

ATCP : TCP for Mobile Ad Hoc Networks



By Jian Liu and Suresh Singh

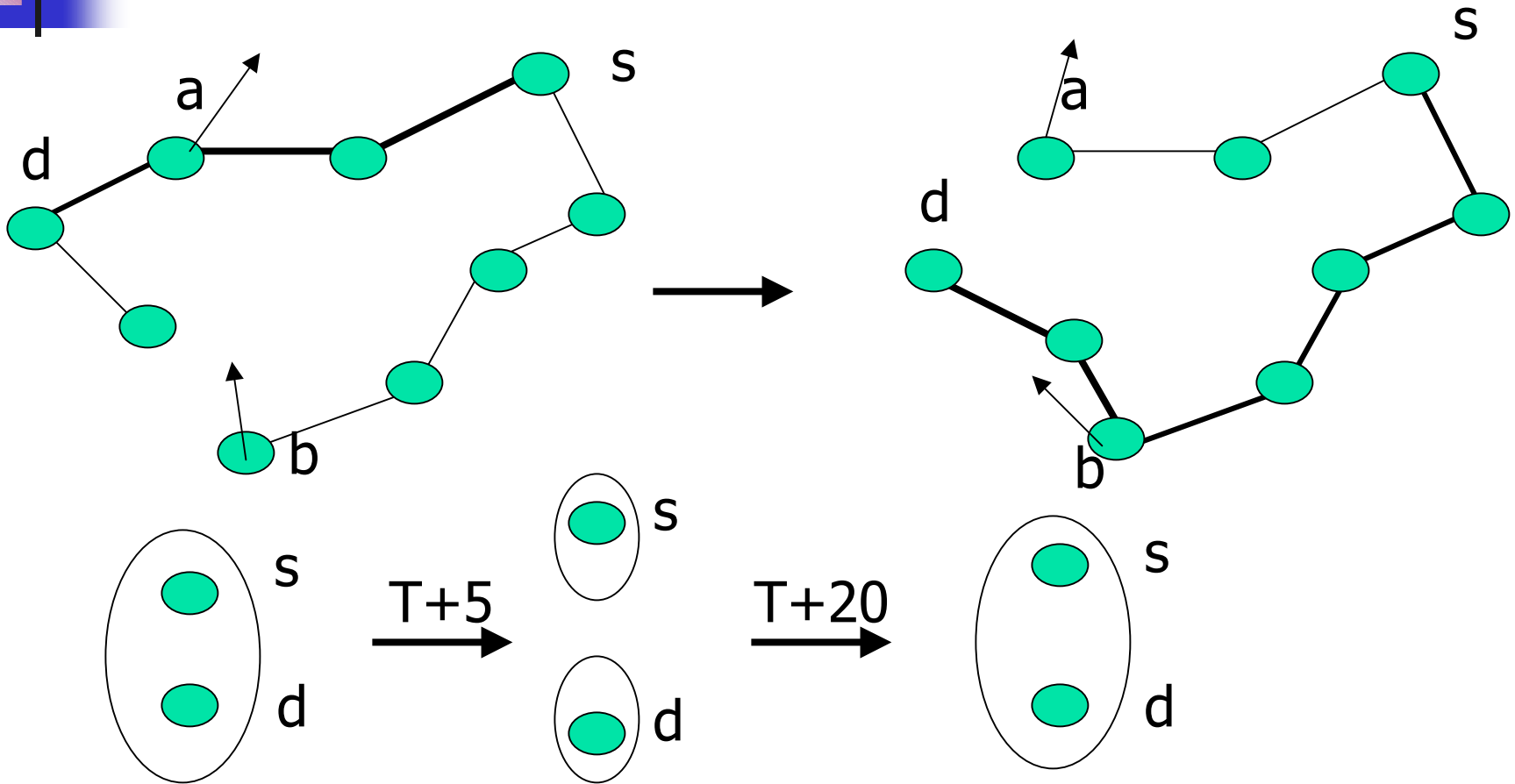
Presented By Harkirat Singh



Motivation

- WireLess Network is Different from WireLine Network
- Ad Hoc Network
 - Node Mobility
 - Network Partition

Mobility Example:

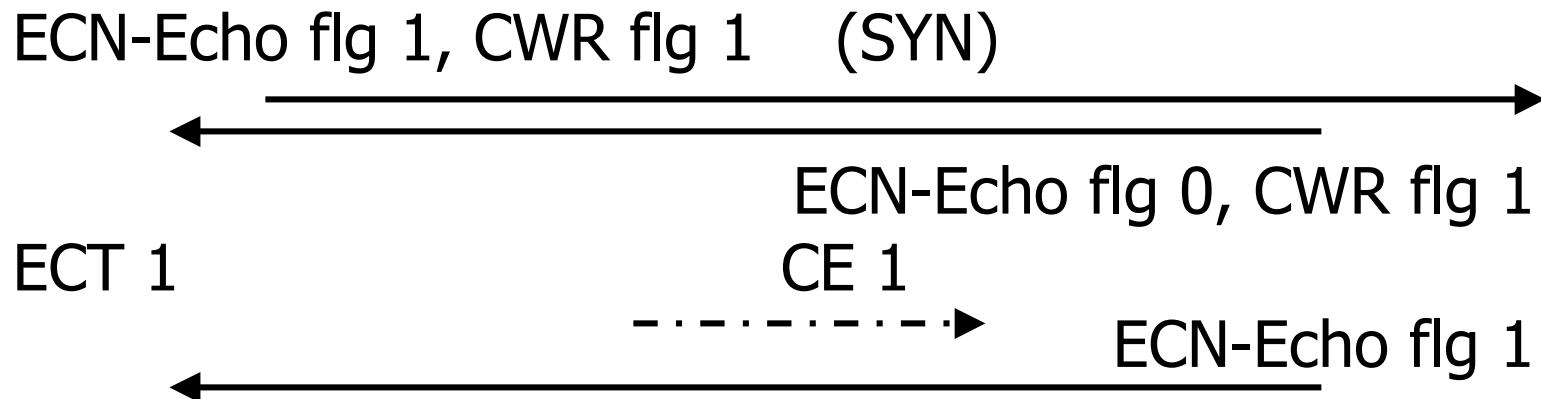




Explicit Congestion Notification

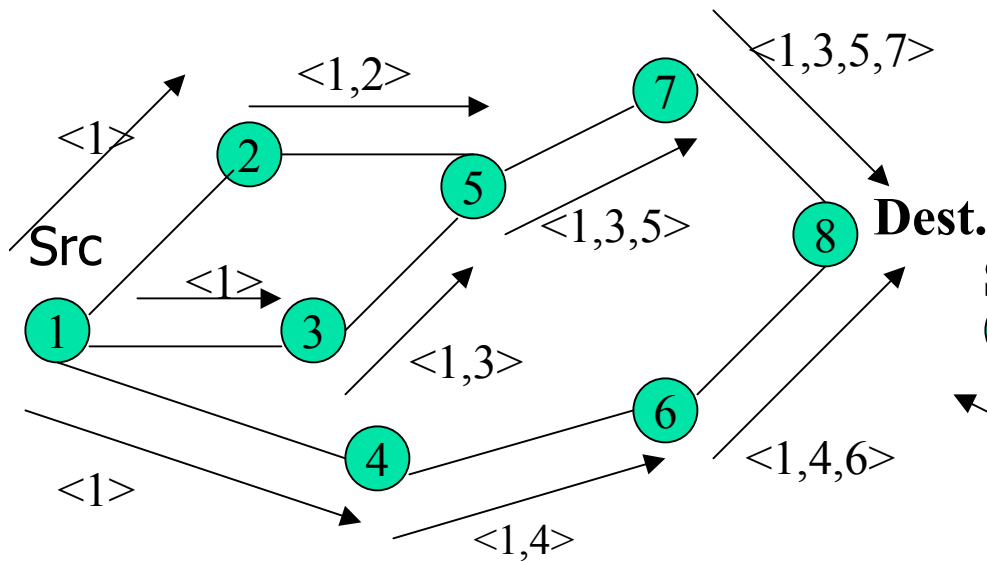
By S.Floyd and Team

- Active queue management with RED
- RED can drop a packet or set a bit

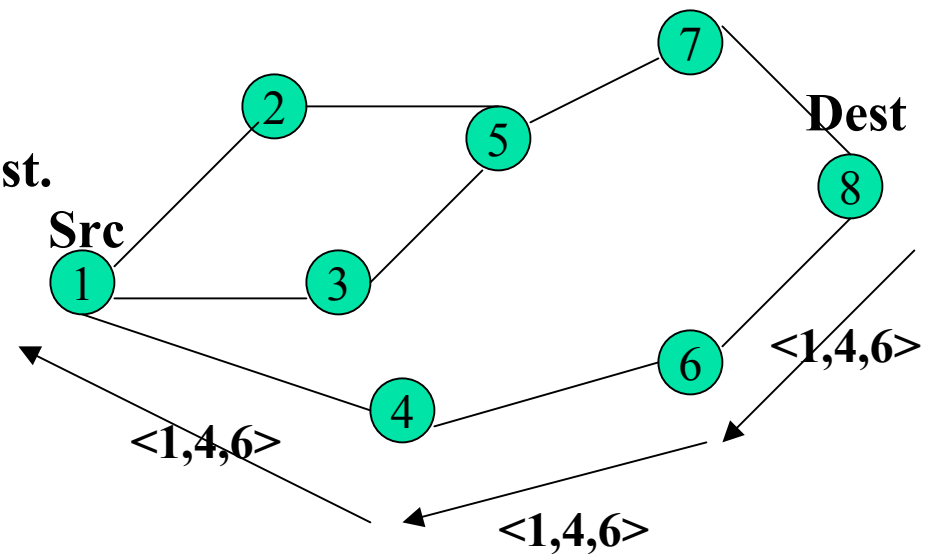




Dynamic Source Routing

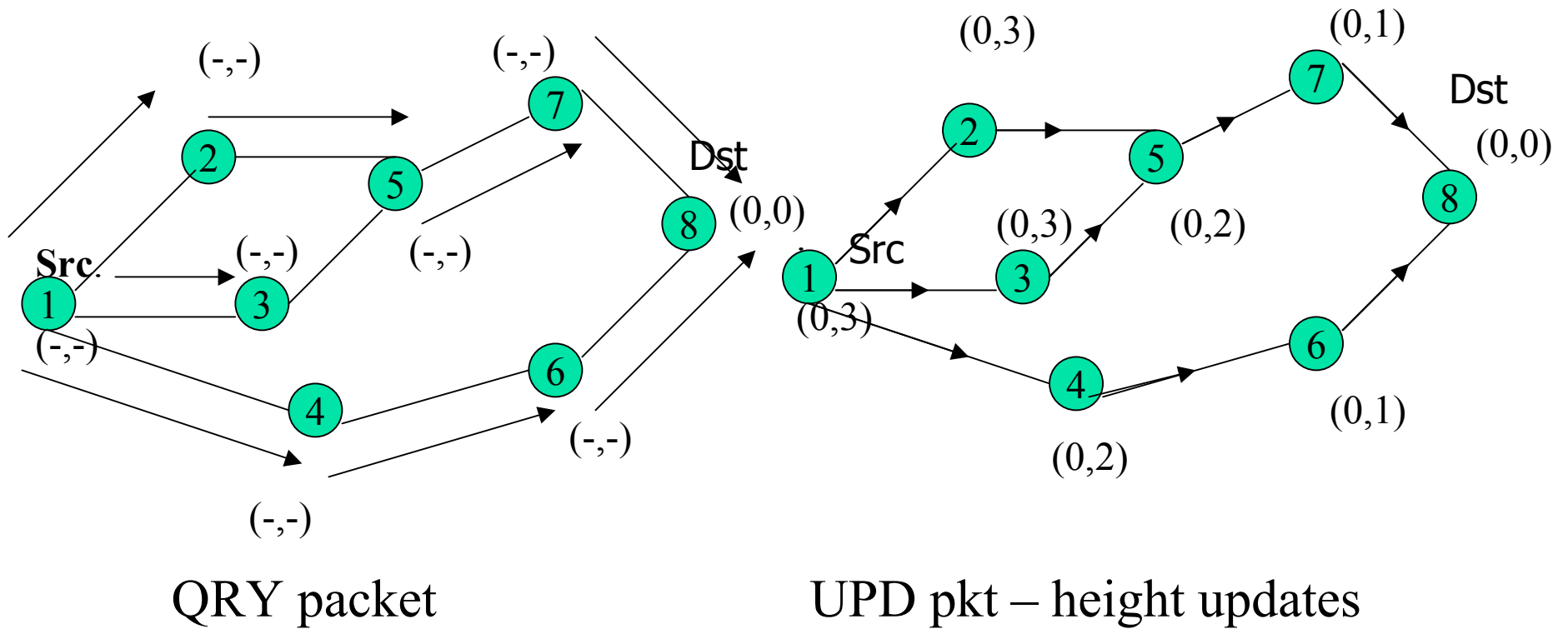


Route Discover – Route Record



Propagation of Route Reply with Route Record

TORA-Route Creation





TCP in Ad Hoc Network

- High Bit Error Rate (BER)
- Route Recomputation
- Network Partition
- Multipath Routing



Goal

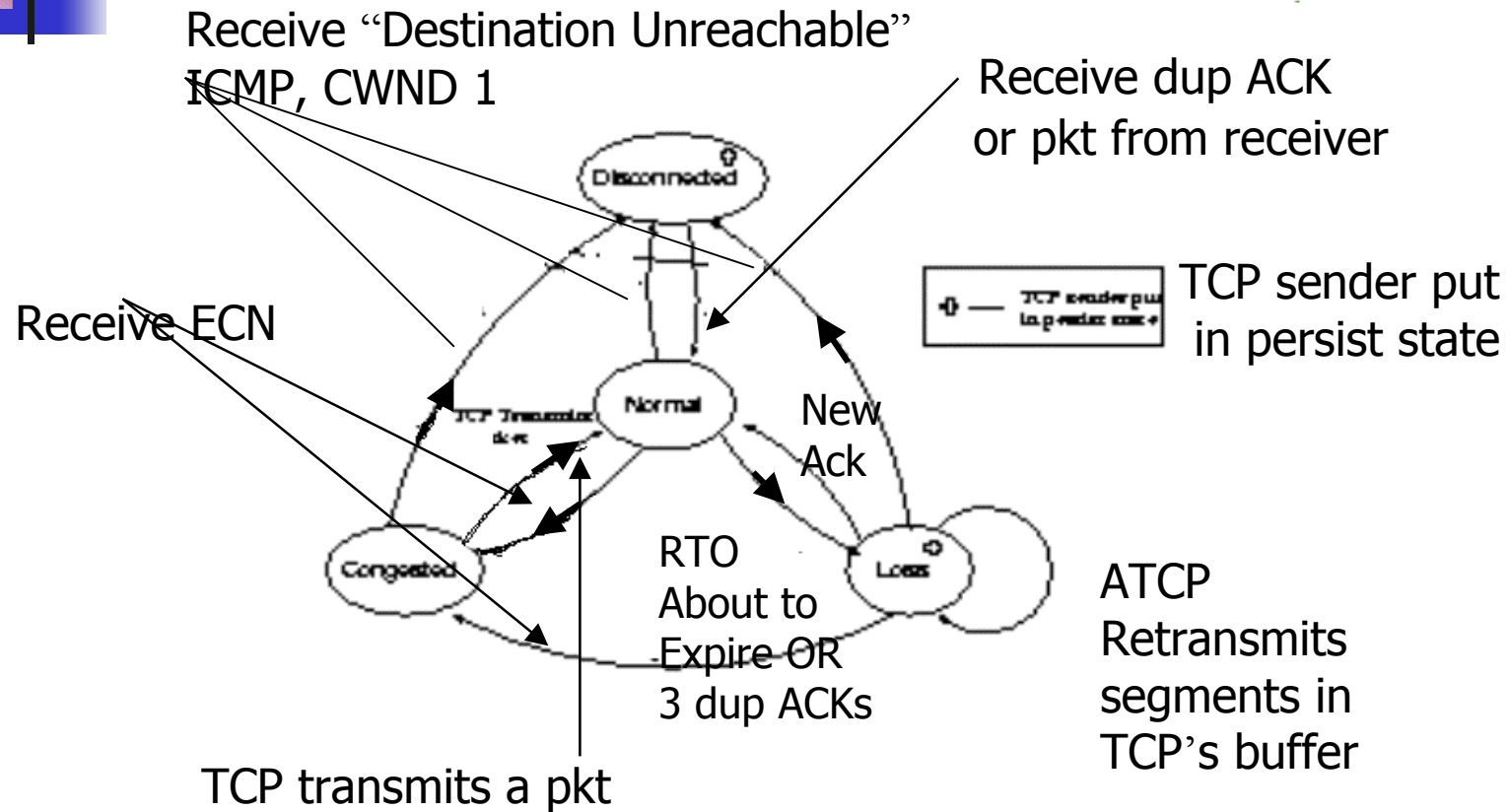
- High BER – retransmit lost pkt
- Route Recomputation & Transient Partition - stop transmitting
- Multipath Routing – No congestion control
- Maintain TCP's congestion control



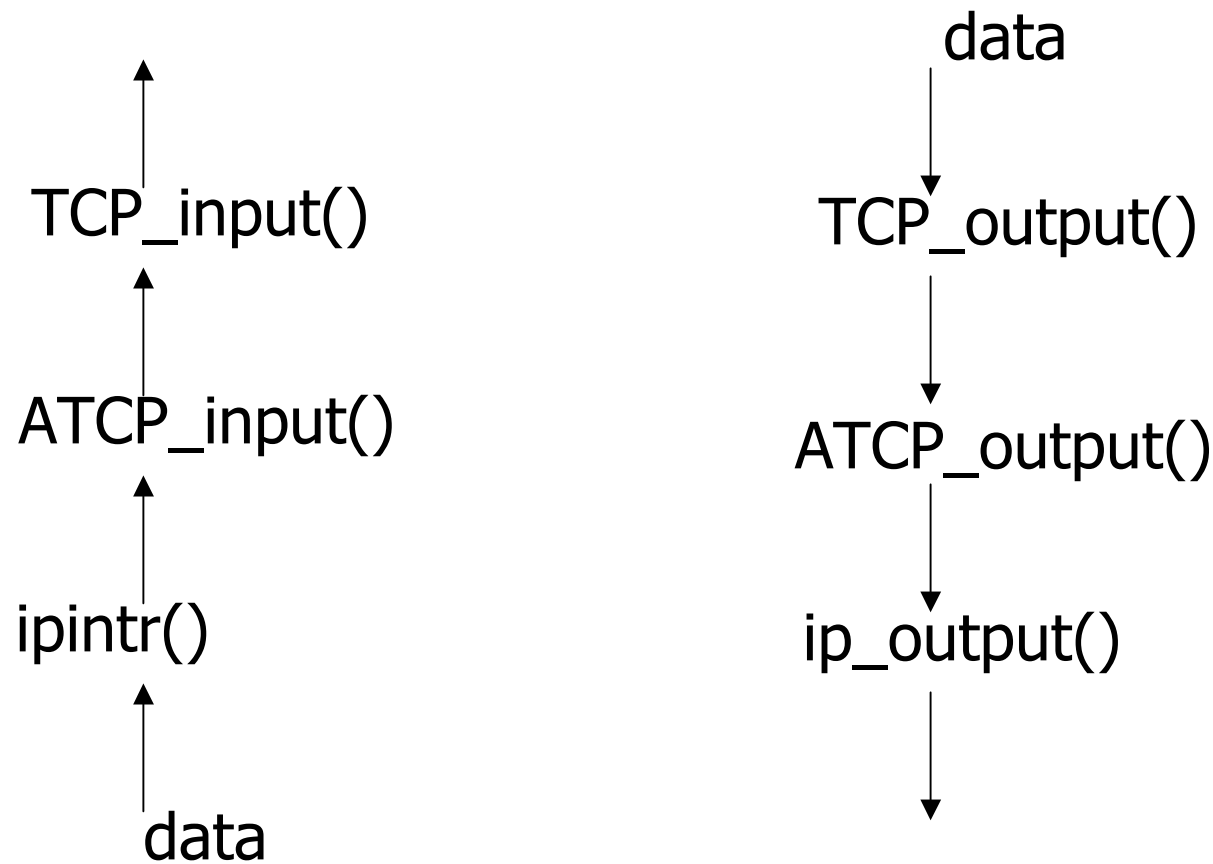
ATCP Functioning

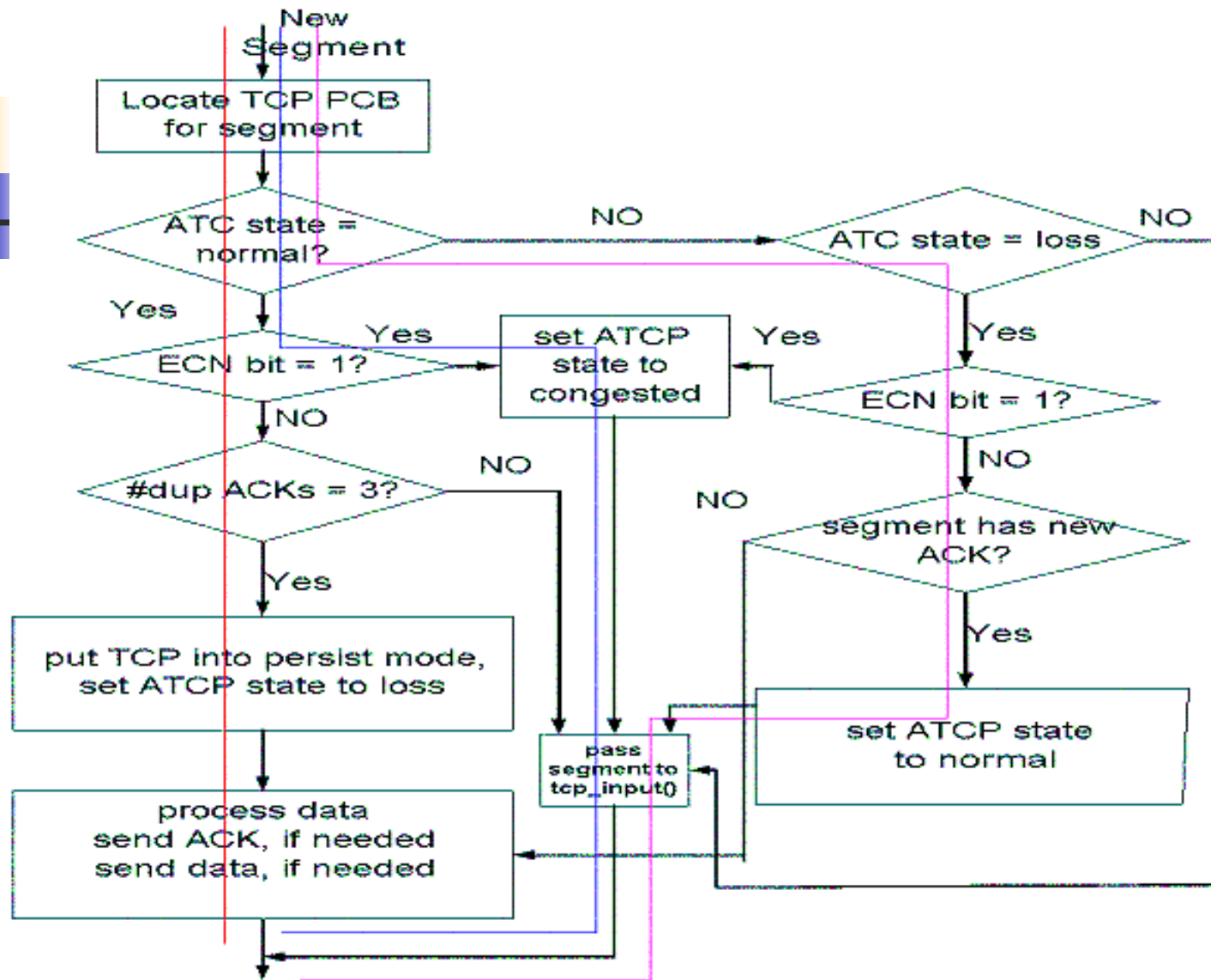
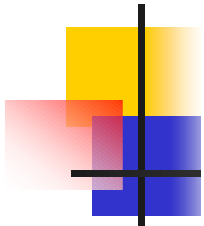
- States – Normal, congested, loss and disconnected
- Lossy Channel – ATCP loss state and TCP Persist state
- Disconnected – ICMP destination unreachable, TCP in persist state and ATCP in disconnected state
- Congested – ECN flag, ATCP in congested state and do nothing!

State transition diagram

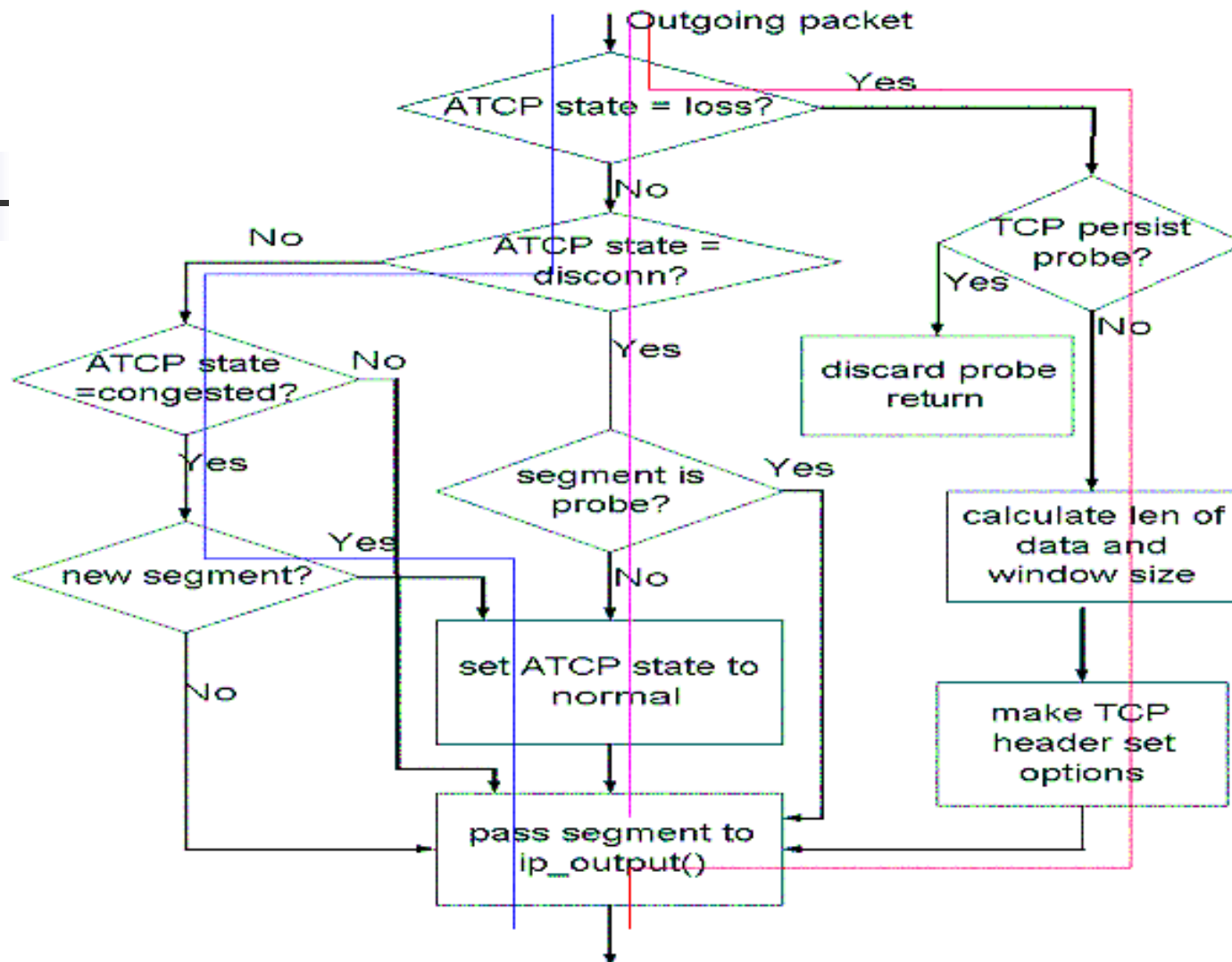
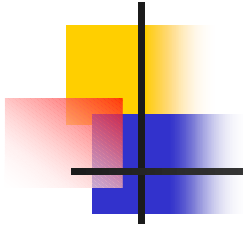


Data flow - TCP/ATCP/IP stack





Flowchart for function atcp_input()



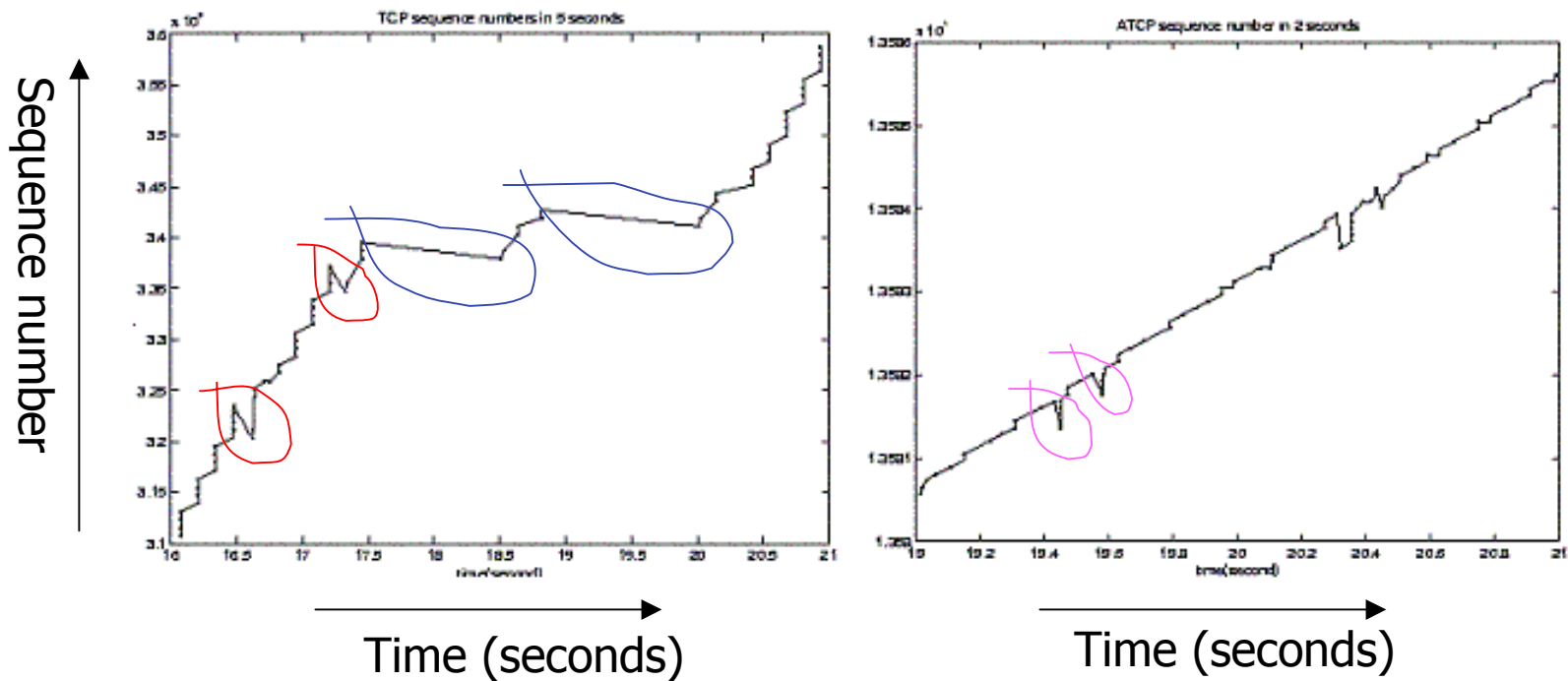
Flowchart for function atcp_output()



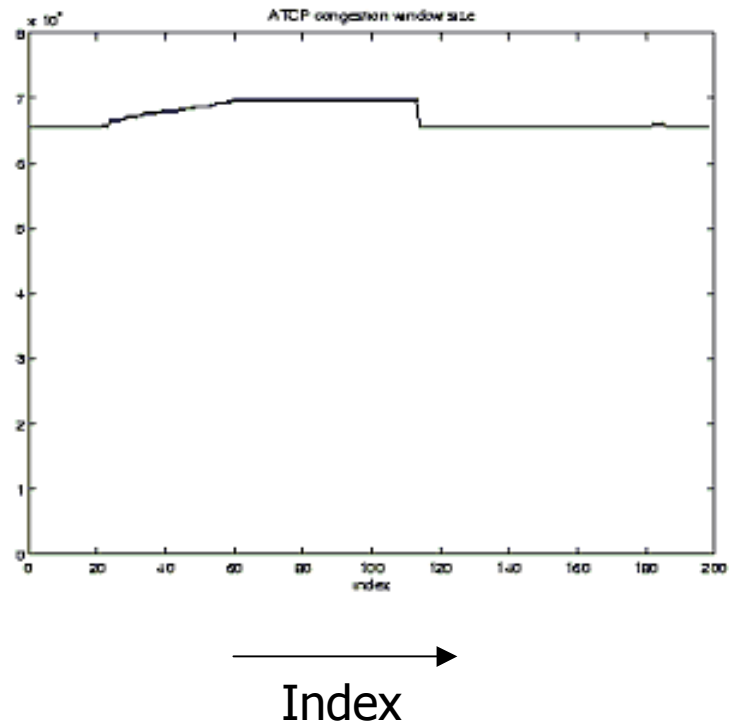
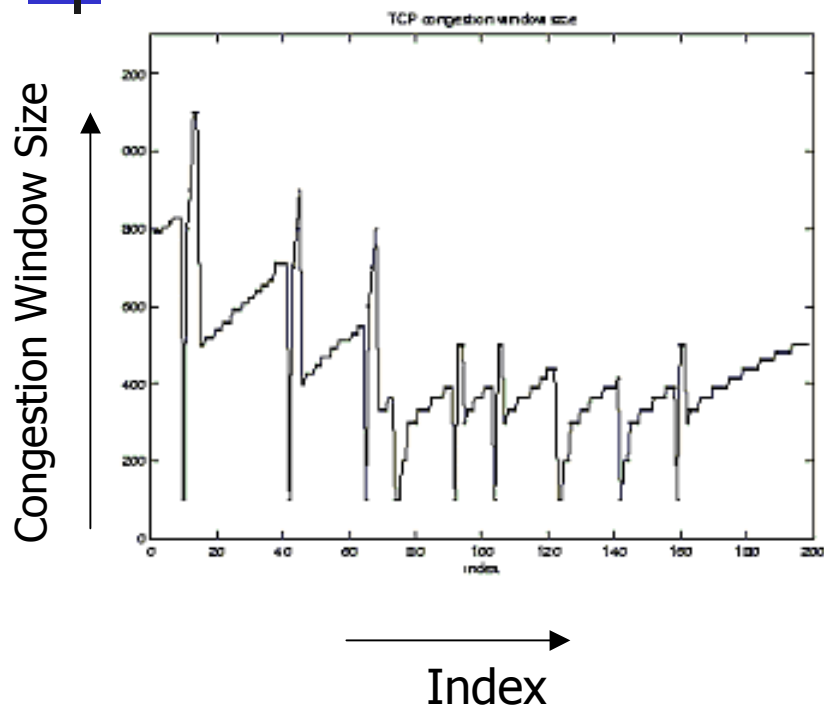
Performance study

- Five Pentium PCs, each with two Ethernet cards
- Emulate wireless in IP, 32 Kbps channel
- Bit error rate 10^{-5}
- Random hop-by-hop delay
- Network congestion – 5sec
- Partition – 5 minutes and last for 1 min.
- Packet reordering – 25 seconds

Bit Error - Performance

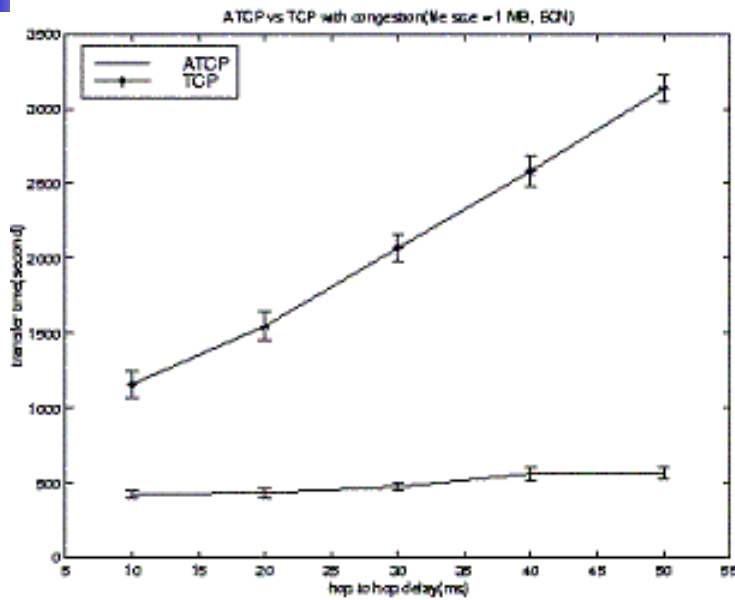


Bit Error, Congestion Window



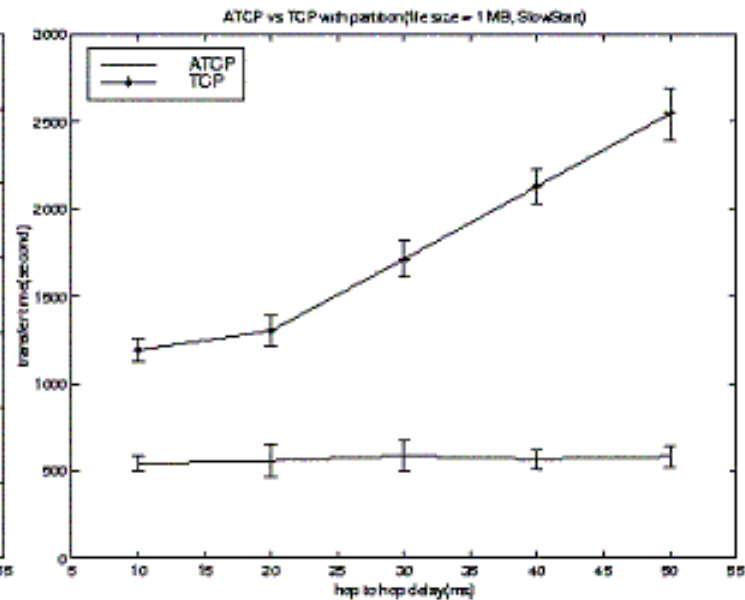
Congestion and Partition Performance

Transfer time (second)



hop by hop delay(ms)

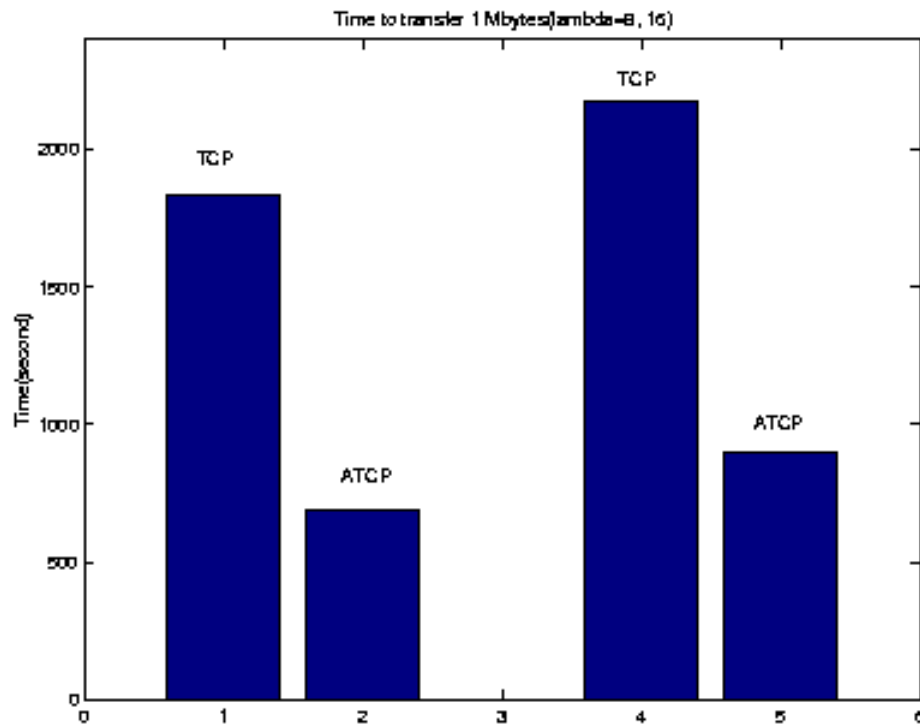
Congestion



hop by hop delay(ms)

Partition

Overall Performance





Conclusion

- End-to-End TCP semantics are maintained
- ATCP is transparent
- ATCP does not interfere with TCP's congestion control behavior
- ATCP improves performance by one-third
- ECN as standard - WIP



References

- RFC 2481
- <http://www-nrg.ee.lbl.gov/floyd/ecn.html>
- draft-ietf-manet-tora-spec-02.txt draft-ietf-manet-tora-spec-02.txt