Hi-performance Architectures for IP-based Multihop 802.11 Networks

IEEE Wireless Communications 2003

Presented by 何德威

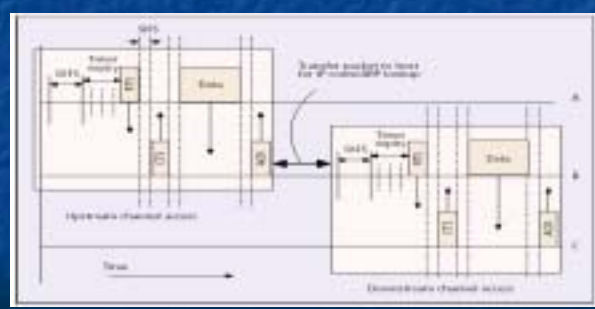
Outline

- The Goal
- Problems Definition
  - Latency Issues
  - Throughput Issues
- Proposed Solutions
  - MPLS[7]
  - DCMA[7]
  - MACA-P[12]
- Conclusions

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



Problems Definition – Latency Issues

- 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*.

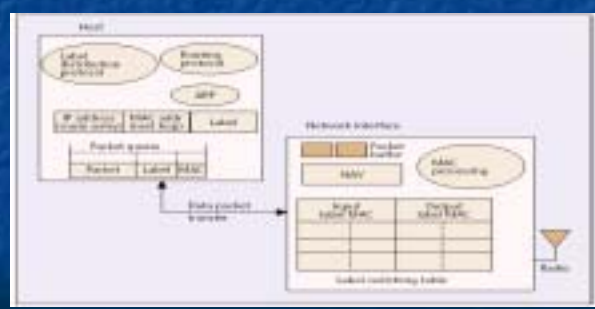
Problems Definition – Throughput Issues

- 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.

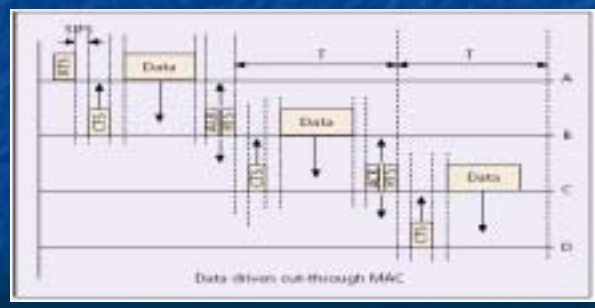
Proposed Solution – MPLS



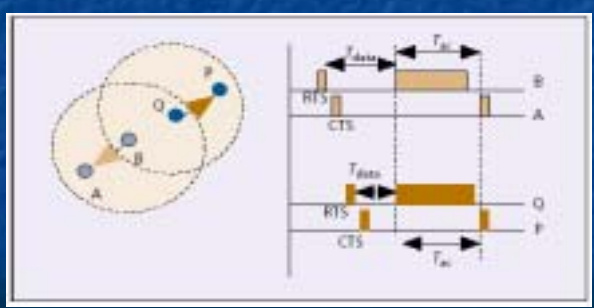
Proposed Solution - DCMA

- 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*.