



SCHLOSS DAGSTUHL
Leibniz-Zentrum für Informatik

GI Dagstuhl Seminar "Quality-of-Service Attributes in Service- and Cloud-based Systems:
Specification, Modelling, Monitoring, Prediction, and Optimisation"

Uncertainty in Software Performance Model Refactoring

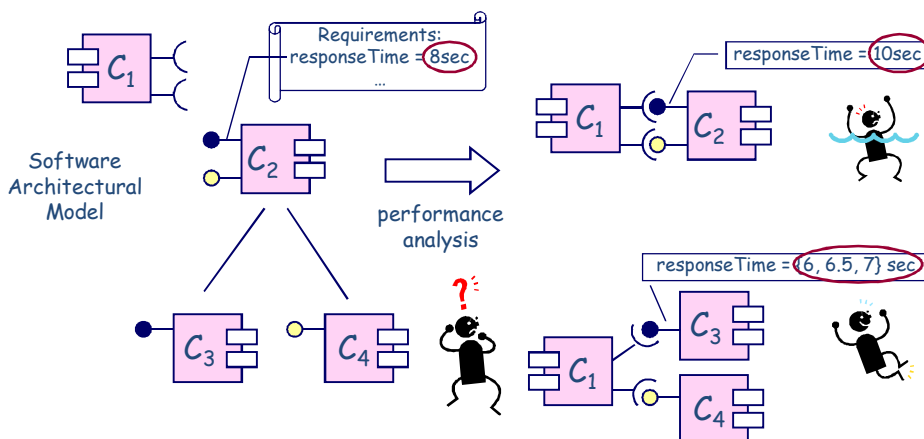
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dipartimentoinformatica
Università degli Studi dell'Aquila

Motivation

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» What to change in order to improve the software design?



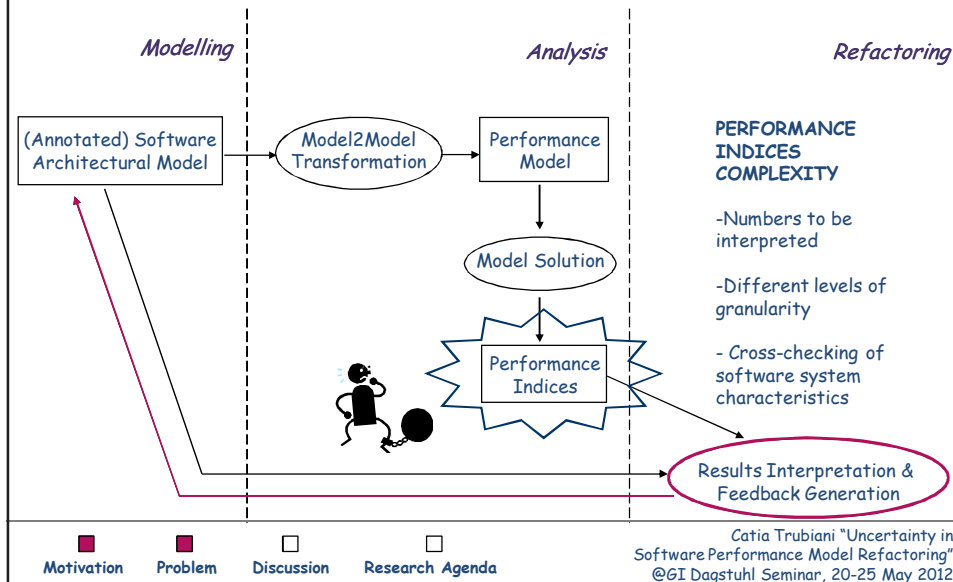
■ Motivation □ Problem □ Discussion □ Research Agenda

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Problem statement

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» Software performance process



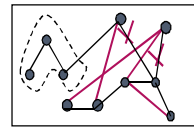
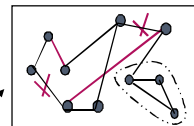
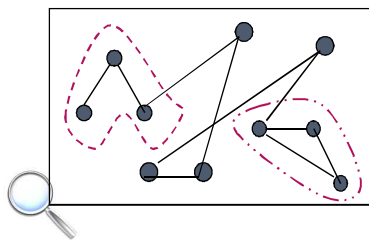
How to apply the "Model Refactoring"

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» Two operational steps:



1-Detecting performance flaws:
How to explore the architectural models to recognize performance problems?



2-Solving performance flaws:
What are the refactoring actions that lead the architectural model to remove performance problems?



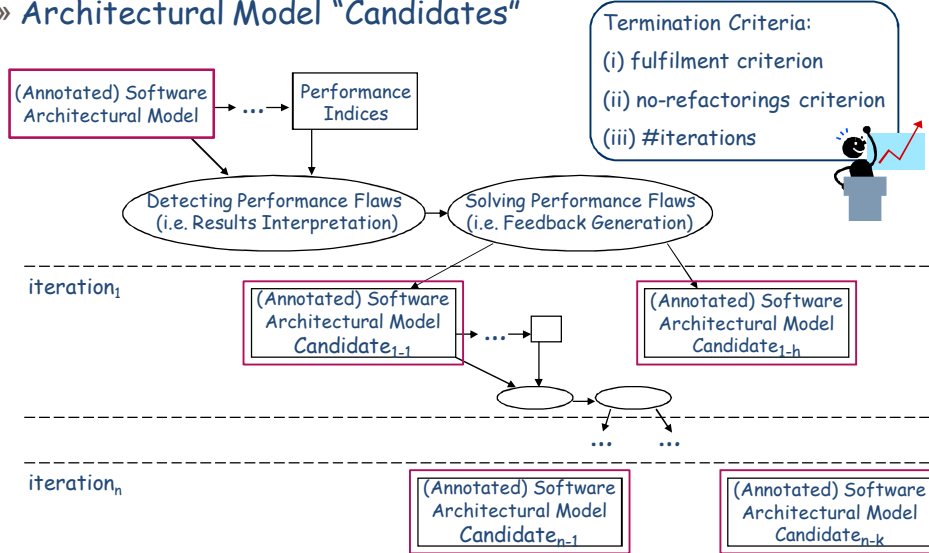
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Model Refactoring approach in deep...

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» Architectural Model "Candidates"

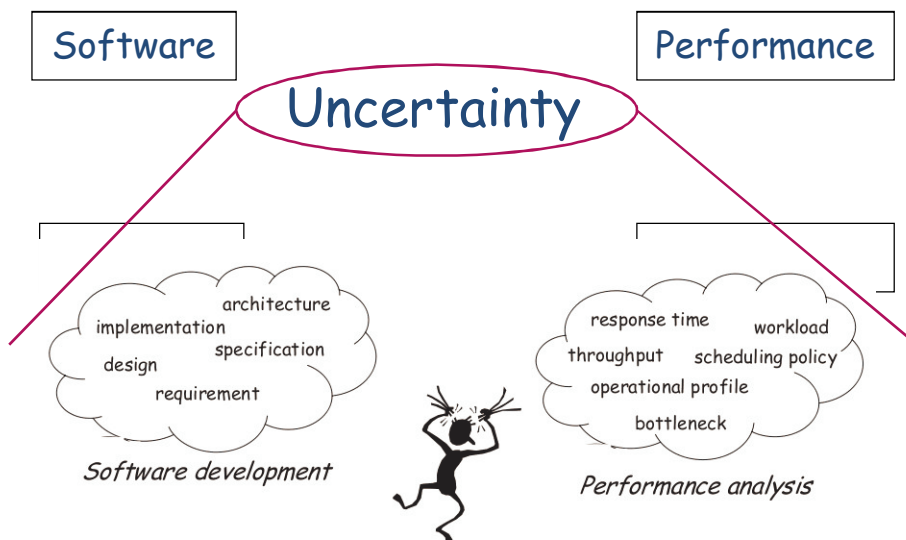


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Challenges in "Software Performance Model Refactoring"

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Software Models Refactoring Uncertainty

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» What are the refactoring actions that lead uncertainty in the software models?

- Add/Change/Delete software model elements;
- Add/Change/Delete connections between software model elements, i.e. modifying the topology;
- Add/Change/Delete interactions between software model elements, i.e. modifying the behavior;
- Further issues: lack of information (e.g. workload, operational profile, ...).



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Performance Models Refactoring Uncertainty

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» What are the refactoring actions that lead uncertainty in the performance models?

- Add/Change/Delete performance model elements;
- Add/Change/Delete connections between performance model elements, i.e. modifying the topology;
- Add/Change/Delete interactions between performance model elements, i.e. modifying the behavior;
- Further issues: lack of information (e.g. service time distribution, waiting policy, routing strategy, ...).



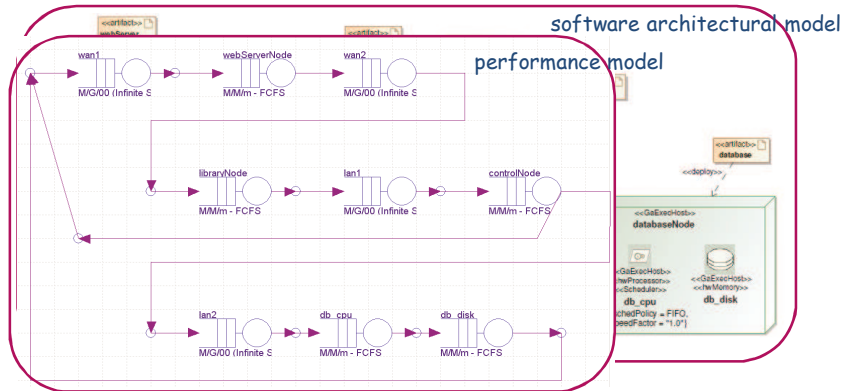
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An example: E-commerce System (1/2)

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» Software and Performance Modeling



Requirement	Required Value	Predicted Value
RT(browseCatalog)	1.2 sec	1.4 sec
RT(makePurchase)	2.5 sec	2.69 sec

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An example: E-commerce System (2/2)

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» Software and Performance Refactoring

(Annotated) Software Architectural Model	RT(browseCatalog) <= 1.2 sec	RT(makePurchase) <= 2.5 sec
ECS	1.4 sec	2.69 sec
ECS - Refactored - 1	1.4 sec	{2.32, 2.37, 2.42} sec
ECS - Refactored - 2	{1.4, 1.6, 1.8, 2.0} sec	{2.69, 2.97, 3.22, 3.47} sec
ECS - Refactored - 3	{1.01, 1.19, 1.39, 1.59} sec	{1.63, 1.67, 1.82, 2.02} sec
ECS - Refactored - 4	1.4 sec	2.18 sec
ECS - Refactored - 5	1.4 sec	2.32 sec
ECS - Refactored - 6	{1.39, 1.4, 1.4} sec	{2.6, 2.65, 2.69} sec
ECS - Refactored - 7	1.3 sec	2.58 sec

Experimental results of the paper: D. Arcelli, V. Cortellessa, C. Trubiani: "Antipattern-Based Model Refactoring for Software Performance Improvement", accepted for QoSA 2012, to appear.



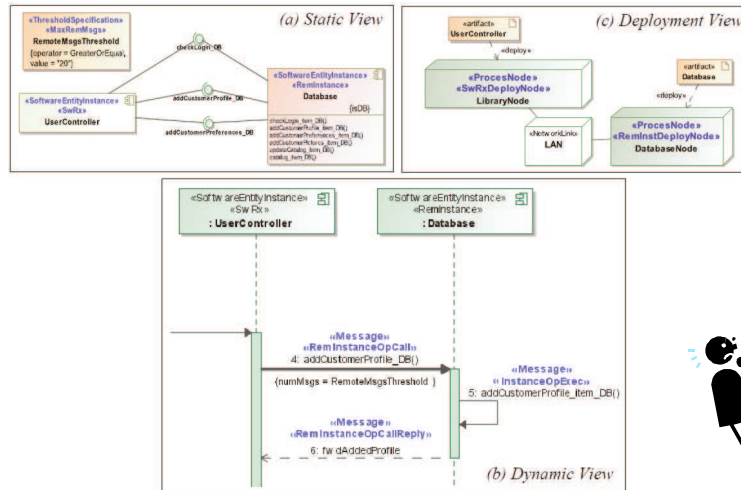
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Refactoring at a glance (1/2)

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» ECS : detecting performance flaws



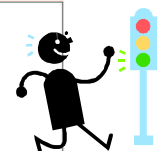
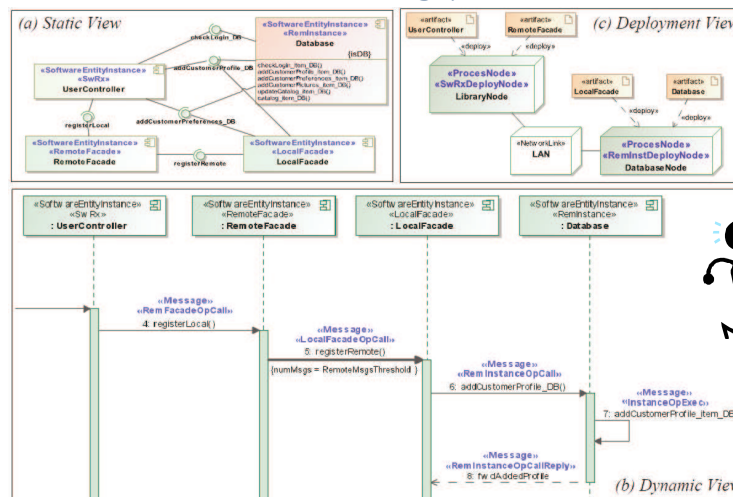
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Refactoring at a glance (2/2)

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» ECS - Refactored: solving performance flaws



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Research Agenda

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» "I want you" ... not for U.S.Army ;) !!!



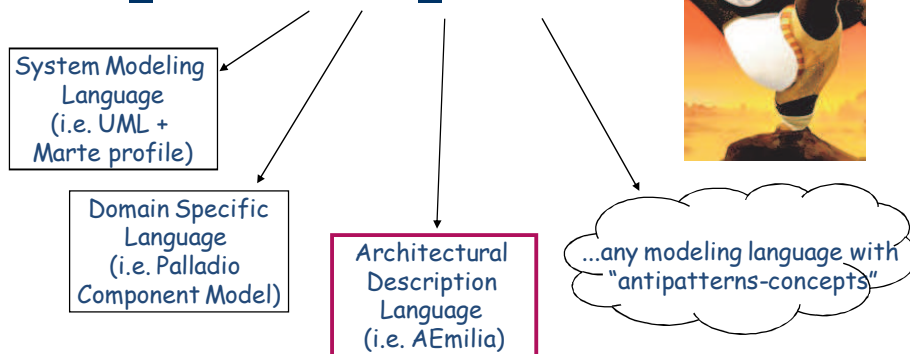
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» PANDA: "Performance Antipatterns aNd FeeDback in Software Architectures"



<http://code.google.com/p/panda-aemilia/>

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Thank you!

Questions ?



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