

# Protocol Validation System for On-Board Communications



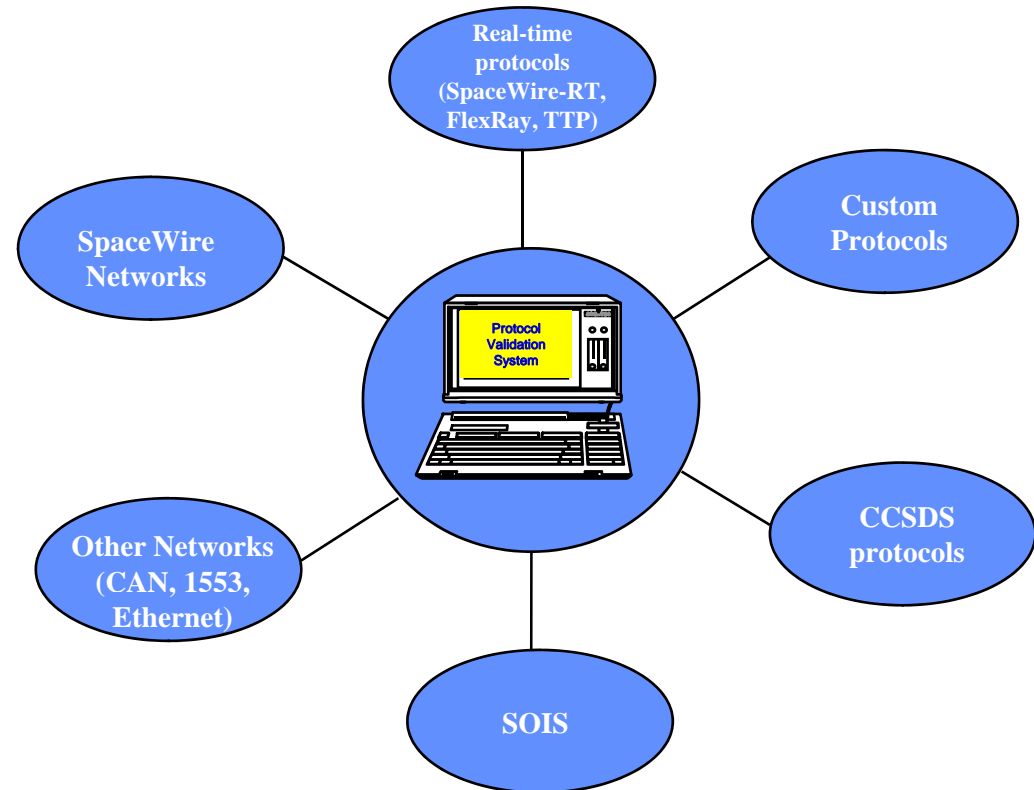
*Response to Tender AO5819 – Call for outline  
proposals under the Greek Industry Incentive Scheme*



*Protocol Validation System for On-board Communications*

## Project Objectives

- Provide an open, integrated validation environment for SpW protocols
- Address the validation requirements for new on-board communication systems
- Assist to extend the domain of SpW applications



## Features and areas of use

Main Features	Areas of Use
<ul style="list-style-type: none"><li>• Protocol Emulation</li></ul>	<ul style="list-style-type: none"><li>• Rapid prototyping</li></ul>
<ul style="list-style-type: none"><li>• Protocol Validation</li></ul>	<ul style="list-style-type: none"><li>• Functional Testing</li></ul>
<ul style="list-style-type: none"><li>• Conformance Testing</li></ul>	<ul style="list-style-type: none"><li>• Interoperability Testing</li></ul>
<ul style="list-style-type: none"><li>• Traffic Generation</li></ul>	<ul style="list-style-type: none"><li>• Network Monitoring</li></ul>
<ul style="list-style-type: none"><li>• Observation</li></ul>	<ul style="list-style-type: none"><li>• Stress Testing</li></ul>

## Project Partnership

**teletel**

**TELETEL SA  
Athens, Greece**



**EADS Astrium SAS  
Toulouse, France**



*Protocol Validation System for On-board Communications*

## TELETEL Profile Overview



### ■ TELETEL S.A. established in 1995

- *HQ:* Athens
- *R&D Branch:* Northern Greece (Ioannina)
- *Repres. Offices:* Stuttgart, London, Boston, Limassol, Hyderabad (India)

### ■ Telecoms & AeroSpace Development Company

- *State-of-the-art Design & Development Tools*
- *S/W & H/W Engineers: 30 (Ph.D., M.Sc., B.Eng.)*
- *Quality Assurance (ISO 9001:2000, NATO Clearance)*



### ■ 70% of Turnover by Major International Customers



***TELETEL is a leading SW & HW development company specializing in the areas of:***

■ **Telecommunications**

- *Switching Systems, Interworking Units & Terminals*
- *Testing & Validation Systems, Network Monitoring*

■ **Avionics & Space**

- *Satellite Positioning (EGNOS, GALILEO)*
- *Avionics sub-systems*
- *Test benches and Simulations*

**TELETEL Profile  
Activities**

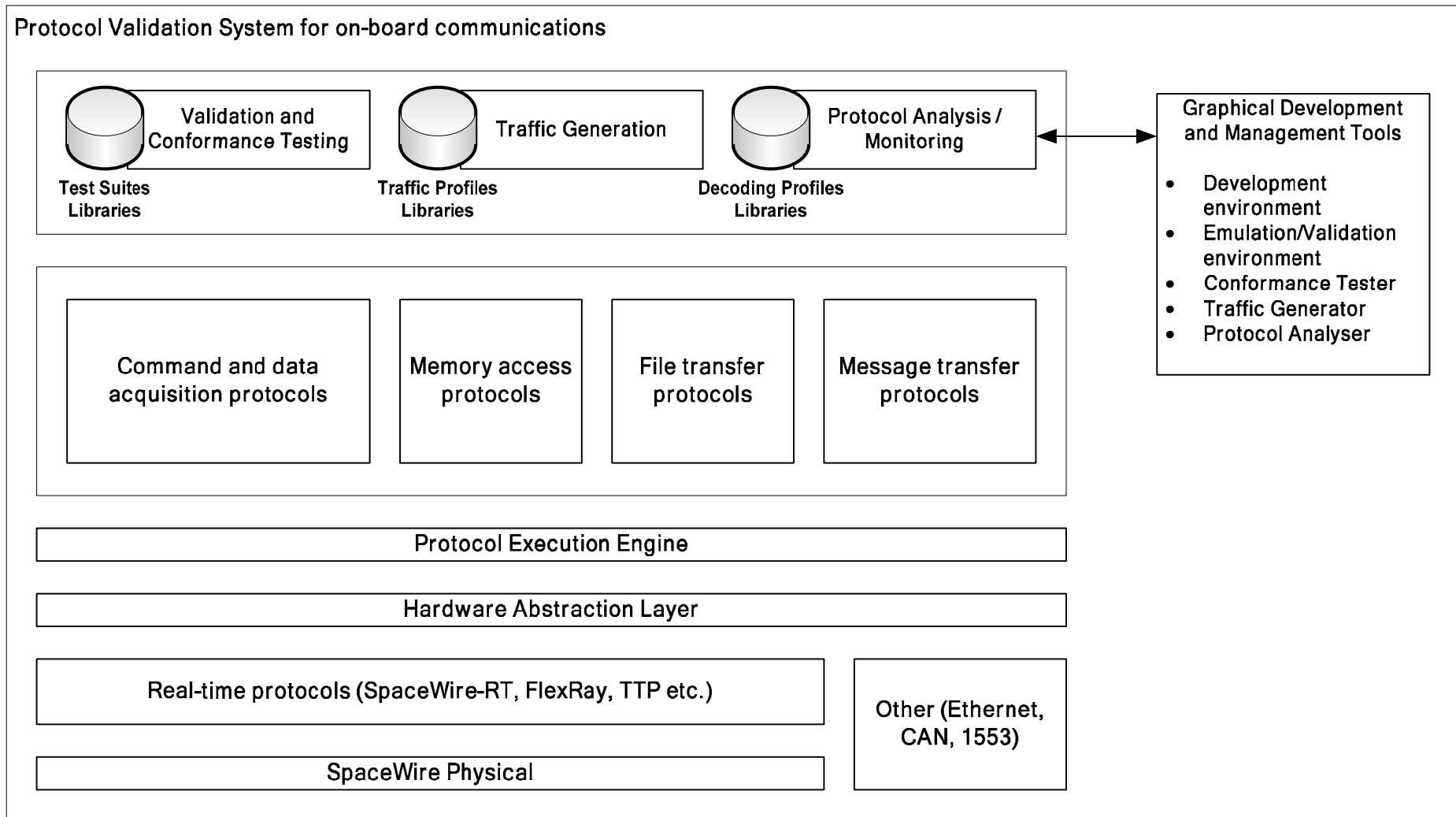


## TELETEL Profile Customers

TELETEL has successfully completed projects with major companies, including:

- ALCATEL-LUCENT (Germany)
- THALES AIR DEFENCE (France)
- THALES COMMUNICATIONS (France)
- EUROPEAN SPACE AGENCY (ESA)
- MOTOROLA Ltd (UK)
- SIEMENS ICN s.p.a. (Italy)
- SAGEM S.A. (France)
- MBDA (France)
- SOLINET GmbH (Germany)
- OTE S.A. (Greece)
- COSMOTE S.A. (Greece)
- THALES ELECTRONIC SYSTEMS (Greece)
- HELLENIC AEROSPACE INDUSTRY (Greece)
- HELL. NAT. METEOROLOGICAL SERVICE
- FRIGOGLASS S.A. (Greece)
- MILTECH HELLAS S.A. (Greece)
- MINISTRY OF DEFENSE (Greece)

# Protocol Validation System Architecture Overview



\*Based on SAFIRE platform ([www.safire-world.com](http://www.safire-world.com))







## SAFIRE Overview Applications

- Rapid Prototyping of event based systems (SDL/C)
- Protocol / Signaling Monitoring and Analysis
- Functional Testing / Simulation
- Device or Network Emulation
- Background Traffic Generation
- Analysis of Traffic Quality
- Conformance Test





# SAFIRE Overview

## Protocols Supported

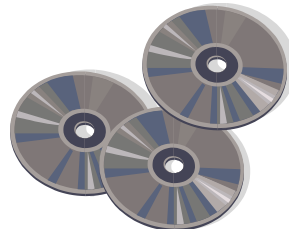
<ul style="list-style-type: none"><li>▪ <b>INAP/CAMEL</b></li><li>▪ CS-1</li><li>▪ CS-2</li><li>▪ CAMEL (1,2,3,4)</li><li>▪ National Variants</li></ul>	<ul style="list-style-type: none"><li>▪ <b>GSM</b></li><li>▪ Abis</li><li>▪ A</li><li>▪ B</li><li>▪ C</li><li>▪ D</li><li>▪ E</li><li>▪ F</li><li>▪ G</li></ul>	<ul style="list-style-type: none"><li>▪ <b>GPRS</b></li><li>▪ Gr</li><li>▪ Gf</li><li>▪ Gc</li><li>▪ Gd</li><li>▪ Gn</li><li>▪ Gb</li><li>▪ Gi</li><li>▪ Gs</li></ul>	<ul style="list-style-type: none"><li>▪ <b>UMTS</b></li><li>▪ IuCS CP</li><li>▪ IuPS CP</li></ul>	<ul style="list-style-type: none"><li>▪ <b>IP - VoIP</b></li><li>▪ H.323</li><li>▪ SIP</li><li>▪ MGCP</li><li>▪ MEGACO</li><li>▪ SIP-T</li><li>▪ RTP / RTCP</li><li>▪ UDP/TCP/SCTP</li></ul>	<ul style="list-style-type: none"><li>▪ <b>SIGTRAN</b></li><li>▪ SCTP</li><li>▪ IUA</li><li>▪ MPA</li><li>▪ M2UA</li><li>▪ M3UA</li><li>▪ V5UA</li><li>▪ SUA</li><li>▪ DUA</li></ul>
<ul style="list-style-type: none"><li>▪ <b>SS7</b></li><li>▪ MTP (L2, L3)</li><li>▪ TUP</li><li>▪ ISUP</li><li>▪ SCCP</li><li>▪ TCAP</li><li>▪ BICC</li><li>▪ National Variants</li></ul>	<ul style="list-style-type: none"><li>▪ <b>ISDN</b></li><li>▪ Q.291</li><li>▪ Q.931</li><li>▪ Q.932</li><li>▪ QSIG</li><li>▪ National Variants</li></ul>	<ul style="list-style-type: none"><li>▪ <b>V5</b></li><li>▪ V5.1</li><li>▪ V5.2</li><li>▪ Data Link Layer</li><li>▪ Local Exchange</li><li>▪ Access Network</li><li>▪ National Variants</li></ul>	<ul style="list-style-type: none"><li>▪ <b>IMS/NGN</b></li><li>▪ SIP IMS</li><li>▪ BICC</li><li>▪ Diameter</li><li>▪ Megaco</li><li>▪ IUA/DUA</li><li>▪ M3UA</li><li>▪ RTP/RTCP</li></ul>	<ul style="list-style-type: none"><li>▪ <b>Other</b></li><li>▪ ATM</li><li>▪ Frame Relay</li><li>▪ Datacoms (X.25)</li></ul>	





## SAFIRE Overview Platform

- SW-only solution (Windows 2000, XP, Vista)
- Rugged Notebook (2 PCMCIA)
- Portable (5+2 slots)
- 19" Rackmount (12 slot)





## SAFIRE Overview Interfaces

### PCMCIA based

- Dual E1/T1/J1



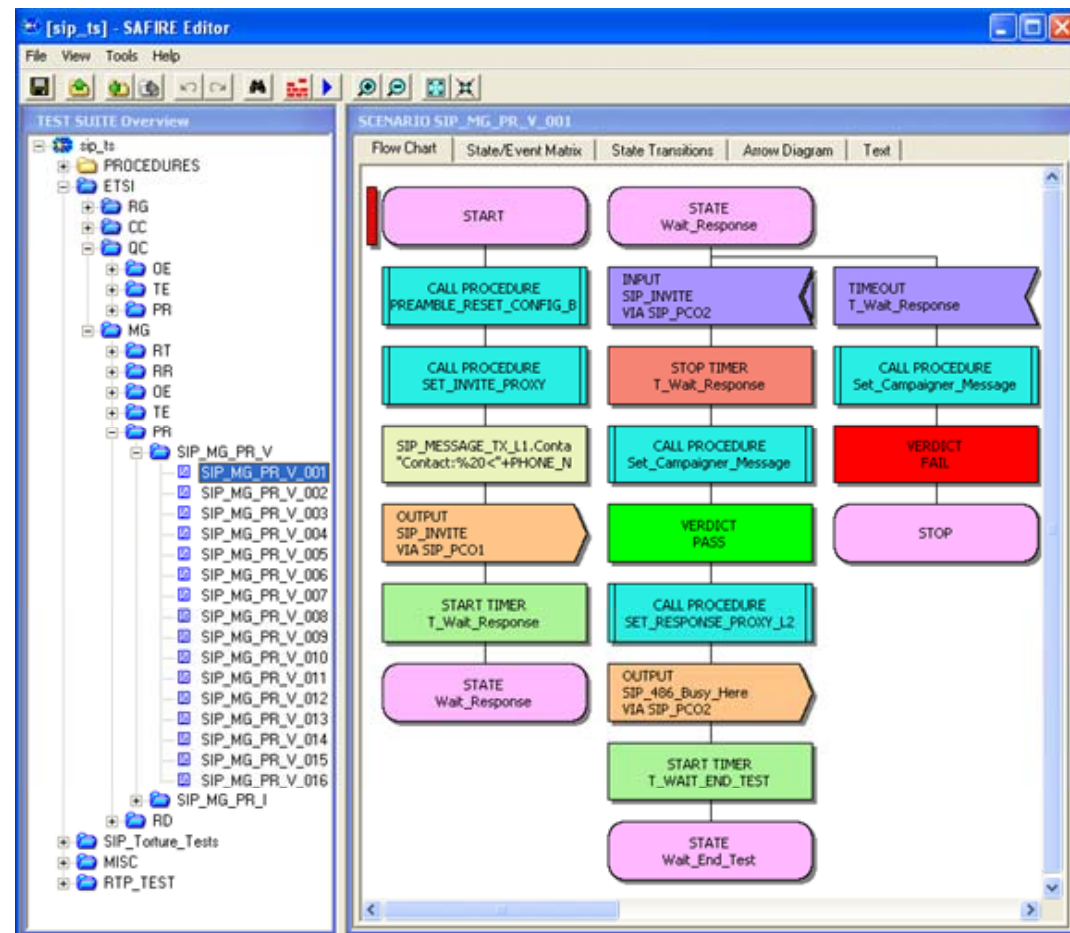
### PCI based

- Quad POTS
- Quad E1/T1/J1
- Dual So
- Dual Uo
- Ethernet 10/100BT PCI
- Dual 10/100/1000BT
- Single optical 1000BT
- STM-1 MM PCI
- STM-1 SM PCI





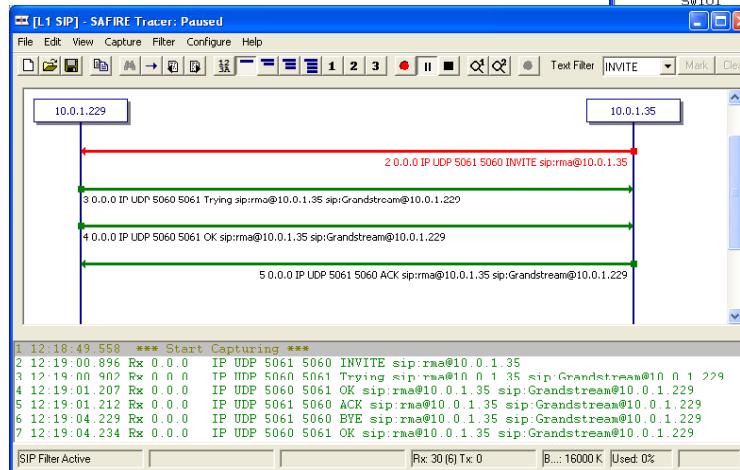
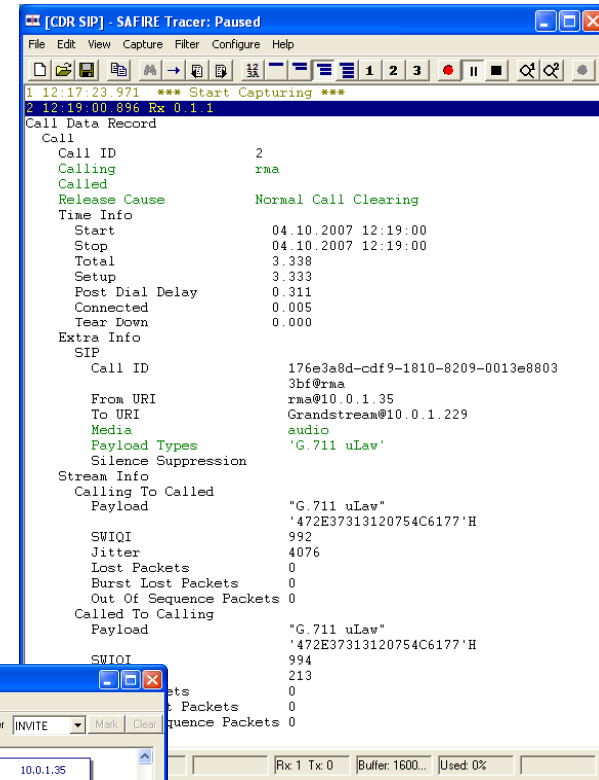
- SAFIRE Toolchain
  - Integrated environment for signaling systems
- Editor
  - Very flexible state machine based solution
  - SDL based presentation
  - Intuitive, graphical editing
  - Framework test suite includes examples



# SAFIRE Applications – Network Monitoring

## □ Network Monitoring

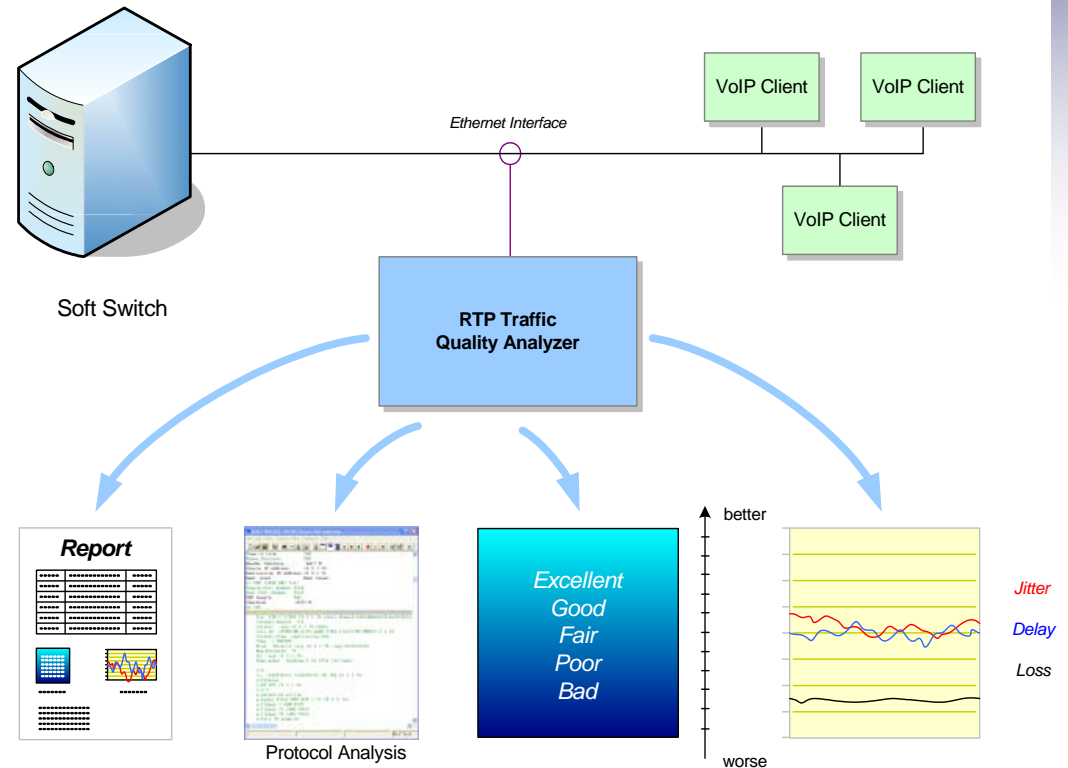
- ◆ Signaling capture & decode
- ◆ Over 1,000 specifications
- ◆ IP and legacy interfaces
- ◆ Filtering for fast & accurate analysis
- ◆ Start/Stop triggers
- ◆ Arrow diagram view
- ◆ CDR creation
- ◆ CDR with QoS metrics



# Network Monitoring - RTP QoS Analysis

## □ Traffic Quality Analyser

- ◆ Monitors Network Traffic
- ◆ Auto Detects RTP Streams
- ◆ Measures Quality Metrics
- ◆ Jitter, Delay & Packet Loss
- ◆ Real-Time Charts
- ◆ Stream Generation, Capture & Replay
- ◆ Integrates with Signaling Testers



# SAFIRE Applications - Conformance Testing

## □ Conformance Testing

- ◆ Supports international standard bodies ITU, ETSI and ANSI
- ◆ Broad range of conformance test suites
  - SIP, H.323, MGCP, Megaco, SIP-T, SIP-IMS
  - SCTP, M2UA, M2PA, M3UA, IUA, V5UA, DUA, SUA
  - ISUP, ISDN
- ◆ Validated by open ACATS Forum
- ◆ Ready-to-run solution
- ◆ Automated test case execution
- ◆ Presentation of test results
- ◆ Export of test results

The screenshot shows the SAFIRE Campaigner software interface. The window title is "[SBUS3\_TS] - SAFIRE Campaigner". The interface includes a menu bar (File, Options, Tools, Help) and two tabs: Campaign Editor and Campaign Execution. The Log List shows the following entries:

```
13:50:49.866: Start campaign
13:50:49.866: Not using test suite configuration data
13:50:50.069: Load Act_Master
```

The progress bar shows Current: 4, Total: 4, Pass: 4, Fail: 0, Inconc: 0, Stopped: 0. The Message from Testcase field is empty. The Result List table is displayed below:

Test case	Group	Verdict	Reason	Start Time	Stop Time	Duration
Act_Master		PASS		13:50:50.069	13:50:50.083	13 ms
Act_Slave		PASS		13:50:50.388	13:50:50.399	10 ms
Deact_Slave		PASS		13:50:50.695	13:50:50.708	12 ms
Data_M25		PASS		13:50:51.013	13:50:51.022	9 ms

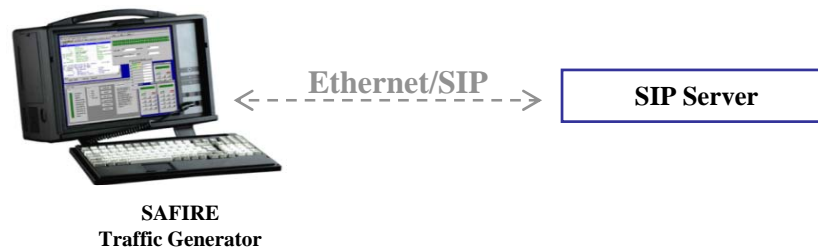
At the bottom of the interface, there are control buttons: Start, Repeat, Next, Stop, Soft Stop, Continue, and Animate. The status bar at the bottom right shows "Idle".



# SAFIRE Applications - Traffic Generation

## □ Traffic Generation

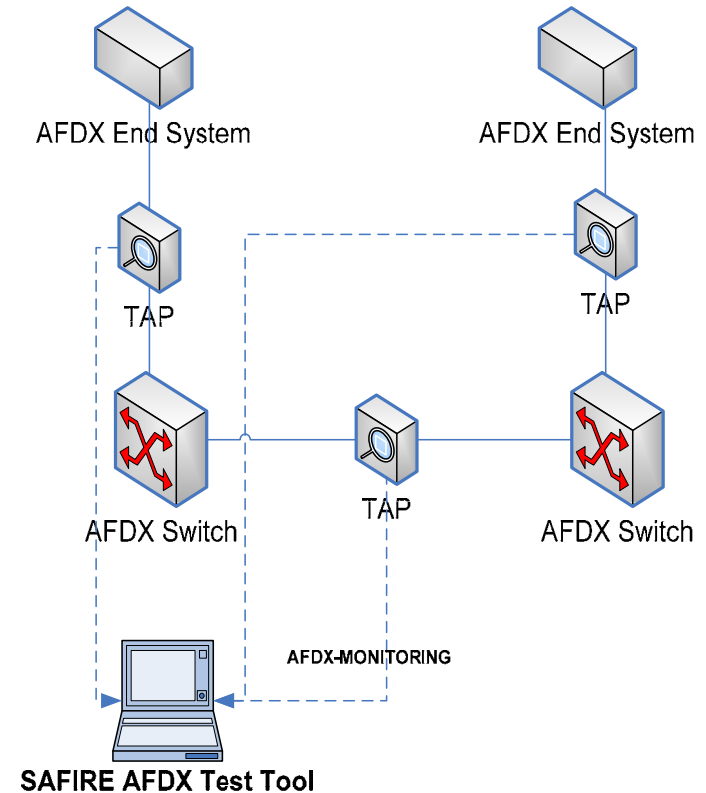
- ◆ SIP, ISUP or INAP
- ◆ Background traffic generation
- ◆ Supports mixed interfaces
- ◆ Configurable call profiles
- ◆ Graphical control & status
- ◆ Online statistics & logging
- ◆ Proven in long-term testing
- ◆ 20+ CPS (72000 BHCA)
- ◆ Up to 30 simultaneous calls
- ◆ Expandable for RTP support (SIP)





## R&D Case: AFDX Validation with SAFIRE

- AFDX Network Monitoring
  - 12 x 1Gbps physical links with high utilization ratio (100ns time resolution)
  - Provide statistics, performance indicators and frame errors
  - Inspection and Verification of
    - Inter Frame Gap (IFG)
    - Jitter per Virtual Link
    - Bandwidth Allocation Gap (BAG) per Virtual Link
    - Time Skew in Redundant Physical Links
- AFDX Fault Injection
  - Generate and transmit frames with user defined errors
  - MAC layer errors including CRC – Sequence Number errors, short IFG and frame size errors
  - UDP, IP protocol header errors



## Two-phase approach

### ■ Phase 1 (current contract):

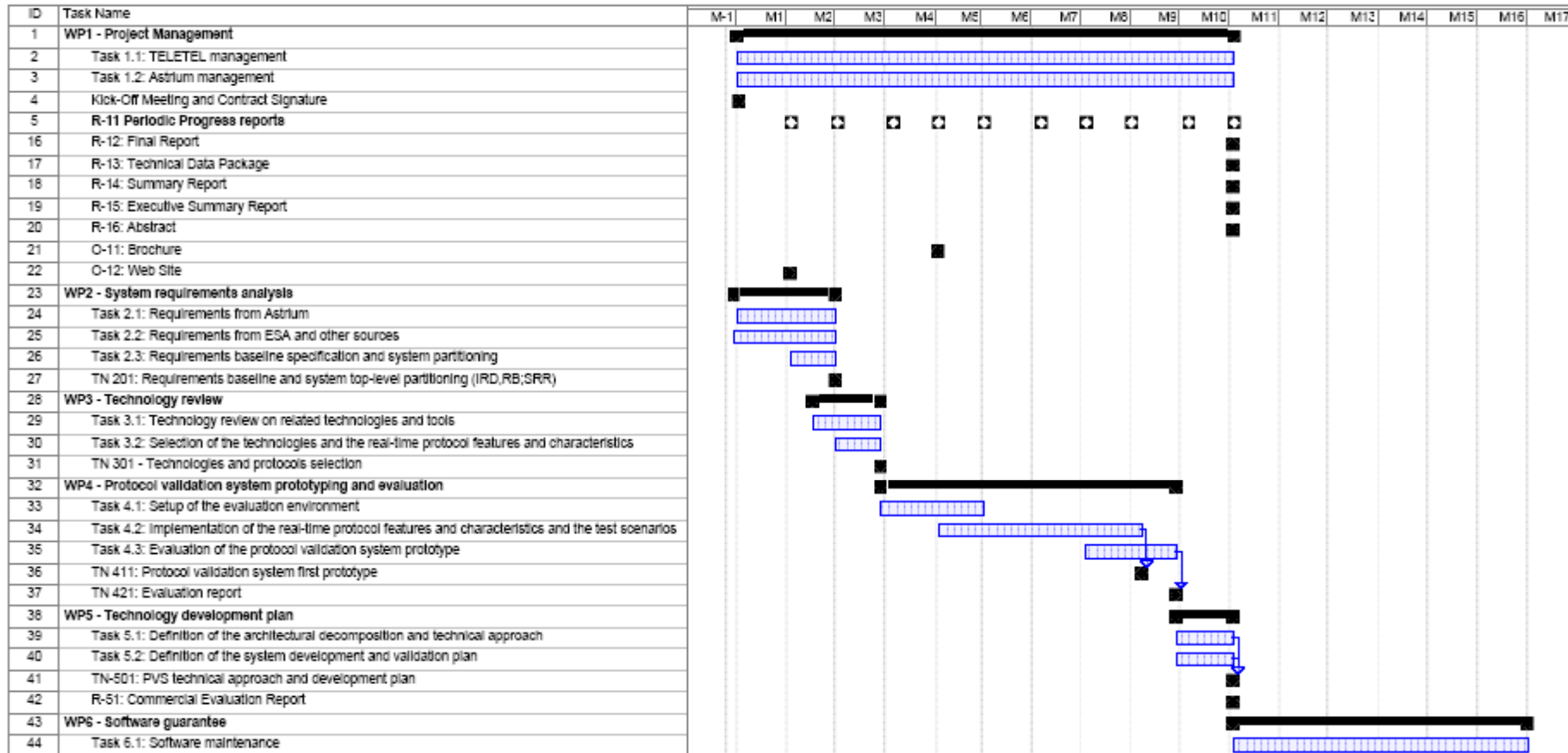
- Requirements capturing & analysis, based on requirements by ESA and Astrium, and top level partitioning
- Technology review on related technologies, tools and protocols
- Selection of SpW-RT and SOIS protocol features for validation
- Realisation of the experimental validation environment based on SAFIRE
- Validation of the selected SpW-RT and SOIS protocols features
- Development plan and roadmap for the development of the full PVS

### ■ Phase 2:

- Full PVS system design, development validation

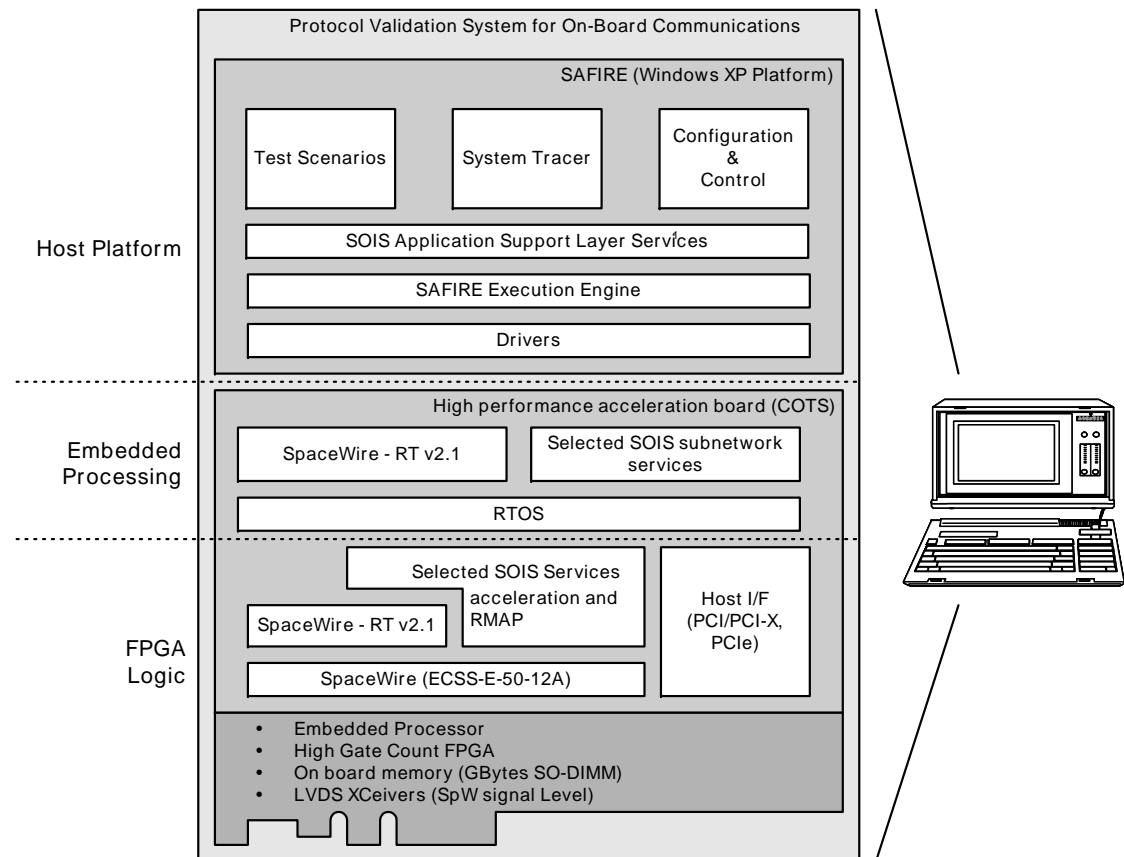
# Phase 1 Schedule

T0 = 16<sup>th</sup> February 2009



# Phase 1 Demonstrator

- PC based
  - Graphical set-up of validation experiments
- Mixed HW-SW implementation
  - Reconfigurability
  - Execution of real-time scenarios
  - Embedded processor for SOIS subnetwork convergence
  - SpW, parts of RMAP, SpW-RT implemented in FPGA





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