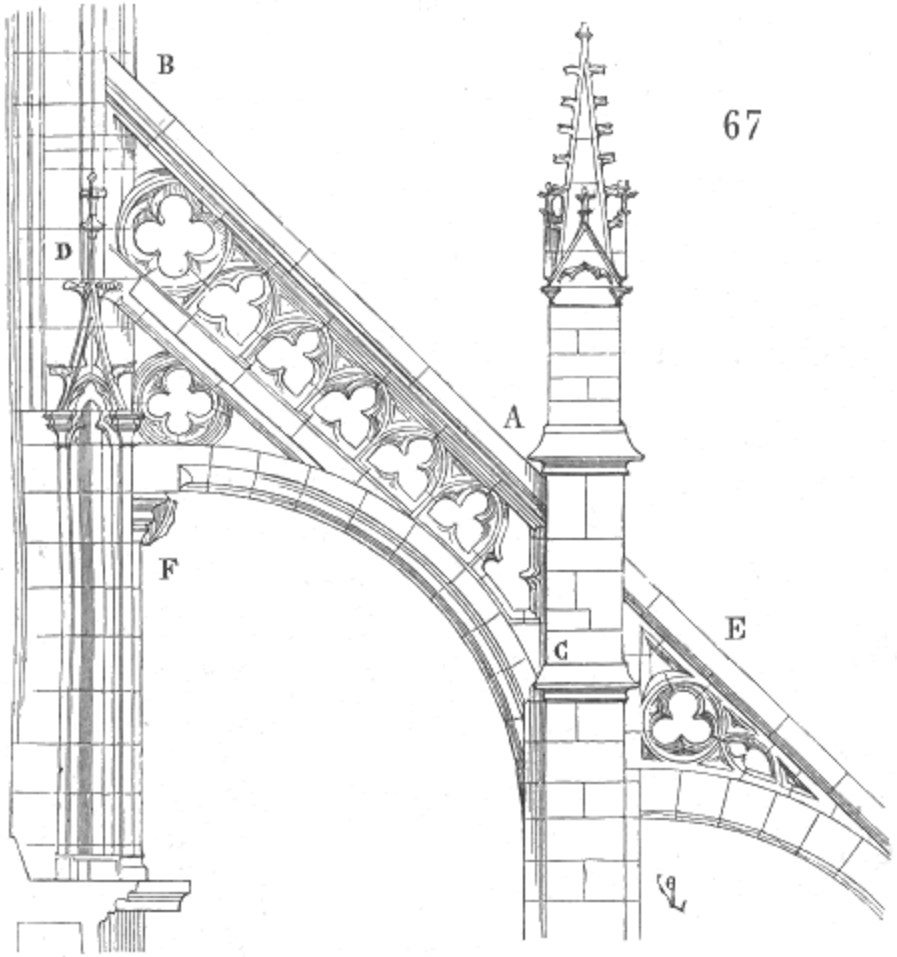


Bicasting along ARCs

draft-thubert-rtgwg-arc-bicast-00

Pascal Thubert
Cisco

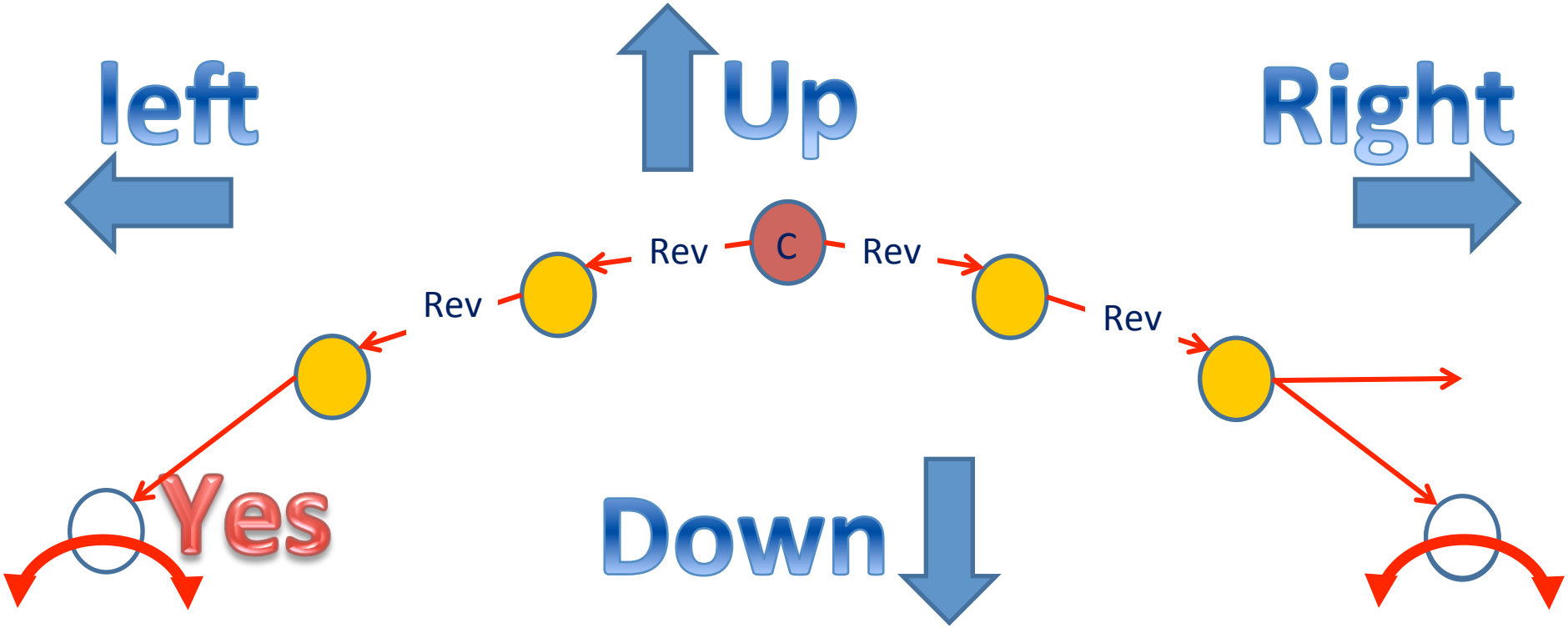
IJsbrand Wijnands
Cisco

RTG Area WG, Atlanta, 2012

Problem: meet latency and jitter constraints in potentially lossy networks

- Bicasting limits loss and controls jitter
  - Sends 2 copies over
  - 2 non-congruent paths
- Or keep alternate path in hot stand by
- Applies to:
  - Datacenters
  - SP (videostreams)
  - Industrial LLN

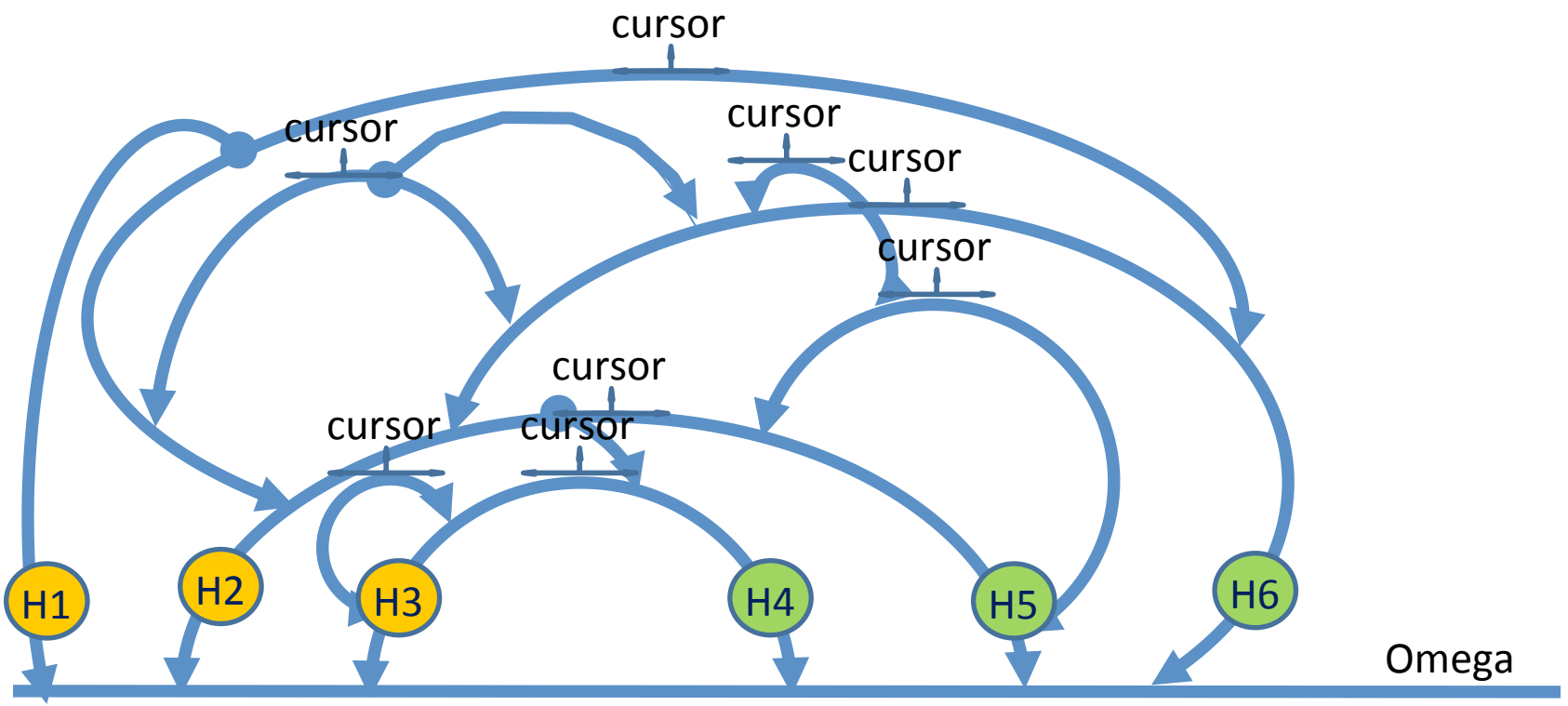
Adding Bicasting to ARCs



A concept of Left and Right is introduced.

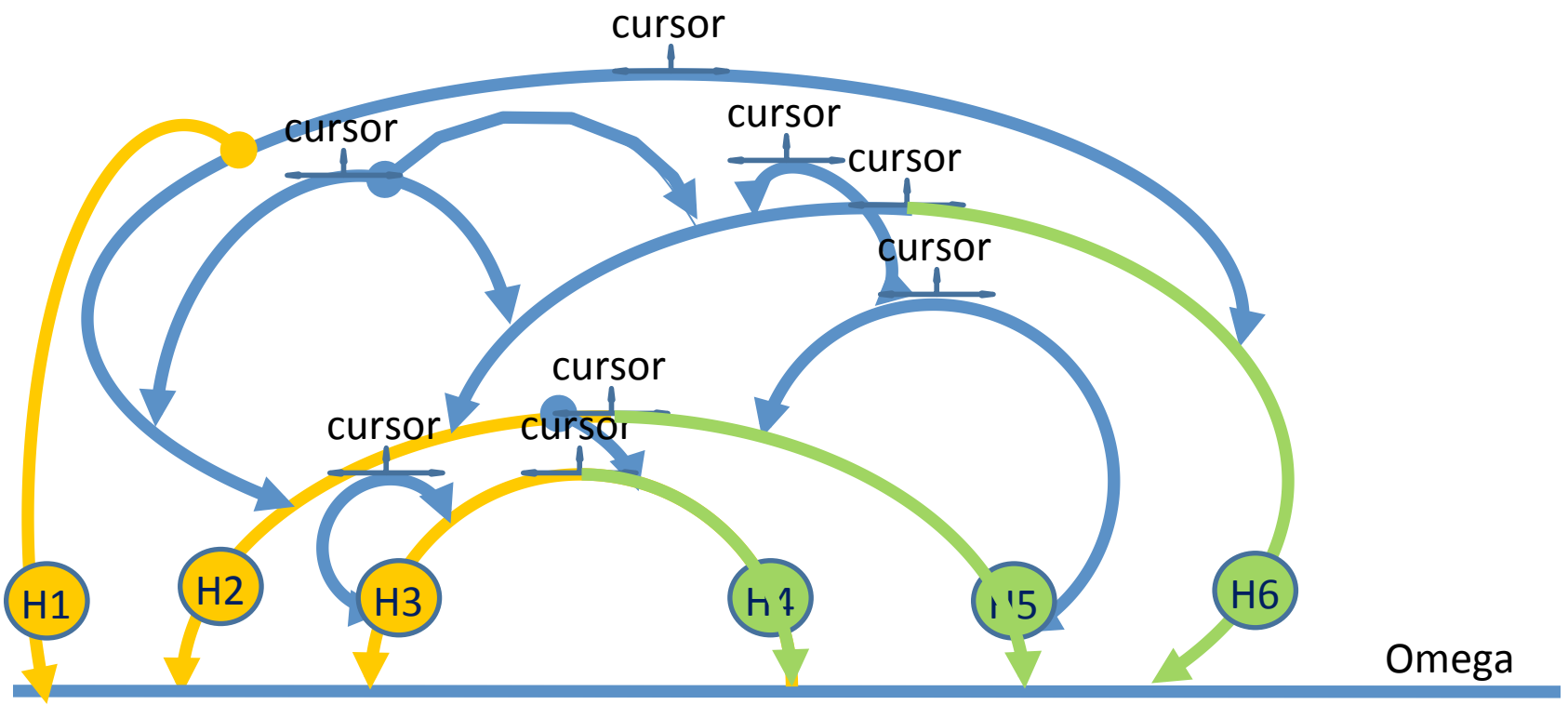
Building L/R indicators

When an ARC is formed, each end is associated to a side.
At least one Right (green) and one Left (orange) per ARC



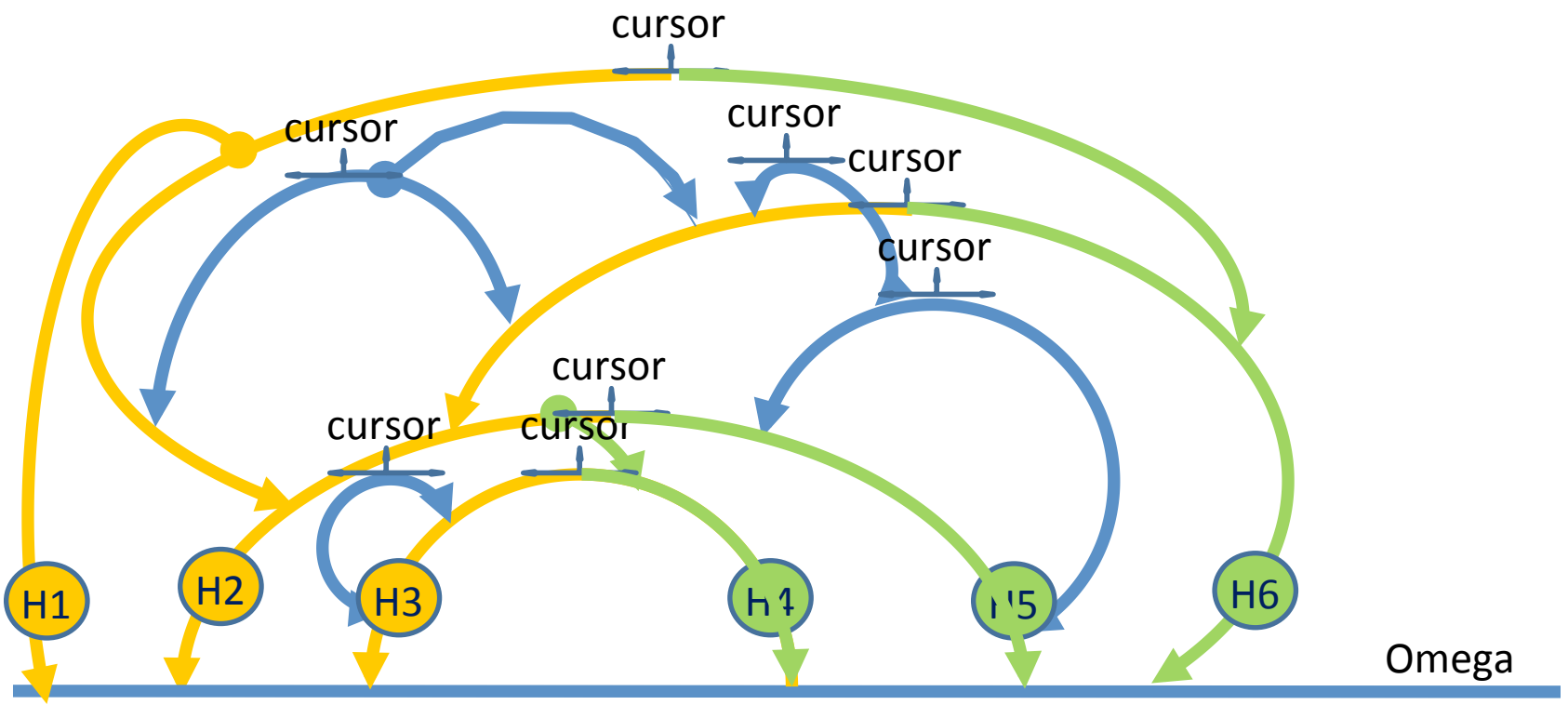
Building L/R indicators (cont'd)

Nodes between cursor and edge are associated to the edge side
For an edge ending at Omega, the association is free form



Building L/R indicators (cont'd)

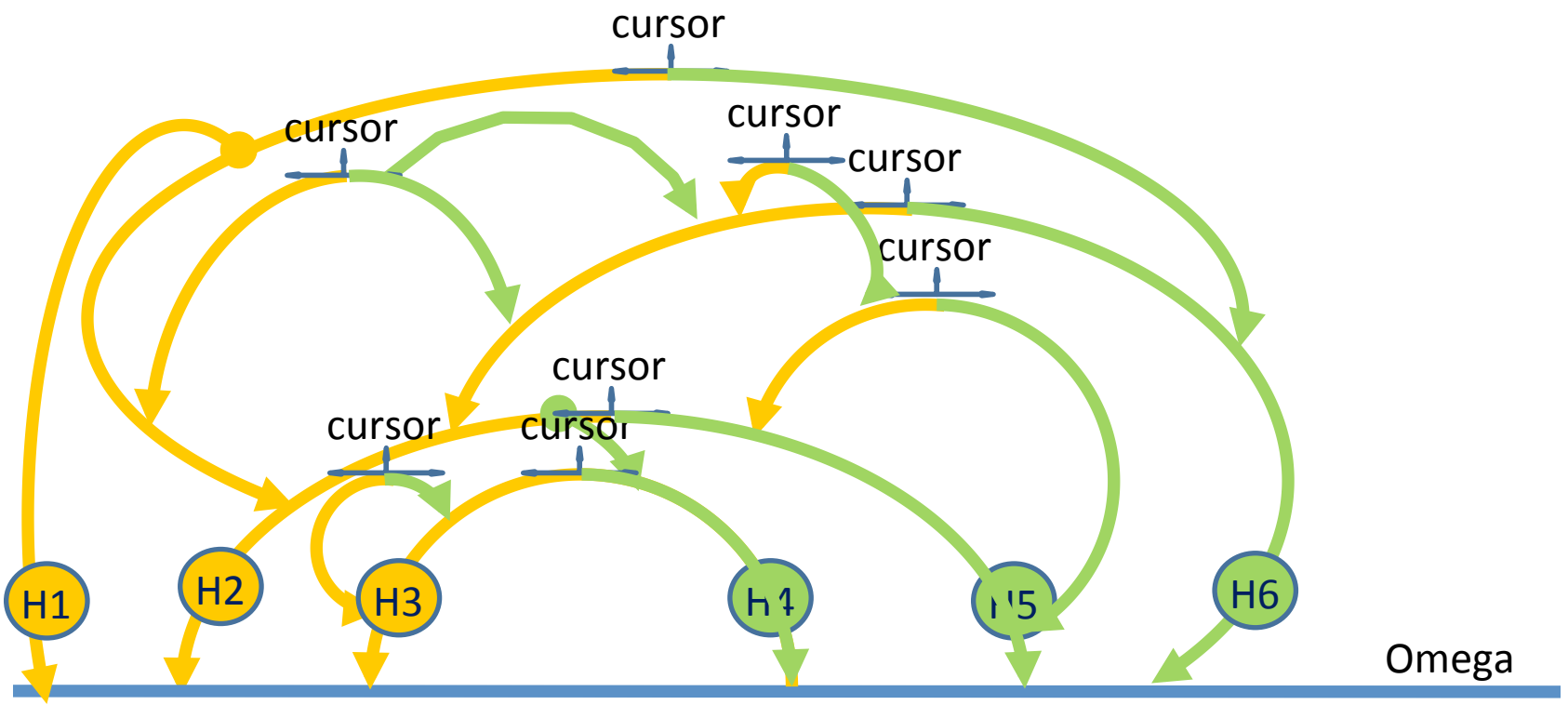
For and ARC ending in another ARC, the end is associated to the same heir as the node the ARC exits into. This keeps ARC bicasting routes close to shortest path.



Building L/R indicators (cont'd)

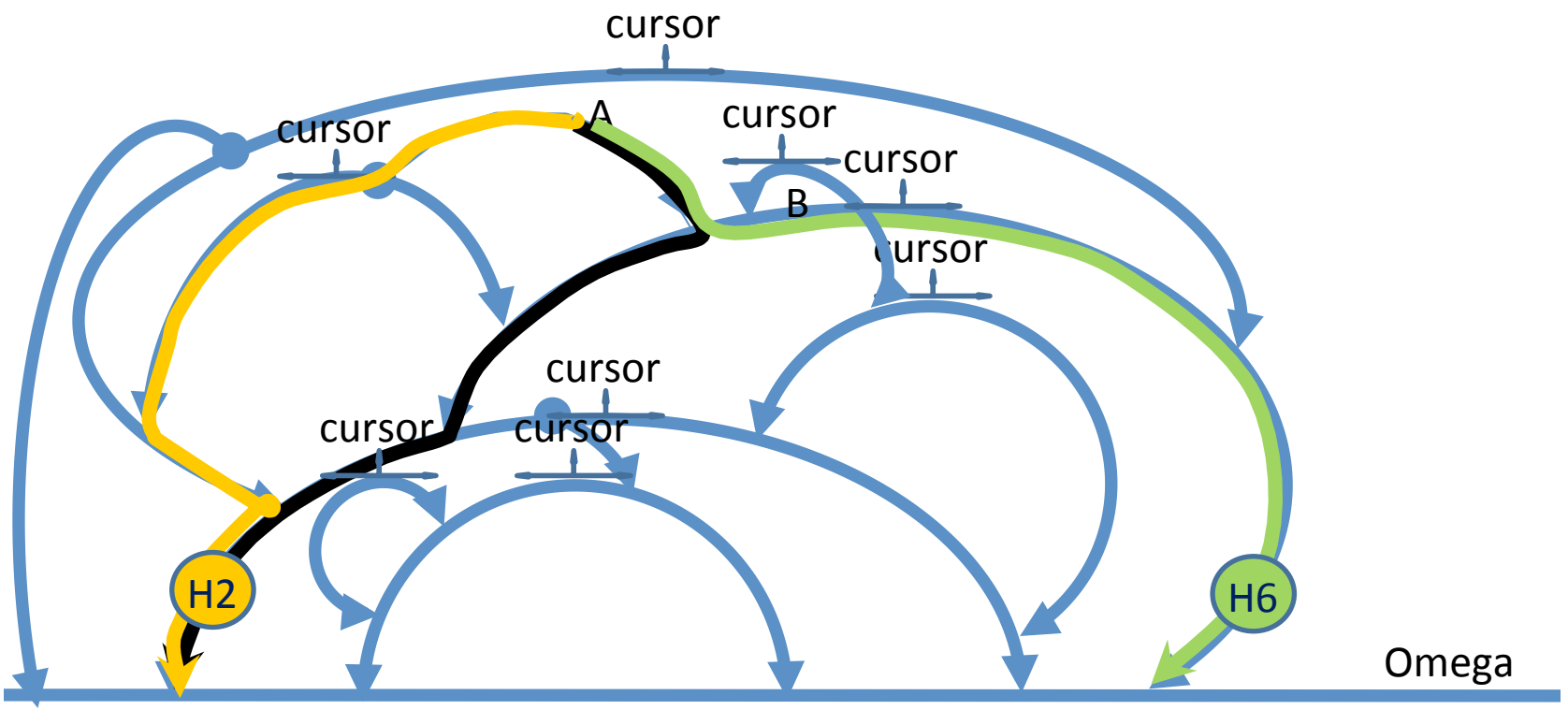
In case of collision (both ends of an ARC select the same heir)

- One end picks that heir (shortest path)
- The other picks the heir of the other end of the ARC it falls into



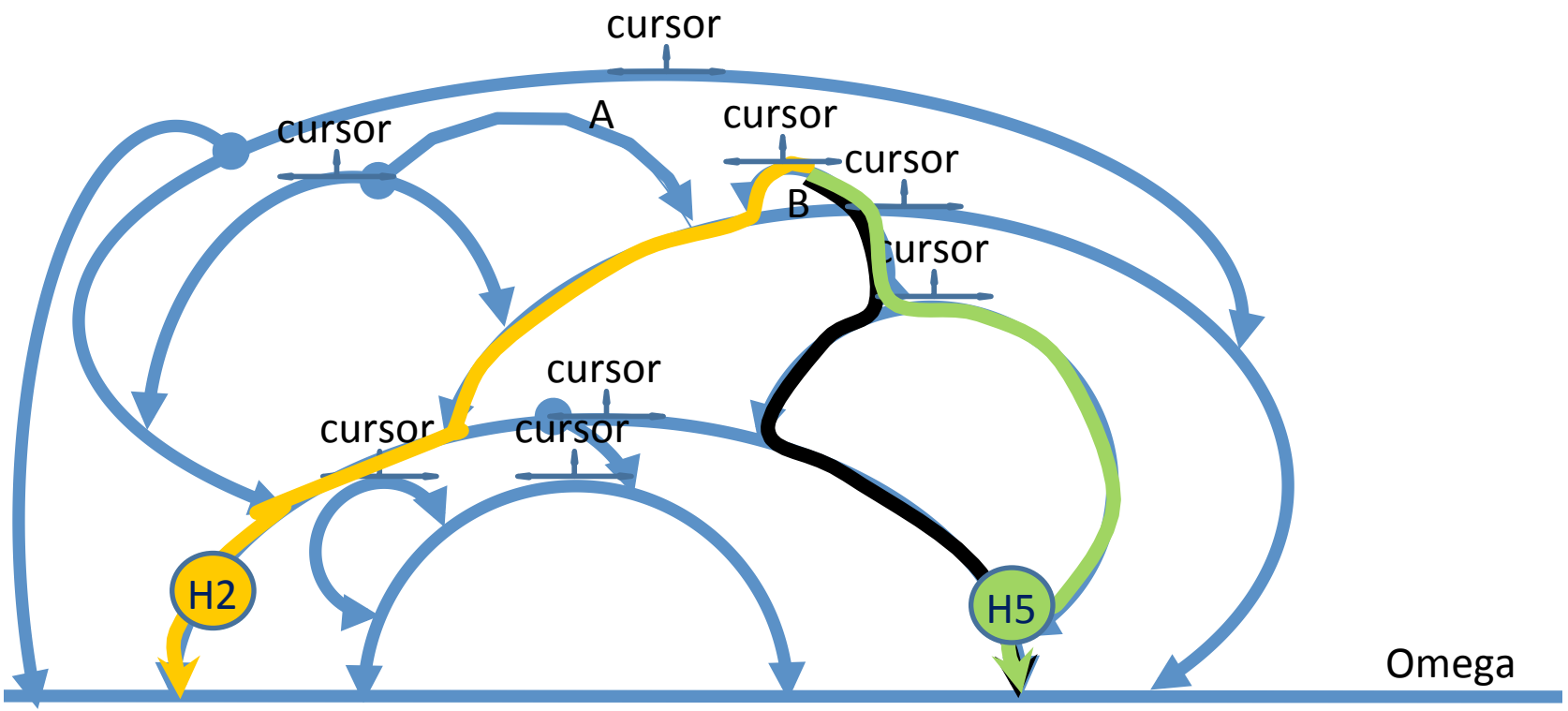
Bicasted routing (ex)

2 packet copies are colored by the colors of the ARC through which the original packet is injected
Packet copies exit ARCs by the the edge corresponding to their color.
Below, the black path is shortest whereas the
orange and green paths are Left and Right paths (via H2 and H6)



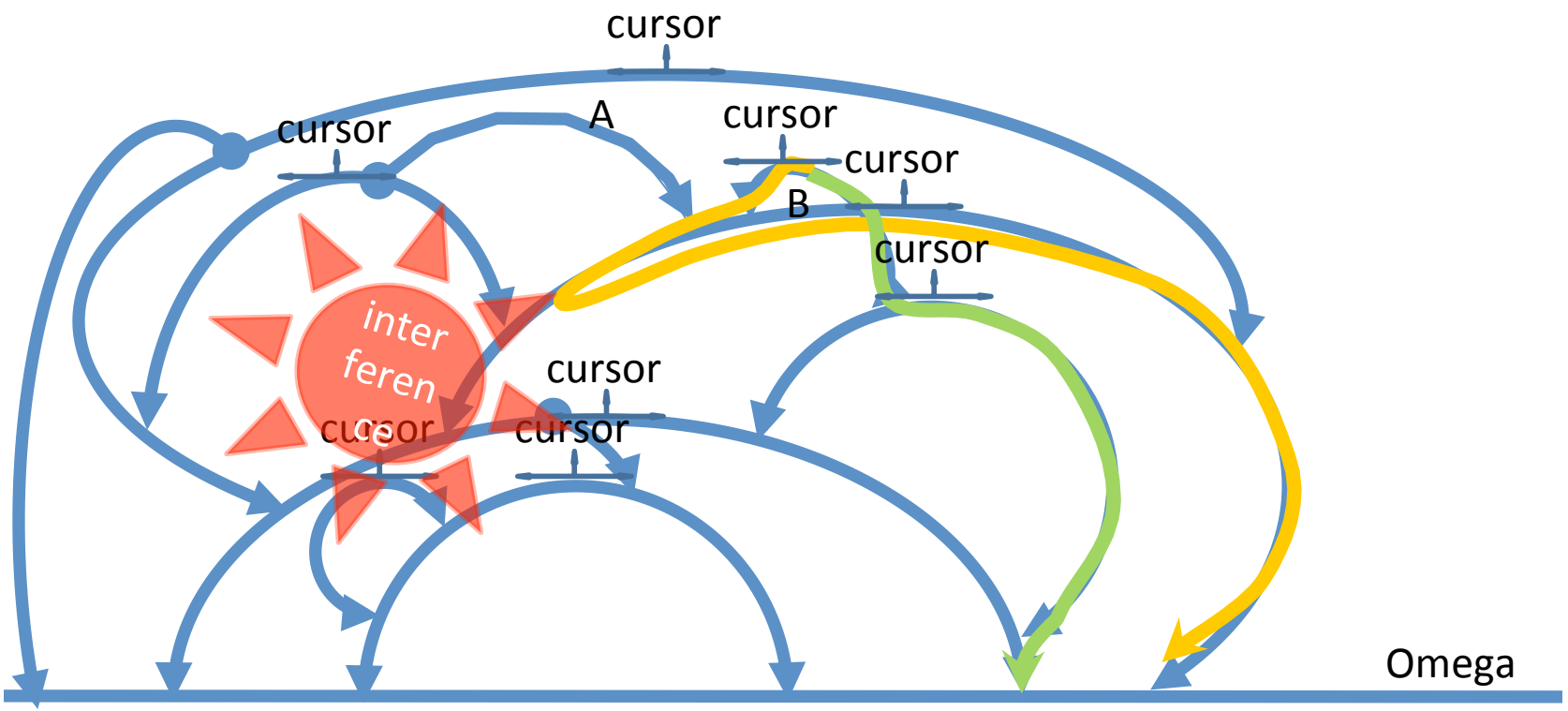
Bicasted routing (2nd ex)

L/R Packets are routed away along there E/W tag,
=> independent of the cursor.
L/R tagging is used to prevent re-U-turning in a same ARC.



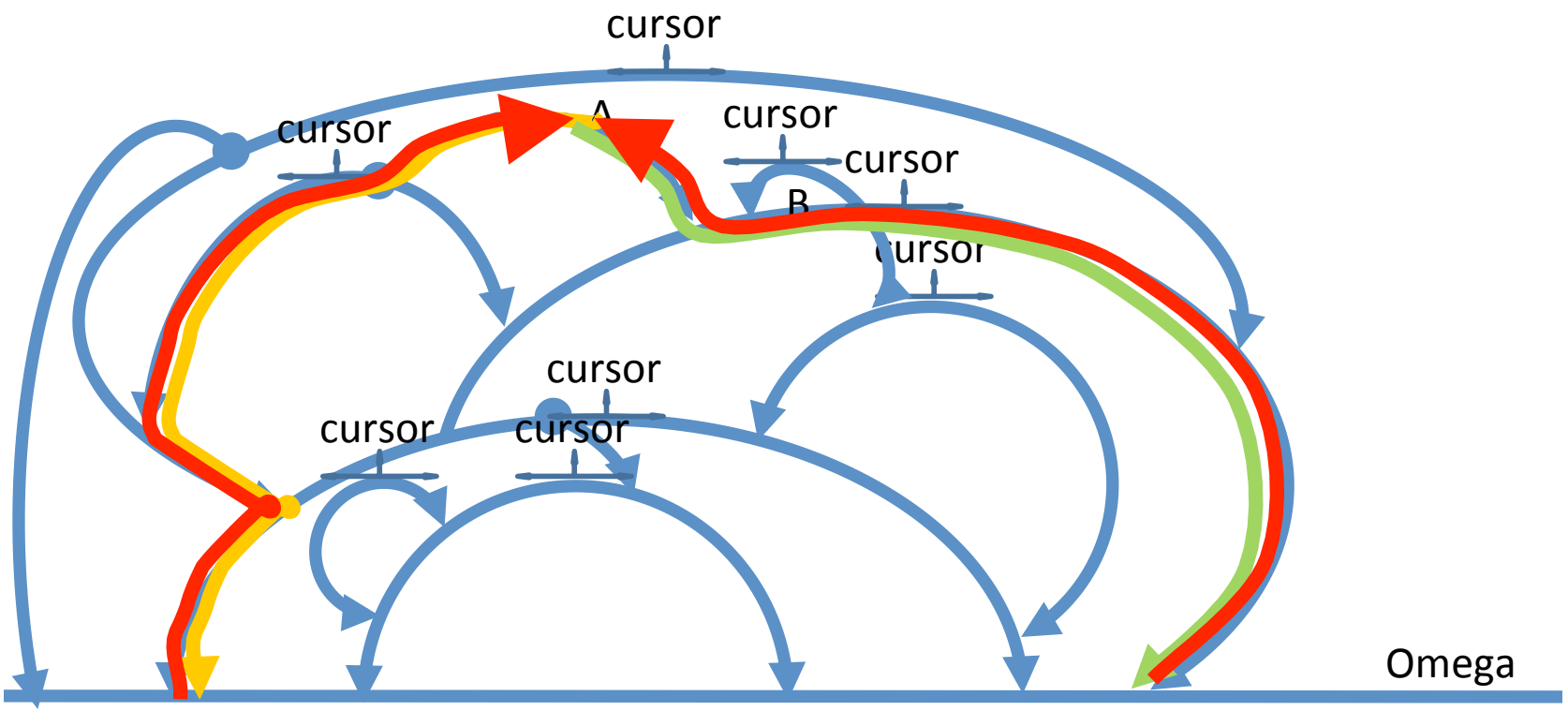
Bicasted routing (2nd, with breakage)

E/W Packets are routed away along there E/W tag,
=> independent of the cursor.
E/W tagging is used to prevent re-U-turning in a same ARC.



Bicasted reservation (ex)

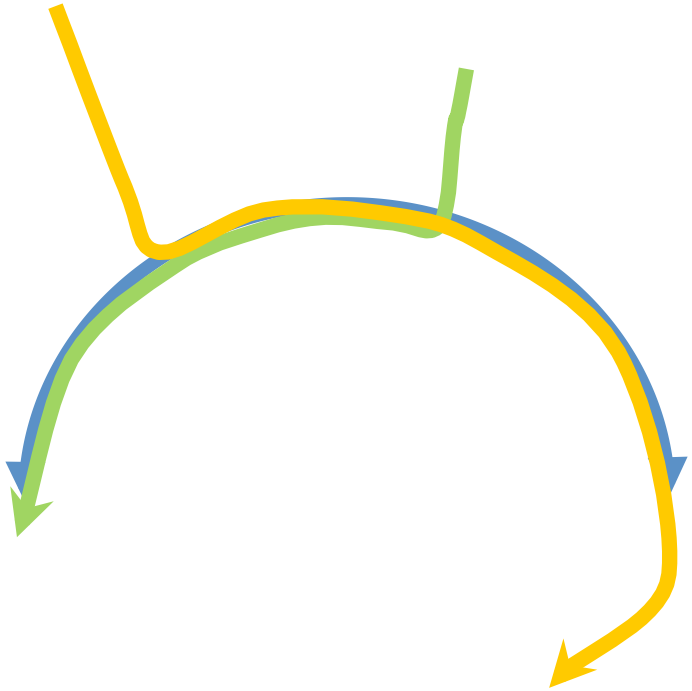
Reservation Packets are routed away along there E/W tag,
For traffic coming back from root (bi-casted, in red)
Collisions are identified and resolved (next slides)

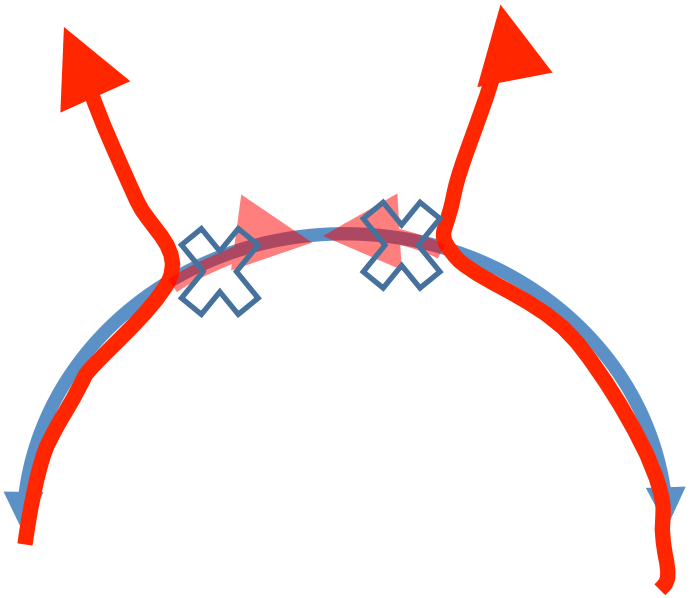


Questions?

Collision type 1

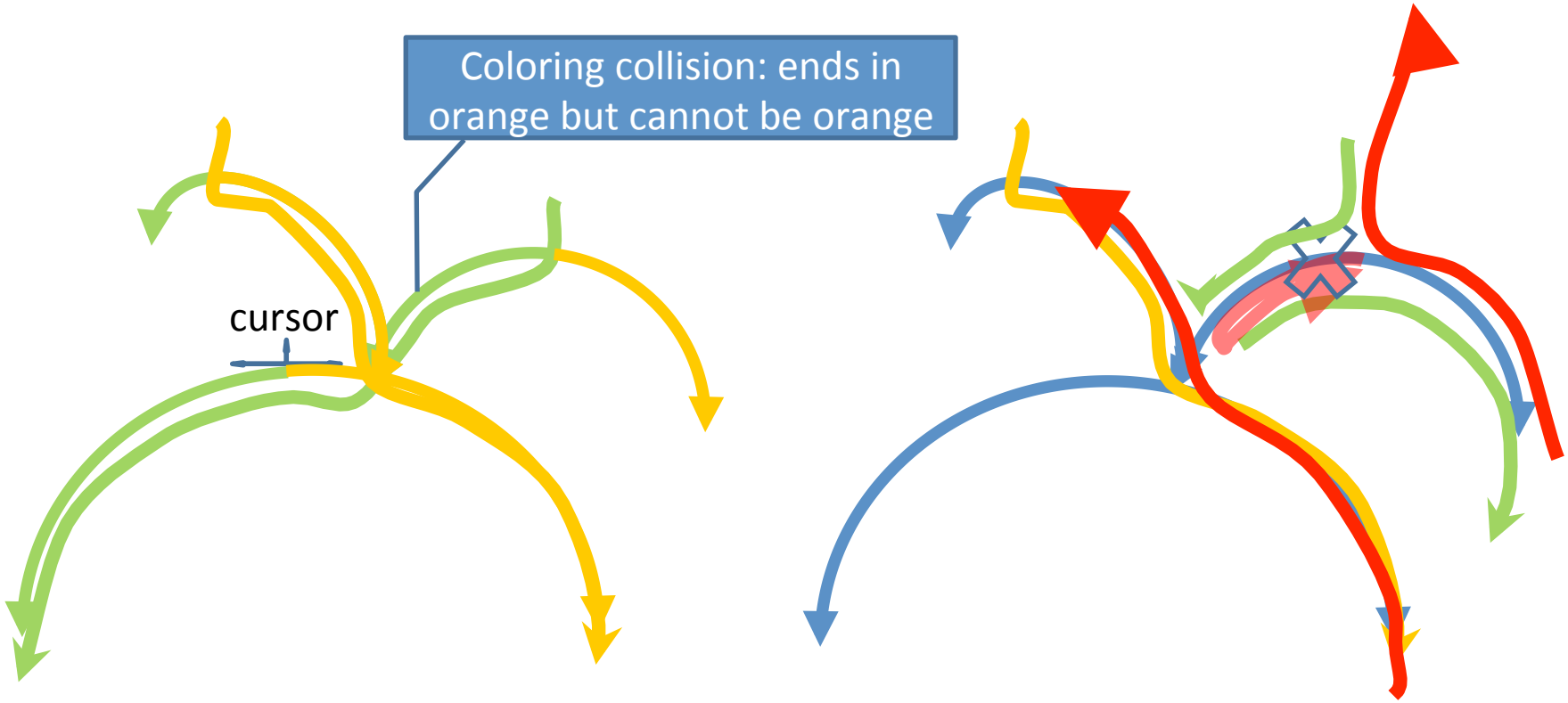
Reservation Packets cross in a same arc from different entry points
Resolution is to prune cross-forwarding along the ARC





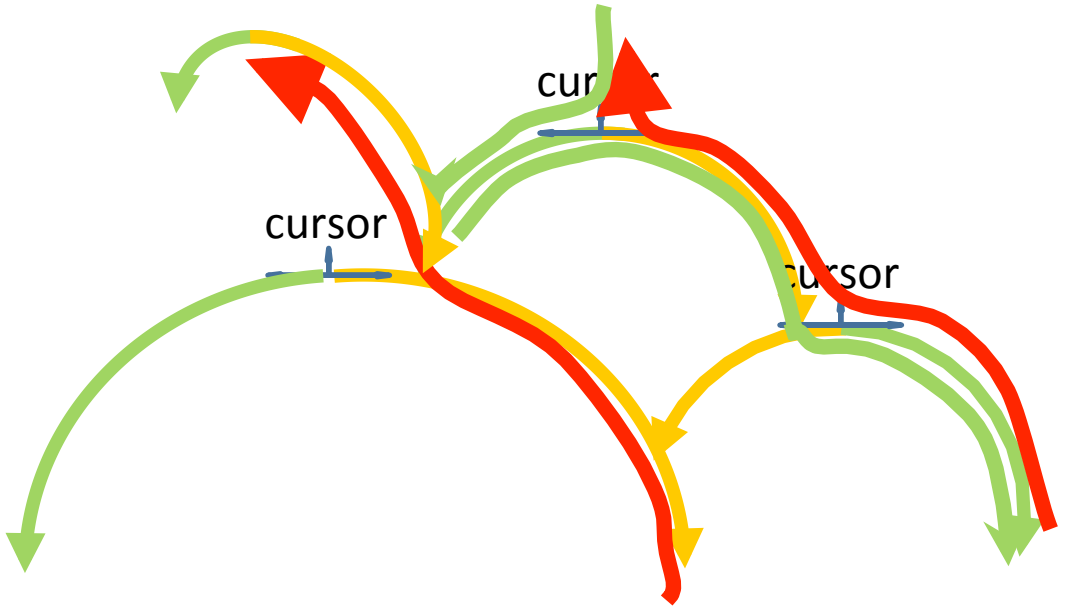
Collision type 2

Reservation Packets enter a same arc at a same entry point
This means an incoming ARC faced a coloring collision (orange below)
Resolution is to return the second reservation packet along its ARC
And prune the u-turn path. Say orange arrived first; green is sent back.



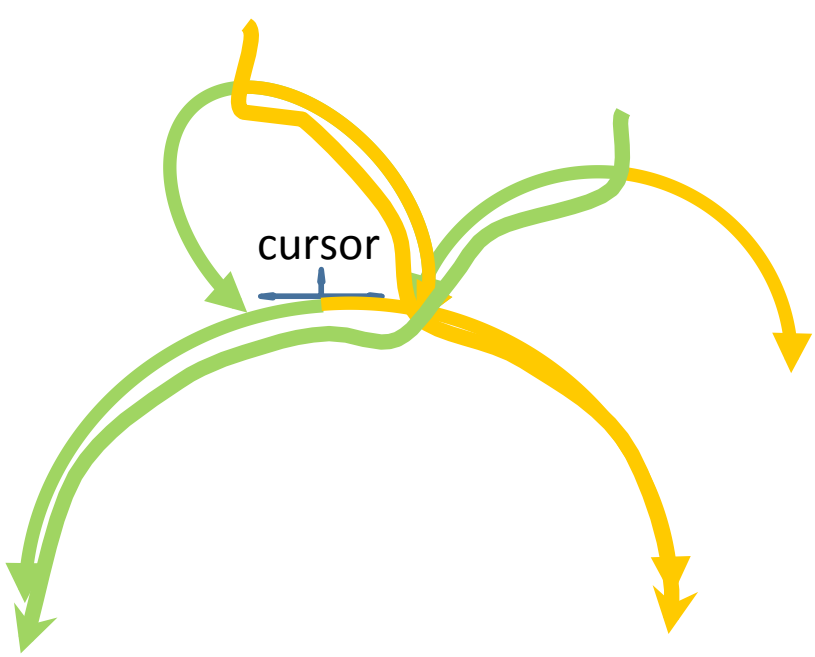
Collision type 2 (cont'd)

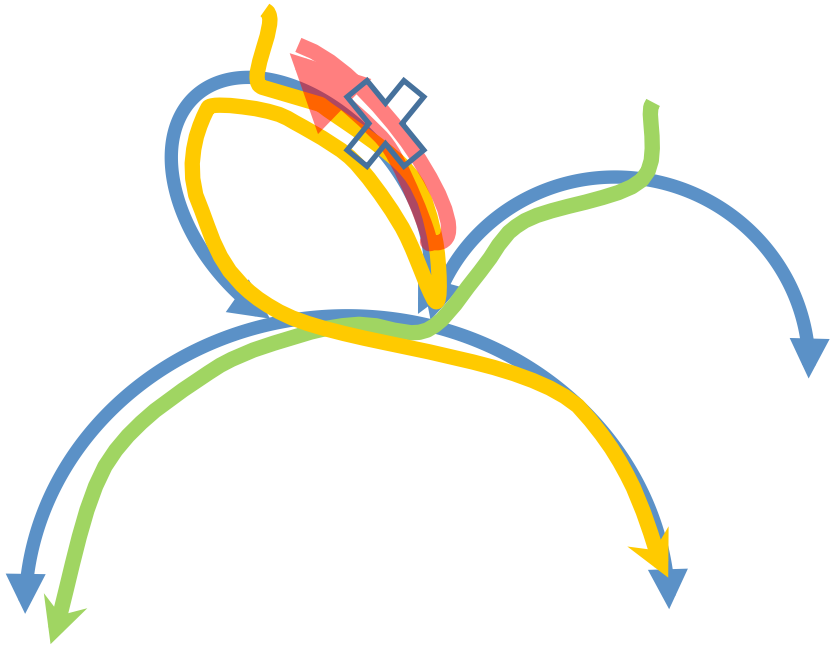
The returned reservation packet arrives on the other end with the wrong color for that end, which is also the color of the other end.
If the packet cannot be forwarded with its original color it is recolored to any color but that of its copy. Returning the packet for a collision is equivalent to a breakage or a missing link if the graph is not biconnected.



Collision type 2 (alt)

Resolution is still to return the second reservation along its ARC
And prune the u-turn path. Say orange arrived last and is sent back.
In this example the orange packet does not need to be recolored at the other end since that terminates in an ARC that has an orange end.





Collision type 2 (alt cont'd)

Now we are back to a collision of type 1 which is resolved by pruning opposite paths along the ARC