Chapter 4: THE MEDIUM ACCESS CONTROL SUBLAYER

The broadcast channels are sometimes referred to as *multiaccess channels or random access channels* . The protocols used to determine who goes next on a multiaccess channel belong to a sublayer of the data link layer called the **MAC** (Medium Access Control) sublayer. Technically, the MAC sublayer is the bottom part of the data link layer.

4.1 THE CHANNEL ALLOCATION PROBLEM

4.1.1 Static Channel Allocation

The conventional way of allocating a single channel, such as a telephone trunk, among multiple competing users is to chop up its capacity by using FDM (Frequency Division Multiplexing).

If there are N users, the bandwidth is divided into N equal-sized portions, with each user being assigned one portion. Since each user has a private frequency band, there is now no interference among users. When there is only a small and constant number of users, each of which has a steady stream or a heavy load of traffic, this division is a simple and efficient allocation mechanism.

However, when the number of senders is large and varying or the traffic is bursty, FDM presents some problems. If the spectrum is cut up into N regions and fewer than N users are currently interested in communicating, a large piece of valuable spectrum will be wasted. And if more than N users want to communicate, some of them will be denied permission for lack of bandwidth, even if some of the users who have been assigned a frequency band hardly ever transmit or receive anything.

If we were to use time division multiplexing (TDM) and allocate each user every Nth time slot, if a user does not use the allocated slot, it is wastage of bandwidth. Since none of the traditional static channel allocation methods work well at all with bursty traffic, we will now explore dynamic methods.

In dynamic channel allocation scheme, frequency bands are not permanently assigned to the users. Instead, channels are allotted to users dynamically as needed. This allocation scheme optimizes bandwidth usage and results is faster transmissions.

4.1.2 Assumptions for Dynamic Channel Allocation

1. Independent Traffic
   Once a frame has been generated, the station is blocked and does nothing until the frame has been successfully transmitted.
2. Single Channel
   A single channel is available for all communication. All stations can transmit on it and all can receive from it.
3. Observable Collisions
   If two frames are transmitted simultaneously, they overlap in time and the resulting signal is garbled. This event is called a collision. All stations can detect that a collision has occurred. A collided frame must be transmitted again later. No errors other than those generated by collisions occur.
4. Continuous or Slotted Time
   Time may be assumed continuous, in which case frame transmission can begin at any instant. Alternatively, time may be slotted or divided into discrete intervals (called slots).
5. Carrier Sense or No Carrier Sense
   With the carrier sense assumption, stations can tell if the channel is in use before trying to use it. No station will attempt to use the channel while it is sensed as busy. If there is no carrier sense, stations cannot sense the channel before trying to use it. They just go ahead and transmit. Only later can they determine whether the transmission was successful.