CVISN System Design Description

POR-97-6998 V1.0

March 1999

Prepared for:

Federal Highway Administration

US Department of Transportation

Prepared by:

The Johns Hopkins University
Applied Physics Laboratory

This is a Baseline Issue

This document has completed internal and external reviews of previously published drafts and preliminary versions. All comments received to date have been incorporated or addressed.

Note: This document and other CVISN-related documentation are available for review and downloading by the ITS/CVO community from the JHU/APL CVISN site on the World Wide Web. The URL for the CVISN site is: **http://www.jhuapl.edu/cvisn/**

This version of the document is intended for use by someone familiar with CVISN concepts and top-level design.

Change Summary:

Version V1.0 of the document incorporates revisions related to these change reports:

- 970116 (stakeholder view, system names, flows associated with inspection reporting)
- 970303 (capability names)
- 970307 (add intrastate vehicle registration where missing)
- 970312 - A baseline update of design drawings to incorporate comments received from stakeholders and the CVISN technical team. Additional top-level design information has also been added.
- 970710 - Change groupings on Stakeholder View; add Treasury
- CRF 220 - Change inspection reporting/retrieval paths & methods
- CRF 285 - Add WebCAT, remove Safety Information System; change CAT to Credentialing System (e.g., CAT)
- CRF 311 - Clarify ITS/CVO versus CVISN Architecture
- CRF 356 - Modifies the way intrastate inspections are reported
- CRF 529 - Add Electronic Screening Enrollment to the design
- CRF 530 - Add Licensing & Insurance, RSPA HazMat, SSRS; remove UCR
- CRF 548 - Primary Carrier ID
- CRF 549 - Transponder ID
- CRF 552 - Restructure CVISN System Design Description
- CRF 560 - Lengthen VIN
- CRF 570 - Add jurisdiction & plate as vehicle IDs

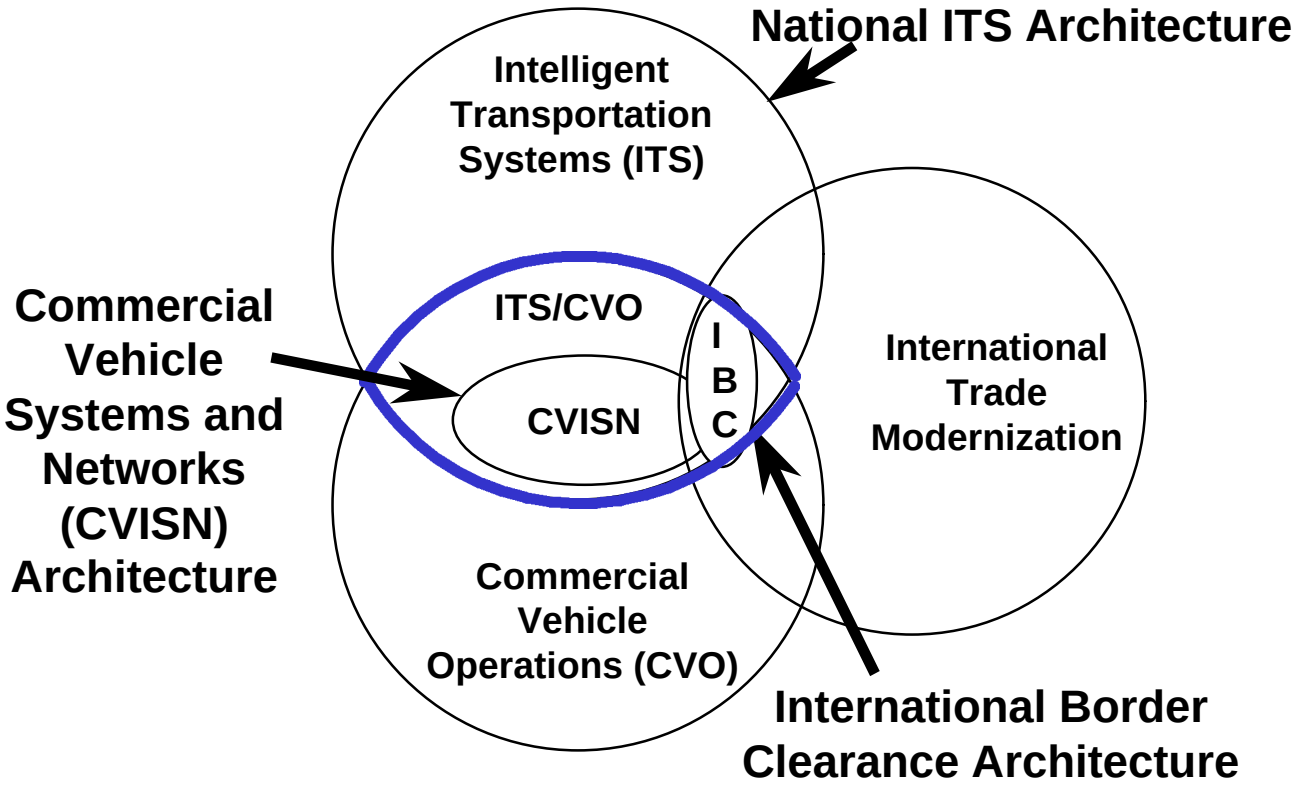
CVISN System Design Description
1 - Introduction

The ITS/CVO architecture is part of the National ITS Architecture

Architecture is a framework which lays out a blueprint for construction. The architecture defines

- the functions associated with ITS user services,
- the physical entities or subsystems within which such functions reside,
- the data interfaces and information flows between physical subsystems, and
- the communications requirements associated with information flows.

Architectural Framework: A Way to Manage Complex Systems



Relationships among the architectures

National ITS Architecture

The common framework for interoperability adopted by the US DOT Secretary, and which defines the functions associated with ITS user services; the physical entities or subsystems within which the functions reside; the data interfaces and information flows between physical subsystems; and the communications requirements associated with the information flows. The ITS/CVO elements are a subset of the National ITS Architecture.

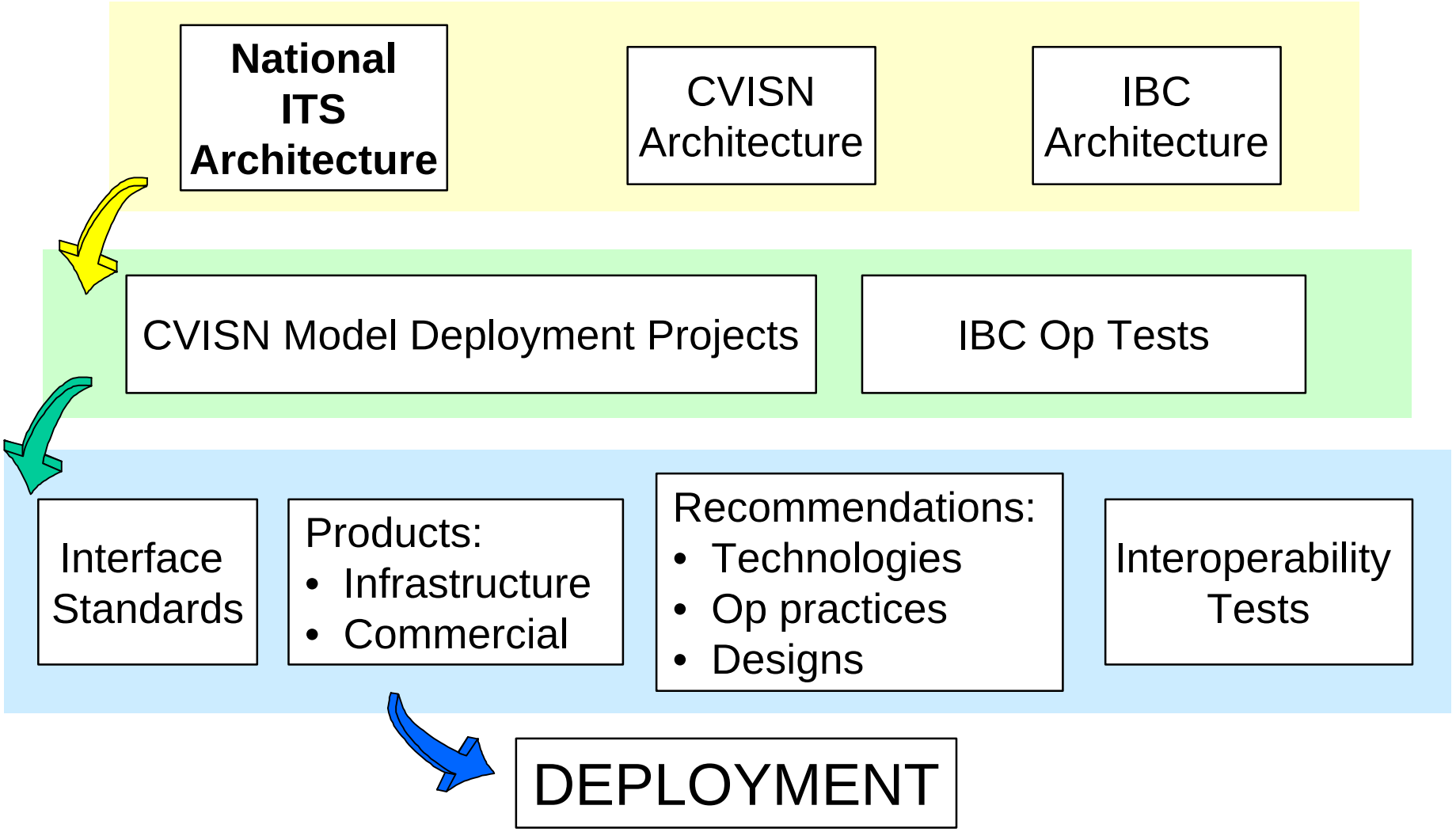
CVISN Architecture

The ITS/CVO information systems and networks portion of the National ITS Architecture. The CVISN Architecture documentation begins with the National ITS Architecture and adds more detail in some areas (e.g., operational concepts and the Electronic Data Interchange (EDI) message requirements) to facilitate further development.

International Border Clearance Architecture

The commercial vehicle border crossing portion of the National ITS Architecture. The structure and unifying design characteristics of an IBC Architecture will permit electronic clearance of commercial motor vehicles at North American land border crossings. This architecture addresses both transportation and non-transportation stakeholders in the IBC community.

The architectures are used to drive model and final deployments



The architectures are used to drive model and final deployments

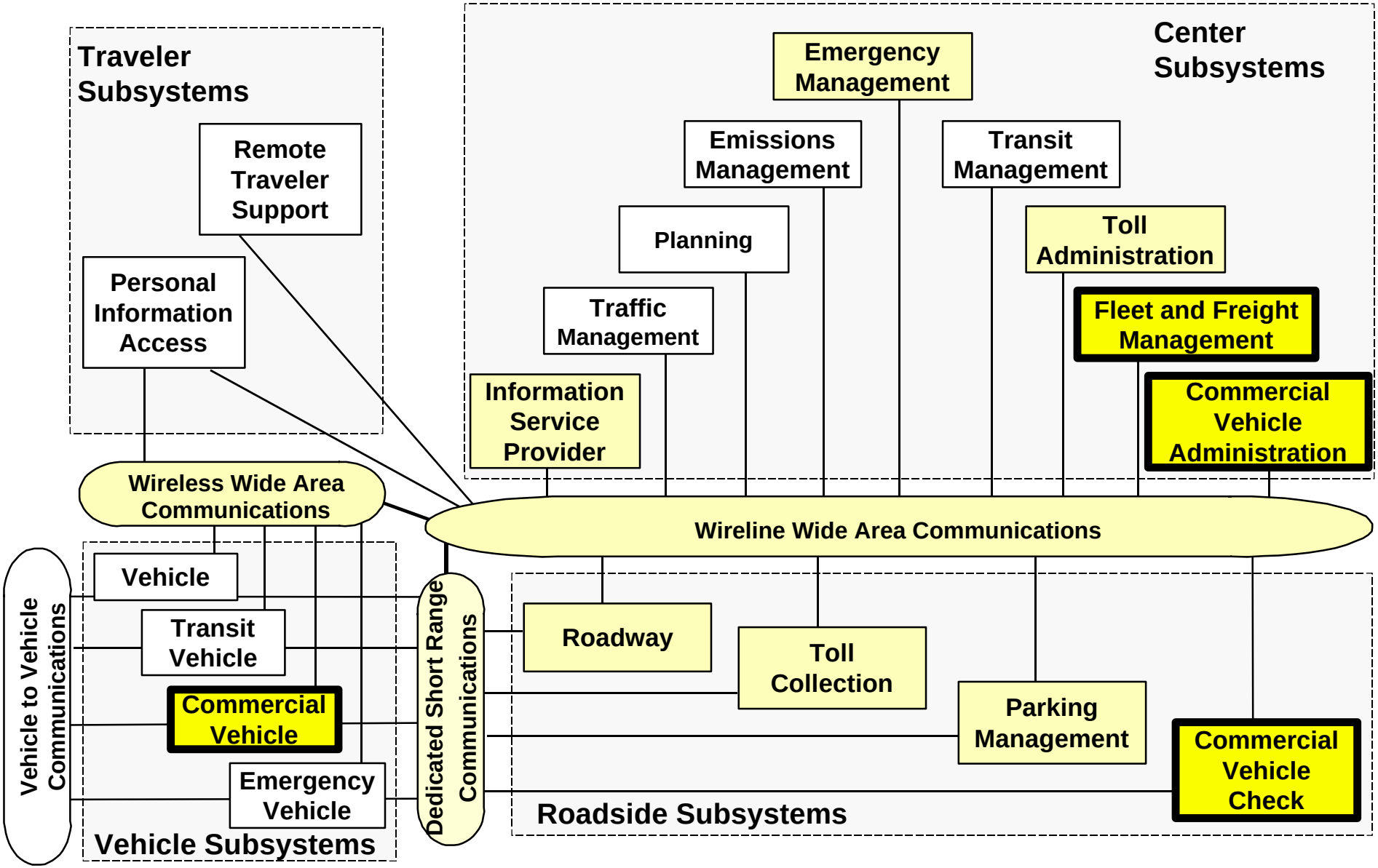
The top row shows the 3 architectures. The CVISN and IBC architectures are derived from the National ITS Architecture, and go into more detail.

That additional detail provided sufficient guidance to the CVISN model deployment projects and IBC operational tests for them to do detailed design.

The projects produced interface standards, products, recommendations, and interoperability tests.

Those efforts lead to deployment of systems that should be interoperable.

This version of the national ITS architecture subsystems interconnect diagram highlights the CVO subsystems



National ITS Architecture Subsystems Interconnect Diagram

The ITS subsystems communicate with each other using the communication elements and architecture interconnect channels shown in the ITS Architecture Interconnect Diagram. The subsystems are shown as boxes, the communications channels are shown as lines, and the communication elements are shown as "sausages." In this version of the drawing, elements unique to Commercial Vehicle Operations are shown with thick borders and those which interface with the CVO-unique elements are shaded.

The subsystems shown as single entities are representative of multiple instances of the specific subsystems. For example, several Commercial Vehicle Administration subsystems in a region, each with their own jurisdiction, may communicate with each other.

The ITS architecture subsystems are grouped by classes where the subsystems may share common communication elements, deployment, and institutional characteristics. The classes of subsystems are Traveler Subsystems, Center Subsystems, Roadside Subsystems, and Vehicle Subsystems.

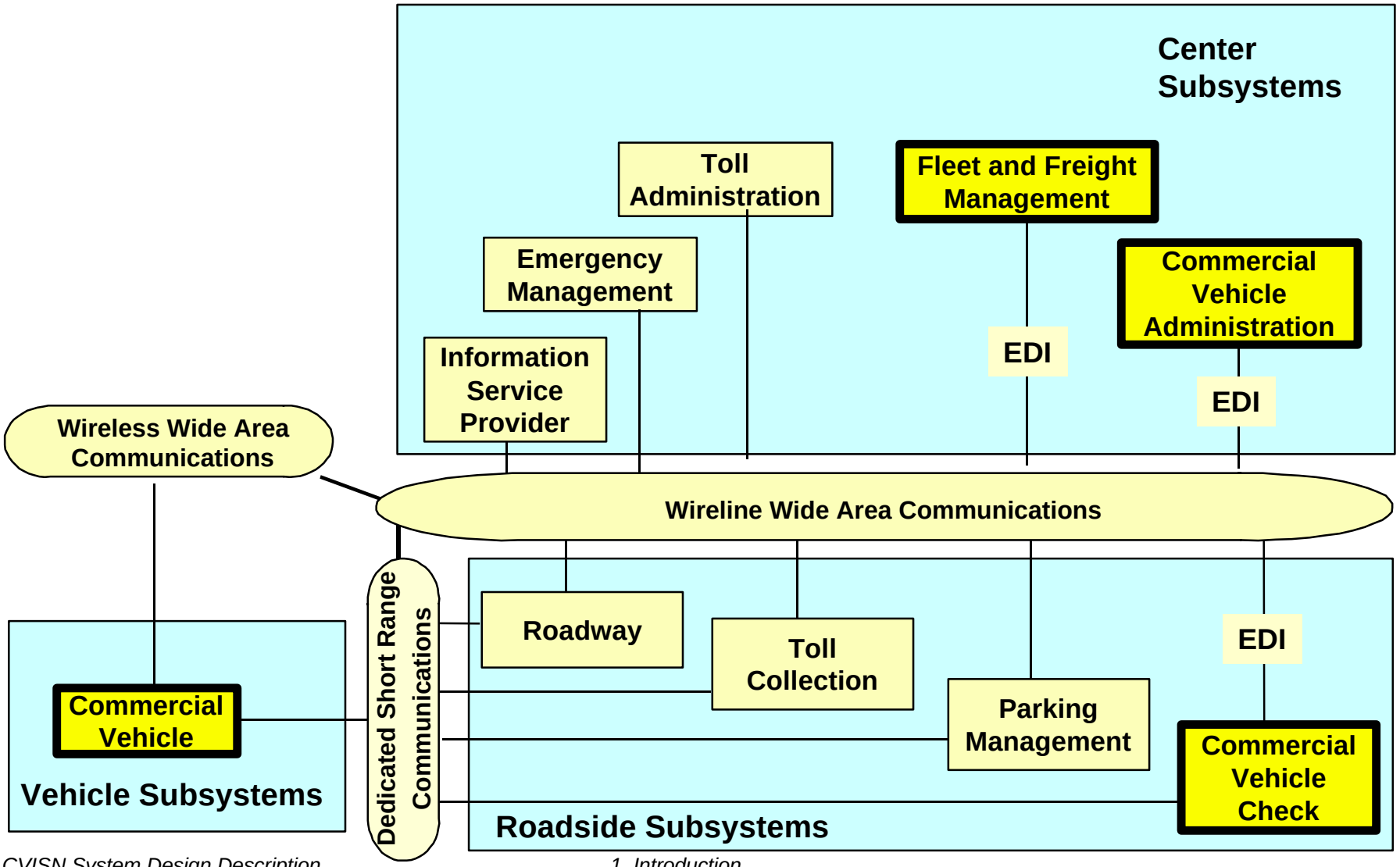
Traveler Subsystems provide the "personal" and portable platform for ITS functions of interest to a traveler for support of multimodal travel. No unique requirements are imposed by CVO on these subsystems.

Center Subsystems are typically located at fixed sites. These subsystems provide management, administration, and support functions for the transportation system. These subsystems communicate with other centers to enable coordination with other agencies, between modes, and across jurisdictions. Center Subsystems provide electronic credentialing services for Commercial Vehicle Operations, support the roadside in screening and inspecting Commercial Vehicles, enable safe HazMat operations, support freight mobility, and provide services in common with other modes of transportation.

Roadside Subsystems include some functions that require convenient access to a roadside location for deployment of sensors, signals, programmable signs, or some other interface with travelers, vehicles, or freight. Roadside subsystems generally need wireline communications for messages to/from one or more Center Subsystems. For Commercial Vehicles, vehicle-to-roadside communications via a transponder mounted on the vehicle and a roadside reader will facilitate roadside check and inspection operations.

Vehicle Subsystems are installed in a vehicle. There will be considerable subsystem commonality across the various vehicle types in some areas such as navigation and Mayday functions. In addition to vehicle-to-roadside communications equipment, some Commercial Vehicles may be equipped with wireless wide area network communications to facilitate data communications with Center Subsystems such as Fleet and Freight Management.

The CVISN architecture connects subsystems via a combination of EDI and DSRC interface standards



The CVISN architecture connects subsystems via a combination of EDI and DSRC interface standards

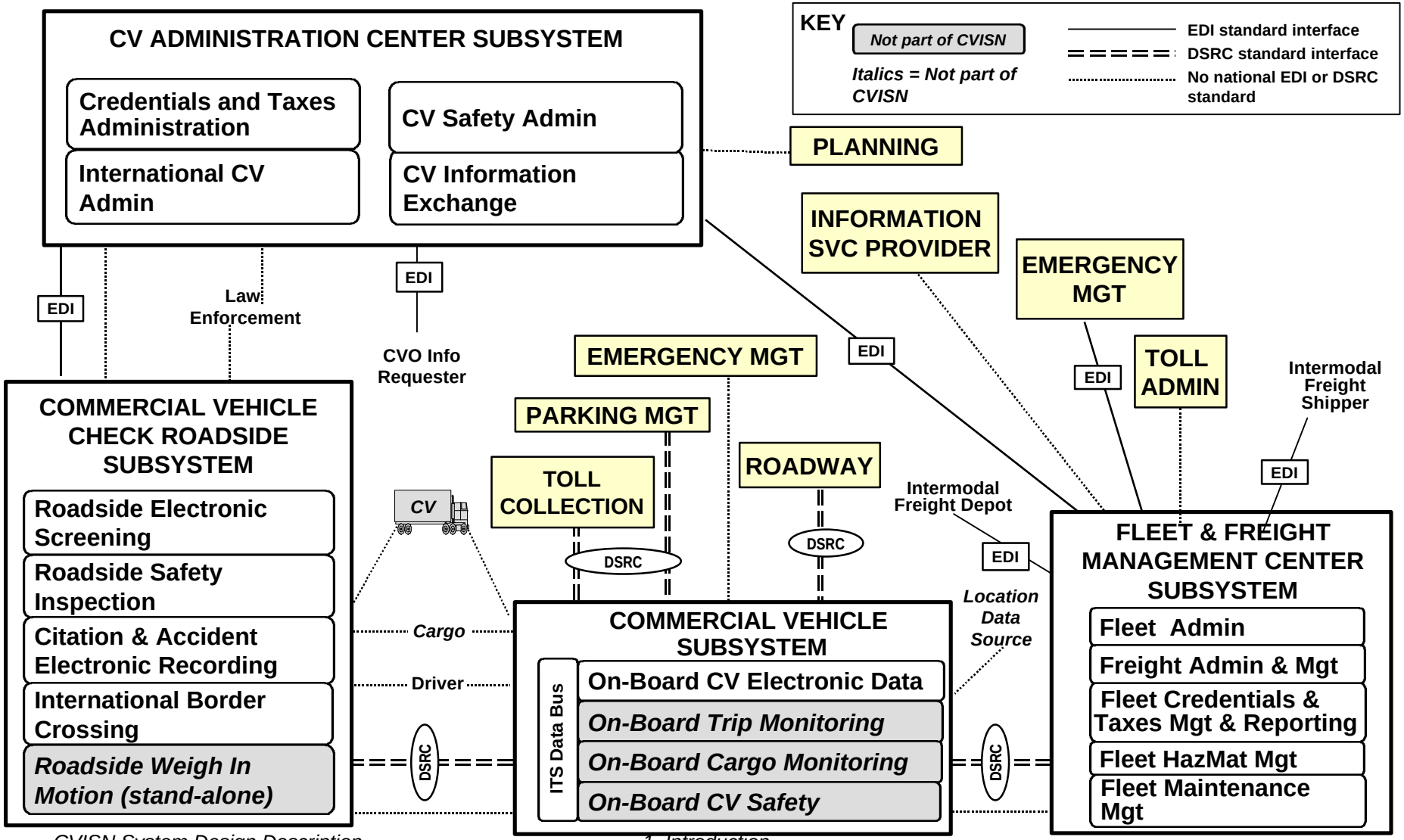
This figure focuses on the ITS subsystems that support Commercial Vehicle Operations (CVO). The subsystems shown with thick borders are unique to CVO. The other boxes contain functions that support CVO and as well as other transportation elements.

The diagram highlights two interface types critical to the CVO portion of ITS: DSRC (Dedicated Short Range Communications) and EDI (Electronic Data Interchange).

DSRC will occur via a transponder (tag) on the vehicle that is read from and written to by a roadside reader. The tag supplies screening data, safety data, and HazMat flags unique to CVO.

EDI transactions, as defined by ANSI Accredited Standards Committee (ASC) X12, will be used to communicate CVO-related business information among trading partners using pre-defined formats so that computers can process information such as credential applications, safety data, etc. EDI transactions are used for CVO data interfaces that must be standardized across jurisdictions.

The CVISN architecture includes the information systems and networks in the ITS/CVO architecture



The figure shows how CVISN functions are allocated to subsystems and equipment packages.

Most CVO-unique equipment packages from the National ITS Architecture are part of the CVISN architecture.

The **Commercial Vehicle Administration Center Subsystem** consists of four equipment packages that are part of the CVISN architecture:

- Credentials and Taxes Administration, supporting the processing, update, and issuance of CVO credentials; collection, processing, and review of CVO fees and taxes
- International Commercial Vehicle Administration, supporting administrative functions associated with commercial vehicles crossing international borders
- Commercial Vehicle Safety Administration, supporting the collection and review of CV safety data
- Commercial Vehicle Information Exchange, facilitating the exchange of snapshots and reports containing safety and credentials information for drivers, carriers, and vehicles.

The **Commercial Vehicle Check Roadside Subsystem**, consists of four equipment packages that are part of the CVISN architecture:

- Roadside Electronic Vehicle Screening, supporting the screening and electronic clearance of vehicles
- Roadside Safety Inspections, supporting automated safety inspections
- Citation/Accident Electronic Recording, supporting the recording of information related to citations or accidents
- International Border Crossing, supporting electronic screening at international borders for CVO.

The **Fleet and Freight Management Center Subsystem** consists of five equipment packages that are part of the CVISN architecture:

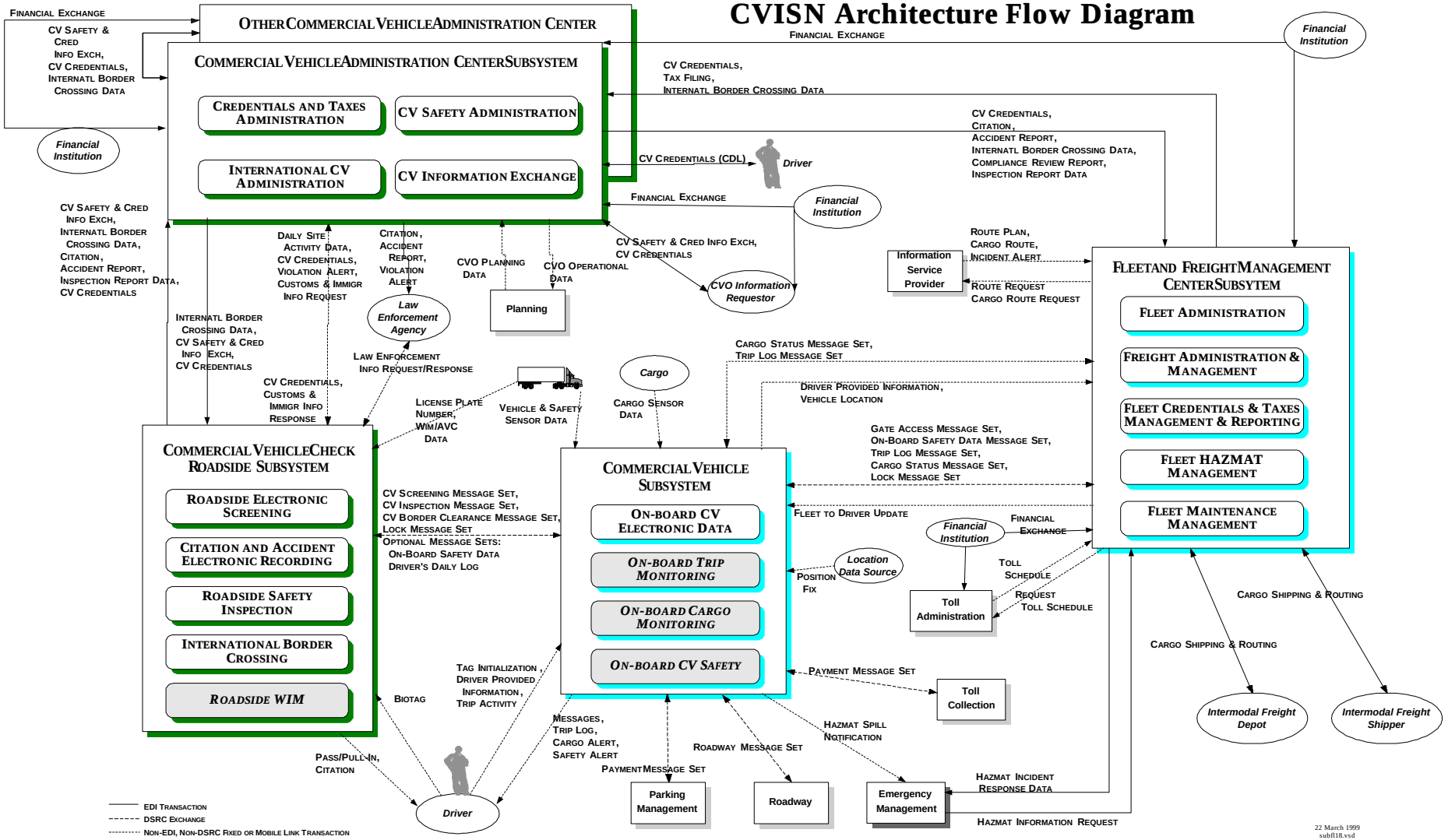
- Fleet Administration, supporting fleet tracking, dispatch, making and distributing route plans
- Freight Administration and Management, supporting cargo tracking and trading partner interfaces
- Fleet Credentials and Taxes Management and Reporting, supporting CV credential application, fee payment, and tax filing
- Freight HazMat Management, communicating information about the location and handling of HazMat for incident response
- Fleet Maintenance Management, providing the capability to use vehicle mileage and safety data to automatically generate maintenance schedules.

The **Commercial Vehicle Subsystem** includes one equipment package that is part of the CVISN architecture:

- On-Board Commercial Vehicle Electronic Data, supporting the communication of IDs and other status and messages from/to the vehicle and driver through DSRC and wireless communications

The other equipment packages consist primarily of sensors. They do not contain significant information system or network components, so they are not considered part of the CVISN architecture. They will often interface with CVISN components to transfer the data collected.

The CVISN Architecture Flow Diagram and related data dictionary were used as the foundation for developing EDI and DSRC interface standards.



CVISN Architecture Flow Diagram

The CVISN Architecture Flow Diagram depicts the CVO data flow among subsystems and between CVO subsystems and external entities. This diagram was used to coordinate with the National Architecture Team and to drive CVISN architecture refinement. The subsystems and equipment packages shown relate to the processes defined in the process architecture. The flows were used to derive requirements for standardized EDI and DSRC exchanges.

Credential and Tax Administration processes are mapped to the Commercial Vehicle Administration Center Subsystem. Roadside Operations processes are mapped to the Commercial Vehicle Check Roadside Subsystem. Safety Assurance processes are split into the CV Safety Administration and Roadside Safety Inspection equipment packages. Vehicle Operation processes are mapped to the Commercial Vehicle Subsystem. Fleet Management Processes are mapped to the Fleet and Freight Management Center Subsystem. General ITS Functions are depicted through interactions with general ITS subsystems from each of the CVO-unique subsystems.

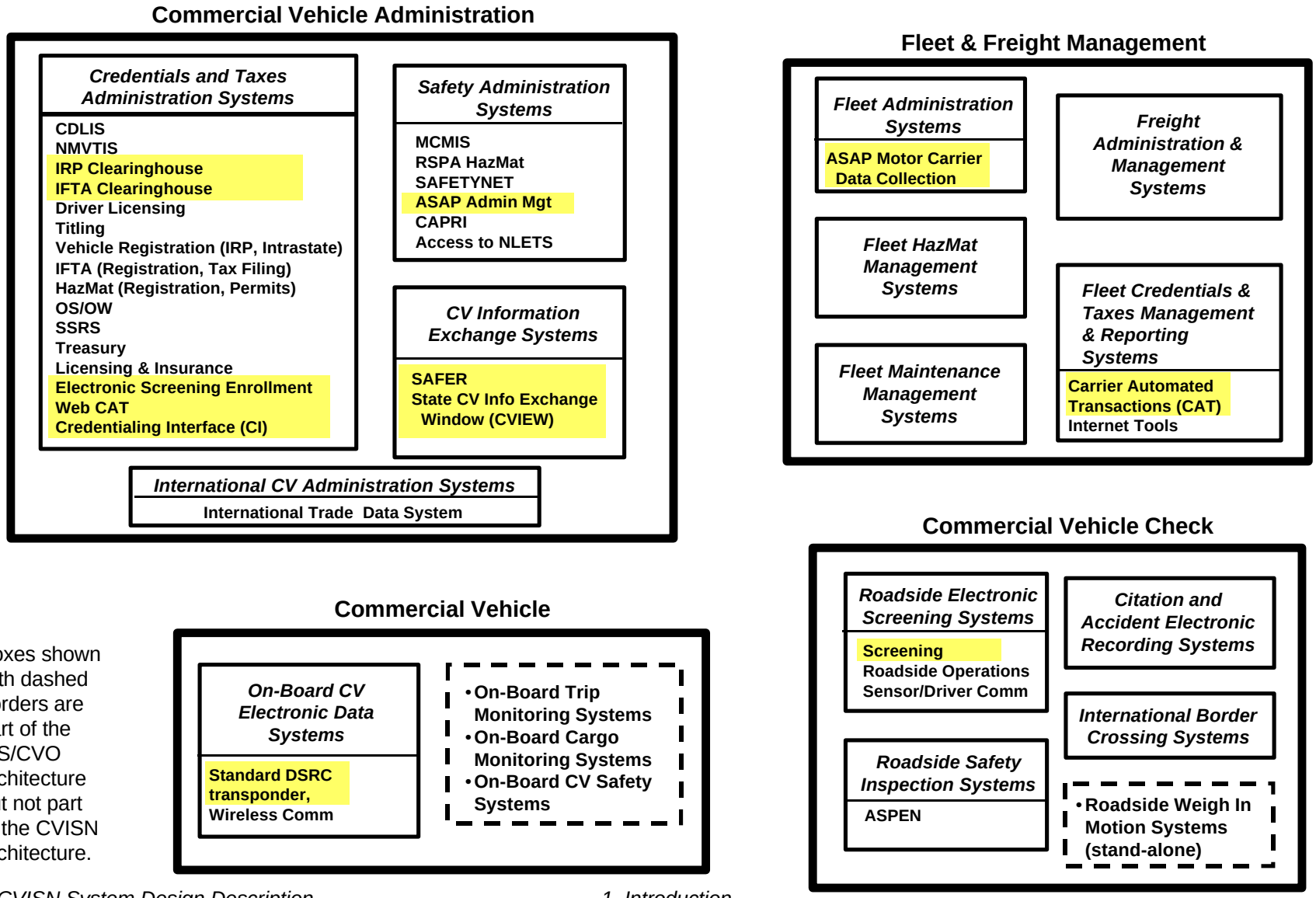
Conventions used on the figure:

Any subsystem that has unique requirements imposed by commercial vehicle operations is shown inside a shadowed box on the figures. Entities external to the ITS information systems are shown in ovals. In National Architecture terminology, these are “terminators.”

Connections and data exchanges shown on the figures are marked with different line types to differentiate the means of communication used.

- Data exchanges shown as solid lines are expected to be accomplished using standardized Electronic Data Interchange (EDI).
- Dedicated short range communications (DSRC) between the commercial vehicle and some roadside facility or fleet center are identified using long dashed lines. Some DSRC messages are recommended for standardization.
- Data exchanges that do not require standardization and that are expected to be accomplished using either fixed or mobile links are shown as dotted lines.

CVISN System Design: Legacy & Planned Systems View



Boxes shown with dashed borders are part of the ITS/CVO architecture but not part of the CVISN architecture.

The CVISN System Design takes the architecture down a level.

The CVISN System Design - Legacy & Planned Systems View shows the transition from “architecture” to “top-level system design”. In the architecture drawings, no specific existing or planned systems are shown. In this top-level system design, legacy systems that handle specific CVO functions are shown. Systems planned to support emerging ITS functions are also shown.

On this diagram, the legacy and planned systems are shown in the subsystem and equipment package groupings that were used in the National ITS and CVISN Architecture drawings shown earlier.

To communicate design concepts more readily to CVISN stakeholders, other drawings have been developed. Those form the basis for the remainder of this document.

This CVISN System Design Description document provides additional detail beyond the CVISN Architecture by describing:

- System requirements related to CVISN Level 1 capabilities
- The generic CVISN design, with the components organized into key stakeholder groups
- How the elements fit together

The document is intended to be a fairly high-level, and easy-to-read document. The primary audience is the state CVISN project team.

The document should answer these questions:

- What does a generic state design look like
  - Main elements & interfaces
  - Standard interfaces
  - How it all fits together
- What do the core infrastructure systems do for the states
- Where to find more information

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CVISN System Design Description
2 - System Requirements

The initial CVISN deployments are focused on three primary capability areas.

Safety Information Exchange: Provides carrier, vehicle, and driver safety information to roadside enforcement personnel and other authorized users.

Credentials Administration: Provides for electronic application, processing, fee collection, issuance, and distribution of CVO credentials, support of base state agreements, and provides for CVO tax filing/auditing.

Electronic Screening: Provides for screening vehicles that pass a roadside check station, determining whether further inspection or verification of credentials is required, and taking appropriate actions. Vehicle-to-roadside communications via transponders and readers/writers facilitate the screening functions at mainline speed. Weigh-In-Motion provides for high speed, mainline weighing. This ITS/CVO capability may be implemented at either fixed or mobile sites.

This chapter depicts the results of requirements analysis for these three capability areas.

For each capability area, this chapter provides four pages:

- A functional view
- Overview of functions included in the capability, and expected benefits
- A design view
- Text describing the design view

The operational concepts and top-level design requirements for CVISN Level 1 are recorded in detail in the COACH Part 1.

The CVISN technical guides provide further amplification of concepts and design guidance:

- CVISN Guide to Top-Level Design
- CVISN Guide to Safety Information Exchange
- CVISN Guide to Credentials Administration
- CVISN Guide to Electronic Screening

The COACH Part 4 defines the Interface Specifications for CVISN.

CVISN Level 1
Deployment Summary

- CVISN is the collection of information systems and communications networks that provide support to commercial vehicle operations (CVO).

- CVISN “levels” are being defined to allow definition of a specific set of capabilities that can be deployed by a state and its motor carriers. The definition of CVISN Level 1 has been baselined.

- Interface standards either exist or are being developed to support CVISN Level 1 capabilities.

Definition of CVISN Level 1 Deployment

An organizational framework for cooperative system development has been established among state agencies and motor carriers.

A State CVISN System Design has been established that conforms to the CVISN Architecture & can evolve to include new technology & capabilities.

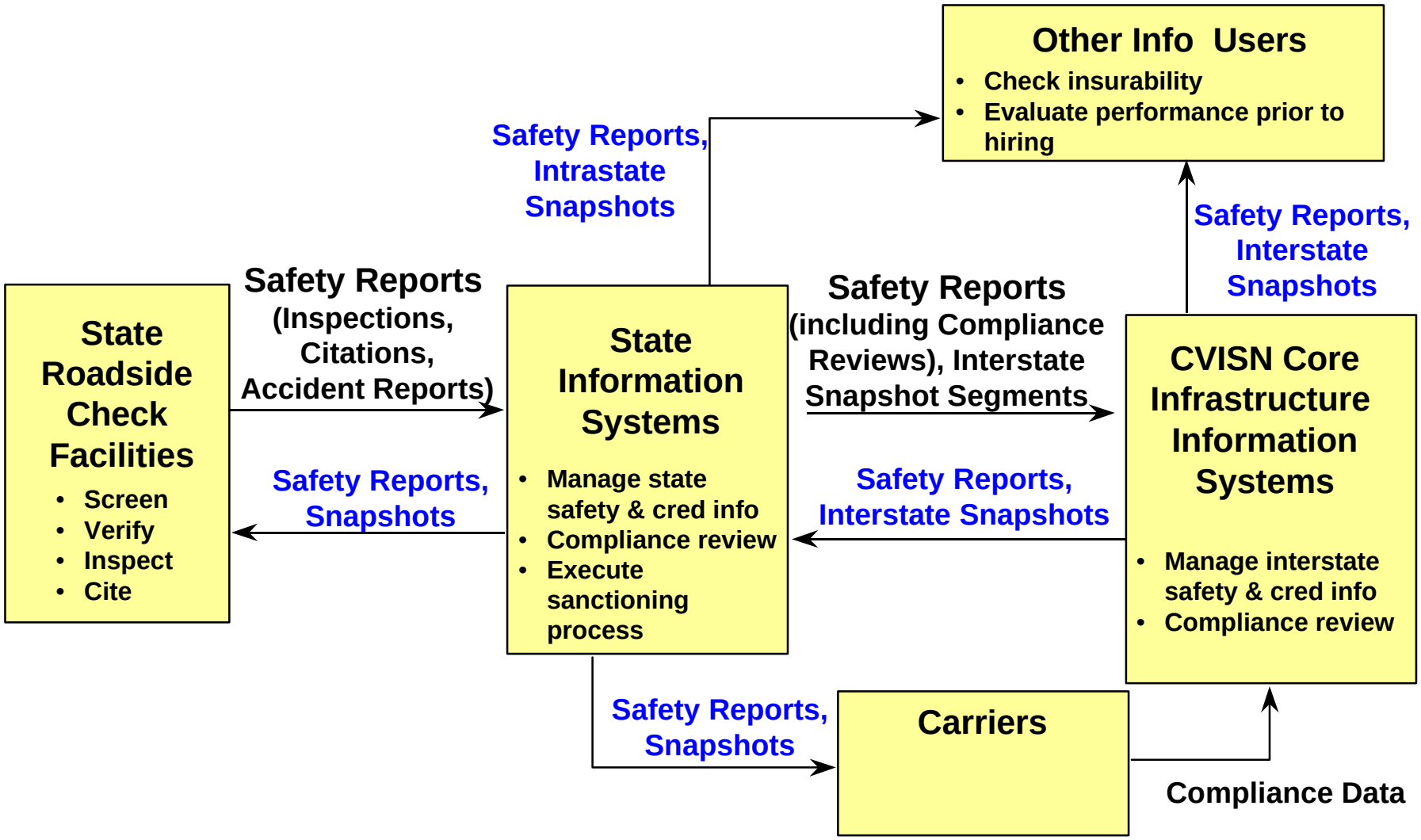
All the following elements of 3 capability areas have been implemented using applicable architectural guidelines, operational concepts, & standards:

- **Safety Information Exchange**
  - ASPEN (or equivalent) at all major inspection sites
  - Connection to SAFER
  - CVIEW (or equivalent) for snapshot exchange within state and to other states
- **Credentials Administration**
  - Automated processing (i.e., carrier application, state application processing, credential issuance, fuel tax filing) of at least IRP & IFTA credentials; ready to extend to other credentials (intrastate, titling, OS/OW, carrier registration, HAZMAT). Note: Processing does not include e-payment.
  - Connection to IRP & IFTA Clearinghouses
  - At least 10% of the transaction volume handled electronically; ready to bring on more carriers as carriers sign up; ready to extend to branch offices where applicable
- **Electronic Screening**
  - Implemented at a minimum of one fixed or mobile inspection site
  - Ready to replicate at other sites

To support all three capability areas, snapshots are assembled & stored by SAFER and CVIEW to facilitate the exchange of safety & credentials information among systems.

- There are 3 kinds of snapshots: carrier (available now), vehicle (available now), and driver (not yet available).
  - The use of common identifiers allows agencies and jurisdictions to exchange information
  - Identifiers, census/demographic information, safety history summary, and credentials information are included in snapshots
- Limited DMV data are included in the snapshots
  - Vehicle apportionment data
  - Credentials check flags are included. A check flag is used to indicate a recent problem, but does not attempt to define current status.

Safety information exchange is intended to improve safety performance.



Safety Information Exchange

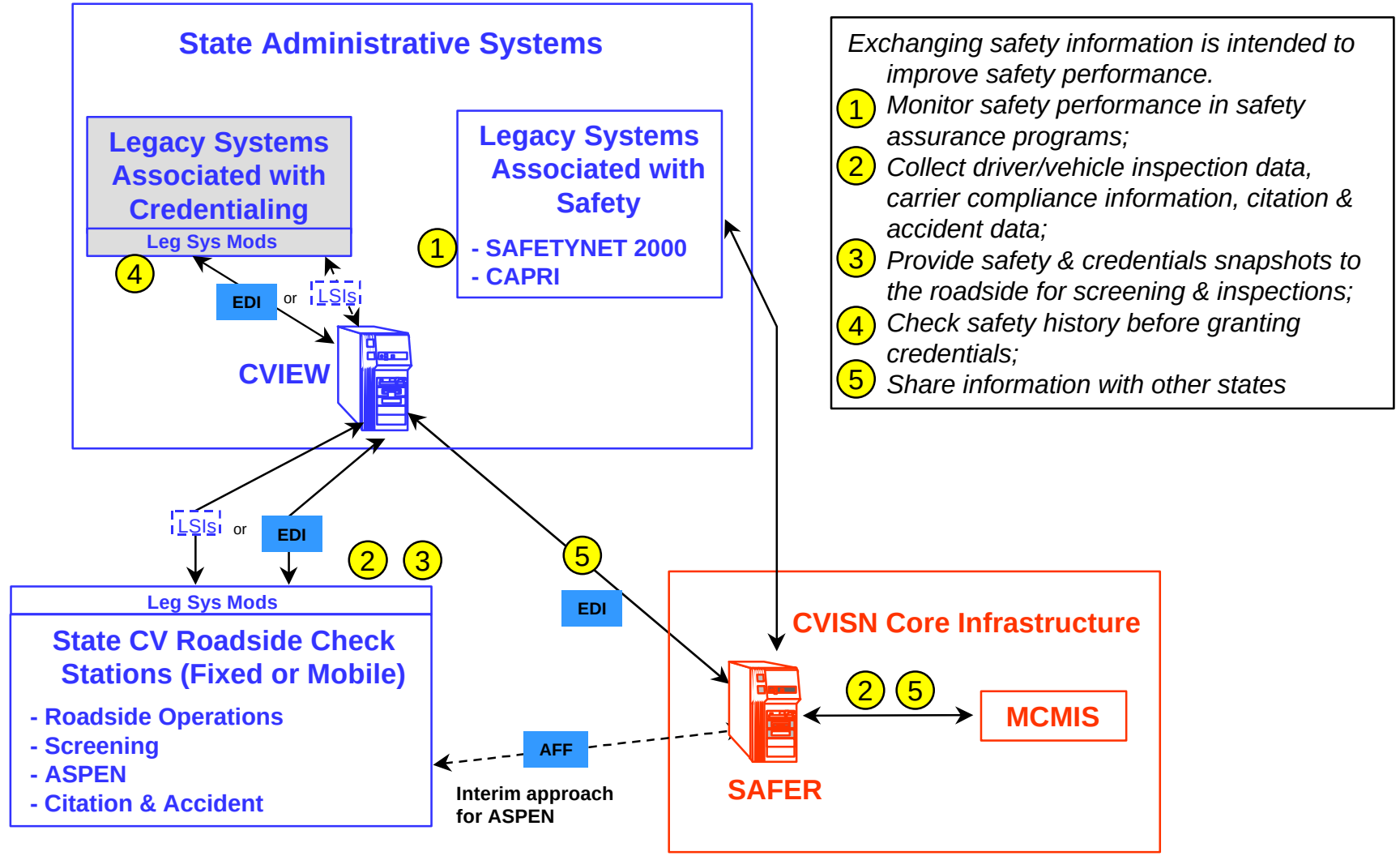
The Safety Information Exchange capability area includes:

- Automated collection of information about safety performance
- To augment the safety information, automated collection of credentials information
- Improved access to carrier, vehicle, and driver safety and credentials information
- Proactive updates of carrier, vehicle, and driver snapshot information
- Support for programs that identify and encourage unsafe operators to improve their performance

Expected benefits are:

- Improved safety performance
- Focusing government resources on high risk operators
- Providing carriers with better information to manage their safety programs

Safety Information Exchange: Standardized EDI transactions and common identifiers also make it possible to check safety performance roadside and deskside.



Safety Information Exchange

For safety information exchange, the design elements include state and federal commercial vehicle credential and safety administration-related offices, roadside check stations (fixed and mobile), and information exchange systems (e.g., MCMIS, SAFER, SAFETYNET/AVALANCHE, CAPRI, state CV Information Exchange Window).

The primary state administrative offices include the designated lead Motor Carrier Safety Assistance Program (MCSAP) agency, SAFETYNET, and other enforcement activities. Other state agencies also provide or have an interest in commercial vehicle safety information (e.g., vehicle registration, driver licensing, titling, permitting). These offices exist in each state or region, and share information through various CVISN core infrastructure systems.

The state CV Information Exchange Window (CVIEW) system supports the transfer of safety and credentials information (SAFER-style snapshots and reports) within the state and with the SAFER system. The state CVIEW handles information about all carriers, vehicles, and any drivers who operate in the state (both intrastate and interstate operators).

The CVISN core infrastructure supports the exchange of safety information between states, and among other stakeholders. The primary safety-related information systems and networks include the Safety and Fitness Electronic Records system (SAFER), Commercial Driver License Information System (CDLIS), and Motor Carrier Management Information System (MCMIS). Other information systems and networks that support law enforcement and credentialing activities, such as the National Law Enforcement Telecommunications System (NLETS) and the Motor Vehicle Titling Information System (NMVTIS), are also used to support the exchange and use of safety information.

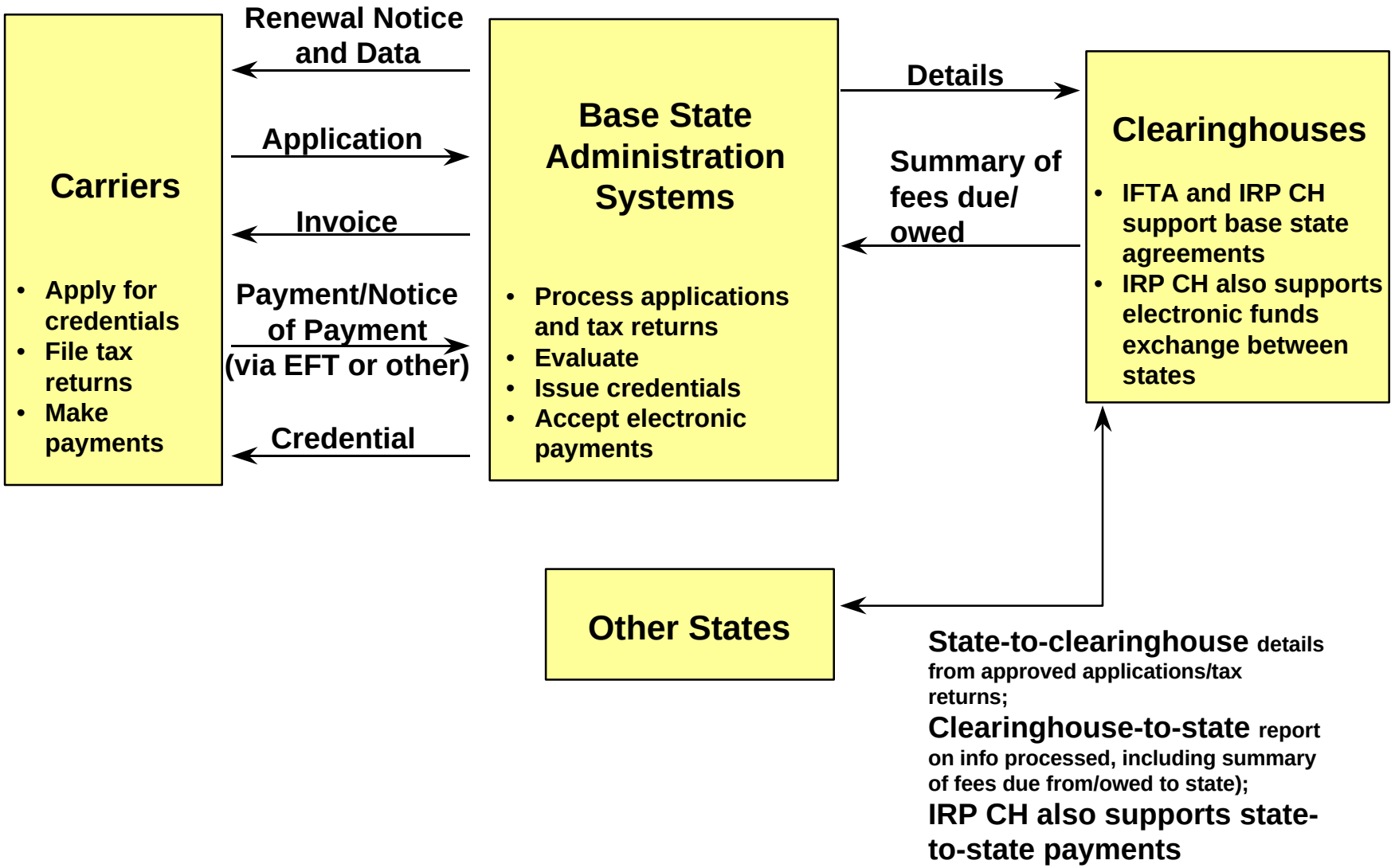
Roadside check stations include those locations with a permanent structure or mobile facility (including police cruisers) that house elements of the inspection and information systems (e.g., computers and communication systems) and enforcement and safety inspection personnel.

The CVISN initiative supports the standardization of dataflows to carry summary (snapshot) and detailed (report) safety and credentials information. These dataflows will provide a consistent basis for automating CVO information exchanges and processing, and to ensure interoperability among existing and developing CVO information systems. EDI X12 transaction set 285 is used to carry snapshot information. EDI X12 transaction set 284 is used to carry most CV safety report information, including inspection reports, compliance reviews, accident reports, and citations.

The snapshots convey information about three major entities: carriers, vehicles, and drivers. Only carrier and vehicle snapshots are part of CVISN Level 1. To minimize response time to requesters, snapshots will be stored nationally in the SAFER system, and within the state in the CVIEW system.

SAFER/CVIEW snapshots are used for screening carriers and vehicles at mainline speeds at roadside check stations, for safety inspections, for limited credentials checking and insurance applications, and for industry self-checks. Different subsets (called “views”) of the snapshot records available in SAFER/CVIEW will support different user systems.

Improved credentials administration should make government and business more efficient.



Credentials Administration

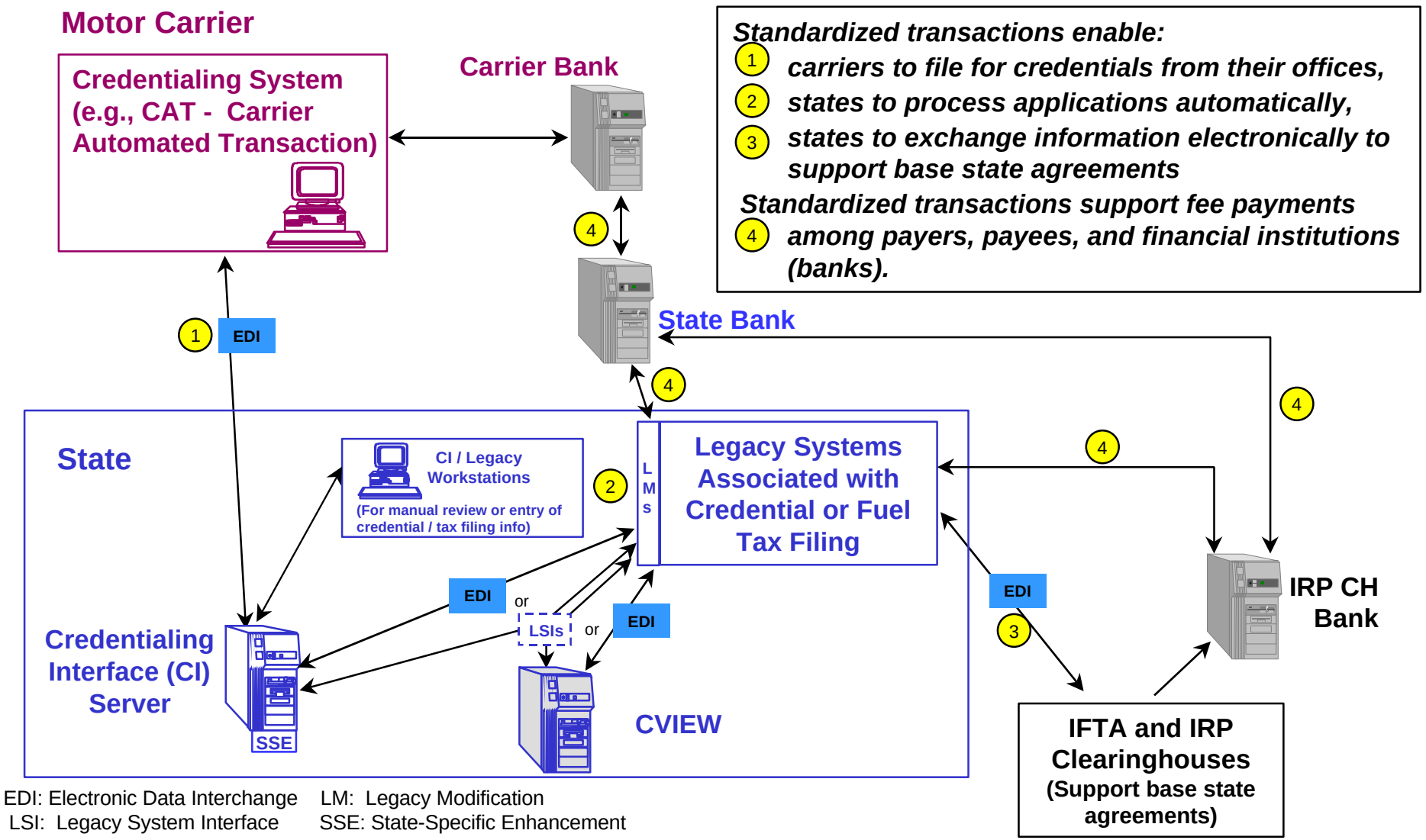
The Credentials Administration ITS/CVO capability area includes:

- All aspects of applying for, reviewing, and granting CVO credentials (IFTA, IRP, Intrastate Registration, Carrier Registration, OS/OW Permits, HazMat Permits, Titling, Electronic Screening Enrollment); paying the associated fees
- Filing returns on fuel taxes; paying the associated taxes
- Managing information about credentials and tax payment status
- Providing information to roadside enforcement and administrative users
- Supporting base state agreements and associated fee payment reconciliation

Expected benefits are:

- Reduced cost and red tape for agencies and carriers
- Improved regulatory compliance
- Improved carrier efficiency in getting new vehicles on the road
- Improved access to credential status information for roadside users.

Credentials Administration: Standardized EDI transactions enable carriers to obtain credentials and enable states to process the applications and support base state agreements electronically.



EDI: Electronic Data Interchange LM: Legacy Modification
LSI: Legacy System Interface SSE: State-Specific Enhancement

Credentials Administration

The design elements involved with credentials administration include the carrier's credentialing system (e.g., Carrier Automated Transaction (CAT)), the state Credentialing Interface(CI) system, communications system(s) that facilitates the exchange of information between the carriers and the state, state legacy systems associated with individual credentials, and the IRP and IFTA clearinghouses in the CVISN Core Infrastructure. The state Commercial Vehicle Information Exchange Window (CVIEW) supports the exchange of credentials-related information via snapshots.

This design allows carriers, owners, and drivers to apply for, pay for, and receive credentials electronically. It also supports states/regions in the administration of credentials, collecting and distributing funds, and in storing and distributing credentials-related data. The design also establishes standard mechanisms (the snapshots) for states to provide credentials information to enforcement officials and other authorized stakeholders.

Normally, the elements exchange information with each other through standardized interfaces (public - private, and infrastructure - state) using ANSI ASC X12 Electronic Data Interchange (EDI) transactions. The elements are virtually linked through government and commercial network services. Proprietary or sensitive information is protected from inadvertent disclosure through network "firewalls", business practices, and procedures.

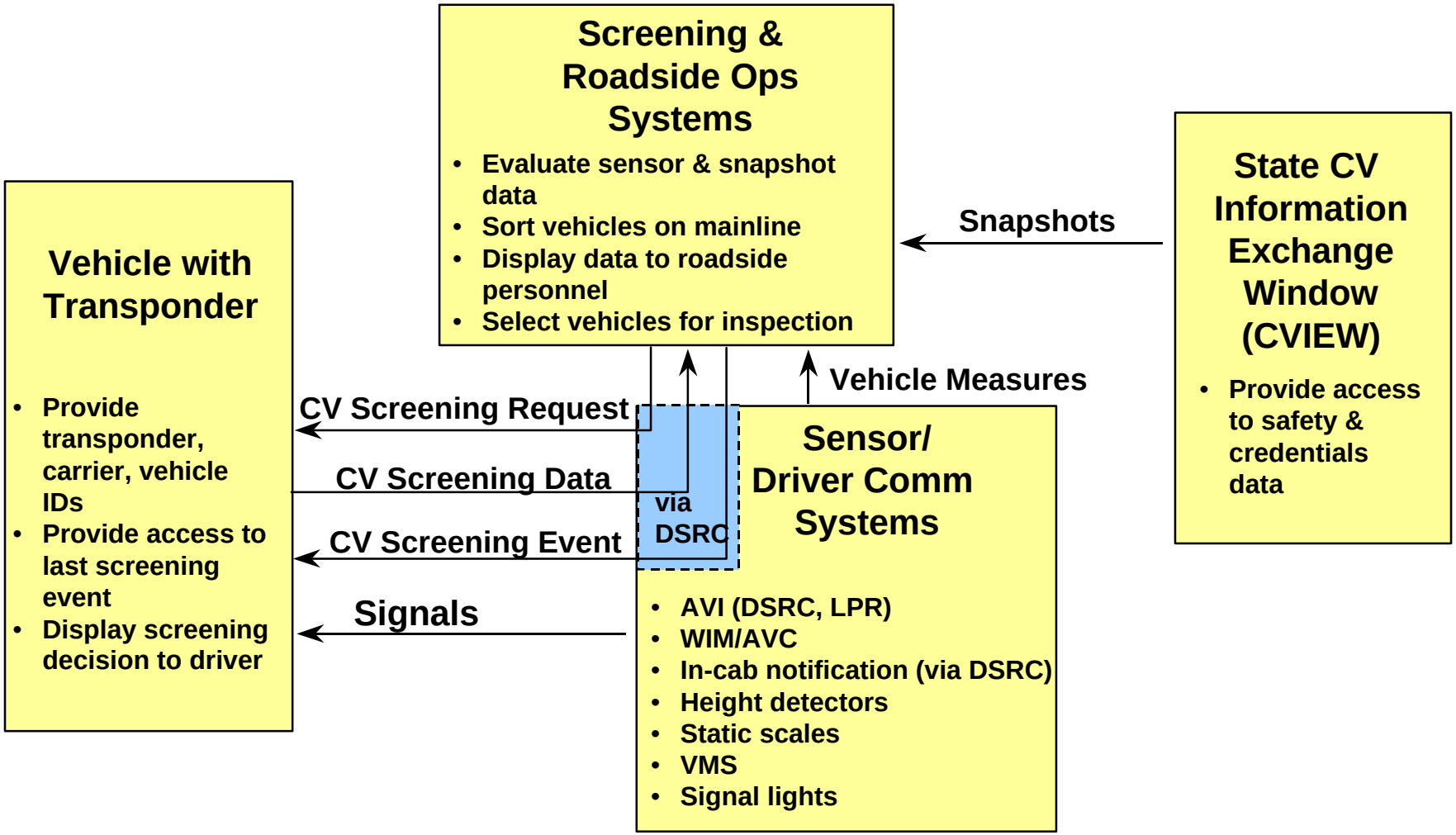
A **credential** is defined to be the authority granted by the issuing jurisdiction. Today, most credentials are issued in paper form, with supporting records on file in the issuing jurisdiction's system. An **electronic credential** is an electronic record of the credential.

The authoritative source for an electronic credential is the issuing agency. The holder of the credential may be issued an electronic copy that represents the same authority as today's paper copy.

To support base state arrangements, states must collect fees from operators, apportion the fees collected to other states according to pre-determined criteria, and transfer funds to those states accordingly. To facilitate that process, the design shown here involves **clearinghouses** to support those financial reconciliation activities. This design centralizes the financial reconciliation required by base state agreements. The clearinghouses could also be used to facilitate other kinds of information exchange. For instance, the clearinghouses could support audits, and provide a consolidated reporting database.

To conform with the CVISN architecture, participants must use X12 EDI transaction sets (TS) as described in the COACH Part 4. The EDI Implementation Guides (IGs) provide additional details about the usage of each transaction set.

Electronic screening is intended to focus enforcement resources on risky operators, and to improve freight mobility.



Electronic Screening

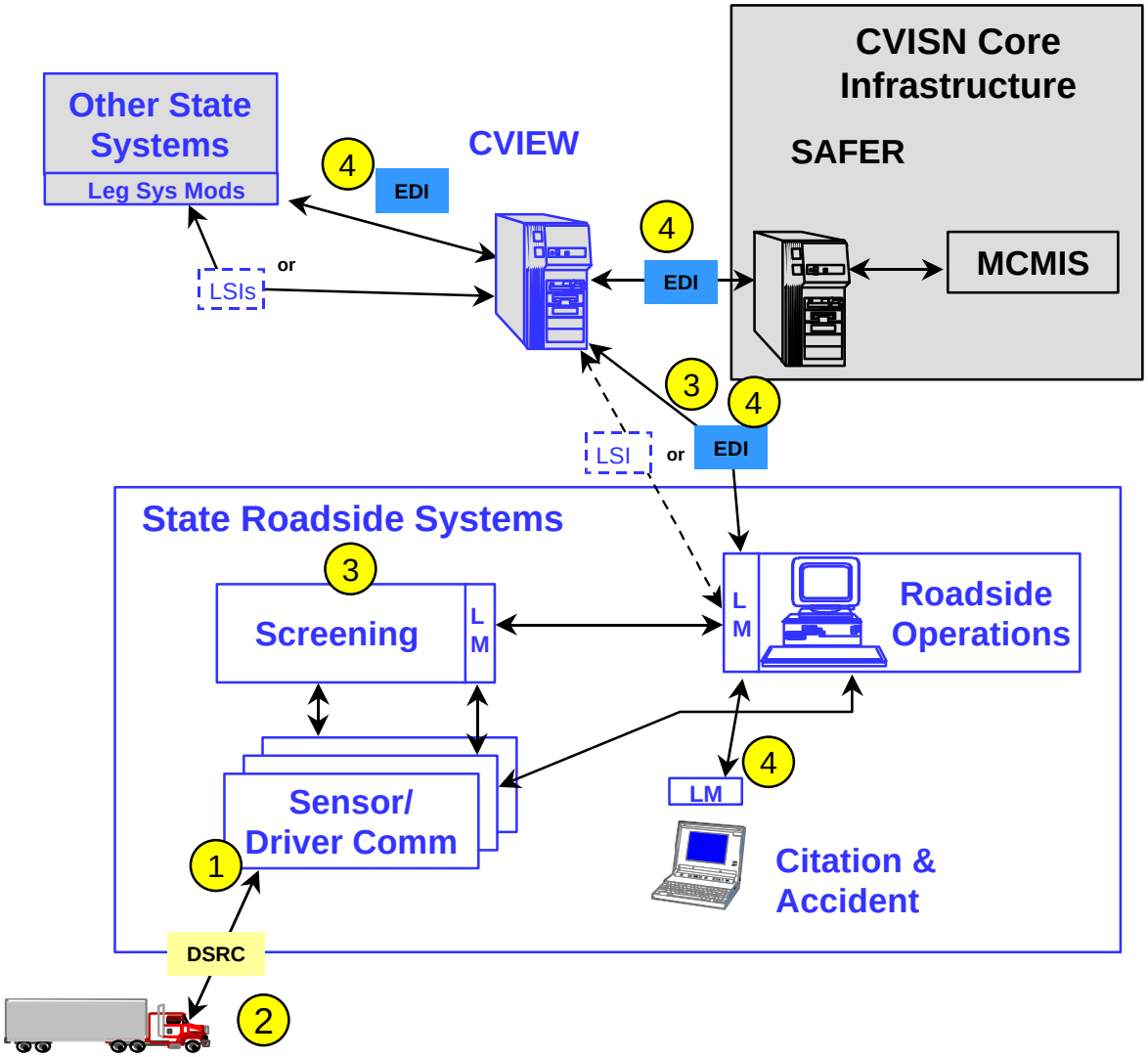
The Electronic Screening capability area provides for:

- Screening vehicles that pass a roadside check station based on identifiers read from the transponder, correlated with safety and credentials information from snapshots
- Determining whether further inspection or verification of credentials is required & taking appropriate actions.

Expected benefits are:

- Focusing resources on high risk operators
- More efficient movement of freight, since safe and legal operators will be pulled in less often

Electronic Screening: DSRC is used to identify the carrier & vehicle; corresponding infrastructure data helps with screening decisions.



Roadside electronic screening focuses resources on high risk operators:

1. ***Identify transponder, carrier, vehicle via DSRC transponder & standard messages***
2. ***Pull in untagged vehicle to identify carrier & vehicle***
3. ***Check snapshot information when making screening decisions***
4. ***Before issuing a citation, check with authoritative source for latest status***

Electronic Screening

For electronic screening, the major design elements include vehicles, manned fixed or mobile roadside check stations, the state commercial vehicle information exchange system window (CVIEW), the state CV safety administration, and various multi-state information systems.

Vehicles are equipped with electronic tags (transponders) that support dedicated short range communications (DSRC) and are integrated with an in-cab display (visual and audio) used for driver notification. Various techniques may be used to store driver and load information on the tag. Vehicles typically interface with screening equipment at mainline speed and drivers are notified of bypass status via the in-cab device.

Fixed commercial vehicle roadside check stations are manned locations with a permanent structure that can house elements of the information system (e.g., computers and communication systems). The stations are equipped with dedicated short range communications (DSRC) systems for interfacing with tagged vehicles. License plate readers may be used to identify untagged vehicles. Fixed sites are usually equipped with some weighing device (weigh-in-motion (WIM) device or a static scale). A more sophisticated configuration includes a screening WIM device integrated with an automated vehicle classification system to perform weight, size, and length checks, and a static scale to measure weight more precisely when the vehicle is stopped. If the WIM and automatic vehicle classification (AVC) system are located in the roadway on the mainline, then "screening" (making pass/pull-in decisions) can be performed at mainline speed. Manned fixed sites are likely to be co-located with a safety inspection facility.

Mobile enforcement units can be equipped with various combinations of DSRC, automatic vehicle identification (AVI), AVC, and WIM systems. They are typically positioned in areas where violations are known or suspected to occur. These units are equipped with tag readers that allow them to interface with vehicle transponders and mobile computers that look up credential and safety records either locally or stored in the infrastructure.

State administration systems support electronic screening operations by providing CVO data required for electronic clearance. The results of roadside activities (vehicles that were seen and cleared, seen and stopped, inspected, citations issued, number of vehicles that passed the station, etc.) are provided to the state CV safety administration.

Core infrastructure systems such as CDLIS may be queried either directly or indirectly to gather safety, license, and enforcement information about the carrier, vehicle, and driver.

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CVISN System Design Description
3 - System Design Overview

This 9 June 1999 version of this chapter has been updated to reflect:

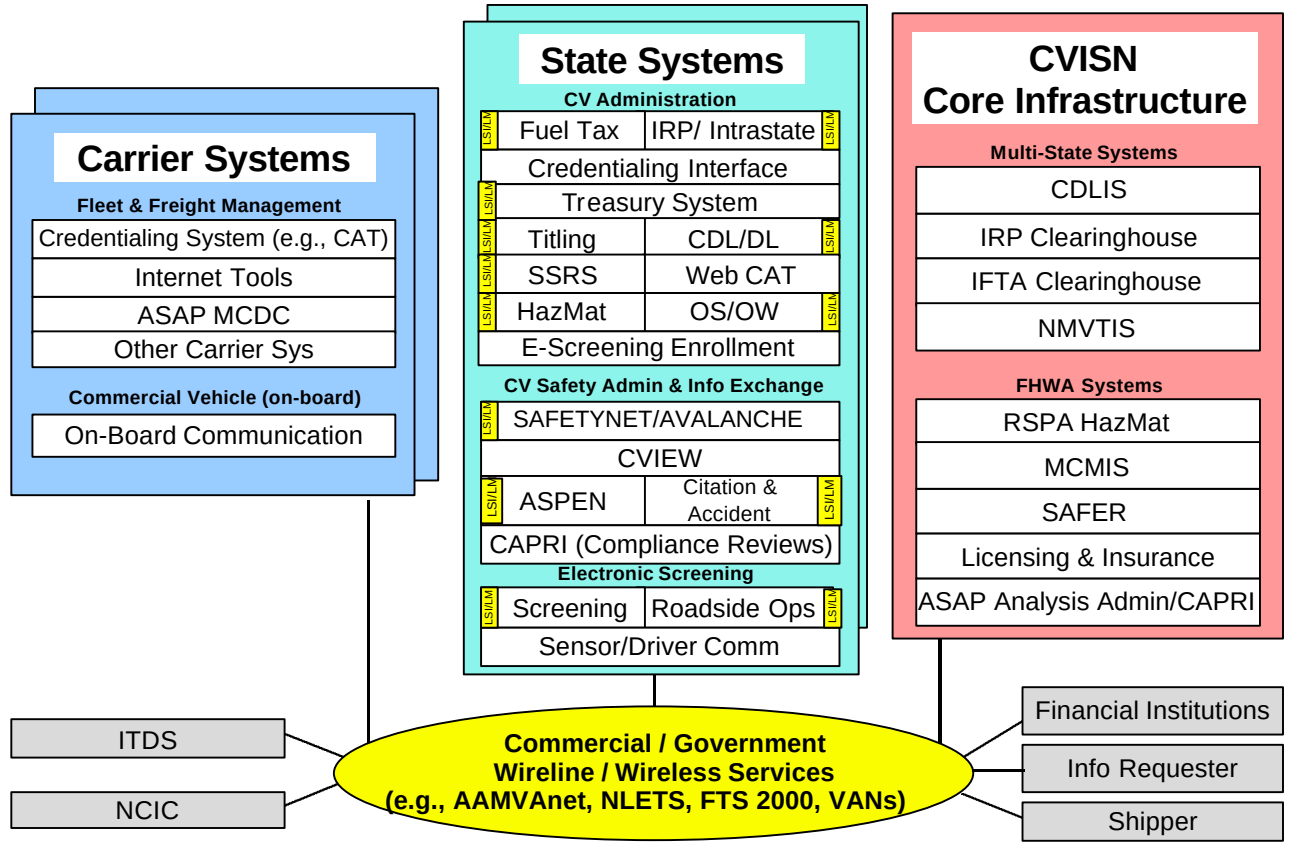
a. Sight changes in the recommendations for standard identifiers.
b. Comments received after the March 1999 version was issued.
c. Other minor corrections to clarify the content.

This chapter version replaces the previous version. Changed pages are marked with a C in the upper right hand corner.

The CVISN architecture and model system design provide a technical framework for all stakeholders to develop interoperable systems.

This view of the CVISN System Design groups systems according to major stakeholder groups, functions, and operators. It illustrates how many subsystems owned by different stakeholders can be viewed as parts of one large system, i.e., CVISN. Each subsystem must be designed with a view toward how it fits into the whole system if interoperability is to be attained. This view of the CVISN System Design shows individual systems in the stakeholder categories. The actual system names for each stakeholder will differ, but functions are fairly common with the names shown here.

CVISN System Design - Stakeholder View



CVISN System Design - Stakeholder View Components

Carrier Systems

Credentialing System. Apply for and receive responses about credentials; file fuel tax returns. One such system is the CAT (Carrier Automated Transactions).

Internet tools. Via Internet browser, access governmental or private Web sites to apply for and receive responses about credentials, file fuel tax returns, and perform other CV-related functions.

ASAP MCDC = Automated Safety Assessment Program Motor Carrier Data Collection. Report compliance information.

Other Carrier Systems. Other elements of fleet and freight management.

On-Board Communication. Communicate via DSRC, voice, etc. Record trip events.

State Systems

Fuel Tax = International Fuel Tax Agreement systems. Register for fuel tax credential and process fuel tax returns.

IRP/Intrastate = International Registration Plan and intrastate registration systems. Register commercial vehicles.

Credentialing Interface. Single interface for carrier interactions related to credentialing; handles EDI.

State Systems (continued)

Treasury System. Process electronic payments.

Titling = Title new and used vehicles

CDL/CL = Commercial Driver's License/ Driver's License.

SSRS = Single State Registration System. Carrier registration.

Web CAT. State WWW site support for electronic credentialing.

HazMat = Hazardous Material. Register to carry HazMat and issue HazMat permits.

OS/OW. Issue Oversize/Overweight permits.

E-Screening Enrollment. Collect and evaluate requests from carriers to participate in electronic screening.

SAFETYNET/AVALANCHE. Collect safety inspections and report to FHWA.

CVIEW= Commercial Vehicle Information Exchange Window. Collect snapshot segments for interstate and intrastate carriers, vehicles, and drivers. Interface with SAFER for interstate snapshot exchange. Provide snapshots to other state systems.

ASPEN. Record & report safety inspections.

Citation & Accident. Record citation and accident data.

CAPRI. Support compliance reviews.

Screening. Make pass/pull-in decision.

Roadside Ops = Roadside Operations. Process snapshots and control site traffic.

Sensor/Driver Comm = Sensor/Driver Communications. Process vehicle measures and communicate via DSRC with driver.

CVISN Core Infrastructure Systems

CDLIS = Commercial Vehicle Driver Information System. Pointer to past performance records for commercial drivers.

IRP Clearinghouse = International Registration Plan Clearinghouse. Administration of IRP base state agreement.

IFTA Clearinghouse = International Fuel Tax Agreement. Administration of IFTA base state agreement.

NMVTIS = National Motor Vehicle Titling Information System. Pointer to title information for all vehicles.

RSPA HazMat = Research & Special Projects Administration Hazardous Materials. Register carriers authorized under federal regulations to carry HazMat.

MCMIS = Motor Carrier Management Information System. Store safety data.

SAFER = Safety and Fitness Electronic Record. Collect snapshots and safety reports, primarily for interstate carriers, vehicles, and drivers. Provide to user systems.

Licensing & Insurance. Register financial responsibility for interstate carriers.

ASAP Analysis Admin/CAPRI = Automated Safety Assessment Program Analysis Administration/CAPRI. FHWA components of systems that support collection of compliance data from carriers and record & report compliance reviews.

Key CVISN Design Features

- **Standard Identifiers for carriers, vehicles, transponders, drivers, international trips, & shipments**
- **DSRC and EDI open standards for information exchange**
- **Snapshots for carrier, vehicle, and driver safety and credentials information exchange**
- **State Systems equivalent to**
  - **Credentialing Interface (CI) - common interface between carriers and legacy credentialing systems for electronic credential applications and responses**
  - **CV Information Exchange Window (CVIEW) - manage snapshots within the state and interface with national SAFER system**
  - **Legacy system modifications (LMs) to handle new functionality and standardized EDI interfaces**
  - **New legacy system interfaces (LSIs) where adoption of standardized EDI interfaces is not practical**
- **Carrier Systems equivalent to**
  - **Carrier Automated Transaction (CAT) - apply for and receive credentials electronically**
- **SAFER (CVISN Core Infrastructure system) to manage interstate snapshots and facilitate the exchange of safety reports**
- **ASPEN to record and report inspections**

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Standard identifiers are intended to facilitate the process of exchanging information about carriers, vehicles, drivers, shipments, and international trips.

✓ **Support CVISN Level 1 functions**

Entity	Identifier Name	Identifier Segments	Number of Characters
✓ Motor Carrier	Primary Carrier ID e.g., For ***interstate*** carrier: MCI 12345 A001 (note that MCI is the code used for ID Type USDOT #)	ID Type (alphanumeric); if carrier is interstate, the type must be USDOT type code (MCI); for intrastate carrier without a USDOT number, the type code must be state-specific (0B) +	3 (max)
	e.g., For ***intrastate*** carrier 0B US-CA 123A45689 1234 (note that 0B is the code used ID Type State-Specific)	Jurisdiction Code, if carrier is intrastate (alphanumeric); 2 character country code, hyphen, 2-character subdivision code; the allowable country and subdivision codes will be defined in the FHWA Code Directory +	5
		Carrier-Specific Identifier corresponding to the ID type (alphanumeric); if carrier is interstate, must be USDOT number; if carrier is intrastate and has a USDOT number, must be USDOT number; for state-specific IDs, the Carrier-Specific Identifier may include a prefix to clarify the agency/source of the identifier) +	12 (max)
		Carrier Terminal ID designated by carrier (alphanumeric)	4 (max)

C

Standard identifiers are intended to facilitate the process of exchanging information about carriers, vehicles, drivers, shipments, and international trips.

Entity	Identifier Name	Identifier Segments	Number of Characters
✓ Vehicle	Vehicle Identification Number e.g., 1FDKE30F8SHB33184 and Vehicle Plate ID e.g., US CA 12345664820M	VIN assigned by manufacturer (alphanumeric) Country code; the allowable country codes will be defined in the FHWA Code Directory + Jurisdiction (state or province) code (alphanumeric); the allowable subdivision codes will be defined in the FHWA Code Directory + License plate ID (alphanumeric)	30 (max) 2 2 12 (max)
✓ Transponder	Transponder ID e.g., 0 123456789	Transponder ID Definition Flag (0=current; 1=IEEE P1455) + *If Transponder ID Definition Flag = current*, then the other segment is: Transponder Serial Number assigned by manufacturer *If Transponder ID Definition Flag = IEEE P1455*, then the other segments are: Manufacturer Identifier + Transponder Serial Number assigned by manufacturer	1 bit 32-bit unsigned integer 16 bits 20 bits

✓ **Support CVISN Level 1 functions**

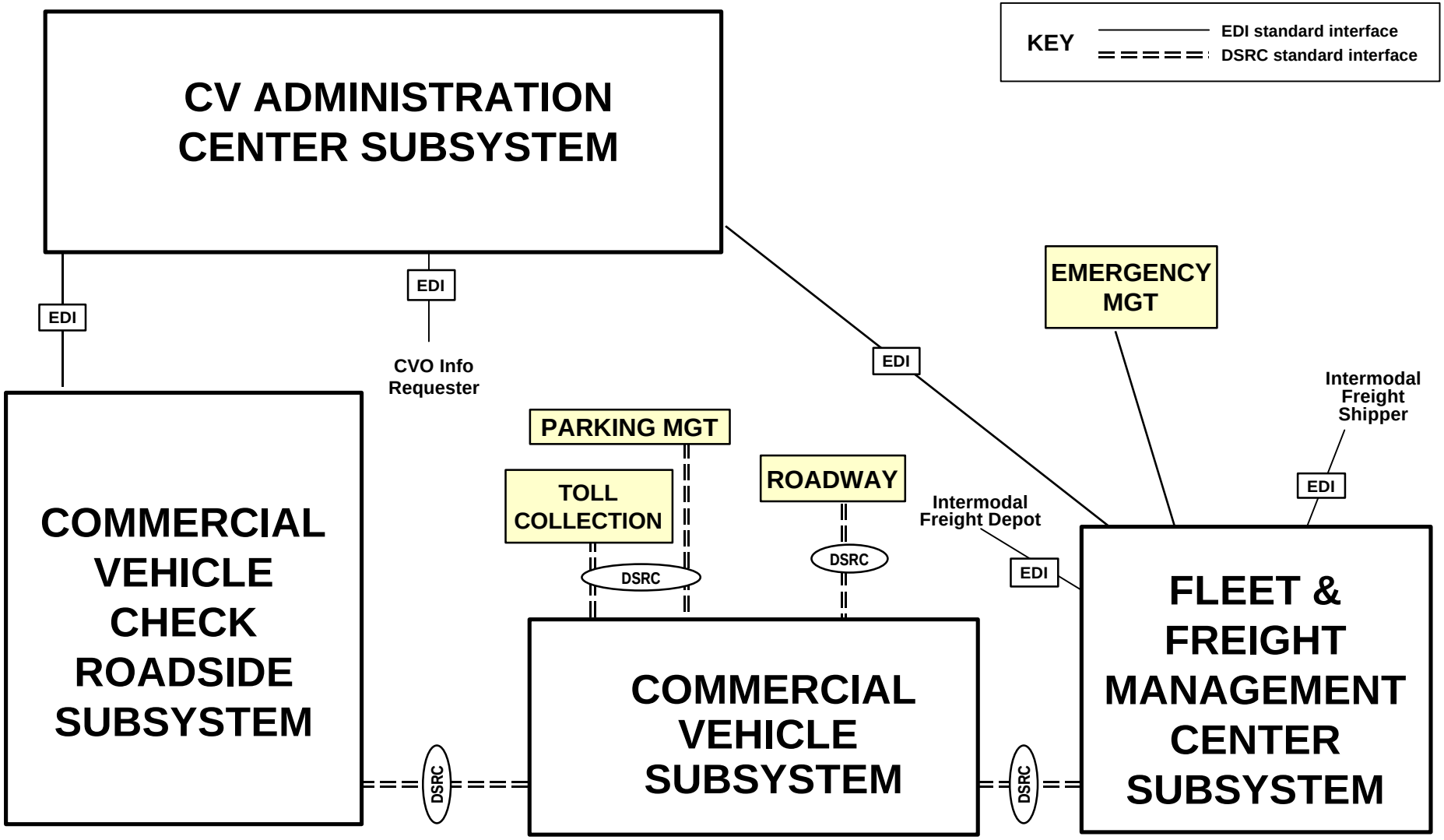
C

Standard identifiers are intended to facilitate the process of exchanging information about carriers, vehicles, drivers, shipments, and international trips.

Entity	Identifier Name	Identifier Segments	Number of Characters
Driver	Driver Unique ID e.g., US MD B99999999999A	Country code; the allowable country codes will be defined in the FHWA Code Directory + Jurisdiction (state or province) code (alphanumeric); the allowable subdivision codes will be defined in the FHWA Code Directory + Driver specific identifier (driver license number) assigned by jurisdiction (alphanumeric)	2 2 16 (max)
Shipment	Shipment Unique ID e.g., 776655443322	Bill of Lading number assigned by the carrier (numeric)	12 (max)
International Trip	Trip/Load Number e.g., 123456789761231	Carrier DUNS number as assigned by Dun and Bradstreet (numeric) + Trip unique number as assigned by carrier (numeric)	9 6

✓ **Support CVISN Level 1 functions**

The CVISN architecture connects subsystems via a combination of EDI and DSRC interface standards



Emerging Dedicated Short-Range Communications (DSRC) standards support near- and long-term goals

In the near-term, FHWA has issued this policy guidance:

For the immediate future, all CVO and Border Crossing projects will continue to utilize the current DSRC configuration, which is an ASTM version 6 active tag.

Type IIIm tags available today are being tested to support limited messages from the IEEE P1455 standard.

FHWA is considering a proposal to require:

All CVO and Border Crossing projects to use an active configuration that is backward compatible with the current configuration and yet consists of the following "sandwich" protocol:

- *ASTM v7 defines the frequency layer,*
- *ASTM v6 defines the data link layer,*
- *IEEE P1455 defines the application layer.*

Future tags are expected to support all message sets defined in IEEE P1455.

Standard EDI transaction sets support computer-to-computer exchange without the need to negotiate unique interface agreements.

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	TS (ANSI X12)	**TS Name**	**Purpose**
✓	150	Tax Rate Notification	Share IFTA tax tables.
✓	151	Electronic Filing of Tax Return Data Acknowledgement	Acknowledge receipt of 813.
✓	284	Commercial Vehicle Safety Reports	Submit or request safety report. Safety Reports include: inspection reports, crash data, safety and compliance review reports, and hazardous material incident reports.
✓	285	Commercial Vehicle Safety & Credentials Information Exchange	Request snapshots. Send snapshot view or snapshot segment update.
✓	286	Commercial Vehicle (CV) Credentials	Submit electronic application for credentials. Return credential data to applicants. Exchange credential data among authorized users.
✓	813	Electronic Filing of Tax Return Data	File quarterly IFTA tax return.
	820	Payment Order/Remittance Advice	Initiate electronic payment process.
✓	824	Application Advice	Report results of processing received 284 or 285.
✓	826	Tax Information Exchange	Share transmittal and netting data among jurisdictions for IFTA and IRP base state agreements.
✓	997	Functional Acknowledgement	Acknowledge receipt of any EDI message.
	many		Cargo Shipping & Routing functions.
	UN/ EDIFACT	CUSDEC, CUSCAR, CUSREP, CUSRES	Entry papers for transport, cargo declaration, response/duty invoices, response/duty invoices Customs inspection reports

Snapshots: Fundamental Principles

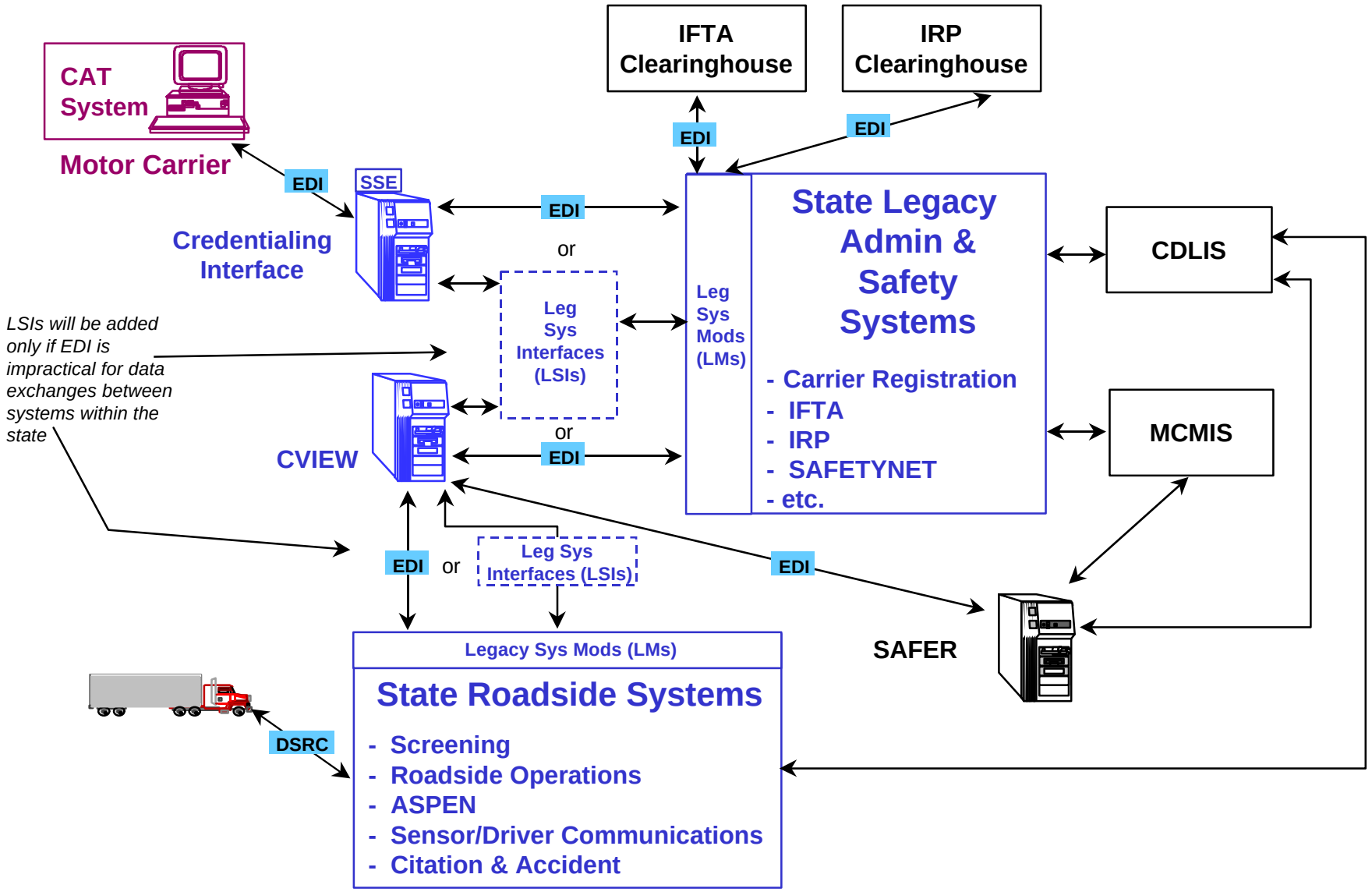
- Three flavors: carrier, vehicle & (future) driver
- SAFER manages interstate snapshots
- State CVIEWs (or equivalent) manage intrastate and interstate snapshots
- Snapshots were primarily designed to support roadside electronic screening; many other uses have emerged
- Snapshots are routinely distributed according to subscription criteria
- Snapshots are also available for near-immediate response to a query
- Authoritative sources contribute specific segments of data proactively to snapshots, sometimes via indirect source systems
- Snapshots contain summary safety data, plus the equivalent of decals and paper documents carried on commercial vehicles today
- Snapshot data are stored in SAFER and CVIEW
- SAFER and CVIEW do not store copies of data readily available to SAFER/CVIEW users from other on-line systems.

Snapshot Data Stored in SAFER/CVIEW

Data → ↓Snapshot	**Identifier/Census Data**	**Safety Information**	**Credential Information**
Carrier	[1]Primary Carrier ID; Other IDs (e.g., Taxpayer ID, DUNS, IRP account, etc.); Names; Addresses; Type; Operations Characterization	Safety Ratings; Accident, Inspection & Violation Summaries; Safety Review History; [1] Last OOS; PRISM Data	Carrier Registration; Fuel Tax Data Insurance Data; HazMat Registration; [1]Permit Data; Electronic Screening Enrollment; Carrier Check Flags (e.g., IRP & IFTA flags)
Vehicle	[1]VIN; [1]Vehicle Plate ID Other IDs (e.g., Plate, IRP Account, CVIS Default Carrier, Transponder, Title Number); Vehicle Description	Last Inspection Overview; Inspection & Violation Summaries; [1]Last OOS; CVSA Decal Data; PRISM Data	Apportionment (i.e. Cab Card Data); [1]Permit Data; Electronic Screening Enrollment; Vehicle Check Flags: (e.g., Registration Check Flag)
Driver (Future)	[1]Driver Unique ID; [1]Home State; Names; Address; DOB, Sex; Citizenship	Last Inspection Overview; Accident Summary; Inspection & Violation Summaries; [1]Last OOS	Driver Check Flags (e.g., DMV Check Flag)

Note: 1 = Data are current; all other data are historical

This Generic CVISN Configuration shows how new functions might be implemented, building on existing systems.



Generic CVISN Configuration

- **Motor Carrier Systems**
  - **CAT (Carrier Automated Transaction) - to transmit applications for credentials, and fuel tax returns**
- **State Systems**
  - **Credentialing Interface (CI) - to be the focal point for credential and tax interaction with the carrier**
  - **Legacy administrative and safety deskside systems (Carrier Registration, IFTA, IRP, OS/OW, Intrastate Vehicle Registration, SAFETYNET/ AVALANCHE, Titling, CDL/DL, HazMat, CAPRI); Legacy Modifications (LMs)**
  - **Legacy System Interfaces (LSIs) -to make translations into and from legacy interface definitions when adherence to EDI standards between the CI or CVIEW and legacy systems is impractical**
- **State Systems, continued**
  - **CV Information Exchange Window (CVIEW) - to generate intrastate snapshots, to handle interstate snapshot data exchange, and to distribute snapshots within the state**
  - **Roadside Check Stations (Sensors, Screening/Driver Communications, Roadside Operations, ASPEN, Citation & Accident)**
- **CVISN Core Infrastructure Systems**
  - **IFTA Clearinghouse - to support the IFTA base state agreement**
  - **IRP Clearinghouse - to support the IRP base state agreement**
  - **SAFER - to generate interstate snapshots and distribute**
  - **Legacy CVISN Core Infrastructure Systems (CDLIS, MCMIS, CAPRI, RSPA HazMat, Licensing & Insurance)**

Legacy Systems in the state will be leveraged to improve commercial vehicle operations and adapt to CVISN principles.

Administrative systems will be updated to support

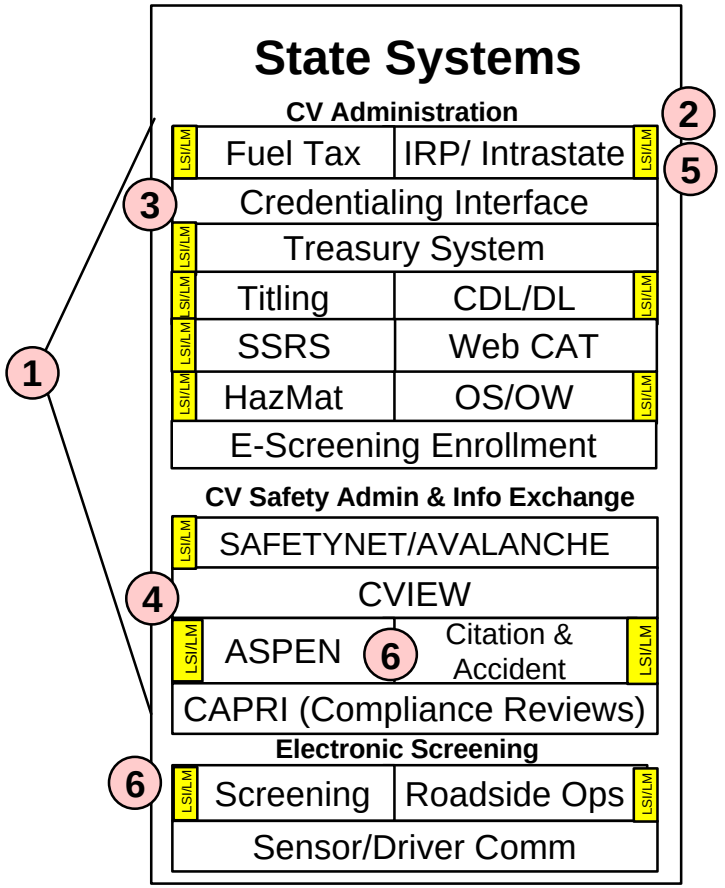
1. ***Electronic credentialing and automation of safety assurance functions.***
2. ***Legacy System Modifications (LMs) to support enhanced information exchange, electronic credentialing, improved safety programs, etc.***

New systems may be added to support key CVISN concepts

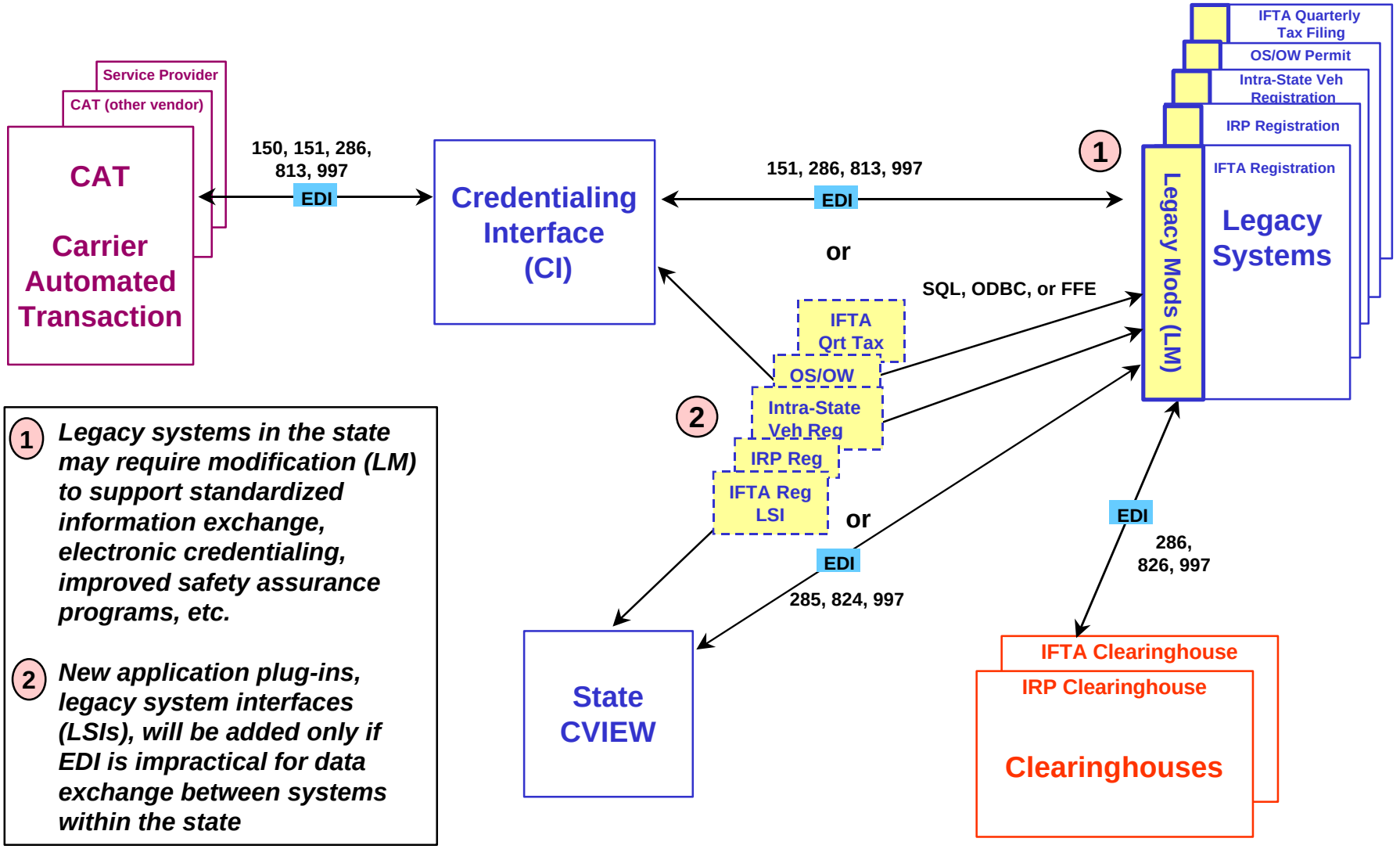
3. ***Credentialing Interface for electronic transaction routing & processing;***
4. ***CV Information Exchange Window for creation of intrastate snapshots and to provide a single source within the state for all snapshots and report queries;***
5. ***Legacy System Interfaces (LSIs) may be added when adherence to EDI standards between the CI or CVIEW and legacy systems is impractical***

Roadside systems will be updated to support use of

6. ***safety & credentials data for electronic screening, to report inspections, and to report citations and accidents.***



Modifications enhance legacy systems to make better use of available information and to improve operations.



1 ***Legacy systems in the state may require modification (LM) to support standardized information exchange, electronic credentialing, improved safety assurance programs, etc.***

2 ***New application plug-ins, legacy system interfaces (LSIs), will be added only if EDI is impractical for data exchange between systems within the state***

The Credentialing Interface provides a convenient interface within the state to accept electronic credentialing application inputs from carriers, and to provide responses from state systems to carriers.

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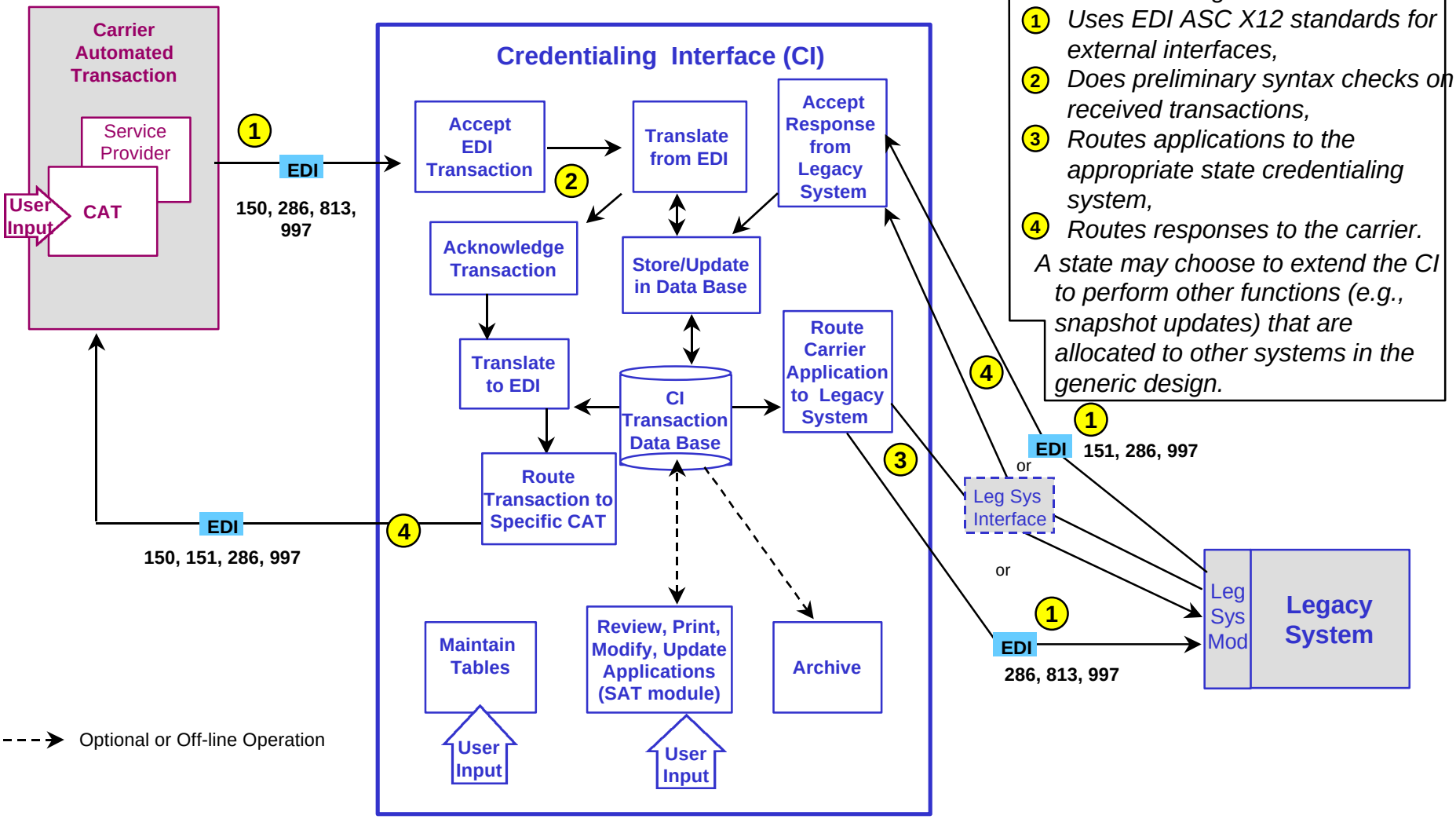

The State CVIEW handles the exchange of safety and credentials information within the state, and with other jurisdictions via SAFER

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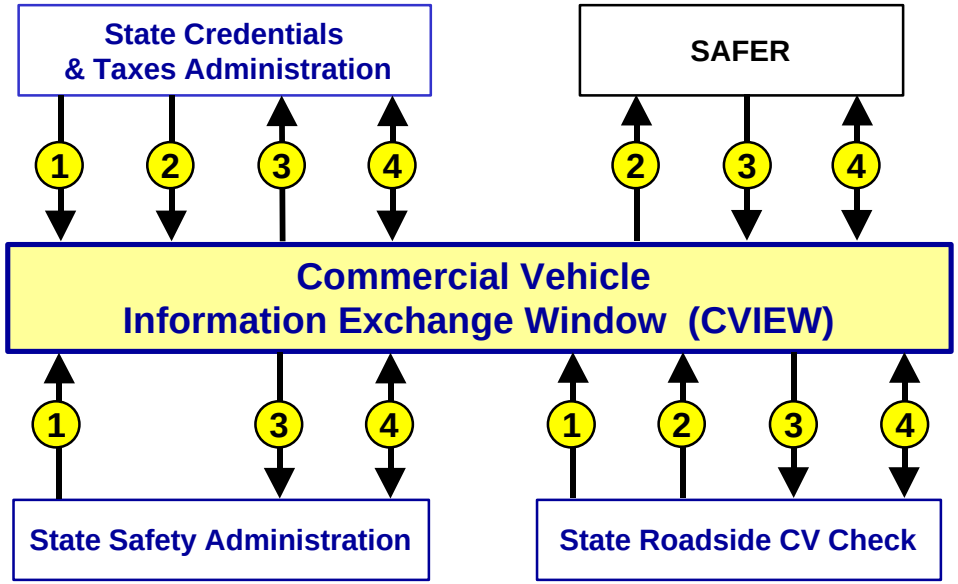
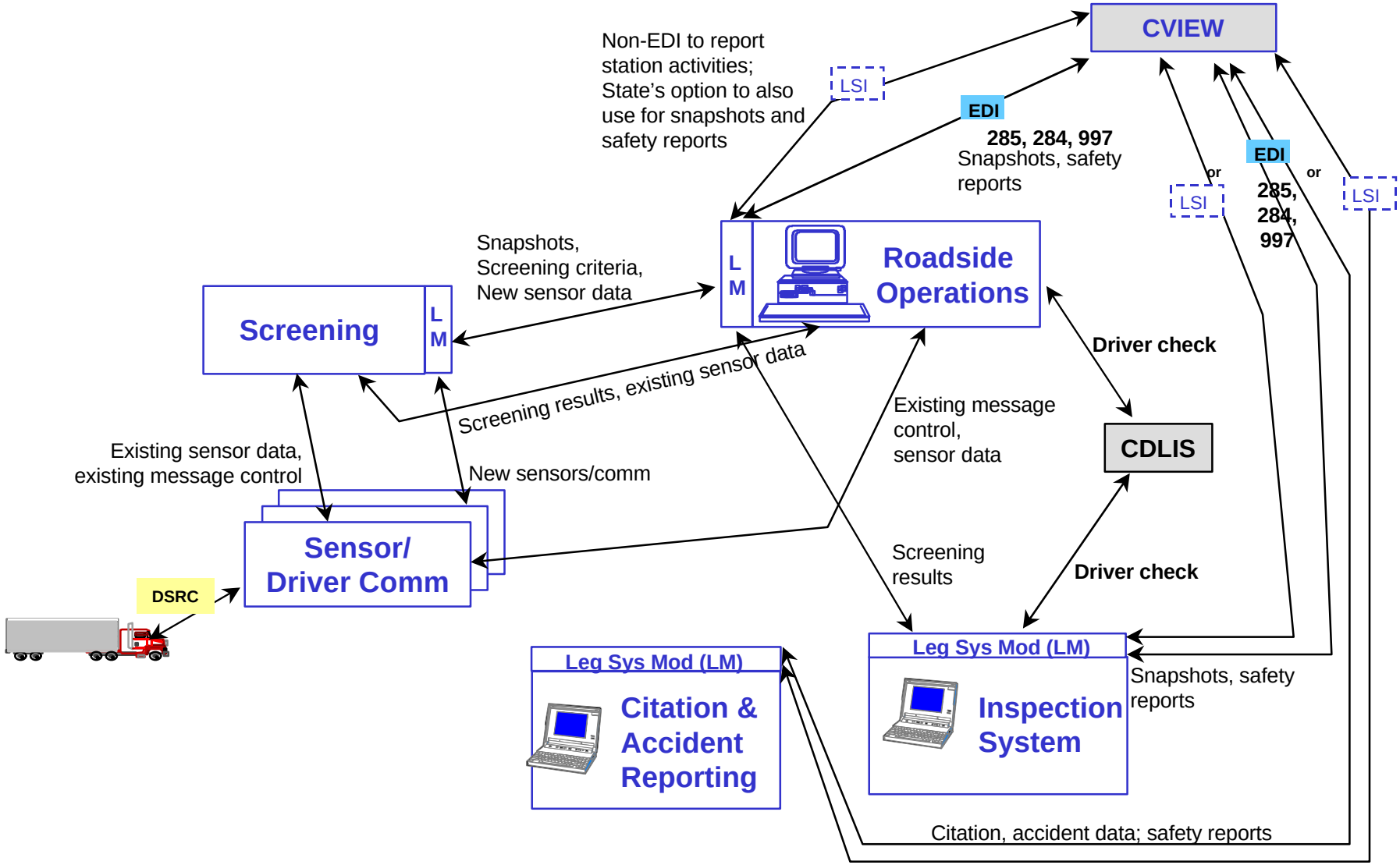
CVIEW

1. **Assembles and maintains *intrastate* snapshots. Manages state's copies of interstate snapshots.**
2. **Provides interstate snapshot segment updates for credentials data to SAFER, and is pass-through for CV safety reports.**
3. **Distributes interstate and intrastate snapshots or reports to roadside sites and other state systems.**
4. **Responds to queries for snapshots and reports from state data users.**

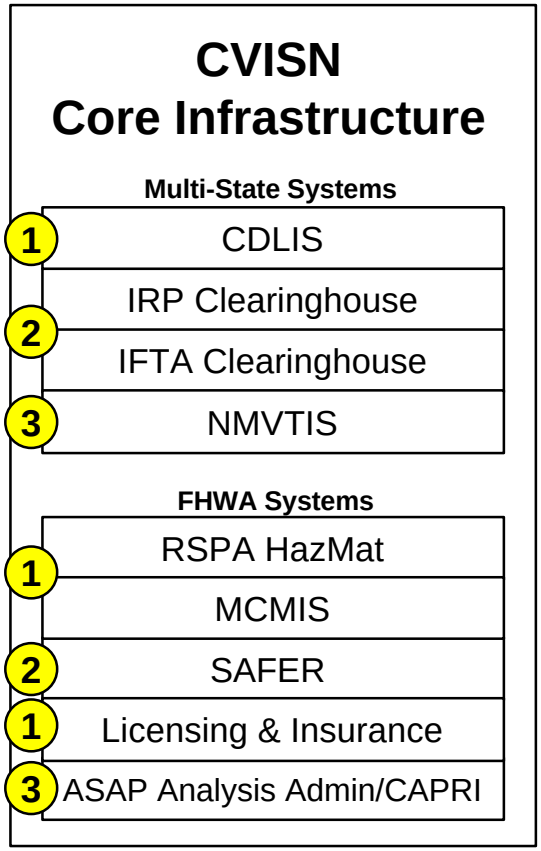


Roadside Systems use technology to support electronic screening and inspections.

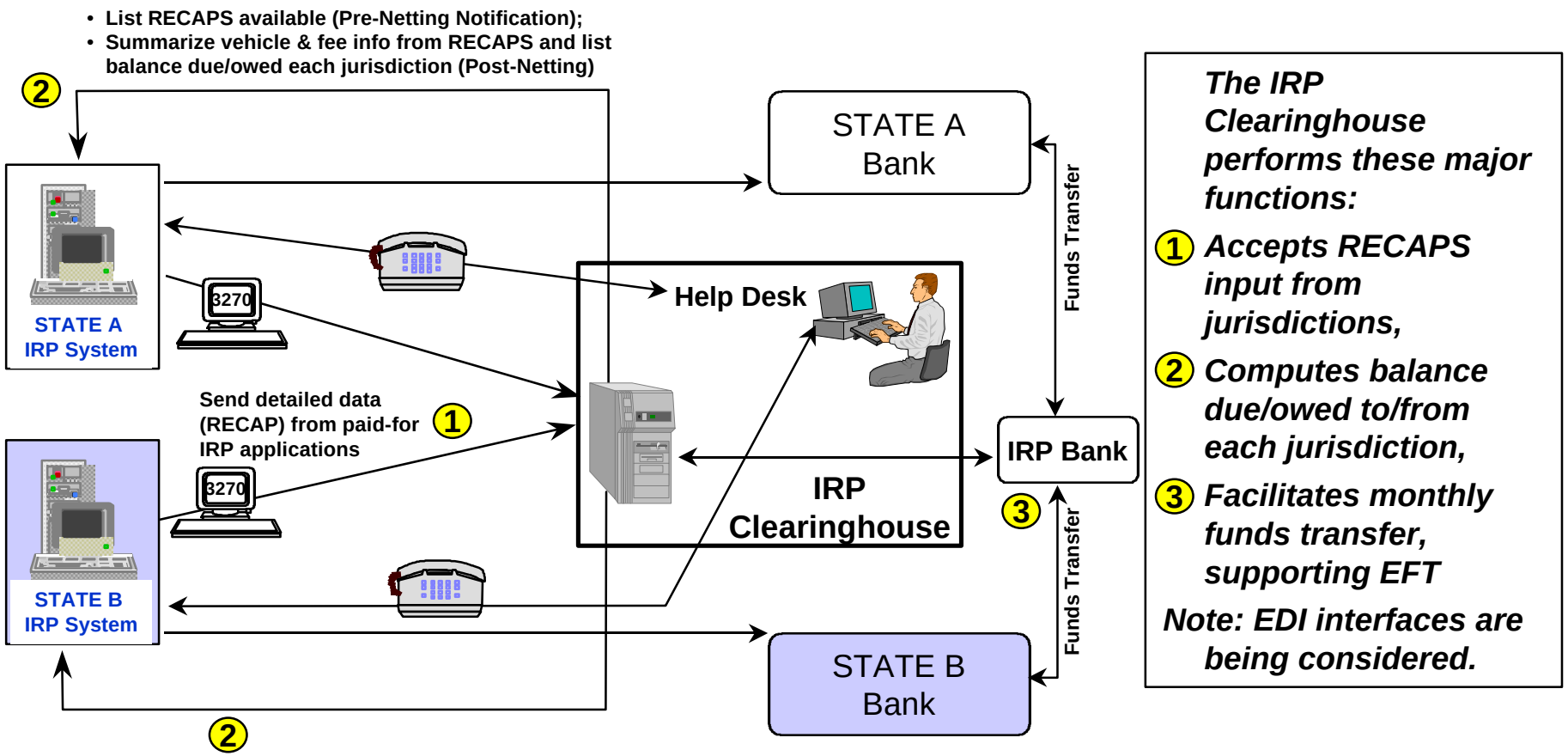


CVISN Core Infrastructure systems support information exchange.

1. ***Existing systems may be updated to support enhanced information exchange.***
2. ***New systems are being developed to support primary CVISN capabilities:***
   - ***IRP Clearinghouse to support administration of IRP base state agreement***
   - ***IFTA Clearinghouse to support administration of IFTA base state agreement***
   - ***SAFER for creation of interstate carrier, vehicle, and driver snapshots and to provide a consolidated source within the core infrastructure for all interstate snapshots and report queries***
3. ***Other systems are being considered for development or are underway to support secondary CVISN capabilities:***
   - ***NMVTIS development is underway to improve access to titling information for all types of vehicles***
   - ***ASAP (under development) and CAPRI (operational) support compliance reviews***



The IRP Clearinghouse processes information received electronically from states to compute fees due/owed each jurisdiction, and facilitates periodic funds transfers.



based on information provided by IRP, Inc.

The IFTA Clearinghouse Central repository provides access to confidential tax information for IFTA, Inc clients.

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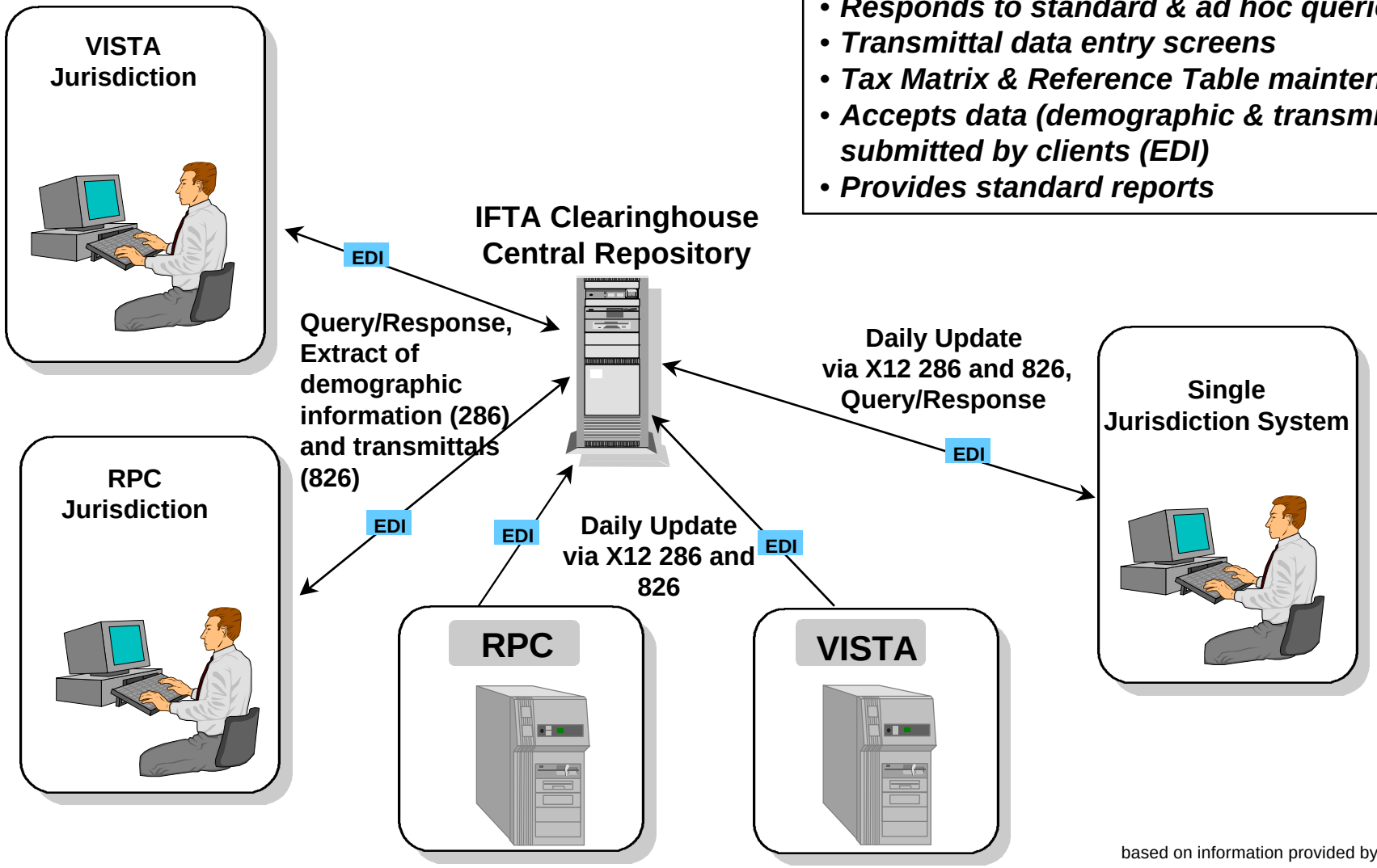
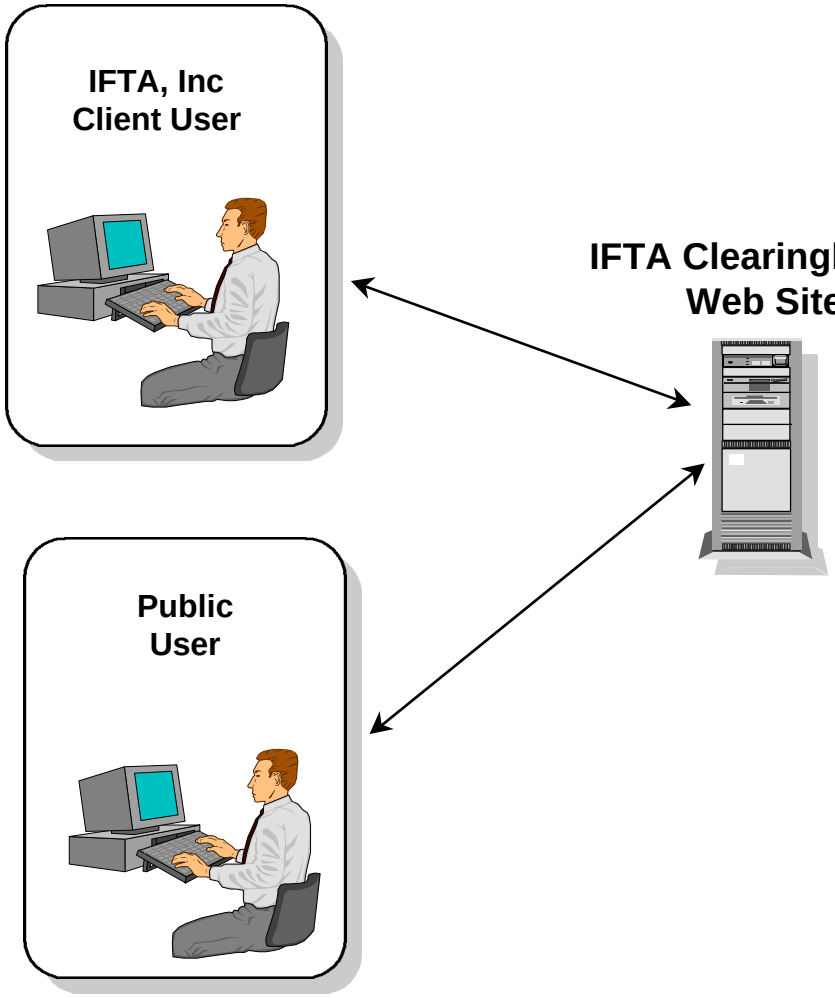
- ***Responds to standard & ad hoc queries***
- ***Transmittal data entry screens***
- ***Tax Matrix & Reference Table maintenance***
- ***Accepts data (demographic & transmittal) submitted by clients (EDI)***
- ***Provides standard reports***



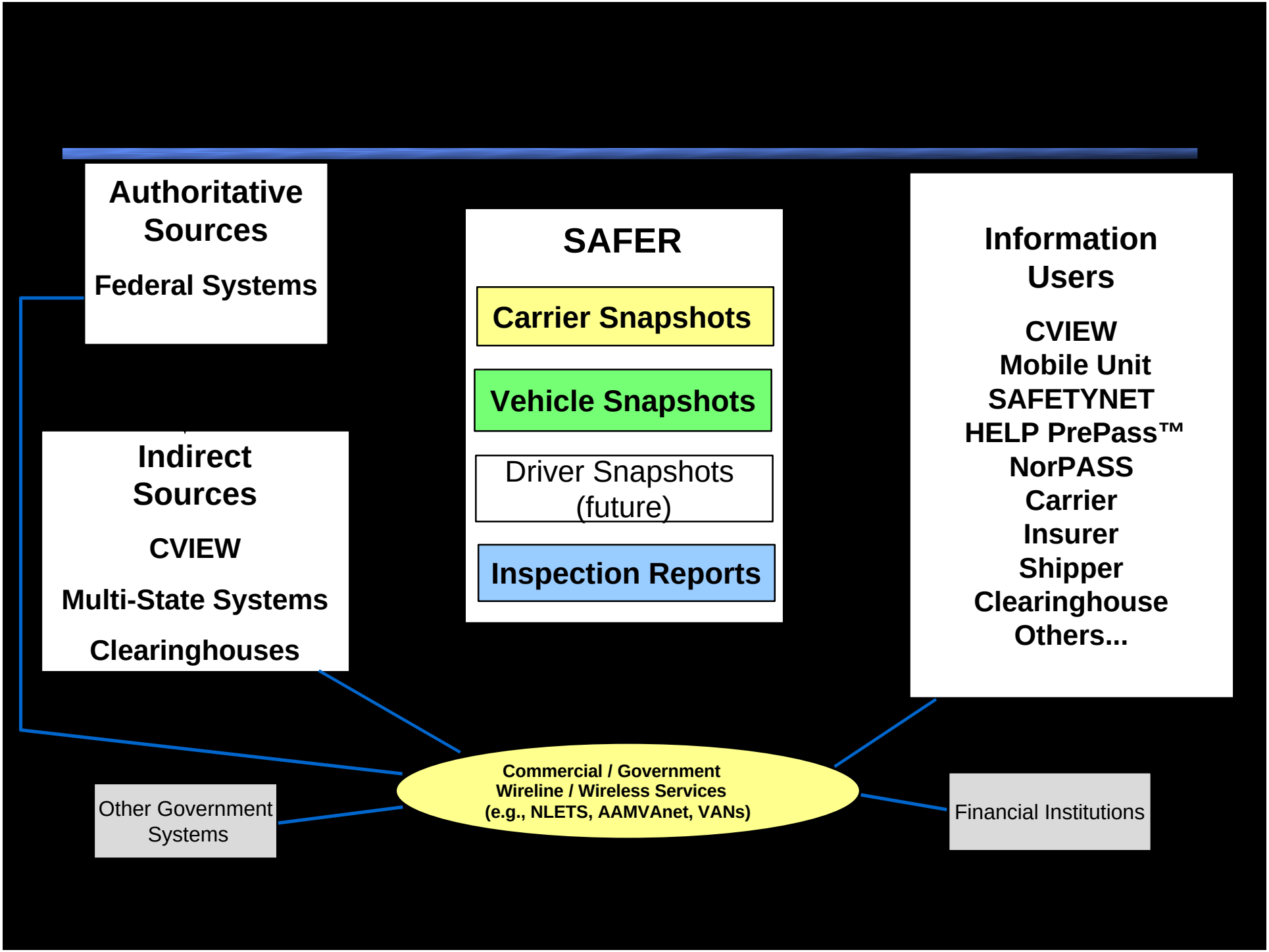
based on information provided by RSIS

The IFTA Clearinghouse Web Site will provide public access to non-confidential tax information.

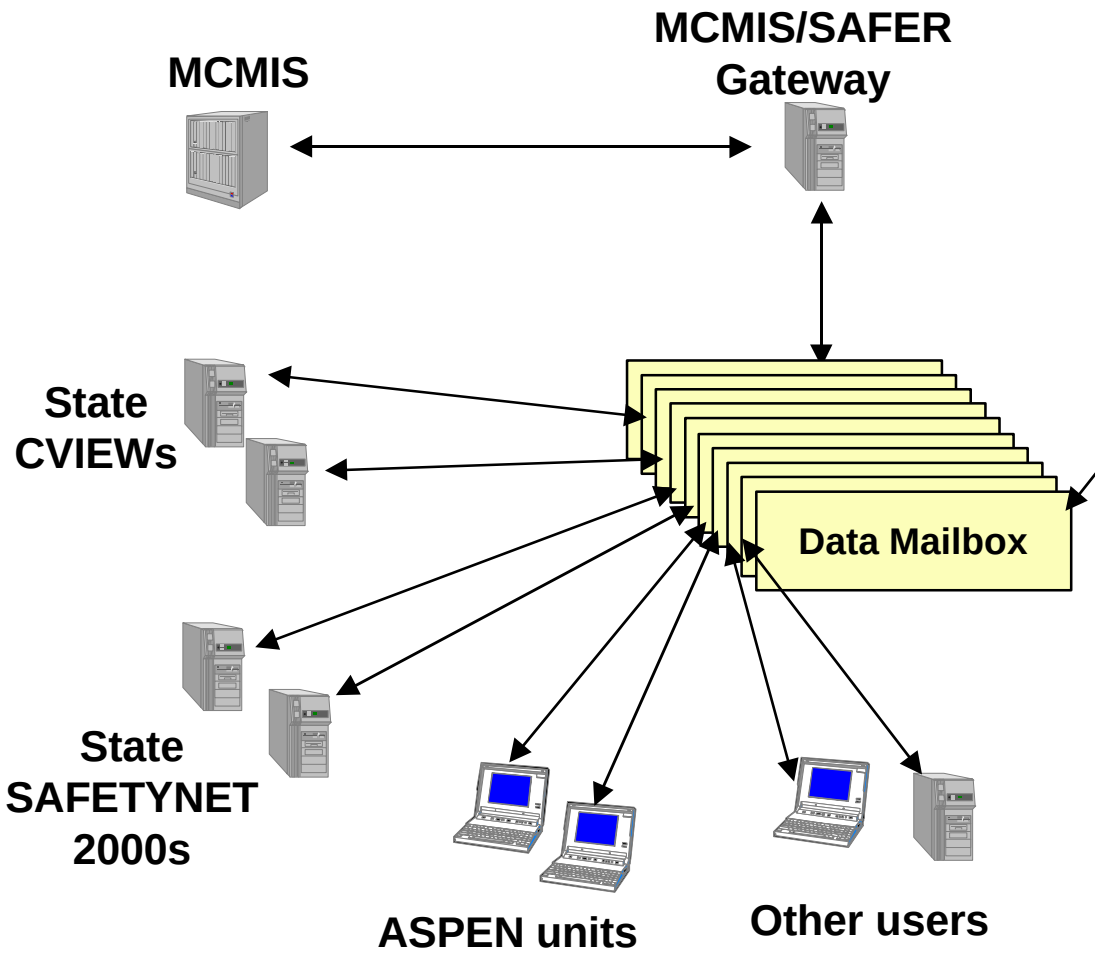


IFTA information
- ***IFTA manuals***
- ***Tax Rate Matrices***
- ***IFTA news & calendar of events***
- ***IFTA related sites & e-mail***
- ***Search capability***

based on information provided by RSIS


Authoritative Sources
Federal Systems
Indirect Sources
CVIEW
Multi-State Systems
Clearinghouses
SAFER
Carrier Snapshots
Vehicle Snapshots
Driver Snapshots (future)
Inspection Reports
Information Users
CVIEW
Mobile Unit
SAFETYNET
HELP PrePass™
NorPASS
Carrier
Insurer
Shipper
Clearinghouse
Others...
Commercial / Government
Wireline / Wireless Services
(e.g., NLETS, AAMVAnet, VANs)
Other Government Systems
Financial Institutions

The SAFER Data Mailbox facilitates the electronic exchange of information just as manual delivery services do for the exchange of paper documents today.



The SAFER Data Mailbox is one component of the SAFER system. It supports the exchange of:

- ***Snapshots,***
- ***Snapshot segment updates,***
- ***Inspection reports,***
- ***Compliance reviews,***
- ***Crash data,***
- ***Enforcement data,***
- ***Facsimiles,***
- ***F-reports.***

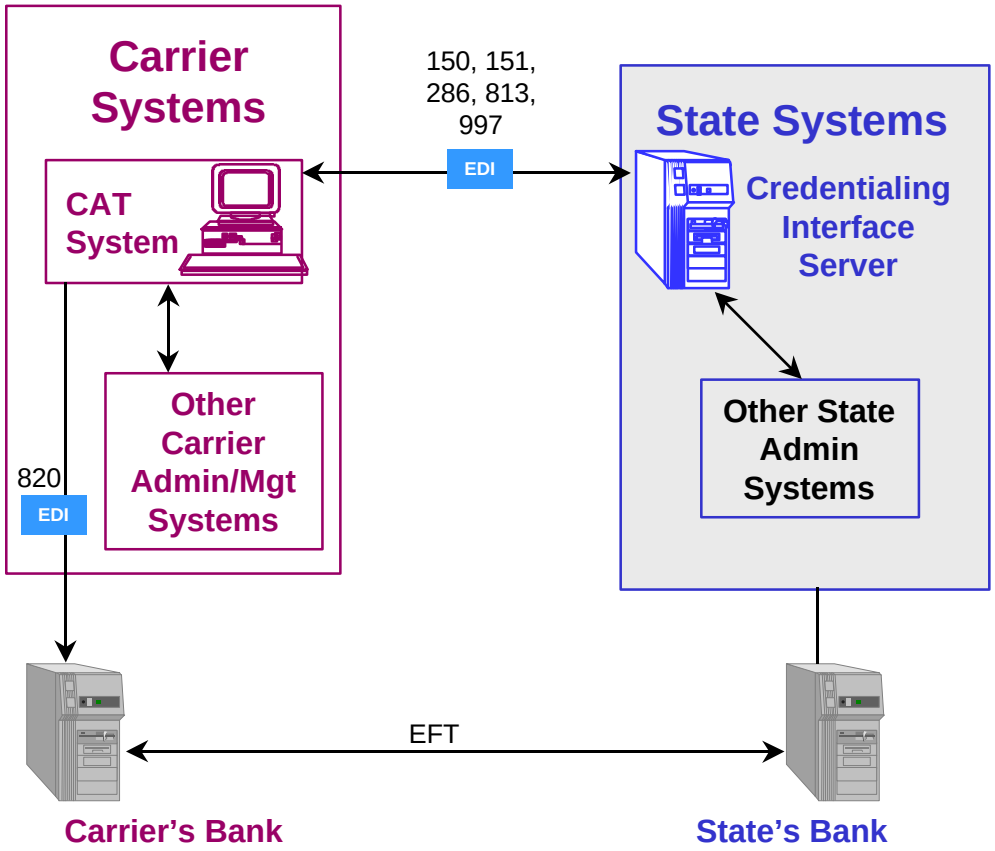
The SAFER Data Mailbox is an SMTP/POP3 E-mail system.

The Carrier Automated Transaction (CAT) system allows carriers to apply for and obtain credentials electronically.

The Carrier Automated Transaction system performs these functions:

- Data entry screens for credential applications & fuel tax filing
- Validate application
- Specify payment method
- Compute fees (some, not all)
- Print applications
- Translate to/from EDI transaction
- Initiate payments through banks (future)
- Send EDI transactions
- Receive EDI transactions
- Acknowledge EDI transactions
- Print credentials, if authorized
- Archive transactions

Some carriers may choose to use a service provider to handle electronic credentialing.



Other credentialing options for carriers . . .

- Carriers may also choose to modify/upgrade their fleet management software systems to support electronic credentialing processes. The fleet management software would perform the same functions as the CAT, with one advantage: the processes would be integrated with other existing capabilities.

- Some states are planning to provide a World Wide Web site (called a Web CAT) for electronic credentialing. Carriers could use their standard Internet browsers to connect to the state's Web CAT and submit and retrieve credential applications and responses.

ASAP enhances OMC's ability to collect compliance review information.

- **ASAP (Automated Safety Assessment Program) is a software tool designed to collect compliance review/performance data from the motor carrier.**
  - **Software designed to collect safety information from carriers for whom OMC has little or no information**
  - **Software consists of hidden analysis questions for assurance of accurate data**
  - **Data is validated with information available from MCMIS**
- **Two components: Motor Carrier Data Collector (carrier portion) and Analysis Administration (OMC portion)**
- **ASAP MCDC provides user-friendly software to carriers without known performance problems but for whom identification and monitoring data is needed.**
- **Customized Part A information**
  - **Will prompt the carrier to review/update general info**
  - **Will prompt the carrier to enter information about drivers, hours of service, vehicles, accidents, and safety management practices**
  - **Help screens**
  - **Education and technical assistance**

Contact: Dan Hartman (OMC) for more information

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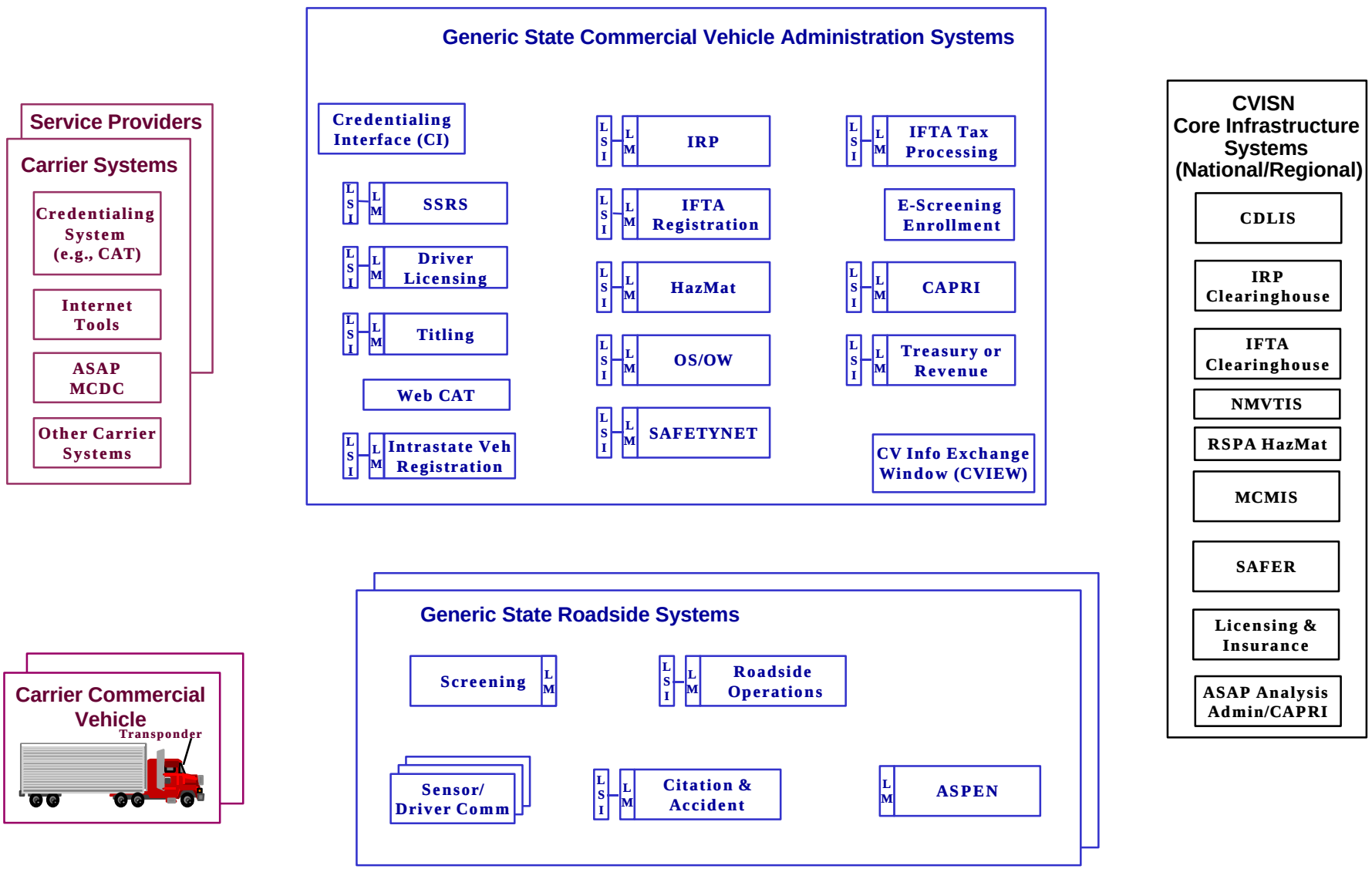
CVISN System Design Description
4 - Putting It All Together

The CVISN Scope is expressed in four top-level interface drawings.

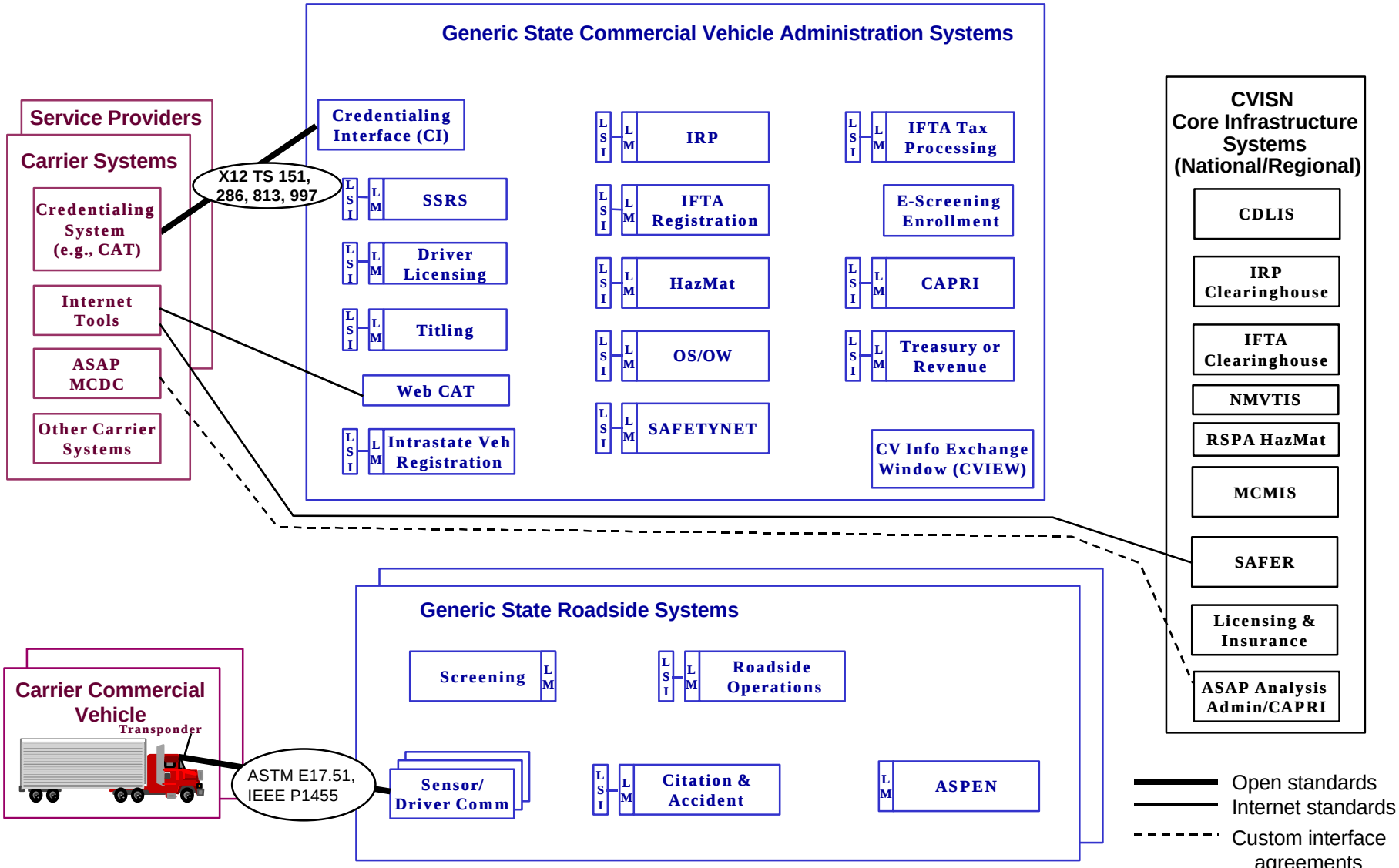
- **Carrier-related interfaces**
- **Interfaces within the state**
- **Interfaces between the state and the CVISN core infrastructure**
- **Interfaces among CVISN core infrastructure systems**

The drawings are based on the standardized interfaces specified in the COACH Part 4, Interface Specification Checklists. The drawings use the "generic state design template", overlaying lines to show connectivity among systems. If a state chooses not to implement the open standard specified for within-state exchanges, it will apply a unique legacy system interface (LSI) to accomplish the information exchange between two of its own systems. These drawings show only the Level 1 CVISN interface capabilities.

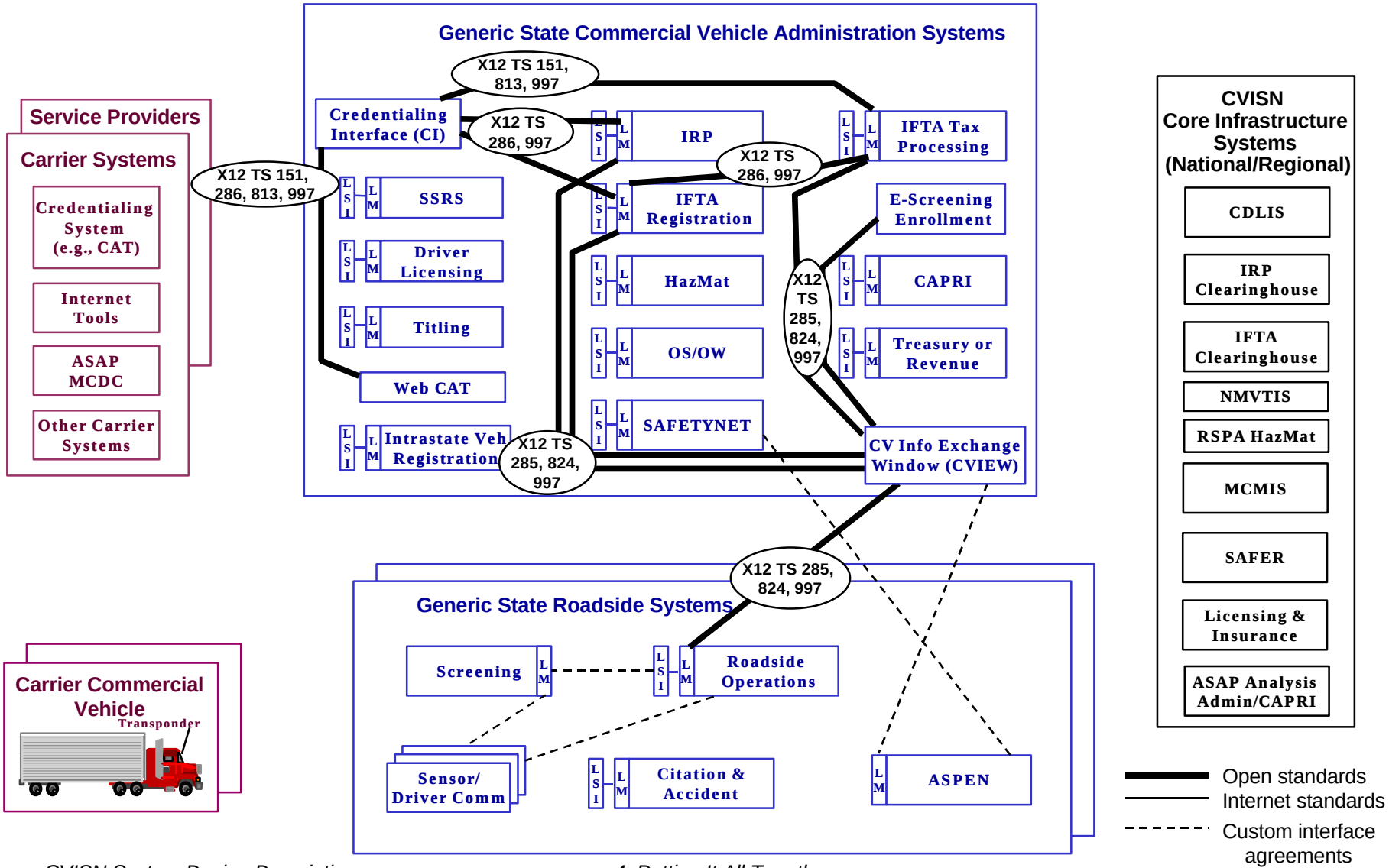
Generic State Design Template



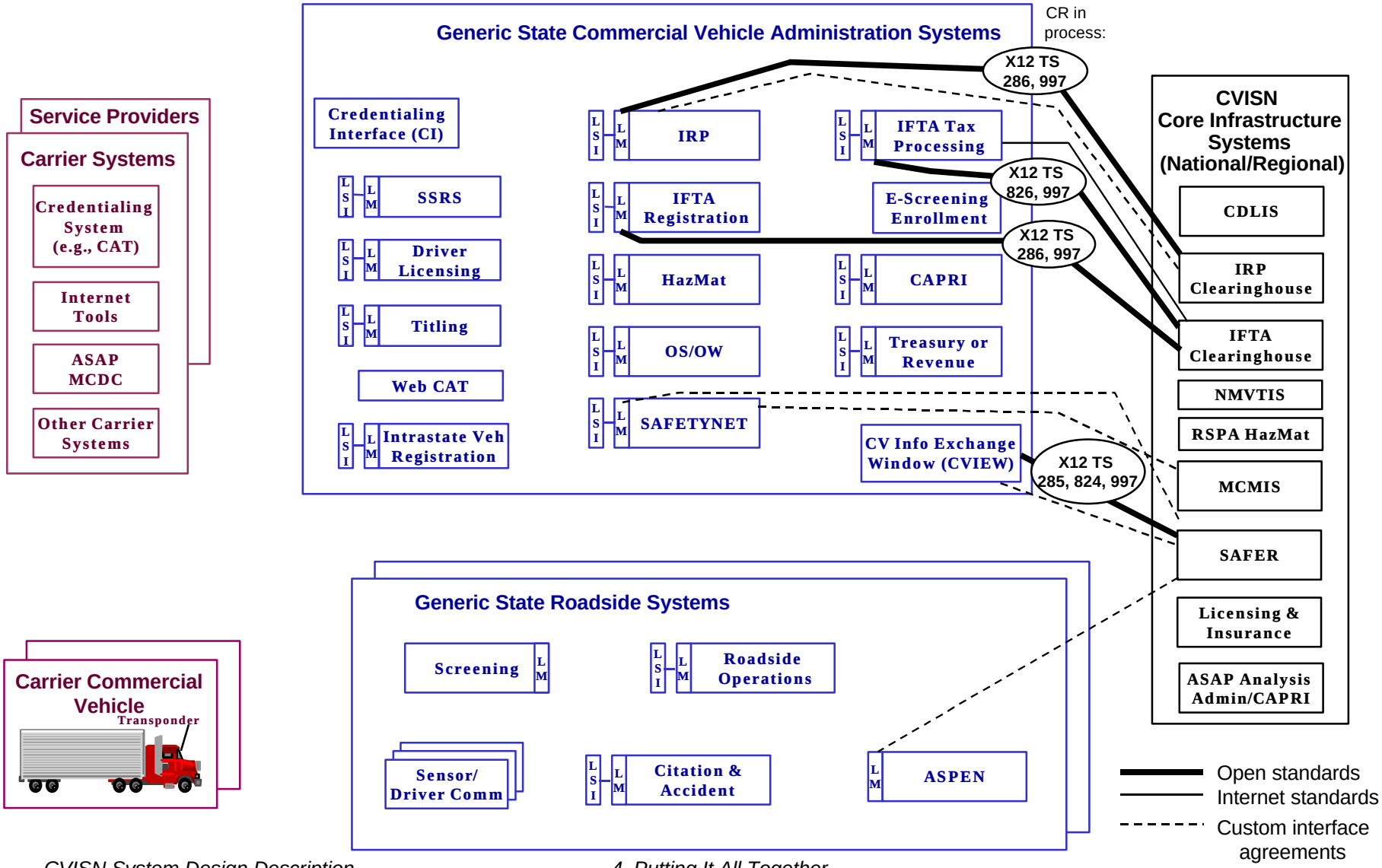
In CVISN Level 1, Carrier-Related Interfaces support credentialing, screening, and safety review operations.



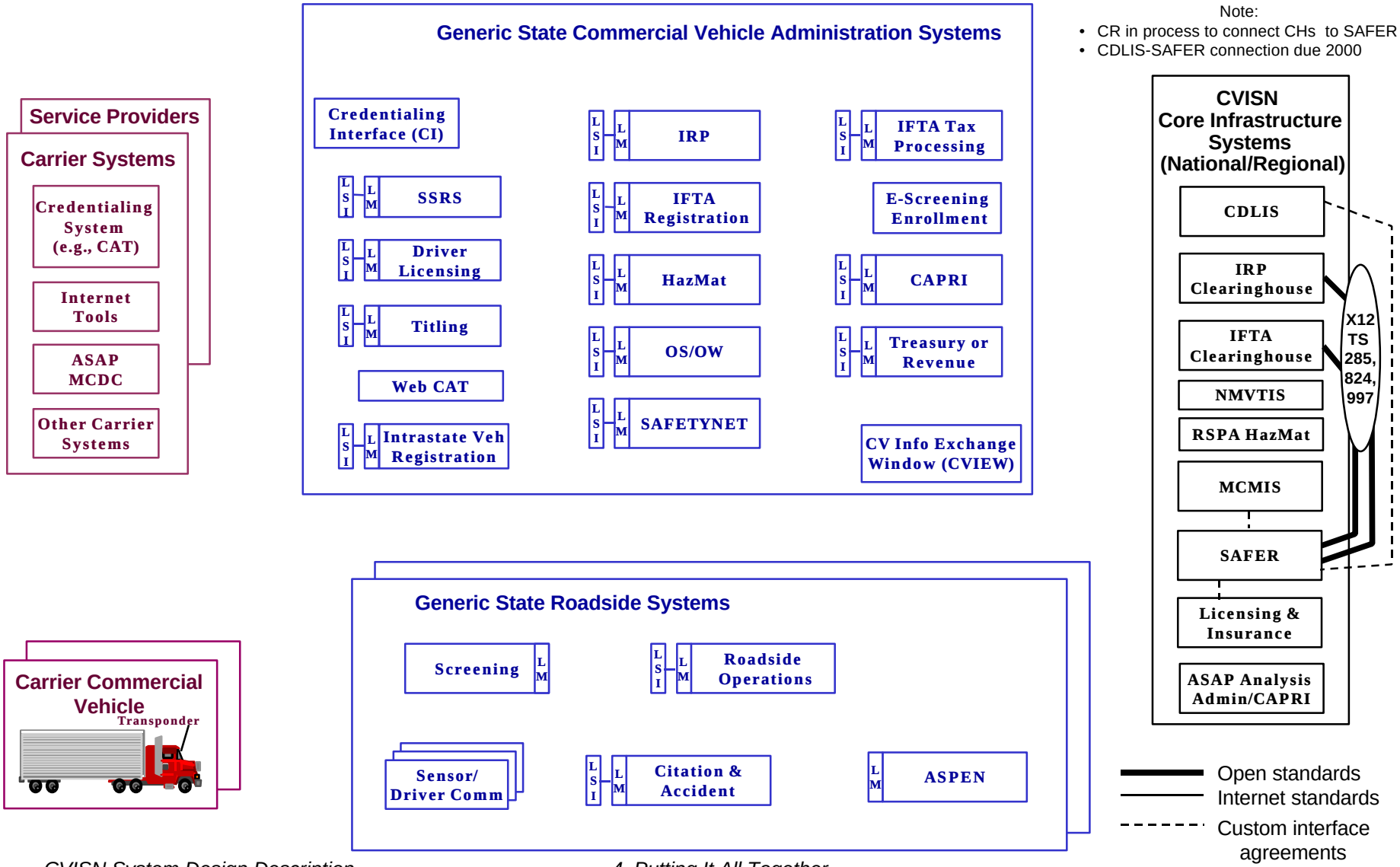
In CVISN Level 1, Interfaces Within the State support enhanced exchange of safety and IRP & IFTA credentials information.



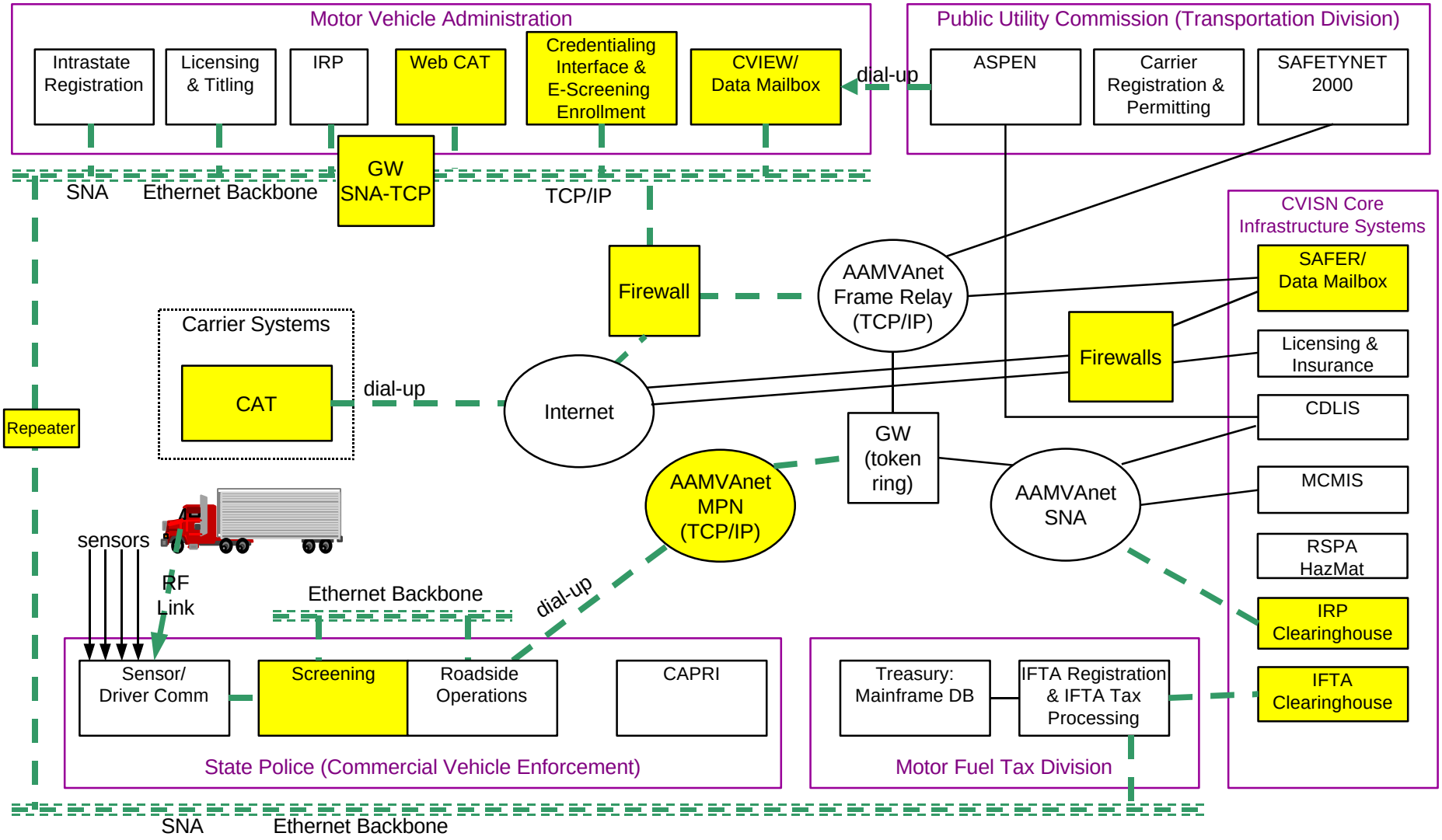
In CVISN Level 1, states share information with each other via the CVISN Core Infrastructure.



In CVISN Level 1, CVISN Core Infrastructure systems share information with each other, primarily for snapshots.



States also use a computer and network template to express the scope of the changes required to implement CVISN. This is an example of the resulting diagram.



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