101

XML & WebServices 2003

Asynchronous and Synchronous Messaging with Web Services and XML

Ronald Schmelzer
Senior Analyst
ZapThink, LLC

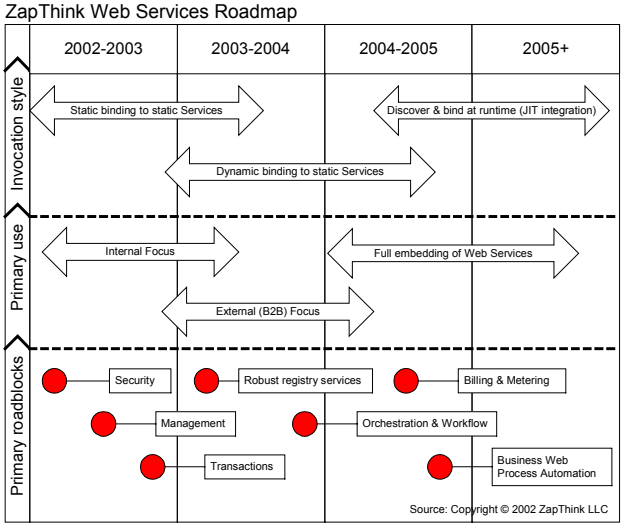
101

XML & WebServices 2003

The Business Objective

- *Automated Business Collaboration*
  - Facilitating ***exchange of information*** between systems, organizations, and markets
  - Allowing line-of-business managers to ***represent business processes***, and IT organizations to enable them
  - ***Promote business agility*** by allowing processes to be defined, executed, and changed as needed

A Web Services Roadmap



Components of the Problem

- Reliable Messaging
- Reliable Transactions
- Process Definition
- Process Execution

101

XML & WebServices 2003

Messaging

- Get a Message from Point A to Point B
  - *"The greatest problem in communication is the illusion that it has been accomplished." -- Daniel W. Davenport*
  - *"Communication works for those who work at it." -- John Powell*
  - *"It was impossible to get a conversation going, everybody was talking too much." -- Yogi Berra*

101

XML & WebServices 2003

But what about processes…?

- One-step messaging is relatively easy
- Multi-step messaging is *difficult*

… but for this presentation, we'll focus on just the first part – reliable messaging for single-step processes…

Web Services *Idées Fortes*: Loose Coupling

- Consumer and Producer controlled by different people
- Changing one doesn't break the other
- Build one without being aware of the other

Web Services *Idées Fortes*: Coarse Granularity

- Business-oriented requests and responses
- Blocks of information exchanged
- *Encapsulate* APIs into fine-grained, atomic Services and *compose* them into coarse-grained, business Services

101

XML & WebServices 2003

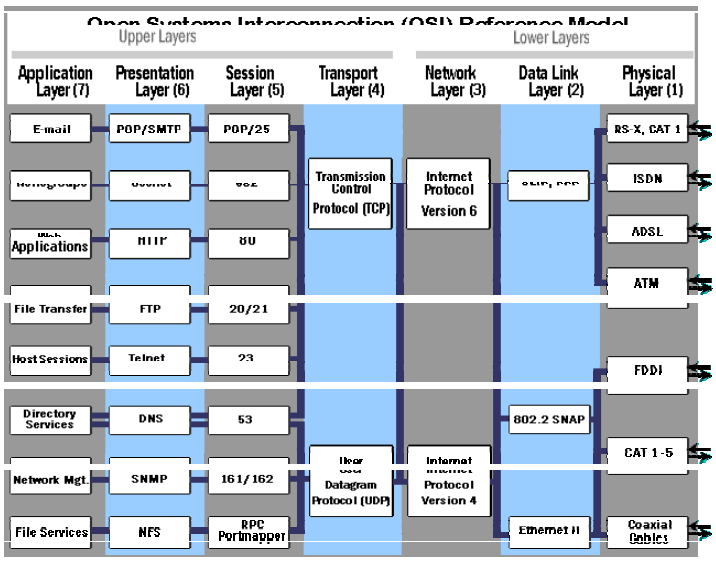
Web Services *Idées Fortes*: Asynchrony

- The Web is *synchronous*: click a button and wait for a response
- Web Services can also be *asynchronous*: allow for long-running processes

J

101

XML & WebServices 2003



101

XML & WebServices 2003

Communications Models

- Synchronous
  - Request and Response
- Asynchronous
  - Or “Message-oriented”
  - Loosely-coupled systems (sounds like XML?)
- Fire-and-Forget
  - Message is sent, but we don’t care about getting any response

101

XML & WebServices 2003

Benefits of Synchronous

- Real-time
- Efficient protocol
- The most “obvious” model
  - I ask a question
  - I wait for a response
- Problem: not all problems can be solved synchronously

101

XML & WebServices 2003

Benefits of Asynchronous

- More closely follows natural business and process logic
- Allows processing of multiple concurrent processes
- Fire and Forget a Special Case

- Challenges: more overhead, reliability issues

101

XML & WebServices 2003

Why Should Service-Oriented Architectures be Asynchronous?

- Fundamental tenet of loose coupling: not being aware of end point requirements
- Composited (virtualized) Web Services may require greater time for processing, requiring asynchrony
- B2B processes are often asynchronous
- Distributed systems can be more reliable when they are asynchronous
- Heterogeneous systems, especially those with limited bandwidth devices, function better asynchronously.
- Support human involvement in proceses

101

XML & WebServices 2003

Messaging Models

- Store-and-forward
  - Messages delivered to a one or more coordinating authorities
  - These forward to end destination
  - Post office model
  - SMTP
- Point-to-point
  - Real-time connection between systems

101

XML & WebServices 2003

What is a Transport Protocol?

- According to OSI Model: TCP
- According to Jabber, et. al:HTTP
- According to W3C: SOAP

- But, semantics:
  - TCP is really a transport protocol
  - HTTP is a *transfer* protocol
  - SOAP is a messaging protocol (even though ebXML identifies a TRP layer)

Wire-level vs. Business-level

- Wire-level Transport
  - Getting point A and point B to talk to each other
  - The carrier
  - HTTP, SMTP, FTP,…
- Business-level Transport
  - Getting point A and point B to understand each other
  - The envelope
  - SOAP, ebXML, XML-RPC, …

Transport Protocols

- TCP/IP
  - If we're talking Internet, this is all we're talking about
  - Ok, UDP too, but not really much any more
- LAN Transport protocols
  - Windows
  - UNIX
  - But, we don't care much about these any more
- EDI VANs
  - XML over the VAN?
- Direct Dial-up
  - What, are we still in the 80's (or early 90's)?

101

XML & WebServices 2003

Transfer Protocols

- Here's where it gets more interesting
- HTTP
  - The basis of the Web
  - Single Connection Request / Response
- SMTP
  - The basis for email (along with POP)
  - Asynchronous communication mechanism
- FTP
  - Meant for file transfer over Internet
  - Synchronous communication mechanism

101

XML & WebServices 2003

HTTP

- Synchronous
- Request / Response
- The Goal of HTTP
  - I want a web page
  - Here it is, now go away.
- Advantages of HTTP
  - Ubiquitous and Familiar
  - Lots of existing code
  - Firewall friendly
  - Compact
- Uses Octet-counting (the header says how big the body is)
  - The Server doesn't need to look at the data

101

XML & WebServices 2003

Problems with HTTP

- Conversation is Unilateral
  - A Client initiates the request
  - The Server terminates it
  - The session doesn't persist past one "conversation"
- Requests have mandated length
  - Servers can truncate requests that are too long

101

XML & WebServices 2003

SMTP

- Been around since 1981
- Individual Connection is Synchronous, but overall process is Asynchronous
- Send a message, wait for response
  - Seconds
  - Hours
  - Days
  - Never
- Goal of SMTP
  - Here's some mail.
- Uses Octet-stuffing (line-oriented)
  - The server needs to look at the data

101

XML & WebServices 2003

FTP

- Synchronous
- Here's a File
  - Did you get it?
  - File interruptions
- Uni-directional
  - No real opportunity to respond
  - No real reason to respond
- Uses Connection-Blasting
  - New connections established for each exchange
  - Separate command and data pipes

101

XML & WebServices 2003

What we REALLY need

- Reliability
  - Connection reliability
  - Non-repudiation
  - Transaction Control
- Security
  - Encryption
  - Authentication
  - Authorization
  - (Privacy)
- Synchronous and Asynchronous Modes
- Bi-directional Communication

101

XML & WebServices 2003

The EDI VAN

- EDI in a Nutshell
- What the VAN offered (offers)
  - A Private Network
  - Security
  - Non-Repudiation
  - Transaction Control
  - A degree of commonality

101

XML & WebServices 2003

A Better HTTP

- HTTPR
  - "Reliable delivery of HTTP packets between the server and client." -- IBM
- HTTP 1.1 is the base protocol
  - SSL
  - Proxies and Firewalls
  - Keep-alive, etc.
- Features
  - Transaction control (once and only once)
  - Non-repudiation (guaranteed delivery)
- Mechanism
  - Keep trying to send until acknowledgement or timeout
- Challenges
  - Server needs persistent store
  - Server needs to record steps
- The Idea of the End-point manager
  - Queuing

101

XML & WebServices 2003

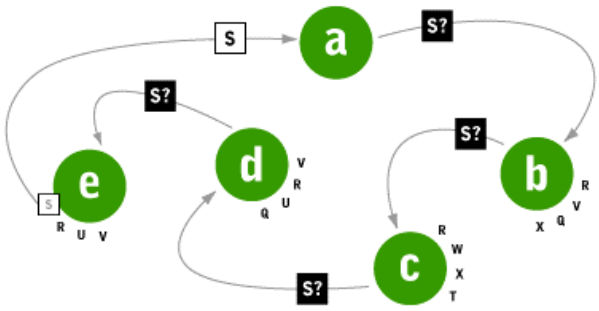
P2P or P2P?

- Point-to-Point (ok, Client/Server)
  - One side designated a server, the other client
  - Browser and Server
  - HTTP, SMTP, FTP…
- Peer-to-Peer (the real P2P)
  - Any side can be a server or client for a particular conversation
  - Instant Messaging
  - Napster
  - Some say Client/Server is a subset of P2P

101

XML & WebServices 2003

Peer to Peer



101

XML & WebServices 2003

Jabber

- Orignially: an open-source IM System
- Real-time messaging
  - Not store-and-forward
- Client/server model
  - Coordinated through a server
  - Subsequent application-specific activities are client-to-client
- Knowledge of availability
  - Presence
  - Servers know when a user is online
- A Network of Servers
  - Each user associated with a particular server
  - Jabber ID's similar to email addresses
- Very Simple client: Just TCP and XML!

101

XML & WebServices 2003

Application-level Transport

- The Envelope
- Components of an Envelope
  - The Addressee (Destination)
  - Return Address (Source)
  - Transaction Control (The Stamp)
  - Non-Repudiation (Return receipt and cancellation)
  - Security (non see-through envelope)
- And some extra stuff…
  - Routing (Behind the scenes at the USPS)

101

XML & WebServices 2003

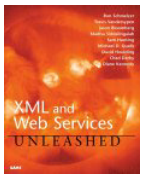
Components of the Problem… Revisited

- Reliable Messaging
- Reliable Transactions
- Process Definition
- Process Execution

101

XML & WebServices 2003

Thank You!



Jason Bloomberg & Ron Schmelzer of ZapThink are coauthors of *XML and Web Services Unleashed.*

zapthink

ZapThink is an industry analysis firm focused exclusively on XML and Web Services.

Find out more about ZapThink at www.zapthink.com

Ronald Schmelzer
rschmelzer@zapthink.com