

# Information Systems Modelling For Enterprise Systems Interoperability

Hervé Panetto, Professor

University of Lorraine, TELECOM Nancy

Research Centre for Automatic Control

Chair of IFAC TC 5.3 « Enterprise Integration and Networking »

Co-Chair of DED&M'2014

[Herve.Panetto@univ-Lorraine.fr](mailto:Herve.Panetto@univ-Lorraine.fr)

# Agenda

What is an Enterprise System?

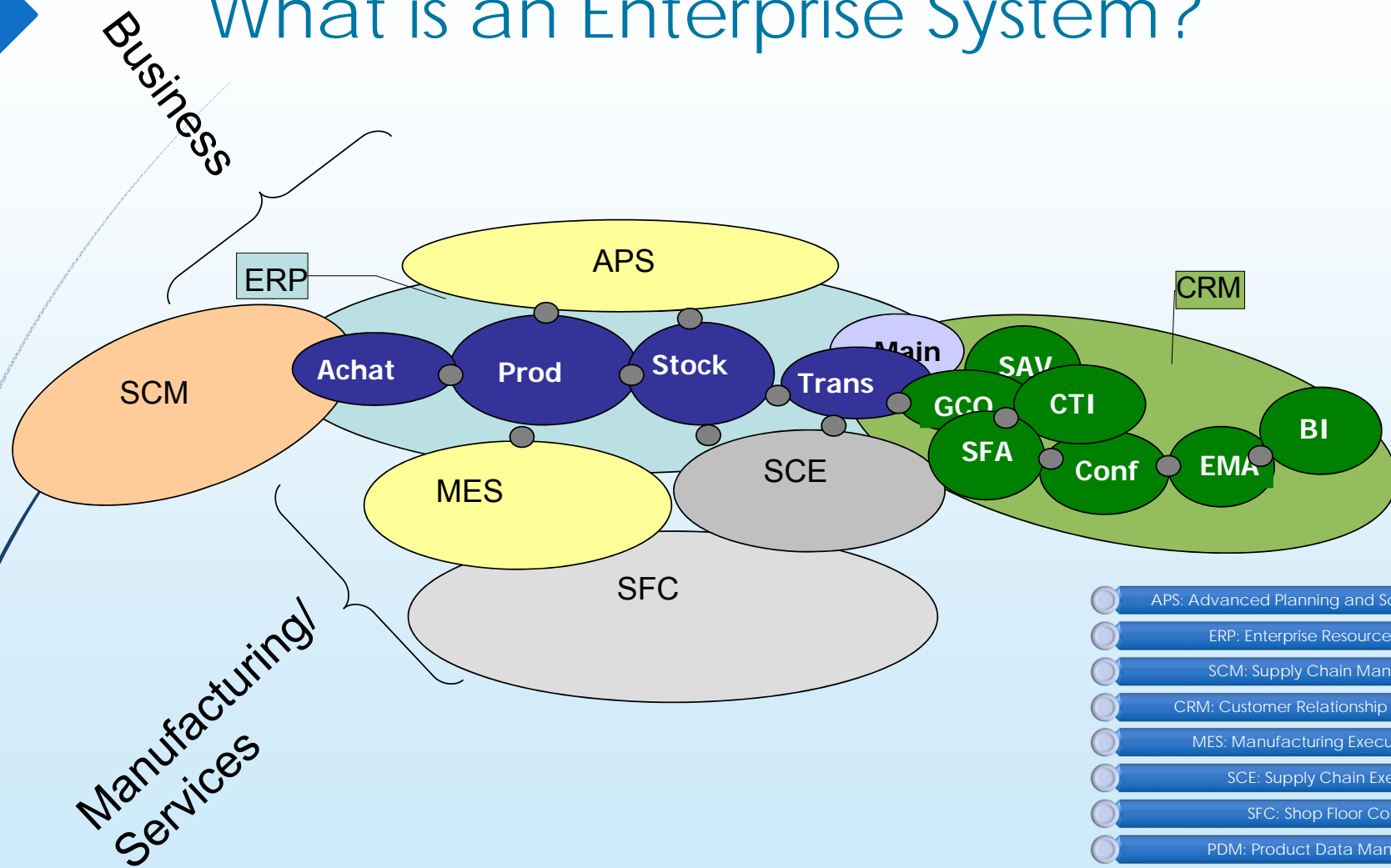
Enterprise Systems Interoperability

Semantic Modelling

Information Systems Modelling

Some thoughts...

# What is an Enterprise System?



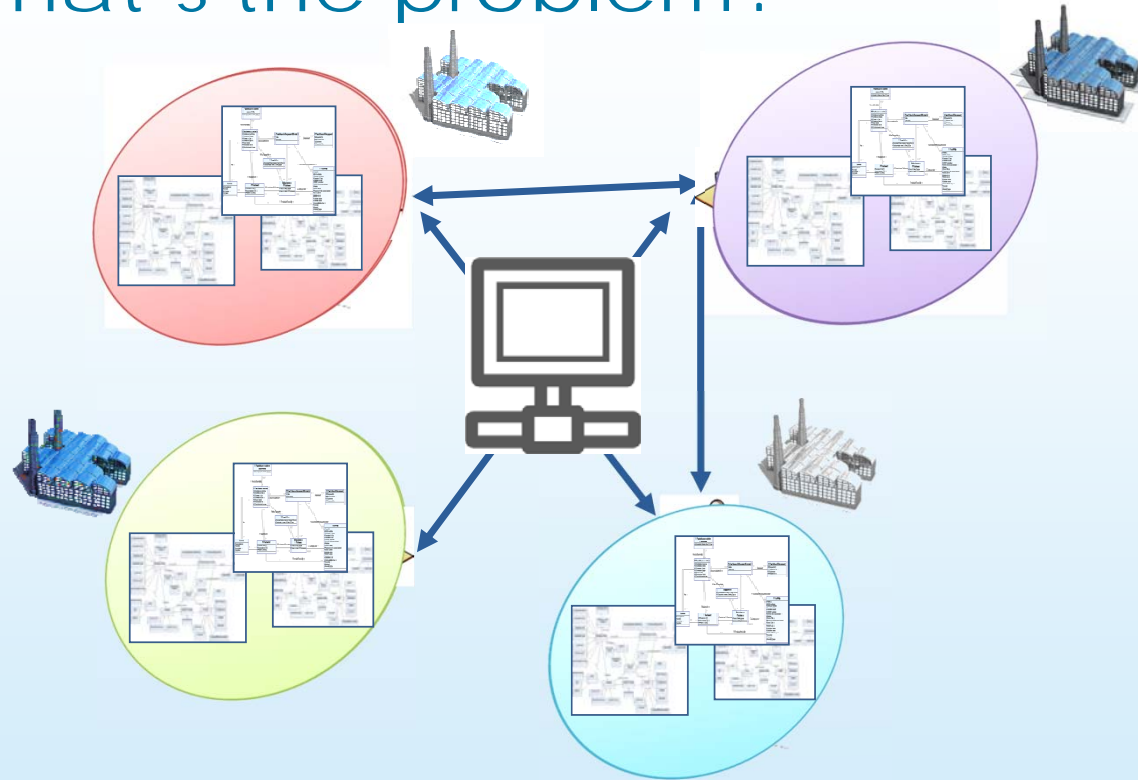
- APS: Advanced Planning and Scheduling System
- ERP: Enterprise Resource Planning
- SCM: Supply Chain Management
- CRM: Customer Relationship Management
- MES: Manufacturing Execution System
- SCE: Supply Chain Execution
- SFC: Shop Floor Control
- PDM: Product Data Management
- PLM: Product Lifecycle Management

# Enterprise Systems Interoperability

## What is interoperability ?

- ▶ ISO/IEC 2382
  - ▶ 01.01.47 interoperability: The capability to communicate, execute programs, or transfer data among various functional units in a manner that requires the user to have little or no knowledge of the unique characteristics of those units.

# What's the problem?



Semantic  
Interoperability

# Semantic Interoperability

## Semantics Modelling



English translation of Welsh: *"I am not in the office at the moment. Please send any work to be translated"*

## What is semantic interoperability ?

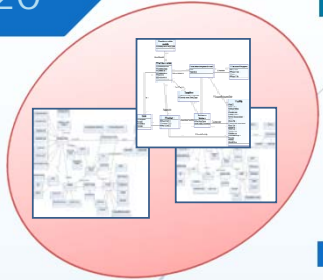
- ▶ A sender's system  $S$  is semantically operable with a receiver's system  $R$  if and only if the follow condition holds for any data  $p$  that is transmitted from  $S$  to  $R$ :
- ▶ For every statement  $q$  that is implied by  $p$  on the system  $S$ ,
  - ▶ there is a statement  $q'$  on the system  $R$  that
    - ▶ (1) is implied by  $p$  on the system  $R$ , and
    - ▶ (2) is logically equivalent to  $q$ .
- ▶ the receiver must at least be able to derive a logically equivalent implication for every implication of the sender's system.

## Issues source: “Lost in translation”

- ▶ There is NO *lingua franca* for enterprises, they all “speak” different languages
- ▶ However, some are “less different” than the others:
  - ▶ Enterprise models (loose alphabets)
  - ▶ Reference models (strict alphabets)
  - ▶ Ontologies (formal alphabets)



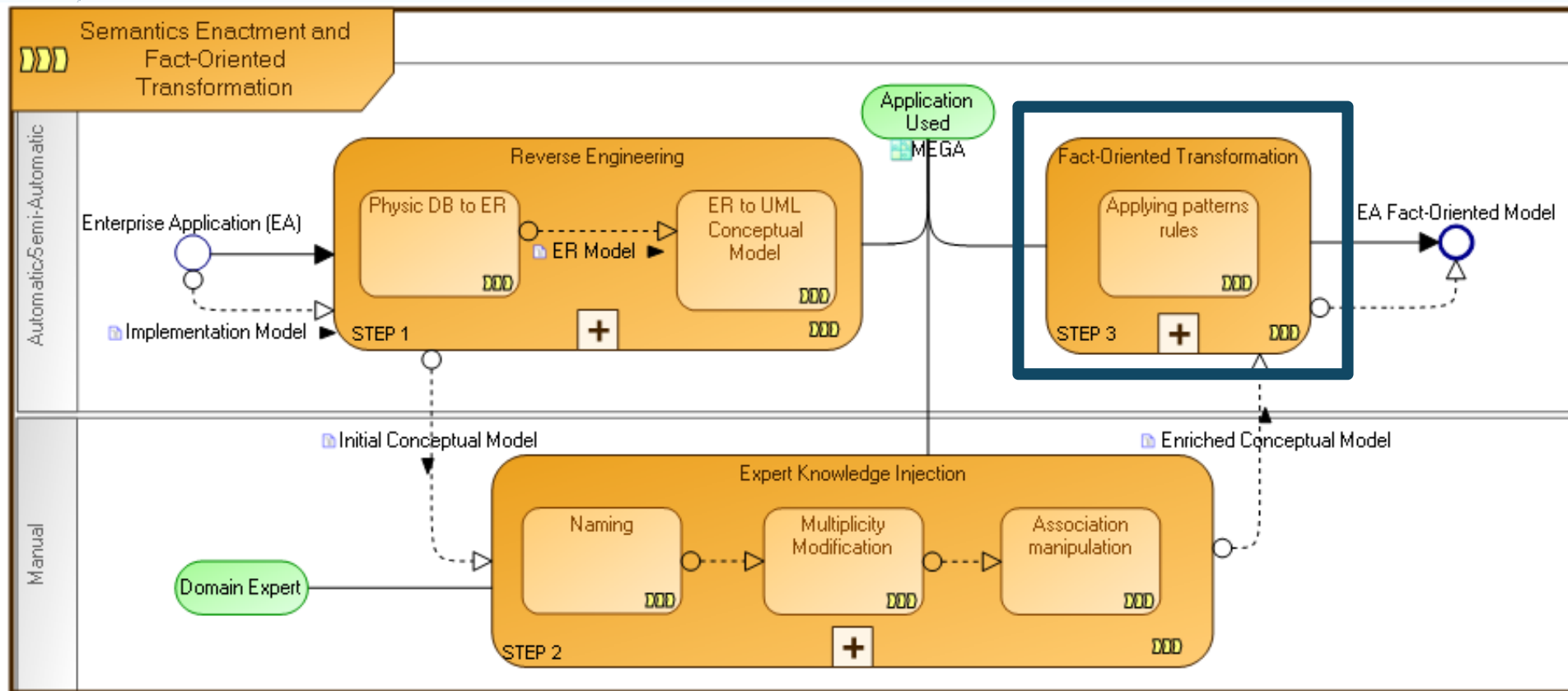
# Information Systems Modelling



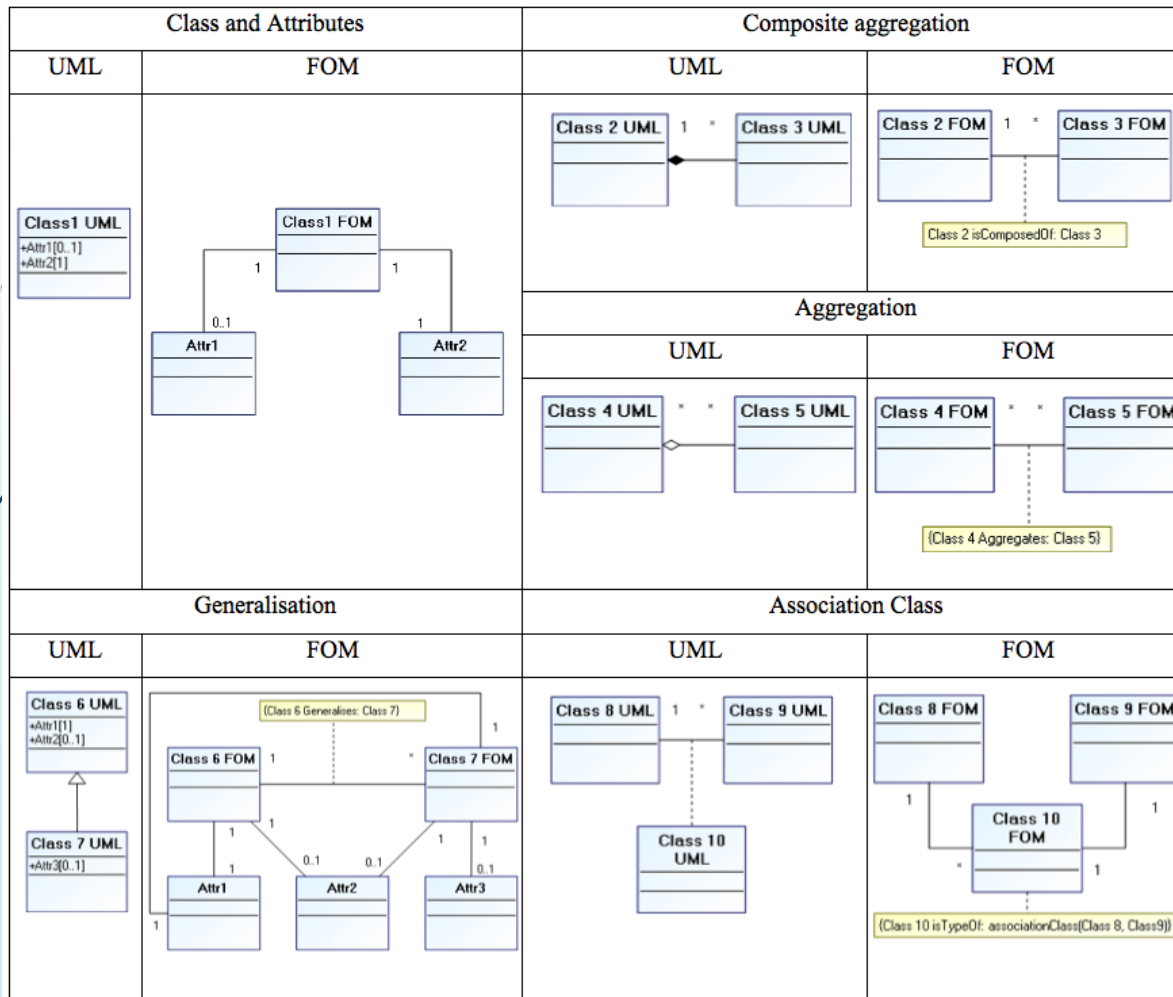
- Multiple languages
- Multiple business vocabularies
- Multiple domains of interest
- Relational-oriented vs. Object-oriented
- Conceptual model vs. Implementation schema

# From a schema to an ontological model

## Fact-Oriented Transformation



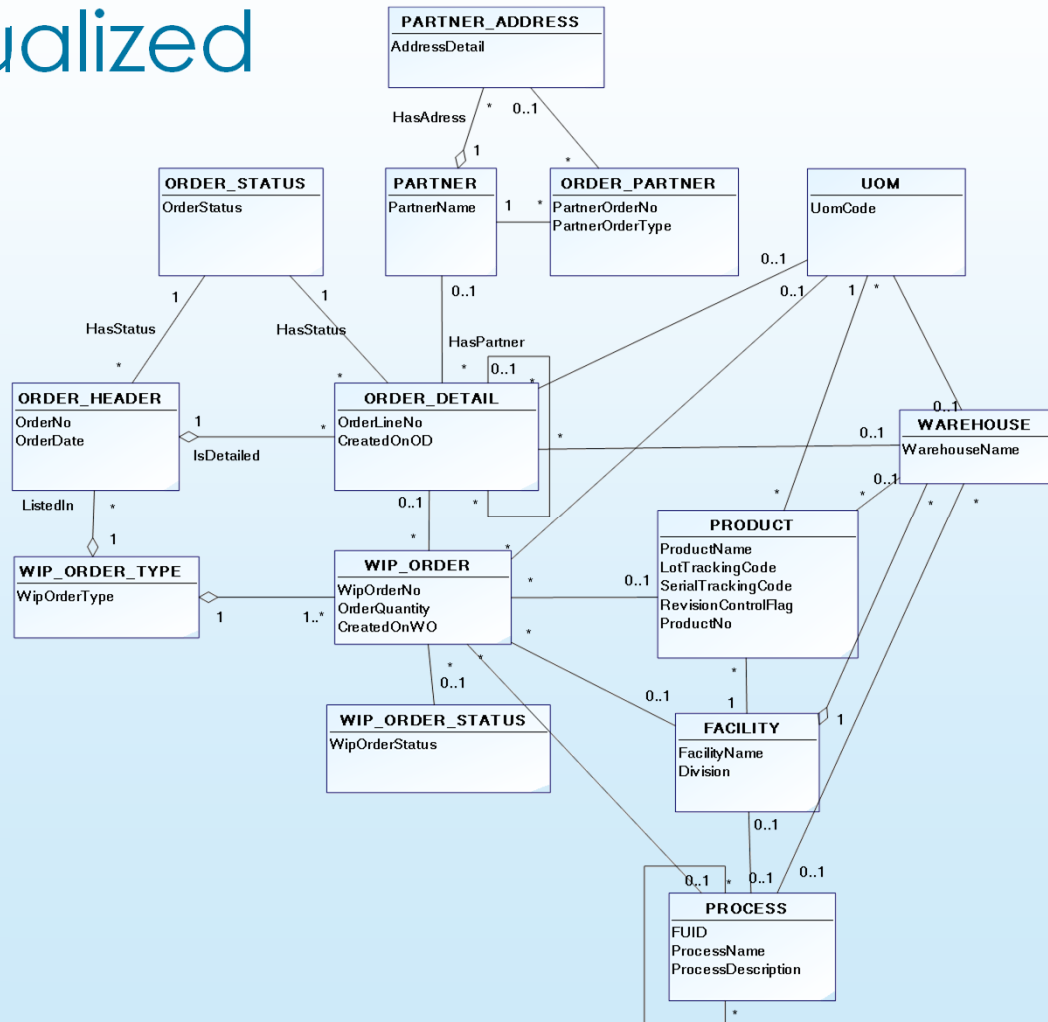
# Fact-oriented transformations



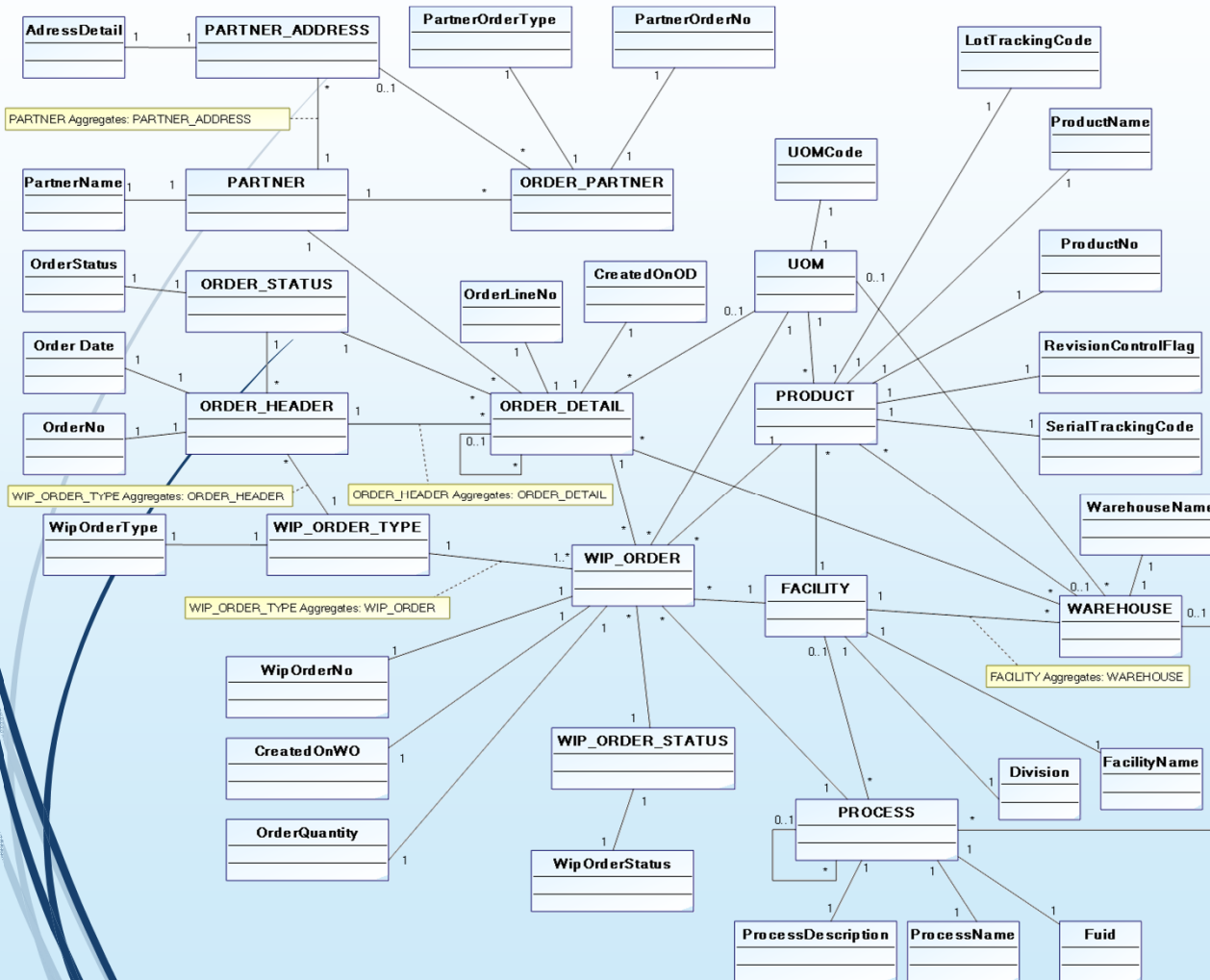
- ▶ ORM (Object Role Modelling) (Halpin, 1989) alike
- ▶ Attribute free
- ▶ Focus on facts (concepts)

(Lezoche, et al, 2012)

# Purchase Order model as conceptualized

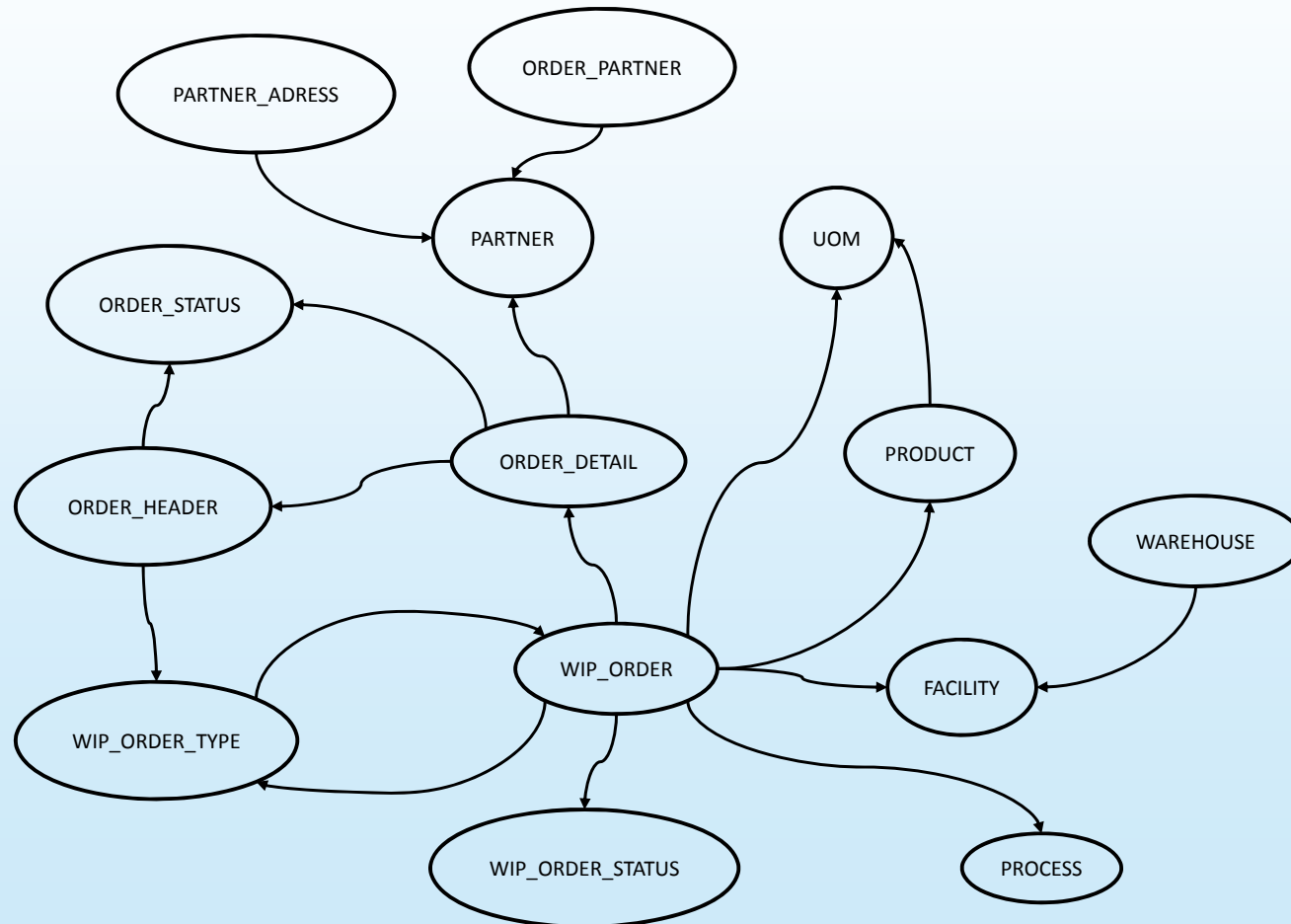


# Fact-oriented Purchase Order model

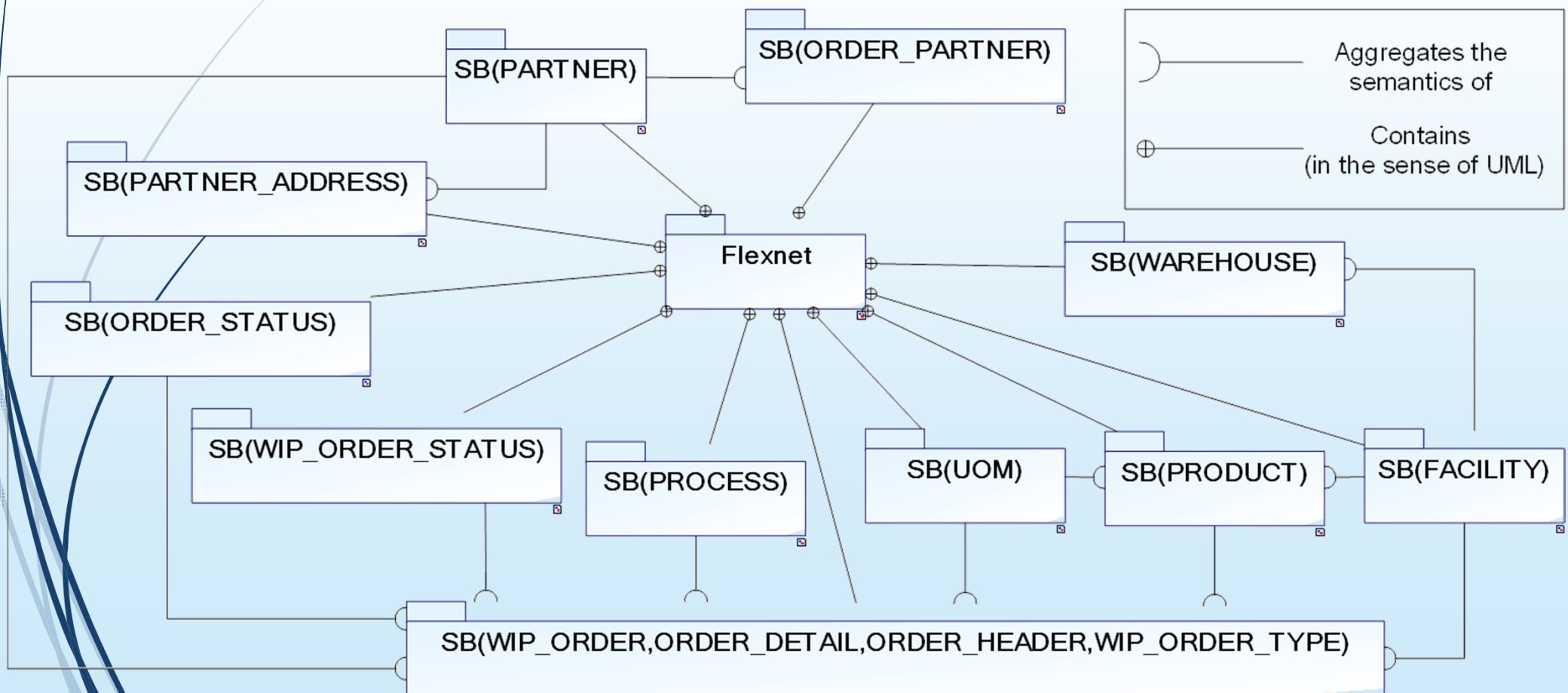


- Automatically processed
  - Prototype in MEGA Suite
- Not to be used by humans
- Input to an ontological analysis

# The semantic-dependency graph related to the fact-oriented model

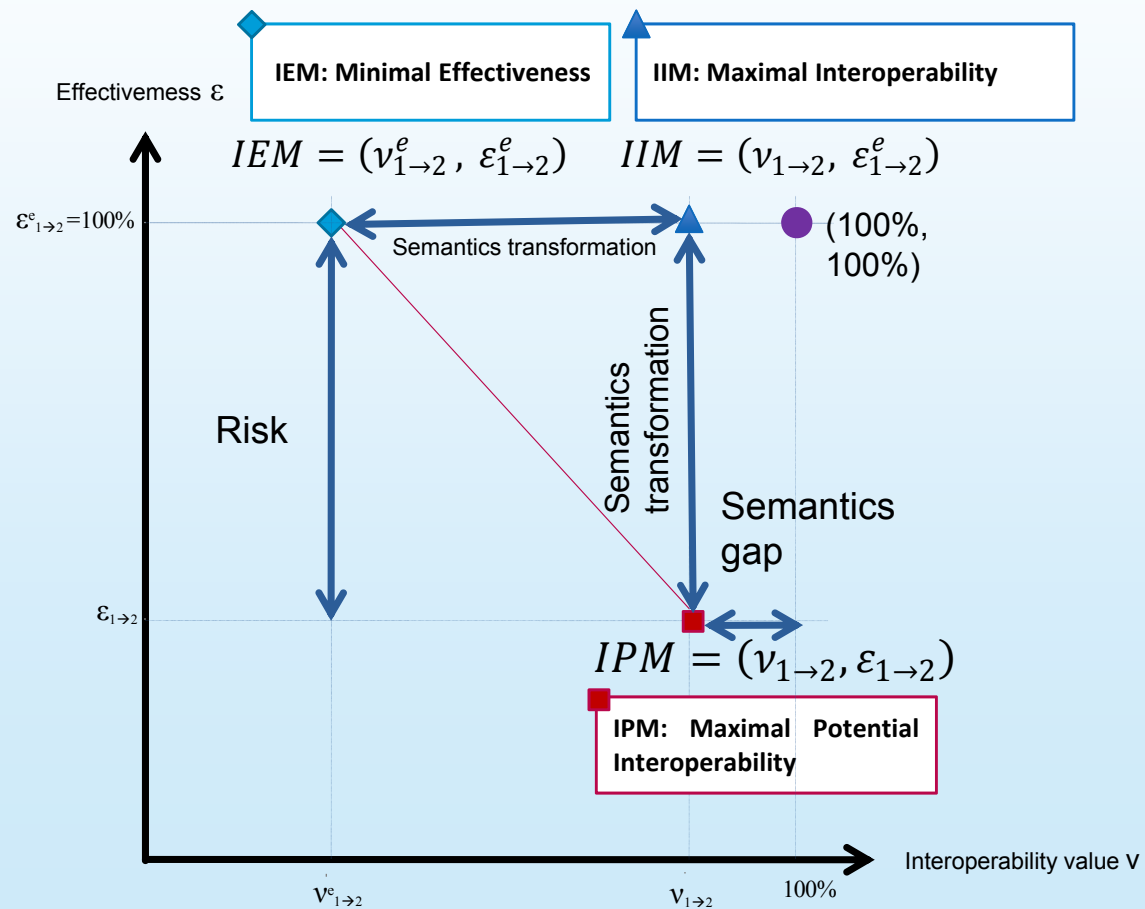


# Partitioning the semantics embedded into a conceptual model



# Interoperability assessment

## Interoperability Map

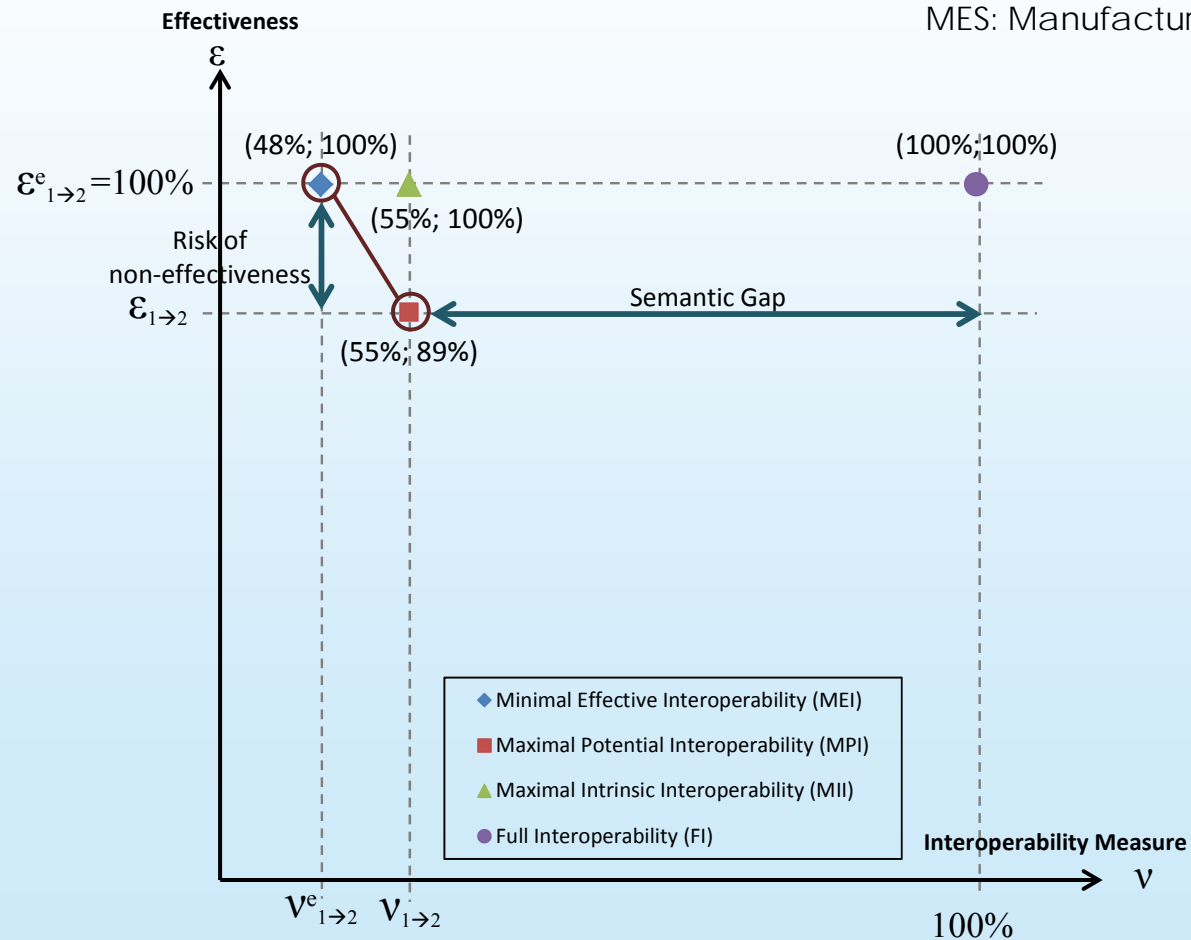


(Yahia, et al, 2012)



# Interoperability Measures Map, from an ERP to a MES

ERP: Enterprise Resource Planning  
MES: Manufacturing Execution System



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The End

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