Applicability of PCE for ACTN
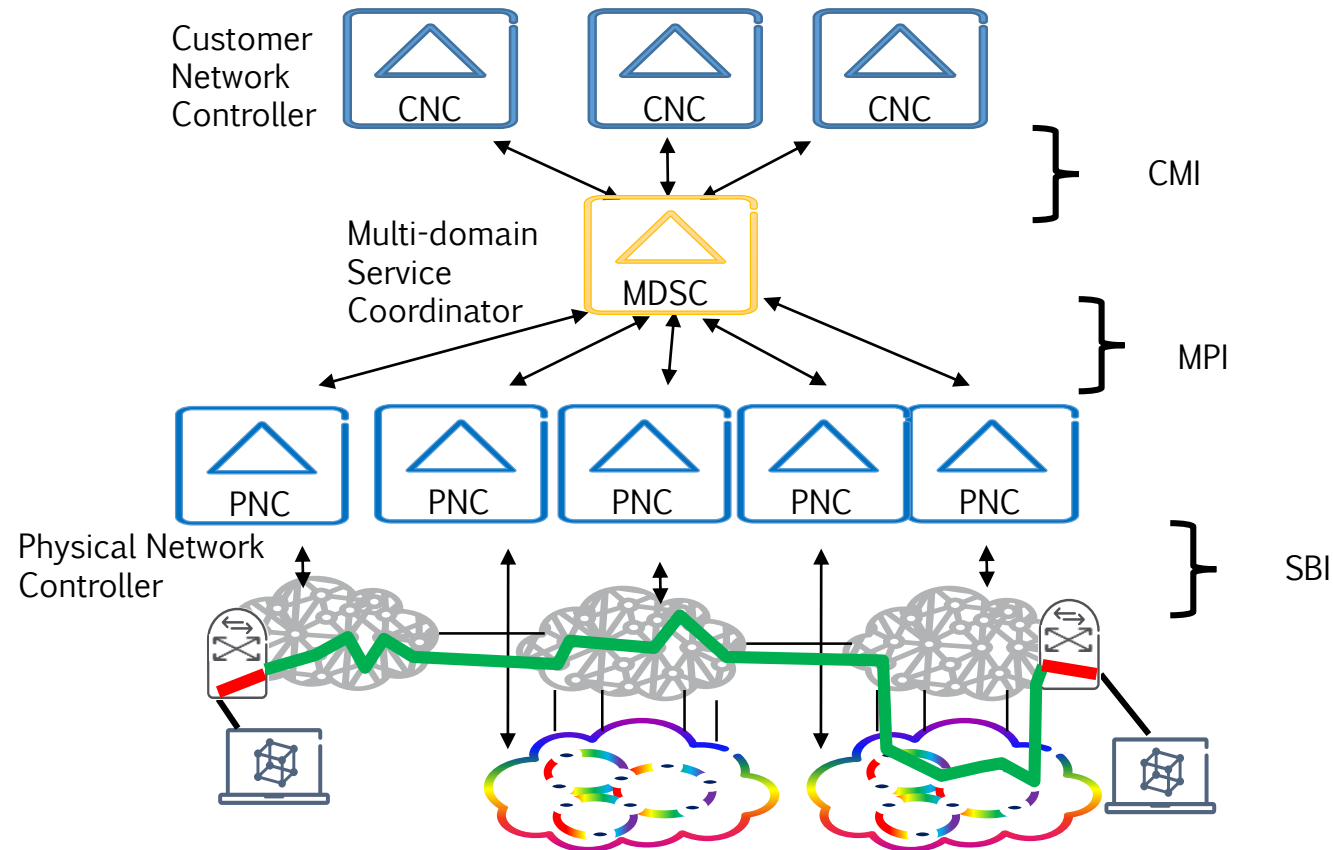
draft-ietf-pce-applicability-actn-05

Dhruv Dhody

Young Lee

Daniele Ceccarelli

ACTN – Abstraction and Control of TE networks

Customer Network Controller
CNC   CNC   CNC

CMI

Multi-domain Service Coordinator
MDSC

MPI

Physical Network Controller
PNC   PNC   PNC   PNC   PNC

SBI

- 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

PCE Applicability for ACTN

ACTN
• MDSC-PNC
• Hierarchy of Controllers
• Tunnel instantiation by the controllers
• MDSC Multi-domain Coordination

PCE/PCEP Architecture
• Parent PCE – Child PCE
• H-PCE
• PCInitiated Message by PCE
• Stateful H-PCE

Stateful H-PCE

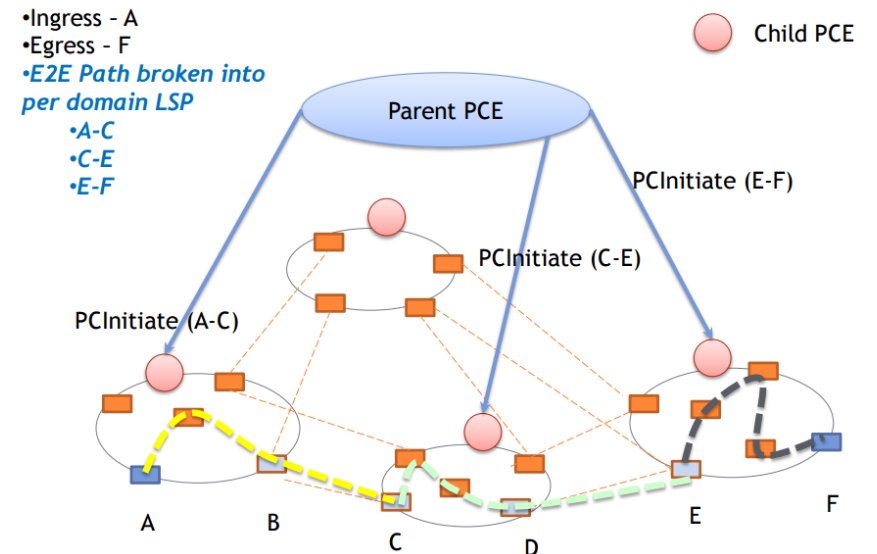https://datatracker.ietf.org/doc/draft-ietf-pce-stateful-hpce/

- 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
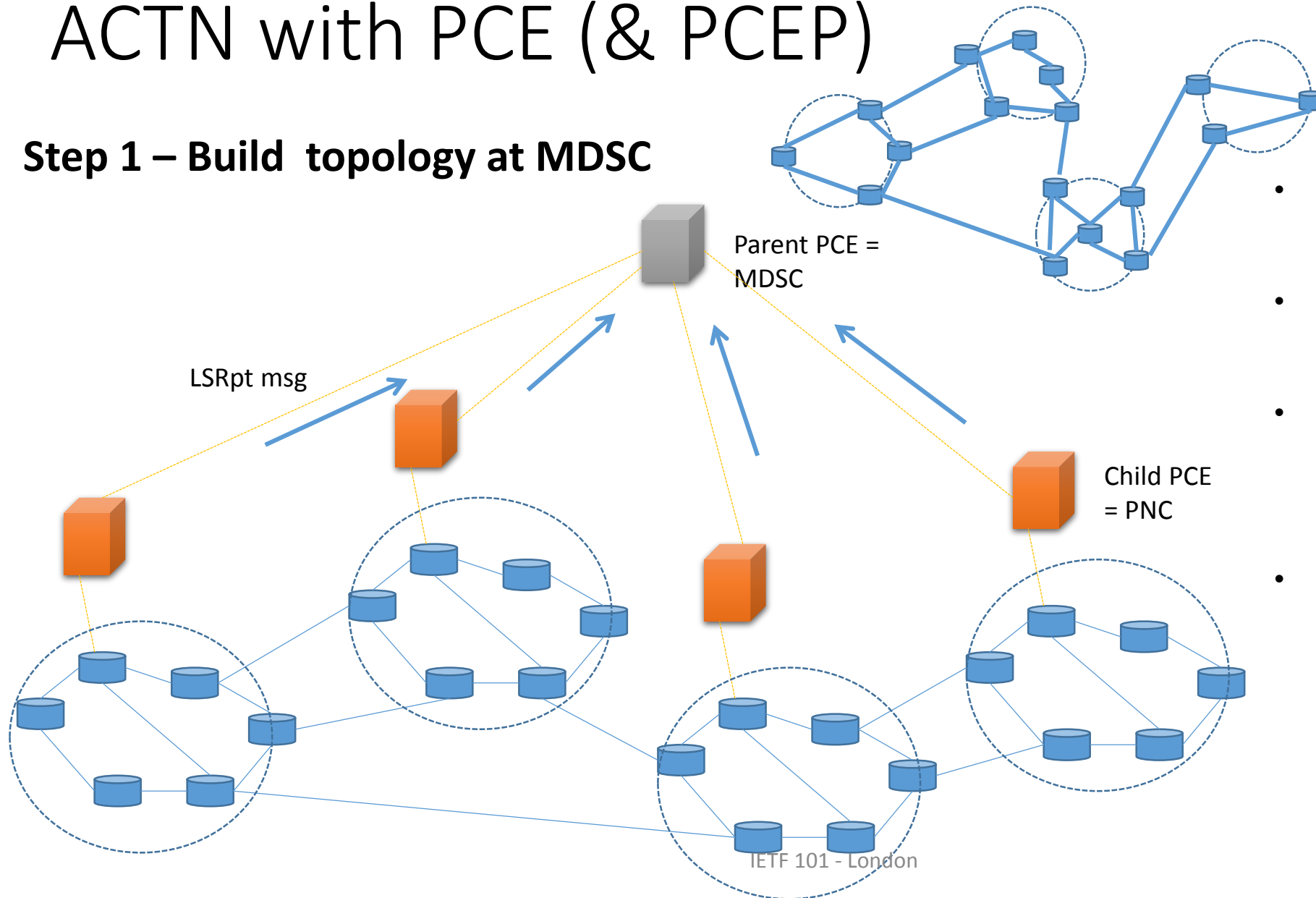
- Initiation of multi-domain E2E LSP at Parent PCE

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

Per Domain Stitched LSP

- Ingress - A
- Egress - F
- E2E Path broken into per domain LSP
  - A-C
  - C-E
  - E-F

Child PCE

Parent PCE

PCInitiate (E-F)

PCInitiate (C-E)

PCInitiate (A-C)

A B C D E F

ACTN with PCE (& PCEP)

Step 1 – Build topology at MDSC
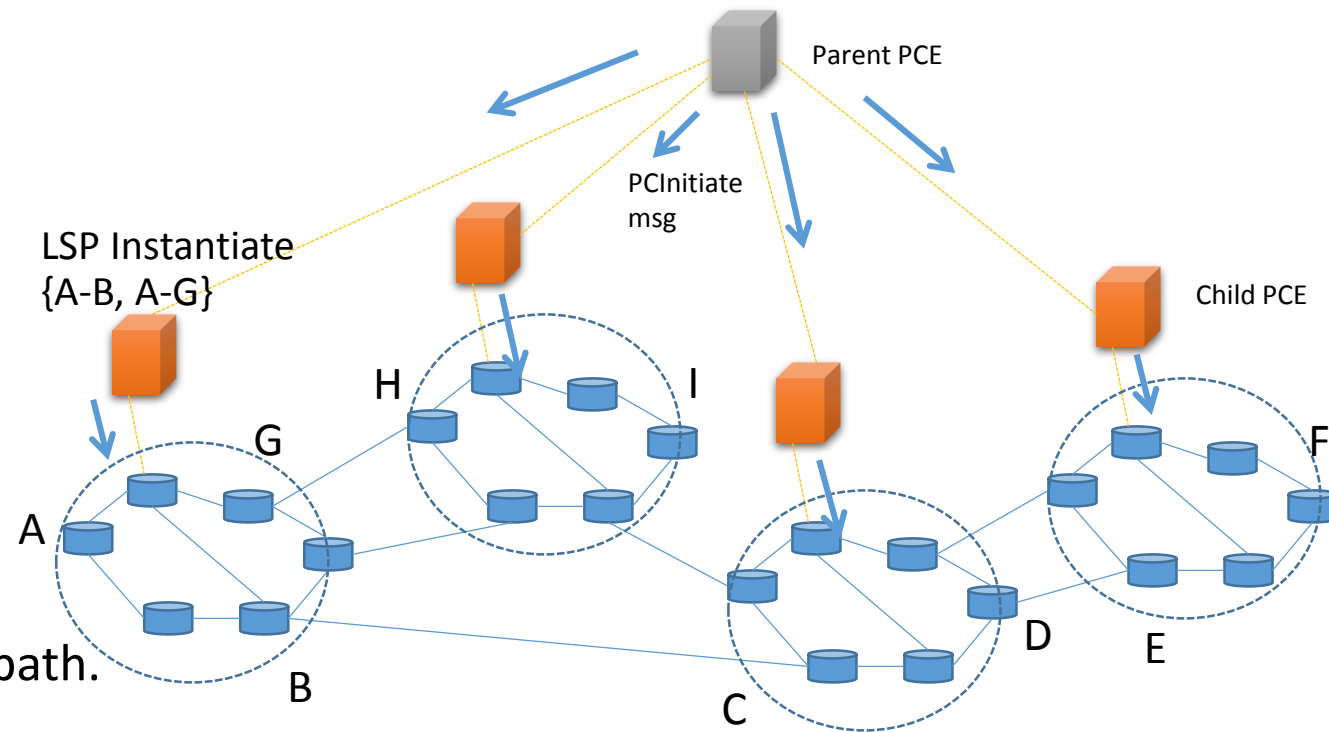
Parent PCE = MDSC

LSRpt msg

Child PCE = PNC

- Use PCEP LSRpt message 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.

Parent PCE

PCInitiate msg

LSP Instantiate {A-B, A-G}

Child PCE

H   I

G   A   B   C   D   E   F

ACTN with PCE (& PCEP)
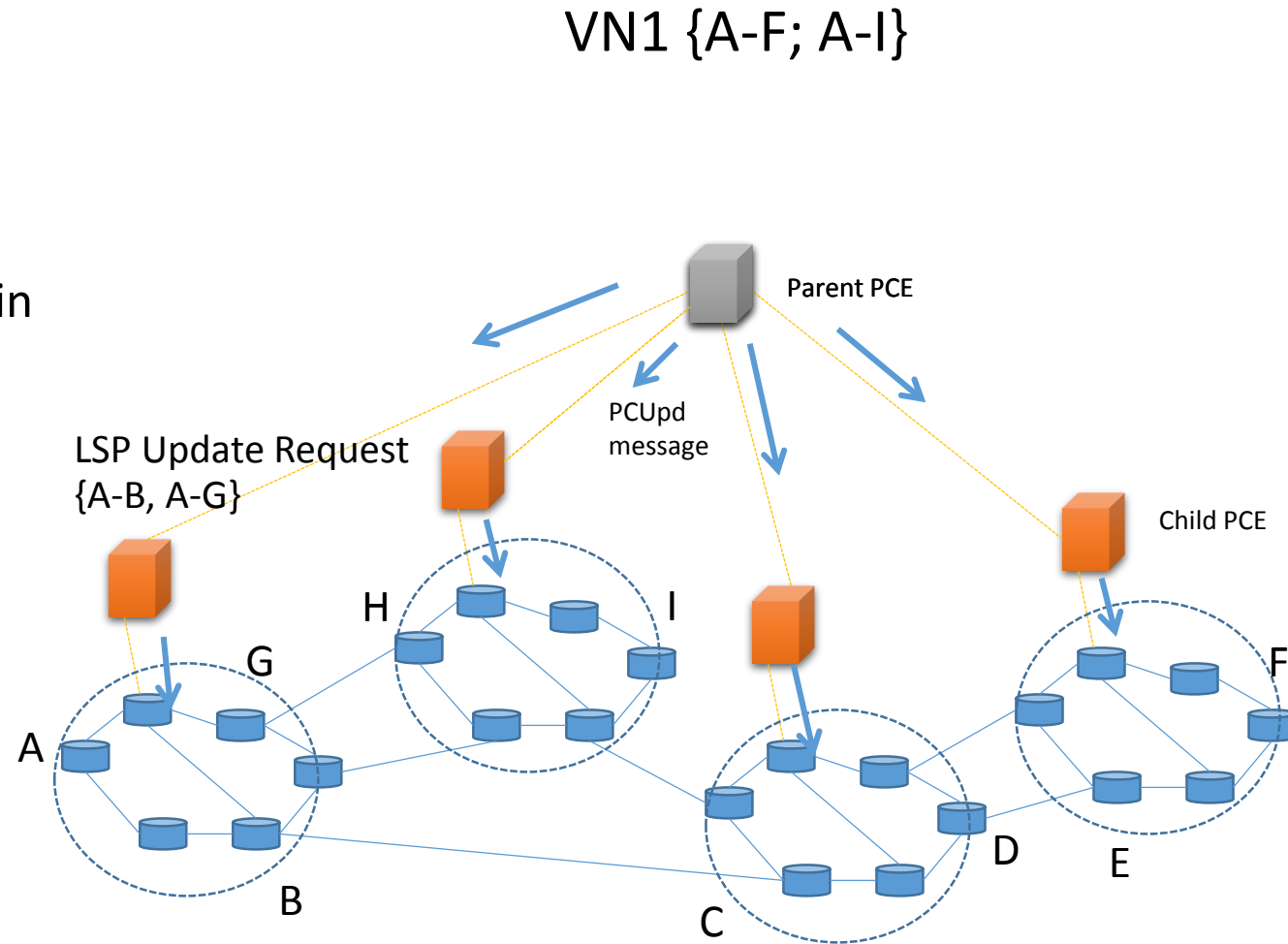
VN1 {A-F; A-I}

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.

LSP Status Report
{A-B, A-G}

PCRpt
message

Parent PCE

Child PCE

A B G H I C D E F

ACTN with PCE (& PCEP)

VN1 {A-F; A-I}
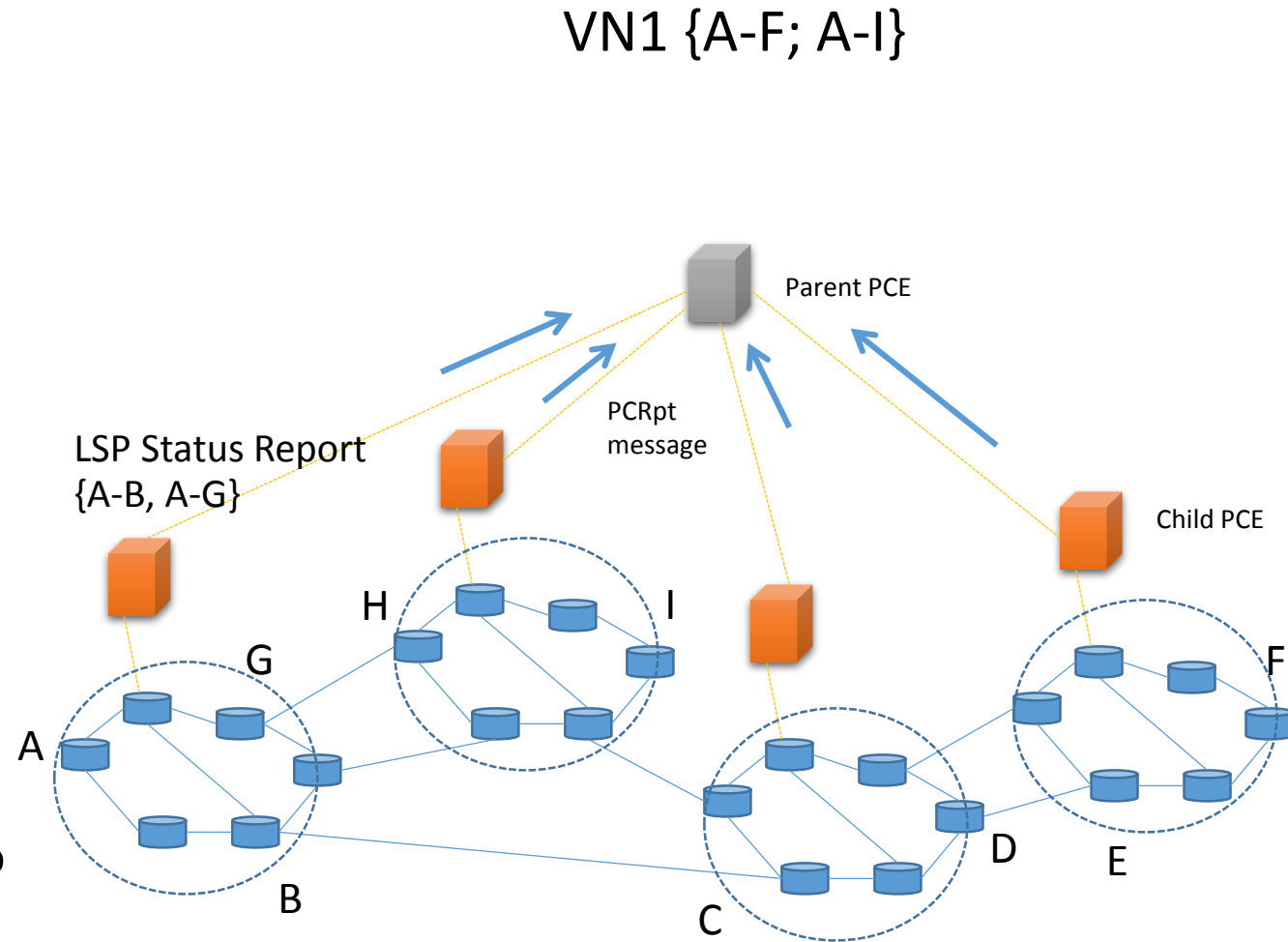
Step 3 – VN Modify

- 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 deleted and a new per-domain path needs to be created between different set of border nodes.

Parent PCE

PCUpd message

LSP Update Request {A-B, A-G}

Child PCE

A B G H I C D E F

ACTN with PCE (& PCEP)

Delete VN1

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

Parent PCE

PCInitiate msg

LSP delete {A-B, A-G}

Child PCE

H

I

G

A

B

C

D

E

F
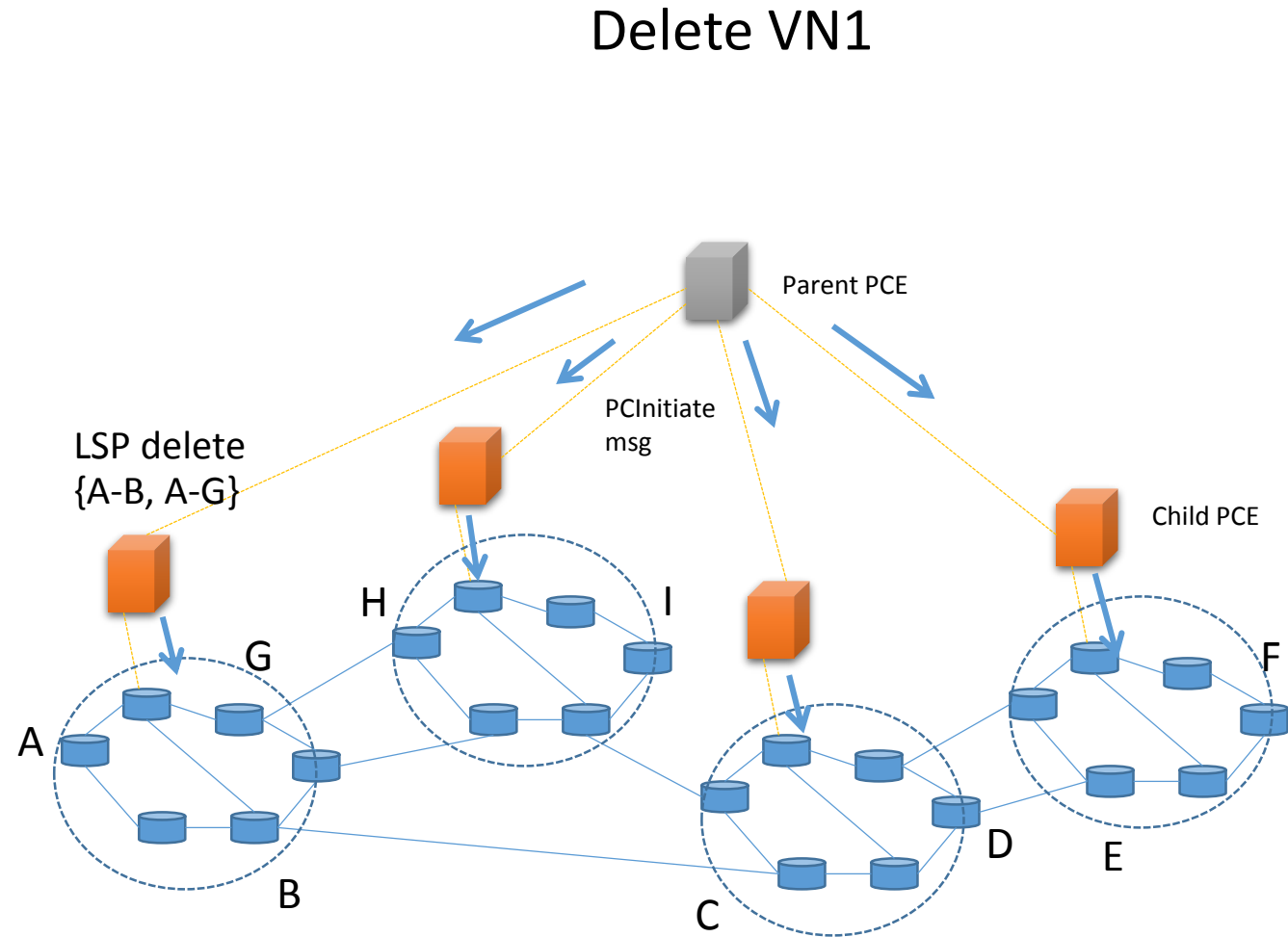
Summary

- This document is useful to understand how PCE and various extensions to PCEP comes together for ACTN.

- ACTN Framework is now in RFC Requested Stage.

- This document is stable and ready for WG LC.

Thanks!