

model centric Testing (.mzT)

Challenges and Solutions in Test Design, Test Management and Test Execution

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Agenda

- ■ TestNGMed project
 - Traditional approach to quality assurance
 - Challenges in the medical domain
 - model centric Testing (.mzT)
 - TestNGMed process and tool chain

- Medium-sized IT service provider
 - More than 28 years experience
 - Our domains
 - Medical
 - Pharmaceutical
 - Automotive
 - Expertise:
complex and safety relevant systems

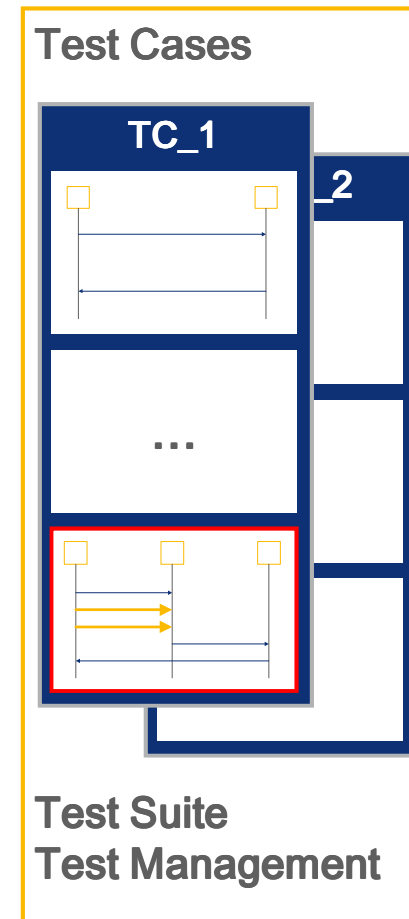


TestNGMed Project

- ■ Test of Next Generation Medical IT
- ProInno / EUREKA-Project Σ! 4053 RETEMES
- Goal:
Tool supported validation and verification for medical IT systems:
 - Test workflows, based on clinical workflows, HL7 and IHE (medical standards)
 - model centric Test-ing using UML profiles
 - Test automation, based on TTCN-3

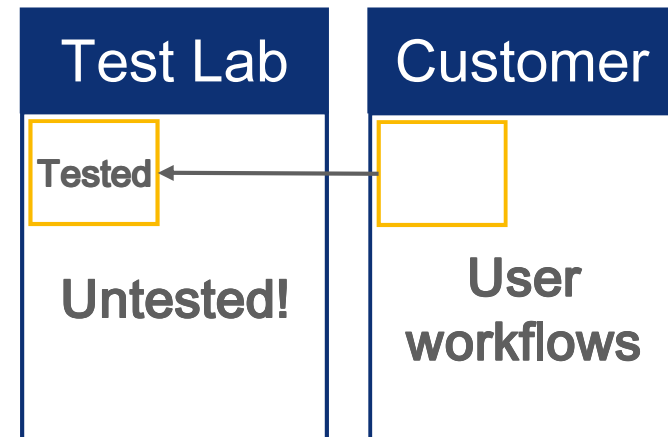
Testing – traditional Approach

- Document based test bed
 - Arbitrary test scenarios
 - Redundancies but no guarantee of completeness
- Challenges
 - Rising complexity
 - Budgets
 - Time to market
 - Maintenance
- Communicability?
- Taxonomy?
- Re-use and maintenance?
- Usage of test/domain standards?
- Automation?



„Test automation always fails“ (in Med)

- Gap between manufacturer and clinical environment
 - Growing
 - Many different stakeholders
- Complexity in clinical environment
 - Heterogenous systems and networks
 - Different vendors and product families
 - Configurations, individual solutions
 - Standards (IHE / HL7) vs. reality
 - Standard conformance and interoperability
- Processes
 - Safety relevance
 - Heavily regulated (FDA, MDD, ...)

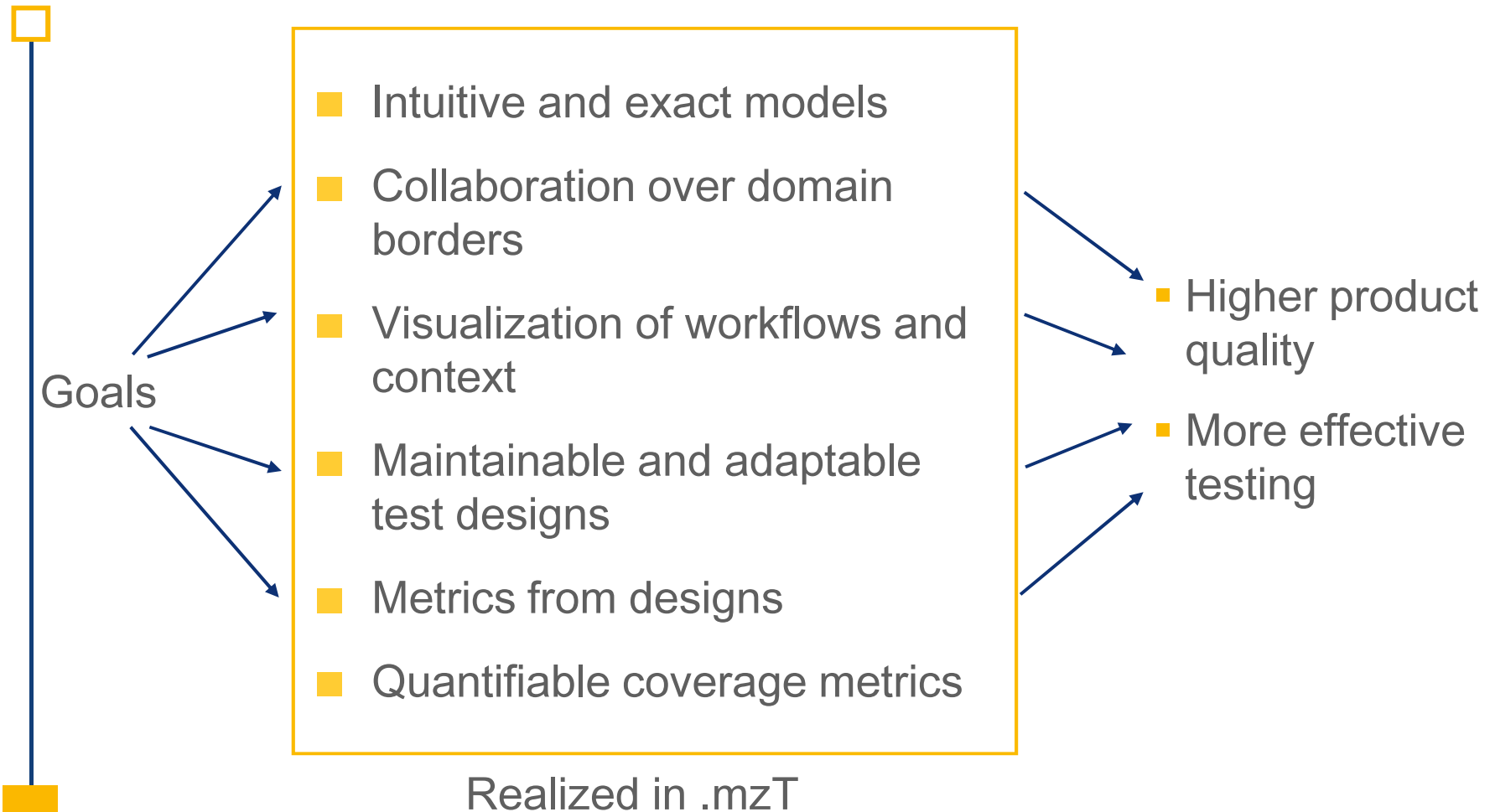


Goals of model centric Test (.mzT*)

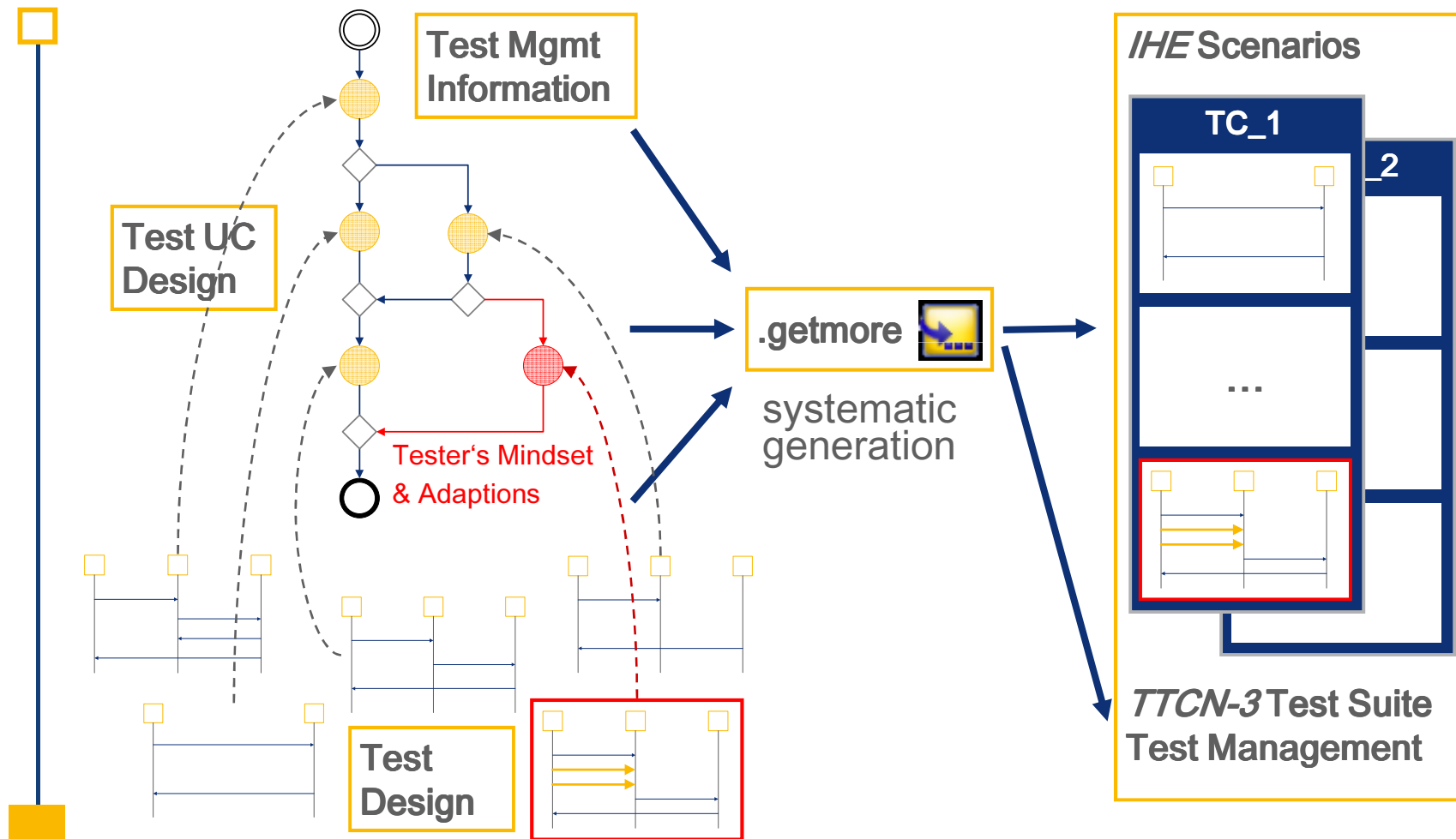
- - Better collaboration and unified documentation
 - Usage oriented tests
 - Metrics
 - Increased efficiency in test execution
 - Process and tool chain for:
 - Modeling of requirements and workflows
 - Automated generation from test models
 - Automated test execution
 - TestNGMed:
 - Using the standards HL7/IHE and TTCN-3/UML

*: from German “modellzentrierter Test”, English: “model centric test”

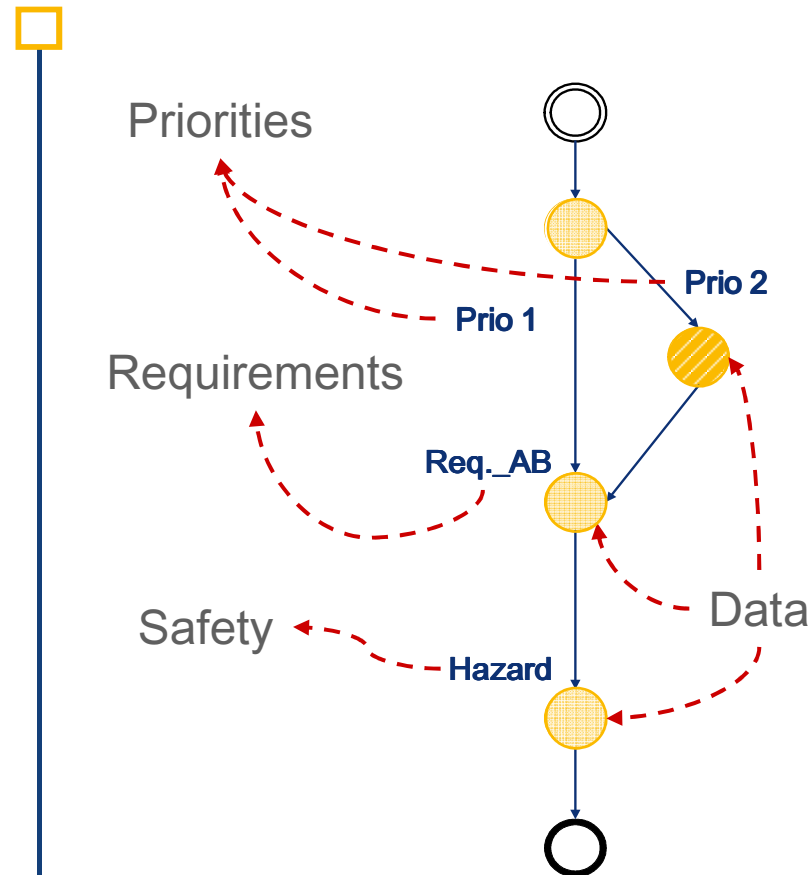
model centric Testing



Test Design & Generation Architecture

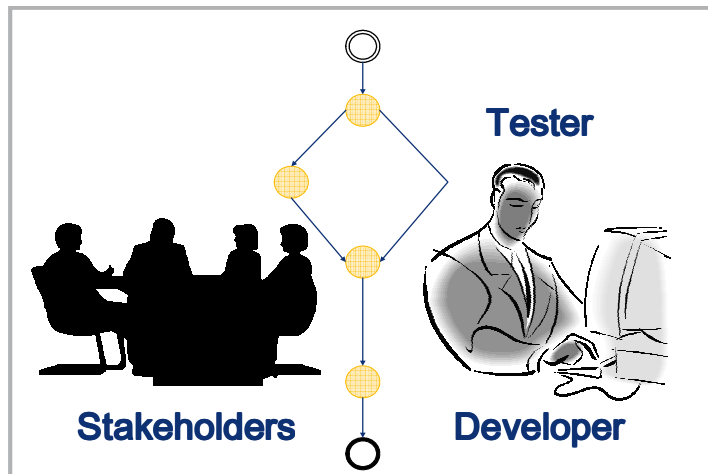


Test model with Management and Tracing Information



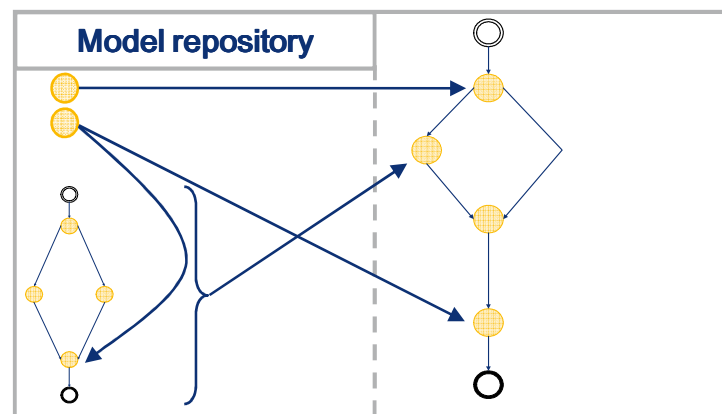
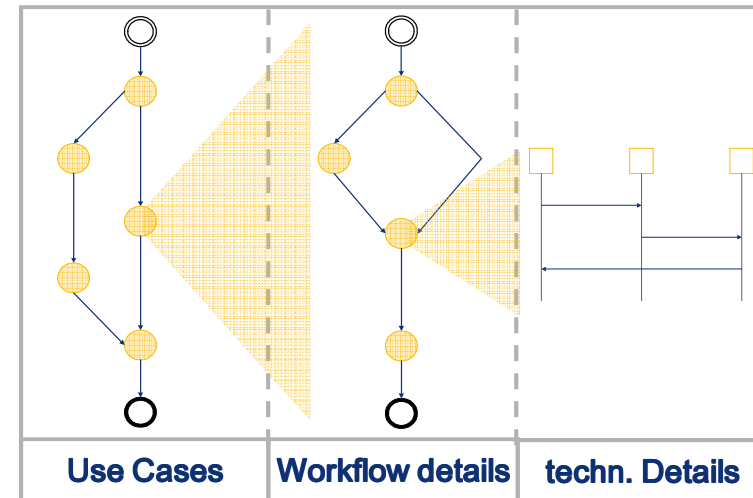
- Visualize relevant information in test designs
- Controlled generation of test cases (coverage, time,...)
- Implementation independent
- Test management in the test design
- Tracing of requirements to test cases
- One repository for all test related data

Features of .mzT



■ Visualization and communication

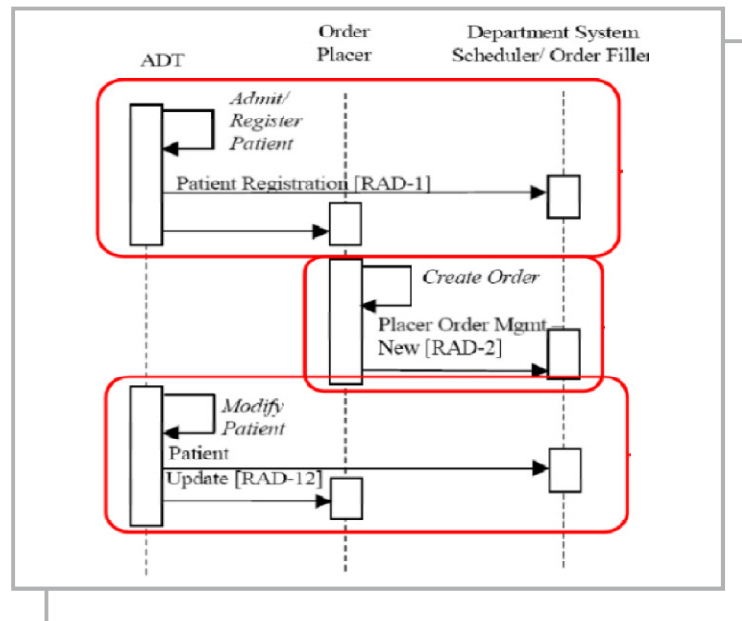
■ Hierarchies and abstraction



■ Reuse and adaptability

IHE Workflow Definitions as Test Basis

■ Basis: IHE Workflows



Actors

- Test systems
- Systems under Test
- Persons / ext. actions

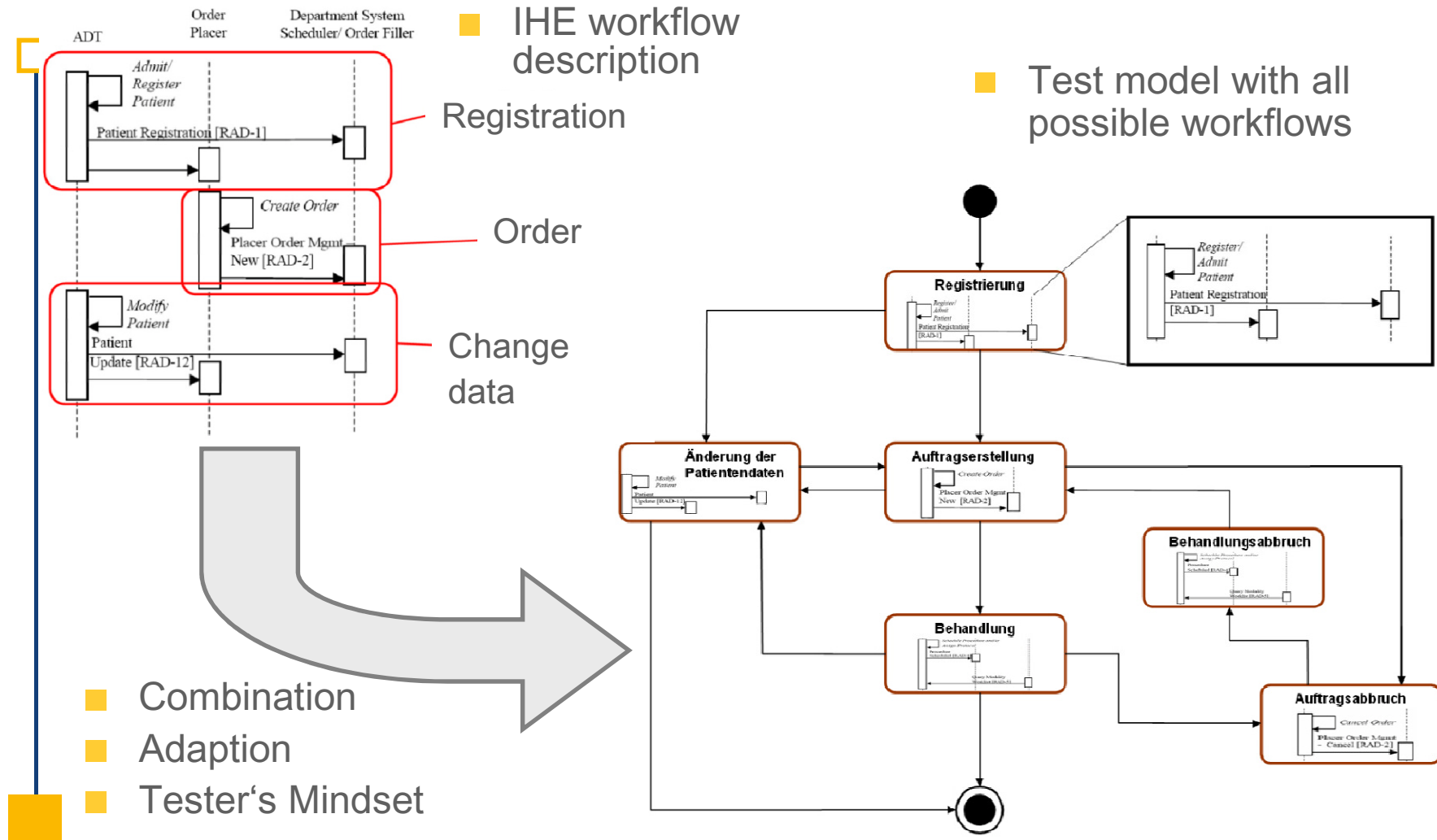
Messages

- HL7
- DICOM
- Generic

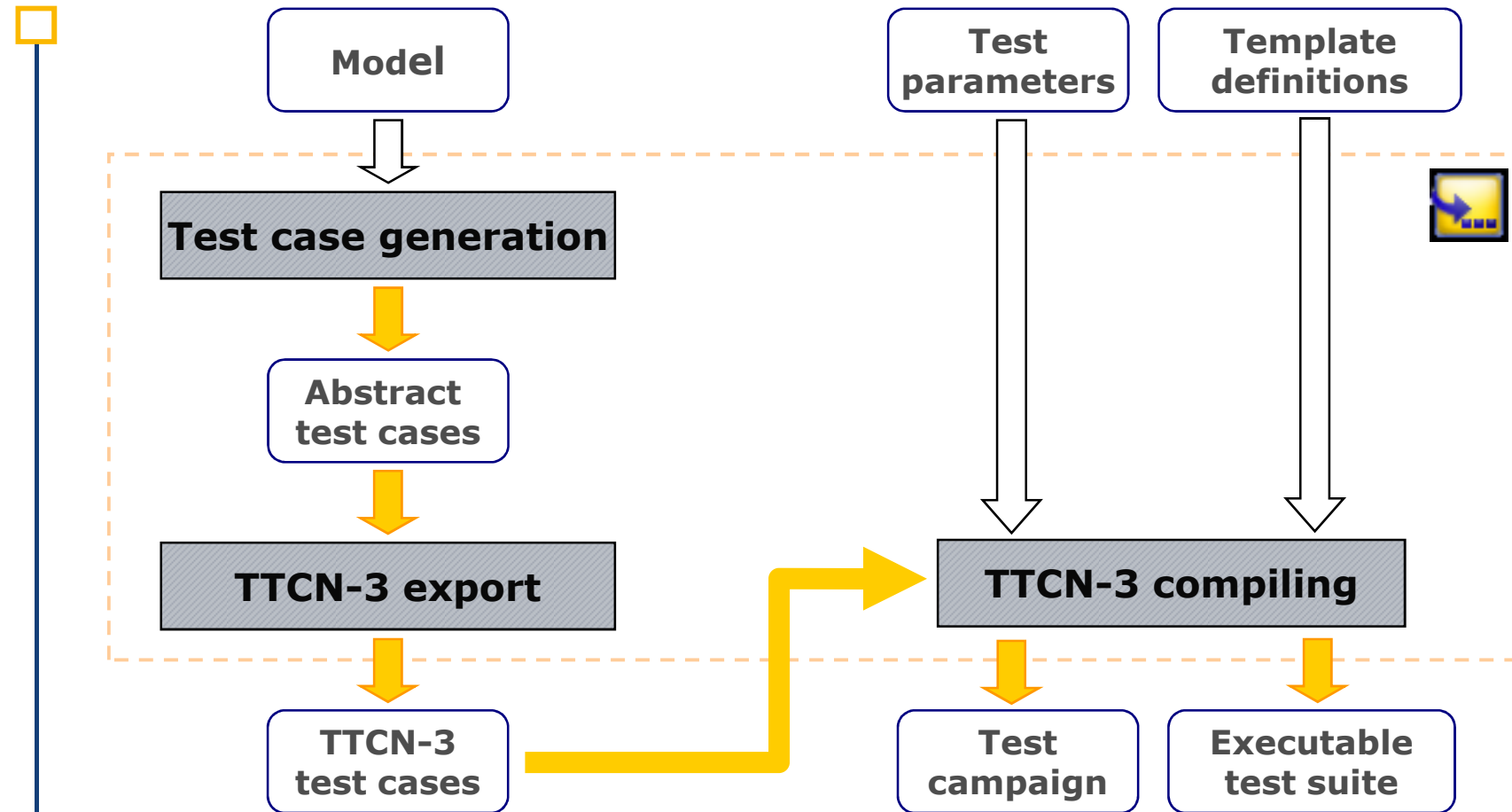
Deficits

- Linear!
- „Good Case“!
- No Tester's Mindset!
- Variations (real world) need specific workflows!
- Only a sample scenario

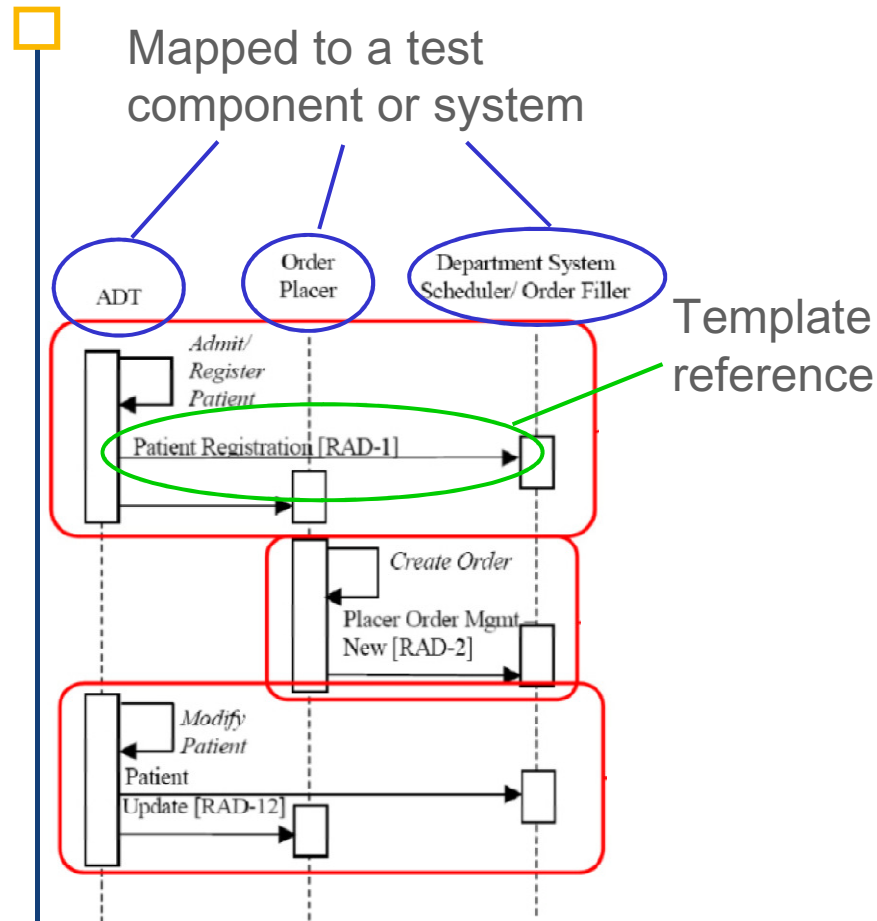
Test Workflow Modeling



TTCN-3 Code Generation

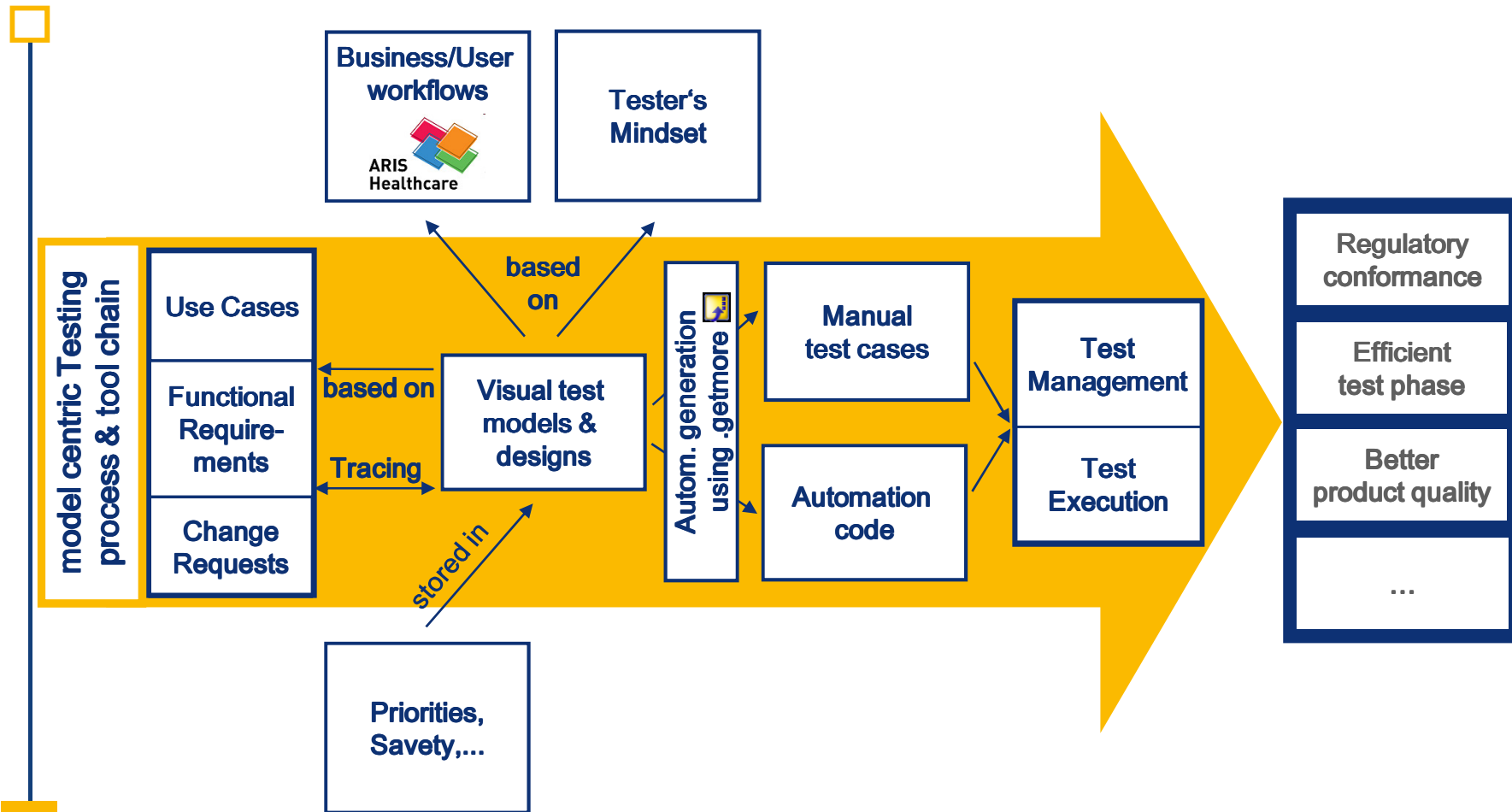


TTCN-3 Code Generation



- Multiple test components
- Multiple SuT
- “Everything talks to everything”
- Different communication protocols concurrently
- Synchronization must be possible
- Data must be manipulated “on the fly” (timestamps...)
- Asynchronous behavior

.mzT: Process and Tool Chain



TestNGMed: model centric Workflow



Usage oriented hierarchical test models

- Med. standards (IHE)
- Efficient maintenance and adaptability
- Economical
- Communicable

Modeling

Test case generation using .getmore

Generation

- TM aspects
- Strategies
- Coverage

Automated generation

SuT

Clinical systems:
KIS, RIS, PACS, modalities

Test procedures

- Test of conformance and interoperability
- System validation and verification

Test Suite

- TTCN-3
- Med. protocol standards HL7/DICOM

Test automation

Test execution using TWorkbench



Thank you for your attention.

Any questions?



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