Hi-performance Architectures for IP-based Multihop 802.11 Networks

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The Goal

- The goal is to create a hi-performance multi-hop 802.11-based wireless datapath.
- In other words, The goal is to design a low latency and high throughput wireless router or forwarding node in multihop 802.11 network.
Problems Definition – Latency Issues
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- Packet forwarding in the wireless environment does not transfer a packet between two different interfaces but over the same interface.
  - There is *an unnecessary round-trip* between the memory of the NIC and the host’s memory.
- The forwarding node is involved in two separate channel access contention.
  - It *suffers the contention resolution time twice*.
Problems Definition – Throughput Issues

- Increase concurrent transmissions through better spatial reuse.
  - The use of power control algorithms
  - The use of smart antennas or multiple directional antennas
  - Modifications of the MAC itself which is the easiest way.
Proposed Solution – MPLS

- The packet forwarding performance can be significantly improved *if the next hop for the packet can be determined within NIC.*

- So, the NIC is enhanced to store a label switching table.

- The label switching table is formed by a label distribution protocol running at the host.
Proposed Solution – MPLS
Proposed Solution - DCMA

- DCMA (Data-Driven Cut-Through Medium Access) combines the ACK to the upstream with the RTS to the downstream in one.
Proposed Solution - DCMA
Proposed Solution – MACA-P
Conclusions

- 802.11 contribute to high forwarding delay and poor system throughput in multi-hop wireless environments.
- Next-hop lookup may be performed at the MAC layer instead of IP layer.
- **DCMA** can provide reduction in forwarding latency.
- **MACA-P** can improve spatial reuse without additional hardware modifications.
- MACA-P can be combined with the pipelined DCMA to be a *hi-performance MAC*. 