Executable and Translatable UML - How Difficult Can it Be?

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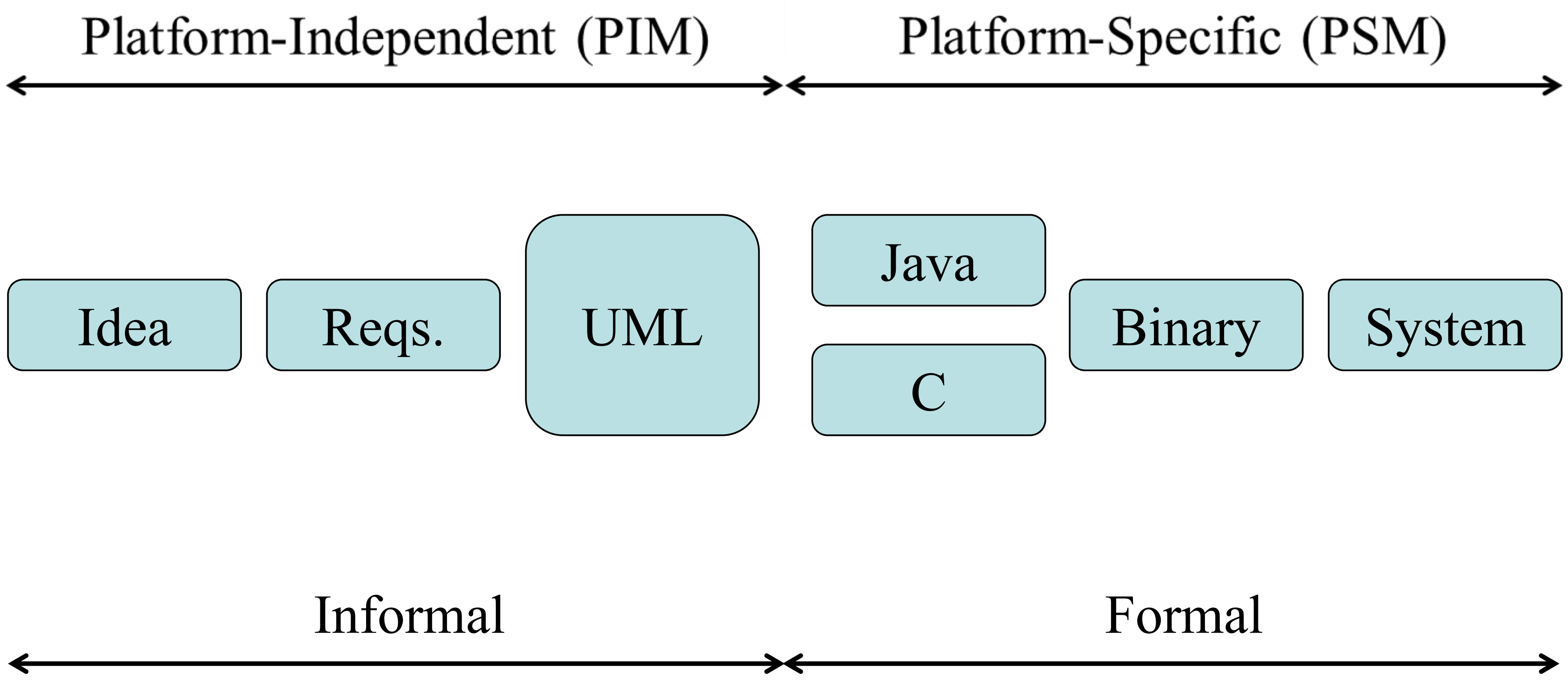
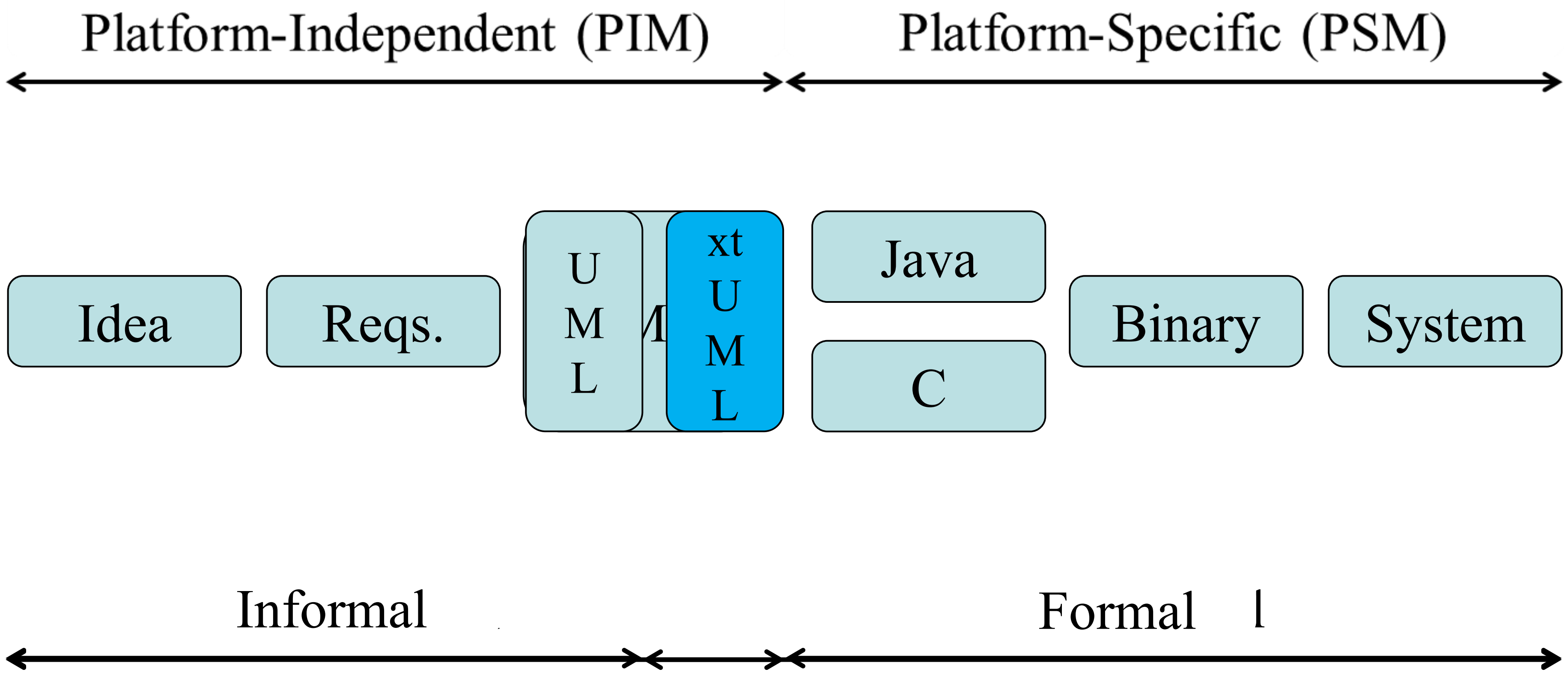
SWEDEN

From Idea to System



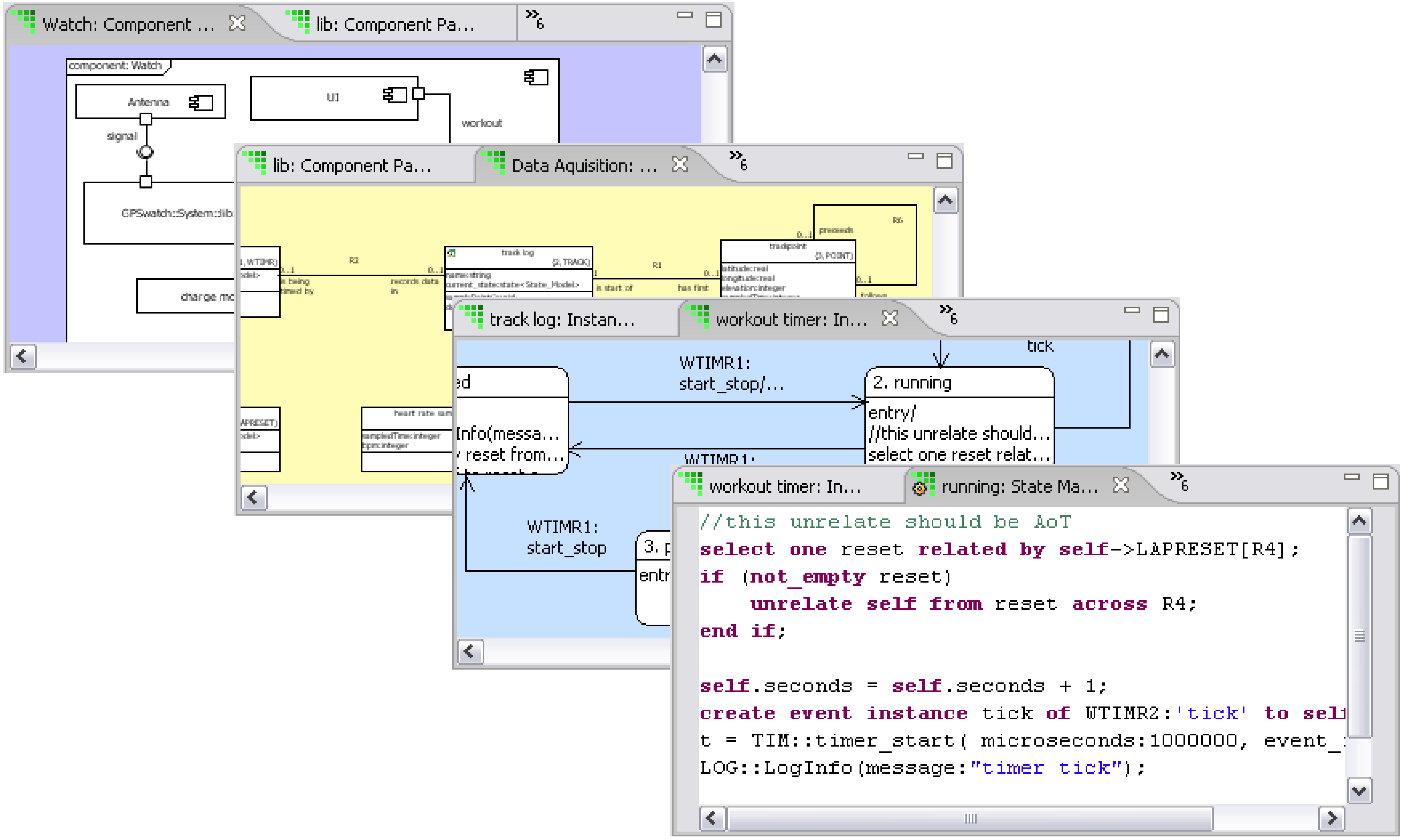
PIM but Formal?



xtUML: Executable and Translatable UML

- Profile of UML
- Executable:
  - formal and testable models
- Translatable:
  - code generation by model compilers

Executable Model Hierarchy



```
//this unrelate should be AoT
select one reset related by self->LAPRESET[R4];
if (not_empty reset)
    unrelate self from reset across R4;
end if;

self.seconds = self.seconds + 1;
create event instance tick of WTIMR2:'tick' to sel
t = TIM::timer_start( microseconds:1000000, event_
LOG::LogInfo(message:"timer tick");
```

How Difficult Can it Be?

- Translatable:
  - efficient code
  - generated for different platforms

- Executable:
  - can novice software modellers solve complex problems using xtUML?

Case Study

- Development teams
  - 3-4 bachelor students
  - total of 300 hours
- Hotel reservation system
  - implemented and tested using xtUML
- Analysis using UML
- Object-oriented evaluation criteria

Results

- Model Evaluation:
  - 2009: 18 of 22 teams
  - 2010: 25 of 28 teams
  - Total: 43 of 50 teams

- Experienced learning threshold in 2010:
  - 30 of 90 students confident within 20 hours
  - 75 of 90 40

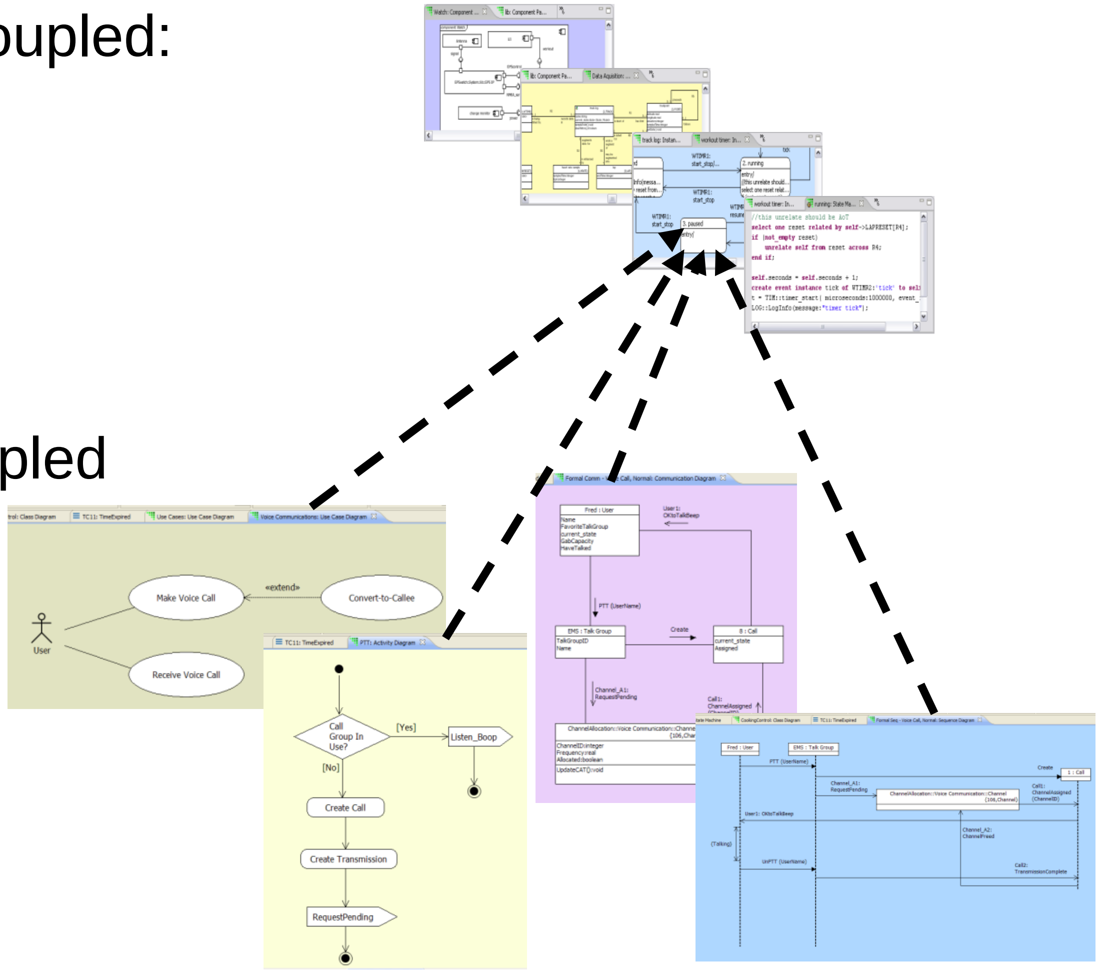
- First time for many students to work with asynchronous calls

Discussion

- No libraries – no internet forums
- Relevance to industry
- Algorithmic vs. control problems
- UML is harder to learn and use for our students

Relationship between Model Elements

- Executable, tightly coupled:
  - Component
  - Class
  - State
  - Action
- Informal, loosely coupled
  - Use Case
  - Sequence*
  - Communication*
  - Activity



```
//this unrelate should be AOT
select one reset related by self->LAPRESET[R4];
if (not_empty reset)
    unrelate self from reset across R4;
end if;

self.seconds = self.seconds + 1;
create event instance tick of WTIMR1:'tick' to self
t = TIM::timer_start( microseconds:1000000, event_
LOG::LogInfo(message:"timer tick");
```