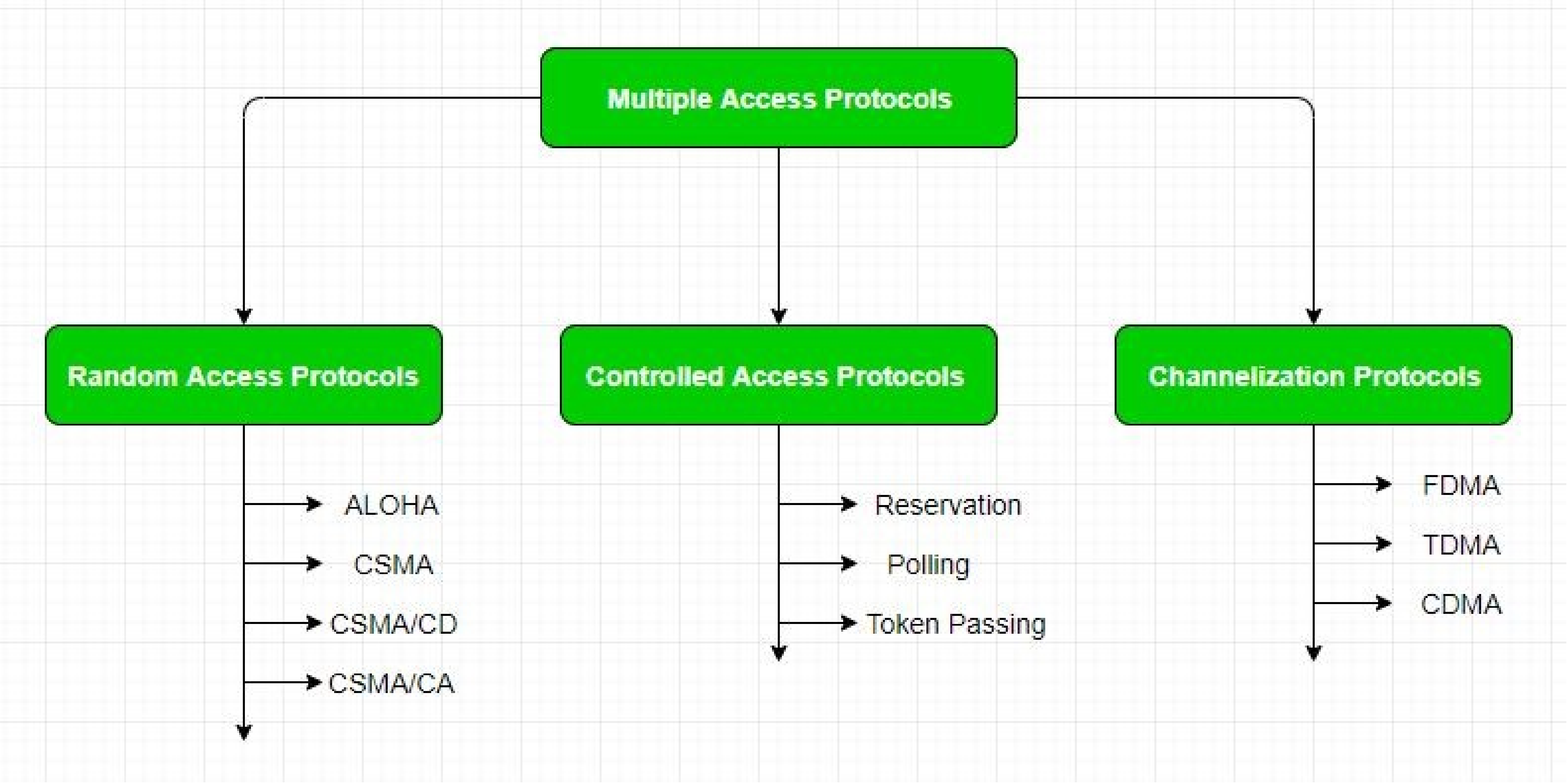
MULTIPLE ACCESS PROTOCOL

MULTIPLE ACCESS

- 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.
- Protocols are required for sharing data on non dedicated channels. Multiple access protocols can be subdivided further as


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

RANDOM ACCESS

- 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:
  - There is no fixed time for sending data
  - There is no fixed sequence of stations sending data

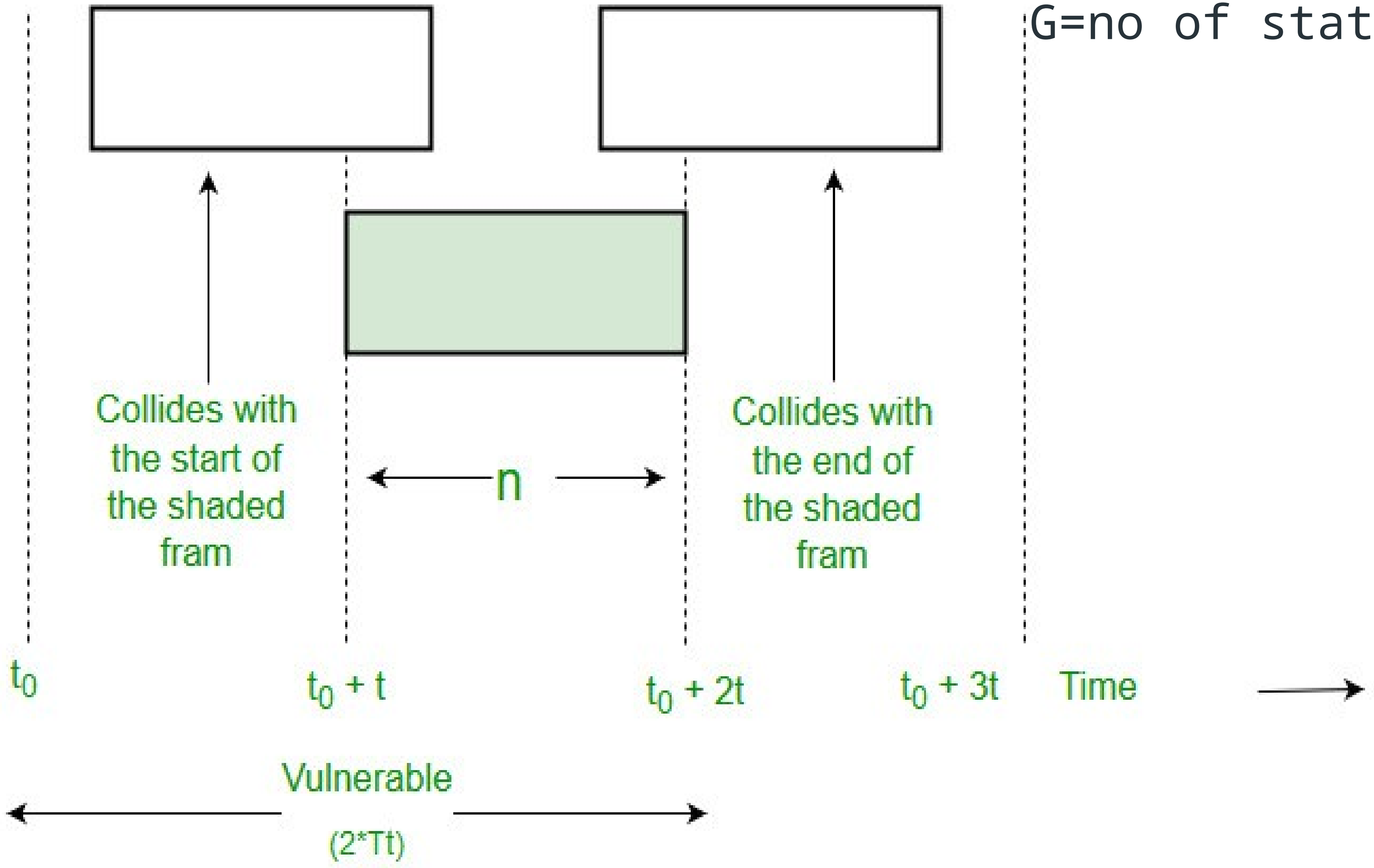
ALOHA

- It was designed for wireless LAN but 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.
  - PURE ALOHA
  - SLOTTED ALOHA

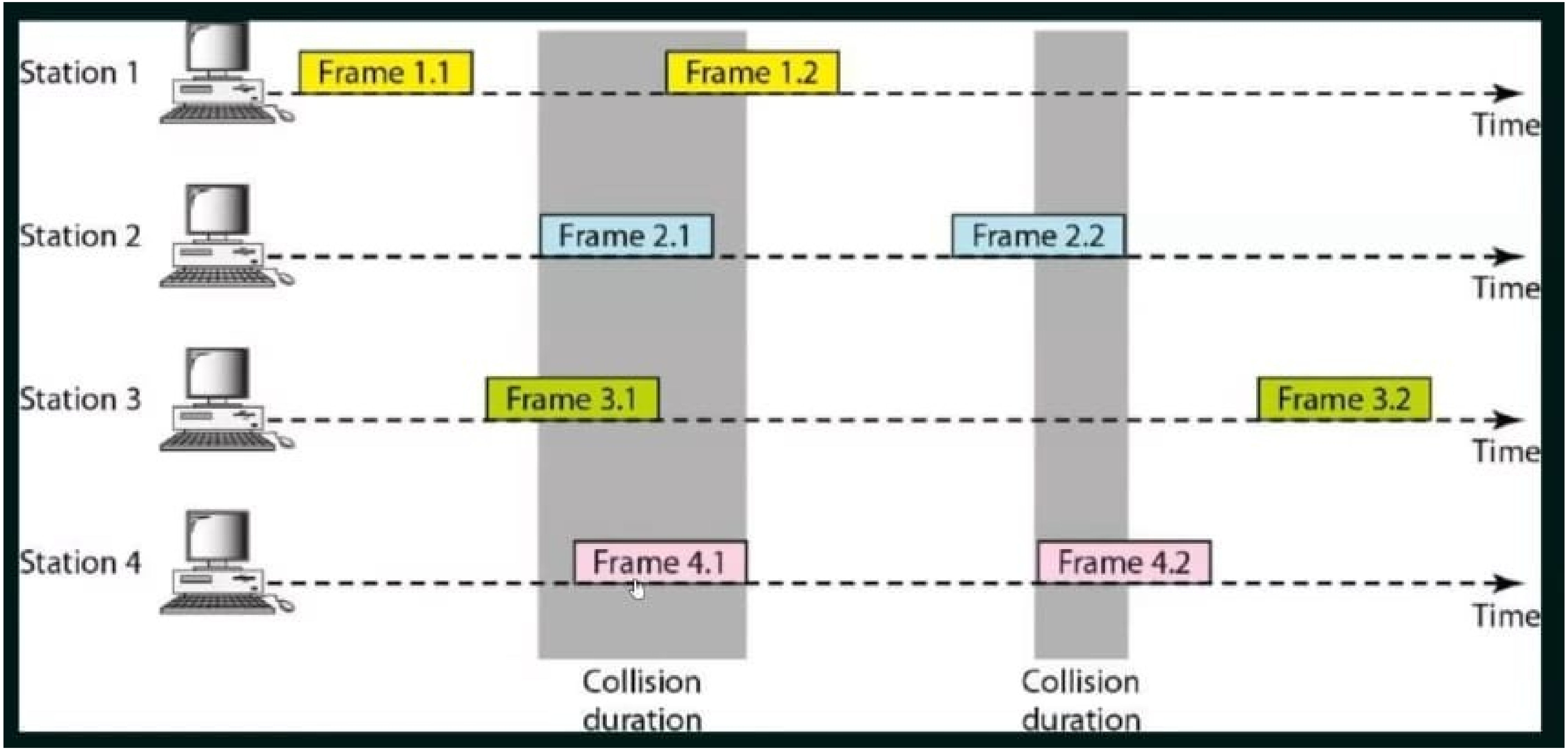
PURE ALOHA

- 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.

Throughput= G * e^-2G
maximum throughput=0.184(G=0.5)
G=no of station on same time

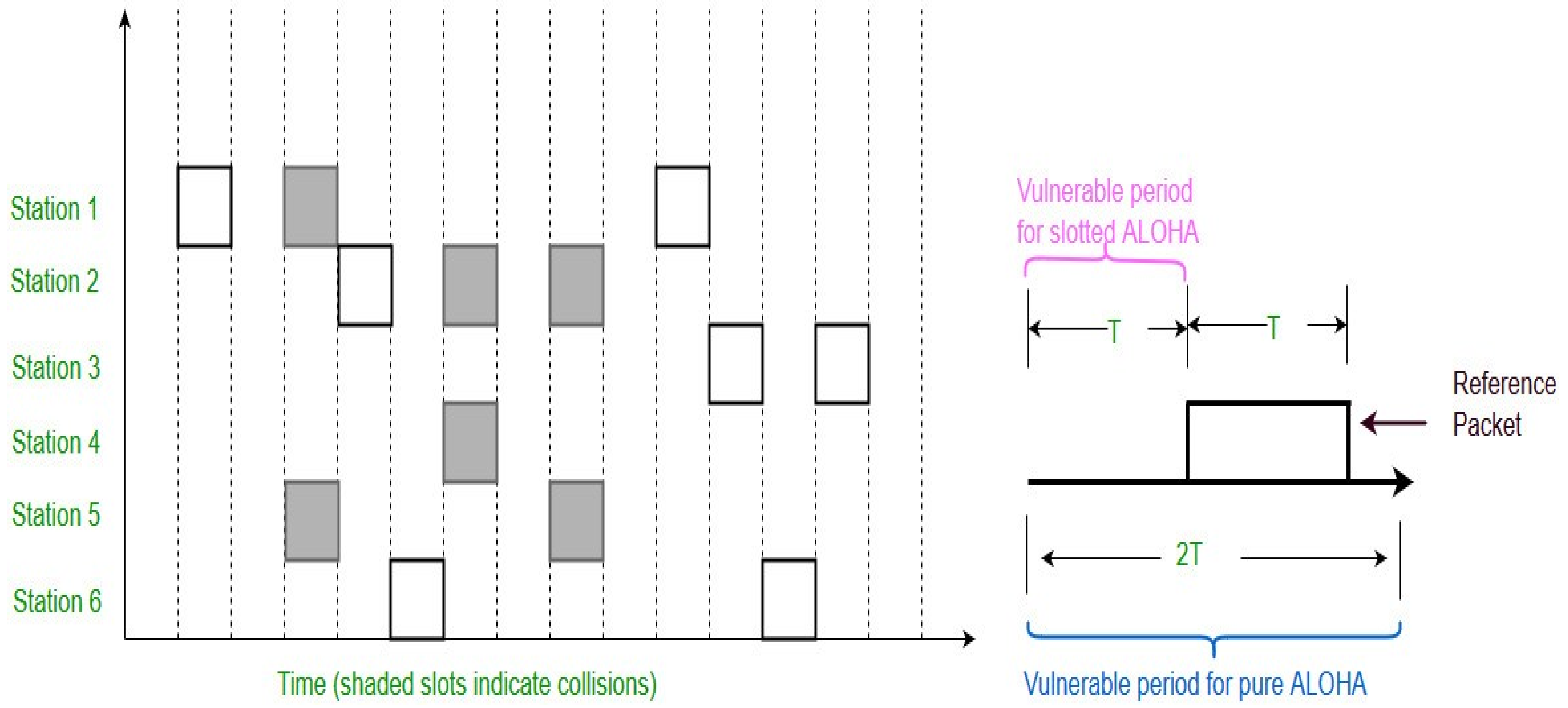


Frames-pure aloha



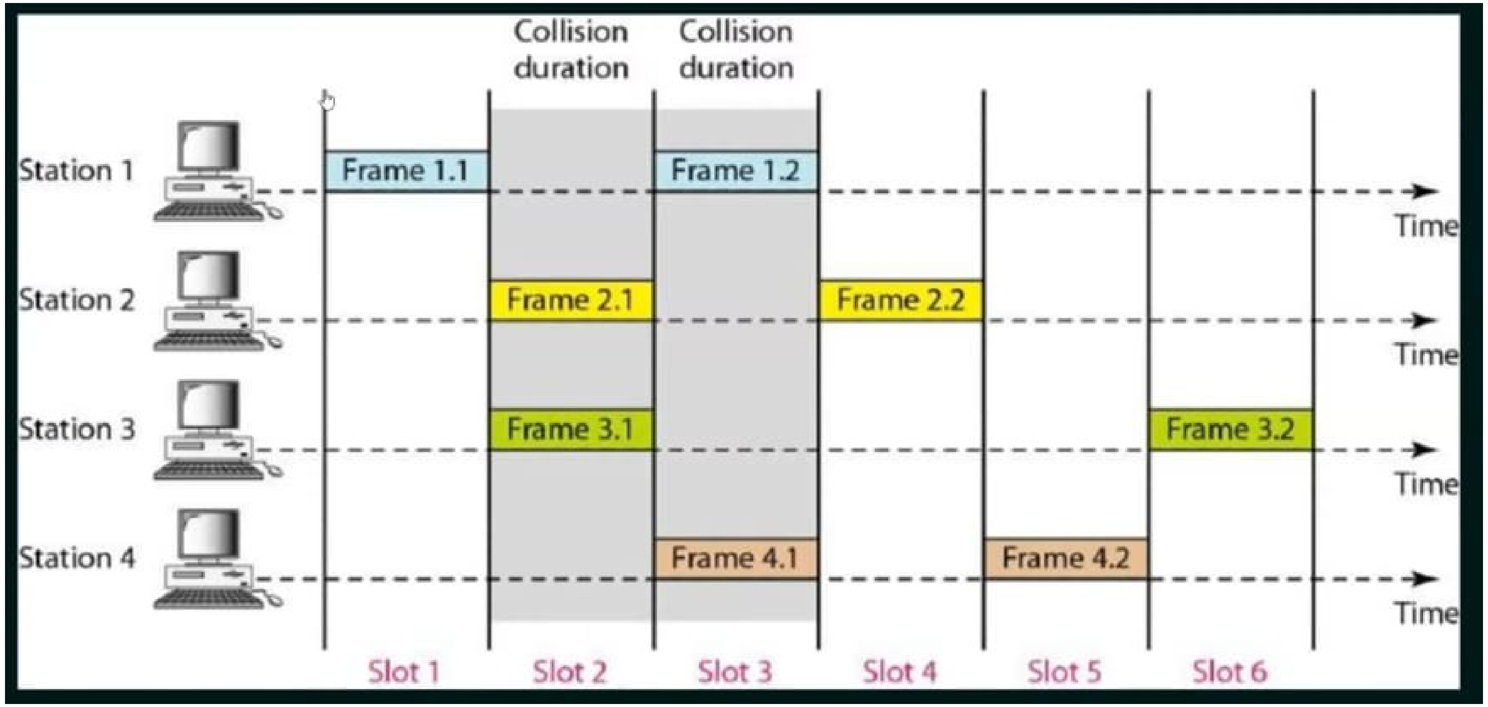
SLOTTED ALOHA

- This is quite similar to Pure Aloha, differing only in the way transmissions take place. Instead of transmitting right at demand time, the sender waits for some time.
- In slotted ALOHA, the time of the shared channel is divided into discrete intervals called *Slots*
- If any station is not able to place the frame onto the channel at the beginning of the slot, it has to wait until the beginning of the next time slot.
- There is still a possibility of collision if two stations try to send at the beginning of the same time slot. But still, the number of collisions that can possibly take place is reduced by a large margin and the performance becomes much well compared to Pure Aloha.



Station 1
Station 2
Station 3
Station 4
Station 5
Station 6
Time (shaded slots indicate collisions)
Vulnerable period for slotted ALOHA
T
T
Reference Packet
2T
Vulnerable period for pure ALOHA

Frames-SlottedALOHA



Pure Aloha	Slotted Aloha
Any station can transmit the data at any time.	Any station can transmit the data at the beginning of any time slot.
The time is continuous and not globally synchronized.	The time is discrete and globally synchronized.
Vulnerable time in which collision may occur $= 2 \times T_{Fr}$	Vulnerable time in which collision may occur $= T_{Fr}$
Probability of successful transmission of data packet $= G \times e^{-2G}$	Probability of successful transmission of data packet $= G \times e^{-G}$
Maximum efficiency = 18.4% (Occurs at G = 1/2)	Maximum efficiency = 36.8% (Occurs at G = 1)
Main advantage: Simplicity in implementation.	Main advantage: It reduces the number of collisions to half and doubles the efficiency of pure aloha.