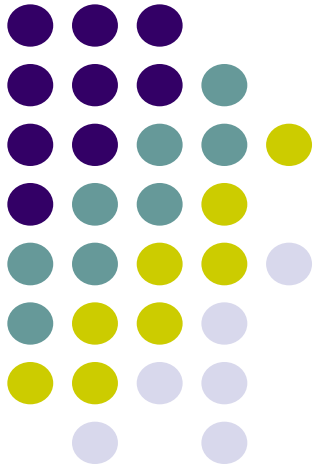
CME 3004 Computer Networks

LAN Wiring
and
Interface Hardware

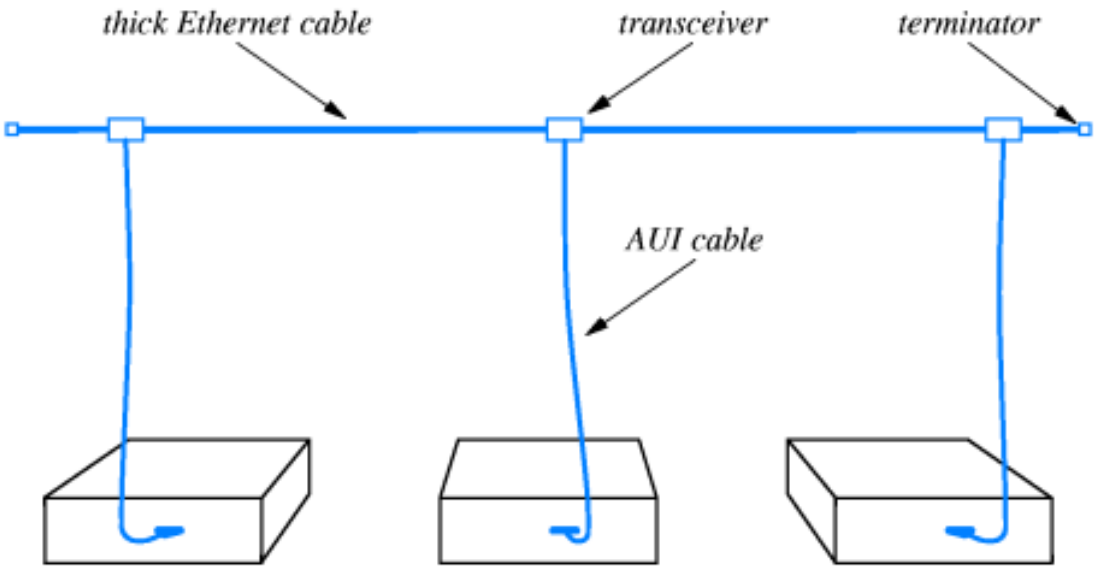


Network Interface Hardware

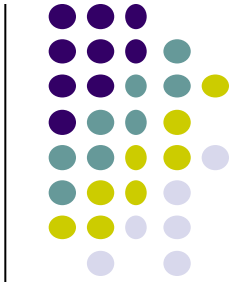
- *Network Interface Card (NIC) is a special-purpose hardware usually consists of a printed circuit board that contains electronic components.*
- *Plugs into the computer's bus, a cable connects it to network medium.*

Thick Ethernet Wiring

- *Thick wire Ethernet or Thicknet*
- *10Base5*



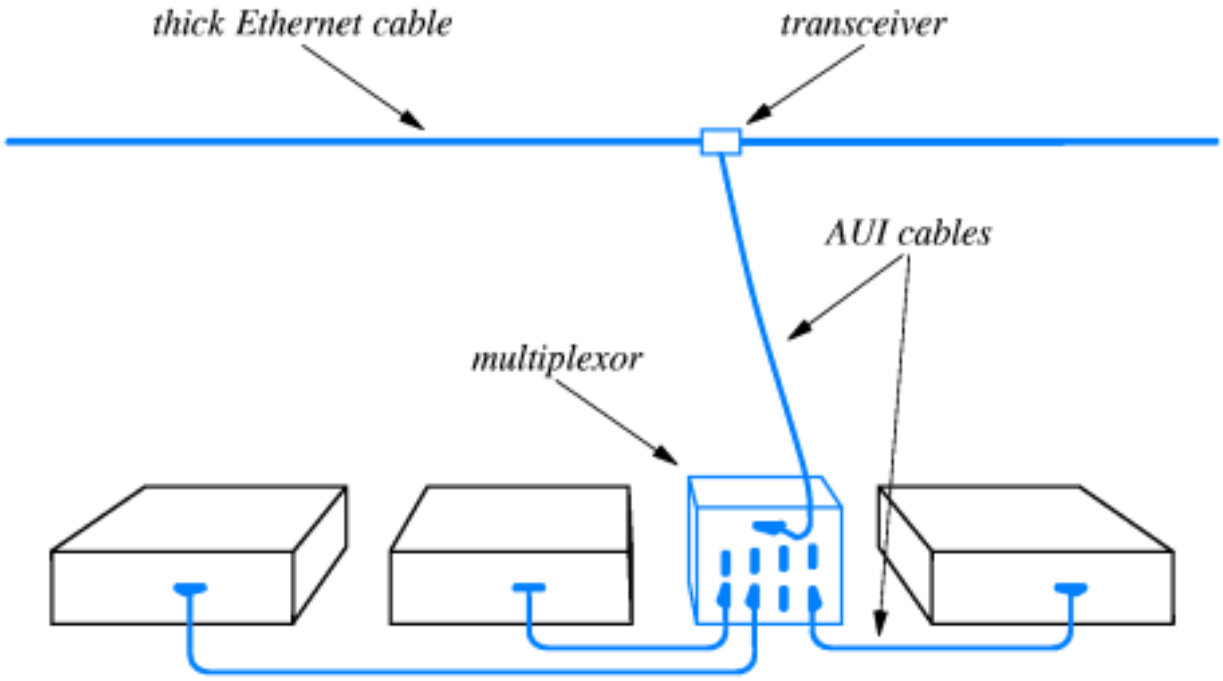
Thick Ethernet Wiring



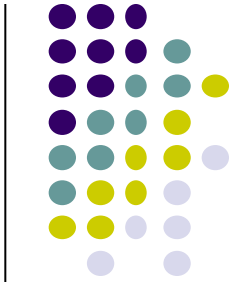
- *Attachment Unit Interface (AUI) Cable*
- *Terminator: Consists of a resistor that connects the center wire in the cable to the shield.*

Connection Multiplexing

- *Connection multiplexor is an electronic device allows multiple computers to attach to a single transceiver.*

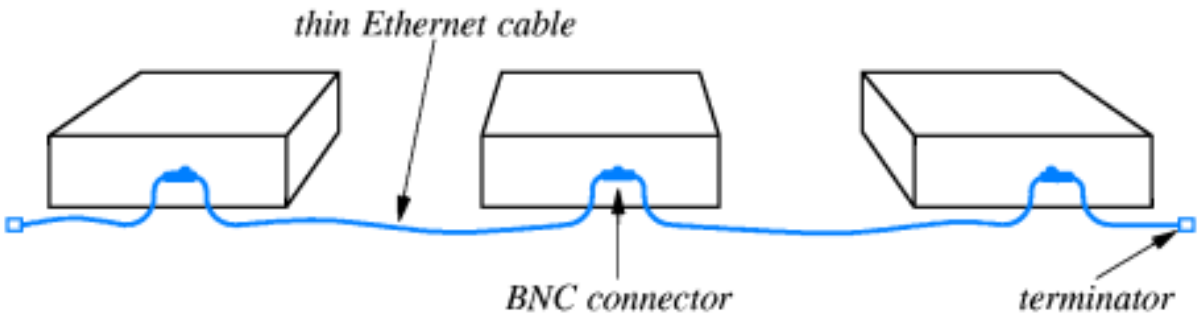


Thin Ethernet Wiring

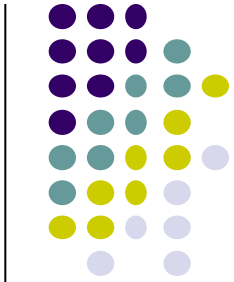


- *Thin wire Ethernet or Thinnet*
- *10Base2*
- *Advantages:*
  - *Cost less*
  - *No external transceiver is needed*
  - *Does not use AUI cable, uses BNC connector.*

Thin Ethernet Wiring

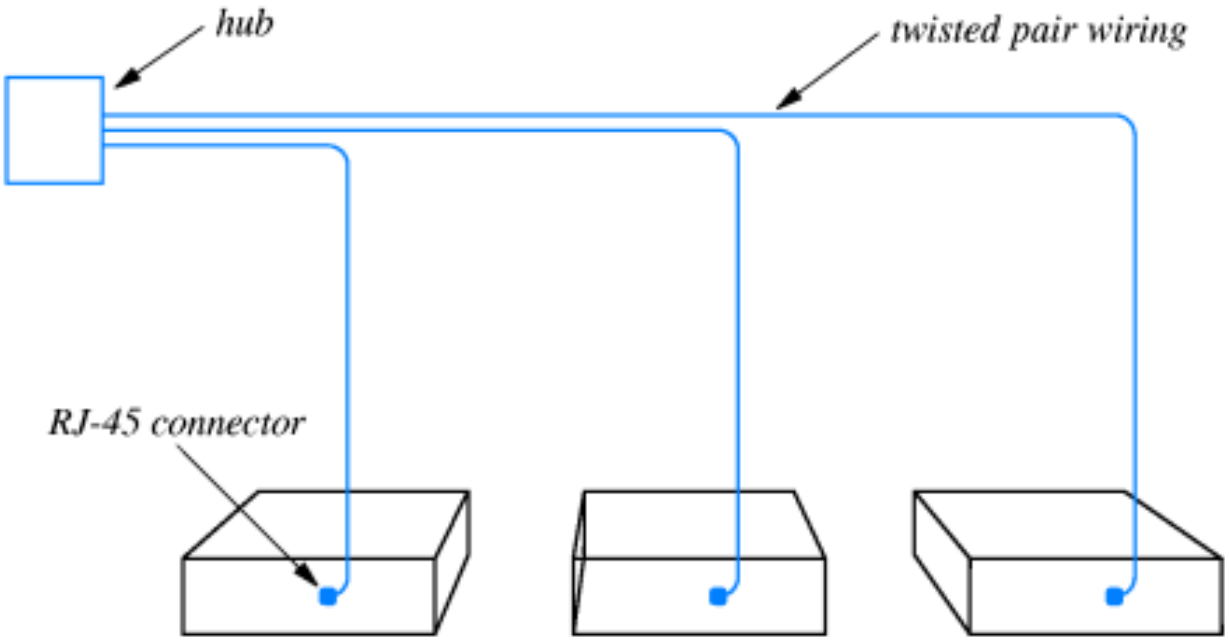


Twisted Pair Ethernet

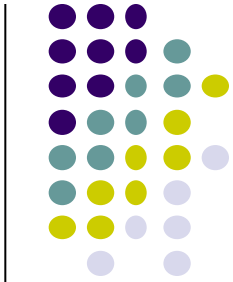


- *10BaseT*
- *Twisted Pair Ethernet or TP Ethernet*
- Uses an electronic device known as *Ethernet hub* in place of shared cable.
- *Uses RJ-45 connector*

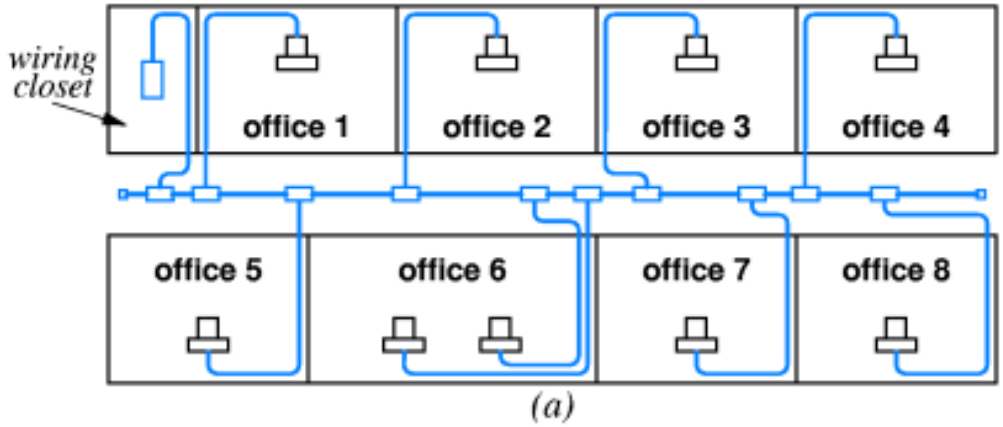
Twisted Pair Ethernet



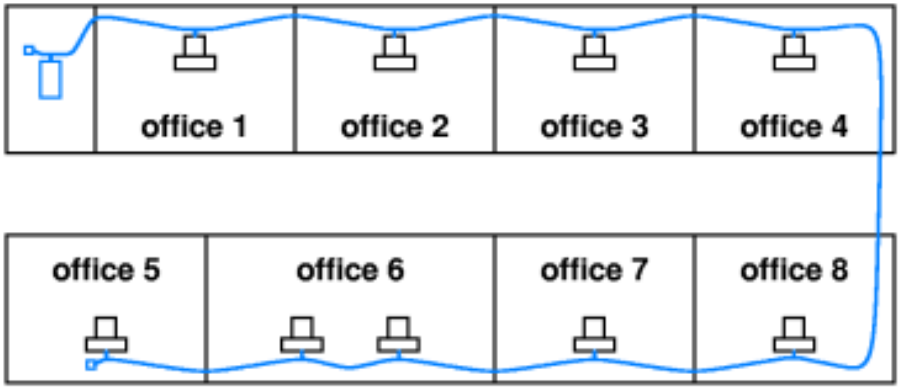
The Topology Paradox



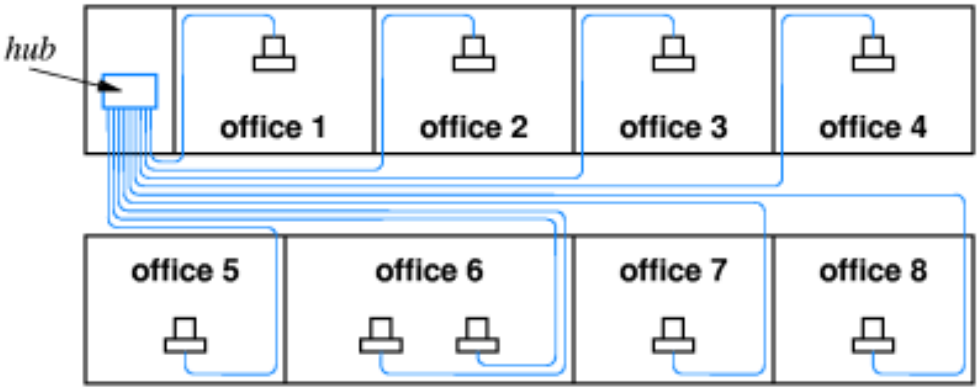
- A given network technology can use a variety of wiring schemes.
- The technology determines the *logical topology*, and the wiring scheme determines *physical topology*.


wiring
closet
office 1
office 2
office 3
office 4
office 5
office 6
office 7
office 8

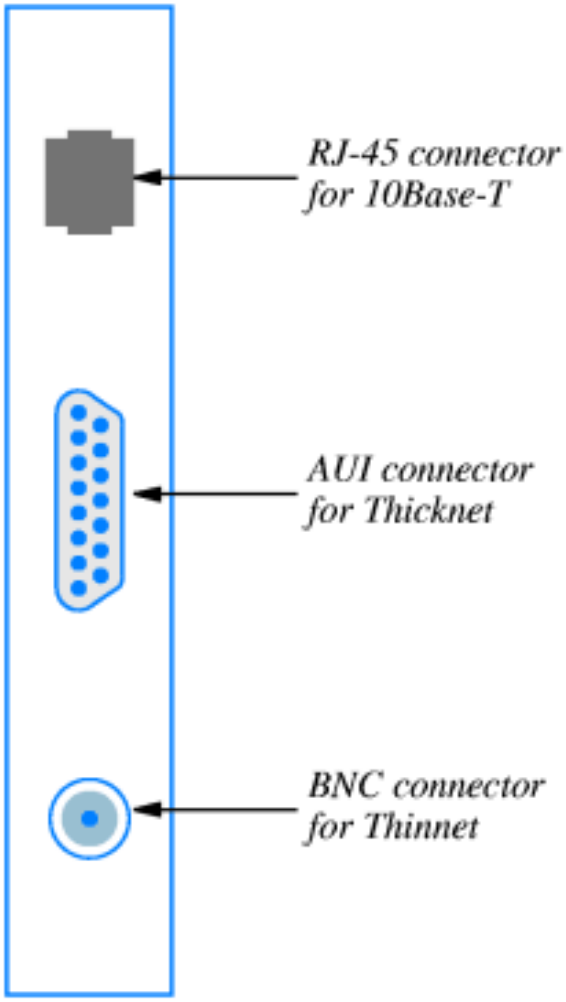
(a)


office 1
office 2
office 3
office 4
office 5
office 6
office 7
office 8

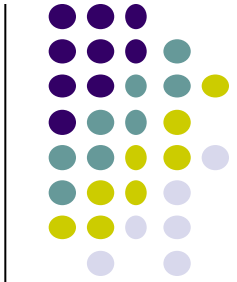
(b)


hub
office 1
office 2
office 3
office 4
office 5
office 6
office 7
office 8

(c)


RJ-45 connector
for 10Base-T
AUI connector
for Thicknet
BNC connector
for Thinnet

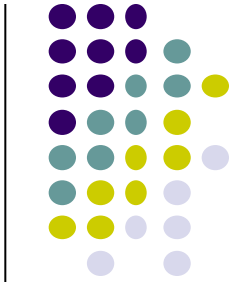
Ethernet Physical Layer Standards



Physical Layer Standard	Speed	Maximum Run Length	Medium
UTP			
10Base-T	10 Mbps*	100 meters	4-pair Category 3 or better
100Base-TX	100 Mbps	100 meters	4-pair Category 5 or better
1000Base-T	1,000 Mbps	100 meters	4-pair Category 5 or better

*With autosensing, 100Base-TX NICs and switches will slow to 10 Mbps for 10Base-T devices. Often called 10/100 Ethernet

Ethernet Physical Layer Standards



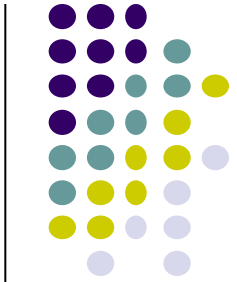
Physical Layer Standard	Speed	Maximum Run Length	Medium
Optical Fiber			
100Base-FX	100 Mbps	2 km	62.5/125 multimode, 1300 nm, switch

Ethernet Physical Layer Standards

Physical Layer Standard	Speed	Maximum Run Length	Medium
1000Base-SX	1 Gbps	220 m	62.5/125 micron multimode, 850 nm, 160 MHz-km modal bandwidth
1000Base-SX	1 Gbps	275 m	62.5/125 micron multimode, 850 nm, 200 MHz-km
1000Base-SX	1 Gbps	500 m	50/125 micron multimode, 850 nm, 400 MHz-km
1000Base-SX	1 Gbps	550 m	50/125 micron multimode, 850 nm; 500 MHz-km

Gigabit Ethernet, 850 nm, various core sizes and modal bandwidths

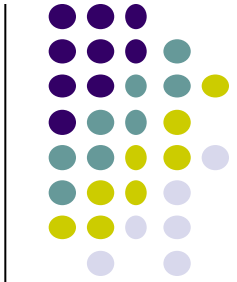
Ethernet Physical Layer Standards



Physical Layer Standard	Speed	Maximum Run Length	Medium
1000Base-LX	1 Gbps	550 m	62.5/125 micron multimode, 1310 nm
1000Base-LX	1 Gbps	5 km	9/125 micron single mode, 1310 nm

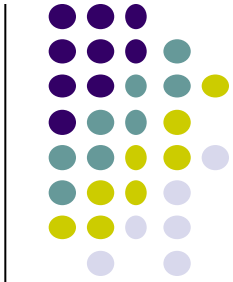
Gigabit Ethernet, 1300 nm, multimode versus single mode

Perspective



- Access links to client stations today are dominated by 100Base-TX
- Trunk links today are dominated by 1000Base-SX
  - Short trunk links, however, use UTP
  - Longer and faster trunk links use other fiber standards

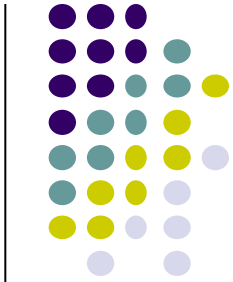
Ethernet Physical Layer Standards



Physical Layer Standard	Speed	Maximum Run Length	Medium
10GBase-SR/SW	10 Gbps	65 m	62.5/125 micron multimode, 850 nm
10GBase-LX4	10 Gbps	300 m	62.5/125 micron multimode, 1300 nm, WDM with 4 lambdas

10 Gbps Ethernet, multimode
- S = 850 nm, L = 1300 nm
- R=LAN, W=WAN

Ethernet Physical Layer Standards



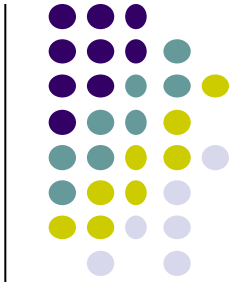
Physical Layer Standard	Speed	Maximum Run Length	Medium
10GBase-LR/LW	10 Gbps	10 km	9/125 micron single mode, 1300 nm.
10GBase-ER/EW	10 Gbps	40 km	9/125 micron single mode, 1550 nm.

10 Gbps Ethernet, for wide area networks

L = 1300 nm, E = 1550 nm

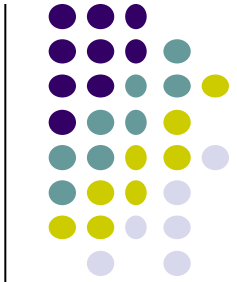
R = LAN, W = WAN

Ethernet Physical Layer Standards



Physical Layer Standard	Speed	Maximum Run Length	Medium
40 Gbps Ethernet	40 Gbps	Under Development	9/125 micron single mode.

Ethernet Physical Layer Standards



- Notes:
  - For 10GBase-x, LAN versions (R) transmit at 10 Gbps. WAN versions (W) transmit at 9.95328 Gbps for carriage over SONET/SDH links (see Chapter 6)
  - The 40 Gbps Ethernet standards are still under preliminary development