Segment Routing

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Why should you care?

- Simplicity
- Traffic Engineering
- Scalability and FRR
- Programmability

On | Off

Re-Use
Technology

The application controls, the network delivers
The state is no longer in the network but in the packet
Node Segment

- Nodes advertise a node segment
  - simple IGP extension
- All remote nodes install node segment ids in data plane

A packet injected anywhere with top label 65 will reach Z via IGP shortest path
Adjacency Segments

- Nodes advertise adjacency label per link
  - simple IGP extension
- Only advertising node installs adjacency segment in data plane
- Enables source routing along any explicit path (segment list)
Combining Segments

- Source Routing
- Any explicit path can be expressed: ABCOPZ
Path ABCOPZ is ok. I account the BW. Then I steer the traffic on this path.

The network is simple, highly programmable and responsive to rapid changes.
Properties
Rapid Evolution, Not Revolution

- Implicit leverage of all MPLS excellent properties
  - standardized and widely supported dataplane
  - standardized and widely supported IP control plane (ISIS, OSPF, BGP)
  - multi-service capability (VPN4, VPN6, 6PE, VPLS, eVPN, PW…)

- Co-existence with MPLS as currently deployed
- Incremental deployment
Simplicity

- Automation
- Fewer protocols to operate
- Fewer protocols interactions to troubleshoot
- Less state to maintain by routers
Automated & Guaranteed FRR

- IP-based FRR is guaranteed in any topology
  - 2002, LFA FRR project at Cisco
  - draft-bryant-ipfrr-tunnels-03.txt

- Directed LFA (DLFA) is guaranteed when metrics are symmetric

- No extra computation (RLFA)

- Simple repair stack
  - node segment to P node
  - adjacency segment from P to Q
Scalability

• Each engineered application flow is mapped on a path
  – millions of paths

• A path is expressed as an ordered list of segments

• The network maintains segments
  – thousands of segments
  – completely independent of application size/frequency

• Excellent scaling with complete application un-coupling
  – the application state is no longer within the router but within the packet
Use Cases
Simple MPLS services

- Massive simplification
  - most services just need shortest-path
- Automated 50msec FRR

Nodal Segment to D identified by global label 65
Simple Disjointness

• A sends traffic with [65]
  Classic ecmp “a la IP”

• A sends traffic with [11, 65]
  Packet gets attracted in blue plane and then uses classic ecmp “a la IP”
Virtual Application Slices

From A to Z with SLA rqt (latency, bandwidth, disjointness)

Use Segment Combo ...

SR PCE

• SR Server performs
  – Policy control
  – Admission control (bandwidth)
  – Path Computation and Segment-Combo Resolution

• Each application slice can change any of its path, any time without any change in the network infrastructure
Conclusion
Now you SHOULD care 😊

- Simplicity
- Traffic Engineering
- Re-Use
- Scalability and FRR
- Programmability
- Off
- On
Thank you.

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