DynAdapt
Last research results

Nicolas Ferry, Jakob Hogenes
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Sophia Antipolis
The models@runtime pattern

- Synchronization engine implicitly define an adaptation plan
  - Typically, this plan is arbitrarily derived from the difference between the desired and the current state of the system

- Problem: Need for customization of the adaptation plan.
Example with CloudMF

Two main components:

- A **modelling environment** with a tool-supported domain-specific modelling language (**CloudML**) to model the provisioning and deployment of multi-cloud systems.

- A **models@run-time environment** for enacting the provisioning, deployment and adaptation of these systems.
Deploying Storm
Proposed approach

Create/update runtime model

Declarative definition of the desired system's state

Execute adaptation plan

Generate adaptation plan from the runtime model

Reconfigure adaptation plan if needed

Definition of the adaptation's behavior
Specifying Adaptation Plans
Manipulating Adaptation Plans

- **Internal DSL**

  ```java
  Activity deploymentPlan = ActivityBuilder.getActivity();
  ActivityInitialNode start = ActivityBuilder.controlStart();
  Action provision = ActivityBuilder.actionNode("Provision", VM);
  ActivityFinalNode stop = ActivityBuilder.controlStop();
  Fork fork = ActivityBuilder.forkNode(false);
  ActivityBuilder.connect(fork, provision, true);
  ```

- **Runtime Visualization**
Runtime environment

 reasoning engine(s)

 Current Model

 Target Model

 Adaptation Plan Generator

 Adaptation Plan

 Plan Validator

 Plan Execution Engine

 Adaptation Action Executor

 Running System

 (5)
Demo – Initial deployment
Demo – Adaptation
Towards Meta-Adaptation of Dynamic Adaptive Systems with Models@Runtime

Reasoning engine(s) / Editor(s)

1. Meta-monitoring rules
2. Monitoring Rules
3. Maintenance rules
4. Maintenance
5. Meta-monitoring rules
6. Observers
7. Current Model
8. Diff
9. Trigger
10. Target Model
11. Transformations
12. Adaptation Plan
13. Plan Validator
14. Adaptation Plan Generator
15. Adaptation Action Executor
16. Plan Execution Engine
17. Running System