Transporting PTP messages over MPLS networks using a link local addressing

draft-jobert-tictoc-ptp-link-local-00
TICTOC WG

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Scope of the draft

- PTPv2/IEEE1588-2008 may be used to support telecom applications that may include MPLS networks. Several methods for transporting PTP messages over MPLS networks are possible:

  - this draft: "*introduces a method for transporting PTP messages over an MPLS network supported by an Ethernet physical layer. The MPLS layer itself is not used to carry the PTP messages with this method; instead, a link local Ethernet channel is used*"

  - draft-ietf-tictoc-1588overmpls - Transporting PTP messages (1588) over MPLS Networks: "*basic idea is to transport PTP messages inside dedicated MPLS LSPs*", "*first method is to transport PTP messages directly over the dedicated MPLS LSP via UDP/IP encapsulation*"; "*second method is to transport PTP messages inside a PW via Ethernet encapsulation*"

- The draft:

  - introduces the use of a link local Ethernet addressing for carrying PTP messages over MPLS networks

  - analyzes the need for MPLS mappings when considering the two PTP telecom profiles developed by ITU-T Q13/15 (frequency and phase/time)

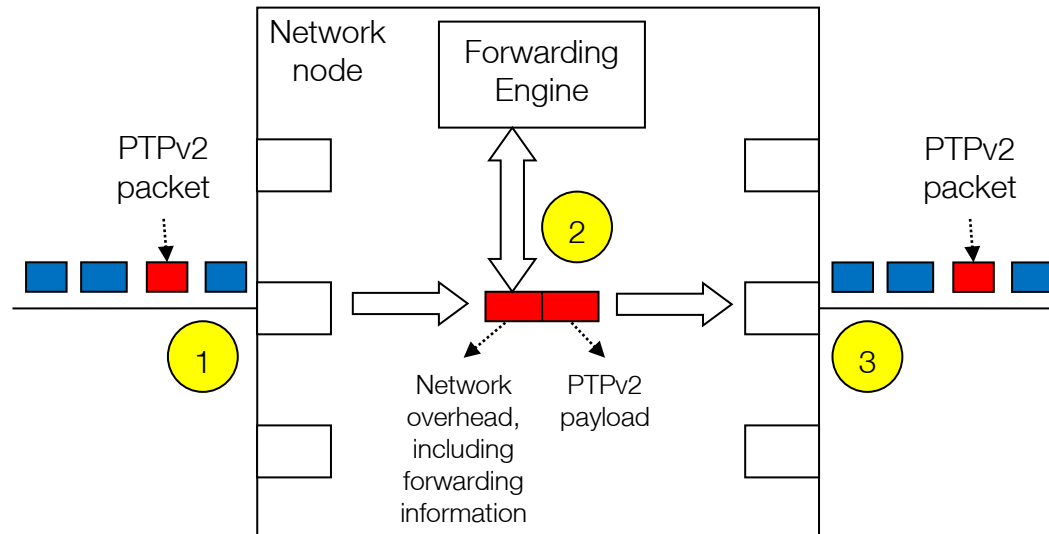 - discusses possible options for TC when using link local Ethernet addressing

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Analysis of the need for MPLS PTP mapping for the two PTP telecom profiles defined by ITU-T

- Two PTP telecom profiles defined at the ITU-T:

    – G.8265.1, PTP telecom profile for frequency synchronization, "end-to-end" mode (intermediate network nodes do not support PTP functions)

    – Future G.8275.1, PTP telecom profile for phase/time synchronization, "link-by-link" mode (intermediate network nodes support PTP functions)

- For the ITU-T frequency profile, no particular need to identify the PTP messages in case they are carried in an MPLS layer. The use of a high priority class of service is in general sufficient to minimize PDV.

- For accurate phase/time delivery, it is in general recognized that PTP support from the network nodes is required (BC or TC). Therefore, being able to identify the PTP messages is considered important.

    – It is advocated that an MPLS mapping is not necessary for carrying PTP messages over MPLS networks supported by an Ethernet physical layer when using a "link-by-link" PTP architecture. Instead, it is considered that the use of a link local addressing is more relevant when the MPLS network is supported by an Ethernet physical layer.

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Use of link local Ethernet addressing to carry PTP messages over MPLS networks

- Solution to carry PTP messages over an MPLS network supported by an Ethernet physical layer, using a link local Ethernet addressing, which fits very well with the "link-by-link" PTP architecture considered by ITU-T for the PTP phase/time telecom profile

- **Ethernet interfaces supporting MPLS traffic MUST use the Ethernet multicast address: "01-80-C2-00-00-0E" based on the Annex F of IEEE1588-2008 for all the PTP messages that are sent**

- Advantages:
  - prevents unwanted forwarding of PTP messages over network nodes which do not provide PTP support

  - facilitates the configuration for the operator, since no particular addressing needs to be configured in the network nodes

  - allows having a consistent PTP mapping all along the chain

  - facilitates the PTP payload identification, since the PTP payload is necessarily at a fixed location

  - avoids layer violation issues with TCs (see next slides)

Standard TC without PTP local forwarding function

Network node

Forwarding Engine

PTPv2 packet

PTPv2 packet

Network overhead, including forwarding information
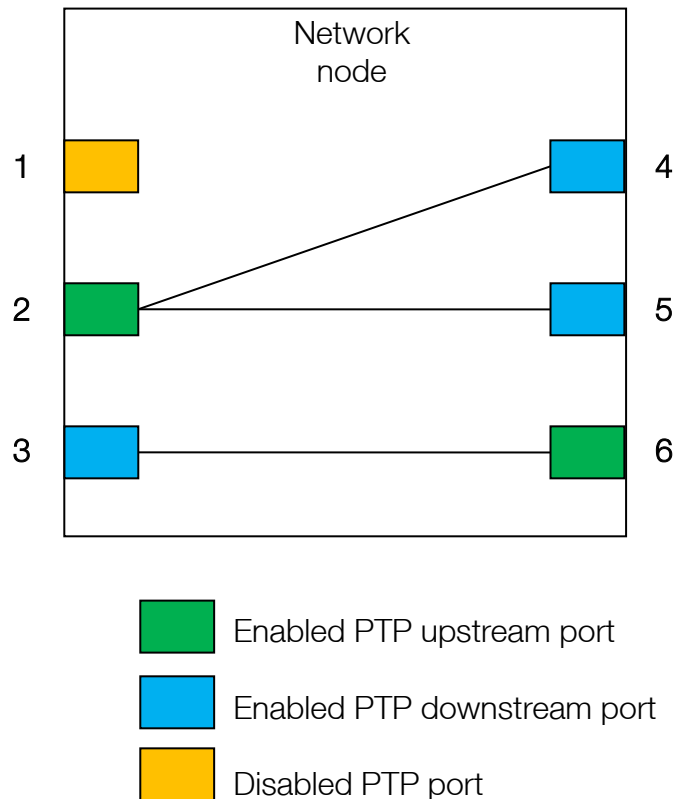
PTPv2 payload

1

2

3

- 1- Detection of the PTP packet among the rest of the traffic

- 2- The PTP packet is treated/forwarded in the network node as a standard packet, e.g. header of the packet used by the forwarding engine to determine the output port => may lead to issues when link local addressing is used

- 3- Transmission of the PTP packet. Modification of the "correction field" of the packet to include the residence time calculation.

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TC with PTP local forwarding function
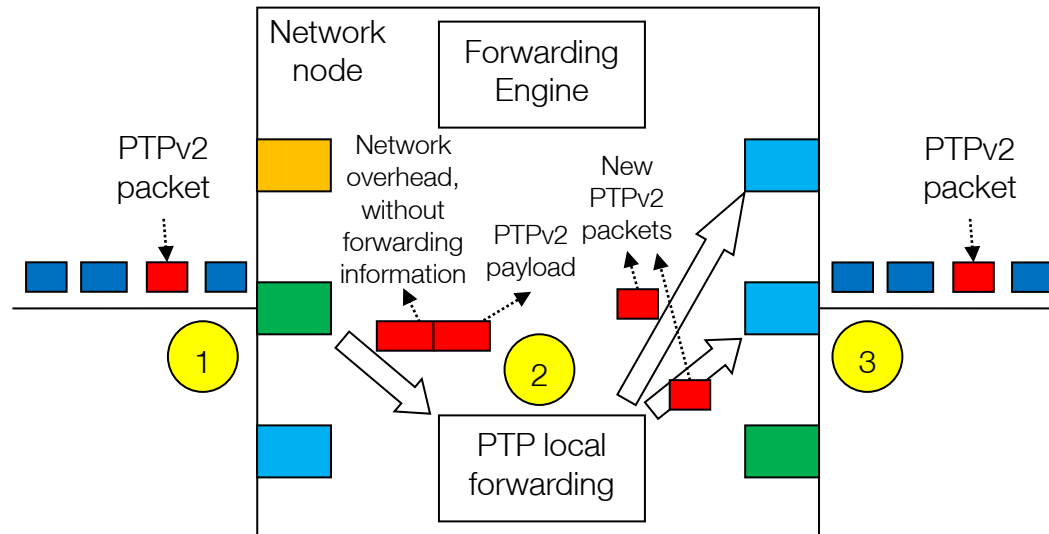
- 1- Detection of the PTP packet (similar to previous case)

- 2- The standard forwarding function of the network node (forwarding engine) MUST NOT be used in this case to forward the PTP packets; instead, the PTP local forwarding function MUST be used. This allows handling PTP packets without forwarding information in the network header of the packet => no issue with link local addressing, no layer violation anymore (packets are terminated in the TC)

- 3- Transmission of the PTP packet (similar to previous case)

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Example of PTP local forwarding function

Network
node

1 — (orange box)
2 — (green box) ——→ 4 (blue box)
2 — (green box) ——→ 5 (blue box)
3 — (blue box) ——→ 6 (green box)

- (green) Enabled PTP upstream port
- (blue) Enabled PTP downstream port
- (orange) Disabled PTP port

- <u>Disabled PTP port:</u> any potential PTP packet received on this port MUST be discarded

- <u>Enabled PTP upstream port:</u> corresponds to a port where upstream PTP packets are received (e.g. the PTP packets generated by a PTP master port). When a PTP packet is received on an enabled PTP upstream port, a new PTP packet MUST be transmitted by one or several enabled PTP downstream ports of the network node associated to the enabled PTP upstream port.

- <u>Enabled PTP downstream port:</u> corresponds to a port where downstream PTP packets are received (e.g. the PTP packets generated by a PTP slave port). When a PTP packet is received on an enabled PTP downstream port, a new PTP packet MUST be transmitted by the enabled PTP upstream port of the network node associated to the enabled PTP downstream port.

Conclusion and next steps

1   Any comment/question/remark on this draft is welcome

2   It is considered important to document in an IETF draft the use of a link local Ethernet addressing for carrying PTP messages over MPLS networks, because it corresponds to a valid alternative option, in line with current developments of PTP phase/time telecom profile at ITU-T

3   Possible options to progress this topic: further develop this draft based on comments received, or integrate its content in "draft-ietf-tictoc-1588overmpls - Transporting PTP messages (1588) over MPLS Networks"

thank you
questions?

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