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

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]

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]

Bibliography


