



Segment Routing

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Segment Routing Introduction

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Illustration and Examples Conventions

- The examples in this presentation follow these conventions:
 - Router-id of NodeX: 1.1.1.X
 - Link address XY:
 - IPv4 99.X.Y.X/24 with $X < Y$
 - IPv6 99::X:Y:X/112 with $X < Y$ and X, Y in decimal representation
 - Prefix-SID index of NodeX: X
 - Prefix-SIDs are labels in the range [16000 – 23999]
 - > This is the default Segment Routing Global Block (SRGB)
 - Adjacency-SIDs are labels with the format 24NXY for the N^{th} adjacency $X \rightarrow Y$
 - LDP/RSVP/BGP3107/... labels are in the range [90000 – 99999]

Segment Routing

- Source Routing
 - the source chooses a path and encodes it in the packet header as an ordered list of segments
 - the rest of the network executes the encoded instructions
- Segment: an identifier for any type of instruction
 - forwarding or service
- In this presentation: IGP-based forwarding construct

Segment Routing – Forwarding Plane

- **MPLS**: an ordered list of segments is represented as a stack of labels
 - Segment Routing re-uses MPLS data plane without any change
 - Segment represented as MPLS label
 - Applicable to IPv4 and IPv6 address families
- **IPv6**: an ordered list of segments is encoded in a routing extension header
- This presentation: **MPLS data plane**

Global and Local Segments

- Global Segment

- Any node in SR domain understands associated instruction
- Each node in SR domain installs the associated instruction in its forwarding table
- MPLS: global label value in Segment Routing Global Block (SRGB)

- Local Segment

- Only originating node understands associated instruction
- MPLS: locally allocated label

Global Segments – Global Label Indexes

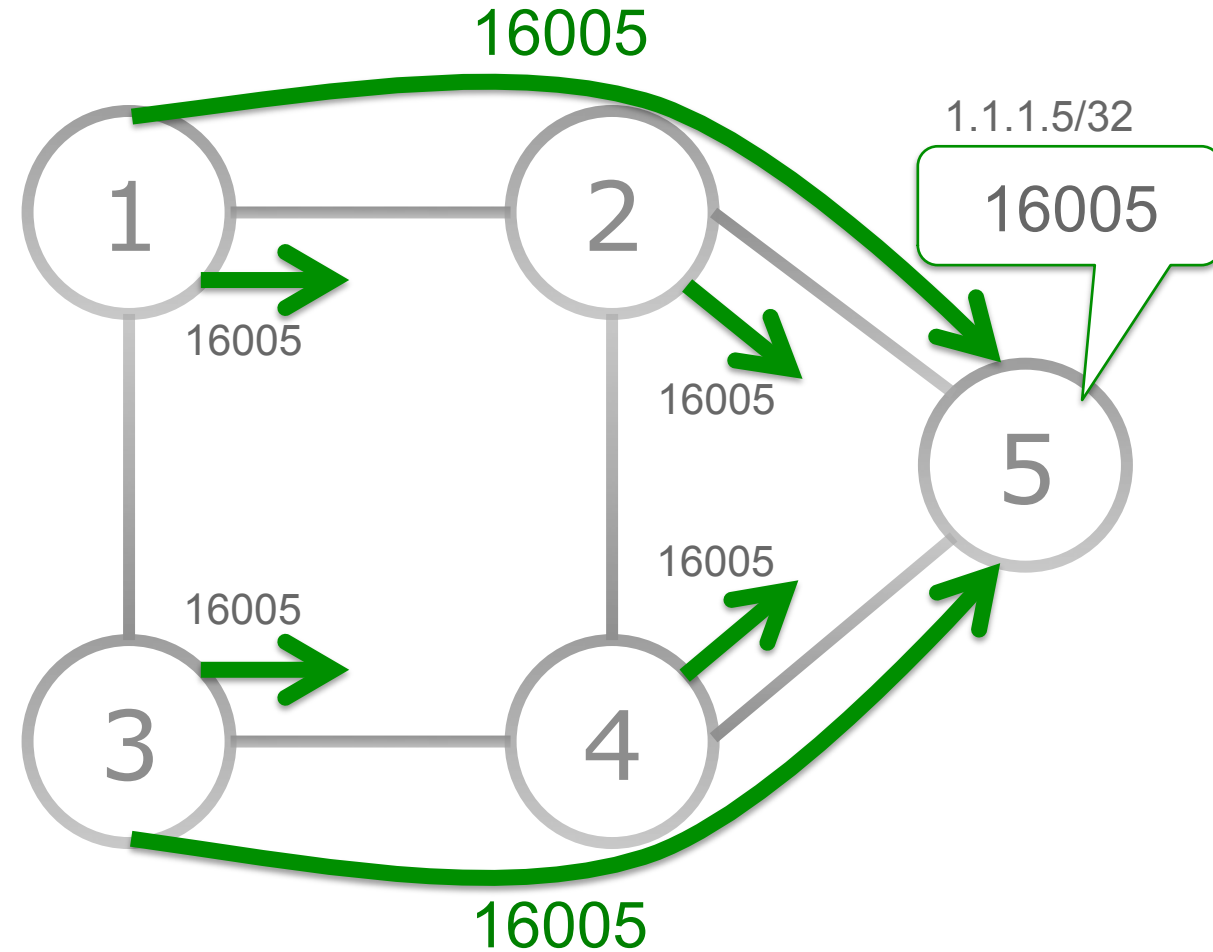
- Global Segments always distributed as a label range (SRGB) + Index
 - Index must be unique in Segment Routing Domain
- Best practice: **same SRGB** on all nodes
 - “Global model”, requested by all operators
 - Global Segments are global label values, simplifying network operations
 - Default SRGB: 16,000 – 23,999
 - > Other vendors also use this label range

IGP segments

- Two basic building blocks distributed by IGP
 - Prefix Segments
 - Adjacency Segments

IGP Prefix Segment

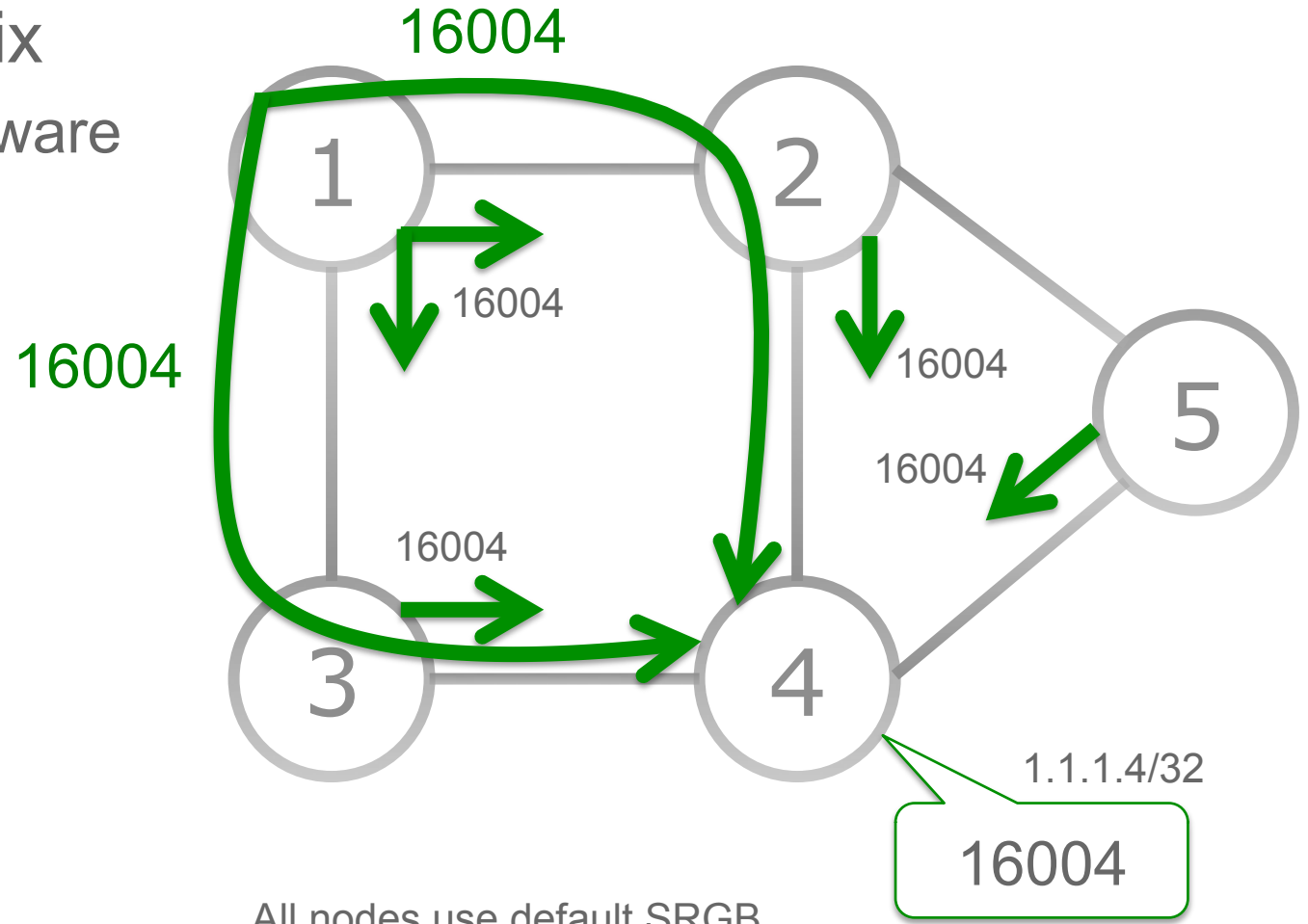
- Shortest-path to the IGP prefix
 - Equal Cost MultiPath (ECMP)-aware
- Global Segment
- Label = 16000 + Index
 - Advertised as index
- Distributed by ISIS/OSPF



All nodes use default SRGB
16,000 – 23,999

IGP Prefix Segment

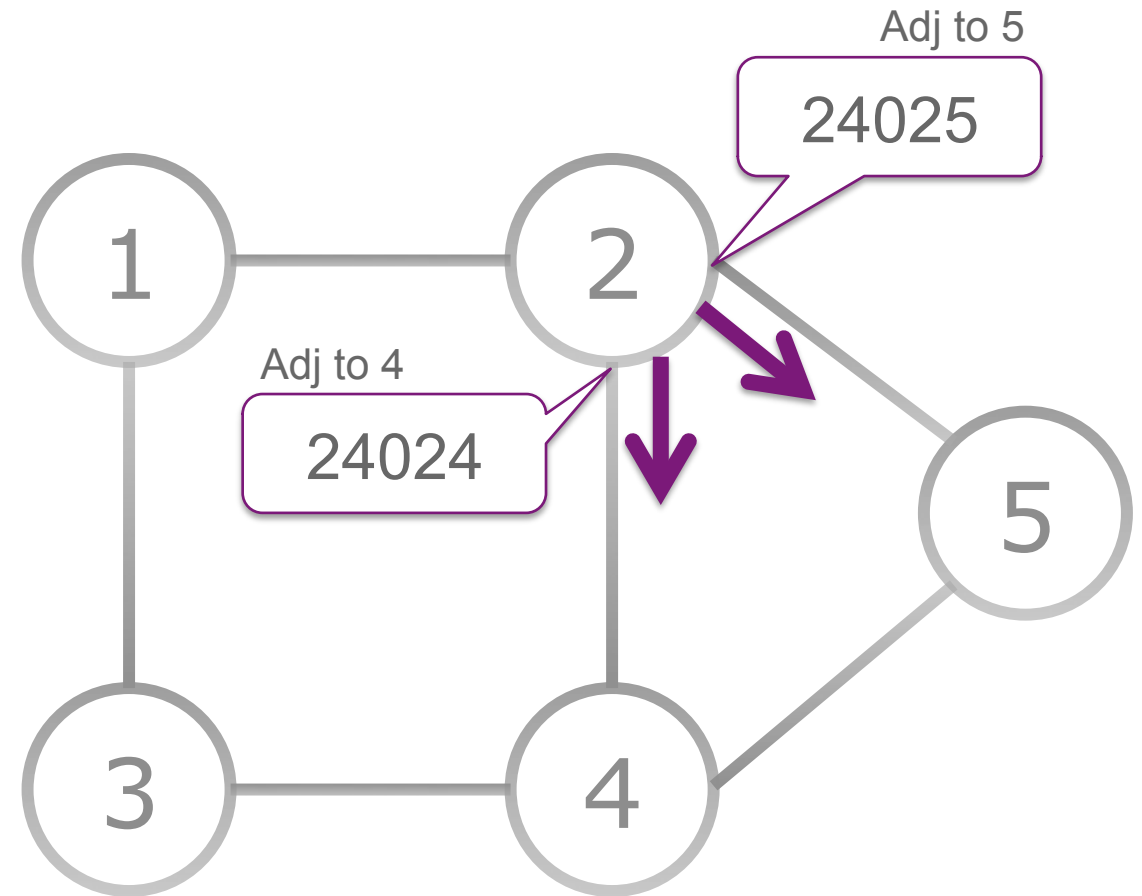
- Shortest-path to the IGP prefix
 - Equal Cost MultiPath (ECMP)-aware
- Global Segment
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All nodes use default SRGB
16,000 – 23,999

IGP Adjacency Segment

- Forward on the IGP adjacency
- Local Segment
- Advertised as label value
- Distributed by ISIS/OSPF

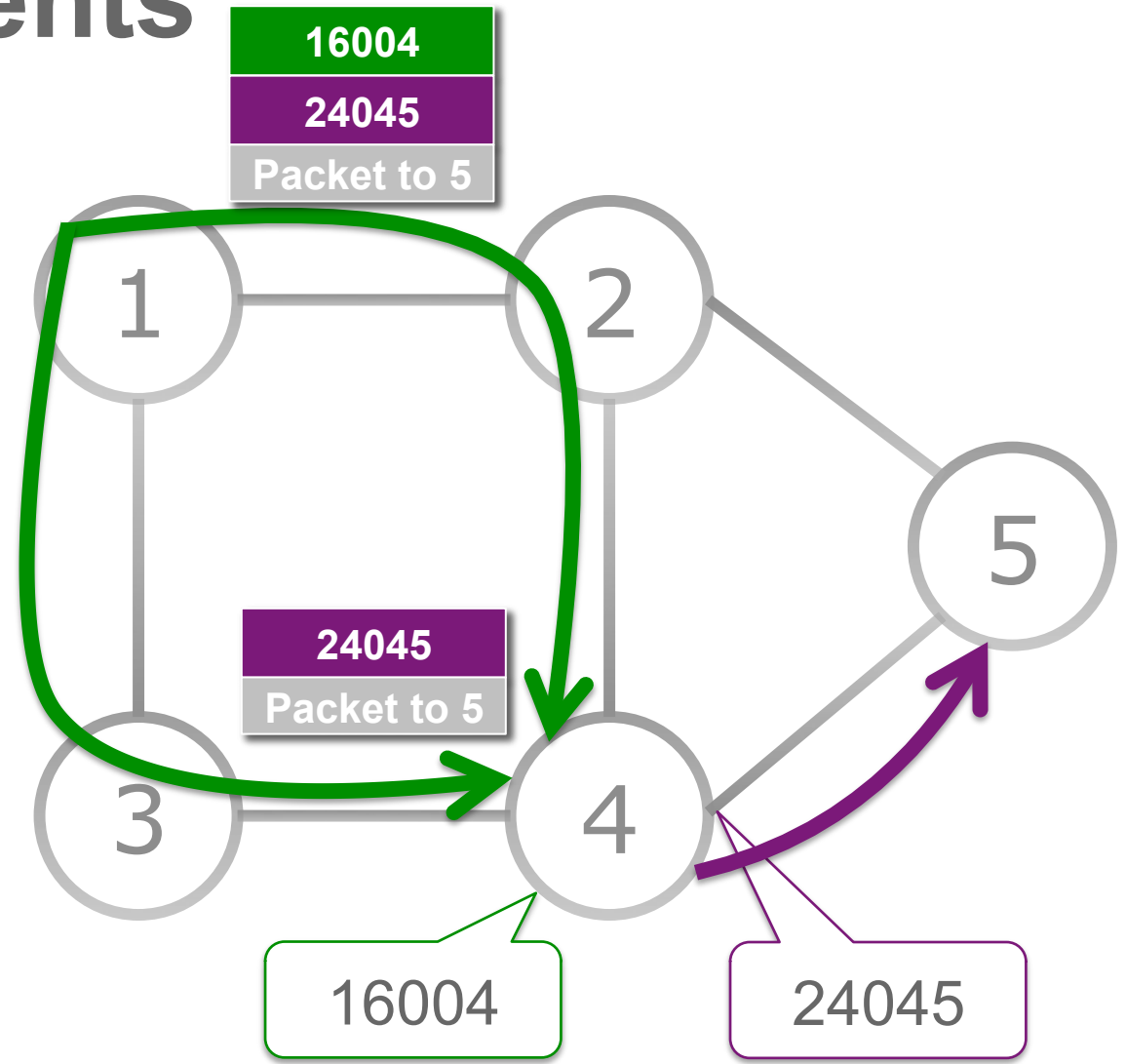


All nodes use default SRGB
16,000 – 23,999

Combining IGP Segments

- Steer traffic on any path through the network
- Path is specified by list of segments in packet header, a stack of labels
- No path is signaled
- No per-flow state is created
- Single protocol: IS-IS or OSPF

All nodes use default SRGB
16,000 – 23,999



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Thank you.

