TCP OVER AD HOC WIRELESS NETWORKS:

- TCP is reliable, end-to-end, connection-oriented TL protocol that provides a byte stream based service.
- Major responsibilities of TCP include
  - Congestion control.
  - Flow control.
  - In-order delivery of packets.
  - Reliable transportation of packets.

Discuss briefly the reasons why TCP does not perform well in Adhoc wireless network

The major reasons behind throughput degradation that TCP faces when used in ad hoc wireless networks are the following.

1. Misinterpretation of packet loss:
   - In traditional TCP design, the packet loss is mainly attributed to network congestion.
     - Ad hoc wireless network experience a much higher packets loss due to
       - High bit rate
       - Increased Collections etc.

2. Frequent path breaks:
   - If the route re-establishment time is greater than the RTO period of TCP sender, then the
     TCP sender assumes congestion in the network retransmits lost packets and initiates congestion control algorithm. This leads to wastage of bandwidth and battery power.

3. Effect of path length: As path length increases, the throughput decreases.

![Figure 9.3. Variation of TCP throughput with path length.](image-url)
4. Misinterpretation of congestion window:
   - When there are frequent path breaks, the congestion window may not reflect the maximum transmission rate acceptable to the network and the receiver.

5. Asymmetric link behavior:
   - Radio channel used in ad hoc wireless network has different properties such as location dependent contention, directional properties etc leading to asymmetric links.
   - This can lead to TCP invoking the congestion control algorithm and several retransmissions.

6. Uni-directional path:
   - TCP relies on end-to-end ACK for ensuring reliability. Path break on an entirely different reverse path can affect the performance of the network as much as a path breaks in the forward path.

7. Multipath Routing:
   - For TCP, multipath routing leads to significant amount of out of order packets, when intern generates a set of duplicate acknowledgement (DUPACKs), which cause additional power consumption and invocation of congestion control.
8. Network partitioning and remerging:

- Fig below illustrates the effect of network partitions in ad hoc wireless networks.
  - A network with two TCP sessions A & B is shown in (a) at time t1.
- At time t2, the network gets partitioned into two as shown in (b) due to dynamic topological changes.
  - Now TCP session A’s sender & receiver belong to two different partitions & TCP session B experiences path break.

9. The use of sliding window based transmission:

- TCP uses a sliding window for flow control.
- This can contribute to degraded performance in bandwidth constrained ad hoc wireless network.
- It can also lead to burstiness in traffic due to the subsequent transmission of TCP segments.