Medium Access Control

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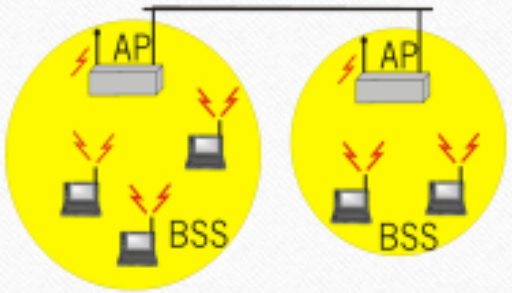
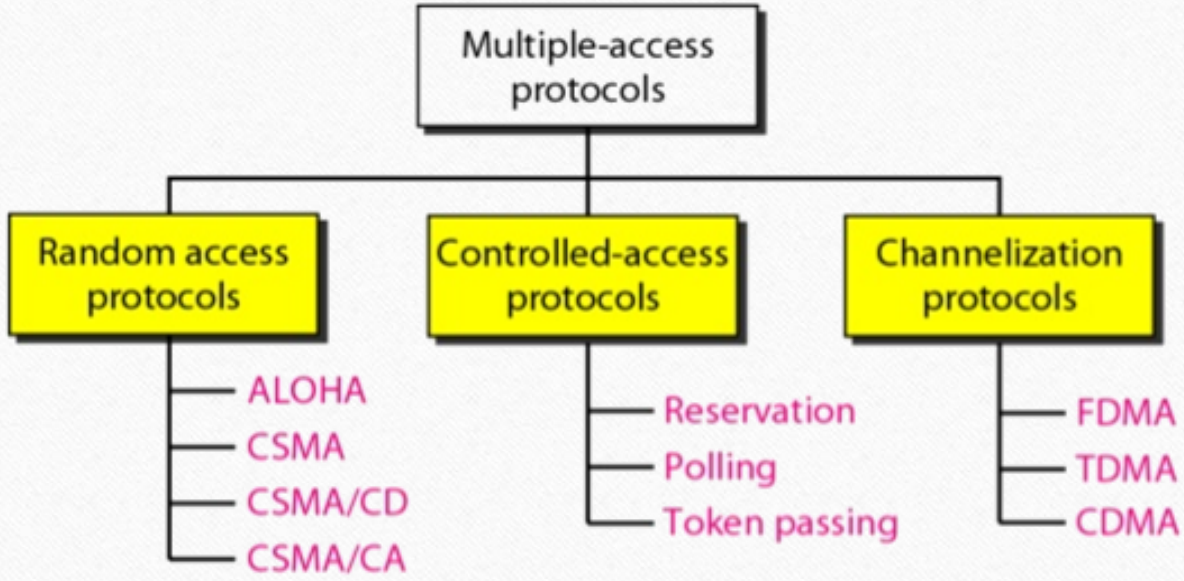
Channel Allocation problem

In a single channel broadcast network, when multiple stations try to send messages simultaneously, who has the right to use the channel?

A common sense:
When we talk about MAC, we are faced with a broadcast network.



Multiple access Protocol



Random Access Protocol:

In this, all stations have same superiority that is no station has more priority than another station. Any station can send data depending on medium's state(idle or busy). It has two features:

1. **There is no fixed time for sending data**
2. **There is no fixed sequence of stations sending data**

ALOHA

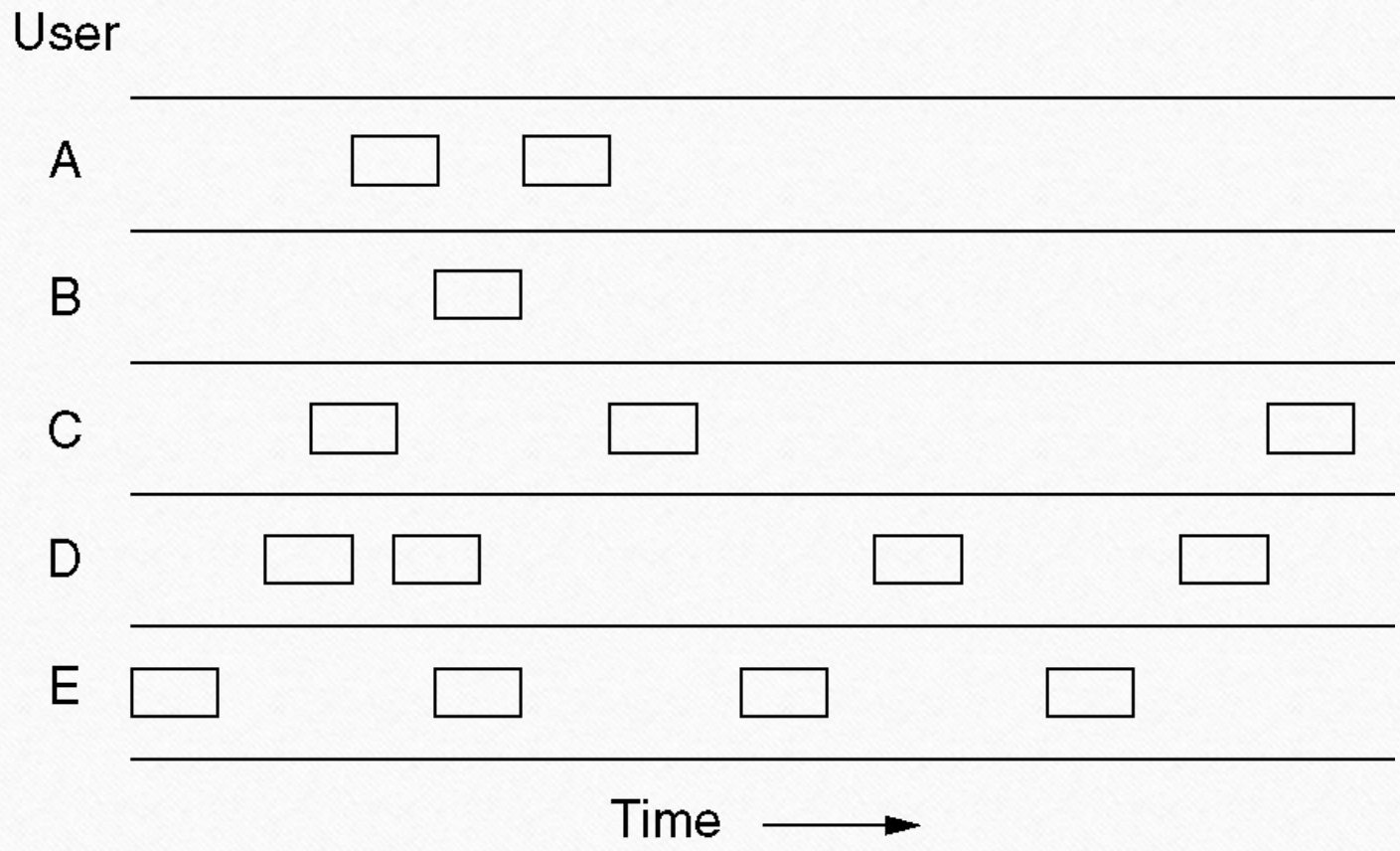
The core idea is extremely simple:

Anyone may transmit whenever they want. (Continuous time model.)

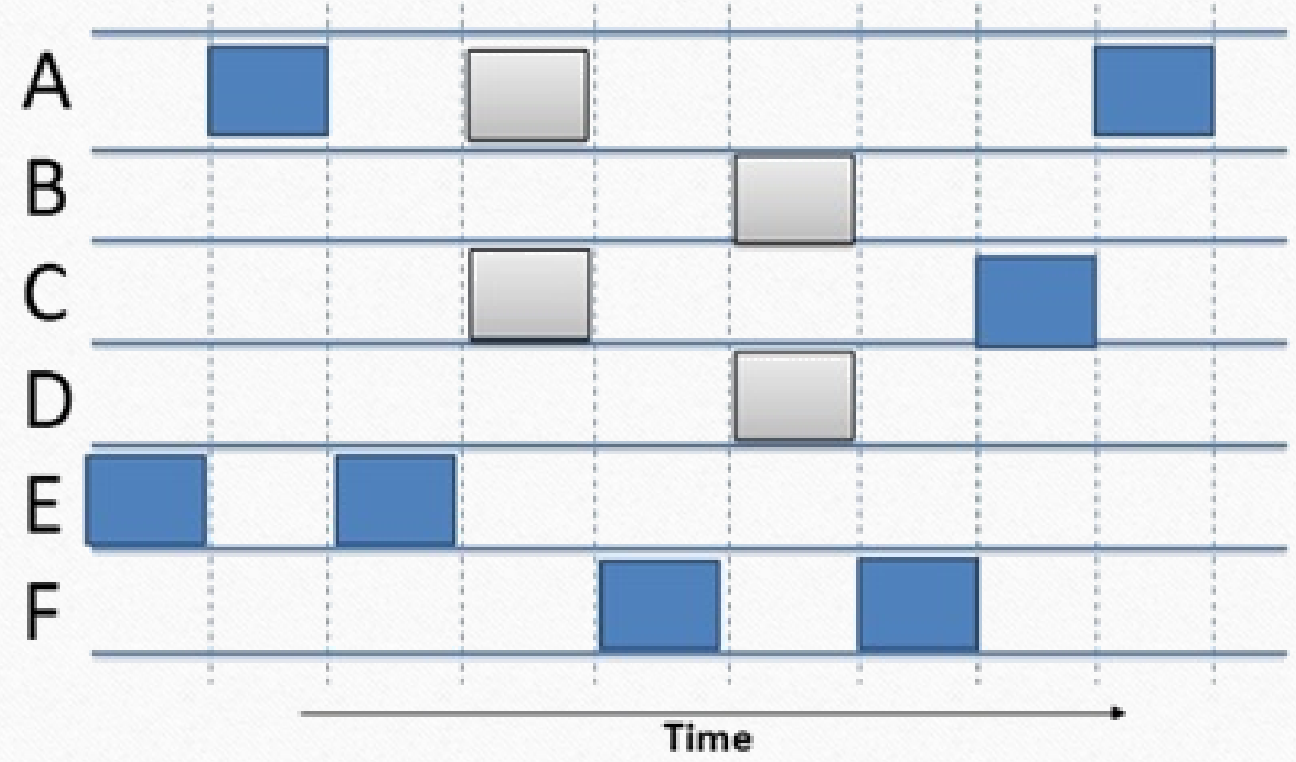
Detect if the transmission is successful. (So we need some way for Collision Detection (CD)).

After a collision, wait a random amount of time and transmit the same frame again. This technique is known as backoff.

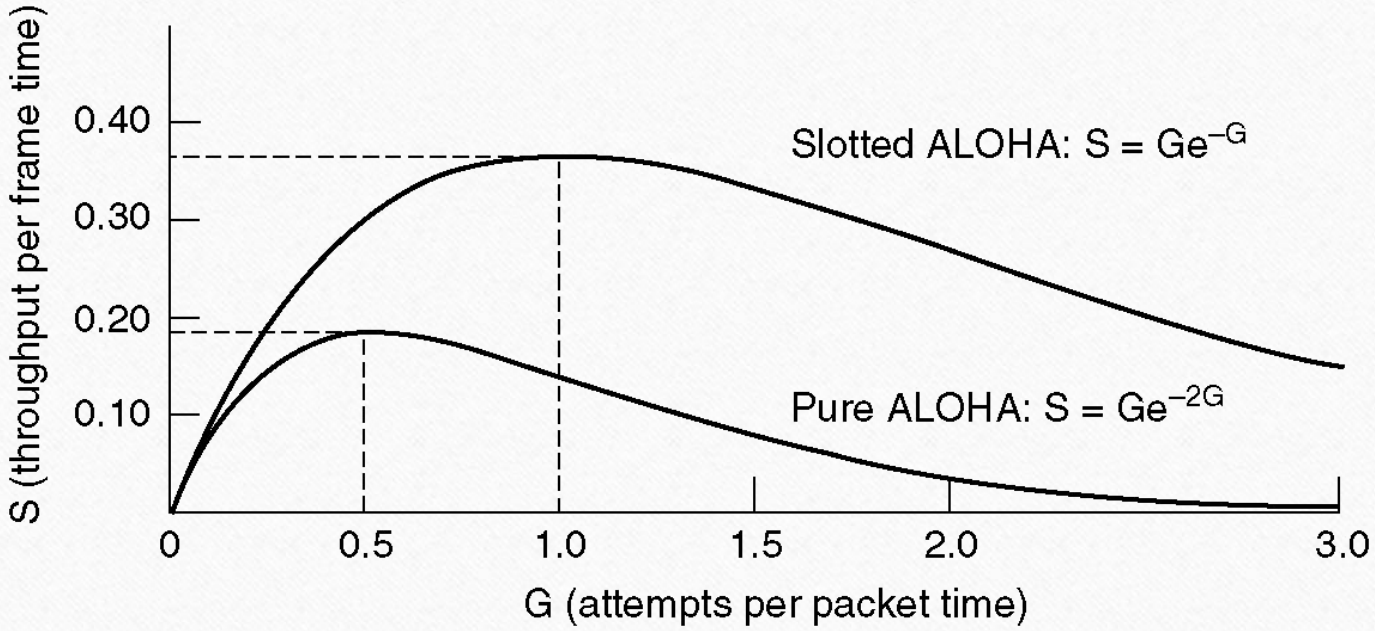
Pure ALOHA



Slotted ALOHA

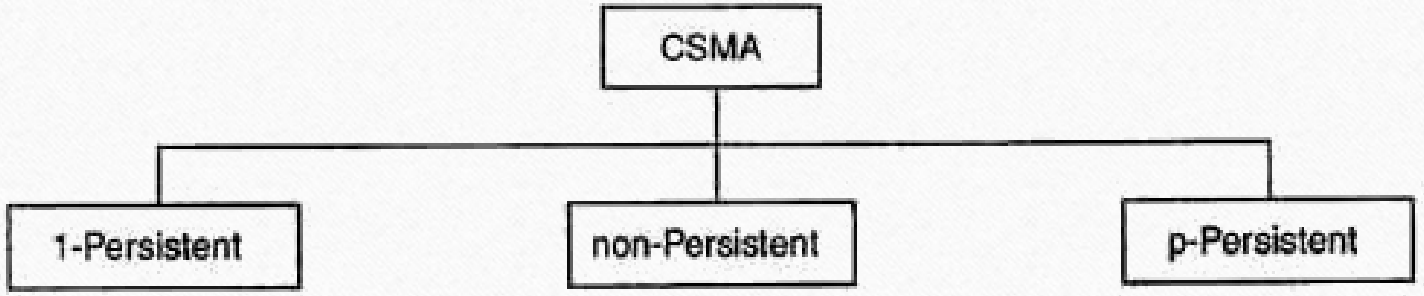


Throughput versus offered traffic for ALOHA systems.



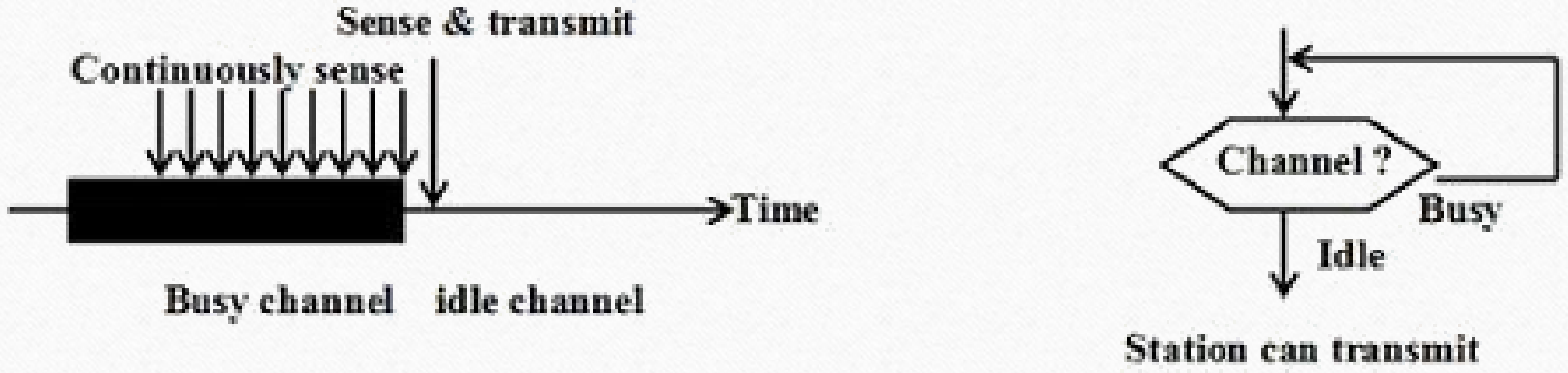
CSMA (Carrier Sense Multiple Access)

First sense the medium (for idle or busy) before transmitting data. If it is idle then it sends data, otherwise it waits till the channel becomes idle.



1-persistent CSMA

In this method, station that wants to transmit data continuously senses the channel to check whether the channel is idle or busy.



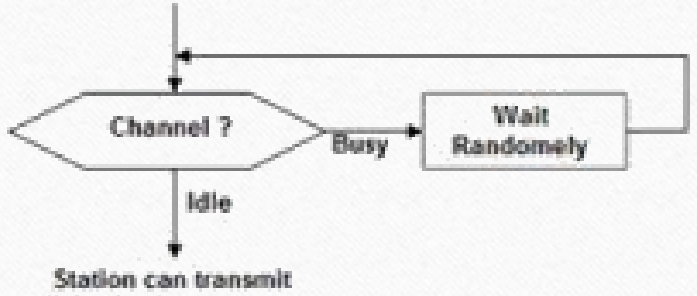
1-persistent CSMA

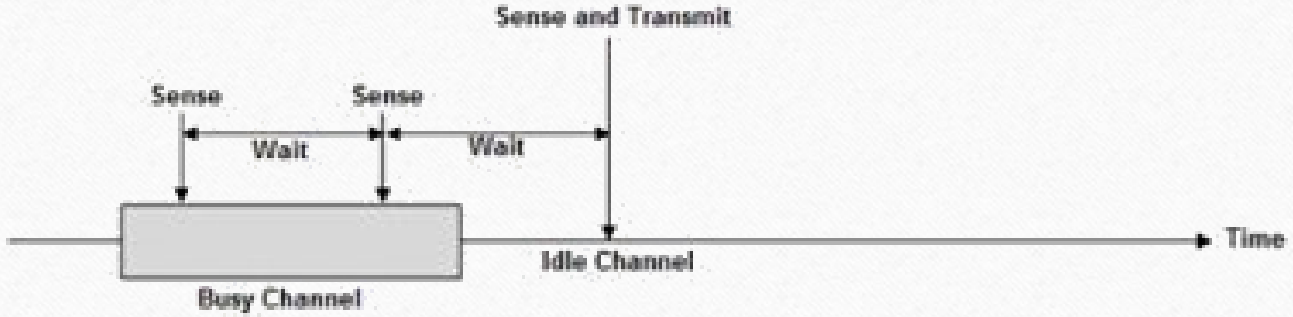
If the channel is busy, the station waits until it becomes idle.

When the station detects an idle-channel, it immediately transmits the frame with probability 1.

Non-persistent CSMA

In this scheme, if a station wants to transmit a frame and it finds that the channel is busy (some other station is transmitting) then it will wait for fixed interval of time.

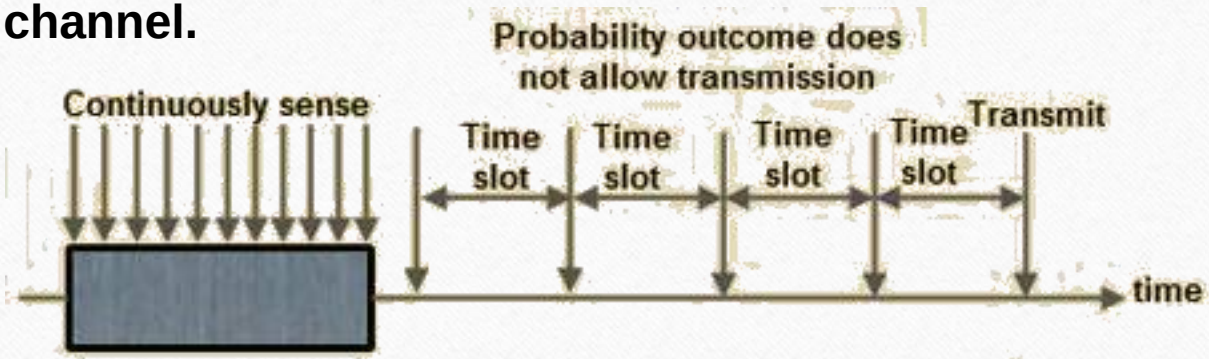




After this time, it again checks the status of the channel and if the channel is free it will transmit.

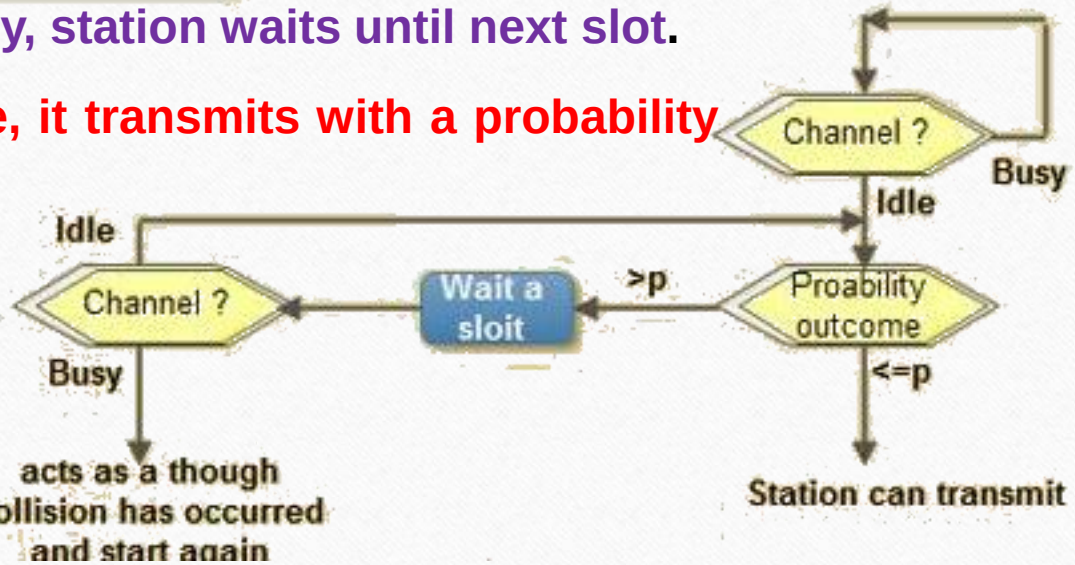
P-persistent CSMA

Whenever a station becomes ready to send, it senses the channel.



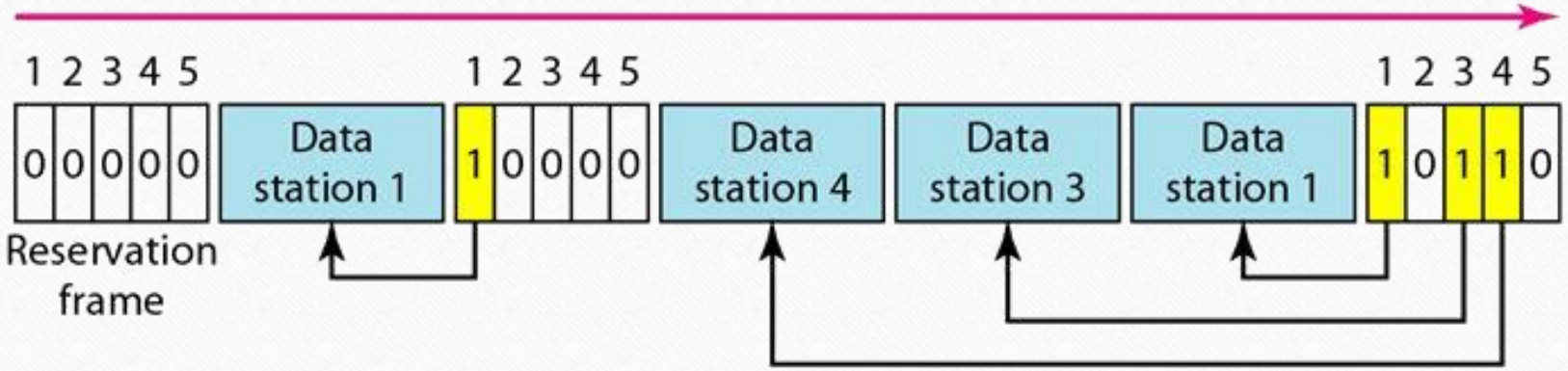
If channel is busy, station waits until next slot.

If channel is idle, it transmits with a probability p.



Controlled Access Protocol:

Reservation:

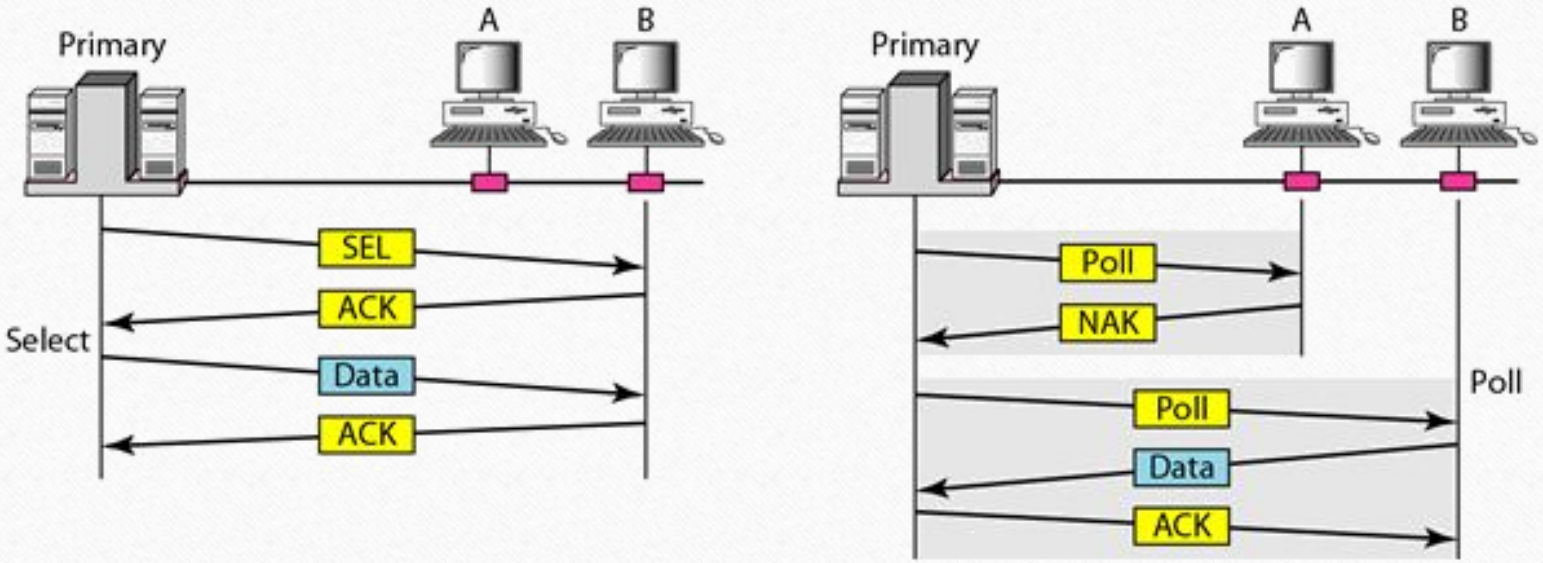


The following figure shows a situation with five stations and a five-minislot reservation frame.

In the first interval, only stations 1, 3, and 4 have made reservations. In the second interval, only station 1 has made a reservation

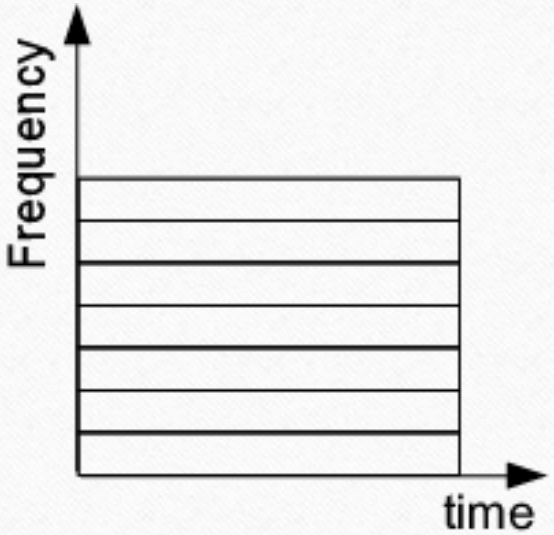
Controlled Access Protocol:

Polling:



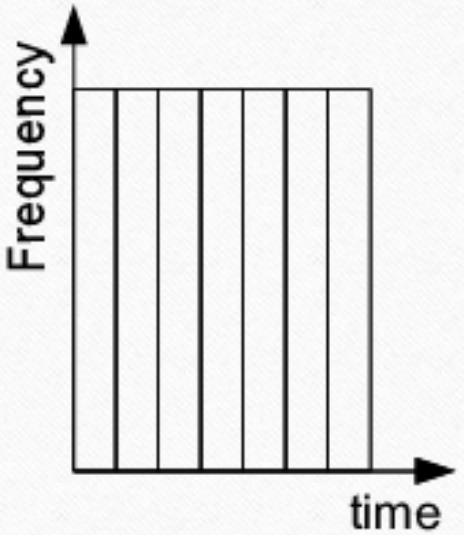
All data exchanges must be made through the primary device even when the ultimate destination is a secondary device.

Channelization:



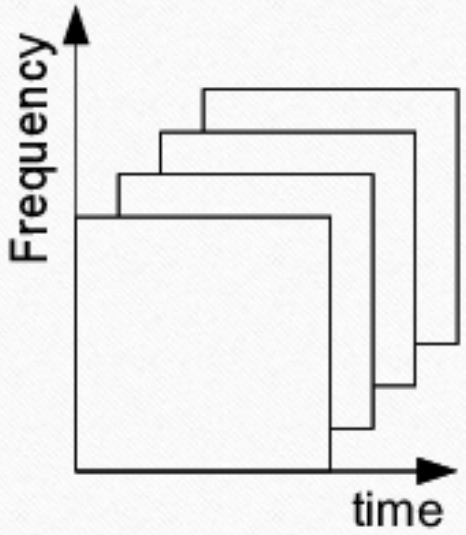
FDMA

The available bandwidth is divided into equal bands so that each station can be allocated its own band.



TDMA

In this, the bandwidth is shared between multiple stations. To avoid collision time is divided into slots and stations are allotted these slots to transmit data.



CDMA

One channel carries all transmissions simultaneously. There is neither division of bandwidth nor division of time.

Thank You

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