Why can't CSMA/CD be used on wireless networks?

Because there is no central controller, CSMA/CD relies on a random access method, which allows collisions to occur. In a wireless network, the channel is not divided based on a physical layer, which can lead to decreased efficiency and increased latency.

Packet Switching

- Uses cable TV line or fibre to the home.
- Combines data at the source and reassembles it at the destination.
- Variable length packets.
- Uses a virtual circuit approach where a connection is set up before data is sent.

Circuit Switching

- Uses a physical connection between processes on different hosts.
- Parameters include bandwidth, delay, and error rate.
- Provides a dedicated connection for the duration of the session.

Queueing

- When a shared facility needs to be accessed for service by a large number of jobs or customers. There is an exponential relationship between the queueing delay and the traffic intensity.
- Little's law: \( E[N] = \lambda E[T] \)
- Probability of inter-arrival time in a Poisson process: \( P_r(\tau) = \frac{e^{-\lambda \tau}}{\tau!} \)
- Expected (average) inter-arrival time: \( E(\tau) = \frac{1}{\lambda} \)
- Markovian systems map to continuous-time Markov chains, which can be solved.
- For Markovian systems, we assume Poisson distributed arrivals and exponential service.

M/M/1 - server, infinite capacity/population, FIFO

M/M/m - As above, but no servers, m storage (e.g., telephone switching network).

M/M/1/K - A server with a finite buffer size.

M/M/m/K - A server with a finite buffer size and m servers.

M/M/infinity - A server with an infinite buffer size.

Traffic characteristic:

- Utilization factor: \( \rho = \frac{\lambda}{\mu} \)
- Balance equation for an M/M/1/K queue:

\[
E[S] = \frac{1 - \rho}{1 - \rho^k}
\]

- Throughput: \( \text{number of packets successfully transmitted through the channel per time frame} \)

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