Enterprise Messaging Infrastructure

Veteran Interoperability and Integrations

VistA Immunizations

Message Flow

Service Integration Design Document



Department of Veterans Affairs

April 2016

Version 1.0

Revision History

Note: The revision history cycle begins once changes or enhancements are requested after the Service Integration Design Document has been baselined.

| Date | Version | Description | Author |
| --- | --- | --- | --- |
| 12/17/2015 | 1.0 | Draft |  |
| 12/30/15 | 1.0 | Tech Review and Format |  |
| 03/01/2016 | 1.0 | Updated contents and diagrams |  |
| 04/01/2016 | 1.0 | Tech Writer Review and Format |  |

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Introduction

The Enterprise Messaging Infrastructure (eMI) VistA Immunizations (VIMM) Messaging Integration will enable bi-directional, SOAP Request-Response Messaging exchanges of Immunization Electronic Health Records (EHRs) formatted as Health Level (HL) 7 2.5.1 Standard Immunization Message payloads, between the Veterans Affairs (VA) Internal, and external partners through secure, standards-based, web transmission protocols, in conformance with the Center for Disease Control (CDC) Immunization SOAP Messaging Schema. The SOAP Web Service endpoints will implement the CDC Web Service Definition Language (WSDL) for Immunization SOAP Messaging exchanges.

Purpose

Describe the specifications for the eMI VIMM interoperable messaging interface to the VA Internal Partner system, and the External Partner System. Detailed integration requirements including eMI VIMM message flows, transport protocols, SOA CDC Web Service endpoints, required service registry artifacts, and governance policies will be delineated in this document.

## Scope

The scope of this Service Integration Design Document (SIDD) is to address interoperability between eMI, VA Internal Partner system, and the External Partner System that provides CDC-compliant Web Services.

The scope items include, but are not limited to:

1. Message Types
2. Validation
3. Ports and Protocol
4. Transformation
5. Error Handling
6. Routing
7. Security

The details of the above are described in the following sections. The common architectural specifications, such as security, logging, exception handling, and etc. are defined in the eMI Software Design Document; however, the definitions of the CDC Web Service, and details of eMI architecture, physical addresses, and system specification are not in the scope of this document.

Audience

This document provides implementation details for project owners and serves as a blueprint for managers, architects, developers, and testers building the system. It is assumed that the readers have a moderate knowledge of Message Broker and Health Level 7 (HL7) 2.5.1 Immunization Messaging.

References

* CDC [**HL7 Version 2.5.1 Implementation Guide for Immunization Messaging, Release 1.5**](http://www.cdc.gov/vaccines/programs/iis/technical-guidance/downloads/hl7guide-1-5-2014-11.pdf)  
  10/1/2014  
  Implementation Guide
* CDC [**HL7 Version 2.5.1 Implementation Guide for Immunization Messaging, Release 1.5 - Addendum**](http://www.immregistries.org/resources/standards/HL7_2.5.1_IG_Addendum_-_July_2015.pdf)  
  7/1/2015  
  Implementation Guide - Addendum
* CDC [**Transport Layer Protocol Recommendation, EHR-IIS Interoperability Enhancement Project**](http://www.cdc.gov/vaccines/programs/iis/interop-proj/downloads/ehr-interop-trans-layer-tech-recs.pdf), version 1.2  
  9/4/2015  
  Formal Specification
* eMI Software Design Document is accessible on the VA eMI SharePoint.
* CDC WSDL  
  urn:cdc:iisb:2011

**Immunization Information Systems Support Branch, Immunization Services Division, National Center for Immunization and Respiratory Diseases, Centers for Disease Control and Prevention   
Phone: (404) 639-8245   
Fax: (404) 639-8171   
Website: http://www.cdc.gov/vaccines/programs/iis/index.html**

Interface Requirements

Table 1 lists the software interfaces that are implemented.

Table 1 - Logical High-Level Message Transmission Flows

| Application | Interface |
| --- | --- |
| VA Internal Partner 🡪 eMI | Utilizes VA Internal CDC SOAP web service messaging endpoint to transmit a SOAP message with an HL7 2.5.1 Immunization Request payload over HTTPS/TLS transport protocols to an eMI VIMM CDC SOAP web service messaging endpoint. |
| eMI 🡪 External Partner | Utilizes eMI VIMM CDC SOAP web service messaging endpoint to transmit a SOAP message with an HL7 2.5.1 Immunization Request payload over HTTPS/TLS transport protocols to an External Partner CDC SOAP web service messaging endpoint. |
| External Partner 🡪 eMI | Utilizes CDC SOAP web service messaging endpoint to transmit a SOAP message with an HL7 2.5.1 Immunization Response Message response payload over HTTPS/TLS transport protocols to an eMI VIMM CDC SOAP web service messaging endpoint. |
| eMI 🡪 VA Internal Partner | Utilizes eMI VIMM CDC SOAP web service messaging endpoint to transmit a SOAP message with an HL7 2.5.1 Immunization Response Message response payload over HTTPS/TLS transport protocols to the VA Internal Partner CDC SOAP web service endpoint. |

The eMI VIMM Message Integration will proxy SOAP Request/Response Messages between the VA Internal and External Partners according to the CDC Immunization SOAP Messaging Schema.

A veteran’s immunization EHR will be bi-directionally exchanged as an HL7 2.5.1 Immunization Message payload between the VA Internal and External Partners through the eMI VIMM Messaging Integration Interface.

The veteran’s immunization EHR data will be encoded in conformance with the HL7 2.5.1 Immunization Message standard specification, and transported as one of the five SOAP message body parameters. The remaining four SOAP Message body parameters, collectively specifying External Partner authentication credentials obtained from the External Partner, will be transmitted as SOAP Message Body parameters. The SOAP Request/Response Message will be transmitted using secure HTTPS/TLS standard protocols to/from SOAP Web Service message endpoints. The SOAP Web Service SHALL support the CDC WSDL.

## Business Unit

Data moves between eMI, VA Internal Partner system, and the External Partner System. Table 2 and Table 3 list the point of contact (POC) information for those systems.

Table 2 - VA Business Unit

| VA Business Unit | |
| --- | --- |
| Agency | Veterans Administration |
| Sending Application | VA Internal Partner |
| POC Name |  |
| Title | Sr. IT Project Manager, eMI |
| Address | <Enter the point of contact’s office mailing address > |

.

Table 3 – External Partner Business Unit

| External Partner Business Unit | |
| --- | --- |
| Agency | Any External Entity supporting the CDC Immunization SOAP Messaging Schema for interoperable immunization Messaging Exchange. |
| Sending Application | State IIS’, DoD, others |
| POC Name |  |
| Title |  |
| Address |  |

## Service Level Agreement Metrics

Table 4 lists the Service Level Agreement (SLA) metrics for the VIMM message flow that are expected to be met.

Table 4 – SLA Metrics

| SLA Type | SLA Data |
| --- | --- |
| Number of messages/day | 850 messages |
| Average Message size | 50 kilobytes (kb) to 10 megabytes (MB) |
| Data Type | SOAP Web Service |
| Throughput | .01 messages per second |

## Message Type Metrics

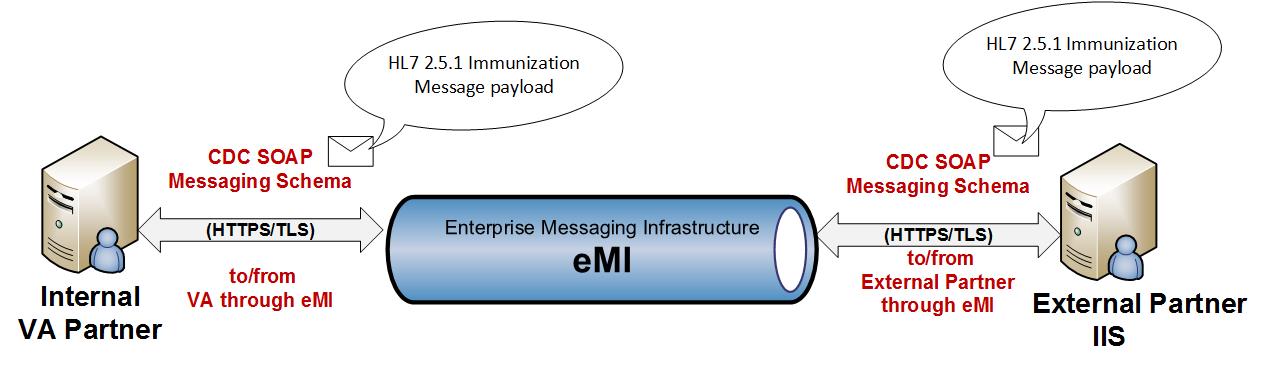
Table 5 lists the message metrics based on message types.

Table 5 – Message Type Metrics

| Message Type | Estimated Message Size in kb |
| --- | --- |
| SOAP Web Service | 50 kb to 10 MB |

Logical System Overview

Figure 1 - eMI and External Partner IIS Logical Overview



**HL7 2.5.1 Immunization Unsolicited Vaccination Update Message:**

**Step 1: VA Internal Partner** receives initiating request from VA EMR system for sending Veteran Immunization Data to an External Partner.

**Step 2: VA Internal Partner** performs the following actions:

* Encodes the Veteran Immunization Information according to the HL7 2.5.1 Immunization Messaging Specification.
* Generates a SOAP Request Message, with an HL7 2.5.1 Immunization request payload, and External Partner Facility ID as parameters.
* Transmits the SOAP Request Message to the eMI VIMM CDC SOAP Web Service endpoint using secure, HTTPS/TLS transport protocols.

**Step 3: eMI** VIMM CDC SOAP Web Service endpoint accepts the SOAP Request Message from the VA Internal Partner.

**Step 4: eMI** VIMM performs the following actions:

* eMI VIMM Integration Message Flow initiated upon receipt of SOAP Request Message.
* External Partner endpoint artifacts obtained from WSRR.
* Generates a SOAP Request Message, porting request payload from VA Internal Partner SOAP Request Message.
* SOAP Request Message transmitted from eMI CDC SOAP Web Service endpoint to External Partner CDC SOAP Web Service endpoint using secure, HTTPS/TLS transport protocols.

**Step 5: External Partner** CDC SOAP Web Service endpoint accepts the SOAP Request Message from the eMI VIMM CDC SOAP Web Service endpoint.

* External Partner immunization processing initiated upon receipt of SOAP Request Message.
* Generates a CDC SOAP Response Message, with an HL7 2.5.1 Immunization Response Message, (**ACK**) response payload.
* CDC SOAP Response Message transmitted from External Partner SOAP Web Service endpoint, to eMI VIMM CDC SOAP Web Service endpoint using secure, HTTPS/TLS transport protocols.

**Step 7: eMI VIMM** SOAP Web Service endpoint accepts the SOAP Response Message from External Partner.

* eMI VIMM Integration Message Flow routes SOAP Response Message and transmits the SOAP Response Message to VA Internal Partner CDC SOAP Web Service endpoint that initiated the request using secure, HTTPS/TLS transport protocols.

**HL7 2.5.1 Query for Immunization Information Message:**

**Step 1: VA Internal Partner** receives initiating request from VA EMR system for querying Veteran Immunization Data to an External Partner.

**Step 2: VA Internal Partner** performs the following actions:

* Encodes the Veteran Query information according to the HL7 2.5.1 Immunization Messaging Specification.
* Generates a SOAP Request Message, with an HL7 2.5.1 Immunization request payload, and External Partner Facility ID as parameters.
* Transmits the SOAP Request Message to the eMI VIMM CDC SOAP Web Service endpoint using secure, HTTPS/TLS transport protocols.

**Step 3: eMI** VIMM CDC SOAP Web Service endpoint accepts the SOAP Request Message from the VA Internal Partner.

**Step 4: eMI** VIMM performs the following actions:

* eMI VIMM Integration Message Flow initiated upon receipt of SOAP Request Message.
* External Partner endpoint artifacts obtained from WSRR.
* Generates a SOAP Request Message, porting request payload from VA Internal Partner SOAP Request Message.
* SOAP Request Message transmitted from eMI CDC SOAP Web Service endpoint to External Partner CDC SOAP Web Service endpoint using secure, HTTPS/TLS transport protocols.

**Step 5: External Partner** CDC SOAP Web Service endpoint accepts the SOAP Request Message from the eMI VIMM CDC SOAP Web Service endpoint.

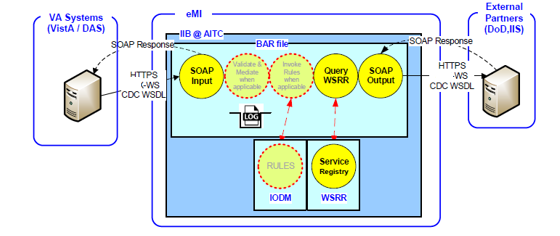
* External Partner immunization processing initiated upon receipt of SOAP Request Message.
* Generates a CDC SOAP Response Message, with an HL7 2.5.1 Immunization Response Message, (**RSP**) response payload.
* CDC SOAP Response Message transmitted from External Partner SOAP Web Service endpoint, to eMI VIMM CDC SOAP Web Service endpoint using secure, HTTPS/TLS transport protocols.

**Step 7: eMI VIMM** SOAP Web Service endpoint accepts the SOAP Response Message from External Partner.

* eMI VIMM Integration Message Flow routes SOAP Response Message and transmits the SOAP Response Message to VA Internal Partner CDC SOAP Web Service endpoint that initiated the request using secure, HTTPS/TLS transport protocols.

Figure 2 shows the logical system overview of eMI, VA Systems, and external partners. The high-level flow is described following the figure

Figure 2 - eMI - Internal and External Partner System

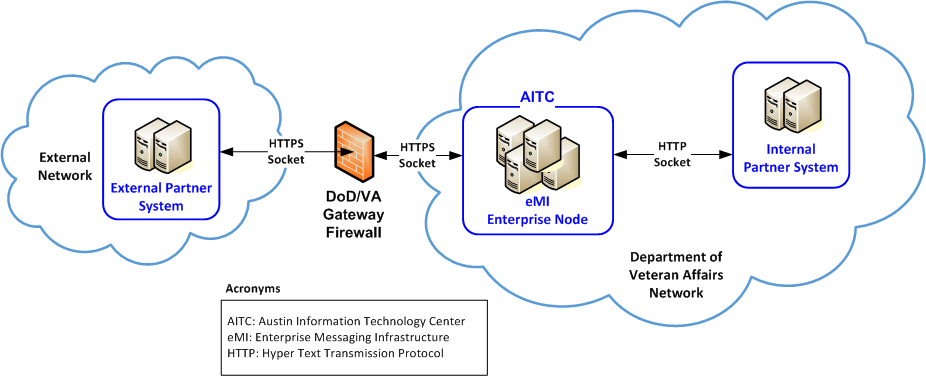


1. The VA internal system initiates a SOAP Web Service call to VIMM message flow hosted on eMI instance at AITC.
2. The eMI VIMM message flow validates input data for data compliance
3. The eMI VIMM message flow mediates input data if necessary to conform to CDC Web Service.
4. The eMI VIMM message flow invokes routing rules to route to external partner system.
5. The eMI VIMM message flow queries WebSphere Service Registry and Repository (WSRR) for external partner system endpoint which includes server name and port.
6. The eMI VIMM message flow forwards a SOAP Web Service call to external partner system.

Logical Deployment Overview

The eMI Enterprise Node hosts the message flow that listens on a configurable port for SOAP Web Service call from Internal partner system over Hyper Text Transmission Protocol (HTTP) and routes the call to external partner system over HTTPS. Figure 3 shows the boundaries, gateway, and locations of sending and receiving systems.

Figure 3 - eMI VIMM Message Flow Deployment Overview

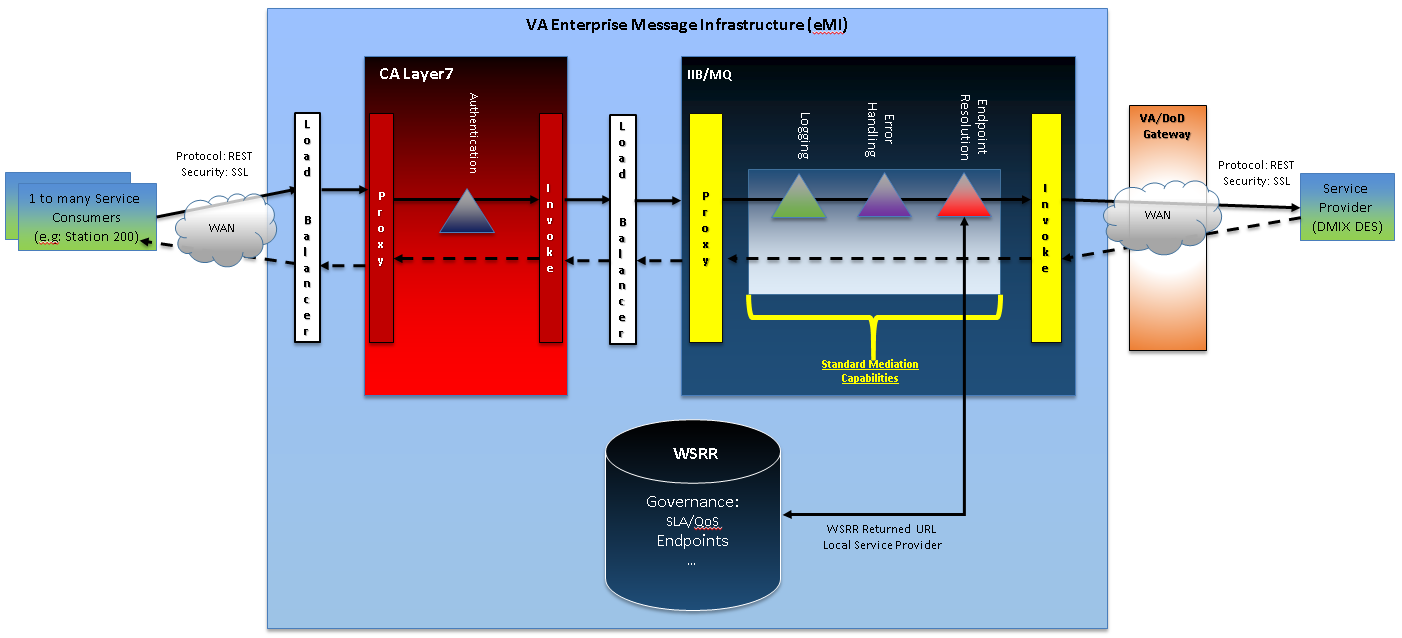


## eMI VIMM Interface Requirements

1. The eMI system shall interface with Internal and External systems that comply with CDC Web Service Definition Language (WSDL)
2. The eMI system shall receive data request and response from Internal partner system via HTTP.
3. receive data request and response from External partner system via HTTPS.
4. The eMI system shall interface with CDC Web Service through VIMM Message Flow using CDC Web Service WSDL service registration
5. The eMI system shall ensure a secured connection with External Partner system by means of two-way Secure Sockets Layer (SSL) encryption.

Nominal VIMM Message Flow

Figure 4 - Nominal VIMM Message Flow



1. The VA service consumer issues a SOAP service call to eMI VIMM message flow via the CA Layer 7 gateway.
2. CA Layer 7 assigns an internal eMI identifier to the request and forwards to IIB for message routing.
3. IIB obtains the CDC Web Service provider SOAP endpoint from WSRR. WSRR SOAP service endpoint values may be cached in the IIB runtime to ensure performance requirements are met.
4. IIB relays the request to the CDC Web Service provider SOAP endpoint. IIB does not modify the request payload
5. Errors originating within the CDC Web Service provider system are relayed unchanged to the VA service consumer. Errors originating within the eMI system are sent to the VA service consumer, either appended to or in place of the response payload, as appropriate

VIMM Message Flow Design

The following section refers to the design of the eMI VIMM message flows which proxy requests to the CDC Web Service provider. Further information about request and response formats can be found in the service provider’s ICD.

Architecture Deviations

The VIMM message flows do not contain any architectural deviations.

Pattern

The VIMM Message Flow are loosely based on the IBM Service Proxy pattern. See section 5 for a detailed explanation of the flow

Protocol

The eMI VIMM integration service uses the protocols described in Table 6, 7, 8 and 9 to interface with the sending and receiving systems.

Table 6 - VA Internal Partner to eMI Interface

| VA Internal Partner to eMI | |
| --- | --- |
| Protocol: | HTTPS over TLS |
| Message Type: | SOAP Message (CDC WSDL) with HL7 v.2.5.1 Immunization Message, (VXU^V04^VXU\_V04 or QBP^Q11^QBP\_Q11 Message Type Message payloads) and External Partner authentication credential parameters. |
| VA hostname: | VA Internal Partner. |
| eMI hostname: | Austin Information Technology Center (AITC) Load balancer. |

Table 7 - eMI Interface to External Partner

| eMI To External Partner | |
| --- | --- |
| Protocol: | HTTPS over TLS |
| Message Type: | SOAP Message (CDC WSDL) with HL7 v.2.5.1 Immunization Message, (VXU^V04^VXU\_V04 or QBP^Q11^QBP\_Q11 Message Type Message payloads) and External Partner authentication credential parameters. |
| eMI hostname: | AITC Message brokers. |
| External Partner hostname: | External Partner CDC SOAP Messaging Web Server. |

Table 8 - External Partner to eMI Interface

| External Partner to eMI | |
| --- | --- |
| Protocol: | HTTPS over TLS |
| Message Type: | HL7 v.2.5.1 ACK, or RSP^K11^RSP\_K11 Response Message |
| External Partner hostname: | External Partner CDC SOAP Messaging Web Server |
| eMI hostname: | AITC Load balancer |

Table 9 - eMI to VA Internal Partner Interface

| eMI to VA Internal Partner | |
| --- | --- |
| Protocol: | HTTPS over TLS |
| Message Type: | HL7 v.2.5.1 ACK, or RSP^K11^RSP\_K11 Response Message |
| eMI hostname: | AITC Message brokers |
| VA hostname | VA Internal Partner |

## Message Routing

Requests to the eMI VIMM Message Flow are routed by means of dynamic WSRR SOAP Service endpoint lookup. The destination URL for the CDC Web Service provider is obtained from the WSRR governance repository. Subsequently, the message flow uses the destination URL to route the inbound request to the proper SOAP endpoint.

## Transformation

The following sections document the various transformations for the eMI VIMM message flow.

### Protocol Transformation

Protocol transformation is not applicable to the eMI VIMM message flow.

### Data Transformation

Data transformation is not applicable to the eMI VIMM message flow.

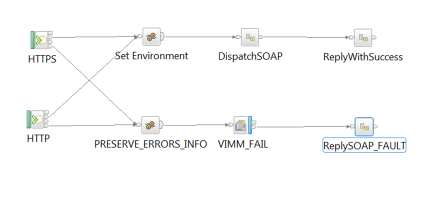
Implementation Details

For the eMI VIMM message flow, there is only one component that runs on the eMI Enterprise Node at AITC which receives outbound data requests from VA systems inside the VA network, sends data requests to CDC Web Service of the External Partner system outside the VA network, or that of the Internal Partner system inside the VA network.

## VIMM Message Flow

eMI VIMM CDC SOAP Web Service endpoint accepts the SOAP Request Message from the VA Internal Partner.

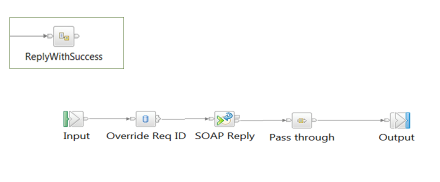
Figure 5 - VIMM Message Flow



eMI VIMM Messaging Integration performs the following actions:

* eMI VIMM Integration Message Flow initiated upon receipt of SOAP Request Message.
* Requests payload ported to eMI CDC SOAP Request Message.
* External Partner CDC SOAP Web Service endpoint artifacts obtained from WSRR.
* Generates a CDC SOAP Request Message, porting request payload from VA Internal Partner SOAP Request Message.
* SOAP Request Message transmitted from eMI CDC SOAP Web Service endpoint to External Partner CDC SOAP Web Service endpoint using secure, HTTPS/TLS transport protocols.

Figure 6 -- VIMM DispatchHTTPReply Sub Flow



eMI CDCSOAP Web Service endpoint accepts the CDC SOAP Response Message from External Partner.

* eMI VIMM Integration Message Flow routes SOAP Response Message to the eMI CDC SOAP Web Service endpoint.
* SOAP Response Message transmitted from eMI CDC SOAP Web Service endpoint, to VA Internal Partner CDC SOAP Web Service endpoint using secure, HTTPS/TLS transport protocols.

Receiver Flows

External Partner CDCSOAP Web Service endpoint accepts the CDC SOAP Request Message from eMI.

* Internal processing initiated upon receipt of SOAP Request Message.
* Generates a CDC SOAP Response Message, with an HL7 2.5.1 Immunization Response Message response payload.
* CDC SOAP Response Message transmitted from External Partner CDC SOAP Web Service endpoint, to eMI VIMM CDC SOAP Web Service endpoint using secure, HTTPS/TLS transport protocols.

Receiver Flows

eMI VIMM Integration Message flow accepts incoming/outgoing CDC SOAP Messages with HL7 2.5.1 Immunization Message payloads, and endpoint authentication credentials as parameters in the SOAP Message Body.

HTTPS Header and request/response payload is obtained from the SOAP Message.

An exception/error handling sub flow is connected to the input node catch terminal.

Requested payload credentials are used to query WSRR for the target endpoint artifacts.

Requested payload is transmitted to the External/Internal Partner CDC SOAP Web Service endpoint.

Internal/External Partner generates a CDC SOAP Request/Response Message with the HL7 2.5.1 Immunization Request/Response Message as the payload.

Internal/External Partner transmits the CDC SOAP Request/Response Message back to the eMI VIMM SOAP Web Service endpoint.

Emi VIMM Integration Message flow transmits the CDC SOAP Request/Response Message payload to the initiating requester.

Error Handling Flows

eMI VIMM Integration Message flow will leverage the eMI Common Library Error Handling sub flows.

eMI VIMM Integration Message flow Errors will be returned via the CDC SOAP WSDL Fault Messages defined for each CDC SOAP Messaging Operation. There are four SOAP Fault Messages defined in the CDC WSDL:

1. **UnknownFault\_Message**

<xsd:complexType name="**soapFaultType**">

<xsd:sequence>

<xsd:element name="**Code**" type="xsd:integer" minOccurs="1"/>

<xsd:element name="**Reason**" type="xsd:string" minOccurs="1"/>

<xsd:element name="**Detail**" type="xsd:string" minOccurs="1"/>

</xsd:sequence>

</xsd:complexType>

1. **UnsupportedOperationFault\_Message**

<xsd:complexType name="**UnsupportedOperationFaultType**">

<xsd:sequence>

<xsd:element name="**Code**" type="xsd:integer" minOccurs="1"/>

<xsd:element name="**Reason**" fixed="UnsupportedOperation"/>

<xsd:element name="**Detail**" type="xsd:string" minOccurs="1"/>

</xsd:sequence>

</xsd:complexType>

1. **SecurityFault\_Message**

<xsd:complexType name="**SecurityFaultType**">

<xsd:sequence>

<xsd:element name="**Code**" type="xsd:integer" minOccurs="1"/>

<xsd:element name="**Reason**" fixed="Security"/>

<xsd:element name="**Detail**" type="xsd:string" minOccurs="1"/>

</xsd:sequence>

</xsd:complexType>

1. **MessageTooLargeFault\_Message**

<xsd:complexType name="**MessageTooLargeFaultType**">

<xsd:sequence>

<xsd:element name="**Code**" type="xsd:integer" minOccurs="1"/>

<xsd:element name="**Reason**" fixed="MessageTooLarge"/>

<xsd:element name="**Detail**" type="xsd:string" minOccurs="1"/>

</xsd:sequence>

</xsd:complexType>

Queue Details

Queue names will follow standard eMI queue naming conventions, representing the message types defined in the CDC WSDL.

Project Configuration File

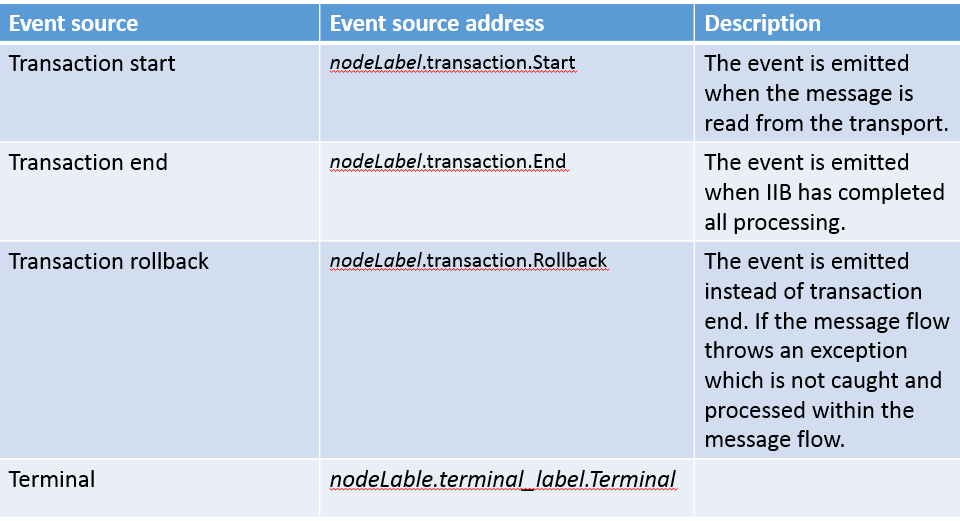
eMI VIMM Integration Project Configuration will follow the eMI Project Standard configuration specifications.

* Trace/Debug/Audit Service: IIB Event Handling/Monitoring:

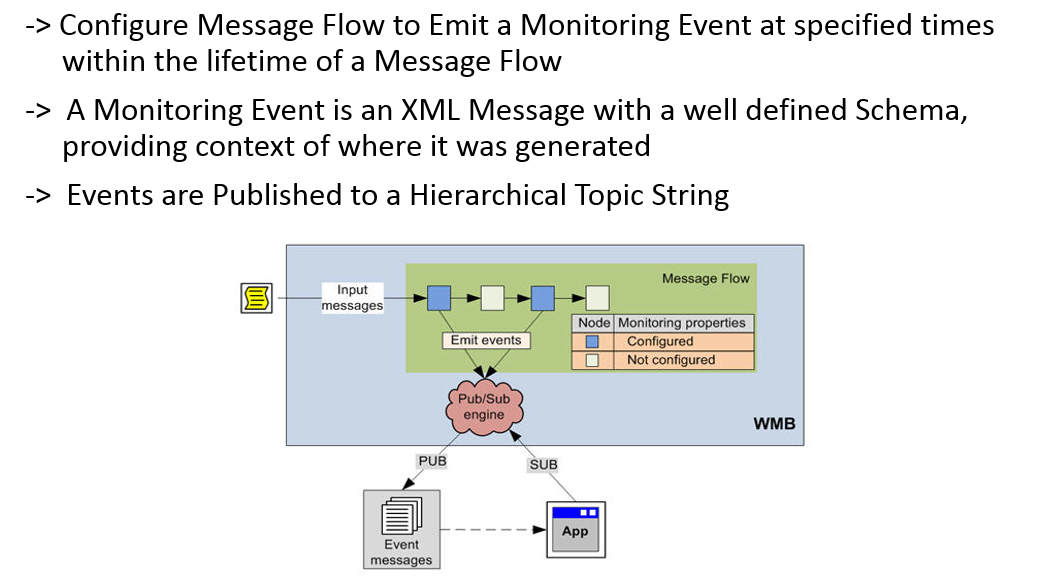
The eMI VIMM Messaging Integration leverages IIB event handling/monitoring capabilities to meet logging and auditing requirements.

-> Follows the route of the message through the entire message flow.

-> Includes all events emitted by the Audit Level, and all nodes with terminal connections.



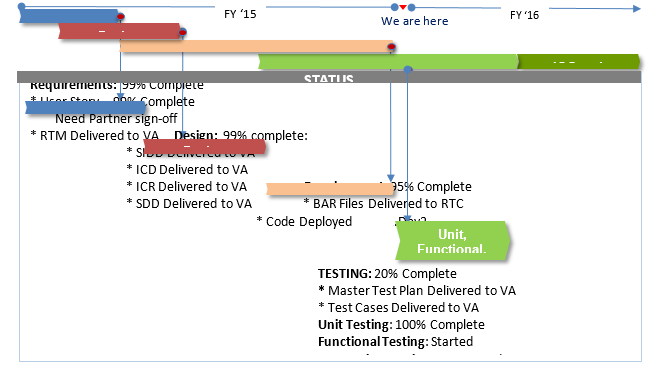
* Monitoring: IIB Message Monitoring Overview:



Timeline

The eMI VIMM Message Integration timeline will follow the eMI Sprint Deliverable timeline.

Figure 7 - Implementation Timeline



# Acronyms

Table 10 - Acronyms

| Abbreviation/Term | Definition |
| --- | --- |
| AITC | Austin Information Technology Center |
| DES | Data Exchange Service |
| DMIX | Defense Medical Information Exchange |
| DoD | Department of Defense |
| eMI | Enterprise Messaging Infrastructure |
| ESS | Enterprise Shared Service |
| IIB | IBM Integration Bus |
| LOINC | Logical Observation Identifiers Names and Codes |
| QoS | Quality of Service |
| SDD | System Design Document |
| SIDD | Service Integration Design Document |
| SLA | Service Level Agreement |
| SOA | Service Oriented Architecture |
| SSL | Secure Sockets Layer |
| VA | Veterans Affairs |
| VII | Veterans Interoperability and Integration |
| WSRR | WebSphere Service Registry Repository |

1. Architecture Design Decisions

The eMI VIMM message flow has not deviated from any recommended or standard patterns defined by IBM or Enterprise Shared Services.

1. Message Flow Documentation

The following PDF attachment contains the documentation generated by the IBM Integration Bus Toolkit for the VIMM message flow:

1. Message Mapping

The CDC Web Service Provider External ICD document attached here describes SOAP API which the eMI VIMM Message Flow support.

1. Outstanding Issues

The eMI VIMM Message Flow does not have any outstanding issue

1. Approval Signature

REVIEW DATE:

Signed: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Integrated Project Team (IPT) Chair Date

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Business Sponsor Date

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IT Program Manager Date

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Project Manager Date