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# Requirements for Edge-to-Edge Emulation of TDM Circuits over Packet Switched Networks

draft-ietf-pwe3-tdm-requirements-00.txt

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# Edition History

- ❑ Initial Edition: draft-riegel-pwe3-tdm-requirements-00.txt
  - presented on IETF-54 in Yokohama
  - covered only pseudo-wire-emulation of signals belonging to the PDH hierarchy (T1, E1, T3, E3)
  
- ❑ Towards a generic TDM emulation requirements document
  - Intensive discussions of a TDM design team during IETF-55 in Atlanta
    - ↙ *Sasha Vainshtein* *Axerra Networks*
    - ↙ *Yaakov Stein* *RAD Data Communication*
    - ↙ *Prayson Pate* *Overture Networks, Inc.*
    - ↙ *Tom Johnson* *Litchfield Communication, Inc.*
    - ↙ *Ron Cohen* *Lycium Networks*
    - ↙ *Tim Frost* *Zarlink Semiconductor*
    - ↙ *Max Riegel* *Siemens (Editor)*
  - Inclusion of requirements for SDH/SONET emulation
  - Clarification of emulated service types
  - Discussion of synchronization issues

# Edition history, cont.

- Release of an enhanced TDM reqs I-D shortly before Xmas (draft-riegel-pwe3-tdm-requirements-01.txt)
  - Inclusion of SONET/SDH
  - Description of TDM services to be emulated
    - ↙ *Introduction*
    - ↙ *Emulated Services*
  - Extended terminology section
  - Aligned to [PWE3-ARCH] and [PWE3-REQ]
  - Refined network synchronization model
  - Addition of service specific requirements
    - ↙ *Packet loss: added requirement to allow reconstruction of lost packets at egress*
    - ↙ *Congestion Control: added MUST requirements*
  - Addition of security considerations
  - Editorial stuff

# draft-ietf-pwe3-tdm-requirements-00.txt

- ❑ Mainly draft-riegel-pwe3-tdm-requirements-01.txt
- ❑ Streamlined use of the term "TDM" throughout the document.  
"TDM" refers to circuits of both the PDH as well as the SONET/SDH hierarchy
- ❑ Covers the emulation of
  - Unstructured TDM Circuits
    - ✦ *E1, T1, E3, T3*
  - Structured TDM Circuits
    - ✦ *T1/E1 with or without CAS*
    - ✦ *NxDS0 with or without CAS*
  - SONET/SDH Circuits
    - ✦ *SONET STS-1 synchronous payload envelope (SPE)/SDH VC-3*
    - ✦ *SONET STS-Nc SPE (N = 3, 12, 48, 192) / SDH VC-4, VC-4-4c, VC-4-16c, VC-4-64c*
    - ✦ *SONET VT-N (N = 1.5, 2, 3, 6) / SDH VC-11, VC-12, VC-2*
    - ✦ *SONET Nx VT-N / SDH Nx VC-11/VC-12/VC-2/VC-3*

# Issues raised: Packet size and delay

- ❑ There was an intensive discussion about packet size

- ❑ The current I-D states:

## *7.5 PSN bandwidth utilization*

- 1. The encapsulation layer SHOULD allow for an effective trade-off between the following requirements:*

- 1. Effective PSN bandwidth utilization. Assuming that the size of encapsulation layer header does not depend on the size of its payload, increase in the packet payload size results in increased efficiency.*
- 2. Low edge-to-edge latency. Low end-to-end latency is the common requirement for Voice applications over TDM services. Packetization latency is one of the components comprising edge- to-edge latency and decreases with the packet payload size.*

- ❑ It seems we might add here:

- edge-to-edge delay should be independent of the service rate for NxDS0
  - ↙ *has special importance for NxDS0 because the service rate may vary from 64 kbit/s to 1920 kbit/s*

# Issues raised: Congestion control

- ❑ The current I-D states:

## *7.8 Congestion Control*

*Edge-to-edge emulation of TDM circuits may result in constant bit rate flows in the PSN. When transferred over the Internet congestion control MUST be provided by appropriate means. It MUST be avoided that all pseudo wires in the congested network are switched down simultaneously or are reestablished again simultaneously to avoid unstable behavior of the network.*

- ❑ Very general statement; should be more specific.  
Probably adopt ideas mentioned on the list, e.g.:

*A suitable strategy might be:*

- 1) Notify the NSP that the PW is experiencing congestion*
- 2) Wait whilst the NSP takes some action to reduce the offered load*
- 3) If congestion still experienced, shut down the PW*

- ❑ How to become TCP-friendly?
- ❑ Relation to <draft-ietf-pwe3-requirements-05.txt>?  
Congestion control is only mentioned in <draft-ietf-pwe3-arch-02.txt>

# Other issues:

- ❑ 7.2 Network Synchronization

*2. If the same high-quality synchronization source is available to all the PE devices in the given domain, the encapsulation layer SHOULD be able to offer additional benefits (e.g., facilitate better reconstruction of the native service clock).*

More specific information necessary!

- ❑ 7.6 Packet Delay Variation

*...  
The encapsulation layer MAY provide for run-time adaptation of delay introduced by the jitter buffer if the packet delay variation varies with time. Such an adaptation MAY introduce low level of errors (within the limits tolerated by the application) but SHOULD NOT introduce additional wander of the egress end service clock.*

Is it an issue for the requirements I-D?

If yes, then more explanation is needed!

- ❑ The parts on SDH/SONET needs to be polished!

# How to proceed...

- ❑ Review the text on SONET/SDH
  - Help from SONET/SDH people very appreciated!
- ❑ Clarify the text on packet size
  - Discussion about protocol proposals may help
- ❑ Clarify what's needed to be mentioned in the TDM requirements I-D about congestion control
  - This is an issue not only for the TDM emulation people
- ❑ Publish revised edition of TDM requirements I-D
  - Beginning of May?
- ❑ Continue discussion on the mailing list!
  
- ❑ Comments?