Path Computation Element Communication Protocol (PCEP) Extensions for Multipath Traffic Engineered Directed Acyclic Graph (MPTED) Tunnels

draft-beeram-pce-pcep-mpted-01

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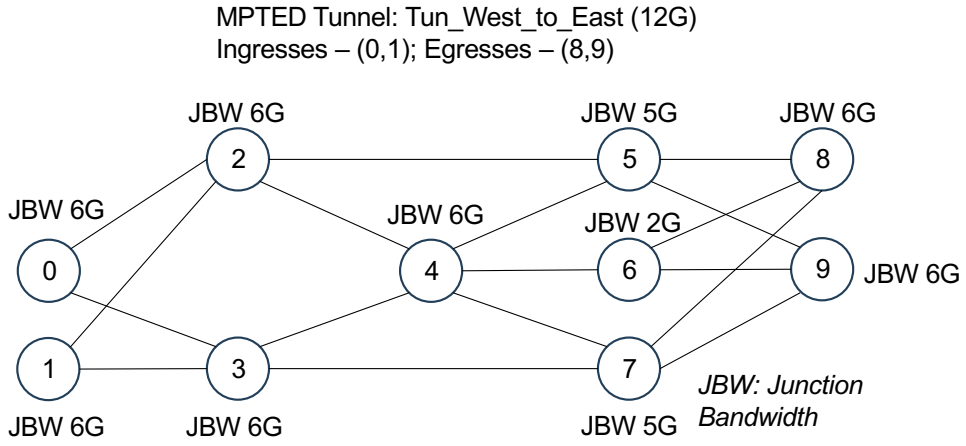
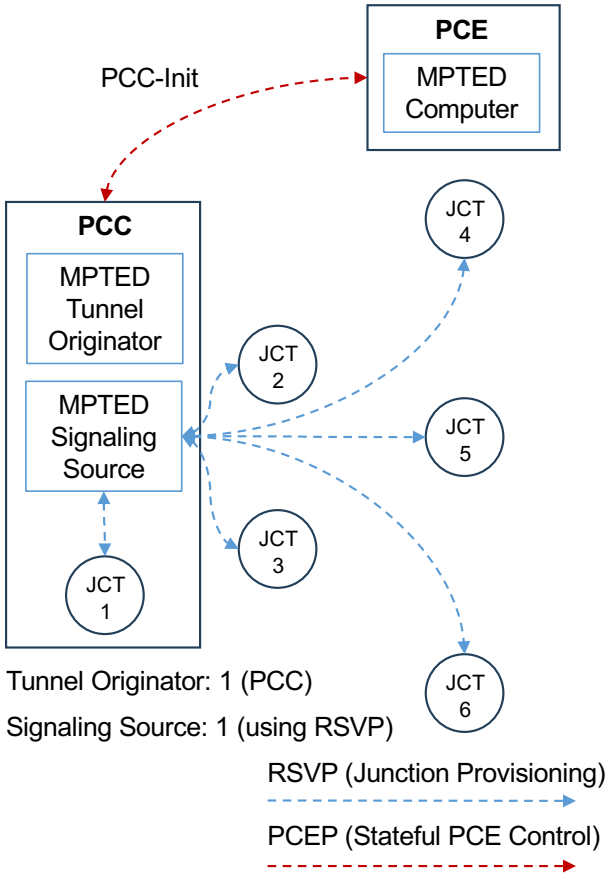
Introduction

- An MPTED tunnel [I-D.draft-kompella-teas-mpte] is a Traffic Engineering (TE) construct that contains a constrained set of paths representing an optimized Directed Acyclic Graph (DAG) from one or more ingresses to one or more egresses.
  - The paths that make up an MPTED tunnel traverse a set of junction no2des.
  - An MPTED junction refers to the construct associated with the MPTED tunnel at each junction node and constitutes a set of previous-hops (JCT-PHOPs) and a set of next-hops (JCT-NHOPs) over which traffic is load-balanced in a weighted fashion.
  - Provisioning an MPTED tunnel in a TE network involves provisioning the control and forwarding plane state associated with the MPTED junction at each junction node.



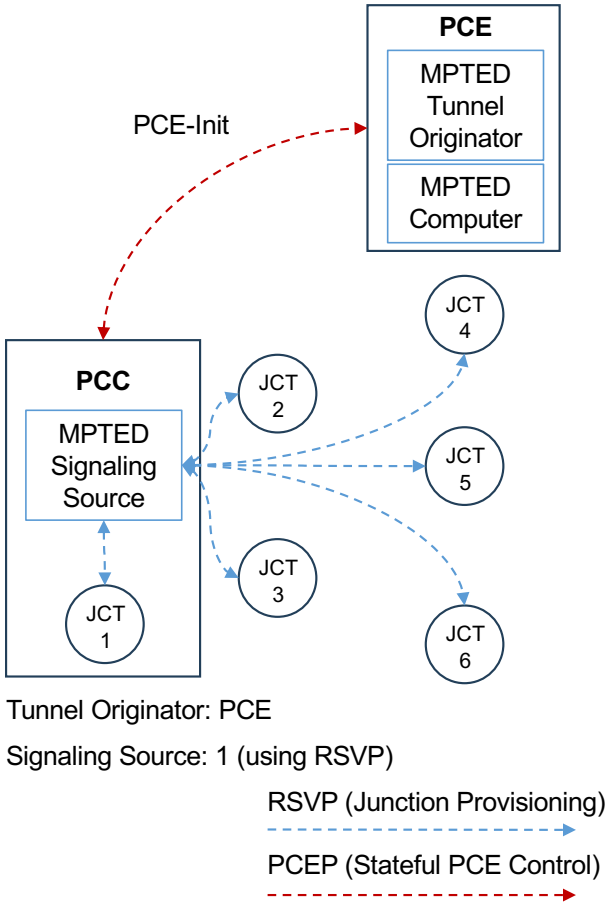
- [I-D.draft-beeram-pce-pcep-mpted] describes the extensions to PCEP that would enable a -
  - PCC to delegate control of the MPTED TE Tunnel to a stateful PCE
  - PCE to instantiate and manage PCE-initiated MPTED Tunnels on a PCC under the stateful PCE model.
  - PCE to act as an MPTED tunnel signaling source and manage the MPTED junctions on a junction node.

Modes of Operation [1]: PCC Initiated and PCC Signaled



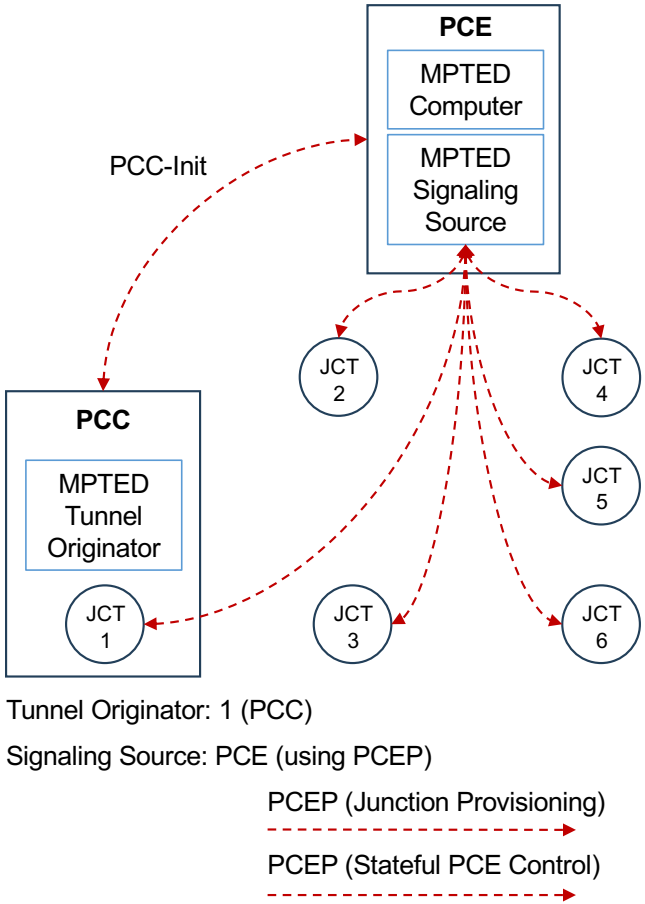
- PCC is the MPTED tunnel originator and the signaling source.
  - PCC delegates the control of the MPTED tunnel to the PCE.
  - PCE computes the MPTED, produces a set of JUNCTIONs, and puts the onus on the PCC to signal and provision the JUNCTION on each junction node. .
  - After the signaling setup sequence is complete, the PCC notifies the PCE of the status of each junction in the DAG.
  - The MPTED tunnel setup is deemed complete on the PCE when all junction notifications are received from the PCC.
  - An example of this mode of operation is an MPLS deployment where RSVP MPTED tunnels that use signaled label switching originate on an ingress node, and the DAG computation is offloaded to the PCE.

Modes of Operation [2]: PCE Initiated and PCC Signaled



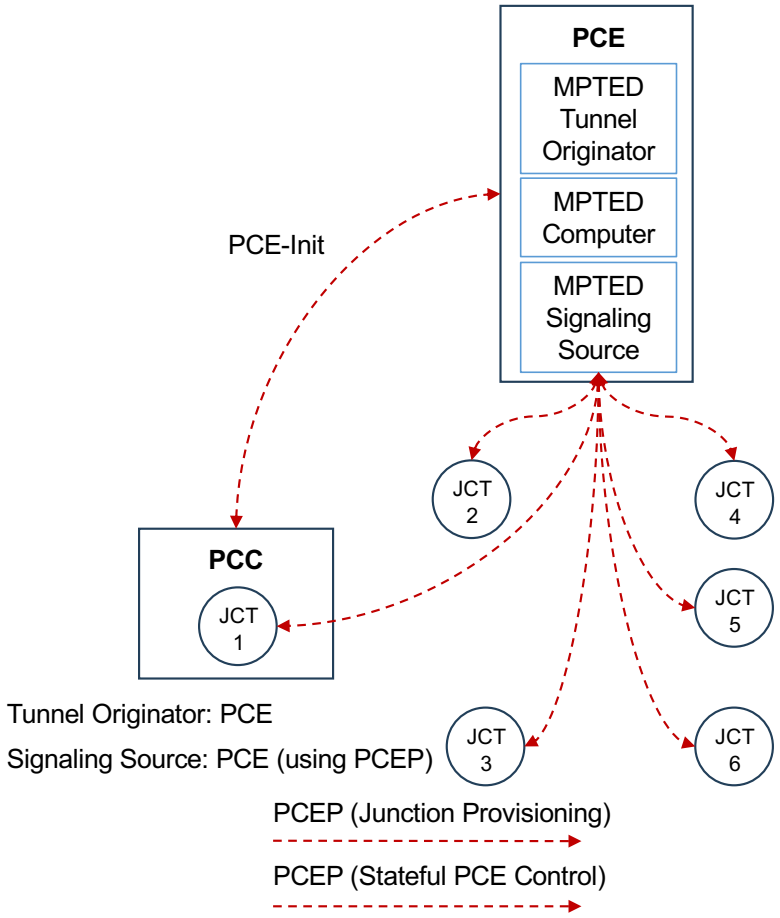
- PCE serves as the MPTED tunnel originator, and the PCC acts as the signaling source.
  - PCE computes the MPTED and initiates the setup process by providing the PCC a list of JUNCTIONs.
  - PCC signals and provisions the JUNCTION on each junction node.
  - After the signaling setup sequence is complete, the PCC notifies the PCE of the status of each junction in the DAG.
  - The MPTED tunnel setup is deemed complete on the PCE when all junction notifications are received from the PCC.
  - An example of this mode of operation is an MPLS deployment where RSVP MPTED tunnels, which use signaled label switching, are originated and computed by the PCE.

Modes of Operation [3]: PCC Initiated and PCE Signaled



- PCC serves as the MPTED tunnel originator, and the PCE acts as the signaling source.
  - PCC delegates the control of the MPTED tunnel to the PCE.
  - PCE computes the MPTED, produces a set of JUNCTIONs, and uses a signaling protocol to provision the JUNCTION on each junction node.
  - PCEP MAY be used as the signaling protocol on the PCE for junction management.
  - The MPTED tunnel setup on the PCE is considered complete once the PCE has initiated the process for all required Junction nodes and has received PcRpts confirming that the Junctions are operationally up.
  - An example of this mode of operation with PCEP signaling for junction management is an MPLS deployment where Segment Routing MPTED tunnels, which use static labels, originate on an ingress node and are provisioned in the TE network by the PCE.

Modes of Operation [4]: PCE Initiated and PCE Signaled



- PCE serves as the MPTED tunnel originator and the signaling source.
  - PCE computes the MPTED, produces a set of JUNCTIONs, and uses a signaling protocol to provision the JUNCTION on each junction node.
  - PCEP MAY be used as the signaling protocol on the PCE for junction management.
  - The MPTED tunnel setup on the PCE is considered complete once the PCE has initiated the process for all required Junction nodes and has received PcRpts confirming that the Junctions are operationally up.
  - An example of this mode of operation with PCEP signaling for junction management is an MPLS deployment where Segment Routing MPTED tunnels, which use static labels, are originated and provisioned in the TE network by the PCE.

Next Steps

- Focus on protocol procedures:
  - Capability Negotiation
  - PCC Initiated MPTED Tunnels
  - PCE Initiated MPTED Tunnels
  - Signaling for Junction Management
  - PCEP Messages and Objects

- Request feedback.

Thank You

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