

Equivalence Checking of Test Case Behavior

Helmut Neukirchen

Philip Makedonski

Jens Grabowski

Benjamin Zeiss

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Software Engineering for Distributed Systems Group
University of Göttingen, Germany

Overview

- Motivation
- Bisimulation
- Approach
- Implementation
- Summary and Outlook

Motivation

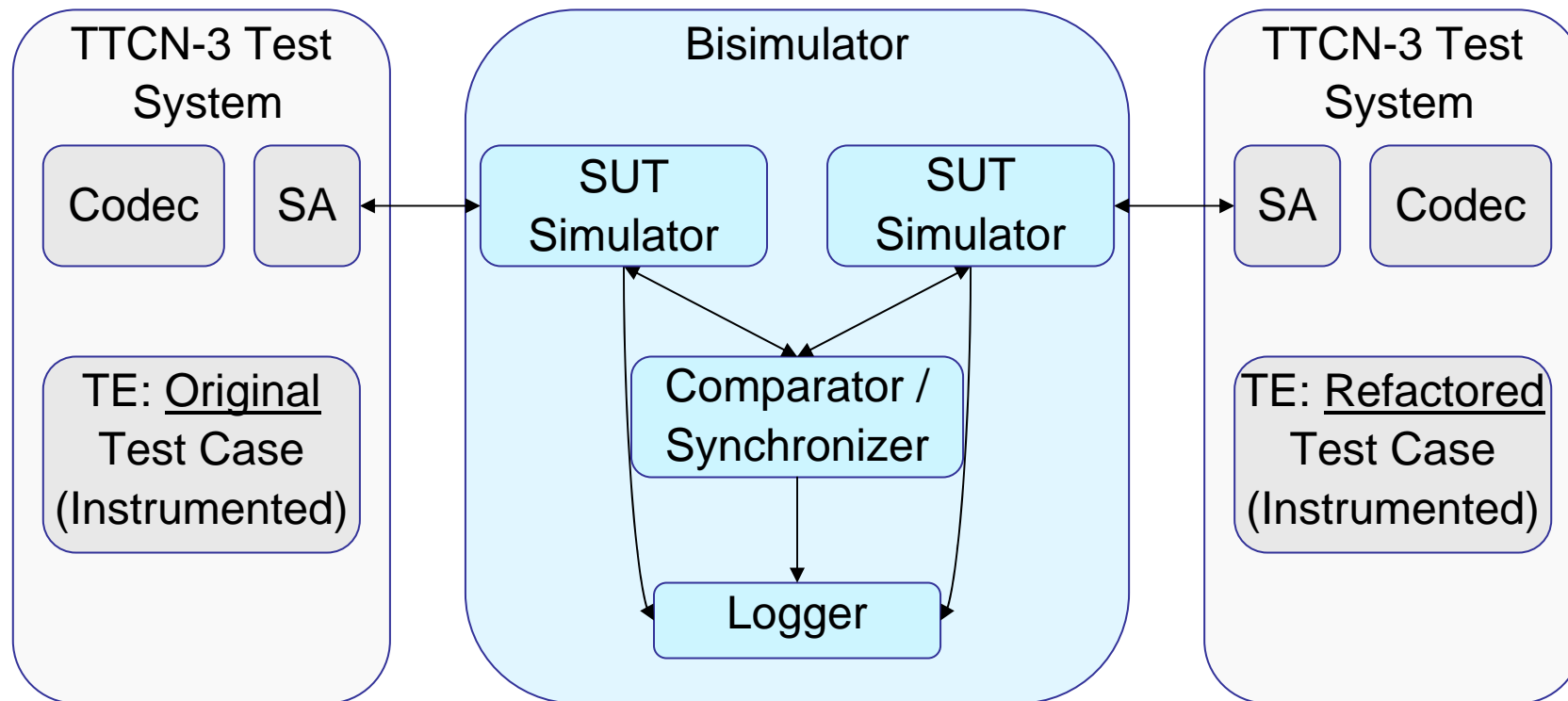
- Code-restructuring and refactoring
 - TTCN-3 refactoring \Rightarrow T3UC 2006
- \Rightarrow Refactoring problems
 - Less-than-perfect tools
 - Often manually applied
 - \Rightarrow Unintended changes to behavior
- \Rightarrow Equivalence checking required
 - Formal equivalence proof
 - Bisimulation

Bisimulation

- Compare observable behavior of two systems
- Bisimulation and TTCN-3?
 - Various bisimulation tools available,
 - Few supporting distributed systems: e.g. CADP
 - None supporting TTCN-3
- Problem: distributed systems \Rightarrow state space explosion
- Solution: incremental bisimulation on the fly

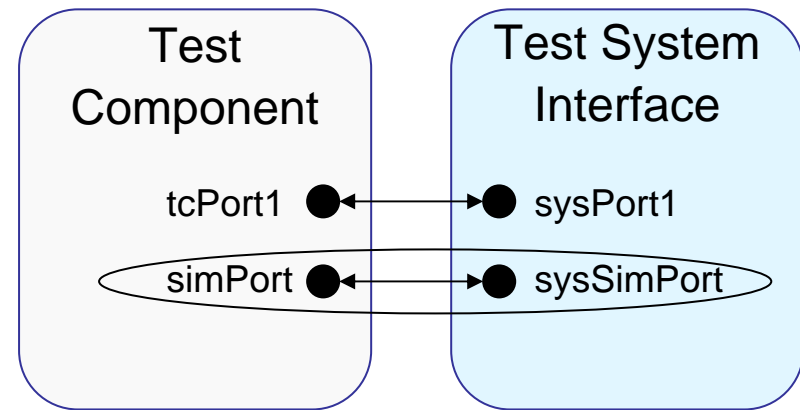
Bisimulation Approach

- Exhaustive simulation environment needed
- ⇒ Use existing TTCN-3 environment and simulate SUT instead

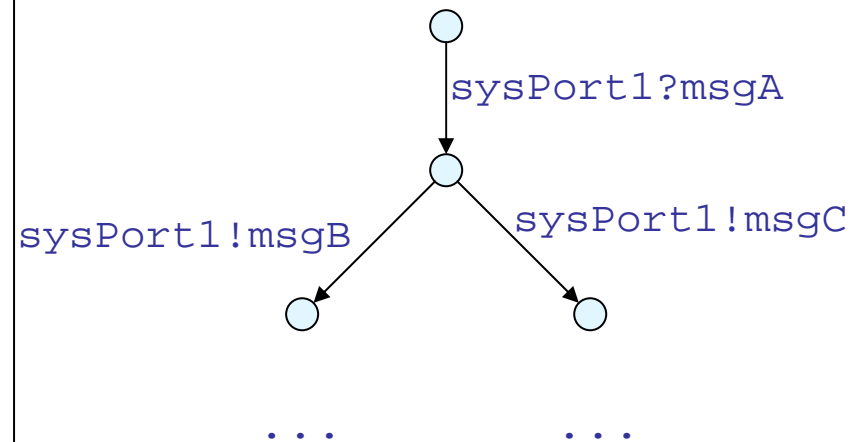


Example – Instrumentation and Simulation

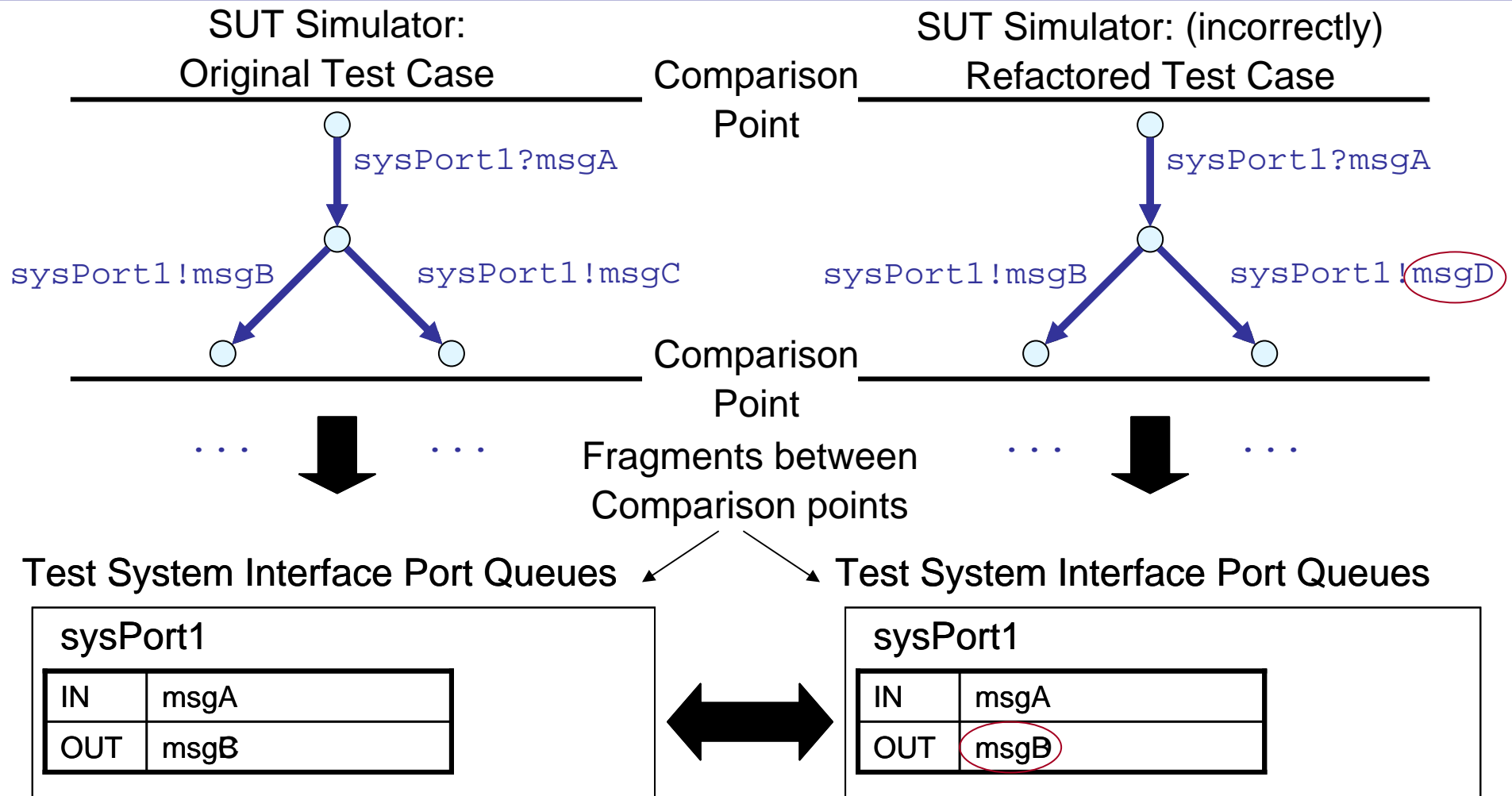
```
tcPort1.send(msgA);  
  
//instrumentation start  
  
simPort.send(msgB);  
simPort.send("expPort = tcPort1");  
  
simPort.send(msgC);  
simPort.send("expPort = tcPort1");  
  
simPort.send("tcBlocked = true");  
  
//instrumentation end  
  
alt{  
    [] tcPort1.receive(msgB){  
        ...  
    }  
    [] tcPort1.receive(msgC){  
        ...  
    }  
}
```



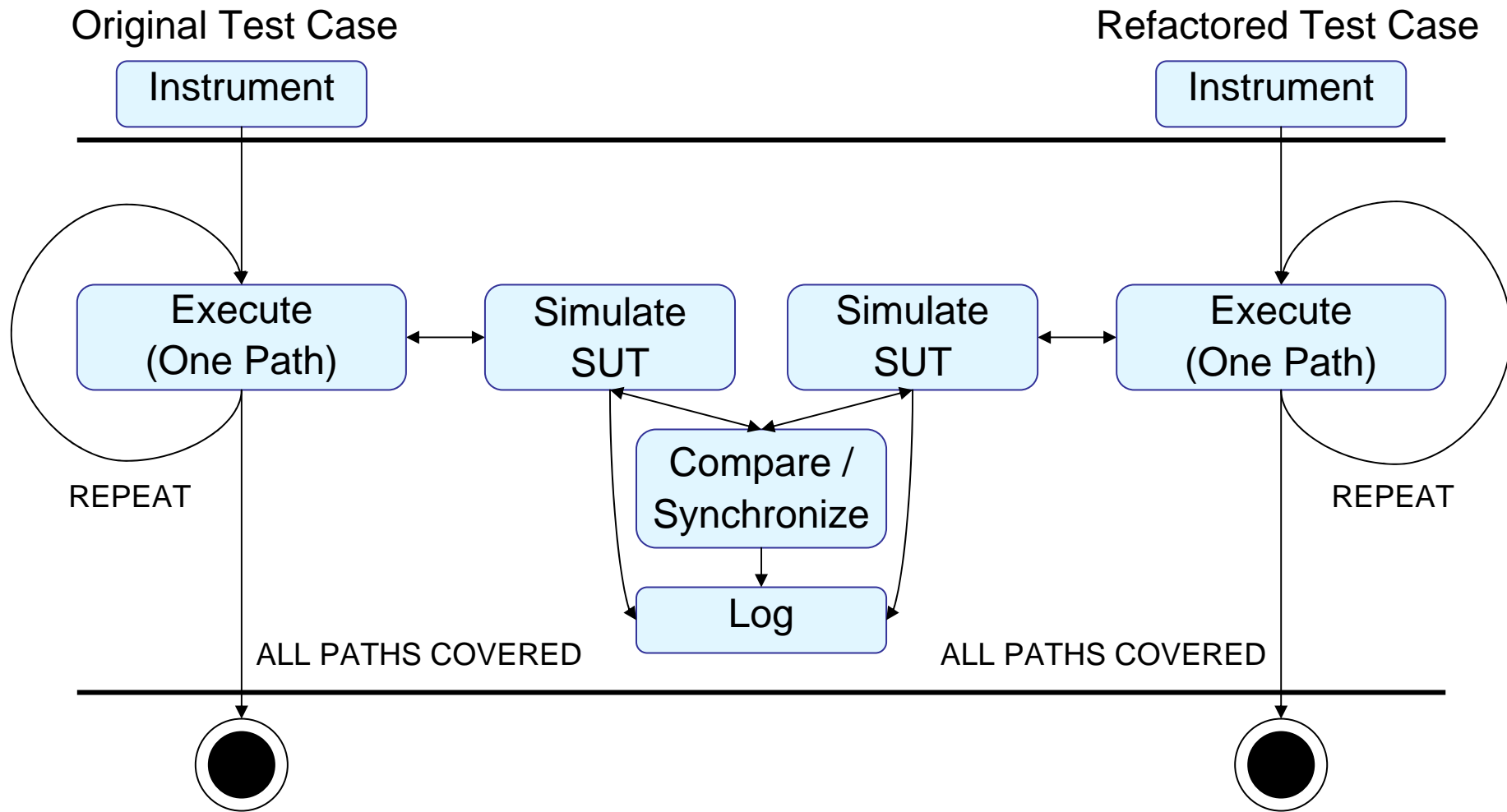
SUT Simulator Behavior



Example – Comparison



Bisimulation Approach - Workflow



Implementation

- Both test systems realized with TTWorkbench
- Modular client/server architecture
- Instrumentation using TRex infrastructure
- Status
 - Simulation environment and comparison module established
 - Refinements still ongoing

Summary and Outlook

- Summary
 - Approach for validating refactored TTCN-3 test cases
 - Versatile simulation environment
 - On-the-fly equivalence checking
 - Prototypical implementation
- Outlook
 - Finalizing implementation
 - Case studies on industrial-size test suites
 - Alternative approach for ETSI STF 343 (TTCN-3 tool validation)

Thank you for your attention!

Software Engineering for Distributed Systems Group
University of Göttingen, Germany
<http://www.swe.informatik.uni-goettingen.de/>

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