A Hybrid Link Protection Scheme for Ensuring Network Service Availability in Link-state Routing Networks

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JOURNAL OF COMMUNICATIONS AND NETWORKS, VOL. 22, NO. 1, FEBRUARY 2020

Abstraction

- Stringent network availability requirement (SNAR)
- Forwarding discontinuity(FW) & The Loop-Free Criterion(LFC)
- HLP: Novel two staged link protection scheme
- Stage 1 & Stage 2 of HLP
- Results of HLP

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Stringent Network Availability Requirement

Metric of (uptime of network / total time passed on network)

- 99.70% uptime ratio → 30 minutes down per week
  - May cause greater accidents than the latter
- 99.95% uptime ratio → 5 minutes down per week
  - Seems tolerable by some, may cause accidents

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Forwarding discontinuity(FW) & The Loop-Free Criterion(LFC)

Network must fix what is broken

- Recalculating routing table leads significant FW, thus overhead
- LFC approach solves FW, but several links go unprotected

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HLP: Novel two staged link protection scheme

→ A new approach: Hybrid Link Protection Scheme
- Based on MNP-e and utilizes BPP if MNP-e fails

→ Based on a network N=G(V, E);
- Time Complexity: O(|E|.log(|V|))
- More efficient than its predecessors

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Stage 1 of HLP: MNP-e

- Version of MNP, queue is implemented as heap (O(N) → O(log(N))
- Calculates all next hops that satisfies LFA
- Compatible with current routing protocol
- Offers Load-Balancing

→ Cannot deal with routing via single link

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Stage 2 of HLP: BPP(Backup Path Protection)

- Covers single link routing failure for MNP-e
- Efficient: Covers not all, but sufficient links that helps providing SNAR
- Special field in header: not-via-address

*SNAR = Stringent Network Availability Requirement

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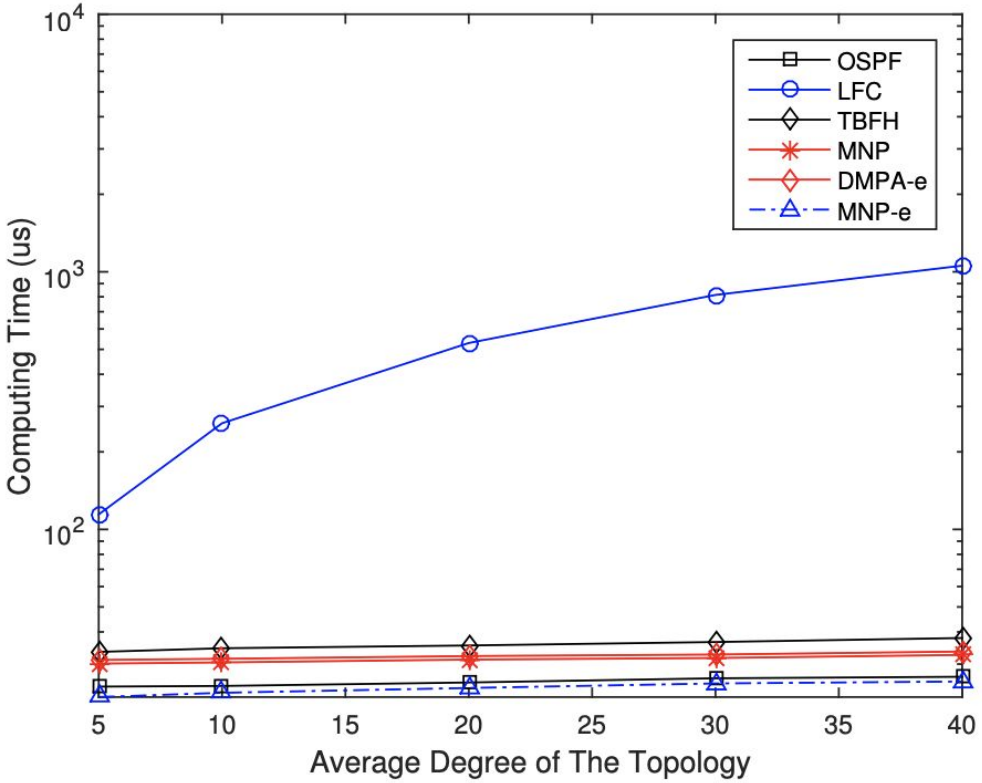
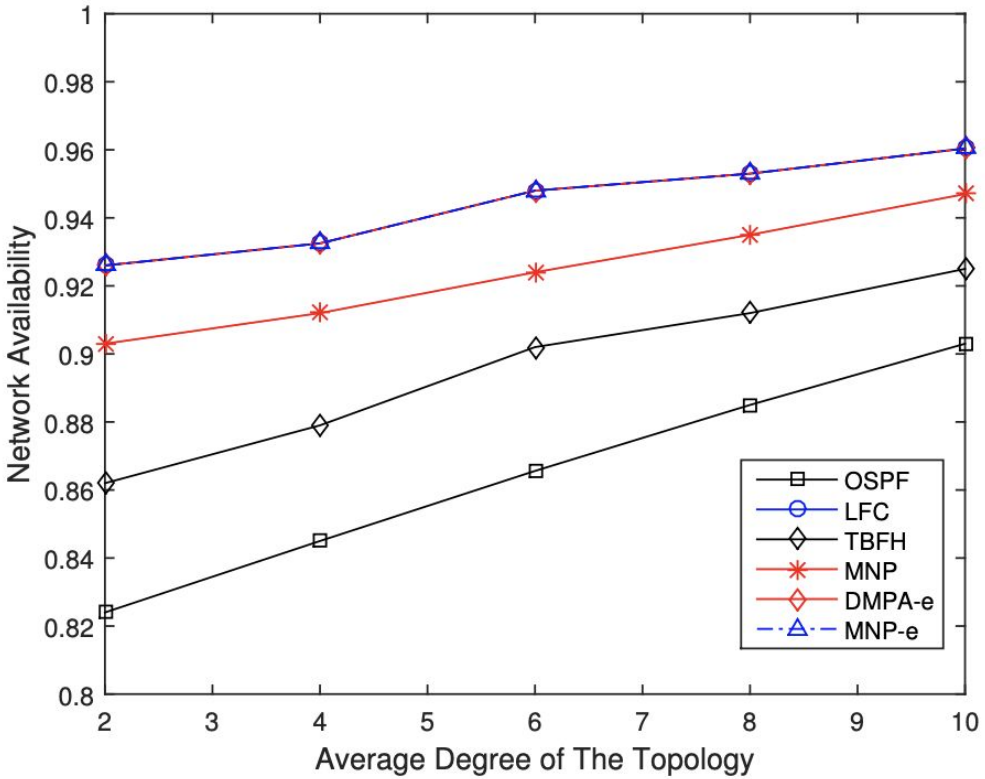
Results of HLP

→ MNP-e has the lowest computing time.



Results of HLP

→ MNP-e has the highest network availability.



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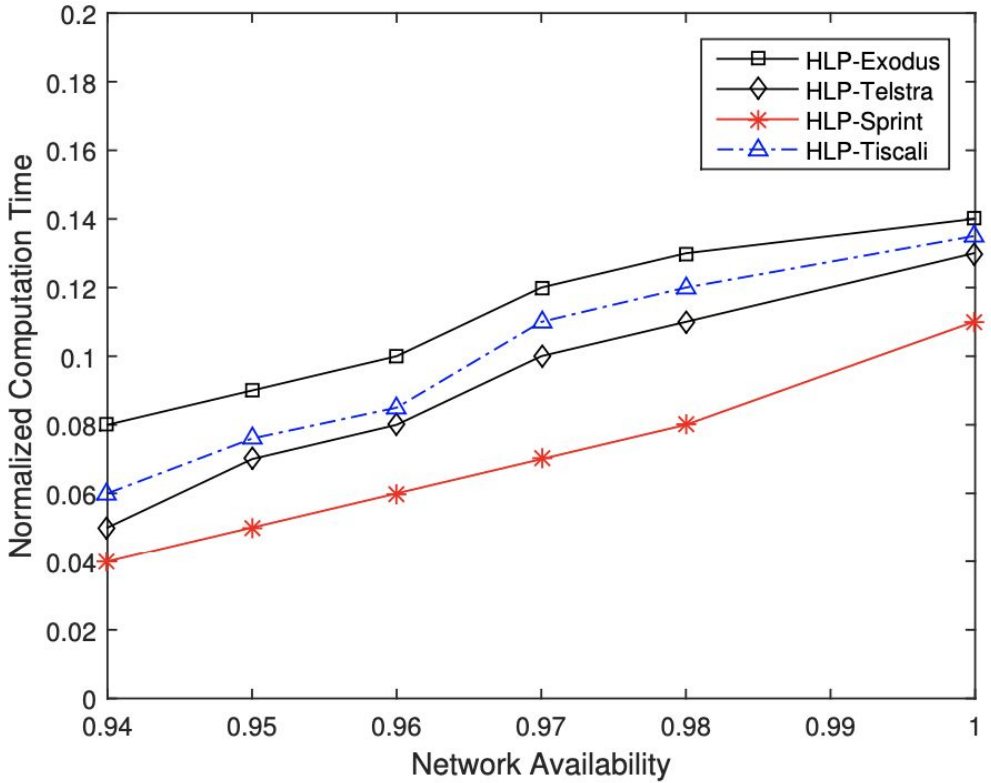
Results of HLP

→ Results on 4 different test networks

*Network specifications can be found in the article.



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Conclusion

- Full protection efficiency improved by TENFOLD.
- Same effects with less overhead in network.
- Compatible with current routing protocols.

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