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“Learning is fun!”**



Agenda

- What is Protocol Binding?
- XML Infoset
- XML Features
- SOAP HTTP Binding
- Web Architecture SOAP Usage
- SOAP SMTP Binding

What is Protocol Binding?

What is Protocol Binding (SOAP Binding)?

- Specification of how SOAP messages may be passed from one SOAP node to another using an underlying protocol

XML InfoSet

SOAP Message as XML Infoset

- SOAP message is defined in the form of an XML Infoset
 - > in terms of element and attribute information items of an abstract "document" called the env:Envelope
- XML Infoset provides **abstract description** of its contents
 - > Can have different on-the-wire representations
 - > (Examples) XML document, DOM object, Custom format

XML Infoset and Protocol Binding

- Any SOAP env:Envelope infoset representation will be made concrete through a **protocol binding**
 - > provides a **serialized representation** of the infoset that can be conveyed to the next SOAP node in the message path in a manner such that the infoset can be reconstructed **without loss of information**

Serialized Representation of XML Infoset

- Typically the serialized representation is in the form of XML document
- However, there may be other serialized representation (via different protocol bindings)
 - > Example1: between two SOAP nodes over a limited bandwidth interface where an alternative, compressed serialization of the same infoset may be chosen
 - > Example2: encrypted structure

XML Features

Protocol Binding and SOAP Features

- Protocol binding provides the mechanisms to support features that are needed by a SOAP application
- A feature is a specification of a certain functionality provided by a binding
- A feature description is identified by a **URI**, so that all applications referencing it are assured of the **same semantics**
 - > reliability, correlation, encryption, etc

SOAP Binding Specification

- Describes, among other things, which (if any) features it provides
 - > HTTP binding provides request/response co-relation feature
- Some features may be provided natively by the underlying protocol
- If the feature is not available through the binding, it may be implemented within the SOAP envelope, using SOAP header blocks
 - > SOAP Module

Example: How do you provide SOAP Message Request/Response Correlation Feature?

- Over UDP
 - > either directly by the application or more likely as a part of the SOAP infosets being exchanged
- Over HTTP
 - > no further support need be provided at the application or the SOAP level because HTTP binding with SOAP provides request/response correlation feature

SOAP Binding Specification

- Defines message exchange pattern(s) that it supports
- Two message exchange patterns
 - > SOAP Request-Response message exchange pattern
 - > one SOAP message is exchanged in each direction between two adjacent SOAP nodes
 - > SOAP Response message exchange pattern
 - > a non-SOAP message (i.e. HTTP request) acting as a request followed by a SOAP message included as a part of the response

SOAP HTTP Binding

SOAP HTTP Binding

- Leverages HTTP request and response model
 - > HTTP implicitly correlates its request message with its response message
 - > A SOAP application can choose to infer a correlation between a SOAP message sent in the body of a HTTP request message and a SOAP message returned in the HTTP response
- HTTP identifies the server endpoint via a URI
 - > URI serves as **the identification of a SOAP node** at the server

Two Exchange Patterns

- SOAP request-response message exchange pattern
 - > Use of the **HTTP POST** method for conveying SOAP messages in the bodies of HTTP request and response message
- SOAP response message exchange pattern
 - > Use of the **HTTP GET** method in a HTTP request to return a SOAP message in the body of a HTTP response

Web Architecture SOAP Usage

Which One to Use?

- SOAP request-response message exchange pattern
 - > Use it when information resource is manipulated
- SOAP response message exchange pattern
 - > Use it when an application is assured that the message exchange is for the purposes of information retrieval
 - > Information resource is "untouched" as a result of the interaction
 - > Safe and idempotent

SOAP HTTP GET Usage

- Response to a HTTP GET request is a **SOAP message** in the HTTP response
 - > instead of html or xhtml for browser consumption
 - > data centric
 - > leverages SOAP framework for expressing some application-specific feature through the use of SOAP headers.
- HTTP Accept header is used to indicate the preferred representation of the resource being requested
 - > “application/soap+xml”

Example8a: HTTP Get Request

GET /travelcompany.example.org/reservations?
code=FT35ZBQ HTTP/1.1

Host: travelcompany.example.org

Accept: text/html;q=0.5, application/soap+xml

- The HTTP Accept header is used to indicate the preferred representation of the resource being requested

Example8b: SOAP message returned as a response to the HTTP GET in Example 8a

HTTP/1.1 200 OK

Content-Type: application/soap+xml; charset="utf-8"

Content-Length: nnnn

```
<?xml version='1.0' ?>
<env:Envelope xmlns:env="http://www.w3.org/2003/05/soap-envelope">
<env:Header>
<m:reservation xmlns:m="http://travelcompany.example.org/reservation"
    env:role="http://www.w3.org/2003/05/soap-envelope/role/next"
    env:mustUnderstand="true">
    <m:reference>uuid:093a2da1-q345-739r-ba5d-pqff98fe8j7d</m:reference>
    <m:dateAndTime>2001-11-30T16:25:00.000-05:00</m:dateAndTime>
</m:reservation>
</env:Header>
<env:Body>
    ...
</env:Body>
</env:Envelope>
```

SOAP HTTP POST Usage

- Used for both exchange of general XML data (Document-driven) or RPC
- HTTP **Content-type header** must be "text/xml" (based on WS-I basic profile R9703)
- The combination of **HTTP Post** and **Host headers** represents **URI** of the resource
 - > <http://travelcompany.example.org/Reservations>
- If error occurs, HTTP 500 "Internal Server Error" is returned along with an embedded SOAP message containing a SOAP fault

SOAP SMTP Binding

SOAP Email Binding

- SOAP messages can be moved as either email text or attachments
- One-way message exchange
- Applications can take advantage of Delivery Status Notification (DSN) of SMTP
 - > Separate from message processing at the SOAP layer
 - > SOAP Message correlation has to be handled at SOAP level

Example14: SOAP Request message carried in a SMTP message

From: a.oyvind@mycompany.example.com

To: reservations@travelcompany.example.org

Subject: Travel to LA

Date: Thu, 29 Nov 2001 13:20:00 EST

Message-Id: <EE492E16A090090276D208424960C0C@mycompany.example.com>

Content-Type: application/soap+xml

```
<?xml version='1.0' ?>
<env:Envelope xmlns:env="http://www.w3.org/2003/05/soap-envelope">
<env:Header>
...
</env:Header>
<env:Body>
...
</env:Body>
</env:Envelope>
```

Example15: SOAP Response message carried in a SMTP message

From: reservations@travelcompany.example.org

To: a.oyvind@mycompany.example.com

Subject: Which NY airport?

Date: Thu, 29 Nov 2001 13:35:11 EST

Message-Id: <200109251753.NAA10655@travelcompany.example.org>

In-reply-to:<EE492E16A090090276D208424960C0C@mycompany.example.com>

Content-Type: application/soap+xml

```
<?xml version='1.0' ?>
<env:Envelope xmlns:env="http://www.w3.org/2003/05/soap-envelope">
  <env:Header>
    ...
  </env:Header>
  <env:Body>
    ...
  </env:Body>
</env:Envelope>
```

Thank you!

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