Preferred Path Routing (PPR) Framework
IETF 112
draft-chunduri-rtgwg-preferred-path-routing-01

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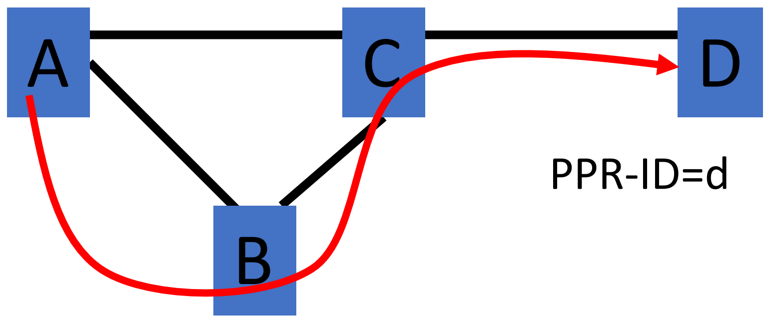
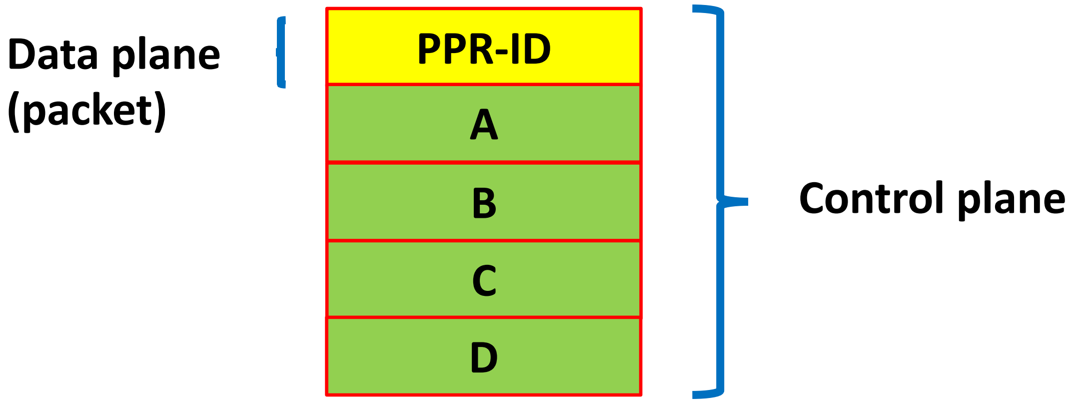
In this talk we will:

1. Provide a two-slide revision of what PPR is.
2. Show the use cases where we think PPR is advantageous
3. Encourage others to work with us on this technology.

PPR Overview

- PPR provides a method of injecting engineered paths into link-state IGPs.
- In the data plane the packet is mapped to its intended path by the PPR-ID.
- PPR-ID is a *single* identifier in the data packet.
- PPR can support multiple data plane types:
- PPR-D can be IPv6 addr, IPv4 addr, MPLS label, MPLS or IPv6 SID, MAC Addr.





See draft-chunduri-lsr-isis-preferred-path-routing for encoding detail

PPR Overview cont.

- PPR supports following connectivity structures:
  - Pt-Pt
  - Mp-Pt
  - Graphs
- PPR paths can be injected by a node (for its own purposes) or using SDN
- Enables engineered paths in cost sensitive network applications
- Runs on simple cheap hardware, has a small packet overhead, and a simple operational model.
- Open source FRR code exists demonstrated at IETF 105

PPR Use cases

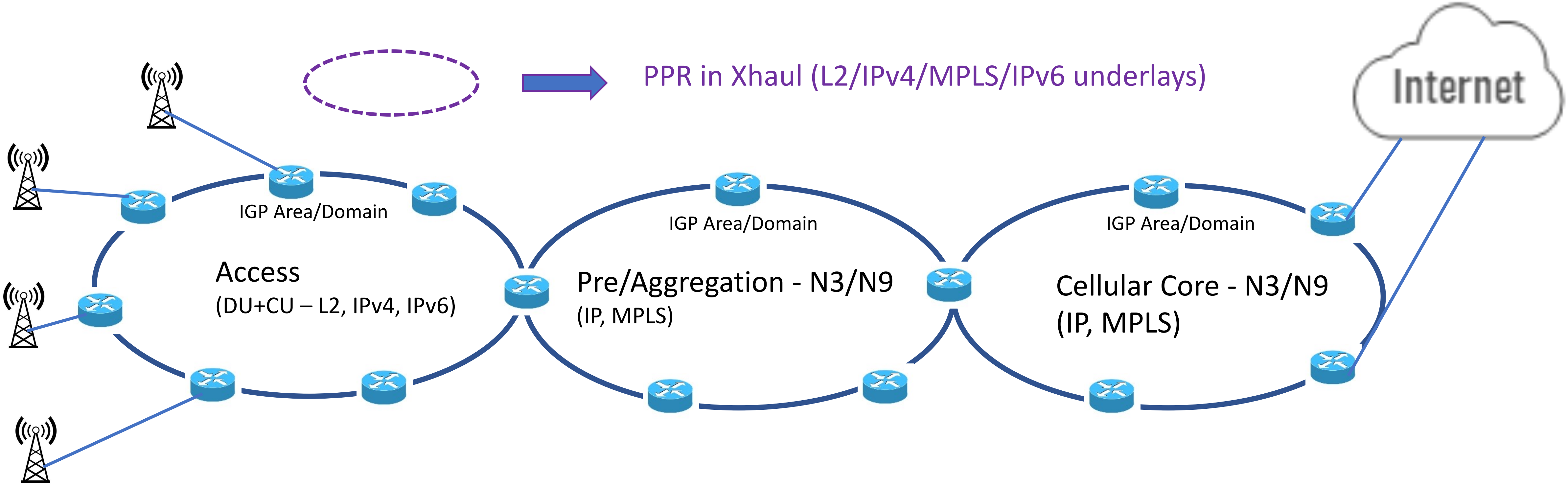
PPR In Mobile Xhaul

```
                                                          +---------+
+-------+    +--------+        +-------+        +-------+ / Cellular \
|(R)AN)|===|CSR/PE |--N3--|PE+UPF|--N9--|PE+UPF|+   Core        +
+-------+    +--------+        +-------+        +-------+ \   Network /
                                                          +---------+
 === : Front and Layer2/Layer3-MidHaul (F1 Interface)
 --- : Backhaul (N3/N9 Network)

                    Figure: Cellular Transport Network
```

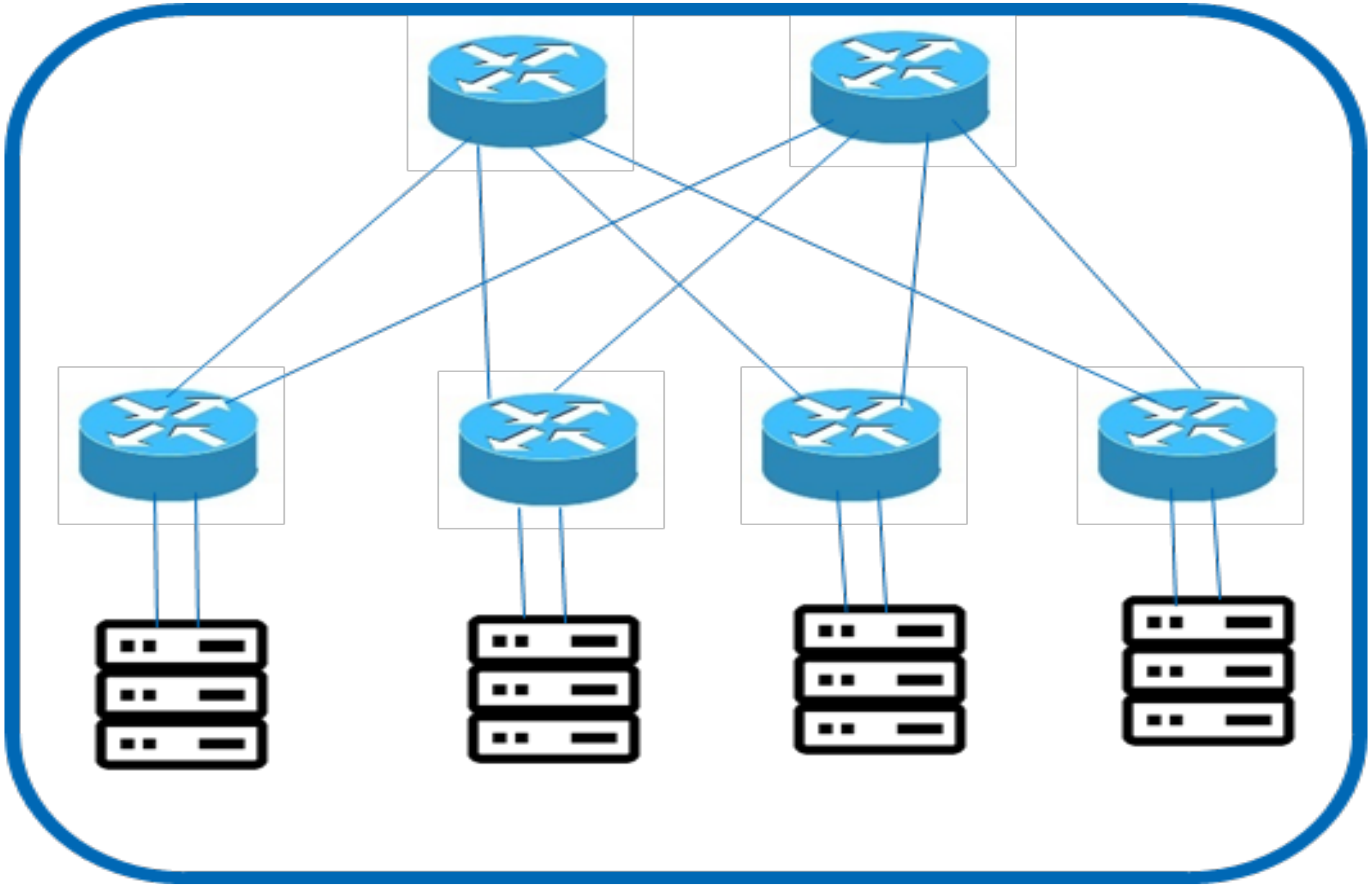
PPR in Xhaul (L2/IPv4/MPLS/IPv6 underlays)

Use Case: Cellular Transport and Edge Networks



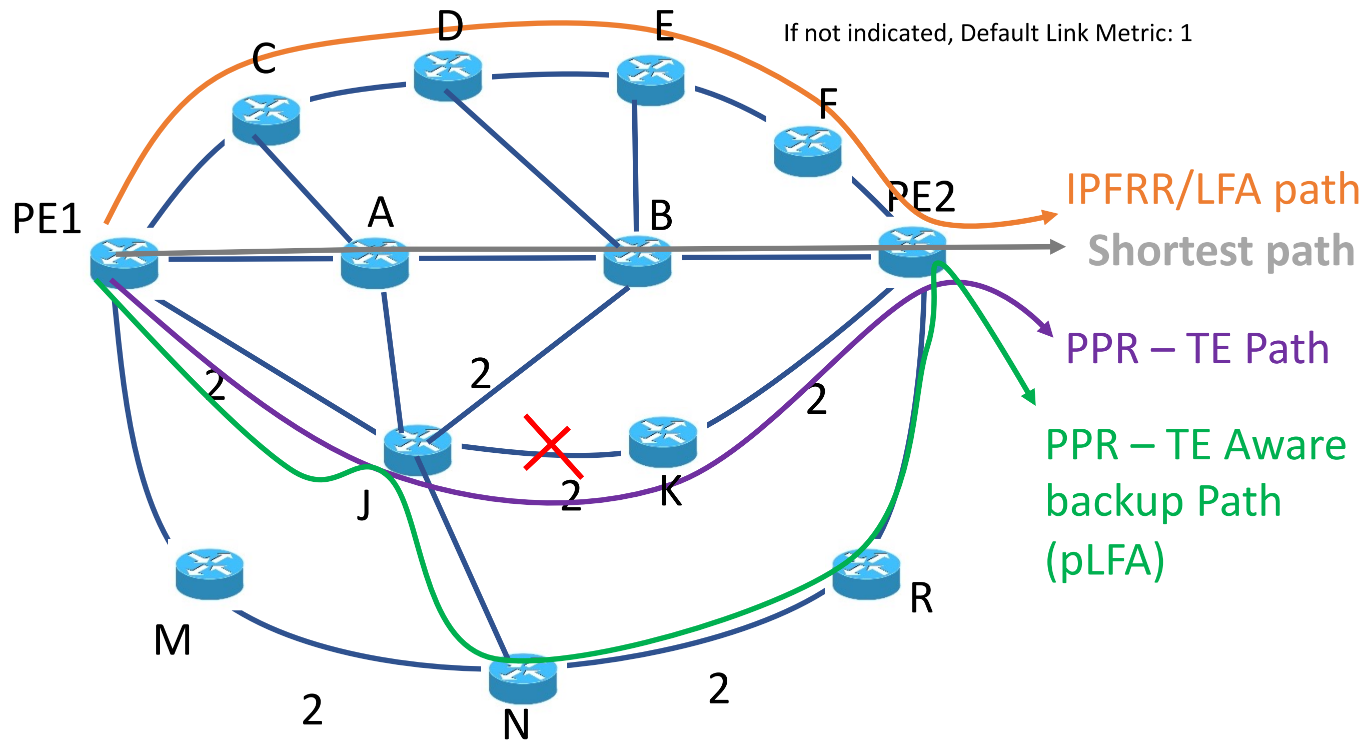
- Large Ring/Subtended Topologies of Various size
- **Slicing**: Needs Strict Paths and Traffic Engineering
- Need TE aware fast-reroute
- Virtualized RAN Networks with disaggregated 5G RAN (DU, CU) with L2 and IPv4 ➔ Cost sensitive

Use Case: PPR In Edge Networks



- Leaf-Spine Edge Fabrics
- Edges are not MSDCs
- Use IGP with **IPv4 data plane**
- Traffic prioritization for critical east-west traffic (virtualized 5G Infra)
- Redundancy and Granular path level OAM

Use Case: PPR Fast Reroute (TE Aware)



draft-bryant-rtgwg-plfa for more details

- Best effort/Shortest path:
  - PE1-A-B-PE2

  IPFRR/LFA paths for shortest path:
  - **PE1-C-D-E-F-PE2**
- PPR TE Path1: PPR-ID: PE2'
  - **PE1-J-K-PE2**

  PPR TE Path2: PPR-ID: PE2''
  - **PE1-J-N-R-PE2**
- Link failure between J and K
  - No Ingress PE switching and E2E multi-hop BFD
  - No controller roundtrips & no additional overhead with FRR label/SID stack
  - Local detection & activation at 'J' to new-PPR-TE path
  - TE aware loop free backup ➔ backup doesn't resort to best effort loop free path

Other Use cases

- Method of constructing traffic-engineered segments in SR that does not introduce extra SIDs for engineered paths.
  - Can be used for signaling BSIDs
  - TI-LFA in IPv4, Ethernet and low overhead MPLS and SRv6

- Underlay for VPN+ (TE for any underlying data plane)

- No per algo metric and an extensible alternative to flex-algo (no 128 algo limitation)

- Energy efficient networks for many industry verticals

- Questions?

- Is anyone interested in collaborating with us on this technology?