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Descartes Research Group

Engineering of Self-Aware Complex Systems

Descartes research

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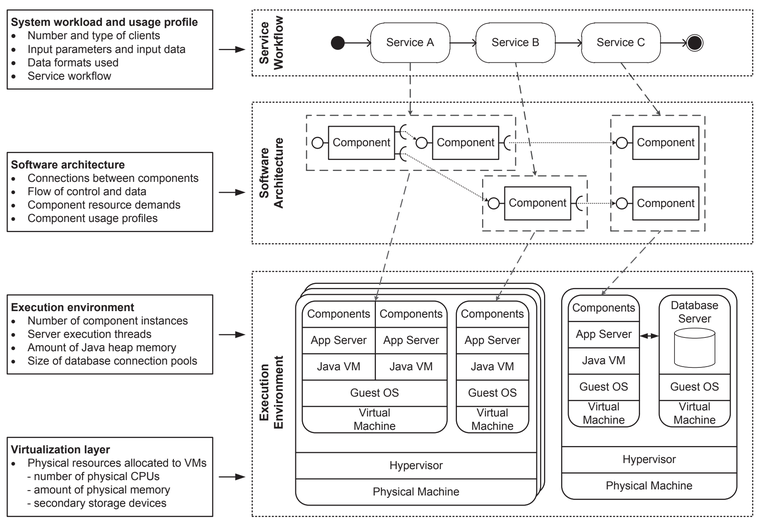
Motivation

- Modern software systems are increasingly complex and dynamic
  - Loosely-coupled highly-distributed and dynamic architectures
  - Multi-layered execution environments & virtualized infrastructures
  - Shift towards Cloud Computing (SaaS, PaaS, IaaS) platforms



- Challenges
  - General lack of trust in virtualized infrastructures & Cloud Computing
  - Inability to provide end-to-end quality-of-service (QoS) guarantees
  - Overprovisioning leading to high TCO (Total-Cost-of-Ownership)

Vision

Self-aware software systems that are

- *self-reflective*: aware of their software architecture, execution environment and hardware infrastructure on which they are running, as well as of their operational goals,
- *self-predictive*: able to predict the effect of dynamic changes as well as predict the effect of possible adaptation actions,
- *self-adaptive*: proactively adapting as the environment evolves in order to ensure that their operational goals are continuously met.

„I think,
therefore I am...“
-- René Descartes

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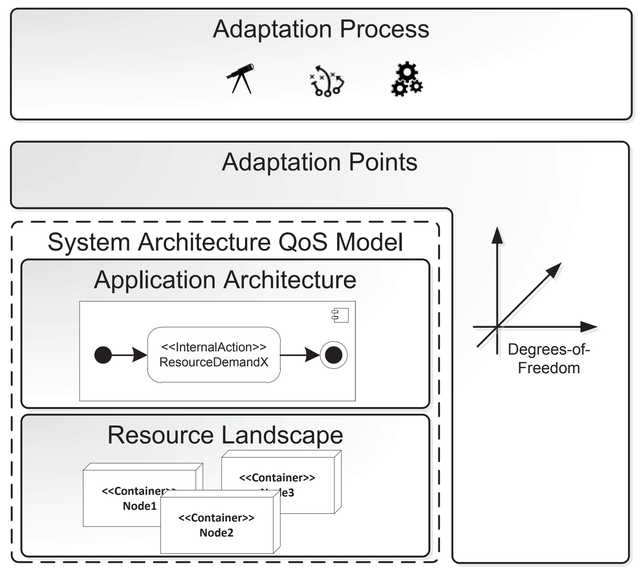
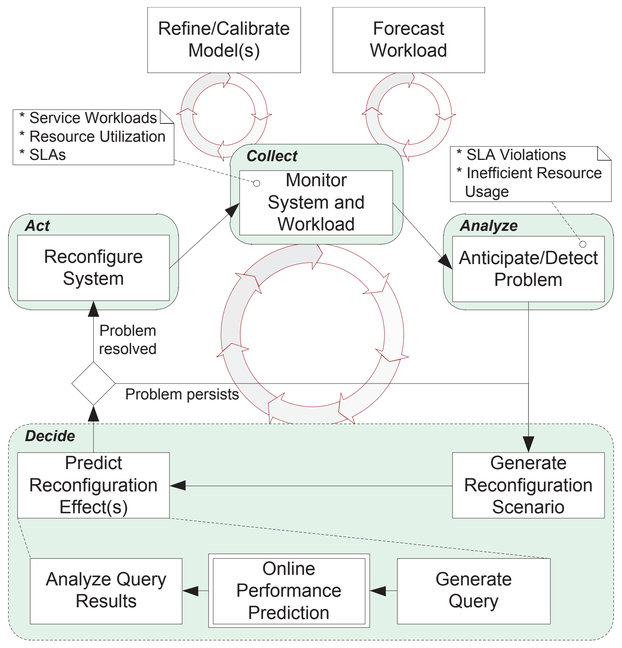
Research Roadmap

- Systems designed with integrated online architecture models
- System architecture modeled using the Descartes Meta-Model (DMM) [QoSA 2012, CBSE 2012, ICEBE 2012]

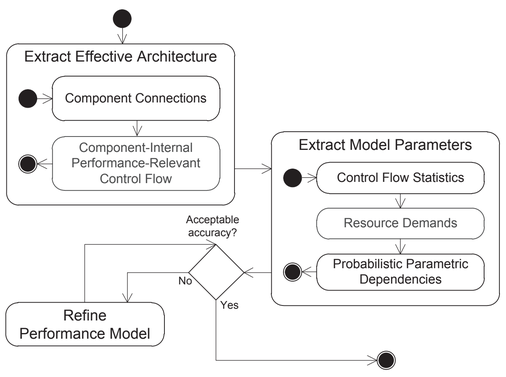


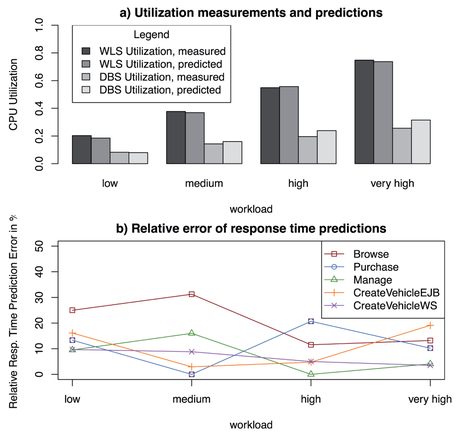
- Models maintained and calibrated automatically during operation
- Models used at run-time for quality-of-service management [ICEBE 2012, SEAMS 2011]



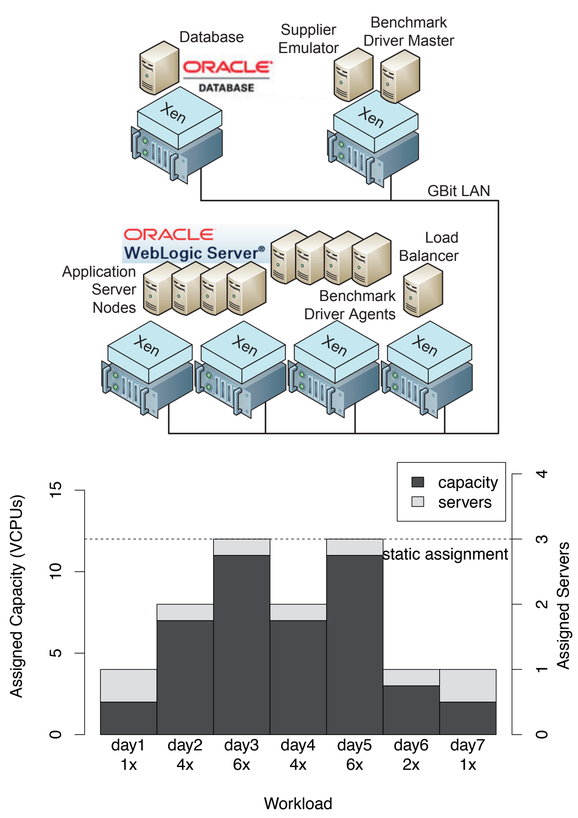
Case Studies

- Automated Extraction of Architecture-Level Performance Models of Distributed Component-Based Systems [ASE 2011]





- Model-based Self-Adaptive Resource Allocation in Virtualized Environments [SEAMS 2011]



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