

Exhibit B  
Method of Compensation  
Contract \_\_\_\_\_  
CENTRAL FLORIDA REGIONAL INTEGRATED CORRIDOR MANAGEMENT SYSTEM  
Financial Project ID No. 436328-1-82-01

1.0 PURPOSE

This exhibit defines the method and limits of compensation to be made to the Vendor for the services for the Central Florida Regional Integrated Corridor Management System (ICMS) and described in Exhibit "A" Scope of Services and Exhibit "C" Minimum Technical Requirements and the method by which payments will be made.

2.0 COMPENSATION

For the successful delivery of the services described in Exhibit "A" – Scope of Services and defined Exhibit "C" Minimum Technical Requirements and authorized under this Agreement, the Department will pay the Vendor the Maximum Limiting Amount of \$\_\_\_\_\_. Currently only \$\_\_\_\_\_ of the Maximum Limiting Amount is available, the remaining \$\_\_\_\_\_ will be made available when approved by the legislature. This is a Term Contract for a defined product whereby the Vendor agrees to furnish the services by the prescribed period of time. Subsequent to contract execution the Department will issue Notice to Proceed for the commencement of production and delivery of these services in accordance with Exhibit "A", Scope of Services and Exhibit "C" Minimum Technical Requirements. Execution of this Agreement does not guarantee that the work will be authorized.

The total amount of this agreement is expected to be funded under multiple appropriations. The State of Florida's obligation to pay under this contract is contingent upon Legislative approval. Therefore, it is agreed that the Vendor will not be obligated to perform services or incur costs under this agreement until the Vendor has received Written Authorization from the Department nor will the Department be obligated to reimburse the Vendor for costs or make fee payments for work performed without a Written Authorization.

The Department, based on need and availability of budget, may increase the Contract amount by amendment. At the Department's option additional services may be added to the contract through one or more supplemental amendments, contingent upon legislative appropriation and budget approval. Changes to the requirements described in Exhibit "A" – Scope of Services and Exhibit "C" Minimum Technical Requirements will be made by amendment to this Agreement.

At the Department's sole discretion and contingent upon legislative appropriation and budget approval. The Department may add financial project numbers and/or increase the Contract amount by Task Work Order for the purchase of the Special Services as described in Exhibit "A" – Scope of Services at the unit rates shown in Table 2 of Section 5.0 below. The Department will not authorize work to be performed under any Task Work Order until funding has been secured.

3.0 INVOICING PROCEDURE

The Vendor will be eligible for progress payments under this Agreement at intervals not less than monthly or when individual tasks or milestones defined in the Schedule of Payment Values are completed or reached.

The Vendor shall provide a certificate at the time of each milestone as indicated in the Schedule of Payment Values, certifying the amount of work completed by the Vendor. For payment approval by the Department, all invoices must be in compliance with all requirements of the Contract Documents.

### 3.1 Required Services

Payments shall be achieved and become eligible for payment in accordance with Table 1, Lump Sum Milestone and Monthly Operations, Maintenance, and Support Payments. The Vendor shall submit with each invoice certification that all requirements of each milestone have been completed and approved by the Department. Milestone requirements are detailed in Exhibit "A" Scope of Services. The Department shall verify that all deliverables meet the requirements of the Contract Documents.

#### 3.1.2 Actual Expenditures

The Vendor will be reimbursed at actual cost for the expense associated that are beyond normal business expenses as invoiced and approved by the department. Normal business expenses are considered to be the allowable and allocable expenses that the business would incur in the normal course of conducting business with the Department. These include, but are not limited to overhead, building maintenance, computers, training, utilities, communications travel, office supplies, copies, presentation materials, pamphlets and brochures, which are included in the hourly billing rates.

### 3.2 Special Services

The Lump Sum or Limiting Amount for the performance of the Special Services will be negotiated and agreed to by both the Department and Vendor prior to the issuance of any Task Work Order (TWO). The Lump Sum or Limiting Amount for each TWO will be included in the contract Lump Sum Amount when executed. The Vendor will receive progress payments for Lump Sum Special Services TWOs based on the percentage of services that have been completed and accepted by the Department during the billing period, and properly invoiced. Vendor will be paid the lump sum amount in full for proper completion of all the work identified to be included in the lump sum amount, regardless of the time, effort, or expense of the Vendor in performing that work. Payment of the lump sum amount will constitute full compensation for the work and no additional compensation will be paid for overhead, operating margin, expenses, travel, costs, or any other matter.

The Vendor will receive progress payments for Limiting Amount Special Services TWOs based on the hourly unit rates shown in Table 2 of this Exhibit "B", Method of Compensation for services that have been completed and accepted by the Department during the billing period. Vendor will be up paid up to the Maximum Limiting Amount in full for proper completion of all the work identified to be included in the TWO, regardless of the time, effort, or expense of the Vendor in performing that work. The Vendor may be paid a portion of the Maximum Limiting Amount as a progress payment based on the work that has been completed, accepted by the Department, and properly invoiced by the Vendor during any billing period. Payment of the Maximum Limiting amount will constitute full compensation for the work and no additional compensation will be paid for overhead, operating margin, expenses, travel, costs, or any other matter.

Documentation must be on file with the Vendor and forwarded to the Department to support the invoiced costs. The Vendor shall maintain books and records as related to this Agreement in such a manner that supports each invoice.

### 3.3 Liquidated Damages

The Vendor acknowledges that failure to complete the services by the completion date designated on the contract document may cause the Department to incur damages that, at present are, and upon the occurrence of the failure to timely complete the services may be difficult to determine. Moreover, the Parties wish to avoid lengthy and expensive litigation relating to failure to complete the services on time. Therefore, in the event the Vendor fails to complete the authorized services by the completion date designated on the contract document, the Department may shall exercise the remedy of a payment adjustment against the Vendor, in the amount s shown in Exhibit "A", Scope of Services. The Parties agree that if the Department allows the Vendor to continue and finish the services, or any part of it, after the expiration of the time allowed, that the Department's action shall in no way act as a waiver on the part of the Department of the liquidated damages due under this contract. The Vendor shall pay said sum to the Department not as a penalty, but as liquidated damages.

Liquidated Damages will be assessed and deducted from the monthly invoice.

#### 3.3.1 Liquidated Damages Reductions:

Monthly at the time of invoice the Project manager shall verify that no Liquidated Damages reductions are due prior to approving any invoice. In the event that liquidated damages are due, the invoice shall be reduced by the amount defined in Exhibit "A", Scope of Services for the corresponding event. The Department reserves the right to reduce any payment by any amount due under the Liquidated Damages provisions within this contract.

## 4.0 PROJECT CLOSEOUT

### 4.1 Final Audit

If requested, the Vendor will permit the Department to perform or have performed, an audit of the records of the Vendor and any or all sub-vendors to support the compensation paid the Vendor. The audit will be performed as soon as practical after completion and acceptance of the contracted services. In the event funds paid to the Vendor under this agreement are subsequently properly disallowed by the Department because of accounting errors or changes not in conformity with this Agreement, the Vendor agrees that such disallowed costs are due to the Department on demand. Further, the Department will have the right to deduct from any payment due the Vendor under any other Agreement any amount due the Department.

## 5.0 PAYMENT SCHEDULES

The Schedule of Payment Values is shown in Table 1: Lump Sum Milestone and Monthly Operations, Maintenance, and Support Payments. Each Item listed in Exhibit “A” Scope of Services for each milestone must be complete and accepted by the Department prior to submitting an invoice for payment.

**Table 1: Lump Sum Milestone and Monthly Operations, Maintenance, and Support Payments**

Scope Reference	Task Name	Milestone Date (days after NTP)	Total Cost	Percentage of lump sum**
3.5.1	Task 1: Project Management (Accepted PMP, SEMP documents)	45*	\$_____	__%
3.5.2	Task 2: System Design (Accepted documents)	105*	\$_____	__%
3.5.3	Task 3: Model Development Plan (Accepted document)	_____	\$_____	__%
3.5.4.1	Sub-Task 4a: System Build – DFE (subsystem)	_____	\$_____	__%
3.5.4.2	Sub-Task Acceptance of DFE 4b: System Build – IEN (Acceptance of IEN subsystem)	_____	\$_____	__%
3.5.4.3	Sub-Task 4c: System Build – DSS (Acceptance of DSS subsystem)	_____	\$_____	__%
3.5.5	Task 5: Deployment (Verification of Installation)	_____	\$_____	__%
3.5.6	Task 6: System Training	_____	\$_____	__%
3.5.7	Task 7: Operations, Maintenance, and Support***	Deployment through end of contract	\$_____ (Total) \$_____ (Monthly)	__%
	<b>Grand Total Cost</b>	<b>N/A</b>	<b>\$_____</b>	<b>100%</b>

\*Per the Scope of Services provided in Table 5: Contract Deliverable Requirements List

\*\*Percentage of lump sum should equal 100%

\*\*\*Total amount over Support Period. This will be bid as a total amount and paid monthly from after the deployment to the end of the contract. Include (total) amount in the grand total cost. The monthly amount is for payment purposes.

**Table 2: Lump Sum Milestone and Monthly Operations, Maintenance, and Support Payments**

<b>Labor Category Name for Special Services under task work order:</b>	<b>Loaded Hourly Rate</b>
Project Manager	
Senior Computer Programmer	
Computer Programmer	
Junior Computer Programmer	
Senior Database Administrator	
Database Administrator	
Junior Database Administrator	
Senior Network Architect	
Network Architect	
Junior Network Architect	
Senior Web Developer	
Web Developer	
Junior Web Developer	
Quality Assurance / Quality Control Manager	

6.0 TANGIBLE PERSONAL PROPERTY:

THIS CONTRACT DOES NOT INVOLVE THE PURCHASE OF TANGIBLE PERSONAL PROPERTY, AS DEFINED IN CHAPTER 273, F.S.





**Exhibit “C”**  
**System/Subsystem Minimum Technical**  
**Requirements for the**  
***Central Florida Regional Integrated Corridor***  
***Management System***

Date: 2-9-2017



## Table of Contents

<b>1</b>	<b>OVERVIEW</b> .....	<b>1</b>
1.1	IDENTIFICATION .....	1
<b>2</b>	<b>REFERENCE DOCUMENTS</b> .....	<b>1</b>
<b>3</b>	<b>REQUIREMENTS</b> .....	<b>1</b>
3.1	SYSTEM DEFINITION .....	2
3.2	SYSTEM REQUIREMENTS .....	5
3.2.1	<i>Performance</i> .....	11
3.2.2	<i>Physical Characteristics</i> .....	13
3.3	SUBSYSTEM REQUIREMENTS.....	14
3.3.1	<i>Data Fusion Environment Subsystem</i> .....	14
3.3.1.1	Definition .....	14
3.3.1.2	Inputs/Outputs .....	15
3.3.1.3	Data Stores.....	15
3.3.1.4	Dependencies/Constraints .....	16
3.3.1.5	Use Case Diagram .....	17
3.3.1.6	Interfaces .....	18
3.3.1.7	High-Level Logical Architecture .....	19
3.3.1.8	Data Fusion Environment Requirements.....	34
3.3.2	<i>Decision Support Subsystem</i> .....	45
3.3.2.1	Definition .....	45
3.3.2.2	Inputs/Outputs .....	45
3.3.2.3	Data Stores.....	45
3.3.2.4	Dependencies/Constraints .....	45
3.3.2.5	Use Case Diagram .....	45
3.3.2.6	Interfaces .....	47
3.3.2.7	Decision Support System Requirements.....	49
3.3.3	<i>Expert Rules Engine</i> .....	53
3.3.3.1	Definition .....	53
3.3.3.2	Inputs/Outputs .....	53
3.3.3.3	Data Stores.....	53
3.3.3.4	Dependencies/Constraints .....	53
3.3.3.5	Use Case Diagram .....	54
3.3.3.6	Data Interfaces .....	55
3.3.3.7	Expert Rules Engine Requirements .....	57
3.3.4	<i>Prediction Engine Requirements</i> .....	62
3.3.4.1	Definition .....	62
3.3.4.2	Data Interfaces .....	64
3.3.4.3	Prediction Engine Requirements.....	66
3.3.5	<i>Evaluation Engine Subsystem</i> .....	72
3.3.5.1	Inputs/Outputs .....	72
3.3.5.2	Data Stores.....	72
3.3.5.3	Use Case Diagram .....	72
3.3.5.4	Sequence Diagram.....	73
3.3.5.5	Data View .....	74
3.3.5.6	Evaluation Engine Requirements .....	76
3.3.5.7	Signal Optimization Tool .....	78
3.3.6	<i>Information Exchange Network Subsystem</i> .....	86
3.3.6.1	Inputs/Outputs .....	86
3.3.6.2	Data Stores.....	86
3.3.6.3	Use Case Diagram .....	86
3.3.6.4	Sequence Diagram.....	88



# System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

---

3.3.6.5	IEN Data View.....	89
3.3.6.6	Information Exchange Network Requirements.....	91
<b>4</b>	<b>USER DEFINITIONS.....</b>	<b>111</b>
4.1	ACTION VERBS.....	112

## List of Tables

TABLE 1: REFERENCE DOCUMENTS .....	1
TABLE 2: USER NEEDS.....	6
TABLE 3: BUSINESS REQUIREMENTS.....	9
TABLE 4: SYSTEM CONSTRAINT REQUIREMENTS.....	11
TABLE 5: SYSTEM PERFORMANCE REQUIREMENTS.....	12
TABLE 6: PHYSICAL CHARACTERISTIC REQUIREMENTS .....	13
TABLE 7: TSM&O DATA SOURCES.....	20
TABLE 8: DSS USE CASE DESCRIPTION .....	46
TABLE 9: DECISION SUPPORT SYSTEM REQUIREMENTS .....	49
TABLE 10: EXPERT RULES ENGINE USE CASE DESCRIPTION .....	55
TABLE 11: EXPERT RULES ENGINE REQUIREMENTS .....	57
TABLE 12: PREDICTION ENGINE REQUIREMENTS.....	66
TABLE 13: EVALUATION ENGINE USE CASE DESCRIPTION .....	73
TABLE 14: EVALUATION ENGINE REQUIREMENTS .....	76
TABLE 15: SIGNAL OPTIMIZATION TOOL REQUIREMENTS .....	78
TABLE 16: INFORMATION EXCHANGE NETWORK USE CASE DESCRIPTION .....	88
TABLE 17: INFORMATION EXCHANGE NETWORK REQUIREMENTS .....	91
TABLE 18: ACTION VERBS .....	112

## List of Figures

FIGURE 1: DATA FUSION ARCHITECTURE .....	4
FIGURE 2: REQUIREMENTS HIERARCHY .....	5
FIGURE 3: DFE USE CASE .....	17
FIGURE 4: DATA FUSION ENVIRONMENT.....	19
FIGURE 5: DSS USE CASE .....	46
FIGURE 6: DATA INTERFACES OF THE DSS .....	48
FIGURE 7: EXPERT RULES ENGINE USE CASE DIAGRAM.....	54
FIGURE 8: EXPERT RULES ENGINE DATA FLOWS.....	56
FIGURE 9: PREDICTION ENGINE USE CASE DIAGRAM.....	63
FIGURE 10: PREDICTION SUBSYSTEM DATA FLOWS .....	65
FIGURE 11: EVALUATION USE CASE.....	72
FIGURE 12: EVALUATION ENGINE SEQUENCE DIAGRAM.....	74
FIGURE 13: EVALUATION ENGINE DATA FLOWS.....	75
FIGURE 14: IEN USE CASE .....	87
FIGURE 15: IEN SEQUENCE DIAGRAM .....	89
FIGURE 16: IEN DATA FLOWS.....	90

## List of Acronyms and Abbreviations

API	Application Programmable Interface
AVL	Automatic Vehicle Location
CCTV	Closed-circuit Television
CSV	Comma-separated Values
D5	District 5
DFE	Data Fusion Environment
DHSMV	Department of Highway Safety and Motor Vehicles
DMS	Dynamic Message Sign
DSS	Decision Support System
DW	Data Warehouse
ERE	Expert Rules Engine
ETL	Extract, Transform, and Load
EVE	Evaluation Engine
FDOT	Florida Department of Transportation
GEH	Geoffrey E. Havers
GIS	Geographical Information System
GPS	Global Positioning System
GUI	Graphical User Interface
I-4	Interstate 4
ICM	Integrated Corridor Management
ICMS	Integrated Corridor Management System
IEN	Information Exchange Network
ITS	Intelligent Transportation Systems
LCIS	Lane Closure Information System
MOE	Measure of Effectiveness
PRE	Prediction Engine
RDBMS	Relational Database Management System
SOT	Signal Optimization tool
TSM&O	Transportation Systems Management & Operations
UF	University of Florida

## 1 Overview

The System/Subsystem Minimum Technical Requirements establishes the functional, performance, design, development, and verification requirements for the Central Florida Regional Integrated Corridor Management System (ICMS) project. This document contains requirements gathered from the contractual elements typically consisting of the contract document, scope of work, concept of operations document, request for proposals, etc. The System/Subsystem Minimum Technical Requirements defines the set of requirements to be verified as part of the acceptance of the intelligent transportation systems (ITS) project.

### 1.1 Identification

This section contains a full identification of the system to which this document applies, including identification number(s), title(s), abbreviation(s), version number(s), and release number(s), as applicable.

## 2 Reference Documents

*The following documents, of the exact issue shown, form a part of this document to the extent specified herein. In the event of a conflict between the documents referenced herein and the contents of this document, this document shall be considered the superseding requirement.*

**Table 1: Reference Documents**

Title and Date	Publisher
Central Florida Regional Integrated Corridor Management System Exhibit "A," Scope of Services	State of Florida Department of Transportation District 5 Procurement Office 719 S Woodland Blvd Deland, Florida 32720-5834

## 3 Requirements

This section covers the functional, performance, interface, data, and hardware requirements. It also covers non-functional and enabling requirements and constraints. For the requirements listed below, the requirement ID provides the level of requirement:

Level 1 – ICMS Software System = 1.

Level 2 – ICMS Software Subsystems = 1.X.

Level 3 – ICMS Software Subsystem Components = 1.X.Y

Level 4 – Functions and Data Elements = 1.X.Y.Z

### Requirement Types

- F = Functional
- I = Interface (interface between ICMS and external systems)
- D = Data (internal storage, send and receive of data within the ICMS)
- C = Constraint
- P = Performance
- H = Hardware

### Verification Method

- **Analysis** = The use of established technical or mathematical models or simulations, algorithms, or other scientific principles and procedures to provide evidence that the item meets its stated requirements.
- **Inspect** = The observation using one or more of the five senses, simple physical manipulation, and mechanical and electrical gauging and measurement to verify that the item conforms to its specified requirements.
- **Demonstrate** = The actual operation of an item to provide evidence that it accomplishes the required functions under specific scenarios.
- **Test** = The application of scientific principles and procedures to determine the properties or functional capabilities of items.)

### Requirement Criticality

- H = High
- M = Medium
- L = Low

### 3.1 System Definition

The concept for the ICMS software is a system of systems that receives data from the data fusion system and SunGuide® software (SunGuide), and utilizes this data in the decision support system (DSS), as shown in Figure Figure 1. Figure Figure 1 shows the overall Florida Department of Transportation (FDOT) District 5 (D5) system of systems.

The DSS receives real-time data and models conditions within the region to select coordinated response plans for events (incidents, congestion) that require a multi-agency response. This data includes freeway, arterial, transit, weather, parking, and other data available in the region that could have an impact on the corridor. When local traffic signal corridors are operating outside of expected conditions, the DSS will provide recommended changes to the timing plans within the active arterial management corridors. For the ramp metering systems along Interstate-4 (I-4), the DSS will utilize the conditions on the approaching arterials and on I-4 to calculate the ramp metering rates. The DSS will also provide multi-agency, pre-agreed response plans for major events within the region, which may overrule the traffic signal and ramp meter recommendations.

The information exchange network (IEN) allows stakeholder agencies to view events within the region and provide information on events in the region. It also provides the notification and interface for coordination of response plans that the DSS generates.

## System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

---

Data collected from stakeholder systems will be integrated into the data fusion environment (DFE) subsystem for use by the ICMS. The ICMS will have an application programmable interface (API) that will facilitate data requests and subscriptions to data stored within the DFE.

# System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

## TSM&O Data Fusion Architecture Road Map

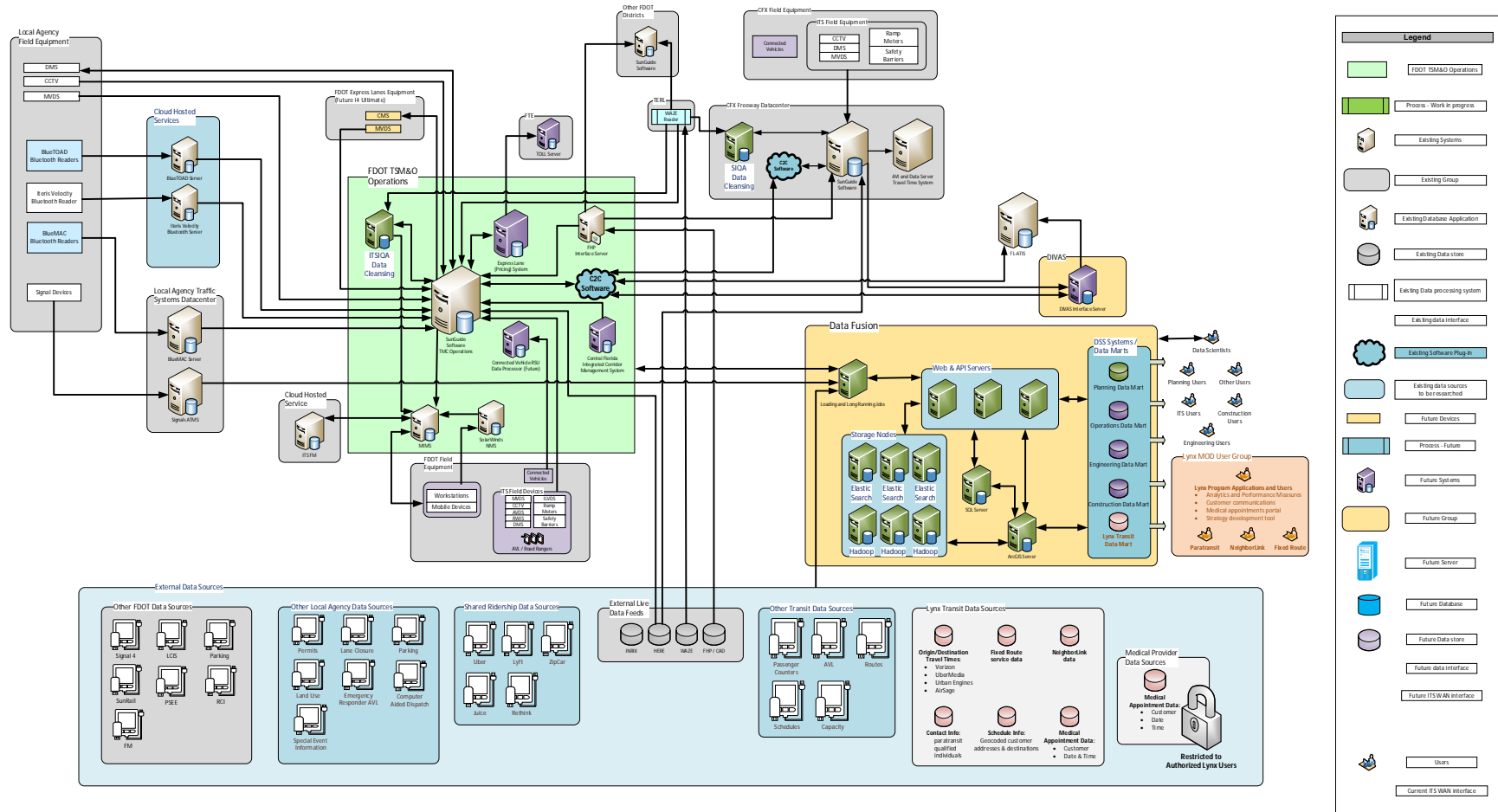


Figure 1: Data Fusion Architecture

### 3.2 System Requirements

This section itemizes the requirements associated with each of the system's capabilities based on the user needs described in Table 2.

Figure 2 shows the subsystem requirements hierarchy.

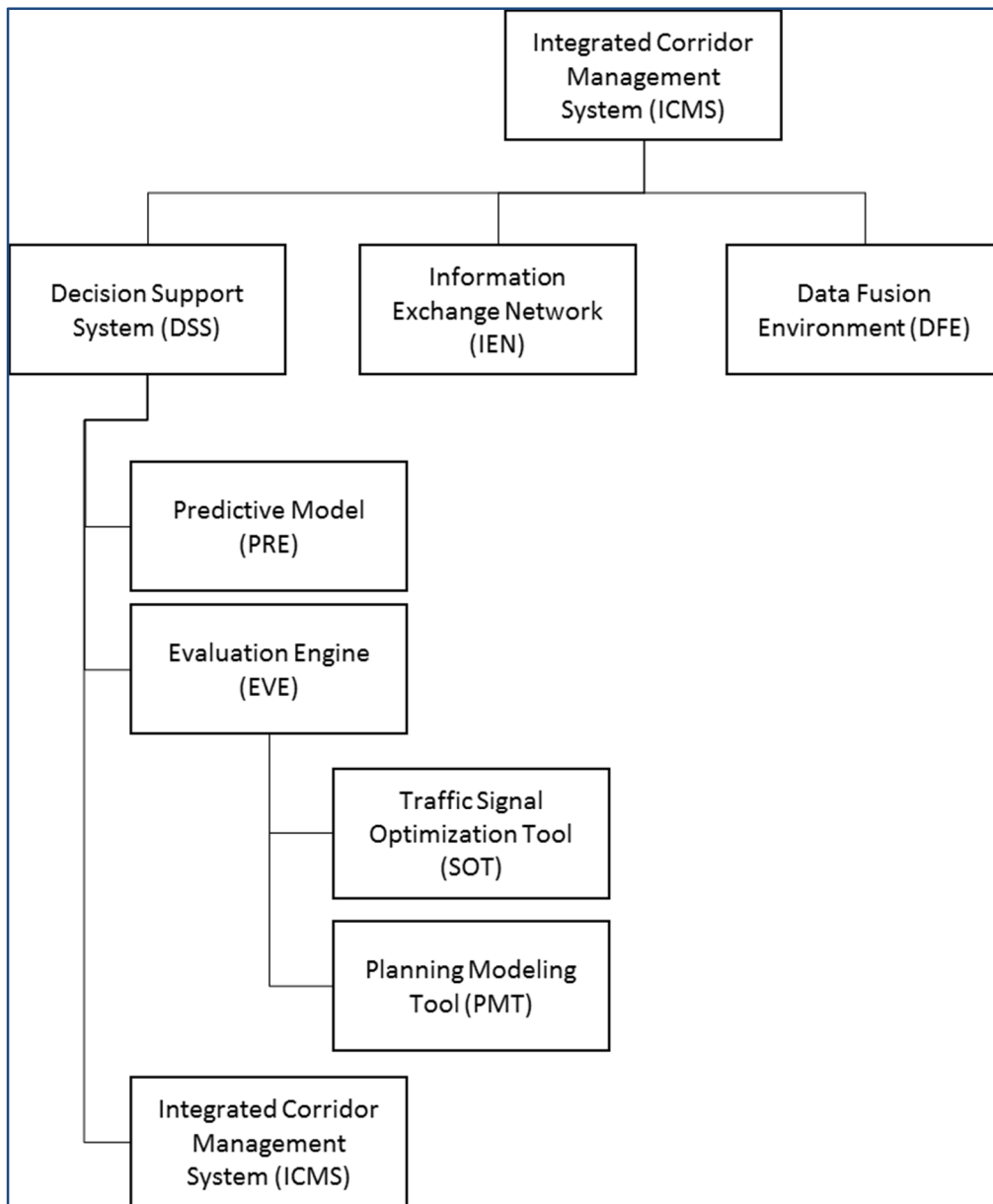


Figure 2: Requirements Hierarchy



# System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Table 2: User Needs

#	User Needs	User Need Description
1	Need for interactive communication among agencies	Agencies need to work together in order to plan for incident remediation and efficiently execute actions to clear incidents in a timely manner, in order to improve the collective response to events.
2	Need to obtain current status of ITS devices in the region	Agencies need to obtain current status of ITS devices and transportation network information (e.g. speed, travel time) within the corridor in order to make informed decisions on actions to be made to improve performance
3	Need to provide current status of ITS devices to the agencies	Agencies need to provide current status of their ITS devices to other agencies within the corridor in order for corridor agencies to make informed decisions on actions to be made to improve performance
4	Need to provide current performance of the transportation network to corridor agencies	Agencies need to provide current conditions of their transportation network (e.g. speed, travel time) to other agencies within the corridor in order to make informed decisions on actions to be made to improve performance.
5	Need to provide predicted performance of the transportation network to corridor agencies	Agencies need to receive near term predictions of transportation network in order to make proactive informed decisions.
6	Need to develop comprehensive incident response plans	Agencies need a means to develop, collect and store new response plans in order to improve response effectiveness in reacting to events within the corridor.
7	Need to provide roadway event information to travelers	Agencies need to provide event information to the public for planning trips and modifying trip plans enroute, in order to allow travelers to make informed decisions about their trips.
8	Need to provide transit event information to travelers	Agencies need to provide transit information to the public for planning trips and modifying trip plans enroute, in order to allow travelers to make informed decisions about their trips.
9	Need to store pre-agreed incident response plans	Agencies need a means to collect and store pre-agreed response plans in order to understand collective roles and responsibilities, communicate effectively, and improve response times when reacting to events within the corridor.

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

#	User Needs	User Need Description
10	Need to coordinate incident responses among agencies to ensure that conflicting responses are not enacted	Agencies need to coordinate responses and understand roles and responsibilities as well as jurisdictional boundaries, such that conflicting responses are not enacted and the correct information is being provided to the public.
11	Need to coordinate incident responses among agencies to ensure prompt response to events	Agencies need to coordinate responses such that agencies understand roles and responsibilities and jurisdictional boundaries in order to ensure prompt response to events and accurate information is provided to the public.
12	Need to coordinate ramp metering systems	Agencies need to be able to view ramp meter system status, and when requested, implement ramp meter rate changes.
13	Need to generate transportation system performance reports	Agencies need to be able track the overall performance of the network through the generation of summary reports to better understand the historical operation of the system.
14	Need to generate transportation system performance dashboards	Agencies need to be able to track current performance on multiple levels of the system through the use of dashboards.
15	Need to track and store history of enacted response plans	Agencies need to be able to track and store history of actions associated with a pre-approved response plan after they have been enacted to determine if any changes are required to improve the response plans.
16	Need to assess the impact of an enacted response plan on the transportation network	During the response to an event in the corridor, agencies need to be able to determine if the pre-agreed response plan is effective and if is having the intended effect. This includes verifying what conditions exist after implementation of the response plan. If the operators of the systems determine that their response is not effective, they should be able to change components of their response plans or implement a new response plan.
17	Need to maintain and modify enacted response plans	As an event progresses and conditions change, agency operators should be able to modify the current response, and communicate changes with other agencies within the corridor in order to effectively adjust to changing conditions and improve conditions in the corridor.

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

#	User Needs	User Need Description
18	Need to maintain and modify stored pre-approved response plans	Agencies need to be able to make recommendations and modify pre-approved response plans, and communicate ideas with other agencies within the corridor, in order to improve response to conditions that will impact the corridor.
19	Need to coordinate traffic signal systems	Agencies need to be able to view traffic signal system status, and when requested implement signal timing plans.
20	Need to optimize traffic signal operations.	Agencies need a tool to be able to optimize traffic signals along pre-defined routes.
21	Need to provide current performance of the transportation network to the public	Corridor agencies need to provide transportation network performance information to the public for use by 3 <sup>rd</sup> party applications.

**Table 3: Business Requirements**

Requirement Number	Requirement Description	Type	User Needs	ICMS	Notes
1.1	The ICMS shall provide interactive communication among agencies.	F	1	IEN	
1.2	The ICMS shall receive current status of the transportation network in the region.	I	2	DF, DSS	
1.3	The ICMS shall send current status of ITS devices to the stakeholder agencies.	I	3	IEN, DF	
1.4	The ICMS shall provide current performance of the transportation network to stakeholder agencies.	F	4	IEN, DF	
1.7	The ICMS shall provide roadway event information to travelers.	I	7	DF	Send to 511 and dynamic message sign (DMS)
1.8	The ICMS shall provide transit event information to travelers.	I	8	DF	Send to 511 and DMS
1.9	The ICMS shall store pre-agreed incident response plans.	D	9	DSS	
1.10	The ICMS shall send incident response plans to agency users to insure appropriate response time.	F	10, 11	DSS	
1.15	The ICMS shall store history of enacted response plans.	D	15	DSS	
1.16	The ICMS shall evaluate the impact of enacted response plans on the transportation network.	F	16	DSS	

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

---

Requirement Number	Requirement Description	Type	User Needs	ICMS	Notes
1.17	The ICMS shall send updated incident response plans to agency users.	I	17	DSS	
1.18	The ICMS shall store updated pre-approved response plans.	D	18	DSS	
1.19	The ICMS shall coordinate traffic signal timing plans.	F	19	TSC	
1.20	The ICMS shall select a response plan based on current and predicted network conditions.	F	4,5	DSS	
1.21	The ICMS shall coordinate ramp meter metering plans.	F	12	TSC	
1.22	The ICMS shall provide the capability to develop and store new response plans.	F	6,9	DSS	
1.23	The ICMS shall provide the capability to generate and manage reports.	F	13	IEN	
1.24	The ICMS shall provide access to system dashboards.	F	14	IEN	
1.25	The ICMS shall provide an offline signal optimization tool	F	20	SOT	
1.26	The ICMS shall provide a data dissemination service	F	21	DFE	

**Table 4: System Constraint Requirements**

Requirement Number	Requirement Description	Type	ICMS	Notes
1.31	The ICMS shall be hosted in the FDOT D5 hosting environment.	C	All	
1.32	The ICMS shall provide predicted conditions data to the DFE Subsystem.	C	DSS, DF	
1.33	The ICMS shall provide evaluation data to the DFE Subsystem.	C	DSS, DF	
1.34	The Prediction Engine shall utilize a mesoscopic model of the Orlando region.	C	DSS	
1.35	The Prediction Engine shall utilize a traffic signal timing plan module.	C	DSS	
1.36	The Prediction Engine shall utilize a ramp metering module.	C	DSS	
1.37	The Prediction Engine shall calculate and store model accuracy.	C	DSS	

### 3.2.1 Performance

This section identifies a required system capability and itemizes the requirements associated with the capability. The requirements specify the required behavior of the system and include applicable parameters, such as response times, throughput times, other timing constraints, sequencing, accuracy, capacities (i.e., how much/how many), priorities, continuous operation requirements, and allowable deviations based on operating conditions. The requirements will include, as applicable, required behavior under unexpected, unallowed, or “out-of-bounds conditions; requirements for error

handling; and any provisions to be incorporated into the system to provide continuity of operations in the event of emergencies.

**Table 5: System Performance Requirements**

Requirement Number	Requirement Description	Type	User Needs	ICMS	Notes
1.41	The ICMS shall provide 99.5 percent availability.	P		ALL	99% for first 90 days
1.42	The ICMS shall provide data latency of less than or equal to three seconds from a data source where a change is received.	P		ALL	
1.43	The ICMS shall provide automated monitoring capabilities to alert operators of outages.	P		ALL	
1.44	The ICMS shall provide failover capabilities within 45 minutes.	P		ALL	
1.45	The Decision Support Subsystem shall send the Information Exchange Network a response plan recommendation within five minutes of incident conditions that trigger a response plan recommendation.	P	20	DSS	
1.46	The Prediction Engine shall calculate the 30-minute predicted network conditions within five minutes of request by the Expert Rules Engine.	P	20	DSS	

Requirement Number	Requirement Description	Type	User Needs	ICMS	Notes
1.47	The Prediction Engine shall not make recommendations less than every 15 minutes for traffic signal timing plans for a given corridor.	P	20	DSS	
1.48	The Prediction Engine shall not make recommendations less than every five minutes for ramp metering plans for each on-ramp.	P	20	DSS	
1.49	The DFE shall track system usage, size of data being transferred and the data sets that were requested	P		DSS	
1.50	The usage data collected shall be available to an administrator via a report	P		DSS	

### 3.2.2 Physical Characteristics

**Table 6: Physical Characteristic Requirements**

Requirement Number	Requirement Description	Type	User Needs	ICMS	Notes
1.51	The ICMS shall be hosted in the FDOT D5 hosting environment.	C		All	
1.52	The ICMS shall follow FDOT D5 standards for hosted systems.	C		All	



### **3.3 Subsystem Requirements**

This section identifies a required system capability and will itemize the requirements associated with the capability. The requirements will specify the required behavior of the system and will include applicable parameters, such as response times, throughput times, other timing constraints, sequencing, accuracy, capacities (i.e., how much/how many), priorities, continuous operation requirements, and allowable deviations based on operating conditions. The requirements will include, as applicable, required behavior under unexpected, un-allowed, or out of bounds conditions; requirements for error handling; and any provisions to be incorporated into the system to provide continuity of operations in the event of emergencies.

#### **3.3.1 Data Fusion Environment Subsystem**

##### **3.3.1.1 Definition**

The purpose of the DFE is to provide the data processing, fusion, and data dissemination functions for the ICMS. The DFE receives data from and provides data to the other ICMS subsystems – the IEN and DSS. The DFE also receives data from external interfaces described in this document. The DFE is the data layer for the ICMS and other transportation systems management and operations (TSM&O) in simplest terms.

The main functionality of the DFE needed for the ICMS is:

- Retrieve data from all data sources available to TSM&O in a timely fashion as it is available, including real-time data streams and less frequently and even manually updated data;
- Catalog data received in an electronically accessible data catalog;
- Transform data received into a format suitable for storage, further processing, and retrieval by users and other applications;
- Secure data to only be accessible according to the usage policy of the data and authorization of the DEPARTMENT;
- Provide user and application account management, authentication, and authorization for accessing the DFE;
- Provide encryption of communications and data between the DFE and its users;
- Provide access to the catalog of all data available specific to the user making the request;
- Provide data available to authenticated and authorized users in a timely fashion, including data in storage and real-time data streams;
- Provide availability and performance necessary to support TSM&O; and
- Produce and provide status and diagnostic information to support the operations, maintenance, and management of the DFE.

The specific functionality of the DFE needed for the DSS and IEN is:

- Receive the current status of devices and roadway and transit network within the corridor;
- Provide roadway link information to external systems to include link speeds, volumes, travel times, and weather conditions;
- Provide event, construction, and special event information to stakeholder agencies and to external systems;
- Store inventory of ITS devices, network data, and device ownership for the corridor network;
- Store pre-agreed incident response plans developed and approved by corridor stakeholders;
- Store history of implementation of pre-agreed incident response plans;
- Provide roadway link information to external systems to include link speeds, volumes, travel times, and weather conditions for calculation of alternate routes and modes; and
- Provide transit information to external systems to include routes, schedules, and current location of transit vehicles for the calculation of alternate routes and modes.

The DFE includes the following underlying components for retrieving, transforming, storing, and disseminating data as well as relaying response plan recommendations and approvals:

- Extract, Transform, and Load (ETL) Component – retrieves data from sources, transforms the data, and loads the data into the DFE
- Data Warehouse (DW) Component – stores the data within the DFE
- Application Programmable Interface (API) Component – provides security and access to data within the DFE

### 3.3.1.2 Inputs/Outputs

- ETL extracts data from external sources in as input into the DFE;
- API provides TSM&O users and applications with access to data as the primary outputs of the DFE;
- API provides the DFE administrators with administration and management of the DFE as an input and an output to the DFE
- The DFE will contain additional internal data management and processing functions directly accessible by users with appropriate access for additional data analytics and processing.

### 3.3.1.3 Data Stores

The DW within the DFE will contain the following data store types:

- Structured data – relational database management system containing data in a relational format, typically from existing external databases

## System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

---

- Unstructured data – file system of data not stored in a relational database management system
- Geographical information system (GIS) data store – data stored in GIS and formatted to support GIS-specific data applications, analytics, and presentation

To support the ICMS specifically, the DFE data stores will contain the following dynamic and static data records, also listed in Table 7:

- DMS status and messages
- Detectors status
- Closed-circuit television (CCTV) status
- Intersection geometry data
- Traffic signal plans and schedules
- Traffic signal status
- Parking data
- Passenger count data
- Weather data (National Weather Service)
- Transit automatic vehicle location (AVL) data
- Link inventory data
- Link dynamic data
- Event data
- Incidents
- Construction
- Special events
- Schedules (for construction and special events)
- Actions taken by users during ICMS operations
- Agency profile configured for use by ICMS operations
- User management (logged in users)
- User profile/user privilege

### 3.3.1.4 Dependencies/Constraints

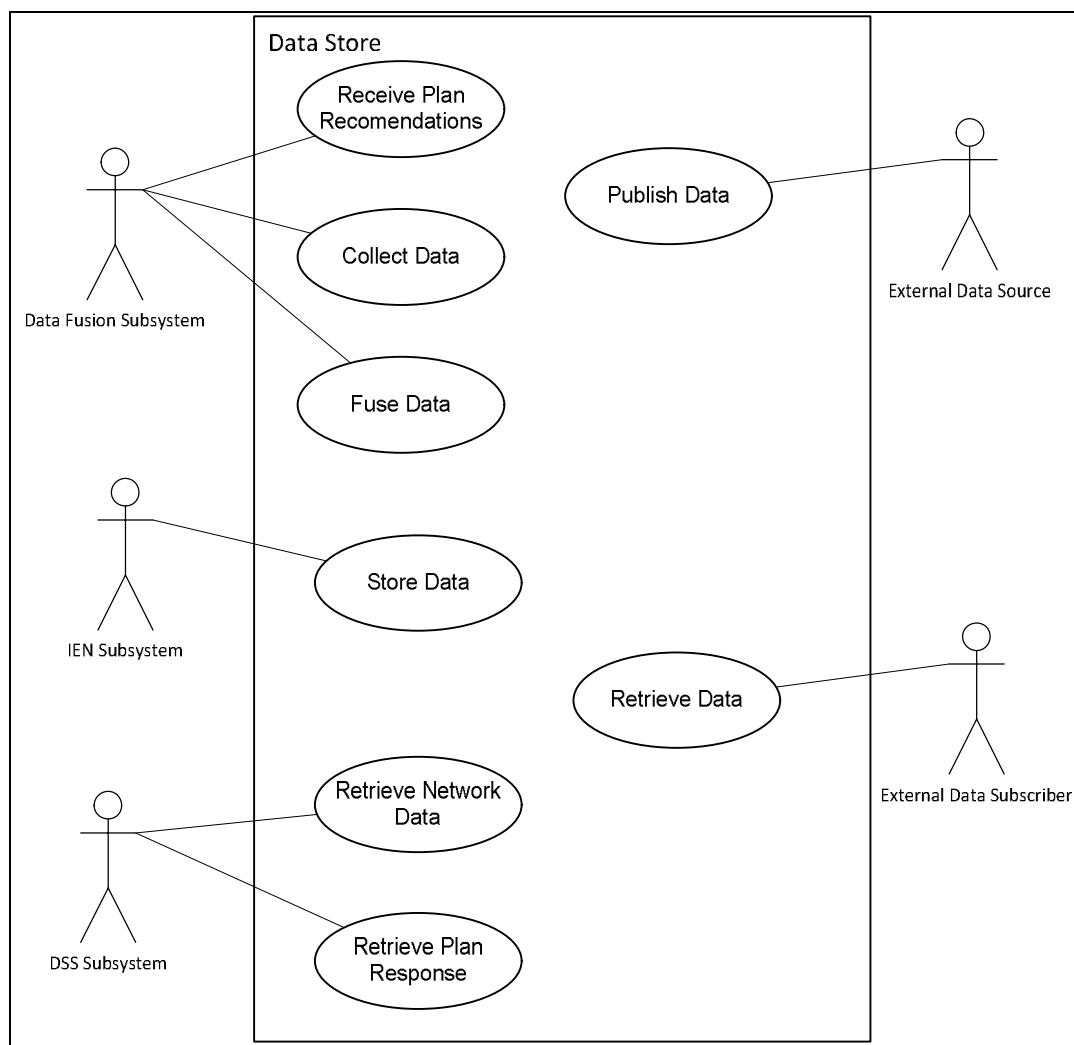
- Data sources must be available and accessible to the DFE via the network
- Data source interface protocol must be defined
- The presence of data must not be provided to users who are not authorized to have disclosure of the data's presence within the ICSM
- Data must not be provided to users who are not authorized to have access to the data

## System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

- Data must not be provided to users whose identity is not authenticated
- Data and communication between users and the DFE must be encrypted if being provided to users outside of the FDOT network
- The DFE and each component must be capable of performing the average operation using 10 percent of availability resources

### 3.3.1.5 Use Case Diagram

The use case diagram in Figure 3 illustrates the basic high-level activities of the DFE.



**Figure 3: DFE Use Case**

The following actors will utilize the DFE subsystem:

- The DFE itself is an actor since these functions are performed by the system being described.
- The IEN subsystem actors will store and write data to the DFE subsystem.

- The DSS subsystem actor retrieves current network data and response plan decisions from the DFE subsystem.
- External Data Source actors provide data to the DFE data collection interfaces.
- The External Data Subscriber retrieves XML data including events from the DFE.

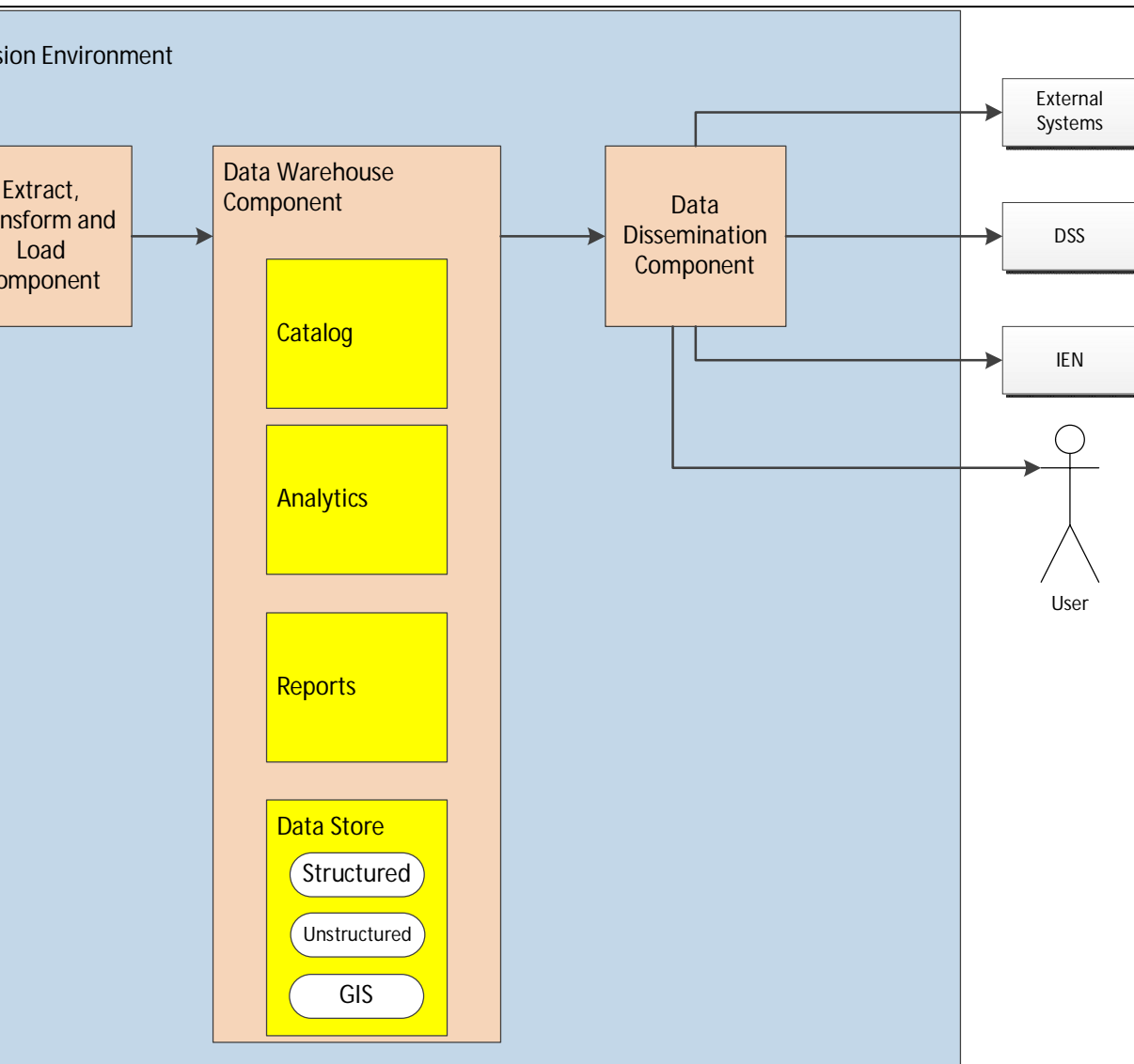
### 3.3.1.6 Interfaces

External User Interfaces represent components external to the DFE and their respective interaction within the DFE. There are many external interfaces required for the DFE. These interfaces are divided into three types supported by the DFE:

1. Data Providers: Provides data to the DFE; the provider dictates these data interfaces and the DFE must develop the interface to meet the process, protocols, and formats of the provider. The provider must have an associated schema or data definition for the DFE to follow.
2. Data Subscribers: Receives data from the DFE; the DFE dictates these data interfaces and the provider must develop their interface to meet the process, protocols, and formats developed by the DFE. The DFE must provide the subscriber an associated schema or data definition.
3. Data Providers/ Subscribers (bi-directional): Receives data and provides data to the ICMS; SunGuide is the only planned interface; SunGuide already has defined processes, protocols, and formats for data subscriber and data publishing.

The following sections describe the interfaces for the DFE; there are several existing data interfaces.

## Level Logical Architecture



**Table 7: TSM&O Data Sources**

ID	Name	Description	Protocol and Source Format	Data Stream and Update Interval	Data Store Format and Destination
1	District 5 SunGuide database	All D5 SunGuide database data	Microsoft SQL Server replication via AlwaysOn  ERWin Data Model (to be provided)	Yes, real-time	Relational Data Store
2	District 5 SunGuide databus	All D5 SunGuide live data	Socket connection, user login request, data subscription request, and asynchronous updates. Sample code to be provided.  ICD: <a href="http://sunguidesoftware.com/sunguidesoftware/documentlibrary/ICD/6_2/SunGuide-General-ICD-6.2.pdf">http://sunguidesoftware.com/sunguidesoftware/documentlibrary/ICD/6_2/SunGuide-General-ICD-6.2.pdf</a>  XML Schemas: <a href="http://sunguidesoftware.com/sunguidesoftware/documentlibrary/ICD/6_2/6.2%20XML%20Schemas.zip">http://sunguidesoftware.com/sunguidesoftware/documentlibrary/ICD/6_2/6.2%20XML%20Schemas.zip</a>	Yes, real-time	XML - Unstructured Data Store

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

ID	Name	Description	Protocol and Source Format	Data Stream and Update Interval	Data Store Format and Destination
3	District 5 SunGuide Center-to-Center	All D5 SunGuide Center-to-Center data	<p>Socket connection, user login request, data subscription request, and asynchronous updates. Sample code to be provided.</p> <p>ICD:  <a href="http://sunguidesoftware.com/sunguidesoftware/documentlibrary/ICD/6_2/SunGuide-C2C-ICD-6.2.pdf">http://sunguidesoftware.com/sunguidesoftware/documentlibrary/ICD/6_2/SunGuide-C2C-ICD-6.2.pdf</a></p> <p>XML Schemas:  <a href="http://sunguidesoftware.com/sunguidesoftware/documentlibrary/ICD/6_2/6.2%20XML%20Schemas.zip">http://sunguidesoftware.com/sunguidesoftware/documentlibrary/ICD/6_2/6.2%20XML%20Schemas.zip</a></p> <p>More Info:  <a href="http://sunguidesoftware.com/sunguidesoftware/documentlibrary/ReadingRoom/Etc/C2C%20Class/FDOT%20C2C%20Training%20Class%20-%20Nov%205,%202008.ppt">http://sunguidesoftware.com/sunguidesoftware/documentlibrary/ReadingRoom/Etc/C2C%20Class/FDOT%20C2C%20Training%20Class%20-%20Nov%205,%202008.ppt</a></p>	Yes, real-time	XML - Unstructured Data Store
4	HERE.com	Traffic data obtained by commercial probe sources	<p>HERE Traffic API Developers Guide:  <a href="https://developer.here.com/documentation/download/traffic_nlp/6.0.27.0/Traffic%20API%20v6.0.27.0%20Developer's%20Guide.pdf">https://developer.here.com/documentation/download/traffic_nlp/6.0.27.0/Traffic%20API%20v6.0.27.0%20Developer's%20Guide.pdf</a></p> <p>HERE Developers Portal:  <a href="https://developer.here.com">https://developer.here.com</a></p>	No, 2 minutes	XML – Unstructured Data Store and GIS Data Store



System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

5	Signal Four Analytics	Crash data provided by Central Office	<p>Protocol to be provided.</p> <ul style="list-style-type: none"> <li>○ The Department of Highway Safety and Motor Vehicles (DHSMV) is the steward of the data <ul style="list-style-type: none"> <li>● Oracle database setup to receive updated data</li> <li>● Pushes out to 3 recipients: Apris, FDOT Central Office, and University of Florida (UF)/Signal4</li> <li>● Vendor Apris <ul style="list-style-type: none"> <li>▪ Provides data to Apris</li> <li>▪ Apris puts it into their structure</li> <li>▪ Sells the reports</li> <li>▪ Hosts a public website <ul style="list-style-type: none"> <li>- Daily statistics of crash data</li> <li>- Google Map of records on the map</li> <li>- Does not use GIS database; just a flat map</li> </ul> </li> <li>▪ Operate purely on latitude/longitude database</li> </ul> </li> <li>● As UF gets data daily from DHSMV, they geocode, and sends the x,y coordinates to Apris</li> </ul> </li> <li>○ The database schemas for all four data repositories are probably different</li> </ul>	No, daily	Relational Data Store and GIS Data Store
---	-----------------------	---------------------------------------	---	-----------	--

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

ID	Name	Description	Protocol and Source Format	Data Stream and Update Interval	Data Store Format and Destination
			<ul style="list-style-type: none"> <li>○ What is common - what DHSMV puts out for export                             <ul style="list-style-type: none"> <li>● Set of nine tables, comma-separated values (CSV) format, organized by major components of crash data                                     <ul style="list-style-type: none"> <li>▪ Drivers, pedestrians, vehicles, violations, etc.</li> </ul> </li> </ul> </li> <li>○ Occasionally UF gets x,y coordinates from FDOT for spot check/verification</li> <li>○ FDOT D5 could either work with UF or FDOT Central Office to get the data.                             <ul style="list-style-type: none"> <li>● We have to pick a basemap                                     <ul style="list-style-type: none"> <li>▪ FDOT uses Roadway Characteristics Inventory, but that's only state roads</li> <li>▪ FDOT also uses Navteq (quarterly updated, accessible via Unified Basemap Repository)</li> </ul> </li> </ul> </li> </ul>		
6	Signal Performance Measures	Purdue system for collecting signal performance measures from traffic signal controllers	SQL (after being converted from CSV which was converted from .dat files from the controller	No, 15 minutes	Imported database - Relational data store

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

ID	Name	Description	Protocol and Source Format	Data Stream and Update Interval	Data Store Format and Destination
7	Lane Closure Information System (LCIS)	Statewide system for storing planned lane closures	<p>Postman app for Chrome to test APIs:  <a href="https://chrome.google.com/webstore/detail/postman/fhbjgbiflinjbdggehcdcbncdddop?hl=en">https://chrome.google.com/webstore/detail/postman/fhbjgbiflinjbdggehcdcbncdddop?hl=en</a></p> <p>LCIS API – Public Search:  <a href="https://lcis.dot.state.fl.us/api/v1/closures/search">https://lcis.dot.state.fl.us/api/v1/closures/search</a>: (Use POST Method, Content-Type: application/JSON from the Postman app for Chrome)</p> <p>Additional Info:                       LCIS public search page:  <a href="https://lcis.dot.state.fl.us/">https://lcis.dot.state.fl.us/</a></p>	No, hourly	Unstructured Data Store, GIS Data Store
8	Lynx bus AVL from Clever	Detailed data from system installed on 33% of Lynx buses	<p><a href="http://lynxbustracker.com">http://lynxbustracker.com</a>                      register an account                      login                      go to My Account                      Register for developer API                      Click: <a href="#">BusTime Developer API Guide</a></p> <p>Protocol doc:  <a href="http://lynxbustracker.com/bustime/apidoc/v1/DeveloperAPIGuide.pdf">http://lynxbustracker.com/bustime/apidoc/v1/DeveloperAPIGuide.pdf</a></p> <p><a href="#">Format: JSON</a></p>	No, 1 minute	Unstructured Data Store and GIS Data Store

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

ID	Name	Description	Protocol and Source Format	Data Stream and Update Interval	Data Store Format and Destination
9	Lynx bus AVL from Trapeze	Detailed data from system installed on 66% of Lynx buses	General Transit Feed Specification -Transit Schedules; -Transit Routes; AVL – Real-time vehicle location	Schedule and routes updated quarterly	
10	Passenger Count Data	Automatic passenger count data from Lynx for passenger count; only on 60% of buses	Automatic passenger count	No, daily	
11	National Weather Service Watches and Warnings		<a href="https://idpgis.ncep.noaa.gov/arcgis/rest/services/NWS_Forecasts_Guidance_Warnings/watch_warn_adv/MapServer">https://idpgis.ncep.noaa.gov/arcgis/rest/services/NWS_Forecasts_Guidance_Warnings/watch_warn_adv/MapServer</a>  JSON	No, 5 minutes	Unstructured Data Store and GIS Data Store
12	Parking Data	To be provided			

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

ID	Name	Description	Protocol and Source Format	Data Stream and Update Interval	Data Store Format and Destination
13	Roadway Geometry Data from Navteq	Shape files from the Unified Basemap Repository provided by FDOT Central Office  Minimum Attributes needed: Posted Speed / Speed Limit Fun Class Number of Lanes AADT AADTT Median Type (width) Intersection Locations Access Management / Access Control Surface width Railroad crossings NHS SIS Bridges	<a href="https://www3.dot.state.fl.us/unifiedbasemaprepository/Default.aspx">https://www3.dot.state.fl.us/unifiedbasemaprepository/Default.aspx</a>  Need to request login approval from FDOT Central Office  HERE website containing documentation: <a href="http://www.navmart.com/here-navstreets.php">http://www.navmart.com/here-navstreets.php</a>	No, quarterly	GIS Data Store

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

ID	Name	Description	Protocol and Source Format	Data Stream and Update Interval	Data Store Format and Destination
14	Roadway Characteristics Inventory	FDOT's map data containing additional attributes for FDOT roadways  Minimum Attributes needed: Posted Speed / Speed Limit Fun Class Number of Lanes AADT AADTT Median Type (width) Intersection Locations Access Management / Access Control Surface width Railroad crossings NHS SIS Bridges	<a href="http://www.fdot.gov/planning/statistics/rci/">http://www.fdot.gov/planning/statistics/rci/</a> contains documentation of the data format.  <a href="http://www.fdot.gov/planning/statistics/rci/RCIPD_Handbook.pdf">http://www.fdot.gov/planning/statistics/rci/RCIPD_Handbook.pdf</a> Data handbook  This may be a manual update	No, quarterly	GIS Data Store
15	Predictive Engine Data	Data provided from the deterministic and simulation predictions	Prediction Engine will provide link, node, route, network, and signal predictions for each simulation completed.	Yes, as needed	XML
16	Expert Rules Engine	Response Plans	Expert Rules Engine (ERE) shall provide new Response Plans to the DFE.	Web services – DF to request updates	XML

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

ID	Name	Description	Protocol and Source Format	Data Stream and Update Interval	Data Store Format and Destination
17	Evaluation Engine	Historical data, Signal Optimization Recommendations	Evaluation Engine will provide historical information on all signal optimization recommendation plans.		
18	SunRail Route and Stops				
19	SunRail Stations				
20	SunRail Ridership				
21	Waze incident and jam data feed	Waze incidents reported by Waze users, along with traffic jams and their associated TVT	An interface document will be provided to the selected VENDOR upon project execution. It will consist of a very simple web services call that must be polled periodically.	1 minute	JSON unstructured and GIS data store
22	ITSIQA traffic conditions truth data feeds				
23	Intersection Geometry Data				
24	Intersection Plans and Schedules				

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

ID	Name	Description	Protocol and Source Format	Data Stream and Update Interval	Data Store Format and Destination
25	Intersection Movement Counts Data	<p>Additional Devices installed to collect turning movement counts. This data may later also be available as a single stream after fusing and cleansing data from the individual devices.</p> <p>Current Devices:                      GridSmart – camera with video analytics including turning movement counts, approach/direction, # lanes, saturation flow rates, but without bike/peds.                      Iteris Vantage – bike, pedestrian, and vehicle detection, turning movement counts, saturation flow rates.                      This works with non-logging traffic signal controllers</p>			
26	Transit routes and stops	Transit routes and stops from local transit agencies			
27	Transit Ridership data				
28	Land Use				GIS Data Store
29	Sidewalks				GIS Data Store



System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

ID	Name	Description	Protocol and Source Format	Data Stream and Update Interval	Data Store Format and Destination
30	Road Ranger service area				GIS Data Store
31	Road Ranger Surveys				Unstructured Data
32	Road Ranger Beat configuration and service details				GIS Data Store
33	Major Investments and Work Program from local agencies		Manual Upload and updating, infrequent		
34	BlueTOAD data	TrafficCast BlueTOAD data from their API. Includes travel time data, device location and pairing data, origin/destination data, last contact timestamp	BlueTOAD API protocol found in develop kit on vendor's website after establishing an account. Requires approval from FDOT	1-2 minutes	GIS Data Store
35	Velocity Bluetooth data	MAC addresses and timestamps captured by devices, travel times, trafficAlerts feeds, calculated trafficflow feed	Provided by vendor		GIS Data Store
36	Twitter data	Tweets related to central Florida transportation system	Provided by Twitter	1 minute	Unstructured Data
37	Pedestrian and Bike data from Strava	Provided by FDOT's unified basemap repository	Manual download		GID Data Store

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

ID	Name	Description	Protocol and Source Format	Data Stream and Update Interval	Data Store Format and Destination
38	TACTICS Signal Controller Software Data	Performance Measures Data Log (available via Linux cintrrollers only)	Provided by vendor		GIS Data Store and/or unstructured data
39	Signal controller status data and detector data		TMDD Center to Center standard		GIS Data Store and/or unstructured data
40	ITS Master Plan				
41	AAM Assets (KML)				
42	SunGuide basemap images	Images for 8 zoom levels for entire state of Florida from the HERE.com basemap	To be provided	Quarterly	Unstructured Data
43	FDOT Unified basemap Repository	Collection of GIS data used throughout FDOT		Quarterly	GIS Data Store
44	Computer Aided Dispatch (CAD)	Florida Highway Patrol's dispatch system data	To be provided	1 minute	To be determined
45	Special Event Information				
46	Passenger Counters				

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

---

ID	Name	Description	Protocol and Source Format	Data Stream and Update Interval	Data Store Format and Destination
47	Uber Movement data				
48	Lyft Shared Ridership data				
49	Zip Car data				
50	Juice data				
51	Rethink				
52	INRIX traffic conditions data feed		Provided by vendor	1 minute	GIS Data Store
53	Level of Service (LOS) data	FDOT system output that takes HERE.com data and outputs the level of service of intersections	To be provided	1 minute	GIS Data Store
54	Bike lanes				
55	Crosswalks				

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

---

ID	Name	Description	Protocol and Source Format	Data Stream and Update Interval	Data Store Format and Destination
56	School locations				
57	Response Zones for fire/rescue				
58	Trails				
59	Weigh stations				
60	Weight in motion sites				
61	Rest areas				
62	FDOT Work Program	Includes 5 year adopted, tentative, and maintenance	Manual		unstructured

### 3.3.1.8 Data Fusion Environment Requirements

**Table 8: Data Fusion Environment Subsystem Requirements**

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.2.1	The DFE shall receive data from external systems shown in the TSM&O Data Sources Table.	D	1.2	DF	Demonstrate
1.2.2	The DFE shall ingest data from the data sources shown in the TSM&O Data Sources Table 7.	F	1.2	DF	Demonstrate
1.2.2.1	The ETL component shall retrieve data from each data source specified in the TSM&O Data Sources Table.	F	1.2.2	DF	Demonstrate
1.2.2.2	The ETL component shall follow the protocol of each data source specified in the TSM&O Data Sources Table.	F	1.2.2	DF	Demonstrate
1.2.2.3	The ETL component shall initiate a continuous connection to each data source specified in the TSM&O Data Sources Table.	F	1.2.2	DF	Demonstrate
1.2.2.4	The ETL component shall re-establish a lost connection to the data sources specified in the TSM&O Data Sources Table.	F	1.2.2	DF	Demonstrate
1.2.2.5	The ETL component shall request data not received due to temporary lost connections if the data source supports such a request.	F	1.2.2	DF	Demonstrate
1.2.2.6	The ETL component shall request data on the specified interval for data within that interval if the data source does not support a data feed.	F	1.2.2	DF	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.2.2.7	The ETL component shall transform the data received from each data source into the format specified for that data in the Data Sources Table.	F	1.2.2	DF	Demonstrate
1.2.2.8	The ETL component shall use all fields from the data received from each data source unless otherwise specified in the Data Sources Table.	F	1.2.2	DF	Demonstrate
1.2.2.9	The ETL component shall append the data with a date and time stamp that the data was received from the server's system clock.	F	1.2.2	DF	Demonstrate
1.2.2.10	The ETL component shall append or associate the data with a geolocation reference or region corresponding to the location represented by the data.	F	1.2.2	DF	Demonstrate
1.2.2.11	The ETL component shall load the transformed data received from each data source into the DW destination specified for the data source.	F	1.2.2	DF	Demonstrate
1.2.3	The DW component shall store all data received from external systems.	F	1.2	DF	Demonstrate
1.2.4	The DW component shall store all data received from external systems.	F	1.2	DF	Demonstrate
1.2.4.1	The DW component shall store data across reboots of the DFE equipment.	F	1.2.4	DF	Demonstrate
1.2.4.2	The DW component shall store data in a functionally distinct data store.	F	1.2.4	DF	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

---

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.2.4.3	The DW component shall store data from an external relational database management system (RDBMS) in a database hosted by an internal RDBMS data store.	F	1.2.4	DF	Demonstrate
1.2.4.4	The DW component shall store unstructured data in an internal file system data store.	F	1.2.4	DF	Demonstrate
1.2.4.5	The DW component shall store GIS data in a GIS data store.	F	1.2.4	DF	Demonstrate
1.2.4.6	The DW component shall be able to expand the capacity of data stores.	F	1.2.4	DF	Demonstrate
1.2.4.7	The DW component shall organize data in a hierarchical manner within a data store.	F	1.2.4	DF	Demonstrate
1.2.4.8	The DW component shall use the source of the data as an element in the hierarchy to organize the data within a data store.	F	1.2.4	DF	Demonstrate
1.2.4.9	The DW component shall use the date interval of the data as an element in the hierarchy to organize the data within the data source's hierarchy within a data store.	F	1.2.4	DF	Demonstrate
1.2.5	The DW component shall provide the capability for administrators to create a report from collected data.	F	1.2	DF	Demonstrate
1.2.5.1	The DW component shall collect and store availability status information of each data source within the DW.	F	1.2.5	DF	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

---

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.2.5.2	The DW component shall monitor the availability of the data store.	F	1.2.5	DF	Demonstrate
1.2.5.3	The DW component shall collect and store errors detected by each data store.	F	1.2.5	DF	Demonstrate
1.2.5.4	The DW component shall collect and store available data storage capacity for each data store.	F	1.2.5	DF	Demonstrate
1.3.1	The Data Dissemination component shall publish data.	F	1.3	DF	Demonstrate
1.3.1.1	The Data Dissemination component shall provide a secure interface to TSM&O data resources.	F	1.3.1	DF	Demonstrate
1.3.1.2	The Data Dissemination Component shall be provided to authorized users via a secure web connection.	F	1.3.1	DF	Demonstrate
1.3.1.3	The Data Dissemination Component shall be accessible through a Secure Sockets Layer (SSL) connection.	F	1.3.1	DF	Demonstrate
1.3.1.4	The Data Dissemination Component shall require a username and encrypted 256 bit AES encrypted password to access the web services.	F	1.3.1	DF	Demonstrate
1.3.1.5	Upon successful authentication, the Data Dissemination Component shall respond with a 256 bit AES encrypted token indicating successful authentication with the system.	F	1.3.1	DF	Demonstrate



System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.3.1.6	A Data Dissemination Component user shall be required to pass the 256 bit AES encrypted token back to the web services as a validation parameter in order to request data from the web services.	F	1.3.1	DF	Demonstrate
1.3.1.7	The 256 bit encrypted AES token shall expire after 'X' minutes, where 'X' is a configurable parameter.	F	1.3.1	DF	Demonstrate
1.3.1.8	A Data Dissemination Component user shall be required to request a new authentication token once the previous token has expired after 'X' minutes, where 'X' is a configurable parameter.	F	1.3.1	DF	Demonstrate
1.3.1.9	Data Dissemination Component user credential information, along with last successful authentication token, shall be stored in a secure database.	F	1.3.1	DF	Demonstrate
1.3.1.10	The Data Dissemination Component support staff shall have the ability to revoke user access if misuse of the system is detected.	F	1.3.1	DF	Demonstrate
1.3.1.11	The Data Dissemination Component shall have the ability to log usage statistics for reporting purposes.	F	1.3.1	DF	Demonstrate
1.3.1.12	The Data Dissemination Component usage shall be stored in flat files.	F	1.3.1	DF	Demonstrate
1.3.1.13	The Data Dissemination Component usage flat files shall contain information about user connection attempts, including username, password, IP address, and whether the login attempt was successful or not.	F	1.3.1	DF	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.3.1.14	The Data Dissemination Component shall provide data content in standard XML format in compliance with W3C.	F	1.3.1	DF	Demonstrate
1.3.1.15	The Data Dissemination Component shall be provided on a non-production test platform for verifying system changes before being applied to production.	F	1.3.1	DF	Demonstrate
1.2.6	The DFE shall provide the capability for an administrator to define a user account.	F	1.2	DF	Demonstrate
1.2.6.1	The DFE shall provide the capability for an administrator to define an access permission specific to a data source.	F	1.2.6	DF	Demonstrate
1.2.7	The DFE shall provide the capability for an administrator to manage user accounts.	F	1.2	DF	Demonstrate
1.2.7.1	The DFE shall provide the capability for an administrator to modify permissions specific to a data source.	F	1.2.6	DF	Demonstrate
1.3.2	The Data Dissemination component shall authenticate users.	F	1.3	DF	Demonstrate
1.3.2.1	The Data Dissemination component shall use a token-based authentication and authorization protocol.	C	1.3.2	DF	Demonstrate
1.3.3	The Data Dissemination component shall deny requests from unauthenticated users.	F	1.3	DF	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.3.4	The Data Dissemination component shall verify that users making requests to data sources have appropriate permission to that source.	F	1.3	DF	Demonstrate
1.3.4.1	The Data Dissemination component shall deny requests from users who do not have the permission to access the requested resource.	F	1.3.4	DF	Demonstrate
1.3.4.2	The Data Dissemination component shall verify that users making requests to modify data sources have permission to modify the requested resource.	F	1.3.4	DF	Demonstrate
1.3.4.3	The Data Dissemination component shall deny requests to modify data sources from users who do not have the permission to modify the requested resource.	F	1.3.4	DF	Demonstrate
1.3.5	The Data Dissemination component shall provide an interface to data stored in the DW.	F	1.3	DF	Demonstrate
1.3.6	The Data Dissemination component shall provide a representational state transfer web services interface.	C	1.3	DF	Demonstrate
1.3.6.1	The Data Dissemination component shall return the data requested by a data access request.	F	1.3.6	DF	Demonstrate
1.3.6.2	The Data Dissemination component shall support the filters defined for each data source in the TSM&O Data Sources Table.	F	1.3.6	DF	Demonstrate
1.3.6.3	The Data Dissemination component shall filter the data requested by the filter parameters used in the request.	F	1.3.6	DF	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

---

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.3.6.4	The Data Dissemination component shall provide a push interface to provide data feeds to user.	F	1.3.6	DF	Demonstrate
1.3.6.5	The Data Dissemination component shall provide a subscription service interface to provide data feeds to user.	F	1.3.6	DF	Demonstrate
1.2.9	The DFE shall provide a data catalog.	F	1.2	DF	Demonstrate
1.2.9.1	The Data Catalog shall store a list of data sources.	F	1.2.9	DF	Demonstrate
1.2.9.2	Data Catalog shall provide the capability for a user to insert entries into the data catalogs.	F	1.2.9	DF	Demonstrate
1.2.9.3	The DW component shall validate new entries into the data catalog.	F	1.2.9	DF	Demonstrate
1.2.9.4	Data Catalog shall provide the capability for an administrator to view access permission for each data source entry in the catalog.	F	1.2.9	DF	Demonstrate
1.2.9.5	Data Catalog shall provide the capability for an administrator to modify permissions for each data source entry in the catalog.	F	1.2.9	DF	Demonstrate
1.2.9.6	Data Catalog shall provide the capability for a user to create new permitted data sources.	F	1.2.9	DF	Demonstrate
1.2.9.7	Data Catalog shall provide the capability for a user to access permitted data sources.	F	1.2.9	DF	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.2.9.8	Data Catalog shall provide the capability for a user to modify permitted data sources.	F	1.2.9	DF	Demonstrate
1.2.9.9	The Data Dissemination component shall provide users the requested permitted data catalog entries.	F	1.2.9	DF	Demonstrate
1.2.9.10	The Data Dissemination component shall provide the ability for a user to modify permitted catalog entries.	F	1.2.9	DF	Demonstrate
1.3.7	The Data Dissemination component shall report status information of each data source.	F	1.3	DF	Demonstrate
1.3.7.1	The Data Dissemination component shall report the range of data loaded based on temporal coverage for each data source.	F	1.3.7	DF	Demonstrate
1.3.7.2	The Data Dissemination component shall report the first date and time represented by the data loaded for each data source.	F	1.3.7	DF	Demonstrate
1.3.7.3	The Data Dissemination component shall report the last date and time represented by the data loaded for each data source.	F	1.3.7	DF	Demonstrate
1.3.7.4	The Data Dissemination component shall report the ranges of missing data based on temporal coverage for each data source.	F	1.3.7	DF	Demonstrate
1.3.7.5	The Data Dissemination component shall report the beginning date and time represented by the data for each missing data range.	F	1.3.7	DF	Demonstrate
1.3.7.6	The Data Dissemination component shall report the end date and time represented by the data for each missing data range.	F	1.3.7	DF	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.2.10	The DFE shall prioritize resources based on levels of criticality.	F	1.2	DF	Demonstrate
1.2.11	The DFE shall provide a data analytics toolset.	F	1.2	DF	Demonstrate
1.2.12	The DFE shall index unstructured data to be searchable without scanning the entire contents.	F	1.2	DF	Demonstrate
1.2.13	The DFE shall provide the capability for a user to query unstructured data.	F	1.2	DF	Demonstrate
1.2.13.1	The DFE shall provide requested indexed data resources a minimum latency of 1 millisecond.	P	1.2.13	DF	Demonstrate
1.2.13.2	The DFE shall scan data at a minimum rate of 500 GB per second.	P	1.2.13	DF	Demonstrate
1.2.13.3	The DFE shall provide data at a minimum rate of 100 GB per second.	P	1.2.13	DF	Demonstrate
1.2.14	The DFE shall be modular and provide the capability for an administrator to install additional tools such as data analytics tools.	C	1.2	DF	Demonstrate
1.2.15	The DFE shall provide all static Transportation Network data to the ICMS, as defined in the data dictionary.	F	1.2	DF	Demonstrate
1.3.8	The DFE shall provide all dynamic transportation network data to the ICMS, as defined in the data dictionary.	F	1.3	DF	Demonstrate

## System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

---

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.3.9	The DFE shall monitor the available bandwidth of the communication network.	F	1.3	DF	Inspect

### *3.3.2 Decision Support Subsystem*

#### 3.3.2.1 Definition

The Decision Support System (DSS) provides candidate response plans to the region based on network conditions received from the DFE, prediction analysis, and on a rule-based assessment of the recommended response plans. The DSS consists of three major components:

- Expert Rules Engine,
- Prediction Engine, and
- Evaluation Engine.

#### 3.3.2.2 Inputs/Outputs

- Current network conditions data, such as highway link speeds and volumes, arterial speeds, and event data, will be provided by the DFE.
- Recommended response plans will be provided to the DSS agency user interface for distribution to agency users.

#### 3.3.2.3 Data Stores

The DSS data stores include the expert rules data store, model data store, and evaluation data stores.

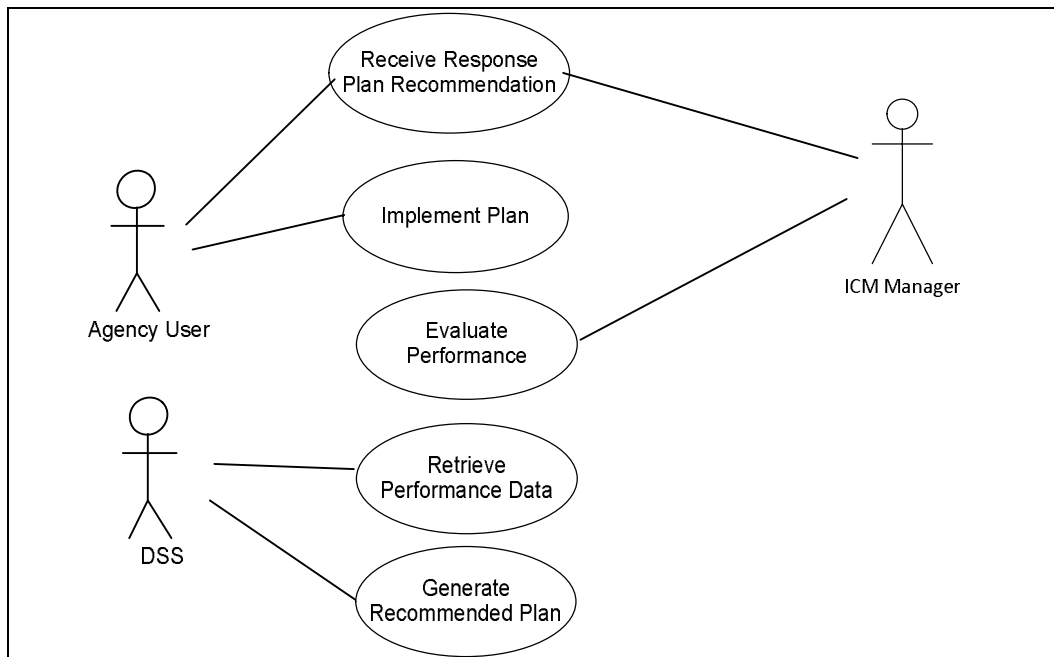
#### 3.3.2.4 Dependencies/Constraints

- All current network data for the transportation system performance and operations will be provided by the DFE;
- Static data for network representation, rules, and other parameters will be updated periodically in the DSS.

#### 3.3.2.5 Use Case Diagram

The use case shown in Figure 5 illustrates the basic high-level activities of the DSS.





**Figure 5: DSS Use Case**

This use case includes the following activities:

- Receive response plan recommendation – Response plan is generated by the DSS and provided to the Integrated Corridor Management (ICM) manager and agency users through the DSS Agency Interface, and more specifically the Plan Coordination user interface.
- Implement plan – The agency user will implement a recommended plan once the ICM Manager approves the plan.
- Evaluate performance – The DSS develops metrics that represent the performance of the system and provides it to the ICM Manager.
- Retrieve performance data – The DSS will retrieve performance data including current network conditions from the DFE.
- Generate recommended plan – The DSS will generate recommended response plans based on performance data and prediction analysis.

**Table 8: DSS Use Case Description**

Use Case ID	1.1.1.01
Description	The DSS produces candidate recommended response plans for the ICM Manager based on existing and predicted roadway network conditions.
Actors	ICM Manager and agency users
Preconditions	ICM Manager and agency users are authenticated users. The DSS is collecting and fusing roadway data.
Post Conditions	Recommended response plan is generated and provided to Agency Operators for implementation.

Normal Course of Events	<ol style="list-style-type: none"><li>1. Operators logs in.</li><li>2. Expert Rules Engine collects roadway conditions data from the DFE.</li><li>3. Prediction Engine uses roadway conditions data to assess existing roadway conditions and predict the impact of candidate response plans.</li><li>4. Expert Rules Engine generates a recommended response plan.</li><li>5. DSS distributes recommended response plan to the DSS Interface for distribution to the Agency operators.</li></ol>
-------------------------	---

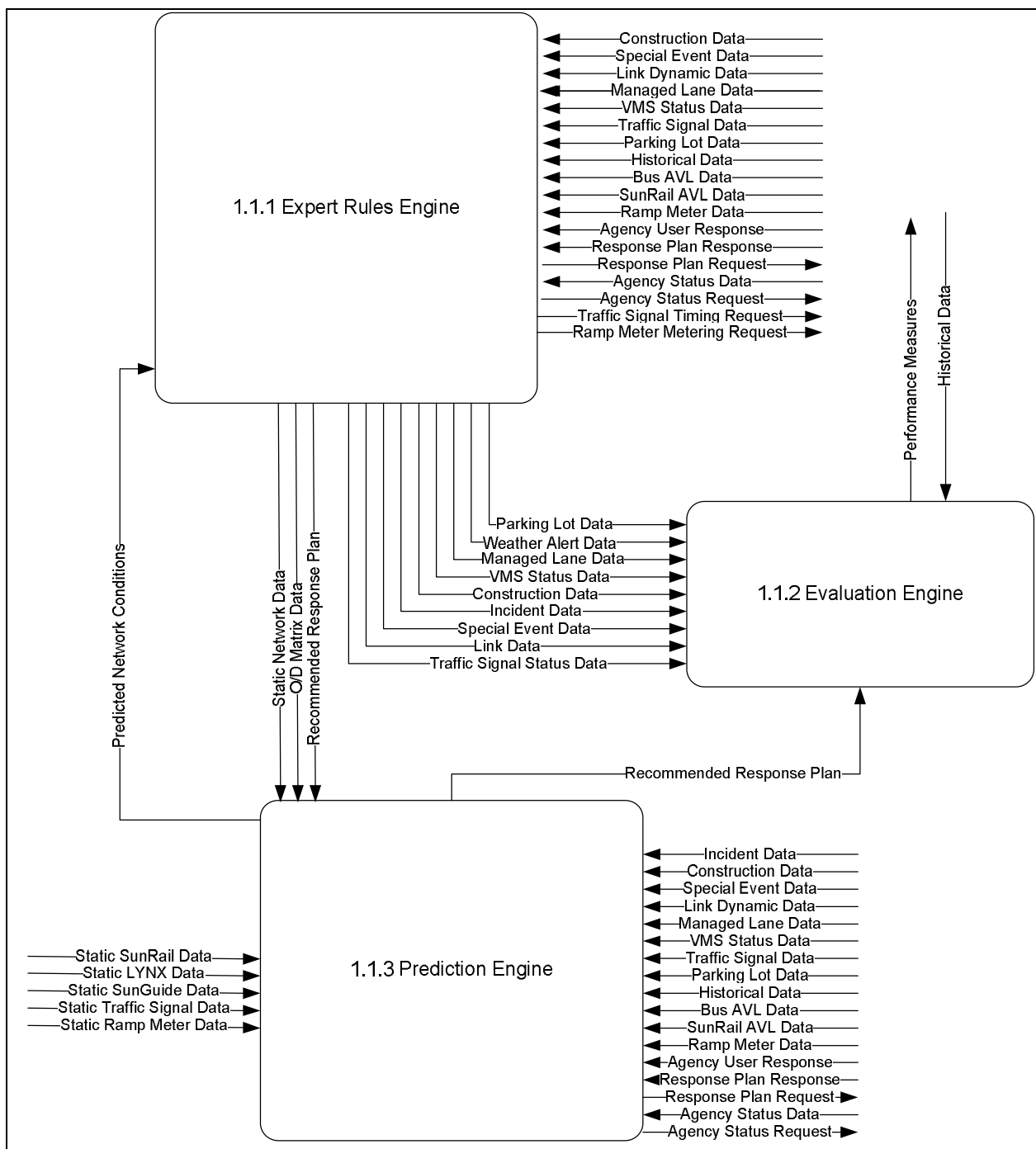
### 3.3.2.6 Interfaces

The DSS has the following interfaces:

- Data Interface to DFE – the DSS will receive data from the DFE.
- Recommended Response Plan Generation Interface to DSS Agency Interface – Once the expert rules subsystem calculates that a response is needed based on conditions and events within the transportation network, a response plan request is generated. The DSS will interface to the DSS Agency Interface so that agency users receive alerts from the system to implement the calculated response plan.

The interfaces to the DSS include the data defined in the System Requirements document, and further defined in the data dictionary. The diagram in Figure 6 shows the data elements received and sent by the DSS.

# System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS



**Figure 6: Data Interfaces of the DSS**

### 3.3.2.7 Decision Support System Requirements

**Table 9: Decision Support System Requirements**

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.2.1	The ICMS shall receive ITS infrastructure status data from the DFE.	D	1.2	DSS	Demonstrate
1.2.2	The ICMS shall receive event data from the DFE.	D	1.2	DSS	Demonstrate
1.2.3	The ICMS shall receive transit data from the DFE.	D	1.2	DSS	Demonstrate
1.2.4	The ICMS shall receive transportation network data from the DFE.	D	1.2	DSS	Demonstrate
1.4.1	The DSS shall evaluate the current performance of the network.	F	1.4	DSS	Demonstrate
1.9.1	The DSS shall store pre-agreed incident response plans as defined in the data dictionary.	F	1.9	DSS	Demonstrate
1.9.2	The DSS shall provide the ICM Manager the capability to add pre-agreed incident response plans for a specified incident.	F	1.9	DSS	Demonstrate
1.9.3	The DSS shall provide the ICM Manager the capability to query pre-agreed incident response plans.	F	1.9	DSS	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

---

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.9.4	The DSS shall provide the ICM Manager the capability to edit pre-agreed incident response plans for a specified incident.	F	1.9	DSS	Demonstrate
1.9.5	The DSS shall provide the ICM Manager the capability to delete pre-agreed incident response plans for specified events.	F	1.9	DSS	Demonstrate
1.10.1	The DSS shall send a proposed response plan to the ICM Manager.	I	1.10	DSS	Demonstrate
1.10.2	The DSS shall send a proposed response plan to agency users.	I	1.10	DSS	Demonstrate
1.10.3	The DSS shall receive response plan coordination data from the IEN.	I	1.10	DSS	Demonstrate
1.10.4	The DSS shall send response plan request to the IEN.	I	1.11	DSS	Demonstrate
1.15.1	The DSS shall store the history of actions enacted during response plan implementation.	D	1.15	DSS	Demonstrate
1.16.1	The DSS shall evaluate the impact of enacted response plans.	F	1.16	DSS	Demonstrate
1.16.2	The DSS shall evaluate the impact on the transportation network of not enacting a response plan.	F	1.16	DSS	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.16.3	The DSS shall evaluate the impact on the transportation network of alternative response plans not enacted.	F	1.16	DSS	Demonstrate
1.17.1	The DSS shall monitor the performance of enacted response plans.	F	1.17	DSS	Demonstrate
1.17.2	The DSS shall send a proposed updated response plan to the ICM Manager.	I	1.17	DSS	Demonstrate
1.17.3	The DSS shall send a proposed updated response plan to agency users.	I	1.17	DSS	Demonstrate
1.18.1	The DSS shall store updated response plans.	D	1.18	DSS	Demonstrate
1.18.2	The DSS shall store the history of changes to response plans.	D	1.18	DSS	Demonstrate
1.19.15	The DSS shall evaluate traffic signal timing plans for specified arterial corridors.	F	1.19	DSS	Demonstrate
1.20.1	The DSS shall receive agency status from the DSS Agency Interface as defined in data dictionary.	D	1.20	DSS	Demonstrate
1.20.2	The DSS shall receive historical data from the DFE.	D	1.20	DSS	Demonstrate
1.20.3	The DSS shall select a response plan recommendation based on the response plan list.	F	1.20	DSS	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

---

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.20.4	The DSS shall coordinate the response plan recommendation with the IEN.	F	1.20	DSS	Demonstrate
1.21.1	The DSS shall evaluate ramp metering strategies for metered on-ramps.	F	1.21	DSS	Demonstrate
1.22.1	The DSS shall develop new response plans to be added to the response plan repository.	F	1.22	DSS	Demonstrate
1.22.2	The DSS shall evaluate new response plans.	F	1.22	DSS	Demonstrate
1.40.1	The DSS shall store the prediction model accuracy	F	1.40	DSS	Demonstrate
1.45.1	The DSS shall provide a response plan recommendation within five minutes.	F	1.45	DSS	Demonstrate
1.45.2	The DSS shall store the total time from start of evaluation of conditions to delivery of system control to the agencies for any iterations that result in a response plan implementation.	F	1.45	DSS	Demonstrate

### 3.3.3 *Expert Rules Engine*

#### 3.3.3.1 Definition

The expert rules engine provides the logical engine of rules selection for the DSS. The primary software component of the expert rules engine is the DSS manager. The DSS manager is essentially the liaison between the DFE, the prediction engine, and the rules engine software component.

The expert rules engine provides recommended response plans based on network conditions, predicted conditions, and a defined set of rules.

The expert rules engine begins with an assessment of existing roadway conditions. It develops that assessment based on monitoring of incidents through the DFE and through monitoring of roadway conditions (such as speeds). The prediction engine also uses this assessment of roadway conditions running a mesoscopic model. The mesoscopic model is continually developing estimates of current system performance. It is also predicting future performance of the system based on continued operation of the current operational strategies. Candidate response plans may also be evaluated using mesoscopic model. The expert rules engine selects the recommended response plans based on existing roadway conditions, predicted future system performance, and potentially the predicted performance of candidate response plans.

Once a recommended candidate response plan has been developed and authorized by the ICM Manager, that plan is communicated to agency users through the DSS agency user interface.

#### 3.3.3.2 Inputs/Outputs

- Current network conditions data, such as highway link speeds and volumes, arterial speeds, and event data, will be provided by the DFE.
- Recommended response plans will be provided to the DSS agency interface for distribution to agency users.

#### 3.3.3.3 Data Stores

- Expert rules data store – contain the rules, static plan information, and static network data.

#### 3.3.3.4 Dependencies/Constraints

- All current network data for transportation system performance and operations will be provided by the DFE.



- Static data for the network representation, rules, and other parameters will be updated periodically in the DSS.

### 3.3.3.5 Use Case Diagram

The use case shown in Figure 7 illustrates the basic high-level activities of the expert rules engine.

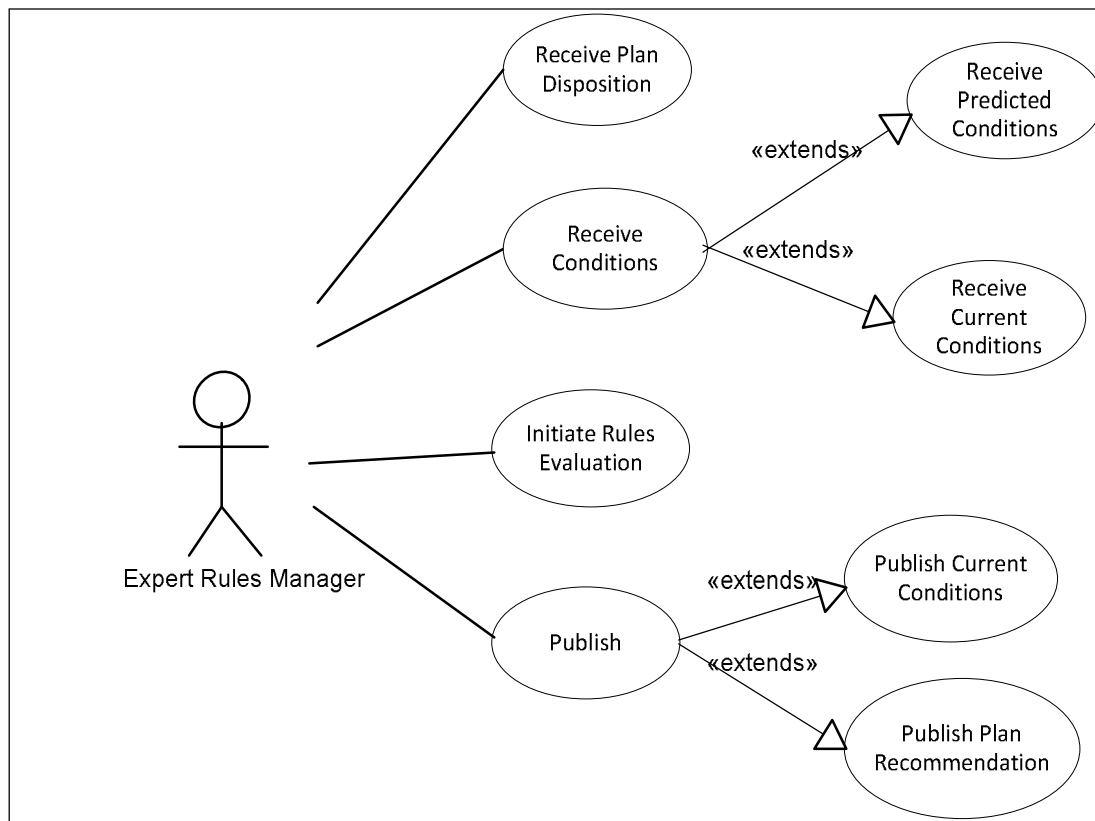


Figure 7: Expert Rules Engine Use Case Diagram

- Receive Current Conditions – The expert rules manager software component receives current conditions published by the DFE. The receipt of new data initiates evaluation of the rules, which may then result in the recommendation of a response plan.
- Publish Supplemental Data – Upon receiving current conditions from the data dissemination subsystem, the expert rules manager software component will publish supplemental data needed for the prediction engine, such as direction on how model parameters are to be applied for the rules that are being evaluated.
- Receive Predicted Conditions – The expert rules manager software component periodically receives predicted conditions from the prediction engine. The receipt of predicted conditions initiates evaluation of the DSS rules, which may then result in the recommendation of a response plan. Predicted conditions are stored for later consumption by the evaluation engine.

## System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

- Initiate Rules Evaluation – Having received new data or new predicted conditions, the expert rules manager software component initiates the rules engine, which evaluates pertinent rules. The rules evaluation may, or may not, result in a plan recommendation.
- Publish Plan Recommendation – When a response plan recommendation is generated by the rules engine, the plan is published to the DSS agency interface by the expert rules manager software component.
- Receive Plan Disposition – The expert rules manager software component receives information from the DSS agency interface, which indicates whether or not the response plans recommended by the DSS were implemented or rejected.

**Table 10: Expert Rules Engine Use Case Description**

Use Case ID	1.1.2.01
Description	The prediction engine develops assessments of the existing travel corridor performance, the predicted travel corridor performance with no changes in system operations, and the predicted travel corridor performance with an implemented response plan.
Actors	Prediction Manager
Preconditions	<ol style="list-style-type: none"> <li>1. The DFE provides fused current roadway conditions data.</li> <li>2. Model-specific static and behavioral data is stored within the prediction engine.</li> <li>3. The expert rules engine develops response plan recommendations.</li> </ol>
Post Conditions	The expert rules engine is provided an assessment of the existing and predicted travel corridor performance for use in response plan selection.
Normal Course of Events	<ol style="list-style-type: none"> <li>1. Existing conditions data is collected from the DFE.</li> <li>2. Additional data is collected from the expert rules engine.</li> <li>3. The mesoscopic model is populated with data.</li> <li>4. The mesoscopic model is run.</li> <li>5. Results of the mesoscopic model runs are provided to the expert rules engine.</li> </ol>

### 3.3.3.6 Data Interfaces

The diagram in Figure 8 shows the data elements received and sent by the Expert Rules Engine.

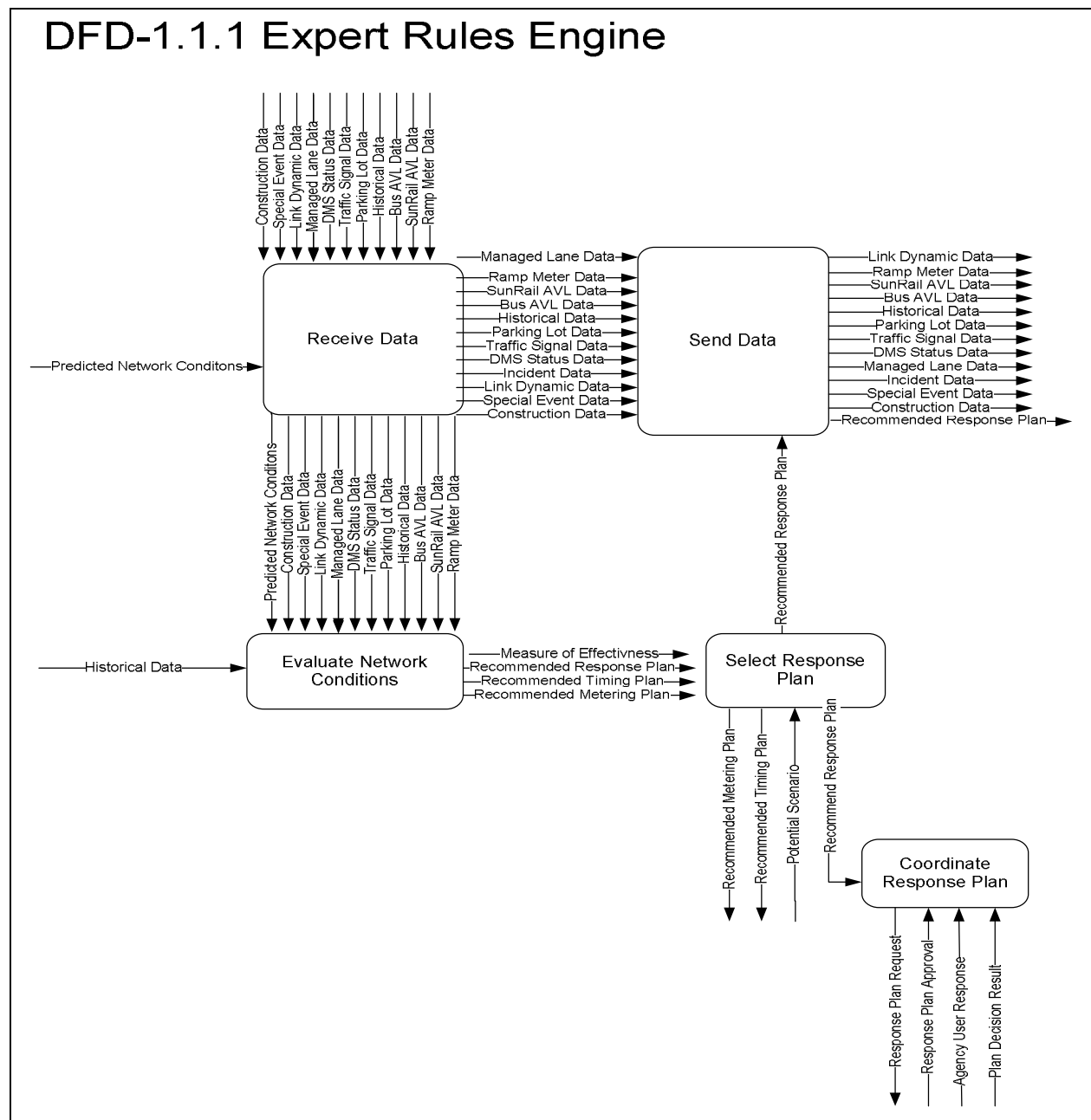


Figure 8: Expert Rules Engine Data Flows

### 3.3.3.7 Expert Rules Engine Requirements

**Table 11: Expert Rules Engine Requirements**

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.2.1.1	The ERE shall receive DMS status data from the DFE.	D	1.2.1	ERE	Demonstrate
1.2.1.2	The ERE shall receive traffic signal status data from the DFE.	D	1.2.1	ERE	Demonstrate
1.2.1.3	The ERE shall receive parking availability data from the DFE.	D	1.2.1	ERE	Demonstrate
1.2.1.4	The ERE shall receive weather alerts from the DFE.	D	1.2.1	ERE	Demonstrate
1.2.1.5	The ERE shall receive managed lane status data from the DFE.	D	1.2.1	ERE	Demonstrate
1.2.1.6	The ERE shall receive ramp meter status data from the DFE.	D	1.2.1	ERE	Demonstrate
1.2.1.7	The ERE shall receive advanced transportation management systems detector status data from the DFE.	D	1.2.1	ERE	Demonstrate
1.2.2.1	The ERE shall receive incident data from the DFE.	D	1.2.2	ERE	Demonstrate
1.2.2.2	The ERE shall receive construction data from the DFE.	D	1.2.2	ERE	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

---

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.2.2.3	The ERE shall receive special event data from the DFE.	D	1.2.2	ERE	Demonstrate
1.2.2.4	The ERE shall receive planned construction data from the DFE.	D	1.2.2	ERE	Demonstrate
1.2.2.5	The ERE shall receive planned special event data from the DFE.	D	1.2.2	ERE	Demonstrate
1.2.3.1	The ERE shall receive bus (transit) global positioning system (GPS)/ AVL data from the DFE.	D	1.2.3	ERE	Demonstrate
1.2.3.2	The ERE shall receive SunRail GPS/ AVL data from the DFE.	D	1.2.3	ERE	Demonstrate
1.2.4.1	The ERE shall receive link speed data from the DFE.	D	1.2.4	ERE	Demonstrate
1.2.4.2	The ERE shall receive link travel time data from the DFE.	D	1.2.4	ERE	Demonstrate
1.2.4.3	The ERE shall receive link volume data from the DFE	D	1.2.4	ERE	Demonstrate
1.9.1.1	The ERE shall store pre-agreed response plans in a network accessible location.	F	1.9.1	ERE	Demonstrate
1.9.1.2	The ERE shall provide the Prediction Engine with pre-agreed response plans.	F	1.9.1	ERE	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.9.1.3	The ERE shall provide the Evaluation Engine with pre-agreed response plans.	F	1.9.1	ERE	Demonstrate
1.9.2.1	The Expert Rules Engine shall provide the DSS Administrator with the capability to add pre-agreed incident response plans for a specified incident to the data store engine.	F	1.9.2	ERE	Demonstrate
1.9.3.1	The Expert Rules Engine shall provide the DSS Administrator with the capability to query pre-agreed incident response plans.	F	1.9.3	ERE	Demonstrate
1.9.4.1	The Expert Rules Engine shall provide the DSS Administrator with the capability to edit pre-agreed incident response plans for a specified incident.	F	1.9.4	ERE	Demonstrate
1.9.5.1	The Expert Rules Engine shall provide the DSS Administrator with the capability to delete pre-agreed incident response plans for specified events.	F	1.9.5	ERE	Demonstrate
1.19.15.1	The Expert Rules Engine shall send recommended traffic signal timing plans to the Prediction Engine for evaluation.	F	1.19.15	ERE	Demonstrate
1.19.15.2	The Expert Rules Engine shall send recommended traffic signal timing plans to the Evaluation Engine.	F	1.19.15	ERE	Demonstrate
1.19.15.3	The Expert Rules Engine shall provide the Prediction Engine with identified corridors for optimization of traffic signal timing plans.	F	1.19.15	ERE	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

---

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.20.3.1	The ERE shall evaluate the current conditions of the network.	F	1.20.3	ERE	Demonstrate
1.20.3.2	The ERE shall get response plans from the DFE.	F	1.20.3	ERE	Demonstrate
1.20.3.3	The ERE shall select response plans for evaluation.	F	1.20.3	ERE	Demonstrate
1.20.3.4	The ERE shall send a recommended response plan to the Prediction Engine for evaluation.	F	1.20.3	ERE	Demonstrate
1.20.3.5	The ERE shall receive predicted network condition from the Prediction Engine.	F	1.20.3	ERE	Demonstrate
1.20.4.1	The ERE shall send a recommended response plan to the IEN.	F	1.20.4	ERE	Demonstrate
1.20.4.2	The ERE shall receive agency status data from the IEN.	F	1.20.4	ERE	Demonstrate
1.20.4.3	The ERE shall send an agency status request to the IEN.	F	1.20.4	ERE	Demonstrate
1.20.4.4	The ERE shall receive a response plan response from the IEN.	F	1.20.4	ERE	Demonstrate
1.21.1.1	The ERE shall send recommended ramp metering plans to the Prediction Engine for evaluation.	F	1.21.1	ERE	Demonstrate

## System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

---

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.21.1.2	The ERE shall send recommended ramp metering plans to the Evaluation Engine.	F	1.21.1	ERE	Demonstrate
1.22.1.2	The ERE shall make the engine parameters configurable to the system administrators through a graphical user interface (GUI).	I	1.22.1	ERE	Demonstrate



### *3.3.4 Prediction Engine Requirements*

#### **3.3.4.1 Definition**

The PRE provides prediction of the transportation network within the Orlando region. The PRE will utilize a mesoscopic model software component to predict the conditions of the transportation network. Three instances of the mesoscopic model software component are planned including a model of the current conditions, a model of the future conditions (30 minutes) without any strategies implemented, and a model of the future conditions (30 minutes) with response strategies.

##### *3.3.4.1.1 Inputs/Outputs*

- Inputs include static data from the mesoscopic model and static data from the DFE.
- Outputs include mesoscopic model runs that are provided to the expert rules engine.

##### *3.3.4.1.2 Data Stores*

The prediction data store consists of the mesoscopic model, which contains static network data and behavioral data including driver diversion routes.

##### *3.3.4.1.3 Dependencies/Constraints*

The prediction engine will use the mesoscopic model validated during the project.

##### *3.3.4.1.4 Use Case Diagram*

The following use case diagram in Figure 9 illustrates the major activities of the prediction engine.

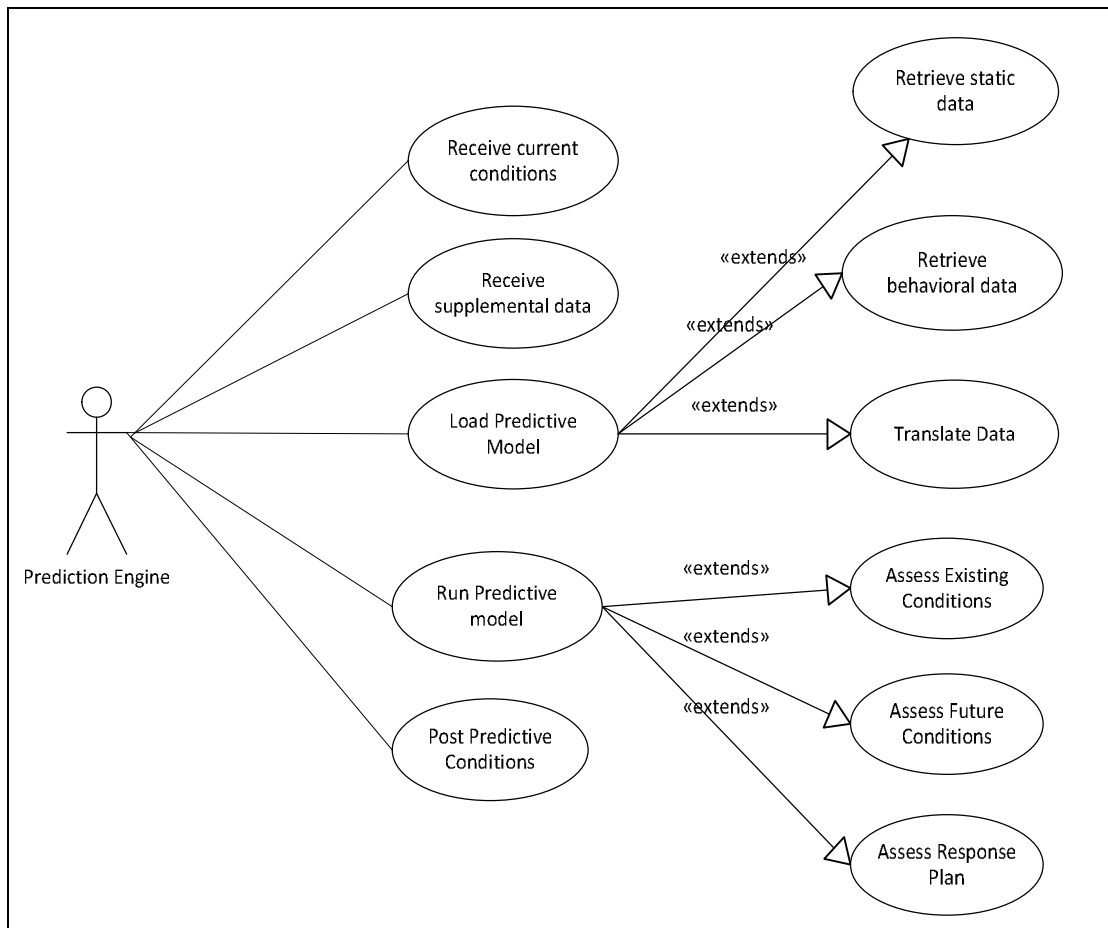


Figure 9: Prediction Engine Use Case Diagram

- Receive Current Conditions – The prediction engine receives dynamic data, such as link speeds and incident data, from the fused data in the DFE.
- Retrieve Plan Data – The prediction engine receives additional model parameters (such as recommended response plan and traffic signal plan and schedule) from the expert rules engine.
- Load Predictive Model – The mesoscopic model requires static data (such as a model specific network description), behavioral data (for instance, to represent the amount of driver diversion based on reading a DMS), and current roadway conditions data. This function populates the mesoscopic model with static, behavioral, and roadway conditions information.
- Retrieve Static Data – The mesoscopic model-specific static data (such as the model network description) is retrieved from a data store within the prediction engine.
- Retrieve Behavioral Data – The mesoscopic model-specific behavioral data (such as driver diversion based on traveler information) is retrieved from a data store within the prediction engine.

- Translate Data – Current conditions data (such as link speeds and incident data from the DFE) is translated to the specific network description and attribute configuration used by the mesoscopic model.
- Run Mesoscopic Model – The prediction manager software component calls the mesoscopic model to assess current and future conditions and future conditions if plan is enacted.
- Assess Existing Conditions – The mesoscopic model is run to assess current conditions.
- Assess Future Conditions – The mesoscopic model is run to assess future conditions using no additional response plans.
- Assess Future Conditions with Plan – The mesoscopic model is run to assess future conditions using the response plan provided by the expert rules engine.

#### 3.3.4.2 Data Interfaces

The diagram in Figure 10 shows the data elements received and sent by the Prediction Engine.

# DFD-1.1.3 Prediction Engine

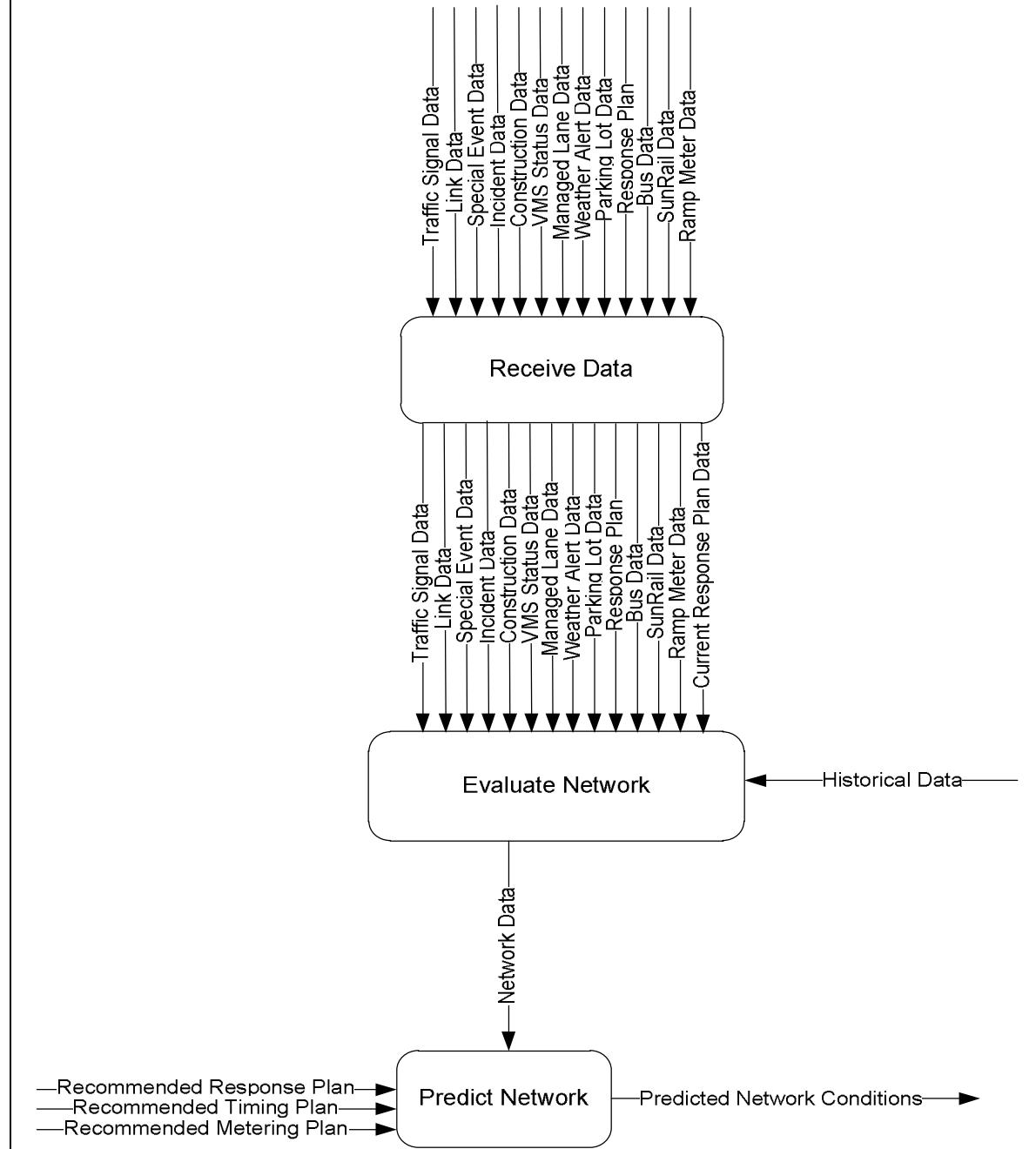


Figure 10: Prediction Subsystem Data Flows

### 3.3.4.3 Prediction Engine Requirements

**Table 12: Prediction Engine Requirements**

Requirement Number	Requirement Text	Type	Parent Requirement	System	Reference	Verification
1.2.1.8	The Prediction Engine shall receive DMS status data from the DFE as defined in the data dictionary.	D	1.2.1	PRE		Demonstrate
1.2.1.9	The PRE shall receive traffic signal status data from the DFE as defined in the data dictionary.	D	1.2.1	PRE		Demonstrate
1.2.1.10	The PRE shall receive parking availability data from the DFE as defined in the data dictionary.	D	1.2.1	PRE		Demonstrate
1.2.1.11	The PRE shall receive weather alerts from the DFE as defined in the data dictionary.	D	1.2.1	PRE		Demonstrate
1.2.1.12	The PRE shall receive managed lane status data from the DFE as defined in the data dictionary.	D	1.2.1	PRE		Demonstrate
1.2.1.13	The PRE shall receive ramp meter status data from the DFE as defined in the data dictionary.	D	1.2.1	PRE		Demonstrate
1.2.1.14	The PRE shall receive static SunGuide data from the DFE as defined in the data dictionary.	D	1.2.1	PRE		Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Reference	Verification
1.2.1.15	The PRE shall receive static traffic signal data from the DFE as defined in the data dictionary.	D	1.2.1	PRE		Demonstrate
1.2.2.6	The PRE shall receive incident data from the DFE.	D	1.2.2	PRE		Demonstrate
1.2.2.7	The PRE shall receive construction data from the DFE.	D	1.2.2	PRE		Demonstrate
1.2.2.8	The PRE shall receive special event data from the DFE special.	D	1.2.2	PRE		Demonstrate
1.2.2.9	The PRE shall receive planned construction data from the DFE.	D	1.2.2	PRE		Demonstrate
1.2.2.10	The PRE shall receive planned special event data from the DFE.	D	1.2.2	PRE		Demonstrate
1.2.3.3	The PRE shall receive bus (Transit) GPS/ AVL data from the DFE as defined in the data dictionary.	D	1.2.3	PRE		Demonstrate
1.2.3.4	The PRE shall receive SunRail GPS/AVL data from the DFE as defined in the data dictionary.	D	1.2.3	PRE		Demonstrate
1.2.3.5	The PRE shall receive static SunRail data from the DFE as defined in the data dictionary.	D	1.2.3	PRE		Demonstrate
1.2.3.6	The PRE shall receive static LYNX data from the DFE as defined in the data dictionary.	D	1.2.3	PRE		Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Reference	Verification
1.2.4.4	The PRE shall receive link speed data from the DFE as defined in the data dictionary.	D	1.2.4	PRE		Demonstrate
1.2.4.5	The PRE shall receive link travel time data from the DFE as defined in the data dictionary.	D	1.2.4	PRE		Demonstrate
1.2.4.6	The PRE shall include the mapping of travel time subpaths to provide appropriate travel time segments.	D	1.2.4	PRE		Demonstrate
1.2.4.6	The PRE shall receive link volume data from the DFE as defined in the data dictionary.	D	1.2.4	PRE		Demonstrate
1.19.15.4	The PRE shall send traffic signal timing plan recommendations to the Expert Rules Engine.	D	1.19.15	PRE		Demonstrate
1.19.15.5	The PRE shall generate traffic signal timing plan recommendations for defined alternative arterial corridors.	D	1.19.15	PRE		Demonstrate
1.19.15.6	The PRE shall be able to emulate adaptive traffic signal control for existing adaptive systems in the network.	F	1.19.15	PRE		Demonstrate
1.20.1.1	The PRE shall receive agency status from the DSS Agency Interface as defined in the data dictionary.	D	1.20.1	PRE		Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Reference	Verification
1.20.2.1	The PRE shall receive historical data from the DFE.	D	1.20.2	PRE		Demonstrate
1.20.3.3	The PRE shall compute future network conditions for the "do nothing" case.	F	1.20.3	PRE		Demonstrate
1.20.3.4	The PRE shall compute future network conditions for a proposed response plan.	F	1.20.3	PRE		Demonstrate
1.20.3.5	The PRE shall evaluate the transportation network conditions to compute the performance measures.	F	1.20.3	PRE		Demonstrate
1.20.3.6	The PRE shall update its model based on the comparison of the forecasted performances against field measurements received once the prediction period has passed.	F	1.20.3	PRE		Demonstrate
1.20.3.7	The PRE shall provide operational measures of effectiveness (MOE) with each response plan prediction to Evaluation Engine.	F	1.20.3	PRE		Demonstrate
1.20.3.8	The PRE shall provide accurate environmental assessment (emissions model) around incident areas.	F	1.20.3	PRE		Demonstrate
1.20.3.9	The PRE shall emulate ITS devices and their impact over traffic.	F	1.20.3	PRE		Demonstrate
1.20.3.10	The PRE shall calculate public transit operation, including lines and schedules, deviations from schedules.	F	1.20.3	PRE		Demonstrate



System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Reference	Verification
1.20.3.11	The PRE shall predict queue and delay propagation	F	1.20.3	PRE		Demonstrate
1.20.3.12	The PRE shall calculate predictions with a rolling horizon of 30 minutes in the future.	F	1.20.3	PRE		Demonstrate
1.20.3.13	The PRE shall evaluate all response plans developed for the area near an incident.	F	1.20.3	PRE		Demonstrate
1.20.3.14	The PRE shall provide MOEs for each evaluated response plan for a 10, 15, and 30-minute time horizon.	F	1.20.3	PRE		Demonstrate
1.20.3.15	The PRE shall provide traffic signal timing plans and changes for pre-defined arterial corridors.	F	1.20.3	PRE		Demonstrate
1.20.3.16	The PRE shall provide traffic ramp metering plan changes.	F	1.20.3	PRE		Demonstrate
1.20.3.17	The PRE shall provide prediction quality summary reports.	F	1.20.3	PRE		Demonstrate
1.21.1.3	The PRE shall send ramp meter plan recommendations to the Expert Rules Engine.	D	1.19.15	PRE		Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Reference	Verification
1.21.1.4	The PRE shall calculate ramp meter metering plan recommendations.	D	1.19.15	PRE		Demonstrate
1.22.1.3	The PRE shall include a planning tool to develop new response plans.	I	1.22.1	PRE		Demonstrate
1.22.1.4	The PRE shall include a planning model to evaluate new response plans.	F	1.22.1	PRE		Demonstrate
1.40.1.1	The PRE shall calculate the Geoffrey E. Havers (GEH) statistics for each prediction.	F	1.40.1	PRE		Demonstration
1.40.1.2	The PRE shall provide an accuracy for GEH of 90% of data points <10.0.	F	1.40.1	PRE		Demonstration
1.40.1.3	The PRE shall calculate the travel time accuracy for each prediction for the mapped traffic time subpaths.	F	1.40.1	PRE		Demonstration
1.40.1.4	The PRE shall provide an accuracy for travel time of 85% of data points <10.0.					

### 3.3.5 Evaluation Engine Subsystem

The evaluation engine uses historical data, static network data, and real-time data to calculate the various MOEs that are used to evaluate the performance of the system.

#### 3.3.5.1 Inputs/Outputs

- Inputs: Current network conditions data, such as highway link speeds and volumes, arterial speeds, and event data, will be provided by the DFE.
- Outputs: MOEs for response plans.

#### 3.3.5.2 Data Stores

- Evaluation data store – contains the past, current, and predicted network conditions, and plan decisions.

#### 3.3.5.3 Use Case Diagram

The use case shown in Figure 11 illustrates the basic high-level activities of the evaluation engine.

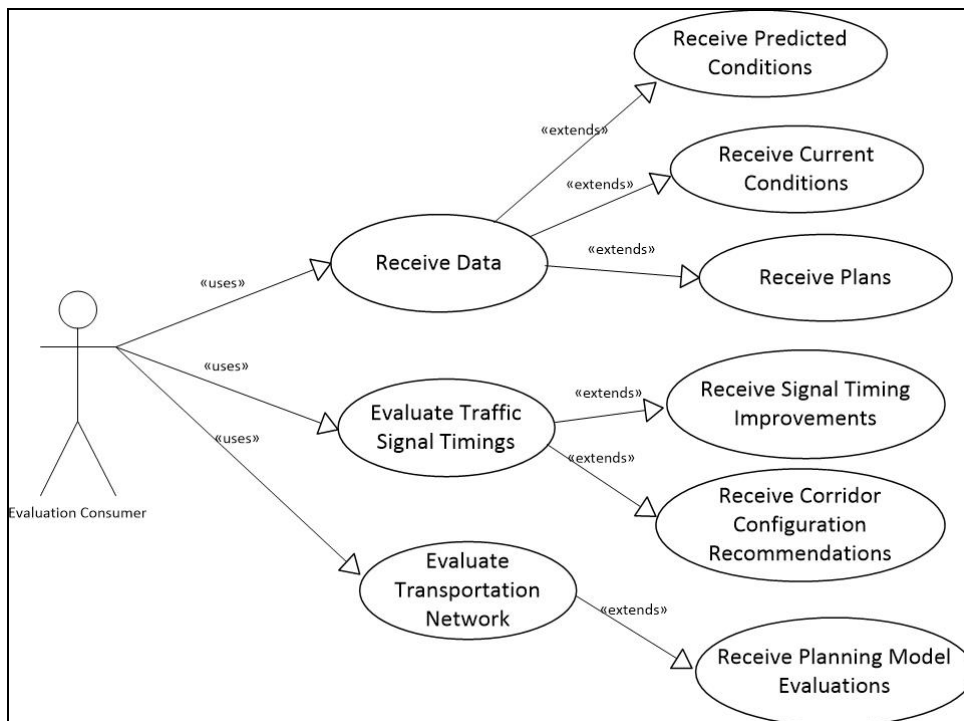


Figure 11: Evaluation Use Case

The evaluation engine retrieves historical data from several sources and makes it available to others for analysis.

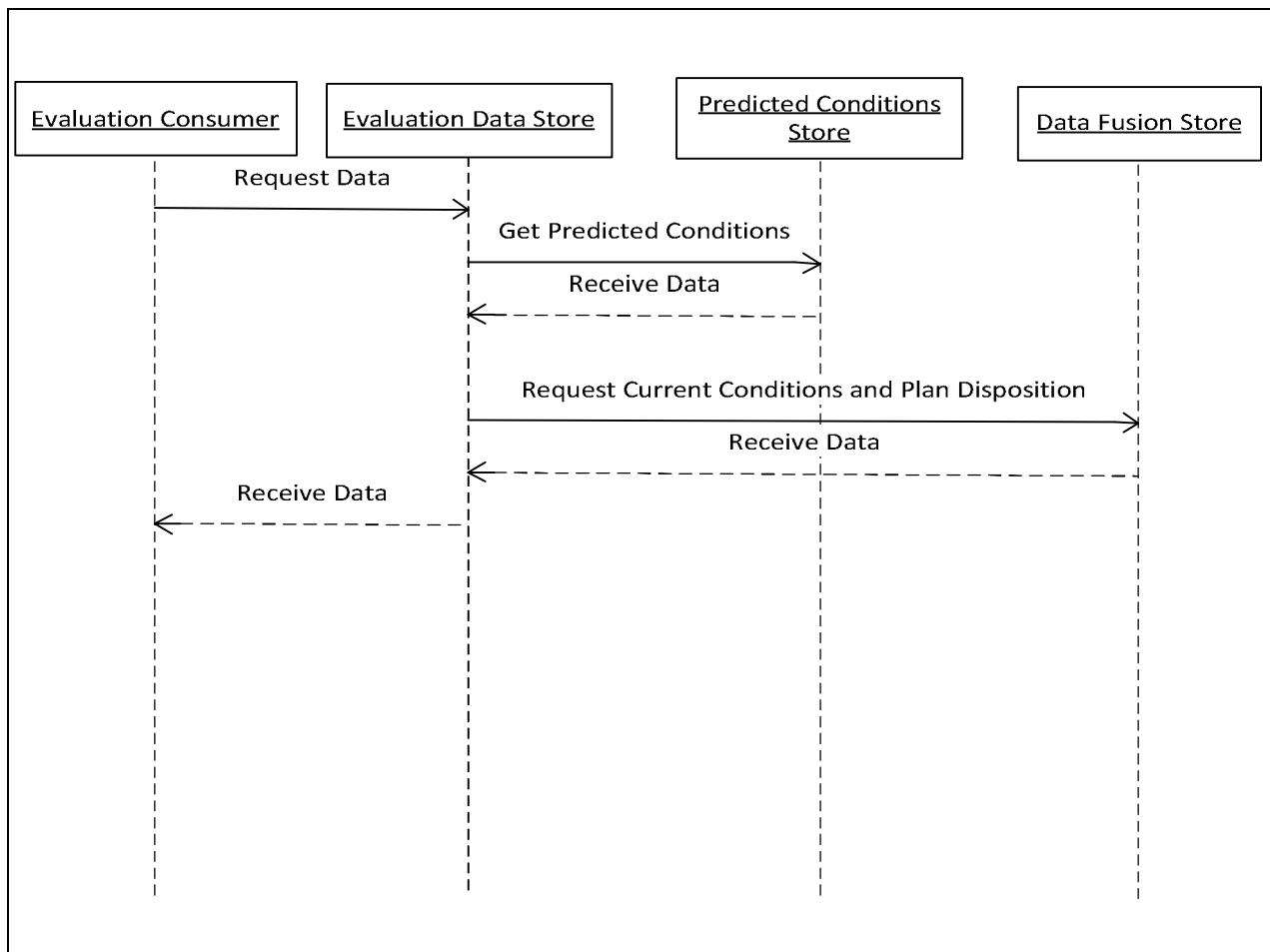
- Receive Data – The evaluation engine provides a unified interface for evaluation consumers to receive data.
- Receive Predicted Conditions – At the request of an evaluation consumer, the evaluation engine retrieves stored prediction data.
- Receive Current Conditions – At the request of an evaluation consumer, the evaluation engine retrieves current condition data from the data dissemination engine.
- Receive Plans – At the request of an evaluation consumer, the evaluation engine requests the disposition of response plans from the data store engine.

**Table 13: Evaluation Engine Use Case Description**

Use Case ID	1.1.4.01
Description	The evaluation engine provides performance measures on the effectiveness of response plans that were implemented as part of the system.
Actors	Evaluation Consumer
Preconditions	<ol style="list-style-type: none"> <li>1. The DFE provides fused current roadway conditions data.</li> <li>2. Model-specific static and behavioral data are stored within the evaluation engine.</li> <li>3. The evaluation engine develops performance measures.</li> </ol>
Post Conditions	The evaluation engine is provided an assessment of the effectiveness of response plans implemented.
Normal Course of Events	<ol style="list-style-type: none"> <li>1. Existing conditions data is collected from the DFE.</li> <li>2. Additional data is collected from the expert rules engine.</li> <li>3. The mesoscopic model is populated with data.</li> <li>4. The mesoscopic model is run.</li> <li>5. Results of the mesoscopic model runs are provided to the expert rules engine.</li> </ol>

### 3.3.5.4 Sequence Diagram

The sequence diagram shown in Figure 12 describes a high-level sequence of activities performed by the evaluation engine.



**Figure 12: Evaluation Engine Sequence Diagram**

The evaluation engine performs the following sequence of activities to evaluate a plan response to existing conditions:

1. The evaluation software component (evaluation consumer) requests data from the evaluation data store.
2. The evaluation data store requests predicted conditions from the prediction data store.
3. The evaluation data store requests current conditions and plan dispositions from the data store engine.

### 3.3.5.5 Data View

The diagram in Figure 13 shows the data elements received and sent by the evaluation engine.

# DFD-1.1.2 Evaluation Engine

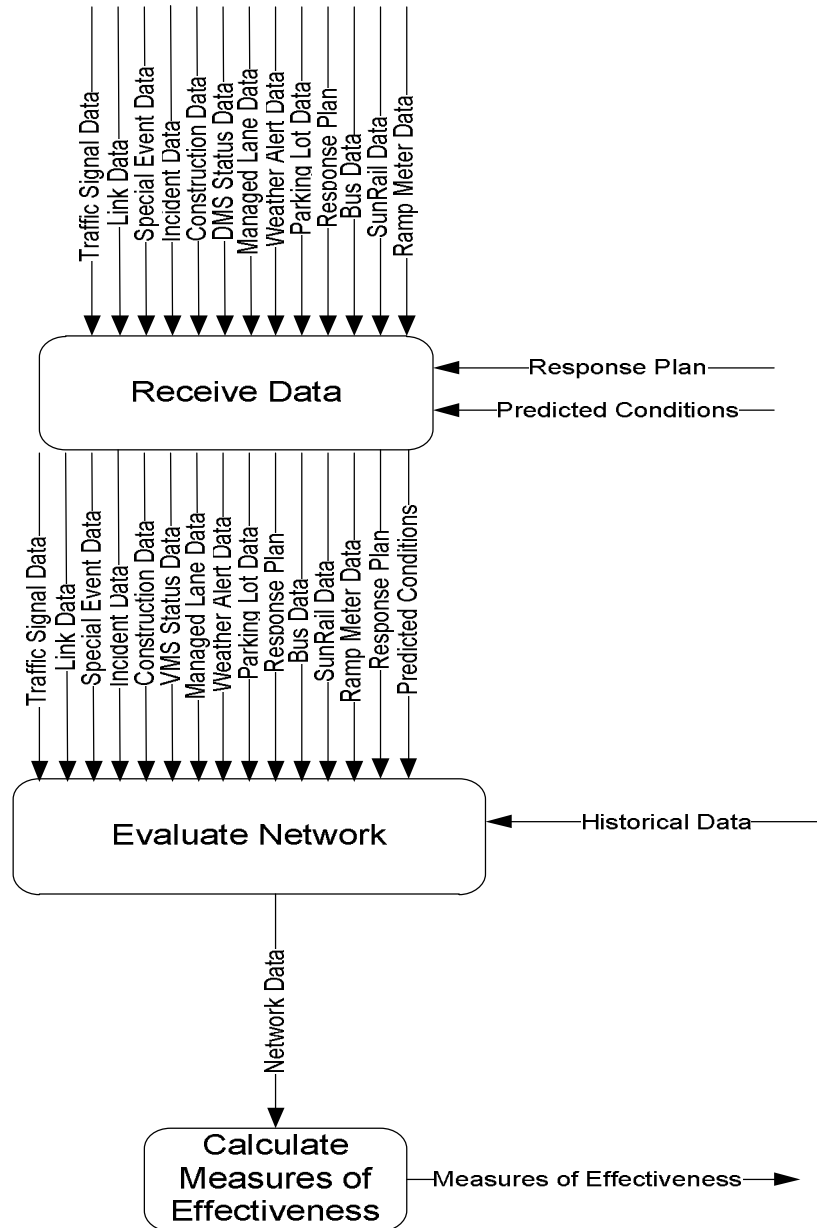


Figure 13: Evaluation Engine Data Flows

### 3.3.5.6 Evaluation Engine Requirements

**Table 14: Evaluation Engine Requirements**

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.16.1.1	The EVE shall receive ITS infrastructure status data from the DFE.	F	1.16.1	EVE	Demonstrate
1.16.1.2	The EVE shall receive event data from the DFE.	F	1.16.1	EVE	Demonstrate
1.16.1.3	The EVE shall receive transit data from the DFE.	F	1.16.1	EVE	Demonstrate
1.16.1.4	The EVE shall receive transportation network data from the DFE.	F	1.16.1	EVE	Demonstrate
1.16.1.5	The EVE shall evaluate the measures of performance for enacted response plans.	F	1.16.1	EVE	Demonstrate
1.16.1.6	The EVE shall send calculated performance measures to the DFE.	F	1.16.1	EVE	Demonstrate
1.16.2.1	The EVE shall receive ITS infrastructure status data from the DFE.	F	1.16.2	EVE	Demonstrate
1.16.2.2	The EVE shall receive event data from the DFE.	F	1.16.2	EVE	Demonstrate
1.16.2.3	The EVE shall receive transit data from the DFE.	F	1.16.2	EVE	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

---

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.16.2.4	The EVE shall receive transportation network data from the DFE.	F	1.16.2	EVE	Demonstrate
1.16.2.5	The EVE shall evaluate the measures of performance for the transportation network without implementing a response plan.	F	1.16.2	EVE	Demonstrate
1.16.2.6	The EVE shall send calculated performance measures to the DFE.	F	1.16.2	EVE	Demonstrate
1.16.2.7	The EVE shall receive link status data from the Prediction Engine for the do nothing scenario.	F	1.16.2	EVE	Demonstrate
1.16.2.8	The EVE shall receive node status data from the Prediction Engine for the do nothing scenario.	F	1.16.2	EVE	Demonstrate
1.16.3.1	The EVE shall receive ITS infrastructure status data from the DFE.	F	1.16.3	EVE	Demonstrate
1.16.3.2	The EVE shall receive event data from the DFE.	F	1.16.3	EVE	Demonstrate
1.16.3.3	The EVE shall receive transit data from the DFE.	F	1.16.3	EVE	Demonstrate
1.16.3.4	The EVE shall receive transportation network data from the DFE.	F	1.16.3	EVE	Demonstrate
1.16.3.5	The EVE shall receive the node status data from the Prediction Engine for the response plan scenarios.	F	1.16.3	EVE	Demonstrate



Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.16.3.6	The EVE shall receive the link status data from the Prediction Engine for the response plan scenarios.	F	1.16.3	EVE	Demonstrate
1.16.3.7	The EVE shall receive the route status data from the Prediction Engine for the response plan scenarios.	F	1.16.3	EVE	Demonstrate
1.16.3.8	The EVE shall evaluate the measures of performance for the transportation network for alternative response plans.	F	1.16.3	EVE	Demonstrate
1.16.3.9	The EVE shall send calculated performance measures to the DFE.	F	1.16.3	EVE	Demonstrate

### 3.3.5.7 Signal Optimization Tool

The Signal Optimization Tool (SOT) analyzes pre-defined corridors to determine if a new, more efficient timing plan is required. The tool can be used to view recommended timing plans as well as allow users to analyze and create a new timing plan.

**Table 15: Signal Optimization Tool Requirements**

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.25.1.1	The SOT will allow users to enter comments.	F	1.25.1	SOT	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.25.1.2	The SOT will automatically analyze Corridors to determine a more efficient set of timing plans.	F	1.25.1	SOT	Demonstrate
1.25.1.2.1	The automation cycle shall be configurable by a user with the appropriate permissions.	F	1.25.1.2	SOT	Demonstrate
1.25.1.3	The SOT shall have varying level of user groups	F	1.25.1	SOT	Demonstrate
1.25.1.3.1	Users can be added to the different group by a system administrator	F	1.25.1.3	SOT	Demonstrate
1.25.1.3.2	The user groups shall include, but not be limited to Traffic Signal Engineer, ICM Manager, Operator, Analyst, and others.	F	1.25.1.3	SOT	Demonstrate
1.25.1.3.3	Each user group shall have an assigned permission.	F	1.25.1.3	SOT	Demonstrate
1.25.1.3.4	Permissions shall be modify or read.	F	1.25.1.3	SOT	Demonstrate
1.25.1.3.5	The ICM Manager and the Traffic Signal Engineer shall have the right to approve or deny recommended changes.	F	1.25.1.3	SOT	Demonstrate
1.25.1.3.6	Analysts shall have the right to change signal timing plans and submit them for approval.	F	1.25.1.3	SOT	Demonstrate
1.25.1.4	Approved plans must be digitally signed by a Professional Engineer.	F	1.25.1	SOT	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.25.1.4.1	PE Digital signatures must be in accordance with Florida State law.	F	1.25.1.4	SOT	Demonstrate
1.25.1.5	Subscribed users shall receive notifications about recommended signal timing plans via email as well as the information feed.	F	1.25.1	SOT	Demonstrate
1.25.1.6	Clicking on the recommended signal plan on the information feed will take the user to that specific timing plan.	F	1.25.1	SOT	Demonstrate
1.25.1.7	The SOT will have a home page	F	1.25.1	SOT	Demonstrate
1.25.1.7.1	The SOT home page will display a table of the latest set of corridors with a recommendation.	F	1.25.1.7	SOT	Demonstrate
1.25.1.7.1.1	The table shall allow the user to view all available data.	F	1.25.1.7.1	SOT	Demonstrate
1.25.1.7.1.2	The recommendation table shall include the name of the corridor, requested by, analysis date/time pattern, FIT, applicability, level of service, delay MOE and associated agencies.	F	1.25.1.7.1	SOT	Demonstrate
1.25.1.7.1.3	The "requested by" column shall display by whom the recommended plans were created. i.e., by the system or by an individual user.	F	1.25.1.7.1	SOT	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.25.1.7.2	The SOT home page shall include a scalable map feature displaying all recommended corridors	F	1.25.1.7	SOT	Demonstrate
1.25.1.7.3	The SOT home page shall provide the ability for users to perform additional analysis via a corridor analysis interface.	F	1.25.1.7	SOT	Demonstrate
1.25.1.7.4	The SOT home page will provide the ability for the user to select a corridor.	F	1.25.1.7	SOT	Demonstrate
1.25.1.8	The SOT will have a corridor recommendation page.	F	1.25.1	SOT	Demonstrate
1.25.1.8.1	The corridor recommendation page shall display a heat map for the various MOE.	F	1.25.1.8	SOT	Demonstrate
1.25.1.8.2	Metrics shown on the page shall correspond to the period selected by the user.	F	1.25.1.8	SOT	Demonstrate
1.25.1.8.3	The page shall display a table which consists of intersection, FIT improvement, applicability, level of service, delay, agencies, and action.	F	1.25.1.8	SOT	Demonstrate
1.25.1.8.3.1	The first row of the table shall display the aggregate corridor results.	F	1.25.1.8.3	SOT	Demonstrate
1.25.1.8.3.2	The aggregated corridor row shall include an action to allow the user to navigate to the Offset details page.	F	1.25.1.8.3	SOT	Demonstrate.2
1.25.1.8.3.3	Rows after that shall display the individual intersection details.	F	1.25.1.8.3	SOT	Demonstrate.3

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.25.1.8.3.4	Each intersection shall have a details button linked to the intersection details page	F	1.25.1.8.3	SOT	Demonstrate
1.25.1.8.3.5	Detail buttons shall be color coded to display the state of the review.	F	1.25.1.8.3	SOT	Demonstrate
1.25.1.8.4	The corridor recommendation page shall provide a way to generate summary reports.	F	1.25.1.8	SOT	Demonstrate
1.25.1.8.4.1	The corridor summary report shall allow users to select elements to include in the report. Elements shall include but not be limited to MOEs, Metrics, individual intersections within the corridor, and agencies.	F	1.25.1.8.4	SOT	Demonstrate
1.25.1.8.4.2	The user will have the ability to select the time of day pattern from AM, PM, off-peak, or 24 hours as part of the report.	F	1.25.1.8.4	SOT	Demonstrate
1.25.1.8.4.3	Selected timing plan details will be displayed in the report.	F	1.25.1.8.4	SOT	Demonstrate
1.25.1.9	The Corridor Offset Details page shall provide a drop down menu for selecting a recommended or existing timing plan	F	1.25.1	SOT	Demonstrate
1.25.1.9.1	The Corridor Offset Details page shall include a scrollable Time Space diagram.	F	1.25.1.9	SOT	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.25.1.9.2	The corridor intersection offset details shall be provided in a table, include but not limited to name, offset, and agency.	F	1.25.1.9	SOT	Demonstrate
1.25.1.9.3	The Time Space Diagram should provide users the ability to modify individual intersection offsets.	F	1.25.1.9	SOT	Demonstrate
1.25.1.9.4	Users will be able to recommend, approve and digitally sign the signal offset recommendations or modifications.	F	1.25.1.9	SOT	Demonstrate
1.25.1.9.5	If modifications have been made to the recommended plan by a user with the appropriate permission, it must be submitted for review.	F	1.25.1.9	SOT	Demonstrate
1.25.1.9.6	When the user clicks save, an alert is displayed providing them the option of re-running the calculations.	F	1.25.1.9	SOT	Demonstrate
1.25.1.9.7	When a modified plan is submitted for review, a notification is sent to the approver.	F	1.25.1.9	SOT	Demonstrate
1.25.1.10	The SOT shall contain a details page for each intersection.	F	1.25.1	SOT	Demonstrate
1.25.1.10.1	The intersection details page shall provide a detail geometric layout.	F	1.25.1.10	SOT	Demonstrate
1.25.1.10.2	The user will have the ability to select the time of day pattern from AM, PM, off-peak, or 24 hours.	F	1.25.1.10	SOT	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.25.1.10.3	For the selected time period, a table shall present the recommended plans compared to the existing plans. It will provide activate time, the FIT and the applicability of each plan.	F	1.25.1.10	SOT	Demonstrate
1.25.1.10.4	By selecting a time plan from the table, a split diagram is displayed for the signal within that plan.	F	1.25.1.10	SOT	Demonstrate
1.25.1.10.4.1	Split diagram will display both the effective green time and the available green time, and provide the present breakdown for each phase.	F	1.25.1.10.4	SOT	Demonstrate
1.25.1.10.4.2	The user will be able to make modifications to the split diagram by sliding the splits.	F	1.25.1.10.4	SOT	Demonstrate
1.25.1.10.4.3	The user will be able to save or undo the modification.	F	1.25.1.10.4	SOT	Demonstrate
1.25.1.10.4.4	Previous versions of the timing plan shall be added to the table allowing the user to revisit.	F	1.25.1.10.4	SOT	Demonstrate
1.25.1.11	The SOT main page will provide the ability for users to request a new optimization from the SOT.	F	1.25.1	SOT	Demonstrate
1.25.1.11.1	Users will be able to select the time window to be analyzed, examples – last week, last month, last quarter.	F	1.25.1.11	SOT	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

---

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.25.1.11.2	Users will be able to select the time period to be analyzed, examples – AM, PM, Off-Peak, 24-hour.	F	1.25.1.11	SOT	Demonstrate
1.25.1.11.3	Users will select the corridor to be analyzed through the use of a drop down list.	F	1.25.1.11	SOT	Demonstrate
1.25.1.12	Newly analyzed corridors will be added to the recommended table on the main page should an improvement be found.	F	1.25.1	SOT	Demonstrate
1.25.1.13	Recommended corridor plans should be archived and retrievable by users.	F	1.25.1	SOT	Demonstrate



### *3.3.6 Information Exchange Network Subsystem*

#### 3.3.6.1 Inputs/Outputs

Inputs represent event data, object status and inventory updates, plan recommendations and approvals. Outputs represent the same data as inputs. All data received in the data store is made available to the DSS Agency User Interface Subsystem and includes:

- Operational user input of incidents, construction, and special events;
- Inputs received from the data store including incidents, construction, and special events;
- Inputs received from the plan decision associated with recommended response plans.

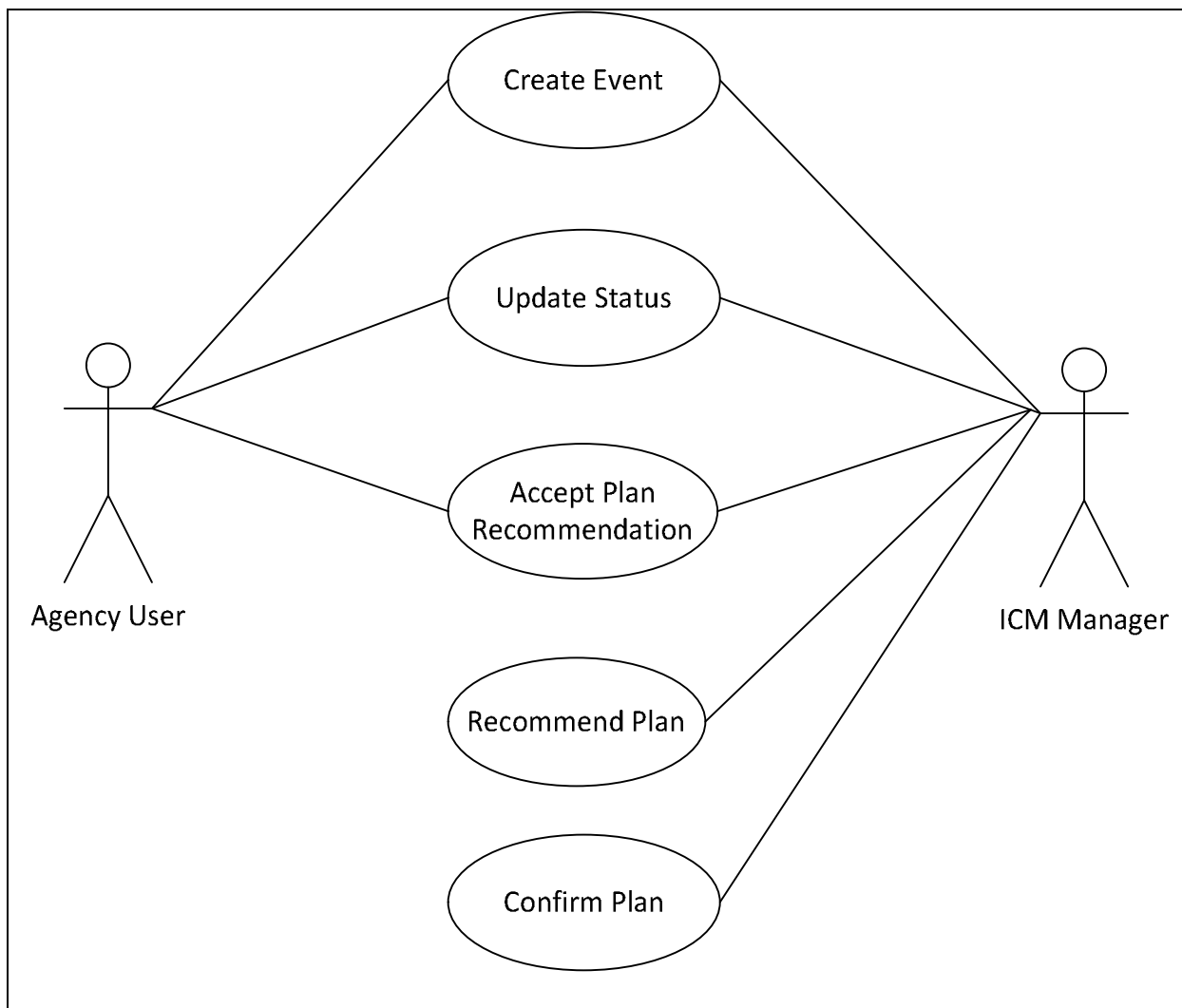
#### 3.3.6.2 Data Stores

The data stores include the following databases:

- db\_EventObject Database – stores all events, objects and associated status, and alarms;
- db\_Public – stores all IEN GUI lookup tables;
- db\_Org – stores all organization settings;
- db\_User – stores all user settings including login and password information;
- IEN data store – Includes all event, object, and static network data for the CFR-ICMS system.

#### 3.3.6.3 Use Case Diagram

The use case shown in Figure 14 illustrates the basic high-level activities of the DSS agency user interface.



**Figure 14: IEN Use Case**

The following actors will utilize the IEN interface:

- The agency user creates and updates events and statuses as well as accepting response plan recommendations.
- The ICM Manager creates and updates events and statuses, recommends response plans, and confirms response plans.

The use case illustrated in Figure 14 represents the basic functions of the IEN, which are described in more detail in the sections that follow.

**Table 16: Information Exchange Network Use Case Description**

Use Case ID	1.1.5.01
Description	The IEN is used by the ICM Manager and agency users to view current conditions within the region and to coordinate response plans for events within the region.
Actors	agency user, ICM Manager
Preconditions	DSS database is populated with plan recommendations.
Post Conditions	Agency users can implement response plans.
Normal Course of Events	<ol style="list-style-type: none"> <li>1. Existing conditions data is collected from the DFE.</li> <li>2. When events occur or change that require a response plan, a response plan request is sent to the ICM Manager and agency users.</li> <li>3. The agency users approve and enact the response plan.</li> <li>4. Once the event has completed, the system closes the event and notifies the agency users and ICM Manager to cancel the response plan and return to normal operation.</li> </ol>

### 3.3.6.4 Sequence Diagram

The sequence diagram shown in Figure 15 describes a high-level sequence of activities performed by the IEN.

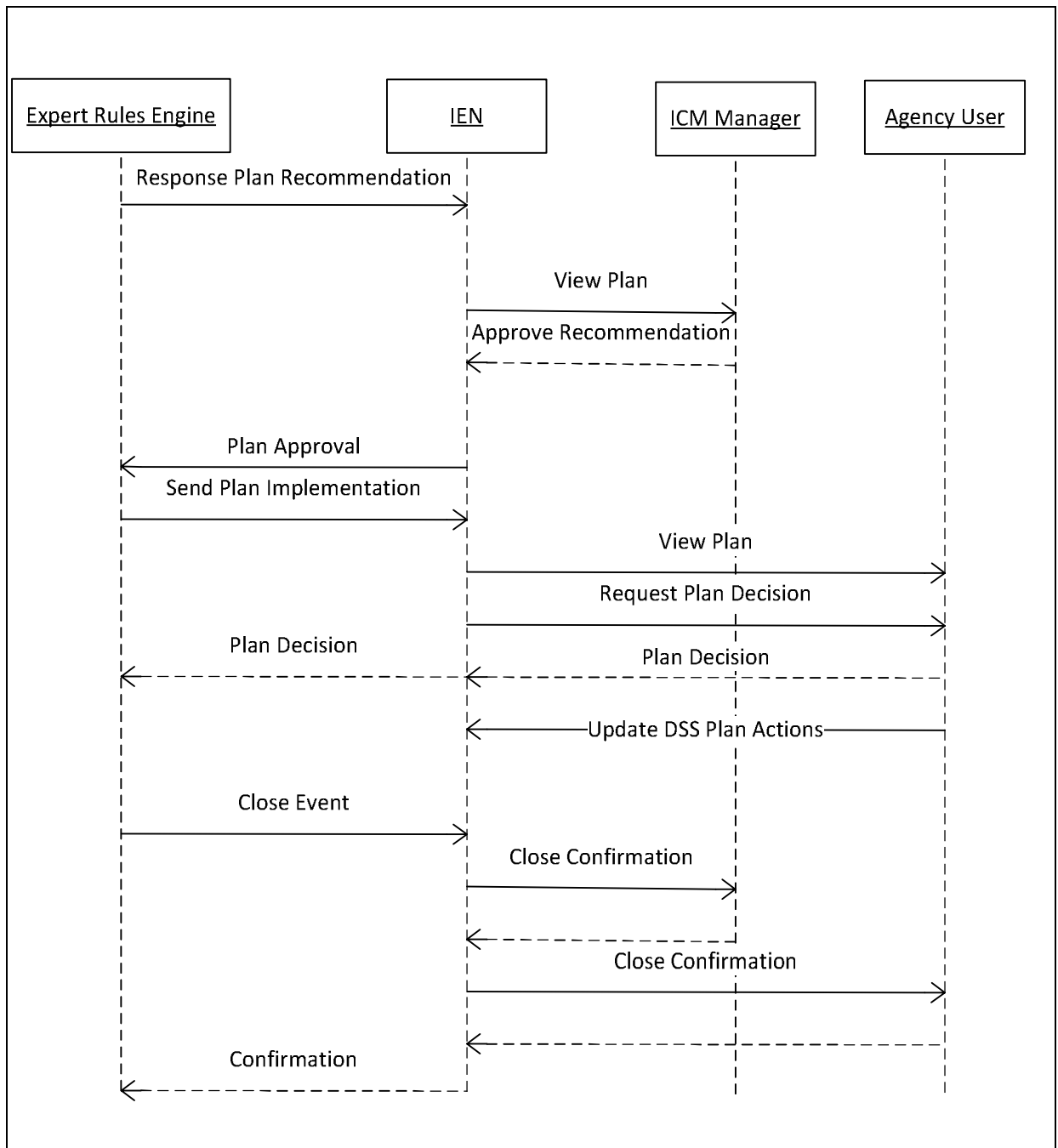


Figure 15: IEN Sequence Diagram

### 3.3.6.5 IEN Data View

The diagram shown in Figure 16 shows the data elements received and sent by the IEN.

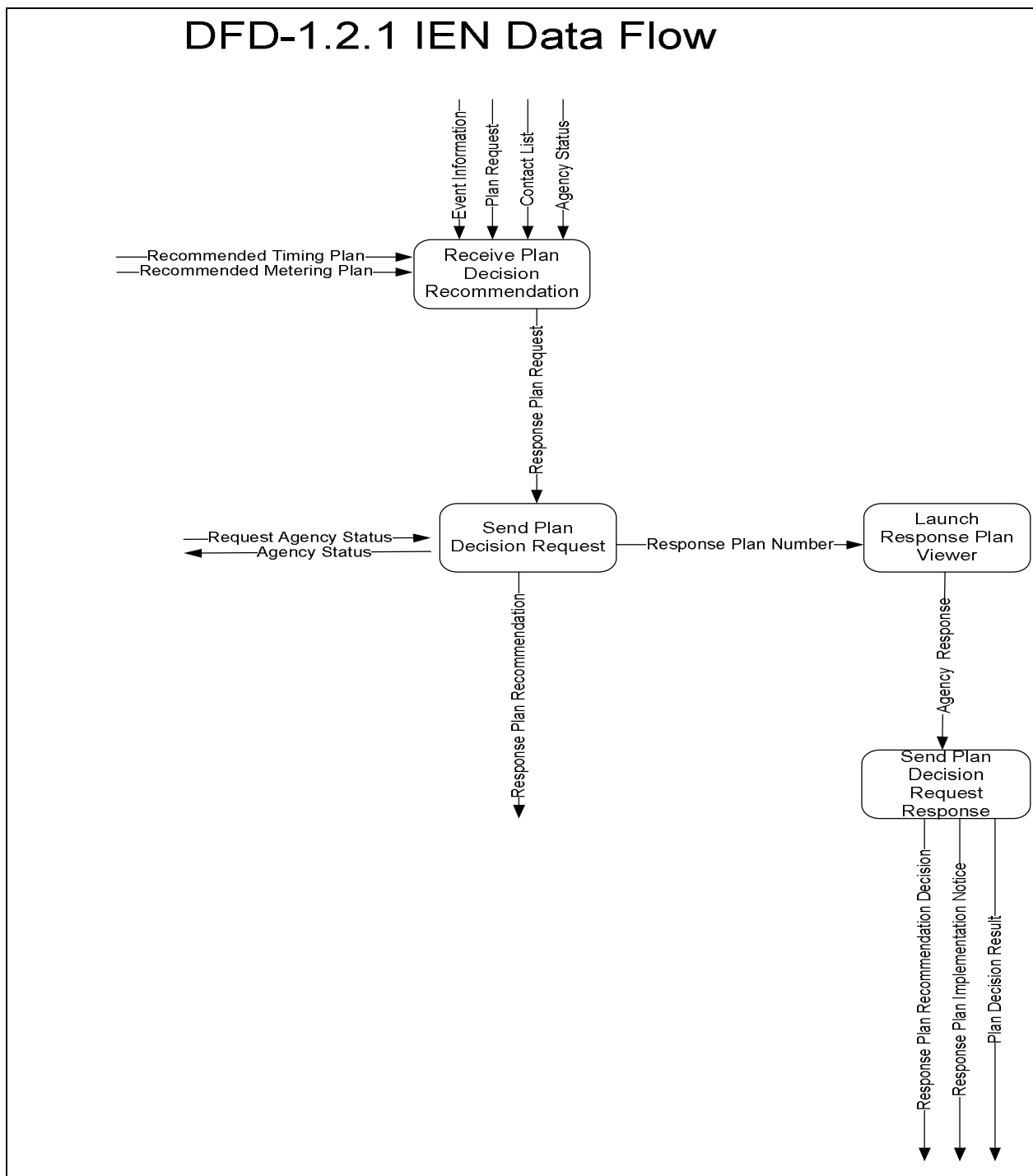


Figure 16: IEN Data Flows

### 3.3.6.6 Information Exchange Network Requirements

**Table 17: Information Exchange Network Requirements**

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.1	The IEN shall provide agency users the capability to view current status of the transportation network.	F	1.1	IEN	Demonstrate
1.1.1.1	The IEN shall provide an event list that shall allow an agency user the capability to view all open, draft, and closed incidents in the region on the covered facilities.	F	1.1.1	IEN	Demonstrate
1.1.1.2	The IEN shall provide an event list that shall allow an agency user the capability to view all open and closed construction events in the region on the covered facilities.	F	1.1.1	IEN	Demonstrate
1.1.1.3	The IEN shall provide an event list that shall allow an agency user the capability to view all open and closed special events in the region on the covered facilities.	F	1.1.1	IEN	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.1.4	The IEN event list shall contain the following fields: <ul style="list-style-type: none"> <li>• Status</li> <li>• Start and End Date</li> <li>• Organization</li> <li>• Owner</li> <li>• Type</li> <li>• Impact</li> <li>• Code</li> <li>• Description</li> </ul>	F	1.1.1	IEN	Demonstrate
1.1.1.5	The IEN event list shall allow for a user to select an event from the list and view it on the map.	F	1.1.1	IEN	Demonstrate
1.1.1.6	The IEN event list shall allow for a user to select an event from the list and view/edit events in the event detail form.	F	1.1.1	IEN	Demonstrate
1.1.1.7	The IEN event list shall allow a user to filter events by the following categories: <ul style="list-style-type: none"> <li>• Dates</li> <li>• Organization</li> <li>• Event Category</li> <li>• Event Type</li> <li>• Impact</li> </ul>	F	1.1.1	IEN	Demonstrate
1.1.1.8	The IEN event list shall allow for a user to create custom filters to filter events into/from their event list.	F	1.1.1	IEN	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.1.9	The IEN event list shall allow for a user to search the event list for a specific string of text.	F	1.1.1	IEN	Demonstrate
1.1.1.10	The IEN shall refresh the Event list in real time, based on event updates on the system.	F	1.1.1	IEN	Demonstrate
1.1.1.11	The IEN shall allow an agency user to create an event list report from the event list tab.	F	1.1.1	IEN	Demonstrate
1.1.1.12	The IEN shall provide an event list that shall allow an agency user the capability to view all open, draft, and closed incidents in the region on the covered facilities.	F	1.1.1	IEN	Demonstrate
1.1.1.13	The IEN shall provide agency users the capability to filter events based on all available criteria	F	1.1.1	IEN	Demonstrate
1.1.2	The IEN shall receive current status of the transportation network.	F	1.1	IEN	Demonstrate
1.1.2.1	The IEN shall receive DMS data from the DFE.	F	1.1.2	IEN	Demonstrate
1.1.2.2	The IEN shall receive CCTV data from the DFE.	F	1.1.2	IEN	Demonstrate



System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.2.3	The IEN shall receive managed lane data from the DFE.	F	1.1.2	IEN	Demonstrate
1.1.2.4	The IEN shall receive transit vehicle location data from the DFE.	F	1.1.2	IEN	Demonstrate
1.1.2.5	The IEN shall receive weather data from the DFE.	F	1.1.2	IEN	Demonstrate
1.1.2.6	The IEN shall receive incident data from the DFE.	F	1.1.2	IEN	Demonstrate
1.1.2.7	The IEN shall receive parking data from the DFE.	F	1.1.2	IEN	Demonstrate
1.1.2.8	The IEN shall receive freeway data from the DFE.	F	1.1.2	IEN	Demonstrate
1.1.2.9	The IEN shall receive link dynamic data from the DFE	F	1.1.2	IEN	Demonstrate
1.1.2.10	The IEN shall receive construction data from the DFE.	F	1.1.2	IEN	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.2.11	The IEN shall receive special event data from the DFE.	F	1.1.2	IEN	Demonstrate
1.1.3	The IEN shall allow an agency user to login via a web browser.	D	1.1	IEN	Demonstrate
1.1.4	The IEN shall provide the capability to administer user privileges.	F	1.1	IEN	Demonstrate
1.1.4.1	The IEN shall notify an agency user when the user's login request is rejected due to invalid credentials.	F	1.1.4	IEN	Demonstrate
1.1.4.2	The IEN shall notify an agency user when the user's login request is rejected due to invalid credentials.	F	1.1.4	IEN	Demonstrate
1.1.4.3	The IEN shall allow for single sign on for authentication requests.	F	1.1.4	IEN	Demonstrate
1.1.4.4	The IEN shall allow an agency user to modify their password.	F	1.1.4	IEN	Demonstrate
1.1.4.5	The IEN shall require minimum password requirements, such as alphanumeric characters, minimum length, special characters, and password expiration.	F	1.1.4	IEN	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.4.6	The IEN shall allow for multi-agency coordination.	F	1.1.4	IEN	Demonstrate
1.1.4.7	The IEN shall provide an administrative user the capability to configure up to a minimum of 32 agencies in the system.	F	1.1.4	IEN	Demonstrate
1.1.4.8	The IEN shall provide an administrative user the capability to roll the list of configured agencies up to a list of eight groups with up to 16 agencies per group.	F	1.1.4	IEN	Demonstrate
1.1.28	The IEN shall provide the capability to select an approval profile for each agency.	F	1.1	IEN	Demonstrate
1.1.28.1	The IEN shall provide the capability to select a jurisdiction for each agency.	F	1.1.28	IEN	Demonstrate
1.1.28.1	The IEN shall provide the capability to add asset permissions to a jurisdiction.	F	1.1.28	IEN	Demonstrate
1.1.5.1	The IEN shall provide an administrative user the capability to create an agency user profile in the Data Store.	F	1.1.5	IEN	Demonstrate
1.1.5.2	The IEN shall provide an agency user the capability to modify an agency user profile in the Data Store.	F	1.1.5	IEN	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.5.3	The IEN shall provide an agency administrator the capability to deactivate an agency user profile in the Data Store.	F	1.1.5	IEN	Demonstrate
1.1.1.1	The IEN shall provide agency users the capability to view current roadway conditions.	F	1.1.1	IEN	Demonstrate
1.1.1.2	The IEN shall provide agency users the capability to view current status of managed lane facilities in the corridor.	F	1.1.1	IEN	Demonstrate
1.1.5	The IEN shall provide an agency user the capability to manage events.	F	1.1	IEN	Demonstrate
1.1.6	The IEN shall provide an agency user the capability to send via email the incident description as defined in the data dictionary.	F	1.1	IEN	Demonstrate
1.1.5.1	The IEN shall provide an agency user the capability to create an incident event.	F	1.1.5	IEN	Demonstrate
1.1.5.2	The IEN shall provide an agency user the capability to create a construction event.	F	1.1.5	IEN	Demonstrate
1.1.5.3	The IEN shall provide an agency user the capability to create a special event.	F	1.1.5	IEN	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.5.4	The IEN shall provide an agency user the capability to modify a construction event.	F	1.1.5	IEN	Demonstrate
1.1.5.5	The IEN shall provide an agency user the capability to modify a special event	F	1.1.5	IEN	Demonstrate
1.1.5.6	The IEN shall provide an agency user the capability to modify an incident.	F	1.1.5	IEN	Demonstrate
1.1.5.7	The IEN shall provide an agency user the capability to close an incident.	F	1.1.5	IEN	Demonstrate
1.1.5.8	The IEN shall provide an agency user the capability to close a construction event.	F	1.1.5	IEN	Demonstrate
1.1.5.9	The IEN shall provide an agency user the capability to close a special event.	F	1.1.5	IEN	Demonstrate
1.1.5.10	The IEN shall provide an agency user the capability to create associated actions for an incident.	F	1.1.5	IEN	Demonstrate
1.1.7	The IEN shall provide an agency user the capability to send via email the incident description as defined in the data dictionary.	F	1.1	IEN	Demonstrate
1.1.1.3	The IEN shall provide an agency user the capability to view information layers on a GIS-based map as defined in the data dictionary.	F	1.1.1	IEN	Demonstrate
1.1.1.4	The IEN GIS-based map shall allow for static and dynamic layers to be added or removed as necessary.	F	1.1.1	IEN	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.1.4.1	Information icons on the GIS-based map shall be grouped when necessary to avoid cluttering on the map.	F	1.1.1.4	IEN	Demonstrate
1.1.1.4.2	When information icons are grouped on the GIS-based map, the parent/grouped icon shall contain the number of nested icons that have been grouped to form the parent icon.	F	1.1.1.4	IEN	Demonstrate
1.1.1.4.3	A parent/grouped information icon shall, when clicked, display the nested icons along with color coding, ordered by worst to least impact.	F	1.1.1.4	IEN	Demonstrate
1.1.1.4.4	Nested icons, when clicked, shall show the nested sub-icons, along with color coding, ordered by worst to least impact.	F	1.1.1.4	IEN	Demonstrate
1.1.1.4.5	A nested icon, when clicked, shall display all information associated with the clicked icon in the IEN.	F	1.1.1.4	IEN	Demonstrate
1.1.1.5	The IEN shall provide an agency user the capability to view incident information in the corridor as a selectable layer on a GIS-based map.	F	1.1.1	IEN	Demonstrate
1.1.1.5.1	The IEN shall provide an agency user the capability to filter incidents based on all data fields	F	1.1.1.5	IEN	Demonstrate
1.1.1.6	The IEN shall provide an agency user the capability to view active construction information in the corridor as a selectable layer on a GIS-based map.	F	1.1.1	IEN	Demonstrate
1.1.1.6.1	The IEN shall provide an agency user the capability to filter construction events based on all data fields	F	1.1.1.6	IEN	Demonstrate
1.1.1.7	The IEN shall provide an agency user the capability to view planned construction information in the corridor as a selectable layer on a GIS-based map.	F	1.1.1	IEN	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.1.7.1	The IEN shall provide an agency user the capability to filter planned construction based on all data fields.	F	1.1.1.7	IEN	Demonstrate
1.1.1.8	The IEN shall provide an agency user the capability to view active special event information in the corridor as a selectable layer on a GIS-based map.	F	1.1.1	IEN	Demonstrate
1.1.1.8.1	The IEN shall provide an agency user the capability to filter special events based on all data fields.	F	1.1.1.8	IEN	Demonstrate
1.1.1.9	The IEN shall provide an agency user the capability to view planned special event information in the corridor as a selectable layer on a GIS-based map.	F	1.1.1	IEN	Demonstrate
1.1.1.9.1	The IEN shall provide an agency user the capability to filter planned special events based on all data fields.	F	1.1.1.9	IEN	Demonstrate
1.1.8	An event icon, when clicked, shall provide the following event information: <ul style="list-style-type: none"> <li>• Timeline of Event (Event Start)</li> <li>• Lanes Affected</li> <li>• Last Updated Date/Time</li> <li>• Event Type</li> <li>• Event Location</li> <li>• Nearest CCTV</li> </ul>	F	1.1	IEN	Demonstrate
1.1.9	The nearest CCTV to an event, when displayed in the event information GUI, shall be determined by searching a configurable radius X miles from the event, where X is a configurable value.	F	1.1	IEN	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.10	The nearest CCTV to an event, when selected from the event information GUI, shall provide the most recent image snapshot from the selected CCTV device.	F	1.1	IEN	Demonstrate
1.1.11	The IEN shall provide an agency user the capability to view signal operations issue information in the corridor as a selectable layer on a GIS-based map.	F	1.1	IEN	Demonstrate
1.1.12	The IEN shall provide agency users the capability to view transit vehicle locations as a selectable layer on a GIS-based map for freight rail providers, denoted as a unique icon located at the last known position of the vehicle.	F	1.1	IEN	Demonstrate
1.1.13	The IEN shall provide agency users the capability to view transit vehicle locations as a selectable layer on a GIS-based map for passenger rail providers, denoted as a unique icon located at the last known position of the vehicle.	F	1.1	IEN	Demonstrate
1.1.14	The IEN shall provide agency users the capability to view transit vehicle locations as a selectable layer on a GIS-based map for service patrol providers, denoted as a unique icon located at the last known position of the vehicle.	F	1.1	IEN	Demonstrate
1.1.15	The IEN shall provide agency users the capability to view transit vehicle locations as a selectable layer on a GIS-based map for school bus providers, denoted as a unique icon located at the last known position of the vehicle.	F	1.1	IEN	Demonstrate
1.1.16	The IEN shall provide agency users the capability to view transit vehicle locations as a selectable layer on a GIS-based map for transit providers, denoted as a unique icon located at the last known position of the vehicle.	F	1.1	IEN	Demonstrate



System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.17	A transit icon, when clicked, shall provide the current number of riders and capacity for the associated transit vehicle.	F	1.1	IEN	Demonstrate
1.1.18	A passenger rail icon, when clicked, shall provide the current number of riders and capacity for the associated passenger rail vehicle.	F	1.1	IEN	Demonstrate
1.1.19	The IEN shall provide agency users the capability to view the vehicle locations of up to 8 bus provider agencies in the region as a selectable layer on a GIS-based map.	F	1.1	IEN	Demonstrate
1.1.19.1	The IEN shall provide agency users the capability to view the location of bus transit vehicles for LYNX.	F	1.1.19	IEN	Demonstrate
1.1.19.2	The IEN shall provide agency users the capability to view the location of bus transit vehicles for Votran.	F	1.1.19	IEN	Demonstrate
1.1.19.3	The bus transit provider agencies shall be subdivided in the IEN by region.	F	1.1.19	IEN	Demonstrate
1.1.20	The IEN shall provide agency users the capability to view the vehicle locations of up to 8 rail provider agencies in the region as a selectable layer on a GIS-based map.	F	1.1	IEN	Demonstrate
1.1.20.1	The IEN shall provide agency users the capability to view the location of rail transit vehicles for Brightline.	F	1.1.20	IEN	Demonstrate
1.1.20.2	The IEN shall provide agency users the capability to view the location of rail transit vehicles for CSX.	F	1.1.20	IEN	Demonstrate
1.1.20.3	The IEN shall provide agency users the capability to view the location of rail transit vehicles for Florida East Coast Railway.	F	1.1.20	IEN	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.20.4	The IEN shall provide agency users the capability to view the location of rail transit vehicles for SunRail.	F	1.1.20	IEN	Demonstrate
1.1.20.5	The rail transit provider agencies shall be subdivided by agency in the IEN.	F	1.1.20	IEN	Demonstrate
1.1.21	The IEN shall provide agency users the capability to view the vehicle locations of up to 10 school bus provider agencies in the region as a selectable layer on a GIS-based map.	F	1.1	IEN	Demonstrate
1.1.21.1	The IEN shall provide agency profiles for school bus transit provider agencies subdivided by county.	F	1.1.21	IEN	Demonstrate
1.1.21.2	The IEN shall provide agency users the capability to view the location of school bus transit vehicles for Orange County.	F	1.1.21	IEN	Demonstrate
1.1.21.3	The IEN shall provide agency users the capability to view the location of school bus transit vehicles for Osceola County.	F	1.1.21	IEN	Demonstrate
1.1.21.4	The IEN shall provide agency users the capability to view the location of school bus transit vehicles for Seminole County.	F	1.1.21	IEN	Demonstrate
1.1.21.5	The IEN shall provide agency users the capability to view the location of school bus transit vehicles for Volusia County.	F	1.1.21	IEN	Demonstrate
1.1.22	The IEN shall provide agency users the capability to view the vehicle locations of up to 8 service patrol provider agencies in the region as a selectable layer on a GIS-based map.	F	1.1	IEN	Demonstrate
1.1.22.1	The IEN shall provide the capability to subdivide the service patrol vehicle agencies in the region as a selectable layer on a GIS-based map.	F	1.1.22	IEN	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.22.2	The IEN shall provide agency users the capability to view the location of service patrol vehicles for Florida's Turnpike Enterprise/Central Florida Expressway Authority.	F	1.1.22	IEN	Demonstrate
1.1.22.3	The IEN shall provide agency users the capability to view the location of service patrol vehicles for I-4 (Mile Post).	F	1.1.22	IEN	Demonstrate
1.1.22.4	The IEN shall provide agency users the capability to view the location of service patrol vehicles for LYNX.	F	1.1.22	IEN	Demonstrate
1.1.23	The IEN shall provide agency users the capability to view on-street parking data in the region as a selectable layer on a GIS-based map, grouped by block, per direction.	F	1.1	IEN	Demonstrate
1.1.23.1	The IEN shall provide agency users the capability to view parking garage/surface lot data in the region as a selectable layer on a GIS-based map.	F	1.1.23	IEN	Demonstrate
1.1.23.2	The IEN shall provide agency users the capability to view rest area/weigh station parking data in the region as a selectable layer on a GIS-based map.	F	1.1.23	IEN	Demonstrate
1.1.23.3	The IEN shall provide agency users the capability to view beach parking data in the region as a selectable layer on a GIS-based map.	F	1.1.23	IEN	Demonstrate
1.1.23.4	On-street parking shall be presented on the GIS-based map as polyline segments on the roadway at the corresponding geographic location.	F	1.1.23	IEN	Demonstrate
1.1.23.5	Sections of on-street parking shall be combined to form sections greater than a block if zoom level/resolution does not support the ability for a user to differentiate locations	F	1.1.23	IEN	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.23.6	For combined sections of on-street parking, the number of spaces and number of occupied spaces shall be divided by block.	F	1.1.23	IEN	Demonstrate
1.1.23.7	Garage parking shall be presented on the GIS-based map as approximations of the representations of the building dimensions at the corresponding geographic location.	F	1.1.23	IEN	Demonstrate
1.1.23.8	If a garage parking lot is too small to discern based on approximations of the representations of the building dimensions, the garage parking lot shall be presented on the GIS-based map in the form of an icon.	F	1.1.23	IEN	Demonstrate
1.1.23.9	A parking icon, when clicked, shall display the current parking lot utilization percentage, in addition to the current percentage compared to the historical average.	F	1.1.23	IEN	Demonstrate
1.1.23.10	Upon clicking a parking garage icon, garage color, or on-street parking block, the following information shall be provided: <ul style="list-style-type: none"> <li>• Total number of spaces</li> <li>• Number of occupied spaces</li> </ul>	F	1.1.23	IEN	Demonstrate
1.1.23.11	On-street parking segment polylines on the GIS-based map shall be color coded with configurable values to indicate current occupancy, least occupied to most occupied.	F	1.1.23	IEN	Demonstrate
1.1.23.12	For rest areas, the number of spaces and the number of occupied spaces shall be divided by car versus truck spaces.	F	1.1.23	IEN	Demonstrate
1.1.23.13	Beach parking shall be summarized by ramp location and shall conform to the requirements of a parking garage.	F	1.1.23	IEN	Demonstrate
1.1.23.14	Weigh station and rest area truck parking shall conform to the requirements of a parking garage.	F	1.1.23	IEN	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.1.2	The IEN shall provide agency users the capability to view dynamic link data as a selectable layer on a GIS-based map.	F	1.1.1	IEN	Demonstrate
1.1.1.3	Each link shall be clickable in the IEN GIS map and when clicked, shall display the current speed, travel time, occupancy, and volume for each link.	F	1.1.1	IEN	Demonstrate
1.1.1.4	The IEN shall provide an agency user the capability to view location, current status, and current message of DMS in the corridor as a selectable layer on a GIS-based map.	F	1.1.1	IEN	Demonstrate
1.1.1.5	The IEN shall provide an agency user the capability to view location, current status, and current image snapshot of CCTVs as a selectable layer on a GIS-based map.	F	1.1.1	IEN	Demonstrate
1.1.1.6	The IEN shall provide an agency user the capability to view location, current status, and timing plan of traffic signals as a selectable layer on a GIS-based map.	F	1.1.1	IEN	Demonstrate
1.1.1.7	The IEN shall provide an agency user the capability to view current weather alerts from the National Weather Service as a selectable layer on a GIS-based map.	F	1.1.1	IEN	Demonstrate
1.1.1.7.1	National Weather Service weather alerts shall be color coded to indicate the following alert types: <ul style="list-style-type: none"> <li>• Fire</li> <li>• Flood</li> <li>• Hurricane</li> <li>• Thunderstorm</li> <li>• Tornado</li> </ul>	F	1.1.1.7	IEN	Demonstrate
1.1.1.7.2	The IEN shall provide an agency user the capability to view a weather radar overlay as a selectable layer on a GIS map.	F	1.1.1	IEN	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.1.7.3	The IEN weather radar overlay shall be provided in a motion loop, indicating changing weather conditions in real-time.	F	1.1.1.7	IEN	Demonstrate
1.1.1.7.4	The IEN shall include a legend describing the weather alert types, and associated color codes.	F	1.1.1.7	IEN	Demonstrate
1.1.1.7.5	The weather alert legend color codes shall be configurable in the system to allow for changes to colors for the different conditions.	F	1.1.1.7	IEN	Demonstrate
1.1.1.7.6	The IEN shall include a legend describing the weather radar overlay rainfall intensities and associated color codes.	F	1.1.1.7	IEN	Demonstrate
1.1.1.7.7	The weather radar overlay legend color codes shall be configurable in the system to allow for changes to colors for the different conditions.	F	1.1.1.7	IEN	Demonstrate
1.1.6.1	The IEN shall send to the Internet email alerts as defined in data definition table.	F	1.1.6	IEN	Demonstrate
1.1.3.1	The IEN shall provide an agency user the capability to create an approval profile.	F	1.1.3	IEN	Demonstrate
1.1.3.2	The IEN shall provide an agency user the capability to automatically approve a response request after a defined value of time.	F	1.1.3	IEN	Demonstrate
1.1.3.3	The IEN shall provide an agency user the capability to automatically reject a response request after a defined value of time.	F	1.1.3	IEN	Demonstrate
1.1.3.4	The IEN shall provide an agency user the capability to automatically approve a response request during defined hours of the day after a defined value of time.	F	1.1.3	IEN	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.5.1	The IEN shall provide an agency user with an alarm indicator when a response plan recommendation is made by the DSS	F	1.1.5	IEN	Demonstrate
1.1.5.1.1	The IEN shall provide an agency user with a pop-up indicating when a response plan recommendation is made by the DSS.	F	1.1.5.1	IEN	Demonstrate
1.1.5.1.2	The IEN shall create an alarm once a response plan has been recommended by the DSS	F	1.1.5.1	IEN	Demonstrate
1.1.5.1.3	The IEN shall provide a user the capability to view an alarm	F	1.1.5.1	IEN	Demonstrate
1.1.5.1.4	The IEN shall provide a user the capability to confirm an alarm	F	1.1.5.1	IEN	Demonstrate
1.1.5.1.5	The IEN shall provide a user the capability to ignore an alarm	F	1.1.5.1	IEN	Demonstrate
1.1.5.1.6	The IEN shall provide a user the capability to acknowledge an alarm	F	1.1.5.1	IEN	Demonstrate
1.1.5.1.7	The IEN shall provide a user the capability to open the event associated with the alarm	F	1.1.5.1	IEN	Demonstrate
1.1.5.2	The IEN shall provide an agency user with a pop-up indicating a substantial maintenance outage.	F	1.1.5	IEN	Demonstrate
1.1.5.2.1	The pop-up indicating the substantial maintenance outage shall be triggered when X or more devices are unavailable or down, where X is a value configurable in the IEN.	F	1.1.5.2	IEN	Demonstrate

System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.1.7.8	The IEN shall provide an agency user with a pop-up indicating a National Weather Service weather alert.	F	1.1.1.7	IEN	Demonstrate
1.23.1	The IEN shall allow an agency user to run custom reports.	F	1.23	IEN	Demonstrate
1.23.2	The report component of the IEN shall be accessible via main menu navigation.	F	1.23	IEN	Demonstrate
1.23.2.1	The report component of the IEN shall be initially configured with, at a minimum, 6 report templates.	F	1.23.2	IEN	Demonstrate
1.23.2.2	The report component of the IEN shall allow for an administrative user to be able to add new reports after the system is deployed.	F	1.23.2	IEN	Demonstrate
1.23.2.3	The report component of the IEN shall provide the capability for a user to apply filters to filter data when running a report in the system.	F	1.23.2	IEN	Demonstrate
1.23.2.4	The report component of the IEN shall provide the capability for a user to generate a report in PDF, HTML, and Excel formats.	F	1.23.2	IEN	Demonstrate
1.24.1	The IEN shall provide the capability for a user to select a pre-defined dashboard.	F	1.24	IEN	Demonstrate
1.24.1.1	The IEN shall provide the capability for a user with the ability to configure the data displayed on a dashboard.	F	1.24.1	IEN	Demonstrate
1.1.27	The IEN shall provide the capability for a user to view graphically archived, statistical data related to the transportation network.	F	1.1	IEN	Demonstrate



System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

---

Requirement Number	Requirement Text	Type	Parent Requirement	System	Verification
1.1.26.2	The IEN shall provide the capability for a user to select the performance measures for display graphically on a dashboard.	F	1.1.26	IEN	Demonstrate
1.1.26.3	The IEN shall display an information feed that will be configurable by the user.	F	1.1.26	IEN	Demonstrate
1.1.26.4	Users can subscribe to different event details that will be displayed in their information feed.	F	1.1.26	IEN	Demonstrate
1.25.1.15	The IEN shall include a menu item to open the SOT module.	F	1.25.1	IEN	Demonstrate

## 4 User Definitions

This section defines the terms and definitions used in the requirements document.

**Real-time** – receipt or calculation of conditions within 2 minutes of occurrence

**Near real-time** - receipt or calculation of conditions more than 2 minutes of occurrence, but within 30 minutes of occurrence

**Status** – condition of infrastructure

**Active** - not marked as out-of-order or in-maintenance

**Link** - the portion of a model connecting two nodes. The link is defined within the model as:

- Facility type
- Number of lanes
- Capacity per lane
- Speed limit
- Average jam density

**Node** – point of branching of physical connections, or terminating a physical connection within a simulation model

**Average jam density** - the maximum number of vehicles per unit length of the highway link

**Intermodal network conditions** – current status and state of modes of travel within the network

**Consistency** – the system's estimation error will fall within a pre-determined range

**Real-world conditions** – model capabilities to match conditions of actual network:

- The system's estimation error of the traffic speed, density, and volume on every highway link in the network should not exceed 15% (plus or minus).
- The system's estimation error of the location of every transit vehicle in the network should not exceed 10% (plus or minus).
- The system's estimation error of the occupancy of every park-and-ride facility in the network should not exceed 20% (plus or minus).

**Corridor management strategy** – management plan for an event or incident within the corridor. These strategies include:

- Pre-trip and en-route traveler information provision
- Congestion pricing
- Traffic signal timing modification
- Transit service modification
- Transit signal priority

- Parking management and pricing
- Combinations of the above

**Traffic management scheme** – a traffic management scheme consists of the different actions that will be implemented by all agencies to manage the corridor. These actions are:

- List of DMS to be activated along with their messages
- Transit vehicle service pattern including any route and headway modifications
- Traffic signal timing plan(s) of all signalized intersections

**Environment-oriented** – factor relating to the environment of the system

### 4.1 Action Verbs

This section defines the action verb terms and definitions used in this requirements document.

**Table 18: Action Verbs**

VERB	DEFINITION
Accept	to receive (e.g. data feed from another system)
Activate	to make active; cause to function or act (e.g. to make a planned event an active incident)
Add	to add (e.g. add a timestamp to a record)
Aggregate	to bring together; collect into one
Allow	to give permission to or for
Authorize	to give authority or official power to (associated with security authentication requirement)
Collect	to get from source; assemble
Compare	to examine (two or more objects, ideas, people, etc.) in order to note similarities and differences
Compute	to determine or ascertain by mathematical or logical means
Confirm	to make valid or binding by some formal or legal act; sanction; ratify
Determine	to settle or decide (a dispute, question, etc.) by an authoritative or conclusive decision
Display	to output (data) on a monitor or other screen
Evaluate	to judge or determine the significance, worth, or quality of; assess
Execute	to run (a program or routine) or to carry out (an instruction in a program)
Filter	to remove by the action of a filter
Generate	to bring into existence; cause to be; produce (erg. generate a log file )
Import	to bring (documents, data, etc.) into one software program from another, implies translate
Index	a value that identifies and is used to locate a particular element within a data array or table
Manage	to handle, direct, govern, or control in action or use (e.g. manage the add, change, delete of an object)
Merge	to combine or blend
Monitor	to watch closely for purposes of control, surveillance, etc.; keep track of; check continually
Notify	to inform (someone) or give notice to

## System/Subsystem Minimum Technical Requirements for the Central Florida Regional ICMS

<b>VERB</b>	<b>DEFINITION</b>
Parse	to analyze (a string of characters) in order to associate groups of characters with the syntactic units of the underlying grammar
Predict	to declare or tell in advance; prophesy; foretell
Provide	to make available (e.g. provide a function to a user)
Publish	to make generally known (e.g. publish to center-to-center)
Receive	to get or be informed of
Recommend	to advise, as an alternative; suggest (a choice, course of action, etc.)
Refresh	to read and write (the contents of dynamic storage) at intervals in order to avoid loss of data
Remove	to get rid of; do away with (e.g. remove from User Interface display)
Reside	- Hardware constraint - e.g. reside in a controller cabinet
Restore	to bring back to a former, original, or normal condition
Restrict	to confine or keep within limits, as of space, action, choice, intensity, or quantity
Retrieve	to locate and read (data) from storage, as for display on a monitor
Save	to copy (a file) from RAM onto a disk or other storage medium
Search	to examine (one or more files, as databases or texts) electronically, to locate specified items
Select	to make a choice; pick
Send	to cause to be transmitted to a destination
Simulate	to create a simulation, likeness, or model of (a situation, system, or the like)
Sort	to arrange according to sort, kind, or class; separate into sorts; classify
Start	to set in operation
Store	to put or retain (data) in a memory unit
Translate	to convert (a program, data, code, etc.) from one form to another
Update	to incorporate new or more accurate information in (a database, program, procedure, etc.)
Use	- Constraint Only - to utilize a specific technology
Validate	to substantiate