

draft-frost-pwe3-timing-pw-reqs-01

IETF 65

PWE3 Working Group

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Tim Frost, Silvana Rodrigues, Zarlink

Stewart Bryant, Cisco Systems

Matthew Bocci, John Tatham, Alcatel

Yaakov Stein, RAD,

Sasha Vainshtein, Axerra,

Ron Cohen, Resolute Networks

Why do we need this draft?

- **Purpose:** *To define the requirements of a protocol suitable for conveying Timing and Synchronization for support of Pseudowire services*
- Doesn't necessarily mean a timing pseudowire, but the support for pseudowires requiring timing
- There are three aspects to the distribution of timing and synchronization:
 - Frequency distribution – i.e. the distribution of an accurate frequency reference from one point to another
 - Phase lock – i.e. the limiting of phase wander accumulation between two clocks to a maximum value
 - Time alignment – i.e. the synchronization of absolute time between two or more points

Potential Applications

- **There are many applications that require distribution of accurate synchronization and timing:**
 - **TDM and ATM emulation (AAL1, AAL2)**
 - Distribution of an accurate frequency reference to replace the physical layer clock in the native service
 - **Synchronization of cellular base-stations over a packet backhaul**
 - **Synchronization of IP PBXs or Voice Gateways**
 - **Real-time services**
 - Packet voice and video
 - **Industrial applications**

Performance Requirements

- **Requirements are application-specific, and are defined in the relevant normative references**
- **Examples:**
 - **GSM and UMTS cellular synchronization requires frequency accuracy within 50ppb**
 - **CDMA cellular synchronization also requires phase alignment between basestations to within 10us**
 - **Wireline telecommunications require phase bounded to within 18us**
 - **Some audio applications e.g. IP speakers require 5us phase alignment**
- **G.8261 (formerly G.pactiming) defines the requirements for delivery of synchronization over Ethernet for TDM emulation**
 - **In future this will be extended to IP and MPLS**
 - **IETF is the primary design authority for IP and MPLS, and should be involved with this work**

Additional Requirements

- **Robustness**
 - Should be robust in the presence of common PSN error conditions
- **Discovery process for selecting best master clock**
 - Needs an indication of the quality of timing sources and path degradation
- **Redundancy and fault tolerance**
 - Should be able to monitor and switch over to alternative timing sources in the event of failure detection
- **Security**
 - Authentication of timing sources
- **Note that there may be implications on network hardware**
 - e.g. use of IEEE1588-style boundary or transparent clocks

Candidate Solutions

- **Adaptive clock based on pseudowire packet arrival times**
 - Provides only frequency and phase lock, not time or phase alignment
- **NTP v4**
 - Designed for time synchronization of computer clocks to an accuracy of around 50ms
 - Requires hardware support to achieve accuracy requirements
- **IEEE1588 v2**
 - Designed for industrial applications over a LAN
 - Currently being extended for operation over WAN
 - Requires modification of routers to achieve performance
- **1588 lacks the wide-area ruggedness of NTP, while NTP lacks the phase/frequency precision of 1588**

Next steps

- **Understand where the existing solutions match or fall short of the application requirements**
- **Decide if they can be fixed, or if we need an alternative approach**
- **Decide which working group or body should carry out this work**
 - **PWE3 WG, NTP WG, IEEE, ITU-T?**