Connected Vehicle Pilot Deployment Program Phase 2

System Design Document (SDD) – Tampa (THEA)

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Connected Vehicle Pilot System Design Document – Tampa (THEA): i

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suite of applications that utilize vehic congestion, improve safety, and dec roadside alerts, transit mobility enha planning for the CV pilot including th	ay Authority (THEA) Connected Vehicle (CV) Pilot cle-to-infrastructure (V2I) and vehicle-to-vehicle (V crease emissions. These CV applications support incements, and pedestrian safety. The pilot is con- e concept of operations development. Phase 2 is instration of the applications developed as part of	2V) communication technology to reduce traffic a flexible range of services from advisories, ducted in three phases. Phase 1 includes the the design, development, and testing phase.
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1 Introduction

1.1 Purpose of the System Design Document

The System Design Document (SDD) describes the detailed design of the subsystems and modules and provides traceability from System Requirements Specification (SyRS) to system design. The SDD provides the connection between the system implementation and how the Tampa CV Pilot meets its requirements.

1.2 Document Overview

The document describes the purpose of each subsystem/component and its function within the overall system and how each subsystem/component will be built. The system design is divided into the infrastructure and in-vehicle subsystems. The infrastructure design includes the Roadside Units (RSU), the Master Server, and the pedestrian applications. The in-vehicle design includes the Onboard Units (OBU).

1.3 Assumptions

The following statements are assumptions on which the design is based:

- There is ample bandwidth to transfer data from the OBUs via DSRC, Personal Information Devices (PID) via WiFi to RSUs.
- There is ample bandwidth to transfer data from the RSUs via WiFi or Fiber to the Master Server.
- There is ample bandwidth to update OBUs apps from the RSU via DSRC.
- The traditional detection devices such as radars are adequate to provide the additional vehicle detection for the Intelligent Signal System (I-SIG) work as designed.
- The commercial SCMS POC will be delivered on schedule and be able to provide as promised features.
- The 5.9 DSRC spectrum will remain fully available for implementation as designed without limitation by changing regulations/rules.
- The Public Data Hub will facilitate a demark connection point that is internet based and does not require infrastructure beyond that of the Pilot's secure internet connection. "Demark connection point" is a common term that identifies where one system ends and another starts. The Public Data Hub will provide information and coordination for this connection, i.e.: IP Address, login info, upload speeds etc.

1.4 Constraints

The following statements have been identified as constraints of the system:

- There is fixed bandwidth to transfer data and apps.
- Adjusting signal timing to address intersection issues will be limited by the existing signal timing plan. Expected Fiber Optic cable is delayed until after pilot completion. Project is now constrained to bandwidth available via cellular modems.
- Budget is a constraint. Should unexpected design developments result in budget shortfall, there is no additional Federal budget and design would either be reduced, or additional local funding partners developed.
- Schedule is constrained by Grant guidelines and includes multiple, interdependent staged deliverables.
- Florida Law and FDOT policy on traffic control devices being on pre-approved product list constrain the ability to make rapid changes in infrastructure – mitigated by advance coordination with FDOT Test Evaluation and Research lab (TERL).

1.5 Risks

The risks are documented and maintained in the Risk Register.

- Inadequate bandwidth to transfer data from the OBUs via DSRC
- Inadequate bandwidth to transfer data from Personal Information Devices (PID) via WiFi to RSUs.
- Inadequate bandwidth to transfer data from the RSUs via Wi-Fi or Fiber to the Master Server.
- Inadequate bandwidth to update OBUs apps from the RSU via DSRC.
- The traditional detection devices such as radars are inadequate to provide the additional vehicle detection for the Intelligent Signal System (I-SIG) work as designed.
- The commercial SCMS POC will not be delivered on schedule
- The commercial SCMS POC will not be able to provide as promised features.
- The 5.9 DSRC spectrum does not remain fully available for implementation as designed without limitation by changing regulations/rules.
- The Public Data Hub will not facilitate a demark connection point that is internet based.

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2 System Description

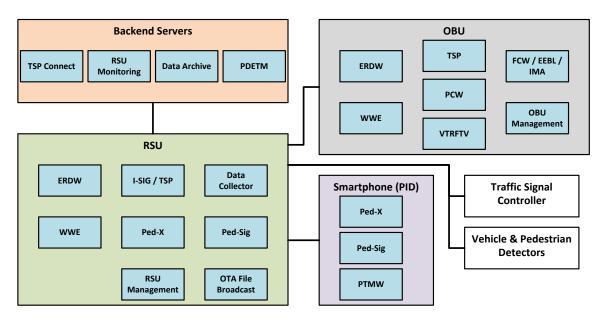
2.1 Physical System Overview

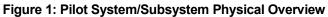
The Pilot system is divided into four major subsystems:

- Backend servers (i.e., Master Server)
- RSUs
- OBUs
- PIDs

These subsystems have both independent modules and integrated modules. Independent modules are those modules that execute functions specifically for that subsystem. Integrated modules are those modules which communicate with other subsystems in order to complete its function (e.g., ERDW).

Figure 1 below depicts the physical breakdown of the subsystems and applications of the Pilot system.





The THEA CV System has functionality distributed across backend servers, roadside units (RSUs), onboard units (OBUs), and smartphones (PIDs). RSUs interface with Traffic Signal Controllers as well as Vehicle & Pedestrian Detectors. (Source: Siemens). For the "soft launch", CUTR logs into the Master Server through VPN to manually retrieve data, such as records of BSMs. Once the data is examined for proper content and format, the manual data collection process is automated through command scripts executed by the master server. System functionality in the tables below references sections of the System Design Document or is COTS per 8.1 of the Comprehensive Acquisition Plan.

Table 1: Backend Server Functions

Functionality	Description
TSP Connect	Siemens application granting or denying priority service requests from buses (COTS)
RSU Monitoring	Siemens application monitoring connected RSUs for basic operation and health (COTS)
Data Archive	Siemens application storing log data received from RSUs (COTS)
PDETM	See application description 2.1.11

Table 2: RSU Functions

Functionality	Description
ERDW	See the application description in Section 2.1.1
WWE	See the application description in Section 2.1.2
I-SIG / TSP	See the application description in Sections 2.1.10 and 2.1.6
Ped-X / Ped-Sig	See the application description in Section 2.1.4
Data Collector	Application responsible for collection of log data (e.g. BSMs, TIMs, alerts, etc.) and forwarding of that data to the backend server (COTS)
RSU Management	Support functions for managing basic RSU operations such as broadcast of MAP and SPaT messages. Functions for application lifecycle management, health monitoring, and browser- based user access. Functions for configuration of core RSU services such as Message Forwarder. Functions for log collection and software update management. (COTS)

Table 3: OBU Functions

Functionality	Description
ERDW	See the application description in Section 2.1.1
WWE	See the application description in Section 2.1.2
TSP	See the application description in Section 2.1.6
VTRFTV	See the application description in Section 2.1.5
FCW / EEBL / IMA	See the application description in Sections 2.1.7, 2.1.8, 2.1.9
PCW	See application description in Section 2.1.12
OBU Management	Support functionality for managing basic OBU operations such as broadcast of BSM messages. Functions for application lifecycle management, health monitoring, and human machine interface. Functions for log collection and software update management. (COTS)

Table 4: Smartphone Functions

Functionality	Description
Ped-X	See the application description in Section 2.1.4
Ped-Sig	See application description in Sections 2.1.3
PTMW	See application description in Section 2.1.13

The following sections are functional views of the CV Pilot applications.

2.1.1 End of Ramp Deceleration Warning

This app computes a geo location of stopped traffic / vehicle queue based on the longest lane queue length computed by I-SIG. In this case, overlapping I-SIG app estimates the queue length from the

end of the Reversible Express Lane (REL). An Infrastructure Sensor Message (ISM) is generated for the end of the longest lane queue and provided to I-SIG only. The REL is divided into multiple speed zones extending from Twiggs to the Selmon main lanes. Based on the end of the longest queue, the RSU sends a TIM that describes the recommended speed for each zone based on the safe stopping distance from the Florida Driver's License Handbook. As the driver approaches the end of queue, the recommended speed TIM drops to within the safe stopping distance or the posted speed, whichever is lower for that zone.

There is a complementary OBU app that receives the recommended safe speeds as TIMs. The OBU app adjusts the recommended safe speed based on the vehicle's type and sends a message to the HMI for display to the driver.

2.1.2 Wrong Way Entry

The RSU app broadcasts the MAP and Signal and Phasing Timing (SPaT) message. According to J2735 201603, each MAP zone includes an allowed direction of vehicle travel, plus a revocable indication for each zone. In this case, seven lanes are present at the end of the REL. Four are always inbound with a fixed direction and not revocable, therefore the MAP message will always indicate inbound. The reversible lanes will indicate a direction of outbound and indication that each of the three reversible lanes is revocable. The RSU sends the seven MAP locations to the OBU each of which includes the direction, plus an indication of whether each lane is active or revoked as described in SAE J2735_201603. The RSU sends SPaT message for each Revocable zone representing the direction of the Revocable zone by time of day. The OBU issues an alert to a driver approaching the inbound lanes from the wrong direction. A secondary, non CV detection point is used as confirmation of continued counter-flow entry and generates a warning to the TMC. The RSU app provides an alert to the TMC that a vehicle is going the wrong way and provides a warning to upstream RSUs that a vehicle is approaching going the wrong way. The RSUs' app begins broadcasting wrong way vehicle ahead. OBU equipped vehicles receive the wrong way vehicle ahead message and HMI warns the driver of the approaching wrong way vehicle. The HMI issues an alert to a driver approaching a lane that has been revoked at that time of day according to the SPaT message.

2.1.3 Mobile Accessible Pedestrian Signal

PED-SIG is composed of two software objects; one on the pedestrian information device (PID) and the second on the RSU. The pedestrian points the PID in the direction they want to cross the intersection and presses the Cross button. The PID app generates a request to the RSU for a pedestrian call. The RSU app interprets the PID app request, sends the command to the signal controller, receives concurrence from the Signal controller, and sends a confirmation to the PID app.

2.1.4 Pedestrian in a Signalized Crosswalk

Ped-X is an application that receives Pedestrian Safety Messages (PSMs) from LIDAR and sends them via DSRC to warn vehicles when pedestrians, within the crosswalk, are in the intended path of the car. The complementary Personal Information Device (PID) application receives BSMs from the RSU via WiFi that a vehicle is approaching a crosswalk. As the PID GPS is unpredictable, the feasibility of warning the pedestrian that they may collide with a vehicle will be analyzed. Equipped vehicles HMI using the PCW app warn the driver of a potential crash course with pedestrian in the crosswalk. There is no detection of unequipped vehicles as defined by the scope of the project.

2.1.5 Vehicle Turning Right in Front of Transit Vehicle

VTRFTV HMI warns the streetcar operator of an equipped vehicle turning right at the intersection the streetcar is approaching and warns the equipped vehicle driver, they are on a potential crash course with the streetcar. VTRFTV uses the BSMs sent and received from the equipped vehicle and equipped streetcar to determine if the vehicle/streetcar are on a potential collision trajectory.

2.1.6 Transit Signal Priority

TSP is part of a larger suite of applications called Multimodal Intelligent Transportation Systems Signal (MMITSS) available on the Open Source Application Development Portal (OSADP). As part of this application suite, TSP must be used in conjunction with I-SIG. TSP provides signal priority to transit at intersections and along arterial corridors. The OBU sends a Signal Request Message (SRM) to the RSU. The RSU forwards that to the Transit Server (i.e., housed on the Master Server) at the TMC. The Transit Server determines if the bus is behind schedule. If the bus is behind schedule, the SRM is returned from the Transit Server to the RSU. The RSU determines priority of all SRMs received from all approaching vehicles, and then selects the controller phase via NTCIP objects to extend the green, allowing the bus to proceed through the intersection. At the same time, RSU sends the Signal Status Message (SSM) to the approaching vehicles to inform which has received priority to extend the green and which vehicles have been denied priority.

2.1.7 Forward Collision Warning

Forward Collision Warning (FCW) is an application where alerts are presented to the trailing driver in order to help avoid or mitigate the severity of potential crashes into the rear end of other vehicles on the road. Forward crash warning responds to a direct and imminent threat ahead of the host vehicle. FCW works lane by lane.

When two equipped vehicles interact, FCW provides a driver alert by calculating potential crash trajectories, if the right conditions occur as follows: one vehicle following the other; the lead vehicle brakes causing the closing distances to decrease (as calculated) to warrant an alert of a potential collision.

2.1.8 Emergency Electronic Brake Light Warning

Emergency Electronic Brake Light (EEBL) warning is an application where the driver is alerted to vehicle exceeding preset deceleration in the traffic stream ahead. This alert is received from one or more vehicles in the same lane ahead but not the immediate vehicle ahead. This provides the driver with additional time to look for, and assess situations developing ahead

2.1.9 Intersection Movement Assist

Intersection Movement Assist (IMA) is an application that uses the HMI to warn the driver of a potential collision when two or more vehicles are approaching one another using the relative position, speed and heading of those vehicles. IMA receives BSMs from approaching vehicles adjacent to the vehicle equipped with IMA. If IMA determines there is a high probability of a collision, the HMI warns the driver.

2.1.10 Intelligent Signal System (I-SIG)

I-SIG is part of a larger suite of applications called MMITSS available in the OSADP. I-SIG receives BSMs from vehicles approaching the intersection and local ITS traffic detection devices (e.g., radar or video) to estimate the length of the queue at the intersection. I-SIG determines green times allocated to phases based on the queue lengths estimated.

2.1.11 Probe Data Enable Traffic Monitoring (PDETM)

PDETM receives BSMs, speeds, and traffic counts (traffic volume) from RSUs along a corridor. These RSUs receive BSMs from vehicles traveling along the corridor. PDETM uses these BSMs to calculate travel times along the corridor. PDETM stores the travel times for use in measuring performance of the corridor. PDETM resides on the Master Server.

2.1.12 Pedestrian Collision Warning (PCW)

PCW receives PSMs to calculate potential crashes with pedestrians entering and in the crosswalk at the courthouse. When PCW detects a potential crash, PCW sends an alert to the driver.

2.1.13 Pedestrian Transit Movement Warning (PTMW)

PTMW receives starting/stopping information from equipped buses and streetcars. If a pedestrian equipped with the PTMW app is within a geo-fenced area around the intersection/transit stop, PTMW will provide an informational message to the pedestrian that the vehicle is approaching within the geo-fence, or is departing within the geo-fence based on incremental forward movement of BSM location.

2.2 List of Subsystems and Components

The following table lists the subsystems and components defined in Section 3.

Systems	Subsystem/Component	
Master Server	TSP Connect	
	RSU Monitoring (Concert)	
	Log Data Archive	
	PDETM	
RSU	ERDW	
	WWE	
	MMITSS (I-SIG/TSP)	
	PED-X	
	PED-SIG	
	Log Data Collector	
	RSU Management	
	Over the Air (OTA) Update	
OBU	ERDW	
	WWE	
	TSP	
	VTRFTV	
	PCW	

Figure 2: Subsystems and Components

Systems	Subsystem/Component
	FCW
	EEBL
	IMA
	Log Data Collection
	OTA Update
	OBU Management
Smartphone (PID)	PED-X
	PED-SIG
	PTMW

The existing traffic controllers and traffic management system are not part of the system design, but rather used to collect portions of the research data, such as stops on green, vehicle counts, research signal plans and others.

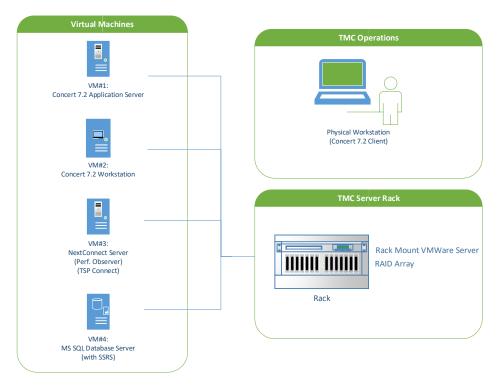
3 Subsystems and Components

3.1 Master Server

The Master Server will be based on the Siemens Sitraffic Concert software which consists of an application server, a NextConnect server, a database server, and at least one workstation. Concert has a modular system design with various application modules. These application modules communicate with each other and subsystem interface via a proprietary middleware. Status information and configuration data is stored in a central data storage. External 3rd party systems can be connected via OCIT-C, OCPI, or NTCIP/TMDD interfaces. Custom business logic can be added to the NextConnect server which is part of Concert.

Concert communicates with connected RSUs via its OCIT-C interface for health monitoring and detector data collection as well as traveler information. NextConnect implements interfaces for the "RSU Log Data Archive" and the "TSP Request Interface".

3.1.1 Hardware Design





The above diagram shows the virtual machines hosted on a rack mount VMWare server with RAID hard disk array. The detailed specifications for each are as follows:

Hardware / Virtual Machine	Specification
Physical VMWare Rack Server Host	CPU Cores: 12 CPUs x 1.9 GHz
	Sockets: 2
	Cores per Socket: 2
	Number of NICs: 4
	Memory: 20 GB
	Storage: 200 GB SSD; 10 TB HDD;
	Note: This host will be part of VMWare HA
	Cluster of vCenter ¹
VM#1: Concert App. Server	Guest OS: Microsoft Windows Server 2012 (x64)
	CPU: 4 vCPU
	Memory: 4 GB
	Storage: 100 GB
VM#2: Concert Workstation	Guest OS: Microsoft Windows 7 (x64)
	CPU: 4 vCPU
	Memory: 2 GB
	Storage: 100 GB
VM#3: NextConnect Server	Guest OS: Microsoft Windows Server 2012 (x64)
(Data Log Archive + TSP)	CPU: 4 vCPU
	Memory: 8 GB
	Storage: 100 GB + 200 GB SSD + 7 TB HDD
VM#4: MS SQL Database Server	Guest OS: Microsoft Windows Server 2012 (x64)
(with SSRS)	CPU: 4 vCPU
	Memory: 6 GB
	Storage: 2 TB
Physical Workstation	Microsoft Windows 7 (x64)
	CPU: Core i5-6400
	Memory: 4 GB
	Storage: 100 GB

Figure 4: Key Specifications of Hardware and Virtual Machines

The VMWare Host server has a RAID hard disk array which will ensure data availability. Also, it will use VMWare HA in order to provide failover of virtual machines. Failover is an automatic restart of virtual machines on redundant hardware in the event of failure.

All of the above VMs and physical machines are considered part of the Master Server. In addition, VM#3 also takes on the role of the Transit Server via the NextConnect TSP component (see also section 3.1.2.2).

¹ VMWare HA Cluster is an available feature of the VMWare vSphere product line. It supports high availability of virtual machines.

3.1.2 Software Design

3.1.2.1 Concert

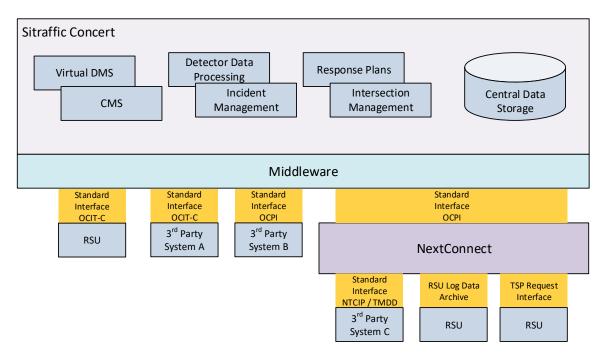


Figure 5: Siemens Concert System Architecture

The above figure depicts the Siemens Sitraffic Concert architecture as it applies to the THEA CV pilot project. Since Sitraffic Concert is an existing Siemens product with a vast number of features and interfaces, not all details can be shown here. Sitraffic Concert is in use in the United States and Europe. The product will be integrated and tested as part of the THEA CV Pilot.

Concert has modular system architecture with various application modules. These application modules communicate with each other and subsystem interface via a proprietary middleware. Status information and configuration data is stored in central data storage. External 3rd party systems can be connected via OCIT-C, OCPI, or NTCIP/TMDD interfaces.

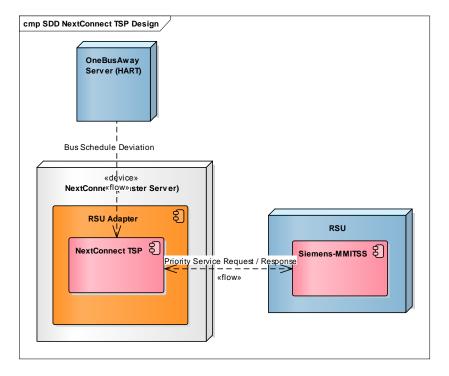
Concert communicates with connected RSUs via its OCIT-C interface for health monitoring and detector data collection. It is via this interface that Concert receives point speed data and equipped vehicle counts from RSUs. See ICD: interface 23014 "Traffic Situation Data".

The OCIT-C interface receives application status information from connected RSUs. See ICD: interface 23018 "RSU Application Status". The OCIT-C interface is also used to send RSU firmware updates to connected RSUs. See ICD: interface 23019 "Application Install / Upgrade".

Project-specific add-on interfaces are typically implemented using the NextConnect subsystem of Concert. In the case of the THEA CV Pilot these interfaces are the "RSU Log Data Archive" and the "TSP Request Interface".

"RSU Log Data Archive" implements the "RSU Data Logs" flows from the RSUs in order to support CV data archiving. See ICD: interface 23030 "RSU Data Logs". This functionality is described in more detail in section 3.1.2.3 of this document.

The "TSP Request Interface" implements the "priority service request/response" flow from the RSU. This flow requests permission to grant an approaching bus priority service at a specific intersection. The response contains the "grant" or "reject" decision made by NextConnect. See ICD: interface 23013 "Signal Priority Service Request". This functionality is described in more detail in section 3.1.2.2 of this document.



3.1.2.2 NextConnect TSP (Transit Server)

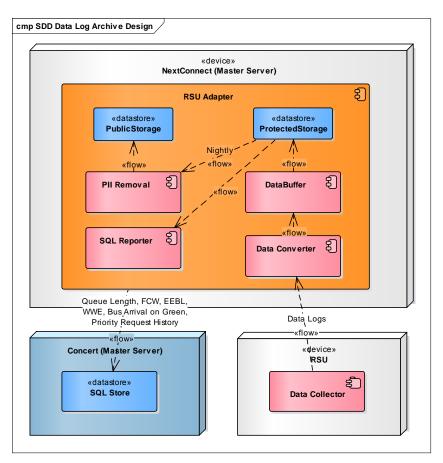
Figure 6: NextConnect TSP Software Design

NextConnect is a modular Siemens software platform. A module in NextConnect is called an "adapter". The Siemens RSU Adapter is responsible for handling communication and business logic related to connected RSUs.

The NextConnect TSP component is part of the RSU Adapter and implements the decision logic for determining if a bus requesting priority service at an intersection is behind schedule. As such it incorporates the role of the Transit Server. It implements the "Priority Service Request / Response" flow. See ICD: interface 23013 "Signal Priority Service Request".

NextConnect TSP receives current bus schedule deviation from HART's OneBusAway server. It polls the server for updated information at regular intervals and caches the result. NextConnect TSP

receives a priority service request from Siemens-MMITSS which includes the bus ID, estimated time of arrival (ETA) and intersection ID. Using this information, it looks up the current schedule deviation of the bus received from the OneBusAway server. If the bus is behind schedule the priority service request is granted. A configurable threshold value (behindScheduleSeconds) ensures that small schedule deviations due to normal fluctuations in traffic don't immediately result in a granted priority service request. See ICD: interface 23033 "Transit Vehicle Status".



3.1.2.3 Data Log Archive

Figure 7: Log Data Archive Software Design

The Data Converter receives the Data Logs from the RSUs. It maintains the connection with connected RSUs and controls the flow of incoming Data Logs. See ICD: interface 23030 "RSU Data Logs".

Data Converter passes the Data Logs on to the DataBuffer component. DataBuffer will combine the data logs into batches and save them to protected storage. Batching is done in order to reduce stress on the storage system. Separate batches are created for each source device where data logs originated from. This will result in data logs coming from the same OBU to be stored next to each other even if they were received via different RSUs. Similarly, data logs originating from the same PID

will be stored together. DataBuffer will also perform deduplication of identical OBU / PID data logs received from multiple RSUs.

ProtectedStorage

The ProtectedStorage is a directory structure on an encrypted file system. Only authorized users will have read access to the protected storage. The directory structure follows this schema: //protected_storage_path>/<year>/<month>/<day>/<hour>/.

Table 5: Protected Storage

<protected_storage_path></protected_storage_path>	Root directory of the protected storage
<year></year>	4 digit year when data log was received (e.g. 2017)
<month></month>	2 digit month when data log was received, 01-12 (e.g. 12)
<day></day>	2 digit day of the month when data log was received, 01-31 (e.g. 09)
<hour></hour>	2 digit hour of the day when data log was received, 00-23 (e.g. 13)

Within each directory a GZIP file is created for each source device from where data logs were received during that hour. Files are named according to this schema: <year>_<month>_<day>_<hour>_<ID>.csv.gz

<ID> is one of RSU_<id>, OBU_<id>, PID_<id> depending on type of the source device. <id> is the unique identifier of the corresponding device.

Each GZIP file contains a single CSV file named according to this schema: <*year>_<month>_<day>_<hour>_<ID>.csv*

The CSV file has the following structure:

timestamp, kind, psid, DSRCmsgID, payload timestamp, kind, psid, DSRCmsgID, payload timestamp, kind, psid, DSRCmsgID, payload

With fields meaning:

- timestamp UNIX timestamp in milliseconds since the unix epoch
- kind type of message (in, out, log, pedx::psm, pedx::collisionAlert, obu::data, mmitss::data)
- psid PSID of message (kind equals "in" or "out") or 0 (all other kinds)
- DSRCmsgID DSRCmsgID (kind equals "in" or "out) or 0 (all other kinds)
- payload plain text human readable data (XER encoded WSM message, XML, JSON or any other plain text data format without newline characters)

See also ICD: interface 23030 "RSU Data Logs" for more details on the definition of these fields.

PII Removal

This component removes Personally Identifiable Information (PII) in a nightly batch job. Data of the last 24 hours is read from the Protected Storage and transferred over to the Public Storage.

Of particular concern during this process is any information part of BSMs which can be used as a unique identifier for a particular vehicle. For purpose of the study the BSM of all vehicles will contain a

unique ID in the "id" field of the BSM coreData data frame. This field will be randomized in the public copy by PII Removal.

PII Removal will also reorganize the GZIP file content stored in the public storage area. The protected storage area has data originating from the same OBU collocated inside the same file. PII Removal will combine all data received from any OBU into a single GZIP file. Similarly, all data originating from individual PIDs will be combined into a single GZIP file.

PublicStorage

The PublicStorage is a directory structure in the file system. The directory structure follows this schema: /<public_storage_path>/<year>/<month>/<day>/<hour>/.

Within each directory a GZIP file is created for each source device from where data logs were received during that hour. Files are named according to this schema: <year>_<month>_<day>_<hour>_<ID>.csv.gz

<ID> is one of RSU_<id>, OBU, PID depending on type of the source device. <id> is the unique identifier of the corresponding RSU. Data from all OBUs and all PIDs will be stored in a single GZIP file.

SQL Reporter

The SQL Reporter extracts information from the data logs in the ProtectedStorage and saves it into a SQL database for reporting purposes. The data stored in SQL is anonymous. It includes the following:

- Queue Length estimate as computed by MMITSS
- FCW, EEBL events logged by OBUs (stripped of OBU identifier)
- Wrong Way Entry events detected by traditional vehicle detector
- Bus Arrival on Green / Red events as computed by MMITSS
- Priority Request / Response Events as computed by MMITSS

3.1.2.4 Performance Measure Collection

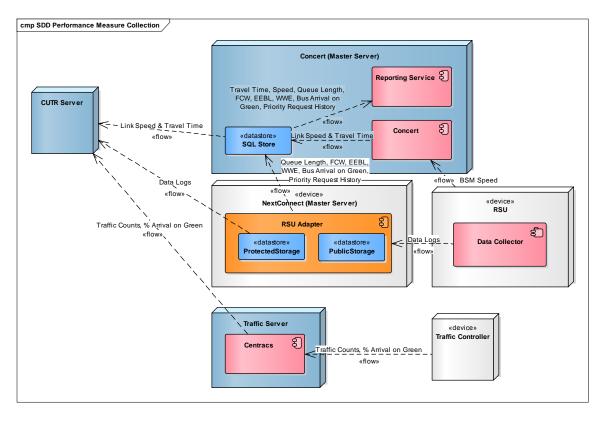


Figure 8: Performance Measure Collection Software Design

The above diagram illustrates how the system collects various performance measures. Ultimately all data used as basis for performance measures is concentrated at the CUTR Server. As described in section 3.1.2.3 of this document NextConnect collects the data logs coming from the RSUs. The CUTR Server accesses to the protected storage area in order to obtain those data logs.

Additional information comes from the Concert Server which hosts a SQL database (Microsoft SQL Server) and Reporting Service (SQL Server Reporting Services). RSUs measure average vehicle speed based on observed BSMs and send this information to Concert. See ICD: interface 23014 "Traffic Situation Data". Concert associated this data with traffic links and calculates link speed and travel time metrics. It saves those in the SQL database from where the data can be access by the CUTR server, which shares data per the Performance Measurement and Evaluation Support Plan.

The Reporting Service allows a user to run a report and specify certain report-specific parameters (e.g. time period). It also allows the user to schedule reports to be created in regular intervals (daily, weekly, or monthly) automatically. Such reporting jobs can also be configured to send the report to a provided email address. Please see further below for a list of supported reports (**Error! Reference source not found.**).

Finally, the existing Centracs traffic control system at the City of Tampa TMC collects traffic counts and percent arrival on green from connected traffic controllers. The CUTR server can access this information from the Centracs system used to manage the traffic signal controllers via NTCIP.

The following table lists all the performance measures defined in the requirements along with the source of the data:

Metric	Source	Comment
delay time	MMITSS Performance	MMITSS measures delay of
	Measures inside Data Logs	equipped vehicles queuing at
		intersections
queue length	MMITSS Performance	MMITSS estimates queue
	Measures inside Data Logs	lengths based on a configured
		CV penetration rate and BSMs.
crashes, conflicts, or near	EEBL, FCW, WWE, VTRFTV,	These events are recorded by
misses	PCW ev	OBUs in their Data Log. CUTR
	ents from OBU Data Logs	server analyzes these events
		and derives the performance
		measure
approaching speed on REL	Point speed from BSMs from	Speed measurement of
	Concert	equipped vehicles passing
		through a virtual detection
		zone (geo-fence).
travel times	Link travel time from Concert	Point speed measurements
		from BSMs are used by
		Concert to compute travel time
		along a road link
travel time reliability indices	Link travel time from Concert	CUTR server uses Concert-
		provided travel times to
		compute reliability indices
percent arrival on green	Centracs report based on	The Econolite Centracs TMC
	traffic controller data	collects available detector calls
		and phase status from
		intersections. Centracs
		supports generation of a report
		for percent arrival on green.
wrong way violation	Incident Log from Concert	Wrong way violation is
		recorded in Concert's incident
		archive
travel time delay on REL	Link travel time from Concert	CUTR server uses Concert-
		provided travel times to
		compute delay
travel time delay on adjacent	Link travel time from Concert	CUTR server uses Concert-
arterial		provided travel times to
		compute delay
approaching speed on Twiggs	Point speed from BSMs from	See "approaching speed on
street toward the REL	Concert	REL" metric

Table 6: Performance Measures and their Data Source

Metric	Source	Comment
vehicle delay time at the crosswalk	Point speed from BSMs from Concert	CUTR server uses Concert- provided travel times to compute delay
pedestrian delay time at the crosswalk	PSMs from RSU Data Log	CUTR server computes pedestrian delay at courthouse crosswalk from analysis of PSMs
vehicle's speed approaching the crosswalk	Point speed from BSMs from Concert	See "approaching speed on REL" metric
bus travel time through the deployment region	SRMs from RSU Data Log	CUTR server analyzes SRMs which are received by RSUs at intersections along the bus route and computes bus travel time between intersections
bus percent arrival on schedule	SRMs, SSMs from RSU Data Log	CUTR server analyzes SRMs received and corresponding SSMs sent out. SSMs contain granted/rejected status of priority request. Requests are only granted when the bus was behind schedule.
bus percent arrival on green	MMITSS performance measure from SRM, bus BSM, signal phase status	MMITSS monitors the bus BSMs and tracks the bus as it travels through the intersection. Bus arrived on green if it didn't stop due to a red light travelling through the intersection.

Table 7: Reports Supported by the Master Server

Report	Interval	Description
Travel Time	Daily	Average travel time for 15
		minute and 1 hour time periods
		during a selected day.
	Weekly	Average travel time for 1 hour
		time periods averaged across
		the workweek (Mo – Fr) and
		the weekend (Sa – Su).
	Monthly	Average travel time for 1 hour
		time periods averaged across
		the workdays (Mo – Fr) and the
		weekends (Sa – Su) of the
		month.

Approaching Speed	Daily	Average approaching speed
		for 15 minute and 1 hour time
		periods during a selected day.
	Weekly	Average approaching speed
	,	for 1 hour time periods
		averaged across the workweek
		(Mo - Fr) and the weekend (Sa
		– Su).
	Monthly	Average approaching speed
		for 1 hour time periods
		averaged across the workdays
		(Mo – Fr) and the weekends
		(Sa – Su) of the month.
Queue Length Estimate	Daily	Average queue length for 15
		minute and 1 hour time periods
		during a selected day for each
		intersection approach.
	Weekly	Average queue length for 1
		hour time periods averaged
		across the workweek (Mo – Fr)
		and the weekend (Sa – Su) for
		each intersection approach.
	Monthly	Average queue length for 1
		hour time periods averaged
		across the workdays (Mo – Fr)
		and the weekends (Sa – Su) of
		the month for each intersection
		approach.
CV Safety	Daily	Count of FCW, EEBL, WWE,
		PCW, and VTRFTV alerts per
		location within each 1 hour
		period of a selected day.
	Weekly	Count of FCW, EEBL, WWE,
		PCW, and VTRFTV alerts per
		location within each 1 hour
		period for the workweek (Mo –
		Fr) and the weekend (Sa –
		Su).
	Monthly	Count of FCW, EEBL, WWE,
		PCW, and VTRFTV alerts per
		location within each 1 hour
		period for the workdays (Mo –
		Fr) and the weekends (Sa –
		Su) of the month.
Bus Priority	Daily	Bus % arrival on green
		(B%AoG)

	Number of times priority is requested and granted (Pg) Number of times priority is requested and denied (Pd) Number of times priority is requested, granted, and then denied due to a higher priority (Pgd) B%AoG, as well as count of Pg, Pd, Pgd for each of the 15 minute and 1 hour time periods of a selected day for each
Weekly	intersection. Average B%AoG, Pg, Pd, Pgd for each of the 1 hour time periods averaged across the workweek (Mo – Fr) and the weekend (Sa – Su) for each intersection.
Monthly	Average B%AoG, Pg, Pd, Pgd for each of the 1 hour time periods averaged across the workdays (Mo – Fr) and the weekends (Sa – Su) of the month for each intersection.

3.1.3 Interfaces

Table 8: Interface triple references used by the Master Server

Triple ID	Triple Name	Used By
23013	Signal Priority Service Request	3.1.2.2 NextConnect TSP
23014	Traffic Situation Data	3.1.2.1 Concert
23018	RSU Application Status	3.1.2.1 Concert
23019	Application Install/Upgrade	3.1.2.1 Concert
23030	RSU Data Logs	3.1.2.3 Data Log Archive

3.2 Roadside Unit (RSU)

3.2.1 Hardware Design

The roadside unit selected for this CV pilot is a Sitraffic ESCoS (Ecosystem for Cooperative Systems) by Siemens. It is a commercial off-the-shelf (COTS) product which is compliant to the USDOT RSU Specification and fulfills the specific requirements of the pilot.

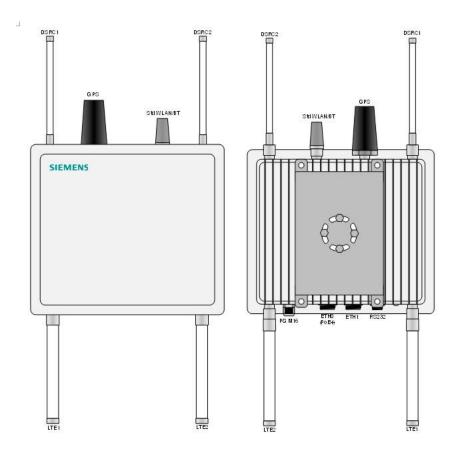


Figure 9: Sitraffic ESCoS Roadside Unit

Table 9: Sitraffic ESCoS Data sheet

Output power (802.11p)	-10 to +23 dBm (CFR 90.210 Emission Mask C)	
Receiver Sensitivity (802.11p)	-97 dBm	
Frequency Band (802.11p)	5.9 GHz	
Operating Modes (802.11p)	Single- and multi-channel operating mode	
Security	HSM for signing of WAVE messages and secure storage of private keys	
GNSS	GPS/GLONASS/Galileo/BeiDou	
	2.0 m CEP position accuracy	
Connectivity	2 x 802.11p 5.9GHz 2 x 10/100 MBit Ethernet 1 x RS232 1 x 802.11 a/b/g/n WLAN 1 x Bluetooth 4.0 1 x LTE	
Operating System	Linux 4.x	
CPU	Dual-Core ARM-Cortex A9 @800MHz	
Memory	1 GB RAM	
Operating Temperature	-40°C to +74°C	
Storage Temperature	-40°C to +85°C	
IP rating	IP67	
Power Supply	PoE+ (802.3at)	
Power Consumption	Тур. 12W	
Mounting	Mounting kit for wall or pole mounting	
Dimensions	270 x 308 x 80 mm	
Weight	4.1 kg (with default antenna set)	
V2x Standards Conformance	ETSI EN 302 571, V2.1.1 ETSI EN 302 636-4-1, V1.2.1 ETSI TS 103097, V1.2.1 ETSI TS 102 636-5-1, V1.2.1 ETSI TS 102 894-2, V1.2.1 ETSI EN 302 637-2, V1.3.2 ETSI EN 302 637-3, V1.2.2 ETSI ITS 103 301, V1.1.1 SAE J2735, MAR 2016 ISO TS 19091, OCT2016 ISO TS 19321, SEP2014	
Communications Security	RSU supports Wi-Fi WPA2 plus TLS encryption via Wi-Fi. RSU supports OpenVPN encryption via LTE.	

3.2.2 Software Design

The following sections describe the software components deployed on the ESCoS RSU.

3.2.2.1 ERDW

3.2.2.1.1 Conceptual Design

The ERDW (end of ramp deceleration warning) application shall provide advance warning to vehicles on the REL driving inbound. The HMI warning shall recommend a safe speed which will allow the vehicle to stop before it reaches the end of the queue / stopped traffic. The following graphic shows 2 examples to illustrate the concept.

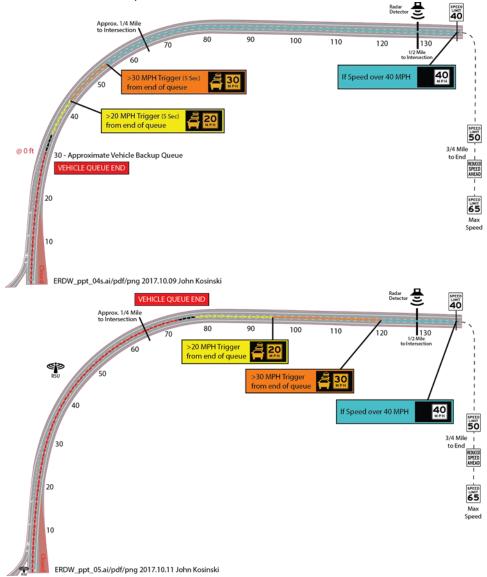


Figure 10: ERDW concept of speed recommendation zones for 2 traffic situations

The top example shows a situation with a short queue of vehicles waiting for green at the intersection of Twiggs & Meridian. In this situation the RSU would broadcast a series of recommended speed zones which apply to road segments of the REL. Each zone has a recommended speed and speeds decrease along the path of a vehicle from one zone to the next until the final zone is reached.

The system will use 3 speed zones. The 40 MPH speed zone represents the point along the REL from where the 40 MPH speed limit is posted until the end of the ramp at the intersection. The other 2 speed zones are overlaid and represent recommended speeds of 30 MPH and 20 MPH. Speed zone length and location are configurable on the RSU by defining the content of the TIM being broadcast for this queue length.

The second situation in above figure shows a longer queue. The speed zones are shifted back / upstream accordingly. The locations of the speed zones for this second situation are defined as part of the TIM associated with the queue length. The RSU is configured to select the speed zone TIM appropriate for a particular queue length from the ERDW application configuration.

In order to have the greatest amount of flexibility it was decided that the ERDW application will allow configuration of arbitrary TIM messages. Each TIM describes the series of speed recommendation zones that ERDW shall broadcast for a specific traffic situation, i.e. when the current queue length is within a certain range. ERDW will pick the appropriate TIM to broadcast based on the current queue length and its configuration.

ERDW supports configuration of queue length ranges (min and max) and their associated TIM to broadcast when the current queue length is within the range. Min and max values for each TIM can be configured such that the values overlap with the next TIM for the next traffic situation. This creates a hysteresis which will prevent the broadcast TIM from changing too frequently in case the current queue length is just above the min value for the next traffic situation but still below the max of the current traffic situation.

The current queue length is determined as the maximum queue length across all 4 lanes of the REL (including the right turn lane) as estimated by I-SIG (MMITSS). The speed recommendation zone inside the TIM will apply to all lanes on the REL, irrespective of whether a particular lane has a vehicle queue. This is to safeguard against vehicles suddenly cutting in and out of the queue from and into free flowing traffic, respectively.

For a complete ERDW configuration on the REL the following items will be defined:

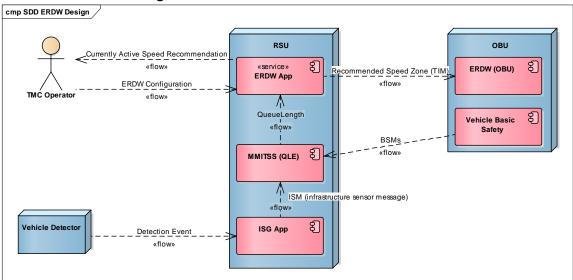
- For a particular traffic situation (x), i.e. queue length range (min and max), the location and length of each of the 3 speed zones shall be defined. The speed zones shall be encoded in a TIM for that traffic situation referred to as TIM(x)
- Traffic situation TIM(x) shall be defined for a sufficient number of situations up to a queue length of 500 meters².

Location and length of a speed zone will follow MUTCD recommendations for advance placement of warning signs (see MUTCD table 2C-4). As an additional constraint, speed zones shall have a

² THEA observes morning peak hour queue lengths of less than 500 meters xxx % of the time

minimum length such that a vehicle travelling at that speed will be within the speed zone for at least 10 seconds.

A total of 6 traffic situations will be configured for queue lengths from 0-100 meters, 100-200 meters, ..., 500 or greater. For each traffic situation the corresponding maximum queue length shall be considered for design of the speed zone location and length.



3.2.2.1.2 Detailed Design



The ERDW application runs as a service on the RSU. The application is implemented using the facilities of the ESCoS software stack. The application consists of a user interface (UI) which supports display of the current queue length as well as the currently selected TIM for broadcast. The UI also enables an authorized user to edit the configuration (see Figure 12).

SIEMENS Ingenuity för life	RSU Control Application		
Status Network Wireless	GPS Monitor ITS Extra	a System Extension	
Queue Length Current TIM	11 Tim2.xml Get Tim		
		Max	TIM File
Configuration	9	20	Tim2.xml
	18 Add Row Remove Roy	30 w Revert Save	Tim3.xml
Tim Upload	Choose Files No file chosen Upload		

Figure 12: ERDW application configuration and status UI

The ERDW configuration UI allows a user to set a TIM(x) to be broadcast for a particular traffic situation defined by min and max value of the vehicle queue. The user can add a row to the table for each traffic situation.

The ERDW application receives the currently estimated queue length (QLE) for the REL from MMITSS (I-SIG) through a local inter-process communication (IPC) interface provided by the ESCoS stack. MMITSS estimates queue lengths on intersection approaches monitoring BSMs of vehicles approaching the intersection. See ICD interface 20004, "Vehicle Location and Motion".

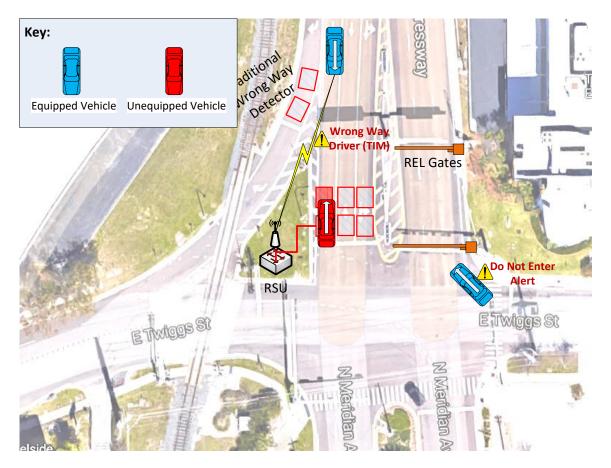
In addition to BSM monitoring the Tampa CV pilot will install one Wavetronix SmartSensor HD radar detector on the REL at a location upstream to capture free flow vehicle data. The detector will be installed in a location along with an RSU³. This information is received by MMITSS in the form of an infrastructure sensor message (ISM) coming from the Infrastructure Sensor Gateway (ISG). The ISM contains the timestamp, location and speed of a single detected vehicle. The ISMs are used along with the BSMs as input for the MMITSS queue length estimation algorithm.

The ISG interfaces with the Wavetronix radar sensor and receives vehicle detection events in realtime. See ICD interface 23016, "Vehicle Entries and Exits" for the corresponding interface specification.

³ The exact location depends on where RSUs will be deployed along the REL which in turn depends on pole locations and availability of power and communication.

The ERDW application uses the received queue length estimation to select a TIM to broadcast based on its configuration. See ICD interface 20014, "I2V Situational Awareness TIM (I2V)".

3.2.2.2 WWE



3.2.2.2.1 Conceptual Design

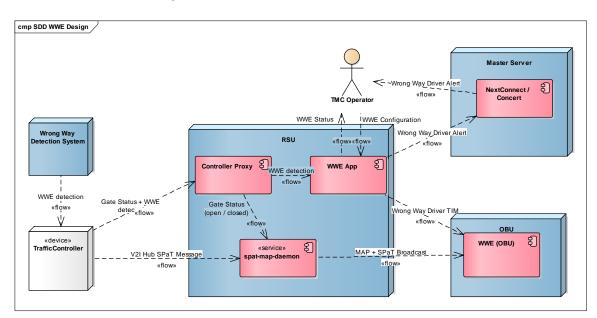
Figure 13: Traditional wrong way driver detection with equipped and unequipped vehicles

Unequipped vehicles going the wrong way would be detected by a radar system (Temple) that covers the 4 possible lanes to drive onto the REL with detection zones. Detection zones on the outbound access lanes aren't needed since the gates are closed when these lanes are closed for traffic.

Detection zones for unequipped vehicles would be located per the "As Built" engineering records such that when a vehicle is detected going the wrong way it is an actual violation with a very high certainty and not a false positive. The red vehicle represents a wrong-way driver entering the REL illegally. The WWE application on the RSU receives the corresponding detection and broadcasts a TIM with a wrong way driver alert. Equipped vehicles driving inbound on the REL receive the alert and warn their driver via the HMI. This is illustrated by the blue vehicle driving southbound on the REL. The TIM would be broadcast continuously for a configurable amount of time.

The OBU of an equipped vehicle will be able to determine that a wrong way violation is imminent or highly likely based on the vehicle's current trajectory. This is illustrated in above figure by the blue vehicle making an illegal right turn when the gates are closed. When the OBU determines that the vehicle is on a trajectory to turn into a closed lane the HMI will warn the driver (see also section 3.3.2.2).

An equipped vehicle detects the wrong way violation based on the MAP message broadcast for the intersection. The OBU detects that the vehicle is approaching an ingress lane going the wrong direction when it rather should be using an egress lane. Likewise, the OBU detects that the vehicle is attempting to use a closed lane.



3.2.2.2.2 Detailed Design

Figure 14: WWE Software Design

The WWE application on the RSU receives a wrong way detection event via the local NTCIP traffic controller to which the wrong way detection system is connected to. The interface used to query for the detection event is defined in ICD: interface 23006 "Phase and Detector Status". This interface also defines the SPaT message sent from the traffic controller to the RSU.

The Controller Proxy component serves as a gateway to isolate other components from the details of the traffic controller interface. It is used by the WWE app to receive detection events from the wrong way detection system. It is also used by the SPaT-MAP-Daemon in order to receive the current open/closed status of the gates. The SPaT-MAP-Daemon uses the gate status in order to set the enabled Lanes in the broadcast SPaT message. See ICD: interface 23007 "reversible lane status".

The WWE application sends out a configured TIM message when a wrong way driver is detected by the wrong way detection system. See ICD: interface 20014, "I2V Situational Awareness TIM (I2V)".

The WWE application also notifies the Concert system of the wrong way incident which is displayed to the TMC operator. See ICD: interface 23018 "RSU Application Status".

		shboard F	ield Devices	Traffic data	Analysis	Control	Service	Settings					
	Messages												
	120		a ≯										
	Detail Edit Stop M		Message Combine										
as													
	Default Sho	rt Roadworks	Incidents	Events O	perator Comb	inations	1						
	State	Name	Editorial	GIS Visualize	Source	Туре	Subtype	Severity	Category	From V	To	Responseplans	Confirm En
	Active	Incident			RSU	Incident	unknown	Level 2		06/07/2017 5:34 PM			
	A Over	Incident			RSU	Incident	unknown	Level 2		06/07/2017 3:54 PM	06/07/2017 3:54 PM		
rchive Search	A Over	Incident			RSU	Incident	unknown	Level 2		06/07/2017 3:54 PM	06/07/2017 3:54 PM		
	Over	Incident			RSU	Incident	unknown	Level 2			06/07/2017 2:50 PM		
formation Display	Over	Incident			RSU	Incident	unknown	Level 2			06/07/2017 2:49 PM		
	Over 0	Incident			RSU	Incident	unknown	Level 2			06/07/2017 2:09 PM		
insport	Over	Incident			RSU	Incident	unknown	Level 2			06/07/2017 2:09 PM		
	Over	Incident			RSU	Incident	unknown	Level 2			06/07/2017 2:05 PM		
	Over	Incident			RSU	Incident	unknown	Level 2			06/07/2017 2:05 PM		
	A Over	Incident			RSU	Incident	unknown	Level 2			06/07/2017 9:49 AM		
	Over Over	Incident			RSU	Incident	unknown	Level 2			06/06/2017 5:58 PM		
		Incident			RSU	Incident	unknown	Level 2			06/06/2017 5:02 PM		
	Over Over	Incident Incident			RSU RSU	Incident	unknown unknown	Level 2			06/06/2017 10:54 AM		
						Incident		Level 2			06/06/2017 10:20 AM		
	Not Commed	DO-KAVENEL		×	concert	Incoent	WING	Level 2 (Medium)		05/05/2017 10:21 PM			
	Over Not Confirmed			Subtype: un	RSU Concert known State	Incident Incident : Active	Unknown Wind	Level 2 Level 2 (Medium)		06/06/2017 10:17 AM 03/03/2017 10:21 PM	06/06/2017 10:17 AM		_
	Source: RSU	Severity: Lev											
	Source: RSU Description:	-											
	Source: RSU	-											
	Source: RSU Description: Wrong way ent	ry		TM No Padia	a Timo (Stat								
	Source: RSU Description: Wrong way ent Validity: Fro	ry m Jun 7, 201		PM No Endin	g Time (Stat	;e)							
	Source: RSU Description: Wrong way ent	ry m Jun 7, 201		PM No Endin	g Time (Stat	ce)							
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	Source: RSU Description: Wrong way ent Validity: Fro	ry m Jun 7, 201		PM No Endin	g Time (Stat	:e)							
	Source: RSU Description: Wrong way ent Validity: Fro	ry m Jun 7, 201		PM No Endin	g Time (Stat	ce)							
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	Source: RSU Description: Wrong way ent Validity: Fro	ry m Jun 7, 201		PM No Endin	g Time (Stat	ce)							
	Source: RSU Description: Wrong way ent Validity: Fro	ry m Jun 7, 201		PM No Endin	g Time (Stat	ce)							

Figure 15: Active Wrong Way Incident on the Concert UI

SIEMENS Ingenuity for life	RS	U Control Application	English
Status Network Wireless	GPS Monitor ITS Ext	a System Extension	
TIM Interval (msec)	1000		
TIM Duration (msec)	10000		
TIM Timeout (msec)	1800000		
TIM send attempts fail reporting threhold	3		
TIM file storage path	/var/lib/its/us/		
	Apply Revert		
Installed Messages		•	
	Edit Add	Delete	
Status	No detector is configured	and thus no TIM is sending.	

Figure 16: WWE Application Configuration and Status

The above figure shows the WWE application UI screen which supports configuration of WWE and displays the current application status. The Interval configures the time interval between repeated broadcasts of a TIM (e.g. 1 second). The Expiration field configures the amount of time that a wrong-way TIM will be broadcast after the wrong-way driver detection occurred (e.g. 60 seconds). Installed Messages shows the TIMs configured to be broadcast in the event of wrong-way detection.

The SPaT-MAP-Daemon is a Siemens core application which processes the V2I Hub SPaT message received from the traffic controller. See ICD: interface 23006 "Phase and Detector Status". The SPaT-MAP-Daemon broadcasts MAP and SPaT messages. See ICD: interface 20008 "Intersection Geometry" and interface 43013 "Intersection Status", respectively.

See section 3.3.2.2 in this document for a discussion on how the WWE (OBU) application uses the TIM, MAP, and SPaT messages received to warn the driver using the HMI.

3.2.2.3 MMITSS

3.2.2.3.1 Conceptual Design

The Multi-Modal Intelligent Traffic Signal System (MMITSS) is innovative traffic control software developed by the University of Arizona within the department of Systems & Industrial Engineering under the supervision of Professor Dr. Larry Head. The software has been funded by the Connected

Vehicle Pooled Fund Study (CV PFS) and has been published on the Open Source Application Development Portal (OSADP⁴).

The conceptual design of MMITSS as used in this CV pilot is described in [5], specifically in section 4.5 of that document.

The Tampa CV pilot uses the MMITSS applications I-SIG (Intelligent Traffic Signal Control), TSP (Transit Signal Priority), and PED-SIG (Pedestrian Mobility) as defined in the Arizona MMITSS architecture. Usage of PED-SIG is further described in sections 3.2.2.4 and 3.4.2.1. I-SIG and TSP usage is further described in the next section.

3.2.2.3.2 Detailed Design

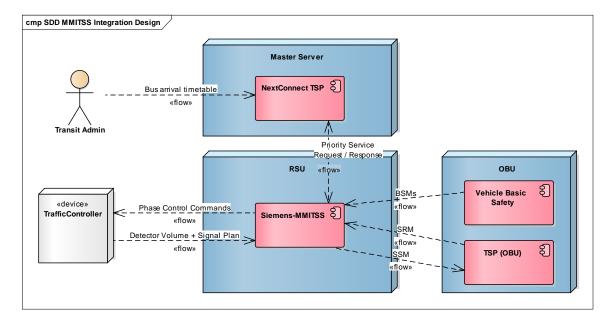


Figure 17: Software Design of MMITSS Integration into ESCoS RSU

MMITSS is existing software and as such comes with an existing software design. See [6] for details on the MMITSS software design.

MMITSS v1.1 was written to run on standard Ubuntu Linux. Prior versions run on Savari RSUs (and OBUs). For the CV Pilot it is necessary to port this software to run on a Siemens ESCoS RSU. Furthermore, MMITSS has to be updated to use SAE J2735_201603 instead of the 2009 revision of the standard. This creates a derivative work tentatively called "Siemens-MMITSS".

Siemens-MMITSS includes all of the following processes defined in the MMITTS Detailed Design document [6]:

• MRP_EquippedVehicleTrajectoryAware

⁴ <u>https://itsforge.net/</u>

- MRP_PerformanceObserver
- MRP_PriorityRequestServer
- MRP_Priority_Solver
- MRP_TrafficControl
- MRP_TrafficControllerInterface

Siemens-MMITSS interfaces with the traffic controller via NTCIP in order to receive information about the controller configuration, current signal plan, and vehicle calls and volume from detectors. It then uses phase control commands (i.e. phase calls, holds, omits, and force offs) to control the phase execution. See ICD: interface 23006 "Phase and Detector Status" and interface 23013 "Signal Priority Service Request".

Siemens-MMITSS receives BSMs from OBUs and estimates queue lengths based on monitoring each vehicle's speed and location as it approaches the intersection. This queue length is used as input to I-SIG for optimizing the phase time allocation. See ICD: interface 20004 "Vehicle Location and Motion".

Siemens-MMITSS also receives priority service requests via SRMs (signal request messages) from OBUs of equipped buses. See ICD: interface 20009 "Local Signal Priority Request".

Priority service requests are sent to the transit server first. At the master server the NextConnect TSP component determines if the bus is behind schedule based on the current bus schedule adherence. If the bus is behind schedule the request is granted and otherwise rejected. See ICD: interface 23013 "Signal Priority Service Request". The design of NextConnect TSP is further described in section 3.1.2.2 of this document.

If the priority service request is granted by the NextConnect TSP then Siemens-MMITSS processes it along with other granted requests in the TSP component. For all received SRMs Siemens-MMITSS adds a corresponding entry to the SSM (signal status message) and informs the TSP (OBU) application the priority response status. See ICD: interface 20009 "Local Signal Priority Request".

The design of the TSP (OBU) application is further described in section 3.3.2.3 of this document.

3.2.2.4 PED-SIG

3.2.2.4.1 Conceptual Design

The CV pilot PED-SIG application is based on the MMITSS PedApp. See [6] section 5.5.4 "Nomadic MMITSS Application (MMITSS PedApp)" for details.

3.2.2.4.2 Detailed Design

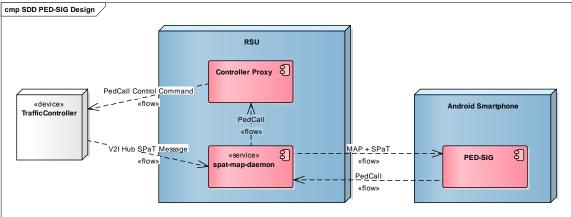


Figure 18: PED-SIG Software Design

The MMITSS PedApp uses a custom format for representing the crosswalk geometry. See [6] section 5.3.8 "MRP_Ped_MAP_Broadcast" for details. The CV pilot improves this design by sending a J2735 MAP message containing crosswalk geometry to PED-SIG. PED-SIG processes the MAP message and extracts relevant crosswalk geometry and signal group IDs. Crosswalks are represented in the MAP message in accordance to [7].

The MMITSS PedApp uses a custom format for representing the pedestrian signal phase and timing status. The CV pilot improves this design by sending the same J2735 SPaT message which I broadcast to vehicles also to PED-SIG. PED-SIG processes the SPaT message and extracts relevant pedestrian signal status and timing information.

PED-SIG receives the MAP and SPaT messages from the SPaT-MAP-Daemon. See ICD: interface 23026 "Intersection Geometry" and 23027 "Intersection Status". PED-SIG allows a user to request walk (pedestrian call) via the smartphone when it is near the crosswalk very much like pushing a button on a pole. PED-SIG sends the pedestrian call to the spat-map-daemon which uses the Controller Proxy component to forward the call to the NTCIP traffic controller. See ICD: interface 23028 "Pedestrian Call" and interface 23013 "Phase Control and Detector Status".

See also section 3.4.2.1 PED-SIG in this document for a more detailed description of the PED-SIG smartphone application.

3.2.2.5 PCW / PED-X / PTMW

3.2.2.5.1 Conceptual Design of PCW

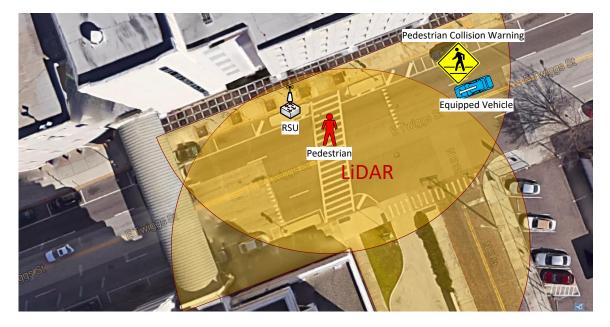


Figure 19: LiDAR Pedestrian Detection triggers a Pedestrian Collision Warning (PCW)

The PED-X application on the RSU is connected with a Pedestrian Detection System which is based on LiDAR. The system is going to be deployed at the unsignalized crosswalk across Twiggs Street near the courthouse. 2 LiDAR sensors scan the cross walk and adjacent sidewalk area from 2 opposite locations.

The LiDAR system is able to accurately measure a pedestrian's location and track their movements. The LiDAR system converts this information into Personal Safety Messages (PSMs) for each tracked pedestrian and sends them out to equipped vehicles via the RSU.

The pedestrian collision warning (PCW) app on the OBU receives the PSMs and uses the vehicle's location and trajectory to calculate a pedestrian collision threat. The HMI warns the driver with a pedestrian collision warning. See section 3.3.2.4 in this document for more details on the OBU PCW application.

The conceptual design of PED-X and PTMW is covered in section 3.4.2.2.

3.2.2.5.2 Detailed Design

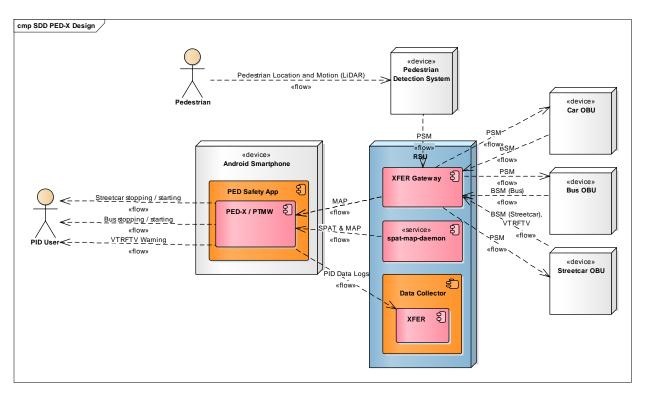


Figure 20: PED-X Software Design

The LiDAR Pedestrian Detection System uses the XFER interface on the RSU to send PSMs. See ICD: interface 23008 "Personal Location". The RSU component XFER Gateway receives the PSMs and sends them out via WAVE to nearby OBUs. See ICD: interface 20012 "Proxy Personal Location".

The XFER Gateway also receives BSMs from nearby OBUs via WAVE. See ICD: interface 20004 "Vehicle Location and Motion". It forwards those BSMs to the pedestrian safety app on nearby smartphones connected via WiFi to the RSU. See ICD: interface 23012 "Proxy Vehicle Location and Motion for PID". The spat-map daemon on the RSU sends SPAT and MAP messages to the smartphone as well. See ICD: interface 23026 "Intersection Geometry" and 23027 "Intersection Status".

PED-X / PTMW app is included in Figure 20 in order to illustrate the RSU side of those PID applications. For a detailed discussion of the PED-X / PTMW app interfaces with the PID User see section 3.4.2.2 of this document. For a detailed discussion of the PID data log flow see section 3.2.2.6.

3.2.2.6 Data Log Collector

3.2.2.6.1 Conceptual Design

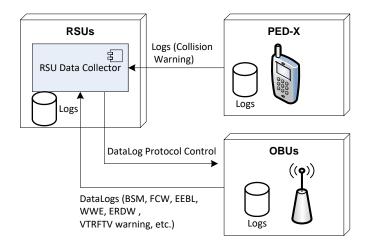


Figure 21: Data Log Collector Concept

OBUs collect log data. The data collected is specified in appendix 7.1 in this document. OBUs will send the collected data via WAVE to RSUs. Due to the fact that OBUs aren't always in radio range of an RSU the log data is stored on the OBU until it can be sent. This also addresses the problem that the communication bandwidth available to a single OBU will depend on at least a few factors such as:

- Other RSUs and OBUs using the same channel
- Signal strength

It is anticipated that data collection rate and transfer rate will vary such that at times data will be collected at a higher rate than it can be transferred to a nearby RSU. There may also be times when data collection rate is lower than the data transfer rate which will allow the OBU to "catch up".

Available bandwidth for data transfer from OBUs to RSUs is a big concern. The total bandwidth will have to be shared among all OBUs within radio range possibly bringing the bandwidth down to a trickle. The design anticipates this situation and allows the RSUs to change certain protocol parameters (e.g. minimum time between data log messages) used by OBUs via log data control messages.

The PED-X smartphone application also collects logs which contain the smartphone location and collision warnings which were computed by PED-X based on that location. These warnings are only computed but not displayed to the smartphone user for safety reasons as well as because the smartphone location is inherently very inaccurate. Additionally, PED-X also collects logs whenever the "bus (streetcar) is stopping / starting warning" is issued and when the VTRFTV warning is displayed.

The RSU collects all the received data logs in a local persistent log buffer. This addresses the issue that most RSUs in the CV pilot are connected to the master server via LTE cellular connection which is considered an unreliable communication link. If the LTE connection is temporarily down data logs aren't lost. They will be transmitted later when the LTE connection is back up again.

3.2.2.6.2 Detailed Design

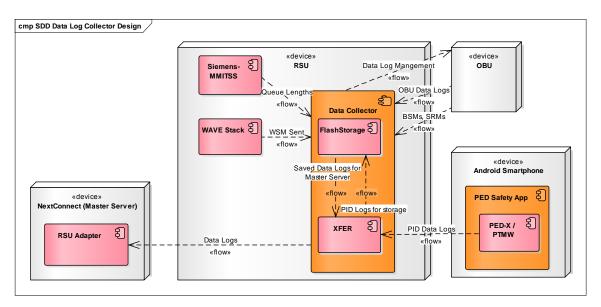


Figure 22: Data Log Collector Software Design

The OBU receives DataLogManagement information via the broadcast WSA containing the DataLog PSID. The OBU will send its data logs to the RSU via an encrypted WAVE connection. See ICD: interface 23015 "OBU Data Logs".

PED-X sends PID data logs to the Data Collector containing the smartphone location and any collision warnings which were computed but not displayed to the user via XFER. See ICD: interface 23029 "PID Data Logs".

The Data Collector receives estimated Queue Lengths from Siemens-MMITSS through a local interprocess communication (IPC) interface provided by the ESCoS stack.

The Data Collector also stores BSMs and SRMs received from OBUs as well as certain WSMs (WAVE Short Messages) sent by the RSU (i.e. MAP, SPAT, TIM, PSM, SSM). The Data Collector stores the WSMs, the Queue Lengths, and the received data logs in local Flash Storage.

The Data Collector creates batches of data logs from Flash Storage and sends them to the master server via XFER. See ICD: interface 23030 "RSU Data Logs".

3.2.2.7 OTA Update

3.2.2.7.1 Conceptual Design

3.2.2.7.1.1 Overview

The OTA File Broadcast leverages RSUs which are distributed through downtown and along the REL⁵ in order to distribute the firmware images and other files to OBUs. Each RSU will continuously broadcast all configured files in a round-robin fashion⁶. The RSUs should ideally use a dedicated DSRC channel which isn't used for anything else but file updates. Also, the RSUs should be located such that their respective radio range doesn't overlap significantly. This should minimize the number of channel access collisions and maximize the available bandwidth for file update broadcast.

The radio range of a dedicated file broadcast RSU (FBR) will overlap with that of regular RSUs providing messages for the CV applications. Since OBUs are equipped with 2 DSRC radios with one radio dedicated to the safety channel, a channel access prioritization scheme is needed in order to define how OBUs are expected to handle contention for available DSRC radio timeslots. See section 3.2.2.7.1.7 for details.

Because of the typically large size of firmware files (100 MB) they will have to be broken up into packets which fit into the size limit of a DSRC / WAVE message frame (1400 bytes). Each FBR will then continuously broadcast those packets using a special encoding scheme. An FBR also broadcasts a corresponding WAVE Service Advertisement (WSA) message which lets OBUs know which files are being broadcast and which channel to tune to.

As OBUs travel through the study area they will be able to collect packets from the dedicated file broadcast RSUs (FBR). However, OBUs will also experience packet loss for various reasons such as:

- The OBU went out of radio range or experienced noise on the channel.
- The OBU got turned off along with the vehicle.

With a naïve implementation approach of sending out sequential packets for each file, it is estimated that it would take 9 – 11 minutes for an FBR to broadcast 100 MB worth of data via the dedicated channel. With 3 such files (e.g. firmware images) going round-robin with packets interleaved, it would take at least 33 minutes for an OBU to receive the full 100 MB file which it too long. This calculation also does not yet include any encoded data overhead and is therefore too optimistic.

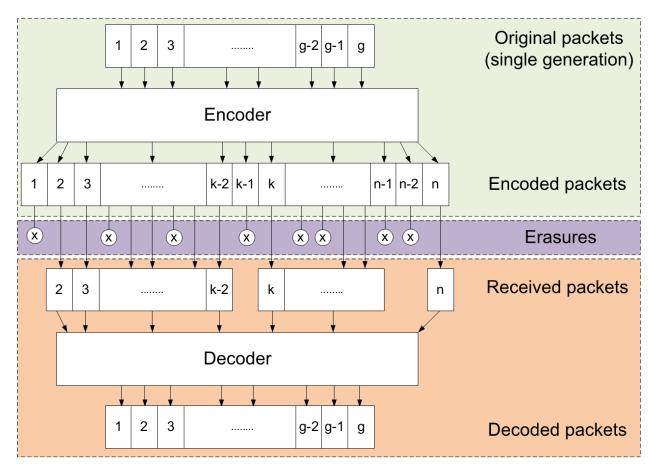
It would be unlikely for an OBU to be within radio range continuously for that amount of time. Moreover, each OBU would have to receive all packets without missing a single one in order to be able to reconstruct the entire firmware image sent. Especially the latter is a highly unlikely assumption. Therefore, a special encoding scheme is needed for the packet broadcast which allows a single OBU to reconstruct the entire file as long as it receives enough file packets.

⁵ It would also be possible to use RSUs which already serve other purposes. However, dedicated RSUs would be able to leverage normally unused DSRC channels and should provide for better bandwidth.

⁶ Round robin scheduling is a method of allocating time slices for broadcasting a given number of files and going in circular order through the files.

The encoding problem to solve here is addressed by the family of erasure codes (Wikipedia <u>https://en.wikipedia.org/wiki/Erasure_code</u>). Among others the following are erasure codes: Tornado Code, Fountain Code, Raptor Code, Reed-Solomon Code, Random Linear Network Code (RLNC).

The erasure code selected for this specification is Wirehair (<u>https://github.com/catid/wirehair</u>). Wirehair belongs to the family of fountain codes, a rateless erasure code. This means it can produce a potentially unlimited number of unique encoded blocks.



(Source: Steinwurf Projects, http://docs.steinwurf.com/nc intro.html)

Figure 23: Working Principle of Random Linear Network Coding

The above figure illustrates how encoding and decoding with a fountain code works (the figure is actually from an RLNC implementation which is similar). The encoder takes as input a so-called generation which has a maximum size. It then breaks up the generation into packets and encodes each one, producing encoded blocks. The block size is typically set to match the maximum transfer unit (MTU) size of the underlying transport. However, there are ways to increase the block size with little drawbacks as per discussion below.

RLNC (like fountain codes) is a rateless erasure code. That means the encoder can produce an unlimited number of encoded blocks. Any one of these blocks can be used by the decoder for decoding the originally encoded generation. The decoder just needs to receive enough unique blocks. The total number of bytes of received encoded blocks usually only needs to be ~3% higher than the generation size. So, in the case of a 100 MB file being broadcast any receiver only needs to receive 103 MB worth of unique encoded blocks in order to be able to decode and reconstruct the original file.

With a rateless code like Wirehair the RSU will continuously generate and broadcast new encoded blocks instead of repeating previously sent blocks. That way it wouldn't matter during which time an OBU receives blocks. It would only matter how many it receives. The alternative would be to have the RSU send a limited number of previously encoded blocks in an endless loop. With such an approach an OBU may see more blocks which it already received, and it might take longer for an OBU to receive enough unique blocks in order to decode the entire file. Choosing between these 2 alternatives will have to be part of the RSU implementation and should be based on considering the computational overhead of continuously creating new encoded blocks vs. the expected delay in decoding the whole file. On the decoding side there is no difference in implementation between the 2 alternatives.

3.2.2.7.1.2 Block Size vs. Block Count

The computational load of encoding/decoding a generation file grows non-linearly with the block size and block count that is produced by the encoder. Block count has a larger impact than block size, so a larger block size with fewer blocks is better than a smaller block size with more blocks.

From experience a 4-8 Kilobyte block size is a good sweet spot. This is larger than the targeted packet data unit (PDU) of 1300 bytes. However, it is possible to send a block of size 5200 bytes in 4 consecutive UDP packets containing 1300 bytes encoded block data each. Packets belonging to the same encoded block are identified by having the same blockID. The 1st packet of a block has the packetID == 0, the next packet has the packetID == 1 and so forth. The packet count for an encoded block shall be configurable. For purpose of further discussion in this specification it shall be assumed to be 4.

The drawback of this approach is that, if an OBU doesn't receive all 4 UDP packets of a block, then the data in the packets already received is useless. On average 1.5 UDP packets would be thrown out when the OBU comes in radio range of the RSU and 1.5 UDP packets would be thrown out when the OBU leaves the RSU radio range.⁷ If the OBU is in range of the RSU for 32 seconds⁸, the OBU will see ~3600⁹ UDP packets of which 1/3 (~1200 packets) will be for Vendor-A OBU (assuming 3 vendors). Hence dropping 3 packets per "session" amounts to less than 0.3% loss.

⁹ At 1.35 Mbps MAC level transfer rate we can expect to broadcast up to 5662310 bytes within 32 seconds or roughly 3700 packets of 1500 bytes each. For argument sake we're reducing that amount

⁷ If an OBU only receives 1-3 packets of a block it has to discard the entire block. The assumption is that this will happen randomly for a single block when the OBU just gets within radio range as well as when it leaves the radio range. Hence on average 1.5 packets are wasted / discarded.

⁸ 32 seconds is the time it takes a vehicle travelling at 70 MPH to pass through a radio range of 1000 meters. This is realistic for unobstructed deployments for example along the REL. Within the Tampa downtown area vehicle speeds are less than 25 MPH and pass-through radio range is estimated to average at least 350 meters resulting in a similar time window.

3.2.2.7.1.3 1 BIG FILE vs MANY FILE FRAGMENTS

Another computational load saver is to break up the large firmware image file into many smaller fragments (called generations in the context of RLNC, see above). All else being equal, it is significantly less computationally expensive to decode 100 1-megabyte encoded fragments than it is to decode one 100-megabyte encoded file.

It is estimated that it would take ~450x the computation power to reconstruct a single 100-megabyte file than it would take to reconstruct one-hundred 1-megabyte fragments and then concatenate them. To allow for breaking the files into fragments, an 8-bit fragment ID field (fragID) and an 8-bit fragment count field (frag) is added to the UDP packets.

Choosing an upper limit on the number of fragments is usually based on the duration of a typical "session". It is desirable that the OBU to receives at least 1 block of data for every fragment during a typical "session" with an RSU.

At 32-seconds per "session", each vendor's OBU will receive ~1200 packets or ~300 encoded blocks. If a 100 MB firmware image file is broken into 100 fragments, the OBU will receive ~3 encoded blocks per fragment per "session". This indicates that 1 MB fragments are acceptable but also shouldn't be much smaller. Fragment size shall be a configurable parameter.

3.2.2.7.1.4 Example Estimated Delivery Time

When using GF(256) and a 100 megabyte file is broken into one hundred 1-megabyte fragments, you can safely say that the firmware image could be reconstructed by receiving 205 blocks of each fragment¹⁰.

At 3 blocks per fragment per "session", a vendor OBU would need ~69 sessions to receive the entire file. Assuming that we deploy 5 non-overlapping RSUs along the commute and the OBU sees these once in the morning commute and once in the evening commute, it would get 10 sessions per "commuter-day".

With the above assumptions, it would take 7 "commuter days" to get the update file (30 blocks per day out of 205).

3.2.2.7.1.5 Packet Broadcast Pattern

The RSU will broadcast file update blocks from multiple vendors interleaved for fairness. In order to allow a recipient OBU for easy filtering of only packets relevant to a particular vendor the RSU will send out each vendor's packets to a unique UDP port (unique to the vendor). The port number used for each vendor will be announced as part of the OTA WSA service info.

to 3600 UDP packets of 1400 bytes which is ~90% of 1.35 Mbps. An RSU will need to broadcast a new packet every 8.8 ms in order to achieve this data rate.

¹⁰ 1 MB divided up into 5200 byte long encoded blocks requires 202 blocks. With assumed 3 additional blocks required due to encoding overhead the total is 205 blocks.

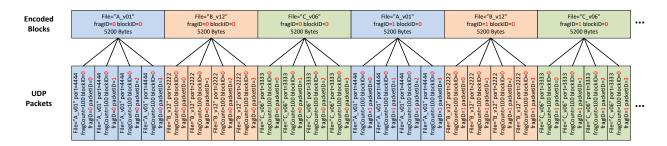


Figure 24: Example Sequence of Packets Broadcast for Firmware Images from 3 Vendors

The above figure illustrates the interleaving of packets from multiple vendors (3 in this example) of the following firmware image files:

- Vendor A, FileName = "A_v01", Port = 4444
- Vendor B, FileName = "B_v12", Port = 2222
- Vendor C, FileName = "C_v06", Port = 3333

Each file is assumed to be 100 MB in total size and has been broken into 100 fragments of 1 MB each.

The diagram shows how blocks from the 3 vendors are interleaved. Each 5200 byte encoded block is broadcast using 4 consecutive UDP packets. It further illustrates that after sending block 0 for fragment 0 of vendor A the RSU will send block 0 of fragment 1. This would continue until block 0 of fragment 99 is sent. At that point the RSU will send block 1 for fragment 0, then block 1 of fragment 1, and so on.

3.2.2.7.1.6 Broadcasting Multiple File Types of Different Size

As discussed in section 3.2.2.7.1.4, successful reception of a large 100 MB file will take roughly 70 sessions. In many cases it isn't necessary to replace the existing firmware of an OBU with a whole new software version, though. Instead it will be sufficient to update certain predefined configuration parameters. Therefore, the OTA file broadcast also needs to support broadcast of small files which could be received by OBUs within only a few sessions.

Assuming a config file of 10 KB size, it would require an OBU to receive at least 2 encoded blocks (5.2 KB each) in order to decode the file. In the packet broadcast pattern discussed above each vendor gets an equal fraction of 1/3 out of all packets broadcast. For each vendor the RSU will broadcast ~300 encoded blocks per 32 second session. Or 3 blocks for each of the 100 fragments. If for example 1 fragment block out of the 100 would be used to broadcast the config file then it would take 1 session for an OBU to receive 3 blocks of the config file which is enough to it.

The firmware file of 100 MB is roughly 10000 times larger than the 10 KB config file. However, the config file would be allocated to be broadcast for 3 out of 300 encoded blocks instead of only 1 out of 10000 blocks. So, the config file gets broadcast disproportionally more often (100 times) which leads to the desired outcome of an OBU receiving the entire file in only one session.

The impact on the delivery time of the 100 MB firmware image is as follows. With 297 encoded blocks per session broadcast for the firmware image file, on average 2.97 encoded blocks per fragment per

session will be received by an OBU. With 205 blocks needed in order to decode all fragments it'll still take roughly 69 sessions until all fragments can be decoded.

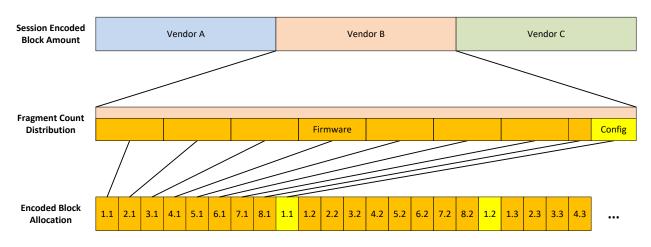


Figure 25: Encoded block allocation with 2 files of different size

Each vendor has the option to broadcast many different file types. The diagram depicts the broadcast of 2 different files by vendor B. The broadcast of encoded blocks for each file is allocated based on the fragment count. With a maximum fragment size of 1 MB the config file (10 KB) will use one fragment while the firmware file (100 MB) uses 100 fragments. Encoded blocks for vendor B are broadcast sending the 1st encoded block for each fragment, then sending the 2nd encoded block, then the 3rd and so on. The block numbers in the diagram are using the nomenclature <FragmentID>.<BlockID>. The block color indicates the file type.

3.2.2.7.1.7 Channel Access Schedule

OBUs are equipped with 2 DSRC radios will dedicate one radio for safety messages (BSMs, MAP, SPaT) on channel 172. The second radio would be able to listen to the control channel (178) for WSAs and TIMs during timeslot 0. That leaves timeslot 1 for tuning to other channels for other services. The following table lists the available services deployed in Tampa in descending priority order. OBUs shall tune to the highest priority service currently advertised by the nearest RSU.

WSA	OBU Behavior
PSM	Listen for PSMs and calculate PCW. This would have to take precedence
(0p27	over everything else. Other messages broadcast on the same channel
Ch 176)	would also be received and could be processed. PSM sending will only be
	deployed on one RSU at the courthouse crosswalk.
SRM /	For bus OBUs with the TSP app running, the app should monitor MAPs
SSM	received via 172. As the TSP app determines that it needs to send out
(0p80-82	SRMs it tunes to 176. SSM status is broadcast once per second at the top of
Ch 176)	the second. The OBU looking for SSMs would tune to 176 at that time.
	-

Table 10: Channel Access Priority Schedule for OBUs

WSA	OBU Behavior
	Note: There is ongoing discussion on whether SRM and SSM will have their own PSID. If so, then this could be used to trigger the OBU to tune to 176 in timeslot 1 right after an SSM PSID was received in the WSA.
SCMS	If the OBU needs to download new certificates it should react to the IPv6
(0pEF-FF-	routing PSID by tuning to 176 and connecting to the commercial SCMS.
FF-FE	
Ch 176)	
ΟΤΑ	If the OBU determines from the OTA WSA that a newer firmware revision is
(0pTBD	available, then it should tune to 182 whenever it can and receive as many
Ch 182)	encoded blocks as possible.
Data Log	If the OBU needs to transfer new data logs it should tune to 176 and send
(0pTBD	the logs.
Ch 176)	

3.2.2.7.2 Detailed Design

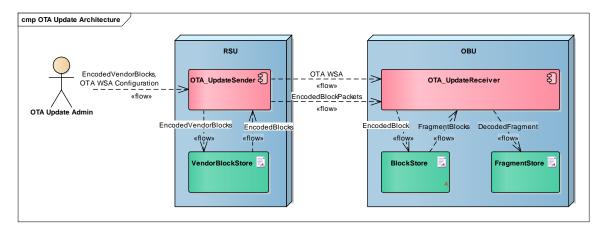


Figure 26: OTA Update Software Design

The RSU implements the OTA_UpdateSender component which is responsible for broadcasting the corresponding WSA service info and the encoded block packets to OBUs. See ICD: interface 23031 "OTA Update".

The OTA_UpdateSender takes configuration information via its browser UI. The configuration includes the encoded firmware image blocks as well as the vendor ID, firmware revision, and UDP port to use. It is intended that vendors perform the fragmentation and encoding of their firmware and provide a ZIP file containing all the fragments and encoded blocks. The OTA Update Admin downloads the ZIP file to the RSU and sets the corresponding vendor, firmware revision and UDP port parameters. The ZIP file is stored in the VendorBlockStore, a storage location on the RSU's Flash Media.

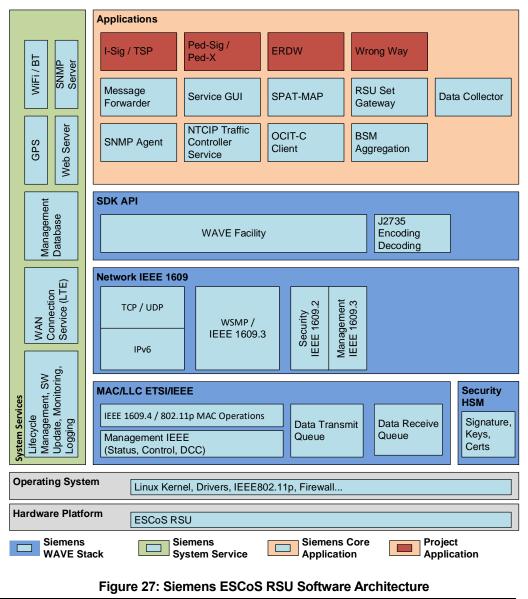
The OTA_UpdateSender continuously sends encoded blocks from the VendorBlockStore to OBUs by dividing each block into 4 packets and interleaving packets from multiple vendors as described above.

The OTA_UpdateReceiver on the OBU receives the packets and concatenates 4 consecutively received packets to an encoded block. It is anticipated that the OTA_UpdateReceiver will store each unique encoded block in a BlockStore. Once enough encoded blocks have been received to decode a fragment the OTA_UpdateReceiver decodes the fragment and puts it in the FragmentStore. When all fragments of a file have been received and decoded the OBU can perform the firmware upgrade.

3.2.2.7.3 OTA Deployment Locations

THEA will deploy additional RSUs not previously considered in the deployment plan along the REL. These RSUs are dedicated to OTA file broadcast and data log transfer. Some downtown RSUs will also broadcast firmware updates to cover buses and streetcars.

3.2.2.8 RSU Management



Siemens Roadside Unit software architecture follows a layered architecture approach. Applications like for example ERDW sit on top of the software stack and are able to leverage the facilities provided in order to implement their functionality. For a description of the individual components of the stack please refer to the "System Architecture Document (SAD) - Tampa (THEA)" [4].

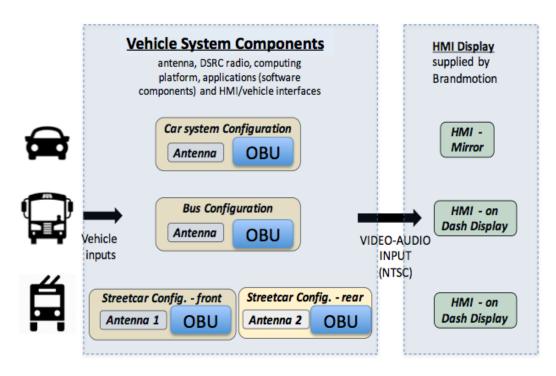
3.2.3 Interfaces

Triple ID	Triple Name	Used By
20004	Vehicle Location and Motion	3.2.2.1 ERDW
		3.2.2.3 MMITSS
		3.2.2.5 PCW / PED-X
20008	Intersection Geometry	3.2.2.2 WWE
20009	Local Signal Priority Request	3.2.2.3 MMITSS
20012	Proxy Personal Location	3.2.2.5 PCW / PED-X
43013	Intersection Status	3.2.2.2 WWE
20014	I2V Situational Awareness TIM (I2V)	3.2.2.1 ERDW
		3.2.2.2 WWE
23006	Phase and Detector Status	3.2.2.2 WWE
		3.2.2.3 MMITSS
23008	Personal Location	3.2.2.5 PCW / PED-X
23012	Proxy Vehicle Location and Motion for PID	3.2.2.5 PCW / PED-X
23013	Signal Priority Service Request	3.2.2.3 MMITSS
23013	Phase Control and Detector Status	3.2.2.4 PED-SIG
23015	OBU Data Logs	3.2.2.6 Data Log Collector
23016	Vehicle Entries and Exits	3.2.2.1 ERDW
23018	RSU Application Status	3.2.2.2 WWE
23026	Intersection Geometry	3.2.2.4 PED-SIG
		3.2.2.5 PCW / PED-X
23027	Intersection Status	3.2.2.4 PED-SIG
		3.2.2.5 PCW / PED-X
23028	Pedestrian Call	3.2.2.4 PED-SIG
23029	PID Data Logs	3.2.2.6 Data Log Collector
23030	RSU Data Logs	3.2.2.6 Data Log Collector
23031	OTA Update	3.2.2.7 OTA Update

Table 11: Interface triple references used by the RSU

3.3 Vehicle Subsystem

The following graphic describes the Vehicle subsystem components consisting of the OBU, rear view mirror as the HMI (display/audio), GNSS/DSRC antenna(s), wiring harnesses and associated installation services.



Note: National Television Standards Committee (NTSC) is an analog video standard

Figure 28: Vehicle System and Components

The following vehicle system diagram and interfaces from the SAD identifies the key system design elements for cars (e.g. light duty vehicles), buses and streetcars.

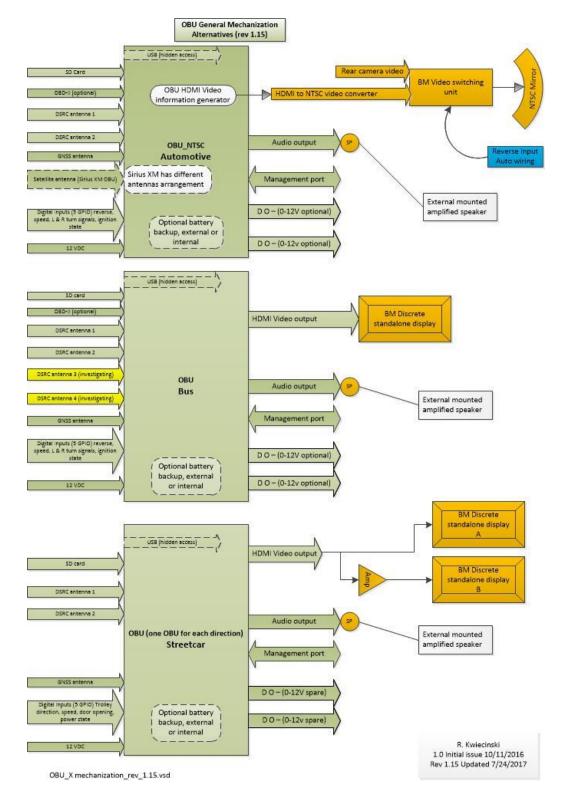


Figure 29: OBU Subsystems and Input/Output – Car, bus and Streetcars

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The following is a description of the hardware/software elements:

The Human Machine Interface (HMI) will display all video alerts generated by the OBU. For the CV Pilot program, the HMI components, displays and speakers, will be:

 Private passenger automobiles and light duty trucks – Each respective OEM rear view mirror will be replaced with a compatible rear-view mirror, that is maintaining all original mirror functions, that will have a 3.5" LCD video display imbedded with an interface conforming to the National Television System Committee (NTSC), or composite video standard. In the case of a rear camera video equipped mirror, the reverse signal will override any alerts generated by the OBU. A commercially available two channel video switching device is used to switch from rear camera video (if the vehicle is equipped with a rear viewing/back up camera) to the video signal from the video (to display alerts to the driver). Shown below a commercially available mirror that provides this functionality.



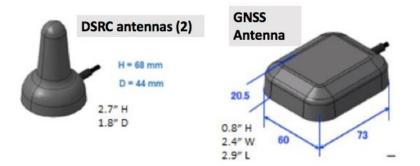
- · Auto display reverse camera;
- Detecting distance is 30cm, 50cm or 70cm, to calculate spare wheel or bike in the backside into the distance.
- Screen: 4.3" TFT-LCD monitor
- Resolution: 480*272
- Video input: 2 ways
- Signal format: PAL/AUTO/NTSC
- Storage temperature: 40°C~85°C
- Working temperature: 20°C~70°C
- Contrast : 16: 9

Figure 30 Example Mirror

Buses and Streetcars – Each bus and streetcar will have an LCD video display box that will be packaged directly in the driver's field of view. In the case of a streetcar there will be two displays, that is one on each end due to the streetcar reversing driving direction. (*note streetcars do not drive in reverse, rather the driver moves to the opposite side of the streetcar to drive in the other direction*).

- **Display Monitor**: A commercially available 4.3-inch monitor (viewing display area) with a VGA or NTSC input with a temperature specification as follows: operating 0-60°C degrees and a storage of -20 to 80°C.
- Speaker (s) will sound an audible alert generated by the OBU. Locations for the speakers in automobiles, light duty trucks, buses and streetcars will be determined and optimized by HMI and safety experts. A speaker integrated with the rearview mirror is being proposed to reduce wiring.

DSRC Antennas – Each vehicle will have two dedicated DSRC antennas connected to two OBU internal radios. The DSRC antennas will be designed according to the following specifications:





Brandmotion is sourcing commercially available antennas from Harada Industries as follows:

Table 12: Harada Antenna Part Numbers

Harada Industries Part Numbers
Single DSRC mag mount antenna (DEN-HA- 001-002-GEN2)
Single DSRC adhesive mount antenna (DEN- HA-003-002-GEN2) as an alternative design
Dual Band mag mount antenna, Single DSRC and GNSS (COM-HA-001-002-GEN2)
GNSS mag mount antenna (DEN-GN-001-002- GEN2)

Private passenger automobiles and light duty trucks – Each vehicle will have two DSRC antennas with each respective antenna supporting a DSRC radio channel. Antenna locations will be determined by in-vehicle testing.

- **Buses** Will have 2 DSRC antennas located on the roof. Locations will be determined by invehicle testing.
- **Streetcars** Will have 2 to 4 DSRC antennas located on the roof at both ends of the streetcar. Locations will be determined by in-vehicle testing. (*note streetcars have a wooden roof and will require a metal ground plane under each antenna*)
- Antennas Each vehicle will have one GPS antenna and two DSRC antennas as previously described.

Wiring harnesses and associated installation services – Each vehicle will require unique wiring and associated installation to accommodate different vehicle types (CV Participants), as identified by Global 5, and OBU suppliers (Commsignia, SiriusXM and Savari). The THEA team members, as lead by Global-5, will assess the potential participant's vehicles, those drivers in the THEA community. This information drives the design and installation of the vehicle system, that is what is the type of vehicle, and therefore the best approach to safely and seamlessly integrate the vehicle system into the participant vehicle. The Hillsborough Community College automotive training facilities and personnel will install the vehicle systems.

The following information is being assembled to design and fabricate the specific vehicle and vehicle system designs:

Signal Description	Vehicle Source	OBU Destination	Electrical Characteristics: Voltage,Current, Impedance, Power Description	Used on
Power 12V (Vbatt) (key off)	Unswitched Vbatt	OBU Power (Pwr) (key off)	fused 5A, I = < 50ma	All
Ground (Gnd) *all grounds common	12 V Grd	OBU 12 V Gnd	Common Gnd	All
Power 12V (lgn)	lgn On 12V	OBU Ign On 12V	fused 5A I = @1A	All
Ground (Gnd) *all grounds common	12 V Gnd	OBU 12 V Gnd	Common Gnd	All
Trolley Speed (Vs) *NOT CONNECTED	Axle mounted sensor (NC)	OBU GPIO pin#	Hall Effect (proposed)	Trolley
Bus Door Status switc h (Ds)	Bus door switch	OBU GPIO pin #	0V = closed, 12V = open I = 20 ma	Bus
Trolley Door Status switch (Ds)	Trolley door switch	OBU GPIO pin #	0V = closed, 12V = open I = 20 ma	Trolley
Car Left Turn Signal (LTs)	Left turn signal switch	OBU GPIO pin#	0v • 12V blinking I = 20 ma	Car
Car Right Turn Signal (RTs)	Right turn signal switch	OBU GPIO pin#	0v • 12V blinking I = 20 ma	Car
Bus LeFt Turn Signal (LTs)	Left turn signal switch	OBU GPIO pin#	0v • 12V blinking I = 20 ma	Bus
Bus Right Turn Signal (RTs)	Right turn signal switch	OBU GPIO pin#	0v • 12V blinking I = 20 ma	Bus
Speaker (Sp)	Speaker, +-	OBU Speaker,+-	l = 160 ma 2 watt	All

Table 13 - Vehicle System Signal Descriptions

U.S. Department of Transportation

Intelligent Transportation System Joint Program Office

Signal Description	Vehicle Source	OBU Destination	Electrical Characteristics: Voltage,Current, Impedance, Power Description	Used on
Reverse (Rvs)	Reverse lamp	OBU GPIO pin#	OV = Off, 12V = ON	Car, Bus
Brake light (Brk)	Brakelight	OBU GPIO pin #	OV = Off, 12V = ON	Car, Bus
Rear Vlew Mirror (Rvm) Video	Rear View Mirror	OBU video out	HDMI (NTSC input conversion)	Car
LCD Display (LCD)	LCD Display	OBU video out	HDMI	Bus,Trolley
SD Card	OBU	SD Card	SD Card	all
GPS Antenna	GPS	GPS	GPS in	all
DSRC Antenna (2)	DSRC ANT (2)	DSRC (2)	DSRC in	all
Ethernet	Internal development only	OBU ethernet	ethernet	all

Abbreviations used:

- pwr power,
- Grd or Gnd signal ground,
- CAN Controller Area Network,
- GPIO General Purpose Input/Output,
- HDMI High-Definition Multimedia Interface,
- Ign ignition signal,
- OV over voltage,
- z Impedance,
- Lt Left turn and
- Rt Right Turn

3.3.1 Hardware Design – On Board Unit (OBU)

On-Board Unit (OBU) design shown in figure, provides the vehicle-based processing, storage, and communications functions. Dedicated Short Range Communications, the "radios" supporting V2V, V2P, and V2I communications are a key component of the Vehicle OBU. This communication platform is augmented with processing and data storage capability that supports the connected vehicle applications. The hardware platform is typical of current OBU designs as follows:

- Processor 1 GHz iMX6 Dual Core
- Memory 1 GB DDR3 DRAM
- Storage Up to 8GB Flash

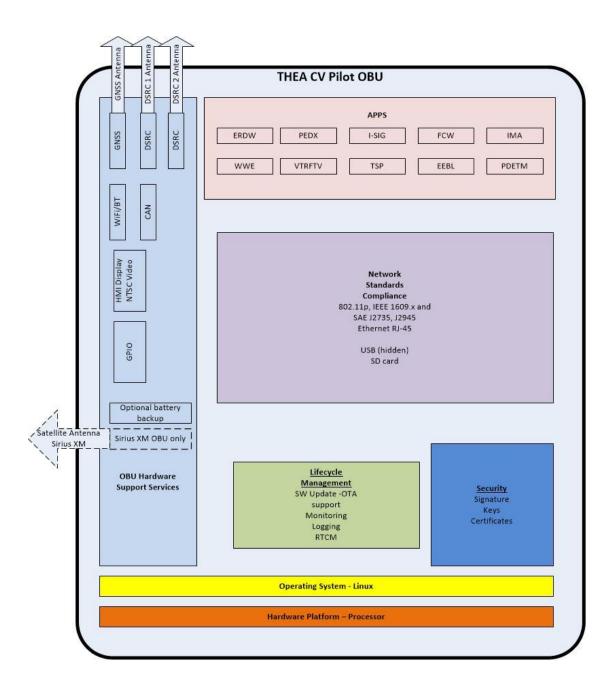


Figure 32: OBU Hardware Design

The following is a description of the OBU hardware and associated functions:

OBU Function	Description
Operating System	LINUX is the OBU OS for development, pre-mass production systems of this type
GPIO	General Purpose Input Output (GPIO) re used for ignition state, reverse, wheel ticks (depending on chipset used), turn signals, brake, door open (buses), and direction (streetcars).
	Discrete inputs shall be used to provide zero to twelve-volt (0-12v) vehicle inputs to the OBU. For example, vehicles equipped with " <i>Rear Camera Video Mirrors,</i> " the OBU will monitor the " <i>Reverse Signal</i> " so the OBU will switch the mirror display from rear camera video to OBU App driven alerts. There is spare digital output available for future use.
HMI Display/NTSC Video	All current rear view camera mirrors are NTSC driven. The OBU will decide which video to display, rear view camera video or OBU App alerts. The vehicle mirror displays are NTSC driven.
CAN	Vehicle electrical communication Bus information is available via the vehicle On-Board Diagnostics connector (OBD). Many vehicle signals are available that could enhance future App alerts algorithms and also enhance the GPS while in a <i>"Dead Reckoning Mode."</i> Another example is utilizing the vehicle "steering wheel angle" signal.
DSRC	Dedicated Short Range Communications (DSRC), this is the radio communications protocol and frequencies allocated for the CV project. Intelligent Transportation Systems (ITS) Radio Service in the 5.850-5.925 GHz band (5.9 GHz band).
GNSS	Location/[positioning services for location tracking
Optional Battery Backup	Battery backup can be supported for future applications, if warranted, i.e. the situation of an unexpected vehicle power interruption or electrical shutdown.
SiriusXM Antenna Input	Satellite antenna to be used for security certificate and CRL distribution on SiriusXM supplied OBUs.

Table 14: OBU Hardware Description

The following is a description of the standards that the hardware must meet:

Table 15: Industry Standards applicable to OBU Design

Component	Description
IEEE802.11p	Dedicated short-range communication (DSRC) and wireless access vehicular environments (WAVE) are the communication standards on which these transportation services are provided. These communication standards are based on IEEE 802.11p PHY/MAC and DSRC wireless communication and messaging protocols.
IEEE 1609.x	 The IEEE 1609 Family of Standards for Wireless Access in Vehicular Environments (WAVE) defines: the architecture, communications model, management structure, security mechanisms and physical access for high speed (up to 27 Mb/s) short range (up to 1000m) low latency
SAE J2735	Basic Safety Message (BSM) Set definitions Standard
SAE J2945	This standard specifies the system requirements for an on-board vehicle- to-vehicle (V2V) safety communications system for light vehicles, including standards profiles, functional requirements, and performance requirements. The system is capable of transmitting and receiving the Society of Automotive Engineers (SAE) J2735-defined Basic Safety Message (BSM) [1] over a Dedicated Short-Range Communications (DSRC) wireless communications link as defined in the Institute of Electrical and Electronics Engineers (IEEE) 1609 suite and IEEE 802.11 standards [2] – [6].
SCMS	Commercial SCMS specific requirements for access and interoperability
Ethernet RJ-45	Ethernet Communications and connector standardized as the 8P8C modular connector used with CAT5 cables
USB (hidden)	Universal Serial Bus (USB) will be used for software and firmware updates. Port will be hidden and encrypted to prevent malicious data entry.
SD Card	Secure Digital (SD) card port/reader, encrypted, will be used to provide software and firmware updates.

3.3.2 Software Design

Industry best practices for software design, application of standards and application of existing OBU design practices drive the THEA OBU designs and software design:

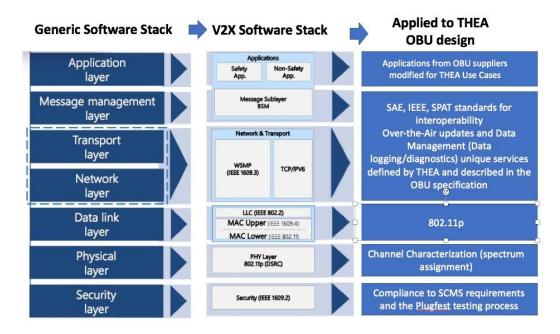


Figure 33: Software Design, Application of Standards and Application of Existing OBU Design Practices

The following table describes key software components as referenced by the software stack.

Software Component	Description
Application layer	OBU suppliers developed (V2V and V2I) applications modified to implement THEA use cases and specific applications as described by the SAD. Brandmotion as described by the SAD. Brandmotion will supply the OBU suppliers with user interface graphics (JPEG files) and audio alert files (standard WAV files).
OTA as software update	Software update support for secure remote software maintenance. Will be securely inputted via OTA or OBU mounted encrypted SD Card input.
Data Management/Logging	OBU through DSRC supports centralized logging of system and application events
Security	OBU suppliers are compliant to the commercial SCMS process and have participated in various forums and Plug fest testing.

Table 16 - Software Component Description

3.3.2.1 ERDW

As mentioned in section 3.2.2.1 of this document, the ERDW application is designed to audible tone warning drivers incoming on the REL of a queue that has formed at the intersection of Twiggs St and Meridian Ave. The warning shall recommend a safe speed which will allow the vehicle to safely stop before it reaches the end of the queue / stopped traffic.

The estimated end of the queue would be transmitted to the vehicle OBUs using a TIM from the RSU that would then be interpreted by the OBUs to display the recommended speed to the driver. As the driver makes their way closer to the end of the queue, the recommended speed would lower so that they have ample time to safely stop their vehicle before reaching the end of the queue. The recommended speeds are based on safe stopping distances for a vehicle class based on the Florida Driver License Handbook. Once the OBU receives the TIM, it would display a recommended speed zone Figure below shows the ERDW functional flow.

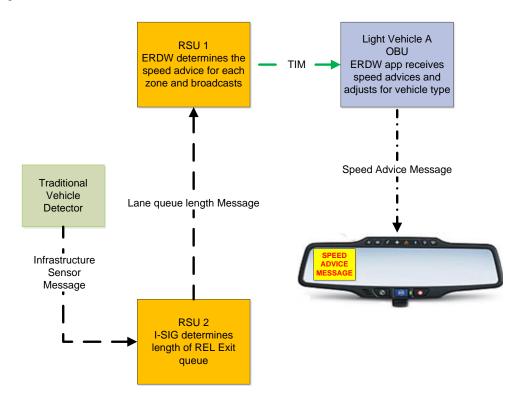
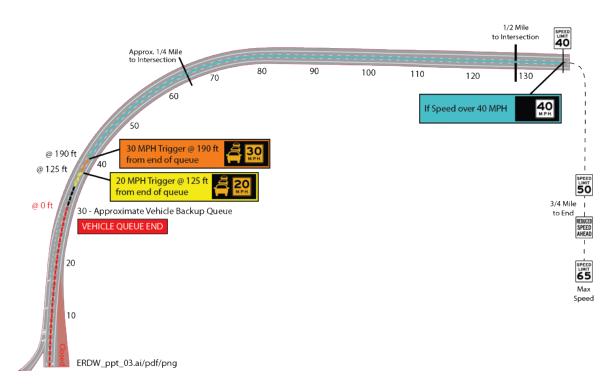


Figure 34: ERDW Functional Flow

Below, two different examples of queue lengths are presented along with the recommended speed zones based on the TIM received by the OBU from the RSU. The figures also show the estimated number of cars in the queue on the section of the REL. Approximately 130 car single lane queue can form within the half mile section of the REL starting at the Twiggs and Meridian intersection.





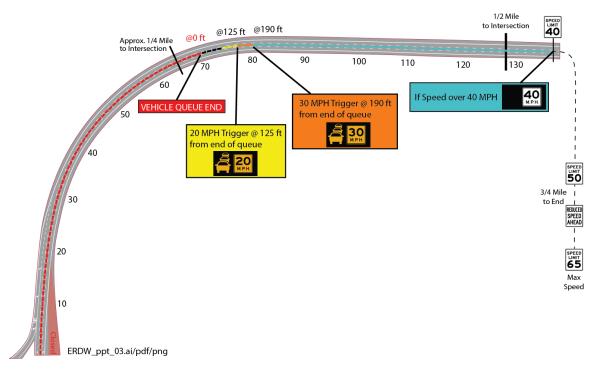


Figure 36: Seventy Car Queue Example

The speed limit on the REL starting at half mile before Meridian and Twiggs is 40MPH. If there is a vehicle queue, based on the Florida Driver License Handbook, the 20MPH speed zone (colored in yellow in Figure 35 and Figure 36) would start at 70 feet away from the last car in queue, and end at 125 feet away from the last car. The 30MPH recommended zone (colored in orange in Figure 35 and Figure 36) would start right were the last zone ended and extend to 190 feet away from the last car. At 190 feet, the 40MPH recommended/posted speed zone (colored in blue in Figure 35 and Figure 36) would start and end where the posted speed zone starts a little over a half mile away from the Twiggs and Meridian intersection. The OBU would display these recommended speeds as they pass through the speed zones while going over the recommended speed. For example, if the driver is going 45MPH in the 40MPH speed zone, they would get a warning message. The time out of the warning messages will depend on three factors: the warning will time out after a certain configurable amount of time, the driver corrects their speed to be within the recommended speed, or another higher priority warning comes on (FCW for example). The warnings are not lane specific therefore even if there is a queue in one lane and not the others, the warnings will be based on backed up lane and displayed for all drivers passing through the speed zones no matter what lane they are in. This will help prevent accidents where cars from the queue might try to get out into an open lane.

3.3.2.2 WWE

As mentioned in section 3.2.2.2 of this document, WWE app is designed to warn OBU equipped vehicles trying to wrong way enter an RSU equipped intersection which provides the MAP and SPaT messages through DSRC. The specific intersection used for this study is at Twiggs St. and Meridian Ave. A radar detector covering the REL entrance is used to detect unequipped wrong-way vehicles.

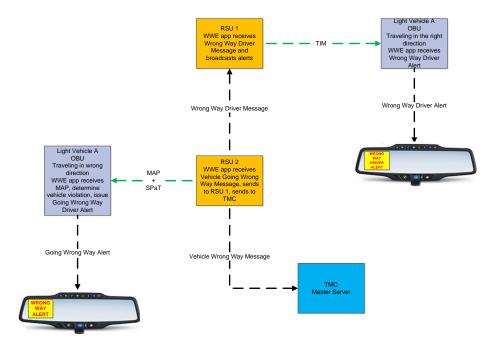


Figure 37: WWE Functional Flow

The app has multiple levels of warning. The driver would receive a first level warning when their OBU equipped vehicle is on a path that is projected to enter a part of the intersection that would make them go the wrong way based on their trajectory and speed (labeled with 1 in Figure 38 and Figure 39). If the vehicle continues to go up a road in the wrong way manner, the driver of the vehicle would receive a secondary warning letting them know that they are already going the wrong way (labeled with 2 in Figure 38 and Figure 39). There is also another warning message displayed to the driver using this app where the equipped vehicle finds itself in an area where no traffic is allowed which is specific to the REL exit (labeled with 3 in Figure 38 and Figure 39). Another feature of the app is that it will warn the drivers of equipped vehicles of a wrong way driver approaching them on the REL based on a TIM that would be broadcast by the RSU.

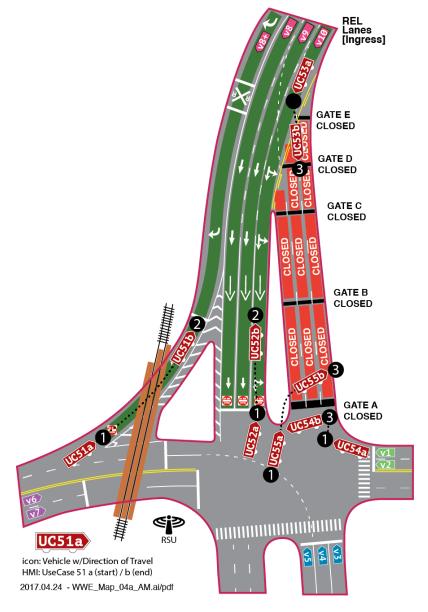


Figure 38: Morning REL

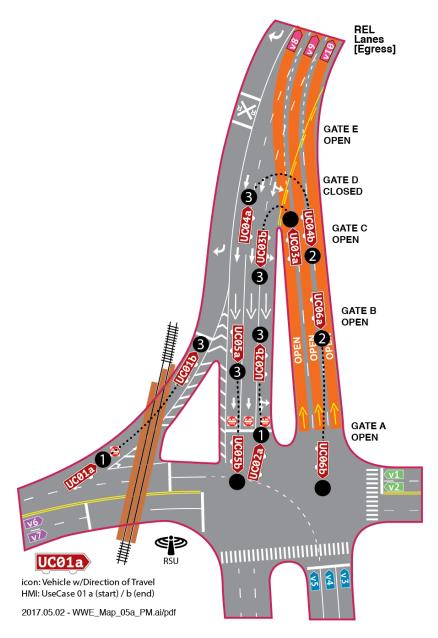


Figure 39: Afternoon REL

As previously mentioned, this app is not specific to the intersection shown in figures above and should function in any intersection that can provide the MAP and SPaT messages to the vehicle OBU.

3.3.2.3 MMITS-TSP

TSP is an application that provides signal priority (green) to transit vehicles at intersections and along arterial corridors only if the bus is behind schedule.

If the bus is behind schedule priority will be granted for the bus. The OBU sends an SRM to the RSU. The RSU forwards that to the Transit Server at the TMC. The Transit Server determines if the bus is behind schedule. If the bus is behind schedule, the SRM is returned from the Transit Server to the RSU. The RSU determines priority of all SRMs received from all approaching vehicles, and then selects the controller phase via NTCIP objects to extend the green, allowing the bus to proceed through the intersection.

At the same time, RSU sends the SSM to the approaching equipped transit vehicles to inform which has received priority to extend the green and which vehicles have been denied priority. If signal priority has been granted, the driver of the transit vehicle is notified. If the bus that is approaching the intersection stops at its stop, TSP app on the OBU would cancel its pending priority request to the next intersection as soon as the door opens (door open/close is one of the GPIO inputs). It will pick up the request again once the door closes and the bus starts moving. Using the MMITSS components for this app is suggested.

The OBU shall continuously estimate the vehicle's arrival time at the intersection stop bar based on the current vehicle speed and distance from the stop bar. In case of a change in estimated time of arrival (ETA) of a second or more the OBU shall send an updated SRM with the new ETA to the RSU. In case the bus stops in traffic without opening the door the OBU shall continue to update the ETA in the SRM to the RSU. This will allow vehicles in front of the bus to move through the intersection and in turn allow the bus to proceed. The TSP application running on the RSU will continue to extend the green phase up to the maximum green time configured in the traffic controller. If the bus does not pass through the intersection the priority request times out and the driver display changes accordingly.

The variables and timing of when the priority granted/denied message is displayed to the driver and how long it will stay on must be configurable.

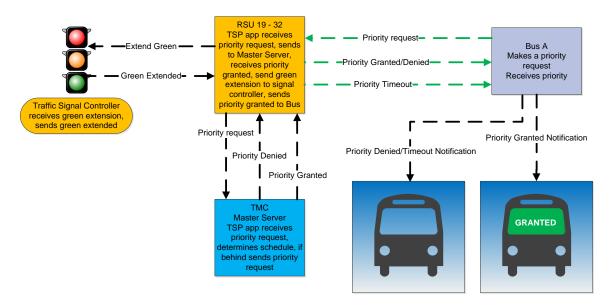


Figure 40: TSP Functional Flow

3.3.2.4 PCW

The PCW (Pedestrian Collision Warning) application is designed to work at the midblock crosswalk on East Twiggs Street at the Hillsborough County Courthouse to improve pedestrian safety. A LiDAR installed at the crosswalk will locate the pedestrians in the area and translate the information to PSMs and send them over DSRC for the HMI to warn drivers when pedestrians, within the crosswalk, are projected to be in the intended path of the vehicle. OBU equipped vehicles, using the PCW app, warn the drivers that are on a collision course with pedestrian in the roadway. The variables and timing of when the message is displayed to the driver and how long it will stay on will be configurable, which is required by the OBU procurement specification and verified by Test Cases.

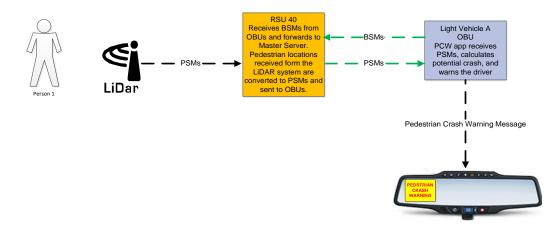


Figure 41: PCW Functional Flow

3.3.2.5 VTRFTV

The VTRFTV app HMI warns the streetcar operator of an equipped vehicle turning right at the intersection the streetcar is approaching, using the BSMs that are being sent and received, if the app determines the vehicles are on a potential collision trajectory. Once a blinker of the equipped vehicle that is approaching the intersection is engaged while passing the streetcar as well as the trajectory and speed determined by the OBU matches that of the potential collision, the streetcar OBU will give the streetcar driver a warning. The equipped vehicle receives a warning that they are on a collision course with streetcar as well. The Streetcar OBU would also put a special ITIS code to SpecialVehicleExtensions.description.typeEvent and SpecialVehicleExtensions.description.description in the BSM once noticing that the blinker in the vehicle was engaged which would then be received by the RSU at the intersection and sent out as a warning message to nearby pedestrians equipped with a PID. Refer to section 3.4.2.2 for a description of the pedestrian interface. The variables and timing of when the message is displayed to the driver and how long it will stay on must be configurable.

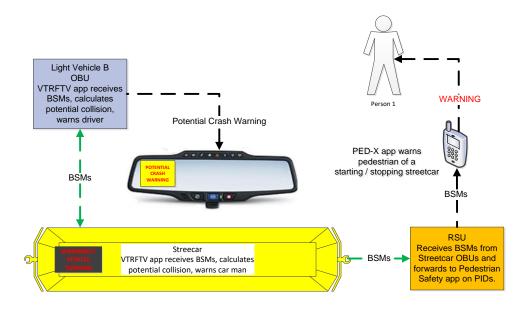
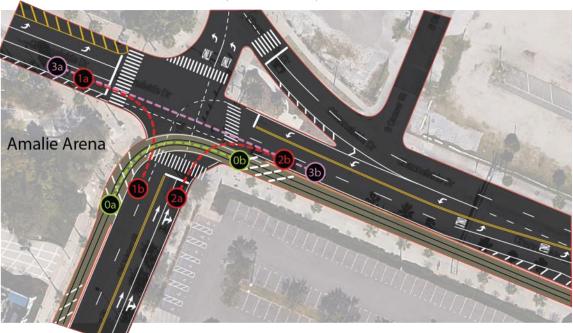


Figure 42: VTRFTV Functional Flow

Because it is a V2V app, it will be operational everywhere where the streetcar travels. The figure below shows an example of an intersection where VTRFTV app would be operational.

Streetcar (Baseline Path 0a to 0b) VS: 1: Vehicle Path 1a to 1b (Warning) 2: Vehicle Path 2a to 2b (Warning) 3: Vehicle Path 3a to 3b (False Positive Test)



Old Water St

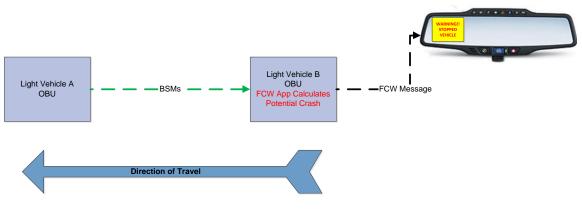
Channelside Dr.

Figure 43: VTRFTV Case Example

As can be seen in **Error! Reference source not found.**, when the streetcar travels from point 0a to 0b, multiple potential situations can happen that can cause accidents which the VTRFTV app will help prevent. If the OBU equipped vehicle approaches the intersection at point 1a and tries to make a right turn in front of the streetcar proceeding to point 0b, the driver of the vehicle as well as the streetcar will receive a warning based on the turn signal engagement, speed and trajectory. Same warning would be issued if the car approaches the intersection at point 2a and tries to make a right turn to 2b in front of the streetcar. It is also important that the app does not give false positive warnings as is shown in the case of the vehicle proceeding from point 3a to 3b and never cutting in front of the streetcar.

3.3.2.6 FCW

The FCW application is intended to alert the driver in case of impending potential rear-end collision with an equipped vehicle ahead in traffic. FCW is intended to help avoid or mitigate the severity of crashes into the rear end of other equipped vehicles in the same lane and direction of travel on the road. Forward crash warning responds to a direct and imminent threat ahead of the host vehicle. The FCW app receives BSMs from the lead vehicle OBU. Using the lead vehicle's BSM data, FCW calculates crash trajectories to determine if the trailing vehicle is about to rear end the lead vehicle. If FCW determines that the trailing vehicle is going to crash into the lead vehicle, a warning is issued to the driver. The FCW application HMI shall warn the driver no more than once when multiple warnings are received within a configurable timeframe, which is required by the OBU procurement specification and verified by Test Cases.

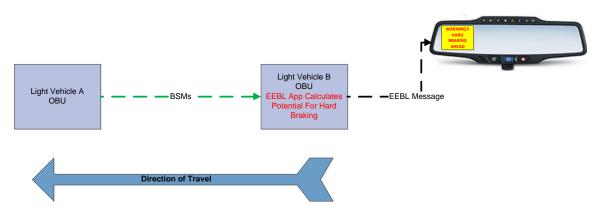




Anywhere two equipped vehicles interact, FCW will work and provide a driver alert if the right conditions occur as follows: one vehicle following the other; the lead vehicle brakes causing the closing distances to decrease (as calculated) to warrant an alert of a potential collision. The variables and timing of when the message is displayed to the driver and how long it will stay on must be configurable.

3.3.2.7 EEBL

The EEBL application is designed to alert driver of the host vehicle an equipped car that is exceeding the predetermined deceleration in upstream traffic. This provides downstream OBU equipped drivers with additional time to look for, and assess situations developing ahead.





The EEBL app receives BSMs from one or more vehicles ahead. Using the BSMs, if EEBL determines any vehicles in the same lane braking/stopping suddenly, the app issues a warning to the driver. This application is particularly useful when the driver's line of sight is obstructed by other vehicles or bad weather conditions (e.g., fog, heavy rain). The variables and timing of when the message is displayed to the driver and how long it will stay on must be configurable, which is part of the OBU procurement specification and verified by Test Cases.

3.3.2.8 IMA

The IMA application is intended to warn the driver when it is not safe to enter an intersection due to high collision probability with other equipped vehicles. IMA is especially useful when something is blocking the driver's view of opposing or crossing traffic.

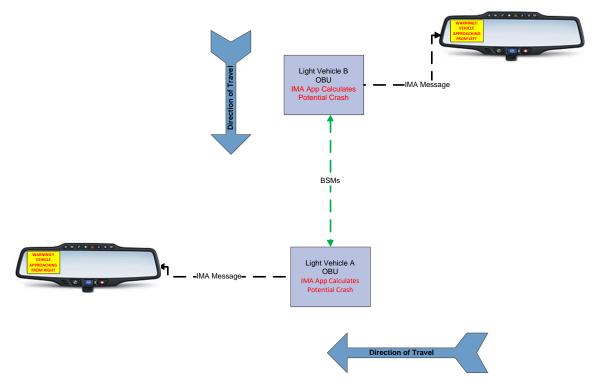


Figure 46: IMA Functional Flow

The IMA app receives BSMs from vehicles approaching the intersection adjacent to the vehicle equipped with IMA. If IMA determines there is a high probability of a collision using relative position, speed and heading of vehicles approaching the intersection, the app warns the driver. The variables and timing of when the message is displayed to the driver and how long it will stay on must be configurable. The variables and timing of when the message is displayed to the message is displayed to the driver and how long it will stay on are configurable and set to provide a timely warning.

3.3.2.9 Log Data Collector

See Section 3.2.2.6 of the Roadside Unit Software Design.

3.3.2.10 OTA Update

See Section 3.2.2.7 of the Roadside Unit Software Design.

3.3.2.11 HMI

The HMI aspect of the apps will be run by the OBUs. There will be both visual (presented on the Brandmotion Mirror) warnings as well as auditory warnings, that are tones (emitted by a speaker). A NTSC video signal will be sent to the mirror from the OBU when the OBU determines that a warning has to be displayed to the driver. At the same time, an auditory warning would be sent through an audio cable to the speaker for the driver to perceive.

3.3.2.12 OBU Management

OBU management is the collection of services and functionality for managing basic operations to include:

- broadcast of BSM messages
- application lifecycle management
- health monitoring
- human machine interface
- log collection and software update management.

3.3.3 Interfaces

Reference ICD

3.4 Smartphone (PID)

3.4.1 Platform Design

The platform used for the CV pilot is a standard off-the-shelf Android smartphone which is provided and owned by the study participant. There are only some required capabilities which are defined:

- Phone needs to have working WiFi and GPS
- Android version 5.0 or newer
- Minimum screen resolution 720 x1280 pixel

Android is an open source, Linux-based software stack created for a wide array of devices and form factors. Please see online web resources for further information on Android (e.g. <u>https://developer.android.com</u>).

3.4.2 Software Design

PED-SIG, PED-X, and PTMW are implemented as features of one smartphone application referred to as Pedestrian Safety App (PSA). As such they all share a common software design.

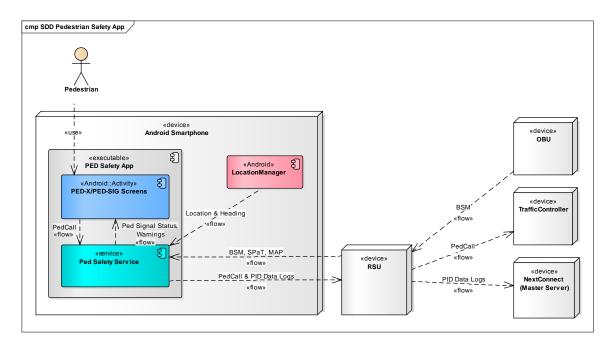


Figure 47: Pedestrian Safety App Software Design

PSA consists of the Ped Safety Service and several UI screens implemented by an Android Activity. The Ped Safety Service is responsible for communicating with nearby RSUs via WiFi and for tracking the smartphone's location. The ped safety service is started in the background when a PSA UI screen is opened by the user. While running, the service will monitor available WiFi networks for an RSU WiFi access point and connect to that WiFi automatically. When the user leaves the PSA, i.e. switches to a different Android application, the ped safety service is stopped and any WiFi connection to an RSU is closed.

The Ped Safety Service receives vehicle BSMs, MAP, and SPaT from the RSU via the established WiFi connection. See ICD: interface 23012 "Proxy Vehicle Location and Motion for PID", interface 23026 "Intersection Geometry" and 23027 "Intersection Status". Ped Safety Service sends pedestrian call request and PID data logs to the RSU via the same connection. See ICD: interface 23028 "Pedestrian Call" and interface 23029 "PID Data Logs".

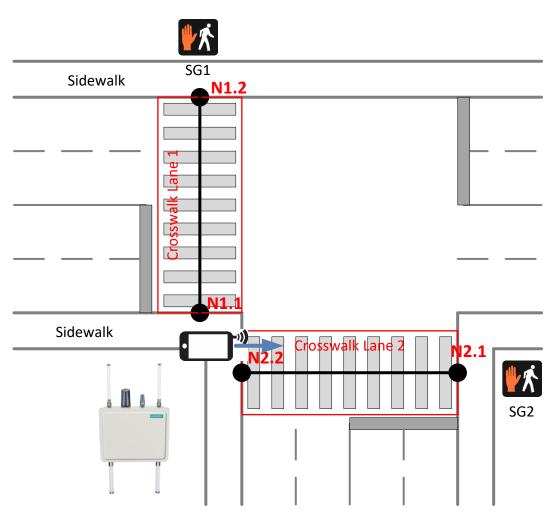


Figure 48: PED-SIG Concept for Determining the Crosswalk Signalgroup

The above figure depicts a smartphone running PSA (phone icon in south-west corner). PSA receives the intersection MAP from the RSU to which the smartphone is connected to via WiFi. The MAP contains crosswalk lanes which represent the crosswalk area. The figure shows an example of an intersection with 2 crosswalk lanes. Crosswalk 1 has start node N1.1 and end node N1.2. Crosswalk 2 has start node N2.1 and end node N2.2. Crosswalk 1 is associated with signal group 1 and crosswalk 2 is associated with crosswalk 2 (see J2735 for more details on crosswalk lanes and how to associate them with signal groups).

PSA determines that the PID is within MaxXWalkDistance¹¹ from crosswalk 1 and 2. However, based on the current PID heading (i.e. compass orientation) PSA determines that the PID is facing crosswalk

¹¹ Parameter will need to be fine-tuned based on phone GPS-accuracy. As initial value 10 meters will be used.

2 which is associated with signal group 2. The following diagram describes what happens when the user presses the "Cross" button on the PED-SIG application screen.

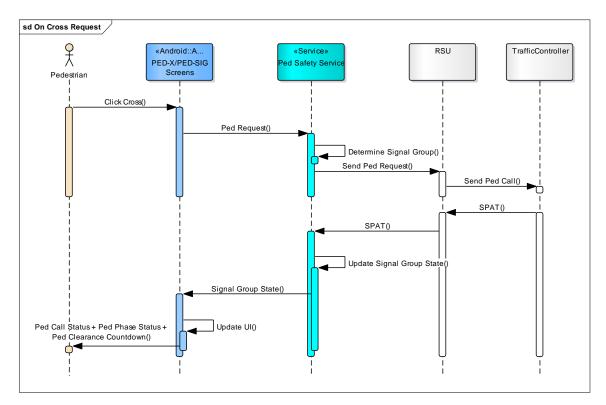


Figure 49: Sequence Diagram of Pedestrian Requesting Walk

When the user presses the button the PED-SIG screen activity sends the ped request to the Ped Safety Service. The Ped Safety Service selects the signal group for the crosswalk that the PID is facing based on the phone's location, the received intersection MAP, and the phone's heading. If a signal group is found which is associated with the crosswalk and heading then it sends a corresponding ped request to the RSU. The RSU transforms the request into a ped call for the phase associated with the identified signal group.

Subsequently SPaT messages are received by the Ped Safety Service from the RSU. The service forwards the phase status and ped call status relevant to the crosswalk to the PED-SIG screen activity. The activity updates the screen UI accordingly. See ICD: interface 23010 "Personal Updates" for more details regarding the PED-SIG user interface.

3.4.2.2 PED-X / PTMW

The PED-X & PTMW application features use the BSMs received in order to perform the following:

- Calculate collision warnings between vehicles and the pedestrian based on the phone's location. These warnings are not displayed to the user and only logged and sent back to the RSU for archiving at the master server.
- Warn the pedestrian of a bus (or streetcar) stopping or starting within an intersection. This event is also logged and sent back to the RSU for archiving at the master server.
- Warn the pedestrian of a VTRFTV event which was detected by a nearby streetcar. This event is also logged and sent back to the RSU for archiving at the master server.

The Ped Safety Service is responsible for calculating these warnings and for creating the PID data log entry. The PED-X screen activity displays the warnings to the user. See ICD: interface 23010 "Personal Updates" for more details regarding the PED-X user interface.

The PED-X application feature receives the current MAP from the RSU. The MAP data is used to match the current position of the PID to the intersection topology (e.g. crosswalks). The OBUs cyclically send BSMs (Basic Safety Message) containing current position, speed and heading values among others. These BSMs are received by the RSU and forwarded to the registered PIDs. PED-X on the PIDs analyzes the received BSMs, performs collision detection and sends data regarding detected collisions to the data collector.

3.4.2.2.1 Intersection Conflict Area

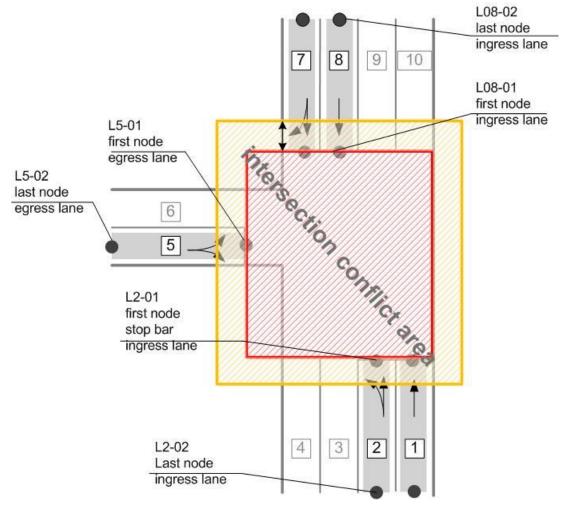


Figure 50: Intersection Conflict Area

In order to detect if a vehicle is crossing the intersection, the PED-X app has to derive a conflict area for the corresponding intersection from the data contained in the MAP. **Error! Reference source not found.** illustrates the MAP data for an example intersection, as well as the derived conflict area. The conflict shall be a rectangle, whose edges are determined by the first nodes (stop line) of the ingress lanes. The PED X App shall use the biggest possible conflict area, thus nodes that are further away from the intersection center shall be preferred to nodes closer to the center. This is depicted as the red rectangle in the figure.

Additionally, there shall be a configurable value ConflictDelta, by which the length and width of conflict area shall be increased in order to cope with inaccurate positioning systems like GPS. This is depicted as the yellow rectangle in the figure.

3.4.2.2.2 Vehicle/PID Conflict Area

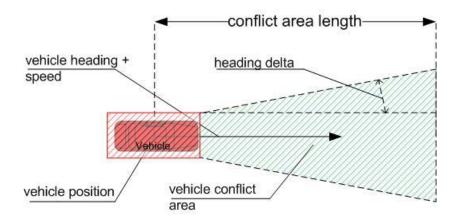


Figure 51: Vehicle Conflict Area

The conflict area of a vehicle shall consist of two parts:

- The first part (red) is a static rectangular area with the vehicle's position as center. Length and width of that area are calculated using the BSM vehicleWidth and vehicleLength values plus a configurable delta.
- The second part (green) is a dynamically calculated trapezoid. The length of that area is calculated by multiplication of the vehicle speed and a configurable pedestrian reaction time¹². The direction is equal to the heading value of the vehicle. The opening angle is determined by a configurable delta value used to deal with inaccurate heading values.

For the conflict area of a PID, the same concept applies.

3.4.2.2.3 Collision detection (PED-X)

The PED-X App shall calculate the conflict areas of all vehicles, of the PID itself, and if the intersection. Every time these objects change their state (changed position, speed, heading etc.) the corresponding conflict areas shall be updated. A collision shall be defined as the overlap of two or more conflict areas. Examples are given below.

¹² Based on recommended perception-reaction time (PRT) by AASHTO this value will be initially set to 2.5 seconds

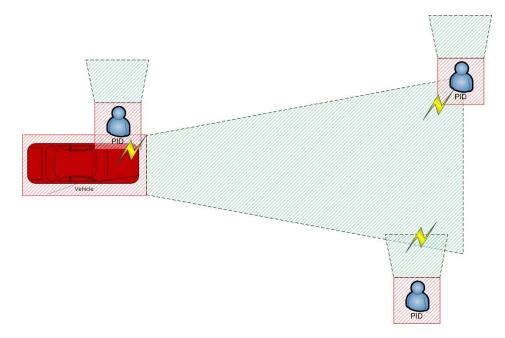


Figure 52: Collision Detection - Vehicle/PID

3.4.2.2.4 Bus Stopping / Proceeding (PTMW)

The PED-X App shall issue a warning when a bus stops or starts in an intersection (is within the intersection conflict area) while the PID is in the intersection conflict area. The bus OBU will be sending BSMs with a value identifying it as a bus (see ICD: interface 20004 "Vehicle location and motion"). Therefore, the PED-X App shall issue the "Bus Stopping / Proceeding Warning" once it receives BSM messages indicating a bus is stopping or starting.

The same warning will be given for streetcars stopping and starting within the intersection conflict area. A streetcar OBU will be sending BSMs with a value identifying it as a streetcar.

3.4.2.2.5 VTRFTV Warning (PTMW)

The streetcar OBU detects other equipped vehicles attempting to make a right turn in front of it and issues a "Vehicle Turning Right in Front of Transit Vehicle" (VTRFTV) Warning to its operator. See section 3.3.2.5 in this document for more details on the OBU operation. The OBU also sets a special field in the BSMs sent out when this warning happens (see ICD: interface 23032 "Transit Safety Alert"). The RSU forwards all BSMs to the PED-X App. The PTMW App detects the VTRFTV Warning field set by the streetcar OBU which is embedded in the streetcar BSMs and notifies the PID user.

3.4.3 Interfaces

Triple ID	Triple Name	Used By
23010	Personal Updates	3.4.2.1 PED-SIG
		3.4.2.2 PED-X
23012	Proxy Vehicle Location and Motion for PID	3.4.2.2 PED-X
23026	Intersection Geometry	3.4.2.1 PED-SIG
		3.4.2.2 PED-X
23027	Intersection Status	3.4.2.1 PED-SIG
23028	Pedestrian Call	3.4.2.1 PED-SIG
23029	PID Data Logs	3.4.2.1 PED-SIG
		3.4.2.2 PED-X
23032	Transit Safety Alert	3.4.2.2 PED-X

Table 17: Interface triple references used by the PID

4 Acronyms

ACRONYM	DEFINITION
ARM	Advanced RISC Machine
BER	Basic Encoding Rules
BRT	Bus Rapid Transit
BSM	Basic Safety Message
BT	Bluetooth
CAMP	Crash Avoidance Metrics Partnership
CAN	Controller Area Network
CBD	Central Business District
ССВ	Change Control Board
CFR	Code of Federal Regulations
ConOps	Concept of Operations
CMS	Central Management System
СОТ	City of Tampa
COTS	Commercial Off the Shelf
CPU	Central Processing Unit
CUTR	Center for Urban Transportation Research
CV	Connected Vehicle
CVRIA	Connected Vehicle Reference Implementation Architecture
CVS	Concurrent Versioning System
DER	Distinguished Encoding Rules
Detector	Infrastructure device that senses moving objects
DMS	Dynamic Message Sign
DRAM	Dynamic Random Access Memory
DSRC	Dedicated Short Range Communications
EEBL	Emergency Electronic Brake Light
ERDW	End of Ramp Deceleration Warning
ESCoS	Ecosystem for Cooperative Systems
ETA	Estimated Time of Arrival
ETSI	European Telecommunications Standards Institute
FBR	File Broadcast RSU
FCW	Forward Collision Warning
FDOT	Florida Department of Transportation
FHWA	Federal Highway Administration
GB	Gigabyte

ACRONYM	DEFINITION
GLONASS	Globalnaya Navigazionnaya Sputnikovaya Sistema
GND	Ground
GNSS	Global Navigation Satellite System
GNU	G, Not Unix
GPIO	General Purpose Input Output
GPS	Global Positioning System
GZIP	GNU compression file
НА	High Availability
HART	Hillsborough Area Regional Transit
HD	High Definition
HDD	Hard Disk Drive
HDMI	High Definition Multimedia Interface
НМІ	Human Machine Interface
HSM	Hardware Security Module
ICD	Interface Control Document
ID	Identifier
IGN	Ignition Signal
IMA	Intersection Movement Assist
IP	Internet Protocol
ISM	Infrastructure Sensor Message of Proxy sent via backhaul, not broadcast to vehicles
ITS	Intelligent Transportation System
IMA	Intersection Movement Assist
IPC	Inter-Process Communications
I-SIG	Intelligent Signal Systems
IEEE	Institute of Electrical and Electronics Engineers
ISO	International Standards Organization
JSON	JavaScript Object Notation
KB	Kilobyte
LCD	Liquid Crystal Display
Lidar	Light Detection and Ranging
LT	Left Turn
LTE	Long Term Evolution
MAFB	MacDill Air Force Base
MAP	MAP message conforming to SAE J2735 standard
MB	Megabyte
MMITSS	Multi-Modal Intelligent Traffic Signal System
MOU	Memorandum of Understanding
MPH	Miles Per Hour

ACRONYM	DEFINITION
MRP	MMITSS Roadside Processor
MTU	Maximum Transfer Unit
MUTCD	Manual on Uniform Traffic Control Devices
NEMA	National Electrical Manufacturers Association
NMEA	National Marine Electronics Association
NA	Not Applicable
NIC	Network Interface Controller
NTCIP	National Transportation Communications for ITS Protocol
NTSC	National Television System Committee
O&M	Operations and Maintenance
OBE	On-Board Equipment
OBU	On-Board Unit
OCIT	Open Communications Interfaces for Traffic Systems
OCPI	Open Content Provider Interface
OEM	Original Equipment Manufacturer
OS	Operating System
OSADP	Open Source Application Development Portal
ΟΤΑ	Over the Air
OV	Over Voltage
PAN	Personal Area Network
PCW	Pedestrian Collision Warning
PDETM	Probe Data Enabled Traffic Monitoring
PDU	Packet Data Unit
PED-SIG	Mobile Accessible Pedestrian Signals System
PED-X	Pedestrian in a Signalized Crosswalk
PFS	Pooled Fund Study
PID	Personal Information Devices
PII	Personally Identifiable Information
POC	Proof of Concept
Proxy	Software application that converts Detector output to BSM based on detection zone location
PSA	Pedestrian Safety Application
PSID	Private System ID
PSM	Personal Safety Message
PTMW	Pedestrian Transit Movement Warning
PWR	Power
QLE	Queue Length Estimate
RAID	Redundant Array of Independent Disks
RAM	Random Access Memory
	1

ACRONYM	DEFINITION
RDE	Research Data Exchange
REL	Reversible Express Lanes
RISC	Reduced Instruction Set Computer
RLNC	Random Linear Network Code
RSE	Roadside Equipment
RSU	Road Side Unit
RT	Right Turn
SAD	System Architecture Document
SAE	Society of Automotive Engineers
SCMS	Security Credential Management System
SD	Secure Digital
SDD	System Design Document
SEP	System Engineering Process
SQL	Structured Query Language
SRM	Signal Request Message
SSD	Solid State Disk
SSM	Signal Status Message
тв	Terabyte
TERL	Test Evaluation and Research Laboratory
THEA	Tampa Hillsborough Expressway Authority
ТІМ	Traveler Information Message
TLS	Transport Layer Security
ТМС	Transportation Management Center
TMDD	Traffic Management Data Dictionary
TSP	Transit Signal Priority
UDP	User Datagram Protocol
UI	User Interface
USB	Universal Serial Bus
USDOT	United States Department of Transportation
V2I	Vehicle-To-Infrastructure
V2V	Vehicle-To-Vehicle
V2X	Vehicle-To-Everything
VGA	Video Graphics Array
VM	Virtual Machine
VTRFTV	Vehicle Turning Right in Front of a Transit Vehicle
WAVE	Wireless Access in Vehicular Environments
WLAN	Wireless Local Area Network
WSA	Web Services Addressing

ACRONYM	DEFINITION
WSM	WAVE Short Message
WWE	Wrong Way Entry
XER	XML Encoding Rules
XFR	Transfer Interface of the RSU
XML	Extensible Markup Language
Z	Impedance

5 References

Table 18: Documents Referenced

RDn	Document (Title, source, version, date, location)
1	Connected Vehicle Reference Implementation Architecture Website, US Department of Transportation, Office of the Assistant Secretary of Transportation for Research and Technology. https://www.iteris.com/cvria
2	Connected Vehicle Pilot Deployment Program Phase 1, Concept of Operations (ConOps) – Tampa (THEA), February 2018, FHWA-JPO-16-311 http://ntl.bts.gov/lib/59000/59300/59360/FHWA-JPO-16-299.pdf
3	Connected Vehicle Pilot Deployment Program Phase 1, System Requirements Specification (SyRS) - Tampa (THEA), February 2018, FHWA-JPO-16-315 https://ntl.bts.gov/lib/60000/60700/60712/FHWA-JPO-16-315.pdf
4	Connected Vehicle Pilot Deployment Program Phase 2, System Architecture Document (SAD) - Tampa (THEA), January 2019, FHWA-JPO-17-459
5	Multi-Modal Intelligent Traffic Signal System – Phase II: System Development, Deployment and Field Test, Final Report, v2.0, September 2016, <u>http://www.cts.virginia.edu/wp-content/uploads/2014/04/53-MMITSS-Phase-2-Final-Report-FINAL-092520161.pdf</u>
6	Multi-Modal Intelligent Traffic Signal System, System Design, v1.1, 6/16/2015 http://www.cts.virginia.edu/wp-content/uploads/2014/04/22-MMITSS-Phase-2-Detailed-Design-AZ-final- 06162015.pdf
7	ISO/TS 19091:2017 - Intelligent transport systems Cooperative ITS Using V2I and I2V communications for applications related to signalized intersections, International Standards Organization, March, 2017 https://www.iso.org/standard/69897.html
8	Connected Vehicle Pilot Deployment Program Phase 2, Interface Control Document (ICD) - Tampa (THEA), May 2018, FHWA-JPO-17-460
9	VEHICLE SYSTEMS – On Board Unit (OBU) COMPONENT SPECIFICATION, OBU_COMPSPEC_BM_THEA v2.3, (unpublished)
10	RFQ OBU, HMI Interface and Antenna, merged into R3 (unpublished)
11	Connected Vehicle Pilot Development Program Phase 1 Participant Training and Stakeholder Education Plan – Tampa (THEA), Final Report – August 1, 2016, FHWA-JPO-16-318
12	Connected Vehicle Pilot Development Program Phase 1, Safety Management Plan – Tampa (THEA), Final Report –January 2019, FHWA-JPO-16-313
13	OBU-RSU Data Collection Interface, Specification Rev 1.3 Final, 8/9/2018, (unpublished)
14	VEHICLE SYSTEMS – Onboard Unit (OBU) HMI SPECIFICATION, OBU_HMISPEC_DM_THEA_v1.3, (unpublished)
15	Connected Vehicle Pilot Development Program Phase 2, Comprehensive Installation Plan – Tampa (THEA), Final Report – May 2018, FHWA-JPO-16-463

6 Requirements Traceability Matrix

This section consists of a Traceability Matrix used to validate Requirements to the major steps of the System Engineering Process (SEP). Each SEP step is documented as [RDn] in Table 18.

Table 19: Requirements Traceability Matrix

Requirement ID [RD3]	Requirement Description [RD3]	Con Ops Chapter [RD2]	User Need Number [RD2]	OBU Component Specification [RD9]	Participant Training and Stakeholder Education Plan [RD11]	Safety Management Plan [RD12]	OBU- RSU-Data Collection Interface [RD13]	OBU HMI Spec [RD14]	Comprehensive Installation Plan [RD15]	SDD Section	Design Element Function (See SDD Section 8 "Related Design Element" for exact wording)	ICD Chapter [RD8]	Flow ID [RD8]
THEA-UC1-001	I-SIG application at Twiggs and Meridian shall transmit southbound estimated queue data to the REL ERDW application.	7.1.1	1	NA	NA	NA	NA	2.2	NA	3.2.2.1.2	MMITSS (QLE) sends queue lengths on lanes to ERDW app	NA	NA
THEA-UC1-002	The drivers shall receive ERDW from ERDW application on the vehicles	7.1.1	1, 6	5.2.2	NA	NA	NA	2.2	NA	3.3.2.1	Drivers receive warning based on their speed and location in reference to the TIM received by the OBU from RSU	3.2.1	23002
THEA-UC1-003	I-SIG application at Twiggs and Nebraska shall transmit westbound queue longth data to the CSW application on the REL per lane.		Deleted										
THEA-UC1-004	The Electronic Emergency Brake Light warning (EEBL) application on the braking vehicle shall broadcast an EEBL warning when the vehicle deceleration exceeds predetermined value.	7.1.1	1	5.2.6	NA	NA	4.1.1.1.4	2.8	NA	3.3.2.7	Hard braking vehicle sends out a BSM with a hard- braking event flag to vehicles around.	3.1.1	20005
THEA-UC1-005	The EEBL application on the receiving vehicle shall receive an EEBL warning from the braking vehicle.	7.1.1	2	5.2.6	NA	NA	4.1.1.1.4	2.8	NA	3.3.2.7	EEBL app on the OBU receives BSMs from hard- braking vehicles around	3.1.1	20005
THEA-UC1-006	The EEBL application on the receiving vehicle shall process an EEBL warning from forward vehicles.	7.1.1	2	5.2.6	NA	NA	4.1.1.1.4	2.8	NA	3.3.2.7	EEBL app on the OBU processes BSMs from hard- braking vehicles ahead	3.1.1	20005
THEA-UC1-007	The EEBL application shall warn the driver of other equipped vehicles ahead exceeding the preset deceleration downstream to Twiggs Street.	7.1.1	2	5.2.6	NA	NA	4.1.1.1.4	2.8	NA	3.3.2.7	EEBL application warns the driver of a vehicle of a hard- braking vehicle in the lane ahead	3.2.1	23002

Requirement ID [RD3]	Requirement Description [RD3]	Con Ops Chapter [RD2]	User Need Number [RD2]	OBU Component Specification [RD9]	Participant Training and Stakeholder Education Plan [RD11]	Safety Management Plan [RD12]	OBU- RSU-Data Collection Interface [RD13]	OBU HMI Spec [RD14]	Comprehensive Installation Plan [RD15]	SDD Section	Design Element Function (See SDD Section 8 "Related Design Element" for exact wording)	ICD Chapter [RD8]	Flow ID [RD8]
THEA-UC1-008	Vehicles equipped with OBUs shall receive BSMs from other vehicles equipped with OBUs within DSRC range.	7.1.1	2	4.9.1.1	NA	NA	NA	NA	NA	3.3.2.12	OBU equipped vehicles continually broadcast and receive BSMs from other equipped vehicles within the range	3.1.1	20004
THEA-UC1-009	The FCW in-vehicle application shall determine potential crash trajectories with other vehicles.	7.1.1	1	5.2.5	NA	NA	NA	2.7	NA	3.3.2.6	FCW application will process BSMs from other vehicles in proximity to determine crash trajectories	NA	NA
THEA-UC1-010	The FCW application shall warn the driver of potential crash trajectories.	7.1.1	2	5.2.5	NA	NA	4.1.1.1.4	2.7	NA	3.3.2.6	Driver will receive a warning if crash is imminent	3.2.1	23002
THEA-UC1-011	The Human Machine Interface (HMI) shall warn the driver no more than once when multiple warnings are received within a configurable timeframe.	7.1.1	2	5.2.5	NA	NA	4.1.1.1.4	1.1.4	NA	3.3.2.6	Driver will receive one warning within a specified timeframe if crash is imminent	3.2.1	23002
THEA-UC1-012	The I-SIG application shall receive BSMs from vehicles equipped with OBUs.	7.1.1	1	5.2.5	NA	NA	NA	NA	NA	3.2.2.3.2	Siemens-MMITSS receives BSMs from vehicles	3.1.1	20004
THEA-UC1-013	I-SIG application running on the RSU at Twiggs and Meridian shall process BSMs to estimate the queue length on the southbound approach from the REL.	7.1.1	1	5.2.5	NA	NA	NA	NA	NA	3.2.2.3.2	MMITSS estimates queue lengths based on received BSMs. See the referenced pre-existing MMITSS Detailed Design.	NA	NA
THEA-UC1-014	I-SIG application at Twiggs and Nebraska shall process BSMs to estimate the queue length.	7.1.1	1, 3, 5	5.2.5	NA	NA	NA	NA	NA	3.2.2.3.2	MMITSS estimates queue lengths based on received BSMs. See the referenced pre-existing MMITSS Detailed Design.	NA	NA
THEA-UC1-015	I-SIG application shall transmit the queue lengths to the THEA master server.	7.1.1	1	5.2.5	NA	NA	NA	NA	NA	3.2.2.6.2	The data collector receives queue lengths from MMITSS and sends them to the master server.	3.12.4	23030
THEA-UC1-016	I-SIG application at Twiggs at Nebraska shall transmit the queue lengths to the THEA master server.		Deleted										
THEA-UC1-017	The Master Server shall receive the queue lengths from I-SIG application running on the RSU.	7.1.1	1	5.2.5	NA	NA	NA	NA		3.1.2.3	The data log archive stores the queue lengths received from RSUs	NA	NA

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THEA-UC1-018	The Master Server shall store the queue lengths received from I-SIG application.	7.1.1	1	5.2.5	NA	NA	3.0	NA	NA	3.1.2.3	The data log archive stores the queue lengths received from RSUs	NA	NA
THEA-UC1-019	The combination of signal controller and the RSU application shall control signal phases based on Multi-Modal Intelligent Traffic Signal Systems (MMITSS).	7.1.1	4	5.2.5	NA	NA	NA	NA	NA	3.2.2.3.2	MMITSS I-SIG controls phases of an intersection based on received BSMs. See the referenced pre- existing MMITSS Detailed Design.	NA	NA
THEA-UC1-020	The combination of signal controller and the RSU application shall modify the signal phase timing based on estimated queue lengths in order to move traffic efficiently through the intersection at Twiggs at Nebraska.	7.1.1	4							3.2.2.3.2	MMITSS I-SIG controls phases of an intersection based on received BSMs. See the referenced pre- existing MMITSS Detailed Design.	NA	NA
THEA-UC1-021	I-SIG application shall prioritize queues that limit safe stopping distance as Priority as defined in the I-SIG requirements.		Deleted										
THEA-UC1-022	The RSU ERDW application shall broadcast a recommended standard speed.	7.1.1	6	5.2.5	NA	NA	NA	NA	NA	3.2.2.1.2	ERDW sends out a corresponding TIM with the speed recommendation zones	3.4.3	20014
THEA-UC1-023	The vehicle ERDW application shall receive the recommended standard speed.	7.1.1	6	5.2.5	NA	NA	NA	NA	NA	3.3.2.1	Equipped cars will receive TIM from RSU with the recommended speed	3.4.3	20014
THEA-UC1-024	The RSU ERDW application shall adjust the configurable speed recommendation zone(s) based on the southbound queue length from I-SIG application on Twiggs and Meridian.	7.1.1	6	5.2.5	NA	NA	NA	NA	NA	3.2.2.1	ERDW calculates the safe speed using a regression formula based on the FL drivers manual table	NA	NA
THEA-UC1-025	The vehicle ERDW application shall provide a configurable speed that the agencies can adjust to local practices to an appropriate speed based on the vehicle type.	7.1.1	6	5.2.5	NA	NA	NA	NA	NA	3.2.1.1 3.3.2.1	Depending on vehicle type, the OBU will convert the recommended speed to assure a safe stopping distance	NA	NA

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THEA-UC1-026	The RSU ERDW application shall calculate the configurable speed recommendation zones to the THEA Master Server.	7.1.1	6							3.2.2.6	The RSU logs all WSM sent out which includes TIMs sent by ERDW. The data collector transfers these logs to NextConnect.	NA	NA
THEA-UC1-026a	The RSU ERDW application shall transmit the configurable speed recommendation zones to the THEA Master Server.	7.1.1	6	5.2.5	NA	NA	3.0	NA	NA	3.2.2.6.2	The TMC Operator can access the current queue length and TIM being broadcast via the RSU service UI.	NA	NA
THEA-UC1-027	TMC operators shall be able to access queue length and corresponding speed recommendation zones.		Deleted										
THEA-UC1-028	A traditional vehicle detector shall issue a call to the RSU when a vehicle occupies the detection zone.	7.1.1	1, 6	5.2.5	NA	NA	NA	NA	NA	3.2.2.1.2	A Wavetronix radar sensor will detector vehicles passing by. The ISG application on the RSU receives the sensor data.	3.9.1	23016
THEA-UC1-029	The RSU shall transmit an ISM (infrastructure sensor message) to I-SIG when the traditional detector issues a call.	7.1.1	1, 6	5.2.5	NA	NA	NA	NA	NA	3.2.2.1.2	The ISG application creates an ISM from the sensor data and sends it MMITSS as input to the queue length estimator.	NA	NA
THEA-UC1-030	Vehicles equipped with OBUs shall broadcast BSMs.	7.1.2	2	5.2.5	NA	NA	NA	NA	NA	3.3.2.12	OBU equipped vehicles continually broadcast and receive BSMs from other equipped vehicles within the range	3.1.1	20004
THEA-UC2-001	Vehicle shall receive the BSMs from other equipped vehicles.	7.1.2	1	5.2.1	NA	NA	NA	NA	NA	3.3.2	OBU equipped vehicles continually broadcast and receive BSMs from other equipped vehicles within the range	3.1.1	20004
THEA-UC2-002	Vehicles traveling in the legal direction shall identify crash trajectory of vehicles traveling opposite the legal direction.		Deleted										

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THEA-UC2-003	Vehicles shall identify crash trajectory of cross street vehicles	7.1.2	1	5.2.1	NA	NA	NA	2.2	NA	3.3.2.8	The IMA application is intended to warn the driver when it is not safe to enter an intersection	3.2.1	23002
THEA-UC2-003a	Vehicles shall warn the driver of a potential crash.	7.1.2	1	5.2.1	NA	NA	4.1.1.1.4	2.2	NA	3.3.2.8	The IMA application is intended to warn the driver when it is not safe to enter an intersection	3.2.1	23002
THEA-UC2-004	RSU at REL entrance shall host the existing 2-phase traffic signal control application.		Deleted										
THEA-UC2-005	Signal control application Phase 1 at REL entrance shall be RED inbound and GREEN outbound during outbound times of day,		Deleted										
THEA-UC2-006	Signal control application Phase 2 at REL entrance shall be GREEN inbound and RED outbound during inbound times of day.		Deleted										
THEA-UC2-007	The RSU at REL entrance shall transmit the latest published standard SPaT message per J2735/201603.	7.1.2	2	5.2.1	NA	NA	4.0	NA	NA	2.1.2 3.2.2.2 3.4.2	The SPaT-MAP-Daemon broadcasts SPaT and MAP	3.4.2	43013
THEA-UC2-008	The RSU at REL entrance shall transmit the REL entrance lane geometry MAP message per J2735/201603 current version	7.1.2	2	5.2.1	NA	NA	4.0	NA	NA	2.1.2	The SPaT-MAP-Daemon broadcasts SPaT and MAP	3.4.1	20008
THEA-UC2-008b	The MAP message shall identify the REL lanes as revocable lanes.	7.1.2	2	5.2.1	NA	NA	4.0	NA	NA	2.1.2	The MAP message broadcast is configurable and will be configured per this requirement.	NA	NA

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THEA-UC2-008c	The SPaT message shall contain the enabled / disabled status of the revocable lanes based on status of the gates at the REL entrance.	7.1.2	2	5.2.1	NA	NA	4.0	NA	NA	3.2.2.2.2	The SPaT-MAP-Daemon receives the current gate open/closed status from the local traffic controller via NTCIP. It then translates this status to the enabled status for the corresponding revocable lanes and includes then EnabledLane list with the SPaT message.	3.8.1	23006
THEA-UC2-008d	The WWE application shall receive the open / closed status from the gates at the REL entrance.	7.1.2	2	5.2.1	NA	NA	4.0	NA	NA	3.2.2.2.2	The SPaT-MAP-Daemon receives the current gate open/closed status from the local traffic controller via NTCIP. It then translates this status to the enabled status for the corresponding revocable lanes and includes then EnabledLane list with the SPaT message.	3.8.1	23006
THEA-UC2-009	Participating vehicles shall host the Wrong Way Entry (WWE) application.												
THEA-UC2-010	Vehicle WWE application shall receive the SPaT message.	7.1.2	2	5.2.1	NA	NA	4.0	NA	NA	3.3.2.2	OBU will receive SPaT messages broadcast by the RSUs	3.4.2	23007
THEA-UC2-011	Vehicle WWE application shall receive the MAP message.	7.1.2	2	5.2.1	NA	NA	4.0	NA	NA	3.3.2.2	OBU will receive MAP messages broadcast by the RSUs	3.4.1	20008, 23007
THEA-UC2-012	Vehicle WWE application at the REL entrance shall warn drivers predicted to enter a closed lane or an ingress lane going the wrong way.	7.1.2	2	5.2.1	NA	NA	4.1.1.1.4	2.1	NA	3.3.2.2	OBUs will warn the driver based on the trajectory and the SPaT and MAP messages from the intersection	3.2.1	23002
THEA-UC2-013	A roadside vehicle detector shall issue a call to the proxy app when a vehicle approaches the REL entrance.												

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THEA-UC2-014	A roadside vehicle detector shall issue a call to the WWE app running on the RSU when a vehicle enters the REL entrance going the wrong way.	7.1.2	3	5.2.1	NA	NA	NA	NA	NA	3.2.2.1.1	The RSU WWE app receives a detection input from a wrong-way detection system via the local traffic controller.	3.8.1	23006
THEA-UC2-015	WWE app running on the RSU shall create a wrong way driver warning message when the roadside detector call is asserted.	7.1.2	3, 4	5.2.1	NA	NA	4.1.1.1.4	2.1	NA	3.2.2.1.1	The RSU WWE app broadcasts a corresponding TIM containing the wrong- way driver alert.	3.4.3	23017
THEA-UC2-015b	While receiving wrong way driver warning messages the OBU shall determine if the vehicle is travelling on along the road segment to which the warning applies.	7.1.2	1	5.2.1	NA	NA	4.1.1.1.4	2.1	NA	3.3.2.2	The application will warn the drivers of equipped vehicles of a wrong way driver approaching them on the REL based on a TIM that would be broadcast by the RSU.	3.2.1, 3.4.3	23002, 23017
THEA-UC2-015c	The OBU shall receive TIMs messages containing warning of a wrong way driver.	7.1.2	1	5.2.1	NA	NA	4.1.1.1.4	2.1	NA	3.3.2.2	The application will warn the drivers of equipped vehicles of a wrong way driver approaching them on the REL based on a TIM that would be broadcast by the RSU.	3.2.1, 3.4.3	23002, 23017
THEA-UC2-015d	The OBU shall warn the driver of a wrong way driver.	7.1.2	1	5.2.1	NA	NA	4.1.1.1.4	2.1	NA	3.3.2.2	The application will warn the drivers of equipped vehicles of a wrong way driver approaching them on the REL based on a TIM that would be broadcast by the RSU.	3.2.1, 3.4.3	23002, 23017
THEA-UC2-016	Vehicle WWE application of violator shall issue a wrong-way alert to the wrong way driver while driving the REL going the wrong way.	7.1.2	3	5.2.1	NA	NA	NA	2.1	NA	3.3.2.2	Driver will receive a warning if they are driving the wrong way on the REL	3.2.1	23002
THEA-UC2-017	RLV application of violator shall issue wrong-way alert to the RSU when the RLV application checks out of the REL MAP geometry during RED phase.												

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THEA-UC2-018	Wrong-way alert from the RSU shall be received at the master server.	7.1.2	4	5.2.1	NA	NA	3.0	NA	NA	3.1.2.3	The data collector receives logs from RSUs and stores them at the master server. The logs contain, among other things, the WWE TIMs broadcast by the RSU.	3.12.4	23030
THEA-UC2-019	Wrong-way alert from the RSU shall be stored at the master server.	7.1.2	4	5.2.1	NA	NA	3.0	NA	NA	3.1.2.3	The data collector receives logs from RSUs and stores them at the master server. The logs contain, among other things, the WWE TIMs broadcast by the RSU.	NA	NA
THEA-UC2-020	Wrong-way alert from master server shall be displayed in Concert.	7.1.2	4	5.2.1	NA	NA	NA	NA	NA	2.1.2	The Concert System will display an alert to the TMC operator when a wrong-way driver is detected.	NA	NA
THEA-UC3-001	The OBU shall receive Personal Safety Messages (PSMs).	7.1.3	1, 3	5.2.4	NA	NA	NA	NA	NA	3.3.2.4	OBU will receive a PSM from the RSU at the Courthouse	3.4.5	20012
THEA-UC3-002	The OBU shall determine if there is a potential conflict with a pedestrian.	7.1.3	1, 3	5.2.4	NA	NA	NA	NA	NA	3.3.2.4	PCW app will process the PSMs and determine if the vehicle is on a collision course with the pedestrian.	NA	NA
THEA-UC3-003	The OBU shall warn the driver upon determination of a potential conflict with a pedestrian.	7.1.3	1, 3	5.2.4	NA	NA	4.1.1.1.4	2.4	NA	3.3.2.4	The driver will receive a warning if they are on a collision course with a pedestrian	3.2.1	23002
THEA-UC3-004	The OBU shall receive data from the RSU of a pedestrian entering the crosswalk.		Deleted										
THEA-UC3-005	The PID shall warn the pedestrian in the crosswalk when a vehicle is approaching the crosswalk.		Deleted										
THEA-UC3-006	The PID shall warn the pedestrian approaching the crosswalk when a vehicle is entering the crosswalk.		Deleted										
THEA-UC3-007	The PID shall warn the pedestrian in a non-crosswalk area on the street when there is an impending vehicle conflict.		Deleted										

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THEA-UC3-008	The PID shall transmit PSM to the RSU.	7.1.3	10	5.2.4	NA	NA	3.0	NA	NA	3.2.2.6.1	The PID sends the PSM included inside the data logs to the RSU	3.6.5	23029
THEA-UC3-009	The RSU shall log PID PSM.	7.1.3	10	5.2.4	NA	NA	3.0	NA	NA	3.2.2.6.2 3.4.2.2	The data collector receives the data logs from the PIDs which include the PSM	3.6.5	23029
THEA-UC3-010	The RSU shall convert the PSM into a BSM.		Deleted										
THEA-UC3-011	The RSU shall send all PID PSMs to the master server.	7.1.3	10	5.2.4	NA	NA	3.0	NA	NA	3.2.2.6.2	RSU data collector sends received data logs to the master server (NextConnect) for storage.	3.12.4	23030
THEA-UC3-012	The RSU shall receive vehicle BSMs.	7.1.3	10	5.2.4	NA	NA	NA	NA	NA	3.2.2.5.1	The XFER gateway on the RSU receives BSMs from vehicles and forwards them to connected PIDs via Wi-Fi.	3.1.1	20004
THEA-UC3-013	The RSU shall send a not in crosswalk message to PIDs who are outside the crosswalk.		Deleted										
THEA-UC3-014	The RSU shall convert vehicle BSMs into PSMs		Deleted										
THEA-UC3-015	The RSU shall send vehicle BSMs over Wi-Fi to the PID.	7.1.3	10	5.2.4	NA	NA	NA	NA	NA	3.2.2.5.2	The XFER gateway on the RSU forwards them to connected PIDs via Wi-Fi.	3.6.1	23012
THEA-UC3-016	The PID shall receive BSMs.	7.1.3	10	5.2.4	NA	NA	4.1.1.1.4	NA	NA	3.2.2.5.2	The PED-X app calculates collision warnings and logs them in the PID data log.	3.6.5	23029
THEA-UC3-016a	The PID shall calculate collision warnings using the PID's location.	7.1.3	10	5.2.4	NA	NA	4.1.1.1.4	NA	NA	3.2.2.5.1	The PED-Sig app lets the user press a button on the UI when facing a cross- walk. The app will send a pedestrian call to the local traffic controller via the RSU over Wi-Fi.	3.6.4	23028
THEA-UC3-016b	The PID shall send warnings to the RSU for offline analysis.	7.1.3	10	5.2.4	NA	NA	4.1.1.1.4	NA	NA	3.2.2.6.2	The PED-Sig app receives the SPaT message from the RSU via Wi-Fi including the pedestrian call status.	3.6.3	23027

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THEA-UC3-017	The PID application, Mobile Accessible Pedestrian Signal (PED-SIG), shall allow the pedestrian to place a crossing request on the signal controller via the RSU		Deleted										
THEA-UC3-017a	The PID app shall receive a confirmation for successfully placing the request and display it to the user.		Deleted										
THEA-UC4-001	Transit vehicle shall send Signal Request Message (SRM) to RSU when vehicle matches the location of the intersection approach.	7.1.4	1, 4	5.2.8	NA	NA	NA	NA	NA	3.3.2.3	The OBU will send an SRM to the RSU	3.4.4	20009
THEA-UC4-002	The RSU shall send a priority service request to the master server.	7.1.4	1, 4	5.2.8	NA	NA	NA	NA	NA	3.2.2.3	Siemens-MMITSS receives the SRM and sends a corresponding priority service request to the transit server / master server (NextConnect).	3.11.1	23013
THEA-UC4-003	Master server shall query the HART OneBusAway server for bus schedule deviation status.	7.1.4	1, 4	5.2.8	NA	NA	NA	NA	NA	3.1.2.2	NextConnect TSP looks up the current schedule deviation for the bus requesting priority.	NA	NA
THEA-UC4-004	If bus is behind schedule, the transit central shall grant permission to process the SRM to the originating RSU. Otherwise permission shall be denied.	7.1.4	1, 4, 7, 8, 9	5.2.8	NA	NA	NA	NA	NA	3.1.2.2	NextConnect TSP replies to the priority service request with granting the request if the bus is behind schedule. Otherwise the request is rejected.	NA	NA
THEA-UC4-005	The TSP application of MMITSS shall consider all priority service request of buses behind schedule and compute a phase execution schedule minimizing overall delay as implemented in the available release of MMITSS.	7.1.4	1, 4, 7, 8, 9	5.2.8	NA	NA	NA	NA	NA	3.2.2.3.2	Siemens-MMITSS processes granted priority service requests per the MMITSS design and implementation.	NA	NA
THEA-UC4-006	TSP shall receive priority status from the Controller Unit (CU).		Deleted										

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THEA-UC4-007	TSP shall broadcast a Signal Status Message (SSM) including the decision from the master server whether the request was granted.	7.1.4	1, 4, 7, 8, 9	5.2.8	NA	NA	NA	NA	NA	3.2.2.3	Siemens-MMITSS informs the bus requesting priority whether the request was granted or rejected by broadcasting a corresponding SSM.	3.4.4	20009
THEA-UC4-008	Bus shall receive SSM from TSP.	7.1.4	1, 4, 7, 8, 9	5.2.8	NA	NA	NA	NA	NA	3.3.2.3	RSU sends an SSM to approaching transit vehicles	3.4.4	20009
THEA-UC4-009	SSM shall be displayed as a bus driver notification.	7.1.4	2	5.2.8	NA	NA	NA	2.5	NA	3.3.2.3	Driver will receive a Priority Granted message if they are behind schedule	3.2.1	23002
THEA-UC4-010	Signal controllers shall extend green in order to move vehicle queues that block a bus stop entrance when the bus is behind schedule.	7.1.4	1, 4, 7, 8, 9							3.2.2.3	Siemens-MMITSS controls the phase execution schedule of an NTCIP controller by applying phase calls, force offs, holds, and omits, thereby implementing the desired behavior of either extending green or giving early green.	3.8.1	23013
THEA-UC4-011	PID shall issue an alert to participant pedestrians within in a geo fenced area that a bus is stopping at an intersection.	7.1.4	6	5.2.8	NA	NA	4.0	NA	NA	3.4.2.2.1	The PTMW feature of the pedestrian safety app monitors BSMs of nearby buses within the MAP area of the intersection and alerts the user of a stopping or starting bus.	3.6.1	23012
THEA-UC4-012	Pedestrian Safety app on PIDs shall issue an alert to pedestrians within in a geo fenced area that bus is starting up again.	7.1.4	6	5.2.8	NA	NA	4.0	NA	NA	3.4.2.2.4	The PTMW feature of the pedestrian safety app monitors BSMs of nearby buses within the MAP area of the intersection and alerts the user of a stopping or starting bus.	3.6.1	23012

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THEA-UC4-013	Transit signal priority (TSP) shall be implemented to extend and existing green in the bus route of travel	7.1.4	1, 4, 7, 8, 9	5.2.8	NA	NA	NA	NA	NA	2.1.6	Siemens-MMITSS controls the phase execution schedule of an NTCIP controller by applying phase calls, force offs, holds, and omits, thereby implementing the desired behavior of either extending green or giving early green.	3.8.1	23013
THEA-UC4-013a	Transit signal priority shall be implemented to request accelerated (early cycle) green.	7.1.4	1, 4, 7, 8, 9							3.2.2.3	Siemens-MMITSS controls the phase execution schedule of an NTCIP controller by applying phase calls, force offs, holds, and omits, thereby implementing the desired behavior of either extending green or giving early green.	3.8.1	23013
THEA-UC5-001	Street car OBUs shall determine the position of received vehicle BSMs within DSRC range.	7.1.5	1, 3							3.3.2.5	OBU equipped vehicles continually broadcast and receive BSMs from other equipped vehicles within the range	3.1.1	20004
THEA-UC5-002	Street car OBUs shall determine the position of received participant PSMs within WiFi range.		Deleted										
THEA-UC5-003	Street car OBUs shall broadcast BSMs.		Deleted										
THEA-UC5-004	RSUs adjacent to street car line shall receive PSMs of in WiFi range pedestrians.		Deleted										
THEA-UC5-005	Pedestrian Safety app on PIDs shall issue an alert to pedestrians within a geo fenced area that the streetcar is stopping.	7.1.5	2, 8, 9, 10	5.2.3	NA	NA	NA	NA	NA	3.4.2.2.2	The PTMW feature of the pedestrian safety app monitors BSMs of nearby buses within the MAP area of the intersection and alerts the user of a stopping or starting streetcar.	3.6.1	23012

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THEA-UC5-006	Pedestrian Safety app on PIDs shall issue an alert to pedestrians within a geo fenced that the streetcar is starting.	7.1.5	2, 8, 9, 10	5.2.3	NA	NA	NA	NA	NA	3.4.2.2.2	The PTMW feature of the pedestrian safety app monitors BSMs of nearby buses within the MAP area of the intersection and alerts the user of a stopping or starting streetcar.	3.6.1	23012
THEA-UC5-007	Streetcar OBUs shall analyze its current position in relation to right turning vehicles to determine if right turning vehicle is in conflict to the streetcar's position.	7.1.5	1, 3	5.2.3	NA	NA	NA	NA	NA	3.4.2.2.5	OBU will use the turn signal of the vehicle in aiding to figure out if there is a potential conflict with the Streetcar	NA	NA
THEA-UC5-007a	Vehicle OBUs shall analyze its current position while preparing to make a right turn across the streetcar tracks in relation to a nearby streetcar to determine if the streetcar is in conflict to the vehicle's projected path.	7.1.5	7	5.2.3	NA	NA	NA	NA	NA	3.3.2.5	OBU will use the turn signal in aiding to figure out if there is a potential conflict with the Streetcar	NA	NA
THEA-UC5-008	Streetcar OBUs shall produce a warning of a vehicle turning in front of the streetcar to streetcar operator.	7.1.5	4	5.2.3	NA	NA	4.1.1.1.4	2.3	NA	3.3.2.5	If the OBU determines that there is a conflict, the Driver will receive a warning and modify a field in the BSM which is sent on to the RSU	3.2.1	23002
THEA-UC5-008a	Vehicle OBUs shall produce a warning of a streetcar conflict to the driver.	7.1.5	7	5.2.3	NA	NA	4.1.1.1.4	2.3	NA	3.3.2.5	If the OBU determines that there is a conflict, the Driver will receive a warning	3.2.1	23003
THEA-UC5-008b	Streetcar OBUs shall produce a warning of a vehicle turning in front of the streetcar to the RSU.	7.1.5	7	5.2.3	NA	NA	4.1.1.1.4	2.3	NA	3.2.2.6.1	If the OBU determines that there is a conflict, the Driver will receive a warning	3.2.1	23002

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THEA-UC5-009	RSUs adjacent to the streetcar line shall send right turning vehicle warning to the Master Server.	7.1.5	2, 8, 9, 10	5.2.3	NA	NA	4.1.1.1.4	NA	NA	3.2.2.6.1 3.2.2.5.2	The VTRFTV warning is included inside the BSM broadcast by the streetcar and is received by the RSU. The data collector RSU app will log the BSM including the VTRFTV warning and forward to the master server.	3.1.1	20004
THEA-UC5-009a	RSUs adjacent to the streetcar line shall send right turning vehicle warning to nearby PIDs.	7.1.5	2, 8, 9, 10	5.2.3	NA	NA	4.1.1.1.4	NA	NA	3.4.2.2.5	The XFER gateway on the RSU receives BSMs from vehicles and forwards them to connected PIDs via Wi-Fi.	3.6.1	23012
THEA-UC5-009b	The PID shall provide warning messages to the pedestrian when a street car stops within an intersection and when it starts back up again.												
THEA-UC5-009c	The PID shall provide warning messages to the pedestrian when a vehicle is turning right in front of the streetcar.	7.1.5	2, 8, 9, 10	5.2.3	NA	NA	4.1.1.1.4	NA	NA	3.4.2.2.5	The PTMW feature of the pedestrian safety app detects the VTRFTV warning included with the BSM received and alerts the user.	3.10.1	23010
THEA-UC5-010	Street car OBUs shall analyze its current position in relation to pedestrians in intersection crossings.		Deleted										
THEA-UC5-011	Street car OBUs shall produce a warning to the street car operator that equipped pedestrians are in conflict to the street car within a configurable threshold defaulted to 100 feet.		Deleted										
THEA-UC5-012	RSUs adjacent to the street car line shall send pedestrian conflicts warnings to the Master Server.		Deleted										
THEA-UC5-013	Street car OBUs shall store the warning message that a pedestrian is crossing the intersection.		Deleted										
THEA-UC5-014	Vehicle OBUs shall receive PSMs from the RSUs adjacent to the street car line.		Deleted										
THEA-UC5-015	Vehicle OBUs shall store the pedestrian crossing warning messages.		Deleted										

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THEA-UC5-016	Vehicle OBUs shall download pedestrians crossing warning messages to the master server		Deleted										
THEA-UC5-017	RSUs adjacent to the street car line shall receive information about location and movement of the street car.		Deleted										
THEA-UC5-018	PIDs shall receive a street car collision warning from the RSUs adjacent to the street car line.		Deleted										
THEA-UC5-019	PIDs shall provide street car collision warning messages to the pedestrian.		Deleted										
THEA-UC5-020	PIDs shall provide vehicle collision warning messages to the pedestrian.		Deleted										
THEA-UC6-001	The master server application shall compute Travel Times from equipped vehicle speeds measured along the corridors specified in other requirements.		Deleted										
THEA-UC6-002	The master server application shall send MAFB gate queues to vehicles and nomadic devices.		Deleted										
THEA-UC6-003	The master server application shall send incident locations to vehicles and nomadic devices.		Deleted										
THEA-UC6-004	-PIDs shall transmit PSMs		Deleted										
THEA-UC6-005	Vehicle OBUs shall broadcast BSMs.		Deleted										
THEA-UC6-006	I-SIG application running on their RSU shall receive vehicles BSMs.	7.1.6	1, 2, 3	5.2.2	NA	NA	NA	NA	NA	3.2.2.3.2	Siemens-MMITSS receives BSMs from nearby vehicles	3.1.1	20004

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THEA-UC6-007	MMITSS shall be implemented to minimize overall delay on Meridian Avenue and Florida Avenue as implemented in the available release of MMITSS.	7.1.6	1, 2, 3	NA	NA	NA	NA	NA	NA	3.2.2.3.1	Siemens-MMITSS component MRP_PerformanceObserver calculates intersection delay time metric	NA	NA
THEA-UC6-008	I-SIG shall archive Multi-Modal Intelligent Traffic Signal Systems (MMITSS)-measured intersection delay time at the TMC Master Server.		Deleted										
THEA-UC6-008a	For each selected intersection on Meridian, I-SIG shall estimate the queue lengths on all approaches and compute the phase execution schedule as implemented in the available release of MMITSS.	7.1.6	1, 2, 3	NA	NA	NA	NA	NA	NA	3.2.2.3.1	Siemens-MMITSS component MRP_PerformanceObserver calculates queue length estimate. Siemens-MMITSS I-SIG component determines the phase execution schedule based on estimated queue lengths.	NA	NA
THEA-UC6-008b	For each selected intersection on Florida, I-SIG shall estimate the queue lengths on all approaches and compute the phase execution schedule as implemented in the available release of MMITSS.	7.1.6	1, 2, 3	NA	NA	NA	NA	NA	NA	3.2.2.3.1	Siemens-MMITSS component MRP_PerformanceObserver calculates queue length estimate. Siemens-MMITSS I-SIG component determines the phase execution schedule based on estimated queue lengths.	NA	NA
THEA-UC6-009	The Master Server shall aggregate travel times across the corridor.		Deleted										
THEA-UC6-010	The Master Server shall present travel times to the TMC Operator.		Deleted										
THEA-UC6-011	Travel times along Meridian Avenue shall be determined in a configurable time threshold (starting at 15 seconds).		Deleted										
THEA-UC6-012	Travel times along Meridian Avenue shall be based on length of corridor and detection points.		Deleted										

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THEA-UC6-013	Travel times along Florida Ave and Nebraska Ave shall be determined with the most current data.		Deleted										
THEA-UC6-014	Travel times along Selmon Expressway shall be determined with the most current data.		Deleted										
THEA-UC6-015	I-SIG shall publish travel times along Meridian Avenue to MAFB commuters.		Deleted										
THEA-UC6-016	I-SIG shall publish travel times along Channelside Drive to MAFB commuters.		Deleted										
THEA-UC6-017	I-SIG shall publish travel times along Selmon Expressway to MAFB commuters.		Deleted										
THEA-UC6-018	The Ped-Sig application shall make a pedestrian call to the RSU.	7.1.6	4	NA	NA	NA	NA	NA	NA	3.4.2.1	The PED-Sig app lets the user press a button on the UI when facing a cross- walk. The app will send a pedestrian call to the local traffic controller via the RSU over Wi-Fi.	3.10.1	23010
THEA-UC6-018a	The Ped-Sig applications shall receive a proceed to cross message with the pedestrian clearance timer from the RSU Ped Sig application.		Deleted										
THEA-UC6-018b	The Ped-Sig application shall audibly inform the pedestrian of the ability to cross and the pedestrian clearance timer.	7.1.6	4	NA	NA	NA	NA	NA	NA	3.4.2.1	The PED-Sig feature of the pedestrian safety app uses Android's text-to-speech feature in order to audibly inform the user of the pedestrian signal head status including the "Flashing Don't Walk" countdown timer.	3.10.1	23010
THEA-UC6-018c	The RSU Ped-SIG application shall receive the pedestrian call from the PID.	7.1.6	4	NA	NA	NA	4.0	NA	NA	3.4.2.1	The SPaT-MAP Daemon receives the pedestrian call from the PID and uses the Controller Proxy component in order to place the call with the NTCIP traffic controller.	3.6.4	23028

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THEA-UC6-018d	The RSU Ped-Sig application shall send pedestrian call to the signal controller.	7.1.6	4	NA	NA	NA	4.0	NA	NA	3.4.2.1	The SPaT-MAP Daemon receives the pedestrian call from the PID and uses the Controller Proxy component in order to place the call with the NTCIP traffic controller.	3.8.1	23006
THEA-UC6-018e	The RSU Ped-Sig application shall request the extended walk time, if available, to the signal controller.	7.1.6	4							3.2.2.4	The Controller Proxy component will use the appropriate NTCIP OID for requesting extended walk time, if supported by the NTCIP controller.	3.8.1	23006
THEA-UC6-018f	The RSU Ped Sig application shall receive the pedestrian timing information from the signal controller.	7.1.6	4	NA	NA	NA	4.0	NA	NA	3.2.2.1	The SPaT-MAP Daemon receives the SPaT message from the traffic controller containing the pedestrian call status.	3.8.1	23006
THE-UC6-018g	The RSU Ped-SIg application shall send the proceed to cross message to the Ped-Sig application running on the PID.	7.1.6	4	NA	NA	NA	4.0	NA	NA	3.4.2.1	The PED-Sig app receives the SPaT message from the RSU via Wi-Fi including the pedestrian clearance timer status.	3.6.3	23027
THEA-SAF-001	Equipment, software, processes, and interfaces shall comply with IEEE and SAE standards as prescribed by one of the USDOT approved certification entities.	5.3	NA	NA	NA	Table 5-1 IDs 22 and 23	NA	NA	NA	Table 15 Table 9	All the standards are listed in the OBU spec RSU implements USDOT v4.1 Spec	NA	NA
THEA-SAF-002	Equipment, software, processes, and interfaces shall be tested for interoperability before deployment to ensure they meet those standards for interoperability.					6.1.1 and 6.2					The vehicle integrator, with THEA team concurrence, will provide an interoperability process and the supplier a plan for certification.		
THEA-SAF-003	During operations the TMC Operator and installation technicians shall performs checks on the equipment, software, interfaces, and processes on a six month basis at a minimum.	8				4.3.6, 6.2.2					Organizational Requirement		
THEA-SAF-004	THEA shall maintain the RSUs installed along the roadside by monitoring the RSU status from the Concert System.	9.5.2	NA	NA	NA	NA	NA	NA	3.5 5.2.7	Table 1	Organizational Requirement	NA	NA

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THEA-SAF-005	OBU/Application failure shall not affect the normal operation of the vehicle.	10	NA	3.3.1	NA	Table 5-1 IDs 12, 14, 16	NA	NA	NA	3.3.2.12	The OBU shall not damage the vehicle's electrical systems, electronic systems, or cause a fire or other condition that could damage the vehicle or injure the driver or passengers.	NA	NA
THEA-SAF-006	RSU/Application failure shall not affect the safe operation of the signal controller.	10	NA	NA	NA	Table 5-1 IDs 3, and 4	NA	NA	NA	2.1.6 3.1 3.1.2.1 3.2.2.2.2 3.2.2.3.2 3.2.2.4.1 3.3.2.3	RSU uses only standard NTCIP interfaces for communication with the signal controller.	NA	NA
THEA-SAF-007	PID application failure shall not affect the normal operation of the PID.					Table 5-1 ID 18					Android OS implements this requirement.		
THEA-SAF-008	OBUs shall be installed properly in vehicles, buses, and street cars.	9.5.3				6.1.2					Organizational Requirement		
THEA-SAF-009	RSUs shall be installed such that they receive GPS and DSRC signals.										Organizational Requirement;		
THEA-SAF-010	RSUs shall be installed near signal cabinets such that the RSU and signal controller can be connected.	5.2 Goal 2									Organizational Requirement		
THEA-SAF-011	Participants shall bring their vehicles in for inspection within 14 days when the vehicle is involved in a crash.	10	NA	NA	Section 3.1	NA	NA	NA	4.2.9	Not SDD	Organizational Requirement	NA	NA
THEA-SAF-012	The invehicle applications shall present information to drivers using a device that drivers are familiar with and limit interaction.									3.3	Private passenger automobiles and light duty trucks – Each respective OEM rear view mirror will be replaced with a compatible rear-view mirror, that is maintaining all original mirror functions	NA	NA
THEA-SAF-013	CV device suppliers shall provide and follow an approved quality management process in designing, constructing and producing their devices.					6.1.2					Organizational Requirement	NA	NA

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THEA-SAF-014	The proposed user interface(s) shall be reviewed and approved by THEA and stakeholders.	5.3	NA	NA	NA	6.1.1	NA	NA	NA	Not SDD	Organizational Requirement	NA	NA
THEA-SAF-015	Safety checks for OBU's and RSU's shall comprise the equipment reset functions upon power loss and restoration.			4.12.1.5		6.1.1					The OBU shall include appropriate watchdog mechanisms that will monitor all software processes and alert the process monitor [on the OBU] when a process appears to be inoperative.		
THEA-SAF-016	Safety checks for OBU's and RSU's shall comprise the redundancy actions upon power loss and restoration.			3.1.4		6.1.1					Upon power loss and restoration, the RSU performs a secure boot checking the integrity and authenticity of the installed software before executing it Upon power loss and restoration the OBU performs a secure boot checking the integrity and authenticity of the installed software before executing it.		
THEA-SAF-017	Safety checks for OBU's and RSU's shall comprise the security actions upon power loss and restoration.			3.1.4		6.1.1					Upon power loss and restoration, the RSU performs a secure boot checking the integrity and authenticity of the installed software before executing it. Upon power loss and restoration the OBU performs a secure boot checking the integrity and authenticity of the installed software before executing it.		

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THEA-SAF-018	Safety checks for OBU's and RSU's shall comprise the equipment reset functions, redundancy, security, and actions upon power loss and restoration.			3.1.4		6.1.1					Upon power loss and restoration, the RSU performs a secure boot checking the integrity and authenticity of the installed software before executing it. Upon power loss and restoration the OBU performs a secure boot checking the integrity and authenticity of the installed software before executing it.		
THEA-SAF-019	Uninterruptible power supply units with sufficient holdup time (2 hours) to implement the response plans shall be installed at all signal controller cabinets as part of the pilot.					6.1.1					Organizational Requirement		
THEA-SAF-020	Device installers shall be approved by the in-vehicle integrator to install devices in vehicles, buses, streetcars.	9.2	NA	NA	7.3	6.1.2	NA	NA	4.2	Not SDD	The Hillsborough Community College automotive training facilities and personnel to install the vehicle systems.	NA	NA
THEA-SAF-020a	Participants shall be trained in the operation and interaction of the installed Onboard Units.	9.2	NA	NA	3.6		NA	NA	4.2	Section 6 RTM		NA	NA
THEA-SAF-021	Device installers shall be approved by the infrastructure integrator THEA and the COT to install devices in signal cabinets and along the roadside.	9.2	NA	NA	7.3	6.1.2	NA	NA	4.2	Section 6 RTM	Organizational Requirement	NA	NA

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THEA-SAF-022	RSUs installed for the pilot shall have a hardware fail safe mode.			4.12.1.5		6.1.2					Upon power loss and restoration, the RSU performs a secure boot checking the integrity and authenticity of the installed software before executing it. Only know good application software will be launched and allowed to broadcast via DSRC. The operating platform shall be able to reload and restart the failed process and shall make an entry in a log indicating that this action took place. Such actions shall include managed hysteresis that will avoid continuous retries for a failed process until it receives an update.		
THEA-PFM-001	The CUTR Server shall collect baseline or "before CV treatment" performance metrics for each CV App used in each Use Case if available.	11.2.1	NA	NA	NA	NA	NA	NA	NA	3.1.2.4	Organizational Requirement	NA	NA
THEA-PFM-002	The CUTR Server shall store baseline or "before CV treatment" performance metrics for each CV App used in each Use Case if available.	11.2.1	NA	NA	NA	NA	NA	NA	NA	3.1.2.4	Organizational Requirement	NA	NA
THEA-PFM-003	The CUTR Server shall collect performance metrics for each CV App used during each Use Case	11.21	NA	NA	NA	NA	3.0	NA	NA	3.1.2.3	The data log archive includes metrics for each deployed CV app	NA	NA
THEA-PFM-004	The CUTR Server shall store performance metrics for each CV App used during each Use Case	11.2.1, 11.2.2	NA	NA	NA	NA	3.0	NA	NA	3.1.2.3	The data log archive includes metrics for each deployed CV app	NA	NA
THEA-PFM-005	The CUTR Server shall enable the analysis or compare historical or "before CV treatment" performance metrics for each CV App used in each Use Case to "after CV treatment" performance metrics for each CV App used in each Use Case.	11.2.5	NA	NA	NA	NA	3.0	NA	NA	3.1.2.3	The data log archive stores data log from both the "before CV treatment" time period and the "after CV treatment" time period.	NA	NA

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THEA-PFM-006	The CUTR Server shall automate routine performance reports.	11.2.5	NA	NA	NA	NA	NA	NA	NA	3.1.2.4	Reporting Service can be configured to generate reports automatically.	NA	NA
THEA-PFM-007	The CUTR Server shall support on demand performance reports.	11.2.5	NA	NA	NA	NA	NA	NA	NA	3.1.2.4	Reports can also be requested on demand from Reporting Service.	NA	NA
THEA-PFM-008	The Master Server shall support daily performance reports.	11.2.5								3.1.2.4	Reports can be scheduled to run automatically. Daily, weekly, and monthly reports are supported.		
THEA-PFM-009	The Master Server shall automate weekly performance reports.	11.2.5								3.1.2.4	Reports can be scheduled to run automatically. Daily, weekly, and monthly reports are supported.		
THEA-PFM-010	The Master Server shall automate monthly performance reports.	11.2.5								3.1.2.4	Reports can be scheduled to run automatically. Daily, weekly, and monthly reports are supported.		
THEA-PFM-011	The Master Server shall transmit reports to USDOT.	11.2.5								3.1.2.4	Reporting jobs can send reports to a provided email address.		

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THEA-PFM-012	 The Concert system shall collect: BSM and ISM queue length crashes, conflicts, or near misses approaching speed on REL BSM travel times number of wrong way violations approaching speed on Twiggs Street toward the REL approaching speed on Nebraska Avenue toward the REL approaching speed on Florida Avenue toward the REL vehicle's speed approaching the crosswalk bus percent arrival on green number of times priority is requested and granted number of times priority is requested, granted, and then denied due to a higher priority approach speed at intersections along Florida Avenue approach speed at intersections along Florida Avenue 	11.2.5	NA	NA	NA	NA	NA	NA	NA	3.1.2.4	See table 3-3 for the list of supported reports	NA	NA
THEA-PFM-012a	 The Concert system shall compute travels times along Meridian travel times along Florida 	11.2.5	NA	NA	NA	NA	NA	NA	NA	3.1.2.4		NA	NA

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THEA-PFM-012b	 The Centracs system shall collect: percent arrival on green percent arrival on green along Meridian Avenue 	11.2.5	NA	NA	NA	NA	NA	NA	NA	3.1.2.4	Centracs supports these via an addon module which will be installed and configured by the City of Tampa	NA	NA
THEA-PFM-012c	 The HART system shall collect: bus travel time through the deployment region bus percent arrival on schedule 	11.2.5	NA	NA	NA	NA	NA	NA	NA	3.1.2.2	HART has existing metrics supporting this.	NA	NA
THEA-PFM-012d	 The CUTR server shall collect: delay time travel time from Bluetooth travel time system travel time reliability indices travel time delay on REL travel time delay on adjacent arterial pedestrian delay time at the crosswalk vehicle delay time at the crosswalk delay time along Meridian Avenue delay time along Nebraska Avenue delay time along Florida Avenue 	11.2.5	NA	NA	NA	NA	NA	NA	NA	3.1.2.4	An internal document is being developed that identifies each performance data element and required calculations and communication methods. This Performance Measures Data Design Document is under development and is targeted for completion by 9/30/17	NA	NA

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THEA-PFM-013	The CUTR system shall store: delay time queue length crashes, conflicts, or near misses approaching speed on REL travel time reliability indices travel times percent arrival on green percent wrong way violation travel time delay on REL travel time delay on REL travel time delay on adjacent arterial approaching speed on Twiggs Street toward the REL vehicle delay time at the crosswalk pedestrian delay time at the crosswalk pedestrian delay time at the crosswalk bus travel time through the deployment region bus percent arrival on green number of times priority is requested and granted number of times priority is requested, granted, and then denied due to a higher priority travel times along Meridian Avenue percent arrival on green along Meridian Avenue 	11.2.5	NA	NA	NA	NA	NA	NA	NA	3.1.2.4	All sour perform stored o See tab data so perform

In Element Function ee SDD Section 8 ted Design Element" or exact wording)	ICD Chapter [RD8]	Flow ID [RD8]
Irce data for these mance measures is on the master server. Ible 3-2 for the list of ources for each mance measure.	NA	NA

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THEA-SEC-001	OBU Wireless Access in Vehicular Environments (WAVE) shall comply with IEEE 1609.2: Standard for WAVE – Security Services for Applications and Management Messages	11.3.1	NA	4.10.1	NA	NA	NA	NA	NA	Table 15	OBUs shall conform to all the required standards listed in the OBU Spec RSU complies with USDOT v4.1 Spec	NA	NA
THEA-SEC-001a	RSU Wireless Access in Vehicular Environments (WAVE) shall comply with IEEE 1609.2: Standard for WAVE – Security Services for Applications and Management Messages	11.3.1	NA	NA	NA	NA	NA	NA	NA	3.2.1		NA	NA
THEA-SEC-002	Devices shall sign and/or encrypt data non-DSRC IP communication (i.e., cellular, WiFi) interfaces with X.509 certificates.	11.3.2	NA	NA	NA	NA	NA	NA	NA	Table 9	RSU supports Wi-Fi WPA2 plus TLS encryption via Wi- Fi. RSU supports OpenVPN encryption via LTE.	NA	NA
THEA-SEC-003	THEA CV Pilot devices shall support requirements identified in the SCMS POC Implementation End Entity (EE) Requirements and Specifications as of November 1, 2017.	41.3.1	NA	4.10.1	NA	NA	NA	NA	NA	<u>3.2.1</u>	The Vehicle System shall have security as defined by the Security Certificate Management System (SCMS) POC and provide data privacy. Human Use and Privacy requirements to be developed. RSU complies with USDOT v4.1 Spec	NA	NA
THEA-SEC-004	Datasets shall be required to have PII information removed prior to being made publicly available.	11.3.2	NA	NA	NA	NA	3.0	NA	NA	3.1.2.3	Data Log Archive performs PII removal before copying data to the public storage area.	NA	NA
THEA-SEC-005	Monitoring systems shall be enabled and used to perform intrusion detection	11.3.1	NA	4.7.3	NA	NA	NA	NA	NA	Table 15	The OBU equipment shall be able to detect when there are any new connections or insertions into the USB port or SD Card slot.	NA	NA
THEA-SEC-006	The RSU firewall shall be enabled and used to prevent unauthorized activity on an IP connection.	11.3.1	NA	NA	NA	NA	NA	NA	NA	Not SDD	Organizational Requirement to use firewall correctly	NA	NA
THEA-SEC-006a	The OBU firewall shall be enabled and used to prevent unauthorized activity on an IP connection.	11.3.1	NA	4.7.1	NA	NA	NA	NA	NA	Not SDD	Organizational Requirement to use firewall correctly	NA	NA

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THEA-SEC-007	OBU hardware shall meet FIPS-140-2 Level 2												
THEA-SEC-008	PIDs shall meet FIPS 140-2 Level 2 or equivalent.												
THEA-SEC-009	RSU hardware shall meet FIPS 140-2 Level 2.												
THEA-SEC-010	ITS Roadway Equipment communications shall be developed meet FIPS 140-2 Level 2 or equivalent.												
THEA-SEC-011	New field cabinets shall include tamper alerts.	11.3.1									Organizational Requirement (responsibility of City of Tampa)		
THEA-SEC-012	New field cabinet tamper alerts shall be sent to the TMC when an unauthorized access occurs.	11.3.1									Organizational Requirement (responsibility of City of Tampa)		
THEA-SEC-013	All participant data, as defined in the SMOC, shall be encrypted with minimum standards, password protected, and maintained separate from the application and performance measurement data (Separate systems, separate login and user access at a minimum).	11.3.2									Organizational Requirement		
THEA-SEC-014	Access to participant data shall be identified in the Human Use Approval document,	11.3.2	NA	NA	NA	NA	NA	NA	NA	3.1.2.3	Organizational Requirement	NA	NA
THEA-SEC-015	The definition of how applications are authorized to communicate shall be using valid certificates.	11.3.1									Organizational Requirement		
THEA-SEC-016	No person shall transfer PII information in an unencrypted state.	11.3.1									Organizational Requirement		
THEA-SEC-017	The participant's location information shall not be provided unless it is part of an application and no correlation to the participants personal information.	11.3.1									Organizational Requirement		
THEA-SEC-018	PII shall not be used as a unique identifier except for buses.	11.3.1									OBUs will be identified using a numeric ID.		

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THEA-SEC-019	For broadcast and transactional unicast transmissions by OBUs, temporary and one-time identifiers shall be used during the pilot, but removed following the completion of the pilot.	11.3.1	NA	4.11	NA	NA	NA	NA	NA	3.1.2.3	OBUs will be identified using a static numeric ID in the TemporaryID field of the BSM. At the end of the study the static ID will be replaced by a true temporary ID according to J2945/1_201603	NA	NA
THEA-SEC-020	The user shall consent to providing data in an agreement that spells out how the data is used and by whom (including re- distribution to third parties).	11.3.2									Organizational Requirement		
THEA-SEC-021	The Master Server Network and remote access shall support remote authenticated access.	11.3.1	NA	NA	NA	NA	NA	NA	NA	Table 2	RSU supports remote access via browser UI which requires a user name and password.	NA	NA
THEA-SEC-022	OBU's and PIDs shall not support remote access of the connected vehicle applications.	11.3.1									OBUs do not have access via SSH or HTTP		
THEA-SEC-023	The OBU shall support physical access to support bootstrapping activities.	11.3.1	NA	4.1.9	NA	NA	NA	NA	NA	Table 3	A management port will be used for data transfers as well as firmware and software upgrades	NA	NA
THEA-SEC-023a	The RSU shall support physical access to support bootstrapping activities.	11.3.1	NA	NA	NA	NA	NA	NA	NA	Table 2		NA	NA
THEA-SEC-024	OBUs and RSUs shall support role- based authentication to enable physical access.												
THEA-SEC-025	The host processor and its operating software shall be delivered in an operational state.	Deleted	NA	NA							The RSU is delivered fully operational with software pre-installed.		
THEA-SEC-026	The host processor and its operating software shall be delivered such that required protections are implemented.	Deleted	NA	NA							The RSU is delivered with a security provisioning pre- installed.		
THEA-SEC-027	If the host processor is initialized in a manufacturing state, the required protections shall not be required.	11.3.1									The RSU isn't delivered to the end-customer in a manufacturing state		

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THEA-SEC-028	Any devices designed so they can return from the operating state to the manufacturing state shall wipe all privileged applications from the processor and all keys as part of the transition.	11.3.1									"Reset to manufacturing state" is done via provisioning files, that also delete/reset all keys & credentials. Only authenticated user can perform this, i.e. via WebGUi.		
THEA-SEC-029	The device shall allow a user to perform a reset to a manufacturing state without any authentication if the reset mechanism guarantees the physical presence of the user.	11.3.1									"Reset to manufacturing state" is done via provisioning files, that also delete/reset all keys & credentials. Only authenticated user can perform this, i.e. via WebGUi.		
THEA-SEC-030	The host processor shall perform integrity checks on boot to ensure that it is in a known good software state.	11.3.1									The RSU uses secure boot with verification of signed code before its execution.		
THEA-SEC-031	If the host processor determines it is not in a known good software state on boot up, it shall not continue and will log an error when possible.	11.3.1									The RSU uses secure boot with verification of signed code before its execution.		
THEA-SEC-032	The host processor integrity checks shall require the use of a hardware- protected value.	11.3.1									The RSU secure boot depends upon an eFuse stored in a masked ROM.		
THEA-SEC-033	The host processor shall not allow any privileged application to request signing until the integrity checks have passed.	11.3.1									If integrity check fails, the system does not boot up. So this is implicit.		
THEA-SEC-034	If the host processor fails the integrity checks it shall not grant access for any process to private keys.	11.3.1									If integrity check fails, the system does not boot up. So this is implicit.		
THEA-SEC-035	If the host processor fails the integrity checks it shall not allow any privileged application to operate.	11.3.1									If integrity check fails, the system does not boot up. So this is implicit.		

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THEA-SEC-036	The host processor integrity check shall carry out a check that stored root CA certificates have not been modified since they were last accessed.	11.3.1									The RSU checks that installed root CA certificates haven't been modified during secure boot. It also checks the installed certificates during runtime in regular intervals.		
THEA-SEC-037	If the integrity check fails, the device shall reject all incoming signed messages that chain back to those root CA certificates as invalid.	11.3.1									If the certificate check fails the RSU logs an error and disables the modified root CA certificates. This automatically leads to incoming signed messages being rejected if their signing certificate chains back to the disabled root CA certificate.		
THEA-SEC-038	Each privileged application shall map to a role as defined in the SMOC.	11.3.1									Privileged applications on the RSU run as a limited rights Linux user which allows them to sign / encrypt messages and verify signatures as well as decrypt messages.		
THEA-SEC-039	The discretionary access control mechanisms of the host processor operating system shall be configured to specify the set of roles that has execute permissions on each private key stored within the Hardware Security Module (HSM).	11.3.1									RSU supports mandatory access control on executing HSM functions		
THEA-SEC-040	The discretionary access control mechanisms of the host processor operating system shall be configured to: specify the set of roles that can modify (i.e., write, replace, and delete) the following programs and plaintext data stored within the host processor boundary												

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THEA-SEC-041	The discretionary access control mechanisms of the host processor operating system shall be configured to specify the set of roles that can read data stored within the host processor boundary and which data can be read by those roles	11.3.2									There are only certain processes that can read and decrypt the encrypted data, but other applications cannot (as part of mandatory control mechanism).		
THEA-SEC-042	The discretionary access control mechanisms of the host processor operating system shall be configured to specify the set of roles that can enter cryptographic keys.	11.3.1									There are only certain processes that can read and decrypt the encrypted data, but other applications cannot (as part of mandatory control mechanism).		
THEA-SEC-043	The host processor OS shall allow processes that correspond to privileged applications to operate without explicit authentication by a user,	11.3.1									The RSU supports daemon processes.		
THEA-SEC-044	The host processor OS shall allow processes that update private key material within the HSM to operate without explicit authentication by a user.	11.3.1									An RSU process with sufficient permission is able to update private keys by generating a new key pair. However, it is not possible to read the private key.		
THEA-SEC-045	The host processor OS shall allow processes to install new software or firmware if that software or firmware is signed by the original developer/manufacturer.	11.3.1									The RSU will only install properly signed software.		
THEA-SEC-046	The host processor OS shall not allow processes to write private key material to the HSM.	11.3.1									The HSM does not allow processes to write private keys.		
THEA-SEC-047	The host processor OS shall require explicit authentication for processes that modify or inspect executing processes.	11.3.1									The RSU supports process inspection privileges as a built-in Linux security feature.		
THEA-SEC-048	The OS shall not allow processes that read private cryptographic key material from the HSM.	11.3.1									The HSM of the RSU does not allow reading any private key material.		
THEA-SEC-049	The host processor shall require that all software installed is signed	11.3.1									The RSU software update only accepts signed software.		

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THEA-SEC-050	The integrity of the verification key shall be protected by local hardware.	11.3.1									The RSU software update only accepts signed software.		
THEA-SEC-051	The hardware protection shall be equivalent to FIPS 140-2 at the level appropriate to the device as a whole.												
THEA-SEC-052	The host processor shall require that software be installed only by an authenticated user.	11.3.1									The RSU software update can only be done from the browser UI after successful login.		
THEA-SEC-053	The update mechanism for the host processor shall include mechanisms to prevent updates from being rolled back. List of exception from comment	11.3.1									The RSU software update allows installation of an older software version per exception list from requirement comment.		
THEA-SEC-054	If an update fails, the host processor shall notify the update mechanism of the failure.	11.3.1									If the update fails the previous version is restored.		
THEA-SEC-055	If the update mechanism receives an update failure, it shall publish a notification of the failure and instruct the host processor to roll back.	11.3.1									If the update fails the previous version is restored.		
THEA-SEC-056	All cryptographic software and firmware shall be developed and installed in a form that protects the software and firmware source and executable code from unauthorized disclosure and modification	11.3.1									The cryptographic software and firmware is contained within the HSM where it is protected from unauthorized disclosure and modification.		
THEA-SEC-057	The HSM shall be certified by one of the approved certification entities or if they are not available the HSM shall be self-certified by the vendor at a minimum.												
THEA-SEC-058	A cryptographic mechanism using an approved integrity technique shall be applied to all cryptographic software and firmware components within the HSM.												

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THEA-SEC-059	If the HSM itself calculates the Message Authentication Code when the software is installed using a secret key known only to the HSM, and uses this secret key to verify the software on boot or if the software provider has a unique shared key with each distinct device and uses this to authenticate the software, the message authentication code shall be us.												
THEA-SEC-060	A Message Authentication Code shall not be used to protect the software unless the Message Authentication Code key is unique to the HSM.												
THEA-SEC-061	Cryptographic software and firmware, cryptographic keys, and control and status information shall be under the control of an operating system that meets the functional requirements specified in the Protection Profiles listed in FIPS 140-2 Annex B and is capable of evaluation at the CC evaluation assurance level EAL2, or an equivalent trusted operating system.												
THEA-SEC-062	To protect plaintext data, cryptographic software and firmware, cryptographic keys, and authentication data, the discretionary access control mechanisms of the operating system shall be configured to specify the set of roles that can execute stored cryptographic software and firmware.	11.3.2									Permission is required and enforced by Linux OS for the user to perform operations on the HSM.		
THEA-SEC-063	To protect plaintext data, cryptographic software and firmware, cryptographic keys, and authentication data, the discretionary access control mechanisms of the operating system shall be configured to specify the set of roles that can modify (i.e., write, replace, and delete) the following cryptographic module software or firmware components stored within the cryptographic boundary: cryptographic programs, cryptographic data.	11.3.2									Permission is required and enforced by Linux OS for the user to perform operations on the HSM.		

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THEA-SEC-064	To protect plaintext data, cryptographic software and firmware, cryptographic keys, and authentication data, the discretionary access control mechanisms of the operating system shall be configured to specify the set of roles that can read the cryptographic software components stored within the cryptographic boundary: cryptographic data.	11.3.2									Permission is required and enforced by Linux OS for the user to perform operations on the HSM.		
THEA-SEC-065	To protect plaintext data, cryptographic software and firmware, cryptographic keys, and authentication data, the discretionary access control mechanisms of the operating system shall be configured to specify the set of roles that can execute stored cryptographic software and firmware.	11.3.2									Permission is required and enforced by Linux OS for the user to perform operations on the HSM.		
THEA-SEC-066	The operating system shall prevent all operators without the appropriate permissions (i.e., system admin) and executing processes from modifying executing cryptographic processes (i.e., loaded and executing cryptographic program images).	11.3.1									Permission is required and enforced by Linux OS for the user to perform operations on the HSM.		
THEA-SEC-067	The operating system shall prevent operators without the appropriate permissions (i.e., system admin) and executing processes from reading cryptographic software stored within the cryptographic boundary.	11.3.1									The HSM of the RSU does not allow read operations.		
THEA-SEC-068	The HSM shall maintain two roles, User which can execute software and firmware, write and delete cryptographic keys, and install signed software and firmware and Security Officer which can install unsigned software and firmware in the event that specialized new software and/or firmware is being tested and troubleshot.												
THEA-SEC-069	Activities carried out by the user role shall not be explicitly authenticated, once the user role has successfully logged in.	11.3.1									Once the user is logged in, the user can exercise activities granted by his role without further authentication		

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THEA-SEC-070	In a networked architecture which includes the host processor, other processors, and the HSM, the host processor shall authenticate itself to the HSM with an authentication mechanism based in hardware with the same physical security as the HSM.	11.3.1									The HSM and RSU form a "connected architecture". So this requirement doesn't apply.		
THEA-SEC-071	OBUs shall support security requirements identified in SAE J2945/1 V5, such as the BSM transmission and reception security profile.	11.3.1		4.9.1							OBUs have to conform to J2935/1 standards		
THEA-SEC-072	All unused media ports shall be sealed with a removable tamper evident seal or better.	11.3.1	NA	4.7.2	NA	NA	NA	NA	NA	Table 15	The OBU shall provide evidence to detect tampering (e.g. opening of the case) through tamper- evident seals on all unused input ports and screw holes. RSU is delivered with tamper-evident seals on ports and enclosure per SCMS and Certification	NA	NA
THEA-SEC-073	OBU devices shall support the ability to reset default user names and passwords by users with Administrative functions (ENG, MRG, and DYNACAdmin).	11.3.1									OBUs do not support access via SSH or HTTP as there is no WiFi module		
THEA-SEC-074	RSU devices shall meet the WAVE Service Advertisement (WSA) security profile covered in IEEE 1609.3 (2016)	11.3.1									The RSU complies with IEEE 1609.3 (2016).		
THEA-SEC-075	RSU devices shall meet the SpaT, MAP and Traveler Information Message (TIM) security profiles covered in the COC system Functional and Performance Specification Version 0.4.0.	11.3.1									RSU will implement security profiles agreed upon between CV pilot sites.		
THEA-SEC-076	RSU devices shall support security requirements identified in SAE J2945/1 V5, such as the BSM transmission and reception security profile	11.3.1									The RSU does not transmit BSMs. The RSU supports the BSM security profile for reception.		

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THEA-SEC-077	RSU devices shall support the ability to reset default user names and passwords by users with Administrative functions (ENG, MRG, and DYNACAdmin).	11.3.1									The RSU supports installation of a provisioning file which resets passwords. Only authenticated user can perform this, i.e. via WebGUi.		
THEA-INM-001	The system shall review participants' personal information including name, address, vehicle make/model, driver's license number at a minimum.	11.3.2	NA	NA	NA	NA	NA	NA	NA	3.1.2.3	This information isn't stored within the CV system.	NA	NA
THEA-INM-002	Personal information collected when registering participants shall be electronically stored separately from connected vehicle data (i.e., BSMs, alerts).	11.3.2	NA	NA	NA	NA	NA	NA	NA	3.1.2.3	This information isn't stored within the CV system.	NA	NA
THEA-INM-003	Personal data access shall require a login with password protection.	11.3.2	NA	NA	NA	NA	NA	NA	NA	3.1.2.3	Organizational Requirement	NA	NA
THEA-INM-004	Data shall be removed of PII before being released to the Public Data Hub.	11.3.2	NA	NA	NA	NA	NA	NA	NA	3.1.2.3	The master server performs PII removal before data is copied to the public storage area. Only data from the public storage area is uploaded to the Public Data Hub.	NA	NA
THEA-SGD-001	Data collected by Vehicles (i.e., OBUs) shall be stored on a storage device connected locally to the vehicle.	8	NA	4.11	NA	NA	2	NA	NA	Table 15	The units must include a minimum of 8 GB SD or micro SD card with a slot for storage of data.	NA	NA
THEA-SGD-002	Messages (i.e., alerts, SPAT, PSMs, TIMs, SSMs) transmitted and received (i.e. BSMs, SRMs) by RSUs shall be stored on a storage device connected locally to the RSU	8	NA	NA	NA	NA	4.0	NA	NA	Table 2	The RSU Data Collector app stores transmitted and received WSMs until they have been transferred to the master server.	NA	NA
THEA-SGD-003	Data locally stored on OBUs (OBU logs) shall be transmitted wirelessly to RSUs through a secure communications connection.	8	NA	4.11	NA	NA	3	NA	NA	3.2.2.7.3	OBUs transfer data logs to nearby RSUs via the Data Log Transfer protocol.	NA	NA
THEA-SGD-004	Data locally stored on RSUs (RSU logs) shall be transmitted to the Master Server through a secure communications connection.	8	NA	NA	NA	NA	NA	NA	NA	3,1 3.2.2.6.2	The RSU Data Collector transmits all collected data to the master server via	NA	NA

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											encrypted websocket connection (XFER).		
THEA-SGD-005	The frequency at which data locally stored on OBUs is transmitted to the Master Server shall be determined by the ability of those devices to wirelessly transmit the data.	8					2				OBUs will transfer data logs to nearby RSUs whenever possible.		
THEA-SGD-006	The frequency at which data locally stored on RSUs is transmitted to the Master Server shall be determined based on the RSUs' storage capacity and communication bandwidth to master server.	8					NA				The RSU Data Collector transmits all collected data to the master server via encrypted websocket connection (XFER). Data is transferred as fast as possible.		
THEA-SGD-007	The Master Server shall securely archive the system generated data (BSMs, TIMS, etc.) to protect and provide redundancy.	8	NA	NA	NA	NA	NA	NA	6.2.9	3.1.1	The master server is hosted on a VMWare Host server which has a RAID hard disk array in order to ensure data availability. Also, it will use VMWare HA in order to provide failover of virtual machines.	NA	NA
THEA-SGD-008	Access to the Master Server shall require a login and password.	11.3.1	NA	NA	NA			NA	NA	3.1.1	Organizational Requirement	NA	NA
THEA-SGD-009	Access to the Master Server shall be limited to authorized personnel as defined in the published version of the SMOC.	11.3.1	NA	NA	NA	NA	NA	NA	NA	Not SDD	Organizational Requirement	NA	NA
THEA-MNT-001	RSU communication failures shall be responded to within one business day in accordance with the City of Tampa and THEA procedures.	9.5.2	NA	NA	NA	NA	NA	NA	NA	Not SDD	Organizational Requirement	NA	NA
THEA-MNT-002	RSU communication shall be restored in accordance with the City of Tampa and THEA procedures.	9.5.2	NA	NA	NA	NA	NA	NA	NA	Not SDD	Organizational Requirement	NA	NA
THEA-MNT-003	RSU hardware failures shall be addressed in accordance with the City of Tampa and THEA procedures.	9.5.2	NA	NA	NA	NA	NA	NA	NA	Not SDD	Organizational Requirement	NA	NA

Requirement ID [RD3]	Requirement Description [RD3]	Con Ops Chapter [RD2]	User Need Number [RD2]	OBU Component Specification [RD9]	Participant Training and Stakeholder Education Plan [RD11]	Safety Management Plan [RD12]	OBU- RSU-Data Collection Interface [RD13]	OBU HMI Spec [RD14]	Comprehensive Installation Plan [RD15]	SDD Section	Design Element Function (See SDD Section 8 "Related Design Element" for exact wording)	ICD Chapter [RD8]	Flow ID [RD8]
THEA-MNT-004	RSU application issues shall be responded in accordance with the City of Tampa and THEA procedures	9.5.2	NA	NA	NA	NA	NA	NA	NA	Not SDD	Organizational Requirement	NA	NA
THEA-MNT-005	Planned RSU maintenance shall be scheduled in accordance with the City of Tampa and THEA procedures	9.5.2	NA	NA	NA	NA	NA	NA	3.5 5.2.7	Not SDD	Organizational Requirement	NA	NA
THEA-MNT-006	Planned RSU maintenance shall be performed during off peak hours of the Pilot's operation.	9.5.2	NA	NA	NA	NA	NA	NA	3.5 5.2.7	Not SDD	Organizational Requirement	NA	NA
THEA-MNT-007	OBU failures shall be logged at the time they are reported.	9.5.2	NA	4.12.1.5	NA	NA	3.0	NA	4.2.9	Not SDD	the operating platform shall be able to reload and restart the failed process and shall make an entry in a log indicating that this action took place.	NA	NA
THEA-MNT-008	OBUs shall alert the participant, if possible, of a failure.	9.5.2	NA	4.12.1.5	NA	NA	NA	1.4	NA	Not SDD	There is a heartbeat in HMI that will let the participant know if there is something wrong with the system	NA	NA
THEA-MNT-009	In order to diagnose OBU failures, an appointment to bring the vehicle into the support facility shall be made at the participant's convenience, but no more than seven business days out.	9.5.2	NA	NA	3.7	NA	NA	NA	4.2.9	Not SDD	Organizational Requirement	NA	NA
THEA-MNT-010	When a participant brings in their vehicle because of an OBU failure, the unit shall be exchanged in order to minimize the time the participant is in the facility or if feasible, the device is replaced at the participant's choice of location.	9.5.2	NA	NA	NA	NA	NA	NA	4.2.9	Not SDD	Organizational Requirement	NA	NA
THEA-MNT-011	When a PID issue is identified, the participant shall follow the instructions for attempting to address the issue before contacting support.	9.5.2									Organizational Requirement		
THEA-MNT-012	Support staff shall be trained to troubleshoot and diagnose RSU, OBU, and PID issues.	9.5.2	NA	NA	7.4	NA	NA	NA	NA	Not SDD	Organizational Requirement	NA	NA
THEA-MNT-013	A set of support, diagnostic and troubleshooting procedures shall be developed to guide the support staff.	9.5.2	NA	NA	7.4.2	NA	NA	NA	NA	Not SDD	Organizational Requirement	NA	NA

Requirement ID [RD3]	Requirement Description [RD3]	Con Ops Chapter [RD2]	User Need Number [RD2]	OBU Component Specification [RD9]	Participant Training and Stakeholder Education Plan [RD11]	Safety Management Plan [RD12]	OBU- RSU-Data Collection Interface [RD13]	OBU HMI Spec [RD14]	Comprehensive Installation Plan [RD15]	SDD Section	Design Element Function (See SDD Section 8 "Related Design Element" for exact wording)	ICD Chapter [RD8]	Flow ID [RD8]
THEA-MNT-014	The CoT shall maintain the RSUs installed in signal cabinets.	9.5.2									Organizational Requirement		
THEA-SRL-001	RSUs, and OBUs shall meet the latest published specification as of September 2016 at a minimum.	5.3		1.4, 4.9, 5							OBUs shall conform to latest specs at the time of document release The RSU complies with USDOT RSU spec v4.1		
THEA-SRL-002	RSUs shall not delete or rollover the data until it has confirmed the data has been successfully transmitted to the master Server and properly stored unless the local storage device has reached 90% capacity.	8	NA	NA	NA	NA	3.0	NA	NA	3.2.2.6.2	OBUs transfer data logs to nearby RSUs via the Data Log Transfer protocol. Data may only be deleted / overwritten if it has been transferred successfully or if free space on the storage medium runs out. The RSU Data Collector transmits all collected data to the master server via encrypted websocket connection (XFER). Data may only be deleted / overwritten if it has been transferred successfully or if free space on the storage medium runs out.	3.4.6 3.12.4	23015 23030
THEA-SRL-003	OBUs shall not delete or rollover the data until it has confirmed the data has been successfully transmitted to the master Server and properly stored unless the local storage device has reached 90% capacity.		NA	4.11	NA	NA	NA	NA	NA	3.2.2.6.1 Section 6 RTM		NA	NA
THEA- PAR-001	The RSUs shall obtain proper licensing from FDOT and the FCC to broadcast using DSRC.	5.3	NA	NA	NA	NA	NA	NA	NA	3.2.1 Section 6 RTM	Organizational Requirement	NA	NA

7 Appendix

7.1 OBU Data Logged

Table 20: OBU Data Logged

Data Management - OBU dat	ta potentially data logged
Data Description	Priority Rating
Display activation (graphics change)	Medium
WWE Screen activation (graphics change)	Medium if audio alert is captured
WWE Audio alert activation	High
ERDW screens activation (graphics change)	Medium if audio alert is captured
ERDW audio activation	High
VTRFTV screen activation (graphics change)	Medium if audio alert is captured
VTRFTV audio alert activation	High
IMA screen activation (graphics change)	Medium if audio alert is captured
IMA audio alert activation	High
PED-X screen activation (graphics change)	Medium if audio alert is captured
PED-X audio alert activation	High
EEBL screen activation (graphics change)	Medium if audio alert is captured
EEBL audio activation	High
FCW screen activation (graphics change)	Medium if audio alert is captured
FCW audio alert activation	High
TSP screen activation (graphics change)	Medium if audio alert is captured
TSP audio alert	High
Display - system activated indicator	Low
Other OBU output activated, TBD	Low
Speed data logged, TBD sampling	High- other methods available
CAN Data (not planned)	N/A
MAP logging	High
RSA logging	High
TIM logging	High
BSM logging	High
Spat logging	High
PSM logging	High
TSP logging	High

U.S. Department of Transportation

Intelligent Transportation System Joint Program Office

Data Management - OBU data potentially o	data logged
Data Description	Priority Rating
SSM logging	High
SRM logging	High
USB data transfer	Medium
OTA transfer activation (data transferred)	Medium
All antenna status	Medium
Turn signal activation (graphics change)	High
Ignition state	Low
Reverse state	High
SD card activation	Low
Tampering/security activation	Medium
Firmware download/install	Medium
SCMS connection & download time	Medium

8 Traceability

This section consists of the Workbook, which is the result of the following project workflows:

- Workbook developed by THEA Pilot team during project Phase 1, Task 6 Requirements
- Walkthrough of Requirements by USDOT AOR and reviewers in April 2016
- Updated Workbook per results of Requirements Walkthrough
- Walkthrough of System Design by USDOT AOR and reviewers in September 2017
- Updated Workbook per results of System Design Walkthrough
- Updated to final System Requirements in February 2018 after Quality Gate 3 review by CCB
- Updated Workbook per updated System Requirements
- Workbook appended to this System Design Document
- Added "Related Design Elements" to the Workbook for each Requirement
- Inserted cross-references from Related Design Elements of this section to design sections of this Systems Design Document for each Requirement

	uirement Grou	-	ion					
THEA-UC1-001 Con Ops								
-	ated Needs	1						
-	ent Section	7.1.1						
I-SI	uirement Text G application at ERDW applicat	Twiggs and Meridi	an shall transr	nit sout	hbou	nd estimated	d queue dat	a to the
		(Comments/Char	nges)					
	Requi	rement Criteria			Ye	s	No/R	lank
1 Is the requirement well-formed?				Х				
2	Is the requirem	ent unambiguous?)		Х			
3	·	ent logically consi			Х			
		sibling requiremen	.ts?					
4	Is the requirem				Х			
5	Is the requirem	ent verifiable?			X	-		
				Insp).	Anal.	Test	Demo.
6	6 If feasible and verifiable, by which method? I-SIG_A							
		f no requires a co	mment or cha	ange in	the (Comments/	Change fiel	d of the
	quirement Text ated Design Ele							
3.2. MM stac	2.1.2 The ERDW ITSS (I-SIG) thro	/ application receive ugh a local inter-pre nates queue lengths	ocess commun	ication	(IPC)	interface pro	vided by the	ESCoS
Des	ign (Comments	/Changes)						
]	Design Criteria				Yes	No	'Rank
1	Is the design up	nambiguous?			X			
2		gically consistent ign components?	with Parent(s)),		Х		
3	Is the design fe	easible?				Х		
4	Is the design ve	erifiable?				Х		
5	Is the requirem	ent fulfilled by the	e design?			Х		
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.							
	Final ResolutionApprovedXModify				Impl	ement Later	Drop	
Con	nments							

Requirement Group	Related Section			
THEA-UC1-002	Con Ops			
Related Needs	1,6			
Parent Section	7.1.1			
Requirement Text				
The drivers shall receiv	The drivers shall receive ERDW from ERDW application on the vehicles.			

Requirement Text (Comments/Changes)

	Requirement Criteria	Y	es	No/R	ank
1	Is the requirement well-formed?	2	X		
2	2 Is the requirement unambiguous? X				
3	Is the requirement logically consistent with Parent(s), and sibling requirements?	Σ	X		
4	Is the requirement feasible?	X			
5	5 Is the requirement verifiable?		X		
		Insp.	Anal.	Test	Demo.
6	If feasible and verifiable, by which method?			ERDW_B	

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

3.3.2.1 ERDW application is designed to audible tone warning drivers incoming on the REL of a queue that has formed at the intersection of Twiggs St and Meridian Ave. The warning shall recommend a safe speed which will allow the vehicle to safely stop before it reaches the end of the queue / stopped traffic.

ICD 23002

Design (Comments/Changes)								
Design Criteria				Yes	No/Rank			
1	Is the design unambiguous?			X				
2	Is the design logically consistent with Parent(s), and sibling design components?			Х				
3	Is the design feasible?			X				
4	Is the design	verifiable?		X				
5	Is the require	ement fulfilled by	the design?	X				
Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.								
Fin	al Resolution	Approved X	Modify	Implement Later	Dron			

Final Resolution	Approved X	Modify	Implement Later	Drop
Comments				

Requirement Group	Related Section
THEA-UCI-003	
Related Needs	
Parent Section	

Requirement Text

I-SIG application at Twiggs and Nebraska shall transmit westbound queue length data to the CSW application on the REL per lane.

Requirement Text (Comments/Changes)

Deleted The queue on the right turn lane from the REL towards Twiggs and Nebraska is not controlled by Twiggs and Meridian. However, I-SIG at Twiggs and Meridian would measure the southbound queue on the REL, including vehicles queueing up for the right turn towards Twiggs and Nebraska.

	Requirement Criteria	Ŋ	les	No	No/Rank	
1	Is the requirement well-formed?					
2 Is the requirement unambiguous?						
3	Is the requirement logically consistent with Parent(s), and sibling requirements?					
4	Is the requirement feasible?					
5	Is the requirement verifiable?					
	·	Insp.	Anal.	Test	Demo.	
6	If feasible and verifiable, by which method?					

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

Des	Design (Comments/Changes)					
	Design Criteria	Yes	No/Rank			
1	Is the design unambiguous?					
2	Is the design logically consistent with Parent(s), and sibling design components?					
3	Is the design feasible?					
4	Is the design verifiable?					
5	Is the requirement fulfilled by the design?					

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.

Final	Approved	Modify	Implement	Drop X
Resolution			Later	_
Comments				

Require	nent Group	Related Section					
THEA-U	JC1-004	Con Ops	Con Ops				
Related	Needs	1					
Parent S	Parent Section 7.1.1						
Require	ment Text						
The Elec	ctronic Emer	gency Brake Light warning (E	EBL) app	plication	on the braking	ng	
vehicle s	shall broadca	st an EEBL warning when the	e vehicle o	lecelerati	on exceeds		
predeter	mined value.						
Require	ment Text (Comments/Changes)					
Add con	nment:						
See J294	5/1 for detai	led performance requirements	s of EEBL	<u>ـ</u>			
	Requir	ement Criteria	Y	es	No/R	ank	
1 Is the	ne requireme	nt well-formed?	Х				
2 Is the	ne requireme	nt unambiguous?	X				
3 Is the	ne requireme	nt logically consistent with	X				
	-	bling requirements?					
4 Is the	ne requireme	nt feasible?	2	X			
5 Is the	ne requireme	nt verifiable?	2	X			
I			Insp.	Anal.	Test	Demo.	
6 If feasible and verifiable, by which method?				EEBL A			
EEBL_B							
Note: A	n answer of	no requires a comment or cl	hange in	the Com	ments/Char	nge field	
of the 'H	Requiremen	t Text' section.	-				

Related Design Elements

3.3.2.7 The EEBL app receives BSMs from one or more vehicles ahead.

ICD 20005

Design (Comments/Changes): BSM is broadcasted from leading car, not EEBL

	Design Criteria	Yes	No/Rank
1	Is the design unambiguous?	Х	
2	Is the design logically consistent with Parent(s), and sibling design components?	Х	
3	Is the design feasible?	Х	
4	Is the design verifiable?	Х	
5	Is the requirement fulfilled by the design?	Х	

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

	uirement Group	Related Sect	ion				
	A-UC1-005	Con Ops					
	ated Needs	2					
-	ent Section	7.1.1					
	uirement Text					u fuana tha hu	مادام <u>م</u>
vehi		on the receiving	y vehicle shall rece	eive an EE	BL warning	g from the br	aking
-	uirement Text (C	Comments/Cha	nges)				
	Requi	rement Criteri	a	Y	es	No/R	lank
1	Is the requirement	nt well-formed?		2	X		
2	Is the requirement	nt unambiguous	?	2	X		
3	Is the requirement	••••		2	X		
	Parent(s), and sil	U 1	nts?		-		
4	Is the requirement				X		
5	Is the requirement	nt verifiable?			X	-	-
				Insp.	Anal.	Test	Demo.
6	If feasible and ve	erifiable, by whi	ch method?			EEBL_A EEBL B	
			omment or change	e in the Co	omments/(Change field	d of the
	quirement Text' ated Design Elem						
3.3. the a	0	s, if EEBL deterr	nines any vehicles	in the same	e lane brak	ing/stopping	suddenly,
Des	ign (Comments/C	Changes): EEBI	is not received b	y trailing c	ar, BSMs a	are received	
	De	sign Criteria			Yes	No/	Rank
1	Is the design una	mbiguous?			Х		
2	Is the design log and sibling desig		with Parent(s),		Х		
3	Is the design feas	sible?			Х		
4	Is the design ver	ifiable?			Х		
5	Is the requirement	nt fulfilled by th	e design?		Х		
	e: An answer of 1 sign Text' section	-	omment or chang	e in the Co	omments/(Change field	d of the
Fina	al Resolution A	pproved X	Modify	Implen	nent Later	Drop	
Con	nments						

	uirement Group	Related Sect	tion				
	A-UC1-006	Con Ops					
	ated Needs	2					
-	ent Section	7.1.1					
The	uirement Text EEBL application cles.	n on the receiving	g vehicle shall pro	ocess an EE	BL warning	g from forwa	ard
Req	uirement Text (Comments/Cha	nges)				
	Dog	irement Criteri	ia	V	es	No/R	ank
1	-					110/1	
1	*	ent well-formed?			X		
2	<u>^</u>	ent unambiguous			X		
3		ent logically cons bling requirement		2	X		
4	Is the requireme			2	X		
5	Is the requireme	ent verifiable?		2	X		
				Insp.	Anal.	Test	Demo.
6	If feasible and v	erifiable, by whi	ich method?			EEBL_A EEBL B	
Not	e: An answer of	no requires a co	omment or chang	ge in the Co	omments/C		d of the
	quirement Text'						
Rela	ated Design Eler	nents					
3.3.	2.7 Using the BS	Vs, if EEBL dete	rmines any vehic	les in the sa	ame lane br	aking/stopp	ing
sude	denly, the app iss	ues a warning to	the driver.				-
ICD	20005						
Des	ign (Comments/	Changes): EEBI	L computes decel	eration base	d on receiv	ved BSMs	
	D	esign Criteria			Yes	No/	Rank
1	Is the design un	ambiguous?			Х		
2		gically consistent	· · · ·		Х		
3	Is the design fea	gn components? sible?			X		
4	Is the design ve				X		
5	Is the requireme	ent fulfilled by th	e design?		X		
Not	e: An answer of	no requires a co	omment or chang	ge in the Co	omments/(Change field	d of the
	sign Text' sectio	-					
		Approved X	Modify	Implen	nent Later	Drop	
Con	nments						

	uirement Grou		ion				
	A-UC1-007	Con Ops					
	ated Needs	2					
	ent Section	7.1.1					
	uirement Text	n shall warn the c	lriver of vehicles e	avceeding t	he nreset (Acceleration	
	instream to Twigg			noccoung t			
		Comments/Cha	nges)				
	Rea	uirement Criteri	9	V	es	No/R	ank
1	-		a			110/1	
1	<u>^</u>	ent well-formed?			X		
2	Is the requirement	ent unambiguous	?	2	X		
3		ent logically cons		2	X		
4	Parent(s), and s Is the requirem	ibling requirement	nts?	, , , , , , , , , , , , , , , , , , ,	X		
	-				X		
5	Is the requirem	ent verifiable?				T (D
	Γ			Insp.	Anal.	Test	Demo.
6	If feasible and	verifiable, by whi	ch method?			EEBL_A EEBL B	
Not	e: An answer of	no requires a co	omment or chang	e in the Co	omments/0		d of the
	quirement Text [*]					U	
Rela	ated Design Elei	nents					
		Ms, if EEBL dete	rmines any vehicle	es in the sa	me lane b	raking/stopp	ving
		sues a warning to	the unver.				
ICD	23002						
Des	ign (Comments/	Changes)					
	D	esign Criteria			Yes	No/	Rank
1	Is the design un	ambiguous?			X		
2	0	gically consistent gn components?	with Parent(s),		Х		
3	Is the design feature				X		
4	Is the design ve	rifiable?		-	X		
5		ent fulfilled by th	e design?		X		
Not	-	•	omment or chang	e in the Co	omments/0	Change field	d of the
	sign Text' sectio						
Fina	al Resolution A	Approved X	Modify	Implen	nent Later	Drop	
Con	nments						

	uirement Group	Related Sect	ion				
	A-UC1-008	Con Ops					
	ated Needs	2					
	ent Section uirement Text	7.1.1					
Veh		h OBUs shall re	ceive BSMs from c	other vehic	les equipp	ed with OBL	Js within
Req	uirement Text (C	Comments/Chai	nges)				
	Requi	rement Criteri	a	Y	es	No/R	ank
1	Is the requirement	nt well-formed?		2	X		
2	Is the requirement	nt unambiguous	?	2	X		
3	Is the requirement Parent(s), and site	U i		Σ	X		
4	Is the requirement		115 ?	2	X		
5	Is the requirement	nt verifiable?		2	x		
				Insp.	Anal.	Test	Demo.
6	If feasible and ve					EEBL_A EEBL_B FCW_A FCW_B	
	e: An answer of r quirement Text' s	-	omment or change	e in the Co	omments/(Change field	l of the
Rela	ated Design Elem	ents					
3.3.2	2.12 OBU manage	ment is the colle	ction of services an	d functiona	ality for man	aging basic	
oper	rations to include b	oadcast of BSM	messages				
ICD	20004						
Des	ign (Comments/C	Changes)					
	De	sign Criteria			Yes	No/	Rank
1	Is the design una	mbiguous?			X		
2	Is the design logi and sibling desig	•	with Parent(s),		Х		
3	Is the design feas				Х		
4	Is the design ver	fiable?			Х		
5	Is the requirement	nt fulfilled by th	e design?		X		
	e: An answer of r sign Text' section	-	omment or change	e in the Co	omments/(Change field	d of the
Fina	al Resolution A	pproved X	Modify	Implen	nent Later	Drop	
Con	nments						

Requirement Group	Related Section
THEA-UC1-009	Con Ops
Related Needs	1
Parent Section	7.1.1
Requirement Text	

The FCW in-vehicle application shall identify crash trajectories with other vehicles. **Requirement Text (Comments/Changes)**

Added Comment:

See J2945/1 for detailed performance requirements of FCW.

	Requirement Criteria		es	No/F	lank
1	Is the requirement well-formed?	2	Х		
2	Is the requirement unambiguous?	Х			
3	Is the requirement logically consistent with Parent(s), and sibling requirements?	Σ	X		
4	Is the requirement feasible?	2	X		
5	Is the requirement verifiable?	Х			
		Insp.	Anal.	Test	Demo.
6	If feasible and verifiable, by which method?			FCW_A FCW_B	

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

3.3.2.6 Using the lead vehicle's BSM data, FCW calculates crash trajectories to determine if the trailing vehicle is about to rear end the lead vehicle.

Design (Comments/Changes)

	Design Criteria	Yes	No/Rank
1	Is the design unambiguous?	Х	
2	Is the design logically consistent with Parent(s), and sibling design components?	Х	
3	Is the design feasible?	Х	
4	Is the design verifiable?	Х	
5	Is the requirement fulfilled by the design?	Х	

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.

Final	Approved X	Modify	Implement	Drop
Resolution		-	Later	_
Comments				

	uirement Group	Related Sect	ion				
THE	EA-UC1-010	Con Ops					
	ated Needs	2					
Pare	ent Section	7.1.1					
	quirement Text						
	FCW application			ectories.			
Req	quirement Text (Comments/Cha	nges)				
	Requ	urement Criter	ia	Y	es	No/H	Rank
1	Is the requirement well-formed?			2	X		
2	Is the requireme	nt unambiguous	?	2	X		
3	Is the requireme Parent(s), and si			2	X		
4	Is the requireme	e i			X		
5	Is the requireme	nt verifiable?		X			
				Insp.	Anal.	Test	Demo.
6	If feasible and v	erifiable, by whi	ch method?			FCW_A FCW B	
Nat	te: An answer of			in the Co		_	J of the
) 23002 sign (Comments/						
DUS		Changes)					
	D	<u> </u>				N	
-	T	esign Criteria			Yes	No/	Rank
1	Is the design una	esign Criteria ambiguous?			Yes X	No/	Rank
1 2	Is the design log	esign Criteria ambiguous? tically consistent	with Parent(s),			No/	Rank
	Ū.	esign Criteria ambiguous? gically consistent gn components?	with Parent(s),		Х	No/	Rank
2	Is the design log and sibling desig	esign Criteria ambiguous? gically consistent gn components? sible?	with Parent(s),		X X	No/	Rank
2 3	Is the design log and sibling design Is the design fea	esign Criteria ambiguous? gically consistent gn components? sible? tifiable?			X X X	No/	Rank
2 3 4 5 Not	Is the design log and sibling design Is the design feat Is the design vert	esign Criteria ambiguous? gically consistent gn components? sible? tifiable? nt fulfilled by th no requires a co	e design?		X X X X X X X		
2 3 4 5 Not 'De	Is the design log and sibling design Is the design feat Is the design vert Is the requirement is the requirement is the requirement is function the sign Text' section	esign Criteria ambiguous? gically consistent gn components? sible? fifiable? nt fulfilled by th no requires a conn.	e design? omment or chang	ge in the Co	X X X X X mments/C	hange field	
2 3 4 5 Not 'De	Is the design log and sibling design Is the design feat Is the design vert Is the requirement is the requirement is the requirement is function the sign Text' section	esign Criteria ambiguous? gically consistent gn components? sible? tifiable? nt fulfilled by th no requires a co	e design?	ge in the Co	X X X X X X X		

Reo	uirement Grou	p Related Sec	rtion				
	A-UC1-011	Con Ops					
Rela	ated Needs	2					
Pare	ent Section	7.1.1					
The are	received within	e Interface shall a configurable tin (Comments/Ch		more than	once when	multiple wa	irnings
Key	-	-				I	
		uirement Crite			Yes	No/	Rank
1	Is the requirement well-formed?				X		
2	•	nent unambiguou			Х		
3		nent logically cor sibling requirement			Х		
4	Is the requiren				Х		
5	Is the requiren	nent verifiable?			Х		
	·			Insp.	Anal.	Test	Demo.
6	If feasible and	verifiable, by wh	nich method?			EEBL_A EEBL_B FCW_A FCW_B	
3.3. rece			ll warn the driver no ne.	more than	once when	multiple wa	rnings are
Des	ign (Comments	s/Changes)					
]	Design Criteria			Yes	No/	Rank
1	Is the design u	nambiguous?			X		
2		ogically consister	nt with Parent(s),		Х		
3	Is the design for	easible?			Х		
4	Is the design v	erifiable?			Х		
5	1	nent fulfilled by t	6		Х		
	e: An answer o sign Text' secti	-	comment or chang	e in the C	omments/	Change fiel	d of the
Fina	al Resolution	Approved X	Modify	Impler	nent Later	Drop	
	nments	rr		Linpier		P	

Ree	quirement Gro	up Related Sec	tion				
	ĒA-UC1-012	Con Ops					
	lated Needs	1					
	rent Section	7.1.1					
	quirement Text		Meridian shall rece	nivo BSMe f	rom vehicle		lwith
	Us.	on at 1 wiggs and 1				s equipped	
		(Comments/Cha	anges)				
	Ree	quirement Criter	ria	Y	es	No/F	lank
1	Is the requirement well-formed?			2	X		
2	Is the requirer	nent unambiguous	s?	2	X		
3		nent logically con sibling requireme		2	X		
4 Is the requirement feasible?			2	X			
5	Is the requirer	nent verifiable?		2	X		
				Insp.	Anal.	Test	Demo.
6	If feasible and	l verifiable, by wh	ich method?			I_SIG_A	
	D 20004 sign (Comment	s/Changes)					
Des							
		Design Criteria			Yes	No/	Rank
1	Is the design u	inambiguous?			Х		
2		ogically consisten sign components?			Х		
3	Is the design f				Х		
4	Is the design v	verifiable?			Х		
5	Is the requirer	nent fulfilled by th	he design?		X		
	te: An answer o esign Text' sect		omment or chang	ge in the Co	omments/C	Change field	
							d of the
Fin	al Resolution	Approved X	Modify	Implen	nent Later	Drop	d of the
	al Resolution	Approved X	Modify	Implen	nent Later	Drop	d of the

Rec	quirement Grou	p Related Sect					
	THEA-UC1-013	Con Ops					
-	ated Needs	1					
	ent Section	7.1.1					
	quirement Text	Taalaan ay d Marid	K		(
		Twiggs and Merid roach from the RE		BSINS to de	termine the	queue ien	gth on
		(Comments/Cha					
	1	(
Requirement CriteriaYesN					No/F	lank	
1	Is the requirem	nent well-formed?			X		
2	Is the requirem	nent unambiguous	?		X		
3	·	nent logically cons			X		
4	Is the requirem	sibling requirement feasible?			X		
5	Is the requirem	nent verifiable?			X		
				Insp.	Anal.	Test	Demo.
6	If feasible and	verifiable, by whi	ich method?			I-SIG_A	
<u>'Re</u> Rel	equirement Text ated Design Ele	ements					
'Re Rel 3.2. mon	equirement Text ated Design Ele .2.3.2 Siemens-M nitoring each veh	t' section. ements AMITSS receives nicle's speed and l	BSMs from OBU	s and estima	ites queue l	engths base	
'Re Rel 3.2. mor	equirement Text ated Design Ele 2.3.2 Siemens-M nitoring each veh sign (Comments	t' section. ements AMITSS receives nicle's speed and l s/Changes)	BSMs from OBU	s and estima oaches the in	ites queue l ntersection.	engths base	ed on
'Re Rel 3.2. mor	equirement Text ated Design Ele 2.3.2 Siemens-M nitoring each veh sign (Comments	t' section. ements AMITSS receives nicle's speed and l	BSMs from OBU	s and estima oaches the in	ites queue l	engths base	
*Re Rel 3.2. mon Des	equirement Text ated Design Ele 2.3.2 Siemens-M nitoring each veh sign (Comments	t' section. ements AMITSS receives nicle's speed and l s/Changes) Design Criteria	BSMs from OBU	s and estima oaches the in	ites queue l ntersection.	engths base	ed on
'Re Rel 3.2. mon Des	ated Design Ele 2.3.2 Siemens-M nitoring each veh sign (Comments Is the design un Is the design lo	t' section. ements AMITSS receives nicle's speed and l s/Changes) Design Criteria nambiguous? ogically consistent	BSMs from OBU location as it appr t with Parent(s),	s and estima oaches the in	ites queue l ntersection. Yes	engths base	ed on
'Re Rel 3.2. mor Des 1 2	ated Design Ele 2.3.2 Siemens-M nitoring each veh sign (Comments Is the design un Is the design lo	t' section. ments AMITSS receives nicle's speed and l (Changes) Design Criteria nambiguous? ogically consistent sign components?	BSMs from OBU location as it appr t with Parent(s),	s and estima oaches the in	ntes queue l ntersection. Yes X	engths base	ed on
'Re Rel 3.2. mon	ated Design Ele 2.3.2 Siemens-M nitoring each veh sign (Comments Is the design un Is the design lo and sibling des	t' section. ments AMITSS receives nicle's speed and l S/Changes) Design Criteria nambiguous? Dgically consistent sign components? easible?	BSMs from OBU location as it appr t with Parent(s),	s and estima oaches the in	ttes queue l ntersection. Yes X X	engths base	ed on
'Re Rel 3.2. mon Des 1 2 3	Equirement Text ated Design Ele .2.3.2 Siemens-M nitoring each veh sign (Comments Is the design un Is the design un Is the design un Is the design fe Is the design fe Is the design veh	t' section. ments AMITSS receives nicle's speed and l S/Changes) Design Criteria nambiguous? Dgically consistent sign components? easible?	BSMs from OBU location as it appr t with Parent(s),	s and estima oaches the in	ttes queue l ntersection. Yes X X X X	engths base	ed on
'Re Rel 3.2. mon Des 1 2 3 4 5 Not	ated Design Ele 2.3.2 Siemens-Maitoring each veh sign (Comments Is the design un Is the design un Is the design log and sibling dess Is the design veh Is the design veh	t' section. ements AMITSS receives nicle's speed and l s/Changes) Design Criteria nambiguous? ogically consistent sign components? easible? erifiable? hent fulfilled by th f no requires a components a component of the sector of	BSMs from OBU location as it appr t with Parent(s), ne design?	s and estima oaches the in	Ites queue 1 Intersection. Yes X X X X X X X X X X X X X X X	engths base	ed on Rank
'Re Rel 3.2. mon Des 1 2 3 4 5 Not 'Dee	A sign (Comments Is the design for	t' section. ements AMITSS receives nicle's speed and l S/Changes) Design Criteria nambiguous? Dgically consistent sign components? easible? erifiable? hent fulfilled by th f no requires a co on.	BSMs from OBU location as it appr t with Parent(s), ne design?	Is and estimation of the independent of the indepen	ttes queue 1 ntersection. Yes X X X X X X X mments/C	engths base	ed on Rank
'Re Rel 3.2. mon Dess 1 2 3 4 5 Not Final	A sign (Comments Is the design for	t' section. ements AMITSS receives nicle's speed and l s/Changes) Design Criteria nambiguous? ogically consistent sign components? easible? erifiable? hent fulfilled by th f no requires a components a component of the sector of	BSMs from OBU location as it appr t with Parent(s), ne design?	Is and estimation of the independent of the indepen	Ites queue 1 Intersection. Yes X X X X X X X X X X X X X X X	engths base	ed on Rank

Rec	quirement Group	Related Sec	tion				
	THEA-UC1-014	Con Ops					
	ated Needs	1, 3, 5					
	ent Section	7.1.1					
	quirement Text						
			aska shall process	BSMs to de	etermine th	e queue ler	igth.
Rec	quirement Text (Comments/Cha	anges)				
	Dage	-income and Children		T	'es	N _o /D	anl
	-	irement Criter				No/R	апк
1	Is the requireme	ent well-formed	?		X		
2	Is the requireme	ent unambiguous	s?		X		
3	Is the requireme Parent(s), and si	••••			X		
4	Is the requireme	U 1	лнцэ :		X		
5	Is the requireme	ent verifiable?		1	X		
				Insp.	Anal.	Test	Demo.
6	If feasible and v	erifiable, by wh	ich method?			I-SIG_A	
<u>'Re</u> Rel 3.2.	equirement Text' ated Design Elen 2.3.2 Siemens-MN	no requires a c section. nents MITSS receives	omment or chang BSMs from OBU location as it appr	s and estima	ntes queue l	engths base	
'Re Rel 3.2. mor	equirement Text' ated Design Elen 2.3.2 Siemens-MM nitoring each vehic	no requires a c section. nents MITSS receives cle's speed and		s and estima	ntes queue l	engths base	
'Re Rel 3.2. mor	equirement Text' ated Design Elen 2.3.2 Siemens-MM nitoring each vehic sign (Comments/0	no requires a c section. ments MITSS receives cle's speed and Changes)	BSMs from OBU	s and estima baches the in	ntes queue 1 ntersection.	engths base	d on
<pre>'Re Rel 3.2. mon Des</pre>	equirement Text' ated Design Elem 2.3.2 Siemens-MN nitoring each vehic sign (Comments/O D	no requires a c section. nents MITSS receives cle's speed and Changes) esign Criteria	BSMs from OBU	s and estima baches the in	ntes queue l ntersection. Yes	engths base	
'Re Rel 3.2. mor	equirement Text' ated Design Elen 2.3.2 Siemens-MM nitoring each vehic sign (Comments/0	no requires a c section. nents MITSS receives cle's speed and Changes) esign Criteria	BSMs from OBU	s and estima baches the in	ntes queue 1 ntersection.	engths base	d on
<pre>'Re Rel 3.2. mon Des</pre>	ated Design Elem 2.3.2 Siemens-MM nitoring each vehic sign (Comments/O D Is the design una Is the design log	no requires a c section. nents MITSS receives cle's speed and Changes) Design Criteria ambiguous? gically consisten	BSMs from OBU location as it appro-	s and estima baches the in	ntes queue l ntersection. Yes	engths base	d on
*Re Rel 3.2. mon Des	equirement Text' ated Design Elem 2.3.2 Siemens-MN nitoring each vehic sign (Comments/O D Is the design una	no requires a c section. ments MITSS receives cle's speed and Changes) Design Criteria ambiguous? gically consisten gn components?	BSMs from OBU location as it appro-	s and estima baches the in	ntes queue l ntersection. Yes X	engths base	d on
'Re Rel 3.2. mor Des 1 2	ated Design Elem 2.3.2 Siemens-MM nitoring each vehic sign (Comments/O Is the design una Is the design log and sibling desig	no requires a c section. nents MITSS receives cle's speed and Changes) resign Criteria ambiguous? gically consisten gn components?	BSMs from OBU location as it appro-	s and estima baches the in	ttes queue 1 ntersection. Yes X X	engths base	d on
'Re Rel 3.2. mon Des 1 2 3	ated Design Elem 2.3.2 Siemens-MM nitoring each vehic sign (Comments/O D Is the design una Is the design log and sibling desig Is the design fea	no requires a c section. nents MITSS receives cle's speed and Changes) Design Criteria ambiguous? gically consisten gn components? sible?	BSMs from OBU location as it appro-	s and estima baches the in	Attes queue 1 Intersection. Yes X X X X	engths base	d on
'Re Rel 3.2. mon Des 1 2 3 4 5 Not	ated Design Elem 2.3.2 Siemens-MM nitoring each vehic sign (Comments/O Is the design una Is the design log and sibling desig Is the design fea Is the design ver Is the design ver Is the requireme	no requires a c section. nents MITSS receives cle's speed and Changes) Pesign Criteria ambiguous? gically consisten gn components? sible? cifiable? ent fulfilled by the components of the components?	BSMs from OBU location as it appro-	s and estimated aches the in	Attes queue 1 Intersection. Yes X X X X X X X X X X X X X X X	engths base	d on
'Re Rel 3.2. mon Des 1 2 3 4 5 Not 'De	ated Design Elem 2.3.2 Siemens-MM nitoring each vehic sign (Comments/O Is the design una Is the design log and sibling desig Is the design fea Is the design ver Is the requireme te: An answer of per- sign Text' section	no requires a c section. nents MITSS receives cle's speed and Changes) Pesign Criteria ambiguous? gically consisten gn components? isible? rifiable? ent fulfilled by the no requires a c n.	BSMs from OBU location as it appro- t with Parent(s), he design? omment or chang	s and estima baches the in	Attes queue 1 Intersection. Yes X X X X X X X Mments/C	engths base	d on
'Re Rel 3.2. mor Des 1 2 3 4 5 5 Not 'De	ated Design Elem 2.3.2 Siemens-MM nitoring each vehic sign (Comments/O Is the design una Is the design log and sibling desig Is the design fea Is the design ver Is the requireme te: An answer of per- sign Text' section	no requires a c section. nents MITSS receives cle's speed and Changes) Pesign Criteria ambiguous? gically consisten gn components? sible? cifiable? ent fulfilled by the components of the components?	BSMs from OBU location as it appro- t with Parent(s), he design?	s and estima baches the in	Attes queue 1 Intersection. Yes X X X X X X X X X X X X X X X	engths base	d on

Rec	quirement Grou	Related Section	on				
	EA-UC1-015	Con Ops					
	ated Needs	1					
Par	ent Section	7.1.1					
		wiggs and Meridi	an shall transmit th	ne queue le	engths to th	e THEA ma	aster
		Comments/Char	nges)				
	Req	uirement Criteri	a	Y	es	No/R	ank
1	Is the requireme	ent well-formed?		2	X		
2	Is the requireme	ent unambiguous?			K		
3	·	ent logically consi ibling requiremen		2	K		
4	Is the requireme	v ,		2	K		
5	Is the requireme	ent verifiable?		2	X		
				Insp.	Anal.	Test	Demo.
6	If feasible and v	verifiable, by which	ch method?			I-SIG_A	
XF ICI			rom Flash Storage				
DCC	<u> </u>				7	N7 /7	
		Design Criteria			les	No/I	
1	Is the design un	ambiguous?			Х		Rank
2	0		Is the design logically consistent with Parent(s),				Rank
3	and sibling design components? Is the design feasible?						Rank
5	C	v .			X		Rank
	Is the design ve	asible?			X X		Rank
4	Is the design ve Is the requirement	asible? rifiable? ent fulfilled by the	0		X X		
4 5 Not	Is the design ve Is the requirement	asible? rifiable? ent fulfilled by the no requires a co	e design? mment or change		X X	hange field	
4 5 Not 'De	Is the design ve Is the requirement te: An answer of esign Text' sectio	asible? rifiable? ent fulfilled by the no requires a co n.	mment or change	in the Co	X X mments/C		
4 5 Vot	Is the design ve Is the requirement te: An answer of esign Text' sectio	asible? rifiable? ent fulfilled by the no requires a co	0	in the Co	X X	hange field	

	HEA-UC1-016	Con One							
	ted Needs	1, 3, 5							
	nt Section uirement Text	7.1.1							
-	G application at		ska shall transmit tl	ne queue lei	ngths to the	e THEA ma	aster		
-		t (Comments/Ch d of THEA-UC1-	0						
	Re	equirement Crite	eria		Yes	No	/Rank		
1	Is the requirer	ment well-formed	?		Х				
2	Is the requirer	nent unambiguou	ıs?		Х				
3	-	nent logically con sibling requirem			Х				
4	Is the requirer				X				
5	Is the requirer	ment verifiable?			Х				
				Insp.	Anal.	Test	Demo.		
6		l verifiable, by w				Х			
'Rec	e: An answer o quirement Tex ated Design El	xt' section.	comment or chang	e in the Co	mments/C	hange fiel	d of the		
	0			- from M	UTCC and				
	ter server.	e data conector fo	eceives queue lengt	IS HOIII IVIIV	III SS and	sends then	i to the		
	.4 23030								
Desi	gn (Comment	s/Changes)							
		Design Criteria			Yes	No	Rank		
1	Is the design u	unambiguous?							
2	U	logically consistents	nt with Parent(s),						
3	Is the design f		•						
4	Is the design v	verifiable?							
5 Is the requirement fulfilled by the design?									
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.								
Fina	l Resolution	Approved	Modify	Implen	nent Later	Drop X			
Con	nments								

Do	quirement Group	Related Section						
	EA-UC1-017	Con Ops						
	lated Needs	1						
		-						
	Parent Section 7.1.1							
		all receive the queue lengths f	rom I-SIG	applicati	on running	on the		
RS	-							
	•	Comments/Changes)						
Ch	anged 'analyze' to	store.						
	Requir	rement Criteria	Y	es	No/R	ank		
1	Is the requireme	nt well-formed?	Σ	K				
2	Is the requireme	nt unambiguous?	2	K				
3		nt logically consistent with bling requirements?	2	K				
4	Is the requireme		2	K				
5	Is the requireme	nt verifiable?	Σ	K				
			Insp.	Anal.	Test	Demo.		
6	If feasible and v	erifiable, by which method?			I-SIG_A			
oft	te: An answer of the 'Requirement lated Design Elen		ange in th	ne Comm	ients/Chan	ge field		

3.1.2.3 The Data Converter receives the Data Logs from the RSUs.

Des	Design (Comments/Changes)						
	Design Criteria	Yes	No/Rank				
1	Is the design unambiguous?	Х					
2	Is the design logically consistent with Parent(s), and sibling design components?	Х					
3	Is the design feasible?	Х					
4	Is the design verifiable?	Х					
5	Is the requirement fulfilled by the design?	Х					

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

Rec	uirement Group	Related Section						
TH	EA-UC1-018	Con Ops						
Rel	ated Needs	1						
Par	ent Section	7.1.1						
	Requirement Text The Master Server shall store the queue lengths from I-SIG application.							
Requirement Text (Comments/Changes) Changed 'analyze' to 'store.'								
	Requir	ement Criteria	l 1	Yes	No/I	Rank		
1	Is the requirement	nt well-formed?	X					
2	Is the requireme	nt unambiguous?		Х				
3	-	nt logically consistent with bling requirements?		Х				
4	Is the requireme			Х				
5	Is the requireme	nt verifiable?	X					
			Insp.	Anal.	Test	Demo.		
6	If feasible and v	erifiable, by which method?			I-SIG_A			
			•		•			

Related Design Elements

3.1.2.3 Data Converter passes the Data Logs on to the DataBuffer component. DataBuffer combines the data logs into batches and saves them to protected storage.

Design (Comments/Changes)

-		T 7	
	Design Criteria	Yes	No/Rank
1	Is the design unambiguous?	Х	
2	Is the design logically consistent with	Х	
	Parent(s), and sibling design components?		
3	Is the design feasible?	Х	
4	Is the design verifiable?	Х	
5	Is the requirement fulfilled by the design?	Х	

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

Requirement Group	Related Section
THEA-UC1-019	Con Ops
Related Needs	4
Parent Section	7.1.1

The combination of signal controller and the RSU application shall control signal phases based on Multi-Modal Intelligent Traffic Signal Systems (MMITSS).

Requirement Text (Comments/Changes)

Changed 'I-SIG... timing when the queue length exceeds a configurable threshold...' to '...based on estimated queue lengths in order to move traffic efficiently through the intersection...'

	Requirement Criteria		Yes		Rank
1	Is the requirement well-formed?		Х		
2	Is the requirement unambiguous?	X			
3	Is the requirement logically consistent with Parent(s), and sibling requirements?	Х			
4	Is the requirement feasible?		Х		
5	Is the requirement verifiable?	X			
		Insp.	Anal.	Test	Demo.
6	If feasible and verifiable, by which method?			I-SIG_B	

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

3.2.2.3.2 Siemens-MMITSS interfaces with the traffic controller via NTCIP in order to receive information about the controller configuration, current signal plan, and vehicle calls and volume from detectors. It then uses phase control commands (i.e. phase calls, holds, omits, and force offs) to control the phase execution.

Design (Comments/Changes)

	Design Criteria	Yes	No/Rank
1	Is the design unambiguous?	Х	
2	Is the design logically consistent with	Х	
	Parent(s), and sibling design components?		
3	Is the design feasible?	Х	
4	Is the design verifiable?	Х	
5	Is the requirement fulfilled by the design?	Х	

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

Rec	uirement Grou	p Related S	ection					
	EA-UC1-020_	Con Ops						
	ated Needs	4						
Par	ent Section	7.1.1						
Rec	quirement Tex	t						
The	e combination of	of signal contro	oller and the RSU a	application	shall mod	lify the si	gnal	
-	•		queue lengths in o	order to mo	ve traffic	efficiently	y through	
	intersection at '	00						
	quirement Tex							
	leted, duplicate			c	11.1	1 1 1 .		
			eue length exceed					
	based on estimation	ated queue len	gths in order to mo	ove traffic e	erriciently	through	ine	
mie								
	Requirement Criteria				Yes	No	/Rank	
1	Is the require	nent well-forr	ned?					
2	Is the require	nent unambig	uous?					
3	Is the require	ment logically	consistent with					
	Parent(s), and	sibling requir	rements?					
4	Is the require	ment feasible?						
5	Is the require	nent verifiable	e?					
	I			Insp.	Anal.	Test	Demo.	
6	If feasible and	l verifiable, by	which method?			X		
Not	te: An answer	of no require	s a comment or ch	nange in th	e Comm	ents/Cha	nge field	
	the 'Requirem	-		iunge m u			inge nera	
			ontrols phases of a	n intersect	ion based	on receiv	ed	
BSI	Ms. See the refe	erenced pre-ex	tisting MMITSS D	etailed Des	sign.			
Des	sign (Commen	ts/Changes)						
	Γ	Design Criteri	a	Yes		No	/Rank	
1	Is the design	unambiguous?						
2	Is the design	logically consi	stent with					
	Parent(s), and	sibling design	n components?					
3	Is the design f	feasible?						
4	Is the design	verifiable?						
5	Is the require	ment fulfilled	by the design?					
Not	te: An answer	of no require	s a comment or cl	nange in th	e Comm	ents/Cha	nge field	
	the 'Design Te						-	
	al	Approved	Modify	Impler	nent	Drop	X	
Fin		11	2	Later		1		
	solution	Comments						
Res								
Res						1		
Res						1		
Res								

Po	quirement Grou	p Related Sect	on				
	TEA-UC1-021		ase 1 - Morning	Peak Hoi	ir Queues		
	lated Needs			<u> </u>	in Queues		
Par	rent Section						
	quirement Tex			_			
	11	shall prioritize qu	ueues that limit	safe stopp	oing distanc	e as Prior	ity as
		G requirements. at (Comments/C	hanges)				
nu	quil ement Tex	at (Comments) C	hanges)				
De	leted Duplicat	e of THEA-UC1	-020				
		uirement Criter			Yes	No	/Rank
1		ment well-forme			105		
	1						
2	-	ment unambiguo					
3		ment logically co l sibling requirer					
4		ment feasible?					
5		ment verifiable?					
5	Is the require.			Incn	Anal.	Test	Demo.
6	TC C '1 . 1	1		Insp.	Allal.	Test	Denio.
6	If leasible and	d verifiable, by v	method?				
	lated Design E	ent Text' section lements					
E							
De	sign (Commen	ts/Changes)					
	I	Design Criteria			Yes	No	/Rank
1	Is the design	unambiguous?					
2	U U U	logically consist					
0		l sibling design c	components?				
3	Is the design						
4	Is the design						
5	Is the require	ment fulfilled by	the design?				
	te: An answer the 'Design Te	of no requires a xt' section.	comment or c	hange in	the Comm	ents/Cha	nge field
Fin	nal	Approved	Modify	Impl	ement	Drop 2	X
	solution			Late	r	_	
Co	mments						

Requirement Gr	oup Related Section					
THEA-UC1-022	2 Con Ops	Con Ops				
Related Needs	6					
Parent Section	7.1.1					
Requirement T	ext					
The RSU ERDV	V application shall broadcast a recom	mended standard	speed.			
Requirement T	ext (Comments/Changes)					
Changed 'CSW'	' to 'ERDW.'					
)	' to 'ERDW.' quirement Criteria	Yes	No/Rank			
Re		Yes X	No/Rank			
Re 1 Is the required	quirement Criteria		No/Rank			
Re1Is the require2Is the require	quirement Criteriarement well-formed?	X	No/Rank			
Re1Is the require2Is the require3Is the require	quirement Criteriarement well-formed?rement unambiguous?	X X X	No/Rank			
Re1Is the require2Is the require3Is the requireParent(s), a	quirement Criteriarement well-formed?rement unambiguous?rement logically consistent with	X X X	No/Rank			

		Insp.	Anal.	Test	Demo.
6	If feasible and verifiable, by which method?			ERDW_A	

Related Design Elements

3.2.2.1.2 The ERDW configuration UI allows a user to set a TIM(x) to be broadcast for a particular traffic situation defined by min and max value of the vehicle queue. The user can add a row to the table for each traffic situation.

The ERDW application uses the received queue length estimation to select a TIM to broadcast based on its configuration.

ICD 20014

Design (Comments/Changes) Design Criteria Yes No/Rank Х 1 Is the design unambiguous? Х 2 Is the design logically consistent with Parent(s), and sibling design components? Х 3 Is the design feasible? Х 4 Is the design verifiable? Х 5 Is the requirement fulfilled by the design?

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.

Final	Approved X	Modify	Implement	Drop
Resolution		-	Later	_
Comments				

Rec	uirement Group	Related Section					
	EA-UC1-023						
Rel	Related Needs 6						
Par	ent Section	7.1.1					
The	Requirement TextThe vehicle ERDW application shall receive the recommended standard speed.Requirement Text (Comments/Changes)						
Changed 'CSW' to 'ERDW.'							
	Requir	amont Critoria	T	705	No/I	Rank	
	-	ement Criteria		les	No/l	Rank	
1	Require Is the requireme			X es	No/I	Rank	
1 2	Is the requireme				No/I	Rank	
	Is the requireme Is the requireme Is the requireme	nt well-formed?		X	No/I	Rank	
2	Is the requireme Is the requireme Is the requireme	nt well-formed? nt unambiguous? nt logically consistent with bling requirements?		X X	No/I	Rank	
23	Is the requireme Is the requireme Is the requireme Parent(s), and si	nt well-formed? nt unambiguous? nt logically consistent with bling requirements? nt feasible?		X X X X		Rank	
2 3 4	Is the requireme Is the requireme Parent(s), and si Is the requireme	nt well-formed? nt unambiguous? nt logically consistent with bling requirements? nt feasible?		X X X X X	Test	Rank Demo.	

Related Design Elements

3.3.2.1 The estimated end of the queue would be transmitted to the vehicle OBUs using a TIM from the RSU that would then be interpreted by the OBUs to display the recommended speed to the driver.

ICD 20014

Design (Comments/Changes)

- •~						
	Design Criteria	Yes	No/Rank			
1	Is the design unambiguous?	Х				
2	Is the design logically consistent with	Х				
	Parent(s), and sibling design components?					
3	Is the design feasible?	Х				
4	Is the design verifiable?	Х				
5	Is the requirement fulfilled by the design?	Х				

Final	Approved X	Modify	Implement	Drop
Resolution		_	Later	_
Comments				

Requirement Group	Related Section
THEA-UC1-024	Con Ops
Related Needs	6
Parent Section	7.1.1

The RSU ERDW application shall adjust the configurable speed recommendation zone(s) based on the southbound queue length from I-SIG application on Twiggs and Meridian.

Requirement Text (Comments/Changes)

Changed 'vehicle CSW' to 'RSU ERDW,' 'recommended' to 'configurable,' Changed 'The delay time is equivalent to the queue that forms in the right turn land and onto the shoulder' to 'The begin and end of a speed recommendation zone for a particular speed is moved upstream on the REL with longer queue lengths.' Added 'recommendation zone(s).'

	Requirement Criteria		Yes		Rank
1	Is the requirement well-formed?	Х			
2	Is the requirement unambiguous?		Х		
3	Is the requirement logically consistent with Parent(s), and sibling requirements?	Х			
4	Is the requirement feasible?		Х		
5	Is the requirement verifiable?	Х			
	·	Insp.	Anal.	Test	Demo.
6	If feasible and verifiable, by which method?			ERDW_A	

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

3.3.2.1 As the driver makes their way closer to the end of the queue, the recommended speed would lower so that they have ample time to safely stop their vehicle before reaching the end of the queue.

De	sign (Comme	ents/Changes)			
	•	Design Criteria		Yes	No/Rank
1	Is the design	n unambiguous?		X	
2	U	n logically consis		X	
3	Is the design	n feasible?		X	
4	Is the design	n verifiable?		X	
5	Is the requir	ement fulfilled b	y the design?	X	
	the 'Design T	-			nments/Change field
Fin	al	Approved X	Modify	Implement	Drop
	solution	II	5	Later	ſ
Co	mments				

Requirement Group	Related Section										
THEA-UC1-025Con Ops											
Related Needs 6											
Parent Section 7.1.1											
Requirement Text	Requirement Text										
	pplication shall provide a con	-	-	at agencies c	an adjust						
*	n appropriate speed based on	the vehic	le type.								
Requirement Text (0										
•	ot dictate local policy.										
Changed 'CSW' to 'E											
01	nger cars, commercial vehicle	es, transit	could hav	ve different							
recommended safe speeds in a curve.											
Require	ement Criteria		Yes	No/I	Rank						
Require1Is the requirement			Yes X	No/l	Rank						
-	nt well-formed?			No/I	Rank						
1Is the requirement2Is the requirement	nt well-formed?		X	No/I	Rank						
1Is the requirement2Is the requirement3Is the requirement	nt well-formed? nt unambiguous? nt logically consistent with		X X	No/I	Rank						
1Is the requirement2Is the requirement3Is the requirement	nt well-formed? nt unambiguous? nt logically consistent with bling requirements?		X X	No/I	Rank						
1Is the requirement2Is the requirement3Is the requirementParent(s), and site	nt well-formed? nt unambiguous? nt logically consistent with bling requirements? nt feasible?		X X X	No/I	Rank						
1Is the requirement2Is the requirement3Is the requirement3Is the requirement4Is the requirement	nt well-formed? nt unambiguous? nt logically consistent with bling requirements? nt feasible?	Insp.	X X X X	No/I	Rank Demo.						
1 Is the requirement 2 Is the requirement 3 Is the requirement 4 Is the requirement 5 Is the requirement	nt well-formed? nt unambiguous? nt logically consistent with bling requirements? nt feasible?		X X X X X X								

Related Design Elements

Aa/Ch

3.2.2.1.1 For a complete ERDW configuration on the REL the following items are defined

- For a particular traffic situation (x), i.e. queue length range (min and max), the location and length of each of the 3 speed zones shall be defined. The speed zones shall be encoded in a TIM for that traffic situation referred to as TIM(x)
- Traffic situation TIM(x) shall be defined for a sufficient number of situations up to a queue length of 500 meters.

3.3.2.1 The estimated end of the queue would be transmitted to the vehicle OBUs using a TIM from the RSU that would then be interpreted by the OBUs to display the recommended speed to the driver.

Des	sign (Comme	nts/Changes)							
	Design Criteria					Yes	No/Rank		
1	Is the design	unambiguous	?			Х			
2	2 Is the design logically consistent with Parent(s), and sibling design components?					Х			
3						Х			
4	Is the design	verifiable?				Х			
5	Is the requir	ement fulfilled	by	the design?		Х			
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.								
Fin	al	Approved X		Modify		Implement	Drop		

Final	Approved	Х	Modify	Implement	Drop
Resolution				Later	
Comments					

De	quirement Grou	p Related Sect	tion				
	TEA-UC1-026	Con Ops	.1011				
	lated Needs	6					
	rent Section	7.1.1					
	quirement Tex						
		ate of THEA-UC	C1-026				
			calculate the cor	nfigurable s	speed reco	ommendat	tion
		A Master Server.					
			Changes)Changeo	d 'CSW' to	• 'ERDW,	,' 'recomr	nend
	ve' to 'configu						
Ad	ded 'recommer	uirement Crite	rio		Yes	No	/Rank
1		-			1 65		
1		ment well-forme		_			
2	Is the require	ment unambiguo	ous?				
3	Is the require	ment logically c	onsistent with				
		l sibling require	ments?				
4	Is the require	ment feasible?					
5	Is the require	ment verifiable?)				
	1			Insp.	Anal.	Test	Demo.
6	If feasible an	d verifiable, by v	which method?			X	
3.2 col	lector transfers	ogs all WSM se these logs to Ne	nt out which inclue extConnect.	udes TIMs	sent by E	RDW. Th	ne data
De	sign (Commen	C			7	N T	/D 1
		Design Criteria)	Yes	No	/Rank
1	Is the design	unambiguous?					
2	0	logically consist					
		l sibling design	components?	_			
3	Is the design	feasible?					
4	Is the design	verifiable?					
5	Is the require	ment fulfilled by	y the design?				
	te: An answer		a comment or ch	nange in th	e Comm	ents/Cha	e 11
of	the 'Design Te	xt' section.					
of t	the 'Design Te	xt' section.	Modify	Impler	nent	Drop	
Fin	the 'Design Te		Modify	Impler Later	nent	Drop	

Requirement Group	Related Section									
THEA-UC1-026a	Con Ops									
Related Needs	6									
Parent Section	Parent Section 7.1.1									
Requirement Text The RSU ERDW application shall transmit the configurable speed recommendation zones to the THEA Master Server.										
Requirement Text (Comments/Changes)Change	d 'CSW'	to 'ERDV	N,' 'recomn	nend					
curve' to 'configurab										
Added 'recommenda	tion zones.									
Requir	ement Criteria]	Yes	No/I	Rank					
1 Is the requireme	ent well-formed?		Х							
2 Is the requireme	ent unambiguous?		Х							
	nt logically consistent with bling requirements?		Х							
4 Is the requireme	ent feasible?		Х							
5 Is the requireme	ent verifiable?		Х							
		Insp.	Anal.	Test	Demo.					
6 If feasible and v	erifiable, by which method?			ERDW_A						

Related Design Elements

3.2.2.6.2 The Data Collector also stores BSMs and SRMs received from OBUs as well as certain WSMs (WAVE Short Messages) sent by the RSU (i.e. MAP, SPAT, TIM, PSM, SSM). The Data Collector stores the WSMs, the Queue Lengths, and the received data logs in local Flash Storage.

Design (Comments/Changes)

	Design Criteria	Yes	No/Rank
1	Is the design unambiguous?	Х	
2	Is the design logically consistent with Parent(s), and sibling design components?	Х	
3	Is the design feasible?	Х	
4	Is the design verifiable?	Х	
5	Is the requirement fulfilled by the design?	Х	

Final Resolution	Approved X	Modify	Implement Later	Drop
Comments				

Ro	quirement Grou	p Related S	ection				
	EA-UC1-027	Con Ops					
	lated Needs						
	ent Section	8					
	quirement Tex	I					
	-		ccess queue length	and corre	sponding s	speed	
rec	ommendation z	ones.					
	quirement Tex <mark>eleted*</mark>	t (Comments/	Changes)				
			to 'queue length an	d correspo	onding spe	ed	
rec	ommendation z	ones'					
Requirement Criteria					Yes	No	/Rank
1	Is the requirer	nent well-form	ned?				
2	Is the requirer	nent unambigu	ious?				
3	-	nent logically sibling require	consistent with ements?				
4	Is the requirer	nent feasible?					
5	Is the requirer	nent verifiable	?				
	1			Insp.	Anal.	Test	Demo.
6	If feasible and	l verifiable, by	which method?	1		X	
3.2 via	the RSU servic	Operator can a e UI.	ccess the current qu	leue lengt	h and TIM	l being br	oadcast
De	sign (Comment	<u> </u>		1			
	Ľ	Design Criteria	a		Yes	No	/Rank
1	Is the design u	inambiguous?					
2		ogically consis					
0			components?				
3	Is the design f						
4	Is the design v						
5	Is the requirer	nent fulfilled b	by the design?				
	te: An answer the 'Design Tex	-	s a comment or ch	ange in tl	ne Comme	ents/Cha	nge field
Fin Res	al	Approved	Modify	Impler Later	ment	Drop	X
Co	mments						

Rec	uirement Grou	p Related Se	rtion				
	A-UC1-028	Con Ops					
	ated Needs	1, 6					
Pare	ent Section	7.1.1					
	uirement Text						
		detector shall is	sue a call to the R	SU when a v	ehicle occu	pies the de	tection
zon	-	<u>(Carrier and a)</u>					
Kec	uirement l'ext	(Comments/Ch	anges)				
	Ree	quirement Crite	ria	,	Yes	No/I	Rank
1	Is the requiren	nent well-formed	?		Х		
2	Is the requiren	nent unambiguou	s?		Х		
3		nent logically con			Х		
	× 71	sibling requirem	ents?				
4	Is the requiren	nent feasible?			Х		
5	Is the requiren	nent verifiable?			Х		
				Insp.	Anal.	Test	Demo.
6	If feasible and	verifiable, by wl	nich method?			I-SIG_A	
Not	e: An answer o	f no requires a o	comment or chan	ge in the Co	mments/C	hange field	of the
'Re	quirement Tex	t' section.		-		_	
	23016						
Des	ign (Comments	s/Changes)					
		Design Criteria			Yes	No/l	Rank
1	Is the design u	nambiguous?			Х		
2		ogically consistentiation of the second s	nt with Parent(s), ?		Х		
3	Is the design for				Х		
4	Is the design v	erifiable?			Х		
5	Is the requiren	nent fulfilled by t	he design?		Х		
	e: An answer o sign Text' secti	-	comment or chan	ge in the Co	mments/C	hange field	of the
Fine	al Resolution	Approved X	Modify	Impler	nent Later	Drop	
		Approved A	wouldy	mpier		Diop	
Cor	nments						

Requirement Group	Related Section
THEA-UC1-029	Con Ops
Related Needs	1,6
Parent Section	7.1.1

The proxy app shall transmit an ISM (infrastructure sensor message) to I-SIG when the traditional detector issues a call.

Requirement Text (Comments/Changes)

Changed 'BSM' to 'ISM (infrastructure sensor message) to I-SIG.'

Modified comment: An ISM would contain details about the detector event (e.g. timestamp, detector location, vehicle speed if supported by detector). An ISM is expected not to be sent over the air via DSRC.

	Requirement Criteria	Ŋ	les	No/I	Rank
1	Is the requirement well-formed?		Х		
2	Is the requirement unambiguous?		Х		
3	Is the requirement logically consistent with Parent(s), and sibling requirements?		Х		
4	Is the requirement feasible?		Х		
5	Is the requirement verifiable?		Х		
		Insp.	Anal.	Test	Demo.
6	If feasible and verifiable, by which method?			I-SIG_A	

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

3.2.2.1.2 This information is received by MMITSS in the form of an infrastructure sensor message (ISM) coming from the Infrastructure Sensor Gateway (ISG). The ISM contains the timestamp, location and speed of a single detected vehicle. The ISMs are used along with the BSMs as input for the MMITSS queue length estimation algorithm.

Design (Comments/Changes)

	Design Criteria	Yes	No/Rank
1	Is the design unambiguous?	Х	
2	Is the design logically consistent with	Х	
	Parent(s), and sibling design components?		
3	Is the design feasible?	Х	
4	Is the design verifiable?	Х	
5	Is the requirement fulfilled by the design?	Х	

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

Related Section			
Con Ops			
2			
7.1.1			
Requirement Text			
Vehicles equipped with OBUs shall broadcast BSMs.			
Requirement Text (Comments/Changes)			

	Requirement Criteria	Ŋ	les	No/I	Rank
1	Is the requirement well-formed?		Х		
2	Is the requirement unambiguous?		Х		
3	Is the requirement logically consistent with Parent(s), and sibling requirements?		Х		
4	Is the requirement feasible?	Х			
5	Is the requirement verifiable?	X			
		Insp.	Anal.	Test	Demo.
6	If feasible and verifiable, by which method?			I-SIG_A	

Related Design Elements

3.3.2.12 OBU management is the collection of services and functionality for managing basic operations to include broadcast of BSM messages

ICD 20004

Des	Design (Comments/Changes)							
Design Criteria				Yes	No/Rank			
1	Is the design	unambiguous?		Х				
2	_	logically consistent sesign components?	with Parent(s),	Х				
3	Is the design	s the design feasible?		Х				
4	Is the design	verifiable?		Х				
5	Is the require	ment fulfilled by the	design?	Х				
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.							
Final Resolution Approved X Modify		Implement Later	Drop					
Con	nments							

Rec	quirement Group	Related Section						
TH	EA-UC2-001	Con Ops						
Rel	ated Needs							
Par	ent Section	7.1.2						
	Requirement Text							
	Vehicle shall receive the BSMs from other equipped vehicles							
	• ·	Comments/Changes)						
	. ,	a' and added a period after vehi						
		ng opposite the legal direction.						
Co	mment: 10 times p	ber second						
Requirement CriteriaYesNo/Rank								
1	Is the requireme	nt well-formed?	X					
2	Is the requireme	nt unambiguous? X						
3	-	nt logically consistent with	X					
		bling requirements?						
4	Is the requireme	nt feasible?		Х				
5	Is the requireme	nt verifiable?		Х				
			Insp.	Anal.	Test	Demo.		
6	If feasible and v	erifiable, by which method?			I-SIG_A			
Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.								
Related Design Elements								
		vehicles continually broadcast inge as described in each subse			ı other equi	pped		

ICD 20004

Design (Comments/Changes) **Design Criteria** No/Rank Yes Is the design unambiguous? Х 1 2 Х Is the design logically consistent with Parent(s), and sibling design components? Х 3 Is the design feasible? Х 4 Is the design verifiable? Х Is the requirement fulfilled by the design? 5

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

Rec	uirement Group	Related S	ection				
	EA-UC2-002		Case 2 - Wrong V	Vay Entries	5		
Rel	ated Needs		0				
Par	ent Section						
Rec *Do wro Vel opp Rec Del	quirement Text eleted* Vehicles ong way driver. hicles traveling i posite the legal d quirement Text leted. Vehicles to ong way driver.	traveling in t n the legal dir <u>irection.</u> (Comments / traveling in th irement Crit nent well-form	e legal direction re ceria ned?	fy crash tra	ajectory of	f vehicles	traveling
3	Parent(s), and	sibling requir	consistent with ements?		X		
4	Is the requirem		0	_	X	_	
5	Is the requirem	ent verifiable	??		X		
				Insp.	Anal.	Test	Demo.
6	5 If feasible and verifiable, by which method?					X	
	ated Design Ele						
	0	esign Criteria	a		Yes	No	/Rank
1	Is the design u	_			X		
2	Is the design lo	ogically consi			Х		
3	Is the design for		•		Х		
4	Is the design v	erifiable?		X			
5	Is the requirem	ent fulfilled l	by the design?		Х		
	te: An answer o he 'Design Tex	-	s a comment or c	hange in th	ne Comm	ents/Cha	nge field
Resolution		Approved	Modify	Impler Later	nent	Drop 2	X
	mments						

Requirement Group	Related Section
THEA-UC2-003	Con Ops
Related Needs	1
Parent Section	7.1.2
Requirement Text	

Vehicles shall identify crash trajectory of cross street vehicles

Requirement Text (Comments/Changes)

Modified (added): '...and warn driver.'

Comments: Calculates crash threat based on the location, heading, speed and elevation of both vehicles.

	Requirement Criteria	Ŋ	les	No	'Rank	
1	Is the requirement well-formed?	Х				
2	Is the requirement unambiguous?		Х			
3	Is the requirement logically consistent with Parent(s), and sibling requirements?	Х				
4	Is the requirement feasible?	X				
5	Is the requirement verifiable?	Х				
		Insp.	Anal.	Test	Demo.	
6	If feasible and verifiable, by which method?			IMA_A		

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

3.3.2.8 If IMA determines there is a high probability of a collision using relative position, speed and heading of vehicles approaching the intersection

ICD 3002

Design (Comments/Changes)

	Design Criteria	Yes	No/Rank
1	Is the design unambiguous?	Х	
2	Is the design logically consistent with Parent(s), and sibling design components?	Х	
3	Is the design feasible?	Х	
4	Is the design verifiable?	Х	
5	Is the requirement fulfilled by the design?	Х	

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

Requirement Group	Related Section
THEA-UC2-003a	Con Ops
Related Needs	1
Parent Section	7.1.2
Requirement Text	

Vehicles shall warn the driver of a potential crash

Requirement Text (Comments/Changes)

Split out from a compound requirement

Comments: Calculates crash threat based on the location, heading, speed and elevation of both vehicles.

	Requirement Criteria	Ŋ	les	No	'Rank
1	Is the requirement well-formed?		Х		
2	Is the requirement unambiguous?	X			
3	Is the requirement logically consistent with Parent(s), and sibling requirements?		Х		
4	Is the requirement feasible?		Х		
5	Is the requirement verifiable?		Х		
		Insp.	Anal.	Test	Demo.
6	If feasible and verifiable, by which method?			IMA_A	

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

3.3.2.8 The app warns the driver.

ICD 23002

Design (Comments/Changes) Design Criteria Yes No/Rank Is the design unambiguous? Х 1 Х 2 Is the design logically consistent with Parent(s), and sibling design components? Х 3 Is the design feasible? Х 4 Is the design verifiable? Х 5 Is the requirement fulfilled by the design?

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

Requirement Group	Related Section
THEA-UC2-004	
Related Needs	
Parent Section	

RSU at REL entrance shall host the existing 2-phase traffic signal control application. Requirement Text (Comments/Changes)

Deleted. WWE will use MAP of physical intersection to determine wrong way violation. With the 2016 J2735 standard revision this is the preferred solution.

	Requirement Criteria	Ŋ	les	No	/Rank
1	Is the requirement well-formed?				
2	Is the requirement unambiguous?				
3	Is the requirement logically consistent with Parent(s), and sibling requirements?				
4	Is the requirement feasible?				
5	Is the requirement verifiable?				
		Insp.	Anal.	Test	Demo.
6	If feasible and verifiable, by which method?				

Rel	ated Design	Elements			
Е					
Des	sign (Comme	nts/Changes)			
		Design Criteria		Yes	No/Rank
1	Is the design	unambiguous?			
2		logically consis			
3	Is the design	feasible?			
4	Is the design	verifiable?			
5	Is the require	ement fulfilled by	y the design?		
	te: An answei he 'Design T	-	a comment or cl	hange in the Comn	nents/Change field
Fin Res	al solution	Approved	Modify	Implement Later	Drop X
Со	nments				

Rec	quirement Gro	up Related Sec	tion				
TH	EA-UC2-005						
	ated Needs						
	ent Section						
	quirement Te		at REL entrance	chall bo D	ED inhou	nd and Cl	DEEN
		outbound times of					NEEN
		xt (Comments/C					
De	l <mark>eted.</mark> WWE w	ill use MAP of p	hysical intersect			ng way vi	iolation.
Wi	th the 2016 J2'	735 standard rev	ision this is the p	referred so	lution.		
	Rec	quirement Crite	eria		Yes	No	/Rank
1	Is the require	ement well-forme	ed?				
2	Is the require	ement unambigue	ous?				
3	Is the require	ement logically c	onsistent with				
	-	d sibling require					
4	Is the require	ement feasible?					
5	Is the require	ement verifiable?)				
	J			Insp.	Anal.	Test	Demo.
6	If feasible an	d verifiable, by	which method?				
No	te: An answer	• of no requires	a comment or c	hange in tl	ne Commo	ents/Cha	nge field
		nent Text' section					
	lated Design H	Elements					
E							
De	sign (Commei	nts/Changes)					
	· · · · · · · · · · · · · · · · · · ·	Design Criteria			Yes	No	/Rank
1	Is the design	unambiguous?					
2	Is the design	logically consist	tent with				
		d sibling design	components?				
3	Is the design	feasible?					
4	Is the design	verifiable?					
5	Is the require	ement fulfilled by	y the design?				
No	te: An answer	of no requires	a comment or c	hange in th	ne Commo	ents/Cha	nge field
	the 'Design To	_		-			
						-	
Fin		Approved	Modify	Implei	nent	Drop	X
	solution			Later			
C01	mments						

INCU	quirement Gro	up Related Sec	tion				
TH	EA-UC2-006						
	lated Needs						
	ent Section						
	quirement Te		2 at REL entrance	shall be G	DEEN int	ound and	
U U		inbound times of			KEEN III		IKLD
		xt (Comments/					
			physical intersection			ng way vi	olation.
Wit	th the 2016 J27	735 standard rev	rision this is the p	referred so	lution.		
	Rec	quirement Crite	eria		Yes	No	/Rank
1	Is the require	ement well-form	ed?				
2	Is the require	ement unambigu	ous?				
3	Is the require	ement logically of	consistent with				
		d sibling require	ements?				
4	Is the require	ement feasible?					
5	Is the require	ement verifiable	?				
				Insp.	Anal.	Test	Demo.
6	If feasible an	d verifiable, by	which method?				
Not	te: An answer	• of no requires	a comment or cl	nange in th	ne Commo	ents/Cha	nge field
		nent Text' section		0			0
	lated Design H	Elements					
E							
Des	sign (Commer	C ,					
		Design Criteria	l		Yes	No	/Rank
1	Is the design	unambiguous?					
2		logically consis					
		d sibling design	components?	-			
3	Is the design						
4	Is the design	verifiable?					
5	Is the require	ement fulfilled b	y the design?				
Not	te: An answer	• of no requires	a comment or cl	nange in tl	ne Comm	ents/Cha	nge field
	the Design Te	ext' section.					
	the Design re						
	the Design re						
of t							
of t Fin	al	Approved	Modify	Impler	ment	Drop	X
of t Fin Res	al solution	Approved	Modify	Impler Later	nent	Drop	X
of t Fin Res	al	Approved	Modify	-	nent	Drop	X
of t Fin Res	al solution	Approved	Modify	-	nent	Drop	X
of t Fin Res	al solution	Approved	Modify	-	nent	Drop	X

Rec	uirement Group	Related Sect	ion				
	EA-UC2-007	Con Ops					
	ated Needs	2					
	ent Section	7.1.2					
The J27 Ree Cha	quirement Text e RSU at REL en 35/201603. quirement Text anged 'Signal comments: Compat	(Comments/C ntrol' to 'SPAT	'hanges) Г-MAP.'				
		rement Crite			Yes	-	Rank
1	Is the requirement				Х		
2	Is the requirem	ent unambiguo	ous?		Х		
3	Is the requireme	Ū.			X		
-	Parent(s), and s						
4	Is the requirement	ent feasible?			Х		
5	Is the requirem	ent verifiable?			Х		
	1			Insp.	Anal.	Test	Demo.
6	If feasible and	verifiable, by v	which method?			SPaT MAP	
mes veh 3.2	2 The RSU app 1 ssage. According ticle travel, plus a .2.2.2 The SPaT- broadcast SPaT 1 .2 43013	g to J2735_201 a revocable ind MAP-Daemon	603, each MAP lication for each	zone incl zone.	udes an a	allowed direc	
Des	sign (Comments	/Changes)					
	De	sign Criteria			Yes	No/I	Rank
1	Is the design un	ambiguous?			Х		
2	Is the design lo Parent(s), and s	•			Х		
3	Is the design fe				Х		
4	Is the design ve	rifiable?		X			
5	Is the requirement	ent fulfilled by	the design?		Х		
	te: An answer of he 'Design Text	-	a comment or c	hange in 1	the Com	ments/Chan	ge field
Fin Res	al A solution	pproved X	Modify	Imple Later	ement	Drop	
Coi	mments						

Rec	quirement Group	Related Section					
TH	EA-UC2-008	Con Ops					
Rel	lated Needs	2					
Par	ent Section	7.1.2					
	quirement Text						
		ance shall transmit the REL en	trance l	ane geo	metry	MAP me	essage
-	J2735/201603.						
	•	Comments/Changes)					
	0 0	ol' to 'SPAT-MAP.'					
Co	mments: Compatib	le with the message payload a	nd secu	rity of C	DEM (Class 1 O	BU.
	Require	ement Criteria		Yes		No/I	Rank
1	Is the requirement	t well-formed?		Х			
2	Is the requirement	t unambiguous?		Х			
3	Is the requiremen	t logically consistent with		Х			
	Parent(s), and sib	ling requirements?					
4	Is the requirement	t feasible?		Х			
5	Is the requiremen	t verifiable?	X				
			Insp.	Anal.		Test	Demo.
6	If feasible and ve	rifiable, by which method?			SPa	T MAP	
No	te• An answer of n	o requires a comment or ch	ange in	the Co	mmer	nts/Chan	a field

Related Design Elements

2.1.2 The RSU app broadcasts the MAP and Signal and Phasing Timing (SPaT) message. According to J2735_201603, each MAP zone includes an allowed direction of vehicle travel, plus a revocable indication for each zone.

ICD 20008, 23007

Des	Design (Comments/Changes)							
		Design Criteria		Yes	No/Rank			
1	Is the design	unambiguous?		X				
2	0	logically consist d sibling design d	X					
3	Is the design	feasible?		X				
4	Is the design	verifiable?		X				
5	Is the require	ement fulfilled by	the design?	X				
	te: An answei he 'Design Te	-	a comment or c	hange in the Comm	nents/Change field			
Final Resolution		Approved X	Modify	Implement Later	Drop			
Cor	nments							

Requirement Group	Related Section			
THEA-UC2-008b	Con Ops			
Related Needs	2			
Parent Section	7.1.2			
Requirement Text				
The MAP message shall identify the REL lanes as revocable lanes.				

Requirement Text (Comments/Changes)

Comments: Added. Adds the capability of 2016 J2735 standard.

Requirement Criteria			Yes		No/I	Rank
1	Is the requirement well-formed?		Х			
2	Is the requirement unambiguous?		Х			
3	Is the requirement logically consistent with Parent(s), and sibling requirements?		Х			
4	Is the requirement feasible?		Х			
5	Is the requirement verifiable?	Х				
		Insp.	Anal.	,	Test	Demo.
6	If feasible and verifiable, by which method?			SPa	T MAP	

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

2.1.2 plus a revocable indication for each zone

Design (Comments/Changes)

	Design Criteria	Yes	No/Rank
1	Is the design unambiguous?	Х	
2	Is the design logically consistent with Parent(s), and sibling design components?	Х	
3	Is the design feasible?	Х	
4	Is the design verifiable?	Х	
5	Is the requirement fulfilled by the design?	Х	

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

Requirement Group	Related Section
THEA-UC2-008c	Con Ops
Related Needs	2
Parent Section	7.1.2
Description and Terra	

The SPaT message shall contain the enabled / disabled status of the revocable lanes based on status of the gates at the REL entrance.

Requirement Text (Comments/Changes) Added.

Requirement Criteria			Yes		No/I	Rank
1	Is the requirement well-formed?		Х			
2	Is the requirement unambiguous?		Х			
3	Is the requirement logically consistent with Parent(s), and sibling requirements?		Х			
4	Is the requirement feasible?		Х			
5	Is the requirement verifiable?	X				
		Insp.	Anal.		Test	Demo.
6	If feasible and verifiable, by which method?			SPa	aT MAP	

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

3.2.2.2 The SPaT-MAP-Daemon uses the gate status in order to set the enabledLanes in the broadcast SPaT message.

ICD 23006

Des	Design (Comments/Changes)						
	Design Criteria	Yes	No/Rank				
1	Is the design unambiguous?	Х					
2	Is the design logically consistent with Parent(s), and sibling design components?	Х					
3	Is the design feasible?	Х					
4	Is the design verifiable?	Х					
5	Is the requirement fulfilled by the design?	Х					
Not	Note: An answer of no requires a comment or change in the Comments/Change field						

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

Requirement Grou	up	Related Section	on					
THEA-UC2-008d	l	Con Ops						
Related Needs		2						
Parent Section		7.1.2						
Requirement Te				_				
The WWE application	atior	n shall receive	e the open / close	ed status	from the	gates at	the R	REL
entrance.			h a m a a a a					
Requirement Tex Added: Assume the			U /	Meridia	n has evi	sting de	tector	input
to obtain gate stat				Wichula	II Has CAI	sting uc		mput
	u o 11		1 1202 (2)	-				
Rec	quire	ement Criter	ia		Yes		No/I	Rank
1 Is the require	emen	nt well-formed	1?		Х			
2 Is the require	men	nt unambiguou	us?		Х			
3 Is the require	emen	t logically co	nsistent with		X			
		ling requirem						
4 Is the require					Х			
5 Is the require	emen	nt verifiable?			Х			
				Insp.	Anal.	Tes	st	Demo
				r ·				
6 If feasible an	d ve	rifiable, by w	hich method?			SPaT N	MAP	
Note: An answer of the 'Requirem	[•] of r nent	no requires a Text' section		ange in	the Com			ge field
Note: An answer of the 'Requirem Related Design F 3.2.2.2.2 The SPa	r of r nent Elem T-M	no requires a Text' section ments	comment or ch			ments/(Chan	
Note: An answer of the 'Requirem Related Design F 3.2.2.2.2 The SPa the broadcast SPa	r of r nent Elem T-M	no requires a Text' section ments	comment or ch			ments/(Chan	
Note: An answer of the 'Requirem Related Design F 3.2.2.2.2 The SPa the broadcast SPa ICD 23006	r of r nent Elem T-M T m	no requires a Text' section ments IAP-Daemon essage.	comment or ch			ments/(Chan	
Note: An answer of the 'Requirem Related Design F 3.2.2.2.2 The SPa the broadcast SPa ICD 23006 Design (Commer	r of r nent Elem T-M T m T m	no requires a Text' section ments IAP-Daemon essage.	comment or ch			ments/(Chan bledL	
Note: An answer of the 'Requirem Related Design H 3.2.2.2.2 The SPa the broadcast SPa ICD 23006 Design (Commer	r of r nent Elem T-M T m nts/C Desi	no requires a Text' section ents IAP-Daemon essage. Changes) gn Criteria	comment or ch		der to set	ments/(Chan bledL	anes in
Note: An answer of the 'Requirem Related Design E 3.2.2.2.2 The SPa the broadcast SPa ICD 23006 Design (Commer 1 Is the design	r of r nent Clem T-M T m nts/C Desi una	no requires a Text' section tents IAP-Daemon essage. Changes) gn Criteria mbiguous?	comment or ch		der to set Yes	ments/(Chan bledL	anes in
Note: An answer of the 'Requirem Related Design H 3.2.2.2.2 The SPa the broadcast SPa ICD 23006 Design (Commer 1 1 Is the design 2 Is the design	r of r nent Clem T-M T m T m nts/C Desi unar logi	no requires a Text' section ents IAP-Daemon essage. Changes) gn Criteria	comment or ch		der to set Yes X	ments/(Chan bledL	anes in
Note: An answer of the 'Requirem Related Design F 3.2.2.2.2 The SPa the broadcast SPa ICD 23006 Design (Commer 1 1 Is the design 2 Is the design Parent(s), and	r of r nent Clem T-M T m T m nts/C Desi unai logi d sib	to requires a Text' section tents IAP-Daemon essage. Changes) gn Criteria mbiguous? cally consiste bling design co	comment or ch		der to set Yes X	ments/(Chan bledL	anes in
Note: An answer of the 'Requirem Related Design F 3.2.2.2.2 The SPa the broadcast SPa ICD 23006 Design (Commer 1 1 Is the design 2 Is the design 3 Is the design	r of r nent Clem T-M T m T m T m nts/C Desi unan logi d sibb feas	to requires a Text' section tents IAP-Daemon essage. Changes) gn Criteria mbiguous? cally consiste bling design co sible?	comment or ch		der to set Yes X X	ments/(Chan bledL	anes in
Note: An answer of the 'Requirem Related Design H 3.2.2.2.2 The SPa the broadcast SPa ICD 23006 Design (Commer 1 1 Is the design 2 Is the design 3 Is the design 4 Is the design	r of r nent Clem T-M T m T m T m T m nts/C Desi unar logi d sib feas veri	to requires a Text' section tents IAP-Daemon essage. Changes) gn Criteria mbiguous? cally consiste bling design co sible?	comment or ch		der to set Yes X X X X	ments/(Chan bledL	anes in
Note: An answer of the 'Requirem Related Design H 3.2.2.2.2 The SPa the broadcast SPa ICD 23006 Design (Commer I I Is the design Parent(s), and 3 Is the design 4 Is the design 5 Is the require Note: An answer	r of r nent Clem T-M T m T m T m T m T m T m T m T m T m T m	no requires a Text' section ents IAP-Daemon essage. Changes) gn Criteria mbiguous? cally consiste bling design co sible? fiable? fiable? at fulfilled by no requires a	comment or ch	tus in or	der to set Yes X X X X X X X X X X X	the ena	Chan bledL	anes in
Note: An answer of the 'Requirem Related Design H 3.2.2.2.2 The SPa the broadcast SPa ICD 23006 Design (Commer I I Is the design Parent(s), and I Is the design A Is the design I Is the design	r of r nent Clem T-M T m T m T m T m T m T m T m T m T m T m	no requires a Text' section ents IAP-Daemon essage. Changes) gn Criteria mbiguous? cally consiste bling design co sible? fiable? fiable? at fulfilled by no requires a	comment or ch	tus in or	der to set Yes X X X X X X X X X X X	the ena	Chan bledL	anes in
Note: An answer of the 'Requirem Related Design H 3.2.2.2.2 The SPa the broadcast SPa ICD 23006 Design (Commer 1 Is the design 2 Is the design 3 Is the design 4 Is the design	r of r nent Clem T-M T m T m T m T m T m T m T m T m T m T m	no requires a Text' section ents IAP-Daemon essage. Changes) gn Criteria mbiguous? cally consiste bling design co sible? fiable? fiable? at fulfilled by no requires a	comment or ch	tus in or	der to set Yes X X X X X X X X X X X	the ena	Chan bledL	anes in

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

Reo	uirement Grou	p Related S	ection						
	EA-UC2-009	Con Ops	cetton						
	ated Needs	2, 3							
	ent Section	7.1.2							
	quirement Tex								
	Participating vehicles shall host the Wrong Way Entry (WWE) application.								
	Requirement Text (Comments/Changes)								
De	eleted								
	0 0		o 'Wrong Way E	• • •					
		• • • •	ation can be adap	ted to detect	t wrong w	ay entry t	o an		
ing	ress lane or clos				-		<u> </u>		
	Req	uirement Crit	teria		les	No	/Rank		
1	Is the require	ment well-form	ned?						
2	Is the require	ment unambig	uous?						
3	-	U .	consistent with						
4		l sibling requir ment feasible?							
5	-	ment verifiable							
5	is the require			Inco	Anal.	Test	Demo.		
6	If fassible and	l varifiable br	which mathed?	Insp.	Allal.	X	Denio.		
			which method?						
of t	the 'Requiremainten ated Design E	ent Text' sect	s a comment or o ion.						
	.2.2 OBUs will		ostalled						
	sign (Commen								
Du	0	Design Criteri	<u> </u>		(es	No	/Rank		
1	Is the design	8					Nank		
2	e	logically consi							
2	0	•	a components?						
3	Is the design t	· · ·	<u> </u>						
4	Is the design	verifiable?							
5	Is the require	ment fulfilled	by the design?						
Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.									
Fina Res	al solution	Approved	Implen Later	nent	Drop 2	X			
Cor	Comments								

Requirement Group	Related Section
THEA-UC2-010	Con Ops
Related Needs	2
Parent Section	7.1.2
Dequinement Tout	

Vehicle WWE application shall receive the signal control application SPaT message. Requirement Text (Comments/Changes)

Changed 'RVL' to 'Vehicle WWE.'

	Requirement Criteria		Yes	No/Rank	
1	Is the requirement well-formed?		Х		
2	Is the requirement unambiguous?	Х			
3	Is the requirement logically consistent with Parent(s), and sibling requirements?	Х			
4	Is the requirement feasible?	Х			
5	Is the requirement verifiable?		Х		
		Insp.	Anal.	Test	Demo.
6	If feasible and verifiable, by which method?			WWE_A WWE_B WWE_C WWE_D WWE_E WWE_F	

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

3.3.2.2 WWE app is designed to warn OBU equipped vehicles trying to wrong way enter an RSU equipped intersection which provides the MAP and SPaT messages through DSRC.

ICD 23007

Design (Comments/Changes)

	Design Criteria	Yes	No/Rank
1	Is the design unambiguous?	Х	
2	Is the design logically consistent with Parent(s), and sibling design components?	Х	
3	Is the design feasible?	Х	
4	Is the design verifiable?	Х	
5	Is the requirement fulfilled by the design?	Х	

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

Requirement Group	Related Section
THEA-UC2-011	Con Ops
Related Needs	2
Parent Section	7.1.2
Requirement Text	

Vehicle WWE application shall receive the MAP message.

Requirement Text (Comments/Changes)

Changed 'RVL' to 'Vehicle WWE.'

	Requirement Criteria	Yes No/Rank			Rank		
1	Is the requirement well-formed?		Х				
2	Is the requirement unambiguous?		Х				
3	Is the requirement logically consistent with Parent(s), and sibling requirements?	Х					
4	Is the requirement feasible?	Х					
5	Is the requirement verifiable?	Х					
		Insp.	Anal.	Test	Demo.		
6	If feasible and verifiable, by which method?			WWE_A WWE B			
				WWE_C			
				WWE_D			
				WWE_E			
				WWE_F			

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

3.3.2.2 WWE app is designed to warn OBU equipped vehicles trying to wrong way enter an RSU equipped intersection which provides the MAP and SPaT messages through DSRC.

ICD 20008, 23007

Design (Comments/Changes)

	Design Criteria	Yes	No/Rank
1	Is the design unambiguous?	Х	
2	Is the design logically consistent with Parent(s), and sibling design components?	Х	
3	Is the design feasible?	Х	
4	Is the design verifiable?	Х	
5	Is the requirement fulfilled by the design?	Х	

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

Requirement Group	Related Section
THEA-UC2-012	Con Ops
Related Needs	2
Parent Section	7.1.2

Vehicle WWE application at the REL entrance shall warn drivers predicted to enter a closed lane or an ingress lane going the wrong way.

Requirement Text (Comments/Changes)

Changed 'RVL' to 'WWE.'

Added: '...enter a closed lane or an ingress lane going the wrong way.' Omitted: violate the RED phase.

Comment: OBUs compare their location, heading, speed and elevation to the RSU SPAT and MAP to predict wrong way violation indicating that the vehicle is on a wrong-way trajectory.

	Requirement Criteria	Ŋ	les	No/	Rank
1	Is the requirement well-formed?		Х		
2	Is the requirement unambiguous?		Х		
3	Is the requirement logically consistent with Parent(s), and sibling requirements?		Х		
4	Is the requirement feasible?		Х		
5	Is the requirement verifiable?		Х		
		Insp.	Anal.	Test	Demo.
6	If feasible and verifiable, by which method?			WWE_A WWE_B WWE_C	

WWE_F Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

3.3.2.2 The driver would receive a first level warning when their OBU equipped vehicle is on a path that is projected to enter a part of the intersection that would make them go the wrong way based on their trajectory and speed. There is also another warning message displayed to the driver using this app where the equipped vehicle finds itself in an area where no traffic is allowed which is specific to the REL exit

ICD 23002

Design (Comments/Changes)							
Design Criteria				Yes	No/Rank		
1	1 Is the design unambiguous?			X			
2	2 Is the design logically consistent with Parent(s), and sibling design components?			Х			
3				X			
4	Is the design verifiable?			X			
5	Is the requir	ement fulfilled b	by the design?	X			
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.						
	solution	Approved X	Modify	Implement Later	Drop		
Co	mments						

WWE_D WWE_E

Related Section
2.4.2 Use Case 2 - Wrong Way Entries

A roadside vehicle detector shall issue a call to the proxy app when a vehicle approaches the REL entrance.

Requirement Text (Comments/Changes)

Deleted. Detecting an approaching unequipped vehicle is not effective as the unequipped vehicle cannot warn its driver of a predicted violation.

	Requirement Criteria	Y	les	No	No/Rank	
1	Is the requirement well-formed?					
2	Is the requirement unambiguous?					
3	Is the requirement logically consistent with Parent(s), and sibling requirements?					
4	Is the requirement feasible?					
5	Is the requirement verifiable?					
		Insp.	Anal.	Test	Demo.	
6	If feasible and verifiable, by which method?					

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

Des	Design (Comments/Changes)							
Design Criteria				Yes	No/Rank			
1	Is the design	unambiguous?						
2	Is the design logically consistent with Parent(s), and sibling design components?							
3	Is the design feasible?							
4	Is the design	verifiable?						
5	Is the require	ement fulfilled by	the design?					
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.							
Fin Res	al solution	Approved	Modify	Implement Later	Drop X			
Cor	nments							

Related N Parent SetParent SetRequirerA roadsic enters the Required1Is th2Is th3Is th3Is th5Is th5Is th6If feeNote: Arr 'RequiredRelated I3.2.2.1.14possibleaccess landICD2300Design (01Is th	ection ment Text de vehicle he REL entr ment Text Requi he requirer he requirer	detector shall issue a call to the ance going the wrong way. (Comments/Changes) rement Criteria ment well-formed? ment unambiguous? ment logically consistent with sibling requirements? ment feasible? ment verifiable? ment verifiable? ment verifiable by which method? f no requires a comment or t' section.	Insp.	Yes X X X X X X X Anal. the Comm	No/Ra No/Ra Test WWE_Warning ents/Change fiele adar system that of zones on the outb	Demo. d of the covers the ound
Related N Parent SetParent SetRequirerA roadsic enters the Required1Is th2Is th3Is th3Is th5Is th5Is th6If feeNote: Arr 'RequiredRelated I3.2.2.1.14possibleaccess landICD2300Design (01Is th	Needs ection ment Text de vehicle he REL entr ment Text Requi he requirer he requirer	3 7.1.2 detector shall issue a call to the ance going the wrong way. (Comments/Changes) rement Criteria nent well-formed? nent unambiguous? nent logically consistent with sibling requirements? nent verifiable? verifiable, by which method? f no requires a comment or t' section. eed vehicles going the wrong we have onto the REL with detectors	Insp.	Yes X X X X X X X Anal. the Comm	No/Ra No/Ra Test WWE_Warning ents/Change fiele adar system that of zones on the outb	Demo. d of the covers the ound
Parent Set Requirer A roadsic enters the Requirer 1 Is the 2 Is the 3 Is the Parent 4 Is the 5 Is the 6 If feet Note: Arrent 6 If feet Note: Arrent 7 Requirer Related I 3.2.2.1.1 4 possible access land ICD 2300 Design (19)	ection ment Text de vehicle he REL entr ment Text Requi he requirer he requirer	7.1.2 detector shall issue a call to the ance going the wrong way. (Comments/Changes) rement Criteria nent well-formed? nent unambiguous? nent logically consistent with sibling requirements? nent verifiable? verifiable, by which method? f no requires a comment or t' section. ents ed vehicles going the wrong we have onto the REL with detectors	Insp.	Yes X X X X X X X Anal. the Comm	No/Ra No/Ra Test WWE_Warning ents/Change fiele adar system that of zones on the outb	Demo. d of the covers the ound
RequiredA roadsic enters theRequired1Is th2Is th3Is th3Is th4Is th5Is th6If feeeNote: Arr 'Required3.2.2.1.14possibleaccess landICD2300Design (feed)1Is th	ment Text de vehicle he REL entro- ment Text Requi he requirer he requirer	detector shall issue a call to the ance going the wrong way. (Comments/Changes) rement Criteria nent well-formed? nent unambiguous? nent logically consistent with sibling requirements? nent feasible? nent verifiable? nent verifiable? verifiable, by which method? f no requires a comment or t' section. ements ed vehicles going the wrong we	Insp.	Yes X X X X X X X Anal. the Comm	No/Ra No/Ra Test WWE_Warning ents/Change fiele adar system that of zones on the outb	Demo. d of the covers the ound
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Related Section
Con Ops
3, 4
7.1.2

Requirement Text WWE app running on the RSU shall create a wrong way driver warning message when the roadside detector call is asserted.

Requirement Text (Comments/Changes)

Changed 'Proxy' to 'WWE.'

Deleted "...proxy Red Light Violations (RLV) when the advance..." and added "...wrong way driver warning message when the roadside..."

Added "is asserted" and deleted "...and followed by the local detection call is asserted during red phase."

Deleted comment: "Advance detector call followed by local detection call during red phase predicts RLV of unequipped vehicle. The distance between calls divided by the time between calls equals the violation speed."

Added comment: "The traditional vehicle detector can distinguish vehicle direction in order to distinguish wrong-way driving from legal distinguish wrong-way driving from legal driving."

	Requirement Criteria		Yes		No/I	Rank
1	Is the requirement well-formed?		Х			
2	Is the requirement unambiguous?		Х			
3	Is the requirement logically consistent with Parent(s), and sibling requirements?		Х			
4	Is the requirement feasible?		Х			
5	Is the requirement verifiable?	Х				
		Insp.	Anal.	Г	Test	Demo.
6	If feasible and verifiable, by which method?			WWE	Warning	

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

3.2.2.1.1 The WWE application on the RSU receives the corresponding detection and broadcasts a TIM with a wrong way driver alert. Equipped vehicles driving inbound on the REL receive the alert and warn their driver via the HMI.

ICD 23017

Design (Comments/Changes)

	Design Criteria	Yes	No/Rank
1	Is the design unambiguous?	Х	
2	Is the design logically consistent with Parent(s), and sibling design components?	Х	
3	Is the design feasible?	Х	
4	Is the design verifiable?	Х	
5	Is the requirement fulfilled by the design?	Х	
	e: An answer of no requires a comment or cha he 'Design Text' section.	ange in the Comme	nts/Change field

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Comments				

U.S. Department of Transportation Intelligent Transportation System Joint Program Office

	uirement Group	Related Secti	ion				
	EA-UC2-015b	Con Ops					
	ated Needs	1					
Pare	ent Section	7.1.2					
Rec	quirement Text						
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	icle is travelling o			hich the	warning a	pplies.	
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3	Is the requireme	nt logically co	onsistent with		Х		
-	Parent(s), and si	U I					
4	Is the requireme	nt feasible?			Х		
5	Is the requireme	nt verifiable?			Х		
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Reo	uirement Group	Related Section					
	EA-UC2-015c	Con Ops					
Rel	ated Needs	1					
Par	ent Section	7.1.2					
	Requirement Text The OBU shall receive TIMs messages containing warning of a wrong way driver.						
Rec	quirement Text (Comments/Changes)					
	ded requirement g	1					
	Added Comment. The warning message sent out from the RSU is expected to contain						
	information about the road segment that the warning applies to (e.g. Geographical Path						
insi	inside a TIM).						
	Requir	ement Criteria	Yes		No/	No/Rank	
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2 3	Is the requirement Is the requirement Parent(s), and site	nt unambiguous? nt logically consistent with bling requirements? nt feasible?		X X			
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Related Design Elements

3.3.2.2 warn the drivers of equipped vehicles of a wrong way driver approaching them on the REL based on a TIM that would be broadcast by the RSU

ICD 23002, 23017

Des	Design (Comments/Changes)				
	Design Criteria	Yes	No/Rank		
1	Is the design unambiguous?	Х			
2	Is the design logically consistent with Parent(s), and sibling design components?	Х			
3	Is the design feasible?	Х			
4	Is the design verifiable?	Х			
5	Is the requirement fulfilled by the design?	Х			

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

Rec	uirement Group	Related Section					
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	ated Needs	1					
Par	ent Section	7.1.2					
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	-	Comments/Changes)					
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		he warning message sent out f					
	de a TIM).	e road segment that the warning	ig applies	to (e.g. C	Jeographical	Path	
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<u> </u>		bling requirements?		*7			
4	Is the requireme			Х			
5	Is the requireme	nt verifiable?	X				
			Insp.	Anal.	Test	Demo.	
6	If feasible and v	erifiable, by which method?			WWE_D		
		no requires a comment or cl	hange in	the Com	ments/Chan	ge field	
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Rel	ated Design Eler	nents					
33	2.2 warn the driv	ers of equipped vehicles of a v	3.3.2.2 warn the drivers of equipped vehicles of a wrong way driver approaching them on				
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Resolution			Later	
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Requirement Group	Related Section
THEA-UC2-016	Con Ops
Related Needs	3
Parent Section	7.1.2

Vehicle WWE application of violator shall issue a wrong-way alert to the wrong way driver while driving the REL going the wrong way.

Requirement Text (Comments/Changes)

Changed 'RVL' to 'Vehicle WWE' and changed "...the wrong way driver when the RLV application leaves the REL MAP geometry during RED phase..." to "...the wrong way driver while driving the REL going the wrong way..."

Changed in comments: "...while the signal phase is in red. Applies to both equipped and unequipped vehicles..." changed to "...and detects an impending wrong way entry based on the vehicle's current trajectory."

	Requirement Criteria	Ŋ	Yes	No/l	Rank
1	Is the requirement well-formed?		Х		
2	Is the requirement unambiguous?		Х		
3	Is the requirement logically consistent with Parent(s), and sibling requirements?		Х		
4	Is the requirement feasible?		Х		
5	Is the requirement verifiable?		Х		
		Insp.	Anal.	Test	Demo.
6	If feasible and verifiable, by which method?			WWE_D WWE_E WWE_F	

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

3.3.2.2 If the vehicle continues to go up a road in the wrong way manner, the driver of the vehicle would receive a secondary warning letting them know that they are already going the wrong way

ICD 23002

Design (Comments/Changes)					
	Design Criteria	Yes	No/Rank		
1	Is the design unambiguous?	Х			
2	Is the design logically consistent with Parent(s), and sibling design components?	Х			
3	Is the design feasible?	Х			
4	Is the design verifiable?	Х			
5	Is the requirement fulfilled by the design?	Х			
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Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

U.S. Department of Transportation

Intelligent Transportation System Joint Program Office

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6 If feasible and verifiable, by which method? WWE_D	ank					
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3 Is the design feasible? X						
4 Is the design verifiable? X						
5 Is the requirement fulfilled by the design? X						
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Final Resolution Approved X Modify Implement Later Drop						
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-	A-UC2-019	Con Ops					
-	ated Needs	4					
-	ent Section	7.1.2					
	uirement Text		be stored at the ma	aster serve	r		
	<u> </u>	(Comments/Ch					
	Rec	uirement Crite	ria	,	Yes	No/	Rank
1	Is the requiren	nent well-formed	?		Х		
2	-	nent unambiguou			Х		
3		nent logically con sibling requirem			Х		
4	Is the requirem	e i			Х		
5	Is the requiren	nent verifiable?			Х		
	*			Insp.	Anal.	Test	Demo.
6	If fassible and	verifiable, by wl	nich mathod?	mop.		WWE D	Demo.
							1 0 /1
		-	comment or chang	e in the Co	omments/	Change field	d of the
'Requirement Text' section. Related Design Elements							
	U						
3.1.	2.3 The data sto	red in SQL is an	onymous. It include	es the follo	wing:		
	Wrong Way	y Entry events			-		
Des	ign (Comments	s/Changes)					
]	Design Criteria		,	Yes	No/	Rank
1	Is the design u	nambiguous?			X		
2		e	nt with Parent(s),		X		
2	U U	sign components			Λ		
3	Is the design f		·		Х		
4	Is the design v	verifiable?			Х		
5	Is the requiren	nent fulfilled by t	he design?		Х		
Not	e: An answer o	f no requires a d	comment or chang	 e in the Co	omments/	Change field	d of the
	sign Text' secti					enunge ner	
	1.5.1.1				-		
Fina	al Resolution	Approved X	Modify	Implen	nent Later	Drop	
Con	nments						

	quirement Group	Related Section				
TH	EA-UC2-020	Con Ops				
Re	ated Needs	4				
	ent Section	7.1.2				
	quirement Text			~		
	<u> </u>	n master server shall be disp	layed in	Concer	t.	
		Comments/Changes)	?? and a d	11-1	available to the T	
	erator."	to law enforcement dispatch	and ac	ided	available to the 1	MC
		ment by deleting "law enfor	ement d	lisnatch	and law enforcem	ent
	0 1	e as to interface from master		1		
	MC operators."					aang
	Require	ement Criteria		Yes	No/Ran	k
1	Is the requireme	nt well-formed?		Х		
2	2 Is the requirement unambiguous?			Х		
3				Х		
Parent(s), and sibling requirements?						
4 Is the requirement feasible?				Х		
5 Is the requirement verifiable?				Х		
i				Anal	Test	Dem
6 If feasible and verifiable, by which method?					WWE_Warning	
б	If feasible and v	erifiable, by which method?				
-		no requires a comment or	change i	in the C		e field
No of t	te: An answer of the 'Requirement	no requires a comment or t Text' section.	change i	in the C		e field
No of 1 Re	te: An answer of the 'Requirement lated Design Elen	no requires a comment or t Text' section.			Comments/Chang	
No of 1 Re 2.1	te: An answer of the 'Requirement lated Design Elen .2. The RSU app	no requires a comment or t Text' section. nents provides an alert to the TMC			Comments/Chang	
No of 1 Re 2.1	te: An answer of the 'Requirement lated Design Elen .2. The RSU app sign (Comments/	no requires a comment or t Text' section. nents provides an alert to the TMC Changes)	that a v	ehicle i	Somments/Chang	way
No of 1 Re 2.1 De	te: An answer of the 'Requirement lated Design Elen .2. The RSU app sign (Comments/ Desigr	no requires a comment or t Text' section. nents provides an alert to the TMC Changes) h Criteria	that a v	ehicle i	Comments/Chang	way
No of 1 Re 2.1 De	te: An answer of the 'Requirement lated Design Elen .2. The RSU app sign (Comments/	no requires a comment or t Text' section. nents provides an alert to the TMC Changes) h Criteria	that a v Ye X	ehicle i	Somments/Chang	way
No of 1 Re 2.1 De	te: An answer of the 'Requirement lated Design Elen .2. The RSU app sign (Comments/ Design Is the design una Is the design log	no requires a comment or t Text' section. nents provides an alert to the TMC Changes) h Criteria ambiguous? ically consistent with	that a v	ehicle i	Somments/Chang	way
No of 1 Re 2.1 De	te: An answer of the 'Requirement lated Design Elen .2. The RSU app sign (Comments/ Design Is the design una Is the design log Parent(s), and si	no requires a comment or t Text' section. nents provides an alert to the TMC Changes) h Criteria ambiguous? ically consistent with	that a v Ye X	ehicle i	Somments/Chang	way
No of 1 Re 2.1 De 1 2	te: An answer of the 'Requirement lated Design Elem .2. The RSU app sign (Comments/ Design Is the design una Is the design log Parent(s), and si components?	no requires a comment or t Text' section. nents provides an alert to the TMC Changes) A Criteria ambiguous? ically consistent with bling design	that a v Ye X	ehicle i	Somments/Chang	way
No of 1 Re 2.1 De 1 2 3	te: An answer of the 'Requirement lated Design Elem .2. The RSU app sign (Comments/ Design Is the design una Is the design log Parent(s), and si components? Is the design fea	no requires a comment or t Text' section. nents provides an alert to the TMC Changes) A Criteria ambiguous? ically consistent with bling design sible?	that a v Ye X X	ehicle i	Somments/Chang	way
No of 1 Re 2.1	te: An answer of the 'Requirement lated Design Elem .2. The RSU app sign (Comments/ Design Is the design una Is the design log Parent(s), and si components? Is the design fea Is the design ver	no requires a comment or t Text' section. nents provides an alert to the TMC Changes) A Criteria ambiguous? ically consistent with bling design sible?	that a v Ye X	ehicle i	Somments/Chang	way

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

Requirement Group	Related Section
THEA-UC3-001	Con Ops
Related Needs	1, 3
Parent Section	7.1.3

The OBU shall receive Personal Safety Messages (PSMs).

Requirement Text (Comments/Changes)

Made PSM plural by adding an 's.'

Added comment: A sensor system (e.g. LiDAR) connected to the RSU provides individual pedestrian location with sufficient accuracy. The RSU converts this information to PSMs being broadcast on behalf of pedestrians.

	Requirement Criteria	J	les	No/	Rank
1	Is the requirement well-formed?		Х		
2	Is the requirement unambiguous?		Х		
3	Is the requirement logically consistent with Parent(s), and sibling requirements?		Х		
4	Is the requirement feasible?		Х		
5	Is the requirement verifiable?		Х		
		Insp.	Anal.	Test	Demo.
6	If feasible and verifiable, by which method?			PED-X PCW_A PCW_B PCW_C PCW_D	

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

3.3.2.4 To PSMs and send them over DSRC for the HMI

ICD 20012

Design (Comments/Changes)

	Design (Commentes, Changes)						
		Design Crite	ria		Yes		No/Rank
1	Is the design	unambiguous?			X		
2					X		
3	Parent(s), and sibling design components?Is the design feasible?				X		
4	Is the design verifiable?			Х			
5	Is the requirement fulfilled by the design?			X			
Not	Note: An answer of no requires a comment or change in the Comments/Change field						hange field
	he 'Design T	-					8
Fin	al	Approved 2	X	Modify	Implement	t Droj	р
Res	olution				Later		
Con	nments						

Requirement Group	Related Section
THEA-UC3-002	Con Ops
Related Needs	1, 3
Parent Section	7.1.3

The OBU shall determine if there is a potential conflict with a pedestrian.

Requirement Text (Comments/Changes)

Omitted Comment "A pedestrian BSM is a standard BSM that is created by the RSU using data received from a PID"

Added Comment "This is a Personal Safety Message based on J2735_201603. PSMs shall be compliant with requirements listed in J2945/9 (among other things this standard prescribes a minimum location accuracy)" to comments.

	Requirement Criteria	Ŋ	les	No/	Rank
1	Is the requirement well-formed?		Х		
2	Is the requirement unambiguous?		Х		
3	Is the requirement logically consistent with Parent(s), and sibling requirements?		Х		
4	Is the requirement feasible?		Х		
5	Is the requirement verifiable?	X			
		Insp.	Anal.	Test	Demo.
6	If feasible and verifiable, by which method?			PED-X PCW_A PCW_B PCW_C PCW_D	

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

3.3.2.4 are projected to be in the intended path of the vehicle

Des	sign (Comme	nts/Changes)			
		Design Criteria		Yes	No/Rank
1	Is the design	unambiguous?		X	
2	0	logically consist		X	
3	Is the design	feasible?		X	
4	Is the design	verifiable?		X	
5	Is the require	ement fulfilled by	the design?	X	
	te: An answei he 'Design To	-	a comment or ch	ange in the Comn	nents/Change field
Fina Res	al olution	Approved X	Modify	Implement Later	Drop
Cor	nments				

Req	uirement Gro	oup	Relate	d Secti	on				
THE	A-UC3-003		Con O	ps					
-	ated Needs		1, 3						
	ent Section		7.1.3						
-	uirement Tex		. بر میں ایران	ام محمد	to main ation of a	notontial ac	affict with a		
	uirement Tex				etermination of a	potential co	onflict with a	a pedestriar	1.
ĸeq	uirement 1 ex		mment	s/Char	iges)				
	R	equire	ement	Criteri	a		Yes	No/	Rank
1	Is the require	ment	well-fo	rmed?			Х		
						Х			
3 Is the requirement logically consistent with Parent(s), and sibling requirements?							Х		
4	Is the require						Х		
5	Is the require	ment	verifiat	ole?			Х		
						Insp.	Anal.	Test	Demo.
6	If feasible an	d veri	fiable, l	by whic	ch method?			PED-X	
							PCW_A		
							PCW_B PCW_C		
								PCW_C PCW_D	
Not	e: An answer	of no	reauir	es a co	mment or chang	e in the Co	omments/C		d of the
	quirement Te		_			,• •• • .			
	ated Design E								
	C .								
			when p	edestria	ans, within the cr	osswalk, ar	e projected	to be in the	intended
path	of the vehicle								
ICD	23002								
ICD	23002								
Dec	ign (Commen	te/Ch	anges)						
DCS			gn Cri	toria			Yes	No	Rank
1	Is the design		0				X		Nank
2	9		U		with Parent(s),		X		
	and sibling d	esign	compoi		with Furcht(b),				
3	Is the design						Х		
4	Is the design						Х		
5	Is the require			•			X		
	e: An answer sign Text' sec		requir	es a co	mment or chang	in the Co	omments/C	change fiel	d of the
Fina	l Resolution	App	roved	X	Modify	Impler	nent Later	Drop	
Con	nments				I	I		_1	

Re	quirement Grou	p Related Sec					
TH	IEA-U C3-00 4_						
Re	lated Needs						
	rent Section						
	quirement Tex				1.1.1		1
	e PID snah war osswalk.	n the pedestriar	n in the crosswalk	when a ve	nicle is ap	proaching	g the
	quirement Tex	xt (Comments/	Changes)				
	leted. This is co						
	Req	uirement Crit	eria		Yes	No	/Rank
1	Is the require	ment well-form	ied?				
2	-	ment unambigu					
3	-	ment logically					
	-	l sibling require					
4	Is the require	ment feasible?					
5	Is the require	ment verifiable	?				
				Insp.	Anal.	Test	Demo.
				mop.			
No		of no requires	which method? a comment or con.		ne Comm	ents/Cha	nge field
No of 1	te: An answer	of no requires ent Text' section	a comment or c		ne Comm	ents/Cha	nge field
No of 1 Re	te: An answer the 'Requirem lated Design E	of no requires ent Text' section lements	a comment or c		ne Comm	ents/Cha	nge field
No of 1 Re	te: An answer the 'Requirem lated Design E sign (Commen	of no requires ent Text' section lements	a comment or c	hange in th	ne Comm		nge field /Rank
No of 1 Re	te: An answer the 'Requirem lated Design E sign (Commen	of no requires ent Text' section lements ts/Changes) Design Criteria	a comment or c	hange in th			
No of Re De	te: An answer the 'Requirem lated Design E sign (Commen I Is the design	of no requires ent Text' section lements ts/Changes) Design Criteria unambiguous?	a comment or c	hange in th			
No of Re De	te: An answer the 'Requirem lated Design E sign (Commen I Is the design Is the design	of no requires ent Text' section lements ts/Changes) Design Criteria	a comment or cont on.	hange in th			
No of Re De	te: An answer the 'Requirem lated Design E sign (Commen I Is the design Is the design	of no requires ent Text' section lements ts/Changes) Design Criteria unambiguous? logically consiss l sibling design	a comment or cont on.	hange in th			
No of 1 Re 1 2 3	te: An answer the 'Requirem lated Design E sign (Commen I Is the design Is the design Parent(s), and	of no requires ent Text' section lements ts/Changes) Design Criteria unambiguous? logically consiss l sibling design feasible?	a comment or cont on.	hange in th			
No of 1 Re De 1 2 3 4	te: An answer the 'Requirem lated Design E sign (Commen Is the design Is the design Parent(s), and Is the design Is the design Is the design	of no requires ent Text' section lements ts/Changes) Design Criteria unambiguous? logically consiss l sibling design feasible?	a comment or con.	hange in th			
No of 1 Re De 1 2 3 4	te: An answer the 'Requirem lated Design E sign (Commen Is the design Is the design Parent(s), and Is the design Is the design Is the design	of no requires ent Text' section lements ts/Changes) Design Criteria unambiguous? logically consist 1 sibling design feasible? verifiable?	a comment or con.	hange in th			
No of Re De 1 2 3 4 5 No	te: An answer the 'Requirem lated Design E sign (Commen Is the design Is the design Parent(s), and Is the design Is the design Is the design Is the design Is the require te: An answer	of no requires ent Text' section lements ts/Changes) Design Criteria unambiguous? logically consist disibling design feasible? verifiable? ment fulfilled b of no requires	a comment or con.	hange in th	Ýes		/Rank
of 1 Re De 1 2 3 4 5 No	te: An answer the 'Requirem lated Design E sign (Commen Is the design Is the design Parent(s), and Is the design Is the design Is the design Is the design Is the require	of no requires ent Text' section lements ts/Changes) Design Criteria unambiguous? logically consist disibling design feasible? verifiable? ment fulfilled b of no requires	a comment or content o	hange in th	Ýes		/Rank
No of Re De 1 2 3 4 5 No	te: An answer the 'Requirem lated Design E sign (Commen Is the design Is the design Parent(s), and Is the design Is the design Is the design Is the require te: An answer the 'Design Te	of no requires ent Text' section lements ts/Changes) Design Criteria unambiguous? logically consist disibling design feasible? verifiable? ment fulfilled b of no requires	a comment or content o	hange in th	řes ne Comm		/Rank
No of Re De 1 2 3 4 5 No of Fin Re	te: An answer the 'Requirem lated Design E sign (Commen Is the design Is the design Parent(s), and Is the design Is the design Is the design Is the require te: An answer the 'Design Te	of no requires ent Text' section lements ts/Changes) Design Criteria unambiguous? logically consist sibling design feasible? verifiable? ment fulfilled b of no requires xt' section.	a comment or comment or comment or comment or comments?	hange in th	řes ne Comm	No ents/Char	/Rank

Rec	uirement Group	Related Se	ection				
_	EA-UC3-005		Case 3 - Pedestria	n Safety			
Rel	ated Needs			ž			
	ent Section						
	quirement Text						
	e PID shall warn i sswalk.	the pedestria	n in the crosswalk	when a ve	hicle is ap	proaching	g the
	quirement Text	Comments	/Changes)				
			acies that could ca	use lead to	false posi	tives and	false
	atives.				-		
	Requi	rement Crit	teria		Yes	No	/Rank
1	Is the requireme	ent well-forn	ned?				
2	Is the requireme	ent unambig	uous?				
3	Is the requireme	ent logically	consistent with				
	Parent(s), and s						
4	Is the requireme						
5	Is the requireme	ent verifiable	?				
				Insp.	Anal.	Test	Demo.
6	If feasible and v	verifiable, by	which method?				
Rel	he 'Requiremen ated Design Ele	t Text' sect	s a comment or c ion.				
Re l E	ated Design Ele	t Text' secti ments		nange in tr			
Rel E	ated Design Ele	t Text [°] secti ments /Changes)	ion.				
Rel E Des	ated Design Ele sign (Comments De	t Text' section ments /Changes) sign Criteri	ion.		ře Commo řes		/Rank
Rel E Des	ated Design Ele	t Text' section ments /Changes) sign Criteri ambiguous?	ion.				
Rel E Des 1 2	ated Design Elex sign (Comments De Is the design un Is the design log Parent(s), and s	t Text' section ments /Changes) sign Criteria ambiguous? gically consi ibling design	a stent with				
Rel E Des 1 2	ated Design Elect sign (Comments) De Is the design un Is the design log	t Text' section ments /Changes) sign Criteria ambiguous? gically consi ibling design	a stent with				
Rel E Des 1 2 3	ated Design Elex sign (Comments De Is the design un Is the design log Parent(s), and s	t Text' section ments /Changes) sign Criteria ambiguous? gically consi ibling design asible?	a stent with				
Rel E Des 1 2 3	ated Design Elect sign (Comments) De Is the design un Is the design log Parent(s), and s Is the design fea	t Text' section ments /Changes) sign Criteria ambiguous? gically consi ibling design asible? rifiable?	a stent with components?				
Rel E Des 1 2 3 4 5 Not	ated Design Elect sign (Comments) De Is the design un Is the design log Parent(s), and s Is the design fea Is the design ve Is the requirement	t Text' section ments /Changes) sign Criteri ambiguous? gically consi ibling design asible? rifiable? ent fulfilled l 'no requires	a stent with components?		Ýes	No	/Rank
Rel E Des 1 2 3 4 5 Not of t	ated Design Elect sign (Comments) De Is the design un Is the design log Parent(s), and s Is the design fea Is the design read Is the design ve Is the requirement te: An answer of the 'Design Text	t Text' section ments /Changes) sign Criteri ambiguous? gically consi ibling design asible? rifiable? ent fulfilled l 'no requires	a stent with components? by the design?		řes ie Commo	No	/Rank

	juirement Group	Related Se	ction				
_	EA-UC3-006						
	ated Needs						
Par	ent Section						
	quirement Text						
		the pedestria	n approaching the	crosswalk	when a ve	ehicle is e	ntering
	crosswalk.	Commontal	(Changes)				
	quirement Text		changes) acies that could car	use lead to	false posi	tives and	false
	atives.				ruise posi	cives und	luise
		irement Crit	eria		Yes	No	/Rank
1	Is the requirem	ent well-forn	ned?				
2	Is the requirem	ent unambigu	ious?				
3	Is the requirem	ent logically	consistent with				
	Parent(s), and s	¥	ements?				
4	Is the requirem	ent feasible?					
5	Is the requirem	ent verifiable	??				
	·			Insp.	Anal.	Test	Demo.
6	If feasible and	verifiable, by	which method?				
of t Rel	the 'Requirement's the second se	nt Text' secti	s a comment or cl	nange in th	ne Commo	ents/Cha	nge field
of t Rel E	he 'Requiremen ated Design Ele	nt Text' secti ements		nange in th	ne Commo	ents/Cha	nge field
of t Rel E	he 'Requiremen ated Design Ele sign (Comments	nt Text' secti ements s/Changes)	on.				
of t Rel E Des	he 'Requiremen ated Design Ele sign (Comments De	nt Text' secti ements s/Changes) esign Criteria	a		ie Commo		nge field /Rank
of t Rel E Des	the 'Requirement ated Design Electric sign (Comments De Is the design un	nt Text' secti ements s/Changes) esign Criteria nambiguous?	a				
of t Rel E Des 1 2	he 'Requiremen ated Design Ele sign (Comments De	nt Text' section ements (Changes) esign Criteria nambiguous? gically consi	a stent with				
of t Rel E Des 1 2	the 'Requirement ated Design Electric sign (Comments De Is the design un Is the design lo	nt Text' section ements S/Changes) esign Criteria nambiguous? ogically consi sibling design	a stent with				
of t Rel E Des 1 2 3	the 'Requirement ated Design Electric sign (Comments Definition Definition De	nt Text' section ements s/Changes) esign Criteria nambiguous? ogically consi sibling design easible?	a stent with				
of 1 Rel E Des 1 2 3 4	the 'Requirement ated Design Electric sign (Comments De Is the design un Is the design lo Parent(s), and s Is the design fe	nt Text' section ements s/Changes) esign Criteria nambiguous? ogically consi sibling design easible? erifiable?	a stent with components?				
of t Rel E Des 1 2 3 4 5 No	the 'Requirement ated Design Electric sign (Comments Definition of the design for the design of the	nt Text' section ements s/Changes) esign Criteria nambiguous? egically consi sibling design easible? erifiable? ent fulfilled to f no requires	a stent with components?		Ýes	No	/Rank
of 1 Rel E Des 1 2 3 4 5 5 Not of 1	the 'Requirement ated Design Elect sign (Comments De Is the design un Is the design un Is the design fe Is the design ve Is the design ve Is the design ve Is the requirem te: An answer of the 'Design Text	nt Text' section ements (Changes) esign Criteria nambiguous? ogically consi sibling design easible? erifiable? ent fulfilled to f no requires t' section.	a stent with components? by the design? s a comment or cl	ange in th	řes ne Commo	No ents/Cha	/Rank
of 1 Rel E Des 1 2 3 4 5 Not of 1	the 'Requirement ated Design Elect sign (Comments De Is the design un Is the design un Is the design fe Is the design ve Is the design ve Is the design ve Is the requirem te: An answer of the 'Design Text	nt Text' section ements s/Changes) esign Criteria nambiguous? egically consi sibling design easible? erifiable? ent fulfilled to f no requires	a stent with a components?		řes ne Commo	No	/Rank

Ree	quirement Group	Related Secti	on				
	EA-UC3-007		use 3 - Pedestria	n Safety			
	lated Needs	2.1.5 0.50 0.0		II Sulety			
	rent Section						
Re	quirement Text						
	e PID shall warn	-	n a non-crossw	alk area on	the street	when the	re is an
-	pending vehicle c		•				
	quirement Text leted due to PID			usa laad ta	folco poci	tives and	folco
	gatives.	OF S maccuraci	es illat could ca	use leau to	Taise posi	uves anu	14180
		irement Criter	ria		Yes	No	/Rank
1	Is the requirem	ent well-formed	d?				
2	Is the requirem	ent unambiguo	us?				
3	Is the requirem	ent logically co	onsistent with				
	Parent(s), and s		nents?				
4	Is the requirem	ent feasible?					
5	Is the requirem	ent verifiable?					
				Insp.	Anal.	Test	Demo.
6	If feasible and	verifiable, by w	hich method?				
E	sign (Comments	(Changes)					
Du	8	sign Criteria		•	Yes	No	/Rank
1	Is the design ur	0					
2	Is the design lo		ent with				
	Parent(s), and s	•••					
3	Is the design fe	asible?					
4	Is the design ve	erifiable?					
5	Is the requirem	ent fulfilled by	the design?				
	te: An answer of the 'Design Text	_	comment or c	hange in th	ne Comm	ents/Cha	nge field
Fin		pproved	Modify	Impler Later	nent	Drop	X
Res	al A solution mments	pproved	Modify	Impler Later	ment	Drop	X

Requirement Group	Related Section
THEA-UC3-008	Con Ops
Related Needs	10
Parent Section	7.1.3
Requirement Text	
The PID shall transmit	PSM to the RSU.
Requirement Text (Co	omments/Changes)

	Requirement Criteria	Ŋ	Yes	No	/Rank	
1	Is the requirement well-formed?		Х			
2	Is the requirement unambiguous?		Х			
3	Is the requirement logically consistent with Parent(s), and sibling requirements?		Х			
4	Is the requirement feasible?		Х			
5	Is the requirement verifiable?		Х			
		Insp.	Anal.	Test	Demo.	
6	If feasible and verifiable, by which method?			PED-X		

Related Design Elements

3.2.2.6.1 The PED-X smartphone application also collects logs which contain the smartphone location (PSM is included inside the data logs to the RSU).

ICD 23029

Des	ign (Comment	ts/Changes)			
		Design Criteria		Yes	No/Rank
1	Is the design	unambiguous?		Х	
2	Ŭ	logically consistent esign components?	with Parent(s),	Х	
3	Is the design	feasible?		Х	
4	Is the design	verifiable?		Х	
5	Is the require	ment fulfilled by the	e design?	Х	
	e: An answer sign Text' sect	-	mment or change	in the Comments/Ch	ange field of the
Fina	al Resolution	Approved X	Modify	Implement Later	Drop
Con	nments		•		•

Requirement Criteria Yes No/Rank SU shall receive PID PSM.	Reo	uirement Gro	p Related S	Section					
It Section 7.1.3 irrement Text Requirement PID PSM. irrement Text (Comments/Changes) No/Rank is the requirement well-formed? X Is the requirement unambiguous? X Is the requirement logically consistent with Parent(s), and sibling requirements? X Is the requirement feasible? X Is the requirement verifiable? X Is the requirement verifiable, by which method? PED-X PCW_A PCW_B PCW_C PCW_D If feasible and verifiable, by which method? PED-X PCW_A PCW_B PCW_C PCW_D An answer of no requires a comment or change in the Comments/Change field of the uirement Text' section. ted Design Elements .6.2 PED-X sends PID data logs to the Data Collector containing the smartphone location .2 This event is also logged and sent back to the RSU for archiving at the master server.		A-UC3-009	1						
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Rec	quirement Group	Related Se	ction				
	EA-UC3-010		Case 3 - Pedestria	n Safety			
	ated Needs						
Par	ent Section						
	quirement Text						
	e RSU shall con						
	quirement Text		opropriate PSM m	essage defi	ned Will	use that ir	stead of
	roxy BSM.	000 nus un u		lissage dem		use that h	istead of
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3	Is the requiren	nent logically	consistent with				
	Parent(s), and						
4	Is the requirem	nent feasible?					
5	Is the requiren	nent verifiable	?				
				Insp.	Anal.	Test	Demo.
6	If feasible and	verifiable, by	which method?				
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	Is the design u	e					
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Co	mments						

Requirement Group	Related Section
THEA-UC3-011	Con Ops
Related Needs	10
Parent Section	7.1.3

The RSU shall send all PID PSMs to the master server.

Requirement Text (Comments/Changes)

Omitted 'send a converted BSM from a pedestrian PSN over DSRC' and added 'log the receive PID PSM and store at the master server.'

Comment Added: The intent is to compare location information sent by the PID with location information determined from the pedestrian sensor system.

Requirement Criteria		Ŋ	les	No/	Rank
1	Is the requirement well-formed?	Х			
2	Is the requirement unambiguous?	X			
3	Is the requirement logically consistent with Parent(s), and sibling requirements?	X			
4	Is the requirement feasible?	Х			
5	Is the requirement verifiable?		Х		
		Insp.	Anal.	Test	Demo.
6	If feasible and verifiable, by which method?			PED-X PCW_A PCW_B PCW_C PCW_D	

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

3.2.2.6.2 PED-X sends PID data logs to the Data Collector containing the smartphone location

ICD 23030

Des	Design (Comments/Changes)					
	Design Criteria	Yes	No/Rank			
1	Is the design unambiguous?	Х				
2	Is the design logically consistent with Parent(s), and sibling design components?	X				
3	Is the design feasible?	X				
4	Is the design verifiable?	X				
5	Is the requirement fulfilled by the design?	X				

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

U.S. Department of Transportation Intelligent Transportation System Joint Program Office

Reo	uirement Gro	up Related Sec	tion				
	A-UC3-012	Con Ops					
Rela	ated Needs	10					
Pare	ent Section	7.1.3					
	uirement Tex						
		eive vehicle BSMs.					
Req	juirement Tex	t (Comments/Cha	inges)				
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	ated Design El						
	2.5.1 The XFE	R Gateway also rec	ceives BSMs from	n nearby OF	3Us via WA	VE.	
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4	Is the design	verifiable?			Х		
5	Is the require	ment fulfilled by th	ne design?		Х		
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	al Resolution	Approved X	Modify	Imple	ment Later	Drop	
Con	nments						

-	quirement Group	Related Se	ction				
TΗ	EA-UC3-013		Case 3 - Pedestrian	Safety			
Re	lated Needs						
	rent Section						
	quirement Text		11				
			swalk message to I	PIDs who a	are outside	e the cross	swalk.
	quirement Text leted due to PID (•	acies that could cau	ise lead to	false nosi	tives and	false
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	Parent(s), and s		ements?				
4	Is the requirem	ent feasible?					
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	juirement Group	Related Sec	ction				
TH	THEA-UC3-014 2.4.3 Use Case 3 - Pedestrian Safety						
	Related Needs						
	ent Section						
	quirement Text		SMa inte DSMa				
	e RSU shall conv quirement Text						
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2	Is the requirem	ent unambigu	ious?				
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6	If feasible and	verifiable, by	which method?				
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Requirement Group	Related Section
THEA-UC3-015	Con Ops
Related Needs	10
Parent Section	7.1.3
Requirement Text	

The RSU shall send vehicle BSMs over Wi-Fi to the PID.

Requirement Text (Comments/Changes)

Added '...to the PID' and removed '...a converted PSM from a.'

	Requirement Criteria		les	No/	Rank
1	Is the requirement well-formed?	Х			
2	Is the requirement unambiguous?	Х			
3	Is the requirement logically consistent with Parent(s), and sibling requirements?	Х			
4	Is the requirement feasible?	Х			
5	Is the requirement verifiable?		Х		
		Insp.	Anal.	Test	Demo.
6	If feasible and verifiable, by which method?			PED-X PCW_A PCW_B PCW_C PCW_D	

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

3.2.2.5.2 It forwards those BSMs to the pedestrian safety app on nearby smartphones connected via WiFi to the RSU.

ICD 23012

Design (Comments/Changes)

	Design Criteria	Yes	No/Rank
1	Is the design unambiguous?	Х	
2	Is the design logically consistent with Parent(s), and sibling design components?	Х	
3	Is the design feasible?	Х	
4	Is the design verifiable?	Х	
5	Is the requirement fulfilled by the design?	Х	

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

Rec	uirement Group	Related Section					
	EA-UC3-016	Con Ops					
	ated Needs	10					
	ent Section	7.1.3					
Rec	quirement Text						
	PID shall receive	BSMs.					
Rec	quirement Text (Comments/Changes)					
Ado	led 'BSMs and	calculate collision warnings us	sing the P	ID's locat	ion. Warn	ings	
sha	ll be logged and se	ent to the RSU for offline analy	vsis.' Rem	oved 'PS	Ms.'		
Ado	ded comment: Inte	ent is to use this information for	r a feasibi	lity analy	sis of colli	sion	
war	ning to pedestriar	s from the PID.					
	Requir	ement Criteria	Yes		No/	Rank	
1	Is the requireme	nt well-formed?		Х			
2	Is the requireme	nt unambiguous?	X				
3	Is the requireme	nt logically consistent with	X				
	Parent(s), and si	bling requirements?					
1	4 Is the requirement feasible?		X				
4	Is the requireme	nt feasible?		Λ			
5	Is the requireme			X X			
-	-				Test	Demo.	
-	Is the requireme			X	Test PED-X	Demo.	
5	Is the requireme	nt verifiable?		X	PED-X PCW_A	Demo.	
5	Is the requireme	nt verifiable?		X	PED-X	Demo.	

Related Design Elements

3.2.2.5.2 It forwards those BSMs to the pedestrian safety app on nearby smartphones connected via WiFi to the RSU.

ICD 23029

Design (Comments/Changes)

	Design Criteria	Yes	No/Rank
1	Is the design unambiguous?	Х	
2	Is the design logically consistent with Parent(s), and sibling design components?	Х	
3	Is the design feasible?	Х	
4	Is the design verifiable?	Х	
5	Is the requirement fulfilled by the design?	Х	

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

Requirement Group	Related Section
THEA-UC3-016a	Con Ops
Related Needs	10
Parent Section	7.1.3

The PID shall calculate collision warnings using the PID's location.

Requirement Text (Comments/Changes)

Added '...BSMs and calculate collision warnings using the PID's location. Warnings shall be logged and sent to the RSU for offline analysis.' Removed 'PSMs.'

Added comment: Intent is to use this information for a feasibility analysis of collision warning to pedestrians from the PID.

	Requirement Criteria	Ŋ	les	No/	Rank
1	Is the requirement well-formed?	Х			
2	Is the requirement unambiguous?	Х			
3	Is the requirement logically consistent with Parent(s), and sibling requirements?	Х			
4	Is the requirement feasible?	Х			
5	Is the requirement verifiable?		Х		
		Insp.	Anal.	Test	Demo.
6	If feasible and verifiable, by which method?			PED-X PCW_A PCW_C PCW_D	

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

3.2.2.5.1 The pedestrian collision warning (PCW) app on the OBU receives the PSMs and uses the vehicle's location and trajectory to calculate a pedestrian collision threat

ICD 23029

Design (Comments/Changes)

	Design Criteria	Yes	No/Rank
1	Is the design unambiguous?	Х	
2	Is the design logically consistent with Parent(s), and sibling design components?	Х	
3	Is the design feasible?	Х	
4	Is the design verifiable?	Х	
5	Is the requirement fulfilled by the design?	Х	

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

U.S. Department of Transportation Intelligent Transportation System Joint Program Office

Requirement Group	Related Section
THEA-UC3-016b	Con Ops
Related Needs	10
Parent Section	7.1.3

The PID shall send warnings to the RSU for offline analysis.

Requirement Text (Comments/Changes)

Added '...BSMs and calculate collision warnings using the PID's location. Warnings shall be logged and sent to the RSU for offline analysis.' Removed 'PSMs.' Added comment: Intent is to use this information for a feasibility analysis of collision warning to pedestrians from the PID.

	Requirement Criteria	Ŋ	les	No/	Rank
1	Is the requirement well-formed?	Х			
2	Is the requirement unambiguous?	Х			
3	Is the requirement logically consistent with Parent(s), and sibling requirements?		Х		
4	Is the requirement feasible?	Х			
5	Is the requirement verifiable?		Х		
	·	Insp.	Anal.	Test	Demo.
6	If feasible and verifiable, by which method?			PED-X PCW_A PCW_C PCW_D	

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

3.2.2.6.2 PED-X sends PID data logs to the Data Collector containing the smartphone location and any collision warnings which were computed but not displayed to the user via XFER.

ICD 23029

Design (Comments/Changes)

	Design Criteria	Yes	No/Rank
1	Is the design unambiguous?	Х	
2	Is the design logically consistent with	Х	
	Parent(s), and sibling design components?		
3	Is the design feasible?	Х	
4	Is the design verifiable?	Х	
5	Is the requirement fulfilled by the design?	Х	

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

Ree	uirement Grou	p Related S	Section				
_	EA-UC3-017	Con Ops					
	ated Needs						
Pare	ent Section	7.1.3					
Rec	quirement Tex	t					
			cessible Pedestria	-			w the
			quest on the signal	controller	via the RS	SU.	
	quirement Tex			- 11 41	. 1	4 1	
	· 1		C3-018 Added ' via the RSU.' Rem	1		1	0
-	in the crosswal		la lie KSU. Kell		in the peu	csulaii, u	icy are
		uirement Cri	teria		Yes	No	/Rank
1	Is the requirer	ned?					
2	Is the requirer						
3	Is the requirer	nent logically	consistent with				
	Parent(s), and						
4	Is the requirer	nent feasible?					
5	Is the requirer	ment verifiable	e?				
				Insp.	Anal.	Test	Demo.
	If foosible and	l				X	
Not of t Rel	te: An answer he 'Requireme ated Design El	of no require ent Text' sect lements				ents/Cha	
Not of t Rel 3.4. The	te: An answer the 'Requireme ated Design El .2.1 The PED-S e app will send a	of no require ent Text' sect lements lig app lets the	s a comment or c	on on the U	l when fac	ents/Cha	ss-walk.
Not of t Rel 3.4. The 3.6.	te: An answer of the 'Requiremon ated Design El .2.1 The PED-S	of no require ent Text' sect lements lig app lets the a pedestrian ca	s a comment or c ion.	on on the U	l when fac	ents/Cha	ss-walk.
Not of t Rel 3.4. The 3.6.	te: An answer of the 'Requireme ated Design El .2.1 The PED-S e app will send a .4 23028 sign (Comment	of no require ent Text' sect lements lig app lets the a pedestrian ca	s a comment or c ion. e user press a butto all to the local traf	on on the U	l when fac	ents/Cha cing a cro RSU over	ss-walk.
Not of t Rel 3.4. The 3.6. Des	te: An answer of the 'Requireme ated Design El .2.1 The PED-S e app will send a .4 23028 sign (Comment	of no require ent Text' sect lements lig app lets the a pedestrian ca ts/Changes) Design Criteri	s a comment or c ion. e user press a butto all to the local traf	on on the U	when fac er via the	ents/Cha cing a cro RSU over	ss-walk. r Wi-Fi.
Not of t Rel 3.4. The 3.6. Des	te: An answer of the 'Requirement ated Design El 2.1 The PED-S e app will send a 4 23028 sign (Comment D Is the design u Is the design 1	of no require ent Text' sect lements lig app lets the a pedestrian ca ts/Changes) Design Criteri unambiguous?	s a comment or c ion. e user press a butto all to the local traf	on on the U	when fac er via the	ents/Cha cing a cro RSU over	ss-walk. r Wi-Fi.
Not of t Rel 3.4. The 3.6. Des 1 2	te: An answer of the 'Requireme ated Design El 2.1 The PED-S e app will send a 4 23028 sign (Comment Is the design u Is the design 1 Parent(s), and	of no require ent Text' sect lements lig app lets the a pedestrian ca ts/Changes) Design Criteri unambiguous? ogically consi sibling design	s a comment or c ion. e user press a butto all to the local traf	on on the U	when fac er via the	ents/Cha cing a cro RSU over	ss-walk. r Wi-Fi.
Not of t Rel 3.4. The 3.6. Des 1 2 3	te: An answer of the 'Requirement ated Design El 2.1 The PED-S e app will send a 4 23028 sign (Comment Is the design u Is the design u Parent(s), and Is the design f	of no require ent Text' sect lements lig app lets the a pedestrian ca ts/Changes) Design Criteri unambiguous? ogically consi sibling design feasible?	s a comment or c ion. e user press a butto all to the local traf	on on the U	when fac er via the	ents/Cha cing a cro RSU over	ss-walk. r Wi-Fi.
Not of t Rel 3.4. The 3.6. Des 1 2 3 4	te: An answer of the 'Requirement ated Design El .2.1 The PED-S e app will send a .4 23028 sign (Comment Is the design u Is the design u Is the design u Is the design u Is the design u	of no require ent Text' sect lements lig app lets the a pedestrian ca ts/Changes) Design Criteri unambiguous? ogically consi sibling design feasible? verifiable?	s a comment or c ion. e user press a butto all to the local traf ia istent with n components?	on on the U	when fac er via the	ents/Cha cing a cro RSU over	ss-walk. r Wi-Fi.
Not of t Rel 3.4. The 3.6. Des 1 2 3 4	te: An answer of the 'Requirement ated Design El .2.1 The PED-S e app will send a .4 23028 sign (Comment Is the design u Is the design u Is the design u Is the design u Is the design u	of no require ent Text' sect lements lig app lets the a pedestrian ca ts/Changes) Design Criteri unambiguous? ogically consi sibling design feasible? verifiable?	s a comment or c ion. e user press a butto all to the local traf	on on the U	when fac er via the	ents/Cha cing a cro RSU over	ss-walk. r Wi-Fi.
Not of t Rel 3.4. The 3.6. Des 1 2 3 4 5 5	te: An answer of the 'Requirement ated Design El 2.1 The PED-S e app will send a 4 23028 sign (Comment Is the design u Is the design u Is the design f Is the design f Is the design f Is the design v Is the design v	of no require ent Text' sect lements lig app lets the a pedestrian ca ts/Changes) Design Criteri unambiguous? ogically consi sibling design feasible? verifiable? ment fulfilled of no require	s a comment or c ion. e user press a butto all to the local traf ia istent with n components?	on on the UI fic controlle	I when fac er via the Yes	ents/Cha eing a cro RSU over	ss-walk. r Wi-Fi.
Not of t Rel 3.4. The 3.6. Des 1 2 3 4 5 5 Not of t	te: An answer of the 'Requirement ated Design El 2.1 The PED-S e app will send a 4 23028 sign (Comment E Is the design u Is the design u Is the design u Is the design f Is the design v Is the design v Is the requirement te: An answer of the 'Design Tes	of no require ent Text' sect lements lig app lets the a pedestrian ca ts/Changes) Design Criteri unambiguous? ogically consi sibling design feasible? verifiable? ment fulfilled of no require xt' section.	s a comment or c ion. e user press a butto all to the local traf ia istent with n components? by the design? s a comment or c	on on the UI fic controlle	I when fac er via the Yes	ents/Cha	ss-walk. Wi-Fi. /Rank
of t Rel 3.4. The 3.6. Des 1 2 3 4 5 Not 5 Not 5	te: An answer of the 'Requirement ated Design El 2.1 The PED-S e app will send a 4 23028 sign (Comment E Is the design u Is the design u Is the design u Is the design f Is the design v Is the design v Is the requirement te: An answer of the 'Design Tes	of no require ent Text' sect lements lig app lets the a pedestrian ca ts/Changes) Design Criteri unambiguous? ogically consi sibling design feasible? verifiable? ment fulfilled of no require	s a comment or c ion. e user press a butto all to the local traf ia istent with n components? by the design?	on on the UI fic controlle	I when fac er via the Yes	ents/Cha eing a cro RSU over	ss-walk. Wi-Fi. /Rank

Rec	uirement Grou	Related Sec	tion				
	EA-UC3-017a	Con Ops					
	ated Needs						
	ent Section	7.1.3					
Re	quirement Text	t					
	1 1	receive a confir	mation for succes	ssfully plac	ing the re	quest and	display
	o the user.						
	quirement Tex						
	leted, duplicate						
Ad	-		requirement text.		7	NT	
	-	uirement Crite)	les	NO	/Rank
1	*	nent well-form					
2	Is the requirer	nent unambigu	ous?				
3	-	nent logically c					
		sibling require	ments?	_			
4	Is the requirer	nent feasible?					
5	Is the requirer	nent verifiable?	2				
				Insp.	Anal.	Test	Demo.
6	If feasible and	verifiable, by	which method?			X	
3.6	pedestrian call .3 23027 sign (Comment						
Des	8	esign Criteria			Zes	No	/Rank
1		8					Allk
1	Is the design u	0	•.•	_			
2		ogically consist sibling design					
3	Is the design f	0 0	components?				
4	Is the design v						
5	0	nent fulfilled by	v the design?				
5	is the requirer.	lient fulfilled by	y the design?				
	te: An answer o the 'Design Tex	-	a comment or ch	nange in th	e Commo	ents/Cha	nge field
Fin		Approved	Modify	Implen	nent	Drop	X
	solution			Later			
CUI	mments						

Requirement Group	Related Section
THEA-UC4-001	Con Ops
Related Needs	1, 4
Parent Section	7.1.4

Transit vehicle shall send Signal Request Message (SRM) to RSU when vehicle matches the location of the intersection approach.

Requirement Text (Comments/Changes).

Omitted "...and no request if signal is already green."

	Requirement Criteria		Yes		No/Rank	
1	Is the requirement well-formed?		Х			
2	Is the requirement unambiguous?		Х			
3	Is the requirement logically consistent with Parent(s), and sibling requirements?	Х				
4	Is the requirement feasible?		Х			
5	Is the requirement verifiable?	X				
		Insp.	Anal.	Test	Demo.	
6	If feasible and verifiable, by which method?			TSP_A TSP_B		

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

3.3.2.3 at intersections and along arterial corridors ... The OBU sends an SRM to the RSU

ICD 20009

Des	Design (Comments/Changes)				
	Design Criteria	Yes	No/Rank		
1	Is the design unambiguous?	Х			
2	Is the design logically consistent with Parent(s), and sibling design components?	Х			
3	Is the design feasible?	Х			
4	Is the design verifiable?	Х			
5	Is the requirement fulfilled by the design?	Х			

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

	uirement Gro		ion				
	A-UC4-002	Con Ops					
	ated Needs	1,4					
-	ent Section	7.1.4					
	uirement Text	d a priority service	request to the ma	astar sarva			
		(Comments/Cha			•		
	Re	quirement Criter	ia		Yes	No/	Rank
1	Is the requirer	nent well-formed?			Х		
2	Is the requirer	nent unambiguous	?		Х		
3	-	nent logically cons sibling requirement			Х		
4	Is the requirer				Х		
5	Is the requirer	nent verifiable?			Х		
				Insp.	Anal.	Test	Demo.
6	If feasible and	l verifiable, by whi	ch method?			TSP_A TSP B	
Not	e: An answer o	of no requires a co	omment or chang	e in the Co	omments/Cl		l of the
	quirement Tex		c	,		8	
Rela	ated Design El	ements					
		ends an SRM to the	e RSU. The RSU	forwards th	hat to the Tr	ansit Serve	er at the
TM	C.						
ICD	23013						
ICD	23013						
Des	ign (Comment	s/Changes)					
		Design Criteria			Yes	No/	Rank
1	Is the design u	e			Х		
2	U	ogically consistent sign components?	with Parent(s),		Х		
3	Is the design f			X			
4	Is the design v	verifiable?		X			
5	_	nent fulfilled by th			Х		
	e: An answer o sign Text' sect	of no requires a co ion.	omment or chang	ge in the Co	omments/C	hange field	l of the
Fina	al Resolution	Approved X	Modify	Implei	ment Later	Drop	
Con	nments						

Rea	quirement Group	Related Section				
TH	IEA-UC4-003	Con Ops				
Rel	lated Needs	1,4				
Par	rent Section	7.1.4				
Re	quirement Text					
Ma	ster server shall qu	ery the HART OneBusAway	server for	bus sched	dule deviat	ion
stat	tus.					
Re	quirement Text (C	Comments/Changes)				
Ad	ded 'route, run' and	d 'adherence status.'				
Cha	anged 'a' to 'the.'					
	1 . 1 4		· · · 1. · · · 1. · · · ·	• 1	dula and r	• , •
		Bus AVL system monitors wh		is on sche	equie and I	naintains
		formation (e.g. in a text file).		is on sche		naintains
	adherence status ir	•	"	Yes		naintains Rank
	adherence status ir	nformation (e.g. in a text file). ement Criteria	"			
the	adherence status ir Require	nformation (e.g. in a text file). ement Criteria t well-formed?	"	Yes		
the 1	adherence status ir Require Is the requirement Is the requirement	nformation (e.g. in a text file). ement Criteria t well-formed? t unambiguous?	"	Yes X		
the 1 2	adherence status ir Require Is the requirement Is the requirement Is the requirement Is the requirement	nformation (e.g. in a text file). ement Criteria t well-formed? t unambiguous? t logically consistent with	"	Yes X X		
the 1 2	adherence status ir Require Is the requirement Is the requirement Is the requirement Is the requirement	nformation (e.g. in a text file). ement Criteria t well-formed? t unambiguous? t logically consistent with ling requirements?		Yes X X		
the 1 2 3	adherence status inRequireIs the requirementIs the requirementIs the requirementParent(s), and sib	nformation (e.g. in a text file). ement Criteria t well-formed? t unambiguous? t logically consistent with ling requirements? t feasible?		X es X X X X		
the 1 2 3 4	adherence status irRequireIs the requirementIs the requirementIs the requirementParent(s), and sibIs the requirement	nformation (e.g. in a text file). ement Criteria t well-formed? t unambiguous? t logically consistent with ling requirements? t feasible?		Yes X X X X X		

Related Design Elements

3.1.2.2 NextConnect TSP receives current bus schedule deviation from HART's OneBusAway server.

Des	Design (Comments/Changes)						
		Design Criteria		Yes	No/Rank		
1	Is the design	he design unambiguous?		X			
2	2 Is the design logically consistent with Parent(s), and sibling design components?			Х			
3	Is the design	feasible?		X			
4	Is the design	verifiable?		X			
5	Is the require	ement fulfilled by	the design?	X			
	te: An answei he 'Design T	-	a comment or ch	ange in the Comm	ents/Change field		
Fin Res	al solution	Approved X	Modify	Implement Later	Drop		
Cor	nments						

Rec	quirement Group	Related Section					
TH	EA-UC4-004	Con Ops					
Rel	lated Needs	1, 4, 7, 8, 9					
Par	Parent Section 7.1.4						
Requirement Text							
If b	ous is behind schedu	ule, the transit central shall gra	nt permis	sion to pro	ocess the S	SRM to	
the	originating RSU.	Otherwise permission shall be	denied.				
	-	Comments/Changes)					
		ssion to process' and "Other	rwise perr	nission sh	all be den	ied."	
Om	nitted 'return'						
	Require	ement Criteria	Ŋ	es	No/	Rank	
1	Is the requiremen	t well-formed?		X			
2	Is the requiremen	t unambiguous?		Х			
3	Is the requirement logically consistent with X						
5	Is the requirement	t logically consistent with		X			
5	-	t logically consistent with ling requirements?		X			
4	-	ling requirements?		x x			
	Parent(s), and sib	ling requirements? t feasible?					
4	Parent(s), and sib Is the requiremen	ling requirements? t feasible?		X	Test	Demo.	
4	Parent(s), and sib Is the requiremen Is the requiremen	ling requirements? t feasible?		X X	Test TSP_A TSP_B	Demo.	

Related Design Elements

3.1.2.2 If the bus is behind schedule the priority service request is granted.

Design (Comments/Changes): Not granting priority is logically equal to denying priority				
	Design Criteria	Yes	No/Rank	
1	Is the design unambiguous?	Х		
2	Is the design logically consistent with Parent(s), and sibling design components?	Х		
3	Is the design feasible?	Х		
4	Is the design verifiable?	Х		
5	Is the requirement fulfilled by the design?	Х		

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

Requirement Group	Related Section
THEA-UC4-005	Con Ops
Related Needs	1, 4, 7, 8, 9
Parent Section	7.1.4

The TSP application of MMITSS shall consider all priority service request of buses behind schedule and compute a phase execution schedule minimizing overall delay as implemented in the available release of MMITSS.

Requirement Text (Comments/Changes)

Changed "The TSP shall request signal priority of the controller when SRM is received from transit central and is of the highest priority." to "The TSP application of MMITSS shall consider all pending signal priority requests and compute a phase execution schedule minimizing overall delay as implemented in the available release of MMITSS."

	Requirement Criteria		Yes		No/Rank	
1	Is the requirement well-formed?	Х				
2	Is the requirement unambiguous?		X			
3	Is the requirement logically consistent with Parent(s), and sibling requirements?	Х				
4	Is the requirement feasible?		Х			
5	Is the requirement verifiable?	X				
		Insp.	Anal.	Test	Demo.	
6	If feasible and verifiable, by which method?			TSP_A TSP_B		

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

3.2.2.3.2 If the priority service request is granted by the NextConnect TSP then Siemens-MMITSS processes it along with other granted requests in the TSP component. ... It then uses phase control commands (i.e. phase calls, holds, omits, and force offs) to control the phase execution.

Design (Comments/Changes)									
Design Criteria					Yes	No/Rank			
1 Is the design unambiguous?					X				
2	Is the design Parent(s), an	U I		X					
3	Is the design	feasible?		X					
4	Is the design	verifiable?		X					
5	Is the require	ement fulfill	ed by	X					
	te: An answei he 'Design Te	-		comment or ch	ange in the Comm	nents/Change field			
Final Resolution		Approved	Х	Modify	Implement Later	Drop			
Con	nments								

Rec	uirement Grou	up Related Se	ection								
<u> </u>	EA-UC4-006_										
	ated Needs										
	ent Section										
	quirement Tex				~						
	TSP shall receive priority status from the Controller Unit (CU). Requirement Text (Comments/Changes)										
			he controller's pr	iority featur	e It rather	· controls	the				
			-	•							
	current phases via phase holds, omits, and force offs. Therefore, no priority status is available from the controller. Rather MMITSS will accommodate a granted request										
			cording to the pri								
vari			o consider. Sugge	st to remove	this requ	irement.					
Requirement Criteria					Yes		No/Rank				
1	Is the require	ement well-form	ned?								
2	Is the require	ement unambig	uous?								
3		ement logically									
		d sibling requir									
4	-	ement feasible?									
5	Is the require	ement verifiable	e?								
				Insp.	Anal.	Test	Demo.				
6	If feasible an	d verifiable, by	which method?								
NT -											
			s a comment or o	change in th	ne Comm	ents/Cha	nge field				
of t	he 'Requirem	ent Text' sect		change in th	ne Commo	ents/Cha	nge field				
of t		ent Text' sect		change in th	ne Commo	ents/Cha	nge field				
of t	he 'Requirem	ent Text' sect		change in th	ne Comme	ents/Cha	nge field				
of t Rel	he 'Requirem	ent Text' secti Elements		change in th	ne Commo	ents/Cha	nge field				
of t Rel	he 'Requirem ated Design E sign (Commen	ent Text' secti Elements	ion.		re Commo		nge field /Rank				
of t Rel	he 'Requirem ated Design E sign (Commen	ent Text' sect Elements nts/Changes)	ion.								
of t Rel Des	he 'Requirem ated Design E sign (Commen Is the design	eent Text' secti Elements nts/Changes) Design Criteri	ion. a								
of t Rel Des	he 'Requirem ated Design E sign (Commen Is the design Is the design	tent Text' section Elements Ints/Changes) Design Criteria unambiguous?	a stent with								
of t Rel Des	he 'Requirem ated Design E sign (Commen Is the design Is the design	tent Text' section Elements Ints/Changes) Design Criteria Unambiguous? logically consi d sibling design	a stent with								
of t Rel Des 1 2	he 'Requirem ated Design E sign (Commen I Is the design Is the design Parent(s), and	nent Text' section Elements (Changes) Design Criteria unambiguous? logically consid d sibling design feasible?	a stent with								
of t Rel Des 1 2 3	he 'Requirem ated Design E sign (Commen Is the design Is the design Parent(s), and Is the design Is the design Is the design	nent Text' section Elements (Changes) Design Criteria unambiguous? logically consid d sibling design feasible?	ion. a stent with n components?								
of t Rel Des 1 2 3 4 5 Not	he 'Requirem ated Design E sign (Commen Is the design Is the design Is the design Is the design Is the design Is the design Is the require te: An answer	nent Text' section Clements Design Criteria unambiguous? logically consid d sibling design feasible? verifiable? ement fulfilled logically of no requires	ion. a stent with n components?		Ýes	No	/Rank				
of t Rel Des 1 2 3 4 5 Not	he 'Requirem ated Design E sign (Commen Is the design Is the design Parent(s), and Is the design Is the design Is the design Is the require	nent Text' section Clements Design Criteria unambiguous? logically consid d sibling design feasible? verifiable? ement fulfilled logically of no requires	ion. a stent with n components? by the design?		Ýes	No	/Rank				
of t Rel Des 1 2 3 4 5 Not of t	he 'Requirem ated Design E sign (Commen Is the design Is the design Is the design Is the design Is the design Is the design Is the require te: An answer the 'Design Te	nent Text' section Clements Design Criteri unambiguous? logically consid d sibling design feasible? verifiable? ement fulfilled logically cof no requires ext' section.	a a by the design? s a comment or o	Shange in th	řes ne Commo	No ents/Cha	/Rank nge field				
of t Rel Des 1 2 3 4 5 Not of t	he 'Requirem ated Design E sign (Commen Is the design Is the design Is the design Is the design Is the design Is the require te: An answer the 'Design Te	nent Text' section Clements Design Criteria unambiguous? logically consid d sibling design feasible? verifiable? ement fulfilled logically of no requires	ion. a stent with n components? by the design?	change in th	řes ne Commo	No	/Rank nge field				
of t Rel Des 1 2 3 4 5 Not of t Fin Res	he 'Requirem ated Design E sign (Commen Is the design Parent(s), and Is the design Is the design Is the design Is the design Is the require te: An answer the 'Design Te al solution	nent Text' section Clements Design Criteri unambiguous? logically consid d sibling design feasible? verifiable? ement fulfilled logically cof no requires ext' section.	a a by the design? s a comment or o	Shange in th	řes ne Commo	No ents/Cha	/Rank nge field				
of t Rel Des 1 2 3 4 5 Not of t Fin Res	he 'Requirem ated Design E sign (Commen Is the design Is the design Is the design Is the design Is the design Is the require te: An answer the 'Design Te	nent Text' section Clements Design Criteri unambiguous? logically consid d sibling design feasible? verifiable? ement fulfilled logically cof no requires ext' section.	a a by the design? s a comment or o	change in th	řes ne Commo	No ents/Cha	/Rank nge field				
of t Rel Des 1 2 3 4 5 Not of t Fin Res	he 'Requirem ated Design E sign (Commen Is the design Parent(s), and Is the design Is the design Is the design Is the design Is the require te: An answer the 'Design Te al solution	nent Text' section Clements Design Criteri unambiguous? logically consid d sibling design feasible? verifiable? ement fulfilled logically cof no requires ext' section.	a a by the design? s a comment or o	change in th	řes ne Commo	No ents/Cha	/Rank nge field				
of t Rel Des 1 2 3 4 5 Not of t Fin Res	he 'Requirem ated Design E sign (Commen Is the design Parent(s), and Is the design Is the design Is the design Is the design Is the require te: An answer the 'Design Te al solution	nent Text' section Clements Design Criteri unambiguous? logically consid d sibling design feasible? verifiable? ement fulfilled logically cof no requires ext' section.	a a by the design? s a comment or o	change in th	řes ne Commo	No ents/Cha	/Rank nge field				

Req	uirement Group	Related Section							
TH	THEA-UC4-007 Con Ops								
Rel	Related Needs 1, 4, 7, 8, 9								
Pare	Parent Section 7.1.4								
Rec	uirement Text								
	•	l Status Message (SSM) to bus	including	the decisi	ion from t	he			
-		r the request was granted.							
	• `	Comments/Changes)							
	Ũ	the decision from the master se			-	0			
or d	lenied.' SSM indi	icates the Granted requests, if r	not granted	l, OBU tre	eats as der	nied.			
	Requir	ement Criteria	N N	les	No	/Rank			
1	Is the requirement	nt well-formed?		Х					
2	Is the requirement	nt unambiguous?		Х					
3	-	nt logically consistent with bling requirements?		Х					
4	Is the requirement	nt feasible?		Х					
5	Is the requirement	nt verifiable?		Х					
	Insp. Anal. Test Demo.								
6	If feasible and ve	erifiable, by which method?			TSP_A TSP_B				

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

3.3.2.3 At the same time, RSU sends the SSM to the approaching equipped transit vehicles to inform which has received priority to extend the green and which vehicles have been denied priority.

ICD 20009

Design (Comments/Changes)

	Design Criteria	Yes	No/Rank
1	Is the design unambiguous?	Х	
2	Is the design logically consistent with Parent(s), and sibling design components?	Х	
3	Is the design feasible?	Х	
4	Is the design verifiable?	Х	
5	Is the requirement fulfilled by the design?	Х	

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

Req	uirement Gro	up Related Sect	ion							
	THEA-UC4-008 Con Ops									
	ated Needs	1, 4, 7, 8, 9								
Parent Section 7.1.4										
Requirement Text Bus shall receive SSM from TSP.										
		t (Comments/Char	nges)							
	Re	equirement Criteri	a		Yes	No/	Rank			
1	Is the require	ment well-formed?			Х					
2	Is the require	ment unambiguous?	2		Х					
3		ment logically const sibling requirement			Х					
4	Is the require	ment feasible?			Х					
5	Is the require	ment verifiable?			Х					
				Insp.	Anal.	Test	Demo.			
6	If feasible and	d verifiable, by which	ch method?			TSP_A TSP B				
		of no requires a co	mment or chang	ge in the Co	omments/Cl		l of the			
	quirement Tex ated Design El									
ICD	20009	the SSM to the app	roaching equippe	ed transit ve	hicles.					
Des	ign (Comment									
		Design Criteria			Yes	No/	Rank			
1		unambiguous?			Х					
2		logically consistent esign components?	with Parent(s),		Х					
3	Is the design t	feasible?			Х					
4	Is the design	verifiable?			Х					
5	*	ment fulfilled by the	2		Х					
	e: An answer o sign Text' sect	of no requires a co ion.	mment or chang	ge in the Co	omments/Cl	hange field	d of the			
Fina	al Resolution	Approved X	Modify	Impler	nent Later	Drop				
Con	nments									

	uirement Grou	<u>*</u>	ion				
-	A-UC4-009	Con Ops					
-	nted Needs	2 7.1.4					
	uirement Text	/.1.4					
-		yed as a bus drive	er notification.				
Req	uirement Text	(Comments/Cha	nges)				
	D		•		T 7		.
		quirement Criter			Yes	No/	Rank
1	-	nent well-formed?			Х		
2	^	nent unambiguous			Х		
3		nent logically cons sibling requirement			Х		
4	Is the requiren				Х		
5	Is the requiren	nent verifiable?			Х		
				Insp.	Anal.	Test	Demo.
6	If feasible and	verifiable, by whi	ch method?			TSP_A TSP B	
Not	e: An answer o	f no requires a co	mment or chang	e in the Co	mments/C		l of the
	quirement Tex	-				in ge ner	
Rela	ated Design Ele	ements					
3.3.	2.3 If signal prior	ity has been grante	ed, the driver of the	transit veni	cie is notified	1.	
ICD	23002						
Dec	ign (Comments	(Changes)					
DCS					X 7		D 1
		Design Criteria			Yes	10/	Rank
1	Is the design u		· · 1 . D . · / ()		X		
2		ogically consistent sign components?	with Parent(s),		Х		
3	Is the design for				Х		
4	Is the design v	erifiable?			Х		
5	Is the requiren	nent fulfilled by th	e design?		Х		
	e: An answer o sign Text' secti	f no requires a co on.	omment or chang	e in the Co	omments/C	hange field	l of the
Fina	ll Resolution	Approved X	Modify	Impler	nent Later	Drop	
Con	nments						

Par	uirement Grou	p Related Sec	tion					
	THEA-UC4-010 Con Ops							
	ated Needs	1, 4, 7, 8, 9						
	ent Section	7.1.4						
Re	quirement Tex	t l						
Sig	nal controllers	shall extend gre	en in order to mo	ve vehicle	queues th	at block a	a bus stop	
		bus is behind so						
	<u>.</u>	t (Comments/C	U ,					
			ed as testing how					
	information sent to it from the RSU is out of scope, rather part of MMITSS project scope.							
Removed 'prevent vehicles from blocking' Added 'extend green in order to move vehicle queues that' and 'block a.'								
Tu		uirement Crite	*		es		/Rank	
1	-	ment well-form						
2	*	ment unambigu						
3	-	ment logically c						
4	1	l sibling require	ments?					
	-	ment feasible?						
5	Is the require	ment verifiable?	?					
				Insp.	Anal.	Test	Demo.	
6	If feasible and	d verifiable, by	which method?			X		
3.2 by a beh 3.8	applying phase avior of either .1 23013	IMITSS control calls, force offs extending green	s the phase execu s, holds, and omits a or giving early g	s, thereby i				
Des	sign (Commen							
	I	Design Criteria		Ŋ	les	No	/Rank	
1	Is the design	unambiguous?						
2	U	logically consist						
	1	l sibling design	components?					
3	Is the design							
4	Is the design	verifiable?						
5	Is the require	ment fulfilled by	y the design?					
	te: An answer the 'Design Te	-	a comment or ch	ange in th	e Comm	ents/Cha	nge field	
Fin	al	Approved	Modify	Implen	nent	Drop	x	
		Approved	withur y	-	nent	Diop	Δ	
	Resolution Image: Comments Image: Comments Image: Comments							

	quirement Group	Related Section	0 n					
TH	EA-UC4-011	UC4-011 Con Ops						
	ated Needs	6						
	ent Section	7.1.4						
	quirement Text	,, , . .			C 1		· ·	
	Shall issue an ale		nt pedestrians wi	thin in a g	eo fenced	area that	a bus 1s	
	pping at an interse q uirement Text (nangag)					
	anged: 'TSP' to 'I		langes)					
	ded: 'stopping		on'					
Removed: 'at an intersection where a bus is about to be given priority.'								
Requirement CriteriaYesNo/Rank							/Rank	
1	Is the requireme	ent well-formed	1?		Х			
2	Is the requireme	ent unambiguou	18?		Х			
3	Is the requireme	0.			Х			
4	Parent(s), and si		ents?		V			
4	Is the requireme				X			
5	Is the requireme	ent verifiable?			X			
				Insp.	Anal.	Test	Demo.	
6	If feasible and v	erifiable, by w	hich method?			PTWM		
ICI	22012				ine data co	ontained in	o has to n the	
D	0 23012					ontained in		
Des	sign (Comments/	0					n the	
	sign (Comments/ Des	sign Criteria		Y	Zes			
1	sign (Comments/	sign Criteria		Y	Z es X		n the	
	sign (Comments/ Des Is the design un Is the design log	sign Criteria ambiguous? gically consiste		Y	Zes		n the	
1	sign (Comments/ Des Is the design un	sign Criteria ambiguous? gically consiste bling design co		<u> </u>	Z es X		n the	
1 2	sign (Comments/ Des Is the design un Is the design log Parent(s), and si	sign Criteria ambiguous? gically consiste bling design co ssible?		<u> </u>	Zes X X X		n the	
1 2 3	sign (Comments/ Des Is the design un Is the design log Parent(s), and si Is the design fea	sign Criteria ambiguous? gically consiste bling design co sible? rifiable?	omponents?	Y	Zes X X X X		n the	
1 2 3 4 5 Not	sign (Comments/ Des Is the design un Is the design log Parent(s), and si Is the design fea Is the design ver	sign Criteria ambiguous? gically consiste bling design co sible? rifiable? ent fulfilled by no requires a	the design?		Xes X X X X X X X X	No/	n the	
1 2 3 4 5 Not of t	sign (Comments/ Des Is the design und Is the design log Parent(s), and si Is the design fea Is the design ver Is the design ver Is the requirement te: An answer of the 'Design Text'	sign Criteria ambiguous? gically consiste bling design co asible? rifiable? ent fulfilled by no requires a section.	the design?	ange in th	Zes X X X X X X X E Comm	No/	n the	
1 2 3 4 5 Not of t	sign (Comments/ Des Is the design und Is the design log Parent(s), and sid Is the design feat Is the design vert Is the design vert Is the requirement te: An answer of the 'Design Text' al	sign Criteria ambiguous? gically consiste bling design co sible? rifiable? ent fulfilled by no requires a	the design?	ange in the	Zes X X X X X X X E Comm	No/	n the	
1 2 3 4 5 Not of t	sign (Comments/ Des Is the design und Is the design log Parent(s), and si Is the design fea Is the design ver Is the design ver Is the requirement te: An answer of the 'Design Text'	sign Criteria ambiguous? gically consiste bling design co asible? rifiable? ent fulfilled by no requires a section.	the design?	ange in th	Zes X X X X X X X E Comm	No/	n the	

Requirement Gro	oup Related Section						
THEA-UC4-012	THEA-UC4-012 Con Ops						
Related Needs	6						
Parent Section	7.1.4						
Requirement Te	ext						
PID shall issue an	n alert to participant pedestrians with	in in a geo fenced	area that bus is				
starting up again.							
Requirement Te	ext (Comments/Changes)						
Changed 'RSU' to 'PIDs' and 'about to proceed' to 'starting up again.'							
Changed 'RSU' t	to 'PIDs' and 'about to proceed' to 's	tarting up again.'					
	quirement Criteria	tarting up again.' Yes	No/Rank				
Re	Ĩ	<u> </u>	No/Rank				
Re 1 Is the required	quirement Criteria	Yes	No/Rank				
Re1Is the require2Is the require	quirement Criteria ement well-formed?	Yes X	No/Rank				
Re1Is the require2Is the require3Is the require	quirement Criteria ement well-formed? ement unambiguous?	Yes X X	No/Rank				
Re1Is the require2Is the require3Is the requireParent(s), and	quirement Criteria ement well-formed? ement unambiguous? ement logically consistent with	Yes X X	No/Rank				

	-				
		Insp.	Anal.	Test	Demo.
6	If feasible and verifiable, by which method?			PTMW	

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

3.4.2.2.4 The PED-X App shall issue a warning when a bus stops or starts in an intersection (is within the intersection conflict area) while the PID is in the intersection conflict area.

ICD 23012

Design (Comments/Changes)								
		Design Criteria	Yes	No/Rank				
1	1 Is the design unambiguous?			Х				
2	2 Is the design logically consistent with Parent(s), and sibling design components?			X				
3	Is the design	feasible?		X				
4	Is the design verifiable?			X				
5	Is the require	ement fulfilled by	y the design?	X				
	te: An answei he 'Design T	-	a comment or c	hange in the Com	nents/Change field			
FinalApproved XModifyResolution		Implement Later	Drop					
Comments								

Rec	uirement Group	Related Section							
	EA-UC4-013	Con Ops							
	ated Needs	1, 4, 7, 8, 9							
-	Parent Section 7.1.4								
Ree	quirement Text								
	-	v shall be implemented to exten	d and exis	sting gree	n in the bu	is route			
of t	ravel.	-		00					
Ree	quirement Text (Comments/Changes)							
Ad	ded 'extend and	existing green in the bus route	of travel.	,					
Rer	moved 'control	signals at streets crossing the b	us route.'						
Cha	anged 'provides' t	o 'extends.'							
	Requir	ement Criteria	Ŋ	les	No/	Rank			
1	Is the requireme	nt well-formed?		Х					
2	Is the requireme	nt unambiguous?		Х					
3	Is the requireme	nt logically consistent with		X					
		bling requirements?							
4	Is the requireme	nt feasible?		Х					
5	Is the requireme	nt verifiable?		Х					
	Insp. Anal. Test Demo.								
6	If feasible and v	erifiable, by which method?			TSP_A				
		-			TSP_B				
Not	te: An answer of	no requires a comment or ch	ange in th	Note: An answer of no requires a comment or change in the Comments/Change field					

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

2.1.6 The RSU determines priority of all SRMs received from all approaching vehicles, and then selects the controller phase via NTCIP objects to extend the green, allowing the bus to proceed through the intersection.

ICD 23013

Design (Comments/Changes)

	Design Criteria	Yes	No/Rank
1	Is the design unambiguous?	Х	
2	Is the design logically consistent with Parent(s), and sibling design components?	Х	
3	Is the design feasible?	Х	
4	Is the design verifiable?	Х	
5	Is the requirement fulfilled by the design?	Х	

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

	uirement Group	Related Section				
ГĤ	EA-UC4-013a	Con Ops				
	ated Needs	1, 4, 7, 8, 9				
	ent Section	7.1.4				
	uirement Text		_			
		y shall be implemented to requ	lest acceler	ated (early	y cycle) g	reen.
	_	Comments/Changes)				
	eted: per the SDE	ests the minimum greens to cy	cla tha ara	on to the h	us's dire	otion of
	vel as quickly as p		cie tile gies		us s uno	20011-01
		rement Criteria		Yes	No	/Rank
1	Is the requireme	ent well-formed?				
2	Is the requireme	ent unambiguous?				
3	Is the requireme	ent logically consistent with				
		bling requirements?				
4	Is the requireme	ent feasible?				
5	Is the requireme	ent verifiable?				
					1	
			Insp.	Anal.	Test	Demo
No	te: An answer of	rerifiable, by which method?			Х	Demo
Not of t Rel 3.2 by a beh 3.8	te: An answer of he 'Requirement ated Design Eler 2.3 Siemens-MM applying phase ca avior of either ext 1 23013	no requires a comment or c t Text' section. nents IITSS controls the phase execu ills, force offs, holds, and omit tending green or giving early	hange in th ution sched s, thereby i	ne Commo	X ents/Cha	nge field
Not of t Rel 3.2 by a beh 3.8	te: An answer of he 'Requirement ated Design Eler 2.3 Siemens-MM applying phase ca avior of either ext 1 23013 Sign (Comments/	no requires a comment or control to Text' section. nents IITSS controls the phase executional sector offs, holds, and omit tending green or giving early are the sector of	hange in the ntion sched s, thereby in green.	ule of an I	X ents/Cha NTCIP co ting the d	nge field
of t Rel 3.2 by 3 beh 3.8 Des	te: An answer of he 'Requirement ated Design Eler 2.3 Siemens-MM applying phase ca avior of either ext 1 23013 sign (Comments/ Des	no requires a comment or controls to the phase exection. ITTSS controls the phase exected lls, force offs, holds, and omit tending green or giving early for the phase exected by	hange in the ntion sched s, thereby in green.	ne Commo	X ents/Cha NTCIP co ting the d	nge field
Not of t Rel 3.2 beh <u>3.8</u> Des 1	te: An answer of he 'Requirement ated Design Eler 2.3 Siemens-MM applying phase ca avior of either ext 1 23013 sign (Comments/ Des Is the design una	no requires a comment or controls to the phase exection. ITTSS controls the phase execution of the phase execution	hange in the ntion sched s, thereby in green.	ule of an I	X ents/Cha NTCIP co ting the d	nge field
Not of t Rel 3.2 beh <u>3.8</u> Des 1	te: An answer of he 'Requirement ated Design Eler 2.3 Siemens-MM applying phase ca avior of either ext 1 23013 sign (Comments/ Des Is the design una Is the design log	no requires a comment or controls to the phase exection. ments IITSS controls the phase exected and omition the phase exected of the	hange in the ntion sched s, thereby in green.	ule of an I	X ents/Cha NTCIP co ting the d	nge field
Not of 1 Rel 3.2 by 5 beh <u>3.8</u> Des 1 2	te: An answer of he 'Requirement ated Design Eler 2.3 Siemens-MM applying phase ca avior of either ext 1 23013 sign (Comments/ Des Is the design una Is the design log Parent(s), and si	no requires a comment or controls to the phase exection. ITTSS controls the phase exected and only the phase exected and only the phase exected and the p	hange in the ntion sched s, thereby in green.	ule of an I	X ents/Cha NTCIP co ting the d	nge field
Not of t Rel 3.2 by : beh 3.8 Des 1 2 3	te: An answer of he 'Requirement ated Design Eler 2.3 Siemens-MM applying phase ca avior of either ext 1 23013 sign (Comments/ Des Is the design una Is the design log Parent(s), and si Is the design fea	no requires a comment or controls to the phase exected and on the phase exected and on the phase exected and t	hange in the ntion sched s, thereby in green.	ule of an I	X ents/Cha NTCIP co ting the d	nge field
Not of 1 Rel 3.2 by 5 beh <u>3.8</u> Des 1 2	te: An answer of he 'Requirement ated Design Eler 2.3 Siemens-MM applying phase ca avior of either ext 1 23013 sign (Comments/ Des Is the design una Is the design log Parent(s), and si Is the design fea Is the design ver	no requires a comment or controls to the phase exected and on the phase exected and on the phase exected and t	hange in the ntion sched s, thereby in green.	ule of an I	X ents/Cha NTCIP co ting the d	nge field

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.

Final	Approved	Modify	Implement	Drop X
Resolution			Later	
Comments				

	uirement Gro	up Related Sec	ction						
-	A-UC5-001	Con Ops							
	ated Needs	1,3							
	ent Section uirement Tex	7.1.5							
			Covered by THEA-	UC1-008					
			position of received		SMs within	DSRC rang	ge.		
Req	uirement Tex	t (Comments/Cha	anges)						
	Requirement CriteriaYesNo/Rank								
1	Is the require	ment well-formed	?		X				
2	Is the require	ment unambiguou	s?		X				
3	Is the require	ment logically cor	sistent with		X				
	-	l sibling requireme							
4	Is the require	ment feasible?			Х				
5	Is the require	ment verifiable?			Х				
				Insp.	Anal.	Test	Demo.		
6	If feasible and	l verifiable, by wh	nich method?			Х			
Not	e: An answer	of no requires a c	comment or change	in the Co	mments/C	hange fiel	d of the		
	quirement Tex								
	ated Design El								
	2.5 OBU equip	oped vehicles							
3.1.	1 20004								
Des	ign (Comment	ts/Changes)							
		Design Criteria			Yes	No	'Rank		
1	Is the design	unambiguous?							
2		logically consister							
2	and sibling de Is the design	esign components'	?						
3									
4	Is the design								
5	•	ment fulfilled by t	<u> </u>						
	e: An answer (sign Text' sect	-	comment or change	in the Co	mments/C	hange fiel	d of the		
Fine	al Resolution	Approved	Modify	Implen	nent Later	Drop X	-		
		1 pproved	iviouir y	Implei			L		
Con	nments								

Rec	quirement Grou	up Related Se	ection				
	EA-UC5-002_						
	ated Needs						
	ent Section	-4					
	q uirement Te x leted: Removed		accuracy for PID	location			
			he position of re		cipant PS	Ms within	WiFi
ran			1	I	1		
	-	xt (Comments/	0				
Del			for PID location.				
	Req	uirement Crite	eria	, I	Yes	No	/Rank
1	Is the require	ment well-form	ed?				
2	Is the requirement unambiguous?						
3	1 0 5						
	Parent(s), and sibling requirements?						
4	Is the require						
5	Is the require	ement verifiable	?				
				Insp.	Anal.	Test	Demo.
6	If feasible an						
No	te: An answer	of no requires	a comment or o	change in th	e Comm	ents/Cha	nge field
of t	the 'Requirem	ent Text' section		_			_
Rel	lated Design E	lements					
Des	sign (Commer	nts/Changes)					
]	Design Criteria	l	Ŋ	Yes	No	/Rank
1	Is the design	unambiguous?					
2	Is the design	logically consis	tent with				
		d sibling design	components?				
3	Is the design	feasible?					
4	Is the design	verifiable?					
5	Is the require	ment fulfilled b	y the design?				
		-	a comment or o	change in th	e Comm	ents/Cha	nge field
of t	the 'Design Te	ext' section.					
	1						
Fin		Approved	Modify	Impler Later	nent	Drop 1	X
	solution mments			Later		<u> </u>	

	uirement Gro		ection				
	A-UC5-003	Con Ops					
	ated Needs ent Section	7					
	uirement Tex	7.1.5					
		• nall broadcast B	SMs.				
Req	uirement Tex	t (Comments/C	(hanges)				
Del	leted per the SI	DD Walkthrough	n. Covered by THEA	-UC1-030.			
Requirement Criteria Yes No/Rar						Rank	
1	1 Is the requirement well-formed?				Х		
2	Is the require	ment unambiguo	ous?		Х		
3	Is the require	ment logically c	onsistent with		Х		
-		l sibling require	ments?				
4	Is the require	ment feasible?			Х		
5	Is the require	ment verifiable?			Х		
	I			Insp.	Anal.	Test	Demo.
6	If feasible and	d verifiable, by	which method?			X	
Not	e: An answer	of no requires a	comment or change	e in the Co	omments/Cl	hange fiel	d of the
'Re	quirement Tex	xt' section.				0	
Rela	ated Design El	ements					
3.3.	2.5 OBU equip	pped vehicles co	ontinually broadcast an	nd receive	BSMs from	other equi	ipped
	cles within the	range					
3.1.	1 20004						
Des	ign (Comment	ts/Changes)					
205		Design Criter			Yes	No	Rank
		0		-	168	110/	Nalik
1		unambiguous?					
2	0	0 1	tent with Parent(s),				
3	Is the design	esign componen feasible?		-			
4	Is the design						
5		ment fulfilled by	the design?				
	•		a comment or change	in the Ce	mmonts/C	hongo field	d of the
	sign Text' sect	-	t comment of change		minents/Ci	nange ner	u or the
Fina	al Resolution	Approved	Modify	Impler	nent Later	Drop X	
Con	nments		·				

no	quirement Gro	up Related Section	on				
	EA-UC5-004						
	lated Needs						
	rent Section						
	quirement Te Us adjacent to	street car line sha	Il receive PSMs	of in WiFi	range ne	destrians	
		xt (Comments/Cl			range per	acstrians.	
	-	er attempting to tra	0	novements	around th	e streetca	rs.
	Ree	quirement Criter	ia	Ŋ	Yes	No	/Rank
1	Is the require	ement well-formed	1?				
2	Is the require	ement unambiguou	us?				
3							
4	· · · · · ·	d sibling requirem ement feasible?	ients?	-			
5	-						
-	is the requirement vermuore.			Insp.	Anal.	Test	Demo.
6	If feasible ar	nd verifiable, by w	hich method?	1			
No	te: An answei	r of no requires a	comment or c	hange in th	e Comm	ents/Chai	nge field
		nent Text' section					ige itera
	lated Design I						
De	sign (Commo						
	Design (Comments/Changes)						
		nts/Changes) Design Criteria		Ŋ	ľ es	No	/Rank
1				<u> </u>	Yes	No	/Rank
1 2	Is the design	Design Criteria	ent with	<u> </u>	l'es	No	/Rank
	Is the design Is the design	Design Criteria unambiguous?		<u> </u>	í es	No	/Rank
	Is the design Is the design	Design Criteria unambiguous? logically consiste d sibling design co		Y	ľ es	No	/Rank
2	Is the design Is the design Parent(s), an	Design Criteria unambiguous? logically consiste d sibling design co feasible?			ζes		/Rank
2	Is the design Is the design Parent(s), an Is the design Is the design	Design Criteria unambiguous? logically consiste d sibling design co feasible?	omponents?		ľes –		/Rank
2 3 4 5 No	Is the design Is the design Parent(s), an Is the design Is the design Is the require te: An answer	Design Criteria unambiguous? logically consiste d sibling design co feasible? verifiable? ement fulfilled by r of no requires a	omponents? the design?				
2 3 4 5 No	Is the design Is the design Parent(s), an Is the design Is the design Is the require	Design Criteria unambiguous? logically consiste d sibling design co feasible? verifiable? ement fulfilled by r of no requires a	omponents? the design?				
2 3 4 5 No of 1	Is the design Is the design Parent(s), an Is the design Is the design Is the require te: An answer the 'Design Te	Design Criteria unambiguous? logically consiste d sibling design co feasible? verifiable? ement fulfilled by r of no requires a ext' section.	omponents? the design? comment or c	hange in th	ne Commo	ents/Char	nge field
2 3 4 5 No of 1 Fin	Is the design Is the design Parent(s), an Is the design Is the design Is the require te: An answer the 'Design Te	Design Criteria unambiguous? logically consiste d sibling design co feasible? verifiable? ement fulfilled by r of no requires a	omponents? the design?		ne Commo		nge field
2 3 4 5 No of 1 Fin Res	Is the design Parent(s), an Is the design Is the design Is the require te: An answer the 'Design Te	Design Criteria unambiguous? logically consiste d sibling design co feasible? verifiable? ement fulfilled by r of no requires a ext' section.	omponents? the design? comment or c	hange in th	ne Commo	ents/Char	nge field
2 3 4 5 No of 1 Fin Res	Is the design Is the design Parent(s), an Is the design Is the design Is the require te: An answer the 'Design To al solution	Design Criteria unambiguous? logically consiste d sibling design co feasible? verifiable? ement fulfilled by r of no requires a ext' section.	omponents? the design? comment or c	hange in th	ne Commo	ents/Char	nge field
2 3 4 5 No of 1 Fin Res	Is the design Is the design Parent(s), an Is the design Is the design Is the require te: An answer the 'Design To al solution	Design Criteria unambiguous? logically consiste d sibling design co feasible? verifiable? ement fulfilled by r of no requires a ext' section.	omponents? the design? comment or c	hange in th	ne Commo	ents/Char	nge field
2 3 4 5 No of 1 Fin Res	Is the design Is the design Parent(s), an Is the design Is the design Is the require te: An answer the 'Design To al solution	Design Criteria unambiguous? logically consiste d sibling design co feasible? verifiable? ement fulfilled by r of no requires a ext' section.	omponents? the design? comment or c	hange in th	ne Commo	ents/Char	nge field

	luirement Grou		ion					
	EA-UC5-005	Con Ops						
-	ated Needs ent Section	2, 8, 9, 10 7.1.5						
	uirement Text	7.1.3						
		op on PIDs shall is	ssue an alert to pe	destrians w	rithin in a ge	eo fenced a	area that	
	streetcar is stop							
Req	uirement Text	(Comments/Cha	nges)					
	Requirement Criteria Yes No/Rank							
1	-				X			
2	-	ent unambiguous	?		X			
3	*	ent logically cons			X			
5		sibling requirement			11			
4	Is the requirem	ent feasible?			Х			
5	Is the requirem	ent verifiable?			Х			
				Insp.	Anal.	Test	Demo.	
6	If feasible and	verifiable, by whi	ch method?			PTMW		
Not	e: An answer of	no requires a co	mment or change	e in the Co	mments/C	hange field	d of the	
	quirement Text							
Rel	ated Design Ele	ments						
34	2.2.2 Warn the r	edestrian of a bus	(or streetcar) stop	ning or star	ting within	an interse	ction	
	·		k to the RSU for a		•			
				U				
ICE	23012							
Des	ign (Comments	/Changes)						
]	Design Criteria			Yes	No/	Rank	
1	Is the design u	nambiguous?			X			
2	Is the design lo	gically consistent	with Parent(s),		X			
	and sibling des	ign components?						
3	Is the design fe				Х			
4	Is the design ve				Х			
5	Is the requirem	ent fulfilled by th	e design?		Х			
		—	mment or change	e in the Co	mments/C	hange field	d of the	
'De	sign Text' section	on.						
Fina	al Resolution	Approved X	Modify	Implen	nent Later	Drop		
Con	nments			I				

	uirement Group		on					
	A-UC5-006	Con Ops 2, 8, 9, 10						
	ated Needs	2, 8, 9, 10						
	uirement Text	7.1.3						
		p on PIDs shall is	sue an alert to peo	destrians w	rithin in a ge	eo fenced t	hat the	
	etcar is starting.							
Req	uirement Text (Comments/Char	iges)					
	Requirement Criteria Yes No/Rank							
1	Is the requireme	ent well-formed?			Х			
2	Is the requireme	nt unambiguous?	,		X			
3	Is the requireme	ent logically consi	stent with		X			
	·	bling requiremen						
4	Is the requireme	ent feasible?			Х			
5	Is the requireme	ent verifiable?			Х			
	•			Insp.	Anal.	Test	Demo.	
6	If feasible and v	erifiable, by which	ch method?			PTMW		
Not	e: An answer of	no requires a co	mment or change	in the Co	mments/Cl	nange fielo	d of the	
'Re	quirement Text'	section.						
Rela	ated Design Elen	nents						
31	2.2.2 Warn the ne	destrian of a bus	(or streetcar) stopp	aing or star	ting within	an interse	ction	
			to the RSU for ar				ction.	
		6		U				
ICD	23012							
Des	ign (Comments/	Changes)						
	E	esign Criteria			Yes	No/	Rank	
1	Is the design un	ambiguous?			X			
2	Is the design log	gically consistent	with Parent(s),		X			
2	•	gn components?			V			
3	Is the design fea			-	X			
4	Is the design ve				X			
5	-	ent fulfilled by the			Х			
		—	mment or change	in the Co	mments/Cl	nange field	d of the	
'De	sign Text' sectio	n.						
Fina	al Resolution A	Approved X	Modify	Implen	nent Later	Drop		
Con	nments							

-	uirement	Related Sect	tion							
	up A-UC5-007		Con Ops							
	ated Needs	1, 3								
-	ent Section	7.1.5								
Req Stre	uirement Tex et car OBUs sl				right turnin	g vehicles to de	etermine if			
Req	uirement Tex	t (Comments/Cha	anges)							
	Req	uirement Criteria	a		Yes	No/R	ank			
1	-	ment well-formed			X					
2		ment unambiguou			X					
3	Is the require	ment logically con l sibling requireme	sistent with		X					
4		ment feasible?	21115 :		Х					
5	Is the require	ment verifiable?			X					
	1			Insp.	Anal.	Test	Demo.			
6	If feasible and	d verifiable, by wh	ich method?	-mpp.		VTRFTV_A VTRFTV_B				
Not	e: An answer	of no requires a c	comment or char	nge in the	Commen		d of the			
'Re	quirement Te ated Design E	xt' section.		0						
fron to it	t of it and issue s operator.	tcar OBU detects of es a "Vehicle Turn								
Des	ign (Commen	8								
	Ι	Design Criteria			Yes	No/R	ank			
1	Is the design	unambiguous?			Х					
2	Parent(s), and	logically consisten l sibling design co			Х					
3	Is the design				X					
4	Is the design	verifiable?			Х					
5	Is the require	ment fulfilled by the	he design?		Х					
	e: An answer sign Text' sect	of no requires a c tion.	comment or char	nge in the	Commen	ts/Change field	d of the			
Fina	al Resolution	Approved X	Modify	Impler	nent Later	Drop				
Con	nments									

	quirement oup	Related Section					
	EA-UC5-007a	Con Ops					
Rel	ated Needs	7					
Par	arent Section 7.1.5						
Ree	quirement Text						
Vel	hicle OBUs shall	analyze its current position	while prep	paring to	make a right tu	ırn	
		cacks in relation to a nearby	streetcar	to determ	ine if the stree	tcar is in	
con	flict to the vehicl	e's project path.					
Ree	quirement Text (Comments/Changes)					
	Require	ment Criteria	Yes		No/R	No/Rank	
1	Is the requireme	ent well-formed?		Х			
2	Is the requireme	ent unambiguous?		Х			
3	Is the requireme	ent logically consistent	X				
	with Parent(s), a	and sibling requirements?					
4	Is the requireme	ent feasible?		Х			
5	Is the requireme	ent verifiable?		Х			
			Insp.	Anal.	Test	Demo.	
6	If feasible and v method?	erifiable, by which			VTRFTV_A VTRFTV_B		

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

3.3.2.5 . Once a blinker of the equipped vehicle that is approaching the intersection is engaged while passing the streetcar as well as the trajectory and speed determined by the OBU matches that of the potential collision ... The equipped vehicle receives a warning that they are on a collision course with streetcar as well.

Des	Design (Comments/Changes)							
	Ι	Design Crite	ria		Yes	No/Rank		
1	Is the design	n unambiguo	us?		Х			
2	U	n logically co nd sibling de		tent with components?	Х			
3	Is the design feasible?				Х			
4	Is the design	n verifiable?			Х			
5	Is the requir	ement fulfill	ed b	y the design?	Х			
	te: An answe he 'Design T	-		a comment or	change in the Co	omments/Change field		
Fin Res	al solution	Approved	Х	Modify	Implement Later	Drop		
Cor	nments							

Req Gro	luirement Dup	Related Section				
TH	EA-UC5-008	Con Ops				
Rel	ated Needs	4				
Par	ent Section	7.1.5				
Rec	quirement Text					
Stre	eet car OBUs shal	l produce a warning of a veh	nicle turni	ing in from	nt of the street	t car to
stre	et car operator.					
	-	Comments/Changes)				
	ded 'and to the					
Rer	noved "and to	the RSU."				
	Require	ment Criteria		Yes	No/R	lank
1	Is the requireme	ent well-formed?		Х		
2	Is the requireme	ent unambiguous?		Х		
3	-	ent logically consistent		Х		
	with Parent(s), a	and sibling requirements?				
4	Is the requireme	ent feasible?		Х		
5	Is the requireme	ent verifiable?		Х		
			Insp.	Anal.	Test	Demo.
6	If feasible and v method?	erifiable, by which			VTRFTV_A VTRFTV_B	

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

3.3.2.5 ... the streetcar OBU will give the streetcar driver a warning.

ICD 23002

Des	sign (Comme	ents/Changes)				
	Ľ	Design Criteria	l		Yes	No/Rank
1	Is the design	n unambiguous	?		Х	
2	U	n logically cons nd sibling desig			Х	
3	Is the design	n feasible?			Х	
4	Is the design	n verifiable?			Х	
5	Is the requir	ement fulfilled	by	the design?	Х	
	te: An answe he 'Design T	-	es a	a comment or c	hange in the Con	nments/Change field
Fina Res	al olution	Approved X		Modify	Implement Later	Drop

Comments		

	luirement Sup	Related Sec	tion				
	EA-UC5-008a	Con Ops					
	ated Needs	7					
	ent Section	7.1.5					
	quirement Tex				CI		
	hicle OBUs shal		<u> </u>	et car con	flict to the	e driver.	
ке	quirement Tex	t (Comments/	Changes)				
	-	rement Criter			Yes	No/R	lank
1	Is the requirer	nent well-form	ed?		Х		
2	Is the requirer	nent unambigu	ous?		Х		
3		nent logically o , and sibling re			Х		
4	Is the requirer	· · · · · · · · · · · · · · · · · · ·	1		Х		
5	Is the requirer	nent verifiable	?		Х		
	1			Insp.	Anal.	Test	Demo.
6	If feasible and method?	l verifiable, by	which	1		VTRFTV_A VTRFTV_B	
	0 23002						
Des	sign (Comment	ts/Changes)		-			
	De	sign Criteria			Yes	No/R	lank
1	Is the design u	inambiguous?			Х		
2	U	ogically consis	tont with		Х		
	Is the design f	sibling design					
3	is the design i	sibling design easible?		-	X		
3	Is the design v	easible?			X X		
	Is the design v	easible?	components?				

TH	quirement Group	Related Section				
	EA-UC5-008b	Con Ops				
Re	lated Needs	7				
	rent Section	7.1.5				
	quirement Text					
		produce a warning of a vehicl	e turning i	n front of	the street	car to the
RS						
Re	quirement Text (Comments/Changes)				
	Requi	rement Criteria]	Yes	No/	Rank
1	Is the requireme	nt well-formed?		Х		
2	Is the requireme	nt unambiguous?		Х		
3	-	nt logically consistent with bling requirements?		Х		
4	Is the requireme			Х		
5	Is the requireme	nt verifiable?		Х		
	1		Insp.	Anal.	Test	Demo.
6	If feasible and v	erifiable, by which method?			PTMW	
	played. D 23002				warning is	5
ICI	0 23002				warning h	5
	sign (Comments/	Changes)				5
	sign (Comments/	Changes) sign Criteria		Čes		Rank
De	sign (Comments/	ign Criteria		ľes X		
De 1	sign (Comments/ Des Is the design una Is the design log	sign Criteria ambiguous? fically consistent with				
De 1 2	sign (Comments/ Des Is the design una Is the design log	sign Criteria ambiguous? fically consistent with bling design components?		X		
De 1 2 3	sign (Comments/ Des Is the design una Is the design log Parent(s), and si	sign Criteria ambiguous? cically consistent with bling design components? sible?		X X		
	sign (Comments/ Des Is the design una Is the design log Parent(s), and si Is the design fea Is the design ver	sign Criteria ambiguous? cically consistent with bling design components? sible?		X X X		

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

U.S. Department of Transportation Intelligent Transportation System Joint Program Office

Requirement Grou	p Related Sec	ction				
THEA-UC5-009	Con Ops					
Related Needs	2, 8, 9, 10					
Parent Section	7.1.5					
Requirement Tex	xt					
-		e shall send right	turning ve	hicle war	ning to the	e Master
Server.		C C	U		U	
Requirement Tex	t (Comments/	Changes)				
Added 'and to r	•					
		of warnings from s				
		varning for PIDs i	s also sent	from stre	et car OB	U and
forwarded to PIDs	•					
		as a compound re	1		No	Rank
	uirement Crite			Yes	NO/	Kank
I Is the require	ment well-form	ed?		Х		
2 Is the require	ment unambigu	ous?		Х		
3 Is the require	ment logically of	consistent with		X		
1	l sibling require					
	ment feasible?			Х		
-	ment verifiable	?		X		
is the require		•	T			D
1			Insp.	Anal.	Test	Demo
5 If feasible and	d verifiable, by	which method?			PTMW	
T / A						
of the 'Requirem Related Design E 3.2.2.6.1 Addition	ent Text [?] section lements	a comment or chon.				
of the 'Requirem Related Design E 3.2.2.6.1 Addition displayed. 3.2.2.5.2 The XFE	ent Text' section lements ally PED-X also R Gateway also	on.	when the `	VTRFTV	warning is	5
of the 'Requirem Related Design E 3.2.2.6.1 Addition displayed. 3.2.2.5.2 The XFE ICD 20004, 23012	ent Text' section lements ally PED-X also ER Gateway also	on. o collects logs	when the `	VTRFTV	warning is	5
of the 'Requirem Related Design E 3.2.2.6.1 Addition displayed. 3.2.2.5.2 The XFE ICD 20004, 23012 Design (Commen	ent Text' section lements ally PED-X also CR Gateway also 2 ts/Changes)	on. o collects logs o receives BSMs f	when the `` from nearb	VTRFTV by OBUs v	warning is	5
of the 'Requirem Related Design E 3.2.2.6.1 Addition displayed. 3.2.2.5.2 The XFE ICD 20004, 23012 Design (Commen	ent Text' section lements ally PED-X also ER Gateway also 2 ts/Changes) Design Criteria	on. o collects logs o receives BSMs f	when the `` from nearb	VTRFTV by OBUs v Yes	warning is	5
of the 'Requirem Related Design E 3.2.2.6.1 Addition displayed. 3.2.2.5.2 The XFE ICD 20004, 23012 Design (Commend I Is the design	ent Text' section lements ally PED-X also ER Gateway also 2 ts/Changes) Design Criteria unambiguous?	on. o collects logs o receives BSMs f	when the `` from nearb	VTRFTV by OBUs v <mark>Yes</mark> X	warning is	5
of the 'Requirem Related Design E 3.2.2.6.1 Addition displayed. 3.2.2.5.2 The XFE CD 20004, 23012 Design (Comment I Is the design 2 Is the design	ent Text' section lements ally PED-X also ER Gateway also ts/Changes) Design Criteria unambiguous? logically consis	on. o collects logs o receives BSMs f	when the `` from nearb	VTRFTV by OBUs v Yes	warning is	5
of the 'Requirem Related Design E 3.2.2.6.1 Addition displayed. 3.2.2.5.2 The XFE CD 20004, 23012 Design (Commendation 1) I Is the design 2 Is the design Parent(s), and	ent Text' section lements ally PED-X also ER Gateway also ts/Changes) Design Criteria unambiguous? logically consis l sibling design	on. o collects logs o receives BSMs f	when the `` from nearb	VTRFTV by OBUs v Yes X X	warning is	5
of the 'Requirem Related Design E 3.2.2.6.1 Addition displayed. 3.2.2.5.2 The XFE ICD 20004, 23012 Design (Commentality) 1 Is the design 2 Is the design 2 Is the design 3 Is the design 3 Is the design	ent Text' section lements ally PED-X also CR Gateway also ts/Changes) Design Criteria unambiguous? logically consist 1 sibling design feasible?	on. o collects logs o receives BSMs f	when the `` from nearb	VTRFTV by OBUs v Yes X X X	warning is	5
of the 'Requirem Related Design E 3.2.2.6.1 Addition displayed. 3.2.2.5.2 The XFE ICD 20004, 23012 Design (Commentality) 1 Is the design 2 Is the design 2 Is the design 3 Is the design 3 Is the design	ent Text' section lements ally PED-X also CR Gateway also ts/Changes) Design Criteria unambiguous? logically consist 1 sibling design feasible?	on. o collects logs o receives BSMs f	when the `` from nearb	VTRFTV by OBUs v Yes X X	warning is	5
of the 'Requirem Related Design E 3.2.2.6.1 Addition displayed. 3.2.2.5.2 The XFE ICD 20004, 23012 Design (Comment 1 Is the design 2 Is the design 2 Is the design 3 Is the design 4 Is the design	ent Text' section lements ally PED-X also CR Gateway also ts/Changes) Design Criteria unambiguous? logically consist 1 sibling design feasible?	on. o collects logs o receives BSMs f tent with components?	when the `` from nearb	VTRFTV by OBUs v Yes X X X	warning is	5
of the 'Requirem Related Design E 3.2.2.6.1 Addition displayed. 3.2.2.5.2 The XFE CD 20004, 23012 Design (Comment 1 Is the design 2 Is the design 2 Is the design 3 Is the design 4 Is the design 5 Is the require	ent Text' section lements ally PED-X also ER Gateway also CR Gateway also c ts/Changes) Design Criteria unambiguous? logically consis l sibling design feasible? verifiable? ment fulfilled b	on. o collects logs o receives BSMs f tent with components? y the design?	when the `` from nearb	VTRFTV by OBUs v Yes X X X X X X X	warning is via WAVE	S Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z
of the 'Requirem Related Design E 3.2.2.6.1 Addition displayed. 3.2.2.5.2 The XFE CD 20004, 23012 Design (Comment I Is the design Parent(s), and Is the design Is the design Is the design Is the design Variable Is the design Is the design	ent Text' section lements ally PED-X also CR Gateway also CR Gateway also c ts/Changes) Design Criteria unambiguous? logically consist sibling design feasible? verifiable? ment fulfilled b of no requires	on. o collects logs o receives BSMs f tent with components?	when the `` from nearb	VTRFTV by OBUs v Yes X X X X X X X	warning is via WAVE	S Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z
of the 'Requirem Related Design E 3.2.2.6.1 Addition displayed. 3.2.2.5.2 The XFE ICD 20004, 23012 Design (Comment 1 Is the design 2 Is the design 2 Is the design 3 Is the design 4 Is the design 5 Is the require Note: An answer	ent Text' section lements ally PED-X also CR Gateway also CR Gateway also c ts/Changes) Design Criteria unambiguous? logically consist sibling design feasible? verifiable? ment fulfilled b of no requires	on. o collects logs o receives BSMs f tent with components? y the design?	when the `` from nearb	VTRFTV by OBUs v Yes X X X X X X X	warning is via WAVE	S Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z
of the 'Requirem Related Design E 3.2.2.6.1 Addition 3.2.2.5.2 The XFE ICD 20004, 23012 Design (Commen 1 Is the design 2 Is the design 3 Is the design 4 Is the design 5 Is the require Note: An answer of the 'Design Te	ent Text' section lements ally PED-X also ER Gateway also Contention (Contention) (o collects logs o collects logs o receives BSMs f tent with components? y the design? a comment or ch	when the `` `rom nearb	VTRFTV by OBUs v Yes X X X X X X A E Comm	warning is via WAVE	S Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z
of the 'Requirem Related Design E Related Design E 3.2.2.6.1 Addition displayed. 3.2.2.5.2 The XFE ICD 20004, 23012 Design (Comment 1 Is the design 2 Is the design 3 Is the design 4 Is the design 5 Is the require Note: An answer of the 'Design Te Final	ent Text' section lements ally PED-X also CR Gateway also CR Gateway also c ts/Changes) Design Criteria unambiguous? logically consist sibling design feasible? verifiable? ment fulfilled b of no requires	on. o collects logs o receives BSMs f tent with components? y the design?	when the `` `rom nearb	VTRFTV by OBUs v Yes X X X X X X A E Comm	warning is via WAVE	S (Rank
of the 'Requirem Related Design E Related Design E 3.2.2.6.1 Addition displayed. 3.2.2.5.2 The XFE ICD 20004, 23012 Design (Commen I Is the design Parent(s), and Is the design Is the design Is the design Is the design Final Resolution	ent Text' section lements ally PED-X also ER Gateway also Contention (Contention) (o collects logs o collects logs o receives BSMs f tent with components? y the design? a comment or ch	when the `` `rom nearb	VTRFTV by OBUs v Yes X X X X X X A E Comm	warning is via WAVE	S Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z
of the 'Requirem Related Design E 3.2.2.6.1 Addition displayed. 3.2.2.5.2 The XFE CD 20004, 23012 Design (Commen I Is the design Parent(s), and Is the design Is the design Is the design Is the design Final Resolution	ent Text' section lements ally PED-X also ER Gateway also Contention (Contention) (o collects logs o collects logs o receives BSMs f tent with components? y the design? a comment or ch	when the `` `rom nearb	VTRFTV by OBUs v Yes X X X X X X A E Comm	warning is via WAVE	S Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z
of the 'Requirem Related Design E Related Design E 3.2.2.6.1 Addition displayed. 3.2.2.5.2 The XFE ICD 20004, 23012 Design (Comment 1 Is the design 2 Is the design 3 Is the design 3 Is the design 4 Is the design 5 Is the require Note: An answer of the 'Design Te Final	ent Text' section lements ally PED-X also ER Gateway also Contention (Contention) (o collects logs o collects logs o receives BSMs f tent with components? y the design? a comment or ch	when the `` `rom nearb	VTRFTV by OBUs v Yes X X X X X X A E Comm	warning is via WAVE	S (Rank

Requirement Group	Related Section
THEA-UC5-009a	Con Ops
Related Needs	2, 8, 9, 10
Parent Section	7.1.5

Requirement Text

RSUs adjacent to the streetcar line shall send right turning vehicle warning to nearby PIDs.

Requirement Text (Comments/Changes)

Added from compound requirement 9

	Requirement Criteria	Ŋ	les	No/	'Rank
1	Is the requirement well-formed?		Х		
2	Is the requirement unambiguous?		X		
3	Is the requirement logically consistent with Parent(s), and sibling requirements?		Х		
4	Is the requirement feasible?		Х		
5	Is the requirement verifiable?		Х		
	·	Insp.	Anal.	Test	Demo.
6	If feasible and verifiable, by which method?			PTMW	

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

3.4.2.2.5 The OBU also sets a special field in the BSMs sent out when this warning happens. The RSU forwards all BSMs to the PED-X App. The PTMW App detects the VTRFTV Warning field set by the streetcar OBU which is embedded in the streetcar BSMs and notifies the PID user.

ICD 23010

Design (Comments/Changes)

-	Design Criteria	Yes	No/Rank
1	Is the design unambiguous?	Х	
2	Is the design logically consistent with Parent(s), and sibling design components?	Х	
3	Is the design feasible?	Х	
4	Is the design verifiable?	Х	
5	Is the requirement fulfilled by the design?	Х	

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

U.S. Department of Transportation Intelligent Transportation System Joint Program Office

	juirement Group	Related Sect	ion				
TH	EA-UC5-009b	Con Ops					
	ated Needs	2, 8, 9, 10					
Par	ent Section	7.1.5					
Re	quirement Text						
	-	0	ssages to the ped	estrian wh	en a street	car stops	s within
	intersection and						
	quirement Text						
			-005 and THEA-				
	1		, and validation n		cont to one	a the str	act of a
	rby street car.	he intent is to v	varn pedestrians	who may v		oss the str	eet of a
nea	•	irement Crite	ria		Yes	No	/Rank
1	Is the requirem						
2	-						
	Is the requirem	U U					
3	Is the requirem						
4	Parent(s), and s		nents?				
4	Is the requirem			_			
5	Is the requirem	ent verifiable?					
				Insp.	Anal.	Test	Demo.
6	If feasible and	verifiable, by v	which method?			X	
Not	te: An answer o	f no requires a	a comment or ch	ange in th	e Comm	ents/Cha	nge field
of t	he 'Requireme	nt Tout? coatio					
			n.				
	ated Design Ele		<u>n.</u>				
Rel 3.4	ated Design Ele	ements feature of the j	pedestrian safety		s the VTR	FTV war	ning
Rel 3.4 incl	ated Design Ele 2.2 The PTMW luded with the B	ements feature of the j			s the VTR	FTV war	ning
Rel 3.4 incl 3.1	ated Design Ele 2.2 The PTMW luded with the B 0.1 23010	ements feature of the j SM received an	pedestrian safety		s the VTR	FTV war	ning
Rel 3.4 incl 3.1	ated Design Ele 2.2 The PTMW luded with the B 0.1 23010 sign (Comments	ements feature of the j SM received an s/Changes)	pedestrian safety	,			
Rel 3.4 incl 3.10 Des	ated Design Ele 2.2 The PTMW luded with the B 0.1 23010 sign (Comments De	ements feature of the j SM received an s/Changes) esign Criteria	pedestrian safety	,	s the VTR Y es		ning /Rank
Rel 3.4 incl 3.1	ated Design Ele 2.2 The PTMW luded with the B 0.1 23010 sign (Comments	ements feature of the j SM received an s/Changes) esign Criteria	pedestrian safety	,			
Rel 3.4 incl 3.10 Des	ated Design Ele 2.2 The PTMW luded with the B 0.1 23010 sign (Comments De Is the design un Is the design lo	ements feature of the p SM received an s/Changes) esign Criteria nambiguous? ogically consist	pedestrian safety nd alerts the user ent with	,			
Rel 3.4. incl 3.10 Des 1 2	ated Design Ele 2.2 The PTMW luded with the B 0.1 23010 sign (Comments De Is the design un Is the design lo Parent(s), and s	ements feature of the j SM received an s/Changes) esign Criteria nambiguous? ogically consist sibling design of	pedestrian safety nd alerts the user ent with	,			
Rel 3.4. incl 3.10 Des 1	ated Design Ele 2.2 The PTMW luded with the B 0.1 23010 sign (Comments De Is the design un Is the design lo	ements feature of the j SM received an s/Changes) esign Criteria nambiguous? ogically consist sibling design of	pedestrian safety nd alerts the user ent with	,			
Rel 3.4. incl 3.10 Des 1 2	ated Design Ele 2.2 The PTMW luded with the B 0.1 23010 sign (Comments De Is the design un Is the design lo Parent(s), and s	ements feature of the p SM received an s/Changes) esign Criteria nambiguous? ogically consist sibling design of easible?	pedestrian safety nd alerts the user ent with	,			
Rel 3.4, incl 3.10 Des 1 2 3	ated Design Ele 2.2 The PTMW luded with the B 0.1 23010 sign (Comments De Is the design un Is the design lo Parent(s), and s Is the design fe	ements feature of the p SM received an s/Changes) esign Criteria nambiguous? ogically consist sibling design of easible? erifiable?	pedestrian safety and alerts the user ent with components?	,			
Rel 3.4 incl 3.1 Des 1 2 3 4	ated Design Ele 2.2 The PTMW luded with the B 0.1 23010 sign (Comments Do Is the design un Is the design lo Parent(s), and s Is the design fe Is the design ve	ements feature of the p SM received an s/Changes) esign Criteria nambiguous? ogically consist sibling design of easible? erifiable?	pedestrian safety and alerts the user ent with components?	,			
Rel 3.4 incl 3.10 Des 1 2 3 4 5	ated Design Ele 2.2 The PTMW luded with the B 0.1 23010 sign (Comments De Is the design un Is the design lo Parent(s), and s Is the design fe Is the design ve Is the design ve	ements feature of the p SM received an s/Changes) esign Criteria nambiguous? ogically consist sibling design of easible? erifiable? ent fulfilled by	pedestrian safety and alerts the user ent with components?		Žes	No	/Rank
Rel 3.4 incl 3.11 Des 1 2 3 4 5 Not	ated Design Ele 2.2 The PTMW luded with the B 0.1 23010 sign (Comments De Is the design un Is the design lo Parent(s), and s Is the design fe Is the design ve Is the design ve	ements feature of the p SM received an s/Changes) esign Criteria nambiguous? ogically consist sibling design of easible? erifiable? tent fulfilled by f no requires a	pedestrian safety and alerts the user ent with components?		Žes	No	/Rank
Rel 3.4 incl 3.11 Des 1 2 3 4 5 Not	ated Design Ele 2.2 The PTMW luded with the B 0.1 23010 sign (Comments Definition Definition of the design of the design for the design	ements feature of the p SM received an s/Changes) esign Criteria nambiguous? ogically consist sibling design of easible? erifiable? tent fulfilled by f no requires a	pedestrian safety and alerts the user ent with components?		Žes	No	/Rank
Rel 3.4 incl 3.11 Des 1 2 3 4 5 Not	ated Design Ele 2.2 The PTMW luded with the B 0.1 23010 sign (Comments De Is the design un Is the design fe Is the design fe Is the design ve Is the design ve Is the requirem te: An answer o the 'Design Text	ements feature of the p SM received an s/Changes) esign Criteria nambiguous? ogically consist sibling design of easible? erifiable? tent fulfilled by f no requires a	pedestrian safety and alerts the user ent with components?		řes ne Commo	No	/Rank
Rel 3.4 incl 3.10 Des 1 2 3 4 5 Not of t	ated Design Ele 2.2 The PTMW luded with the B 0.1 23010 sign (Comments De Is the design un Is the design fe Is the design fe Is the design ve Is the design ve Is the requirem te: An answer o the 'Design Text	ements feature of the p SM received an s/Changes) esign Criteria nambiguous? ogically consist sibling design of easible? erifiable? erifiable? ent fulfilled by f no requires a t' section.	ent with components?	ange in th	řes ne Commo	No	/Rank
Rel 3.4 incl 3.11 Des 1 2 3 4 5 Not of t Fin Res	ated Design Ele .2.2 The PTMW luded with the B 0.1 23010 sign (Comments Do Is the design fe Is the design fe Is the design ve Is the design ve Is the requirem te: An answer o che 'Design Text al A	ements feature of the p SM received an s/Changes) esign Criteria nambiguous? ogically consist sibling design of easible? erifiable? erifiable? ent fulfilled by f no requires a t' section.	ent with components?	ange in the Implementation of the Implementa	řes ne Commo	No	/Rank
Rel 3.4 incl 3.11 Des 1 2 3 4 5 Not of t Fin Res	ated Design Ele 2.2 The PTMW luded with the B 0.1 23010 sign (Comments Do Is the design un Is the design lo Parent(s), and s Is the design fe Is the design vol Is the requirem te: An answer o the 'Design Text al A	ements feature of the p SM received an s/Changes) esign Criteria nambiguous? ogically consist sibling design of easible? erifiable? erifiable? ent fulfilled by f no requires a t' section.	ent with components?	ange in the Implementation of the Implementa	řes ne Commo	No	/Rank
Rel 3.4 incl 3.11 Des 1 2 3 4 5 Not of t Fin Res	ated Design Ele 2.2 The PTMW luded with the B 0.1 23010 sign (Comments Do Is the design un Is the design lo Parent(s), and s Is the design fe Is the design vol Is the requirem te: An answer o the 'Design Text al A	ements feature of the p SM received an s/Changes) esign Criteria nambiguous? ogically consist sibling design of easible? erifiable? erifiable? ent fulfilled by f no requires a t' section.	ent with components?	ange in the Implementation of the Implementa	řes ne Commo	No	/Rank

Requirement Group	Related Section				
THEA-UC5-009c	Con Ops				
Related Needs	2, 8, 9, 10				
Parent Section	7.1.5				
Requirement Text					
	e warning messages to the pede	estrian wh	en a vehic	ele is turni	ng right
in front of the streetc	ar.				
Requirement Text (Comments/Changes)				
Added from compou	nd requirement 9				
Requir	rement Criteria	Yes		No/	'Rank
1 Is the requireme	ent well-formed?		X		
2 Is the requireme	ent unambiguous?		Х		
3 Is the requireme	ent logically consistent with		Х		
Parent(s), and si	bling requirements?				
4 Is the requireme	ent feasible?		Х		
5 Is the requireme	nt verifiable?		Х		
		Insp.	Anal.	Test	Demo.
6 If feasible and v	erifiable, by which method?			PTMW	
	no requires a comment or ch	ange in th	e Comm	ents/Chai	nge field

of the 'Requirement Text' section. Related Design Elements

3.4.2.2.5 The OBU also sets a special field in the BSMs sent out when this warning happens. The RSU forwards all BSMs to the PED-X App. The PTMW App detects the VTRFTV Warning field set by the streetcar OBU which is embedded in the streetcar BSMs and notifies the PID user.

ICD 23010

Des	Design (Comments/Changes)							
	Design Criteria	Yes	No/Rank					
1	Is the design unambiguous?	Х						
2	Is the design logically consistent with Parent(s), and sibling design components?	Х						
3	Is the design feasible?	Х						
4	Is the design verifiable?	Х						
5	Is the requirement fulfilled by the design?	Х						

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

Rec	uirement Gro	up Related Se	ction				
TH	EA-UC5-010						
	ated Needs						
	ent Section						
	quirement Te		aumont position	in rolation t	o nodostrij	na in inte	reaction
	ssings.	shall analyze its	current position	in relation t	o pedestria	ans in me	ersection
		ext (Comments/	Changes)				
	-		for PID location.				
	Re	quirement Crit	eria		Yes	No	/Rank
1	Is the require	ement well-form	ned?				
2	Is the require	ement unambigu	ious?				
3	-	ement logically					
		d sibling require	ements?				
4	-	ement feasible?					
5	Is the require	ement verifiable	?				
				Insp.	Anal.	Test	Demo.
6	If feasible ar	nd verifiable, by	which method?				
		-	a comment or c	hange in tl	he Comm	ents/Cha	nge field
		nent Text' secti	on.				
	lated Design I	Elements					
Е							
Des	sign (Comme	nts/Changes)					
		Design Criteria	a		Yes	No	/Rank
1	Is the design	unambiguous?					
2	0	logically consist					
0		d sibling design	components?				
3	Is the design						
4	Is the design						
5	Is the require	ement fulfilled b	by the design?				
	te: An answei the 'Design Te	-	a comment or c	hange in th	ne Commo	ents/Cha	nge field
Fin Res	al solution	Approved	Modify	Implei Later	ment	Drop 2	X
Co	mments						

Rec	quirement Gro	up Related Se	ction				
	EA-UC5-011						
	lated Needs						
	ent Section						
	quirement Te		warning to the str	eet car oner	ator that e	auinned	
		-	street car within a	-			ed to 100
feet				0			
	-	xt (Comments/ GPS inaccuracy	(Changes) for PID location.				
	Re	quirement Crit	eria	Ŋ	Yes	No	/Rank
1	Is the require	ement well-forn	ned?				
2	Is the require	ement unambigu	lous?				
3	-	ement logically d sibling requir	consistent with ements?				
4	Is the require	ement feasible?					
5	Is the require	ement verifiable	??				
				Insp.	Anal.	Test	Demo.
6	If feasible ar	nd verifiable, by	which method?				
Re l	lated Design I	Elements					
	sign (Comme	nts/Changes)					
	-	Design Criteria	a	y	Yes	No	/Rank
1	-	unambiguous?					
2	Is the design	logically consi	stent with				
3	Is the design	d sibling design feasible?	r components :				
4	Is the design						
5	e	ement fulfilled b	by the design?				
	-		s a comment or c	hange in th	ne Comm	ents/Cha	nge field
	the 'Design To						0
Fin Res	al solution	Approved	Modify	Impler Later	nent	Drop	X
Cor	mments						

Rec	uirement Grou	ID Related Se	ection				
-	EA-UC5-012						
	ated Needs						
	ent Section						
	quirement Tex		na ahall aand nad	antuinu anuf	l:		Maatan
	Us adjacent to ver.	the street car h	ne shall send ped	estrian conf	licts warn	ings to the	e Master
		kt (Comments	(Changes)				
	-		for PID location.				
	Req	uirement Crit	teria	Ŋ	Yes	No	/Rank
1	Is the require	ment well-form	ned?				
2	Is the require	ment unambig	uous?				
3			consistent with				
		d sibling requir					
4		ment feasible?					
5	Is the require	ment verifiable	e?				
				Insp.	Anal.	Test	Demo.
6	If feasible an	d verifiable, by	which method?				
of t		ent Text' sect	s a comment or o				
Des	sign (Commen	ts/Changes)					
]	Design Criteri	a	Ŋ	Yes	No	/Rank
1	Is the design	unambiguous?					
2	0	logically consi					
2			n components?				
3	Is the design						
4	Is the design						
5	1	ment fulfilled			~		
	te: An answer <u>he 'Design Te</u>	-	s a comment or c	change in th	e Comm	ents/Cha	nge field
Fin Res	al solution	Approved	Modify	Impler Later	nent	Drop	X
Con	mments						

Red	quirement Grou	p Related Se	etion				
	EA-UC5-013						
	lated Needs						
Par	ent Section						
Re	quirement Tex	xt					
	•	the street car li	ine shall send ped	estrian conf	licts warn	ings to th	e Master
	ver.						
	quirement Te x leted. Due to G	•	(Changes) for PID location.				
	Req	uirement Cri	teria		Yes	No	/Rank
1	Is the require	ment well-form	med?				
2	Is the require	ment unambig	uous?				
3	-	ment logically 1 sibling requir	consistent with rements?				
4	Is the require	ment feasible?					
5	Is the require	ment verifiable	e?				
				Insp.	Anal.	Test	Demo.
6	If feasible an	d verifiable, by	which method?				
E De	sign (Commen	ts/Changes)					
		Design Criteri	a		Yes	No	/Rank
1		unambiguous?					
2	Is the design	logically consi	stent with				
	U	0.	n components?				
3	Is the design	feasible?					
4	Is the design	verifiable?					
5	Is the require	ment fulfilled	by the design?				
	te: An answer the 'Design Te	-	s a comment or o	change in th	ne Comm	ents/Cha	nge field
of t				1		1	
Fin		Approved	Modify	Impler Later	nent	Drop	X

Ree	quirement Grou	p Related Sec	tion				
	EA-UC5-014_						
Re	lated Needs						
	ent Section						
	quirement Tex						
-		all receive PSMs		adjacent to	the street	car line.	
	-	xt (Comments/C PS inaccuracy fo	0				
		-		x	Yes	No	Rank
1		uirement Crite		1	tes		Kalik
1	-	ment well-forme					
2	Is the require	ment unambiguo	ous?				
3	-	ment logically co					
		l sibling requirer					
4	-	ment feasible?					
5	Is the require	ment verifiable?					
				Insp.	Anal.	Test	Demo.
6	If feasible and	d verifiable, by v	which method?				
No	te: An answer	of no requires a	a comment or c	hange in th	ne Comme	ents/Chai	nge field
		ent Text ⁷ sectio		U			0
Re	lated Design E	lements					
Е							
De	sign (Commen	ts/Changes)					
	I	Design Criteria		Ŋ	Yes	No/Rank	
1	Is the design	unambiguous?					
2	Is the design	logically consist	ent with				
	Parent(s), and	d sibling design o	components?				
3	Is the design	feasible?					
4	Is the design	verifiable?					
5	Is the require	ment fulfilled by	the design?				
	te: An answer the 'Design Te	of no requires a xt' section.	a comment or c	hange in th	ne Comme	ents/Char	nge field
Fin	al	Approved	Modify	Imple	mont	Dron	v
	solution	Approved	Modify	Impler Later	nent	Drop 2	A
	mments		I	Later		1	

Rec	uirement Grou	p Related Sect	ion				
	EA-UC5-015						
Rel	ated Needs						
Par	ent Section						
	quirement Tex						
		all store the pedes		rning mes	sages.		
	<u> </u>	xt (Comments/C	0 /				
Del		PS inaccuracy for		T	7	NT	
	-	uirement Criter)	les	NO	Rank
1	Is the require	ment well-formed	1?				
2	Is the require	ment unambiguo	us?				
3	-	ment logically co					
	× / /	d sibling requirem	nents?				
4		ment feasible?					
5	Is the require	ment verifiable?					
				Insp.	Anal.	Test	Demo.
6	If feasible and	d verifiable, by w	hich method?				
of t Rel E	the 'Requirem lated Design E			ange in th		ents/Chai	nge field
Des	sign (Commen	ts/Changes)					
	I	Design Criteria		Y	les	No	Rank
1	Is the design	unambiguous?					
2	0	logically consiste					
-		d sibling design c	omponents?				
3	Is the design						
4	Is the design	verifiable?					
5	Is the require	ment fulfilled by	the design?				
	te: An answer the 'Design Te	of no requires a xt' section.	comment or cha	ange in th	e Comme	ents/Char	nge field
Fin	al	Approved	Modify	Implen	nent	Drop 2	X
	solution			Later			
Co	mments						

Rec	quirement Gro	up Related Secti	on					
TH	EA-UC5-016							
	ated Needs							
	ent Section							
Re	quirement Te	ext						
	· · · · · · · · · · · · · · · · · · ·	ext (Comments/Cl GPS inaccuracy for	0					
	Re	quirement Criter	ia	Ŋ	Yes	No/Rank		
1	Is the require	ement well-formed	1?					
2	Is the require	ement unambiguor	us?					
3	-	ement logically co d sibling requirem						
4	Is the require	ement feasible?						
5	Is the require	ement verifiable?						
				Insp.	Anal.	Test	Demo.	
6	If feasible an	nd verifiable, by w	hich method?					
of t	the 'Requiren	r of no requires a nent Text' section		hange in th	ne Commo	ents/Cha	nge field	
	lated Design l	Liements						
E	• (0							
Des	sign (Comme	U						
		Design Criteria)	Yes	No	/Rank	
1	Is the design	unambiguous?						
2	0	logically consiste						
2		d sibling design co	omponents?					
3	Is the design							
4	Is the design							
5	-	ement fulfilled by	<u> </u>					
	te: An answei the 'Design Te	r of no requires a ext' section.	comment or c	hange in th	e Commo	ents/Cha	nge field	
Fin Res	al solution	Approved	Modify	Impler Later	nent	Drop 2	X	
Co	mments							

Rec	uirement Grou	p Related Se	ction				
	EA-UC5-017	Con Ops					
Rel	ated Needs	2, 8, 9, 10					
	ent Section	7.1.5					
	quirement Tex						
	•		ne shall receive in	formation a	bout loca	tion and	
	vement of the st		(Cham gog)				
	quirement Tex eted: Per the SI		0				
			ls broadcast by str	eet car OB	U (see TH	EA-UC5	-003)
110		uirement Crit			les		/Rank
1	Is the requirer						
2	Is the requirer	nent unambigu	ious?				
3	-	•	consistent with				
		sibling require	ements?				
4	Is the requirer						
5	Is the requirer	nent verifiable	?				-
				Insp.	Anal.	Test	Demo.
6	If feasible and	l verifiable, by	which method?			X	
		-	s a comment or c	hange in th	e Comm	ents/Cha	nge field
	he 'Requireme		on.				
Re	ated Design El	ements					
			included inside th				
			collector RSU ap		he BSM in	ncluding t	the
V1 3.1		and forward to	o the master serve	r.			
	sign (Comment	ts/Changes)					
DC	<u> </u>	esign Criteria	9		les	No	/Rank
1	Is the design u	0		-			, Kallix
2	<u> </u>		atopt with				
Z	-	ogically consists	components?				
3	Is the design f		reomponents:				
4	Is the design v			-			
5	Is the requirer	nent fulfilled b	by the design?				
No	te: An answer	of no requires	s a comment or c	hange in th	e Comm	ents/Cha	nge field
of t	the 'Design Tex	kt' section.				-	
Fin		Approved	Modify	Impler	nent	Drop 2	X
	solution			Later			
Co	mments						

Re	quirement Grou	p Related Se	ction				
	EA-UC5-018						
	lated Needs						
	rent Section						
	quirement Tex				T 1.	1 .	
PII line		a street car coll	lision warning fr	om the RSU	s adjacen	t to the st	reet car
		xt (Comments/	Changes)				
	-		for PID location.				
	Req	uirement Crite	eria		Yes	No	/Rank
1	Is the require	ment well-form	ed?				
2	Is the require	ment unambigu	ous?				
3	Is the require	ment logically o	consistent with				
	Parent(s), and	l sibling require	ements?				
4	Is the require	ment feasible?					
5	Is the require	ment verifiable ⁴	?				
				Insp.	Anal.	Test	Demo.
6	If feasible and	d verifiable, by	which method?				
E De	sign (Commen	ts/Changes)					
		Design Criteria			Yes	No	/Rank
1	Is the design	unambiguous?					
2	Is the design	logically consis	tent with				
		l sibling design	components?				
3	Is the design	feasible?					
4	Is the design	verifiable?					
5	Is the require	ment fulfilled b	y the design?				
	te: An answer the 'Design Te	-	a comment or o	change in th	ne Comm	ents/Cha	nga fiald
							lige neiu
							0
Fin		Approved	Modify	Impler	nent	Drop	0
Fin Re:	solution	Approved	Modify	Impler Later	nent	Drop	0
Fin Re:		Approved	Modify	-	nent	Drop	0
Fin Re:	solution	Approved	Modify	-	nent	Drop	0
Fin Re:	solution	Approved	Modify	-	nent	Drop	0

-	uirement Grou	p Related Section	20				
ΠĤ	EA-UC5-019	ip Related Section					
	ated Needs						
	ent Section						
	quirement Tex	t					
		street car collisio	on warning mess	ages to the	e pedestria	an.	
	<u>.</u>	t (Comments/Ch	U /				
Del	eted. Due to G	PS inaccuracy for	PID location.				
	Requirement Criteria			Yes		No/Rank	
1	Is the require	ment well-formed	?				
2	Is the require	ment unambiguou	is?				
3		ment logically con					
		l sibling requirem	ents?				
4	-	ment feasible?					
5	Is the require	ment verifiable?					
				Insp.	Anal.	Test	Demo.
6	If feasible and	d verifiable, by wl	hich method?				
		of no requires a		ange in th	e Commo	ents/Cha	nge field
Not	to. An onewar	of no requires a	commont or ch	ngo in th	o Comm	nte/Cha	ngo fiold
01 L	ne Requirem	ent Text' section	•				
Rel	ated Design E	lements					
E							
	sign (Commen	ts/Changes)					
	<u> </u>	is/ Unanges/					
	L	—		Ŋ	les	No	/Rank
1		Design Criteria		Y	l'es	No	/Rank
1 2	Is the design	Design Criteria unambiguous?	nt with	Y	les	No	/Rank
	Is the design	Design Criteria		Y	l es	No	/Rank
	Is the design	Design Criteria unambiguous? logically consister l sibling design co		Y	les	No	/Rank
2	Is the design Is the design Parent(s), and	Design Criteria unambiguous? logically consisten l sibling design co feasible?		<u> </u>	l'es	No	/Rank
2 3	Is the design Parent(s), and Is the design Is the design	Design Criteria unambiguous? logically consisten l sibling design co feasible?	omponents?	5	∕es	No	/Rank
2 3 4	Is the design Parent(s), and Is the design Is the design	Design Criteria unambiguous? logically consisten l sibling design co feasible? verifiable?	omponents?	Y	í es	No	/Rank
2 3 4 5 Not	Is the design Is the design Parent(s), and Is the design Is the design Is the requires te: An answer	Design Criteria unambiguous? logically consisten l sibling design co feasible? verifiable? ment fulfilled by to of no requires a	omponents?				
2 3 4 5 Not	Is the design Is the design Parent(s), and Is the design Is the design Is the required	Design Criteria unambiguous? logically consisten l sibling design co feasible? verifiable? ment fulfilled by to of no requires a	omponents?				
2 3 4 5 Not of t	Is the design Is the design Parent(s), and Is the design Is the design Is the require te: An answer the 'Design Te	Design Criteria unambiguous? logically consisten l sibling design co feasible? verifiable? ment fulfilled by to of no requires a xt' section.	omponents? the design? comment or cha	ange in th	e Comme	ents/Cha	nge field
2 3 4 5 Not of t	Is the design Is the design Parent(s), and Is the design Is the design Is the requirer te: An answer the 'Design Te al	Design Criteria unambiguous? logically consisten l sibling design co feasible? verifiable? ment fulfilled by to of no requires a	omponents?	ange in th	e Comme		nge field
2 3 4 5 Not of t Fin Res	Is the design Is the design Parent(s), and Is the design Is the design Is the requires te: An answer the 'Design Te al solution	Design Criteria unambiguous? logically consisten l sibling design co feasible? verifiable? ment fulfilled by to of no requires a xt' section.	omponents? the design? comment or cha	ange in th	e Comme	ents/Cha	nge field
2 3 4 5 Not of t Fin Res	Is the design Is the design Parent(s), and Is the design Is the design Is the requirer te: An answer the 'Design Te al	Design Criteria unambiguous? logically consisten l sibling design co feasible? verifiable? ment fulfilled by to of no requires a xt' section.	omponents? the design? comment or cha	ange in th	e Comme	ents/Cha	nge field
2 3 4 5 Not of t Fin Res	Is the design Is the design Parent(s), and Is the design Is the design Is the requires te: An answer the 'Design Te al solution	Design Criteria unambiguous? logically consisten l sibling design co feasible? verifiable? ment fulfilled by to of no requires a xt' section.	omponents? the design? comment or cha	ange in th	e Comme	ents/Cha	nge field
2 3 4 5 Not of t Fin Res	Is the design Is the design Parent(s), and Is the design Is the design Is the requires te: An answer the 'Design Te al solution	Design Criteria unambiguous? logically consisten l sibling design co feasible? verifiable? ment fulfilled by to of no requires a xt' section.	omponents? the design? comment or cha	ange in th	e Comme	ents/Cha	nge field

Req	uirement Grou	p Related S	ection				
	EA-UC5-020_						
	ated Needs						
	ent Section						
-	uirement Tex		~~ ····		n a d a atui a u		
		t (Comments/	on warning mess	ages to the	pedestrian	•	
			for PID location.				
	Req	Yes		No/Rank			
1	Is the require	ment well-forn	ned?				
2	Is the require	ment unambigu	ious?				
3	-	ment logically l sibling requir	consistent with ements?				
4	Is the require	ment feasible?					
5	Is the require	ment verifiable	?				
				Insp.	Anal.	Test	Demo.
6	If feasible and	d verifiable, by	which method?	-			
Not	e: An answer	of no requires	a comment or c	hange in th	ie Comm	ents/Chai	nge field
		ent Text' secti					
Rel	ated Design E	lements					
E							
Des	sign (Commen	ts/Changes)					
	l	Design Criteria	a		Yes	No	/Rank
1	Is the design	unambiguous?					
2	Is the design	logically consi	stent with				
	U	l sibling design					
3	Is the design	feasible?					
4	Is the design	verifiable?					
5	Is the require	the requirement fulfilled by the design?					
	e: An answer he 'Design Te	-	s a comment or c	hange in th	ne Comm	ents/Cha	nge field
01 t.					nent		
	al	Approved	Modify	Imniei		Dron	X
Fina	al olution	Approved	Modify	Implei Later	nent	Drop 2	X
Fina Res		Approved	Modify	-		Drop	X
Fina Res	olution	Approved	Modify	-		Drop	X
Fina Res	olution	Approved	Modify	-		Drop .	X

Requirement Gro	up Related Se	ction					
THEA-UC6-001	Con Ops						
Related Needs	11.2.1						
Parent Section	7.1.6						
Requirement T	ext						
The master serve	r application sha	all compute Trave	l Times fro	m equippe	ed vehicle	e speeds	
measured along	he corridors spe	cified in other req	uirements.				
Requirement T							
Deleted per the S	-						
		quipped vehicle sp	eeds measu	ired along	the corri	dors	
specified in othe							
Removed 'to v				7	NT		
	quirement Crit			Yes		No/Rank	
1 Is the requir	ement well-forn	ned?					
2 Is the requir	ement unambig	ious?					
3 Is the requir	ement logically	consistent with					
	nd sibling requir						
	ement feasible?						
5 Is the requir	ement verifiable	?					
1			Insp.	Anal.	Test	Demo.	
6 If feasible a	nd vorifiable by	which mathod?	msp.	7 mai.	X	Demo.	
		which method?					
of the 'Require	-	s a comment or cl	hange in tr	ie Commo	ents/Cna	nge field	
Related Design							
		ert) receives vehicl	e speed (ar	d count) t	from RSI	Is It	
		eed for a road seg					
road segment.	since from the sp		lineine using	u comigu	ieu iengu	i or that	
3.12.1 23014							
Design (Comme	nts/Changes)						
	Design Criteri	a		Yes	No	/Rank	
1 Is the design	unambiguous?						
2 Is the design	logically consi	stent with					
0	nd sibling design						
3 Is the design							
4 Is the design							
	ement fulfilled l	ov the design?					
1			hango in 41	o Comm	onte/Cha	ngo field	
of the 'Design T		s a comment or c	lange in ti	le Comm	ents/Cha	nge neid	
of the Design 1							
		Modify	Imple	nont	Dron	v	
Final			Impler	nem	Drop X		
Final Resolution	Approved	1.10 011)	Lator		Diop		
Resolution	Approved		Later		Diop		
	Approved		Later		Diop		
Resolution	Approved		Later				
Resolution	Approved		Later		Diop		
Resolution	Approved		Later		Diop		

Rec	quirement Grou	ID Related Sec	tion					
	EA-UC6-002_							
Rel	ated Needs							
	ent Section							
The	quirement Tex e master server vices.		ll send MAFB g	ate queue	es to vehicles	and nom	adic	
	-	xt (Comments/ FB app project v	C hanges) was discontinued	1.				
	Requirement Criteria				Yes		No/Rank	
1	Is the require	ment well-form	ed?					
2	Is the require	ment unambigu	ous?					
3		ment logically of sibling require						
4	Is the require	ment feasible?						
5	Is the require	ment verifiable	?					
				Insp	o. Anal.	Test	Demo.	
6	If feasible an	d verifiable, by	which method?					
		of no requires ent Text' section	a comment or on.	change ii	n the Comm	ents/Cha	nge field	
Re	lated Design E	lements						
E								
Des	sign (Commen	ts/Changes)						
]	Design Criteria	L		Yes	No	/Rank	
1	Is the design	unambiguous?						
2	Is the design	logically consis	tent with					
		d sibling design	components?					
3	Is the design	feasible?						
4	Is the design	verifiable?						
5	Is the require	ment fulfilled b	y the design?					
	te: An answer the 'Design Te		a comment or	change ii	n the Comm	ents/Cha	nge field	
Fin Res	al solution	Approved	Modify	Imp Lat	olement er	Drop	X	
Co	mments							

Ree	quirement Gro	up Related Sect	tion					
TH	EA-UC6-003							
	lated Needs							
	rent Section							
	quirement Te		l and insident l	1		vahialaa a		1: .
	e master serve	r application shal	I send incldent	locatio	ons to v	enicies a	na nomac	lic
		ext (Comments/C	Changes)					
		information is no		there	fore ca	nnot be p	rovided.	
	Re	quirement Crite	ria		Ŋ	es	No	/Rank
1	Is the require	ement well-forme	ed?					
2	Is the require	ement unambigue	ous?					
3		ement logically c						
		d sibling require	ments?					
4	Is the require	ement feasible?						
5	Is the require	ement verifiable?	•					
	1			Ι	lnsp.	Anal.	Test	Demo.
6	If feasible an	nd verifiable, by	which method?					
No	te: An answe	r of no requires	a comment or o	chang	ge in th	e Comm	ents/Cha	nge field
		nent Text' sectio	n.					
Re	lated Design l	Elements						
Е								
De	sign (Comme	nts/Changes)						
		Design Criteria			Y	es	No	/Rank
1	Is the design	unambiguous?						
2	Is the design	logically consist	ent with					
	Parent(s), an	d sibling design	components?					
3	Is the design	feasible?						
4	Is the design	verifiable?						
5	Is the require	ement fulfilled by	y the design?					
		r of no requires	a comment or o	chang	ge in th	e Commo	ents/Cha	nge field
of	the 'Design T	ext' section.						
Fin Res	al solution	Approved	Modify		Implen Later	nent	Drop	Х
Co	mments			•				
		1						

Rec	quirement Gro	up Related Secti	on				
	EA-UC6-004						
	lated Needs						
	rent Section						
	quirement Te Ds shall transm						
		ext (Comments/Cl	hanges)				
		te requirement; TH					
	Re	quirement Criter	ia	Y	les	No	/Rank
1	Is the require	ement well-formed	1?				
2	Is the require	ement unambiguou	us?				
3	-	ement logically co					
4		nd sibling requirement feasible?	nents?				
+ 5	-	ement verifiable?					
5	15 the require			Insp.	Anal.	Test	Demo.
6	If feasible a	nd verifiable, by w	hich method?				2 0
No		r of no requires a		hange in th	e Comm	ents/Chai	nge field
		nent Text' section		nunge in ti	ie comm		ige neiu
-	lated Design						
Е							
Des	sign (Comme	nts/Changes)					
		Design Criteria		Ŋ	les	No	/Rank
1	Is the design	unambiguous?					
2	Is the design	logically consiste	ent with				
_		nd sibling design co	omponents?				
3	Is the design						
4	Is the design	verifiable?					
5	-	ement fulfilled by	0				
	te: An answei the 'Design T	r of no requires a ext' section	comment or c	hange in th	e Comm	ents/Chai	nge field
01 0	ine Design i						
Fin Res	al solution	Approved	Modify	Impler Later	nent	Drop 2	X
	mments						

	uirement Gro	-	ction				
	EA-UC6-005	Con Ops					
-	ated Needs	1, 2, 3					
-	ent Section	7.1.6					
	uirement Tex						
-		l broadcast BSMs					
Req	ulrement lex	t (Comments/Ch	anges)				
Dele	eted per the SD	D Walkthrough.	Covered by THEA-	UC1-030			
	Re	equirement Crite	eria		Yes	No/	'Rank
1	Is the require	- ment well-formed	?		X		
2	-	ment unambiguou			Х		
3	Is the require	ment logically cor	nsistent with	-	X		
C	-	l sibling requirem					
4	Is the require	ment feasible?			Х		
5	Is the require	ment verifiable?			Х		
				Insp.	Anal.	Test	Demo.
6	If feasible and	d verifiable, by wl	nich method?			Х	
			comment or change	in the Co	mments/C	hange fiel	d of the
	quirement Tex						
3.3.	ated Design El		tinually broadcast ar				
vehi 3.1.	cles within the 1 20004	range					
Des	ign (Comment	ts/Changes)					
		Design Criteria			Yes	No/	Rank
1	Is the design	unambiguous?					
2	0	logically consister					
3	Is the design		•				
4	Is the design	verifiable?					
5	Is the require	ment fulfilled by t	he design?				
	e: An answer (sign Text' sect		comment or change	in the Co	mments/Cl	hange field	d of the
Fina	l Resolution	Approved	Modify	Impler	nent Later	Drop X	
Con	nments						

Req	uirement Grou	p Related Sec	ction				
TH	EA-UC6-006	Con Ops					
Rel	ated Needs	1, 2, 3					
	ent Section	7.1.6					
	quirement Tex				~ ~ ~		
			RSU shall receiv	e vehicles B	SMs.		
	noved ' and]	t (Comments/C	Changes)				
Rei		uirement Crite	ria		Zes	No	/Rank
1	-	ment well-forme			X		
2	1	nent unambiguo		X			
3	-	nent logically c			X		
U	-	sibling require					
4	Is the requirer	ment feasible?			X		
5	Is the requirer	nent verifiable?	•		X	<u> </u>	
				Insp.	Anal.	Test	Demo.
6	If feasible and	l verifiable, by v	which method?			I-SIG	
			a comment or o	hange in th	e Comm	ents/Cha	nge field
of t		ent Text' sectio	n.				
Rel 3.2.	ated Design El 2.3.2 Siemens- 0 20004		ves BSMs from	OBUs			
Rel 3.2. ICE	2.3.2 Siemens- 0 20004	MMITSS receiv	ves BSMs from	OBUs			
Rel 3.2. ICE	2.3.2 Siemens- 2 20004 sign (Comment	MMITSS receiv ts/Changes)				No	/Rank
Rel 3.2. ICE	2.3.2 Siemens- 2 20004 sign (Comment	MMITSS receiv		Y	Zes X	No	/Rank
Rel 3.2. ICE Des	2.3.2 Siemens- 2 20004 sign (Comment E Is the design u	MMITSS receiv ts/Changes) Design Criteria		Y		No	/Rank
Rel 3.2. ICE Des 1 2	2.3.2 Siemens- 2 20004 sign (Comment Is the design to Is the design to Parent(s), and	MMITSS receiv ts/Changes) Design Criteria unambiguous? logically consist sibling design	tent with	Y	X X	No	/Rank
Rel 3.2. ICE Des 1	2.3.2 Siemens- 2 20004 sign (Comment Is the design to Is the design to Parent(s), and Is the design for	MMITSS receives the second state of the second	tent with	Y	X X X	No	/Rank
Rel 3.2. ICI Des 1 2 3 4	2.3.2 Siemens- 2 20004 sign (Comment Is the design t Is the design t Parent(s), and Is the design t Is the design t	MMITSS receives the second state of the second	tent with components?	Y	X X X X X	No	/Rank
Rel 3.2. ICE Des 1 2 3	2.3.2 Siemens- 2 20004 sign (Comment Is the design t Is the design t Parent(s), and Is the design t Is the design t	MMITSS receives the second state of the second	tent with components?	Y	X X X		/Rank
Rel 3.2. ICE Des 1 2 3 4 5 Not	2.3.2 Siemens- 2 20004 Sign (Comment Is the design t Is the design 1 Parent(s), and Is the design f Is the design f Is the design f Is the design f	MMITSS received the sector of	tent with components?		X X X X X X		
Rel 3.2. ICE Des 1 2 3 4 5 Not of t	2.3.2 Siemens- 2.20004 sign (Comment E Is the design u Is the requirent te: An answer u he 'Design Tex	MMITSS receiver ts/Changes) Design Criteria unambiguous? logically consist sibling design of feasible? verifiable? werifiable? ment fulfilled by of no requires a xt' section.	tent with components? y the design? a comment or o	hange in th	X X X X X ie Comm	ents/Char	
Rel 3.2. ICE Des 1 2 3 4 5 Not of t	2.3.2 Siemens- 2 20004 sign (Comment Is the design of Is the requirent te: An answer of he 'Design Text al	MMITSS received the sector of	tent with components? y the design?	hange in th	X X X X X ie Comm		
Rel 3.2. ICE Des 1 2 3 4 5 Not of t Res	2.3.2 Siemens- 2.20004 sign (Comment E Is the design u Is the requirent te: An answer u he 'Design Tex	MMITSS receiver ts/Changes) Design Criteria unambiguous? logically consist sibling design of feasible? verifiable? werifiable? ment fulfilled by of no requires a xt' section.	tent with components? y the design? a comment or o	hange in th	X X X X X ie Comm	ents/Char	
Rel 3.2. ICE Des 1 2 3 4 5 Not of t Res	2.3.2 Siemens- 2 20004 sign (Comment Sign (Comment Is the design to Is the requirent te: An answer to he 'Design Text al solution	MMITSS receiver ts/Changes) Design Criteria unambiguous? logically consist sibling design of feasible? verifiable? werifiable? ment fulfilled by of no requires a xt' section.	tent with components? y the design? a comment or o	hange in th	X X X X X ie Comm	ents/Char	
Rel 3.2. ICE Des 1 2 3 4 5 Not of t Res	2.3.2 Siemens- 2 20004 sign (Comment Sign (Comment Is the design to Is the requirent te: An answer to he 'Design Text al solution	MMITSS receiver ts/Changes) Design Criteria unambiguous? logically consist sibling design of feasible? verifiable? werifiable? ment fulfilled by of no requires a xt' section.	tent with components? y the design? a comment or o	hange in th	X X X X X ie Comm	ents/Char	
Rel 3.2. ICE Des 1 2 3 4 5 Not of t Fina Res	2.3.2 Siemens- 2 20004 sign (Comment Sign (Comment Is the design to Is the requirent te: An answer to he 'Design Text al solution	MMITSS receiver ts/Changes) Design Criteria unambiguous? logically consist sibling design of feasible? verifiable? werifiable? ment fulfilled by of no requires a xt' section.	tent with components? y the design? a comment or o	hange in th	X X X X X ie Comm	ents/Char	

Req	uirement Grou	Related Section	ion				
	EA-UC6-007	Con Ops					
	ated Needs	1, 2, 3					
-	ent Section	7.1.6					
	uirement Text	lemented to mini	mize overall delay o	on Meridia	n Avenue a	and Florida	Avenue
		e available releas					Avenue
		Comments/Char					
Cha	nge to identify sp	pecific corridors u	sing available relea	se of MM	ITSS.		
	-	uirement Criteri	a		Yes	No	Rank
1	Is the requireme	ent well-formed?			Х		
2	Is the requireme	ent unambiguous?	,		Х		
3		ent logically consi			Х		
4		ibling requiremen	ts?		V		
4	Is the requirement				X		
5	Is the requireme	ent verifiable?			X		
				Insp.	Anal.	Test	Demo.
6	If feasible and v	verifiable, by which	ch method?			I-SIG	
			mment or change	in the Co	mments/Cl	hange fiel	d of the
	quirement Text'						
Kela	ated Design Eler	nents					
32	2 3 1 Siemens-M	MITSS includes a	all of the following	nrocesses	defined in	the MMIT	TS
			P PerformanceObs		defined in		15
	C		_				
Des	ign (Comments/	Changes): MRP	Performance Obse	rver minir	nizes overa	ll delay, se	e [6].
		Design Criteria			Yes	-	Rank
1	Is the design un	0			X		
-	<u> </u>		with Depent(a)		X		
2	0,	gically consistent gn components?	with Parent(s),		Λ		
3	Is the design fea	v ,			Х		
4	Is the design ve	rifiable?			Х		
5	Is the requireme	ent fulfilled by the	e design?		Х		
Not	e: An answer of	no requires a co	mment or change	in the Co	mments/Cl	hange fiel	d of the
	sign Text' sectio	-					
Fina	al Resolution A	Approved X	Modify	Implen	nent Later	Drop	
Con	nments						

_	uirement Grou	up Related Sect	ion					
	EA-UC6-008	Con Ops						
	ated Needs	1, 2, 3						
	ent Section	7.1.6						
I-SI			ent Traffic Signal S	Systems (N	/IMITSS)-mo	easured in	tersection	
		(Comments/Cha						
Del	leted per the SD	D Walkthrough.						
	Re	quirement Criter	ia		Yes	No	/Rank	
1	Is the requirem	nent well-formed?			Х			
2	Is the requiren	nent unambiguous	?		Х			
3		nent logically cons sibling requirement			Х			
4	Is the requiren		115 :		Х			
5	Is the requiren	nent verifiable?			X			
	1			Insp.	Anal.	Test	Demo.	
6	If feasible and	verifiable, by whi	ch method?	F		X		
			omment or change	in the Co	mments/C		d of the	
	quirement Tex	-	minent of change	in the Co	initients/ Ci	liange ner	u or the	
Rela	ated Design Ele	ements						
Sier 3.12	nens-MMITSS 2.4 23030	and logs them. The	eceives queue lengt e data is forwarded					
Des	ign (Comments	s/Changes)						
		Design Criteria			Yes	No	Rank	
1	Is the design u	nambiguous?						
2	0	ogically consistent sign components?	with Parent(s),					
3	Is the design f	easible?						
4	Is the design v	verifiable?						
5	Is the requiren	nent fulfilled by th	e design?					
	e: An answer o sign Text' secti	-	omment or change	in the Co	mments/Cl	hange fiel	d of the	
Fina	Final Resolution Approved Modify Implement Later Drop X							
Con	nments							

Requirement Grou	p Related Sect					
THEA-UC6-008a	Con Ops					
Related Needs	1, 2, 3					
Parent Section	7.1.6					
Requirement Tex	t					
For each selected						
approaches and co		e execution sche	dule as imp	lemented	in the ava	ilable
release of MMITS		~ `				
Requirement Tex	•	0		-		
Req	uirement Crite	ria		Yes	No	/Rank
1 Is the require	ment well-forme	ed?		Х		
2 Is the require	ment unambiguo	ous?		Х		
3 Is the require	ment logically c	onsistent with		X		
1	l sibling require					
	ment feasible?			Х		
_	ment verifiable?			X		
1			Insp.	Anal.	Test	Demo.
6 If feasible and	d verifiable, by v	which method?	-		I-SIG	
Note: An answer	of no noquinos	a commont or a	hongo in tl	Comm	onta/Cha	ngo fiold
of the 'Requirem Related Design E 3.2.2.3.1 Siemens	ent Text' sectio lements ·MMITSS inclue	n. des all of the fol	lowing proc	cesses defi		2
of the 'Requirem Related Design E 3.2.2.3.1 Siemens MMITTS Detailed	ent Text' sectio lements MMITSS includ l Design docume	n. des all of the fol ent [6]: MRP	lowing proc _Performar	cesses defi aceObserv	er	
of the 'Requirem Related Design E 3.2.2.3.1 Siemens MMITTS Detailed Design (Commen	ent Text' sectio lements MMITSS includ l Design docume	n. des all of the fol ent [6]: MRP	lowing proc _Performan eeObserver	cesses defi aceObserv	er queues, s	
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Parent Section	7.1.6					
Requirement Tex						
For each selected						
approaches and co		e execution sche	dule as imp	lemented i	in the ava	ilable
release of MMITS						
Requirement Tex	•	<u> </u>				
Req	uirement Crite	eria		Yes	No	Rank
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-	EA-UC6-009_	Con Ops						
	lated Needs	11.2.1						
Par	ent Section	7.1.6						
Re	quirement Tex	xt						
Th	e Master Server	shall aggregate	travel times act	oss th	ne corri	idor.		
	-	xt (Comments/C	Changes)					
	leted per SDD	walkthrough						
On	nitted 'delay.'					7		<u></u>
	-	uirement Crite			J	res	No	/Rank
1	Is the require	ment well-forme	ed?					
2	Is the require	ment unambiguo	ous?					
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3.1	.2.4 Concert co	mputes aggregat	ted travel times	for co	nfigur	ed links v	which are	
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3.1	.2.4 Concert d	isplays travel tin	nes of links in it U	JI to the us	er.		
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2	Is the design	logically consis	tent with				
	Parent(s), an	d sibling design	components?				
3	Is the design	feasible?					
4	Is the design	verifiable?					
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			a comment or c	hange in tl	ne Comm	ents/Cha	nge field
of t	he 'Design To	ext' section.					
Fin Res	al solution	Approved	Modify	Impler Later	ment	Drop	X
Co	mments						

Req	luirement Gro	up Related Sec	ction						
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	ated Needs	1, 2, 3							
-	ent Section	7.1.6							
	uirement Text		shall be determined	in a confic	urabla time	thraphold	(starting		
	5 seconds).	Ivienulari Avenue	Shall be determined	in a coning		e unesnoio	(starting		
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3.1.	2.4 Travel time	e calculation in C	oncert is configurabl	e					
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	uirement Text		e shall be based on le	ength of co	rridor and d	letection p	oints.	
		t (Comments/C		0		•		
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		imes are calculate		Florida, an	d Nebrask	a.	
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	is the require		·	Insp.	Anal.	Test	Demo.
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oft	the 'Design To	ext' section.					
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	mments		1	I			
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Ree	quirement Gro	up Related Secti	on				
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	lated Needs						
	rent Section						
Re	quirement Te	ext					
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		AFB commuters d			meenams	sin to pro-	viue
		quirement Criter	2) S	Yes	No	/Rank
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2	Is the require	ement unambiguou	us?				
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4		ement feasible?					
5	-	ement verifiable?					
	1			Insp.	Anal.	Test	Demo.
6	If feasible ar	nd verifiable, by w	hich method?	F ·			
_		r of no requires a		hango in th	A Comm	ants/Chai	nga fiald
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4	Is the design						
5	Is the require	ement fulfilled by	the design?				
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of	the 'Design To	ext' section.					
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		h travel times alc xt (Comments/C		e Dri	ve to M	AFB com	imuters.	
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2	Is the require	ment unambiguo	ous?					
3	-	ement logically co						
		d sibling requirer	nents?					
4	Is the require	ement feasible?						
5	Is the require	ement verifiable?						
					Insp.	Anal.	Test	Demo.
6	If feasible an	d verifiable, by v	which method?					
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2	Is the design	logically consist	ent with					
	-	d sibling design c						
3	Is the design	feasible?						
4	Is the design	verifiable?						
5	Is the require	ment fulfilled by	the design?					
		of no requires a	a comment or	chan	ge in th	e Comm	ents/Cha	nge field
of	the 'Design Te	ext' section.						
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		sh travel times alor ext (Comments/Cl		oressv	vay to I	МАГВ СО	mmuters.	
Del	leted. The MA	FB gate app was r AFB commuters d	not completed.	Ther	e is no	mechanis	sm to pro	vide
	Re	quirement Criter	ia		Ŋ	les	No	/Rank
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2	Is the require	ement unambiguor	us?					
3	1	ement logically co d sibling requirem						
4	Is the require	ement feasible?						
5	Is the require	ement verifiable?						
				I	Insp.	Anal.	Test	Demo.
6	If feasible ar	nd verifiable, by w	hich method?					
		r of no requires a		hang	ge in th	e Comm	ents/Cha	nge field
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Re	lated Design I	Elements						
Da	sign (Commo	nts/Changes)						
Des	sign (Comme	C ,				7.0.7	No	/Dowlz
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Req	uirement Gro	up Related Sect	ion					
TH	EA-UC6-018	Con Ops						
-	ated Needs	4						
-	ent Section	7.1.6						
	uirement Text Ped-Sig applic	ation shall make a	pedestrian call to	the RSU	to the RS	U.		
	uirement Text	(Comments/Char	nges)				No/D	ank
	r	quirement Criteri	a		Yes		No/R	апк
1	-	nent well-formed?			X			
2	*	nent unambiguous			Х			
3		nent logically cons sibling requiremen			Х			
4	Is the requirer				Х			
5	Is the requirer	nent verifiable?			Х			
				Insp.	Anal.		Test	Demo.
6	If feasible and	verifiable, by which	ch method?				D-SIG_A D-SIG_B	
Not	e: An answer o	of no requires a co	mment or chang	ge in the (Comment			of the
	quirement Tex ated Design Ele							
sign ICD	al group. 23010	ansforms the reque	st into a ped call t	for the ph	ase associ:	ated	with the ide	ntified
Des	ign (Comment	<u> </u>		-			1	
		Design Criteria			Yes		No/R	ank
1	Is the design u	inambiguous?			Х			
2	0	ogically consistent sign components?	with Parent(s),		Х			
3	Is the design f	easible?			Х			
4	Is the design v	verifiable?			Х			
5	Is the requirer	nent fulfilled by the	e design?		Х			
	e: An answer o sign Text' secti	of no requires a co ion.	mment or chang	e in the (Comment	s/Ch	ange field o	of the
Fina	al Resolution	Approved X	Modify	Impl	ement Lat	ter	Drop	
Con	nments							

Req	uirement Grou	Related Section	on				
TH	EA-UC6-018a	Con Ops					
Rela	ated Needs	4					
Pare	ent Section	7.1.6					
	uirement Text						
	0 11		a user to point the			•	
	-	CROSS button t	to request to cross	the stree	t to the RS	SU Ped-S	ig
	lication.	(0 + 10)	``				
	•	(Comments/Cl	0 /		0		
	1	identifier and te	plicate of THEA-	000-010	5		
Aut		irement Criter		T	les	No	'Rank
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1		nent well-formed					
2	-	nent unambiguou					
3	-	nent logically co					
4	Is the requirem	sibling requirem					
5	-	nent verifiable?					
5	is the requirem			-			-
				Insp.	Anal.	Test	Demo.
6	If feasible and	verifiable, by w	hich method?			Х	
		of no requires a nt Text' section	comment or char	nge in th	e Commo	ents/Chai	nge field
	ated Design El		-				
3.4.	2.1 The PED-S	g app receives t	he SPaT message f	from the	RSU via	Wi-Fi inc	luding
		ance timer statu	-				0
3.6.	3 23027						
Des	ign (Comment	s/Changes)					
	D	esign Criteria		Y	les	No	'Rank
1	Is the design u	nambiguous?					
2	Is the design l	ogically consiste	ent with				
	Parent(s), and	sibling design co	omponents?				
3	Is the design f	easible?					
4	Is the design v	erifiable?					
5	Is the requirem	nent fulfilled by	the design?				
		-	comment or char	nge in th	e Comme	ents/Chai	nge field
01 U	he 'Design Tex	t' section.					
				. .			7
Fina Res	al diution	Approved	Modify	Impler Later	nent	Drop 2	X
-	nments		ı			1	

Requirement Group	Related Section					
THEA-UC6-018b	Con Ops					
Related Needs	4					
Parent Section	7.1.6					
Requirement Text The Ped-Sig applicat pedestrian clearance	ion shall audibly inform the pe timer.	destrian	of the a	bility	to cross a	and the
- -	Comments/Changes)					
Requir	ement Criteria		Yes		No/I	Rank
1 Is the requireme	nt well-formed?		Х			
2 Is the requireme	nt unambiguous?		Х			
-	nt logically consistent with bling requirements?		Х			
4 Is the requireme	nt feasible?		Х			
5 Is the requireme	nt verifiable?		Х			
		Insp.	Anal.	r	Test	Demo.
	erifiable, by which method?			PED	D-SIG_A D-SIG_B	

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section. Related Design Elements

3.4.2.1 The activity updates the screen UI accordingly.

ICD 23010: The PED-Sig feature of the pedestrian safety app uses Android's text-tospeech feature in order to audibly inform the user of the pedestrian signal head status including the "Flashing Don't Walk" countdown timer.

Des	sign (Comme	nts/Changes)			
		Design Criteria		Yes	No/Rank
1	Is the design	unambiguous?		X	
2	-	logically consistend sibling design c		X	
3	Is the design	feasible?		X	
4	Is the design	verifiable?		X	
5	Is the require	ement fulfilled by	the design?	X	
	te: An answei he 'Design To	-	comment or o	change in the Com	nents/Change field
	ne Design I				
Fina Res	al olution	Approved X	Modify	Implement Later	Drop
Cor	nments				

Requirement Group	Related Section					
THEA-UC6-018c	Con Ops					
Related Needs	4					
Parent Section	7.1.6					
Requirement Text						
The RSU Ped-SIG ap	plication shall receive the pede	estrian c	all from	the P	ID.	
Requirement Text (Comments/Changes)					
Added requirement id	entifier and text.					
Requir	ement Criteria		Yes		No/I	Rank
1 Is the requirement	nt well-formed?		Х			
2 Is the requirement	nt unambiguous?		Х			
	nt logically consistent with		Х			
Parent(s), and sit	oling requirements?					
4 Is the requirement	nt feasible?		Х			
5 Is the requirement	nt verifiable?		Х			
		Insp.	Anal.	r	Гest	Demo.
6 If feasible and ve	erifiable, by which method?				-SIG_A	
					-SIG_B	
Note: An answer of	no requires a comment or ch	ange in	the Co	mmen	ts/Chan	ge field

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section. Related Design Elements

3.4.2.1 When the user presses the button the PED-SIG screen activity sends the ped request to the Ped Safety Service. The Ped Safety Service selects the signal group for the crosswalk that the PID is facing based on the phone's location, the received intersection MAP, and the phone's heading. If a signal group is found which is associated with the crosswalk and heading then it sends a corresponding ped request to the RSU.

ICD 23028

Design (Comments/Changes)

	0 、	8 /				
		Design Criteria			Yes	No/Rank
1	Is the design	unambiguous?			Х	
2		logically consist d sibling design			Х	
3	Is the design	feasible?			Х	
4	Is the design	verifiable?			Х	
5	Is the require	ement fulfilled by	the design?		Х	
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Rec	uirement Group	Related Se	ection					
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	ent Section	7.1.6						
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	quirement Text		all send a pedestria (Changes)		the sign		muomer.	
	ded requirement		0 ,					
	-	irement Cri			Yes		No/	Rank
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2	Is the requirem	ent unambig	uous?		Х			
3	Is the requirem Parent(s), and s	. .	consistent with		Х			
4	Is the requirem	×			Х			
5	Is the requirem	ent verifiable	e?		Х			
	1			Insp.	Anal.		Test	Demo.
6	If feasible and	verifiable, by	which method?				D-SIG_A D-SIG_B	
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Rel 3.4 ider ICI Des	ated Design Ele 2.1 The RSU transition of 23006 sign (Comments	ements insforms the bup. S/Changes) esign Criteri	request into a ped o	call for t	Yes	e asso		th the
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	• · · · ·	controller vendor has verified th	nis option i	s not avai	lable in f	heir		
	nal controller.	inter vender nus venned i	ns option i	5 1101 4141		nen		
	ded requirement i	dentifier and text.						
		rement Criteria	Ŋ	es	No	/Rank		
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2	Is the requireme	nt unambiguous?						
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4		bling requirements?						
	4 Is the requirement feasible?							
5 Is the requirement verifiable?								
5	is the requireme							
5	13 the requireme		Insp.	Anal.	Test	Demo.		
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6 No of 1 3.2 req 3.8 De 1 2	If feasible and v te: An answer of the 'Requirement lated Design Eler .2.4 The Controller uesting extended .1 23006 sign (Comments/ Des Is the design una Is the design log Parent(s), and si	erifiable, by which method? no requires a comment or ch t Text' section. nents er Proxy component will use th walk time, if supported by the 1 Changes) sign Criteria ambiguous? sically consistent with bling design components? sible?	ange in th	e Commo	X ents/Cha	nge field		

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.

Final	Approved	Modify	Implement	Drop X
Resolution			Later	
Comments				

Rela Pare	uirement Group	Related Sec	tion				
Pare	EA-UC6-018f	Con Ops					
	ated Needs	4					
	ent Section	7.1.6					
-	uirement Text						
	U 1	plication shal	l receive the pede	strian tii	ning inf	formation from	m the
<u> </u>	al controller. uirement Text	(Comments/	hanges)				
	led requirement i		0				
		rement Crite			Yes	No	Rank
1	Is the requireme				X		
2	Is the requireme				Х		
3					Х		
	Parent(s), and s						
4	Is the requireme	ent feasible?			Х		
5	Is the requireme	ent verifiable?	?		Х		
				Insp.	Anal.	Test	Demo
6	If feasible and v	verifiable, by	which method?			PED-SIG_A	
			a comment or ch			PED-SIG_B	
	23006	(Changes)					
Desi	ign (Comments	0 .					
		sign Criteria			Yes	No	/Rank
1	Is the design un	ambiguous?			Х		
2	Is the design log				Х		
2	Parent(s), and s	<u> </u>	components?	_	X		
3	Is the design fea			_			
4	Is the design ve				Х		
5	Is the requireme	ent fulfilled by	y the design?		Х		
		no requires	a comment or ch	ange in	the Co	mments/Cha	
	he 'Design Text	-				1	nge field
of tl		' section.	Modify	Imp	omont	Dron	nge field
of tl Fina		-	Modify	Impl	ement r	Drop	nge field
of tl Fina Reso	al A	' section.	Modify	-		Drop	nge field
of tl Fina Reso	al A olution	' section.	Modify	-		Drop	nge field

Req	uirement Group	Related Section							
TH	E-UC6-018g	Con Ops							
Rel	ated Needs	4							
Par	ent Section	7.1.6							
Rec	Requirement Text								
The	RSU Ped-SIg ap	plication shall send the proceed	d to cros	s messa	ge to	the Ped-S	Sig		
app	lication running o	n the PID.							
	-	Comments/Changes)							
Ado	Added requirement identifier and text.								
	Requir	Yes			No/Rank				
1	Is the requireme	nt well-formed?	X						
2	Is the requireme	nt unambiguous?	X						
3	Is the requireme	nt logically consistent with	X						
	Parent(s), and si	bling requirements?							
4	Is the requireme	nt feasible?		Х					
5	Is the requireme	nt verifiable?		Х					
	·		Insp.	Anal.	,	Test	Demo.		
6	If feasible and v	erifiable, by which method?				D-SIG_A D-SIG_B			
				I	FLL	-2IO_D			

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

3.4.2.1 The service forwards the phase status and ped call status relevant to the crosswalk to the PED-SIG screen activity.

ICD 23027

Design (Comments/Changes)

	Design Criteria	Yes	No/Rank
1	Is the design unambiguous?	Х	
2	Is the design logically consistent with Parent(s), and sibling design components?	Х	
3	Is the design feasible?	Х	
4	Is the design verifiable?	Х	
5	Is the requirement fulfilled by the design?	Х	

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.

Final	Approved	Modify	Implement	Drop X
Resolution			Later	
Comments				

	uirement Grouj									
	A-SAF-001	RFQ OBU, H	IMI Interface and	Antenna; Sat	fety Manag	gement Pla	an			
	ated Needs									
-	ent Section	4.0; Table 5-1	IDs 22 and 23							
	uirement Text	processes and	interfaces shall o	omoly with IE	EE and S		de ac			
	Equipment, software, processes, and interfaces shall comply with IEEE and SAE standards as prescribed by one of the USDOT approved certification entities.									
		Comments/Char								
	Requirement Criteria Yes No/Rank									
			a			110/	Nalik			
1	*	ent well-formed?	~	<u>></u>						
2		ent unambiguous		Σ						
3		ent logically cons ibling requiremen		Х Х	ζ.					
4	Is the requireme			Σ	K					
5	Is the requireme	ent verifiable?		У	K					
				Insp.	Anal.	Test	Demo.			
6	6 If feasible and verifiable, by which method?									
	e: An answer of quirement Text'	-	mment or chang	e in the Con	nments/Cl	hange fiel	d of the			
	ated Design Eler									
T -1-1		a de ade terre l'estate								
Iabi	e 15: Industry Sta	ndards applicable	to OBU Design							
Err	or! Reference so	ource not found.								
Des	ign (Comments/	Changes)								
	D	esign Criteria		Y	es	No	'Rank			
1	Is the design un	ambiguous?		Х	K					
2	and sibling desi	gically consistent gn components?	with Parent(s),	Х						
3	Is the design fea	asible?		Σ	K					
4	Is the design ve			У						
5	*	ent fulfilled by the	Ũ	Х						
	e: An answer of sign Text' sectio	-	mment or chang	e in the Con	nments/Cl	hange fiel	d of the			
Fina	al Resolution A	Approved X	Modify	Impleme	ent Later	Drop				
Con	nments									

	uirement Gro										
	A-SAF-002	RFQ_OBU, H	MI Interface and A	ntenna; Sa	afety Mana	gement Pla	an				
	ated Needs	4.3 BM-010;	611 and 62								
-	uirement Text		0.1.1 and 0.2								
Equ	ipment, softwar	re, processes, and i ure they meet those				ility before					
		t (Comments/Char		operability							
		D walkthrough									
	Requirement Criteria Yes No/Rank										
1	r	-	a			110/	Kalik				
1	•	ment well-formed?			X						
2		ment unambiguous?			Х						
3		ment logically consi			Х						
4		sibling requiremen nent feasible?	ts?		X						
5	-	ment verifiable?			X						
5	is the requirer			т			D				
				Insp.	Anal.	Test	Demo.				
6	6 If feasible and verifiable, by which method?					Х					
		of no requires a co	mment or change	in the Co	mments/C	hange fiel	d of the				
	quirement Tex ated Design El										
	U			11							
	-	tor, with THEA tea for certification.	m concurrence, wi	ll provide	an interope	rability pro	ocess and				
the	supplier u plui										
Dee	· (C										
Des	ign (Comment	U .		-							
		Design Criteria			Yes	No	/Rank				
1	Is the design u	unambiguous?									
2		ogically consistent	with Parent(s),								
3	Is the design f	esign components?									
4	Is the design v										
			1								
5	•	ment fulfilled by the									
	e: An answer o sign Text' sect	of no requires a co ion.	mment or change	in the Co	mments/C	hange fiel	d of the				
	-										
Eine	al Resolution	Annuovad	Modify	Imploy	aant Latan	Duon V	7				
		Approved	Modify	Impien	nent Later	Drop X	L				
Con	nments										

	uirement Gro	-									
	A-SAF-003	Con Ops; Sa	afety Management F	Plan							
-	ated Needs										
	ent Section	8; 4.3.6, 6.2.	2								
	uirement Tex										
	During operations the TMC Operator and installation technicians shall performs checks on the equipment, software, interfaces, and processes on a six month basis at a minimum.										
	Requirement Text (Comments/Changes)										
	Deleted per the SDD walkthrough										
20	per life si										
	Re	equirement Criter	ria		Yes	No/	Rank				
1	Is the require	ment well-formed?)		Х						
2	Is the require	ment unambiguous	;?		Х						
3	Is the require	ment logically con	sistent with		X						
5	-	l sibling requireme			1						
4		ment feasible?			Х						
5	Is the require	ment verifiable?			Х						
	*			Insp.	Anal.	Test	Demo.				
6	If feasible and	d verifiable, by wh	ich method?	p.		1000	X				
						P* 1					
		-	omment or change	in the Co	mments/C	nange fiel	a of the				
	quirement Tex ated Design El										
Org	anizational Rec	quirement									
D	. (0										
Des	ign (Comment	ts/Changes)									
		Design Criteria			Yes	No	Rank				
1	Is the design	unambiguous?									
2	0	logically consisten									
		esign components?									
3	Is the design										
4	Is the design	verifiable?									
5	Is the require	ment fulfilled by th	ne design?								
			omment or change	in the Co	mments/C	hange fiel	d of the				
'De	sign Text' sect	tion.									
Fina	Final Resolution Approved Modify Implement Later Drop X										
Con	nments	**									
201											
-											

	uirement Grou		tion							
	A-SAF-004 ated Needs	Con Ops								
	ent Section	9.5.2								
-	uirement Text									
THE		n the RSUs install	ed along the road	side by m	nonitoring t	he RSU s	tatus from the			
	Requirement Text (Comments/Changes)									
	Req	uirement Criteri	a		Yes	Ν	No/Rank			
1	Is the requirer	nent well-formed?			Х					
2	Is the requirem	nent unambiguous	\$?		Х					
3		nent logically con sibling requireme			Х					
4	Is the requirem		4115 :		X					
5	Is the requirem	nent verifiable?			Х					
				Insp.	Anal.	Test	Demo.			
6	If feasible and	verifiable, by wh	ich method?				Maintenance			
		of no requires a c	omment or chan	ge in the	Comment	s/Change	field of the			
	quirement Tex ated Design Ele									
	e 1: Backend Se									
Des	ign (Comment	5 ,								
	Ι	Design Criteria			Yes	N	lo/Rank			
1	Is the design u	inambiguous?			Х					
2	0	ogically consisten sibling design cor			Х					
3	Is the design f	<u> </u>	•		Х					
4	Is the design v	verifiable?			Х					
5	Is the requirem	nent fulfilled by th	ne design?		Х					
	e: An answer o sign Text' secti	of no requires a co ion.	omment or chan	ge in the	Comment	s/Change	field of the			
		Approved X	Modify	Impler	nent Later	Drop				
Con	nments									

	uirement Gro								
	A-SAF-005	OBU Compon	ent Specification;	Safety Ma	nagement F	Plan			
	ated Needs								
	ent Section		-1 IDs 12, 14, 16						
	uirement Text	, ilure shall not affect	the normal operat	ion of the	vehicle				
		(Comments/Chan							
			8)						
	Requirement CriteriaYesNo/Rank								
1	Is the requirer	nent well-formed?			X				
2	^	nent unambiguous?			X				
	·	6			X				
3		nent logically consi sibling requiremen			Λ				
4	Is the requirer				Х				
5	Is the requirer	nent verifiable?			Х				
				Insp.	Anal.	Test	Demo.		
6	If feasible and	l verifiable, by whic	h method?			Safe_A			
Not	e: An answer o	of no requires a co	mment or change	in the Co	mments/C	hange field	l of the		
	quirement Tex	-	0			0			
Rela	Related Design Elements								
	· · -								
6 R6	equirements Tra	ceability Matrix							
The	OBU shall not	damage the vehicle	's electrical system	ns electro	nic systems	or cause	a fire or		
		t could damage the	-	· ·	-	· · · · · · · · · · · · · · · · · · ·	a 111 0 01		
			J		I				
		107							
Des	ign (Comment	s/Changes)							
		Design Criteria			Yes	No/	Rank		
1	Is the design u	inambiguous?			Х				
2	0	ogically consistent	with Parent(s),		Х				
3	Is the design f	sign components? easible?			X				
4	Is the design v				X				
5		nent fulfilled by the	design?		X				
_	•	of no requires a co		in the Co	mmonts/C	hange field	l of the		
	sign Text' sect	-	innent of change	in the Co	initionits/ C	nange new	i or the		
Fina	al Resolution	Approved X	Modify	Implen	nent Later	Drop			
Con	nments			I					

Req	uirement Gro	up Related Secti	ion							
	A-SAF-006	Safety Manag	ement Plan							
	ated Needs		0 14							
	ent Section	Table 5-1 IDs	3, and 4							
	uirement Text		the safe operation	of the sig	nal controll	or				
	RSU/Application failure shall not affect the safe operation of the signal controller. Requirement Text (Comments/Changes)									
Reg	requirement rent (comments, chunges)									
Requirement Criteria Yes No/Rank										
1		nent well-formed?			X					
2	· ·	nent unambiguous?	,		X					
3	•	nent logically consi			X					
5		sibling requiremen			Λ					
4	Is the requirer	nent feasible?			Х					
5	Is the requirer	nent verifiable?			Х					
				Insp.	Anal.	Test	Demo.			
6	If feasible and	l verifiable, by whic	ch method?			Safe_B				
Not	Note: An answer of no requires a comment or change in the Comments/Change field of the									
	'Requirement Text' section.									
Rela	ated Design El	ements								
6 0/	auiromonto Tro	oo obility Motrix								
0 6	equirements Tra									
RSI	J uses only stan	dard NTCIP interfa	aces for communica	tion with	the signal of	controller.				
	5				U					
Deg	an (Campant	a/Changes), DCU	where the failed to	ana ata Ni		ODT				
Des	ign (Comment		nust not be failed to		<u>^</u>					
		Design Criteria			Yes	No/	Rank			
1	Is the design u	inambiguous?			Х					
2	•	ogically consistent	with Parent(s),		Х					
3	Is the design f	sign components? easible?			X					
4	Is the design v				X					
5		nent fulfilled by the	e design?		X					
	•		mment or change i			hanga fial	d of the			
	sign Text' sect	-	linnent of change i		innents/C	nange new	1 of the			
Fina	al Resolution	Approved X	Modify	Implen	nent Later	Drop				
Con	nments									

Req	Requirement Group Related Section									
THE	A-SAF-007	Safety Manag								
Related Needs										
	Parent Section Table 5-1 ID 18									
	uirement Tex									
		ure shall not affect		tion of the PID.						
Req	urrement Tex	t (Comments/Cha	nges)							
	Pa	equirement Criter	ia	Yes		No/R	ank			
1	-		14			No/Rank				
1	Is the require	ment well-formed?		X						
2	Is the require	nent unambiguous	?	X						
3		ment logically cons		X						
4		sibling requirement feasible?	nts?	X						
5	*	nent verifiable?		X						
5	is the require				An	al. Test	Domo			
6	IC C '1.1	1	-1	Insp.	Ana	al. Test	Demo.			
6	-	l verifiable, by whi		App failure doc						
		-	omment or chang	ge in the Comments	/Cha	inge field	of the			
	quirement Tex ated Design El									
Ku	ateu Design Ei	cincints								
6 Re	6 Requirements Traceability Matrix									
		·								
And	roid OS implei	nents this requirem	ient.							
Des	ign (Comment	s/Changes)								
		Design Criteria		Yes		No/R	ank			
1	Is the design	unambiguous?		X						
2			with Parent(s)	X						
2	2 Is the design logically consistent with Parent(s), X and sibling design components?									
3										
4	Is the design	the design verifiable? X								
5	5 Is the requirement fulfilled by the design? X									
Note: An answer of no requires a comment or change in the Comments/Change field of the										
'Design Text' section.										
Final Resolution Approved X Mod			Modify	Implement Late	er	Drop				
Con	nments		1	I	1					

Reo	uirement Gro	up Related Sec	tion					
	THEA-SAF-008 Con Ops; Safety Management Plan							
Related Needs								
Parent Section 9.5.3;6.1.2								
	uirement Tex		hicles, buses, and	streat care				
		t (Comments/Cha		Slieel Cars	•			
		DD Walkthrough						
	1	C						
	Re	equirement Criter	ria		Yes	No	/Rank	
1	Is the require	ment well-formed	?		X			
2	•	ment unambiguous			X			
	<u>^</u>							
3		ment logically con l sibling requireme			Х			
4		ment feasible?	1115 :	-	X			
5	-	ment verifiable?			X			
5	is the require			T			D	
-	1			Insp.	Anal.	Test	Demo.	
6	If feasible and	d verifiable, by wh	ich method?	X				
		-	omment or change	e in the Co	mments/Cl	hange fiel	d of the	
	quirement Tex							
Rela	ated Design El	ements						
Organizational Requirement								
Des	ign (Comment	ts/Changes)						
	<u> </u>	Design Criteria			Yes	No	/Rank	
1	To the design	8				110/	Rains	
1	č	unambiguous?			X			
2					Х			
3	and sibling design components?3 Is the design feasible?				X			
4								
	5 Is the requirement fulfilled by the design? X							
		-	omment or change	e in the Co	mments/C	hange fiel	d of the	
'Design Text' section.								
Final Resolution Approved Modify			Impler	nent Later	Drop X			
	nments	**	5	r		r		
	linento							
-								

Rec	uirement Gro	up Related So	ection							
	THEA-SAF-009 Con Ops; Safety Management Plan									
Related Needs										
-	Parent Section 9.5.3;6.1.2									
-	uirement Text		ey receive GPS and	DSRC sig	nals.					
		t (Comments/Cl								
Deleted per the SDD Walkthrough										
	Re	equirement Crit	eria		Yes	No	/Rank			
1	•	nent well-forme			X					
2	•	nent unambiguo			Х					
3		nent logically co sibling requiren			Х					
4		nent feasible?			Х					
5	Is the requirer	nent verifiable?			X					
				Insp.	Anal.	Test	Demo.			
6	If feasible and	l verifiable, by w	hich method?			X				
		-	comment or change	in the Co	omments/C	hange fiel	d of the			
	quirement Tex ated Design El									
	anizational Rec									
Des	ign (Comment	s/Changes)								
		Design Criteria	a	Yes		No/Rank				
1	Is the design u	unambiguous?								
2	2 Is the design logically consistent with Parent(s), and sibling design components?									
3										
4	Is the design v									
5 Is the requirement fulfilled by the design?										
Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.										
Final Resolution Approved Modify		Implei	ment Later	Drop X	[
Con	Comments									

	uirement Gro		tion							
THEA-SAF-010 Con Ops										
	Related Needs Parent Section 5.2 Goal 2									
	Requirement Text									
RSI	RSUs shall be installed near signal cabinets such that the RSU and signal controller can be connected.									
	-	t (Comments/Cha	nges)							
Del	leted per the SL	DD Walkthrough								
	Re	equirement Criter	ia		Yes	No/	/Rank			
1	Is the requirer	ment well-formed?			X					
2	Is the require	ment unambiguous	?		Х					
3	Is the require	ment logically cons	sistent with		X					
	·	sibling requirement								
4	Is the requirer	ment feasible?			Х					
5	Is the requirer	ment verifiable?			Х					
	I			Insp.	Anal.	Test	Demo.			
6	If feasible and	l verifiable, by whi	ch method?	Х						
Not	e: An answer (of no requires a co	omment or change	in the Co	mments/C	hange fiel	d of the			
	quirement Tex									
Rela	ated Design El	ements								
Org	Organizational Requirement									
Des	ign (Comment	ts/Changes)								
		Design Criteria			Yes	No/	/Rank			
1	Is the design u	unambiguous?								
2										
3	and sibling design components? 3 Is the design feasible?									
4		lesign verifiable?								
5		ement fulfilled by the design?								
	•	_	÷	• 4h C		e 1-	1 - 6 41			
Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.										
Final Resolution Approved Modify			Modify	Implen	nent Later	Drop X	r L			
Con	Comments									

Requirement Group Related Section										
THEA-SAF-011 Participant Training and Stakeholder Education Plan										
-	Related Needs Parent Section Section 3.1									
	Requirement Text									
Requirement Text Participants shall bring their vehicles in for inspection within 14 days when the vehicle is involved										
	in a crash.									
-		(Comments/Char	0	.1						
This	s is to ensure the	e equipment is wor	king properly afte	r the ve	hicle has	been re	paired			
	Rec	quirement Criteria	a		Yes		No/Rank			
1		nent well-formed?			X		100/ 100/			
	•									
2	•	nent unambiguous?			Х					
3		nent logically cons			Х					
4	Is the requirer	sibling requirement	its ?		X					
	*				X					
5	is the requirem	nent verifiable?		-						
				Insp.	Anal.	Test	Demo.			
6	If feasible and	verifiable, by which	ch method?				OBU Inspection			
		of no requires a co	mment or chang	e in the	Comme	nts/Cha	ange field of the			
	quirement Tex									
Kela	Related Design Elements									
6 Re	equirements Tra	ceability Matrix								
	•	,								
Org	anizational Req	uirement								
Des	ign (Comment	s/Changes)								
		Design Criteria		Yes			No/Rank			
1	Is the design u	inambiguous?		X						
2	Is the design 1	design logically consistent with Parent(s),								
	Is the design logically consistent with Parent(s), X and sibling design components?									
3	3 Is the design feasible? X									
4	Is the design v	esign verifiable? X								
5	Is the requirement fulfilled by the design? X									
Note: An answer of no requires a comment or change in the Comments/Change field of the										
'Design Text' section.										
Final Resolution Approved X Modify			Imn	lement La	ater T	Drop				
			wouldy	mp			hoh			
Con	nments									

Req	Requirement Group Related Section											
	THEA-SAF-012 RFQ OBU, HMI Interface and Antenna											
	Related Needs Parent Section Section 4.2											
	uirement Text		nt information to dr		a dovice th	ot drivoro	oro					
	iliar with and lim			ivers using	a device li	lat unvers	ale					
		(Comments/Cha	nges)									
Deleted per the SDD Walkthrough												
Requirement CriteriaYesNo/Rank												
1	1 Is the requirement well-formed? X											
2	Is the requirem	nent unambiguous	?		Х							
3	·	nent logically con			Х							
4	Is the requirem	sibling requireme nent feasible?	nts?		X							
5	•	nent verifiable?			X							
				Insp.	Anal.	Test	Demo.					
6												
			omment or change	e in the Co	mments/C	hange fiel	d of the					
	quirement Tex ated Design Ele											
			ght duty trucks – Ea	-1		· · · · · · · · · · · · · · · · · · ·						
		·	ew mirror, that is n	naintaining	all original	mirror fur	nctions					
Des	ign (Comments	s/Changes)										
		Design Criteria			Yes	No/	Rank					
1	Is the design u	inambiguous?										
2	0	ogically consisten sign components?										
3	Is the design f											
4	Is the design v	verifiable?										
5	Is the requirem	nent fulfilled by th	e design?									
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.											
	al Resolution	Approved	Modify	Impler	nent Later	Drop X						
Con	nments											

	uirement Gro			ntonno. Sc	fati Mana	nomont Dk	22			
	THEA-SAF-013 RFQ OBU, HMI Interface and Antenna; Safety Management Plan Related Needs									
	Parent Section Section 5.6; Section 6.1.2 Requirement Text									
CV	device suppliers	s shall provide and t ting and producing		quality m	anagement	process ir	ו			
		t (Comments/Chan								
Del	leted per the SD	DD Walkthrough								
	Re	quirement Criteria	a]	Yes	No	'Rank			
1	1Is the requirement well-formed?X									
2	Is the requirer	nent unambiguous?			Х					
3		nent logically consi sibling requiremen			Х					
4 Is the requirement feasible? X										
5 Is the requirement verifiable? X										
	Insp. Anal. Test Demo.									
6	6 If feasible and verifiable, by which method? X									
	e: An answer o quirement Tex	of no requires a con at' section.	nment or change	in the Co	mments/C	hange fiel	d of the			
	ated Design El									
	anizational Req									
Des	ign (Comment	<u> </u>								
		Design Criteria]	Yes	No	Rank			
1	Is the design u	inambiguous?								
2	and sibling de	ogically consistent sign components?	with Parent(s),							
3	Is the design f	easible?								
4	Is the design v	verifiable?								
5	Is the requirer	nent fulfilled by the	design?							
	e: An answer o sign Text' sect	of no requires a con ion.	nment or change	in the Co	mments/C	hange fiel	d of the			
Fina	Final ResolutionApprovedModifyImplement LaterDrop X									
Con	nments									

Req	uirement Gro	up Related Sect	ion						
	A-SAF-014	Safety Manag	gement Plan						
	ated Needs								
-	ent Section	Section 6.1.1							
-	uirement Text		o reviewed and a	pproved by THEA a	nd stak	aboldore			
		(Comments/Cha							
	Re	quirement Criteri	a	Yes		No/R	ank		
1	Is the requirer	nent well-formed?		X					
2	Is the requirer	nent unambiguous	?	X					
3		nent logically cons sibling requiremer		X					
4	Is the requirer	nent feasible?		X					
5	Is the requirer	nent verifiable?		X					
				Insp.	Anal.	Test	Demo.		
6	If feasible and	verifiable, by whi	ch method?	HMI Graphics					
	e: An answer o quirement Tex	-	omment or chang	e in the Comments	/Chang	e field o	of the		
6 Re	a ted Design El equirements Tra anizational Req	ceability Matrix							
Des	ign (Comment	s/Changes)							
		Design Criteria		Yes		No/R	ank		
1	Is the design u	inambiguous?		X					
2	U U	ogically consistent sign components?	with Parent(s),	X					
3	Is the design f	<u> </u>		X					
4	Is the design v	verifiable?		X					
5	Is the requirer	nent fulfilled by th	e design?	X					
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.								
	1.0.1.1								
	Final Resolution Approved X Modify Implement Later Drop								
Con	nments								

	Requirement Group Related Section											
	THEA-SAF-015 OBU Component Specification; Safety Management Plan Related Needs Image: Component Specification (Component Plan)											
-	Related Needs Section 4.12.1.5; Section 6.1.1											
	uirement Text											
Safe	Safety checks for OBU's and RSU's shall comprise the equipment reset functions upon power loss and restoration.											
	Requirement Text (Comments/Changes)											
Del	leted per the SE	DD Walkthrough										
	Requirement Criteria Yes No/Rank 1 Is the memirment well formed? X											
1	Is the requirer	nent well-formed?			Х							
2	Is the requirer	nent unambiguous	?		Х							
3	Is the require	nent logically cons	istent with		X							
Parent(s), and sibling requirements?												
4	Is the requirer	ment feasible?			Х							
5	Is the requirer	nent verifiable?			Х							
				Insp.	Anal.	Test	Demo.					
6	6 If feasible and verifiable, by which method? X											
Not	e: An answer o	of no requires a co	omment or change	in the Co	mments/C	hange fiel	d of the					
'Re	quirement Tex	ct' section.				0						
	ated Design El											
		lude appropriate wa					processes					
and	alert the proces	ss monitor [on the (JBU] when a proce	ess appears	s to be inop	erative.						
Des	ign (Comment	s/Changes)										
		Design Criteria			Yes	No	/Rank					
1	Is the design u	unambiguous?										
2	0	ogically consistent	with Parent(s),									
2	0	sign components?										
3	Is the design f											
4	Is the design v											
5	5 Is the requirement fulfilled by the design?											
	Note: An answer of no requires a comment or change in the Comments/Change field of the											
•De	'Design Text' section.											
Fina	Final Resolution Approved Modify Implement Later Drop X											
Con	omments											

	Requirement Group Related Section											
	THEA-SAF-016 OBU Component Specification; Safety Management Plan Related Needs											
	ent Section	Section 3.1.4	Section 6.1.1									
	uirement Text											
Safe	Safety checks for OBU's and RSU's shall comprise the equipment reset functions upon power loss and restoration.											
	Requirement Text (Comments/Changes)											
Del	Deleted per the SDD Walkthrough											
Requirement Criteria Yes No/Rank												
1	1Is the requirement well-formed?X											
2	Is the requiren	nent unambiguous?	,		Х							
3 Is the requirement logically consistent with X												
Parent(s), and sibling requirements? 4 Is the requirement feasible? X												
5	*	nent verifiable?			X							
5	is the requirem	nent vermable:		Ince		Tast	Dama					
Insp. Anal. Test Demo.												
	6 If feasible and verifiable, by which method? x											
	e: An answer o quirement Tex	of no requires a contract of the section	mment or change	e in the Co	mments/C	hange fiel	d of the					
	ated Design Ele											
"Up	on power loss a	and restoration the I	RSU performs a se	cure boot c	hecking th	e integrity	and					
		nstalled software b			0	6 5						
T T	1			1 (1 1 1 1	• , •,	1					
-	A	nd restoration the O nstalled software b	A		necking the	integrity	and					
uuti	ientienty of the f	instance software s	erore executing it.	•								
Des	ign (Comments	s/Changes)										
		Design Criteria			Yes	No	/Rank					
1	Is the design u	inambiguous?										
2	Is the design le	ogically consistent	with Parent(s),									
2	0	sign components?										
3	Is the design f											
4	Is the design v		design?	-								
	5 Is the requirement fulfilled by the design?											
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.											
Fina	al Resolution	Approved	Modify	Implen	nent Later	Drop X						
Con	nments					·						

	Requirement Group Related Section									
-	THEA-SAF-017 OBU Component Specification; Safety Management Plan Related Needs									
	Parent Section Section 3.1.4; Section 6.1.1									
	uirement Text									
Safe	Safety checks for OBU's and RSU's shall comprise the security actions upon power loss and restoration.									
		(Comments/Chan	ages)							
Del	leted per the SD	D Walkthrough								
Requirement CriteriaYesNo/Rank										
1	Is the requirem	nent well-formed?			Х					
2	Is the requiren	nent unambiguous?			Х					
3	*	nent logically consi			Х					
4		sibling requiremen	ts?		V					
4	Is the requiren				X					
5	Is the requirem	nent verifiable?			X					
				Insp.	Anal.	Test	Demo.			
6	If feasible and	verifiable, by which	h method?			Х				
		of no requires a con	mment or change	in the Co	mments/C	hange fiel	d of the			
	quirement Tex									
	ated Design Ele		~~~~			<u> </u>				
		nd restoration the F nstalled software be		cure boot c	checking th	e integrity	and			
auti	lentierty of the f	instance software by	crore executing it.							
-	A	nd restoration the O	·		hecking the	e integrity	and			
auth	enticity of the i	nstalled software be	efore executing it.'	'						
Deg	an (Commont)									
Des	ign (Comments	5 /								
	r	Design Criteria			Yes	No	Rank			
1	Is the design u	inambiguous?								
2	0	ogically consistent	with Parent(s),							
3	Is the design f	sign components? easible?								
4	Is the design v									
5		nent fulfilled by the	design?							
	•	•	0	in the Co	mmonts/C	hange fiel	d of the			
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.									
Fina	al Resolution	Approved	Modify	Implen	nent Later	Drop X	K			
Con	Comments									

	Requirement Group Related Section											
	THEA-SAF-018 OBU Component Specification; Safety Management Plan Related Needs											
	Parent Section Section 3.1.4; Section 6.1.1											
	uirement Text											
Safe	Safety checks for OBU's and RSU's shall comprise the equipment reset functions, redundancy,											
	security, and actions upon power loss and restoration.											
	Requirement Text (Comments/Changes) Deleted per the SDD Walkthrough											
	Deleted per the SDD warkthrough											
	Requirement CriteriaYesNo/Rank											
1	1 Is the requirement well-formed?											
2												
3 Is the requirement logically consistent with X												
C		sibling requirement										
4	Is the requirem	nent feasible?			Х							
5	Is the requirem	nent verifiable?			Х							
				Insp.	Anal.	Test	Demo.					
6 If feasible and verifiable, by which method? X												
		of no requires a co	mment or change	in the Co	mments/C	hange fiel	d of the					
	quirement Tex											
	ated Design Ele											
		ind restoration the			checking th	e integrity	and					
auth	ienticity of the 1	nstalled software b	efore executing it.									
Upc	on power loss ar	nd restoration the C	BU performs a sec	cure boot c	hecking the	integrity	and					
		nstalled software b			C	0.1						
Des	ign (Comment	s/Changes)										
		Design Criteria			Yes	No	'Rank					
1	Is the design u	inambiguous?										
2		ogically consistent	with Parent(s),									
3	and sibling de Is the design f	sign components?										
4	Is the design v											
			a design?									
	5 Is the requirement fulfilled by the design? Nate: An ensure of ne mervine a comment on change in the Commenta/Change field of the											
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.											
Fina	al Resolution	Approved	Modify	Implen	nent Later	Drop X	<u> </u>					
Con	Comments											

	Requirement Group Related Section											
	THEA-SAF-019 Safety Management Plan											
	Related Needs Parent Section Section 6.1.1											
-	uirement Tex		1.1									
Unir	Uninterruptible power supply units with sufficient holdup time (2 hours) to implement the response											
	plans shall be installed at all signal controller cabinets as part of the pilot. Requirement Text (Comments/Changes)											
	eted	t (Comments/C	nanges)									
	oteu											
	Requirement Criteria Yes No/Rank											
1	1 Is the requirement well-formed? X											
2	Is the require	ment unambiguo	us?		Х							
3	·	ment logically co			X							
4		l sibling requiren ment feasible?	nents?		X							
5	•	ment verifiable?			X							
5	is the require	linent vermuoie.		Inco		Test	Dama					
Insp. Anal. Test Demo.												
-	6 If feasible and verifiable, by which method? X											
	e: An answer (quirement Tex	-	comment or change	in the Co	mments/C	hange fiel	d of the					
	ated Design El											
	anizational Red											
Org		Junement										
Dec	ign (Comment	ta/Changag)										
Des		U .			Yes	N	/D l-					
1	To the design	Design Criteria	a		ies	100/	Rank					
1	0	unambiguous?	·									
2	0	logically consistences ign component	ent with Parent(s), s?									
3	Is the design	feasible?										
4	Is the design	verifiable?										
5	5 Is the requirement fulfilled by the design?											
Not	Note: An answer of no requires a comment or change in the Comments/Change field of the											
'De	'Design Text' section.											
Fina	al Resolution	Approved	Modify	Implen	nent Later	Drop X						
Con	nments											

	Requirement Group Related Section									
	THÊA-SAF-020 Safety Management Plan									
	Related Needs Parent Section Section 6.1.2									
	uirement Text	36010110.1.2								
Dev	Device installers shall be approved by the in-vehicle integrator to install devices in vehicles, buses, street cars.									
Rec	Requirement Text (Comments/Changes)									
Requirement Criteria Yes No/Rank										
1	1 Is the requirement well-formed? X									
2	Is the requireme	ent unambiguous	?	2	X					
3 Is the requirement logically consistent with X Parent(s), and sibling requirements?										
4 Is the requirement feasible? X										
5	Is the requireme	ent verifiable?		2	X					
Insp. Anal. Test										
6	6 If feasible and verifiable, by which method? Installers									
		-	mment or chang	e in the Cor	nments/Cl	hange fiel	d of the			
	quirement Text' ated Design Eler									
The veh	icle systems.	mmunity College	e automotive train	ing facilities	and perso	nnel to ins	tall the			
Des	ign (Comments/	Changes)								
	D	esign Criteria		Y	es	No	/Rank			
1	Is the design un	ambiguous?		2	X					
2		gically consistent gn components?	with Parent(s),	2	X					
3	Is the design fea	sible?		2	X					
4	Is the design ve	rifiable?		2	X					
5	Is the requireme	ent fulfilled by the	e design?	2	X					
	e: An answer of sign Text' sectio	-	mment or chang	e in the Cor	nments/Cl	hange field	d of the			
		Approved X	Modify	Implem	ent Later	Drop				
Cor	nments									

	Requirement Group Related Section										
-	HEA-SAF-020a Safety Management Plan										
	elated Needs arent Section Section 6.1.2										
	uirement Text										
		e trained in the ope	eration and interac	tion of the ir	nstalled On	board Uni	ts.				
		(Comments/Char									
	Requirement CriteriaYesNo/Rank										
1	Is the requirem	nent well-formed?			X						
2											
3 Is the requirement logically consistent with X Parent(s), and sibling requirements?											
4 Is the requirement feasible? X											
5	Is the requirem	nent verifiable?			X						
	<u> </u>			Insp.	Anal.	Test	Demo.				
6	If feasible and	verifiable, by which	ch method?	Training							
	e: An answer o quirement Tex	of no requires a co	mment or change	e in the Co	nments/C	hange fiel	d of the				
The	equirements Trac Hillsborough C icle systems.	ceability Matrix Community College	e automotive traini	ng facilities	and perso	nnel to ins	stall the				
Des	ign (Comments	s/Changes)									
		Design Criteria		Ŋ	es	No	/Rank				
1	Is the design u	inambiguous?			X						
2	0	ogically consistent sign components?	with Parent(s),		X						
3	Is the design f	<u> </u>			X						
4	Is the design v	verifiable?			X						
5	Is the requirem	nent fulfilled by the	e design?		X						
	e: An answer o sign Text' secti	of no requires a co ion.	mment or change	e in the Co	nments/C	hange fiel	d of the				
Fina	Final Resolution Approved X Modify Implement Later Drop										
Con	nments										

	Requirement Group Related Section										
	THEA-SAF-021 Safety Management Plan										
	Related Needs Section 6.1.2										
	uirement Text										
		all be approved by	the infrastructure	integrator T	HEA and t	he COT to	install				
devi	ices in signal ca	binets and along t	he roadside.								
Req	Requirement Text (Comments/Changes)										
Requirement Criteria Yes No/Rank											
1	Is the requirer	nent well-formed?			X						
2	Is the requirer	nent unambiguous	?		X						
3 Is the requirement logically consistent with X											
		sibling requirement	nts?	ļ							
4	Is the requirer	nent feasible?			X						
5	Is the requirer	nent verifiable?			X						
Insp. Anal. Test Dem											
6	6 If feasible and verifiable, by which method? Installers										
Not	e: An answer o	of no requires a co	omment or chang	e in the Cor	nments/C	hange fiel	d of the				
	quirement Tex										
Rela	ated Design El	ements									
6 R4	equirements Tra	ceability Matrix									
010											
Org	anizational Req	uirement									
Des	ign (Comment	s/Changes)									
		Design Criteria		Y	es	No	Rank				
1	Is the design u	inambiguous?			X						
2	Is the design 1	ogically consistent	with Parent(s),		X						
3	and sibling de Is the design f	sign components?			X						
-	Is the design v				л Х						
4	Ũ		a dagian?								
	5 Is the requirement fulfilled by the design? X										
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.										
Fina	al Resolution	Approved X	Modify	Implem	ent Later	Drop					
Con	Comments										

-	Requirement Group Related Section										
	THEA-SAF-022 OBU Component Specification; Safety Management Plan Related Needs										
	ent Section	Section 4.1	2.1.5; Section 6.1.2								
	uirement Text		2.1.0, 000001 0.1.2								
RSI	RSUs installed for the pilot shall have a fail-safe mode.										
	-	t (Comments/Ch	0		11						
Del	Deleted as there are no hardware failure scenario where harm could be caused.										
	Requirement CriteriaYesNo/Rank										
1	Is the requirer	nent well-formed	1?		X						
2	Is the requirer	ment unambiguou	18?		Х						
3		nent logically co			Х						
4	Parent(s), and Is the require	sibling requirem	ents?		X						
	*										
5	Is the require	ment verifiable?		-	X		5				
	xa a 11 1			Insp.	Anal.	Test	Demo.				
6		l verifiable, by w				Х					
			comment or change	in the Co	mments/C	hange fiel	d of the				
	quirement Tex ated Design El										
	U		• DCU asafaansa o oo		ah a alain a 4h	- intoit	and				
			e RSU performs a se before executing it.								
			adcast via DSRC.		n good upp	neution so.	itware				
	1 01		e to reload and restart ion took place. Such		•						
		•	a failed process unt			-	ly steres is				
Des	ign (Comment	U		1							
		Design Criteria	l		Yes	No	/Rank				
1	Is the design u	unambiguous?									
2			nt with Parent(s),								
3	Is the design f	esign components feasible?	57 								
4	Is the design v										
5	Is the requirer	ment fulfilled by	the design?								
Not	Note: An answer of no requires a comment or change in the Comments/Change field of the										
'De	'Design Text' section.										
Fina	al Resolution	Approved	Modify	Impler	nent Later	Drop X					
Con	nments										

	uirement Group	Related Secti	on									
	A-PFM-001	Con Ops										
	ated Needs	Section 11.2.7	1									
Req	uirement Text CUTR Server shall			reatment" perform	nance n	netrics for e	each					
	App used in each l											
Req	Requirement Text (Comments/Changes) Requirement Criteria Yes No/Rank											
	-		a	Yes		No/R	ank					
1	Is the requiremen	t well-formed?		X								
2	Is the requiremen	t unambiguous?	,	X								
3	Is the requiremen Parent(s), and sib	••••		X								
4	Is the requiremen	t feasible?		X								
5	Is the requiremen	t verifiable?		X								
				Insp.	Anal	. Test	Demo.					
6	If feasible and ve	rifiable, by whic	ch method?	Data Logged								
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.											
3.1.: the	ated Design Elemo	ollects the data l rea in order to o			UTR S	erver acces	sses to					
Des	ign (Comments/C	0										
	De	sign Criteria		Yes		No/R	ank					
1	Is the design una	U U		X								
2	Is the design logic and sibling design	n components?	with Parent(s),	X								
3	Is the design feas	ible?		X								
4	Is the design veri	fiable?		X								
5	Is the requiremen	t fulfilled by the	e design?	Х								
	e: An answer of n sign Text' section.	-	mment or chang	e in the Commer	nts/Cha	nge field o	of the					
Fina	al Resolution Ap	proved X	Modify	Implement L	ater	Drop						
Con	nments											

-	uirement Group		ion									
-	THEA-PFM-002 Con Ops Related Needs											
-	ated Needs	Section 11.2.	1									
	uirement Text	00000111.2.	<u> </u>									
The	CUTR Server sha		l or "before CV trea	atment" performa	nce me	etrics for e	each CV					
	used in each Use											
Req	uirement Text (.omments/Char	iges)									
	Requirement CriteriaYesNo/Rank											
1	Is the requireme	nt well-formed?		X								
2	Is the requireme	nt unambiguous?)	X								
3	Is the requireme	nt logically consi	istent with	X								
4	Parent(s), and si		ts?	V								
4	Is the requireme			X								
5	Is the requireme	nt verifiable?		X		-						
	Γ			Insp.	Anal.	Test	Demo.					
6	If feasible and v			Data Logged								
	Note: An answer of no requires a comment or change in the Comments/Change field of the											
'Requirement Text' section. Related Design Elements												
Iter	ateu Design Lien											
3.1.	2.4 Ultimately all	data used as basi	s for performance	measures is conc	entrate	ed at the C	UTR					
Serv	ver.											
Dec	ian (Commontal	Thomas										
Des	ign (Comments/	<u> </u>										
		esign Criteria		Yes		No/ł	Rank					
1	Is the design una	e		X								
2	Is the design log and sibling design	-	with Parent(s),	X								
3	Is the design fea	/ 1		X								
4	Is the design ver	ifiable?		X								
5	Is the requireme	nt fulfilled by the	e design?	X								
Not	e: An answer of	no requires a co	mment or change	in the Commen	ts/Cha	nge field	of the					
	sign Text' section	-				0						
Fina	Final Resolution Approved X Modify Implement Later Drop											
Con	nments		1		I							

	uirement Group	Related Section				
THE	A-PFM-003	Con Ops				
Rela	ated Needs					
Pare	ent Section	Section 11.2.1				
	uirement Text CUTR Server shall	collect performance metrics for	each CV App use	d during	a each l	Jse Case
		omments/Changes)	••		<u>.</u>	
	Requi	ement Criteria	Yes		No/Rank	
1	Is the requirement	well-formed?	X			
2	Is the requirement	Х				
3 Is the requirement logically consistent with Parent(s), and sibling requirements?			X			
4	Is the requirement	feasible?	X			
5	Is the requirement	verifiable?	X			
			Insp.	Anal.	Test	Demo.
6	If feasible and ver	ifiable, by which method?	Data Logged			
		requires a comment or change	e in the Commer	nts/Cha	nge fiel	d of the
	quirement Text' so					
Kela	ated Design Eleme	nts				
21	2 2 Mart Cannact as	llasta tha data lasa asuring fusur	the DOLLS. The C			
		ea in order to obtain those data log				
		ch hosts a SQL database (Micros	0			
		Services). RSUs measure average	~ /	-	0	
	1 0	on to Concert". Concert associate	· 1			
		ne metrics. It saves those in the S				
		rver, which shares data per the Pe				
		orting Service allows a user to run				
		time period) It also allows the		-	-	

specific parameters (e.g. time period). It also allows the user to schedule reports to be created in regular intervals (daily, weekly, or monthly) automatically. Such reporting jobs can also be configured to send the report to a provided email address. Please see further below for a list of supported reports. Finally, the existing Centracs traffic control system at the City of Tampa TMC collects traffic counts and percent arrival on green from connected traffic controllers. The CUTR server can access this information from the Centracs system used to manage the traffic signal controllers via NTCIP.

Design (Comments/Changes) **Design Criteria** No/Rank Yes Is the design unambiguous? Х 1 Х 2 Is the design logically consistent with Parent(s), and sibling design components? 3 Х Is the design feasible? Х 4 Is the design verifiable? 5 Is the requirement fulfilled by the design? Х Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section. Final Resolution Approved X Modify Implement Later Drop Comments

Rec	quirement Group	Related Section									
	A-PFM-004	Con Ops									
	ated Needs	-									
	ent Section	Section 11.2.1 & 11.2.2									
	quirement Text			مار بینام م							
		store performance metrics for ea omments/Changes)	ch CV App used	auring	each Us	se Case					
mu	an ement Text (Co	sinnenus, chunges)									
	Requi	rement Criteria	Yes		No	'Rank					
1	Is the requirement	well-formed?	X								
2	Is the requirement	unambiguous?	X								
3	Is the requirement	logically consistent with	Х								
	Parent(s), and sibl										
4	Is the requirement	feasible?	Х								
5	Is the requirement	verifiable?	Х								
			Insp.	Anal.	Test	Demo.					
6	If feasible and ver	ifiable, by which method?	Data Logged								
Not	te: An answer of no	o requires a comment or change	in the Commen	ts/Chai	nge fiel	d of the					
	equirement Text' se										
Rel	ated Design Eleme	nts									
3.1.	2.3 NextConnect co	ollects the data logs coming from t	he RSUs. The C	UTR Se	rver acc	cesses to					
		ea in order to obtain those data log									
		ch hosts a SQL database (Microso		-	•						
		Services). RSUs measure average	-								
		on to Concert". Concert associated									
		ne metrics. It saves those in the S									
	2	rver, which shares data per the Per									
		orting Service allows a user to run g. time period). It also allows the u		~	-						
-	· · ·			-							
-		regular intervals (daily, weekly, or monthly) automatically. Such reporting jobs can also be									
	•	configured to send the report to a provided email address. Please see further below for a list of supported reports. Finally the existing Centracs traffic control system at the City of Tampa TMC									
		· ·	ontrol system at t			pa TMC					
		ally the existing Centracs traffic co	-	-		-					
	ver can access this h	· ·	connected traffic	controll	ers. The	e CUTR					
con	trollers via NTCIP.	ally the existing Centracs traffic conducted and percent arrival on green from c	connected traffic	controll	ers. The	e CUTR					
	trollers via NTCIP.	ally the existing Centracs traffic conductive of the existing Centracs traffic conductive of the centracs and the centracs systems of the centrac systems	connected traffic	controll	ers. The	e CUTR					
	trollers via NTCIP. sign (Comments/Cl	ally the existing Centracs traffic conductive of the existing Centracs traffic conductive of the centracs and the centracs systems of the centrac systems	connected traffic	controll	ers. The	e CUTR					

		Design Criteria		Yes	No/Ranl	k			
1	Is the design	unambiguous?		X					
2	0	logically consisten esign components?	· · · ·	X					
3	Is the design	feasible?	X						
4	Is the design	verifiable?	X						
5	Is the require	ment fulfilled by th	ne design?	X					
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.								
Fin	al Perclution	Approved X	Modify	Implement l	ater Drop				

Final Resolution	Approved X	Modify	Implement Later	Drop
Comments				

	uirement Group		on								
-	A-PFM-005	Con Ops									
	ated Needs	Section 11.2.5	5								
-	uirement Text	0000011112.0	, 								
The	CUTR Server sha		lysis or compare h								
	performance metrics for each CV App used in each Use Case to "after CV treatment" performance metrics for each CV App used in each Use Case.										
	uirement Text (
	Requ	irement Criteria	a	Yes		No/I	Rank				
1	1 Is the requirement well-formed? X										
2	Is the requireme	nt unambiguous?		Х							
3	-	nt logically consi bling requirement		Х							
4	Is the requireme		15 /	Х							
5	Is the requireme	nt verifiable?		Х							
				Insp.	Anal.	Test	Demo.				
6	If feasible and v	erifiable, by whic	h method?	Data Logged							
			nment or change	in the Commen	ts/Cha	nge field	of the				
	quirement Text' ated Design Elen										
	2.3 CUTR server, port Plan.	which shares dat	a per the Performa	nce Measuremen	nt and E	Evaluation	1				
Des	ign (Comments/	Changes)									
	D	esign Criteria		Yes		No/l	Rank				
1	Is the design una	ambiguous?		Х							
2	Is the design log and sibling design	gically consistent	with Parent(s),	Х							
3	Is the design fea			Х							
4	Is the design ver	rifiable?		Х							
5	Is the requireme	nt fulfilled by the	design?	Х							
	e: An answer of sign Text' section		nment or change	in the Commen	nts/Cha	nge field	of the				
	10 1	1 **		x 1 -							
Fina	al Resolution A	Approved X	Modify	Implement L	ater 1	Drop					
Con	nments										

Rea	uirement Grou	p Related Sec	rtion								
-	A-PFM-006	Con Ops									
Rela	ated Needs										
	ent Section	Section 11.2	2.5								
Requirement Text The CUTR Server shall automate routine performance reports.											
Requirement Text (Comments/Changes)											
1.04											
	Requirement CriteriaYesNo/Rank										
1	Is the requirem	nent well-formed	?		Х						
2	Is the requirem	nent unambiguou	s?		Х						
3	3 Is the requirement logically consistent with Parent(s), and sibling requirements?				Х						
4	Is the requirem	0 1			Х						
5 Is the requirement verifiable?				Х							
			Insp.	Anal.	Test	Demo.					
6	If feasible and	verifiable, by wh	nich method?				Reports				
	e: An answer o quirement Tex	-	comment or change	e in the Co	mments/C	hange fiel	d of the				
para	meters (e.g. tin	•	s a user to run a repo allows the user to s automatically	-	•	· ·					
Des	ign (Comment	s/Changes)									
		Design Criteria			Yes	No	/Rank				
1	Is the design u	nambiguous?			X						
2		ogically consister			Х						
3	Is the design f	easible?			Х						
4	Is the design v	erifiable?			Х						
5	Is the requirem	nent fulfilled by t	he design?		Х						
	e: An answer o sign Text' secti	-	comment or change	e in the Co	mments/Cl	hange fiel	d of the				
Fina	al Resolution	Approved X	Modify	Implen	nent Later	Drop					
Comments											

Req	uirement Gro	oup Related Sect	tion								
-	A-PFM-007	Con Ops									
Rela	ated Needs										
-	ent Section	Section 11.2.	.5								
Requirement Text The CUTR Server shall support on demand performance reports.											
Requirement Text (Comments/Changes)											
	R	equirement Criter	ia		Yes	No	Rank				
1	Is the require	ment well-formed?			Х						
2	Is the require	ment unambiguous	?		Х						
3		ment logically cons sibling requirement			Х						
4		ment feasible?			Х						
5	Is the require	ment verifiable?			Х						
				Insp.	Anal.	Test	Demo.				
6 If feasible and verifiable, by which method?				-			Reports				
Not	e: An answer	of no requires a co	omment or chang	e in the Co	mments/Cl	hange fiel	d of the				
'Requirement Text' section. Related Design Elements											
	2.4 The Report ameters (e.g. tin	ing Service allows ne period).	a user to run a rep	oort and spec	cify certain	report-spe	cific				
Des	ign (Commen	ts/Changes)									
		Design Criteria			Yes	No	/Rank				
1	Is the design	unambiguous?			X						
2	Ŭ	logically consistent esign components?	t with Parent(s),		Х						
3	Is the design	<u> </u>			Х						
4	Is the design	verifiable?			Х						
5	Is the require	ment fulfilled by th	e design?		X						
	e: An answer sign Text' sec	of no requires a co tion.	omment or chang	e in the Co	mments/Cl	hange fiel	d of the				
Fina	al Resolution	Approved X	Modify	Implen	nent Later	Drop					
Comments Instance Instance Instance Instance											

Rec	uirement Grou	p Related So	ection							
	EA-PFM-008_	Con Ops								
Rel	ated Needs									
	ent Section	11.2.5								
	quirement Tex									
			daily performance	reports.						
	quirement Tex									
	eted per the SE anged 'automat	U U								
Cha		uirement Crit			les	No	/Rank			
1	-				105					
		ment well-form		_						
2	Is the require	ment unambigu	ious?							
3			consistent with							
		l sibling require	ements?	_						
4 Is the requirement feasible?										
5	Is the require	ment verifiable	?							
				Insp.	Anal.	Test	Demo.			
6	If feasible and	d verifiable, by	which method?			X				
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.									
Rel	ated Design E	lements								
3.1	.2.4 Reports car	n be scheduled	to run automatica	lly. Daily,	weekly, a	nd month	ly reports			
	supported.									
Des	sign (Commen	ts/Changes)								
	I	Design Criteria	a	Y	les	No	/Rank			
1	Is the design	unambiguous?								
2	Is the design	logically consis	stent with							
	•	l sibling design								
3	Is the design	UU								
4	Is the design	verifiable?								
5	Is the require	ment fulfilled b	by the design?							
Not	-	of no requires	a comment or ch	nange in th	e Commo	ents/Cha	nge field			
Fin	al	Approved	Modify	Impler	nent	Drop 2	X			
	solution	TT		Later	*	P				
-	Comments									
	Comments									

Rec	uirement Gro	up Related Sect	ion							
_	A-PFM-009	Con Ops	1011							
	ated Needs									
Pare	ent Section	11.2.5								
-	uirement Tex Master Server	t shall automate we	ekly performance r	enorts						
		t (Comments/Cha		000110.						
	leted per the S	SDD walkthrough			Yes	No	Rank			
		-	14			110/	Nalik			
1	Is the require	ment well-formed?			Х					
2	Is the require	quirement unambiguous? X								
3	3 Is the requirement logically consistent with Parent(s), and sibling requirements?				Х					
4		ment feasible?			Х					
5	Is the require	ment verifiable?			Х					
			Insp.	Anal.	Test	Demo.				
6	If feasible and	d verifiable, by whi	ch method?			Х				
		of no requires a co	omment or change	e in the Co	mments/C	hange fiel	d of the			
-	quirement Te									
Rel	ated Design E	lements								
	ported.	n be scheduled to r								
Des	ign (Commen	ts/Changes)								
		Design Criteria			Yes	No	/Rank			
1	Is the design	unambiguous?								
2		logically consistent esign components?	with Parent(s),							
3	Is the design	<u> </u>		-						
4	Is the design	verifiable?								
5	Is the require	ment fulfilled by th	e design?							
	e: An answer sign Text' sect	of no requires a co tion.	omment or change	e in the Co	mments/C	hange fiel	d of the			
Fina	al Resolution	Approved	Modify	Impler	nent Later	Drop X				
Cor	nments									

Rec	juirement Gro	up Related Sect	ion									
	A-PFM-010	Con Ops	1011									
-	ated Needs											
Pare	ent Section	11.2.5										
	uirement Tex Master Server	t shall automate mo	nthly performance	reports.								
		t (Comments/Cha		•								
De	Deleted per the SDD walkthrough Requirement Criteria Yes No/Rank											
	R	equirement Criter	ia		Yes	No	Rank					
1	•	ment well-formed?			Х							
2	· ·	ment unambiguous			X							
3	3 Is the requirement logically consistent with Parent(s), and sibling requirements?				Х							
4	Is the require	ment feasible?			Х							
5	5 Is the requirement verifiable?				Х							
					Anal.	Test	Demo.					
6	6 If feasible and verifiable, by which method? X											
	Note: An answer of no requires a comment or change in the Comments/Change field of the											
	quirement Ter ated Design E											
		in be scheduled to r	un automatically.	Doily wook	ly and mo	nthly ropo	rta ara					
	ported.											
Des	ign (Commen	ts/Changes)		<u>.</u>								
		Design Criteria			Yes	No/	Rank					
1	Is the design	unambiguous?										
2	U	logically consistent esign components?	with Parent(s),									
3	Is the design	<u> </u>										
4	Is the design	verifiable?										
5	Is the require	ment fulfilled by th	e design?									
	e: An answer sign Text' sect	of no requires a co tion.	omment or change	in the Co	mments/C	hange fiel	d of the					
Fina	al Resolution	Approved	Modify	Implen	nent Later	Drop X						
Cor	nments											

Rec	uirement Gro	up Related Se	ection				
	A-PFM-011	Con Ops					
	ated Needs						
Pare	ent Section	11.2.5					
	uirement Tex Master Server	t shall transmit re	ports to USDOT.				
		t (Comments/Ch					
De	Ĩ	SDD walkthroug					
	Re	equirement Crit	eria		Yes	No	/Rank
1	-	ment well-formed			Х		
2	_	ment unambiguo			Х		
3		ment logically co sibling requirem			Х		
4	Is the require	ment feasible?			Х		
5	Is the require	ment verifiable?			Х		
				Insp.	Anal.	Test	Demo.
6	If feasible and	l verifiable, by w	hich method?			Х	
		-	comment or change	e in the Co	mments/C	hange fiel	d of the
-	quirement Tex ated Design El						
	0		orts to a provided er	noil addrag	9		
Des	ign (Comment	0 /					
		Design Criteria	1		Yes	No	/Rank
1	Ũ	unambiguous?					
2	and sibling de	esign components	ent with Parent(s), s?				
3	Is the design t	feasible?					
4	Is the design	verifiable?					
5	-	ment fulfilled by	ę				
	e: An answer o sign Text' sect	-	comment or change	e in the Co	mments/C	hange fiel	d of the
	10 1	A 1					7
	al Resolution	Approved	Modify	Impler	nent Later	Drop X	
Cor	nments						

Requirement Group	Related Section			
THEA-PFM-012	Con Ops			
Related Needs				
Parent Section	11.2.5			
Requirement Text				
The Concert system s	shall collect:			
BSM and ISM	I queue length			
• crashes, conflicts, or near misses				
• approaching speed on REL				

- BSM travel times
- number of wrong way violations
- approaching speed on Twiggs street toward the REL
- approaching speed on Florida Avenue toward the REL
- vehicle's speed approaching the crosswalk
- bus percent arrival on green
- number of times priority is requested and granted
- number of time priority is requested and denied
- approach speed at intersections along Meridian Avenue
- approach speed at intersections along Florida Avenue

Requirement Text (Comments/Changes)

Added: 'Concert.'

Removed: 'delay time,' 'travel time reliability indices,' 'percent arrival on green,' 'percent...red light running,' 'travel time delay on REL,' 'bus travel time through the deployment region,' 'bus percent arrival on schedule,' 'bus percent red light violation running,' 'delay time along Meridian Avenue,' 'percent arrival on green along Meridian Avenue,' 'percent red light violation/running along Meridian.'

	Requirement Criteria	Yes		No/I	Rank
1	Is the requirement well-formed?	Х			
2	Is the requirement unambiguous?	Х			
3	Is the requirement logically consistent with Parent(s), and sibling requirements?	Х			
4	Is the requirement feasible?	Х			
5	Is the requirement verifiable?	Х			
	Insp. Ana		Anal.	Test	Demo.
6	If feasible and verifiable, by which method?	Data Logged			

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

Error! Reference source not found.

Design (Comments/Changes)

	Design Criteria	Yes	No/Rank				
1	Is the design unambiguous?	Х					
2	Is the design logically consistent with	Х					
	Parent(s), and sibling design components?						
3	Is the design feasible?	Х					

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4	Is the design	verifiable?		Х					
5	Is the require	ement fulfilled by	the design?	Х					
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.								
Fina	al	Approved X	Modify	Implement	Drop				
Res	olution			Later	_				
Cor	nments								

Rec	Requirement Group Related Section						
TH	EA-PFM-012a	Con Ops					
Rel	lated Needs						
Par	ent Section	11.2.5					
Requirement Text The Concert system shall compute: • travel times along Meridian • travel times along Florida							
Re	quirement Text (Comments/Change)					
	Requir	ement Criteria	Yes		No/Rank		
1	Is the requireme	nt well-formed?	X				
2	Is the requireme	nt unambiguous?	X				
3	3 Is the requirement logically consistent with Parent(s), and sibling requirements?		X				
4	Is the requireme	nt feasible?	X				
5	Is the requireme	nt verifiable?	Х				
			Insp.	Anal.	Test	Demo.	
6	If feasible and v	erifiable, by which method?	Data logged				

Related Design Elements

3.1.2.4 Finally the existing Centracs traffic control system at the City of Tampa TMC collects traffic counts and percent arrival on green from connected traffic controllers.

Des	Design (Comments/Changes): BT Travel time from FDOT system, not City of Tampa					
	Design Criteria	Yes	No/Rank			
1	Is the design unambiguous?	Х				
2	Is the design logically consistent with Parent(s), and sibling design components?	Х				
3	Is the design feasible?	Х				
4	Is the design verifiable?	Х				
5	Is the requirement fulfilled by the design?	Х				

Final	Approved X	Modify	Implement	Drop
Resolution		-	Later	_
Comments				

Req	uirement Group	Related Section						
TH	EA-PFM-012b	Con Ops						
Rela	Related Needs							
Pare	Parent Section 11.2.5							
Req	Requirement Text							
The	Centracs system s	hall collect:						
•	percent arrival	on green						
•	percent arrival	on green along Meridian Avenue						
Req	quirement Text (Comments/Changes)						
	D!.		V 7		NT - /1) -		
	Requir	ement Criteria	Yes		INO/I	Rank		
1	Is the requirement	nt well-formed?	Х					
2	Is the requirement	nt unambiguous?	Х					
3	-	nt logically consistent with	Х					
		bling requirements?						
4	Is the requirement	nt feasible?	Х					
5	Is the requirement	nt verifiable?	Х					
			Insp.	Anal.	Test	Demo.		
6	If feasible and ve	erifiable, by which method?	Data logged					

Related Design Elements

3.1.2.4 Finally the existing Centracs traffic control system at the City of Tampa TMC collects traffic counts and percent arrival on green from connected traffic controllers.

Design (Comments/Changes)

- •~							
	Design Criteria	Yes	No/Rank				
1	Is the design unambiguous?	Х					
2	Is the design logically consistent with	Х					
	Parent(s), and sibling design components?						
3	Is the design feasible?	Х					
4	Is the design verifiable?	Х					
5	Is the requirement fulfilled by the design?	Х					

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

Req	Requirement Group Related Section							
TH	EA-PFM-012c	Con Ops						
Rel	Related Needs							
Par	Parent Section 11.2.5							
Rec	quirement Text							
The	e HART system sł	nall collect:						
•	bus travel tim	e through the deployment region	n					
•	bus percent an	rrival on schedule						
Rec	quirement Text (Comments/Changes)						
	Requir	ement Criteria	Yes	No/Rank				
1	Is the requireme	nt well-formed?	X					
2	Is the requireme	nt unambiguous?	X					
3		nt logically consistent with bling requirements?	X					
4	Is the requireme		X					
5	Is the requireme	nt verifiable?	Х					
	·		Insp.	Anal.	Test	Demo.		
6	If feasible and v	erifiable, by which method?	Data logged					
No	Note: An answer of no requires a comment or change in the Comments/Change field							

Related Design Elements

6 Requirements Traceability Matrix

HART has existing metrics supporting this.

Design (Comments/Changes)

	Design Criteria	Yes	No/Rank
1	Is the design unambiguous?	Х	
2	Is the design logically consistent with Parent(s), and sibling design components?	Х	
3	Is the design feasible?	Х	
4	Is the design verifiable?	Х	
5	Is the requirement fulfilled by the design?	Х	

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

Req	uirement Group	Related Section							
TH	EA-PFM-012d	Con Ops							
	Related Needs								
	ent Section	11.2.5							
	Requirement Text The CUTR system shall collect: • delay time								
•	travel time from Bluetooth travel time system								
•	travel time relial	pility indices							
•	travel time delay	y on REL							
•	travel times								
•	travel time delay	y on adjacent arterial							
•	pedestrian dela	y time at the crosswalk							
•	vehicle delay tin	ne at the crosswalk							
•	delay time along	g Meridian Avenue							
•	delay time along	g Nebraska Avenue							
•	delay time along	g Florida Avenue							
Add Rer 'per dep run	ded: 'Concert.' noved: 'delay time rcentred light ru loyment region,' 'l ning,' 'delay time	Comments/Changes) e,' 'travel time reliability indic nning,' 'travel time delay on F bus percent arrival on schedul along Meridian Avenue,' 'per light violation/running along	REL, ' 'bus travel e, ' 'bus percent : cent arrival on g	l time th red ligh	rough t violat	ion			
		ement Criteria	Yes		No/I	Rank			
1	Is the requirement	t well-formed?	X						
2	Is the requirement	t unambiguous?	X						
3		t logically consistent with ling requirements?	X						
4 Is the requirement feasible? X									
5	Is the requirement	t verifiable?	X		•				
			Insp.	Anal.	Test	Demo.			
6	If feasible and ve	rifiable, by which method?	Data logged						

Related Design Elements

3.1.2.4. It saves those in the SQL database from where the data can be access by the CUTR server, which shares data per the Performance Measurement and Evaluation Support Plan.

Des	Design (Comments/Changes)								
	Design Criteria	Yes	No/Rank						
1	Is the design unambiguous?	Х							
2	Is the design logically consistent with Parent(s), and sibling design components?	Х							
3	Is the design feasible?	Х							
4	Is the design verifiable?	Х							
5	Is the requirement fulfilled by the design?	Х							

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Note: An answer of no requires a comment or change in the Comments/Change field
of the 'Design Text' section.Image: Section of the 'Design Text' section.</t

Requirement Group	Related Section							
THEA-PFM-013	Con Ops							
Related Needs Parent Section	11.2.5							
Requirement Text								
The CUTR system shall store:								
delay time								
• queue length								
• crashes, confl	icts, or near misses							
• approaching s	peed on REL							
• travel time rel	iability indices							
• travel times								
• percent arriva	l on green							
• percent wrong	g way violation							
• travel time de	lay on REL							
• travel time de	lay on adjacent arterial							
• approaching s	peed on Twiggs street toward t	he REL						
• vehicle delay	time at the crosswalk							
• pedestrian del	ay time at the crosswalk							
• vehicle's spee	d approaching the crosswalk							
• bus travel tim	e through the deployment regio	n						
• bus percent ar	rival on schedule							
• bus percent ar	rival on green							
• number of tim	es priority is requested and gra	nted						
• number of tim	e priority is requested and deni	ed						
• number of tim priority	es priority is requested, granted	l, and then denied du	e to a higher					
• travel times al	ong Meridian Avenue							
• delay time alo	ng Meridian Avenue							
• percent arriva	l on green along Meridian Aver	nue						
• approach spee	ed at intersections along Meridi	an Avenue						
Requirement Text (Comments/Changes) Added missing 'l' to shall. Added missing 'e' to speed. Omitted red light running and added wrong way. Omitted 'bus percent red light violation/running,' and 'percent red light violation/running along Meridian Avenue.								
Requir	ement Criteria	Yes	No/Rank					
•								

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2	Is the requirement unambiguous? X				
3	Is the requirement logically consistent with	X			
	Parent(s), and sibling requirements?				
4	Is the requirement feasible?	Х			
5	Is the requirement verifiable?	Х			
		Insp.	Anal	. Test	Demo.
6	If feasible and verifiable, by which method?	Data logged			

Related Design Elements

3.1.2.4 Ultimately all data used as basis for performance measures is concentrated at the CUTR Server. ... It saves those in the SQL database from where the data can be access by the CUTR server, which shares data per the Performance Measurement and Evaluation Support Plan.

Design (Comments/Changes)

	Design Criteria	Yes	No/Rank
1	Is the design unambiguous?	Х	
2	Is the design logically consistent with Parent(s), and sibling design components?	Х	
3	Is the design feasible?	Х	
4	Is the design verifiable?	Х	
5	Is the requirement fulfilled by the design?	Х	

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

Req	Requirement Group Related Section										
	THEA-SEC-001 Con Ops; OBU Component Specification										
-	ated Needs	11.2.1.4.10.1									
-	Parent Section 11.3.1; 4.10.1 Requirement Text										
			vironments (WAVF	-) shall comply with		609 2.					
OBU Wireless Access in Vehicular Environments (WAVE) shall comply with IEEE 1609.2: Standard for WAVE – Security Services for Applications and Management Messages											
Requirement Text (Comments/Changes)											
	Ree	quirement Criteri	a	Yes		No/R	ank				
1	Is the requiren	nent well-formed?		X							
2	Is the requiren	nent unambiguous?)	X							
3	^	nent logically consi sibling requiremen		X							
4	Is the requiren			X							
5	Is the requiren	nent verifiable?		X							
				Insp.	Anal.	Test	Demo.				
6	If feasible and	verifiable, by which	ch method?	Certification							
Not	e: An answer o	f no requires a co	mment or change	in the Comments	/Chang	e field o	of the				
	quirement Tex ated Design Ele										
		andards applicable	to OBU Design								
Des	ign (Comments	s/Changes)									
		Design Criteria		Yes		No/R	ank				
1	Is the design u	nambiguous?		X							
2	0	ogically consistent sign components?	with Parent(s),	X							
3	Is the design for	easible?		X							
4	Is the design v	erifiable?		X							
5	Is the requiren	nent fulfilled by the	e design?	X							
	e: An answer o sign Text' secti	-	mment or change	in the Comments	/Chang	e field (of the				
Fina	al Resolution	Approved X	Modify	Implement Late	er Dro	op					
Con	nments										

Req	Requirement Group Related Section											
-	EA-SEC-001a	Con Ops; OB	BU Component S	Spec	ification							
-	ated Needs											
	Parent Section 11.3.1; 4.10.1											
	Requirement Text											
RSU Wireless Access in Vehicular Environments (WAVE) shall comply with IEEE 1609.2: Standard for WAVE – Security Services for Applications and Management Messages												
	Requirement Text (Comments/Changes)											
	Requ	irement Criteria	a		Yes	;	No	/Rank				
1	Is the requirem	ent well-formed	?		X							
2	Is the requirem	ent unambiguous	s?		X							
3	-	ent logically con			X							
		sibling requireme	ents?	_	**							
4	Is the requirem				Х							
5	Is the requirem	ent verifiable?			Х							
					Insp.	Anal.	Test	Demo.				
6	If feasible and	verifiable, by wh	ich method?	Ce	ertification							
		no requires a c	omment or cha	nge	in the Com	ments/Cl	nange fiel	d of the				
	quirement Text ated Design Ele											
		cial off-the-shelf lfills the specific	· · ·		·	liant to the	e USDOT	RSU				
Des	ign (Comments	/Changes): Curr	ently v4.1, Para	grap	h 3.7.1.3							
	De	esign Criteria			Yes	5	No	/Rank				
1	Is the design un	nambiguous?			Х							
2		gically consisten sibling design con			Х							
3	Is the design fe				X							
4	Is the design ve	erifiable?			Х							
5	Is the requirem	ent fulfilled by th	he design?		Х							
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.											
Fina	al Resolution A	Approved X	Modify		Implement	Later	Drop					
Con	nments											

	uirement Grou	p Related Secti	on				
	EA-SEC-002	Con Ops					
-	ated Needs	11.2.0					
	ent Section uirement Text	11.3.2					
			non-DSRC IP cor	nmunications (i.e.,	cellular.	Wi-Fi)	
inte	rfaces with X.50	9 certificates.			,	,	
Req	uirement Text	(Comments/Chan	nges)				
	Re	quirement Criteri	a	Yes		No/R	ank
1	Is the requiren	nent well-formed?		X			
2	Is the requiren	nent unambiguous?	,	X			
3	<u>^</u>	nent logically consi		X			
5	·	sibling requiremen					
4	Is the requiren	nent feasible?		X			
5	Is the requiren	nent verifiable?		X			
				Insp.	Anal.	Test	Demo.
6	If feasible and	verifiable, by which	ch method?	Message log			
Not	e: An answer o	f no requires a co	mment or change	e in the Comments	/Chang	e field (of the
'Re	quirement Tex	t' section.					
Rela	ated Design Ele	ements					
6 0/	auiromonto Tra	a a bility Matrix					
	equirements Trac						
RSU	J supports Wi-F	i WPA2 plus TLS	encryption via Wi	-Fi. RSU supports	OpenVI	PN encr	yption
via	LTE.						
Des	ign (Comments	s/Changes)					
		Design Criteria		Yes		No/R	ank
1	Is the design u	8		X			
2		ogically consistent	with Parent(s)	X			
_	0	sign components?					
3	Is the design for	easible?		X			
4	Is the design v	erifiable?		X			
5	Is the requiren	nent fulfilled by the	e design?	X			
		-	mment or change	e in the Comments	/Chang	e field	of the
'De	sign Text' secti	on.					
Fina	al Resolution	Approved X	Modify	Implement Late	er Dr	op	
Con	nments			I	1		

-	uirement Group	Related Sect								
THE	EA-SEC-003	Con Ops; OBU Component Specification; RFQ_OBU, HMI Interface and Antenna								
Rela	Related Needs									
	Parent Section 11.3.1; 4.10.1; 4.3 BM-009									
	uirement Text			atificant in the C						
THEA CV Pilot devices shall support requirements identified in the SCMS POC Implementation End Entity (EE) Requirements and Specifications as of November 1, 2017.										
Requirement Text (Comments/Changes)										
	Requir	ement Criteri	a	Ye	S	No	/Rank			
1	Is the requirement	nt well-formed?		Х						
2	Is the requirement	Ū.		Х						
3	Is the requirement Parent(s), and sit			Х						
4	Is the requirement			Х						
5	Is the requirement	nt verifiable?		Х						
				Insp.	Anal.	Test	Demo.			
6	If feasible and ve	• •		Certificates						
	e: An answer of n quirement Text's		omment or chan	ge in the Con	nments/Cl	nange field	d of the			
	ated Design Elem									
3.2. Spec 6 Re "The Syst	e 15: Industry Stan I It is a commercia cification and fulfi equirements Tracea e Vehicle System s em (SCMS) POC eloped.	al off-the-shelf lls the specific ability Matrix shall have secu	(COTS) product requirements of t rity as defined by	he pilot.	Certificate	Managem	ent			
Des	ign (Comments/C	Changes)								
	Des	ign Criteria		Ye	s	No	/Rank			
1	Is the design una	mbiguous?		Х						
2	Is the design logi and sibling desig			Х						
3	Is the design feas	•		Х						
4	Is the design veri	fiable?		Х						
5	Is the requirement	-	J.	Х						
	e: An answer of n sign Text' section		omment or chan	ge in the Con	nments/Cl	nange field	d of the			
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Con	Final Resolution Approved X Modify Implement Later Drop Comments <									

U.S. Department of Transportation Intelligent Transportation System Joint Program Office

Rea	uirement Grou	p Related Sect	tion								
-	EA-SEC-004	Con Ops									
Rela	ated Needs	•									
	ent Section	11.3.2									
	uirement Text			und prior to bain a m		lieb e en m					
		(Comments/Cha		ved prior to being m		niciy ava					
	Re	quirement Criter	ia	Yes		No/R	ank				
1	Is the requiren	nent well-formed?		X							
2	Is the requiren	nent unambiguous	?	X							
3	Is the requiren Parent(s), and	X									
4	Is the requiren	X									
5	Is the requiren	nent verifiable?	X								
				Insp.	Anal.	Test	Demo.				
6	If feasible and	verifiable, by whi	ich method?	Data logged							
Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.											
3.1.1 Data Stor	a of the last 24 h age.	nent removes Pers nours is read from	-	e Information (PII) i age and transferred	-	-					
Des	ign (Comments	s/Changes)									
		Design Criteria		Yes		No/R	ank				
1	Is the design u	nambiguous?		X							
2		ogically consistent sign components?		Х							
3	Is the design f	v i		X							
4	Is the design v	erifiable?		X							
5	•	nent fulfilled by th	-	Х							
	e: An answer o sign Text' secti		omment or chang	e in the Comments	s/Chang	e field (of the				
F '	10 1	A 1 ¥7	M PC	Y 1 . Y							
	al Resolution	Approved X	Modify	Implement Lat	er Dr	op					
Con	nments										

Req	Requirement Group Related Section										
TH	EA-SEC-005	Con Ops; OE	3U Component Spe	ecification							
-	ated Needs										
	ent Section	11.3.1; 4.7.3									
-	uirement Text										
				m intrusion detection	า.						
Req	uirement l'exi	(Comments/Cha	inges)								
	Ro	quirement Criter	า๋ฉ	Yes		No/R	ank				
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1	Is the requirer	ment well-formed?		X							
2	Is the requirer	nent unambiguous	?	X							
3	Is the requirer		X								
4	Parent(s), and	nts?	X								
4	Is the requirer										
5	Is the requirer	nent verifiable?		X		-	5				
				Insp.	Anal.	Test	Demo.				
6	6 If feasible and verifiable, by which method? Per DPP										
Note: An answer of no requires a comment or change in the Comments/Change field of the											
'Requirement Text' section.											
Related Design Elements											
6 R4	equirements Tra	ceability Matrix									
010											
The	OBU equipme	nt shall be able to	detect when there a	are any new connect	ions or	insertio	ns into				
the	USB port or SE	Card slot.									
Doc	ign (Comment	c/Changes)									
Des		0 /				N T (TD					
		Design Criteria		Yes		No/R	ank				
1	Is the design u	inambiguous?		X							
2	0	ogically consisten		X							
3	and sibling de Is the design f	sign components?		X							
				X							
4	Is the design v		1								
5	•	nent fulfilled by th	C	X							
	e: An answer o sign Text' sect		omment or change	e in the Comments	/Chang	e field (of the				
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-	uirement Grou	Related Secti	ion							
-	EA-SEC-006	Con Ops								
-	ated Needs	11.0.1								
	uirement Text	11.3.1								
The	RSU firewall sha	II be enabled and	used to detect abn	ormal unauthorize	d activit	y on an	IP			
Req	uirement Text (Comments/Chan	nges)							
	Requirement Criteria Yes No/Rank									
	Req	uirement Criteri	a	Yes		No/R	ank			
1	Is the requireme	ent well-formed?		Х						
2	Is the requireme	ent unambiguous?	•	Х						
3 Is the requirement logically consistent with Parent(s), and sibling requirements?				Х						
4	Is the requireme	e i		Х						
5	Is the requireme	ent verifiable?		Х						
				Insp. An		Test	Demo.			
6	If feasible and	verifiable, by which	ch method?	RSU settings						
Not	Note: An answer of no requires a comment or change in the Comments/Change field of the									
Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.										
Org	Related Design Elements 6 Requirements Traceability Matrix Organizational Requirement									
Des		<u> </u>	ing is organizationa		ent, not					
	Ι	Design Criteria		Yes		No/R	ank			
1	Is the design un	ambiguous?		Х						
2	U .	gically consistent gn components?	with Parent(s),	Х						
3	Is the design fea	asible?		Х						
4	Is the design ve	rifiable?		Х						
5	Is the requireme	ent fulfilled by the	e design?	Х						
	e: An answer of sign Text' sectio	-	mment or change i	in the Comments	/Chang	e field (of the			
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	uirement Grou	p Related Secti	ion							
	EA-SEC-006a	Con Ops								
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	ent Section uirement Text	11.3.1								
The		all be enabled and	l used to detect at	onormal unauthorize	ed activi	ty on ar	ı IP			
Req	uirement Text	(Comments/Chan	nges)							
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1	Is the requirem	ent well-formed?		X						
2	Is the requirem	ent unambiguous?	•	X						
3		ent logically consi sibling requiremen	X							
4	Is the requirem			X						
5	Is the requirem	ent verifiable?		X						
				Insp.	Anal.	Test	Demo.			
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'Requirement Text' section.										
Rela	Related Design Elements									
6 Re	equirements Trac	eability Matrix								
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Org	anizational Requ	irement								
Des	ign (Comments	/Changes): Enabli	ing is organizatior	nal policy enforcement	ent, not	design				
	1	Design Criteria		Yes		No/R	ank			
1	Is the design u	nambiguous?		X						
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3	Is the design fe	v ·		X						
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	sign Text' sectio	-	0		0					
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Rec	quirement Grou	up Related S	ection					
	EA-SEC-007							
-	ated Needs							
	ent Section							
	quirement Tex		140 0 L aval 0					
		all meet FIPS- xt (Comments)						
	-		Ill SCMS requirer	nents. See '	ГНЕА-SF	C-003		
		uirement Cri	-		Yes	No/Rank		
1	Is the require	ement well-form	ned?					
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4		ement feasible?						
5	Is the require	ment verifiable	e?					
				Insp.	Anal.	Test	Demo.	
6	If feasible an	d verifiable, by	which method?	1				
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		ent Text' sect		inunge m u		ents, ente	inge neru	
	ated Design F							
Des	sign (Commer	nts/Changes)						
		Design Criteri	a	Y	Yes	No	/Rank	
1	Is the design	unambiguous?	,					
2	Is the design	logically consi	stent with					
		UU	n components?					
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4	Is the design	verifiable?						
5	Is the require	ment fulfilled	by the design?					
	te: An answer he 'Design Te		s a comment or o	change in th	ne Comm	ents/Cha	nge field	
Fin	al solution	Approved	Modify	Impler Later	nent	Drop	X	
	mments			Later				

Rec	quirement Grou	1p Related Sec	tion						
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	ent Section								
	quirement Tex								
			1 2 or equivalent	t.					
	· ·	xt (Comments/	covided by partic	cinante ara n	lanned to	uso WiFi	to		
			consumer smart						
	vel 2	its of standard	consumer smart	phones usua		incer i n	51102		
	Req	uirement Crite	eria		Yes	No	No/Rank		
1	Is the require	ment well-form	ed?						
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4		<u>d sibling require</u> ment feasible?							
5	-	ment verifiable							
5	Is the require		<i>!</i>	T	A 1		D		
	T	Insp.	Anal.	Test	Demo.				
6	6 If feasible and verifiable, by which method?								
Des	sign (Commen	ts/Changes)							
	J	Design Criteria	l		Yes	No	/Rank		
1	Is the design	unambiguous?							
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4	Is the design								
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Fin Res	al solution	Approved	Modify	1	nent	Drop	X		

THEA-SEC-009_ Related Needs Parent Section Requirement Text (Comments/Changes) Deleted. This is part of the overall SCMS requirements. See THEA-SEC-003 Requirement Text (Comments/Changes) Deleted. This is part of the overall SCMS requirements. See THEA-SEC-003 Requirement Text (Comments/Changes) Deleted. This is part of the overall SCMS requirements. See THEA-SEC-003 Is the requirement Well-formed? 1 Is the requirement logically consistent with Parent(s), and sibling requirements?
Parent Section Requirement Text Requirement Text (Comments/Changes) Deleted. This is part of the overall SCMS requirements. See THEA-SEC-003 Requirement Text (Comments/Changes) Deleted. No/Rank 1 Is the requirement Criteria Yes No/Rank 1 Is the requirement unambiguous? - - 2 Is the requirement logically consistent with Parent(s), and sibling requirements? - - 4 Is the requirement teasible? - - - 5 Is the requirement verifiable? - - - - 6 If feasible and verifiable, by which method? Image: Comments/Change field of the 'Requirement Text' section. -
Requirement Text RSU hardware shall meet FIPS 140-2 Level 2. Requirement Text (Comments/Changes) Deleted. This is part of the overall SCMS requirements. See THEA-SEC-003 Requirement Text (Comments/Changes) Deleted. This is part of the overall SCMS requirements. See THEA-SEC-003 Requirement Text (Comments/Changes) Deleted. This is part of the overall SCMS requirements. See THEA-SEC-003 Requirement Criteria Yes No/Rank 1 Is the requirement well-formed?
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of the 'Design Text' section.
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Comments

	quirement Grou	1p Related Secti	ion				
	EA-SEC-010						
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	ent Section						
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	• •	ipment communi	ications shall be	developed	meet FIP	S 140-2 L	level 2 or
	ivalent.	xt (Comments/C	hanges)				
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	Req	uirement Criter	ria	3	Yes	No	/Rank
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Des	ated Design E sign (Commen I Is the design Is the design	Clements hts/Changes) Design Criteria unambiguous?	ent with		Yes	No	/Rank
Des 1	ated Design E sign (Commen I Is the design Is the design	Clements Its/Changes) Design Criteria unambiguous? logically consisted d sibling design c	ent with		Yes	No	/Rank
Des 1 2	ated Design E sign (Commen I Is the design Is the design Parent(s), and	Clements Its/Changes) Design Criteria unambiguous? logically consisted d sibling design c feasible?	ent with		Ýes	No	/Rank
Des 1 2 3	ated Design E sign (Commen Is the design Is the design Parent(s), and Is the design Is the design Is the design	Clements Its/Changes) Design Criteria unambiguous? logically consisted d sibling design c feasible?	ent with components?		Yes		/Rank
Des 1 2 3 4 5 Not	ated Design E sign (Commen Is the design Is the design Parent(s), and Is the design Is the design Is the require te: An answer	Clements Its/Changes) Design Criteria unambiguous? logically consisted d sibling design c feasible? verifiable? ment fulfilled by of no requires a	ent with components? the design?				
Des 1 2 3 4 5 Not	ated Design E sign (Commen Is the design Is the design Parent(s), and Is the design Is the design Is the design Is the require	Clements Its/Changes) Design Criteria unambiguous? logically consisted d sibling design c feasible? verifiable? ment fulfilled by of no requires a	ent with components? the design?				
Des 1 2 3 4 5 Not of t	ated Design E sign (Commen I Is the design Is the design Parent(s), and Is the design Is the design Is the design Is the require te: An answer the 'Design Te	Clements Its/Changes) Design Criteria unambiguous? logically consisted d sibling design c feasible? verifiable? ment fulfilled by of no requires a ext' section.	ent with omponents? the design?	nange in th	ne Commo	ents/Cha	nge field
Des 1 2 3 4 5 Not of t Fin	ated Design E sign (Commen I Is the design Is the design Parent(s), and Is the design Is the design Is the design Is the require te: An answer the 'Design Te al	Clements Its/Changes) Design Criteria unambiguous? logically consisted d sibling design c feasible? verifiable? ment fulfilled by of no requires a	ent with components? the design?	nange in th	ne Commo		nge field
Des 1 2 3 4 5 Not of t Fin Res	ated Design E sign (Commen Is the design Is the design Parent(s), and Is the design Is the design Is the design Is the require te: An answer the 'Design Te al solution	Clements Its/Changes) Design Criteria unambiguous? logically consisted d sibling design c feasible? verifiable? ment fulfilled by of no requires a ext' section.	ent with omponents? the design?	nange in th	ne Commo	ents/Cha	nge field
Des 1 2 3 4 5 Not of t Fin Res	ated Design E sign (Commen I Is the design Is the design Parent(s), and Is the design Is the design Is the design Is the require te: An answer the 'Design Te al	Clements Its/Changes) Design Criteria unambiguous? logically consisted d sibling design c feasible? verifiable? ment fulfilled by of no requires a ext' section.	ent with omponents? the design?	nange in th	ne Commo	ents/Cha	nge field
Des 1 2 3 4 5 Not of t Fin Res	ated Design E sign (Commen Is the design Is the design Parent(s), and Is the design Is the design Is the design Is the require te: An answer the 'Design Te al solution	Clements Its/Changes) Design Criteria unambiguous? logically consisted d sibling design c feasible? verifiable? ment fulfilled by of no requires a ext' section.	ent with omponents? the design?	nange in th	ne Commo	ents/Cha	nge field
Des 1 2 3 4 5 Not of t Fin Res	ated Design E sign (Commen Is the design Is the design Parent(s), and Is the design Is the design Is the design Is the require te: An answer the 'Design Te al solution	Clements Its/Changes) Design Criteria unambiguous? logically consisted d sibling design c feasible? verifiable? ment fulfilled by of no requires a ext' section.	ent with omponents? the design?	nange in th	ne Commo	ents/Cha	nge field

	Requirement Group Related Section									
	EA-SEC-011	Con Ops								
	ated Needs	11.2.1								
	ent Section	11.3.1								
	uirement Text	ι shall include tampe	er alerts							
		t (Comments/Chai								
Dele	Deleted: This is covered under the Florida Department of Transportation's Traffic Engineering Research Laboratory Approved Products Lists test specifications									
	Re	equirement Criteri	ia		Yes	No/	Rank			
1		ment well-formed?			X					
2	Is the require	ment unambiguous	?		Х					
3	-	ment logically cons sibling requiremer			Х					
4		ment feasible?			X					
5					Х					
				Insp.	Anal.	Test	Demo.			
6	6 If feasible and verifiable, by which method?					Х				
org		quirement (responsi	Unity of City of 17	unpa)						
Des	ign (Comment	ts/Changes)								
		Design Criteria			Yes	No/	Rank			
1	Is the design u	unambiguous?								
2	•	logically consistent esign components?	with Parent(s),							
3	Is the design f	v i								
4	Is the design	verifiable?								
5	Is the require	ment fulfilled by the	e design?							
	e: An answer o sign Text' sect	of no requires a co ion.	mment or change	in the Co	omments/Cl	hange field	d of the			
Fina	al Resolution	Approved	Modify	Implei	ment Later	Drop X				
Con	nments									

	uirement Grou	p Related Secti	on						
	EA-SEC-012	Con Ops							
	ated Needs								
	ent Section	11.3.1							
	uirement Tex		11 he cout to the T			howing do			
occi		amper alerts sna	ll be sent to the T	VIC when	n an unaut	norized a	ccess		
		t (Comments/C	hanges)						
		pinets are already	0						
		ber seal is broker							
		rized access occ							
	Requ	irement Criter	ia	3	Yes	No/	Rank		
1	Is the requirer	nent well-formed	1?						
2	2 Is the requirement unambiguous?								
3	-	nent logically co sibling requirem							
4	Is the requirer								
5	Is the requirer	nent verifiable?							
				Insp.	Anal.	Test	Demo.		
6	6 If feasible and verifiable, by which method? X								
		of no requires a ent Text' section	comment or cha	nge in tł	ne Comme	ents/Chai	nge field		
	ated Design El		l•						
Org	anizational Rec	uirement (respo	nsibility of City of	f Tampa))				
Des	ign (Comment	s/Changes)							
	D	esign Criteria		Yes No/Rank					
1	Is the design u	nambiguous?							
2	Is the design l	ogically consiste	ent with						
		sibling design co	omponents?						
3	Is the design f	easible?							
4	Is the design v	erifiable?							
5	Is the requirer	nent fulfilled by	the design?						
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.								
FinalApprovedModifyResolution				Impler Later	nent	Drop 2	X		
	nments		J			1			

Req	uirement Grou	p Related Secti	on						
-	EA-SEC-013	Con Ops							
-	ated Needs								
	ent Section	11.3.2							
All p pas	sword protected	as defined in the S	MOC, shall be enci eparate from the ap n and user access a	plication a	and perforn				
		(Comments/Chan	0						
Del		t with THEA-INM							
	Ree	quirement Criteri	a]	Yes	No	Rank		
1	-	nent well-formed?			Х				
2	Is the requiren	nent unambiguous?			Х				
3 Is the requirement logically consistent with X Parent(s), and sibling requirements?									
4									
5	Is the requiren	nent verifiable?			Х				
					Anal.	Test	Demo.		
6	If feasible and	verifiable, by which	ch method?			Х			
Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.									
Related Design Elements									
Des	ign (Comments	s/Changes)							
		Design Criteria		3	Yes	No/	Rank		
1	Is the design u	ę							
2	0	ogically consistent sign components?	with Parent(s),						
3	Is the design for	0 1							
4	Is the design v	erifiable?							
5	Is the requiren	nent fulfilled by the	e design?						
	e: An answer o sign Text' secti	-	mment or change i	in the Co	mments/C	hange fiel	d of the		
		Approved	Modify	Implen	nent Later	Drop X	- 		
Con	nments								

Rec	uirement Gro	up Related Sect	ion								
TH	EA-SEC-014	Con Ops									
	ated Needs										
-	ent Section	11.3.2									
-	uirement Text		and the state of t								
				an Use Approval do	cume	ent					
Req	uirement l'ext	(Comments/Cha	nges)								
	Do	quirement Criter	0	Yes		No/R	onk				
1		-	la	X		110/1	allk				
1	<u>^</u>	nent well-formed?									
2	Is the requirer		X								
3	Is the requirer	X									
4	Is the requirer	sibling requirement feasible?	X								
5	Is the requirer	nent verifiable?		X							
				Insp.	Ana	I. Test	Demo.				
6	If feasible and	l verifiable, by whi	ch method?	Server access							
Not	Note: An answer of no requires a comment or change in the Comments/Change field of the										
Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.											
Rel	Related Design Elements										
		0	-	an encrypted file sy	stem.	Only auth	orized				
usei	rs will have read	l access to the prot	ected storage.								
Des	ign (Comment	s/Changes)									
		Design Criteria		Yes		No/R	ank				
1	Is the design u	inambiguous?		X							
2	U	ogically consistent	with Parent(s),	X							
3	Is the design f	sign components?		X							
4	Is the design v			X							
5	, , , , , , , , , , , , , , , , , , ,	nent fulfilled by th	e design?	X							
	-	-	÷.				£ 41				
	sign Text' sect		omment or change	e in the Comments		nge field (or the				
Fina	al Resolution	Approved X	Modify	Implement Late	er l	Drop					
Cor	nments										

Rec	uirement Gro	up Related Se	ection					
	EA-SEC-015	Con Ops						
Rela	ated Needs							
	ent Section	11.3.1						
	uirement Tex definition of ho		re authorized to com	municate s	hall be usin	g valid cer	tificates.	
		t (Comments/Cl						
De	leted per the SI	DD Walkthrough						
	Re	equirement Crit	eria		Yes	No	/Rank	
1	Is the require	ment well-formed	d?		X			
2	Is the require	ment unambiguo	us?		X			
3	1 0 5				Х			
Parent(s), and sibling requirements?4 Is the requirement feasible?					X			
5 Is the requirement verifiable?			-	X				
-				Insp.	Anal.	Test	Demo.	
6	6 If feasible and verifiable, by which method?			- map -		X	2 • … • •	
	Note: An answer of no requires a comment or change in the Comments/Change field of the							
	quirement Te	-	••••••••••••••••••	• • • • •				
Rel	ated Design E	lements						
Org	anizational Red	quirement						
Des	ign (Commen	ts/Changes)						
	0	Design Criteria	1		Yes	No	/Rank	
1	Is the design	unambiguous?	-					
2	Is the design	logically consiste	ent with Parent(s),					
2	<u> </u>	esign components	s?	_				
3	Is the design							
4	Is the design		the design?	_				
5	•	ment fulfilled by	0				1 6 (1	
	e: An answer sign Text' sect		comment or chang	e in the Co	mments/C	hange fiel	d of the	
Fina	al Resolution	Approved	Modify	Implen	nent Later	Drop X	X	
Cor	nments		1	I				

Rec	uirement Gro	up Related S	ection				
	EA-SEC-016	Con Ops					
Rela	ated Needs						
Pare	ent Section	11.3.1					
	luirement Tex person shall tra		ation in an unencrypt	ed state.			
	leted per the SI	t (Comments/C DD Walkthrough equirement Cri	1		Yes	No	/Rank
1	Is the require	ment well-forme	ed?		Х		
2 Is the requirement unambiguous?				Х			
3		ment logically c			Х		
4	Parent(s), and sibling requirements?4Is the requirement feasible?				X		
5	5 Is the requirement verifiable?				Х		
	I			Insp.	Anal.	Test	Demo.
6	If feasible and	d verifiable, by	which method?			Х	
'Re Rela	quirement Tex ated Design El anizational Rec	xt' section. lements	a comment or chang				
Des	ign (Comment	ts/Changes)					
		Design Criter	ia		Yes	No	/Rank
1	Is the design	unambiguous?					
2		logically consist	tent with Parent(s),				
3	Is the design						
4	Is the design	verifiable?					
5	Is the require	ment fulfilled by	the design?				
	e: An answer sign Text' sect		a comment or chang	e in the Co	omments/Cl	hange fiel	d of the
	al Resolution	Approved	Modify	Impler	nent Later	Drop X	Ϋ́Υ.
Con	nments						

	uirement Gro	up Related Section	ion								
	EA-SEC-017	Con Ops									
	ated Needs										
-	ent Section	11.3.1									
	Requirement Text The participant's location information shall not be provided unless it is part of an application and										
	no correlation to the participants personal information.										
	Requirement Text (Comments/Changes)										
Del	Deleted per the SDD Walkthrough										
	Requirement Criteria Yes No/Rank										
	r	quirement Criteri	a			INO	Kank				
1	-	ment well-formed?			Х						
2	Is the requirer	nent unambiguous?)		Х						
3		nent logically consi			Х						
		sibling requiremen	ts?		*7						
4	Is the requirer				Х						
5 Is the requirement verifiable?					Х						
		Insp.	Anal.	Test	Demo.						
6	If feasible and	l verifiable, by which	ch method?			Х					
Not	Note: An answer of no requires a comment or change in the Comments/Change field of the										
'Re	'Requirement Text' section.										
Rela	Related Design Elements										
Organizational Requirement											
Des	ign (Comment	s/Changes)									
		Design Criteria			Yes	No	Rank				
1	Is the design u										
2	e	ogically consistent	with Parent(s)								
2	0	sign components?	with Fullent(5),								
3	Is the design f	easible?									
4	Is the design v	verifiable?									
5	Is the requirer	nent fulfilled by the	e design?								
Not	e: An answer o	of no requires a co	mment or change	in the Co	mments/C	hange fiel	d of the				
	sign Text' sect	-	U			U					
Fina	al Resolution	Approved	Modify	Implen	nent Later	Drop X	[
	nments	TT		pren		=10P 1					
Con	innents										

Reo	uirement Gro	up Related S	ection				
-	EA-SEC-018_	Con Ops					
	ated Needs						
	ent Section	11.3.1					
Req	uirement Tex	t					
PII	shall not be use	ed as a unique io	dentifier except for but	ses.			
		t (Comments/C					
De	leted per the SI	OD Walkthrough	1				
	R	equirement Cri	teria		Yes	No	/Rank
1	•	-					Kalik
1	-	ment well-forme			X		
2	1 0				Х		
3	3 Is the requirement logically consistent with				Х		
4	Parent(s), and sibling requirements?4 Is the requirement feasible?				X		
5	•	ment verifiable?	· · · · · · · · · · · · · · · · · · ·		X		
3	is the require						5
	1			Insp.	Anal.	Test	Demo.
6		d verifiable, by v				Х	
			a comment or change	e in the Co	mments/C	hange fiel	d of the
	quirement Te						
Rela	ated Design E	lements					
		tified using a nu					
Des	ign (Commen	ts/Changes)					
		Design Criteri	ia		Yes	No	/Rank
1	Is the design	unambiguous?					
2			ent with Parent(s),				
3	and sibling dealers and si	esign componen feasible?	ts?				
4	Is the design						
5	, , , , , , , , , , , , , , , , , , ,	ment fulfilled by	the design?				
	•						1 6 41
	e: An answer sign Text' sec		a comment or change	e in the Co	mments/C	nange fiel	d of the
Fina	al Resolution	Approved	Modify	Impler	nent Later	Drop X	
Con	nments						

Req	uirement Group	Related Section						
TH	EA-SEC-019	Con Ops						
Rela	ated Needs							
Pare	ent Section	11.3.1						
Req	Requirement Text							
	For broadcast and transactional unicast transmissions by OBUs, temporary and one-time							
	identifiers shall be during the pilot, but removed following the completion of the pilot.							
Add	Requirement Text (Comments/Changes) Added 'during the pilot, but removed' Removed 'used to protect against inadvertently providing PII'							
	Requir	ement Criteria	Yes		No/Rank			
1	Is the requirement	nt well-formed?	Х					
2	Is the requirement	nt unambiguous?	Х					
3	-	nt logically consistent with bling requirements?	Х					
4	Is the requirement	nt feasible?	Х					
5	Is the requirement	nt verifiable?	Х					
			Insp.	Anal.	Test	Demo.		
6	If feasible and ve	erifiable, by which method?	PII data logs					

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section. Related Design Elements

6 Requirements Traceability Matrix

OBUs will be identified using a static numeric ID in the TemporaryID field of the BSM. At the end of the study the static ID will be replaced by a true temporary ID according to J2945/1_201603

Des	Design (Comments/Changes)								
	Design Criteria	Yes	No/Rank						
1	Is the design unambiguous?	Х							
2	Is the design logically consistent with Parent(s), and sibling design components?	Х							
3	Is the design feasible?	Х							
4	Is the design verifiable?	Х							
5	Is the requirement fulfilled by the design?	Х							

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.

Final	Approved X	Modify	Implement	Drop
Resolution			Later	
Comments				

Req	luirement Grou	ip Related Secti	on								
-	EA-SEC-020	Con Ops									
	ated Needs										
	ent Section	11.3.2									
	user shall cons	ent to providing da	ta in an agreement	that shell	s out how t	he data is i	hae basi				
		re-distribution to th		tinat spen	S OUL HOW L						
		(Comments/Char									
Del	leted per the SD	D Walkthrough									
	Requirement Criteria Yes No/Rank										
1	Is the requiren	nent well-formed?			Х						
2	Is the requiren	nent unambiguous?	,		Х						
3	Is the requiren	nent logically consi	stent with		X						
		sibling requiremen	ts?								
4	Is the requiren	nent feasible?			Х						
5 Is the requirement verifiable?					Х						
				Insp.	Anal.	Test	Demo.				
6	If feasible and	verifiable, by which	ch method?	X							
Not	Note: An answer of no requires a comment or change in the Comments/Change field of the										
	'Requirement Text' section.										
Rela	Related Design Elements										
Org	Organizational Requirement										
Des	ign (Comments	s/Changes)									
Des	<u> </u>	0			7	N	/D l-				
		Design Criteria			Yes	10/	Rank				
1	Is the design u	6									
2	0	ogically consistent	with Parent(s),								
3	Is the design f	sign components?									
4	Is the design v										
			. de si su 9								
5	-	nent fulfilled by the									
		f no requires a co	mment or change	in the Co	mments/C	hange fiel	d of the				
De	'Design Text' section.										
Fina	al Resolution	Approved	Modify	Implen	nent Later	Drop X					
Con	nments		•			-					

Rec	Requirement Group Related Section										
	EA-SEC-021	Con Ops									
	ated Needs										
	ent Section	11.3.1									
-	uirement Text Master Server		omoto acco	ee eball eupr	ort ror	noto qui	hontic	tod access			
	uirement Text			33 311ali 3up		note aut					
100			enunges)								
				-				1			
	Re	quirement Ci	riteria			Yes		No/Rank			
1	Is the requirer	nent well-forn	ned?			Х					
2	Is the requirer	nent unambigu	ious?			Х					
3	Is the requirer			vith		Х					
4	Parent(s), and sibling requirements?4Is the requirement feasible?					X					
+ 5	_		0			<u>х</u> Х					
5 Is the requirement verifiable?				*		-					
	1				Insp.	Anal.	Test	Demo.			
6	If feasible and	verifiable, by	which meth	nod?				Server Access			
	Note: An answer of no requires a comment or change in the Comments/Change field of the										
	'Requirement Text' section. Related Design Elements										
Kei	ateu Design El	ements									
6 R	equirements Tra	ceability Matrix									
	-						_	_			
RSU	J supports remo	ote access via l	prowser UI	which require	es a us	er name	and pa	ssword.			
Des	ign (Comment	s/Changes)									
		Design Crite	ria			Yes		No/Rank			
1	Is the design u	inambiguous?				Х					
2	Is the design l			arent(s),		Х					
3	and sibling de Is the design f	<u> </u>	nts?			X					
4	Is the design v					X					
5	Is the requirer		w the design	n?		X					
	•		<u> </u>		41		4 101	0* 1 1 0 41			
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.										
Fina	Final ResolutionApproved XModify			fy	Imp	lement I	Later	Drop			
Cor	nments					_					

Rec	uirement Gro	up Related S	ection				
	EA-SEC-022	Con Ops					
	ated Needs						
Pare	ent Section	11.3.1					
	uirement Tex						
			remote access of the	connected	vehicle app	lications.	
		t (Comments/C DD Walkthrough					
Del	leteu per tile SL	D warkinougi	1				
	Da	equirement Cri	torio		Yes	No	/Rank
	n	-					Kalik
1	•	ment well-forme			Х		
2	Is the require	ment unambiguo	ous?		Х		
3	1 0 5				Х		
4	Parent(s), and	ments?		X			
4	*	ment feasible?					
5	Is the require	ment verifiable?			Х		
				Insp.	Anal.	Test	Demo.
6	If feasible and	l verifiable, by v	which method?			Х	
Not	e: An answer	of no requires a	comment or chang	e in the Co	mments/Cl	hange fiel	d of the
	quirement Tex						
Rela	ated Design El	ements					
OB	Us do not have	access via SSH	or HTTP				
Des	ign (Comment	s/Changes)					
200	-8 (Design Criteri	9		Yes	No	/Rank
1	Is the design	unambiguous?			105	110/	Kanik
		C	ant with Dement(a)				
2		sign component	ent with Parent(s),				
3	Is the design t	<u> </u>					
4	Is the design	verifiable?					
5	Is the require	nent fulfilled by	the design?				
Not	•		comment or chang	e in the Co	mmonts/C	hange fiel	d of the
	sign Text' sect		i comment of chang	e in the Co	minents/ Ci	nange ner	u or the
Fina	al Resolution	Approved	Modify	Impler	nent Later	Drop X	
Con	nments					•	

Req	Requirement Group Related Section										
TH	EA-SEC-023	Con Ops; O	BU Component	Specification							
Rela	ated Needs										
	ent Section	11.3.1; 4.1.9									
-	Requirement Text										
	The OBU shall support physical access to support bootstrapping activities.										
Reg	Requirement Text (Comments/Changes)										
Requirement CriteriaYesNo/Rank											
1	Is the require	ment well-formed?		X							
2 Is the requirement unambiguous?			Х								
3 Is the requirement logically consistent with Parent(s), and sibling requirements?			X								
4 Is the requirement feasible?			X								
5	Is the require	ment verifiable?		X							
				Insp.	Anal.	Test	Demo.				
6	6 If feasible and verifiable, by which method?			OBU housing							
Not	e: An answer	of no requires a co	mment or chang	e in the Comments	/Chano	e field (of the				
	quirement Te				, on ang	e meru v					
	ated Design E										
Tabl	e 3: OBU Func	tions									
Sup	port functional	ity for monoging h	osia OBU oporatio	ns such as broadcas	t of BSN	A masse					
-	-		•	monitoring, and hur			0				
		collection and softw		0	inan ina		terrace.				
	Ū.										
Figu	ire 29: OBU Sul	bsystems and Input	Output – Car, bus	and Streetcars							
Ma	a comont Dort										
Iviai	nagement Port										
-											
Des	ign (Comment										
-	1	Design Criteria		Yes		No/R	ank				
1	0	unambiguous?		X							
2		logically consisten	t with Parent(s),	X							
3	Is the design	esign components?		X							
4	Is the design			X							
5		ment fulfilled by th	e design?	X							
	^	-				e field	ef 41 e e				
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.										
Fina	al Resolution	Approved	Modify	Implement Late	er Dr	op					
Con	nments										

THEA SEC 0220 Com One DSH Commence C									
THEA-SEC-023a Con Ops; RSU Component Specification									
Related Needs									
Parent Section 11.3.1; 4.1.9									
Requirement Text									
The RSU shall support physical access to support bootstrapping activities.									
Requirement Text (Comments/Changes)									
Requirement Criteria Yes No/Rank									
1Is the requirement well-formed?X									
2 Is the requirement unambiguous? X									
3 Is the requirement logically consistent with X									
Parent(s), and sibling requirements? 4 Is the requirement feasible? X									
5 Is the requirement verifiable? X									
	Гest	Demo.							
6 If feasible and verifiable, by which method? RSU housing									
Note: An answer of no requires a comment or change in the Comments/Change field of the									
'Requirement Text' section.									
Related Design Elements									
Table 2: RSU Functions									
Support functions for managing basic RSU operations such as broadcast of MAP and S	SPaT								
messages. Functions for application lifecycle management, health monitoring, and bro		-based							
user access. Functions for configuration of core RSU services such as Message Forwar	rder.								
Functions for log collection and software update management. (COTS)									
Design (Comments/Changes)									
Design Criteria Yes N	No/Ra	ank							
1Is the design unambiguous?X									
2 Is the design logically consistent with Parent(s), X									
and sibling design components? 3 Is the design feasible? X									
4 Is the design verifiable? X									
5 Is the requirement fulfilled by the design? X									
Note: An answer of no requires a comment or change in the Comments/Change fi	ield o	of the							
'Design Text' section.									
Final ResolutionApproved XModifyImplement LaterDrop									
Comments									

Requirement Group Related Section								
THEA-SEC-024	HEA-SEC-024							
Related Needs	Related Needs							
Parent Section	nt Section							
Requirement Text								
OBUs and RSUs shall	ll support role-based authentica	tion to enable physica	al access.					
Requirement Text (Comments/Changes)							
Deleted. Unclear how	role-based authentication to a	device could prevent	physical access					
to the device. For exa	mple, RSUs are mounted on a	pole. Nothing preven	ts a malicious					
actor from climbing u	p the pole and physically acces	ssing the RSU						
Requir	rement Criteria	Yes	No/Rank					
1 T /1 ·	. 11.0 10							

1	Is the requirement well-formed?				
2	Is the requirement unambiguous?				
3	Is the requirement logically consistent with Parent(s), and sibling requirements?				
4	Is the requirement feasible?				
5	Is the requirement verifiable?				
		Insp.	Anal.	Test	Demo.
6	If feasible and verifiable, by which method?				

Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.

Related Design Elements

Des	Design (Comments/Changes)								
		Design Criteria	a	Yes	No/Rank				
1	Is the design	unambiguous?							
2	U	logically consisted as a sibling design							
3	Is the design	feasible?							
4	Is the design	verifiable?							
5	Is the require	ement fulfilled b	by the design?						
Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.									
-	al colution nments	Approved	Modify	Implement Later	Drop X				

Rec	uirement Grou	up Related Sec	ction							
	EA-SEC-025	Con Ops								
	Related Needs									
	Parent Section 11.3.1 Pageiragement Text									
	Requirement Text The host processor and its operating software shall be delivered in an operational state.									
	<u> </u>	st (Comments/	•	l de deliver	eu in an of	berational	state.			
	-	•	art of RSU 4.1 sp	ecification						
In comment: Replaced 05 with a '10' to 'THEA-SEC-10.'										
		uirement Crit			Yes	No	/Rank			
1	Is the require	ment well-form	ied?							
2	2 Is the requirement unambiguous?									
3	1 0 5									
		d sibling require								
4	Is the require	ement feasible?								
5	Is the require	ment verifiable	?							
	1			Insp.	Anal.	Test	Demo.			
6	If feasible and verifiable, by which method?					X				
No	Note: An answer of no requires a comment or change in the Comments/Change field									
	of the 'Requirement Text' section.									
Rel	ated Design E	lements								
The	e RSU is delive	ered fully operation	tional with softwa	are pre-inst	alled.					
Des	sign (Commer	nts/Changes)								
]	Design Criteria	ı		Yes	No/Rank				
1	Is the design	unambiguous?								
2	Is the design	logically consist	stent with							
		d sibling design	components?							
3	Is the design	feasible?								
4	Is the design	verifiable?								
5	Is the require	ment fulfilled b	y the design?							
			a comment or c	hange in tl	ne Comme	ents/Cha	nge field			
of t	the 'Design Te	ext' section.								
	Final Approved Modify Resolution		Implei Later	ment	Drop 2	X				
Co	mments				-					

Rec	quirement Grou	up Related Sec	tion							
TH	EA-SEC-026	Con Ops								
	ated Needs									
	rent Section	11.3.1								
	quirement Te		C 1 1	1 1 1 1 1	1 1 1		1			
	e host processo tections are im	r and its operation	ng software shal	l be deliver	red such the	at require	d			
		xt (Comments/(Thanges)							
	Deleted per SDD walkthrough; part of RSU 4.1 specification									
	In comment: Replaced 05 with a '10' to 'THEA-SEC-10.'									
	Req	luirement Crite	eria		Yes	No	/Rank			
1	Is the require	ement well-forme	ed?							
2	2 Is the requirement unambiguous?									
3	1 0 5									
4		d sibling require	ments?							
4	-	ement feasible?								
5 Is the requirement verifiable?						_				
				Insp.	Anal.	Test	Demo.			
6	If feasible an	d verifiable, by	which method?			X				
of t Re	the 'Requirem lated Design E	of no requires ent Text' section Clements ered with a secur	on.							
De	sign (Commer	nts/Changes)								
]	Design Criteria			Yes	No	No/Rank			
1	Is the design	unambiguous?								
2		logically consist								
		d sibling design	components?							
3	Is the design									
4	Is the design	verifiable?								
5	-	ment fulfilled by	<u> </u>							
		of no requires	a comment or o	hange in t	he Comm	ents/Cha	nge field			
011	the 'Design Te	ext' section.								
Fin Res	al solution	Approved	Modify	Imple Later	ment	Drop 2	X			
Co	mments									

	uirement Gro	up Related Secti	on							
	EA-SEC-027	Con Ops								
	ated Needs									
-	ent Section	11.3.1								
Requirement Text If the host processor is initialized in a manufacturing state, the required protections shall not be										
	required.									
Requirement Text (Comments/Changes)										
Deleted per SDD Walkthrough; part of RSU 4.1 Specification										
	D					N.T.				
		equirement Criteri	a		Yes	No	Rank			
1	Is the require	ment well-formed?			Х					
2	Is the requirer	ment unambiguous?	,		Х					
3		nent logically consi			Х					
		sibling requiremen	ts?		*7					
4	-	ment feasible?			Х					
5	Is the requirer	nent verifiable?			Х					
				Insp.	Anal.	Test	Demo.			
6	If feasible and	l verifiable, by whic	ch method?			Х				
Not	Note: An answer of no requires a comment or change in the Comments/Change field of the									
	'Requirement Text' section.									
Related Design Elements										
The RSU isn't delivered to the end-customer in a manufacturing state										
Des	ign (Comment	s/Changes)								
		<i>U</i> ,			Vag	No	/Dowlz			
		Design Criteria			Yes	190/	Rank			
1	-	unambiguous?								
2	U	ogically consistent	with Parent(s),							
3	Is the design f	esign components?								
4	Is the design v									
	6		1							
5		ment fulfilled by the	e							
	e: An answer o sign Text' sect	of no requires a con	mment or change	in the Co	mments/C	hange fiel	d of the			
De	sign rext sect	1011.				-				
Fina	al Resolution	Approved	Modify	Implen	nent Later	Drop X				
Con	nments			I						

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sor	tate to the	manufact	uring
	and all ke	ys as part	t of the
tion	1		
	V 7	NT-	/D l-
	Yes	INO	/Rank
p.	Anal.	Test	Demo.
		X	
,	that also d via WebGU		
	Yes	No	/Rank
	105	110	/ Kullix
		ents/Cha	nge field
		in the Commo	in the Comments/Cha

	<mark>luirement</mark> Gro	A	tion							
	THEA-SEC-029 Con Ops									
	ated Needs	11.2.1								
-	ent Section uirement Text	11.3.1								
			rm a reset to a mar	nufacturing	state witho	out anv				
auth	nentication if the	e reset mechanism	guarantees the ph	•						
	-	t (Comments/Cha								
Del	leted per SDD	Walkthrough; part	of RSU 4.1 Specifi	cation						
	Re	equirement Criter	ia		Yes	No	/Rank			
1	Is the require	ment well-formed?			X					
2	•	ment unambiguous			X					
	•									
3		ment logically cons sibling requirement			Х					
4		ment feasible?			Х					
5	Is the require	ment verifiable?			X					
	1			Insp.	Anal.	Test	Demo.			
6	If feesible one	l	ah mathad9	msp.	7 11141.	X	Demo.			
		l verifiable, by whi								
	Note: An answer of no requires a comment or change in the Comments/Change field of the									
'Requirement Text' section. Related Design Elements										
"Re	"Reset to manufacturing state" is done via provisioning files, that also delete/reset all keys &									
			an perform this, i.e			eset all ney	5 C			
	•		•							
Des	ign (Comment	c/Changes)								
Des					V7	N	/D l-			
		Design Criteria			Yes	INO	Rank			
1	Is the design u	unambiguous?								
2	U U	logically consistent	t with Parent(s),							
3	Is the design f	esign components?								
4	Is the design									
	č		1 . 0							
5	-	ment fulfilled by th	e							
		_	omment or change	e in the Co	mments/C	hange fiel	d of the			
De	sign Text' sect	1011.				-				
Fina	al Resolution	Approved	Modify	Implen	nent Later	Drop X	ζ.			
Con	nments		•	I						

	uirement Grou	-	on								
	EA-SEC-030	Con Ops									
	ated Needs	11.2.1									
	ent Section uirement Text	11.3.1									
The host processor shall perform integrity checks on boot to ensure that it is in a known good											
soft	software state.										
	Requirement Text (Comments/Changes)										
Deleted per SDD Walkthrough; part of RSU 4.1 Specification											
	Requirement Criteria Yes No/Rank										
1	Is the requiren	nent well-formed?			Х						
2	Is the requiren	nent unambiguous?			X						
3	•	nent logically consi			X						
5	·	sibling requiremen									
4	Is the requiren				Х						
5	Is the requiren	nent verifiable?			Х						
				Insp.	Anal.	Test	Demo.				
6	If feasible and	verifiable, by whic	h method?			X					
				in the Ce			J of the				
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.										
Related Design Elements											
The RSU uses secure boot with verification of signed code before its execution.											
			C								
Des	ign (Comments	s/Changes)									
		Design Criteria		, ,	Yes	No	/Rank				
1	Is the design u	0			105		Nalik				
		e	with Devent(a)								
2	0	ogically consistent sign components?	with Parent(s),								
3	Is the design for										
4	Is the design v										
5		nent fulfilled by the	design?								
	•	f no requires a co		in the Co	mmonts/C	hange field	d of the				
	sign Text' secti	-	innent of change	in the Co		nange ner	a or the				
Fina	al Resolution	Approved	Modify	Implen	nent Later	Drop X	[
Con	nments	-		-		~					

-	uirement Grou	A	on							
	THEA-SEC-031 Con Ops									
	ated Needs	11.2.1								
-	ent Section	11.3.1								
Requirement Text If the host processor determines it is not in a known good software state on boot up, it shall not										
		g an error when pos		Soltware		01 up, 11 01				
Requirement Text (Comments/Changes)										
Deleted per SDD Walkthrough; part of RSU 4.1 Specification										
	Re	quirement Criteria	a		Yes	No	Rank			
1	Is the requirem	nent well-formed?			Х					
2	Is the requiren	nent unambiguous?			Х					
3	Is the requiren	nent logically consi	stent with		Х					
		sibling requiremen								
4	Is the requiren	nent feasible?			Х					
5	Is the requiren	nent verifiable?			Х					
				Insp.	Anal.	Test	Demo.			
6	If feasible and	verifiable, by whic	h method?	1		X				
							d of the			
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.									
	Related Design Elements									
The RSU uses secure boot with verification of signed code before its execution.										
The	Roo uses seeu		ation of signed cot		is execution	1.				
-										
Des	ign (Comment	s/Changes)								
		Design Criteria			Yes	No	/Rank			
1	Is the design u	nambiguous?								
2	Is the design l	ogically consistent	with Parent(s),							
		sign components?								
3	Is the design f	easible?								
4	Is the design v	verifiable?								
5	Is the requirem	nent fulfilled by the	design?							
Not	e: An answer o	f no requires a co	nment or change	in the Co	mments/C	hange fiel	d of the			
'De	sign Text' secti	on.								
Fina	al Resolution	Approved	Modify	Implen	nent Later	Drop X	<u> </u>			
	nments	rr				P 11				
Con	innents									
-										

Rec	uirement Gro	oup Related So	ection						
	EA-SEC-032	Con Ops							
Rela	ated Needs								
Pare	ent Section	11.3.1							
	luirement Tex								
			shall require the use	e of a hard	vare-protec	ted value.			
	leted per SDD		rt of RSU 4.1 Specifi						
	R	equirement Crit	eria		Yes	No	/Rank		
1	Is the require	ment well-forme	d?		Х				
2	Is the require	ment unambiguo	us?		Х				
3	-	ment logically co d sibling requiren			Х				
4		ment feasible?	ients:		Х				
5	Is the require	ment verifiable?			X				
	1			Insp.	Anal.	Test	Demo.		
6	If feasible an	d verifiable, by w	which method?	msp.		X			
				e in the Co			d of the		
Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.									
Rel	Related Design Elements								
Des	ign (Commen	ts/Changes)							
		Design Criteria	a		Yes	No	/Rank		
1	Is the design	unambiguous?							
2		logically consiste esign component	ent with Parent(s), s?						
3	Is the design		••						
4	Is the design	verifiable?							
5	Is the require	ment fulfilled by	the design?						
	e: An answer sign Text' sec	-	comment or change	e in the Co	mments/C	hange fiel	d of the		
					_		-		
	al Resolution	Approved	Modify	Impler	nent Later	Drop X	, L		
Con	nments								

	uirement Grou	A	on							
THEA-SEC-033 Con Ops										
-	ated Needs									
	ent Section	11.3.1								
Requirement Text The host processor shall not allow any privileged application to request signing until the integrity										
	checks have passed.									
Requirement Text (Comments/Changes)										
Deleted per SDD Walkthrough; part of RSU 4.1 Specification										
	Re	quirement Criteria	a		Yes	No	/Rank			
1	Is the requiren	nent well-formed?			Х					
2	Is the requirem	nent unambiguous?			Х					
3	Is the requiren	nent logically consi	stent with		Х					
		sibling requiremen	ts?							
4	Is the requiren	nent feasible?			Х					
5	Is the requirem	nent verifiable?			Х					
				Insp.	Anal.	Test	Demo.			
6	If feasible and	verifiable, by whic	ch method?	-		X				
	Note: An answer of no requires a comment or change in the Comments/Change field of the						d of the			
		-	innent of change	In the Co	innents/C	nange ner	u of the			
-	'Requirement Text' section. Related Design Elements									
If integrity check fails, the system does not boot up. So this is implicit.										
		ino, the system doe.	not boot up. bo u	no io impi						
Des	ign (Comments	s/Changes)								
		Design Criteria			Yes	No	Rank			
1	Is the design u	inambiguous?								
2	0	ogically consistent	with Parent(s),							
		sign components?				_				
3	Is the design f									
4	Is the design v	verifiable?								
5	Is the requiren	nent fulfilled by the	e design?							
Not	e: An answer o	of no requires a con	mment or change	in the Co	mments/C	hange fiel	d of the			
'De	sign Text' secti	on.								
Fina	al Resolution	Approved	Modify	Implen	nent Later	Drop X	<u> </u>			
	nments	rr				P 11				
Con	innents									
-										

	uirement Gro							
THEA-SEC-034 Con Ops								
Related Needs								
	Parent Section 11.3.1 Requirement Text							
		; or fails the integrity o	checks it shall not	arant acce	ss for any r	process to	orivate	
keys	•	in tails the integrity t		grant aboo			pinato	
		(Comments/Chan						
Del	eted per SDD V	Walkthrough; part o	f RSU 4.1 Specific	cation				
		quirement Criteria	a	Yes		No/Rank		
1	Is the requirer	nent well-formed?			Х			
2	Is the requirer	nent unambiguous?			Х			
3	Is the requirer	nent logically consi	stent with	X				
	Parent(s), and	sibling requiremen	ts?					
4	Is the requirer	nent feasible?			Х			
5	Is the requirer	nent verifiable?			Х			
				Insp.	Anal.	Test	Demo.	
6	If feasible and	l verifiable, by whic	h method?	-		X		
	Note: An answer of no requires a comment or change in the Comments/Change field of the							
	quirement Tex	-	innent of change	in the Co		nange ner	u or the	
	ated Design El							
If integrity check fails, the system does not boot up. So this is implicit.								
		, , , , , , , , , , , , , , , , , , ,	· · · · · · · · · · · · · · · · · · ·	r r				
-								
Des	ign (Comment	0		r		-		
		Design Criteria		Yes		No/Rank		
1	Is the design u	inambiguous?						
2	0	ogically consistent	with Parent(s),					
	and sibling design components?							
3	Is the design f							
4	4 Is the design verifiable?							
5 Is the requirement fulfilled by the design?								
Note: An answer of no requires a comment or change in the Comments/Change field of the								
'Design Text' section.								
Final Resolution Approved Modify			Implen	nent Later	Drop X			
Comments			r		·r ·			
Con	intento							

Req	luirement Gro	up Related Sect	ion						
THEA-SEC-035 Con Ops									
-	Related Needs								
	Parent Section 11.3.1 Requirement Text Image: Constraint of the section of the sectio								
		or fails the integrity	checks it shall not a	allow anv i	privileged a	pplication	to		
	rate.								
		t (Comments/Chai							
Del	leted per SDD	Walkthrough; part of	of RSU 4.1 Specific	cation					
	Re	equirement Criteri	a		Yes	No	Rank		
1	r	ment well-formed?			X				
	*								
2	*	ment unambiguous			Х				
3	^	ment logically cons			Х				
4		l sibling requiremen ment feasible?	its?		X				
	^								
5	Is the require	ment verifiable?			X				
				Insp.	Anal.	Test	Demo.		
6	If feasible and	d verifiable, by which	ch method?			Х			
Not	e: An answer	of no requires a co	mment or change	in the Co	mments/C	hange fiel	d of the		
	quirement Tex								
Rela	ated Design El	ements							
If in	tegrity check fa	ails, the system doe	s not boot up. So th	is is impli	cit.				
Des	ign (Comment	ts/Changes)							
		Design Criteria		Yes		No/Rank			
1	Is the design	unambiguous?							
2	-	logically consistent	with Parant(a)						
2	U	esign components?	with r arcin(s),						
3									
4 Is the design verifiable?									
5 Is the requirement fulfilled by the design?									
Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.									
Final Resolution Approved Modify			Implen	nent Later	Drop X	[
Comments			L						

	uirement Grou	up Related Section	ion						
THEA-SEC-036 Con Ops									
	Related Needs								
	Parent Section 11.3.1 Permit Text								
Requirement Text The host processor integrity check shall carry out a check that stored root CA certificates have not									
		e they were last acc							
Requirement Text (Comments/Changes) Deleted per SDD Walkthrough; part of RSU 4.1 Specification									
	Re	quirement Criteri	a		Yes	No	/Rank		
1	Is the requiren	nent well-formed?			Х				
2	Is the requirem	nent unambiguous?)		X				
3	*	nent logically consi sibling requiremen		X					
4	Is the requiren	e i			Х				
5	Is the requiren	nent verifiable?		-	Х				
				Insp.	Anal.	Test	Demo.		
6	If feasible and	verifiable, by which	ch method?			X			
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.								
	ated Design Ele								
The RSU checks that installed root CA certificates haven't been modified during secure boot. It also checks the installed certificates during runtime in regular intervals.									
Des	ign (Comments	s/Changes)							
		Design Criteria		Yes		No/Rank			
1	Is the design u	inambiguous?							
2	Is the design logically consistent with Parent(s), and sibling design components?								
3									
4	4 Is the design verifiable?								
5 Is the requirement fulfilled by the design?									
Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.									
Final ResolutionApprovedModify		Modify	Implen	nent Later	Drop X				
Con	nments								

Req	uirement Grou	up Related Secti	ion						
THEA-SEC-037 Con Ops									
Related Needs									
	Parent Section 11.3.1								
	uirement Text		hall reject all incon	nina sianea	1 messares	that chair	hack to		
If the integrity check fails, the device shall reject all incoming signed messages that chain back to those root CA certificates as invalid.									
Req	uirement Text	(Comments/Char	nges)						
Del	eted per SDD V	Valkthrough; part o	of RSU 4.1 Specific	cation					
				T					
	Re	quirement Criteri	a	Yes		No/Rank			
1	Is the requirem	nent well-formed?		X					
2	Is the requiren	nent unambiguous?)		Х				
3	Is the requirem	nent logically consi	istent with	X					
C		sibling requiremen							
4	Is the requirem	nent feasible?		X					
5	Is the requirem	nent verifiable?			Х				
				Insp.	Anal.	Test	Demo.		
6	If feasible and	verifiable, by which	ch method?	•		X			
				in the Co	mmonto/C		d of the		
	quirement Tex	of no requires a con t' section	initient of change	In the Co	innents/Ci	lange ner	u of the		
	ated Design El								
If th	e certificate che	eck fails the RSU lo	ogs an error and di	sables the	modified ro	ot CA cer	tificates		
		leads to incoming s	•						
		lisabled root CA ce	0 0	2 5		0 0			
Design (Comments/Changes)									
		Design Criteria		Yes		No/Rank			
1	Is the design u	nambiguous?							
2	Is the design logically consistent with Parent(s),								
		sign components?							
3	Is the design f								
4	4 Is the design verifiable?								
5 Is the requirement fulfilled by the design?									
Not	e: An answer o	of no requires a co	mment or change	in the Co	mments/C	hange fiel	d of the		
'Design Text' section.									
Final Resolution Approved Modify		Implen	nent Later	Drop X	7				
Comments			implei	Long Dator	Liop 1	_			
Con	innents								

Reo	juirement Gro	up Related S	ection							
	EA-SEC-038_	Con Ops								
	ated Needs									
Pare	ent Section	11.3.1								
-	uirement Tex									
			ap to a role as define	d in the SN	10C.					
		t (Comments/C	nanges) art of RSU 4.1 Specifi	ination						
	leted per SDD	warkunougn, pa	at of KSU 4.1 Specifi	ication						
	R	equirement Cri	teria		Yes	No	/Rank			
1										
1	•				Х					
2	Is the require	ment unambiguo	ous?		Х					
3	-	ment logically c			Х					
4		l sibling require	ments?		X					
	<u>^</u>	ment feasible?		_						
5	Is the require	ment verifiable?			Х					
				Insp.	Anal.	Test	Demo.			
6	If feasible and	d verifiable, by v	which method?	X						
Not	e: An answer	of no requires a	comment or change	e in the Co	omments/C	hange fiel	d of the			
	quirement Te									
Rela	ated Design E	lements								
Priv	vileged applicat	ions on the RSU	run as a limited righ	ts Linux us	ser which al	lows them	to sign /			
enci	rypt messages a	and verify signat	ures as well as decryp	ot message	s.					
Dee	· (C									
Des	ign (Commen									
		Design Criteri	a		Yes	No	/Rank			
1	Is the design	unambiguous?								
2			ent with Parent(s),							
2	Ŭ	esign component	ts?							
3	Is the design			_						
4	Is the design									
5	Is the require	ment fulfilled by	the design?							
			comment or change	e in the Co	omments/C	hange fiel	d of the			
'De	sign Text' sec	tion.								
Fina	al Resolution	Approved	Modify	Implei	nent Later	Drop X	<u> </u>			
	nments		5	r		r				

Req	uirement Gro	up Related Secti	on									
	EA-SEC-039	Con Ops										
-	ited Needs											
	ent Section	11.3.1										
The conf	igured to speci	t iccess control mech fy the set of roles th e Security Module (I	at has execute per									
	Requirement Text (Comments/Changes)											
Del	Deleted per SDD Walkthrough; part of RSU 4.1 Specification											
Paguiromont Critorio Vog No/Derek												
	Requirement CriteriaYesNo/Rank											
1	*	ment well-formed?			X							
2	•	nent unambiguous?			Х							
3		nent logically consi sibling requiremen			Х							
4	× 7.1	nent feasible?			Х							
5	Is the require	ment verifiable?			Х							
				Insp.	Anal.	Test	Demo.					
6	If feasible and	l verifiable, by whic	ch method?				Х					
	e: An answer o quirement Tex	of no requires a con at' section.	mment or change	in the Co	mments/C	hange field	d of the					
	ated Design El											
RSI	I supports man	datory access contro	ol on executing HS	M functio	ns							
1000	supports mun			in raneno								
Dec	an (Commont	(Changes)										
Desi	ign (Comment	Design Criteria			Yes	No	Rank					
1	Is the design 1	unambiguous?			1 65		Nalik					
2	U U	logically consistent	with Parent(s).									
	and sibling de	esign components?										
3	Is the design f											
4 5	0	nent fulfilled by the	design?									
	•	of no requires a co	Ũ	in the Co	mments/C	hange field	d of the					
	sign Text' sect	-										
	l Resolution	Approved	Modify	Implen	nent Later	Drop X						
Con	Final Resolution Approved Modify Implement Later Drop X Comments											
Coll	nments											

_	uirement Group	Related Sect	tion				
TIT	EA-SEC-040						
Rela	ated Needs						
	ent Section						
-	uirement Text						
	discretionary acc			-	-	•••	
	onfigured to: spectrum following program						
	uirement Text (iai y.
	eted. This is part		0	ents. See'	THEA-SE	C-003	
	Requir	ement Criter	ia		Yes	No	/Rank
1	Is the requireme	nt well-formed	1?				
2	Is the requireme	nt unambiguou	us?				
3	Is the requireme	nt logically co	nsistent with				
	Parent(s), and si		nents?				
4	Is the requireme						
5	Is the requireme	nt verifiable?					
				Insp.	Anal.	Test	Demo.
6	If feasible and v	erifiable, by w	hich method?				
Desi							
	ign (Comments/	Changes)					
	ign (Comments/ Des				Yes	No	/Rank
1	<u> </u>	ign Criteria			Yes	No	/Rank
	Des Is the design una	ign Criteria ambiguous?	ent with		Yes	No	/Rank
	Des	ign Criteria ambiguous? ically consiste			Yes	No	/Rank
2	Des Is the design una Is the design log	ign Criteria ambiguous? ically consiste bling design co			Yes	No	/Rank
23	Des Is the design una Is the design log Parent(s), and si	ign Criteria ambiguous? ically consiste bling design co sible?			Yes	No	/Rank
1 2 3 4 5	Des Is the design una Is the design log Parent(s), and si Is the design fea	ign Criteria ambiguous? ically consiste bling design co sible? ifiable?	omponents?		Yes	No	/Rank
2 3 4 5 Not	Des Is the design una Is the design log Parent(s), and si Is the design fea Is the design ver	ign Criteria ambiguous? ically consiste bling design co sible? ifiable? nt fulfilled by no requires a	omponents? the design?				
2 3 4 5 Note of th	Des Is the design una Is the design log Parent(s), and si Is the design fea Is the design ver Is the requireme e: An answer of he 'Design Text'	ign Criteria ambiguous? ically consiste bling design co sible? ifiable? nt fulfilled by no requires a section.	omponents? the design? comment or ch	ange in tl	ne Comm	ents/Cha	nge field
2 3 4 5 Note of th	Des Is the design una Is the design log Parent(s), and si Is the design fea Is the design ver Is the design ver Is the requireme e: An answer of he 'Design Text'	ign Criteria ambiguous? ically consiste bling design co sible? ifiable? nt fulfilled by no requires a	omponents? the design?	ange in tl	ne Comm		nge field
2 3 4 5 Note of th Fina Resc	Des Is the design una Is the design log Parent(s), and si Is the design fea Is the design ver Is the requireme e: An answer of he 'Design Text' Il Ap olution Ap	ign Criteria ambiguous? ically consiste bling design co sible? ifiable? nt fulfilled by no requires a section.	omponents? the design? comment or ch	ange in tl	ne Comm	ents/Cha	nge field
2 3 4 5 Note of th Fina Resc	Des Is the design una Is the design log Parent(s), and si Is the design fea Is the design ver Is the design ver Is the requireme e: An answer of he 'Design Text'	ign Criteria ambiguous? ically consiste bling design co sible? ifiable? nt fulfilled by no requires a section.	omponents? the design? comment or ch	ange in tl	ne Comm	ents/Cha	nge field
2 3 4 5 Note of th Fina Resc	Des Is the design una Is the design log Parent(s), and si Is the design fea Is the design ver Is the requireme e: An answer of he 'Design Text' Il Ap olution Ap	ign Criteria ambiguous? ically consiste bling design co sible? ifiable? nt fulfilled by no requires a section.	omponents? the design? comment or ch	ange in tl	ne Comm	ents/Cha	nge field

Keq	uirement Gro	up Related Sect	ion									
	EA- SEC-0 41	Con Ops										
	ated Needs											
	Parent Section 11.3.2 Requirement Text											
The cont and	The discretionary access control mechanisms of the host processor operating system shall be configured to specify the set of roles that can read data stored within the host processor boundary and which data can be read by those roles											
	Requirement Text (Comments/Changes)											
De	Deleted per SDD Walkthrough; part of RSU 4.1 Specification Requirement Criteria Yes No/Rank											
	Re	quirement Criteri	a	-	Yes	No/	Rank					
1	Is the requirer	ment well-formed?			Х							
2	Is the requirer	nent unambiguous?	2		Х							
3		nent logically cons sibling requirement			Х							
4	Is the requirer	<u> </u>	115 !		X							
5	Is the requirer	ment verifiable?			Х							
				Insp.	Anal.	Test	Demo.					
6	If feasible and	l verifiable, by which	ch method?				Х					
		of no requires a co	mment or change	in the Co	mments/C	hange field	d of the					
	quirement Tex ated Design El											
	8	ain processes that c	on road and doomin	t the ener	mtad data	hut other						
		as part of mandat	• 1	•								
Des	ign (Comment	s/Changes)										
		Design Criteria			Yes	No/	Rank					
1	Is the design u	unambiguous?										
2	U	ogically consistent sign components?	with Parent(s),									
3	Is the design f	0 1										
4	Is the design v	verifiable?										
5	Is the requirer	nent fulfilled by the	e design?									
	e: An answer o sign Text' sect	of no requires a co ion.	mment or change	in the Co	mments/C	hange field	d of the					
	al Resolution	Approved	Modify	Implen	nent Later	Drop X	_					
Con	nments											

-	<mark>uirement</mark> Gro	up Related Secti	on								
	EA-SEC-042	Con Ops									
	ated Needs										
	Parent Section 11.3.1 Requirement Text Image: Constraint of the section of the sectio										
			anisms of the host	nrocosso	r operating	evetor ch	all bo				
	The discretionary access control mechanisms of the host processor operating system shall be configured to specify the set of roles that can enter cryptographic keys.										
Req	luirement Text	t (Comments/Chan Walkthrough; part o	nges)								
Requirement Criteria Yes No/Rank											
1	1 Is the requirement well-formed? X										
	•										
2	•	ment unambiguous?			Х						
3		nent logically consi			Х						
4		sibling requiremen ment feasible?	ts?		X						
	<u>^</u>					_					
5	Is the require	ment verifiable?			X						
				Insp.	Anal.	Test	Demo.				
6	If feasible and	l verifiable, by whic	ch method?				Х				
Not	e: An answer o	of no requires a co	mment or change	in the Co	mments/C	hange fiel	d of the				
	quirement Tex										
Rela	ated Design El	ements									
	-	ain processes that ca		-	pted data,	but other					
app	lications cannot	t (as part of mandate	ory control mechar	usm).							
Des	ign (Comment	s/Changes)									
		Design Criteria		,	Yes	No	Rank				
1	Is the design i	unambiguous?									
2		logically consistent	with Parent(s)								
2	0	esign components?	with I dient(3),								
3	Is the design f										
4	Is the design	verifiable?									
5	Is the require	ment fulfilled by the	e design?								
Not	e: An answer o	of no requires a co	mment or change	in the Co	mments/C	hange field	d of the				
	sign Text' sect	-				unde ner					
Fina	al Resolution	Approved	Modify	Impler	nent Later	Drop X					
Con	nments			I							

Req	uirement Gro	up Related Secti	on								
-	EA-SEC-043	Con Ops									
-	ated Needs										
-	Parent Section 11.3.1 Requirement Text The host processor OS shall allow processes that correspond to privileged applications to operate										
The	host processo	r OS shall allow pro		ond to pri	vileged app	olications t	o operate				
	without explicit authentication by a user, Requirement Text (Comments/Changes)										
	eted per SDD V	Walkthrough; part o	f RSU 4.1 Specific								
	Re	equirement Criteri	a		Yes	No	Rank				
1	Is the requirer	ment well-formed?			Х						
2	Is the require	ment unambiguous?	1		Х						
3	·	ment logically consi sibling requiremen			Х						
4		ment feasible?	15 /		X						
5	•	ment verifiable?			X						
	1			Insp.	Anal.	Test	Demo.				
6	If feasible and	l verifiable, by whic	h method?	F ·		X					
		of no requires a co		in the Co	mments/C		d of the				
	quirement Tex		innent of change			nange new	u or the				
Rela	ated Design El	ements									
		daemon processes.									
Des	ign (Comment	s/Changes)									
		Design Criteria			Yes	No	Rank				
1	Is the design u	unambiguous?									
2	0	logically consistent esign components?	with Parent(s),								
3	Is the design f	feasible?									
4	Is the design	verifiable?									
5	Is the require	ment fulfilled by the	e design?								
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.										
Fina	al Resolution	Approved	Modify	Implen	nent Later	Drop X					
Con	nments			•		·					

Req	uirement Gro	up Related Section	ion								
-	EA-SEC-044	Con Ops									
-	ated Needs										
	ent Section	11.3.1									
	uirement Text		cesses that undate	a nrivata ke	w material	within the	HSM to				
	The host processor OS shall allow processes that update private key material within the HSM to operate without explicit authentication by a user.										
	Requirement Text (Comments/Changes)										
Del	Deleted per SDD Walkthrough; part of RSU 4.1 Specification										
	Requirement CriteriaYesNo/Rank										
1	Is the requirer	ment well-formed?			Х						
2	Is the requirer	nent unambiguous?)		Х						
3	Is the requirer	nent logically const	istent with		X						
5	A	sibling requiremen									
4	Is the requirer				Х						
5	Is the requirer	ment verifiable?			Х						
				Insp.	Anal.	Test	Demo.				
6	If feasible and	l verifiable, by which	ch method?	1		X					
				in the Co			d of the				
	e: An answer (quirement Tex	of no requires a co t' section	mment or change	in the Co	mments/C	nange Hei	a of the				
	ated Design El										
	U	ith sufficient permi	ssion is able to up	late private	e kevs hv g	enerating a	new key				
	-	not possible to read	•		c Reys by g	cherating t	t new key				
1	· · · · · · · · · · · · · · · · · · ·		I I III IJ								
Des	ign (Comment	s/Changes)									
		Design Criteria			Yes	No	Rank				
1	Is the design u	inambiguous?									
2	Is the design l	ogically consistent	with Parent(s),								
-	e e	sign components?									
3	Is the design f										
4	Is the design v	verifiable?									
5	Is the requirer	nent fulfilled by the	e design?								
Not	e: An answer o	of no requires a co	mment or change	in the Co	mments/C	hange fiel	d of the				
'De	sign Text' sect	ion.									
Fina	Final Resolution Approved Modify Implement Later Drop X										
Con	nments	••		*							
201											

Req	uirement Gro	up Related Secti	on							
-	EA-SEC-045	Con Ops								
	ated Needs									
	ent Section	11.3.1								
	uirement Text		cesses to install n	w softwar	or firmwa	re if that so	oftware or			
	The host processor OS shall allow processes to install new software or firmware if that software or firmware is signed by the original developer/manufacturer.									
Req	uirement Text	t (Comments/Char	nges)							
Del	Deleted per SDD Walkthrough; part of RSU 4.1 Specification									
						-				
	Re	quirement Criteri	a		Yes	No	Rank			
1	Is the requirer	ment well-formed?			Х					
2	Is the requirer	nent unambiguous?	,		Х					
3	Is the requirer	nent logically consi	stent with		Х					
		sibling requiremen	ts?							
4	Is the requirer				Х					
5	Is the requirer	ment verifiable?			Х					
				Insp.	Anal.	Test	Demo.			
6	If feasible and	l verifiable, by whic	ch method?							
Not	e: An answer o	of no requires a co	mment or change	in the Co	mments/C	hange fiel	d of the			
	quirement Tex									
	ated Design El									
The	RSU will only	install properly sig	ned software.							
Des	ign (Comment	s/Changes)								
		Design Criteria			Yes	No	Rank			
1	Is the design u	inambiguous?								
2	Is the design 1	ogically consistent	with Parent(s),							
	e e	sign components?								
3	Is the design f									
4	Is the design v	verifiable?								
5	Is the requirer	nent fulfilled by the	e design?							
		of no requires a co	mment or change	in the Co	mments/C	hange fiel	d of the			
'De	sign Text' sect	ion.								
Fina	al Resolution	Approved	Modify	Implen	nent Later	Drop X				
Con	nments			I						

Rec	uirement Gro	Pup Related S	ection				
	EA-SEC-046_	Con Ops					
	ated Needs						
-	ent Section	11.3.1					
-	uirement Tex host processo		ow processes to writ	e private ke	y material	to the HSM	1.
Rec	uirement Tex	t (Comments/C					
	R	equirement Crit	teria		Yes	No	/Rank
1	Is the require	ment well-forme	d?		Х		
2	Is the require	ment unambiguo	us?		X		
3		ment logically co d sibling requiren			Х		
4		ment feasible?			Х		
5	Is the require	ment verifiable?			X		
				Insp.	Anal.	Test	Demo.
6	If feasible an	d verifiable, by w	which method?			X	
			comment or chang	e in the Co		hange fiel	d of the
	quirement Te ated Design E						
	8						
The	e HSM does no	t allow processes	to write private keys	8.			
Dee	• (C						
Des	ign (Commen				.7	N	/D 1
		Design Criteri	a		Yes	No	/Rank
1		unambiguous?					
2	U	logically consistent esign component	ent with Parent(s),				
3	Is the design	<u> </u>	5:				
4	Is the design	verifiable?					
5	Is the require	ment fulfilled by	the design?				
Not	e: An answer	of no requires a	comment or chang	e in the Co	mments/C	hange fiel	d of the
	sign Text' sec						
Fina	al Resolution	Approved	Modify	Implen	nent Later	Drop X	<u> </u>
Cor	nments						

-	uirement Gro	up Related Secti	ion									
	EA-SEC-047	Con Ops										
	ated Needs											
	ent Section	11.3.1										
	uirement Text		volicit authenticatio	on for proce	assas that i	modify or i	nsnect					
The host processor OS shall require explicit authentication for processes that modify or inspect executing processes.												
		t (Comments/Char	nges)									
Del	Deleted per SDD Walkthrough; part of RSU 4.1 Specification											
Requirement Criteria Yes No/Rank												
1		ment well-formed?			X	110/						
	•			-								
2	Is the requirer	nent unambiguous?			Х							
3	·	nent logically consi sibling requiremen			Х							
4	Is the requirer				Х							
5	Is the requirer	nent verifiable?			Х							
	-			Insp.	Anal.	Test	Demo.					
6												
		of no requires a con		in the Co	mmonts/C		d of the					
	quirement Tex		innent of change	In the Co	mments/C	liange ner	u or the					
	ated Design El											
The	RSU supports	process inspection	privileges as a buil	t-in Linux	security fe	ature.						
	11				5							
D	: (C											
Des	ign (Comment	_		1			-					
		Design Criteria			Yes	No	Rank					
1	Is the design u	inambiguous?										
2	0	ogically consistent	with Parent(s),									
3	Is the design f	sign components? Teasible?										
4	Is the design v	verifiable?										
5	Is the requirer	nent fulfilled by the	e design?									
Not	e: An answer o	of no requires a co	mment or change	in the Co	mments/C	hange fiel	d of the					
	sign Text' sect	_	8			0						
Fina	al Resolution	Approved	Modify	Implen	nent Later	Drop X						
Con	nments			I								

Rec	uirement Gro	oup Related So	ection								
-	EA-SEC-048_	Con Ops									
Rela	ated Needs										
	ent Section	11.3.1									
	uirement Tex					f					
		t (Comments/Cl	hat read private cryp	tographic k	ey material	from the F	ISM.				
	leted per SDD	Walkthrough; pa	rt of RSU 4.1 Specif								
	Requirement CriteriaYesNo/Rank										
1	Is the require	ment well-forme	d?		Х						
2	Is the require	ment unambiguo	us?		Х						
3		ment logically co			Х						
4		d sibling requiren ment feasible?	nents?		X						
5	Is the require	ment verifiable?			Х						
				Insp.	Anal.	Test	Demo.				
6											
Not	e: An answer	of no requires a	comment or chang	e in the Co		hange fiel	d of the				
	quirement Te										
	ated Design E		w reading any privat		• •						
Des	ign (Commen	<u> </u>									
		Design Criteria	a		Yes	No	Rank				
1	Is the design	unambiguous?									
2	0	logically consiste esign component	ent with Parent(s), s?								
3	Is the design	<u> </u>	-								
4	Is the design	verifiable?									
5	Is the require	ment fulfilled by	the design?								
	e: An answer sign Text' sec		comment or chang	e in the Co	mments/C	hange fiel	d of the				
					_		-				
	al Resolution	Approved	Modify	Impler	nent Later	Drop X					
Con	nments										

Rec	uirement Gro	up Related Se	ction				
	EA-SEC-049	Con Ops					
Rela	ated Needs						
Pare	ent Section	11.3.1					
	luirement Tex						
			t all software installe	ed is signed			
		t (Comments/Ch Walktbrough: par	anges) t of RSU 4.1 Specifi	cation			
	letted per SDD	warktmough, par	t of Roo 4.1 Speen	cation			
	R	equirement Crite	vria		Yes	No	/Rank
1	•	-				110/	Rank
1	*	ment well-formed			Х		
2	Is the require	ment unambiguou	is?		Х		
3		ment logically con			Х		
		1 sibling requirem	ents?				
4	Is the require	ment feasible?			Х		
5	Is the require	ment verifiable?			Х		
	•			Insp.	Anal.	Test	Demo.
6	If feasible an	d verifiable, by w	hich method?			Х	
Not	e: An answer	of no requires a	comment or change	e in the Co		hange fiel	d of the
	quirement Te	-	8			8	
Rel	ated Design E	lements					
The	RSU software	update only acce	pts signed software.				
D							
Des	ign (Commen						
	-	Design Criteria			Yes	No	/Rank
1	Is the design	unambiguous?					
2		logically consiste					
3	Is the design	esign components	?				
4	Is the design						
5	, , , , , , , , , , , , , , , , , , ,	ment fulfilled by	the design?				
	•						1 6 41
	e: An answer sign Text' sec	-	comment or change	e in the Co	mments/C	hange fiel	d of the
Fina	al Resolution	Approved	Modify	Impler	nent Later	Drop X	X
Cor	nments			<u>.</u>			

Rec	uirement Gro	up Related So	ection						
-	EA-SEC-050	Con Ops							
	ated Needs								
Pare	ent Section	11.3.1							
-	luirement Tex								
-		t (Comments/Cl	shall be protected by	/ local hard	ware.				
			rt of RSU 4.1 Specif	fication					
	F = = = =								
	R	equirement Crit	eria		Yes	No	/Rank		
1	Is the require	ment well-forme	d?		Х				
2	2 Is the requirement unambiguous?				Х				
3	<u>^</u>				X				
5	3 Is the requirement logically consistent with Parent(s), and sibling requirements?				21				
4	Is the require	ment feasible?			Х				
5	5 Is the requirement verifiable?				Х				
				Insp.	Anal.	Test	Demo.		
6	If feasible an	d verifiable, by w	hich method?	X					
Not	e: An answer	of no requires a	comment or chang	e in the Co	omments/C	hange fiel	d of the		
'Re	quirement Te	xt' section.				0			
Rel	Related Design Elements								
The RSU software update only accepts signed software.									
Des	ign (Commen	ts/Changes)							
		Design Criteria	a a a a a a a a a a a a a a a a a a a		Yes	No	/Rank		
1	Is the design	unambiguous?							
2	Is the design	logically consiste	ent with Parent(s),						
		esign component	s?						
3	Is the design								
4	Is the design								
5	Is the require	ment fulfilled by	the design?						
			comment or chang	e in the Co	omments/C	hange fiel	d of the		
'De	sign Text' sec	tion.							
Fina	al Resolution	Approved	Modify	Implei	ment Later	Drop X	X		
Cor	nments			I					

	uirement Group	Related Sect	tion						
TH	EA-SEC-051								
Rel	ated Needs								
	ent Section								
	quirement Text			~			_		
	e hardware protect	tion shall be eq	juivalent to FIPS	S 140-2 at 1	the level a	ppropriate	e to the		
	tice as a whole.	Commonts/Cl	hongos)						
	Requirement Text (Comments/Changes) Deleted. This is part of the overall SCMS requirements. See THEA-SEC-003								
	Beleted.Fins is part of the overall Service requirements.See THEA SEC 005Requirement CriteriaYesNo/Rank								
1	Is the requireme								
2 Is the requirement unambiguous?									
3 Is the requirement logically consistent with									
5	-	.							
Parent(s), and sibling requirements?4 Is the requirement feasible?									
5 Is the requirement verifiable?									
				Insp.	Anal.	Test	Demo.		
6	6 If feasible and verifiable, by which method?								
Not	Note: An answer of no requires a comment or change in the Comments/Change field								
	he 'Requiremen	-		U					
Rel	Related Design Elements								
Des	sign (Comments/	Changes)							
	Des	sign Criteria		Ŋ	les	No/Rank			
1	Is the design una	ambiguous?							
2	Is the design log	· ·							
2	Parent(s), and si	0 0	omponents?						
3	Is the design fea								
4	Is the design ver								
5	Is the requireme	ent fulfilled by	the design?						
	te: An answer of	-	comment or ch	nange in th	e Comm	ents/Chai	nge field		
01 t	he 'Design Text'	section.							
						_			
Fin	al Resolution	Approved	Modify	Implemen	nt Later	Drop	X		
Coi	nments								

Rec	uirement Gro	oup Related S	ection						
	EA-SEC-052	Con Ops							
Rela	ated Needs								
Pare	ent Section	11.3.1							
	luirement Tex								
			at software be installe	ed only by a	an authentic	cated user.			
	leted per SDD		rt of RSU 4.1 Specif						
	R	equirement Crit	teria		Yes	No	/Rank		
1	1 Is the requirement well-formed?				Х				
2	2 Is the requirement unambiguous?				Х				
3					Х				
4	Parent(s), and sibling requirements?4 Is the requirement feasible?				X				
	5 Is the requirement verifiable?				X				
5				Incn		Tast	Domo		
6	6 If feasible and verifiable, by which method?			Insp.	Anal.	Test	Demo.		
6						X			
		-	comment or change	e in the Co	mments/C	hange fiel	d of the		
'Requirement Text' section. Related Design Elements									
	The RSU software update can only be done from the browser UI after successful login.								
Des	ign (Commen	ts/Changes)							
		Design Criteri	a		Yes	No	Rank		
1	Is the design	unambiguous?							
2		logically consistent esign component	ent with Parent(s),						
3	Is the design	<u> </u>	5:						
4	Is the design	verifiable?							
5	Is the require	ment fulfilled by	the design?						
	e: An answer sign Text' sec	-	comment or change	e in the Co	omments/Cl	hange fiel	d of the		
Fina	al Resolution	Approved	Modify	Impler	nent Later	Drop X			
Con	nments								

Rec	uirement Grou	Related Sect	tion				
~	EA-SEC-053	Con Ops					
	ated Needs						
	ent Section	11.3.1					
Ree	quirement Text	, I					
	1		processor shall in	clude me	echanisms	to prever	nt updates
froi	m being rolled b	ack. List of exce	eption from comm	ent		-	-
		c (Comments/C					
			f RSU 4.1 Specificat	tion			
		eption from com		•			
			nt does not apply to				
			ion. In other word		1		install a
SOL		irement Criter	e currently installe		Yes		/Rank
	-			1	1 05	140	AIIK
1	Is the requirem	nent well-formed	d?				
2	Is the requirem	nent unambiguo	us?				
3	Is the requiren	nent logically co	onsistent with				
	Parent(s), and	sibling requiren	nents?				
4	Is the requiren	nent feasible?					
5	Is the requiren	nent verifiable?					
				Insp.	Anal.	Test	Demo.
6	6 If feasible and verifiable, by which method?			insp.	1 111111	X	Demot
6							
			comment or char	nge in th	ne Commo	ents/Cha	nge field
		nt Text' section	1.				
	ated Design El						
	e RSU software up uirement commer		llation of an older so	oftware ve	ersion per e	exception I	ist from
	sign (Comment						
	<u> </u>	esign Criteria			Yes	No	/Rank
1	Is the design u	8		-		110	
	<u> </u>						
2	0	ogically consiste					
3		sibling design c	omponents?				
	Is the design for						
4	Is the design v						
5	Is the requirem	nent fulfilled by	the design?				
		-	comment or char	nge in th	ne Commo	ents/Cha	nge field
of t	he 'Design Tex	t' section.	T			-	
Fin	al A	Approved	Modify	Impler	nent	Drop	X
Res	solution			Later			
	Comments						
Coi	mments						
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Co	mments						

Rec	juirement Gro	up Related S	ection							
	EA-SEC-054_	Con Ops	cetton							
	ated Needs									
Pare	ent Section	11.3.1								
	luirement Tex									
			or shall notify the upd	ate mecha	nism of the	failure.				
		t (Comments/C	hanges) rt of RSU 4.1 Specifi	antion						
De.	leteu per SDD	warkunough, pa	it of KSU 4.1 Specifi	cation						
	Requirement CriteriaYesNo/Rank									
	•	-				INO	Kank			
1	Is the require	ment well-forme	d?		Х					
2	Is the require	ment unambiguo	us?		Х					
3	3 Is the requirement logically consistent with				Х					
	Parent(s), and sibling requirements?									
4	Is the require	ment feasible?			Х					
5	Is the require	ment verifiable?			Х					
				Insp.	Anal.	Test	Demo.			
6		d	uhi ah an ath a d9	msp.	i mui.		Demo.			
6		d verifiable, by w				X				
		-	comment or change	e in the Co	omments/C	hange fiel	d of the			
	quirement Te									
	Related Design Elements									
If th	ne update fails	the previous vers	10n 1s restored.							
Des	ign (Commen	ts/Changes)								
	8	Design Criteri	D		Yes	No	/Rank			
-	x . 1 .	U	a		1 05	110/	Nalik			
1	ŭ	unambiguous?								
2	•	•••	ent with Parent(s),							
2		esign component	s?							
3	Is the design									
4	Is the design	verifiable?								
5	Is the require	ment fulfilled by	the design?							
Not	e: An answer	of no requires a	comment or change	e in the Co	mments/C	hange fiel	d of the			
	sign Text' sec	-	0			8				
Fina	al Resolution	Approved	Modify	Impler	nent Later	Drop X				
Con	nments									

Re	quirement Grou	p Related Sec	tion				
-	EA-SEC-055	Con Ops					
Re	lated Needs						
	rent Section	11.3.1					
	quirement Tex						6.1
	-		an update failure ssor to roll back.	, it shall pu	iblish a no	tification	of the
	quirement Tex						
			of RSU 4.1 Specifi	cation			
	moved 'request						
	Requ	uirement Crite	eria		Yes		/Rank
1	Is the requirer	nent well-form	ed?				
2	Is the requirer	nent unambigu	ous?				
3 Is the requirement logically consistent with							
Parent(s), and sibling requirements?							
4	Is the requirer	nent feasible?					
5	Is the requirer	nent verifiable?)				
				Insp.	Anal.	Test	Demo.
6	6 If feasible and verifiable, by which method?					Χ	
	he update fails t sign (Comment	1	sion is restored.				
	0	Design Criteria			Yes	No/Rank	
1	Is the design u						
2	Is the design 1	ogically consist	tent with				
	U U	sibling design					
3	Is the design f	feasible?					
4	Is the design v	verifiable?					
5	Is the requirer	nent fulfilled by	y the design?				
	te: An answer the 'Design Tex	-	a comment or cl	hange in th	ne Comme	ents/Cha	nge field
T '							T 7
	al Resolution	Approved	Modify	Implem	ent Later	Drop	X
Co	mments						

1 Is the requirement well-formed? X 2 Is the requirement unambiguous? X 3 Is the requirement logically consistent with Parent(s), and sibling requirements? X 4 Is the requirement feasible? X 5 Is the requirement verifiable? X 6 If feasible and verifiable, by which method? X Note: An answer of no requires a comment or change in the Comments/Change field	otects								
Parent Section 11.3.1 Requirement Text All cryptographic software and firmware shall be developed and installed in a form that prot the software and firmware source and executable code from unauthorized disclosure and modification Requirement Text (Comments/Changes) Deleted per SDD Walkthrough; part of RSU 4.1 Specification Requirement well-formed? X 1 Is the requirement unambiguous? X 2 Is the requirement logically consistent with Parent(s), and sibling requirements? X 4 Is the requirement verifiable? X 5 Is the requirement verifiable? X 6 If feasible and verifiable, by which method? X 8 Note: An answer of no requires a comment or change in the Comments/Change field									
Requirement Text All cryptographic software and firmware shall be developed and installed in a form that prot the software and firmware source and executable code from unauthorized disclosure and modification Requirement Text (Comments/Changes) Deleted per SDD Walkthrough; part of RSU 4.1 Specification I Is the requirement well-formed? X 2 Is the requirement logically consistent with Parent(s), and sibling requirements? X 3 Is the requirement treasible? X 5 Is the requirement verifiable? X 5 Is the requirement verifiable? X 6 If feasible and verifiable, by which method? X									
All cryptographic software and firmware shall be developed and installed in a form that protite software and firmware source and executable code from unauthorized disclosure and modification Requirement Text (Comments/Changes) Deleted per SDD Walkthrough; part of RSU 4.1 Specification I Is the requirement well-formed? X 2 Is the requirement unambiguous? X 3 Is the requirement logically consistent with Parent(s), and sibling requirements? X 4 Is the requirement verifiable? X 5 Is the requirement verifiable? X 6 If feasible and verifiable, by which method? X									
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1 Is the requirement well-formed? X 2 Is the requirement unambiguous? X 3 Is the requirement logically consistent with Parent(s), and sibling requirements? X 4 Is the requirement feasible? X 5 Is the requirement verifiable? X 6 If feasible and verifiable, by which method? X Note: An answer of no requires a comment or change in the Comments/Change field	Rank								
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4 Is the requirement feasible? X 5 Is the requirement verifiable? X 6 If feasible and verifiable, by which method? X 6 If feasible and verifiable, by which method? X 7 Note: An answer of no requires a comment or change in the Comments/Change field									
5 Is the requirement verifiable? X 5 Is the requirement verifiable? Insp. 6 If feasible and verifiable, by which method? X 7 Note: An answer of no requires a comment or change in the Comments/Change field									
Insp. Anal. Test 6 If feasible and verifiable, by which method? X Note: An answer of no requires a comment or change in the Comments/Change field									
Note: An answer of no requires a comment or change in the Comments/Change field	Demo.								
'Requirement Text' section.	Note: An answer of no requires a comment or change in the Comments/Change field of the								
'Requirement Text' section. Related Design Elements									
The cryptographic software and firmware is contained within the HSM where it is protected from									
The cryptographic software and firmware is contained within the HSM where it is protected from unauthorized disclosure and modification.									
Design (Comments/Changes)									
	Rank								
1 Is the design unambiguous?									
2 Is the design logically consistent with Parent(s), and sibling design components?									
3 Is the design feasible?									
4 Is the design verifiable?									
5 Is the requirement fulfilled by the design?									
Note: An answer of no requires a comment or change in the Comments/Change field 'Design Text' section.	of the								
Final ResolutionApprovedModifyImplement LaterDrop X									
Comments									

Re	quirement Group	Related Sect	ion				
TH	EA-SEC-057						
	lated Needs						
	rent Section						
	quirement Text e HSM shall be ce	ortified by one	of the approved	loortificatio	n antitias	or if they	ora not
	ailable the HSM si	•				of if they	are not
Re	quirement Text (leted This is part ((Comments/C	hanges)			C-003	
	Requi	rement Criter	ria	Y	les	No	/Rank
1	Is the requireme	ent well-forme	d?				
2	Is the requireme	ent unambiguo	us?				
3 Is the requirement logically consistent with Parent(s), and sibling requirements?							
4	4 Is the requirement feasible?						
5 Is the requirement verifiable?							
				Insp.	Anal.	Test	Demo.
6	If feasible and v	verifiable, by v	which method?				
E	lated Design Eler sign (Comments/						
	De	sign Criteria		Y	les	No/Rank	
1	Is the design un	ambiguous?					
2	Is the design log Parent(s), and s						
3	Is the design fea	<u> </u>	•				
4	Is the design ve	rifiable?					
5	Is the requireme	ent fulfilled by	the design?				
	te: An answer of the 'Design Text	-	a comment or a	hange in th	e Commo	ents/Cha	nge field
Fin	al Resolution	Approved	Modify	Impleme	ent Later	Drop	X
Co	mments						

Rec	quirement Grou	p Related Se	ction							
	THEA-SEC-058 3.3 System Security: Table 3.1 Security Requirements									
	ated Needs									
	ent Section	4								
	q uirement Tex cryptographic m		an approved in	teority tech	nique shall	l he annli	ed to all			
	ptographic softv					r oe uppin				
	quirement Tex		•							
Del	Deleted This is part of the overall SCMS requirements. See THEA-SEC-003									
	Requ	uirement Crite	eria	N N	Yes		/Rank			
1	Is the requirer	nent well-form	ed?							
2	Is the requirer	nent unambigu	ous?							
3 Is the requirement logically consistent with										
Parent(s), and sibling requirements?4 Is the requirement feasible?										
4	-									
5	Is the requirer	nent verifiable	?							
				Insp.	Anal.	Test	Demo.			
6	If feasible and	l verifiable, by	which method?							
	te: An answer o the 'Requireme			change in th	e Comm	ents/Cha	nge field			
Re	lated Design El	ements								
E										
Des	sign (Comment	ts/Changes)								
	D	esign Criteria		Ŋ	Yes	No/Rank				
1	Is the design u	inambiguous?								
2		ogically consis								
2		sibling design	components?							
3	Is the design f									
4	Is the design v									
5	-	nent fulfilled b								
	te: An answer of the 'Design Tex	-	a comment or	change in th	e Comm	ents/Cha	nge field			
Fin	al Resolution	Approved	Modify	Implemen	nt Later	Drop	X			
Co	mments		11	I		<u> </u>				

Req	uirement Grou	p Related Sect	ion							
TH	EA-SEC-059									
Rel	ated Needs									
	ent Section									
If th		alculates the Mes	0							
	•	cret key known o	•			•	•			
	software on boot or if the software provider has a unique shared key with each distinct									
	device and uses this to authenticate the software, the message authentication code shall be									
US. Poquiromont Toxt (Commonts/Changes)										
Requirement Text (Comments/Changes) Deleted This is part of the overall SCMS requirements. See THEA-SEC-003										
	Requ	uirement Criter	ia	Ŋ	Yes	No	Rank			
1	Is the requirer	nent well-formed	1?							
2	Is the requirer	nent unambiguou	ıs?							
3	Parent(s), and sibling requirements?									
4	Is the requirer	nent feasible?								
5	Is the requirer	nent verifiable?								
				Insp.	Anal.	Test	Demo.			
6	, ,									
		of no requires a ent Text' section		nange in th	ne Commo	ents/Chai	nge field			
Rel	ated Design El	ements								
Е										
Des	sign (Comment	ts/Changes)								
	D	esign Criteria		Ŋ	Yes	No	/Rank			
1	Is the design u	inambiguous?								
2	U	ogically consiste								
2		sibling design co	omponents?	-						
3	Is the design f			-						
4	Is the design v		the design?							
	-	nent fulfilled by	e	ongo in th	Comm	onts/Chor	ago fiold			
	he 'Design Tex	-					ige neiu			
F 'a	-1 D 1	A	Matte	T		Dura	V			
	al Resolution	Approved	Modify	Implement	nt Later	Drop 2	A			
Cor	nments									

THEA-SEC-060 Related Needs Parent Section Requirement Text									
Parent Section									
Kequirement lext									
A Message Authentication Code shall not be used to protect the software unless th	e								
Message Authentication Code key is unique to the HSM.									
Requirement Text (Comments/Changes)									
Deleted This is part of the overall SCMS requirements. See THEA-SEC-003									
Requirement CriteriaYesNo/	Rank								
1 Is the requirement well-formed?									
2 Is the requirement unambiguous?									
3 Is the requirement logically consistent with									
Parent(s), and sibling requirements?									
4 Is the requirement feasible?									
5 Is the requirement verifiable?									
Insp. Anal. Test	Demo.								
6 If feasible and verifiable, by which method?									
Note: An answer of no requires a comment or change in the Comments/Chan	ge field								
of the 'Requirement Text' section.									
Related Design Elements									
E									
Design (Comments/Changes)									
Design Criteria Yes No/	Rank								
1 Is the design unambiguous?									
2 Is the design logically consistent with									
Parent(s), and sibling design components?									
3 Is the design feasible?									
4 Is the design verifiable?									
5 Is the requirement fulfilled by the design?									
Note: An answer of no requires a comment or change in the Comments/Change field									
of the 'Design Text' section.									
of the 'Design Text' section.	7								
of the 'Design Text' section. Final Resolution Approved Modify Implement Later Drop X	ζ								
of the 'Design Text' section.	ζ								
of the 'Design Text' section. Final Resolution Approved Modify Implement Later Drop X	<u> </u>								
of the 'Design Text' section. Final Resolution Approved Modify Implement Later Drop X	ζ								

Req	uirement Group	Related Sect	ion							
	EA-SEC-061									
Rel	ated Needs									
	ent Section									
	uirement Text		_			_				
-	ptographic softw			•						
	ormation shall be		-	•••						
	requirements specified in the Protection Profiles listed in FIPS 140-2 Annex B and is capable of evaluation at the CC evaluation assurance level EAL2, or an equivalent trusted									
-	operating system.									
-	Requirement Text (Comments/Changes)									
Deleted This is part of the overall SCMS requirements. See THEA-SEC-003										
		irement Criter	=		les		/Rank			
1 Is the requirement well-formed?										
2	Is the requirem	ent unambiguou	ıs?							
3	Is the requirem	ent logically co	nsistent with							
	-	ibling requirem								
4	Is the requirem	ent feasible?								
5	Is the requirem	ent verifiable?								
				Insp.	Anal.	Test	Demo.			
6	6 If feasible and verifiable, by which method?									
	e: An answer o	-		hange in th	e Comm	ents/Chai	nge field			
	he 'Requiremen		l•							
	ated Design Ele	ments								
Е										
Des	sign (Comments	/Changes)								
	De	sign Criteria		Y	les	No	Rank			
1	Is the design un	nambiguous?								
2	Is the design lo	gically consiste	nt with							
		ibling design co	omponents?							
3	Is the design fe	asible?								
4	Is the design ve	erifiable?								
5	Is the requirem	ent fulfilled by	the design?							
	e: An answer of		comment or c	hange in th	e Commo	ents/Chai	nge field			
of t	he 'Design Text	' section.								
Fina	al Resolution	Approved	Modify	Implemen	t Later	Drop 2	X			
Cor	nments									

Req	uirement Grou	p Related Secti	on								
	THEA-SEC-062 Con Ops										
	ated Needs										
-	ent Section	11.3.2									
	uirement Text	lata cryptographic	software and firm	wara cryp	tographic l	have and					
	To protect plaintext data, cryptographic software and firmware, cryptographic keys, and authentication data, the discretionary access control mechanisms of the operating system shall be										
			at can execute sto								
	· · · · ·	Comments/Chan	0 /								
Del	eted per SDD W	alkthrough; part o	f RSU 4.1 Specific	cation							
	Req	uirement Criteria	a]	Yes	No	Rank				
1	1 Is the requirement well-formed? X										
2	2 Is the requirement unambiguous? X										
3											
C	Parent(s), and sibling requirements?										
4											
5 Is the requirement verifiable? X											
	Insp. Anal. Test Demo.										
6											
Not	e: An answer of	no requires a con	nment or change	in the Co		hange fiel	d of the				
	quirement Text'	-									
Rela	ated Design Eler	nents									
Perr	nission is require	d and enforced by	Linux OS for the	user to per	form opera	ations on th	ne HSM.				
		~									
Des	ign (Comments/										
	I	Design Criteria		<u> </u>	Yes	No	Rank				
1	Is the design un	ambiguous?									
2		gically consistent	with Parent(s),								
2	0	gn components?									
3	Is the design fea										
4	Is the design ve										
5	5 Is the requirement fulfilled by the design?										
	Note: An answer of no requires a comment or change in the Comments/Change field of the										
'De	'Design Text' section.										
Fina	al Resolution A	Approved	Modify	Implen	nent Later	Drop X					
Con	Comments										

TH											
	THEA-SEC-063 Con Ops										
	ated Needs										
	ent Section	11.3.2									
To p auth conf cryp	Requirement Text To protect plaintext data, cryptographic software and firmware, cryptographic keys, and authentication data, the discretionary access control mechanisms of the operating system shall be configured to specify the set of roles that can modify (i.e., write, replace, and delete) the following cryptographic module software or firmware components stored within the cryptographic boundary: cryptographic programs, cryptographic data.										
	Requirement Text (Comments/Changes) Deleted per SDD Walkthrough; part of RSU 4.1 Specification										
	Re	equirement Criteria	a		Yes	No	/Rank				
1	Is the require	ment well-formed?			Х						
2	Is the require	ment unambiguous?			Х						
3		ment logically consi I sibling requiremen			Х						
4	Is the require	ment feasible?			Х						
5	Is the require	ment verifiable?			Х						
	L			Insp.	Anal.	Test	Demo.				
6	If feasible and	l verifiable, by whic	ch method?		X						
		of no requires a co	mment or change	in the Co	mments/Cl	nange fiel	d of the				
	quirement Tex ated Design El										
		red and enforced by	Linux OS for the	user to per	rform opera	tions on tl	ne HSM.				
Des	ign (Comment	_		1		-					
		Design Criteria			Yes	No	/Rank				
1	Is the design u	unambiguous?									
2	and sibling de	logically consistent esign components?	with Parent(s),								
3	Is the design f	feasible?									
4	Is the design	verifiable?									
5	Is the require	ment fulfilled by the	e design?								
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.										
	al Resolution	Approved	Modify	Implen	nent Later	Drop X	Χ				
Con	nments										

Req	uirement Grou	Related Section	ion							
TH	EA-SEC-064	Con Ops								
Rel	ated Needs									
	ent Section	11.3.2								
	uirement Text									
-	-	• • •	phic software ar		• • • •					
			ry access control				•			
	0	1 4	et of roles that c		71 U	1	vare			
	components stored within the cryptographic boundary: cryptographic data. Requirement Text (Comments/Changes)									
	Requirement Text (Comments/Changes) Deleted per SDD Walkthrough; part of RSU 4.1 Specification									
	noved 'followir	• •	i KSO 4.1 Specifi	cation						
	Requirement CriteriaYesNo/Rank									
1	1 Is the requirement well-formed?									
2	Is the requirem	nent unambiguo	us?							
3	Is the requirem	nent logically co	onsistent with							
-	-	sibling requiren								
4	Is the requirem									
5	Is the requiren	nent verifiable?								
				Insp.	Anal.	Test	Demo.			
6	If feasible and	verifiable, by w	hich method?		X					
		of no requires a nt Text' section	comment or ch	nange in th	e Comme	ents/Chai	nge field			
Rel	ated Design El	ements								
Per HSI	-	red and enforced	d by Linux OS f	or the user	to perforn	n operatio	ns on the			
-	ign (Comment	s/Changes)								
	D	esign Criteria		Y	les	No	'Rank			
1	Is the design u	nambiguous?								
2	•	ogically consiste								
3	Parent(s), and Is the design f	sibling design c	omponents?							
3 4	Is the design v									
4 5			the design?							
3	is the requirem	nent fulfilled by	the design?							
	e: An answer o he 'Design Tex	-	comment or cl	nange in th	e Comme	ents/Chai	nge field			
Fina	Final Resolution Approved Modify Implement Later Drop X									
Cor	nments			-						

Req	uirement Group	Related Section	on						
TH	EA-SEC-065	Con Ops							
	ated Needs								
	ent Section	11.3.2							
To j auth shal	Requirement Text To protect plaintext data, cryptographic software and firmware, cryptographic keys, and authentication data, the discretionary access control mechanisms of the operating system shall be configured to: specify the set of roles that can execute stored cryptographic software and firmware.								
Dele	uirement Text eted per SDD Wal laced capitalized	kthrough; part of	f RSU 4.1 Specifi		ifv.'				
		rement Criter			les	No/	Rank		
1	Is the requirem	ent well-formed	1?						
2	Is the requirem	us?							
3	Is the requirement Parent(s), and s	. .							
4	Is the requirem	ent feasible?							
5	Is the requirement	ent verifiable?							
Insp. Anal. Test Demo.									
6	If feasible and	verifiable, by w	hich method?		X				
	e: An answer of he 'Requiremen			ange in th	e Comme	ents/Chai	nge field		
Rel	ated Design Ele	ments							
Per HSI	mission is requir M.	ed and enforced	l by Linux OS fo	or the user	to perforn	n operatio	ns on the		
Des	ign (Comments	/Changes)							
	De	sign Criteria		Ŋ	les	No/	Rank		
1	Is the design un	ambiguous?							
2	Is the design lo Parent(s), and s	•							
3	Is the design fe	asible?							
4	Is the design ve	rifiable?							
5	Is the requirement	ent fulfilled by	the design?						
	e: An answer of he 'Design Text	-	comment or ch	ange in th	e Comme	ents/Char	nge field		
Fina	al Resolution	Approved	Modify	Implemen	nt Later	Drop 2	X		
Cor	Comments								

Req	uirement Gro	up Related Sect	ion								
	EA-SEC-066	Con Ops									
	Related Needs										
	ent Section	11.3.1									
The adm and	Requirement Text The operating system shall prevent all operators without the appropriate permissions (i.e., system admin) and executing processes from modifying executing cryptographic processes (i.e., loaded and executing cryptographic program images).										
	Requirement Text (Comments/Changes) Deleted per SDD Walkthrough; part of RSU 4.1 Specification										
	Re	equirement Criteri	a	Ŋ	Yes	No/	Rank				
1											
2	-	ment unambiguous?			X						
3		ment logically const sibling requirement			Х						
4											
5 Is the requirement verifiable? X											
	Insp. Anal. Test Demo.										
6	6 If feasible and verifiable, by which method? X										
'Re Rela	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section. Related Design Elements Permission is required and enforced by Linux OS for the user to perform operations on the HSM.										
Des	ign (Comment	ts/Changes)									
		Design Criteria		Ŋ	Yes	No	Rank				
1	Is the design u	unambiguous?									
2	U U	logically consistent esign components?	with Parent(s),								
3	Is the design f	feasible?									
4	Is the design v	verifiable?									
5	Is the requirer	ment fulfilled by the	e design?								
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.										
T '	10 1				. •		-				
	al Resolution	Approved	Modify	Implen	ent Later	Drop X					
Con	nments										

Req	uirement Grou	up Related Sect	ion							
	THEA-SEC-067 Con Ops									
	ated Needs	11.2.1								
	ent Section uirement Text	11.3.1								
-			erators without the	appropria	te permissi	ons (i.e., s	vstem			
adm	nin) and execution	ng processes from	reading cryptograp				,			
	tographic boun									
		(Comments/Char Vallethrough: part		otion						
	Deleted per SDD Walkthrough; part of RSU 4.1 Specification									
	Requirement CriteriaYesNo/Rank									
1	Is the requirem	nent well-formed?			X					
2	Is the requiren	nent unambiguous	?		X					
3	Is the requirem	nent logically cons	istent with		X					
	Parent(s), and sibling requirements?									
4	Is the requirem	nent feasible?			Х					
5	Is the requirem	nent verifiable?			X					
	Insp. Anal. Test Demo.									
6	6 If feasible and verifiable, by which method? X									
		-	mment or change	in the Co	mments/C	hange fiel	d of the			
	quirement Tex ated Design Ele									
	U									
The	nsm of the KS	SU does not allow	read operations.							
Des	ign (Comments	s/Changes)								
		Design Criteria		y	Yes	No/	Rank			
1	Is the design u	inambiguous?								
2	U	ogically consistent	with Parent(s),							
3	Is the design f	sign components? easible?								
4	Is the design v									
5		nent fulfilled by th	e design?							
_	•	•		in the Co	nments/C	hange field	d of the			
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.									
Fina	al Resolution	Approved	Modify	Implem	nent Later	Drop X				
Con	Comments									

	uirement Grou	Related Section	on						
	EA-SEC-068								
	ated Needs								
	ent Section								
The and	delete cryptogr	ntain two roles, aphic keys, and	install signed so	oftware and	firmware	and Secu	rity		
		nstall unsigned s r firmware is be				hat specia	lized		
		(Comments/Cl	0						
Del	eted' Allowing	installation of ur	nsigned softwar	e, even whe	en protect	ed by a sp	ecial		
	user account, is a backdoor mechanism with the potential to compromise security. In the								
inte	interest of security this should not be a mandatory requirement.								
	Requirement CriteriaYesNo/Rank								
1	Is the requirem	nent well-formed	1?						
2	Is the requiren	nent unambiguou	18?						
3	-	nent logically co							
		sibling requirem	ents?						
4	Is the requiren								
5	Is the requiren	nent verifiable?							
				Insp.	Anal.	Test	Demo.		
6	If feasible and	verifiable, by w	hich method?						
of t	he 'Requireme	of no requires a nt Text' section		hange in th	e Comme	ents/Chai	nge field		
Rel	ated Design El	ements							
E									
Des	ign (Comment	s/Changes)							
	D	esign Criteria		Y	Yes	No	Rank		
1	Is the design u	nambiguous?							
2	0	ogically consiste sibling design co							
3	Is the design for	easible?	•						
4	Is the design v	erifiable?							
5	Is the requiren	nent fulfilled by	the design?						
	e: An answer o he 'Design Tex	of no requires a t' section.	comment or c	hange in th	e Comm	ents/Chai	nge field		
Fina	Final ResolutionApprovedModifyImplement LaterDrop X								
Cor	nments								

	uirement Grou	IP Related Section	on								
	EA-SEC-069	Con Ops									
	ated Needs	11.0.1									
	ent Section	11.3.1									
	Requirement Text Activities carried out by the user role shall not be explicitly authenticated, once the user role has										
	cessfully logged										
		(Comments/Char									
Del	<mark>leted</mark> per SDD V	Valkthrough; part o	f RSU 4.1 Specifi	cation							
	Re	quirement Criteri	ล		Yes	No	Rank				
1											
	*										
2	•	nent unambiguous?			Х						
3		nent logically consi			Х						
4		sibling requiremen	ts?		X						
5	is the requirem	nent vermable?			-		-				
				Insp.	Anal.	Test	Demo.				
6	6 If feasible and verifiable, by which method? X										
		f no requires a co	mment or change	in the Co	mments/C	hange fiel	d of the				
	quirement Tex										
Rela	ated Design Ele	ements									
	-	ged in, the user car	n exercise activitie	s granted b	y his role v	vithout fur	ther				
auth	nentication										
Des	ign (Comments	s/Changes)									
		Design Criteria			Yes	No	Rank				
1	Is the design u	nambiguous?									
2	Ŭ	ogically consistent	with Parent(s)	-							
2	0	sign components?	with I arent(s),								
3	Is the design f										
4	Is the design v	verifiable?									
5	Is the requirem	nent fulfilled by the	e design?	-							
	5 Is the requirement fulfilled by the design? Note: An answer of no requires a comment or change in the Comments/Change field of the										
	'Design Text' section.										
	10 1.0	A 1		T 1			7				
Fina	al Resolution	Approved	Modify	Implen	nent Later	Drop X					
Con	Comments										

Req	Requirement Group Related Section										
	THEA-SEC-070 Con Ops										
-	ated Needs										
	ent Section	11.3.1									
	uirement Text		ides the host proces	sor othe		rs and the	НСМ				
	In a networked architecture which includes the host processor, other processors, and the HSM, the host processor shall authenticate itself to the HSM with an authentication mechanism based in										
		same physical secur									
	Requirement Text (Comments/Changes)										
Del	Deleted per SDD Walkthrough; part of RSU 4.1 Specification										
	Requirement CriteriaYesNo/Rank										
1	1 Is the requirement well-formed? X										
2	Is the requirer	nent unambiguous?			Х						
3	Is the requirer	nent logically consi	stent with		X						
	Parent(s), and sibling requirements?										
4	4 Is the requirement feasible? X										
5 Is the requirement verifiable? X											
	Insp. Anal. Test Demo.										
6	6 If feasible and verifiable, by which method? X										
Not	e: An answer o	of no requires a con	nment or change in	n the Co	mments/C	hange field	d of the				
'Re	quirement Tex	t' section.				0					
Rela	ated Design El	ements									
The	HSM and RSU	form a "connected	architecture". So th	is require	ement does	n't apply.					
D	• (0 •										
Des	ign (Comment	0									
		Design Criteria]	Yes	No/	Rank				
1	Is the design u	inambiguous?									
2		ogically consistent	with Parent(s),								
3	U	sign components?									
	Is the design f										
4	Is the design v		1								
5	^	nent fulfilled by the	J								
	Note: An answer of no requires a comment or change in the Comments/Change field of the										
Des	'Design Text' section.										
Fina	al Resolution	Approved	Modify	Implen	nent Later	Drop X					
Con	Comments										

	Requirement Group Related Section										
	THEA-SEC-071 Con Ops; OBU Component Specification										
	Related Needs Parent Section 11.3.1; 4.9.1										
	uirement Tex		ents identified in SA	E.12945/1	V5 such	as the BSN	Λ				
	OBUs shall support security requirements identified in SAE J2945/1 V5, such as the BSM transmission and reception security profile.										
	Requirement Text (Comments/Changes)										
Del	Deleted per SDD Walkthrough; part of RSU 4.1 Specification										
	Requirement Criteria Yes No/Rank										
1											
1	*										
2	<u>^</u>	ment unambiguous?			Х						
3		ment logically consi			Х						
4		l sibling requiremen ment feasible?	ts?		X						
5	-				X						
5	is the require	ment verifiable?		×			D				
	Insp. Anal. Test Demo.										
6	If feasible and	d verifiable, by whic	ch method?			Х					
		of no requires a co	mment or change	in the Co	mments/C	hange fiel	d of the				
	quirement Tex										
	ated Design El										
OB	Us have to cont	form to J2935/1 star	ndards								
Des	ign (Comment	ts/Changes)									
		Design Criteria			Yes	No	Rank				
1	Is the design	unambiguous?									
2	, e	logically consistent	with Parent(s).								
	0	esign components?									
3	Is the design	feasible?									
4	Is the design	verifiable?									
5	Is the require	ment fulfilled by the	e design?								
Not	Note: An answer of no requires a comment or change in the Comments/Change field of the										
'De	'Design Text' section.										
Fina	al Resolution	Approved	Modify	Implen	nent Later	Drop X					
Con	Comments										
-											

	uirement Grou	p Related Section	ion									
	EA-SEC-072	Con Ops; OB	U Component Spe	ecification								
	ated Needs											
	Parent Section 11.3.1; 4.7.2 Requirement Text											
					•							
				e tamper evident or	better.							
Req	uirement Text	(Comments/Char	iges)									
Requirement Criteria Yes No/Rank												
		quirement Criteri	a	Yes		NO/K	апк					
1	Is the requirem	nent well-formed?		Х								
2	Is the requirem	nent unambiguous?	,	X								
3	-	nent logically consi		X								
4	Parent(s), and Is the requirem	sibling requiremen	its?	X								
5	•	nent verifiable?		X								
5	is the requirem	ient vermable:			Anal.	Test	Demo.					
6	If feesible and		ah an ath a d?	Insp.	Allal.	Test	Denio.					
6		verifiable, by which		RSU port seals								
		-	mment or change	e in the Comments	/Chang	e field (of the					
	quirement Tex											
Kela	ated Design El	ements										
6 D4	equirements Tra	populity Matrix										
010												
The	OBU shall prov	vide evidence to de	tect tampering (e.	g. opening of the ca	se) thro	ugh tan	nper-					
evid	lent seals on all	unused input ports	and screw holes.	RSU is delivered w	vith tam	per-evic	lent					
seal	s on ports and e	nclosure.										
D	• (0											
Des	ign (Comment											
		Design Criteria		Yes		No/R	ank					
1	Is the design u	nambiguous?		X								
2		ogically consistent	with Parent(s),	X								
3	Is the design f	sign components? easible?		X								
4	Is the design v			X								
5		nent fulfilled by the	e design?	X								
-	•		-	e in the Comments	/Chang	o fiold (of the					
	sign Text' secti		minent of change	e in the Comments	Chang	e neiu (of the					
Fina	Final Resolution Approved X Modify Implement Later Drop											
Con	nments		•		I							

Req	uirement Gro	up Related Secti	on						
	EA-SEC-073	Con Ops							
	Related Needs								
		11.3.1							
	uirement Text		- react default use				co with		
		support the ability to tions (ENG, MRG, a			nu passwoi	us by use	SWIII		
		t (Comments/Chan							
		Walkthrough; part o		cation					
	Re	quirement Criteri	a		Yes	No	/Rank		
1	Is the requirer	nent well-formed?			X				
2	<u>^</u>		1		X				
	-	nent unambiguous?							
3	▲	nent logically consi sibling requiremen			Х				
4	Is the requirer				X				
5	-	nent verifiable?			X				
_				Insp.	Anal.	Test	Demo.		
6									
	6 If feasible and verifiable, by which method? X								
		of no requires a con	mment or change	in the Co	mments/C	hange fiel	d of the		
	quirement Tex ated Design El								
	<u> </u>			W.F.					
OB	Us do not suppo	ort access via SSH o	or HIIP as there is	5 no w1F1 1	nodule				
Des	ign (Comment	s/Changes)							
		Design Criteria			Yes	No	Rank		
1	Is the design u	6							
2	e	ogically consistent	with Parent(s)						
2	U	sign components?	with Fullent(5),						
3	Is the design f	easible?							
4	Is the design v	verifiable?							
5	Is the requirer	nent fulfilled by the	e design?						
Not	e: An answer o	of no requires a co	mment or change	in the Co	mments/C	hange fiel	d of the		
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.								
Fine	al Resolution	Approved	Modify	Implen	nent Later	Drop X	7		
	nments	rippio iou	litouity	Implei		Drop A	_		
Con	ments								

Req	uirement Grou	up Related Sect	ion							
-	EA-SEC-074	Con Ops								
	ated Needs									
	ent Section	11.3.1								
RSI	uirement Text J devices shall 1 9.3 (2016)		ervice Advertisemer	nt (WSA) s	security pro	file covere	d in IEEE			
		c (Comments/Char	nges)							
Del			of RSU 4.1 Specific							
	Requirement Criteria Yes No/Rank									
1	1 Is the requirement well-formed? X									
2	Is the requirer	nent unambiguous	?		Х					
3	Is the requirer	nent logically cons	istent with		Х					
		sibling requirement	its?							
4	Is the requirer				Х					
5	5 Is the requirement verifiable? X									
	Insp. Anal. Test Demo.									
6	If feasible and verifiable, by which method? X									
Not	e: An answer o	of no requires a co	mment or change	in the Co	mments/C	hange field	d of the			
'Re	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.									
Rela	Related Design Elements									
	·	with IEEE 1609.3	()							
Des	ign (Comment									
		Design Criteria			Yes	No/	Rank			
1	Is the design u	inambiguous?								
2	0	ogically consistent sign components?	with Parent(s),							
3	Is the design f	easible?								
4	Is the design v	verifiable?								
5	Is the requirer	nent fulfilled by the	e design?							
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.									
	1D 1	A 1	M 116	T 1			•			
Fina	nal Resolution Approved Modify Implement Later Drop X									
Con	nments									

	uirement Grou	up Related Secti	on							
-	EA-SEC-075	Con Ops								
-	ated Needs									
	ent Section	11.3.1								
	uirement Text	neet the SpaT, MA	P and Traveler Info	ormation M	lessage (Ti	M) securit	v profiles			
		system Functional					y promos			
		(Comments/Chan	0							
Del	eted per SDD V	Valkthrough; part o	f RSU 4.1 Specific	cation						
	Requirement Criteria Yes No/Rank									
1	1Is the requirement well-formed?X									
2	Is the requirem	nent unambiguous?			Х					
3	Is the requiren	nent logically consi	stent with		Х					
		sibling requiremen	ts?							
4	Is the requiren	nent feasible?			Х					
5	Is the requirem	nent verifiable?			Х					
	Insp. Anal. Test Demo.									
6	If feasible and verifiable, by which method? X									
Not		of no requires a co		in the Co	mments/C	hange fiel	d of the			
	quirement Tex	-	intent of change	in the co		lunge ner	a of the			
	ated Design Ele									
RSU	J will implemen	nt security profiles a	greed upon betwe	en CV pilo	ot sites.					
	1	J 1		ľ						
D										
Des	ign (Comments									
		Design Criteria			Yes	No	Rank			
1	Is the design u	inambiguous?								
2	0	ogically consistent	with Parent(s),							
2		sign components?								
3	Is the design f									
4	Is the design v									
5	Is the requiren	nent fulfilled by the	design?							
	Note: An answer of no requires a comment or change in the Comments/Change field of the									
'De	sign Text' secti	on.								
Fina	al Resolution	Approved	Modify	Implen	nent Later	Drop X				
Con	nments		l			1				

	uirement Grou	up Related Secti	on							
	EA-SEC-076	Con Ops								
	ated Needs									
-	ent Section	11.3.1								
	uirement Text	support security req	uirements identifie	d in SAF .	12945/1 \/5	such as t	he BSM			
		eception security pro			2040/1 00	, ouon uo t				
		(Comments/Chan								
Del	eted per SDD V	Valkthrough; part o	f RSU 4.1 Specifi	cation						
					-		-			
	Requirement Criteria Yes No/Rank									
1	1 Is the requirement well-formed? X									
2	Is the requirem	nent unambiguous?			Х					
3		nent logically consi			Х					
		sibling requiremen	ts?							
4	Is the requirem	nent feasible?			X					
5 Is the requirement verifiable? X										
	Insp. Anal. Test Demo.									
6	If feasible and	verifiable, by whic	ch method?			Х				
Not	e: An answer o	of no requires a co	mment or change	in the Co	mments/C	hange fiel	d of the			
	quirement Tex	-				0				
Rela	ated Design Ele	ements								
The	RSU does not t	transmit BSMs. The	e RSU supports the	e BSM sec	urity profil	e for recep	tion.			
Dog	ign (Comment	c/Changes)								
Des		0		T -			(T) 1			
		Design Criteria			Yes	No	Rank			
1	Is the design u	inambiguous?								
2	0	ogically consistent	with Parent(s),							
3	Is the design f	sign components?								
4	Is the design v		1 2 0							
5	*	nent fulfilled by the								
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.									
Des	sign Text secu	1011.								
Fina	al Resolution	Approved	Modify	Implen	nent Later	Drop X	<u> </u>			
Con	Comments									

Req	luirement Grou	p Related Sect	ion							
	EA-SEC-077	Con Ops								
	ated Needs									
	ent Section	11.3.1								
	luirement Text	upport the ability t	o reset default use	r names a	nd nasswor	ds by user	's with			
			and DYNACAdmin				o with			
		(Comments/Char								
Del	<mark>leted</mark> per SDD W	Valkthrough; part o	of RSU 4.1 Specifi	cation						
	Requirement CriteriaYesNo/Rank									
1	Is the requirem	nent well-formed?			Х					
2	Is the requirem	ent unambiguous	?		Х					
3	Is the requirem	nent logically cons	istent with		X					
_	*	sibling requiremen								
4	Is the requirem	ent feasible?			Х					
5	Is the requirem	nent verifiable?			Х					
				Insp.	Anal.	Test	Demo.			
6										
	Note: An answer of no requires a comment or change in the Comments/Change field of the									
	e: An answer of quirement Text	-	mment or change	in the Co	mments/C	hange fiel	d of the			
	ated Design Ele									
	0		vicionina filo whi	ah nagata ni	agregation of a) mly outhou	tiontad			
		is, i.e. via WebGU	ovisioning file which i	in resets pa	isswords. C	my autier	nicaleu			
user	cui periorii ui	10, 1.0. Viu V 00000								
Des	ign (Comments	/Changes)								
		Design Criteria			Yes	No	/Rank			
1	Is the design u	nambiguous?								
2	Is the design lo	ogically consistent	with Parent(s),							
	0	sign components?								
3	Is the design for	easible?								
4	Is the design v	erifiable?								
5	Is the requirem	ent fulfilled by the	e design?							
Not	e: An answer o	f no requires a co	mment or change	in the Co	mments/C	hange fiel	d of the			
	sign Text' secti	-	g.							
			T							
	1D 1.4	A 1	NA 110	T 1			r			
	nal Resolution Approved Modify Implement Later Drop X									
Con	nments									

Req	uirement Group	Related Sec	tion								
	EA-INM-001	Con Ops									
	ated Needs										
	ent Section uirement Text	11.3.2									
The			personal informati at a minimum.	on i	ncluding name,	address	s, vehicl	е			
	uirement Text (
	Requirement Criteria Yes No/Rank										
1	Is the requirement well-formed? X										
2	Is the requirement	nt unambiguous	\$?		Х						
3	Is the requirement Parent(s), and sit	••••			Х						
4	Is the requirement	<u> </u>			Х						
5	Is the requirement	nt verifiable?			Х						
	Insp. Anal. Test Demo.										
6	If feasible and ve	erifiable, by wh	ich method?		Collected data						
	Note: An answer of no requires a comment or change in the Comments/Change field of the										
	quirement Text' ated Design Elem										
used vehi be r	l as a unique ident	ifier for a partic unique ID in th	his process is any i cular vehicle. For p he "id" field of the PII Removal.	urp	ose of the study	the BSI	A of all				
Des	ign (Comments/C	Changes): Rese	archers correlate ra	ndo	omized ID outsid	le of sys	stem				
	D	esign Criteria			Yes		No/R	ank			
1	Is the design una	mbiguous?			Х						
2	Is the design log and sibling desig	•			Х						
3	Is the design fea				Х						
4	Is the design ver	ifiable?			Х						
5	Is the requirement	nt fulfilled by th	ne design?		Х						
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.										
Fina	al Resolution A	Modify		Implement Late	er Dr	op					
Con	nments										

Rec	uirement Grou	p Related Secti	on						
-	EA-INM-002	Con Ops							
-	ated Needs								
	ent Section	11.3.2							
	uirement Text	collected when re	aistering particina	ants shall be electro	nically	stored			
		ected vehicle data			mouny	otoroa			
Req	uirement Text (Comments/Chan	iges)	•					
	Req	uirement Criteri	a	Yes		No/R	ank		
1	Is the requirem	ent well-formed?		X					
2	Is the requirem	ent unambiguous?	,	X					
3	·	ent logically consi		X					
4	Is the requirem	ibling requiremen ent feasible?		X					
5	Is the requirem	ent verifiable?		X					
	<u>^</u>			Insp.	Anal.	Test	Demo.		
6									
Not	Note: An answer of no requires a comment or change in the Comments/Change field of the								
	quirement Text	-							
Dat	·		•	Information (PII) in age and transferred of	•	•	•		
Des	ign (Comments/	Changes)							
	I	Design Criteria		Yes		No/R	ank		
1	Is the design un	ambiguous?		X					
2	0	gically consistent gn components?	with Parent(s),	X					
3	Is the design fe	<u> </u>		X					
4	Is the design ve	rifiable?		X					
5	Is the requirement	ent fulfilled by the	e design?	X					
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.								
Fina	al Resolution	Approved X	Modify	Implement Late	er Di	op			
Cor	nments								

Dee		p Related	1 Coat:							
-	<mark>uirement Grou</mark> EA-INM-003	Con Op		on						
	ated Needs									
	ent Section	11.3.2								
	uirement Text									
				gin with passwor	d protection.					
Req	luirement Text	(Comments,	/Chan	ges)						
	Re	quirement C	Criteria	1	Yes		No/R	ank		
1	Is the requiren	nent well-form	med?		X					
2	Is the requiren				X					
3										
4	Is the requiren			.8 :	X					
5	Is the requiren	nent verifiabl	le?		X					
					Insp.	Anal.	Test	Demo.		
6	6 If feasible and verifiable, by which method? Login process									
	e: An answer o quirement Tex		s a coi	nment or chang	e in the Comments	/Chang	e field	of the		
	2.3 The Protecters will have read				an encrypted file sy	stem. O	nly auth	norized		
Des	ign (Comments	s/Changes)								
		Design Crite	eria		Yes		No/R	ank		
1	Is the design u	nambiguous	?		X					
2	Is the design lead and sibling design and sibling d	U V		with Parent(s),	Х					
3	Is the design f		ents?		X					
4	Is the design v	erifiable?			X					
5	Is the requiren	nent fulfilled	by the	design?	X					
	e: An answer o sign Text' secti		s a coi	nment or chang	e in the Comments	/Chang	e field (of the		
	10 1		X 7	N 110						
	al Resolution	Approved 2	X	Modify	Implement Lat	er Dr	op			
Con	Comments									

Req	uirement Gro	up Related	l Secti	on					
TH	EA-INM-004	Con Op	S						
-	ated Needs								
	ent Section	11.3.2							
-	uirement Text		ore be	ing released to t	he F	Research Data E	xchand	e (RDF)	
	uirement Text	t (Comments,	/Chan	iges)					
	Re	quirement C	riteri	a		Yes		No/R	ank
1	Is the requirer	nent well-form	med?			Х			
2	2 Is the requirement unambiguous? X								
3	Is the requirer Parent(s), and					Х			
4	Is the requirer					Х			
5	Is the require	nent verifiabl	e?			Х			
						Insp.	Anal	Test	Demo.
6	6 If feasible and verifiable, by which method? RDE data								
	Note: An answer of no requires a comment or change in the Comments/Change field of the								
'Requirement Text' section. Related Design Elements									
Data Stor	a of the last 24 areas	hours is read t	from t	he Protected Sto	rage	formation (PII) in and transferred	over to	the Pub	lic
Des	ign (Comment	s/Changes):	Only o	lata from the pu	olic	storage area is up	oloadec	to the R	RDE.
		Design Crite	eria			Yes		No/R	ank
1	Is the design u	unambiguous	?			Х			
2	Is the design l and sibling de			with Parent(s),		Х			
3	Is the design f	feasible?				Х			
4	Is the design v	verifiable?				Х			
5	5 Is the requirement fulfilled by the design? X								
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.								
Fina	al Resolution	Approved 2	X	Modify		Implement Late	er D	rop	
Con	Comments								

		Related Sect	ion							
	A-SGD-001	Con Ops; OB	U Component Spe	ecificatio	on					
	ated Needs									
-	ent Section	8; 4.11								
Data	uirement Text a collected by Ve vehicle.	nicles (i.e., OBUs) shall be stored o	n a stora	age devi	ce con	nected locally to			
Req	uirement Text (Comments/Chai	nges)							
	Requirement Criteria Ves No/Rank									
	Requirement Criteria Yes No/Rank									
1	1 Is the requirement well-formed? X									
2	Is the requirement	ent unambiguous?	?		Х					
3	▲	ent logically const bling requirement			Х					
4	Is the requireme				Х					
5	Is the requirement	ent verifiable?			Х					
				Insp.	Anal.	Test	Demo.			
6	If feasible and v	erifiable, by which	ch method?				OBU storage			
		-	mment or change	e in the	Comme	nts/Ch	ange field of the			
	'Requirement Text' section. Related Design Elements									
firm 6 Re	ware updates.	ability Matrix	t/reader, encrypted 8 GB SD or micro			•				
Des	ign (Comments/	Changes)								
	Γ	esign Criteria			Yes		No/Rank			
1	Is the design un	ambiguous?			X					
2		gically consistent gn components?	with Parent(s),		Х					
3	Is the design fea	Y I			Х					
4	Is the design ve	rifiable?			Х					
5	Is the requirement	ent fulfilled by the	e design?		Х					
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.									
Fine	al Resolution A	Approved X	Modify	Imn	lement I	ator	Drop			
		Approved A	Moully	mp			ыор			
Con	nments									

	luirement Grou	p Related Section	ion							
	A-SGD-002	Con Ops								
	ated Needs									
	ent Section	8								
	uirement Text		IMa SSMa) tran	mittadia	nd roadi	und (i d	PSMa SPMa) by			
		d on a storage dev				veu (i.e	e. BSMs, SRMs) by			
		(Comments/Char								
	Rec	uirement Criteri	a		Yes		No/Rank			
1	Is the requirem	ent well-formed?			Х					
2	Is the requirem	ent unambiguous?	2		Х					
3	3 Is the requirement logically consistent with Parent(s), and sibling requirements? X									
4										
5	Is the requirem	ent verifiable?		Х						
	Insp. Anal. Test Demo.									
6										
	Note: An answer of no requires a comment or change in the Comments/Change field of the									
	quirement Text	-	minent of chang	e in the	Comme	1115/ CI	lange neid of the			
Data		ons lication responsibl aat data to the back			a (e.g. B	SMs, T	TIMs, alerts, etc.)			
Des	ign (Comments	/Changes)								
]	Design Criteria			Yes		No/Rank			
1	Is the design u	nambiguous?			X					
2		ogically consistent ign components?	with Parent(s),		Х					
3	Is the design fe	<u> </u>			Х					
4	Is the design ve	erifiable?			Х					
5	Is the requirem	ent fulfilled by the	e design?		Х					
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.									
	1.5									
Fina	al Resolution	Approved X	Modify	Imp	lement I	Later	Drop			
Con	nments									

	uirement Grou	p Related Secti	on							
	A-SGD-003	Con Ops								
	ated Needs									
	ent Section uirement Text	8								
		n OBUs (OBU log	s) shall be trans	smitte	ed wirelessly to R	SUs	through	as	secure	
	munications cor				-					
Req	uirement Text	(Comments/Chan	iges)							
	Requ	irement Criteria			Yes		No	'Ra	nk	
1	Is the requirem	ent well-formed?			Х					
2	Is the requirem	ent unambiguous?	ı.		Х					
3	Is the requirem	ent logically consi	stent with		X					
	·	sibling requiremen								
4	Is the requirem	ent feasible?			Х					
5	Is the requirem	ent verifiable?			Х					
	•				Insp.	Ana	l. Tes	t	Demo.	
6	If feasible and	verifiable, by whic	ch method?	OB	U to RSU data					
Not	Note: An answer of no requires a comment or change in the Comments/Change field of the									
'Requirement Text' section.										
Rela	ated Design Ele	ments								
3.2.	2.7.3 data log tra	nsfer								
Des	ign (Comments	/Changes)								
]	Design Criteria			Yes		No	'Ra	nnk	
1	Is the design u	nambiguous?			Х					
2	U	gically consistent	with Parent(s),		Х					
-	<u> </u>	ign components?								
3	Is the design fe				X					
4	Is the design ve				X					
5	•	ent fulfilled by the			Х					
	Note: An answer of no requires a comment or change in the Comments/Change field of the									
·Des	sign Text' sectio)n.	-							
Fina	inal Resolution Approved X Modify Implement Later Drop									
Con	nments									

	uirement Grou	ip Relate	ed Secti	on							
	A-SGD-004	Con O	ps								
-	ated Needs	0									
-	ent Section uirement Text	8									
		on RSUs (R	SU logs	s) shall be transi	nitte	ed to the Master S	Server	through	а		
secu	ure communicat	ions connec	ction.	·							
Req	uirement Text	(Comment	s/Chan	iges)							
	Requirement CriteriaYesNo/Rank										
1	1 Is the requirement well-formed? X										
2	Is the requiren	nent unambi	iguous?			Х					
3	Is the requiren					Х					
4	Parent(s), and			ts?		X					
4	Is the requirem					X X					
5	Is the requiren	ient verifiat	ole?				A	Test	Deme		
	TC C 111 1			1 1 10	0	Insp.	Anal	. Test	Demo.		
6											
	Note: An answer of no requires a comment or change in the Comments/Change field of the										
	'Requirement Text' section. Related Design Elements										
	C C										
						CIT-C interface f			•		
				he "TSP Reques		. NextConnect in terface"	pleme	ents interi	taces		
101			und t		• 111						
			eates ba	tches of data log	gs fi	rom Flash Storage	e and s	ends the	n to the		
mas	ter server via X	FER									
Deg	an (Commont		VEED	:	1	alvat lavor OCIT	:				
Des	<u> </u>	<u> </u>		is encrypted we	DSO	cket layer, OCIT	is pro				
		Design Cri				Yes		No/R	ank		
1	Is the design u	<u> </u>				Х					
2	Is the design lo and sibling des			with Parent(s),		Х					
3	Is the design for		ilents:			Х					
4	Is the design v	erifiable?				Х					
5	Is the requirem	nent fulfilled	d by the	e design?		Х					
Not	Note: An answer of no requires a comment or change in the Comments/Change field of the										
'De	sign Text' secti	on.									
Fina	al Resolution	Approved	Х	Modify		Implement Late	er I	rop			
Con	nments					•					

-	uirement Gro	up Related Secti	on								
-	A-SGD-005	Con Ops									
-	Related Needs Parent Section										
-	Requirement Text										
The	Requirement Text The frequency at which data locally stored on OBUs is transmitted to the Master Server shall be determined by the ability of those devices to wirelessly transmit the data.										
	determined by the ability of those devices to wirelessly transmit the data. Requirement Text (Comments/Changes)										
Del	Deleted per the SDD Walkthrough										
Requirement CriteriaYesNo/Rank											
1	Is the requirer	ment well-formed?			Х						
2	Is the requirer	nent unambiguous?			Х						
3	A	nent logically consi sibling requiremen			Х						
4	Is the requirer				X						
5	Is the requirer	nent verifiable?			X						
	1			Insp.	Anal.	Test	Demo.				
6	Insp.Anal.TestDemo.6If feasible and verifiable, by which method?X										
-		of no requires a con		in the Co	mmonts/C		d of the				
	quirement Tex	-	innent or change		innents/C	nange neo	a of the				
	ated Design El										
OB	Us will transfer	data logs to nearby	RSUs whenever p	ossible.							
Des	ign (Comment	s/Changes)									
		Design Criteria			Yes	No	'Rank				
1	Is the design u	inambiguous?									
2	U	ogically consistent sign components?	with Parent(s),								
3	Is the design f										
4	Is the design v	verifiable?									
5	Is the requirer	nent fulfilled by the	e design?								
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.										
Fina	al Resolution	Approved	Modify	Implen	nent Later	Drop X					
Con	Comments										

	uirement Grou	p Related Secti	on									
	A-SGD-006	Con Ops										
	Related Needs Con Ops Parent Section 8 Requirement Text											
		-										
The dete	The frequency at which data locally stored on RSUs is transmitted to the Master Server shall be determined based on the RSUs' storage capacity and communication bandwidth to master server.											
	Requirement Text (Comments/Changes)											
Del	Deleted per the SDD Walkthrough											
Requirement Criteria Yes No/Rank												
1	Is the requirem	nent well-formed?			Х							
2	Is the requirem	nent unambiguous?			Х							
3		nent logically consi			Х							
		sibling requiremen	ts?									
4	Is the requirem				Х							
5	Is the requirem	nent verifiable?			Х							
				Insp.	Anal.	Test	Demo.					
6												
		f no requires a co	mment or change	in the Co	mments/C	hange fiel	d of the					
	quirement Text											
-	ated Design Ele											
		ector transmits all o			erver via er	ncrypted w	ebsocket					
com	nection (AFER)	. Data is transferred	i as fast as possibl	e.								
Des	ign (Comments	s/Changes)										
		Design Criteria			Yes	No	Rank					
1	Is the design u	nambiguous?										
2	U	ogically consistent	with Parent(s),									
2	Ŭ	sign components?										
3	Is the design for											
4	Is the design v											
	5 Is the requirement fulfilled by the design?											
	Note: An answer of no requires a comment or change in the Comments/Change field of the											
'De	sign Text' secti	on.										
Fina	al Resolution	Approved	Modify	Implen	nent Later	Drop X						
Con	Comments											

	uirement Group	Related Sect	ion								
	A-SGD-007	Con Ops									
-	ated Needs										
-	Parent Section 8 Requirement Text The Master Server shall securely archive the system generated data (RSMs_TIMS_etc.) to										
	The Master Server shall securely archive the system generated data (BSMs, TIMS, etc.) to										
	protect and provide redundancy										
Req	Requirement Text (Comments/Changes)										
Requirement CriteriaYesNo/Rank											
1											
1	<u>^</u>		<u></u>	X							
2	Is the requireme	ę		Х							
3	Is the requireme Parent(s), and si	•••		Х							
4	Is the requireme			X							
5	Is the requireme			Х							
				Insp.	Anal.	Test	Demo.				
6	If feasible and v	erifiable by whi	ch method?	Archive							
				in the Comments/	Chong	o fiold (of the				
	quirement Text'	-	millent of change	In the Comments/	Chang	e neiu (л ше				
	ated Design Elen										
			1								
3.1.	1 the virtual ma	chines hosted or	a rack mount VM	Ware server with R.	AID ha	ard disk	array.				
Figu	re 4: VMWare H	A in order to pro	vide failover of virt	ual machines.							
90		in order to pro									
Des	ign (Comments/0	Thanges)									
Deb	0	esign Criteria		Yes		No/R	only				
1						NO/K	анк				
1	Is the design una	-		X							
2	Is the design log and sibling design	~	with Parent(s),	X							
3	Is the design fea	/ 1		Х							
4	Is the design ver	ifiable?		Х							
5	Is the requireme	nt fulfilled by the	e design?	Х							
Not	e: An answer of	10 requires a co	mment or change	in the Comments/	Chang	e field o	of the				
'De	sign Text' section	l.									
Fina	al Resolution A	pproved X	Modify	Implement Later	Dr	op					
Con	nments										

	uirement Grou	p Related Sect	ion									
-	EA-SGD-008	Con Ops										
	ated Needs											
	Requirement Text Access to the Master Server shall require a login and password.											
		(Comments/Char										
	Requirement Criteria Yes No/Rank											
1	Is the requiren	nent well-formed?			Х							
2	Is the requiren	nent unambiguous	?		Х							
3	-	nent logically cons sibling requirement			Х							
4	Is the requiren	nent feasible?			Х							
5	Is the requiren	nent verifiable?			Х							
	•				Insp.	Anal.	Test	Demo.				
6	If feasible and	verifiable, by which	ch method?	Log	gin procedure							
	ated Design Ele	ements	n a rack mount V	/MWa	re server with F	RAID ha	ırd disk	array.				
Des	ign (Comments	s/Changes): VMW	are login and pa	asswor	d security							
		Design Criteria			Yes		No/R	ank				
1	Is the design u	nambiguous?			Х							
2	•	ogically consistent sign components?	with Parent(s),		Х							
3	Is the design for	easible?			Х							
4	Is the design v	erifiable?			Х							
5Is the requirement fulfilled by the design?X												
	e: An answer o sign Text' secti	f no requires a co on.	mment or chan	ige in t	the Comments,	/Chang	e field (of the				
Find	al Resolution	Approved X	Modify		Implement Late	er Dr	o n					
	nments		Moully				ър					
	miento											

	uirement Grou	p Related Secti	ion								
	A-SGD-009	Con Ops									
	ated Needs										
	Parent Section 11.3.1 Requirement Text										
Acc	Requirement Text Access to the Master Server shall be limited to authorized personnel as defined in the published version of the SMOC.										
		(Comments/Chan	nges)								
	Requirement CriteriaYesNo/Rank										
1	Is the requirem	ent well-formed?		X							
2	Is the requirem	ent unambiguous?	,	X							
3	·	ent logically consi sibling requiremen		Х							
4	Is the requirem			X							
5	Is the requirem	ent verifiable?		X							
				Insp.	Ana	l. Test	Demo.				
6											
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.										
	ated Design Ele										
	anizational Requ	-									
Des	ign (Comments	/Changes): VMW	are login, passwo	ords assigned by sta	kehol	ders per S	MOC				
]	Design Criteria		Yes		No/R	ank				
1	Is the design u	nambiguous?		X							
2	U	gically consistent ign components?	with Parent(s),	X							
3	Is the design fe	<u> </u>		X							
4	Is the design ve	erifiable?		X							
5	Is the requirem	ent fulfilled by the	e design?	X							
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.										
Fina	al Resolution	Approved X	Modify	Implement Late	er l	Drop					
Con	nments				1						

	uirement Grou	p Related Secti	on								
	EA-MNT-001	Con Ops									
	ated Needs										
-	Parent Section 9.5.2 Requirement Text										
		n failures shall be r	esponded to withir	one business dav	in acc	ordance	with				
	RSU communication failures shall be responded to within one business day in accordance with the City of Tampa and THEA procedures.										
Req	uirement Text	(Comments/Chan	ages)								
Requirement Criteria Yes No/Rank											
1	-										
1	<u>^</u>			X							
2	Is the requirem	ent unambiguous?		Х							
3		ent logically consi		X							
4		sibling requirement	ts?	X							
	Is the requirem										
5	Is the requirem	ent verifiable?		X							
				Insp.	Anal.	Test	Demo.				
6	If feasible and	verifiable, by whic	h method?	Service policy							
		-	nment or change	in the Comments,	/Chan	ge field o	of the				
	quirement Text										
Kei	ated Design Ele	ments									
6 Re	equirements Trac	eability Matrix									
0.00	anizational Dear										
Org	anizational Requ	urement									
Des	ign (Comments	/Changes)									
		Design Criteria		Yes		No/R	ank				
1	Is the design u	nambiguous?		X							
2	<u> </u>	ogically consistent	with Parent(s)	X							
_	U	sign components?	(),								
3	Is the design fe	easible?		X							
4	Is the design v	erifiable?		X							
5	Is the requirem	ent fulfilled by the	design?	X							
Not	e: An answer o	f no requires a coi	nment or change	in the Comments	/Chan	ge field (of the				
	sign Text' section	-	U		·						
Fina	Final Resolution Approved X Modify Implement Later Drop										
						- ⁻ r					
Con	nments										

	uirement Grou	p Related Secti	on								
	A-MNT-002	Con Ops									
	ated Needs	0.5.0									
	Parent Section 9.5.2 Requirement Text RSU communication shall be restored in accordance with the City of Tampa and THEA										
RSI		n shall be restored	in accordance wit	h the City of Tampa	and TH	IEA					
Req	uirement Text	(Comments/Chan	iges)								
Requirement CriteriaYesNo/Rank											
1	Is the requirem	ent well-formed?		Х							
2	Is the requirem	ent unambiguous?		Х							
3		ent logically consi sibling requiremen		Х							
4	Is the requirem	V		Х							
5	Is the requirem	ent verifiable?		Х							
	I			Insp.	Anal.	Test	Demo.				
6	6 If feasible and verifiable, by which method? Service policy										
		-	mment or change	e in the Comments	/Chang	e field o	of the				
	quirement Text ated Design Ele										
Org	equirements Trac	uirement									
Des	ign (Comments										
-	r	Design Criteria		Yes		No/R	ank				
1	Is the design u	nambiguous?		X							
2	U	gically consistent	with Parent(s),	X							
3	Is the design fe	easible?		X							
4	Is the design ve	erifiable?		X							
5	Is the requirem	ent fulfilled by the	e design?	X							
	e: An answer of sign Text' section	-	mment or change	e in the Comments	/Chang	e field (of the				
Fina	al Resolution	Approved X	Modify	Implement Late	er Dro	op					
Con	nments										

-	uirement Grou	p Related Secti	on								
	A-MNT-003	Con Ops									
	ated Needs	0.5.0									
	Parent Section 9.5.2 Requirement Text RSU bardware failures shall be addressed in accordance with the City of Tampa and THEA										
RSU	Requirement Text RSU hardware failures shall be addressed in accordance with the City of Tampa and THEA procedures.										
Req	uirement Text (Comments/Chan	nges)								
	Paquirament Criteria Ves No/Pank										
	Requirement CriteriaYesNo/Rank										
1	Is the requirem	ent well-formed?		X							
2	Is the requirem	ent unambiguous?	1	X							
3	·	ent logically consi ibling requiremen		X							
4	Is the requirem			X							
5	Is the requirem	ent verifiable?		X							
				Insp.	Anal.	Test	Demo.				
6	6 If feasible and verifiable, by which method? Service policy										
		-	mment or change	in the Comments	/Chang	ge field	of the				
	quirement Text ated Design Ele										
Org	equirements Trac	irement									
Des	ign (Comments/	Changes)									
	I	Design Criteria		Yes		No/R	ank				
1	Is the design ur	ambiguous?		X							
2	0	gically consistent gn components?	with Parent(s),	X							
3	Is the design fe	<u> </u>		X							
4	Is the design ve	rifiable?		X							
5	Is the requirem	ent fulfilled by the	e design?	X							
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.										
Fina	ll Resolution	Approved X	Modify	Implement Late	er Di	op					
Con	nments										

	uirement Grou	p Related Secti	on								
	A-MNT-004	Con Ops									
-	ated Needs	0.5.0									
	Parent Section 9.5.2 Requirement Text RSU application issues shall be responded in accordance with the City of Tampa and THEA										
RSL		ues shall be respor	nded in accordanc	e with the City of Ta	ampa ai	nd THE	A				
Req	uirement Text	(Comments/Chan	iges)								
	Req	uirement Criteri	a	Yes		No/R	ank				
1	Is the requirem	ent well-formed?		X							
2	Is the requirem	ent unambiguous?	•	X							
3	▲	ent logically consi sibling requiremen		X							
4	Is the requirem	U 1		X							
5	Is the requirem	ent verifiable?		X							
				Insp.	Anal.	Test	Demo.				
6	6 If feasible and verifiable, by which method? Service policy										
		-	mment or change	in the Comments	/Chang	e field o	of the				
	quirement Text ated Design Ele										
Org	equirements Trac	irement									
Des	ign (Comments	/Changes)									
]	Design Criteria		Yes		No/R	ank				
1	Is the design u	nambiguous?		X							
2	0	gically consistent ign components?	with Parent(s),	Х							
3	Is the design fe	U 1		X							
4	Is the design ve	erifiable?		X							
5	Is the requirem	ent fulfilled by the	e design?	X							
	e: An answer of sign Text' section	-	mment or change	in the Comments	/Chang	e field (of the				
Fina	al Resolution	Approved X	Modify	Implement Late	er Dr	op					
Con	nments										

	uirement Grou	-	on								
	A-MNT-005	Con Ops									
	ated Needs										
-	Parent Section 9.5.2 Requirement Text Planned RSU maintenance shall be scheduled in accordance with the City of Tampa and THEA										
Plar		enance shall be sc	heduled in accord	ance with the City o	of Tamp	a and T	HEA				
Req	uirement Text	(Comments/Chan	ages)								
	Requirement Criteria Yes No/Rank										
	Rec	uirement Criteria	a	Yes		No/R	ank				
1	Is the requirem	ent well-formed?		Х							
2	Is the requirem	ent unambiguous?		Х							
3	·	ent logically consi sibling requiremen		Х							
4	Is the requirem			Х							
5	Is the requirem	ent verifiable?		Х							
				Insp.	Anal.	Test	Demo.				
6	6 If feasible and verifiable, by which method? Service policy										
		f no requires a coi	mment or change	in the Comments	/Chang	e field o	of the				
	quirement Text ated Design Ele										
	equirements Trac anizational Requ	·									
Des	ign (Comments	/Changes)									
]	Design Criteria		Yes		No/R	ank				
1	Is the design up	nambiguous?		Х							
2	0	gically consistent ign components?	with Parent(s),	Х							
3	Is the design fe	easible?		Х							
4	Is the design ve	erifiable?		Х							
5	Is the requirem	ent fulfilled by the	e design?	Х							
	e: An answer of sign Text' section	f no requires a cor on.	nment or change	in the Comments	/Chang	ge field (of the				
Fina	al Resolution	Approved X	Modify	Implement Late	er Di	op					
Con	nments										

Reo	uirement Gro	up Related Sect	ion							
	A-MNT-006	Con Ops								
	ated Needs									
	ent Section	9.5.2								
	Requirement Text Planned RSU maintenance shall be performed during off peak hours of the Pilot's operation.									
		t (Comments/Cha		j on pe		<u>r not s o</u>	peration	1.		
Requirement CriteriaYesNo/Rank										
1	Is the require	ment well-formed?			Х					
2	Is the require	nent unambiguous	?		Х					
3		nent logically cons sibling requirement			Х					
4	· · · · ·	nent feasible?			Х					
5	Is the requirer	nent verifiable?			Х					
					Insp.	Anal.	Test	Demo.		
6	6 If feasible and verifiable, by which method? Maintenance plan									
Rela	quirement Tex ated Design El equirements Tra anizational Req	ements ceability Matrix juirement								
Des	ign (Comment	s/Changes)								
		Design Criteria			Yes		No/R	ank		
1	Is the design u	inambiguous?			Х					
2	U	ogically consistent sign components?	with Parent(s),		Х					
3	Is the design f	feasible?			X					
4	Is the design v	verifiable?			Х					
5 Is the requirement fulfilled by the design? X										
	e: An answer o sign Text' sect	of no requires a co ion.	omment or cha	nge in	the Comments,	/Chang	e field (of the		
E	1 Decelet'	A mm a 1 - 37	Malle		Tree la constant de la					
	Final Resolution Approved X Modify Implement Later Drop									
Con	nments									

	uirement Gro	up Related Sec	tion							
	EA-MNT-007	Con Ops; OI	BU Component Spec	cification						
	ated Needs									
	ent Section	9.5.2; 4.12.1	.5							
	uirement Text		ne they are reported	ı						
		t (Comments/Cha								
	Requirement CriteriaYesNo/Rank									
1	Is the require	ment well-formed?		Х						
2	Is the require	ment unambiguous	?	Х						
3		ment logically cons sibling requireme		Х						
4		ment feasible?		Х						
5	Is the require	ment verifiable?		Х						
				Insp.	Anal	. Test	Demo.			
6	If feasible and	l verifiable, by wh	ich method?	OBU logs						
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.									
The		·	o reload and restart on took place.	the failed process	and sh	all make	an			
Des	ign (Comment	ts/Changes)								
		Design Criteria		Yes		No/R	ank			
1	Is the design	unambiguous?		Х						
2		logically consistentesign components?	t with Parent(s),	Х						
3	Is the design t	feasible?		Х						
4	Is the design	verifiable?		Х						
5	Is the require	ment fulfilled by th	e design?	Х						
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.									
F .	10 1	A 1 37		T 1 · · · ·						
	al Resolution	Approved X	Modify	Implement Late	er D	rop				
Con	nments									

	uirement Grou	up Related Sec	ction						
	EA-MNT-008	Con Ops							
	ated Needs								
-	ent Section	9.5.2							
	uirement Text		ossible, of a failure.						
	Requirement Text (Comments/Changes) Requirement Criteria Yes No/Rank								
	Re	quirement Crite	eria		Yes		No/Rank		
1	Is the requirem	nent well-formed	?		Х				
2	1 8				Х				
3 Is the requirement logically consistent with Parent(s), and sibling requirements?					Х				
4	1				Х				
5	Is the requirem	nent verifiable?			Х				
				Insp.	Anal.	Test	Demo.		
6	If feasible and	verifiable, by wh	nich method?				OBU failure alert		
	Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.								
6 Requirements Traceability Matrix There is a heartbeat in HMI that will let the participant know if there is something wrong with the system									
Des	ign (Comment	s/Changes)							
		Design Criteria			Yes		No/Rank		
1	Is the design u	inambiguous?			Х				
2	U	ogically consister sign components	nt with Parent(s), ?		Х				
3	Is the design f				Х				
4	Is the design v	verifiable?			Х				
5	Is the requirem	nent fulfilled by t	he design?		Х				
	e: An answer o sign Text' secti		comment or chang	ge in the	Comme	nts/Ch	ange field of the		
	al Resolution	Approved X	Modify	Imp	lement I	Later	Drop		
Con	nments								

	uirement Grou	.							
	THEA-MNT-009Con Ops; Participant Training and Stakeholder Education Plan								
	ated Needs	0 5 0: 0 7							
	ent Section uirement Text	9.5.2; 3.7							
			appointment to bri	ng the v	ehicle in	to the	support facility shall		
be n	nade at the part	icipant's convenien	ice, but no more th						
Req	uirement Text	(Comments/Char	iges)						
	Re	quirement Criteri	a		Yes		No/Rank		
1	Is the requiren	nent well-formed?			Х				
2	Is the requiren	nent unambiguous?	,		Х				
3	*	nent logically consi			X				
5		sibling requiremen			21				
4	Is the requiren				Х				
5 Is the requirement verifiable?				Х					
	-			Insp.	Anal.	Test	Demo.		
6	If feasible and	verifiable, by which	h method?	insp:		1000	Appointment		
		_							
	e: An answer o quirement Tex	f no requires a contract of the section	mment or change	in the	Comme	nts/Ch	ange field of the		
	ated Design Ele								
6 Requirements Traceability Matrix									
Organizational Paguirament									
Organizational Requirement									
-									
Des	ign (Comments	s/Changes)					-		
		Design Criteria			Yes		No/Rank		
1	Is the design u	nambiguous?			Х				
2	U	ogically consistent	with Parent(s),		Х				
		sign components?							
3	Is the design f				Х				
4	Is the design v	erifiable?			Х				
5	Is the requirem	nent fulfilled by the	e design?		Х				
Not	e: An answer o	f no requires a co	mment or change	in the	Comme	nts/Ch	ange field of the		
'De	sign Text' secti	on.							
Fine	al Resolution	Approved X	Modify	Imn	lement I	ater	Drop		
		reproted A	inour j	Imp		20101	210p		
Con	nments								

	uirement Group		on							
	A-MNT-010	Con Ops								
	ated Needs	9.5.2								
	uirement Text	9.5.2								
		ings in their vehic	le because of an (DBU fai	lure, the	unit sl	hall be exchanged			
			ipant is in the facili	ty or if f	easible,	the de	vice is replaced at			
	participant's choic uirement Text (0		ores)							
neg	un ement Text (commentes, chan	(GCS)							
	Requirement CriteriaYesNo/Rank									
1	-		u		X					
1	Is the requirement									
2		nt unambiguous?			Х					
3	-	nt logically consi bling requiremen			Х					
4	Is the requirement		Х							
5	Is the requirement	nt verifiable?			Х					
	*			Insp.	Anal.	Test	Demo.			
6	If feasible and ve	erifiable, by whic	h method?				Replace OBU			
			mment or change	in the	Comme	nts/Ch	<u> </u>			
	quirement Text'		entry of entry e		comme	1105/ 01	unge neru er ene			
Rela	ated Design Elem	ients								
6 Requirements Traceability Matrix										
Organizational Requirement										
Des	ign (Comments/O	Changes)								
	D	esign Criteria			Yes		No/Rank			
1	Is the design una	ambiguous?			Х					
2		ically consistent	with Parent(s),		Х					
3	and sibling design Is the design fea				X					
4	Is the design ver				X					
5		nt fulfilled by the	e design?		X					
Not	-		mment or change	in the	Comme	nts/Ch	ange field of the			
	sign Text' section									
Fina	al Resolution A	pproved X	Modify	Imp	lement I	Later	Drop			
Con	nments		I				I			

	uirement Gro		ion					
	A-MNT-011	Con Ops						
	ated Needs	0.5.2						
	ent Section uirement Text	9.5.2						
			ticipant shall follow	the instru	ctions for a	ttempting 1	to	
add	ress the issue b	pefore contacting su	upport.			1 0		
		t (Comments/Chai	0					
Del	leted, this is a p	articipant responsit	oility					
	Re	quirement Criteri	a		Yes	No	'Rank	
1		ment well-formed?			X			
	*)		X			
2	•	nent unambiguous						
3		nent logically cons			Х			
4	Is the requirer	sibling requirement			X			
5	-							
3	is the requirer	ment verifiable?		Х			-	
				Insp.	Anal.	Test	Demo.	
6	If feasible and	l verifiable, by whi	ch method?				Х	
		-	mment or change	in the Co	mments/C	hange fiele	d of the	
	quirement Tex							
Rela	ated Design El	ements						
Org	anizational Req	luirement						
Des	ign (Comment	s/Changes)						
		Design Criteria			Yes	No	Rank	
1	Is the design u	inambiguous?						
2	<u> </u>	ogically consistent	with Parent(s).					
	0	sign components?						
3	Is the design f	feasible?						
4	Is the design v	verifiable?						
5	Is the requirer	nent fulfilled by the	e design?					
Not	e: An answer o	of no requires a co	mment or change	in the Co	mments/C	hange fiel	d of the	
'De	sign Text' sect	ion.						
Fina	al Resolution	Approved	Modify	Implen	nent Later	Drop X		
Con	nments	**	-					
Con	linentis							

Req	uirement Gro	up Related Se	ction				
	A-MNT-012	Con Ops					
	ated Needs						
-	ent Section	9.5.2					
	uirement Tex		bleshoot and diagr				
		t (Comments/Ch		<u>1036 (130</u>	, 060, 2		5 155UES.
	Re	equirement Crite	eria		Yes		No/Rank
1	Is the require	ment well-formed	!?		X		
2	-	ment unambiguou			Х		
3	3 Is the requirement logically consistent with Parent(s), and sibling requirements?				Х		
4	Is the require		Х				
5	Is the require	ment verifiable?			Х		
				Insp.	Anal.	Test	Demo.
6	If feasible and	l verifiable, by w	hich method?				Troubleshooting
		-	comment or chan	ge in the	Comme	nts/Ch	ange field of the
	quirement Tex ated Design El						
6 Requirements Traceability Matrix Organizational Requirement							
Des	ign (Comment	s/Changes)					
		Design Criteria			Yes		No/Rank
1	Is the design	unambiguous?			Х		
2		logically consistent sign components	nt with Parent(s), ?		Х		
3	Is the design				Х		
4	Is the design	verifiable?			Х		
5	•	ment fulfilled by	-		Х		
	e: An answer sign Text' sect		comment or chan	ge in the	Comme	nts/Ch	ange field of the
	al Resolution	Approved X	Modify	Imp	lement I	Later	Drop
Con	nments						

	uirement Grou	*	on					
	A-MNT-013	Con Ops						
	ated Needs	9.5.2						
	uirement Text	9.5.2						
A se		gnostic and trouble	eshooting procedu	res sha	ll be dev	eloped	to guide the	
		(Comments/Char	iges)					
	Req	uirement Criteri	a		Yes		No/Rank	
1	Is the requirem	ent well-formed?			Х			
2	Is the requirem	ent unambiguous?	,		Х			
3	^	ent logically consi			Х			
4	Parent(s), and s Is the requirem	sibling requiremen ent feasible?	ts?		X			
5 Is the requirement verifiable?					X			
	is the requirem			Insp.	Anal.	Test	Demo.	
6	If feasible and	verifiable, by whic	h method?	msp.	Allal.	Test	Diag. procedure	
				• 4				
Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section.								
6 Requirements Traceability Matrix Organizational Requirement								
Des	ign (Comments	/Changes)						
]	Design Criteria			Yes		No/Rank	
1	Is the design u	nambiguous?			Х			
2	U	gically consistent ign components?	with Parent(s),		Х			
3	Is the design fe	easible?			Х			
4	Is the design ve	erifiable?			Х			
5	Is the requirem	ent fulfilled by the	e design?		Х			
	e: An answer of sign Text' sectio	f no requires a con on.	mment or change	in the	Comme	nts/Ch	ange field of the	
Fina	al Resolution	Approved X	Modify	Imp	lement I	Later	Drop	
Con	nments							

Rec	uirement Gro	up Related S	ection				
	A-MNT-014	Con Ops					
Rela	ated Needs						
Pare	ent Section	9.5.2					
	uirement Tex CoT shall main		nstalled in signal cab	inets.			
Req	uirement Tex	t (Comments/C	hanges)				
Del	leted per the SI	DD Walkthrough	1				
	D	aninomont Cui	torio		Yes	No	Rank
	r	equirement Cri				110/	Nalik
1	Is the require	ment well-forme	ed?		Х		
2	Is the require	ment unambiguo	bus?		Х		
3		ment logically c			Х		
4		l sibling require	ments?		V		
4	-	ment feasible?			Х		
5	Is the require	ment verifiable?			Х		
				Insp.	Anal.	Test	Demo.
6	If feasible and	d verifiable, by v	which method?				Х
Not	e: An answer	of no requires a	comment or chang	e in the Co	mments/C	hange fiel	d of the
	quirement Tex						
Rela	ated Design El	ements					
Org	anizational Rec	quirement					
Des	ign (Comment	ts/Changes)					
		Design Criteri	a		Yes	No	Rank
1	Is the design	unambiguous?			Х		
2	Is the design	logically consist	ent with Parent(s),		Х		
	and sibling de	esign component					
3	Is the design	feasible?			Х		
4	Is the design	verifiable?			Х		
5	Is the require	ment fulfilled by	the design?		Х		
Not	e: An answer	of no requires a	comment or chang	e in the Co	mments/C	hange fiel	d of the
'De	sign Text' sect	ion.					
Fina	al Resolution	Approved	Modify	Impler	nent Later	Drop X	7
	nments	-FF	J			P 11	
	linionto						

-	uirement Gro	up Related Section	ion							
	A-SRL-001	Con Ops; OB	U Component Spe	cification						
-	ated Needs									
	ent Section	5.3, 1.4, 4.9, 6	& 5							
RSL	uirement Text Js, and OBUs s imum.	t shall meet the latest	published specific	ation as of	Septembe	er 2016 at a	1			
Req	Requirement Text (Comments/Changes)									
Del		of THEA-UC2-007								
		quirement Criteri	a		Yes	No/	Rank			
1	Is the requirer	nent well-formed?			Х					
2	Is the requirer	nent unambiguous?			Х					
3	·	nent logically consi sibling requiremen			Х					
4	Is the requirer	nent feasible?			Х					
5	Is the requirer	nent verifiable?		X						
				Insp.	Anal.	Test	Demo.			
6	If feasible and	l verifiable, by which	ch method?	X						
Not	e: An answer o	of no requires a co	mment or change	in the Co	mments/C	hange fiel	d of the			
	'Requirement Text' section. Related Design Elements									
"OBUs shall conform to latest specs at the time of document release The RSU complies with USDOT RSU spec v4.1"										
Des	ign (Comment	s/Changes)								
		Design Criteria			Yes	No/	'Rank			
1	Is the design u	inambiguous?			Х					
2	0	ogically consistent sign components?	with Parent(s),		Х					
3	Is the design f	feasible?			Х					
4	Is the design v	verifiable?			Х					
5	Is the requirer	nent fulfilled by the	e design?		Х					
	e: An answer o sign Text' sect	of no requires a co ion.	mment or change	in the Co	mments/C	hange fiel	d of the			
Fina	al Resolution	Approved	Modify	Implen	nent Later	Drop X	<u> </u>			
Con	nments									

	uirement Gro	up Rela	ated Sec	tion					
	EA-SRL-002	Con	Ops						
	ated Needs								
	ent Section	8							
RSI tran 90%	smitted to the n 6 capacity.	ete or rollo naster Sei	rver and	data until it has properly stored					
Req	uirement Text	t (Comme	ents/Cha	inges)					
	Req	uirement	Criteria	a		Yes		No/R	ank
1	Is the requirer	ment well-	-formed?)		Х			
2	Is the requirer	ment unan	nbiguous	\$?		Х			
3	Is the requirement Parent(s), and	•	•			Х			
4	Is the requirer	U	•			Х			
5	Is the requirer	ment verif	iable?			Х			
	I					Insp.	Ana	l. Test	Demo
6	If feasible and	d verifiabl	e, by wh	ich method?	RSU	RSU data logs			
				omment or cha	nge in th	e Comment	s/Cha	nge field	of the
	quirement Tex ated Design El		l .						
runs web succ ICD	s out. The RSU psocket connect cessfully or if fr 2 23015, 23030	U Data Col ion (XFE) ree space o	lector tra R). Data on the sto	insferred succes ansmits all colle may only be de orage medium r	cted data leted / ov	to the maste	r serve	er via enci	ypted
Des	ign (Comment	0							
1	.	Design C				Yes		No/R	ank
1	Is the design u			(11 D ()		X			
2	Is the design l and sibling de	<u> </u>		t with Parent(s)	,	Х			
3	Is the design f	feasible?				Х			
4	•	Is the design verifiable?				X			
	5 Is the requirement fulfilled by the design?								
	Is the requirer	ment fulfil	lled by th	ne design?		Х			
5 Not	-	of no requ		ne design? omment or cha	nge in th		s/Cha	nge field	of the
5 Not 'De	e: An answer o sign Text' sect	of no requ ion.	iires a c	omment or cha		e Comment			of the
5 Not 'De Fina	e: An answer o	of no requ	iires a c					nge field Drop	of the

6 If feasible and verifiable, by which method? OBU data logs If feasible and verifiable, by which method? Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section. Related Design Elements 3.2.2.6.1 Due to the fact that OBUs aren't always in radio range of an RSU the log data is stored on the OBU until it can be sent. 6 Requirements Traceability Matrix 0BUs transfer data logs to nearby RSUs via the Data Log Transfer protocol. Data may only be 9 Protocol. Protocol	orage device has reached No/Rank No/Rank Anal. Test Demo.									
Parent Section 8 Requirement Text OBUs shall not delete or rollover the data until it has confirmed the data has been successfully transmitted to the master Server and properly stored unless the local storage device has reached 90% capacity. Requirement Text (Comments/Changes) No/Rank 1 Is the requirement well-formed? X 2 Is the requirement logically consistent with Parent(s), and sibling requirements? X 3 Is the requirement feasible? X 4 Is the requirement verifiable? X 5 Is the requirement verifiable? X 6 If feasible and verifiable, by which method? OBU data logs Note: An answer of no requires a comment or change in the Comments/Change field of the 'Requirement Text' section. Related Design Elements 3.2.2.6.1 Due to the fact that OBUs aren't always in radio range of an RSU the log data is stored on the OBU until it can be sent. 6 Requirements Traceability Matrix 0BUs transfer data logs to nearby RSUs via the Data Log Transfer protocol. Data may only be deleted / overwritten if it has been transferred successfully or if free space on the storage medium runs out. The RSU Data Collector transmits all collected data to the master server via encrypted	orage device has reached No/Rank No/Rank Anal. Test Demo.									
Requirement Text OBUs shall not delete or rollover the data until it has confirmed the data has been successfully transmitted to the master Server and properly stored unless the local storage device has reached 90% capacity. Requirement Text (Comments/Changes) Requirement numbiguous? X 3 Is the requirement logically consistent with Parent(s), and sibling requirements? X 4 Is the requirement feasible? X 5 Is the requirement verifiable, by which method? OBU data logs Image: Comment Change field of the Requirement Text' section. Related Design Elements 3.2.2.6.1 Due to the fact that OBUs aren't always in radio range of an RSU the log data is stored on the OBU until it can be sent. Gequirements Traceability Matrix OBUs transfer data logs to nearby RSUs via the Data Log Transfer protocol. Data may only be deleted / overwritten if it has been transferred successfully or if free space on the storage medium runs out. The RSU Data Collector transmits all collected dat	orage device has reached No/Rank No/Rank Anal. Test Demo.									
OBŪs shall not delete or rollover the data until it has confirmed the data has been successfully transmitted to the master Server and properly stored unless the local storage device has reached 90% capacity. Requirement Text (Comments/Changes) Image: state in the state in the state in the storage device has reached 90% capacity. Requirement Text (Comments/Changes) Image: state in the storage device has reached 90% capacity. Requirement Text (Comments/Changes) Image: state in the storage device has reached 90% capacity. Image: state in the storage device has reached 90% capacity. Image: state in the storage device has reached 90% capacity. Image: state in the storage device has reached 90% capacity. Image: state in the storage device has reached 90% capacity. Image: state in the storage device has reached 90% capacity. Image: state in the storage device has reached 90% capacity. Image: state in the storage device has reached 90% capacity. Image: state in the storage of an state in the storage of an the storage of an the obst or the storage field of the storage field 90% capacity. Image: state in the storage in the storage in the obst or the storage field of the storage of an the obst or the storage of an the obst or the storage medium runs out. The RSU base of a storage of an the storage medium runs out. The RSU bat Collector transmits all	orage device has reached No/Rank No/Rank Anal. Test Demo.									
Requirement Criteria Yes No/Rank 1 Is the requirement well-formed? X	gs Anal. Test Demo.									
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ICD 2301, 23030										
Design (Comments/Changes)										
Design Criteria Yes No/Rank	No/Rank									
1 Is the design unambiguous? X										
2 Is the design logically consistent with Parent(s), and sibling design components?										
3 Is the design feasible? X										
4 Is the design verifiable? X										
5 Is the requirement fulfilled by the design? X										
Note: An answer of no requires a comment or change in the Comments/Change field of the 'Design Text' section.										
	ents/Change field of the									
Final Resolution Approved X Modify Implement Later Drop	ents/Change field of the									
Comments										

	uirement Gro	up Related Sec	tion							
	A- PAR-001	Con Ops								
	ated Needs	5.0								
	ent Section uirement Tex	5.3								
The RSUs shall obtain proper licensing from FDOT and the FCC to broadcast using DSRC.										
		t (Comments/Cha				9	-			
	D	• • • • • •	•	T 7		N. (D)	-			
		quirement Criter		Yes		No/R	ank			
1	•	ment well-formed?		X						
2	Is the require	ment unambiguous	?	Х						
3		ment logically con		X						
4		sibling requireme ment feasible?		X						
5	Is the require	ment verifiable?		X						
				Insp.	Anal.	Test	Demo.			
6	If feasible and	l verifiable, by wh	ich method?	FCC license site						
Not	e: An answer o	of no requires a c	omment or chan	ge in the Comments	s/Chang	ge field (of the			
	quirement Tex	-				, ,				
Rela	ated Design El	ements								
2.2.1 It is a commercial off the shalf (COTS) product which is compliant to the USDOT PSU										
3.2.1 It is a commercial off-the-shelf (COTS) product which is compliant to the USDOT RSU Specification and fulfills the specific requirements of the pilot.										
Spe	specification and runnis the specific requirements of the prot.									
6 R	equirements Tra	ceability Matrix								
0	aninational Day									
Org	anizational Rec	Juirement								
Des	ign (Comment	ts/Changes): RSU	spec requires FC	C certification. User	rs must	register	RSUs.			
		Design Criteria		Yes		No/R	ank			
1	Is the design	unambiguous?		X						
2	•	logically consisten		X						
3	and sibling de Is the design t	esign components? feasible?		X						
4	Is the design			X						
5		ment fulfilled by th	ne design?	X						
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	e: An answer o sign Text' sect	-	omment or chan	ge in the Comments	s/Cnanş	ge ffeld (of the			
Fina	al Resolution	Approved X	Modify	Implement Lat	er D	op				
Con	nments		I	I	I					

U.S. Department of Transportation ITS Joint Program Office-HOIT 1200 New Jersey Avenue, SE Washington, DC 20590

Toll-Free "Help Line" 866-367-7487 www.its.dot.gov

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