

# Testing NoTA Interconnect R3 via H\_IN interface

A model-based automated  
test design approach

Conformiq Software



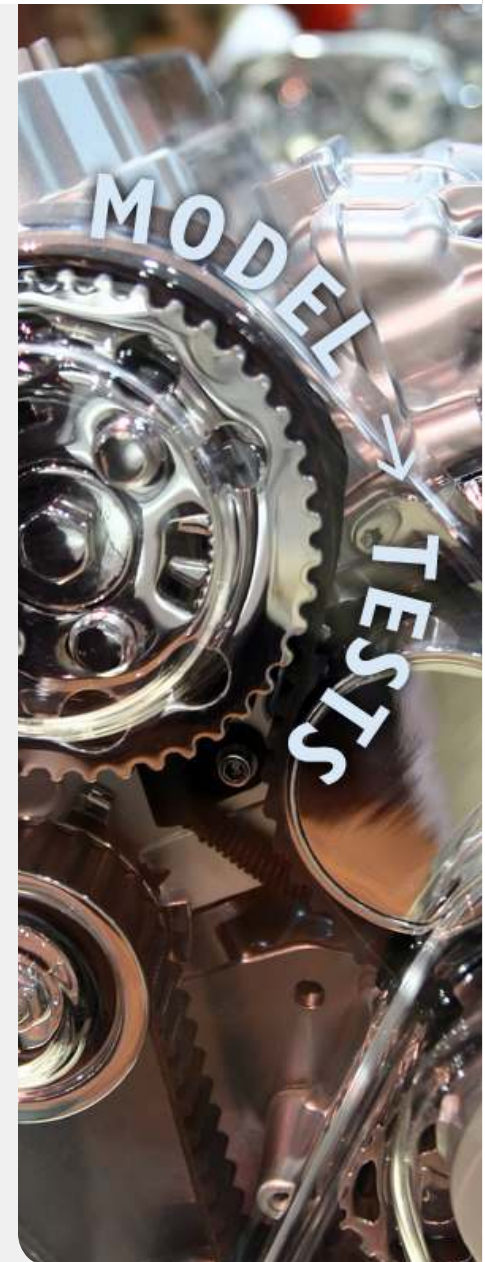
## Objectives

- Test NoTA interconnect R3 on Linux through H-IN interface
- Deliver high-quality testing and documentation assets i.e. executable test cases, test plan and system model in a limited time frame



## Results

- In a 1.5 month Conformiq Software
  - Created a system **model** with 3 instances of NoTA Interconnect R3
  - Created a **test harness** to run the tests
  - **Automatically** generated **191 test cases** using **Conformiq Qtronic™**
  - **Tested NoTA Interconnect** by running the generated tests
- Great results in a short time
  - Our independent validation spotted gaps in both documentation and reference implementation
  - Significantly improved quality of NoTA R3 release



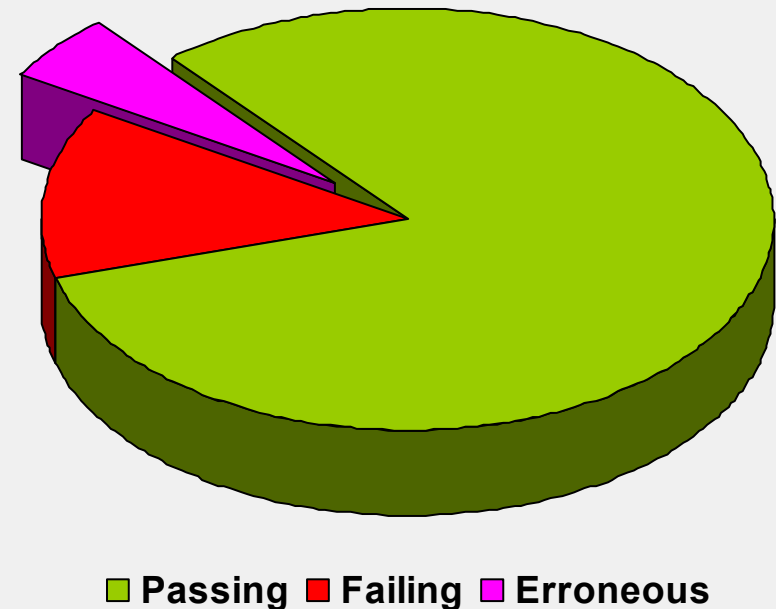
# First Test Execution Report

- Release: 20080527A
- Tests: 92 tests generated using Conformiq Qtronic
  - 25 pass
  - **64 fail**
    - 4 high-priority problems
    - 9 bad error code situations
    - 4 other obvious anomalies
  - 3 erroneous, fail after fixing by hand



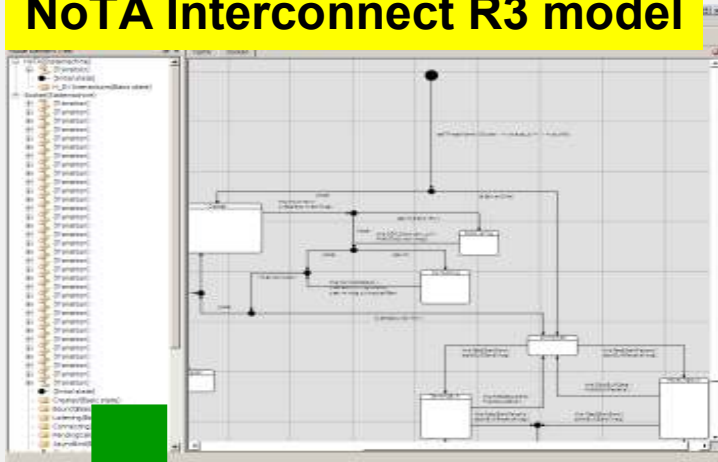
# Final Test Execution Report

- Release: 20080605-284
- Tests: 191 tests generated using Conformiq Qtronic (More test cases due to extended functionality)
  - 158 pass
  - **17 fail**
    - 3 different Hselect-related
    - 4 distinct error code scenarios
    - infrequent L-IN failures
  - 16 erroneous; all but one attributable to Hselect

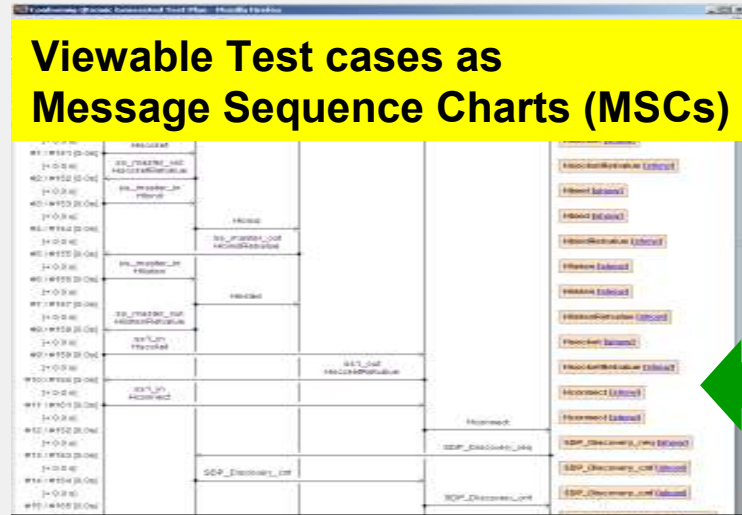


# NoTA Interconnect Testing Workflow

NoTA Interconnect R3 model



Viewable Test cases as Message Sequence Charts (MSCs)

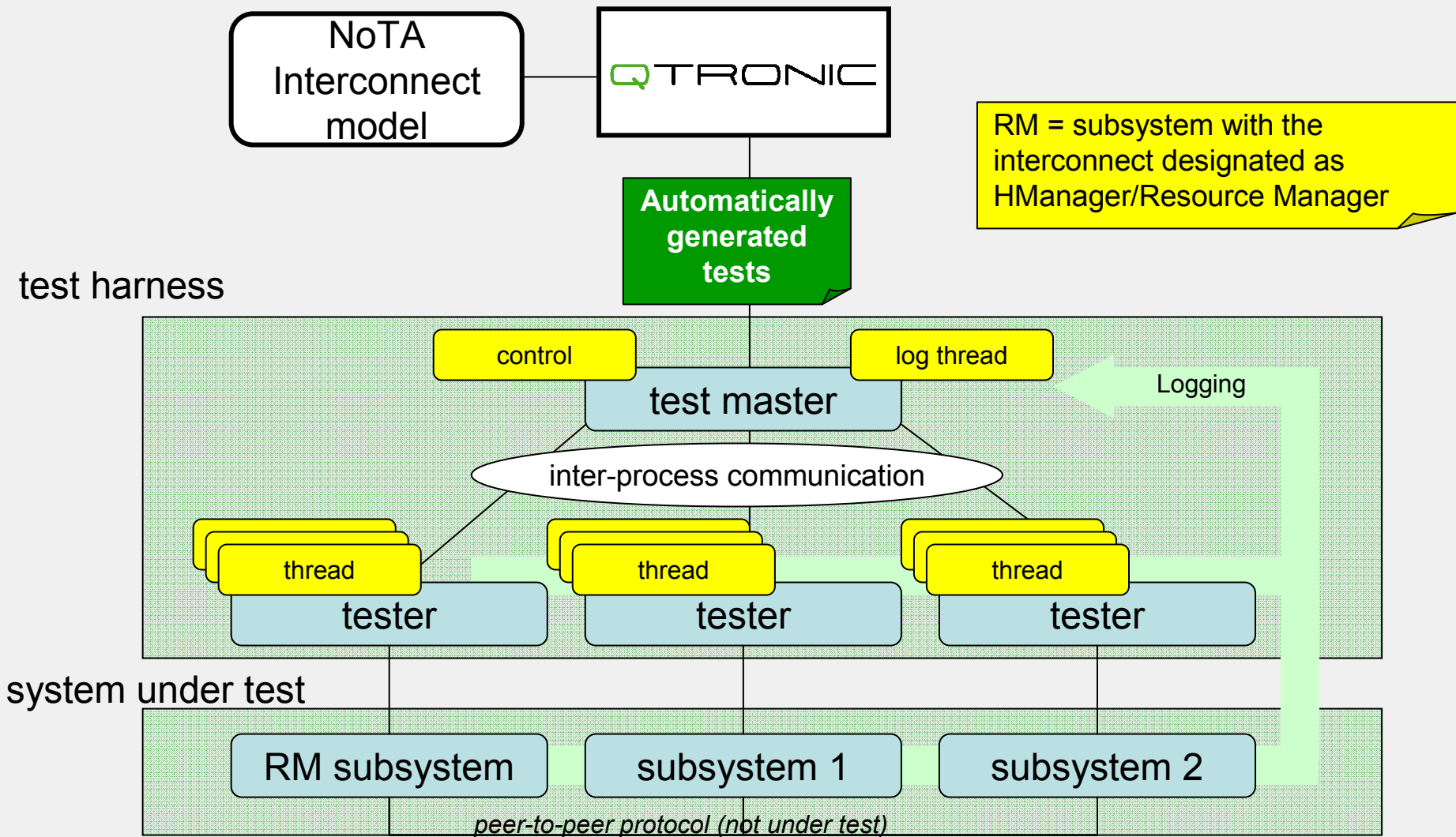


Automatic test generation

Executable test cases in C

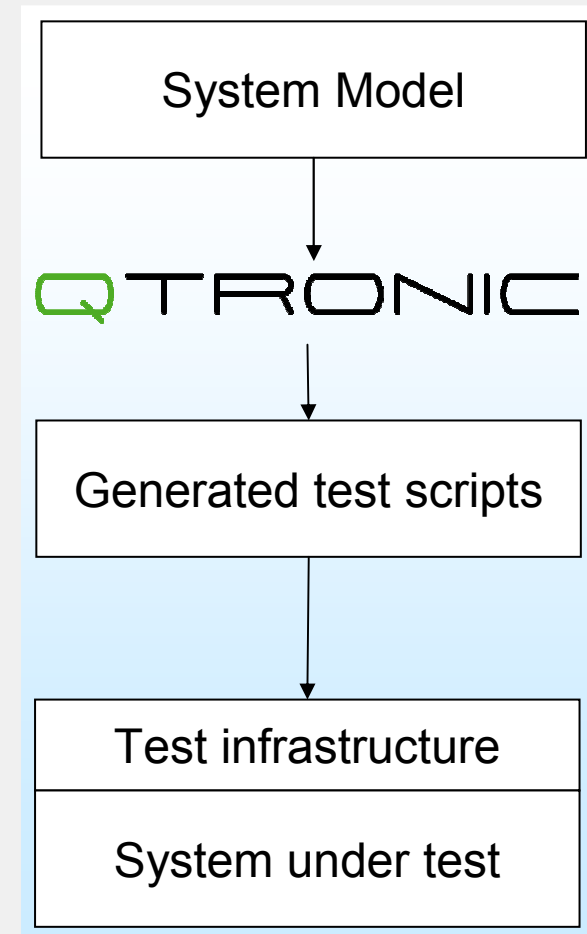
```
TEST_CASE
{
    TestInput(ss_master_in, Hsocket(0));
    TestOutput(ss_master_out, HsocketRetvalue(0, 0, "OK"));
    TestInput(ss_master_in, Hbind(0, 0, 1001, 0));
    TestOutput(ss_master_out, HbindRetvalue(0, "OK"));
    TestInput(ss_master_in, Hlisten(0, 0));
    TestOutput(ss_master_out, HlistenRetvalue(0, "OK"));
    TestInput(ss1_in, Hsocket(0));
    TestOutput(ss1_out, HsocketRetvalue(0, 0, "OK"));
    TestInput(ss1_in, Hconnect(0, 0, 1001, 0));
    TestInput(ss_master_in, Hlisten(0, 0));
    TestOutput(ss_master_out, HlistenRetvalue(0, "OK"));
    TestInput(ss_master_in, Hsocket(0));
    TestOutput(ss_master_out, HsocketRetvalue(0, 1, "OK"));
    TestInput(ss_master_in, Haccept(0, 0));
    TestOutput(ss_master_out, HacceptRetvalue(0, 2, "OK"));
    TestOutput(ss1_out, HconnectRetvalue(0, "OK"));
    TEST_CASE_POSTAMBLES;
}
```

# NoTA Interconnect Test Architecture



# Conformiq Qtronic - Automated Test Design Approach

- Testing Goals
  - Desired requirements and features coverage
  - Requirements and features traceability
  - Positive and negative testing
  - Easy to maintain and extend test cases
  - Repeatability of complex testing scenarios
- Implementation
  - Model the system “as envisioned”
  - Let Conformiq Qtronic generate test cases
  - Create fully automatic test execution bench
  - Develop model incrementally, benefiting from test automation during development process



## Extending the Approach within NoTA

- Peer-to-peer protocol testing
  - Model and test a NoTA subsystem via both BSD socket API and the **peer-to-peer interface**
- Application testing
  - Extract a standard model out of the peer-to-peer model, on top of which an **application model** can be integrated
  - Full end-to-end testing of **applications** via the peer-protocol interface, verifying
    - application implementation
    - NoTA subsystem implementation

**For more information, comments  
or questions please contact**

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