Phase 2 Comprehensive Maintenance and Operations Plan (CMOP)

HIRTA ITS4US Deployment Project

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ITS4US

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U.S. Department of Transportation

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16. Abstract

Heart of Iowa Regional Transit Agency (HIRTA) is one of four awardees for Phase 2 of the ITS4US program for its proposed concept ***"Health Connector: Bridging the Gap Between Healthcare and Transportation" (***Health Connector) by the United States Department of Transportation (USDOT). Per the goals of the program, Health Connector project is focused on improving transportation access to healthcare for all groups in Dallas County, Iowa. This document serves as the Comprehensive Maintenance and Operations Plan (CMOP) for the Health Connector project. The CMOP provides a high-level overview of the operations and maintenance policies and procedures associated with Health Connector. This document describes such policies and procedures pertaining to various users (e.g., drivers, vehicles, customer service staff, administrators, vendors, and others) for all cloud services, software systems, hardware systems, and vehicles associated with Health Connector. In addition, the CMOP covers parts of the Health Connector service that may be operated and maintained by a 3rd party contractor.

The CMOP also guides the development of detailed Standard Operating Procedures (SOPs) with step-by-step instructions to be followed by system users to manage daily functions of Health Connector. Those SOPs are referenced in this document but will be developed and maintained outside CMOP.

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1. Introduction

1.1. Intended Audience

The intended audience for this document is the Heart of Iowa Regional Transit Agency (HIRTA) project team, the United States Department of Transportation (USDOT), vendor teams, and project stakeholders.

1.2. Project Background

HIRTA provides over 300,000 customer rides and operates 95,000 hours (2019 estimates; pre-pandemic) along with 1.3 million miles of service within the seven-county region encircling the Des Moines urban area. HIRTA provides demand response services to customers for all trips booked from 24 hours to up to 14 days in advance. If capacity is available, HIRTA also provides trips to meet same day requests. HIRTA also acts as a service provider for the State of Iowa Medicaid broker, Access2Care.

Health Connector is an innovative solution that will address various bottlenecks associated with transportation access to healthcare for HIRTA communities. Some of these challenges are key reasons behind missed appointments or the unacceptable level of preventive or as-needed healthcare in the HIRTA service area. For this deployment, the HIRTA team plans to implement a scalable and replicable solution that enables access to non-emergency medical transportation for all travelers by resolving transportation access barriers with the use of advanced technologies. This solution will allow Dallas County residents without access to transportation who may be seeking a medical appointment to explore their transportation alternatives and book both medical and transportation appointments at the same time through separate smart device (e.g., smartphone) applications or an equally effective alternate method. Further, this solution will include information and wayfinding services to guide them at every step of their trip.

This deployment will provide enhanced transportation access to healthcare options for all travelers in Dallas County with a specific focus on underserved communities, including rural travelers, older adults, and veterans. In addition to addressing mobility needs, the proposed deployment will recognize the net impact that access to health services has on patient healthcare outcomes as well as both the financial and health outcomes from the perspective of the healthcare community/Dallas County Health Department (DCHD).

HIRTA was awarded a Phase 2 agreement of the Complete Trip - ITS4US contract for its proposed concept *"Health Connector: Bridging the Gap Between Healthcare and Transportation"* by the United States Department of Transportation (USDOT) to showcase innovative business partnerships, technologies, and practices that promote independent mobility for travelers regardless of location, income, or disability.

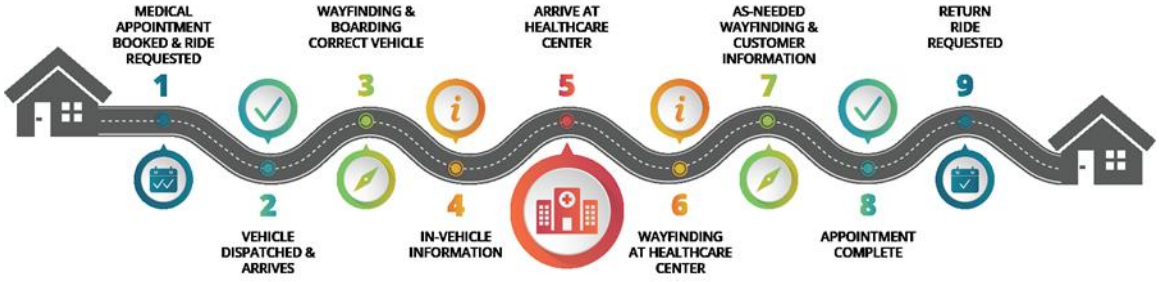

Figure 1. Overview of Health Connector System Concept (Source: HIRTA team)

For more information about the key capabilities of the proposed Health Connector technology, refer to the Concept of Operations (ConOps) and System Requirements Specifications (SyRS) documents [1] [2].

There are five main goals for the Health Connector Concept, which include:

- Improved health outcomes through increased access to medical transportation for Dallas County residents
- Self-reliance and spontaneity for all, including underserved groups
- Efficient transportation management capabilities for medical transportation services
- Financial sustainability of medical transportation programs
- Safe medical transportation services

For more information regarding these goals and more detailed objectives and performance measures, please refer to the Performance Measurement and Evaluation Support Plan (PMESP) [3]. Throughout, 'Traveler' refers to those individuals who will use Health Connector services to access healthcare appointments.

1.3. Purpose of the Plan

The Comprehensive Maintenance and Operations Plan (CMOP) provides a high-level overview of the operations and maintenance policies and procedures associated with Health Connector. This document describes such policies and procedures pertaining to various users (e.g., drivers, vehicles, customer service staff, administrators, vendors, and others) for all cloud services, software systems, hardware systems, and vehicles associated with Health Connector. In addition, the CMOP covers parts of the Health Connector service that may be operated and maintained by a 3rd party contractor.

The CMOP also guides the development of detailed Standard Operating Procedures (SOPs) with step-by-step instructions to be followed by system users, including HIRTA operators and DCH staff, to manage daily functions of Health Connector. Those SOPs are referenced in this document but will be developed and maintained outside the CMOP.

1.4. Document Organization

The CMOP is organized as follows:

1. **Introduction** – Provides information about the purpose of this document and relevant project background.
2. **System Overview** – Provides a high-level description of the Health Connector system and identify specific policies and procedures as those relate to operations and maintenance.
3. **Operations Roles and Responsibilities** – Identifies organizations that will be involved with operating the system, any subsystems or other operational components/equipment, along with their roles and responsibilities.
4. **Operations Procedures** – Identifies the different operational processes and procedures for Phase 3 and beyond.
5. **Maintenance Roles and Responsibilities** – Identifies who will be involved with maintaining the system, any subsystems and components/equipment.
6. **Maintenance Processes** – Describes the maintenance processes and procedures that will be utilized throughout Phase 3 and beyond.
7. **Configuration and Inventory Management** – Describes the configuration management procedures that will be followed. This section also lists the interactions that will occur for configuration control, change control, and configuration status account reporting. In order to maintain the configuration information for the hardware and software installed in the operational environment.
8. **Operations and Maintenance Risks and Contingencies** – Identifies the risks related to operations and or maintenance and their associated contingencies.
9. **Referenced Documents** – Provides a list of all documents referenced throughout the CMOP.
10. **Definitions, Acronyms, and Abbreviations** – Identifies and defines all terms, acronyms, and abbreviations used in the CMOP.

2. System Overview

2.1. Physical System Overview

Figure 2 represents the block diagram of the subsystems and interfaces included in the HIRTA Health Connector system. This view illustrates the result of design decisions made by the HIRTA team for implementing the Health Connector systems and its subsystems. Furthermore, it presents the physical architecture that is used by the project team to establish plans for system integration and testing, as well as to track and report readiness for deployment. The Health Connector Team utilized the information described in Figure 2 to ensure all systems and subsystems and their interactions were considered during the development of the maintenance and operational procedures and processes documented in the CMOP.

The subsystems and components being deployed as part of Heath Connector are as follows:

- **Traveler-end Subsystem**: includes the tools and technologies (phone/interactive voice response (IVR), mobile/smart devices, web-based tools) to be used by Travelers seeking transportation services for their healthcare appointments as part of their pre-trip, during trip, on arrival, and return trip activities. This includes both a mobility-on-demand (MOD) application for planning, booking, and payment, as well as a wayfinding application for more detailed guidance within care facilities.

  This application, provided by Via, the selected (MOD) vendor for Health Connector, also provides real-time status of trips on demand and through push notification services and allows Travelers to discover options and plans trips. Mobile/smart devices will be used as part of the Traveler-end subsystem but are not a part of this procurement.

- **HIRTA Transportation Management Subsystem (TMS):** A TMS refers to any subsystems and components related to the operational backend functions involved in service delivery. HIRTA's TMS includes the Mobility-on-Demand TMS in addition to other functions that support Health Connector from outside if the MOD platform such as the call center software. The MOD Platform TMS will also host two interfaces (middleware products) being developed by the HIRTA team and made freely and publicly available on GitHub under a permissive license to support interfacing with State of Iowa Medicaid transportation broker(s) and the Electronic Healthcare Record (EHR) system.

  - **MOD Platform TMS (also referred to as "VOC"):** Provided by Via and includes the technologies used to assist customer care and operations staff with Traveler registration, eligibility management, reservations, scheduling, dispatching, billing, and administration activities.

- **Vehicle Subsystem**: refers to the technologies deployed on vehicles to support driver-end functions for driver-dispatch communications, manifest management, support just-in-time dispatching, turn-by-turn navigation and outdoor wayfinding (e.g., to locate Travelers at the time

of pickup), on-board information and fare payments. On all HIRTA-owned vehicles, drivers will use tablets running the driver app. On other vehicles, drivers may use the driver app on their tablet or their phone.

- **Wayfinding Subsystem:** refers to the technologies and infrastructure to be used for providing outdoor wayfinding, indoor positioning, orientation, and navigation on request to travelers. It may also assist with translation functionality. In addition, this category includes components that assist customers with information during the on-board leg and other points on their trip. One or more commercially available wayfinding system providers will be used. Health Connector partners providing such technologies include:
    - NaviLens: provider of indoor/outdoor wayfinding.
    - SafeFleet: provider of infotainment devices inside vehicles for providing relevant information during on-board leg of the trip.
    - RedyRef: provider of the wayfinding kiosk for return trip booking, trip status check and other relevant information before or after a trip starts or ends.
- **External Systems:** These systems, external to Health Connector, have been identified for close coordination among HIRTA and partners for providing efficient transportation services for medical trips or for collecting data for performance measurement needs.
    - **Medicaid Transportation Broker**: refers to the State of Iowa Medicaid broker. Currently, Access2Care's system is used for booking and managing Medicaid trips. HIRTA is one of the providers used by Access2Care. Medicaid trips will continue to be booked by Access2Care when requested by Travelers. Medicaid trips will be ingested in the HIRTA system when assigned to HIRTA. At that point, a Traveler using Medicaid benefits will be able to use Health Connector Traveler tools.
    - **Health Navigator- and Healthcare-end Subsystem**: refers to the limited access MOD platform that will be available to health navigators and healthcare customer care staff to request trips, modify trip requests, and check on trip status on behalf of Travelers. Additionally, health navigators and the health administrator at the Dallas County Health Department (DCHD) use a Microsoft Access-based information and referral (I&R) product to track the status of referral activities and for coordination with Dallas County residents' health navigation/social care services.
    - **EHR/Medical Record Subsystem**: refers to the systems used by partner hospitals and clinics for booking medical appointments and maintaining their appointments, including discharge and any subsequent referral activities. Participating healthcare partners use different EHR services. The following bullet points outline participating healthcare partners and the EHR systems they currently employ. Health Connector will develop a new interface with at least one healthcare partner's EHR system.
        - Mercy One Hospital – Transitioning to Epic EHR, in the near future.

        - Dallas County Hospital – Veradigm EHR until at least 2026, then transitioning to Epic EHR.

- **Other**: Additional relevant details for the system to be deployed are as follows:

    - **Supporting systems**: These are existing systems and are not part of Health Connector. However, the TMS will exchange data with these systems or HIRTA staff may interact with these systems for certain operational functions, as needed. Specifically, this refers to the phone system, payroll, driver or vehicle information management, vehicle maintenance management, customer service management, safety event reporting, and other systems and processes for data collection and reporting.

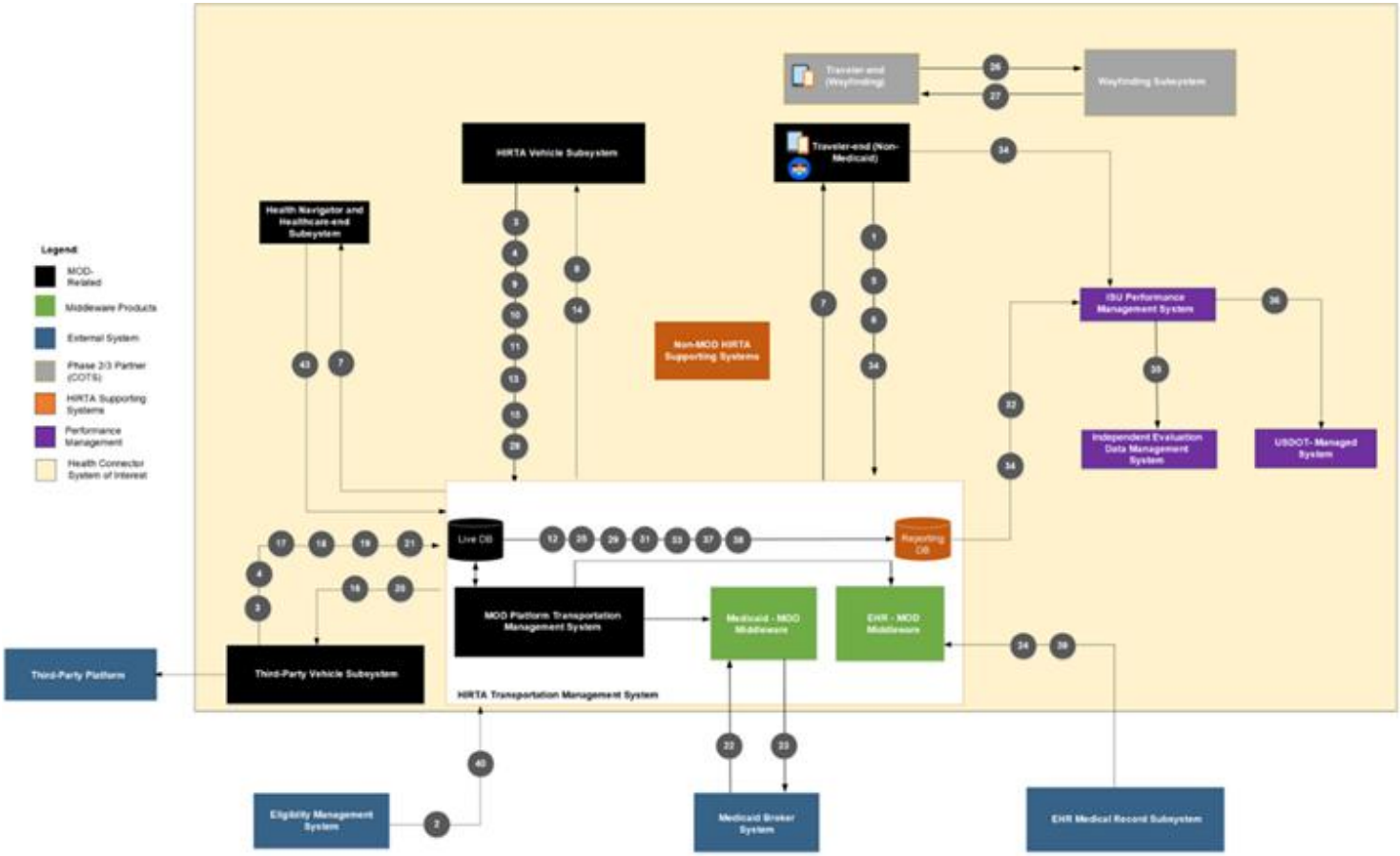

Figure 2. Detailed System of Interest Diagram (Source: HIRTA Team)

The system of interest diagram outlines the data that will pass between systems as part of Health Connector. Keeping the replicability of Health Connector in mind, these datasets and terms used are common in paratransit/demand response industry and are applicable to most commercially available platforms/solutions. The labels referencing data flow IDs in Figure 2 refer to IDs described in Table 1(please see the Data Management Plan (DMP) [5]]for further reference).

Table 1 Data Needs Summary

ID	Data	High-level Description	System(s) of Interest Involved
1	Traveler profile	Traveler's personal details as provided as part of registration.	MOD Platform TMS
2	Traveler eligibility	Traveler's eligibility for a funding source or program; also verified with funding entities (e.g., Medicaid).	Eligibility management system/funding source
3	Fleet information	Details on HIRTA's vehicles; also, details on third-party vehicles.	MOD Platform TMS; third-party platform
4	Driver information	Details on HIRTA's drivers; also, details on third-party vehicles.	MOD Platform TMS; third-party platform
5	Trip request	Traveler request for a trip from a web or mobile device; some Travelers may request over phone and use concierge/ customer care service.	MOD Platform TMS
6	Trip modification or cancellation	Traveler's request to cancel an existing scheduled trip. To modify an existing trip, Travelers will cancel existing reservations and submit new booking requests.	MOD Platform TMS
7	Trip status	Current information on upcoming trip.	MOD Platform TMS
8	Manifest	Time and location details on Travelers to be picked up and dropped off by a driver during a shift.	MOD Platform TMS
9	Vehicle location	Location and heading along with other details for a vehicle in service.	MOD Platform TMS
10	Trip performance	Trip-level log of actual time and location for trips on the manifest along with any no-shows and cancellation events.	MOD Platform TMS
11	Driver performance	Driver-level log of operational performance on log on, on-time performance, manifests completed.	MOD platform TMS
12	Travel time	Time needed to perform on-board component of a trip.	MOD Platform TMS
13	Driver messages	Messages sent by drivers to dispatchers.	MOD Platform TMS

ID	Data	High-level Description	System(s) of Interest Involved
14	Dispatcher messages	Messages sent by dispatchers to drivers.	MOD Platform TMS
15	Fare payment log	Log of amount paid for a trip and method of payment.	MOD Platform TMS
16	Request for third-party trips	Time and location details on Travelers to be picked up and dropped off by a third-party driver during a shift.	MOD Platform TMS
17	Trip performance (third party)	Trip-level log of actual time and location for trips on the manifest along with any no-shows and cancellation events for trips delivered by a third-party provider.	Third-party platform
18	Vehicle location (third party)	Location and heading for a vehicle in service along with other details for a third-party provider.	Third-party platform
19	Driver messages (third party)	Messages sent by drivers to HIRTA dispatchers.	MOD Platform TMS
20	Dispatcher messages (third party)	Messages sent by HIRTA dispatchers to drivers.	MOD Platform TMS
21	Fare payment log (third party)	Log of amount paid for a trip and method of payment.	Third-party platform
22	Medicaid trip requests	HIRTA-accepted request for Medicaid-funded trips through Medicaid broker platform.	Medicaid broker system
23	Medicaid trip performance	Trip-level log of actual time and location for trips on the manifest along with any no-shows and cancellation events for trips delivered for Medicaid-funded trips.	MOD Platform TMS
24	Medical appointment details	Consists of medical appointment date, time, and location (facility address and doctor's office) for a particular Traveler.	EHR
25	Aggregated summary	Aggregated data on driver, vehicle, and trip performance.	MOD Platform TMS
26	Traveler wayfinding request	Requests initiated by Travelers to the wayfinding system.	Wayfinding Subsystem
27	Traveler wayfinding guidance	Log of wayfinding information provided to Travelers.	Wayfinding Subsystem
28	Safety event	Log of incidents and accidents by vehicle/driver/trip.	MOD Platform TMS
29	Safety event report	Detailed reports by a safety event (incident, accident) with response.	MOD Platform TMS
31	System performance	Log of system performance, including any failures.	MOD Platform TMS; HIRTA supporting systems

ID	Data	High-level Description	System(s) of Interest Involved
32	Anonymized and/or aggregated data for performance evaluation	Anonymized/aggregated Traveler, trip, and operations data (as described in Table 3. Scope and Availability of Private Data in the Data Privacy Plan [1]) to support Health Connector performance evaluation.	MOD Platform TMS
33	Traveler complaints log	Log of Traveler complaints received and actions taken.	MOD Platform TMS
34	Traveler survey results	Customer data and survey conducted by ISU (including through the MOD platform) of human use participants and control group.	MOD Platform TMS; local data system at ISU
35	Processed data for controlled sharing	Controlled-access data available to researchers and the Independent Evaluation team.	Local data system at ISU
36	Data for public access	Aggregated trip summary at Census tract and/or traffic analysis zone (TAZ) level as defined in DMP (or another unit as refined in Phase 2) will be provided. Other data such as fleet, vehicle, and safety event (incident/accident) will also be provided.	Local data system at ISU
37	Cost and revenue data	Cost and revenue data by trip, including actual cost, fare paid, funding source share.	MOD Platform TMS
38	Wheelchair failure log	Summary of events referring to situations when wheelchair lift could not function at the time of pickup or drop-off.	HIRTA
39	Medical appointment status	Real-time status of progress on a medical appointment resulting in an impact on the pick-up time.	EHR
40	Discount coupon/credit	Discount coupons or credits applied by trip.	Eligibility management system/funding source
41	Call center log	HIRTA call center statistics available from phone systems or manual logs.	HIRTA supporting systems
43	Trip request (partners)	Trips requested by DCHD and healthcare providers using MOD platform. To be tracked separately to assess the benefit of such capability.	MOD Platform TMS

2.2. List of Subsystems and Components

This section provides a summary of the major subsystems, components, and subcomponents part of the Health Connector System. Components identified are matched to their corresponding subsystem and major system in Table 2.

Table 2. List of Subsystems and Components

Subsystem	Component	Subcomponent	High Level Description
HIRTA TMS	Hardware Components	HIRTA Supporting Hardware	Includes HIRTA-owned, health navigator, and healthcare partner phones, tablets and computers.
HIRTA TMS	MOD Platform TMS	Scheduling	Allows for advanced and real-time scheduling, driver/vehicle assignment, batch optimization of trips booked in advance, and real-time optimization.
HIRTA TMS	MOD Platform TMS	Manifest Building/Runcutting	Allows for vehicle manifest creation and distribution.
HIRTA TMS	MOD Platform TMS	Dispatch	Allows for shift creation, modification and monitoring, ride assignment, ride status updates
HIRTA TMS	MOD Platform TMS	Cost Allocation and Billing	Allows for trip verification, billing and invoicing, reimbursement and accounting, and reporting.
HIRTA TMS	MOD Platform TMS	Performance Management and Reporting	Allows for reporting of defined performance key performance indicators (KPIs), custom reporting through direct data access (DDA) and data sharing.
HIRTA TMS	MOD Platform TMS	Notifications	Allows HIRTA staff to receive audio notifications and push notifications to Travelers and drivers.
HIRTA TMS	MOD Platform TMS	Reservations and Customer Service	Allows for Customer Service Representatives (CSRs) to perform traveler registration, customer profile creation, trip booking, and trip cancellation and to assist with broker or third-party contractor trips, self-service tools, and translation services on behalf of travelers. Also allows CSRs to contact Travelers and view Traveler trip history and relevant KPIs.

Subsystem	Component	Subcomponent	High Level Description
HIRTA TMS	MOD Platform TMS	Operations Management	Allows for driver manifest management, management of third-party provider and Access2Care trips, dynamic vehicle reassignment, real-time capacity management, and access to real-time trip details.
HIRTA TMS	MOD Platform TMS	Safety Event/Incident Management	Allows users to report and modify details on safety events, as well as assign risk levels to the events.
HIRTA TMS	Health Navigator & Healthcare-end Subsystem	N/A	Provides health navigators and healthcare partners a limited access version of the web-based MOD Platform TMS available to HIRTA operations staff. This subsystem allows health navigators and healthcare partners to perform trip planning, trip booking, trip cancellation, translation services, and appointment management on behalf of Travelers as well as to access real-time trip status and trip feedback.
External System	Health Navigator & Healthcare-end Subsystem	I&R	The product used by DCHD to track the status of referral activities and for coordination with Dallas County residents' health navigation/social care services.
HIRTA TMS	MOD-EHR Middleware	Electronic Health Record (EHR) Software	Provides platform for partner hospitals and clinics for booking and maintaining medical appointments.
HIRTA TMS	MOD-EHR Middleware	EHR Application Programming Interface (API)	Allows for data exchange between the MOD Platform TMS and EHR software, including confirmed medical appointment data, trip booking confirmation, medical appointment changes or cancellations, and trip status.
HIRTA TMS	MOD-EHR Middleware	EHR Read-Only Webpage	Allows HIRTA staff and healthcare partner staff to access real-time information through the MOD-EHR middleware.
HIRTA TMS	MOD-Medicaid Middleware	Brokerage	Provides the State of Iowa Medicaid broker, which uses Access2Care, the ability to perform Medicaid trip booking and management.

Subsystem	Component	Subcomponent	High Level Description
HIRTA TMS	MOD-Medicaid Middleware	Medicaid API	Allows for data exchange between the MOD Platform TMS and Medicaid broker, including service requests from the Medicaid broker and service confirmations, trip status, and trip performance data from the MOD Platform TMS.
HIRTA TMS	MOD-Medicaid Middleware	Medicaid Read-Only Webpage	Allows HIRTA staff and Access2Care staff to access real-time information on Medicaid-funded trips through the MOD-Medicaid middleware.
HIRTA TMS	Reporting Database	CyBox	Provides file sharing and file storage for performance-related datasets and reports.
Traveler-end Subsystem	Hardware Components	Personal Devices	Includes Travelers' personal web-enabled devices, such as smart phones and tablets to deploy the Traveler mobile application and Traveler web application.
Traveler-end Subsystem	Health Connector Traveler Mobile Application	Registration	Allows Travelers to perform registration and preference management and to input funding eligibility and mobility aid/accessibility needs.
Traveler-end Subsystem	Health Connector Traveler Mobile Application	Trip Planning	Allows travelers to select pick-up and drop-off locations, trip brokering, and multimodal trip planning.
Traveler-end Subsystem	Health Connector Traveler Mobile Application	Travel Assistance	Provides Travelers with additional assistance in planning/booking trips through a HIRTA contact and FAQ page.
Traveler-end Subsystem	Health Connector Traveler Mobile Application	Trip Booking	Allows travelers to submit on-demand, pre-scheduled, and recurring trip proposals and to access third-party services if no Health Connector rides are available. Also allows Travelers to perform trip cancellation, rebook for modifications, and to input mobility aid/accessibility services needed, requests for personal companions, and number of passengers.
Traveler-end Subsystem	Health Connector Traveler Mobile Application	Translation Services	Allows Travelers with limited English proficiency (LEP) needs to access translation services before, during, and after a trip.

Subsystem	Component	Subcomponent	High Level Description
Traveler-end Subsystem	Health Connector Traveler Mobile Application	Payments	Allows Travelers to select from the following payment methods for Health Connector trips: electronic payments/credit cards, account debit, discount codes/coupons, cash or check, and debit account replenishment.
Traveler-end Subsystem	Health Connector Traveler Mobile Application	Traveler Notifications	Allows Travelers the ability to subscribe to receive trip-related notifications and add up to 5 individual contacts to receive notifications on their trip status.
Traveler-end Subsystem	Health Connector Traveler Mobile Application	Trip Information	Allows Travelers to perform vehicle identity verification and Traveler identity verification, obtain real-time trip status information, and share ride status.
Traveler-end Subsystem	Health Connector Traveler Web Application	N/A	Provides the same functionalities and comprises the same components as the Traveler mobile application. Provides additional translation service abilities through Google Translate.
Traveler-end Subsystem	Interactive Voice Response (IVR)	N/A	HIRTA's IVR system allows Travelers to obtain automated Traveler assistance and notifications by phone.
Vehicle Subsystem	Hardware Components	HIRTA Supporting Hardware	Includes on-board mobile tablets for deployment of driver application, driver terminal GPS receiver and magnetometer for vehicle tracking, and two-way radio for operations communication.
Vehicle Subsystem	Hardware Components	Third-party Driver Devices	Third-party vehicles operating Health Connector trips will use GPS-enabled smart devices, including phones and tablets, to deploy the driver application.
Vehicle Subsystem	Driver Application	Scheduling	Allows drivers to receive trip assignments, Traveler details, trip manifests and waiting locations, as well as contact Travelers and input breaks and break requests.

Subsystem	Component	Subcomponent	High Level Description
Vehicle Subsystem	Driver Application	Navigation	Allows drivers to receive turn-by-turn navigation, live support, Traveler information and translation services and track driver locations and manifest updates via cellular data coverage or cached data in the event of lost connectivity.
Vehicle Subsystem	Driver Application	Trip Performance	Allows drivers to input information on pick-up status, no-shows, drop-off status, payment status, and pre-trip and post-trip vehicle checks as well as to send non-medical emergency safety messages.
Wayfinding Subsystem	Hardware Component	Kiosks	Physical, static hardware systems through which Travelers are able to book trips and check trip status.
Wayfinding Subsystem	Hardware Component	NaviLens Codes	Located throughout the healthcare facility to assist with Traveler navigation within the facility and to pick-up locations.
Wayfinding Subsystem	Hardware Component	Personal Devices	Includes web-enabled smart devices for scanning codes and deploying the wayfinding application.
Wayfinding Subsystem	Wayfinding Application	NaviLens/NaviLens GO App	Provides Travelers the ability to perform wayfinding within the healthcare facility, including buildings, offices, check-in desks, referred buildings/offices after discharge, and door entrances.
Wayfinding Subsystem	Wayfinding Kiosk CMS	N/A	Communicates with the wayfinding kiosks to provide information to Travelers and allows healthcare facilities and other relevant parties to update code content.
Wayfinding Subsystem	NaviLens and Cloud Platform	N/A	Cloud-based server that handles traveler wayfinding requests and traveler wayfinding guidance through the mobile wayfinding application.
Performance Management	ISU Performance Management System	Public Dashboard	Provides an interface for public-facing information regarding Health Connector performance.
External System	Eligibility Management System	N/A	Contains a database that regulates who is eligible for Health Connector rides and the use of discount coupons or credit.

Subsystem	Component	Subcomponent	High Level Description
External System	Eligibility Management System	Funding Entities	Organizations funding customer trips that will interface with the system for automated billing and payment processing.
External System	Third-Party Platform	N/A	Platform for managing vehicles and operations available for Health Connector service that are not operated by HIRTA (i.e. TNC platform).
External System	Medicaid Broker System	N/A	The State of Iowa Medicaid broker, which uses Access2Care for booking and managing Medicaid trips.
External System	EHR Medical Record System	N/A	Systems used by partner hospital and clinics for booking and maintaining medical appointments.

2.3. Operational Hardware

2.3.1. Wayfinding Kiosks

The HIRTA team has purchased one kiosk for installation at Dallas County Hospital from RedyRef. One additional kiosk computer from Redyref will be kept with the vendor as a backup, per terms of the premium-tier support plan. The kiosk is a component of the Health Connector wayfinding subsystem, as defined in the System Architecture Document.

While several use cases have been explored for the kiosk, the HIRTA team determined the most useful scenario for the kiosk would be to assist Travelers in booking return trips from the hospital. This would be particularly critical for supporting the complete trip for travelers who may not have a personal device with them to make ride requests. It also may be beneficial to Travelers who prefer a larger screen and larger fonts, because the available display (e.g., over 20 inches) will be much larger than a phone screen. Further, the kiosk will allow Travelers to search the status of their trips. This is a useful feature for low-income Travelers who may not have subscribed to automated alerts or want to limit their data plan use for the purposes of tracking trip status.

The make, model, and quantity of kiosks can be found in Section 5 of the Comprehensive Installation Plan (CIP) [4].

2.3.2. Wayfinding Codes

Wayfinding codes, similar to QR codes, are physical codes that can be scanned to provide Travelers with guidance and directions to and from vehicles as well as within facilities via visual and/or audio references. These codes can also be scanned to provide translation services or other information pertinent to care facility processes.

NaviLens codes use patented and proprietary technology so these are not common QR codes and present limited security risks. Codes themselves or associated apps currently do not provide any capability to report on compromised QR codes. However, codes can only be generated using NaviLens software and read by NaviLens apps.

NaviLens and NaviLens GO are the associated smartphone apps used by Travelers for scanning these codes. The NaviLens app relays wayfinding and navigation information auditorily only. NaviLens GO on the other hand can provide visual navigation, translation, trip planning information, and status of trip information to help user navigate care facilities and to board vehicles.

The make, model, and quantity of codes can be found in Section 4 of the CIP [4].

2.3.3. Infotainment Devices

The HIRTA team is currently in the process of purchasing infotainment devices for installation on HIRTA vehicles from Safe Fleet. Infotainment devices are a component of the Health Connector MOD Platform Traveler subsystem.

While a number of use cases have been explored for the infotainment devices, screens will be used to display relevant information about appointments and facilities. Further detail on screens and system design can be found in the Systems Design Document [4]. For initial configuration, additional coordination with HIRTA will be required to determine content and parameters prior to installation.

The make, model, and quantity of infotainment devices can be found in Section 6 of the CIP [4].

2.3.4. Other

There are other hardware units that will be used directly or indirectly for Health Connector operations and referenced in the SOP but are not being deployed specifically for this project as HIRTA already utilizes such hardware. This list includes:

- Tablets inside vehicles that will run driver application from MOD Platform TMS vendor.
- Two-way radios that will be used for voice communications between drivers and dispatchers.
- On-board security cameras that are installed for driver and Traveler safety/security.

2.4. Operational Software

2.4.1. MOD Platform TMS

2.4.1.1. Central Application

The MOD transportation management system (TMS) includes the technologies used to assist customer care and operations staff with traveler registration, eligibility management, reservations, scheduling, dispatching, billing, and administration activities. The MOD TMS fits within broader HIRTA TMS, which also supports operations beyond Health Connector operations.

The HIRTA TMS is built upon the MOD Platform TMS, which is currently provided by Via. This software acts as the backend for the HIRTA TMS and provides an interface for HIRTA operations and customer service staff to manage Health Connector trips and aid Travelers in booking and managing rides. The licensing agreement with Via is two years long. System details on MOD Platform TMS can be found in the Systems Design Document (SDD) [7].

2.4.1.2. Driver Application

The MOD Platform vendor's Driver Application is part of the vehicle subsystem and is the software application through which drivers are able to utilize the vehicle subsystem. The driver application allows scheduling, navigation, and trip performance functionality, details on functionality can be found in the SDD [7]. The Driver Application is part of the COTS software from Via as part of the MOD Platform. Make, model, and version information can be found in the CAP [8].

2.4.2. MOD-EHR and MOD-Medicaid Middleware

The two middleware products facilitate data exchange between the MOD Platform TMS, and either the Medicaid broker software, or the electronic health record (EHR) software.

The MOD- Medicaid middleware product facilitates data exchange between the MOD platform and the Medicaid broker system. This middleware is external to the MOD-TMS but sits within the broader HIRTA TMS subsystem which includes functions that support health connector from outside of the MOD platform.

The MOD-her facilitates data exchange between the MOD platform and the electronic health record (EHR) subsystem. EHRs in this context refer to the software used by partner hospitals and clinics for booking medical appointments and maintaining their appointments, including discharge and any subsequent referral activities. Further information on requirements and system design of middleware components can be found in the Comprehensive Acquisition Plan (CAP) [8], SDD [7], and the Middleware Design Document [9]. Arcadis IBI Group is developing the middleware software.

2.4.3. Health Connector Traveler Mobile and Web Application

The Health Connector Traveler Mobile and Web Application provide travelers with 6 major functionalities, including registration, trip planning, trip booking, translation services, payments, and traveler notifications. Further system details can be found in the SDD [7]. Additionally, acquisition details, make, and model can be found in the CAP [8].

2.4.4. Wayfinding Application

As part of the wayfinding subsystem, HIRTA contracted with NaviLens to provide the wayfinding application. The Wayfinding Application comprises of two subcomponent applications, including NaviLens and the NaviLens GO app (version: NVGO 1.3.30). Both applications can be used my travelers to scan NaviLens codes and obtain wayfinding information on HIRTA vehicles and DCH locations. Further details on wayfinding system design and functionality can be found in the SDD [7]. Additionally, information on make, model, and licensing can be found in the CIP [4].

2.4.5. Wayfinding Kiosk

2.4.5.1. Content Management Software

Content management for the kiosk software will be done through the Engage IoT software platform, which will allow for configuration and monitoring of the kiosk and configuration of kiosk-compliant webpages. The Wayfinding Kiosk Content Management Software (CMS) complements the wayfinding kiosk from RedyRef, as described in Section 2.3.1.

2.4.5.2. Kiosk Web Application

The wayfinding kiosk will run a custom-built web application being deployed by Arcadis.

The web application will connect to the MOD Platform API to allow Travelers to retrieve trip status information and book new trips, provided they comply with security requirements of the system and meet the needs required to book on the MOD Platform TMS.

2.4.6. Infotainment Devices Content Management Software

The Infotainment Device CMS communicates with infotainment device media player on vehicles to deliver content to travelers on the screens onboard. The CMS will include a backend portal for HIRTA to update content. The Infotainment device CMS will similarly be provided through Safe Fleet, the vendor for infotainment devices. The make, model and licensing information can be found in the CIP [4].

2.5. Cloud Services

This section provides an overview of the cloud services being utilized to run the MOD-Medicaid Middleware, MOD-EHR Middleware, and the kiosk web application. These products are being built using off-the-shelf microservices and frameworks available from Amazon Web Service (AWS) and python language, with the specific cloud services and packages detailed in

Table 3. While AWS-based deployment is going to use serverless architecture using AWS Cloud Development Kit (CDK), the applications utilize open-source python-based framework, Flask. It can be deployed on-premises (or with non-AWS cloud provider) using virtual machines along with any hypervisor and operating system or Docker container setup for a web application. A detailed documentation for deployment and configuration will be provided in the open-source documentation compiled on the Health Connector Github page for both approaches.

Table 3. Cloud Services

Item	On Premises (or non-AWS Cloud Service)	AWS – Serverless
Execution Environment	Python 3.12 running Flask	AWS Lambda running Python 3.12
Database	Configurable for any relational database that is supported by SQLAlchemy (SQLite, MySQL, Microsoft SQL Server, Oracle) with no specific database dependencies. As built: SQLite	AWS DynamoDB
Storage	Flask: Served from internal storage	AWS S3 with AWS CloudFront CDN
Authentication	Flask-OAuth2 library using OAuth2	AWS Cognito
API Management	Flask	AWS API Gateway
Domain / DNS	n/a	AWS Route 53

Item	On Premises (or non-AWS Cloud Service)	AWS – Serverless
Python Libraries	blinker 1.7.0 certifi 2024.2.2 cffi 1.16.0 charset-normalizer 3.3.2 click 8.1.7 colorama 0.4.6 cryptography 42.0.5 defusedxml 0.7.1 Flask 3.0.2 Flask-OAuth 0.9.5 greenlet 3.0.3 idna 3.6 itsdangerous 2.1.2 Jinja2 3.1.3 MarkupSafe 2.1.5 oauthlib 3.2.2 pip 24.0 pycparser 2.21 PyJWT 2.8.0 requests 2.31.0 requests-oauthlib 1.3.1 SQLAlchemy 2.0.27 typing_extensions 4.9.0 tzdata 2024.1 untangle 1.2.1 urllib3 2.2.1 waitress 3.0.0 Werkzeug 3.0.1	blinker 1.7.0 certifi 2024.2.2 cffi 1.16.0 charset-normalizer 3.3.2 click 8.1.7 colorama 0.4.6 cryptography 42.0.5 defusedxml 0.7.1 Flask 3.0.2 Flask-OAuth 0.9.5 greenlet 3.0.3 idna 3.6 itsdangerous 2.1.2 Jinja2 3.1.3 MarkupSafe 2.1.5 oauthlib 3.2.2 pip 24.0 pycparser 2.21 PyJWT 2.8.0 requests 2.31.0 requests-oauthlib 1.3.1 SQLAlchemy 2.0.27 typing_extensions 4.9.0 tzdata 2024.1 untangle 1.2.1 urllib3 2.2.1 waitress 3.0.0 Werkzeug 3.0.1

The services listed above are primarily paid for on a pay-as-you-go basis.

2.6. Security and Privacy

Each of the components within the system of interest for Health Connector require security processes and/or access restrictions to ensure proper use of the technology. These security measures are outlined by components below. Note that this is distinct from data security and privacy restrictions, which are covered in more detail in the Data Privacy Plan (DPP) [6].

2.6.1. MOD Platform TMS

To ensure proper use of the MOD Platform TMS technology, several security measures have been developed. Log-in protections are set into place to ensure only authorized users can access the system. Also, two factor authentication is required for application login. To gain access to the system, the HIRTA

system administrator must configure unique access control measures for each user to ensure authorized users only have access to relevant data and functions.

Access control measures will vary depending on user-type. No user-type will be granted access to any data or functions beyond what is required of them to access. Once measures have been established, the HIRTA system administrator must send the authorized user a link to facilitate the initial account log-in.

Any modifications for software access control will be authorized and configured by the HIRTA system administrator. Once the initial log-in process has been completed, all authorized users must participate in two-factor authentication to log-in to the system.

2.6.2. Middleware

The middleware in AWS is protected by standard cybersecurity measures through multifactor authentication with a session timeout of one hour by default. Root passwords must have at least 8 characters and at least three of the four-character types- uppercase, lowercase, numbers, and symbols. Users of the management console that are not root have a similar password requirement except that all character types are required. Typical usage of the middleware should not necessitate direct console access to the AWS instance on a regular basis. Root password access will be limited and will be made available only to the HIRTA System Administrator their delegates.

The users of the MOD-EHR Middleware are managed through AWS Cognito's User Pool feature and will have a password complexity of 8 (or preferably 16) characters or more with four different character types. The Wayfinding Kiosk will also require similar password complexity to refresh tokens. Access Tokens have an expiry period of 60 minutes with a refresh token of 30 days before reauthentication is required.

API connections from Access2Care to the middleware for the MOD-Medicaid Middleware also have a 60-minute Access Token expiration. The pre-configured 'client id' and 'client secret' are shared with Lyft to allow Access2Care to connect to the MOD-Medicaid Middleware through OAuth2 protocols.

2.6.3. Health Connector Traveler Mobile and Web Application

To register a Health Connector account, customers must navigate to the HIRTA website and complete the "Health Connector Rider Registration Form" and agree to the terms of the required informed consent. HIRTA will then review the submitted form, set up an account for the user and enable the 'toggle' on the Health Connector subservice to allow the user to utilize the mobile and or web application. As such, for the duration of the pilot, no Traveler will be able to register and use Health Connector without an approved account and without agreeing to the informed consent. These protections are in place to ensure the application is used by the intended audience and that they agree to the privacy implications as outlined in the IRB.

2.6.4. Driver Application

Measures have been established to ensure tablets used for operating the Driver Application onboard HIRTA vehicles are physically secure within the vehicle. Log-in protections have also been established to ensure only authorized users can access and utilize the Driver Application. While using the Driver Application, devices are connected to cellular networks, various protections are also in place to prevent

access for unauthorized individuals. Cellular networks typically use encryption protocols to secure data transmitted between devices and the network tower. Encryption scrambles the data, making it unreadable to anyone without the proper decryption keys, thus preventing interception. In addition, A Driver's device will authenticate itself and connect utilizing carrier Access Point Name (APN), configured in coordination with the carrier.

2.6.5. Wayfinding Application and Codes

The following parties will be responsible for mounting the wayfinding code types:

- Authorized HIRTA staff – Vehicle Codes
- Facility managers at Dallas County Hospital – Facility Codes

Both parties will monitor respective code types to ensure the mounted codes remain functional and untampered. All wayfinding codes will be developed to be protected against replication and overlay attempts. Modifications to vehicle codes and select facility codes (at HIRTA's discretion) shall be made by the HIRTA Outreach Coordinator. The back-end software that will be used to manage code content will remain password-protected at all times.

2.6.6. Wayfinding Kiosk

Public-facing kiosks are generally unsupervised, making them easy targets for security breaches. In particular, security concerns may include kiosk settings being altered, people using the device to access inappropriate content, and vulnerabilities to cyber-attacks. Solutions will include locking kiosks into single-app mode, ensuring all software is up to date and networks are secure, and either remote or in-person kiosk monitoring to ensure proper use. In addition, kiosk tablets will be physically secured to a stand and locked in place to prevent them from being removed. Log-in protections have been established to access the kiosk as well. The webpage that will be utilized to run the Traveler booking and trip status webpage is also password protected.

2.6.7. Infotainment Devices

Infotainment Devices will be securely fastened on-board vehicles to prevent theft and tampering. The software that is used to manage the content that is displayed on infotainment devices is password-protected. Additional information on system security measures established and followed by SafeFleet were not available upon request for incorporation in a public document.

2.7. Safety

Safety scenarios were identified in Phase 1 as part of the Safety Management Plan (SMP). The table below outlines how the safety scenarios will be addressed within the operating context.

Strategies generally fall into the following categories:

- **Design**: safety risks will be addressed as part of requirements development and detailed design.
- **Operations**: safety risks will be addressed by adjusting SOPs and taking optional actions.

- **Mitigation and Fail Safe**: mitigation actions will be taken to limit the likelihood of risk.
- **Response:** A response action will be taken when a safety event occurs.

Table 4. Safety Risk Assessment

ID	Safety Scenario	Description	Operational Concept Strategies	Approach
SC-TRV-1	Traveler device failure	Traveler device may not be functional due to low charge or another reason. This may leave them without any information on their trip or without the ability to use wayfinding system.	Response	Traveler may contact HIRTA customer service using another phone. If device failure occurs at kiosk partner facility, trip booking and checking trip status can still occur for Travelers. If such situation occurs after a drop-off at a care facility, Travelers will need to coordinate with a healthcare coordinator to assist with any transportation or wayfinding needs.
SC-TRV-2	Caregiver or Health Navigator not authorized to assist Traveler with their needs	Traveler is authorized to use the Health Connector application, but their caregiver or Health Navigator are not able to access on their behalf. This causes issues with Travelers that rely on such help (e.g., persons with LEP, persons with disabilities, older adults). Lack of such help may leave Travelers in vulnerable situations.	Design	Caregivers will be able to login to Traveler application to assist Travelers with mobility services. Health Navigators and care facility employees will also have access to limited view of the MOD Platform TMS to assist with scheduling or other requests.

ID	Safety Scenario	Description	Operational Concept Strategies	Approach
SC-TRV-3	Traveler profile does not have accurate details on mobility needs	Traveler is registered in the system but information within the system on their mobility needs are inaccurate which may include wrong information on the Driver manifest. Also, scheduler and schedule optimizer may use inaccurate approach for scheduling, grouping and vehicle assignment.	Operations	Chances are low for such error, but in the event a wheelchair or other mobility need has not been requested HIRTA should still be able to serve the Traveler as all vehicles are wheelchair accessible vehicles (WAVs). In the event this is an after-hours trip, additional HIRTA would check with the Traveler to confirm their mobility needs and with the contracted provider to ensure WAV vehicle is available if needed. During Health Connector registration, traveler profile can be created or updated to ensure mobility needs are accurately reflected.
SC-TRV-4	Traveler cannot recognize HIRTA vehicle	Traveler may not be able to recognize HIRTA or HIRTA contractor vehicle if appropriate methods for enabling this feature are not used, particularly when services are provided by contractors.	Operations	The Traveler application will provide information on vehicle appearance and relevant details including driver name. Wayfinding codes on vehicles will also have vehicle identifying information.
SC-TRV-5	Driver cannot find Traveler waiting to be picked up	If Travelers are not sure about the pick-up spot (front entrance, back entrance, street intersection), particularly when a designated spot with physical signage is not available, it may create delays in pick-up or may result in a missed trip leading to missed appointment and delayed medical care.	Operations	A Navilens code featuring the Health Connector logo will be placed on vehicles and inside vehicles, and third-party contractors will be required to display the codes as well where they can easily be read by the wayfinding application. Health Navigators will work with LEP Travelers so they are aware about tools for identifying the right vehicle. Also, Drivers are trained to assist in such situations and an SOP has been developed for this scenario (see section 4).

ID	Safety Scenario	Description	Operational Concept Strategies	Approach
SC-TRV-6	Malfunction in wheelchair lift	Persons with disability will have difficulty in boarding due to malfunctioning wheelchair lift. HIRTA may have to send another vehicle causing delays with the trip. This may be a major or minor delay depending on system capacity to provide another vehicle. Non-HIRTA vehicles may not all be accessible (e.g., TNCs may have limited WAV capacity). This situation may very well lead to a cancelled appointment.	Operations	Vehicle prechecks are performed to mitigate any risk of failure, but mechanical failures may occur during the driver shift. Chances of this occurring are extremely rare. In the event this happens, HIRTA drivers will communicate with dispatch and swap vehicle as soon as the issue is discovered.
SC-TRV-7	Driver/Traveler Conflict	While not system-related, there may be situations when there is a conflict between Driver and Traveler during boarding or while the trip is in progress. On-board security cameras must be operational for after-the-fact verification of the event. Drivers will have the ability to safely notify Dispatcher about the incident using the Driver terminal.	Mitigation/Fail Safe	As part of HIRTA's Safety Promotion component of SMS, Driver education and training is required. One of the focuses of this training is to train Drivers on any expected conflicts and resolution protocols to avoid any safety risks for themselves or for Travelers. Any reported incidents or complaints from Travelers and Drivers will be logged in the ESRP so a focused training can be provided. In the event of any incidents on board, cameras will record the incident and Drivers can mark the time on the camera feed for review by pulling a lever near their left leg while on board.

ID	Safety Scenario	Description	Operational Concept Strategies	Approach
SC-TRV-8	Severe weather Event	Highly severe weather impacts Traveler's normal pattern at pick-up. This event may also cause trip delays. The system must be able to communicate any impact to trip status to all parties.	Operations	Actions for abnormal service situations including weather events, medical emergencies and system failure are outlined in the appended Health Connector SOPs. For highly severe weather, when services cannot be operated, trips may get cancelled in advance of a pick-up and Travelers will be notified accordingly. Travelers will be able to book an alternate appointment for both medical care and transportation using Health Connector. For other situations when trip is not cancelled, appropriate information will be communicated to Travelers per the stage of their trip.
SC-TRV-9	Traffic incident delay	Delay is caused due to a traffic incident while the vehicle is en-route to a drop-off destination and predicted arrival information is unreliable. Delay may cause postponement or cancellation of appointment. Depending on the nature of medical care, this may be consequential for some Travelers.	Response	The MOD Platform TMS will automatically notify all concerned parties about the delay and appropriate revised ETAs.

ID	Safety Scenario	Description	Operational Concept Strategies	Approach
SC-TRV-10	Inaccurate notifications	There may be situations when notifications provided to Travelers the day before and/or same day are not reliable (e.g., vehicles not there to pick-up as notified). This could be caused by malfunction in notification delivery system or in the TMS pushing out this information. Inaccurate notifications may cause anxiety and, in some cases, may lead Travelers to cancel their appointments.	Mitigation/Fail Safe	Travelers will be advised to call HIRTA customer service if their vehicle does not arrive within 10 minutes of pick-up time, as notified to them.
SC-TRV-11	Inaccurate real-time information	There may be situations when system is not providing accurate prediction arrival information. This could be caused by lack of reliable vehicle tracking information and manifest progress updates.	Mitigation/Fail Safe	Travelers will be advised to call HIRTA customer service if their vehicle does not arrive within 10 minutes of pick-up time, as notified to them.
SC-TRV-12	Drop-off	Travelers may get dropped off at a different spot than originally intended due to construction or other issues. It may be a safety issue if Travelers are not familiar with the facility and wayfinding direction from the drop-off is not available.	Mitigation/Fail Safe	Drivers will be trained to assist Travelers in this situation, so they are able to reach the correct entrance. Travelers will also be able to request human assistance by coordinating with care facility representatives beforehand and sharing the status of their trip via the Traveler app.
SC-TRV-13	Outdoor wayfinding malfunction	Wayfinding system installed at a medical facility for customers to locate the right building and entrance is not functional. This will cause a different level of safety hazard to Travelers based on their disabilities.	Design, Mitigation/Fail Safe	Limited outdoor wayfinding will be available based on current design. Codes identifying an entrance door will be tested, and if non-operational those impacts will be communicated with Travelers upon scanning codes.

ID	Safety Scenario	Description	Operational Concept Strategies	Approach
SC-TRV-14	Indoor wayfinding malfunction-infrastructure	Wayfinding system installed indoors is not functional due to issues with infrastructure (e.g., sensors or visual markers to support indoor positioning) installed within the facility.	Design, Mitigation/Fail Safe	The wayfinding system has been designed to detect anomalies with the indoor navigation infrastructure that cause issues with localization and orientation functions. Traveler may also request human assistance via the Traveler app by using the phone numbers of relevant care facilities provided in the application.
SC-TRV-15	Indoor wayfinding malfunction-device	Wayfinding application on the Traveler device is not able to provide the desired step-by-step guidance.	Design, Mitigation/Fail Safe	Step by step guidance is no longer anticipated for the wayfinding application based on current use cases. Travelers can reach out to care facilities to coordinate beforehand if needed.
SC-TRV-16	Indoor wayfinding – configurations	Traveler profile for wayfinding application is not accurately configured causing the system to provide incorrect guidance (e.g., elevator vs escalator) and causing a safety risk.	Design,	No profile will be needed to use wayfinding application services, this was addressed during design.
SC-TRV-17	Insufficient data-outdoor wayfinding	Travelers are not dropped off at the facility entrance and have to access sidewalk, but sidewalk data may not be accurate. The system should consider the accuracy of sidewalk data prior to providing the step-by-step guidance.	Operations	Step-by-step guidance is no longer applicable, and outdoor wayfinding is limited primarily to vehicle use. In the event Travelers struggle with scanning codes or understanding their uses, drivers will be available to explain and assist as needed.
SC-TRV-18	Insufficient data-indoor wayfinding	The data needed for the indoor wayfinding may not be sufficient, causing the system to provide incorrect guidance.	Operations	The likelihood of this is very low and has been tested by the team during execution of the ORTP.

ID	Safety Scenario	Description	Operational Concept Strategies	Approach
SC-TRV-19	Unable to notify healthcare facility regarding arrival	When Travelers need assistance in situations when they are not accompanied by caregivers, system should be able to notify the healthcare staff for such requests as the vehicle is approaching the facility. If this function is not available, Traveler should be notified so they can call to make such arrangements.	Operations	Traveler can call via phone.
SC-TRV-20	Unable to book return trip with HIRTA	Travelers may not be able to book return trip with HIRTA if capacity is not available and Travelers may get stranded at the hospital and may be forced to walk if can't afford for premium mode alternatives. Alternate arrangements through taxis or TNCs should be facilitated via Health Connector in such situations and in partnership with funding entities.	Response	HIRTA will take several actions to ensure the availability of same day service to all travelers. These actions include: • Service availability during after-hours. • Engaging third party service providers (e.g., taxi) so needed capacity is available. • Engaging volunteer drivers so capacity is available where TNCs and taxis may not be available (e.g., rural areas). • Provision of microtransit service so capacity can be made available through a better coordinated shared ride service. • Provision to allow hospitals to pay for premium fare where appropriate funding sources cannot be identified. • Providing a booking kiosk for those without access to resources to book on site. Booking through the kiosk can also be done with coupon codes to pay if provided to the front desk at a facility and used for those in need.

ID	Safety Scenario	Description	Operational Concept Strategies	Approach
SC-TMS-1	Health Navigator/ Caregiver are not able to access TMS	Health Navigators/Caregivers will have access to TMS in limited capacity to help Travelers they are working with to provide them a status on appointment booking (medical or transportation) and trip progress. Not having this access will disrupt Travelers' trips in situations where they are fully reliable on Caregivers and Health Navigators, leaving them vulnerable to safety risks.	Mitigation/Fail Safe	A multi-party phone call may be arranged either by Health Navigator or HIRTA with Traveler and their caregiver to assist. Will call line can be used in such scenarios.
SC-TMS-2	TMS Server Failure	Failure in TMS server will disrupt HIRTA's ability to book trips and manage trips in real-time. HIRTA will have to fall back on two-way radio and Drivers will have to turn to paper manifests. This will cause severe disruption to the standard operations. In the absence of operational tools Dispatchers' capability to ensure safe operations will be severely impacted	Mitigation/Fail Safe	Paper manifest and two-way radio will be used which will cause severe disruption to real-time service management. Full failure of TMS may limit access to other information and can have major issues. Same-day service may get impacted. Guidance for this is further outlined in Health Connector SOPs.
SC-TMS-3	Cellular communication disruption or loss of data connectivity between vehicle and TMS subsystems.	In the event of data communication failure, HIRTA vehicles will not be able to communicate with TMS and real-time operations will be impacted. HIRTA will have to fall back on two-way radio and Drivers will have to turn to paper manifests. In the absence of operational tools Dispatchers' capability to ensure safe operations will be severely impacted.	Response	Paper manifest and two-way radio will be used which will cause severe disruption to real-time service management. Same-day service may get impacted. Guidance for this is further outlined in Health Connector SOPs.

ID	Safety Scenario	Description	Operational Concept Strategies	Approach
SC-TMS-4	HIRTA is not able to connect to Access2Care	HIRTA's inability to connect to Access2Care will limit its ability to deliver Medicaid trips unless those manifests are made available in another format (e.g., email, fax). While not a direct safety risk, inability to timely and correctly process details may cause delays and missed trips for Medicaid customers.	Response	Middleware should automate the process of incorporating Access2Care trips. In the event it is not operational, manifests will have to be delivered to HIRTA using another method (phone/email/fax).
SC-TMS-5	Incorrect geocoding of addresses	Incorrect geocoding of addresses, caused by a variety of issues, may impact scheduling and service delivery. Drivers may get sent to wrong location or wrong side of the road causing delays in pick-up and drop-off of Travelers.	Operations	Drivers are being trained to report any time they encounter incorrect address location by sending a text message using their terminal.
SC-TMS-6	Obsolete basemap data used for scheduling	Obsolete basemap data may not have current data on road network, barriers and other pertinent details resulting in inefficient and in some cases unsafe schedules and runs.	Mitigation/Fail Safe, Response	Maps will be updated at deployment and MOD Platform vendor will work to ensure up to date. Ticket can be lodged with vendor if there are any issues.
SC-TMS-7	Customer profile details incomplete or have changed but not adjusted in the system	In some cases, Travelers may not update their details (e.g., mobility needs, eligibility, contact, and address) when booking trips leaving the system to schedule trips with incorrect details. It may result in both inefficient schedule and cause safety risks.	Operations	Standard practice of verifying details at trip booking will be implemented.

ID	Safety Scenario	Description	Operational Concept Strategies	Approach
SC-TMS-8	TMS does not have access to real-time information on third party service providers	Not having access to Driver/Vehicle resources and information on the status of trips may cause severe safety risks.	Design, Mitigation/Fail Safe	SLAs (service level agreements) will be developed to have HIRTA access to such data at all times. Third-party vehicles can be added to MOD Platform TMS for ease of tracking.
SC-TMS-9	Inability to communicate with Drivers	HIRTA must be able to communicate with Drivers at all times via data or voice communications. If neither of these options are available that will be a severe safety risk.	Mitigation/Fail Safe	HIRTA will ensure to have one communication method always available (Driver terminal, radio, back-up communication device)
SC-TMS-10	Issues with timely update of manifest details	System may behave erratically when it is not able to timely send out new trips, changes to existing trips or cancellation requests in real-time. This may result in Driver's trip performance and may result in missed trips for customers.	Mitigation/Fail Safe	Appropriate action may need to be taken by system support team. Ticket can be filed with MOD Platform vendor, and communication between dispatch and drivers via radio or phone will be used.
SC-TMS-11	Maintenance issues with assigned vehicle	There may be issues with vehicle assignment if TMS does not have accurate information from maintenance department. It may impact vehicle's ability to pull out or there may be some issues that occur while the vehicle is still in revenue service causing vehicle breakdown and trip reassignments.	Operations	A list of available HIRTA vehicles and third-party vehicles will be provided to Dispatcher before service day starts.

ID	Safety Scenario	Description	Operational Concept Strategies	Approach
SC-TMS-12	System not having capability to accommodate all members of the group in the same vehicle	There may be situations where in shared ride scenario when more than one person is traveling as part of a group, not all people can be accommodated on the same vehicle. Alternate assignments methods (e.g., assigning another vehicle, taxi service) may be needed for Traveler's safety.	Operations	Scheduling parameters will be defined such that this issue doesn't occur. Any occurrences as reported by Travelers or Drivers will be noted and data will be analyzed to assess the cause.
SC-VEH-1	Data communication system failure	As discussed earlier in the case of TMS, data communication failure (on the carrier or network side) will disrupt any communication between vehicle and central systems and therefore severally impacting Health Connector operations.	Response	Paper manifest and two-way radio will be used which will cause severe disruption to real-time service management. Same-day service may get impacted.
SC-VEH-2	Voice communications system failure	HIRTA's voice and data communications systems use separate infrastructure. In some cases, voice communication system may go down while data communications are still operational. This may be a moderate risk but voice communication going down at the same time as cellular system (e.g., in the event of a storm/lightning or faulty modem/radios on vehicle) the vehicle may not be operational unless communications are stored.	Mitigation/Fail Safe	Back-up communication method will be instituted for continuity of operations.

ID	Safety Scenario	Description	Operational Concept Strategies	Approach
SC-VEH-3	Surveillance and driver behavior monitoring system not operational	While not part of Health Connector system, on-board surveillance and driver behavior monitoring systems will be supporting technologies for ensuring Driver and Traveler safety.	Response	Maintenance department will maintain units. This is not within the system of interest for Health Connector.
SC-VEH-4	Driver not able to log on	Inability of Drivers to log on to their devices will disrupt the electronic manifest management.	Response	If situation cannot be resolved, Drivers will have to utilize paper manifests and two-way radios.
SC-VEH-5	Delivery of changes to Driver manifests do not occur timely	For various reasons, sometimes data transmission may be slow causing delays in messages. This will, however, disrupt the operations causing delays in trip delivery and may also cause missed trips.	Operations	Appropriate action may need to be taken by system support team.
SC-VEH-6	Manifest details are inaccurate	Manifest details may be inaccurate due to data entry error during booking or incorrect field mapping between vehicle and central subsystems during system configuration. This may impact trip delivery.	Operations	Occurrence is rare but will ticket would be lodged with MOD Platform provider and filed as high priority.
SC-VEH-7	Turn-by-turn navigation not sending to correct destinations	Incorrect geocoding or issues in the turn-by-turn navigation software may provide incorrect guidance.	Operations	Geocoding will have to be corrected.
SC-VEH-8	Wheelchair lift non-operational	Due to unexpected issues wheelchair lift may not be operational and the built-in function to automatically notify such failure may not be available. This is a severe issue and may require sending another vehicle causing trip delays.	Response	Vehicle will be swapped out as soon as possible.

3. Operations Roles and Responsibilities

Table 5 provides an overview of each role and organization, and which hardware and software components that each organization is responsible for.

Table 5. Operational Roles and Responsibilities

Role	Organization	Responsibilities
Outreach Coordinator	HIRTA	Manage content and delivery of content for infotainment devices, manage content for paid wayfinding codes
Operations Manager	HIRTA	Ensure infotainment devices are working properly onboard vehicles, coordinate with vendor on any maintenance needed
Facility Manager	Dallas County Hospital	Ensure wayfinding codes are in good working condition, report any issues to HIRTA staff, login to wayfinding kiosk as needed and ensure device is operational
Dispatch/Operations Staff	HIRTA	Ensure MOD Platform TMS is operational and report any issues to MOD Platform Vendor
Partner Success Lead	MOD Platform Vendor	Assign tickets as needed and follow up to address any issues related to MOD Platform performance
Development Team Lead	Arcadis IBI	Monitor and resolve any issues as seen or reported for the MOD-EHR middleware and MOD-Medicaid middleware
Project Manager	NaviLens	Resolve any issues as reported relating to wayfinding codes, applications, or content management software

4. Operations Procedures

4.1. Operational Modes

Various HIRTA operating modes reflect both normal operations and a variety of anomalies that may arise during the course of a regular service. The operational modes are defined as follows:

- **Normal:** In normal mode, the following capabilities exist:
  - HIRTA staff can use all functions within the MOD Platform software as installed.
  - Drivers can perform manifests, and can communicate with the HIRTA operations staff.
  - MOD Platform Vendor system can provide customer-focused functions which include real-time information on trips and automated notifications on trip status and vehicle arrival status.
- **Degraded/Delayed Vehicles:** HIRTA vehicles experience the same traffic and weather conditions as the rest of the commuting public. Occasionally, their buses may be late for a pick-up. If the vehicle has not arrived by the end of the 20-minute (+/- 10 min) pick-up window, customers are advised to contact the office and they will be advised of the expected time of arrival.
- **Server or Communication Failure:** Occasionally servers that host MOD Platform may partially (or fully) fail disrupting operations. Also, issues with carrier network may disrupt communication between central system and vehicles which will impact HIRTA's ability to automatically find out trip status. In this scenario HIRTA would rely strictly on paper manifests and two-way radios.
- **Emergency/Adverse Weather:** HIRTA will make every effort to provide service, however in the event extreme weather conditions exist and make travel unsafe, HIRTA reserves the right to discontinue services until conditions are more favorable. If service is temporarily discontinued, all rides, regardless of trip purpose, may be cancelled.

  HIRTA will place cancelation announcements on television stations KCCI and WHO, as well as on its website and social media outlets. HIRTA also notifies customers via channels if their preference of a service is cancelled using phone/IVR, email or text message. In the event of other changes in operational modes, similar protocols will be followed. If operational, the MOD Platform TMS can also be used to contact Travelers with trips scheduled via email or phone.

  The following may occur when hazardous road conditions exist:
  - Travel time may increase.
  - Some trips may be cancelled, or service hours shortened.
  - Bus service may be cancelled on non-plowed or un-sanded roads.
  - Bus is not allowed to travel on alleyways.
  - In case of severe weather, all customers may be taken home immediately.

- **Medical Emergency:** HIRTA will make every effort to provide service, however in the event of a medical emergency aboard the vehicle, HIRTA reserves the right to discontinue services until the

individual is safely removed from the vehicle and under the care of an emergency care service provider or emergency contact. If service is temporarily discontinued, all rides, regardless of trip purpose, may be cancelled.

HIRTA will notify customers via channels of their preference if a service is cancelled using phone/IVR, email or text message.

The following may occur in the event of a medical emergency.

- Travel time may increase.
- Some trips may be cancelled, or service hours shortened.
- Bus service may be cancelled.
- In the event that other customers are on the vehicle at the time of the medical emergency, HIRTA will dispatch additional vehicles to safely transport customers to their trip origin or destination location (at HIRTA's discretion)

- **After Hours:** To provide services outside the regular hours of service, HIRTA will contract with a third-party service provider. The following capabilities will be available:
  - Third-party staff can use all functions within the MOD platform driver software.
  - Third party service providers will perform Health Connector trips as assigned through the MOD Platform.
  - MOD Platform TMS can provide customer-focused functions which include real-time information on trips and automated notifications on trip status and vehicle arrival status.
  - Coordination may be needed in advance of after-hours trips where possible.

4.2. Operational Processes

Operational processes that will be utilized within the Health Connector system are described in the SOP and broken down by user group (health navigator, transportation operations staff, etc.). Table 6 identifies and defines the users included in the Health Connector SOPs.

Table 6. Users Included in Health Connector SOPs

Organization	User Group	Abbreviation	Short Description
DCHD	Health navigators	HNV	Refers to the employees of the Dallas County Health Department (DCHD) who connect customers/patients with healthcare providers and HIRTA (or other transportation service providers) by providing information and referral services.
HIRTA	Trip scheduler	SCH	HIRTA staff who processes customer requests and schedules rides.

Organization	User Group	Abbreviation	Short Description
HIRTA	Transportation operations staff	OPS	HIRTA staff who assigns trips to vehicles, monitors trips, coordinates with drivers in real time (e.g., their ability to perform additional trips, assisting to find origin or destination locations, help resolve no-show or cancellation) and makes reassignments if necessary. At times, this process may also be fully automated and performed by the dispatching algorithm (e.g., TNC that may be used as third-party provider for real-time trips include algorithm that does dynamic ride-matching with available driver pool without manual interaction).
HIRTA	Customer service staff	CSR	Refers to HIRTA customer service staff who responds to Travelers' requests for all aspects of their trip experience beyond trip booking/modifications.
HIRTA	Driver	DRV	Refers to HIRTA or contractor employees who pick up and drop off customers for their requested trips. There are no major changes expected for drivers as part of this implementation, but relevant needs are documented.
Healthcare Partner	Healthcare customer care staff	HCR	Healthcare staff who take calls and intake customer request for medical appointments. Customer care staff may do other coordination related to medical appointments as well.
Healthcare Partner	Healthcare operations staff (e.g., customer care, nursing, community health partnership)	HOP	Staff that is responsible for interacting with customer on check-in and check-out. Also, includes staff that interacts with HIRTA, DCHD and other community partners on behalf of patients related to their appointments.

4.2.1. SOP Overview

While specific Health Connector SOPs are not included in this document, this section provides an overview of the categories of operating procedures that are covered and some information about the purpose of each. These include:

4.2.1.1. Normal Operations: Drivers

Pre-Trip Processes: Covers inspection and maintenance procedures for vehicles that should take place before the trip, and relevant software used for issue tracking.

Logging In and Starting a Shift: Instructs Drivers on how they can log into the Driver Application and start a shift.

Manifest Management: Provides step by step guidance on how Drivers can manually edit or change their daily manifest if needed.

Checking Notes: Covers where to find Traveler notes for easier pick up if needed.

Collecting Payment: Covers fare collection procedures and relevant fare policies Drivers should be aware of for Health Connector.

No Shows: Provides instructions for how to mark a Traveler as no show if needed.

Drop Offs: Covers policies and guidance for marking a trip as complete and any additional information Drivers should know before beginning their next trip.

Ending a Shift: Covers log-off procedures at the end of the day when no more assigned trips remain.

Helping with Traveler Accessibility Needs: Specific to Health Connector, this section describes how Drivers can assist Travelers who may need extra assistance, either for ambulatory purposes, language purposes, or other.

Miscellaneous: Covers any other policies Drivers should be aware of when operating a vehicle.

4.2.1.2. Normal Operations: Health Navigators and Healthcare Staff

Logging in: Provides guidance for how Health Navigators and healthcare staff using the limited-view MOD Platform TMS can log in and access the system for assisting with ride booking or tracking trip status.

Registering a Traveler: Covers how Travelers can be registered for Health Connector and any additional steps that need to be followed in the MOD Platform TMS once they are signed up.

Scheduling: Provides instructions for how to schedule a trip in the MOD Platform TMS.

Coordinating with HIRTA: Provides instructions for how Health Navigators or healthcare staff can contact HIRTA in the most efficient manner to avoid delays in scheduling.

Using the MOD-EHR Dashboard: Provides instructions on how to access the MOD-EHR dashboard and the purpose of the associated columns presented on the dashboard.

Kiosk Management (DCH Only): Includes relevant instructions and operations for managing content, log-in, and power for the kiosk at Dallas County Hospital.

Normal Operations: Operations and Customer Service Staff

Call Center Management: Covers policies and procedures for receiving Traveler calls and assisting them with any travel needs.

Customer Service: Covers policies and best practices for customer service in person and on the phone.

Registration & Eligibility Management: Covers how Travelers can be registered for Health Connector and any additional steps that need to be followed in the MOD Platform TMS once they are signed up.

Scheduling: Provides instructions for how to schedule a trip in the MOD Platform TMS.

Reservations: Guides MOD Platform TMS users on how to make future reservations for Travelers.

Dispatching: Provides procedures for HIRTA dispatchers when editing or making changes to the ride plan.

Using the MOD-EHR Dashboard: Provides instructions on how to access the MOD-EHR dashboard and the purpose of the associated columns presented on the dashboard.

Setting up and Modifying Wayfinding Codes: Covers set up and installation requirements for NaviLens codes, as well as how content can be modified for each of the dynamic codes.

Changing Content for Infotainment Devices: Covers set up and installation requirements for Infotainment Devices as well as how content can be changed, modified or deleted.

Abnormal Operations

After-Hours Service/Third-Party Trips: Covers policies for how after-hours trips are assigned to third-parties and how trips should be performed if no dispatch staff is available.

Medical Emergency: Covers circumstances in which a Traveler has a medical emergency on board while en route to a destination.

Degraded Mode: Provides procedures for when MOD Platform TMS is partially down, and how Health Connector can still operate.

System Failure: Provides instructions for continuing Health Connector operations even when MOD Platform TMS is completely down.

Vehicle Breakdown: Provides instructions for Drivers in the rare circumstance that there is a vehicle failure while in operation.

Vehicle Accident: Provides instructions for Drivers and HIRTA team for how to handle a situation in which Driver has been involved in an accident.

4.2.2. Performance Data Capture

The operational processes associated with capturing performance data during the operational period are identified in Section 2.2 Use Cases/ Scenarios in the Performance Measurement and Evaluation Support Plan (PMESP) [3].

4.3. Operational Issue Handling Procedures

During Phase 3, as issues arise during revenue service, they will be tracked using a punch list by the HIRTA team. Then, if further coordination is required to resolve the issue, a ticket may be assigned to any relevant vendor or personnel until the problem has been resolved. Relevant vendors or roles that receive issues to resolve match those organizations and roles covered in Table 5.

The HIRTA team will categorize each of the issues on the punch list with level of severity as follows:

- Low severity items will typically relate to quality-of-life improvements and do not impact the functionality of the system. These should be resolved within the month of assigning a relevant ticket.
- Medium severity items may pose some potential risk to system performance or functionality but are not immediate cause for concern. Tickets assigned with this categorization should be addressed within a week.
- High severity items pose immediate threats to system operations and should be addressed as soon as possible.

Beyond Phase 3, the HIRTA Operations Manager and Outreach Coordinator would be responsible for regular QA/QC, and for tracking any issues and following up with relevant assigned parties as needed.

4.4. Operations Shutdown, Restart/Recovery

With several different subsystems and components comprising Health Connector, there is no single function or process to shutting down or restarting operations. Rather, processes would need to be performed in coordination with vendors and stakeholders to ensure that all components are shutdown and/or restarted synchronously when shutdowns are needed for maintenance. If the decision was made by the HIRTA team to cease operations, the following steps would need to take place for each of the subsystems.

4.4.1. TMS Subsystem

The MOD Platform TMS subservice for Health Connector can be deactivated by the MOD Platform vendor at any such time it is requested by the HIRTA team. As a best practice, for scheduled maintenance or when the system will no longer be operational, stakeholders and Travelers would be notified via phone or email at least a month in advance. Any rides currently scheduled on Health Connector subservice would then be migrated to existing HIRTA subservice so that rides could still be delivered.

The Health Connector registration page, a non-MOD TMS component of the TMS subsystem, would be deactivated by HIRTA directly. Again, allowing for at least one month notice that Health Connector would no longer be accepting applications is recommended to prepare all relevant Travelers and stakeholders for the transition.

Middleware products can be shut down at any time by the Arcadis team upon request. Arcadis would work to ensure at least one week notice is given to anyone who uses the software such that alternative processes can be identified and put into place. For example, if MOD-Medicaid middleware were

deactivated, HIRTA staff would need to reengage in the process of checking for trips through the Access2Care portal and coordinating with their team on accepting rides.

In the event that any of these components are to be restarted, similar processes would be followed in reverse and at least a two-week window is recommended to allow for operational start-up and appropriate communications. Brief retesting may be required internally to ensure all functions are operational.

4.4.2. Traveler-End Subsystem

The Traveler application can be deactivated by the MOD Platform vendor at any such time it is requested by the HIRTA team. As a best practice, stakeholders and Travelers would be notified that the Traveler application would no longer be operational at least a month in advance of operational shutdown. Travelers would be advised to book trips on the HIRTA subservice moving forward, and communications regarding what this means for Travelers (i.e., booking further in advance would be required) would be disseminated.

Traveler wayfinding applications on personal devices will continue to work and no deactivation would be required. Communication would be provided that these applications would continue to function with any active wayfinding codes, but that codes are being removed from vehicles and facilities (see section 4.4.4).

In the event that any of these components are to be restarted, similar processes would be followed in reverse and at least a two-week window is recommended to allow for operational start-up and appropriate communications. Brief retesting may be required internally to ensure all functions are operational.

4.4.3. Vehicle-End Subsystem

The MOD Driver application can be deactivated by the MOD Platform vendor at any such time it is requested by the HIRTA team. As a best practice, drivers would be notified that the application would no longer be operational at least a month in advance of operational shutdown. For HIRTA, drivers would continue to use existing NEMT navigation application features to complete rides. For Third-party drivers using the application, service would be discontinued and contractors would return to using other applications or methods for delivering other trips. Service with third-party providers would be discontinued but payment and coordination subject to SLAs as agreed to by HIRTA and the provider.

In the event that the driver applications come back online, similar processes as outlined above would be followed to restart the Health Connector subservice and functionality for the driver app. Drivers would download the app again if it had been deleted and log back into the application. Passwords may need to be reset if they have expired. Once logged back in, drivers should be able to receive manifests and start completing trips again, provided the MOD Platform TMS is also operational. Further contracting or coordination with third-party providers may be required to restart their participation. Brief retesting may be required internally to ensure all functions are operational.

4.4.4. Wayfinding Subsystem

Wayfinding codes on board vehicles can be removed by HIRTA upon deciding to shut down Health Connector operations. Codes in place at health care facilities should only be removed with the consent and approval of the facilities manager. Because codes have already been licensed, paid codes will

continue to work until such time they are not renewed by the HIRTA team. Free codes will continue to work with the traveler wayfinding application.

The wayfinding kiosk may be removed by the HIRTA team at any time if deemed appropriate. Communication with the Dallas County Hospital would be provided at least two weeks in advance to allow adequate time for preparation and removal. Front desk staff at the facility would need to be briefed on why the kiosk was removed and if it will be returning in case questions are received by patients.

Infotainment devices could remain in place for other functions even if not used for Health Connector, as they will have already been purchased and operating costs are minimal. HIRTA will determine the appropriate course of action and if the devices are useful in any other context. If uninstallation is required, HIRTA may coordinate with SafeFleet or its radio vendor for service.

In the event any of these components are reactivated communication between the HIRTA team and Dallas County Hospital would be paramount. At least one month would be recommended to allow for codes, kiosks, and infotainment devices to be reinstalled as needed. Brief retesting may be required internally to ensure all functions are operational.

4.4.5. Performance Management Subsystem

ISU systems involved with performance management and system evaluation will be largely unaffected by a system shut down. The HIRTA team would notify ISU that data would no longer be transferred to ISU for the purposes of evaluation and the IRB in place for the project would expire. If the project were to be reactivated in a research setting, 3-4 months may be needed to reacquire a new IRB. If the system were reactivated in a non-research setting, no IRB would be required but a new set of terms and conditions pertaining to the collection of data should be added to the registration process.

4.4.6. Healthcare and Health Navigator and Healthcare-end Subsystem

Health Navigators and healthcare employees primarily interact with Health Connector by assisting Travelers with booking trips, tracking trips, and other travel needs to and from their appointments. To do so, they depend on a limited view of the MOD Platform TMS, provided by the MOD vendor, which has several functions but does not require them to perform dispatching or similar responsibilities handled by HIRTA. As such, the process for shutting down the limited-view TMS is similar to that described above in section 4.4.1. The MOD Platform TMS subservice for Health Connector can be deactivated by the MOD Platform vendor at any such time it is requested by the HIRTA team. As a best practice, healthcare end employees be notified that the system would no longer be operational at least a month in advance of operational shutdown. Any rides currently scheduled on Health Connector subservice would then be migrated to existing HIRTA NEMT subservice so that rides could still be delivered with the assistance of HIRTA staff.

5. Maintenance Roles and Responsibilities

Table 7 outlines the relevant maintenance roles and responsibilities applicable to the Health Connector project. In addition to these roles, the HIRTA team acts collectively as a maintainer by reviewing system performance regularly and communicating any issues to the team as they arise.

Table 7. Maintenance Roles and Responsibilities

Role	Organization	Responsibilities
Travelers	N/A	Updates traveler-end applications as needed and maintains personal devices that can operate updated apps, if the Traveler is using those features as part of participating in Health Connector
Dispatch and Operations Staff	HIRTA	Oversees overall system performance and makes requests for maintenance as needed
Partner Success Lead	MOD Platform Vendor	Maintains and manages all software needs related to the MOD Platform TMS, Driver application, and Traveler application
Facility Manager	Dallas County Hospital	Manages physical codes in place for wayfinding at care facility
Outreach Coordinator	HIRTA	Manages HIRTA registration page, as well as wayfinding codes in place onboard vehicles and inside vehicles. Also responsible for updating codes for new content as needed.
Project Manager	NaviLens	Maintains NaviLens software in line with standards presented in Section 6
Project Manager	Infotainment Device Vendor	Maintains infotainment device software services and responsible for responding to hardware maintenance issues as they arise
Project Manager	Kiosk Vendor	Maintains kiosk software and operating system as well as physical screen and mounting station. Also responsible for related server management and data maintenance as outlined in Section 6
Technical Lead	Arcadis IBI Group	Makes changes or updates to middleware code and kiosk webpage through end of Phase 3

6. Maintenance Processes

This section outlines the maintenance processes and procedures that the HIRTA team will utilize throughout the operation period. The HIRTA team will be responsible for overall system monitoring and following up on maintenance, but maintenance of individual components often involves the support of vendors and other team members. Where maintenance processes could not be provided by vendors due to confidentiality, references of those processes are described to the extent possible.

6.1. MOD Platform

The MOD Platform is comprised of the Central-end Transportation Management System (TMS), Traveler app, and Driver app. The MOD vendor is responsible for the regular maintenance of the related software platforms and applications, as well as coordinating non-regular maintenance to those systems as needed. Regular maintenance reviews should be conducted for the HIRTA live environment monthly. Most issues related to software that are encountered can typically be resolved without any disruption to live service, and the vendor follows a blue green deployment release model. This means that one environment (blue) is running the current application version and one environment (green) is running the new application version.

If any downtime is necessary for the Health Connector software, it would be rare. If that were the case, the project success lead for the vendor would coordinate with HIRTA at least two weeks in advance, if possible, to schedule the downtime for as little disruption as possible.

6.2. Middleware

The following processes are established for regular maintenance of the middleware solutions.

6.2.1. Determining the Need for Changes

Arcadis IBI Group will serve as the developer and is equipped to make any changes to the configuration of the middleware products as needed for the duration of the project. Arcadis IBI will also maintain a list of any configuration changes that are made so as to document versions of the middleware as needed. Any changes will be approved by the HIRTA Change Control Board (CCB), as established in the Project Management Plan [8]. The following methods may be used for determining a change in conjunction with that process:

6.2.1.1. Change Request Submitted by the CCB

At meetings with the CCB or as communicated via email, there may be issues that are discovered with the middleware that need to be resolved. These can be formally requested by the CCB at any time. These issues would be documented and any associated fixes needed would be discussed with the CCB.

6.2.1.2. Regular Audit Leads to Change Request and Approval by CCB

Regular system audits conducted by the Arcadis IBI Group team help ensure system performance and productivity against established thresholds. These are conducted at regular monthly intervals and may also identify vulnerabilities and potential risks with the solutions. Regular review helps address issues promptly and remediation actions can be documented and communicated to the CCB as necessary. These issues would then be addressed based on their priority after approval.

6.2.2. Maintenance Processes

Arcadis IBI Group will carefully monitor middleware data flows and functionality for the duration of Phases 2 and 3 and assess the solutions' effectiveness and vulnerability. Arcadis IBI Group will use established criteria for prioritizing and categorizing patches based on severity and relevance. This criterion is based on the Common Vulnerability Scoring System (CVSS) used to assess severity based on factors like exploitability and impact. Items to follow up on can then be grouped into categorizations including:

- **Critical:** Vulnerabilities with a high likelihood of affecting middleware success or protection. Includes any potential for significant data breaches, system compromise, or unauthorized access.
- **High:** Significant vulnerabilities with a lower likelihood of affecting success. May still lead to severe consequences if unaddressed.
- **Medium:** Moderate vulnerabilities that may lead to some compromise but have limited impact on overall system performance.
- **Low:** Minor vulnerabilities with minimal impact. These may be quality of life issues.

Relevance of the issues will also be considered, factoring in criticality for HIRTA and the sensitivity of data involved. Finally, patches will consider ease of deployment, and dependencies between system components.

Any changes that are made to the middleware will be tested either in a functional (Flask-based) or installation (AWS) environment. Where appropriate, test data will be used for both MOD-Medicaid and MOD-EHR solutions to retest data flows. Validation will be confirmed by multiple people within the software development team before being deployed to the HIRTA environment for the approval of the CCB. Rollback procedures will be documented in the event of unforeseen issues during deployment.

6.3. Wayfinding Codes and Software

NaviLens will provide the wayfinding software and codes required to support the Health Connector Project. NaviLens is ISO207001 certified and will follow all standards and requirements associated with ISO207001 to ensure the system is maintained properly and safely. The handbook used by NaviLens is restricted and cannot be shared publicly. For further information on the handbook, please contact NaviLens to request access.

6.4. Infotainment Devices

SafeFleet will provide the infotainment devices being deployed onboard vehicles as part of the Health Connector system. Any ongoing maintenance will be the responsibility of SafeFleet and covered under

contract and warranty signed with the vendor that would last until at least the end of Phase 3. In the event onsite maintenance is required for hardware components, the HIRTA team would work directly with the vendor for a solution. Specific maintenance procedures were not publicly available upon request.

6.5. Wayfinding Kiosk

RedyRef will provide the software and hardware required to support the wayfinding kiosks that will be used for the Health Connector Project. RedyRef will conduct several maintenance processes to ensure the proper functioning of their products used for the Health Connector Project including but not limited to:

- Server Management
  - RedyRef will maintain server software via RedyRef servers.
- Data Maintenance
  - Daily back-up of all data stored in RedyRef computing environment.
  - Upload data on servers and convert data into databases.
- Standard System Enhancements
- Error Investigation

In addition, RedyRef will be responsible for swapping inoperable units on-premises to ensure no device is inoperable for an extended period of time. The duration of the service plan stipulating these responsibilities is two years and should cover until at least the end of Phase 3.

6.6. Vehicle Maintenance

HIRTA vehicles are subject to routine inspection and maintenance which are covered in HIRTA's Health Connector SOPs. In addition, the useful life of HIRTA's vehicles are typically five years and need to be replaced at regular intervals in order to maintain successful operations. This vehicle replacement strategy is integral to providing Health Connector service.

Any contract signed for third party vehicles to be used in Health Connector would require third parties to comply with manufacture maintenance recommendations and be subject to quarterly review of that compliance and those procedures by HIRTA.

7. Configuration and Inventory Management

7.1. Operational Configuration Management

Configuration management procedures related to hardware items, including wayfinding codes, wayfinding kiosks, and infotainment devices, can be found in Section 4.1.1.3, 5.1.1.3, and 6.1.1.3 of the CIP [4]. For software, configuration management procedures and decisions will be made the HIRTA team and carried out by vendors of each relevant component. For example, changes to how far in advance travelers can book rides will be decided by the HIRTA team and Via will make changes to the live environment as needed.

7.2. Inventory Management

Inventory management information related to hardware items, including wayfinding codes, wayfinding kiosks, and infotainment devices, can be found in Section 4.1.1.2, 5.1.1.2, and 6.1.1.2 of the CIP [4].

8. Operations and Maintenance Risks and Contingencies

Operational or maintenance risks and their associated contingencies are listed in Table 8 below.

Table 8. Operational and Maintenance Risks

Risk # (from Risk Register)	Risk	Contingency
2073	User groups may disagree on developed standard operating procedures (SOPs).	HIRTA team will collaborate with all user groups during development of the SOPs. HIRTA will also develop a working committee to review and update the SOPs on a quarterly basis for all user groups.
3050	Some standard operating procedures (SOPs) may require revision as a result of testing. Testing will provide an opportunity to receive feedback from key users on how developed SOPs may not accurately describe how the system will be used.	The HIRTA team will ensure all relevant users are invited to testing and continue to update SOPs to most accurately describe how the system will be used throughout the testing phase.

Source: HIRTA Team

9. Reference Documents

[1] Concept of Operations (ConOps): Heart of Iowa Regional Transit Agency ITS4US Deployment Project (FHWA-JPO-21-859) https://rosap.ntl.bts.gov/view/dot/57469

[2] Systems Requirements Specifications Document (SyRS): Heart of Iowa Regional Transit Agency ITS4US Deployment Project (FHWA-JPO-21-882) https://rosap.ntl.bts.gov/view/dot/61724

[3] Performance Measurement and Evaluation Support Plan (PMESP): Heart of Iowa Regional Transit Agency ITS4US Deployment Project (FHWA-JPO-21-877) https://rosap.ntl.bts.gov/view/dot/60580, to be updated

[4] Comprehensive Installation Plan: Heart of Iowa Regional Transit Agency ITS4US Deployment Project (FHWA-JPO-993), to be published

[5] Data Management Plan (DMP): Heart of Iowa Regional Transit Agency ITS4US Deployment Project (JPO-21-867) https://rosap.ntl.bts.gov/view/dot/61727, to be updated

[6] Data Privacy Plan (DPP): Heart of Iowa Regional Transit Agency ITS4US Deployment Project, to be published

[7] Systems Design Document (SDD): Heart of Iowa Regional Transit Agency ITS4US Deployment Project (FHWA-JPO-23-101), to be published

[8] Comprehensive Acquisition Plan (CAP): Heart of Iowa Regional Transit Agency ITS4US Deployment Project (FHWA-JPO-24-132), to be published

[9] Middleware Design Document (MDD): Heart of Iowa Regional Transit Agency ITS4US Deployment Project (appended to the SDD), to be published

10. Definitions, Acronyms, and Abbreviations

Table 9. Definitions, Acronyms, and Abbreviations

Acronym	Name	Definition
	Access2Care	A transportation broker for State of Iowa Medicaid program that performs booking and scheduling and works with service providers such as HIRTA for successful delivery of Medicaid-eligible trips.
API	Application Programming Interface	Software interface that allows two devices or applications to exchange data with each other
	Billing	Refers to the process of invoicing third-party funding sources (e.g., Medicaid) after a successful delivery of a trip. Billing is typically done on a monthly basis.
	Cost Allocation	Refers to the process of associating a funding source that should be billed for a trip in a shared ride scenario when riders are covered by separate funding sources and share a vehicle for a trip.
COTS	Commercial Off-The-Shelf	A software/hardware that is commercially ready, made and available for sale, lease, or license to the general public
CSR	Customer Service Representative	Refers to the person who will act as a liaison between HIRTA and Traveler. The CSR will answer questions, and resolve emerging problems that Travelers may face
DCHD	Dallas County Health Department	One of the project Partners who will lead integration with health care services.
	Dispatching	Refers to an operations management function which involves assigning vehicle, tracking fleet location, managing schedule adherence, managing trip manifests and other operational functions.
DMP	Data Management Plan	The Data Management Plan describes the approach for data collection, processing, storage and utilization.

Acronym	Name	Definition
DOT	Department of Transportation	The government department responsible for transportation. In this report, this generally refers to either the State of Iowa's DOT or the United States DOT referred to as Iowa DOT and USDOT, respectively.
EHR	Electronic Healthcare Record	Refers to the healthcare information management system used by hospitals for patients' healthcare-related appointments, transactions, and records management
HIRTA	Heart of Iowa Regional Transit Agency	Rural, regional public transit agency in central Iowa. HIRTA will serve as Proposer/Applicant for the Complete Trip – ITS4US project.
IVR	Interactive Voice Response	Technology that allows telephone users to interact with a computer-operated telephone system through the use of voice and inputs using a keypad
KPI	Key Performance Indicators	Represents primary metrics used to assess the success of a project or operations
LEP	Limited English Proficiency	Refers to individuals who have a limited ability to read, speak, write, or understand English.
MOD	Mobility-On-Demand	Refers to the ability of individuals to utilize varying transportation modes to make their journeys more efficient or complete
PMESP	Performance Measurement and Evaluation Support Plan	Documents the KPIs, targets, goals, and objectives that will be evaluated as the project launches
	Provider	Provider in this context mainly refers to an entity performing service delivery for requested trips, sometimes also referred to as service provider. We have also used healthcare partners as providers in some cases but referred as 'healthcare providers.'
	Reservation	Refers to the act of booking a trip based on a request from a customer. Reservation is available to only registered customers.

Acronym	Name	Definition
	Scheduling	Refers to the process of identifying driver and vehicle resources and their runs/shifts for a given workday. Scheduling is typically performed for all requests received until 24 hours in advance. Booking within 24-hour notice and on-demand is offered but not encouraged due to limited system capacity and resources.
	Smart Device	Refers to smartphone and similar personal devices that may be internet enabled and are equipped with sensors.
SyRS	**System Requirements Specifications**	**Refers to the requirements developed to guide implementation of the system**
TMS	**Transportation Management System**	**Refers to the technologies used to assist customer care and operations staff with Traveler registration, eligibility management, reservations, scheduling, dispatching, billing, and administration activities.**
TNC	**Transportation Network Company**	**Encompasses a group of companies that provide on-demand ride hailing services.**
	Traveler	Refers to the customer using the Health Connector application.
	Vehicle Subsystem	Refers to the technologies deployed on vehicles to support driver-end functions for driver-dispatch communications, manifest management, support just-in-time dispatching, turn-by-turn navigation and outdoor wayfinding (e.g., to locate Travelers at the time of pickup), on-board information and fare payments.
VOC	Via Central Software	Central operations software used by HIRTA operations for scheduling, dispatching, ride monitoring and reporting
	Wayfinding Subsystem	Refers to the technologies and infrastructure to be used for providing outdoor wayfinding, indoor positioning, orientation, and step-by-step guidance on request to travelers.
WAV	Wheelchair Accessible Vehicle	Vehicles that are manufactured to offer ease of access for wheelchair and scooter users

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