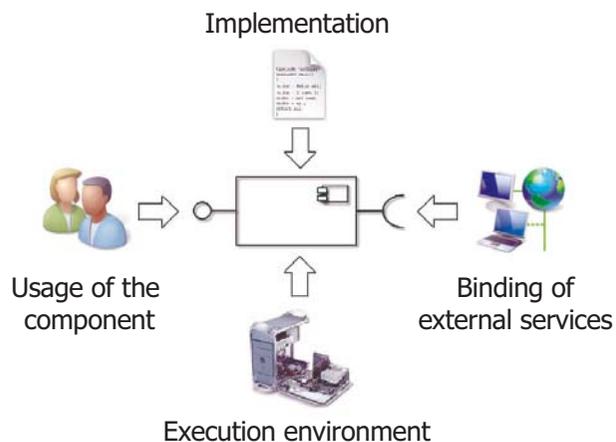


The Palladio Component Model (PCM) is a domain-specific modeling language to describe component-based software architectures.

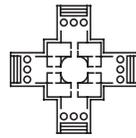
It is designed to enable early performance predictions for software architectures and is aligned with a component-based software development process. The PCM is implemented using the Eclipse Modeling Framework (EMF). We are currently implementing an integrated modelling environment (called PCM-Bench) based on the Eclipse Rich Client Plattform. It enables developers to create PCM model instances with graphical editors and derive performance metrics from the models using analytical techniques and simulation. Development of the model started in 2003 at the University of Oldenburg, and is now (since 2006) being continued at the Universität of Karlsruhe (TH). The model is named after the Italian Renaissance architect Andrea Palladio (1508-1580).

Influences on Component Performance

The PCM makes factors influencing the performance explicit to enhance "what-if" analyses.



The Palladio Approach:



A Component Model

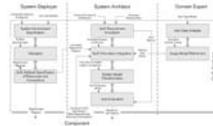
- Context-independent specification
- Sub-models reduce complexity
- Arbitrary distribution functions



Multiple Analysis Methods

$$\sum_{i=0}^N p_i(i) \left(\sum_{j=1}^i f_j \right) (t)$$

- Simulation based on queueing networks
- Stochastic Process Algebra

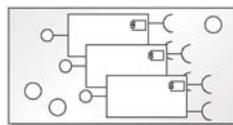


A Development Process

- Applicable using the PCM
- Explicit support of component principles

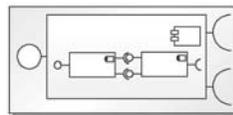
Sub-Models

The PCM is split into multiple domain-specific modelling languages:



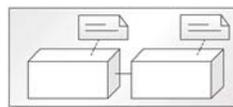
Repository model

- Components and Interfaces
- Service Effect Specification (SEFF)



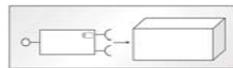
System model

- Component assembly



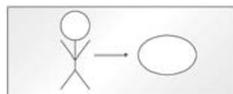
Resource environment model

- Ressource types model



Allocation model

- Mapping between execution platform and software components



Usage model

- User interaction with the system

Analysis Methods

Queuing Network

- Simulation solution
- Support of concurrency, different scheduling strategies

Stochastic Regular Expression

- Analytical solution
- No support for concurrency, but faster than simulation

Stochastic Process Algebra

- Hybrid solution (analysis + simulation)
- Advanced scheduler model

All Support

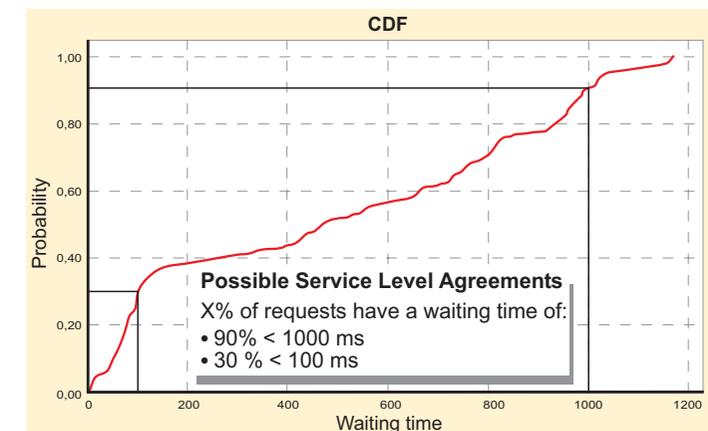
- Parameterisation (usage, assembly, allocation, implementation)
- General distribution functions



Performance model
of a component-based
software architecture

Performance data
Execution time
Throughput

Prediction Result





About the Chair for Software Design and Quality at Universität Karlsruhe (TH)

The chair Software Design and Quality (SDQ) was founded by Prof. Ralf Reussner to conduct research on methodical software engineering with special attention to extra-functional properties of software. The results of this research are processes, models and tools that allow a systematic evaluation of software design alternatives with respect to quality requirements.

The main advantage of early, design-time evaluation is the avoidance of the risks associated with previous trial-and-error approaches. Also, the achievements of the SDQ team include support for construction of software systems that follow the design-time models. Members of the chair are involved in organising international conferences and workshops on such topics as software architectures, software quality aspects and software components. Results of research are published at high-ranked international conferences and journals.



Ralf Reussner is full professor for software engineering at the University of Karlsruhe and holds the Chair for Software Design and Quality since 2006. His research interests include software components, software architecture and model-based quality prediction. Ralf graduated from University of Karlsruhe with a PhD in 2001 and was with the DSTC Pty Ltd, Melbourne, Australia. From 2003 till 2006, he held a junior professorship for Software Engineering at the University of Oldenburg, Germany. Ralf is organiser of various conferences and workshops, including QoSA and WCOP. As Director of Software Engineering at the IT Research Centre in Karlsruhe (FZI) he consults various industrial partners.

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Chair for Software Design and Quality

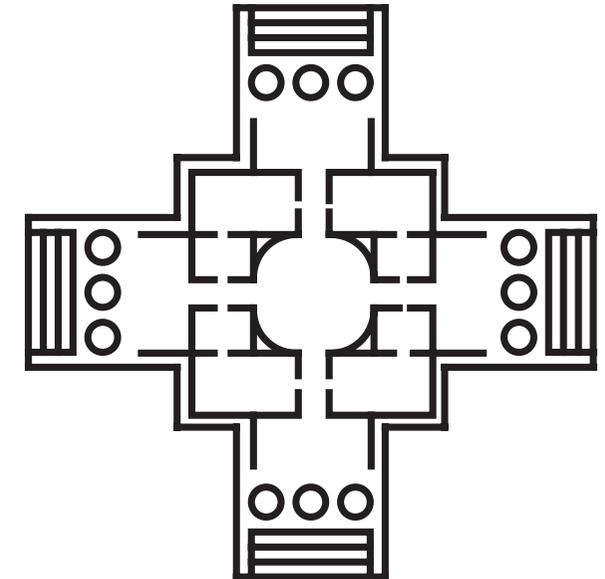
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