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Furniture scenario

Delocalisation with production networks to countries with cheaper human efforts, or skill competencies

Scenario

- Delocalisation is a fact that nowadays
  - cannot be avoided
  - suppliers and manufacturers moving their production networks
    - to countries with cheaper human efforts
    - To partners with skill competencies.
- E.g., Today there is no apparent reason for not having a Portuguese costumer ordering an Italian designed, Chinese manufactured piece of furniture in a Spanish e-marketplace or online retailer.
- E.g., Considering interior/exterior design/decoration of rooms and spaces
  - The huge number of potential combinations that can be addressed to fulfill the costumer/designer/user interest is of very large complexity
  - the number of regions that are able to manufacture, assembly, market the products and components, make this situation as combinatory non-linear and very complex.

Challenges for the scenario

- This scenario brings globalization to a new level, however, nowadays for this to be feasible at a large scale some interopability challenges need to be addressed:
- **Multilanguage and multimodal e-procurement**
- **Advanced user-customization**
- **Business information for product transaction and management fully integrated with the product data**
- **Integrated logistics information**
- **Optimized products development**

- **Multilanguage and multimodal e-procurement**,

- i.e., depending on the region the furniture information as different semantics that need to be integrated for such an international scenario to be feasible
  - semantic interoperability;

- **Advanced user-customization**

- i.e., more and more the costumer likes to experiment new part configurations and product combinations. However, most of the times that is not possible without having to wait more than a week for the response of the manufacturer/supplier
  - Interoperable electronic catalogues and parameterized information across the supply chain through the usage to product data standards;

- **Business information for product transaction and management fully integrated with the product data**

- , thus enabling seamless integration of ERP with e-commerce, supply chain management, and customer relationship management;
  - Standards harmonization (e-business + product data)

- **Integrated logistics information**

- to lower costs concerning the outsourcing of different product components and services.
  - Process monitoring and usage of standards

- **Optimized products development**
  - taking in consideration the sources from the different players, to better meet the users requests, with lower enterprise resources and costs.

Standards and the scenario

- The use of standards in the business relationships raises the confidence of sellers and buyers of the products and services, and increases performance.
- This boost of confidence means successful manufacturing networks promoting an enlargement of both the market size and growth rates.
- However, the increasing number of non-harmonized and non-interoperable standards put in the market may block or slow down growth and innovation associated with the presented scenario.

Standards and the scenario

- In this scenario ISO 10303-236 (AP236) standard covers part of the supply chain exchange of data among different stakeholders
  - but its implementation needs to be facilitated
  - Enterprise services for data and knowledge integration (AP236+domain ontology) are required.
- E-business, logistics and transport are still out of the scope of ISO 10303-236
  - but multiple standards exist.
- Therefore, there is the need to consider the signed Memorandum of Understanding for e-Business standards harmonization ensuring that interoperability possible.
- Also, extensions to cover cultural and language depending characteristics in enterprise business need to be integrated.

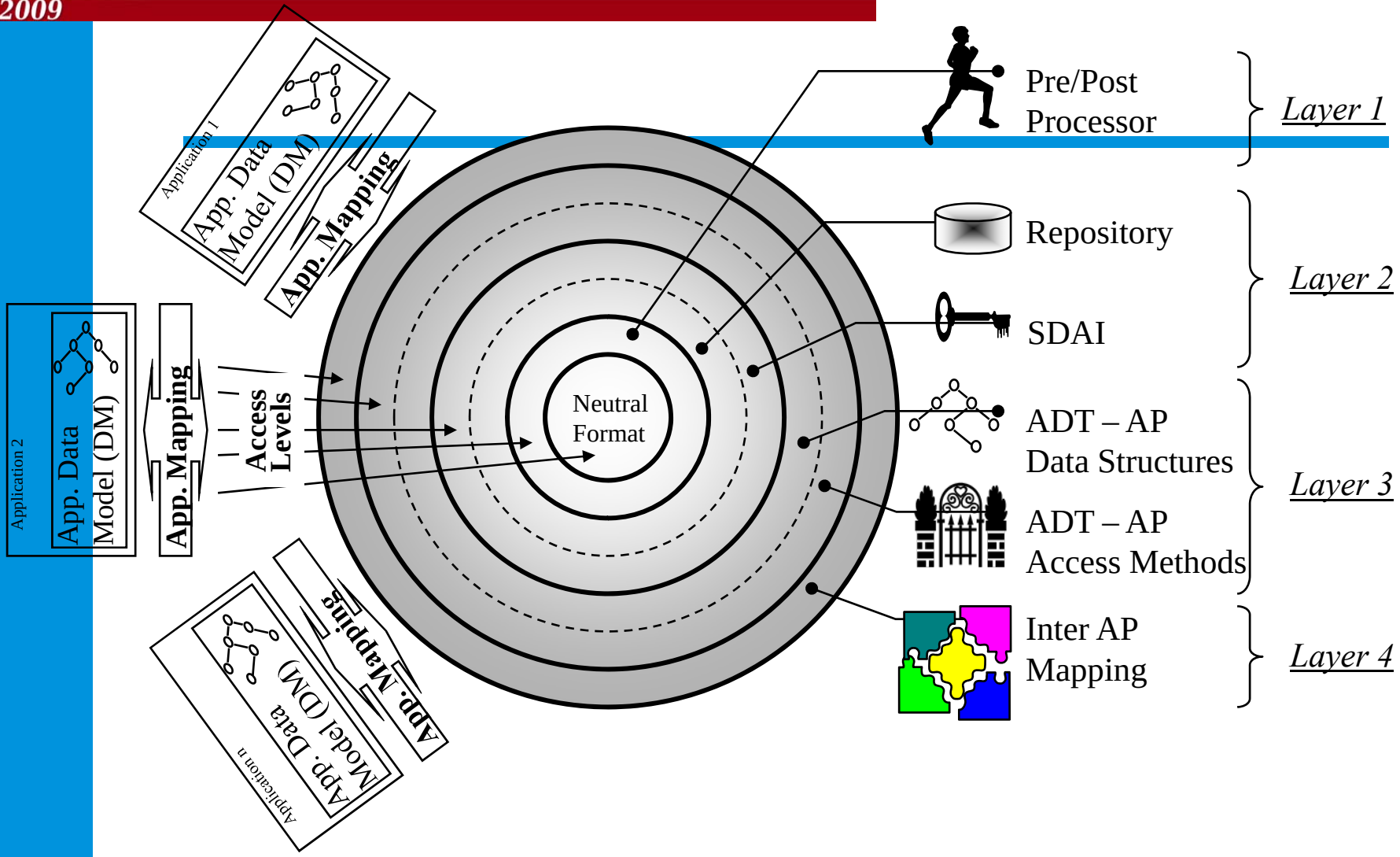
Benefits

- With all these aspects covered on the daily business transactions, the SME-based furniture sector will see tremendous benefits

Challenge

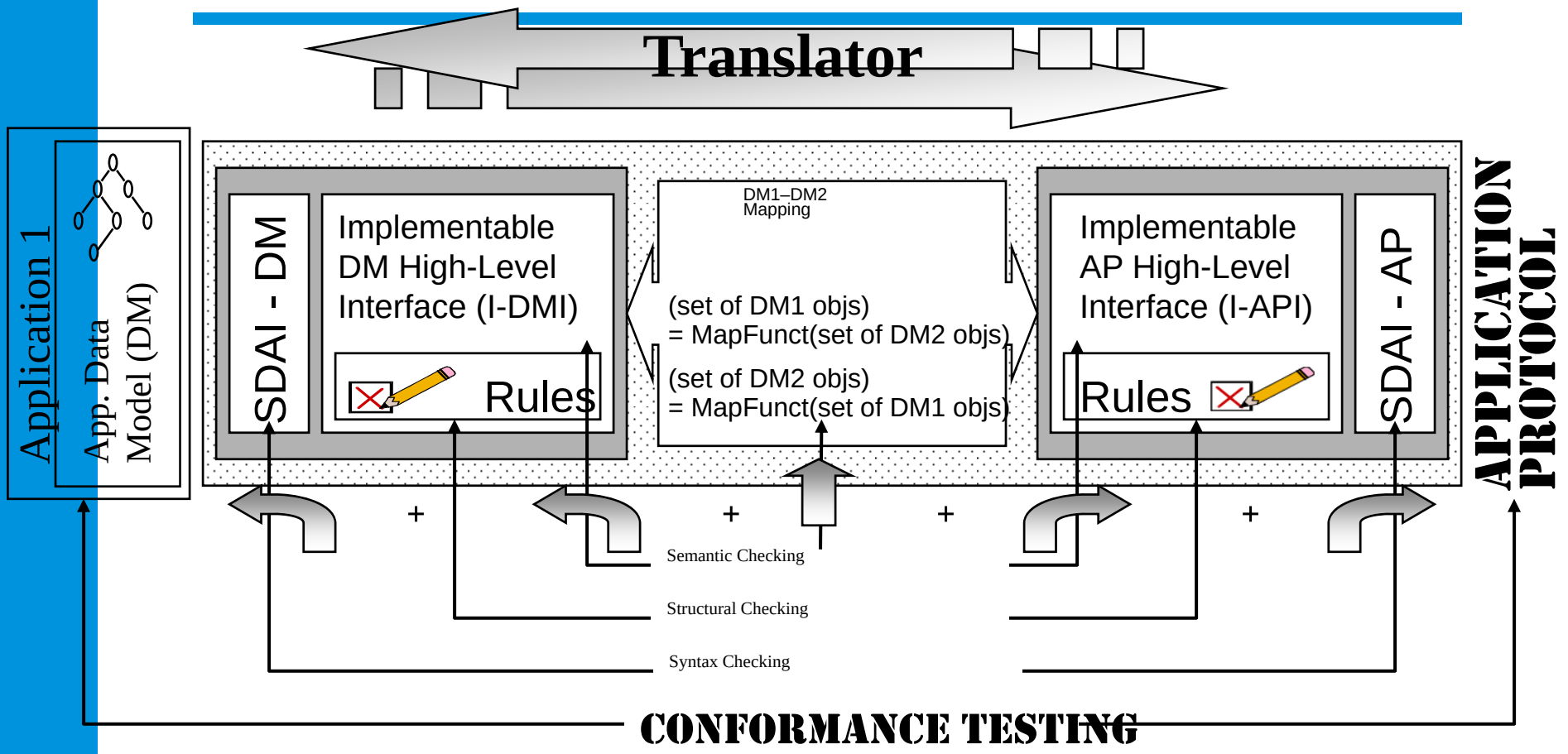
Delocalisation with production networks to countries with cheaper human efforts, or skill competencies.

So... ☺



Layers of a Standard-based Integration Platform

Standards Implementation

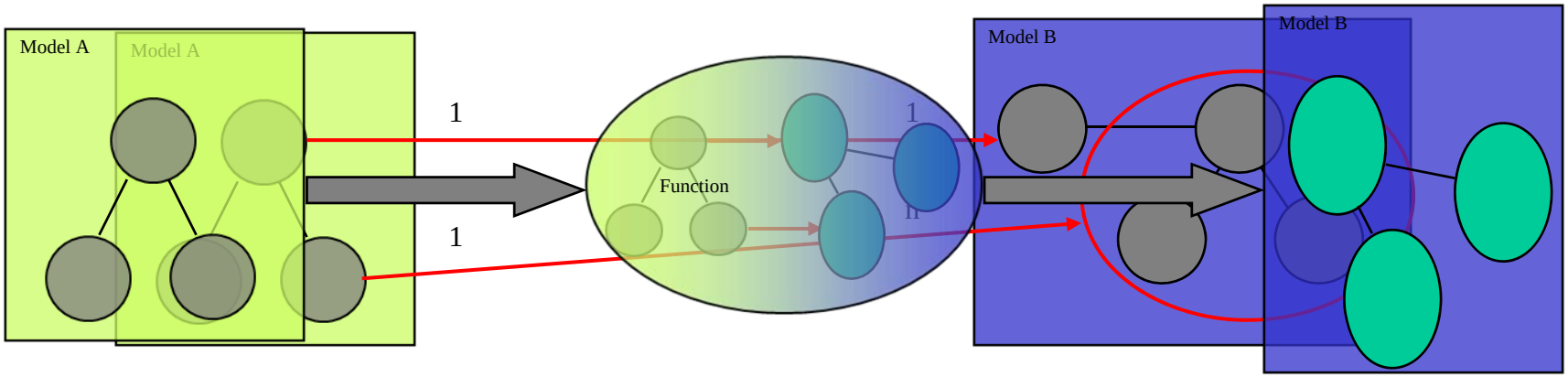


Using.... Model Morphisms

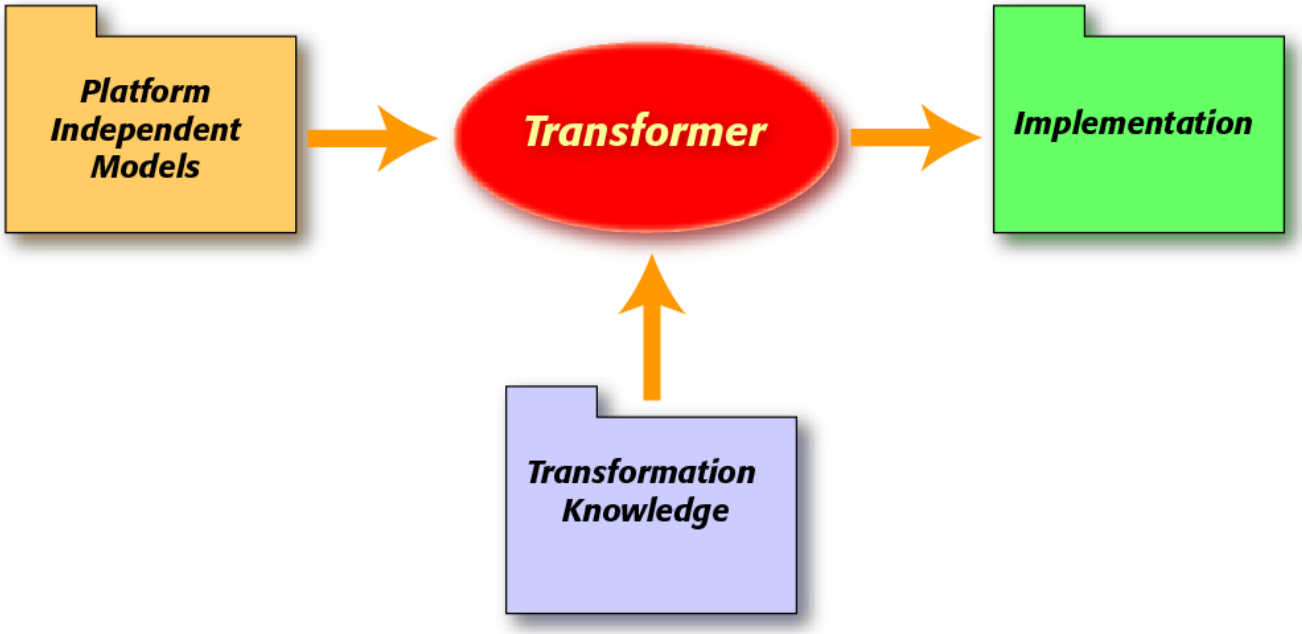
- Relationships between two or more model specifications that can be represented in different technologies and languages
- Unary and binary operations that can be applied to models

Model-Altering
~~Non-Altering~~

Transformations
having $A \in MOD$, and a function $t: MOD \rightarrow MOD$,
if $t(A) = B$, then $B \in MOD$

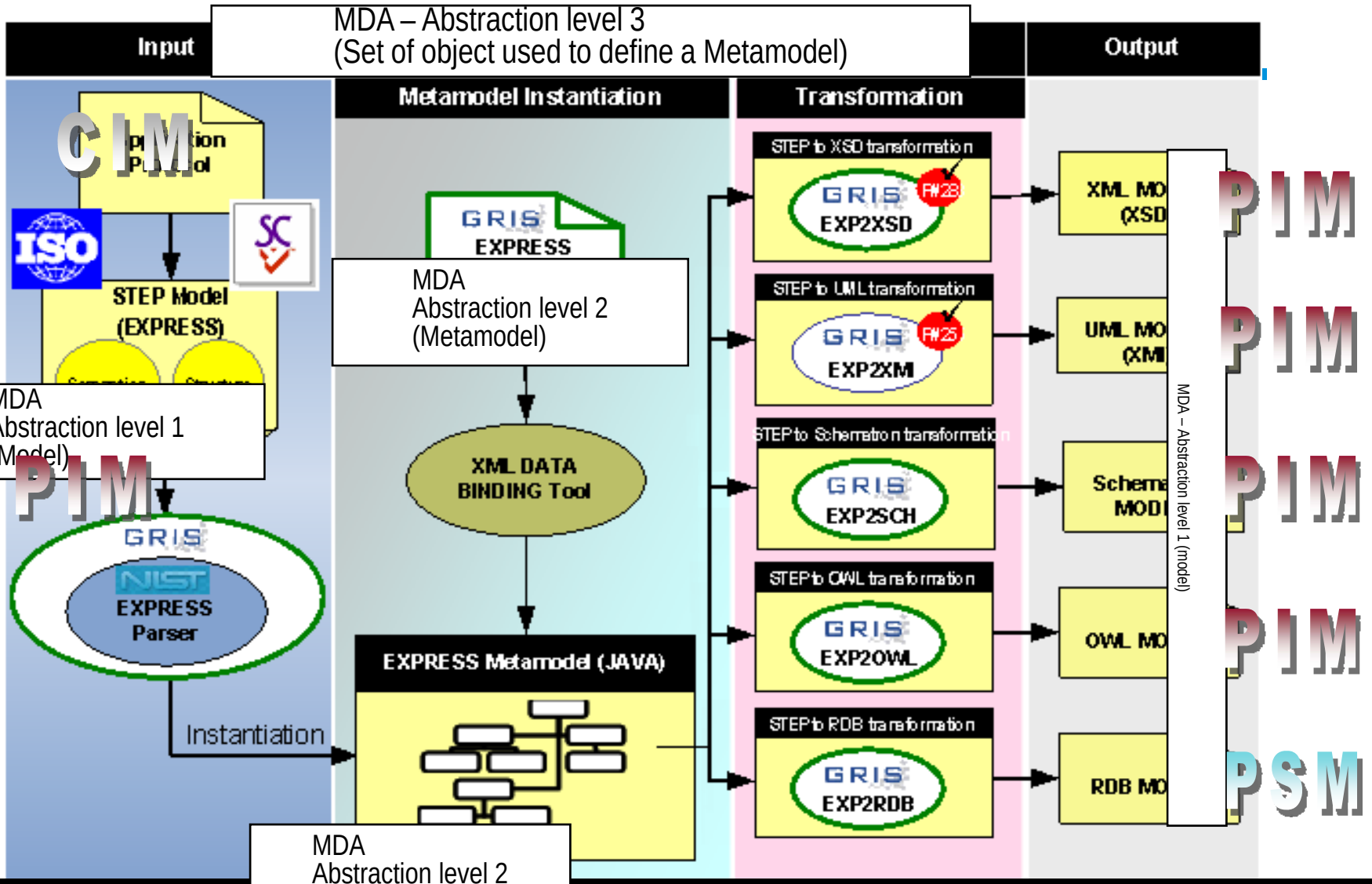


And… MDA Methodology



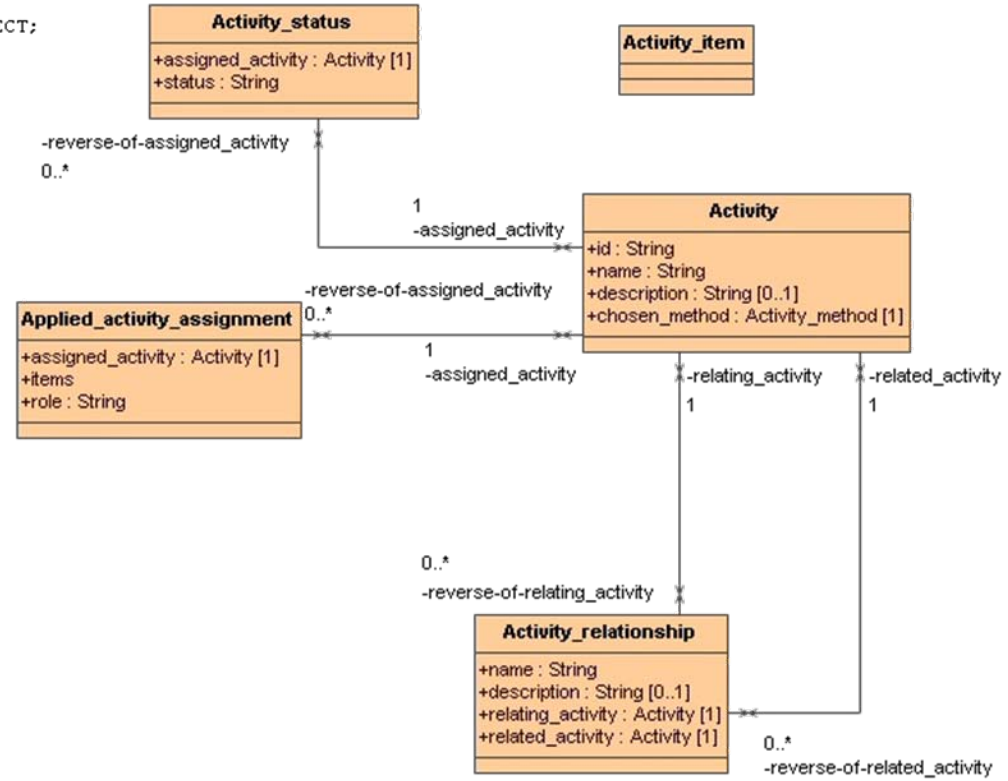
- Use of platform independent models (PIMs) as specification
- Transformation into platform specific models (PSMs) using automated tools

Transformation Framework



Express2XMI mapping

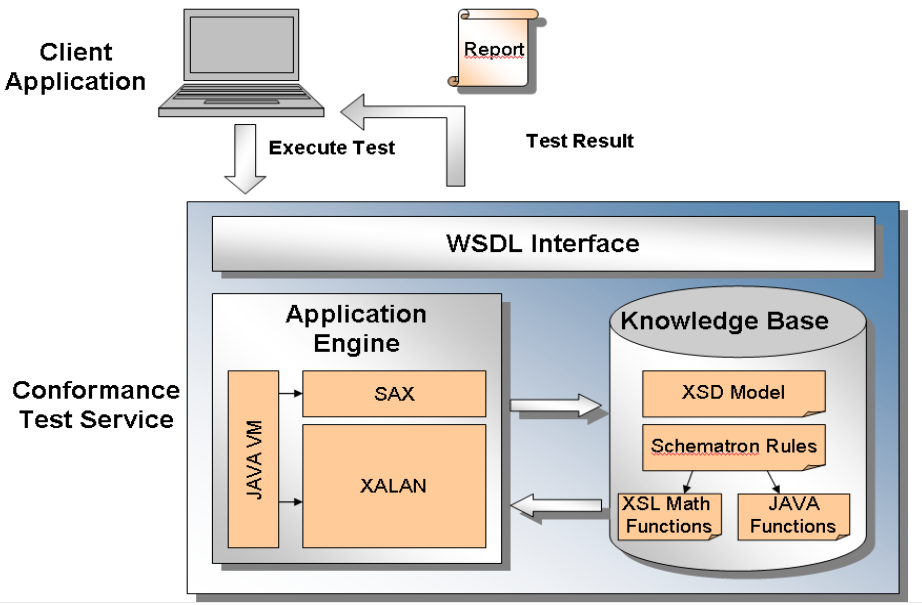
```
SCHEMA Activity_arm;

USE FROM Activity_method_arm;


TYPE activity_item = EXTENSIBLE GENERIC_ENTITY SELECT;
END_TYPE;

ENTITY Activity;
  id : STRING;
  name : STRING;
  description : OPTIONAL STRING;
  chosen_method : Activity_method;
END_ENTITY;

ENTITY Activity_relationship;
  name : STRING;
  description : OPTIONAL STRING;
  relating_activity : Activity;
  related_activity : Activity;
END_ENTITY;

ENTITY Activity_status;
  assigned_activity : Activity;
  status : STRING;
END_ENTITY;

ENTITY Applied_activity_assignment;
  assigned_activity : Activity;
  items : SET[1:?] OF activity_item;
  role : STRING;
END_ENTITY;

ENTITY Activity_method;
  name : STRING;
  description : OPTIONAL STRING;
  consequence : OPTIONAL STRING;
  purpose : STRING;
END_ENTITY;

END_SCHEMA;  -- Activity_arm
```



Express2Schematron

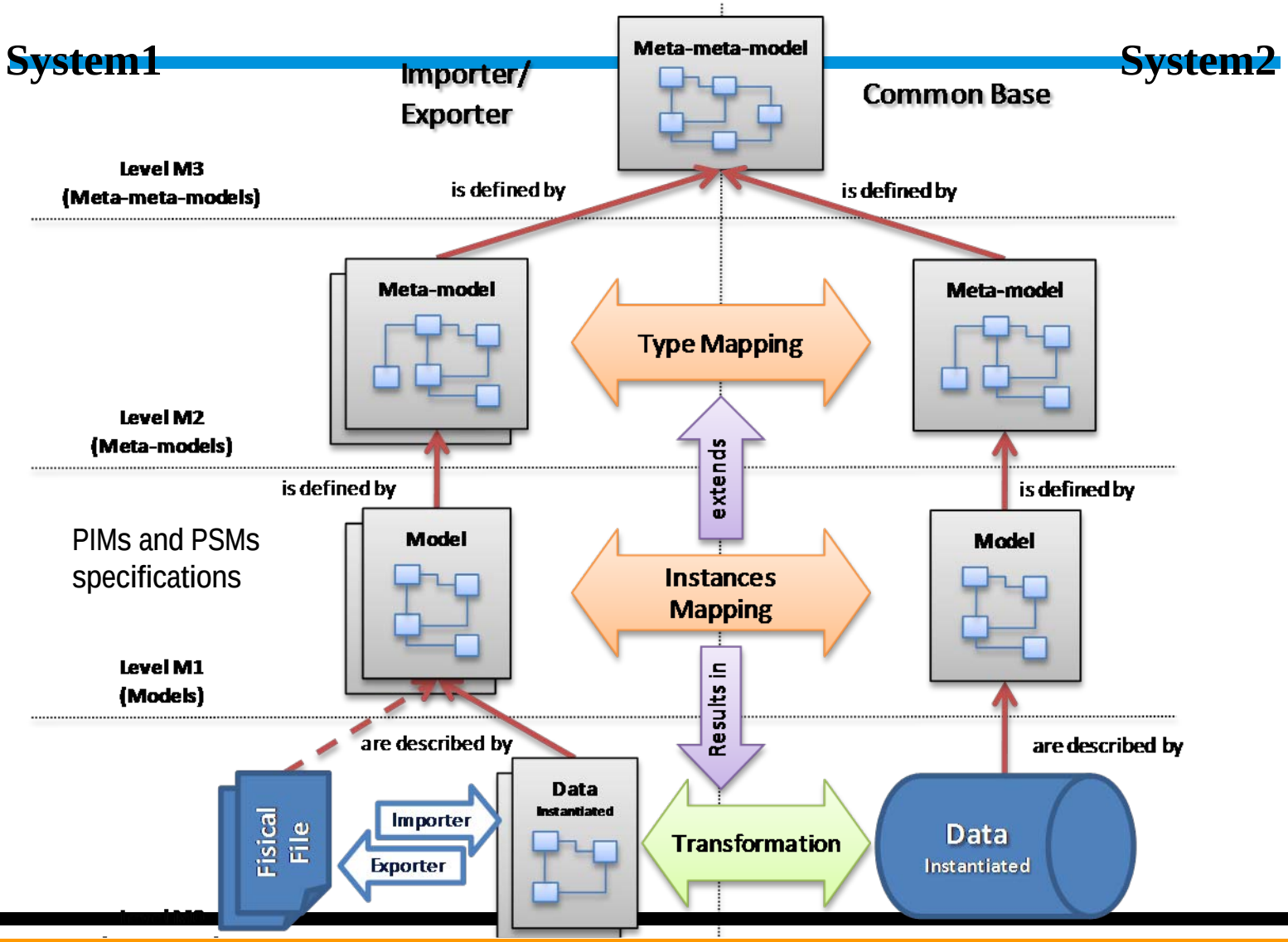
```
ENTITY Product_Record_Information;
 RelatedTo: Product;
 supplierProductCode : OPTIONAL
     STRING;
 buyerProductCode : OPTIONAL
     STRING;
 quantity : NUMBER;
 requestedDeliveryDate : OPTIONAL
     date_or_date_time_select;
WHERE
     WR1: quantity >0;
END_ENTITY;
```

Conformance Testing Framework

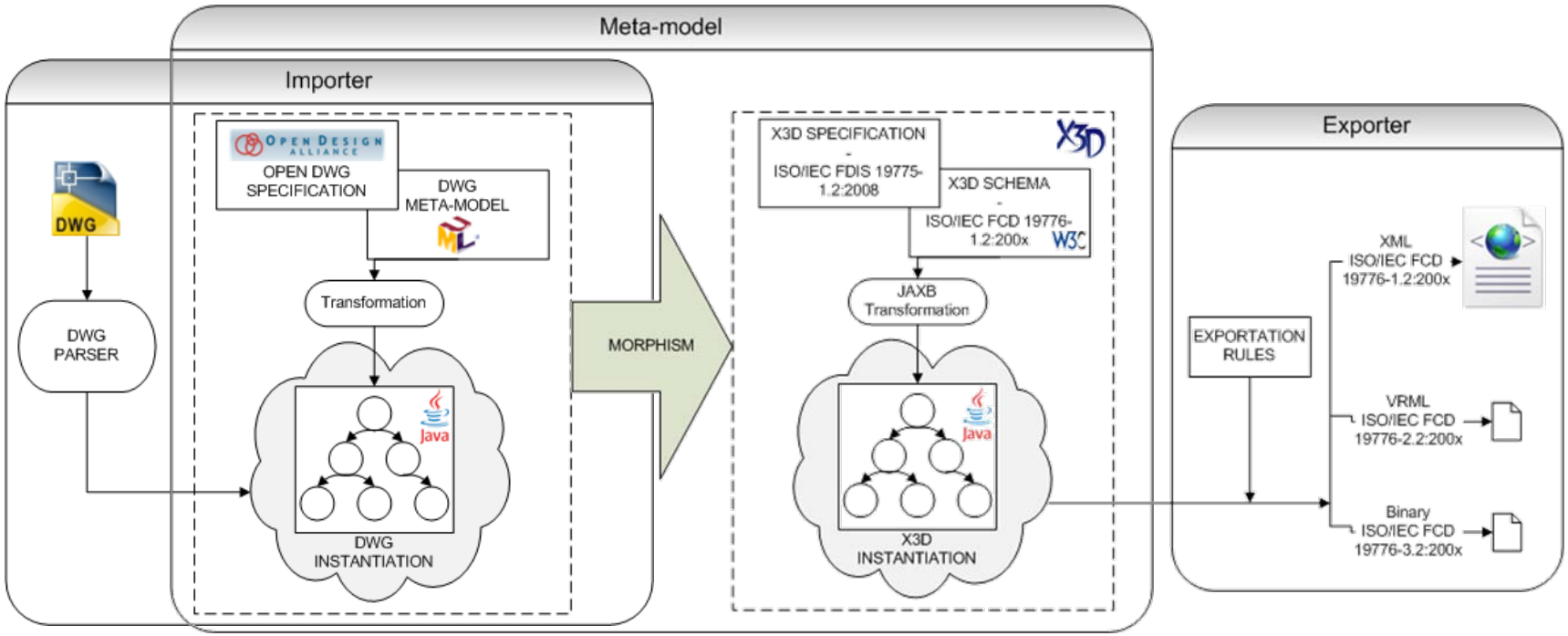



```
<pattern name= "Product_Record_Information - WHERE">
    <rule context="quantity">
      <assert test="current() &gt; 0 or @ref">ERROR WR1 quantity &gt; 0
     SELF</assert>
    </rule>
  </pattern>
```

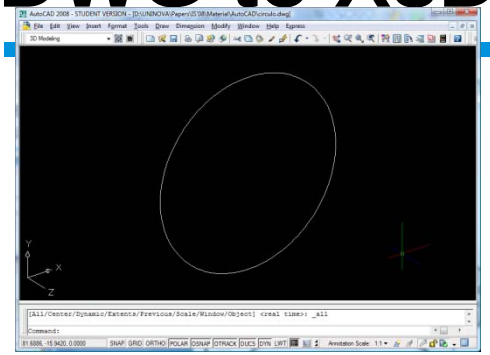
Model Driven Approach

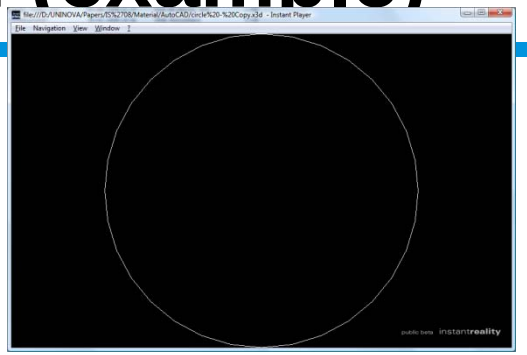


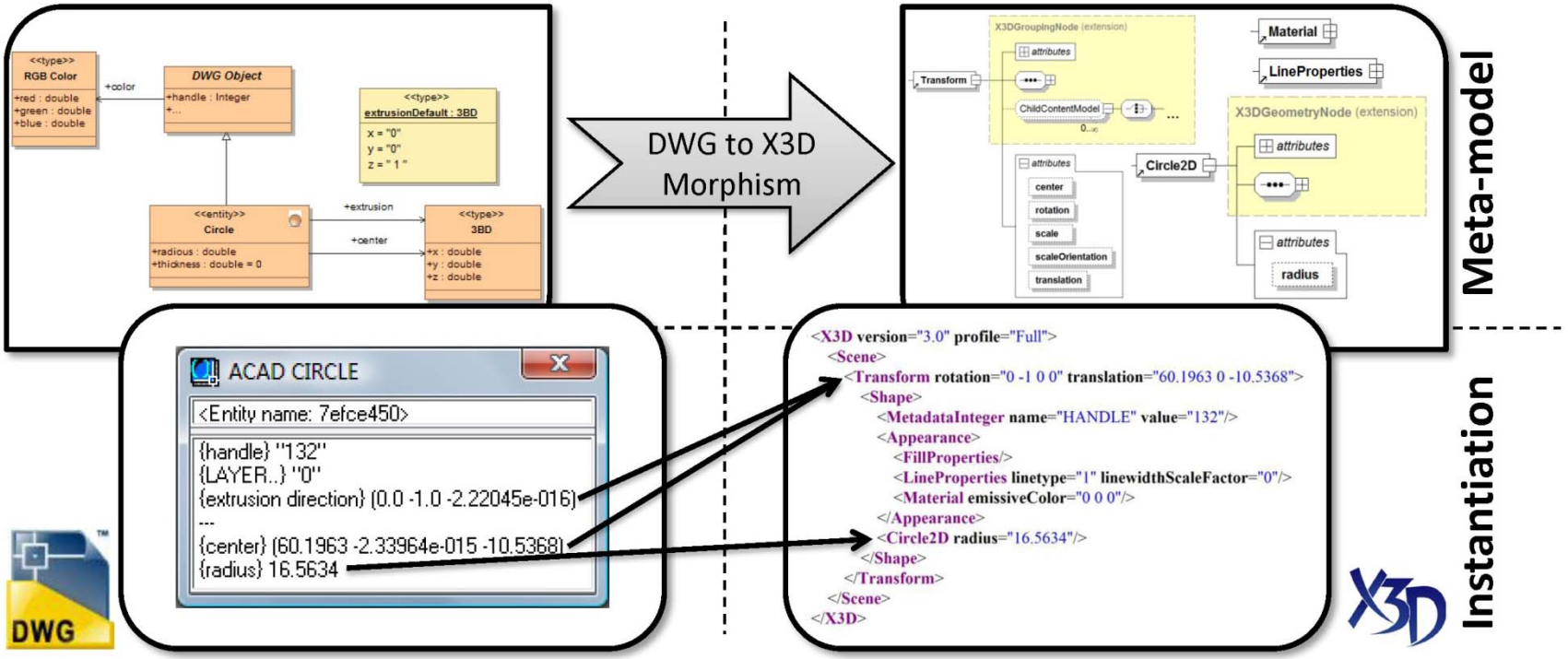
Framework instantiation



DWG to X3D Morphism (example)

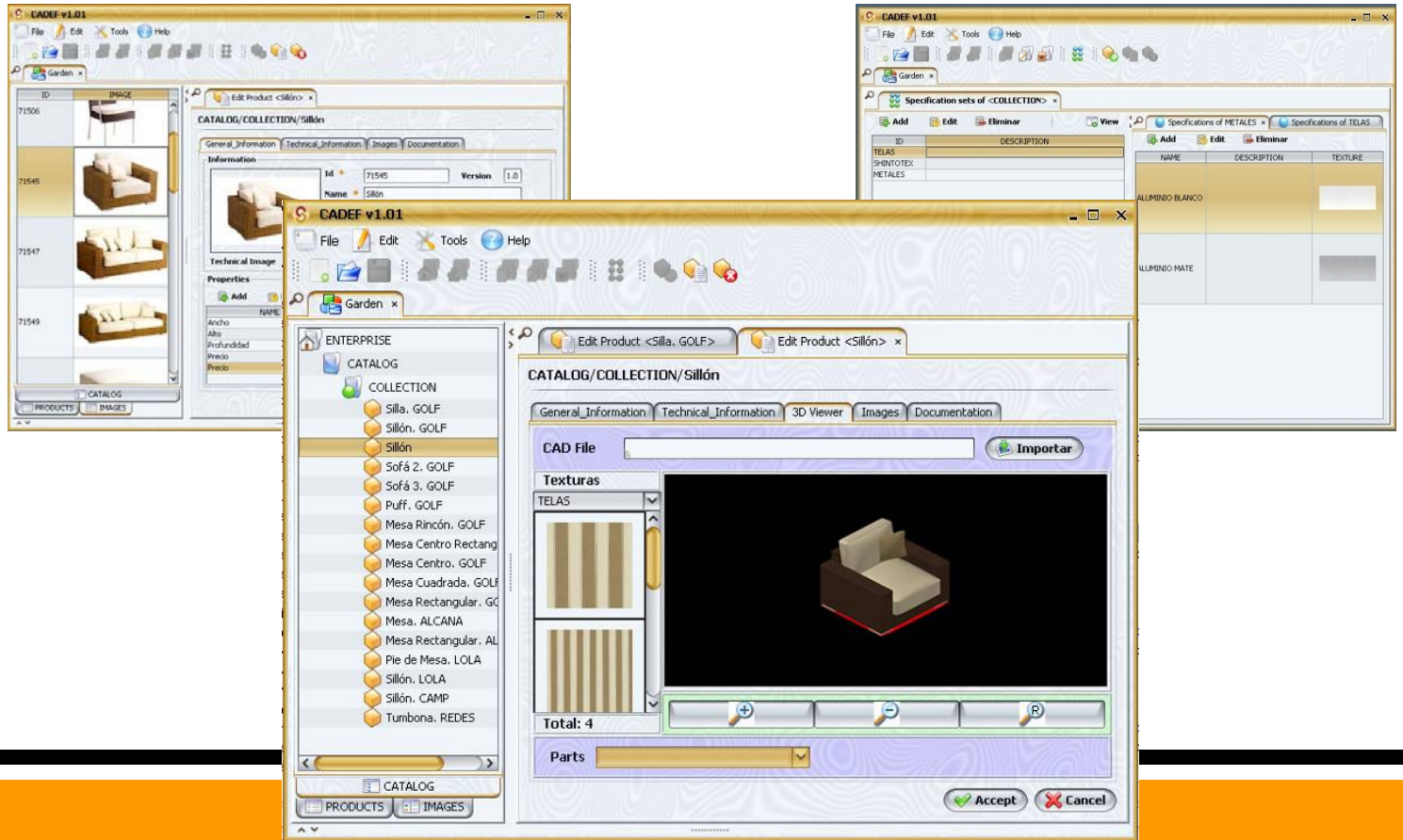






Integration with industrial e-commerce tool

CADEF, a tool to build product catalogues, has been integrated with the framework to enable access to visualization data for assistance in the manufacturer catalogue construction.



Furniture scenario

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Thank you

UNINOVA
Instituto de Desenvolvimento de Novas Tecnologias

GRIS
Group for Research in Interoperability of Systems