

Karlsruhe Institute of Technology

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Descartes Research Group

Engineering of Self-Aware Software Systems

Motivation

- Modern software systems 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





- Independent applications hosted on shared physical infrastructures
- Challenges
 - Lack of direct control over the underlying physical hardware
 - Dynamic resource allocations
 - New threats arising from the use of shared physical infrastructures
- Major showstoppers
 - General lack of trust in virtualized infrastructures & cloud computing
 - Inability to provide end-to-end quality-of-service guarantees
- Overprovisioning leading to high TCO (Total-Cost-of-Ownership)

Research Roadmap

- Long-term vision: Self-aware software systems that are
- aware of their quality-of-service and resource efficiency and of the way they are influenced by the environment they are running in,
- able to predict the effect of changes in the environment, e.g., changing workloads or resource allocations,
- automatically adapting to such changes to enforce quality-ofservice requirements and improve efficiency thus lowering TCO.





Approach

- Systems designed with integrated *dynamic* models
- Models maintained and calibrated automatically during operation

Measurement,

Monitoring and

Analysis

Benchmarking

- Models used at run-time for quality-of-service management
- Benefits
- Guaranteed end-to-end quality-of-service
- Higher resource efficiency
- Lower TCO (Total-Cost-of-Ownership)





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