



Asynchronous Services - The key to enterprise SOA

Johan Eltes
Callista Enterprise AB



Agenda

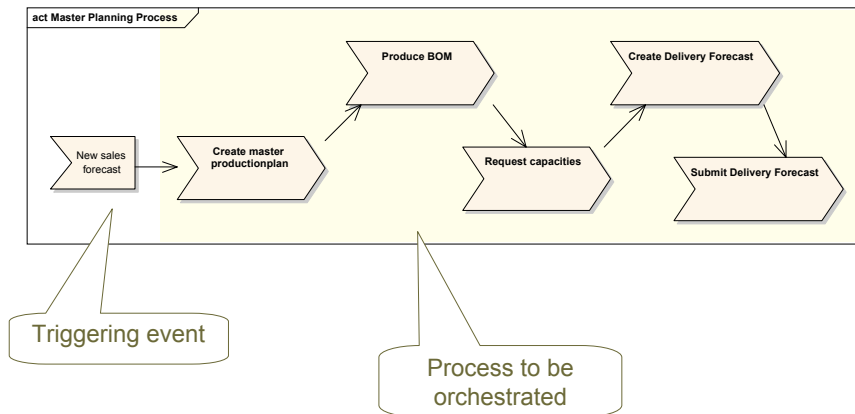
- Why asynchronous services are important
- Asynchronous Message Exchange
- Quality-of-service
- Web-Service technology
- Interoperability of asynchronous web services
- Deploying SOA integrations to an ESB
- Summary
- Q&A

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Why asynchronous services are important

Business Processes are asynchronous

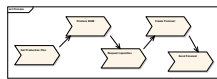


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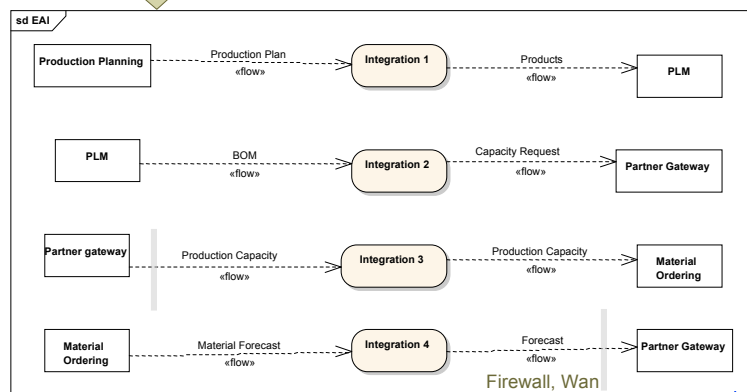


Why asynchronous services are important

Enterprise Application Integration



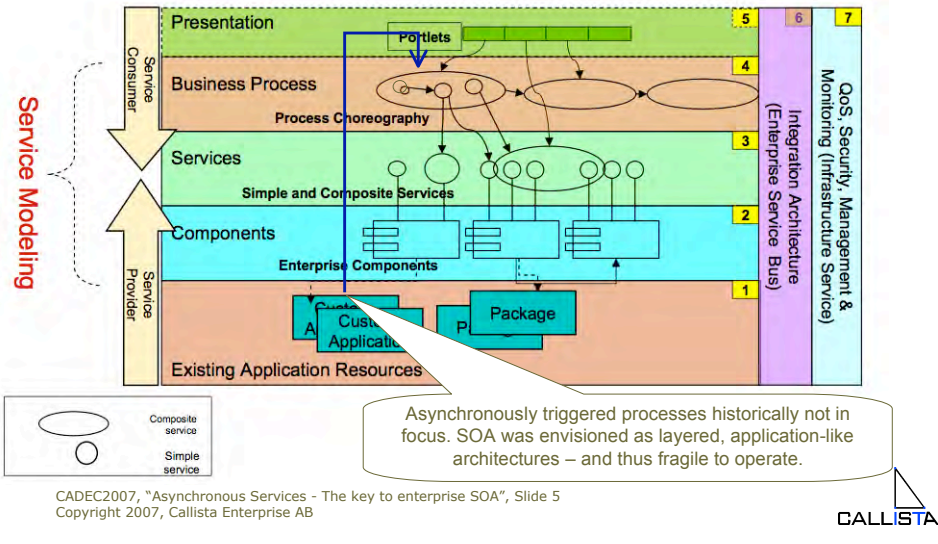
Business process transformed into independent stateless flows: Low visibility of process.



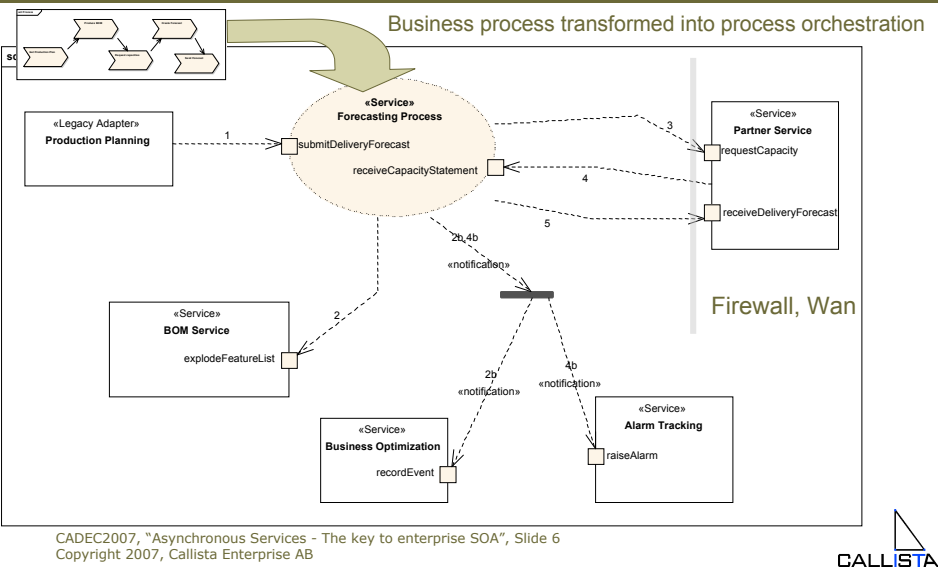
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SOA emerged as layered composition model

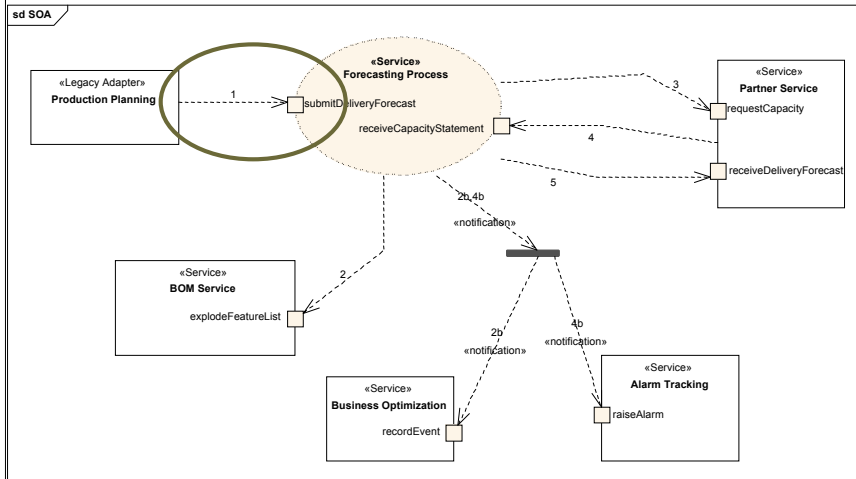


SOA based integration



Why asynchronous services are important

Asynchronous services: Stateless, batch one-way service invocation

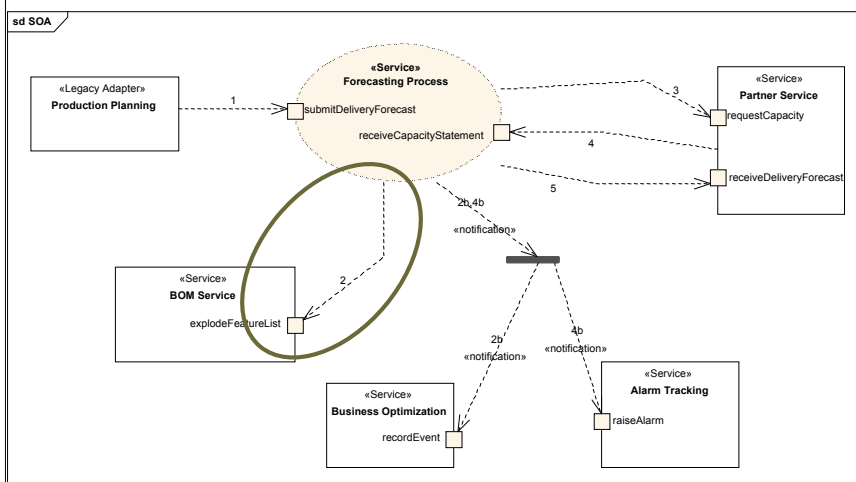


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Why asynchronous services are important

Synchronous service: Request-response

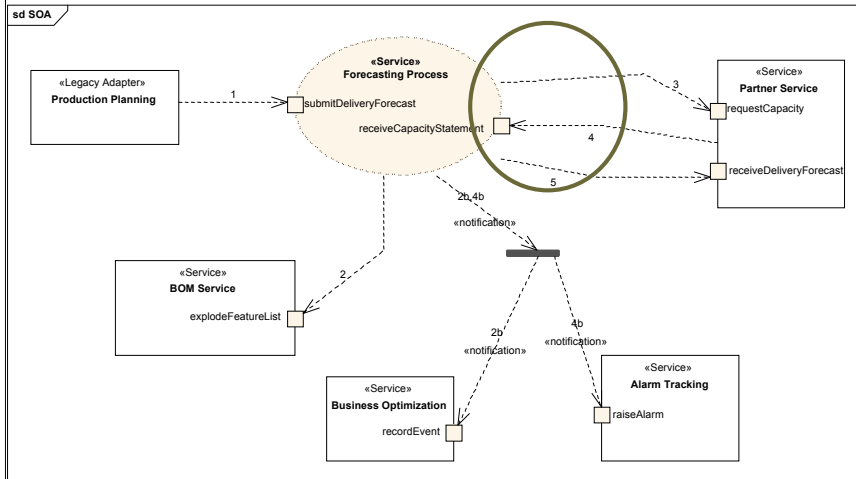


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Why asynchronous services are important

Asynchronous services: Stateful conversation

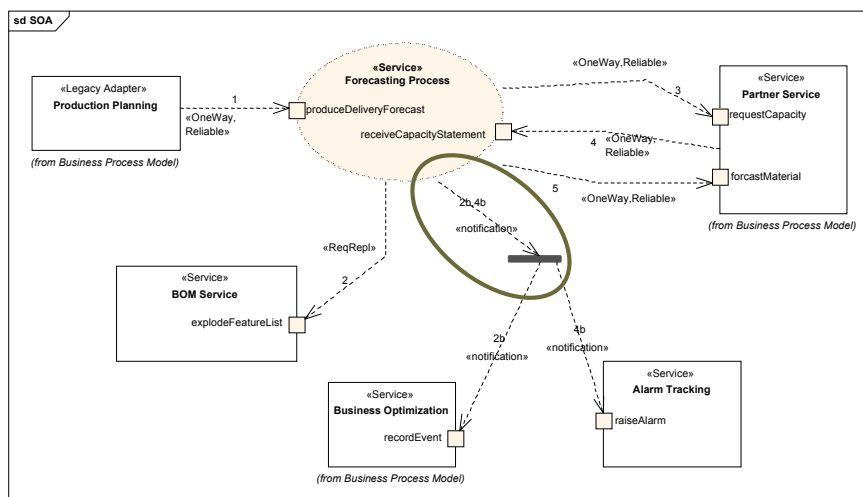


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Why asynchronous services are important

Asynchronous services: Event-driven services



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Why Asynchronous Services – Summary

- Business-to-Business over the internet
 - Asynchronous by nature
 - COTS B2B gateways too complex/expensive for smaller businesses (Rosetta net, edifact...)
- Event-driven architectures
 - Asynchronous by nature (publish / subscribe)
 - Unsolicited events for alarming and business process monitoring
- When (very) loose coupling is required
 - Large, synchronous call stacks (“large service depth”) are fragile
 - Different operations cycles and uptime requirements may require asynchronous de-coupling

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Asynchronous Message Exchange

- Why asynchronous services are important
- **Asynchronous Message Exchange**
- Quality-of-service
- Web-Service technology
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Asynchronous Message Exchange

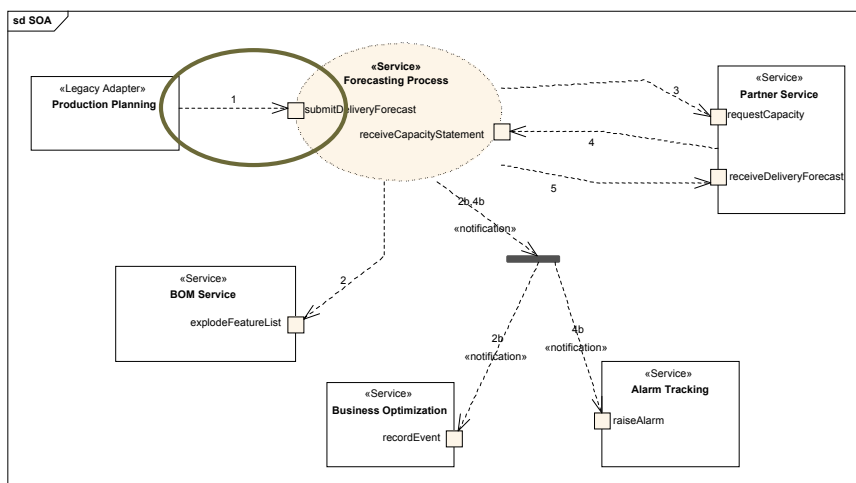
- One-way
- Request/Response with callback
- Bi-directional with callback
- Message Correlation
- Stateful Conversations
- Mediation (intermediaries)

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Asynchronous Message Exchange

One-way

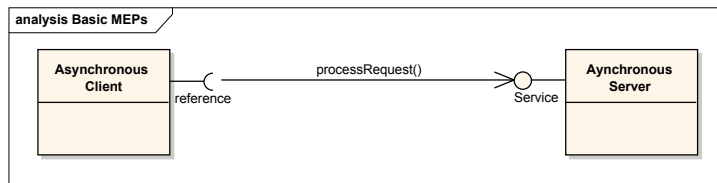


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One-way

- One-way service
 - Operation has no response message

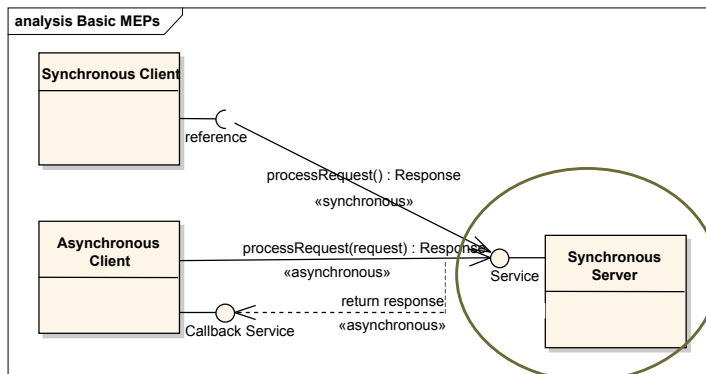


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Request/Response

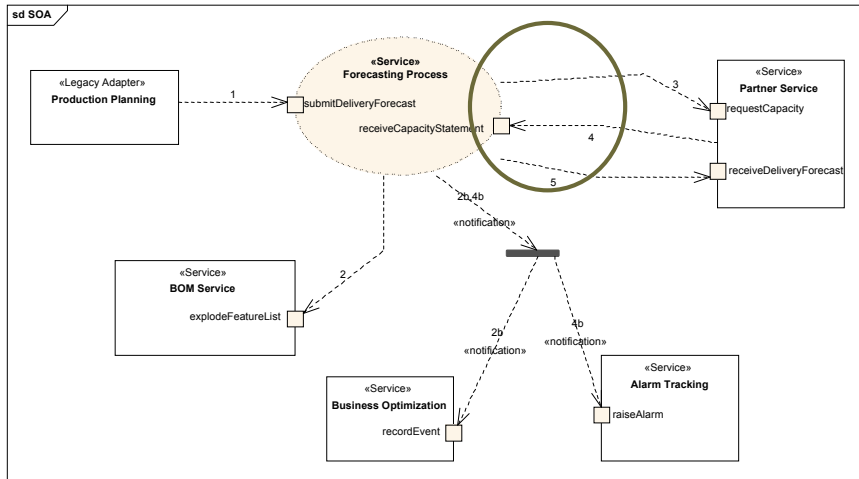
- Request/Response Service – Operation has response-message
 - Response message becomes implicit callback
 - *Asynchronous use not supported by BPEL*



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Bi-directional with callback

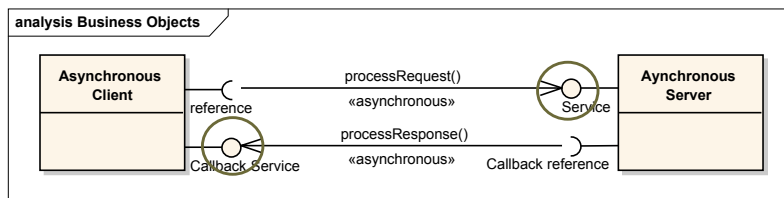


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Bi-directional with callback

- Server logic explicitly sends the response through a callback interface
- Tight coupling between service- and callback interfaces
 - WS Design best-practice: Server Service + Client callback Service in same WSDL

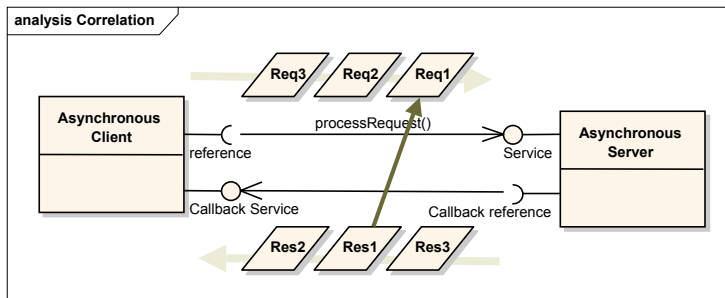


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Message Correlation

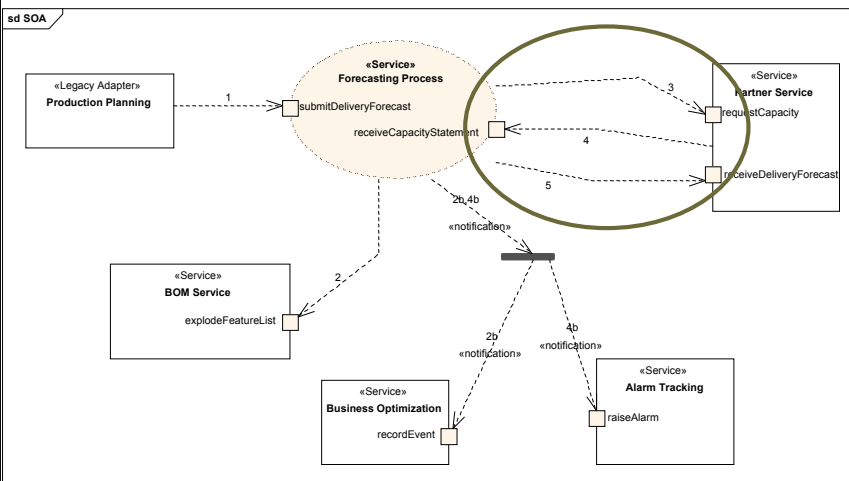
- Request and response of bi-directional message exchanges needs to be correlated
 - ...when client is stateless
 - Responses will be processed in parallel
 - Requests will be processed in parallel



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Message Correlation

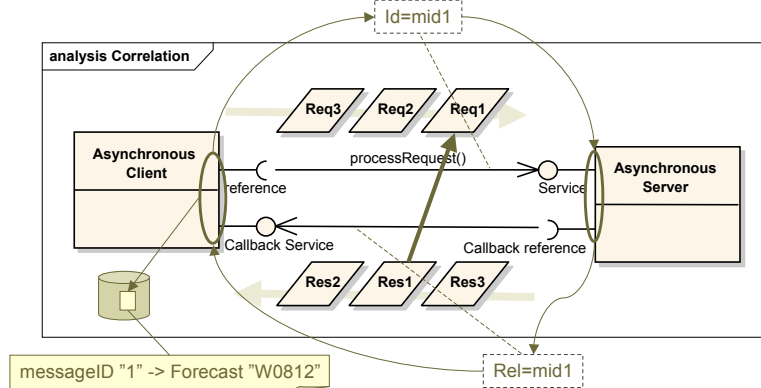


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Message Correlation – Protocol Support

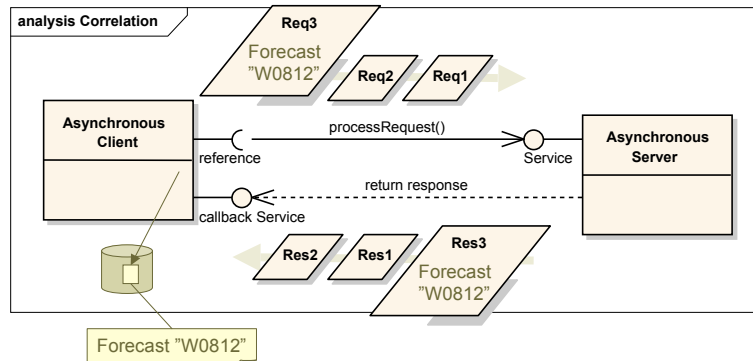
- Message metadata carries a technical / generated correlation identifier
- Stateless client has to “remember” association between correlation identifier and business context



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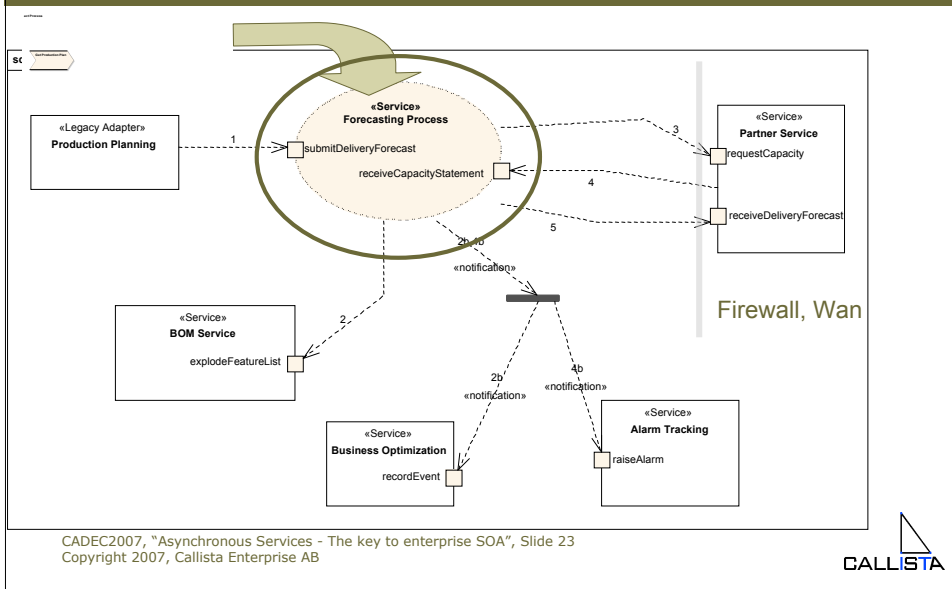
Message Correlation – Application managed

- Requires that request- and response message content share a business identifier
- Stateless client has to “remember” association between correlation identifier and business context
- *Can not handle parallel callbacks for the same “business object”*



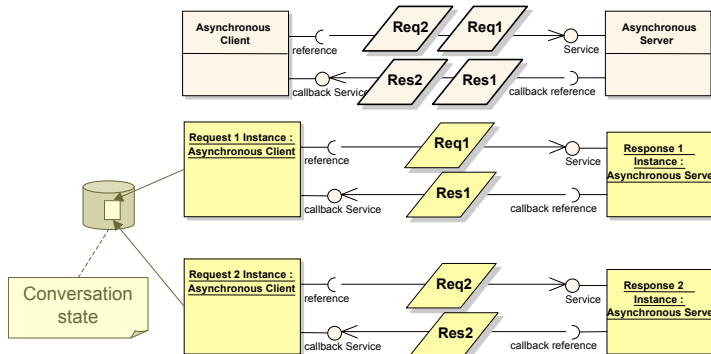
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Stateful Conversations Transparent Correlation



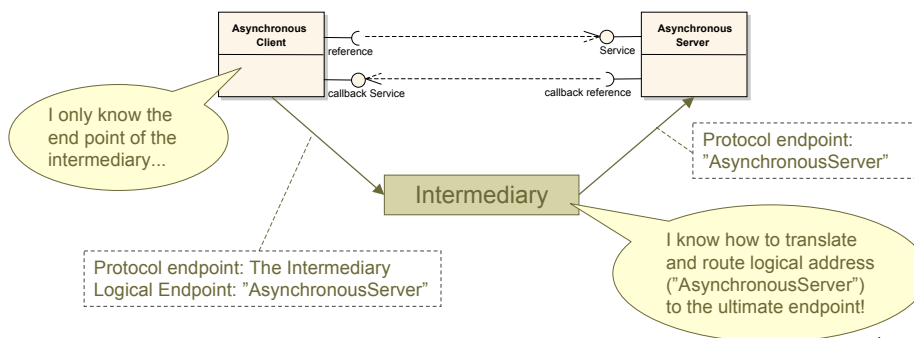
Stateful Conversations Transparent Correlation

- Conversations are virtually stateful
 - Infrastructure aware of "Server Instances" (incl. protocol)
 - Practically stateless, due to passivation (e.g. in database)
 - Can handle parallel callbacks for the same "business object"



Mediation (intermediaries)

- De-coupling of endpoint address from service
- Common in traditional messaging systems
- Foundation for service-oriented message bus



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Asynchronous Message Exchange

- Why asynchronous services are important
- Asynchronous Message Exchange
- **Quality-of-service**
 - Web-Service technology
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Quality-of-service

- Typical QoS requirements for asynchronous messaging
 - Reliable transmission of messages (requests and responses)
 - Secure transmissions (out-of-scope for this presentation)
 - Robust error handling
- Reliability requirements for message transmission
 - Once and only once
 - All messages have to arrive
 - Requirements on transmission time
 - In order
 - arrive in same sequence as produced
- Transaction coordination
 - Mainly for mediation activities – depends on underlying messaging system

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Web-Service technology

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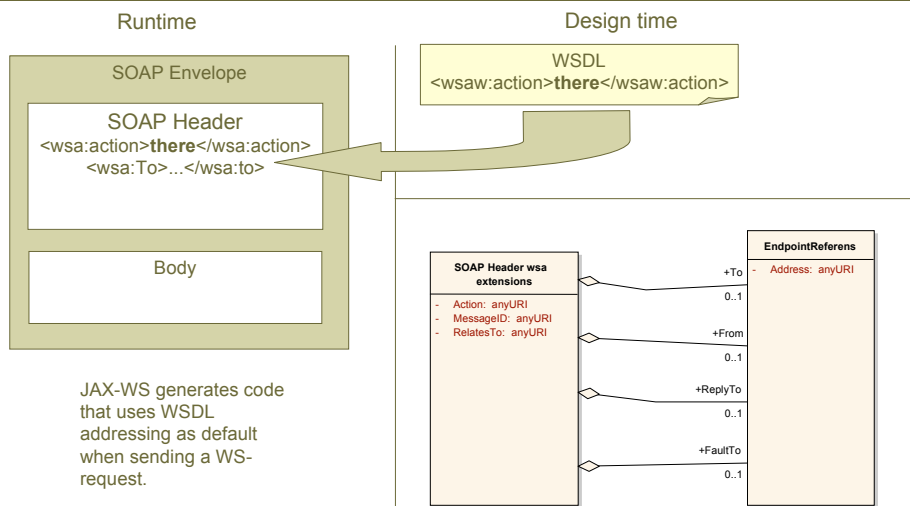
Web-Service technology

- **WS-Addressing**
 - Foundation for routing. Re-used by other specs in this list
- **WS-Reliable Messaging**
 - Reliable point-to-point transport for web-services
- WS-Notification framework
 - Publish / Subscribe model for web-services
- **WS-BPEL**
 - High-level language for synch orchestration of web services.
- Service Component Architecture
 - Provides generalized support for stateful synch conversations between service component wires (not only for web-services and not only for Java)

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WS-Addressing: Foundation for routing

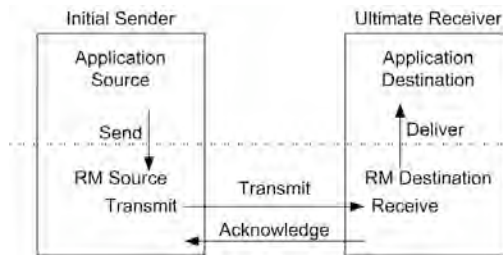


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WS-ReliableMessaging

- SOAP extension for reliable transmissions of SOAP messages
- Supports any protocol with SOAP binding (HTTP, SMTP etc)
- Features
 - Handshaking
 - Re-send of lost transmissions
 - Preserve message sequence
 - WSDL integration through WS-Policy

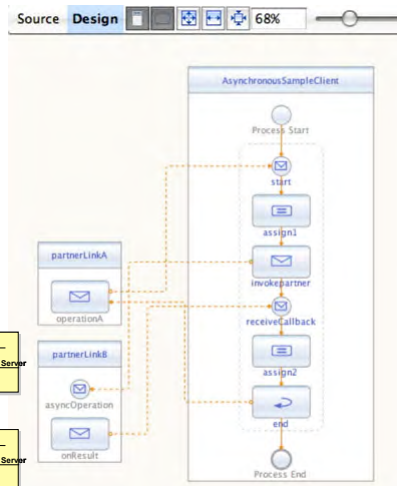
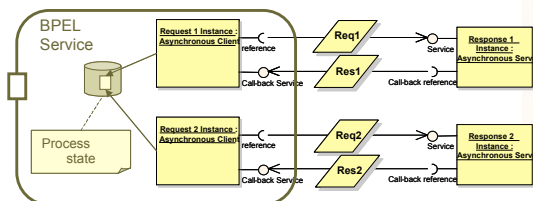


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WSBPEL

- XML-based language designed for service-based integration in a process-centric way
- *Does not support asynchronous Req/Response*
- Built-in support for application-level message correlation
- Support for Stateful Conversations



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Summary: WS-* support for asynchronous SOA

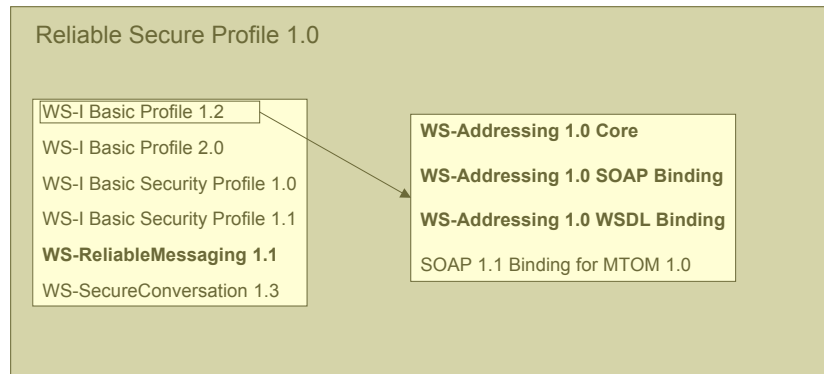
- All message exchange patterns except re-use of synchronous services
 - BPEL restriction
- Separation of transport address and logical address through “intelligent messages” (WS-Addressing)
- Support for un-reliable SOAP transports (WS-ReliableMessaging)
- Support for message sequence and re-send (WS-ReliableMessaging)
- Dedicated language (BPEL) for orchestration of business processes

Interoperability of asynchronous web services

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Interoperability of asynchronous web services

- WebService-Interoperability is now focusing on messaging aspects of web-service standards



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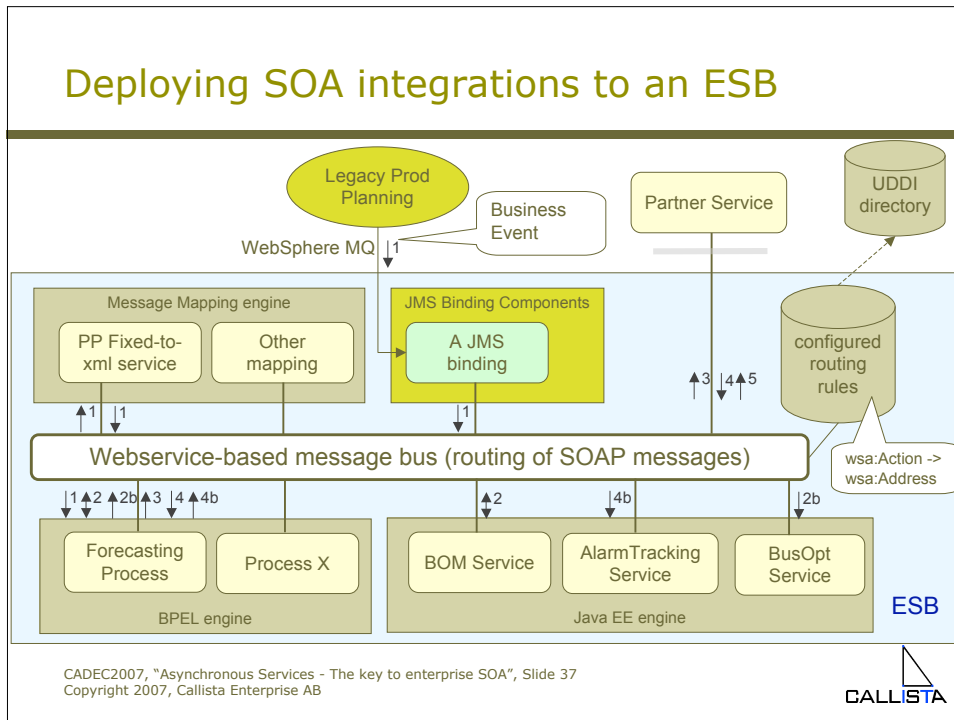
Deploying SOA integrations to an ESB

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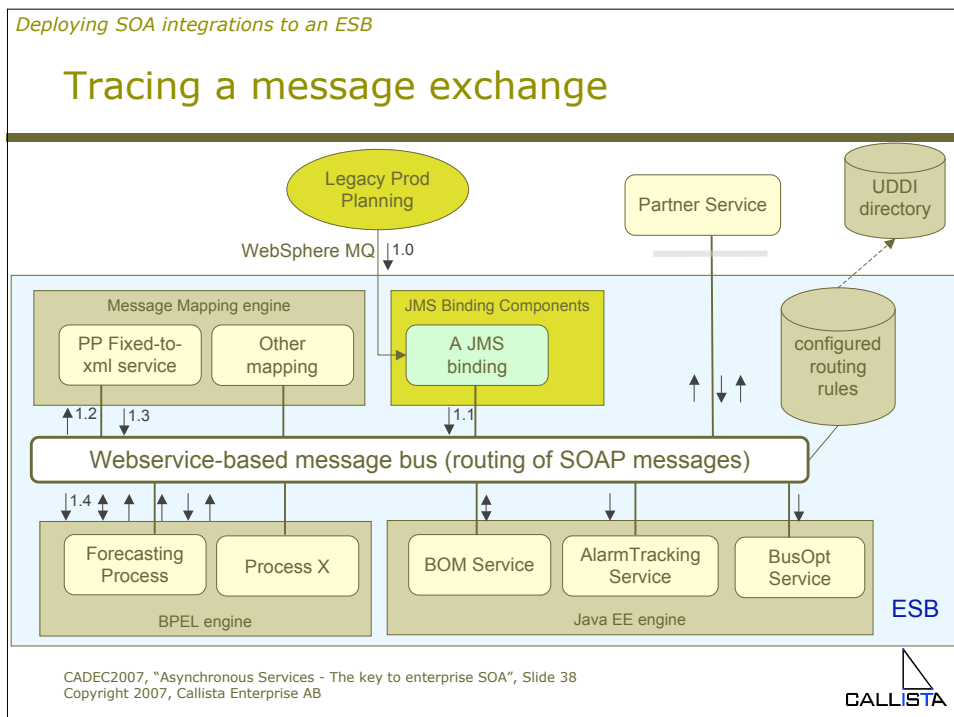


Deploying SOA integrations to an ESB



Deploying SOA integrations to an ESB

Tracing a message exchange



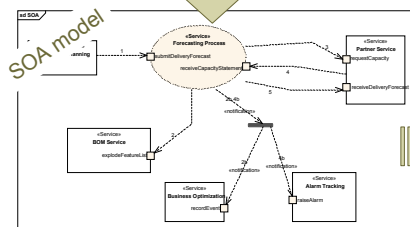
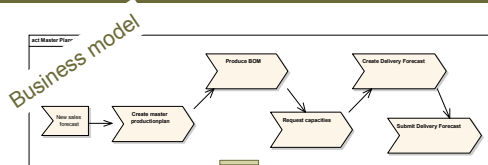
Summary

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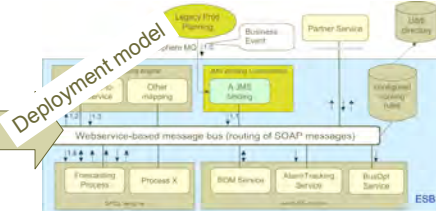
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Summary



- SOA is a powerful architecture for business process integration
- Asynchronous message exchange patterns are essential
- Services needs to be designed for asynchronous process orchestration
- Use the ESB as a model when implementing a service-oriented runtime



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Q & A



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