TTESwitch Lab Space

Deterministic Ethernet switch based on the TTESwitch Controller HiRel ASIC

Key Benefits

- 19 x 100 Mbit/s full-duplex Ethernet
- 6 x 100/1,000 Mbit/s full-duplex Ethernet
- 4,096 virtual links with up to 8 priorities
- Switching features 100% identical to those of the corresponding space flight Ethernet switch
- Copper and optical physical layer available
- Partitioning between three traffic classes (standard Ethernet traffic, rate-constrained and Time-Triggered Ethernet traffic)

The TTESwitch Lab Space supports laboratory testing efforts of Time-Triggered Ethernet applications; user development costs can be reduced by using the internal TTESwitch Controller HiRel ASIC that is also used in flight equipment. With advanced features like speeds of up to 1 Gbit/s, flexible physical layer configuration and three supported traffic classes, it is the optimal switching solution for a large variety of application areas. TTEthernet® is a fault-tolerant, real-time communication protocol for safety-relevant systems integrating Ethernet and TTEthernet data flows onto one physical infrastructure.

Switching function

The TTESwitch Lab Space is a Deterministic Ethernet switch enabling the implementation of critical network-centric applications. Based on the flight TTESwitch Controller HiRel, it is especially useful as a launching platform for customers planning to work with or build a space-grade switch equipment box in the future, as the TTESwitch Controller HiRel can be reused for spaceflight missions.

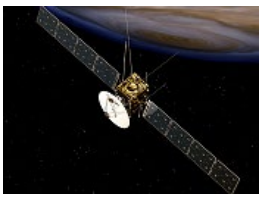
The high-performance switch enables packet processing on all 25 ports with full line speeds. The TTEthernet® technology of the TTESwitch Lab Space allows for convenient configuration of deterministic processing of critical and non-critical Ethernet traffic. It supports best-effort Ethernet (IEEE 802.3), ARINC 664 part 7 and time-triggered (SAE AS 6802) traffic flows. The TTESwitch Lab Space offers built-in mechanisms for traffic policing and fault isolation.

Virtual links and protocol support

The TTESwitch Lab Space allows the configuration of up to 4,096 virtual links (VLs). Virtual links can be configured with eight priorities and a bandwidth allocation gap (BAG) of 0.5 ms to 1,600 ms. The configuration of the network is stored in the switch's non-volatile memory (256 Mbit). As an option, IEEE 802.1Q VLANs can be configured. Profiled IP/UDP, redundancy management, and traffic shaping are implemented in hardware. The internal LEON2 CPU is used for management and higher-layer protocol functions.

Data loading and diagnostics

The built-in management module runs transparently and allows for data loading as well as for querying the network status via SNMP. Data loading is done according to TFTP.



Application Fields

- Laboratory development
- Space

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Connectors	6 x 100/1,000 Mbit/s full-duplex Ethernet (1000BASE-T/100BASE-TX via RJ45 or 1000BASE-X via SFP) 19 x 100 Mbit/s Ethernet (100BASE-TX via RJ45) Optional support of optical SFPs USB interface for CPU debugging / UART1 SpaceWire interface RS422/485 interface (can be used for debugging) Support advanced functions with GPIOs Monitoring faulty/healthy switch state through SNMP
Time-Triggered (SAE AS 6802) Implementation	8 sub-schedules 8 clock sync masters 4,096 virtual links Store-and-forward switch architecture
ARINC 664 part 7 Implementation	Policing, filtering, switching engine for bandwidth control and traffic prioritizing Integrity and error checking of frames 4,096 virtual links with up to 8 priorities with restrictions of their associated ports 4,096 shared bandwidth allocation gaps (BAGs) BAGs freely configurable from 0.5 to 1,600 ms BAG configuration granularity 100 µs Jitter & BAG resolution of 8 ns SNMP v1 & ICMP fully supported TFTP data-loading
Key Features	6 x 100/1,000 Mbit/s full-duplex Ethernet 19 x 100 Mbit/s full-duplex Ethernet Ethernet link/activity LED per port Support of copper and optical physical layer Full line speed switching capability Switching engine core identical to corresponding TTEthernet flight switch Up to 1 Mbyte of frame memory 256 Mbit Flash memory for storing switch configurations Internal LEON2 CPU for management functions Built-in tests (BITs) for health monitoring
Standards Compliance	IEEE 802.3-2005 (switching, flow control), IEEE 802.1Q (VLAN core capabilities), ARINC 664 part 7, SAE AS6802
Environmental Operating Ranges	Operational temperature: -40 °C to +70 °C Storage temperature: -55 °C to +85 °C Operating/non-operating humidity: humidity level from 25 to 90%
Power Supply	AC voltage: 100 to 240 V, 60 to 50 Hz, 2A max. thermal control 260 W AC power supply with PFC
Dimensions	Size: 44 x 483 x 356 (in mm), weight: 4.7 kg
Form Factor	19” rack housing 1 height unit
Order Number	13523: TTESwitch Lab Space – Package → TTESwitch Controller HiRel ASIC rev. ‘B’ (available until Q1/2021) 13970: TTESwitch Lab Space – Package (rev. ‘C’) → TTESwitch Controller HiRel ASIC rev. ‘C’ (available from Q1/2021)

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