SEMINAR ANNOUNCEMENT

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
COLLEGE OF DESIGN AND ENGINEERING
Website: https://cde.nus.edu.sg/ece

Area: Communications and Networks (CN)

Host: Prof Biplab Sikdar

TOPIC	:	**Precision Time Sync at the Wireless Edge: A Scalable Framework for Sub-Microsecond Accuracy**
SPEAKER	:	**Mr Chellappan Pillai Sreedevi Ullas Kumar** **PhD student, ECE Dept, NUS**
DATE	:	**Tuesday, 15 July 2025**
TIME	:	**11:00AM to 12:00PM**
VENUE	:	**Join Zoom:** **https://nus-sg.zoom.us/j/8092137897?pwd=eXFwV0s2SW14VFBzYW5GVXJtdUtvQT09** **Meeting ID: 809 213 7897** **Passcode: 405792**

ABSTRACT

Modern distributed systems—from data centers and telecom to industrial automation and IoT—demand precise time synchronization, often at sub-microsecond levels. However, the widespread use of Wi-Fi at the network edge poses significant challenges to achieving this accuracy. Traditional wireless synchronization methods like IEEE 802.11 TSF and RBS lack the precision, scalability, and robustness required. This presentation introduces a novel edge-integrated synchronization framework that combines the Precision Time Protocol (PTP) over Wi-Fi with hardware-assisted timestamping via TSF and peer-to-peer correction inspired by RBS. It leverages high-stability oscillators in edge nodes acting as localized Grandmasters or Boundary Clocks, and incorporates concepts from Synchronous Ethernet to ensure frequency stability. To overcome wireless impairments, the framework also includes algorithms to compensate for oscillator drift, asymmetric delays, and timing attacks. This scalable, power-efficient, and secure approach is designed to meet the needs of next-generation time-critical systems, such as smart infrastructure, autonomous platforms, and coordinated sensor networks.

BIOGRAPHY

Ullas Kumar is a PhD student at NUS, researching synchronization networks. He holds an M.Tech in Electronics Design and Technology from the Indian Institute of Science.

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