TSN/A CONFERENCE
TECHNOLOGY & APPLICATIONS

29 - 30 September 2021
Virtual Conference
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We are very pleased to welcome you again to the Time-Sensitive Networks and Applications (TSN/A) Conference, which is purely virtual again. Like you, perhaps, we look forward to the normalcy of in-person events, sidebar hallway conversations, meeting old friends and new associates.

The conference utilizes the newest innovations for online conferences in order to encourage interactions among participants and presenters. Please join and add your unique perspective to the group discussions.

Open standards like TSN provide great benefits for end users, and their success requires the collaboration of all participants in the value chain including: vendors of silicon, network switches, software components, compute endpoints, sensors/actuators, as well as providers, system integrators, and end customers. We can all play a role in transforming industries towards a vision of intelligent things that are interconnected and share information to increase productivity, improve efficiency, reduce our footprint, and improve the lives of people around the world.

While in-person standards meetings and testbed efforts have been disrupted by the pandemic, you’ll learn about the meaningful progress that teams around the world have nonetheless made, including new use case definitions, expansions in time-sensitive wireless networks, further development of the various industry profiles, real-world performance measurements, and other topics relevant to those planning deployments of TSN in support of mission critical time-sensitive distributed applications. Thank you for joining us at TSN/A 2021!

Warm regards from your conference and program chairs,

Kevin, Meinrad & Janos
### Day 1 | Wednesday, 29. September 2021

#### SESSION 1 | OPENING SESSION

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>15:00</td>
<td>Opening remarks</td>
</tr>
<tr>
<td>15:10</td>
<td><strong>Keynote</strong>: Shaping the future of industrial automation</td>
</tr>
<tr>
<td>15:50</td>
<td>IEEE 802.1 TSN update; IEC/IEEE 60802 update; P802.1DG update; IETF DetNet update; 3GPP update; 802.11 update; Followed by Q&amp;A</td>
</tr>
<tr>
<td>17:00</td>
<td>Break</td>
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</tbody>
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#### SESSION 2 | SOFTWARE, SYSTEMS, & OPEN SOURCE

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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</thead>
<tbody>
<tr>
<td>17:30</td>
<td>Software Time Sensitive Networking with Linux</td>
</tr>
<tr>
<td>18:00</td>
<td>TSN Network Interface support in Linux – towards a standards-based solution</td>
</tr>
<tr>
<td>18:30</td>
<td>OPC UA PubSub over TSN performance in a highly integrated system concept</td>
</tr>
<tr>
<td>19:00</td>
<td>Testing TSN functionality in base silicon and modules to ensure compliance and interoperability</td>
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#### WORKSHOP SESSION

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>19:30</td>
<td>Workshop 1: Latency of Time Sensitive Networks</td>
</tr>
<tr>
<td></td>
<td>Workshop 2: Intel®: Going from Standards to End-to-End Deployment of TSN-based Solutions</td>
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</tbody>
</table>

### Day 2 | Thursday, 30. September 2021

#### SESSION 4 | INDUSTRIAL

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>15:00</td>
<td>OPC UA FX over TSN: Extending OPC UA with determinism for the field level</td>
</tr>
<tr>
<td>15:30</td>
<td>Converged Security for Industrial Automation</td>
</tr>
<tr>
<td>16:00</td>
<td>Experiments on IEEE 802.3cg 10BASE-T1L &amp; Preemption in Process/Industrial Automation</td>
</tr>
<tr>
<td>16:30</td>
<td>The difference between TSN and TN</td>
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<tr>
<td>17:00</td>
<td>Break</td>
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#### SESSION 5 | IN-VEHICLE

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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</thead>
<tbody>
<tr>
<td>15:00</td>
<td>TSN Profile for Aerospace</td>
</tr>
<tr>
<td>15:30</td>
<td>Using TSN for digitalization of Train Control and Monitoring Systems in the SAFE4RAIL project</td>
</tr>
<tr>
<td>16:00</td>
<td>Demonstration of Ethernet based redundancy for Autonomous drive applications</td>
</tr>
<tr>
<td>16:30</td>
<td>Demystifying frame preemption use cases for in-vehicle networks</td>
</tr>
<tr>
<td>17:00</td>
<td>Break</td>
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</tbody>
</table>

#### SESSION 6 | CLOSING SESSION (Generic)

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>17:30</td>
<td>Best practices for configuring Time Aware Shaper over multiple hops</td>
</tr>
<tr>
<td>18:00</td>
<td>Dynamic reconfiguration of centrally managed TSN networks</td>
</tr>
<tr>
<td>18:30</td>
<td>Attack Resilience for Time-Sensitive Networking &amp; Applications</td>
</tr>
<tr>
<td>19:00</td>
<td>Diffusion of TSN across Markets and Ecosystems: Where We Are and a Roadmap Forward</td>
</tr>
<tr>
<td>19:40</td>
<td>Closing remarks</td>
</tr>
<tr>
<td>19:50</td>
<td>Virtual Hallway – Open Discussion</td>
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www.tsnaconference.de
The media brand Computer&AUTOMATION reaches and creates a link between the automation- and the manufacturing- and processing-industries. The classic themes of automation, such as control technology, sensor technology, drive technology and networking find a place here in the reporting of trends: Industry 4.0, IIoT, human-robot cooperation, safety and security, big data and real-time Ethernet (TSN).

The reporting is user-oriented, illustrating the value and benefits of technologies in a neutral, sophisticated and independent manner. Parallel to the coverage in print and online, the automation community can find out about the professional events of Computer&AUTOMATION. The intensive training seminars for professionals, the safety and security forum, Automation 4.0 Congress in conjunction with the SPS IPC Drives are a few examples of the face-to-face offerings.

Elektronik automotive

Elektronik automotive – world of solutions

Focused on the really relevant topics of the automotive industry – autonomous driving, electromobility, connected car, services & shared mobility and alternative drives – the monthly electronic automotive magazine covers a wide spectrum along the value chain from individual components to system solutions and software engineering. With top-class events on top topics of the industry and a wide-ranging independent website in the business network elektroniknet with a weekly newsletter, Elektronik automotive offers a technically sophisticated, cross-media platform. Elektronik automotive, a media brand for efficient and effective market communication in automotive electronics: Print - Online - Event.

The Avnu Alliance is a community creating an interoperable ecosystem of low-latency, time-synchronized, highly reliable networked devices using open standards. Avnu creates comprehensive certification programs to ensure interoperability of networked devices. The foundational technology enables deterministic synchronized networking based on IEEE Audio Video Bridging (AVB) / Time Sensitive Networking (TSN) base standards.

The Alliance, in conjunction with other complimentary standards bodies and alliances, develops complete solutions in professional AV, automotive, industrial control and consumer segments. For more information about Avnu Alliance, please visit http://www.Avnu.org

www.tsnaconference.de
“Evolve your infrastructure with Intel® technologies to capture the IoT data you need to solve your business problems”.

IEEE Standards Association (IEEE SA), a globally recognized standards-setting body within IEEE, develops consensus standards through an open process that engages industry and brings together a broad stakeholder community.
INTEL

Supporting the convergence of industrial workloads and edge use cases

Computing and networking products from Intel help the industry develop and build next-generation industrial control solutions for Industry 4.0. Using new levels of integration, we deliver:

1. Powerful CPU performance
2. Real-time capabilities
3. High integration to support workload consolidation
4. Fast graphics and media/image processing
5. More security

11th Gen Intel® Core™ Processors

Intel® Core™ processors integrate up to 4 high-performance cores with Intel® Deep Learning Boost, new Intel® Time Coordinated Computing (Intel® TCC) and IEEE time-sensitive networking (TSN) technologies. Intel® Iris® Xe graphics, FuSa collateral support. Extended Temp: up to -40°C to +100°C.

Intel® Cyclone® FPGA

Choice between FPGA + included IEEE TSN IP or off-the-shelf solutions. Device drivers and Linux S/W support. Switched end point capable.

Intel Atom® x6000E Processor Series

Intel Atom x6000E processors—up to four cores—integrate new Intel TCC and TSN, support for functional safety (FuSa) with Intel® Safety Island. Extended Temp: up to -40°C to +110°C.

Partnering on Industry Standards/Initiatives

Collaboratively working with the Industrial Ecosystem towards Industry 4.0. Engagements include: The Open Group, OPC Foundation, OSADL, AVNU, IEEE, IETF, open62541.org, Linux Foundation Edge.

Intel® Ethernet Controller I225–IT

Intel silicon supporting IEEE time-sensitive networking technologies. 2.5GbE MACPHY, PCIe v3.1, gen 2x1 (7x7mm).

Edge Controls for Industrial

Software reference platform enabling software-defined solutions optimized for Intel silicon that integrates real-time compute, standards-based connectivity, safety, virtualization, orchestration, and IT manageability.

Learn more: intel.com/iot

1- Not all skus have industrial features: Refer to Intel product guides for detail.
2- Intel® Time Coordinated Computing technology and IEEE time-sensitive networking (TSN) reduce latency and minimize jitter for synchronous process control and real-time computing—technologies that improve deterministic behavior within individual processors by synchronizing data, communications, and executions across networks of IoT devices. 3- Supports commercial and open source operating systems: Windows 10 IoT Enterprise, Yocto Project Linux distribution with TSN Reference Software including open62541 Pub/Sub, Wind River Real-Time Systems real-time operating systems; Linux LTS kernel, Android.

Intel technologies may require enabled hardware, software or service activation. No product or component can be absolutely secure. © Intel Corporation. Intel, the Intel logo, and other Intel marks are trademarks of Intel Corporation or its subsidiaries. Other names and brands may be claimed as the property of others.
System-on-Chip engineering (SoC-e) is a worldwide leading supplier of time-aware Ethernet networking solutions. We are pioneer in developing a portfolio of IP cores and end-devices that implement these technologies for critical systems.

Time Matters. TSN Systems are experts for Time Sensitive Networking for Automotive, Industrial and AV applications. Since 2008 we provide holistic measurement and analysis tools for deterministic systems that are always reliable.

TTTech Industrial develops innovative computing and connectivity solutions that help customers to modernize automation systems and become IoT leaders in their field.
SoC-e, a worldwide leading supplier for high-availability time-aware Ethernet networking solutions, presents the most comprehensive and flexible portfolio of TSN solutions available in the market:

- **MTSN IP Core** up-to 32 ports, full profile support, with first commercial CB solution
- **Bridge, endpoint and testing** devices for PoC, testing and development
- **Fully functional and certified TSN switches** for deployment in Critical Applications

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Time Matters.

[www.tsn.systems](http://www.tsn.systems)
Taking the complexity out of TSN

You do the application.
We will deal with everything below the surface.

tttech-industrial.com/slate
Dr. Henning Löser  
AUDI  
Wednesday, 29. September 2021  
Keynote: Shaping the future of industrial automation

Dr. Mohammed Abuteir  
TTTech  
Thursday, 30. September 2021  
Using TSN for digitalization of Train Control and Monitoring Systems in the SAFE4RAIL project

Dr. Dave Cavalcanti  
Intel  
Wednesday, 29. September 2021  
Wireless TSN: Exploring market expectations, technologies, certification, and interoperability

Lulu Chan  
NXP Semiconductors  
Thursday, 30. September 2021  
Demonstration of Ethernet based redundancy for Autonomous drive applications

Dieter Cohrs  
Intel  
Wednesday, 29. September 2021  
Workshop 2: Intel®: Going from Standards to End-to-End Deployment of TSN-based Solutions

János Farkas  
Ericsson  
Wednesday, 29. September 2021  
Standards Update

Christopher Hall  
Intel  
Wednesday, 29. September 2021  
End-to-End Time-Performance in heterogeneous TSN environments

Prof. Jeroen Hoebbeke  
imec - IDLab - UGent  
Wednesday, 29. September 2021  
Verifiable wired-wireless time-sensitive networking

Dr. René Hummen  
Hirschmann Automation and Control  
Thursday, 30. September 2021  
OPC UA FX over TSN: Extending OPC UA with determinism for the field level

www.tsonaconference.de
Dr. Abdul Jabbar
GE Research
Thursday, 30. September 2021
TSN Profile for Aerospace’

Henning Kaltheuner
d&b audiotechnik
Thursday, 30. September 2021
Diffusion of TSN across Markets and Ecosystems: Where We Are and a Roadmap Forward

Kurt Kanzenbach
Linutronix
Wednesday, 29. September 2021
Software Time Sensitive Networking with Linux

Vuk Lesi
Intel
Thursday, 30. September 2021
2021 Attack Resilience for Time-Sensitive Networking & Applications

Patrick Loschmidt
TTTech Industrial
Wednesday, 29. September 2021
TSN Network Interface support in Linux - towards a standards-based solution

Peter Lutz
OPC Foundation
Thursday, 30. September 2021
OPC UA FX over TSN: Extending OPC UA with determinism for the field level

Alen Mehmedagic
Schneider Electric
Thursday, 30. September 2021
The difference between TSN and TSN

Dr. Martin Ostertag
Zurich University of Applied Sciences
Thursday, 30. September 2021
Experiments on IEEE 802.3cg 10BASE-T1L & Preemption in Process/Industrial Automation

Donald Pannell
NXP
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Razvan Petre
Spirent
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Demystifying frame preemption use cases for in-vehicle networks
Thursday, 30 September 2021
Best practices for configuring Time Aware Shaper over multiple hops

Catherine Redmond
Analog Devices
Thursday, 30 September 2021
Experiments on IEEE 802.3cg 10BASE-T1L & Preemption in Process/Industrial Automation

Dr. Oliver Pfaff
Siemens
Thursday, 30 September 2021
Converged Security for Industrial Automation

Alon Regev
Keysight Technologies
Wednesday, 29 September 2021
Testing TSN functionality in base silicon and modules to ensure compliance and interoperability
Wednesday, 29 September 2021
Adapting wired TSN test specifications to testing of Wireless TSN devices

Manoj Sastry
Intel
Wednesday, 29 September 2021
OPC UA PubSub over TSN performance in a highly integrated system concept

Greg Schlechter
Intel
Thursday, 30 September 2021
Diffusion of TSN across Markets and Ecosystems: Where We Are and a Roadmap Forward

Maik Seewald
Cisco
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Fraunhofer IPMS
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Ericsson
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Malcolm Smith
Cisco
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Standards Update

Guenter Steindl
Siemens
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End-to-End Time-Performance in heterogeneous TSN environments

Tom Weingartner
Analog Devices
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Pekka Varis
Texas Instruments
Wednesday, 29. September 2021
Testing TSN functionality in base silicon and modules to ensure compliance and interoperability

Ganesh Venkatesan
Intel
Wednesday, 29. September 2021
Testing TSN functionality in base silicon and modules to ensure compliance and interoperability

Balázs Varga
Ericsson
Wednesday, 29. September 2021
Standards Update
SPEAKERS

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<th>Lukas Wüsteney</th>
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<tr>
<td>L.A.N. Winkel</td>
<td>Hirschmann Automation and Control</td>
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SAVE THE DATE

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TECHNOLOGY & APPLICATIONS
28 - 29 SEPTEMBER 2022
STUTTGART, GERMANY