

# Explicitly Routed Tunnels using MPLS Label Stack

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# Rationale for SPRING

- Do we ***need new architectural documents*** for SPRING ?
- Can Label stacking for achieving ***explicit routing*** be described using ***existing*** MPLS architecture (RFC3031) documents ?
- Lets have a look at RFC3031 !

# Explicitly Routed Tunnels with MPLS

- Explicitly Routed Tunnels
  - “If a Tunneled Packet travels from Ru to Rd over a path other than the Hop-by-hop path, we say that it is in an *“Explicitly Routed Tunnel”* (section 3.27.2 of RFC3031)
- Explicitly routed tunnels realized by explicitly routed LSPs established via either *RSVP-TE* or *CR-LDP* require intermediate nodes of these tunnels to maintain per tunnel (per path) state
- Is it possible to establish *explicitly routed tunnels* **without** requiring intermediate nodes of these tunnels to maintain per tunnel (per path) state ?

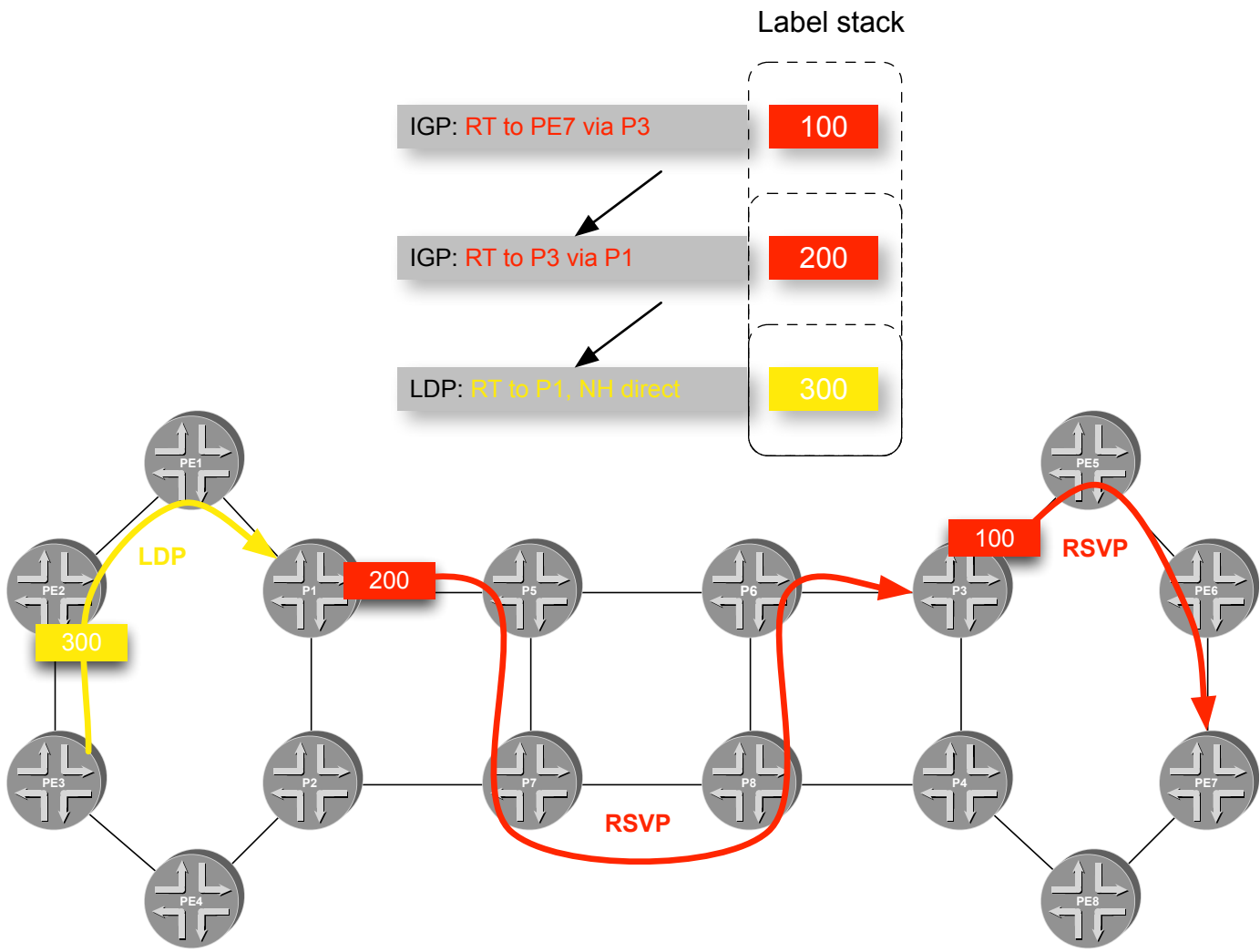
# Stacked LSPs for Explicitly Routed Tunnels (1)

- **YES !**
- **Instead** of an explicitly routed LSP, one can use **stack of LSPs** to realize explicitly routed tunnels
- Such stack of LSPs **provides the functionality** to forward a packet through a **sequence of LSP egress** of the LSPs on the stack
  - the sequence of LSP egress represents the explicit route
- Stack of LSPs in the control plane **corresponds** to the stack of labels in the data plane

# Constructing Label Stack at the Ingress

- To construct label stack for an explicitly routed tunnel the ingress of that tunnel has to obtain *label binding* from the first intermediate nodes of each LSPs in the stack
- First intermediate nodes of all LSPs in the stack, except for the topmost LSP, are *remote label distribution peers* of the ingress
- Obtaining label bindings from remote label distribution peers could be done by *extending link-state protocols* (ISIS/OSPF) to provide label distribution
- In certain scenarios Targeted LDP (T-LDP) *could* be used to obtain label bindings from remote label distribution peers

# Example



# “Rosetta Stone” of Segment Routing with MPLS

- **Segment** = *MPLS label advertised by the first intermediate point of an LSP*
- **Segment list** = *MPLS label stack*
- **Advertising segments in OSPF/ISIS** = *extending OSPF/ISIS to provide label distribution functionality*

# Summary

- For SPRING there is no **need** for further **architectural documents** to define **MPLS label stacking**
- MPLS Label stacking for achieving **explicit routing** can perfectly be described using **existing** MPLS architecture (RFC3031) documents