ADeS presentation

ADeS

a simulator for AADL
v0.2.3

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Agenda

• Objective of the simulation
• Presentation of the tool
• Demonstration
• To go further
Objective of the simulation
Why simulating AADL?

- Scheduling analysis
- Mode change analysis
- Workload statistics
- Temporal dimensioning
- Data flow study
- Control flow study
- ADeS
  Behavior simulation of AADL architecture
- ...
Requirements for a simulator

- Simulation of the full AADL specification with exact compliance with the standard
- Support of behavior descriptions
- Support of AADL extensibility (new properties, new protocols, etc.)
- Integration with other AADL tools
- Storage of the results for post-analyses
Area of the simulation

- Components
  - Individual behavior
- Communication between components
  - Bus & data access
  - Subprogram calls
  - Port connections
- Modes
  - Local mode change
  - SOM change
Presentation of the tool
Technical overview

- ADeS
  - Eclipse plug-in
  - Built on OSATE and Topcased
  - Interoperability with AADL tools
  - Under Eclipse Public License
Architecture

OSATE

INSTANTIATION

UI
GUI Log

Trace
Component Feature

AADL
Elements
Component Feature

Managers
Mode SOM
Feature Connection
Property Subcomponent

BASE SIMU
SimuThreadEvent SimuProcessEvent SimuDeviceEvent

CORE
Jimex Events Stack
Behavior description

Simulation kernel

AADL standard behavior

Scheduling protocols

Queuing protocols

...

user annex

behavior annex

ADeS default annex

Annex behavior annex user annex
Objective: provide a minimal behavior description

Target: threads, devices, subprograms

Form: list of sequential actions

Possible actions:

- Compute (<duration>)
- Raise (<port>)
- Raise (<port>, <data>)

```
annex behavior {**
  t1 {
    compute(10 ms);
    raise(chMode);
  } in modes (normal);
  t1 {
    compute(25 ms);
    raise(chMode);
  } in modes (backup);
**};
```
Flexibility and extensions

- Support of AADL annexes
  - Capability to develop new supports
- Capability to add of new protocols
  - scheduling protocols
  - dispatch protocols
  - dequeuing protocols
  - overflow handling protocols
  - queue processing protocols
- Possibility to reuse of the core level for other simulation models
Project creation wizard

- ADeS simulation project creation wizard

![Image of project creation wizard](image)
Simulation creation wizard

- ADeS simulation creation wizard

![Simulation creation wizard interface](image.png)
• Instantiated architecture

• Instances attributes
Simulation events display

<table>
<thead>
<tr>
<th>Id</th>
<th>Date</th>
<th>P</th>
<th>Event Type</th>
<th>Source</th>
<th>Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>45</td>
<td>7 ms</td>
<td>2</td>
<td>TIME_OUT</td>
<td>timer_simpleSystem_DemoSystem_impl_Instance.singleProcess.sender</td>
<td>timer_simpleSystem_DemoSystem_impl_Instance.singleProcess.sender</td>
</tr>
<tr>
<td>51</td>
<td>7 ms</td>
<td>2</td>
<td>TIME_OUT</td>
<td>timer_simpleSystem_DemoSystem_impl_Instance.singleProcess.sender</td>
<td>timer_simpleSystem_DemoSystem_impl_Instance.singleProcess.sender</td>
</tr>
<tr>
<td>27</td>
<td>122 ms</td>
<td>2</td>
<td>HYPERPERIOD_ENDED</td>
<td>evg_simpleSystem_DemoSystem_impl_Instance.singleProcess.sender</td>
<td>evg_simpleSystem_DemoSystem_impl_Instance.singleProcess.sender</td>
</tr>
<tr>
<td>37</td>
<td>122 ms</td>
<td>8</td>
<td>TIME_OUT</td>
<td>timer_simpleSystem_DemoSystem_impl_Instance.singleProcess.sender</td>
<td>timer_simpleSystem_DemoSystem_impl_Instance.singleProcess.sender</td>
</tr>
<tr>
<td>25</td>
<td>152 ms</td>
<td>2</td>
<td>HYPERPERIOD_ENDED</td>
<td>evg_simpleSystem_DemoSystem_impl_Instance.singleProcess.receiver</td>
<td>evg_simpleSystem_DemoSystem_impl_Instance.singleProcess.receiver</td>
</tr>
<tr>
<td>31</td>
<td>152 ms</td>
<td>8</td>
<td>TIME_OUT</td>
<td>timer_simpleSystem_DemoSystem_impl_Instance.singleProcess.receiver</td>
<td>timer_simpleSystem_DemoSystem_impl_Instance.singleProcess.receiver</td>
</tr>
<tr>
<td>30</td>
<td>602 ms</td>
<td>4</td>
<td>HYPERPERIOD_END</td>
<td>SOM Manager</td>
<td>SOM Manager</td>
</tr>
</tbody>
</table>

Current date: 2 ms (2000000000 ps)
ADeS perspective

ADeS tool bar

Instances tree viewer

Editor

Project navigator

Simulation events stack

Console

Instances attributes
With a simple scheduling protocol, if a thread has no priority property value.

If a thread is not bound onto any processor.
- For a *raise* action inside a *behavior annex*, if feature does not exist.

- If the actions list of a thread does not respect its compute execution time property.
ADeS trace file

- Keep a simulation history
- XML file in simulation project hierarchy
- Content
  - States, modes, properties, subcomponents changes
  - Compute data
  - Simulation events

```xml
<?xml version="1.0" encoding="UTF-8"?>
<adesSimulationTrace>
  <event type="simu_event" date="0">
    <element>testMode03_S_I_Instance</element>
    <eventLabel>START</eventLabel>
    <eventSrc>testMode03_S_I_Instance</eventSrc>
  </event>
  <event type="state_change" date="0">
    <element>testMode03_S_I_Instance</element>
    <newState>STARTING</newState>
  </event>
  <event type="simu_event" date="0">
    <element>testMode03_S_I_Instance.p</element>
    <eventLabel>HYPERPERIOD_ENDED</eventLabel>
    <eventSrc>testMode03_S_I_Instance.p</eventSrc>
  </event>
  <event type="subcomponent" date="0">
    <element>testMode03_S_I_Instance.p</element>
    <subcomponents>
      <subcomponent>testMode03_S_I_Instance.p.t2</subcomponent>
      <subcomponent>testMode03_S_I_Instance.p.t1</subcomponent>
    </subcomponents>
  </event>
  <event type="simu_event" date="0">
    <element>testMode03_S_I_Instance.p.t2</element>
    <eventLabel>HYPERPERIOD_ENDED</eventLabel>
    <eventSrc>testMode03_S_I_Instance.p.t2</eventSrc>
  </event>
  <event type="properties" date="0">
    <element>testMode03_S_I_Instance.p.t2</element>
    <properties>
      <property value="Periodic" name="Dispatch_Protocol"/>
      <property value="4000000000" name="Deadline"/>
      <property value="4000000000" name="Period"/>
      <property value="" name="Actual_Processor_Binding"/>
      <property value="[4000000000..5000000000]" name="Compute_Execution_Time"/>
    </properties>
  </event>
</adesSimulationTrace>
```
Demonstration
Driving a simulation

OSATE

- AADL modeling
- Check of the AADL model

ADeS

- ADeS needs fulfilled?
  - Yes: Instantiation
  - No: Simulation
Demo scenario 3

processor

sched. protocol = RMS

bus

prop. delay = 5ms

memory

50ms

CET = 20ms

50ms

150ms 300ms

CET = 52ms 104ms

200ms 50ms

CET = 46ms 11ms

t1

t2

normal

backup

chMode

complete

chMode

backup

chMode

complete

chMode

normal

t2.normal-t3.backup

t2.backup-t3.normal

prop. delay = 5ms

t2.normal-t3.normal

t2.backup-t3.backup

sched. protocol = RMS
1er Hyperperiod


<table>
<thead>
<tr>
<th>Mode</th>
<th>Default</th>
<th>Mode</th>
<th>Normal</th>
<th>Mode</th>
<th>Normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Period</td>
<td>100 ms</td>
<td>Period</td>
<td>150 ms</td>
<td>Period</td>
<td>200 ms</td>
</tr>
<tr>
<td>CET</td>
<td>20 ms</td>
<td>CET</td>
<td>52 ms</td>
<td>CET</td>
<td>46 ms</td>
</tr>
<tr>
<td>Priority</td>
<td>0.010</td>
<td>Priority</td>
<td>0.007</td>
<td>Priority</td>
<td>0.005</td>
</tr>
</tbody>
</table>

Axlog Ingénierie 2007
2nd Hyperperiod

Hyperperiod: 300 ms

<table>
<thead>
<tr>
<th>Mode</th>
<th>Default</th>
<th>Period</th>
<th>CET</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>RUNNING</td>
<td>&lt;20&gt;</td>
<td>READY</td>
<td>0.010</td>
</tr>
<tr>
<td>T2</td>
<td>Normal</td>
<td>&lt;19&gt;</td>
<td>&lt;33&gt;</td>
<td>0.007</td>
</tr>
<tr>
<td>T3</td>
<td>Backup</td>
<td>&lt;11&gt;</td>
<td>&lt;11&gt;</td>
<td>0.020</td>
</tr>
</tbody>
</table>

Default Period 100 ms  
Backup Period 50 ms  
Normal Period 150 ms  
Backup Period 50 ms

Axlog Ingénierie 2007
**3rd Hyperperiod**

**SOM: T2.Backup-T3.Backup**

Hyperperiod: 300 ms

### Mode Default

- **T1**
  - **Mode**: Default
  - **Period**: 100 ms
  - **CET**: 20 ms
  - **Priority**: 0.010

### Mode Backup

- **T2**
  - **Mode**: Backup
  - **Period**: 300 ms
  - **CET**: 104 ms
  - **Priority**: 0.003

- **T3**
  - **Mode**: Backup
  - **Period**: 50 ms
  - **CET**: 11 ms
  - **Priority**: 0.020

**Axlog Ingénierie 2007**
4th Hyperperiod

SOM: T2.Backup - T3.Normal

Hyperperiod: 600 ms

- **T1**
  - **Mode**: Default
  - **Period**: 100 ms
  - **CET**: 20 ms
  - **Priority**: 0.010
  - **Mode**: RUNNING
  - **Period**: <20> <20> <20> <20> <20> <20>
  - **CET**: 1220 1276 1330 1400 1430 1510 1576 1610 1676 1710 1810
  - **Priority**: 0.010

- **T2**
  - **Mode**: Backup
  - **Period**: 300 ms
  - **CET**: 104 ms
  - **Priority**: 0.003
  - **Mode**: RUNNING
  - **Period**: <34> <70> <80> <24>
  - **CET**: 1210 1276 1330 1400 1476 1530 1620 1676 1710 1730 1810
  - **Priority**: 0.003

- **T3**
  - **Mode**: Normal
  - **Period**: 200 ms
  - **CET**: 46 ms
  - **Priority**: 0.005
  - **Mode**: RUNNING
  - **Period**: <46> <46> <46>
  - **CET**: 1210 1276 1330 1400 1476 1530 1620 1676 1710 1730 1810
  - **Priority**: 0.005
Components initialization 1/2

<table>
<thead>
<tr>
<th>Component</th>
<th>Time</th>
<th>Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>system</td>
<td>0 ps</td>
<td>'GlobalSystem' has the state STARTING.</td>
</tr>
<tr>
<td>bus</td>
<td>0 ps</td>
<td>'bus' treats a HYPERPERIOD_ENDED sent by SOMManager 'SOM Manager'.</td>
</tr>
<tr>
<td>bus</td>
<td>0 ps</td>
<td>'bus'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Properties list:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Propagation_Delay [5000000000..5000000000]</td>
</tr>
<tr>
<td>process</td>
<td>0 ps</td>
<td>'process' treats a HYPERPERIOD_ENDED sent by SOMManager 'SOM Manager'.</td>
</tr>
<tr>
<td>process</td>
<td>0 ps</td>
<td>'process'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Subcomponents list:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- T3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- T1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- T2</td>
</tr>
<tr>
<td>thread</td>
<td>0 ps</td>
<td>'T3' treats a HYPERPERIOD_ENDED sent by SOMManager 'SOM Manager'.</td>
</tr>
<tr>
<td>thread</td>
<td>0 ps</td>
<td>'T3'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Properties list:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Dispatch_Protocol Periodic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Deadline 200000000000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Initialize_Deadline 10000000000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Actual_Processor_Binding RMS Scheduler [STOPPED][default]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Synchronized_Component true</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Initialize_Execution_Time [10000000000..10000000000]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Compute_Execution_Time [46000000000..46000000000]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Period 200000000000</td>
</tr>
<tr>
<td>thread</td>
<td>0 ps</td>
<td>'T2' treats a HYPERPERIOD_ENDED sent by SOMManager 'SOM Manager'.</td>
</tr>
<tr>
<td>thread</td>
<td>0 ps</td>
<td>'T2'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Properties list:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Dispatch_Protocol Periodic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Deadline 150000000000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Initialize_Deadline 150000000000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Actual_Processor_Binding RMS Scheduler [STOPPED][default]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Synchronized_Component true</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Initialize_Execution_Time [10000000000..10000000000]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Compute_Execution_Time [52000000000..52000000000]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Period 150000000000</td>
</tr>
<tr>
<td>thread</td>
<td>0 ps</td>
<td>'T1' treats a HYPERPERIOD_ENDED sent by SOMManager 'SOM Manager'.</td>
</tr>
<tr>
<td>thread</td>
<td>0 ps</td>
<td>'T1'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Properties list:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Dispatch_Protocol Periodic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Deadline 100000000000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Initialize_Deadline 10000000000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Actual_Processor_Binding RMS Scheduler [STOPPED][default]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Synchronized_Component true</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Initialize_Execution_Time [10000000000..10000000000]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Compute_Execution_Time [20000000000..20000000000]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Period 100000000000</td>
</tr>
<tr>
<td>processor</td>
<td>0 ps</td>
<td>'RMS Scheduler' treats a HYPERPERIOD_ENDED sent by SOMManager 'SOM Manager'.</td>
</tr>
<tr>
<td>processor</td>
<td>0 ps</td>
<td>'RMS Scheduler'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Properties list:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Scheduling_Protocol RMS</td>
</tr>
</tbody>
</table>
### Components initialization 2/2

<table>
<thead>
<tr>
<th>Component</th>
<th>Time</th>
<th>State</th>
<th>Event</th>
<th>Sender</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor</td>
<td>0 ps</td>
<td>'RMS Scheduler'</td>
<td>START</td>
<td>System 'GlobalSystem'.</td>
</tr>
<tr>
<td>Processor</td>
<td>0 ps</td>
<td>'RMS Scheduler'</td>
<td>STARTING.</td>
<td></td>
</tr>
<tr>
<td>Process</td>
<td>0 ps</td>
<td>'process'</td>
<td>LOAD</td>
<td>Processor 'RMS Scheduler'.</td>
</tr>
<tr>
<td>Process</td>
<td>0 ps</td>
<td>'process'</td>
<td>LOADING.</td>
<td></td>
</tr>
<tr>
<td>Thread</td>
<td>0 ps</td>
<td>'T3'</td>
<td>LOADED</td>
<td>Process 'process'.</td>
</tr>
<tr>
<td>Thread</td>
<td>0 ps</td>
<td>'T3'</td>
<td>PERFORMING_INITIALIZATION.</td>
<td></td>
</tr>
<tr>
<td>Thread</td>
<td>0 ps</td>
<td>'T1'</td>
<td>LOADED</td>
<td>Process 'process'.</td>
</tr>
<tr>
<td>Thread</td>
<td>0 ps</td>
<td>'T1'</td>
<td>PERFORMING_INITIALIZATION.</td>
<td></td>
</tr>
<tr>
<td>Thread</td>
<td>0 ps</td>
<td>'T2'</td>
<td>LOADED</td>
<td>Process 'process'.</td>
</tr>
<tr>
<td>Thread</td>
<td>0 ps</td>
<td>'T2'</td>
<td>PERFORMING_INITIALIZATION.</td>
<td></td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thread</td>
<td>10 ms</td>
<td>'T3'</td>
<td>PERFORM INIT ENDED</td>
<td>ActionTimer 'timer_T3'.</td>
</tr>
<tr>
<td>Thread</td>
<td>10 ms</td>
<td>'T3'</td>
<td>AWAITING_DISPATCH.</td>
<td></td>
</tr>
<tr>
<td>Thread</td>
<td>10 ms</td>
<td>'T1'</td>
<td>PERFORM INIT ENDED</td>
<td>ActionTimer 'timer_T1'.</td>
</tr>
<tr>
<td>Thread</td>
<td>10 ms</td>
<td>'T1'</td>
<td>AWAITING_DISPATCH.</td>
<td></td>
</tr>
<tr>
<td>Process</td>
<td>10 ms</td>
<td>'process'</td>
<td>LOADED</td>
<td>Process 'process'.</td>
</tr>
<tr>
<td>Thread</td>
<td>10 ms</td>
<td>'T2'</td>
<td>PERFORM INIT ENDED</td>
<td>ActionTimer 'timer_T2'.</td>
</tr>
<tr>
<td>Thread</td>
<td>10 ms</td>
<td>'T2'</td>
<td>AWAITING_DISPATCH.</td>
<td></td>
</tr>
<tr>
<td>Process</td>
<td>10 ms</td>
<td>'process'</td>
<td>LOADED.</td>
<td></td>
</tr>
<tr>
<td>Processor</td>
<td>10 ms</td>
<td>'RMS Scheduler'</td>
<td>STARTED</td>
<td>Process 'process'.</td>
</tr>
<tr>
<td>Processor</td>
<td>10 ms</td>
<td>'RMS Scheduler'</td>
<td>OPERATING.</td>
<td></td>
</tr>
<tr>
<td>System</td>
<td>10 ms</td>
<td>'GlobalSystem'</td>
<td>OPERATING.</td>
<td></td>
</tr>
<tr>
<td>Thread</td>
<td>10 ms</td>
<td>'T3'</td>
<td>DISPATCH</td>
<td>PeriodEvtGen 'evg_T3'.</td>
</tr>
<tr>
<td>Thread</td>
<td>10 ms</td>
<td>'T3'</td>
<td>READY.</td>
<td></td>
</tr>
<tr>
<td>Thread</td>
<td>10 ms</td>
<td>'T1'</td>
<td>DISPATCH</td>
<td>PeriodEvtGen 'evg_T1'.</td>
</tr>
<tr>
<td>Thread</td>
<td>10 ms</td>
<td>'T1'</td>
<td>READY.</td>
<td></td>
</tr>
<tr>
<td>Thread</td>
<td>10 ms</td>
<td>'T2'</td>
<td>DISPATCH</td>
<td>PeriodEvtGen 'evg_T2'.</td>
</tr>
<tr>
<td>Thread</td>
<td>10 ms</td>
<td>'T2'</td>
<td>READY.</td>
<td></td>
</tr>
</tbody>
</table>
Scheduling and execution

thread \( t=10 \text{ ms} \) \( 'T3' \) treats a DISPATCH sent by periodEvtGen 'evg_T3'.

thread \( t=10 \text{ ms} \) \( 'T3' \) has the state READY.

thread \( t=10 \text{ ms} \) \( 'T1' \) treats a DISPATCH sent by periodEvtGen 'evg_T1'.

thread \( t=10 \text{ ms} \) \( 'T1' \) has the state READY.

thread \( t=10 \text{ ms} \) \( 'T2' \) treats a DISPATCH sent by periodEvtGen 'evg_T2'.

thread \( t=10 \text{ ms} \) \( 'T2' \) has the state READY.

processor \( t=10 \text{ ms} \) \( 'RMS Scheduler' \) treats a SCHEDULE sent by processor 'RMS Scheduler'.

processor \( t=10 \text{ ms} \) \( 'RMS Scheduler' \) treats a SCHEDULE_ENDED sent by processor 'RMS Scheduler'.

processor \( t=10 \text{ ms} \) \( 'RMS Scheduler' \) executes element 'T1' from the schedulable elements list:
- 'T3'
- 'T1'
- 'T2'

processor \( t=30 \text{ ms} \) \( 'RMS Scheduler' \) treats a SCHEDULE sent by processor 'RMS Scheduler'.

processor \( t=30 \text{ ms} \) \( 'RMS Scheduler' \) treats a SCHEDULE_ENDED sent by processor 'RMS Scheduler'.

processor \( t=30 \text{ ms} \) \( 'RMS Scheduler' \) executes element 'T2' from the schedulable elements list:
- 'T3'
- 'T2'

thread \( t=10 \text{ ms} \) \( 'T1' \) treats a RESUME sent by processor 'RMS Scheduler'.

thread \( t=10 \text{ ms} \) \( 'T1' \) treats an action COMPUTE(20 ms).

thread \( t=10 \text{ ms} \) \( 'T1' \) has the state RUNNING.

thread \( t=30 \text{ ms} \) \( 'T1' \) treats a ACTION_ENDED sent by actionTimer 'timer_T1'.

thread \( t=30 \text{ ms} \) \( 'T1' \) has the fixed actions list:
- COMPUTE(20 ms).

thread \( t=30 \text{ ms} \) \( 'T1' \) actual exec. time 20 ms.

thread \( t=30 \text{ ms} \) \( 'T1' \) has the state AWAITING_DISPATCH.

processor \( t=30 \text{ ms} \) \( 'RMS Scheduler' \) treats a ELEMENT_COMPUTATION_ENDED sent by thread 'T1'.

processor \( t=30 \text{ ms} \) \( 'RMS Scheduler' \) treats a SCHEDULE sent by processor 'RMS Scheduler'.

processor \( t=30 \text{ ms} \) \( 'RMS Scheduler' \) treats a SCHEDULE_ENDED sent by processor 'RMS Scheduler'.

processor \( t=30 \text{ ms} \) \( 'RMS Scheduler' \) executes element 'T2' from the schedulable elements list:
- 'T3'
- 'T2'

thread \( t=30 \text{ ms} \) \( 'T2' \) treats a RESUME sent by processor 'RMS Scheduler'.

thread \( t=30 \text{ ms} \) \( 'T2' \) treats an action COMPUTE(12 ms).

thread \( t=30 \text{ ms} \) \( 'T2' \) has the state RUNNING.

thread \( t=42 \text{ ms} \) \( 'T2' \) treats a ACTION_ENDED sent by actionTimer 'timer_T2'.

thread \( t=42 \text{ ms} \) \( 'T2' \) has the fixed actions list:
- COMPUTE(12 ms)
- COMPUTE(40 ms).

thread \( t=42 \text{ ms} \) \( 'T2' \) treats an action COMPUTE(40 ms).

thread \( t=82 \text{ ms} \) \( 'T2' \) has the state RUNNING.

thread \( t=82 \text{ ms} \) \( 'T2' \) treats a ACTION_ENDED sent by actionTimer 'timer_T2'.

thread \( t=82 \text{ ms} \) \( 'T2' \) has the fixed actions list:
- COMPUTE(12 ms)
- COMPUTE(40 ms).

thread \( t=82 \text{ ms} \) \( 'T2' \) actual exec. time 52 ms.

thread \( t=82 \text{ ms} \) \( 'T2' \) has the state AWAITING_DISPATCH.
### Message propagation

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<th>Event</th>
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<tbody>
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<td>T2</td>
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<td>ACTION_ENDED</td>
<td>sent by actionTimer</td>
<td>'timer_T2'.</td>
</tr>
<tr>
<td>T1</td>
<td>82 ms</td>
<td>COMPUTE(12 ms)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T1</td>
<td>82 ms</td>
<td>COMPUTE(40 ms)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T1</td>
<td>82 ms</td>
<td>AWAITING_DISPATCH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T3</td>
<td>82 ms</td>
<td>RESUME</td>
<td>sent by processor</td>
<td>'RMS Scheduler'.</td>
</tr>
<tr>
<td>T3</td>
<td>82 ms</td>
<td>COMPUTE(16 ms)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T3</td>
<td>82 ms</td>
<td>RUNNING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T3</td>
<td>87 ms</td>
<td>DISPATCH</td>
<td>sent by port</td>
<td>'chModeT3'.</td>
</tr>
<tr>
<td>T3</td>
<td>98 ms</td>
<td>ACTION_ENDED</td>
<td>sent by actTimer</td>
<td>'timer_T3'.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Processor</th>
<th>Time</th>
<th>Action</th>
<th>Event</th>
<th>Details</th>
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<tbody>
<tr>
<td>RMS Scheduler</td>
<td>82 ms</td>
<td>ELEMENT_COMPUTATION_ENDED</td>
<td>sent by thread</td>
<td>'T2'.</td>
</tr>
<tr>
<td>RMS Scheduler</td>
<td>82 ms</td>
<td>SCHEDULE_ENDED</td>
<td>sent by processor</td>
<td>'RMS Scheduler'.</td>
</tr>
<tr>
<td>RMS Scheduler</td>
<td>82 ms</td>
<td>SCHEDULE</td>
<td>sent by processor</td>
<td>'RMS Scheduler'.</td>
</tr>
<tr>
<td>RMS Scheduler</td>
<td>82 ms</td>
<td>EXECUTES_ELEMENT</td>
<td></td>
<td>'T3'</td>
</tr>
<tr>
<td>T3</td>
<td>82 ms</td>
<td>RESUME</td>
<td>sent by processor</td>
<td>'RMS Scheduler'.</td>
</tr>
<tr>
<td>T3</td>
<td>82 ms</td>
<td>COMPUTE(16 ms)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T3</td>
<td>82 ms</td>
<td>RUNNING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T3</td>
<td>87 ms</td>
<td>EVENT_ARRIVAL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T3</td>
<td>98 ms</td>
<td>DISPATCH</td>
<td>sent by port</td>
<td>'chModeT3'.</td>
</tr>
<tr>
<td>T3</td>
<td>98 ms</td>
<td>ACTION_ENDED</td>
<td>sent by actTimer</td>
<td>'timer_T3'.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bus</th>
<th>Time</th>
<th>Action</th>
<th>Event</th>
<th>Details</th>
</tr>
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<tbody>
<tr>
<td>bus</td>
<td>82 ms</td>
<td>PROPAGATE_CONNECTION_MESSAGE</td>
<td>sent by port</td>
<td>'T2.Complete'.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Thread</th>
<th>Time</th>
<th>Action</th>
<th>Event</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>T2</td>
<td>82 ms</td>
<td>ACTION_ENDED</td>
<td>sent by actionTimer</td>
<td>'timer_T2'.</td>
</tr>
<tr>
<td>T2</td>
<td>82 ms</td>
<td>COMPUTE(12 ms)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T2</td>
<td>82 ms</td>
<td>COMPUTE(40 ms)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T2</td>
<td>82 ms</td>
<td>AWAITING_DISPATCH</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Hyperperiod ending

- SOMManager [t−610 ms] 'SOM Manager' receives a HYPERPERIOD_END
  - current SOM: [T3:backup T2:normal]  
  - hyperperiod: 300000000000

- bus [t−610 ms] 'bus' treats a HYPERPERIOD_ENDed sent by SOMManager 'SOM Manager'.
  - Properties list:
    - Propagation_Delay [5000000000..50000000000]

- process [t−610 ms] 'process' treats a HYPERPERIOD_ENDed sent by SOMManager 'SOM Manager'.
  - Subcomponents list:
    - T3
    - T1
    - T2

- thread [t−610 ms] 'T3' treats a HYPERPERIOD_ENDed sent by SOMManager 'SOM Manager'.
  - Properties list:
    - Dispatch_Protocol Periodic
      - Compute_Execution_Time [110000000000..110000000000]
      - Period 50000000000

- processor [t−610 ms] 'RMS Scheduler' treats a HYPERPERIOD_ENDED sent by SOMManager 'SOM Manager'.
  - Scheduling_Protocol RMS

- thread [t−610 ms] 'T2' treats a HYPERPERIOD_ENDed sent by SOMManager 'SOM Manager'.
  - Properties list:
    - Dispatch_Protocol Periodic
      - Compute_Execution_Time [520000000000..520000000000]
      - Period 15000000000

- thread [t−610 ms] 'T1' treats a HYPERPERIOD_ENDed sent by SOMManager 'SOM Manager'.
  - Properties list:
    - Dispatch_Protocol Periodic
      - Compute_Execution_Time [200000000000..200000000000]
      - Period 100000000000
SOMManager \(t=1\) sec 210 ms) "SOM Manager" receives a PREEMPTION_END
- current SOM: \[ T3:\text{normal} T2:\text{backup} \]
- hyperperiod: \[ 600000000000 \]

\[ \ldots \]

thread \((t=1)\) sec 210 ms) 'T2' has the state \text{READY}.

thread \((t=1)\) sec 210 ms) 'T1' has the state \text{READY}.

thread \((t=1)\) sec 210 ms) 'T3' has the state \text{READY}.

\[ \ldots \]

processor \((t=1)\) sec 210 ms) 'RMS Scheduler' executes element 'T1' from the schedulable elements list:
- 'T3'
- 'T1'
- 'T2'

\[ \ldots \]

thread \((t=1)\) sec 210 ms) 'T1' has the state \text{RUNNING}.

\[ \ldots \]

thread \((t=1)\) sec 230 ms) 'T1' has the state \text{AWAITING_DISPATCH}.

\[ \ldots \]

processor \((t=1)\) sec 230 ms) 'RMS Scheduler' executes element 'T3' from the schedulable elements list:
- 'T3'
- 'T2'

\[ \ldots \]

thread \((t=1)\) sec 230 ms) 'T3' has the state \text{RUNNING}.

\[ \ldots \]

thread \((t=1)\) sec 276 ms) 'T3' has the state \text{AWAITING_DISPATCH}.

\[ \ldots \]

processor \((t=1)\) sec 276 ms) 'RMS Scheduler' executes element 'T2' from the schedulable elements list:
- 'T2'

thread \((t=1)\) sec 276 ms) 'T2' treats a RESUME sent by processor 'RMS Scheduler'.

thread \((t=1)\) sec 276 ms) 'T2' treats an action COMPUTE(52 ms).

thread \((t=1)\) sec 276 ms) 'T2' has the state \text{RUNNING}.

thread \((t=1)\) sec 310 ms) 'T1' treats a DISPATCH sent by perEvtGen 'evg_T1'.

thread \((t=1)\) sec 310 ms) 'T1' has the state \text{READY}.

processor \((t=1)\) sec 310 ms) 'RMS Scheduler' treats a NEW_SCHEDULABLE_ELEMENT sent by thread 'T1'.

processor \((t=1)\) sec 310 ms) 'RMS Scheduler' treats a SCHEDULE sent by processor 'RMS Scheduler'.

\[ \ldots \]

processor \((t=1)\) sec 310 ms) 'RMS Scheduler' treats a PREEMPT sent by processor 'RMS Scheduler'.

processor \((t=1)\) sec 310 ms) 'RMS Scheduler' has the state \text{READY}.

processor \((t=1)\) sec 310 ms) 'RMS Scheduler' executes element 'T1' from the schedulable elements list:
- 'T1'
- 'T2'
thread $[t=1\text{ sec }310\text{ ms}]$ 'T2' treats a PREEMPT sent by processor 'RMS Scheduler'.

thread $[t=1\text{ sec }310\text{ ms}]$ 'T2' has the state READY.

processor $[t=1\text{ sec }310\text{ ms}]$ 'RMS Scheduler' treats a SCHEDULE_ENDED sent by processor 'RMS Scheduler'.

processor $[t=1\text{ sec }310\text{ ms}]$ 'RMS Scheduler' executes element 'T1' from the schedulable elements list:
- 'T1'
- 'T2'

thread $[t=1\text{ sec }310\text{ ms}]$ 'T1' treats a RESUME sent by processor 'RMS Scheduler'.

thread $[t=1\text{ sec }310\text{ ms}]$ 'T1' treats an action COMPUTE(20 ms).

thread $[t=1\text{ sec }330\text{ ms}]$ 'T1' has the state RUNNING.

thread $[t=1\text{ sec }330\text{ ms}]$ 'T1' treats a ACTION_ENDED sent by actTimer 'timer_T1'.

thread $[t=1\text{ sec }330\text{ ms}]$ 'T1' has the fixed actions list:
- COMPUTE(20 ms).

thread $[t=1\text{ sec }330\text{ ms}]$ 'T1' actual exec. time 20 ms.

thread $[t=1\text{ sec }330\text{ ms}]$ 'T1' has the state AWAITING_DISPATCH.

processor $[t=1\text{ sec }330\text{ ms}]$ 'RMS Scheduler' treats a ELEMENT_COMPUTATION_ENDED sent by thread 'T1'.

processor $[t=1\text{ sec }330\text{ ms}]$ 'RMS Scheduler' treats a SCHEDULE sent by processor 'RMS Scheduler'.

processor $[t=1\text{ sec }330\text{ ms}]$ 'RMS Scheduler' treats a SCHEDULE_ENDED sent by processor 'RMS Scheduler'.

processor $[t=1\text{ sec }330\text{ ms}]$ 'RMS Scheduler' executes element 'T2' from the schedulable elements list:
- 'T2'

thread $[t=1\text{ sec }330\text{ ms}]$ 'T2' treats a RESUME sent by processor 'RMS Scheduler'.

thread $[t=1\text{ sec }330\text{ ms}]$ 'T2' treats an action COMPUTE(18 ms).

thread $[t=1\text{ sec }330\text{ ms}]$ 'T2' has the state RUNNING.

thread $[t=1\text{ sec }348\text{ ms}]$ 'T2' has the fixed actions list:
- COMPUTE(52 ms)
- COMPUTE(52 ms).

thread $[t=1\text{ sec }348\text{ ms}]$ 'T2' treats an action COMPUTE(52 ms).

thread $[t=1\text{ sec }348\text{ ms}]$ 'T2' has the state RUNNING.

thread $[t=1\text{ sec }400\text{ ms}]$ 'T2' treats a ACTION_ENDED sent by actTimer 'timer_T2'.

thread $[t=1\text{ sec }400\text{ ms}]$ 'T2' has the fixed actions list:
- COMPUTE(52 ms)
- COMPUTE(52 ms).

thread $[t=1\text{ sec }400\text{ ms}]$ 'T2' actual exec. time 104 ms.

thread $[t=1\text{ sec }400\text{ ms}]$ 'T2' has the state AWAITING_DISPATCH.

processor $[t=1\text{ sec }400\text{ ms}]$ 'RMS Scheduler' treats a ELEMENT_COMPUTATION_ENDED sent by thread 'T2'.
To go further
Design of a new GUI

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<td>receiver</td>
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</table>
Simulation "builder"

- Perform AADL instantiation with respect to
  - AADL standard
  - AADL annexes
  - ADeS simulation needs
- Automatically called when
  - An AADL resource is modified
  - A simulation option or parameter is modified
- Display of "markers" helping user to correct errors
"Configuration launcher"

- Perform simulation execution
- Control of the simulation
  - Run, Goto, Next step, Next time step, Reset
- Provide breakpoints mechanism
- Simulation execution options
  - Simulation duration
  - Simulation time step
  - Display/hide UI parts
Simulation replay

- Go back in the past
- Re-execution of the simulation from a specified date
- Re-use of the content of the trace file
- Re-load the simulation kernel stack of events (core, base simu and aadl layers are serialized)
- Re-build UI parts
2006
• Strengthening of simulation kernel
• Improvement of AADL compliance
• Trace mechanism

2007
• Version 0.2.2 for trial
• Version 0.2.3
• New GUI
• Support of behavior annex
• New developments on demand

Feb. 2007
Mar. 2007
More information

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  • Fax: +33 1 41 24 07 36
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    94110 Arcueil, FRANCE
  • E-mail: aadl@axlog.fr
  • Web page (document and download)
    http://www.axlog.fr/aadl/ades_en.html
Demo scenario 1

Sched. protocol = RMS
Demo scenario 2

- **t1**: CET = 10ms/25ms, prop. delay = 5ms
- **t2**: CET = 20ms
- **p**: Sched. protocol = RMS
- **mem**
- **b**: 
  - Normal
  - Backup
- **dev**

Axlog Ingénierie 2007