Primary Channel Assignment based MAC (PCAM) – A Multi-Channel MAC Protocol for Multi-Hop Wireless Networks

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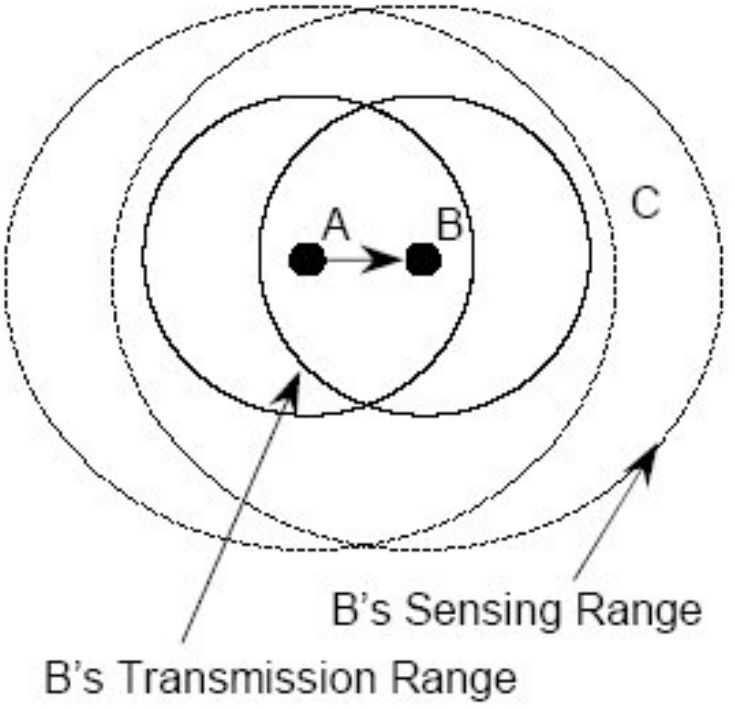
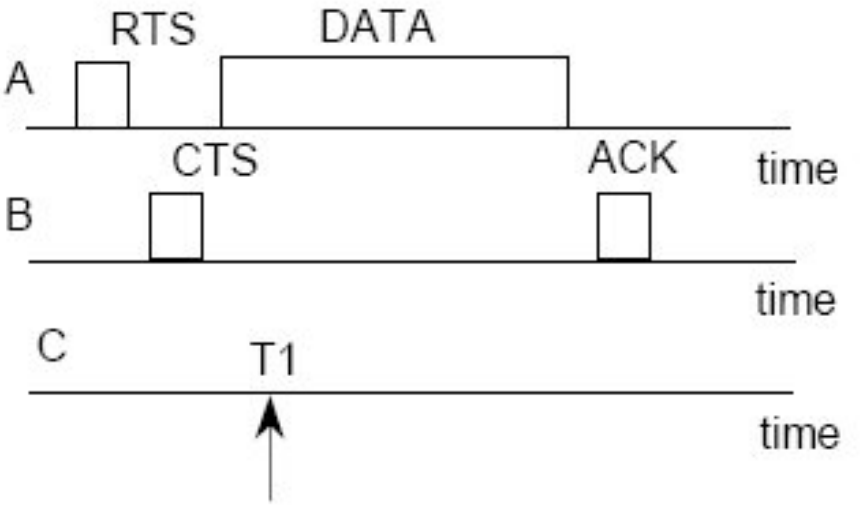
Introduction

- There are some problems under the multi-channel WLAN
  - Hidden terminal problems
  - Busy receiver problems (single transceiver)
  - Broadcast messages losing problems
  - …

Hidden Terminal Problem (Multi-channel)





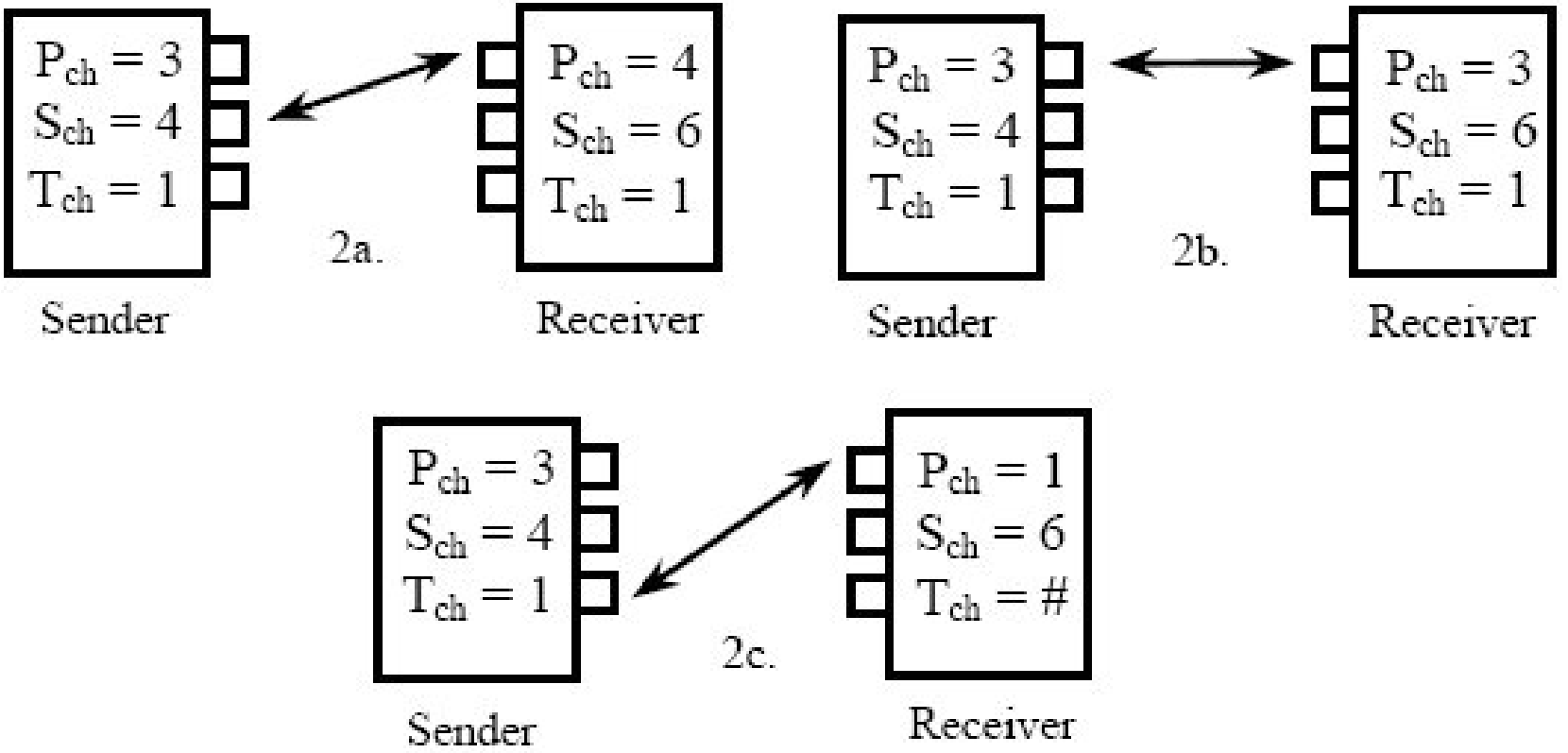
Main Goals and Assumptions in This Paper

- Does not require any dedicated control channel or complex synchronization
- Using multi-transceivers
  - P (Primary) → data channel
  - S (Secondary) → data channel
  - T (Tertiary) → broadcast channel and data channel

PCAM Protocol

- The primary interface is assigned a certain channel know as “primary channel”
  - Default channels to communicate with other MH
- The Secondary transceiver is used mainly for sending data.
  - Not be assigned any fixed channel
- Nodes are always contactable by their primary channel.

The Channel Assignment Example

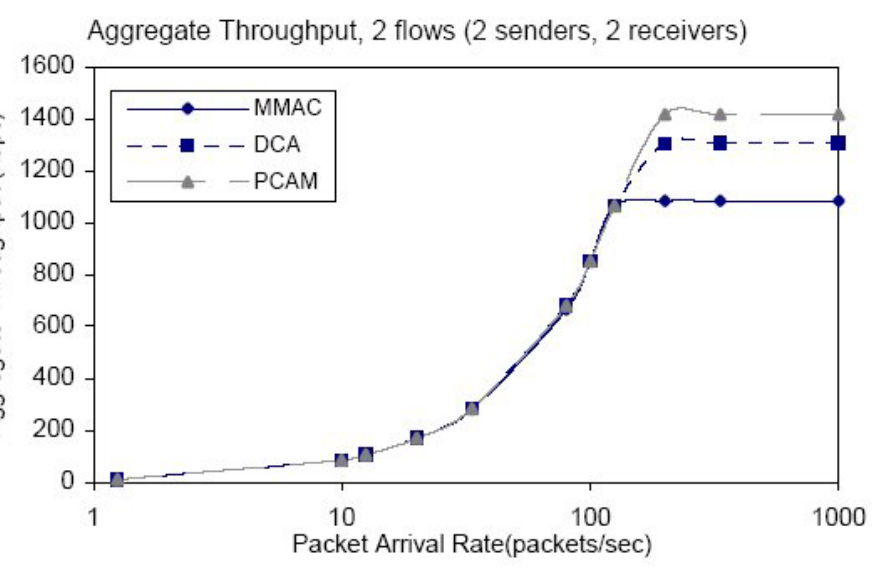


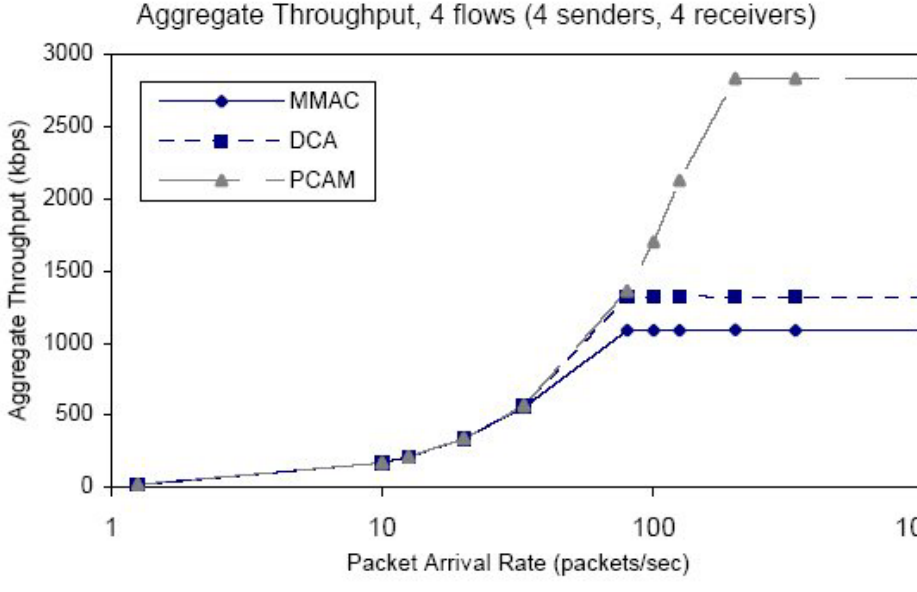
Other Suggestions

- Shorten the transmission range (250m→200m)
  - To solve the hidden terminal problem

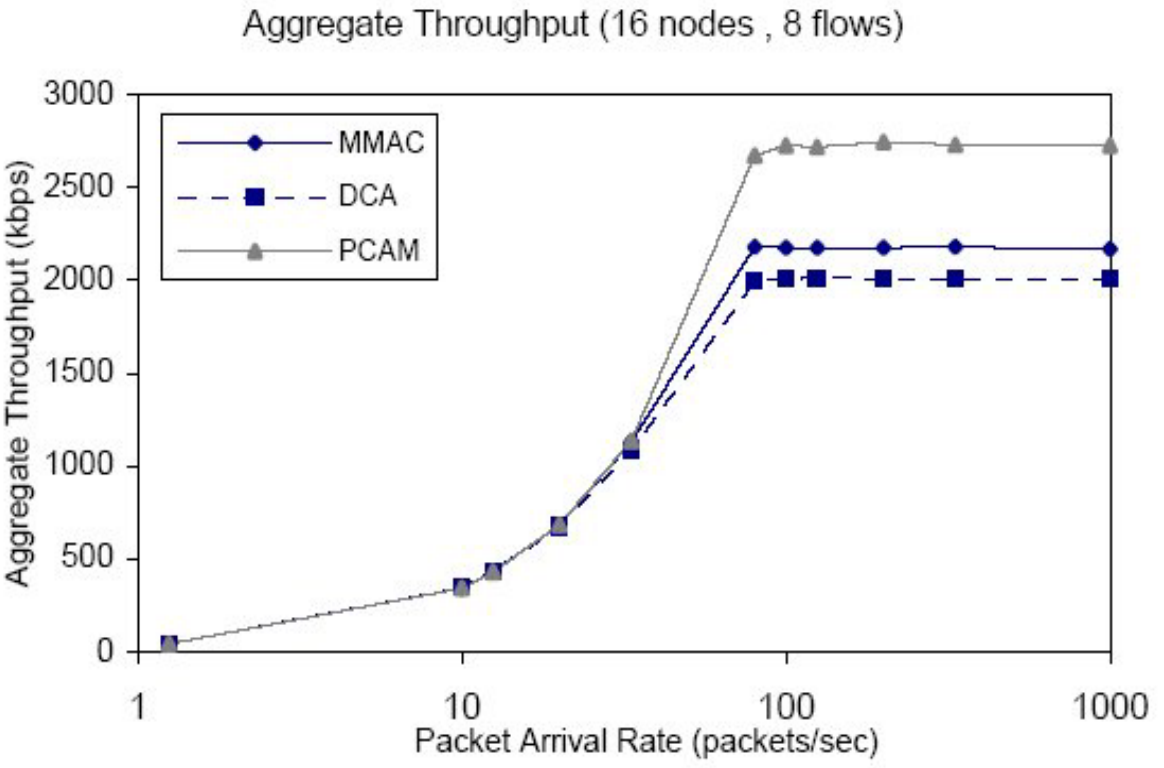
Performance Evaluation

- Comparing with [1] and [2]

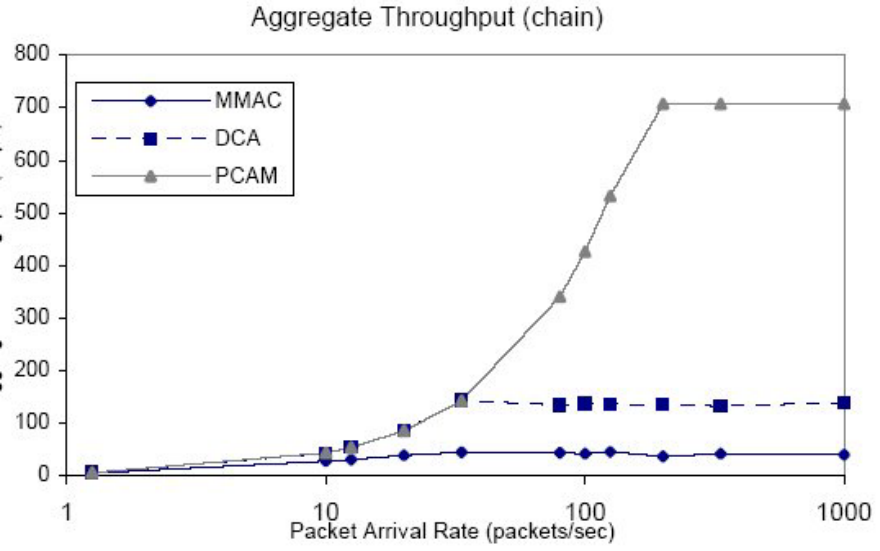




Performance Evaluation (cont.)



Performance Evaluation (cont.)



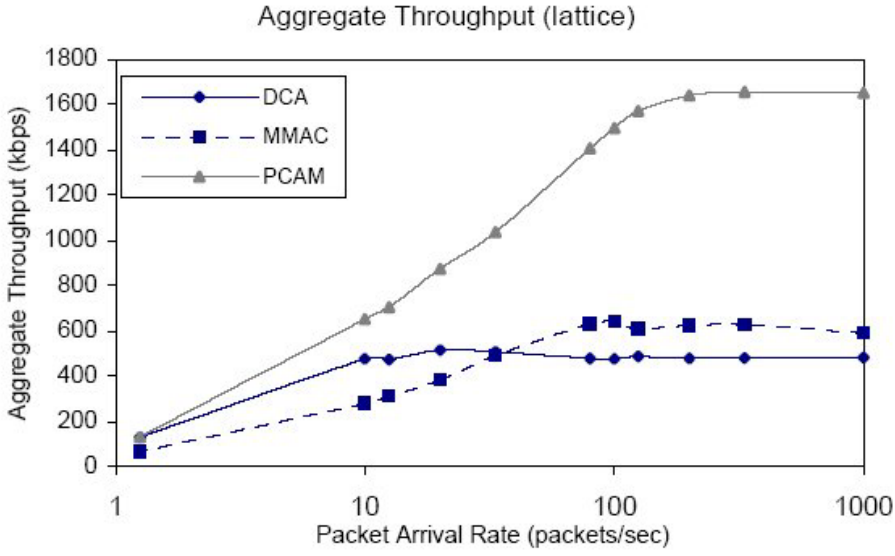


TABLE III.

	MMAC	DCA	PCAM	1-channel 802.11
Throughput (kbps)	33.550	132.986	707.489	53.115
Delay (sec)	1.3676	0.8871	0.3699	0.4577

TABLE IV. AVERAGE END-TO-END DELAY (IN SECONDS)

DCA	MMAC	PCAM
1.1815	0.3629	0.5805

Discussion

- Do we need control channel?
  - Broadcast messages are important
- Using a fixed transceiver to receive the messages from other nodes may be a good idea
  - Reducing the channel negotiation latency

Summary

- PCAM is a MAC protocol for multi-channel wireless networks.
- PCAM using three transceivers.
  - P (Primary) → data channel
  - S (Secondary) → data channel
  - T (Tertiary) → broadcast channel and data channel

References

[1] S.-L. Wu, C.-Y. Lin, Y.-C. Tseng and J.-P. Sheu, “A New Multi-Channel MAC Protocol with On-Demand Channel Assignment for Multi-Hop Mobile Ad Hoc Networks,” Int'l Symposium on Parallel Architectures, Algorithms and Networks(I-SPAN), 2000, pp. 232-237.

[2] J. So, N. H. Vaidya, “A Multi-channel MAC Protocol for Ad Hoc Wireless Networks”, UIUC Technical report, 2003.