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AADL Meta Model & XML/XMI

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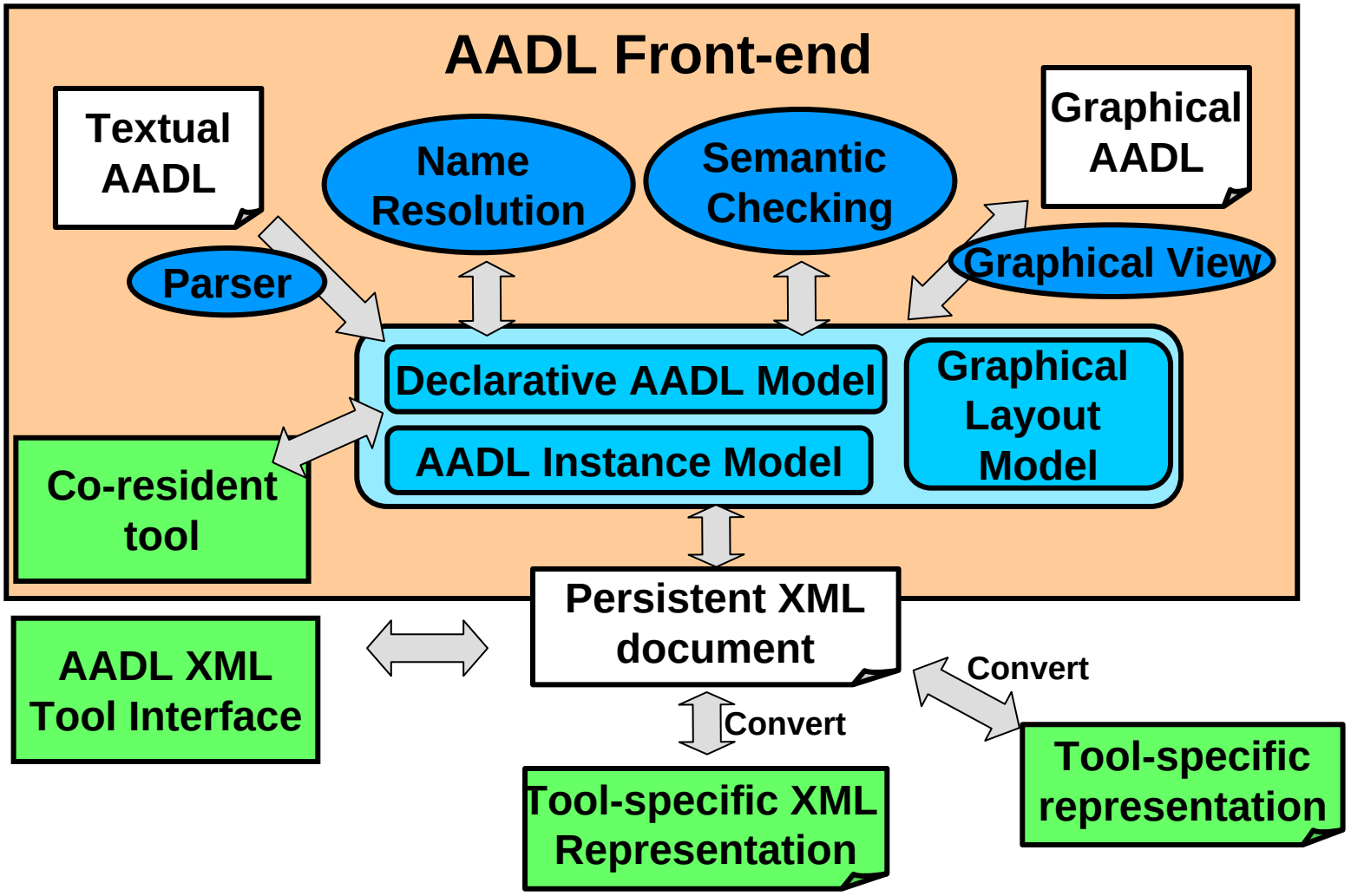
Outline

- Meta Modeling Approach
- Declarative AADL Model
- AADL Instance Model

XMI/XML Based Tool Interoperability



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AADL Meta Model

- Defined in Eclipse Modeling Framework (EMF)
  - Collection of meta model packages with graphical views
  - Separate from, but close to UML profile of AADL
- XML as persistent storage
  - XMI specification from Ecore meta model
  - Generated XML schema
- In-core AADL model
  - Generated methods for AADL model manipulation
  - Edit history, deep copy, object editor, graphical editor
  - Methods to support
    - AADL extends hierarchy
    - feature “inheritance”
    - property value “inheritance”

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AADL Meta Model Packages

- Core: defines the concepts of component type, implementation, subcomponent, AADL packages and modes.
- Component: defines the concrete classes for the different categories of components, including the constraints on their containment.
- Feature: defines the features of component types.
- Connection: defines the connections between component features.
- Flow: defines flow related elements of the AADL.
- Property: defines the elements for associating property values and for introducing new property types and properties via property sets.

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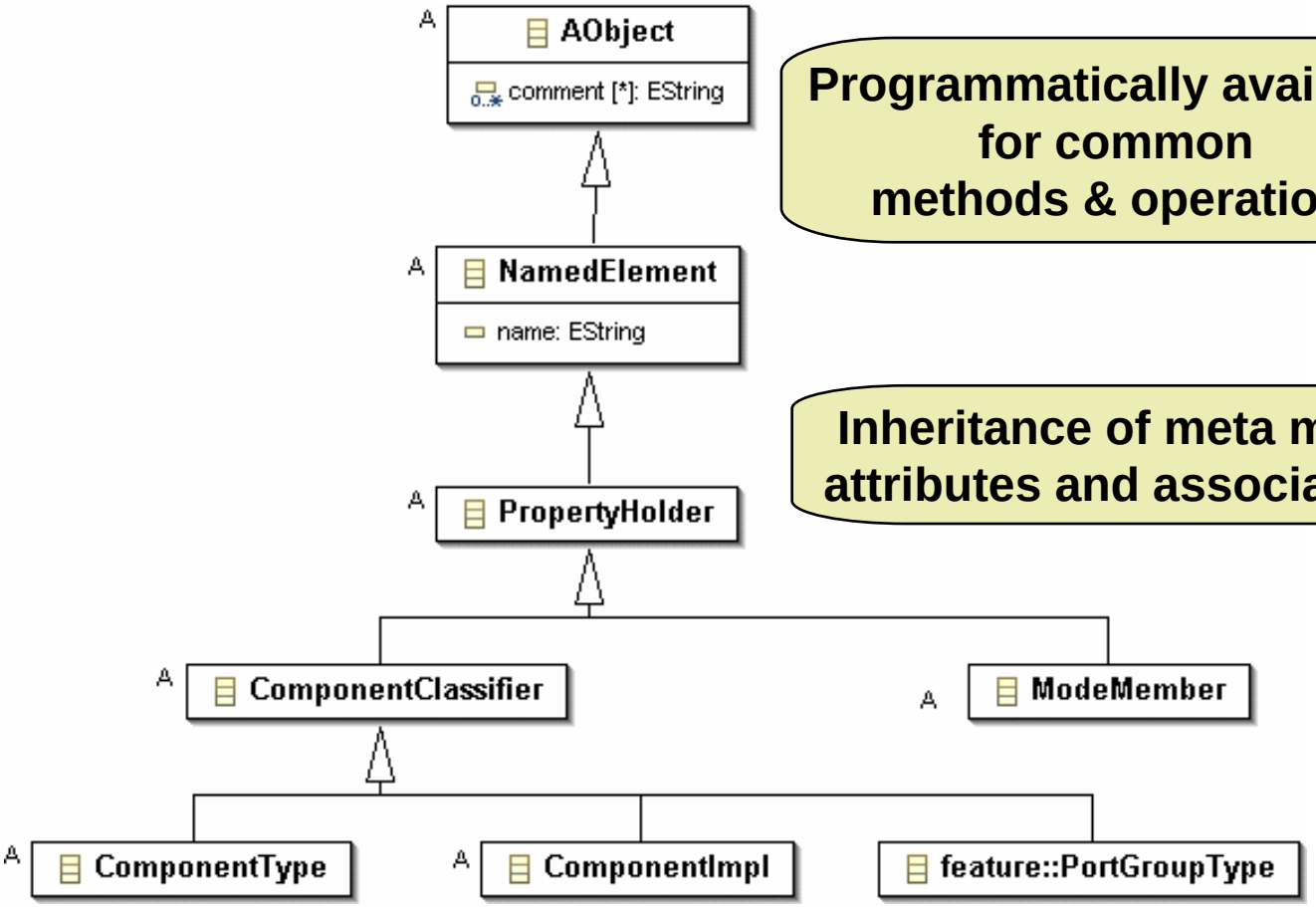
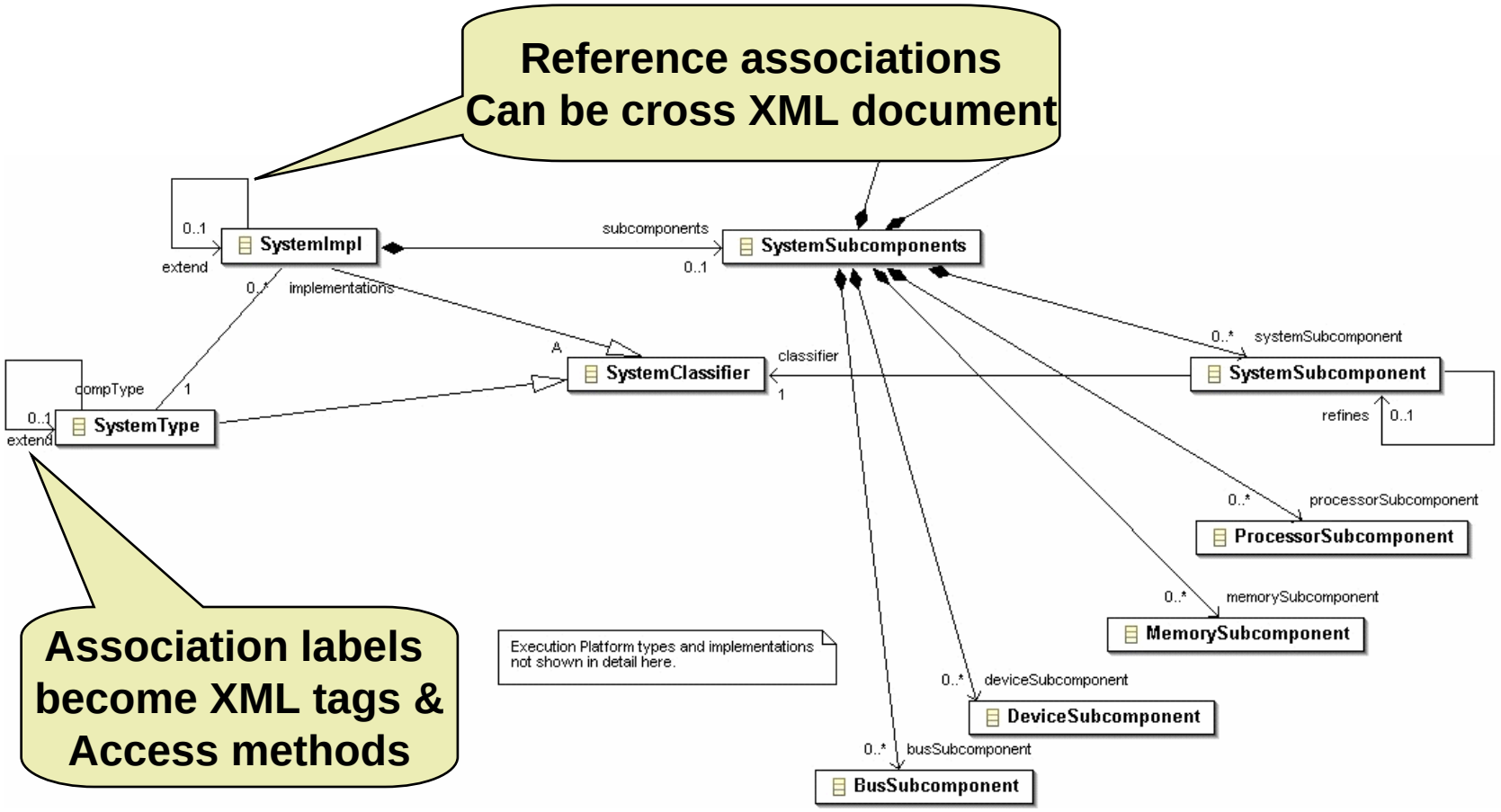
AADL Meta Model Class Hierarchy



Programmatically available for common methods & operations

Inheritance of meta model attributes and associations

AADL Meta Model Fragment



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AADL Text Example

```
package edu::cmu::sei::XMIExample
public
    system GPS
    features
        init: in event port;
        signal: out data port GPS_Signal;
    end GPS;
    system implementation GPS.basic
    end GPS.Basic;
    data GPS_Signal
    end GPS_Signal;
end edu::cmu::sei::XMIExample;
```

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AADL XML Example

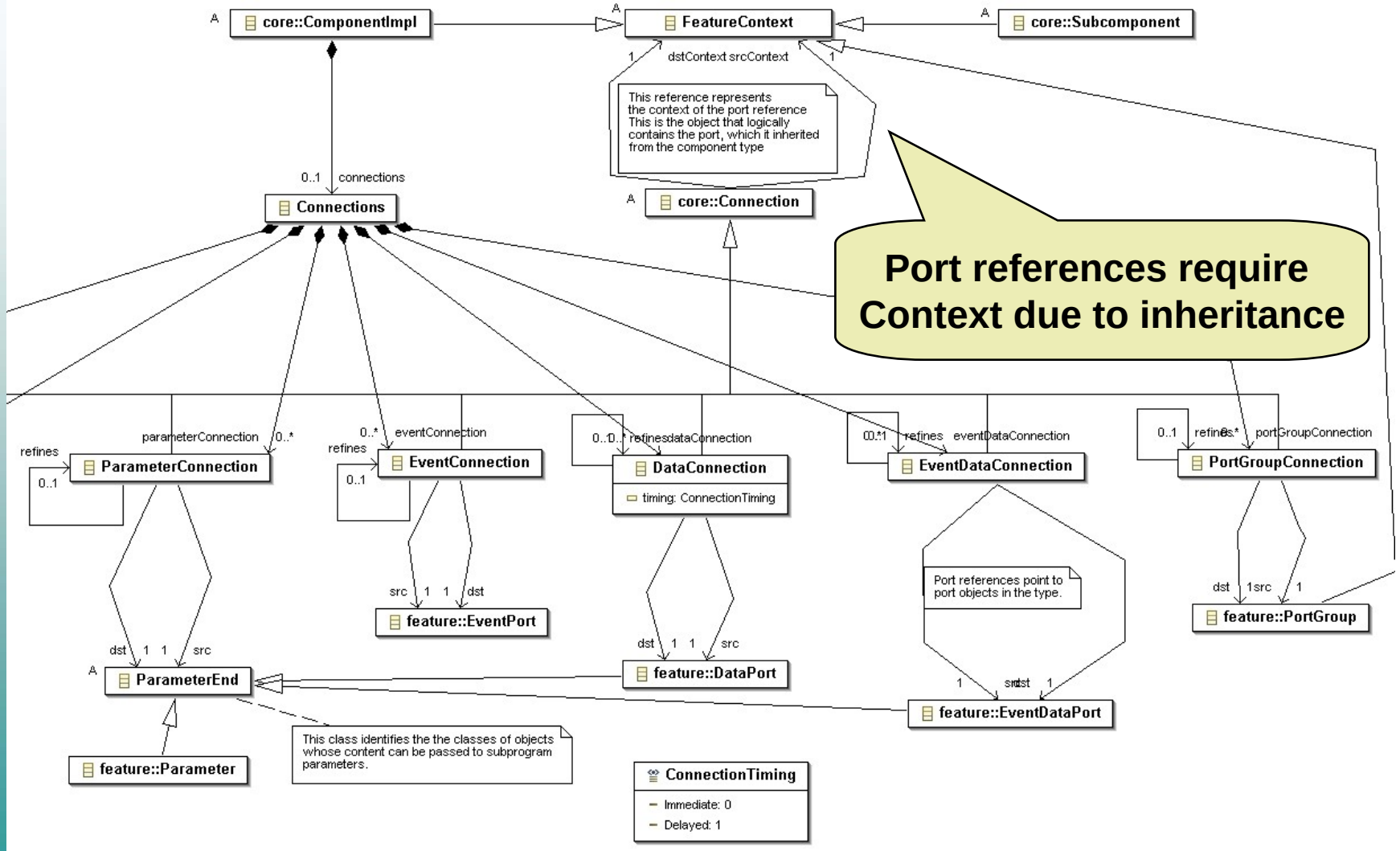
```
<?xml version="1.0" encoding="UTF-8"?>
<core:AadlSpec xmi:version="2.0" ……>
  <aadlPackage name="edu::cmu::sei::XMIExample">
    <aadlPublic>
      <systemType name="GPS">
        <features>
          <eventPort name="init"/>
          <dataPort name="signal" direction="out"
        dataClassifier="//aadlPackage[@name=edu::cmu::sei::XMIExample]/aadl
        Public/dataType[@name=GPS_Signal]"/>
        </features>
      </systemType>
      <systemImpl name="GPS.basic"
        compType="//aadlPackage[@name=edu::cmu::sei::XMIExample]/aadlPu
        blic/systemType[@name=GPS]"/>
      <dataType name="GPS_Signal"/>
    </aadlPublic>
  </aadlPackage>
</core:AadlSpec>
```

AADL Inheritance

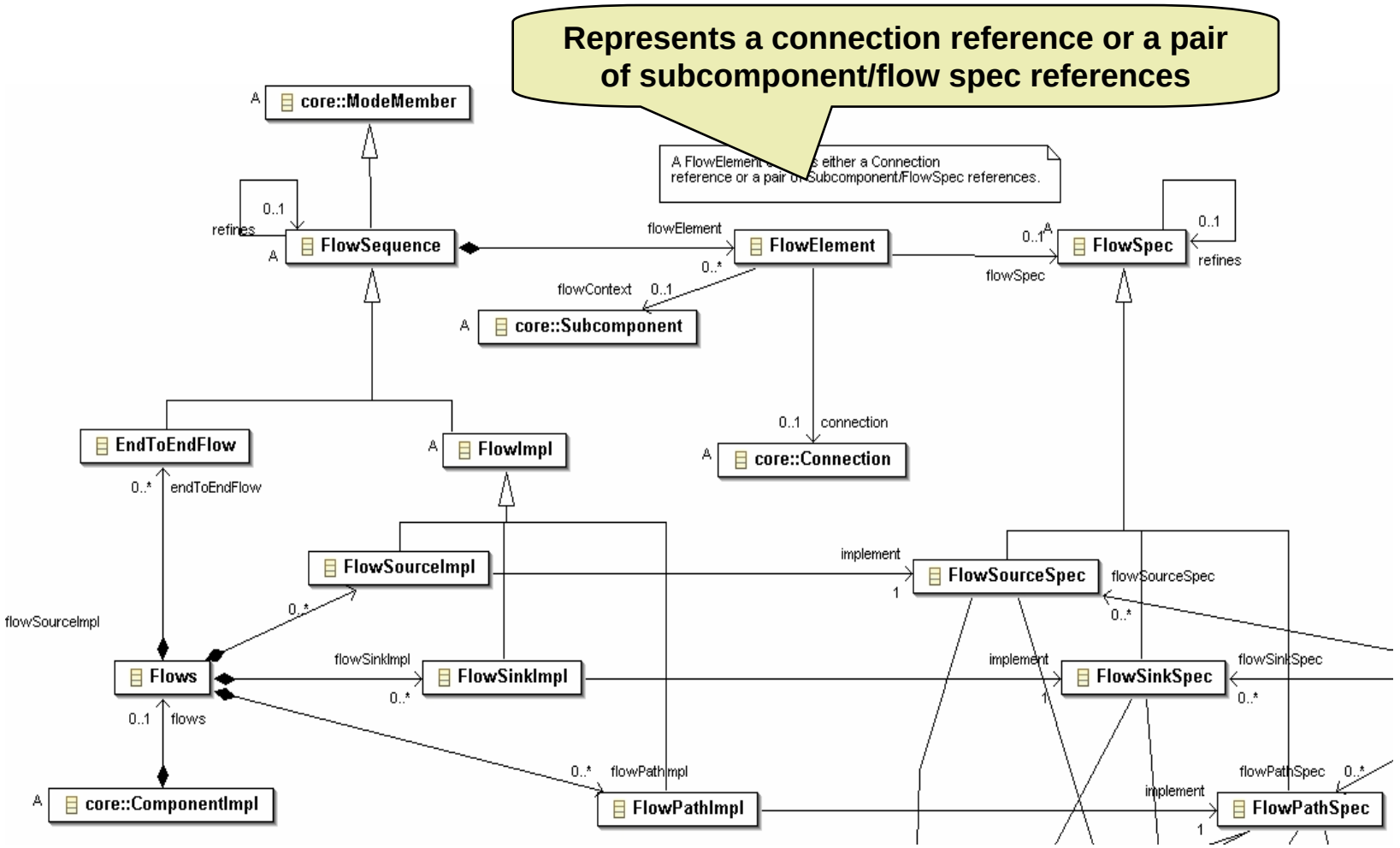
- Inheritance of component type features
  - By type extensions
  - By implementations
  - By subcomponents
- Inheritance of component implementation elements
  - By implementation extensions
  - By subcomponents
- Inheritance of property values
  - By type extensions
  - By implementations
  - By subcomponents
  - By contained components
  - By instance model

AADL inheritance handled by methods

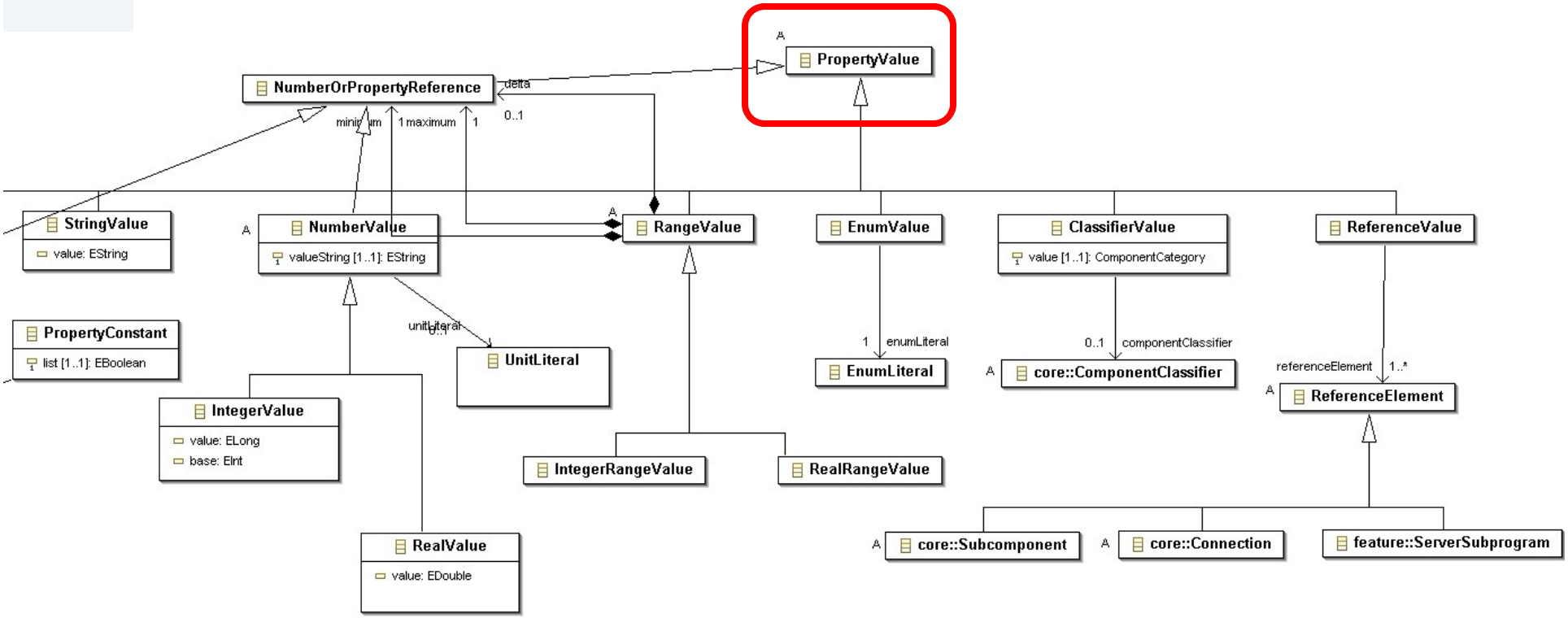
AADL Inheritance



Flow Sequence Meta Model



Property Values As Objects



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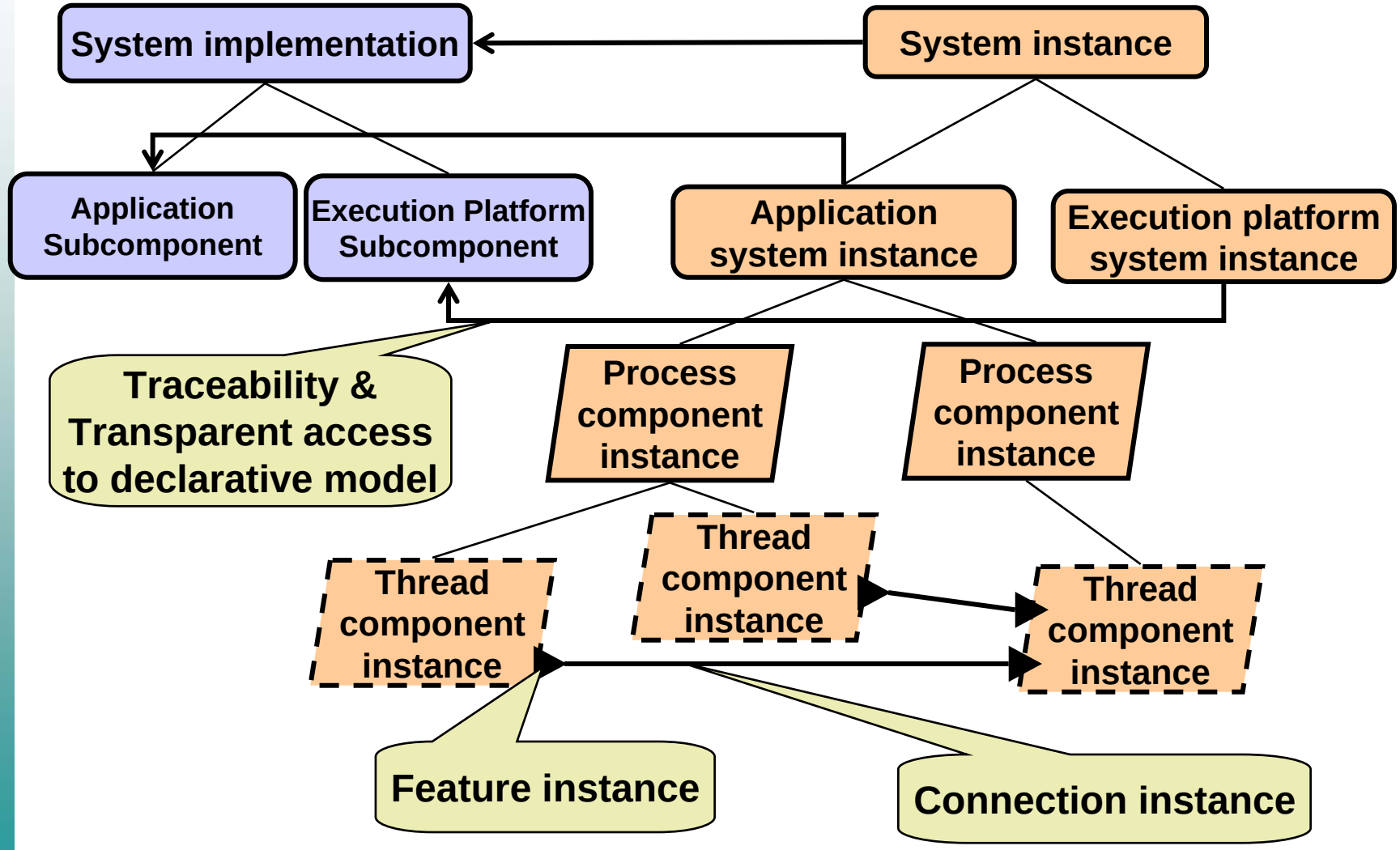
AADL Instance Model Objectives

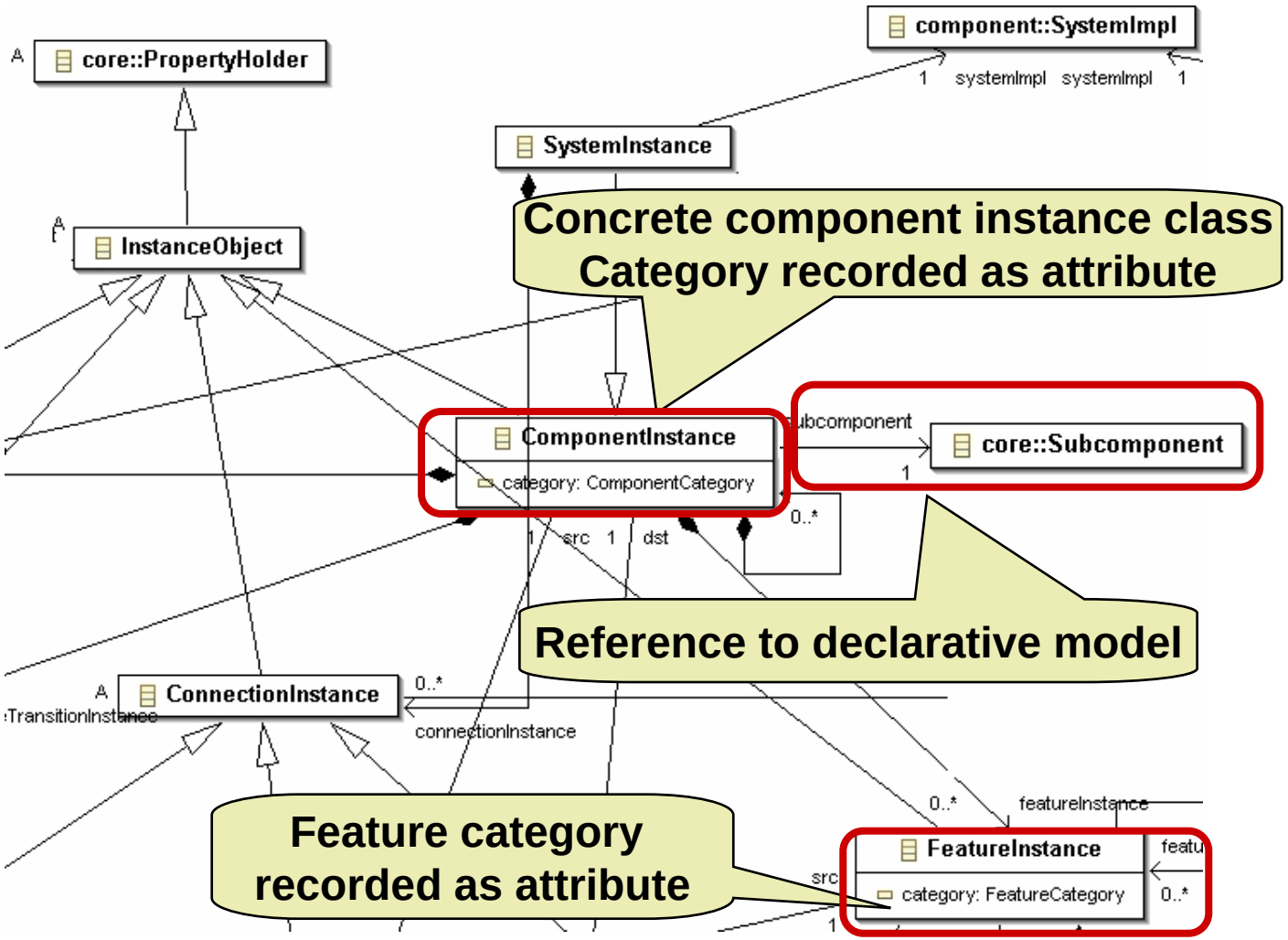
- Derivable from declarative AADL model
  - System implementation as root
  - Application & execution platform as subcomponents
  - Traceability to declarative model
- Self-contained compact system model
  - Compact representation
  - Separately loadable XML document
  - Semantic connections
  - Profile of locally cached property values
- Modal system instances
  - Legal mode combinations for system operation modes
  - System operation mode specific property values
- Recording of instance analysis results

OSATE creates instance models

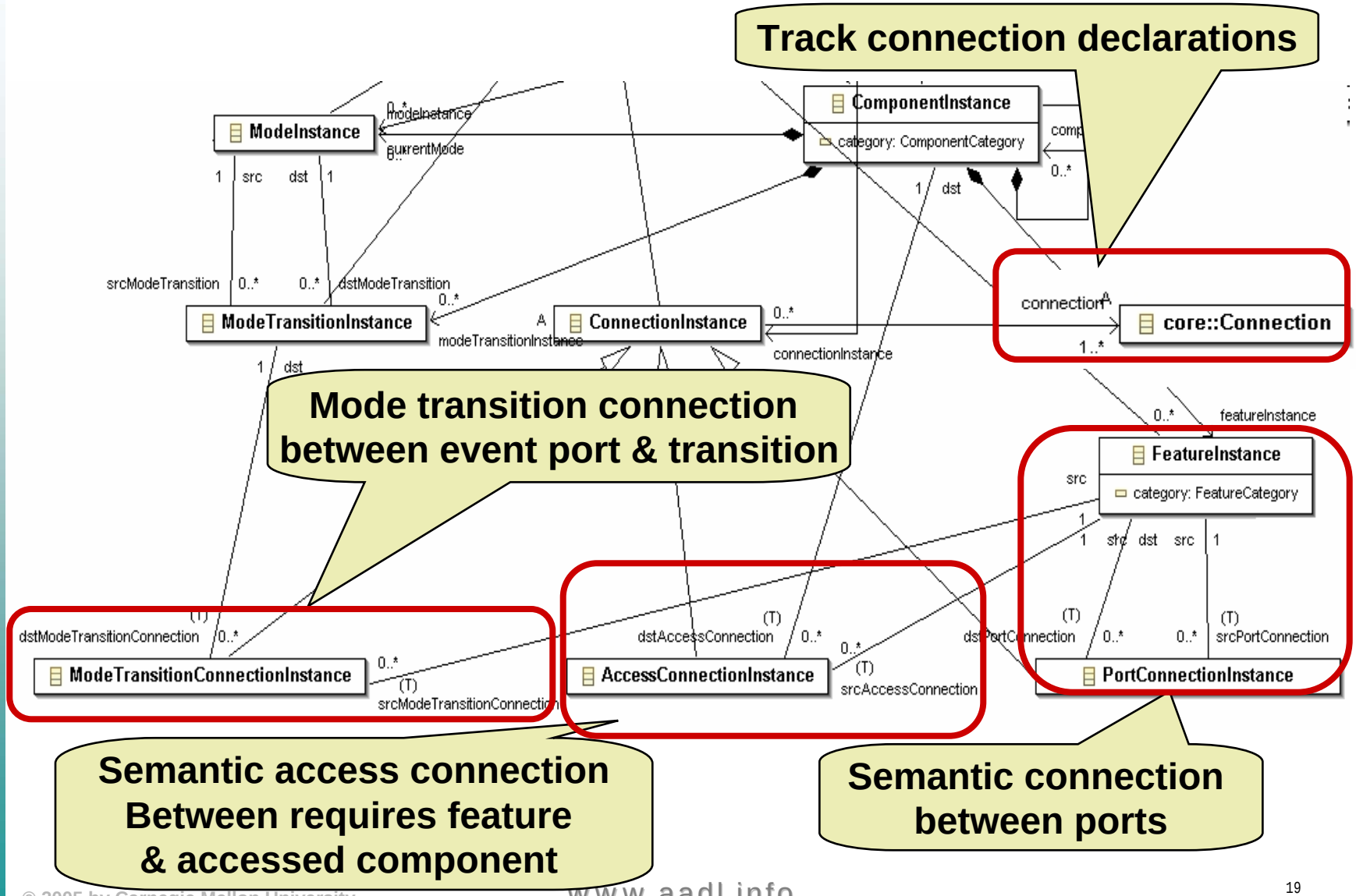
AADL Instance Model



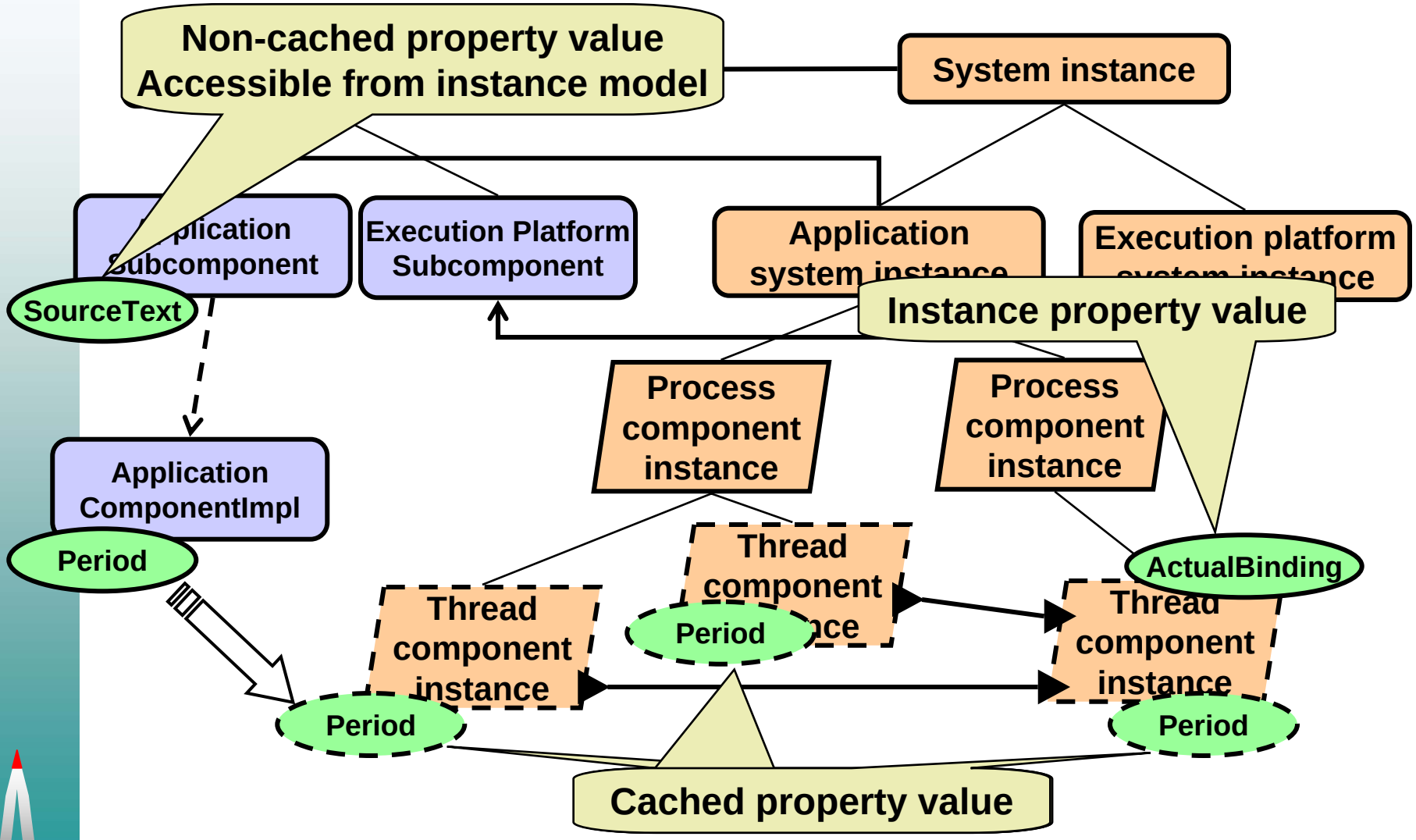
Instance Meta Model



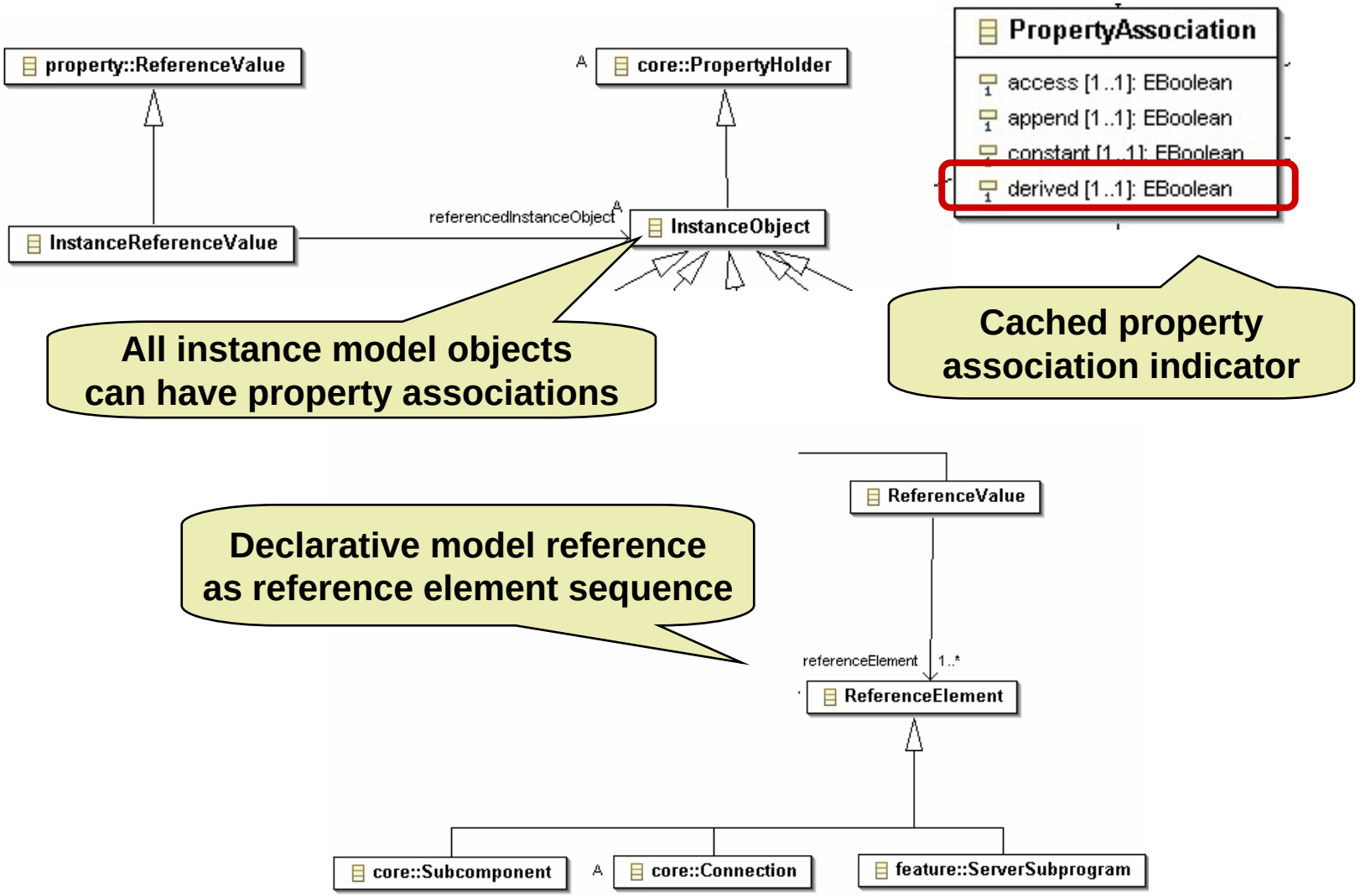
Semantic Connections



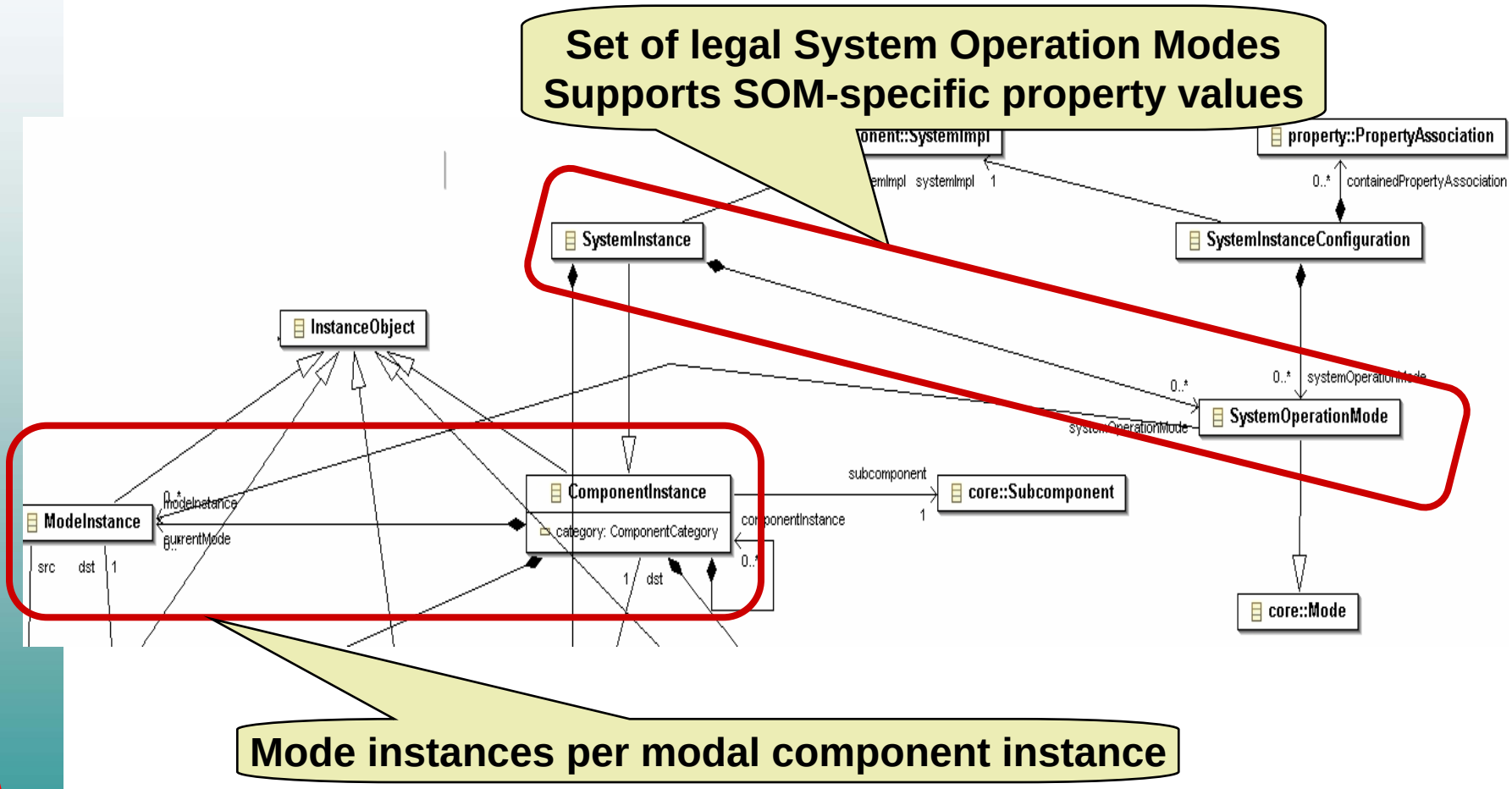
AADL Properties & Instance Model



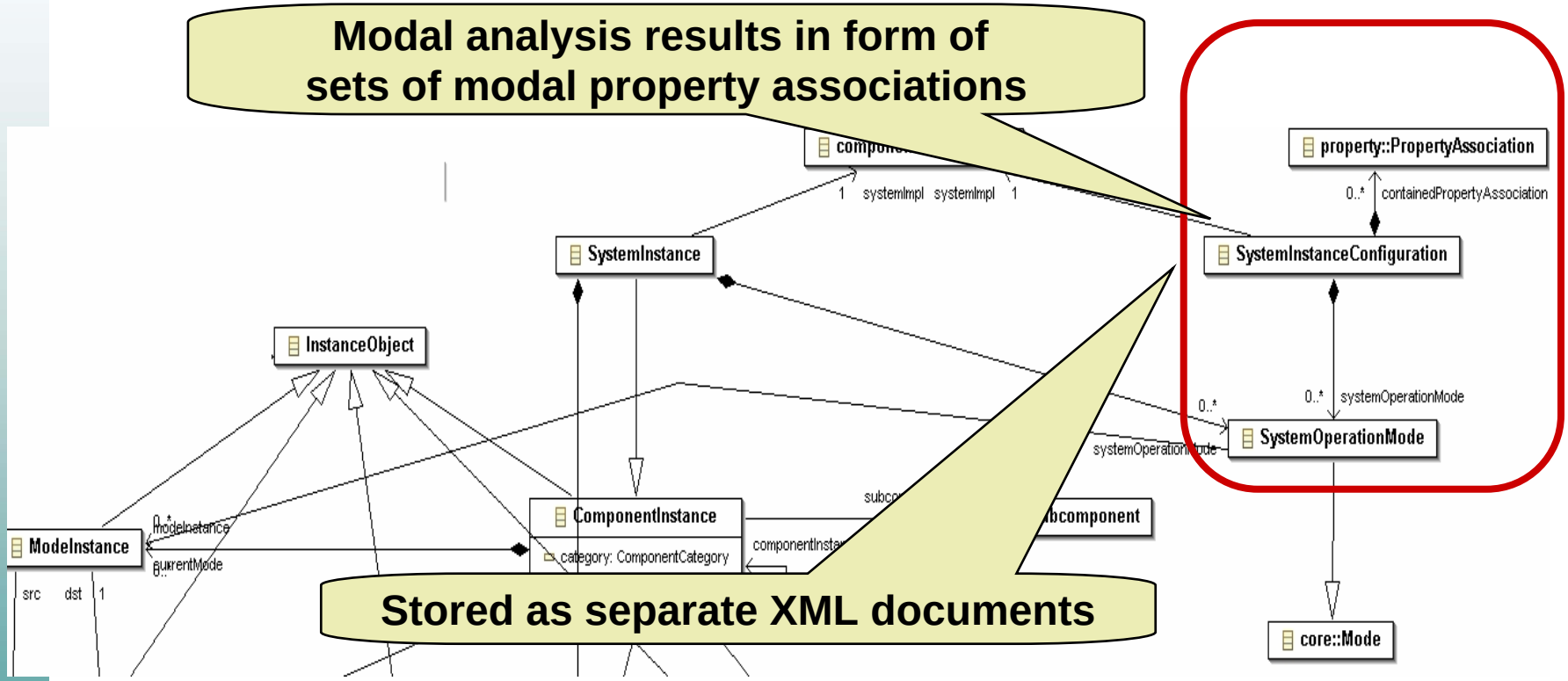
Instance Property Values



Modal & Configurable System Instances



Modal Analysis Result Sets



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Summary

- AADL Meta Model specified in Ecore
- Modular, extensible meta model specification
- XML Schema & XMI specification generated from meta model
- Declarative model & instance model
- Self-contained instance models