RSVP PROTOCOL EXTENSIONS FOR
Resilient MPLS Rings
draft-deshmukh-mpls-rsvp-rmr-extension-00

IETF 98 (MPLS WG)

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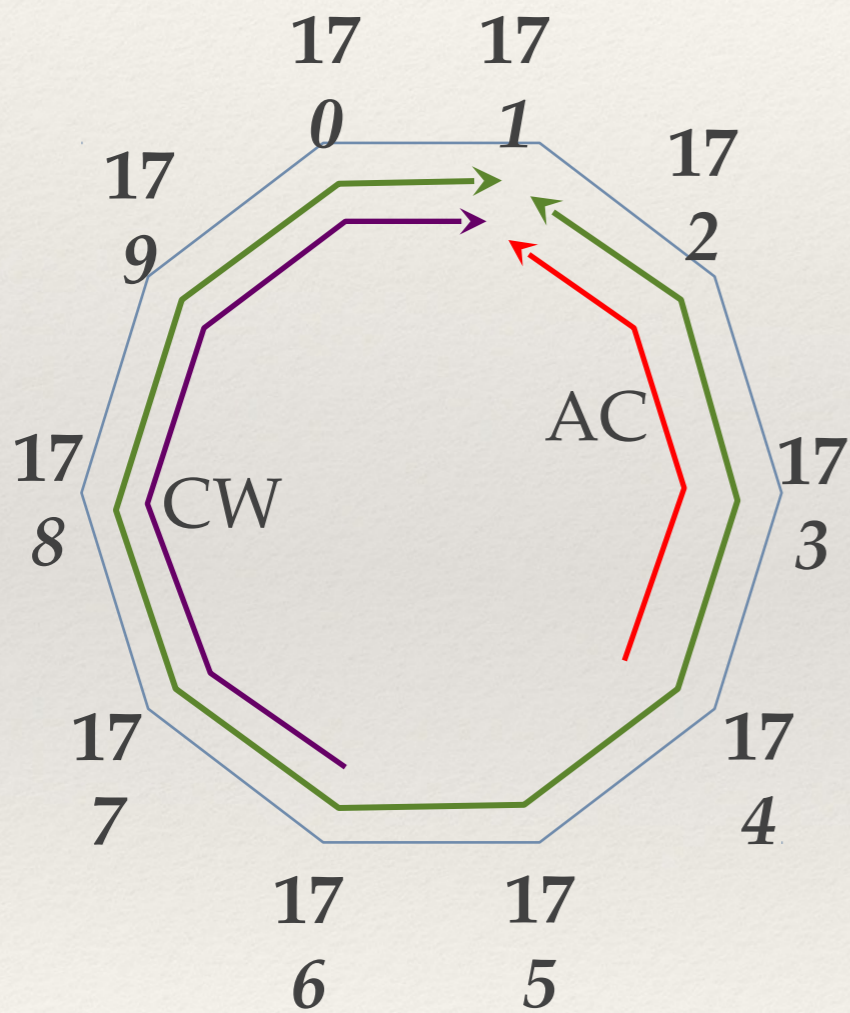
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MP2P Ring LSPs

✝ Ring LSPs form a loop. Ingress & Egress are same node for a ring LSPs.

✝ A Ring LSP is multipoint to point (MP2P) LSP

✝ Each transit node of ring LSP is also an ingress node for the ring LSP.

✝ The bandwidth of a ring LSP can change hop-to-hop (since it is MP2P)

R0---->R1---->R2---->R3---->R4---->R5---->R6--->R7--->R0   (CW LSP)

R0---->R7---->R6---->R5---->R4---->R3---->R2--->R1--->R0   (ACW LSP)
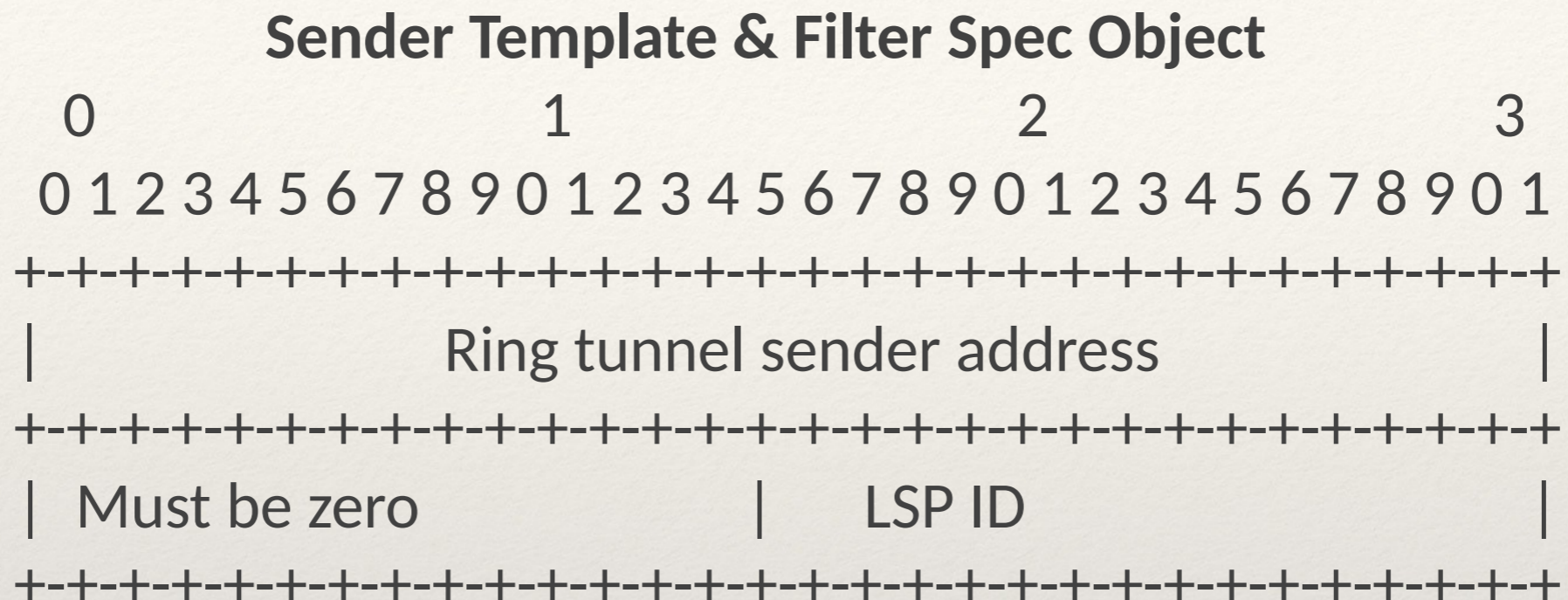
MP2P Ring LSPs

Ring LSP RL1 starts and ends on R1.

Every node can be an ingress for RL1.

The **egress** for RL1 is **R1**.

A ring of N nodes has 2N ring LSPs, not N*(N-1)!
None of these LSPs are configured!

Extensions - Session Object

RMR_TUNNEL_IPv4 Session Object

Class = SESSION, RMR_TUNNEL_IPv4 C-Type = TBD

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                   Ring anchor node address                   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   Ring Flags             |             MBB ID                |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                         Ring ID                              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Ring anchor node address: IPv4 address of the anchor node. Each anchor node creates a LSP to itself.

Ring Flags :   1 = Clockwise   2 = Anti-Clockwise

MBB ID : A 16-bit identifier used in the SESSION. This "Make- before-break" (MBB) ID is useful for graceful ring topology changes.

Ring ID : A 32-bit identifier for the ring. This number remains constant throughout the existence of ring.

Extensions - Sender Template Object

Sender Template & Filter Spec Object

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                    Ring tunnel sender address                 |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|   Must be zero                |        LSP ID                 |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Ring tunnel sender address

    IPv4 loopback address of the sender .

LSP ID

    A 16-bit identifier used in the SENDER_TEMPLATE.

No changes to the format of SENDER_TEMPLATE and FILTER_SPEC objects.
Only the semantics of these objects will slightly change.
Different sender template & filter spec objects can be inserted by different nodes along the ring.

Multiple Sender Templates

ST1 : SenderAddress-1 LSPID-1

ST1 : SenderAddress-1 LSPID-1
ST2 : SenderAddress-2 LSPID-1

ST1 : SenderAddress-1 LSPID-1
ST2 : SenderAddress-2 LSPID-1
ST3 : SenderAddress-3 LSPID-1

ST1 : SenderAddress-1 LSPID-1
ST2 : SenderAddress-2 LSPID-1
ST3 : SenderAddress-3 LSPID-1
ST4 : SenderAddress-4 LSPID-1
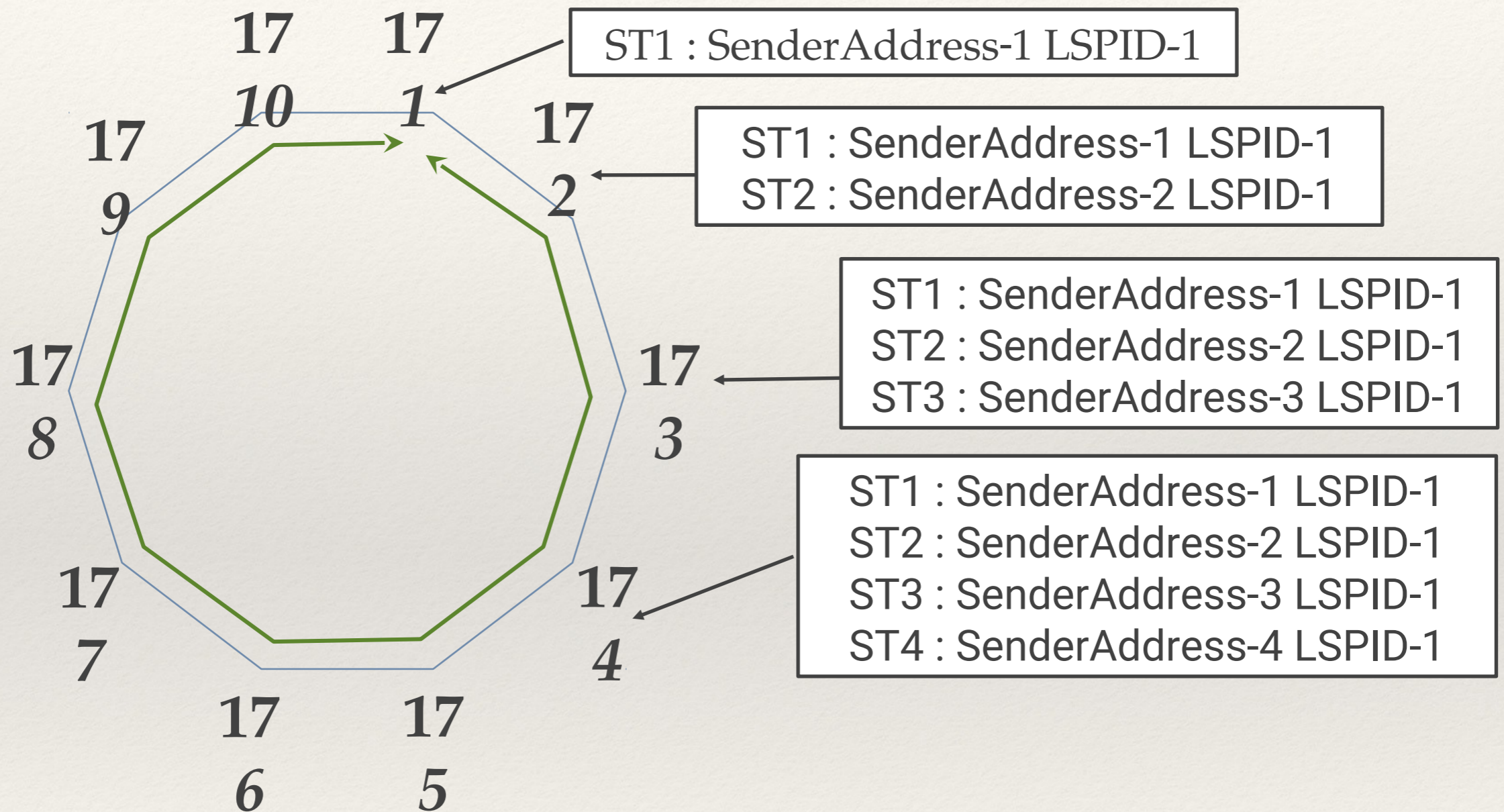
When ring node R4 receives a Path message initiated by anchor node R1, the outgoing path message at R4 will have the above sender templates. Similarly, the corresponding RESV message will have multiple FILTER_SPEC objects corresponding to the SENDER_TEMPLATE objects.

Ring LSPs: Bandwidth Management
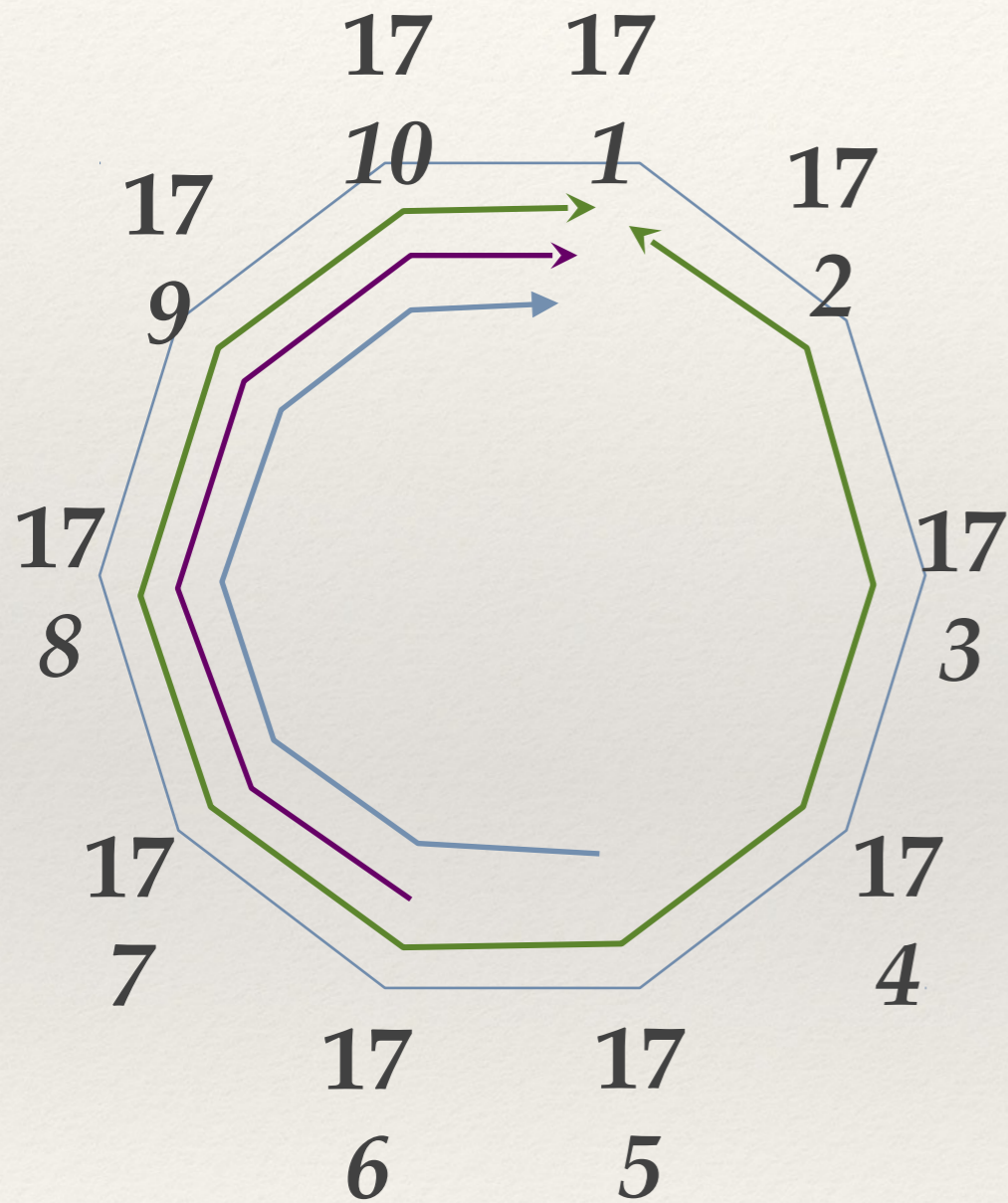
Let's say that the CW & AC anchor LSPs are already established for node 1 – LSP1. (Green arrow LSP)
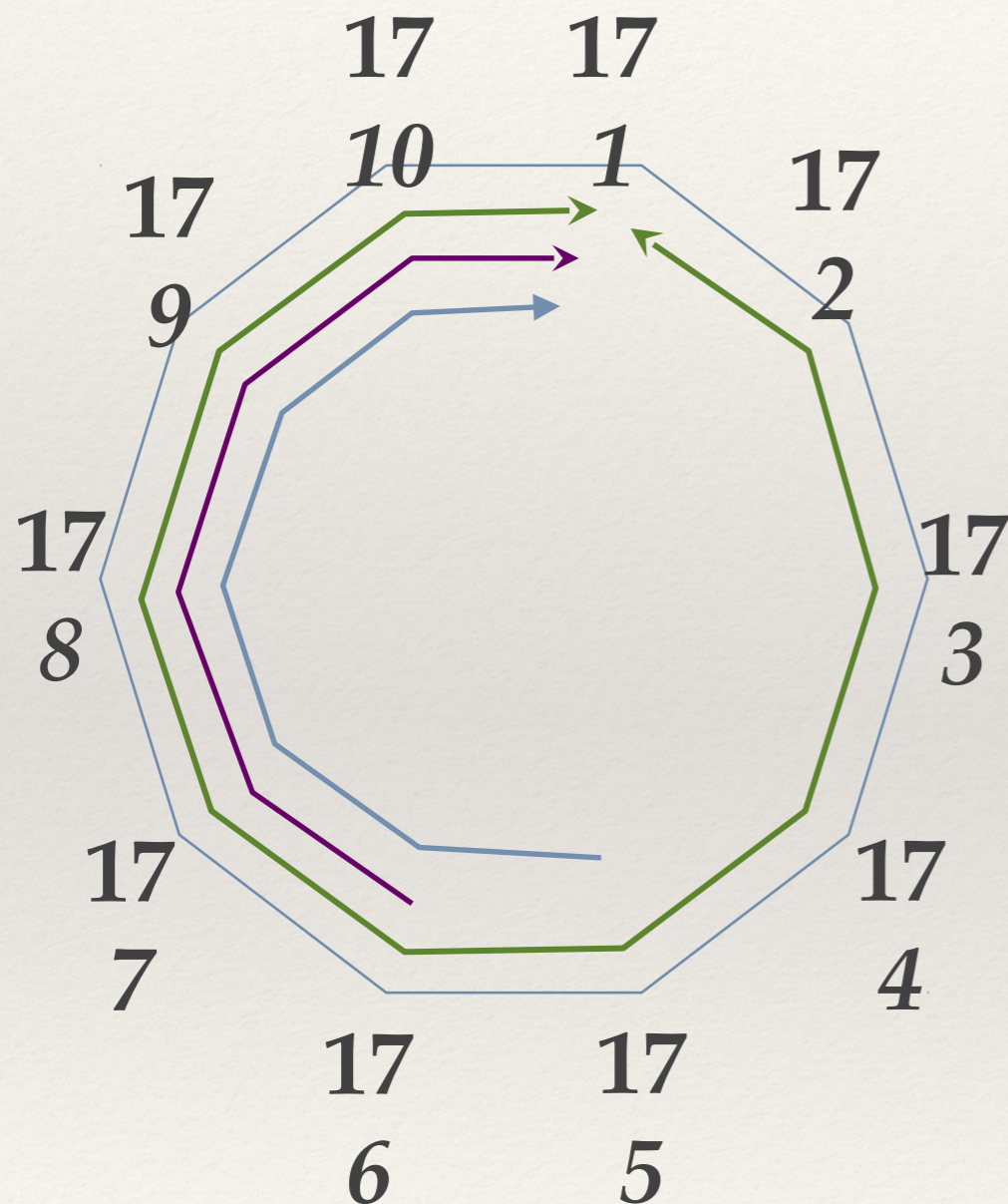
Let's focus on the CW LSP.

Now, node 5 wants to achieve BW increase from 0G to 1G (Blue arrow LSP)

Similarly node 6 may want to increase BW (Purple arrow LSP)

Now, let's say, node 5 wants to increase bw again from 1G to 2G

Ring LSPs: Bandwidth Management

17 17

17   10   1   17

17   9   2

17   17
8   3

17   17
7   4

17   17
6   5

To increase the BW, node 5 will signal a Path message with a different sender-template object for "LSP1" towards node 1.
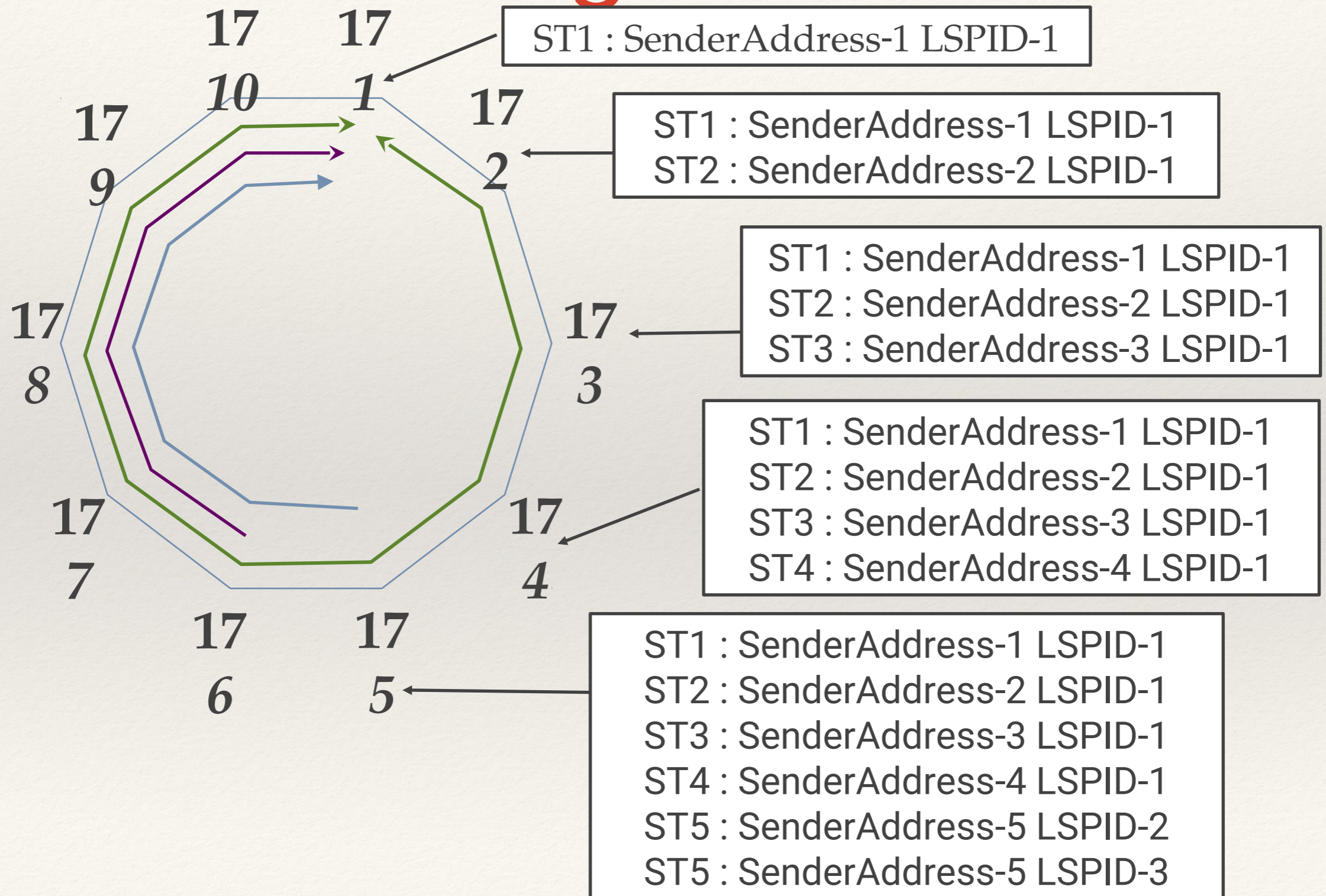Ring tunnel sender address = node 5; lsp-id = 2

Node 1 will respond with Resv message for this new path if sufficient bw is available. This Resv message will have the appropriate filter-spec object. (Blue arrow LSP)

Similarly node 6 can increase BW by signaling a Path message with different sender template object with its own address. (Purple arrow LSP)

If node 5 wants to increase bw again from 1G to 2G, then it will again create a new Path message for "lsp1" with Ring tunnel sender address = node 5 & lsp-id = 3

Ring LSPs: Bandwidth Management

ST1 : SenderAddress-1 LSPID-1

ST1 : SenderAddress-1 LSPID-1
ST2 : SenderAddress-2 LSPID-1

ST1 : SenderAddress-1 LSPID-1
ST2 : SenderAddress-2 LSPID-1
ST3 : SenderAddress-3 LSPID-1

ST1 : SenderAddress-1 LSPID-1
ST2 : SenderAddress-2 LSPID-1
ST3 : SenderAddress-3 LSPID-1
ST4 : SenderAddress-4 LSPID-1

ST1 : SenderAddress-1 LSPID-1
ST2 : SenderAddress-2 LSPID-1
ST3 : SenderAddress-3 LSPID-1
ST4 : SenderAddress-4 LSPID-1
ST5 : SenderAddress-5 LSPID-2
ST5 : SenderAddress-5 LSPID-3

Ring LSPs: Bandwidth Management

✝ If sufficient BW is not available at some Downstream (say node 9), then ring node 9 will generate PathErr with the corresponding Sender Template Object.

✝ When ring node 5 no longer needs the bw reservation, then ring node 5 will originate a new Path message with a new Sender Template Object with 0 bw. Every downstream node will then remove bw allocated on the corresponding link.

✝ Note that we will not actually change any label as part of this bw increase/decrease. So, the label remains same as it is signaled initially for the anchor LSP. Only BW accounting changes when these Path messages get signaled.

Next Steps

- Need more feedback from the working group.

- Request for MPLS WG document.

Thank you !