

# **2021 IEEE International Symposium on Precision Clock Synchronization for Measurement, Control, and Communication (ISPCS 2021)**

**Virtual Conference  
27 – 28 October 2021**



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## Technical Program

### Wednesday, October 27, 2021

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#### 15:00 Welcome Ceremony

**Session Chair:** Lee Cosart (Microchip, USA)

**Speakers:** Nikolaus Kerö (Oregano Systems, Austria), Lee Cosart (Microchip, USA), Radim Bartos (University of New Hampshire, USA), Kang Lee (NIST, USA)

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#### 15:15 Keynote

**Session Chair:** Lee Cosart (Microchip, USA)

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#### Optical Frequency Ratios: Putting Atomic Clocks and Fundamental Physics to the Test

*Dr. David Hume (National Institute of Standards and Technology)*

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#### 16:15 Paper Session I

**Session Chair:** Kang Lee (NIST, USA)

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#### Hyperbolic Positioning Accuracy Issues: Measurement Noise, Geometric Dilution of Position, and Synchronization Errors...1

*Marc Weiss (University of California Santa Cruz, USA)*

*Charles Barry (Luminous Cyber LLC, USA)*

#### PTP Security Key Management Solutions...8

*Martin Langer (Ostfalia University of Applied Sciences, Germany)*

*Steffen Fries (Siemens AG, Germany)*

*Marius Rohde (Meinberg Funkhrehn GmbH & Co. KG, Germany)*

*Kai Heine (Ostfalia University of Applied Sciences, Germany)*

*Dieter Sibold (Physikalisch-Technische Bundesanstalt, Germany)*

*Rainer Bermbach (Ostfalia University of Applied Sciences, Germany)*

#### Self-Learning of the Dynamic, Non-linear Model of Frequency-Temperature Characteristic of Oscillators for Improved Clock Synchronization...14

*Tamás Kovács házy (Budapest University of Technology and Economics, Hungary)*

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#### 18:45 Work in Progress Presentation

**Session Chair:** Radim Bartos (University of New Hampshire, USA)

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#### Experimental Analysis of the Performance and Scalability of Network Time Security for the Network Time Protocol...N/A

*Griffin Leclerc (University of New Hampshire InterOperability Laboratory (UNH-IOL), USA)*

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#### 18:55 Presentations on the Deployment of Timing Technology

**Session Chair:** Douglas Arnold (Meinberg-USA, USA)

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#### GPS/GNSS independent Time Transfer over Telco IP Core Networks using DTM overlay...20

*Umut Keten (Türk Telekom, Turkey)*

#### High Accuracy Network Timing for a Naval Ship Network...N/A

*Didrik Erenborg (Meinberg GmbH, Germany)*

#### Ensuring Trusted Timing in Critical Infrastructure – Managing Live Sky and Terrestrial Time Sources to Protect Against Emerging Cybersecurity Threats...N/A

*Greg Wolff (Microchip, USA)*

**Thursday, October 28, 2021**

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**15:00 Standards Update**  
**Session Chair:** Douglas Arnold (Meinberg-USA, USA)

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**Introduction to IEEE 1588 Working Group...N/A**  
*Douglas Arnold (Meinberg-USA, USA)*

**P1588 New Features - Highlights and Status...N/A**  
*Maciej Lipinski (CERN, Switzerland)*

**Time Security: Moving from Standards to Deployments...N/A**  
*Karen O'Donoghue (Internet Society, USA)*

**IEEE 1588 Management Subcommittee Update...N/A**  
*Rodney Cummings (National Instruments, USA)*

**Toward a More Inclusive Terminology in Network Timing Standards...N/A**  
*Douglas Arnold (Meinberg-USA, USA)*

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**16:40 Paper Session II**  
**Session Chair:** Radim Bartos (University of New Hampshire, USA)

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**Time error analysis of 5G time synchronization solutions for time aware industrial networks...24**

*Dhruvin Patel (Ericsson, Germany)*  
*John Diachina (Ericsson, USA)*  
*Stefano Ruffini (Ericsson, Italy)*  
*Marilet De Andrade Jardim (Ericsson, Sweden)*  
*Joachim Sachs (Ericsson Research & Ericsson AB, Sweden)*  
*Daniel Philip Venmani (Orange Labs, France)*

**Challenges with Linuxptp on Telco RAN deployments...30**

*Maciej Machnikowski (Intel, Poland)*  
*M Ramana Reddy (& AltioStar Networks, India)*  
*Zoltan Fodor (Intel Uk. Ltd., United Kingdom (Great Britain))*

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**17:45 Paper Session II (continued)**  
**Session Chair:** Radim Bartos (University of New Hampshire, USA)

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**Portable, PTP-based Clock Synchronization Implementation for Microcontroller-based Systems and its Performance Evaluation...34**

*Tamás Kovácsházy (Budapest University of Technology and Economics, Hungary)*  
*András Wiesner (Budapest University of Technology and Economics, Hungary)*

**Multi-Core Intra-Process Clock Synchronization...40**

*James Coleman (Intel Corporation, USA)*

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**18:35 Standards Update**

**Session Chair:** Lee Cosart (Microchip, USA)

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**ITU-T Q13 Synchronization Expert Group Overview...N/A**

*Stefano Ruffini (Ericsson, Italy)*

**Network Time Protocol Version 5: What Will It Be and Why?...N/A**

*Douglas Arnold (Meinberg-USA, USA)*

**Resilient PNT Conformance Framework Overview...N/A**

*Ernest Wong and James Platt (Department of Homeland Security, USA)*

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**19:35 Closing Session**

**Session Chair:** Lee Cosart (Microchip, USA)

**Speakers:** Nikolaus Kerö (Oregano Systems, Austria), Lee Cosart (Microchip, USA), Radim Bartos (University of New Hampshire, USA), Kang Lee (NIST, USA)

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