

# Extending Palladio by Business Process Simulation Concepts

## Palladio Days 2012

**Robert Heinrich<sup>1</sup>,**

**Jörg Henss<sup>2</sup>,**

**Barbara Paech<sup>1</sup>**

<sup>1</sup> Institute of Computer Science  
Chair of Software Engineering  
University of Heidelberg

<http://se.ifi.uni-heidelberg.de>

[heinrich@informatik.uni-heidelberg.de](mailto:heinrich@informatik.uni-heidelberg.de)



<sup>2</sup> Institute for Programme Structures and  
Data Organisation  
Karlsruhe Institute of Technology

<http://sdq.ipd.kit.edu>

[joerg.henss@kit.edu](mailto:joerg.henss@kit.edu)

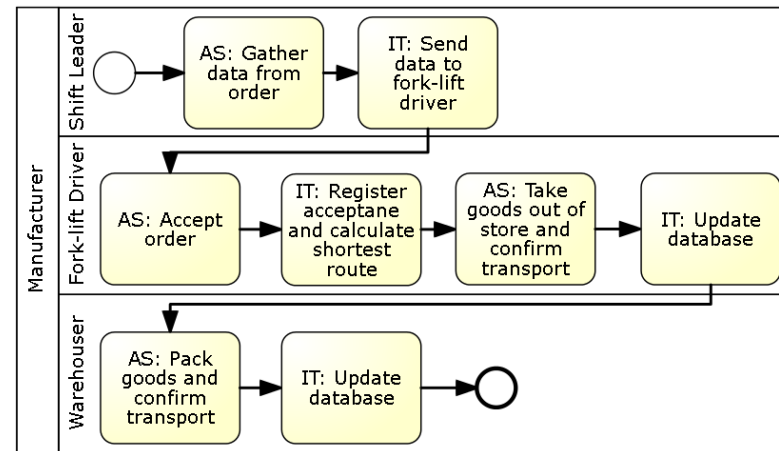


## Mutual Impact of Business Process and IT

## Open Issues and Requirements

## Extensions to Palladio

# Business Processes and IT Systems mutually impact each other in several non-trivial ways



- Process impact on IT system performance
  - Business process design
  - Business process workload
- IT System impact on process performance
  - Overload of IT system
  - IT system response time may increase the process execution time
- Mutual impact of actor steps and system steps on workload distribution

# There is little integration between process and IT in current simulation approaches

- Simulation is a powerful approach to predict the mutual impact in terms of performance.
  - Based on the predicted impact, business process design and IT system design can be adapted to enable alignment.
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- Process simulation → process performance and financial impact
  - Computer network simulation → performance of network topologies
  - Software architecture simulation → IT performance and utilization

## If we abstract from the different semantics of process simulation and IT simulation, there are several analogies

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- Both kinds of simulations:
    - Can be built upon queuing networks
    - Simulate the utilization of resources
    - Use a specification of a workflow of actions to be processed
    - Use actions that can be composed hierarchically
    - Use a specification of workload
    - Acquire and release shared passive resources
- Palladio is an adequate foundation to be extended by business process simulation concepts

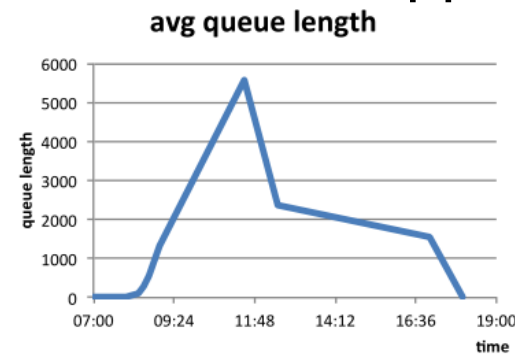
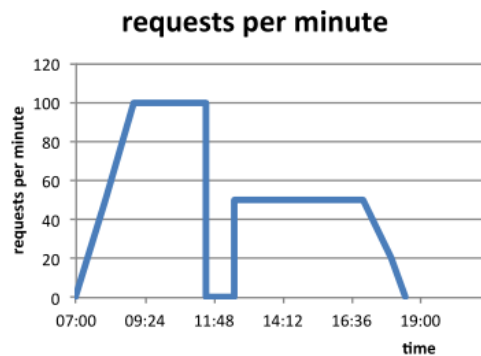
Mutual Impact of Business Process and IT

Open Issues and Requirements

Extensions to Palladio

# There are several open issues in Palladio in order to enable an integrated simulation

- **O1:** Actor steps are not included in simulation.
- **O2:** Time-variant arrival distribution is not supported



- **O3:** Systems steps cannot be included in the simulation of business process scenarios
- **O4:** Workload distribution is only influenced by IT system steps in simulation.
- **O5:** Steps are stochastically independent in terms of their parameters.

# Palladio has to fulfill the following requirements to represent the mutual impact of processes and IT

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- **R1:** Execution time of actor steps are determined by simulation instead of using assumptions.
- **R2:** IT resources are demanded directly from the process simulation without deriving an IT usage profile.
- **R3:** In process performance prediction the response time of system steps are determined by simulation
- **R4:** In simulation the workload distribution is influenced by actor steps as well as system steps
- **R5:** Probabilistic parametric dependencies of actor steps and system steps are considered in simulation.

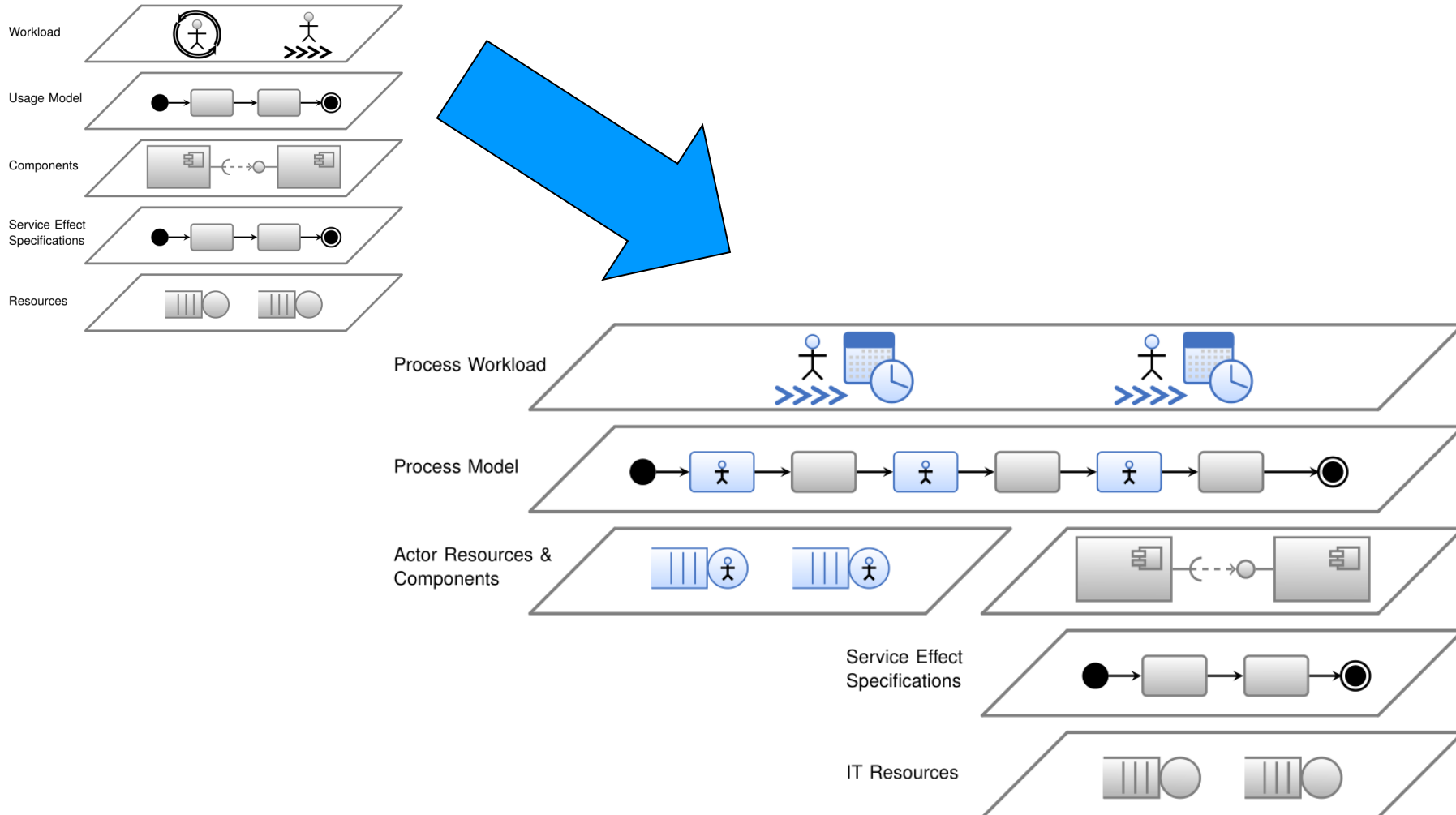


Mutual Impact of Business Process and IT

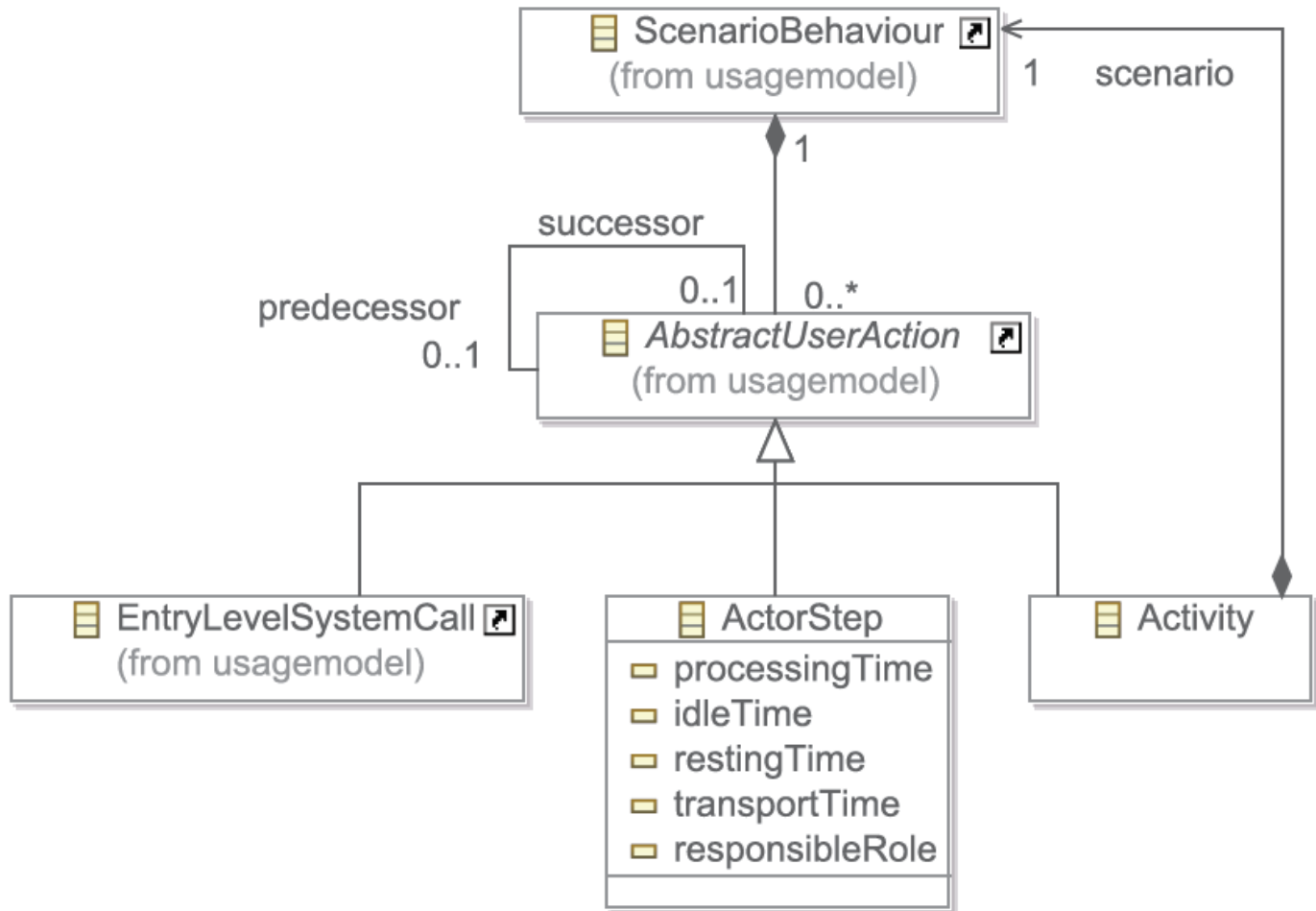
Open Issues and Requirements

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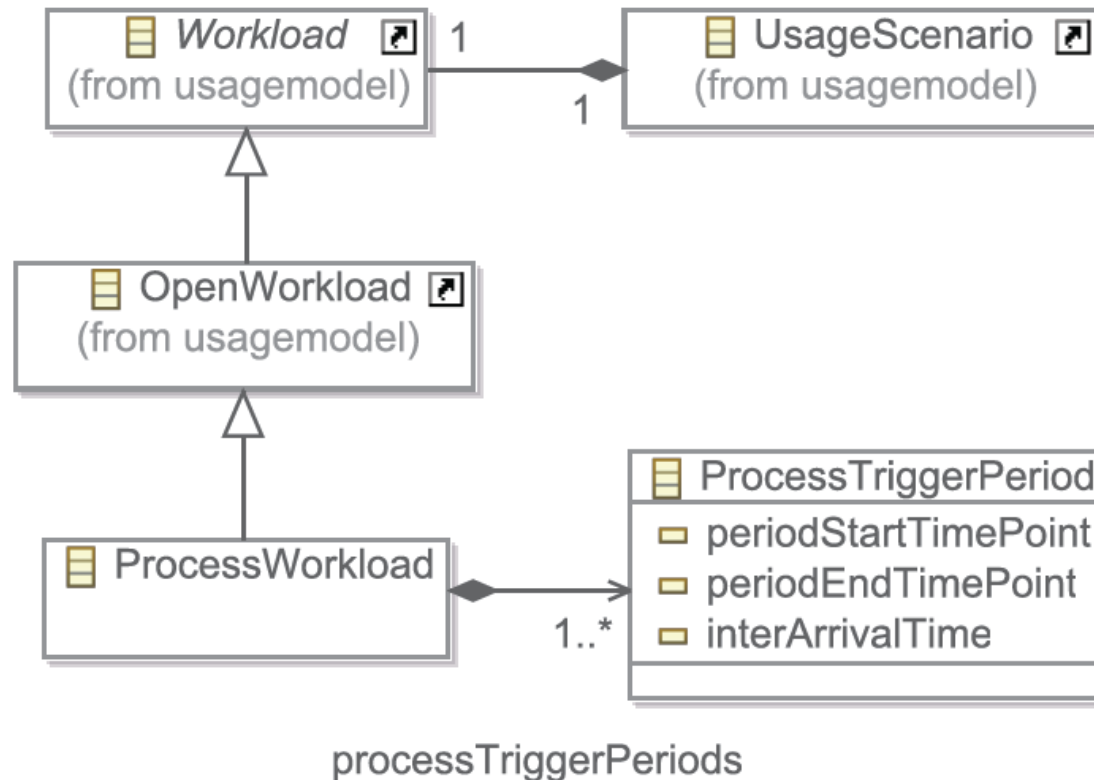
# Palladio is extended by business process simulation concepts



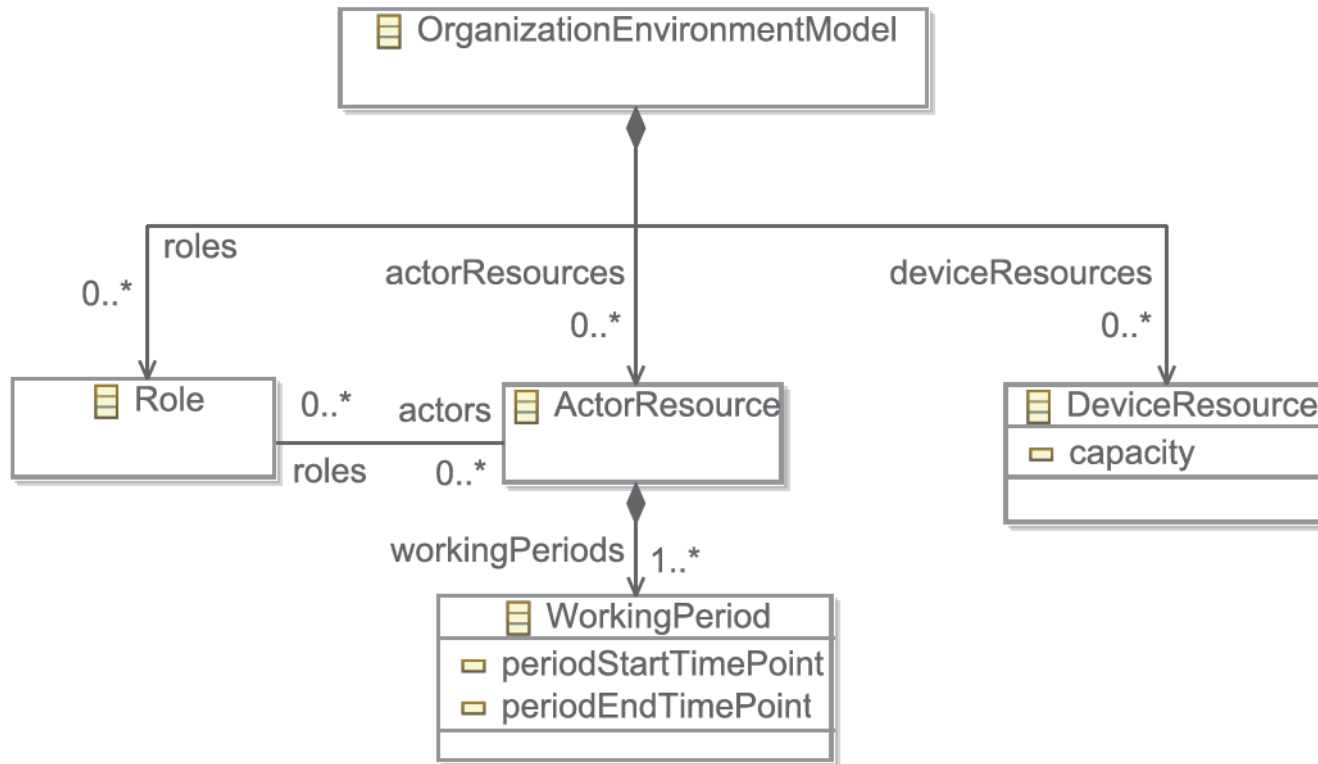
# Usage Model is extended by business process elements



# Process Workload is derived from the Open Workload



# PCM is extended by the organization environment model which represents the organizational context of the process



# Simulation behavior is extended based on the new model elements

- We decided to extend the EventSim simulator
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- ProcessWorkloadGenerator enables time-variant workload
  - Execution time of actor steps is determined in simulation
    - ActorResources included in simulation
    - WorkingPeriods of human actors are considered
  - Workload distribution is influenced by actor steps and system steps
  - Passive process resources impact on workload distribution
  - Probabilistic parametric dependencies of actor steps as well as system steps are considered on usage level

# There are still open questions

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- Different granularities of events in terms of their duration may limit the feasibility of the simulation
  - Short running demands (milliseconds for IT events)
  - Long running demands (minutes for actor steps)
  - Different time intervals (e.g. working time or breaks)
  - Simulation may take a long time to reach confidence
  
- We focus on IT response times that may impact the business process performance
  - fine-grained events do not necessarily need to be considered
  
- “Smart” simulation strategies will be useful to circumvent the problem
  - perform isolated fine-grained IT simulations prior to the integrated simulation for a set of representative classes
  - During simulation, look up results from an equivalent class



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