Simulate, Prototype, Validate!

iSAFT SpaceWire / MIL-STD-1553 Simulator is an advanced EGSE platform with traffic generation capabilities that simulates SpaceWire / MIL-STD-1553 devices or instruments, enabling S/C integration tests before the availability of Flight Models.

The iSAFT SpaceWire / MIL-STD-1553 Simulator provides an 8 – 20 port SpaceWire interface with advanced traffic generation and asynchronous transmission capabilities and/or a 2 - 4 channel MIL-STD-1553 interface with BC and multiple RT simulation and Bus Monitoring capabilities. It is capable of transmitting/receiving data packets over multiple SpaceWire links and simulating a BC or multiple RTs over the MIL-STD-1553 buses, time stamping received packets, and capturing transmitted/received traffic to a powerful Protocol Analyser. It is based on the iSAFT graphical tool chain, for the configuration/management of the simulation (locally or remotely). The iSAFT simulator is a powerful device for the validation of on-board data networks at early stages, minimizing costs and schedule. It can be part of EGSE Data Front Ends and implement the core functionality of an EGSE controller.

FEATURES

- Heavy duty HW platform with high processing power.
- Asynchronous SpaceWire transmission, Bulk traffic generation, per packet programmable parity error injection.
- 1553 BC/Multiple-RTs emulation with error injection capabilities.
- Synchronized SpaceWire/1553 transmissions, synchronization to external PPS/triggers as option.
- IRIG-B002 interface with down to 8 ns accuracy/resolution for common time-stamping across all elements in a test-bed.
- IRIG regeneration / level translation for IRIG signal propagation to cascaded iSAFT instance / other testbed equipment.
- GUI for complete local operation (iSAFT graphical tool chain), remote control & operation through CCSDS/EDEN protocols.
- Real-time statistics per port / channel.
- Built-in recording function for received/transmitted packets.
- Traffic logs export to XML, PostScript®, CSV, or plain text.
- RMAP, CPTP, N-MaSS, ECSS-E-ST-50-13C services.
- RMAP target with programmable response time down to sub-microsecond as option.
- Open APIs for rapid prototyping of new protocol/device emulation functionality (C/C++, C#, Python).
- Interfaces with EGSE Central Checkout System and RTS.

Based on an open architecture and modular design, the iSAFT Simulator is a future-safe, cost-effective and already validated solution for demanding AIT/AIV activities and EGSE. One (1) or multiple iSAFT SpaceWire / MIL-STD-1553 Simulators can be synchronized for simultaneous data transmission, traffic generation, traffic recording, interfacing to Central Checkout System (CCS) / SCOEs, thus completely replacing the need for multiple separated EGSE elements in your testbed (dedicated SpaceWire / 1553 terminals, separate IRIG receivers/sources, dedicated stations for control, connection to CCS, etc.). It is fully compliant with all standards and certifications required to install it on a flight equipment/mission EGSE (FMEA, hazard/safety analysis, CE compliance, etc.).
iSAFT SPACEWIRE SIMULATOR

General Features

- Eight to twenty (8-20) SpaceWire ports, external triggers per port.
- Link speed from 1 - 400 Mbps with 1 Mbps granularity, independently programmable per port.
- Transmission of user packets unconditionally or upon the detection of programmable trigger event.
- Programmable packet truncation on received packets.
- Bulk traffic generation, transmission of Linked-listed packets & repetitive packets/sequences, with microsecond accurate traffic shaping capability through independent transmission triggers per packet.
- Hardware packet sinking for connected device transmission performance evaluation.
- Trigger port event generation upon packet transmission/reception or link status event (connect, disconnect etc.).

Transmission Triggers

- Synchronized over several ports with time-offset.
- Delay from previous packet.
- Programmable signaling code, with time-offset.
- Full or Partial IRIG time.
- Link disconnect on another port.
- External trigger(s) with/without time-offset (option).

Statistics

- EoP & EEP terminated Tx packets.
- Asynchronous (user) Tx packets.
- Bulk Traffic Generation Tx packets.
- EoP & EEP terminated Rx packets.
- Transmitted Signaling Codes.
- Received Signaling Codes.
- Port disconnects.
### General Features
- One to four (1-4) independent, dual redundant MIL-STD-1553 channels.
- 1553A and 1553B support.
- Full function operation BC, BM and multiple RTs (1-31) simultaneously.
- BC and RT simulation fully compliant with MIL-STD-1553B Notice II & IV.
- Support of ECSS-E-ST-50-13C services during BC and RT simulation (time distribution, communication synchronization, get/set data, data block transfer and terminal management services).

### RT Features
- Static or circular user configurable data buffers.
- Simulation of data, status and response time of each RT / TX or RX SA.
- Full buffering of all Mode Codes supporting legal and reserved Mode Codes.
- Programmable trigger Input/Output per received command or detected event.
- 1553A and 1553B Support.
- Full Error Injection/Detection.

### BC Features
- Simple one-shot lists to advanced message framing and sub-framing capabilities.
- Low and high priority aperiodic messages.
- Multi branching per message, no-ops and delays support.
- Message timing with 100 ns accuracy.

### Web Services / TCP/IP
- EDEN / C&C CCSDS
- Local Control
- iSAFT MIL-STD-1553 Simulator
- Bus Controller (BC) & Bus Monitor
- MIL-STD-1553 Network
- Dual Redundant 1553 Bus

### RT Simulator & Bus Monitor
- Instrument
- OBC
- Dual Redundant 1553 Bus

### Customer Software
- iSAFT-1553-AM
- (EDEN, C&C CCSDS)
- Central Checkout System (CCS)
HARDWARE PERIPHERALS - PHYSICAL INTERFACES

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

Octal SpW PCIe NIC
- Full size PCIe form factor board
- Eight SpaceWire Ports
- Link speed 1 to 400Mbps
- ANSI/TIA/EIA-644-A, 100 Ohms terminated
- Standard SpaceWire 9-pins micro-miniature
- IRIG-B002 generator/receiver TTL/RS-422 electrical levels, with down to 8 nano-seconds accuracy/resolution
- 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 (up to 4 per board)
- Transformer bus coupling, Full Error Detection
- Full Function Model: BC, BM and multiple RTs (1-31) simultaneously
- Start-up, Loop-Back, User and Periodic BIT tests
- IRIG-B002 receiver, 64-bit, 20 ns time stamp resolution
- 1 LVTTTL Input and 1 Output Trigger per Channel
- Fully Compliant to MIL-STD-1553B Notice II/IV
- SAE AS4111/AS4112 protocol test as option

Trigger/Synchronisation Board
- 1/2 Size PCIe board
- User-configurable mapping between trigger and SpaceWire/1553 ports
- 20 single-ended or 20 differential PPS/triggers
- Support for TTL, BDM, LVDS and SBDL (RS-422), RS-485 standards
- Synchronisation to external IRIG source, IRIG signal regeneration for connection to other testbed elements
- Distribution of IRIG signal to all iSAFT interface cards
- Flight equipment protection against internal failures (FMEA available)

STRENGTHS AT A GLANCE
- All-in-one simulation, prototyping & validation environment
- Suitable for many different areas/users
- Easy integration of new protocols & interfaces
- Built on open and standard technologies
- Support of multiple network interfaces simultaneously

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Note: This brochure describes the full set of the iSAFT Simulator capabilities and features. Depending on specific iSAFT Simulator configurations, the supported features may vary.