An Enterprise Physics Approach for Evolution Support in Heterogeneous Service-Oriented Landscapes

Tiziana Margaria

Chair Service and Software Engineering

Bernhard Steffen

Chair Programming Systems

technische universität dortmund

Overview

- Enterprise Physics
- The Mediation Scenario
- Handling Evolution
- Observations

Enterprise Physics…

- Constrained by laws, standards, contracts, policies, legal codes, regulations
- Constrained by available resources, services, time,
- ”Attracted” to the company’s and individual goals

Go where allowed -
and if more alternatives are possible,
choose where preferred

Enterprise Physics…

Easy for the many, difficult for the few

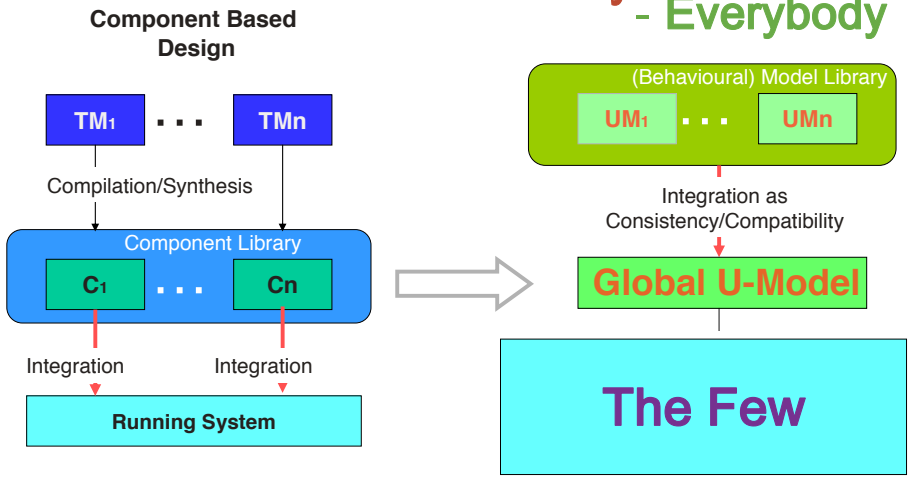
Finding adequate domain modelling formalisms
that help taming the complexity of
service orchestration and service discovery.

Declarative and robust

VSTTE 2005: From the How to the What

(Composition and matchmaking)

Extreme Model Driven Design
For the Many - Everybody



A new Rational Mechanics?

- Business Objects, e.g. line items and orders, comparable to things in the physical reality like atoms, molecules, or larger compound bodies,
- Services, e.g. ordering or order confirmation, that act upon or happen to them, comparable to chemical reactions, motion, or deformation.
- Constraints (relations, laws)
- Minimality (minimal energy states)

  ⟶ preferences, cost functions,…

A new Rational Mechanics?

- Business Objects, e.g. line items and orders, comparable to things in the physical reality like atoms, molecules, or larger compound bodies,
- Services, e.g. ordering or order confirmation, that act upon or happen to them, comparable to chemical reactions, motion, or deformation.

Described abstractly
~ semantically
local (compatibility) constraints
use of taxonomies
} properties and relations

A new Rational Mechanics?

- Constraints (relations, laws)

  global constraints similar to physics' (electromagnetic or gravitational) fields and boundary conditions.

  entire scenario, entire evolution

  German data protection laws, business rules, …

- Minimality (minimal energy states)

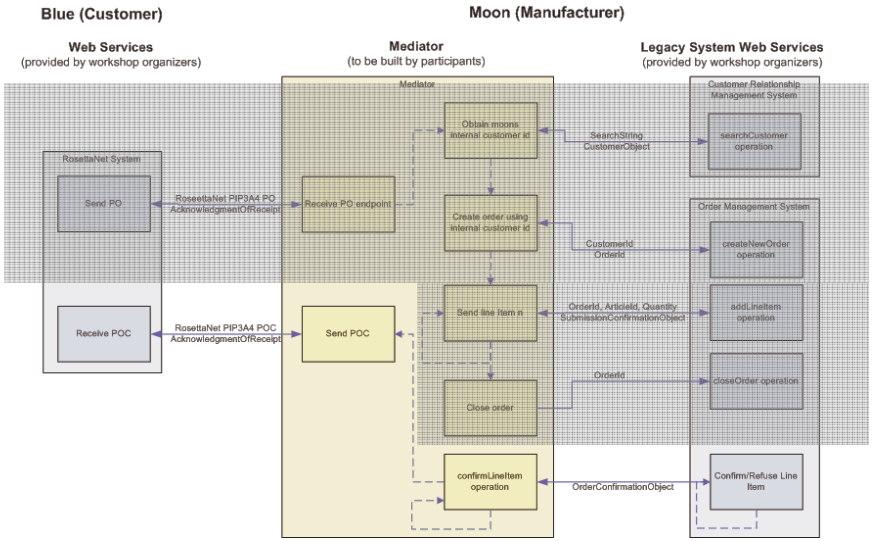
  preferences, cost functions,…

  equilibrium

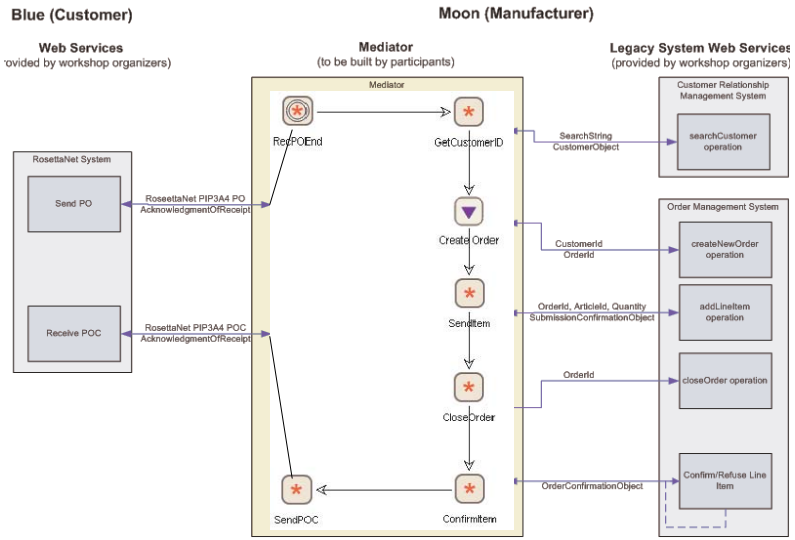
Overview

- Enterprise Physics
- The Mediation Scenario
- Handling Evolution
- Observations

B2B Data and Process Mediation Scenario



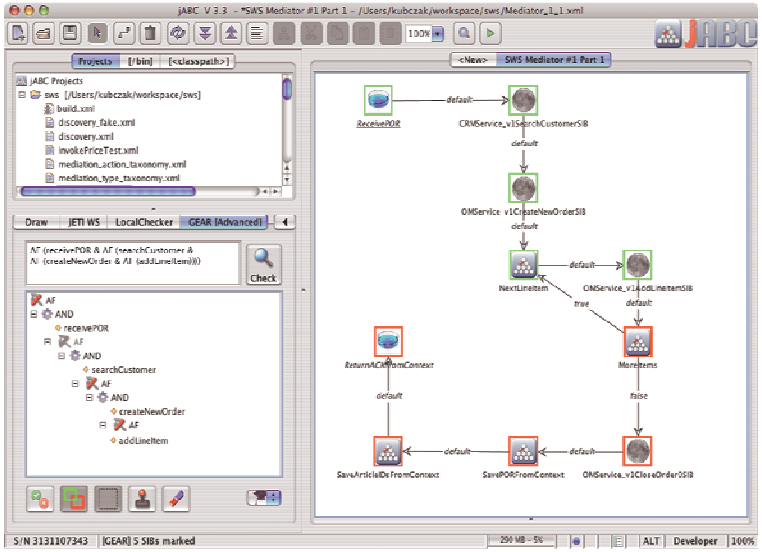
Moon Mediator Workflow



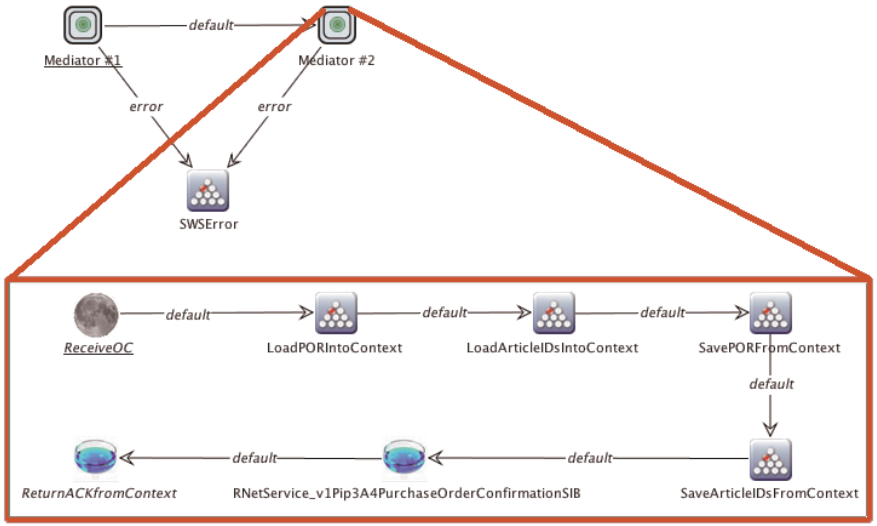
Model-driven Solution

1. Generate SIBs from Moon's WSDL descriptions of the Legacy System
2. Model Mediator orchestration in jABC (SLG)
3. Generate web service out of SLG
4. Use generated web service with RosettaNet Client

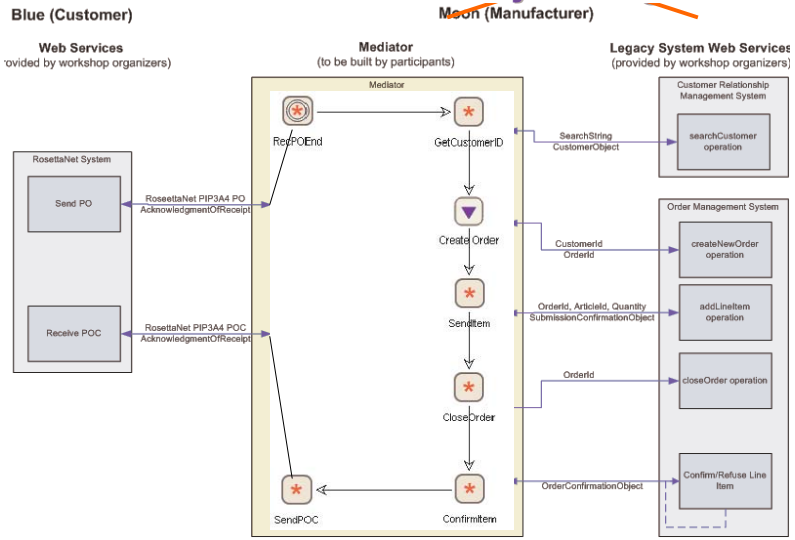
Mediator Service 1 (POR)



The Running Orchestration



Process Synthesis



Mediator Synthesis

- Since 1993: from TL specifications

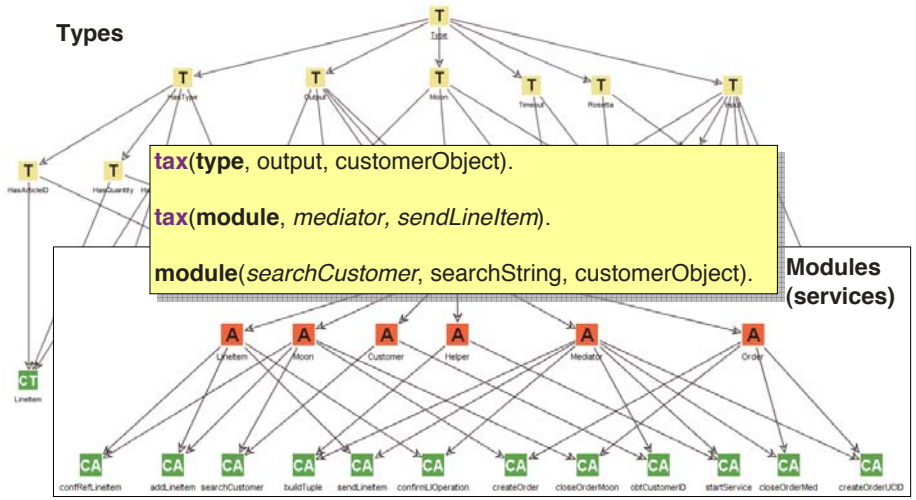
  [DASFAA'94, PACT'96, PACT'97, SCT96, STTT97, FASE98, VISUAL98]

- Now: via MC and POE [SAS'96]

- Automatic Adaptation/Evolution

Safe Service Customization,
[Proc. IN'97, IEEE Communic. Soc. Workshop on Intelligent Networks]

Mediator: Taxonomies



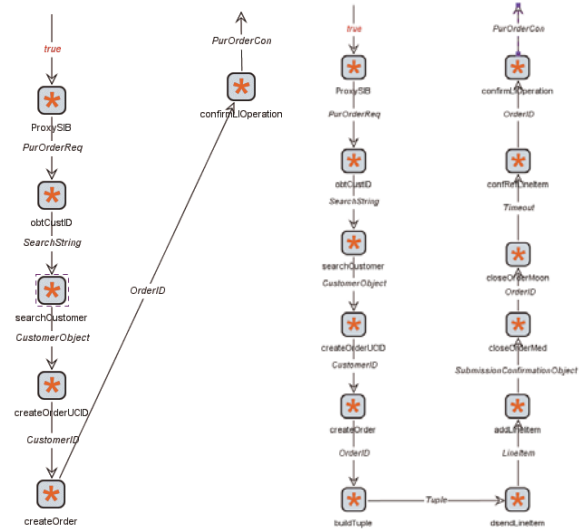
SWS Mediation Modules

module name	input type	output type	description
Mediator			Maps RosettaNet messages to the backend
startService	{*true*}	*PurOrderReq*	Receives a purchase order request message
obtCustomerID	*PurOrderReq*	*SearchString*	Obtains a customer search string from the req. message
createOrderUCID	*CustomerObject*	*CustomerID*	Gets the customer id out of the customer object
buildTuple	*OrderID*	*Tuple*	Builds a tuple from the orderID and the POR
sendLineItem	*Tuple*	*LineItem*	Gets a LineItem incl. orderID, articleID and quantity
closeOrderMed	*SubmConfObj*	*OrderID*	Closes an order on the mediator side
confirmLIOperation	*OrderConfObj*	*PurOrderCon*	Receives a conf. or ref. of a LineItem and sends a conf.
Moon			The backend system
searchCustomer	*SearchString*	*CustomerObject*	Gets a customer object from the backend database
createOrder	*CustomerID*	*OrderID*	Creates an order
addLineItem	*LineItem*	*SubmConfObj*	Submits a line item to the backend database
closeOrderMoon	*OrderID*	*TimeoutOut*	Closes an order on the backend side
confRefLineItem	*Timeout*	*orderConfObj*	Sends a conf. or ref. of a prev. subm. LineItem

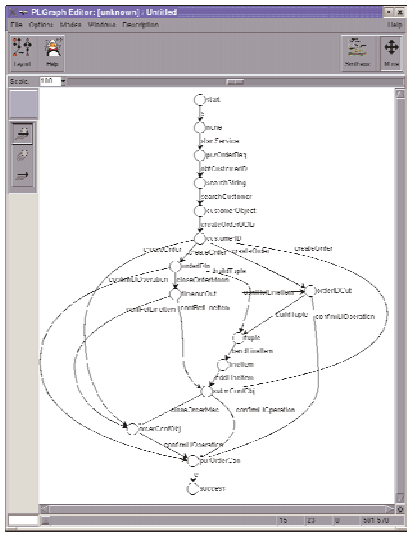
Mediator: Solutions

startService < PurOrderCon

startService
< LineItem
< confRefLineItem
< PurOrderCon



Mediator: Solutions



startService < PurOrderCon
(minimal)

Overview

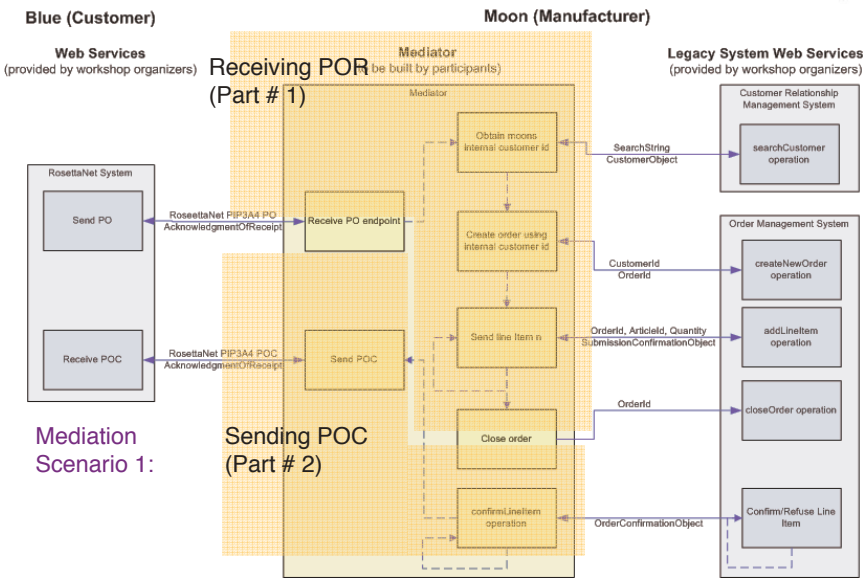
- Enterprise Physics
- The Mediation Scenario
- Handling Evolution
- Observations

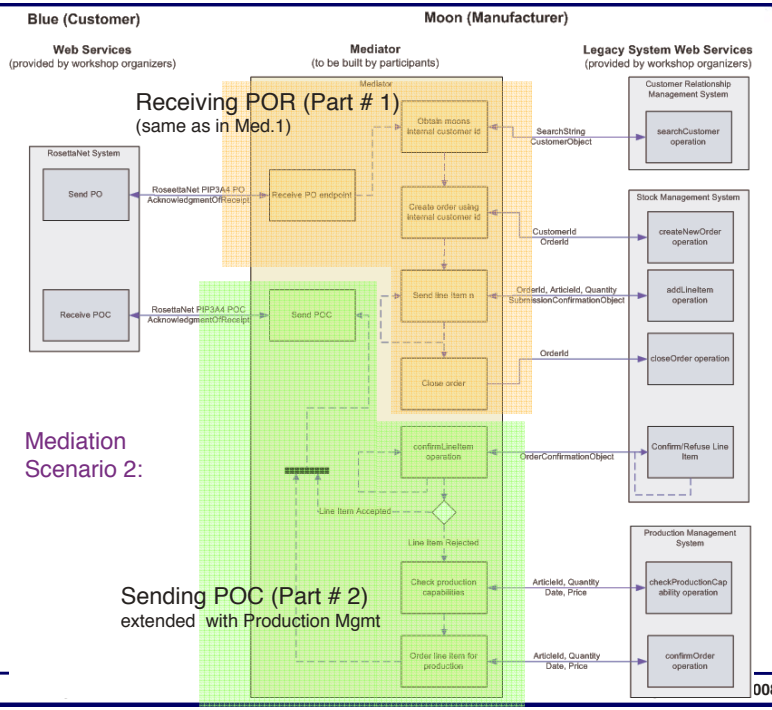
Evolution

- The **process** changes
- The **environment** changes
  - Platform Migration
  - Backend Extension

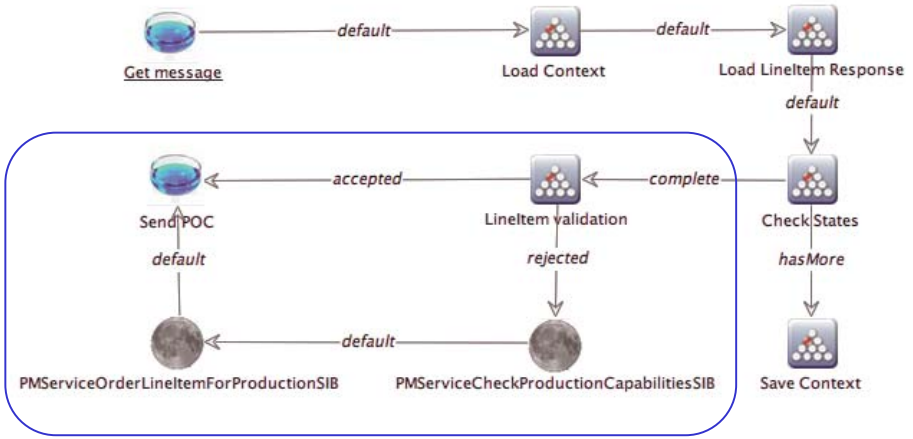
Heterogeneity increases.

Process Evolution





Mediator Service with Production Management



Evolution

- The process changes
- The **environment** changes
  - Platform Migration
    (Moon gets another Backend)
  - Backend Extension
    (Moon enhances its Backend)

Heterogeneity increases.

ES Bundle – Order to Cash

The ES Bundle Order to Cash …

- …enables customer and partners to build individual composite applications on top of existing Order-to-Cash processes. ERP 6.0 EnhPack 2 and higher
- … allows collaboration and data exchange with customers as well as collaboration within corporate groups at lower TCO. ERP 6.0 EnhPack 3 and higher

Business Value

- Build individual composite applications for Order to Cash process to fulfill specific needs of Sales and Customer Service department
- Set up B2B connection to customers at lower TCO. Reduce time and cost of *onboarding* new customers.

Use Cases

- Build individual Cockpits for B2B customers, sales, customer service agents and warehouse clerks. Example: Fast Sales Order Entry, Order Tracking
- Integrate 3rd party software in existing Order-to-Cash process to streamline the Order-to-Cash process

THE BEST-RUN BUSINESSES RUN SAP

Service and BO Replacement

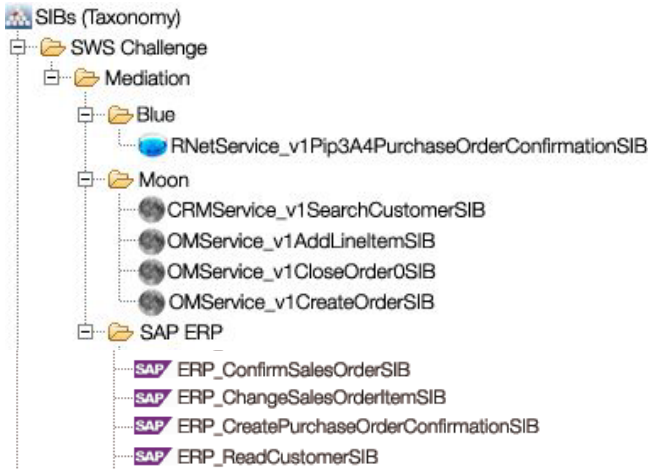
Moon Service	SAP Enterprise Service
Search Customer	Read Customer
Create Order	Create Sales Order
Add LineItem	Change Sales Order Item
Close Order	Confirm Sales Order
Confirm/Refuse LineItem	Create Purchase Order Conf.

Table 1. The Service replacement map for Moon's new ERP backend.

SAP Enterprise Service	Business Object
Read Customer	Customer
Create Sales Order	Sales Order
Change Sales Order Item	Sales Order
Confirm Sales Order	Sales Order
Create Purchase Order Conf.	Purchase Order Conf.

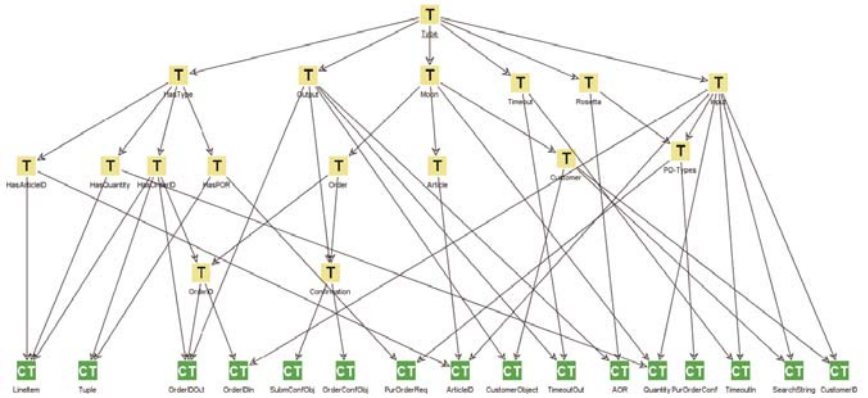
Table 2. The Business Objects replacement map for Moon's new ERP backend.

Adding the new ERP services



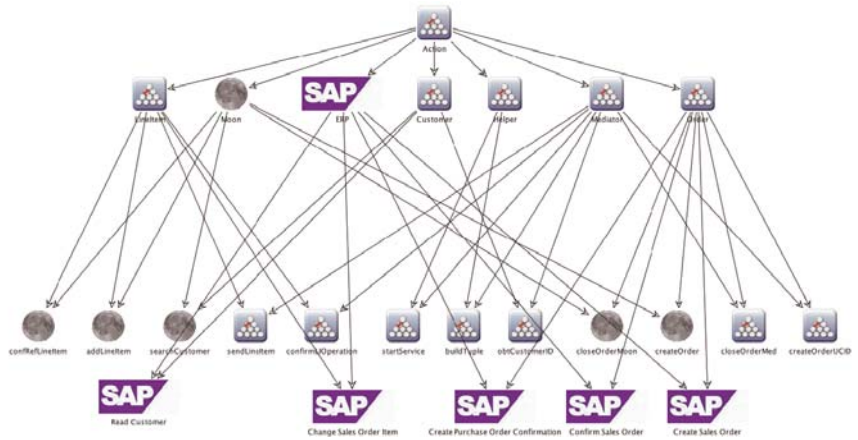
Platform Migration Scenario

- **Same Type Taxonomy**

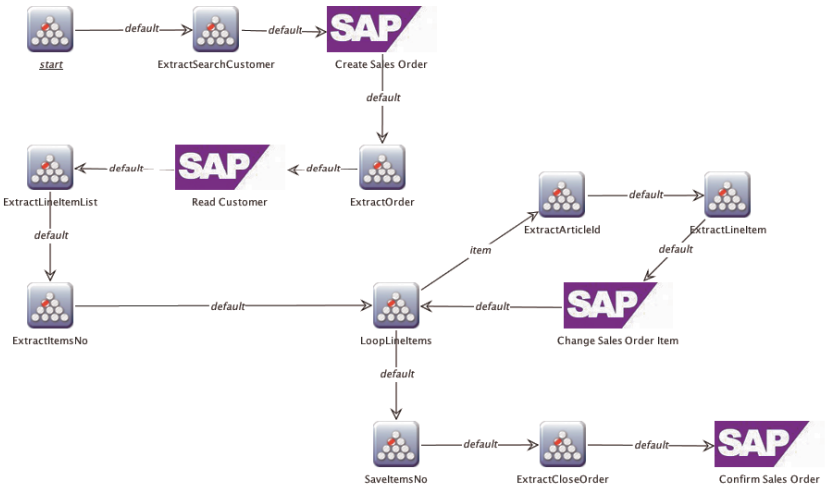


Platform Migration Scenario

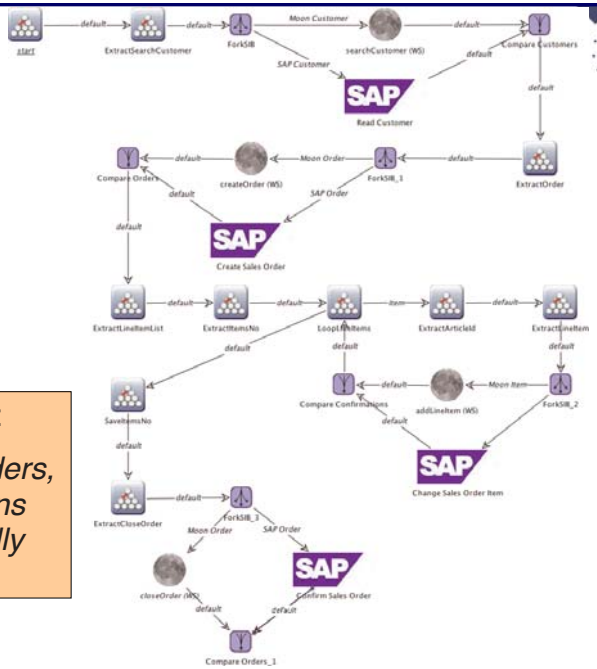
- **Extended Action Taxonomy**



Mediation Process after Platform Migration



Moon's Backend Extension

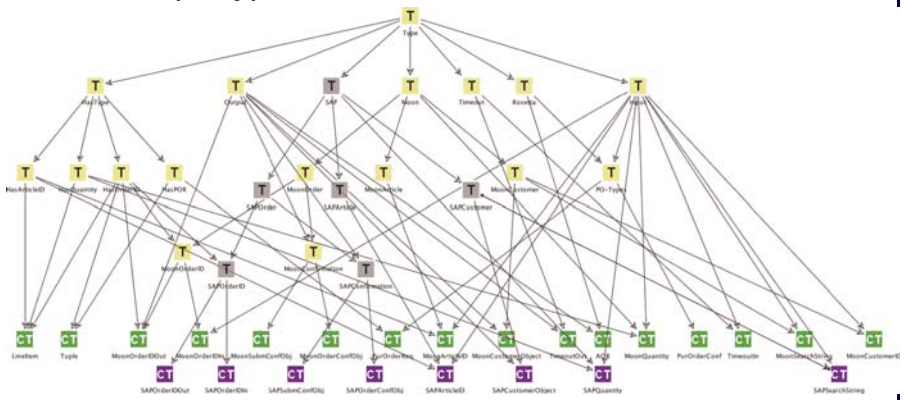


Business policy:

"*Customers, orders, and confirmations must successfully match*".

Extended Type Taxonomy

- ERP-Related Instance Types
- Concept Types



Observations

- Data issues

  BO vs. programming objects, XML vs. Java, Parlay-X

- Orchestration issues

  in the discovery, synthesis appeared late, if at all

- Domain modelling

  static, dynamic, and how?

  Preconditions, effects on service, data item, composition

- Tangling (no best decomposition!)

- Theory vs. practice (in theory, it works…)

User-Centric Modelling

- **User Focus**
- **User Control**
- **User Satisfaction**

Driving a car needs no engineer!

An Enterprise Physics Approach for Evolution Support in Heterogeneous Service-Oriented Landscapes

Tiziana Margaria

Chair Service and Software Engineering

Bernhard Steffen

Chair Programming Systems

technische universität dortmund