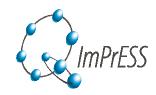


Heiko Koziolek, Emanuel Kolb, Jens Doppelhamer • Industrial Software Systems, ABB Corporate Research

Architecture Model Reconstruction Towards Change Scenario Evaluation

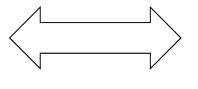
Introduction Software Quality Prediction

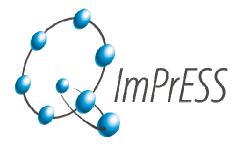


Goals for ABB

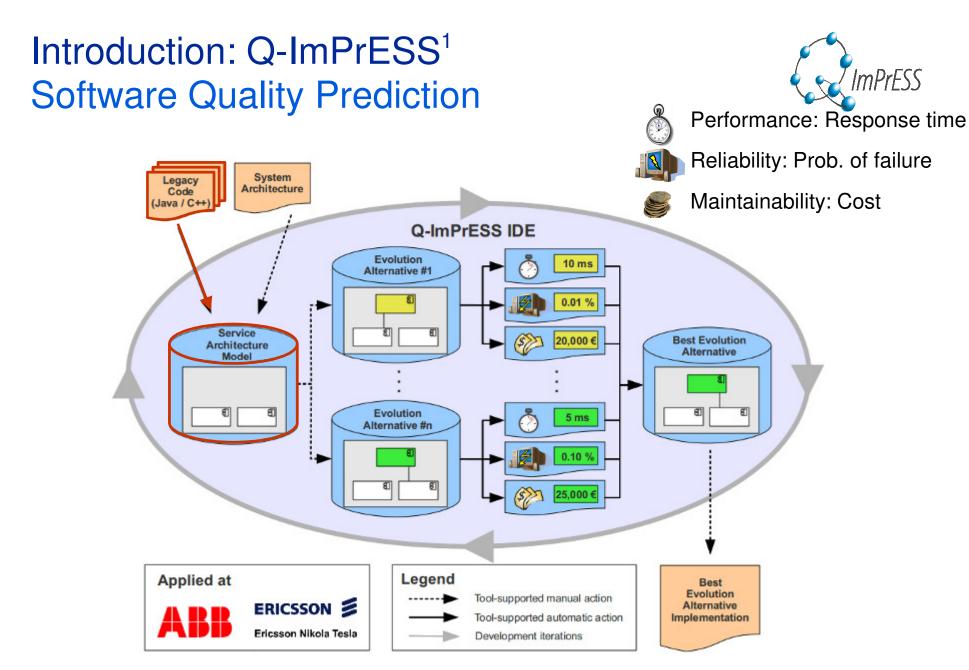
- Understand consequences that system changes have on quality attributes
 - Without costly try-and-error
 - Including existing/legacy software
- Understand trade-offs between quality attributes during evolution







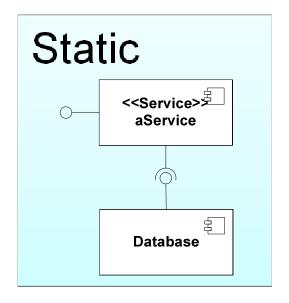


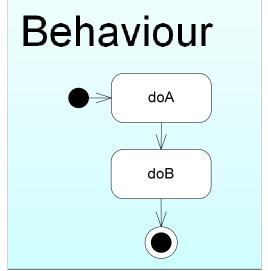


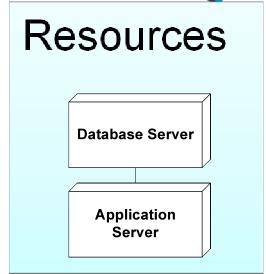


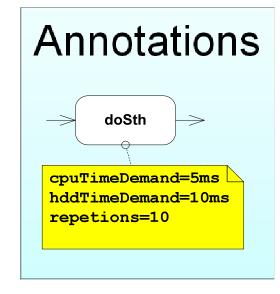
Q-ImPrESS Meta Model – Sample Models

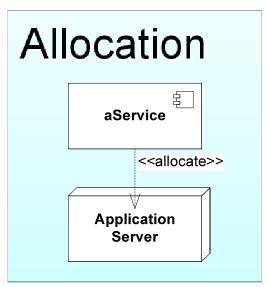


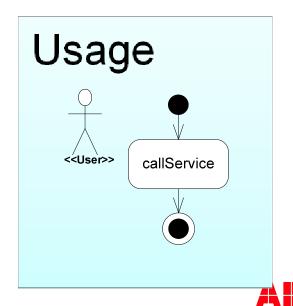






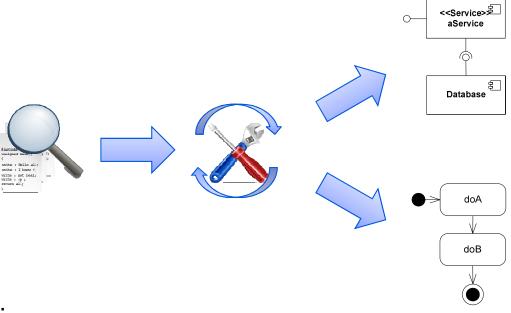






Reverse Engineering Architecture Model Extraction





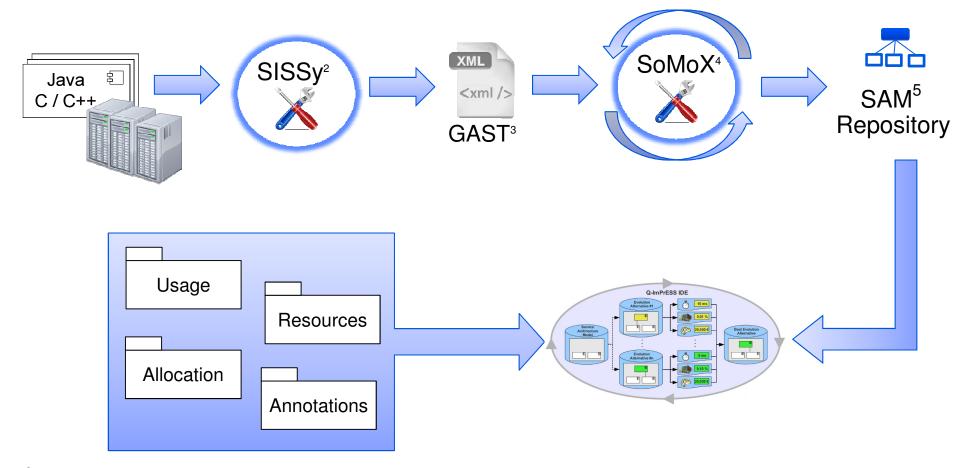
Problem:

- Suitable abstraction of the code base
- Suited for quality predictions
- Higher level components not explicit in the code



Q-ImPrESS Reverse Engineering - Overall Workflow





²Structural Investigation of Software Systems ³Generalized Abstract Syntax Tree



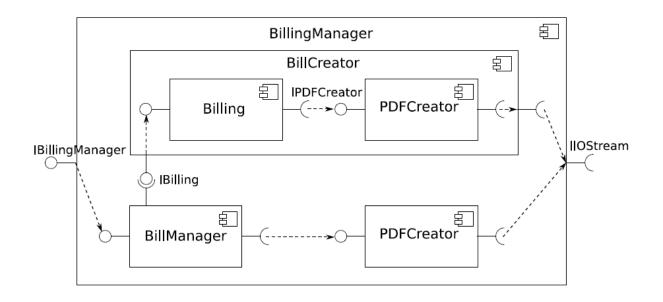
⁴Software Model eXtractor

⁵Service Architecture Model

Model Extraction SoMoX Overview

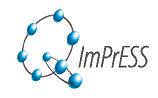


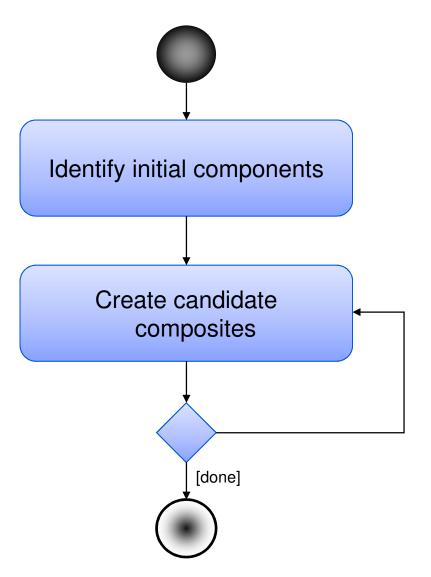
- Underlying component concept:
 - Explicit interfaces
 - Composite components
- Target model defined within the Q-ImPrESS meta-model





SoMoX Component Identification





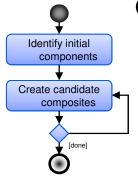
Classes with their required and provided interfaces

Based on OO metrics, compute score for candidates



SoMoX Candidate Composites





OO Metrics used to evaluate candidates

- Distance from the main sequence
- Coupling and
 - Name resemblance
 - Interface violation
- + X

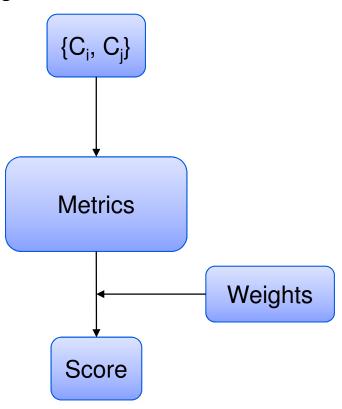
Metrics are combined

Metrics are weighted

System/technology specific

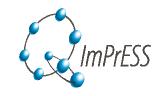
Metrics are computed pair wise

Subsequent clustering





Case studies Overview



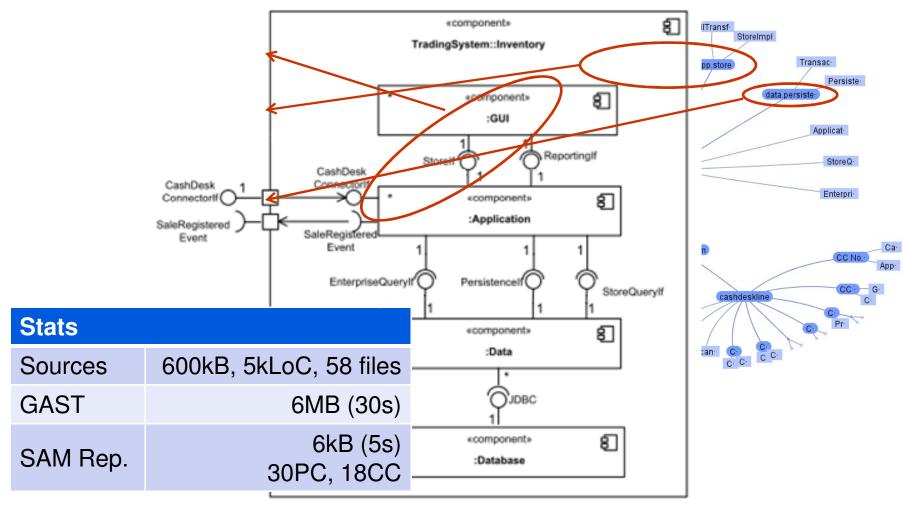
Java	LoC	# Files	Total file size
CoCoME	5k	125	600kB
Ant	200k	1690	10MB

C++	LoC	# Files	Total file size
Industrial I	10k	15	150 KB
Industrial II	50k	58	750 KB
Industrial III	150k	65	2.4 MB



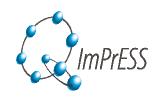
Java: CoCoME⁶ Examplary implementation of a SOA

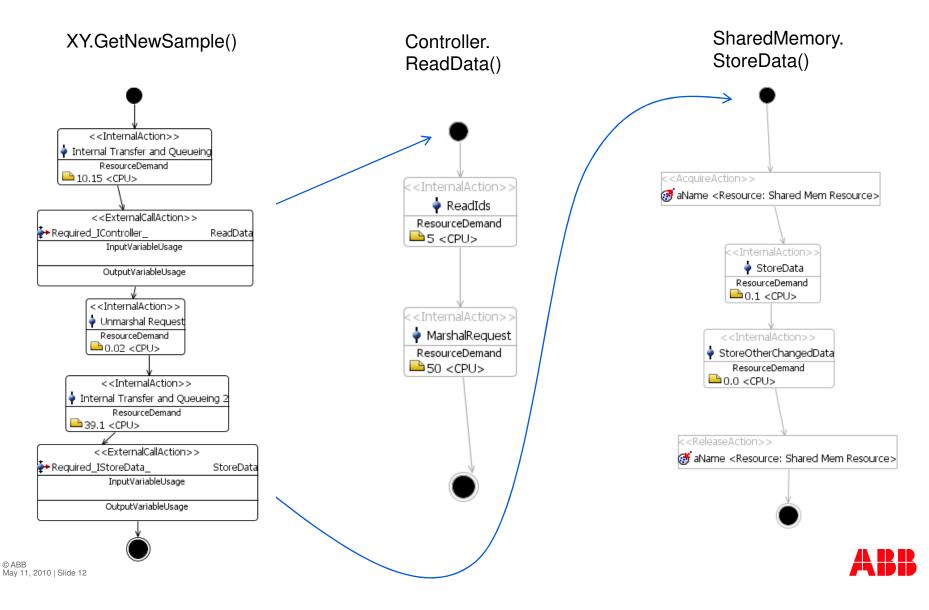




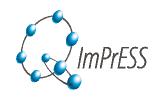


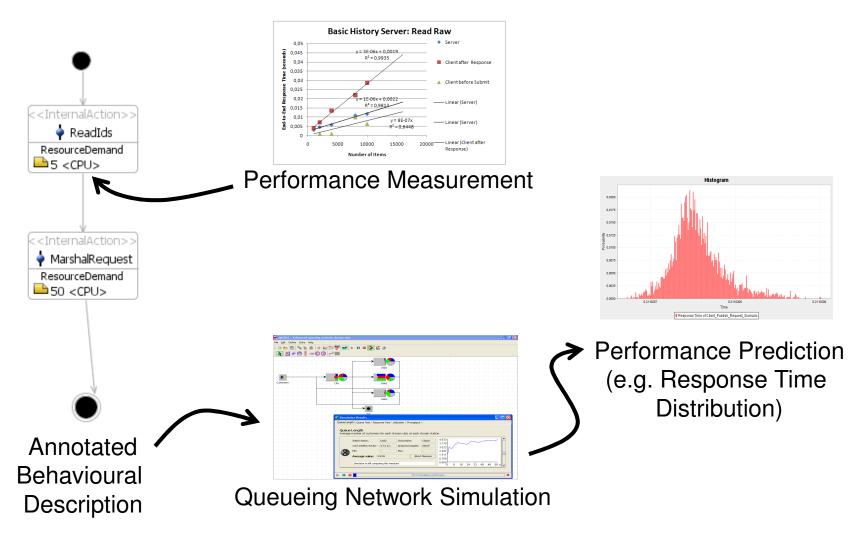
Service Effect Specifications (SEFFs) Component Behavior



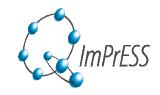


Industrial Case Studies Performance Prediction





Case studies Summing up the results



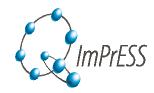
Java	LoC	Size	SISSy	SoMox
CoCoME	5k	600KB	++	++
Ant	200k	10MB	++	(++)

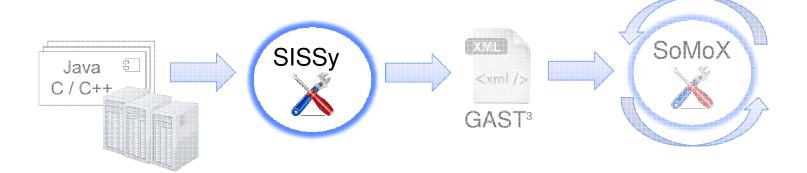
C++	LoC	Size	SISSy	SoMox
Industrial I	10k	150kB	•	•
Industrial II	50k	750kB	+	++
Industrial III	150k	2,4MB	*	

++: very good; +: good; •: ok; -: bad; --: very bad; **×**: No results



Q-ImPrESS Reverse Engineering – Conclusion





- Promising approach to reverse engineering for model based software quality prediction
- Support for C++ incomplete
 - Real world dialects (MS C++) problematic
 - No precompiled header support
 => Performance issues



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Q-ImPrESS Further information



- http://www.q-impress.eu
- http://jira.ow2.org/browse/QIMPRESS
- http://sdqweb.ipd.kit.edu/wiki/SoMoX
- http://sissy.fzi.de/
- http://sdqweb.ipd.kit.edu/wiki/Palladio Component Model

