

Middleware and Web Services

Lecture 6: Integration Patterns

doc. Ing. Tomáš Vitvar, Ph.D.

tomas@vitvar.com • @TomasVitvar • <http://vitvar.com>



Czech Technical University in Prague

Faculty of Information Technologies • Software and Web Engineering • <http://vitvar.com/courses/mdw>



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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

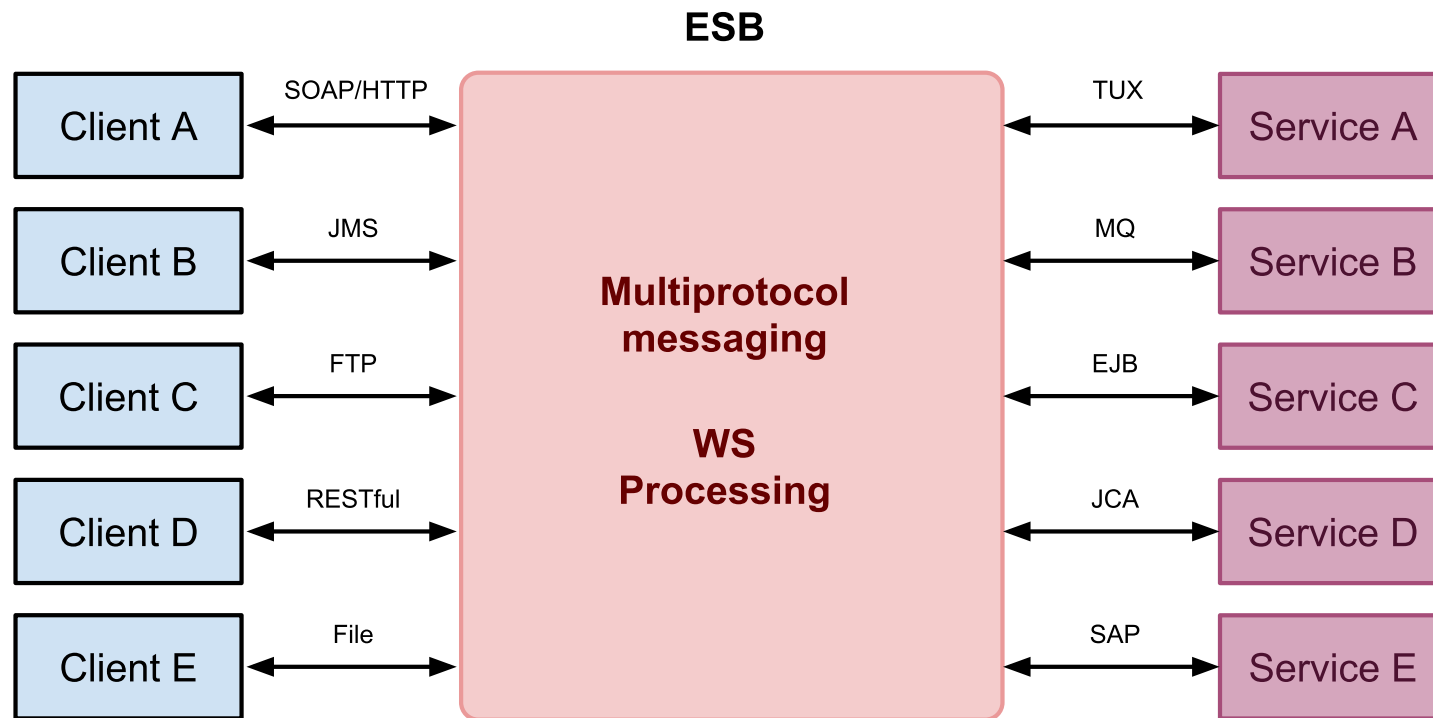
- Oracle
 - *Oracle Service Bus (OSB)*
 - *Oracle SOA Suite*
 - *Oracle Enterprise Gateway (OEG)*
- IBM
 - *IBM WebSphere*
- SAP
 - *SAP NetWeaver*
- Microsoft
 - *.NET Framework*
 - *BizTalk server*
- Opensource
 - *JBoss*
 - *Apache ServiceMix*
 - *WSMX – Semantic Web Service Execution Environment*

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*

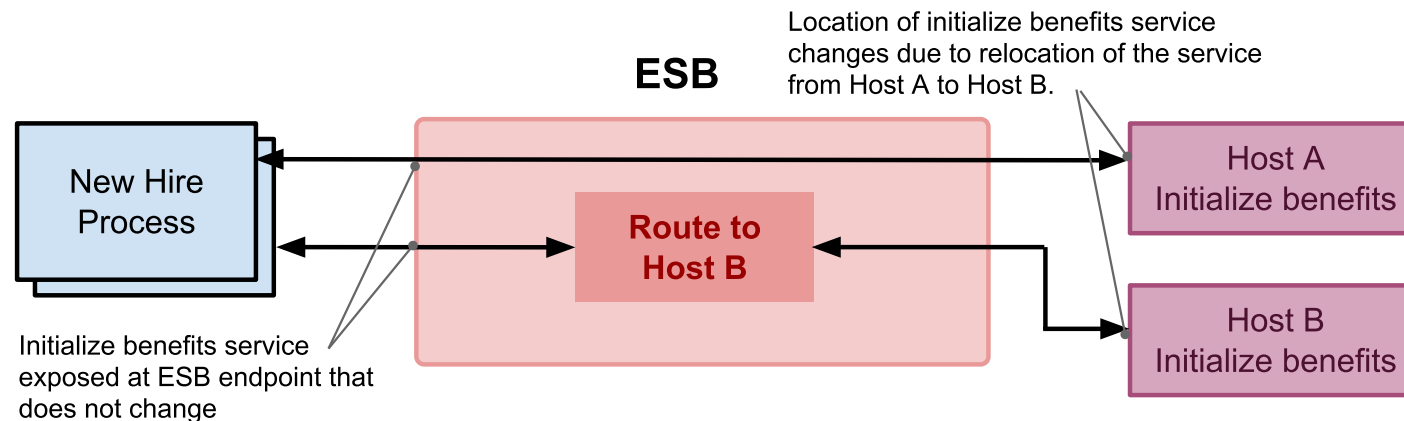
Message Broker

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



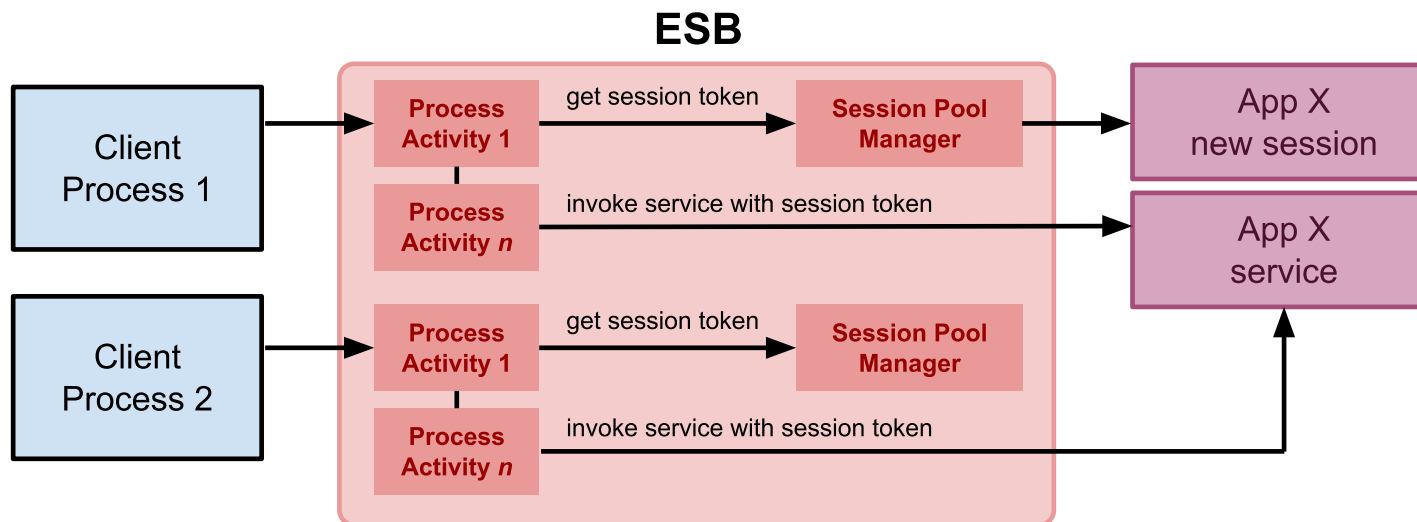
Location Transparency

- 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*



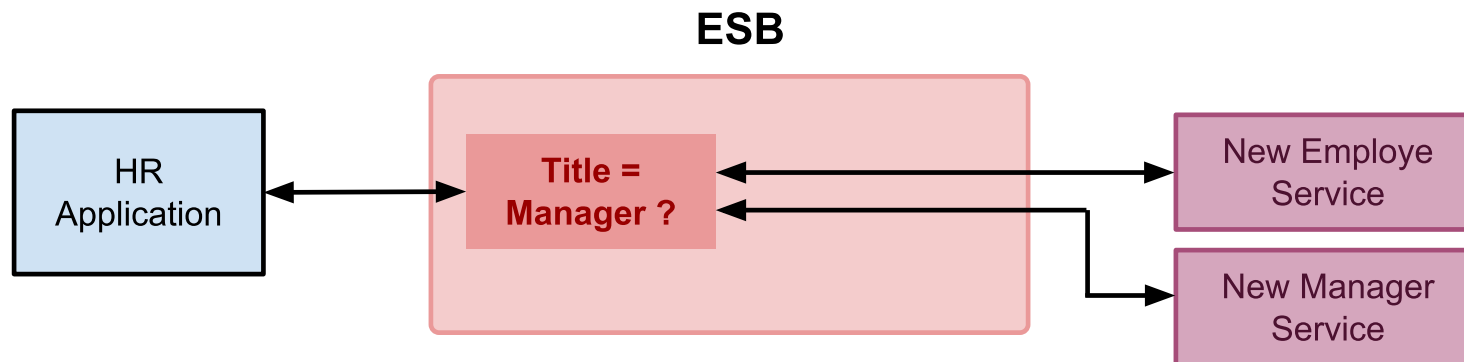
Session Pooling

- 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*



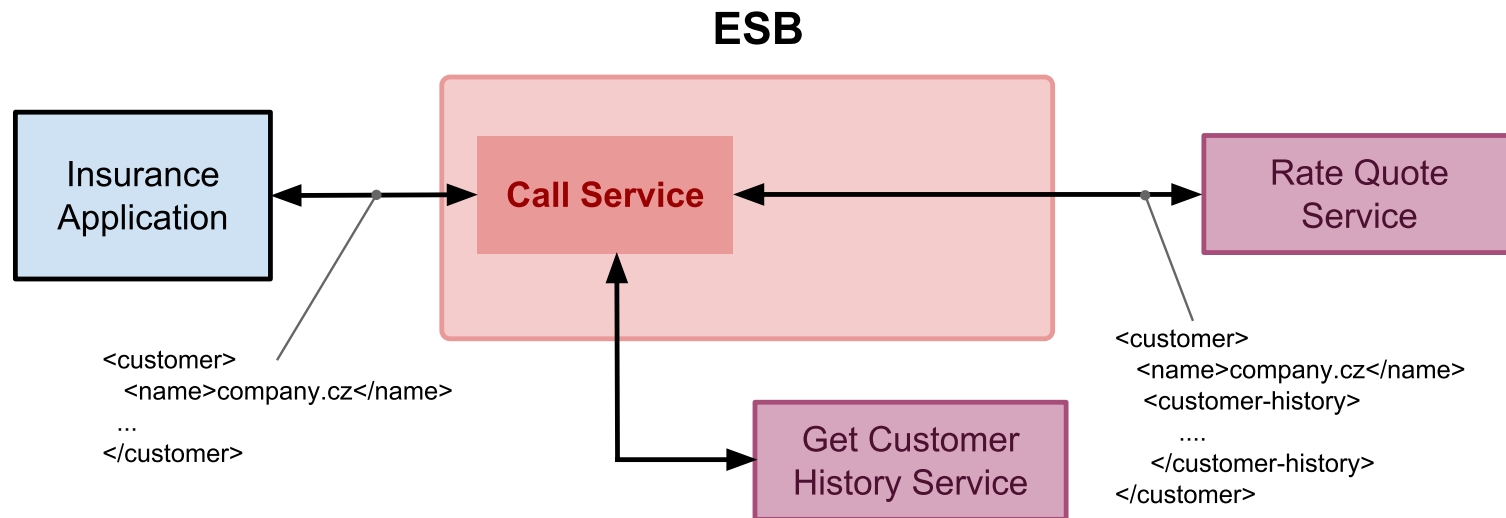
Dynamic Routing

- 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.*

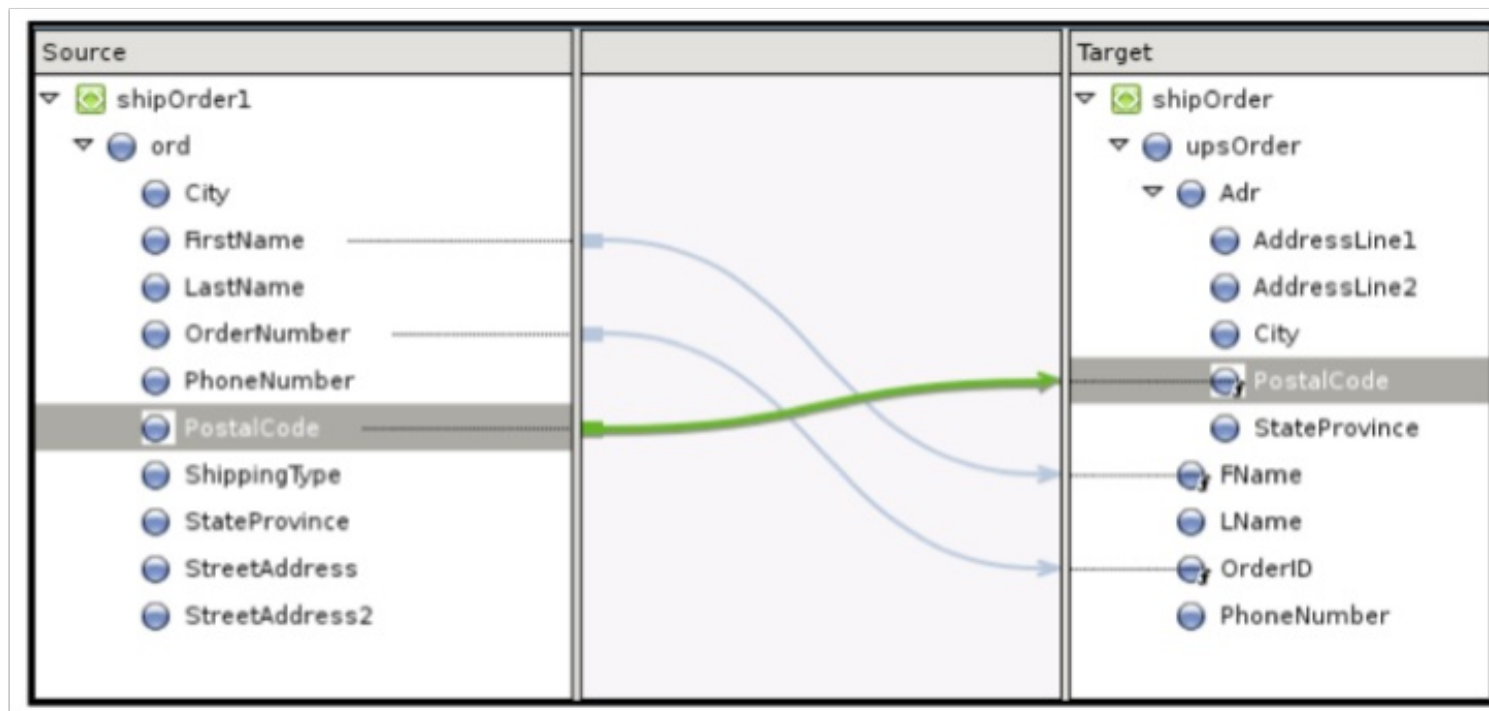


Data Transformation

- 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*



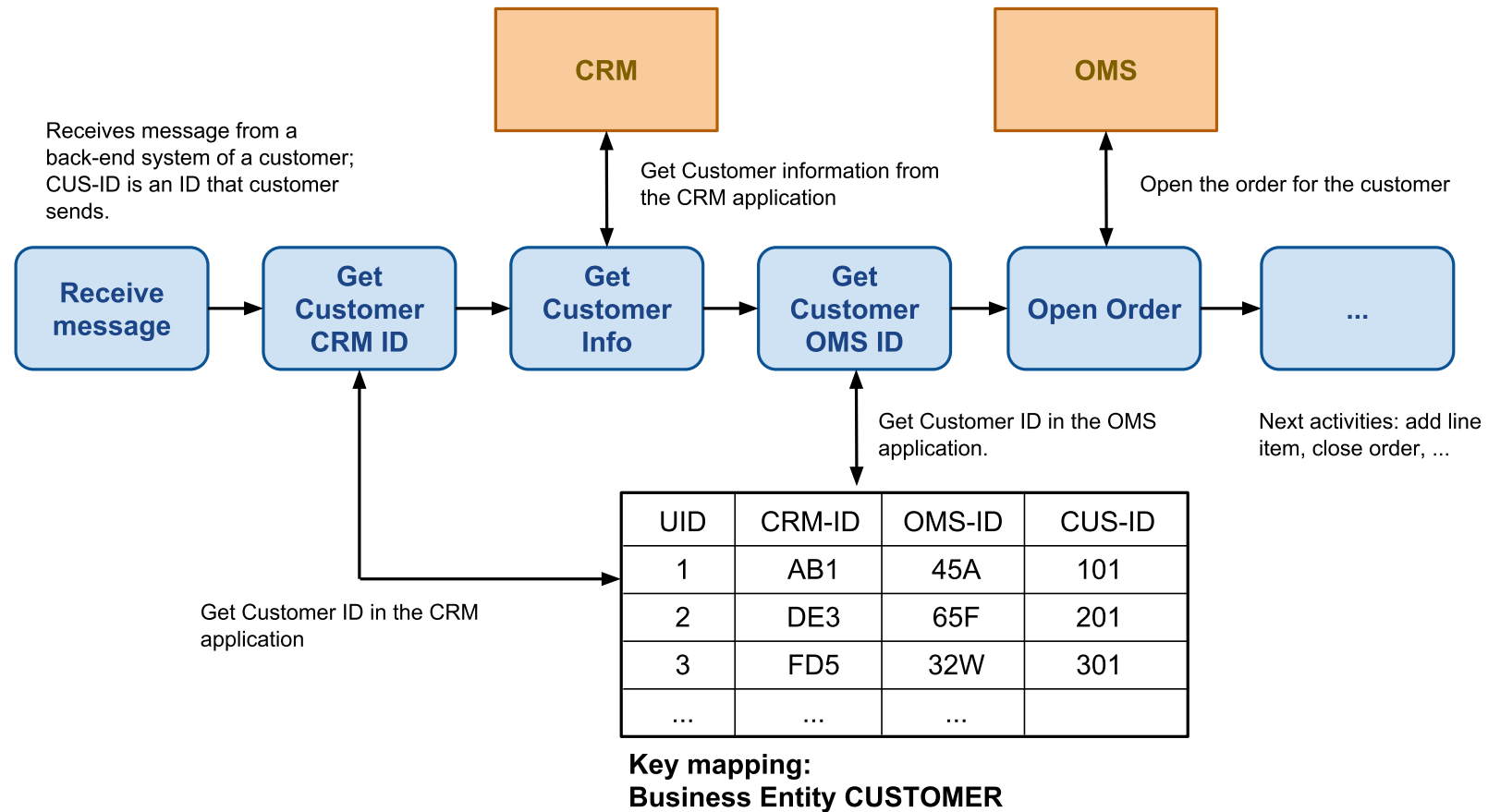
Service Orchestration

- 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)

