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ERP-Control: A REA-based Enterprise Resource Planning Application

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Problem Statement

ERP-Control: A REA-based Enterprise Resource Planning Application

- **ERP-Applications:** SAP ERP 6.0, MS Dynamics AX 2013, ...
transactional recording of business data and resource planning functionalities
- **“REA Ontology”:** REA Accounting Ontology (McCarthy 1982), REA Business Ontology (Geerts/McCarthy 2002), ...
- **Enterprise Control System Integration Standard (ECSI 2008):** Focusing on the information flows between
 - enterprise system (mostly exchange processes)
 - production control system (mostly conversion processes)
- **Integration problem:** How can the different concepts be integrated?
- **Demonstration:** REA-semantic data and business process modeling and prototypical implementation

ERP-Control: Prototypical Web-based ERP-Application

ERP-Control: <http://erpcontrol.imw.tuwien.ac.at/ERPControl/home.seam>

ERP-Control: [Home](#) [Login](#)

Business Processes

- Sales Processes
- Production Processes
- Procurement Processes
- Treasury Processes
- Financing Processes
- Investment Processes

Control

Reporting

Performance Management

Analytical Planning

Welcome to ERPControl Enterprise Information System!

ERPControl

Welcome to the ERP Control System - Version 1.1

Please log in with any username and password - admin: false

Authors

- Abmayer Michael: Resource List, IFRS Reporting, SVN Server, ControllIX
- Achleitner Stefan: Borrowing, Derivative Instrument Valuation, Fixed Income Instrument
- Czerny Rene: Documentation
- Dural Oemer: Production Planning, Execution and Analysis
- Fellner Daniel: Production Management
- Findeis Herbert: Integration
- Nasufi Aqif: Production Planning, Execution and Analysis
- Ranzi Robert: Architecture, Sales Process
- Rodler Christopf: Architecture, Sales Process, Risk Planning and Risk Reporting
- Schwaiger Walter: REA-MIS Architecture, General Coordinator
- Sporer Christian: IT-Consulting

Agenda

- Problem Statement
- ERP-Control: Financial Reporting and Business Processes
- ERP-Control: Semantic Data and Process Models
- ERP-Control: Semantic Implementation
- Conclusion
- Literature

ERP-Control: Implementation of financial reporting processes

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Business Processes		IFRS Report		
	description	2010-01-01	2010-12-31	difference
▣ Sales Processes	▼ Balance Sheet	EUR 0.00	EUR 0.00	EUR 0.00
▣ Production Processes	▼ Assets	EUR	EUR	EUR -74059.99
▣ Procurement Processes	▶ Current assets	EUR 287296.94	EUR 254724.64	EUR -32571.30
▣ Treasury Processes	▶ Non-current assets	EUR 788764.05	EUR 745275.36	EUR -41488.69
▣ Financing Processes	▼ Equity and liabilities	EUR	EUR	EUR 74059.99
▣ Investment Processes	▶ Equity	EUR -143116.69	EUR -170994.01	EUR -27877.32
Control	▶ Non-current provisions and liabilities	EUR -701262.79	EUR -611425.56	EUR 89837.23
Reporting	▶ Current provisions and liabilities	EUR -229680.51	EUR -217580.43	EUR 12100.08
Performance Management	<hr/>			
Analytical Planning	▶ Changes in Equity	change from 2010-01-01 to 2010-12-31		EUR 27877.32
	<hr/>			
	▶ Income Statement	change from 2010-01-01 to 2010-12-31		EUR 127878.14
	<hr/>			
	▶ Cash Flow Statement	change from 2010-01-01 to 2010-12-31		EUR 0.00

- Annual Report: IFRS financial statements (balance sheet, income statement, change of equity, cash flow statement) as an essential by-product

ERP-Control: Sales process execution

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Business Processes | Sales Process

- Sales Processes** (circled) | [Initialize new Business Process Instance](#)
- Production Processes
- Procurement Processes
- Treasury Processes
- Financing Processes
- Investment Processes

Control

Reporting

Performance Management

Analytical Planning

Customer Selection

[Add new Customer](#)

Customer Id	Description	
6	Customer - No 20001	Select

Product Selection

Product ID	Description	Actual Stock	UoM	
1	Guss-Paraffin	500000.00	kg	Select
2	Press-Paraffin	500000.00	kg	Select

Quantity and Price Input

Available quantity: 500000.0 kg

Sales quantity: * kg

Payment Selection

Type of Payment:

Confirmation

Customer ID	Product ID	Quantity	Sales Price (excl.)	Rate of taxation	Payment Type	
6	2	1000.0 kg	1.04 EUR	20 %	Cash	confirm sale cancel

Sales with value EUR 1248.00 (incl. tax) successfully saved!

ERP-Control: Production process execution

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Business Processes

- ⌵ Sales Processes
- ⌵ **Production Processes**
- ⌵ Procurement Processes
- ⌵ Treasury Processes
- ⌵ Financing Processes
- ⌵ Investment Processes

Control

Reporting

Performance Management

Analytical Planning

Production Execution Process

[Initialize new Production Execution Process Instance](#)

Selection of Quarterly Plan

Product ID	Description
9	Molded-Candles Produkt Segment 2014 S0 Select

Selection of Monthly Plan

Product ID	Description	Planned Quantity
19	Molded-Candles Produkt Segment 2014 S0 February	833.00 Select

Output Production

Molded-Candles Produkt Segmen2014 S0 February

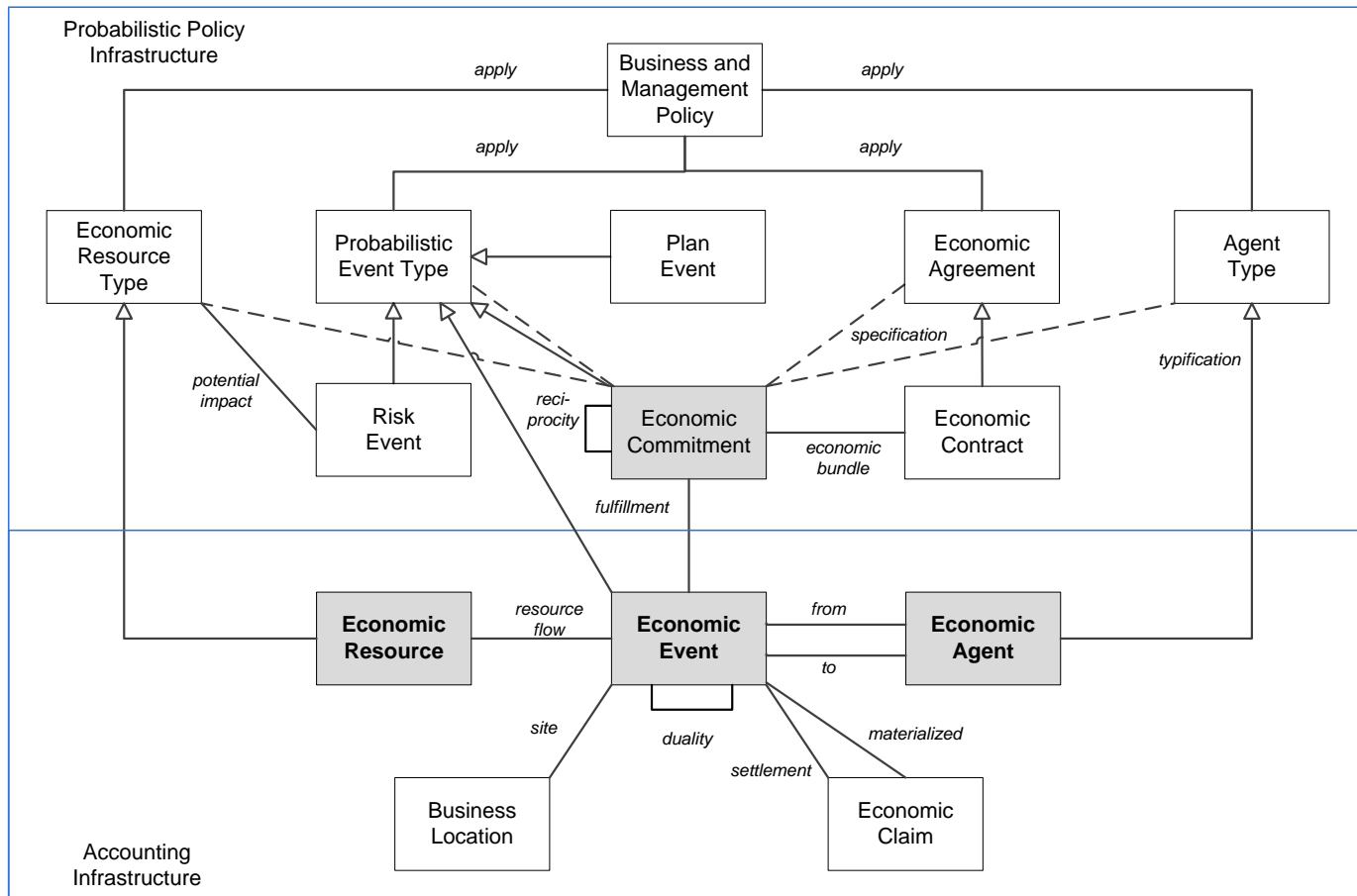
Planned Input	833.00 kg
Produced Output *	<input type="text" value="900.0"/> kg

Confirmation

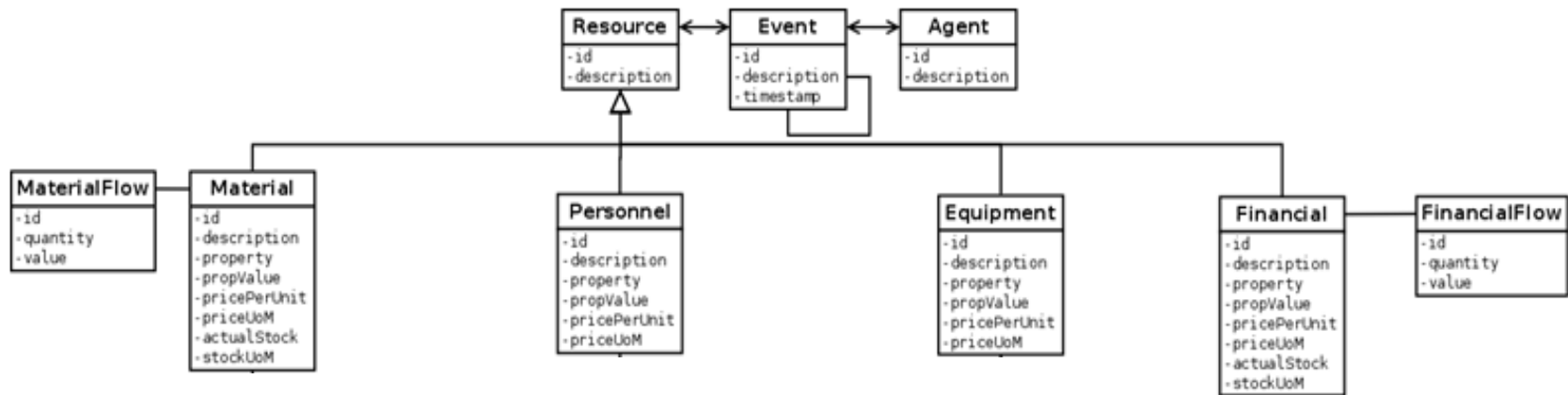
MaterialResource (Molded-Candles Produkt Segment 2014 S0 February) has been successfully saved

ERP-Control: Semantic Data and Process Models

"REA Ontology": Economic meaning of business processes

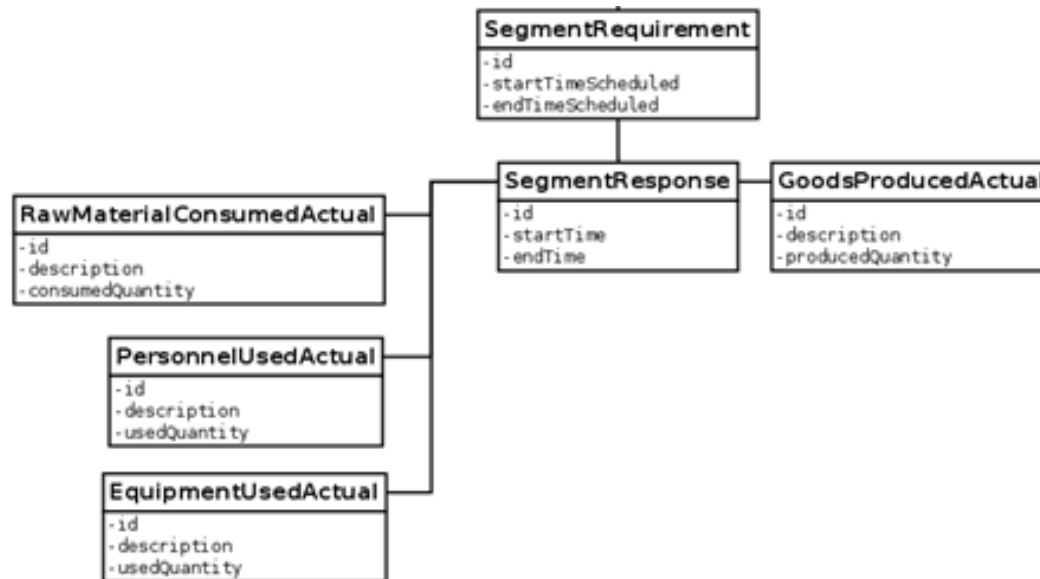


Exchange processes: REA-semantic data model



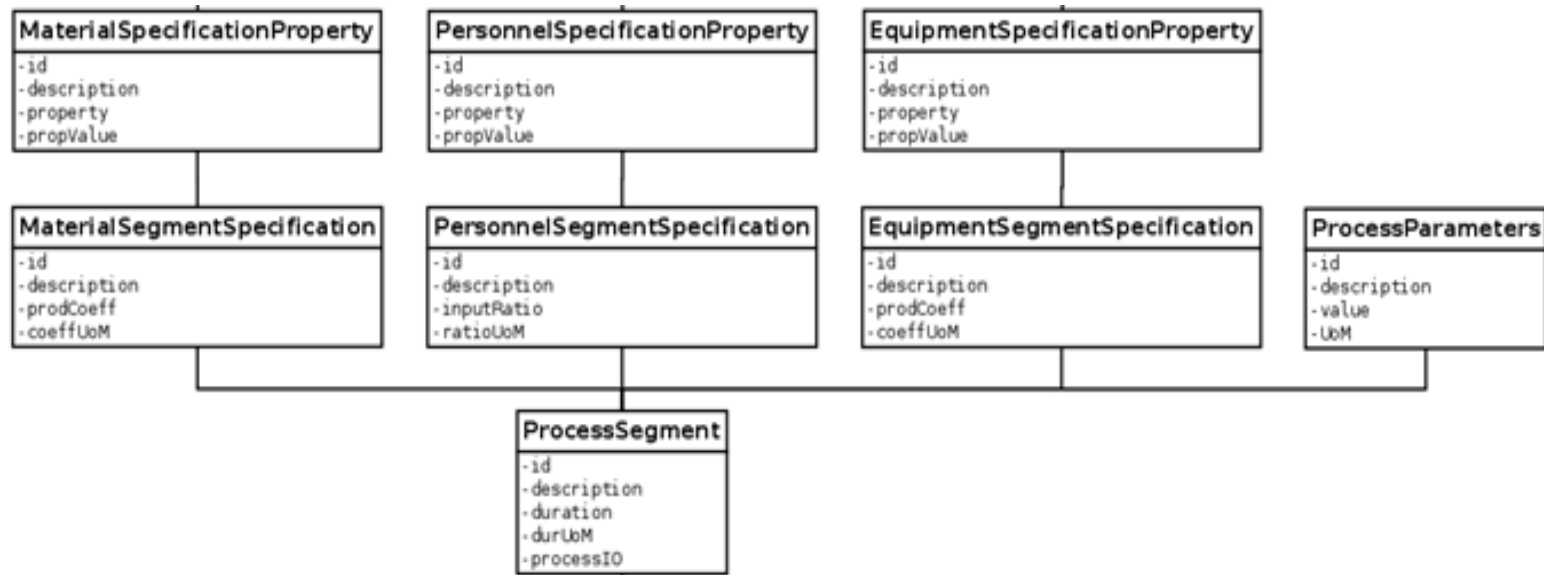
- Hierarchical data model for the REA elements
 - Abstract classes for the Economic Resource, Economic Event, Economic Agent
 - Derived classes for material, personnel, equipment and resources
- Flow classes for the material and financial resources

Conversion processes: REA-semantic data model



- Enterprise Control System Integration Standard (ECSI, 2008) defines
 - Conversion processes via process segments
 - Segment Response is linking the input (consumed/used) to the output (produced)
 - Segment Response is related to Segment Requirement (internal commitment)

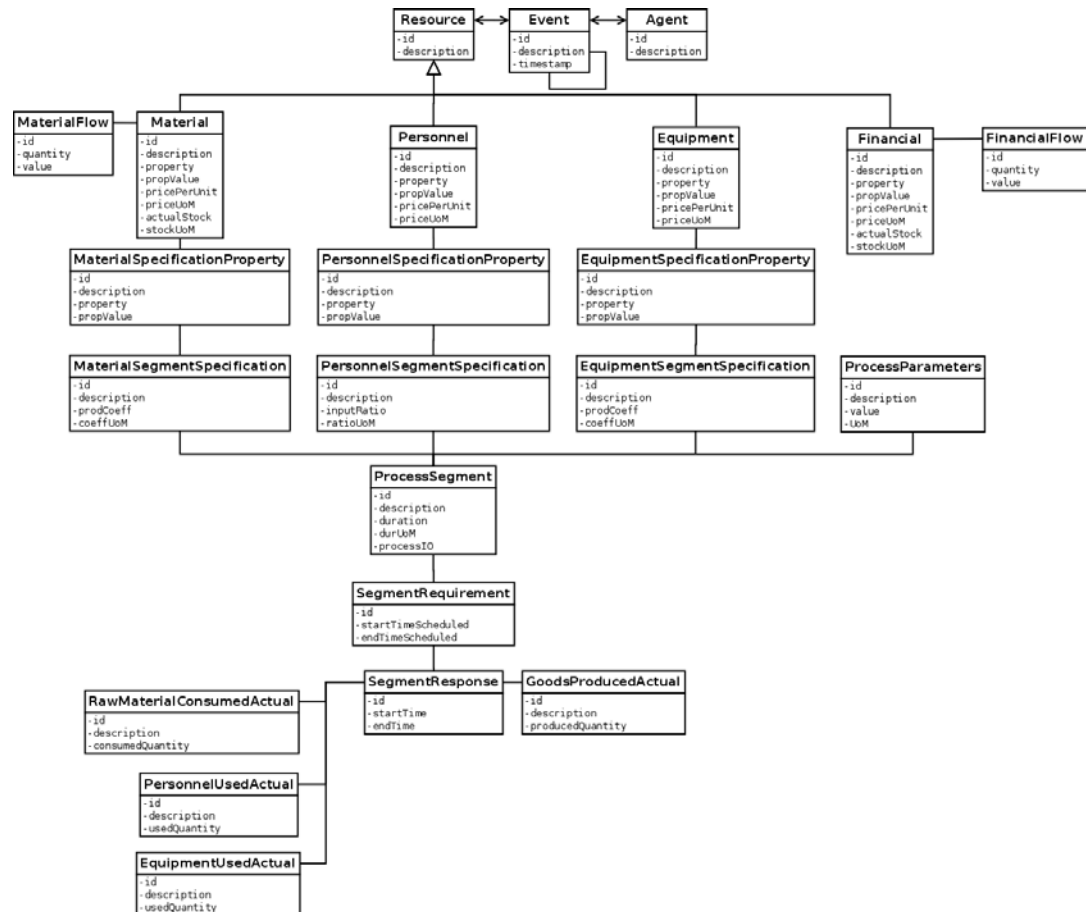
Conversion processes: Production technology model



- ECSI Standard: Hierarchical modeling of the production technology
 - resource-specific Segment Specification => specification of the production function
 - properties of Segment Specifications => linkage to the derived resource classes

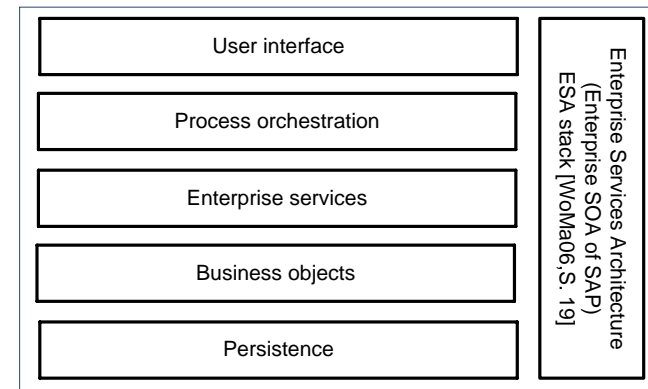
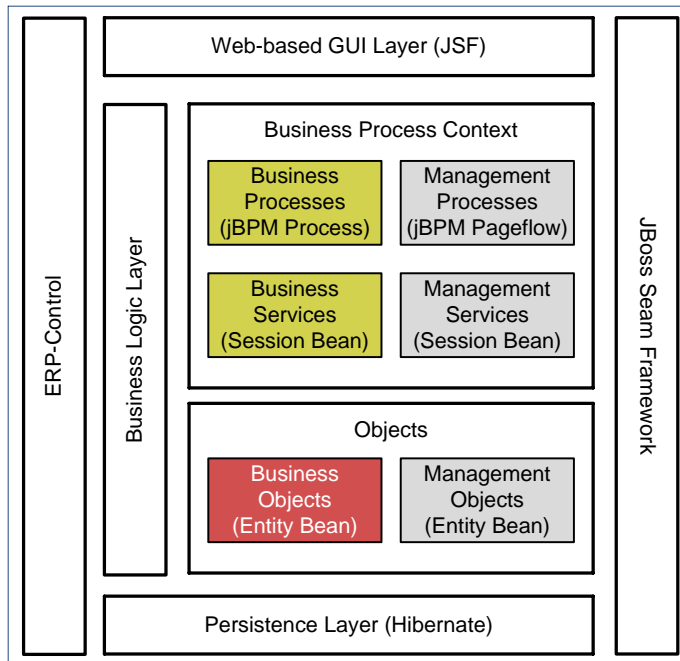
ERP-Control: Semantic Data and Process Models

REA-semantic data model: The parts fit together



ERP-Control: Semantic Implementation

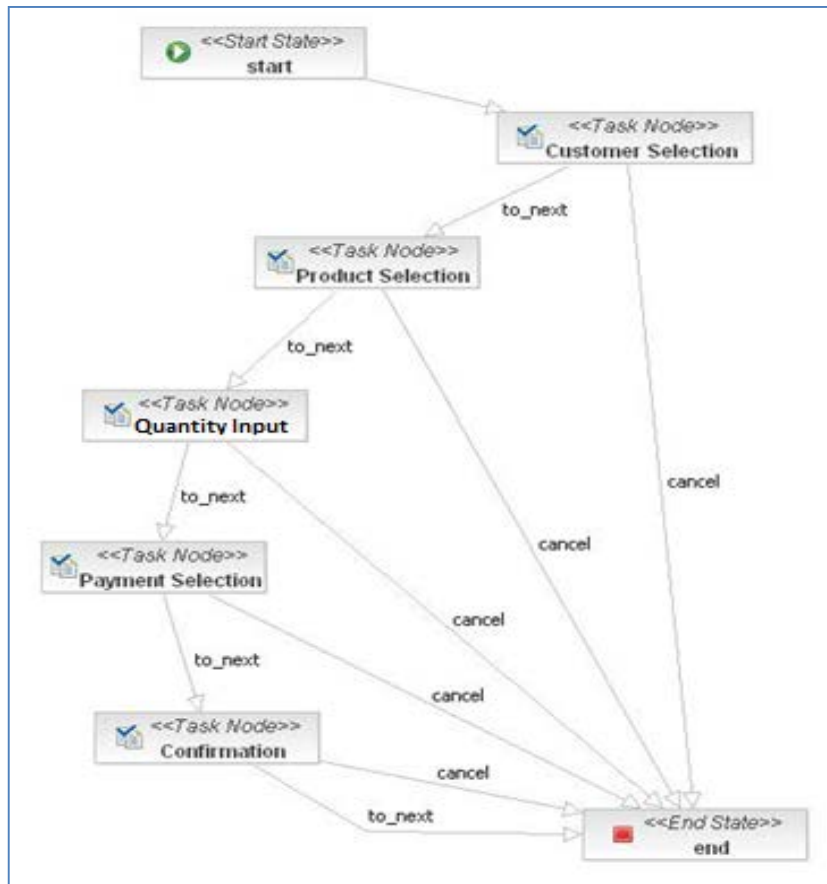
Web-based Implementation in Java Technology



- JBoss Seam Framework: Seamless implementation of object and process oriented ERP systems in Java EE 3-tier architecture (similar to SAP's Enterprise SOA)

ERP-Control: Semantic Implementation

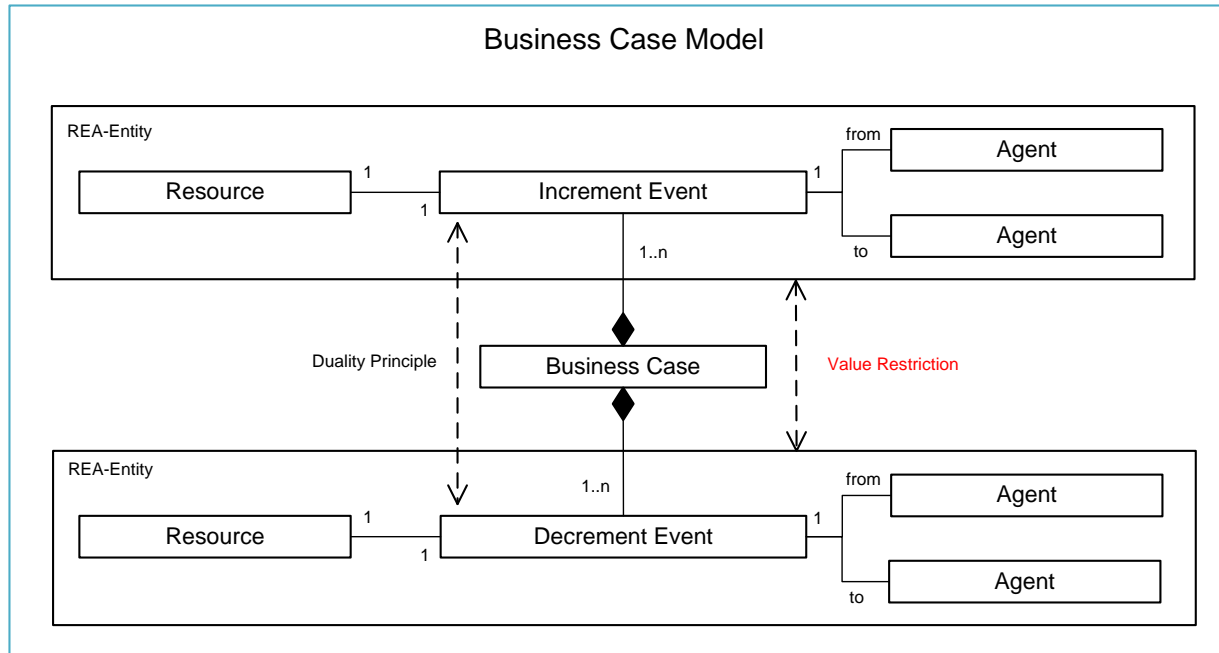
REA-semantic business process model: Sales model



- REA-semantic sales process design: Selection of agents, resources, quantity and double-entry bookkeeping
- Business process modeling in the Java Process Definition Language (jPDL)
- jPDL is language which can be executed in the Java Business Process Manager (jBPM) workflow engine

ERP-Control: Semantic Implementation

Confirmation Task Node: booking()-service



- Business Case: Transactional recording of resource flows and related value flows according to the REA ontology

Conclusion

ERP-Control: A REA-based Enterprise Resource Planning Application

The **REA-semantic data and business process models** behind ERP-Control show that

- the “REA ontology” is generic so that it can be concretized e.g. with
 - the **production resources** specified in the Enterprise Control System Integration Standard (ECSI 2008) and
 - the **financial resources** defined in the finance literature and
- it can be expected that a REA-semantic design and implementation should
 - **reduce engineering costs** by reducing the communication problems between users, designers and programmers,
 - **enhance the quality** of the designed and implemented ERP systems,
 - **improve the maintainability** and **the extensibility** by giving all involved parties a common understanding of the ERP system functioning

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