

# iSAFT Protocol Validation Platform For on-board Data Networks



**Simulate,**

**Observe,**

**Validate!**

*iSAFT is an advanced, integrated, high performing, modern platform for the simulation, validation & monitoring of a wide range of satellite/spacecraft on-board communication protocols and data networks. Its variety of features makes it suitable for use in many different areas.*

iSAFT is an integrated powerful HW/SW environment for the simulation, validation & monitoring of satellite/spacecraft on-board data networks supporting **simultaneously** a wide range of protocols (RMAP, PTP, CCSDS Space Packet, TM/TC, CANopen, etc.) and network interfaces (SpaceWire, ECSS MIL-STD-1553, ECSS CAN). It is based on over 20 years of experience in the area of protocol validation in the telecommunications and aeronautical sectors, and it has been fully re-engineered in cooperation with ESA & space Primes, to comply to space on-board industrial validation requirements (ECSS, EGSE, AIT, AIV, etc.). iSAFT is highly modular, thus easily expandable to support new network interfaces & protocols and it is based on the iSAFT powerful graphical tool chain (Protocol Analyser / Recorder, TestRunner, Device Simulator, Traffic Generator, etc.).

## FEATURES

### ■ RAPID PROTOTYPING/EVALUATION

Implementation of new protocols, experimentation with various protocol features (parameterization of protocol variables, exclusion/inclusion of protocol optional functions, combination of multiple protocols, etc.).

### ■ DEVICE SIMULATION

Economic & portable replacement of a device in the testbed (SSMM, RTU, RMAP responder, etc.).

### ■ FUNCTIONAL/CONFORMANCE TESTING

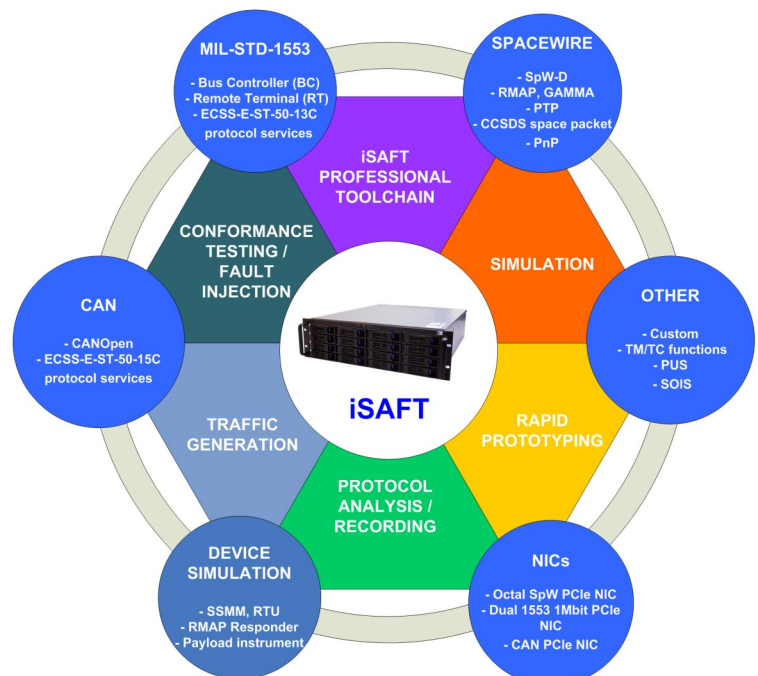
Execution of nominal tests to ensure that a device (System Under Test) is operating in compliance with the applicable ECSS standards. Error injection at various protocol layers to validate the response of the devices/networks in erroneous conditions.

### ■ TRAFFIC GENERATION

Bulk traffic injection at higher & lower protocol layers for performance evaluation and network dimensioning.

### ■ PROTOCOL ANALYSIS/RECORDING

Message decoding & recording, filters, start-stop triggers, intelligent error detection, export results, statistics.



The iSAFT protocol validation platform can be used for **rapid prototyping & evaluation** of new network protocols/features, for **functional testing** and **stress testing**. Moreover it can be used for **device simulation** (SSMM, RTU, etc.) as well as for **protocol analysis & recording**. Based on an open architecture and modular design, iSAFT is a future-safe, cost-effective and already validated solution for demanding **ESA activities** towards the future evolution of S/C on-board data handling/networks.

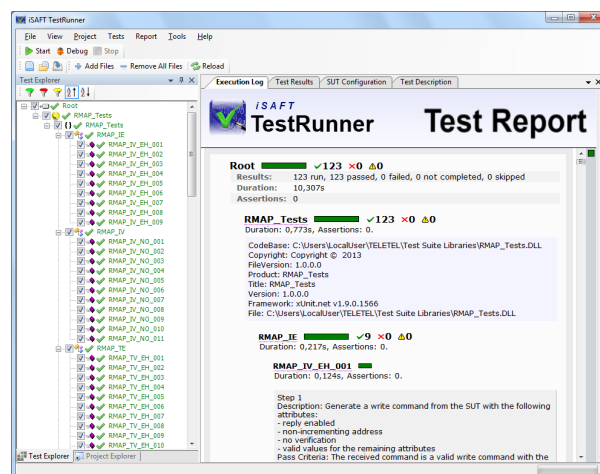


## iSAFT Validation Tool

iSAFT TestRunner is a GUI-based test execution environment that enables test engineers to select and execute test suite libraries, test suites and test cases developed for validating the functionality of specific systems under test (SUTs).

### Features

- Easy management and execution of test cases from a GUI.
- Selection and loading of test suite libraries including contained test suites and test cases to be executed.
- Execution of selected test suite libraries, test suites and test cases.
- Capability to save and load specific test execution configuration (i.e., test campaigns).
- Test report generation after each test execution in at least one standard format (i.e., XML, HTML, etc.), extensions available to support PDF format and test history reports.
- Capability to support the development of complex test cases (support hierarchical grouping of test cases into test scenarios / test suites that can be created from GUI).
- Error injection and traffic generation capabilities.



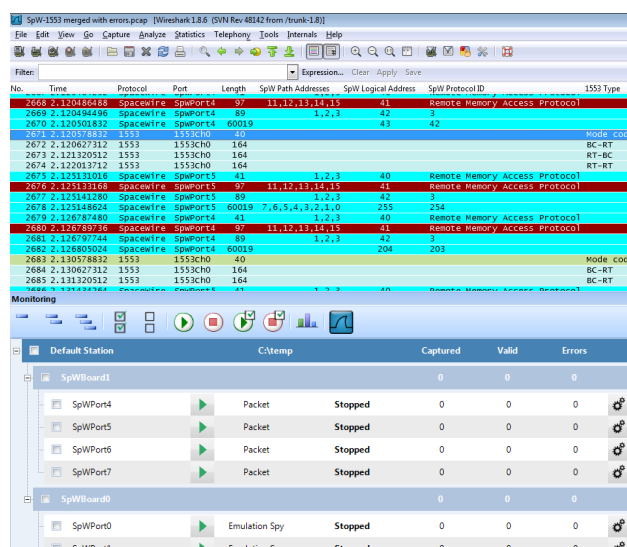
- Rapid test development using a high level test language (C# .NET, xUnit.net).
- Capability to configure test cases without needing to rebuild the SW.
- Tests debugging during execution.

## iSAFT Protocol Analyser / Recorder

iSAFT Protocol Analyser / Recorder is an advanced, integrated, high performing, modern network traffic capture, recording and analysis tool for the validation of satellite/spaceraft on-board communication protocols and data networks. It enables passive monitoring/recording of data packets, time stamping, recording, and delivering them to a powerful Protocol Analyzer for further processing & analysis.

### Features

- Powerful HW platform (high processing power, multi-Gbytes storage capacity), advanced file and recordings management (auto-archive, disk clean-up, file system and disk optimization, etc.).
- iSAFT graphical tool chain (Runtime engine, iSAFT Console, offline analysis with the Wireshark Protocol Analyzer, recordings management).
- Capturing & recording of large volumes of traffic from multiple SpW links, MIL-STD-1553 and/or CAN buses.
- Off-line analysis of multi-gigabyte traffic logs. Chronological merging of recorded traffic (i.e. from both SpW and 1553) for complex topologies.
- Event-trace trigger & selective tracing (filtering) support, available plug-ins and statistics for various protocols.
- Graphical tools for local/remote control, data recording, managing, searching and filtering the recordings.
- Interfaces with EGSE Central Checkout System.



- Export of traffic recordings to XML, PostScript®, CSV, or plain text, user selected protocol fields per packet.
- Open APIs to 3rd-party applications, support for customization, adaptations to customer needs.

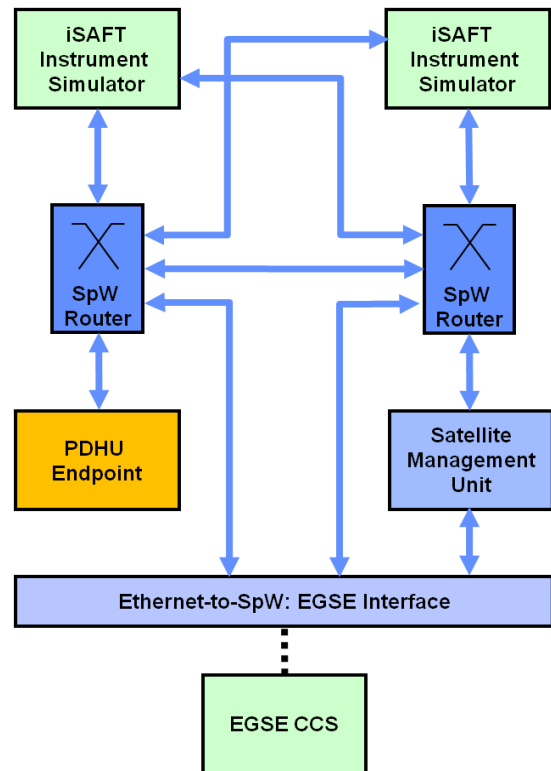


## Device Simulation

iSAFT provides the ability for prototyping on-board data network devices allowing for economic and portable replacement of a network element in a testbed.

### Capabilities

- Economic & portable replacement of a device in the testbed including instrument nodes, etc.
- Rapid prototyping of new functionalities allowing for experimentation with various device features and variations including parameterization of variables, exclusion/inclusion of device optional functions, combination of multiple protocols, etc.
- Simulation of specific satellite/spacecraft platform interfaces (as power, command, telemetry and communication) to different Payload Instruments.
- Easy integration of boards for multiple network interfaces support.
- Easy integration with 3rd party simulation software based on open APIs.
- TCP/IP based remote control interface for integration to LAN-based environments.



## Hardware Peripherals - Physical Interfaces

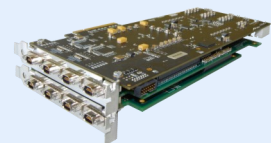
### Site Rackmount System

- 2U/3U Rack Mounted System
- High processing power, Heavy Duty Platform
- 256GB data storage, 2TB data archive (expandable)
- Microsoft® Windows 64 bit
- CE, EN55022, EN55024 certifications



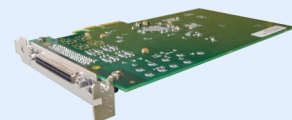
### Octal SpW PCIe NIC

- Full size PCIe form factor board
- Eight SpW Ports, Triggers IN/OUT
- Link speed over 300Mbps (up to 200Mbps for recording)
- Time-stamping I/F IRIG-B002 generator/receiver
- Flight equipment protection against internal failures (FMEA available)



### Dual 1553 1Mbit PCIe NIC

- 1/2 Size 4 Lane PCIe board
- 2 Independent, Dual Redundant Channels
- IRIG-B RX PAM and TX/RX PPS Time Sync
- Fully Compliant to MIL-STD-1553B Notice II/IV
- Supports SAE tests



### CAN PCIe NIC

- Full size PCIe form factor board
- 2 - 4 independent high-speed CAN interfaces according to ISO11898-2
- Bit rates from 10kbit/s up to 1 Mbit/s
- High resolution timestamping accuracy down to 20ns
- IRIG-B interface support
- Error injection support, advanced CAN diagnostic





## iSAFT recent case studies:

### SpaceWire-T/SpaceWire-D validation

An ESA/ESTEC project, in which TELETEL has designed and developed a proof-of-concept prototype for the functional and performance validation of SpW-T & SpW-D protocols. TELETEL performed analysis and validation (in terms of latency, efficiency, timeslot periods, etc.) through simulations and prototype implementations on TELETEL's iSAFT platform, including the RMAP protocol & an RMAP conformance test suite.



### SpaceWire Evolutions prototyping/validation

An ESA/ESTEC project, where TELETEL (Prime Contractor) cooperated with ASTRIUM Satellites, 4Links and SCISYS for the definition, design, breadboarding, testing and validation on the iSAFT platform of SpaceWire new features (PnP support, Interrupts distribution, Simplex & Half Duplex), compatible with the current SpaceWire standard. Functional tests performed, validating new features, assessing their efficiency.



### FDIR / N-MaSS Instrument Simulator/Analyser

An ESA/ESTEC project, in which TELETEL implements N-MaSS end-point protocols as well as simulation SW of instrument and telemetry / telecommand of data sources, in an instrument simulator / analyser. TELETEL will also perform tests to verify the correct operation of an N-MaSS enabled end node, having as a target to demonstrate the backwards compatibility of N-MaSS to non N-MaSS enabled nodes.



### Applicability of ARINC-664 (AFDX) in space on-board data networks

An FP7-SPACE project (MISSION), in which TELETEL designs, develops and validates on the iSAFT platform, a representative ground demonstrator of a S/C on-board architecture, in order to assess the suitability of AFDX technology elements over the SpaceWire physical interface for deterministic on-board data networks.



### Starkit/SCOC3 Drivers & System Validation

An ESA/ESTEC project, where TELETEL validated the Basic Support SW for ASTRIUM's SCOC3 Starter Kit board, consisting mainly of the I/O drivers, and associated Board Support Package. TELETEL has developed in the iSAFT platform the complete Starter kit integrated I/O Test Bench, made of SpW, MIL-STD-1553 and CAN test systems (functional/stress test suites + physical interfaces).



### ARINC-664 (AFDX) Tester and Analyzer

A THALES Avionics & AIRBUS project, in which TELETEL developed in iSAFT, a fully configurable high-performance tool for the monitoring, traffic generation, fault injection of AFDX frames used for the intercommunication of safety-critical components situated in the cockpit and other areas of modern civil and military aircrafts. The system has been optimized for extremely efficient processing of large volumes of high-speed data.



## STRENGTHS AT A GLANCE

- ✓ All-in-one validation environment
- ✓ Suitable for many different areas/users
- ✓ Easy integration of new interfaces, protocols
- ✓ Built on open and standard technologies
- ✓ Support of multiple networks simultaneously

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