

Telecommunications Seminar Series presents...

# What time is it? Synchronization techniques and issues in packet networks

*David Tipper, Professor, University of Pittsburgh*



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**1:00-2:00 PM**

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**University of  
Pittsburgh**

**School of  
Information  
Sciences**

**IS Building  
Room 403**

Tight synchronization timing is expected to play a crucial role for the realization of high value applications such as smart transportation and smart grid. In this paper, we first overview the main synchronization protocols and improvement mechanisms recently proposed, which are based on configuration, software, and specific hardware improvements. Further, we next discuss the main network delay components, since delay asymmetry is one the most significant challenges for synchronization protocols over packet-switched networks. We next propose probing-based mechanisms in order to estimate asymmetry and evaluate the synchronization performance under several network conditions. Lastly we discuss open issues such as security.

**David Tipper** is the Director of the Graduate Telecommunications & Networking Program and is a Professor at the School of Information Sciences at the University of Pittsburgh, Pittsburgh, PA. He is a graduate of the University of Arizona (Ph.D. EE, MS SIE) and Virginia Tech (BS EE).

His research interests include survivable networks, performance analysis techniques, wireless/wired network design, information assurance, network design and traffic restoration; simulation and queuing theory with emphasis on transient/non-stationary behavior, virtual network design, and network control algorithms.

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