

Ethernet Networks

Implementing 802.3

Ethernet

- May operate over several cable types.
 - **10 Base 2** Thin wire coax, bus topology.
 - 10 Base 5 Thick wire coax, bus topology.
 - **10 Base T** Twisted pair, star topology.
 - 10 Base F Optical fibre, star topology.

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802.3 Frame Format

Preamble	SD	Dest Addr	Src Addr	LD	Data	Pad	CRC
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- Preamble (7 bytes): Sine wave, clock synch.
- SFD (1 byte): 10101011 denoted.
- Dest Addr: 6 byte unique 802 address.
- Src Address: 6 byte address, 2^{48} possible.
- LD: Size of payload.
- Data: Payload max 1500 bytes.
- Pad: Ensures min size of 64 bytes.
- CRC: As discussed previously.

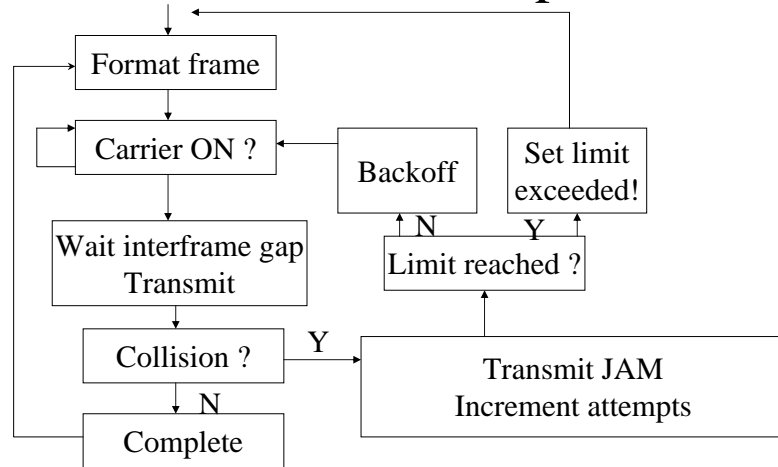
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802.3 MAC

- Carrier Sense Multiple Access with Collision Detection CSMA\CD
- Allows multiple stations to share transmission medium.
- Senses carrier to see if medium is quiet.
- Be able to detect if another station is interfering by continuing to listen to carrier while transmitting.

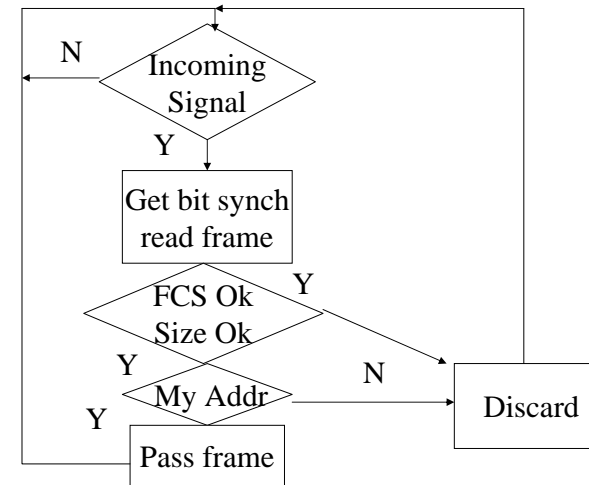
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802.3 MAC Sender Operation



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802.3 MAC Receiver Operation



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Truncated Binary Exponential Backoff

- When collision is detected, two stations wish to transmit simultaneously.
- Need to prevent continuous collisions between this pair.
- Better to have graceful degradation of throughput.

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Algorithm

- The number of slot times before the N^{th} retransmission attempt is chosen as a uniformly distributed random integer in the range
 - $0 \leq R \leq 2^K$,
 - where $K = \min(N, \text{backoff limit})$,
 - e.g. for a backoff limit of 20, possible ranges of K will be 0..2, 0..4, 0..8, 0..16, 0..20, 0..20, 0..20 for successive attempts at retransmission up to a maximum number of attempts.
- The backoff limit of 20 is imposed and prevents the series continuing 8, 16, 32, 64, etc, etc and thus the heuristic is called *truncated binary exponential backoff*.

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HDLC and 802 LLC

- Only best effort datagram service offered by 802 MAC.
- LLC offers error controlled, flow controlled data link above 802 MAC.
- LLC is common to all 802 standards, based closely on OSI standards.
- MAC encapsulates LLC packets.
- Based on HDLC.

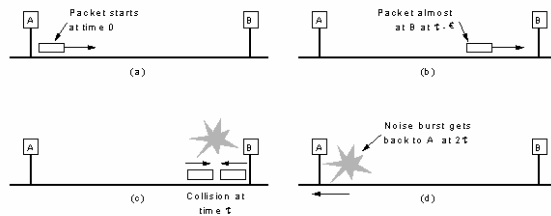


Fig. 4-22. Collision detection can take as long as 2τ .

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802.3 Modern Implementations

- Most modern implementations of Ethernet use Switched Ethernet.
- Improved throughput and better utilisation.

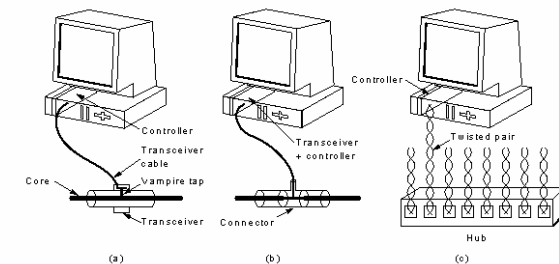


Fig. 4-18. Three kinds of 802.3 cabling. (a) 10Base5. (b) 10Base2. (c) 10Base-T.

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