

Multipath Extension for OLSRv2

draft-yi-manet-olsrv2-multipath

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What's olsrv2-multipath?

- A multipath extension of OLSRv2
- Makes use of the topology graph of OLSRv2
- Calculates multiple disjoint paths
- Source routing for packet forwarding
- Interoperable with OLSRv2

Why?

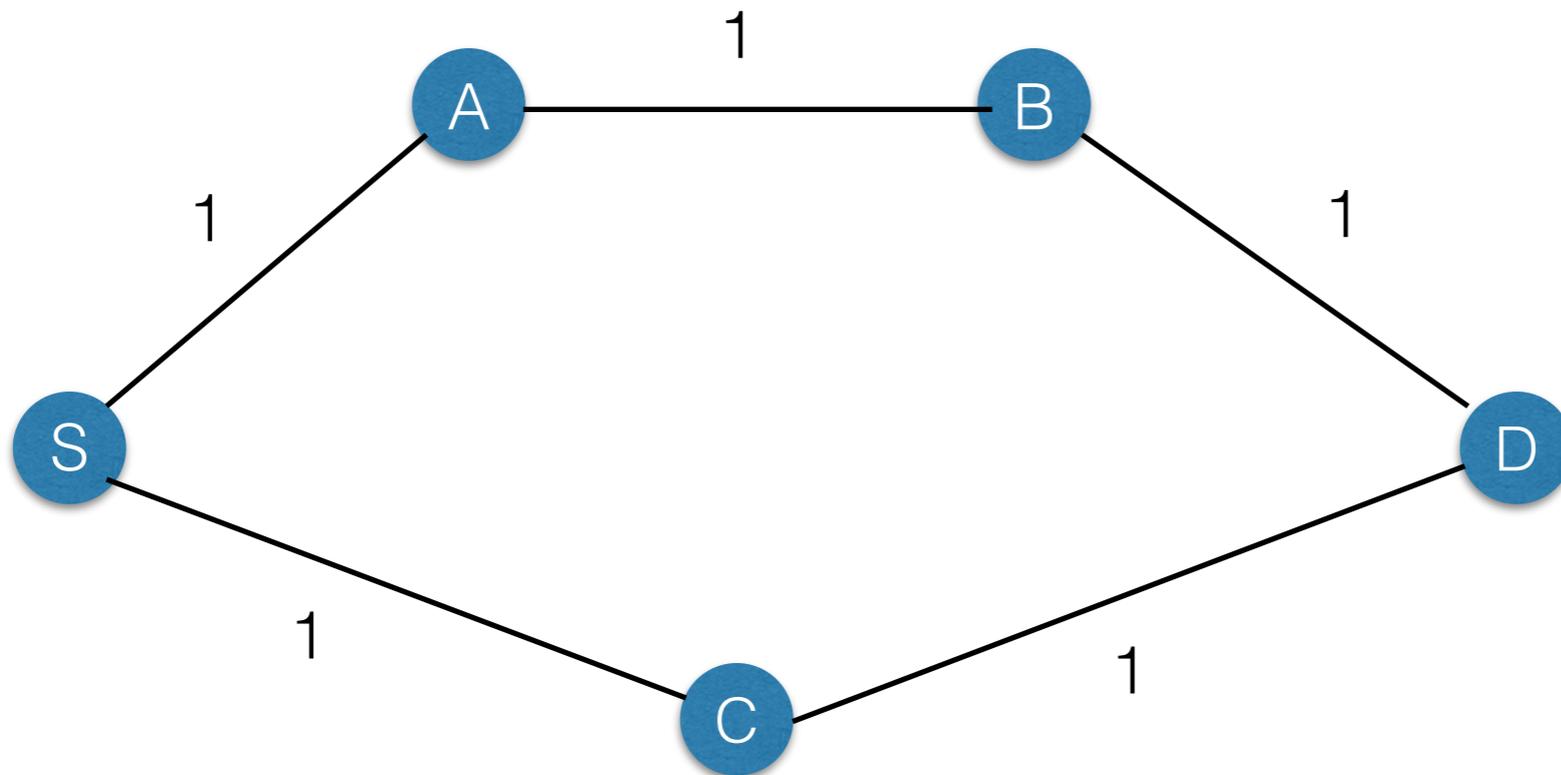
- Provide higher aggregated throughput
- Choose or avoid specific intermediate routers (By using source routing)
- Resilient to routing failure
- Decrease end-to-end delay
- Possibility of forward error correction at network layer, or multi-topology for different paths

How?

- Multiple paths calculation launched on-demand at the source
- Using multi-path Dijkstra algorithm
- Packet forwarding using (loose) source routing
- Packets sent out in parallel along multiple paths

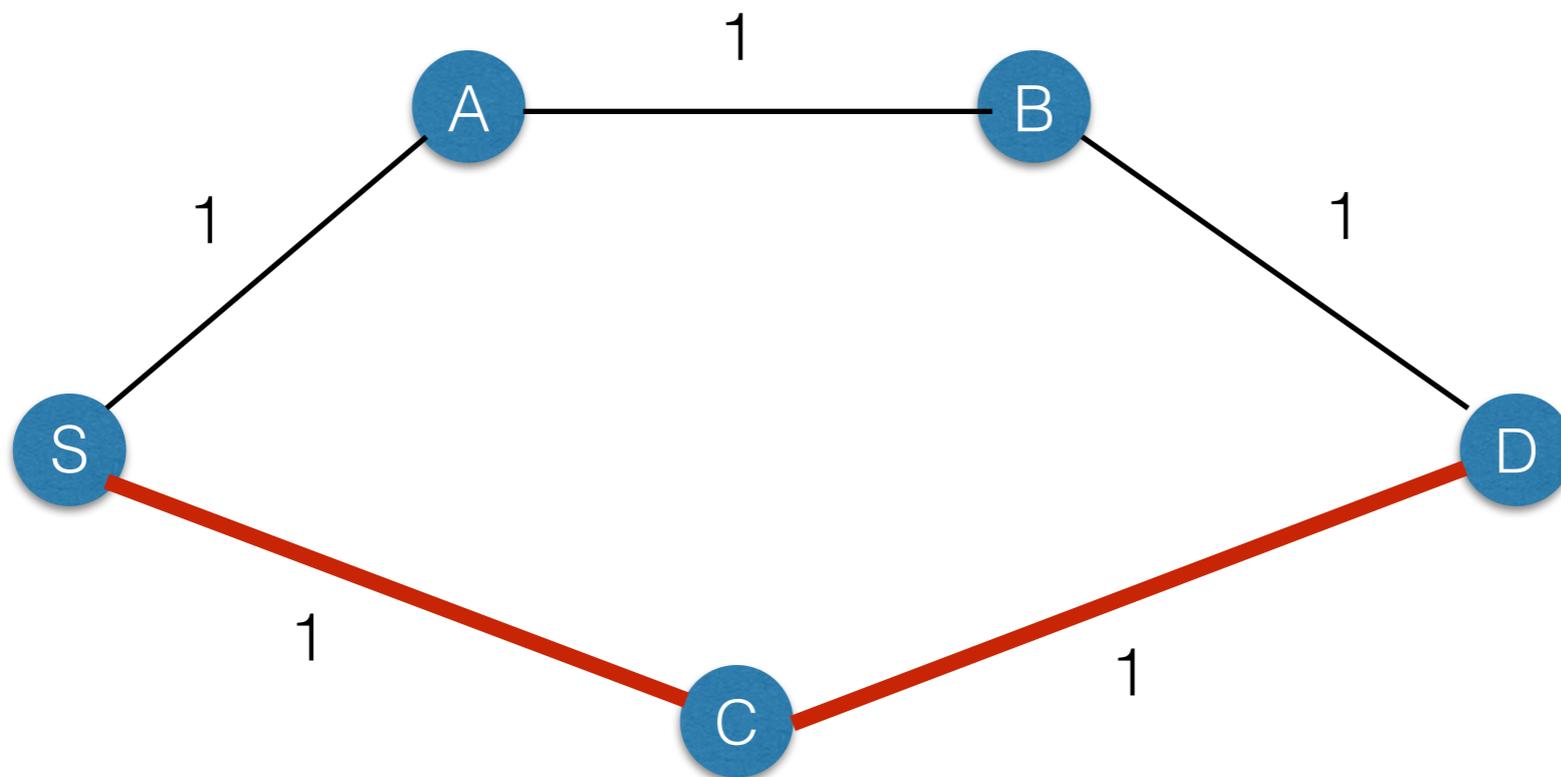
Multipath Dijkstra Algorithm

- Based on “cost function” to punish previously used paths
- Can generate node-disjoint or link-disjoint paths as required, depending on the parameters set



Multipath Dijkstra Algorithm

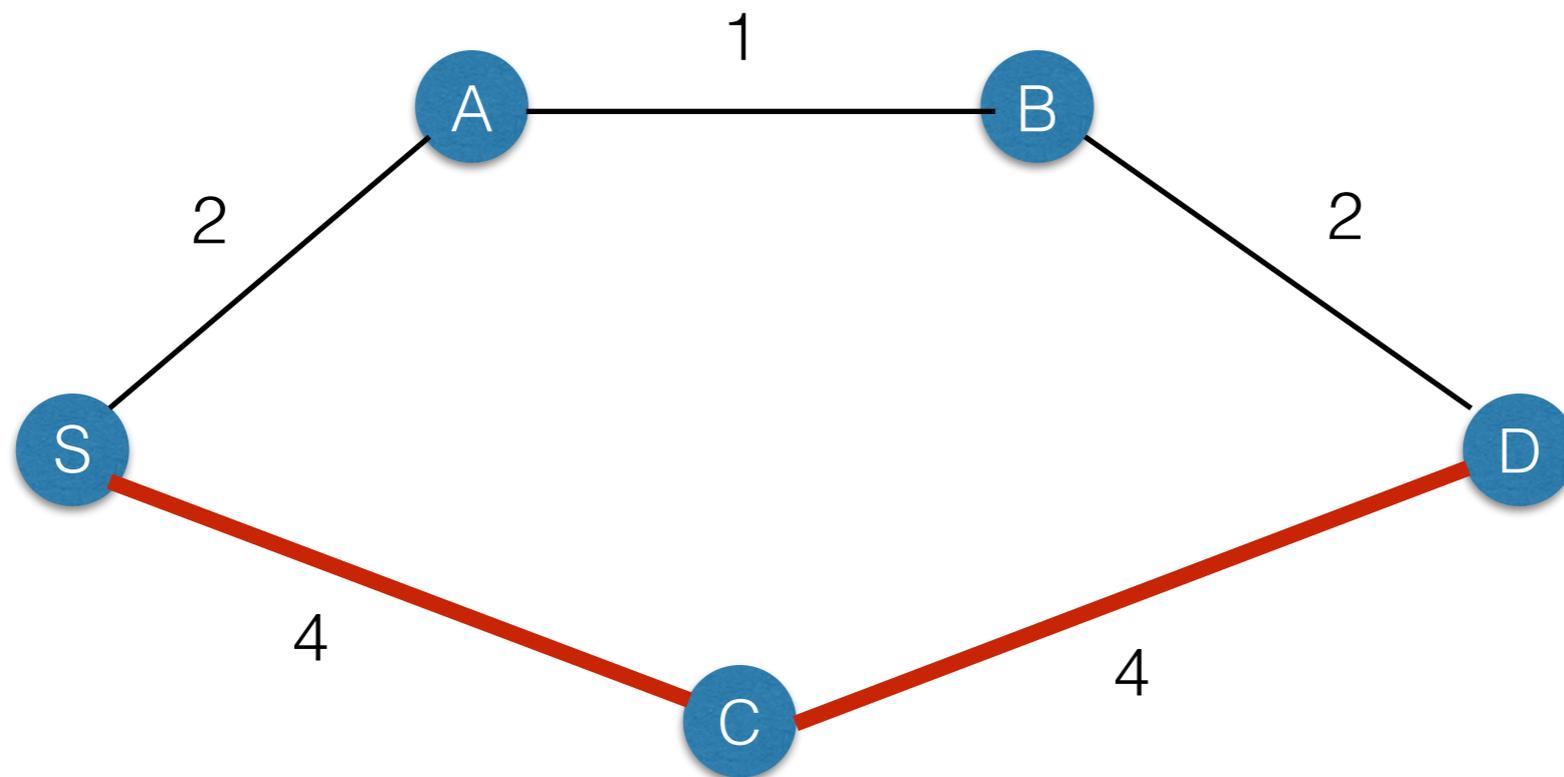
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The shortest path is calculated

Multipath Dijkstra Algorithm

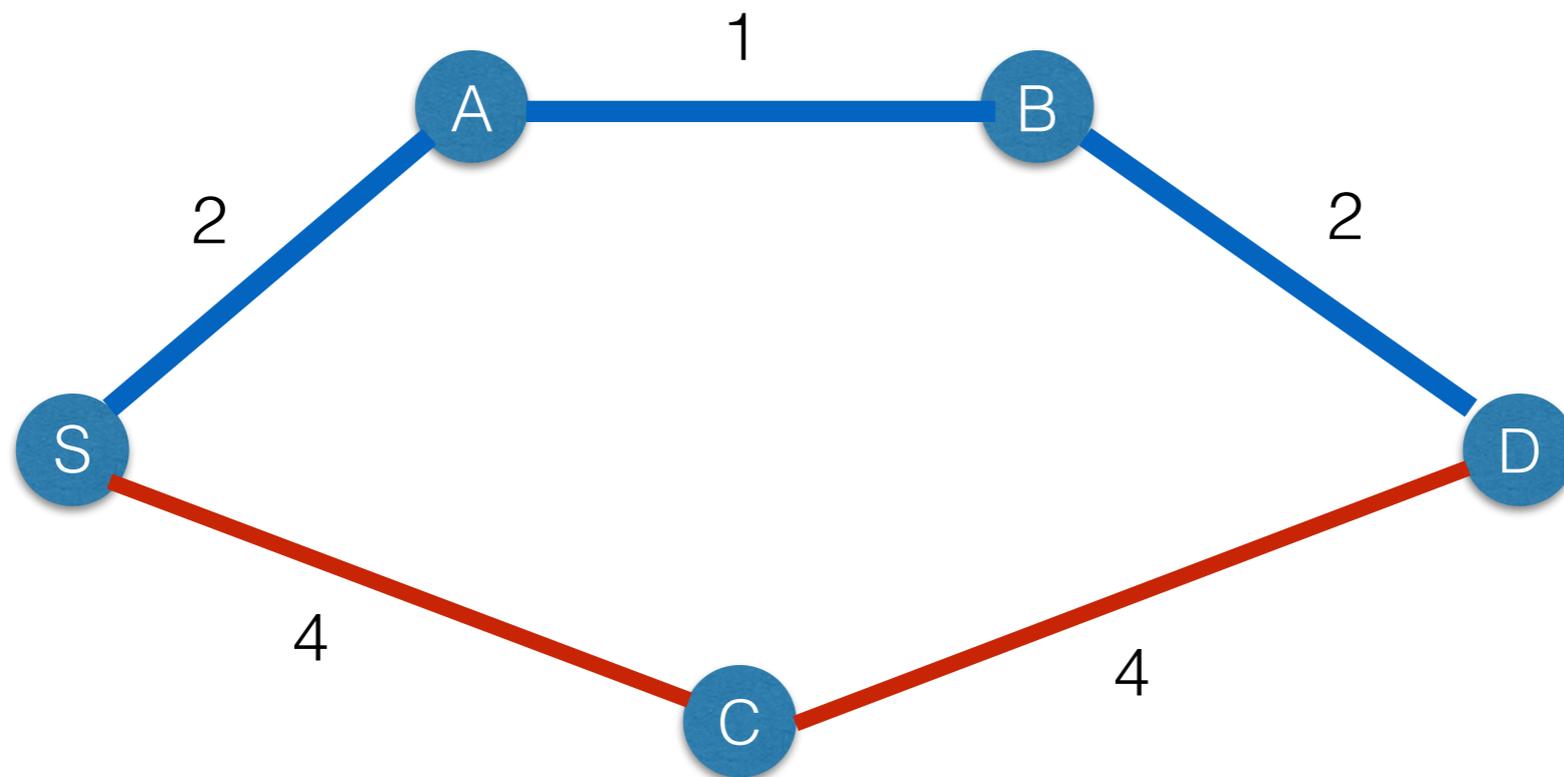
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Increase the cost of related links

Multipath Dijkstra Algorithm

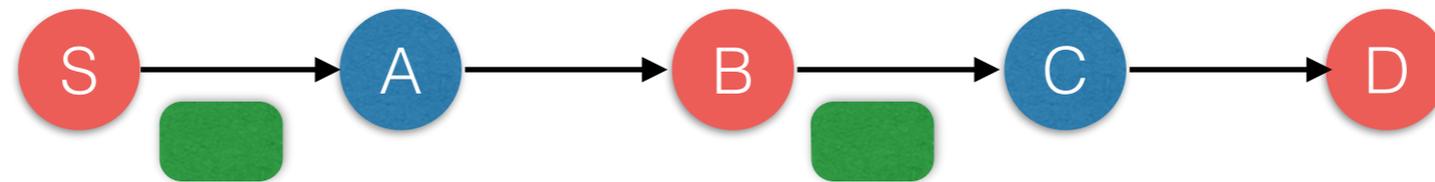
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Calculate the shortest path using the new graph

Interoperability with OLSRv2

- One additional message TLV to indicate the type of original router (MP_OLSR) in HELLO or TC
- Only the MP-OLSR supported router can be added to the source routing header



IP destination field: B

IP destination field: D

Source routing header: S-B-D

- MP-OLSRv2 supported router
- Normal OLSRv2 router

Running code

- 3 known implementations for testbed and simulations
 - 1 based on OLSRv2-Niigata (testbed and Qualnet 5.0 simulation)
 - 1 based on olsrd (testbed)
 - 1 based on um-olsr (NS2 simulation)
- **All open source and available on-line!**

Testbed and simulation experience

- Testbed with 10 routers, and simulation up to 500 routers
- Can improve the delivery ratio and delay, especially in dynamic and high load traffic scenarios
- More results can be found at
 - Multipath Optimized Link State Routing for Mobile ad hoc Networks, Elsevier Ad Hoc Networks Journal (2011), Volume 9, Issue 1,28-47, Jan. 2011.
 - Multipath OLSR: Simulation and Testbed, 5th OLSR Interop/Workshop (2009)
 - Implementation of Multipath and Multiple Description Coding in OLSR, IEEE Wireless Communications and Networking Conference (2008)

Why Experimental RFC?

- Preliminary experience has shown that multipath routing can be helpful - in certain scenarios
- More operational experience is required:
 - Better understanding of protocol behavior
 - Better understanding of scenarios, in which it is applicable
- Experiments are needed!
- To allow interoperable implementations (including interoperability with OLSRv2), an unambiguous specification is required, with corresponding TLV code points

Experiments to be conducted

- Generally:
 - Interoperability, performance, applicability, etc.
- Parameter settings:
 - Number of paths, different cost functions, application of different metrics other than hop count, etc.
- In combination with other mechanisms:
 - Forward Error Correction (FEC) Coding
 - Make use of multi-topology to build multiple paths

Next Steps

- **We hereby ask the WG chairs to call for WG adoption of this document.**