SOAP 1.2, MTOM
and their applications

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Agenda

• SOAP 1.2
• XOP, MTOM and Resource Header
• Canon
SOAP 1.2
SOAP – Background

• Web success
  – Easy information sharing
  – Built on HTML and HTTP

• Logical evolution: applications over the web
  – Loose coupling
  – Use XML and HTTP
SOAP 1.2 Standard

- Standardization process
  - W3C Working Group
  - From September 2000 to June 2003
- Result
  - SOAP Version 1.2 Part 0: Primer
  - SOAP Version 1.2 Part 1: Messaging Framework
  - SOAP Version 1.2 Part 2: Adjuncts
SOAP 1.2

Messaging Framework
SOAP Message

• Transferred between nodes:
  – From a sender
  – To a receiver
  – Through intermediaries(s)
SOAP Envelope

- XML Construct
- Body
  - For ultimate receiver
- Header block
  - For any node
  - Processing may be mandatory: mustUnderstand
SOAP Message Processing

• Main steps:
  – Check message can be processed
    • Find header blocks targeted at the node
    • Look for mustUnderstand
  – Process message
    • Process identified header blocks
    • Process body (ultimate receiver)
  – Transmit message
    • Send modified message (intermediary)
SOAP Fault

• Failure is indicated by a fault
• SOAP Fault
  – Contained in Envelope Body
  – Indicates the type of failure
  – May contain:
    • Node where fault happened
    • Application related details
SOAP Binding Framework

• SOAP has:
  – Message structure
  – Processing rules

• To transmit messages another protocol is needed

• Binding Framework
  – Rules for defining how a protocol is used to transmit SOAP messages
SOAP Extensibility

• SOAP Features
  – Extension of the messaging framework

• Through Processing Model
  – Expressed as Header Block (SOAP Module)
  – Can use `mustUnderstand`

• Through Binding Framework
  – Expressed using underlying protocol
SOAP 1.2

Adjuncts
SOAP RPC

- Convention for doing RPC
- Invocation
  - Element with function name in Body
  - Sub-element for each parameter
- Response
  - Element representing result in Body
  - Sub-element for each parameter
SOAP Data Model

SOAP Encoding

• SOAP Data Model
  – Mapping convention from application data to XML
  – Used by SOAP RPC

• SOAP Encoding
  – Serialization rules for Data Model
  – SOAP Part 2 defines an Encoding
  – Other Encoding can be created
SOAP MEP
(Message Exchange Pattern)

• MEP
  – Template for an exchange of several SOAP messages
  – Provides an abstraction over the underlying protocol

• MEP defined by standard
  – SOAP Request-Response
  – SOAP Response
SOAP HTTP Binding

- Binding of SOAP to HTTP
- Support two MEPs
  - SOAP Request-Response
  - SOAP Response
- Support Web Method Feature
  - Use either GET or POST
XOP, MTOM
and Resource Header
Binary Data in SOAP

- Problem: including binary data in a SOAP message
  - Need to encode data
  - base64 encoding: 33% size increase
- XOP: binary data in XML documents
- MTOM: application of XOP to SOAP
XOP Introduction

- XML-binary Optimized Packaging
- Goal: serialize efficiently XML Infosets containing binary data
- Uses XOP Package construct for serialization
XOP Package

- XML Linked to binary data
  - `xop:Include` element
- XML and binary data enclosed in XOP Package

```
<x:data>
  <xop:Include href="..."/>
</x:data>
...
XOP Advantages

• At application layer, everything is XML
  – Compatible with legacy applications
  – Efficient XOP-aware applications

• At serialization layer
  – XOP Package: more compact
  – Can be compatible with legacy XML libraries
MTOM

- Message Transmission Optimization Mechanism
- SOAP Feature for using XOP with SOAP
- Use MIME Multipart/Related for XOP Package
- Extension to the HTTP Binding
Resource Representation
Header Block

- SOAP Feature for including representations of Web resources
- Representation carried in a Header Block
  - Stored in base64
- Designed to optimize when used with MTOM
Canon
Canon

- Net sales: 26 billions €
- Employees: 115,000

Sales by products

- Office imaging
- Computer peripherals
- Business information
- Cameras
- Optical and other
Canon Research Centre France

- European R&D centre for Canon
- 70 employees
- Field of expertise
  - Image processing
  - Networks
  - Internet technologies
Web Services for copiers

- Provide extension mechanism
  - Using functionalities from another copier
  - Retrieving resource from a PC
Web services for cameras

• Increase communication possibilities
  – Sharing images over the Internet
Thank you!

Question?