Applicability of PCE for ACTN

draft-dhody-pce-applicability-actn-00

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ACTN – Abstraction and Control of TE networks

- A set of virtual network operations to orchestrate, manage and control of multi-domain heterogeneous TE networks.
- Three tier controller hierarchy
  - Customer Network Controller (CNC)
  - Multi Domain Service Coordinator (MDSC)
  - Physical Network Controller (PNC)
- Four functions in ACTN
  - Multi domain coordination
  - Virtualization/Abstraction
  - Customer mapping
  - Virtual service coordination
- TEAS
  - draft-ietf-teas-actn-requirements
  - draft-ietf-teas-actn-framework
What can PCE offer?

**Controller**
- PCE is a key function in a controller
- Stateful PCE
  - Initiation capability
- ABNO [RFC7491]
- PCE based central control is being discussed in TEAS

**Multi-Domain & Multi-Layer**
- Per-domain path computation [RFC5152]
- BRPC [RFC5441]
- Inter-Layer [RFC5623]
- H-PCE [RFC6805]
- Stateful H-PCE
Architectural Considerations

- **Multi domain coordination**
  - MDSC oversees different domains and build an E2E network topology and coordinate E2E path setup.

- **Virtualization/Abstraction**
  - Multi-domain topology at MDSC = abstracted view of underlying network of each domain.
  - Customer view of network slice

- **Customer mapping**
  - Map customer VN requirements into network provisioning requests

- **Virtual service coordination**
  - Seamless virtual network operations for each customer
  - VN Association

- **Stateful H-PCE**
  - Stateful PCE with initiation
  - H-PCE

- **PCEP-LS**
  - With support for abstract topology
  - Virtual Network

- **VN-Association**
  - Associate set of LSPs to a VN
Stateful H-PCE

- Hierarchy of stateful PCEs
- Stateful PCEP messages and procedures between child and parent PCE – active and passive!
  - Parent PCE maintain domain topology and inter-domain LSPDB
  - Initiation of multi-domain E2E LSP at Parent PCE

- Initiation of per-domain LSP by each child PCE, stitched.

VN Association

Associate a set of LSPs to a particular VN
- to identify all LSP under a VN.

Use ASSOCIATION
- A new VN Association group (VNAG) for 'VN association type'.

Associate all E2E LSP as well as the per-domain LSPs with the customer VN

PCEP-LS

Link State and TE information is learned at PCE via PCEP.

Nodes, Links, Prefix including TE parameters

Includes -

- Border Nodes and Inter-domain links useful in H-PCE
- Abstracted Topology (instead of full topology)
- Tag for VN

Between any PCEP speakers

- from PCC to PCE
- between PCEs
  - Including child to parent PCE in H-PCE

https://datatracker.ietf.org/doc/draft-dhodylee-pce-pcep-ls/
Step 1 – Build topology at MDSC

- Use PCEP-LS mechanism to build domain topology
- Include border nodes and inter-domain links
- Can also have abstracted information from within the domain
- Based on network events, change in topology is reported to MDSC.
Step 2 – VN Instantiation

- VN Instantiation will include constraints and optimization criteria
- E2E Path computation for \{A-F\} and \{A-I\}
  - **Step 2.1 Per-domain paths**
    - \{A-F\} = \{A-B, C-D, E-F\}
    - \{A-I\} = \{A-G, H-I\}
    - PCE Initiate message to initiate per-domain path.
ACTN with PCE (& PCEP)

Step 2.2 – Per-domain report

- Each child PCE reports the status of per-domain LSP via PCRpt message
- E2E LSP is up when all per-domain LSP along the path are up.
  - \{A-F\} = \{A-B, C-D, E-F\}
  - \{A-I\} = \{A-G, H-I\}
- Any change in status of per-domain LSP is sent to parent PCE.
ACTN with PCE (& PCEP)

Step 3 – VN Modify

- VN parameters can be modified, such as change in bandwidth
- After re-computation, the per-domain path may need to be updated.
- There might also be a case that existing per-domain path needs to be deleted and a new per-domain path needs to be created between different set of border nodes.
ACTN with PCE (& PCEP)

Step 4 – VN Delete

- Customer may request VN to be deleted
- For each E2E path
  - Each per-domain LSP
    - Needs to be deleted
    - PCInitiate with R flag

Delete VN1
Questions to the WG...

- Do you agree?
  - Hierarchy of Stateful PCE fits the ACTN reference architecture.
  - PCEP is also a good candidate for the MPI (MDSC – PNC Interface)
    - Parent PCE to Child PCE interface.
  - This document is useful to understand how PCE and various extensions to PCEP comes together for ACTN.
    - Stateful H-PCE
    - VN Association
    - PCEP-LS
Thanks!