

draft-anand-spring-poi-sr-00.txt

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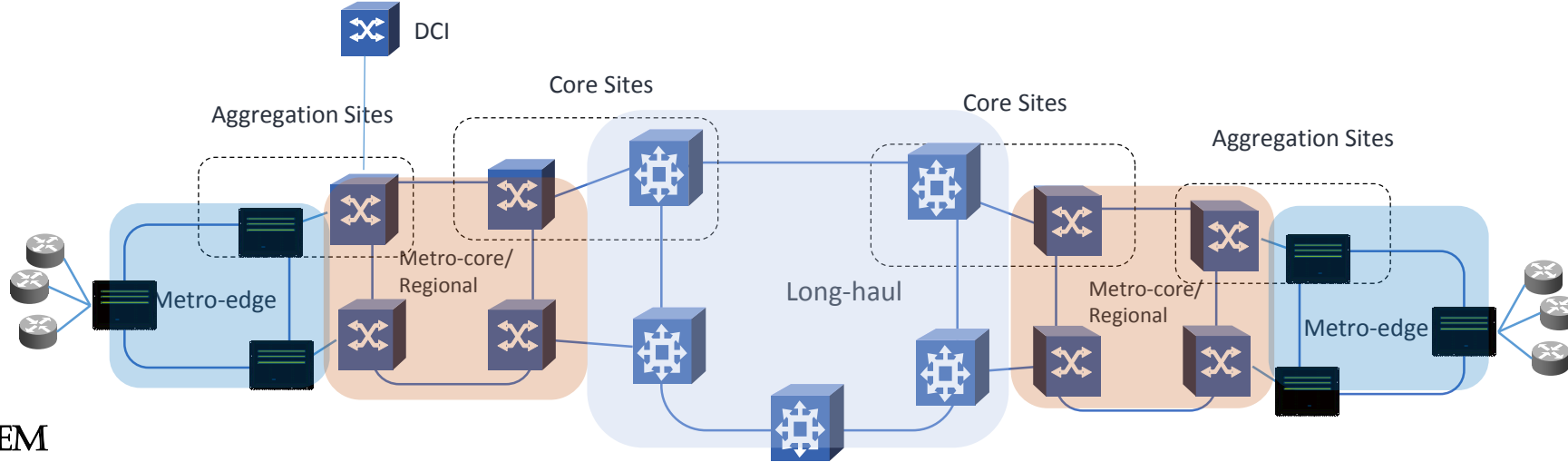
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Reference Topology and Problem Statement



- Multi-layer
- Metro networks
- DC Interconnects

PROBLEM STATEMENT

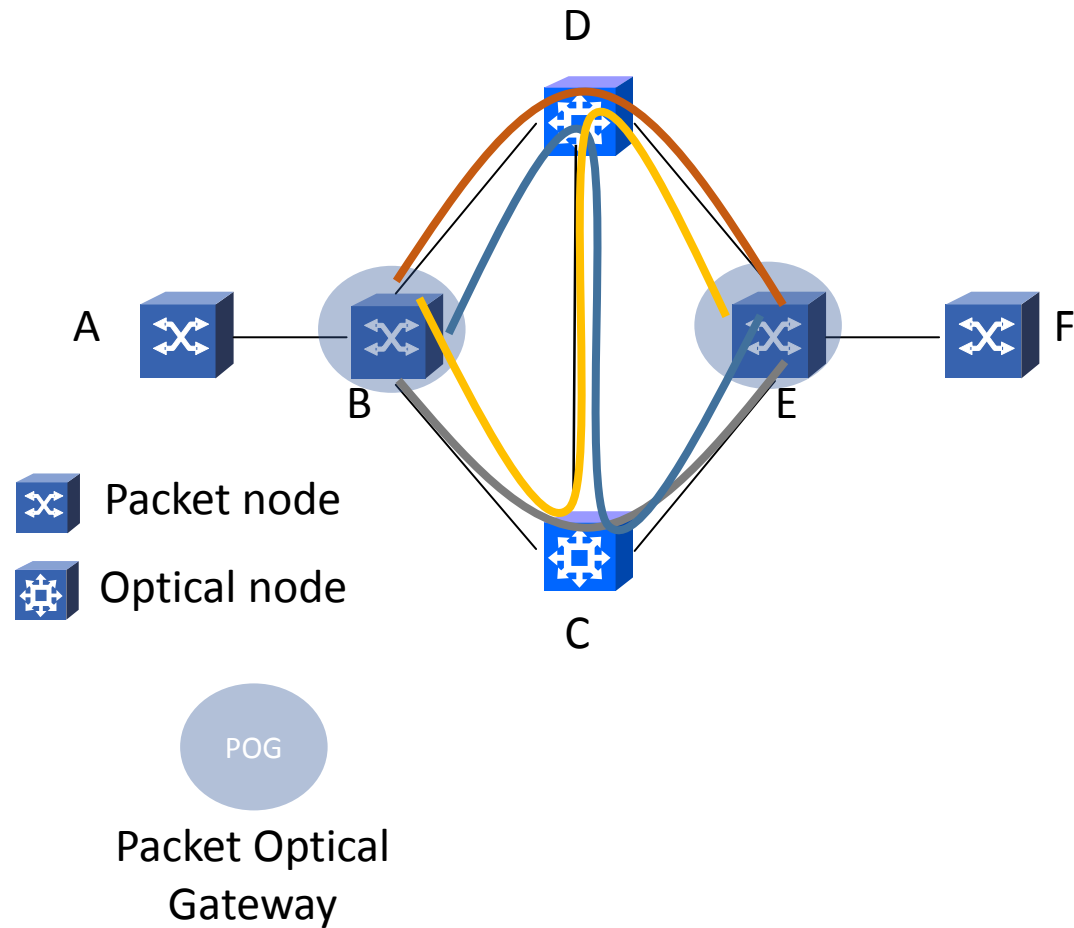
Multi Layer extensions to Segment Routing Paradigm

- Expose characteristics of optical transport links in an opaque manner into the packet domain which is not for IGP consumption

CONSTRAINTS

- ☐ Leverage existing signaling and routing protocols
- ☐ Scale well to both Metro/DCI scenarios

Solution Overview



- In the packet network, node B is one hop away from node E
- POGs B and E may advertise 4 optical paths with different optical characteristics as **transport segments** into the packet domain
 1. O1 (B, D, E)
 2. O2 (B, C, E)
 3. O3 (B, D, C, E)
 4. O4 (B, C, D, E)
- The Packet PCE can include these transport segments O1, O2, O3, O4 in specifying paths for reaching F from A based on service needs and including them in the appropriate segment lists
- **Transport segment** is an opaque abstraction of the optical plane and leaves the definition of the optical path (O1/O2/O3/O4) to the optical control plane

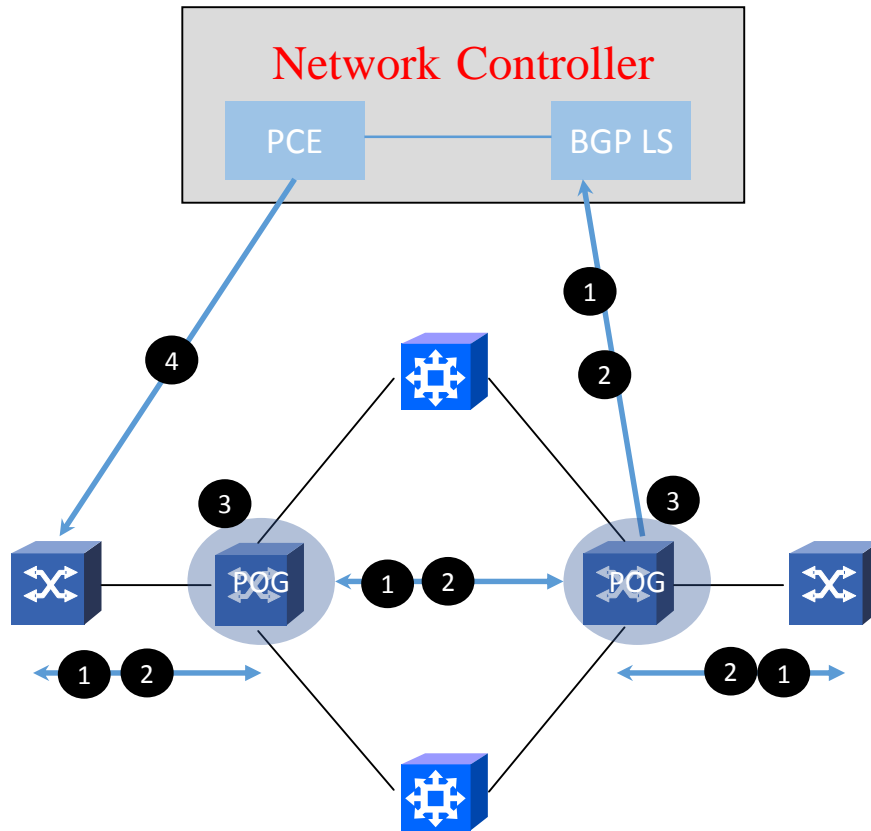
Mechanism for Packet-Optical Integration using SR

1. Underlay topology is discovered using standard protocols (e.g., IGPs) and mechanisms for both packet and optical domains:
 - Labels for internal nodes are distributed
 - Customer Subnets are learned at the edge routers and distributed
2. Packet-Optical Gateway(POG) announce themselves in the IGP Packet domain (Protocol Extensions Proposal)
3. POGs announce optical segments as an Opaque Adjacency Segment within the IGP Packet Domain (Protocol Extensions Proposal)

Mechanism for Packet-Optical Integration using SR

4. Map incoming label on the packet side to appropriate forwarding action on the optical side and program the forwarding plane
5. Communicate opaque adjacency segment/labels to the Controller or PCE using BGP-LS or PCEP-LS (Protocol Extensions Proposal)
6. Controller/PCE then uses opaque adjacency label in an end-to-end path for a given service

Mechanism for Packet-Optical Integration using SR



- 1 Announce Prefixes, Topology, Label/SID mapping
- 2 POGs announce themselves along with **Transport Segments** (Opaque Adjacencies) thru IGP
- 3 POG programs forwarding action for **Transport Segment** Labels it has advertised
- 4 PCE communicates Prefix -> Label Stack (which includes the **Transport Segment** Label)



Changes to existing drafts

- ISIS – draft-ietf-segment-routing-extensions-06
 - New type of Adj-SID to accommodate an opaque adjacency
 - New flag in SR capabilities sub-TLV indicating a Packet-Optical gateway function
- Similar changes in OSPF, BGP-LS and PCEP-LS

BACKUP SLIDES

Protocol Extensions (ISIS)

- Optical paths are provisioned on the POGs by the Optical Control Plane.
- When a path is established, the following opaque adjacency is announced by IS-IS
- Updates to draft-ietf-isis-segment-routing-extensions-06
- We are defining a new type of SID - Opaque-Adj-SID. It is an opaque SID that should not be used by IS-IS.

```

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
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|  Type           |      Length      |      Flags       |      Weight       |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|      Domain ID          |Opaque Sub Type| Reserved          |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                               Remote POG System ID          |
+                               +---+---+---+---+---+---+---+
|                               |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                               Packet-Optical Label          |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

Type: TBD, suggested value 33

Length: variable.

Weight: TBD

Flags: 1 octet field of following flags: L – Local ; V – Value

Domain ID: An identifier for the transport domain

Opaque Sub Type: TBD

Remote POG System-ID: 6 octets of IS-IS System-ID

Packet-Optical Label : Label of Local or Global significance

Protocol Extensions (ISIS)

- Updates to draft-ietf-isis-segment-routing-extensions-06
- Section 3.1 – add a new flag in SR capabilities sub-TLV
- Flag

```
0 1 2 3 4 5 6 7
+--+--+--+--+--+--+
| I | V | H | O |      |
+--+--+--+--+--+--+
```

I, V, H flags are defined in [I-D.ietf-isis-segment-routing-extensions].

O-Flag: If set, then the router is capable of performing Packet Optical Gateway function.