Segment Routing

Jérôme DURAND – Consulting Systems Engineer
jerduran@cisco.com - http://reseauxblog.cisco.fr

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Why should you care ?

Simplicity

Traffic Engineering

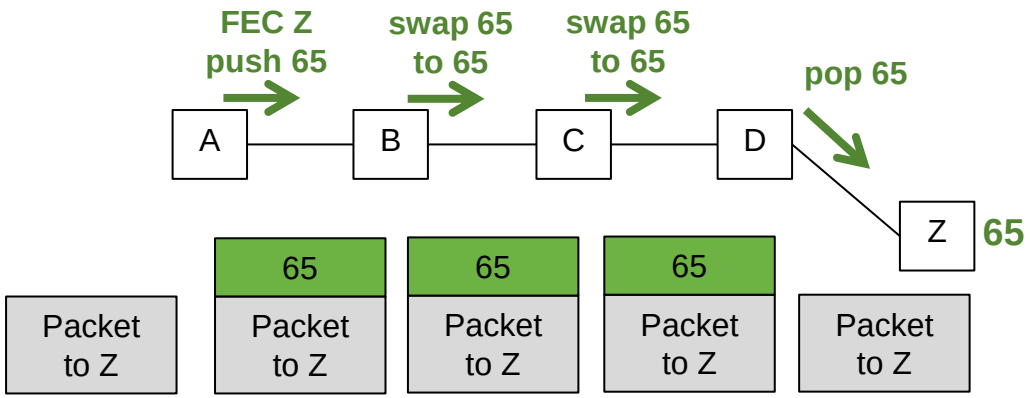
Scalability and FRR

Programmability

Technology

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

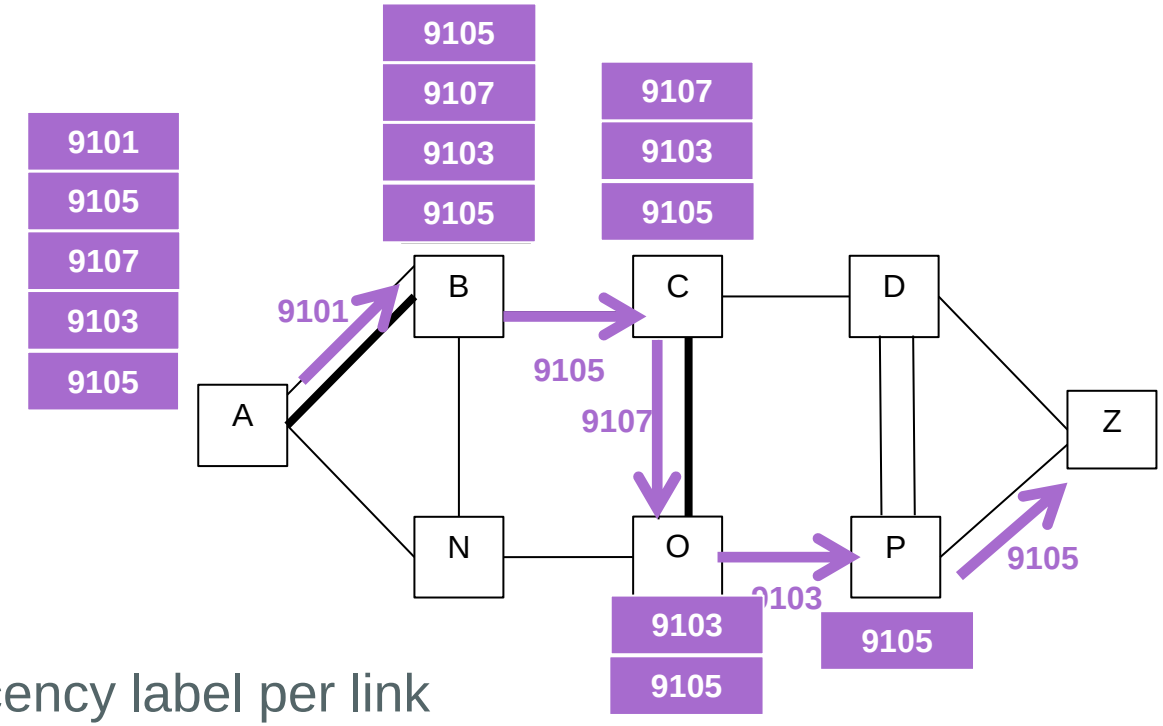
Node Segment



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

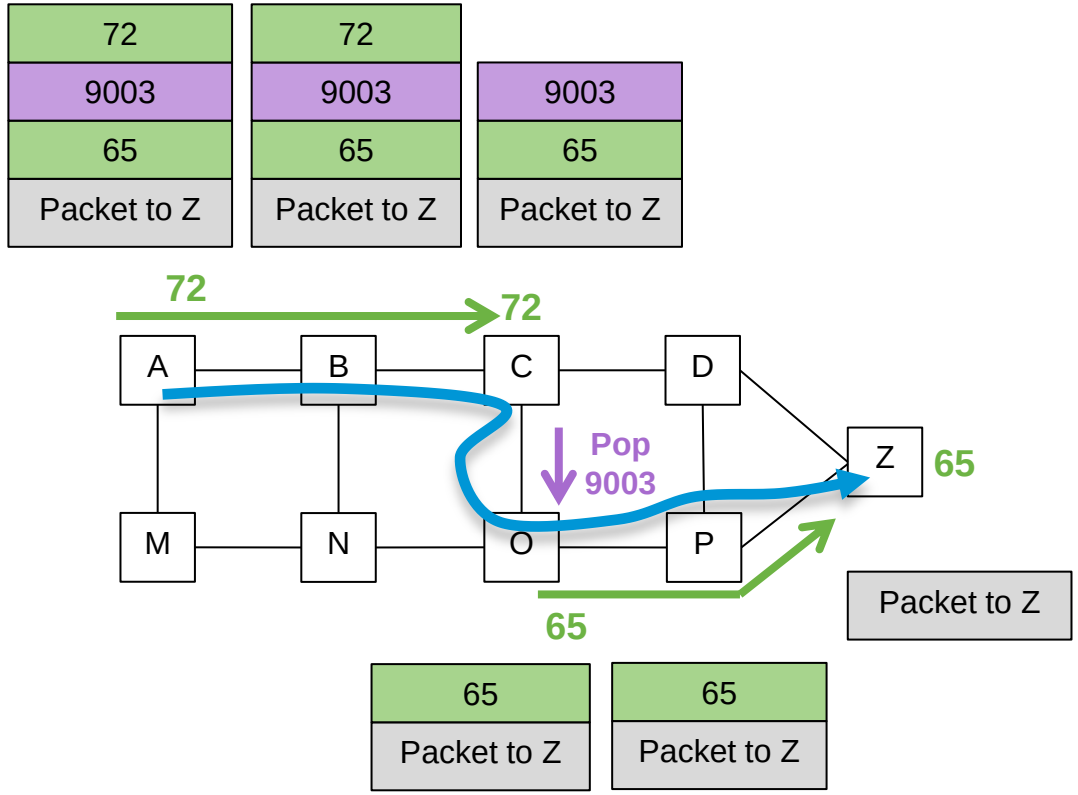
- Nodes advertise a node segment
  - simple IGP extension
- All remote nodes install node segment ids in data plane

Adjacency Segments



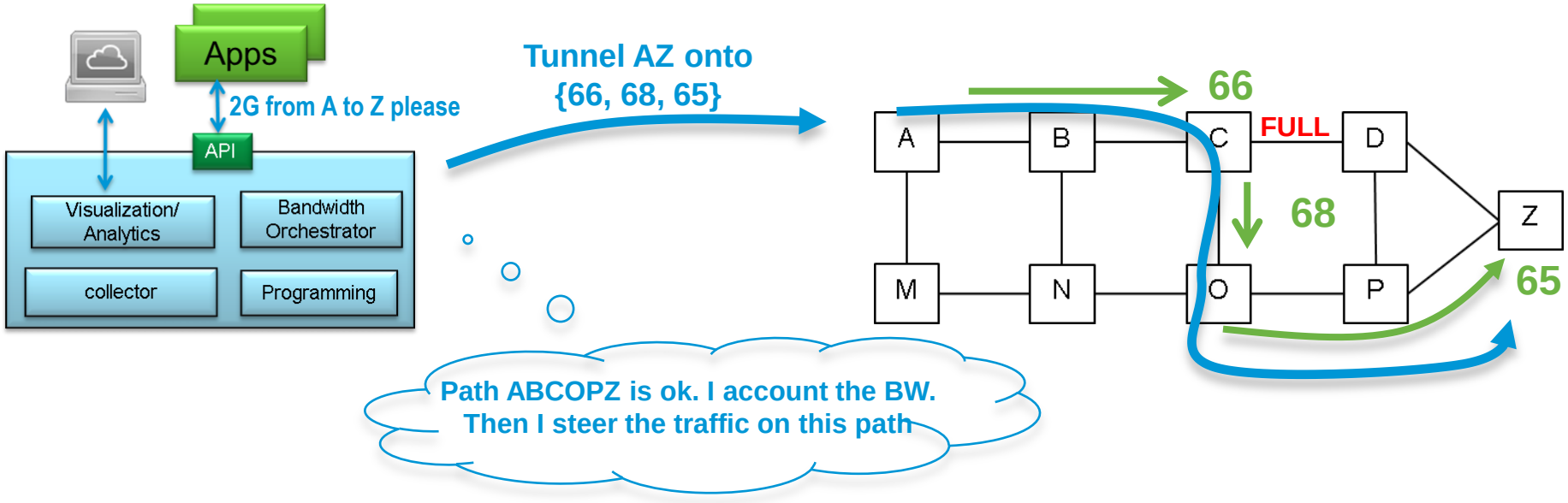
- Nodes advertises adjacency label per link
  - simple IGP extension
- Only advertising node installs adjacency segment in data plane
- Enables source routing along any explicit path (segment list)

Combining Segments



- Source Routing
- Any explicit path can be expressed: ABCOPZ

Application controls – network delivers



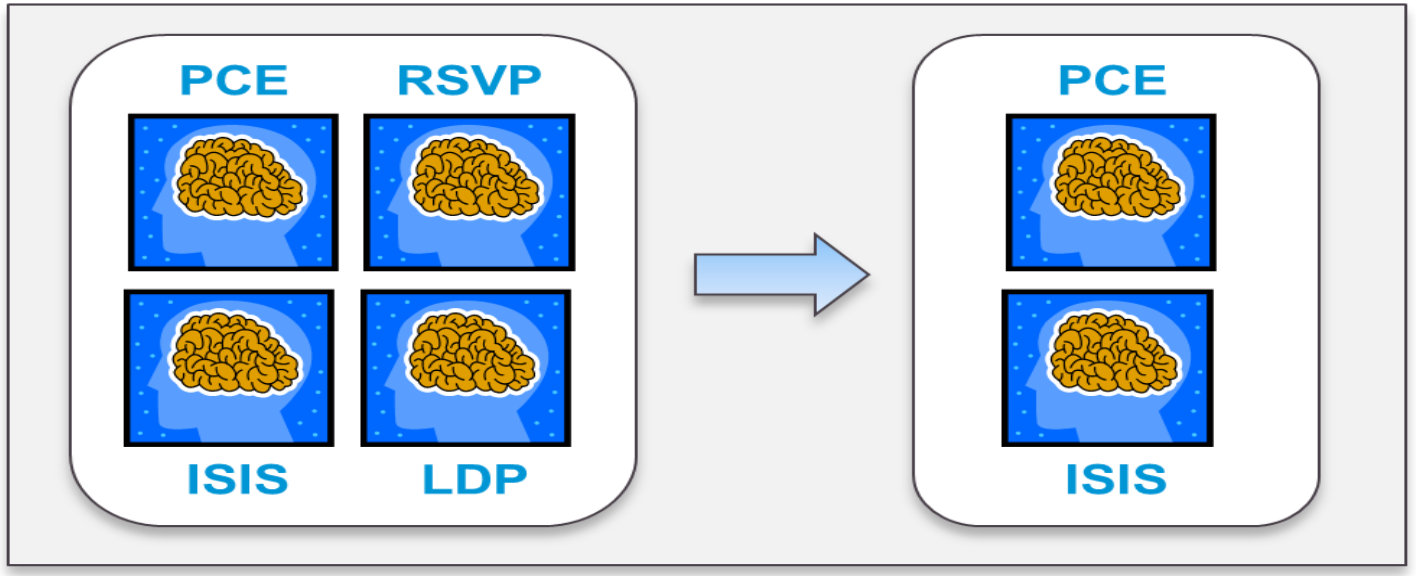
The network is simple, highly programmable and responsive to rapid changes

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

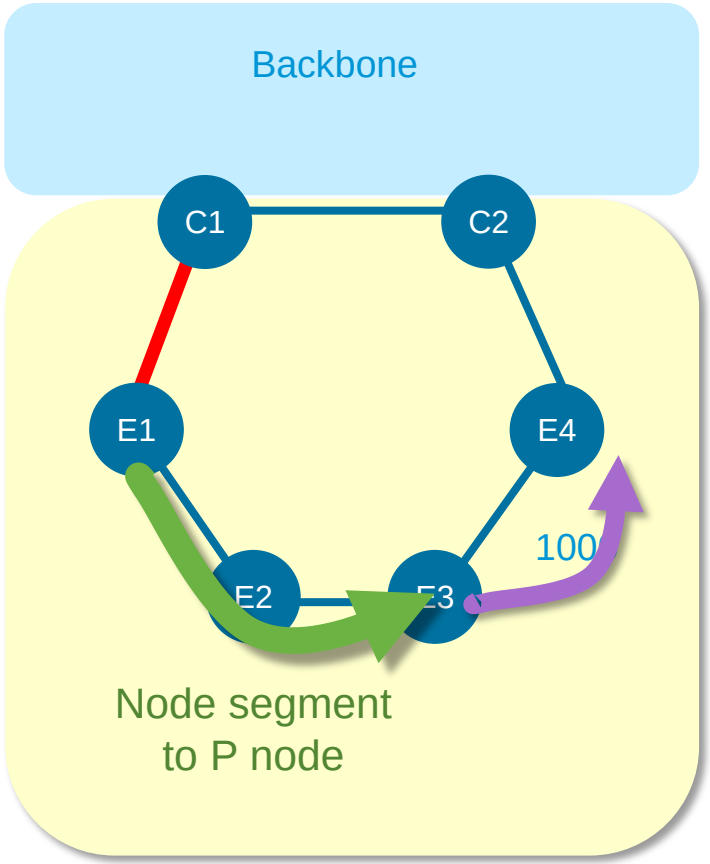
Simplicity



- Automation
- Fewer protocols to operate
- Fewer protocols interactions to troubleshoot
- Less state to maintain by routers

Automated & Guaranteed FRR

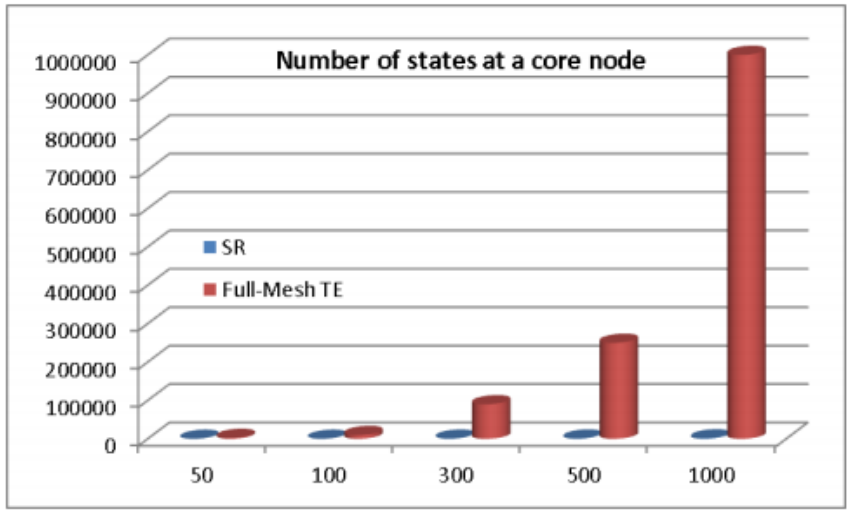
- IP-based FRR is guaranted in any topology
  - 2002, LFA FRR project at Cisco
  - draft-bryant-ipfrr-tunnels-03.txt
- Directed LFA (DLFA) is guaranteed when metrics are symetric
- No extra computation (RLFA)
- Simple repair stack
  - node segment to P node
  - adjacency segment from P to Q

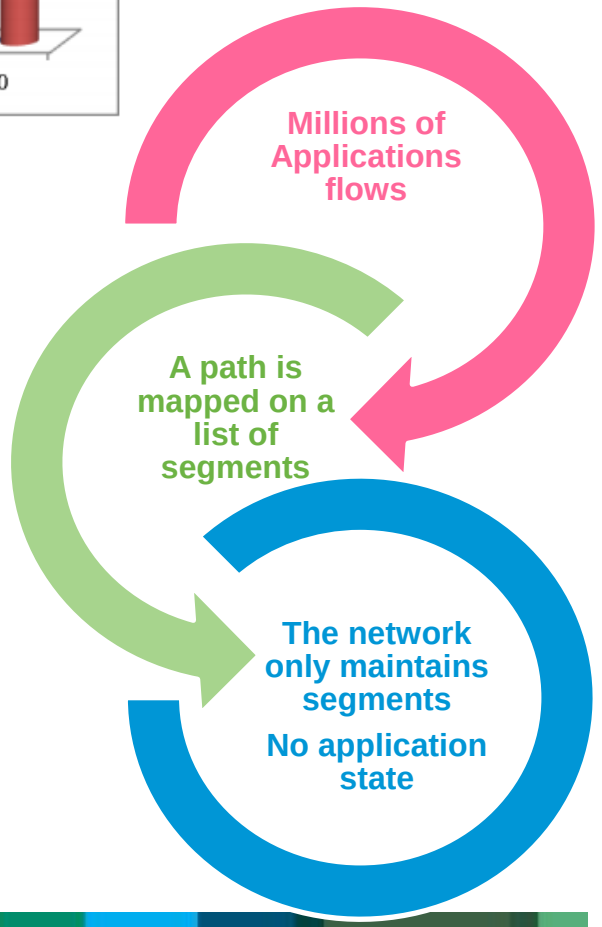


Default metric: 10

Scalability

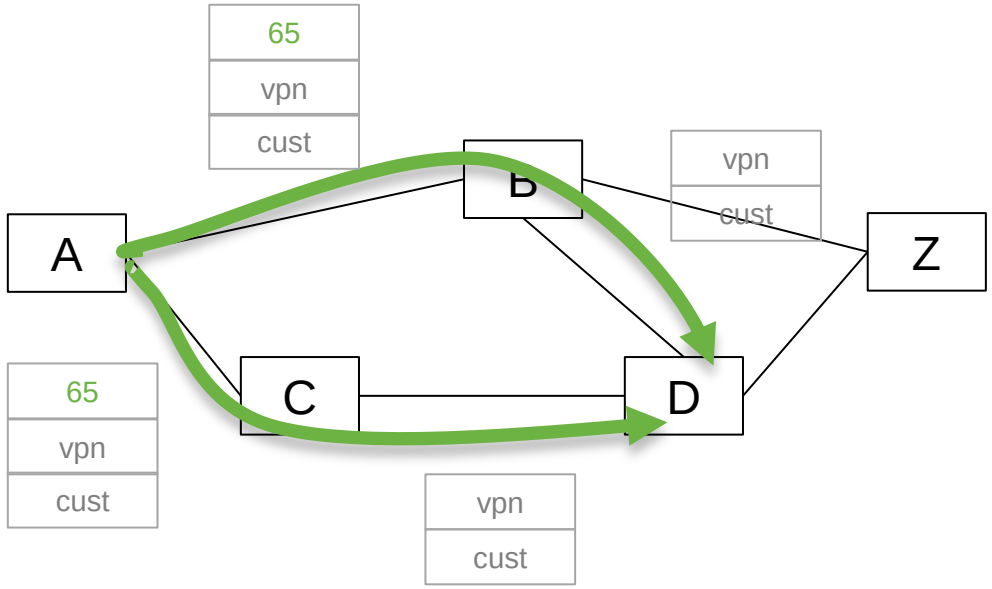
- Each engineered application flow is mapped on a path
  - millions of paths
- A path is expressed as an ordered list of segments
- The network maintains segments
  - thousands of segments
  - completely independent of application size/frequency
- Excellent scaling with complete application un-coupling
  - the application state is no longer within the router but within the packet



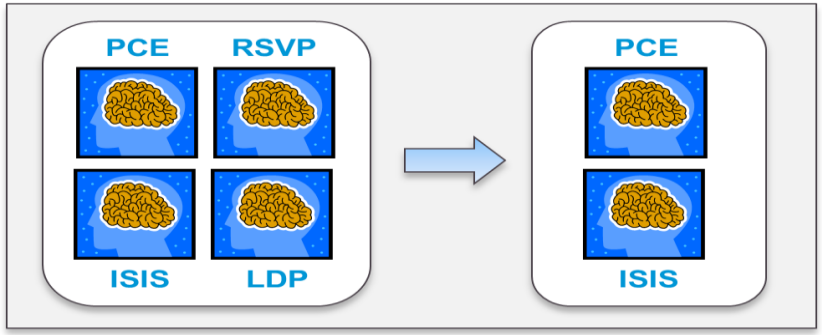


Use Cases

Simple MPLS services



Nodal Segment to D identified by global label 65

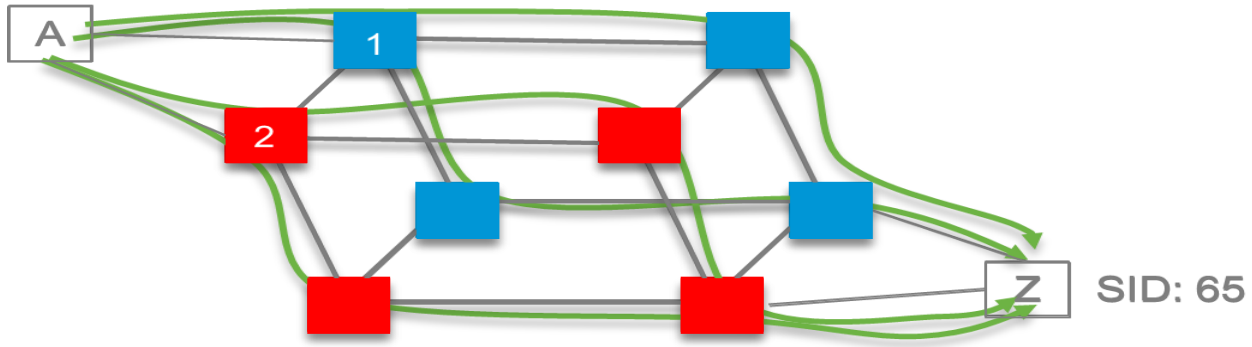


- Massive simplification
  - most services just need shortest-path
- Automated 50msec FRR

Simple Disjointness

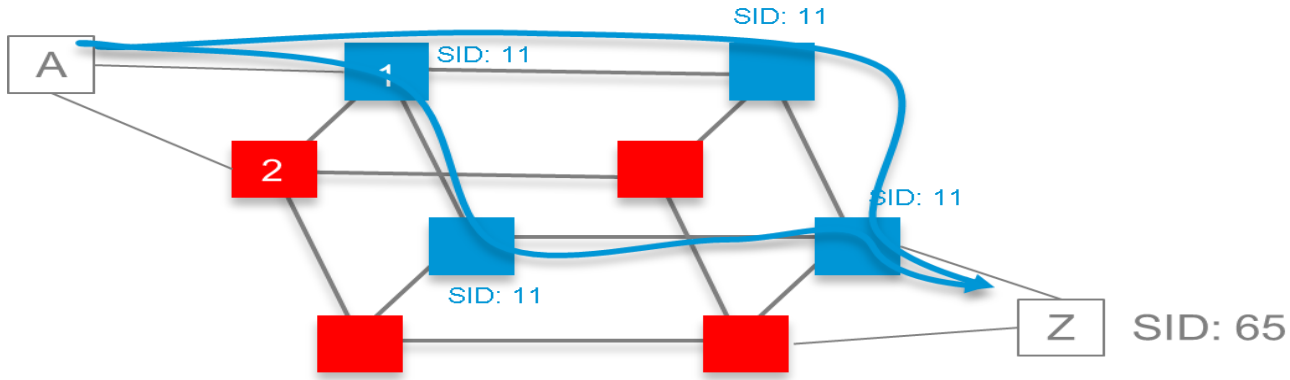
- A sends traffic with [65]

  Classic ecmp “a la IP”



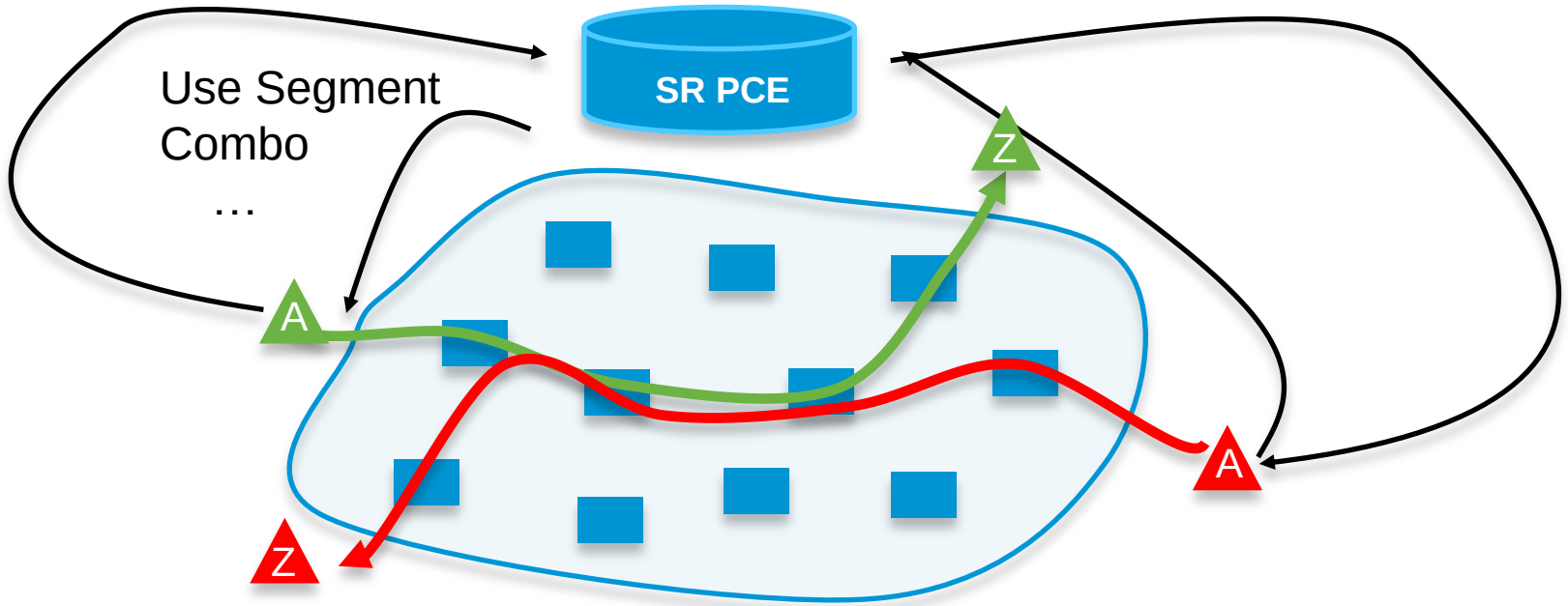
- A sends traffic with [11, 65]

  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, bandwdith, disjointness)



- 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

Thank you.

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