TECHNISCHE UNIVERSITÄT DRESDEN

5G Lab GERMANY

MESHMERIZE

A MULTIPATH WIRELESS MESH ROUTING PROTOCOL

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INTRODUCTION

- We are ***Ph.D. Students*** from Deutsche Telekom Chair of Communication Networks at ***TU-Dresden***.

- In the past 10 years, Simon Wunderlich has been actively developing the ***B.A.T.M.A.N.*** mesh software, which is also part of the Linux kernel.

- We want to introduce our research project '***Meshmerize***' to gather ***feedback*** and ask for ***collaborations***.

CONCEPT

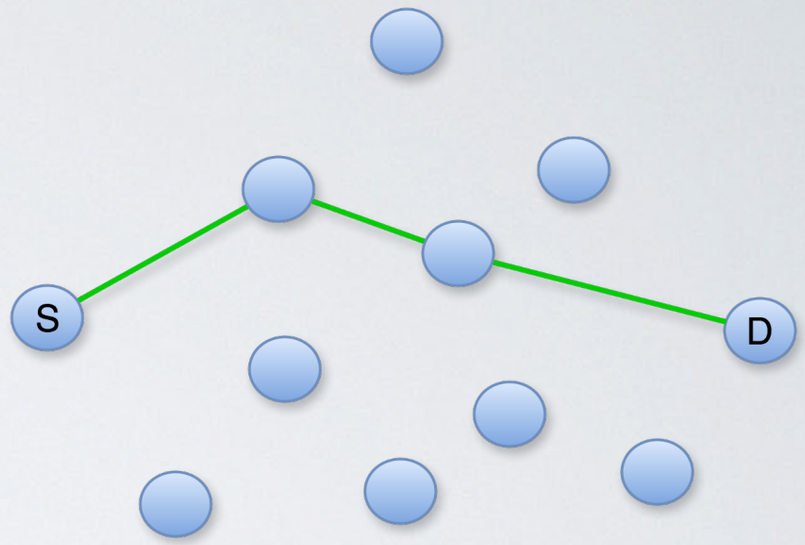
What is Meshmerize?

- A multipath opportunistic wireless mesh routing protocol based on network coding.
- Exploit the broadcast nature of wireless medium.
- *Relay* nodes - not just packet forwarding; but recode the packet.

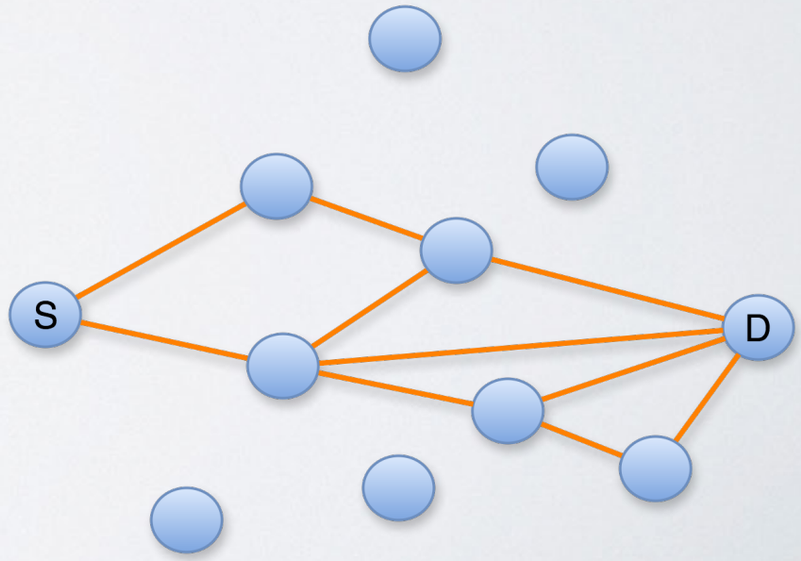
Objectives

- High resilience to topology change
- Aggregated throughput from multiple paths

Traditional



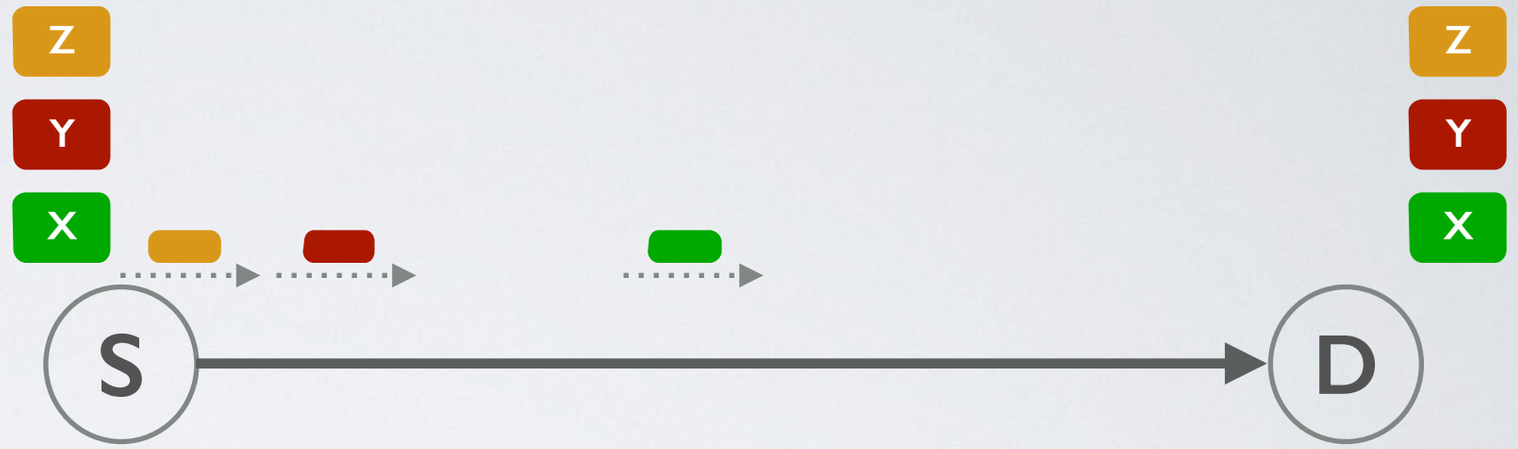
Meshmerize



NETWORK CODING - IN A NUTSHELL

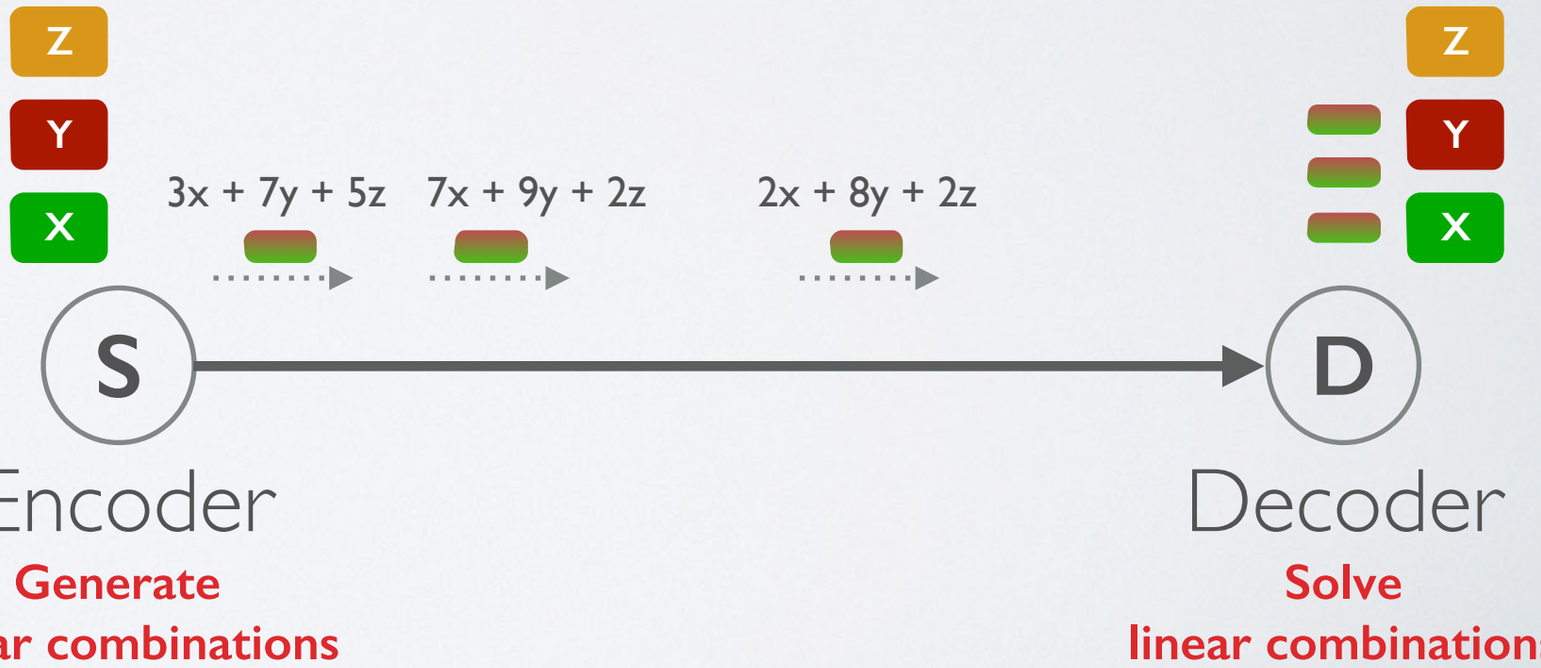
Typical WiFi Network

- Packets are acknowledged
- Lost packets are resent



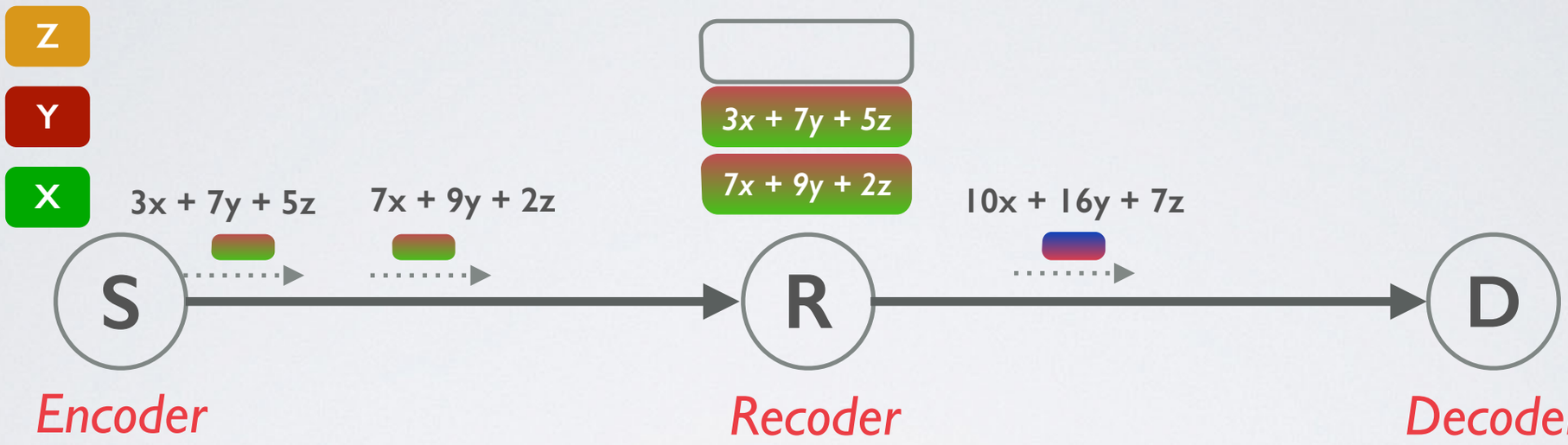
Coded Network

- No packet specific retransmissions
- Only sufficient number of linear combinations needed.



NETWORK CODING - IN A NUTSHELL

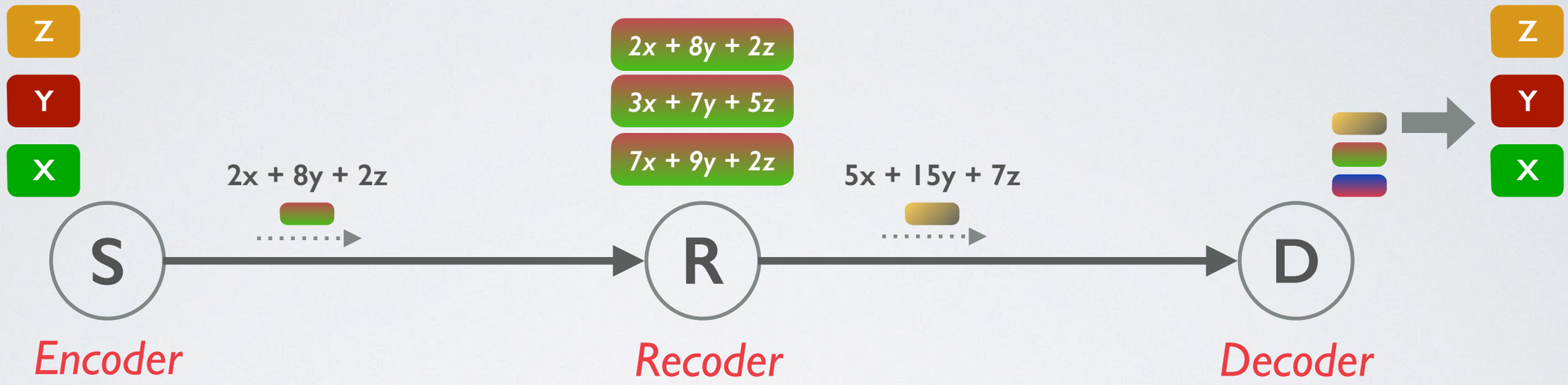
Recoding



- Recoder - mixes packets to create new coded packets
- Different recoders create different coded packet

NETWORK CODING - IN A NUTSHELL

Recoding



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Network coding characteristics

- Resilient in chaotic environments.
- Low feedback required.
- Independent of packet arrival order.
- Applied to mesh network:

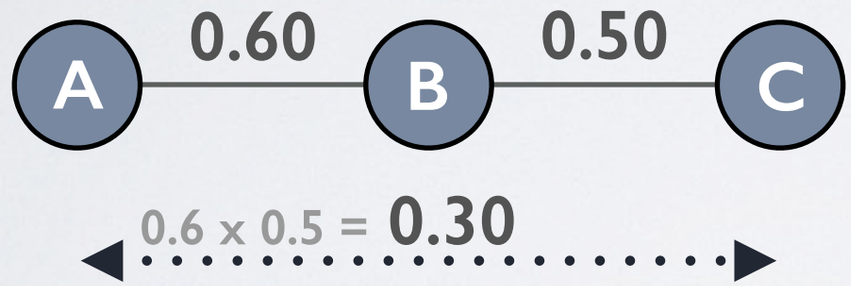
  ➡multihop

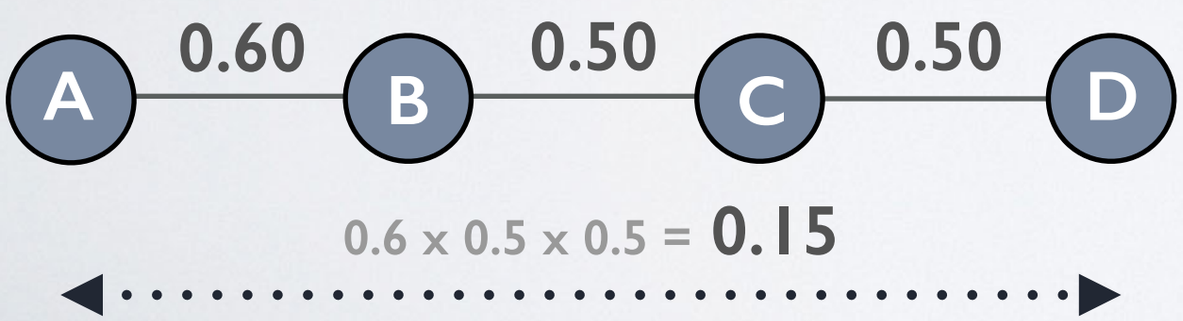
  ➡multipath

MULTIHOP IN MESHMERIZE

Problems with general mesh networks

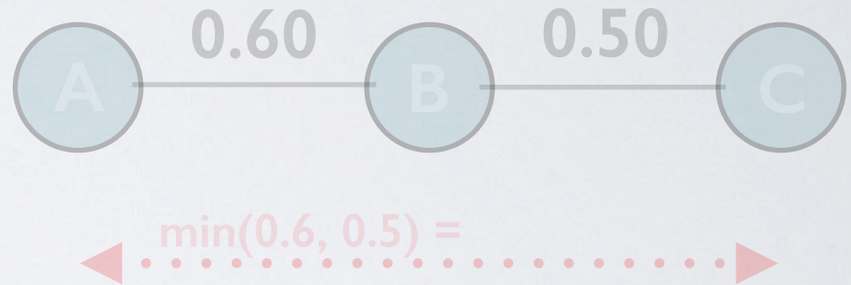
- Loss compounds with each hop





Network coded Wireless mesh

- Overall link quality is the minimum of individual link qualities



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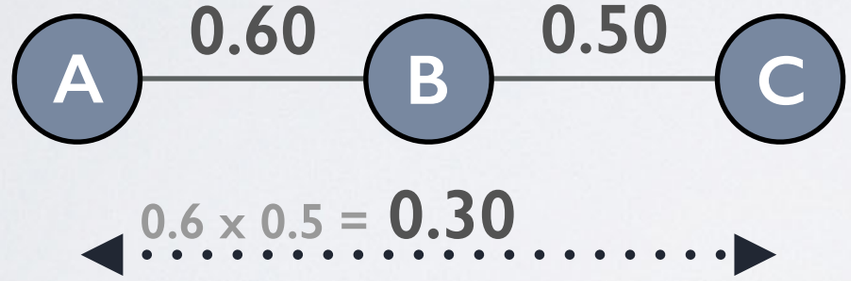

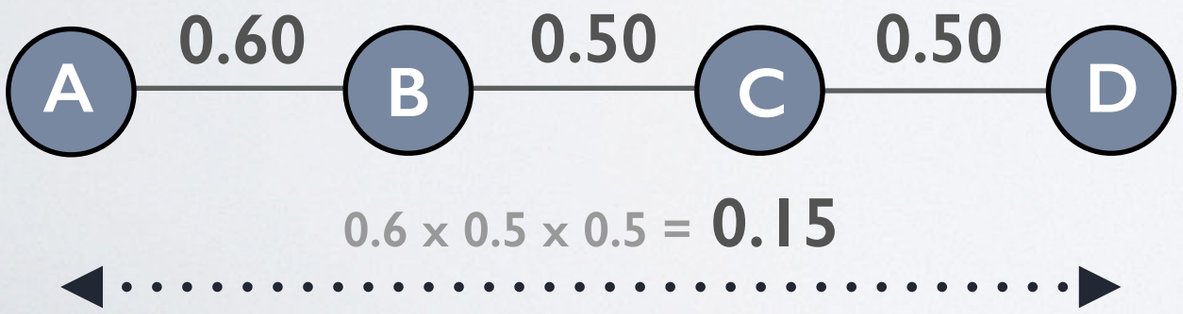

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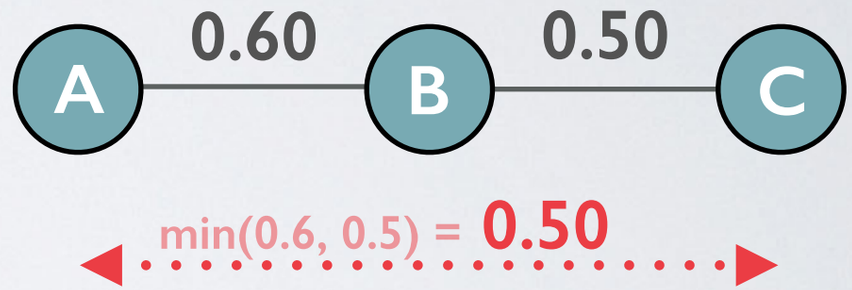
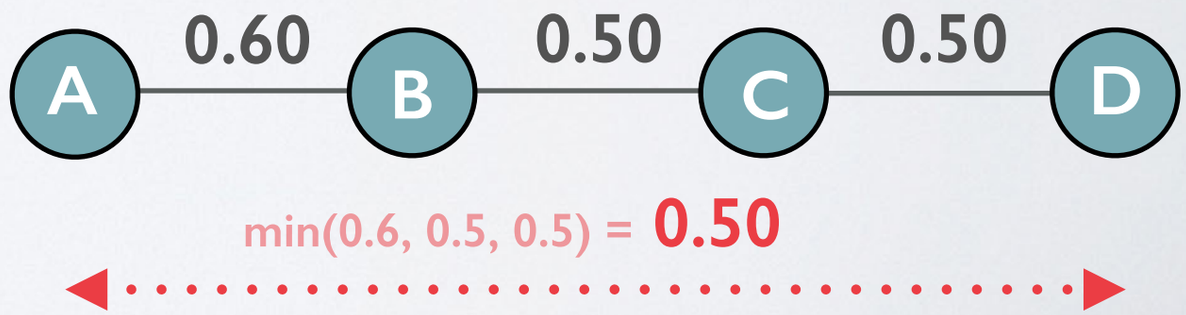
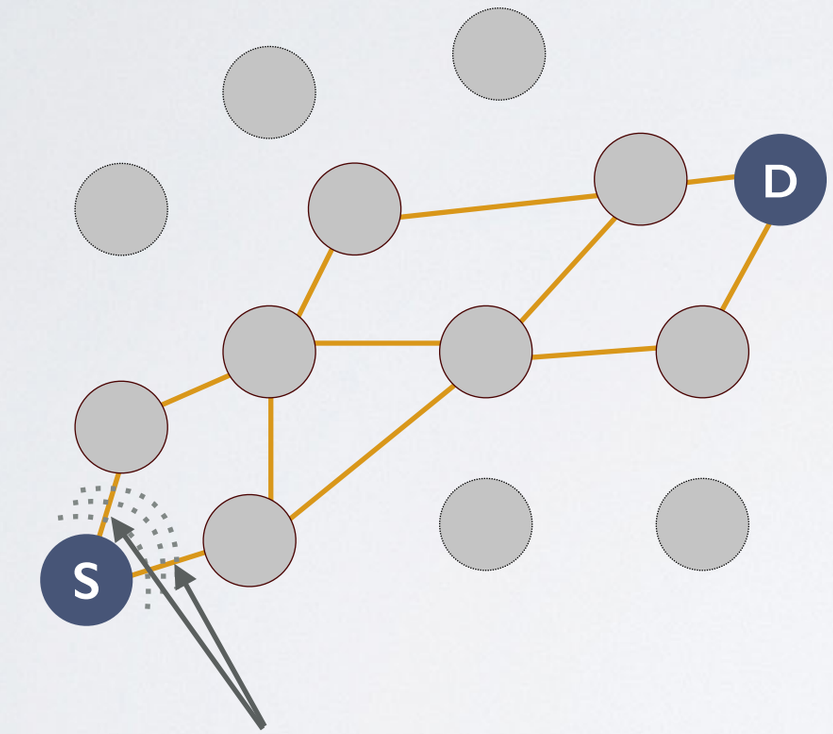




MULTIPATH IN MESHMERIZE

Leverage the Broadcast medium

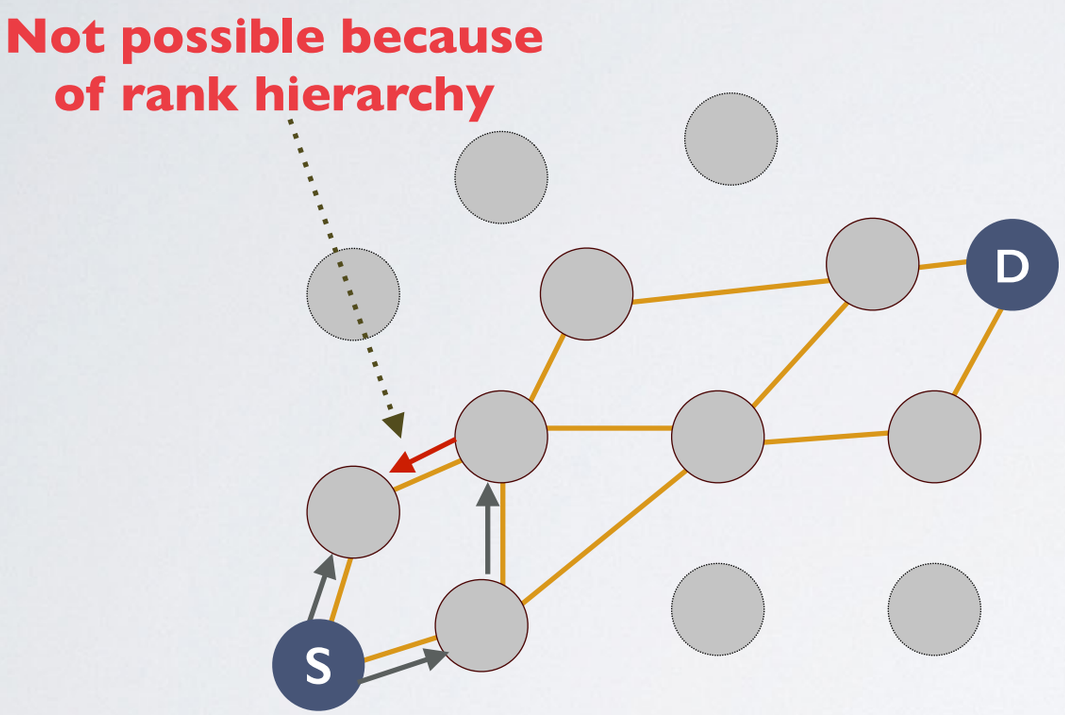


single transmission

- Route through **corridors**, not paths.
- Every transmission is a custom multicast.
- Relay nodes that hear the packet determines whether to participate in the transmission based on ***routing metrics***.
- Different relays hear different packets due to channel losses and therefore contribute uniquely to the transmission.

MULTIPATH IN MESHMERIZE

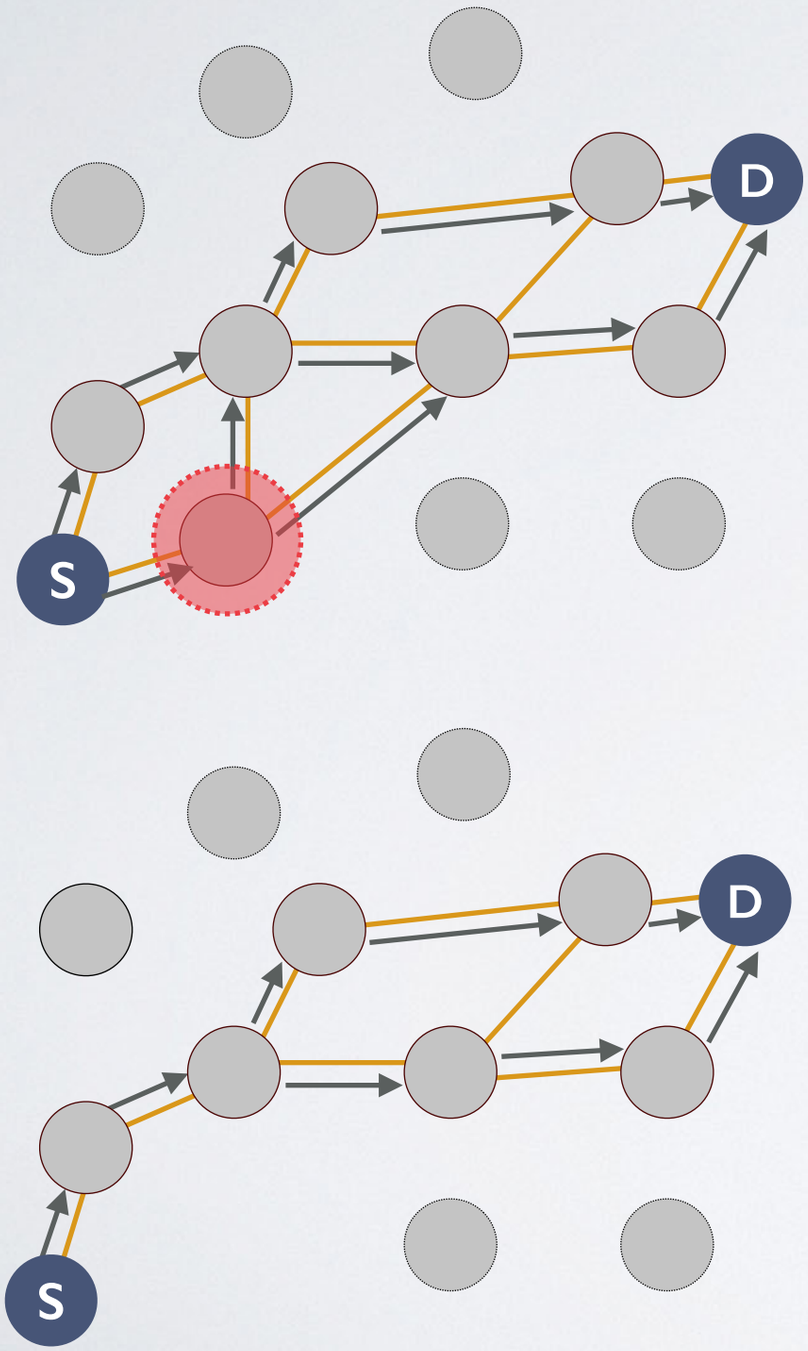
Leverage network coding characteristics



- Recoders only send out packets upon increase in ***rank***.
- ***rank -*** number of linear independent packets in the recoder.
- Implicitly avoid ***routing loops***.

MULTIPATH IN MESHMERIZE

Leverage Multipath



- Dropping of some corridor nodes does not affect the overall route.
- Feedback restricts the number of recoded packets sent.
- No need to wait for periodic updates (like the usual proactive protocols) upon link failure.
- Size of the corridor can be dynamically controlled using the metric.

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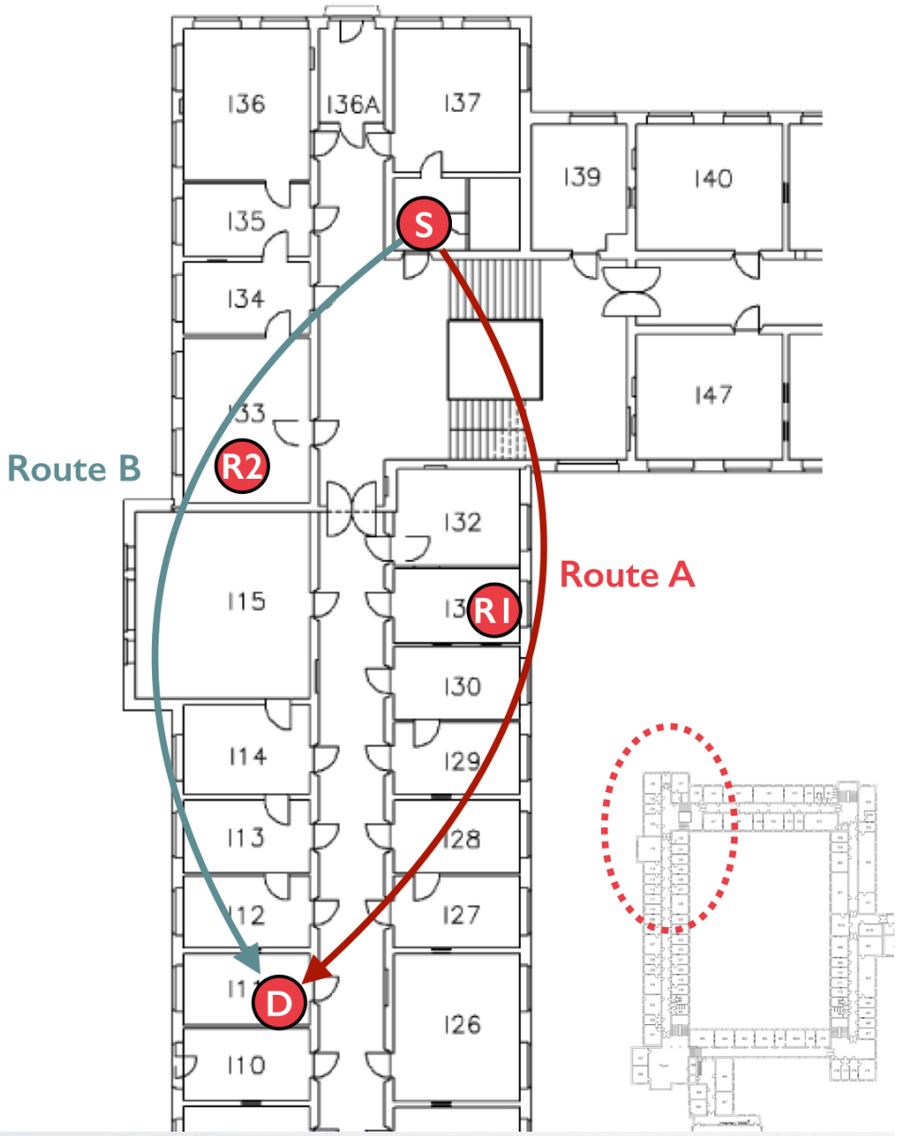
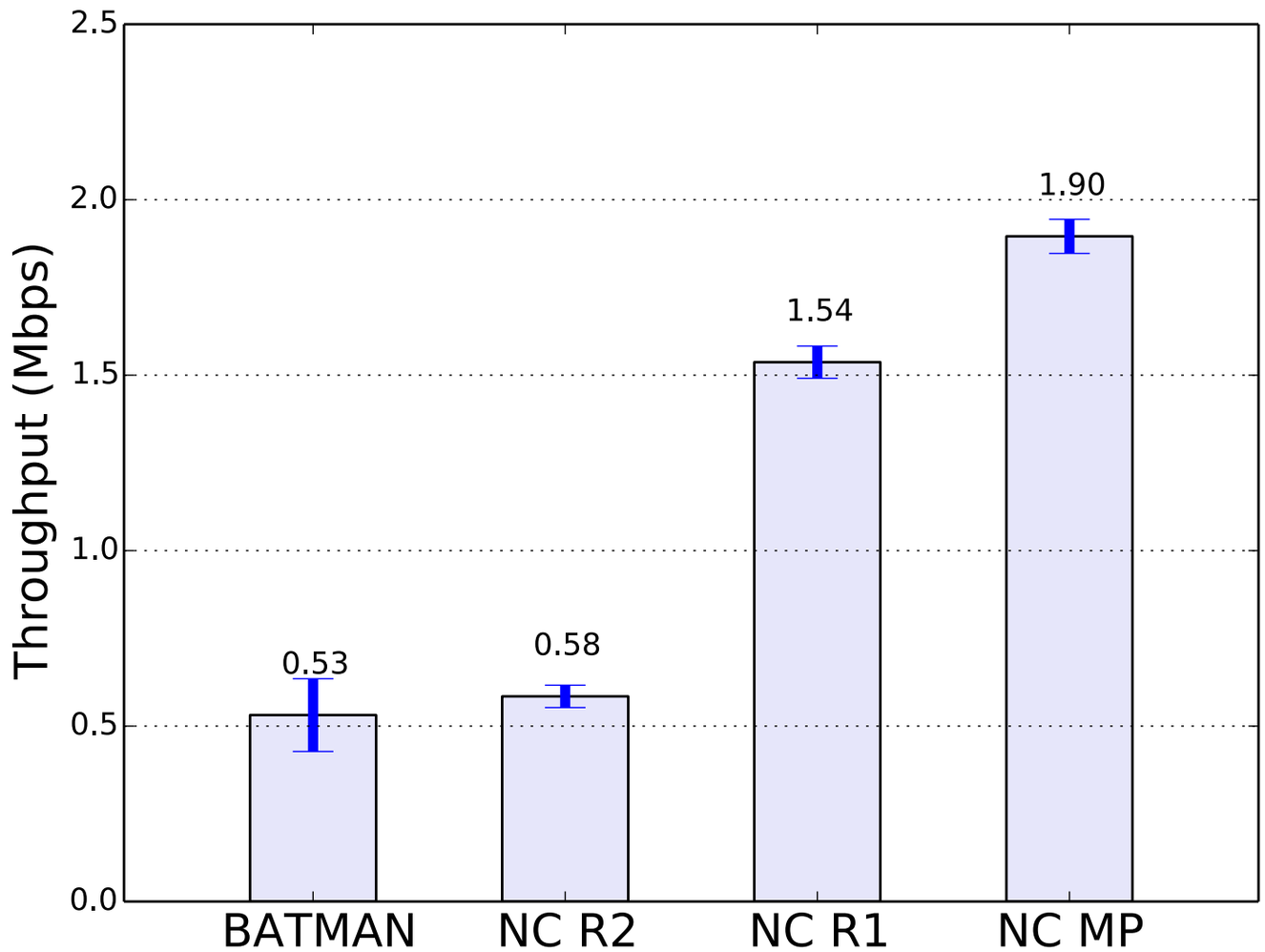
PRELIMINARY RESULTS





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SUMMARY

We apply network coding in wireless mesh:

- to exploit the broadcast nature of the wireless medium.
- to improve error resilience.
- to (possibly) improve network throughput.
- to eliminate the need for explicit scheduling and path finding.

Currently in evaluation phase.

THANK YOU

Questions or Suggestions?