AADL v3 Roadmap
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Software Engineering Institute
Carnegie Mellon University
Pittsburgh, PA 15213

Peter Feiler

Overall Strategy

AADL V2.2

- Ballot & publication of AADL V2.2 standard document
- Release of OSATE 2.2.1 (April 2016)
- Next OSATE release will include last several errata to be implemented
- New AADL V2.2 errata: https://github.com/saeaadl/aadlv2.1
  - May become smaller V3 issues
- OSATE issue reports: https://github.com/osate

AADL V3

- Working slides & documents
- Prototype implementation
- AADL V3 Issues: https://github.com/saeaadl/aadlv3
- Discussion/working document area: https://github.com/saeaadl/aadlv3/wiki and committee area at www.sae.org

AADL V3 Strategy

AADL V3 Major issues

- Require multiple meetings to discuss
- Need to ensure consistency with rest of core AADL

Smaller issues/errata

- V2.1 errata to go into current OSATE release stream
- Some may be addressed as V3 change (recorded as V3 issues)

From white paper/slides to draft standard

- Incremental prototyping of V3 implementation
- Draft text into possibly new document structure

V3 Prototyping

Separate from OSATE v2.2 release stream

- New file extension aadlv3

Prototyping schedule and priorities

- End user need
- Validation of new concepts

Meta model changes

- Meta model for instance has not changed much from V1 to V2
  - Is not expected to change much for V3
  - Possible simplification of connection instance support
  - Scalability of generated system operation modes
- Meta model for declarative model
  - Current Meta model size/complexity
  - Impact of Meta model changes

OSATE Infrastructure Cleanup

- V1 legacy code (e.g., AObject, Location, aadl/aaxl files)
- Error reporting/diagnostics
- Plugin support: run & run as job, read-only/read-write
- Consolidation of public API libraries

- Textual instance model representation
  - Compact & readable
  - Similar to declarative model

Instantiation of any classifier, i.e., also types.

Textual Instance Model Implementation

Available in nightly build of OSATE

- Invoke “Generate textual instance” in context menu on aaxl2 instance file

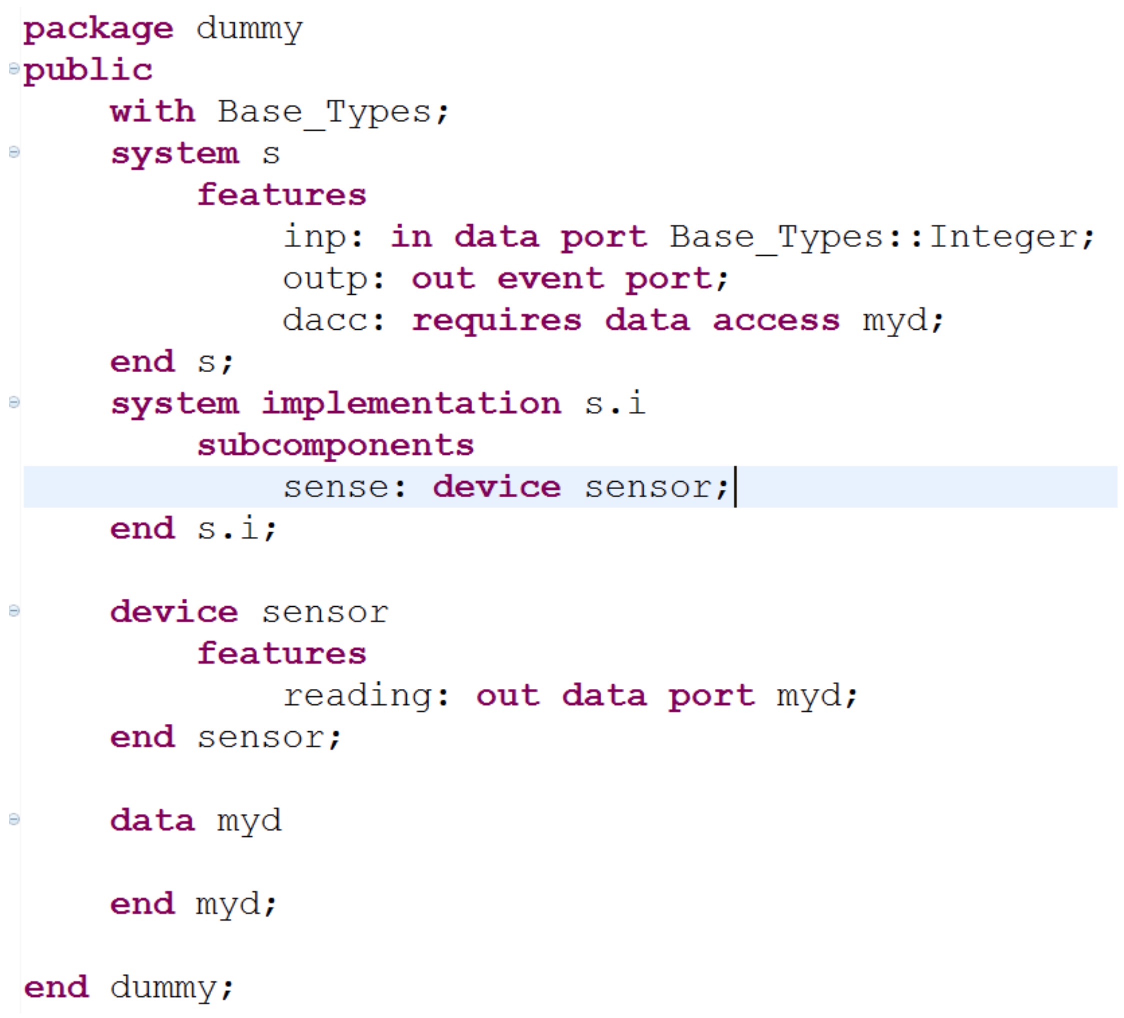
Syntax objective: compact, readable

- Size: 20-25% of XMI representation
- References into declarative model (grey)
  - References to unnamed elements (property association, mode transition, SOM)

Sources on Github

- https://github.com/osate/osate2-core org.osate.aadl2.instance.textual
- Includes unit tests

Declarative Example



```
package dummy
public
    with Base_Types;
    system s
        features
            inp: in data port Base_Types::Integer;
            outp: out event port;
            dacc: requires data access myd;
    end s;
    system implementation s.i
        subcomponents
            sense: device sensor;
    end s.i;

    device sensor
        features
            reading: out data port myd;
    end sensor;

    data myd

    end myd;

end dummy;
```

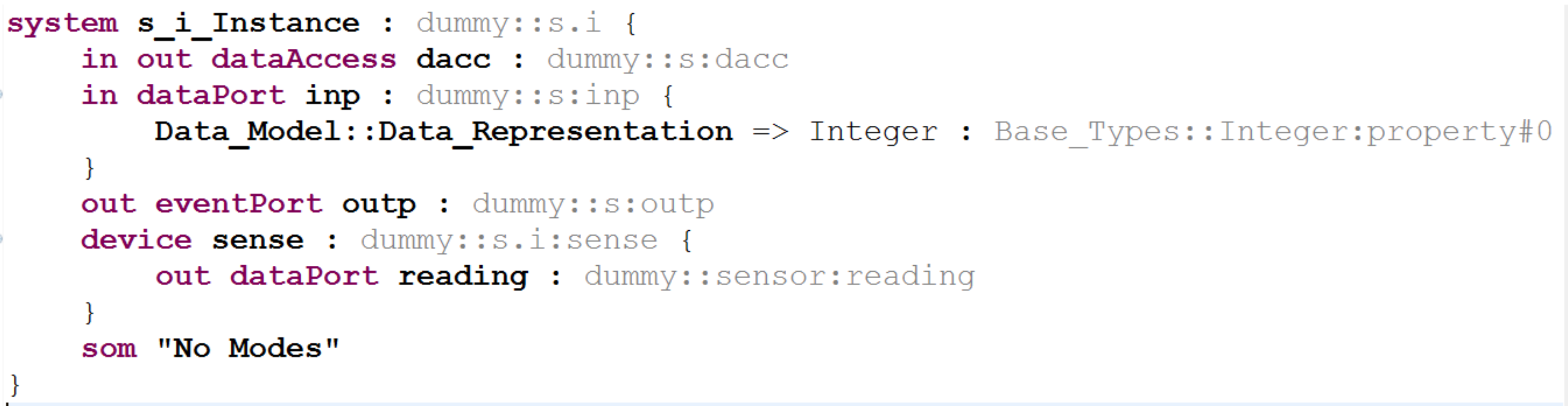
Textual Instance Model Example

Red: keywords

Black: instance related names

Grey: traceability references into declarative model

References to unnamed elements (property association, mode transition)

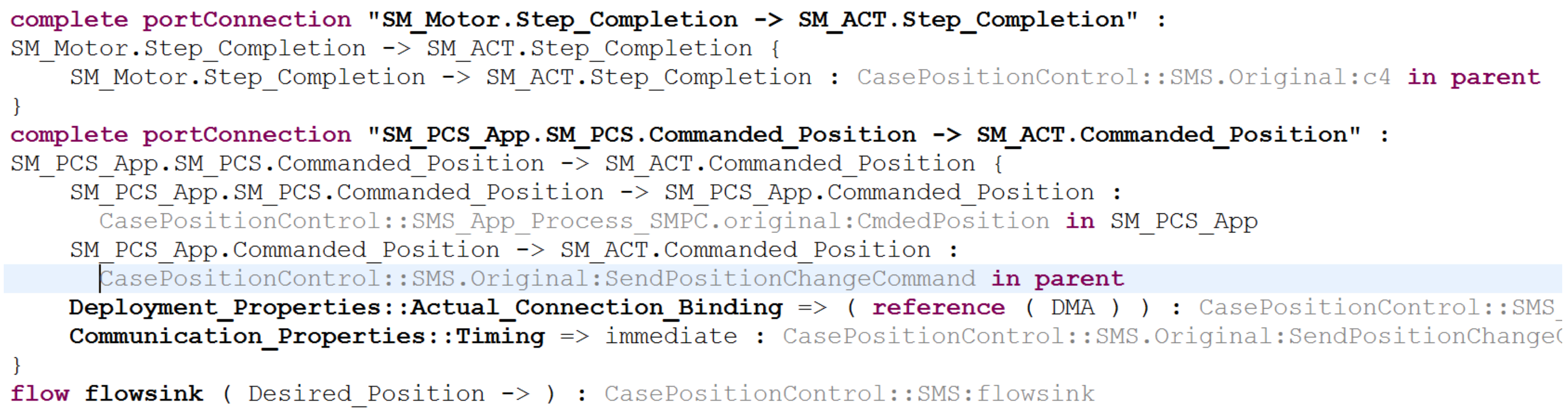


```
system s_i_Instance : dummy::s.i {
    in out dataAccess dacc : dummy::s:dacc
    in dataPort inp : dummy::s:inp {
        Data_Model::Data_Representation => Integer : Base_Types::Integer:property#0
    }
    out eventPort outp : dummy::s:outp
    device sense : dummy::s.i:sense {
        out dataPort reading : dummy::sensor:reading
    }
    som "No Modes"
}
```

Oddity in instance object names for connection instances and SOM

- Can be fixed

Connections and Flows



```
complete portConnection "SM_Motor.Step_Completion -> SM_ACT.Step_Completion" :
SM_Motor.Step_Completion -> SM_ACT.Step_Completion {
    SM_Motor.Step_Completion -> SM_ACT.Step_Completion : CasePositionControl::SMS.Original:c4 in parent
}
complete portConnection "SM_PCS_App.SM_PCS.Commanded_Position -> SM_ACT.Commanded_Position" :
SM_PCS_App.SM_PCS.Commanded_Position -> SM_ACT.Commanded_Position {
    SM_PCS_App.SM_PCS.Commanded_Position -> SM_PCS_App.Commanded_Position :
      CasePositionControl::SMS_App_Process_SMPC.original:CmdedPosition in SM_PCS_App
    SM_PCS_App.Commanded_Position -> SM_ACT.Commanded_Position :
      CasePositionControl::SMS.Original:SendPositionChangeCommand in parent
    Deployment_Properties::Actual_Connection_Binding => ( reference ( DMA ) ) : CasePositionControl::SMS_
    Communication_Properties::Timing => immediate : CasePositionControl::SMS.Original:SendPositionChange(
}
flow flowsink ( Desired_Position -> ) : CasePositionControl::SMS:flowsink
```

Roadmap – Active

Compositional Interfaces (Julien, Peter*, Alexey*, Jerome, Bren)

- Interface composition, Feature group improvements, Interface properties
- Action:
- Schedule:

Variability points and configuration (Peter)

- Implementation selection for subcomponents, properties, in modes mappings, bindings, prototypes: reach down into model
- Syntactic distinction of architecture design and configuration, **final** design/configuration
- Action: configuration of virtual bus, virtual processor, and other implementations (Implemented as)
- Schedule:

Roadmap – Active

General binding concept

- Binding type, binding point, binding instances (single target, alternative targets, target sequences), Binding constraints
- Action: binding sequences and flows
- Schedule:

Array indexed connection declarations (Peter, Brendan)

- Instance configuration: pattern or index mapping set on top connection
- Exposure of index dimensions/sizes via feature arrays
- Feature mapping connection, index subset mapping
- Action: interplay with configuration view (mapping) – inverse of mapping
- Schedule:

Roadmap - Candidates

Nested processors (Julien, Jerome, Alexey)

Virtual memory (Alexey, Julien)

“Hardware” flows

- Flows between platform components
- Flow specs on hardware components
- Target of connection, virtual bus bindings

Virtual platform connectivity

- Connections between virtual bus, virtual processor, virtual memory
- Virtual process/memory via virtual bus?
- Mixture of virtual and physical?
- Virtual platform flows

Roadmap - Candidates

Unification of type systems and expression languages (Alexey, Brian, Serban)

- Data types, property types, constraint language variable types
- Lists & sets for properties: Set with unique element semantics?
- Union of values: collapse entry point properties (3-to-1)
- *Removal of classifier/reference in expression part (typed expressions)*
- Handling of units: part of value, association via property

Property sublanguage

- Properties presented as separate sublanguage from core AADL
- Integration of proposed Units system
- Nested naming of property sets and possibility of inheritance

Property inheritance, override, and **final**

Inheritance & Overriding of Property Values

Property associations without applies to

- Applies to was originally introduce to deal with model reference values for expressing bindings
- Property value rules allow overriding from outside in
- Used to allow configuration of data sets to instance model
- Configurable data set concept introduced in V2

Final on property association vs. final as default

- Override in extends hierarchy (always unless **constant**)
- Override in component hierarchy (definition states **inherit**)
- We have **constant** instead of **final**
- Final as default
  - Explicit specification of variability point
  - Inherit without override

Default value for properties at definition time

- Examine each for actual need
- Default with component classifier; is inherited

Roadmap - Candidates

Usefulness of public/private package sections (Bren, Jerome)

AADL Project (Jerome)

Multiple (Mode) state machines aka state variables (Peter, Alex, Bren*, Jerome, Julien*, Brian) [kickoff in Feb]

- Modes, BA states, EM states, hybrid annex, interacting state machines

More Candidates

Virtual devices (Bren)

- Device as VHDL and SW device drivers
- Device as part of the system architecture & device as part of functional architecture

Flow related

- End to end flow requirement without an implementation (Approved errata)
- Flow path/source/sink as end to end instance

Add’l Candidates

Table of Content (Jerome, Peter)

Core constraints by constraint expression rather than properties

Applies to in property definition: do not require listing of enclosing component categories when property is inherit

Call sequence is currently not a name space for call identifiers.

Interrupt handler (Jerome)

More Candidates

Data aggregation via protocol

Data mapping via new binding/mapping concept

Clean up directionality of access features (Peter)

- Need for Access_Right?

Categories on connections: make them optional or leave out?

Table of Content: Organization of Std Document

Currently

- Generic package and component concepts
  - Includes annex mechanism, prototypes, aliases, abstract components as category
- Specific component categories
- Generic concept of features and specific feature categories
- Generic concept of connections and specific connection categories
- Concept of flows
- Property sublanguage
  - Property association, property and type definition
- Concept of modes
  - Impact on architecture hierarchy & topology
- Concept of system instance

Table of Content: Organization of Std Document

Proposal

- Generic architecture concepts
  - Components, features, connections/flows
  - Modes, configurations, instances
- Specific component categories
- Property sublanguage
- Model organization concepts
  - Packages, aliases
  - Annexes, data sets