A Survey on Synchronization Approach in MAC Layer Protocols

Manali Chandnani, Government Mahila Engineering College, Ajmer, India
Mukesh Kumar Khandelwal, Government Mahila Engineering College, Ajmer, India
Meeta Sharma, Government Mahila Engineering College, Ajmer, India

ABSTRACT

The Open Systems Interconnection (OSI) model describes the layered approach for communication between two networked systems. The Data link layer of OSI model consists of a sub layer known as MAC layer for achieving coordination among the communicating nodes to access the shared channel. This channel is shared between multiple nodes in a communication network and the packets transmitted at same time by different nodes collide with each other. This situation leads to loss of data and bandwidth gets wasted. To avoid this situation, MAC layer supports various protocols: TDMA, ALOHA, CSMA/CD, CSMA/CA and many hybrid techniques which employ their own criteria of synchronization for minimizing the collisions. In this paper the authors discuss about the MAC layer and the multiple access protocols which it supports for achieving synchronization among the nodes in the channel.

KEYWORDS
ALOHA, Collision, CSMA/CD, MAC, Multiple Access Protocols, OSI, Synchronization, TDMA

1. INTRODUCTION

A communication network consists of a common channel which is shared between multiple nodes for their data transmission. This shared channel is of two types:

- Wired Channel: Twisted pair cables, coaxial and optical cables are examples of wired channel (Pandya, 2013; Santra and Acharjya, 2013).
- Wireless Channel: It can be a free space (Pandya, 2013; Santra and Acharjya, 2013).

The problem arises when two different nodes attempt to send their packets simultaneously using the shared channel and their packets collide with each other.

Therefore, collision leads to packet loss and the bandwidth get wasted in transmitting the corrupted data as well as the receiver node does not receive the correct data (Georgiadis, 2002). This situation is depicted in Figure 1.

1.1. Mac Layer

MAC layer is a subordinate layer of data link layer and it is located between Physical layer and Logical Link Control subordinate layer of Data link layer (Crow et al., 1997). The MAC layer has following functions:

DOI: 10.4018/IJBDCN.2017010102

Copyright © 2017, IGI Global. Copying or distributing in print or electronic forms without written permission of IGI Global is prohibited.
This paper describes the channel access function of MAC layer. It supports the protocols which are used to coordinate the nodes and achieve synchronization among them. These protocols help in time management of data transmissions. They work in a scheduled manner so that the bandwidth is utilized in an appropriate way as well as the transmission delay remains low and high throughput can be achieved (Jain et al., 2005).

These protocols help in reducing the collisions. The protocols like ALOHA, TDMA, CSMA/CD, CSMA/CA and many other composite protocols are supported by MAC (Media access control) layer, which allow the nodes to transmit their data efficiently by synchronizing among themselves and thus minimizing the number of collisions.

Many challenges are faced by the MAC layer when it is designed for an ad-hoc wireless network (Ramanathan and Redi, 2002; Geier, 2002):

- The bandwidth must be utilized efficiently by the designed MAC protocol and the overhead of managing the communication should be low.
- The reserved bandwidth in the current region by a node becomes unavailable due to mobility. Therefore, Quality of Support (QOS) is difficult to be maintained in this case (Mohapatra et al., 2003; Chakrabarti and Mishra, 2001).
- The control packets like RTS, CTS should not consume more bandwidth.
- A MAC protocol must be capable enough to avoid hidden terminal and exposed terminal problems.
Centrality-Based Connected Dominating Sets for Complex Network Graphs

[www.igi-global.com/article/centrality-based-connected-dominating-sets-for-complex-network-graphs/124036?camid=4v1a](www.igi-global.com/article/centrality-based-connected-dominating-sets-for-complex-network-graphs/124036?camid=4v1a)