

# (1) Applicability of Stateful PCE

## (2) PCEP Extensions for Stateful PCE Usage in GMPLS Networks

PCE WG, IETF 84<sup>th</sup>, Vancouver, BC, Canada

draft-zhang-pce-stateful-pce-app-01.txt  
draft-zhang-pce-pcep-stateful-pce-gmpls-00.txt

Fatai Zhang (zhangfatai@huawei.com)

[Xian Zhang \(zhang.xian@huawei.com\)](mailto:zhang.xian@huawei.com)

Young Lee (leeyong@huawei.com)

Ramon Casellas (ramon.casellas@cttc.es)

Oscar Gonzalez de Dios (ogondio@tid.es)

Dhruv Dhody (dhruv.dhody@huawei.com)

# Outline

- Stateful PCE applicability update
- PCEP extensions for stateful PCE usage in GMPLS networks
- Summary and next step

# Stateful PCE Applicability

## Main Objective:

- (1) Presenting generic considerations for stateful PCE architecture based on RFC4655;
- (2) Exhibiting the superiority of stateful PCE through the following typical scenarios;
  - Impairment-aware RWA in WSON networks
  - Recovery (Protection & Restoration)
  - Time-based Scheduling
  - SRLG Diversity
  - Defragmentation in flexible grid networks
  - Maintenance of Virtual Network Topology
  - GCO (Incremental)
  - P2MP Application

# From Version 00 to 01

## Major Updates:

- (1) Linked this document with relevant drafts that cover PCEP extensions;
  - *draft-ietf-pce-stateful-pce*
  - *draft-zhang-pce-pcep-stateful-pce-gmpls*
- (2) Added a section talking about the usage of under construction LSP information;
  - *LSP-DB stores **two types** of LSP info.: (a) established LSPs; (2) yet-to-be established LSPs;*
- (3) Added contents for security and manageability sections;
- (4) Editorial updates;

# PCEP Extensions for Stateful PCE Usage in GMPLS Networks

## ◆ Motivation

Gaps identified between what PCEP extensions are needed with the WG (*draft-ietf-pce-stateful-pce*) according to the appl. draft (*draft-zhang-pce-stateful-pce-app*)

## ◆ Overview of PCEP Extensions

- LSP capability advertisement and negotiation;
- LSP state synchronization;
- LSP delegation;
- PCEP simplification ;
- Application-specific extension;

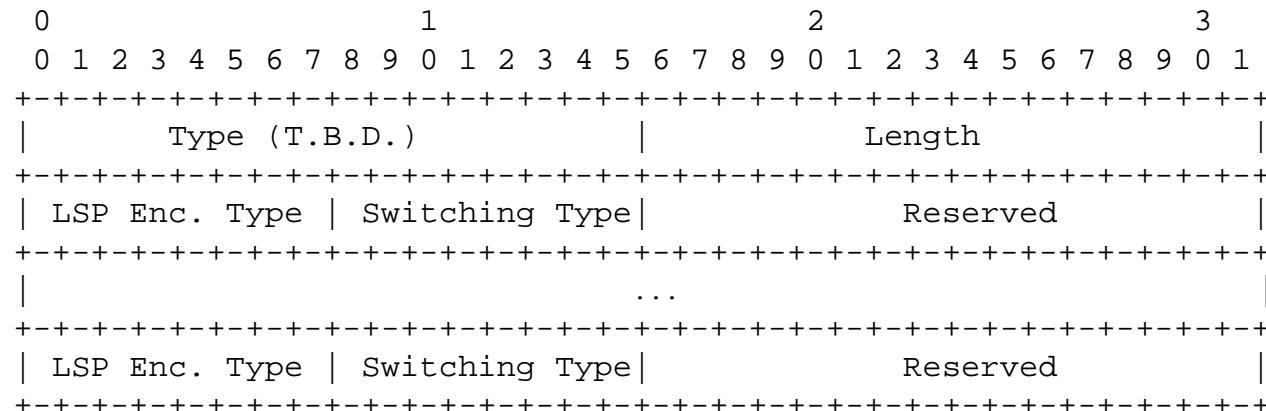
# PCEP Extensions for Stateful PCE Usage in GMPLS Networks

## ◆ LSP capability advertisement and negotiation (essential)

- ┌ Negotiation: during PCEP session establishment process
- └ Advertisement: through routing protocol(s)

multi-layer: Layer-specific capability advertisement => **LayerCapability TLV**

(note: carried in OPEN msg)



# PCEP Extensions for Stateful PCE Usage in GMPLS Networks

## ◆ LSP State Synchronization (essential)

GMPLS LSP characteristics should be considered :

- <GENERALIZED BANDWIDTH>
- <PROTECTION ATTRIBUTE >
- Extended Objects to support the inclusion of the label sub-object
  - <RP>, <IRO>, <XRO>

## ◆ LSP Delegation

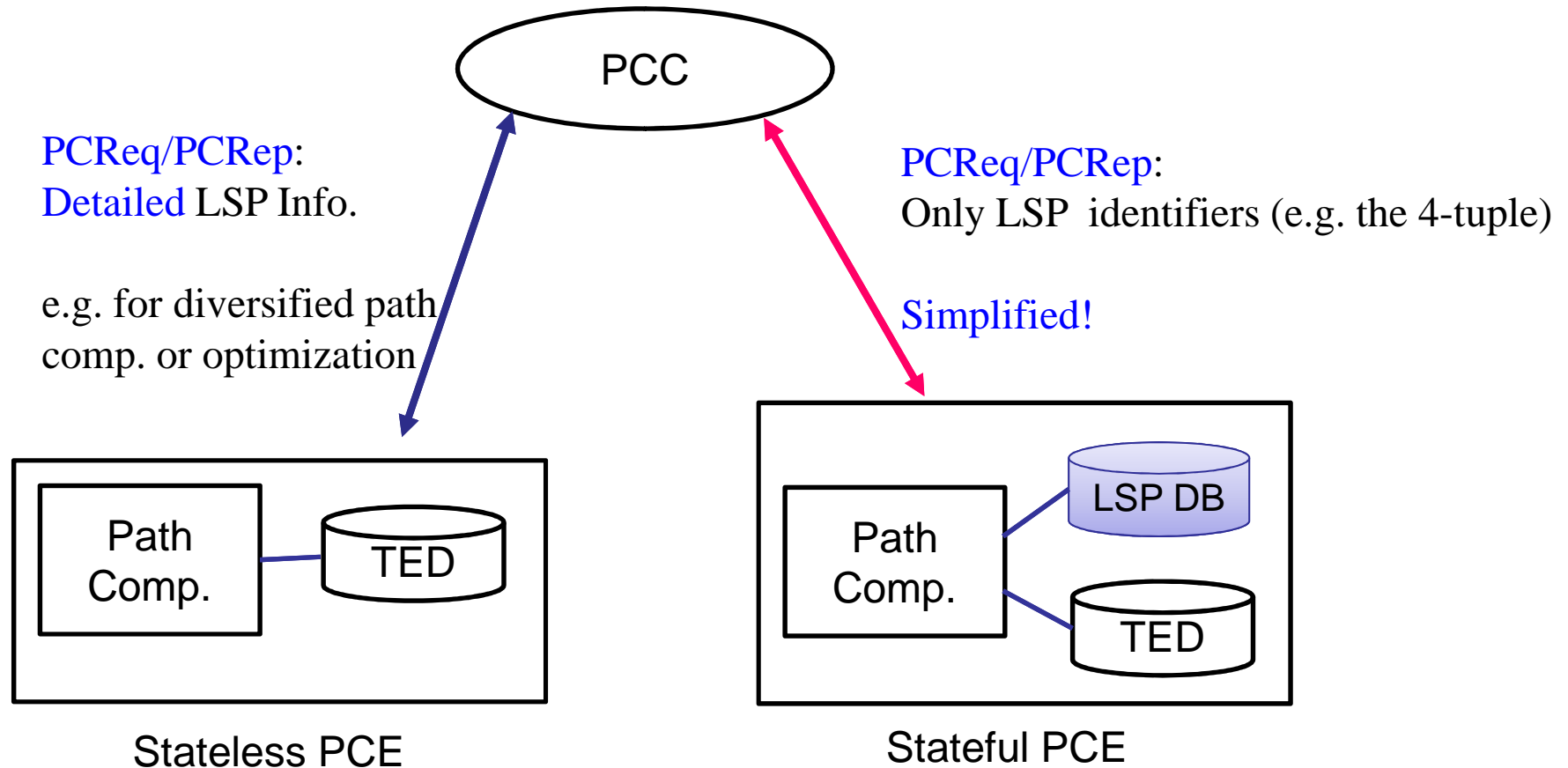
Q1: Should it be part of RFC5394 (Policy-enabled PCE FRWK)?

Q2: Typical usage?

Q3: A LSP spanning across multiple domains? How to maintain the per LSP mode?

# PCEP Extensions for Stateful PCE Usage in GMPLS Networks

## ◆ PCEP Simplification





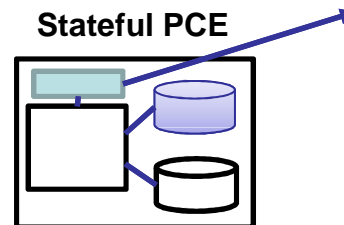
# PCEP Extensions for Stateful PCE Usage in GMPLS Networks

## ◆ Application-specific Extension

### Time-based scheduling:

(1) Internal to PCE:

Scheduled LSP info.;



LSP scheduling Table

LSP ID	Time	Resource
1	T1-T2	E-C-D-G
2	T2-T4	E-C-D-F
3	T3-T4	E-F

(2) PCEP extension: LSP starting time and LSP holding time =>

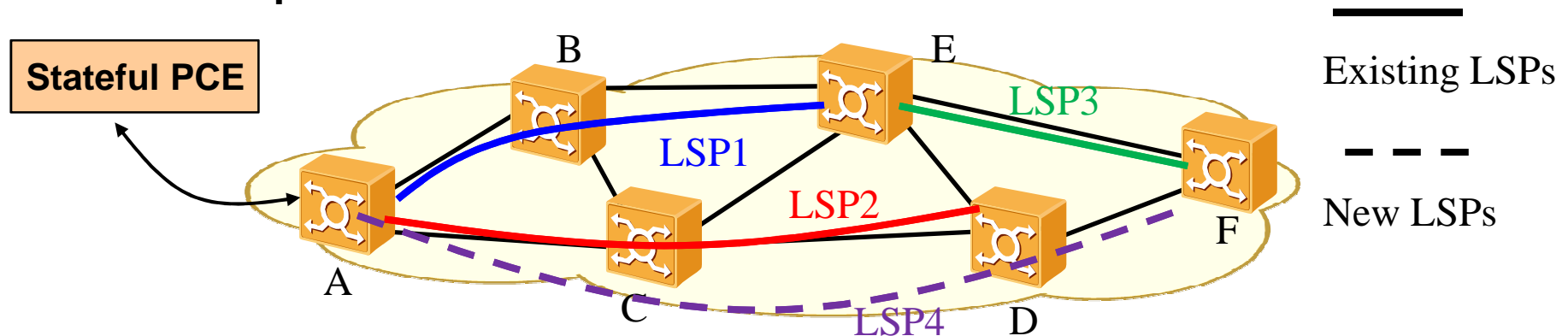
### A new object (Service-Time)

0										1										2										3									
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
Start-Year										Month										Day																			
Hour					Minute					Second					Reserved																								
Duration (in seconds)																																							

# PCEP Extensions for Stateful PCE Usage in GMPLS Networks

## ◆ Application-specific Extension

RWA in impairment-aware WSON networks:



**Requirement:** should not impact existing LSPs while establishing new LSPs

**Extension needed:** Impairment related information, e.g. Power, OSNR, PMD, etc.

- Extension to **the METRIC object** to include the requirement relating to these impairment parameters

# Summary & Next Step

- Welcome feedback from the meeting or mailing list and further revision
- Suggestion for moving forward: [requirement/applicability first, then specific PCEP extensions](#)
  - ⇒ **Requirement:** merge relevant contents from existing two drafts
    - (1) *part of **draft-ietf-pce-stateful-pce***
    - (2) ***draft-zhang-pce-stateful-pce-app***
  - ⇒ one PCEP extensions draft
    - (1) *part of **draft-ietf-pce-stateful-pce***
    - (2) ***draft-zhang-pce-pcep-stateful-pce-gmpls***