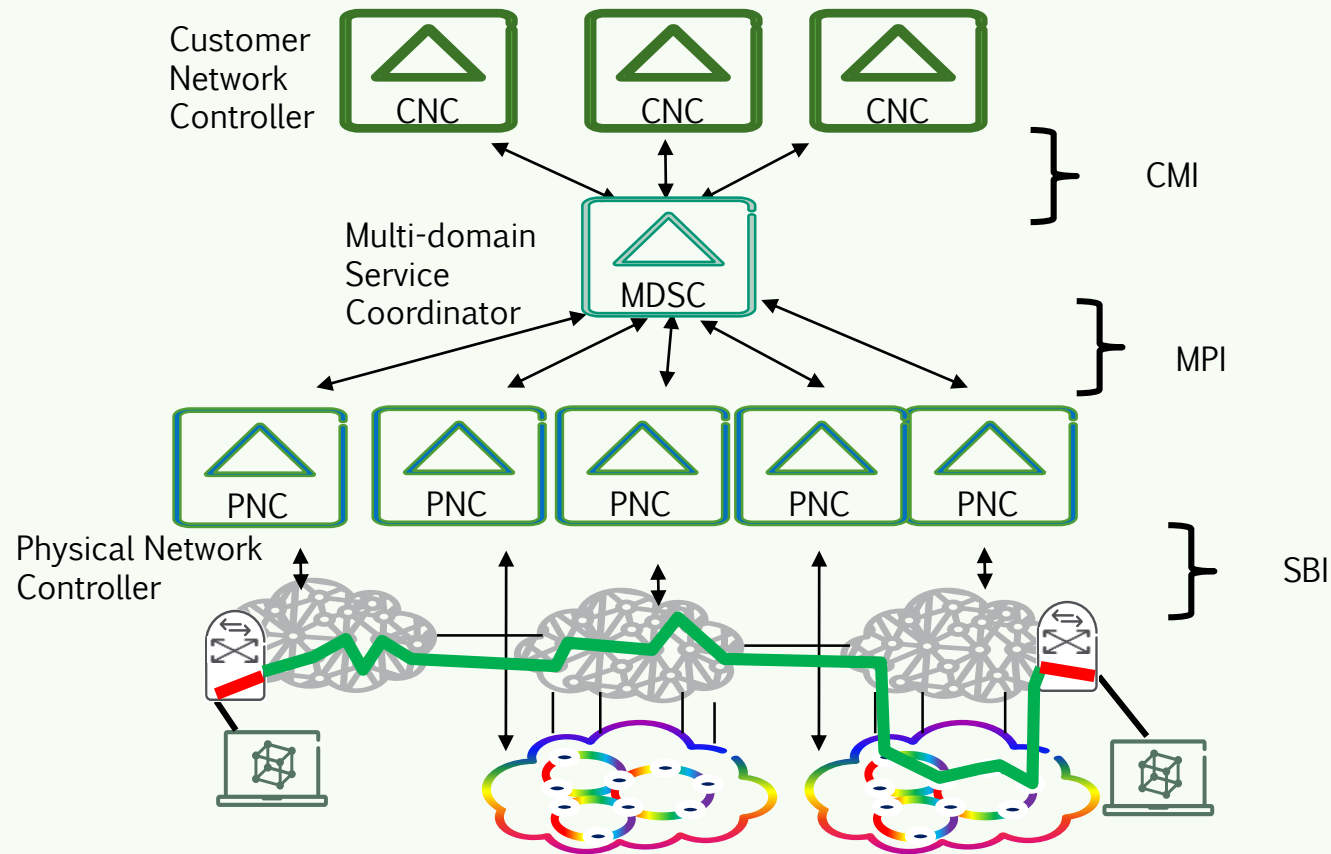


Applicability of PCE for ACTN

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?

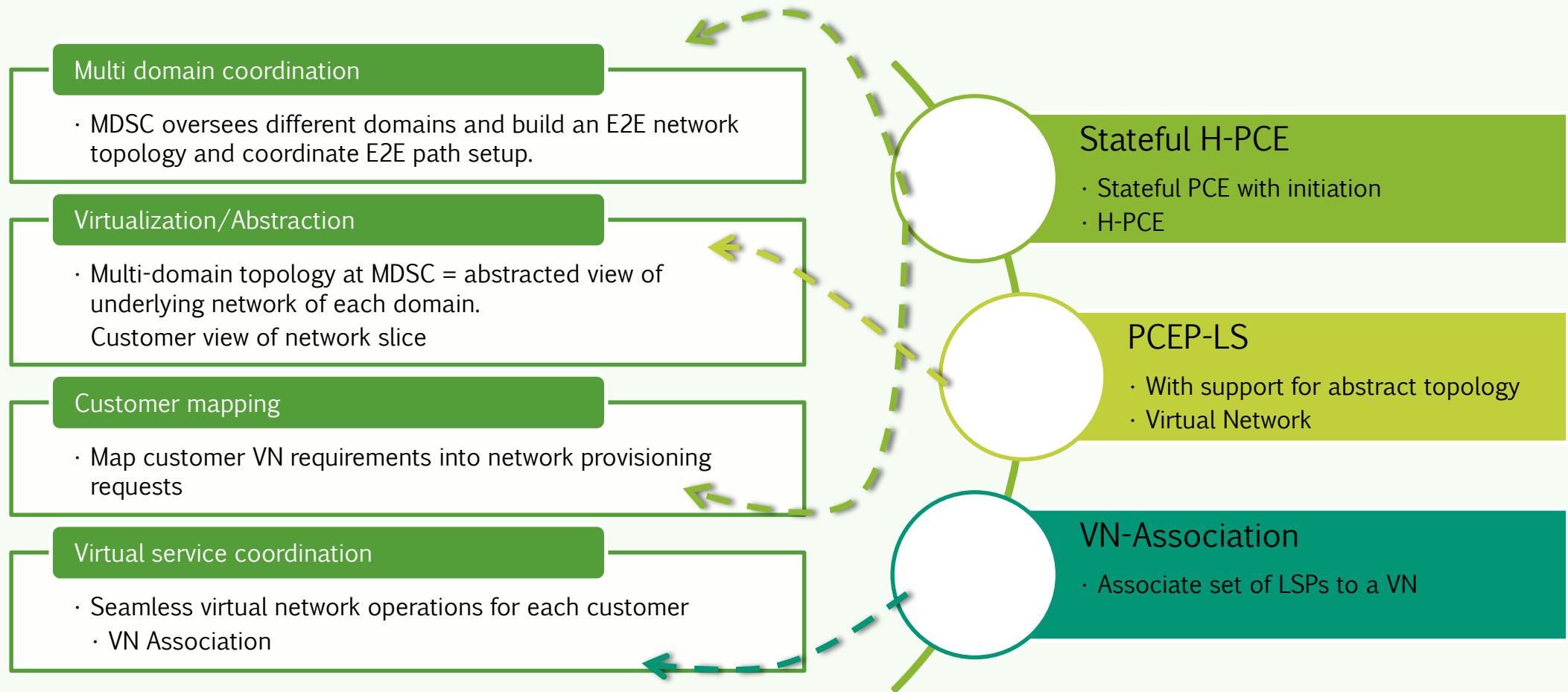
Controller

- 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

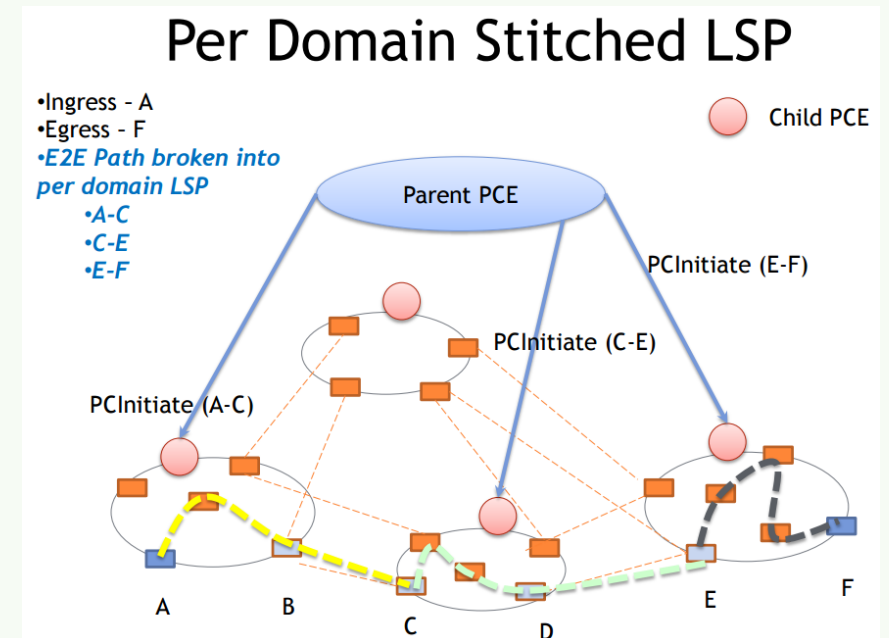
Architectural Considerations



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.

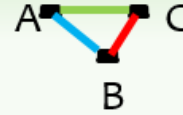


<https://datatracker.ietf.org/doc/draft-dhodylee-pce-stateful-hpce/>

VN Association

- P-PCE computes paths and determines each domain paths and associate VN1 with LSPs for each Domain
- For each LSP Initiate, Use- **Association Object** to associate VN ID with LSPs

VN 1 includes three e2e tunnel: (a-c; a-b; b-c)



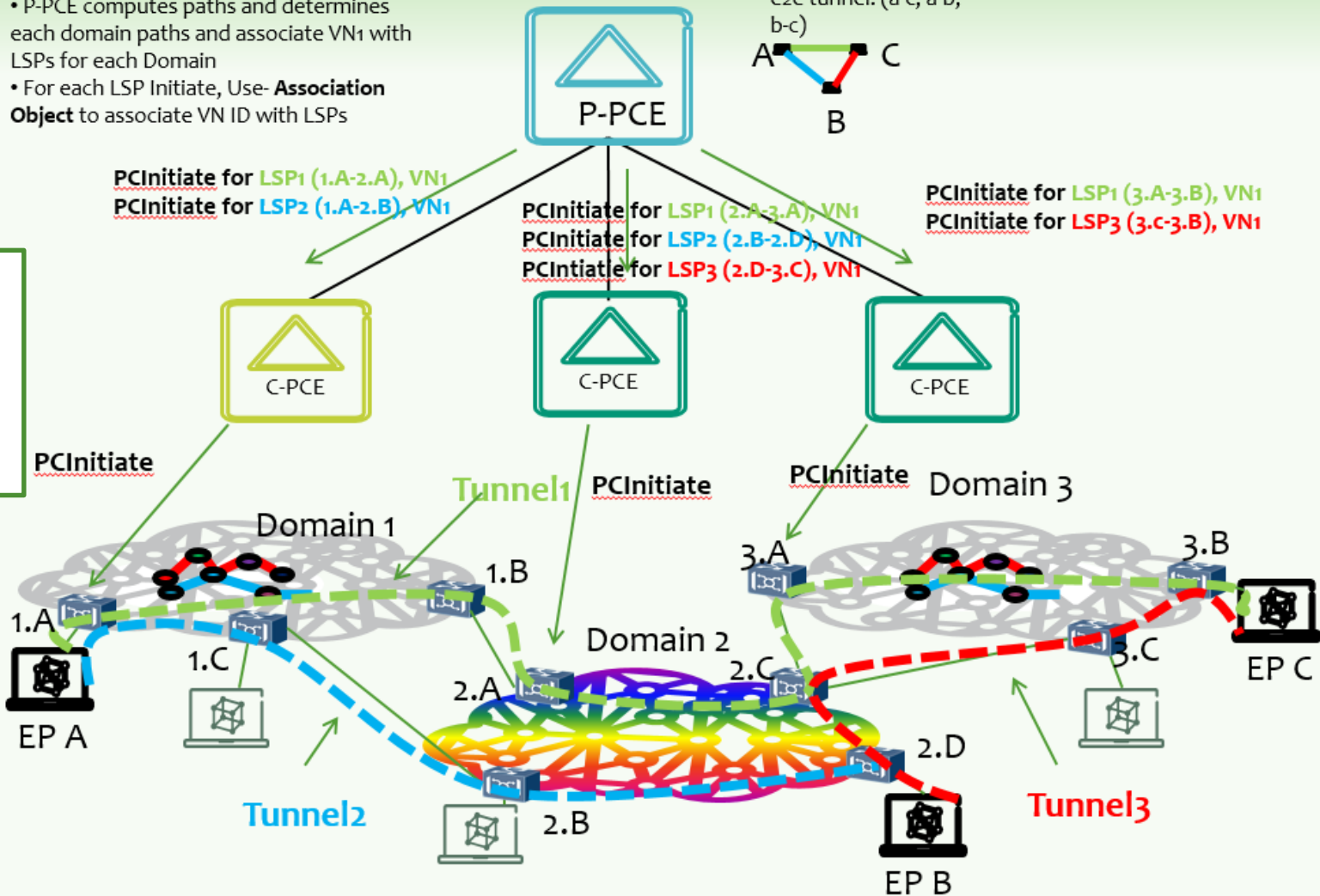
Associate a set of LSPs to a particular VN

- 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



<https://datatracker.ietf.org/doc/draft-leedhody-pce-vn-association/>

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

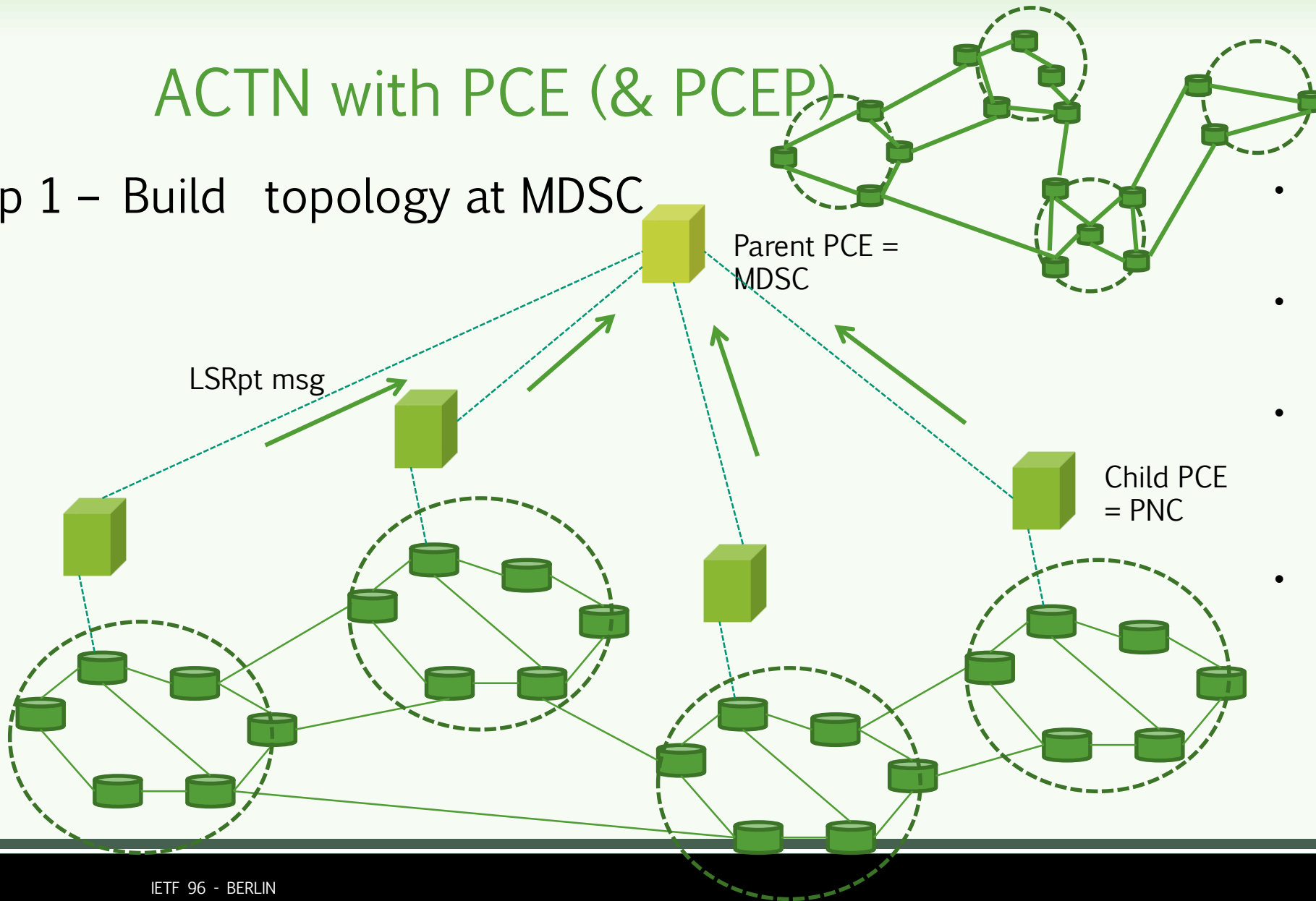
Between any PCEP speakers

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

<https://datatracker.ietf.org/doc/draft-dhodylee-pce-pcep-ls/>

ACTN with PCE (& PCEP)

Step 1 – Build topology at MDSC



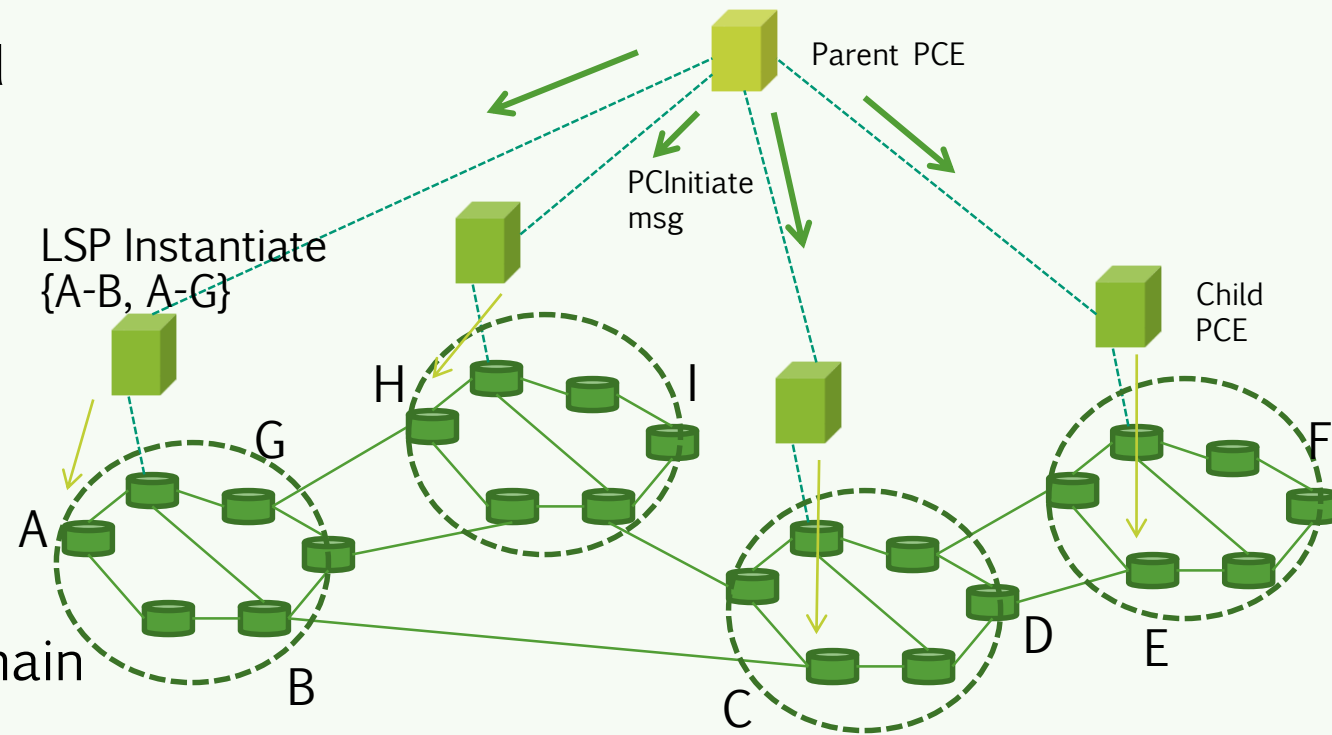
- Use PCEP-LS mechanism to build domain topology
- Include border nodes and inter-domain links
- Can also have abstracted information from within the domain
- Based on network events, change in topology is reported to MDSC.

ACTN with PCE (& PCEP)

VN Instantiate: VN1 {A-F; A-I}

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.

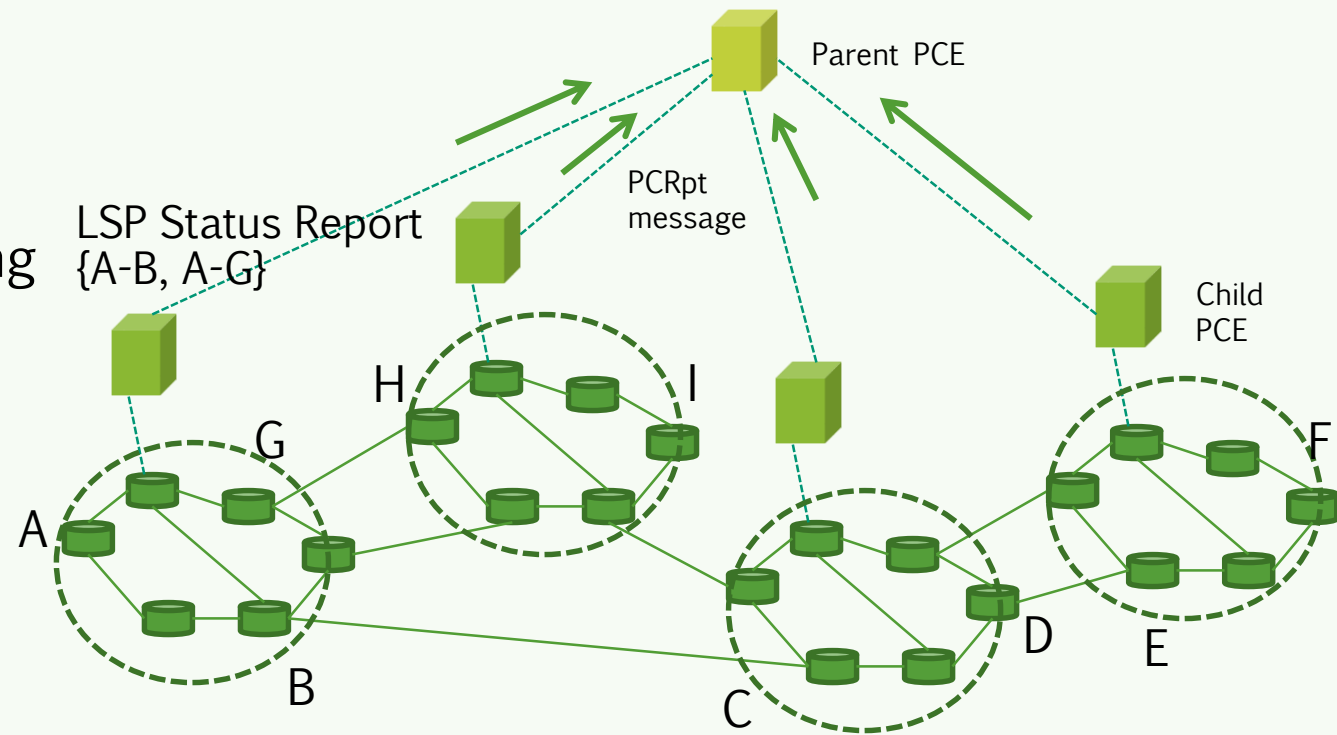


ACTN with PCE (& PCEP)

VN1 {A-F; A-I}

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.

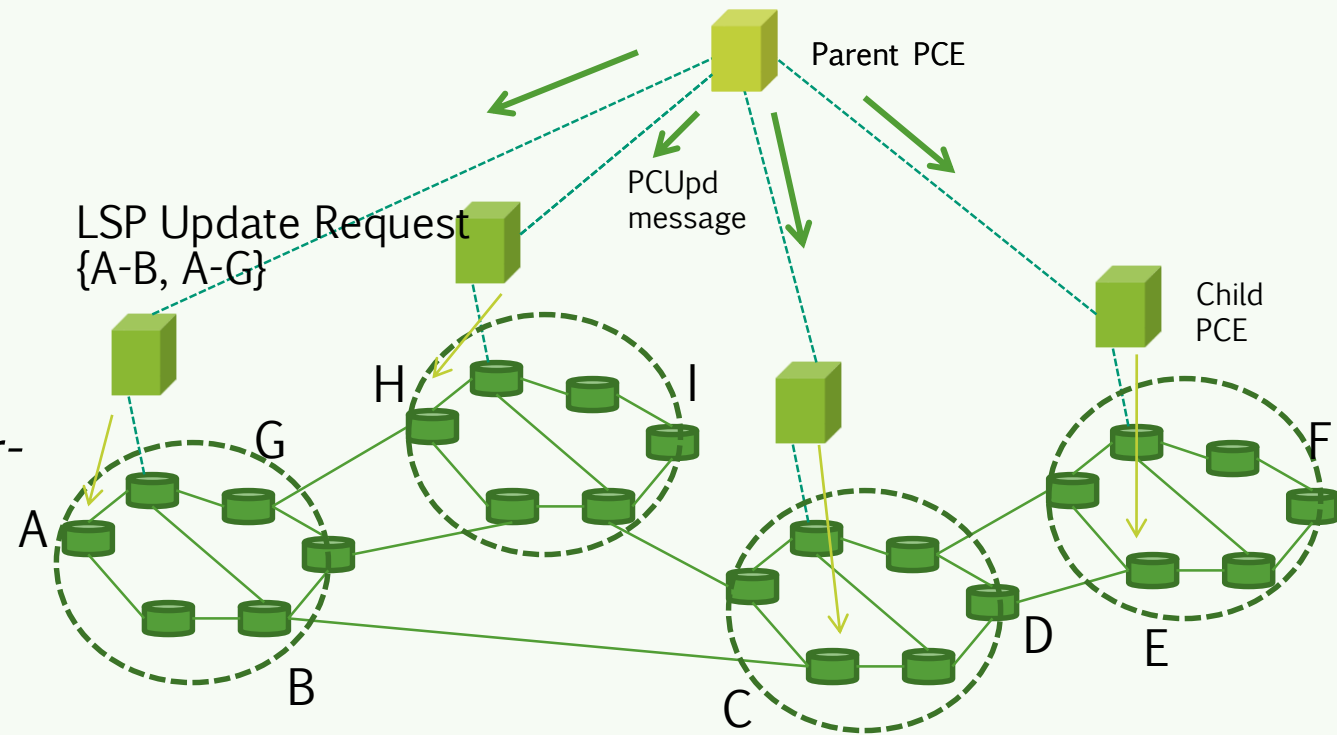


ACTN with PCE (& PCEP)

VN1 {A-F; A-I}

Step 3 – VN Modify

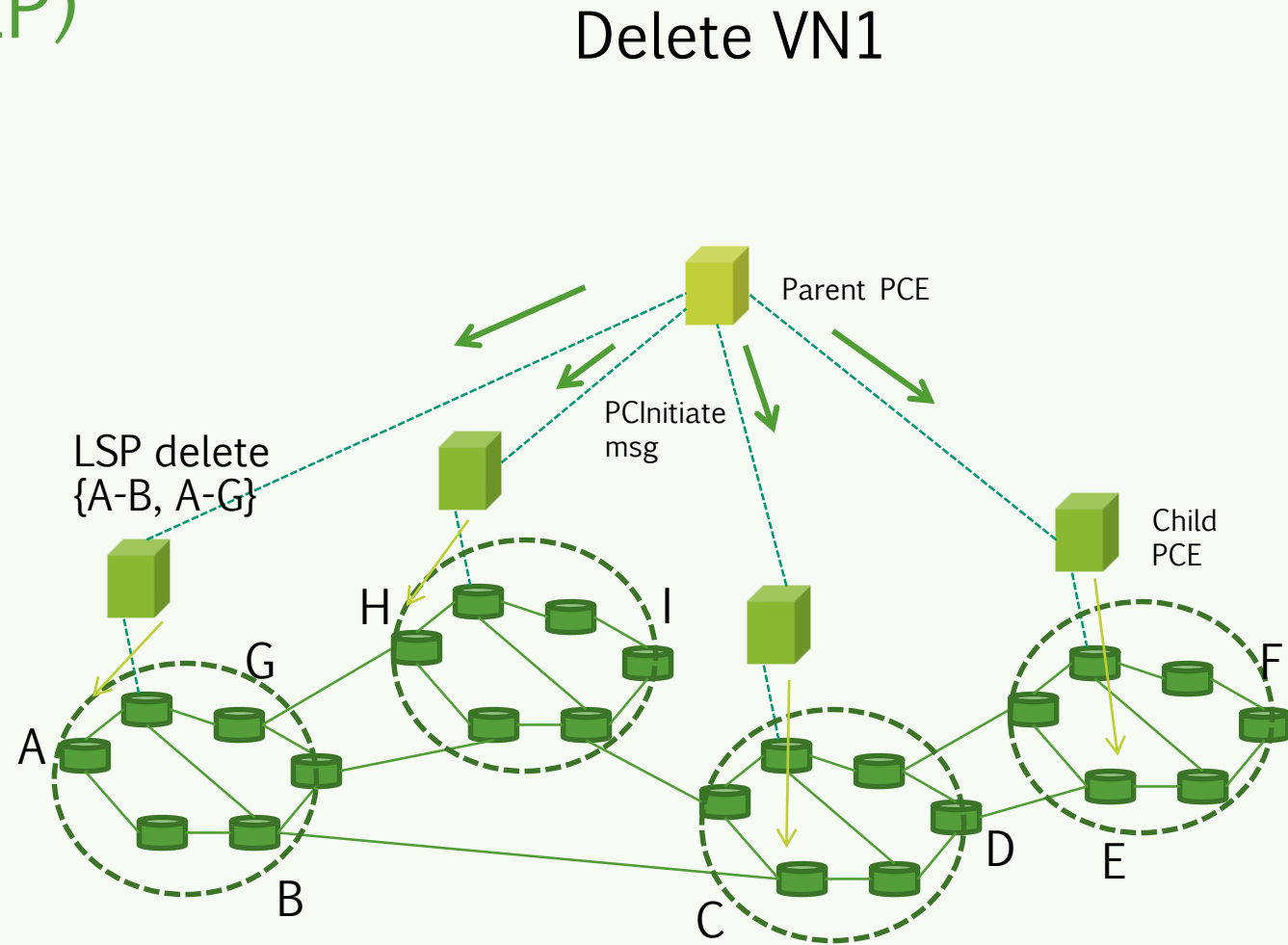
- VN parameters can be modified, such as change in bandwidth
- After re-computation, the per-domain path may need to be updated.
- There might also be a case that existing per-domain path needs to be deleted and a new per-domain path needs to be created between different set of border nodes.



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



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!