# Timing and Synchronization for Time-Sensitive Applications in Bridged Local Area Networks

## Draft PAR
## October 26, 2005

# Title (4)

**Draft:**   IEEE Standard for Local and Metropolitan Area Networks –
Timing and Synchronization for Time-Sensitive Applications in
Bridged Local Area Networks

# PAR Scope (13)

The proposed standard specifies protocol elements and filtering functions that allow time synchronization to be distributed through bridged local networks.

The synchronization distribution will be done via the exchange of time stamp messages between adjacent network elements (bridges and/or end stations).  The result will be to provide a synchronization signal at each network element that is traceable to one element, termed the grandmaster.

# PAR Scope (13)

The standard will specify (1) the time stamp information that is exchanged, (2) how the time stamp information is used to obtain a synchronization signal at each network element, and (3) the procedures for selecting the grandmaster.   Items (1) and (2) will include sufficiently detailed specification of

a)   the time stamp information exchange (e.g., frequency of the time stamps, time stamp granularity)
b)   the algorithms for using the information (e.g., algorithm for computing phase corrections)
c)   the filtering functions that processes the time stamp information (e.g., filter bandwidth and gain peaking) to guarantee the synchronization performance required for time-sensitive applications.

# PAR Scope (13)

Is the completion of this document contingent upon the completion of another document?

- This standard is designed to support the AV802 architecture and applications (802.1av?)

# PAR Purpose (14)

This standard will enable bridged LANs to transport time-sensitive applications and meet the respective jitter, wander, and time synchronization requirements for those applications. Its primary purpose is to provide timing information at each network element where a time-sensitive application may be mapped or demapped.

- The application mapping can use this timing information to determine and record when particular information is mapped. The recorded information can then be used at the demapper, relative to the timing information there, to determine when to present the demapped information to the application layer.
  - This process requires that the timing information at the mapper and demapper be synchronized.

# PAR Purpose (14)

- The manner in which the application uses the timing information at the mapper and demapper is not part of this standard; rather, this standard covers the synchronization of the timing information at the mapper and demapper.

- The synchronization of the grandmaster to an externally provided timing signal (e.g., a recognized timing standard such as UTC or TAI) is not part of this standard but is not precluded.

  – If the grandmaster is synchronized to an externally provided timing signal that provides time of day , the standard will allow applications that require time of day to perform.

# PAR Reason (15)

- The use of current IEEE 802 technologies for time sensitive applications, such as high quality audio/video streaming, does not assure that the applications be delivered at the network egress with acceptable jitter and wander. In addition, applications that involve multiple streams delivered to different locations may require that the delivery be synchronized in time. Finally, some applications may require knowledge of time of day.

- To facilitate the widespread use of bridged LANs for these applications, synchronization information is needed at each network element where a time-sensitive application is mapped or demapped or a time sensitive function is performed.
  - The synchronization information provided to each network element will allow the jitter, wander, and time synchronization requirements of the most demanding applications in a residential environment to be met.

# PAR Reason (15)

- This standard will use relevant aspects of other standards that transport synchronization using time stamps, such as IEEE 1588 and NTP; however, it differs from those standards in that

  1) it goes beyond them by providing sufficient specifications to guarantee performance of high quality audio/video streaming applications, and

  2) it is optimized for the transport of these applications in a bridged LAN environment and therefore differs in some aspects and omits other aspects of those standards to minimize complexity.