iObserve\textsuperscript{2}

Integrated Observation and Modeling Techniques to Support Adaptation and Evolution of Software Systems

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Trends for software-intensive systems

- Usage of third-party software-defined services
  - Systems built by selecting, configuring, and composing services
  - Software usage separated from software ownership, maintenance, and operation

- Deployment on Distributed / virtualized “cloud” infrastructures
  - Processing and storage, software-defined networks, Internet-of-Things/CPS
  - Hardware resources and middleware owned and operated by (many) third parties
Pros and Cons of Cloud and Services

- Flexibility, scalability, reusability
- Economic use of resources
- Unprecedented complexity and heterogeneity
- Design-time uncertainty (need for run-time adaptation and evolution)
- Limited observability
One Key Challenge: **Data Protection**

- **Dynamic migration / replication** of cloud resources
- Complexity, **geographic distribution** of cloud services and their data (e.g., Hadoop, Spark, …)
- **Dynamic reclassification** of data (e.g., aggregation of personal data)

Is my data (still) protected?
1st Funding Period

Descriptive Architectural Run-time Models

Analysis
Evolution
Evaluation
Monitoring & Observation
Realization
Execution
Adaptation
Planning

Instrumentation

Cloud Infrastructure

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Results of the 1st Funding Period

- **Instrumentation:** Model-driven instrumentation of dynamic Cloud applications

- **Monitoring & Observation:** Architectural run-time models for automated adaptation & manual evolution

- **Analysis:** Model-based analysis of performance and privacy
2nd Funding Period

Prescriptive Architectural Run-time Models

Planning

Analysis

Adaptation

Monitoring & Observation

Execution

Evolution

Evaluation

Realization

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Project Goals for 2nd Funding Period

- **Privacy-driven planning**
  - Extended run-time models to reflect cloud adaptation mechanisms
  - Constraint-based generation of adaptation alternatives from run-time models
  - Impact analysis of privacy related adaptations on other quality requirements (such as performance)
Project Goals for 2nd Funding Period

- **Design-space exploration**
  - Extended run-time models to reflect dimensions for architectural adaptations
  - Generation and evaluation of adaptation plans (~ design alternatives) during runtime
  - Translation of adaptation plans into detailed adaptation tasks (for actual execution)
Project Goals for 2nd Funding Period

- **Operator-in-the-loop adaptation**
  - DevOp-Dashboard for providing information on system context (e.g., new data handling policies, changed workload models)
  - DevOp-Dashboard for (visual) decision support in selecting adaptation plans (where self-adaptation is not feasible / wanted)
Planned Cooperations in 2nd Funding Period

MOCA ↔ Model Evolution ↔ iObserve ↔ System Evolution
Usage Profiles, QoS Models, Monitoring ↔ Security complementing Privacy ↔ Decision Support ↔ QoS Models and Analysis

Case Study CoCoME

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Publications (excerpt)


Jointly Edited Proceedings
