Vehicle Infrastructure Integration (VII)

Network User to
Service Delivery Node (SDN) Subsystem
[X-031, X-032, X-033]
Software Interface Requirements Specification

February 26, 2007
Version 1.1

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DOCUMENT CHANGE HISTORY

Date	Author	Description
10/18/2006	Booz Allen Hamilton	Version 1.0 Released.
12/12/2006	Booz Allen Hamilton	– Lexicon removed and incorporated in "VII Infrastructure Lexicon 1.0 Document" – IRS75, "Notification" removed. – IRS76, IRS77 - Space deleted. – IRS497 and IRS498 added. – ASU9 wording changed. – ASU19 deleted, redundant. – ASU25, ASU26, ASU27, and ASU28 added. – Appendix B: Version column added, versions updated. – Appendix D: Political Boundary ID, spelling fixed. – Added clarifying text to Section 1.1. – Data Element Dictionary removed and incorporated in "VII Data Element Dictionary 1.0 Document"

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1. INTRODUCTION

This *Network User to SDN Software Interface Requirements Specification (IRS)* is based on guidance and information provided by the USDOT, subsequent meetings and discussions, and agreed upon assumptions by the USDOT and VIIC. Every effort has been made to ensure the content and approach in developing this document reflects available guidance from the USDOT and accurately reflects the overall scope and intent of VII's objectives.

1.1 SCOPE

This document, the *Vehicle Infrastructure Integration (VII) Network User to SDN Subsystem [X-031,X-032, X-033] Software Interface Requirements Specification*, addresses the top-level software interface requirements for the X-031, X-032 and X-033 interfaces as specified in the VII National System Requirements. This specification is one of a series of technical documents detailing the SDN Subsystem and defining the technical characteristics of the VII System. The main focus of this document is the Proof of Concept (POC) system functionality, which will subsequently be implemented in the National System. For further background on the VII System's projected operations, refer to the *VII National System Requirements* (Reference 1) and the *VII Concept of Operations* (Reference 17).

1.2 DOCUMENT OVERVIEW

This IRS captures the comprehensive system requirements for Network User to SDN Subsystem Interface as part of the Vehicle Infrastructure Integration (VII) project.

The remaining IRS sections are organized as follows:

- **Section 2. Interface Description**: Describes the interfaces between the Network User and the SDN Subsystem in the order of the services they support.
- **Section 3. Interface Requirements**: Lists the requirements for the interfaces between the Network User and SDN Subsystem.
- **Appendix A. Assumptions & Dependencies**: Provides a list of the assumptions and dependencies related to the requirements.
- **Appendix B. Reference Documents**: Lists the Network User and SDN Subsystem reference documents.
- **Appendix C. National System Requirements Traceability:** Traces requirements from this document to their parent requirements in the National System Requirements.

1.3 MESSAGE AND INTERFACE NAMING

The VII System includes many services and components, all of which must communicate with one another. For clarity in discussion, this section provides a convention for describing how these communications occur. The term "unit," in this discussion may refer to a system, a subsystem, a service, a component, or any other entity within the VII System.

Every instance of communication between two units is referred to as a *message*; for example, a subscription request is one type of message, and the response is another. The grouping of all messages that two units send each other in performing a task is called the *interface* between those units. Two units might have multiple interfaces between them depending on the tasks they perform.

An interface's name is made up of the unit the interface belongs to, followed by a period, followed by the task the messages traversing that interface perform. For example, the Lookup Information interface, which belongs to the Information Lookup Service (ILS), is called **ILS.LookupInformation**. Messages that use an interface are specified

with the interface name, followed by the message name in brackets. For instance, the message used to request information in a geographic area is called **ILS.LookupInformation[GeospatialRequest]**, and the response is **ILS.LookupInformation[GeospatialResponse]**.

2. INTERFACE DESCRIPTION

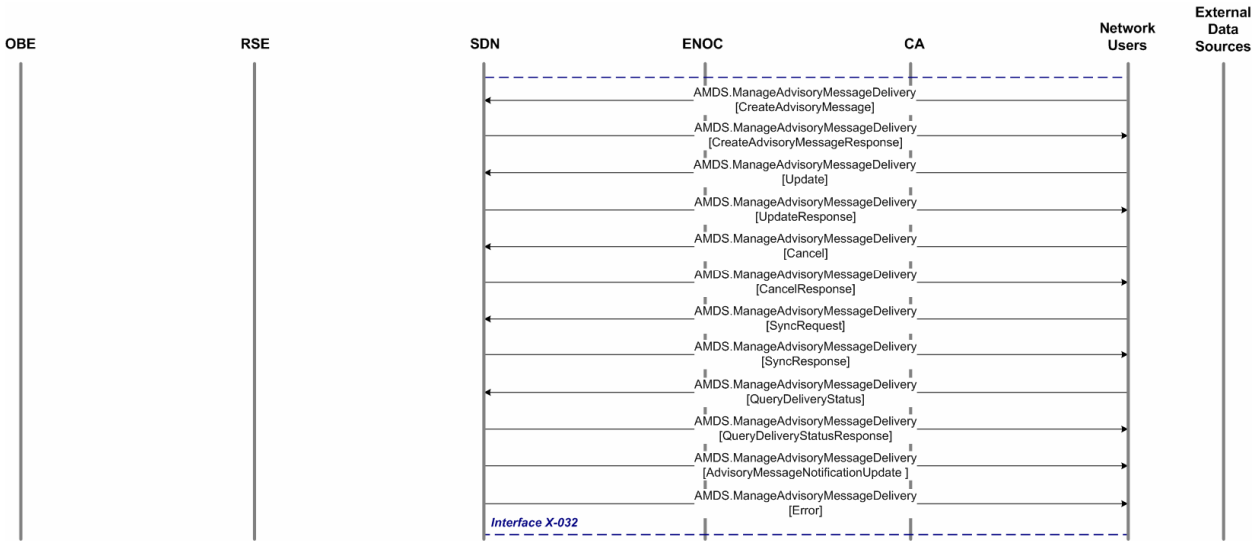
2.1 ADVISORY MESSAGE DISTRIBUTION SERVICE (AMDS)

2.1.1 Interface: AMDS.ManageAdvisoryMessageDelivery

This interface provides the ability for Network Users to create, modify, delete, and query Advisory Message delivery requests to the SDN Subsystem. Additionally, this interface provides a mechanism for the SDN Subsystem to deliver error messages to Network Users. The ENOC Subsystem can initiate an Active Advisory Message synchronization request from an SDN Subsystem to corresponding RSE Subsystems.

- **Type:** Asynchronous
- Message Frequency:
  - As requested by Network Users, predictably infrequent
  - As VII topology changes affect Advisory Message delivery requests, predictably infrequent
- **Network Interface**: External Access Transport

Figure 2-1: Dispatch Advisory Message Interface Messages



2.2 PROBE DATA SERVICE (PDS)

2.2.1 Interface: PDS.ManageProbeDataMessageSubscription

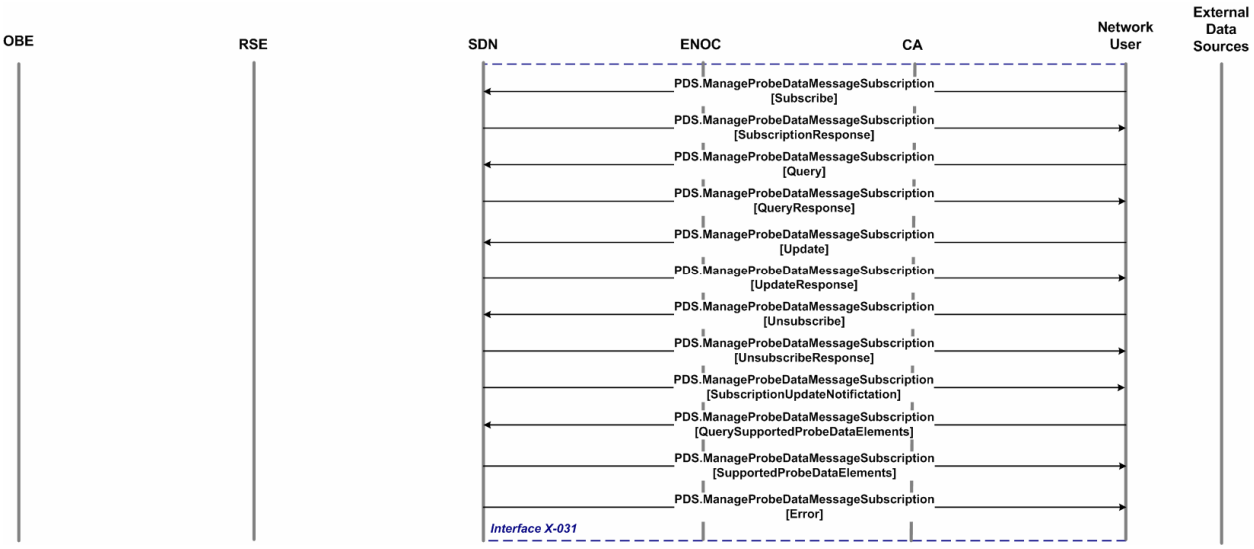
This interface provides the ability for Network Users to create, query, update, and delete Probe Data Message subscriptions. This interface also provides the ability for the SDN Subsystem to notify Network Users of updates in their Probe Data Message subscriptions resulting from VII infrastructure or administrative changes. Additionally, Network Users can query and discover the Probe Data Elements currently supported by PDS.

- **Type:** Synchronous/Asynchronous Communication, Reliable/Nonpersistent Message Delivery
- **Message Frequency:**

- As required by Network Users, predictably infrequent per Network User.
- As changes occur in the VII infrastructure or by Administrative Users, predictably infrequent.

- **Network Interface**: External Access Transport.

Figure 2-2: Manage Probe Data Message Subscription Interface Messages

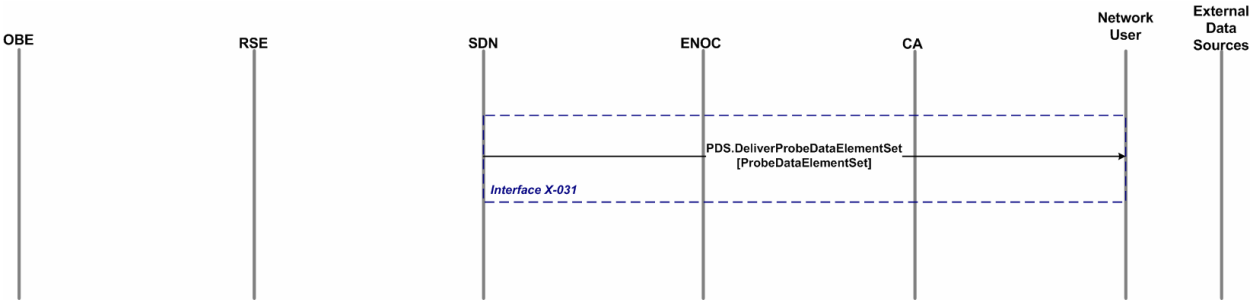


2.2.2 Interface: PDS.DeliverProbeDataElementSet

This interface provides the ability for the SDN Subsystem to deliver parsed Probe Data Messages to Network Users. Probe Data Messages arrive at the SDN Subsystem from the RSE Subsystem. Incoming Probe Data Messages destined for a Network User are processed in a continuous first-in, first-out (FIFO) order. These Probe Data Messages are parsed into the Probe Data Message's individual Probe Data Elements. The Probe Data Elements are then packaged together based on a Network User's Probe Data Message subscription parameters. The collection of requested Probe Data Elements, also known as Probe Data Element Sets, is then forwarded and delivered to the Network User.

- **Type:** Asynchronous Communication, Unreliable/Nonpersistent Message Delivery.
- **Message Frequency:** Dependent on the rate at which Probe Data Messages arrive at the SDN Subsystem and how many Network Users have requested that Probe Data Message.
- **Network Interface**: External Access Transport.

Figure 2-3: Deliver Probe Data Element Set Interface Messages



3. INTERFACE REQUIREMENTS

3.1 ADVISORY MESSAGE DISTRIBUTION SERVICE

3.1.1 Interface: AMDS.ManageAdvisoryMessageDelivery

REQ #	REQUIREMENT	POC	NATIONAL
IRS62	The AMDS. ManageAdvisoryMessageDelivery[CreateAdvisoryMessage] message shall be used to submit Advisory Messages to the SDN Subsystem.	Yes	Yes
IRS63	The AMDS. ManageAdvisoryMessageDelivery[CreateAdvisoryMessage] message shall support the following parameters: • Advisory Message Activation Time • Advisory Message Duration • Advisory Message • Destination IP Address • Destination Port • RSE Subsystem List • Geographic Region • RSE Group ID	Yes	Yes
IRS64	The AMDS. ManageAdvisoryMessageDelivery[CreateAdvisoryMessage Response] message shall be used to respond to a AMDS.ManageAdvisoryMessageDelivery[CreateAdvisoryMessage] message.	Yes	Yes
IRS65	The AMDS. ManageAdvisoryMessageDelivery[CreateAdvisoryMessage Response] message shall support the following parameters: • Advisory Message ID • Response Code • Response Description • RSE Subsystem List • Advisory Message Activation Time • Advisory Message Duration • Advisory Message • Destination IP Address • Destination Port	Yes	Yes
IRS66	The AMDS.ManageAdvisoryMessageDelivery[Update] message shall be used to request update of an Advisory Message or delivery instructions.	Yes	Yes
IRS67	The AMDS.ManageAdvisoryMessageDelivery[Update] message shall support the following parameters: • Advisory Message ID • Advisory Message Activation Time • Advisory Message Duration • Advisory Message • Destination IP Address • Destination Port • RSE Subsystem List • Geographic Region • RSE Group ID	Yes	Yes
IRS68	The AMDS. ManageAdvisoryMessageDelivery[UpdateResponse] message shall be used to respond to an AMDS.	Yes	Yes

REQ #	REQUIREMENT	POC	NATIONAL
	ManageAdvisoryMessageDelivery[Update] message.		
IRS69	The AMDS. ManageAdvisoryMessageDelivery[UpdateResponse] message shall support the following parameters: • Advisory Message ID • Advisory Message Activation Time • Advisory Message Duration • Advisory Message • Destination IP Address • Destination Port • RSE Subsystem List • Geographic Region • RSE Group ID	Yes	Yes
IRS70	The AMDS.ManageAdvisoryMessageDelivery[Cancel] message shall be used to remove an active Advisory Message from the SDN Subsystem.	Yes	Yes
IRS71	The AMDS.ManageAdvisoryMessageDelivery[Cancel] message shall support the following parameters: • Advisory Message List	Yes	Yes
IRS72	The AMDS. ManageAdvisoryMessageDelivery[CancelResponse] message shall be used to respond to AMDS. ManageAdvisoryMessageDelivery[Cancel] messages.	Yes	Yes
IRS73	The AMDS. ManageAdvisoryMessageDelivery[CancelResponse] message shall support the following parameters: • Advisory Message List	Yes	Yes
IRS74	The AMDS. ManageAdvisoryMessageDelivery[AdvisoryMessage NotificationUpdate] message shall be used when Active Advisory Message requests have changed due to an addition or removal of RSE Subsystems.	No	Yes
IRS75	The AMDS. ManageAdvisoryMessageDelivery[AdvisoryMessageUpdate] message shall support the following parameters: • Advisory Message ID • RSE Subsystem List	Yes	Yes
IRS76	The AMDS.ManageAdvisoryMessageDelivery[QueryDeliveryStatus] message shall be used to query the delivery status of Advisory Message requests.	Yes	Yes
IRS77	The AMDS.ManageAdvisoryMessageDelivery[QueryDeliveryStatus] message shall support the following parameters: • Advisory Message List • RSE Subsystem List • Geographic Region • RSE Group ID	Yes	Yes
IRS380	The AMDS. ManageAdvisoryMessageDelivery[AdvisoryMessage NotificationUpdate] message shall be used when Active Advisory Message requests have changed due to a change in logical grouping of RSE Subsystems.	Yes	Yes
IRS381	The AMDS.ManageAdvisoryMessageDelivery[AdvisoryMessage NotificationUpdate] message shall be used when Active Advisory Message requests have changed due to authorization changes.	Yes	Yes

REQ #	REQUIREMENT	POC	NATIONAL
IRS497	The AMDS.ManageAdvisoryMessageDelivery[QueryDeliveryStatusResponse] message shall be used to respond to an AMDS.ManageAdvisoryMessageDelivery[QueryDeliveryStatus] message.	Yes	Yes
IRS498	The AMDS.ManageAdvisoryMessageDelivery[QueryDeliveryStatusResponse] message shall support the following parameters: • Advisory Message List • Response Code • Response Description • RSE Subsystem List • Advisory Message Activation Time • Advisory Message Duration • Advisory Message • Destination IP Address • Destination Port • Delivery Status	Yes	Yes

3.2 PROBE DATA SERVICE

3.2.1 Interface: PDS.ManageProbeDataMessageSubscription

REQ #	REQUIREMENT	POC	NATIONAL
IRS80	The PDS.ManageProbeDataMessageSubscription[Subscribe] message shall be used to place a Probe Data Message subscription.	Yes	Yes
IRS81	The PDS.ManageProbeDataMessageSubscription[Subscribe] message shall support the following parameters: • RSE Subsystem List • Geographic Region • RSE Group ID • Probe Data Element List • Destination IP Address • Destination Port • Probe Data Message Throttle • Subscription Duration	Yes	Yes
IRS82	The PDS. ManageProbeDataMessageSubscription[SubscribeResponse] message shall be used to respond to the PDS. ManageProbeDataMessageSubscription [Subscribe] message.	Yes	Yes
IRS83	The PDS. ManageProbeDataMessageSubscription[SubscribeResponse] message shall support the following parameters: • Subscription ID • RSE Subsystem List • Probe Data Element List • Destination IP Address • Destination Port • Probe Data Message Throttle • Subscription Duration	Yes	Yes
IRS84	The PDS.ManageProbeDataMessageSubscription[Query] message shall be used to view Probe Data Message subscriptions.	Yes	Yes
IRS85	The PDS.ManageProbeDataMessageSubscription[Query] message shall support the following parameter: • Subsciption ID List	Yes	Yes
IRS86	The PDS.ManageProbeDataMessageSubscription[QueryResponse] message shall be used to respond to the PDS.ManageProbeDataMessageSubscription [Query] message.	Yes	Yes
IRS87	The PDS.ManageProbeDataMessageSubscription[QueryResponse] message shall support the following parameters: • Subscription ID • RSE Subsystem List • Probe Data Element List • Destination IP Address • Destination Port • Probe Data Message Throttle • Subscription Duration • Geographic Region • RSE Group ID	Yes	Yes
IRS88	The PDS.ManageProbeDataMessageSubscription[Update] message shall be used to update a Probe Data Message subscription.	Yes	Yes

REQ #	REQUIREMENT	POC	NATIONAL
IRS89	The PDS.ManageProbeDataMessageSubscription[Update] message shall support the following parameters: • Subscription ID • Probe Data Element List • Destination IP Address • Destination Port • Probe Data Message Throttle • Subscription Duration • RSE Subsystem List • Geographic Region • RSE Group ID	Yes	Yes
IRS90	The PDS.ManageProbeDataMessageSubscription[UpdateResponse] message shall be used to respond to the PDS.ManageProbeDataMessageSubscription [Update] message.	Yes	Yes
IRS91	The PDS.ManageProbeDataMessageSubscription[UpdateResponse] message shall support the following parameters: • Subscription ID • RSE Subsystem List • Probe Data Element List • Destination IP Address • Destination Port • Probe Data Message Throttle • Subscription Duration	Yes	Yes
IRS92	The PDS.ManageProbeDataMessageSubscription[Unsubscribe] message shall be used to remove a Probe Data Message subscription.	Yes	Yes
IRS93	The PDS.ManageProbeDataMessageSubscription[Unsubscribe] message shall support the following parameter: • Subscription ID List	Yes	Yes
IRS94	The PDS.ManageProbeDataMessageSubscription[UnsubscribeResponse] message interface shall be used to respond to the PDS.ManageProbeDataMessageSubscription [Unsubscribe] message.	Yes	Yes
IRS95	The PDS.ManageProbeDataMessageSubscription[UnsubscribeResponse] message shall support the following parameters: • Subscription ID List	Yes	Yes
IRS96	The PDS. ManageProbeDataMessageSubscription[SubscriptionUpdateNotification] message shall be used when active subscriptions have changed due to an addition or removal of RSE Subsystems.	No	Yes
IRS97	The PDS. ManageProbeDataMessageSubscription[SubscriptionUpdateNotification] message shall be forwarded in a nonpersistent delivery method.	No	Yes
IRS98	The PDS. ManageProbeDataMessageSubscription[SubscriptionUpdateNotification] message shall support the following parameters: • Subscription ID • RSE Subsystem List • Geographic Region • RSE Group ID	No	Yes

REQ #	REQUIREMENT	POC	NATIONAL
IRS99	The PDS. ManageProbeDataMessageSubscription[QuerySupportedProbeData Elements] message shall be used to request supported Probe Data Elements.	Yes	Yes
IRS100	The PDS.ManageProbeDataMessageSubscription[QuerySupportedProbe DataElements] message shall support the following parameter: • - Probe Data Message Version	Yes	Yes
IRS101	The PDS. ManageProbeDataMessageSubscription[SupportedProbeMessageElements] message shall be used to respond to the PDS. ManageProbeDataMessageSubscription [QuerySupportedProbeMessageElements] message.	Yes	Yes
IRS102	The PDS.ManageProbeDataMessageSubscription [SupportedProbeMessageElements] message shall support the following parameter: • Probe Data Element List	Yes	Yes
IRS103	The PDS.ManageProbeDataMessageSubscription[Error] message shall support the following parameters: • Error ID • Error Description	Yes	Yes
IRS139	The PDS. ManageProbeDataMessageSubscription[SubscriptionUpdateNotification] message shall be used when active subscriptions have changed due to change in the subscribed logical grouping of RSE Subsystems.	Yes	Yes
IRS140	The PDS. ManageProbeDataMessageSubscription[SubscriptionUpdateNotification] message shall be used when active subscriptions have changed due to authorization changes.	Yes	Yes

3.2.2 Interface: PDS.DeliverProbeDataElementSet

REQ #	REQUIREMENT	POC	NATIONAL
IRS104	The PDS.DeliverProbeDataElementSet[ProbeDataElementSet] message shall be used to deliver parsed Probe Data Elements Sets.	Yes	Yes
IRS105	The PDS.DeliverProbeDataElementSet [ProbeDataElementSet] message shall support the following parameters: • Subscription ID • RSE Subsystem ID • Probe Data Element ID • Probe Date Element Value	Yes	Yes

APPENDIX A: ASSUMPTIONS & DEPENDENCIES

ASSUMPTIONS

ASSUMPTION ID	ASSUMPTION TEXT
ASU3	The Proof of Concept will have no more than 100 concurrently connected RSE Subsystems for each SDN Subsystem
ASU4	The Proof of Concept will have no more than three (3) concurrently connected SDN Subsystems.
ASU5	An RSE Subsystem will collect and aggregate no more than 375 Probe Data Messages per second. This assumes (5 vehicles / lane / sec) * (10 lanes) * (30 Probe Data Snapshots / vehicle) / (4 Probe Data Snapshots / Probe Data Message)
ASU6	The Proof of Concept will have no more than one (1) ENOC Subsystem.
ASU9	The ENOC will consist of the Management Service and the Security Service.
ASU10	The ENOC subsystem shall use network management protocols which comply with recognized internetworking management standards
ASU11	The ENOC subsystem shall use recognized internetworking management standards for fault, configuration, accounting and performance management
ASU12	The ENOC subsystem shall use non standard network management protocols if necessary to manage specific managed network elements
ASU13	The ENOC subsystem shall be a platform comprised of multiple sub-components which together complete the requirements of the ENOC subsystem
ASU14	The ENOC subsystem shall capture and process configuring orders for all types of service and managed network elements
ASU15	ENOC operators will be able to access standard process documentation for handling reported incidents and requests for service
ASU16	ENOC operators will be trained to follow standard process for handling reported incidents and requests for service
ASU17	Roadside Equipment (RSEs) will support two types of digital certificates: IEEE 1609.2 for wireless communication and X.509v3 for network communication requirements.
ASU18	CA to SDN, CA to ENOC, RSE to SDN, and SDN to ENOC communication will use X.509 v3 compliant certificates for certificate-based activities.
ASU20	The VII wireless infrastructure (OBE, RSE) will use IEEE 1609.2 compliant certificates for certificate-based activities.
ASU21	Bridging of X.509 and IEEE 1609.2 Certificate Authorities will not be required.
ASU22	The VII CA Subsystem shall consist of two separate CA certificate systems: the X.509 CA, and the IEEE 1609.2 compliant CA.
ASU23	VII Infrastructure systems and devices will use X.509 certificates for digital signatures, encryption, and identification.
ASU25	All connections internal to the SDN and the NAP shall use Ethernet.
ASU26	A separate document will be created to specify requirements regarding electrical power supply, surge protection, physical space, humidity control, temperature control and similar environmental factors for the supporting facilities.

ASU27	The VII POC Environment shall have no more than 50 Network and/or Administrative Users.
ASU28	RSE Backhaul traffic flowing to and from RSE Backhaul Gateways will be aggregated by service providers.

DEPENDENCIES

DEPENDENCY ID	DEPENDENCY
DEP1	Probe Data Serveice (PDS) performance requirements are dependent upon the structure and size of the SAE J2735 Probe Data Message.
DEP2	Advisory Message Distribution Service (AMDS) performance requirements are dependent upon network transport availability.
DEP3	The implementation of ENOC management services is dependent on the establishment of network connectivity between the ENOC and the managed network elements.
DEP4	The implementation of ENOC security services is dependent on the establishment of network connectivity between the ENOC and the managed security elements
DEP5	A Network management agent is running in each managed network element and network connectivity exists between the managed network element and the ENOC
DEP6	The ENOC has connectivity to the managed network elements
DEP7	Connectivity with the ENOC Subsystem.
DEP8	The existence of a VII CA certificate repository.
DEP9	Hardware Security Modules (HSMs) capable of supporting required certificate assurance levels.
DEP10	A VII CA Certificate Practice Statement (CPS) describing the practices and standards to which the CA shall be managed.
DEP11	The VII System will support Lightweight Directory Access Protocol (LDAP) Version 3.0.
DEP12	The VII System will support Secure Lightweight Directory Access Protocol (LDAPS).
DEP13	The VII System will support Hypertext Transfer Protocol (HTTP).
DEP14	The VII System will support Secure Hypertext Transfer Protocol (HTTPS).

APPENDIX B: REFERENCE DOCUMENTS

REF #	REFERENCE	VERSION
1	VII National System Requirements	Version 1.2.1
2	Road Side Equipment (RSE) Subsystem Specification	Version 1.0
3	Enterprise Network Operations Center (ENOC) Subsystem Specification	Version 1.1
4	Certificate Authority (CA) Subsystem Specification	Version 1.1
5	ENOC to Administrative User Subsystem Software IRS [X-011]	Version 1.1
6	Network User to SDN Subsystem Software IRS [X-031, X-032, X-033]	Version 1.1
7	ENOC to Managed Entity Subsystem Software IRS	Version 1.1
8	ENOC to Managed Network Element Software IRS	Version 1.1
9	Reference Maps – TBD	TBD
10	Navstar GPS Space Segment/Navigation User Interfaces, ICD GPS 200	Revision C
11	SDN to RSE Subsystem Software IRS [I-06]	Version 1.1
12	ENOC to CA Subsystem Software IRS [I-13]	Version 1.1
13	ENOC to SDN Subsystem Software IRS [I-11]	Version 1.1
14	*Service Provider Management Systems to SDN Subsystem IRS [X-061] Not in scope for POC*	Not in Scope
15	VII USDOT Day-1 Use Case Descriptions (May 2006)	Version 1.0
16	Network Subsystem Specification	Version 1.0
17	VII Concept of Operations	Draft 1.2
18	VII Systems Security Plan	Version 2.1
19	SDN Subsystem Specification (SSS)	Version 1.1
20	Internet Engineering Task Force (IETF) Request for Comments (RFC) 2510 Internet X.509 Public Key Infrastructure Certificate Management Protocols	© 1999
21	Internet Engineering Task Force (IETF) RFC 3280 Internet X.509 Public Key Infrastructure (PKI) Proxy Certificate Profile	© 2004
22	VII Infrastructure Lexicon	Version 1.0
23	Draft SAE J2735 Dedicated Short Range Communications (DSRC) Message Set Dictionary	Rev. 15
24	POC Additions & Exceptions to the POC Version of SAE J2735	APP190-02
25	VII x.509 Certificate Authority Certificate Practice Statement (CPS)	TBD

APPENDIX C: NATIONAL SYSTEM REQUIREMENTS TRACEABILITY

SUBSYSTEM SPECIFICATION ID	NSR SPECIFICATION ID
IRS62	VF-AMDS-02
IRS63	VF-AMDS-02
IRS64	VF-AMDS-02
IRS65	VF-AMDS-02
IRS66	VF-AMDS-06
IRS67	VF-AMDS-06
IRS68	VF-AMDS-06
IRS69	VF-AMDS-06
IRS70	VF-AMDS-06
IRS71	VF-AMDS-06
IRS72	VF-AMDS-06
IRS73	VF-AMDS-06
IRS74	VF-AMDS-06
IRS75	VF-AMDS-06
IRS76	VF-AMDS-07
IRS77	VF-AMDS-07
IRS80	VF-PDS-02
IRS81	VF-PDS-02
IRS82	VF-PDS-02
IRS83	VF-PDS-02
IRS84	VF-PDS-03
IRS85	VF-PDS-03
IRS86	VF-PDS-03
IRS87	VF-PDS-03
IRS88	VF-PDS-03
IRS89	VF-PDS-03
IRS90	VF-PDS-03

SUBSYSTEM SPECIFICATION ID	NSR SPECIFICATION ID
IRS91	VF-PDS-03
IRS92	VF-PDS-03
IRS93	VF-PDS-03
IRS94	VF-PDS-03
IRS95	VF-PDS-03
IRS96	VF-PDS-03
IRS97	VF-PDS-03
IRS98	VF-PDS-03
IRS99	VF-PDS-03
IRS100	VF-PDS-03
IRS101	VF-PDS-03
IRS102	VF-PDS-03
IRS103	VF-PDS-03
IRS104	VF-PDS-05
IRS105	VF-PDS-05
IRS139	VF-PDS-03
IRS140	VF-PDS-03
IRS380	VF-AMDS-06
IRS381	VF-AMDS-06
IRS497	VF-AMDS-07
IRS498	VF-AMDS-07