Improving Flow level Fairness and Interactivity in WLANs using Size-based Scheduling Policies

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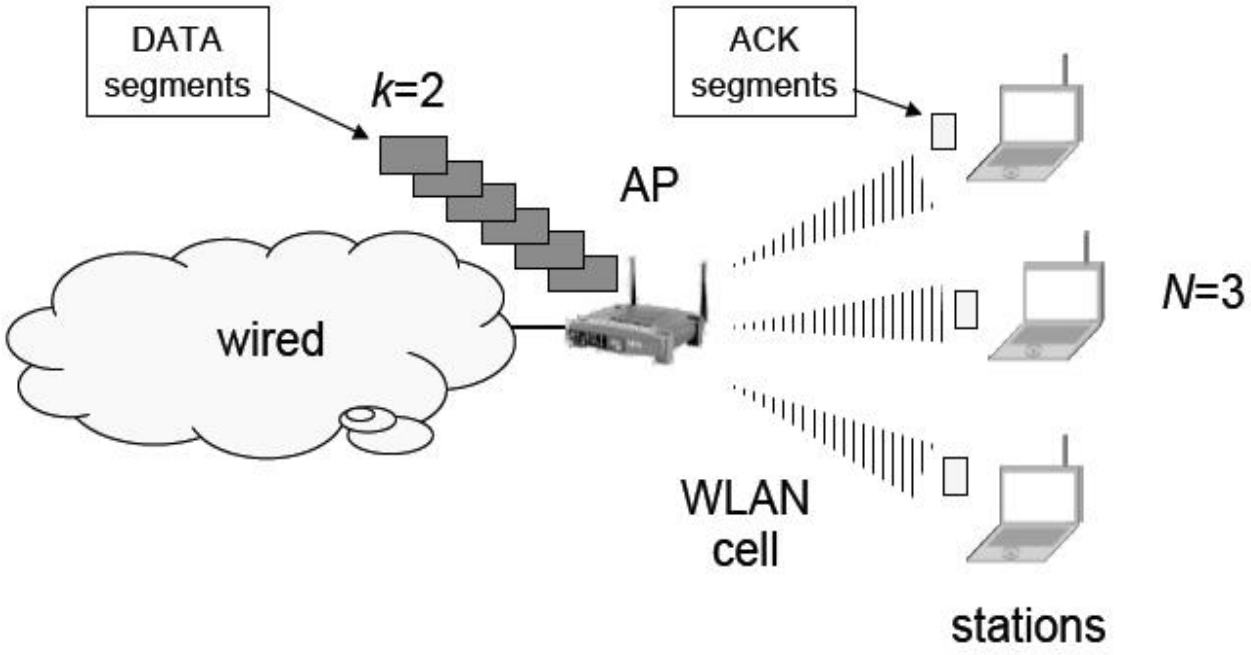
- Why slow Performance in 802.11 ?
- Size based scheduling in IP layer
- Experiment environment
- Evaluation & Comparison between FIFO,LAS,LASACK
- Conclusion

Another problem: TCP over WLAN (cont.)



Courtesy to M.Heusse

Slow Performance in 802.11

- Wireless Station Bandwidth fluctuate over time
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Solution

- ***Resolve unfairness by introducing size based scheduling (LASACK) policies at the IP layer of the Access Point(AP)***

Size Based Scheduling

- Flow Level Fairness and InteractivitY is abbreviated as FLF and IY
- FIFO - FLF (Bad) ,IY (Bad) (non-size based scheduling)
- LAS - FLF (Average) ,IY (Good)
- LASACK - FLF (Good) ,IY (Good)
- Implemented in IP layer

Scheduling Policy

- **LAS** **-** TCP data priority which is inversely proportional to the number of bytes sent so far by the corresponding connection

  - LAS is not good for 5%(large data) flow distributions

- **LASACK -** TCP ack priority equal to the number of bytes acknowledged by this packet

Experiment

- 10 wired and wireless stations serviced by a single access point.
- Protocol in wireless IEEE 802.11b (11Mbps)
- RTS/CTS disabled because of Line of Sight
- Qualnet Simulator to measure performance

Upload,Download,Buffersize Reln

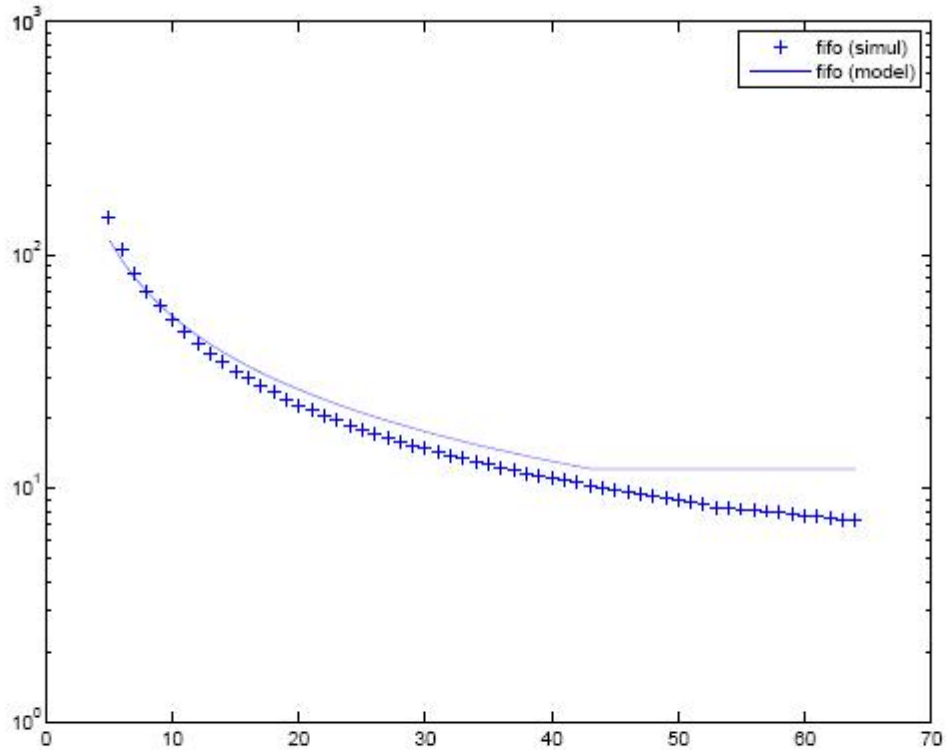

Figure 2: Ratio of upload to download throughputs w.r.t. buffer size at the Access point, under the FIFO policy

FIFO (CWnd,RTT)

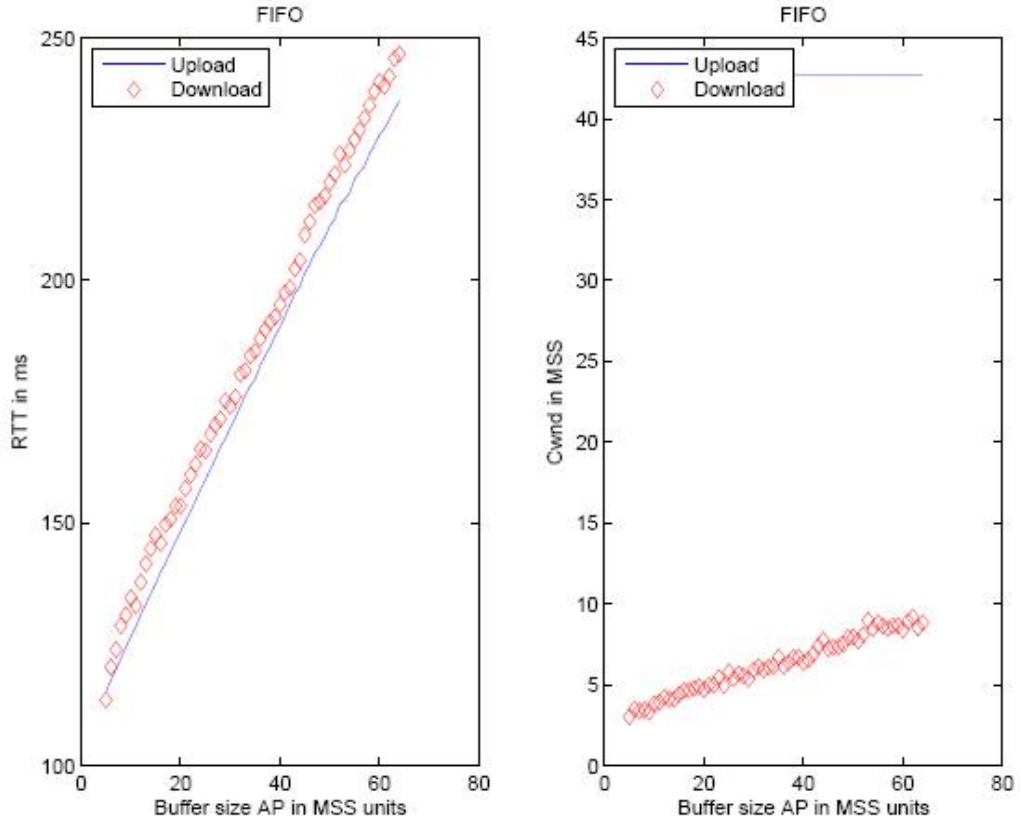

Figure 1: Average RTTs (left) and Cwnd(right) w.r.t. buffer size at the Access point,under the FIFO policy

LAS (CWnd,RTT)

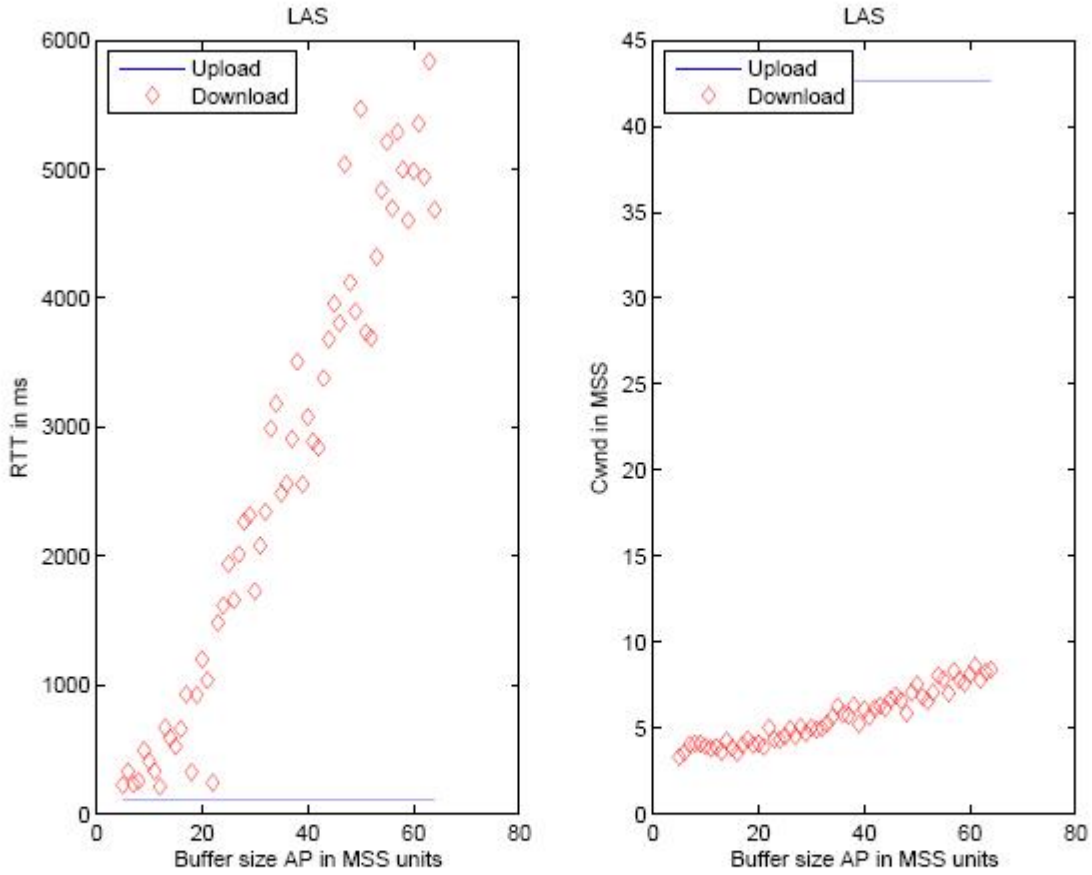

Figure 5: RTTs (left) and Cwnd(right) w.r.t. buffer size at the Access point, under LAS

LASACK (CWnd,RTT)

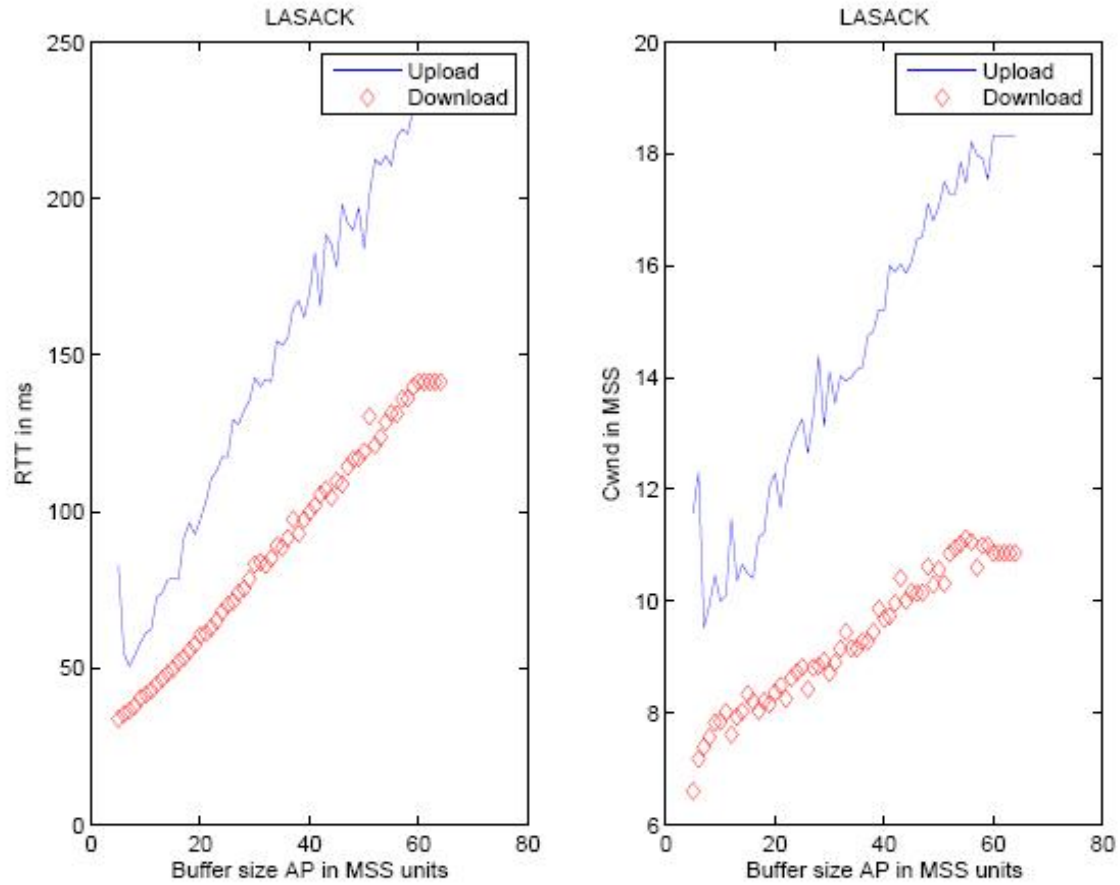

Figure 6: RTTs (left) and Cwnd(right) w.r.t. buffer size at the Access point, under LASACK

Upload/Download Competition

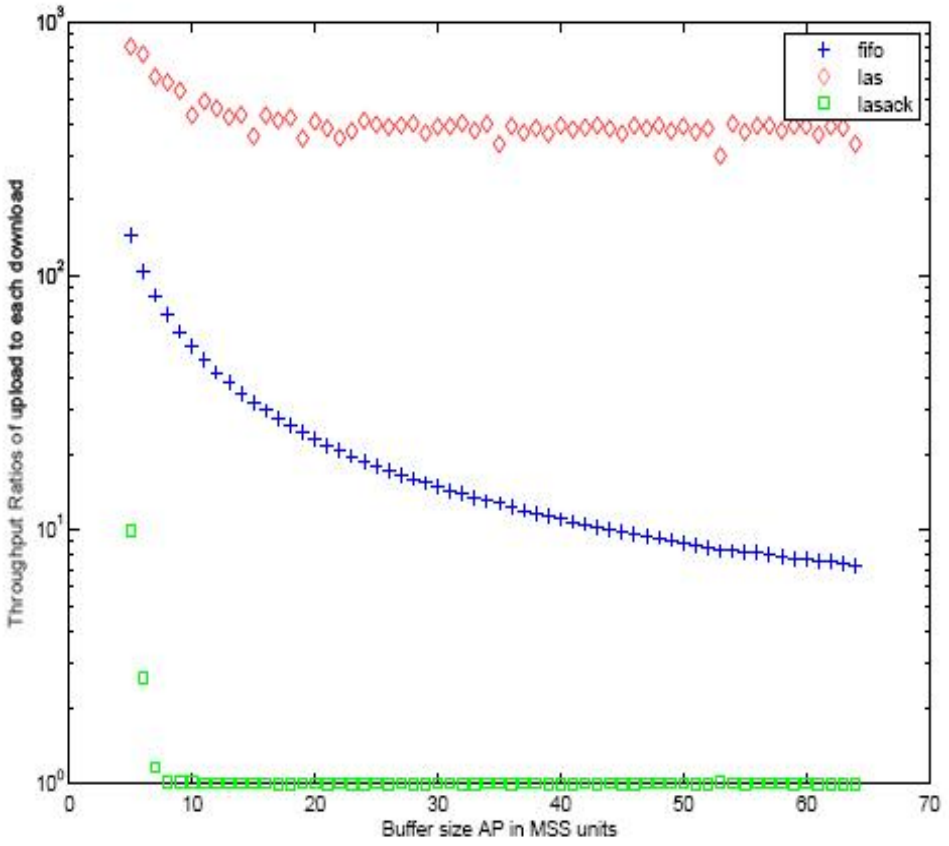

Figure 3: Ratio of upload to download throughputs w.r.t. buffer size at the Access point

Compare Aggregate throughputs

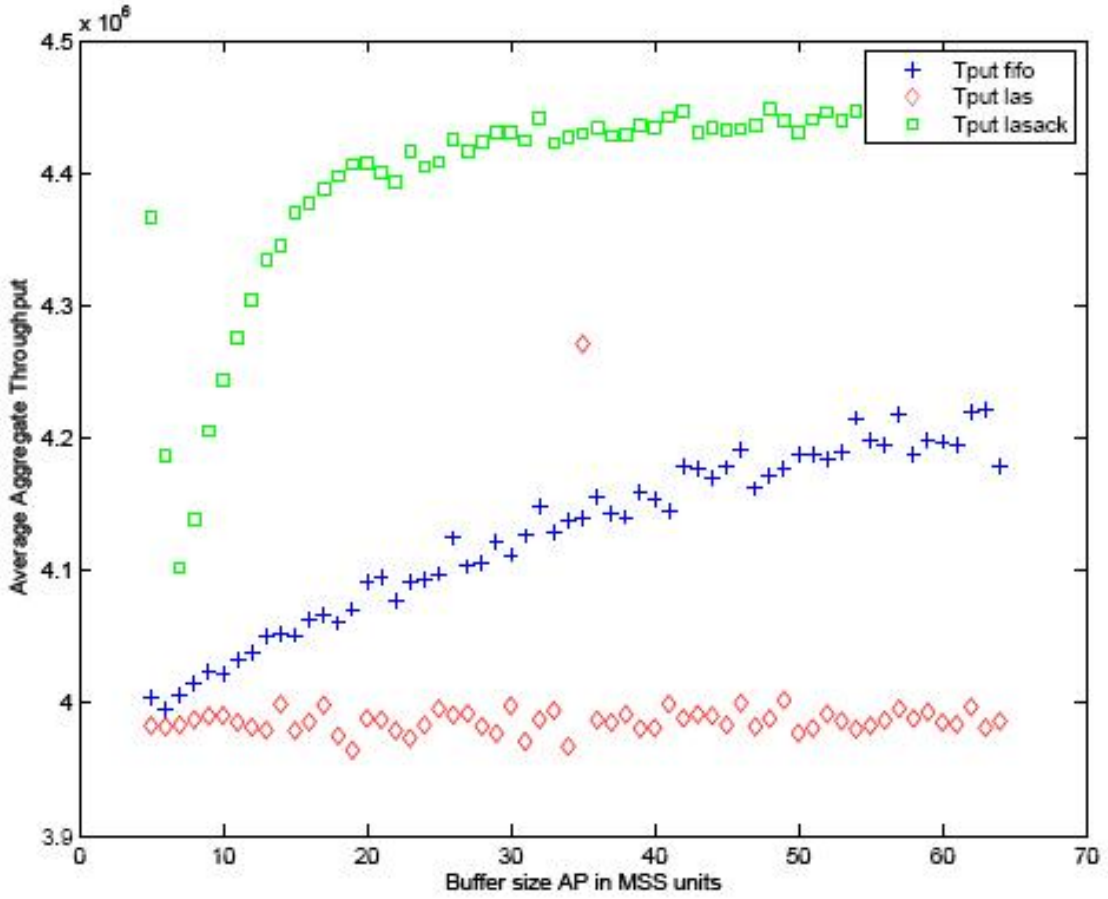

Figure 4: Aggregate throughputs w.r.t. buffer size at the Access point

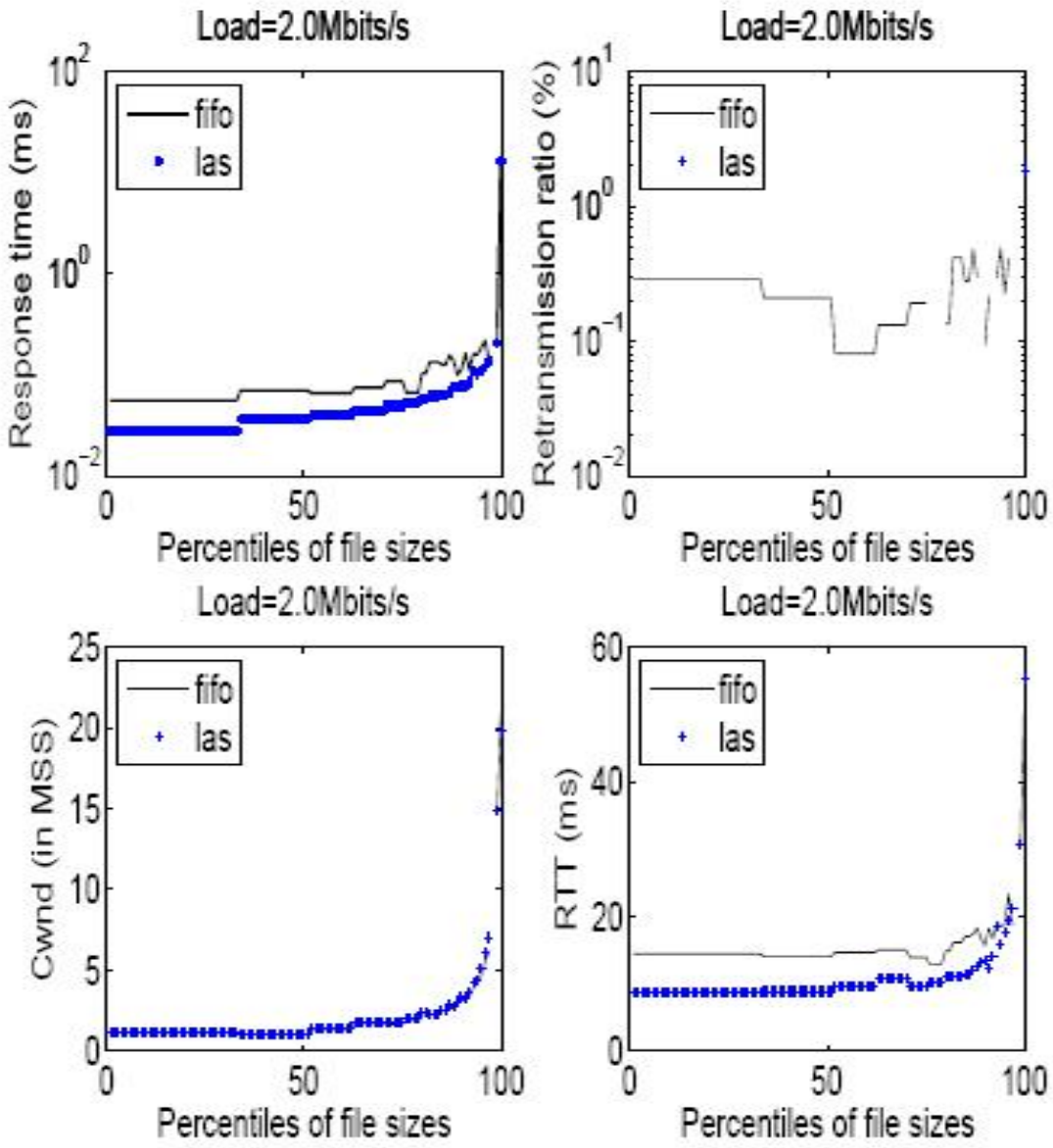

Figure 13: Download traffic only - Input load of 2 Mbit/s

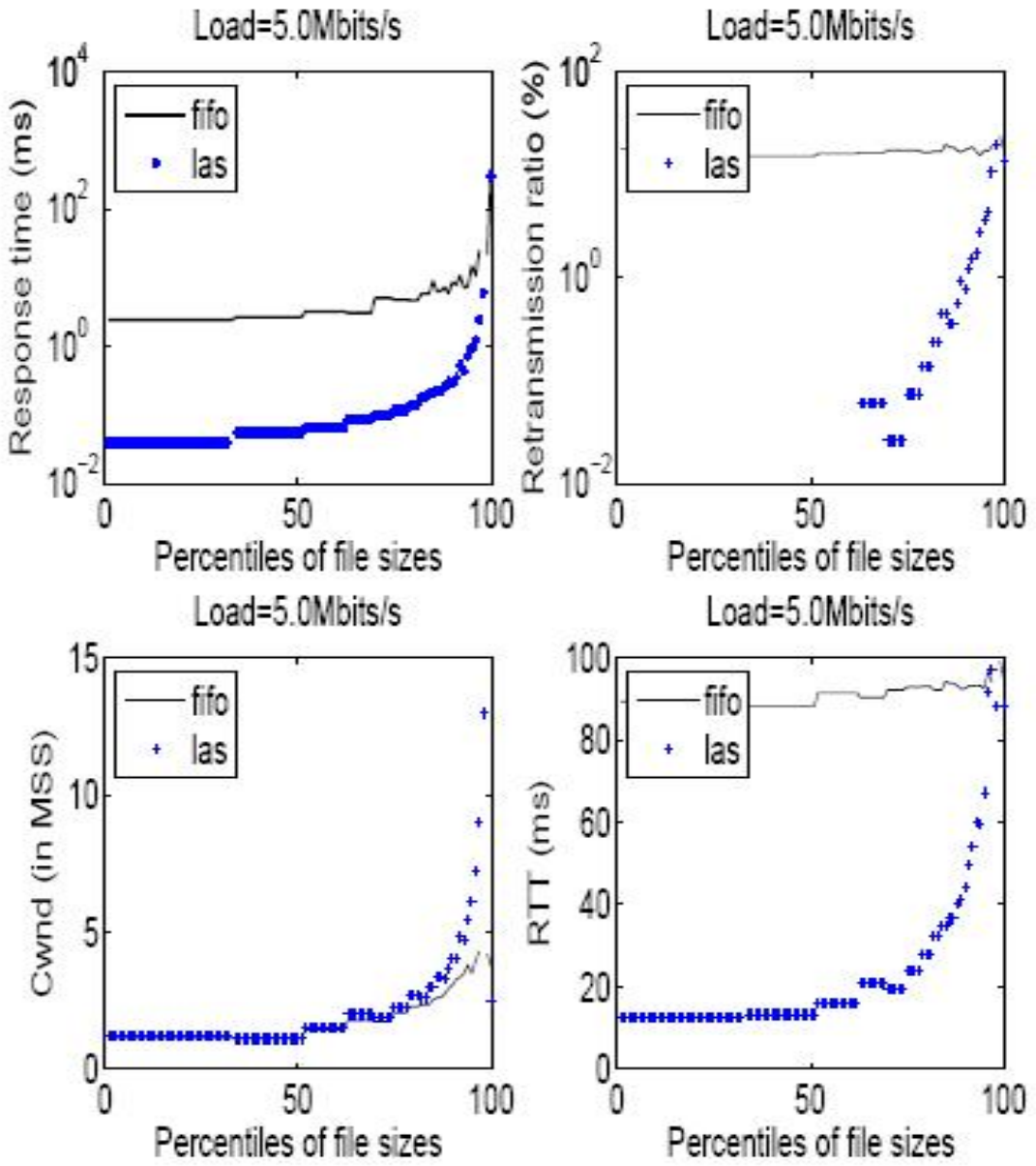

Figure 14: Download traffic only - Input load of 5 Mbit/s

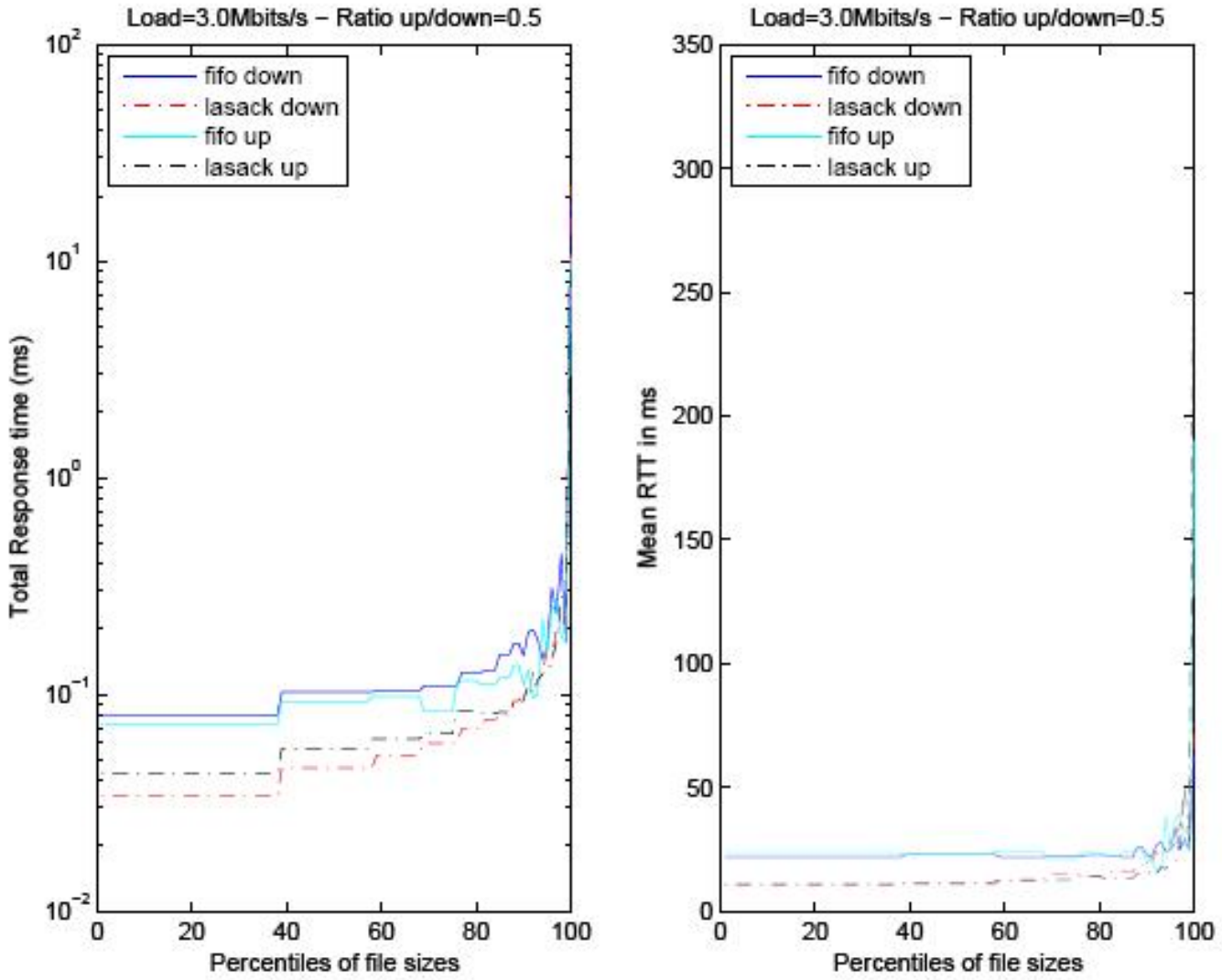

Figure 19: LASACK vs FIFO for a total input load of 3 Mbits/s

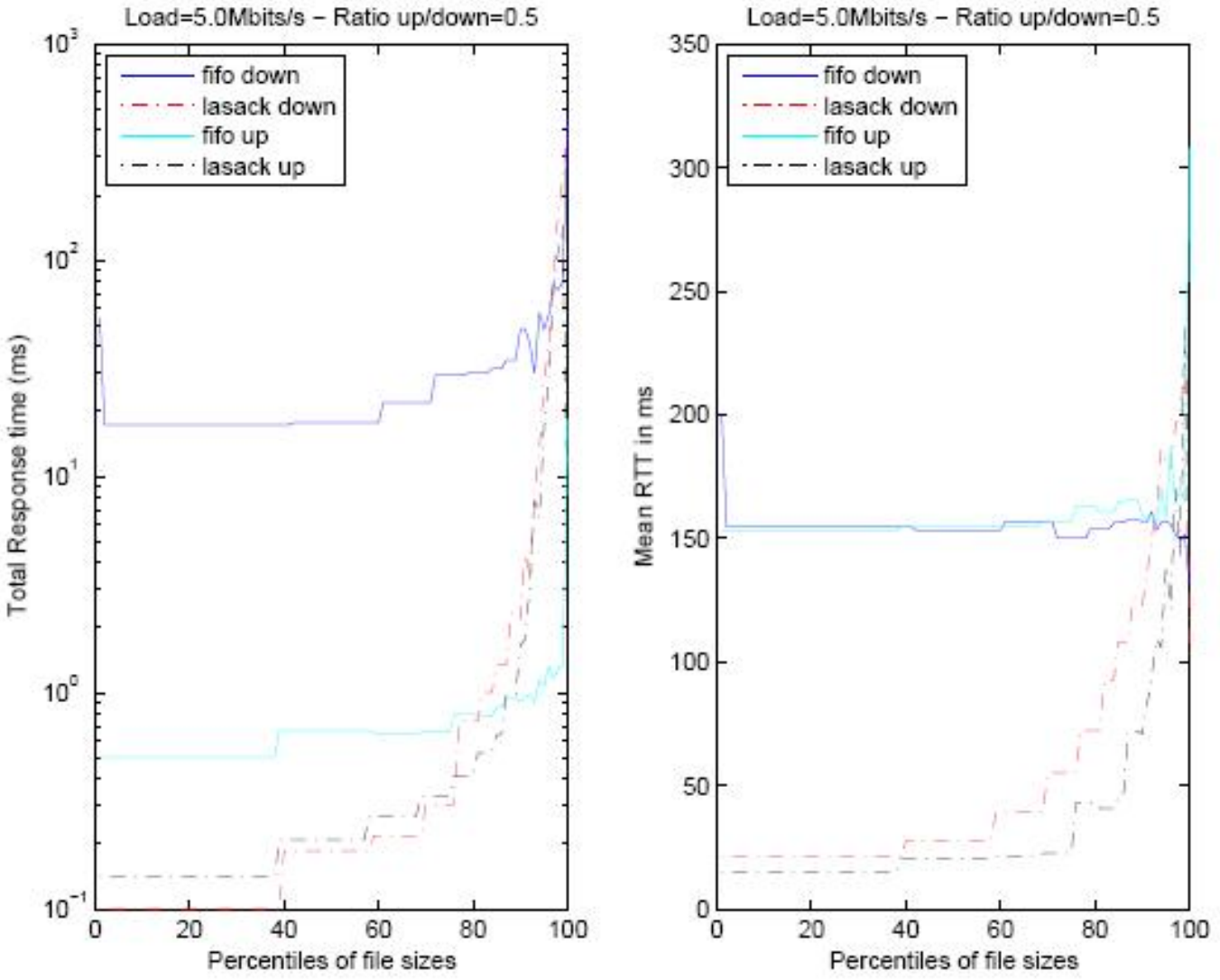

Figure 20: LASACK vs FIFO for a total input load of 5 Mbits/s

Conclusion

- LASACK improve fairness under all scenarios
- LASACK fulfills interactivity in the load increase
- But this paper does not care about
  - Hidden node problem
  - Mobility of users
  - Variations of channel quality due to the environment
- TCP flows are subject to wide variations in Ad-Hoc and Wireless mesh networks

Querries ?