Workflow Variability for Autonomic IoT Systems
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Introduction

Workflows represent IoT systems composed of billions of services with an overwhelming number of interactions [1, 2]. Thus, manually managing such systems becomes infeasible as the scale and complexity increases. This research proposes DX-MAN, a model that allows adapting workflows at runtime to different contexts without requiring any dynamic reconfiguration mechanism [3].

- **Autonomicity** is crucial for building complex large-scale IoT systems operating in highly dynamic environments [4, 5].
- **Autonomicity** requires workflow variability for the definition of alternative system behaviours [3].
- **DX-MAN** provides infinite alternative behaviours/workflows which are selected at runtime by a MAPE-K loop.

DX-MAN Model

- **Algebraic Reference**
- **Computation Unit**
- **Operation**
- **Variability Operators**
- **Composite Service**
- **Atomic Service**
- **Workflow Space**

Parallelizer Example: Smart Home

- **Smart Home**
- **Vacuum Robot**
- **Washing Machine**
- **Oven**

Genetic Algorithm for Selecting Optimal Workflows

- **Element**
- **UserPresence(u)**
- **Energy(e)**
- **Tidiness(t)**

Conclusions

- A DX-MAN variability operator defines infinite Turing machines for a composite service.
- A MAPE-K Loop selects a workflow that best adapts to the current context at run-time.
- Dynamic reconfiguration is not needed as workflows are non-deployable and executable only.

References