PCEP-LS : Distribution of Link-State and TE Information via PCEP.

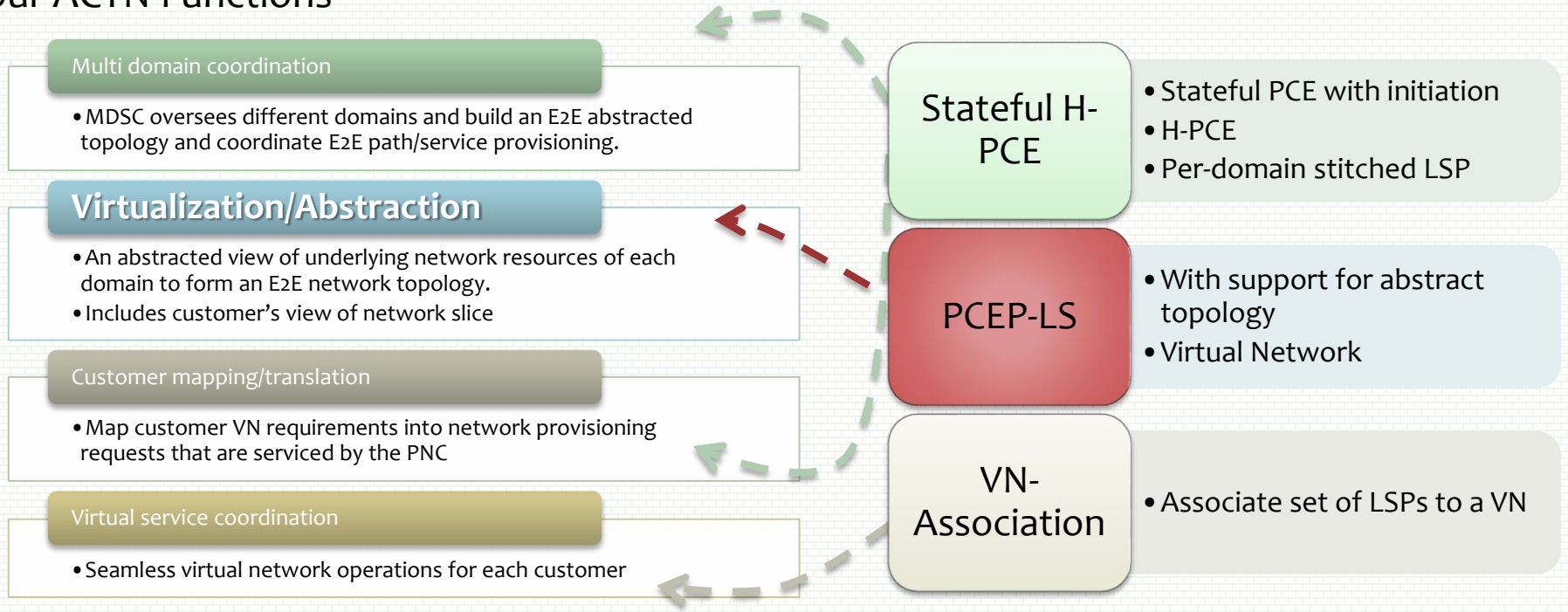
https://tools.ietf.org/html/draft-dhodylee-pce-pcep-ls-08
https://tools.ietf.org/html/draft-lee-pce-pcep-ls-optical-02

D. Dhody (Huawei)
Y. Lee (Huawei)
D. Ceccarelli (Huawei)

Y. Lee, H. Zheng (Huawei)
D. Ceccarelli (Ericsson)
W. Wang (BUPT)
P. Park (KT)
B. Yoon (ETRI)

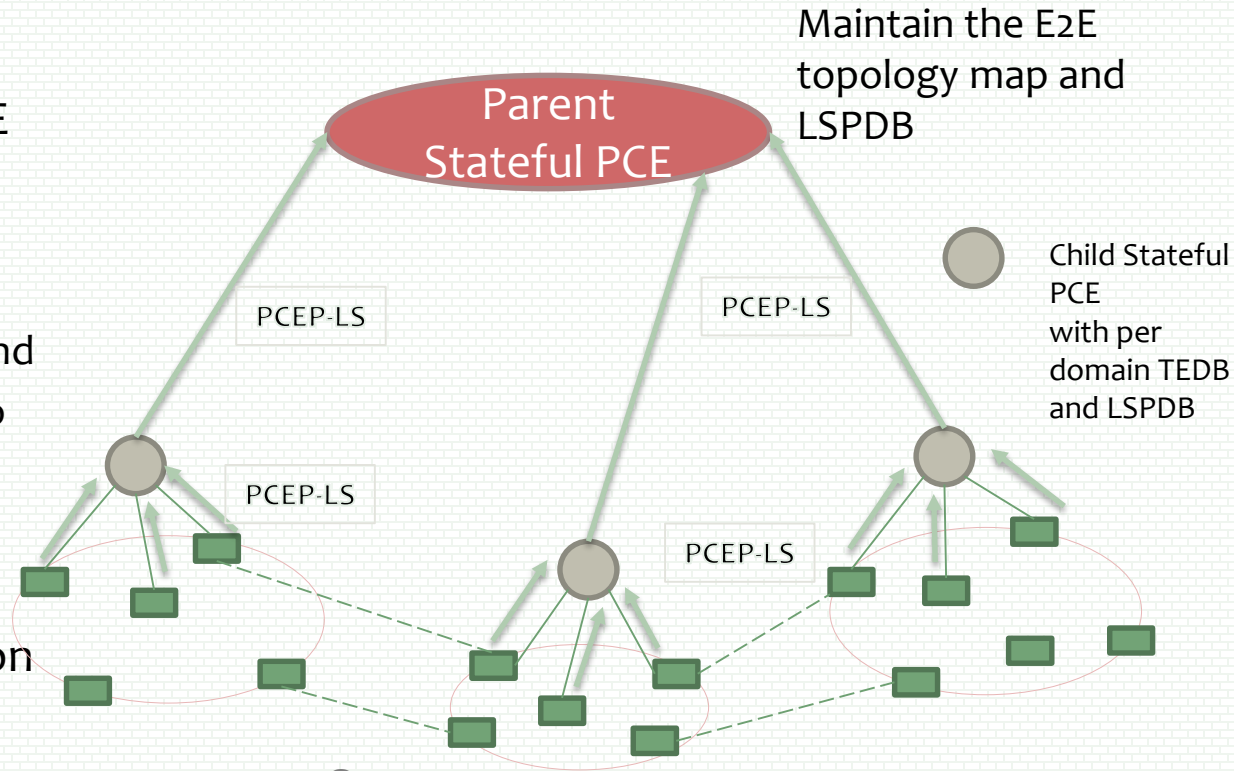
Architectural Context

Four ACTN Functions



Stateful H-PCE Context

- PCEP-LS allow recursive update of TE and Link State information
  - from Device to Domain Child PCE and
  - from Domain PCE to Parent PCE.
- Only incremental updates/changes
- Support for abstraction



Key Features of PCEP-LS

Capability to report the link-state and TE information

- Local and remote information
- Support for synchronization

Incremental Update in link-state and TE information with encoding of only the fields that are impacted.

(Fast Convergence)

Mechanism to link information learned via IGP and BGP-LS

Support Optical Network TE information

LSRpt Message

PCC MUST report any changes in the link-state (and TE) information to the PCE by sending a LS Report carried on a LSRpt message to the PCE.

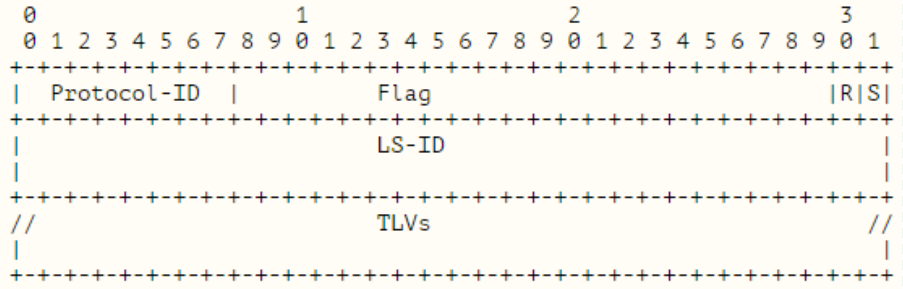
Each node and Link would be uniquely identified by a PCEP LS identifier (LS-ID). - remains constant for the lifetime of a PCEP session

The LS reports may carry local as well as remote link-state (and TE) information

The format of the LSRpt message is as follows:

```
<LSRpt Message> ::= <Common Header>
                    <ls-report-list>
Where:

<ls-report-list> ::= <LS>[<ls-report-list>]
```



TLV & Sub-TLV

- Routing Universe TLV
- Local and Remote Node Descriptor TLV
- Link Descriptor TLV
- Prefix Descriptor TLV
- Node Attributes TLV
- Link Attributes TLV
- Optical Node Attributes TLV
- Optical Link Attributes TLV

Implementation Report

Hierarchical Transport PCE controllers

- The PCEP-LS has been implemented as part of IETF97 Hackathon and Bits-N-Bites demonstration. The use-case demonstrated was DCI use- case of ACTN architecture in which to show the following scenarios: - connectivity services on the ACTN based recursive hierarchical SDN/PCE platform that has the three tier level SDN controllers (two-tier level MDSC and PNC) on the top of the PTN systems managed by EMS.
- Integration test of two tier-level MDSC: The SBI of the low level MDSC is the YANG based Korean national standards and the one of the high level MDSC the **PCEP-LS** based ACTN protocols. - Performance test of three types of SDN controller based recovery schemes including protection, reactive and proactive restoration. **PCEP-LS protocol was used to demonstrate quick report of failed network components.**

ONOS-based Controller (MDSC and PNC) Huawei (PNC, MDSC) and SKT (MDSC) implemented PCEP-LS during Hackathon and IETF97 Bits-N-Bites demonstration.

- The demonstration was ONOS-based ACTN architecture in which to show the following capabilities: Both packet PNC and optical PNC (with **optical PCEP-LS extension**) implemented **PCEP-LS on its SBI and well as its NBI** (towards MDSC). SKT orchestrator (acting as MDSC) also supported PCEP-LS (as well as RestConf) towards packet and optical PNCs on its SBI. Further description can be found at <ONOS-PCEP> and the code at <ONOS-PCEP-GITHUB>.

CTTC experimental Stateful PCE controller:

- We have detailed the implementation of the ACTN architecture in terms of hierarchical active stateful PCEs, using **PCEP-LS extensions for (aggregated) topology management**, and how per-client controllers are instantiated on-demand, to control allocated slices. Reference: Experimental Validation of the ACTN architecture for flexi-grid optical networks using Active Stateful Hierarchical PCEs. ICTON 2017.

Summary & Next Steps

- PCEP-LS completes ACTN Applicability to PCE and Stateful H-PCE implementation to support TE and Link State Information Updates.
- A number of implementations have been reported to date.
- Comments handled from Ramon.
- Ask for WG adoption!

Thanks!