STATUS Use Case:

Performance Engineered LSPs.

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Key Requirement.

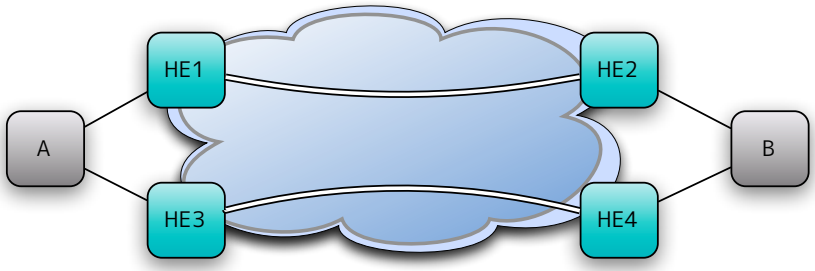
Create LSPs within an IP/MPLS infrastructure which:

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

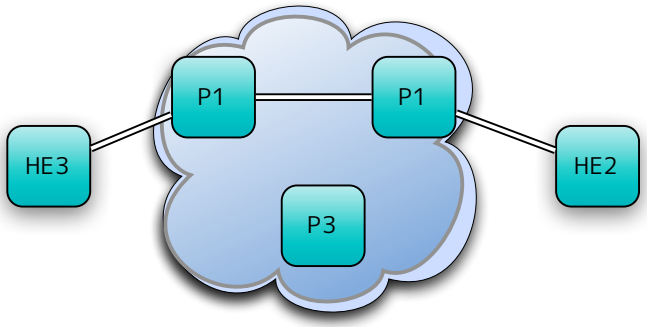
Background – What's the problem we're trying to address?

- 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.

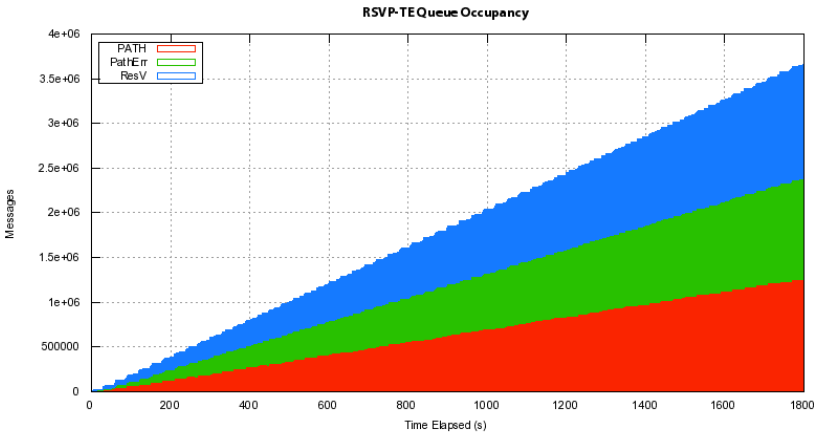
- How do we meet the requirement for such constraints?
  - Transport networks have generally provided such constrained paths.
  - More applications requiring performance guarantees.
    - For all traffic (e.g., Broadcast).
    - A subset (e.g., voice within a multi-service VPN).

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.

Path Constraints and Technology Options.

- **Requirement for a number of types of constrained service/flow routing:**
  - Co-routing.
    - Considering SRLG/Node/Link diversity or bi-directional paths.
  - Affinity-based routing.
    - Diverging from SPT based on constraining available paths by colour/admin-group.
  - Performance-managed services.
    - Latency, available bandwidth, etc.
- Clearly, a number of these constraints can be delivered by RSVP-TE today.

- **Per-service/flow routing requires a significant increase in the number of RSVP-TE LSPs when compared to current deployments:**
  - Number of LSPs is greater than full mesh (already not recommended).
  - Scale limit of mid-point signalling during large failures.
- **Limited additional functionality is offered by having mid-point state**.
  - Generally only admission control.
  - Required in a subset of path routing scenarios.



Mid-point Overloading – Post-Mortem Model

Unbounded RSVP-TE queue growth based on inability to process PATH messages within LSP retry time – **LSPs never successfully re-signal.**

Suggested Architecture.

- **Use segment routing (STATUS approach) to provide means to instantiate the data-plane paths.**
  - Removes constraint of number of LSPs that can be created by removing mid-point state.
  - Stacked labels indicate the path to be taken through the network.
  - Some consideration of per-label semantics may be required (particularly for reversion).

- **Re-use existing CSPF machinery where it is applicable.**
  - Distributed path calculation based on IGP or TED influences selection (e.g., affinity etc.)
  - Extended IGP attributes can provide increased CSPF-functionality.
    - *draft-previdi-isis-te-metric-extensions-03*
    - *draft-ietf-ospf-te-metric-extensions-04*

- **Re-use existing PCE to provide SID stacks where global visibility is required.**
  - Co-computation of coupled services (bidirectional, diverse with divergent head-ends).
  - Stateful PCE can provide admission control where required.
    - Only maintain state for the subset of services where it is required.

- Use case described in more detail in *draft-shakir-rtgwg-sr-performance-engineered-lsps.*

- Encourage swift progress towards standardised solutions to meet these requirements.
  - Extend IETF technologies to meet an IP/MPLS functionality gap.
  - Existing WGs provide a good forum with experts in each domain.

Thanks!
Questions/Comments?