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Improving TCP performance in wireless networks

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Abstract:-

TCP (Transmission Control Protocol) is a standard which defines how a network conversation can be established and maintain ed via which application programs can exchange data. Together, TCP and IP are the basic rules defining the Internet. The Transmission Control Protocol provides a communication service at an intermediate level between an application program and the Internet Protocol. The main objective of the proposed work is to enhance the performance of TCP over wireless networks. The solution put forth is the detection and avoidance of SRTO along with packet loss differentiation.

Key Words: ***TCP, SRTO, QRMR, AODV, QoS***

1. Transmission Control Protocol

The main function of TCP is to divide the message/document into packets to definite size on the source computer and to reassemble the packets on the destination computer.

1.1 TCP issues in wireless networks

Wireless network is a computer network that uses wirelessconnection to send data between the computer nodes. Cell phone networks, satellite communication networks are a few common examples of wireless networks.

The way Uber, Meru and Ola work can be seen as the best examples of wireless networks.

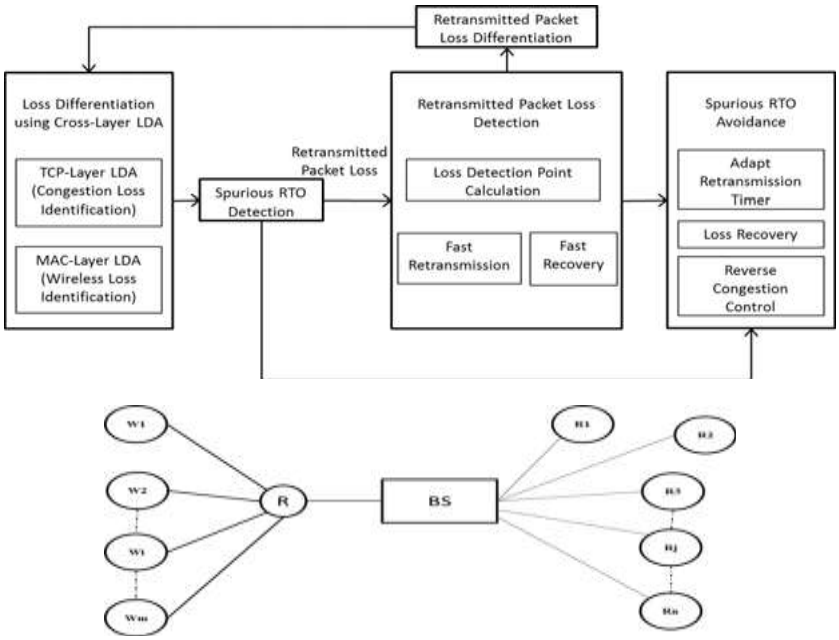
- Congestion as well as wireless loss.
- Random loss due to signal fading.
- Need end-to-end connectivity.
- Disambiguating wireless bit errors from congestion:-
  - Frequent window reduction.
  - Frequent time-outs.

1.2 Steps of data transmission on internet

On the client computer, the message or the file to be sent to another computer is firstly divided into very small parts, called packets. A packet generally contains up to 1500 characters. Each packet is given a number serialwise eg 1,2,3,..All these packets are then sent to the address of destination computer. The destination computer receives the packets in random manner. If a packet is garbled or lost, it is demanded again. The packets are reassembled in the order of their number and the original message /file is obtained. The main function of TCP is to divide the message/document into packets of definite size on the source computer. Other work is to reassemble the packets on the destination computer.

2. Proposed System – Basic Network System

The main objective of the proposed work is to improve the performance of TCP over wireless networks. The solution proposed is to detect and avoid SRTO along with the differentiation of packet loss.Package losses are differentiated between congestion loss and wireless loss through a crosslayer approach. SRTO is detected by removing the ambiguity in the ACK and is avoided by modif ying the TCP RTO recovery process.



Simulation Environment

- The simulation is carried out using latest Network Simulator (NS-3) .
- 20-30 nodes and 1 Base station to form our network.
- We select single Source node and destination node.
- From source node we send RREQ to reach destination node.
- Destination will send RREP to reach the source.
- During RREQ and RREP,the nodes will get the data.
- Perform SRTO process by PQMR Algorithm.
- AODV Protocol is used for shortest path.
- Analysis of results

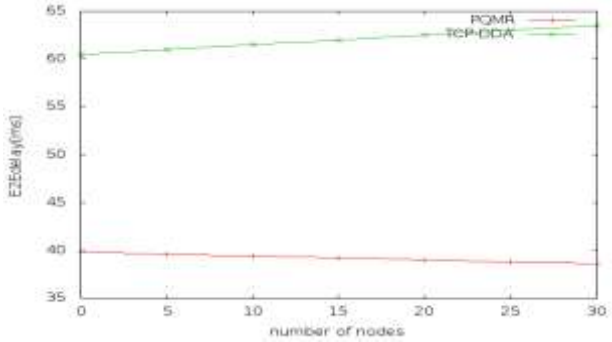


Chart -1: E2E Delay

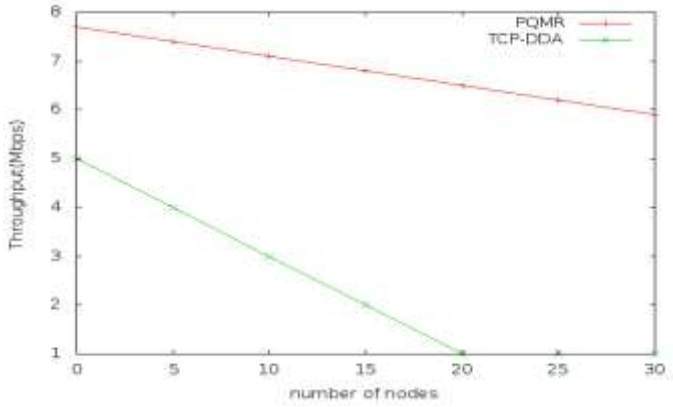


Chart -2: Throughput

AODV

Ad-
Hoc On Demand Distance Vector is a routing protocol for networks with a high number of mobile nodes. The protocol creates rou tes only when the source is requested. Flexibility to allow nodes to enter and exit the network.Routes are active only when packe ts travel. A lifetime is associated with the entry in the route table. This is an important feature of AODV.

If a route entry is not used within the specified lifetime, it is deleted. A route is maintained only when it is used. A route that is unused for a long time is assumed to be stale.

Advantages of AODV are as follows:-

- Adaptable to highly dynamic networks
- Support both unicast and multicast
- Lowest delay for connection and detection

SRTO

SRTO is caused by Spurious Timeouts (STOs) and Spurious Fast Retransmissions (SFRs). STO is possibly caused by a sudden incr ease in the delay that occurs in the data and/or the ACK path which, in turn, could cause an acceptable ACK to arrive late, i.e. after the TCP transmitter's timer has expired. SFR occurs when the packets get reordered to the extent of exceeding the duplicate threshold (dupthresh) (default value of three). STO can be easily detected if the ACK ambiguity gets resolved.

3. CONCLUSION

TCP-DDA, that utilizes cross-layer design, is employed to enhance the performance of TCP over wireless networks. The performance enhancement is achieved by differentiation of wireless losses from congestion losses using a Cross-layer LDA, detection of SRTO by removing the ambiguity in ACK and avoidance of SRTO. The congestion control state is reversed and the retransmission timer is adapted to avoid the SRTO. A new TCP mechanism that is capable of detecting the loss in the retransmitted packet and differentiating the same is also proposed, thereby improving the performance of TCP over wireless networks. The proposed work is simulated using NS-2 and the simulation results show that there is an appreciable improvement in its performance when compared with the existing TCP Reno using TCP-DDA

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