60. Metamodelling in Heterogeneous Technical Spaces

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1) Heterogeneous technical spaces

DRESDEN concept
Exzellenz aus Wissenschaft und Kultur

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Obligatorische Literatur

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Other Literature

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  - This PhD thesis lays the ground for component models and composition technology for modeling languages.
  - www.reuseware.org
- Birgit Grammel. Automatic Generation of Trace Links in Model-driven Software Development. PhD thesis, Technische Universität Dresden, Fakultät Informatik, February 2014

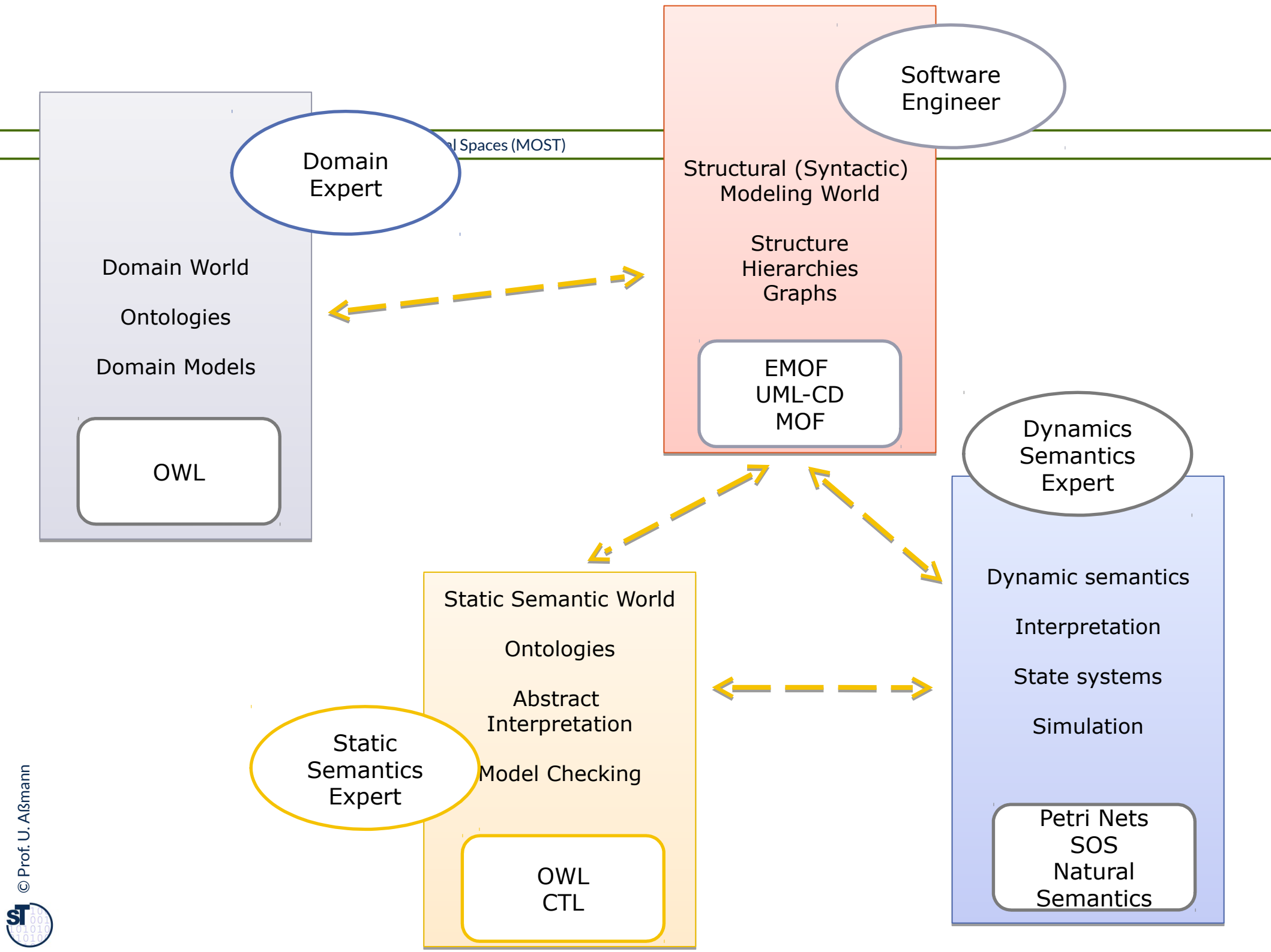
The Book of the MOST Project for Multi-TS Development

MOSTPROJECT
http://most-project.eu

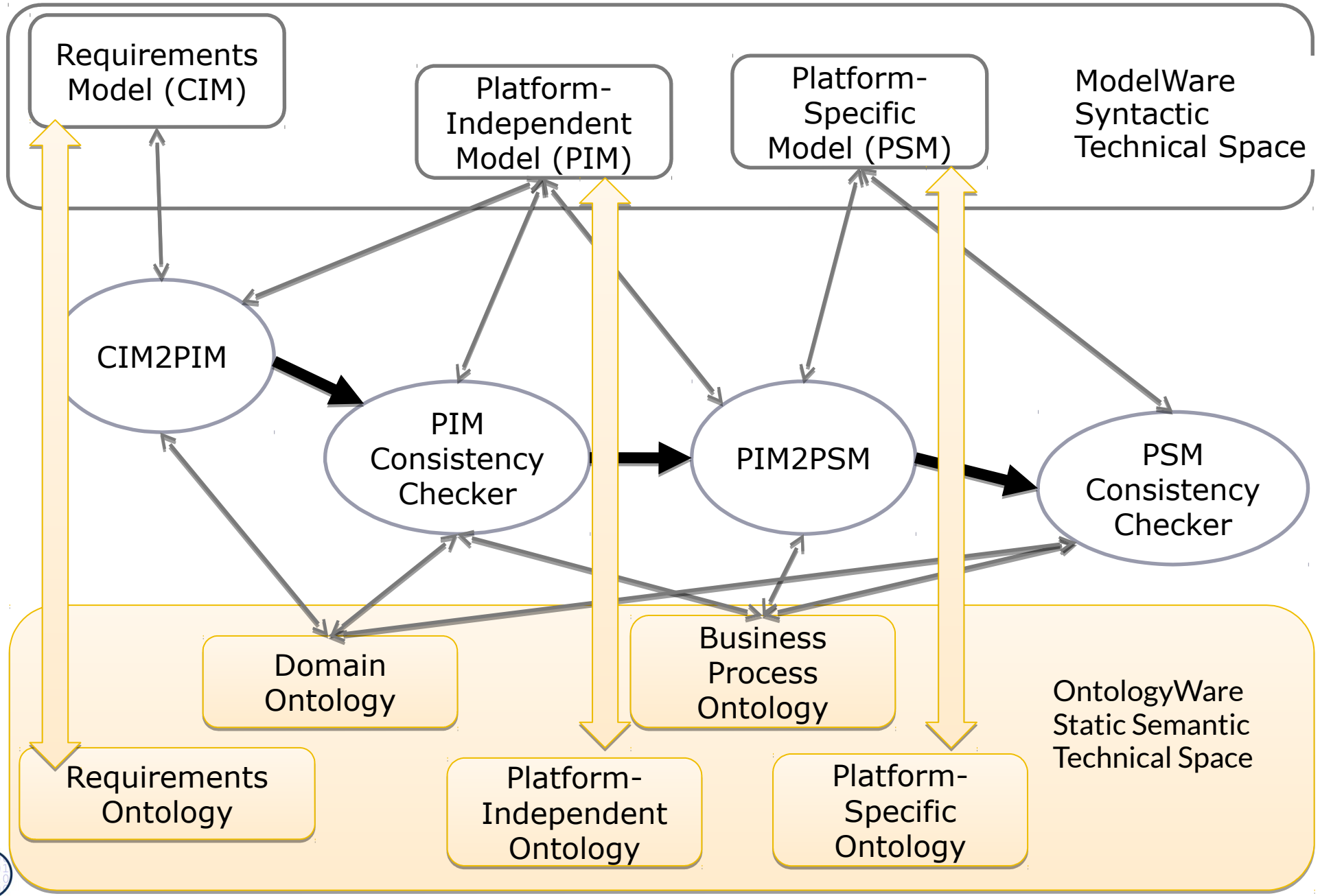
60.1 MDSD in Multiple Technical Spaces (Multi-TS Development)

The Problem: Heterogeneous Software Lives in **Several** Technical Spaces

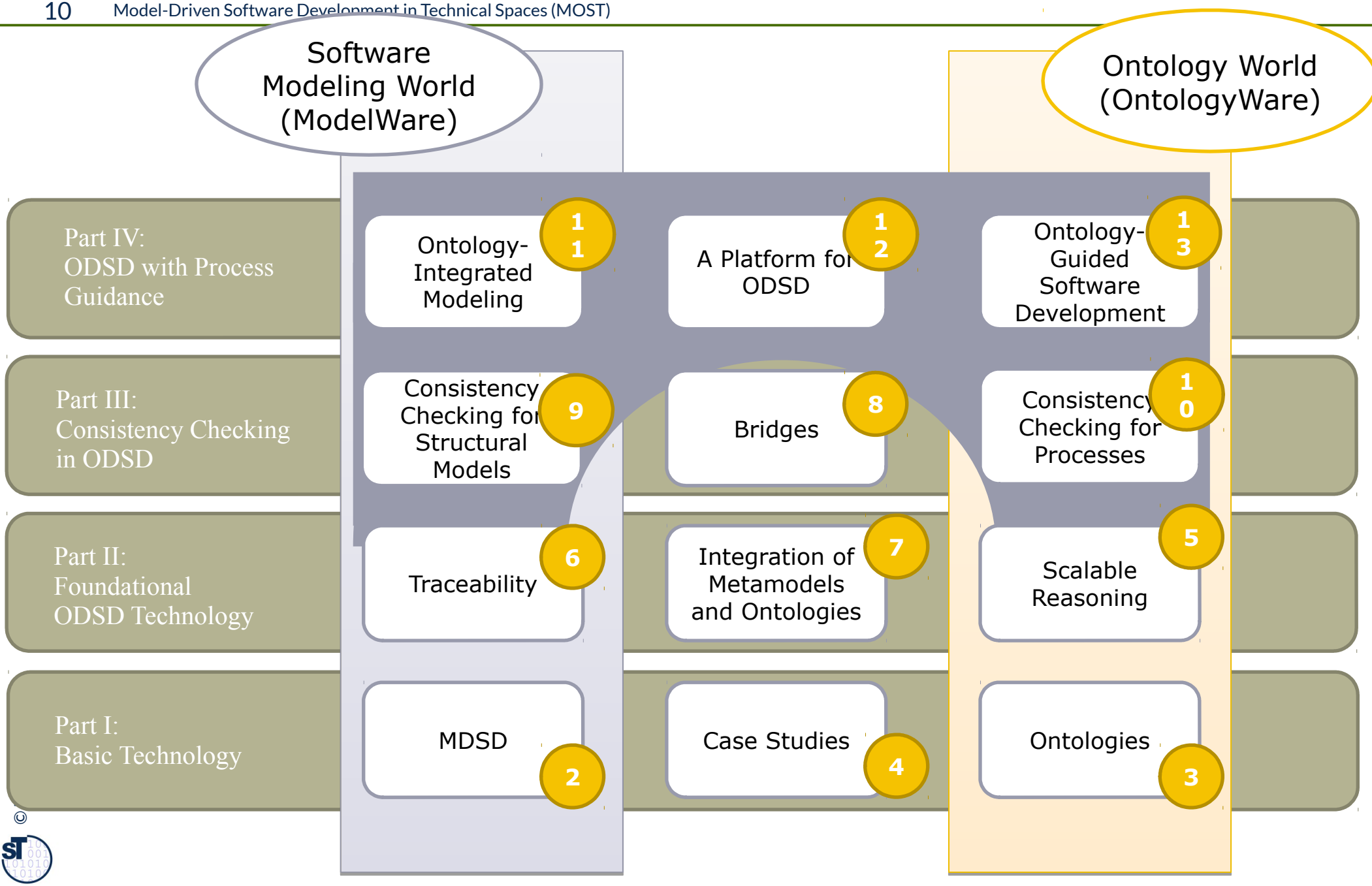
- Modern cars, cloud robots (Kiva robots), and other CPS live in several technical spaces:
  - Syntactic technical space
  - Static semantic technical spaces
  - Dynamic semantic technical space (usually one)
  - Domain world technical space



Example: A Heterogeneous MDA (From MOST Project)

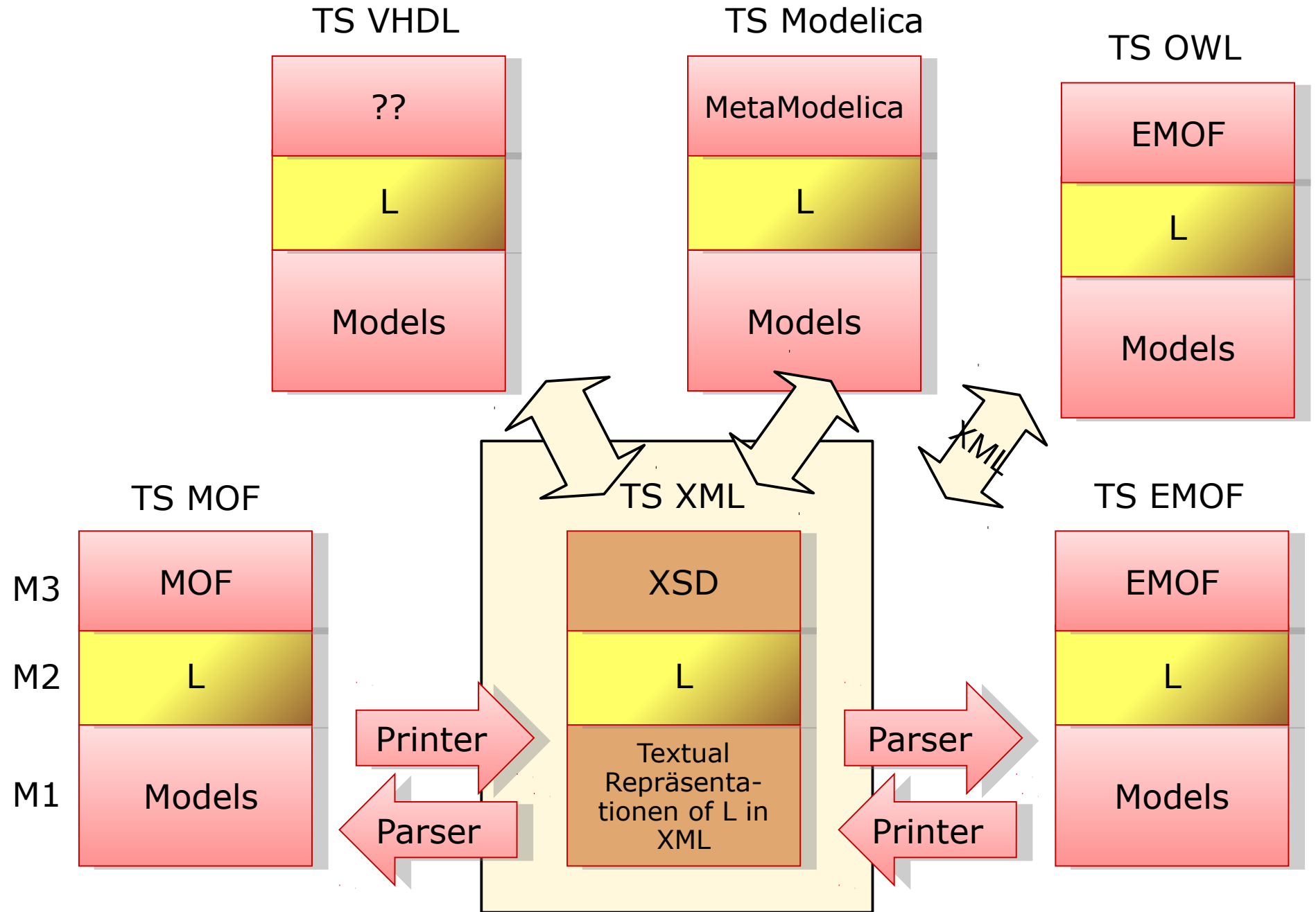


MOST: Tasks for Bridging between Syntactic and Semantic TS



60.2 Applications Working in Multiple Technical Spaces

Language Mapping between Several TS via XML
Data Exchange via Link Trees



Multi-Technical-Space MDSD Tools (Software Factories

A **multi-TS toolkit** is a toolkit using several technical spaces at the same time.

A **(heterogeneous) software factory** is a multi-TS toolkit.

- Today, most MDSD toolkits work in one technica space.
- However, industrial software development usually is heterogeneous and several technical spaces must be used (XML, Java, C++, UML, csv, ...)
- PreeVision, ASCET are software factories

A **software factory** produces heterogeneous software product lines in several technical spaces.

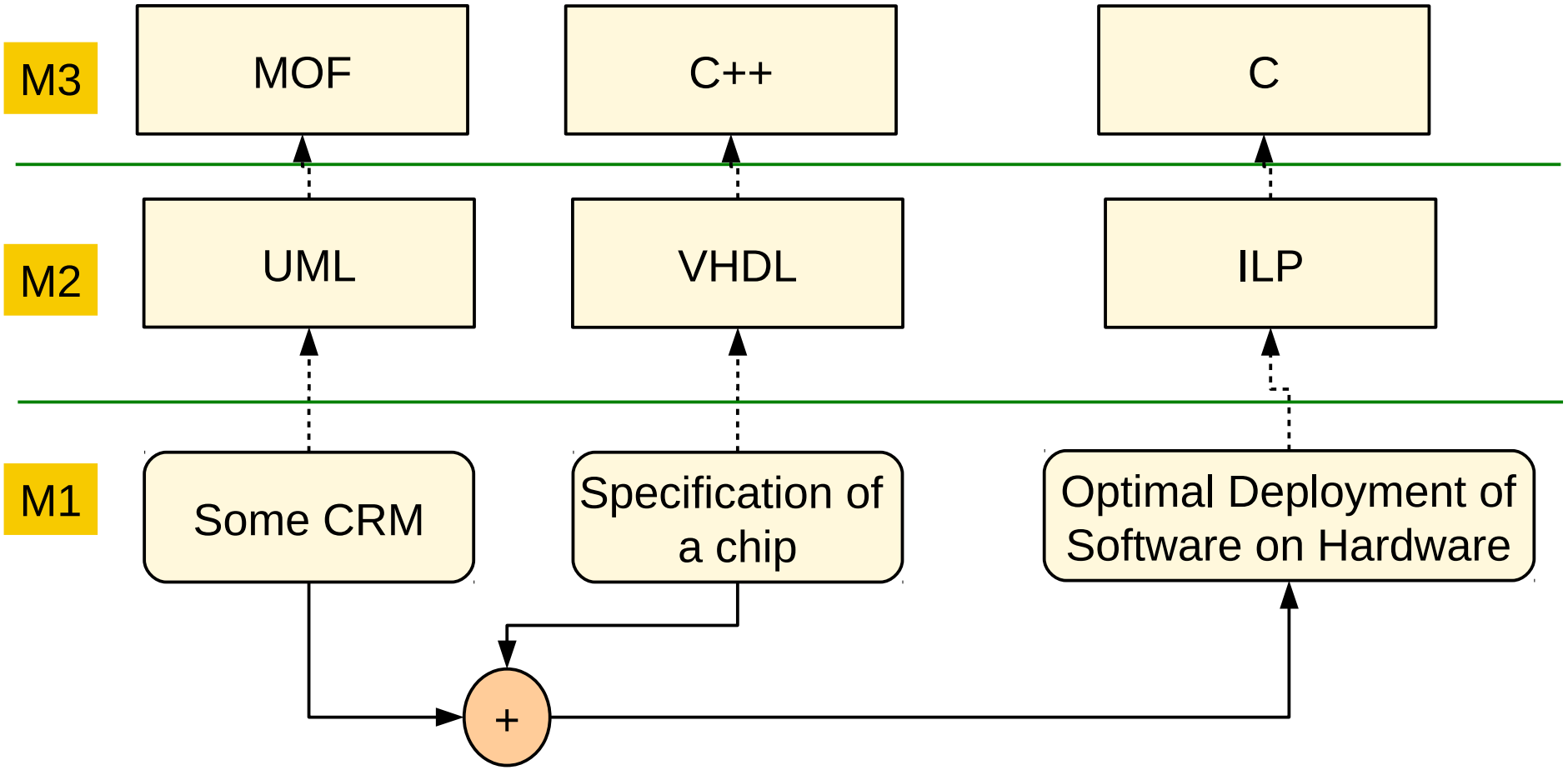
Multi-Technical-Space MDSD Tools (Software Factories)

- Bezivin's Model Engineering Metapher:
- “The world consists of different villages connected by streets. Every sort of engineer maintains one or several “model villages” (technical spaces) or “model towns” (or technological spaces)”
- The task of model engineering is to build bridges and streets in the modeling landscape

Model Engineering is is the engineering of software factories – the engineering with several technical spaces in multiple technological spaces

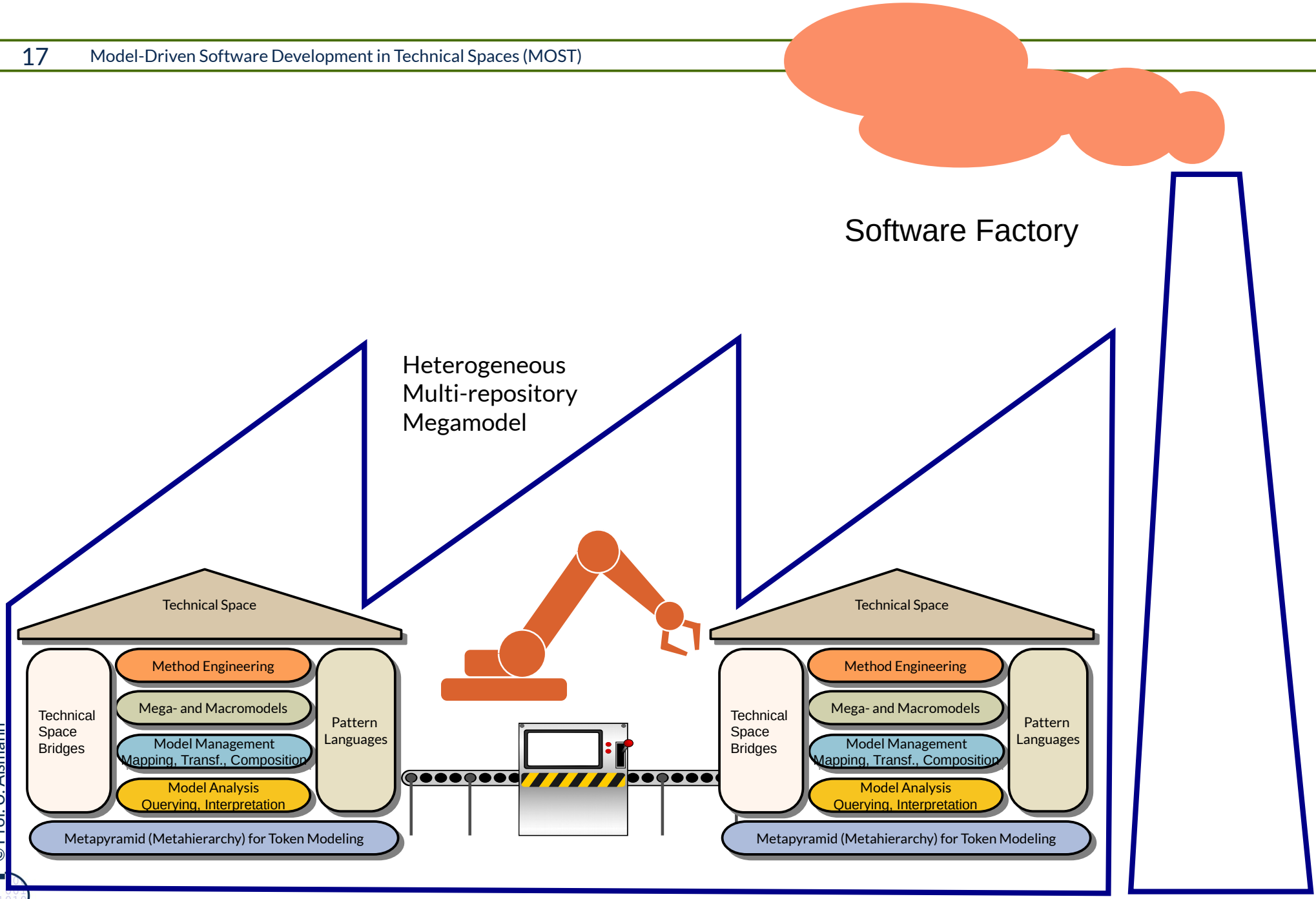
Example: Hardware Design

- To automate the optimization of software systems you need
  - A language to describe software systems (e.g., UML in MOF)
  - A language to describe hardware (e.g., VHDL in C++)
  - A language to express the optimization problem (e.g., ILP in C)

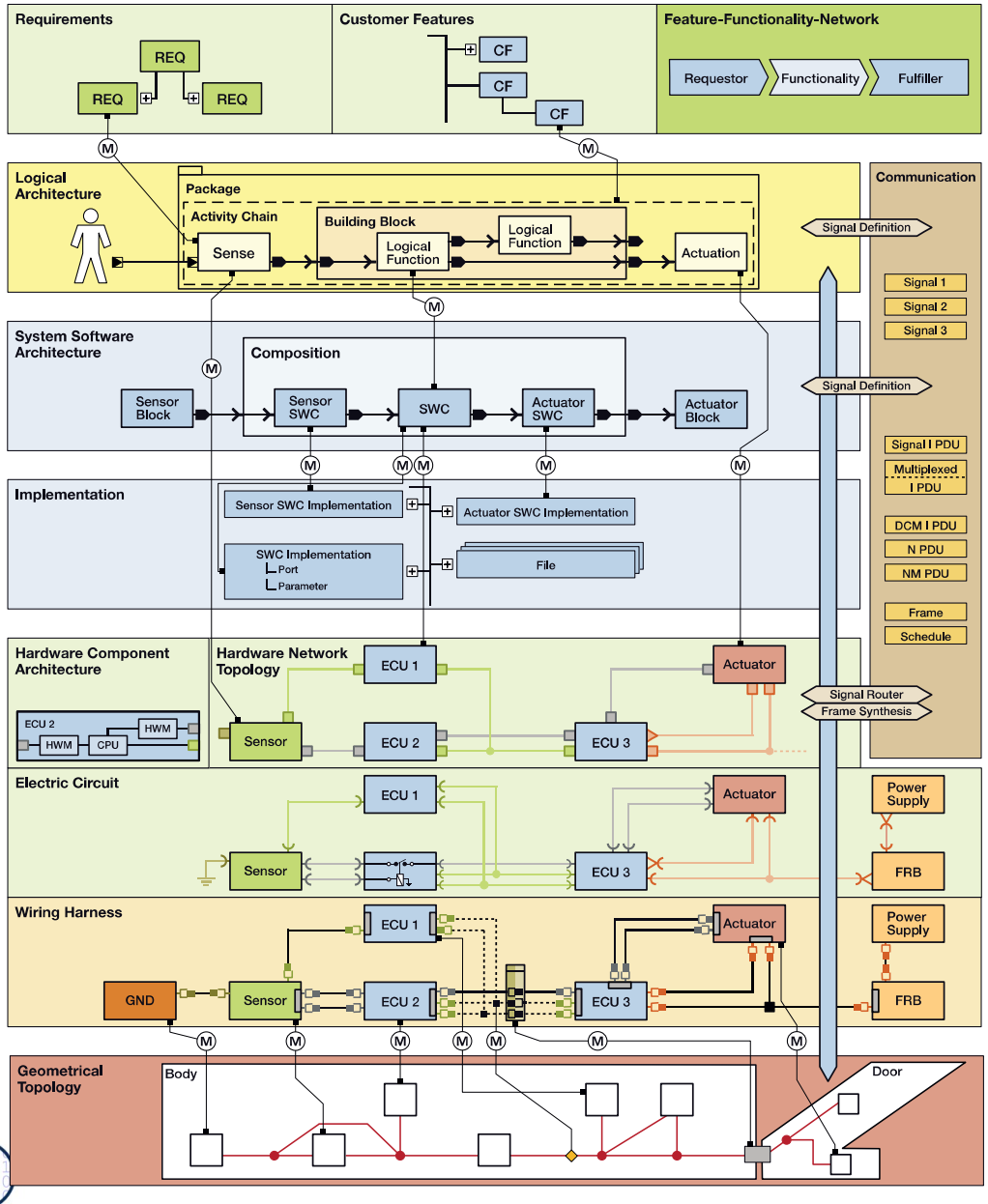


60.2 Software Factories (Wrapup)

Q13: A Software Factory's Heart: the Multi-TS Megamodel



Remember the Big Example: Car Design with PREEVision (Vector): Interoperability with XML Link Trees



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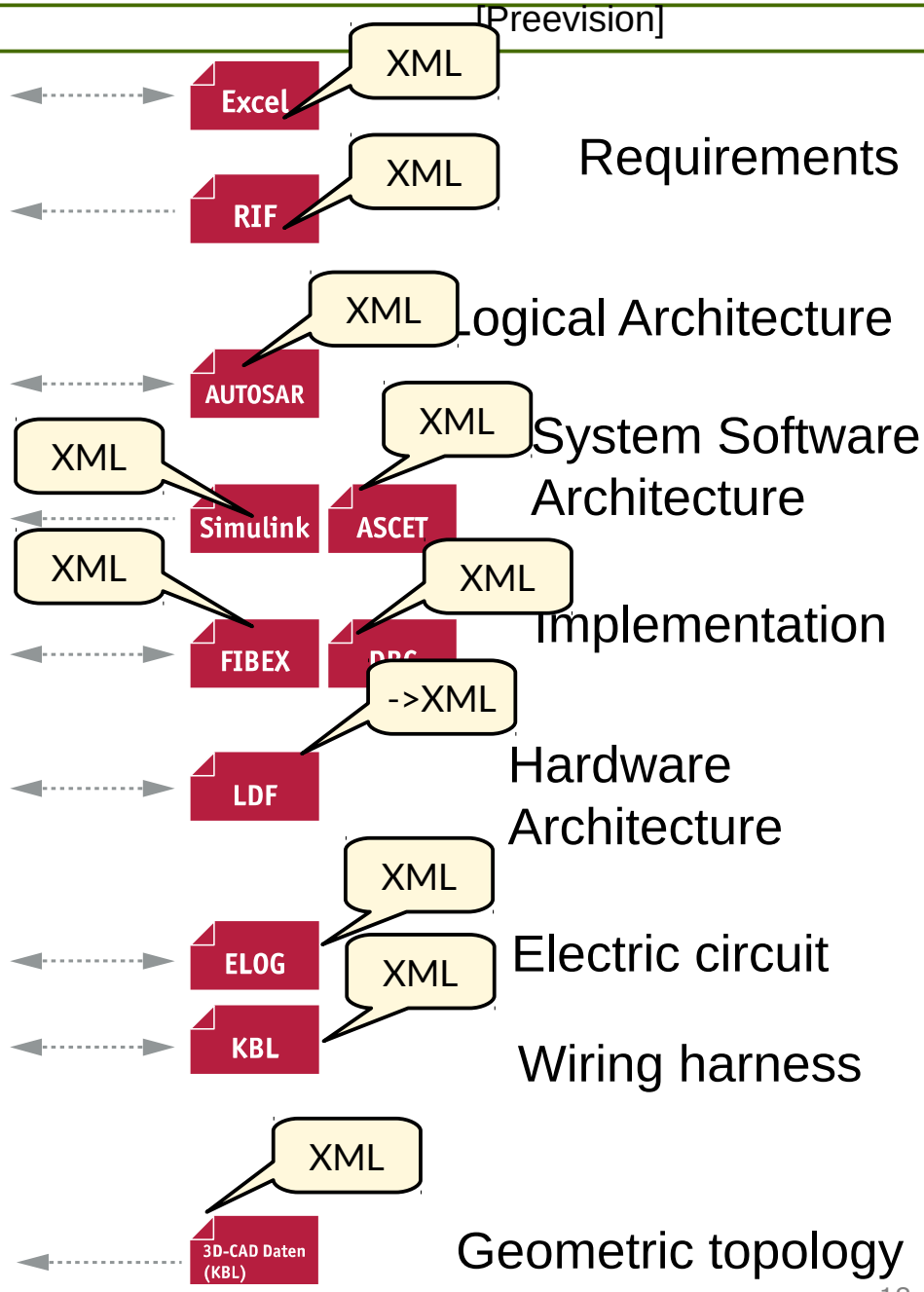

Engineering of Multi-Technical Space Megamodels

- Engineering of Technical Spaces and Megamodels is one of the most important topics of the future of software development
- Dresden has modern technologies and tools
  - Transformation tools (such as RACR)
  - Invasive composition
  - Metacomposition tools (Reuseware)
  - CROM (Role-based metalanguages)
  - Round-Trip Engineering and Role-based tools

Join us

The End

- Explain why future toolkits to design complex things will be multi-TS software factories
- What is different in the handling of a multi-TS megamodel compared to a 1-TS megamodel?
- Which technical space would you choose to exchange data in a software factory? Why?
- Why will all engineering disciplines do software factories in 50 years from now?

The End