

DynAdapt

Last research results

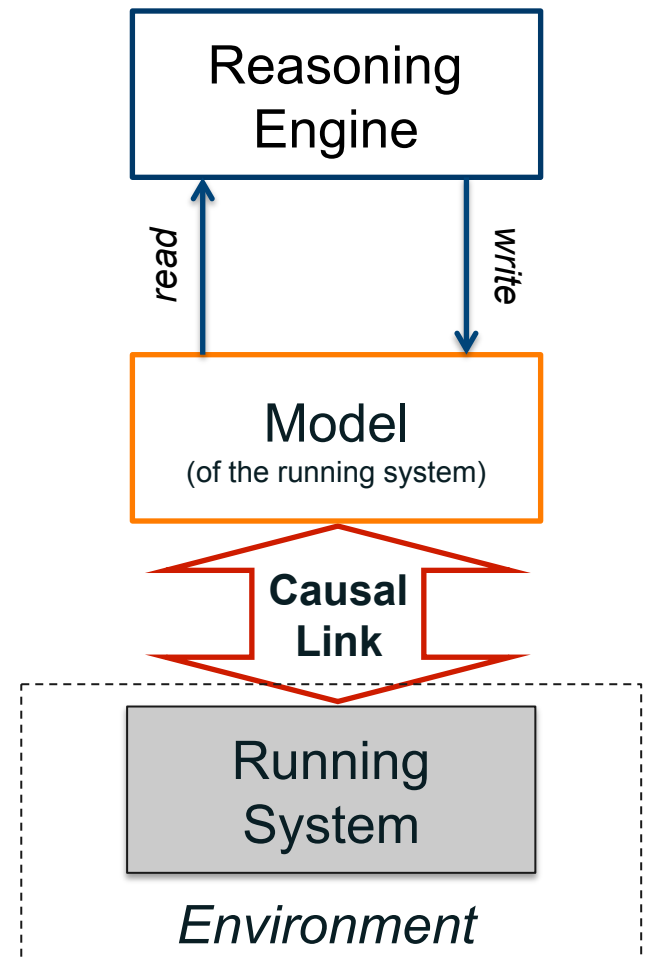
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29/04/16

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The models@runtime pattern

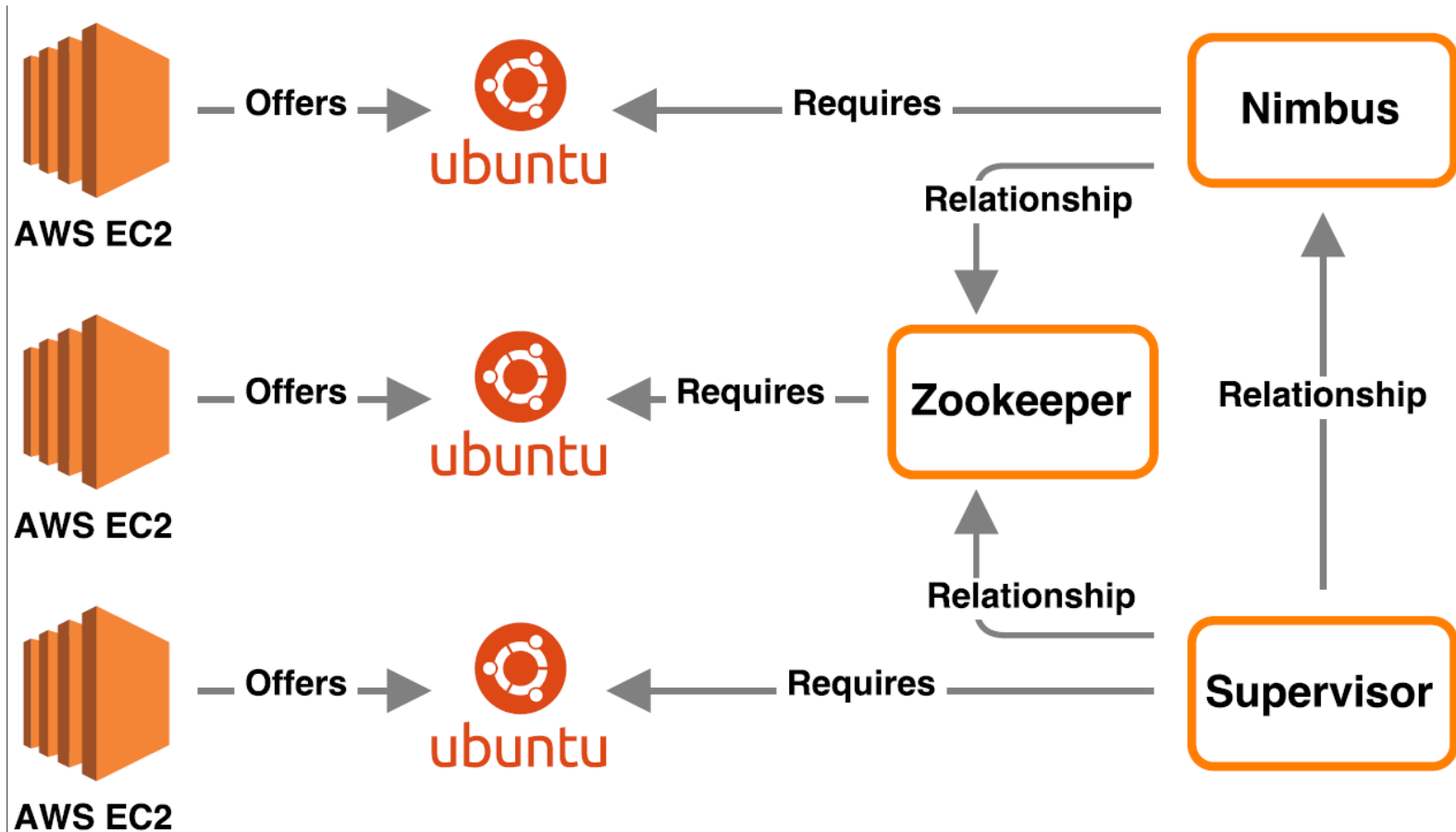
- Synchronization engine implicitly define an adaptation plan
 - Typically, this plan is arbitrarily derived from the difference between the desired and the current state of the system
- **Problem:** Need for customization of the adaptation plan.



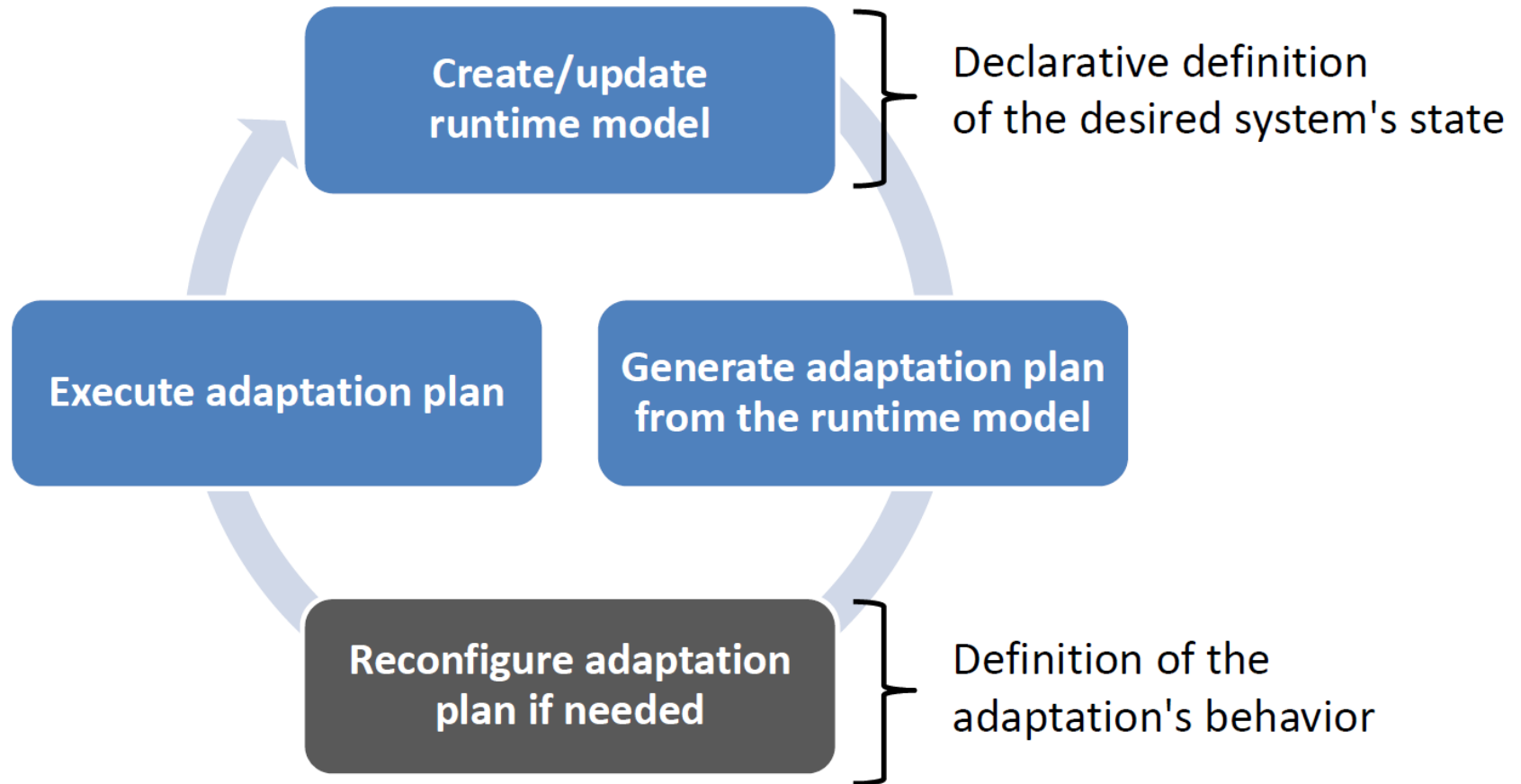
Example with CloudMF

- 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.

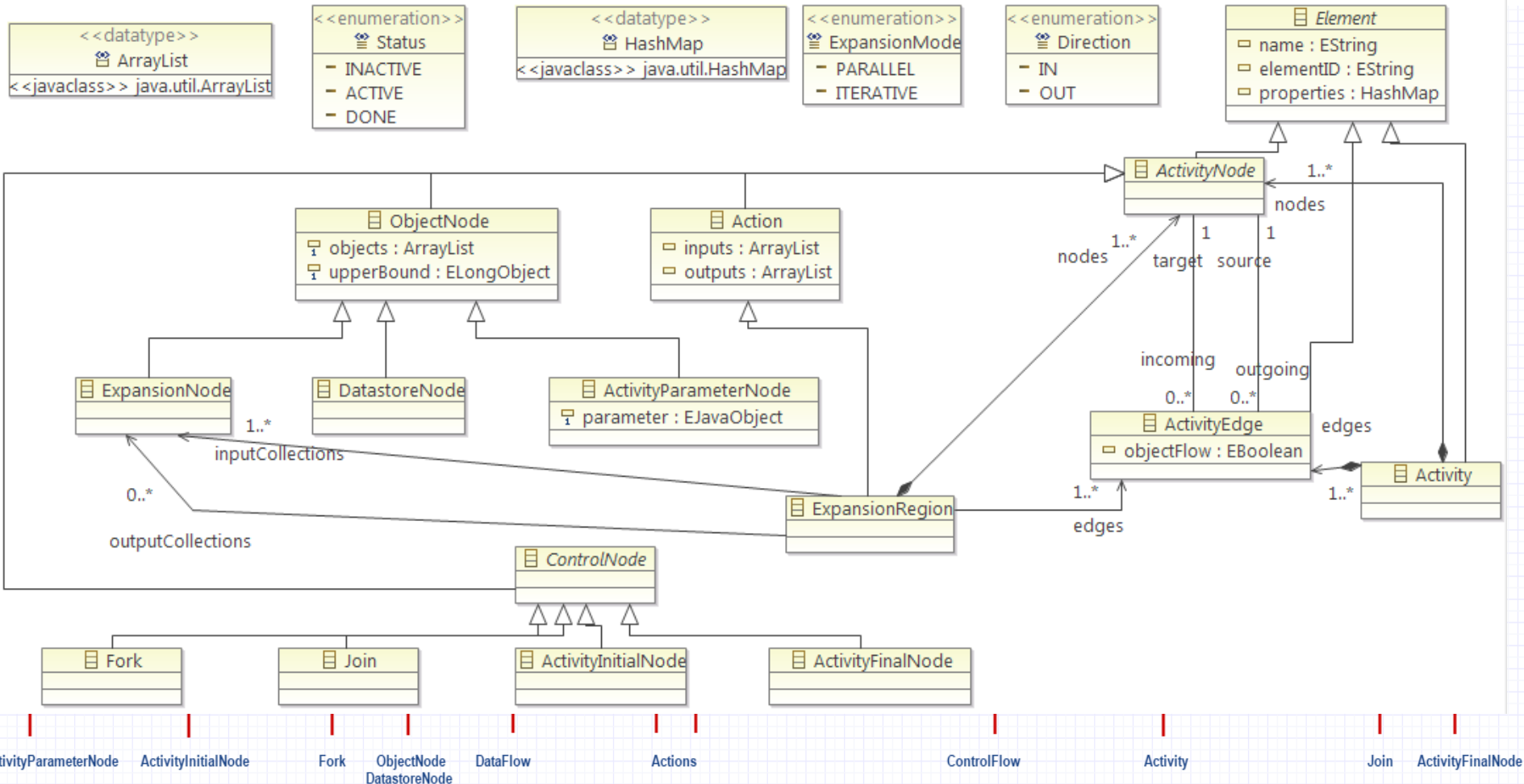
Deploying Storm



Proposed approach



Specifying Adaptation Plans

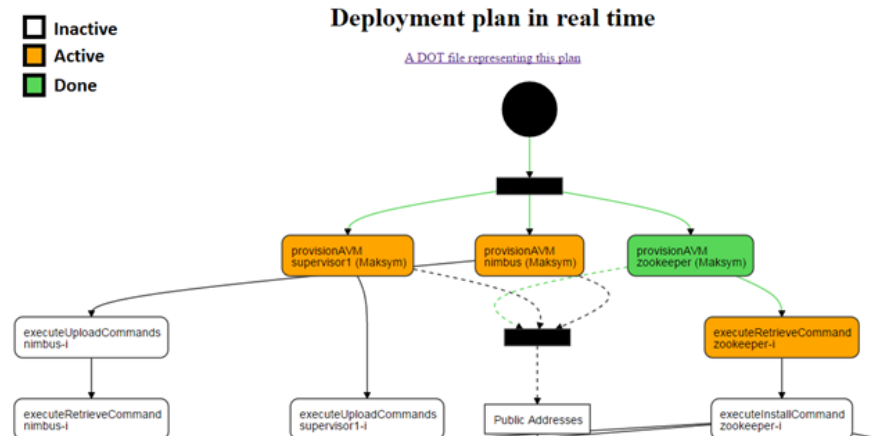


Manipulating Adaptation Plans

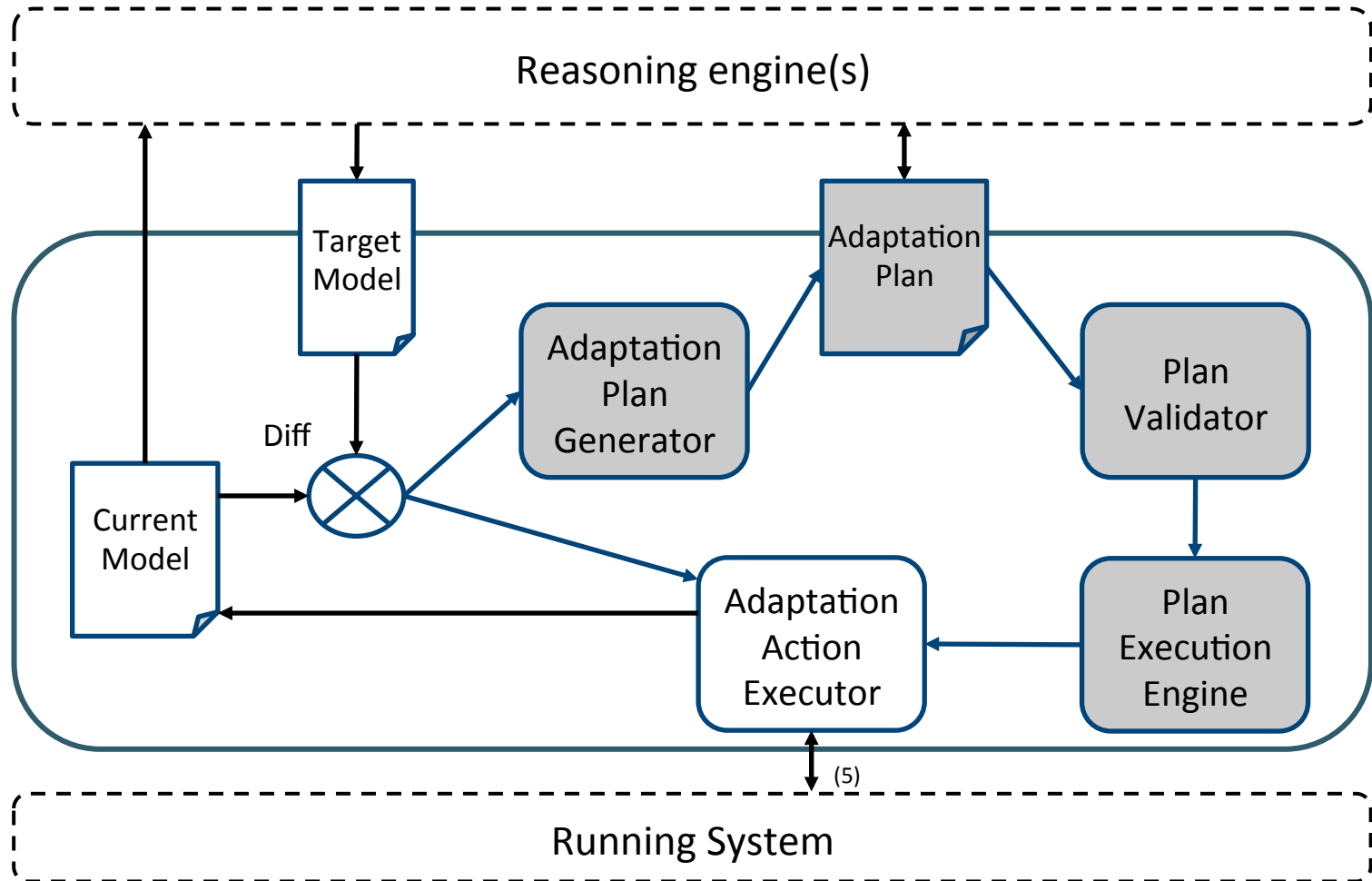
Internal DSL

```
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



Demo – Initial deployment

The screenshot displays the AWS Management Console interface for the EC2 service. The top navigation bar shows the user 'Maksym' in the 'Oregon' region. The left sidebar contains a navigation menu with categories like EC2 Dashboard, INSTANCES, IMAGES, ELASTIC BLOCK STORE, and NETWORK & SECURITY. The main content area is titled 'Instances' and shows a search filter 'Maksym' with the result 'None found'. A table header is visible with columns: Name, Instance ID, Instance Type, Availability Zone, Instance State, Status Checks, Alarm Status, and Public DNS. Below the table, a message states 'No Instances found matching your filter criteria'. At the bottom of the console, there is a footer with 'Feedback', 'English', copyright information '© 2008 - 2015, Amazon Web Services, Inc. or its affiliates. All rights reserved.', 'Privacy Policy', and 'Terms of Use'.

Demo – Adaptation

The screenshot displays the AWS Management Console interface on the left and a terminal window in the center. The terminal window shows the output of a CloudML deployment process, including model updates, status changes, and successful execution of control flows.

AWS Console (Left): Shows the EC2 Dashboard with a search for 'Maksym'. The 'Instances' section is active, listing instances: zookeeper (Maksym), supervisor1 (Maksym), and nimbus (Maksym). A 'Launch Instance' button is visible.

Terminal Window (Center): Shows the following log output:

```
2015-06-18 19:47:45 >>
2015-06-18 19:47:46 >> Updating the model..
2015-06-18 19:47:46 >> Status of: supervisor1-i changed in: CONFIGURED
2015-06-18 19:47:46 >> Closing connection ...
2015-06-18 19:47:46 Executing: Control flow from (Action:configure:connectionCon
figure_supervisor1-i) to (Join:empty)
2015-06-18 19:47:46

Inside join which synchronizes:
- Control flow from (Action:configure:connectionConfigure_supervisor1-i) to (Join:empty)
- Control flow from (Join:empty) to (Join:empty)

2015-06-18 19:47:46 Executing: Control flow from (Join:empty) to (Join:empty)
2015-06-18 19:47:46 Executing: Control flow from (Join:empty) to (Join:empty)
2015-06-18 19:47:46

Inside join which synchronizes:
- Control flow from (Join:empty) to (Join:empty)
- Control flow from (Join:empty) to (Join:empty)

2015-06-18 19:47:46 Executing: Control flow from (Join:empty) to (Action:start_s
upervisor1-i)
2015-06-18 19:47:46 Action: Starting supervisor1-i
2015-06-18 19:47:46 Start storm (Maksym)
2015-06-18 19:47:46 >> Connecting to aws-ec2 ...
2015-06-18 19:47:46 >> Authenticating ...
2015-06-18 19:47:47 >> executing command...
2015-06-18 19:47:47 >> sudo bash storm_config.sh
2015-06-18 19:48:01 >>
2015-06-18 19:48:02 >> Updating the model..
2015-06-18 19:48:02 >> Status of: supervisor1-i changed in: RUNNING
2015-06-18 19:48:02 >> Closing connection ...
2015-06-18 19:48:02 Executing: Control flow from (Action:start_supervisor1-i) to
(ActivityFinalNode:empty)
2015-06-18 19:48:02

Deployment has finished successfully

Info: Deployment Complete.

CloudML >
```

Table (Right): A table showing instance details, including Alarm Status and Public DNS. The table has 3 columns: Alarm Status, Public DNS, and an unlabeled column. The data rows are:

Alarm Status	Public DNS	
None	ec2-52-25-7	sed
None	ec2-52-26-6	sed
None	ec2-52-26-9	sed

Towards Meta-Adaptation of Dynamic Adaptive Systems with Models@Runtime

