Week 5
MAC Sub-Layer Contd

Internet Technologies
COMP90007

Persistent and Non-Persistent CSMA

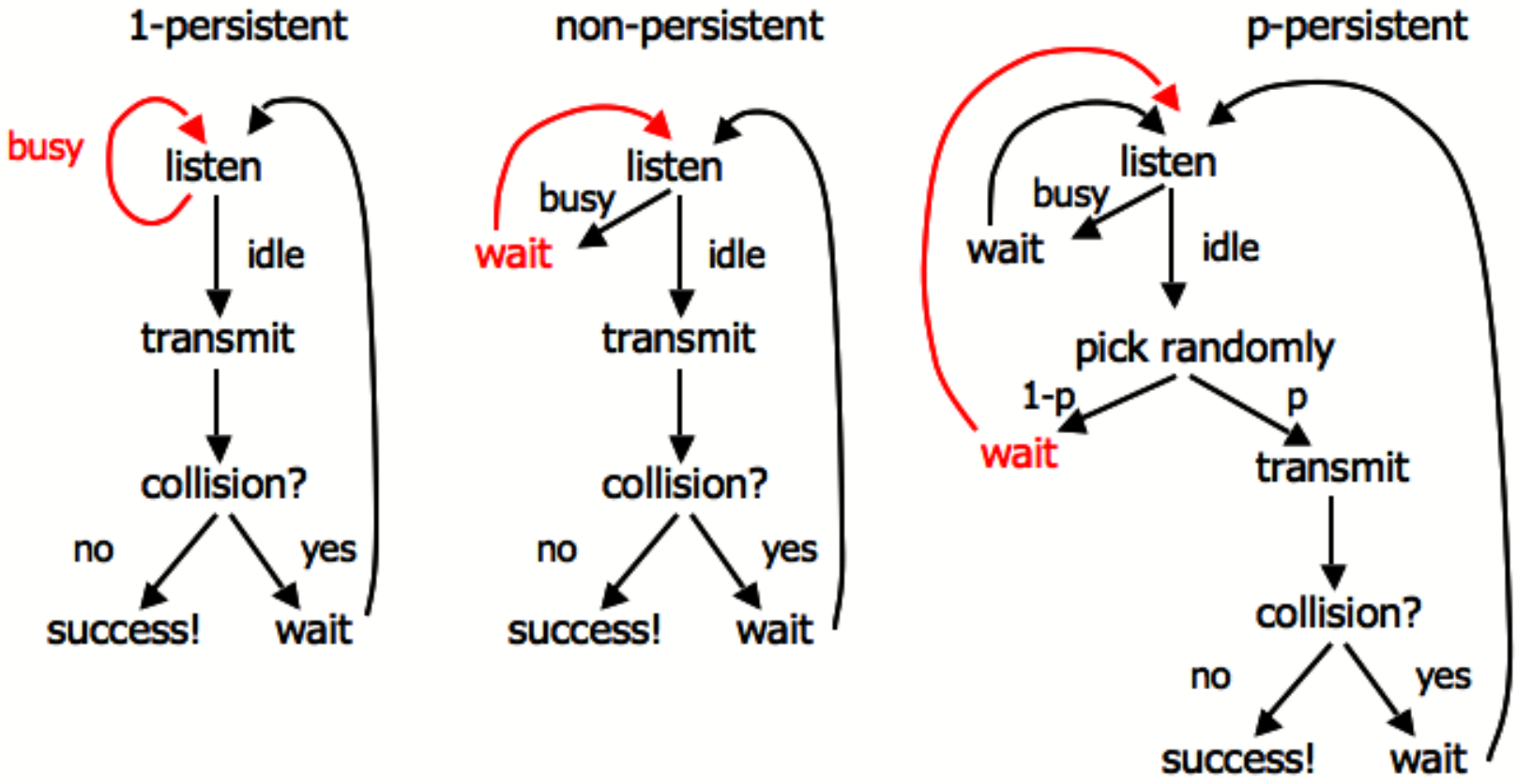
- When a sender has data to transmit, first check channel to **detect other active transmission**

- 1-persistent CSMA
  - **Wait until channel idle; transmit one frame and check collisions**; if collision, wait for a random time and repeat

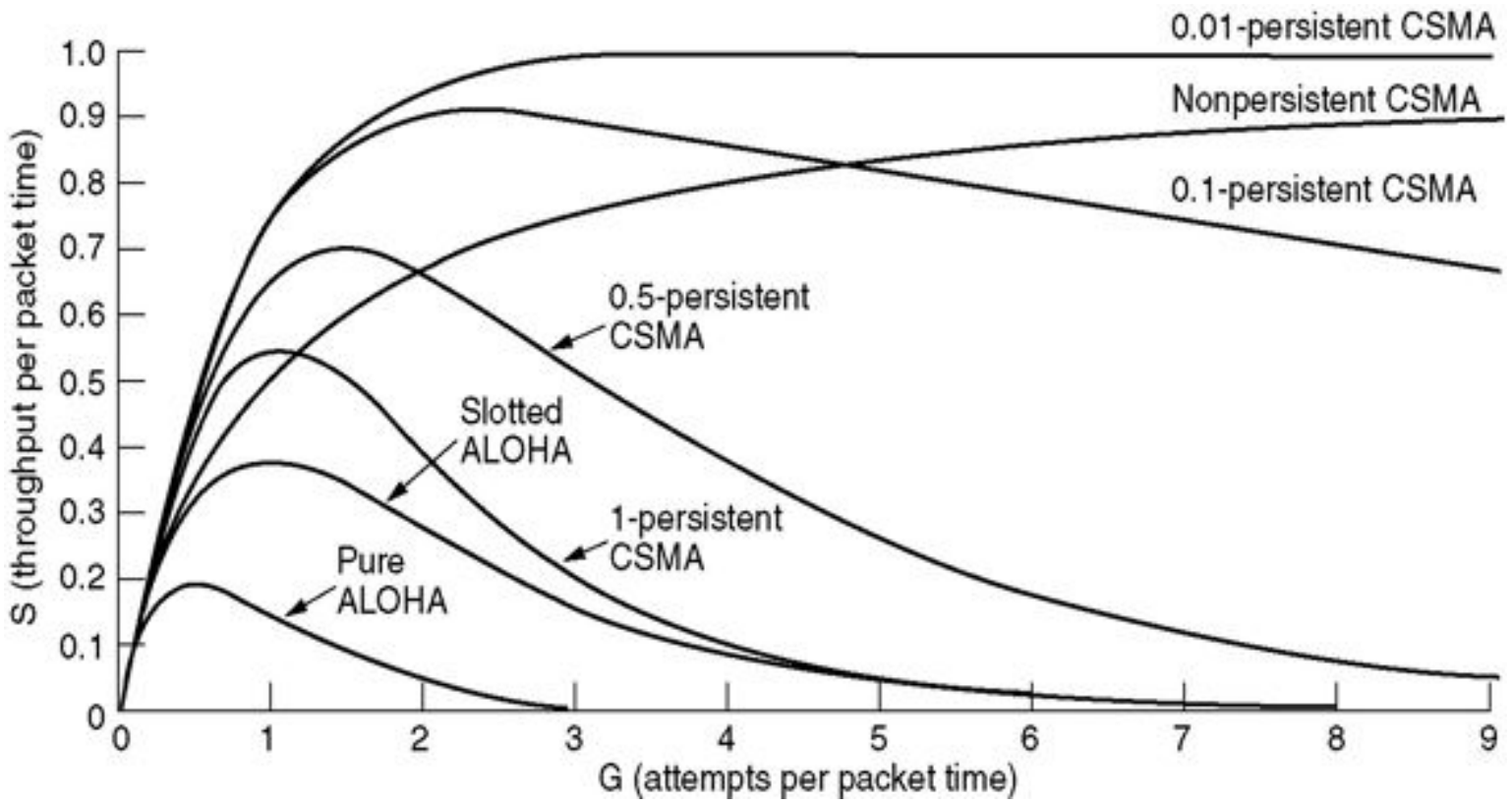
- Non-persistent CSMA
  - **If channel busy, wait random period and check again**; if not, start transmitting

- p-persistent CSMA
  - **If channel idle, transmit with probability p, or wait with probability (1-p)** and check again

Persistent and Non-Persistent CSMA



CSMA Variants Performance

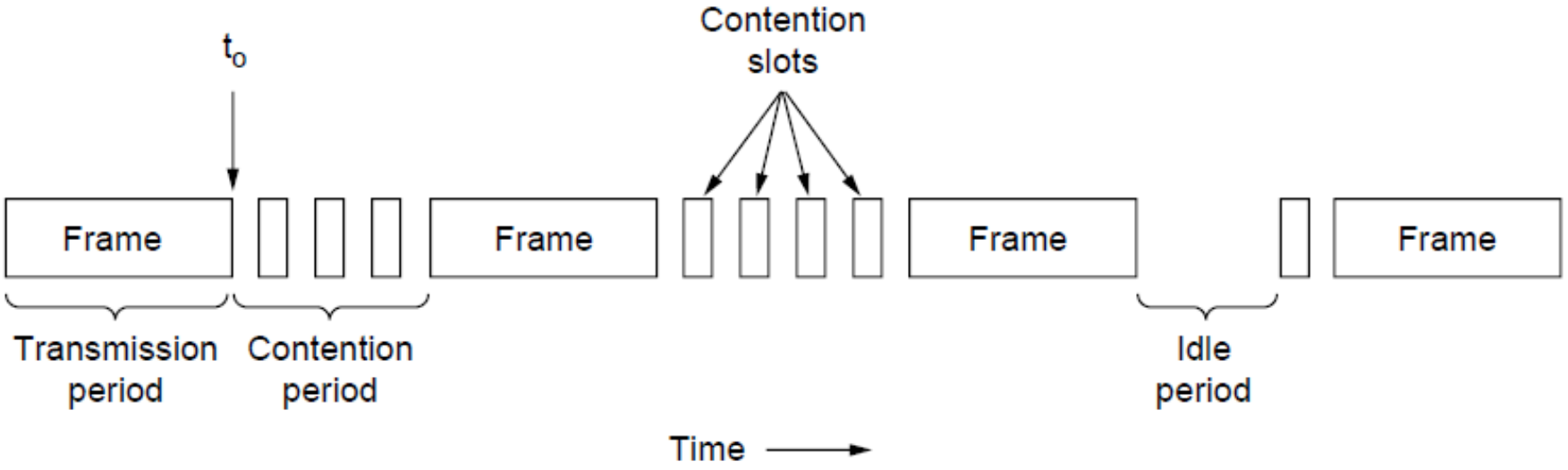


CSMA outperforms ALOHA, and being less persistent is better under high load

CSMA with Collision Detection

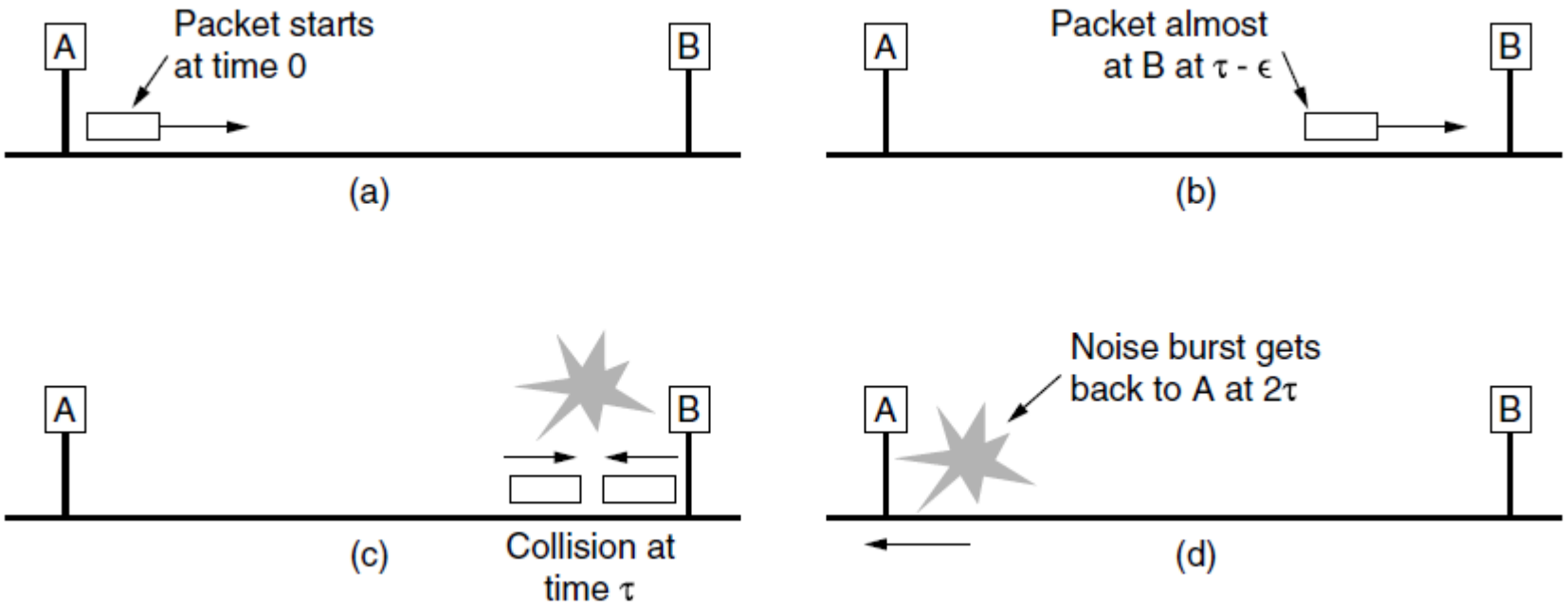
- Principle that **transmission aborted when collision detected**
- After collision detected, abort, wait random period, try again
- **Channel must be continually monitored**

Reduced contention times improve performance



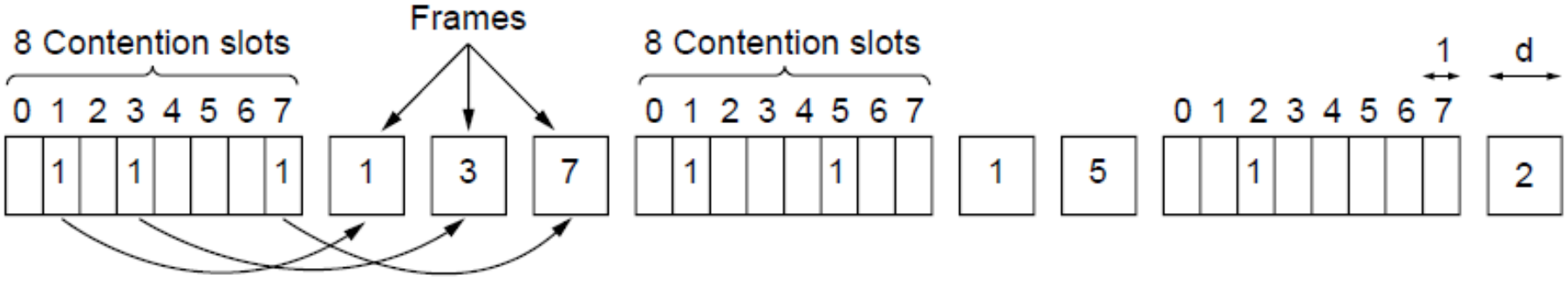
Classic Ethernet Min Packet Size

- Collisions can occur and take as long as 2τ to detect
  - τ is the time it takes to propagate over the Ethernet
  - Leads to minimum packet size for reliable detection



Collision Free Protocols

- Bit Map Protocol
  - Reservation-based protocol
  - 1 bit per station overhead
  - Division of transmission right, and transmission event - no collisions as this is a reservation based protocol

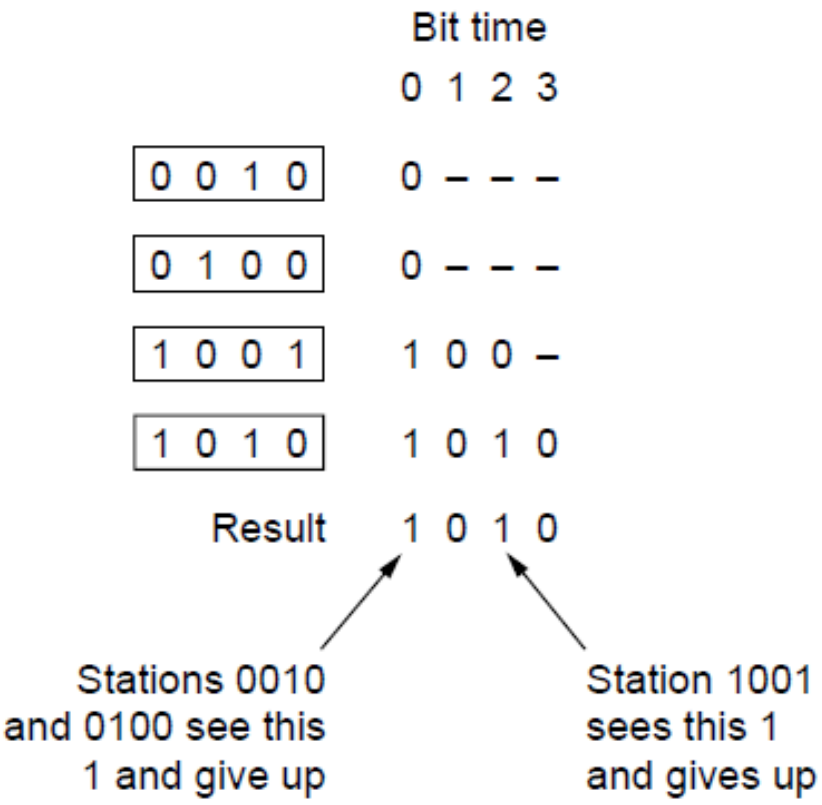


Collision Free Protocols

- Binary Countdown Protocol
  - Avoid the 1 bit per station scalability problem by using binary station addressing
  - No collisions as higher-order bit positions are used to arbitrate between stations wanting to transmit
  - Higher numbered stations have a higher priority

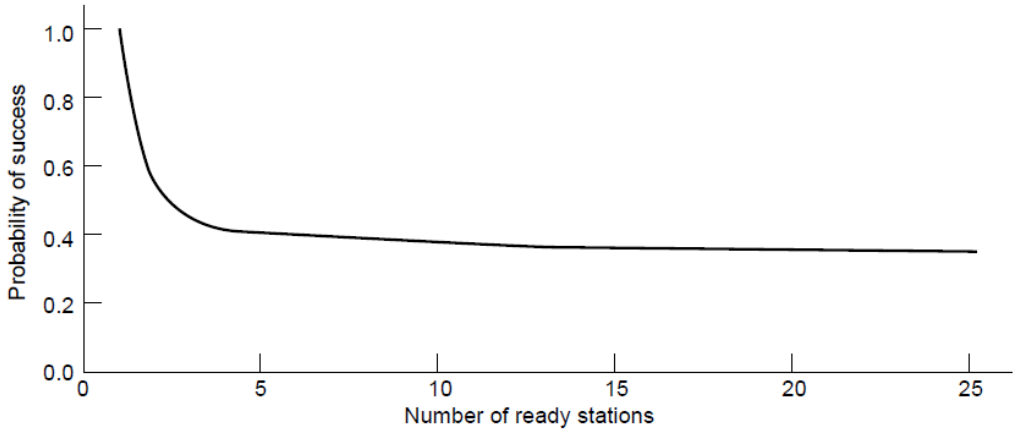
Binary Countdown Protocol

- Stations send their address in contention slot (log N bits instead of N bits)
- Channel medium ORs bits; stations give up when they send a “0” but see a “1”
- Station that sees its full address is next to send



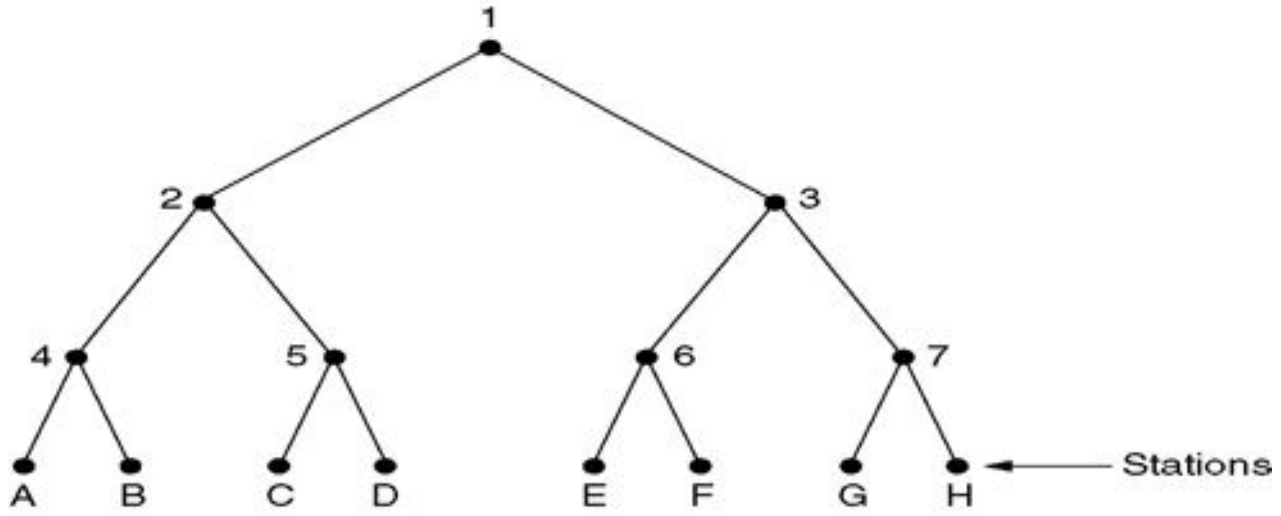
Limited Contention Protocols

- 2 strategies - contention and collision free - both become inefficient at different points
- Under low loads, collision free is less attractive because of a higher delay between transmissions
- Under higher loads, contention is less attractive because overhead associated with channel arbitration becomes greater
- Limited Content Protocols increase the probability of stations acquiring transmission rights by arbitrarily dividing stations and using a binary algorithm to determine rights allocation
  - Idea is to divide stations into groups within which only a very small number are likely to want to send
  - Avoids wastage due to idle periods and collisions



Adaptive Tree Walk Protocol

- All stations compete for right to transmit, if a collision occurs, binary division is used to resolve contention
- Tree divides stations into groups (nodes) to poll
  - Depth first search under nodes with poll collisions



Example 1: D G
Slot 1 → D, G – collision
Slot 2 → D
Slot 3 → G

Example 2: B D G
Slot 1 → B, D, G – collision
Slot 2 → B, D - collision
Slot 3 → B
Slot 4 → D
Slot 5 → G