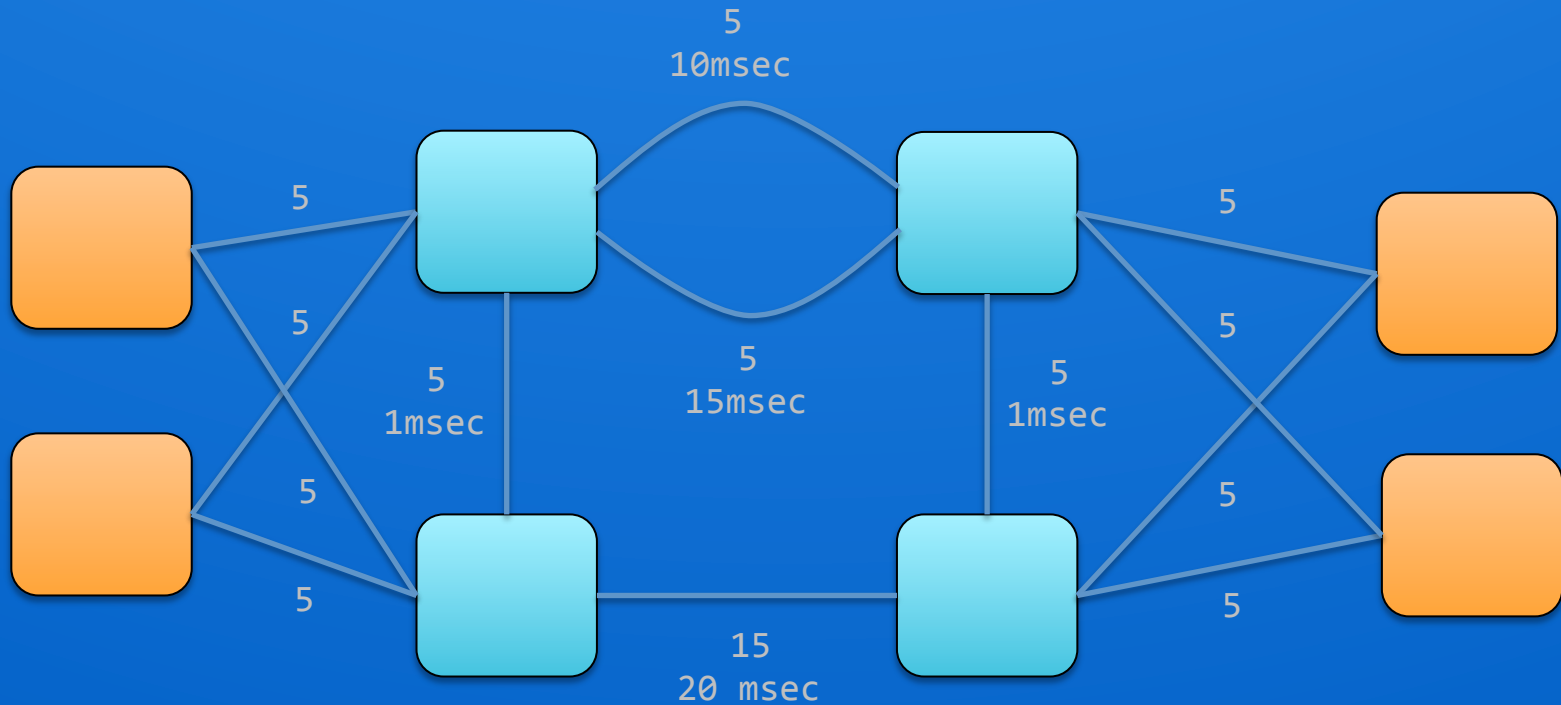




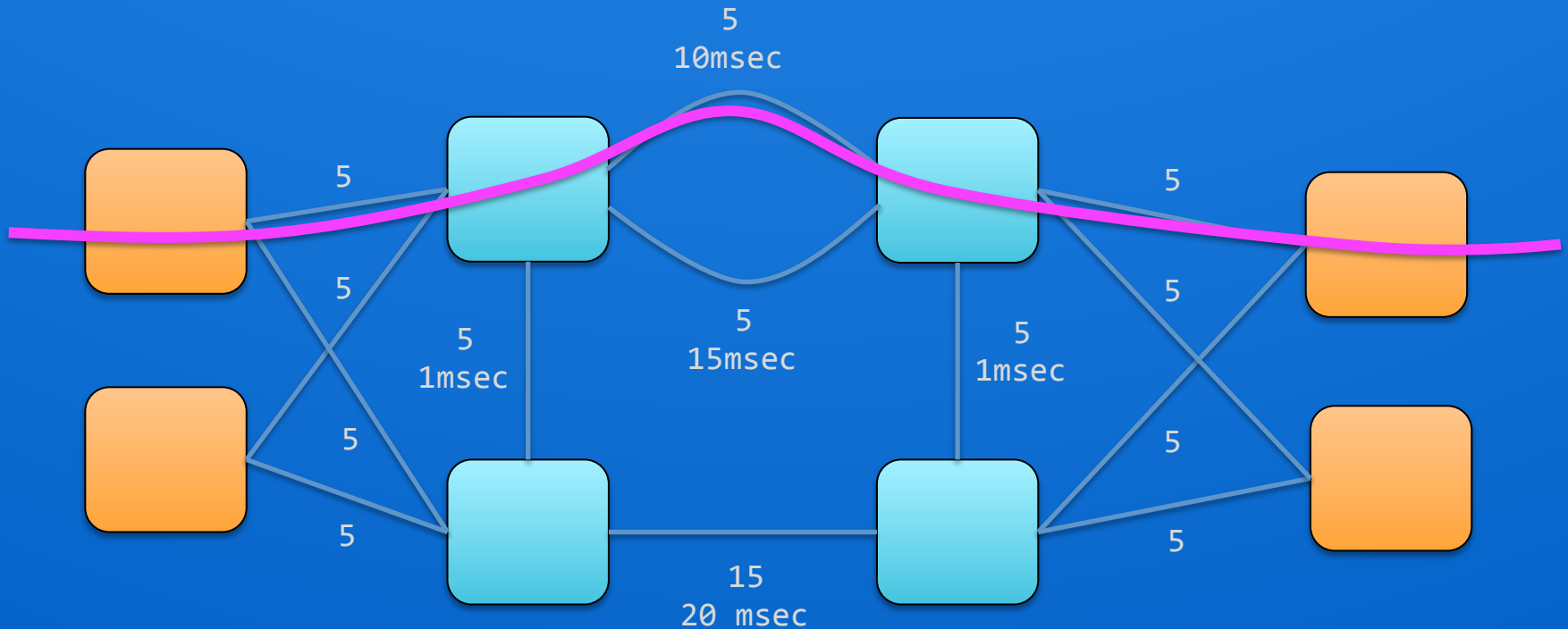
# SPRING FORWARD(ING).

EVOLVING IP/MPLS NETWORKS WITH SEGMENT ROUTING.

# DEVIATING FROM THE IGP TOPOLOGY.

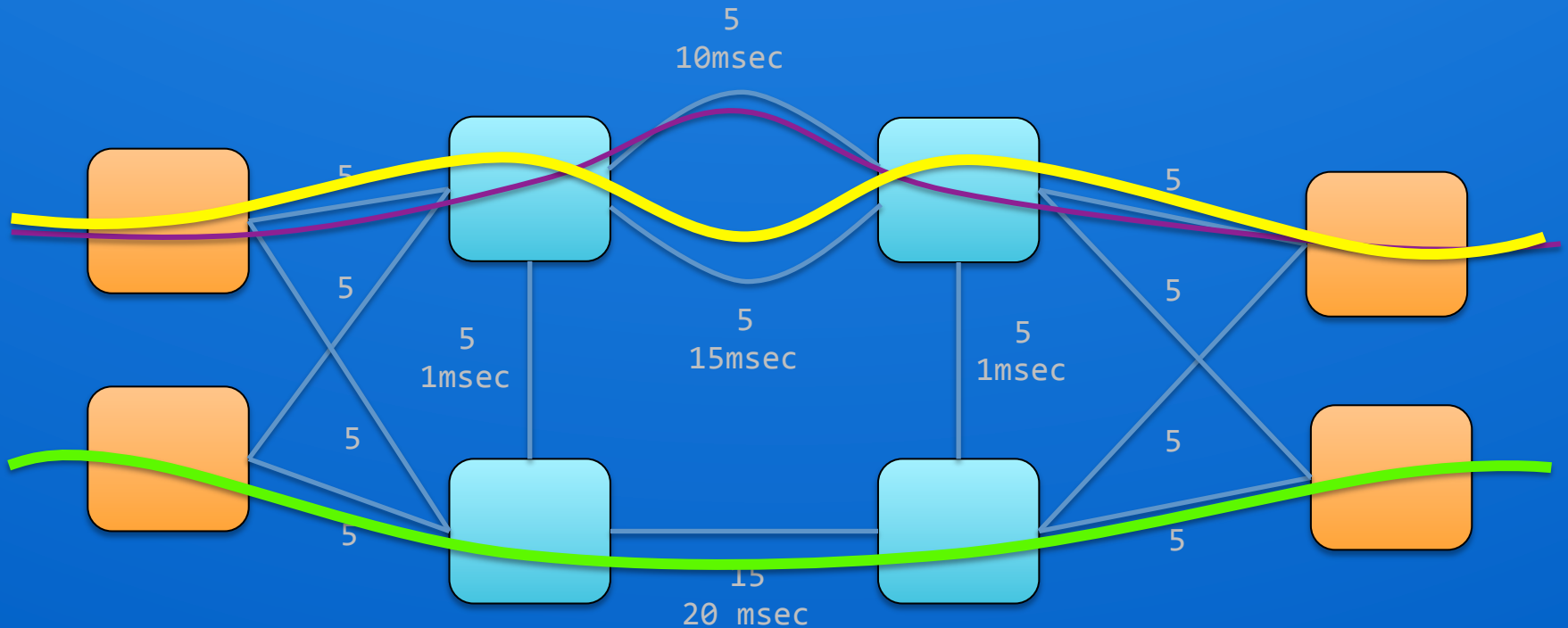


# DEVIATING FROM THE IGP TOPOLOGY.



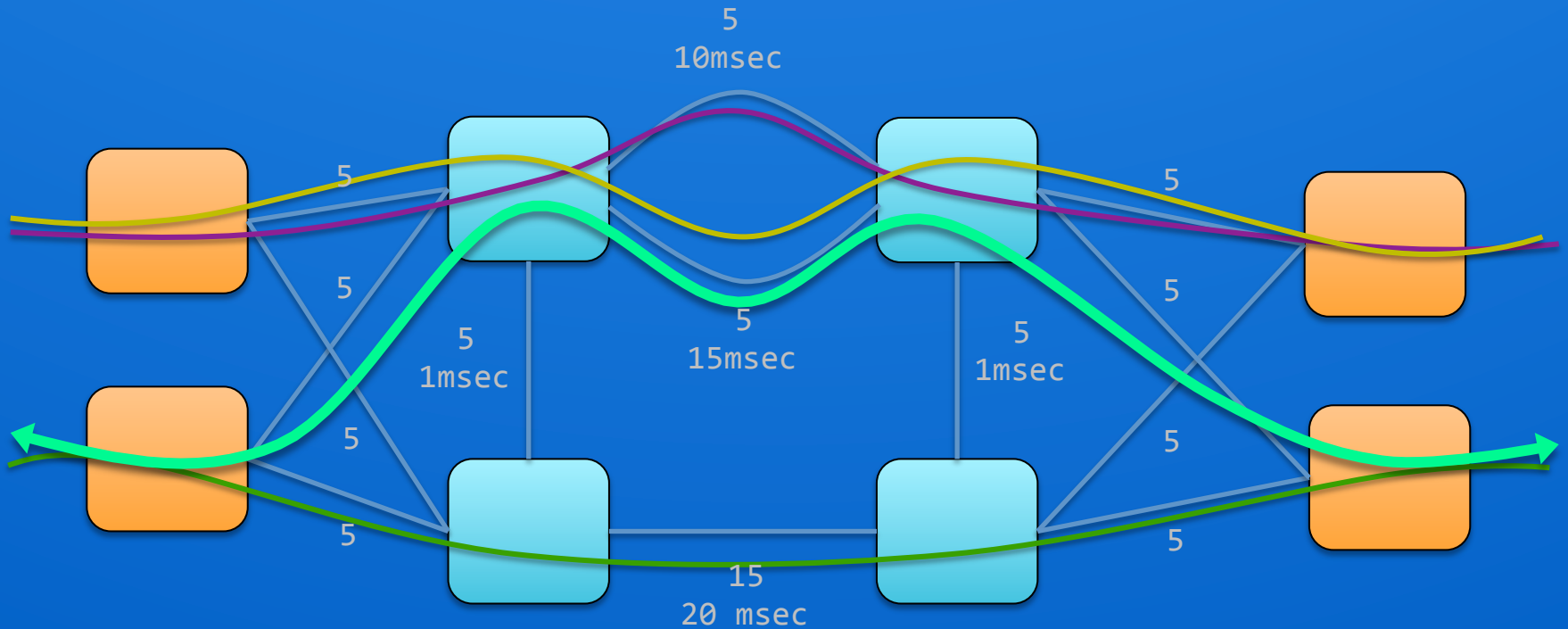
MIN(LATENCY) SERVICE – ONE VERSION OF SPT.

# DEVIATING FROM THE IGP TOPOLOGY.



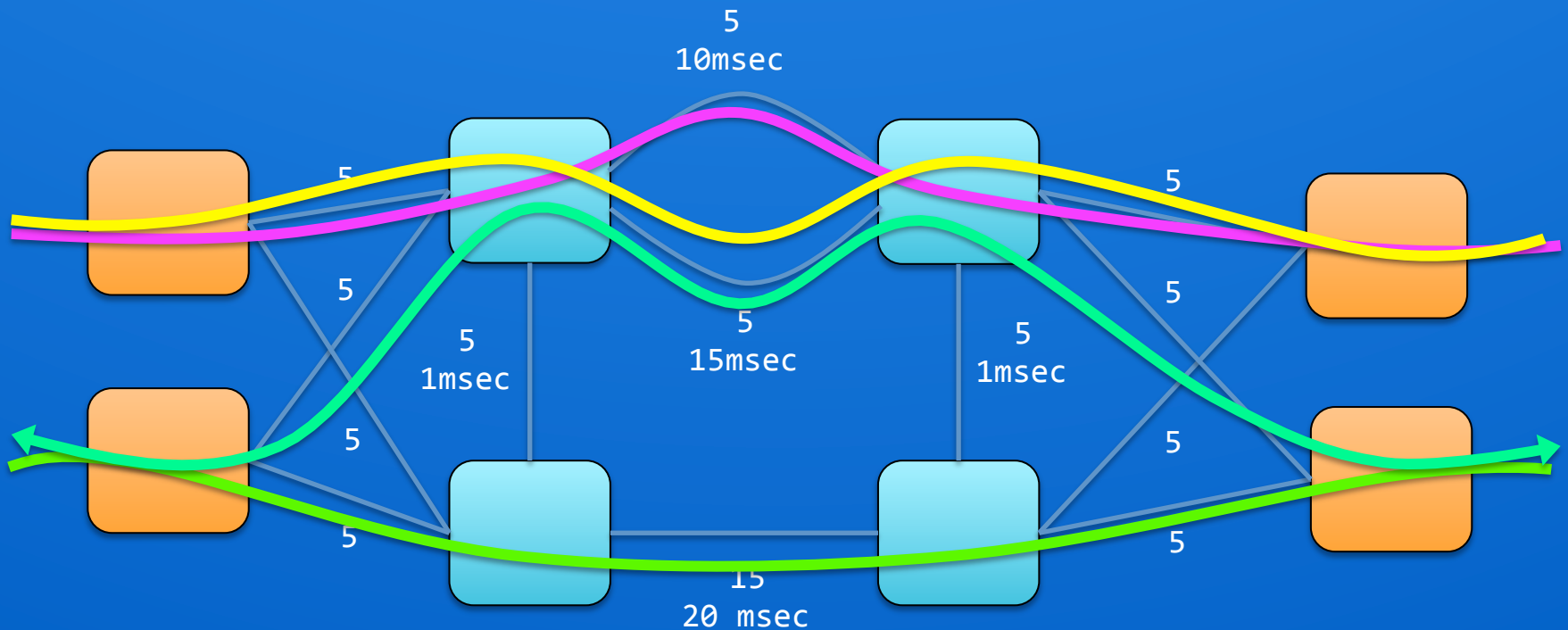
DISJOINT SERVICE PAIR – NOT ON SPT.

# DEVIATING FROM THE IGP TOPOLOGY.



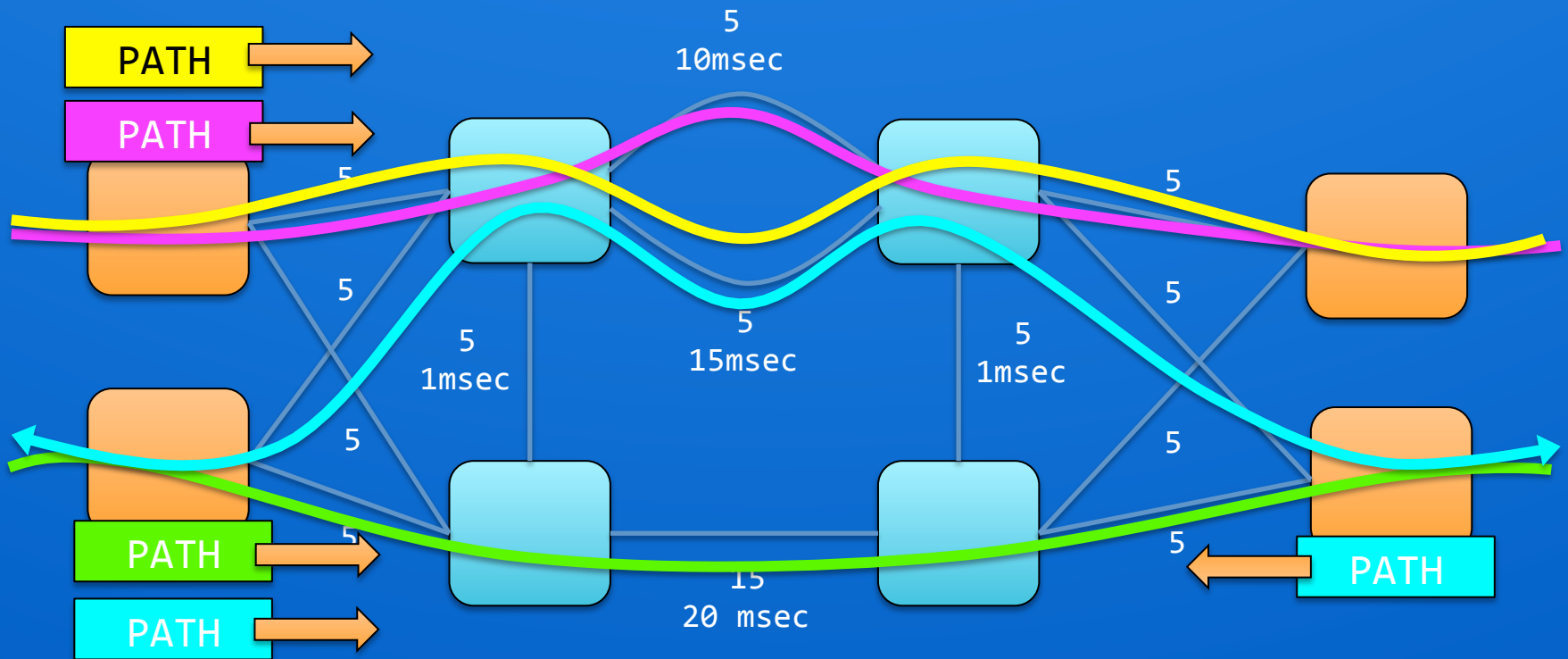
CO-ROUTING – SYMMETRIC SINGLE ECMP.

# RSVP-TE MIDPOINT SCALE.



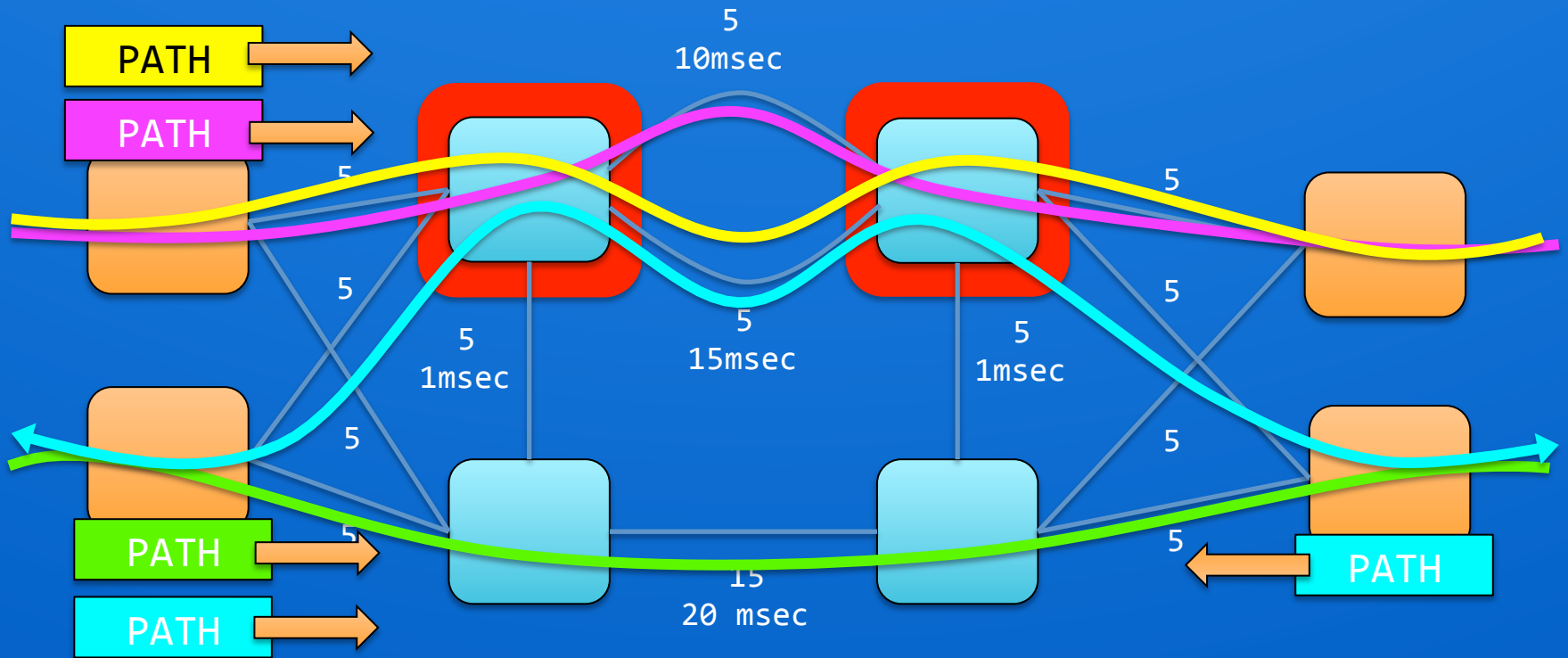
1 LSP = 1 SET OF RSB/PSB STATE.

# RSVP-TE MIDPOINT SCALE.



LINK FLAPS LEAD TO MESSAGE FLOODS.

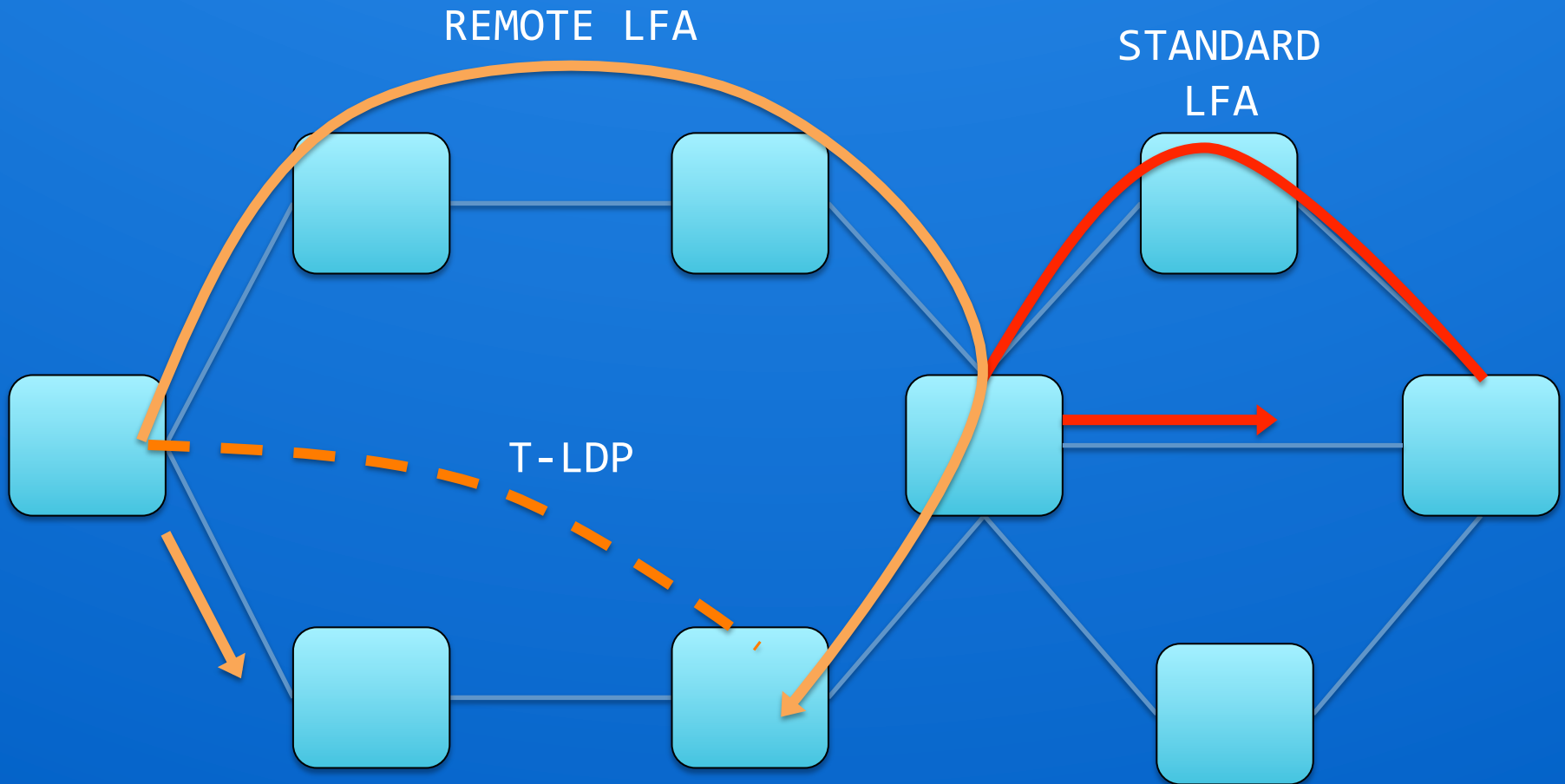
# RSVP-TE MIDPOINT SCALE.



MIDPOINT MESSAGE PROCESSING LIMITS SCALE.

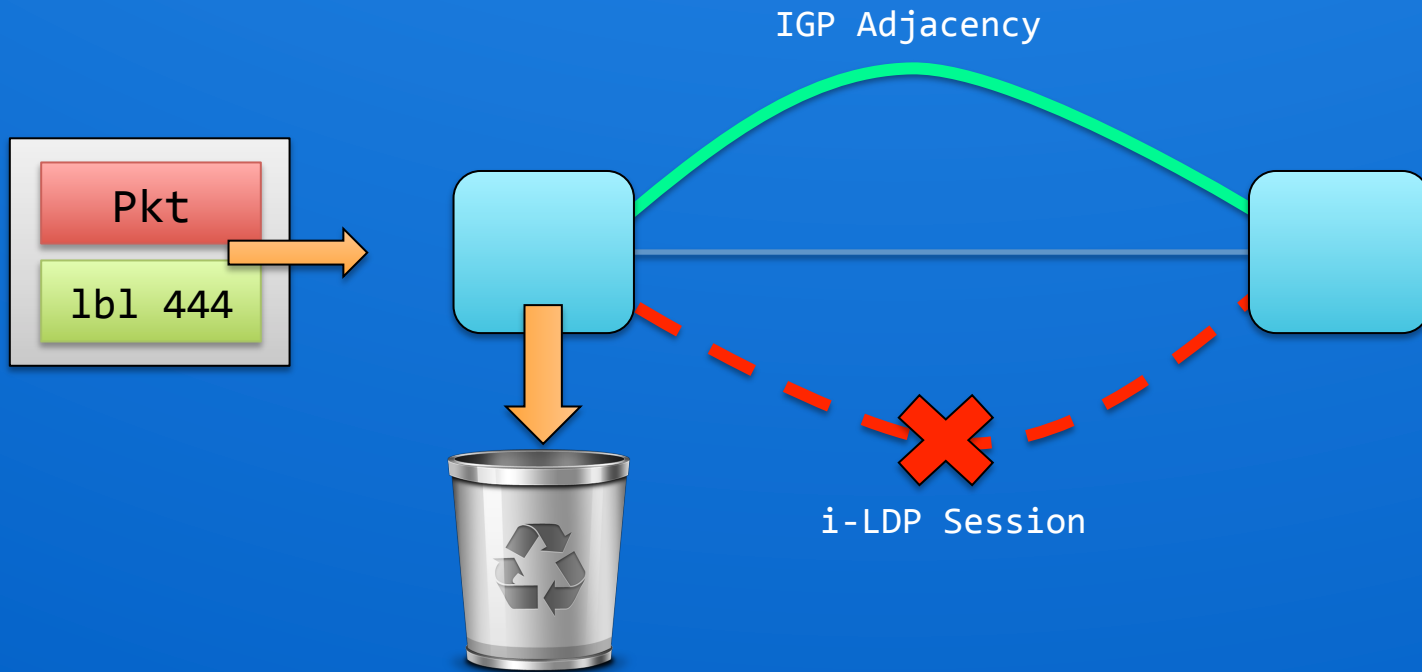


# IP FRR.

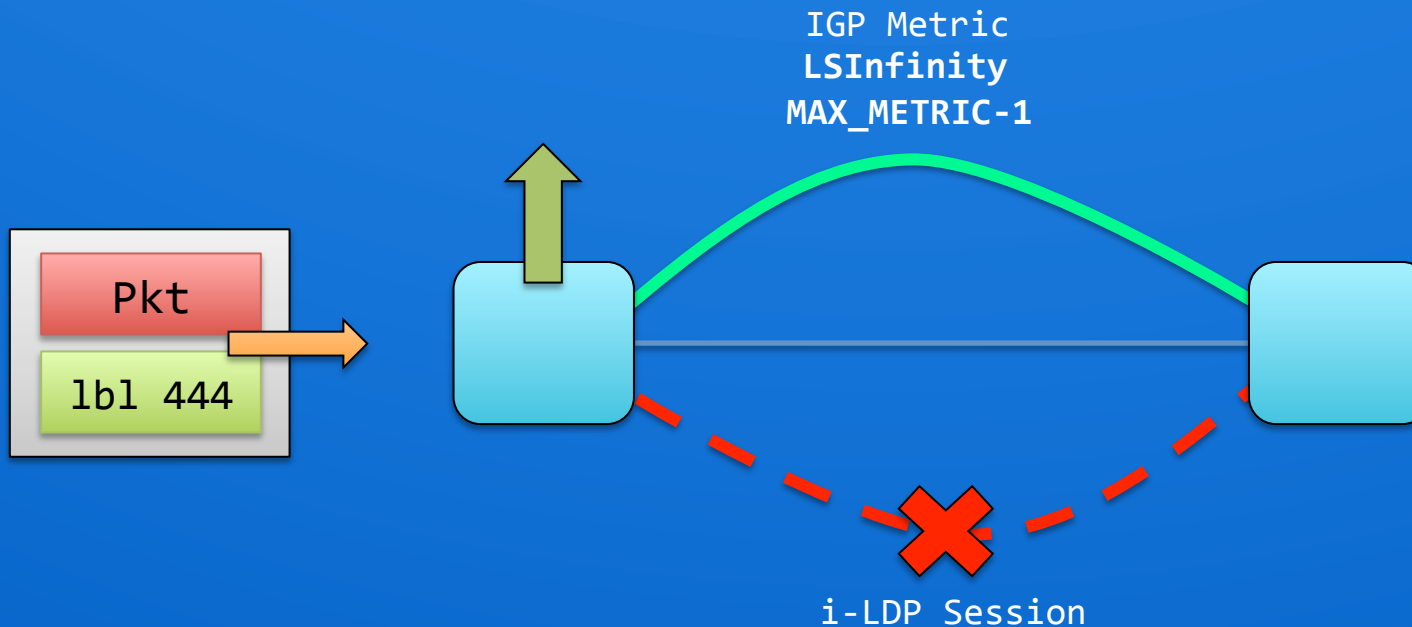


100% COVERAGE REQUIRES EXPLICIT FORWARDING.

# LDP-IGP SYNC.

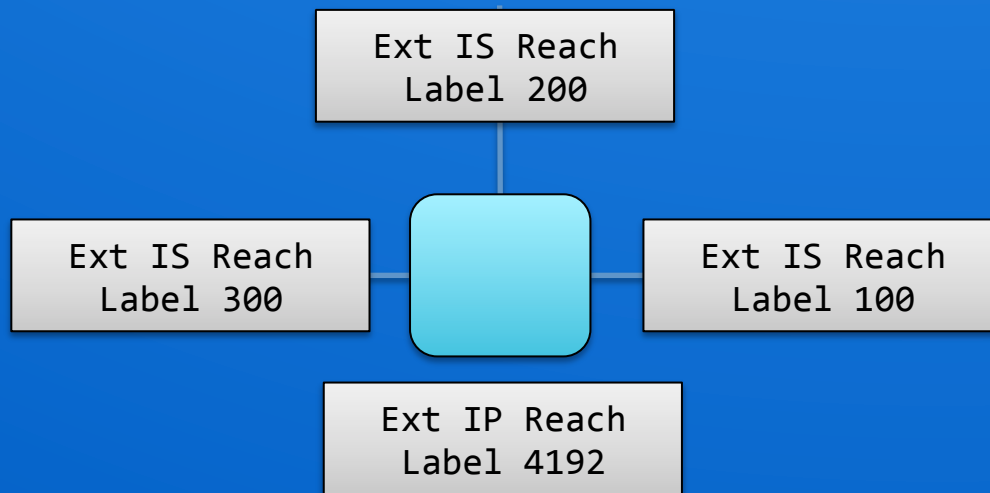


# LDP-IGP SYNC.

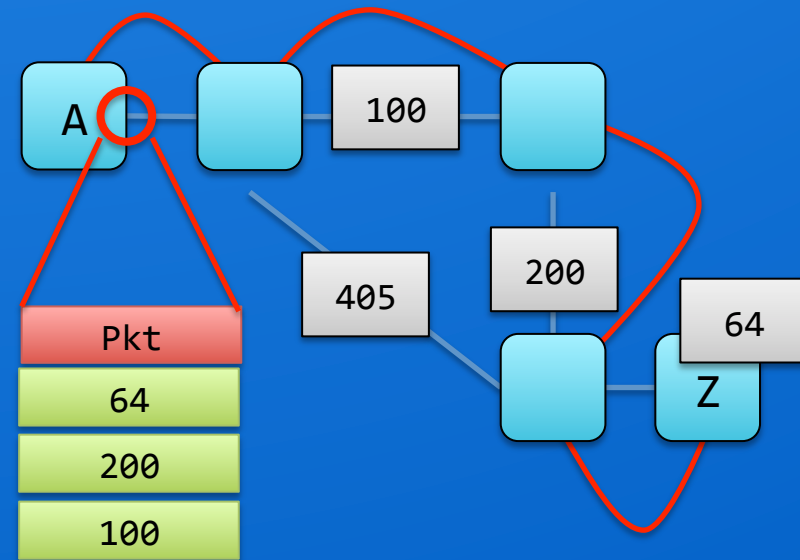


DECOUPLING OF LABEL REACHABILITY AND IGP REACHABILITY – KLUDGE?

# SOURCE PACKET ROUTING IN NETWORKING.

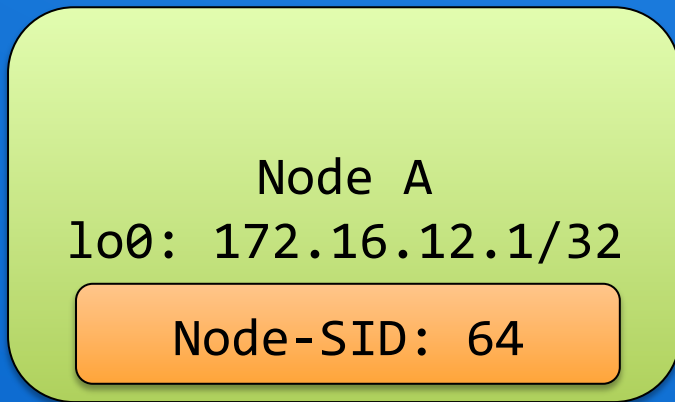


LABEL ADVERTISEMENT IN THE IGP.



FORWARDING BASED ON STACKED LABELS.

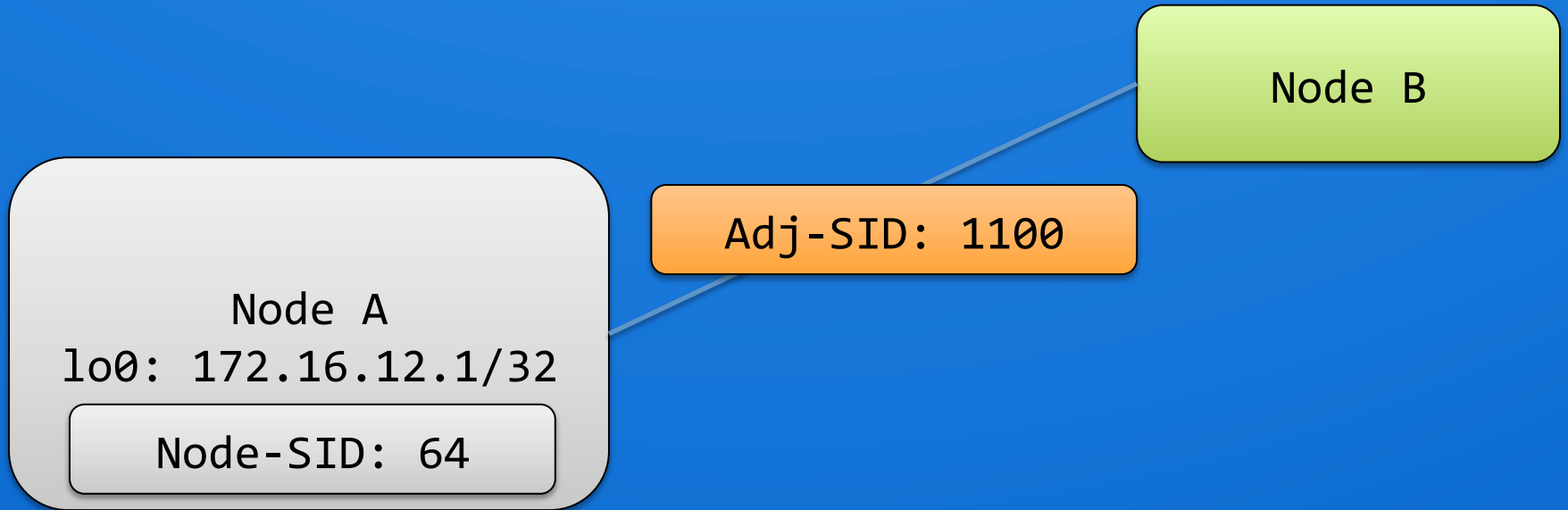
# SEGMENT IDENTIFIERS.



**NODE SID:**

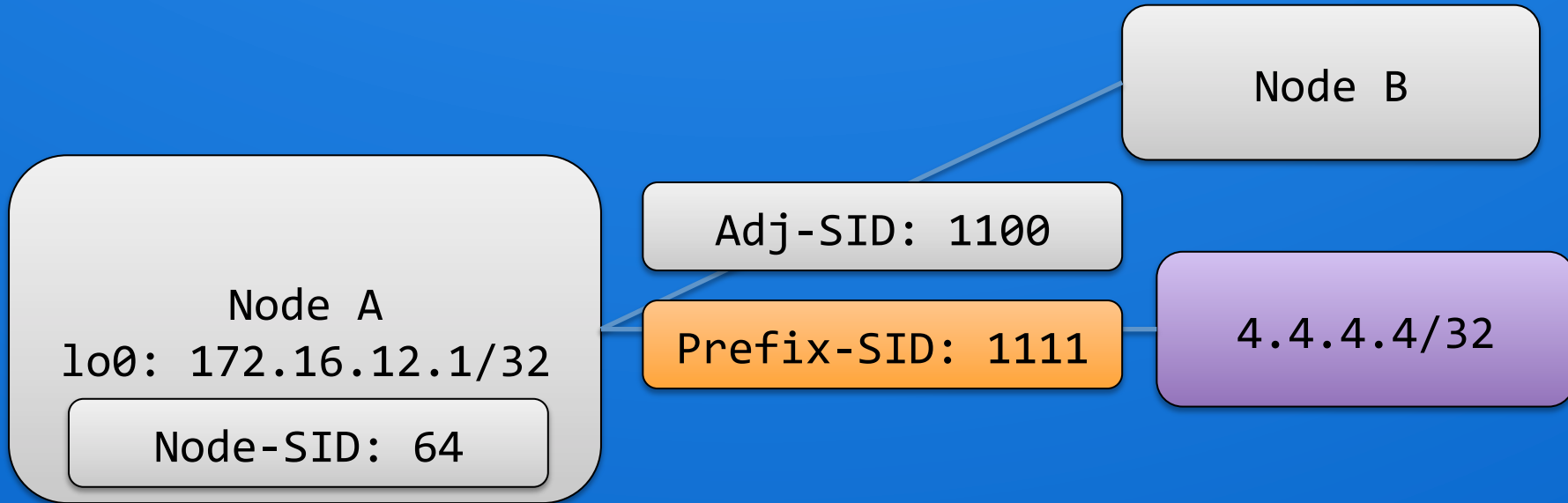
**GLOBAL (INDEXED) LABEL ALLOCATION INDICATING  
SPT TO ADVERTISING NODE (SPECIAL PREFIX SID).**

# SEGMENT IDENTIFIERS.



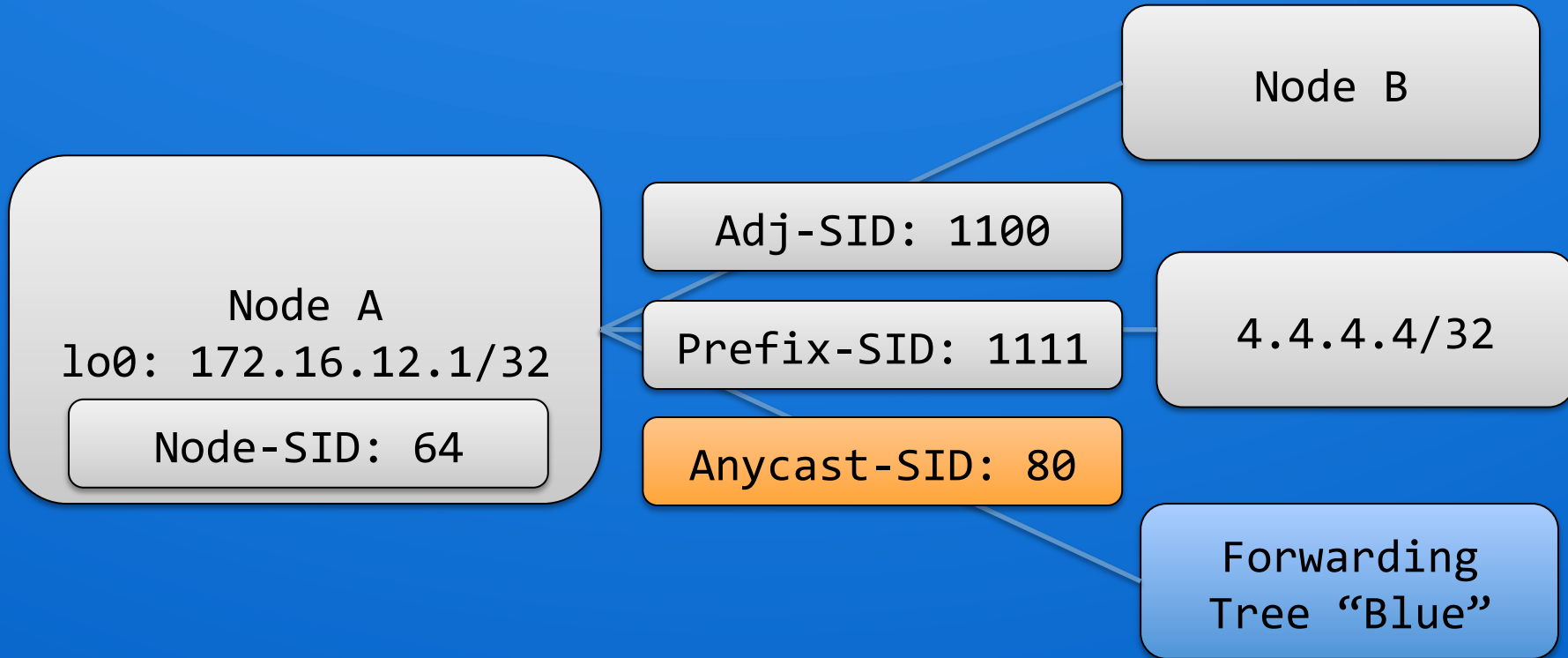
**ADJACENCY SID:**  
LOCAL LABEL ALLOCATION INDICATING A LINK (OR SET OF LINKS) WITHIN THE IGP TOPOLOGY.

# SEGMENT IDENTIFIERS.



**PREFIX SID:**  
LOCAL LABEL ALLOCATION INDICATING AN IGP  
"LEAF" IP PREFIX (E.G, ATTACHED NODE).

# SEGMENT IDENTIFIERS.

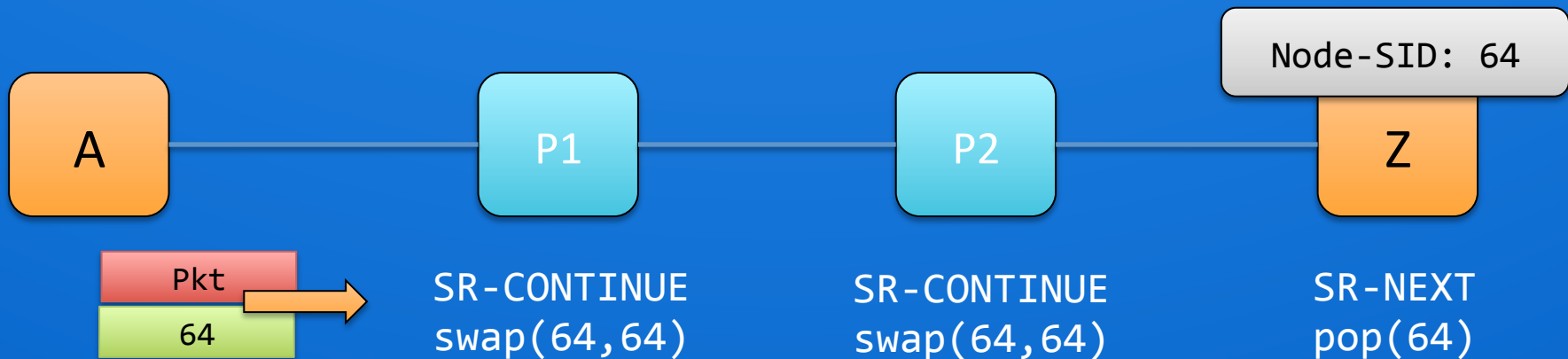


**IGP-ANYCAST SID:**  
GLOBAL LABEL ALLOCATION INDICATING  
REACHABILITY TO A CERTAIN RESOURCE OR  
FORWARDING PATH.



# SPRING FORWARDING.

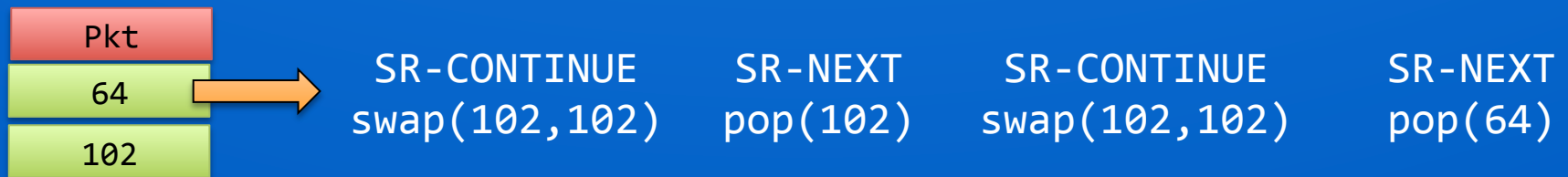
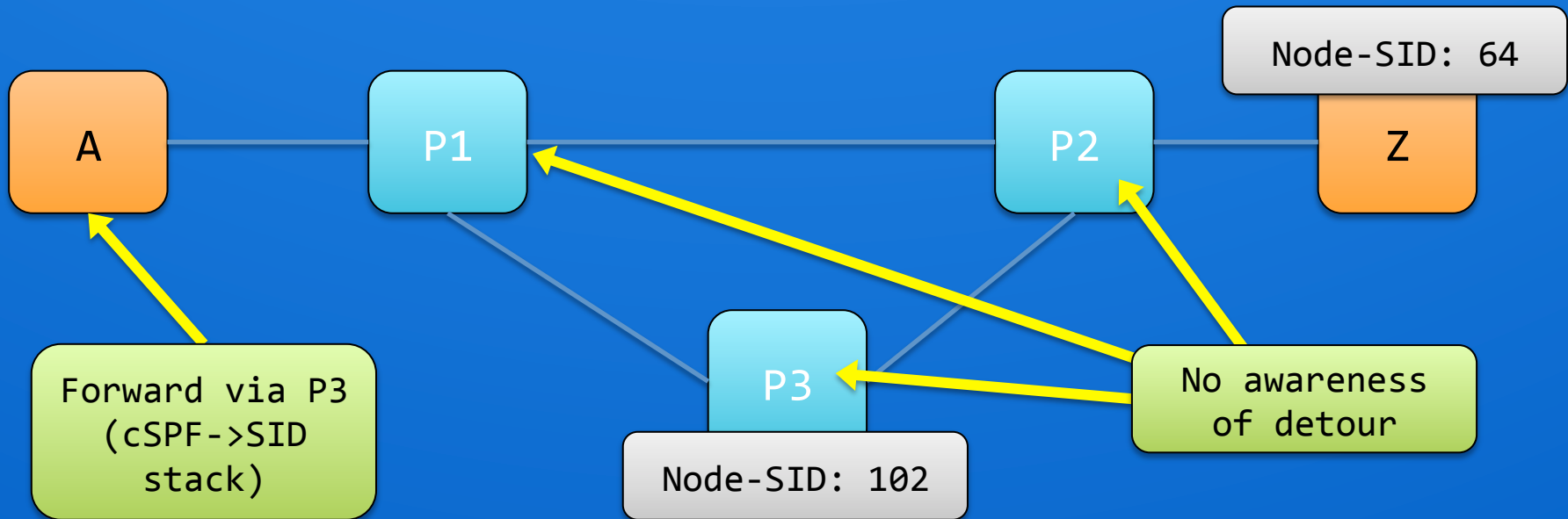
NODE-TO-NODE ALONG SPT:



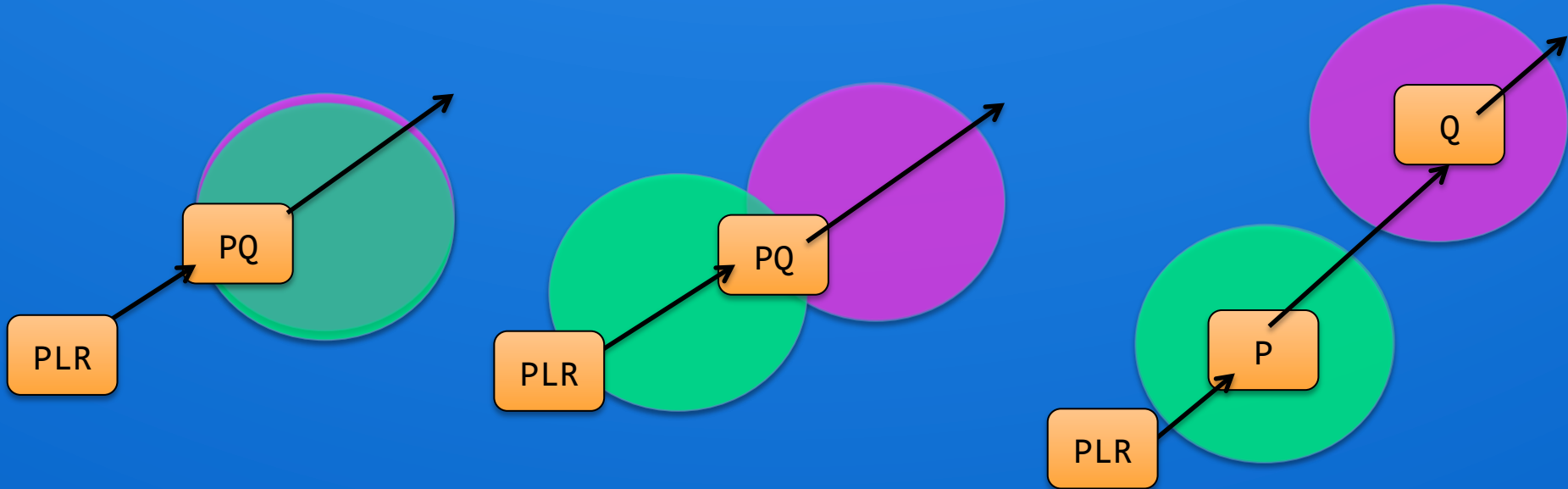
**NO NEED FOR LDP FOR FORWARDING TO NODES WITH NODE-SID, OR FECs WITH IGP-PREFIX-SID – CAN ELIMINATE LDP AND LDP-IGP SYNC.**

# SPRING TACTICAL TE.

## NODE-TO-NODE – TACTICAL TE:



# IP FRR WITH SPRING.



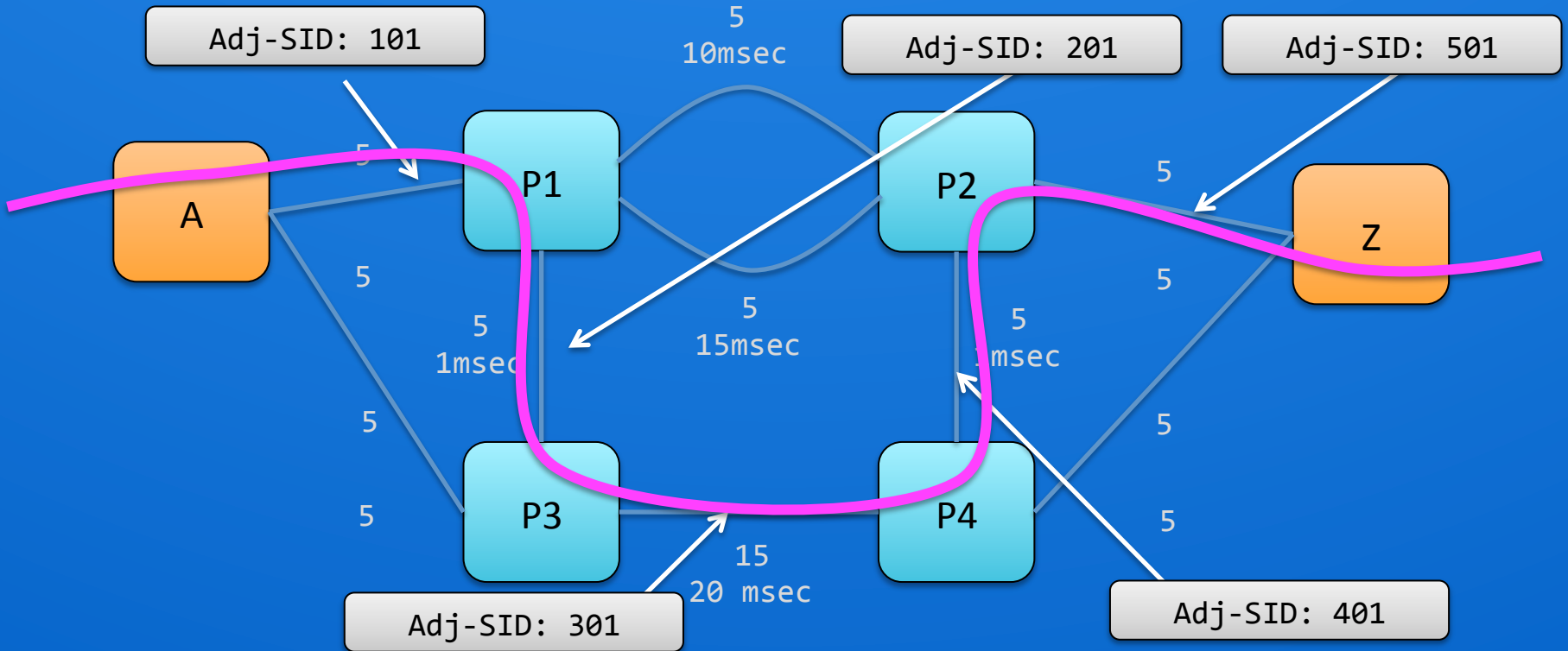
“VANILLA LFA”:  
PUSH()

“REMOTE LFA”:  
PUSH(PQ)

“DIRECTED LFA”:  
PUSH(P, P-Q)

**SINGLE FORWARDING APPROACH FOR ALL LFA –  
NO ADDITIONAL CONTROL-PLANE REQUIRED.**

# EXPLICIT FORWARDING.



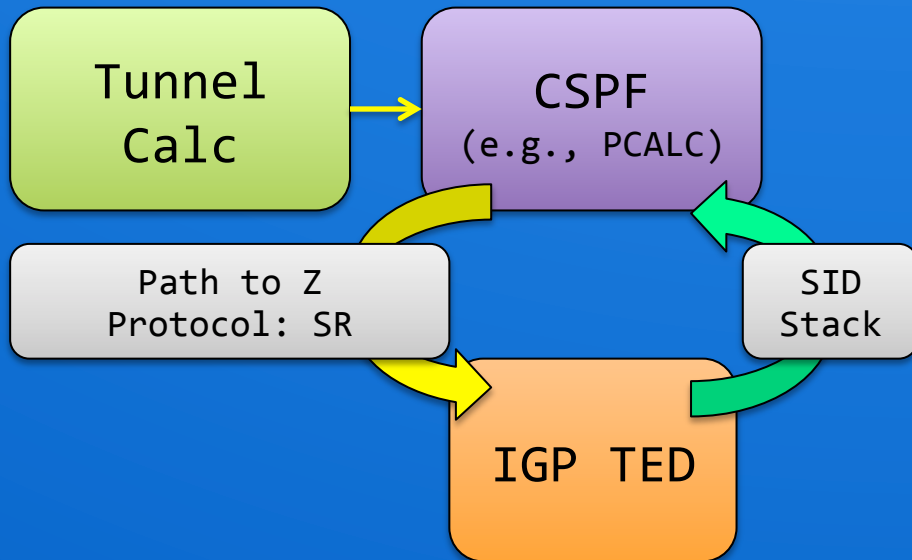
SR-NEXT  
pop(201)  
NHOP: P3

SR-NEXT  
pop(301)  
NHOP: P4

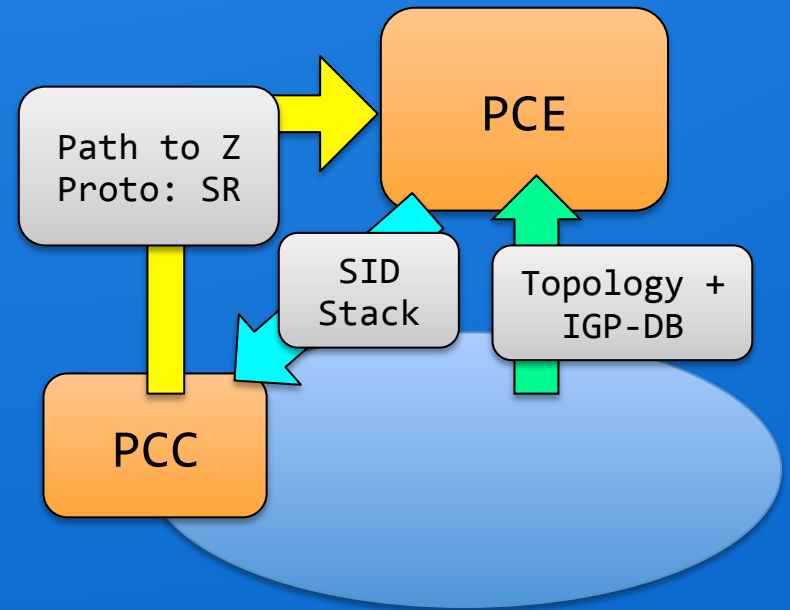
SR-NEXT  
Pop(401)  
NHOP: P4

SR-NEXT  
pop(501)

# CALCULATING SIDS.

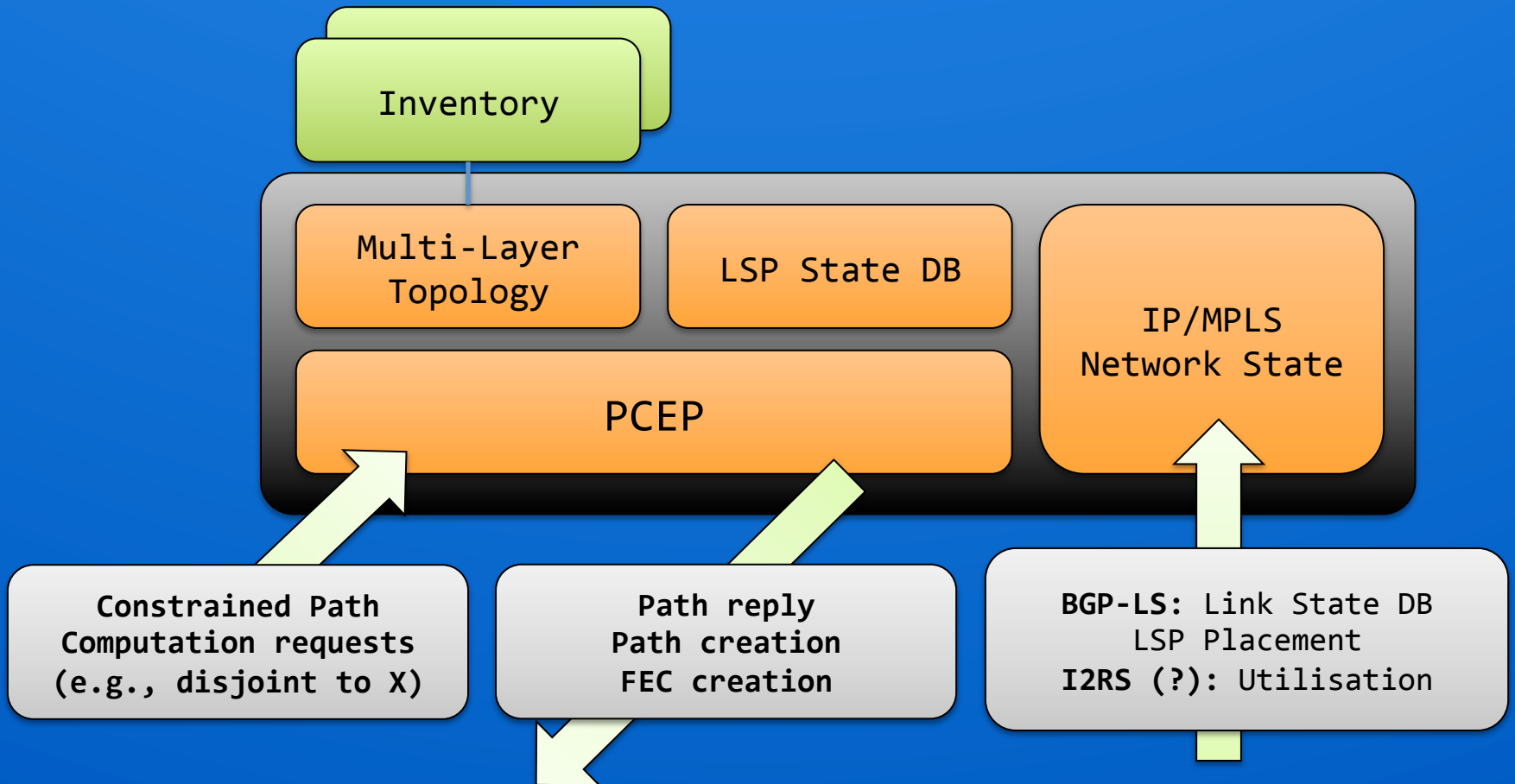


RE-USE OF EXISTING  
CSPF MACHINERY:  
WHERE HEAD-END HAS  
VISIBILITY OF ALL  
REQUIRED ROUTING INFO.

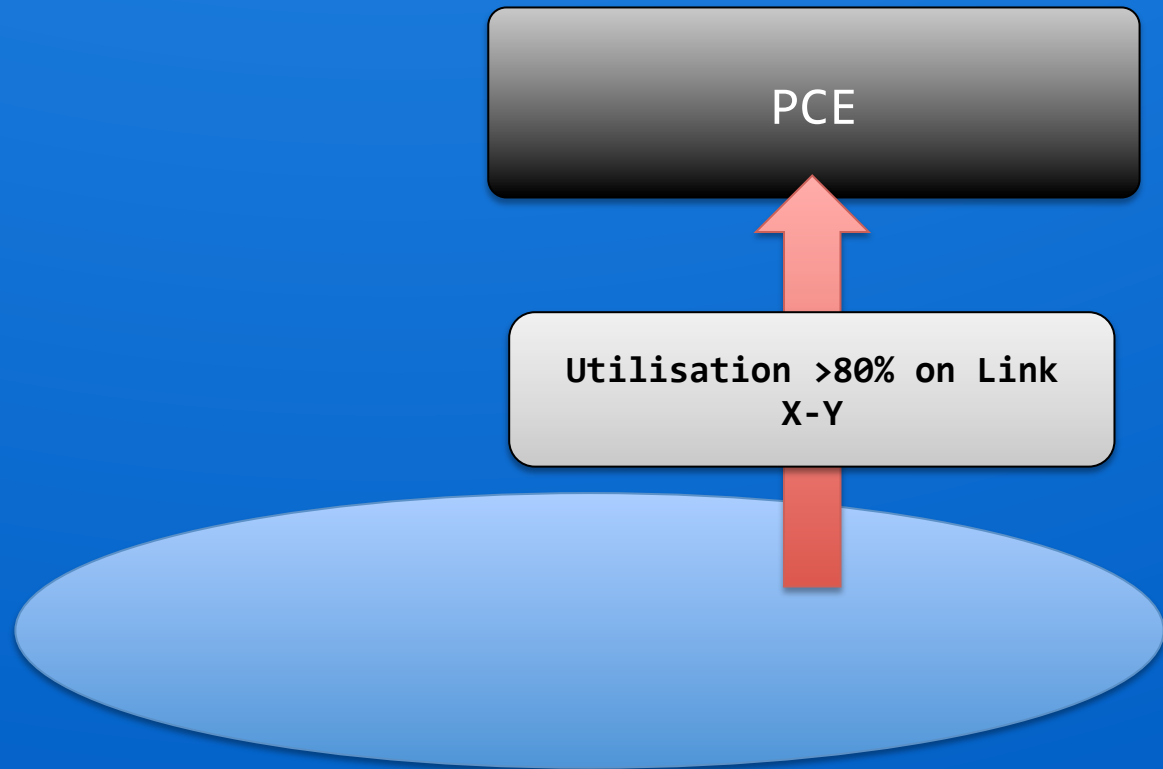


USE OF PATH  
COMPUTATION ELEMENT:  
GIVING HEAD-END  
ADDITIONAL VISIBILITY  
OR EXTERNAL INFO.

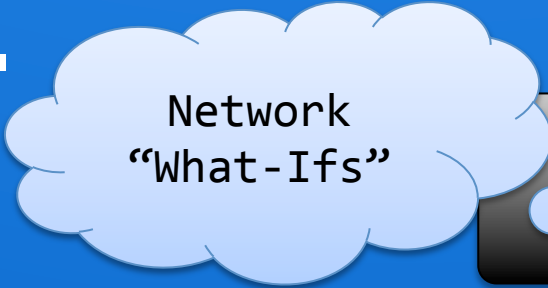
# PCE – EXTRACTING NETWORK INFO.



# AUGMENTED REACTIVE IP/MPLS CONTROL PLANE.



# AUGMENTED REACTIVE IP/MPLS CONTROL PLANE.



Network  
“What-Ifs”



PCE

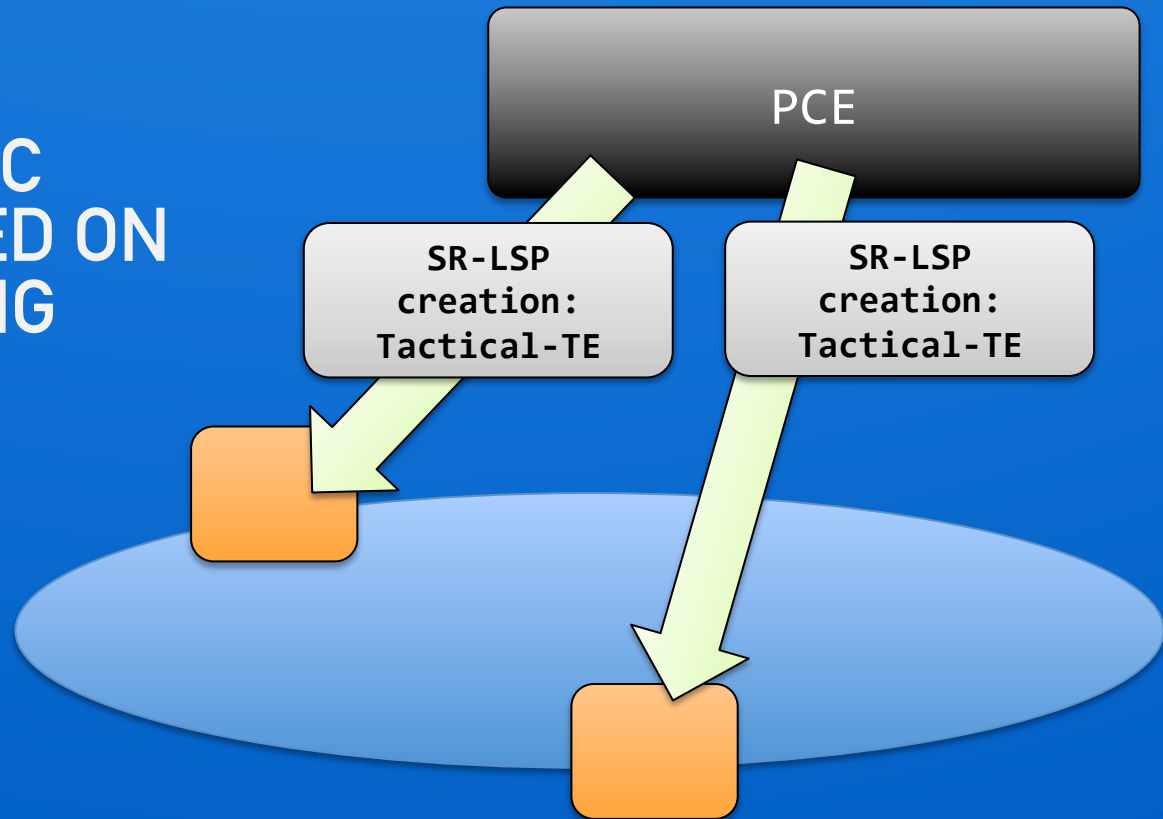
RE-OPTIMISATION  
BASED ON GLOBAL  
RESOURCE VISIBILITY





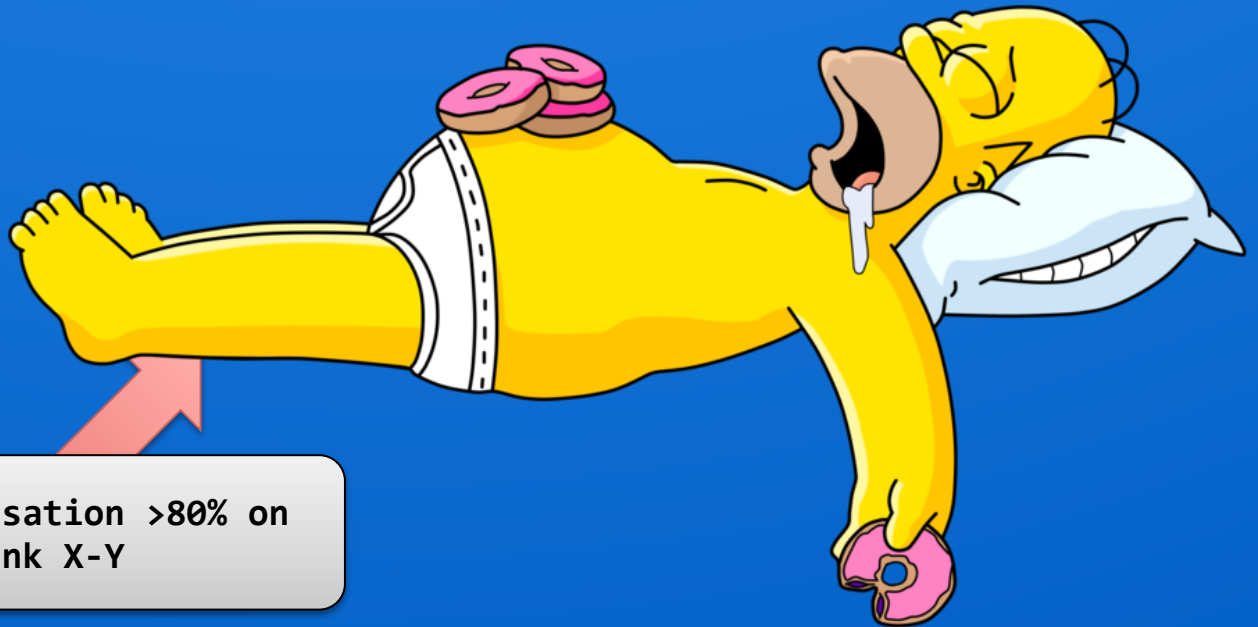
# AUGMENTED REACTIVE IP/MPLS CONTROL PLANE.

LSP AND/OR FEC  
CREATION BASED ON  
SR – NO SCALING  
IMPACT.



# AUGMENTED REACTIVE IP/MPLS CONTROL PLANE.

MEANWHILE...\*



SMS: Utilisation >80% on  
Link X-Y

\* Does not reflect real NOC staff.



# THANKS – QUESTIONS?

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