

TTCN-3 and the Test Process

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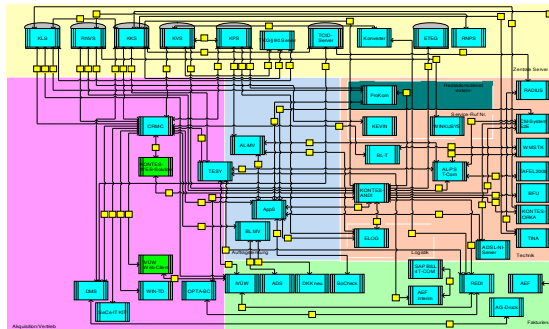
Testfactory: The challenge we face

- Our main focus
 - Big, complex projects
 - Functional, non-functional test types
 - Business-oriented
- Pressure on costs
- The trend to offshoring
- The complexity of our systems

The challenge we face: an example

Our task:

- Ensure the operational readiness for the T-Com application stack
- 4 releases/year with new requirements and products
- Perform integration tests at system level



Test team

- 150 persons
- 5 locations

Key facts

- 100 business processes
- 20 locations
- 40,000 users
- 40,000,000 data records

- If something goes wrong here – we're in trouble!

Why TTCN-3?

- Possible enabler for offshoring
- Evaluate and leverage new technologies
 - practical use in our testing projects
 - potential uses for our customers
- But first we need an understanding of where TTCN-3 fits into the test process.
 - TTCN-3 in isolation X
 - Big picture ✓

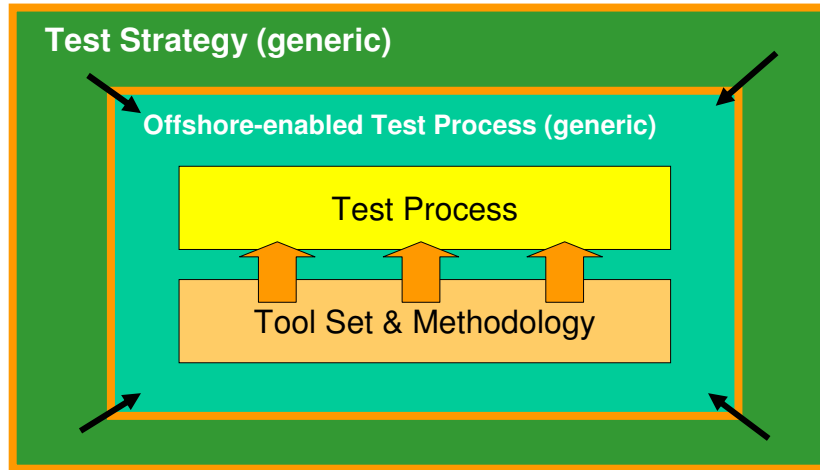
What I am going to talk about

- Specifically:
 - Experiences in integrating TTCN-3 into our test process
 - Focus offshore projects
- Generically:
 - Where could TTCN-3 fit into the big picture?
 - What role could TTCN-3 play in improving the test process?

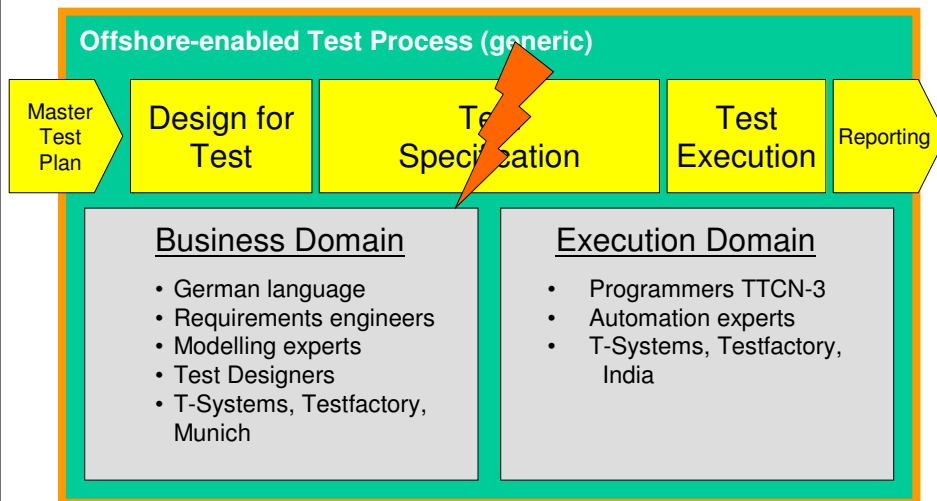
Integrating TTCN-3 into our test process

- We set up a pilot project „Proof of Concept“
 - Realism is a very significant factor
 - Team nominated
 - Andreas Braun, T-Systems:
a Test Manager in T-Com Project
 - Brahim Sakout Andaloussi, T-Systems/TU-Munich:
Tester
 - Bernd Bruegge, TU-Munich:
Professor of Applied SW-Engineering
- We had an open mind regarding TTCN-3
- This is what came out >>>>>>>>

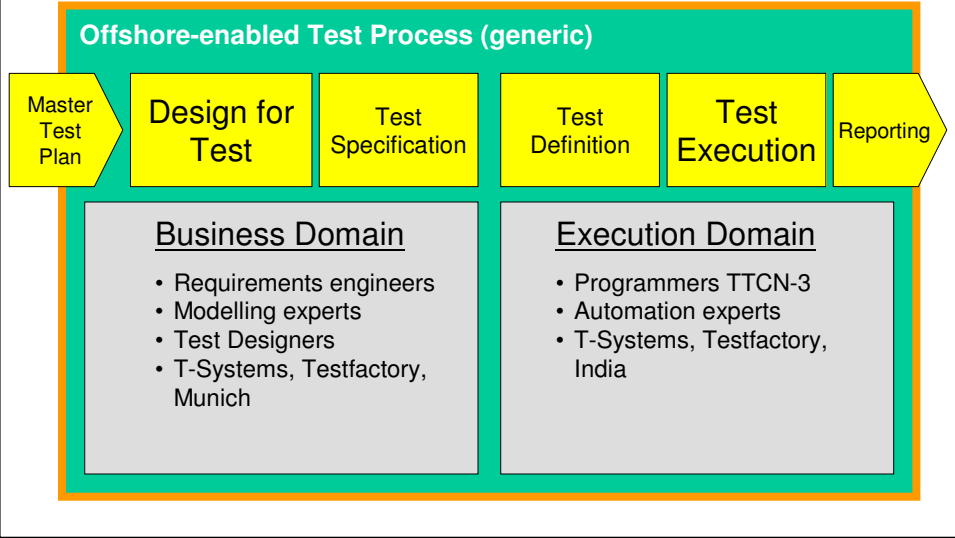
Establish a context for the Test Process



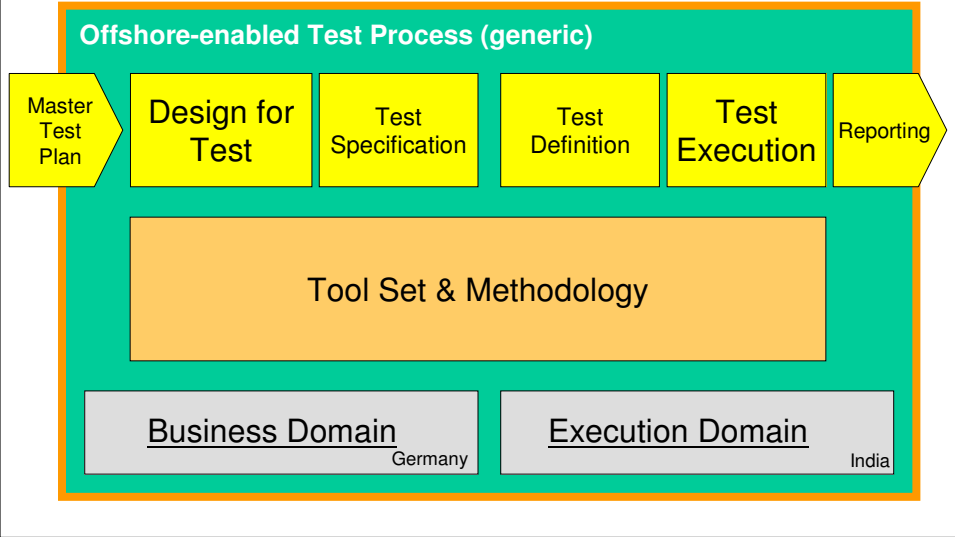
Creating the offshore-enabled Test Process



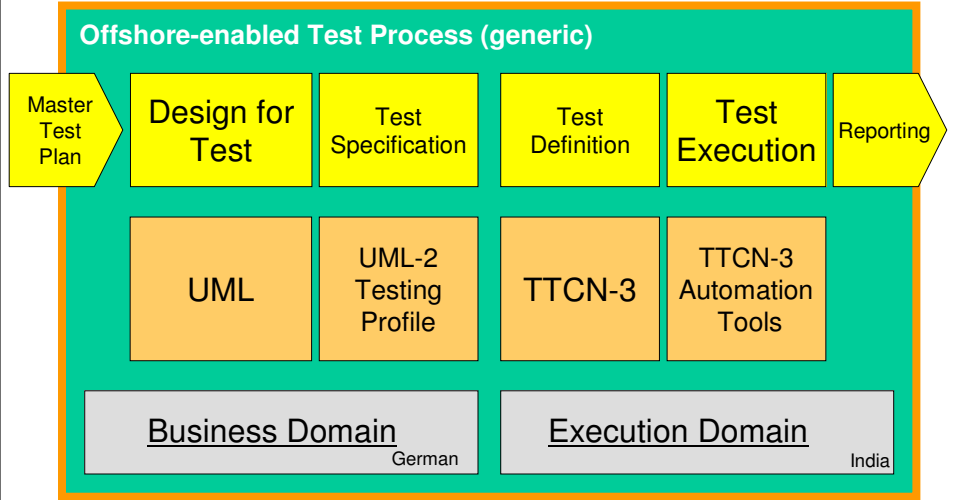
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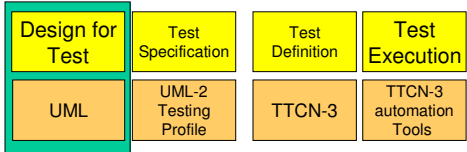
Supporting the Test Process with a Tool Set



Elements of the Tool Set

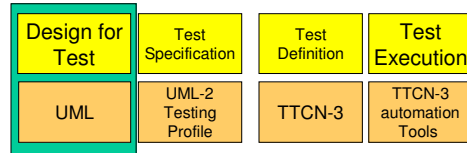


Overall approach:
Our objective



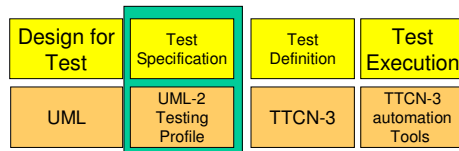
- Establish a tool set that combines UML and TTCN-3 notations to obtain a systematic method for implementing an offshore-enabled test process for automated testing.

Overall approach: Design for Test



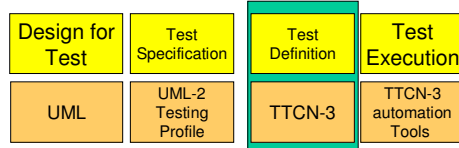
- Start with „Design for Test“ using UML.
- Analyse the Test Basis (e.g. business requirements) and capture as:
 - Use Case Diagrams
 - Sequence Diagrams
 - Class Diagrams
- Use a mix of english description and application-specific elements in german.

Overall approach: Test specification



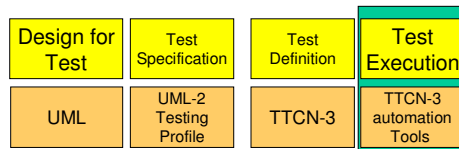
- Take over the UML diagrams and extend for test purposes using UML-2 Testing Profile (U2TP).
- The result is a Test Model (Test Specification) containing information about the System under Test (SUT) and each test case.
- The Test Model is used for
 - Test Definition (automated testing)
 - Test Execution (manual testing)

Overall approach: Test definition



- Test definition takes place if an automatic test execution is required.
- Take over the U2TP-Models for each test case and implement (code) in TTCN-3.
- Predefined mapping rules to link U2TP Model to TTCN-3.

Overall approach: Test execution



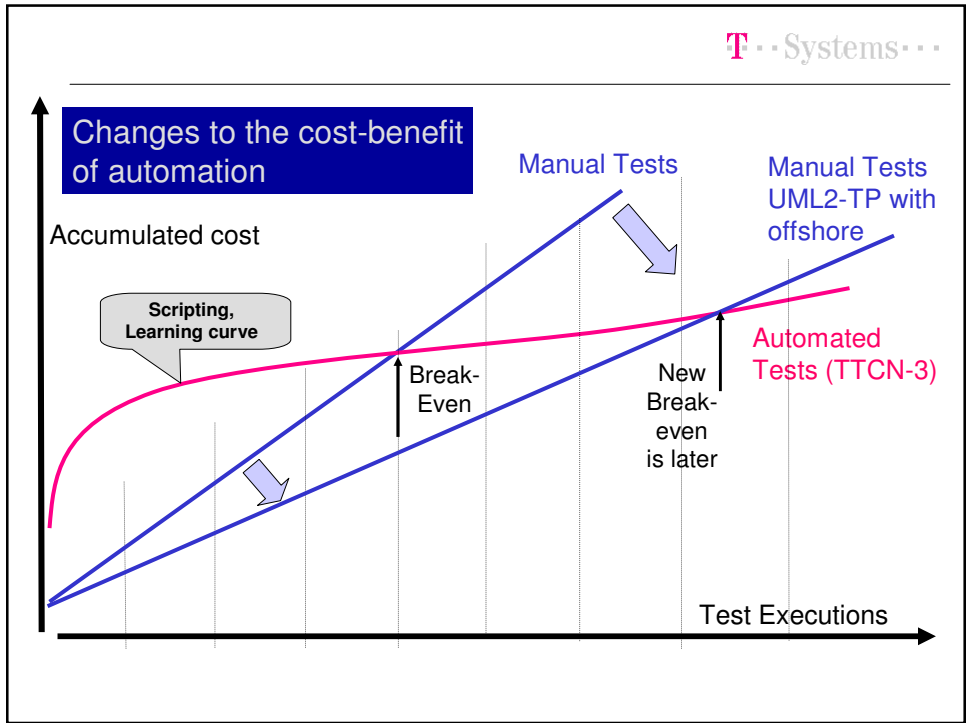
- Manual strategy
 - The Test Model (U2TP) and UML-documents are the basis for test execution.
 - Execution on-shore or off-shore depends on the language used in the documentation.
- Automated strategy
 - Use TTCN-3 automation tools
 - Off-shore enabled!

What we found

- The design stage prior to using TTCN-3 is critical.
- For the type of tests we do at the Testfactory, it is not enough to use TTCN-3 in isolation.
- TTCN-3 appears to have its strengths at lower test levels (component tests, component integration tests).
- UML2-TP is a good way to design high level tests,
- The manual implementation of TTCN-3 on the basis of UML2-TP works well, but could be more efficient with tool support (the non-commercial tools which we used were not good enough for our needs.)

Consequences on the test process

- A test process can be defined in which TTCN-3 is an integral element.
- A mix of manual and automated testing strategies is recommended.
- Benefits of automation with TTCN-3 appear to be more at lower level tests. These tests can, however, be provided to developers by the testing organisation as a basis for daily builds.
- UML2-TP can provide a good basis for manual testing off-shore. The break even curve for implementing automatic tests with TTCN-3 has shifted back!



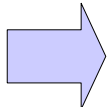
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Specifically:



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- Focus offshore projects

Generically:



- Where could TTCN-3 fit into the big picture?
- What role could TTCN-3 play in improving the test process?

Where does TTCN-3 „fit“

- We need a model of a test process
- The TPI-Model is the one we use
 - The TPI-Model is a registered trademark of Sogeti Netherland B.V.
 - The model is based on the practical experiences of testers

TPI-Model: Key Areas

Life Cycle

- Life Cycle Model
- Moment of Involvement
- Test Strategy

Organisation

- Test Process Management
- Testware Management
- Organisation
- Evaluation
- Defect Management
- Reporting
- Communication
- Scope of Methodology
- Commitment & Motivation
- Testing Functions & Training

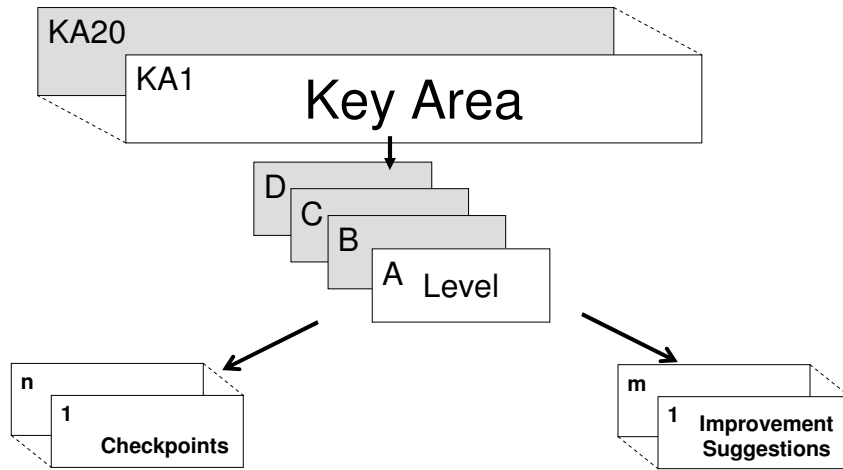
Techniques

- Estimating & Planning
- Test Specification Techniques
- Static Test Techniques
- Low-Level-Testing
- Metrics

Infrastructure

- Test Tools
- Office Environment
- Test Environment

Structure of the TPI-Model.



The TPI-Matrix: All Key Areas - all Levels

Key Area	Increasing maturity →									
Test Strategy	A				B			C	D	
Life-Cycle Model	A			B						
Moment of involvement		A			B			C	D	
Estimating and Planning			A					B		
Test specification techniques	A		B							
Static test techniques				A	B					
Metrics					A		B		C	D
Test Tools				A		B		C		
Test Environment				A		B				C
Office Environment				A						
Commitment and motivation	A				B				C	
Test functions and training				A		B		C		
Scope of Methodology				A				B		C
Communication		A		B					C	
Reporting	A			B		C			D	
Defect Management	A				B	C				
Testware Management		A			B			C		
Test Process Management	A		B							C
Evaluation					A		B			
Low-Level Testing				A	B	C				

Example

Required test maturity for the organisation

Kerngebiet	Controlled			Efficient			Optimising		
1 Teststrategie	A			B			C		D
2 Phasenmodell	A		B						
3 Zeitpunkt der Beteiligung		A		B			C		D
4 Schätzung und Planung			A				B		
5 Testfallermittlungsmethode	A	B							
6 Statische Testmethodik			A	B					
7 Metriken				A	B		C		D
8 Testtools			A	B			C		
9 Testumgebung		A		B					C
10 Testarbeitsplatz		A							
11 Engagement und Motivation	A			B				C	
12 Testfunktion und Ausbildung			A	B			C		
13 Reichweite der Methodik			A				B		C
14 Kommunikation		A	B					C	
15 Berichtswesen	A		B	C				D	
16 Fehlermanagement	A			B	C				
17 Testwaremanagement		A		B			C		D
18 Testprozessmanagement	A	B					C		
19 Prüfung				A			B		
20 Low-Level Testing			A	B	C				
21 Integration			A	B	C				

Example: Results

Target achieved

Need for improvement

Main problem areas

Kerngebiet	Controlled			Efficient			Optimising		
1 Teststrategie	A			B			C		D
2 Phasenmodell	A		B						
3 Zeitpunkt der Beteiligung		A		B			C		D
4 Schätzung und Planung			A				B		
5 Testfallermittlungsmethode	A	B							
6 Statische Testmethodik			A	B					
7 Metriken				A	B		C		D
8 Testtools			A	B			C		
9 Testumgebung		A		B					C
10 Testarbeitsplatz		A							
11 Unterstützung und Motivation	A			B				C	
12 Testfunktion und Ausbildung			A	B			C		
13 Reichweite der Methodik			A				B		C
14 Kommunikation		A	B					C	
15 Berichtswesen	A		B	C				D	
16 Fehlermanagement	A			B	C				
17 Testwaremanagement		A		B			C		D
18 Testprozessmanagement	A	B					C		
19 Prüfung				A			B		
20 Low-Level Testing			A	B	C				
21 Integration			A	B	C				

Influence of TTCN-3 on Test Process Improvement

Key Area	Increasing maturity →															
Test Strategy	A					B					C				D	
Life-Cycle Model	A			B												
Moment of involvement		A				B					C				D	
Estimating and Planning			A								B					
Test specification techniques	A		B													
Static test techniques				A		B										
Metrics					A		B				C				D	
Test Tools					A		B				C					
Test Environment				A		B										C
Office Environment				A												
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Reporting	A				B		C								D	
Defect Management	A					B		C								
Testware Management			A			B						C				
Test Process Management	A		B													C
Evaluation							A		B							
Low-Level Testing					A		B		C							

Using TTCN-3 will help achieve these testing maturity levels

Influence of TTCN-3 on improving Test Strategy

- Mature test strategies include specific strategies for a number of testing issues, including regression testing.
- The use of TTCN-3 can be considered to be an „enabling“ technology for modern, mature regression testing strategies.
- In particular, TTCN-3 enables daily builds to be implemented for development staff and can strengthen the co-operation between tester and developer.

Influence of TTCN-3 on improving Test Specifications

- More mature test processes require that test specifications are made reusable within the test team by means of a uniform working method.
- TTCN-3 implements a „uniform working method” by which several testers can share test specifications.

Influence of TTCN-3 on better Test Tool Use

- More mature test processes require that test tools can be reused for a future test projects.
- Furthermore, the use of a test tool must not result in inefficiency or undesired limitations being placed on the test process.
- TTCN-3 fulfills both of these criteria.

Influence of TTCN-3 on better Low-Level Testing

- More mature test processes require that low-level tests have a recognizable planning, design and execution activities.
- TTCN-3 is an „enabler“ which permits these test process objectives (which are frequently absent!) to be achieved.

Summary of main points

- TTCN-3 has to be seen in the context of an overall test process.
- T-Systems, Testfactory has evaluated how to integrate TTCN-3 into an offshore-enabled test process for high-level tests (further pilot studies are planned).
- TTCN-3 can be instrumental in improving the test process.
- Specific improvements can be identified within the TPI-model.

