Leveraging IEEE 802.11 built-in mechanisms to form wireless multi-hop networks

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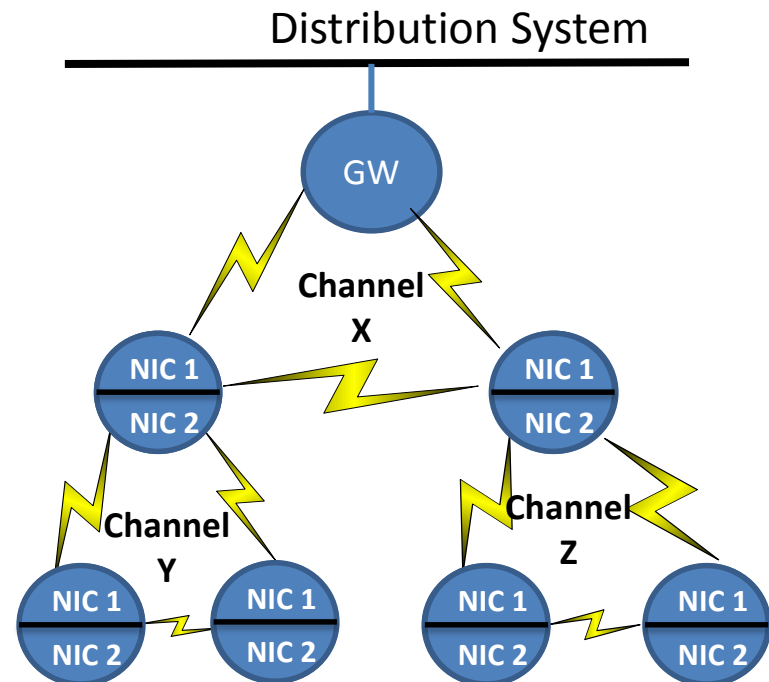Centre for Telecommunications and Multimedia
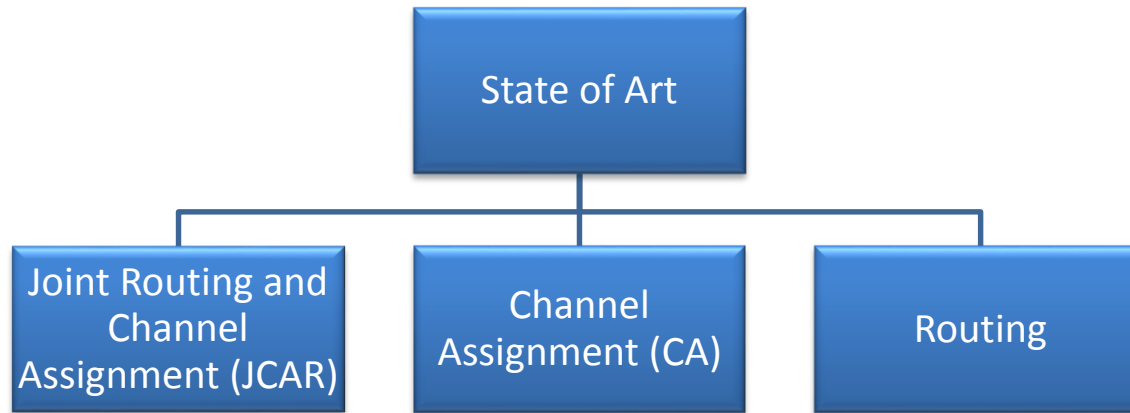
Wireless Battle of the Mesh v9, May 2016

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Introduction

Multi-Radio Multi-Channel Wireless Mesh Networks (MRMC WMN)

Flexible and cost-effective way to extend a wireless infrastructure

State of Art

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            │ State of Art │
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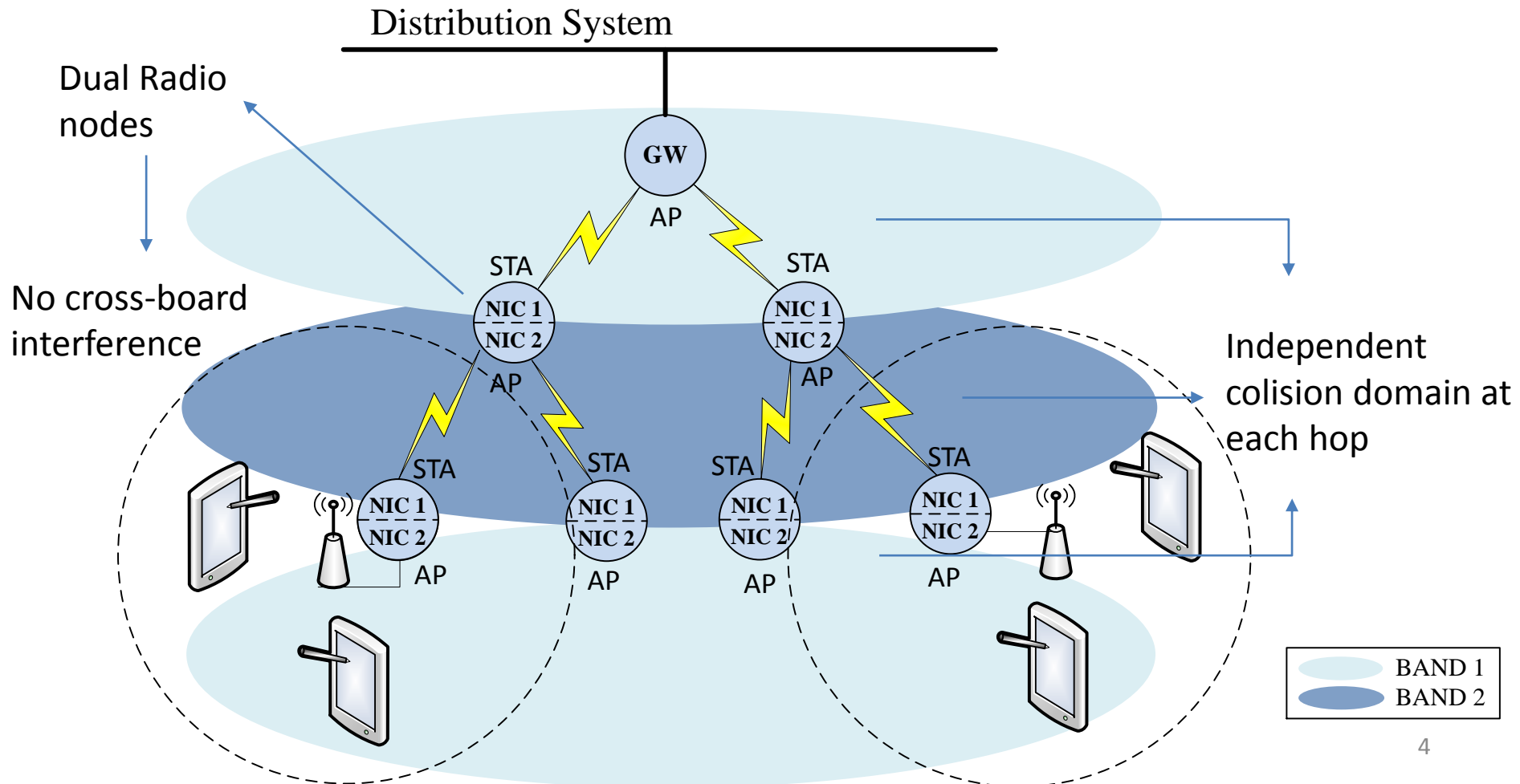| Joint Routing and Channel Assignment (JCAR) | Channel Assignment (CA) | Routing |

Weaknesses in state of art MRMC WMN solutions

- Underuse of radio resources
- Underuse of frequency spectrum
- Excessive control messages
- Centralized coordination
- Layer 3 routing

WiFIX-DR

Proposed hierarchical architecture with distributed coordination
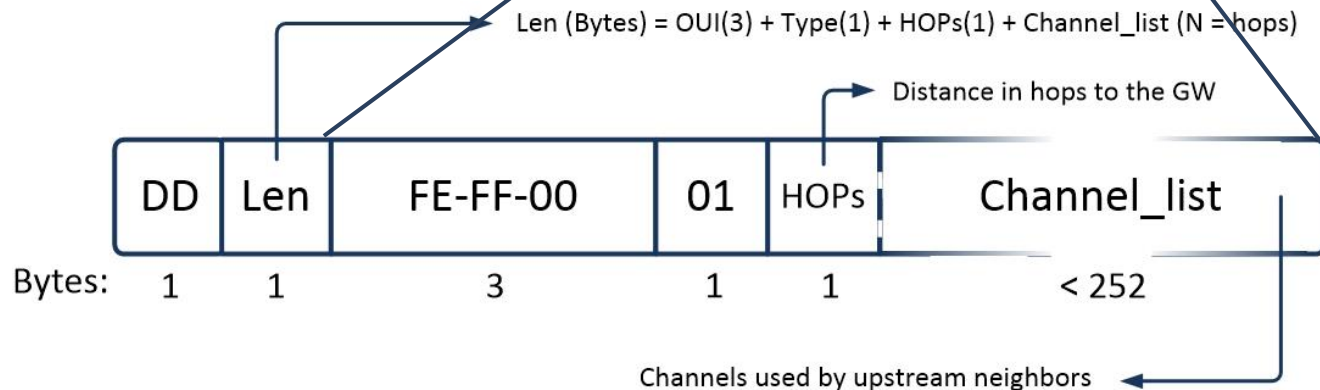### BSS Cascading

WiFIX-DR

Topology Creation

– Control information and beacons

- Beacons used in IEEE 802.11 to broadcast Service Set info
- Vendor Specific Information Element (IE 221)

– Beacon IE

– Proposed IE

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WiFIX-DR

- ## Channel Assignment Strategy in MAPs
  - Create channel diverse paths with alternating frequency bands
  - Choose best channel among candidate set according to weight reduction function

$$weight_{k\_new} = weight_{k\_actual} * \frac{d_k}{d_{hops}}$$

- ## WiFIX as routing protocol
  - Layer-2 routing scheme
  - Linux learning bridge
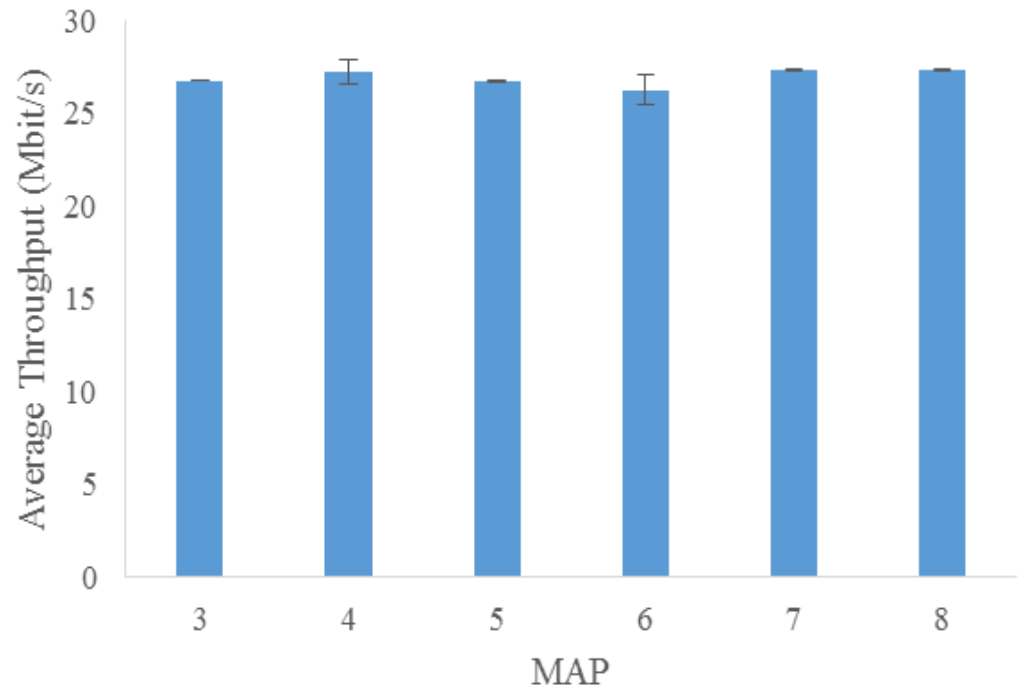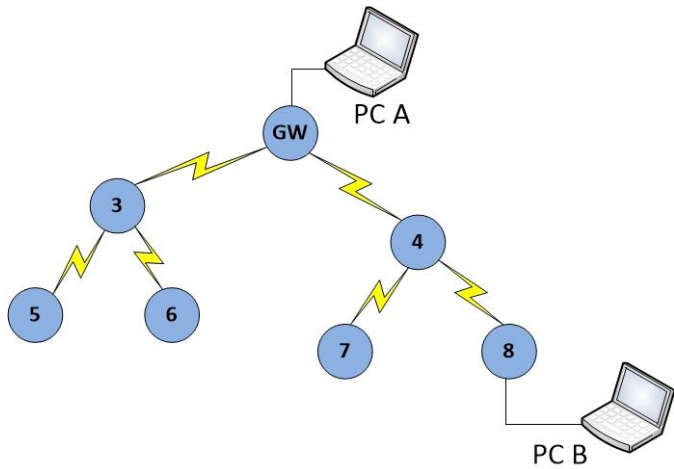 - Single radio routing protocol

Experimental Evaluation
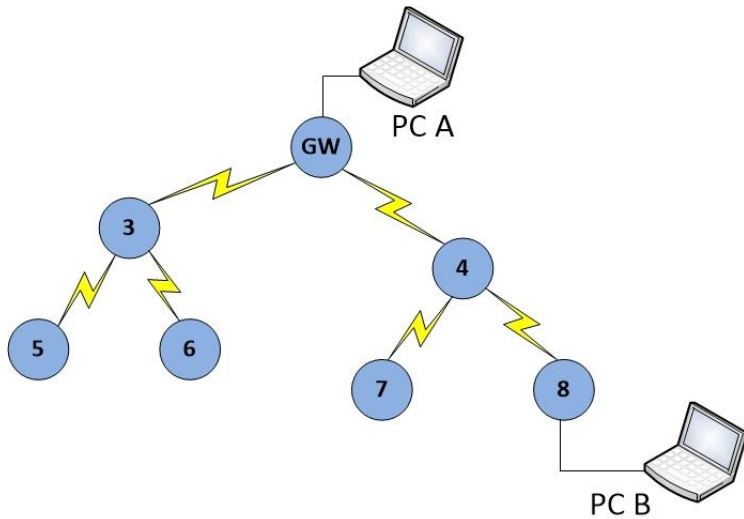
Testbed Setup
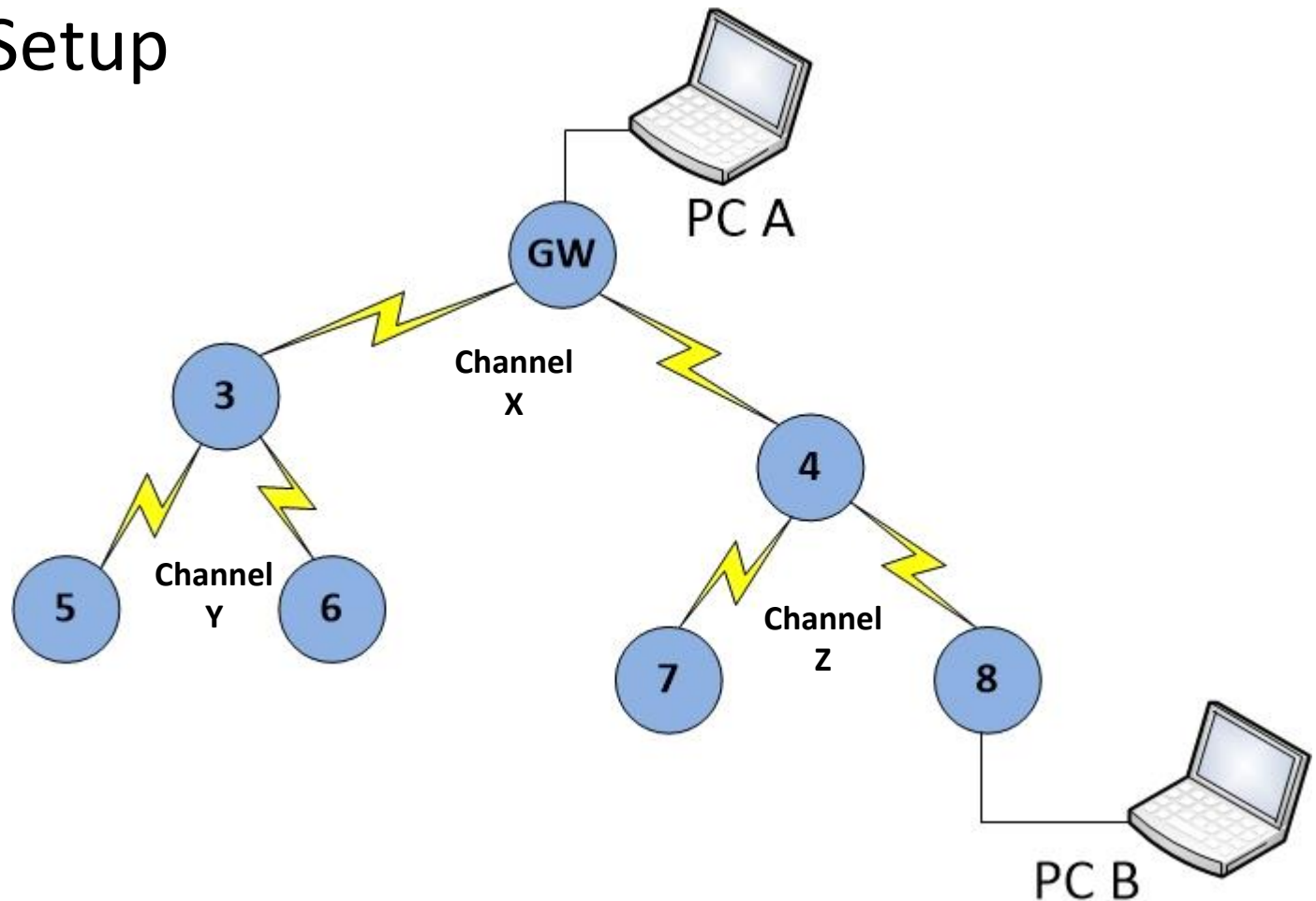
Experimental Evaluation

UDP Results

– Single flow experiment

– One and two hop througput comparison

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Experimental Evaluation

One way throughput with competing flows
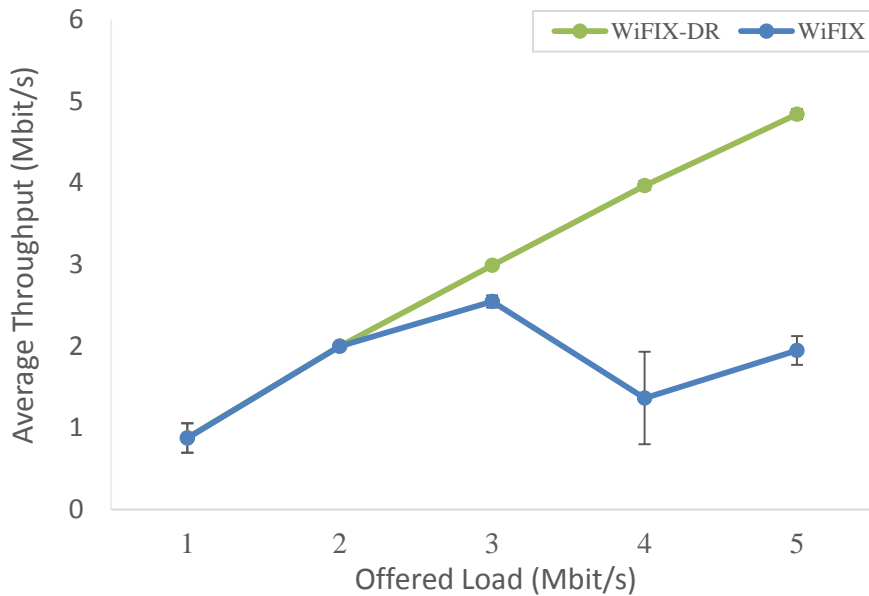

One Way Throughput WiFIX-DR
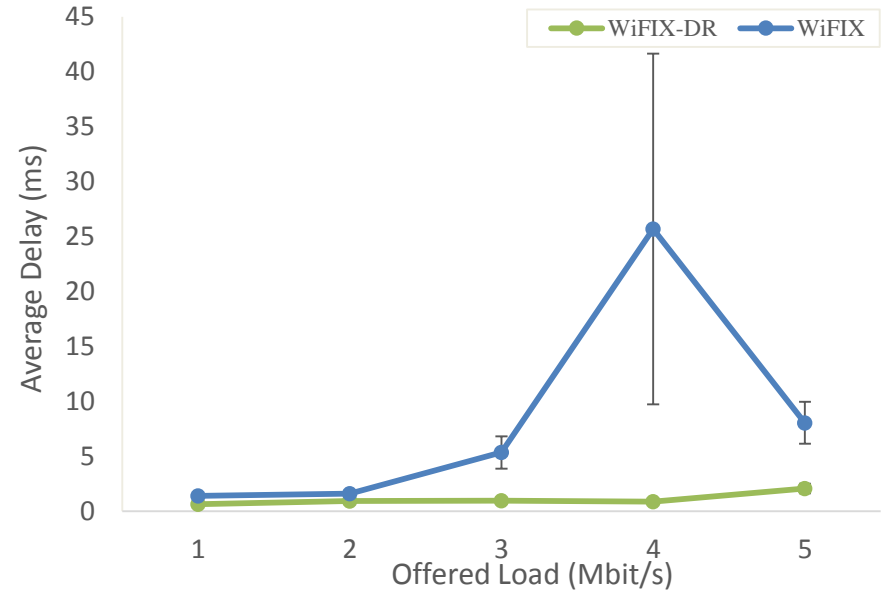
Experimental Evaluation

Comparison with WiFIX (single radio)
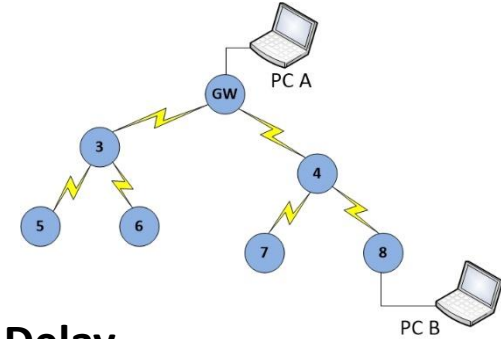
Throughput

Delay

Conclusions

- WiFIX-DR enables self-configurable multi-hop net by reusing IEEE 802.11 built-in mechanisms
  - no additional signalling
  - overall capacity not affected by number of hops
  - improved scalability

- Experimental results show its effectiveness

Future Work

- Experimental evaluation in larger testbed

- Comparison with other SoA solutions

- Improve channel assignment strategy

Thank you!

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