SPRING Use Case:

Performance Engineered LSPs.

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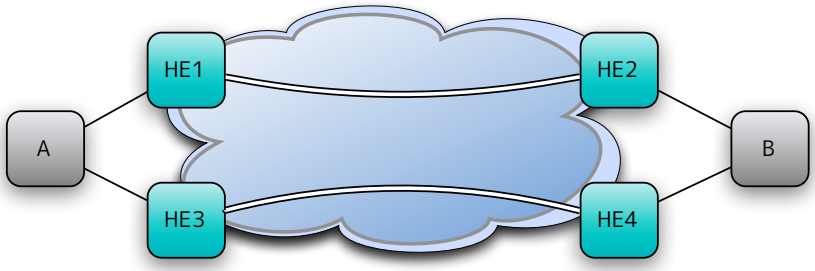
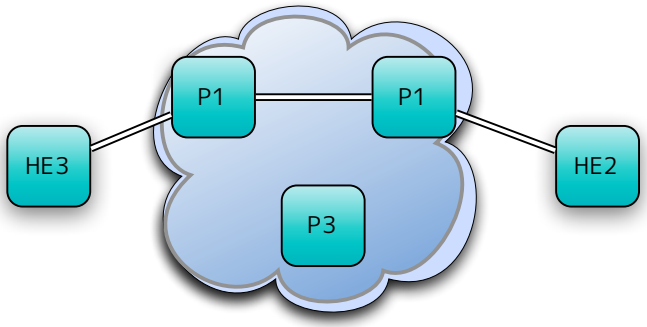
(BoF Recap) What's the problem we're trying to address?

- In IP/MPLS networks, we have a concept of one "base" topology – which is the SPT.
  - One set of logic applied to choose IGP costs – used to route all services within this topology.

- **Problem for a core network supporting multiple services:** Not all services have the same logic as to the constraints for their routing through the infrastructure.



Co-routing service placement based on consideration of other services within the network.

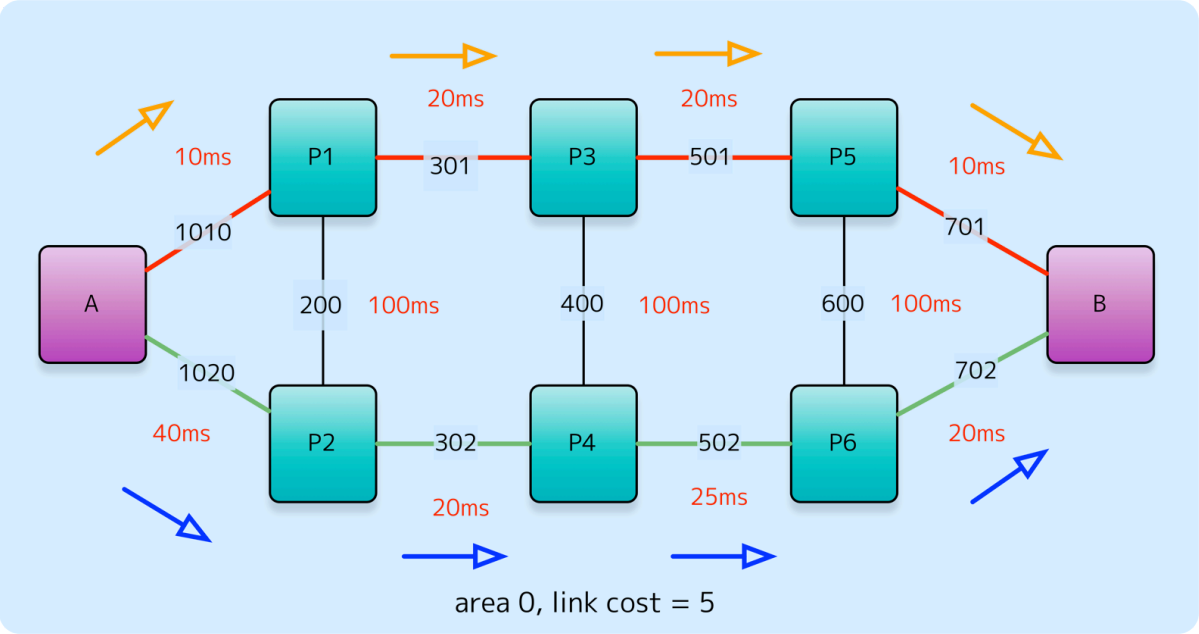


Pinned paths where services are constrained based on underlying path resources.

- How do we meet the requirement for such constraints?
  - Transport networks have generally provided such constrained paths.
  - More applications requiring performance guarantees.
    - For all traffic (e.g., Broadcast).
    - A subset (e.g., voice within a multi-service VPN).

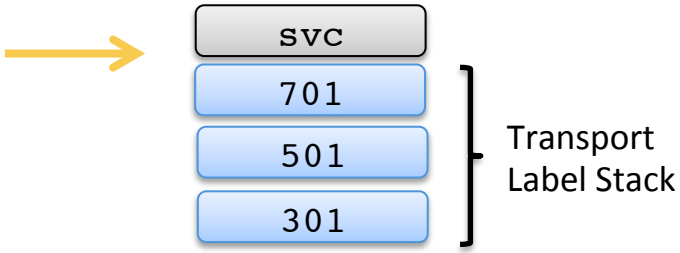
Problem: Provide means to introduce routing constraints which diverge from the SPT on a per-service or per-flow basis, utilising the existing underlying IP/MPLS network infrastructure.

Head-end Based Calculation of Segment Stack.



Affinity – Green.

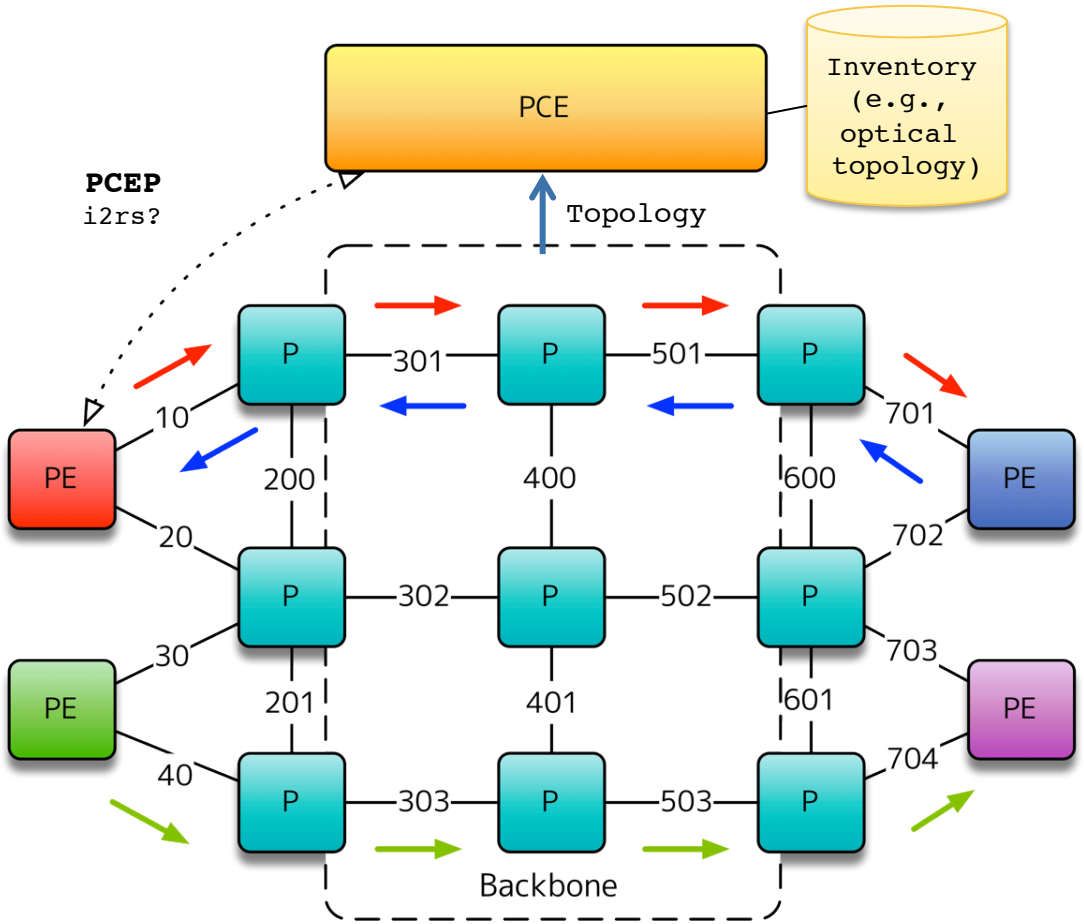
Objective Function – Latency.
(Extended IGP metric)



- Head-end based computation – as per RSVP-TE ERO computation to determine SID stack to be used.
- Allows explicit path to be specified – where IGP visibility exists.
- Such services (e.g., affinity, latency-based) did not impact admission control metrics in RSVP-TE: state reduction.

Centralised Computation of Segment Stack.

- Centralised computation required for a subset of performance demands – e.g., bi-directional co-routed, disjoint service paths.
- Further requirement introduced by multi-area IGP – no visibility of segments.

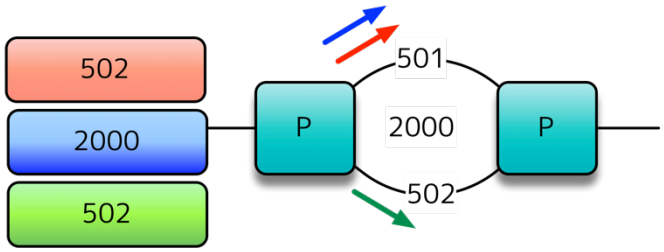


- Architecture using PCE to calculate SID stacks to provide such performance constraints (improving visibility).
- Requires some IETF stitching into overall architecture:
  - Path computation (PCEP, stateful PCE).
  - IGP Discovery (OSPF/ISIS extensions or BGP-LS).
  - Liveliness detection (MPLS-TP OAM?)
  - Protection.

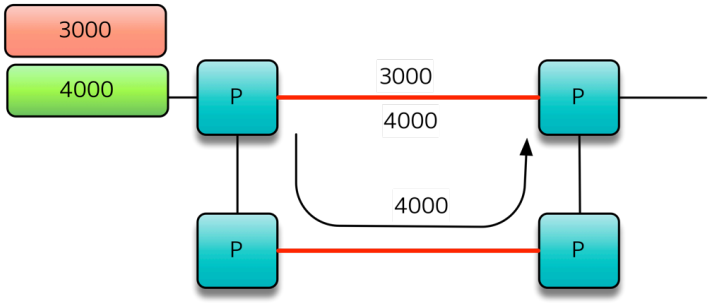
Co-routed service

Disjoint service pair

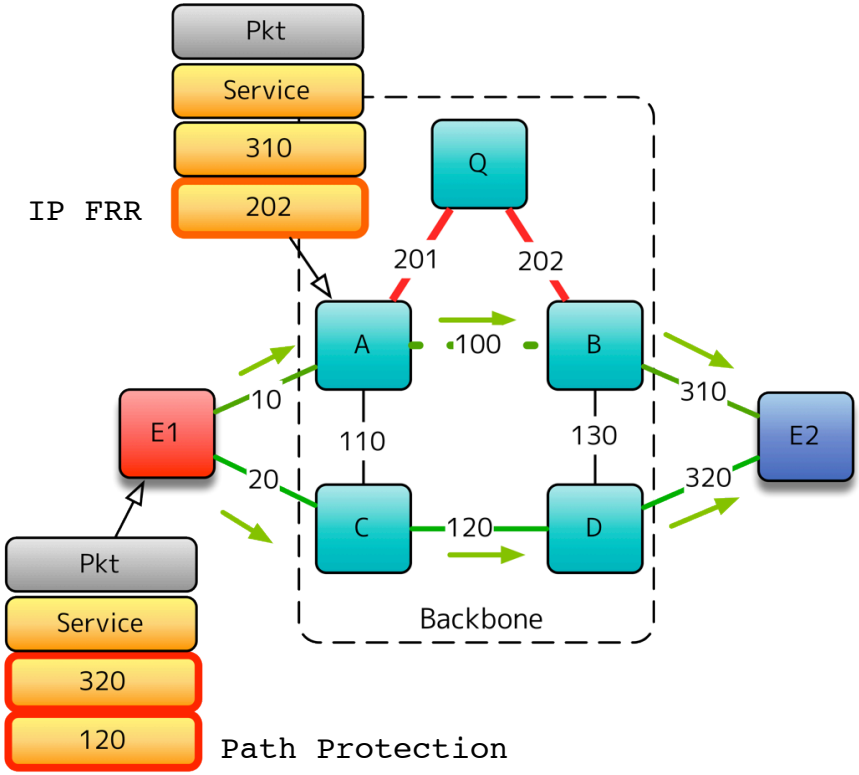
Dataplane Considerations and Protection.



Adj-SID supporting parallel paths
(take advantage of ECMP)



SIDs signalling protection behaviours



- Services have differing requirements for protection per-application:
  - No protection –non-revertive SIDs.
  - IP/MPLS FRR – {vanilla,remote,directed}-LFA.
  - Application-layer protection – utilising path-protection (could be computed by PCE).
- Survivability of solution increased by PCE due to path recomputation – benefit of online vs. offline computation.

Use Case/Architecture aims to describe a mechanism to create LSPs within an **MPLS LSR infrastructure** which:

- **Are routed away from the SPT based on performance constraints** (affinity, latency, SRLG etc.) **or coupling with other LSPs** within the network (e.g., for diversity or bi-directionality).
- Provide **adequate scale to support per-service or per-flow constraints.**
- Are routed according to **distributed CSPF or centrally by a PCE** based on service requirements.

Aiming to **augment the capabilities of the existing IP/MPLS packet layer** to support new service demands.