Remote-LFA Node Protection and and Manageability

draft-psarkar-rtgwg-rlfa-node-protection-03

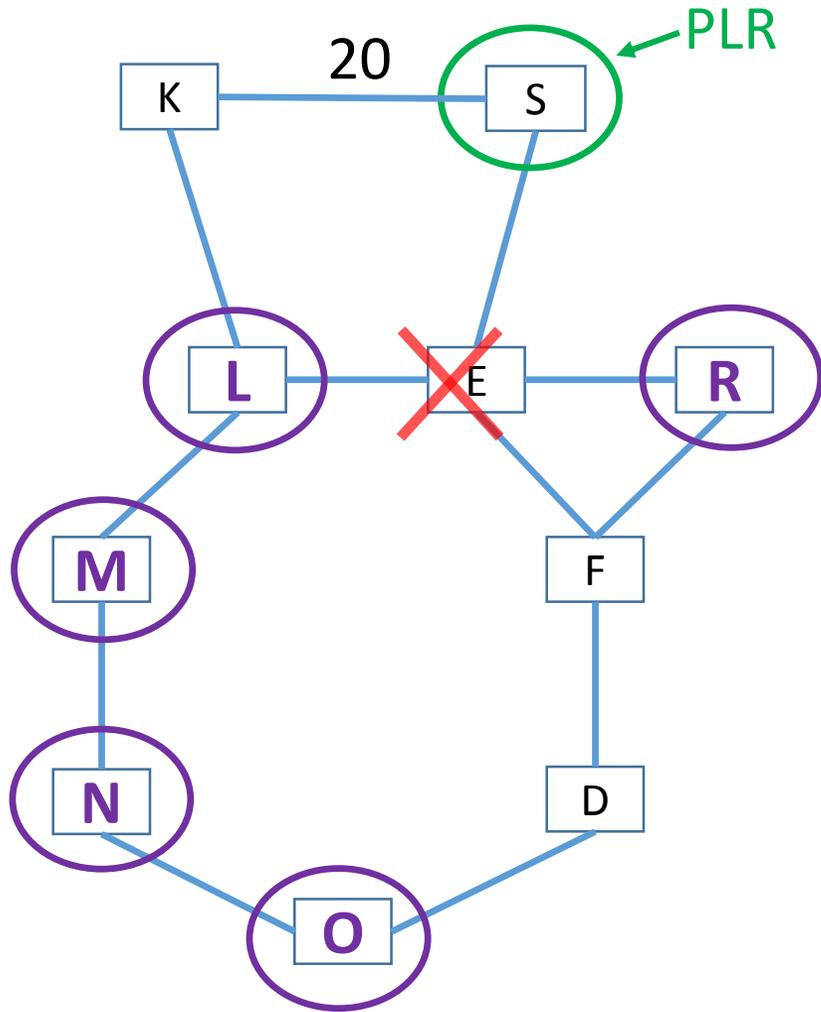Pushpasis Sarkar psarkar@juniper.net
Hannes Gredler hannes@juniper.net
Shraddha Hegde shradda@juniper.net
Harish Raghuveer hraghuveer@juniper.net
Chris Bowers cbowers@juniper.net
Stephane Litkowski stephane.litkowski@orange.com

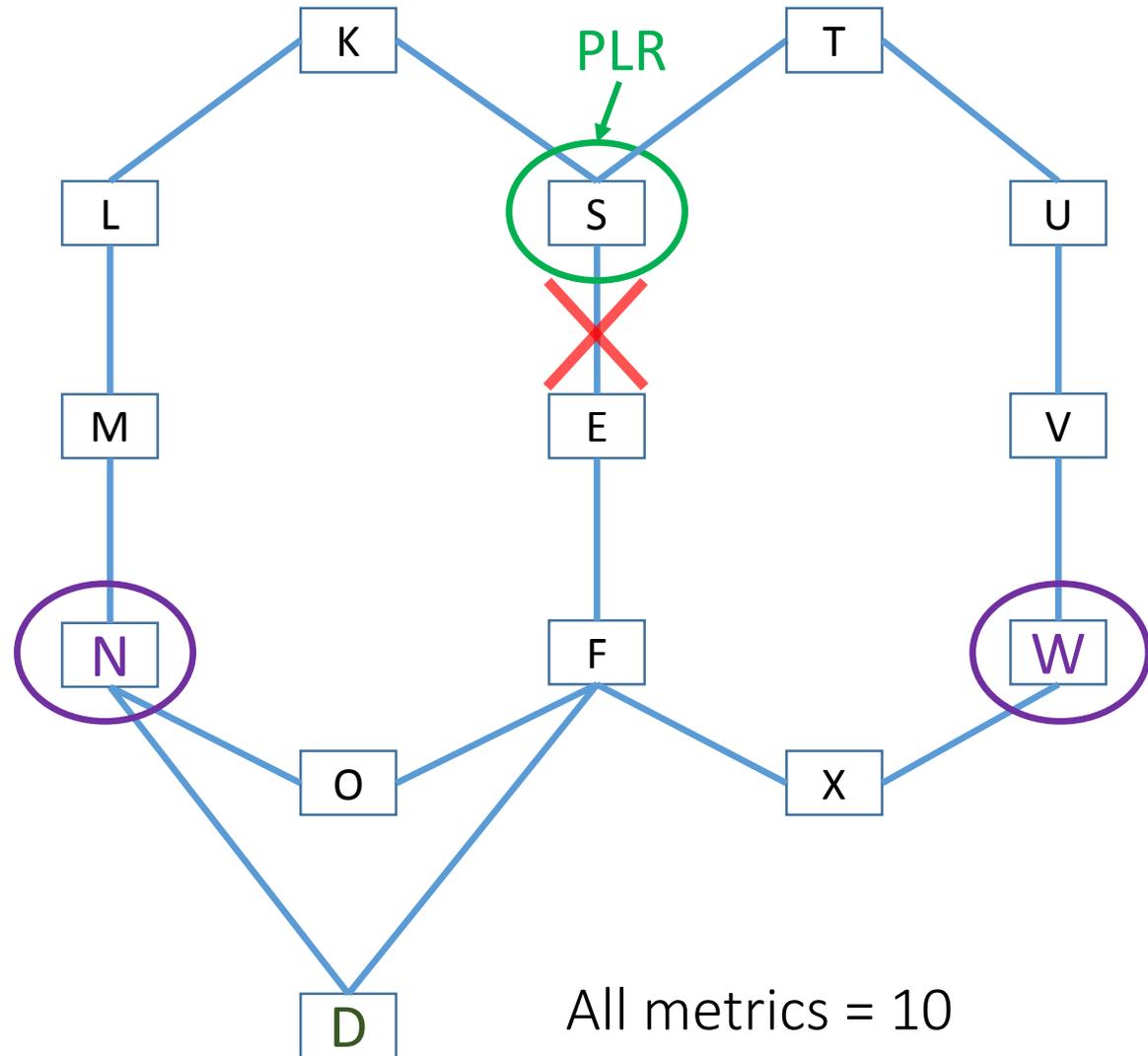# Example topology illustrating node protection

PQ node	Node protecting wrt failure of E	
	S to PQ	PQ to D
R	No	Yes
L	Yes	No
M ★	Yes	Yes
N ★	Yes	Yes
O ★	Yes	Yes

PLR

metric = 10
except where given

evaluated with forward
SPF rooted at PQ node

Example topology illustrating general usefulness of forward SPFs rooted at PQ-nodes (1)

All metrics = 10

PQ node	Path Property	
	$D_{opt}(S,PQ)$	$D_{opt}(PQ,D)$
N	40	50 ⭐
W	40	70

evaluated with forward SPF rooted at PQ node

Example topology illustrating general usefulness of forward SPFs rooted at PQ-nodes (2)
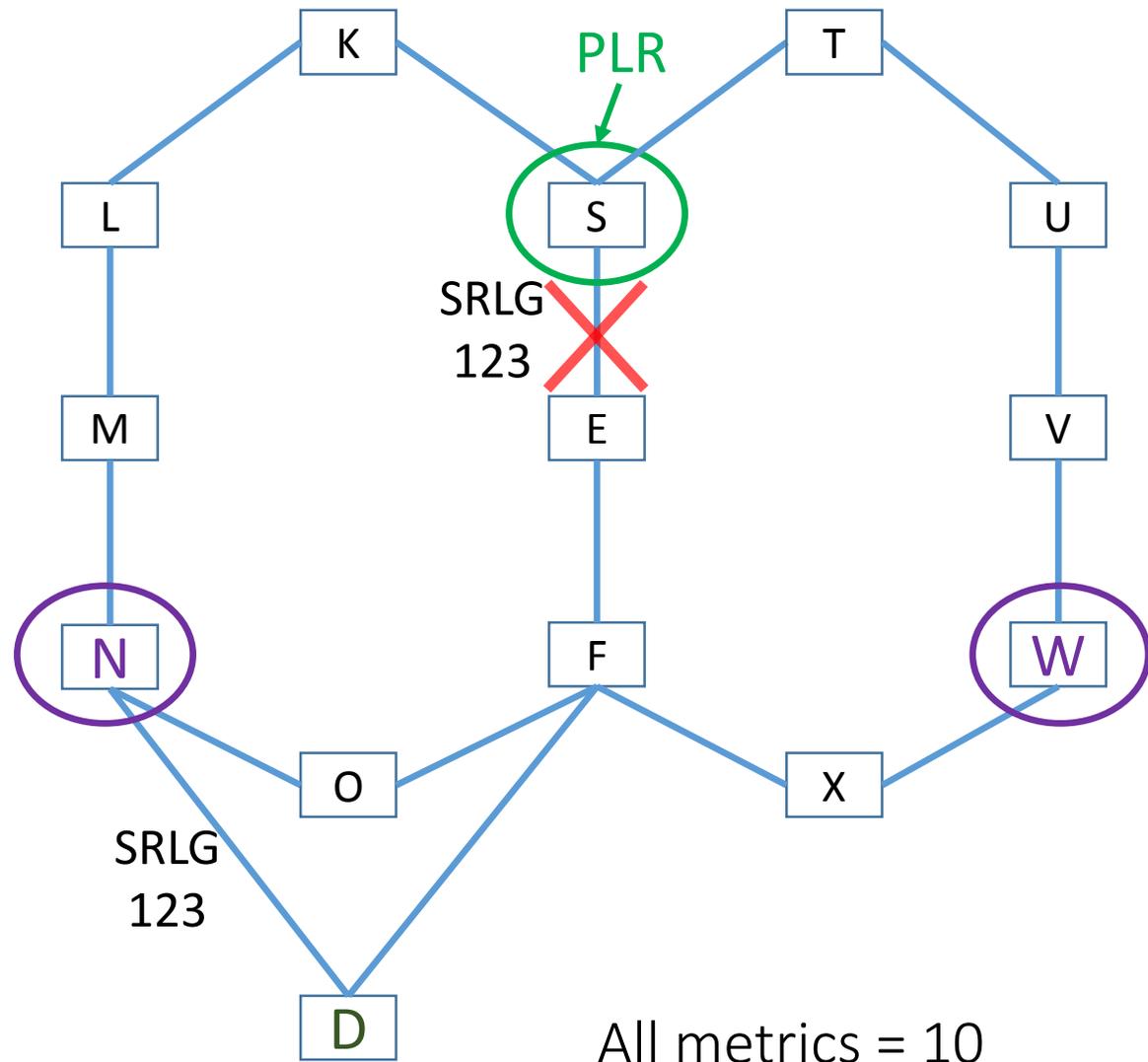
PQ node	Path Property		
	$D_{opt}(S,PQ)$	$D_{opt}(PQ,D)$	Common SRLG
N	40	50	Yes
W	40	70	No ★

evaluated with forward SPF rooted at PQ node

All metrics = 10

Draft history

- draft-litkowski-rtgwg-node-protect-remote-lfa-00
  - Proposed reverse SPF calculation rooted at next-next-hops to determine next-next-hop Q-space.
  - Choosing repair tunnel endpoint from intersection of next-next-hop Q-space and extended-P-space guarantees tunnel endpoint to destination path will not hit primary next-hop.
  - Proposed metric based test to guarantee that path from PLR to repair tunnel endpoint does not hit primary next-hop.
- draft-psarkar-rtgwg-rlfa-node-protection-00
  - Proposed forward SPF calculation rooted at subset of PQ nodes to test if tunnel endpoint to destination path hits primary next-hop.
  - Forward SPF from PQ node provides additional information on complete repair path.

  …….
- draft-psarkar-rtgwg-rlfa-node-protection-03
  - Merge of draft-litkowski-rtgwg-node-protect-remote-lfa-00 and draft-psarkar-rtgwg-rlfa-node-protection-00.
  - Uses forward SPF rooted at subset of PQ nodes to determine tunnel endpoint to destination node protection property.
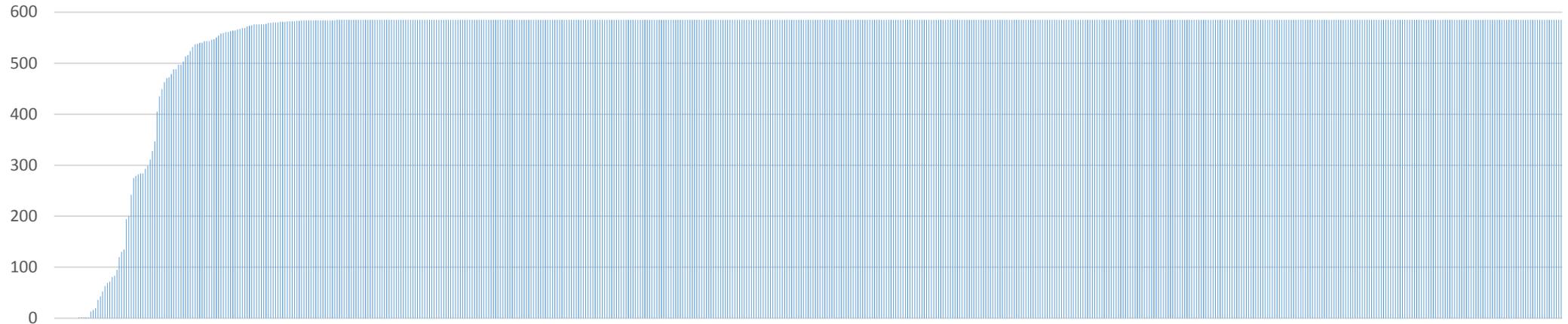 - Uses metric test to determine PLR to tunnel endpoint node-protection property.

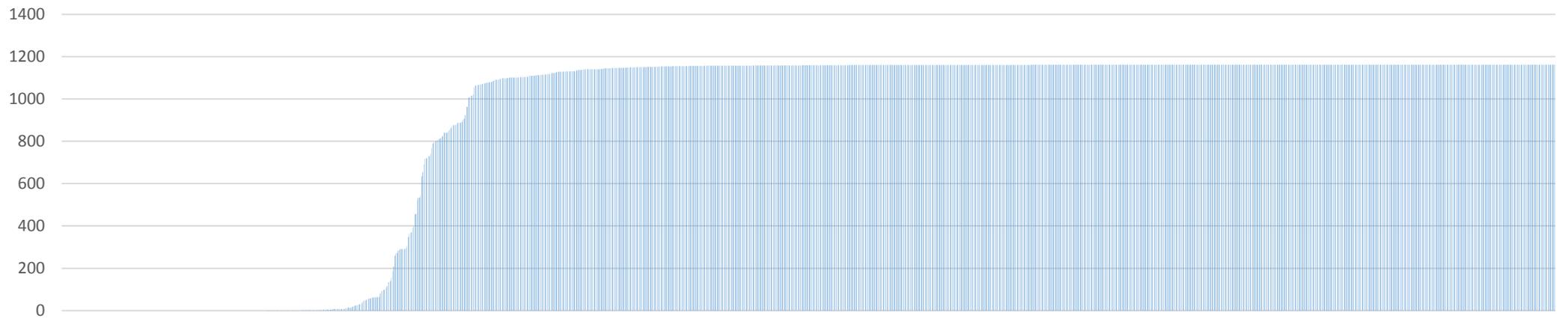# Next steps

- Questions?

- Working group adoption?

Overview of analysis of PQ selection heuristics for remote LFA on service provider network topologies

Why select a subset of PQ nodes from which to perform forward SPFs?

Topology A - PQ nodes per PLR
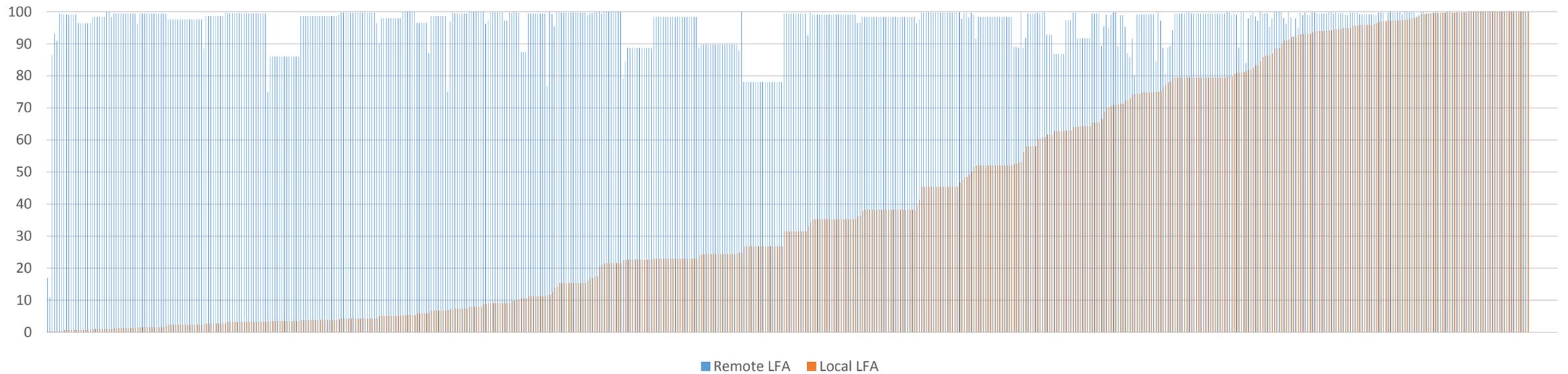

Topology B - PQ nodes per PLR

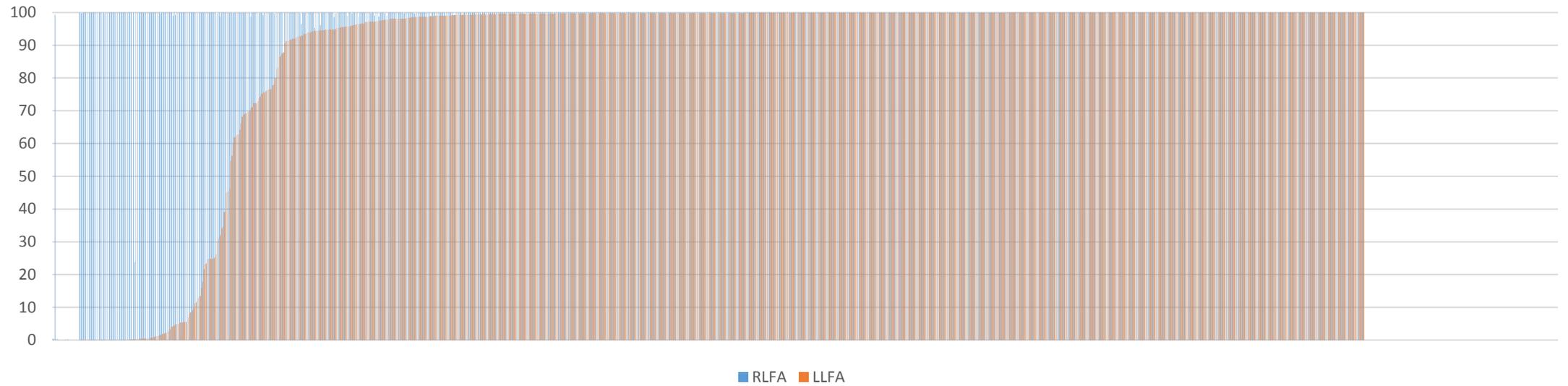- For most PLRs, most nodes are PQ nodes wrt some primary next-hop.

Topology A – Link protection coverage for remote LFA with 16PQ nodes vs. local LFA only
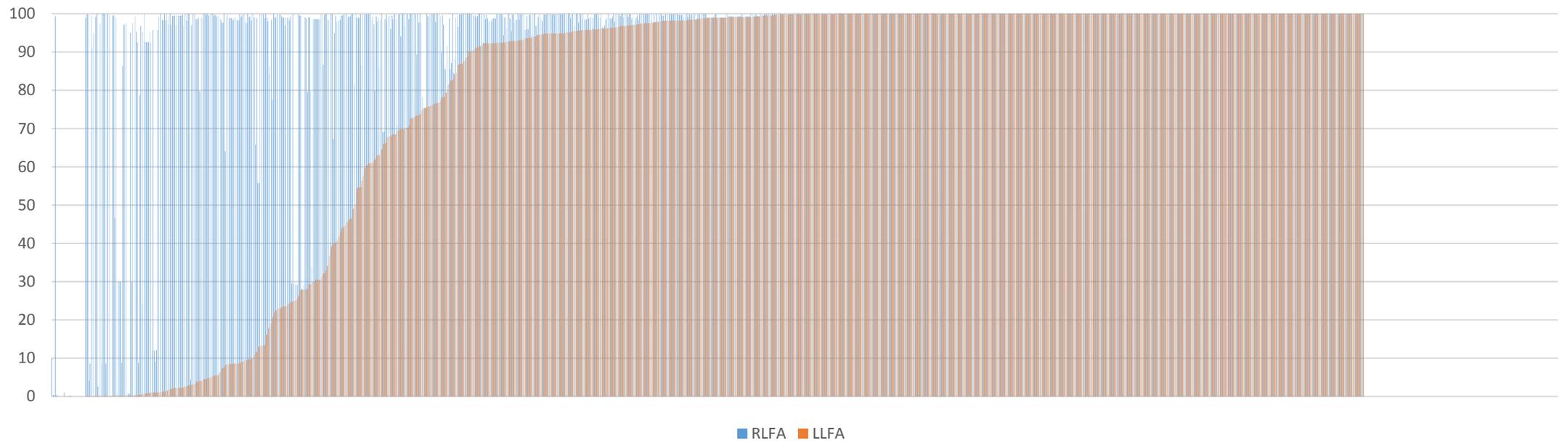

Remote LFA   Local LFA

Topology A – Node protection for remote LFA with 16PQ nodes vs. local LFA only

Remote LFA   Local LFA

Topology B – Link protecting coverage for remote LFA with 16PQ nodes vs. local LFA only

RLFA LLFA

Topology B – Node protecting coverage for remote LFA with 16PQ nodes vs. local LFA only

RLFA LLFA

PQ selection heuristics assessed

AVOID_THEN_DIST = sort PQ nodes on decreasing avoid_count then sort on increasing distance of PQ node from source.

DIST_THEN_AVOID = sort PQ nodes on increasing distance of PQ node from source then on decreasing avoid_count.

RR_ AVOID_THEN_DIST = initially sort PQ nodes using AVOID_THEN_DIST. Final PQ node order is obtained by applying a round-robin dequeuing strategy to the initially sorted list.

DIST_THEN_AVOID = initially sort PQ nodes using DIST_THEN_AVOID . Final PQ node order is obtained by applying a round-robin dequeuing strategy to the initially sorted list.

*Avoid node is another term for primary next-hop node (used in the context of assuming a link from the PLR to that the avoid node has failed.)

**Avoid_count is the number of avoid nodes for which a given PQ node satisfies the PQ conditions.

Topology A - Link protecting coverage with remote LFA

■ AVOID_THEN_DIST_LP_tep[16]
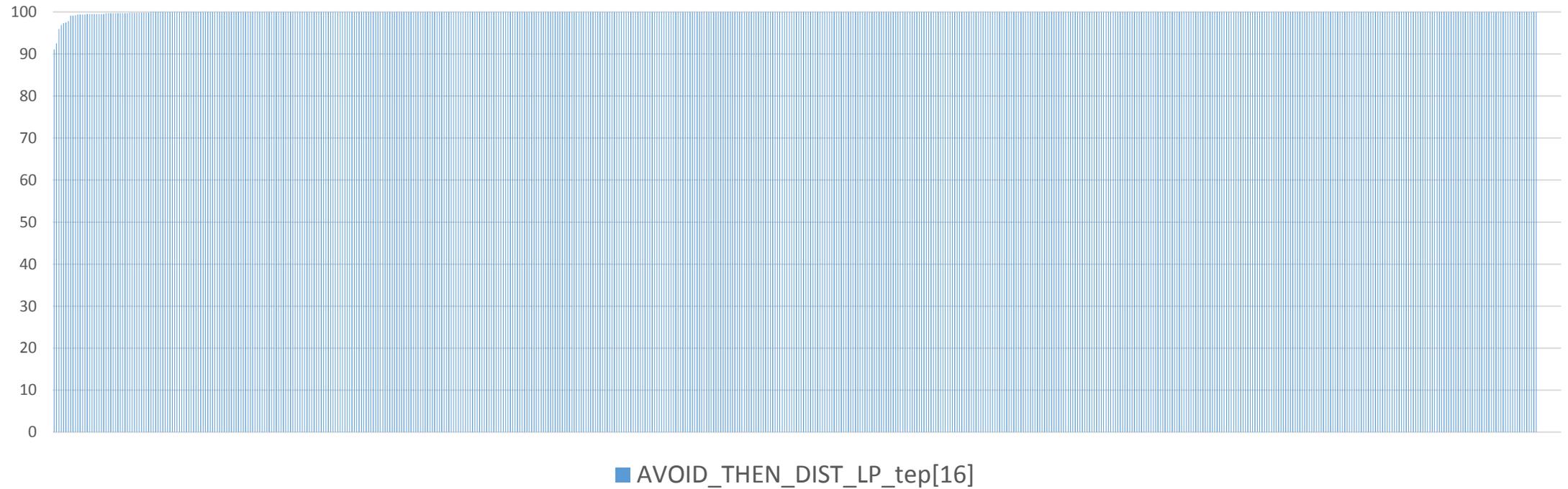
Link protecting coverage using the AVOID_THEN_DIST_LP_tep[16] heuristic for topology A is 100% for all but a few of the routers, and those few are above 90%.
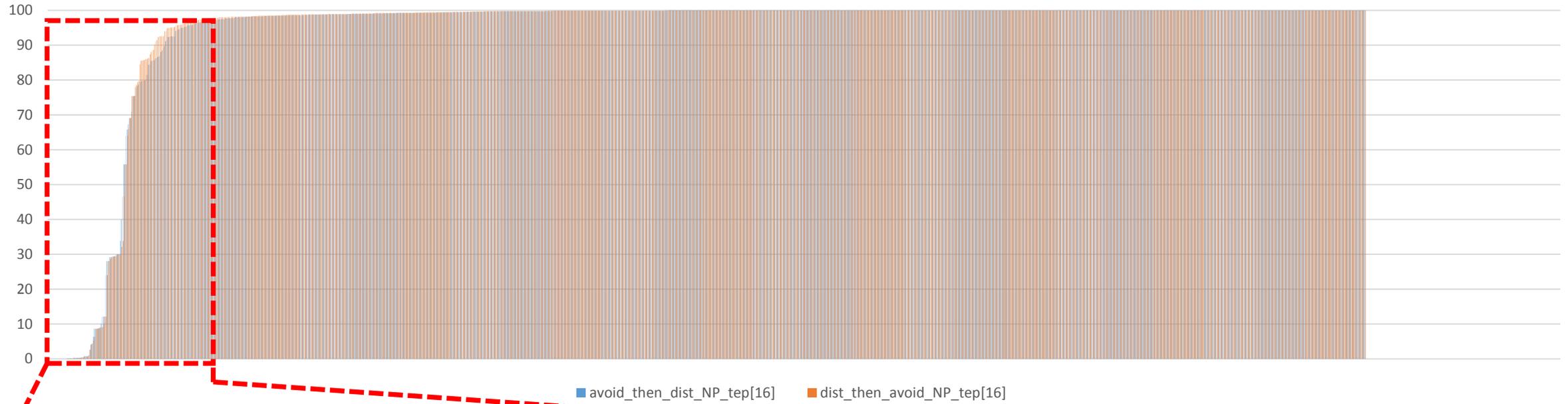
Topology A - Node protecting coverage with remote LFA

■ AVOID_THEN_DIST_NP_tep[16]   ■ RR_AVOID_THEN_DIST_NP_tep[16]
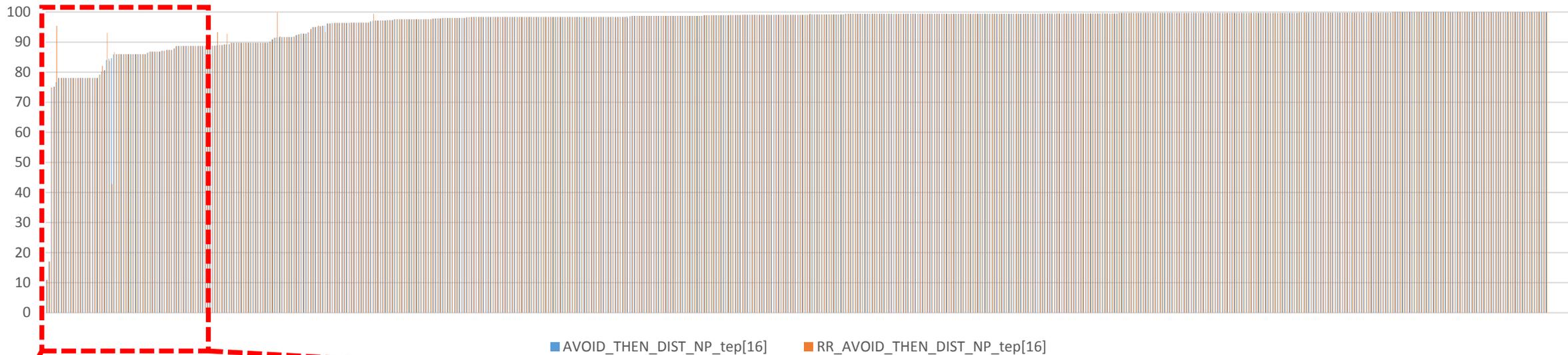
Topology A - Node protecting coverage with remote LFA (62 least covered nodes)

■ AVOID_THEN_DIST_NP_tep[16]   ■ RR_AVOID_THEN_DIST_NP_tep[16]
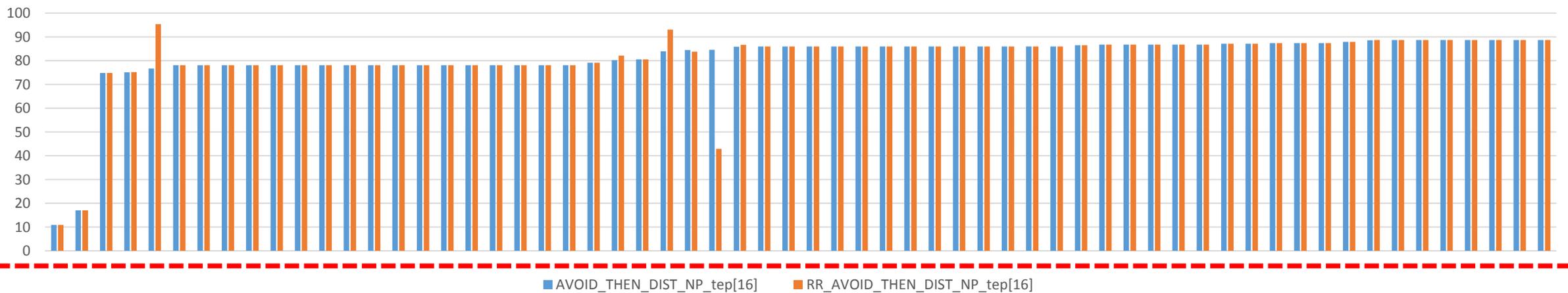
Topology B – Node protecting coverage for avoid_then_dist_vs_dist_then_avoid (all nodes)

avoid_then_dist_NP_tep[16]   dist_then_avoid_NP_tep[16]

Topology B – Node protecting coverage for avoid_then_dist_vs_dist_then_avoid (150 least covered nodes)

avoid_then_dist_NP_tep[16]   dist_then_avoid_NP_tep[16]