

Evaluation of Protocol efficiency

Alan Winkowski
BreezeCOM Ltd.

Introduction

- New PHY's defined lately in 802.11, while MAC remained static
- Efficiency was analyzed for different packet sizes as well as different transaction scenarios
- Analysis was performed on a transaction basis
- Substantial degradation in protocol efficiency

Efficiency calculation

$$Eff = \frac{ND}{TrD * NDR}$$

- *ND* = Amount of Network Data
 - 60, 400 and 1500 bytes Data Packets
- *TrD* = Transaction duration
 - DFC (Data-Ack and RTS-CTS-Data-Ack)
 - PCF (CF-Poll{+Data}-CF-Ack{+Data})
- *NDR* = Nominal Data Rate
 - 2Mbps, 11Mbps, 24Mbps and 54Mbps

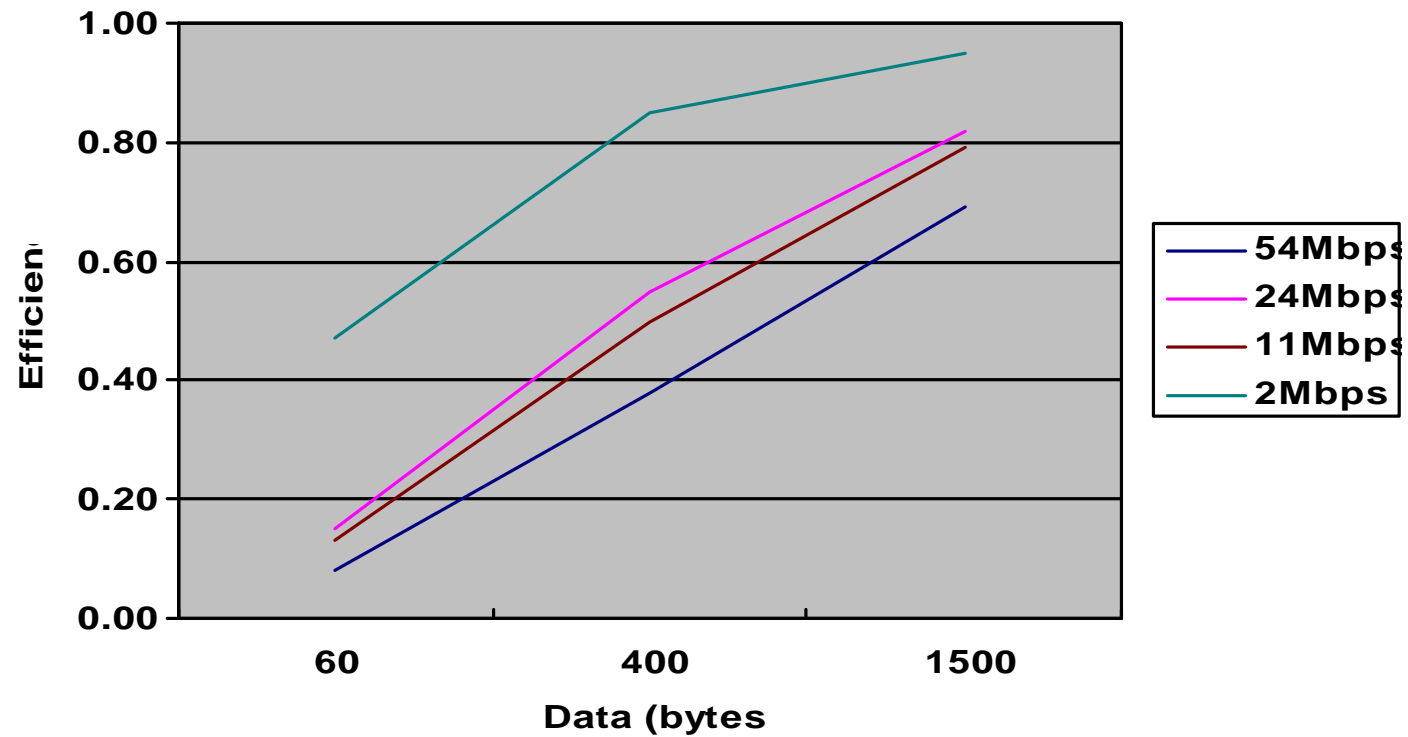
DFC Efficiency values

RATE	DATA-ACK			RTS-CTS-DATA-ACK		
	Shortest	Average	Largest	Shortest	Average	Largest
2Mbps	0.47	0.85	0.95	0.22	0.65	0.87
11Mbps	0.13	0.50	0.79	0.07	0.35	0.67
24Mbps	0.15	0.55	0.82	0.09	0.40	0.71
54Mbps	0.08	0.38	0.69	0.05	0.25	0.55

- Events like Collisions and Backoff were not considered, thus efficiency is actually lower

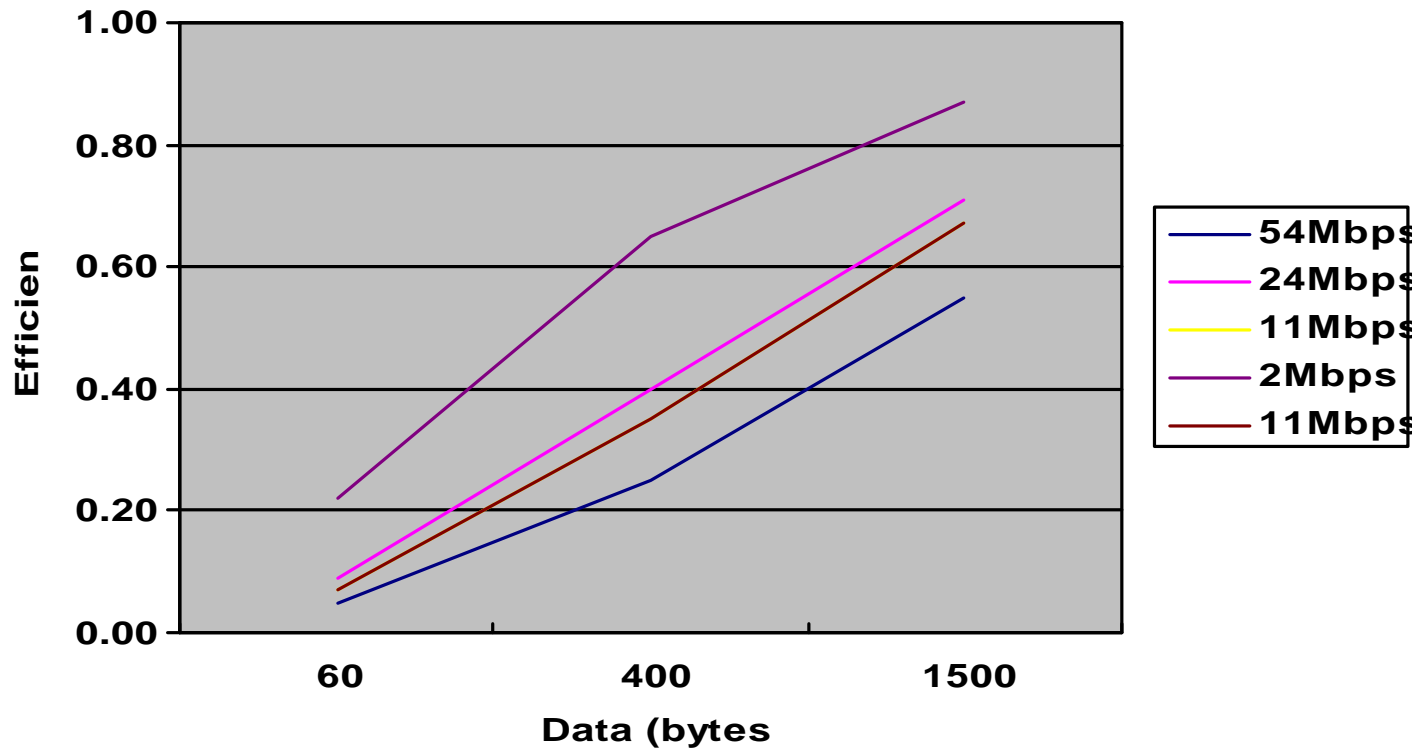
DCF: Data-ACK

**Protocol Efficiency
DATA-ACK transactions**



DFC: RTS-CTS-Data-Ack

**Protocol Efficiency
RTS-CTS-DATA-ACK transactions**

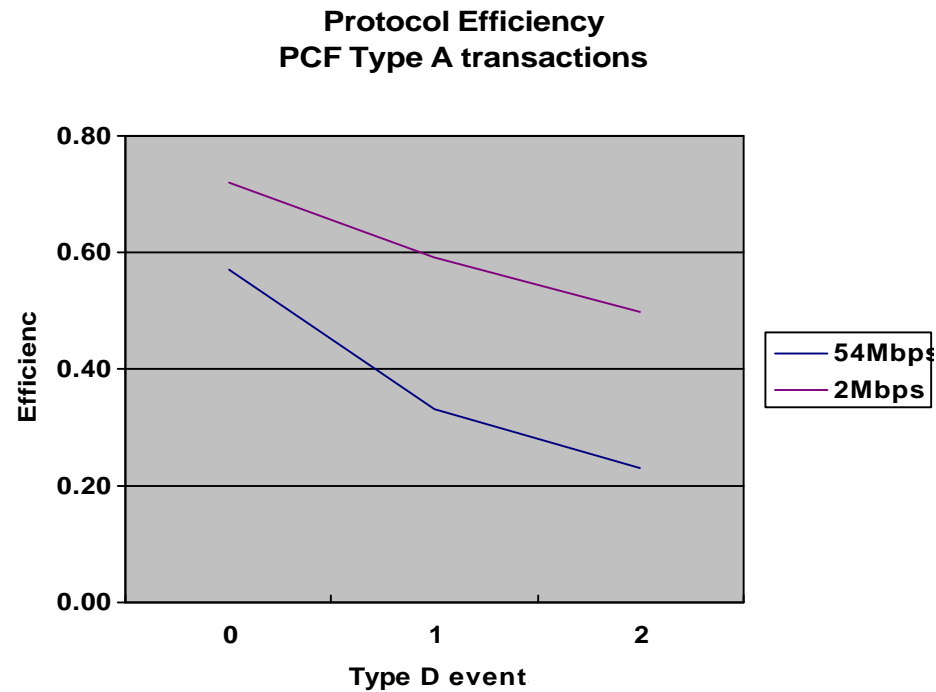


PCF Efficiency

- Protocol performance depends on protocol flow
- Flow simulation is required
 - packet length: 400 bytes
 - Mix of different transactions:
 - A. Data (CF-Poll) - Data (CF-Ack)
 - B. CF-Poll - Data (with CF-Ack on next poll)
 - C. Data (CF-Poll) - CF-Ack (No Data)
 - D. CF-Poll (No Data) - PIFS

PCF Efficiency - simulation

RATE	EFFICIENCY (100% A TRANSACTIONS)		
	0 Type D Events	1 Type D Events	2 Type D Events
2Mbps	0.72	0.59	0.50
54Mbps	0.57	0.33	0.23



Conclusions and Recommendations

- Quantitative efficiency degradation in all scenarios analyzed
- Possible improvements proposed:
 - Greater frames for Data and Control information (specially in short frames)
 - Aggregation of feedback information
 - Scheduling in advance by the AP (PCF improvement)