Segment Routing Global Block (SRGB)

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Segment Routing Global Block (SRGB)

- What is the Segment Routing Global Block?
- Benefits of using same SRGB on all Segment Routing nodes
- How to modify Segment Routing Global Block
- SRGB allocation mechanism

SR Global Block (SRGB)

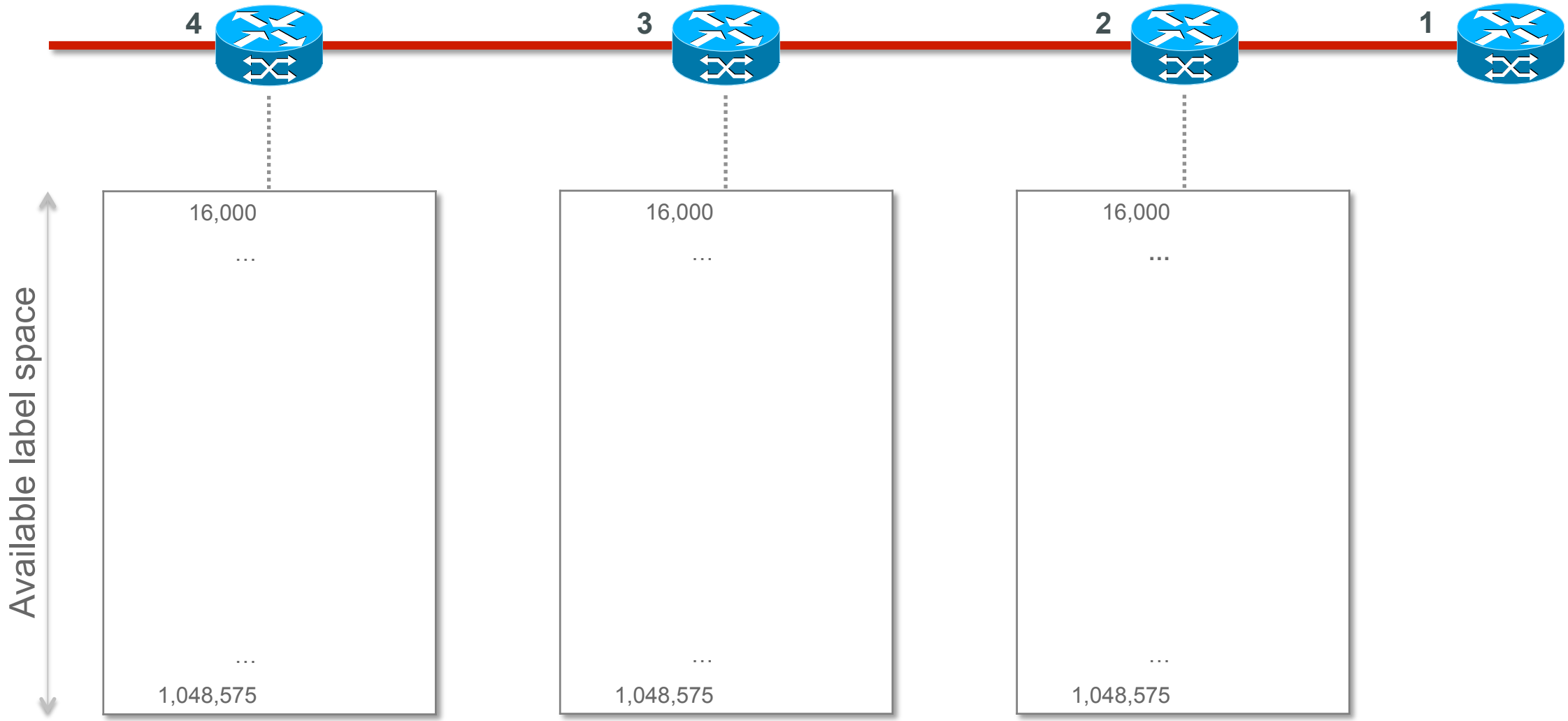
Segment Routing Global Block (SRGB)

- Segment Routing Global Block
  - Range of labels reserved for Segment Routing Global Segments
  - Default SRGB is 16,000 – 23,999
- A prefix-SID is advertised as a domain-wide unique index
- The Prefix-SID index points to a unique label within the SRGB
  - Index is zero based, i.e. first index = 0
  - Label = Prefix-SID index + SRGB base
  - E.g. Prefix 1.1.1.65/32 with prefix-SID index 65 gets label 16065

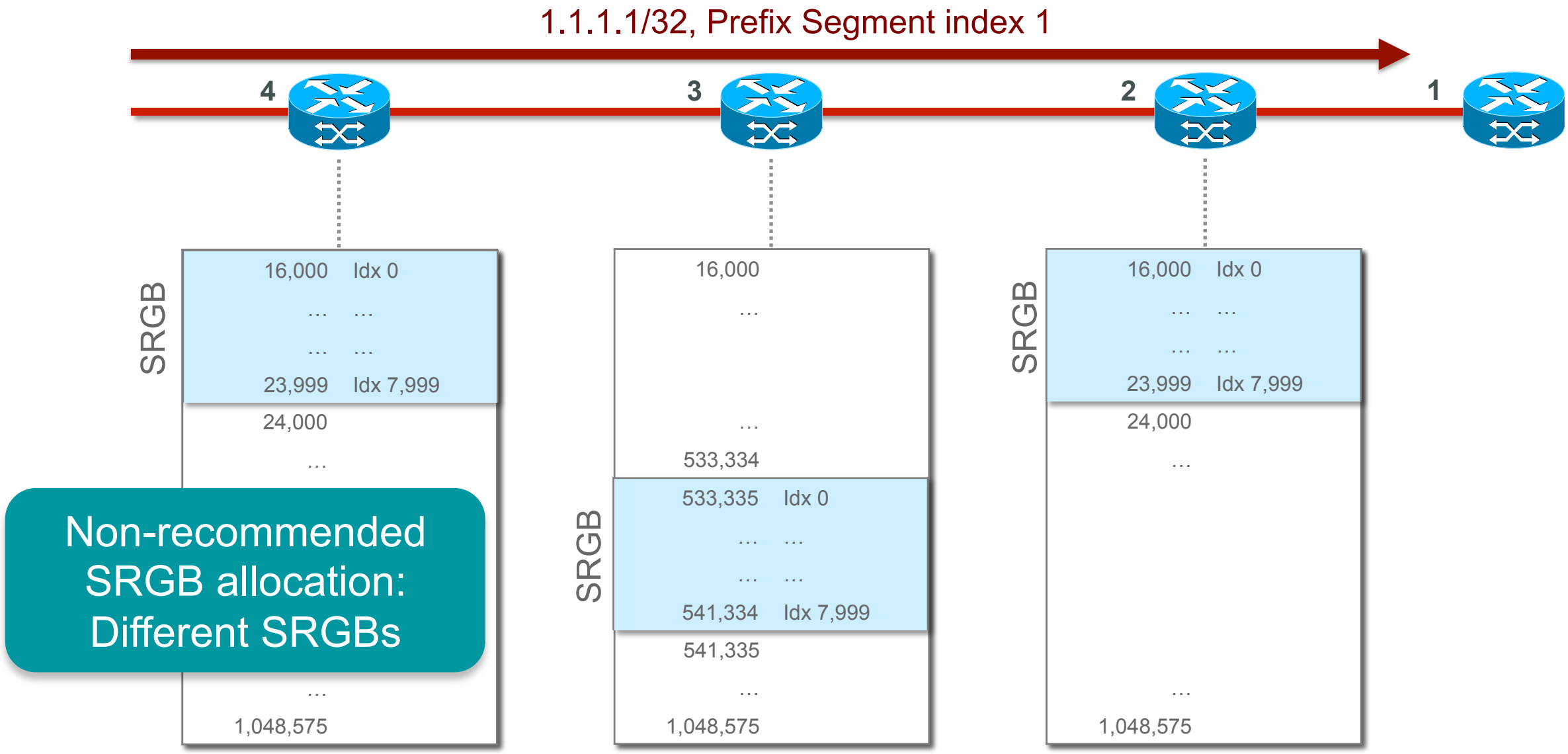
Segment Routing Global Block (SRGB)

- Strongly recommended to use same SRGB on all nodes
  - All operators asked for this deployment model
  - Simple, straightforward
  - Global Segment == Global Label value
  - Using different SRGBs is supported, but complicates operations for user
- A non-default SRGB can be allocated between 16,000 and 1,048,575
  - Or up to the platform limit, if any
- The size of the SRGB should be equal on all nodes
  - Current maximum size is 64k

Segment Routing Global Block (SRGB)



Not recommended, but possible SRGB allocation



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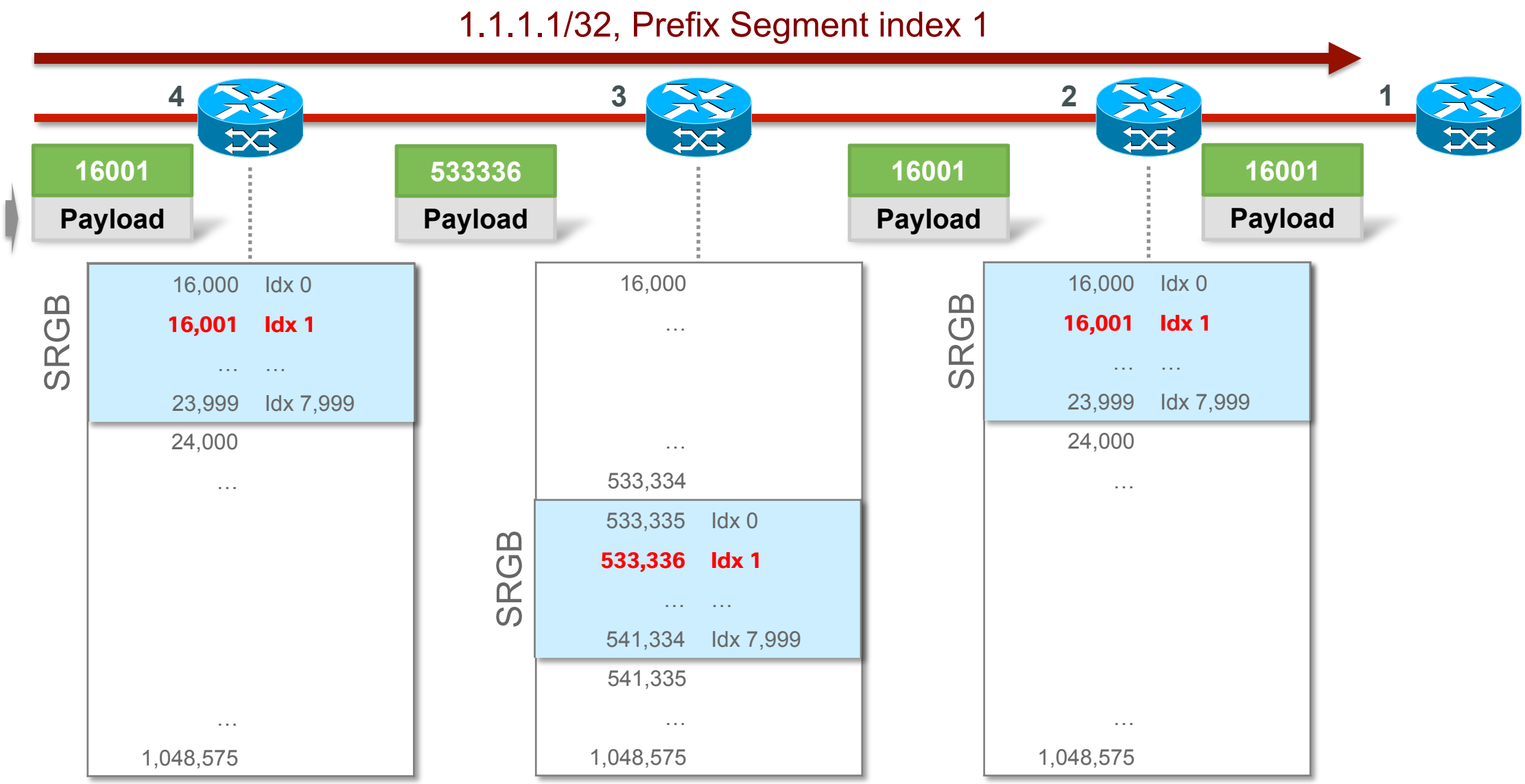
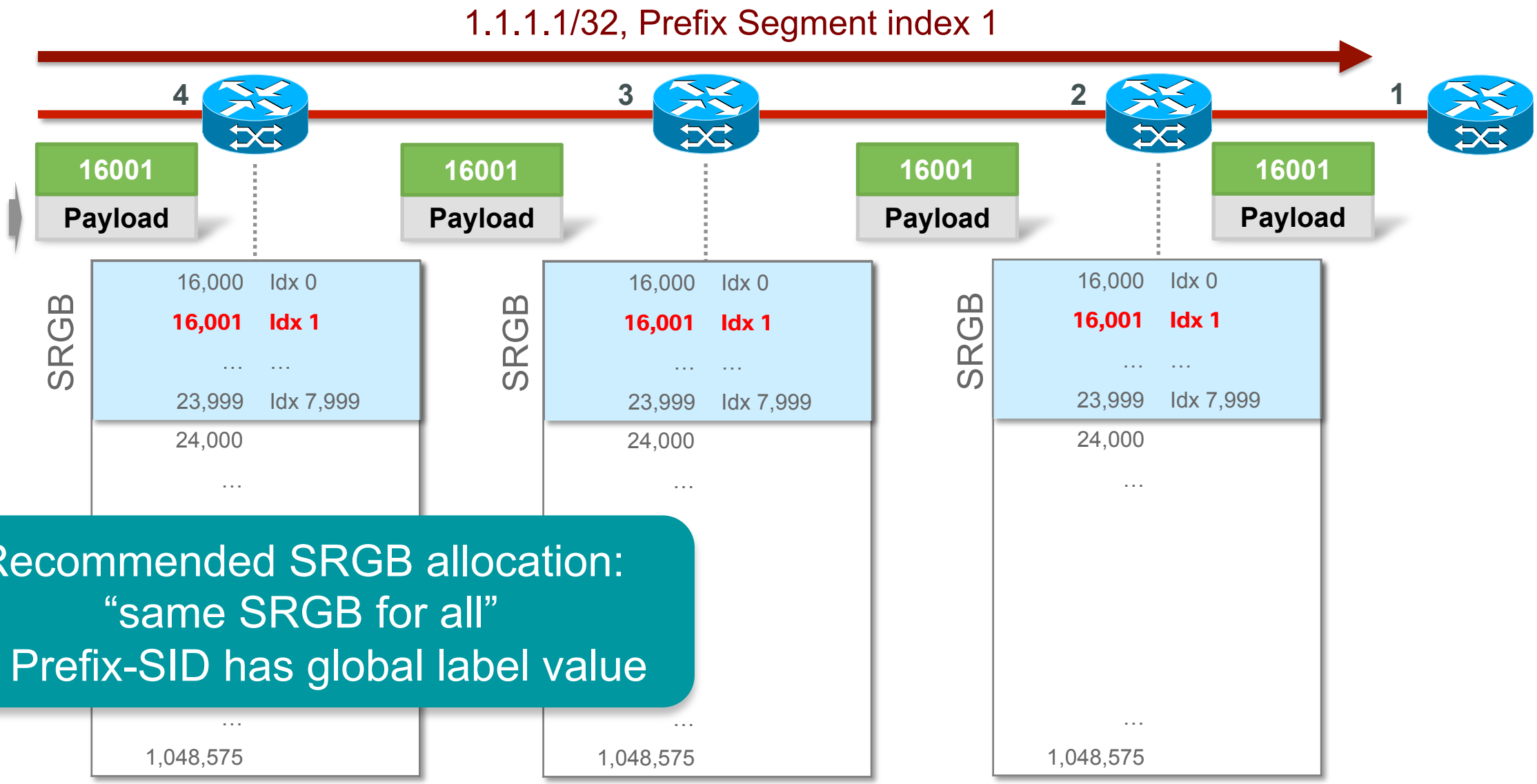
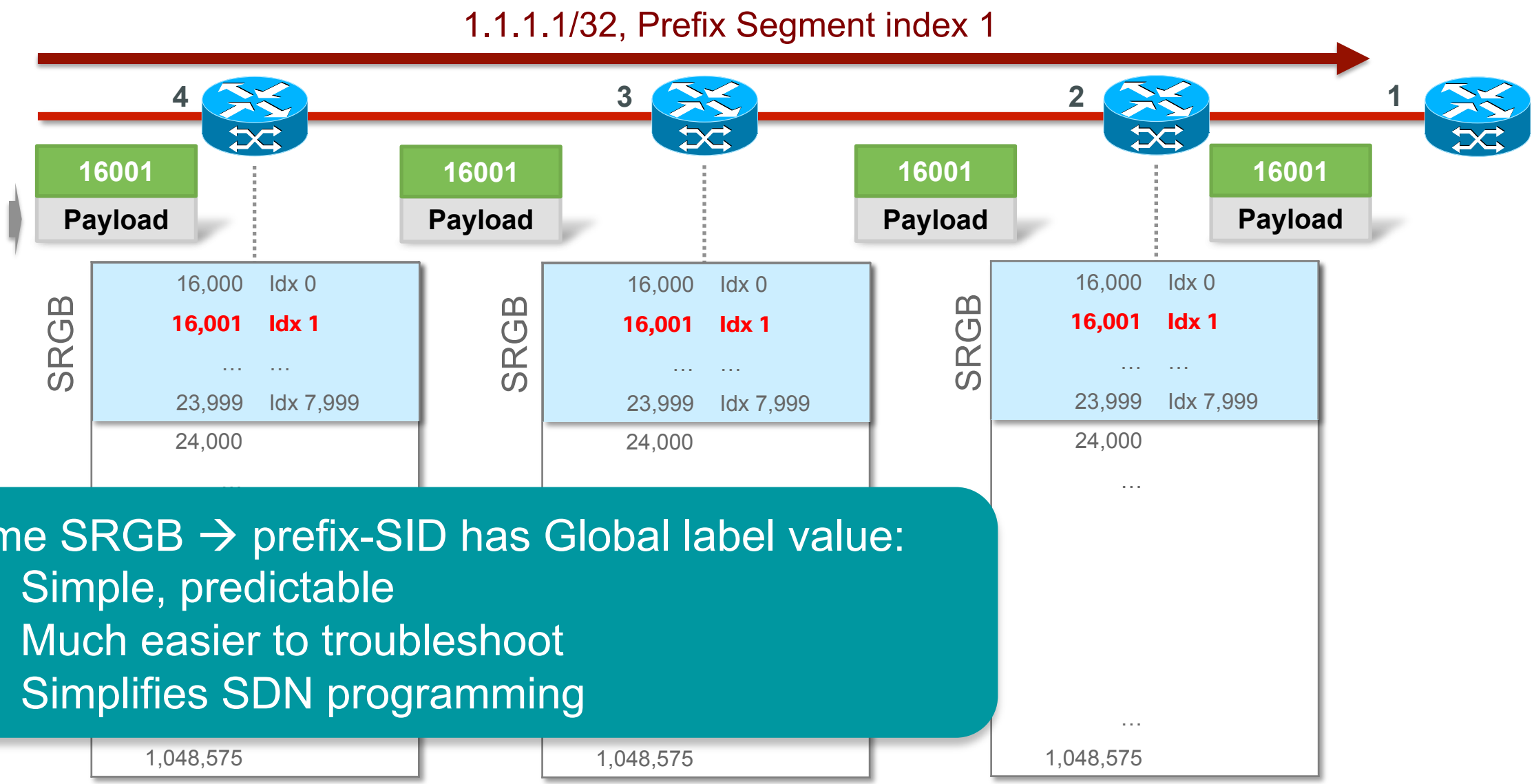


Recommended SRGB allocation



Recommended SRGB allocation:
"same SRGB for all"
→ Prefix-SID has global label value

Recommended SRGB allocation



Same SRGB → prefix-SID has Global label value:

- Simple, predictable
- Much easier to troubleshoot
- Simplifies SDN programming

Label Switching Database (LSD)

- Local label allocation is managed by Label Switching Database (LSD)
- MPLS Applications must register as client with LSD to allocate labels
  - MPLS Applications are e.g. IGP, LDP, RSVP, MPLS static, …
- Label space carving of Segment Routing capable software release (even if Segment Routing is not enabled) :
  - Label range [0-15] reserved for special-purposes
  - Label range [16-15,999] reserved for static MPLS labels
  - Label range [16,000-23,999] preserved for SRGB
  - Label range [24,000-max] used for dynamic label allocation

Label Switching Database (LSD)

- Most MPLS Applications use labels dynamically allocated by LSD:
  - LDP, RSVP, L2VPN, BGP (LU, VPN), IS-IS (Adj-SID), OSPF (Adj-SID), TE (Binding-SID)
  - Dynamic labels are allocated from the dynamic label range (above the preserved SRGB label range), more details later in this section

SRGB label range preservation

- LSD preserves the default SRGB label range [16,000-23,999]
  - In any Segment Routing capable software release
  - Even if Segment Routing is not enabled
  - Except if the configured mpls label range includes this default range
- LSD allocates dynamic labels starting from 24,000
- If the configured mpls label range includes the default SRGB label range, the default preservation is disabled
  - E.g. `mpls label range 16000 1048575`

SRGB label range preservation

- Preservation of the default SRGB label range makes future Segment Routing activation possible without reboot
  - No labels are allocated from that preserved range. When enabling Segment Routing with default SRGB some time in the future, that label range is available and ready for use
  - See illustration further in this presentation

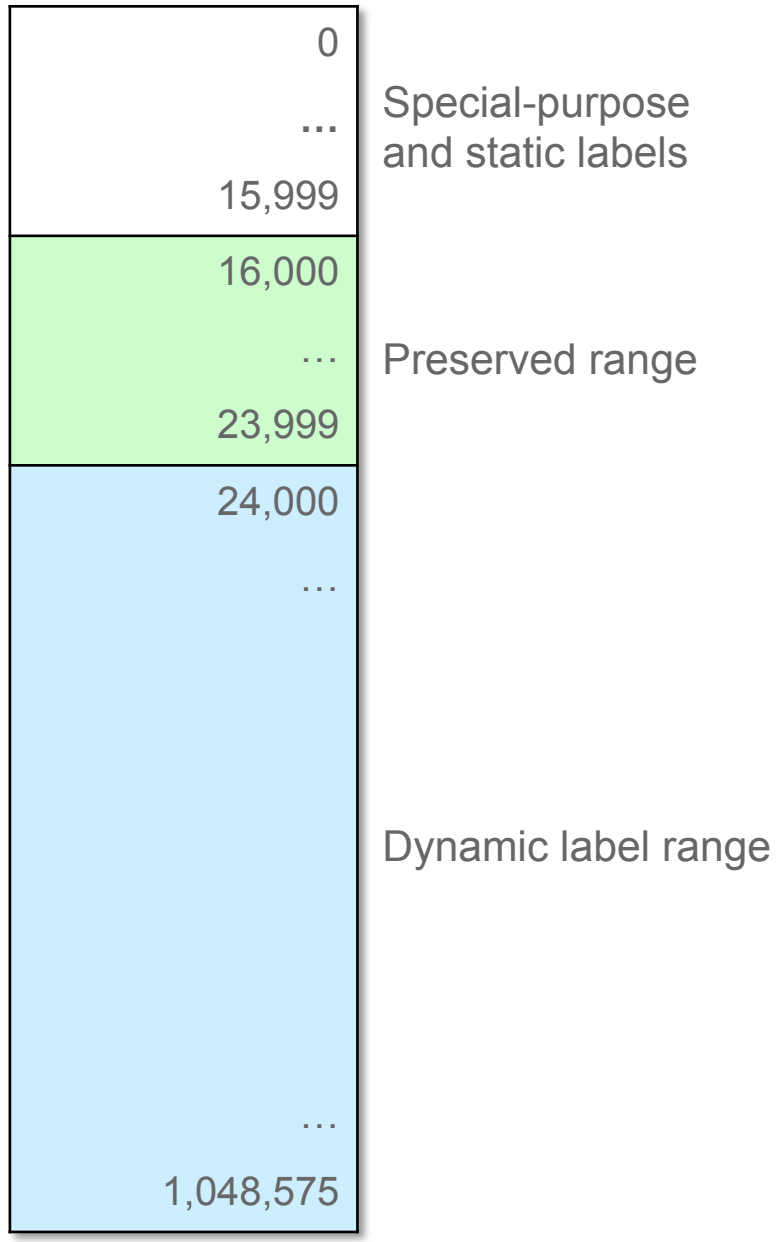
LSD SRGB allocation mechanism

- Upon boot, LSD does not accept any dynamic label allocation before ISIS/OSPF have registered with LSD
- Upon ISIS/OSPF registration, LSD allocates the requested SRGB
  - If Segment Routing not enabled, ISIS/OSPF don't request an SRGB
    - No SRGB is allocated
  - If Segment Routing is enabled, ISIS/OSPF request an SRGB
    - either as per customized SRGB configuration
    - or the default [16000, 23999] if Segment Routing enabled without customized SRGB
- Once ISIS/OSPF have registered and their SRGB is allocated, LSD starts serving dynamic label requests from other clients
  - LSD preserves the label range [16,000-23,999] by default, even if not used as SRGB

LSD SRGB allocation Example

- An example sequence of events after a router booted:

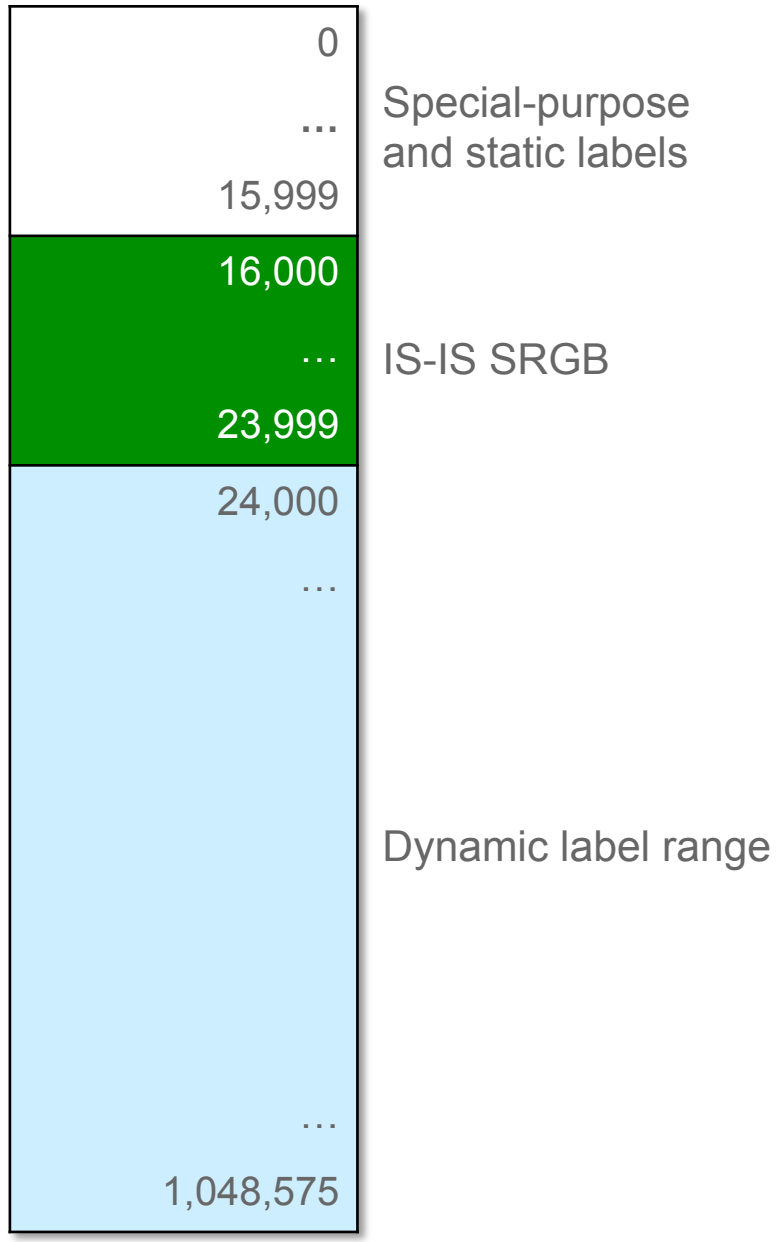
1. LSD waits for high priority clients



LSD SRGB allocation Example

- An example sequence of events after a router booted:

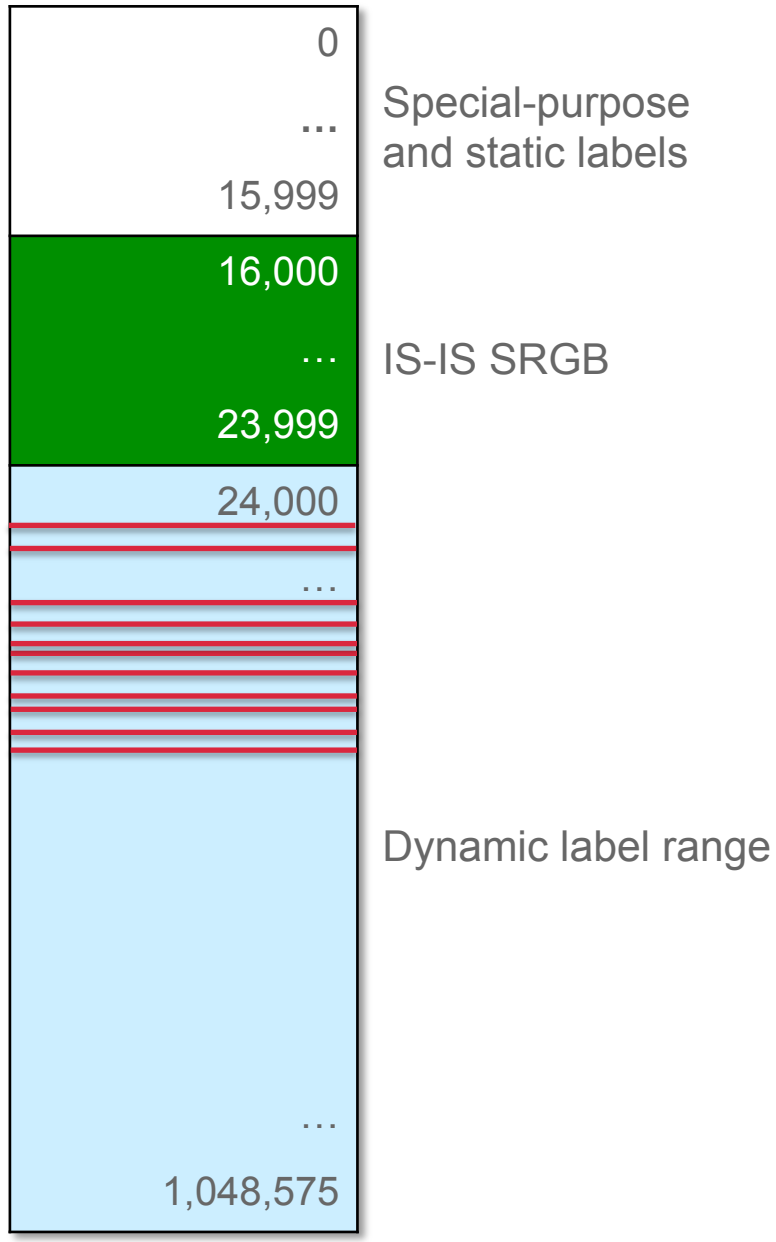
1. LSD waits for high priority clients
   - IS-IS registers with LSD, requests default SRGB [16,000-23,999]



LSD SRGB allocation Example

- An example sequence of events after a router booted:

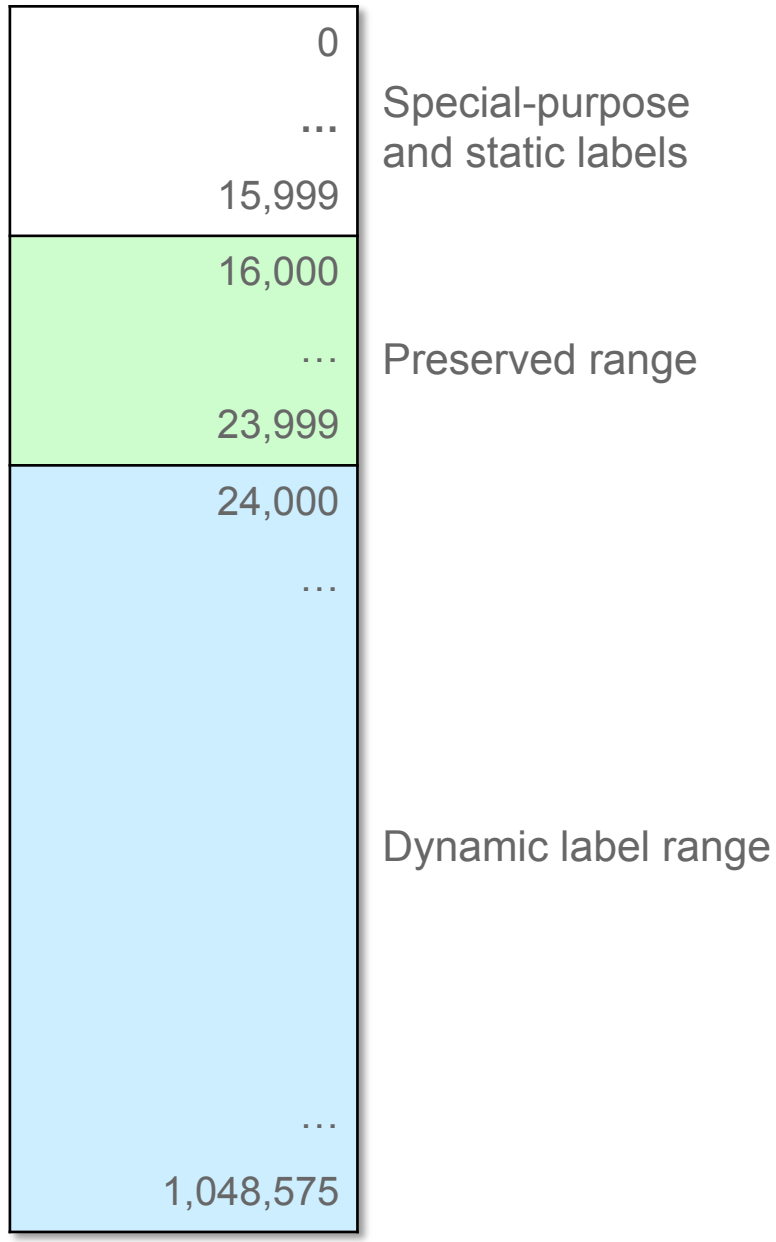
1. LSD waits for high priority clients
   - IS-IS registers with LSD, requests default SRGB [16,000-23,999]
2. All high priority clients have registered, LSD starts allocating labels
   - LDP requests dynamic labels (—in diagram)



LSD SRGB allocation Example

- Another example sequence of events after a router booted (using non-default SRGB):

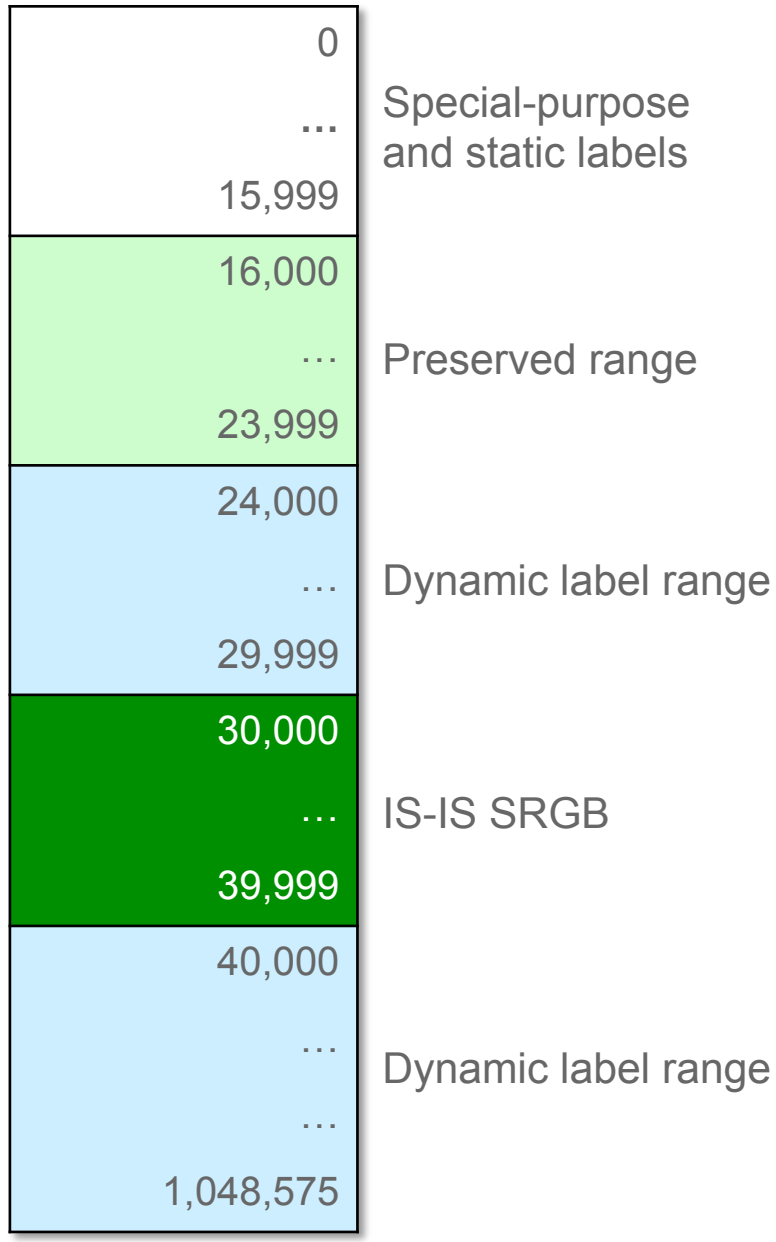
1. LSD waits for high priority clients



LSD SRGB allocation Example

- Another example sequence of events after a router booted (using non-default SRGB):

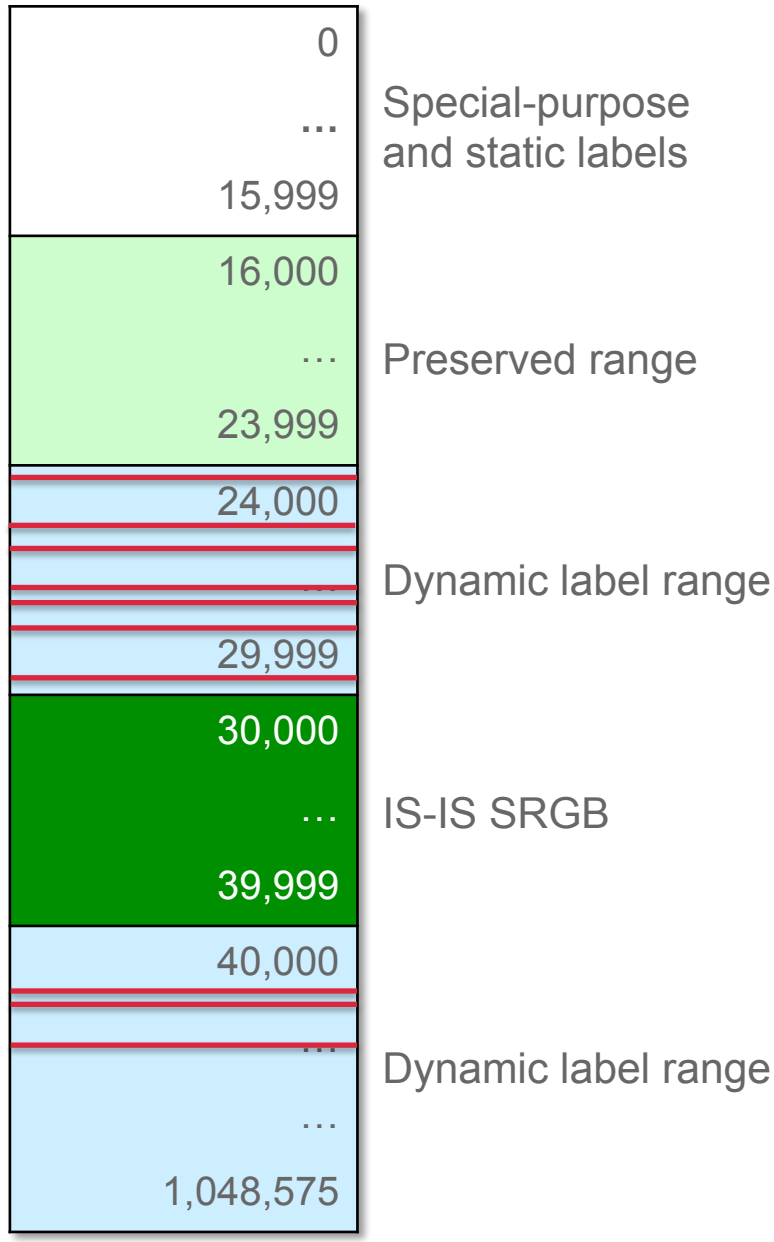
1. LSD waits for high priority clients
   - IS-IS registers with LSD, requests SRGB [30,000-39,999]



LSD SRGB allocation Example

- Another example sequence of events after a router booted (using non-default SRGB):

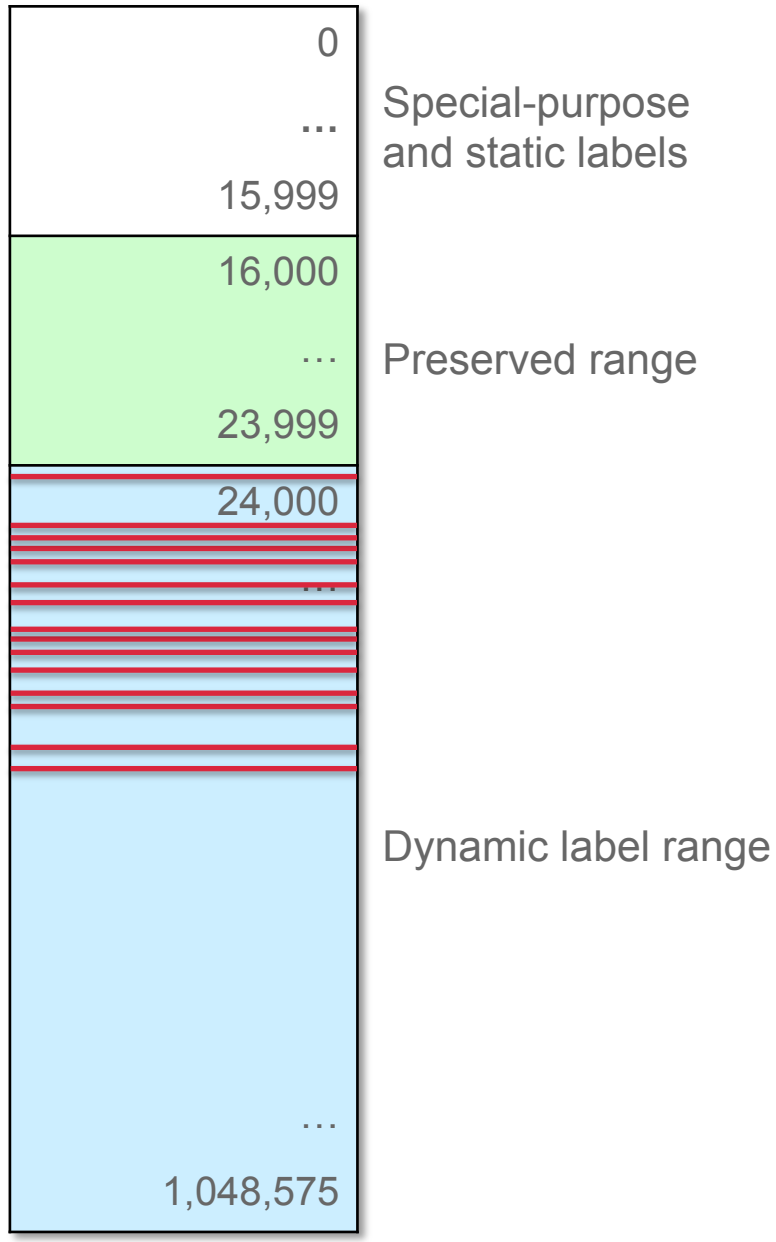
1. LSD waits for high priority clients
   - IS-IS registers with LSD, requests SRGB [30,000-39,999]
2. All high priority clients have registered, LSD starts allocating labels
   - LDP requests dynamic labels (— in diagram)
   - Note that LSD preserves the *Preserved Range*



LSD SRGB preservation Example

- An example sequence of Segment Routing activation:

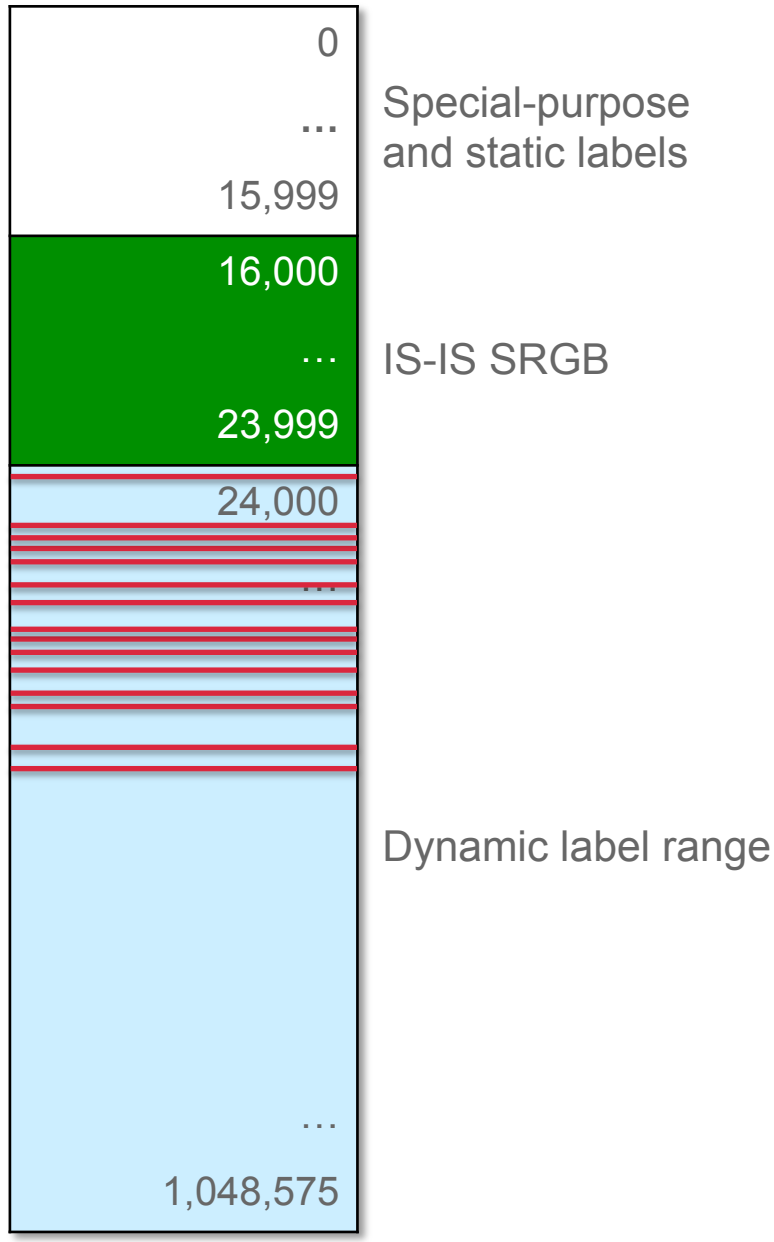
1. No Segment Routing enabled, no SRGB allocated
   - LSD preserves default SRGB label range
   - Dynamic labels are allocated by various MPLS applications (— in diagram)



LSD SRGB preservation Example

- An example sequence of Segment Routing activation:

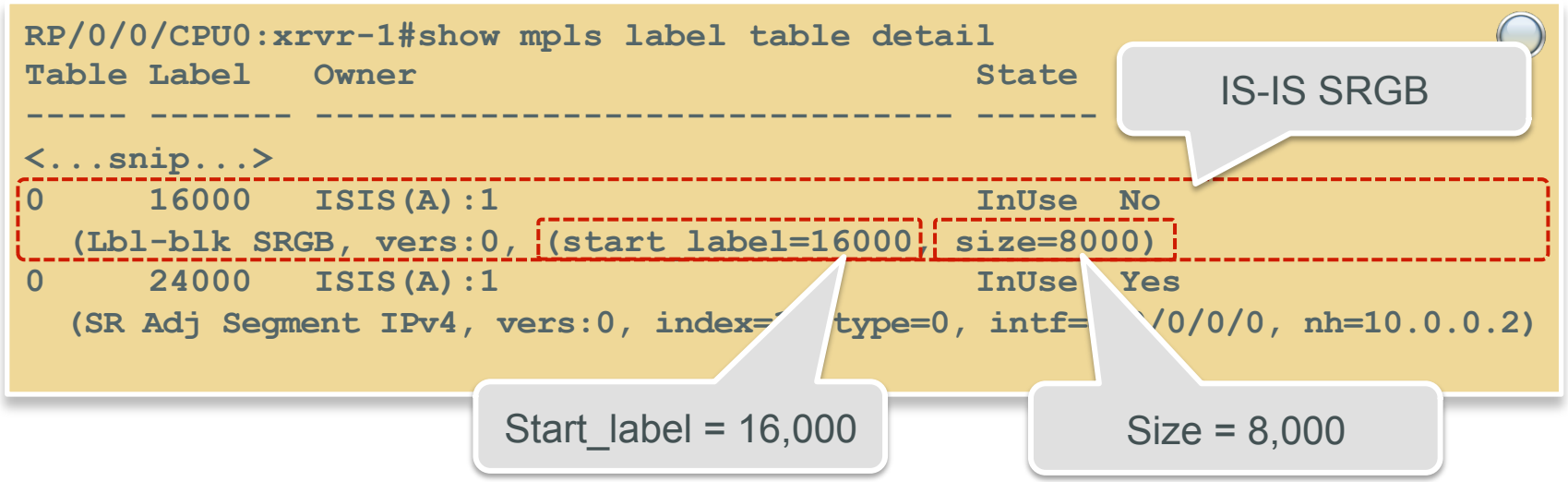
1. No Segment Routing enabled, no SRGB allocated
   - LSD preserves default SRGB label range
   - Dynamic labels are allocated by various MPLS applications (— in diagram)
2. Sometime later, Segment Routing IS-IS is enabled with default SRGB
   - SRGB label range is free (preserved), start using Segment Routing without reboot!



Segment Routing Global Block (SRGB)
Notes

- Multiple IGP instances can use the same SRGB or use different non-overlapping SRGBs
- Modifying a SRGB configuration is disruptive for traffic
  - And may require a reboot if the new SRGB is not (entirely) available

Segment Routing Global Block (SRGB)
Default SRGB



Default SRGB label block allocation for ISIS
[16,000 – 23,999]

Segment Routing Global Block (SRGB)
Non-default SRGB Example

```
router isis 1
 segment-routing global-block 18000 19999
```

Configure a non-default SRGB
18,000 – 19,999

```
RP/0/0/CPU0:xrvr-1#show mpls label table detail
Table Label   Owner                              State
----- ------- ---------------------------------- ------
<...snip...>
0     18000   ISIS(A):1                          InUse  No
  (Lbl-blk SRGB, vers:0, (start_label=18000) size=2000)
0     24000   ISIS(A):1                          InUse  Yes
  (SR Adj Segment IPv4, vers:0, index=1 type=0, intf=  /0/0/0, nh=10.0.0.2)
```

IS-IS SRGB

Start_label = 18,000

Size = 2,000

Non-default SRGB label block allocation for ISIS
[18,000 – 19,999]

Visit us:

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segment-routing.net

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Thank you.