

Networks

Sprint 2 Deliverables

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Parity

Suppose you want to transmit the following 32-bit sequence:

0xBEEFCAFE = 1011 1110 1110 1111 1100 1010 1111 1110

Determine the extra bits you would need to transmit if you chose to use a two-dimensional parity algorithm. Use a four row by eight column matrix.

								Row
1011 1110								0
1110 1111								1
1100 1010								0
1111 1110								1
COL	0	1	0	0	1	0	1	COL PARITY

13 extra bits

Link Layer Protocols

The Ethernet protocol allows multiple hosts to share a connection to one physical link. Explain briefly how Ethernet manages access to the link to ensure that simultaneous transmissions from multiple hosts do not interfere with each other.

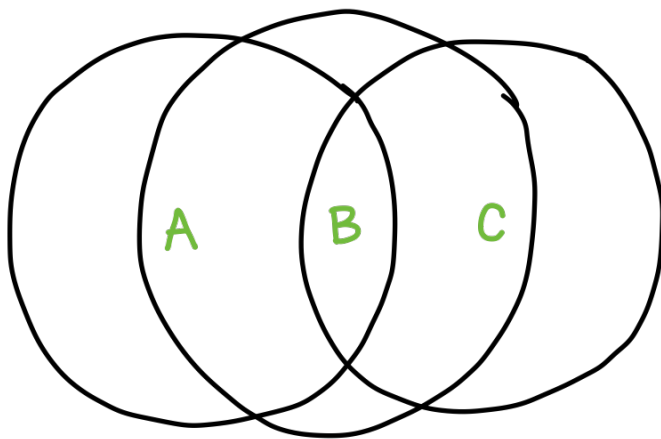
Ethernet manages access by way of CSMA/CD, which stands for “Carrier Sense Multiple Access/Collision Detection.” That last part is the most important — old school Ethernet doesn’t guarantee the avoidance of collisions, it merely detects them when they occur.

Upon the detection of a collision: stop transmitting, send a 32-bit “jam sequence,” wait for some randomized amount of time (exponential backoff), then re-transmit (up to 16 times).

Describe at least two factors that make collision avoidance more challenging in 802.11 networks than in multiple-access wired Ethernet. How is collision avoidance implemented in wireless networks?

Collision avoidance is more difficult to implement for wireless networks because 1) hosts can't "listen" during transmission and 2) the "hidden node" problem. The hidden node problem occurs when two hosts can communicate with a recipient, but their ranges aren't wide enough to communicate with each other. Thus, they may unknowingly transmit to the recipient at the same time and cause a collision.

"hidden node problem"



Collision avoidance is implemented with the use of special packages called ACK packets and RTS/CTS packets. An ACK ("acknowledgement") packet lets a host know that a transmission was successfully received at the intended destination. RTS/CTS ("ready to send"/"clear to send") packets are exchanged so that a pair of hosts are prepared for transmission. These packets also let the rest of the network know to wait, since the network space will be in use.

MAC Addresses

Explain the significance of media access control (MAC) addresses in link-layer networks. How is a device's MAC address set?

Ethernet uses a broadcast protocol, which means that each transmission is sent to every host. MAC addresses are important because they allow a host to specify a destination for a transmission. And upon the receipt of data, a host can verify whether the transmission is meant for them or not.

A device's MAC address is programmed into the hardware so that every host is given a unique address.