Best Path Calculation and Distribution of TE Link Information

CSPF or PCALC calculates the shortest path that adheres to the constraints. Alternatively the shortest path could be one that is explicitly defined

TE Database

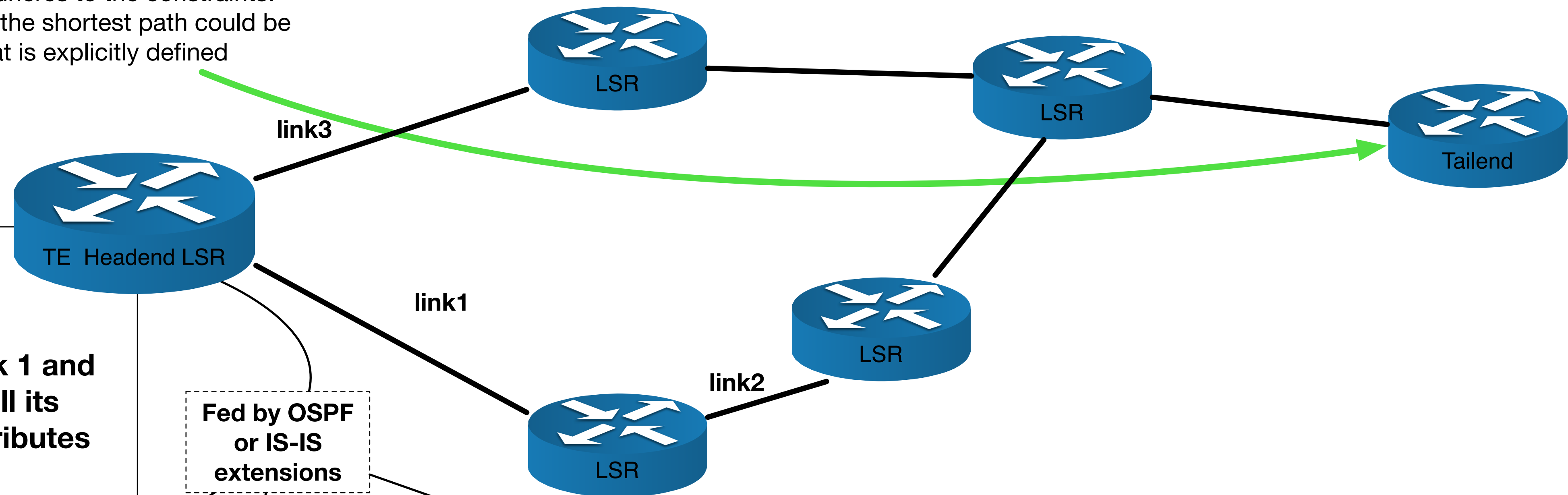Link 1 and all its attributes

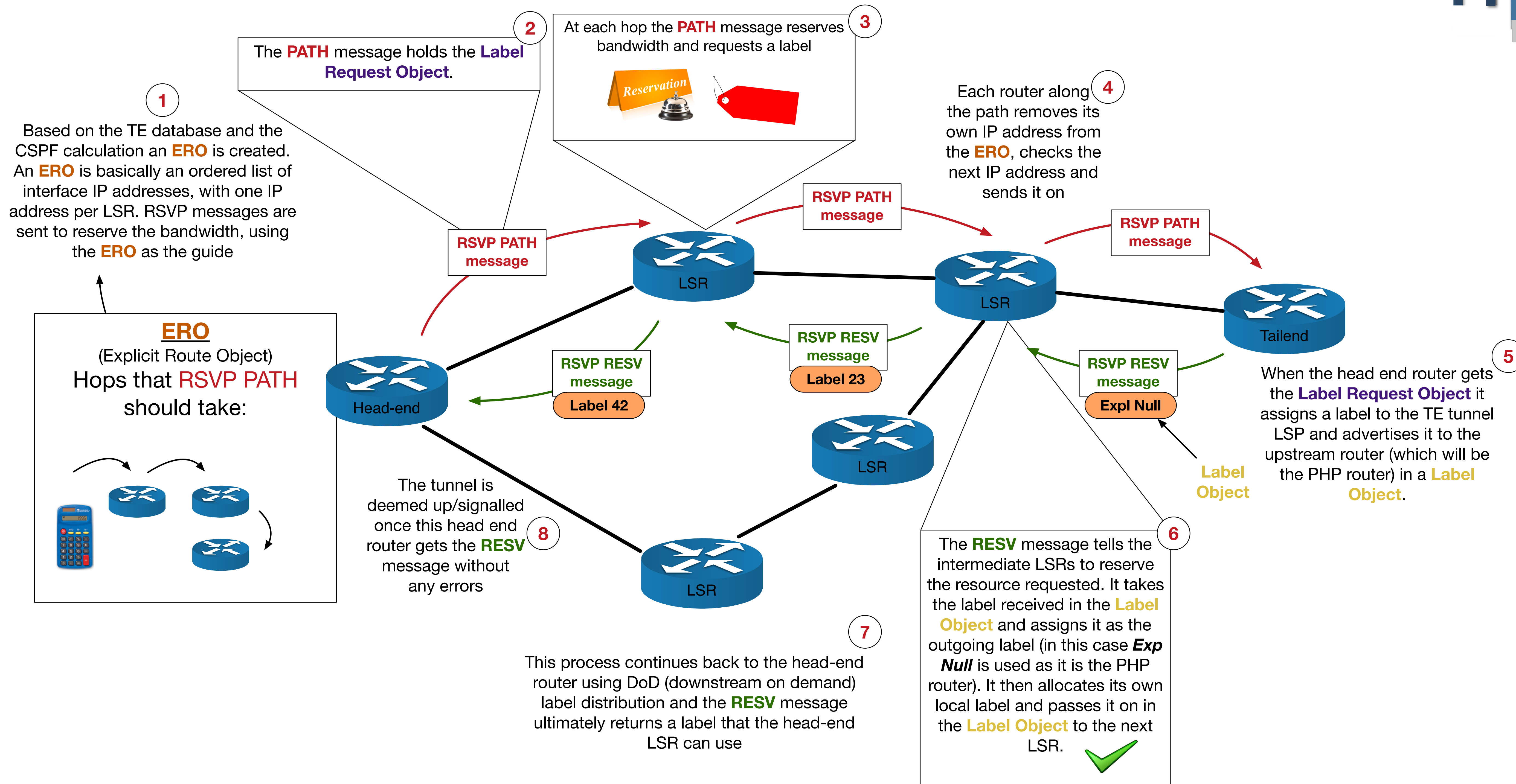Link 2 and all its attributes

...

Link n and all its attributes

Fed by OSPF or IS-IS extensions

link3

link1

link2

LSR

LSR

Tailend

LSR

TE Headend LSR

LSR

Link attributes communicated through
Extension to link state IGPs (IS-IS or OSPF):
> TE metric (administrative weight)
> Maximum Bandwidth (total bandwidth of link)
> Maximum Reservable Bandwidth (max available to TE)
> Unreserved Bandwidth (Max Reservable Bandwidth minus Current TE usage)
> Administrative Group (32 bit field used with affinity bits)

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RSVP Process

2
The **PATH** message holds the **Label Request Object**.

3
At each hop the **PATH** message reserves bandwidth and requests a label

1
Based on the TE database and the CSPF calculation an **ERO** is created. An **ERO** is basically an ordered list of interface IP addresses, with one IP address per LSR. RSVP messages are sent to reserve the bandwidth, using the **ERO** as the guide

4
Each router along the path removes its own IP address from the **ERO**, checks the next IP address and sends it on

ERO
(Explicit Route Object)
Hops that RSVP PATH should take:

RSVP PATH message

RSVP PATH message

RSVP PATH message

LSR

LSR

Tailend

Head-end

LSR

LSR

RSVP RESV message
Label 42

RSVP RESV message
Label 23

RSVP RESV message
Expl Null

5
When the head end router gets the **Label Request Object** it assigns a label to the TE tunnel LSP and advertises it to the upstream router (which will be the PHP router) in a **Label Object**.

Label Object

8
The tunnel is deemed up/signalled once this head end router gets the **RESV** message without any errors

6
The **RESV** message tells the intermediate LSRs to reserve the resource requested. It takes the label received in the **Label Object** and assigns it as the outgoing label (in this case *Exp Null* is used as it is the PHP router). It then allocates its own local label and passes it on in the **Label Object** to the next LSR.

7
This process continues back to the head-end router using DoD (downstream on demand) label distribution and the **RESV** message ultimately returns a label that the head-end LSR can use

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RSVP Message Components

Carried in PATH Message
Session Object
Request Label
Sender_Tspec
Session Attribute
ERO
RRO (optional)

Carried in RSVP Message
Session Object
Label Object
Sender_Tspec
RRO (optional)

Record Route Object

RSVP PATH message — RRO

RSVP RESV message — RRO

The Record Route Object is carried in the RSVP PATH and RESV messages.

It stores the IP Addresses of the routers that the TE tunnel crosses.

The path in the RRO and ERO are normally the same but can differ sometimes - for example in FRR failover scenarios, the RRO will change to reflect the new path.

In the RRO you can record the label that is associated with each hop. A TE tunnel is created with the RRO that is enabled on the tunnel interface on the head end router.
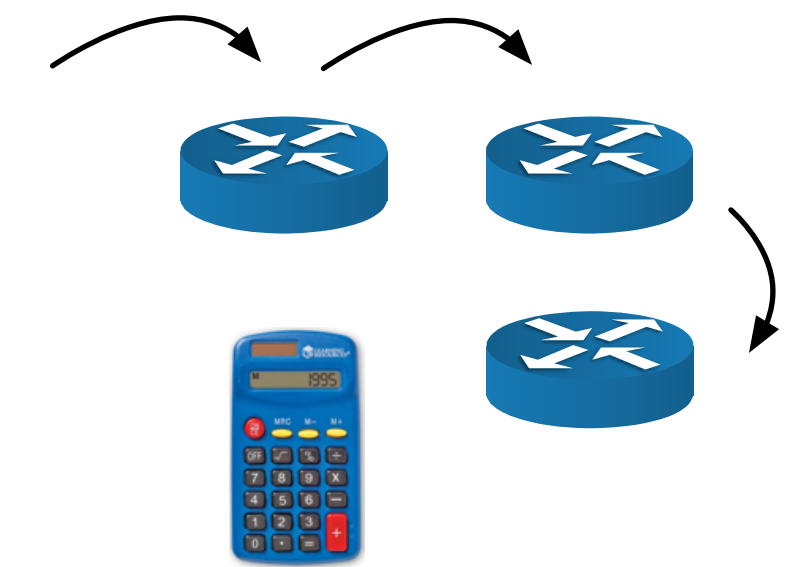
RRO

Label	Hop
23	x
42	y
...	...
123	z

Explicit Route Object

Hops that RSVP PATH should take:

Label Request Object

Reservation

Used to request a label in the RESV Message

Label Object

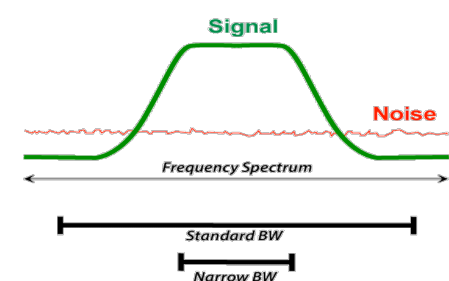Used to communicate assigned label at each hop of LSP in the PATH message

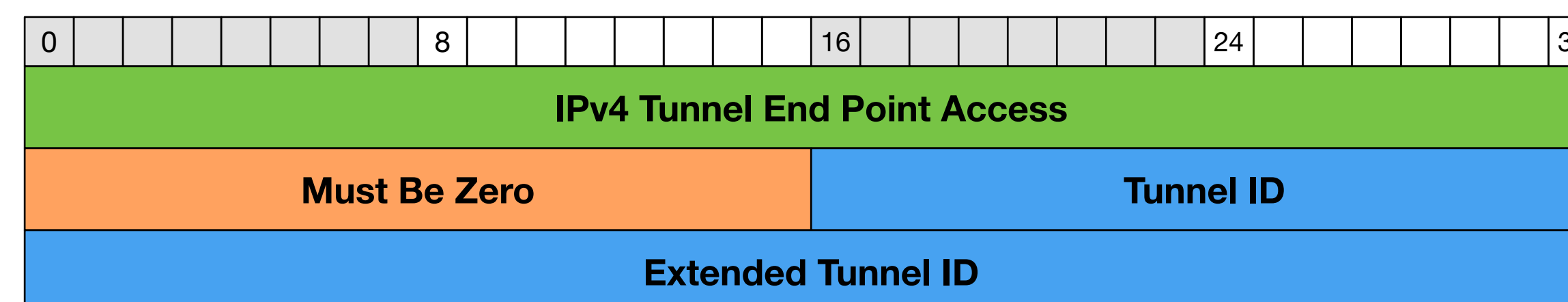Label number

SENDER_TSPEC

Signal
Noise
Frequency Spectrum
Standard BW
Narrow BW

Represents the bandwidth required and is carried as an average rate in bytes per second

Session Object

0	8	16	24	31
IPv4 Tunnel End Point Access				
Must Be Zero		Tunnel ID		
Extended Tunnel ID				

Session Attribute

0	8	16	24	31
Setup Priority	Holding Priority	Flags	Name Length	
Session Name + Null Padded				

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