



**NAVTEL COMMUNICATIONS**  
*The Future of Network Testing*

## TTCN Case Study - InterWatch

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# Navtel Overview

- ♥ Navtel provides network operators and equipment manufacturers with a variety of test solutions on its InterWatch platform
  
- ♥ InterWatch Features
  - > Control and data-plane testing over a number of interface types
  - > Rack-mount and portable configurations
  - > Testing for Voice over IP, SS7, UMTS 3G Wireless, G.MPLS, ATM and IP technologies

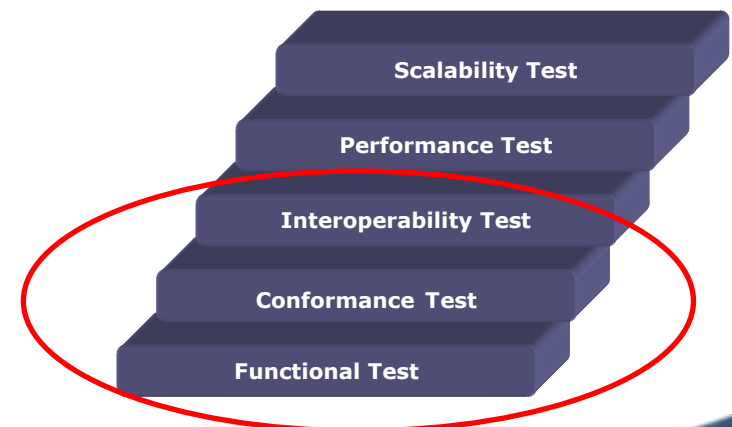


**InterWatch  
Performance  
and Verification  
System**



## TTCN's Fit into Navtel's Test Methodology

- ❖ Navtel's progressive test methodology includes functional, conformance, interoperability, performance and scalability testing.
- ❖ TTCN is used by Navtel to implement functional, conformance and interoperability testing.





## Why Does Navtel Use TTCN?

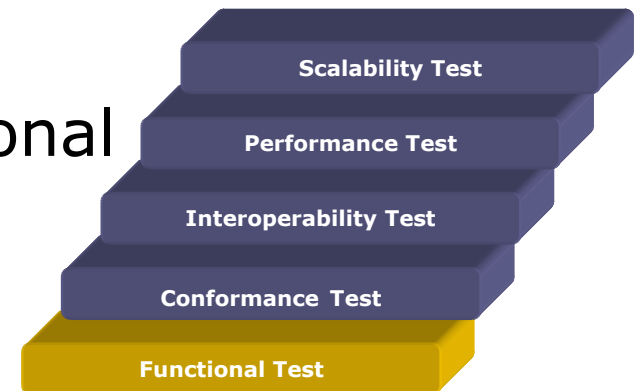
- ❖ TTCN has advantages over other development languages (C++/Java)
  - > Structured, maintainable, readable code
  - > Specially suited to test suites
  - > Less development time, faster time to market for Navtel's test suites
    - faster to market for our customers' products
  - > Common infrastructure can be re-used between protocols
    - TTCN functions and protocol stack PCOs





# Functional Testing

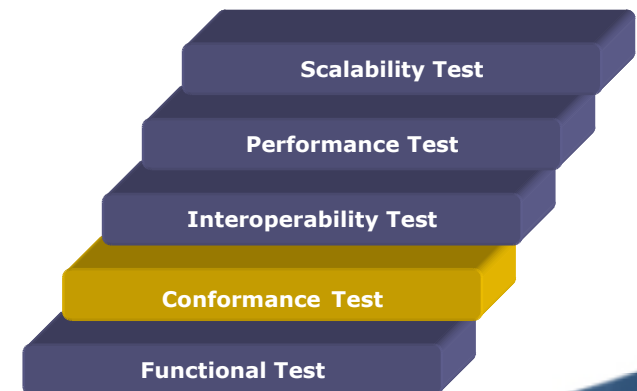
- ☛ Testing the functional requirements of a protocol implementation or service
- ☛ Much easier to work with than Tcl for protocol testing
  - > Encoding/Decoding of messages
  - > Timer implementation
  - > Test case structure
- ☛ TTCN provides an easy to implement, reproducible and automated test suite for functional testing





# TTCN Conformance Testing

- ❖ TTCN Allows Navtel to write canned test suites for Conformance and InterWorking
  - > Tests are based entirely on standards' "MUST and SHALL" requirements
    - Every MUST has a test case to verify compliance to the clause
  - > Executable TTCN test suites sold in a non-editable form, providing automated conformance verification by an independent third party to equipment vendors and network operators
  - > Without conformance, interoperability with other vendors is highly unlikely





# TTCN Conformance Testing

## Test Purpose:

Verify that the IUT will respond with a ServiceChangeReply, with the ServiceChangeMGCIId set to itself, upon receiving a ServiceChange command with a "Restart" method on the ROOT termination.

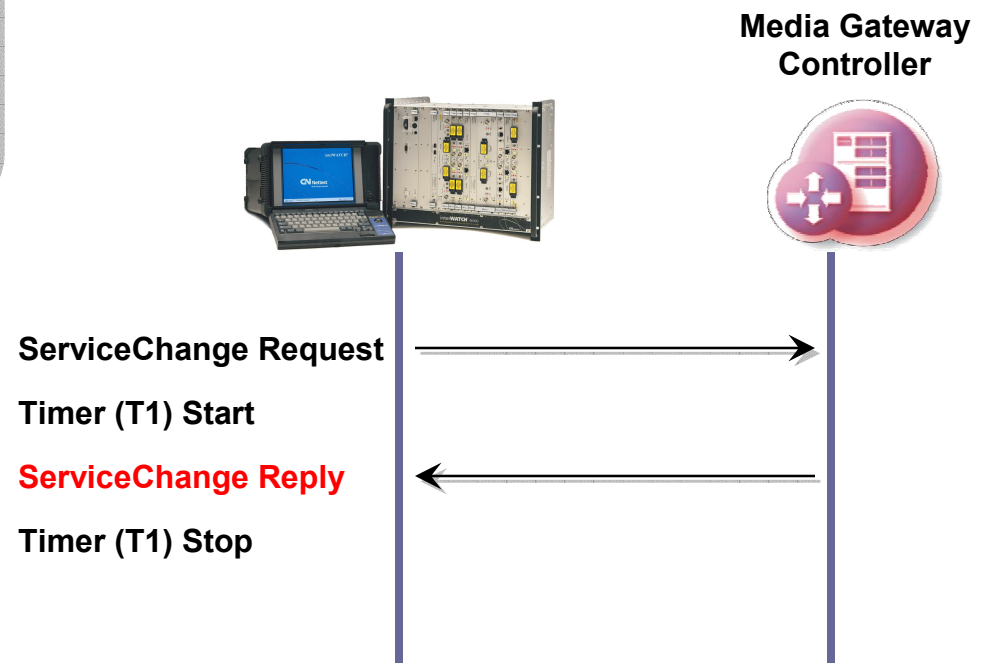
Reference: RFC 3015 – Section 11.2

## Log Information:

TC_x_x	Execution Starting	01/01/80 12:50
TC_x_x	Wrong Packet	01/01/80 12:50
TC_x_x	Final Verdict	01/01/80 12:50
TC_x_x	Execution Ending	01/01/80 12:50

 FAILED

- Navtel uses TTCN as a tool for the implementation of conformance test suites





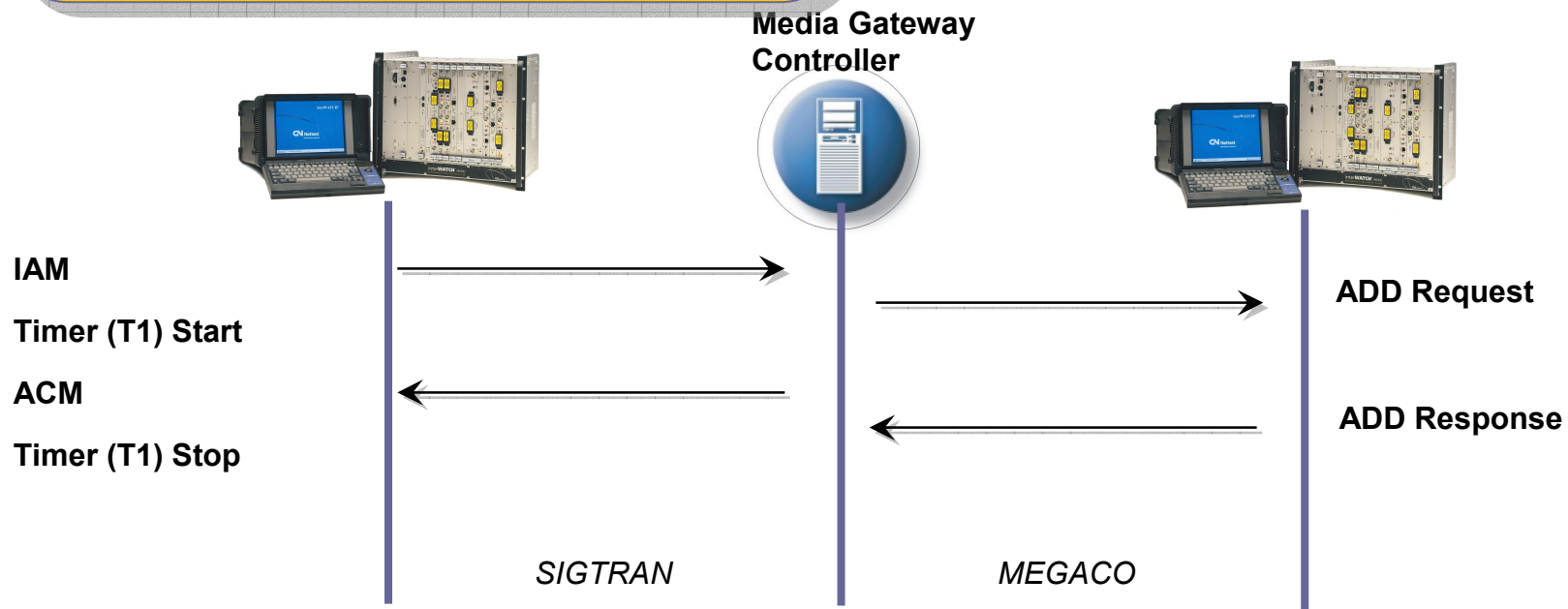
# TTCN Conformance Testing - InterWorking

## Log Information:

TC_x_x	Execution Starting	01/01/80 12:50
TC_x_x	ADD Received	01/01/80 12:50
TC_x_x	Final Verdict	01/01/80 12:50
TC_x_x	Execution Ending	01/01/80 12:50

**PASSED**

- TTCN is a useful tool for testing interworking

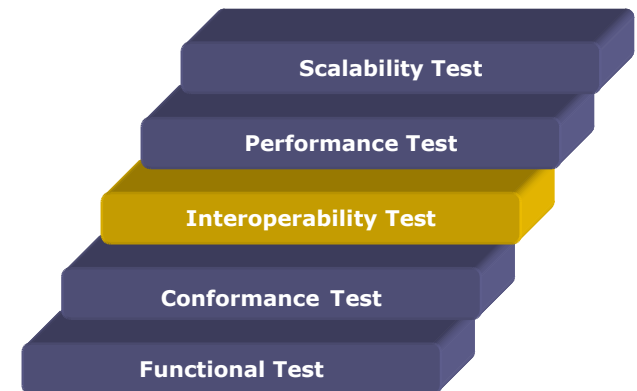






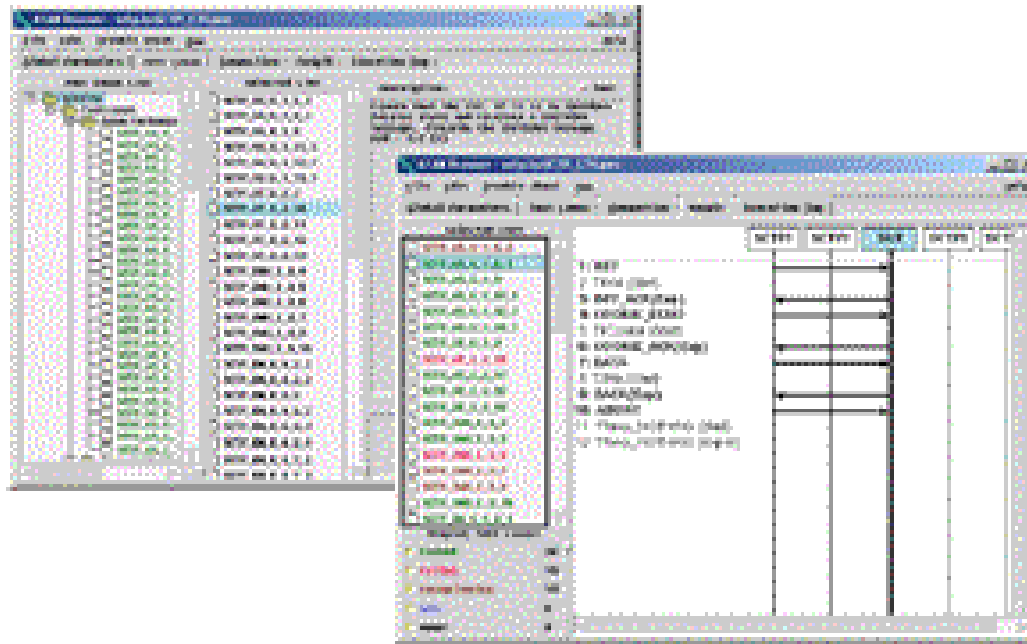
# Interoperability Testing

- ☛ Test suite that verifies interoperability of devices from different vendors
  - > For example, a SIP Proxy from Vendor A and a SIP Proxy from Vendor B are tested to ensure they work when connected to one another
  - > Test cases for critical services, both mandatory and optional, are run to ensure interoperation
  - > Interoperation is crucial for network operators, especially those in the VoIP softswitch arena
  - > These tests can be canned test suites or test cases written by our customers





## Navtel TTCN Test Suites - Runtime



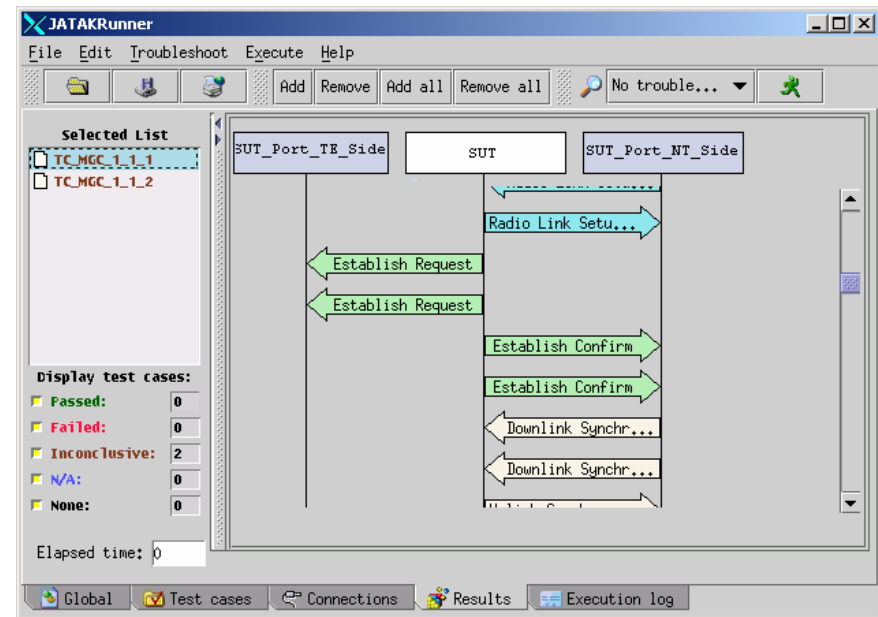
Following internal TTCN coding standards, our executable test suites provide logging and message flows resulting in a test environment that makes troubleshooting straightforward



# User Generated Test Suites

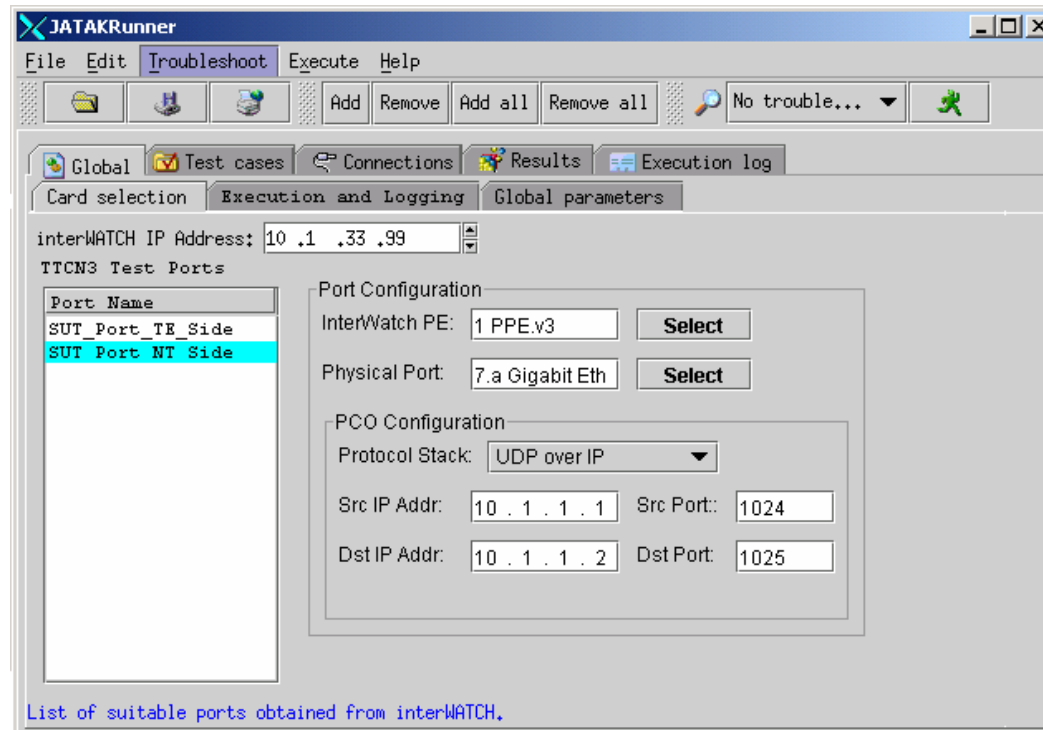
♥ Executable test suite environment expanded to support TTCN 3 test suites written by InterWatch users

- > Brings automated functional, conformance and interoperability test authoring to InterWatch users
- > Test suites are compiled and run on the InterWatch platform
- > Message sequence chart and report generation is automated
- > Compliments our canned test suite offering





# User Generated Test Suites



- ☛ PCOs are selectable from available stacks in InterWatch
  - > Selections are independent of protocol being tested
    - One test suite, multiple data link layers and physical interfaces



## Future of TTCN 3 on the InterWatch

- ✧ Navtel will continue to produce canned Conformance testing applications using TTCN 3 as an internal development tool
- ✧ Navtel will exploit the flexibility of TTCN 3 to let users generate their own additional TTCN 3 test suites to verify optional clauses in standards
- ✧ Users can generate test suites for proprietary protocols or proprietary extensions to standardized protocols using the TTCN 3 development environment on the InterWatch



# NAVTEL COMMUNICATIONS

*The Future of Network Testing*

VoIP / SS7

UMTS

GMPLS

MPLS

IPv4 / IPv6

ATM

?



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