



COIN

Enterprise **CO**llaboration & **IN**teroperability

InterOP - VLab

The International Virtual Laboratory
for Enterprise Interoperability

Business Cases for Enterprise Interoperability

Collaboration and Interoperability in Production Management of Ship-Building Industry



Prof. Xiaofei XU,

Prof. Dechen ZHAN, Dr. Lanshun NIE

School of Computer Science and Technology

Harbin Institute of Technology, P.R. China

Outline

- Background and characteristics of ship-building industry
- Typical collaboration / interoperability issues in ship-building production and supply chain management
- Model-driven interoperability & methodology for enterprise application software systems in ship-building manufacturing
- Case study in HUANGHAI SHIP-BUILDING Co. LTD in China



Ship-Building Processes



Purchase and inventory
(采购与库存)

Tube /board handling
(Part machining)
(管材/板材加工)

Supply Hub-based logistics
(collection and distribution)
(集配)



Dock fitting-out
(码头舾装)

Slipway fabrication and fitting-out
(ship body assembling & system assembling)
(船台合拢和舾装)

Block assembling and advance fitting-out
(Block assembling & system pre-assembly)
(分段制造/舾装)



Characteristics of Ship-Building Industry

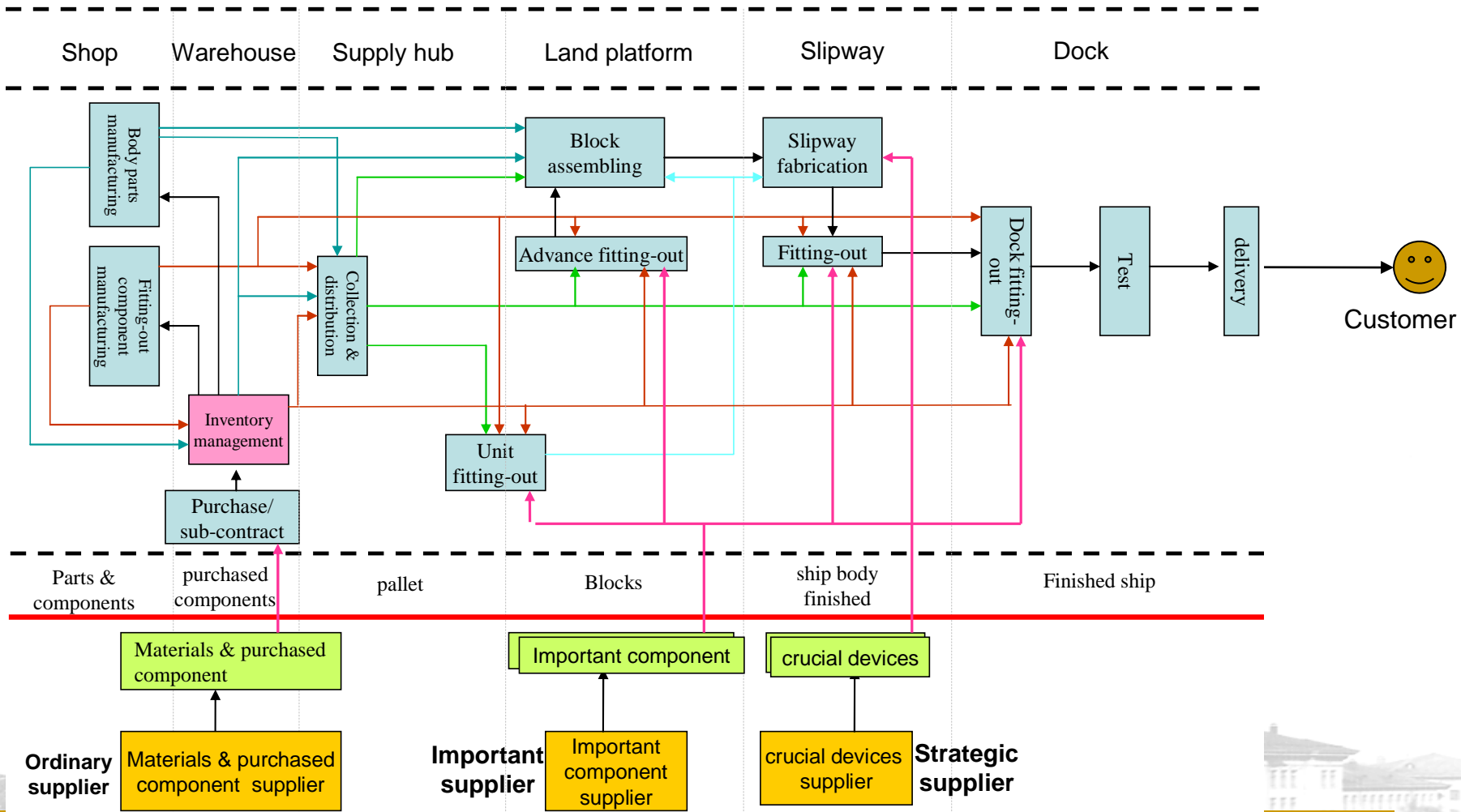
■ Production Characteristics:

- Production modes: ETO (engineering-to-order), OKP (one-kind-of-a-product) and small batch manufacturing
- The production process is divided into multiple stages.
- Very large products with complex product structure and multi-functional systems.
- Thousands of materials, devices, and components come from suppliers.
- The relationships across multiple enterprises, multiple stages and multiple specialties are complicated.
- The lead time is very long while the due-date is tight.

- Collaboration and interoperability inside and outside of enterprises are critical for ship-building.



Physical View of ship-building



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Typical interoperability problems in ship-building industry

- Interoperability between
 - Product design and production engineering
 - Production engineering and product manufacture / assembly
 - Batch manufacture and project oriented product assembly
 - Manufacturers and strategic suppliers(e.g. engine suppliers, steel material suppliers)
 - Manufacturers and sub-contractors
 - Manufacturers and customers

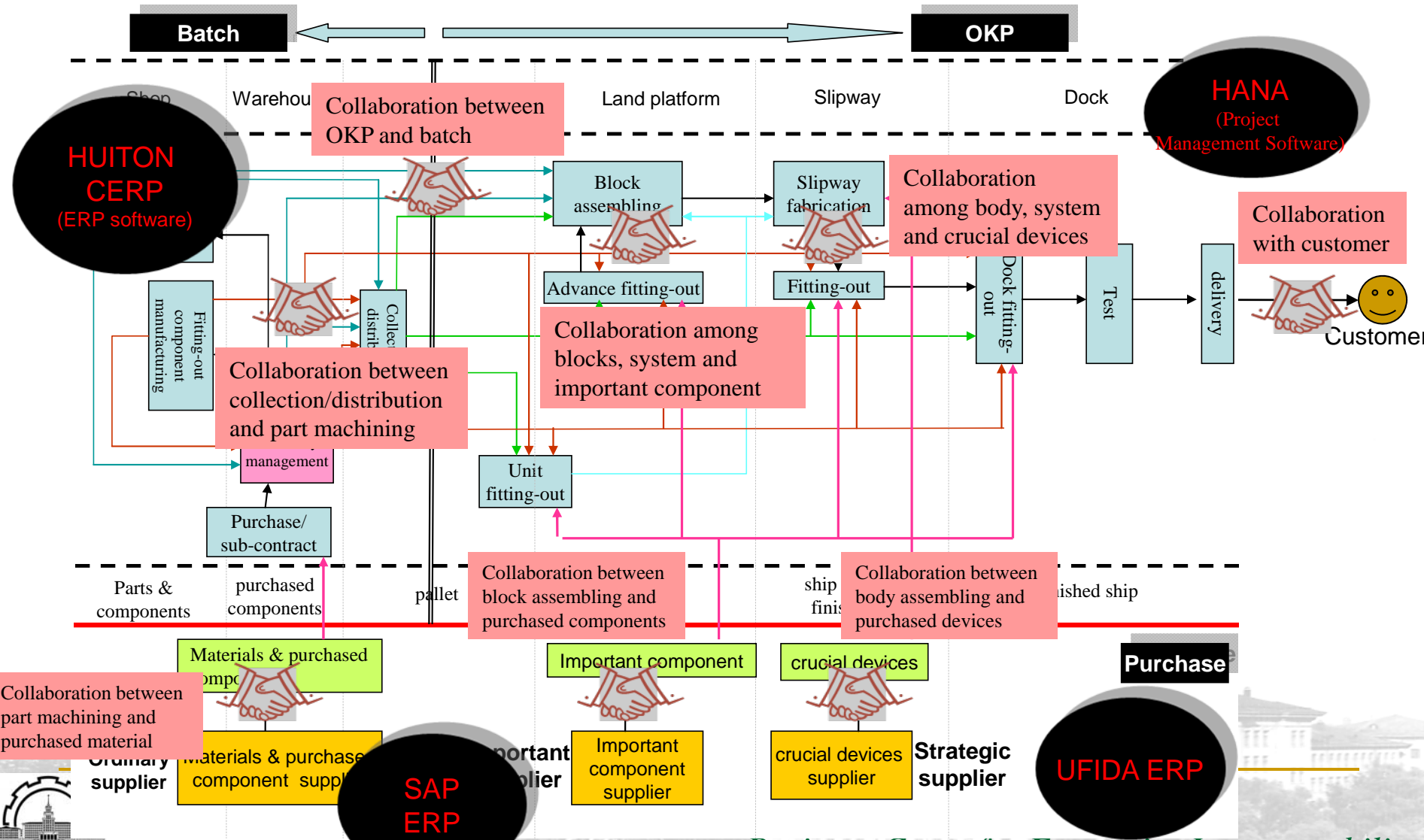


Typical interoperability problems in ship-building industry

- Interoperability requirements
 - Information level -- data exchange
 - Order data
 - Planning data
 - Progress/Execution data
 - Design data
 - Quality Check data
 - Business level – process coordination
 - Collaborative production planning
 - Collaborative order processing
 - Collaborative quality checking
 - Collaborative order bidding
 - Vendor Managed Inventory
 - Event-based execution controlling and coordination



Requirements of Collaboration and Interoperability in Ship-Building



Typical interoperability problems in ship-building industry

- Barriers and difficulty in interoperability
 - Inconsistency in naming
 - Multiple meanings for single terminology
 - In-compatible data format
 - Un-unified units for goods, currency, ...
 - Multiple standards of products and business/manufacturing processes
 - Mismatching between business processes
 - Multi-production modes and business processes
 - Heterogeneous platforms, languages and technologies of existing IT system
 - Un-transparency and low openness of existing IT systems

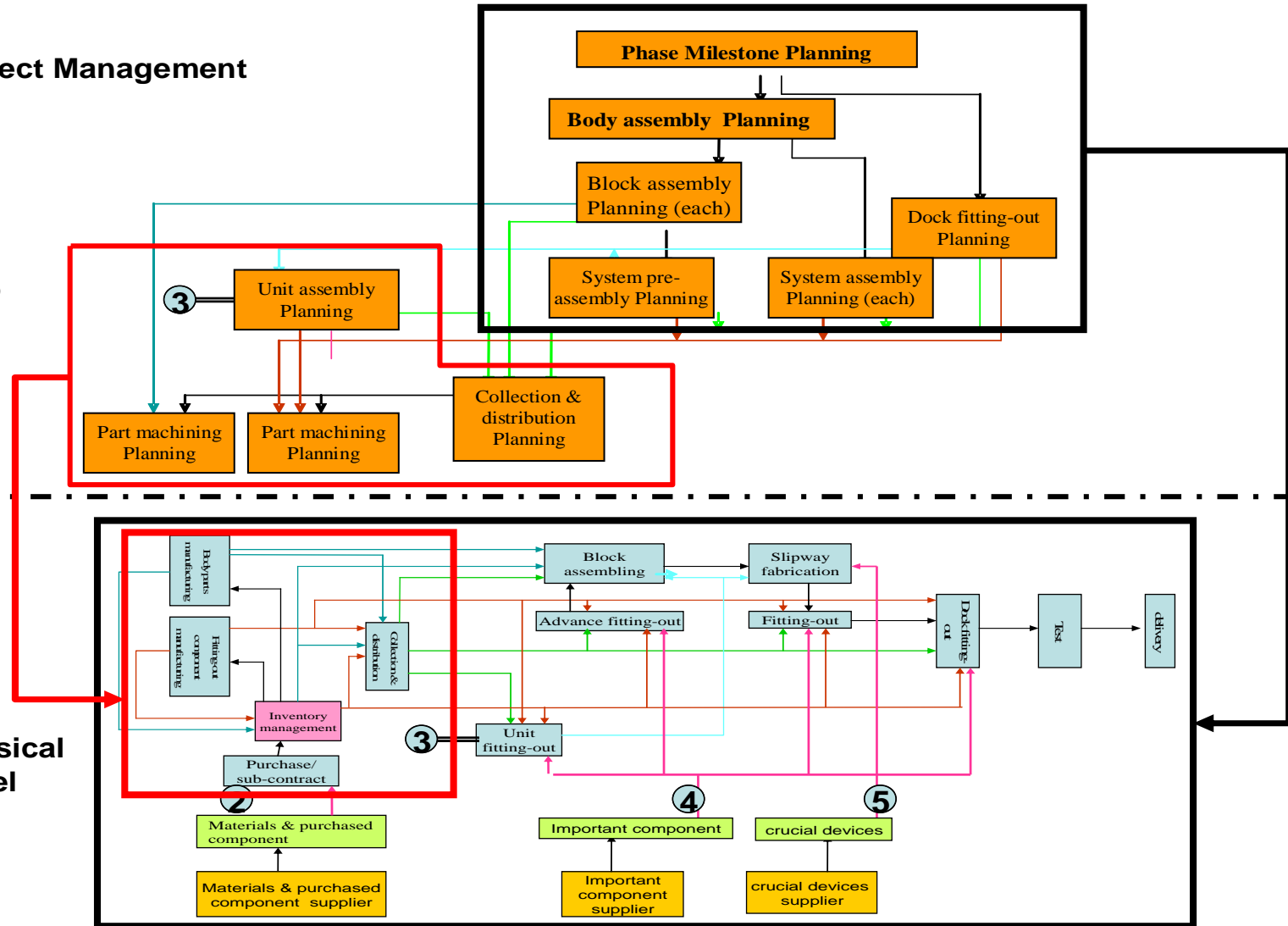


Collaborative Production Management for Ship-Building

Project Management

ERP

Physical Level

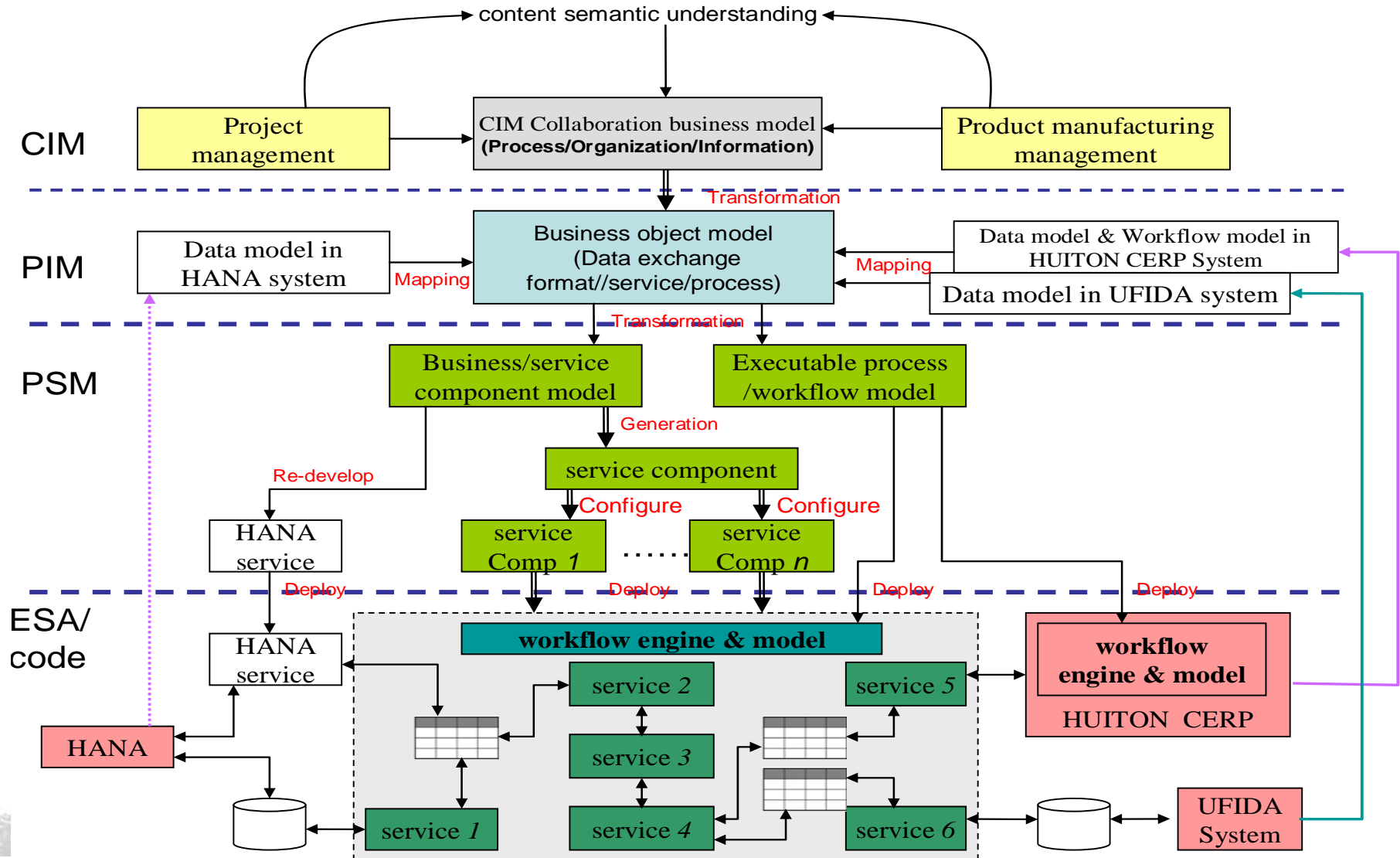


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Model-driven Collaboration and Interoperability

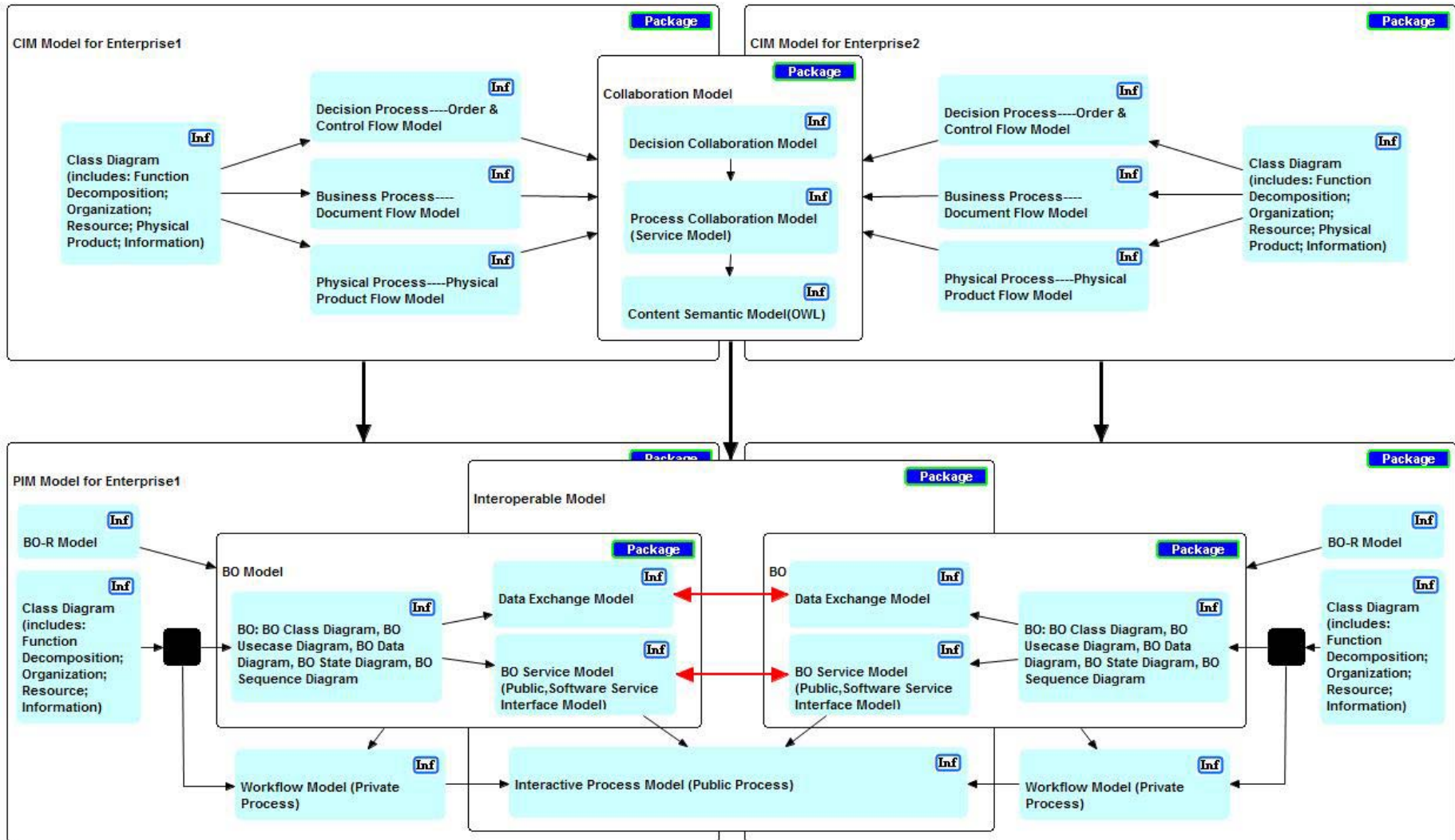


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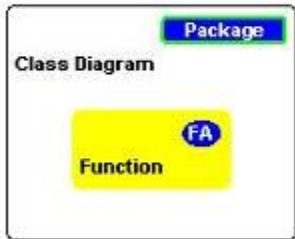
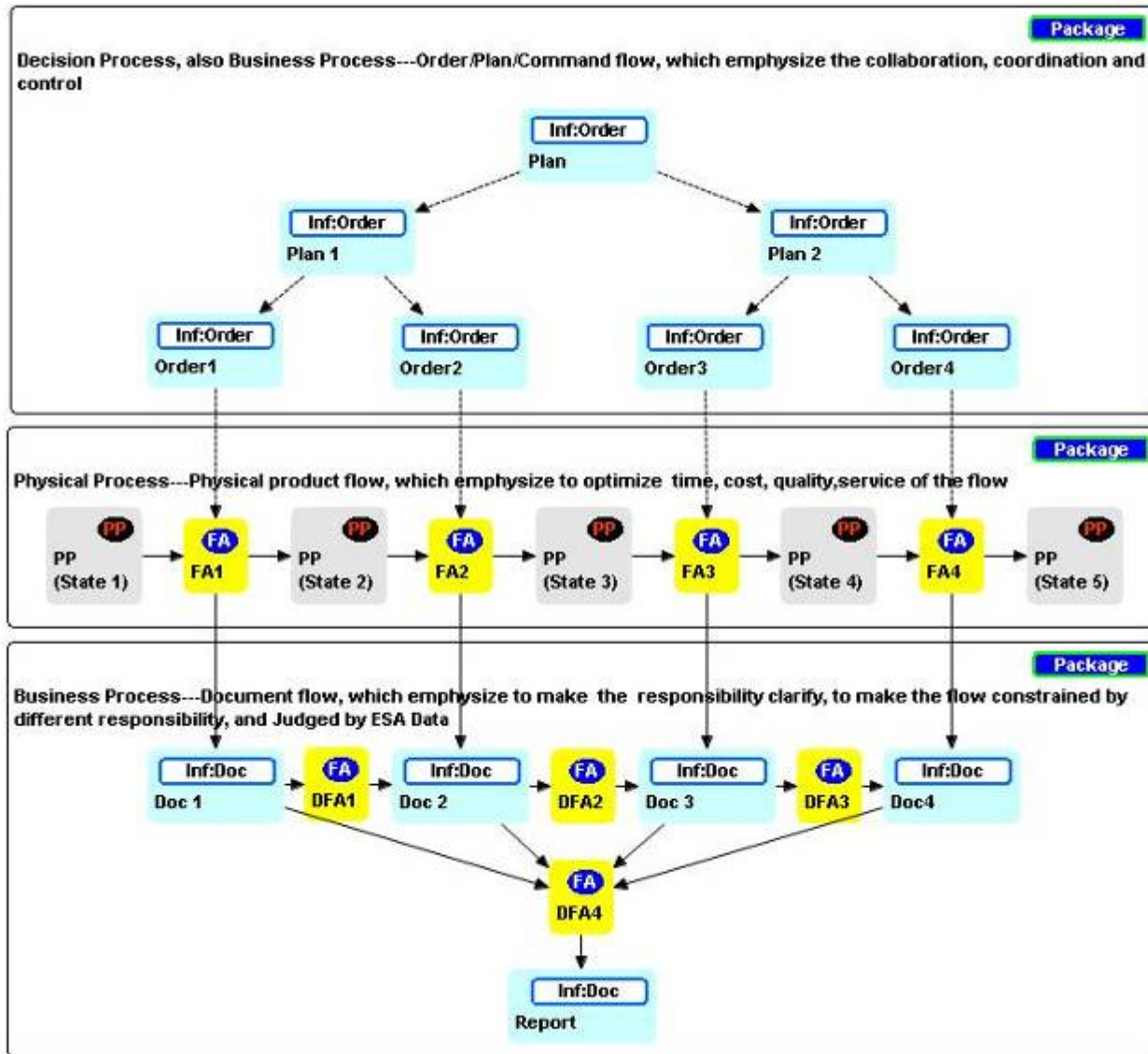
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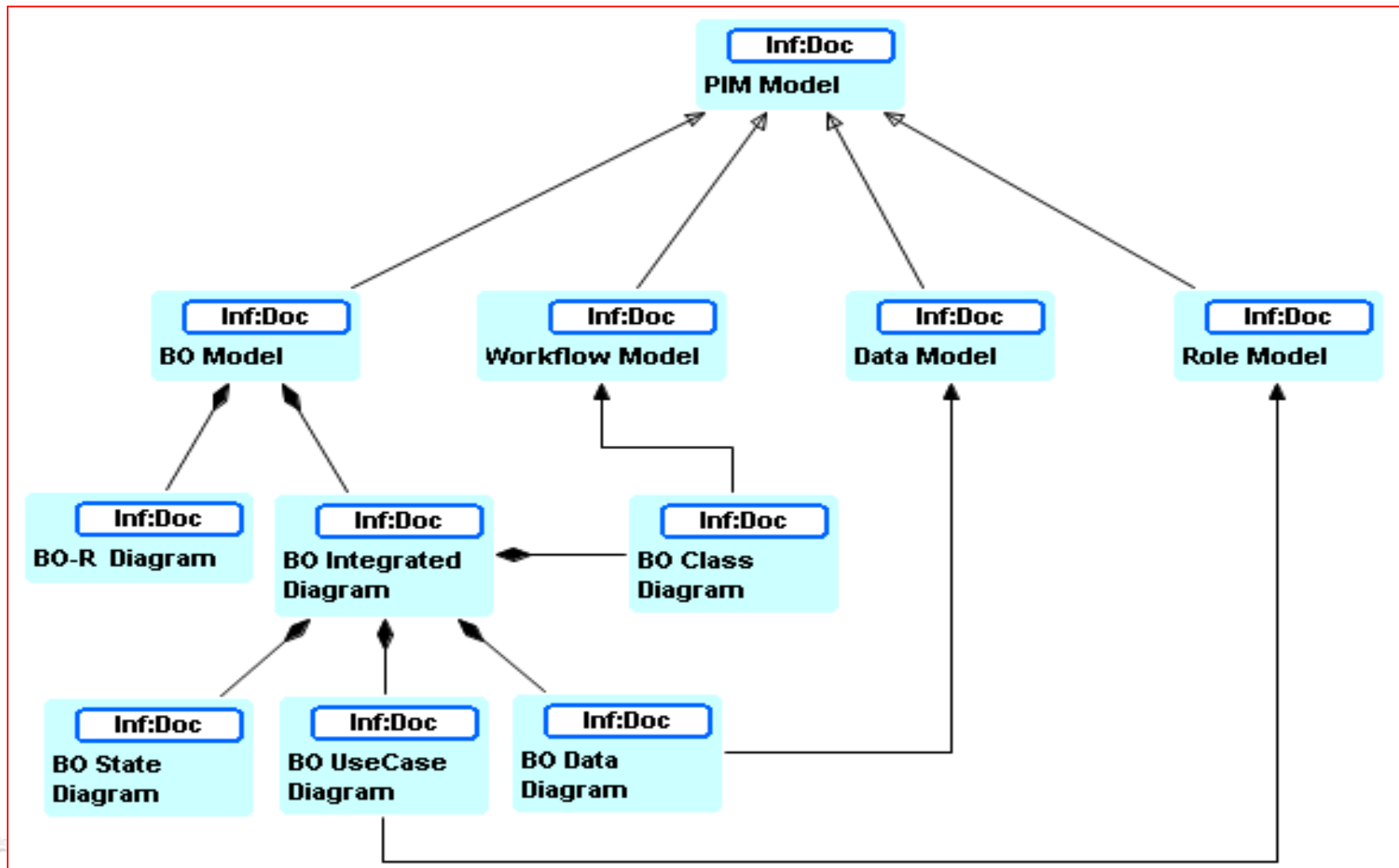
Model-Driven Interoperability



CIM Model

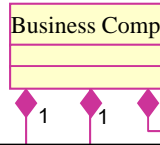


PIM Model



PSM model

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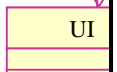


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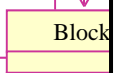
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<!-- 分区基本信息结束 -->
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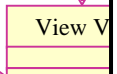
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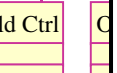
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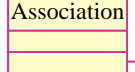
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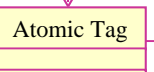
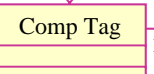
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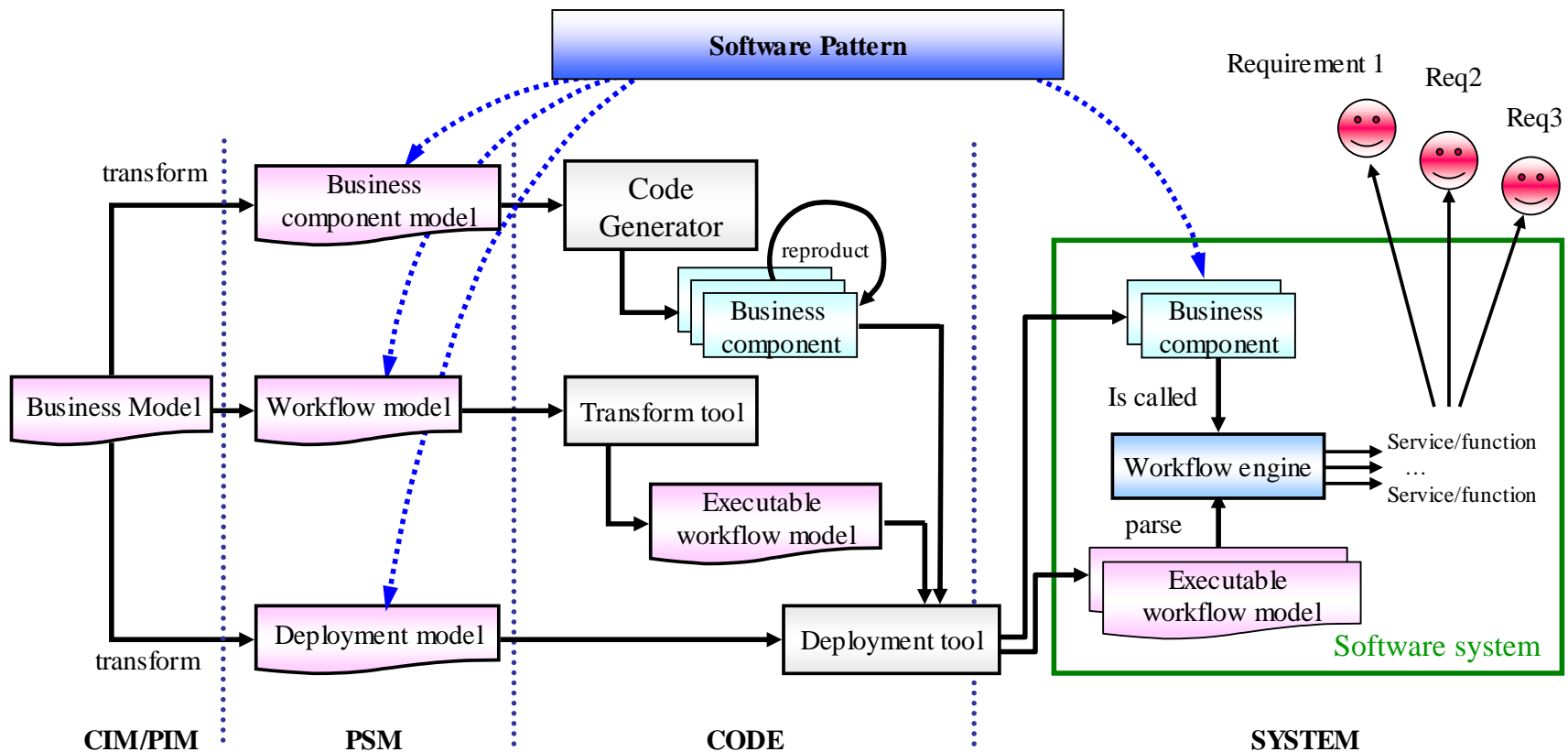
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Model-Driven Software Generation

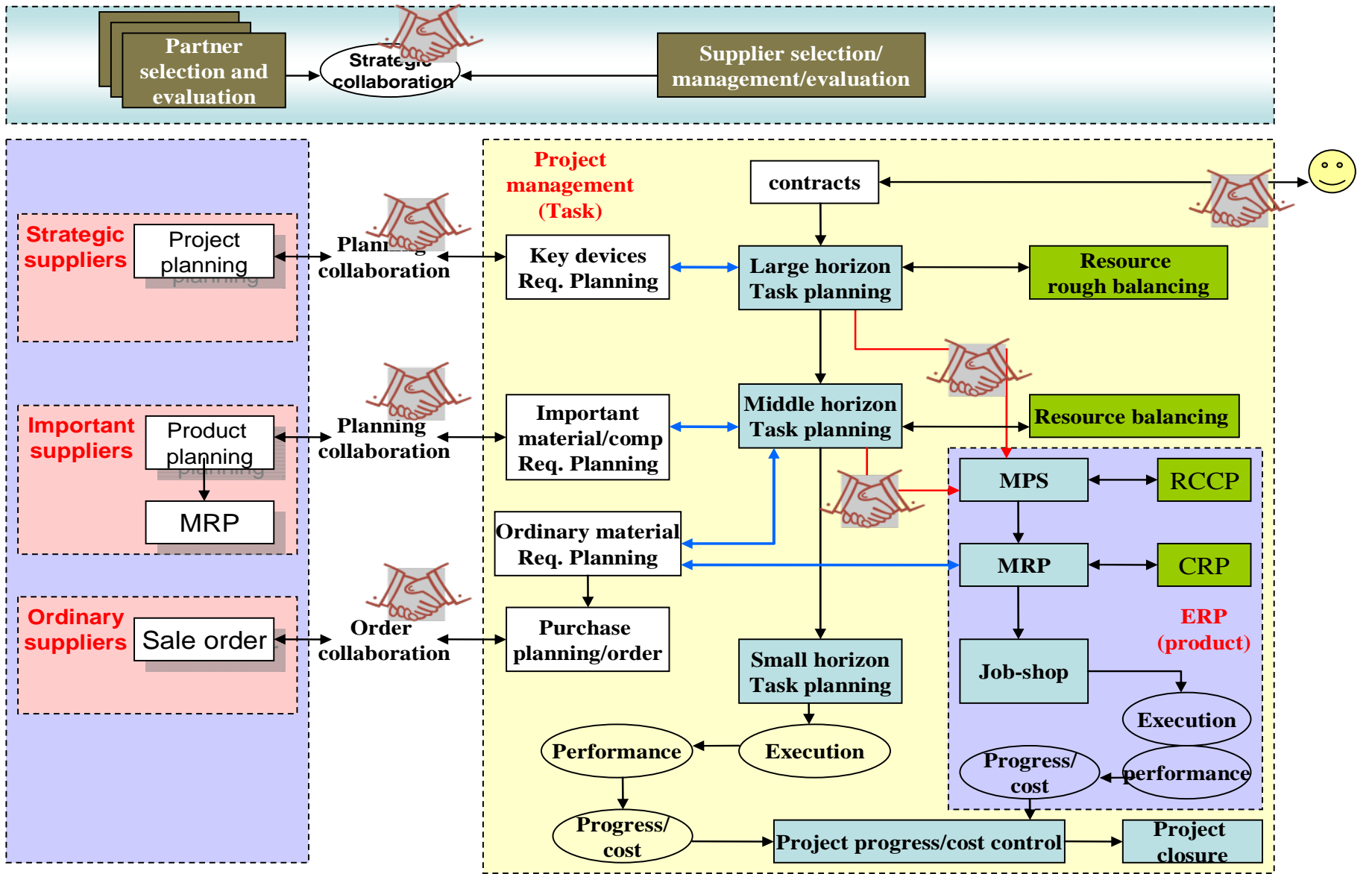


Collaborative Resource Planning

suppliers

Ship-building enterprise

customers



Case study: HUANGHAI Ship-Building Co. Ltd in China

HUANGHAI SHIP-BUILDING Co. LTD



Passenger ro-ro ship (Weihai to Dalian)
1020 passengers/615m car lane



600TEU multi-purpose container ship
Exported to Europe in batch



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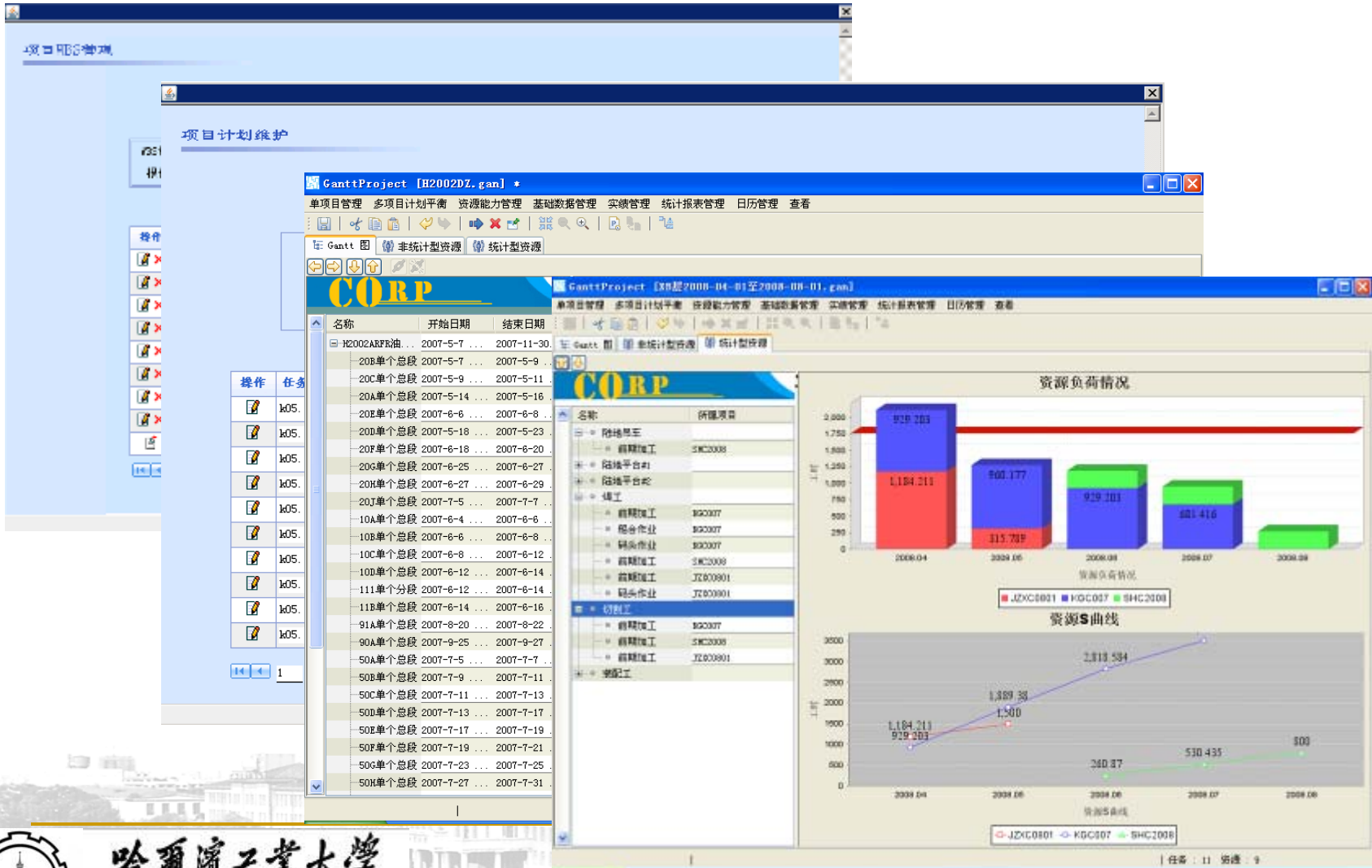
CORP for HUANGHAI SHIP-BUILDING Co. LTD

■ CORP Management System

- ❑ Life cycle management for projects
- ❑ Tasks and WBS management
- ❑ Product and materials management
- ❑ Collaborative production planning and execution
- ❑ Organizations and resources management
- ❑ Planning/Scheduling and resource balancing
- ❑ Constraints management
- ❑ Procurement management
- ❑ Supply chain and subcontract management
- ❑ Graphic interaction supported decision making



Production Planning



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Co-ordination management

设备需求计划

计划编号: admin20090212003
 计划名称: 主机需求计划
 计划类型: 关键协作计划
 计划状态: 审批完成
 制单人编号: ZZY
 制单日期: 2009-02-12
 制单名称: 黄海造船厂
 审批状态: 审批完成
 备注: 测试数据

设备供货计划

单据编号: admin20090215001
 单据名称: 协作反修模型01
 单据类型: 关键协作计划
 单据状态: 发送完成
 协作咨询单编号: admin200902140
 制单人编号: GJX2001
 制单名称: 冠盛设备制造公司
 编制日期: 2009-02-15
 备注: 模拟数据

计划明细信息

操作	设备编号
	ZJ001
	ZJ002
	ZJ003

企业信息 设备信息

操作	设备编号
	ZJ001
	ZJ002
	ZJ003

计划冲突检测

检测单编号: ZZYJC20090401
 检测单名称: 主机计划检测0401
 制单人编号: ZZY
 制单日期: 2009-04-01
 设备需求计划编号: admin20090212003
 设备供货计划编号: admin20090215001

执行冲突检测

计划冲突消解策略生成界面

单据编号: ZZYXJSC2009040100
 单据名称: 主机冲突消解策略
 制单人编号: ZZY
 制单日期: 2009-04-05
 检测单编号: ZZYJC20090401
 设备需求计划编号: admin20090212003
 设备供货计划编号: admin20090215001
 最大调整值: 9

消解策略生成

检测结果

检测结果编号	设备编号	结果
JCJ001	ZJ001	延期供应
JCJ002	ZJ002	正常供应
JCJ003	ZJ003	提早供应

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消解策略详细信息

策略编号	待消解冲突值	产生方案	对应消解策略	消解策略代价 (万元)	该策略的实施方	
ZJ001	0	解决方案一	后续任务A5压缩5天, B6压缩4天	1.1	总装企业	进入策略评价选择界面
ZJ002	0	解决方案二	关键任务A1压缩2天, B4压缩3天, B	1.0	协作企业	进入策略评价选择界面
ZJ003	4	解决方案三	后续任务A5压缩2天, B6压缩2天	0.5	总装企业	进入策略评价选择界面
ZJ003	5	解决方案三	关键任务A1压缩1天, B4压缩2天, B	0.4	协作企业	进入策略评价选择界面

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Benefits of the Ship-building Co.

- Improved requirements analysis for collaboration and interoperability of ship-building manufacturing;
- Decreased term and cost for developing ship-building ESAs;
- Eliminated interoperability barriers
 - Information level: data standardization, technical data exchange, production planning data exchange, order execution data exchange, etc)
 - Business level: production planning collaboration, order processing, event-based coordination, etc.
- Performance improvement:
 - Rate of the orders (ships) which fulfill due-date is increased through collaborative production planning and control;
 - Utilization of key resources, e.g. slipway, is increased by means of collaborative planning;
 - Transactions between partners (e.g. order processing) is accelerated and the cost is decreased;
 - Information and data, e.g. technical data, business data and manufacturing data, are exchanged more quickly.



Business Cases for Enterprise Interoperability

**Collaboration and Interoperability in Production
Management of Ship-Building Industry**

Thank you! Dank!

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