Designing Service Collaborations: The Design of ‘Wire’-Centric Integration

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The ‘Wire’ Is the ‘Computer’

In the past, integration design was focused on middleware.

Today, the internet is the focus. ‘Wire’ design is global, non-proprietary, and platform-independent.

This session presents an overview of ‘wire’ centric design and describes several ‘wire’ design best practices.

Agenda

Focus shifts to the ‘wire’

What the ‘wire’ isn’t

What the ‘wire’ is

‘Wire’ design

‘Wire’ design best practices

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The ‘Wire’

…Or the ‘what’ beyond my code

- Network context
  - Code’s view of its ‘wire’ consumers
  - Code’s view of its ‘wire’ suppliers
- Network community
  - Attracting and retaining consumers
  - Leveraging suppliers
  - Stability with constant change
  - A ‘wire’ economy

‘Wire’ Supplier Concerns

- Consumer is king
- Evolve to survive
- Consumer tail is the ‘wire’
- The ‘wire’ is the product
  - Make it flexible
  - Provide a full consumer view

‘Wire’ Consumer Concerns

- Depending on suppliers is risky
- It’s useful to reverse proxy supplier ‘wires’
- Important ‘wire’ properties
  - Visibility
  - Stability
  - Security
  - Performance

eBusiness Is the Goal

- ‘Wire’ infrastructure
- ‘Wire’ collaboration
- ‘Wire’ centric design

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The ‘Wire’ Isn’t a Program

- It isn’t a remote procedure
- Don’t use it to pass control
- Code composition principles don’t apply to it

The ‘Wire’ Isn’t a Component Model

- It doesn’t have a constructor
- It doesn’t need to be configured
- It isn’t ‘reused’
- It isn’t ‘contained’

The ‘Wire’ Isn’t Reliable

- The network is unreliable
- Suppliers and consumers
  - Fail
  - Have bugs
  - Duplicate work

The ‘Wire’ Isn’t Static

- Evolution is the rule
- Coordinating change is hard
- The ‘wire’ has a tail

The ‘Wire’ Isn’t an Architecture

- Architectures are conceptual abstractions
- The ‘wire’ is not an abstraction
  - It doesn’t exist until it’s available for use
  - An abstract supplier is useless
  - The ‘wire’ can’t be separated from the stack of internet standards that are its foundation

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The ‘Wire’ Is Global

- Global: no technical barriers to global access
- A non-global ‘wire’ is a contradiction-in-terms
- Global access is a fundamental ‘wire’ attribute
- Global computing is the HTTP stack
- Be suspicious of non-HTTP ‘wires’

The ‘Wire’ Is Peer-to-Peer

- Many collaborations require participants to be both suppliers and consumers
- Client-server concepts are too limiting
  - Session ‘cookies’ aren’t useful
  - Pseudo conversation modes aren’t useful
- Correlation is at the business layer not the protocol layer

The ‘Wire’ Is Asynchronous

- The ‘wire’ spans sessions
- The ‘wire’ interleaves its work
- The ‘wire’ is more ad hoc than conventional integration
- The ‘wire’ requires correlation to function

The ‘Wire’ Is a Network Resource

- The nature of network resources continues to evolve
- Composition of network resources defines a new computing space
  - It is fundamentally different than code composition
  - In some ways it has become more important than code composition
  - We have experience with the browser aspect of network composition but are just beginning to learn about ‘wire’ composition

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Message Exchange Patterns (MEPs)

- The units of ‘wire’ collaboration are MEPs
  - HTTP Put, Post, Get, Delete
  - WSDL 2.0 MEPs
  - AS 2.0 MEPs
- Transient message exchanges
  - Within HTTP session
  - Transport single message and quick acknowledge/response
- Design focus
  - Select MEP
  - Define the message/response it transports

Conversations

- Correlated message exchanges
  - Span HTTP sessions
  - Related by correlation values exposed via message properties
  - Peer-to-peer
- Design focus
  - Define the roles
  - Define the correlations
  - Define the life cycle
  - Define the shared state

Shared State

- The semantics of collaboration
  - Conversation
    - The message exchanges used to move the shared state of a collaboration through its life cycle
  - Shared state
    - The state that the roles in a collaboration semantically share as the representation of their common goal
- Visibility of shared state
  - Shared state may be implied but not accessible
  - Correlation values are ‘links’ to shared state
  - The more visible its shared state is, the more stable a collaboration is

Collaboration Evolution

- Collaborations aren’t static
- Participants don’t evolve in lock-step
- The tail of a collaboration must continue to function
- While the XML messages evolve well, the XML Schema that describe them don’t
  - Don’t assume that message evolution can be contained within a single XML Schema
  - Don’t over-complicate message schemas with ‘extension points’
  - Assume that new versions of messages may use new schemas

The ‘Wire’ Is the Collaboration

- The ‘wire’ is the technical definition of a collaboration
- The simpler it is, the easier it is to collaborate
    - Use the least complex, most universal ‘wire’ possible
    - Decide what not to use
    - Visibility is important for stability
- ‘Wire’ policies are collaboration policies
    - Collaboration participants have internal policies just like they have internal state and semantics

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#1: A Wire Design Separates the Wire From the Applications That Use It

- The Collaboration design is a complete design element that captures the full semantic content of the collaboration and stands apart from the applications
- Throw away the implementation of the roles and still be left with a complete collaboration design that documents well-defined semantics
- A third-party should be able to follow everything that’s going on, about all the messages that flow through the system by just looking at the design

#2: Use Unique Element to ‘Wrap’ Each Business Message

- Business messages may contain one or more business objects that they carry
- If you have a complicated interchange that has multiple business objects to it, aggregate these messages together by wrapping them
- Ensure that the container of the wrapped messages has a unique top-level element name
- This wrapper can serve as an open-ended container that sets the business context for what to do with these messages and ensures these messages are self-defining

#2: Use Unique Element to ‘Wrap’ Each Business Message…

```
<?xml version="1.0" encoding="UTF-8"?>
<NewPurchaseOrder version="1.0">
  <Originator>
    ...
    <Role>Seller</Role>
  </Originator>

  <Receiver>
    ...
    <Role>Buyer</Role>
  </Receiver>

  <PurchaseOrder>
     ...
  </PuchaseOrder>
</NewPurchaseOrder>
```

#3: For Large Messages Use MTOM

- If the exchanged Business Objects are large, use MTOM
- Create a wrapper message that can contain multiple different types of files
- The wrapped message can then serve as a virtual message
- Use multi-part MIME to physically carry the message so at any point, you don’t have to parse the entire message at once

#4: Version Number Message Wrappers

- Explicitly add a version number attribute to the first element of both the request and the response message
- This will ensure the Message Exchange Pattern (MEP) and the schema of the exchanged messages evolve in tandem
- You now have complete control over how to evolve the MEP

#4: Version Number Message Wrappers

```
<!-- Version 1.0 message -->
<?xml version="1.0" encoding="UTF-8"?>
<person version="1.0">
    <firstName>John</firstName>
    <lastName>Doe</lastName>
</person>

<!-- Version 2.0 message -->
<?xml version="1.0" encoding="UTF-8"?>
<person version="2.0">
    <firstName>John</firstName>
    <middleInitial>A</middleInitial>
    <lastName>Doe</lastName>
</person>
```

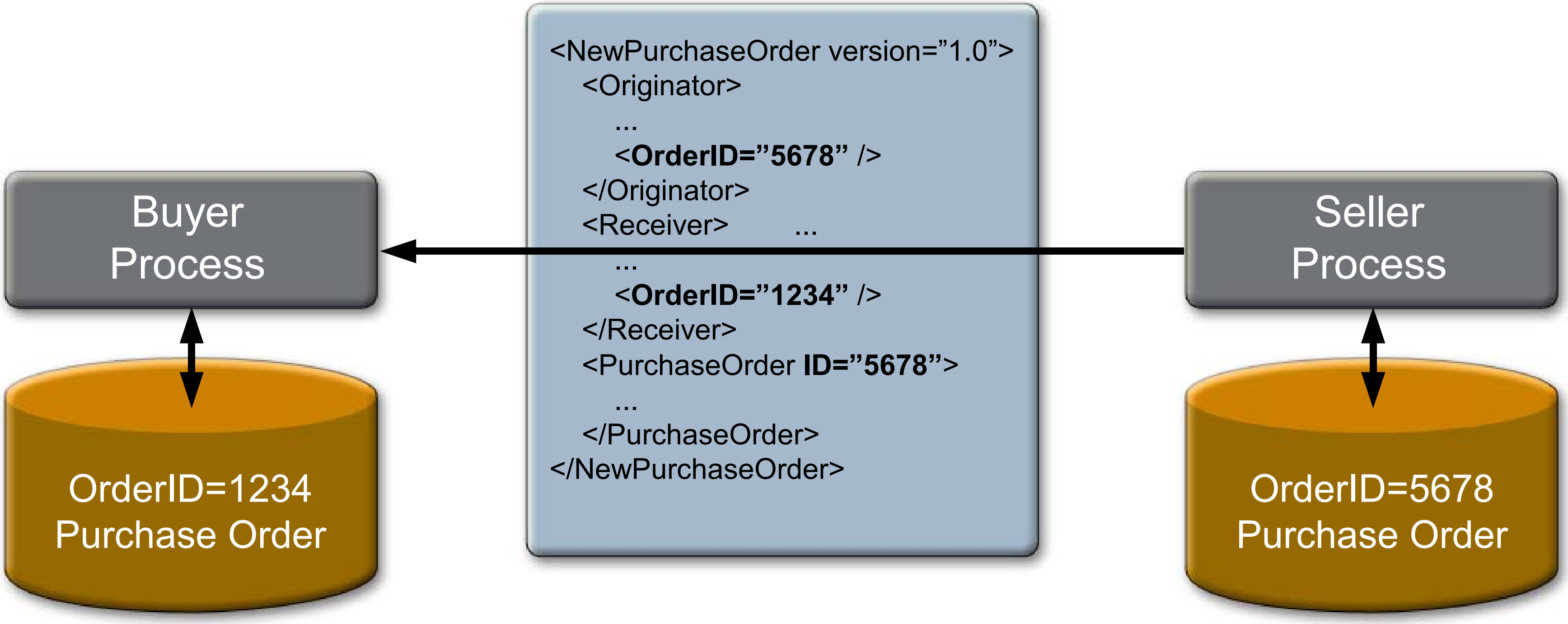
#5: Protocol Is Not Part of the Business Message

- A message has a header and a body
- However when you want to persist the data in a database for further processing, you only persist the message body since that contains the business data
- Therefore the Message body has to stand alone—do not place information that you will need to reuse to process a collaboration in the Message header
- Caveat: Do not use SOAPAction to route messages

#6: Identify Shared Conversational State Upfront

- Conversations have an implied semantic state that participants can share and refer to the shared state in the message body to keep track of message relationships
- Identify element(s) in the message that can serve as a shared state-holder, e.g., unique business specific identifiers that are customer specific, like SSNs, Claim Numbers, PO ids, etc.
- Ensure that these values are easy to find in the message body by clearly defining XPath queries to extract the identifier(s) from within each message

#6: Identify Shared Conversational State Upfront…



```
<NewPurchaseOrder version=”1.0”>
   <Originator>
      ...
      <OrderID=”5678” />
   </Originator>
   <Receiver>        ...
      ...
      <OrderID=”1234” />
   </Receiver>
   <PurchaseOrder ID=”5678”>
      ...
   </PurchaseOrder>
</NewPurchaseOrder>
```

- Correlation identifiers:
  - /NewPurchaseOrder/Originator/OrderID
  - /NewPurchaseOrder/Receiver/OrderID

#7: Use Correlation Values to Reference Shared State

- Share conversational state on the wire using self-defined correlations in the message
- This ensures that subsequent processes in the collaboration tail can correlate the response to a specific request
- The identifier(s) placed in the Message Property can serve as correlation identifier(s) that tie together message instances with a particular conversation

#8: Use Separate MEPs for Business Responses

- When dealing with stateful interactions, mandating a business response as part of a single request/response MEP overly restricts the asynchronous collaboration that is required
- Often the business response is not available quick enough to place the acknowledgment into the response
- The only way the business response can fully be decoupled from messages that produce them is to place the acknowledgment in a separate MEP

#9: The Wire Always Goes Forward

- Compensation is an application level function that defines the semantics for resolving issues that come up with in-flight instances; It is better handled by providing application level ‘cancellation’ functions
- Think of the Collaboration as an entity that relentlessly pushes forward—it may change but it never ‘goes back’ to a previous state
- If things get hopelessly stuck, then cancel and take whatever business hit cancellation costs (such as canceling a nonrefundable flight reservation)

#10: Contract First Development (Top-Down)

- Also called Design By Contract
- Create the data contract in XSD and the behavioral contract in WSDL upfront
- Use the XSD and WSDL editors provided by the NetBeans™ Software SOA Pack to do this
- This approach forces the designer to focus on messages and contracts as the key concepts in designing a service contract

#11: Prefer Use of Document/Literal Rather than RPC

- Prefer ‘document’ encoding and ‘literal’ use over other types for interoperability
- It is better-suited for coarse-grained interactions and better represents the data exchanged
- It provides the ability to validate the XML data if the XML Schema is available
- Ability to Transform messages using XSLT easily
- Provides better performance than other encoding/use styles
- Since the service interface in the WSDL clearly defines the types of documents expected, it makes it easy for the consumer

#12: For Asynchronous, Peer-to-Peer Collaborations Use Multiple MEPs

- MEPs are transient message exchange elements
- If there is work that can be accomplished in a single, one-shot, stateless, self-contained collaboration, use a single MEP
- For long-running, conversational, peer-to-peer collaborations, where there is an asynchronous lag between a request and a response with shared state use multiple MEPs with correlations
- You cant have an asynchronous collaboration without having peer-to-peer message exchanges

#13: Don’t Expose Unnecessary Details in the Service Contract

- When exposing your existing applications as services:
  - Analyze your existing architecture
  - Define a service contract
  - Define a logical architecture that you want to migrate to
  - Refactor your existing architecture by exposing appropriate facades to match the service contract
  - Migrate your implementation to conform to the logical architecture
- In service orientation you are exposing services not objects

#14: Don’t Use WS-Addressing Cookies for Acknowledgments

- WS-Addressing requires you to use cookies in the header to perform callbacks
- However, in an asynchronous, peer-to-peer exchange scenario, where the response is not immediately available, the data may have to be persisted to database until the business response is available
- In such a case, the message body that has the business data and the correlation values will be persisted to the database and the header with the WS-Addressing cookie data will be thrown away

#15 Maintain Secure Conversation With Users Often Communicating With You

- Efficient strategy is to maintain a secure conversation with those users who are often communicating with each other in a fairly high bandwidth way
- Based on amount of communication between the provider and a consumer, consider setting up a secure conversation with partners that you are frequently communicating with

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http://open-esb.org

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JBI = Java Business Integration

Q&A

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