Experience and Evaluation of the Distributed Node Consensus Protocol

draft-jin-homenet-dncp-experience-00

Kaiwen Jin, Pierre Pfister, Jiazi Yi

93rd IETF

Prague, Czech Republic

Introduction

- Objective:

Evaluate the performances of DNCP in different scenarios.

- ns-3

A discrete-event network simulator.

- Libdncp implementation
- Integration of libdncp into ns-3

Metrics

- Convergence time:

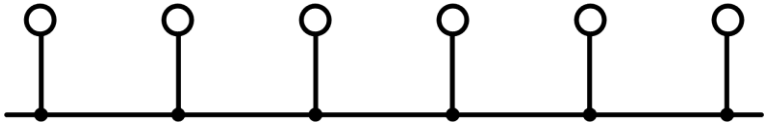
The time it took for the network to converge.

- Average traffic sent per node until convergence:

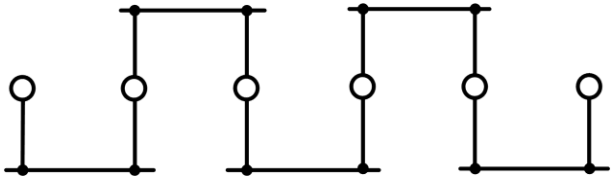
The overall traffic sent until convergence divided by the number of nodes.

Topologies

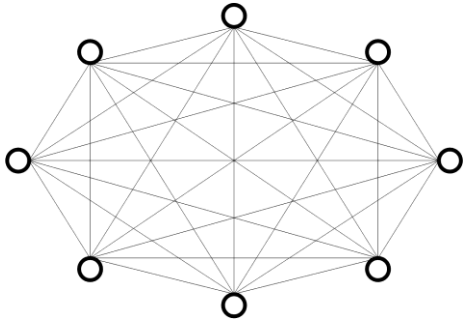
- **Single link topology**



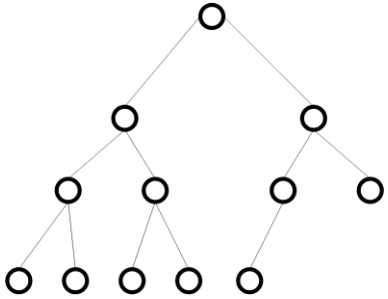
- **String topology**



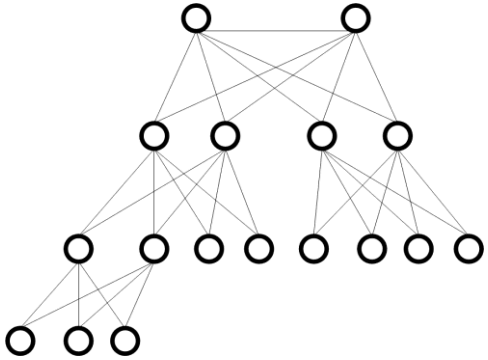
- **Full mesh topology**



- **Tree topology**



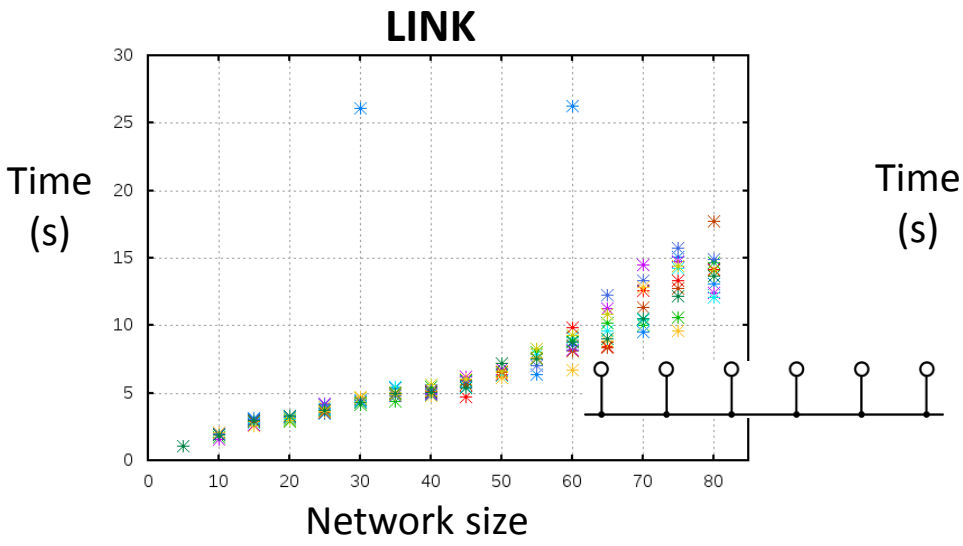
- **Double tree topology**

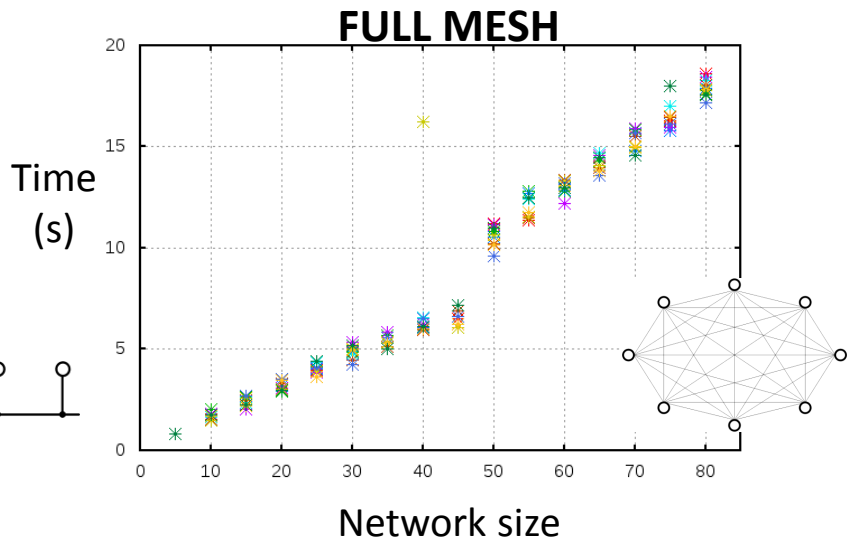


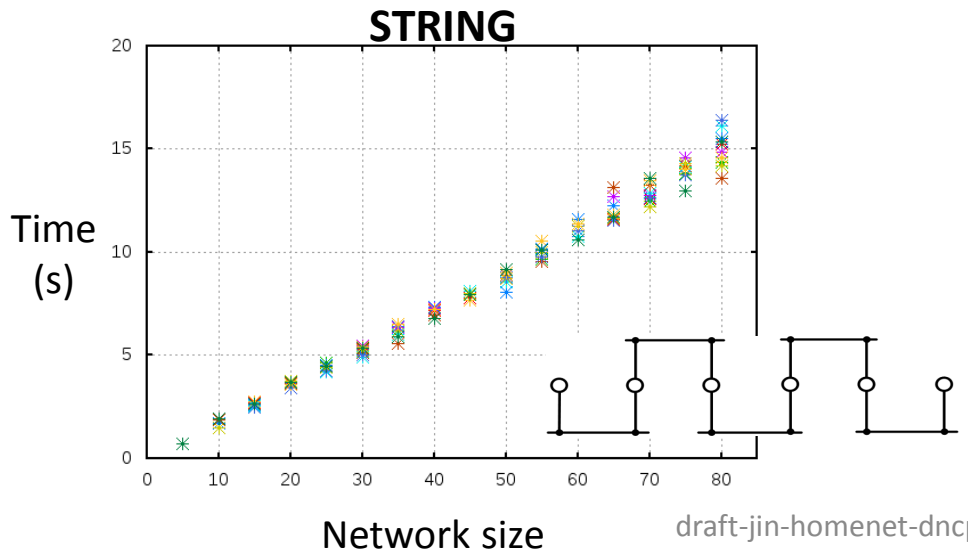
Simulation description

- Network size: 5, 10, 15,20,……,80
- 10 experiments for each scenario
- Used HNCP profile
- Data rate of simulated net device: 1 Gbps (Virtually infinite throughput for DNCP)
- All DNCP instances start simultaneously and struggle to converge from a null state.

Convergence time

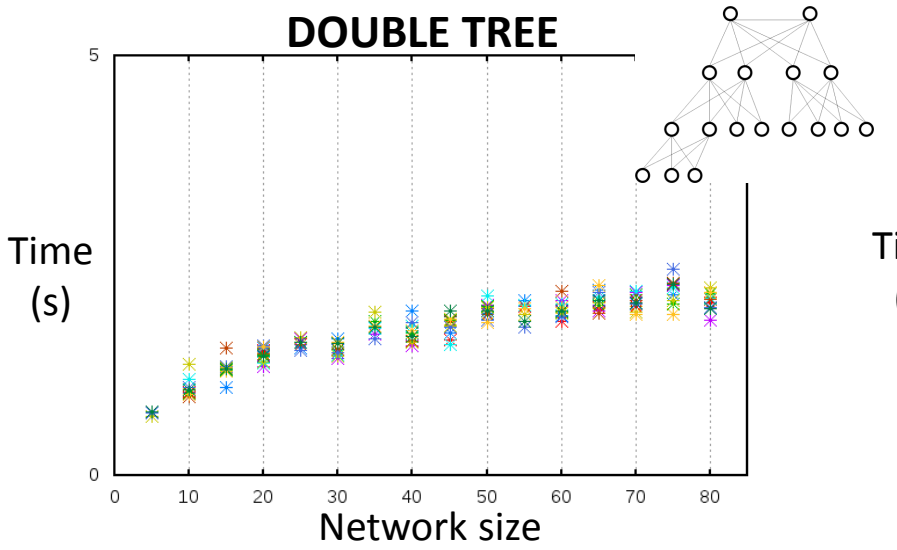


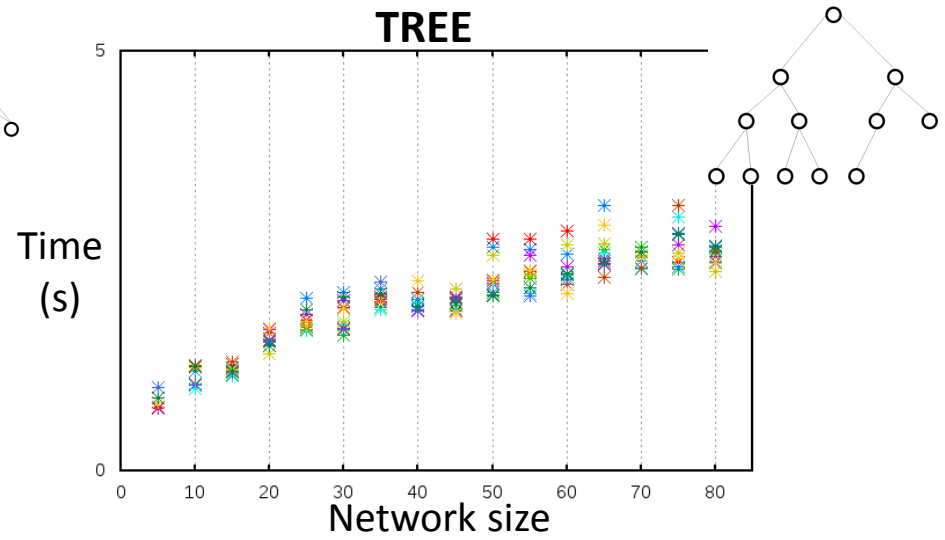




- 3 incidents were observed in link and mesh topology
- Slope inconsistency in mesh topology at around 50 nodes.
- Convergence time linear in string topology

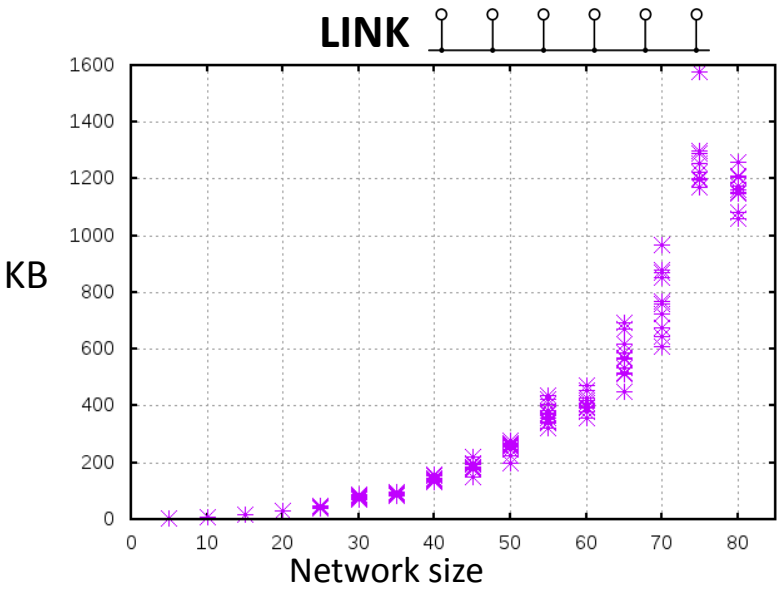
Convergence time(2)

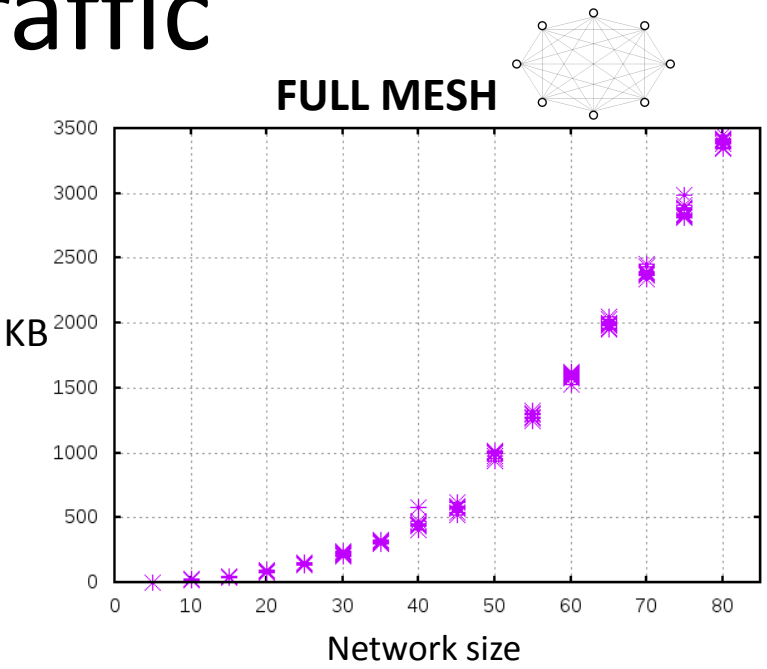


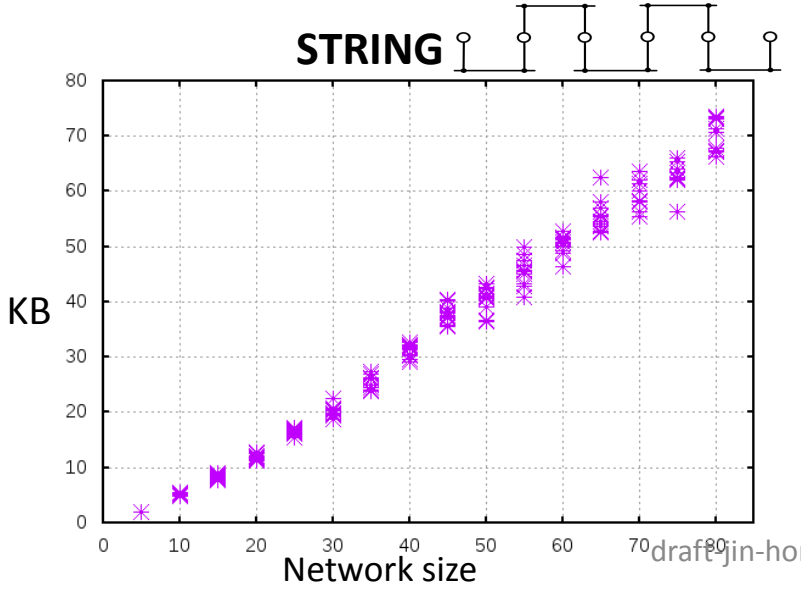


- Convergence is quick
- Convergence time is sub-linear

Traffic

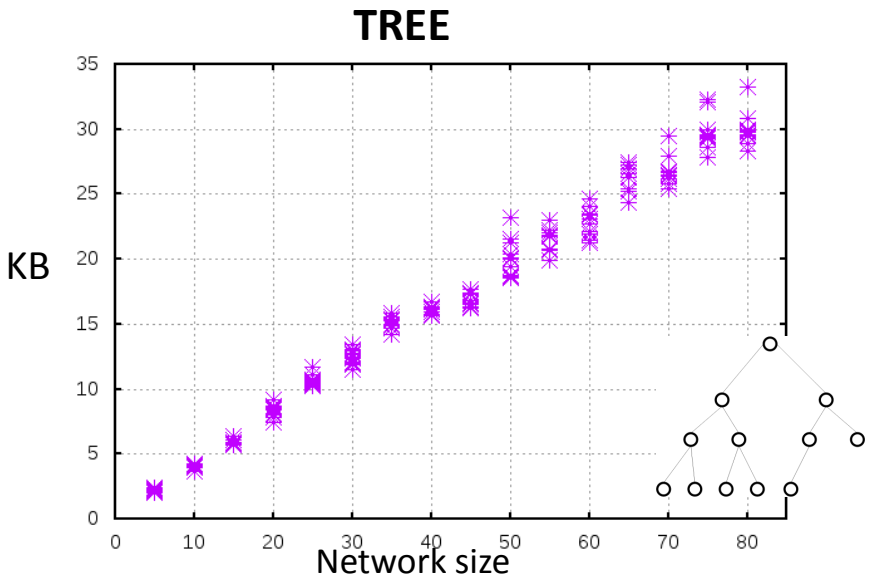


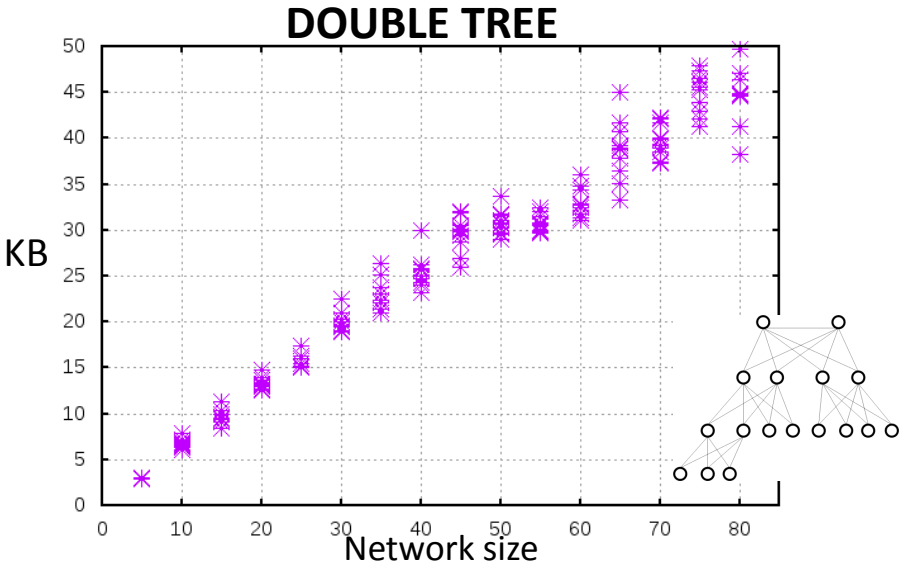


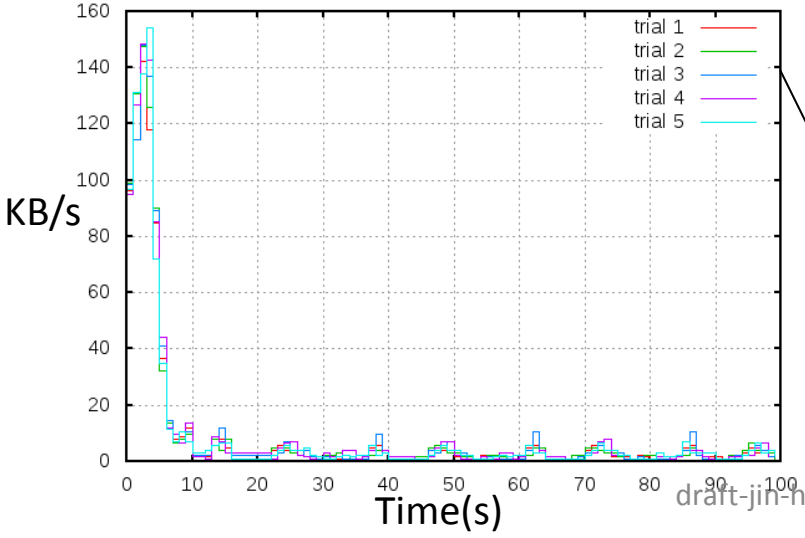


- Significant traffic in link and mesh topology
- Support For Dense Broadcast Links proposed in draft-ietf-homenet-dncp-07.

Traffic(2)







- Traffic per node sub-linear
- Light overhead in these two topologies.

Network throughput within 100 seconds

- Once converged, very small traffic is used to keep-alive

Conclusion

- DNCP can converge in different topologies of different sizes.
- Quick convergence.
- Trickle makes DNCP verbose in reaction to frequent change (expected to behave better in a less extreme situation).
- DNCP implementation status

--libdncp implementation (separated from HNCP implementation)

--libdncp2 Implementation

--shncpd Implementation

Next steps?

- Test newer implementation: libdncp2
- Measure convergence time in a less extreme situation (with only part of the nodes publishing new data).
- Different topologies: input from topology generators
- Test with lossy links and moving nodes.
- Interesting work to be continued in the WG?

Thank you, questions?