



Multimodal Test & Measurement Solutions

TSN Box
TSN Tools

Control complexity.

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TSN Systems?
www.tsn.systems

Control complexity

The invention of OPC-UA with TSN will challenge the well-known proprietary industrial field busses.

With the IEEE based Ethernet TSN standards, factories and production lines can be efficiently and scalable synchronized without leaving the realm of standard IT equipment and technologies.

A fully horizontal and meshed production network will be the enabler for many Industry 4.0 applications.

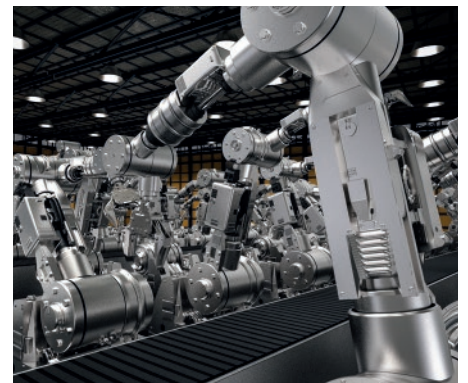
Solve complex tasks quickly and with high accuracy

Nanosecond precise timing, latencies of some μs and cycle times of 100 μs and less are great features. Our solutions provide you with deep measurement insight in such high performance networks.



TSN Tools and TSN Box

TSN Systems provide TSN stacks, development services and precise and reliable test equipment to enable you to make the next step in industrial automation networks with IEEE TSN protocols.



Our strengths lie in the following fields of application

PTP Analysis
PTP Master/Slave

AVB/TSN Simulation & Signal Generation

Sensor Data Simulation, Fusion and Time Stamping

TAP
100/1000 Base T1
1000 Base T
HDBaseT
CAN
Audio

TSN Box

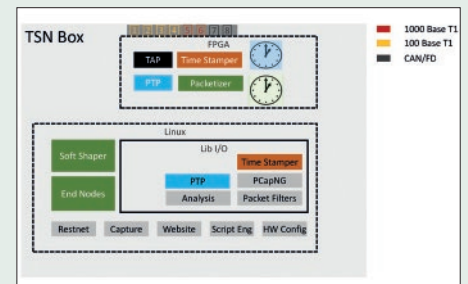
The Network Interface and Gateway

The TSN Box functions as a network interface / gateway and media converter for time sensitive automotive Ethernet networks and CAN/CAN FD. The TSN Box prepares the data and communicates with TSN Tools. The FPGA-based hardware supports various modes as TAP, data logger and AVB Talker/Listener.



Nanosecond precise time stamps

The TSN Box provides a FPGA timestamp engine with 8 ns precision, covering multiple clock domains. The timestamp engine can be driven by the DUT clock (car PTP), the local clock or an external PTP grandmaster. In this mode multiple TSN Boxes can be synchronized.



Traffic Generator AVB/TSN Talker

The system provides a flexible signal generation unit that allows rest-net simulations of all relevant signal types in the TSN world. Signal generation and rest bus simulation can be done as audio/video talkers, sensor data generation/playback or general command and control data. The flexible yet precise AVB and TSN Talker within the TSN Box can handle the biggest challenges.

Supports natively future TSN protocols

The TSN Box provides right away a feature rich set of support for the AVB and TSN protocols typically used in industrial architectures of 2021 and beyond. The solution is the ideal partner to explore PTPv2, 802.1ASrev and different shaping options within TSN such as credit based, time aware or asynchronous shapers.



TSN Tools

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Complexity

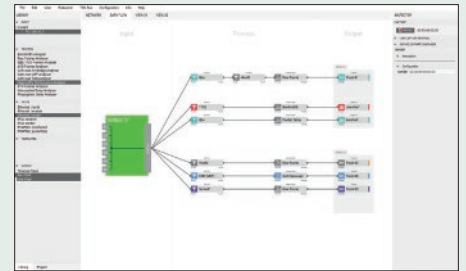
Platform
independent

Easy-to-use

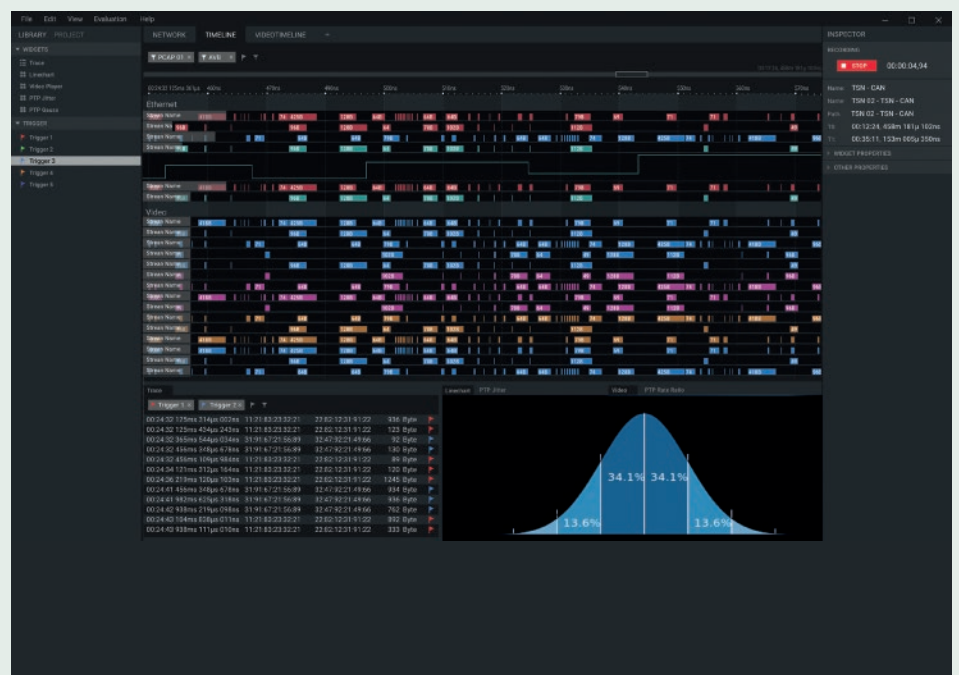
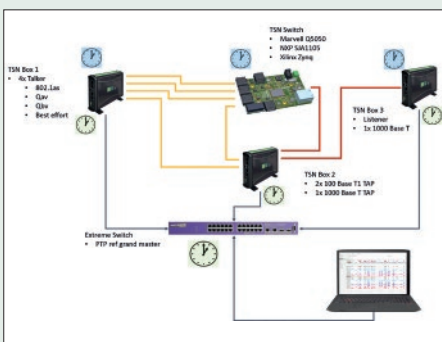
The TSN Tools software provides a high level network analysis and visualization approach to keep track at any time.

TSN Tools is available for Windows 7/10 and Linux platforms and tailored to fit into existing and new workflows of future automotive development. Embedded software specialists do not need to leave their well-known Linux development environment.

Debugging Automotive Ethernet can be complex. TSN Tools provides a Test & Measurement solution on expert technical level with a highly intuitive user interface. This eases the learning curve when starting ECU development within Automotive Ethernet.



TSN Testbed

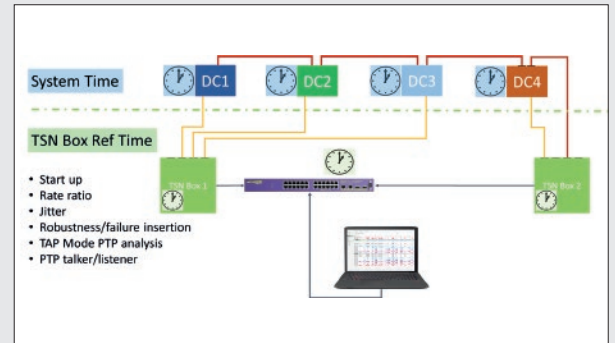


Use cases

1

PTP start up testing

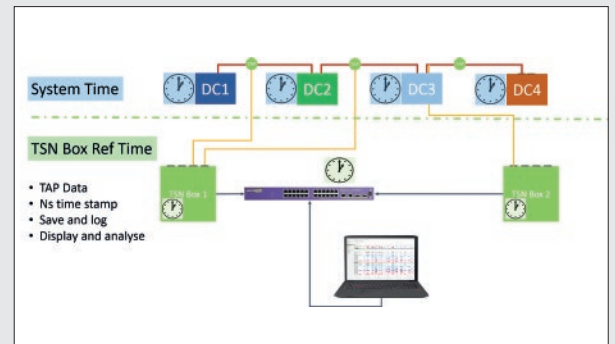
PTP timing is essential for any time sensitive network. PTP start-up and stability can be tested under many circumstances to ensure proper behaviour. TSN Tools and TSN Box support various PTPv2 testing scenarios (IEEE 802.1AS and IEEE 802.1 ASrev).



2

Multi-link TSN Tap

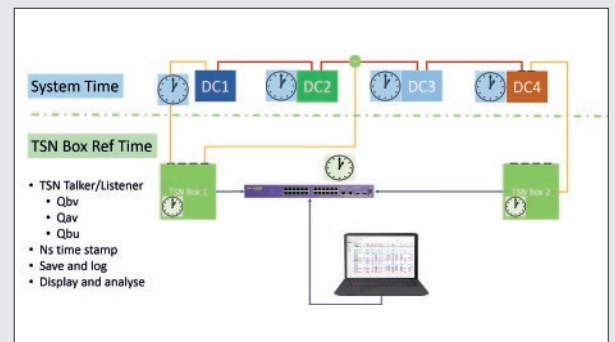
Since Ethernet is not a bus, looking into an Industrial Ethernet link is not easy, especially when PTP and AVB/TSN are involved. TSN Box provides a total of six Ethernet ports for serving as fully transparent 100/1000 Base T TAP with nanosecond precision timestamps.



3

TSN Talker/Listener

To test complex automation networks and sub-systems you need easy to set-up but precise TSN Talker/Listener devices. TSN Box is the right partner for many situations, whether it is 802.1as(rev), 802.1Qbv, 802.1Qav or just best effort traffic.



TAP 100/1000Base-T1, 1000Base-T
HDBaseT
AVB/TSN Talker/Listener
PTP Analysis
Audio (Analog, Digital, A2B)
Rest Net Simulation
CAN-Gateway

TSN Box 3.0 Technical Data



Physical Parameters		
Dimensions	210 mm x 150 mm x 74 mm	
Maximum envelope with connectors	210 mm x 187 mm x 74 mm	
Weight	1.7 Kg	
External power supply	8-15 VDC	
Power consumption	27 W	
Temperature range	0 – 70 °C (-40 – 70 °C possible)	
Interfaces & Connectors		
General Interfaces	No.	
USB2.0	2	
USB3.0	1	
1Gb/s Ethernet	1	
USB Serial Terminal	1	
Front Panel Reset	1	
Recovery Button	1	
GPIO & Sync		
Isolated Input	2	
Isolated Outputs (open-collector)	2	
Output Power (12V non-isolated)	1	
High-speed GPI (SMA, 50Ω load impedance)	2	up to 8 ns precision
High-speed GPO (SMA, 50Ω source impedance)	2	up to 8 ns precision
BNC SYNC Module	2	1 x PPS in/1 x PPS out or SYNC in/out
Audio		
12x Audio Ports (6 x stereo connectors)	48 kHz, 24 Bit, line level	
Outputs channels	8	
Input channels	4	
A2B & Digital Audio (SPDIF)	2	each
Ethernet		
Dual 1Gb/s Modules	2	Configured as either 2 x 1000BASE-T & 2 x 1000Base-T1 or 4 x 1000BASE-T
Quad 100Mb/s Module	1	Configured as 4 x 100BASE-T1
CAN		
CAN Module	1	optional CAN-FD
HDBaseT		
VA6000 TAP Mode	2	

Headquarter

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- » TSN Tools
- » Simulation & E/E Architecture
- » Marketing & Sales

Team Cape Town

- » TSN Box
- » Hardware & Embedded Firmware
- » AVB/TSN Talker Listener
- » AVB/TSN Switch
- » TAP Device

Write now: info@tsn.systems or call: +49 661 410 951 80

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