

Previously

- Protocol Design issues
- Framing
- Error Control
- Flow Control

Ethernet

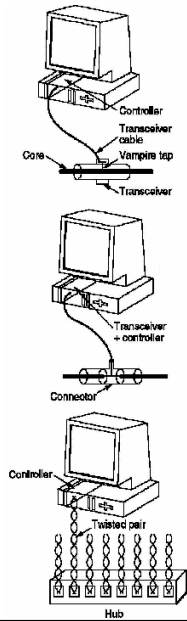
Classic Ethernet
Improvements

- IEEE standard 802.3
 - CSMA / CD

Ethernet Cabling

- 10Base-5: _____
 - Connected using _____
 - Up to 100 _____
- 10Base-2: _____
 - Uses a _____
 - Connected using _____
 - Up to 30 _____
- 10Base-T: _____
 - Runs to a _____
 - Up to 1024 stations allowed within 200m
- 10Base-F
 - Typically a hub/star topology
 - Max segment 2km, Up to 1024 stations per segment

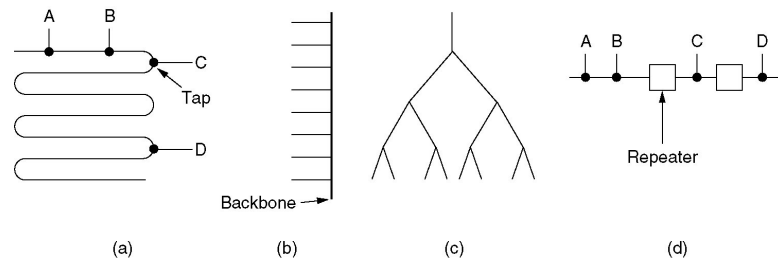
Classic Ethernet Improvements



Cable Topologies

- Linear: _____
- Spine: _____
- Tree: _____
- Repeaters: _____

Classic Ethernet Improvements

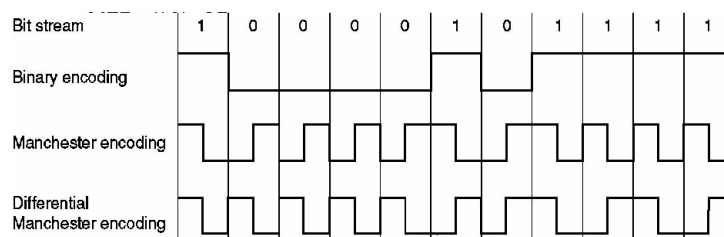


Encoding

- Considering a stream of bits to be transmitted and received we must address a number of issues:
 - How to distinguish idle from 0?
 - Solution: _____
 - How can we avoid having an average D.C. voltage?
 - Solution: _____
 - How can we be sure that we sample the signal correctly?
 - Solution: _____

Manchester Encoding

- Manchester
 - 1 represented as _____
 - 0 represented as _____
- Differential Manchester
 - 1 represented as _____
 - 0 represented as _____



MAC Sublayer protocol

Classic Ethernet
Improvements

- A preamble is sent in order to _____
 - This consists of _____
 - This is followed by a SOF byte: _____
- Destination & Source Addresses are
 - Either _____
 - High order bit (Destination Bit 47) is
 - 0 _____
 - 1 _____
 - 111...111 _____
 - Destination Bit 46 indicates _____

Bytes	8	6	6	2	0-1500	0-46	4
	Preamble	SOF Destination address	Source address	Length	Data	Pad	Check- sum

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MAC Sublayer protocol

Classic Ethernet
Improvements

- Length / Type is interpreted differently...
 - ≤ 1500 _____
 - > 1500 _____
- Data & PAD
 - Data + PAD ≥ 46 bytes as _____
- Checksum is _____

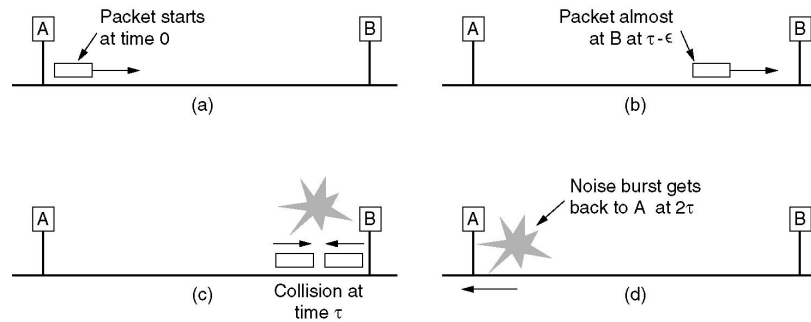
Bytes	8	6	6	2	0-1500	0-46	4
	Preamble	SOF Destination address	Source address	Length	Data	Pad	Check- sum

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Detecting Collision

Classic Ethernet
Improvements

- Assume stations A and B are at extremes of the LAN



- Time Simultaneous transmission _____
- Time Collision Detection _____
- Worst Case _____

Binary Exponential Backoff

Classic Ethernet
Improvements

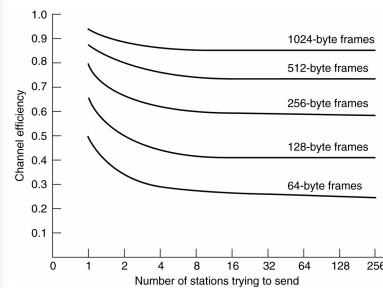
- After a collision time is divided into discrete time slots
 - Length of time slot: _____
- After collisions 1-9: _____
- After collisions 10-15: _____
- After collision 16: _____
- Performance:
 - Small number of stations colliding: _____
 - Large number colliding _____

Performance

Classic Ethernet
Improvements

■ Under high load to increase efficiency:

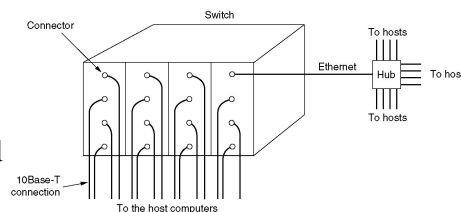
- Decrease B _____
- Decrease L _____
- Increase F _____
- Note: Channel efficiency = $1 / (1 + 2.B.L.e/c.F)$
- (See text for more detailed mathematics).



Switched Ethernet

Classic Ethernet
Improvements

- Eventually Ethernet will become saturated with traffic
- One approach to solving this is use _____. This contains ...
 - Cards _____
 - Connectors _____
 - High speed backbone _____
- Card operation:
 - On-card LAN so that _____
 - Buffering can be used _____



Fast Ethernet

Classic Ethernet
Improvements

- 802.3u _____.
- Selected by IEEE because
 - Compatibility _____
 - Fear: _____
 - Speed: _____
- No changes _____
- Changes were made...
 - 10Base-T _____
 - Wiring: _____

Fast Ethernet Wiring

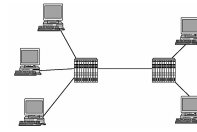
Classic Ethernet
Improvements

- 100Base-T4 _____
 - Cabling & Speed: _____
 - Cable organisation: _____
 - Encoding
 - 8B/6T _____
- 100Base-TX _____
 - Cabling & Speed: _____
 - Cable organisation: _____
 - Encoding
 - 4B/5B _____
- 100Base-FX _____
 - Cabling & Speed: _____

Gigabit Ethernet

Classic Ethernet
Improvements

- 802.3z: _____
 - Compatibility: _____
 - Protocol: _____
- Point-to-point connections only
- Two modes of operation supported:
 - Full duplex – where only _____
 - No possibility _____
 - Max cable length now determined by _____
 - Half duplex – where _____
 - Standard CSMA/CD used
 - Max length maintained by:
 - Carrier Extension: _____
 - Frame bursting: _____



Gigabit Ethernet Wiring

Classic Ethernet
Improvements

- Wiring Options:
 - 1000Base-SX _____
 - 1000Base-LX _____
 - 1000Base-CX _____
 - 1000Base-T _____
- Encoding (fiber)
 - 8B/10B _____
 - 4 identical bits: _____
 - Six 0s or six 1s: _____
- Encoding (1000Base-T) _____
- Flow control _____
- 802.3ae _____

Logical Link Control

- Data Link Layer is in theory capable of supporting reliable communication on an unreliable line...

- LLC _____

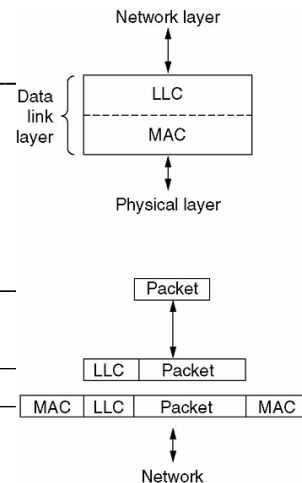
- Service Options

1. _____
2. _____
3. _____

- Header _____

It contains:

- Access points _____
- Control field _____



Why Ethernet?

- Competition: _____
- Reliability: _____
- Simple: _____
- Maintenance: _____
- TCP/IP: _____
- Stability: _____