State Space Exploration for Planning Reconfigurations in Cloud-native Systems

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Motivation – Where do we come from?

Self-Adaptive System

Develhopper
Motivation – Where do we come from?

The Plan:
Scale-out Order and Payment Service at once.

Monitor
Analyse
Plan
Execute

Scale-out: responsetime > 5s
Scale-in: responsetime < 2s

Develhopper

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Motivation – Where do we go?

Devolhopper

Solution: State Graph

Improves Scaling Behaviour

Explainable

Scale-out: responsetime > 5s
Scale-in: responsetime < 2s

Scale-out: responsetime > 3s
Scale-in: responsetime < 1s

Monitor

Knowledge

Execute

Analyse

Plan
State Graph – courtesy of Matthias Becker

- Environmental change
- Reconfiguration
- Point in time
- Architecture configuration
- Measurements
State Graph – SimuLizar
State Graph – Explore multiple Paths
State Graph – Explore multiple Paths
State Graph – Explore multiple Paths
State Graph – Judge the States
State Graph – Judge the States

calculate utility

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State Graph – The Desired State
State Graph – Can we get to the Desired State?
State Graph – Can we get to the Desired State?

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State Graph – Can we get to the Desired State?

futures no longer applicable
State Graph – Can we get to the Desired State?

start replanning
Develhopper

Use for explanations $\rightarrow$ improved understanding of SAS

Better plans $\rightarrow$ improved performance

Summary

- Analyse
- Plan
- Execute
- Monitor

Knowledge

- Analyse
- Plan

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