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 **Test@Cloud**

MBT and cloud-testing - a powerful combination

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Agenda

- Motivation
- Test@Cloud
- Conclusions

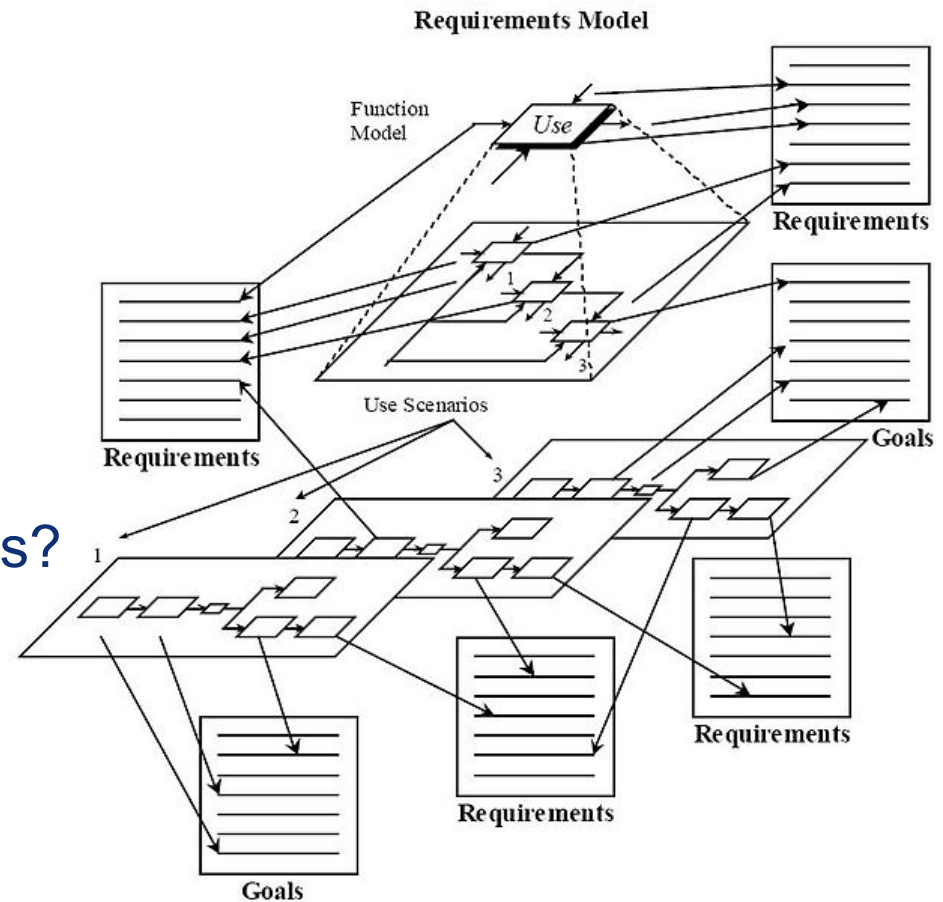


Motivation (1 / 2)

- Are you hunting bugs?



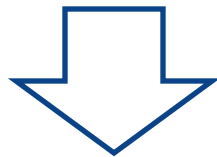
- ... or assuring requirements?



Motivation (2 / 2)

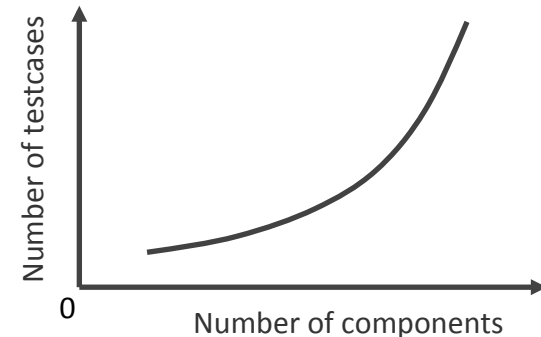
■ Increasing Complexity of Products and Systems:

- Functions per component
- Number of components
- Combinatorics
- Multi-version, Multi-variant



■ Exponential Increase of:

- Number of system states
- Number of testcases



Structured Approach Wanted

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Test@Cloud

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



- Partners

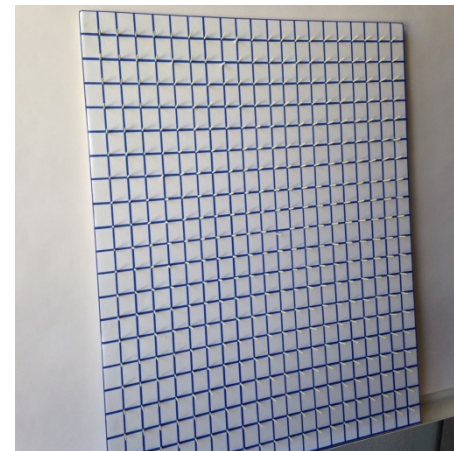
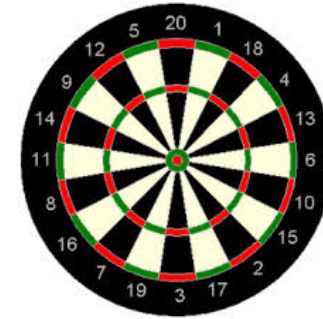
- sepp.med gmbh
- Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU),
Chair of Computer Science 3
(Computer Architecture)



- Started: January 2012

Test@Cloud – Modell Based Testing (1 / 2)

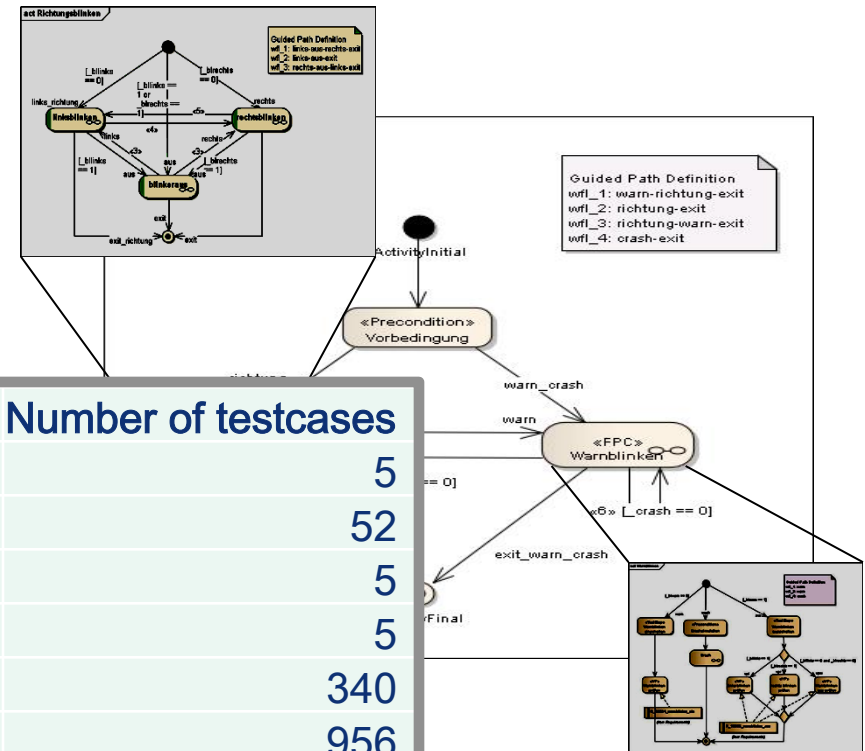
- Product
 - System under Test (SuT)
- Handcrafted Testcase
 - „Property“ of test engineer
- Testcase Matrix Derived from Model
 - Testcases to assure requirements for a defined quality



Test@Cloud – Model Based Testing (2 / 2)

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

Coverage strategy	Number of testcases
Every requirement once	5
All requirements in all their paths	52
All nodes once	5
All edges once	5
All paths	340
All paths with 1 loop	956
...	



Determine Testcases Based on Strategies

Test@Cloud – The Cloud

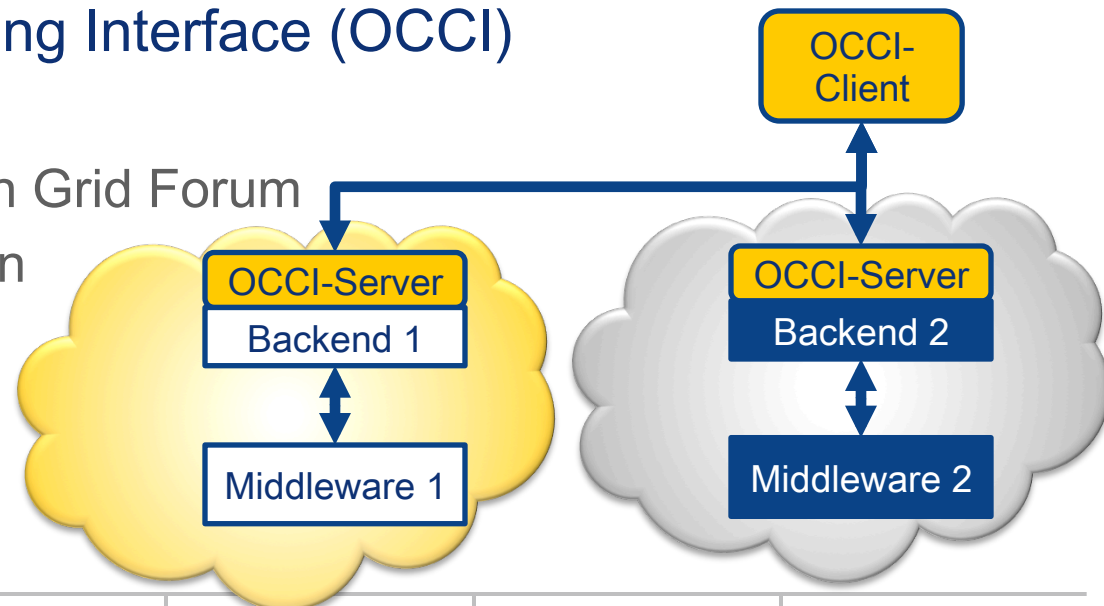
■ Cloud Infrastructure Provider

- Cluster (120 x86 CPUs)
- OpenNebula (Cloud-Management)
- Open Cloud Computing Interface (OC CI)

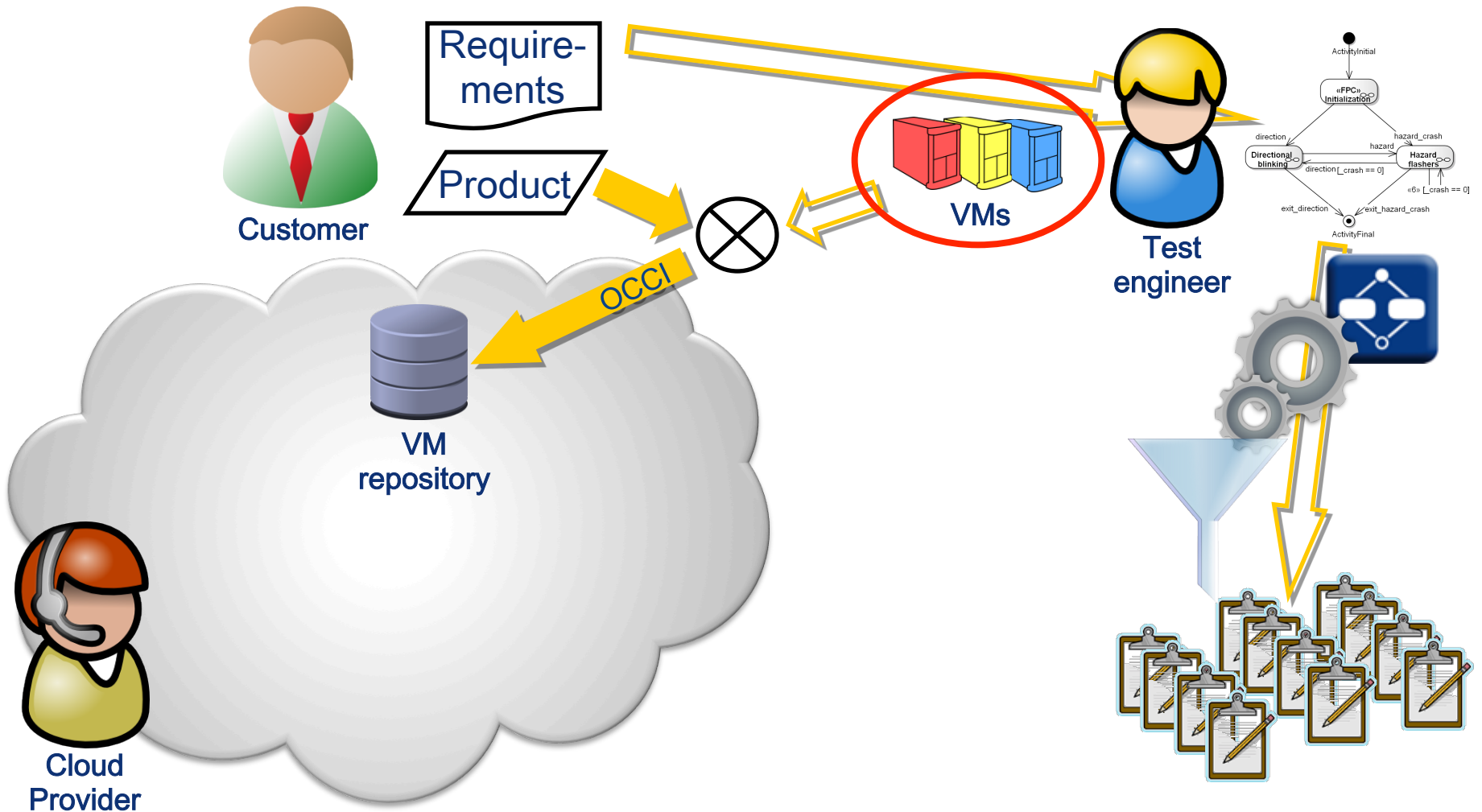


■ Open Cloud Computing Interface (OC CI)

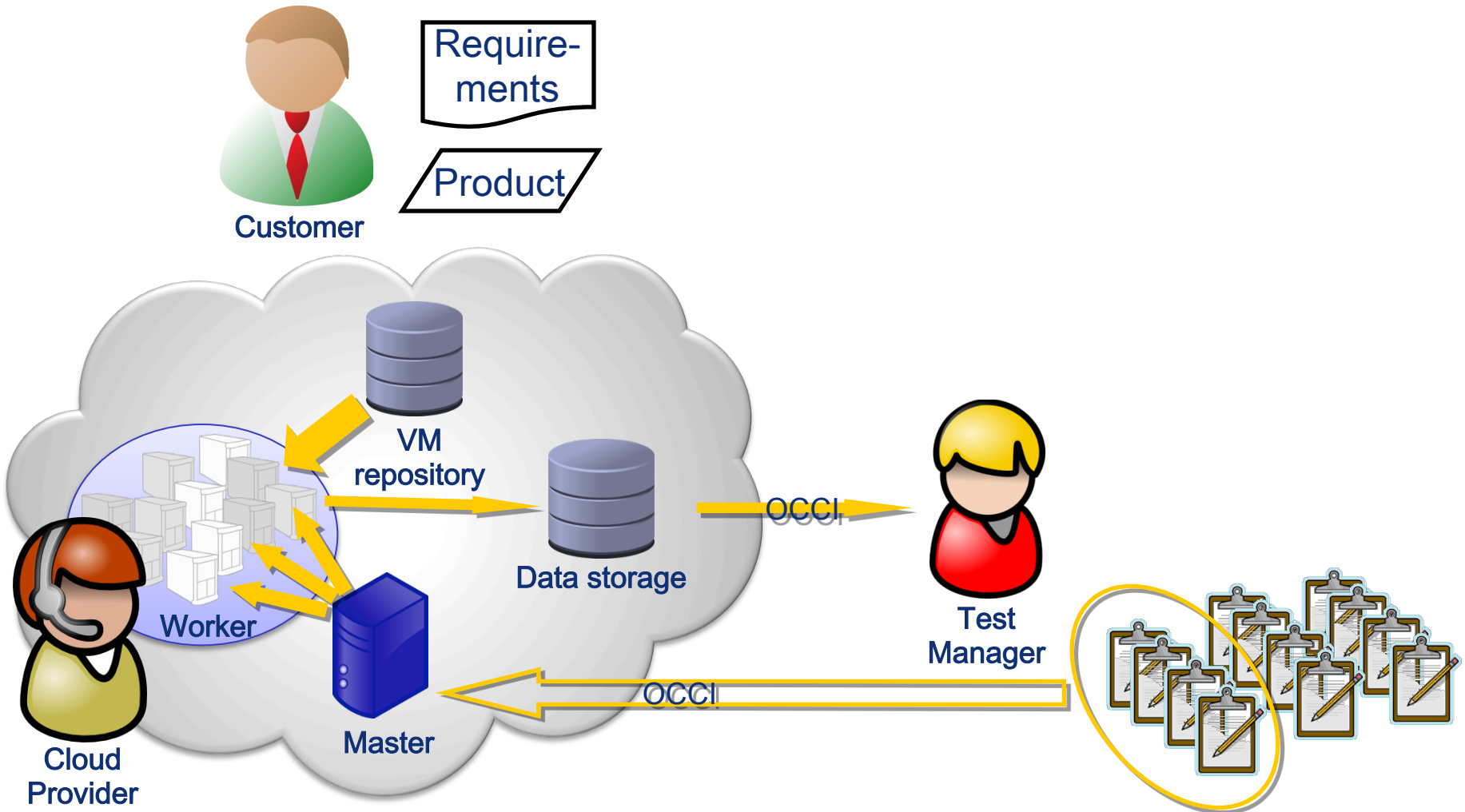
- Open Standard
- Developed by Open Grid Forum
- Avoid vendor lock-in



Test@Cloud – Setup

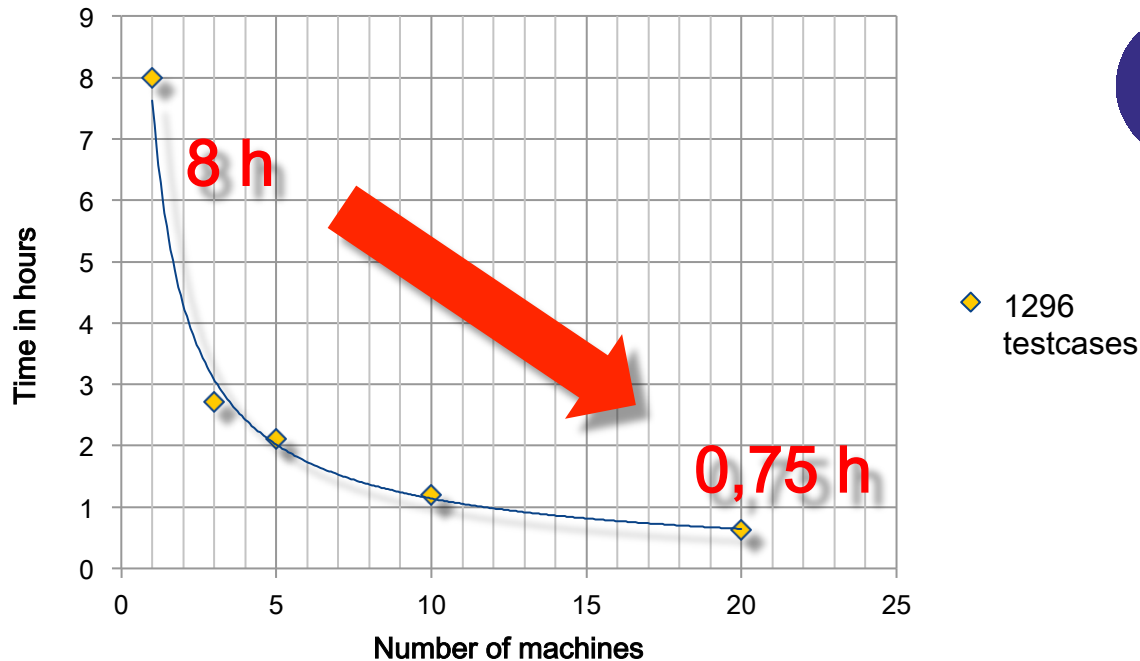


Test@Cloud – Execute



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



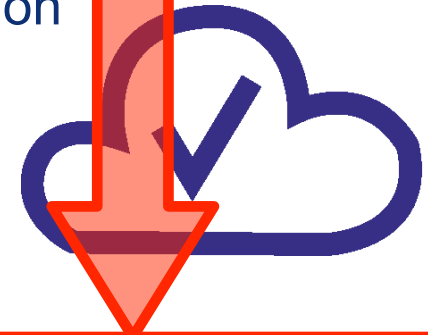
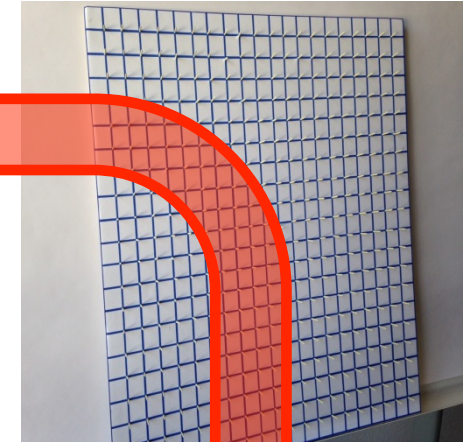
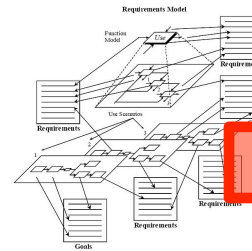
Agenda

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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

End



- Thank you for your attention.



References

- [1] <http://www.ondemand4u.com/cloud-computing/vorteile-von-cloud-computing>
- Cliparts: <http://www.clker.com/>
- Photos: <http://pixabay.com/>

Model Based Testing – Definitions

- We Use a Behavioural Model:

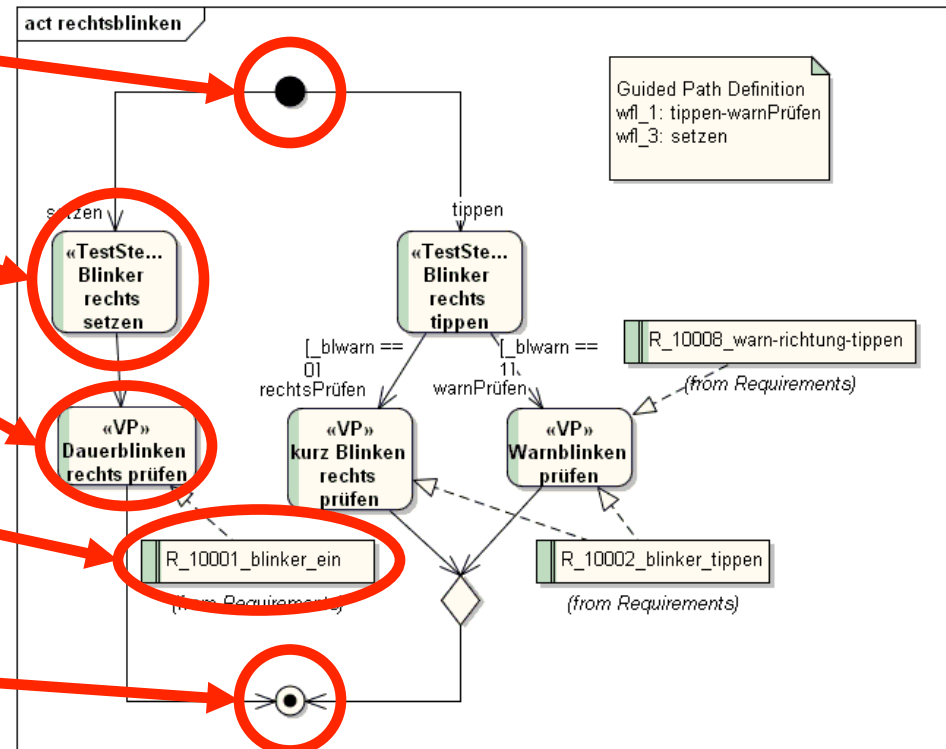
- Entry

- Test Step

- Verification Point

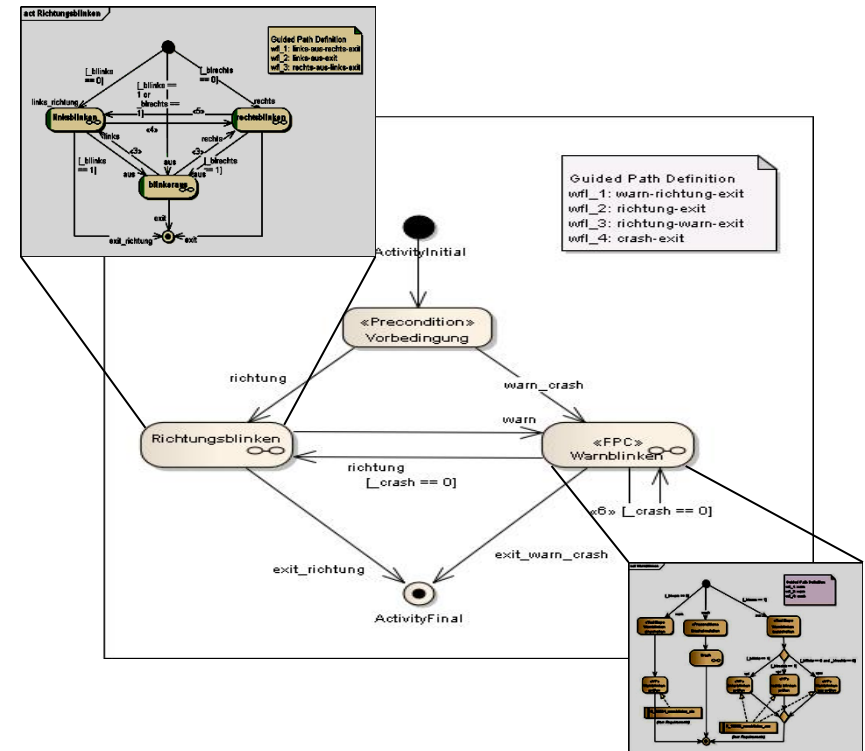
- Requirement Tag

- 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 testcases



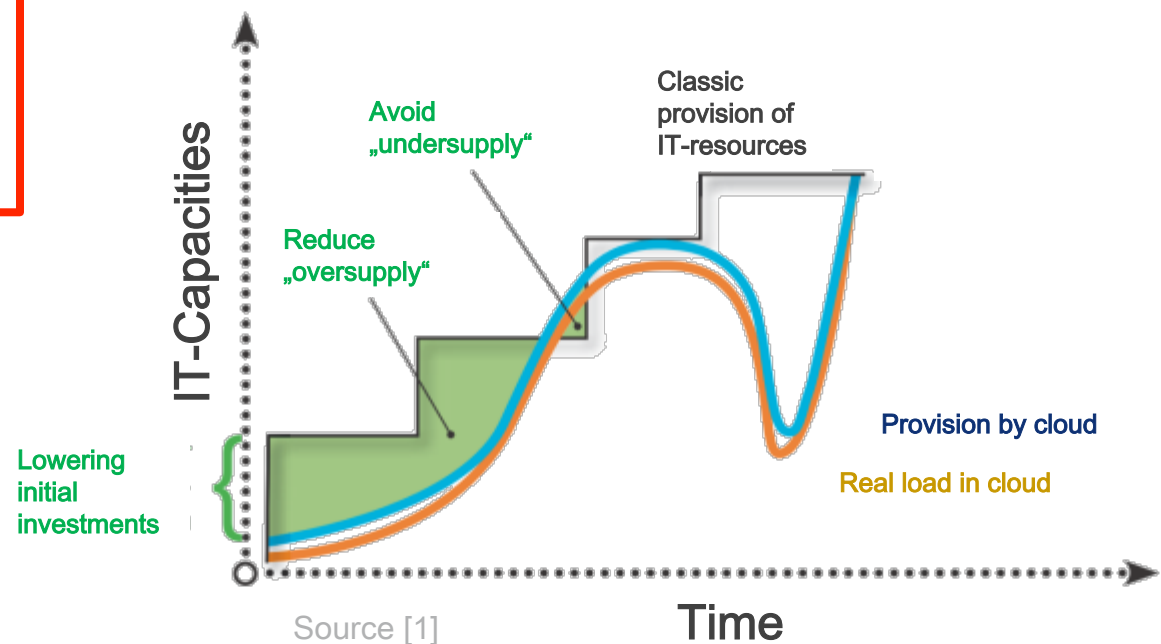
Test@Cloud – The Cloud

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



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
 - ...

