ALOHA

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Multiple Access Protocols

The Data Link Layer is responsible for transmission of data between two nodes. Its main functions are-

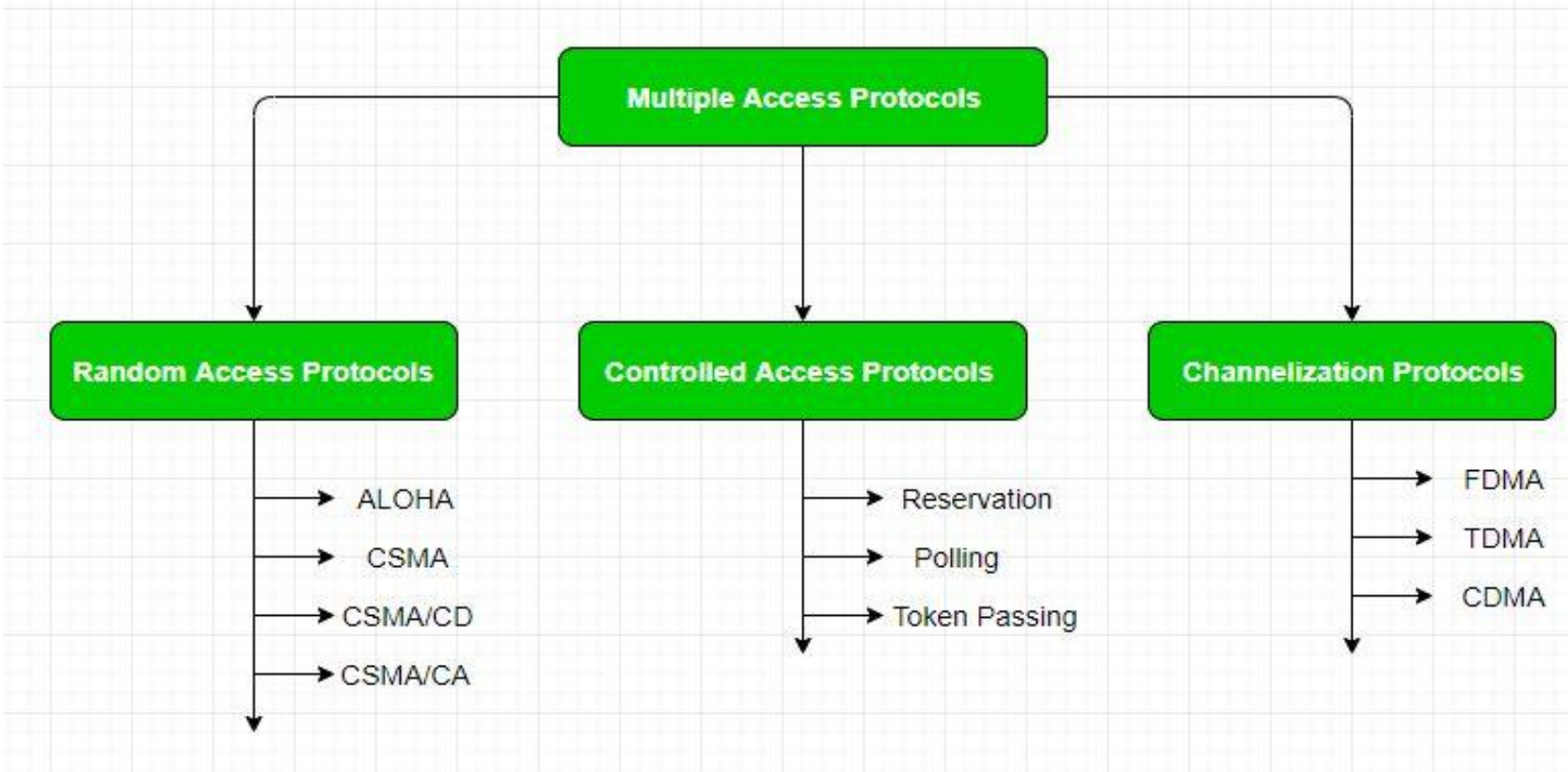
- Data Link Control
- Multiple Access Control

Data Link control –

The data link control is responsible for reliable transmission of message over transmission channel by using techniques like framing, error control and flow control.

Multiple Access Control –

If there is a dedicated link between the sender and the receiver then data link control layer is sufficient, however if there is no dedicated link present then multiple stations can access the channel simultaneously. Hence multiple access protocols are required to decrease collision and avoid crosstalk.


Multiple Access Protocols
Random Access Protocols
ALOHA
CSMA
CSMA/CD
CSMA/CA
Controlled Access Protocols
Reservation
Polling
Token Passing
Channelization Protocols
FDMA
TDMA
CDMA

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

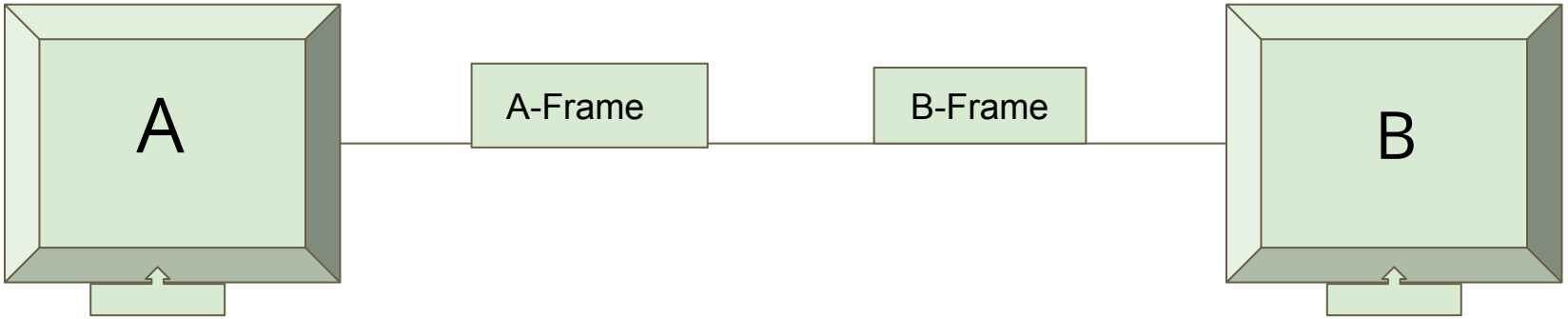
- Aloha is a random access protocol.
- It was actually designed for WLAN but it is also applicable for shared medium.
- In this,multiple stations can transmit data at the same time and can hence lead to collision and data being garbled.

Collision

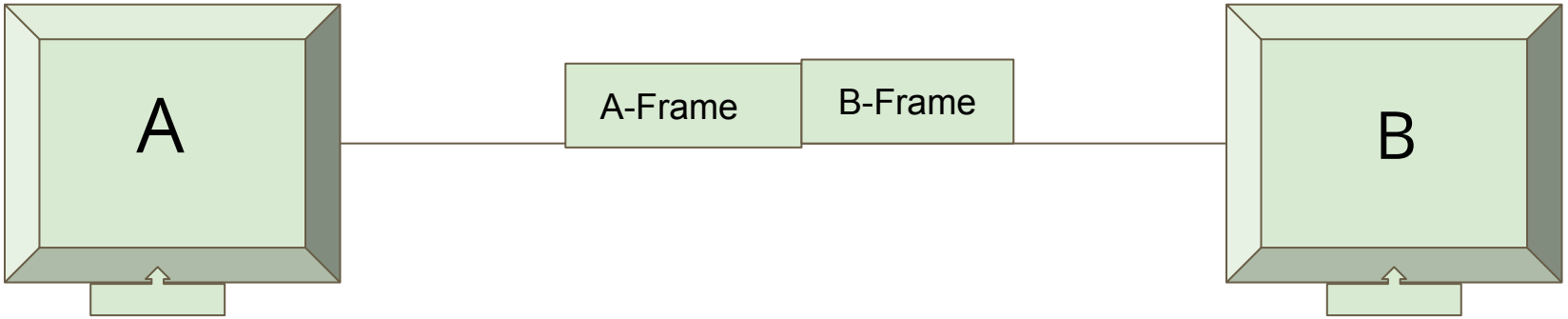
Collision

Collision

Collision



Collision



Collision

Types:

- **Pure Aloha:**

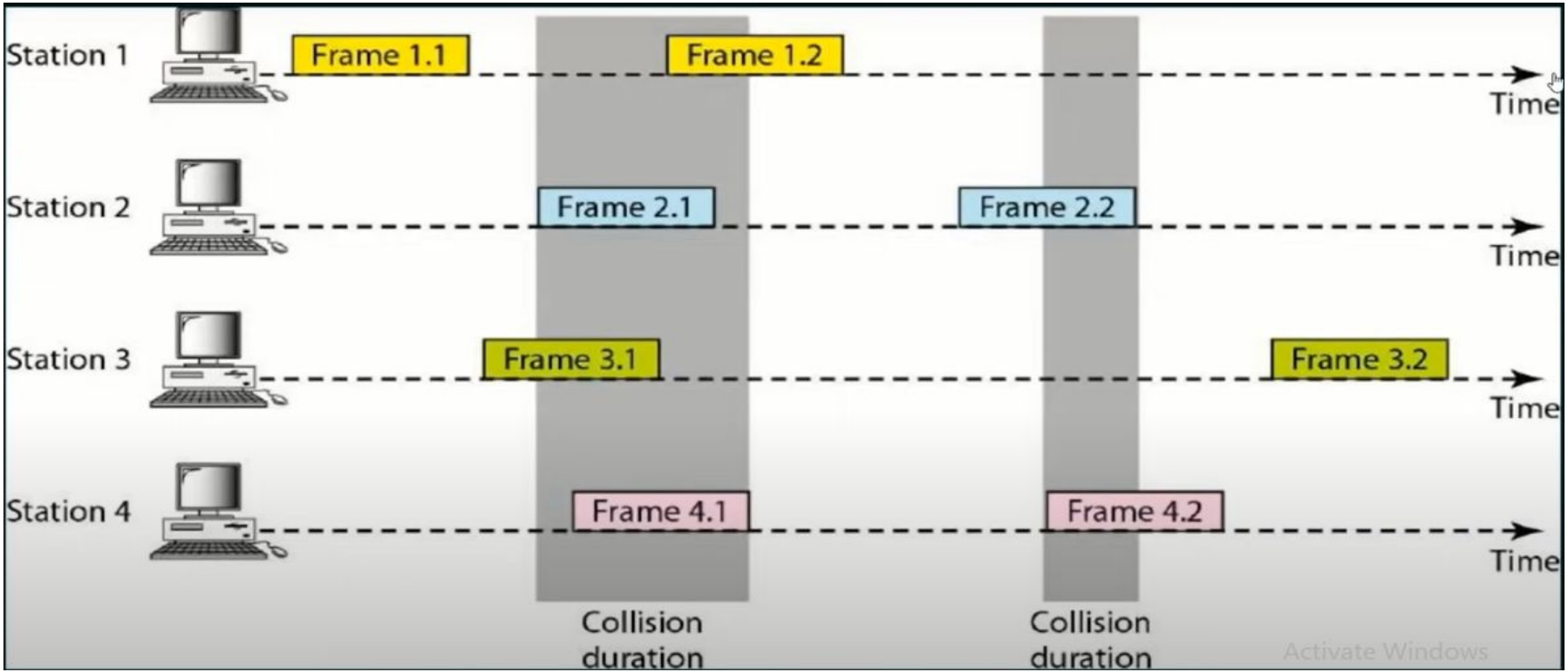
  When a station sends data it waits for an acknowledgement. If the acknowledgement doesn’t come within the allotted time then the station waits for a random amount of time called back-off time (Tb) and re-sends the data. Since different stations wait for different amount of time, the probability of further collision decreases.

```
Vulnerable Time = 2* Frame transmission time

Throughput =  G exp{-2*G}

Maximum throughput = 0.184 for G=0.5
```

Pure ALOHA


Station 1
Frame 1.1
Frame 1.2
Time
Station 2
Frame 2.1
Frame 2.2
Time
Station 3
Frame 3.1
Frame 3.2
Time
Station 4
Frame 4.1
Frame 4.2
Time
Collision duration
Collision duration
Activate Windows

Slotted ALOHA

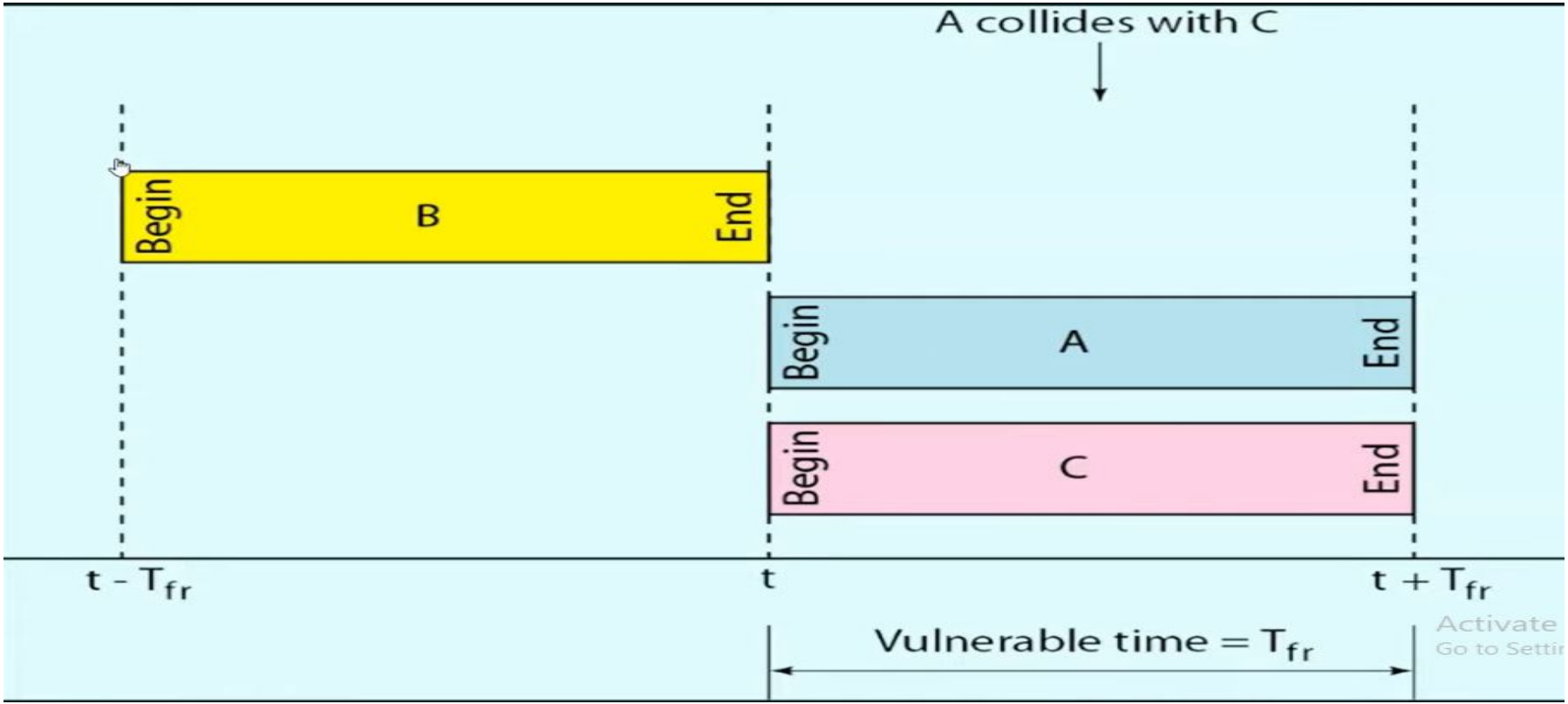
It is similar to pure aloha, except that we divide time into slots and sending of data is allowed only at the beginning of these slots. If a station misses out the allowed time, it must wait for the next slot. This reduces the probability of collision.

```
Vulnerable Time =  Frame transmission time

Throughput =  G exp{-*G}

Maximum throughput = 0.368 for G=1
```

Slotted ALOHA



THANKYOU!