Shaping the Future

TSN CoreSolution

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Overview

TSN CoreSolution

Systemic approach for vehicle network testing

To meet the tremendous challenges in the development and validation of next-generation vehicle networks, OEMs and TIER1 are increasingly pushed to their limits with classical analysis approaches. The complexity of service-oriented zone architectures in conjunction with TSN requires intelligent, systemic validation solutions that include all aspects of communication; the time-sensitive and the service-oriented and enable a consistent and thus efficient workflow in the analysis.
Based on a large number of successful OEM projects in which TSN Box and TSN Tools have already been used, TSN Systems has developed TSN CoreSolution, an ecosystem that consistently addresses all aspects and challenges in the development and validation of zone architectures. On the one hand, the TSN CoreSolution supports the high-precision data generation and analysis that is crucial for time-sensitive networks. However, the zone-to-zone integration from other aspects essential to the validation process: Automated Testing, High Level Dashboards and the uncompromising integration of SOME/IP. This creates a coherent workflow where TSN Box and TSN Tools merge into one product.

TSN CoreSolution: TSN Box 3.2

Hardware Interface, TAP and Emulator for TSN Test & Measurement Applications

The TSN Box 3.2 is designed to assist with automotive network development, particularly in the context of next-generation zonal architectures, as well as with planning and analysis of modern industrial automation systems based on TSN and OPC-UA.

Key Features

- Hardware interface for test and measurement
- Automotive and industrial networks
- Next generation zonal architectures and TSN
- Transparent TAP
- Analysis with enhanced DUT syncing and time stamping
- Signal generation
- Extended high-precision gPTP testing capabilities
- Enhanced AVB and audio testing capabilities

TSN CoreSolution: TSN Tools

PC Software for recording, analysis and visualisation of Ethernet, TSN and CAN data

TSN Tools is a platform-independent software environment specifically designed to capture complex measurements and analyse tasks at a glance.

Key Features

- Efficient analysis of complex network setups
- Unique and powerful approach for packet, timing and payload correlation
- Fast overview and deep dissection
- Efficient error/event hunt down
- Extensive SOME/IP support
- gPTP test suite
- AVB audio test suite

Features

TSN CoreSolution: TSN Box 3.2

TSN Box is the hardware physical interface to the network and can be configured as either a transparent TAP or as an active network participant or emulator, for example TSN Talker/Listener or SOME/IP endpoint. Our standard configuration includes the following:

Multi-functional AVB/TSN Device

- Multi-port TAP, DUT-sync feature, packet filtering, 8ns time stamp precision, 802.1Qbu support
- gPTP MasterSlave with failure injection, 1PPS out
- AVB Talker/Listener, IEEE 1722 AVTP/1733, CRF, media clock recovery, failure insertion, audio mute/unmute & tone generation, Qav shaping
- TSN Qbv Talker/Listener
- TSN pcapng player with dynamic time stamp refresh mechanism
- SOME/IP controller, entity
- REST API

Hardware Interfaces

- 4x 100BASE-T1, 2x 100/1000BASE-T1, 2x 100/1000BASE-T
- 1x CAN/CAN-FD
- 2 x LIN Capture Ports
- 1 x 10BASE-T1S
- BNC Sync In into TV out, SMA High-speed 2x In/2x out, GPIO 2x In/2x out
- 1000BASE-T Host port, USB3 Host, 2x USB2 Host
- Digital audio TDSL/MLADAT optical 2x In/2x out, 48kHz, 2ch/8ch each

P5 - P8 can be equipped either with Automotive T1 or regular BASE-T Ethernet PHYs

P7/8 PHY modules 100/1000BASE-T

- Dual speed twin port Ethernet 100/1000BASE-T PHY module with RJ45 connector for industrial or laboratory applications
- Replaces P7/8 100/1000BASE-T1 PHY modules on TSN Box 3.2 if equipped

P5/6 PHY modules 100/1000BASE-T1

- Dual speed twin port Automotive Ethernet 100/1000BASE-T1 PHY module
- Replaces P5/6 100/1000BASE-T PHY modules on TSN Box 3.2 if equipped

Up to 16 channels digital audio option for complex AVB applications

Digital Audio 16in/16out Option

- Software module, 2x 8 channel digital audio in, 2x 8 channel digital audio out
- 48kHz, 16/20/24bit, TDSL/MLADAT format in combination with TSN Box 3.2 digital card
- Digital audio mixer/matrix, signal generator, CRF clock output

Digital Audio 8in/8out Option

- Software module, 1x 8 channel digital audio in, 1x 8 channel digital audio out
- 48kHz, 16/20/24bit, TDSL/MLADAT format in combination with TSN Box 3.2 digital card
- Digital audio mixer/matrix, signal generator, CRF clock output

TSN CoreSolution: TSN Tools

TSN Tools can correlate, analyse and visualize various data. Scalable and flexible, it can be applied to a wide variety of scenarios. The following generic feature set provides solutions for even the most complex problems in modern time-sensitive network analysis.

- Stream detection: logical recognition of coherent packets and their visualization in automotive and industrial networks
- PTP Analysis: in-depth analysis of PTP status per link and network-wide
  - 1PPS read-in support (precise analysis of SMA input events from TSN Box)
- Multimodal payload analysis:
  - Packet delay analysis
  - Generic plotter
  - Audio/Video content (AVB)
  - AVB Audio Suite (PCM, wave export, presentation time budget, 1722/1733 analysis)
  - Raw audio support for correlation of ETH PCM and analog audio (e.g. for audio amplifier analysis)
  - TSN analysis (support and special features for 802.1 Qbv, Qbu, Qci, CB and much more)
  - Extensive SOME/IP support (AXIVAL import, service discovery, TCP/IP, UDP, packet fragmentation)
- Correlation between Ethernet and CAN bus
- RESTbet simulation (AVB/TSN Talker/Listener)
- SOME/IP service discovery, entity, controller

Examples of typical TSN Tools applications like gPTP, AVB, audio, SOME/IP analysis:

TSN Analysis

AVB Audio Test Suite

gPTP Analysis Suite

Network Overview

Use Cases

Use Case AVB

TSN Box supports in even the most complex AVB scenarios with precise signal generation and nanosecond precise time stamping. Very demanding hybrid use cases are supported with advanced media clock generation and synchronisation as well as live audio I/O and gPTP analysis.

Use Case SOME/IP

System validation in AVB and TSN context is challenging, especially in combination with service-oriented communication based on SOME/IP or DDS. Therefore, TSN Box provides full integration of generic SOME/IP communication to make validation on system level smooth and efficient.

Time Matters.

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