

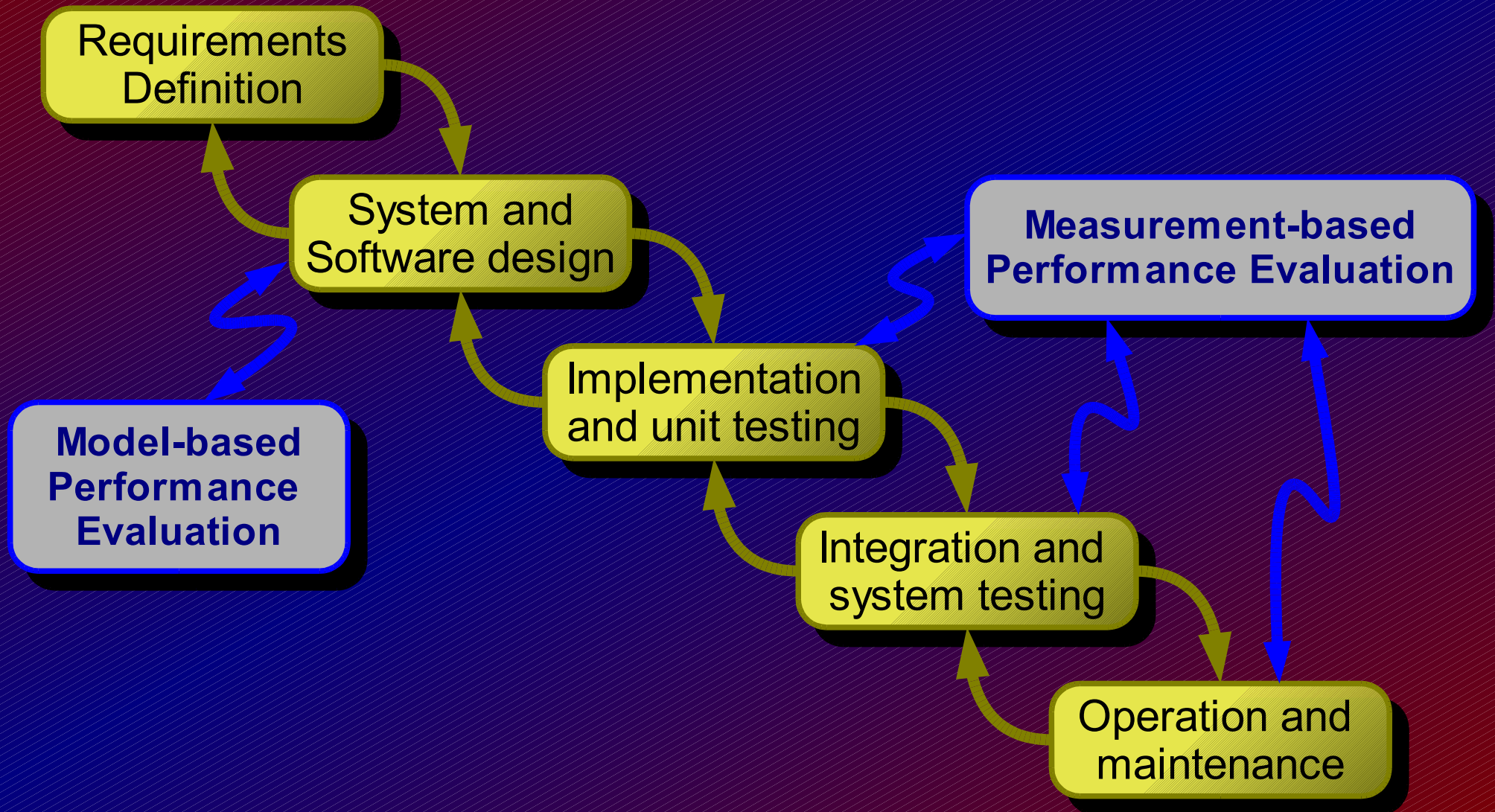
Valutazione delle prestazioni di Architetture Software con specifiche UML tramite modelli di simulazione



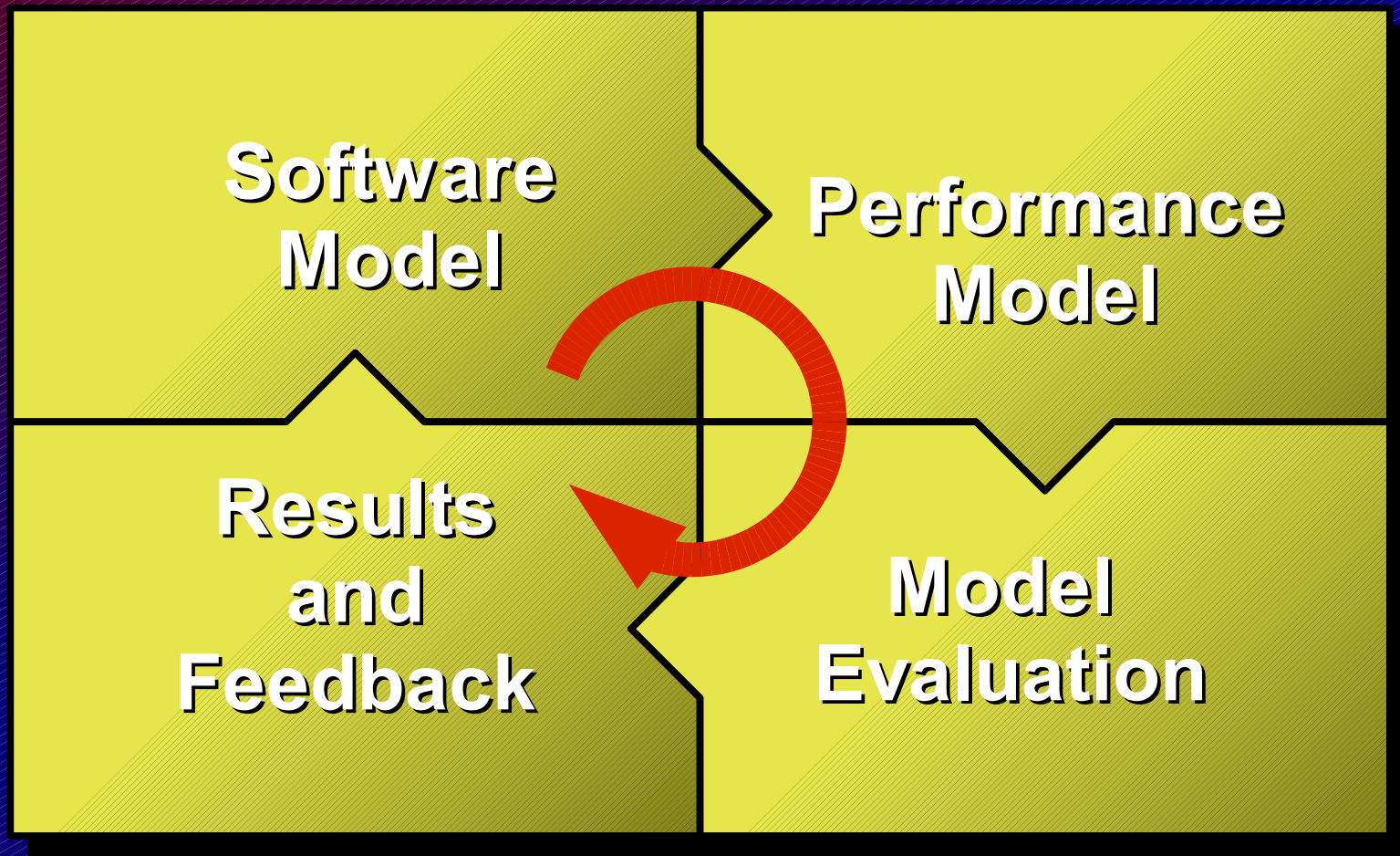
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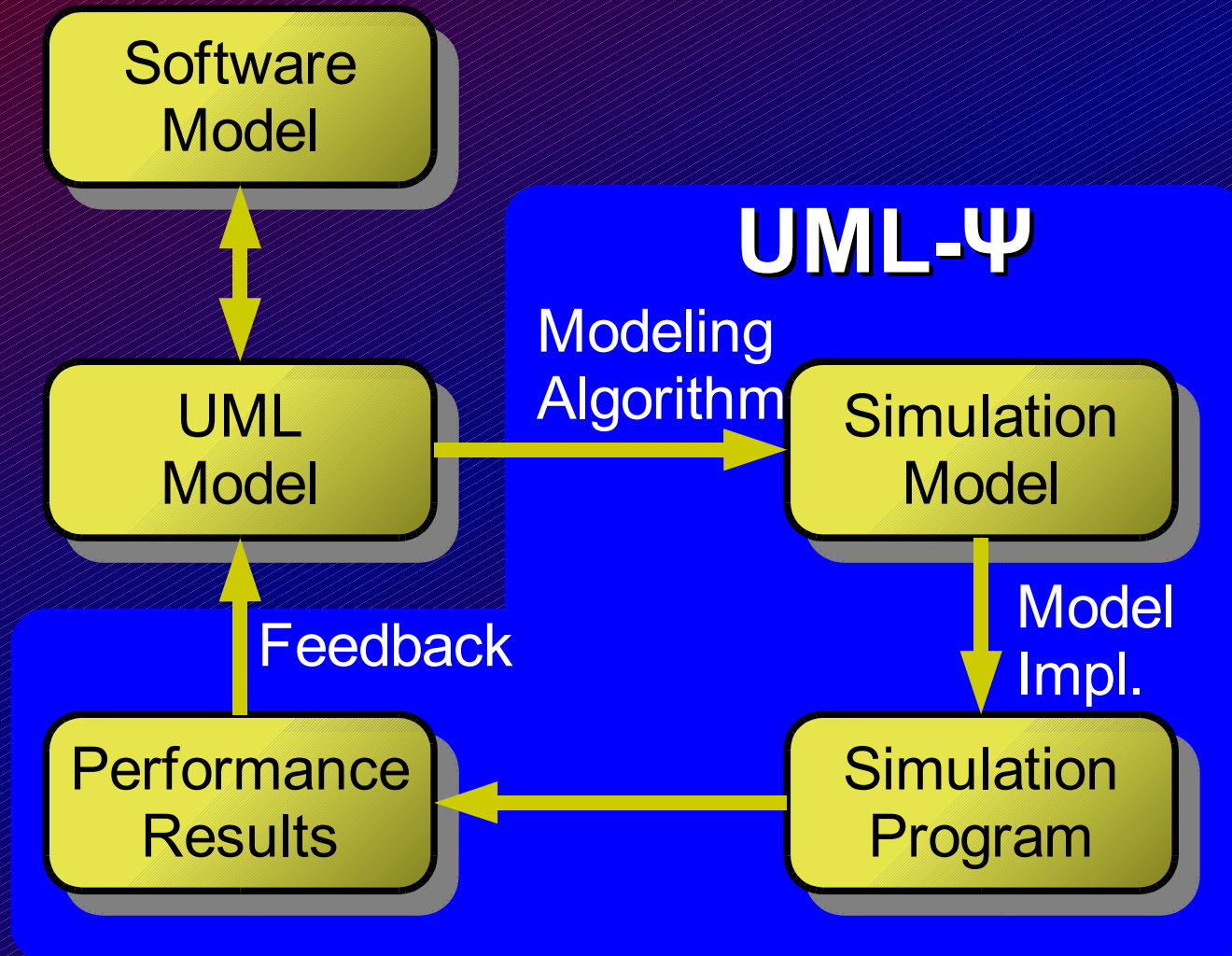
Where performances can be evaluated?



General Software Performance Modeling



The approach

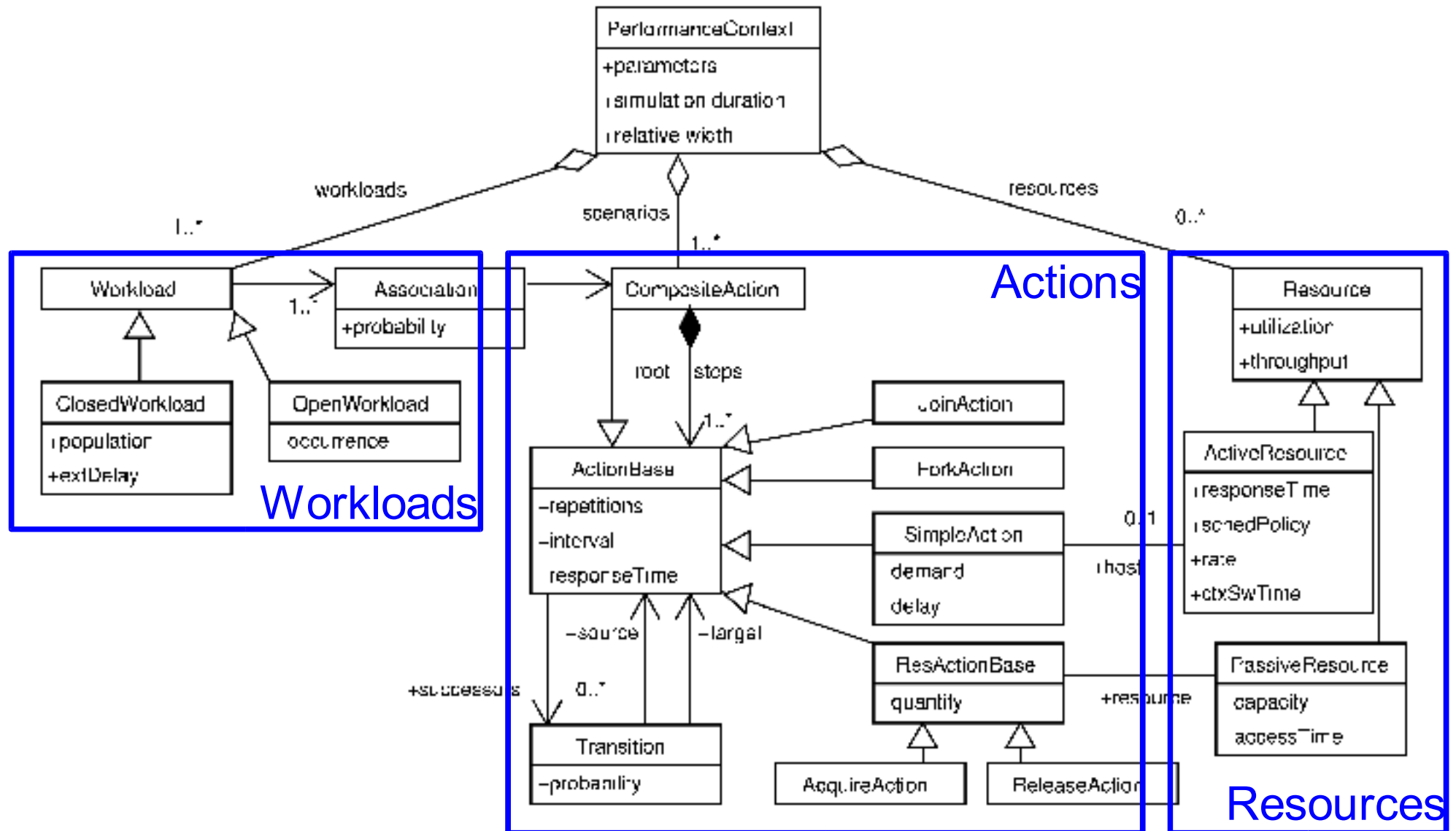


UML

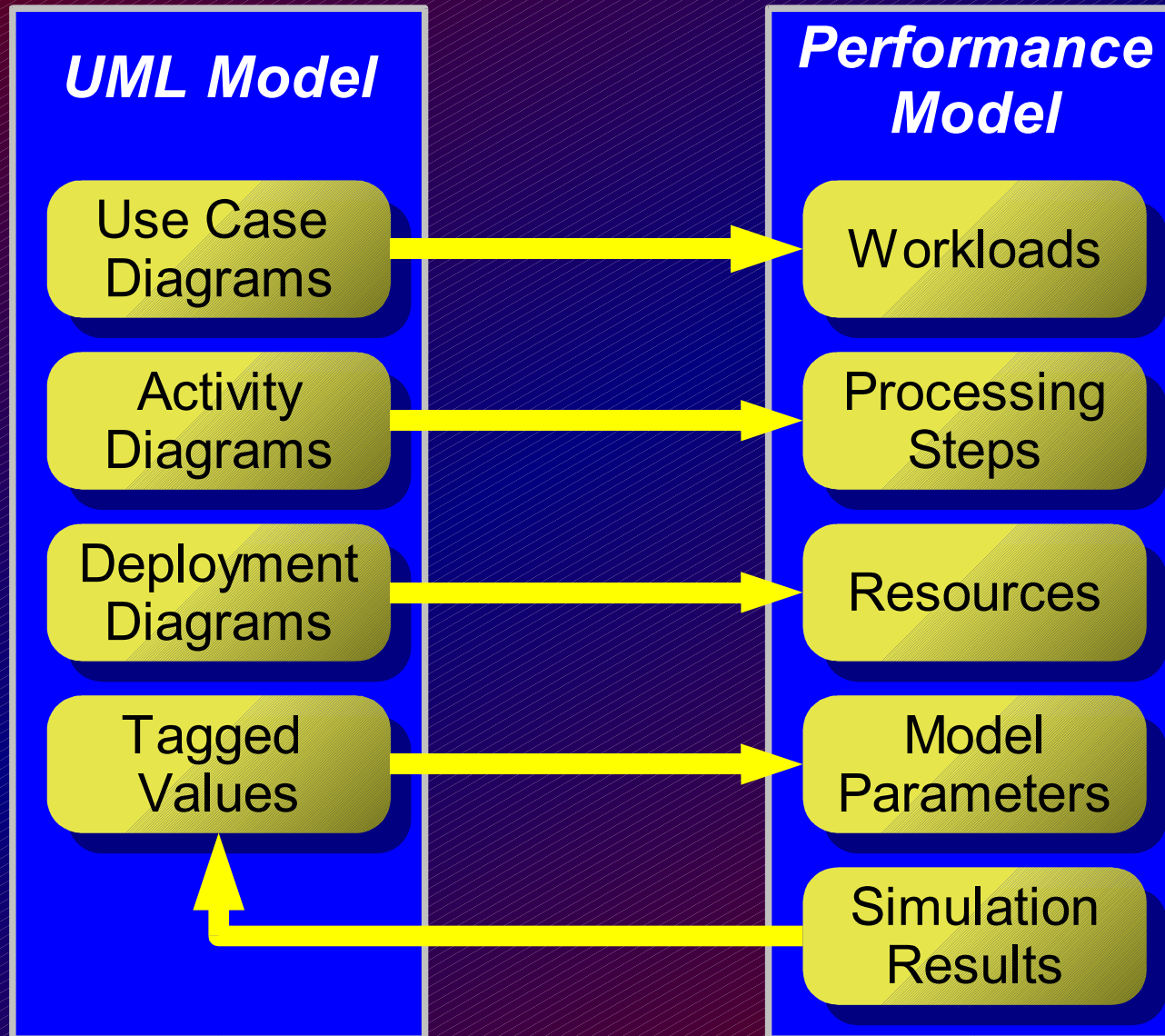
- UML is a graphical modeling notation
- Widely used to describe Object-Oriented software systems
- Informally specified
- Provides several types of diagrams
 - ◆ Use Case
 - ◆ Deployment
 - ◆ Activity
 - ◆ State
 - ◆ Class / Package
 - ◆ Collaboration
 - ◆ Sequence



Performance Model in UML



Model Generation



What we have done

- We described how performance analysis can be done at the SA design level
- A UML profile has been defined for adding quantitative annotations to UML models
- We define a process-oriented simulation model of a SA
- A prototype tool (UML- Ψ) has been developed
 - ◆ Parses annotated UML diagrams saved in XMI format
 - ◆ Generates simulation model
 - ◆ Executes simulation and reports feedback

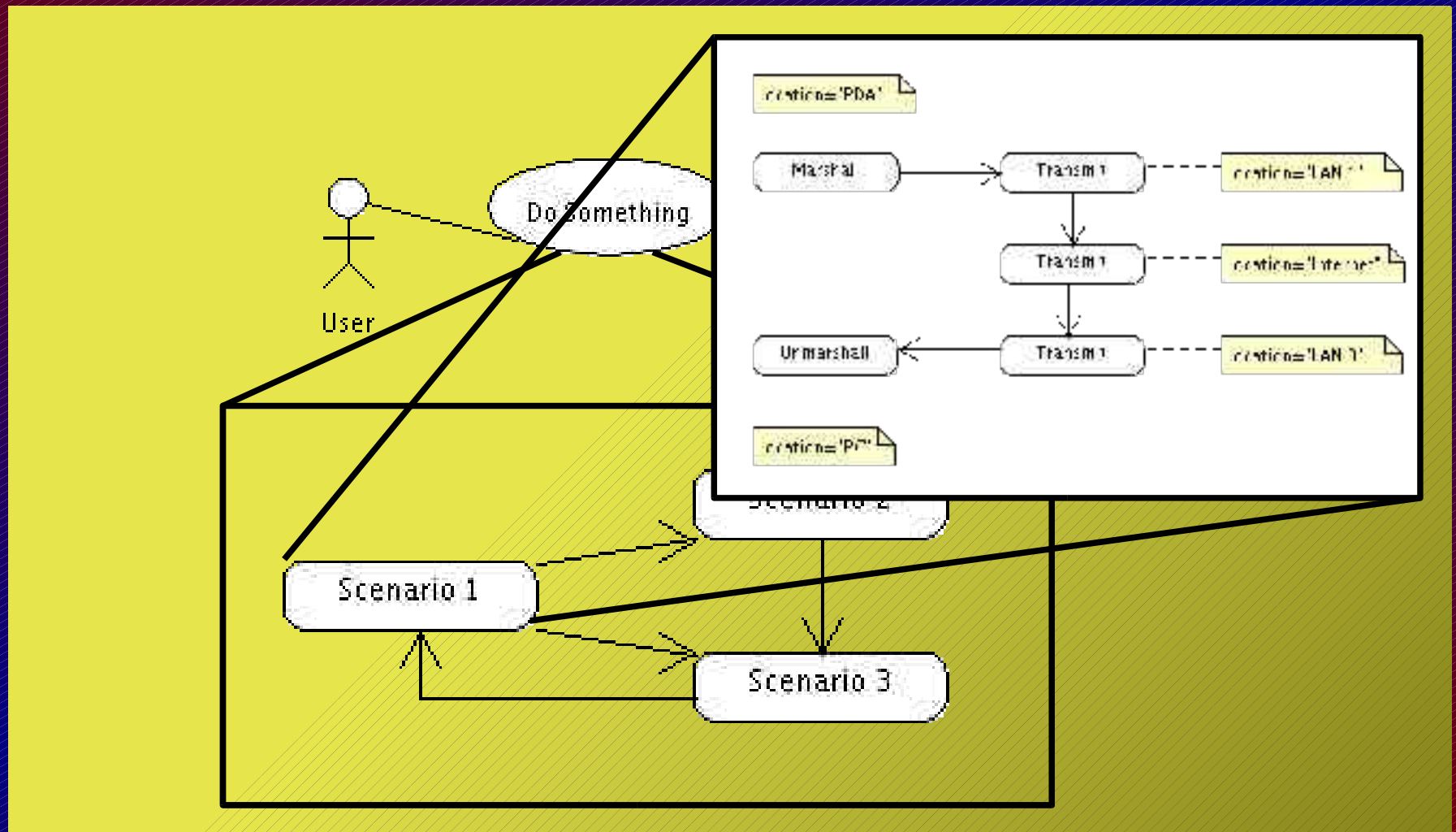


Current Research

- UML 2.0 becoming an adopted specification right now
 - ◆ More formally specified
 - ◆ Could help in validating the simulation model
 - ◆ Simulation model validation answers the question “are we building the right model?”
 - ◆ Simulation model verification answers the question “are we building the model right?”
- Integrated UML-based performance and mobility modeling
 - ◆ Preliminary work presented at ESMc'03



Mobility and Performance Modeling with UML



Integrated UML performance and mobility modeling

- Description of all the mobility scenarios / behaviors could be too verbose
 - ◆ More compact notation
 - ◆ “Template” mechanism
- There does not exist a standard “UML profile for mobility”, BUT...
 - ◆ There is a very interesting proposal from uniroma2 which definitely should be considered



More UML profiles

- We focused on performance modeling only
- Consider other properties as well
 - ◆ A good candidate may be UML reliability modeling
 - ◆ Work by Vittorio Cortellessa
- To be done
 - ◆ Define a UML profile for expressing informations related to reliability and fault tolerance
 - ◆ Derive a (simulation?) reliability model, as we already do for the performance model
 - Tricky: simulation of rare events, must be handled with suitable techniques



Simulation tool integration

- Integrate different tools into a unified framework
 - ◆ Performs different kind of analysis (performance, reliability, dependability...)
 - ◆ Derives multiple models
 - Queuing-network based
 - Simulation
 - ...



Relevant publications

- ◆ S. Balsamo, M. Grosso and M. Marzolla. *Towards Simulation-Based Performance Modeling of UML specifications*, Technical Report CS-2003-2, Jan 2003, Dip. di Informatica, Università Ca' Foscari di Venezia.
- ◆ S. Balsamo and M. Marzolla. *Simulation Modeling of UML Software Architectures* Proc. ESM'03, Nottingham (UK), Jun 9—11 2003, pp. 562—567
- ◆ S. Balsamo and M. Marzolla. *A Simulation-Based Approach to Software Performance Modeling*. Proc. ESEC/FSE 2003, Helsinki (FI), Sep 1—5 2003, pp. 363-366
- ◆ S. Balsamo and M. Marzolla. *Towards Performance Evaluation of Mobile Systems in UML*. Proc. ESMc'03, Napoli (IT), Oct 27—29 2003, pp. 61—68
- ◆ S. Balsamo, A. Di Marco, P. Inverardi and M. Marzolla. *Experimenting Different Software Architectures Performance Techniques: A Case Study*. Proc. WOSP 2004, Redwood Shores (CA), Jan 14—16 2004
- ◆ M. Marzolla, *Simulation-Based Performance Modeling of UML Software Architectures*, PhD Thesis, Dipartimento di Informatica, Università Ca' Foscari di Venezia
- ◆ S. Balsamo and M. Marzolla, *Performance Modeling of Software Architectures based on UML and simulation* (in preparation)
- ◆ All available on <http://www.dsi.unive.it/~marzolla/publications.html>

