Your custom "UML like" tool based on Papyrus

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Building Modeling Tools based on Open-Source Technologies

Software and systems engineering
Hardware producers,
Mobile networks,
Firmware, ...

Information Systems
Insurances, Accounting,
information management,
...

Modeling tools development

Business application development
Domain-specific Modeling

- Model-based engineering is most successful if it is *domain-specific*
  - Highly customized modeling environments
  - Directly reflecting specific needs of a domain and its users
  - User roles, their backgrounds, and methodologies (e.g., systems architect, electrical engineer, …)
Domain-specific Graphical Modeling
Domain-specific Modeling

So let's build our domain-specific modeling language.

Yeah, but our DSML somewhat looks like UML activity diagrams and state machines.

Maybe, however, there is also a lot of stuff in our DSML that isn't covered by that.

But we don't want to re-invent the wheel for the part of UML that we need, do we?

Well, but there is also a lot in UML that we don't want to have in our DSML.

What if we just wouldn't use those parts?

That would confuse our users. They need a domain-specific language streamlined for their tasks and not a UML tool.
Domain-specific Modeling with UML

To UML or not to UML?

DSML \[\text{fork} \] UML
Domain-specific Modeling with UML

To UML or not to UML?
That is not the question!

DSML  UML

Domain-specific tool  Off-the-shelf tool
Domain-specific Modeling with UML

To UML or not to UML?
That is not the question!

Domain-specific tool  \(\rightarrow\)  Off-the-shelf tool

but it can still be built on top of UML  \(\rightarrow\)  UML Modeling Platform!
Papyrus as a Platform

- Open Source UML modeling platform
  - Not only a UML tool
Papyrus as a Platform

- Open Source UML modeling platform
  - Based on the Eclipse Modeling Framework
  - Based on modeling standards: UML, SysML, OCL, fUML, Alf, …
  - Supported by a large open-source community
  - Governed by an industry consortium
  - Enables to build domain-specific tools based on UML, SysML, etc.
Papyrus as a Platform

- Adding “domain-specificness” to UML
  - “Plain” UML is a general purpose modeling language
  - UML Profiles allow to extend UML with domain-specific concepts
Papyrus as a Platform

- Building a domain-specific modeling tool
  - UML profile defines only structure of the model (metamodel)
  - Off-the-shelf UML tools provide *generic* graphical syntax
  - A domain-specific modeling environment
    - Domain-specific tooling for editing models
    - Rich client platform to support domain-specific workflows, ...
    - Powerful API to process models (e.g., for codegen, validation, etc.)
Papyrus as a Platform

- **Customizability of Papyrus**
  - Customizable graphical syntax
  - Customizable tooling (palette, property views, editing behavior, ...)

- **Built on EMF**
  - Great programming API for processing models (codegen, analysis, validation, ...)
  - Interoperability with other EMF-based tools and DSMLs

- **Based on the Eclipse rich client platform**
  - Easy to build a domain-specific tool around Papyrus-based editors
  - Can be integrated into existing Eclipse-based tools
Example

**Roles**

1. Develop hardware model
2. Design user workflows based on hw components and implement UI
3. Verify, simulate and analyze user scenarios

**Shared Model**
Example

Roles

- Develop hardware model
- Design user workflows based on hw components and implement UI
- Verify, simulate and analyze user scenarios

Shared Model
Example

- User Workflow Modeling Language
  - A workflow contains tasks
  - Manual task and automatic tasks
  - Flow between tasks and decisions
  - Duration, responsibilities, and probabilities
UML Profiles

- Profile can be applied to UML models
  - Stereotypes can be applied to instances of meta classes extended by the stereotype
  - Stereotype applications contain the values

→ Extension of UML’s metamodel
UML Profiles define extensions of UML’s abstract syntax

- Papyrus supports CSS and SVG to style diagrams
- Papyrus builds on EMF → combinable with any EMF technology (Sirius, Xtext, …)

```plaintext
[appliedStereotypes="AutomaticTask"] {
  fillColor: gray;
}
[appliedStereotypes="ManualTask"] {
  fillColor: lightblue;
}
Label[type=StereotypeLabel] {
  visible: false;
}
[appliedStereotypes="WeightedFlow"][probability=LOW] {
  lineColor: gray;
}
[appliedStereotypes="WeightedFlow"][probability=HIGH] {
  lineColor: black;
  lineWidth: 2px;
}
```
Tooling for UML Profile Applications

- Abstract and concrete syntax doesn’t make a tool
  - More customizations are required for a domain-specific modeling environment
  - Papyrus supports full customizability of palette, property views, menus, ...
  - Papyrus builds on Eclipse → rich tool development platform
    - Integration with other tools, code generators, etc.
    - Wizards, menus, toolbars, views, ...
Demos

Roles

1. Develop hardware model
2. Design user workflows based on hw components and implement UI
3. Verify, simulate and analyze user scenarios

Shared Model

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Conclusions

- Domain-specificity is a key factor for success
  - Streamlined to what is really needed
  - As close as possible to the domain and to the tasks to be achieved
  - Integration with existing workflows, methodologies, infrastructure, …

- DSML tools based on UML / SysML
  - Guaranteed UML compliant models for re-used parts
  - Reuse what’s already there in the UML tool platforms
  - Interoperability with other UML models is a major advantage

- All depends on the characteristics of your DSML
  - Reasonable overlap with UML → high potential of reuse
  - No or low overlap → better create DSML from scratch

- If reusing UML and building on Papyrus
  → You can still have a domain-specific language and customized tool!
Thanks a lot for your attention!

- Links
  - [https://www.eclipse.org/papyrus/download.html](https://www.eclipse.org/papyrus/download.html)
  - [https://wiki.eclipse.org/Papyrus_Compare](https://wiki.eclipse.org/Papyrus_Compare)
  - [https://wiki.polarsys.org/Papyrus_IC](https://wiki.polarsys.org/Papyrus_IC)
# Evaluate the Sessions

Sign in and vote at [eclipsecon.org](http://eclipsecon.org)

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