ISSN (Online) 2394-2320

International Journal of Engineering Research in Computer Science and Engineering (IJERCSE)

Vol 9, Issue 9, September 2022

Mobile Ad-Hoc Wireless Networks In Medium Access Control Protocol

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Abstract*— Nodes in an ad hoc wireless network share a common broadcast radio channel. The radio spectrum is limited, the bandwidth available for communication in such networks is also limited. Access to this shared medium should be controlled in such manner that all nodes receive a fair share of the available bandwidth, and that the bandwidth is utilized efficiently. Since the characteristics of the wireless medium are completely different from those of the wired medium ,and since ad hoc wireless networks need to address unique issues such as node mobility, limited bandwidth availability ,error-prone broadcast channel hidden and exposed terminals problems and power constraints that are not applicable to wired networks ,a different set of protocols is required for controlling access to the shared medium in such networks, This paper focuses on media access protocols for ad hoc wireless networks.

I. INTRODUCTION

Issues in Designing a Mac Protocol for Ad Hoc Wireless Networks

1. Bandwidth Efficiency

The radio spectrum is limited, the bandwidth available for communication is also limited, The MAC protocol must be designed in such a way that the scarce bandwidth is utilized in an efficient manner. The control overhead involved must be kept as minimal as possible. Bandwidth efficiency can be defined as the ratio of the bandwidth used for actual data transmission to the total available bandwidth. The MAC protocol must try to maximize this bandwidth efficiency.

2. Quality of service support

Bandwidth reservation made at one point of time may become invalid once the node moves out of the region where the reservation was made.QoS support is essential for supporting time-critical traffic session such as in military communications. The MAC protocol for ad hoc wireless networks that are to be used in such real time applications must have some kind of a resource reservation mechanism that takes into consideration the nature of the wireless channel and the mobility of nodes.

3. Synchronization

The MAC protocol must take into consideration the synchronization between nodes in the network. Synchronization is very important for bandwidth rfeservations by nodes. Exchange of control packets may be required for achieving time synchronization among nodes. The control packets must not consume too much of network bandwidth.

4. Hidden and Exposed Terminal Problems

The hidden and exposed terminal problems are unique to wireless networks. The hidden terminal problem refer to the collision of packets at a receiving node due to the simultaneous transmission of those nodes that are not within the direct transmission range of the sender, but are within the transmission range of the receiver. Collision occurs when both nodes transmit packets at the same time without knowing about the transmission of each other. For example if both node S1 and node S2 transmit to node R1 at the same time, their packets collide at node R1.This is because both nodes S1 and S2 are hidden from each other as they are not within the direct transmission range of each other and hence do not about the presence of each other.

The exposed terminal problem refers to the inability of a node, which is blocked due to transmission by a nearby transmitting node, to transmit to another node. For example if a transmission from node S1 to another node R1 is already in progress, node S3 cannot transmit to node R2,as it concludes that its neighbor node S1 is in transmitting node and hence it should not interfere with the on-going transmission.

The hidden and exposed terminal problems significantly reduce the throughput of a network when the traffic load is high.

It is therefore desirable that the MAC protocol be free from the hidden and exposed terminal problems

5. Error-Prone Shared Broadcast Channel

Multiple nodes may contend for the channel simultaneously, the possibility of packet collisions is quite high in wireless networks. A MAC protocol should grant channel access to nodes in such a manner that collisions are minimized.

6. Distributed Nature/Lack of Central Coordination

Nodes must be scheduled in a distributed fashion for gaining access to the channel. This may require exchange of control information. The MAC protocol must make sure that the additional overhead, in terms of bandwidth consumption, incurred due to this control information exchange is not very high.

7. Mobility of Nodes

The MAC protocol obviously has no role to play in influencing the mobility of the node. The protocol design must take this mobility factor into consideration so that the performance of the system is not significantly affected due to node mobility.

II. CONCLUSION

Mobile Ad-Hoc Network in Medium Access Control Protocol should be distributed; The protocol should provide QoS support for real-time traffic. The available bandwidth must be utilized efficiently. The protocol should minimize the effects of hidden and exposed terminal problems. The protocol must be scalable to large networks. It should have power control mechanisms in order to efficiently manage energy consumption of the nodes

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