Experimental Evaluation of TCP Performance and Fairness in an 802.11e Test-bed

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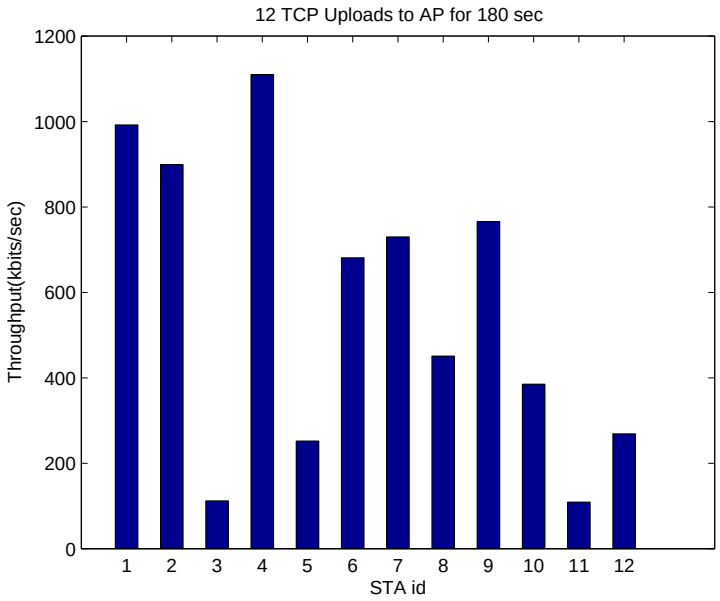
22nd August 2005

802.11b TCP Performance

12 uploads



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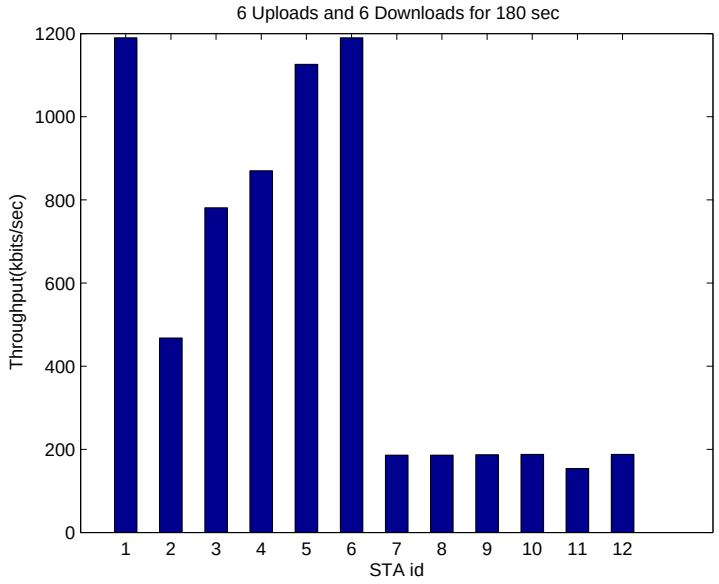


Have proposed fixes, want to test in practice.

802.11(e) Summary

- After TX choose rand$(0, \mathrm{CW}_{\min} - 1)$.
- Wait until medium idle for DIFS$(50\mu s)$,
- While idle count down in slots $(20\mu s)$.
- TX when counter gets to 0, ACK after SIFS $(10\mu s)$.
- If ACK then $\mathrm{CW} = \mathrm{CW}_{\min}$ else $\mathrm{CW}* = 2$.

Ideally produces even distribution of packet transmissions.

In 11e have multiple queues. Each has own $\mathrm{CW}_{\min}$, DIFS(aka AIFS) and can have TXOP.

Why use a testbed?

- Can we believe ns?
  Bugs: aCCATime, virtual collisions.
- Can we believe the standard?
- Can we believe models?
- What are the practical issues?

Testbed setup

Number of identical stations (Linux) connection to AP (Linux hostap).

1× AP	Dell GX 280	2.8Ghz P4
12× STA	Soekris net4801	266Mhz 586
WLAN	D-Link DWL-G520	Atheros AR5212

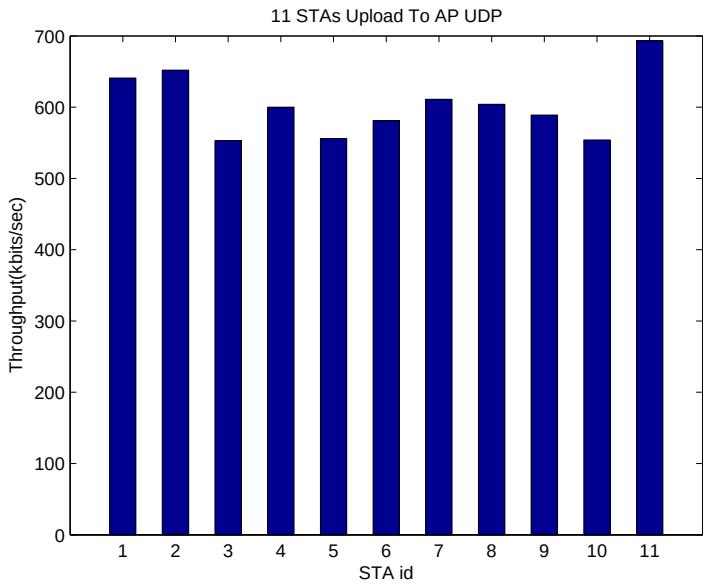
Cards have external antenna, PCI interface, Madwifi driver with local patches for 11e parameter setting.

MGEN and iperf used for traffic generation.

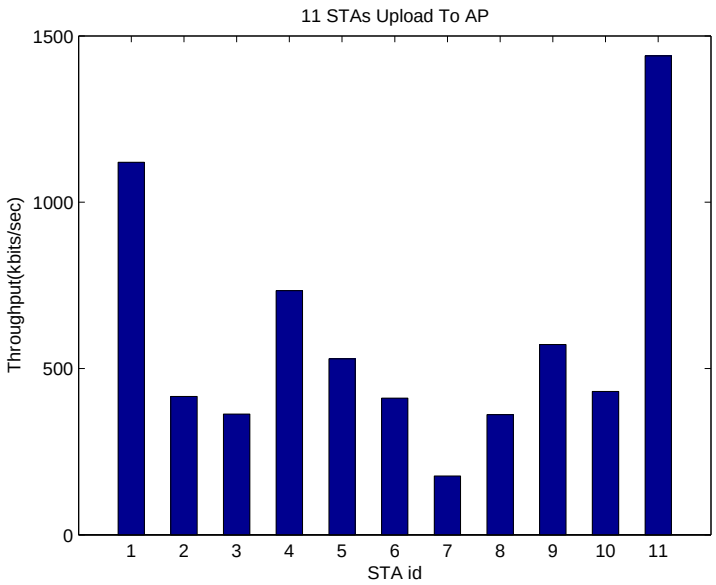

192.168.0.180&180
192.168.0.187
187
192.168.0.7&177

Practical Issue: Calibration

UDP up

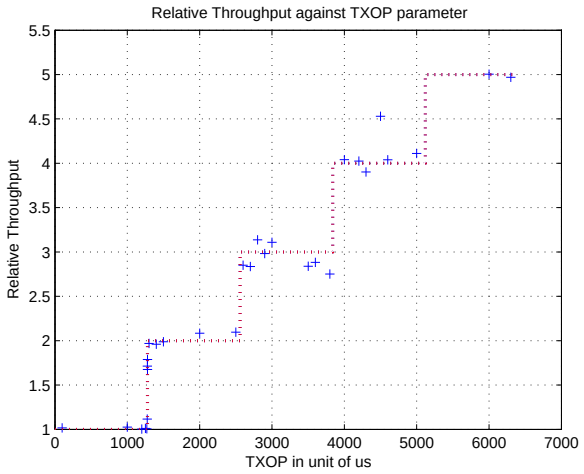


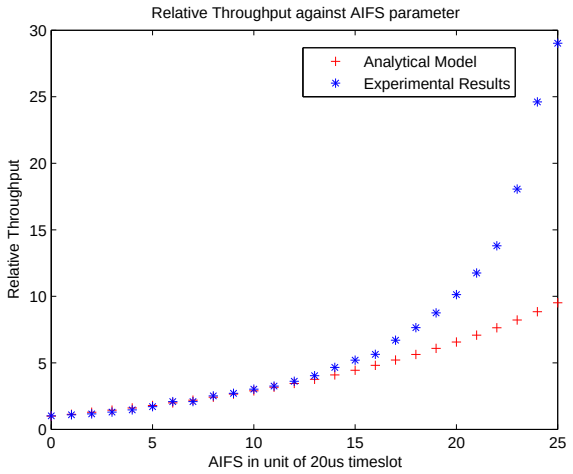
TCP up

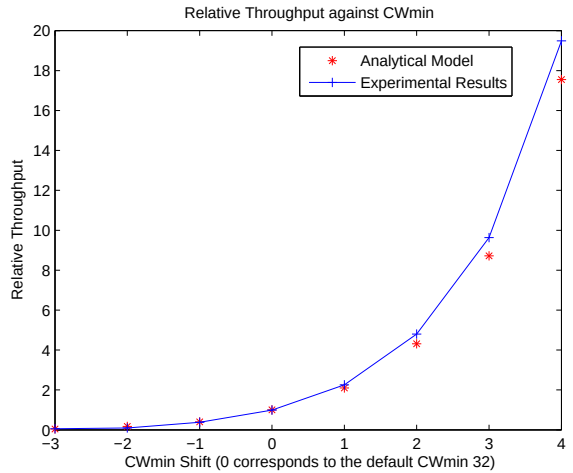


Small changes until well behaved.

Validation







Measure relative performance of two saturated flows while varying TXOP, AIFS and $\mathrm{CW}_{\mathrm{min}}$. Compare to well-known models.

Proposed settings

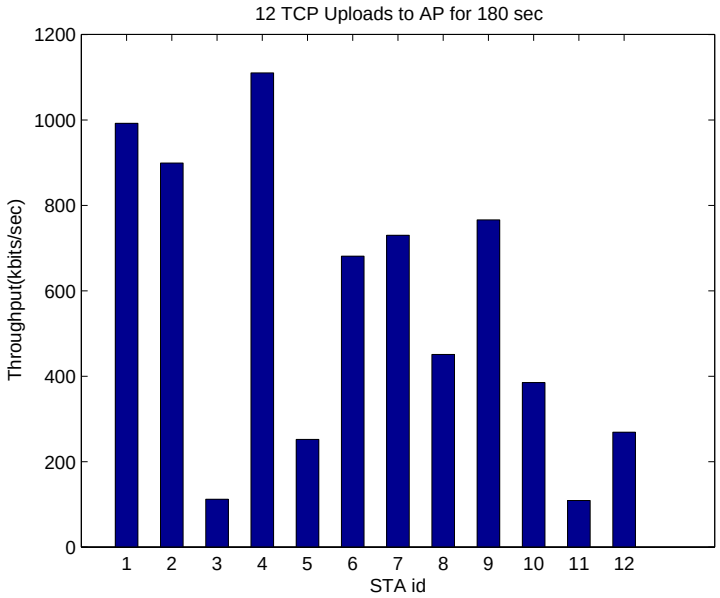
		AIFS (slots)	CWmin	TXOP (packets)
AP	Upload ACKs	0	4	1
	Download data	4	32	n_d
wireless	Download ACKs	0	32	1
station	Upload data	4	32	1

Derived using analytical modeling and ns.

Will they work in practice?

Before

12 uploads



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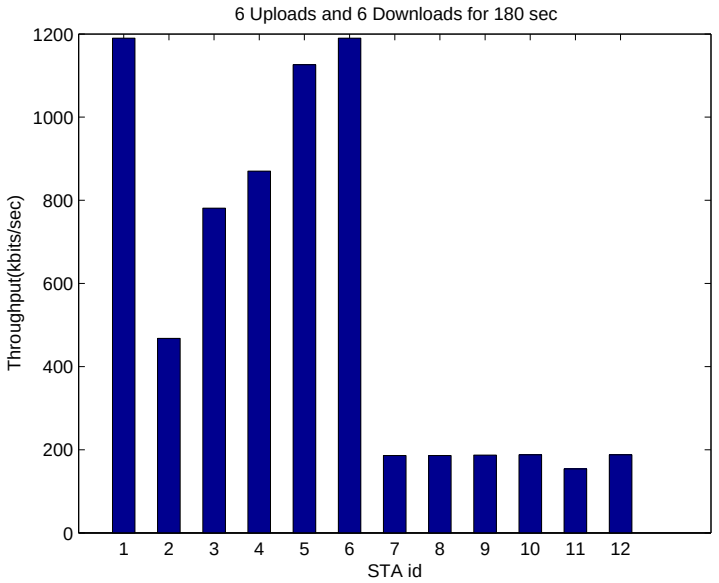

After

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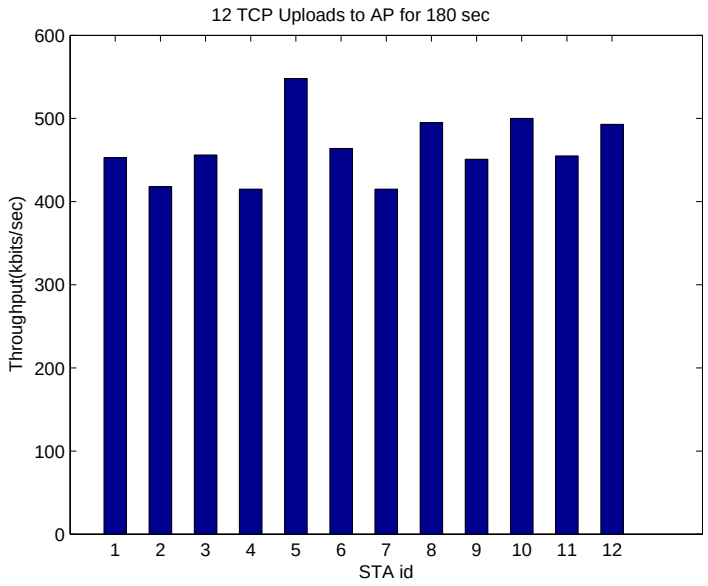

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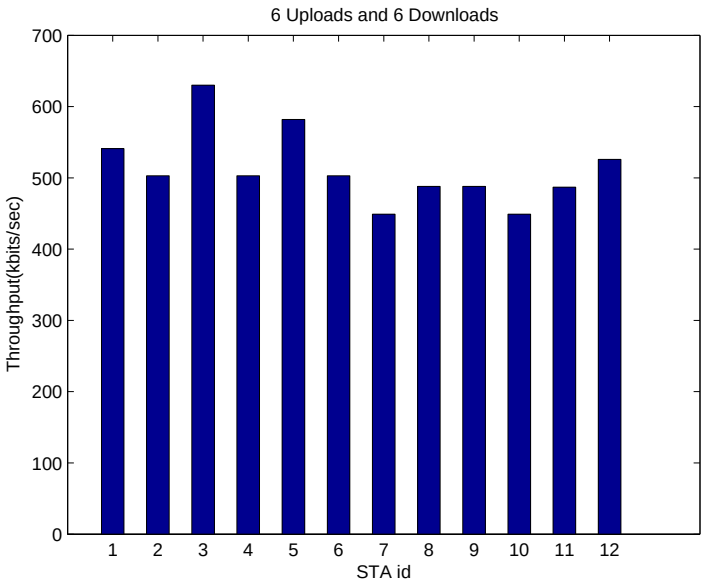

Conclusions

- Small operational testbed.
- Hardware seems to behave as expected.
- Radio issues can be amplified by other issues.
- 11e can be used to combat MAC/TCP issues.
- Now looking at mixed voice/data networks.