AADL : a radar case study

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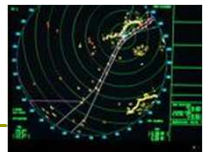


- Goal: to model a simple radar system
- Let us suppose we have the following requirements

1. System implementation is composed by physical devices (Hardware entity): antenna + processor + memory + bus
2. and software entity : running processes and threads + operating system functionalities (scheduling) implemented in the processor that represent a part of execution platform and physical devices in the same time.
3. The main process is responsible for signals processing : general pattern: transmitter -> antenna -> receiver -> analyzer -> display
4. Analyzer is a periodic thread that compares transmitted and received signals to perform detection, localization and identification.
5. [..]

Tools used for modeling

- AADL syntax is both textual and graphical, with several editors available
  - Modes exist for emacs, vi
  - OSATE2 provides a comprehensive IDE on top of Eclipse, and additional plug-ins
    - IMV : Instance Model Viewer
    - Consistency checkers, statistics, etc.
  - Adele: graphical editor for Eclipse
- In the following, we will use OSATE2 and IMV

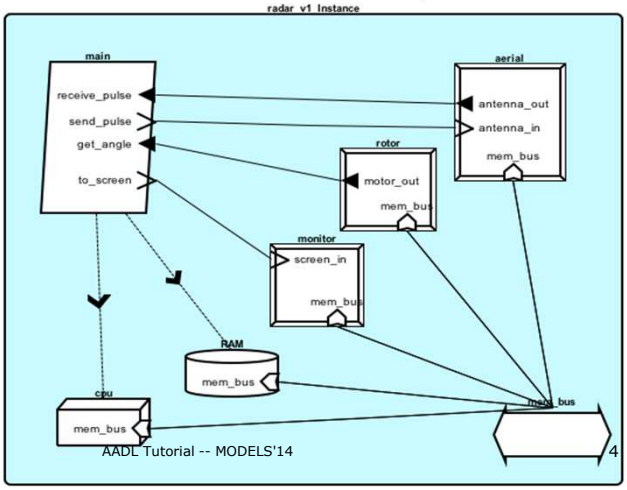
Radar case study

- Hardware/Software breakdown: components

```
PACKAGE radar
PUBLIC

PROCESS processing
-- …
END processing;
DEVICE antenna
-- …
END antenna;

END RADAR;
```

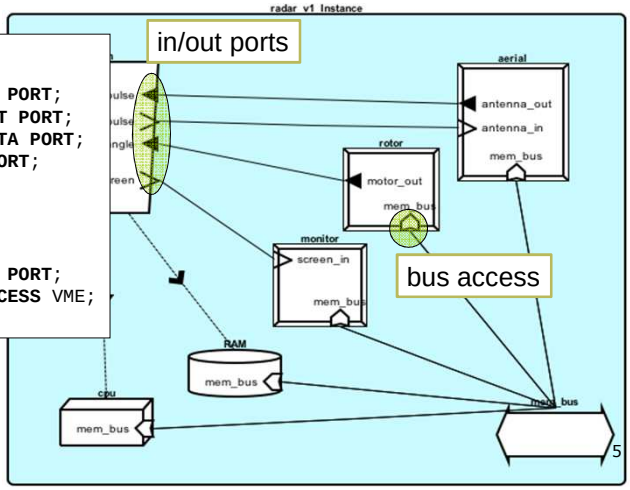


Radar case study

- Hardware/Software breakdown: features

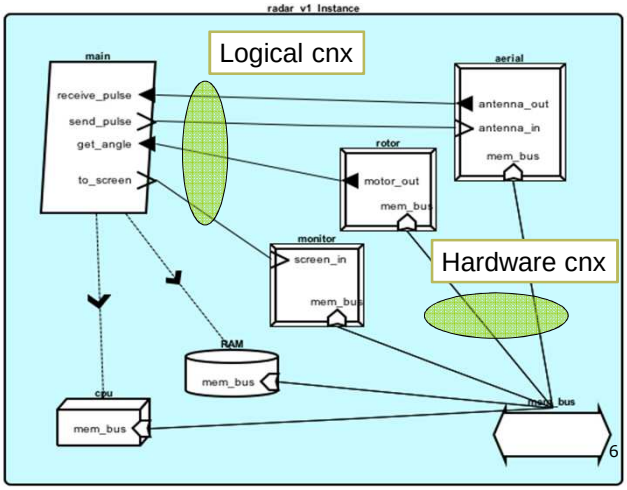
```
PROCESS processing
FEATURES
  to_screen : OUT EVENT PORT;
  send_pulse : OUT EVENT PORT;
  receive_pulse : IN DATA PORT;
  get_angle : IN DATA PORT;
END processing;

DEVICE antenna
FEATURES
  antenna_in : IN EVENT PORT;
  VME : REQUIRES BUS ACCESS VME;
END antenna;
```



Radar case study

- Hardware/Software breakdown: connections



Radar case study

- Hardware/Software breakdown: connections

```
SYSTEM IMPLEMENTATION radar.simple
SUBCOMPONENTS
  aerial : DEVICE antenna;
  rotor : DEVICE motor;
  monitor : DEVICE screen;
  main : PROCESS processing.others;
  cpu : PROCESSOR leon2;
  VME : BUS VME;
  RAM : MEMORY RAM;
CONNECTIONS
  PORT aerial.antenna_out -> main.receive_pulse;
  PORT rotor.motor_out -> main.get_angle;
  PORT main.send_pulse -> aerial.antenna_in;
  PORT main.to_screen -> monitor.screen_in;
  BUS ACCESS VME -> aerial.VME;
  BUS ACCESS VME -> rotor.VME;
  BUS ACCESS VME -> monitor.VME;
  BUS ACCESS VME -> cpu.VME;
  BUS ACCESS VME -> RAM.VME;
```

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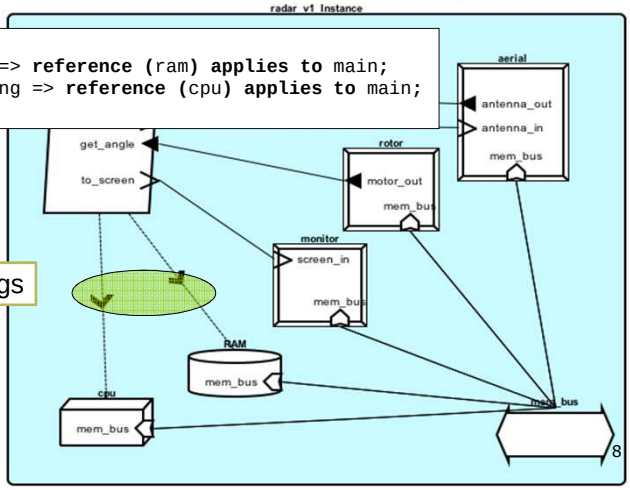
Radar case study

- Hardware/Software breakdown: bindings

```
PROPERTIES
  Actual_Memory_Binding => reference (ram) applies to main;
  Actual_Processor_Binding => reference (cpu) applies to main;
END radar.simple;
```



Bindings

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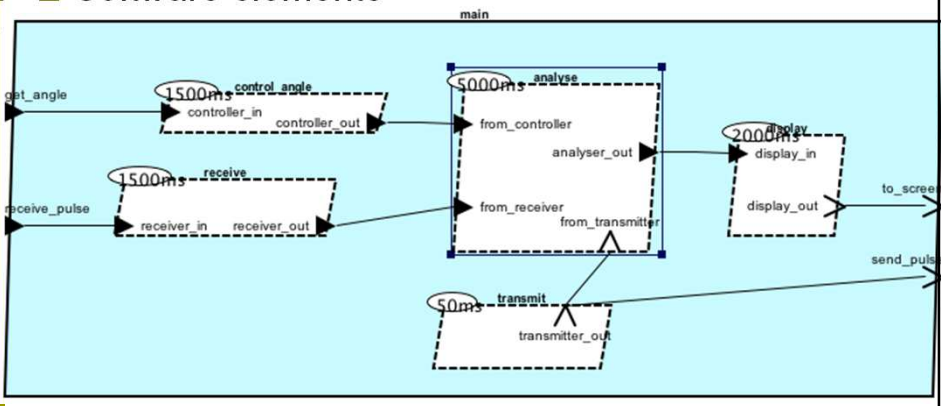
Radar case study

- Software elements



A few words on AADL usage

- AADL is for architectural description, period
- Not to be compared with UML suites
  - Behavior, types, link with source code is not required
- Keep in mind models support an objective
  - For now, it is just a high-level view of the design
- In the next sections, we will complete the models with
  - Properties to support schedulability analysis
  - Elements to generate actual implementation