IEC 61968-100

Implementation Profiles for IEC 61968

Overview
CIM University – UCAIug Summit
New Orleans, LA

22 October 2012

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Agenda

- Introduction
  - A look at the purpose, scope and key terms and definitions.
- Use Cases and Messaging Patterns
  - What are the key messaging patterns used to exchange data?
- The Message Envelope and Stereotypes
  - How is the data housed for transport and what are the types of messages used?
- Three Flavors of Implementation
  - A look at the JMS, Generic and Strongly-Typed Web Services.

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Agenda

- Interoperability Patterns and Use Cases
  - How can the three flavors achieve interoperability in the enterprise?
- Other Considerations
  - Security, WSDL Generation, etc.
- Status
  - Where is this standard now?

Introduction

A look at the purpose, scope and key terms and definitions.

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Key Terms and Definitions

- Enterprise Service Bus (ESB)
  - An Enterprise Service Bus (ESB) refers to a software architecture construct that is used as an integration layer. This construct is typically implemented by technologies found in a category of middleware infrastructure products.
  - Typically provides mediation, routing, transformation and logging/auditing logic.
- Java Message System (JMS)
  - A Java Message Oriented Middleware API for sending messages between two or more clients. JMS supports publish/subscribe and point to point messaging patterns

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Key Terms and Definitions

- Service Oriented Architecture (SOA)
  - A computer systems architectural style for creating and using business processes packaged as services.
  - SOA separates functions into distinct units (services), which can be distributed over a network and can be combined and reused to create business applications.
- SOAP
  - A protocol specification that contains an envelope for the exchange of structured information via XML.
  - Serves as a foundation layer of the web services protocol stack.

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Key Terms and Definitions

- XML Schema (XSD)
  - AN XML document which defines the structure and content of a type of XML document.
  - Can be used to validate XML instance documents.
- Web Services Definition Language (WSDL)
  - An XML document which describes the functionality provided by a web service.
  - Provides a machine-readable description of how the service can be called what parameters it expects and what data structures it returns.

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Scope

- IEC 61968
  - Defines architecture (part 1) and interfaces for distribution systems within a utility enterprise.
  - Defines CIM object model and normative XML payloads to exchange CIM derived data. (parts 3 - 9)
- IEC 61968-100
  - Defines profile for application of the other parts of 61968 using common integration technologies, including JMS and web services.
  - Defines normative message envelope and WSDL definitions for interfaces.
  - Provides guidelines and recommendations for usage of Enterprise Service Bus technologies and specific message exchange patterns.
  - Goal: Make IEC 61968 standards more useful in the marketplace.

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Purpose

- What is an Implementation Profile?
  - A specification that goes beyond the conceptual level and provides concrete implementation details necessary to produce working software.
- What is the Goal?
  - The other IEC 61968 series of standards provide a conceptual architecture with use cases and normative object payloads. They do not specify how to use specific technologies to produce interoperable software products.
  - The -100 implementation profile is meant to provide concrete message envelopes and interface specifications to enable software to exchange the CIM object payloads using JMS and web services technologies.

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Purpose

- Why is this Important?
  - **Interoperability.**
    - Without these specifications, the distance to integrate applications is much greater.
  - Common message envelope = Less data mapping/transformation requirements.
  - Defined support for message exchange patterns = Less vendor-specific integration code.
  - The results:
    - Lower project costs.
    - Shorter project timelines.
    - Decreased vendor lock-in.

Messaging Patterns

What are the key messaging patterns used to exchange data?

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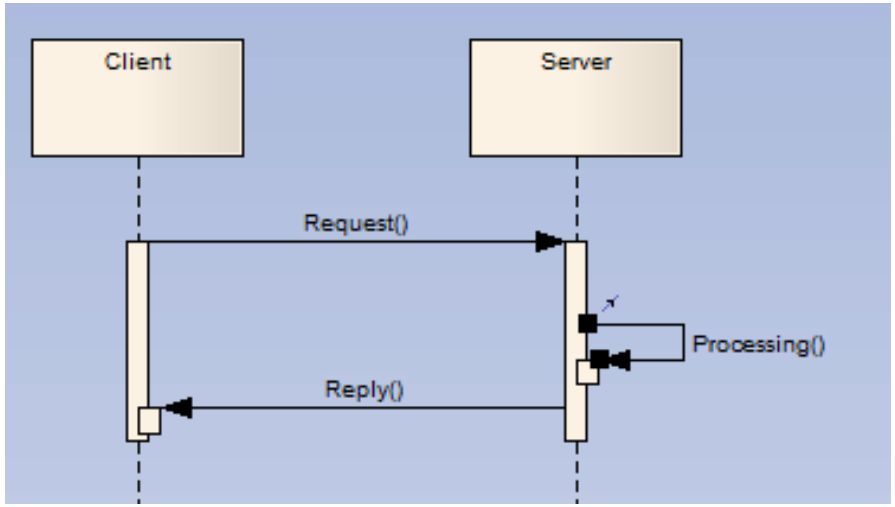
Simple Request/Reply



- A client application makes a request to a server.
- The server fulfills the request and reply synchronously with the result.

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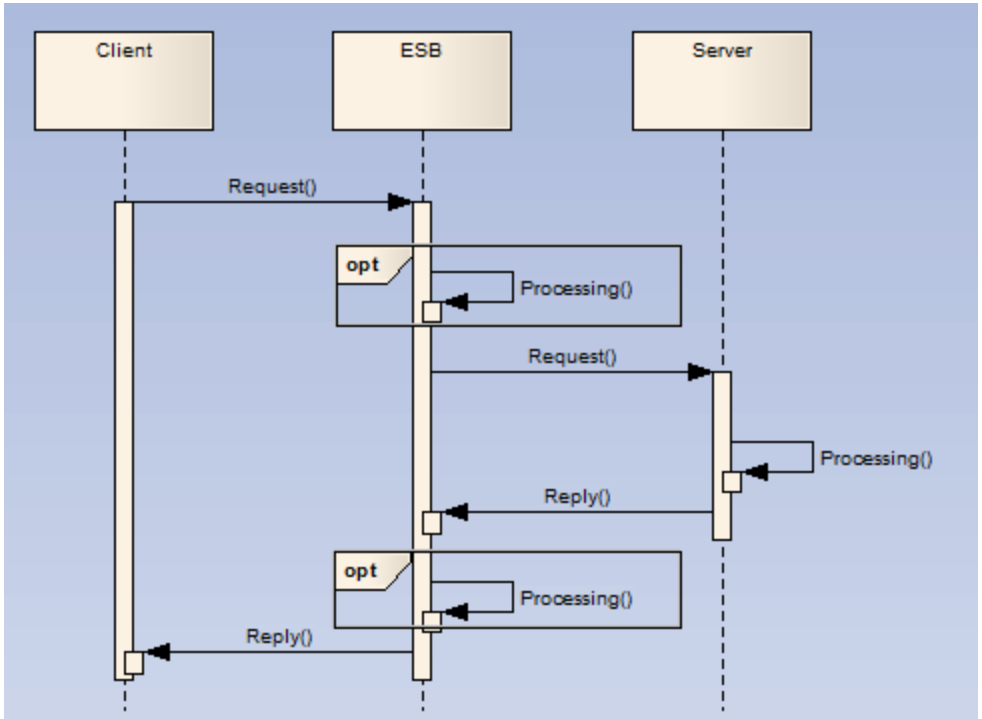
Request/Reply with an ESB



- A client makes a request to a server via an ESB call.
- The ESB routes the request to the server.
- The server fulfills the request and sends the reply to the ESB.
- The ESB routes the reply back to the client.
- The ESB can provide mediation services in each direction.

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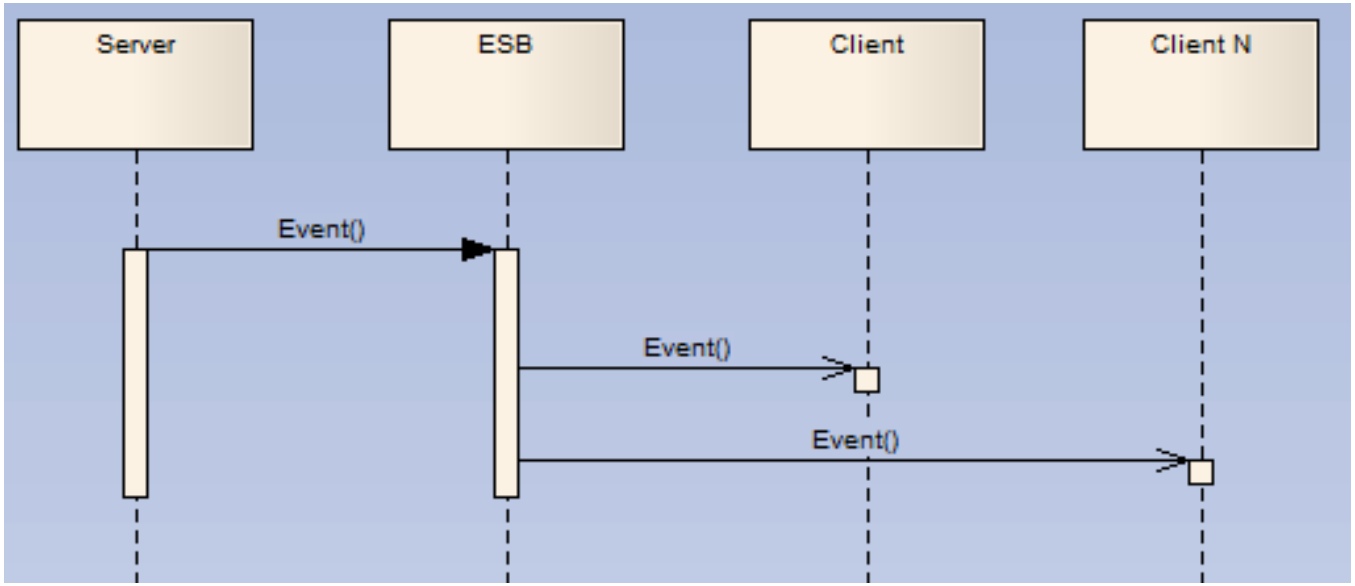
Event Publication



- A server creates and sends an Event to an ESB for publication.
- The ESB routes the event each client application which has an interest in the Event.
- The use of an ESB can provide an enterprise service which contains event propagation knowledge and provides propagation services.
- Isolates individual applications from enterprise business logic.

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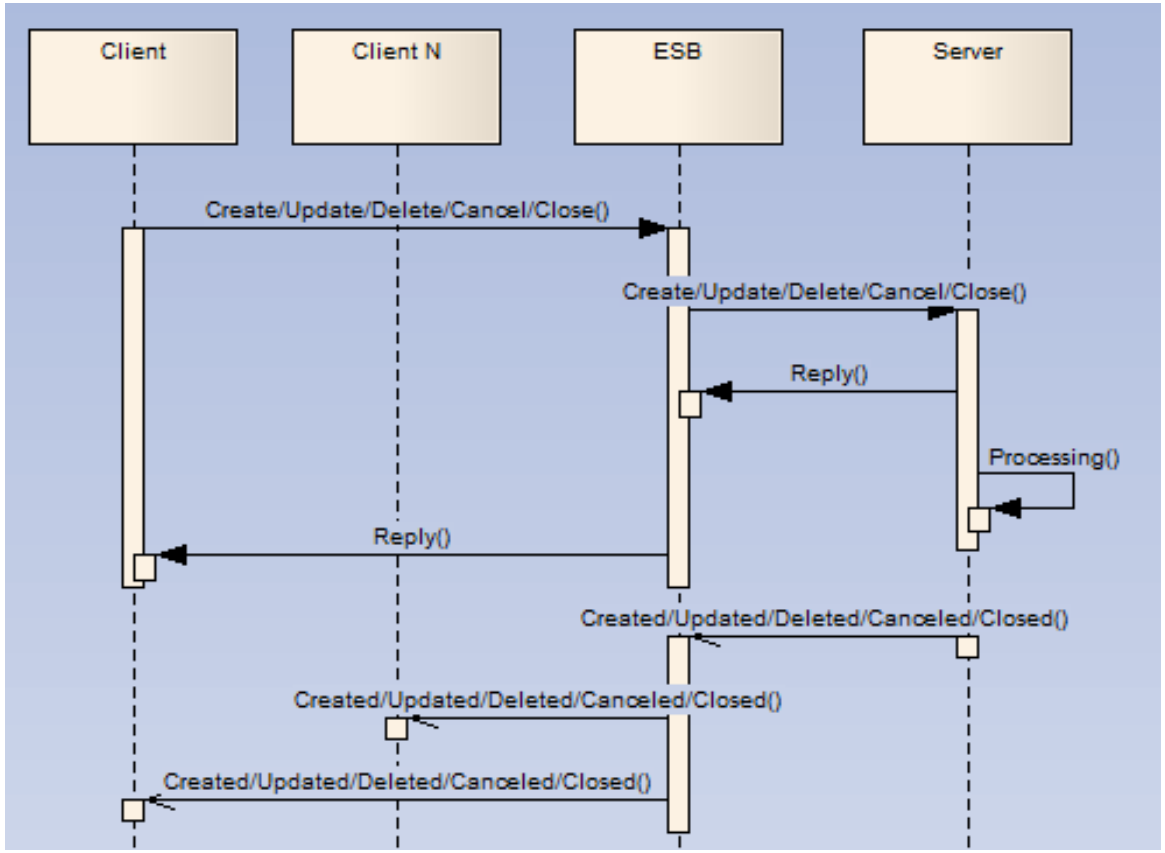
Complex Messaging



- A combination of request/response and event publication.

The Message Envelope and Stereotypes

How is the data housed for transport and what are the types of messages used?

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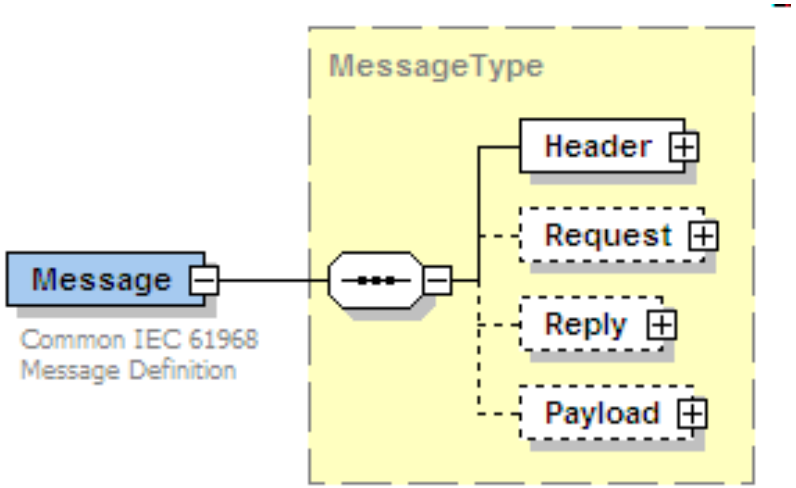
Common Message Envelope



- One structure used to convey all 61968 messages.
- Contains the following items:
  - Header: Meta-data about the message. (Verb, Noun, Correlation Id, etc.)
  - Request: Optional request parameters for request messages.
  - Reply: Captures result/error state for response messages.
  - Payload: Core CIM information being exchanged.
- Message stereotypes will have different combinations of these elements.

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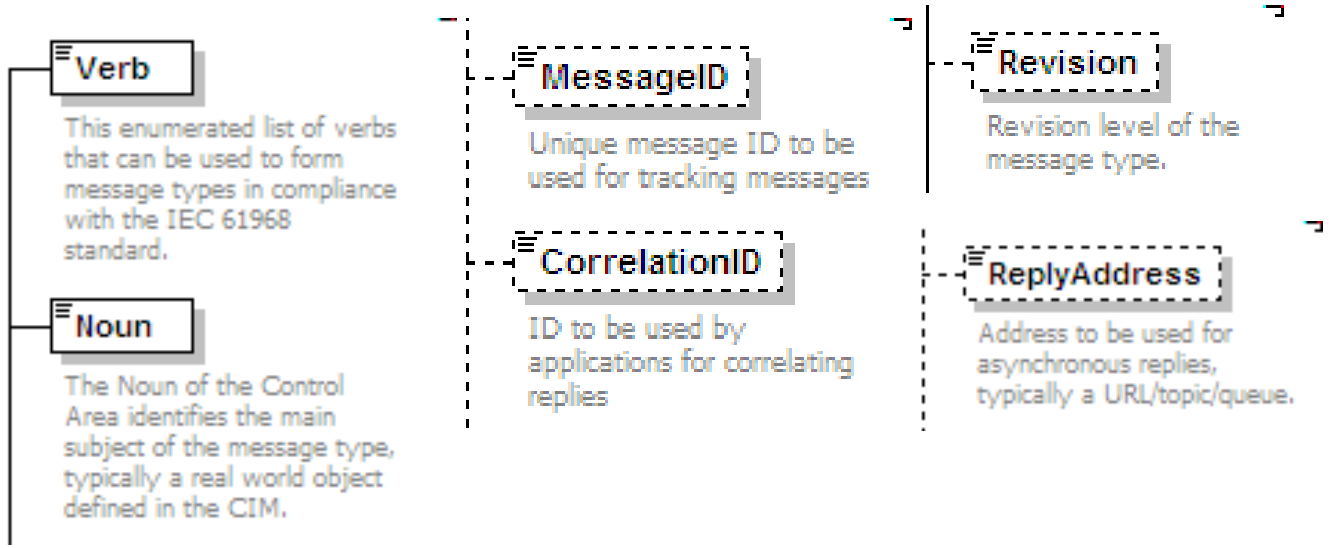
Header Element



- Required for all messages, except Faults.
- Noun: Identifies the CIM profile being exchanged. Matches Payload.
- Verb: Identifies the action to be taken.
  - create, change, close, cancel, delete + past tense for events (created…)
- Message Id: Unique identifier of the message.
- Correlation Id: Unique identifier used to map related messages.
- Reply Address: Address to specify url for asynchronous replies.
- Revision: Version of standard used. (2.0 for 2nd edition of 61968-9)

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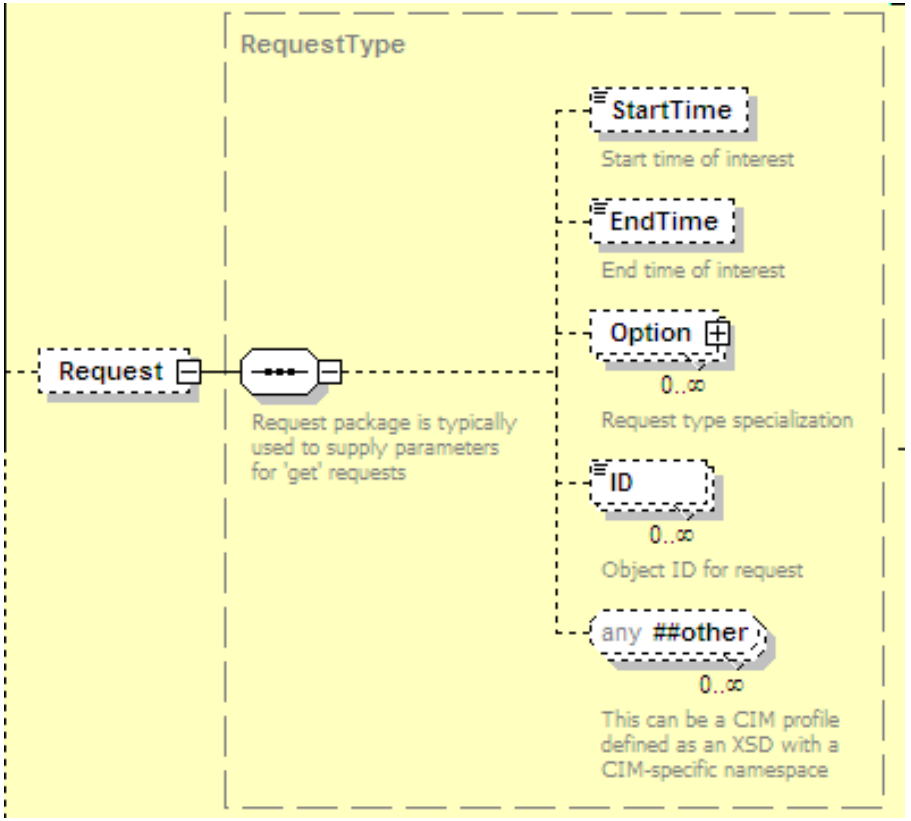
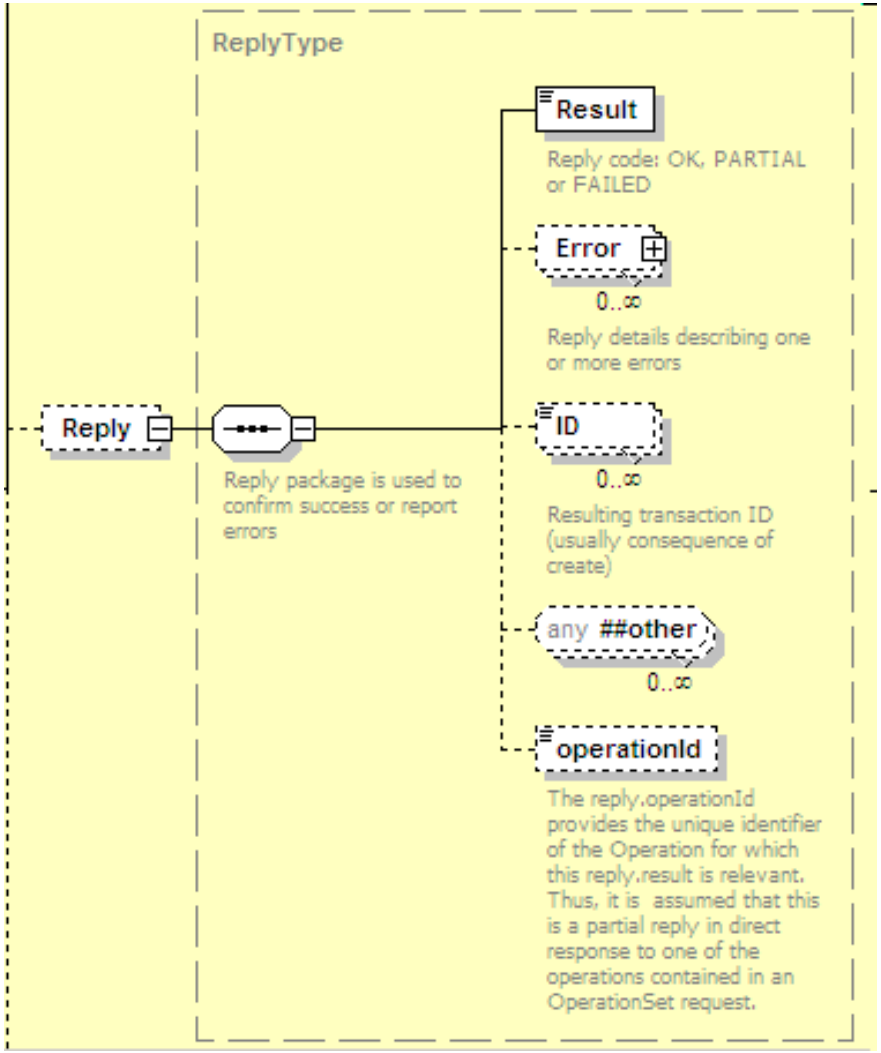
Request Element

- Used to convey request parameters for request messages.
- Start and End Time: Used for time-based queries.
- Option: Set of name-value pairs.
- xs:any: Location for “Get” profiles.
- Strongly-typed Web Services use specific “Get” profile type here.



Reply Element

- Captures result/error state for response messages.
- Result: Overall status: OK, PARTIAL, FAILED
- Error: One or more sets of error information.
- operationId: Used to map which operation in an operation set this reply correlated to.



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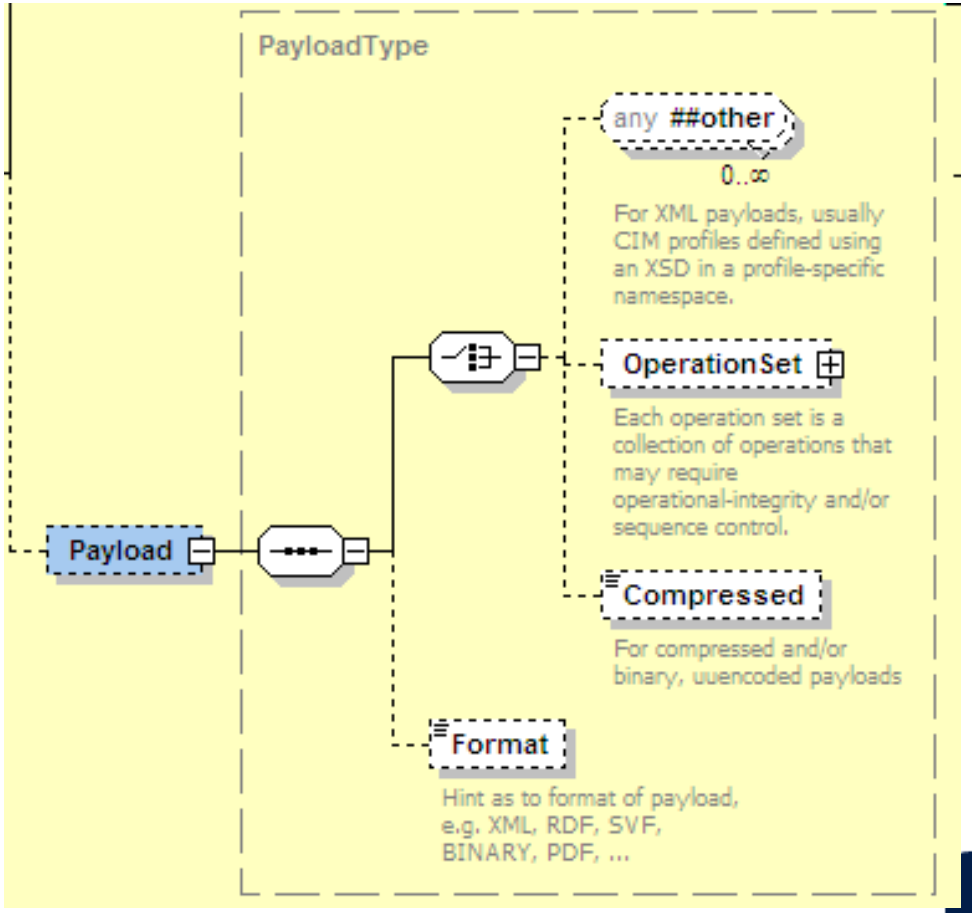
Payload Element

- Holds the CIM profile object being exchanged.
- Matches Noun in Header.
- xs:any: XML CIM profile object. Strongly-typed web services use specific payload type here.
- Compressed: Holds compressed payload type for large payloads.
- Format: Format of payload object. (XML, BINARY, RDF, PDF, etc.)



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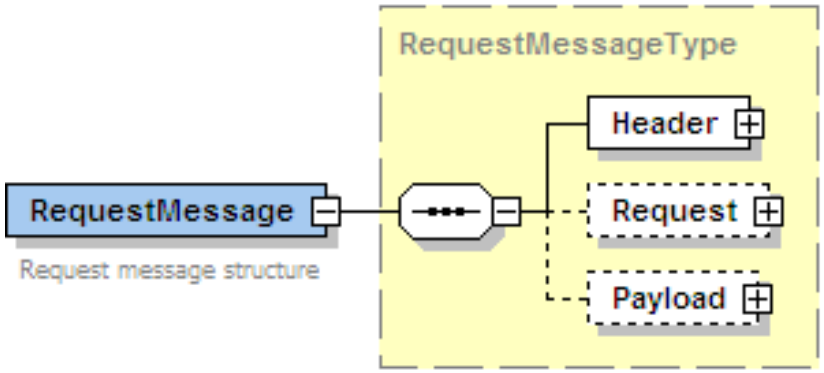
Request Message

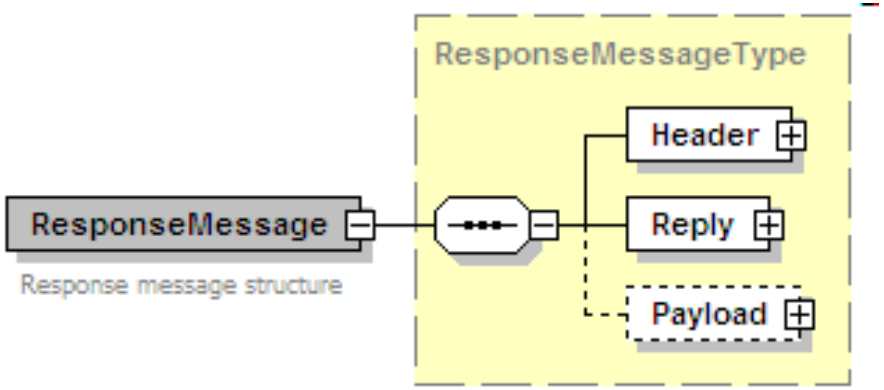
- Used to invoke services to request information or start processing.
- Contains:
  - Header
  - Request (Optional)
  - Payload (Optional)




```
<ns0:RequestMessage xmlns:ns0 = "http://www.iec.ch/TC57/2011/schema/message">
<ns0:Header>
        <ns0:Verb>get</ns0:Verb>
        <ns0:Noun>Switches</ns0:Noun>
        <ns0:Revision>2.0</ns0:Revision>
        <ns0:CorrelationID>1729363b5b7d9c6a0a88d02ae97c64b0</ns0:CorrelationID>
</ns0:Header>
<ns0:Request>
        <ns0:ID>35378383838</ns0:ID>
        <ns0:ID>363482488448</ns0:ID>
        <ns0:ID>894094949444</ns0:ID>
</ns0:Request>
</ns0:RequestMessage>
```

Response Message

- Used to convey the results of a request.
- Contains:
  - Header
  - Reply
  - Payload (Optional)




```
<ns0:ResponseMessage xmlns:ns0 = "http://www.iec.ch/TC57/2011/schema/message">
<ns0:Header>
        <ns0:Verb>reply</ns0:Verb>
        <ns0:Noun>Switches</ns0:Noun>
        <ns0:Revision>2.0</ns0:Revision>
        <ns0:CorrelationID>1729363b5b7d9c6a0a88d02ae97c64b0</ns0:CorrelationID>
</ns0:Header>
<ns0:Reply>
        <ns0:ReplyCode>OK</ns0:ReplyCode>
</ns0:Reply>
<ns0:Payload>
        <ns0:Compressed>dghuywqeiwihn353218u23hb2b3b3bhu</ns0:Compressed>
        <ns0:format>XML</ns0:format>
</ns0:Payload>
</ns0:ResponseMessage>
```

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Response Message (Error Example)

```
<ns0:ResponseMessage xmlns:ns0 = "http://www.iec.ch/TC57/2011/schema/message">
<ns0:Header>
        <ns0:Verb>reply</ns0:Verb>
        <ns0:Noun>Switches</ns0:Noun>
        <ns0:Revision>2.0</ns0:Revision>
        <ns0:CorrelationID>1729363b5b7d9c6a0a88d02ae97c64b0</ns0:CorrelationID>
</ns0:Header>
<ns0:Reply>
        <ns0:ReplyCode>ERROR</ns0:ReplyCode>
        <ns0:Error>
                <ns0:level>ERROR</ns0:level>
                <ns0:code>2.8</ns0:code>
                <ns0:details>Unknown object ID: 35378383838</ns0:details>
        </ns0:Error>
</ns0:Reply>
<ns0:Payload>
        <m:Switches xsi:schemaLocation="http://www.iec.ch/TC57/2008/CIM-schema-
cim12# Switches.xsd" xmlns:m="http://iec.ch/TC57/2007/CIM-schema-cim12#"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
                <m:Switch>
                        <m:mRID>363482488448</m:mRID>
                        <m:name>SW2</m:name>
                        <m:normalOpen>true</m:normalOpen>
                </m:Switch>
                <m:Switch>
                        <m:mRID>894094949444</m:mRID>
                        <m:name>SW3</m:name>
                        <m:normalOpen>false</m:normalOpen>
                </m:Switch>
        </m:Switches>
</ns0:Payload>
</ns0:ResponseMessage>
```

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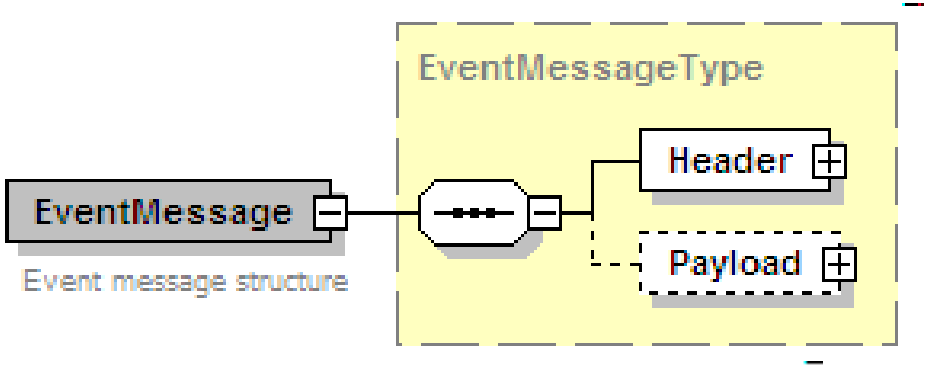
Event Message

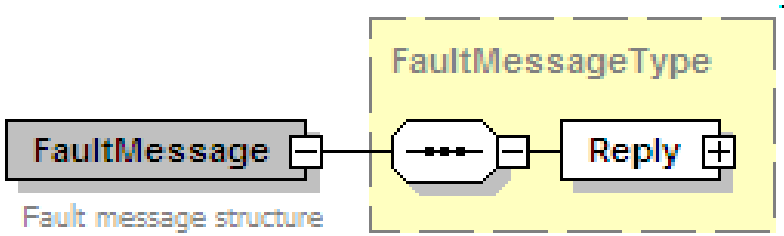
- Published to convey a condition of interest.
- Contains:
  - Header (Past-tense Verb)
  - Payload (Optional)




```
<ns0:EventMessage xmlns:ns0 = "http://www.iec.ch/TC57/2011/schema/message">
<ns0:Header>
        <ns0:Verb>changed</ns0:Verb>
        <ns0:Noun>Switches</ns0:Noun>
        <ns0:Revision>2.0</ns0:Revision>
</ns0:Header>
<ns0:Payload>
        <m:Switches xsi:schemaLocation="http://iec.ch/TC57/2008/CIM-schema-cim12#
Switches.xsd"
                xmlns:m="http://iec.ch/TC57/2007/CIM-schema-cim12#"
                xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
                <m:Switch>
                        <m:mRID>363482488448</m:mRID>
                        <m:normalOpen>false</m:normalOpen>
                </m:Switch>
                <m:Switch>
                        <m:mRID>894094949444</m:mRID>
                        <m:normalOpen>true</m:normalOpen>
                </m:Switch>
        </m:Switches>
</ns0:Payload>
</ns0:EventMessage>
```

Fault Message

- Reports a failure to process a request message.
  - Malformed or invalid XML.
- Contains:
  - Reply




```
<ns0:FaultMessage xmlns:ns0 = "http://www.iec.ch/TC57/2011/schema/message">
<ns0:Reply>
        <ns0:ReplyCode>ERROR</ns0:ReplyCode>
        <ns0:Error>
                <ns0:level>ERROR</ns0:level>
                <ns0:code>1.8</ns0:code>
                <ns0:details>Malformed XML</ns0:details>
        </ns0:Error>
</ns0:Reply>
</ns0:FaultMessage>
```

Three Flavors of Implementation

A look at the JMS, Generic and Strongly-Typed Web Services.

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Two Types/Three Favors

- Web Services (SOAP)
  - Built on W3C recommended WS-* standards for interface specification and messaging.
  - Interfaces specified via Web Service Definition Language (WSDL).
    - document-literal wrapped
    - WSI Basic Profile 1.1 Compliant
  - Generic-Typed
    - Uses a single WSDL to define all messages.
    - WSDL uses generic payload definition.
  - Strongly-Typed
    - Uses multiple WSDLs to define all messages.
    - WSDL has semantic-based payload definitions on semantic-based endpoints.
- Java Message Service (JMS)
  - Handles exchange of messages using JMS Topics and Queues.
  - Built on JMS apis provided by different messaging middleware vendors.
  - Specifies options around persistent messaging and publish/subscribe mechanisms.

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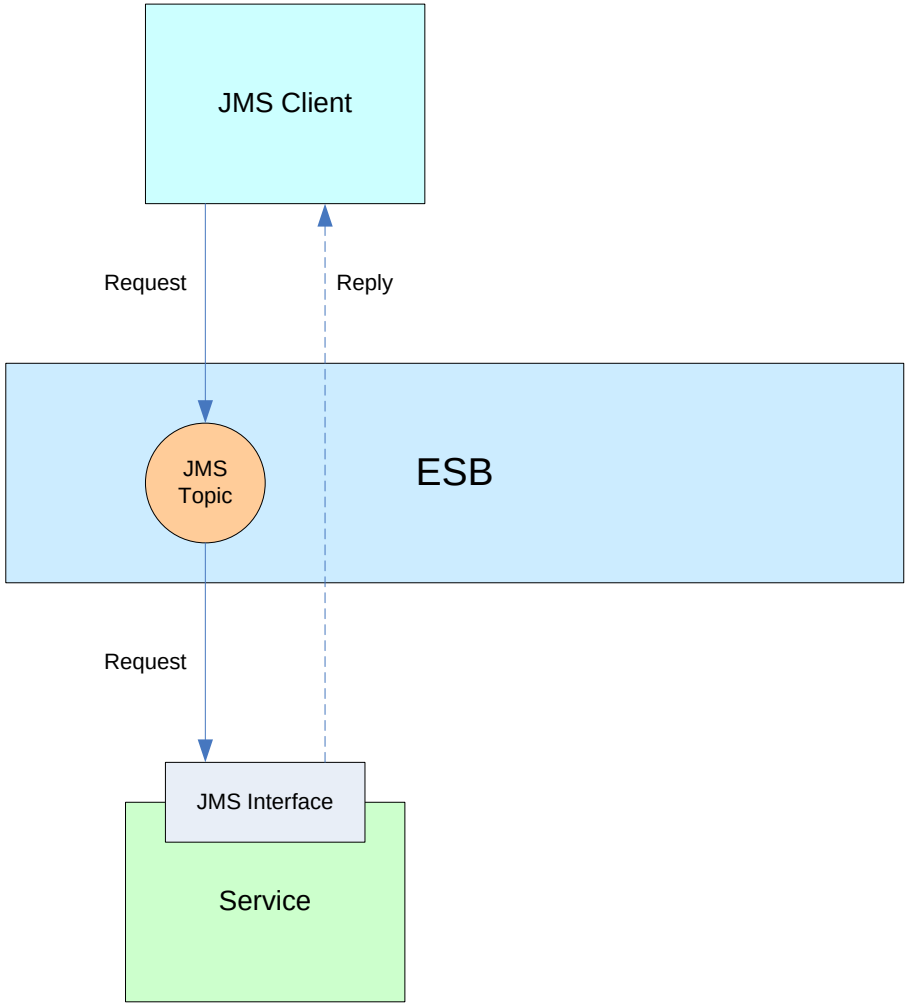
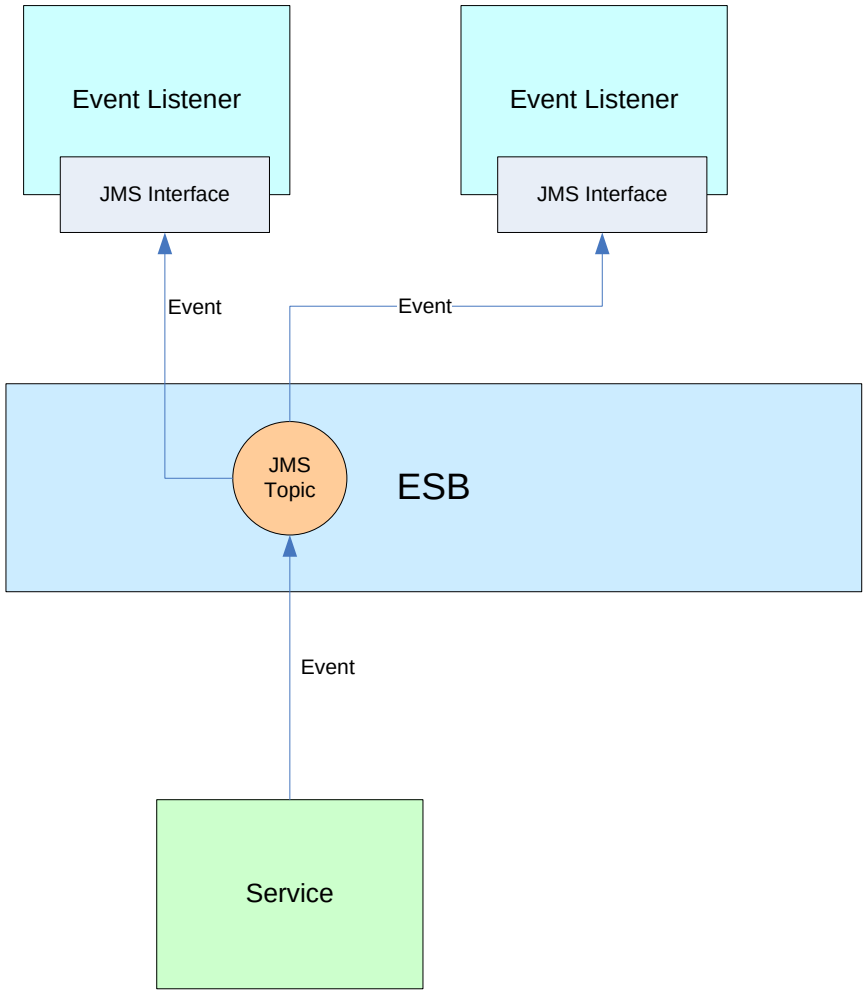
JMS: Request/Reply Pattern

- JMS Queue
  - Destination provided by JMS provider for message buffering. FIFO Queue.
- Request is sent to the appropriate JMS destination.
  - **queue:Request.EndDeviceControls**
- Optional reply is synchronous or asynchronous.



JMS: Event Publishing Pattern

- JMS Topic
  - Destination provided by JMS provider for message publishing. Sent to all subscribers.
- Applications interested in types of events subscribe to a JMS topic.
- Event is sent to the appropriate JMS topic.
  - **topic:Event.EndDeviceControls**
- Topic sends the event message to all subscribers.



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JMS: Message

- Example Request Message:

```
<ns2:RequestMessage xmlns="http://iec.ch/TC57/2011/schema/message"
      xmlns:ns3="http://iec.ch/TC57/2011/EndDeviceControls#">
 <Header>
  <Verb>create</Verb>
  <Noun>EndDeviceControls</Noun>
  <Revision>2.0</Revision>
  <Timestamp>2011-11-10T16:26:54.232Z</Timestamp>
  <Source>Vendor X Software</Source>
  <ReplyAddress>queue:Event.EndDeviceControls</ReplyAddress>
  <MessageID>0d39be6c-ddb0-4056-b9e7-5f15d91658cc</MessageID>
  <CorrelationID>e3f37e15-10e6-43de-8b45-6537022f9065</CorrelationID>
 </Header>
 <Payload>
  <ns3:EndDeviceControls>
   <ns3:EndDeviceControl>
    <ns3:EndDeviceControlType ref="3.31.0.23"/>
    <ns3:EndDevices>
     <ns3:mRID>cf14ac6f-4829-4d32-bbc4-ed90ddfa2760</ns3:mRID>
    </ns3:EndDevices>
   </ns3:EndDeviceControl>
  </ns3:EndDeviceControls>
 </Payload>
</RequestMessage>
```

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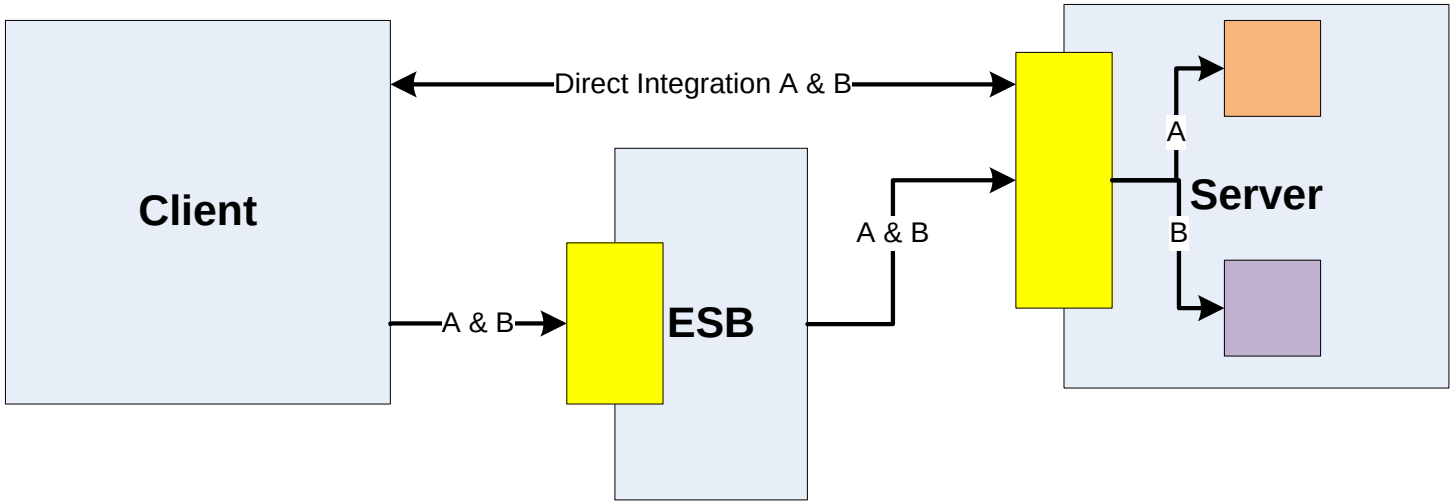
Generic-Typed Web Services



- Uses a single WSDL to define messages corresponding to the Message Stereotypes.
- Payload is generic (xs:any)
- Typically one endpoint to handle and route requests.
- Introspection of message can be used to route appropriately.
- Payload validation is typically handled within application.

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Generic-Typed: Operations

- Three operations:
  - Request
  - Response
  - PublishEvent
- Type of payload can be inferred from <noun> in header.
- Action to be taken can be inferred from <verb> in header.

```
<wsdl:operation name="PublishEvent">
  <wsdl:input message="ns:EventMessage"/>
  <wsdl:output message="ns:ResponseMessage"/>
</wsdl:operation>
<wsdl:operation name="Request">
  <wsdl:input message="ns:RequestMessage"/>
  <wsdl:output message="ns:ResponseMessage"/>
</wsdl:operation>
<wsdl:operation name="Response">
  <wsdl:input message="ns:ResponseMessage"/>
  <wsdl:output message="ns:ResponseMessage"/>
</wsdl:operation>
```

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Generic-Typed: Message

- Example Request Message:

```
<ns2:RequestMessage xmlns="http://iec.ch/TC57/2011/schema/message"
      xmlns:ns3="http://iec.ch/TC57/2011/EndDeviceControls#">
 <Header>
  <Verb>create</Verb>
  <Noun>EndDeviceControls</Noun>
  <Revision>2.0</Revision>
  <Timestamp>2011-11-10T16:26:54.232Z</Timestamp>
  <Source>Vendor X Software</Source>
  <ReplyAddress>http://somehost/CIM/CIMService</ReplyAddress>
  <MessageID>0d39be6c-ddb0-4056-b9e7-5f15d91658cc</MessageID>
  <CorrelationID>e3f37e15-10e6-43de-8b45-6537022f9065</CorrelationID>
 </Header>
 <Payload>
  <ns3:EndDeviceControls>
   <ns3:EndDeviceControl>
    <ns3:EndDeviceControlType ref="3.31.0.23"/>
    <ns3:EndDevices>
     <ns3:mRID>cf14ac6f-4829-4d32-bbc4-ed90ddfa2760</ns3:mRID>
    </ns3:EndDevices>
   </ns3:EndDeviceControl>
  </ns3:EndDeviceControls>
 </Payload>
</RequestMessage>
```

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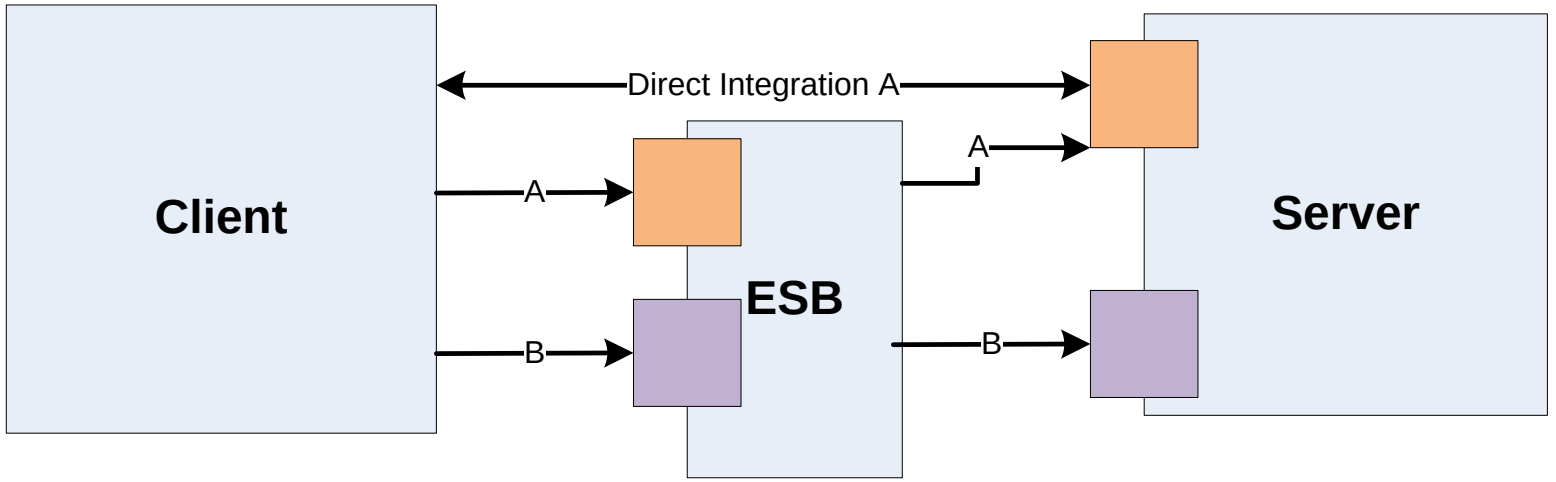
Strongly-Typed Web Services



- Uses multiple WSDLs to define messages corresponding to the Message Stereotypes based on CIM profile semantics.
- Payload is specific to one CIM profile type.
- Multiple endpoints to handle and route requests.
- Message routing can be handled via endpoint semantics without content introspection.
- Message validation can be handled by the endpoint.

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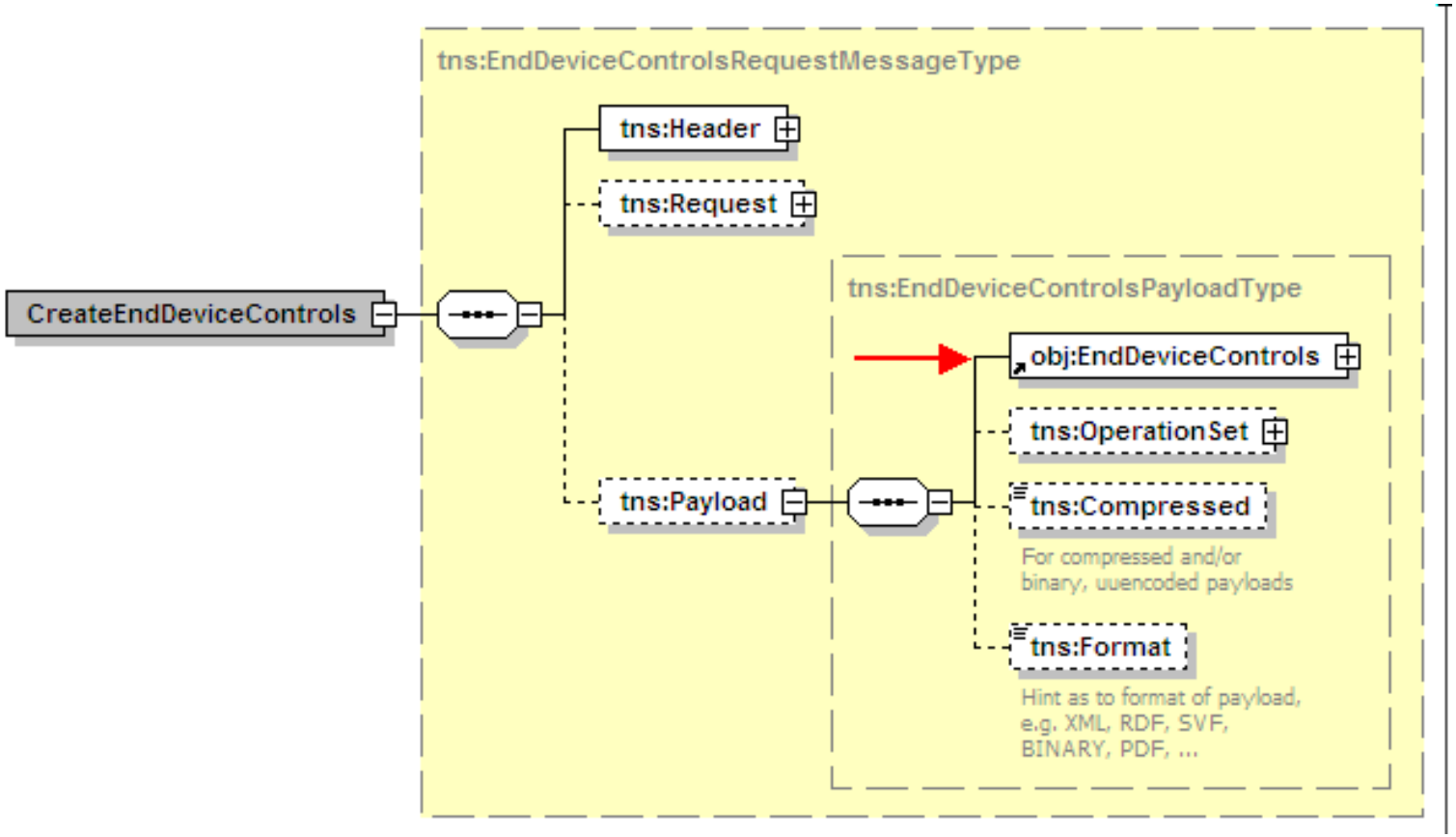
Strongly-Typed: Web Services



- xs:any replaced with specific CIM profile type.
- Allows full validation of message payload from WSDL definition.

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Strongly-Typed: Services

- CIM profile semantic based services.
- Service Types:
  - Client-based services
    - **Receive**: Consumes business objects from an external source.
  - Server-based services
    - **Execute**: Executes a service execution request.
    - **Get**: Executes a query request.
  - Intermediary (ESB) based services:
    - **Get**: Routes a query request.
    - **Show**: Provides a business object for consumption when state is not changed. (Response to a Get request.)
    - **Send**: Provides a business object for consumption when state has changed. (Unsolicited publication service.)
    - **Request**: Routes a service execution request.
    - **Reply**: Routes a response to an execute service request.
- Common interaction patterns will illustrate the usage.

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Strongly-Typed: Operations

- Operations are based on 61968 Verbs:
  - Request and Execute Services:
    - **Create**: used to create objects of the type specified by the noun.
    - **Change**: used to modify objects.
    - **Cancel**: implies actions related to business processes, such as the cancellation of a control request.
    - **Close**: implies actions related to business processes, such as the closure of a work order.
    - **Delete**: used to delete objects.
  - Send, Reply and Receive Services:
    - **Created**: Event denoting creation of object(s).
    - **Changed**: Event denoting modification of objects(s).
    - **Canceled**: Event denoting cancellation of object(s).
    - **Closed**: Event denoting closure of object(s).
    - **Deleted**: Event denoting deletion of objects(s).
  - Get Services:
    - **Get**: used to query for objects of the type specified by the message noun.

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Strongly-Typed: Naming Patterns

- Service Naming Pattern: <ServiceType><CIMProfile>
- Operation Naming Pattern: <Verb><CIMProfile>
- WSDLs are derived from Templates in 61968-100 Annex.
- Examples:
  - ExecuteEndDeviceControls Service:
    - CreateEndDeviceControls
    - ChangeEndDeviceControls
    - CancelEndDeviceControls
    - CloseEndDeviceControls
    - DeleteEndDeviceControls
  - SendEndDeviceEvent Service:
    - CreatedEndDeviceEvent
    - ChangedEndDeviceEvent
    - CanceledEndDeviceEvent
    - ClosedEndDeviceEvent
    - DeletedEndDeviceEvent

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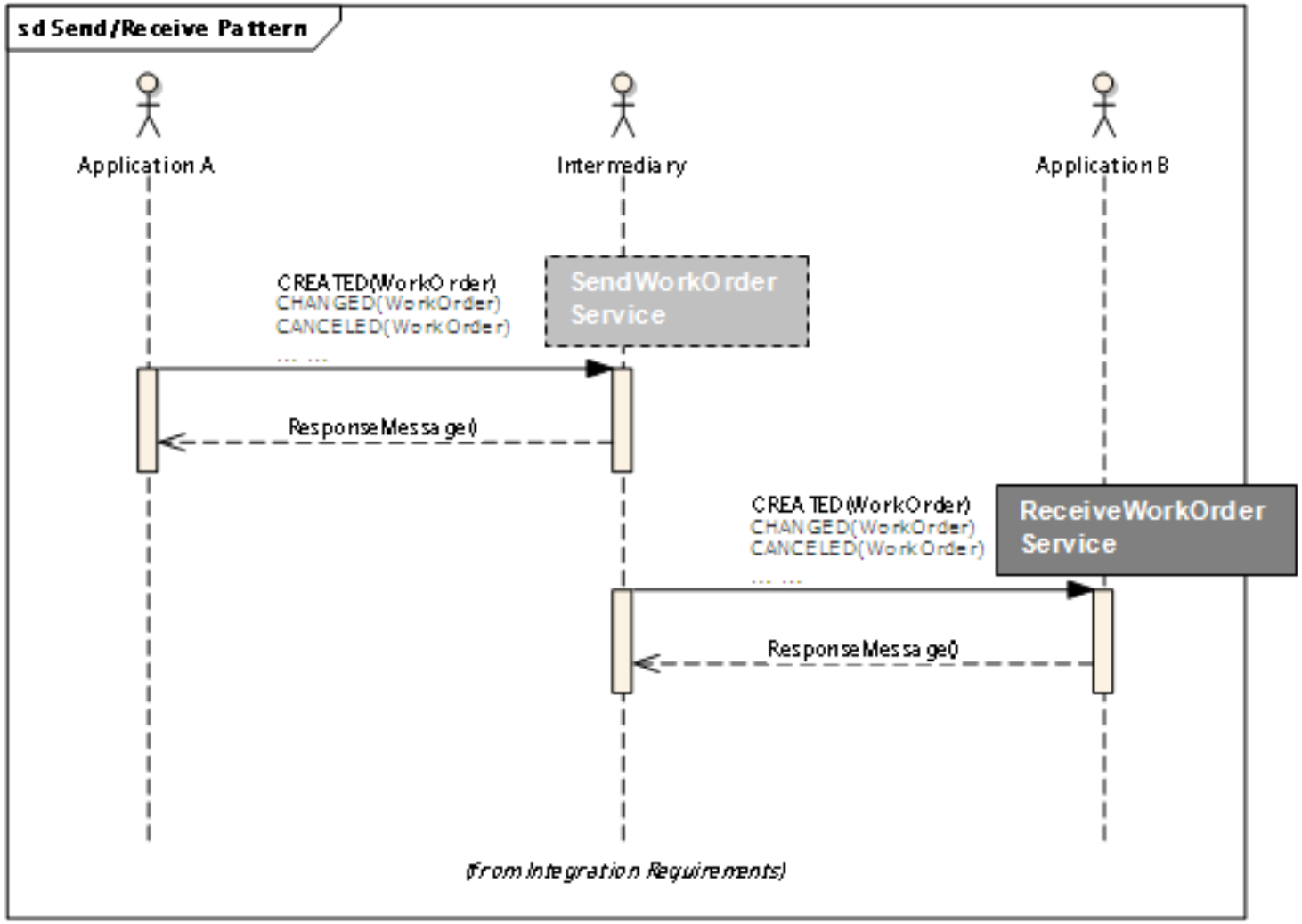
Vital Connections

Strongly-Typed: Send/Receive



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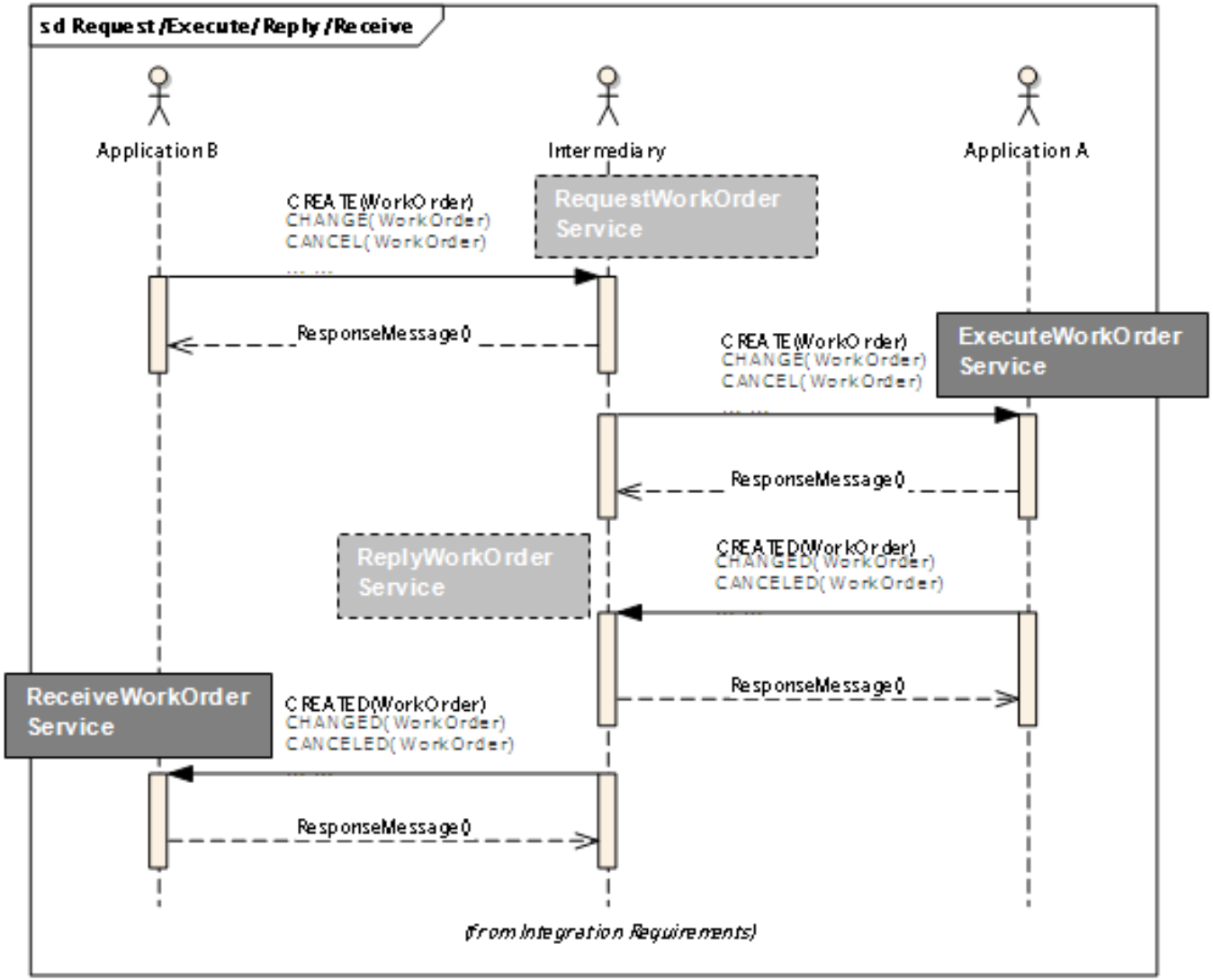
Vital Connections

Strongly-Typed: Execute/Receive



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Strongly-Typed: Message

- Example CreateEndDeviceControls message implemented by ExecuteEndDeviceControls service:

```
<ns2:CreateEndDeviceControls xmlns:ns2="http://iec.ch/TC57/2011/EndDeviceControlsMessage"
      xmlns="http://iec.ch/TC57/2011/schema/message"
      xmlns:ns3="http://iec.ch/TC57/2011/EndDeviceControls#">
 <ns2:Header>
  <Verb>create</Verb>
  <Noun>EndDeviceControls</Noun>
  <Revision>2.0</Revision>
  <Timestamp>2011-11-10T16:26:54.232Z</Timestamp>
  <Source>Vendor X Software</Source>
  <ReplyAddress>http://somehost/CIM/ReceiveEndDeviceControls</ReplyAddress>
  <MessageID>0d39be6c-ddb0-4056-b9e7-5f15d91658cc</MessageID>
  <CorrelationID>e3f37e15-10e6-43de-8b45-6537022f9065</CorrelationID>
 </ns2:Header>
 <ns2:Payload>
  <ns3:EndDeviceControls>
   <ns3:EndDeviceControl>
    <ns3:EndDeviceControlType ref="3.31.0.23"/>
    <ns3:EndDevices>
     <ns3:mRID>cf14ac6f-4829-4d32-bbc4-ed90ddfa2760</ns3:mRID>
    </ns3:EndDevices>
   </ns3:EndDeviceControl>
  </ns3:EndDeviceControls>
 </ns2:Payload>
</ns2:CreateEndDeviceControls>
```

Interoperability Patterns and Use Cases

How can the three flavors achieve interoperability in the enterprise?

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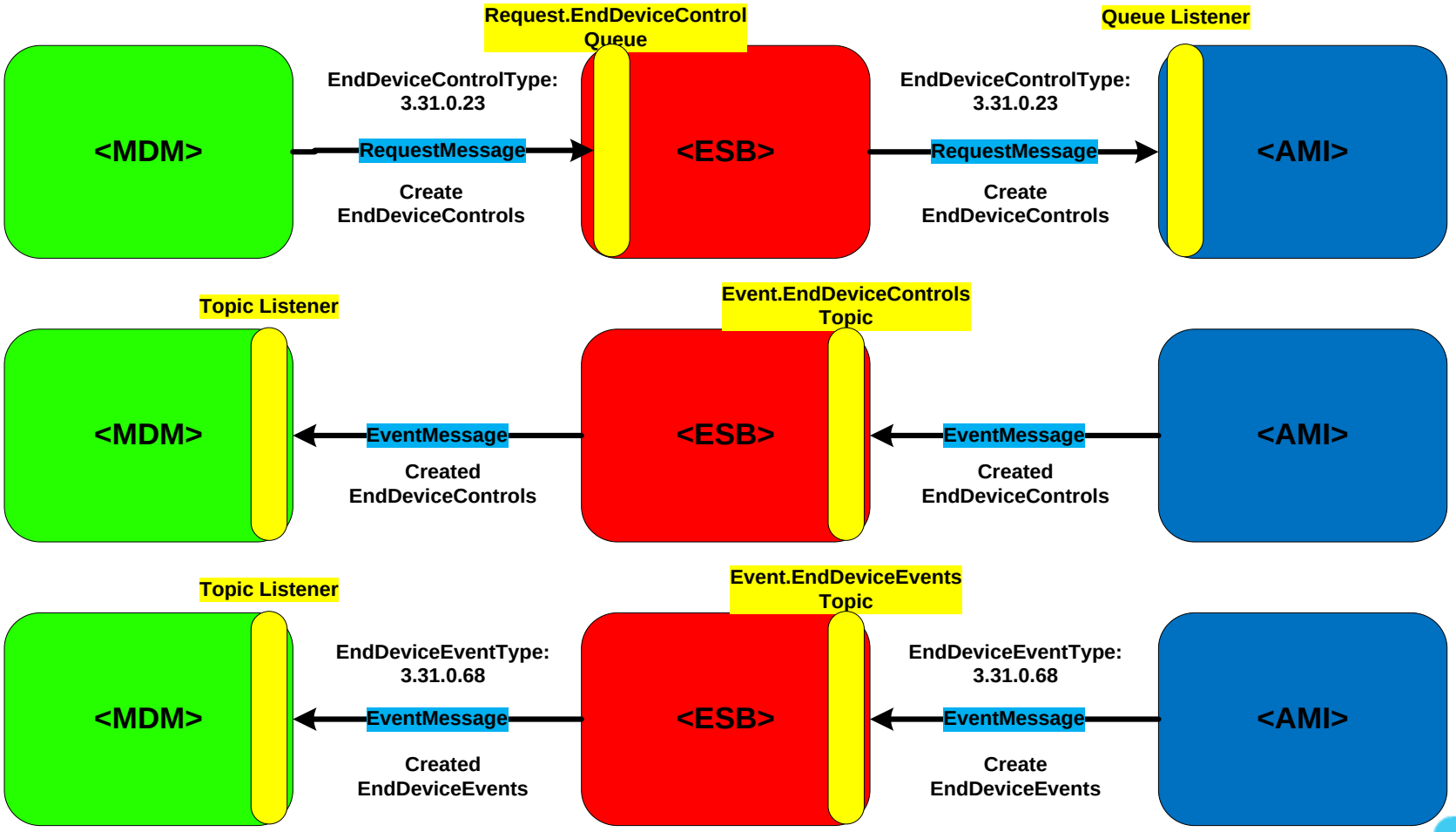
Use Case: MDM Disconnects AMI Meter (JMS)



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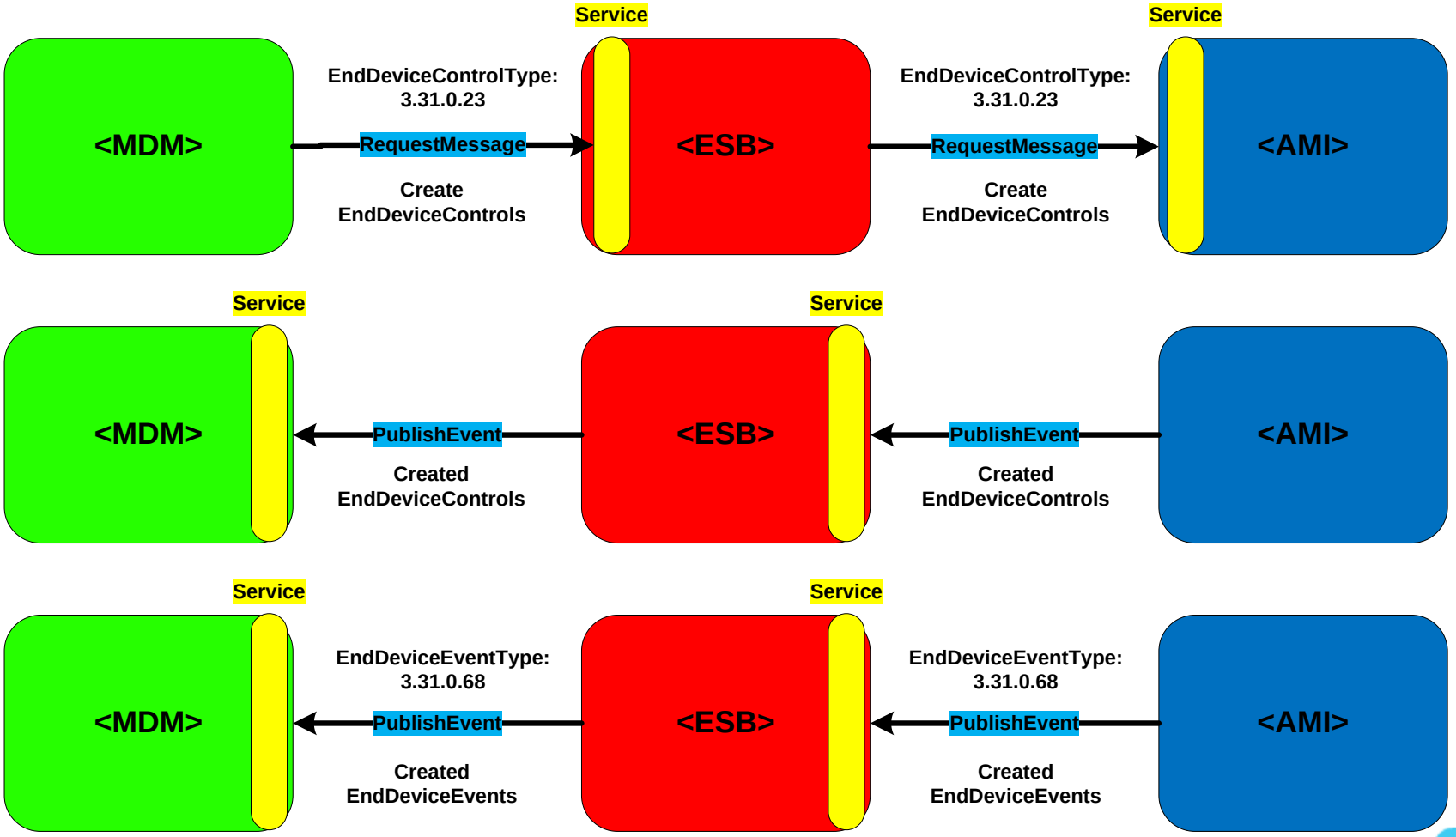
Use Case: MDM Disconnects AMI Meter (Generic WSDL)



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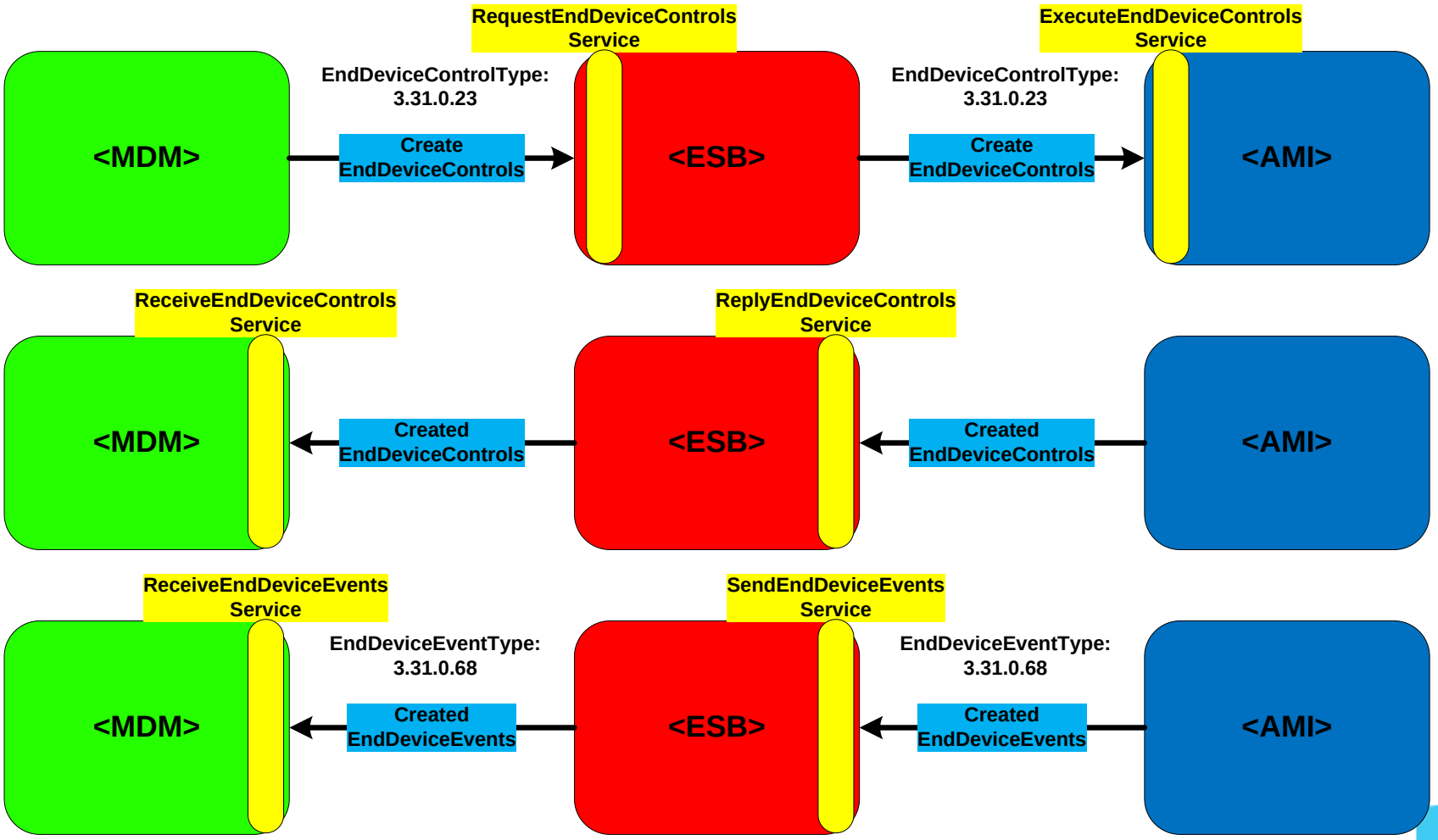
Use Case: MDM Disconnects AMI Meter (Strongly-Typed WSDL)



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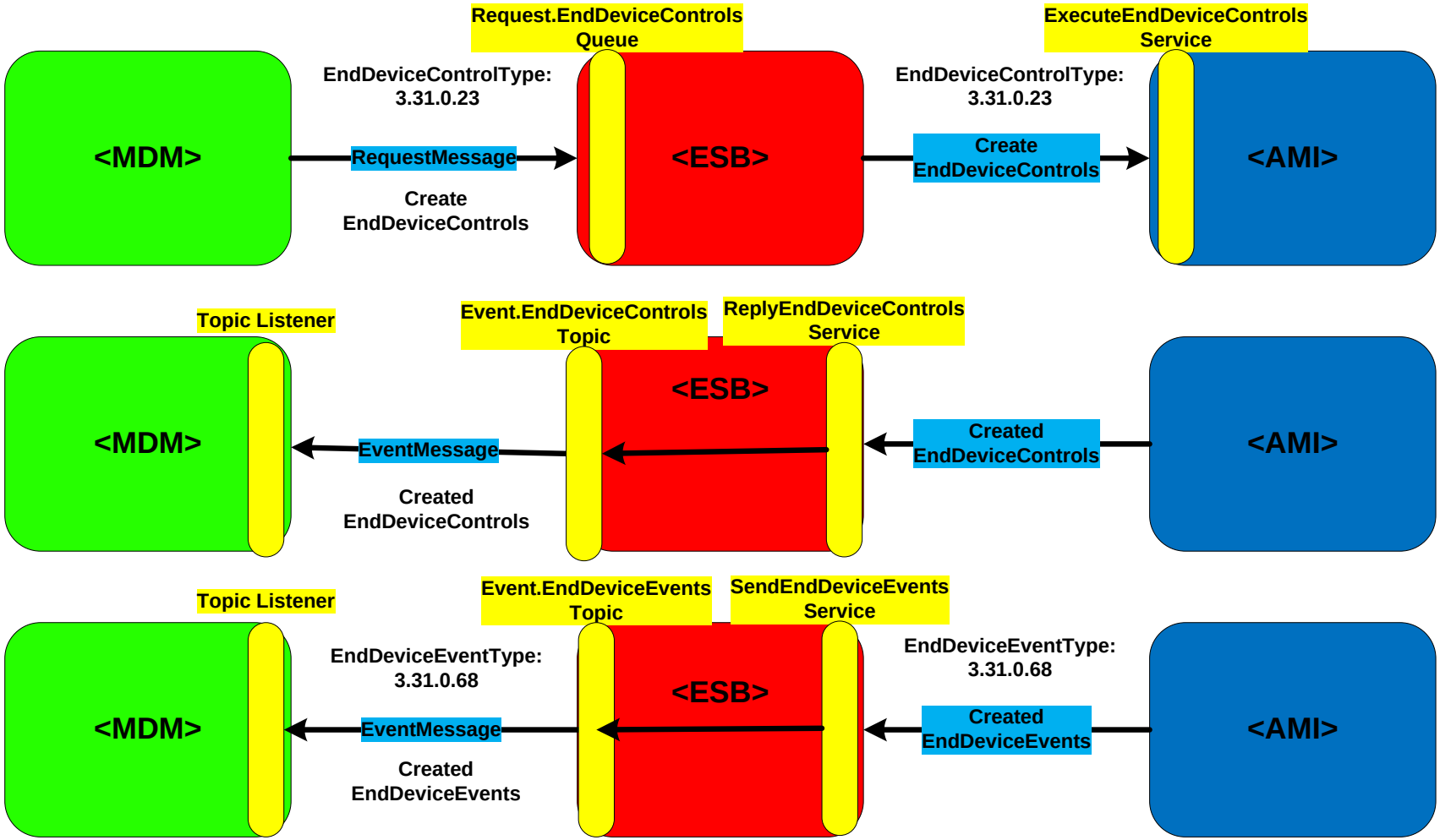
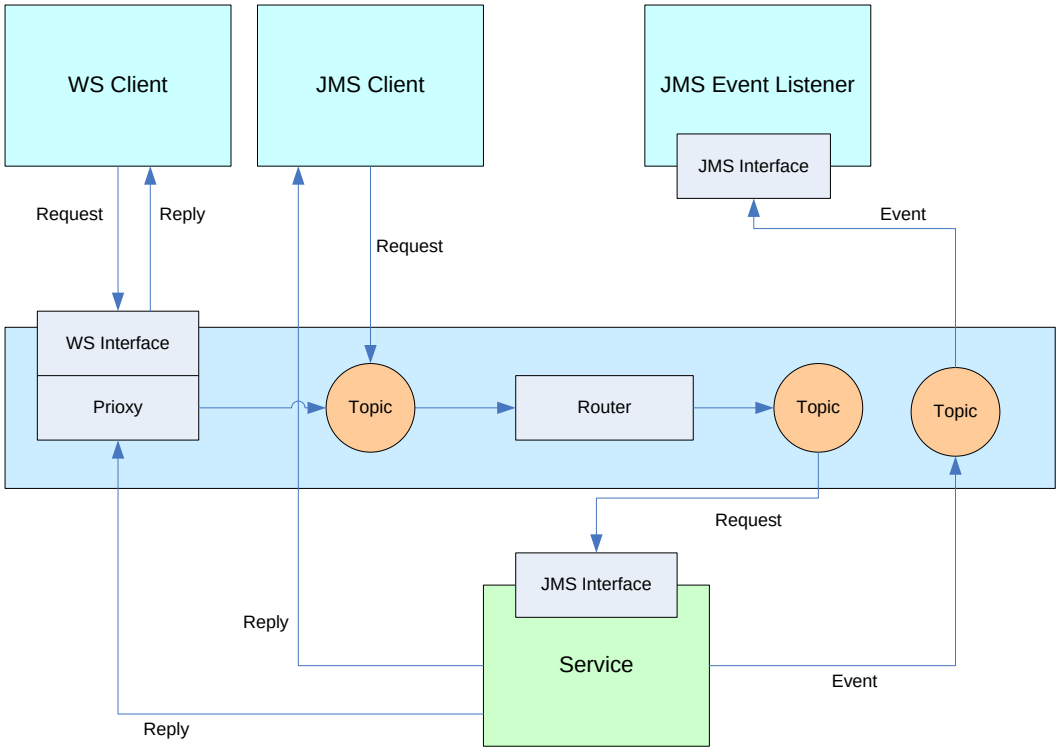
JMS and Web Service Interoperability



JMS Web Service Integration

- JMS-Centric Pattern
  - ESB hosts destinations
- Smart Router component does content-based routing.
- Smart Proxy implements web service interfaces and routes to appropriate destination.
- Replies and Events sent to appropriate desetination/endpoint.



Other Considerations

Security, WSDL Generation, etc.

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Security

- Goals
  - Reliably establish the identity of the entity interacting with the system. (Authentication)
  - Ensure that the entity is properly authorized to interact with the system in the manner requested. (Authorization)
  - Protect messages from eavesdropping and tampering.
- No specific implementation can be mandated.
  - Too many different approaches/requirements.
- A set of common strategies with recommended approaches:
  - Use of embedded credentials with secured transport. (SSL/TLS)
  - WS-Security

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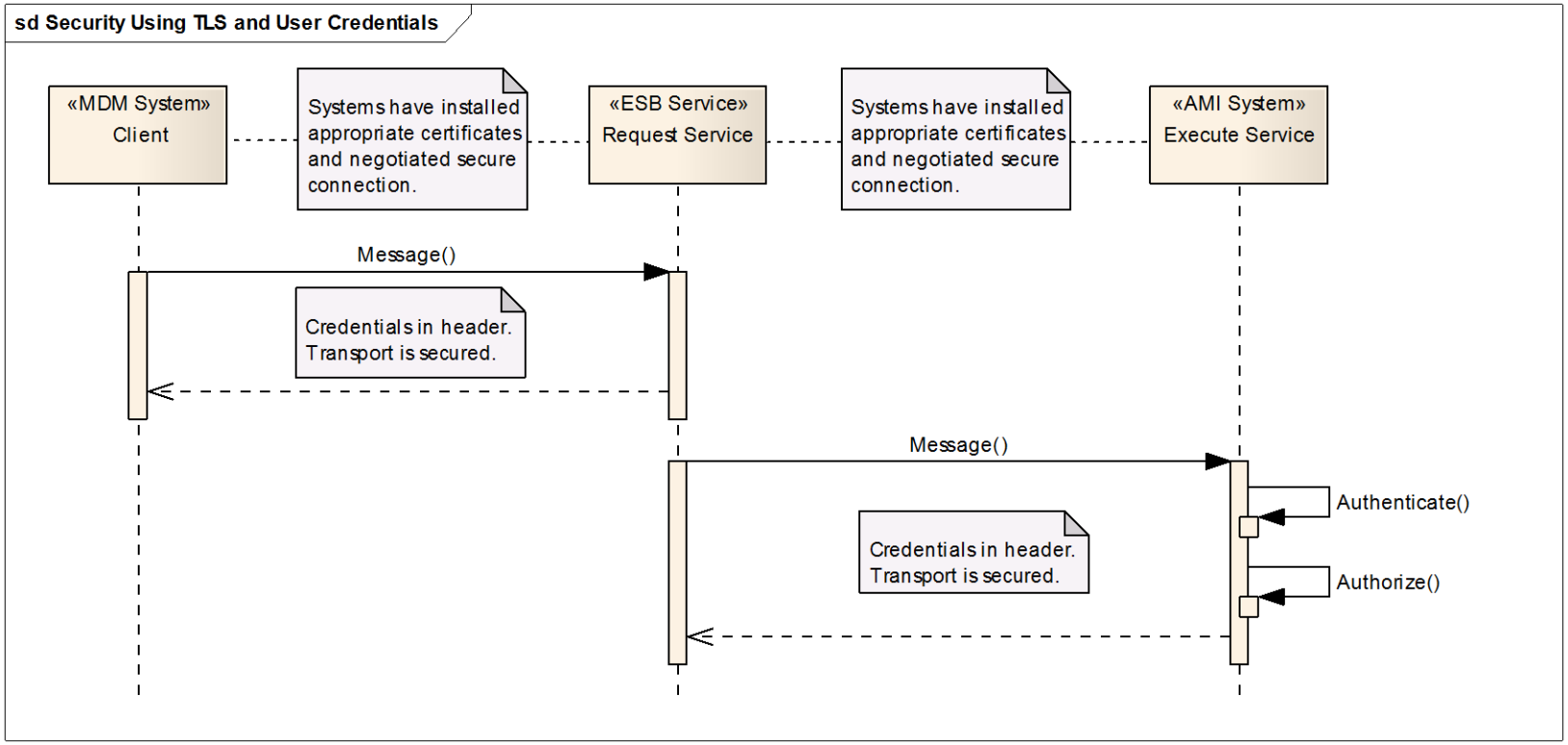
SSL/TLS Security



- Credentials (Username and Password) are in SOAP or JMS Header.
- Transport between systems encrypted.
- Details of how systems/certificates setup is outside scope.

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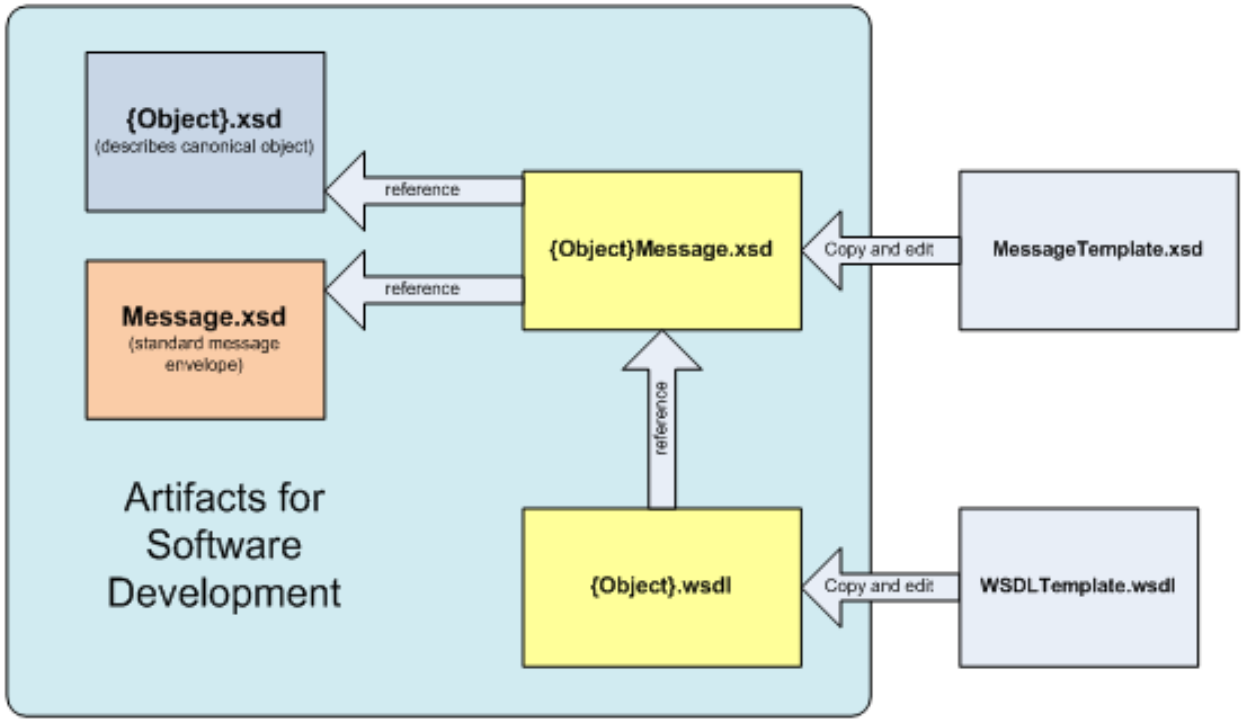
Strongly-Typed WSDL Generation



- Two sets of templates: MessageTemplate.xsd, WSDLTemplate.wsdl
- Copy each Template and perform string substitution.
- Produces Type-Specific Message.xsd and Service-Specific.wsdl.

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Strongly-Typed Message Generation

```
<xs:schema xmlns:tns="http://iec.ch/TC57/2011/{Information_Object_Name}Message" xmlns:xs="http://www.w3.org/2001/XMLSchema
 <!-- Base Message Definitions -->
 <xs:import namespace="http://iec.ch/TC57/2011/schema/message" schemaLocation="Message.xsd"/>
 <!-- CIM Information Object Definition -->
 <xs:import namespace="http://iec.ch/TC57/2011/{Information_Object_Name}#" schemaLocation="{Information_Object_Name}.xsd"/>
 <!-- PayloadType Definition -->
 <xs:complexType name="{Information_Object_Name}PayloadType">
  <xs:sequence>
   <xs:element ref="obj:{Information_Object_Name}"/>
   <xs:element name="OperationSet" type="msg:OperationSet" minOccurs="0"/>
```

- Substitute EndDeviceControls for {Information_Object_Name} Yields:

```
<xs:schema xmlns:tns="http://iec.ch/TC57/2011/EndDeviceControlsMessage" xmlns:xs="http://www.w3.org/2001/XML
 <!-- Base Message Definitions -->
 <xs:import namespace="http://iec.ch/TC57/2011/schema/message" schemaLocation="Message.xsd"/>
 <!-- CIM Information Object Definition -->
 <xs:import namespace="http://iec.ch/TC57/2011/EndDeviceControls#" schemaLocation="EndDeviceControls.xsd"/>
 <!-- PayloadType Definition -->
 <xs:complexType name="EndDeviceControlsPayloadType">
  <xs:sequence>
   <xs:element ref="obj:EndDeviceControls"/>
   <xs:element name="OperationSet" type="msg:OperationSet" minOccurs="0"/>
```

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Strongly-Typed WSDL Generation

```
<wsdl:message name="Create{Information_Object_Name}RequestMessage">
  <wsdl:part name="Create{Information_Object_Name}RequestMessage" element="infoMessage:Create{Information_Object_Name}"/>
</wsdl:message>

<wsdl:message name="Change{Information_Object_Name}RequestMessage">
  <wsdl:part name="Change{Information_Object_Name}RequestMessage" element="infoMessage:Change{Information_Object_Name}"/>
</wsdl:message>

<wsdl:message name="Close{Information_Object_Name}RequestMessage">
  <wsdl:part name="Close{Information_Object_Name}RequestMessage" element="infoMessage:Close{Information_Object_Name}"/>
</wsdl:message>

<wsdl:message name="Cancel{Information_Object_Name}RequestMessage">
```

- Substitute EndDeviceControls for {Information_Object_Name} Yields:

```
<wsdl:message name="CreateEndDeviceControlsRequestMessage">
  <wsdl:part name="CreateEndDeviceControlsRequestMessage" element="infoMessage:CreateEndDeviceControls"/>
</wsdl:message>

<wsdl:message name="ChangeEndDeviceControlsRequestMessage">
  <wsdl:part name="ChangeEndDeviceControlsRequestMessage" element="infoMessage:ChangeEndDeviceControls"/>
</wsdl:message>

<wsdl:message name="CloseEndDeviceControlsRequestMessage">
  <wsdl:part name="CloseEndDeviceControlsRequestMessage" element="infoMessage:CloseEndDeviceControls"/>
</wsdl:message>

<wsdl:message name="CancelEndDeviceControlsRequestMessage">
```

Status

Where is the standard now?

Status

- Not a standard yet, but already being used in:
  - Interoperability tests
  - Vendor Products
  - Utility Projects

- Committee Draft for Voting (CDV) was submitted to IEC on March 7, 2012.
- Voting completed October 5, 2012.
  - Document approved

- Final Draft for International Standard (FDIS) submission in process.
  - Expected final standard issued in 2013.

Thank you

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