

Middleware and Web Services

Lecture 6: Integration Patterns

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Humla v0.3

Enterprise Service Bus

- ESB is a central intermediary in SOA
 - *Types of services: shared and infrastructure*
 - *Types of processes: Technical and Business*
- ESB Application
 - *Application running on an application server*
 - *Exposes functionality via Web service interface*
 - *Allows to communicate with various messaging protocols*
- Integration Patterns
 - *Technical-level interoperability – message broker*
 - *Location transparency*
 - *Dynamic routing*
 - *Data transformations – mediator*
 - *Resequencing of messages*
 - *Session pooling*
 - *Service orchestrations – BPMN, BPEL*
 - *Message enrichment*

Major Vendors

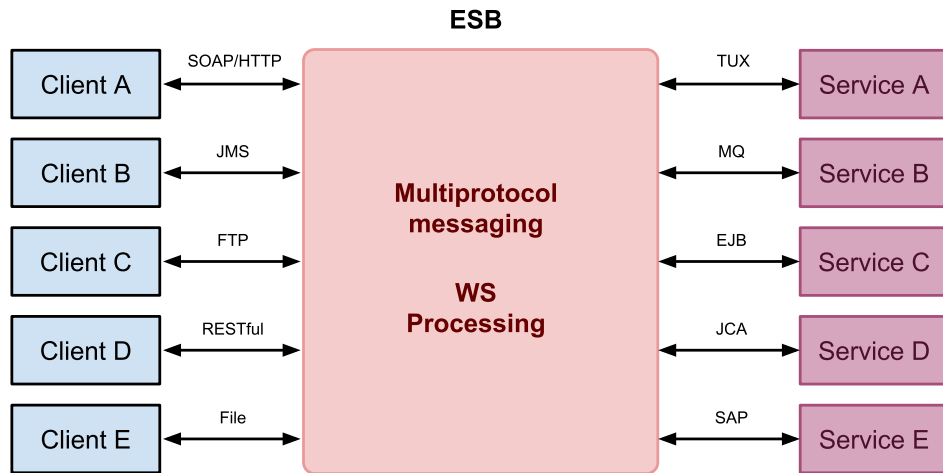
- Oracle
 - *Oracle Service Bus (OSB)*
 - *Oracle SOA Suite*
 - *Oracle Enterprise Gateway (OEG)*
- IBM
 - *IBM WebSphere*
- SAP
 - *SAP NetWeaver*
- Microsoft
 - *.NET Framework*
 - *BizTalk server*
- Opensource
 - *JBoss*
 - *Apache ServiceMix*
 - *WSMX – Semantic Web Service Execution Environment*

Integration Patterns

- Applied in implementation of business services and processes
 - *Usually a combination of more patterns*
- Technical patterns
 - *Deals with technical aspects of service communication*
 - *Message broker – technical-level interoperability*
 - *Location transparency*
 - *Session pooling*
- Business patterns
 - *Deals with business aspects (message content) of service communication*
 - *Dynamic routing*
 - *Data transformations – mediator*
 - *Service orchestrations – BPMN, BPEL*
 - *Message enrichment*
 - *Resequencing of messages*

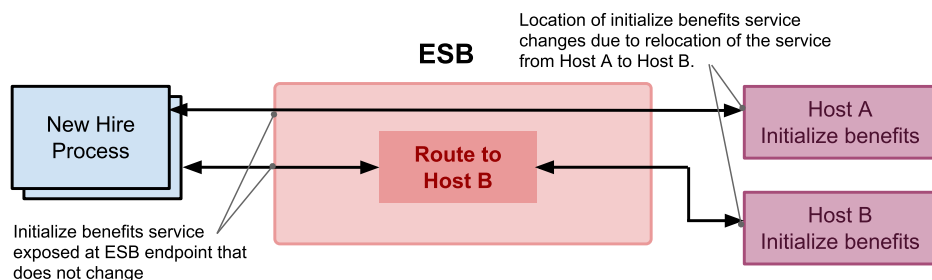
Message Broker

- Message broker
 - ESB can mix and match transports both standard and proprietary



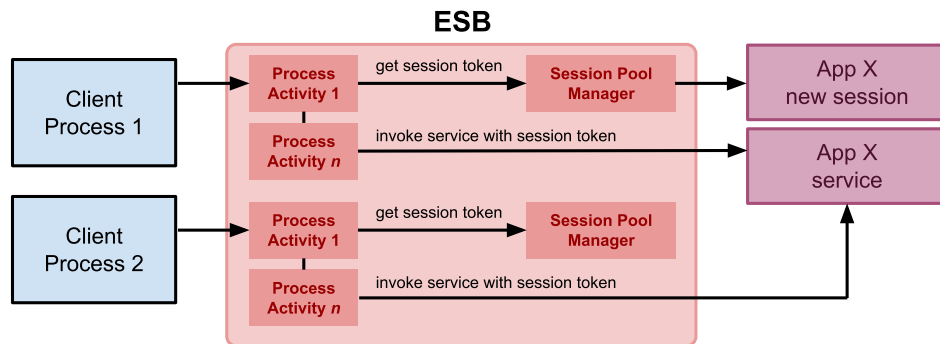
Location Transparency

- Location transparency
 - ESB can hide changes in location of services
 - Such changes will not affect clients
 - Can also be used for load balancing for multiple service instances



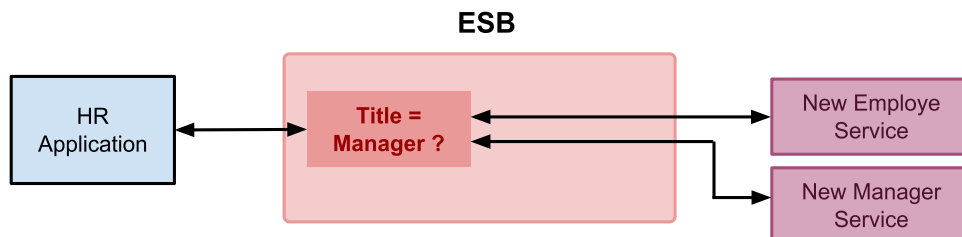
Session Pooling

- Session Pooling
 - ESB can maintain a pool of connections (session tokens) to a back-end app when creating a new connection is expensive
 - A single session token can be reused by multiple instances of business processes



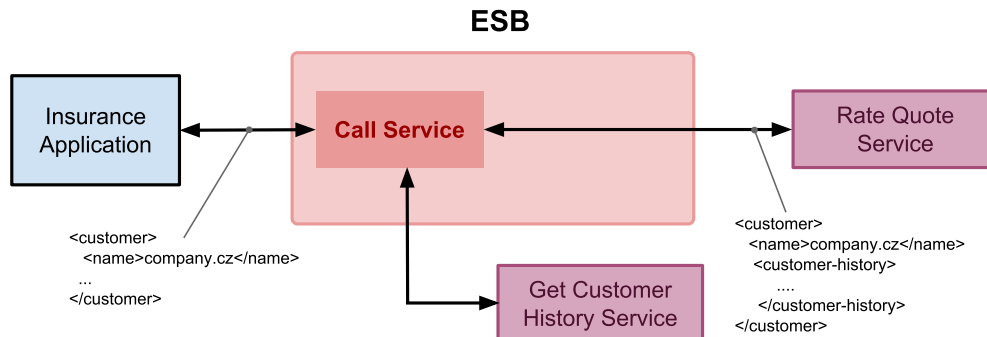
Dynamic Routing

- Dynamic routing
 - ESB exposes a service that routes to various back-end services based on message contents.



Message Enrichment

- Message enrichment
 - Enriches a message before invoking back-end application service.

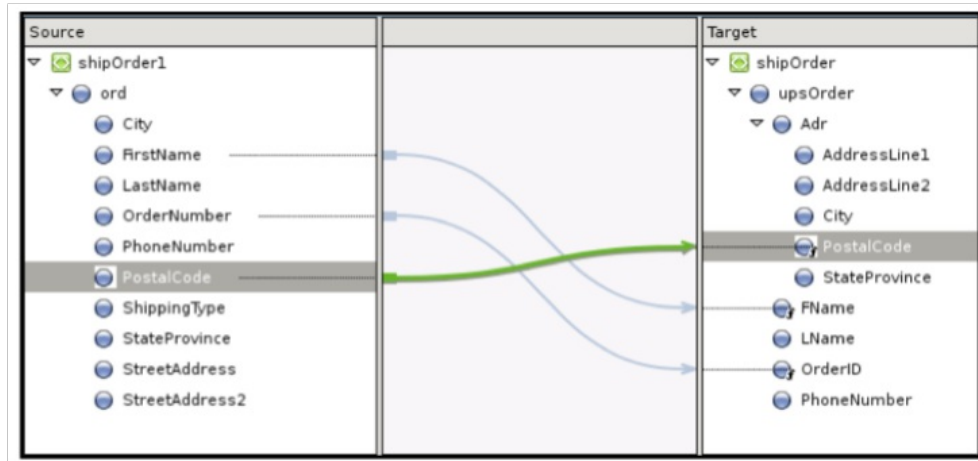


Data Transformation

- Data transformation phases:
 - Definition of mapping and execution of mappings
- Definition of mappings (design-time)
 - A mapping associates one data structure to another data structure and defines a conversion between them.
 - Mapping languages
 - graphical for design that translates to XSLT, XQuery
 - Sometimes implemented in 3rd gen. languages (e.g., Java)
- Execution of mappings (runtime)
 - application of mappings to instance data
- CDM terminology
 - Application Business Message – back-end app format
 - Enterprise Business Message – CDM format

Definitions of Data Mapping Example

- Source and target schemas
 - Source: Order – flat data structure
 - Target: UPS order with address as a sub-entity
 - Differences in names of entities
 - Conversion function applied to postal code



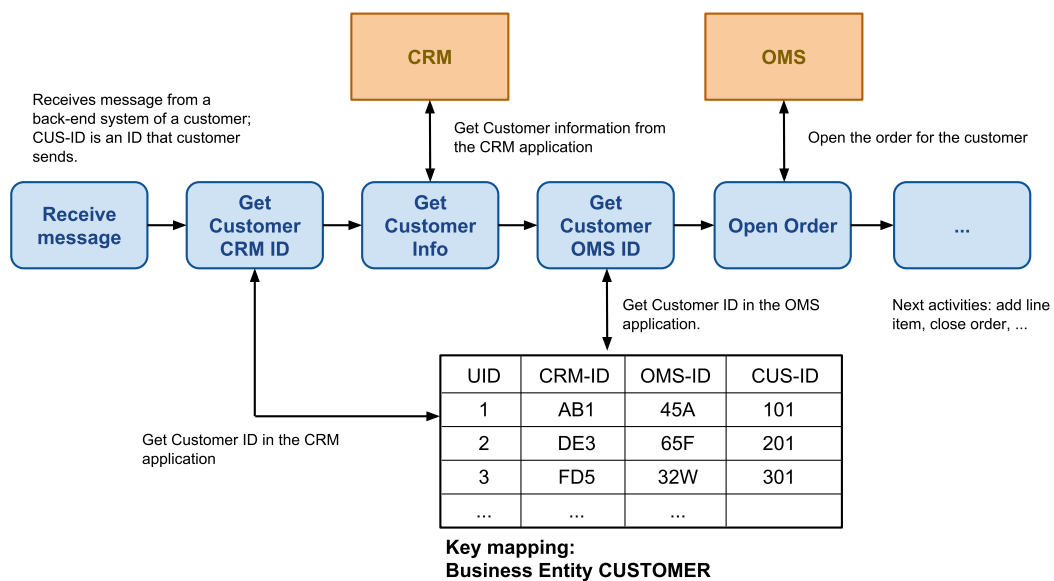
Service Orchestration

- Orchestration of multiple business services
 - Includes transformation, message enrichment, service callouts, etc.
 - A step in orchestration is an activity
- Patterns
 - Sequential processing of activities
 - Parallel processing of activities with synchronization points
 - Decision branches, iterations
- Technologies
 - Graphical languages
 - Standard representations: BPEL, BPMN
 - Proprietary, for example OSB uses graphical language that translates to XQuery
- Good design
 - Orchestration facilitates communication in CDM
 - Orchestration handles key-mapping

Key Mapping

- What is key mapping
 - Key = identifier of an entity in a back-end application
 - Key Mapping = a mapping of an ID of an entity in one system to an ID of the same entity in another system.
 - Key mapping is realized using universal IDs (UID)
- Example
 - A customer MOON exists in CRM and OMS systems
 - In CRM system, MOON has an CRM-ID=AB1
 - In OMS system, MOON has an CRM-ID=45A
 - Key mapping allows to map the CRM-ID AB1 to the OMS-ID 45A
 - Key mapping is a table
 - CRM-ID → UID → OMS-ID

Key Mapping Example



Message Sequencing

- Resequencer in update sales order
 - Every order line item needs to update its status several times (e.g. open, completed)
 - Resequencer makes sure that the update status messages arrive to CRM in the same order as they were created in OMS system (FIFO resequencer)

