**Link Layer Protocols Problem**

*Ethernet Protocol Part*

Ethernet controls access to a shared physical link using CSMA/CD, or “Carrier Sense Multiple Access Collision Detection.” The Collision Detection (CD) part tells us that Ethernet does not actually prevent collisions from occurring at all, but instead chooses to detect collisions when they occur and correct the error.

This checking is usually done through an Error Correction Code (ECC), and when a collision is detected, a 32 bit jam sequence is sent telling the sending host to stop transmitting and wait for a randomized period of time and retransmit. A host can retransmit up to 16 times, with the delay time before being allowed to transmit again increasing according to exponential backoff, before timing out and being unable to transmit the data.

*Wireless Networks (802.11) Part*

Collision avoidance is more challenging on a wireless network for a couple reasons:

1. Hosts are not able to “listen” for the transmissions of other hosts during their own transmission process.
2. The “hidden node” problem. This happens when one host B that is the intended recipient data from two other hosts A and C exists so that B is within the range of both A and C, but A and C are out of range from one another (as in the diagram below). As a result, A is completely unaware of when C is transmitting and C is completely unaware of when A is transmitting, creating the potential for collisions between the signals from A and C, as both try to communicate with B simultaneously.

A

C

B

**MAC Addresses Problem**

Ethernet uses a broadcast protocol, which means that every host receives every transmission. MAC addresses are important because they are unique to each host on the Network and are programmed into their host’s hardware. As a result, they can be used to specify which host is the intended recipient of a transmission. It can also be used to inform other hosts that see the transmission that it was not in fact meant for them.

**Parity Problem**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **1** | **0** | **1** | **1** | **1** | **1** | **1** | **0** |
| **1** | **1** | **1** | **0** | **1** | **1** | **1** | **1** |
| **1** | **1** | **1** | **0** | **1** | **0** | **1** | **0** |
| **1** | **1** | **1** | **1** | **1** | **1** | **1** | **0** |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **0** | **1** | **0** | **0** | **0** | **1** | **0** | **1** |

|  |
| --- |
| **0** |
| **1** |
| **1** |
| **1** |

|  |
| --- |
| **0** |

< - 1D row parity

2D parity outcome

^ 1D Column Parity

13 extra bits would be required