MPLS-TP Use Cases and Design Considerations
draft-mpls-tp-use-cases-and-design

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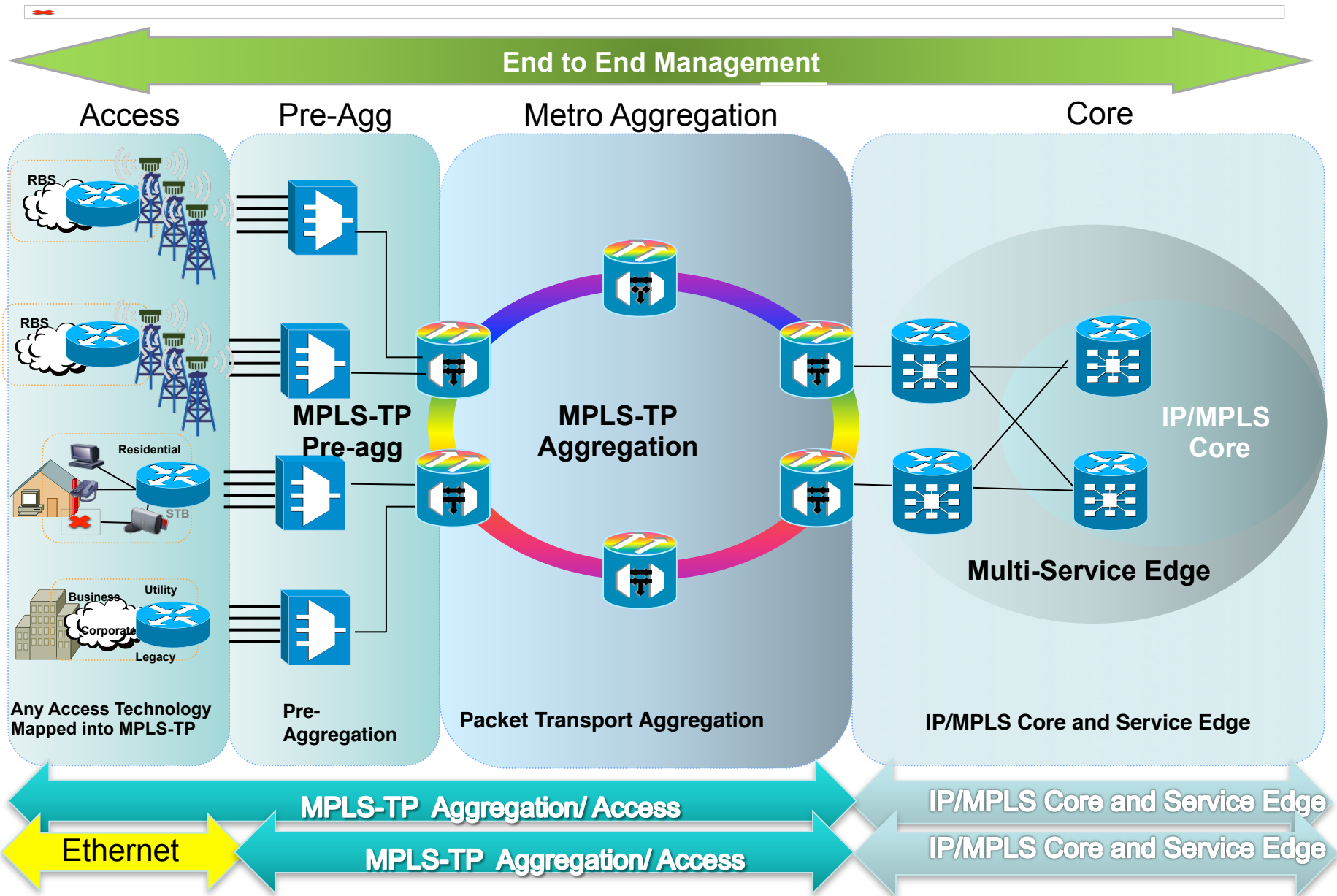- **Nurit Sprecher**
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Objective and Status

- Objectives:
  - Provide MPLS-TP use case studies
  - Discuss design considerations and options
  - Intent to serve as best practice guide

- Status
  - Issued 04 version
    - Complete use case scenarios
    - Additions to reflect recent development experience
    - Point to draft-martinotti-mpls-tp-interworking-02.txt for interworking
  - Adopted as MPLS WG document 11/17/2011
    - Thanks for the support of WG and comments by many folks!
  - Will first update to WG document without any other change
  - The will change the document title to "MPLS-TP Applicability; Use Cases and Design" and upload again
    - Agreed with Eric Gray suggestion through WG poll.
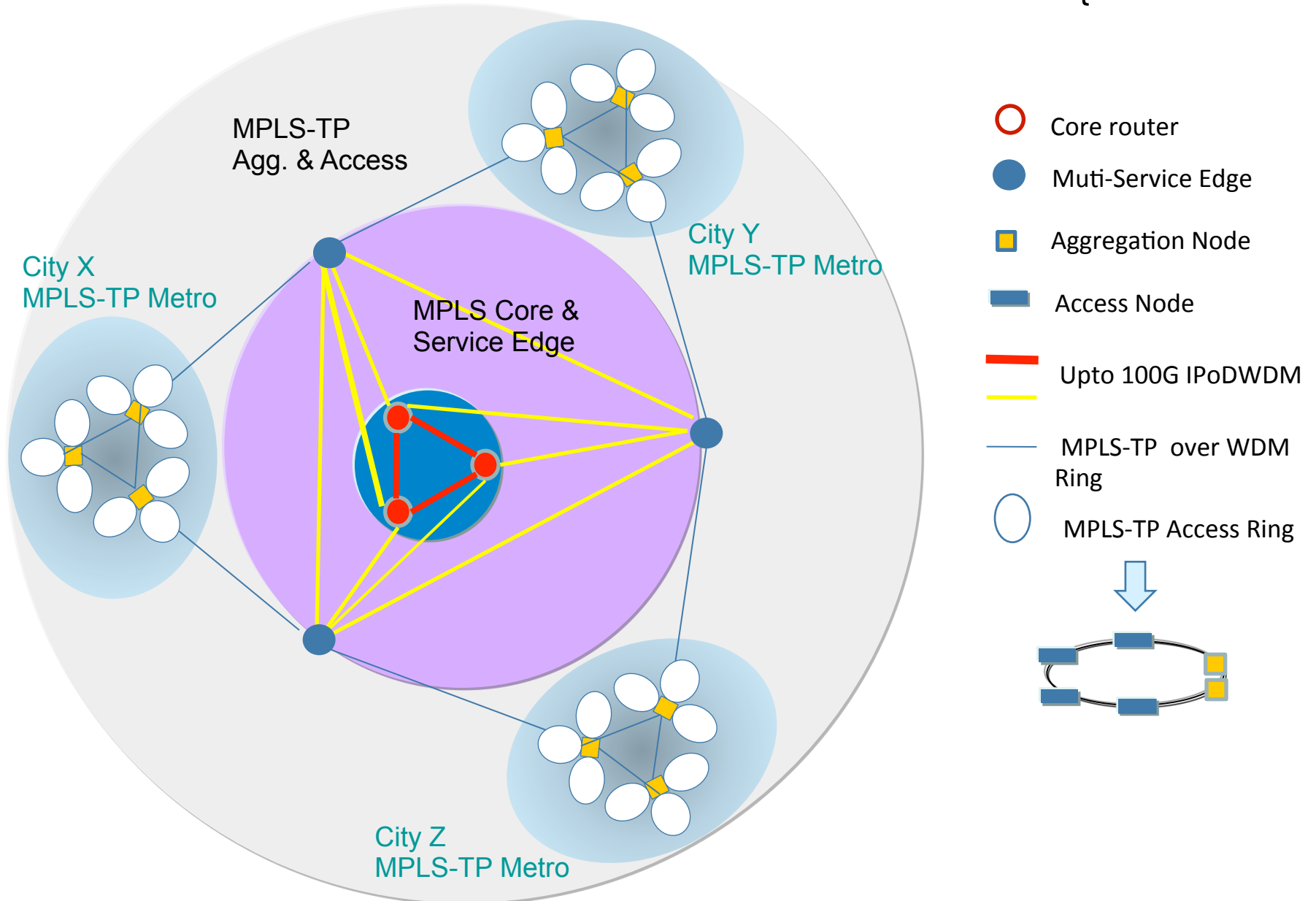   - Following Chairs recommendation on change process.

Overview

- ## Use cases

  - Metro Agg/Acc, Packet Optical Transport, Mobile backhaul

  - MPLS-TP provides the transport for multi-services, e.g. wireline/wireless, business VPNs/residential broadband, whole sale/retail…

  - Bring in latest real world deployment/planning examples which using IETF standards MPLS-TP solutions.

Unified MPLS

Use Case 1: MPLS-TP For Metro Aggregation and Access (Most common)

MPLS-TP Agg. & Access

City X
MPLS-TP Metro

MPLS Core & Service Edge

City Y
MPLS-TP Metro

City Z
MPLS-TP Metro

○ Core router

● Muti-Service Edge

▣ Aggregation Node

▬ Access Node

▬ Upto 100G IPoDWDM

▬ MPLS-TP over WDM Ring

○ MPLS-TP Access Ring

IP or MPLS

IP/MPLS

IP/MPLS

Ethernet

Ethernet

Client Layer – Support L2/L3 Service

Server Layer - Optical Packet Transport

MPLS-TP

MPLS-TP

MPLS-TP

MPLS-TP

MPLS-TP

WDM

WDM

WDM

Access

Aggregation

Core

Aggregation

Access

Dynamic Control Plane:
GMPLS for LSP
tLDP for PW

Working LSP

GMPLS:
RSVP-TE
OSPF-TE/ISIS-TE

Client node   PE   PE   Client node

Protect LSP

Dynamic MPLS-TP LSP

Pseudowire

Client Signal
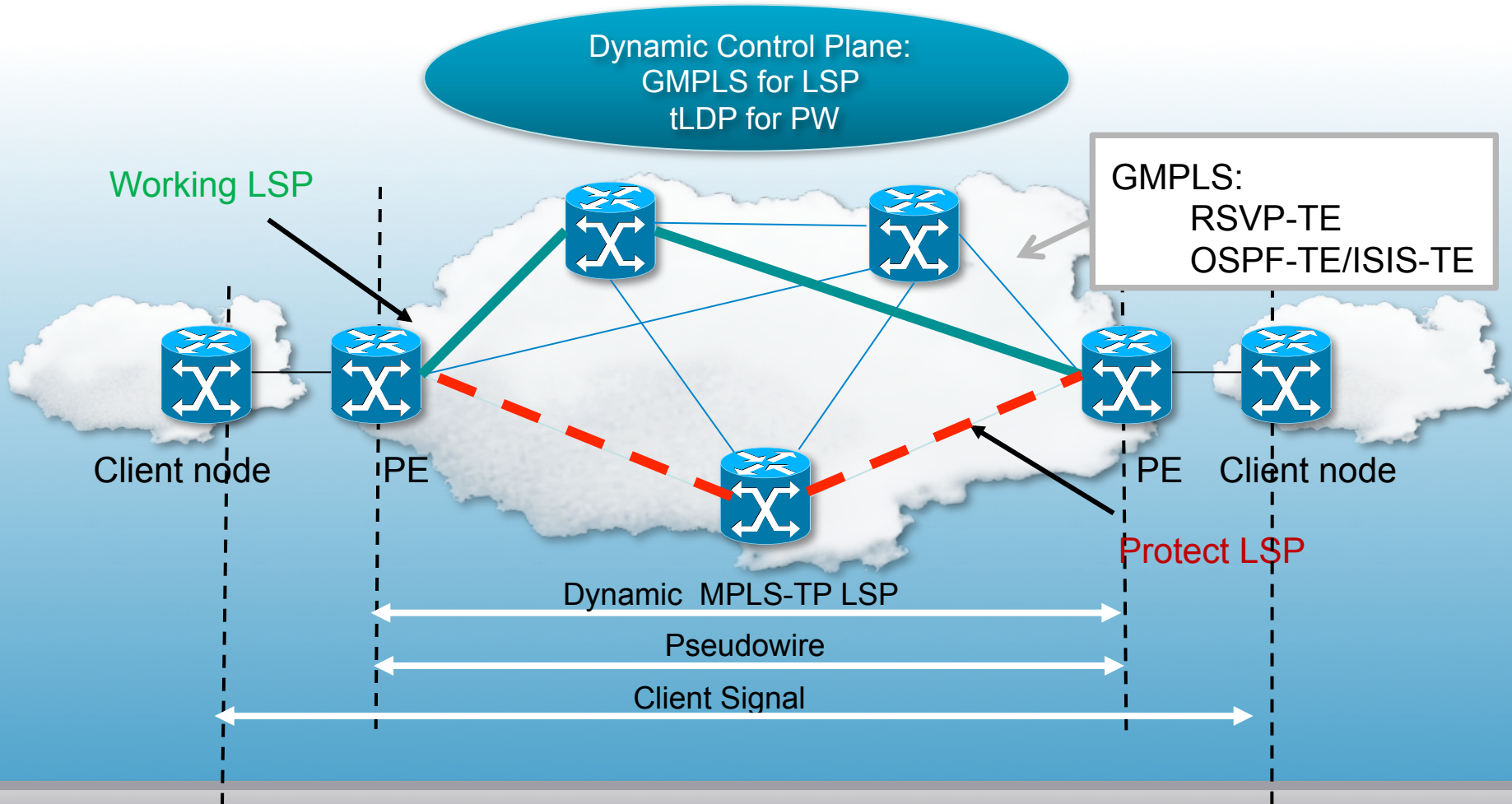
Dynamic control plane provisioned working path and protect path
MPLS-TP in-band OAM: BFD CC/CV, AIS/RDI/LDI
Transport Tunnel 1:1, 1+1, 1:N protection, switching triggered by in-band OAM
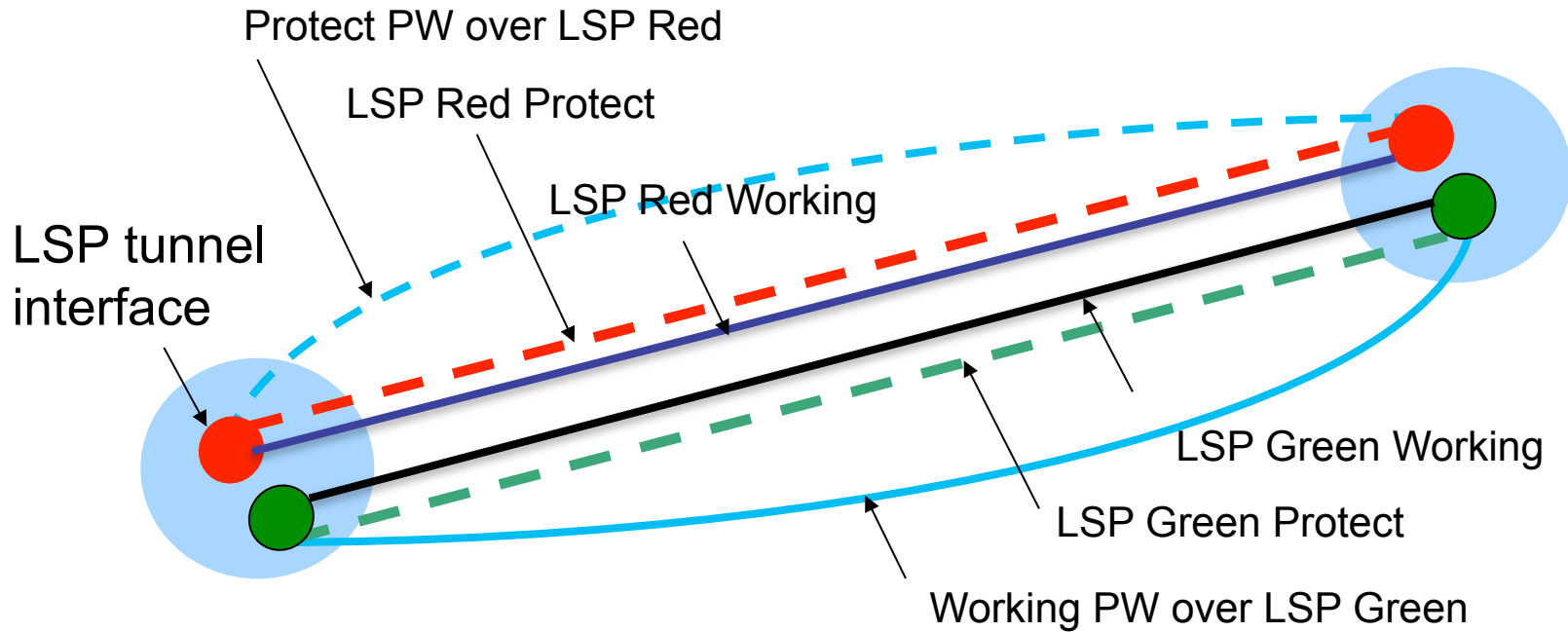Preferred option - if Operation Model allows

- When to consider MPLS-TP?
  - Most common use case: replacing SONET/SDH with MPLS-TP
  - Typical applications:
    - Metro aggregation access
    - Mobile back-haul
    - Long-haul optical packet transport
- Which MPLS-TP Model?
  - Depending on the operational model and long term planning
    - Dynamic with GMPLS control plane is preferred if ops model allows
    - Static provisioning model may provide easy adaption for the transport ops – most commonly adopted practice today
- Can MPLS-TP be used to replace IP/MPLS?
  - No. MPLS-TP is MPLS focused on transport-only features, it does not provide L2/L3 services functions as IP/MPLS does

More on General Design Considerations

- Protection
  - 1:1, 1+1, 1:N (1 protects n working lsps)
  - Linear/Ring/Shared mesh protection
  - Recovery coordination among layers
  - PW protection and LSP protection
  - Support of multi-homing, multi-chassis redundancy
  - Delay variation between working and protect LSPs
- OAM
  - Balance between protection coverage and efficiency/reduce complexity
  - Tuning BFD hello interval and hold off timer
  - Distance impact to AIS/RDI/LDI – use of TP style fast reroute
  - Clocking and loss/delay measurement
  - Use of loopback and lock Instruct for test and maintenance
  - OAM and control plane relations

MPLS-TP PW Design Considerations

- Does PW work the same as in IP/MPLS?
    - Mostly yes.
        - Both SS-PW and MS-PW are supported
        - tLDP is used for dynamic control plane
    - PW status is new OAM feature for failure notification for static provisioning
    - Both directions of a PW must be bound to the same transport bidirectional LSP
- When multi-tier rings involved, should S-PE be used or not?
    - Pros for using S-PE
        - Domain isolation, may facilitate trouble shooting
        - the PW failure recovery may be quicker
    - Cons for using S-PE
        - Adds more complexity
        - If the operation simplicity is the high priority, some SPs choose not to use S-PE, simply forming longer path across primary and secondary rings.
- Should PW protection be used in addition to LSP protection?
    - An operator choice. Pros for using PW protection
        - PW is protected when both working and protect LSPs carrying the working PW fails as long as the protection PW is following a diverse LSP path from the one carrying the working PW
        - Adds more complexity, some choose not to use.

Protect PW over LSP Red

LSP Red Protect

LSP Red Working

LSP tunnel interface

LSP Green Working

LSP Green Protect

Working PW over LSP Green

- Working PW is configured over LSP Green tunnel interface with working and protect paths.

- When LSP Green working path fails, it switches to lsp Green Protect. No PW switching is needed.

- PW protection takes place only when both lsp Green Working and Protect paths fail, PW will switch to the protect PW which is attached on the lsp Red tunnel int.

- *PW protection is set to protect from LSP failures on both working and protect*

- Should both proactive fault detection and event driven tools be used ?
  - Yes
  - LDI is event driven
    - Fiber cut will cause LDI message generated and trigger immediate protection switching.
  - BFD hello is used for proactive fault management
    - BFD sessions should be configured for both working and protecting LSPs
    - BFD hardware support for scalability
    - No dependency on Control Plane or Management Plane
- Unidirectional Failure
  - When Unidirectional failure happen, RDI will send the failure notification to the opposite direction to trigger both end switch over.

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Next Steps

- More input/comments from WGs appreciated – especially based on design/deployment experience.