MBT and cloud-testing - a powerful combination

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Agenda

- Motivation
- Test@Cloud
- Conclusions
Motivation (1 / 2)

- Are you hunting bugs?

- ... or assuring requirements?
Motivation (2 / 2)

- Increasing Complexity of Products and Systems:
  - Functions per component
  - Number of components
  - Combinatorics
  - Multi-version, Multi-variant

- Exponential Increase of:
  - Number of system states
  - Number of testcases

Structured Approach Wanted
Agenda

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Test@Cloud

- Project Funded by Bavarian FuE-Program „Informations- und Kommunikationstechnik“
  - Modellzentrizierter Test in virtualisierten Testumgebungen - Test@Cloud

- Partners
  - sepp.med gmbh
  - Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Chair of Computer Science 3 (Computer Architecture)

- Started: January 2012
Test@Cloud – Modell Based Testing (1 / 2)

- **Product**
  - System under Test (SuT)

- **Handcrafted Testcase**
  - „Property“ of test engineer

- **Testcase Matrix Derived from Model**
  - Testcases to assure requirements for a defined quality
Test@Cloud – Model Based Testing (2 / 2)

- Blinker Example:
  - Requirements = 8
  - Test Steps = 7
  - Verification Pnts. = 9

- Testcase Generation:

<table>
<thead>
<tr>
<th>Coverage strategy</th>
<th>Number of testcases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Every requirement once</td>
<td>5</td>
</tr>
<tr>
<td>All requirements in all their paths</td>
<td>52</td>
</tr>
<tr>
<td>All nodes once</td>
<td>5</td>
</tr>
<tr>
<td>All edges once</td>
<td>5</td>
</tr>
<tr>
<td>All paths</td>
<td>340</td>
</tr>
<tr>
<td>All paths with 1 loop</td>
<td>956</td>
</tr>
</tbody>
</table>

Determine Testcases Based on Strategies
Test@Cloud – The Cloud

- **Cloud Infrastructure Provider**
  - Cluster (120 x86 CPUs)
  - OpenNebula (Cloud-Management)
  - Open Cloud Computing Interface (OCCI)

- **Open Cloud Computing Interface (OCCI)**
  - Open Standard
  - Developed by Open Grid Forum
  - Avoid vendor lock-in
Test@Cloud – Setup

Customer

Requirements

Product

VMs

Test engineer

Cloud Provider

VM repository

OCCI

Test engineer

Cloud

Provider

Customer

Requirements

Product

VMs

Test engineer

Cloud

Provider

VM repository

OCCI
Test@Cloud – Execute

Customer

Worker

Cloud Provider

Master

VM repository

Data storage

Test Manager

OCCI

OCCI

Requirements

Product

Test@Cloud – Execute

Worker

Cloud Provider

Master

VM repository

Data storage

Test Manager

OCCI

OCCI

Requirements

Product

Test@Cloud – Execute

Worker

Cloud Provider

Master

VM repository

Data storage

Test Manager

OCCI

OCCI

Requirements

Product

Test@Cloud – Execute

Worker

Cloud Provider

Master

VM repository

Data storage

Test Manager

OCCI

OCCI

Requirements

Product
Test@Cloud – Results

- Performance Test (MBTsuite UI-Test):

Scalability Works
Test@Cloud – Experiences

- Reduced Effort for Testcase Implementation
  - Additional coverage easily generated

- Simplified Test Automation
  - Domain knowledge provided by departments

- Nearly Arbitrary Short Test Execution Time
  - Depends on rented cloud performance and testcase with maximum execution time
Agenda

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Conclusions

- Assure Requirements
- Model Based Testing
  - Early testdesign (time-to-market)
  - Structured approach to testmatrix (controlled coverage)
  - Stops effort explosion in testcase implementation
- Cloud
  - Cost-effective test execution (pay-as-you-use)
  - Fast feedback (parallel execution)

MBT + Cloud = A Powerful Combination to Control Complexity
Thank you for your attention.
References


- Cliparts: http://www.clker.com/
- Photos: http://pixabay.com/
Model Based Testing – Definitions

- We Use a Behavioural Model:
  - Entry
  - Test Step
  - Verification Point
  - Requirement Tag
  - Exit
Model Based Testing – Properties

- Easily Understandable
  - Graphical representation
  - Hierarchical composition

- Minimum Effort
  - Implementation of modular test steps
  - Business logic by model
  - Reuse by test step libraries
  - Easily maintainable

- Machine Processible
  - Standard UML
  - Automatic generation of independent test cases
Test@Cloud – The Cloud

How Does the Cloud Save Costs?

- Tailored Provision of Resources:
  - Investment in hardware, software and maintenance
  - Continuous update to most efficient technologies
  - Management focus on efficiency

![Graph showing IT-capacities over time, with improvements in efficiency through cloud provision, avoiding undersupply and oversupply. Source [1]](image-url)
Test@Cloud – Virtualisation

- Product
  - System under Test (SuT)
- Test Execution Environment
  - Custom-tailored
- Operating System
  - Windows
  - Linux, …
- Virtual Machine (VM)
  - Number of CPU-cores
  - Main memory
  - Network definitions
  - …