LAYER 3 TSN – DRAFT 3.1

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REMEMBER THE “HOMENET” ARCHITECTURE?

- L3 routers are connected by multiple L2 segments not managed by L3.
- The challenge:
  - How to manage path selection & reservation between L3 devices?
  - How to manage path selection & reservation across L2/L3 boundaries?
Clear separation of “independent” but cooperating layers:
- Layer 3 topology and (non-)adjacent layer 2 topologies are handled separately.

Role separation for layer 3 router:
- “L3 PCE + L2 PCE” or “L3 PCC + L2 PCE”.
- One router is an elected or preconfigured god-box.

One L2 PCE per Layer 2 topology.
PCEs for both layer 3 and layer 2 purposes:
- They have different topology view.
- An L3 PCE knows L2 circuits (logical paths) to the next L3 hop(s) and an L2 PCE knows its own network links/hops.

Layer 2 could use any standard link-state protocol (e.g. IS-IS or equivalent) for path management.

Layer 2 circuits computed based on Layer 3 path requests.

Assumption: A PE (switch or bridge):
- Does not necessarily feature an IP stack.
- Allow remote management of FIB.

PEs are managed by an L2 PCE.
PEs do not have any access to L3 information
PEs do not perform any local path computation.
- It must know the layer 2 topology it manages:
  - Either it learns it dynamically or it is pre-configured.

- It must manage the switch/bridge (PE) QoS & reservations:
  - The PCE must be informed of the any PE locally originated configurations, initial configuration and obviously its own configuration commands.

- Service the L3 PCE for a path computation and selection:
  - L3 circuit establishment request is serviced by L2 PCE computation and path selection.
  - L2 PCE provides an aggregated summary of L2 information.

- Layer 2 path management and reservation:
  - Independent of the protocol solutions at the L3!
  - Could use .1Qca (/w ECTs) or other adequate protocol such as Netconf over SSH, etc.
Layer 3 routers have a dual role:
- Either an L3 PCE Client (PCC) or a goP-box (PCE).
- Based on the IETF PCE architecture and model.

PCE must know the layer 3 topology:
- Either PCE learns it dynamically (e.g., IS-IS, HNCP, OSPF) or it is pre-configured.
- Layer 2 topology knowledge is not relevant beyond “circuits”.

PCE must know both layer 3 and layer 2 QoS & reservations:
- Reporting from other L3 PCCs /w L2 summaries or.. L3 PCE just knows..

Layer 3 “circuit” management and reservation:
- Independent of the protocol solutions at the L2!
- Proposal to use IETF “PCE initiated LSP model” (with modification) to push the layer 3 path to other L3 routers that then take care of the layer 2 path.

No path reservation protocol like RSVP-TE in this proposal.
Simple device.. hopefully..
- Remote management of FIB must be possible.
- PE should accommodate static FIBs.
- Proper security must be in place..

Unaware what happens at layer 3 circuit computation and most likely also on layer 2 path computation:
- However, it may needs to report its own capabilities & status to L2 PCE..
Layer 3 – IETF protocols could & should be reused but unfortunately not possible without being extended:
- PCE architecture – [RFC4655].
- Stateful PCE – [draft-ietf-pce-stateful-pce].
- PCE initiated LSP + delegation – [draft-ietf-pce-pce-initiated]
  - Apply to this specific context tbd. (since we have no MPLS here..)
- PCEP – [RFC5440]
  - Capability indication tbd.
  - Adding the listener/talker models tbd.
  - Dynamic reporting tbd.
- PCE discovery – e.g. [RFC5088, 5089] for IS-IS & OSPF.
- Possibly Netconf over HTTP or SSH – e.g. [RFC5539, 6242].

Layer 2:
- Minimal changes...1Qca + ECT sound promising (for .1aq capable PEs).

Data model:
- For exchanging specs and etc..
- Could be YANG.. At the same time transportation over PCEP should also be considered!
The illustrated solution approach is for layer 3 traffic. If layer 2 (or non-IP) transmission is needed, then layer 2 frames need to be tunneled over layer 3 network:

- PseudoWire could fit in there..
- Would require MPLS support..
- PCE initiated LSP model would allow the use of segment routing -> no LSP setup signaling/reservation.
A comprehensive L3 and L2 PCE model with a clear layer separation is a must:
- We cannot let homenets and equivalent run ahead without putting enough considerations on L2.
- L2 TSN alone without a comprehensive L3 solution is at risk to achieve limited adoption only.

Allows plumbing together arbitrary layer 3 networks with support for path management & reservation at layer 2 as well.

Aims to maximize protocol & prior work reuse.
Thank you..