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Documentation of South Dakota's ITS/CVO Data Architecture

SD99-07

FINAL REPORT

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16. Abstract

This report documents the ITS/CVO data architecture for the State of South Dakota. It details the current state of affairs in terms of CVO business areas, processes, data flow linkages and the systems used by each agency and for each process. This study also identifies the system deficiencies in terms of CVISN deployment.

Process and data models are developed using information engineering methodology/framework and software that are consistent with South Dakota's Bureau of Information Telecommunication's newly approved information engineering standards. The process model includes data flow diagrams (DFD) showing details of the information flow for each process and sub-process. The data model includes entity relationship diagrams (ERD) that show data attributes and major components associated with each key data entity. Interaction matrices are developed to show the linkages between data and processes and identify the level of data usage and sharing as well as any missing links in data exchange among agencies. The process-to-organization matrix maps the processes to the state agencies that perform the processes. A process-entity interaction or CRUD matrix maps the business area processes to the subject areas. The CRUD matrix shows data dependencies between the processes and subject areas.

This report also identifies current system characteristics and deficiencies with regards to CVISN systems deployment. CVISN architecture top-level design templates and equipment packages are used as templates to summarize the data gathered in the study. The purpose is to gauge current systems' compatibility and to help identify areas of focus in developing and deploying CVISN in South Dakota. The templates reflect the major functions that support CVO in South Dakota and illustrate which functions currently exchange information. They also serve as starting points in developing operational scenarios and system interfaces.

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TABLE OF CONTENTS

List of Tables

List of Figures

EXECUTIVE SUMMARY

The scope of the Commercial Vehicle Operations (CVO) component of the national Intelligent Transportation System (ITS) policy initiative includes operations associated with passenger and freight movement by commercial vehicles and the activities necessary to regulate these operations. The national ITS/CVO goals are accomplished within a framework defined by four functional areas: safety assurance, administrative or deskside processes, roadside electronic clearance, and carrier operating systems. These four functional areas are re-grouped into three major CVISN elements: administrative processes (includes carrier systems), electronic roadside screening, and safety information exchange. Data architecture that facilitates linkage of motor carrier-related databases forms the basis for commercial vehicle information systems and networks (CVISN) deployment. Currently, most state agencies involved with commercial vehicle operations in South Dakota are unable to share commercial vehicle (CV) related information, and some agencies collect the same data from motor carriers.

The primary objective of this project is to develop data and process models to describe and document the current business areas and processes for agencies involved with the regulation of motor carriers operating in South Dakota. This project also assesses the deficiencies of existing relevant carrier credentialing and safety performance databases, data sharing, and transfer mechanisms and limitations, and identifies opportunities for improving effectiveness and efficiency in these linkages for the purposes of CVISN deployment.

The outputs of the research effort will be presented in a format that fits within the CVISN templates for state system design. This project is intended to provide a high level functional design that depicts the data flows and data entity relationships. The data architecture documentation will form the basis for a detailed design. The project is not intended to develop a detailed design of the architecture that prescribes how systems will be linked in the state. The detailed design will be developed as new systems are installed.

RESEARCH APPROACH

The technical approach in documenting the data architecture for ITS/CVO in South Dakota is divided into eight interdependent tasks. The tasks are discussed below.

Review and finalize project scope and work plan – This task offered the opportunity to confirm the identity and contact information for individuals from different state agencies. This task ensured a common understanding among the study team and the South Dakota Department of Transportation (SDDOT) Technical Panel of the objective, tasks, issues, schedules, and deliverables related to this project. The work plan was reviewed and finalized.

Review literature and establish an information engineering methodology – The study team reviewed literature pertinent to ITS/CVO and state and national database architectures. The review included national, regional and South Dakota-specific ITS/CVO initiatives, in particular,

the data and process architecture specifications. The review resulted in an annotated bibliography of relevant literature.

The information engineering framework was developed for documenting the ITS/CVO data architecture. In order to maintain consistency with South Dakota's Bureau of Information and Telecommunications (BIT) newly approved information engineering standards, *ERwin* and *BPwin* software were used in documenting South Dakota's motor carrier regulatory agencies' information.

Collect data - Detailed information on CVO data and processes were collected through on-site in-person interviews. A survey guide approved by the Technical Panel was used.
The technical Panel reviewed the information gathered from the interviews to confirm accuracy and completeness of the data.

Develop process and data models - A process model was developed that defines the CVO processes and linkages among all functional areas and databases. The process model describes key processes of each business area in terms of what is done. A data model was developed that consists of an entity relationship diagram (ERD) of the entities' information classes, definitions, and relationships. The ERD will be the basis for the more detailed logical database design.

Develop a process-to-organization and process-entity matrices - A process-to-organization matrix was developed that maps CVO processes and sub-processes to the organizations that perform CVO process. A process-entity interaction matrix was developed that can be used for scoping and sequencing application designs and implementation of projects. The matrix maps key processes of each business area to the subject areas.

Conduct current systems assessment - This task assessed the current systems, including hardware, software, and databases, and identified opportunities for improvements. The task also assessed the compatibility of software and hardware of different agencies involved in sharing and transferring CVO-related data.

Document the information using CVISN templates - CVISN templates were used to document the information gathered in the previous tasks to ensure compatibility with national CVISN architecture.

Prepare a final report and executive summary - The research findings are presented in a comprehensive document with a stand-alone executive summary.

DATA ARCHITECTURE

A major problem with current CVO information systems is the difficulty of data exchange. One step in resolving the data exchange problem is to identify the entities within CVO and to develop an entity-relationship diagram to depict the relationships among these entities. The data architecture consists of a definition of data entities, attributes, and relationships and provides a framework for resolving the data exchange problem.

Another step is to determine the processes and develop data flow diagrams to show:

- Where data is used and stored
- The interfaces between processes
- The equipment package's interfaces with external equipment package(s).

A logical data architecture provides a description of what the CVO enterprise does and the information it uses. The logical architecture contains two primary elements: the process architecture and the data architecture, which are simply analytical tools for understanding requirements and operations in detail. A model-based approach was used that involved developing process and data models and interaction matrices that map business area processes to data entities and organizations. The information engineering framework used is a high-level architecture that focuses on the "ballpark" view and owner's view in describing both data and processes. This includes development of entity relationship diagrams and functional flows diagrams. The process model is developed to contain high- and mid-level modeling elements.

Process Model

The process model describes key processes of each business area in terms of what is done. The process model does not represent who performs the process or how it is performed or how often the process is performed. The process is developed as a logical model that provides a technology-independent description, and serves as a tool to analyze CVO activities to determine the scope of the problem and to identify the types of information flows that would be required to support identified interfaces.

The process model is organized around primary process areas in CVO where a hierarchy of processes and sub-processes within each area are defined. The process model consists of process definitions and two graphical representations of business processes. The two graphical representations are: (a) node diagrams or hierarchical decomposition diagrams of processes from high-level to detailed, and (b) data flow diagrams (DFD) showing details of the information flow for each process and sub-process.

Data Model

The data model consists of entity relationship diagrams (ERDs) of the entities' information classes, definitions, and relationships. These ERDs form the basis for the more detailed logical database design. The ERDs show the major data elements of each agency's database and the attributes associated with each data element. The ERDs developed for key data entities fundamental to CVO and common to multiple agencies in South Dakota include the following:

1. Account entity
2. Audit entity
3. Carrier entity
4. Driver entity
5. Insurance entity

6. International Registration Plan (IRP) filing
7. Roadside inspection entity
8. Tax return entity
9. Trip entity
10. Vehicle entity.

Interaction Matrices

Interaction matrices are developed to help identify linkages among agencies in terms of CVO. These matrices show the linkage between data and processes and identify the level of data usage and sharing as well as missing links in data exchange among agencies.

Process-To-Organization and Organization-to-Organization Matrices
A process-to-organization matrix is developed to show linkages among agencies in terms of CVO functions. The process-to-organization matrix maps the processes to the state agencies that perform the processes. The following abbreviations are used to describe each organization's role in each process and sub-process:

PE – Performs this process or sub-process
PO – Sets the policy on how this process or sub-process is performed
SU – Supports the process or sub-process or supports those who perform them
BO – Both sets policy and performs process or sub-process.

For example, the policies for International Fuel Tax Agreement (IFTA) registration are set or regulated by the Department of Revenue (DOR) and the registration process is performed by the DOR. This process is supported by the Highway Patrol (HP) through motor carrier enforcement, supported by BIT through information and data processing, and supported by State Treasury through financial transactions and remittals.

In addition, an agency interaction matrix is constructed that shows agencies that interact directly (D) or indirectly (I) with other state agencies in performing their CVO functions. These two matrices clearly show which agencies interact in performing CVO functions, and which agencies need to interact in order to have an integrated system. For example, the matrices show that the Public Utility Commission (PUC) does not interact with other regulating agencies. For purposes of CVISN deployment, all state regulatory processes (administrative and roadside) should be integrated and interfaced effectively in the sharing and exchange of data related to carriers, vehicles, and drivers.

Process-Entity Interaction Matrix
A process-entity interaction (CRUD) matrix is developed that provides the information necessary to define the size and scope of a business area and to determine the sequence of implementing projects designed to address limitations of data sharing and exchange among organizations. Typically, a business area will create much of the data it requires and provide/receive data to/from other business areas. The amount of data sharing is a major consideration that determines the size and scope of the business area. A CRUD matrix is developed that maps the business area processes to the subject areas. The subject area represents a grouping of information used in

the performance of business area processes. The CRUD matrix shows data dependencies between the processes and subject areas (data). The CRUD matrix clearly shows which areas operate independently of other agencies or organizations and which agencies do interact with other agencies in performing their CVO functions. The matrix provides a means to easily identify the missing links in developing an integrated system. The matrix shows the level of data sharing and usage among CVO business areas in South Dakota. The following abbreviations are used in the CRUD matrix:

C – Created i.e., data points can be created by the process
R – Retrieved i.e., data is accessed or retrieved in performing the process
U – Updated i.e., data can be updated during the process
D – Deleted i.e., data can be deleted during the process.

SYSTEMS ASSESSMENT

The assessment of the current systems included identifying the hardware, software, mainframe and PC-based applications, external systems as well as linkages, and communication mechanisms that support CVO processes. The study team determined the adequacy of current systems to support CVO processes and identified any potential problems relating to CVISN systems deployment identified. These problems are expected to guide the improvement of the systems and also help identify and prioritize suitable CVISN elements to be deployed in South Dakota.

It was noted that the current systems are generally adequate for performing CVO processes under the present conditions. Although there may be no problems with the current systems in supporting the various processes, the current systems may not have the functionality to support CVISN technology. Data exchange and transfer facilities among agencies are lacking. For some business areas and processes, a number of potential problems are identified in terms of CVISN deployment. For example, problems of interfacing, integrating, and data-sharing facilities among agencies involved with credentialing processes are identified. Roadside operations currently rely on the State Radio to access credential's information on carriers, vehicles, and drivers, although poor radio reception in certain areas of the State makes it ineffective.

Currently, PUC is the only business area that relies solely on PC-based applications for processing and issuing Single State Registration System (SSRS), interstate exempt and single-trip permits. In addition, PUC is not part of South Dakota's Wide Area Network (WAN). It is therefore recommended that a first step in interfacing or integrating credentialing legacy systems is to include PUC as part of the WAN. Secondly, a number of agencies are currently upgrading their computer systems and software to be Y2K compliant. It is therefore important to conduct this upgrade consistently in all agencies to ensure compatibility.

The study team identified the following problems in CVISN deployment:

- Many of the current operations are manual and oriented towards paper, which creates processing problems such as data error, handling and storage.

- Lack of connectivity among state agencies restricts integration which indicates potential replication of data and duplication of data collection efforts.

- Lack of connectivity to provide real-time access to data on vehicle registration and drivers for roadside enforcement operations.

- Limited electronic fund transfer (EFT) between carriers and state agencies and other jurisdictions.

- Non-uniformity in the databases and software used for different CVO functions by state agencies, raising issues of compatibility and interoperability.

- Applications do not include downloading/uploading functionality between mainframe and PC systems.

- Lack of network facilities for mobile sites in commercial driver licensing process.

- Some PC-based systems are stand alone, designed for very specific business functionality.

- Lack of systematic and consistent approach in maintaining readily accessible historical data for future use in electronic format.

- No automated links to state accounting systems.

CVISN COMPATIBILITY

CVISN architecture top-level design templates and equipment packages are used as templates to summarize the data gathered in the study. The purpose is to gauge current systems' compatibility and to help identify areas of focus in developing and deploying CVISN systems. The following conclusions can be drawn:

Top-level design templates – These templates reflect the major functions that support CVO in South Dakota and illustrate which functions currently exchange information. They also serve as starting points in developing operational scenarios and system interfaces.

Credentials and Taxes Administration supporting the processing, update, and issuance of CVO credentials, supporting the collection, processing, and review of CVO fees and taxes. All processes under this functional area are currently performed in South Dakota except those that are electronic. This applies to each credential processed and issued for CVO in South Dakota (e.g., IRP, IFTA, SSRS, CDL, oversize/overweight [OS/OW] permits). There is no connectivity or interface for online access between roadside support functional area and the agencies.

Commercial Vehicle Safety Administration, supporting the collection and review of CV safety data. Apart from compliance reviews, none of the activities under safety administration are

currently carried out in South Dakota. Analysis of safety data is performed using national safety databases and programs such as Motor Carrier Management Information System (MCMIS) and Safety Status (SAFESTAT). There is no on-line connectivity between the credentials and taxes administration functional area and the management of safety data functional area.

Commercial Vehicle Information Exchange, facilitating the exchange of snapshots and profiles containing safety and credentials information for drivers, carriers, and vehicles. This functionality is not currently available in South Dakota.

Roadside Electronic Screening, supporting the screening and electronic clearance of vehicles. South Dakota does not have the facilities for roadside electronic screening.

Roadside Safety Inspection, supporting automated safety inspections. The Inspection Selection Subsystem (ISS) algorithm is used for screening vehicles for inspection. Electronic processes that are currently performed include the use of ASPEN and ISS. Other processes are currently not performed in South Dakota.

Roadside Weigh-In-Motion (WIM), weighs commercial vehicles at mainline speeds. WIM installations are currently not used in roadside operations in South Dakota.

Citation and Accident Electronic Recording, supporting the recording of information related to citations or accidents. In South Dakota, accident record and citation processing are not currently electronic.

RECOMMENDATIONS

The following recommendations focus on CVISN deployment in South Dakota:

- Link CVO agencies and databases to facilitate data exchange among credentialing processes. Integrate or interface all business areas that process and issue motor carrier credentials to allow access to credentialing databases. Within the DOR, this will include interfacing IRP with IFTA. The databases of Department of Revenue (DOR), DCR, PUC, and DOT need to interface with each other. This effort will be part of the overall CVISN deployment in South Dakota.

- Currently, PUC is the only business area that relies solely on PC-based applications for processing and issuing SSRS, interstate exempt, and single trip permits. In addition, PUC is not part of South Dakota's WAN. It is therefore recommended that a first step in interfacing or integrating credentialing legacy systems is to have PUC as part of the WAN. Secondly, a number of agencies are currently upgrading their computer systems and software for Y2K compliance. It is therefore important to carry this upgrade consistently in all agencies to ensure compatibility.

- Ensure compatibility and interoperability of credentialing systems. Hardware, operating platforms and software used by various state agencies should be compatible and

interoperable in order to facilitate interfacing and integration. This is required to facilitate data exchange among state agencies and with other jurisdictions. As various state agencies upgrade their individual systems, compatibility and interoperability should be the guiding principles in the choice of systems.

- Interface roadside operations and credentialing processes in order to facilitate safety information exchange and enhance efficiency and effectiveness in roadside operations. This interface would allow enforcement officers easy access to carrier, vehicle, and driver credentials information. Currently, enforcement officers obtain such information through the State Radio. Poor radio reception in certain areas of the State also makes data access inefficient. Improvements in data exchange for roadside operations should be given immediate attention. Current research on automated routing and permitting should be coordinated with other roadside inspection needs.

- Undertake a detailed assessment of the identified CVISN-related problems and compatibility issues. The problems identified in this study need further evaluation in terms of improvement, re-engineering, costs, and resources, as well as short- and long-term effects. This assessment will determine the magnitude of each problem and how it impacts the deployment of CVISN systems. The results of this assessment are expected to influence the selection and prioritization of potential CVISN elements. For example, it will be necessary to explore the communication linkage problem between roadside and administrative processes to identify potential alternative solutions.

- Evaluate the alternative CVISN element options based on experiences of the pilot states. This study reviewed the various CVISN elements being deployed in the 10 pilot states for all functional areas (administrative processes, safety information exchange, and roadside screening). The suitability of any given element should be evaluated in terms of local regulatory environment, current levels of ITS/CVO-related technology deployment and projects, weather, truck traffic conditions, enforcement practices, data access and exchange practices. This evaluation also must consider compatibility with national and regional ITS/CVO initiatives.

- Initiate a detailed data architecture that is CVISN compatible. This study is a high-level architecture that documents the current state of affairs in terms of CVO business areas, processes, databases, linkages, data-process interactions, organization-process interactions, and the systems used by each agency and for each process. This study also identifies the system's deficiencies in terms of CVISN deployment. The detailed architecture will prescribe how the systems will be linked. The detailed architecture will evolve as new systems are deployed and installed.

- Use the deficiencies identified in the CVISN equipment package templates to guide the selection and development of CVISN elements. These templates clearly show linkages and processes that are currently not performed or supported by current systems in South Dakota.

1.0 INTRODUCTION

1.1 PROBLEM STATEMENT

Data architecture that facilitates linkage of motor carrier-related databases forms the basis for commercial vehicle information systems and networks (CVISN) deployment. CVISN is not a new information system, but rather a way for existing systems to exchange information through the use of standards and the U.S. commercially available communications infrastructure. Currently, most state agencies involved with commercial vehicle operations (CVO) in South Dakota are unable to share commercial vehicle (CV) related information in a seamless and efficient manner and some agencies collect the same data from motor carriers. This project documents the CVO processes and data flows in South Dakota and develops a plan for linking the various CVO regulatory databases. In developing the plan, this project assesses the deficiencies of existing relevant carrier-credentialing and safety-performance databases, data sharing, and transfer mechanisms and limitations, and identifies opportunities for improving effectiveness and efficiency of these linkages for the purposes of CVISN deployment. This project develops a functional design that depicts the flow of relevant data for CVISN deployment in the State of South Dakota, which is compatible with the national CVISN architecture. This project is directed at achieving some long-term intelligent transportation system (ITS)/CVO goals of South Dakota including improving safety and efficiency of CVO in South Dakota, increasing efficiency and effectiveness of state CVO regulatory processes, and providing better service to industry.

The scope of the CVO component of the national ITS policy initiative includes operations associated with passenger and freight movement by commercial vehicles and the activities necessary to regulate these operations. The national ITS/CVO goals are accomplished within a framework defined by four functional areas: safety assurance, administrative or deskside processes, roadside electronic clearance, and carrier operating systems. These four functional areas are re-grouped into three major CVISN elements: administrative processes (includes carrier systems), electronic roadside screening, and safety information exchange.

South Dakota participated in four major ITS projects in the last few years. First, the Dakotas' ITS/CVO Institutional Issues Study was completed in 1996. The study documented barriers to implementing ITS/CVO technology. Second, the Advanced Traveler Information System, also a joint North Dakota and South Dakota project, is a test to provide road and weather information to travelers; weather is communicated to travelers by cellular phone on selected routes in the two states, electronic mail, and Internet. Third, South Dakota was one of the seven states that participated in the Midwest Electronic One-Stop Shopping Operational Test. The test was developed to give motor carriers the capability of obtaining credentials from multiple states through electronic application to their base state. This capability was not tested in South Dakota. Fourth, South Dakota is participating in the ITS/CVO Mainstreaming effort. South Dakota is a member of the Midwest Mainstreaming Consortium. Along with Missouri, Nebraska, and Kansas, South Dakota contributes to the development of a Midwest regional coordination plan for multistate ITS/CVO projects.

As part of the mainstreaming efforts, South Dakota developed an ITS/CVO business plan for CVISN systems implementation. A major requirement of South Dakota's ITS/CVO Business Plan is that it targets and coordinates the state's investments in ITS technology in order to conserve resources and provide benefits to state agencies and the motor carrier industry. The plan identified the need for a CVO database architecture for linking the various regulatory databases. Such linkage will reduce the need for carriers to provide the same information to multiple agencies. Connectivity among administrative processes and with roadside operations will facilitate data exchange and improve efficiency and cost-effectiveness in state regulatory processes. Currently, most state agencies involved with CVO in South Dakota are unable to share CV-related information, and some agencies collect the same data from motor carriers. CVISN is designed to address this basic problem of facilitating the ability of state agencies to share CVO-related data among agencies in the same state and with other states. This is a critical requirement to deploy systems that can achieve the goals of the functional areas of the CVISN initiative. CVISN is expected to enable state agencies, motor carriers, and other parties engaged in CVO safety and regulation to exchange information and conduct business transactions electronically.

1.2 STUDY OBJECTIVES

The primary objective of this project is to develop data and process models to describe and document the current business areas and processes for agencies involved with the regulation of motor carriers operating in South Dakota. This project is intended to assess the nature and structure of existing state agency databases and the nature and mode of data sharing and transfer, and to develop data and process models that will facilitate CVISN deployment.

This project is intended to provide a high-level functional design that depicts the data flows and data entity relationships. The data architecture documentation will form the basis for a detailed database and information system architecture design. The output will be a database architecture for linking the various CVO regulatory databases in the State of South Dakota that is consistent with the CVISN architecture. The project is not intended to develop a detailed design of the architecture that prescribes how systems will be linked in the state. The detailed design will be developed as new systems are installed.

2.0 RESEARCH PLAN

This section describes the technical approach in used documenting the data architecture for ITS/CVO in South Dakota. The tasks are discussed below.

Task 1. Review and finalize project scope and work plan

The purposes of this task were to meet with the technical panel to review and finalize the work plan for conducting the research and also to identify potential key persons and confirm business areas in state and other agencies that are involved with CVO within South Dakota.

Immediately following the contract award, the project team held a kick-off meeting with the South Dakota Department of Transportation (SDDOT) project technical panel for the project. This forum also offered the opportunity to confirm the identity and contact information for individuals from different state agencies. This task ensured a common understanding among the study team and the SDDOT technical panel of the objective, tasks, issues, schedules, and deliverables related to this project. The work plan was reviewed and finalized.

Task 2. Review literature and establish an information engineering methodology

The purpose of this task was to review and summarize literature pertinent to state and national database architectures and establish an information engineering methodology for documenting South Dakota's motor carrier regulatory agencies' CVO-related processes, data entities, and their interactions.

This task was fundamental to conducting each of the subsequent tasks of the research plan and in meeting the objective of developing the data and process models. First, national ITS/CVO initiatives, in particular the data and process architecture specifications were reviewed. Second, past South Dakota ITS/CVO studies were reviewed, in particular the recently developed ITS/CVO business plan. Third, several South Dakota Web sites were reviewed, including those of DOT and the Bureau of Telecommunications (BIT). Fourth, business plans and ITS/CVO studies of other states in the Midwest Mainstreaming (South Dakota, Kansas, Nebraska, and Missouri) as well as the Midwest CVO Mainstreaming coordination plan were reviewed to have a regional understanding of ITS/CVO initiatives. Other state ITS/CVO business plans and studies were reviewed, including North Dakota, Iowa, Minnesota, and Montana. Finally, several database books and articles were reviewed to understand information engineering principles and database structure, efficiency, and other related issues. The literature review is provided in Section 3, and a complete list of literature reviewed is provided in Section 9.

The information engineering methodology established and used in this study is discussed in Section 4. The South Dakota's BIT has approved *ERwin* and *BPwin* to be the standard data and business process modeling tools. Therefore in order to maintain consistency, these software

packages were used in documenting CVO-related process and data models of South Dakota's motor carrier regulatory agencies.

Task 3. Collect data

The purpose of this task was to collect detailed information in order to document CVO processes in South Dakota and develop data and process models.

Having identified the key business areas and the contact persons in Task 1, this task focused on collecting data through on-site in-person interviews. A survey guide was first developed and reviewed by the technical team. The study team designed the survey instrument to obtain sufficient information on the functional and technical data requirements of each state agency involved in the regulation of motor carrier operations. In addition, the survey captured information required to assess current systems. The interview guide addressed a number of important elements, including the following:

- Business functions, information inputs/outputs, and personnel responsibilities
- Definition of the roles and responsibilities of each agency in CVO
- Description of processes in each business area
- Types of data collected, methods of data collection, handling, and storage
- Data requirements and standards
- Database approaches used
- Current level of integration among various databases and systems
- Ease of use of current databases and systems
- Current system degree of functionality and improvement needs
- Technical environment, constraints, and available equipment and needs
- Current automated and manual system and associated deficiencies
- Opportunities for deployment of higher technologies.

Next, using the survey guide, individual interviews were conducted with the selected key contact persons. The data collection effort was combined with the kick-off meeting (Task 1). In this regard, a draft survey guide was submitted to the technical panel for review following the award of the contract and ahead of the meeting. The final interview guide was revised based on the comments and suggestions from the technical panel.

On March 24-25, 1999, the project team met with the staff from different state agencies and business areas for interviews and gathered data. The information gathered from the interviews was then summarized and presented to the key contacts for review and confirmation of accuracy and completeness of the data gathered and the study team's understanding of the functionality of the databases in each motor carrier regulatory agency. A subsequent group meeting was held on June 11, 1999 to discuss the data summaries that included draft data and process models and interaction matrices. Data for Task 8 on deficiencies, incompatibilities, and potential courses of action for improvement were also discussed at both meetings.

Task 4. Develop process model

The purpose of this task was to develop a process model that consists of process definitions as well as two different graphical representations of business processes.

In developing the process model a series of analyses was conducted with the information gathered in the data collection task of the project (Task 3). These included:

- Defining the roles and relationships among all affected state agencies in CVO regulatory and enforcement processes
- Identifying processes and sub-processes of each CVO functional areas (e.g., credentialing and tax administration, roadside operations, safety assurance)
- Determining input and output data elements for each process
- Determining existing data sharing linkages and flow of information among state agencies and mechanisms for sharing and transferring data.

Based on the above analyses, a prototype process model was developed that defines the CVO processes and linkages among all functional areas and databases. The process model describes key processes of each business area in terms of what is done. The process model is organized around primary process areas in CVO where a hierarchy of processes and sub-processes within each area is defined. The process model is presented by two graphical representations of each business area process: (a) node diagram or hierarchical decomposition diagrams of processes from a high-level to more detailed ones, and (b) data flow diagrams (DFD) showing details of the information flow for each process and sub-process. These diagrams are developed using BPwin software to be consistent with South Dakota's information engineering standards. The graphical representations are presented in Appendix A, and the process model is discussed in Section 5.2.

Task 5. Develop data model

The purpose of this task was to develop a data model that consists of an entity relationship diagram (ERD) of the entities' information classes, definitions, and relationships. The ERD will be the basis for the more detailed logical database design.

In this task, a data model was developed that will form the basis for a detailed logical database design. Based on information gathered in Task 3, the different types of relevant data for credentialing and enforcement processes were reviewed in terms of structure of the databases maintained by the various state agencies. The data model establishes entity relationships between different entities of information classes and definitions. Entity relationship diagrams (ERD) are developed for the key data entities. These ERDs show the data elements and the attributes for each element and relationships. The ERD were developed using ERwin software to be consistent with South Dakota's information engineering standards. Entity relationship

diagrams (ERD) are used to link major entities to major CVO information users. The key data entities that are fundamental to CVO and for which ERD were developed are account, audit, carrier, driver, insurance, IRP filing, roadside inspection, tax return, user and vehicle entities. The data model establishes data entities, needs, and requirements for use by all major CVO information users.

The ERD are presented in Appendix B and the data model is discussed in Section 5.3.

Task 6. Develop a process-to-organization matrix

The purpose of this task was to develop a process-to-organization matrix that maps CVO processes and sub-processes to the organizations that perform CVO process.

A process-to-organization matrix was developed based on information gathered and process and data models. Commercial vehicle operations involve several processes such as credential and tax administration, roadside operations, safety assurances, vehicle operation, and traffic management and control. Each of these processes involves several sub-processes. The process-to-organization matrix maps the processes to the organizational units that perform the process. This matrix reflects South Dakota's circumstances and indicates the uniqueness of the responsibilities for common CVO processes.

In addition, an agency interaction matrix is constructed that shows agencies that interact directly or indirectly with other state agencies in performing their CVO functions. These matrices are discussed in Section 5.4.

Task 7. Develop a process-entity interaction matrix

The purpose of this task was to develop a process-entity interaction matrix that can be used for scoping and sequencing application designs and implementation of projects.

A first step in developing the process-entity matrix was to define the subject areas or data associated with each business area. A process-entity matrix was then developed that maps key processes of each business area to the subject areas. The subject area represents a grouping of information that tends to be used in the performance of business processes. This matrix shows data dependencies between the processes and subject areas (data). This is presented in the form of data usage by a business processes matrix that identifies the data that are used by each process. The matrix shows the level of data sharing and usage among CVO business areas in South Dakota. The product of this task is shown in Section 5.4.

Task 8. Conduct current systems assessment

The purpose of this task was to assess the current systems – including hardware, software, and databases – and identify opportunities for improvements through interviews and working group sessions with business experts and technical staff.

One of the key issues that this project addresses relates to compatibility of software and hardware of different agencies involved in sharing and transferring CVO-related data. In this task, existing hardware and software used by each state agency involved with CVO data was assessed. The assessment effort focused on the type of software currently used, limitations, hardware capabilities and limitations, plans for future upgrades and improvements, structure of databases, and any existing linkages with other databases. Information for this assessment was gathered through interviews and working group discussions as part of Task 3.

Current system characteristics are presented in the form of a matrix that maps the systems to the processes in each CVO business area. The matrix shows the different types of hardware, software, databases, and linkage mechanisms associated with each process. A table summarizing the system characteristics, deficiencies and opportunities with ITS technologies is also presented. In addition, the CVISN-related problems are identified in the table mapping processes to the problems. This matrix and tables are shown and discussed in Section 6.

Task 9. Document the information using CVISN templates

The purpose of this task was to use CVISN templates to document the information gathered in the previous tasks to ensure compatibility with national CVISN architecture.

CVISN templates for data flow for the three main functional areas – credentials administration, roadside screening, and safety enforcement exchange – were used to document South Dakota's CVO processes and data flows. These templates are equipment packages of the national CVISN architecture. The templates show connectivity between processes, data sources, and data entities. The product of this task is presented in Section 7.

Task 10. Prepare a final report and executive summary

The purpose of this task was to present the research findings in a comprehensive document and prepare a stand alone executive summary.

The final report documents the literature review, research methodology, current systems assessment process model, findings, conclusions, and recommendations. In addition, problems identified during the data collection phase of the project are also documented. The outputs of this task include:

Draft Final Report – The draft final report was submitted to the technical panel for review and comments. The following are considered major components of the draft final report:

- Executive summary
- Literature review
- Research methodology
- Research findings (including database architecture, data, and process models)
- Documentation of current processes, hardware, and software used by South Dakota
- Conclusions and recommendations.

Final Report and Executive Summary – The final report was prepared incorporating the comments and revisions suggested by the technical review panel. The final report was submitted to Office of Research of the DOT on September 15, 1999.

Task 11. Presentation to research review board

The purpose of this task was to communicate to the South Dakota DOT Research Review Board, in presentation form, a summary of the Data Architecture of ITS/CVO in South Dakota.

The project study team prepared and delivered an executive presentation to the SDDOT's Research Review Board at the conclusion of the project. The presentation covered all aspects of the research effort and addressed specific questions identified by the Board. The presentation was made on August 19, 1999.

3.0 LITERATURE REVIEW

3.1 CVISN AND NATIONAL ARCHITECTURE

The Federal Highway Administration's Office of Motor Carriers (FHWA/OMC) has undertaken an ITS/CVO program to promote the deployment of ITS/CVO technology that would ensure electronic information sharing and exchange among states and state agencies, federal agencies, carriers, shippers, and third-party service providers. The national effort for development of Commercial Vehicle Information System (CVISN) began with the development of a national architecture (JHUAPL, 1996a, 1998a, and 1999a). Data model and data architecture (JHUAPL, 1996b) were established, followed by process architecture, equipment package diagrams, and CVISN templates (JHUAPL, 1998a). An operational concept document was established that defined the problems with current CVO processes and various support systems and laid a roadmap of how and what should be improved in processes and the systems that support it. Identifiers were established to allow data sharing and communication among various databases and systems and recommendations in that regard were made (FHWA, 1995; JHUAPL, 1996b).

CVISN envisions that by the year 2005, the vast majority of CVO business transactions among carriers, shippers, government agencies, and insurance companies would be conducted electronically. Carriers would apply and pay for credentials electronically, including operating authority, registration, and permits. They would also file and pay taxes electronically and deal with a base state for all routine business transactions, including registration, permits, taxes, and clearance. Credentials would be distributed electronically and no decals or paper permits would be required for participating carriers. Information from one process (e.g., registrations) would be available to other processes (e.g., fuel tax) in a timely manner. This would avoid redundant data entry, improve data accuracy, and provide data to support better decision making. It would also permit cross checks such as denying registration to a carrier with a poor safety history.

The scope of the CVO component of the national ITS policy initiative includes operations associated with passenger and freight movement by commercial vehicles and the activities necessary to regulate these operations. The national ITS/CVO goals are accomplished within a framework defined by four functional areas: safety assurance, administrative or desk-side processes, roadside electronic clearance, and carrier operating systems. These four functional areas are re-grouped into three major CVISN elements: administrative processes (includes carrier systems), electronic roadside screening, and safety information exchange.

Administrative processes include a combination of Carrier and State government systems. These systems will automate the complete credential life-cycle process. All aspects of the commercial vehicle credentialing process will be integrated to include electronic submittal of applications, automated processing and cross-checking of applications, automated fee calculation and invoice transmittal, electronic fee payment, and automated issuance and printing of credentials. Credentials Administration will also encompass and integrate with initiatives that electronically share data between States (also known as "Base State" agreements), including the International Registration Plan (IRP) Clearinghouse and the International Fuel Tax Agreement

(IFTA) Clearinghouse. Credentials Administration will also encompass the electronic filing and paying of commercial vehicle fuel taxes.

Roadside Screening includes the electronic screening of vehicles at fixed (e.g., weigh stations) and mobile sites to confirm if the vehicles are safe, at proper weight, have appropriate credentials, or have been placed out-of-service. The systems that make up the CVISN Roadside Screening element are intended to perform screening so that safe, compliant trucks can proceed on the highway without stopping while potentially unsafe or non-compliant trucks can be pulled in for closer inspection and confirmation of proper operating credentials.

Safety Information Exchange includes the automated recording of vehicle inspection data, the automatic issuance of citations if appropriate, and the exchange of safety data between agencies within a State and between other States. Each of these CVISN elements is described in more detail in the following subsections.

The National ITS Architecture provides a common framework for planning, defining, and integrating intelligent transportation systems. The architecture defines:

- Functions (e.g., gather traffic information or request a route) that are required for ITS
- Physical entities or subsystems where these functions reside (e.g., the roadside or the vehicle).
- Information flows that connect these functions and physical subsystems together into an integrated system.

Concepts of the National ITS Architecture include logical architecture, physical architecture, and equipment packages. A logical architecture is a tool that assists in organizing complex entities and relationships. It focuses on the functional processes and information flows of a system. Developing a logical architecture helps identify the system functions and information flows, and guides development of functional requirements for new systems and improvements. A logical architecture should be independent of institutions and technology, i.e., it should not define where or by whom functions are performed in the system, nor should it identify how functions are to be implemented. It defines the processes that perform ITS functions and the information or data flows that are shared between these processes (JHUAPL, 1996a; 1998i).

The physical architecture forms a high-level structure around the processes and data flows in the logical architecture. It defines the architecture flows that connect the various Subsystems and Terminators into an integrated system. The subsystems generally provide a rich set of capabilities, more than would be implemented at any one place or time.

Equipment Packages are the building blocks of the physical architecture subsystems. Equipment Packages group like processes of a particular subsystem together into an “implementable” package. The grouping also takes into account the user services and the need to accommodate various levels of functionality. The following are relevant subsystems and equipment packages for CVO.

The Commercial Vehicle Administration Center Subsystem will operate at one or more fixed locations within a region. This subsystem performs administrative functions supporting credentials, tax, and safety regulations. The subsystem coordinates with other Commercial Vehicle Administration Subsystems (in other states/regions) to support nationwide access to credentials and safety information for administrative and enforcement functions.

The Commercial Vehicle Administration Center Subsystem consists of three equipment packages:

- Credentials and Taxes Administration, supporting the processing, update, and issuance of CVO credentials and collection, processing, and review of CVO fees and taxes
- Commercial Vehicle Safety Administration, supporting the collection and review of CV safety data
- Commercial Vehicle Information Exchange, facilitating the exchange of snapshots and profiles containing safety and credentials information for drivers, carriers, and vehicles

The Commercial Vehicle Check Roadside Subsystem supports automated carrier, vehicle, and driver identification at mainline speeds for credential checking, supports roadside safety inspections, and conducts weigh-in-motion. The subsystem enhances current capabilities by supporting expedited brake inspections, the use of operator hand-held devices, on-board safety data access, and rapid access to safety history information.

The Commercial Vehicle Check Roadside Subsystem consists of four equipment packages:

- Roadside Electronic Screening, supporting the screening and electronic clearance of vehicles
- Roadside Safety Inspections, supporting automated safety inspections
- Roadside Weigh-In-Motion, which weighs commercial vehicles at mainline speeds.
- Citation/Accident Electronic Recording, supporting the recording of information related to citations or accidents.

These subsystems and equipment packages are discussed further in Section 3.8 under description of CVISN Elements. The discussion highlights the experience of pilot and prototype states in developing such systems and equipment packages as part of the CVISN model deployment initiative.

3.2 ITS/CVO AND RELATED STUDIES IN OTHER STATES AND REGIONS

Several truck-related research studies have been carried out that provide an insight into the rationale for ITS-CVO implementation. A recent study on hours-of service compliance (Smadi, 1997) identified various issues related to program management, roadside enforcement, compliance reviews, training, data analysis, technology, and industry outreach. The study concluded that technology is playing a growing role in enabling State and Federal Motor Carrier Safety Assistance Program (MCSAP) agencies to accomplish their missions effectively and efficiently. Selection of drivers and vehicles for inspection is carried out in many states using Inspection Selection System (ISS), radar, radar detectors, CB radio, and other available information such as inspection station clearance forms. Maps, road atlases, distance tables, Log Checker, and computer software (PC Miler, Automap, Trip Maker) are used to estimate and

verify mileage and travel times. Information is gathered using telephones, cellular phones, fax machines, and computer systems. The inspection records are made using ASPEN software. Motor Carrier Regulatory Information System (MCREGIS), a reference software for motor carrier regulations, is used for compliance reviews.

Several states contiguous to South Dakota or involved with South Dakota in regional mainstreaming activities have developed business plans. North Dakota is the only one with no ITS/CVO business plan. Minnesota is among the first eight pilot states for CVISN deployment and has developed a business plan (Cambridge Systematics, Inc, 1995) as well as a project plan (Cambridge Systematics, Inc., 1997; MnDOT, 1997). Other states in the Midwest region have also developed ITS/CVO business plans, including South Dakota (Erickson and Markert, 1998), Kansas (KDOT, 1998), Wyoming (Castle Rock Consultants, 1997), Montana (MDT, 1998), Missouri (MoDOT, 1998), and Nebraska (NDMV, 1998). Several regional mainstreaming efforts are underway such as Western Mainstreaming (NTI & SAIC, 1998; and Western Mainstreaming, 1999), Great Lakes and Southeastern mainstreaming (CVOz, 1998), and Midwest Mainstreaming (CTRE, 1998). South Dakota is part of Midwest Mainstreaming effort along with Kansas, Missouri, and Nebraska.

Midwest mainstreaming has provided South Dakota the opportunity to gain an insight into regional perspective and the coordination and interoperability issues related to the midwest region. Currently, motor carrier regulation and credentialing responsibilities are shared by several agencies within each of the Midwest Mainstreaming member states and the extent of the interagency cooperation varies from state to state.

Some states have undergone considerable process changes and innovation. For example, Montana has brought all the CVO regulatory and safety business functions under the auspices of DOT, which fosters better coordination. Minnesota also reengineered by putting all the CVO functions under the responsibilities of two agencies and housed both of them in the same building. These business process changes have helped carriers considerably because they have to go to one place for applying and getting credentials. Highway Patrol is responsible for roadside operations in all the states aforementioned. Such process changes can have considerable impact on database architecture to be developed. Also, if such changes have to take place, it should precede the development of complete data architecture.

Missouri has embarked on projects that will link interstate weigh stations using desktops PCs to SAFETYNET, the portable units that could use ASPEN software and MCREGIS, ISS on the Missouri State Patrol's laptop inspection computers. Kansas has initiated work on Motor Carrier Status Screen and a Motor Carrier Central Permit system, The Kansas Statewide Telecommunications Roads Access (ASTRA), and the laptop based ISS system to be used by the highway patrol. Nebraska is involved with SAFETYNET system, that will be applied in a frame relay network and is also installing ASPEN and ISS.

South Dakota participated in a number of regional and national projects including Performance and Registration Information Systems Management (PRISM), Road Weather Information System (RWIS), effective linkage to SAFETYNET, installation of ASPEN, and use of MCREGIS. MCREGIS is a distributed database, which contains updated descriptions of federal

regulations that pertain to the motor carrier industry. All these projects have database, data sharing, and data communication considerations and different states can learn from each other and may even design a uniform system for these projects and other future projects. Automated oversize/overweight permitting will simplify the process of compliance for motor carriers and enhance the states' ability to track oversize/overweight operations. Electronic screening applications allow weight enforcement officers to check a significantly greater percentage of commercial vehicles for compliance. However, design of such a system should take into account the various data sources and linkages.

Some of the coordinating efforts being proposed are coordinating weigh station and inspection activities, group purchase of ITS/CVO equipment, and/or multi-state deployment initiatives. The member states agree, in principle, to electronically exchange enforcement data in support of electronic screening, out of service verification, and other enforcement activities. Future coordination activities may involve electronic credentials and fund transfers with regional clearinghouses.

3.3 SOUTH DAKOTA MOTOR CARRIER AND RELATED STUDIES

South Dakota carried out a truck weight study in 1990. Another study examined the effects of increased truck tire loads on pavement (Khatri, 1993), where historical details on South Dakota truck size and weight (TSW) regulations and statutes were examined. The study concluded that the TSW were fairly stable from 1960 to 1976 and in 1984 several changes took place where the standards were relaxed or increased. This consequently led to changes in administrative rules that govern oversize/overweight (OS/OW) vehicles. A study on spring load restriction was carried out to understand the validity of administrative rules for overweight vehicle during spring time and recommendations were made regarding the limit and timing of spring load restrictions (Wilson, 1994). The current truck size and weight laws and the administrative rules pertaining to oversize and over weight permitting are documented in South Dakota's Motor Carrier Handbook (SDDOT, 1998b) and available on the Department of Transportation's web site (SDDOT, 1999). A study was carried out to determine the need and justification for automating South Dakota's oversize and overweight vehicle permitting operation and to define the functional and data requirements for automated routing and permitting systems (Kurt, 1997). This study assessed the feasibility of automated routing and permitting of oversize/overweight vehicles in South Dakota. The study concluded that the implementation of such an automated system would have a benefit/cost ratio of 1.58, based on approximations and assumptions used. It also concluded that overall the implementation of the proposed permit and routing system would have a very positive impact for South Dakota and on the service provided to the trucking industry using South Dakota highways.

3.4 ITS/CVO STUDIES IN SOUTH DAKOTA

South Dakota participated in an ITS-CVO institutional issues study and the Mid-west one-stop shopping operational test (Smadi and Rodriquez, 1996). Among the barriers that were cited for ITS-CVO implementation were financial resource requirement, lack of mandate, lack of

common vision, lack of perceived need, and carriers reluctance. In addition, South Dakota has been part of a joint project with North Dakota on advanced traveler information system (Erickson and Markert, 1998). The major benefit of this project was accurate and timely communication of weather information to all travelers using cellular phones on selected routes in the two states, electronic mail, and internet.

As part of the mainstreaming efforts, South Dakota recently developed an ITS/CVO business plan for CVISN systems implementation. The business plan identified the various agencies involved in CVO in South Dakota, described the CVO environment that identified the roles and responsibilities of state agencies), trucking and economic characteristics, issues affecting CVO, and the opportunities to apply ITS technology to improve the regulation of motor carriers in South Dakota. It provided strategic direction for ITS/CVO activities which included mission statement, guiding principles, and goals and objectives. The business plan recommended a number of projects necessary to achieve the goals and objectives for CVISN deployment in South Dakota. Documentation of the ITS/CVO data architecture was one of the first projects to be implemented. The ITS/CVO business plan identified the key issues that should be considered in developing the data architecture to include the following:

- *Database incompatibilities among state agencies and other agencies outside South Dakota***.** Differences in database structures and formats need to be addressed in developing the database architecture.

- *Differences in software and hardware for data collection and storage by different agencies***.** Variable systems performance, software compatibility, and limitations need to be assessed in developing the database architecture.

- *Technological differences regarding communication and other data transfer standards.* New technologies in data communication mechanisms and standards need to be taken into account in making recommendations.

- *Interoperability with CVISN architecture***.** The product needs to be designed so it is operationally compatible with the national CVISN architecture.

3.5 CVO PROCESSES AND ORGANIZATIONS IN SOUTH DAKOTA

The need for state agencies to share data electronically was recognized as a key element for automated systems that will improve efficiency and effectiveness in their service to industry. Currently, most state agencies involved with commercial vehicle operations (CVO) in South Dakota are unable to share commercial vehicle (CV) related information and some agencies collect same data from motor carriers. CVISN is designed to address this basic problem of facilitating the ability of state agencies to share CVO-related data among agencies in the same state and with other states. The integration and coordination of database systems of all state agencies, which requires a clear understanding of the CVO responsibilities of each agency. The current CVO environment in South Dakota is described in detail in the ITS/CVO Business Plan

(Erickson and Markert, 1998). CVO responsibilities of the various state agencies are highlighted below.

- *Department of Transportation (DOT)* is primarily responsible for dissemination of information to the commercial vehicle industry, and determining oversize and overweight administrative rules.

- *Department of Revenue (DOR)* - The Division of Motor Vehicles (DMV) in the Department of Revenue administers the International Registration Plan (IRP), the International Fuel Tax Agreement (IFTA), and vehicle titles.

- *Department of Commerce and Regulation (DCR)* is responsible for driver licenses and the driver improvement.

- *Department of Environment and Natural Resources (DENR)* oversees the regulation of hazardous waste transport and participates in incident management of spills of hazardous materials including hazardous waste.

- *Department of Agriculture (DOA)* - The role of the DOA in CVO is limited to milk bulk truck inspection carried out by the Dairy and Agriculture Division.

- *Public Utilities Commission (PUC*) - The Transportation Division of the PUC is responsible for regulating exempt interstate carriers and for administering the Single State Registration System (SSRS).

- *Highway Patrol (HP)* is responsible for with roadside enforcement, permitting, and hazardous materials incident management.

- *Unified Judicial System (UJS)* provides judicial support to the CVO regulatory agencies, which includes interpretation of laws. The agency's responsibilities include handling citations, penalties, and fines incurred by motor carriers and motor coach companies and their employees. It does not have CVO regulatory responsibility.

- *FHWA, Office of Motor Carriers (OMC)* administers a number of safety- and education-related programs including the federal Drug and Alcohol Program, and con-ducts safety compliance reviews.

- *Bureau of Information and Telecommunication (BIT)* does not have regulatory responsibility but is responsible for supporting the information technology needs of state regulatory systems. The BIT is responsible for implementing new hardware and software systems, support and network existing state computer systems for state agencies. BIT is migrating toward Information Engineering Standards. It is therefore important that the outputs of this project are consistent with information engineering methodologies.

3.6 ITS/CVO OPPORTUNITIES IN SOUTH DAKOTA

Apart from CVISN, other programs that present opportunities for ITS technologies in South Dakota and which need to be taken into account in designing the database architecture include the following:

PRISM – This system is designed to improve highway safety by linking registration to safety performance so unsafe carriers can be identified and entered into safety improvement programs. South Dakota has presented a proposal to the PRISM steering committee to adopt and implement the PRISM system.

Automated Routing and Permitting – This is a system for automating what currently are manual processes has potential for improving safety and efficiency.

Automated Inspection, Citation, and Accident Reporting Software – South Dakota is exploring the possibility of installing a software that was specially developed for the Iowa Department of Transportation that enables enforcement officers to enter inspection, citation, and accident data electronically. This software will be installed on laptop computers equipped with cellular communications capability.

Weigh-in-Motion Installation – A new, ITS-equipped POE facility is being planned north of North Sioux City to reduce queues of commercial vehicles backing up onto the interstate highway.

3.7 INFORMATION ENGINEERING STUDIES IN SOUTH DAKOTA

South Dakota DOT carried out two major information engineering studies in the early 1990s. The first was a historical database feasibility study (Svalstad et al., 1991) that identified pavement management uses of a historical database and recommended specific data items and retention times needed, developed a conceptual design for a historical data consistent with existing SDDOT data, and estimated costs of implementation. The SDDOT Roadway Environmental Subsystem (RES) database was examined in detail. With few exceptions, most RES files were found to be Virtual Storage Access Mode (VSAM) files with common index key. Some exceptions to this were the Bridge Inventory and the Railroad Crossing inventory files, and they were ADABAS files. The files were structured in a hierarchical database and a NATURAL language query interface was provided.

In developing the conceptual design of historical database, the study examined system requirements such as a database management system (DBMS), network hardware and software, and application developer tools. Adaptive capability, key index, and data requirements were the key issues identified in the conceptual design. In addition, elements of data, types of DBMS (hierarchical, network, relational), and specific DBMS options were investigated. This included ADABAS, a network approach based DBMS for storage and retrieval of information. As a short term measure, an SQL-based interface to ADABAS was introduced to provide a relational look and feel to the end-user, but did not address the issues of the intrinsic inflexibility of the network

approach. The study recommended selecting an relational DBMS (RDBMS) with an SQL interface and windows-based user interface development kit, which is compatible with the RDBMS. The study indicated that such a system would have the capability of being networked such that users could execute a custom software interface (from PCs, Macintosh Workstations, or CAD workstations), which would in turn provide the automatic communication with a database server resident on the state's IBM CMOS 9972-RC4 mainframe computer.

Transportation Information Study (Deloitte & Touche, 1991) was carried out to develop an information systems plan for South Dakota DOT. The study recommended that SDDOT's information systems plan should be highly synchornized with the Strategic Business Plan. The study recommended SDDOT to integrate information systems to reduce or eliminate department-wide data redundancy. It recommended Software Development Life Cycle (SDLC) methodologies and use of Computer Aided Software Engineering (CASE) tools. The study also recommended a client server environment for long term strategic applications processing architecture.

SDDOT recently developed its department wide data model (SDDOT, 1998a). It developed business process model, organizational model, informational model, business area architecture (BAA), business strategy model, and current systems inventory. It provided summaries of individual business areas. It identified the need for development of department-wide "clearinghouse" of information and an intranet to disseminate best practices, and other reports and findings. The data model was developed using KnowledgeWare CASE software.

3.8 DESCRIPTION OF CVISN ELEMENTS

This section provides a general overview of CVISN elements and a description of the potential capabilities within each CVISN element that states may elect to test or deploy (Battelle, 1998). The three major CVISN functional elements are earlier.

3.8.1 Administrative Processes

The administrative processes for CVISN system deployment include the following components:

- International Registration Plan (IRP)
- International Fuel Tax Agreement (IFTA) Registration
- IFTA Quarterly Tax
- OS/OW Permits
- Single State Registration System (SSRS)
- Intrastate Registration
- Hazardous Materials (HAZMAT) Permits
- Weight Distance Tax.

Essential components of the administrative processes are the Carrier Automated Transaction (CAT) System and the Credentialing Interface (CI). The CAT is a Personal Computer with commercially available software that is developed specifically for CVISN Credential Administration. These systems will reside in either motor carrier offices or service provider

offices. These systems provide for credential application data entry and error checking; fee calculation (for certain types of credentials); fee payment (via electronic funds transfer); conversion of the application data to open standard electronic data interchange (EDI) formats; and electronic submission of the EDI data to the appropriate state's CI. This system also provides for receipt of invoice or credential information from the CI and local printing of commercial vehicle credentials.

An alternative to the Personal Computer-based CAT system is the Web CAT. In this alternative, the carrier only needs to have a Personal Computer that has access to the internet. The states will build a Web Page on a State server that will perform all functions of the CAT, including interface with the State CI.

The CI is a system that provides the state's single point of entry for all electronic credential applications and fuel tax transmittals. The CI will perform validations to ensure completeness of applications. States may deploy Legacy System Interfaces (LSIs) which would provide electronic interfaces from these State's CI to the Legacy System. The implementation of the LSIs prevents the state from having to manually re-key data into the Legacy Systems. The CI will also provide an interface to the state's Commercial Vehicle Information Exchange Window (CVIEW) to enable the sharing of credential and tax data to the roadside.

The State Legacy Systems calculate the respective registration or permit fees for IRP, IFTA, and (in some states) Intrastate registration, Oversize/Overweight permits, and Hazardous Materials permits. A state may develop and maintain their own Legacy Systems for calculating the registration fees or they may contract with a Service Provider to perform the calculations. Currently, there are three Service Providers that have developed IRP and IFTA Legacy Systems to perform the fee calculations: Lockheed Martin (VISTA), R.L. Polk (COVRS), and CACI.

There are two Clearinghouses: the IRP Clearinghouse and the IFTA Clearinghouse. The IRP Clearinghouse supports the International Registration Plan Base-State agreement and acts as a repository that stores data related to fees for the states participating in IRP. Initially, the states send the IRP Clearinghouse a recap (data from approved applications). The clearinghouse provides the state with transmittals (reports on data processed). The clearinghouse then generates a netting report which summarizes the fees due from/owed to states. The IFTA Clearinghouse supports the International Fuel Tax Agreement Base-State agreement and acts as a repository that stores data related to fees for the states participating in IFTA. It performs the same functions as the IRP Clearinghouse, except for generating the netting report.

Potential capabilities within administrative processes

The CVISN Pilot program allows states to choose which Electronic Credentialing capabilities they wish to implement within their state. The following paragraphs present brief descriptions of the six most common capabilities that the pilot states plan to implement.

Electronic Application Submittal: The CAT, Web CAT, and CI will provide many attractive functions for motor carriers and state agencies. The functions include: data entry screens for credential applications and fuel tax filing; validation for application data completeness to prevent

state receipt of incomplete Motor Carrier applications; automatic fee calculation; and many other functions targeted for accuracy and time savings.

The architecture of the CAT and state systems will be developed as an open standard that is modular and adaptable to allow for data exchange among systems. The transactions will be sent and received between state systems and the public (Motor Carriers, Permit Services, Shippers, and Insurance companies, etc.) using X12 as the Electronic Data Interchange (EDI) standard of the American National Standards Institute (ANSI).

Integration with Legacy Systems: An electronic interface is needed between the state's CI and each Legacy System. This may be accomplished either by the development of a Legacy System Interface (LSI), or by a modification to the Legacy System (LM), or in many cases both, as in the case of states using the VISTA system for IRP (e.g., Maryland, Virginia). The LSI or LM will convert the EDI transaction sets into file formats that are compatible with the Legacy System. It will also support data exchange back from the Legacy System such as invoices, credential approvals, and renewal notices.

Electronic Funds Transfer: States may elect to implement Electronic Funds Transfer (EFT), which provides the capability for the Motor Carrier or Service Provider to pay for credentials and quarterly tax filings electronically. The different types of EFT to be considered include credit accounts; debit accounts; and credit cards, such as VISA or Master Charge.

Electronic Issuance of Credentials: States may implement the capability for the electronic transmission of official credentials from the CI to the CAT and the capability for the CAT to print the credentials on a local printer. Motor Carriers will be able to print the official credential on their printer in their office, the same day they applied for the credential and place it in the vehicle cab. Most pilot states (e.g., Colorado, Kentucky, Maryland, Minnesota, Virginia) plan to implement electronic issuance of at least the IRP credential. Some states may elect to offer the capability for the CI to fax credentials, such as an OS/OW Permit, to a designated fax machine.

Interface with IRP and IFTA Clearinghouses: States may elect to implement an electronic interface from their IRP Legacy System to the IRP Clearinghouse. This will provide exchange of data for fee recaps and transmittals with other states. States may elect to implement an electronic link from their IFTA Legacy System to the IFTA Clearinghouse. This will provide exchange of rate information, tax violator information, and other tax-related data for transmittals between other states. Most pilot states plan to deploy an electronic interface to the IRP and IFTA Clearinghouses.

Interface with Internal State Databases: States may also elect to implement an electronic interface between the CI and their internal state databases to capture data for state-specific processing and maintenance. For example, state may want to capture IRP and IFTA registration data by an interface between the CI and their Department of Motor Vehicles Mainframe system.

3.8.2 Electronic Roadside Screening

There two basic types of roadside screening operations: (1) fixed site or scalehouse Operations, and (2) mobile operations.

Roadside screening includes the electronic screening of vehicles at fixed (e.g., weigh stations) and mobile sites to confirm if the vehicles are safe, at proper weight, have appropriate credentials, or have been placed out-of-service. The systems that make up the CVISN roadside screening element are intended to perform these screening in such a manner so that safe, compliant trucks can proceed on the highway without stopping while potentially unsafe or non-compliant trucks can be pulled in for closer inspection and confirmation of proper operating credentials.

Fixed site screening
Fixed site screening is a method of screening vehicles that utilizes the technology of CVISN systems to access data about carriers, vehicles and drivers to prevent unnecessary inspections and delays of vehicles. Fixed site screening is implemented at stationary roadside inspection sites for commercial vehicles. Most pilot states plan to implement fixed site screening at their inspection weigh stations. The following sub-sections describe the alternative approaches to roadside screening.

Mainline Screening: Mainline screening is a method of screening commercial vehicles without the need to stop at a vehicle inspection site. It involves vehicle sensors as part of the screening system to identify the carrier, vehicle, and driver when traveling at mainline highway speed. In some configurations, it also reads the last screening event from the tag. The WIM equipment and the Automatic Vehicle Identifier (AVI) equipment weighs and classifies the vehicle. All CVISN prototype and pilot states are planning to implement some form of mainline screening. California, Kentucky and Minnesota plan to fully deploy mainline by-pass capabilities.

Sorter Lane Screening: Sorter lane screening or ramp sorting is a method of screening vehicles off of the mainline. The screening process entails the used of vehicle sensors and is typically deployed in conjunction with WIM and License Plate Readers (LPRs). Both mainline and sorter lane screening may be used to clear both transponder and non-transponder equipped trucks.

Dedicated Short Range Communications (DSRC) Equipment: The Dedicated Short Range Communications (DSRC) transponders facilitate communication between the trucks and roadside computers. These will be installed on trucks of participating motor carriers. The DSRC reader equipment installed at the roadside relays information on the carrier, vehicle, driver from the DSRC transponder and in the future may also contain load type identifiers. Once the DSRC reader receives this information, it can be used to check the vast majority of vehicles at mainline speeds. California, Maryland, Minnesota, Oregon, Virginia, and Washington plan to deploy DSRC equipment.

License Plate Reader/Optical Character Recognition Systems: License Plate Readers (LPR) will be used to scan and recognize vehicle's license plate number and transmit this information to the screening computer. The LPRs are intended for use in sorter lane screening. Minnesota,

Oregon, Virginia, and Washington plan to deploy at least one LPR. Colorado plans to test the capability of the LPR.

Integration with Existing Clearance Systems: Some states may elect to implement CVISN Roadside Screening by integrating CVISN concepts within their existing Clearance Systems. Such systems include: the Pre-Pass Program in California, Colorado, and Washington; the I-75 Mainline Automated Clearance System (MACS) in Kentucky and Michigan; and the Multi Jurisdictional Automated Pre Clearance System (MAPS) and Green Light Program in Oregon. The Pre-Pass, MACS, and MAPS provide mainline by-pass capabilities at selected facilities.

Mobile site screening
Mobile site screening is similar to fixed site screening with the exception that the site is not stationary and can be placed in different sites within a state. Some pilot states plan to implement different options with respect to the WIM, DSRC, and LPR for mobile site screening. California, Minnesota and Virginia plan to deploy Mobile Site Screening. Michigan plans to test the capability.

Remote monitoring site
Kentucky plans to use remotely monitoring sites to enhance mainline screening. These will be located on by-pass routes equipped with WIM and communication links to nearby mainline fixed weigh station. The OCR capability with video systems offer great flexibility to the screening process by capturing images for display and reading license plate numbers and other identifiers like US DOT number and registered weight. This will be checked against the snapshot data in the weigh scale station.

3.8.3 Safety Information Exchange

Safety Information Exchange is a process where safety information related to Carriers (credentials and safety rating), vehicles (inspections and citations) and drivers are collected, stored, and exchanged.

Automated safety inspection
CVISN states plan to use hardware and software tools to automate the safety inspection process. Most pilot states use or plan to use the ASPEN or similar software loaded on laptop or pen-based computers. This software will enable safety inspectors to electronically collect and disseminate inspection data at the roadside. The use of automated safety inspection software will provide better timeliness and more accurate data when compared to the current method where a state employee re-enters hand written inspection report data into the state's SAFETYNET system days, weeks, or even months after the inspection occurred.

ASPEN will also provide the safety inspector with an inspection selection algorithm and the most current data to assist in determining which vehicles should be inspected. ASPEN will also provide an interface for distributing citations, accident reports, and compliance review reports electronically.

Methods of distributing data from/to roadside

The CVISN pilot states plan to utilize a number of different methods to distribute safety data from/to roadside inspection sites. Several CVISN pilot states will use the current method of ASPEN data distribution. On a periodic basis, the SAFER system will create CDs with snapshot Carrier (and later Vehicle) safety data, which will be distributed to all ASPEN sites within those states. The snapshot data consists of carrier compliance review reports, safety inspections, citations, credential, and tax information. State inspectors will record safety inspection records using ASPEN, and will upload this data on a daily basis to their respective state SAFETYNET systems. The state SAFETYNET systems will electronically transmit their data into the Motor Carrier Management Information System (MCMIS), which will process the data and forward it to SAFER. The time between the creation of the safety inspection at the roadside and the entry of this data into SAFER is expected to be at least a week.

Other CVISN states will accelerate the above process by establishing a link between SAFER and the State's CVIEW system, as well as a link between the CVIEW system and the ASPEN units. CVIEW also provides the capability to distribute intrastate carrier safety and credential information within the State, and to distribute interstate safety and credential information to computers at the roadside for screening and enforcement.

A number of CVISN states located on the Interstate 95 Corridor plan to use the SAFER Data Mailbox to further accelerate their Safety Data exchange process. For these states (Maryland, Virginia, and Connecticut), inspection data from the roadside will be transmitted from ASPEN to the SAFER Data Mailbox, which in turn will distribute portions of this data to other states. These states plan to use Cellular, Cellular Digital Packet Data (CDPD), and satellite technology to enable the ASPEN units to communicate directly to CVIEW or SAFER.

Alternatives for safety information exchange

Another unique alternative that states plan to implement is to electronically interface with other preexisting databases that provide commercial vehicle information. This includes Connecticut's plan to link its ASPEN units to National Crime Information Center (NCIC), Commercial Driver's License Information System (CDLIS), and National Law Enforcement Telecommunication System (NLETS).

4.0 INFORMATION ENGINEERING FRAMEWORK

4.1 INFORMATION SYSTEMS ARCHITECTURE

Since the early 1980s, various structural changes have occurred within organizations and the concept of architecture systems has been emphasized and implemented (Brookes et al., 1982; Modell, 1988; Inmon 1989; Olle et al. 1991; and Davenport, 1993). Much has been done in the private sector, and in the 1990s the public sector began embracing such changes and concepts to improve their effectiveness and efficiency. In this evolution and/or revolution, the two important emphases are on "process improvement and innovation" and "information engineering."

The development or documentation of data architecture of information system (s) requires understanding of some basic concepts. Such concepts pertain to the notion of information systems architecture; information engineering principles; data models and data entities; constructs of process models and data flow; and interaction among data, business processes, and business organizations. In addition, systems (hardware, software, communication) supporting such interactions should be understood to identify problems and opportunities and to assess the improvement approaches.

An information system consists of data associated with business processes, which need to be communicated within and among various business processes. The perspectives, representation, and level of detail for the three basic components of an information system--data, process, and communication--differ depending on who is viewing it or within what context it is being viewed. The information engineering methodology or framework for developing the data architecture is shown in Figure 1 (Inmon, 1989). The figure shows different perspectives of methodology or framework for information systems architecture. Each element on either axis of the matrix is explicitly differentiable from all other elements on that one axis. These representations are not merely successive levels of increasing detail but are actually different representations--different in content, in meaning, in motivation, and in use. Also, the data description columns (entity-relationship-entity) differ from the process description column (input-process-output). For example, the model of business (owner's perspective) is different from the model of information system (designer's perspective). Also, the data description columns (entity-relationship-entity) are different from the process description columns (input-process-output).

This project is concerned primarily with the “ballpark view” and the owner’s view for both data and process description. In the ballpark view, important data elements and the business processes are first identified. This is then followed by development of entity relationship diagrams and functional flows diagrams. Data flow diagrams are also provided for the processes.

4.2 DATA AND PROCESS MODELS

The conceptual information system model consists of a data model and a process model. The techniques for modeling (both data and process) can be stratified into high-level modeling, mid-level modeling, and low-level modeling. Table 1 shows the different process and data techniques for different levels of modeling.

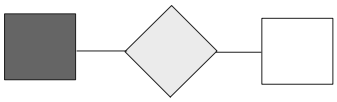
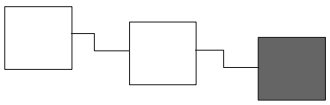
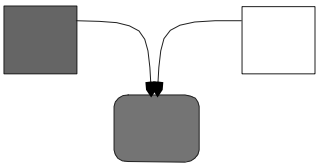
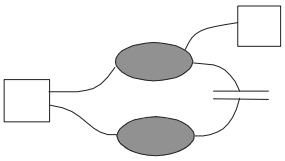
	DATA DESCRIPTION Entity and Relation	**PROCESS DESCRIPTION** Process and Input/Output
SCOPE DESCRIPTION **(Ballpark View)**	LIST OF ENTITIES IMPORTANT TO THE BUSINESSES  Entity = class of business entity	LIST OF PROCESSES THE BUSINESS PERFORMS  Process = class of business process
MODEL OF THE BUSINESS **(Owner's View)**	E.G., ENTITY/RELATIONSHIP DIAGRAM  Entity = business entity Relation = business rule	E.G., FUNCTIONAL FLOW DIAGRAM  Process = business processes I/O = business resources
MODEL OF INFORMATION SYSTEM **(Designer's View)**	**E.G., DATA MODEL**  Entity = data entity Relation = data relationship	**E.G., DATA FLOW DIAGRAM**  Process = application function I/O = user view's (set of data elements

Figure 1. Framework for information systems architecture (adapted from Inmon, 1989)

Table 1. Levels of Modeling and Techniques (Inmon, 1989)

Levels of Modeling	Data	Process
High level	• ERD • Subject Data Base	• Context Diagrams • State Transition Diagrams
Mid level	• Data Item Set (DIS) • Normalized Data Structures • Canonical Data Structures • Bubble Charts	• Data Flow Diagrams • Functional Decomposition • Structure Charts • Flow Charts
Low level	• COBOL Layouts • Relational Tables • Hierarchical Structures • Network Structures	• Program Specifications • Pseudocode

High-level modeling is useful for identifying major components and for selecting strategies for determining phases of data architecture development. An ERD, a high-level data model, is useful in identifying the major entities/subjects of the organization area. However, high level is not useful for detail. Mid-level modeling is useful for collecting, aggregating, and organizing detail, and the content and structure of the model are emphasized at this level. The low-level flushes out much detail that is suggested at the mid-level and paves the way for system development. In ERD, data is related by processes (or relationships that strongly suggest processes) and in a context-level diagram, processes are related by the flow of data.

At the mid-level of data modeling is the data item set (the DIS) and the normalized grouping of data. The corresponding mid-level of the process modeling contains functional decompositions and data flow diagrams. DIS and functional decomposition and the data flow diagrams contain much more detail than ERD and context-level diagram. A mid-level data model, a DIS, identifies the structure of data, grouping of data elements, and key structure. Functional decomposition allows processes to be transformed from high-level functions into primitives. It is at the primitive level that the day-to-day actions that are performed are identified. Data flow diagrams show how the functions relate in terms of sequence of execution. Data item sets are useful for further details about the content of data, the grouping of the elements of data, and the identification of the entities found at ERD level. The key structure identified in the data item set describes how the groups of data in the data model are related.

A low-level data model is where data attributes and other characteristics are identified. The physical database design and the code to support the data is carried out in low-level modeling. The focus at this level is the physical model and the physical data base design (for the data model) and Pseudocode, programming specifications, mini-specs, and programs. The physical data model and physical data base design are profoundly influenced by the structure and content of DIS. Pseduocode, program specifications, and programs are the natural extension of data flow diagrams and functional decompositions.

This project focuses on the high level modeling with some mid-level for the processes. At the high-level ERDs are developed for the important data entities and context diagrams are developed for the business processes. In addition, data flow diagrams are developed for the business processes.

4.3 LINKING DATA AND PROCESS MODELS

Each grouping of data in the DIS needs to be supported by certain basic activities or processes. The basic process allows linkage to be made between the data model and the process model. In general, a basic process is made up of one of the fundamental data manipulation activities--the creation (**C)** (or addition) of data, the retrieval (**R**) (or access) of data, the updating (**U**) (or changing) of data, or the deletion (**D**) of data--as the process interacts with each data element (Figure 2).

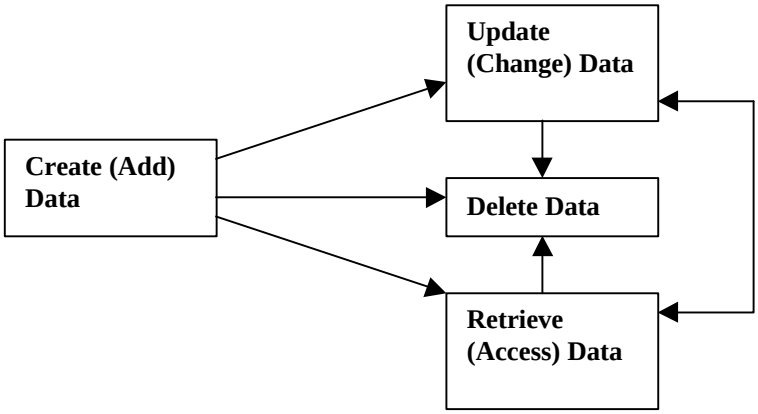


Figure 2. General Basic Process Model

In this project, a process-entity matrix is developed that maps the business processes to the data entities and information classes.

4.4 REPRESENTATION OF PROCESS AND DATA MODELS

South Dakota has moved from KnowledgeWare CASE tool, the one used in developing SDDOT Data Model, to PLATINUM BPwin for developing process models and PLATINUM ERwin for developing data models. This is part of the Bureau of Information and Telecommunications' effort to migrate to new information engineering standards. BPwin is a powerful modeling tool to analyze, document and improve complex business processes. PLATINUM BPwin is designed for process modeling, business process improvement and data flow diagramming. It helps to

understand business processes and defines how business processes interact with data. BPwin process models can be synchronized with PLATINUM ERwin data models.

PLATINUM ERwin is a database design tool to help design, generate, and maintain high-quality, high-performance database applications. This product is targeted to a number of applications including information engineering modeling, transactional and warehouse database design, and logical and physical database design. ERwin is a data modeling tool that is used to create entity relationship diagrams (ERD) of all data requirements and capture business rules in a logical model, and displaying all entities, attributes, relationships and key groups.

The process and data models developed in this project are representative of high-level and mid-level models of information systems architecture as discussed earlier.

5.0 DATA ARCHITECTURE

5.1 INTRODUCTION

System architecture refers to the overall structure (i.e., major components and interfaces) and unifying design characteristics (i.e., principles, concepts, and standards) of a system. The architecture is intended to provide guidance for CVO system implementation. A good architecture allows component systems to:

- Use consistent concepts, processes, data definitions, and user interfaces
- Share data
- Cooperate in carrying out a process
- Be developed independently
- Avoid overlapping functions and redundant development
- Evolve with changing practices and technology.

A logical architecture provides a description of what the CVO enterprise does and the information it uses. The logical architecture contains two primary elements: the process architecture and the data architecture. These are simply analytical tools for understanding requirements and operations in detail.

A major problem with current CVO information systems is the difficulty of data exchange. One step in resolving the data exchange problem is to identify the entities within CVO and to develop an entity-relationship diagram graphically depicting the relationships between these entities. The data architecture consists of a definition of data entities, attributes, and relationships and provides a framework for resolving the data exchange problem.

Another step is to determine the processes and develop data flow diagrams to show:

- Where data is used and stored
- The interfaces between processes
- The equipment package's interfaces with external equipment package(s).

The data architecture for ITS/CVO in South Dakota involved the development of process and data models and interaction matrices that map business area processes to data entities and organizations. The data architecture is developed based on the information engineering methodology discussed earlier. This is a high-level architecture that focuses on the ballpark view and owner's view in describing both data and processes. In the ballpark view, important data elements and the business processes are first identified. This is then followed by development of entity relationship diagrams and functional flows diagrams. The process model is developed to contain high- and mid-level modeling elements, which are identification and definition of business processes, and context and data flow diagrams.

The interaction matrices identify the linkages between data and process models, interaction between processes and organizations, and interactions between processes and systems and

CVISN problems. The models and matrices provide the basis necessary to facilitate integration and interfacing of systems. In addition, a current systems assessment provides guidance on system deficiencies and opportunities for improvement in ensuring an integrated system

5.2 PROCESS MODEL

To ensure that the architecture supports all necessary functions, a high-level process (logical or functional) model is developed. The process model describes key processes of each business area in terms of what is done. The process model does not represent who performs the process or how it is performed or how often the process is performed. The process is developed as a logical model that provides a technology-independent description, and serves as a tool to analyze CVO activities to determine the scope of the problem and to identify the types of information flows that would be required to support identified interfaces.

The process model is organized around primary process areas in CVO where a hierarchy of processes and sub-processes within each area are defined. The process model consists of process definitions and two graphical representations of business processes. The two graphical representations are: (a) node diagrams or hierarchical decomposition diagrams of processes from a high-level to more detailed ones, and (b) data flow diagrams (DFD) showing details of the information flow for each process and sub-process. These diagrams are included in Appendix A, and the processes are defined in the following sections.

5.2.1 Graphical Representations

The two graphical representations are: (a) node diagram or hierarchical decomposition diagrams of processes from a high-level to more detailed ones, and (b) data flow diagrams (DFD) showing details of the information flow for each process and sub-process. These diagrams are developed using PLATINUM BPwin software. The graphical representations are presented in Appendix A, and the processes of each business area are defined in the following sections.

5.2.2 Process Definitions

This subsection defines the business processes performed by each state agency and identifies linkages with other agencies, carriers and other jurisdictions.

Agency – Department of Revenue (DOR)
Process – International Registration Plan (IRP)
Definition – South Dakota is a member of the International Registration Plan (IRP). Carriers traveling in these jurisdictions may pay license fees on a prorated basis, which is determined by the percentage of total miles traveled in each jurisdiction. Carriers must carry the original registration (cab card) in the vehicle. The registration must list the jurisdictions and weight for which the carrier has paid license fees. The IRP registration process includes accepting, reviewing, and validating new, supplemental, and renewal applications; creating invoice;

processing payment; printing credential and cab cards; and processing customer inquiry. Applications are received by fax, mail or walk-in. IRP applications are processed nightly in batches on an AS400 mainframe computer located in Pierre. Applications are received in paper form and data are manually keyed into the IRP system by DMV staff. Cab cards are issued from the AS400 computer and mailed to the carrier. In addition to processing new, annual renewal and supplemental applications, DOR also conducts IRP audits.
Interacting agencies – HP, State Treasury, BIT, Other jurisdictions
Databases – Prorate database (RV12), vehicle registration database (RV01)

Agency – Department of Revenue (DOR)
Process – International Fuel Tax Agreement (IFTA)
Definition – South Dakota is a member of the International Fuel Tax Agreement (IFTA). The IFTA program is also a base state agreement where one license is valid in all states. In addition to having an annual license, motor carriers are required to complete a quarterly tax form which fulfills the fuel tax reporting requirements for all states through which the motor carrier has traveled. Advance payment of the fuel tax can be accomplished by obtaining an IFTA license decal. This process includes accepting, reviewing, and validating new, supplemental, renewal, and temporary registration/decal permit; transmittal processing; and processing inquiries. Applications are received by fax, mail or walk-in. Application and tax return data are manually keyed, and processed on the state's mainframe computer. The IFTA license is printed at the Data Center of the BIT. The IFTA license is returned to the DMV office and mailed to the carrier. In addition to processing applications, DOR also conducts IFTA audits. The DMV has been accepting quarterly tax filings electronically. Permitting services are filing returns for some 250–300 motor carriers using a bulletin board system (BBS).
Interacting agencies – Highway Patrol, State Treasury, BIT Technology, Other jurisdictions
Databases – IFTA database (RV14), vehicle registration database (RV01), MS Access database

Agency – Department of Transportation (DOT)
Process – Oversize and overweight permitting
Definition – South Dakota Codified Laws (SDCL), Chapter 32-22 contains statutory information regarding legal limits for vehicle size and weight. Vehicles moving over highways in South Dakota must comply with these limits or be traveling under the authority of a special permit. A motor carrier is required to obtain an oversize (OS) and/or overweight (OW) permit to operate a vehicle that exceeds the specified limits. Permits are issued on a per-trip or annual basis and are obtained from the Highway Patrol. The permitting process includes examining the oversize and overweight vehicles, determining fee, and issuing permits. It may involve structural analysis of bridges on proposed routes and checking of vehicle parameters, determining alternative routes, and the number of escort vehicles in the case of OS permits. DOT maintains the administrative rules.
Interacting agencies – HP
Databases – PONTIS, BARS, VIRTIS, color-coded roadway map, bridge weight limit map, construction restriction file, vertical clearance data.

Agency – Department of Transportation (DOT)
Process – Accident data reporting
Definition – The Office of Accident Records of the DOT processes accident records. The major items of accident record processing include reviewing the accident report, assigning additional information, entering and verify data, correcting electronic data and updating the accident database. They supply DCR with driver accident information. (An automated DCR mainframe job updates the DCR driver history.) They route the Truck/Bus Supplemental form from Law Enforcement to the HP Motor Carrier Division
Interacting agencies – Police, HP, DCR
Databases – PS-Accident, SDDLIS, RV01, FARS, MRM file

Agency – Department of Commerce and Regulation (DCR)
Process – Commercial driver licensing
Definition – All heavy truck and bus drivers involved in interstate or intrastate commerce must be licensed under the Commercial Driver License (CDL) Standards. This requirement applies to drivers of vehicles with a GVWR in excess of 26,000 pounds. This requirement also applies to drivers of vehicles with a GVWR of 26,000 pounds or less that are designed to carry 16 or more passengers, including the driver, or are carrying a placardable amount of hazardous materials. This requirement does not apply to drivers of recreational, military, emergency, and personal use rental vehicles. This requirement does not apply to drivers of farm vehicles if the vehicle is: (1) controlled and operated by a farmer; (2) used to transport agricultural products or machinery to and from a farm; (3) not used in for-hire or contract carrier operations; and (4) driven no further than 150 miles from the farm. This process includes processing applications for new, renewals, work permit, and duplicates; processing payment; testing applicant; issuing or denying license; disqualifying and reinstating drivers; and processing customer inquiries. Applicants are required to take both written and driving (or skills) tests and pay a driver license fee. Third party companies conduct road skill tests and issue test certificates. Licenses are issued after verification of safe driving history through CDLIS.

The DCR notifies commercial drivers when their license is being suspended, disqualified, or revoked. A driver can have his or her license disqualified for several reasons. The driver has 10 days to request a hearing after receiving the notification letter; the hearing generally takes place within one or two months. The DCR also responds to questions by telephone concerning driver licenses, lost licenses, and replacements.
Interacting agencies – HP, Law Enforcement, State Radio, UJS, other jurisdictions.
Databases – SDDLIS, CDLIS, PDPS, UJS docketing system

Agency – Public Utilities Commission (PUC)
Process – Single State Registration System (SSRS)
Definition – The SSRS is another base state agreement. The program relieves carriers from having to register their operating authority in other SSRS-participating states. The Public Utilities Commission (PUC) motor carrier regulations apply to all common and contract (for hire carriers). The SSRS is a system in which interstate carriers register their Interstate Commerce

Commission (ICC)/FHWA operating authority in their base state. Proof of insurance is required for SSRS carriers. Carriers must have a form RS-3 Registration Receipt in their possession listing SD if they have ICC/FHWA authority.
The process for SSRS registration includes accepting and reviewing applications and insurance, processing applications, confirming fees and issuing registration, filing applications and RS-3 forms, reconciling accounts, preparing monthly reports, and processing inquiries. New, annual renewal, and supplemental applications are received and processed. Approximately 90 percent of SSRS applications arrive by mail or fax. The remaining 10 percent of SSRS applications are submitted in person. SSRS applications are received in paper form and data is manually keyed, processed, and stored in Q&A software on a personal computer. Credentials are automatically issued in the PUC office. The database is maintained and supported by the PUC.
Interacting agencies – HP, Other jurisdictions
Databases – Q&A database, MS Access

Agency – Public Utilities Commission (PUC)
Process – Interstate Exempt
Definition – Carriers transporting only exempt commodities must have in their possession a D-1 cab card. Exempt carriers must also have a valid South Dakota PUC stamp affixed to the back of their cab card. The PUC is also responsible for issuing operating authority to exempt interstate carriers. Proof of insurance is required for exempt carriers. For interstate exempt registration, the process includes accepting and reviewing applications, processing application, verifying insurance, issuing Bingo stamps or issuing insurance termination letter if necessary; and providing Highway Patrol with the list of Bingo Stamps. Interstate exempt applications are received in paper form and data is manually keyed, processed, and stored in Q&A database.
Interacting agencies – HP, Other jurisdictions
Databases – Q&A database

Agency – Public Utilities Commission (PUC)
Process – Single-Trip Permit
Definition – The PUC also administers single-trip permits. A single Trip permit may be issued by the HP at ports of entry for $40. The carrier must provide proof of insurance (RS-3, Bingo Stamp attached to D1-Cab Card from another state, or an Insurance Cab Card). The Single Trip Permit allows the carrier to travel to their destination and back out of the state. The HP then sends copies of the issued Single Trip Permits to PUC. The PUC then sends the carrier the proper credentialing application forms for processing SSRS registration or Interstate Exempt.
Interacting agencies – HP, Other jurisdictions
Databases – Q&A database, MS Access

Agency – Office of Motor carriers, Federal Highway Administration (OMC/FHWA)
Process – Compliance Review
Definition – The Office of Motor Carriers (OMC) of the FHWA conducts safety compliance reviews (CRs). CRs are conducted to assess a carrier compliance with the Federal Motor Carrier

Safety regulations (FMCSRs). During CRs, logbooks, vehicles, and vehicle reports are sampled and reviewed.
Interacting agencies – DOT, HP
Databases – SafeStat, MCMIS, CDLIS
Agency – Highway Patrol (HP)
Process – Motor vehicle enforcement
Definition – The Commercial Vehicle Division of the Highway (HP) is responsible for roadside enforcement in the state. Enforcement includes the weighing of vehicles and inspection of drivers, vehicles, hazardous cargo, fuel, and credentials. The credentials that the Highway Patrol inspects include vehicle registration, fuel tax license, SSRS registration, CDL, and logbook hours of service. Vehicle weighings and safety inspections occur at different sites in the state: POEs, mobile enforcement locations, and spot checks along the roads.

The Highway Patrol, as the state's primary enforcement agency, issues a large number of citations for hours of service and other violations and out-of-service orders. The Highway Patrol is also involved in incident response, an operational rather than enforcement activity, including incidents involving hazardous materials spills.
Interacting agencies – DOR, DCR, PUC, DOT, FHWA, UJS, State Radio, Other jurisdictions.
Databases – ASPEN, SDDLIS, CDLIS, MCMIS, SAFETYNET, NCIC, NLETS, UJS Docketing system, MS Access citation database

Agency – Highway Patrol (HP)
Process – Permit issuance
Definition – The HP issues OS and OW permits to carriers. Over half of trip permit requests come in by person to the POEs or to Highway Patrol headquarters in Pierre. About 50 percent of the requests are made over the telephone. The permit applications are completed by hand. Permit processing is not automated. Overweight permits must be obtained in advance of the trip in South Dakota. A trip permit for an over-dimensional load or fuel or registration can be obtained at a POE at the time of the trip. The HP also sells harvest permits and single trip permits to carriers.
Interacting agencies – PUC, DOT
Databases – MS SQL server

Agency – Highway Patrol (HP)
Process – Accident data processing
Definition – The Highway Patrol also processes accident data for purposes of safety enforcement. Accident records received from the DOT and law enforcement agencies are reviewed and coded to conform to the SAFETYNET standard. The information is then loaded into SAFETYNET database.
Interacting agencies – DOT, Law enforcement agencies
Databases – SDDLIS, CDLIS, MCMIS, SAFETYNET

Agency – Unified Judicial System (UJS)
Process – Offense processing and judicial support
Definition – The Unified Judicial System (UJS) provides judicial support to the CVO regulatory agencies, which includes interpretation of laws. The agency's responsibilities include handling citations, penalties, and fines incurred by motor carriers and motor coach companies and their employees. UJS processes Class I and II offenses. It does not have CVO regulatory responsibility. The UJS maintains a database of citation information on a mainframe application, the Criminal Justice Information System (CJIS). The Driver Licensing Program in the DCR, Highway Patrol, and Department of Criminal Investigation (DCI), do have direct access to this docketing system.
Interacting agencies – HP, Law enforcement, DCR
Databases – UJS docketing system

Agency – Department of Environment and Natural Resources (DENR)
Process – Hazardous waste transportation
Definition – South Dakota does not require a state permit to transport hazardous waste or other hazardous materials. The state has adopted the federal regulations governing the transport of hazardous waste, including the inspection of vehicles hauling hazardous waste; the state has no additional regulations.
Interacting agencies – HP, DOT, EPA
Databases – MS Access database

Agency – Department of Environment and Natural Resources (DENR)
Process – Hazardous spill
Definition – The DENR participates in incident management of spills of hazardous materials including hazardous waste. If a hazardous material spill occurs within the state, various agencies could respond depending on the location of the spill. DENR assigns a spill number and stores the information in database. Carriers are responsible for clean-up and the associated costs.
Interacting agencies – HP, Law enforcement, DOT
Databases – Visual Fox-Pro database, Waste Information Needs (WIN), Hazardous Waste Information Needs for Making Environmental Decisions (INFORMED)

Agency – Department of Agriculture (DOA)
Process – Milk bulk truck inspection
Definition – The Dairy and Agriculture Division of the DOA oversees the inspection of milk bulk trucks. The role of the DOA in CVO is limited to milk bulk truck inspection. An inspection certificate issued.
Interacting agencies – None
Databases – MS Excel database

5.3 DATA MODEL

The primary purpose and use of a data architecture is to develop a central uniform set of data elements that can be shared by developers and users whenever possible. The development of a data architecture provides an analysis tool to analyze interface requirements and operations in detail. It also provides confidence that resultant data elements will be useful and complete for standards development, and more efficient for applications development.

One step in resolving the data exchange problem is to identify the entities within CVO and to develop an entity-relationship diagram graphically depicting the relationships between these entities. Part of the development of this diagram includes defining the attributes (data elements) of each entity. The data architecture consists of a definition of data entities, attributes, and relationships.

Entity: Any person, place, thing, concept, or event that has meaning to the enterprise and about which data may be stored. (Example: vehicle)

Attribute: A named characteristic of an entity. Data attributes are sometimes also referred to as data elements. (Example: vehicle_reg_weight)

Relationship: An attribute whose value is the identifier of another entity. (Example: carriers manage vehicles)

The data model consists of entity relationship diagrams (ERDs) of the entities' information classes, definitions, and relationships. These ERDs form the basis for the more detailed logical database design. The ERDs show the major data elements of each agency's database and the attributes associated with each data element. ERDs are developed for key data entities that are fundamental to CVO and are common to multiple agencies in South Dakota. These are defined below:

1. ***Account entity*** – The transfer of funds that is initiated to order, instruct or authorize a financial institution to debit or credit an account.

2. ***Audit entity*** – Audit identifies one motor carrier or jurisdiction audited, the type of audit conducted, the agency and one name of one auditor conducting the audit. Also included are fees or interests due as a result of the audit.

3. ***Carrier entity*** – A motor carrier is an individual, partnership, association, corporation, business trust, or any other organized group or individual, that is responsible for the safety fitness of commercial motor vehicles engaged in commerce on highways. The carrier is responsible for obtaining the operating authority and all other necessary credentials to operate on the highways. The data attributes that describe the carrier entity include the carrier identifying information and the total inventory of trucks and buses that are owned by the motor carrier.

4. ***Driver entity*** – The person operating a commercial vehicle. The attributes associated with describing the driver include the driver's description information.

5. ***Insurance entity*** – Insurance coverage for vehicle and driver. The attributes that describe the insurance entity include the type of insurance coverage and identifications for carrier, vehicle and driver.

6. ***IRP filing*** – Identifies information for vehicle use tax including tax payer identification and account status. Other data attributes describing the IRP filing entity include the carriers unique ID and type of vehicle.

7. ***Roadside inspection entity*** – The inspection entity describes the general inspection information for an inspection during roadside enforcement. This includes vehicle and driver inspections. Data attributes associated with roadside inspection entity include carrier, vehicle and driver unique IDs.

8. ***Tax return entity*** – Identifies information for a specific tax including tax payer identification number and status of tax return.

9. ***Trip entity*** – A trip is the period during which a vehicle is continuously travelling from its point of origin to its destination. The vehicle may stop for short periods during the trip without causing discontinuation of the trip and without causing a change in loaded weight. Attributes associated with the trip entity include trip identification, data, origin, destination and type of cargo.

10. ***Vehicle entity*** – A motor vehicle may be truck or a bus. The attributes that describe the vehicle include the vehicle's unique ID, the owner of the vehicle, configuration, type, and year of make.

The data model establishes data entities, needs, and requirements for use by all major CVO information users. The model is a comprehensive representation of all information relationships with all state agencies as well as the motor carrier industry and other jurisdictions. The ERD are shown in Appendix B. The attributes indicated in the ERDs represent the key identifiers with some representative data attributes. As noted earlier, the ERD is a high level data model in information systems architecture and depicts data description from the owner's perspective. The ERDs show the major components associated with each key business data entity.

Appendix C lists data items required for each major commercial vehicle regulatory process in South Dakota. These represent the pieces of information currently required in processing the motor carrier credentials and permits and in roadside operations.

5.4 INTERACTION MATRICES

Two interaction matrices are developed to help identify linkages among agencies in terms of CVO functions: (1) a process-organization matrix and (2) process-entity matrix. These matrices show the linkage between data and processes and identify the level of data usage and sharing as well as missing links in data exchange among agencies. Information contained in these matrices helps determine connectivity improvement needs among agencies and entities that would ensure data flow integration. These matrices are discussed in the following sections.

5.4.1 Process-To-Organization Matrix

A process-to-organization matrix is developed based on information gathered through in-person interviews with the technical panel. CVO involve several processes such as credential and tax administration, roadside operations, safety assurances, vehicle operation, and traffic management and control. Each of these processes involves several sub-processes. For example, safety assurance involves carrier compliance review, vehicle inspection, driver inspection, out-of-service verification, and statistics reporting. These are not carried out by any one agency. The process-to-organization matrix maps the processes to the organizational units that perform the processes. The following abbreviations are used to describe each organization's role in each process and sub-process:

PE – Performs this process or sub-process
PO – Sets the policy on how this process or sub-process is performed
SU – Supports the process or sub-process or supports those who perform them
BO – Both sets policy and performs process or sub-process.

The process – organization matrix is shown in Table 2. For example, the policies for IFTA registration are set or regulated by the DOR and the registration process is performed by the DOR. This process is supported by HP through motor carrier enforcement, supported by BIT through information and data processing, and supported by State Treasury through financial transactions and remittals.

In addition to the process – organization matrix, an agency interaction matrix is constructed that shows agencies that interact directly (**D**) or indirectly (**I**) with other state agencies in performing their CVO functions (Table 3). These two matrices clearly show which agencies interact in performing CVO functions, and which agencies need to interact in order to have an integrated system. For example, the matrices show that PUC does not interact with other regulating agencies such as DCR or DOR. For purposes of CVISN deployment, all state regulatory processes (administrative and roadside) should be integrated and interfaced effectively in the sharing and exchange of data related to carriers, vehicles, and drivers.

Table 2. Process - Organization Interaction Matrix														
Process	Sub-Process	DCR	DOR	DOT	PUC	HP	UJS	DENR	DOA	BIT	FHWA/OMC	State Treasury	State Radio	Law Enforcement
IRP	new	SU	BO			SU				SU		SU		
	renewal	SU	BO			SU				SU		SU		
	supplemental	SU	BO			SU				SU		SU		
	transmittal		BO							SU		SU		
	audit		BO							SU		SU		
IFTA	new		BO			SU				SU		SU		
	renewal		BO			SU				SU		SU		
	supplemental		BO			SU				SU		SU		
	transmittal		BO							SU		SU		
	audit		BO							SU		SU		
Vehicle title	vehicle title & registration	SU	BO	SU		SU	SU			SU			SU	SU
SSRS	new				BO	SU				SU				
	renewal				BO	SU				SU				
	supplemental				BO	SU				SU				
	monthly report				BO					SU		SU		
Interstate exempt	interstate exempt				BO	PE				SU				
Single trip permitting	single trip permit				BO	PE				SU		SU		
OS/OW Permitting	overweight permit			BO		PE				SU	PE	SU	SU	
	oversize permit			BO		PE				SU	PE	SU	SU	
Accident data reporting	accident data reporting	SU	SU	BO		PE				SU	SU			PE
CDL	new	BO				SU				SU			SU	SU
	renewals	BO				SU				SU			SU	SU
	work permit/duplicates	BO				SU	PE			SU			SU	SU
	disqualification/reinstatement	BO				SU	SU			SU	SU		SU	SU
Roadside inspections	screening	SU	SU	PO	SU	PE				SU			SU	
	OOS verification	SU		PO		PE				SU	SU		SU	
	vehicle inspections	SU	SU	PO	SU	PE				SU	SU		SU	
	driver inspections	SU	SU	PO		PE				SU	SU		SU	
	citations			PO		BO	SU			SU		SU	SU	
	harvest permit		SU			PE			BO			SU		
Judicial support	process offenses	SU	SU			SU	PE							PE
	judicial support	SU	SU			SU	PE			SU			SU	SU
Compliance review	compliance review			SU							BO			
Hazmat materials	hazmat waste transportation					SU		BO						
	hazmat spills			SU		SU		BO	SU					SU
Milk bulk truck inspection	milk bulk truck inspection								BO					

PE - performs process; PO - sets policy; BO - sets policy and performs process; SU - supports policy

Table 3. Agency-Agency Interaction Matrix

		Interacts with										
Agency	Process	DOR	DCR	DOT	PUC	HP	UJS	DENR	DOA	State Radio	OMC	Law Enforcement
DOR	IRP					I						
	IFTA					I						
	Title & Registration		D			I						
DCR	CDL					I	D			D	I	I
DOT	OS/OW					D						D
	Accident reporting	I	D			D						D
PUC	SSRS					D						
	Permitting					D						
HP	Enforcement	I	I	I	I		D			D		
	Permitting			D	D							
UJS	Judicial support	D	D			D				D		
DENR	Hazmat	D		D		D			D & I			
DOA	Bulk milk truck											

D – Directly I - Indirectly

5.4.2 Process-Entity Interaction Matrix

A process-entity interaction matrix provides the basis for scoping and sequencing application designs and implementation of projects. In order words, the data usage by organization matrix provides the information necessary to define the size and scope of a business area and to determine the sequence of implementing projects designed to address limitations of data sharing and exchange among organizations. Typically, a business area will create much of the data it requires and provide/receive data to/from other business areas. The amount of data sharing is a major consideration that determines the size and scope of the business area. This matrix enhances the understanding of collection, collation, storage, retrieval, transfer, and communication of data.

In developing the process-entity matrix, the subject areas or data associated with each business area are defined. This matrix maps key processes of each business area to the subject areas. The

subject area represents a grouping of information that tends to be used in the performance of business processes. This matrix shows data dependencies between the processes and subject areas (data). This is presented in the form of data usage by a business processes matrix that identifies the data used by each process. The matrix shows the level of data sharing and usage among CVO business areas in South Dakota. The following abbreviations are used in the CRUD matrix:

C – Created, i.e., data points can be created by the process
R – Retrieved, i.e., data is accessed or retrieved in performing the process
U – Updated, i.e., data can be updated during the process
D – Deleted, i.e., data can be deleted during the process

As shown below, several data entities are associated with the processes in each business area. These processes and entities are used in constructing the CRUD matrix shown in Table 4.

Processes	**Entities**
IRP	**IRP**
Accept, review and validate application	Account
Create carrier account	Carrier
Process payment	Vehicle
Print credential	IRP payment
Prepare transmittals	IRP credential
Process customer inquires	IRP registration
Conduct IRP Audit	Law and regulation
	IRP audit
IFTA	**IFTA**
Accept and process application	Account
Create and update carrier account	Carrier
Process payment	Vehicle
Issue credential	IFTA payment
Process cancellation request	Tax return
Process tax returns	Audit
Prepare transmittals	IFTA credential
Conduct audit	Vehicle registration
Process customer inquires	IFTA registration
	Law and regulation
Vehicle Title & Registration	**Vehicle Title & Registration**
Process vehicle title	Vehicle
Register vehicle	Owner information
	Payment
	Law and regulation

CDL
Process applications
Process payment and test applicant
Issue CDL
Process disqualifications /reinstatements
Process customer inquires

CDL
Driver
Law and enforcement
CDL payment
Law and regulation
PDPS database
CDLIS database

SSRS/Interstate Exempt/Single trip
Accept, review and process application
Process Insurance BM91X, BMC35 Files
Issue SSRS registration
Prepare monthly reports
Update insurance files (forms E & K)
Issue Single Trip Permits
Process customer inquires

SSRS/Interstate Exempt/Single trip
Carrier
Trip
Vehicle
Insurance
Permit payment
Bingo stamp (registration)
SSRS registration database

Roadside Enforcement
Conduct roadside inspections
Issue citations
Administer OS/OW permits
Administer single trip permits
Process accident data
Sell harvest permits

Roadside Enforcement
Carrier
Vehicle
Driver
Accident report
Insurance
Trip
Law and regulations
Inspection reports
Citations
OS/OW permits
Harvest permits
Single trip permits

OS/OW permitting
Set OS/OW policy and procedures
Conduct bridge loading analysis
Determine permit information

OS/OW permitting
Administrative rule
Vehicle
Permit information
OS/OW policy
Trip
Color coded maps
Bridge weight limit map
Construction restriction list

Accident records	**Accident records**
Review and code accident reports	Carrier
Generate files and upload	Vehicle
Upload to SAFETYNET	Driver
	Insurance
	Trip
	Location
	Accident report
	Accident data
Judicial Support	**Judicial Support**
Process class I offenses	Driver
Process class II offenses	Vehicle
Provide judicial support	Carrier
	Law enforcement
	Citations
	Court hearing document
	Judicial docketing system
Compliance Review	**Compliance Review**
Conduct compliance review	Carrier profile
Hazardous materials	**Hazardous materials**
Assign ID number to hazardous waste	Carrier
Assign spill number	Vehicle
Process customer inquires	Trip
	Number assignment
	Law and regulation
Milk bulk truck inspection	**Milk bulk truck inspection**
Conduct milk bulk truck inspection	Carrier
Issue inspection certificate	Vehicle
	Inspection certificate
	Law and regulations

Table 4. Process - Entity Interaction (CRUD) Matrix

	IRP									IFTA											Title					CDL							SSRS/Interstate Exempt/Single t								Roadside Enforcement														
		Account	Carrier data	Vehicle data	IRP payment	IRP credential	IRP registration data	Law and regulation	Audit		Account	Carrier data	Vehicle data	IFTA payment	Tax return	Audit	IFTA credential	vehicle registration data	IFTA registration data	Law and regulation		Vehicle data	Owner information	Payment	law and regulation		Driver data	Law enforcement	CDL payment	Law and regulation	PDPS database	CDLIS database		Carrier data	Trip data	Insurance data	Permit payment	Bingo stamp (registration)	SSRS registration data		Carrier data	Vehicle data	Driver data	Accident report	Insurance data	Trip data	Law and regulations	Inspection reports	Citations	OS/OW permits	Harvest permits	Single trip permits
IRP																																																				
Accept, review and validate application		CRUD	CRUD	CRUD			R	R			R	R			R							R	R																													
Create carrier account		CRUD	CRUD	CRUD			CRUD	R																																											
Process payment		RUD	R	R	CRUD									R																																							
Print credential						CRU	RU																																													
Prepare transmittals		R	R	R	R																																														
Process customer inquires		R	R	R	R	R	R	R																																											
Conduct IRP audit		RU			RU		R	R	CRUD																																											
IFTA																																																			
Accept and process application		R									CRUD	CRUD	CRUD						CRUD	R																																	
Create and update carrier account											CRUD	R			C				CRUD	R																																
Process payment					R								CRUD	CRUD																																						
Issue credential											R						CRU		RU																																
Process cancellation request											R	RUD							RUD	R																															
Process tax returns											R			CRU	U																																		
Prepare transmittals											R	R		R	R																																		
Conduct audit											RU			RU		CRUD			R	R																														
Process customer inquires											R	R	R	R	R		R	R	R	R																														
Vehicle title																																																			
Vehicle title																						CRUD	CRUD	CRUD	R																										
vehicle registration																						CRUD	CRUD	CRUD	R																										
CDL																																																		
Process applications																										CRUD	R		R	R	CRUD																					
Process payment & test applicant																										CRUD	R	CRUD	R																					
Issue CDL																										CRUD	R		R	R	CRUD																				
Process disqualifications /reinstatements																										CRUD	R		R	CRUD	R																			
Process customer inquires																										CRUD	R		R	R	R																			
SSRS/Interstate Exempt/Single trip																																																		
Accept and review application																																		CRUD		R	CRU	CRUD	CRUD													
Process insurance BM91x, BMC35 files																																		RU		RU			RUD													
Issue registration																																		RU		R	R	CRUD	CRUD		CU									
Prepare monthly reports																																				CRUD	R	R	R											
Update insurance files (E & K forms)																																		RU		RU		RUD											
Issue single trip permit																																			CRUD	R													RU
Process customer inquires																																		R	R	RU		R	R											
Roadside Enforcement																																																		
Conduct roadside inspections						R	R	R									R	R	R	R						R			R					R			R	R		RU	RU	RU	CR	R	R	R	CRUD	CRUD	CRUD	CRUD	CRUD
Issue citations																																					R	R		RU	RU	RU		R	R	R	CRUD	CRUD	R	R	R
Administer OS/OW permits																																									R	R			R	R			CRUD		CR
Administer single trip permits																																									R				R	R					CRUD
Process accident data																																								R	R	R	CRUD	R	RU	R					
Sell harvest permits																																									R				RU					CRUD	
OS/OW permitting																																																		
OS/OW policy and procedures																																																		
Conduct bridge loading analysis																																																		
Determine OS permit information																																																		
Accident records																																																		
Review and code accident reports																																														CR					
Generate files and upload																																																		
Judicial support																																																		
Process class I offenses & felonies																										R			R																					
Process class II offenses																										R			R																					
Provide judicial support																																																		
Compliance review																																																		
Conduct compliance review																														R	R																				
Hazardous materials																																																		
Assign ID number to hazardous waste																																																		
Assign spill number																																																		
Process customer inquires																																																		
Bulk milk tank inspection																																																		
Conduct milk tank inspection																																																		
Issue inspection certificate																																																		

C - create; R - retrieve; U - update; D - delete

Table 4. Process - Entity Interaction (CRUD) Matrix (contd.)

	OS/OW permitting	Vehicle data	Administrative rules	Permit information	OS/OW policy	Trip data	Coded maps	Bridge weight limit map	Construction restriction list	Accident records	Carrier data	Vehicle data	Driver data	Trip data	Location	Accident record	Accident database	Judicial support	Carrier data	Vehicle data	Driver data	Law enforcement	Citations	Court hearing document	Judicial docketing system	Compliance review	Carrier profile	Hazardous materials	Carrier data	Vehicle data	Trip data	Number assignment	Law and regulation	Milk tank inspection	Carrier data	Vehicle data	Inspection certificate	Law and regulation
IRP																																						
Accept, review and validate application																																						
Create carrier account																																						
Process payment																																						
Print credential																																						
Prepare transmittals																																						
Process customer inquires																																						
Conduct IRP audit																																						
IFTA																																						
Accept and process application																																						
Create and update carrier account																																						
Process payment																																						
Issue credential																																						
Process cancellation request																																						
Process tax returns																																						
Prepare transmittals																																						
Conduct audit																																						
Process customer inquires																																						
Vehicle title																																						
Vehicle title																																						
vehicle registration																																						
CDL																																						
Process applications																																						
Process payment & test applicant																																						
Issue CDL																																						
Process disqualifications /reinstatements																																						
Process customer inquires																																						
SSRS/Interstate Exempt/Single trip																																						
Accept and review application																																						
Process insurance BM91x, BMC35 files																																						
Issue registration																																						
Prepare monthly reports																																						
Update insurance files (E & K forms)																																						
Issue single trip permit																																						
Process customer inquires																																						
Roadside Enforcement																																						
Conduct roadside inspections		R	R	R	R	R	R	R	R								R							CRU						R	R							
Issue citations		R	R	R	R	R	R	R	R																													
Administer OS/OW permits		R	R	R	R	R	R	R	R																													
Administer single trip permits																																						
Process accident data										R	R	R	R	R	R	R																							
Sell harvest permits																																						
OS/OW permitting																																						
OS/OW policy and procedures			CRUD		CRUD			CRUD																														
Conduct bridge loading analysis		R	R	CRUD	R	RU	CRUD	CRUD	CRUD																													
Determine OS permit information		R	R	CRUD	R	RU	CRUD		CRUD																													
Accident records																																						
Review and code accident reports												R	R	R	RU	CRUD																						
Generate files and upload												RUD	RUD	R	CRUD	R	CRUD																					
Judicial support																																						
Process class I offenses & felonies																			R	R	R	R	CRUD	CRUD														
Process class II offenses																			R	R	R	R	CRUD	CRUD														
Provide judicial support																			R	R	R	R	R	R														
Compliance review																																						
Conduct compliance review										R	R	R				R		R	R	R		R	R	R		CRUD	R	R										
Hazardous materials																																						
Assign ID number to hazardous waste																											CRUD	CRUD	CRUD	CRUD	R						
Assign spill number																											CRUD	CRUD	CRUD	CRUD	R						
Process customer inquires																													R	R	R						
Bulk milk tank inspection																																						
Conduct milk tank inspection																																	CRUD	CRUD		R		
Issue inspection certificate																																	R	R	CRUD	R		

C - create; R - retrieve; U - update; D - delete

6. 0 SYSTEMS ASSESSMENT

This section presents a discussion of the current systems used by each state agency in credentialing and roadside operations in South Dakota. An assessment of the current systems that support CVO functions was achieved in three steps: (1) description of current systems; (2) identification of systems characteristics, deficiencies, and opportunities; and (3) CVISN-related problem identification and mapping to the processes.

6.1. DESCRIPTION OF CURRENT SYSTEMS

First, a mapping of current systems to business processes was developed. This step helps identify hardware and software currently used for each process and communication links for data exchange among state agencies and other jurisdictions. The various computer platforms and databases for the various processes and sub-processes are also identified. Hardware, software and networking facilities as well as linkage mechanisms are documented. The information is summarized in a matrix (Table 5) that maps the processes in each business area to the system components that are used to perform those processes. The matrix highlights the differences in the usage of various mainframe and PC-based applications and identifies commonalities in the usage of various systems and applications. The current or legacy systems that support each process are described below.

IRP, IFTA and Vehicle Title and Registration

- IRP, IFTA and Vehicle Title and Registration are administered by the DOR. IRP or Prorate and Business tax are IBM AS/400 applications that are written in Case Tool Sterling/Cool:2E formally known as SYNON/2E.

- IFTA and Vehicle Title and Registration are ADABAS applications. ADABAS is a database management systems (DBMS) based on network approach. ADABAS is available on the IBM CMOS 9972-RC4 mainframe computer. DOR is planning to migrate IFTA to a client-server SQL application by the end of the third quarter of 1999.

- There is no interface between IRP and IFTA. For transmittals, however, PC-based software, MS Access, MS Excel, and MS Word are used.

- DOR is part of the wide area network (WAN) in South Dakota in addition to local area network (LAN) within the department. Fax and telephone are the primary communication linkages for data exchange with other agencies.

Commercial Driver License

- CDL are issued by the DCR. ADABAS DBMS and Virtual Storage Access Mode (VSAM) are used in processing and issuing CDLs. ADABAS is a DBMS available on the South Dakota IBM CMOS 9972-RC4 mainframe computer. Digitized Imaging System is used to digitize pictures and issue licenses. Access to the mainframe on PCs is achieved directly through Attachmate EXTRA which emulate mainframe terminals by modem connections.

Table 5. Processes Supported by Current System

			Mainframe system, software & databases										PC- based applications									External databases				Linkage mechanism							Hardware				
			SYNON		ADABAS					SQL																											
			RV12 - Prorate	Business tax	RV14 - IFTA Extra*	RV01- Extra	DL03 (CDL)	SC25 (UJS)	PS01 (accident)	BARS**	PONTIS	VSAM	MS Access	MS Excel	MS Word	Keyentry3	intersection magic	Q&A	Visiual Fox Pro	ISS	ASPEN	PDPS	CDLIS	SAFETYNET	MCMIS	SAFER	LAN	WAN	E-mail	Phone	Fax	State Radio	Desktop PC	Laptop	IBM mainframe	Extra	Doc. Imaging system
		Technical Support	BIT	BIT	BIT	BIT	BIT	BIT	BIT	BIT	BIT	BIT	IND	IND	IND	BIT	BIT	BIT	IND	EXT	EXT	EXT	EXT	EXT	EXT	EXT	BIT	BIT	BIT	BIT	BIT	BIT	BIT	BIT	BIT	BIT	BIT
		Primary User Agency	DOR	DOR	DOR	DOR	DCR	UJS	DOT	DOT	DOT	DCR	IND	IND	IND	DOT	DOT	PUC	DENR	HP	HP	DCR	DCR	HP	HP	HP	ALL	ALL	MUL	ALL	ALL	ALL	ALL	HP	MUL	MUL	DCR
Agency	Process	Sub-Process																																			
DOR	IRP	new	x	x	x	x																					x	x		x	x		x		x	x	
		renewal	x			x																					x	x		x	x		x		x	x	
		supplemental	x			x							x		x												x	x		x	x		x		x	x	
		Transmittal	x										x	x	x												x	x					x		x	x	
		audit	x																								x	x					x	x	x		
	IFTA	new	x		x																						x	x		x	x		x		x	x	
		renewal			x																						x	x		x	x		x		x	x	
		supplemental			x																						x	x		x	x		x		x	x	
		transmittal			x								x	x	x												x	x					x		x	x	
		audit			x																						x	x					x	x	x	x	
	Title & registration	title & registration				x																					x	x		x	x	x	x		x		
DCR	CDL	new					x	x	x			x	x									x	x				x	x		x	x		x		x		x
		renewals					x	x	x			x	x									x	x				x	x		x	x		x		x		x
		work permit/duplicates					x	x	x			x	x									x	x				x	x		x	x		x		x		x
		disqualif./reinstatement					x	x	x			x	x		x							x	x				x	x		x	x		x		x		x
PUC	SSRS	new													x			x									x		x	x	x		x				
		renewal													x			x									x		x	x	x		x				
		supplemental													x			x									x		x	x	x		x				
	exempt	Interstate/ exempt													x			x									x		x	x	x		x				
	Permit	single trip permit											x		x			x									x		x	x	x		x				
DOT	OS/OW	overweight								x	x		x	x													x	x	x	x	x		x		x		
		oversize									x		x	x													x	x	x	x	x		x		x		
	Accident data reporting	accident data reporting				x			x				x	x	x	x	x										x	x	x	x	x		x		x	x	
HP	Roadside	screening																	x							x	x	x		x	x	x	x	x			
	operations	OOS verification																		x					x		x	x		x	x	x	x	x			
		vehicle inspections																		x				x	x	x	x	x		x	x	x	x	x			
		driver inspections																		x							x	x		x	x	x	x	x			
		citations						x					x					x		x							x	x		x	x		x				
		accident reporting							x															x			x	x		x	x		x		x		
		harvest permits											x																	x	x		x				
		OS/OW permits											x	x																x	x		x				
UJS	Judicial support	process cases (I &II)				x	x	x																			x	x		x	x	x	x		x	x	
		judicial support				x	x	x																			x	x		x	x	x	x		x	x	
FHWA/OMC	Compliance Rev	compliance review							x											x			x	x	x	x	x		x	x		x	x	x			
DENR	Hazmat	hazmat waste transport											x														x	x		x	x		x				
		hazmat spill																	x								x	x		x	x						
DOA	Milk bulk truck insp.	milk bulk truck inspection												x													x	x		x	x		x				

Notes:

* - will migrate to client server SQL by 9/1999

** - VIRTIS replaces BARS, a mainframe program

MUL - multiple agency use

IND - no interagency connection. Software used on LAN within agency only

ALL - all agencies have connectivity

EXT - external

- The DCR is part of the WAN in South Dakota in addition to LAN within the department. Fax and telephone are the primary communication linkages for data exchange with other agencies.

SSRS, Interstate Exempt and Single Trip Permit

- SSRS, Interstate exempt permits, and single-trip permits are processed by the PUC. These processes use PC-based applications only. The Q&A is the major software for these processes. Q&A is a DOS-based database program. MS Word is used for tracking and reporting purposes.

- PUC is not part of the WAN and not interfaced with any other state agency. PUC has LAN connectivity. E-mail, fax, and telephone are the primary communication linkages for data exchange with other agencies.

Oversize and Overweight Permits and Accident Records

- The administrative rules governing oversize and overweight permits are determined by the DOT, although the DOT does not issue the permits themselves. The DOT Office of Operations support uses PONTIS to provide lists of structure clearances to the Highway Patrol for use in oversize permit processing. The DOT Office of Bridge Design uses PONTIS and BARS in analyzing permissible loads for bridges for use in overweight permit processing. BARS will eventually be replaced by VIRTIS. Both PONTIS and VIRTIS are client-server SQL applications available on the LAN and WAN. VIRTIS is currently under development by AASHTO. BARS is a mainframe application.

- In addition to PC-based applications, MS Access and MS Excel are used in processing oversize and overweight permit requests.

- The Office of Accident Records of the DOT uses the ADABAS DBMS in processing accident records. Specialized PC-based applications, Keyentry 3 and Intersection Magic, ArcView and common applications such as MS Access, MS Excel, are used in processing and reporting accident records.

- The DOT is part of the WAN in South Dakota in addition to LAN within the department. E-mail, fax and telephone are the primary communication linkages for data exchange with other agencies.

Roadside Enforcement

- HP uses both desktop and laptop computers for roadside enforcement operations. Inspection Selection System (ISS) and ASPEN are the PC-based software for screening and conducting vehicle and driver inspections.

- HP has access to accident database (PS01) and the judicial docketing system database for uploading and accessing citations. These are ADABAS applications resident on the IBM CMOS 9972-RC4 mainframe computer. In addition to PC-based applications, MS Access and MS Excel are used in processing and issuing oversize, overweight permits and recording harvest permit sales.

- HP is part of the WAN in South Dakota in addition to LAN within the department. Fax and telephone are the primary communication linkages for data exchange with other agencies. During roadside operations, access to carrier, vehicle, and driver information is obtained through the State Radio.

Judicial Support

- Processes of the UJS are performed using the ADABAS DBMS on the IBM mainframe. No PC-based applications are currently required for the UJS processes.

- UJS is part of the WAN in South Dakota in addition to LAN within the department. Fax and telephone are the primary communication linkages for data exchange with other agencies. UJS also uses the State Radio for obtaining and sharing motor-carrier-related information.

Compliance Review

- The FHWA/OMC uses desktop and laptop PCs for compliance reviews and related safety enforcement activities. Access to external databases relies on modem connections. ASPEN, a PC-based software, is used for conducting compliance reviews.

- Fax, telephone and e-mail are the primary communication linkages for data exchange with other agencies.

Hazardous Materials

- The DENR uses only MS Access in conducting hazardous waste transportation and Visual Fox Pro for hazardous spill processes. These PC-based applications are resident on LAN within the department. DENR does not use any mainframe application. Fax and telephone are the primary communication linkages for data exchange with other agencies.

Milk Bulk Truck Inspection

- The DOA uses only MS Excel in conducting bulk milk truck inspections. This PC-based application is resident on LAN within the department. DOA does not use any mainframe application. Fax and telephone are the primary communication linkages for data exchange with other agencies.

6.2 SYSTEMS CHARACTERISTICS AND OPPORTUNITIES

The second step in the system assessment identified the characteristics of the current systems, their limitations to satisfy the requirements of the processes they currently support, and opportunities for ITS technology deployment. These are summarized in Table 6.

Table 6. Summary of System Characteristics, Deficiencies, and Opportunities

Agency	Current System Characteristics	Deficiencies / Limitations	Opportunities
Department of Revenue (DOR)	- LAN and WAN connectivity - Mainframe access - PCs being upgraded to Pentiums - Manual application processing	- No ITS technologies deployed - No connectivity to provide real time access for roadside operations - no limitations to data transfer or sharing within the agency - No electronic data transfer with other state agencies - No online access to other state agency databases	- Connectivity to provide real time access for roadside operations - Compatibility of data platforms to minimize duplication of data collection efforts - Ability to interface IRP with IFTA - Automated permit decal issuing of registration and decals - Ability to use PRISM - Use client server type of connectivity - Centrally accessible database - Electronic funds transfer - Ability to issue USDOT# - Speed and flexibility of operations - Ability to download information from AS400 to MS Access directly
Department of Commerce and Regulations (DCR)	- LAN and WAN connectivity with 7-8 fixed sites and mobile sites –54 total - 23 NBS/polaroid units to process driver license (3 as backup) - 15 dumb mainframe access only terminals - 18 – 386 & 486PCs (being replaced with Pentiums) - 23 Pentium II PCs - Direct access to mainframe or dial-in using phone/modem - NBS /Polaroid system for digitized pictures and issuing licenses (1990) being upgraded.	- Lack of network for mobile sites and staff - Interface problems of SDDLIS with other states via CDLIS; e.g., errors in conversion of other state data in VSAM to SDDLS, ADABAS system	- Better coordination with requesting entities--carriers, other states - Electronic transmission of driver record for roadside operations - Use of kiosks and internet, for duplicate or data change type requests.

Table 6. Summary of System Characteristics, Deficiencies, and Opportunities (contd.)

Agency	Current System Characteristics	Deficiencies / Limitations	Opportunities
Public Utilities Commission (PUC)	- LAN connectivity - 5 Pentium 200 workstations - E-mail functionality - Computer equipment upgraded less than a year ago – not plans for upgrade - No automated system	- Not connected to WAN - No ITS technologies deployed - Problems with printing letters from Q&A database – Q&A is DOS based and Q&A Write is Windows based - No data sharing with other state agencies - No mainframe access	- Online access to letters of insurance suspensions - Easy access of highway patrol to registration information - Online access to other state agency databases - Potential ability to access SSRS databases of other states
Department of Transportation (DOT)	- LAN and WAN connectivity *Office of Accident Reporting* - 4 Pentium PC (new) - 3 Pentium PC (old) *Office of Operations Support & Office of Bridge Design* - 4 Pentium workstations (bridge analysis) - 1 new Pentium PC - Recently upgraded system last year - System is generally adequate. No immediate improvement plans - BARS – mainframe software moving to a new program VIRTIS (a client server relational database system) - - Data transfer between DOT and POE by phone, fax and e-mail	*Office of accident reporting* - Needs to update accident reporting form - Accident reporting in paper form - No limitations or deficiencies for current purposes *Office of Operations Support & Office of Bridge Design* - No integration with other state agency databases - No significant limitations or deficiencies	*Office of accident reporting* - Desirable to capture accident reporting form electronically - Electronic data transfer between DOT and Highway Patrol - Potential for GIS based database of accident data *Office of Operations Support & Office of Bridge Design* - Automated routing and permitting system currently proposed

Table 6. Summary of System Characteristics, Deficiencies, and Opportunities (contd.)

Agency	Current System Characteristics	Deficiencies / Limitations	Opportunities
Highway Patrol (HP)	- 12 PCs – 3 at each of the 4 POEs - PCs – being replaced - 16 Panasonic ruggerized laptops - Computer systems upgrade almost complete – includes e-mail functionality, modems, laptops, and desktop PCs - 90% of safety inspections electronic with laptops - Adequate number of computers with adequate capacity - Linkage mechanism to SAFTYNET via modem - POEs networked to central office - Mobile teams use voice communication with central office and POEs by cellular phone - Data transfer by cellular modems - Access other state agency data through State Radio	- No ITS technology deployed currently - No direct access to other state agency databases for roadside operations - Outdated communication systems with State Radio – cumbersome, reception very poor at certain locations - Problems with manual system – non-timeliness of information – e.g., it takes about 2 months to get some into the system in some cases - ASPEN is relatively new to officers – may take sometime to get used to it. - No direct connectivity to provide real time access to CDL information for roadside operations	- Access to other state agency databases directly both at central HP office and from roadside and POE. For example, use CDL # to verify information in SDDLIS or vehicle unique ID to verify registration and credential data in the databases without having to call the State Radio - Online access to safety information possible when SAFER is fully implemented – will offer real time safety information - Communication with State Radio needs improvement - Radios in cars need improvement – poor communication quality - Use of SAFER - Use of bar codes for automatic citation and accident reporting - Use of cellular modems on lap tops at mobile sites and by highway patrol for online access to mainframe systems
DENR	- Q&A Program on LAN; Pentium PCs - Adequate systems for purposes - Communication with HP (not on regular basis) – only when there is a problem - No data transfer needs with other agencies	- No limitations or deficiencies for current purposes - No real improvement needs – very few Hazmat waste transportation in SD	- No real improvement needs or potential opportunities identified
Department of Agriculture (DOA)	- 1 Pentium PC; LAN available - No need for integration with other state agency databases - Adequate for inspection record storage purposes - no immediate improvement plans	- No limitations or deficiencies for current purposes	- No real improvement needs or potential opportunities identified

6.3 CVISN-RELATED PROBLEM IDENTIFICATION

The third step identified problems with current systems regarding data exchange and opportunities for ITS technology deployment for CVO regulatory activities in South Dakota. These are based on the information presented in the matrix and summary tables. These problems are defined in terms of CVISN system deployment. Although there may be no problems with the current systems in supporting the various processes, the current systems may not have the functionality to support CVISN technology. A summary of current systems problems are listed below in general terms. Specific areas for CVISN functionality are then identified as potential problem areas that are mapped to the various processes in Table 7. The problem areas shown in Table 7 are also defined in terms of CVISN technology deployment.

6.3.1 Summary of Problems

1. Much of the current operations are manual and oriented towards paper, which creates processing problems. These include data error, handling and storage.

2. The lack of connectivity among state agencies restricts integration. The implication is replication of data and duplication of data collection effort.

3. Lack of connectivity to provide real time access to data on vehicle registration and drivers for roadside enforcement operations.

4. Limited electronic fund transfer between carriers and state agencies and other jurisdictions

5. Non-uniformity in the databases and software used for different CVO functions by state agencies. Compatibility and interoperability are issues to be addressed.

6. Applications do not include downloading/uploading functionality between mainframe and PC systems. This creates data presentation, access, and timeliness problems and may be related to data security or lack of interfaces.

7. Lack of network facilities for mobile sites in commercial driver licensing process

8. Some PC based systems are stand alone, designed for very specific business functionality.

9. Lack of systematic and consistent approach in maintaining readily accessible historical data for future use in electronic format.

10. No automated links to state accounting systems.

Table 7. CVISN-Related Problems with Processes

			Problems with Processes																	
			Data Error	Data Accessibility	Data accuracy / Consistency	Data Availability	Data Definition	Data Standards	Data Presentation	Ad hoc query / Analysis	Data Timeliness	Data Redundancy	Data Handling & Storage	Integration	User Interfaces	Data Security	Version Control	Data Sharing	Mainframe Online
PBO	Process	Sub-Process																	
DOR	IRP	New	●	●	●	●	●					●	●	●	●	●		●	
		Renewal	●	●	●	●	●					●	●	●	●	●		●	
		Supplemental	●	●	●	●	●					●	●	●	●	●		●	
		Transmittal	●					●					●						
		Audit													●				
	IFTA	New	●	●	●	●	●	●				●	●	●	●	●		●	
		Renewal	●	●	●	●	●	●				●	●	●	●	●		●	
		Supplemental	●	●	●	●	●	●				●	●	●	●	●		●	
		Transmittal	●					●					●						
		Audit													●				
	Title & Registration	Title & Rgistration																	
DCR	CDL	New	●	●	●							●	●	●	●				
		Renewal	●	●	●							●	●	●	●				
		Work Permit & Duplicate											●						
		Disqualification Reinstatement											●						
PUC	SSRS	New	●	●			●						●	●		●		●	●
		Renewal	●	●			●						●	●		●		●	●
		Transmittal																	●
	Interstate Exempt	Interstate Exempt	●		●								●						●
	Single Trip Permit	Single Trip Permit		●										●	●				●
DOT	OS/OW	Overweight		●	●	●				●									
		Oversize								●	●								
	Accident Recording	Accident Data Record & Report		●	●		●		●					●			●		
HP	Roadside Operations	Screening		●	●						●						●		
		OOS Verification		●	●						●								
		Vehicle Inspection		●	●						●								
		Driver Inspection		●	●						●								
		Citations																●	
		Accident Reporting			●							●			●				
		Harvest Permits																	
		OS/OW Permits	●	●		●					●								
UJS	Judicial Support	Process Cases												●	●			●	
		Support to Prosecutors																	
FHWA	CR	Compliance review																	
DENR	Hazmat	Hazmat Waste/ Spill																	
DOA	Milk Tank	Milk Tank Inspection																	

6.3.2 Problem Definition

Data Error – Pertains to current paper-based processes where applications need to be manually checked for errors in completing the forms. This creates processing problems.

Data Accessibility – Relates to accessing data required for a process but resident in another agency and not readily available. For example, ability to access carrier and vehicle data by field personnel and roadside operations. This could also refer to inefficiency in existing systems and also inability to access systems that may contain data (e.g., slow mainframe connection, secured access to mainframe). Access to historical information could also be an issue if historical information is not maintained or knowledge about what it conveys is uncertain.

Data Accuracy / Consistency – Data accuracy relates to correct information that is provided from data sources or correct interpretation of information that is being provided. Data consistency relates agreement or logical coherence among different elements of data.

Data Availability – Availability of certain pieces of information required in carrying out processes but currently not available in data sources. For example, lack of historical safety information may prevent appropriate analysis and identification regarding carriers/ vehicles drivers/ highway areas that are unsafe.

Data Definition – Standardization of definitions of same or similar data used by different systems, applications, and their manuals, is necessary to allow analysis of data quality and correct interpretations and accesses. This may cause inappropriate linkage and sharing and hence inaccurate retrieval, transmission, or analysis. The data may be used in different processes but may mean different things in each process.

Data Standards – Relates to information exchange standards, such as open Electronic Data Interchange (EDI). The transactions involved in such exchanges are largely system/application independent. Absence of such standards may make information exchange difficult or even impossible. If there is no computer system linkage presently existing for information exchange, then the issue of such standards is irrelevant.

Data Presentation – Pertains to the format in which the data is presented so that it is understood and useful for the process, or else misinterpretation is possible. This may lead to data inaccuracies.

Ad hoc Query/Analysis – An important task in interacting with databases and conducting analysis that requires multiple data from different sources, is the ability to conduct query/ analysis instantly (or in ad hoc manner). Absence of such feature or difficult construction of such a feature makes the interaction of data problematic and may even lead to errors. Most of mainframe systems, in general, have inferior ad hoc query capability compared to the PCs because PCs have better user-interfaces.

Data Timeliness – Pertains to availability of accurate data for a process in a timely fashion. It relates to data gathered, transmitted or retrieved during the performance of a process using direct computer system linkage, direct entry into computer system, or using non-computer mechanism (e.g., phone, mail).

Data Redundancy – Refers to same data entity collected and/or stored by multiple agencies (paper-based or computer-based). Sometimes this is necessary because of the way processes and activities have evolved and changed. However, same data in multiple locations can be the main cause of data accuracy and consistency problems, especially when data update is not synchronized.

Data Handling and Storage – This is a problem typical of paper based transactions. The need to handle, store and archive large volumes of paper applications and documents may be a problem. Also associated is the retrieval of information from archived data.

Integration – Refers to whether the different systems used in the process are integrated and perform in seamless and efficient manner or are made of disparate systems connected by non-computer transactions and actions.

User Interfaces – Refers to availability of user interfaces that allow data exchange among processes and agencies. For example, lack of interfaces between IRP and IFTA processes may slow down the process.

Data Security – Concerns of security of data for certain processes may limit the level of data access and data sharing that can be permitted among agencies. This concern may translate to inefficiency in certain processes.

Version Control – Migration to different versions of a commonly used software by different agencies at different times can create problems with data exchange.

Data Sharing – Relates to inability or difficulty in sharing data with other agencies through direct computer linkage or other means. This may be due to incompatibility of data and/or systems and processes. Differences in data definition or standard, lack of integration and lack of user interfaces can create data sharing problems.

Mainframe Online – Relates mainframe connectivity for processes. Certain processes are currently performed on PC applications only. Data for these processes cannot be shared with other processes that are performed on mainframe programs. Data access and sharing becomes a problem for such processes.

7.0 DOCUMENTATION IN CVISN TEMPLATES

7.1 INTRODUCTION

The ITS/CVO program has developed CVISN National Architecture, supporting standards and has initiated model deployment in 10 states. The next phase is CVISN model deployment in all interested states. In documenting the data architecture for South Dakota, the requirements for CVISN Level One deployment are first reviewed. CVISN Level One deployment requires that the following three capability areas are implemented using applicable architectural guidelines, operational concepts and standards. This is necessary to ensure consistency with the national model deployment initiative. CVISN Level One capability refers to the following specific items:

- An organizational framework for cooperative system deployment has been established among state agencies and motor carriers.
- A state CVISN System design has been established that conforms to the CVISN Architecture and can evolve to include new technology and capabilities.
- Elements of three capability areas have been implemented using applicable architectural guidelines, operational concepts, and standards.

Credentials Administration

- End-to-end processing (i.e., carrier application, state application processing, payment, credentials, credential issuance) of at least IRP and IFTA credentials; ready to extend to other credentials (interstate, titling, OS/OW, carrier registration).
- Connection to IRP and IFTA Clearinghouses.
- At least 10 percent of transaction volume handled electronically; ready to bring on more carriers as carriers sign up; ready to extend to branch offices where applicable.

Electronic Screening

- Electronic screening implemented at a minimum of one fixed or mobile inspection site.
- Ready to replicate at other sites.

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.

This section describes documentation of processes and data in CVO functions in South Dakota using CVISN architecture templates. Two types of templates are used. The first type is the systems design and network templates that are used for CVISN top-level design. The top-level design is one of the outcomes of analyzing the state's existing systems, CVISN project objectives, guiding principles, existing and planned business processes and intended operational changes (JHUAPL, 1999). The second type is CVISN architecture equipment packages that are building blocks for the physical architecture of the CVISN subsystems. The equipment packages

are implementable groups of processes into functional areas. These templates are used to document the current processes, data and network for CVO functions in South Dakota.

7.2 CVISN TOP-LEVEL DESIGN TEMPLATES

In characterizing the existing systems and to facilitate CVISN top-level systems design process, CVISN Architecture templates are used to document the current processes and network systems (JHUAPL, 1999c). The generic system design template and network template are used. These templates reflect the major functions that support CVO in South Dakota and illustrate which functions currently exchange information. This documentation will serve as starting points in developing operational scenarios and system interfaces for CVISN systems deployment.

7.2.1 System Design Template

The system design template is used to show the major CVO functions (Figure 3). Each box represents a major function. Lines are drawn to connect functions that currently exchange information. For purposes of characterizing the current system design the small LSI (legacy system interface) and LM (Legacy modification) boxes are not considered important. All interfaces are assumed to be the legacy systems. These boxes are included with the current system characterization to facilitate the CVISN system design process. The following are some characteristics of the current processes and linkages as depicted in system design template.

- Currently, there is no credentialing interface between the carriers and the state credentialing systems. This explains why the credentialing interface box is not linked to any major function. With CVISN systems deployment however, all connections between the carrier systems and the state systems will go through a credentialing interface.

- The box labeled Carrier Systems or Service Providers is used to represent carriers or commercial vehicle drivers for the purposes of this documentation. Currently, carriers do not have the functionality to directly interface with the state credentialing systems.

- Currently, some form of linkage mechanisms exist between some individual state credentialing systems and components of national or regional systems that are considered part of CVISN core infrastructure. With CVISN systems deployment, all connections between state systems and CVISN core infrastructure systems may have to be channeled through the commercial vehicle information exchange window (CVIEW). Similarly, CVIEW will serve as a link between roadside operations and credentialing systems.

- The State Radio acts as an information exchange link between state credentialing functions and roadside operations. With CVISN systems deployment, the function currently performed by the State Radio will be achieved through CVIEW.

- Information from CDLIS is required in processing commercial driver licenses. Information on CDL, and vehicle title and registration is available to enforcement officers via the State Radio.

- The State Treasury plays a key role in funds transfer and remittances to and from other jurisdictions relating to credentials and permits. Major functions requiring transactions with State Treasury are, vehicle titling and registration, IRP, IFTA, commercial driver licensing, SSRS, interstate exempt registration, single trip permit, oversize/overweight permits and hazardous waste materials transportation.

- In processing SSRS, interstate exempt registrations and single trip permits, carriers' insurance information are verified. Currently, there is no central depository of insurance information on carriers. Carriers are required to provide the required insurance information.

- Electronic screening is not currently used for roadside operations in South Dakota. WIM is currently not used for roadside enforcement or screening activities.

- Safety inspections are conducted as part of roadside operations. Safety inspection data gathered with ASPEN is transferred to SAFETYNET via SAFER. This data may then be uploaded to MCMIS. Also, as part of roadside operations, HP issues OS/OW permits at POEs and sells single trip permits.

- Citations resulting from roadside operations and safety inspections and accidents data are uploaded to the citation and accidents database.

7.2.2 Network Template

The network template is used to show how the major functions are allocated to computers and the existing network connectivity among those computers using various kinds of network technologies. Figure 4 illustrates the existing network in South Dakota. Each box represents a computer or computers dedicated to a particular major function. Lines are drawn to show LANs and WAN connecting different computers and functions. Details of hardware, software and linkage mechanisms for CVO functions are summarized in Table 5 and discussed in Section 6 of this report. The following are explanatory comments on the information presented in Figure 4.

- All major functions in each functional area are connected and part of a LAN. Except for PUC, all major functional areas are part of the state's Wide Area Network (WAN). The IBM IBM CMOS 9972 RC-4 mainframe computer is available on WAN and used for major functions including vehicle titling and registration, commercial driver licensing, OS/OW permitting and accident reporting. The IBM AS400 mainframe computer, also available on WAN, is used for IRP registration and business tax functions only.

- Roadside operations access information on carriers, drivers and vehicles by calling in to the State Radio. The State Radio has direct access to vehicle titling and registration and commercial driver licensing systems.

- For purposes of processing and issuing CDLs, CDLIS is accessed via AMMVAnet frame relay (TCP/IP).

- In conducting safety inspections with ASPEN, enforcement officers use cellular modems to dial into SAFER for data transfer. The connection is achieved via AAMVAnet frame relay. Similarly, SAFETYNET connects to MCMIS by dial-up connection via AAMVAnet frame relay (TCP/IP).

These templates can be used to verify the physical connectivity between systems and identify bottlenecks for CVISN systems deployment. The information provided in these templates can help determine modifications that are necessary to facilitate information exchange and connectivity among state systems and also with CVISN core infrastructure systems.

7.3 CVISN ARCHITECTURE EQUIPMENT PACKAGE TEMPLATES

The CVISN Architecture and the National ITS Architecture are aligned at a top level, in terms of subsystems and equipment package interface data flows. The CVISN architecture includes a number of subsystems and equipment packages for CVO. The equipment packages provide templates that can be used to gauge current systems adequacy and identify areas of focus in developing and deploying CVISN systems. The four subsystems unique to CVO are:

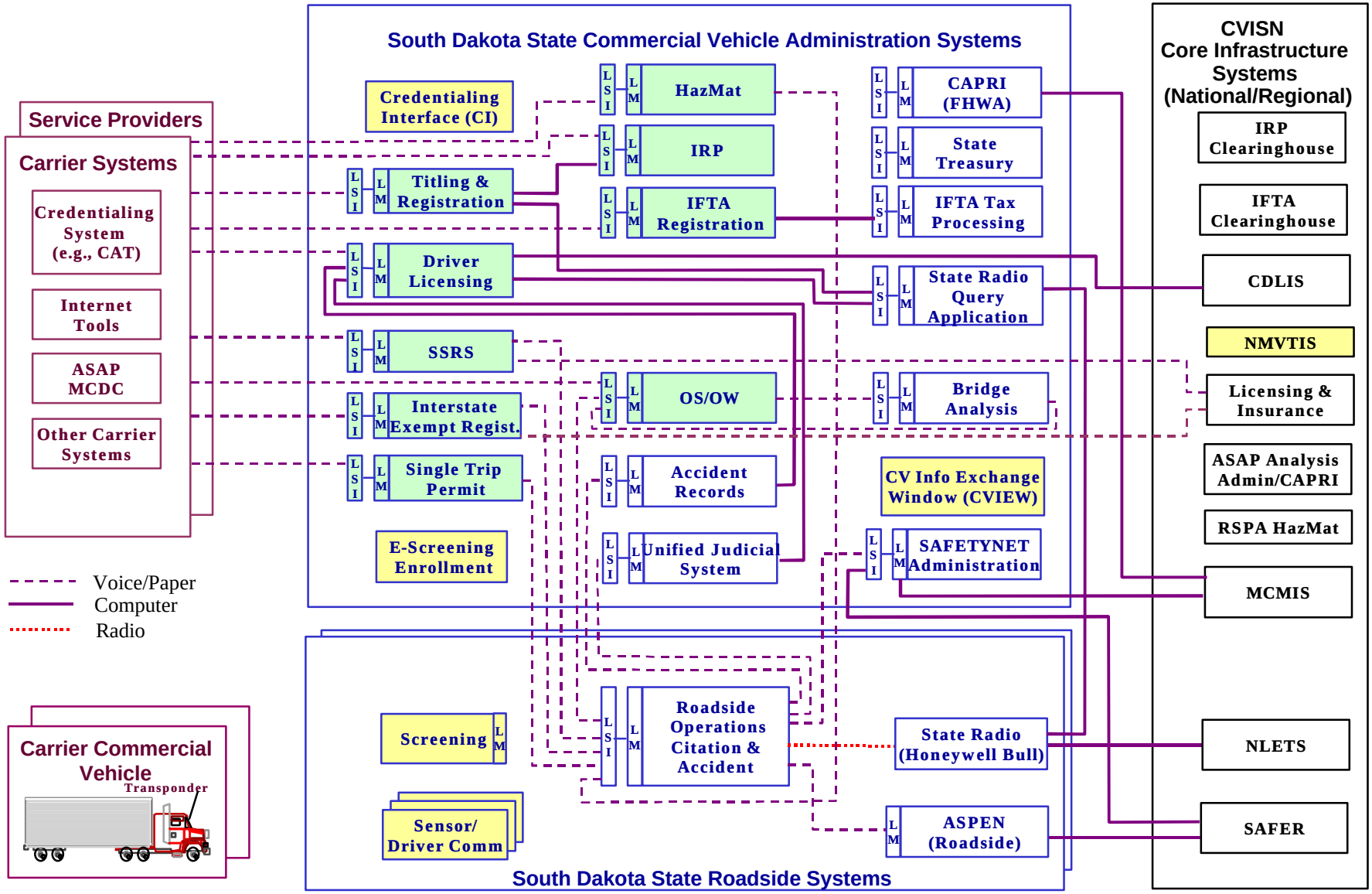
- Commercial Vehicle Administration
- Commercial Vehicle Check
- Fleet and Freight Management
- Commercial Vehicle.

Credential and Tax Administration processes are mapped to the Commercial Vehicle Administration Center Subsystem. Roadside Operations processes are mapped to the Commercial Vehicle Check 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.

The subsystems that are relevant for CVISN level-one deployment are commercial vehicle administration center and commercial vehicle check roadside subsystems. These subsystems and the relevant equipment packages are discussed in the following sections. A general description is provided for each equipment package followed by a summary the status in South Dakota relative to the provisions of the architecture.

The data flow diagrams summarize the processes and data flow between functional areas. The dotted arrows and lines are used to indicate linkages or functional areas that are not currently available in South Dakota. A solid line or arrow indicates that such linkage or functional area currently exists in South Dakota. Processes in a functional area indicated in italics are currently not performed in South Dakota.

Figure 3. Current South Dakota State System Design



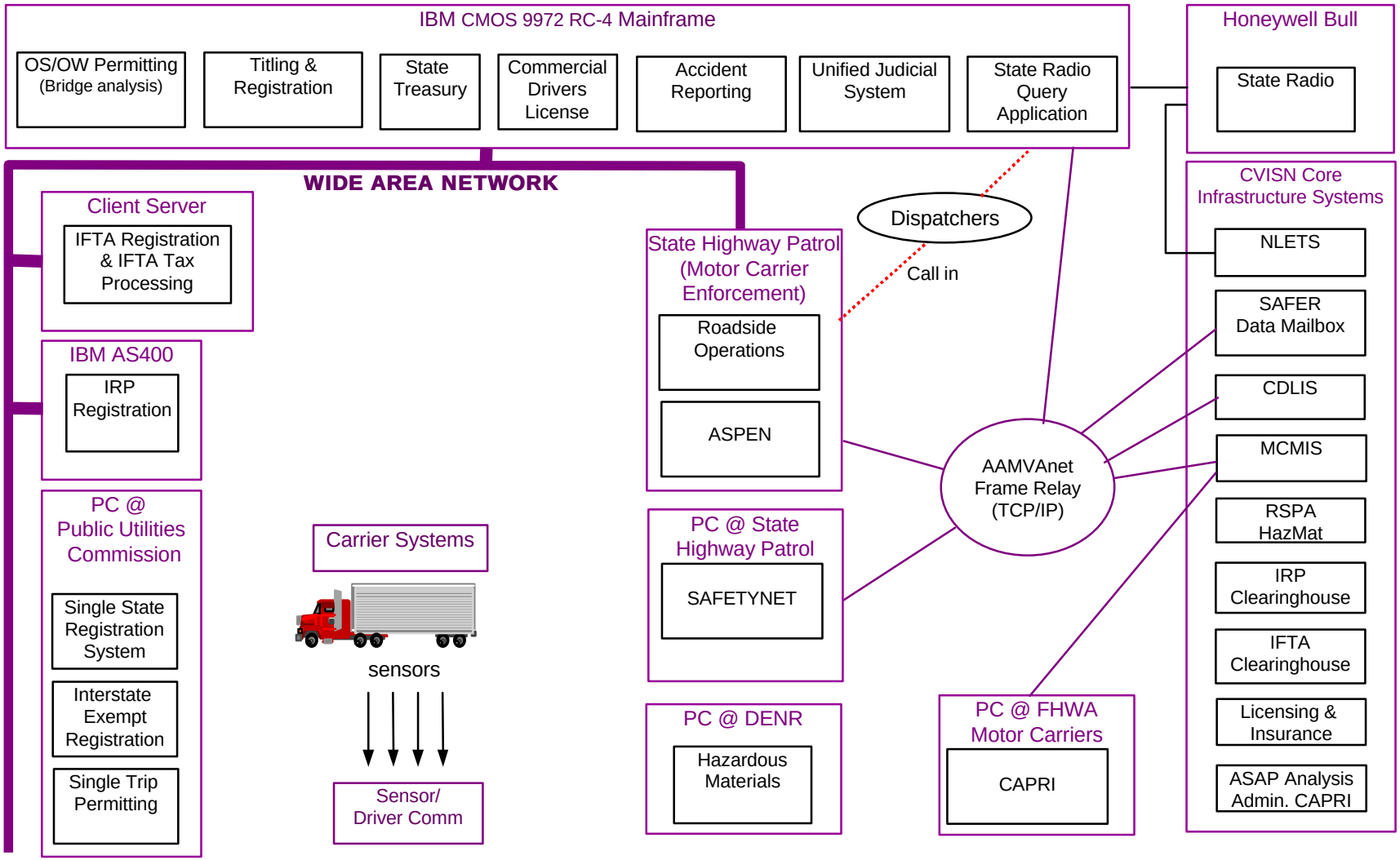
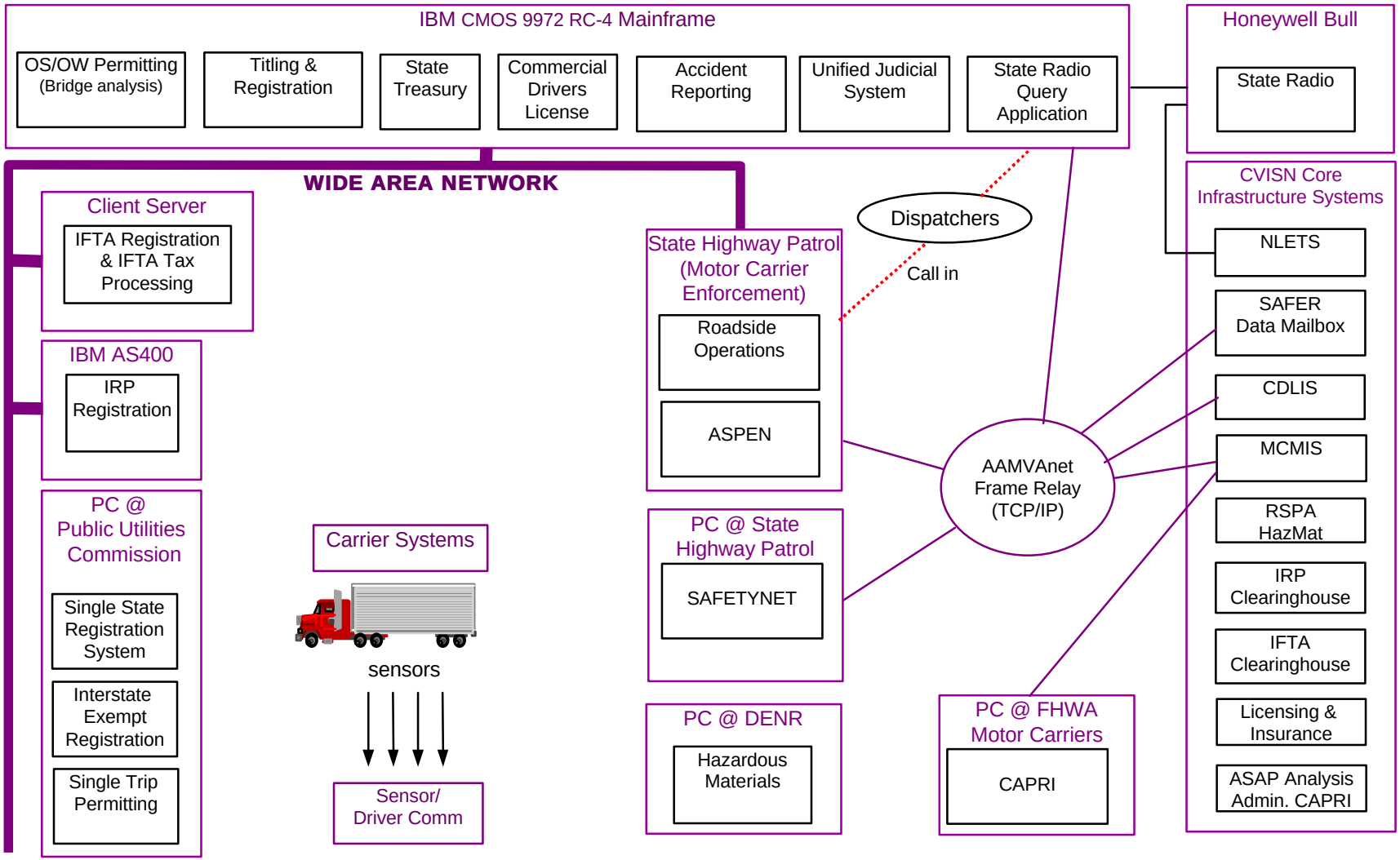

IBM CMOS 9972 RC-4 Mainframe
OS/OW Permitting (Bridge analysis)
Titling & Registration
State Treasury
Commercial Drivers License
Accident Reporting
Unified Judicial System
State Radio Query Application
Honeywell Bull
State Radio
WIDE AREA NETWORK
Client Server
IFTA Registration & IFTA Tax Processing
IBM AS400
IRP Registration
PC @ Public Utilities Commission
Single State Registration System
Interstate Exempt Registration
Single Trip Permitting
Carrier Systems
sensors
Sensor/ Driver Comm
State Highway Patrol (Motor Carrier Enforcement)
Roadside Operations
ASPEN
Dispatchers
Call in
PC @ State Highway Patrol
SAFETYNET
PC @ DENR
Hazardous Materials
AAMVAnet Frame Relay (TCP/IP)
PC @ FHWA Motor Carriers
CAPRI
CVISN Core Infrastructure Systems
NLETS
SAFER Data Mailbox
CDLIS
MCMIS
RSPA HazMat
IRP Clearinghouse
IFTA Clearinghouse
Licensing & Insurance
ASAP Analysis Admin. CAPRI

Figure 4. Current South Dakota State Network



7.3.1 Commercial Vehicle Administration Center Subsystem

The Commercial Vehicle Administration Center Subsystem will operate at one or more fixed locations within a region. This subsystem performs administrative functions supporting credentials, tax, and safety regulations. The subsystem coordinates with other Commercial Vehicle Administration Subsystems (in other states/regions) to support nationwide access to credentials and safety information for administrative and enforcement functions.

The Commercial Vehicle Administration Center Subsystem consists of four equipment packages:

- 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 profiles containing safety and credentials information for drivers, carriers, and vehicles

The International Commercial Vehicle Administration equipment is not considered relevant to South Dakota and is excluded from further discussions.

Credentials and Taxes Administration Equipment Package

The Credentials and Taxes Administration equipment package supports the processing, update, and issuance of CVO credentials and the collection, processing, and review of CVO fees and taxes. This equipment package includes state, regional, and national public functions associated with domestic credentials.

The data flow diagram for this equipment package is illustrated in Figure 5. All process under this functional area are currently performed in South Dakota except those that are electronic in nature. This data flow diagram applies to each credential processed and issued for CVO in South Dakota (e.g., IRP, IFTA, SSRS, CDL, OS/OW permits). Connectivity or interface between roadside support functional area and the credentials database does not exist currently. Non-existing linkages and equipment packages are shown in dotted lines.

Commercial Vehicle Safety Administration Equipment Package

The Commercial Vehicle (CV) Safety Administration supports the processing and review of CVO safety information. This equipment package includes state, regional, and national public functions associated with CVO safety information utilization.

The data flow diagram is shown in Figure 6. Apart from the conduct of compliance reviews, none of the activities are carried out in South Dakota currently. Analysis of safety data is performed using national safety databases and programs such as MCMIS and SAFESTAT. In South Dakota currently, there is no connectivity between the credentials and taxes administration functional area and the management of safety data functional area.

Commercial Vehicle Information Exchange Equipment Package
The Commercial Vehicle Information Exchange (CVIE) equipment package collects safety and credential information related to carriers, vehicles and drivers from various authoritative sources; unifies and assembles that data, and provides it (where allowed by privacy laws) to jurisdictional agencies, enforcement personnel, industry related organizations, and the general public. This equipment package may be implemented at continental, national, regional, or state/province levels. At the continental/national/regional level, the package must address operators who cross jurisdictional boundaries. At the state level, the package may interface with the higher-level package for inter-jurisdictional operator data, and store/exchange data for operators who stay within the state borders.

Information from various authoritative sources may be acquired through two means:

- Proactive Update: The source provides the information to the CVIE when it changes, either periodically or at the time of update.
- Responsive Update: The source responds to one or more queries generated by the CVIE with updates.

The information may be accessed through two means:

- On-line queries, in which a request is made for a specific piece of information and a response is provided according to the requested priority.
- Subscription information transfer according to general criteria for the kind of information desired and the frequency at which it should be provided.

The CVIE also provides a service for transferring safety inspection information from the roadside to the relevant state/province or national safety administrations. In the process, vehicle and driver out-of-service information is made available to the CVIE users. All requests undergo authentication and authorization checks to insure that data security and integrity are maintained. Information covered by privacy laws is not made available to the general public.

The data flow diagram for CVIE is shown in Figure 7. This functionality is not currently available in South Dakota. Thus, none of the processes in this equipment package are currently performed in South Dakota.

7.3.2 Commercial Vehicle Check Roadside Subsystem

The Commercial Vehicle Check Roadside Subsystem supports automated carrier, vehicle, and driver identification at mainline speeds for credential checking, supports roadside safety inspections, and conducts weigh-in-motion. The subsystem enhances current capabilities by supporting expedited brake inspections, the use of operator hand-held devices, on-board safety data access, and rapid access to safety history information.

The Commercial Vehicle Check Roadside Subsystem, consists of four equipment packages that are relevant to South Dakota:

- Roadside Electronic Screening, supporting the screening and electronic clearance of vehicles
- Roadside Safety Inspections, supporting automated safety inspections

- Roadside Weigh-In-Motion, which weighs commercial vehicles at mainline speeds.
- Citation/Accident Electronic Recording, supporting the recording of information related to citations or accidents

Roadside Electronic Screening (RES) Equipment Package

Roadside Electronic Screening (RES) Equipment Package is used by state enforcement personnel to:

- Verify safe and legal commercial vehicles and allow them to bypass roadside electronic screening sites
- Identify illegal vehicles and those with higher safety risks and alert enforcement personnel

The data flow diagram for RES equipment package is shown in Figure 8. South Dakota does not have the facilities for roadside electronic screening. Therefore the processes and data flow are not available. These are shown in dotted lines.

Roadside Safety Inspections Equipment Package

Roadside Safety Inspection (RSI) is used by roadside inspectors and law enforcement personnel to:

- Efficiently inspect commercial vehicles and drivers
- Report inspection results electronically
- Transmit citation report data.

This equipment package description assumes that the Roadside Electronic Screening (RES) equipment package is co-located, and therefore the RES equipment package runs the Inspection Selection Subsystem (ISS) algorithm, and uses these results during the screening process. This equipment package would have to include ISS if it were not co-located with RES.

The data flow diagram for RSI equipment package is shown in Figure 9. Some of the processes are currently performed even though roadside screening is not electronic. Electronic oriented processes are shown in italics and those that are currently performed using ASPEN and ISS shown in normal text and the arrows in solid lines.

Roadside Weigh-In-Motion Equipment Package

Roadside Weigh-In-Motion (WIM) is used by a jurisdiction's enforcement personnel to monitor and enforce vehicle weights and dimensions. Additional screening will occur as a vehicle interacts with a complete Roadside Electronic Screening (RES) system.

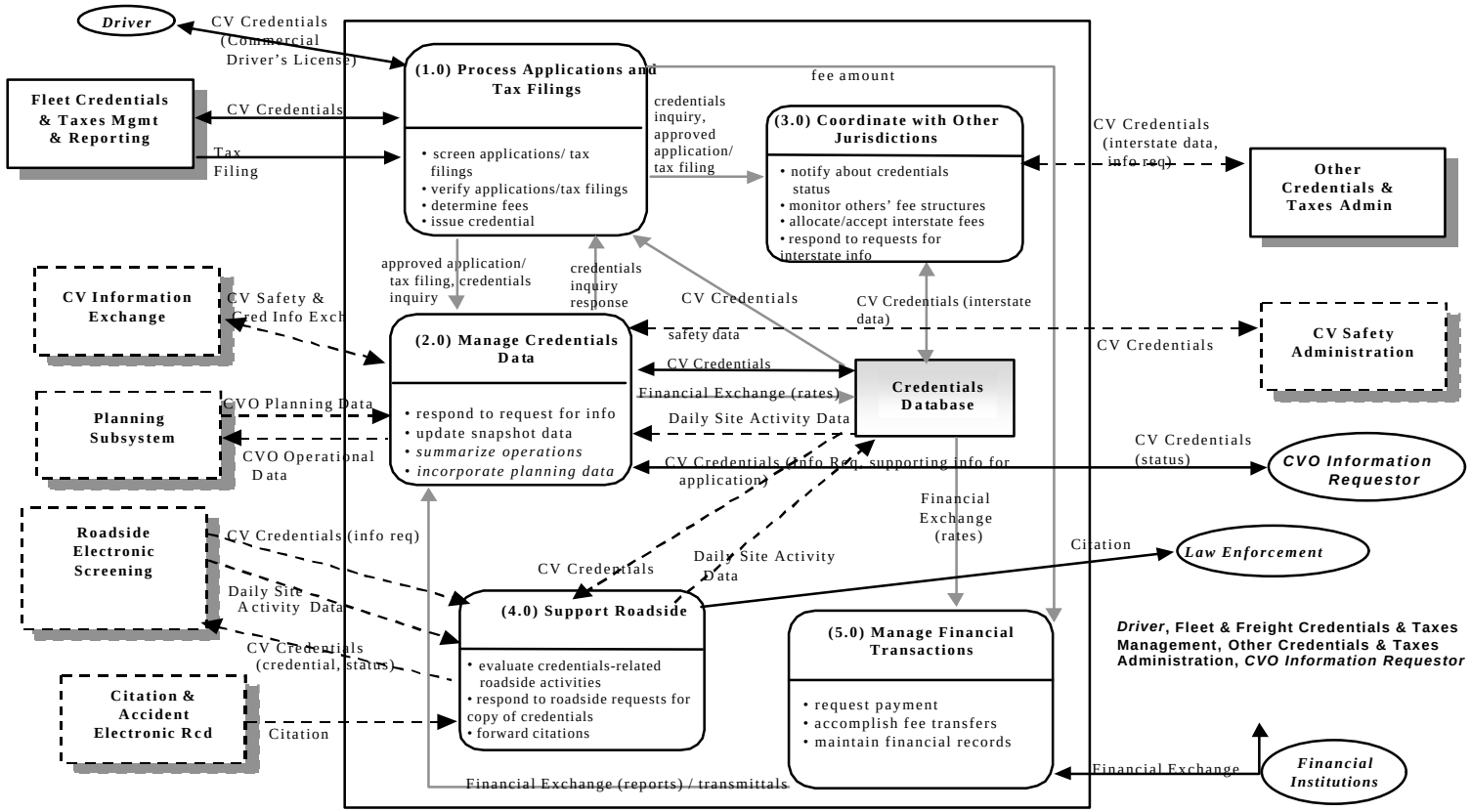
The data flow diagram for WIM equipment package is shown in Figure 10. WIM installation are currently not used in roadside operations in South Dakota. These processes and data flow are not currently available and are shown in dotted lines.

Citation and Accident Electronic Recording Equipment Package

Citation and Accident Electronic Recording (CAER) is used by roadside inspectors and law enforcement personnel to generate and transmit citations and accident reports electronically. CAER equipment packages reside at CV Check Roadside Subsystem fixed sites and mobile units. Citations and accident reports can be transmitted immediately (e.g., cellular link, network link) after an inspection or incident, or later as part of a bulk transfer.

The data flow diagram for CAER equipment package is shown in Figure 11. In South Dakota, accident record and citation processing is not electronic. Processes and data flow in this equipment package are not available and are therefore shown in dotted lines.

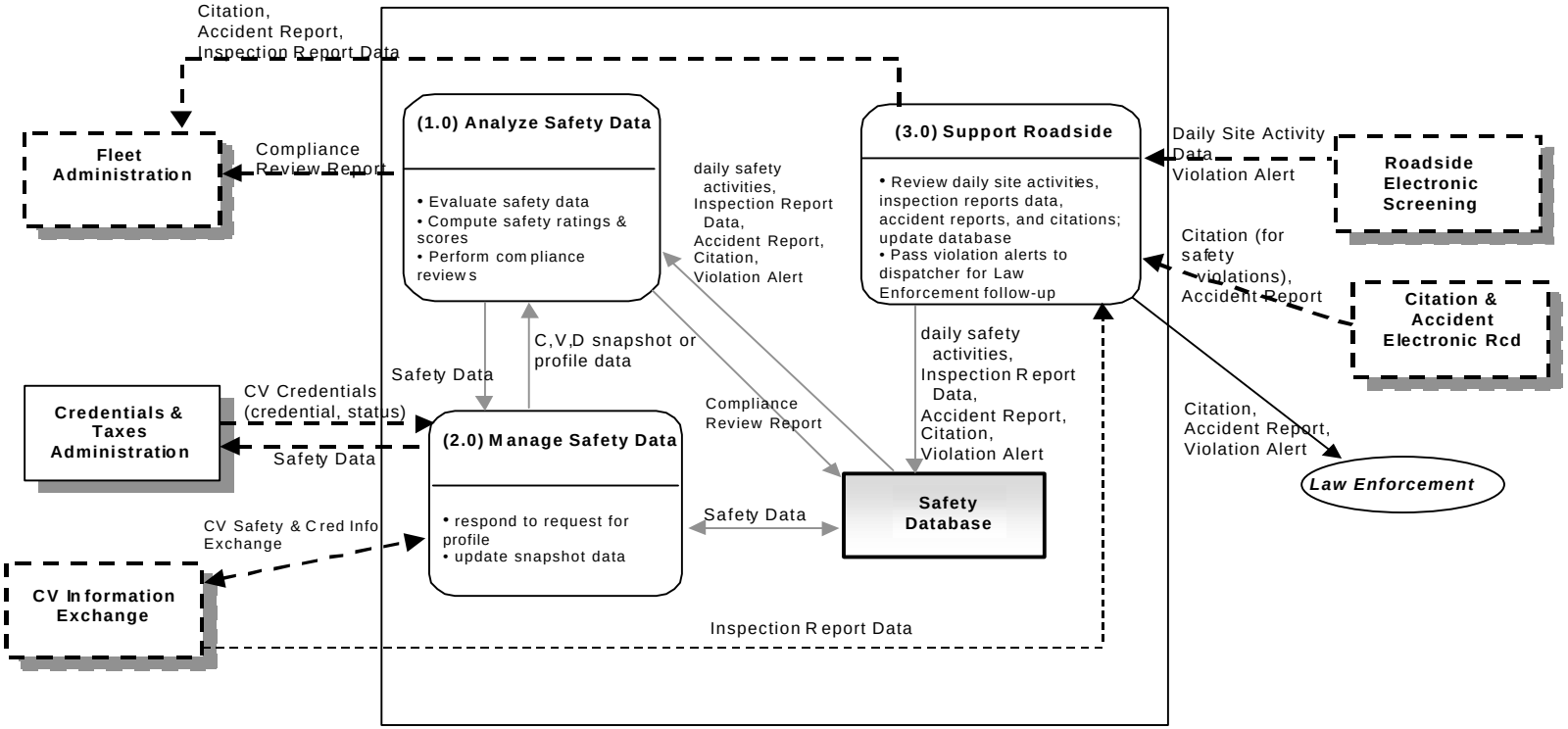
Figure 5. Credentials and Taxes Administration Equipment Package Data Flow Diagram



The Credentials and Taxes Administration equipment package supports the processing, update, and issuance of CVO credentials and the collection, processing, and review of CVO fees and taxes.

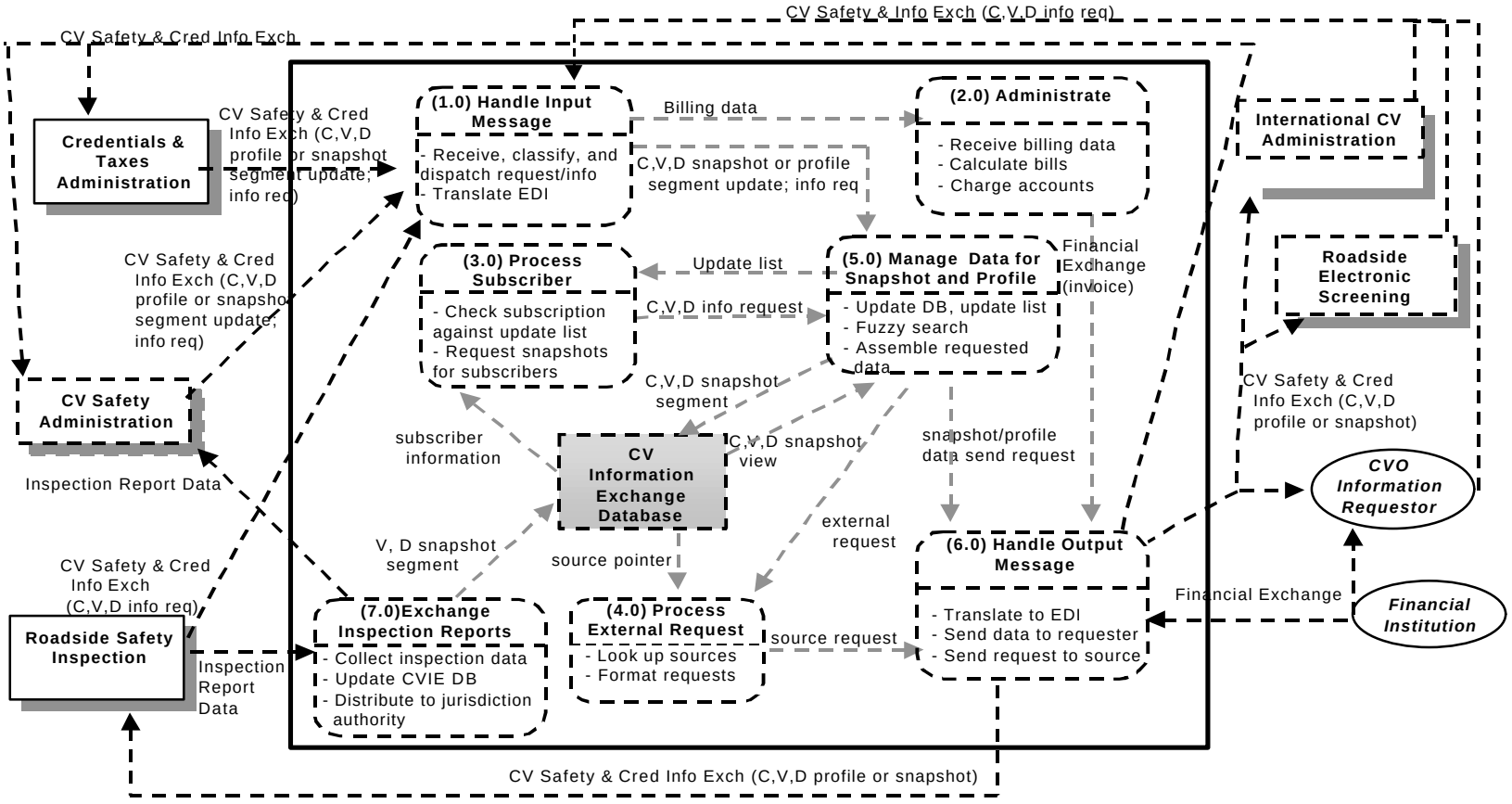
Notes:
Solid lines indicate functional area or linkage that currently exists in South Dakota
Dotted lines indicate functional areas or linkages not currently available in South Dakota

Figure 6. Commercial Vehicle Safety Administration Equipment Package Data Flow Diagram



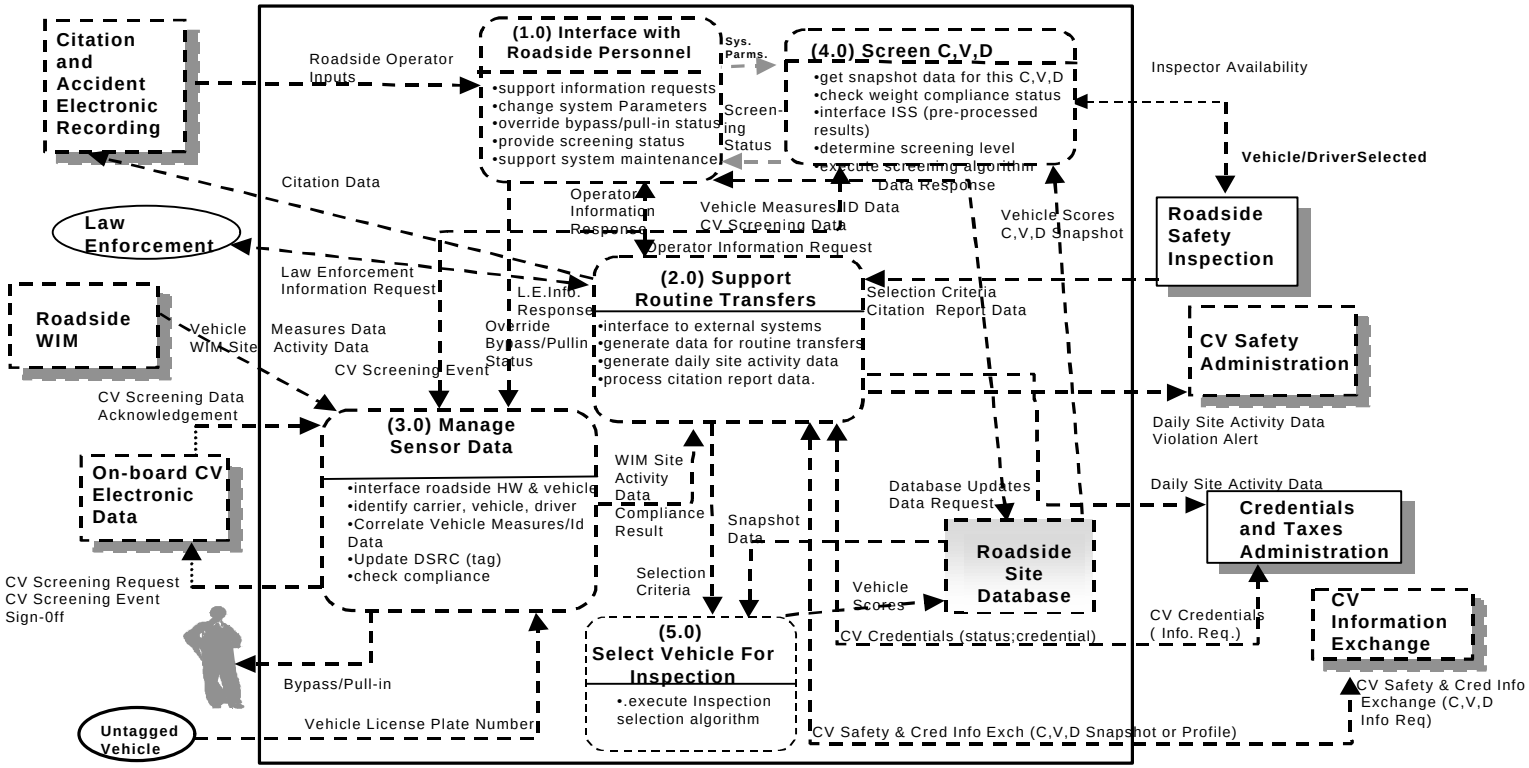
The Commercial Vehicle (CV) Safety Administration supports the processing and review of CVO safety information. This equipment package includes state, regional, and national public functions associated with CVO safety information utilization.

Figure 7. Commercial Vehicle Information Exchange Equipment Package Data Flow Diagram



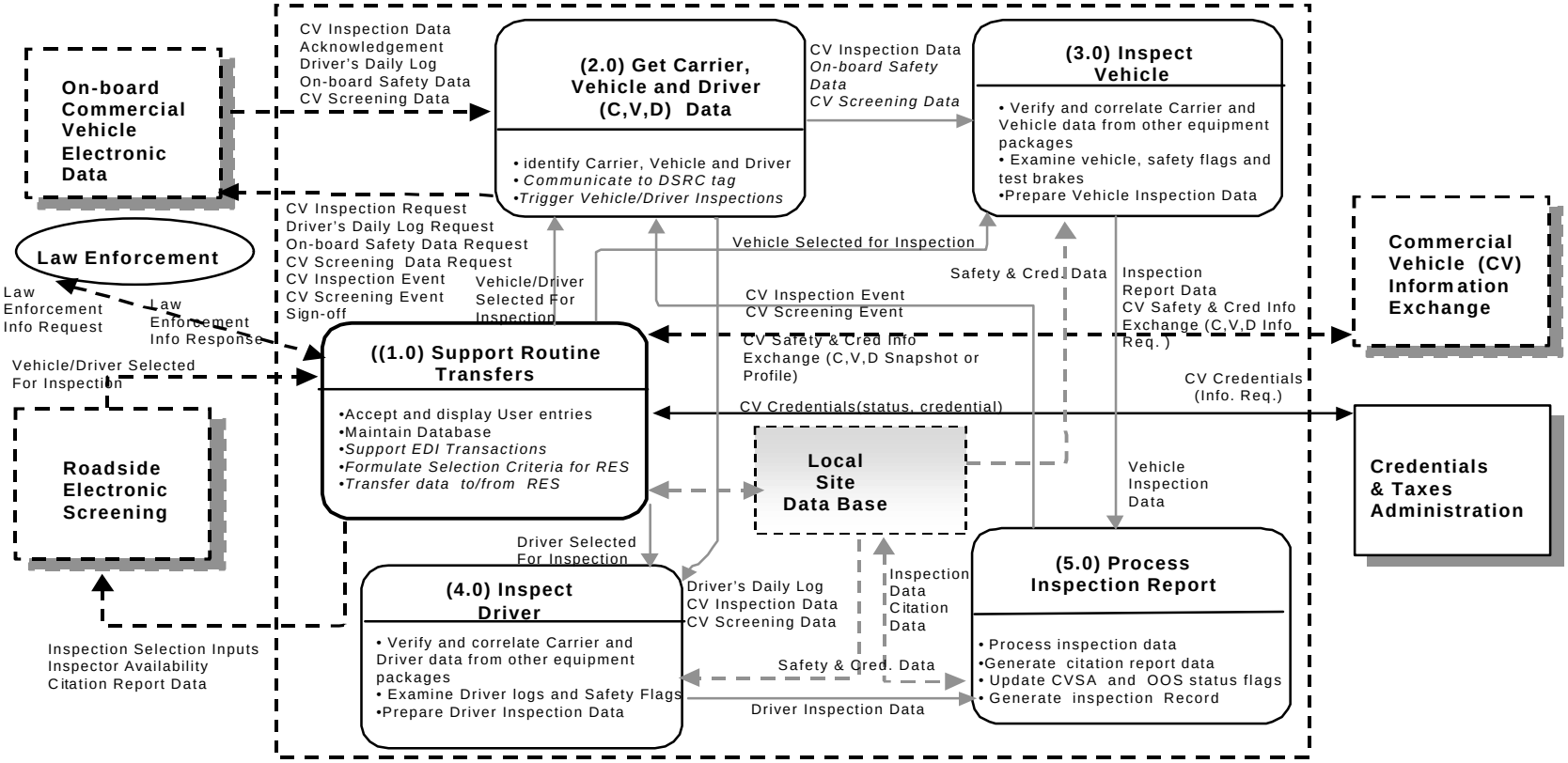
The Commercial Vehicle Information Exchange (CVIE) equipment package collects safety and credential information related to carriers, vehicles and drivers from various authoritative sources; unifies and assembles that data, and provides it (where allowed by privacy laws) to jurisdictional agencies, enforcement personnel, industry related organizations, and the general public. This equipment package provides a service for transferring safety inspection information from the roadside to the relevant state/province or national safety administrations.

Figure 8. Roadside Electronic Screening Equipment Package Data Flow Diagram



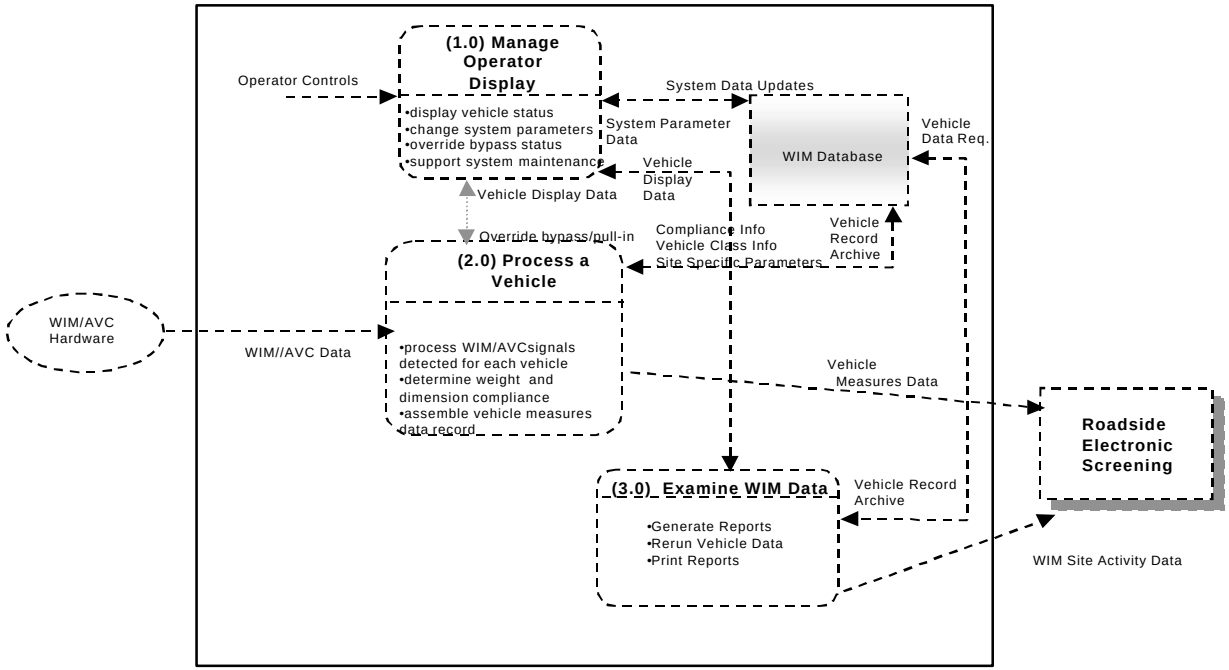
Roadside Electronic Screening (RES) Equipment Package is used by state enforcement personnel to (a) verify safe and legal commercial vehicles and allow them to bypass roadside electronic screening sites, and (b) identify illegal vehicles and those with higher safety risks and alert enforcement personnel.

Figure 9. Roadside Safety Inspection Equipment Package Data Flow Diagram



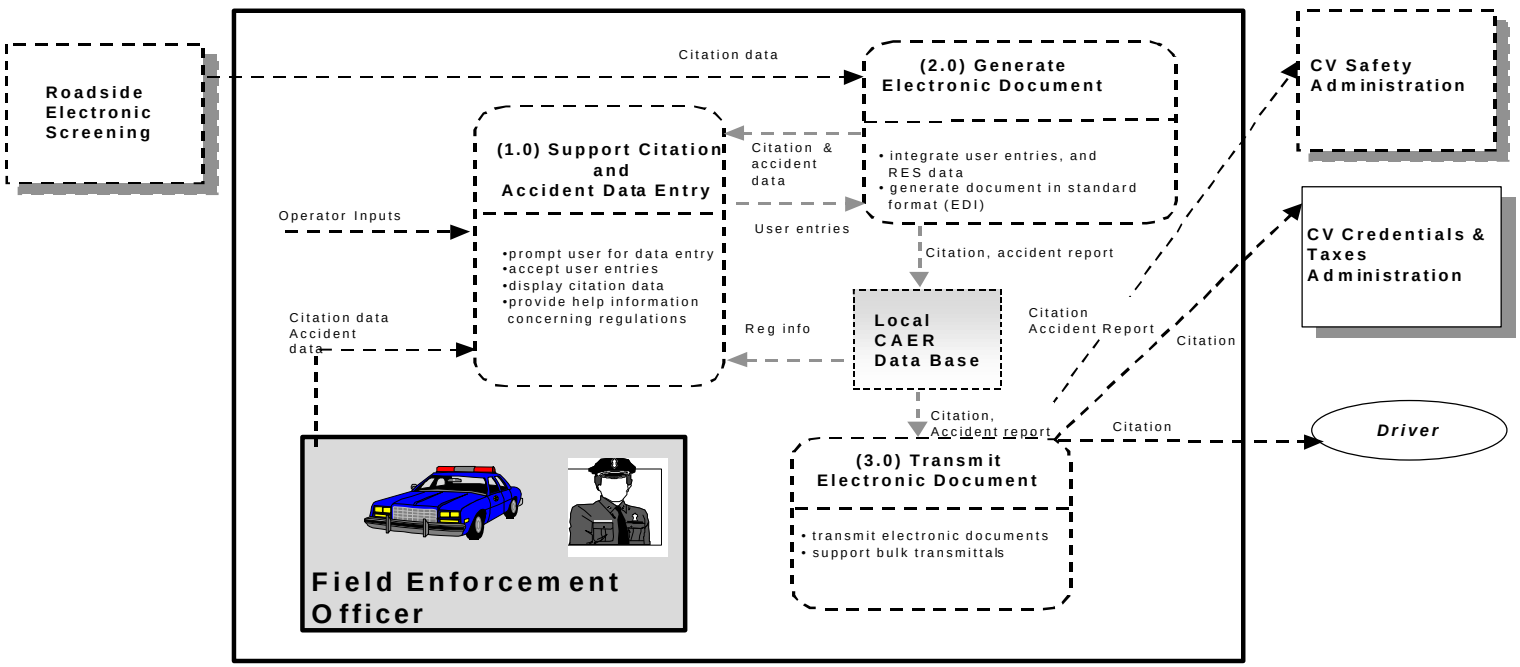
Roadside Safety Inspection (RSI) is used by roadside inspectors and law enforcement personnel to: (a) efficiently inspect commercial vehicles and drivers; (b) report inspection results electronically; (c) transmit citation report data. This equipment package description assumes that the Roadside Electronic Screening (RES) equipment package is co-located, and therefore the RES equipment package runs the Inspection Selection Subsystem (ISS) algorithm, and uses these results during the screening process. This equipment package would have to include ISS if it were not co-located with RES.

Figure 10. Roadside Weigh-In-Motion (WIM) Equipment Package Data Flow Diagram



Roadside Weigh-In-Motion (WIM) is used by a jurisdiction's enforcement personnel to monitor and enforce vehicle weights and dimensions. Additional screening will occur as a vehicle interacts with a complete Roadside Electronic Screening (RES) system.

Figure 11. Citation and Accident Electronic Recording Equipment Data Flow Diagram



Citation and Accident Electronic Recording (CAER) is used by roadside inspectors and law enforcement personnel to generate and transmit citations and accident reports electronically. CAER equipment packages reside at CV Check Roadside Subsystem fixed sites and mobile units. Citations and accident reports can be transmitted immediately (e.g., cellular link, network link) after an inspection or incident, or later as part of a bulk transfer.

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1 CONCLUSIONS

This study documented the ITS/CVO data architecture for the state of South Dakota. An information engineering methodology / framework was established to facilitate the data documentation. This framework allows a logical approach that defines different levels of detail in the data and process modeling and the outputs to be generated at each level. The documentation is intended to be a high level functional design that provides the basis for the development of a detailed architecture. The framework used is a high level modeling approach with some middle level elements. The framework also accounts for data flow and linkage between processes and data. ERwin and BPwin software are used in documenting the data and process models. These software are consistent with South Dakota's new information engineering standards.

A total of 15 CVO-related processes are identified. State agencies involved in CVO functions in South Dakota are: DOR, responsible for IRP, IFTA and vehicle titling and registration; DCR, responsible for commercial driver license; DOT and HP have a shared responsibility in issuing OS/OW permits; PUC, responsible for SSRS, interstate exempt and single trip permits; and HP, responsible for roadside operations which includes safety inspections and size and weight regulation enforcement. In addition, other agencies perform activities involving commercial vehicles, including DENR, responsible for hazardous waste materials transportation and spills and DOA, inspection of bulk milk trucks.

All motor carrier credentialing processes in South Dakota are currently paper based. The current computer and networking facilities are adequate for processing the credentials. However, the agencies performing the credentialing processes are not integrated or interfaced with each other to allow effective and efficient online data sharing and exchange. The PUC is noted to be the only credentialing agency that is not part of the statewide WAN and does not use mainframe applications.

Process and Data Models

In developing the process model, two graphical representations are developed for each business area. These are, hierarchical decomposition diagrams of processes (Node diagram), and data flow diagrams (DFD) showing details of the information flow for each process and sub-process. These diagrams are developed using BPwin. These diagrams are developed for IRP, IFTA, Vehicel Title and Registration, OS/OW permitting, Accident Recording, Judicial Support, Roadside Operations, Commercial Driver Licensing, SSRS, Interstate Exempt, Single Trip Permit, Compliance Reviews and Hazardous Waste Materials Transportation and Spills. These diagrams describe the data flow for all processes, the databases needed to perform the processes and the external agencies or organization that interact with the primary agency.

Entity relationship diagrams are developed for key data entities using ERwin software. Ten key data entities are identified as those that recur in multiple business area processes and are

fundamental to CVO. These include, carrier, driver, vehicle, roadside inspections, trip, account, audit, IRP filing, insurance and tax return entities. The data model establishes data entities, needs, and requirements for use by all major CVO information users. ERD is a high level data model in information systems architecture and depicts data description from the owner's perspective. The ERDs show the major components associated with each key business data entity.

Interaction matrices

A CRUD matrix is developed that maps the business area processes to the subject areas. The subject area represents a grouping of information used in the performance of business area processes. The CRUD matrix shows data dependencies between the processes and subject areas (data). The CRUD matrix clearly shows which areas operate independently of other agencies or organizations and which agencies do interact with other agencies in performing their CVO functions. The matrix provided a means to easily identify the missing links in developing an integrated system.

The study also identified the organizational responsibilities for processes. These organizational responsibilities are identified as performing process (PE), setting policy for that process but not performing the process (PO), providing support function (SU) for the process, and setting policy and performing the process (BO). Such delineation of responsibilities are captured by developing an process-organization matrix. In general, state agencies operate independently of each other with little or no interaction with other agencies.

Current systems assessment

This study assessed the current systems. This included identification of the hardware, software, mainframe, and PC-based applications, and external systems as well as linkage and communication mechanisms that support CVO processes. Adequacy of current systems to support CVO processes was determined and any potential problems relating to CVISN systems deployment were identified. These problems are expected to guide the improvement of the systems and also help identify and prioritize suitable CVISN elements to be deployed in South Dakota. It was noted that the current systems are generally adequate for performing CVO processes under the present conditions. Data exchange and transfer facilities among agencies are however lacking. For some business areas and processes, a number of potential problems are identified in terms of CVISN deployment. For example, problems of interfacing, integrating and data sharing facilities among agencies involved with credentialing processes are identified. Roadside operations currently rely on the State Radio to access credentials information on carriers, vehicles and drivers. While this approach is cumbersome, poor radio reception in certain areas of the State makes it ineffective.

CVISN compatibility

CVISN architecture top-level design templates and equipment packages are used as templates to summarize the data gathered in the study. The purpose is to gauge current systems' compatibility and identify areas of focus in developing and deploying CVISN systems. The

following conclusions can be drawn on the compatibility of the current systems with the CVISN systems.

Top-level design templates – These templates reflect the major functions that support CVO in South Dakota and illustrate which functions currently exchange information. They also serve as starting points in developing operational scenarios and system interfaces. These templates can also be used to verify the physical connectivity between systems and identify bottlenecks for CVISN systems deployment.

Credentials and Taxes Administration – All processes under this functional area are currently performed in South Dakota except those that are electronic in nature. This applies to each credential processed and issued for CVO in South Dakota (e.g., IRP, IFTA, SSRS, CDL, OS/OW permits). There is no connectivity or interface for online access between roadside support functional area and the agencies.

Commercial Vehicle Safety Administration – Apart from the conduct of compliance reviews, none of the activities under safety administration are currently carried out in South Dakota. Analysis of safety data is however performed using national safety databases and programs such as MCMIS and SAFESTAT. There is no online connectivity between the credentials and taxes administration functional area and the management of safety data functional area.

Commercial Vehicle Information Exchange – This functionality is not currently available in South Dakota.

Roadside Electronic Screening – South Dakota does not have the facilities for roadside electronic screening.

Roadside Safety Inspection – Inspection Selection Subsystem (ISS) algorithm is used for screening vehicles for inspection. Electronic processes that are currently performed include the use of ASPEN and ISS. Other processes are currently not performed in South Dakota.

Roadside Weigh-In-Motion – WIM installations are currently not used in roadside operations in South Dakota.

Citation and Accident Electronic Recording – In South Dakota, accident record and citation processing are not electronic.

8.2 DATA COLLECTION PROBLEMS

No major problems were encountered during the data collection phase of this project. The on-site in-person interview approach greatly facilitated the data collection process. The technical panel's support and assistance in reviewing draft data summaries were helpful in ensuring that data are accurately captured and presented. The technical panel's knowledge and understanding of the subject area was found to be critical in facilitating communication with the consultants and in documenting the data architecture.

8.3 RECOMMENDATIONS

The following recommendations focus on CVISN deployment in South Dakota.

- Link CVO agencies and databases to facilitate data exchange among credentialing processes. Integrate or interface all business areas that process and issue motor carrier credentials to allow access to credentialing databases. Within the DOR, this will include interfacing IRP with IFTA. The databases of Department of Revenue (DOR), DCR, PUC, and DOT need to interface with each other. This effort will be part of the overall CVISN deployment in South Dakota.

- Currently, PUC is the only business area that relies solely on PC-based applications for processing and issuing SSRS, interstate exempt, and single trip permits. In addition, PUC is not part of South Dakota's WAN. It is therefore recommended that a first step in interfacing or integrating credentialing legacy systems is to have PUC as part of the WAN. Secondly, a number of agencies are currently upgrading their computer systems and software for Y2K compliance. It is therefore important to carry this upgrade consistently in all agencies to ensure compatibility.

- Ensure compatibility and interoperability of credentialing systems. Hardware, operating platforms and software used by various state agencies should be compatible and interoperable in order to facilitate interfacing and integration. This is required to facilitate data exchange among state agencies and with other jurisdictions. As various state agencies upgrade their individual systems, compatibility and interoperability should be the guiding principles in the choice of systems.

- Interface roadside operations and credentialing processes in order to facilitate safety information exchange and enhance efficiency and effectiveness in roadside operations. This interface would allow enforcement officers easy access to carrier, vehicle, and driver credentials information. Currently, enforcement officers obtain such information through the State Radio. Poor radio reception in certain areas of the State also makes data access inefficient. Improvements in data exchange for roadside operations should be given immediate attention. Current research on automated routing and permitting should be coordinated with other roadside inspection needs.

- Undertake a detailed assessment of the identified CVISN-related problems and compatibility issues. The problems identified in this study need further evaluation in terms of improvement, re-engineering, costs, and resources, as well as short- and long-term effects. This assessment will determine the magnitude of each problem and how it impacts the deployment of CVISN systems. The results of this assessment are expected to influence the selection and prioritization of potential CVISN elements. For example, it will be necessary to explore the communication linkage problem between roadside and administrative processes to identify potential alternative solutions.

- Evaluate the alternative CVISN element options based on experiences of the pilot states. This study reviewed the various CVISN elements being deployed in the 10 pilot states for

all functional areas (administrative processes, safety information exchange, and roadside screening). The suitability of any given element should be evaluated in terms of local regulatory environment, current levels of ITS/CVO-related technology deployment and projects, weather, truck traffic conditions, enforcement practices, data access and exchange practices. This evaluation also must consider compatibility with national and regional ITS/CVO initiatives.

- Initiate a detailed data architecture that is CVISN compatible. This study is a high-level architecture that documents the current state of affairs in terms of CVO business areas, processes, databases, linkages, data-process interactions, organization-process interactions, and the systems used by each agency and for each process. This study also identifies the system's deficiencies in terms of CVISN deployment. The detailed architecture will prescribe how the systems will be linked. The detailed architecture will evolve as new systems are deployed and installed.

- Use the deficiencies identified in the CVISN equipment package templates to guide the selection and development of CVISN elements. These templates clearly show linkages and processes that are currently not performed or supported by current systems in South Dakota. The focus area(s) for CVISN deployment should be based on the strengths and weaknesses of current systems to support the various CVISN equipment packages.

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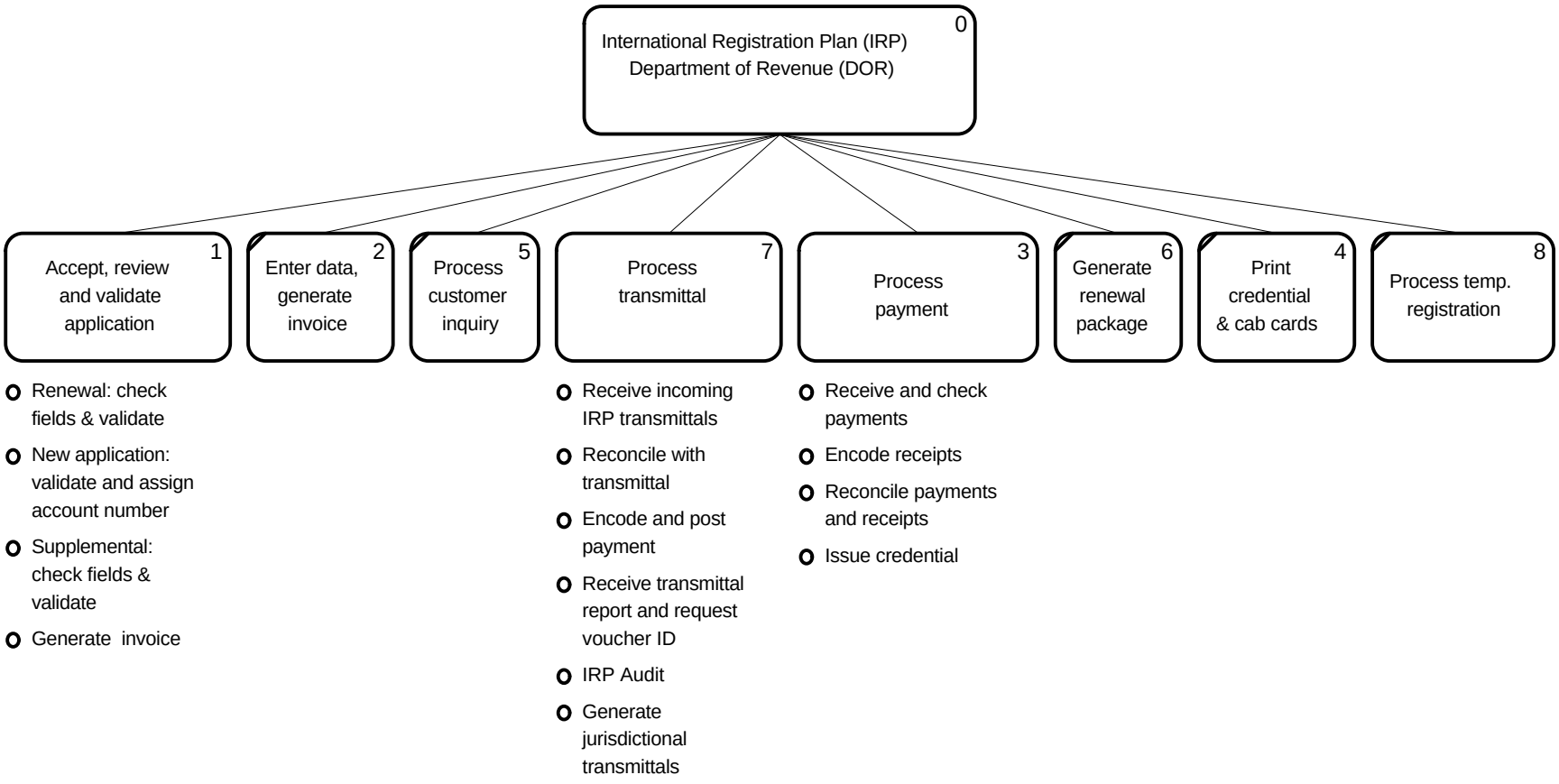
Appendix A – Process Model Diagrams

For each process, two graphical representations are developed:

(a) node diagram or hierarchical decomposition diagram, and
(b) data flow diagrams (DFD).

The processes are:

1. International Registration Plan (IRP)
2. International Fuel Tax Agreement (IFTA)
3. Vehicle Title and Registration
4. Commercial Driver License (CDL)
5. Single State Registration System (SSRS)
6. Interstate Exempt
7. Single Trip Permitting
8. Oversize / Overweight Permitting
9. Accident Records Reporting
10. Roadside Operations
11. Unified Judicial System
12. Compliance Review
13. Hazardous Waste Transportation & Hazardous Materials Spills
14. Milk Bulk Truck Inspection



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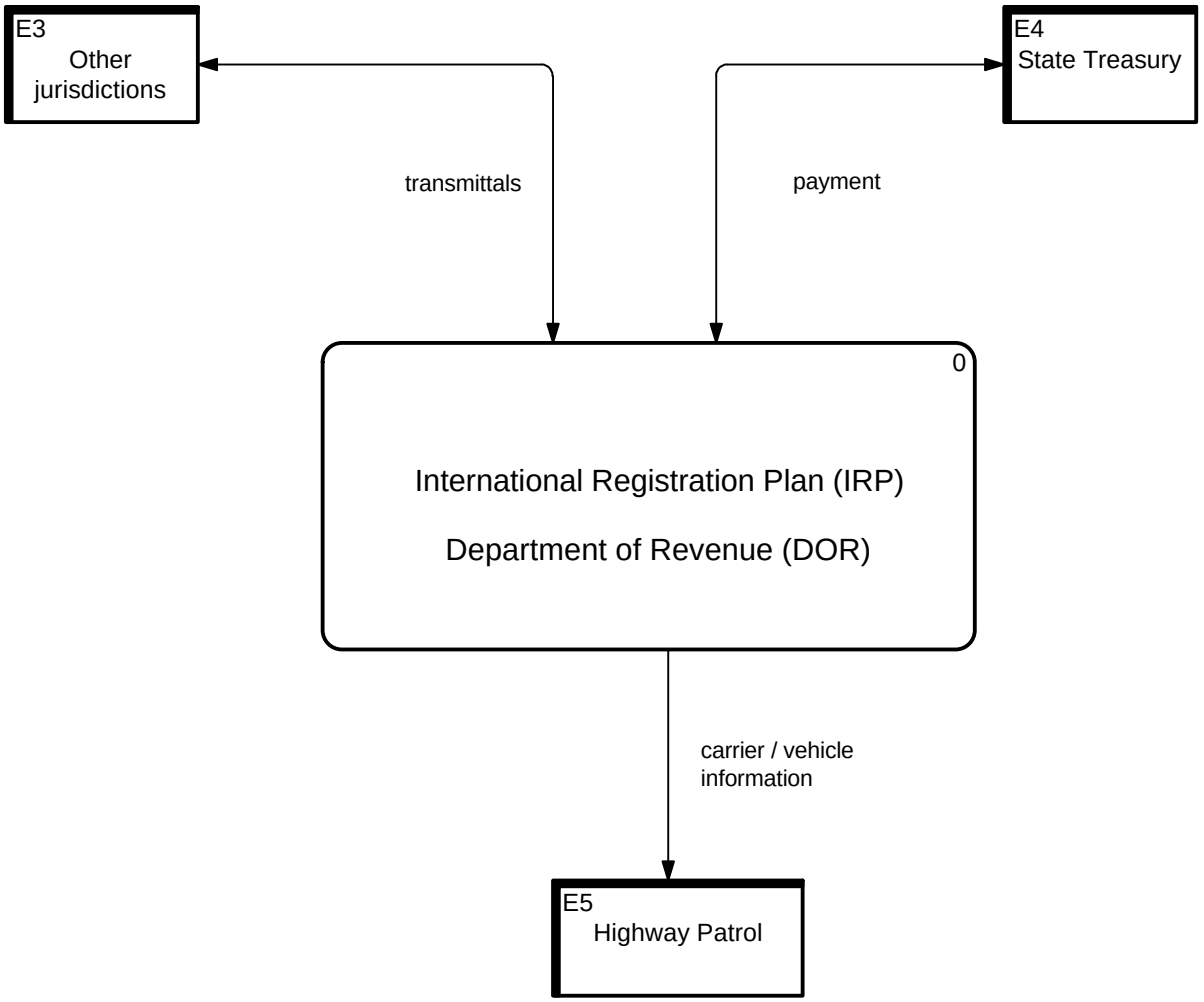

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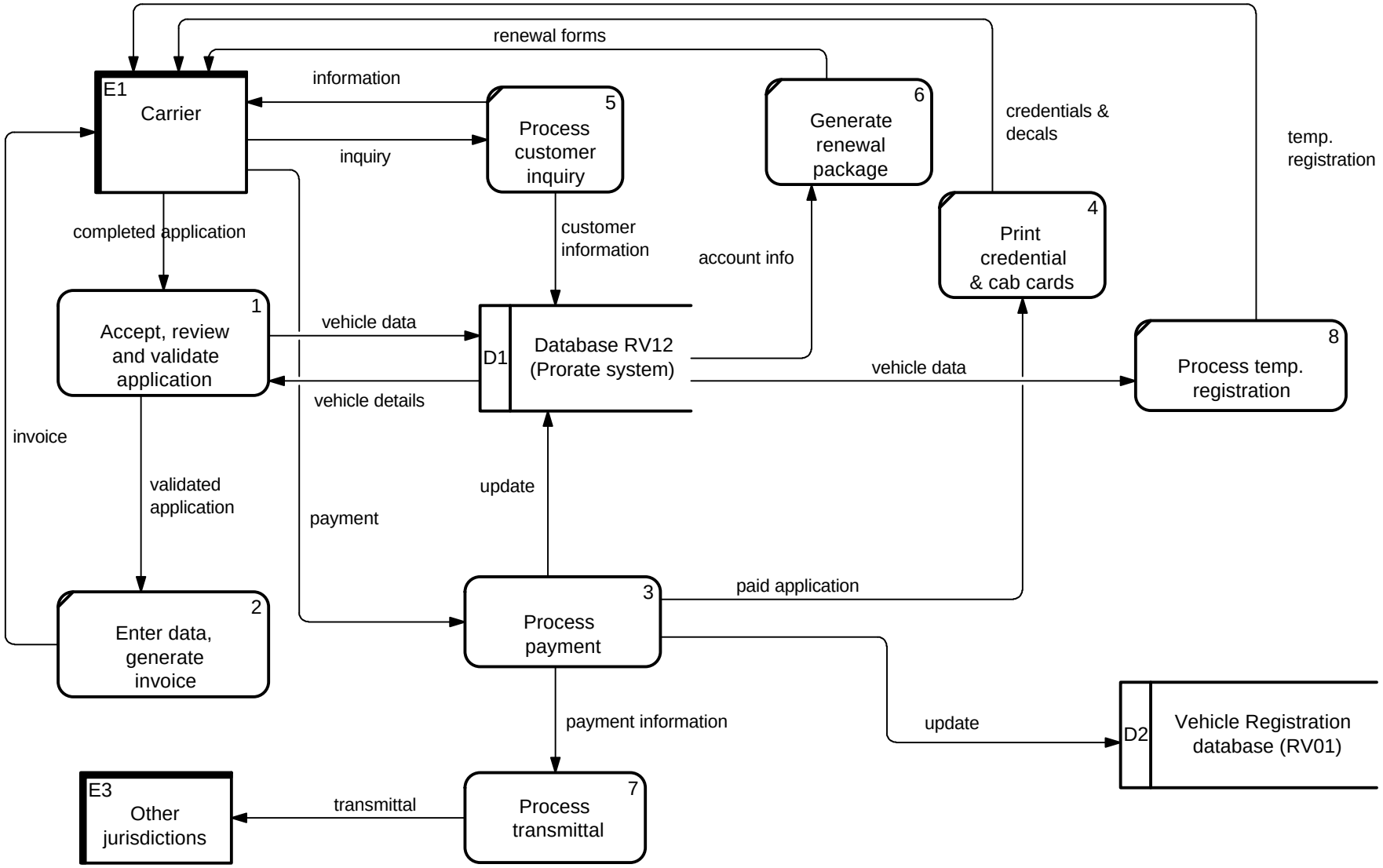

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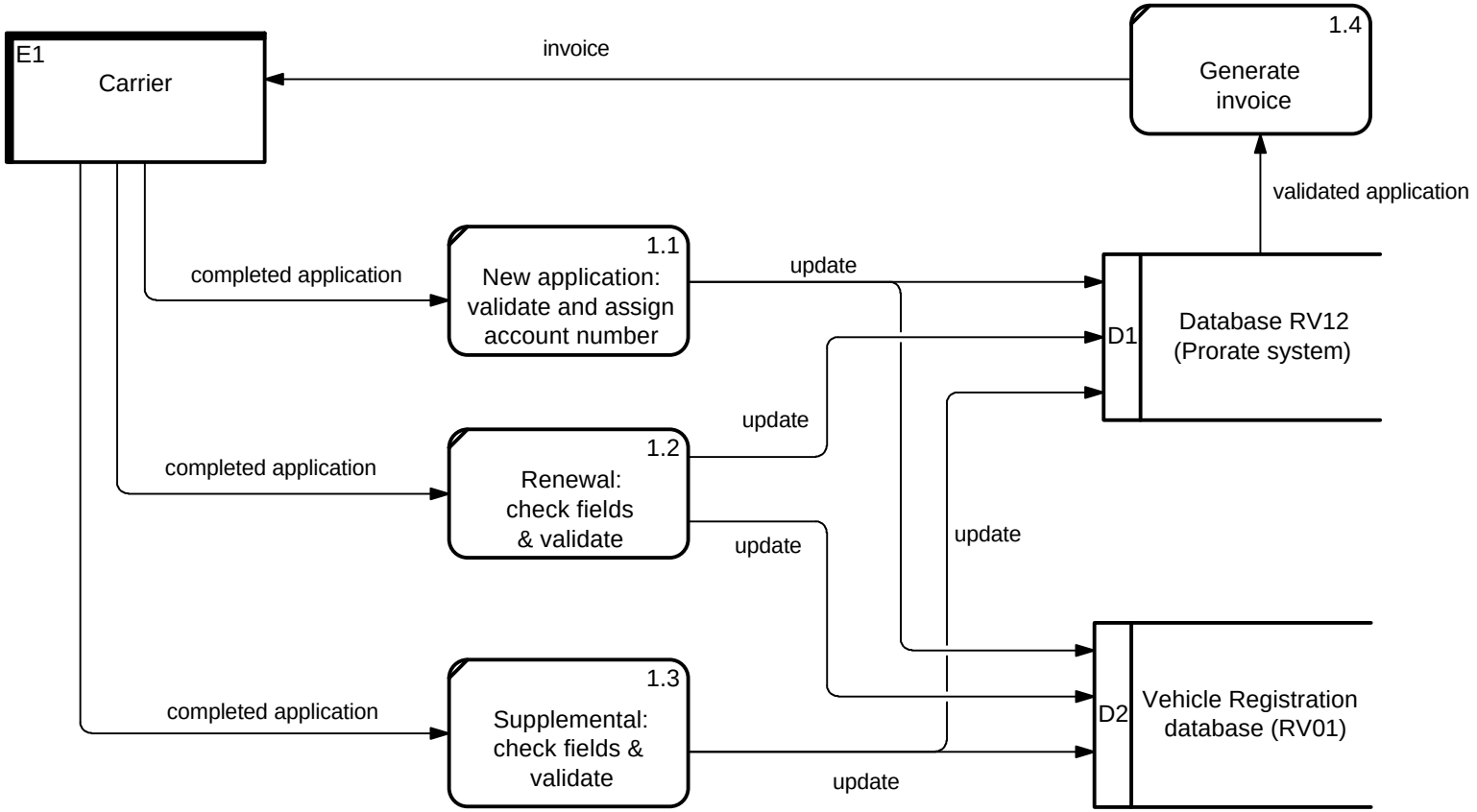

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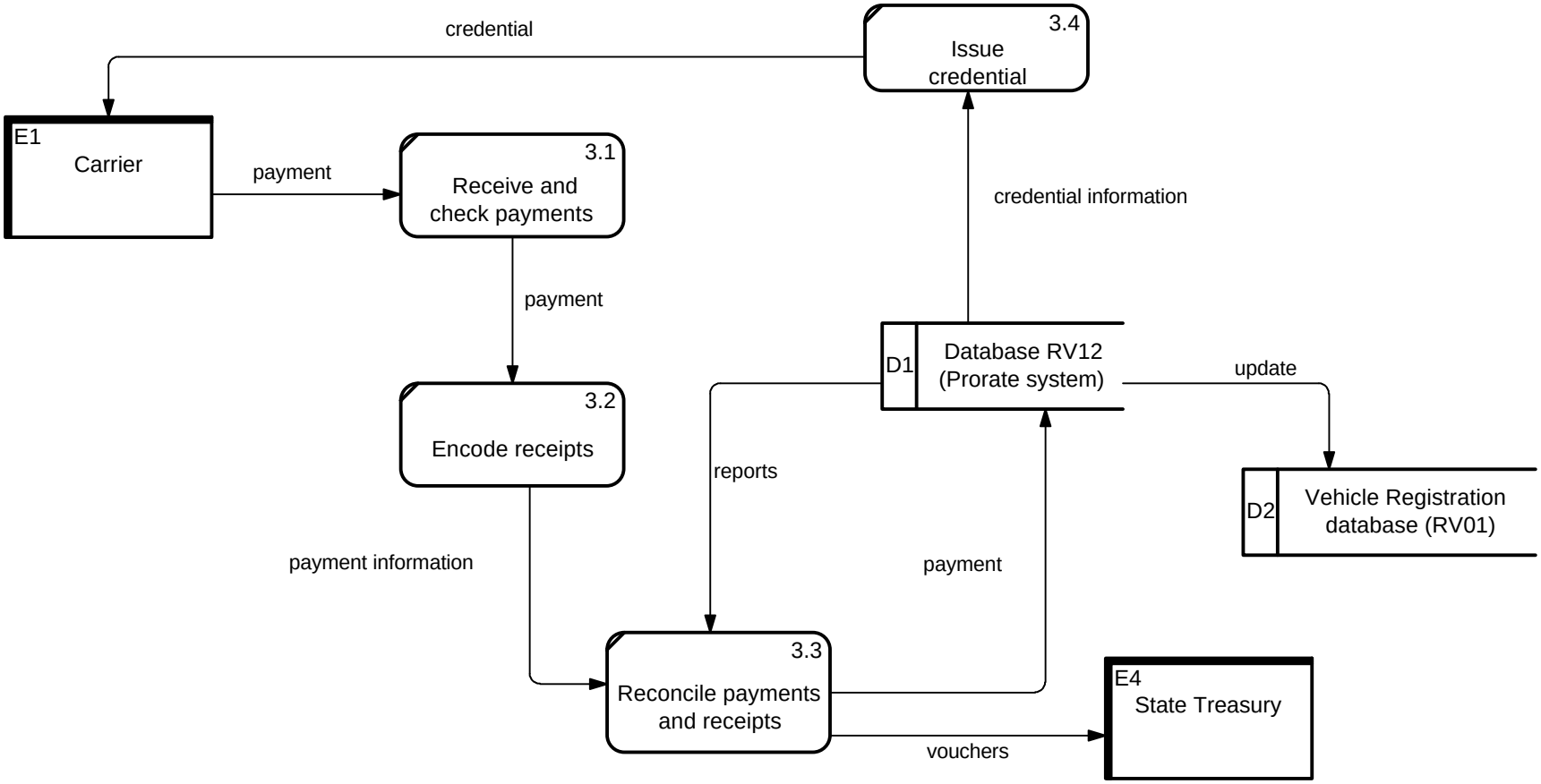
A1	Accept, review and validate application	



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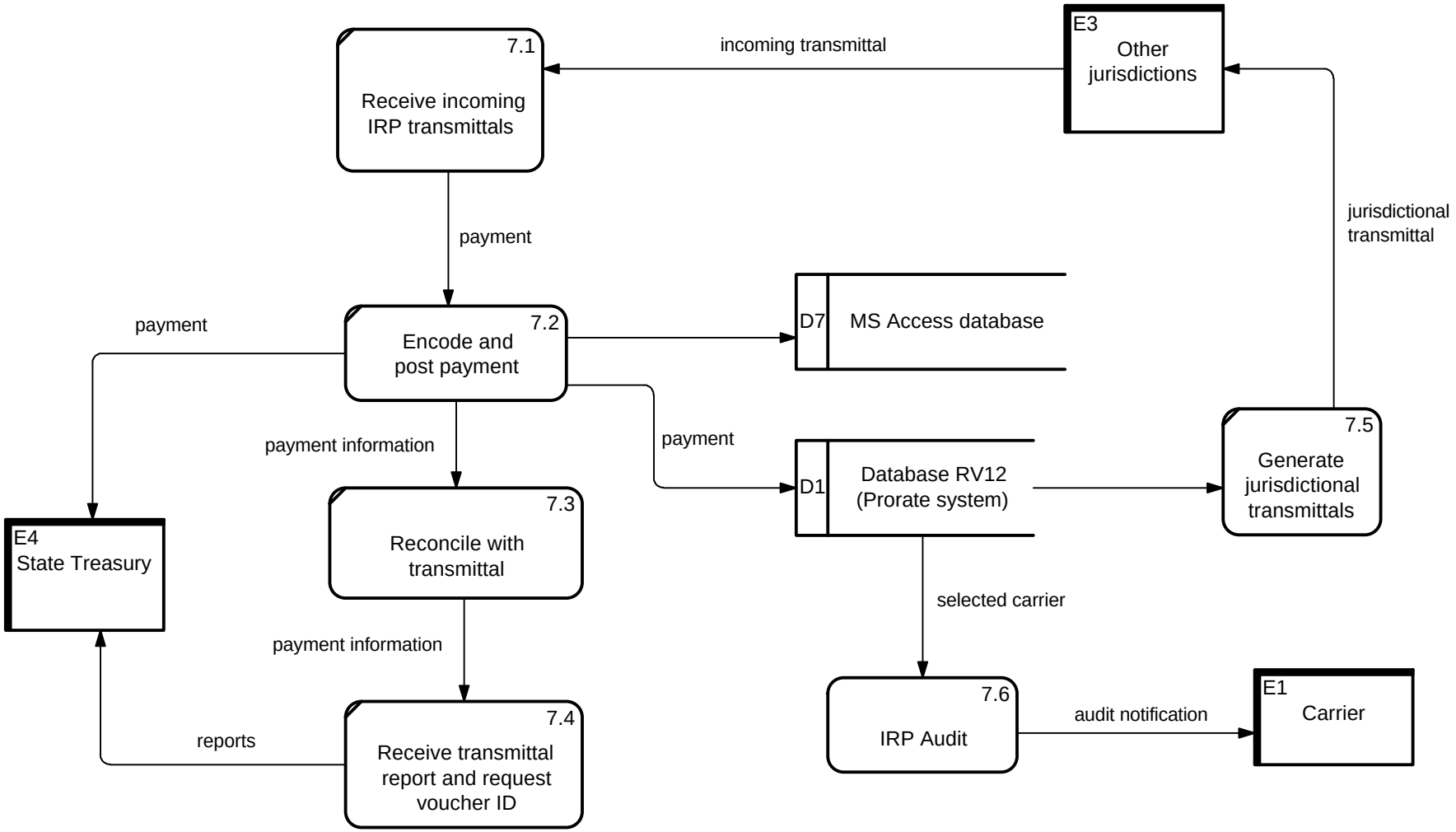

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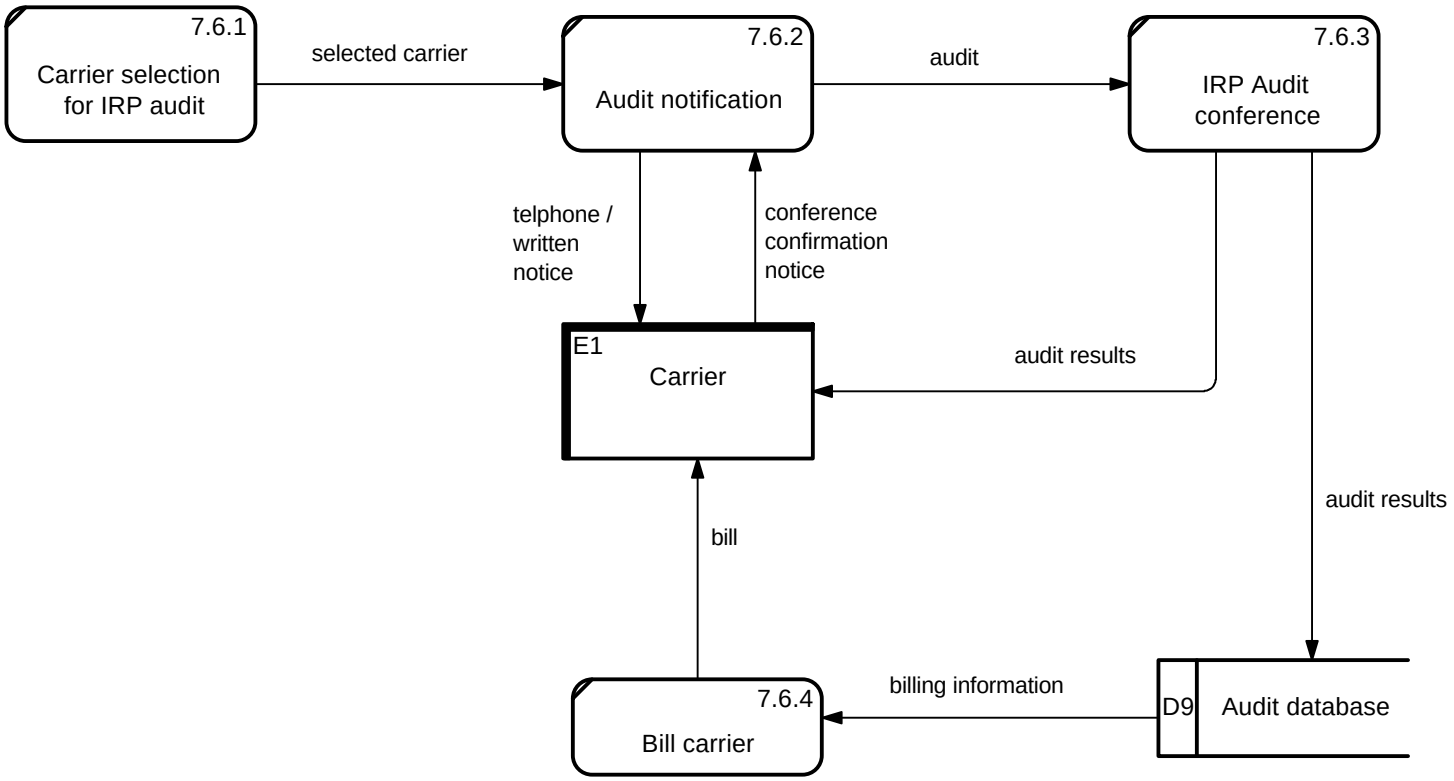
A7	Process transmittal	



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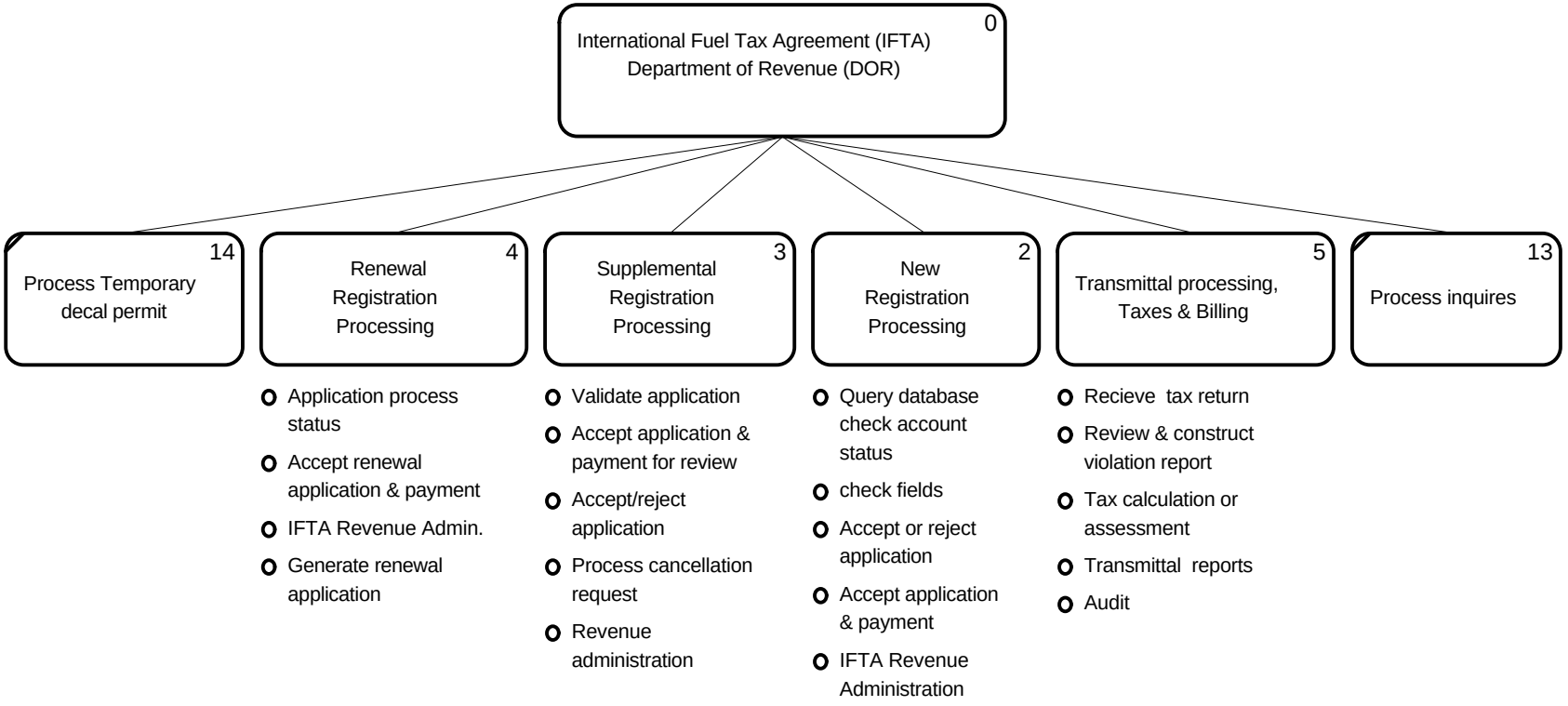

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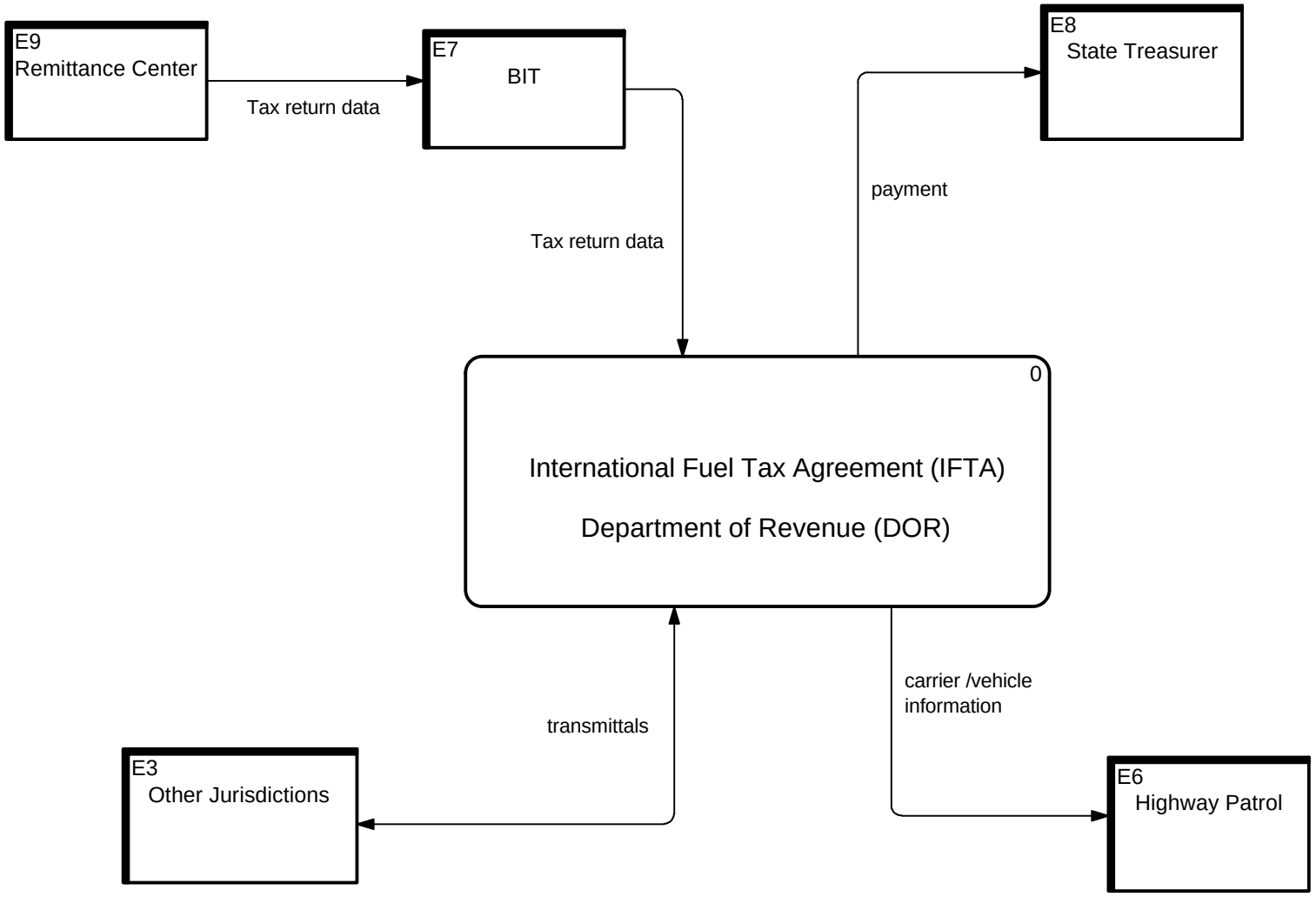
A0	International Fuel Tax Agreement (IFTA) - Department of Revenue	



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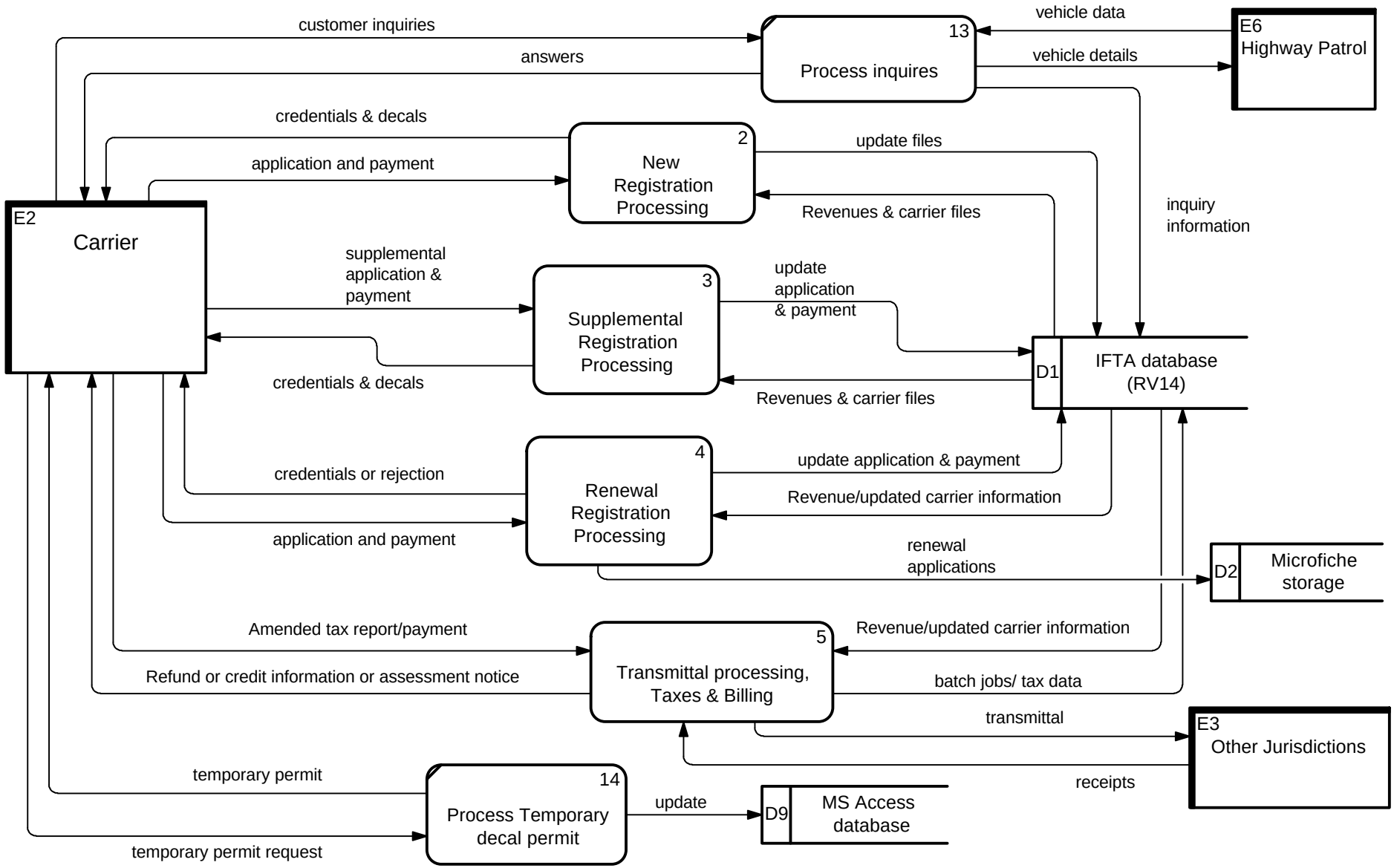

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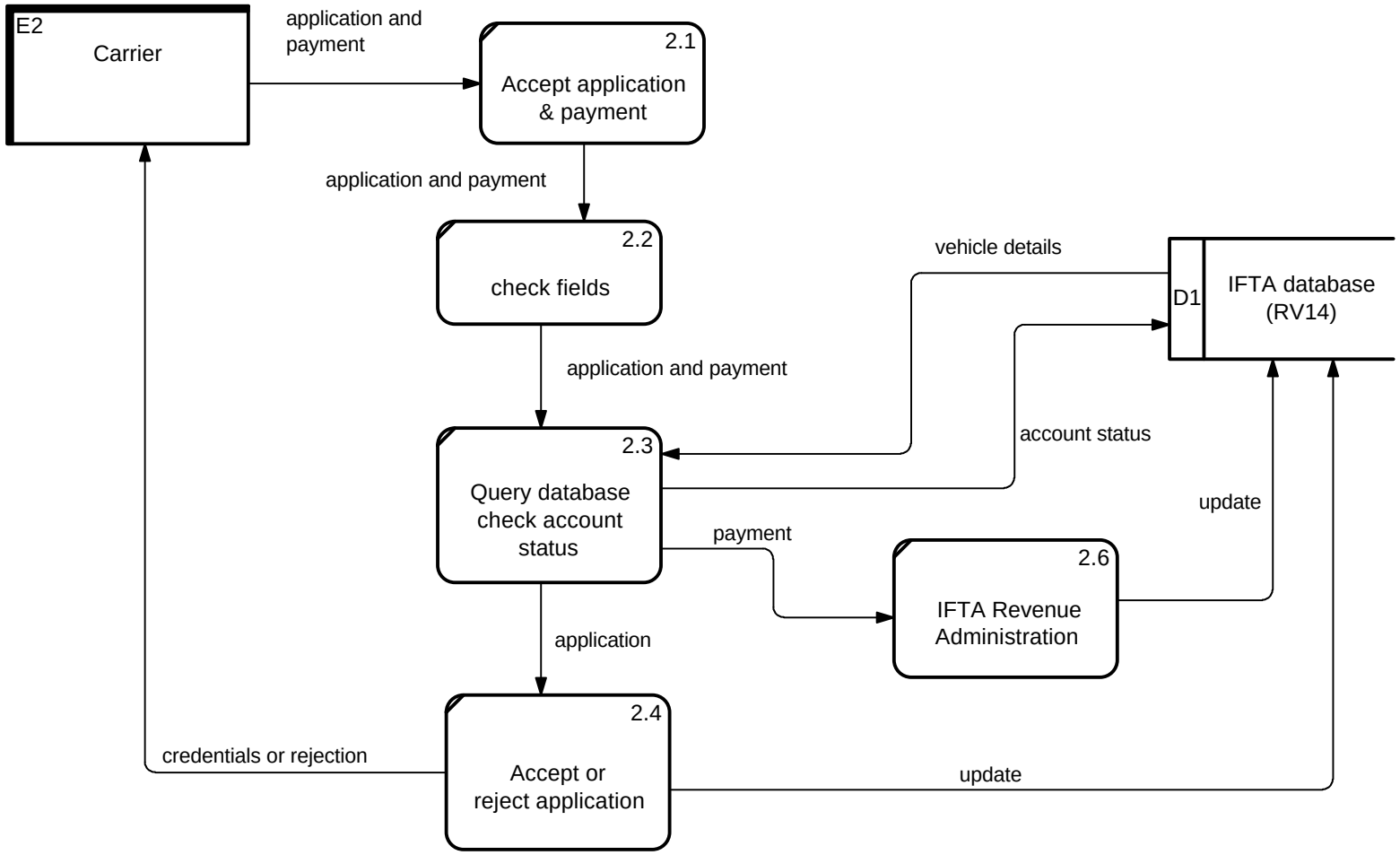

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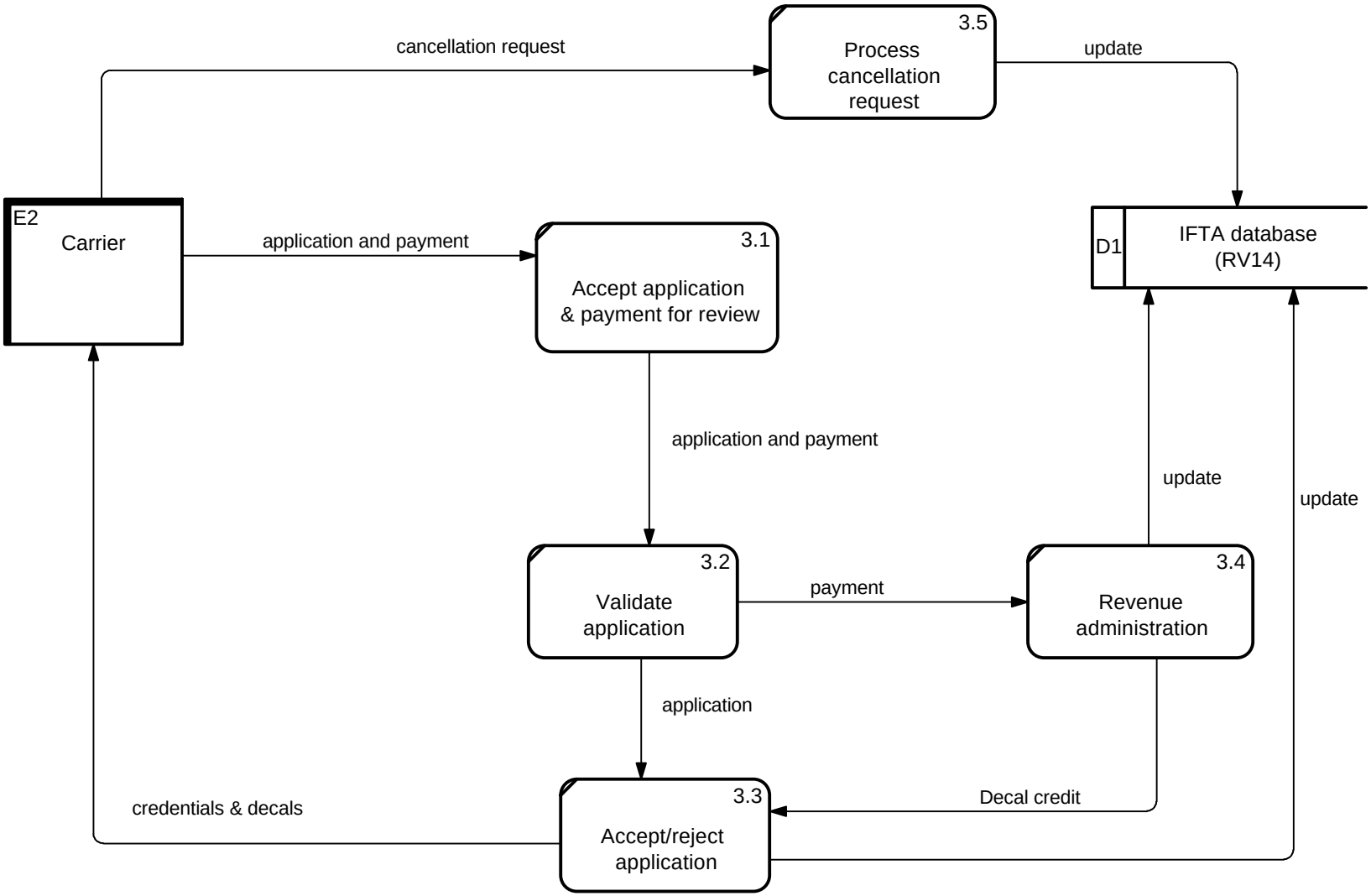

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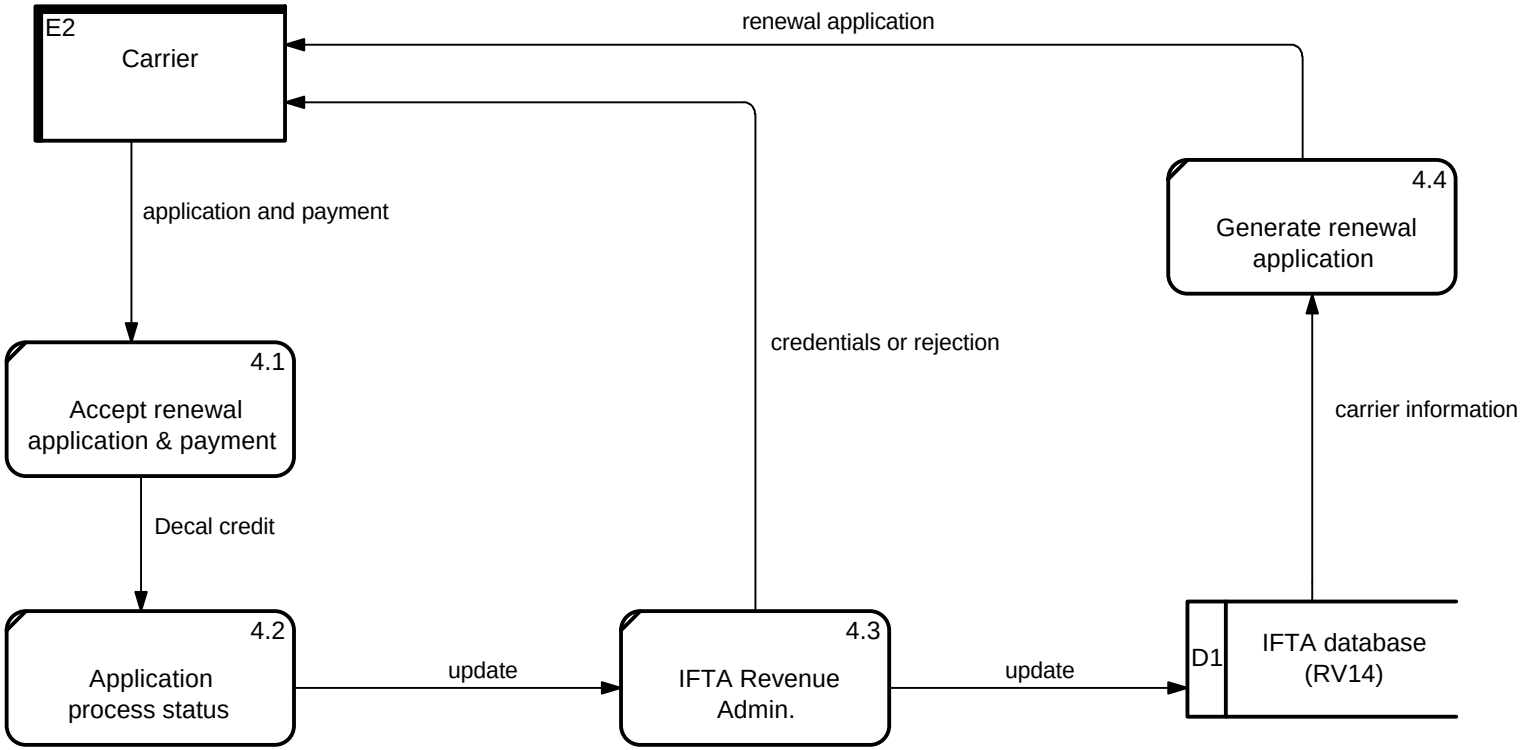
A3	Supplemental Registration Processing	



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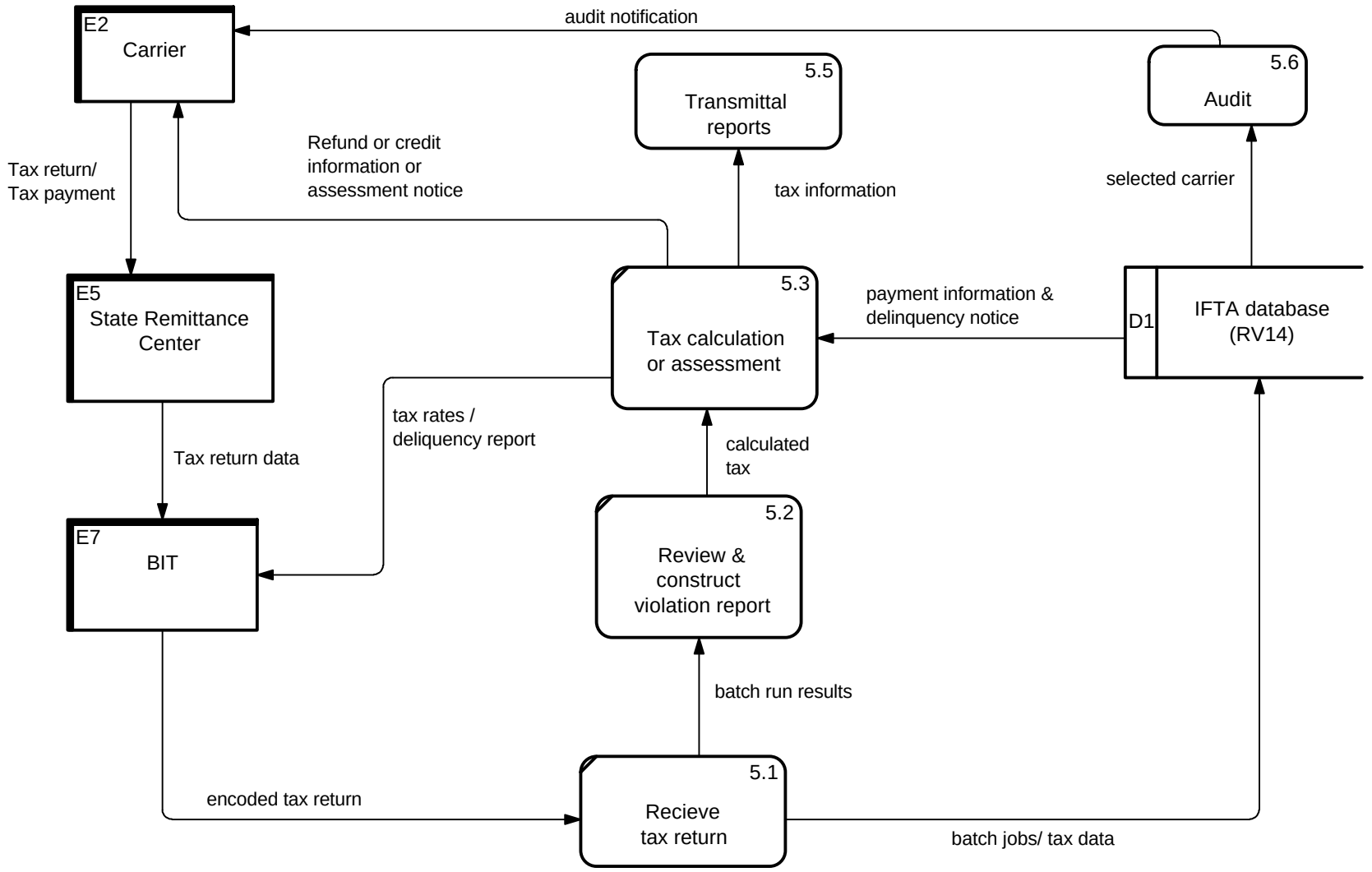
A4	Renewal Registration Processing	



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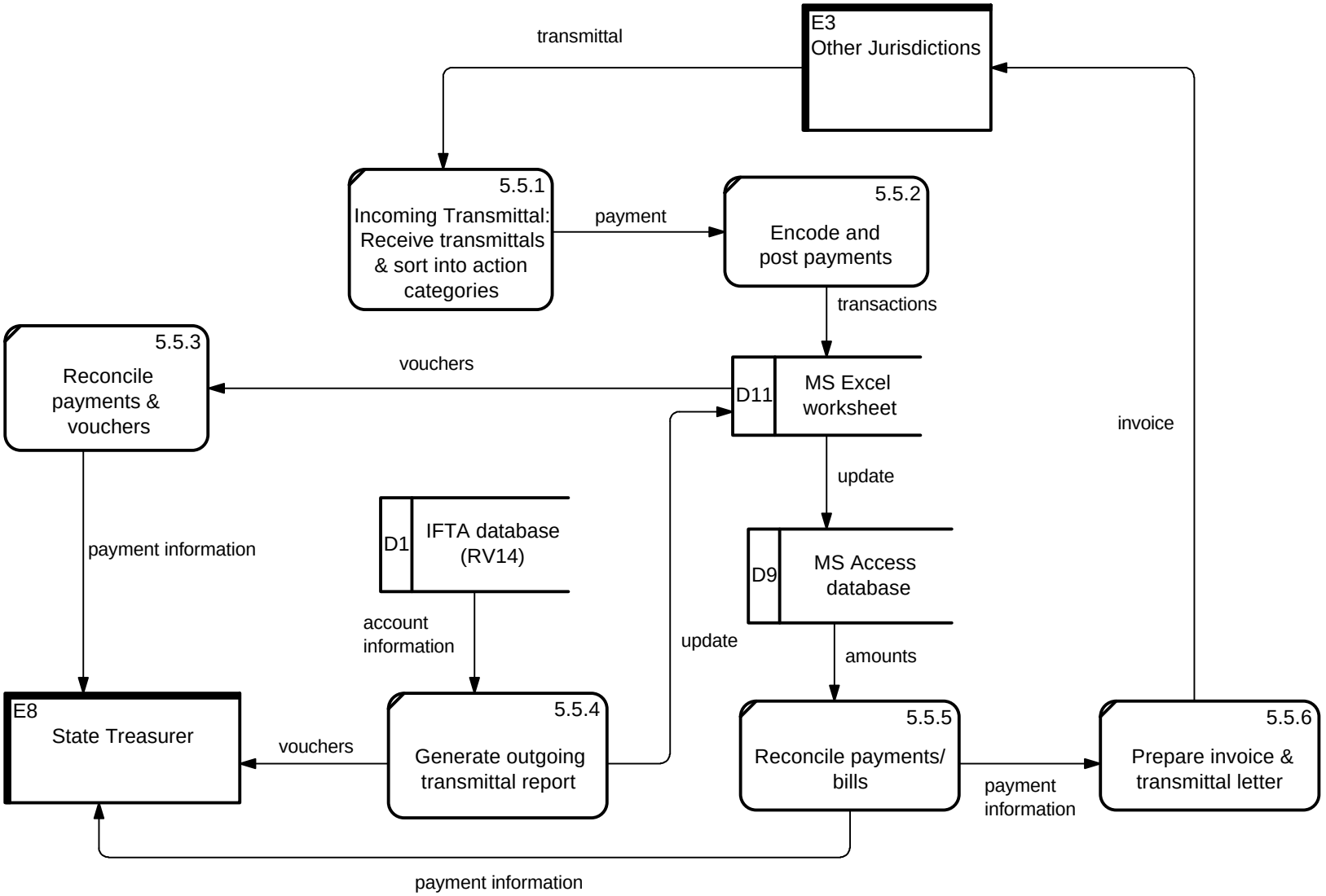
A5	Transmittal processing, Taxes & Billing	



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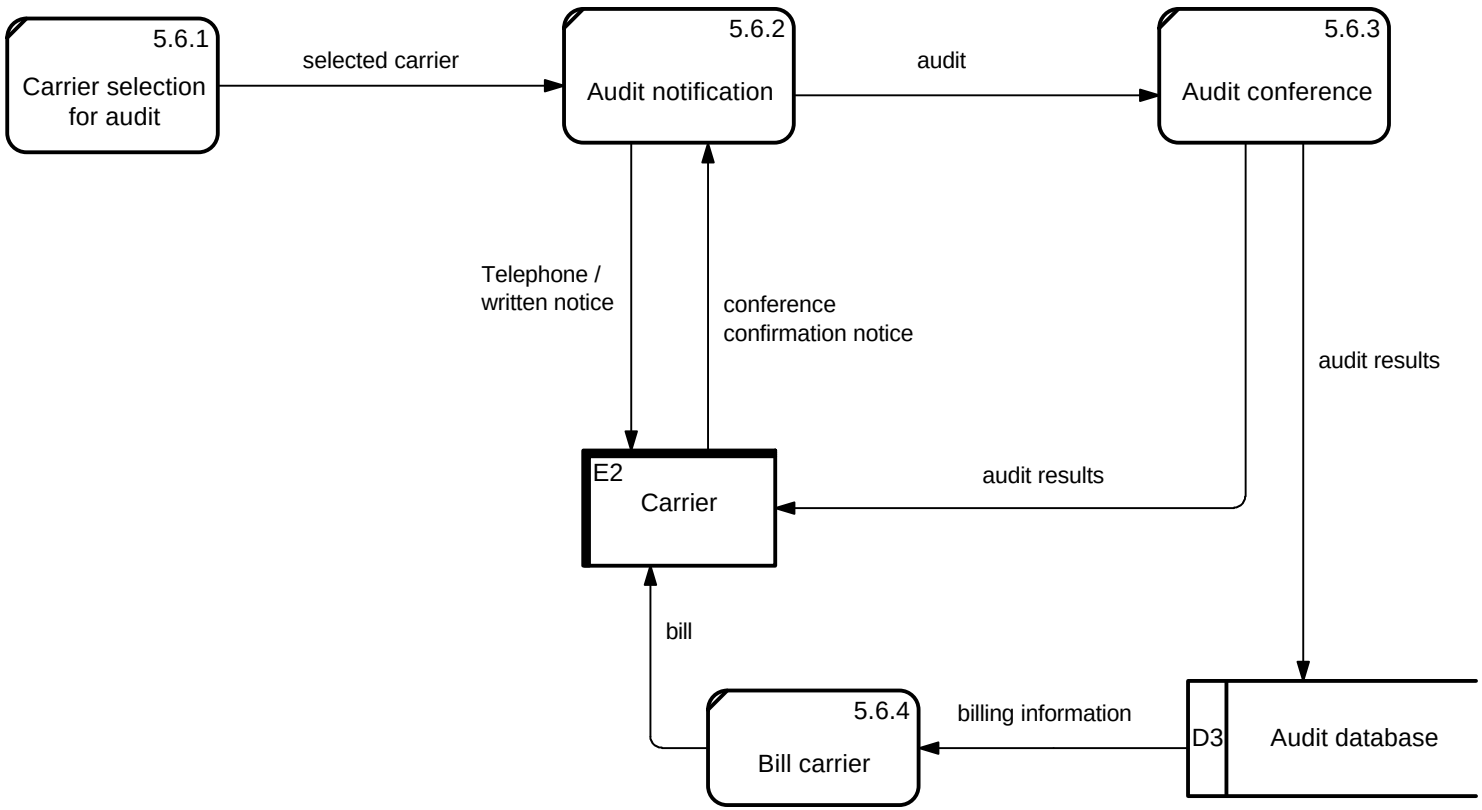

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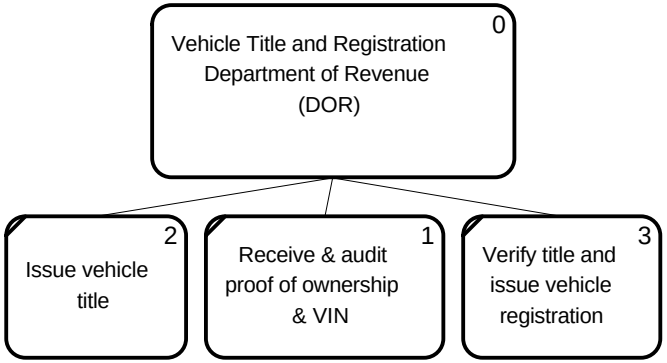
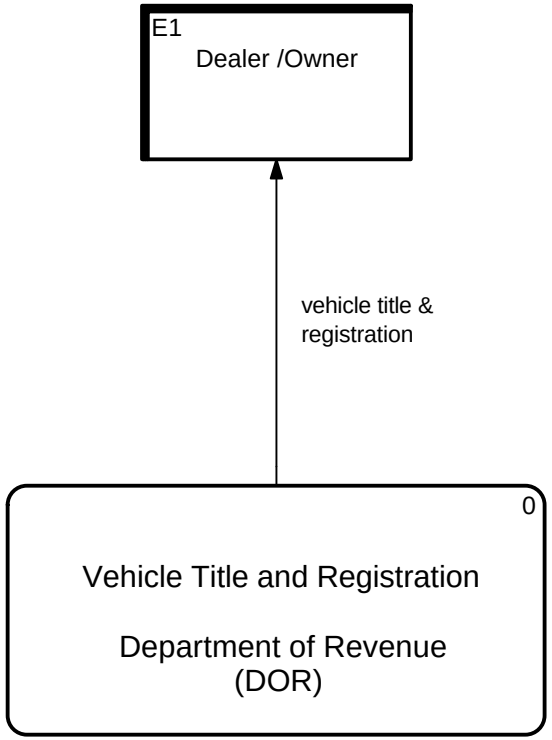


NODE:	TITLE:	NUMBER:
A0	Vehicle Title and Registration - Department of Revenue (DOR)	



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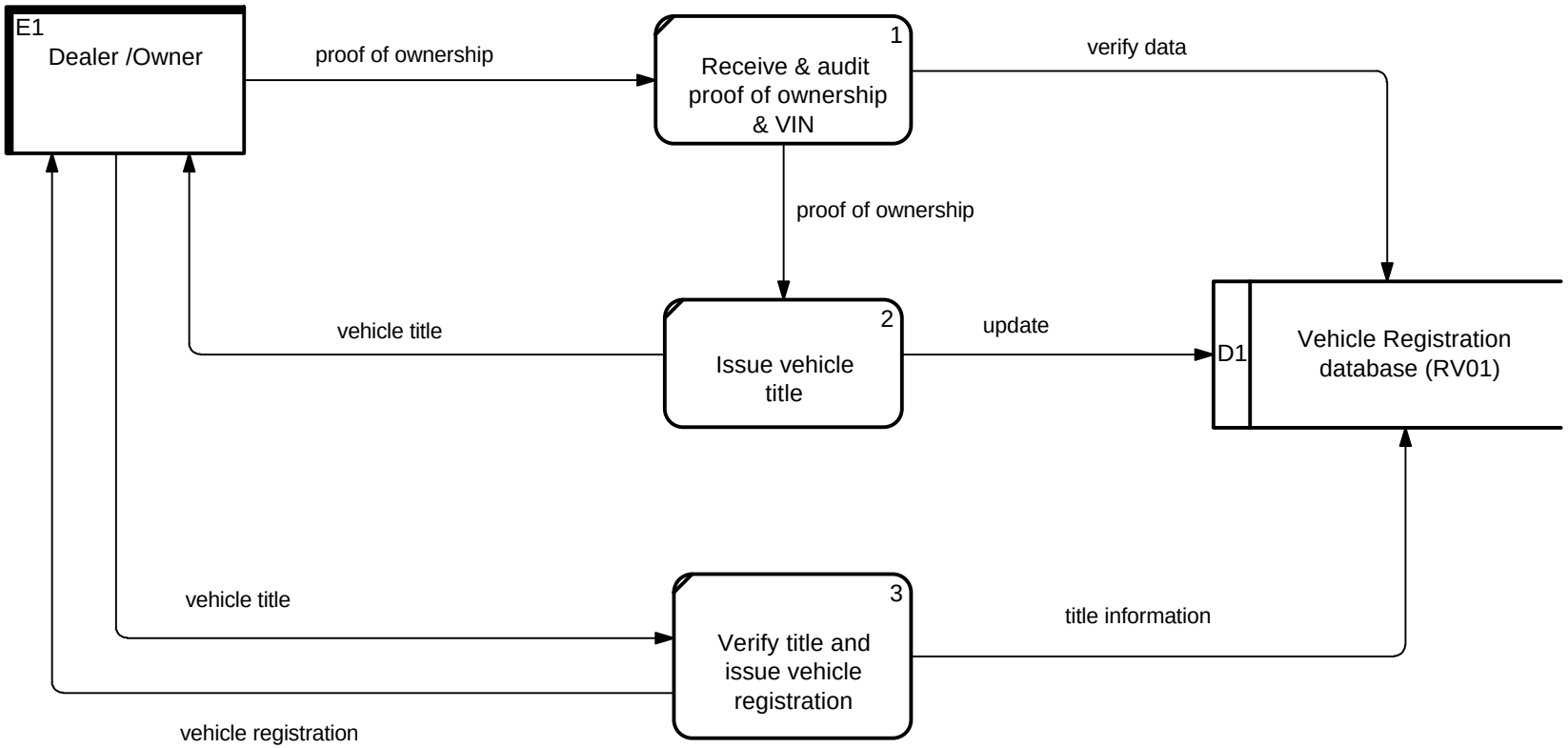

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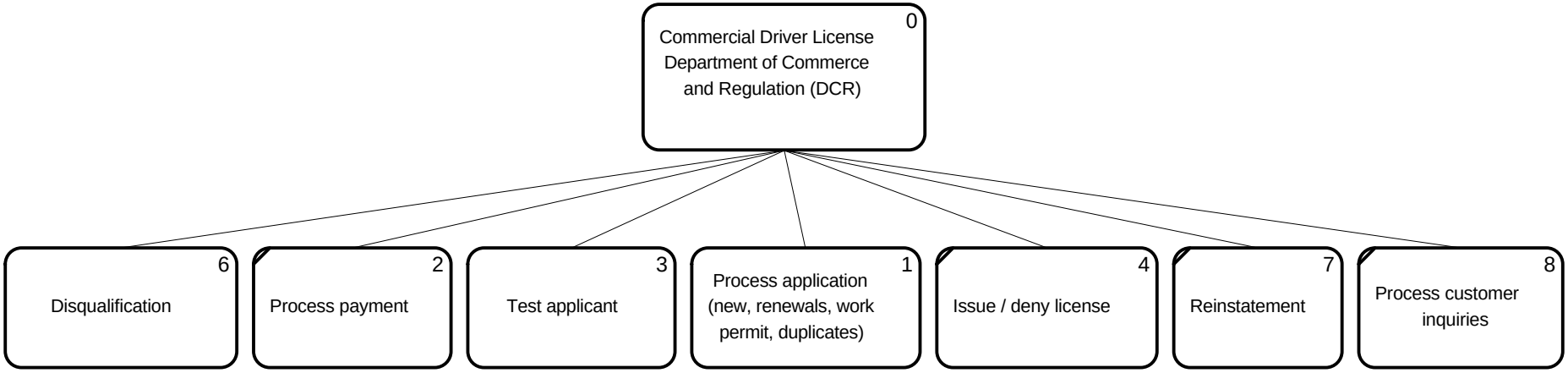
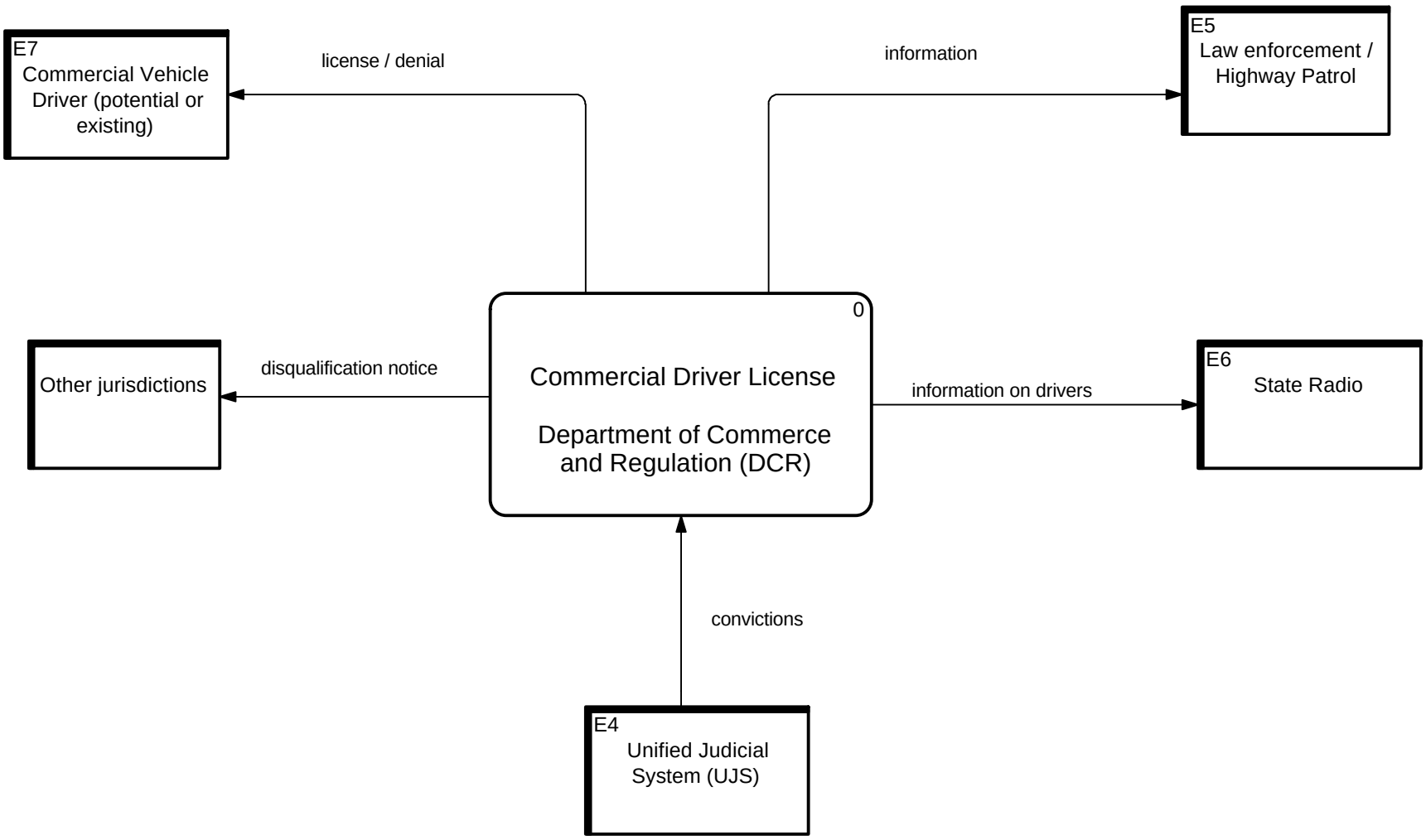


- No disqualification
- Hearing
- Transfer convictions into driver record
- Review violations & determine disqualifications
- Code disqualification & update databases

- Administer eye, written and endorsement tests
- Road skill test (by 3rd party)
- Issue test certificate

- accept application and review for accuracy & fraud
- Check for eligibility in SD
- Verify licenses in other states
- Check for suspensions & revocations in other states

NODE:	TITLE:	NUMBER:
A0	Commercial Driver License - Department of Commerce and Regulation (DCR)	



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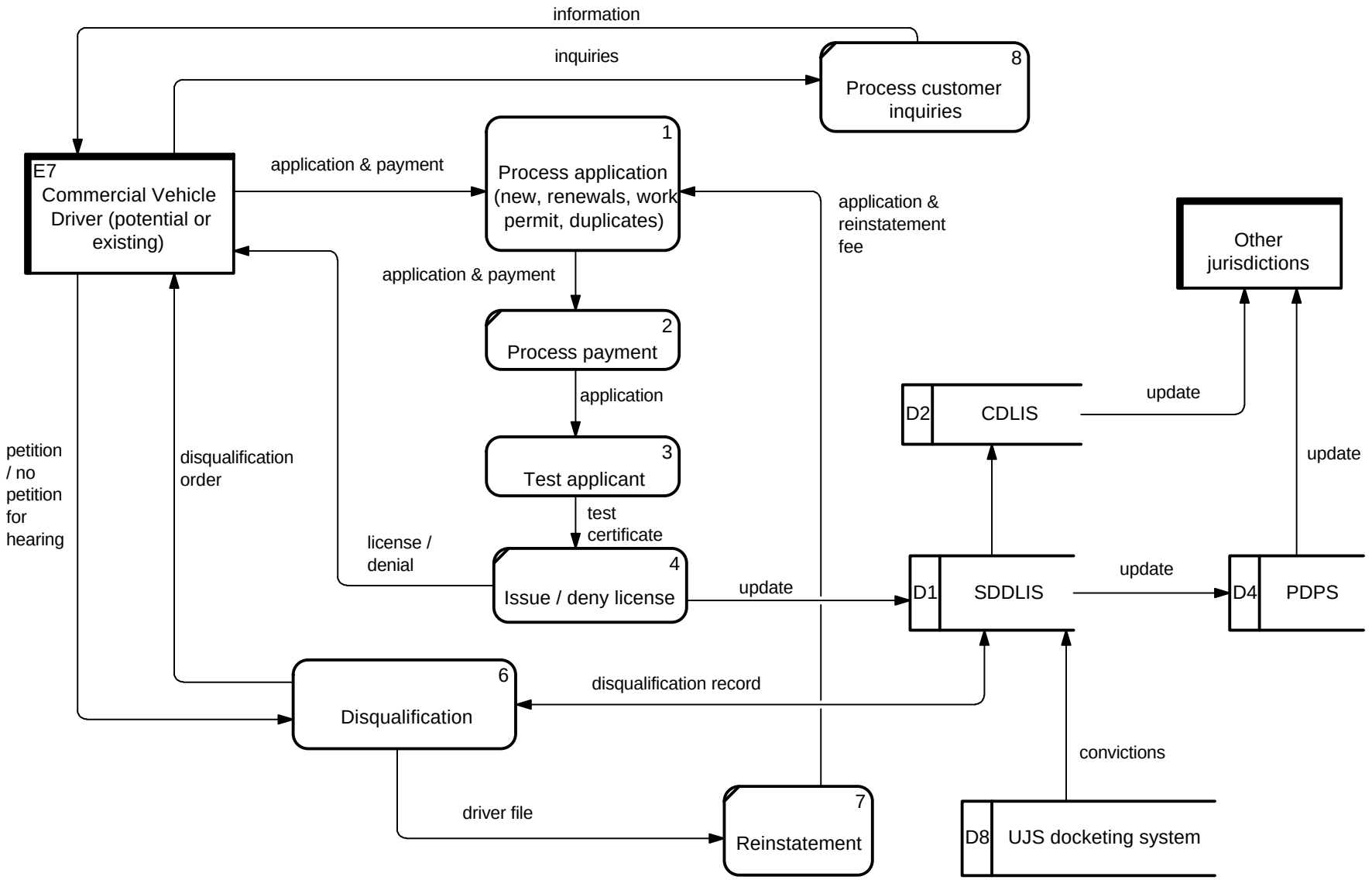

NODE:	TITLE:	NUMBER:
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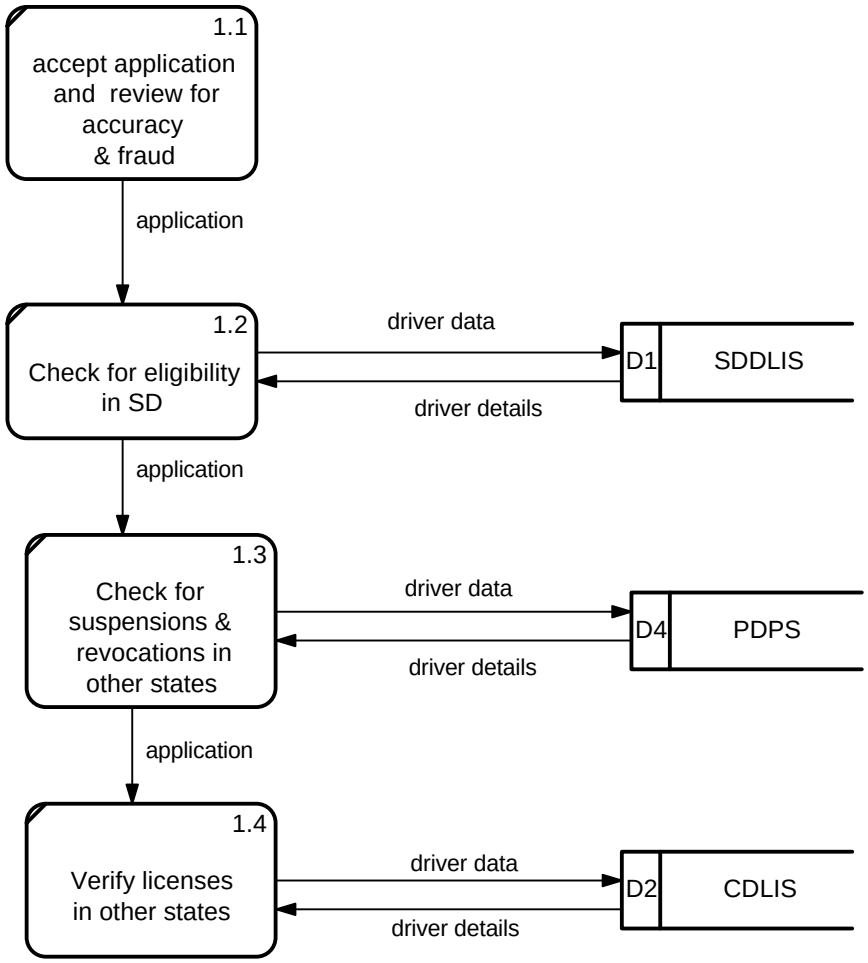
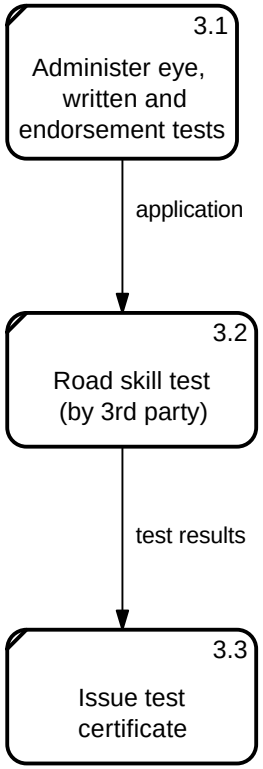


NODE:	TITLE:	NUMBER:
A1	Process application (new, renewals, work permit, duplicates)	



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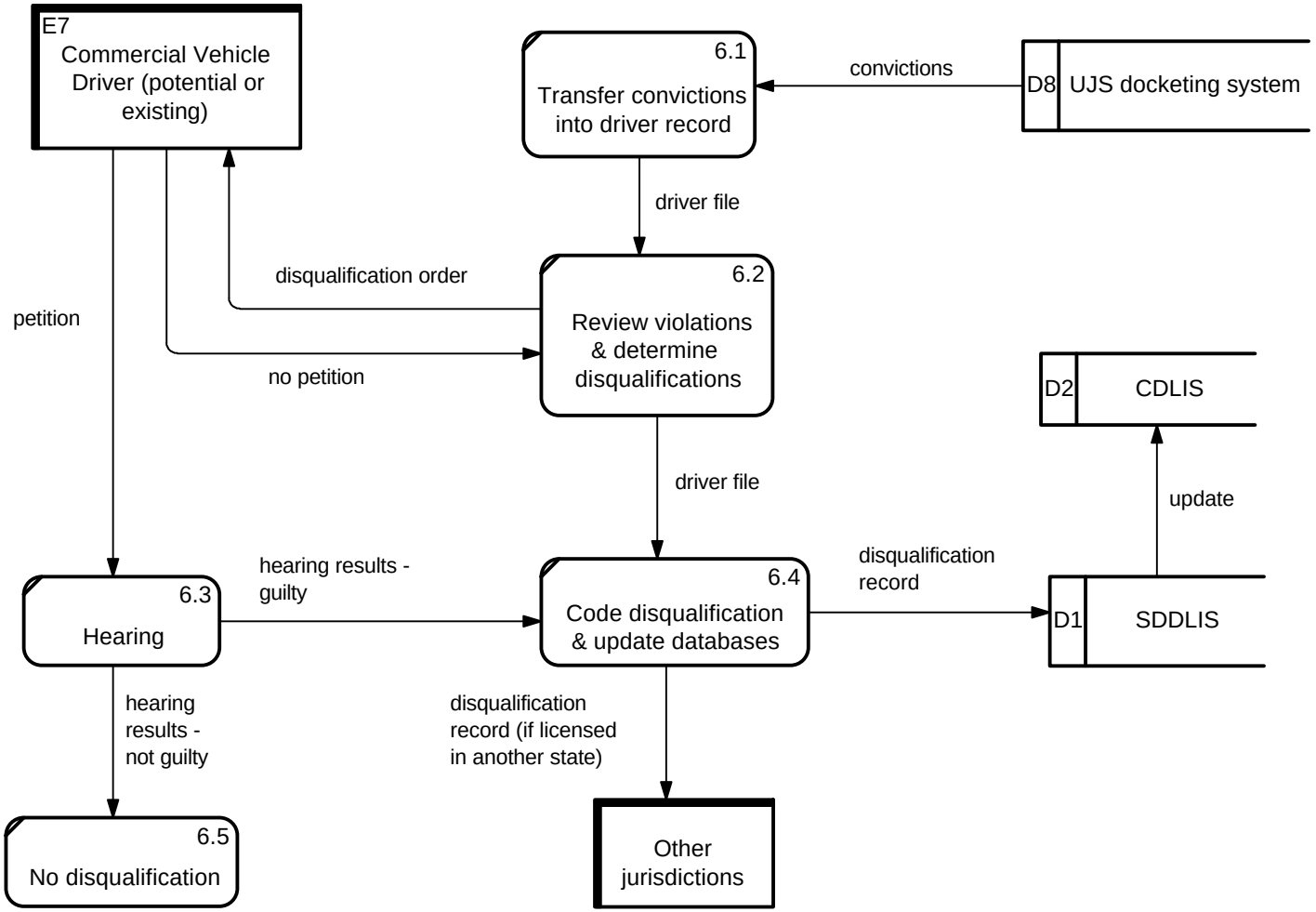

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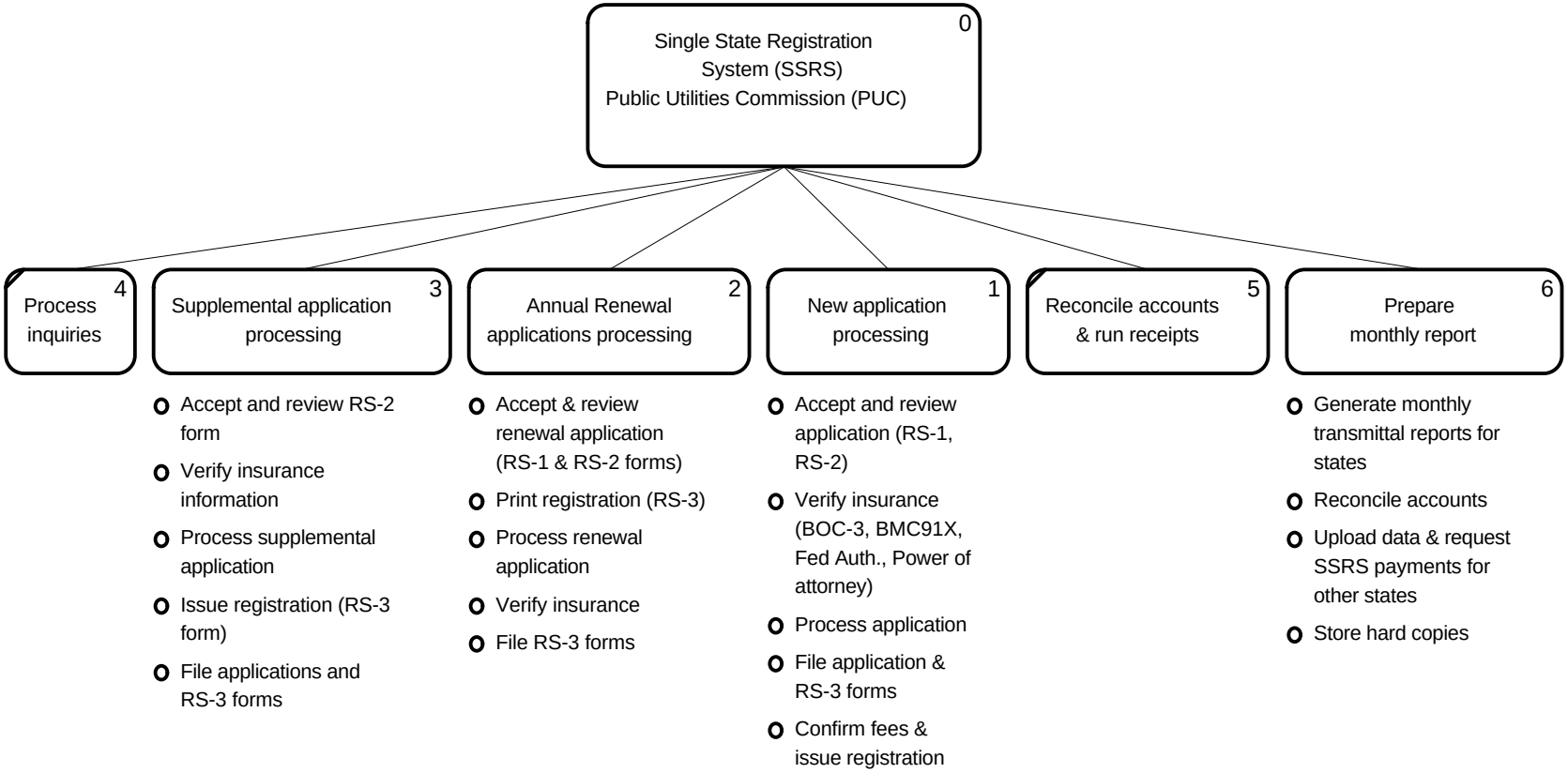

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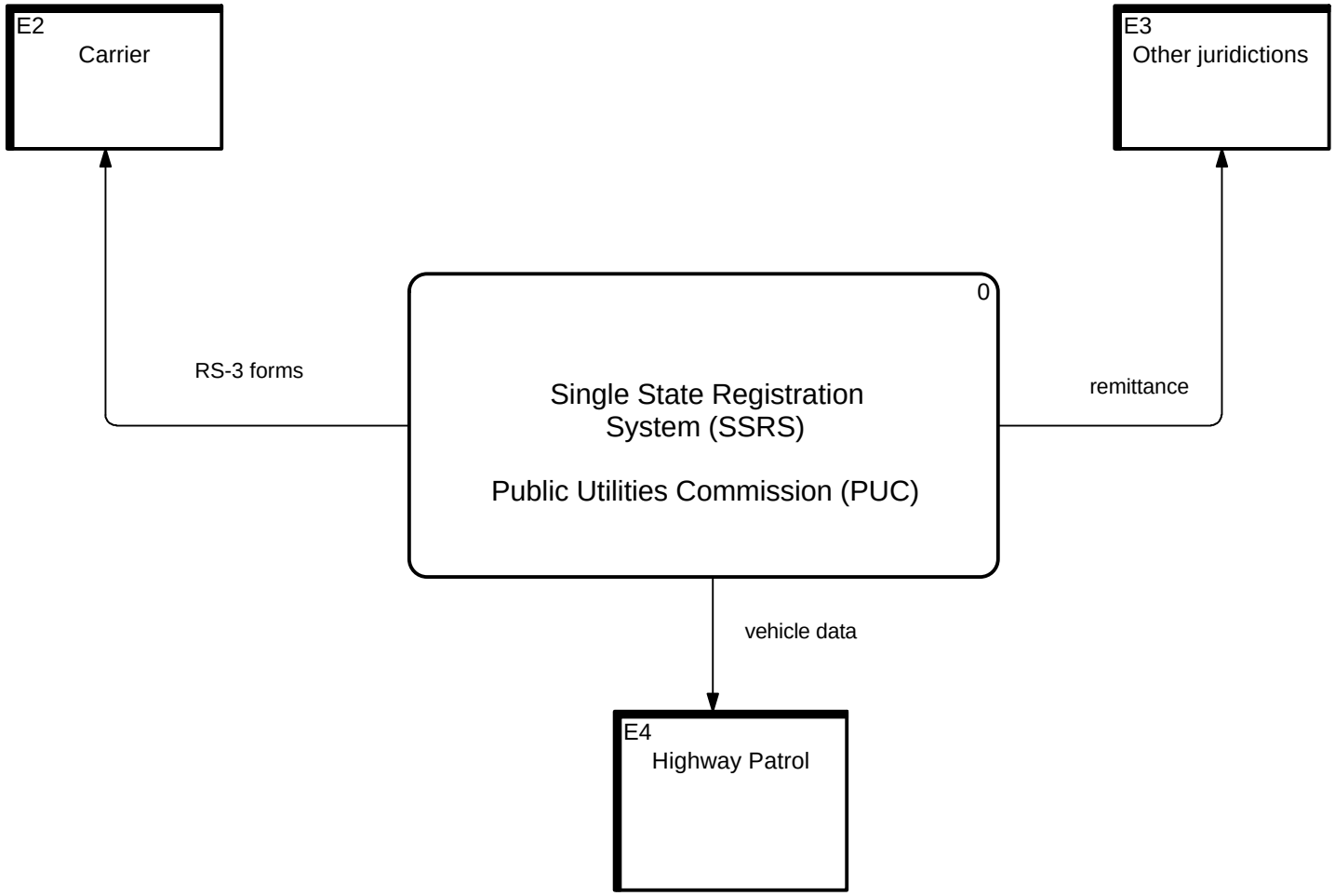
A0	Single State Registration - Public Utilities Commission	



NODE:	TITLE:	NUMBER:
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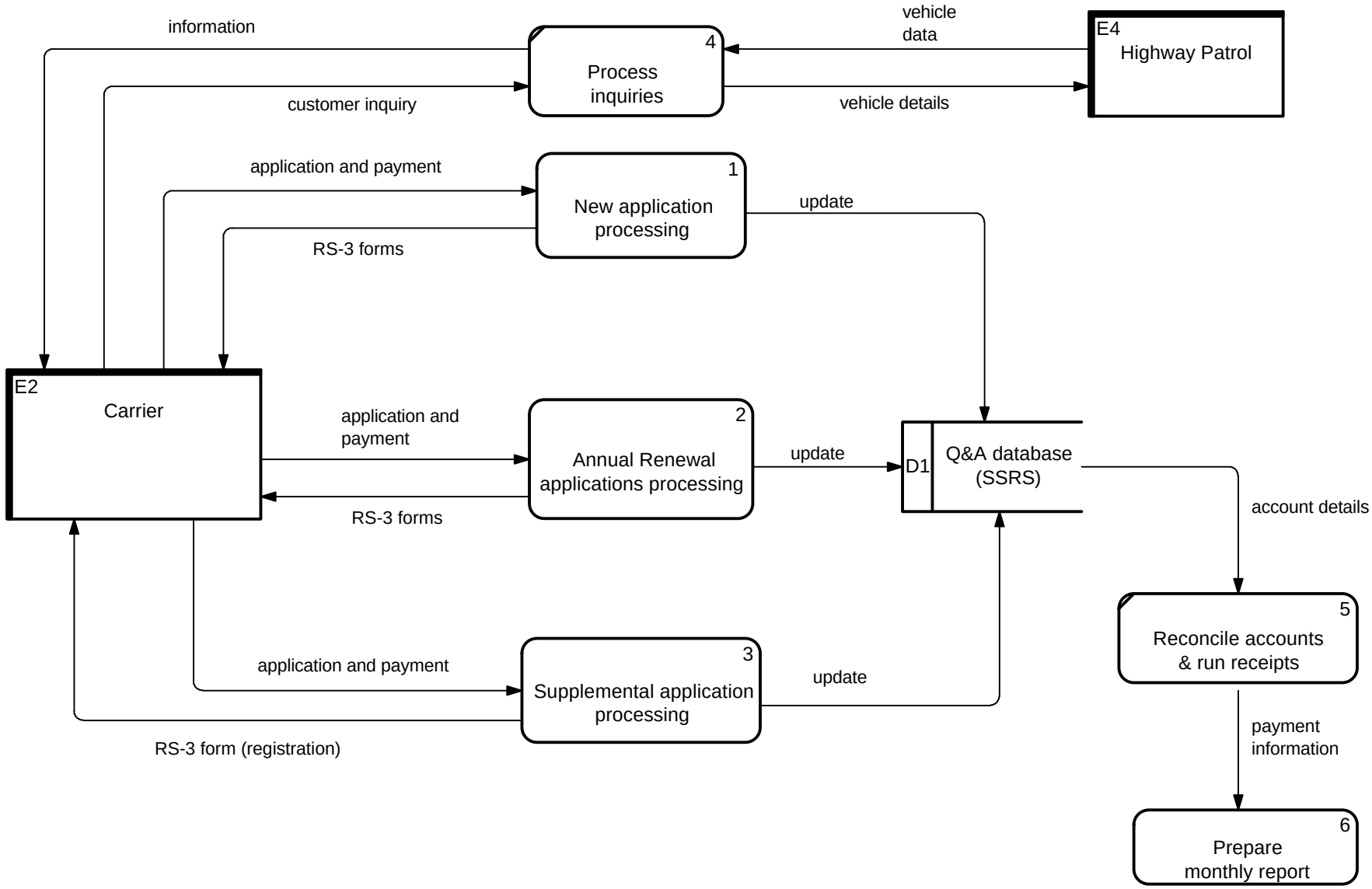

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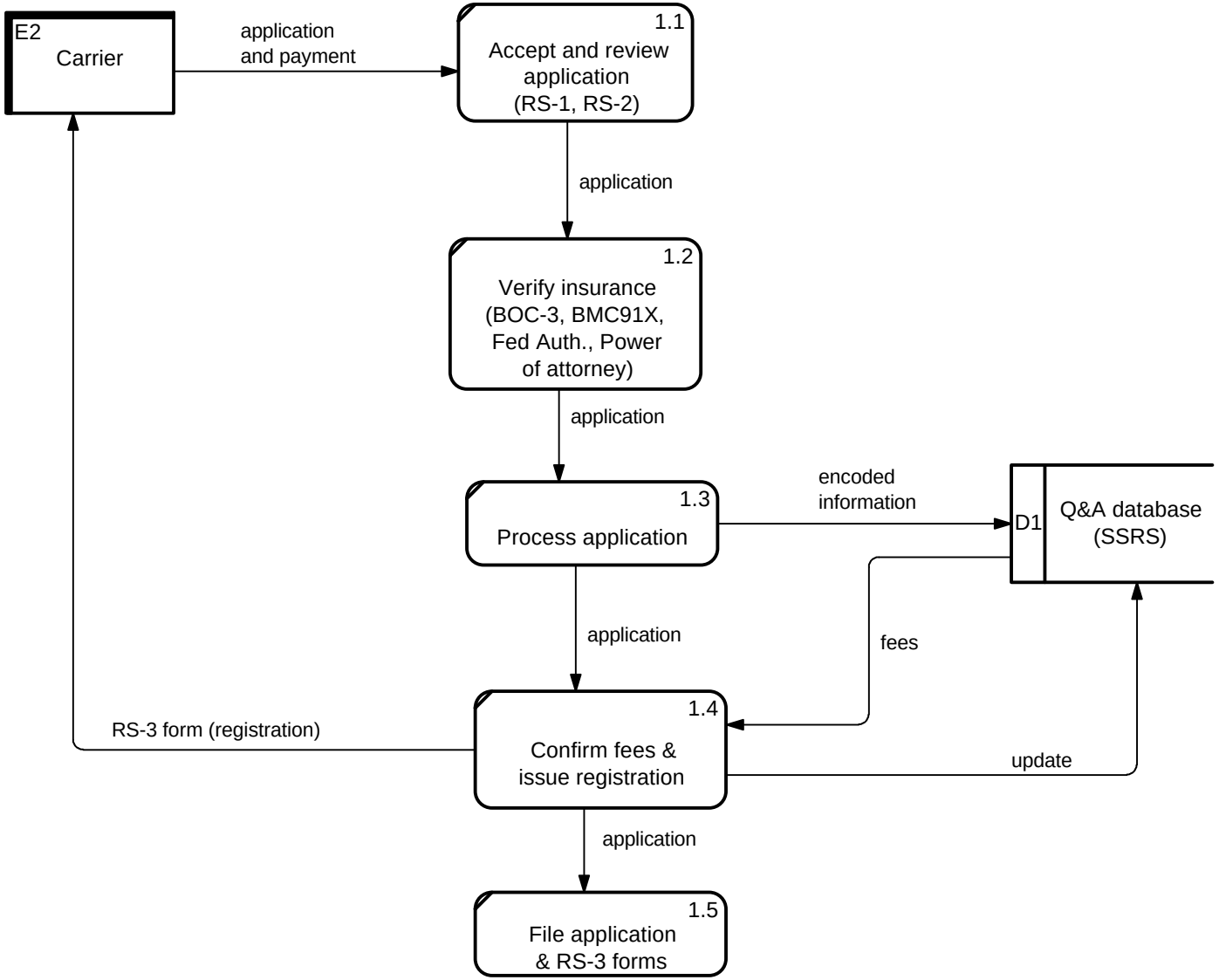
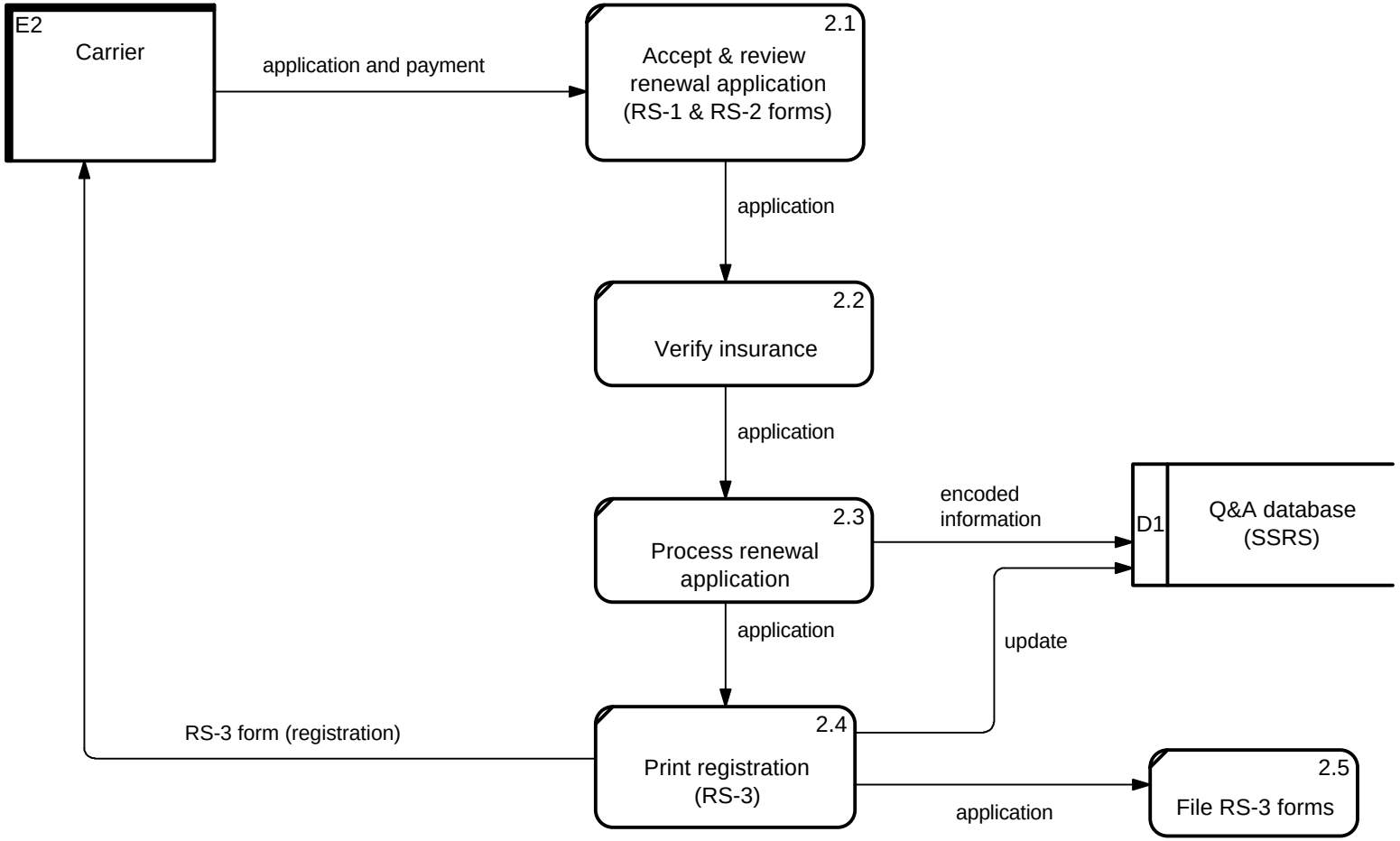


NODE:	TITLE:	NUMBER:
A1	New application processing	



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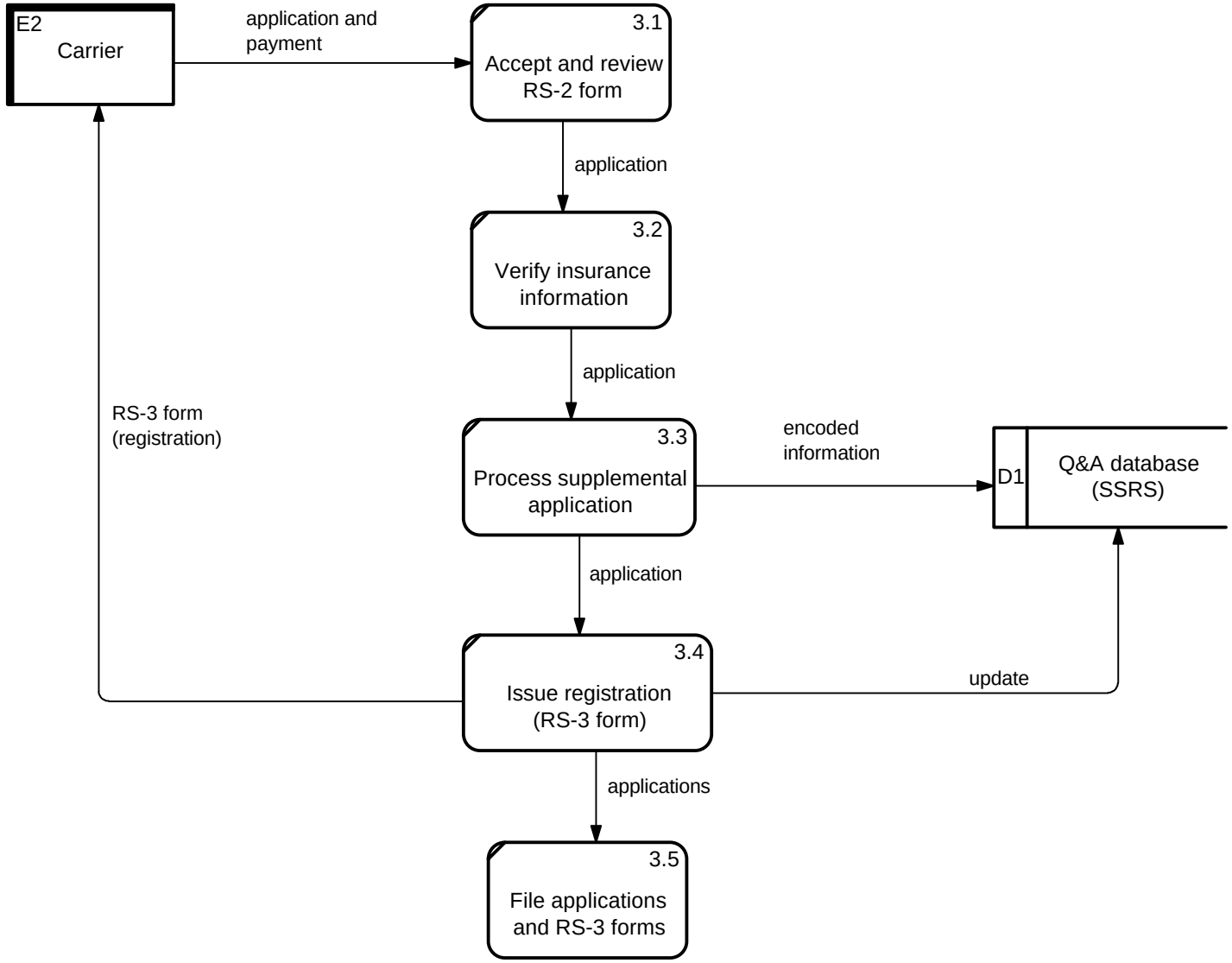

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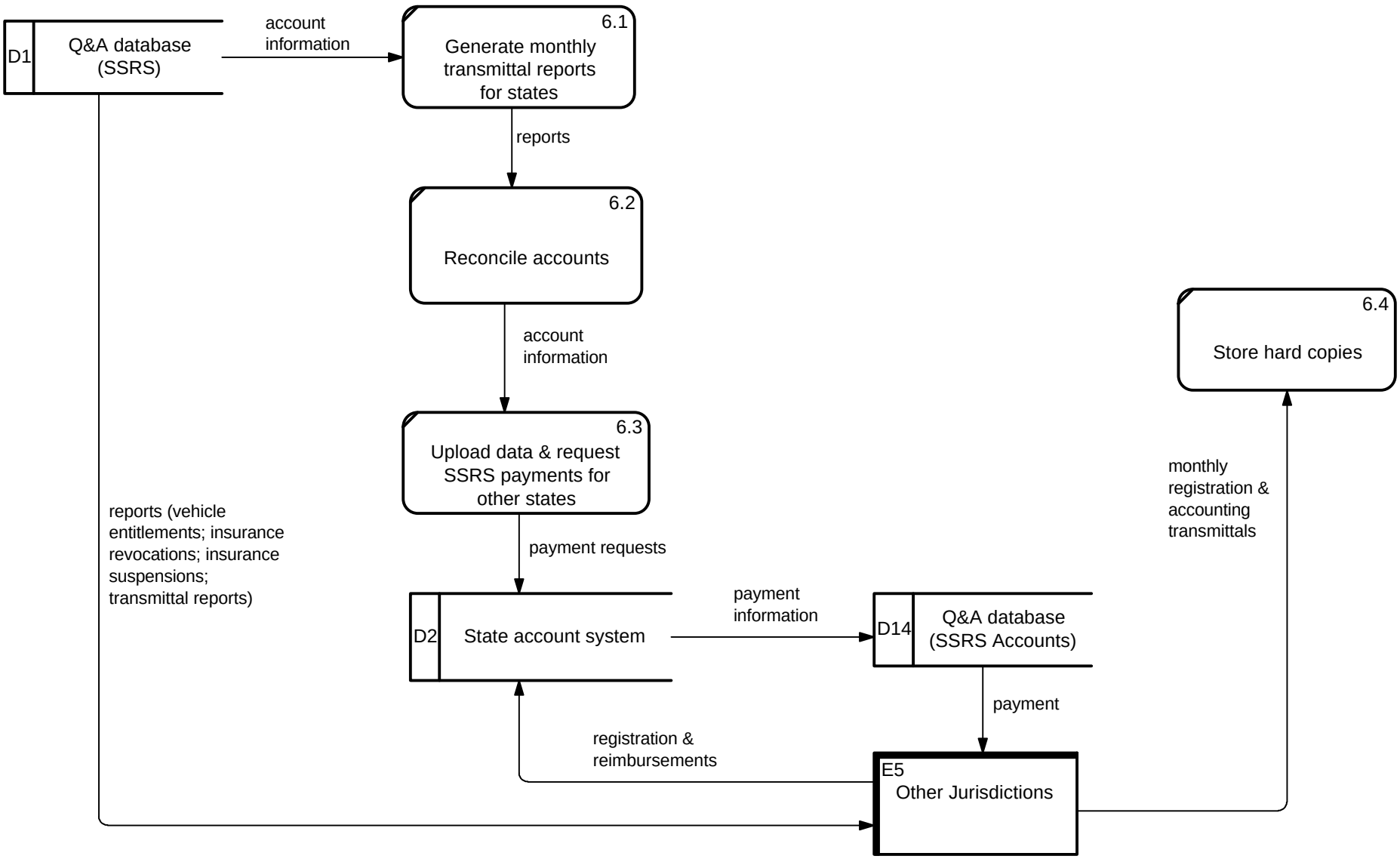
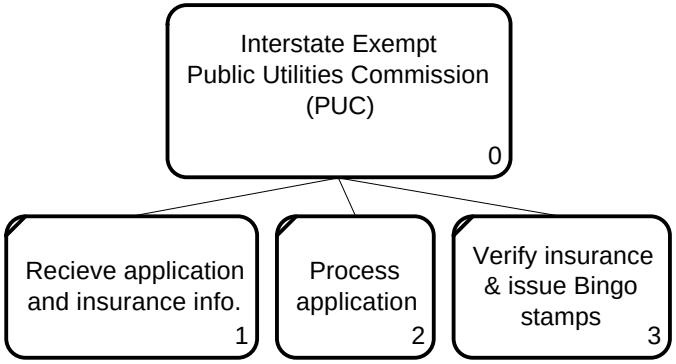
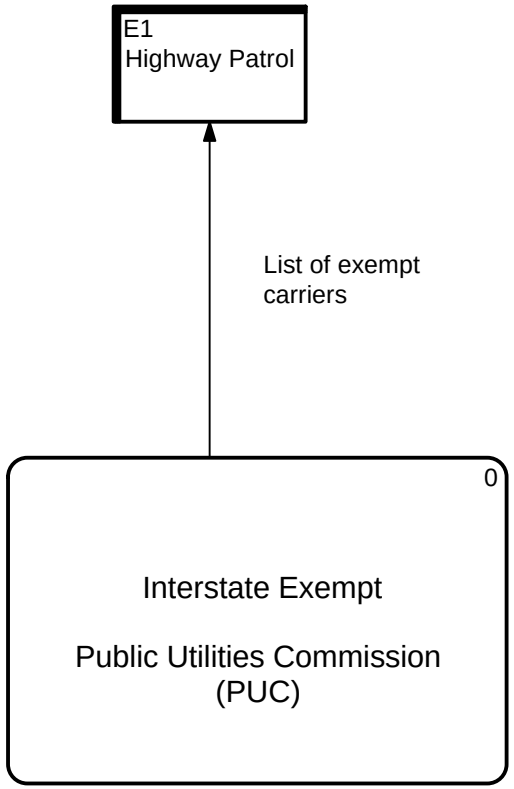


NODE:	TITLE:	NUMBER:
A6	Prepare monthly report	



NODE:	TITLE:	NUMBER:
A0	Interstate Exempt - Public Utilities Commission	A-34



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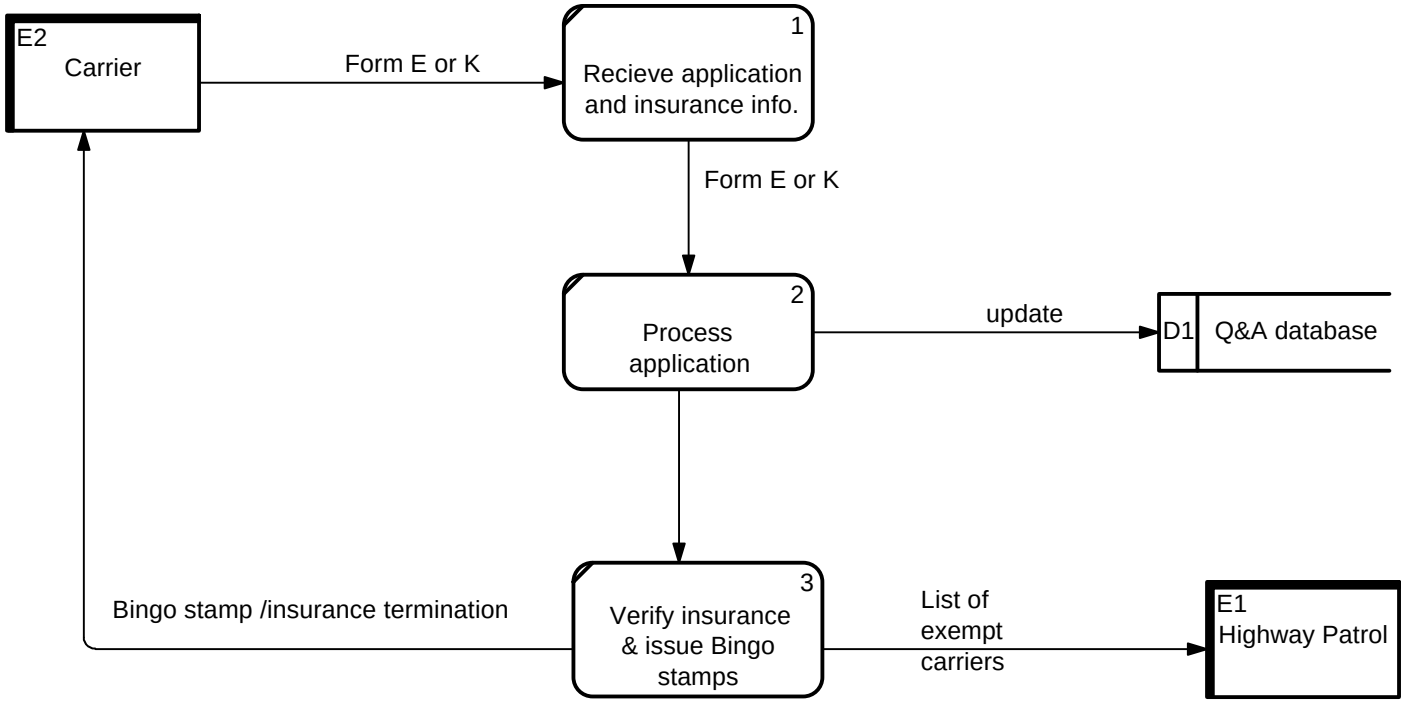

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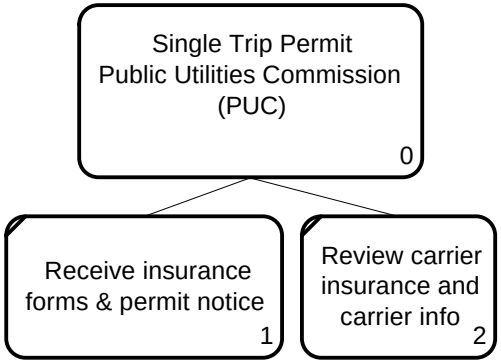
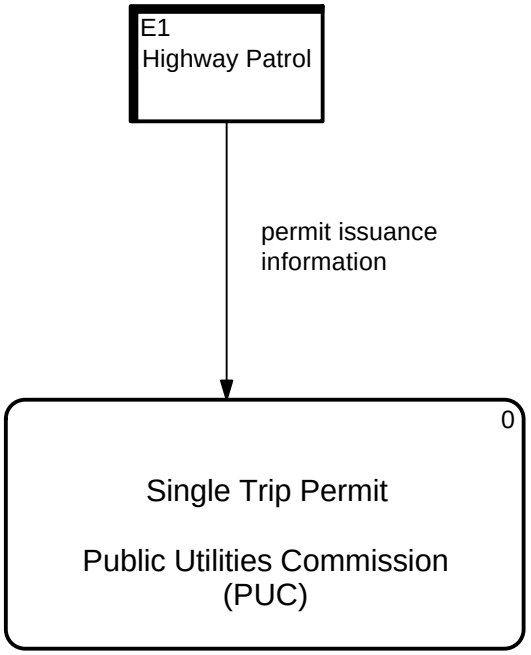


NODE:	TITLE:	NUMBER:
A0	Single Trip Permit - Public Utilities Commission	A-37



NODE:	TITLE:	NUMBER:
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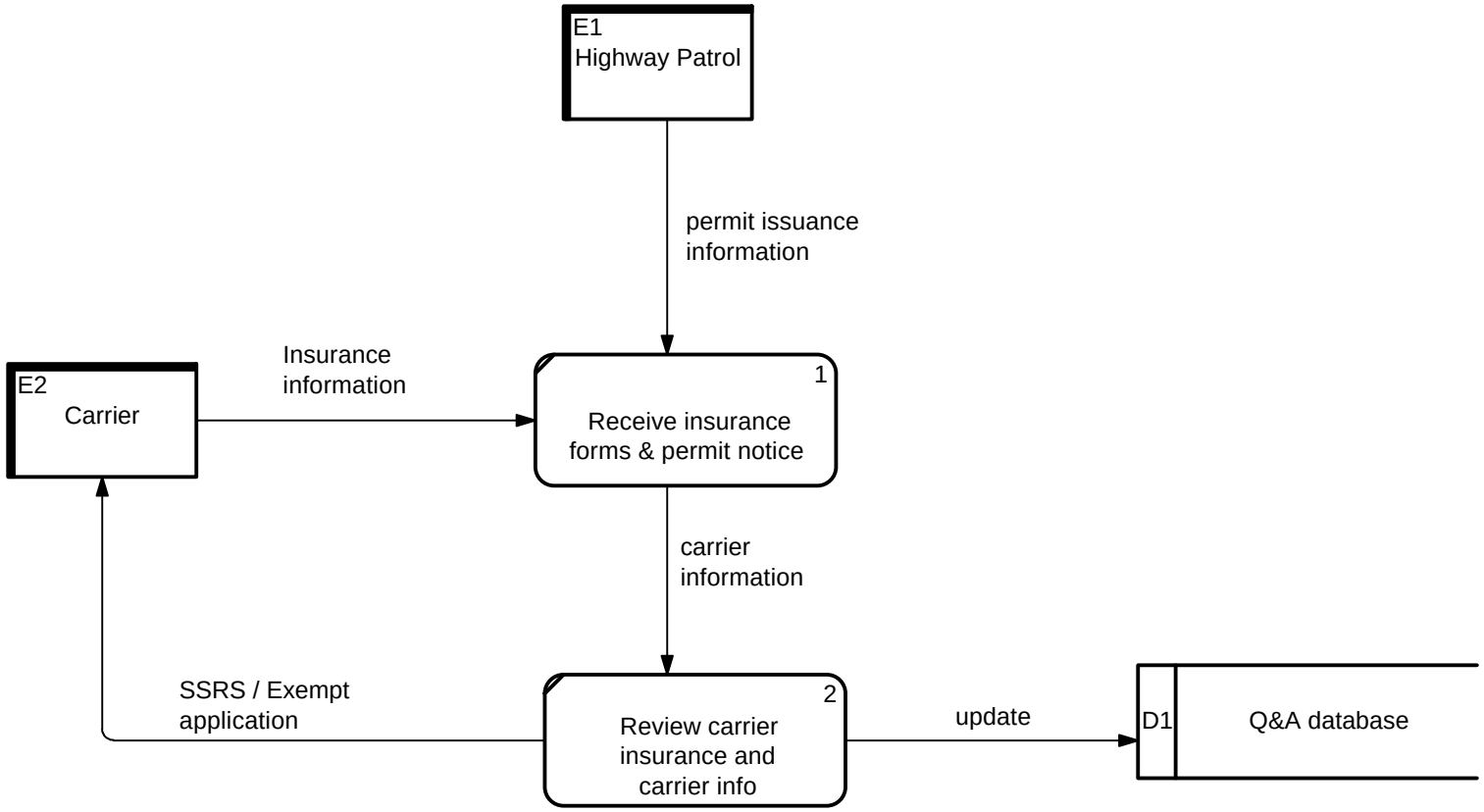

NODE:	TITLE:	NUMBER:
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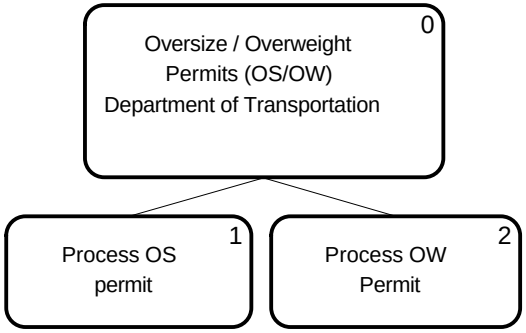
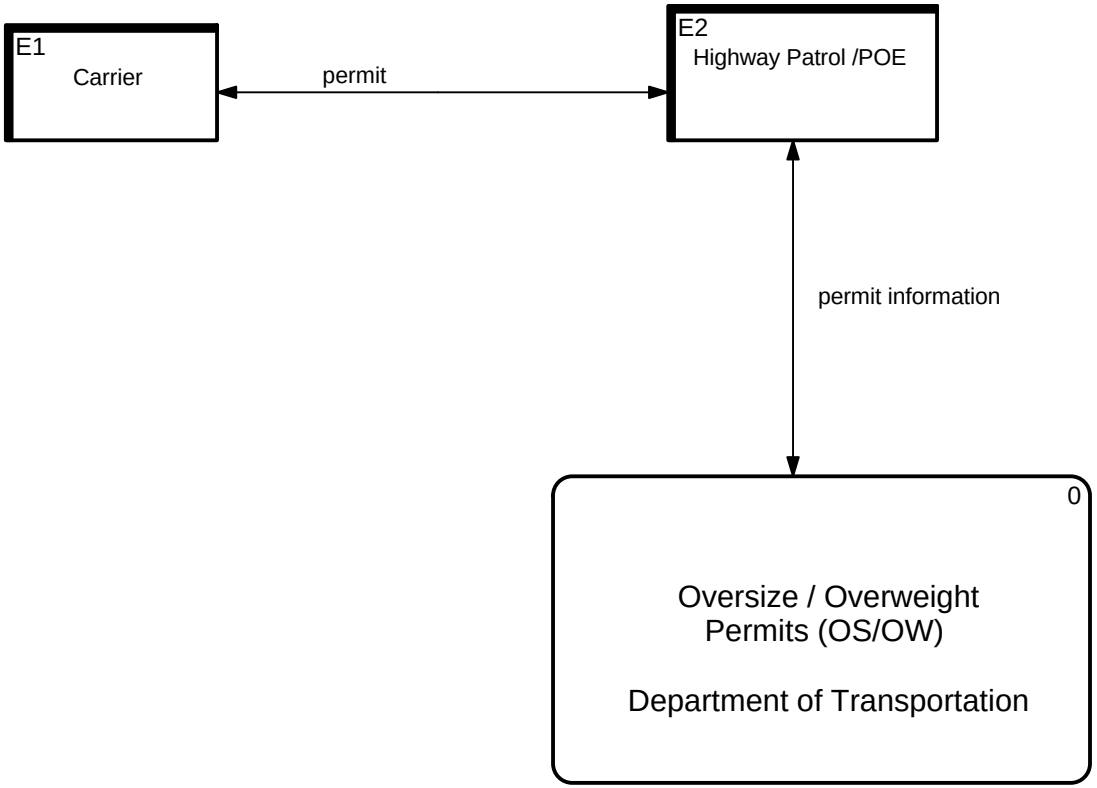


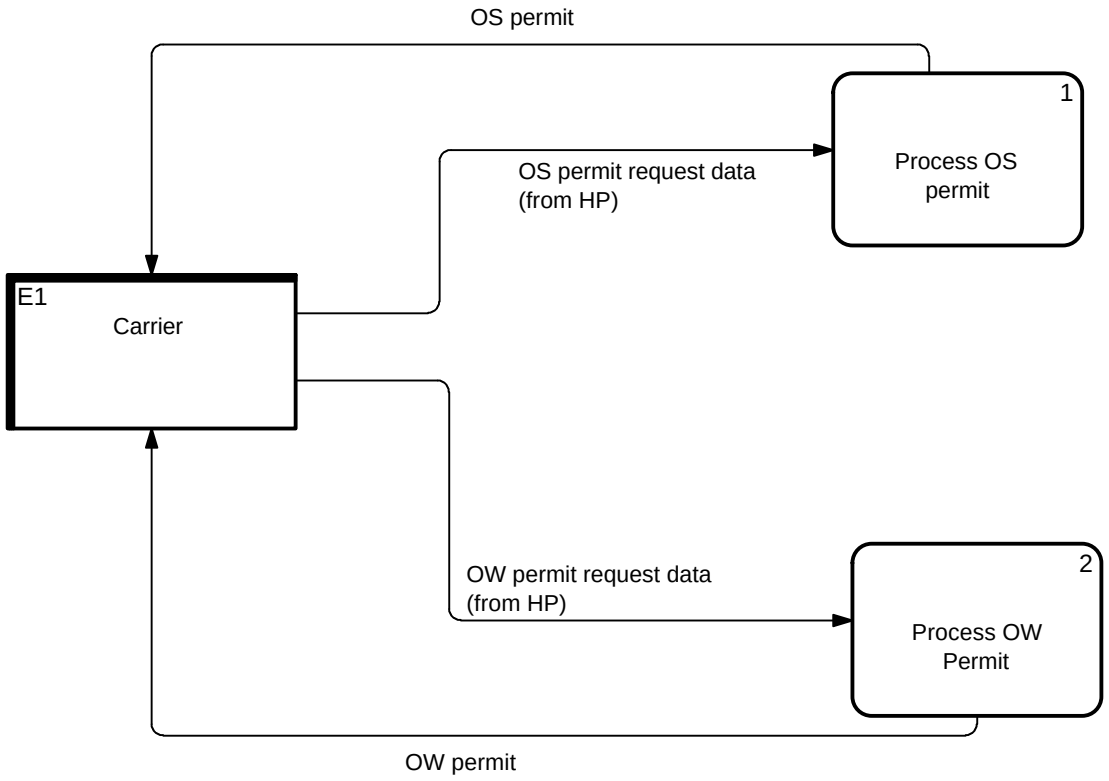
- HP/POE evaluates permit request
- DOT checks construction & other restrictions
- DOT checks vertical clearance
- Determine # escort vehicles
- Determine fee issue permit Highway Patrol / POE

- HP/POE evaluates OW permit request
- DOT reviews list of bridges on proposed route
- Determine fee & issue permit Highway Patrol / POE
- Analyze weaker bridges

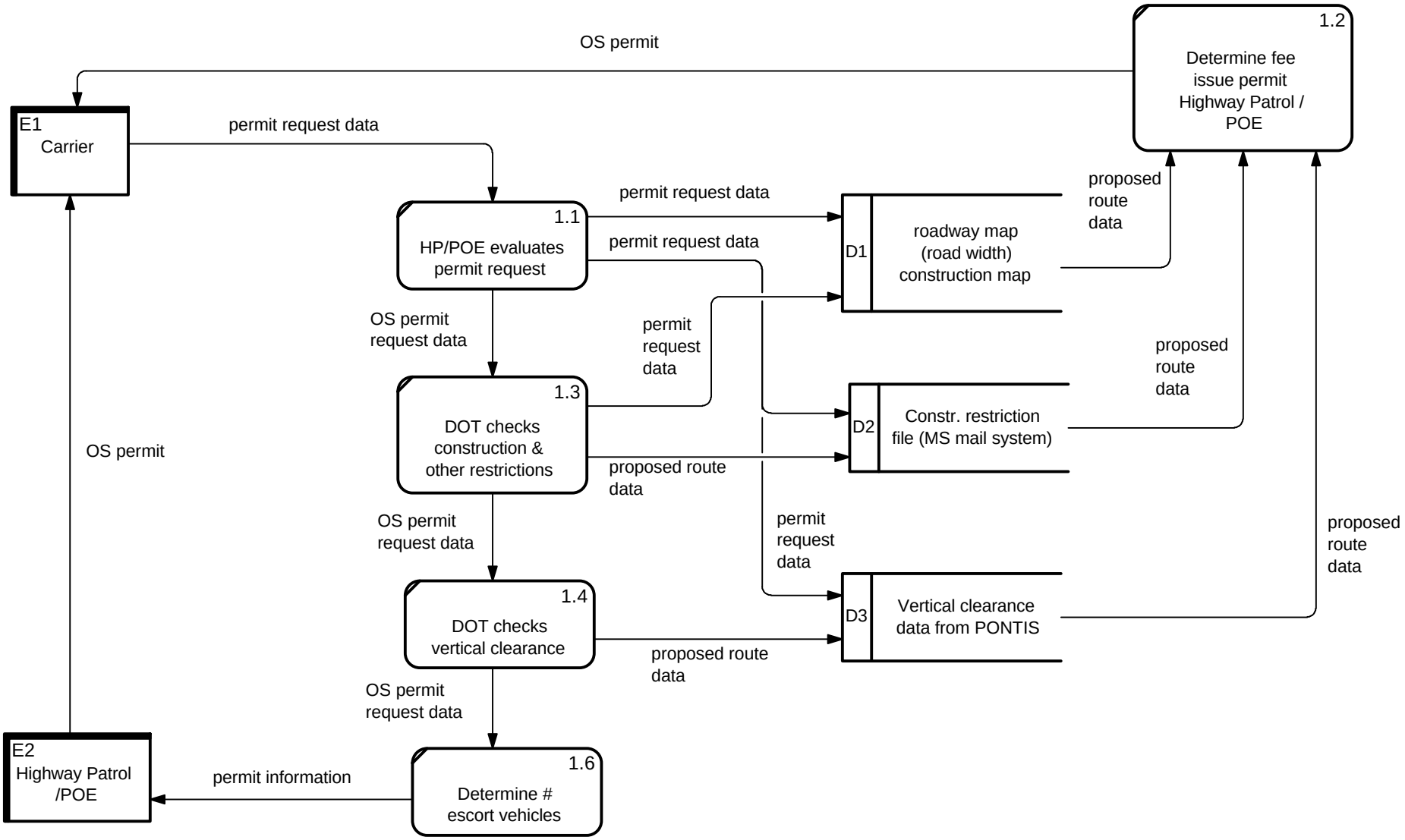
NODE:	TITLE:	NUMBER:
A0	Oversize / Overweight Permitting (OS/OW) - Department of Transportation (DOT)	



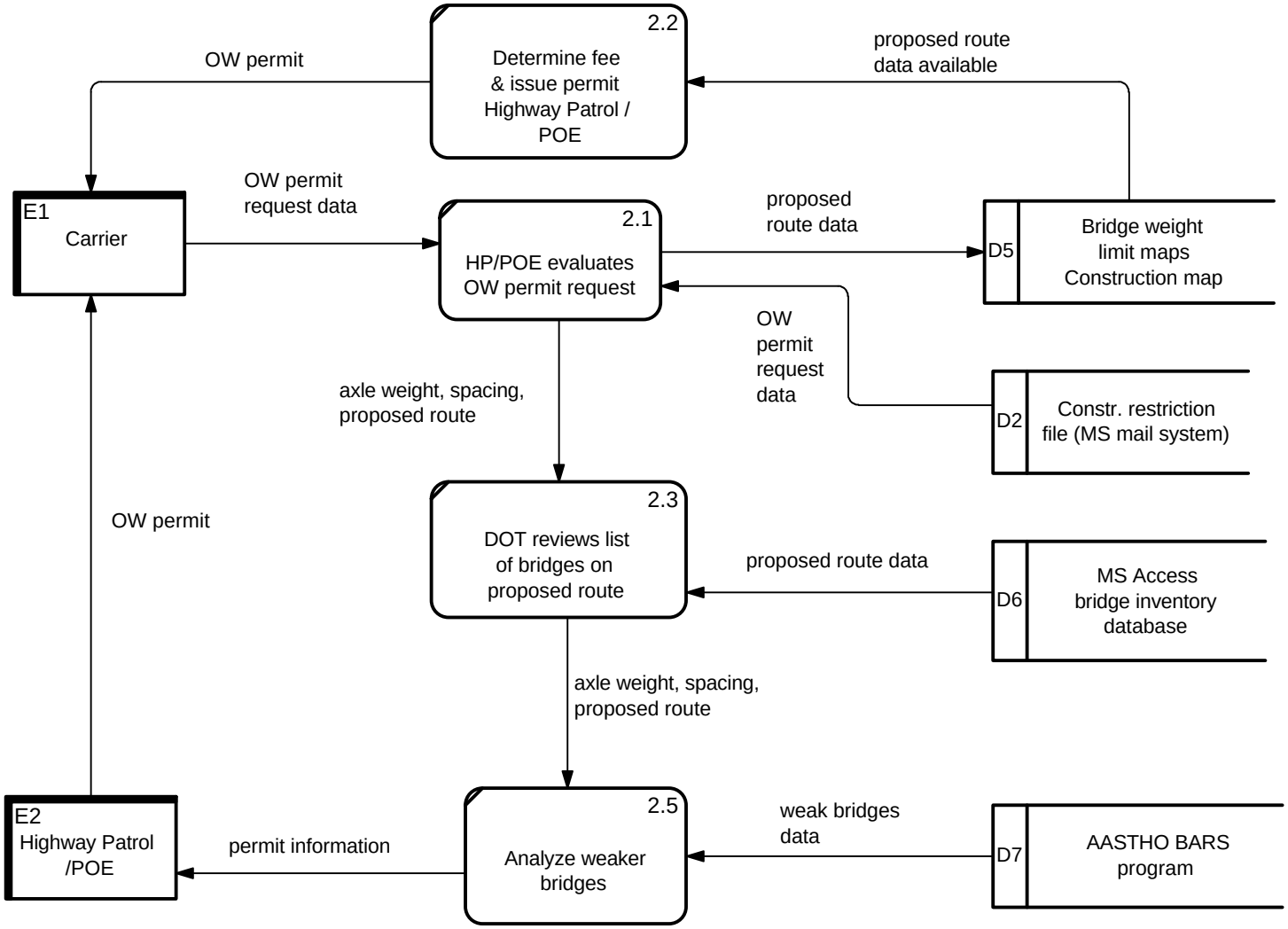
NODE:	TITLE:	NUMBER:
A-0	Oversize / Overweight Permits (OS/OW) Department of Transportation	



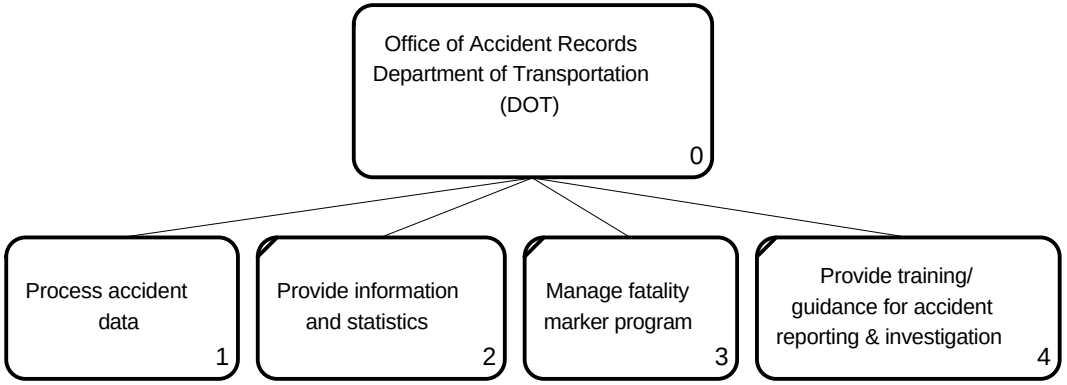
NODE:	TITLE:	NUMBER:
A0	Oversize / Overweight Permits (OS/OW) Department of Transportation	



NODE:	TITLE:	NUMBER:
A1	Process OS permit	

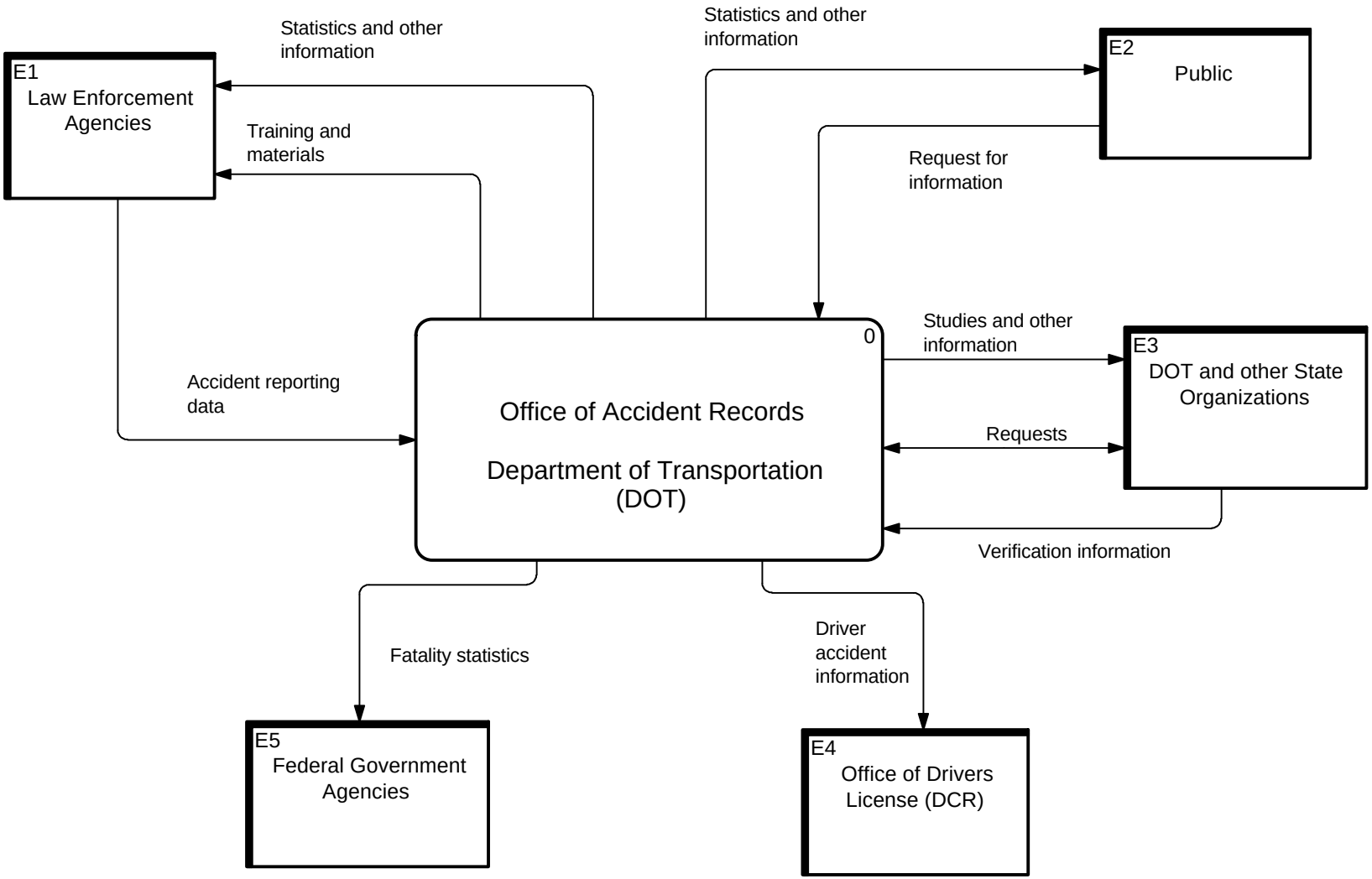


NODE:	TITLE:	NUMBER:
A2	Process OW Permit	

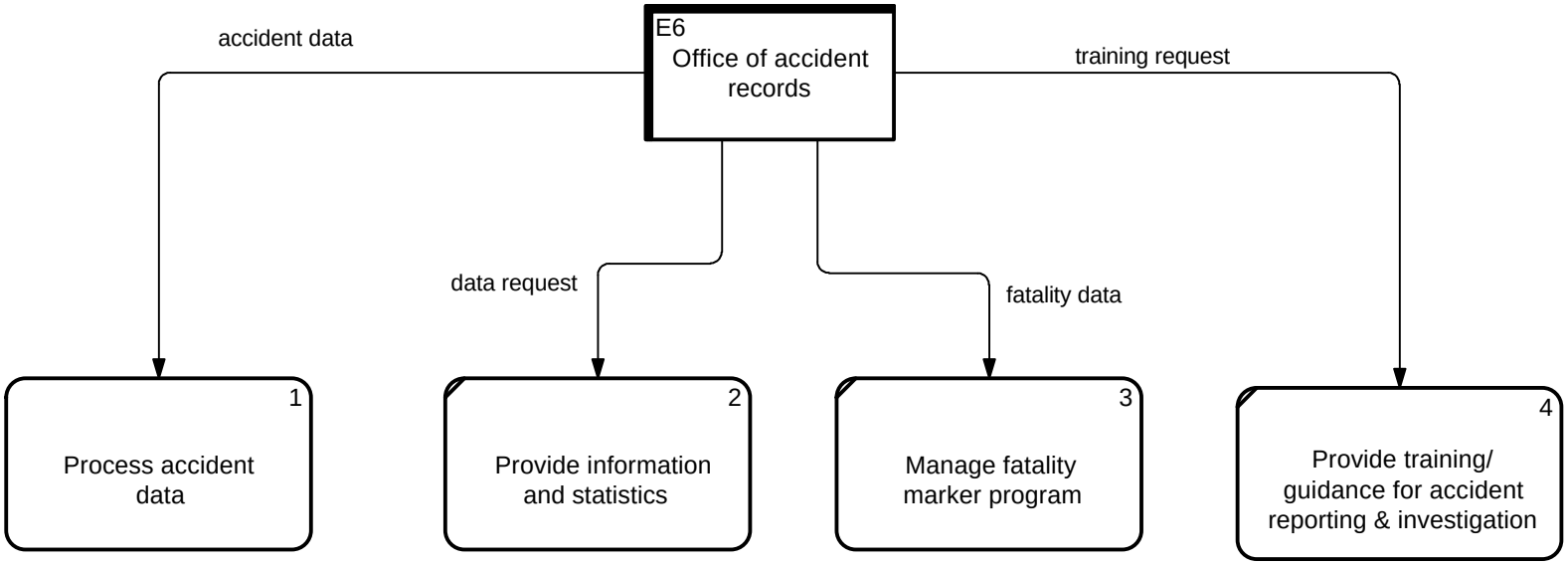


- Assign additional information
- Enter data
- Verify data (Error correction)

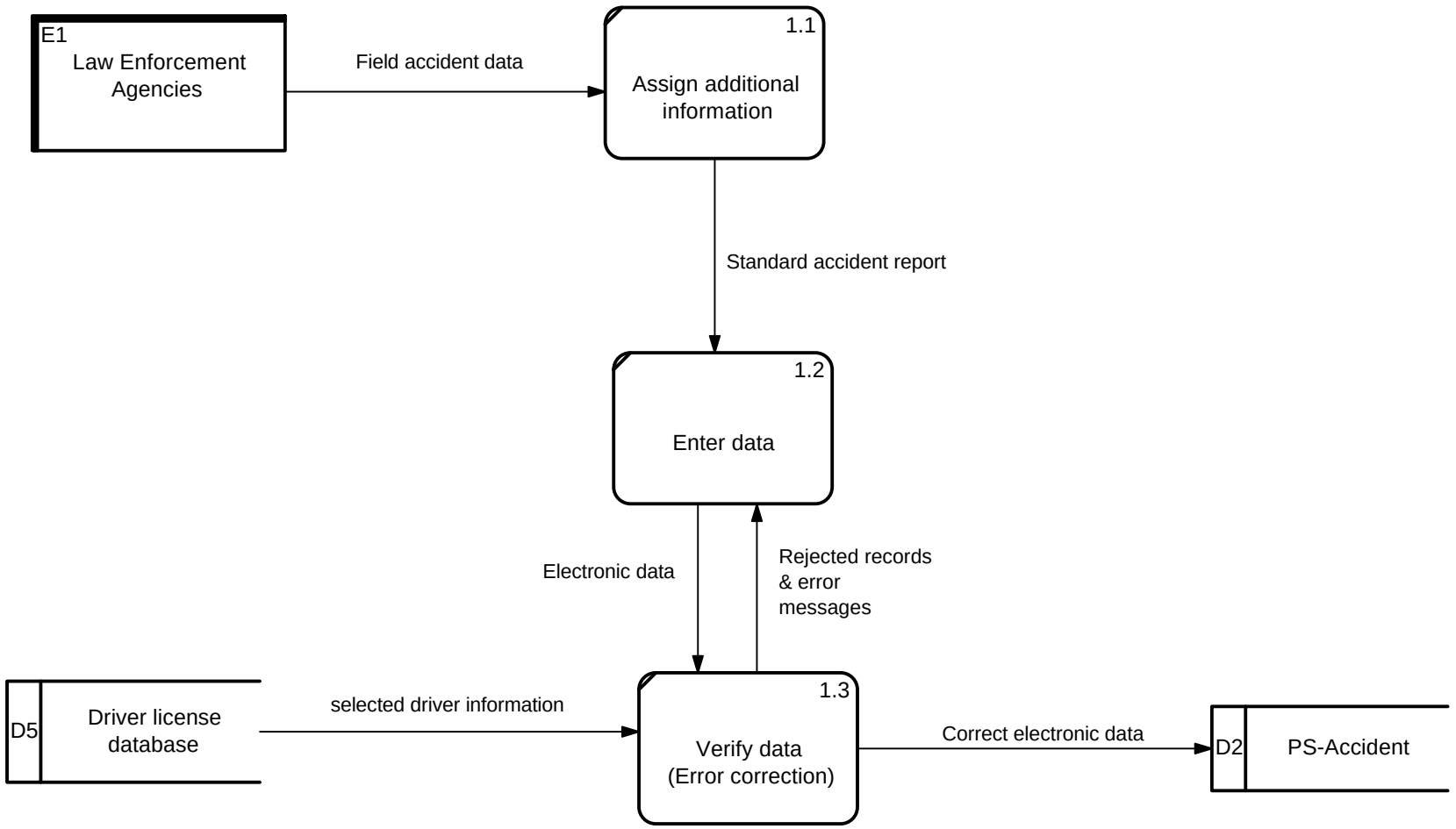
NODE:	TITLE:	NUMBER:
A0	Office of Accident Records - Department of Transportation (DOT)	



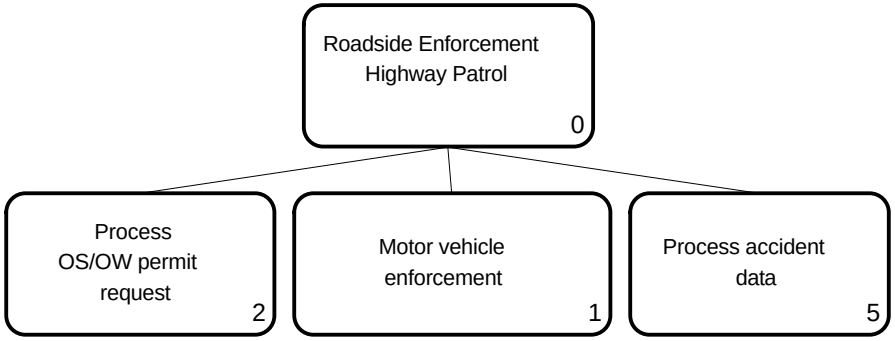
NODE:	TITLE:	NUMBER:
A-0	Office of Accident Records Department of Transportation (DOT)	



NODE:	TITLE:	NUMBER:
A0	Office of Accident Records Department of Transportation (DOT)	



NODE:	TITLE:	NUMBER:
A1	Process accident data	

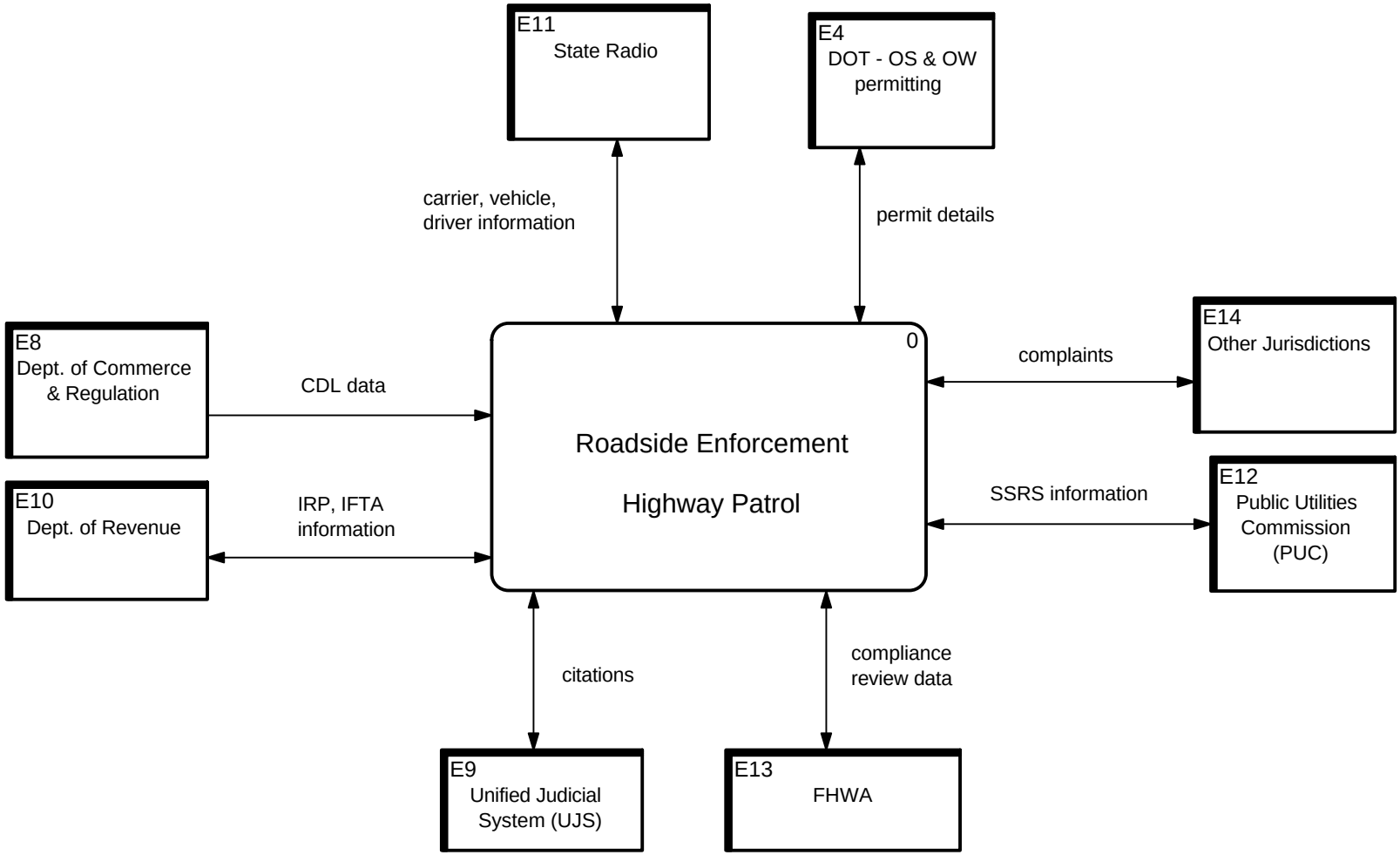


- Receive & review permit request
- Check coded maps and/or restriction and permits files
- Call information to DOT bridge & operations support
- Receive permit information and issue permit

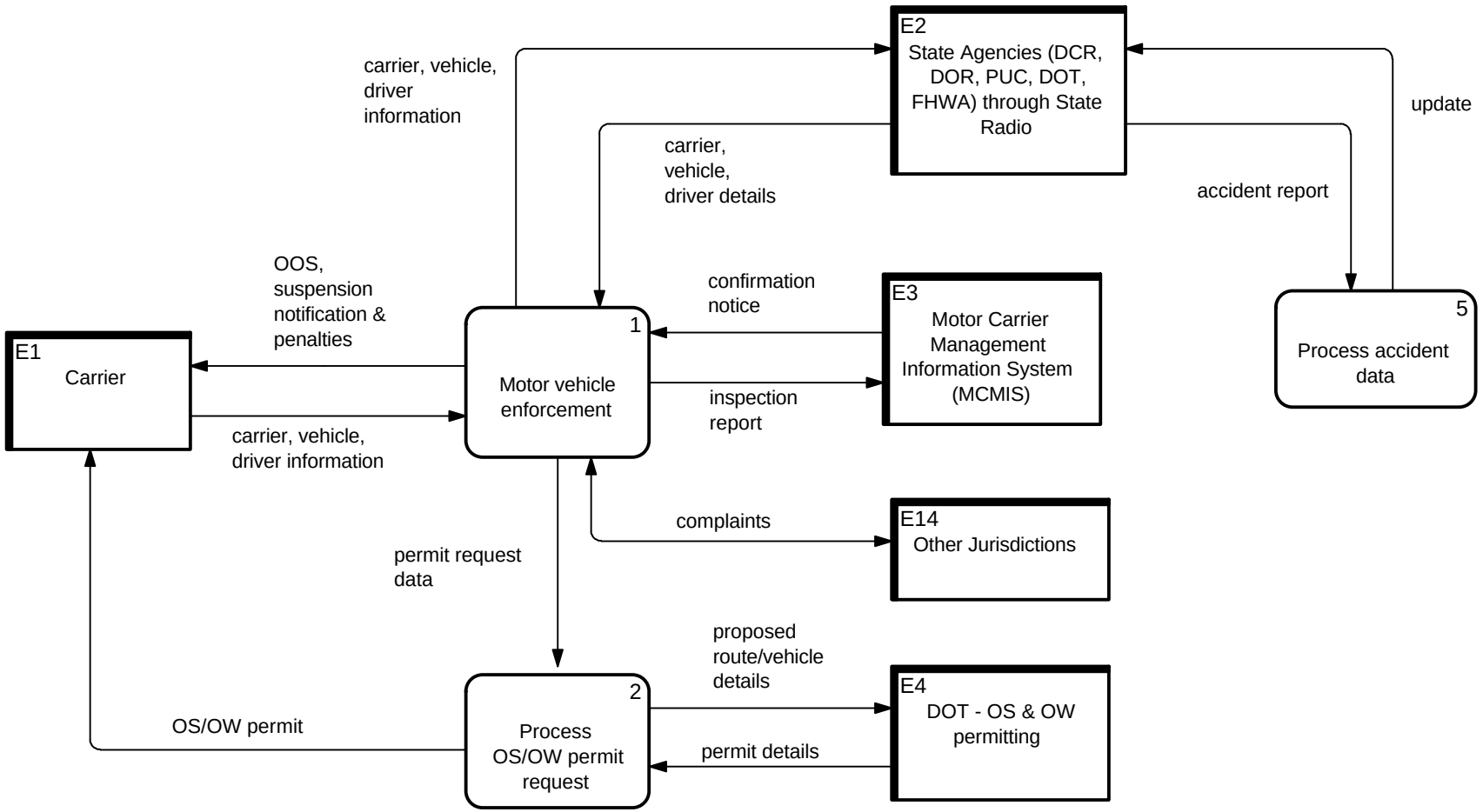
- Manual entry & transfer to SAFETYNET
- Merge Inspection reports
- Conduct safety inspections
- Conduct visual / weight inspection selection
- Process in AVALANCHE (Formatting ASPEN for SAFETYNET)
- Check and correct Inspection results
- Manual data entry

- HP receives & reviews accident reports
- Recode accident reports & enter data into SAFETYNET

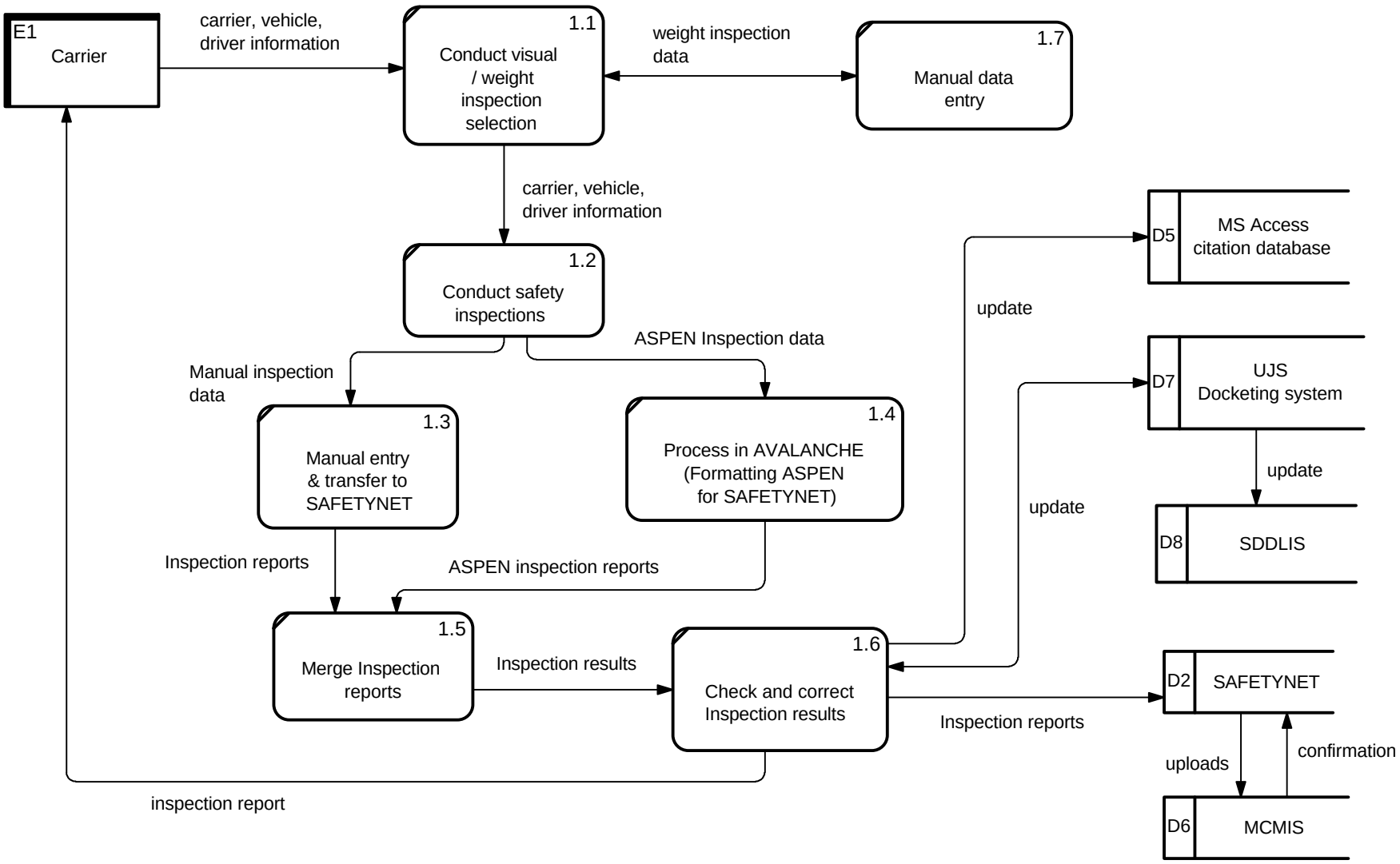
NODE:	TITLE:	NUMBER:
A0	Roadside Enforcement - Highway Patrol	



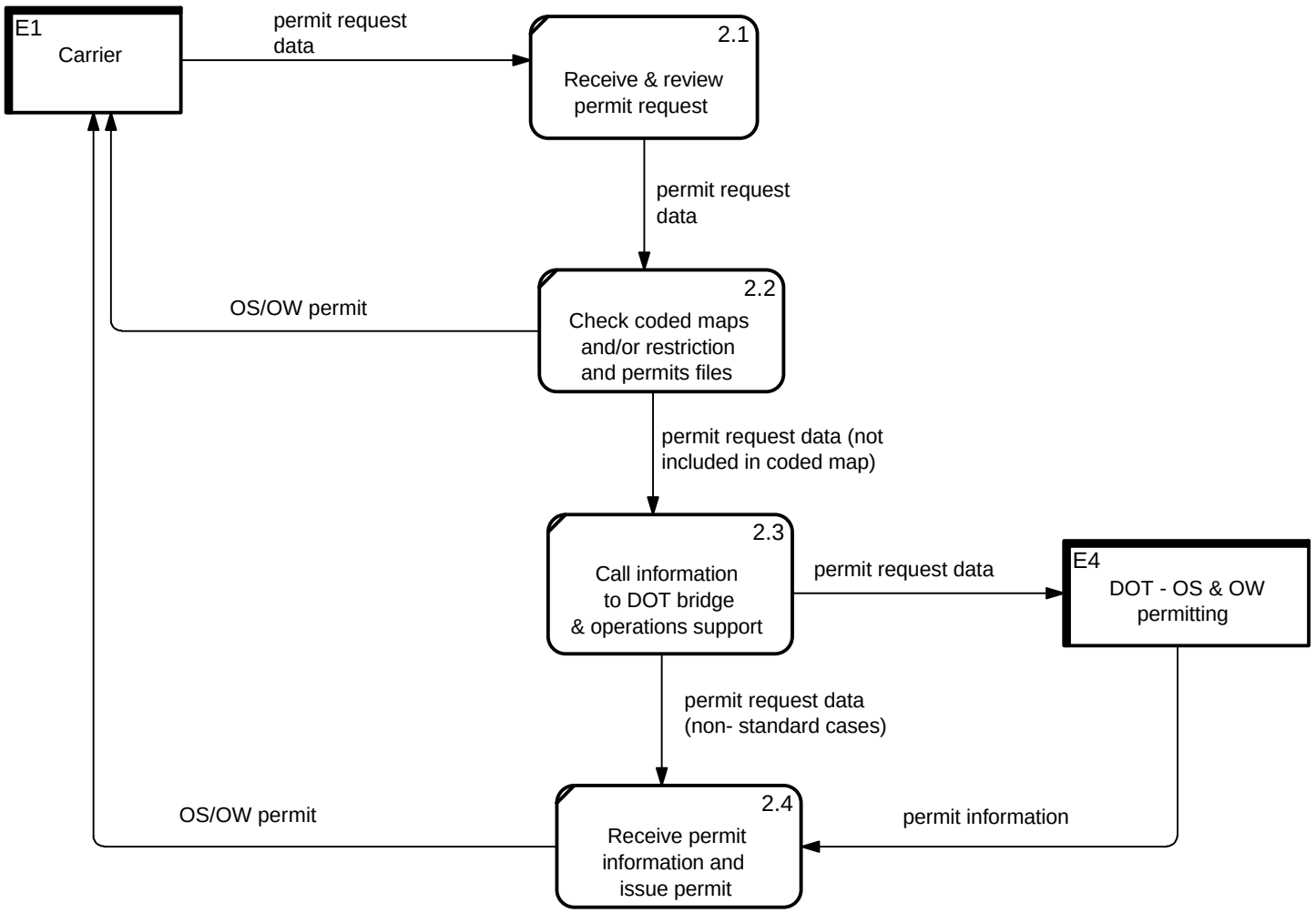
NODE:	TITLE:	NUMBER:
A-0	Roadside Enforcement Highway Patrol	



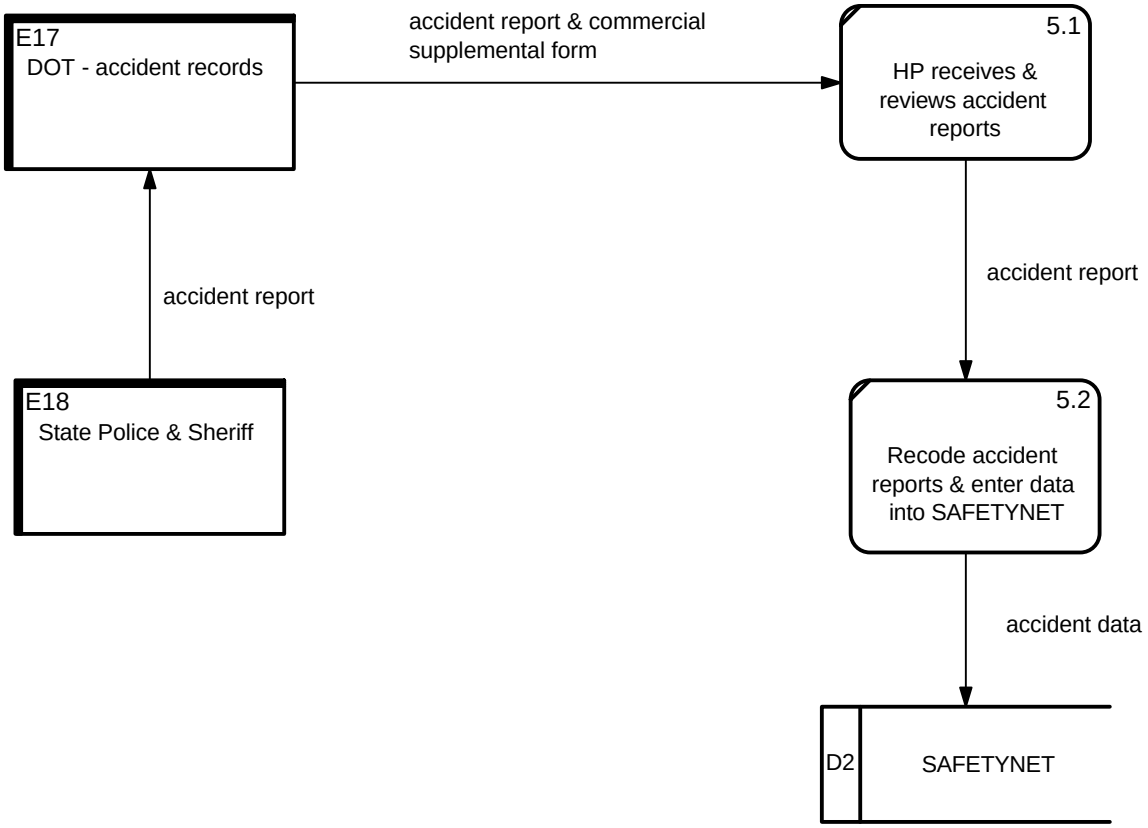
NODE:	TITLE:	NUMBER:
A0	Roadside Enforcement Highway Patrol	



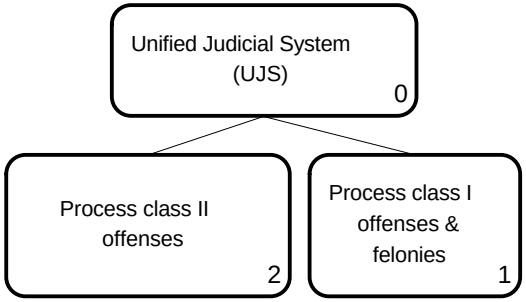
NODE:	TITLE:	NUMBER:
A1	Motor vehicle enforcement	



NODE:	TITLE:	NUMBER:
A2	Process OS/OW permit request	



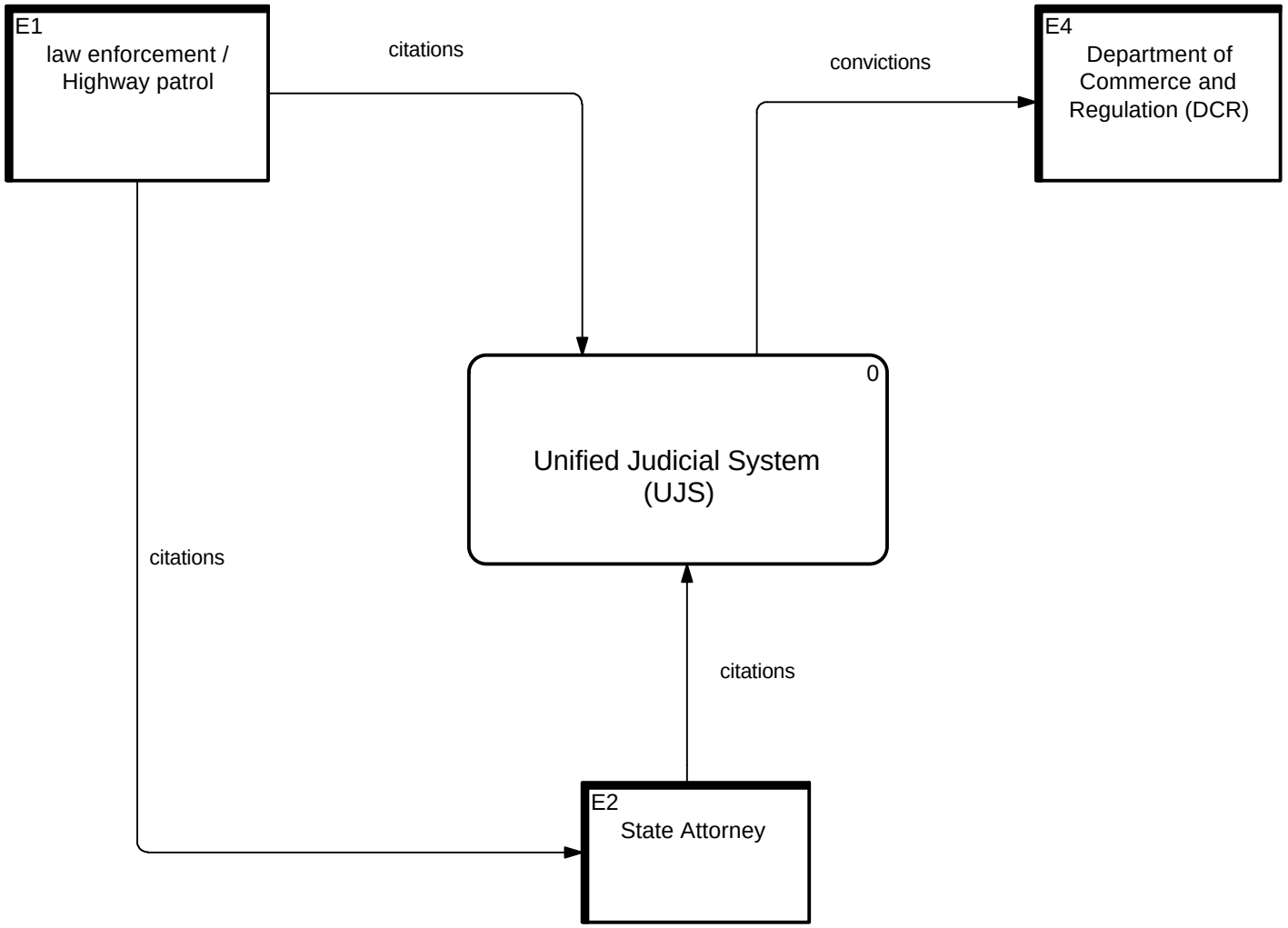
NODE:	TITLE:	NUMBER:
A5	Process accident data	



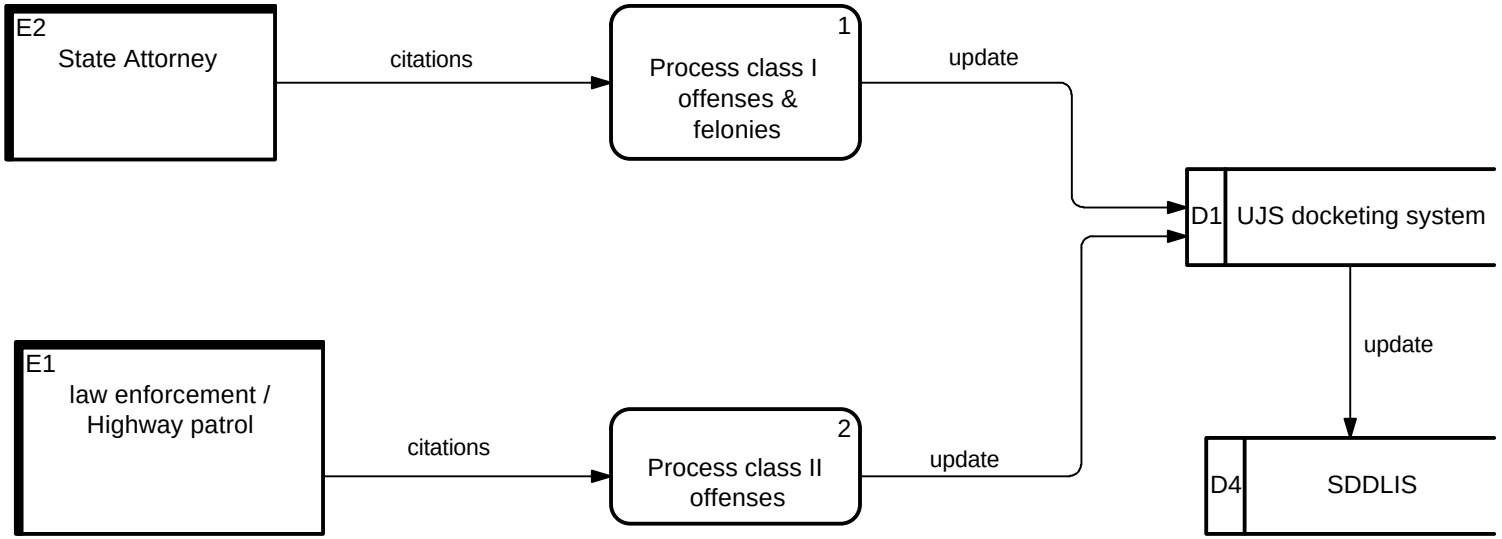
- Process fine or plea
- Accept citation & assign docket number
- Determine power of attorney
- Court appearance
- Conviction or dismissal

- File formal complaint
- Assign docket number
- Process fine and/or court appearance

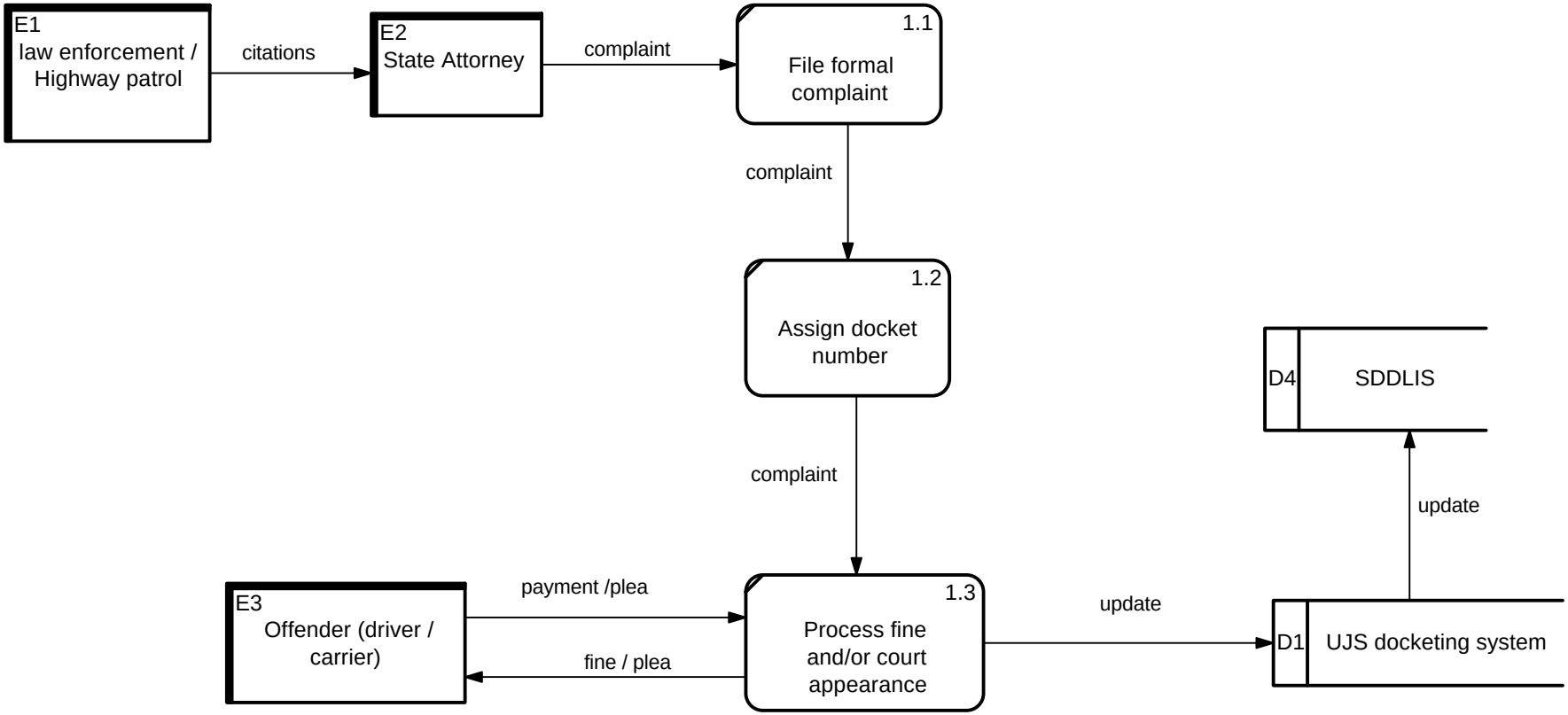
NODE:	TITLE:	NUMBER:
A0	Unified Judicial System (UJS) (DFD)	



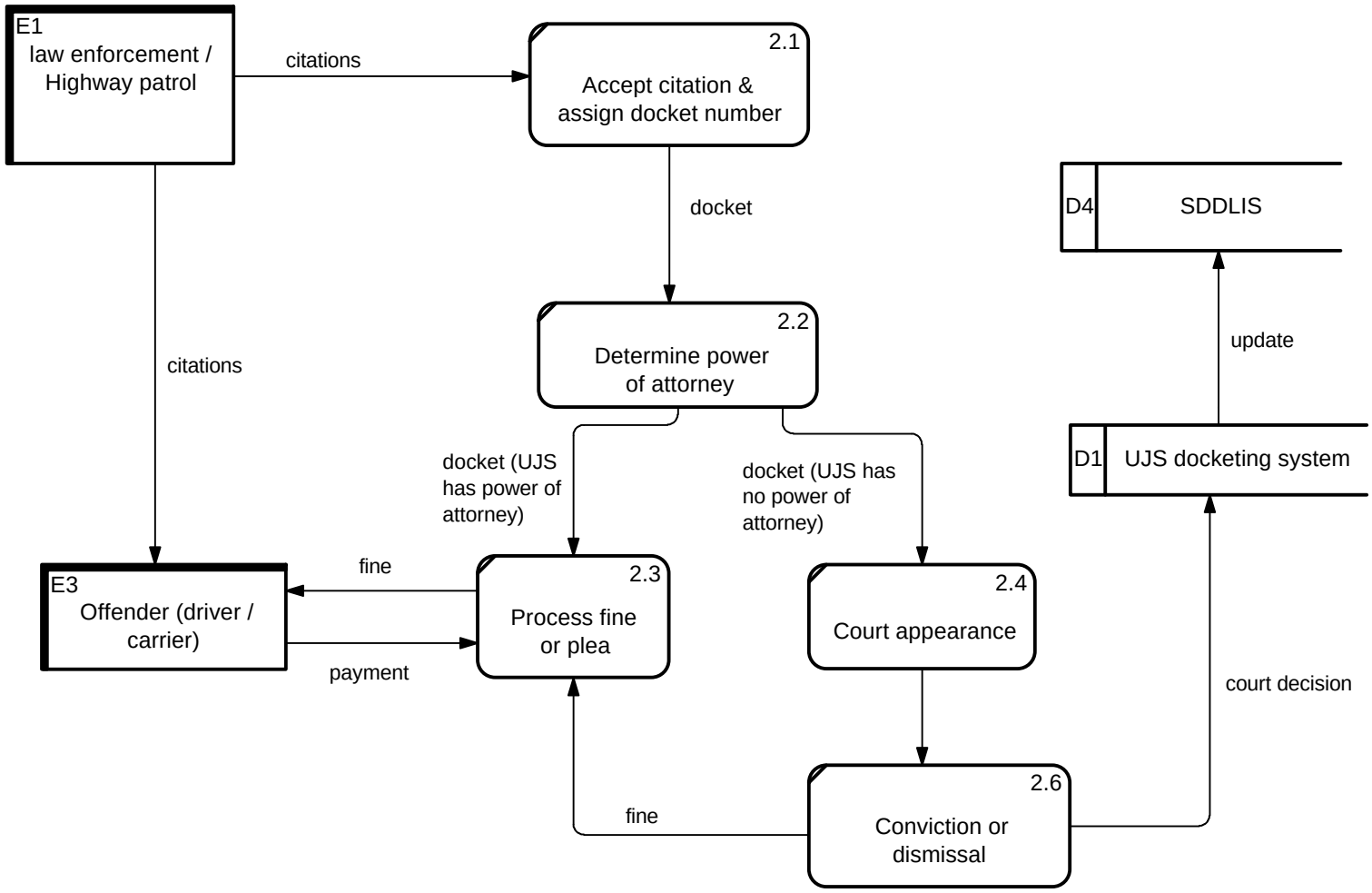
NODE:	TITLE:	NUMBER:
A-0	Unified Judicial System (UJS)	



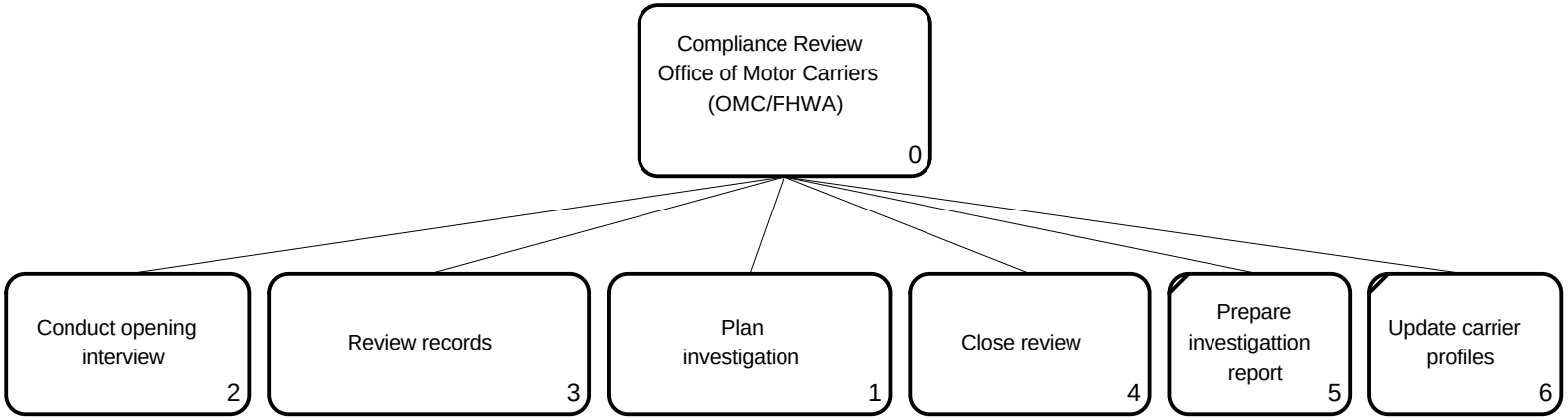
NODE:	TITLE:	NUMBER:
A0	Unified Judicial System (UJS)	



NODE:	TITLE:	NUMBER:
A1	Process class I offenses & felonies	



NODE:	TITLE:	NUMBER:
A2	Process class II offenses	



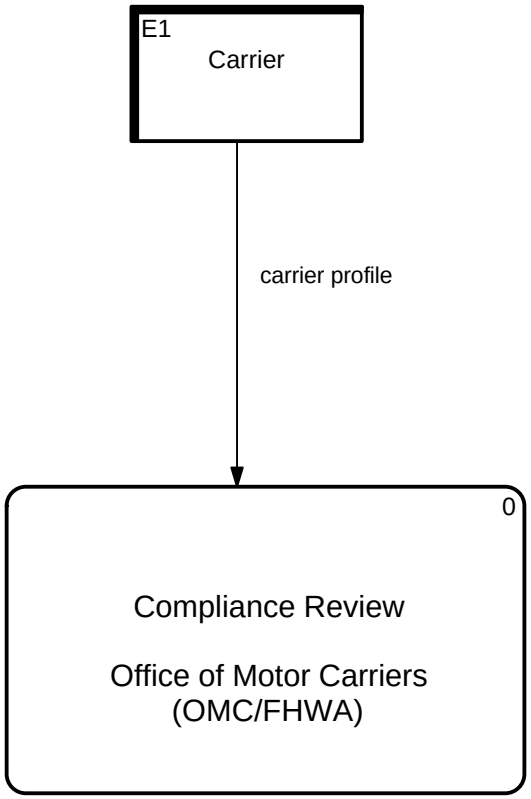
- Introduction and interview about operations
- Request records and working space
- Take tour of facility

- Sample records for review
- Review safety management control -general
- Driving motor vehicle files-part 392
- Review hours of service of drivers records - Part 395
- Review drug & alcohol testing, CDL, drivers' qualification files (Parts 382, 383, 391)
- Review vehicle parts and accessories/maintenance records Parts 393 & 396
- Review Hazmat files Parts 107 & 397

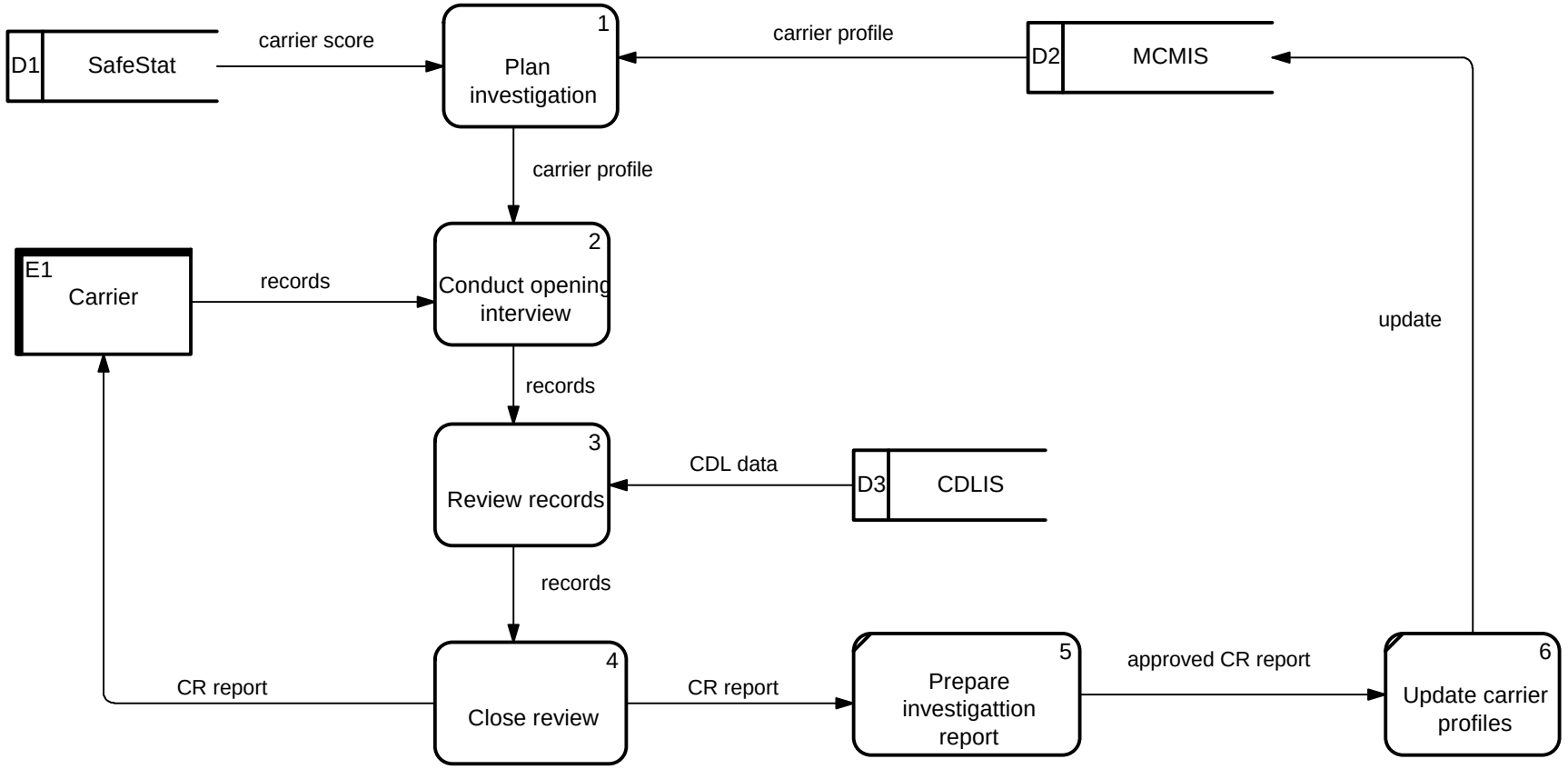
- Conduct telphone interview of carrier
- Review last CR with investigator
- Review regulations applicability
- Review carrier profile
- Request information & prepare investigative plan
- Make appointment for CR (except complaint CR)

- Identify violations discovered
- Explain likely safety rating
- Provide accident countermeasures
- Discuss review with carrier representative
- Provide details of consequences of violations
- Get review signed by SI and carrier

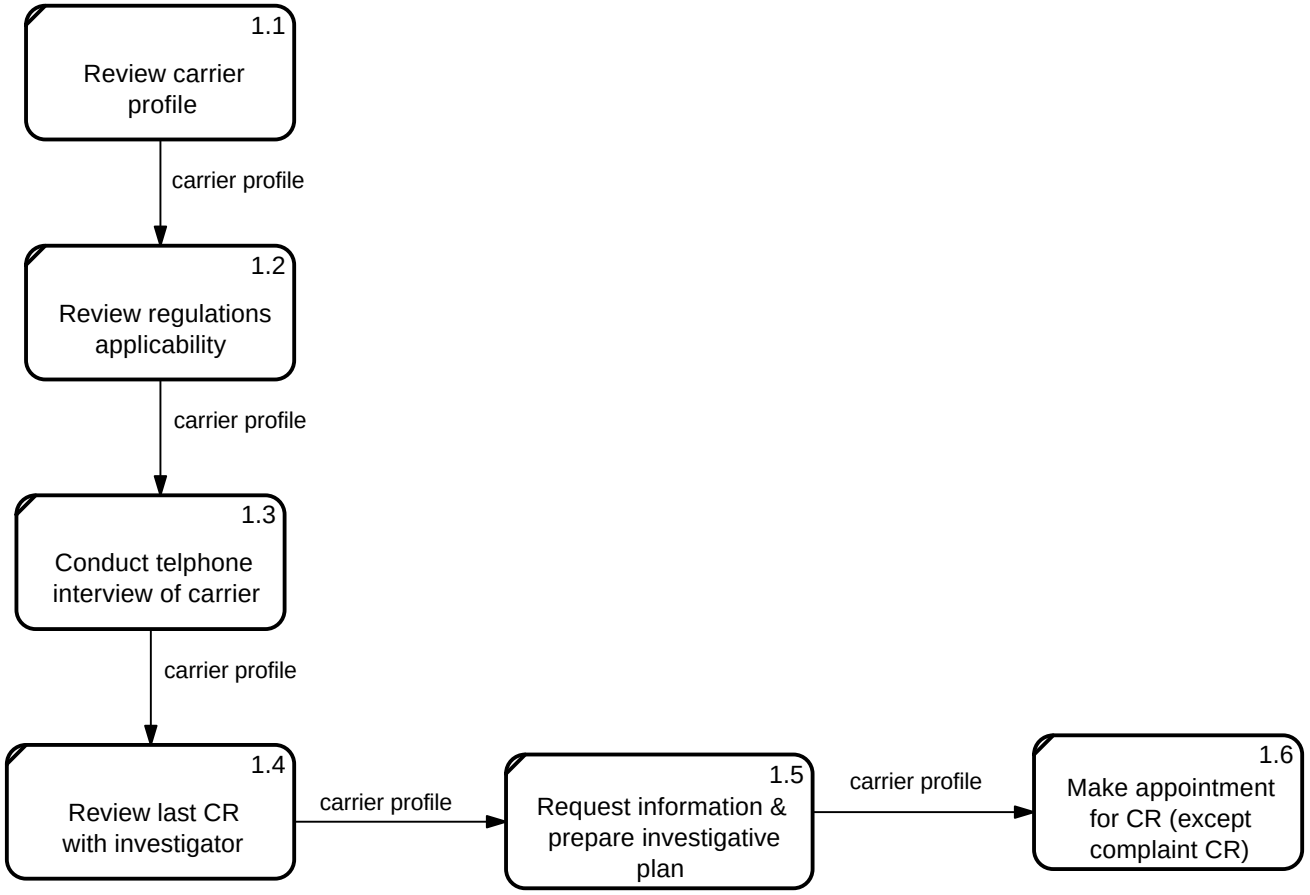
NODE:	TITLE:	NUMBER:
A0	Compliance Review - OMC/FHWA	



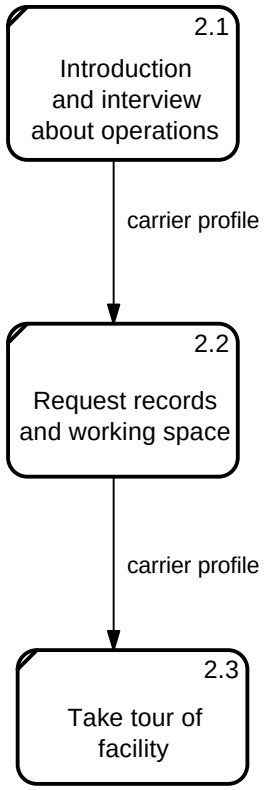
NODE:	TITLE:	NUMBER:
A-0	Compliance Review Office of Motor Carriers (OMC/FHWA)	



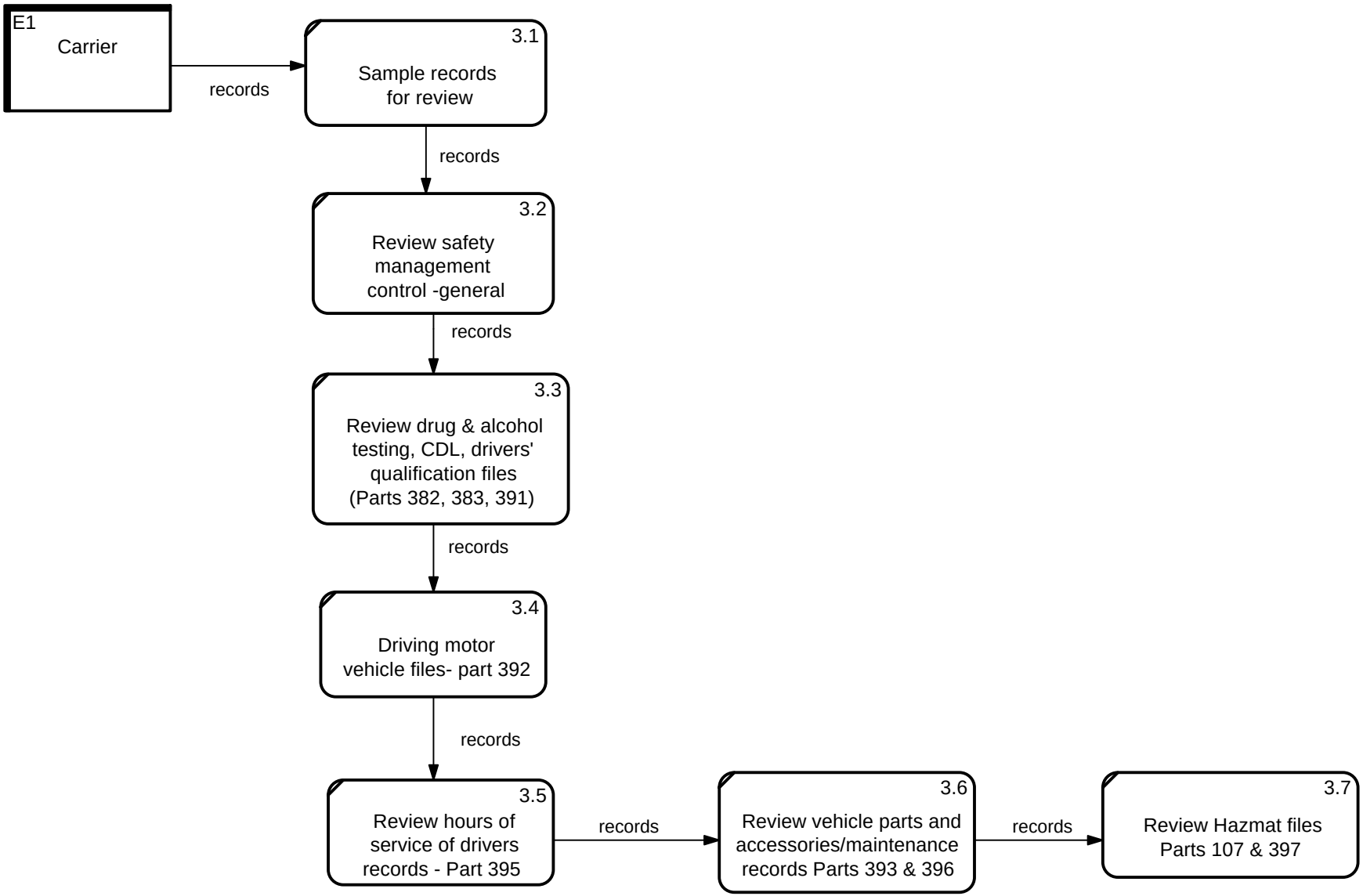
NODE:	TITLE:	NUMBER:
A0	Compliance Review Office of Motor Carriers (OMC/FHWA)	



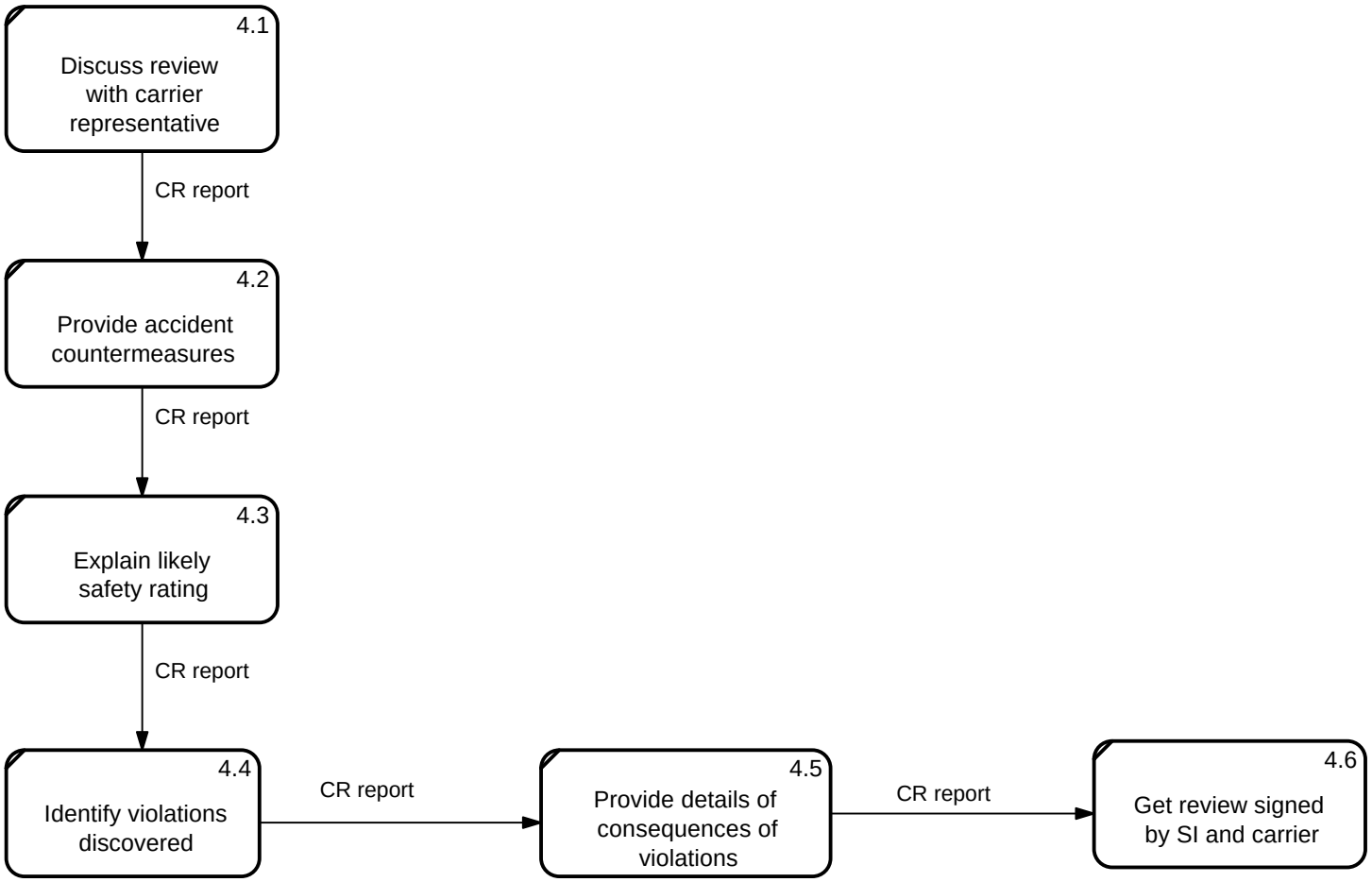
NODE:	TITLE:	NUMBER:
A1	Plan investigation	



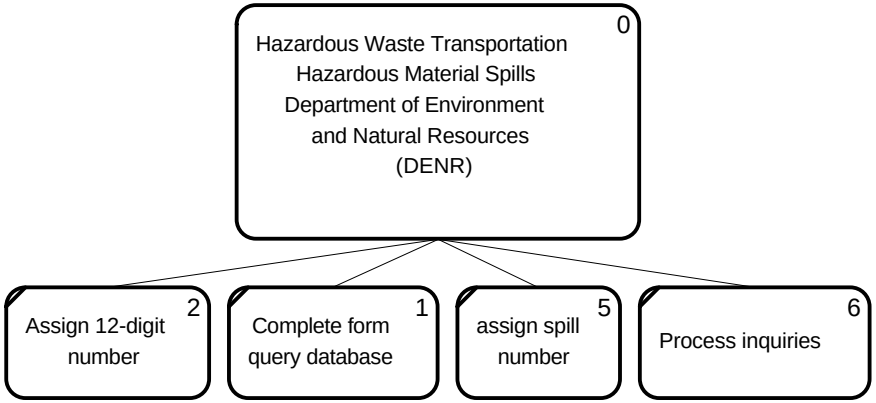
NODE:	TITLE:	NUMBER:
A2	Conduct opening interview	



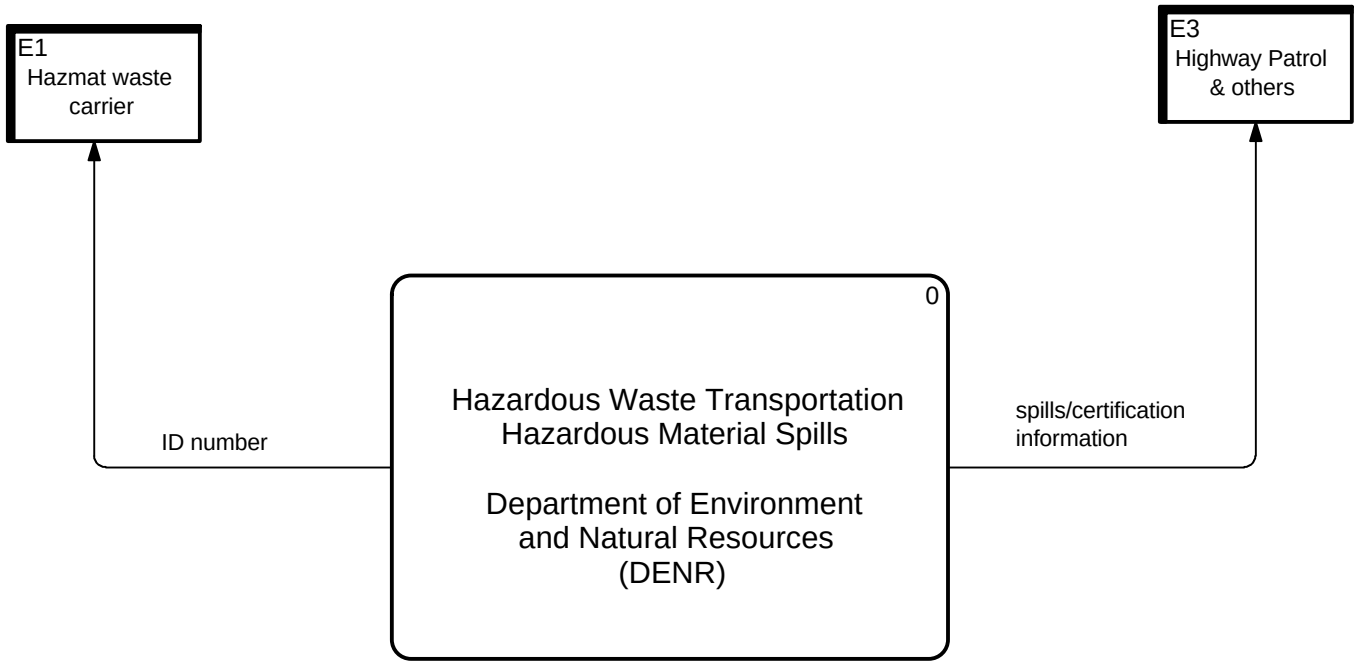
NODE:	TITLE:	NUMBER:
A3	Review records	



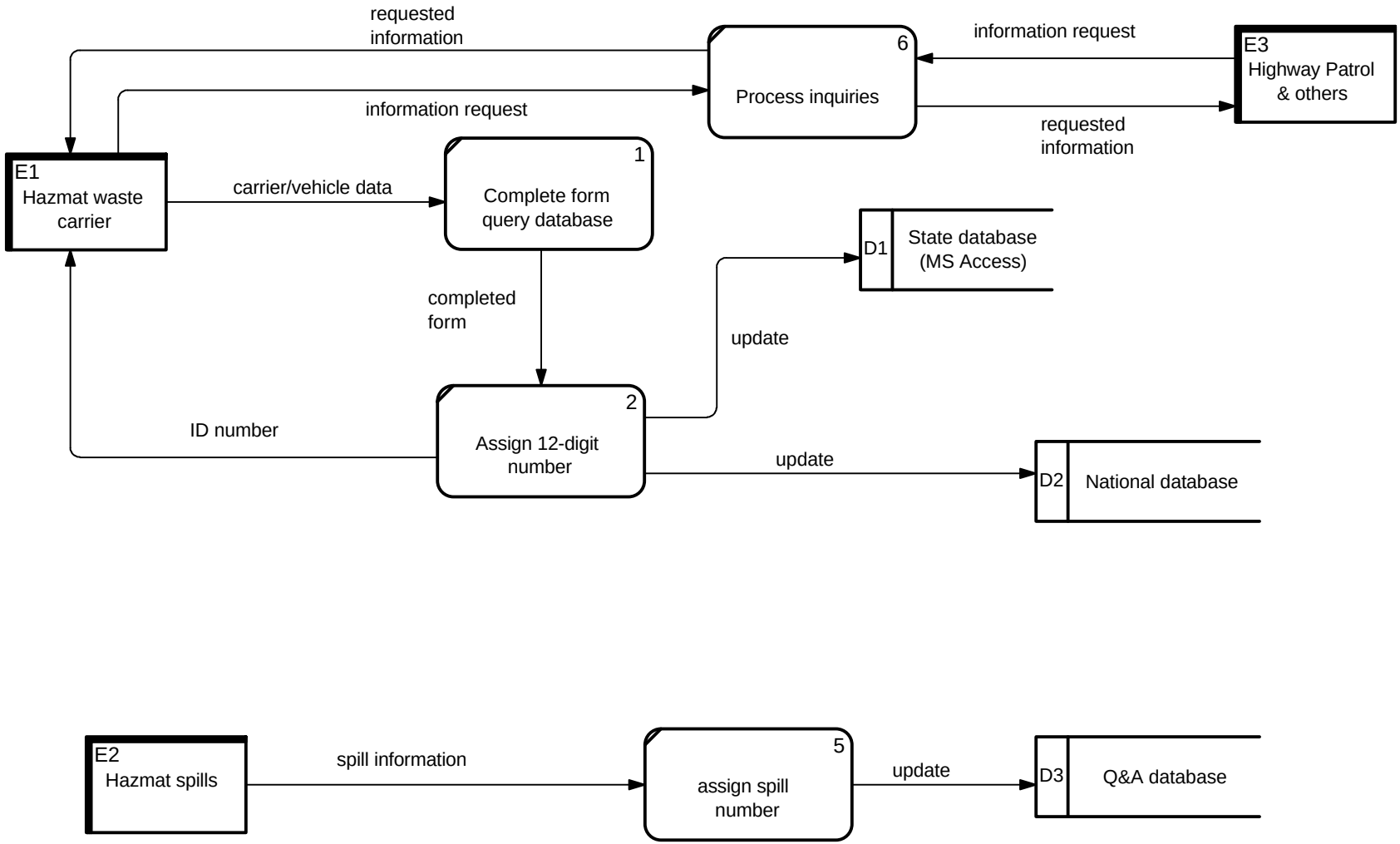
NODE:	TITLE:	NUMBER:
A4	Close review	



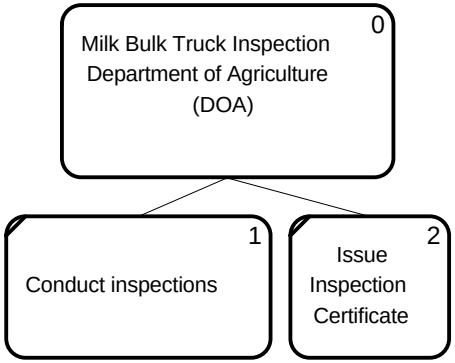
NODE:	TITLE:	NUMBER:
A0	Hazardous Waste Transportation & Hazmat Spills - DENR	



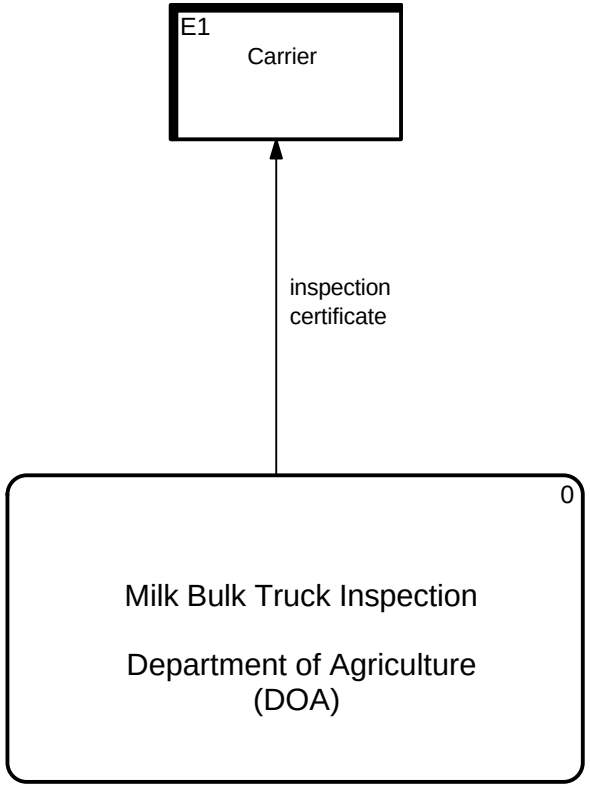
NODE:	TITLE:	NUMBER:
A-0	Hazardous Waste Transportation Hazardous Material Spills Department of Environment and Natural Resources (DENR)	



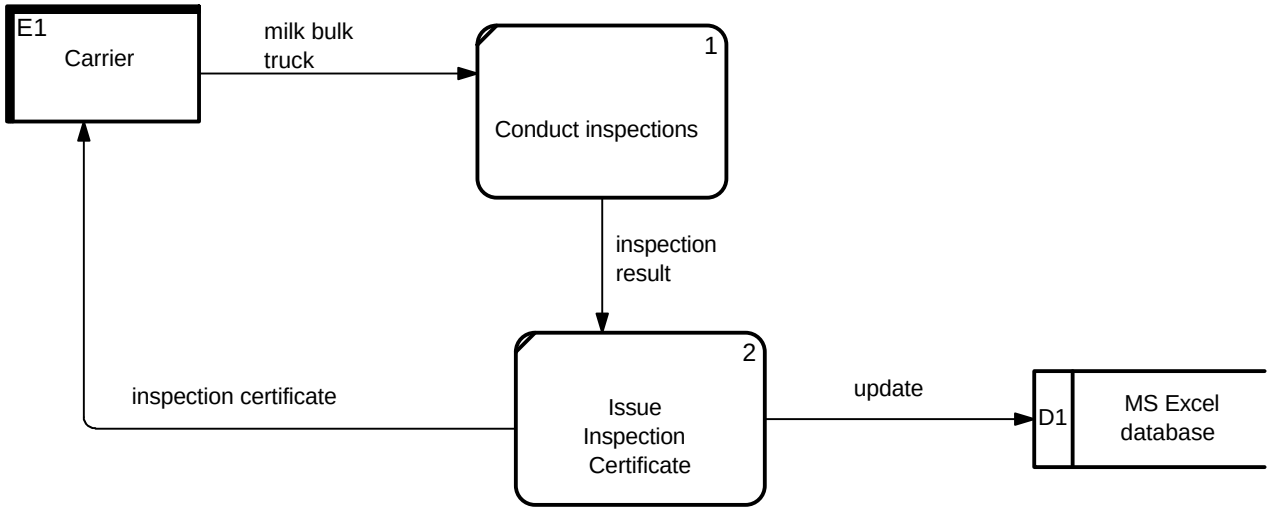
NODE:	TITLE: Hazardous Waste Transportation Hazardous Material Spills Department of Environment and Natural Resources (DENR)	NUMBER:
A0		



NODE:	TITLE:	NUMBER:
A0	Milk Bulk Truck Inspection - Department of Agriculture (DOA)	A-70



NODE:	TITLE:	NUMBER:
A-0	Milk Bulk Truck Inspection Department of Agriculture (DOA)	



NODE:	TITLE:	NUMBER:
A0	Milk Bulk Truck Inspection Department of Agriculture (DOA)	

Appendix B – Entity Relationship Diagrams (ERDs)

Notes on Entity Relationship Diagrams (ERD)

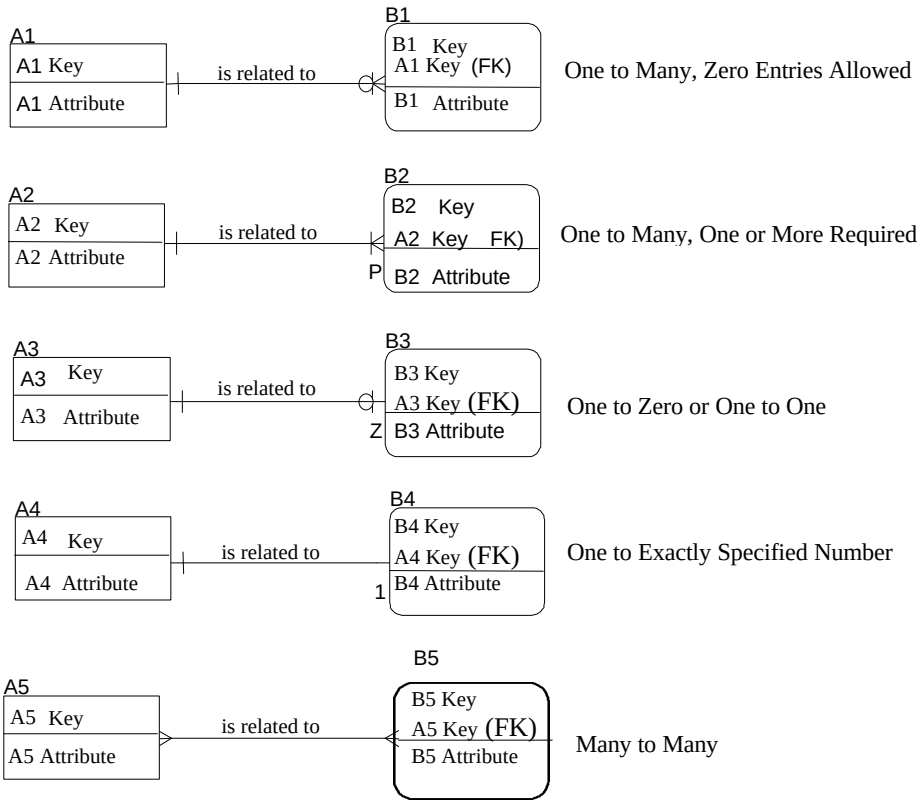
1. The relationships or cardinality available in the ERwin software and their meanings are summarized in the sketch below.

2. The ERDs are high-level functional designs whereby the information depicted cannot be directly transformed into a database. Thus, certain relationships that are generally not permitted for a good database design are shown. For example, ERwin does not permit zero, one or many to zero, one or many relationships because, for a good database design, such a relationship would require an intermediary entity.

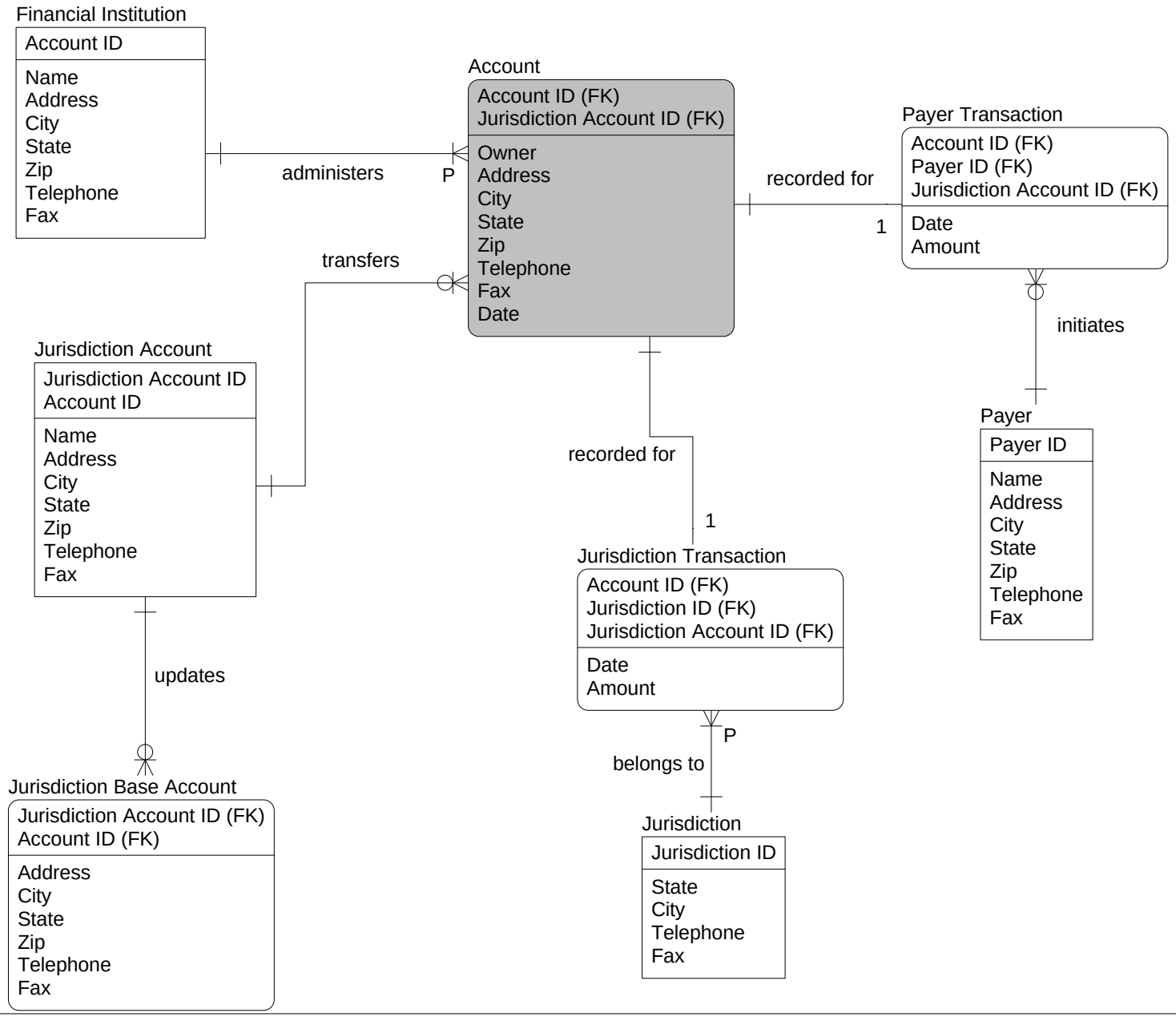
3. The foreign keys (FK) are propagated for one-to-many and one-to-one relationships.

4. The attributes shown represent examples of the attributes that describe each data entity.

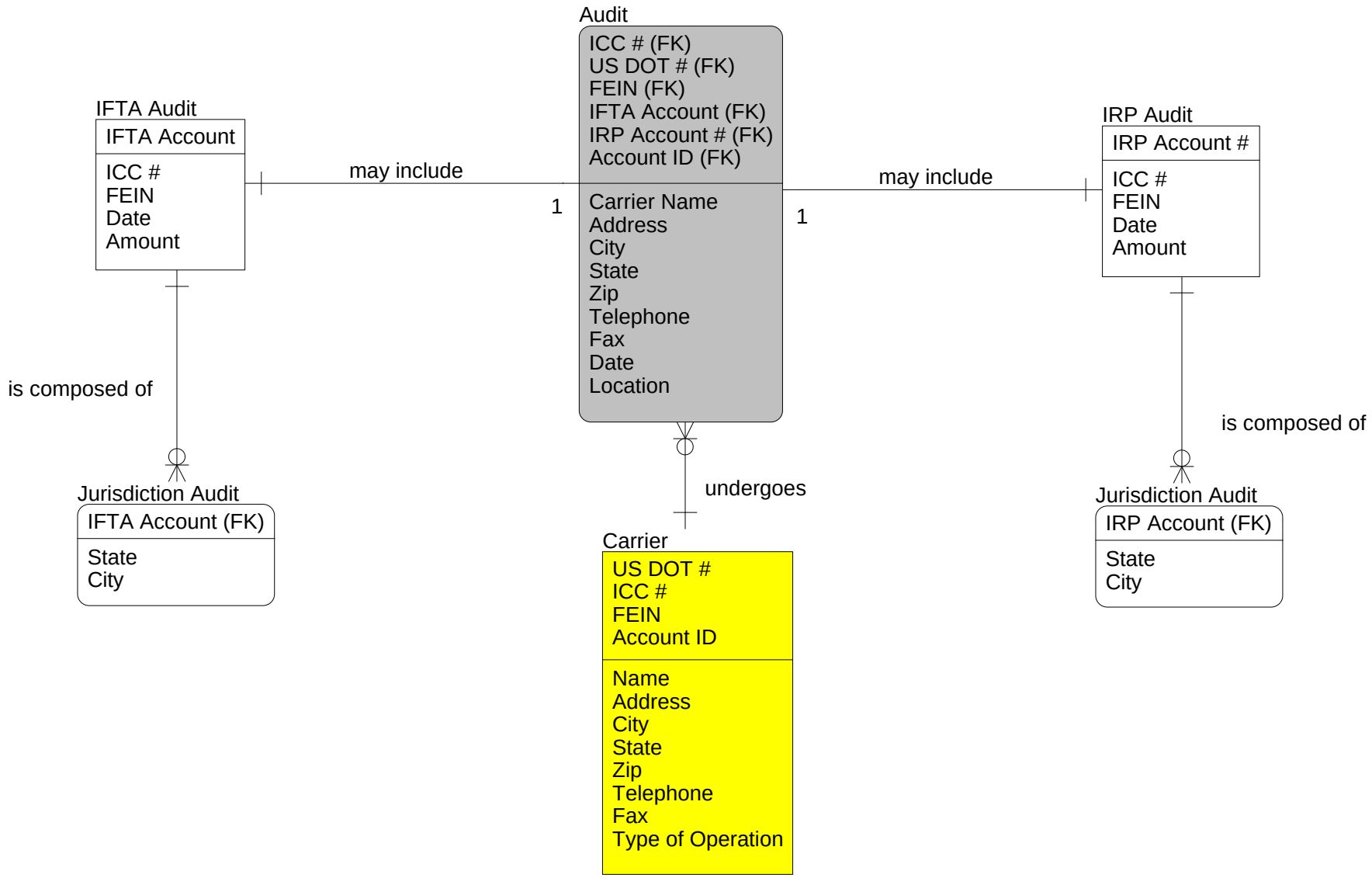
Symbols Used in Identifying Relationships

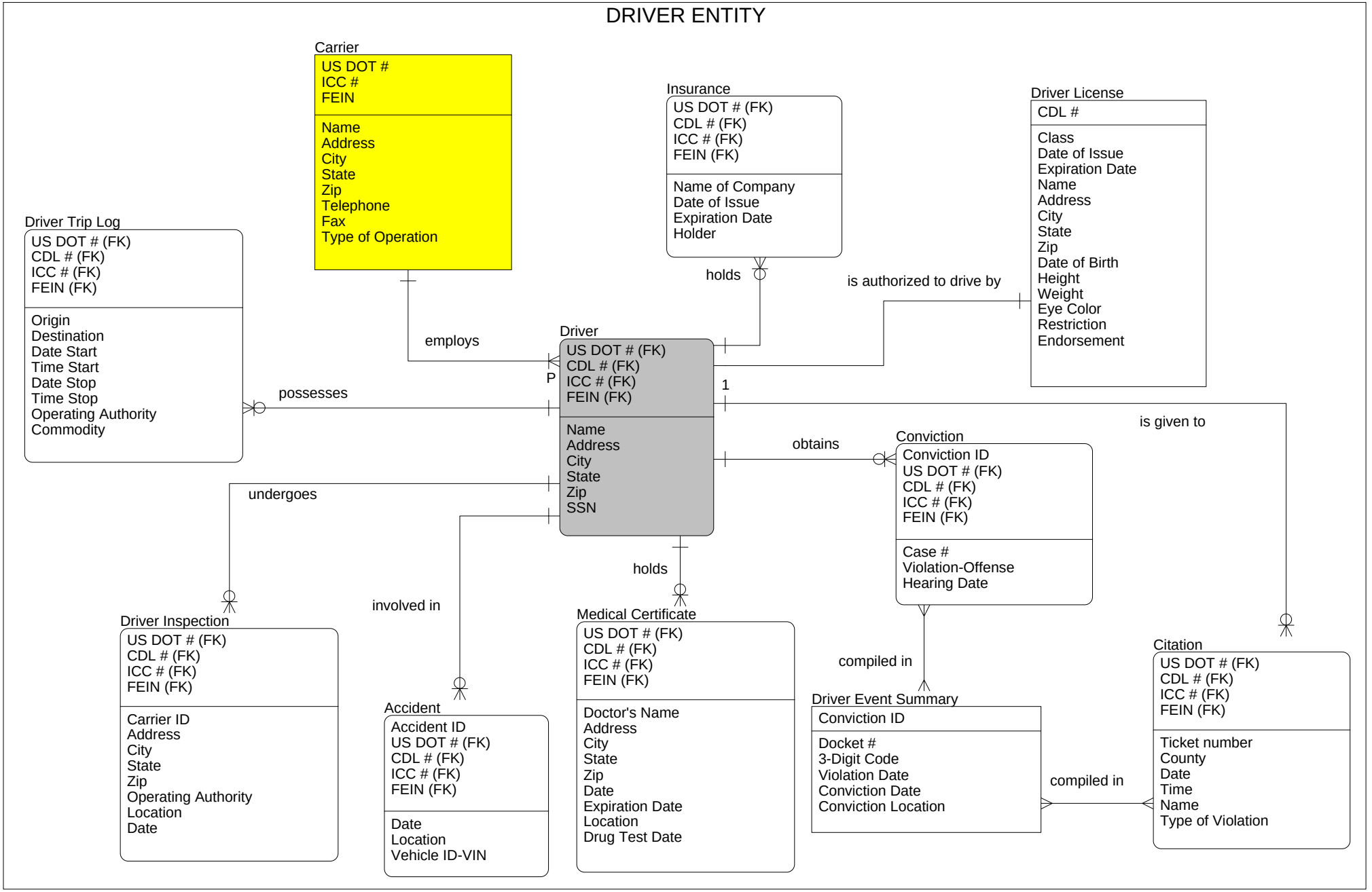


ACCOUNT ENTITY

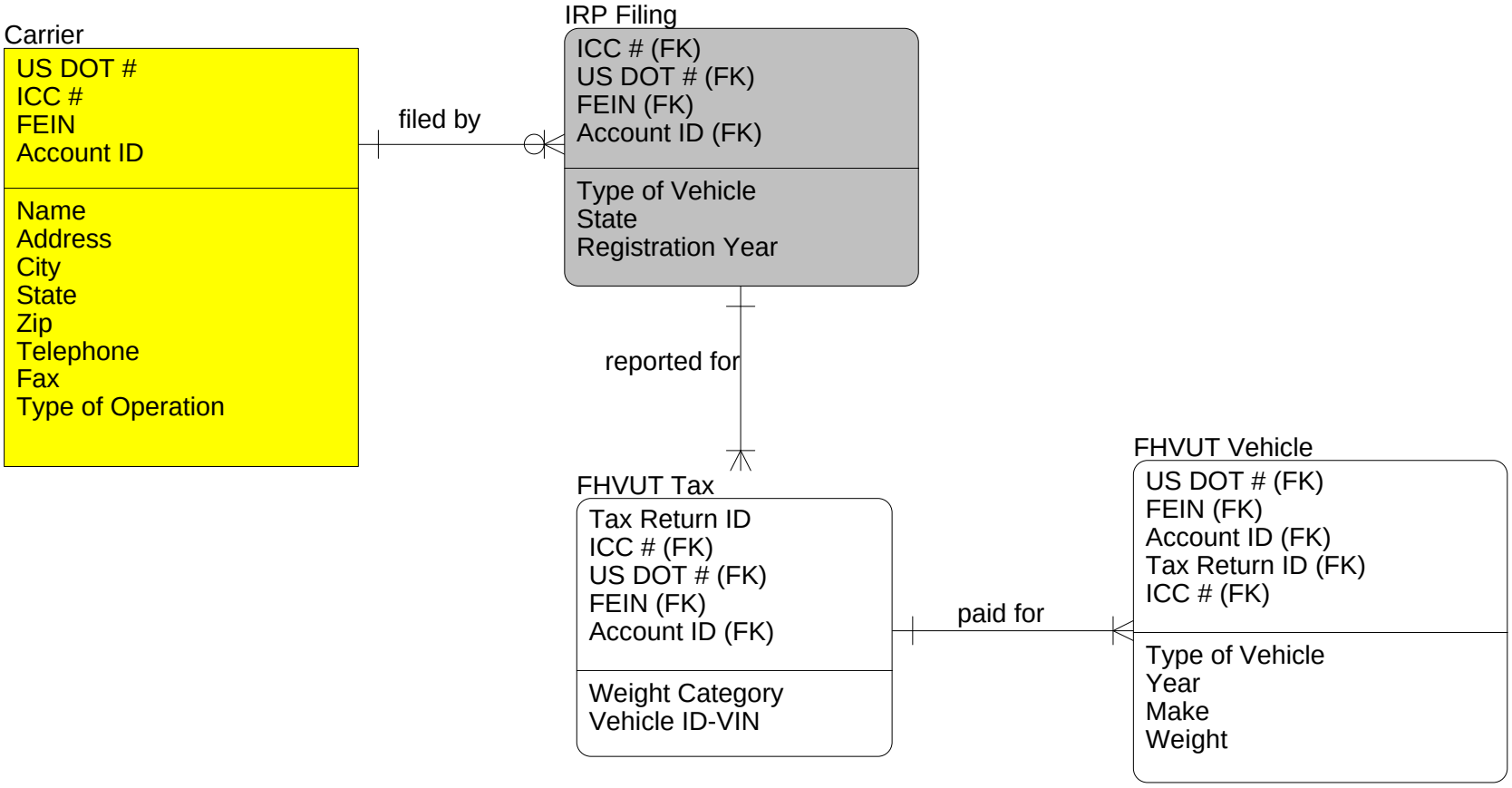


AUDIT ENTITY

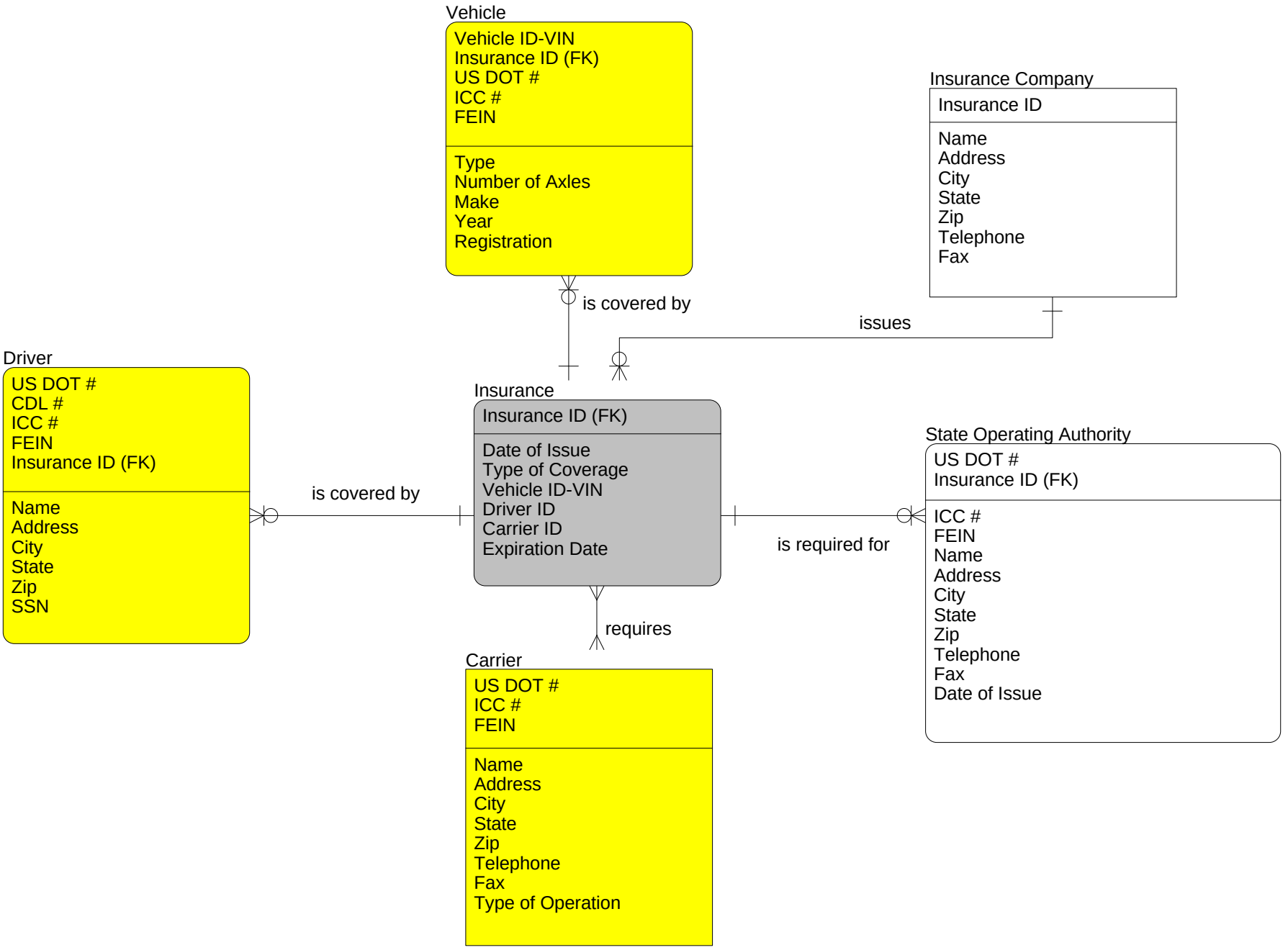



DRIVER ENTITY
Carrier
US DOT #
ICC #
FEIN
Name
Address
City
State
Zip
Telephone
Fax
Type of Operation
Insurance
US DOT # (FK)
CDL # (FK)
ICC # (FK)
FEIN (FK)
Name of Company
Date of Issue
Expiration Date
Holder
Driver License
CDL #
Class
Date of Issue
Expiration Date
Name
Address
City
State
Zip
Date of Birth
Height
Weight
Eye Color
Restriction
Endorsement
Driver Trip Log
US DOT # (FK)
CDL # (FK)
ICC # (FK)
FEIN (FK)
Origin
Destination
Date Start
Time Start
Date Stop
Time Stop
Operating Authority
Commodity
holds
is authorized to drive by
employs
Driver
US DOT # (FK)
CDL # (FK)
ICC # (FK)
FEIN (FK)
Name
Address
City
State
Zip
SSN
P
1
possesses
is given to
obtains
Conviction
Conviction ID
US DOT # (FK)
CDL # (FK)
ICC # (FK)
FEIN (FK)
Case #
Violation-Offense
Hearing Date
undergoes
holds
involved in
Driver Inspection
US DOT # (FK)
CDL # (FK)
ICC # (FK)
FEIN (FK)
Carrier ID
Address
City
State
Zip
Operating Authority
Location
Date
Accident
Accident ID
US DOT # (FK)
CDL # (FK)
ICC # (FK)
FEIN (FK)
Date
Location
Vehicle ID-VIN
Medical Certificate
US DOT # (FK)
CDL # (FK)
ICC # (FK)
FEIN (FK)
Doctor's Name
Address
City
State
Zip
Date
Expiration Date
Location
Drug Test Date
compiled in
Driver Event Summary
Conviction ID
Docket #
3-Digit Code
Violation Date
Conviction Date
Conviction Location
compiled in
Citation
US DOT # (FK)
CDL # (FK)
ICC # (FK)
FEIN (FK)
Ticket number
County
Date
Time
Name
Type of Violation

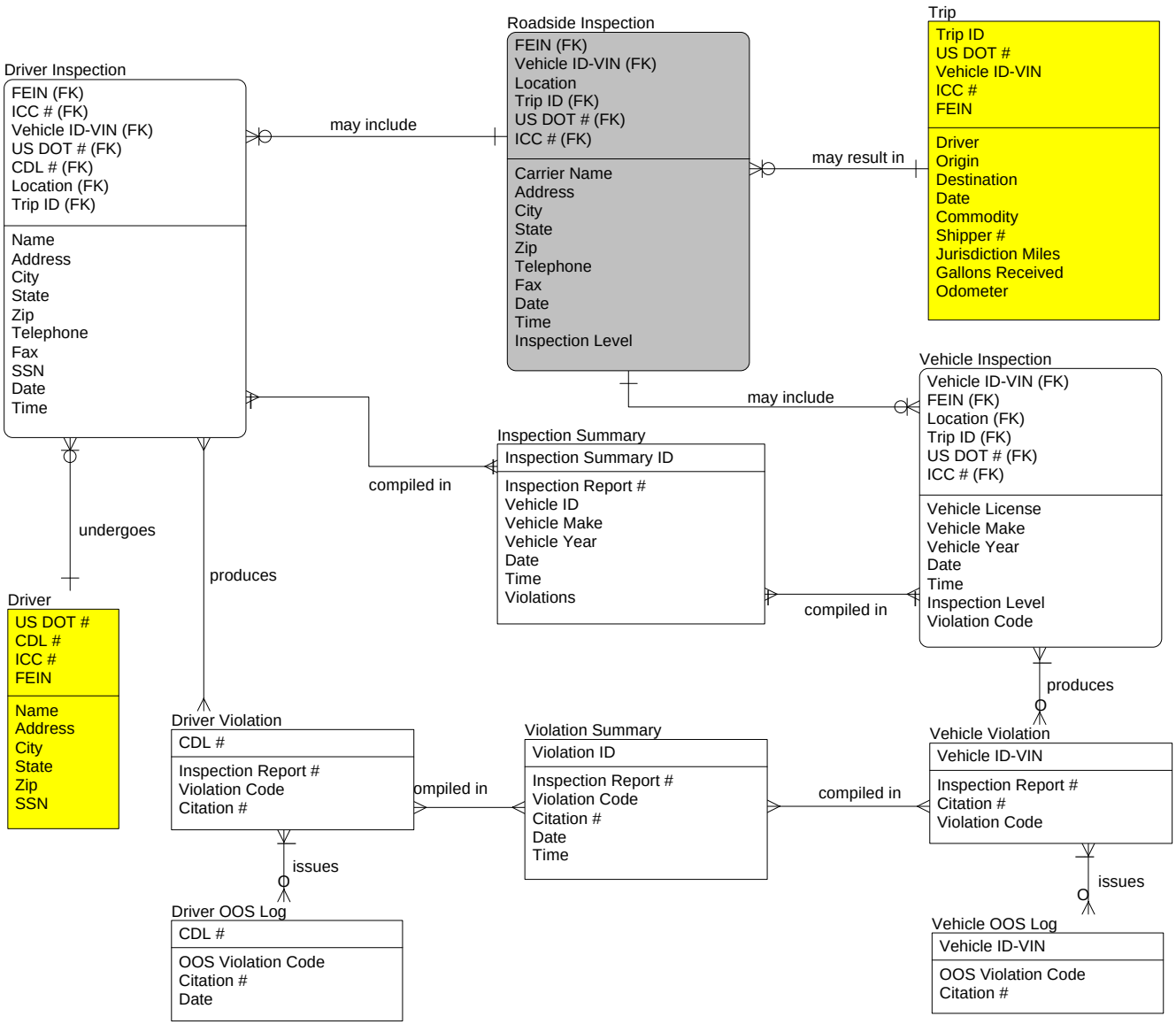
IRP FILING ENTITY



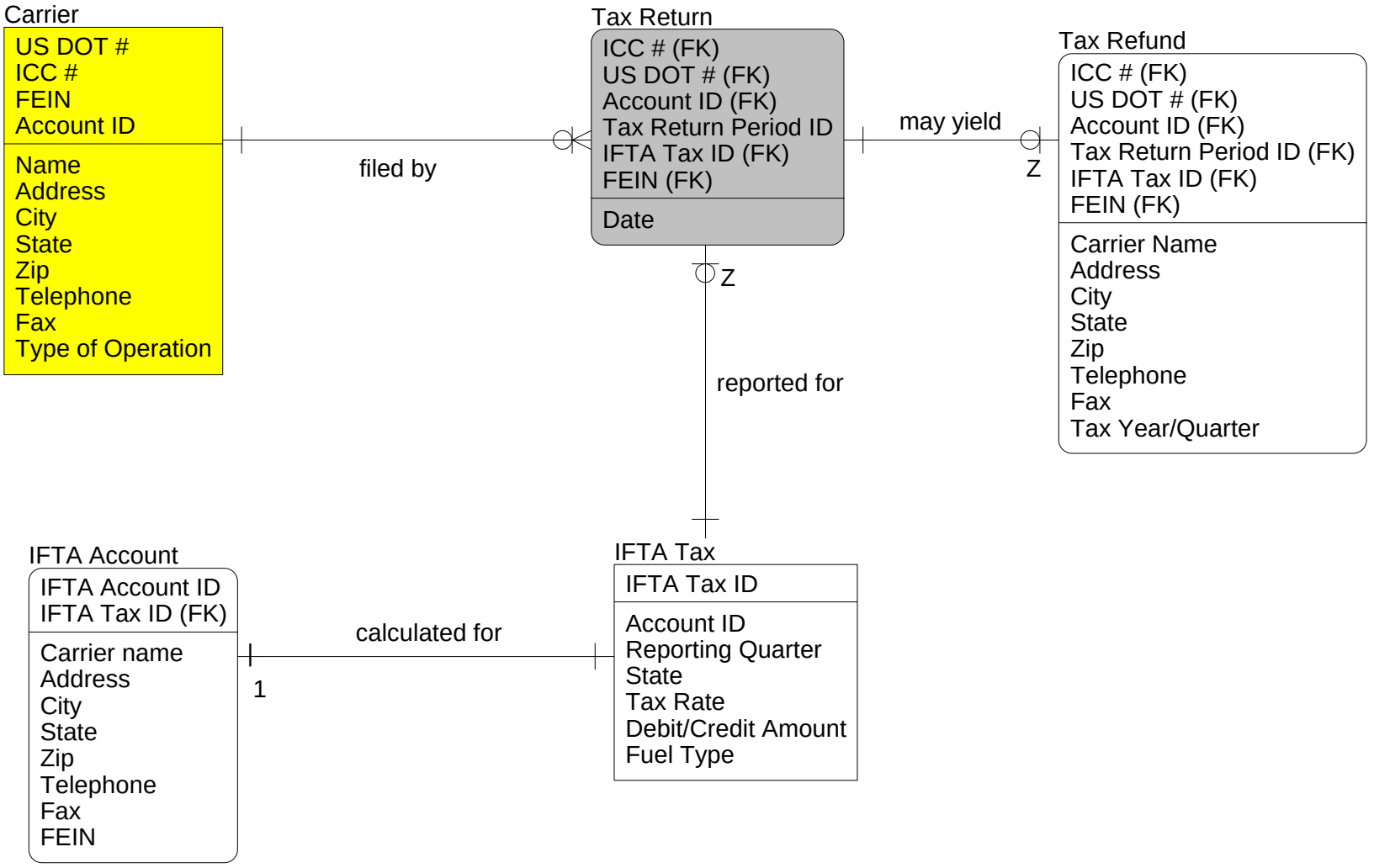
INSURANCE ENTITY



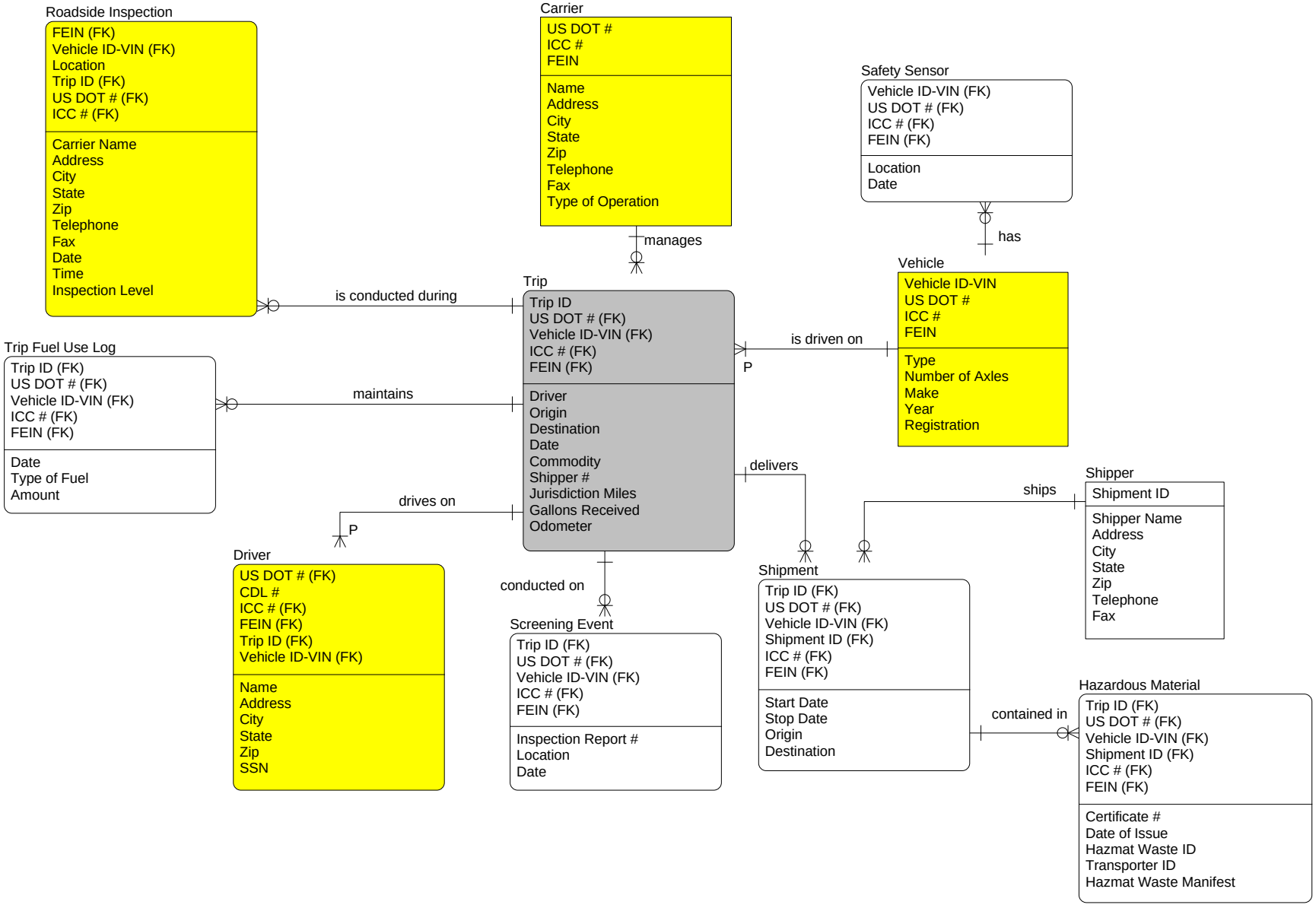
ROADSIDE INSPECTION ENTITY



IFTA TAX RETURN ENTITY



TRIP ENTITY


Roadside Inspection
FEIN (FK)
Vehicle ID-VIN (FK)
Location
Trip ID (FK)
US DOT # (FK)
ICC # (FK)
Carrier Name
Address
City
State
Zip
Telephone
Fax
Date
Time
Inspection Level
Carrier
US DOT #
ICC #
FEIN
Name
Address
City
State
Zip
Telephone
Fax
Type of Operation
Safety Sensor
Vehicle ID-VIN (FK)
US DOT # (FK)
ICC # (FK)
FEIN (FK)
Location
Date
has
manages
Vehicle
Vehicle ID-VIN
US DOT #
ICC #
FEIN
Type
Number of Axles
Make
Year
Registration
is conducted during
Trip
Trip ID
US DOT # (FK)
Vehicle ID-VIN (FK)
ICC # (FK)
FEIN (FK)
Driver
Origin
Destination
Date
Commodity
Shipper #
Jurisdiction Miles
Gallons Received
Odometer
is driven on
P
Trip Fuel Use Log
Trip ID (FK)
US DOT # (FK)
Vehicle ID-VIN (FK)
ICC # (FK)
FEIN (FK)
Date
Type of Fuel
Amount
maintains
delivers
ships
Shipper
Shipment ID
Shipper Name
Address
City
State
Zip
Telephone
Fax
drives on
P
Driver
US DOT # (FK)
CDL #
ICC # (FK)
FEIN (FK)
Trip ID (FK)
Vehicle ID-VIN (FK)
Name
Address
City
State
Zip
SSN
conducted on
Screening Event
Trip ID (FK)
US DOT # (FK)
Vehicle ID-VIN (FK)
ICC # (FK)
FEIN (FK)
Inspection Report #
Location
Date
Shipment
Trip ID (FK)
US DOT # (FK)
Vehicle ID-VIN (FK)
Shipment ID (FK)
ICC # (FK)
FEIN (FK)
Start Date
Stop Date
Origin
Destination
contained in
Hazardous Material
Trip ID (FK)
US DOT # (FK)
Vehicle ID-VIN (FK)
Shipment ID (FK)
ICC # (FK)
FEIN (FK)
Certificate #
Date of Issue
Hazmat Waste ID
Transporter ID
Hazmat Waste Manifest

CARRIER ENTITY

IRP
US DOT # (FK)
ICC # (FK)
FEIN (FK)

Title #
License Year
SSN
Owners Name
Vehicle ID-VIN
Type of Vehicle
Model
Make
Year
Number of Axles
Date of Issue

Carrier OOS Log
US DOT # (FK)
ICC # (FK)
FEIN (FK)

Violation Code
Date
Citation #

IFTA Registration
US DOT # (FK)
ICC # (FK)
FEIN (FK)

Decal #
IFTA Account #
Carrier
Business Name
Address
City
State
Zip
Telephone
Fax
Type of Ownership
Date of Issue

OOS History
US DOT # (FK)
ICC # (FK)
FEIN (FK)

Citation
Vehicle ID-VIN
Driver ID
Date
Type

Carrier Location
US DOT # (FK)
ICC # (FK)
FEIN (FK)

Address
City
State
Zip
Telephone
Fax

Audit
Account ID
US DOT # (FK)
ICC # (FK)
FEIN (FK)

Carrier Name
Address
City
State
Zip
Telephone
Fax
Date
Location

Tax Return
Tax Return Period ID
IFTA Tax ID
FEIN (FK)
US DOT # (FK)
ICC # (FK)

Date

Hazmat Waste
Hazmat Waste ID
US DOT # (FK)
ICC # (FK)
FEIN (FK)

Transporter ID
Hazmat Waste Manifest
Hazmat Waste Certification

Compliance Review Violation
Compliance Review ID (FK)
US DOT # (FK)
ICC # (FK)
FEIN (FK)

Type of Violation
Citation
Sanction
Enforcement Action
OOS
Date

Prosecution
US DOT # (FK)
ICC # (FK)
FEIN (FK)

Violation
Citation
Hearing Date

Carrier State Credential
US DOT # (FK)
ICC # (FK)
FEIN (FK)

Credential #
Date
Type of Operation

Carrier
US DOT #
ICC #
FEIN

Name
Address
City
State
Zip
Telephone
Fax
Type of Operation

Compliance Review
Compliance Review ID
US DOT # (FK)
ICC # (FK)
FEIN (FK)

Date
Location
Type of Business

User
US DOT # (FK)
User ID
ICC # (FK)
FEIN (FK)

Name
Address
City
State
Zip
Telephone
Fax

User Access Rule
User ID (FK)
US DOT # (FK)
ICC # (FK)
FEIN (FK)

Rules

State Operating Authority
US DOT # (FK)
ICC # (FK)
FEIN (FK)
SSN

Name of Carrier
Date of Issue

Complaint
US DOT # (FK)
ICC # (FK)
FEIN (FK)

Nature of Complaint
To/By
Date

Safety Evaluation
Compliance Review ID
Safety Evaluation ID

Driver's List
Qualification Files
Medical Records
Driver's Logs
Safety Rating
Accident Records

Enforcement
US DOT # (FK)
Enforcement ID
ICC # (FK)
FEIN (FK)

Vehicle ID-VIN
Driver ID
Date

Enforcement Violation
Enforcement ID (FK)
US DOT # (FK)
ICC # (FK)
FEIN (FK)

CDL #
Vehicle ID-VIN
Date
Vehicle Registration
Violation Code
Sanction
OOS

Carrier Sanction
Safety Evaluation ID (FK)
Compliance Review ID (FK)

Violation Code
Type of Sanction
Date

Driver
US DOT # (FK)
CDL #
ICC # (FK)
FEIN (FK)

Name
Address
City
State
Zip
SSN

Trip
Trip ID
US DOT # (FK)
Vehicle ID-VIN
ICC # (FK)
FEIN (FK)

Driver
Origin
Destination
Date
Commodity
Shipper #
Jurisdiction Miles
Gallons Received
Odometer

Accident
Accident ID

Accident Report #
Location
Date

Accident Summary
Accident ID

Accident Report #
Carrier Name
Driver ID
Vehicle ID
Location
Date
Time

Hazmat Incident
Incident ID (FK)

Type
Location
Date
Time

Fleet
US DOT # (FK)
ICC # (FK)
FEIN (FK)

Vehicle ID-VIN
Type/Body Type
Date

ICC Operating Authority
US DOT # (FK)
ICC Operating Authority
ICC # (FK)
FEIN (FK)

Name
Address
City
State
Zip
Telephone
Fax

Cargo
ICC Operating Authority ID
US DOT # (FK)
ICC Operating Authority (FK)
ICC # (FK)
FEIN (FK)

Shipper ID
Type of Cargo
Origin
Destination
Date

Vehicle Inspection
Compliance Review ID (FK)
US DOT # (FK)
ICC # (FK)
FEIN (FK)

Vehicle ID-VIN
Registration
Maintenance Records
Inspection Level
Date
Location

1 registers for
1 has
1 registers for
1 has
obtains
has
has
files
undergoes
transports
is performed on
undergoes
results in
results in
is located at
undergoes
files
1
O
operates by
employs
manages
O tracks
compiled in
constitutes
1
owns/leases
has
P
P
operates under
1
has
result in
results in
hauled under
1

VEHICLE ENTITY

Trip
- Insurance ID (FK)
- Account ID (FK)
- Owner ID (FK)
- Trip ID
- US DOT # (FK)
- Vehicle ID-VIN (FK)
- ICC # (FK)
- FEIN (FK)

- Driver
- Origin
- Destination
- Date
- Commodity
- Shipper #
- Jurisdiction Miles
- Gallons Received
- Odometer

Vehicle Maintenance Log
- Vehicle ID-VIN

- Mechanic Shop
- Location
- Type of Maintenance
- Date

has

driven on

1

Registration
- Insurance ID (FK)
- Account ID (FK)
- Owner ID (FK)
- FEIN (FK)
- US DOT # (FK)
- Vehicle ID-VIN (FK)
- Carrier ID (FK)
- ICC # (FK)

- Registration #
- Type of Vehicle
- Number of Axles
- Make
- Year
- Date of Issue
- Type of Ownership
- License Year

holds

P

updates

1

has

reported for

Registrant
- Carrier ID
- US DOT #
- FEIN

- Name
- Address
- City
- State
- Zip
- Telephone
- Fax
- Type of Operation
- IRP
- Account #

IRP Mileage and Weight
- Insurance ID (FK)
- Account ID (FK)
- Owner ID (FK)
- US DOT # (FK)
- Vehicle ID-VIN (FK)
- Carrier ID (FK)
- ICC # (FK)
- FEIN (FK)

- Trip ID
- Distance
- Weight Transported
- Type of Fuel
- Jurisdiction

IRP Supplement
- Vehicle ID-VIN

- Date
- Weight
- Type
- Year
- Make
- Number of Axles
- Purchase Price
- Purchase Date

Owner
- Vehicle ID-VIN
- Owner ID

- SSN
- Name
- Address
- City
- State
- Zip
- Telephone
- Fax
- Type of Operation

owns

1

Fleet
- Vehicle ID-VIN
- US DOT # (FK)
- ICC # (FK)
- FEIN (FK)
- Account ID

- Carrier ID
- Number of Vehicles
- Type/Axle
- Make
- Year

owns/leases

Carrier
- US DOT #
- ICC #
- FEIN

- Name
- Address
- City
- State
- Zip
- Telephone
- Fax
- Type of Operation

Vehicle Inspection
- Insurance ID (FK)
- Account ID (FK)
- Owner ID (FK)
- Vehicle ID-VIN (FK)
- US DOT # (FK)
- ICC # (FK)
- FEIN (FK)

- Date
- Time
- Location
- Vehicle Type
- Year
- Number of Axles
- Violation Code

undergoes

1

Vehicle
- Insurance ID (FK)
- FEIN (FK)
- ICC # (FK)
- US DOT # (FK)
- Account ID (FK)
- Owner ID (FK)
- Vehicle ID-VIN (FK)

- Type
- Number of Axles
- Make
- Year
- Registration

is composed of

is driven by

1

Driver
- US DOT # (FK)
- CDL #
- ICC # (FK)
- FEIN (FK)
- Insurance ID (FK)
- Account ID (FK)
- Owner ID (FK)
- Vehicle ID-VIN (FK)

- Name
- Address
- City
- State
- Zip
- SSN

Accident
- Accident ID
- Insurance ID (FK)
- FEIN (FK)
- ICC # (FK)
- US DOT # (FK)
- Account ID (FK)
- Owner ID (FK)
- Vehicle ID-VIN (FK)

- Accident Report #
- Date
- Location
- Time

is involved in

1

holds

1

Vehicle State Credential
- Insurance ID (FK)
- Account ID (FK)
- Owner ID (FK)
- Vehicle ID-VIN (FK)
- US DOT # (FK)
- ICC # (FK)
- FEIN (FK)

- Credential #
- Date of Issue
- Place of Issue

has

1

is covered by

1

Insurance
- Insurance ID

- Date of Issue
- Type of Coverage
- Vehicle ID-VIN
- Driver ID
- Carrier ID

Lease Agreement
- Vehicle ID-VIN

- Lease Owner
- Address
- City
- County
- State
- Zip
- Date
- Expiration Date

leased under a

Vehicle Title
- Vehicle ID-VIN

- Name of Owner
- Title #
- Type of Vehicle
- Date
- Place of Issue
- County
- State
- Year
- Make
- Model
- License Plate #

Permit
- Vehicle ID-VIN (FK)
- Insurance ID (FK)
- FEIN (FK)
- ICC # (FK)
- US DOT # (FK)
- Account ID (FK)
- Owner ID (FK)
- Permit ID (FK)

- Permit #
- Type of Permit
- Date of Issue
- Expiration Date

is covered by

1

includes

Z

Oversize/Overweight Permit
- Permit ID
- Vehicle ID-VIN

- Date
- Route
- Expiration Date
- Axle Spacing
- Axle Weight
- Height
- Weight
- Width

Appendix C - Current Data Items

International Registration Plan

Application Type (Check all that may apply)
- New IRP License
- Add Vehicle
- Delete Vehicle
- Increase Weights
- Add State

License Year
IRP Account Number
Supp. #
Fleet Number
Name of Registrant
FEIN/SSN
Contact Person for this Application
Carrier's USDOT Number
Street Address/ Post Office Box
City
State
Zip
Telephone
Fax
Canadian Province Authority Number

Type of Operation: (Check all that may apply)
- Private Carrier
- For Hire Carrier
- Exempt Commodity Carrier
- Household Goods Carrier

If private or for-hire, indicate commodity hauled:
- Log
- Produce
- Concrete
- Gravel
- Grain
- Ore
- Fuel Transporter
- Other

Vehicle Information
- Unit #
- Year
- Make of Vehicle

Vehicle ID Number (As Shown on Title)
- Type
- Axles or Seats
- Model #
- Unladen Weight
- Fuel
- Gross Weight
- Combined Gross Weight
- Vehicle Purchase Price
- Factory List Price
- Date (MM/YY)
- Name of Owner (As Shown on Title
- South Dakota Title Number
- USDOT # On Vehicle

International Fuel Tax Agreement (IFTA)

License Type
- Diesel
- Gasoline
- LPG
- CNG

License Number
Owner Search
Business Search
Date Issued
Filing Code
- Quarterly
- Annual

Taxpayer Business Information

Owner or Corporation Name
Business Name
Street Address
City
State
Zip Code
Mailing Address
City
State Zip Code
Business Telephone
Home Telephone
Social Security Number
FAX Number
Federal Employer's ID

Ownership Information

Type of Ownership
- Single Owner
- Partnership
- Other (list)
- Corporation/ State of Incorporation
- Date of Incorporation
- President/Partner
  - Social Security #
  - Address
  - Home Telephone
  - City
  - State
  - Zip Code
- Vice President/ Partner
- Secretary/ Partner
- Treasurer/Partner

IRP Ownership Information

Owner, Partner, or Corporation name
Federal Identification number
Location Address
Mailing Address
Ownership Type (check one)
Partnership Type
- Formal
- Unformal
- Single Owner
- Partnership
- Limited Liability Company
- Trust
- Corporation

Business Owner Information

Name Address
Title
Home Address
City
State
Zip
Home Phone Number
Social Security Number

IFTA Applicants

Check States you may travel in and/or have bulk storage fuel in
Number of decals required
Prorate account number
Date applied

Commercial Driver License (CDL)

Applying For:
- Driver License
- Instruction Permit
- ID Card
- Duplicate/Data Change
- Temporary License

Driver License Number
Social Security Number
Restrictions (circle)
Class
Endorsements
Do you wish to use your Social Security number for you driver license number? (yes/no)
Name
Date of Birth
Sex
Street Address
City
State
Zip Code
Mailing Address
Height
Weight
Eye Color
County
Indicate which of the following you wish to appear on your license:
- Organ Donor (SDCL 34-26)
- Living Will (SDCL 34-12D)
- Durable Power of Attorney (SDCL 59-7) C

Currently behind in child support payments of $1,000 or more (yes/no)
Currently licensed in any other state (yes/no)
- If YES,
- State
- License #

Right to drive suspended, revoked, canceled, disqualified or denied. (yes/no)
In the past twelve months, experienced any convulsions, seizures or blackouts. (yes/no)
Currently on the active duty in the U.S. Armed Forces (Not including National Guard or Reserves.) (yes/no)
Licensed under any other name (yes/no)
- If YES, state name

Commercial Driver License Applicant

Applying for: (select one)
- CLASS A: Combination Vehicle
- CLASS B: Heavy Straight Vehicle)
- CLASS C: Commercial Vehicle under 26,001 lbs.

Endorsements:
- Passenger
- School Bus
- Double/triple Trailer
- Hazardous Materials
- Tank Vehicles
- Combination Tank/Hazardous Materials
- CDL Work Permit
- Seasonal CDL

Operating a vehicle equipped with air brakes (yes/no)
Required to carry a medical card and I am subject to 49 CFR PART 391 (yes/no)

Single State Registration

Motor Carrier Identification Numbers:
FHWA/ICC NO. (s)
US DOT No.
FEIN No.:

Applicant: Identical to name on FHWA order
Name
D/B/A
Telephone Number
Fax Number
Principal Place of Business Address
Mailing Address if Different From Business Address Above

Type of Registration:
New Carrier Registration
Annual Registration
New Registration State Selection

Type of Motor Carrier: (Check One)
Individual
Partnership
Corporation
Name of partners or officers
    Name
    Title

Type of FHWA Registered Authority
Permanent Certificate of Permit
Temporary Authority (TA)
Emergency Temporary Authority (ETA)
    Expiration Date

Type of Motor Carrier Operation: (check one)
Transporter of Property - Freight vehicles with a gross weight of 10,000 lbs or more
Transporter of Property – Only freight vehicles with a gross vehicle weight of less than 10,000 lbs.
Transporter of Passengers – Vehicles with a seating capacity of 15 passengers or less
Transporters of Passengers – Only vehicles with a seating capacity of 15 passengers or less

FHWA Certificate(s) or Permits: (check one)
FHWA Authority Order(s) attached for first year registration
FHWA Authority Order(s) attached for additional authority received
No change from prior year registration

Proof of Public Liability Security: (Check only one)
The applicant on its insurance company **will file** a copy of its proof of public liability security to the registration site

The applicant or its insurance company **has filed** a copy of its proof of public liability security with the registration state and the insurance coverage as stated on that form remains in effect.

The applicant has an approved self-insurance plan or other security in full force and effect and the carrier is in full compliance with the conditions imposed by the ICC order. A copy of the ICC insurance order is attached or has previously been filed with the registration state.

Hazardous Materials: (check one)
The applicant will not haul hazardous materials in any quantity.
The applicant will haul hazardous materials requiring $1 million in Public Liability and Property Damage Insurance.
The applicant will haul hazardous materials requiring $5 million in Public Liability and Property Damage Insurance.

Process Agent:
FHWA Form No. BOC-3 or blanket designation attached for new registration
FHWA Form No. BOC-3 or blanket designation attached reflecting changes of designation of process agents

No change from prior year registration

Certification:
Name
Date
Signature
Title

Exempt Interstate/Application
US DOT #
FEIN #
Name
Address
Street or PO Box
City/State
Zip+4
Check one
- Individual
- Partnership
- Corporation

If partnership, corporation or association, list each member
- Name
- Title

South Dakota process agent
- Name
- Address

New applicants must enclose an original Form E, proof of Liability Insurance

Driver and Vehicle Inspection Report
Report No.
U.S. DOT No.

Motor Carrier
Name of Motor Carrier
Street Address
ICC/Motor Carrier No.

Inspection
Inspection Location
Operating Authority
Inspection Level
Inspection Date
Declared GVW
Actual GVW
Highway Routes

Driver's Information
Driver's License No.
Time Started
Driver Identification
Driver is (check one):
- Employed
- Term Leased
- Trip Leased

Description
Commodity Transported
Origin
Destination
For Hire (yes/no)
Shipping Paper No.
Whose Document?
If Cargo Tank, Enter MC SPEC or "NON"
If H. M. Being Transported Under Exemption, Enter "E" Number
Hazardous Materials Transported (yes/no)

Vehicle
Vehicle Identification
- Unit Number
- Unit Type
- Own/Leased
- Serial Number
- Co. No.
- State
- License Number

Compliance
Violation Identification
- Unit No.
- Out-of-Service
- Violation Discovered
- Description

Report Preparation
Preparer's name
Code
Time Completed

Regulated Waste Activity
Installation ID Number
First notification for this location?
Subsequent notification for this location?
Name of Installation
Location of Installation
- Street
- City
- State
- Zip
- County
- Main Telephone Number

Installation Mailing Address (if different from above)
- Street or Box
- City
- State
- Zip

Contact Person
Owner of Installation
- Name of company/Owner
- Mailing Address – Street or Box

Land Type (circle)
- County
- District
- Municipal
- Private
- State
- Federal
- Indian Land
- Other

Owner Type
- County
- District
- Municipal
- Private
- State
- Federal
- Indian Land
- Other

Change of Owner? (yes/no)
Date of Ownership Change
Name of Installation
Type of Regulated Waste Activity
- Hazardous Waste: (check one)

Conditionally Exempt Small Quantity Generator (<220 lbs.)
Small Quantity Generator (220-2,200 lbs.)
Large Quantity Generator (>2,200 lbs.)
Transporter of Own Waste
Commercial Transporter
Treatment, Storage, or Disposal Facility (permit required)
Generator Marketing Hazardous Waste Fuel to Burner
Marketer of hazardous Waste Fuel
Hazardous Waste Fuel Boiler or Industrial Furnace
Used Oil Recycling: (check one)
Marketer of off-specification used oil
Marketer of on-specification used oil
Used Oil Burner – Utility Boiler
Used Oil Burner – Industrial Boiler
Used Oil Burner – Industrial Furnace
Used Oil Transporter
Used Oil Transfer Facility
Used Oil Processor
Used Oil Re-refiner
Description of Regulated Wastes: (check one)
Ignitable – D001
Corrosive – D002
Reactive – D003
Characteristic Wastes
Toxicity Characteristic – List the waste numbers
Listed Wastes

Hazardous Materials Spill

File Number
Site Name
Class
Responsible Party
County
City
Street
Material Spilled: (check one)
Petroleum
Industrial Chemical
Agricultural Chemical
Amount
Spill Date
Report Date
Close Date
Land Use: (check one)
Commercial
Residential
Industrial
Agricultural
Other

APPENDIX D -ACRONYMS

This section provides acronyms, listed in alphabetical order, and their expanded names.

AAMVA	American Association of Motor Vehicle Administrators
ADVANCE	Advanced Driver and Vehicle Advisory Navigation Concept
ASAP	Automated Safety Assurance Program
ASPEN	(Not an acronym) Software for conducting safety inspections
BIT	Bureau of Information and Telecommunication
CAER	Citation and Accident Electronic Recording
CAPRI	Compliance Analysis and Performance Review Information
CASE	Computer Aided Software Engineering
CAT	Carrier Automated Transaction
CDL	Commercial Driver's License
CDLIS	Commercial Driver's License Information System
CI	Credentialing Interface
CJIS	Criminal Justice Information System
CMV	Commercial Motor Vehicle
CMVSA	Commercial Motor Vehicle Safety Act
COACH	CVISN Operational and Architectural Compatibility Handbook
COVE	COmmercial VEhicle
CR	Compliance Review
CV	Commercial Vehicle
CVA	Commercial Vehicle Administration
CVIEW	Commercial Vehicle Information Exchange Window
CVIS	Commercial Vehicle Information System
CVISN	Commercial Vehicle Information Systems and Networks
CVO	Commercial Vehicle Operations

CVSA	Commercial Vehicle Safety Alliance (or Administration)
DBMS	DataBase Management System
DCR	Department of Commerce and Regulation (South Dakota)
DENR	Department of Environment and Natural Resources (South Dakota)
DOA	Department of Agriculture (South Dakota)
DOR	Department of Revenue (South Dakota)
DSRC	Dedicated Short Range Communication
EDI	Electronic Data Interchange
EFT	Electronic Funds Transfer
FA	Fleet Administration
FARS	Fatal Accident Reporting System
FEIN	Federal Employer Identification Number
FHVUT	Federal Heavy Vehicle Use Tax
GCWR	Gross Combination Weight Rating
GIS	Geographical Information System
GPS	Global Positioning System
GVW	Gross Vehicle Weight
HAZMAT	Hazardous Material (including Waste Transportation)
HELP	Heavy Vehicle Electronic License Plate Program
HM	Hazardous Material
HOS	Hours of service
HP	Highway Patrol (South Dakota)
HSWIM	High Speed Weigh-In-Motion
HVUT	Heavy Vehicle Use Tax
IDT	Intelligent Decision Technologies
IFTA	International Fuel Tax Agreement
IRP	International Registration Plan

ISS	Inspection Selection System
JHUAPL	The Johns Hopkins University Applied Physics Laboratory
LAN	Local Area Network
LM	Legacy Modification
LPR	License Plate Reader
LSI	Legacy System Interface
MACS	Mainline Automated Clearance System
MAPS	Multi-Jurisdictional Automated Preclearance System
MCMIS	Motor Carrier Management Information System
MCREGIS	The Motor Carrier Regulatory Information System
MCSAP	Motor Carrier Safety Assistance Program
MEOSS	Mid-West Electronic One-Stop Shopping
MPO	Metropolitan Planning Organization
MRM	Mile Reference Marker
NAFTA	North American Free Trade Agreement
NCIC	National Crime Information Center
NDR	National Driver Register
NGA	National Governors' Association
NIMC	National Incident Management Coalition
NLETS	National Law Enforcement Telecommunication System
NMVTIS	National Motor Vehicle Title Information System
NTSB	National Transportation Safety Board
NYRPC	New York Regional Processing Center
OOS	Out of Service
OS/OW	Oversize/Overweight
PASS	Port of Entry Advanced Sorting System
PDPS	Problem Driver Pointer System

POE	Port of Entry
PRISM	Performance and Registration Information Systems Management
PUC	Public Utilities Commission (South Dakota)
RAPP	Regional Automated Permit Processing
RES	Roadside Electronic Screening
RFTA	Regional Fuel Tax Agreement
ROC	Roadside Operations Computer
ROVER	CVO ROving VERification Van
RPC	Regional Processing Center; Remote Procedure Call
RSI	Roadside Safety Inspection
RSIS	RS Information Systems, Inc
RWIM	Roadside Weigh-In-Motion (RWIM)
SAE	Society of Automotive Engineers
SAFER	Safety and Fitness Electronic Records
SafeStat	Safety Status
SDDOT	South Dakota Department of Transportation
SQL	Structured Query Language
SSRS	Single State Registration System
TIFA	Trucks Involved in Fatal Accident
TIN	Tax Identification Number
UJS	Unified Judicial System (South Dakota)
USDOT	United States Department of Transportation
VIN	Vehicle Identification Number
VISTA	Vehicle Information System for Tax Apportionment
VISTA/RS	VISTA Registration System
VISTA/TS	VISTA Tax System
VMS	Variable Message Sign

VTIE	Vehicle Title Information Exchange
WAN	Wide Area Network
WIM	Weigh-In-Motion
WRA	Western Regional Agreement

Appendix E - SD99-07 Technical Panel

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Appendix F – Interviewees and Interview Guide

In-Person Interviewees

Department of Revenue
- Debra A. Hillmer
- Lila Bohr
- Alana Gourneau
- Robbyn Bothwell
- Jennifer Kirk

Department of Commerce and Regulation
- Cindy Gerber
- Rory Menenger
- Lisa Maskovich
- Don Hayward
- Deb Labrie

Public Utilities Commission
- Martin Bettmann
- Katie Johnson

Highway Patrol
- Janet McKenzie
- Sgt. Noel Gabriel

Department of Transportation
- Hal Rumpca
- Daris Ormesher
- Todd Thompson
- Darin Larson
- Creighton Miller

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DATA COLLECTION INTERVIEW GUIDE

Interview Objectives

The purpose of the interview is to gather sufficient data that would allow a detailed documentation of the processes, hardware, software, databases, data elements, data flow, process, process interaction, systems capacities and limitations of all state agencies involved with CVO in South Dakota. Contact persons and business areas will include the Public Utilities Commission (PUC), Department of Revenue (DOR), Department of Commerce and Regulation (DCR), Highway Patrol (HP), Department of Transportation (DOT), Unified Judicial System (UJS), Department of Environment and Natural Resources (DENR), Department of Agriculture (DOA), and the Federal Highway Administration (FHWA)

This interview guide is designed with the primary objective to obtain sufficient information on the functional and technical data requirements of each state agency. It is also structured to capture information required to assess system capabilities and deficiencies. The following important elements are addressed.

- Business functions, information inputs/outputs, and personnel responsibilities
- Definition of the roles and responsibilities of each agency in CVO
- Current and anticipated business objectives
- Types of data collected, methods of data collection, handling, and storage
- Data requirements and standards
- Database approaches used
- Current level of integration among various databases and systems
- Ease of use of current databases and systems
- Completeness of user documentation of current databases and systems
- Current system degree of functionality and improvement needs
- Technical environment, constraints, and available equipment and needs
- Current automated and manual system and associated deficiencies.

This interview guide is divided into sections each dealing with a specific aspect as it relates to CVO. The guide attempts to identify pertinent data elements of each aspect that needs to be captured. To facilitate data collection for development of the data and process models, generic models are included, where relevant, that can be reviewed by key technical personnel. The review process will involve modifications, deletions and additions to help customize the models that reflect South Dakota's data needs and processes while maintaining compatibility with CVISN architecture.

Business Areas

This section identifies state agencies, business areas, processes, sub-processes and provides names and phone numbers of contact persons for each business area.

	Process	Agency / Business area	Contact person(s)	Tel #
	Credentialing and permitting			
1	IRP	DOR/DMV		
2	IFTA	DOR/DMV		
3	OS/OW	DOT/HP		
4	SSRS	PUC/Transp. Div		
5	Intrastate	PUC/Transp. Div		
6	CDL	DCR		
7	HAZMAT	DENR/		
8				
	Roadside operations			
1	Enforcement screening	Hwy Patrol		
2	International border clearance	Hwy Patrol		
3	Hazmat inspections	Hwy Patrol		
4	OOS verification	Hwy Patrol		
5	Compliance Review	FHWA/OMC		
6	Vehicle inspections	Hwy Patrol		
7	Driver inspections	Hwy Patrol		
8	Milk bulk trucks	DOA		
9				
	Other processes			
1	Tax return (funds transfer)	DOR		
2	IRP and IFTA audit	DOR/DMV		
3	Prosecution of carriers	UJC		
4	Information technology support	BIT		
5	Hazmat incident management	Hwy Patrol		
6				

Background

I. General – The purpose of this section is to gather background information on the types of CVO functions of the organization.

1. Name of agency
2. Which CVO functions are the responsibilities of your department?
3. What is your role in CVISN systems deployment in your state?

4. What other agencies does your agency interact with in performing its CVO functions?
5. What are your agency's most significant coordination issues in working with other agencies in CVO functions?

Commercial Vehicle Operations

The purpose of this section is to collect detailed information on the CVO processes performed by various state agencies. The data requirements for each agency are also identified as well as linkages among these agencies in terms of data sharing and exchange.

II. Processes - Provide detailed step-by-step description of each CVO process undertaken by your agency – input, processes, outputs, linkages with other agencies. The following boxes show pertinent data elements that must be captured in describing these processes.

Administrative processes

- Name of credential or permit (e.g., IRP, IFTA, SSRS, OS/OW, CDL etc)
- List of other interacting agencies for processing the credential/permit
- List CVO related databases used in the credentialing/permitting process
- Detailed description of each step of the process including:
    - Application (input requirements)
    - Review and checks – databases, checks, other sub-processes
    - Update databases
    - Generate invoice
    - Receive and process payment
    - Issue credential or permit (temporary or permanent)
    - Fund remittance to other states
    - etc

Road side operations

- List of other interacting agencies – for database access
- Description of roadside inspection/screening process
- Database links - names of databases and agency (local, state, external to state)
- Mode of data acquisition (fax, tel, LAN, online, hardcopy, local)
- Communication medium (fax, tel, online etc)
- Computer hardware – fixed locations (POEs) and mobile teams (e.g., desktop PC, laptops, pen based)
- Software – ASPEN, ISS, etc

III. Key data elements – In describing the processes, the following details on each data element must be provided.

- types of data required for each process and data attributes
- sources of data – (e.g., in-house database, other agencies)
- format of data and standards – (at source and required format) – compatibility with interacting agencies
- method of data acquisition (existing data, local and other agencies) – written request, fax, tel, online etc)
- data handling processes – conversion, translation etc
- data acquisition and handling time
- storage – format, medium, updates

IV. Data entities and attributes – This section focuses on data entities. Generic data models for some common entities are used to facilitate the information gathering process. Use these generic data entities and models to customize for SD. Data entities:

1. Account
2. Audit
3. Carrier
4. Driver
5. Road inspection
6. Tax return
7. Trip
8. Vehicle
9.
10.

Note: Entity represents a set of real events or attributes which have common attributes or characteristics. Entity may be either independent or dependent.

V. Database – The purpose of this section is to provide detailed information on the types and characteristics of databases and linkages among these databases maintained by different agencies for CVO activities. The following questions will be addressed:

- What CVO related databases used by your agency (local, other state agency, national etc)? For example,
    - Credentials Databases
    - Safety Databases
    - CVA Network of Databases
    - ICVA Network of Databases
    - Local Site Database

    - Local CAER Database
    - Fleet Database
    - HAZMAT Database
    - etc
- What are the database approaches used by your agency for each CVO process (e.g., relational, network, hierarchical, object oriented)?
- What are the linkage mechanisms with all databases needed for CVO functions – data transfer and data sharing?
    - EDI
    - DSRC
    - Modem
    - LAN
      etc

- What are the database standards for data storage, transfer and sharing?
- What is the current level of integration among various databases of interacting agencies?
- What is the ease of use of current databases (local and external to agency)?
- What are the compatibility and interoperability issues with databases outside your agency and how resolved?
- What is the completeness of user documentation of current databases (local and external to agency)?
- Who or what agency is responsible for maintenance and update of CVO databases?

Systems Assessment

The purpose of this section is to gather sufficient information that would allow an assessment of the current systems and identification of system deficiencies and opportunities for improvement.

VI. Current systems - Provide detailed information on current system including the following:

- What computer hardware used by agency for CVO purposes only – data collection, storage, retrieval and usage (# of units, age, type, speed, capacity, etc)?
- What software – list of database, spreadsheet software and others for CVO data collection, storage, retrieval and usage?
- What networking facilities – within agency, with other others (within and out of state)?
- What facilities for data transfer – communications infrastructure?

- What is the current system degree of functionality and improvement needs?
- What are your agency's plans for equipment upgrades?

VII. System deficiencies and improvement opportunities – Provide information on systems deficiencies and opportunities for improvement including the following:

- What ITS technologies is your agency currently using? What are your agency's plans for their expansion?
- What are major technical environment and constraints associated with current systems for data transfer and sharing?
- What are the limitations and deficiencies of existing computer systems for CVO functions (hardware and software)?
- What are the limitations and deficiencies of data communication infrastructure?
- What are the equipment needs to address limitations of current systems?
- Describe current automated and manual systems for CVO functions and the associated deficiencies.
- What are the limitations of data standards with respect to data transfer and sharing?
- What are the opportunities to coordinate with/expand on/remain consistent with ITS plans and programs of other states, other regions and the nation?