Towards a Modular Palladio Component Model

Joint Kieker/Palladio Days 2013

Misha Strittmatter, Philipp Merkle, Andreas Rentschler, Michael Langhammer | 28.11.2013
Variety of Palladio Extensions

Performance

Palladio

Motivation Vision Impact MM Extension Challenges Conclusion

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Variety of Palladio Extensions

Reliability

Performance

Palladio
Variety of Palladio Extensions

- Reliability
- Performance
- Confidentiality
- Smart Grid
- Security
- Source Code Mapping
- Subset
- Infrastructure
- Documentation
- Events
- Infrastructure Documentation

Motivation Vision Impact MM Extension Challenges Conclusion
Ordinary Extension

Core Metamodel

Repository

1

* 

Repository Component

Basic Component

Extension1

MyComponent

Motivation Vision Impact MM Extension Challenges Conclusion
Editors and Simulators cannot handle metamodel extensions.
PCM Refactoring

Goals

- Provide holistic and clearly defined extension mechanism
  - Separation of concerns & reduced complexity
  - Maintainability, understandability & easier extensibility
  - PCM as an integration platform (external)
- Reduce technical debt
- Users only install extensions they need
PCM Refactoring

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Views
Views

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Vision

Transformation

PCM Classic

Current MM

∙ ∙ ∙

Transformation

Simulators & Solvers

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Vision

New, Modular MM

PCM-Rel
PCM-Per
PCM-Beh
PCM ADL

Current MM

PCM Classic

Refactor

Transformation

Simulators & Solvers
Vision

New, Modular MM

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Motivation Vision Impact MM Extension Challenges Conclusion
Vision

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Simulators & Solvers
**Vision**

- **New, Modular MM**
  - PCM-Rel
  - PCM-Per
  - PCM-Beh
  - PCM ADL

- **Current MM**
  - Transformation
  - Refactor

- **PCM Classic**
  - Transformation

- **Simulators & Solvers**

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**Motivation** | **Vision** | **Impact** | **MM Extension** | **Challenges** | **Conclusion**
---|---|---|---|---|---

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Users

Impact on Users

- Install plugins according to their needs
- When creating model: Choose metamodel configuration
  - Either manually
  - Or from predefined configurations
- Metamodel configuration may be changed
- Switching of view types
- Opening models with unsupported content: probably deny
Editors

Impact on (Graphical) Editors

- One core editor per viewpoint
- Support for new content provided by plugins (editor fragments)
- New editors can be added by extensions
Impact on Transformations/Simulators

- Plugins provide routines for simulators to handle extension
  - Need for extensible simulations
- Plugins provide transformation fragments for their metamodel extensions
  - Need for composable transformations
**Metamodel Extension**

**Extension Types**

- Add metaclass
- Add attribute to existing metaclass
- Add containment reference to existing metaclass
Metamodel Extension

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Metamodel Extension

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Core Metamodel

1

\[\text{Repository} \xrightarrow{1} \text{Repository Component} \]

\[\text{Basic Component} \xrightarrow{*} \text{Repository Component} \]

Extension

BlackBox Component
Metamodel Extension

Extension Types

- Add metaclass
- Add attribute to existing metaclass
- Add containment reference to existing metaclass

Core Metamodell

1

Repository

Basic Component

*

Repository Component

BlackBox Component

BlackBox Behavior

Motivation | Vision | Impact | MM Extension | Challenges | Conclusion
---|---|---|---|---|---
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Metamodel Extension

Extension Types

- **Add metaclass**
- Add attribute to existing metaclass
- Add containment reference to existing metaclass

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**Core Metamodel**

- Repository
  - 1
  - Repository Component
  - Basic Component

**Extension**

- BlackBox Component
  - 1
  - BlackBox Behavior

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Metamodel Extension

Extension Types

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Reliability Extension

SEFF

InternalAction

Breakable

InternalAction

failureProbability
Metamodel Extension

Extension Types

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Metamodel Extension

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EMF Profiles
[Kramer et al. 2012]
Challenges

Currently

Feasibility of metamodel extension & editor fragments via plugin

Further challenges

- Compositional transformations
- Extensible simulators
- ADL forming
- How to slice the metamodel
- Bidirectional relations
Conclusion

- Many new extensions emerging
- Palladio not designed to support metamodel extensions
  ⇒ Develop holistic extension mechanism & modularize PCM
Summary

PCM Modules

Holistic Extension Mechanism

Approach
Palladio’s Dimensions

Quality

- Survivability (Smart Grid)
- Security
- Confidentiality
- Performability
- Reliability
- Performance

Modeling

- ADL
- Infr.
- ResEnv
- Events
- RDSEFF
- Network Topology

References

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Related Work

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Related Work: ArchStudio

University of California Irvine, Institute of Software Research
http://isr.uci.edu/projects/archstudio/
Shortcomings of Alternatives

PCM Classic

Rel
Events
Perf
Structure
Infrastr.
Behavior
...

extend

extend

Code
Rel
Conf
Events
SoS
Perf
Dep
Structure
Sec
Infrastr.
Behavior
...

References Related Work

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