

OSLC-Style Tool Adapter for MATLAB/Simulink

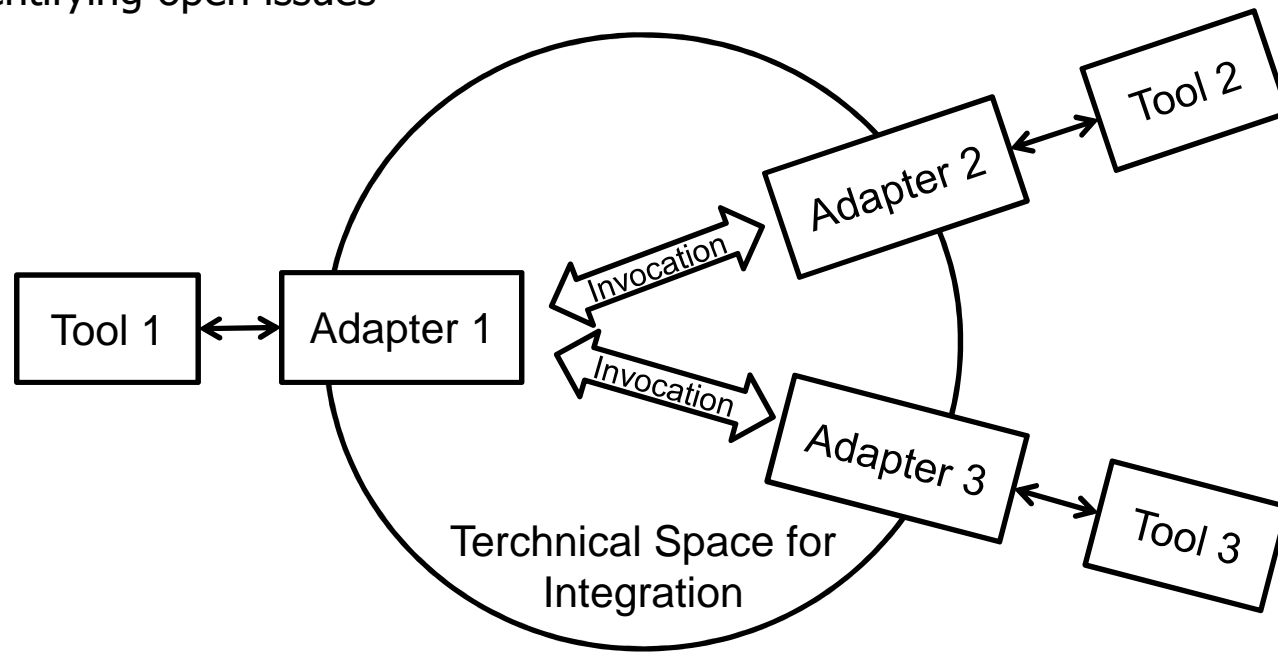
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Embedded Control Systems
Royal Institute of Technology
Stockholm, Sweden



Intro

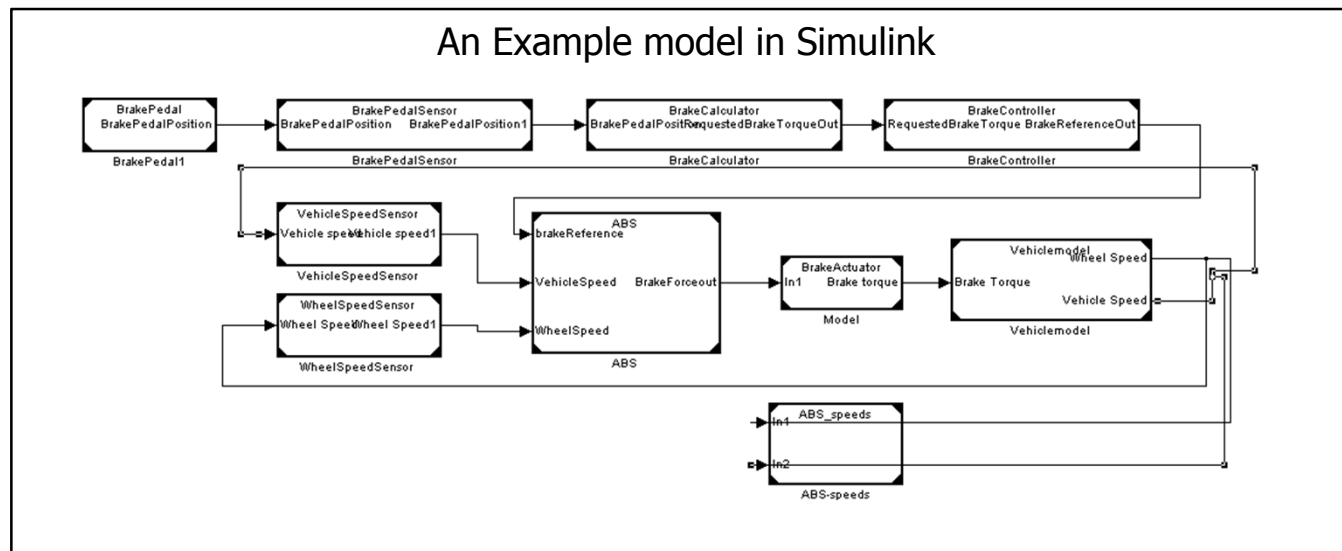


- iFEST Project
 - aims at specifying and developing a tool integration framework for HW/SW co-design
 - European ARTEMIS project with 20 partners, 16M€, 04/2010 - 03/2013
- Preparation for the decision of a technical space for integration
 - Evaluation of OSLC
 - Evaluation by building a tool adapter for OSLC for MATLAB/Simulink
 - Identifying open issues

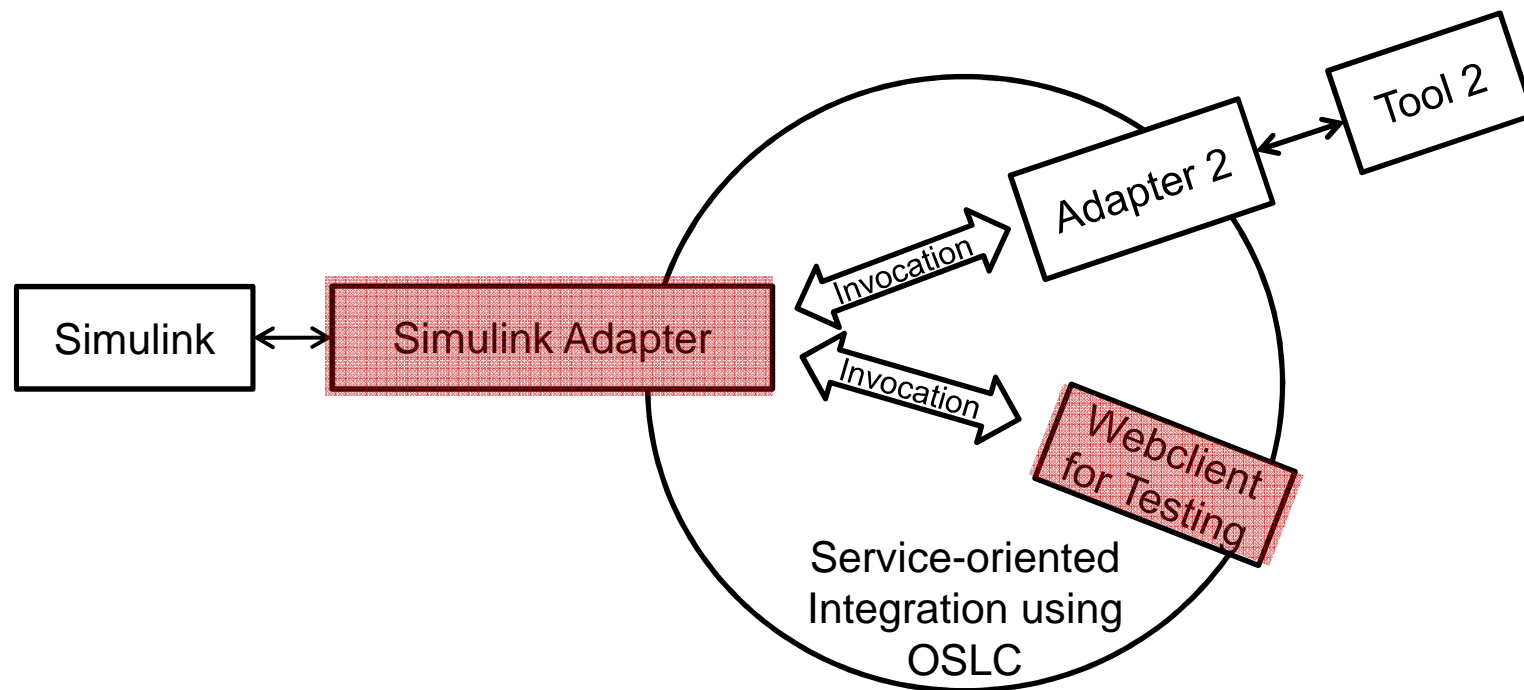


MATLAB/Simulink

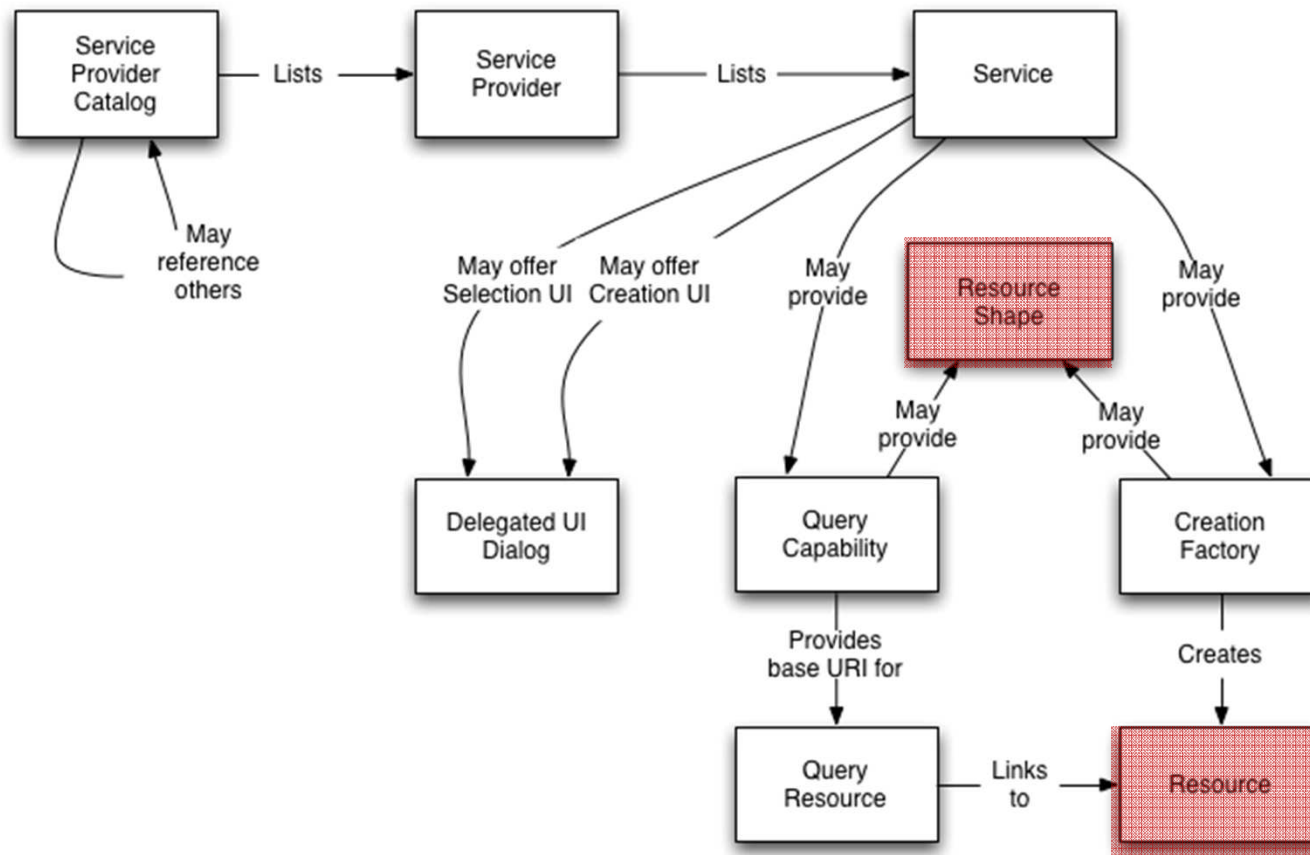
- A commercial tool for modeling, simulating and analyzing multidomain dynamic systems
- For embedded systems it is used for
 - Simulation
 - Rapid prototyping
 - Code generation
 - Testing



Architecture of our OSLC-conform Tool Adapter



Artifacts of an OSLC Solution



Artifacts of an OSLC Adapter for MATLAB/Simulink



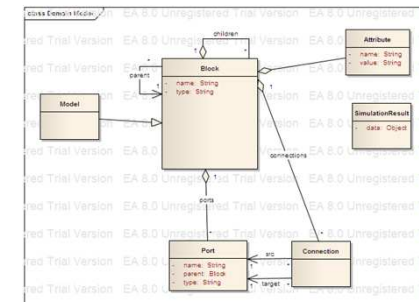
- Resource (= Model)
 - is a resource managed by an OSLC Service

```
OSLC Block Resource
<rdf:RDF
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:dcterms="http://purl.org/dc/terms/"
  xmlns:foaf="http://xmlns.com/foaf/0.1/"
  xmlns:oslc_simulink="http://md.kth.se/osl/simulink/"
  <rdf:Description rdf:about="http://md.kth.se/osl/simulink/block">
    <dcterms:title>Block</dcterms:title>
    <rdf:type>oslc:Block</rdf:type>
  </rdf:Description>
  <!-- Attributes are inlined -->
  <oslc_simulink:attributes>
    <rdf:Seq>
      <rdf:li>
        <rdf:Description rdf:about="http://md.kth.se/osl/simulink/block/1.1/attribute/1">
          <rdf:value>45</rdf:value>
          <dcterms:title>speed</dcterms:title>
        </rdf:Description>
      </rdf:li>
    </rdf:Seq>
  </oslc_simulink:attributes>
  <oslc_simulink:parent rdf:resource="http://md.kth.se/osl/simulink/block/20/">
    <oslc_simulink:children>
      <rdf:Seq>
        <rdf:li rdf:resource="http://md.kth.se/osl/simulink/block/1/" />
      </rdf:Seq>
    </oslc_simulink:children>
    <oslc_simulink:ports>
      <rdf:Seq>
        <rdf:li rdf:resource="http://md.kth.se/osl/simulink/port/1/" />
      </rdf:Seq>
    </oslc_simulink:ports>
    <oslc_simulink:connections>
      <rdf:li rdf:resource="http://md.kth.se/osl/simulink/connection/45/" />
    </rdf:li>
  </oslc:Block>
  </rdf:RDF>
```



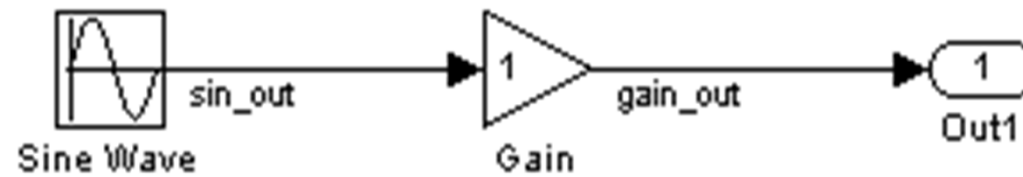
- Resource Shapes (= Metamodel)

```
OSLC Block Shape Resource
<rdf:RDF
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:dcterms="http://purl.org/dc/terms/"
  xmlns:foaf="http://xmlns.com/foaf/0.1/"
  xmlns:oslc="http://open-services.net/ns/core#"
  <oslc:ResourceShape rdf:about="http://md.kth.se/osl/simulink/shape">
    <dcterms:title>Simulink Block Shape</dcterms:title>
    <oslc:name>Block</oslc:name>
    <oslc:describes rdf:resource="http://md.kth.se/osl/simulink#Block">
    </oslc:describes>
    <oslc:property>
      <oslc:Property>
        <oslc:name>name</oslc:name>
        <oslc:propertyDefinition rdf:resource="http://purl.org/cosmos/property-definition/1.0/#string">
        </oslc:propertyDefinition>
        <oslc:occurs rdf:resource="http://open-services.net/ns/core#1">
        </oslc:occurs>
      </oslc:Property>
    </oslc:property>
  </oslc:ResourceShape>
  </rdf:RDF>
```



- Data access services

Model – OSLC Resource



Model – OSLC Resource



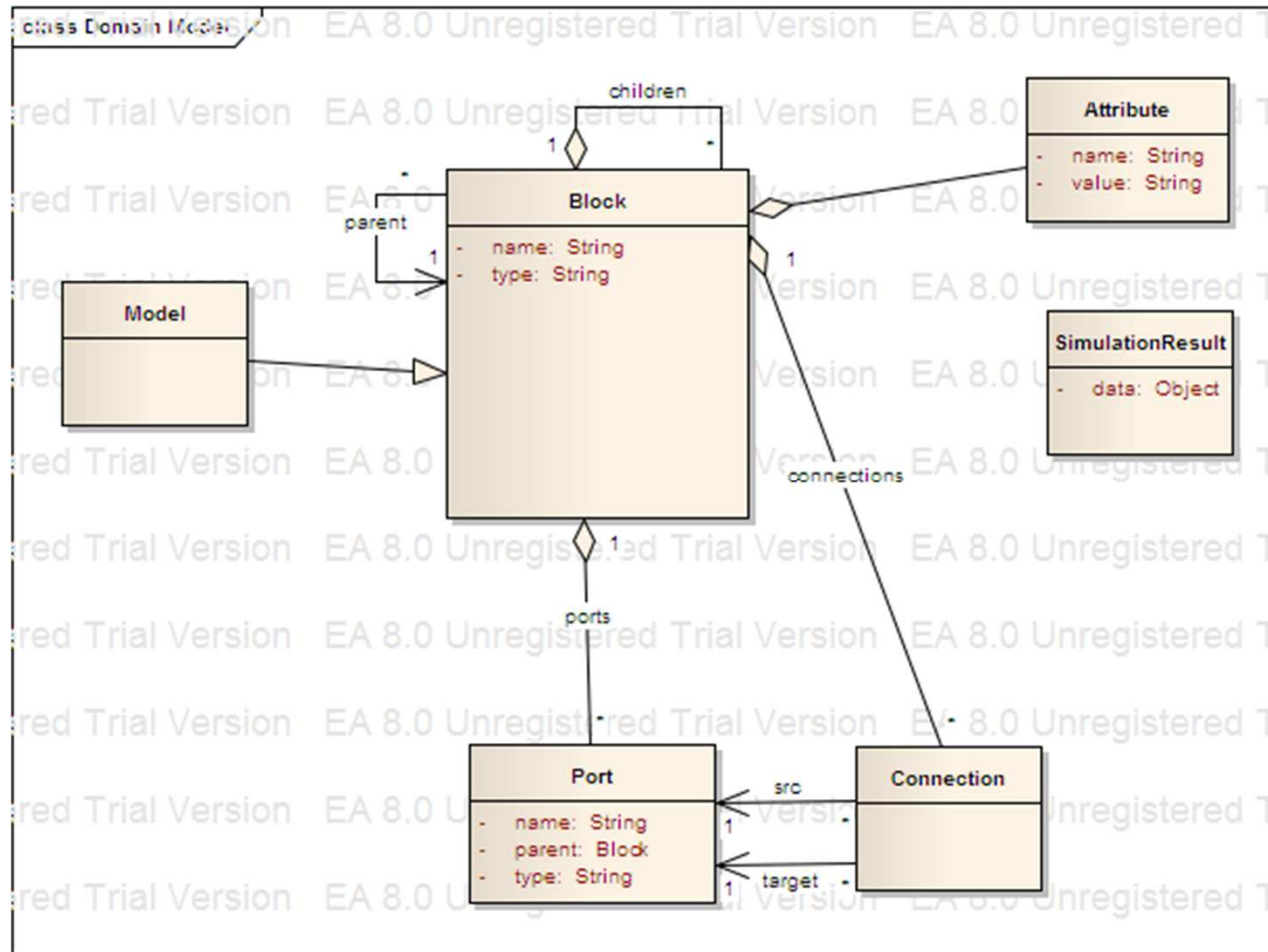
OSLC Block Resource

```
<rdf:RDF
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:dcterms="http://purl.org/dc/terms/"
  xmlns:foaf="http://xmlns.com/foaf/0.1/"
  xmlns:oslc_simulink="http://md.kth.se/oslc/simulink">
  <rdf:Description rdf:about="http://md.kth.se/oslc/simulink/block">
    <dcterms:title>Engine</dcterms:title>
    <rdf:type>Basic</rdf:type>

    <!-- Attributes are inlined -->
    <oslc_simulink:attributes>
      <rdf:Bag>
        <rdf:li>
          <rdf:Description rdf:about="http://md.kth.se/oslc/simulink/block/1.23/attribute/1">
            <rdf:value>45</rdf:value>
            <dcterms:title>speed</dcterms:title>
          </rdf:Description>
        </rdf:li>
      </rdf:Bag>
    </oslc_simulink:attributes>

    <oslc_simulink:parent rdf:resource="http://md.kth.se/oslc/simulink/block/28"/>
    <oslc_simulink:children>
      <rdf:Bag>
        <rdf:li rdf:resource="http://md.kth.se/oslc/simulink/block/1" />
      </rdf:Bag>
    </oslc_simulink:children>
    <oslc_simulink:ports>
      <rdf:Bag>
        <rdf:li rdf:resource="http://md.kth.se/oslc/simulink/port/1" />
      </rdf:Bag>
    </oslc_simulink:ports>
    <oslc_simulink:connections>
      <rdf:Bag>
        <rdf:li rdf:resource="http://md.kth.se/oslc/simulink/connection/45" />
      </rdf:Bag>
    </oslc_simulink:connections>
  </rdf:Description>
</rdf:RDF>
```


Metamodel – OSLC Resource Shape



Metamodel – OSLC Resource Shape



OSLC Block Shape Resource

```
<rdf:RDF
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:dcterms="http://purl.org/dc/terms/"
  xmlns:foaf="http://xmlns.com/foaf/0.1/"
  xmlns:oslc="http://open-services.net/ns/core#" >

  <oslc:ResourceShape rdf:about="http://md.kth.se/oslc/simulink/shape" >

    <dcterms:title>Simulink Block Shape</dcterms:title>

    <oslc:name>Block</oslc:name>
    <oslc:describes rdf:resource="http://md.kth.se/oslc/simulink#Block" />

    <oslc:property>
      <oslc:Property>
        <oslc:name>name</oslc:name>
        <oslc:propertyDefinition rdf:resource="http://purl.org/c" />
        <oslc:valueType rdf:resource="http://www.w3.org/1999/02/
        <oslc:occurs rdf:resource="http://open-service.net/ns/cc" />
      </oslc:Property>
    </oslc:property>

    <oslc:property>
```

Demo: OSLC Adapter for MATLAB/Simulink (click to start)



Open Issues



- **Orchestration Architecture:**
 - How to connect several OSLC adapters?
- **Control Integration: How to make a web service an OSLC service?**
 - OSLC Descriptors?
- **Transformations with OSLC:**
 - How to write transformations with OSLC data?
 - Are transformations necessary?
- **Data of different granularity**
 - Does it go against OSLC principles to expose data in both coarse- and fine-granular ways?
 - e.g. as a complete XMI model (as a serialized string in a resource) and as model elements (each model element is a resource)
- **Repository and OSLC/RESTful is this a contradiction?**
- **Different ways of using OSLC**
- **How is PLM focused and how does it relate to other workinggroups**