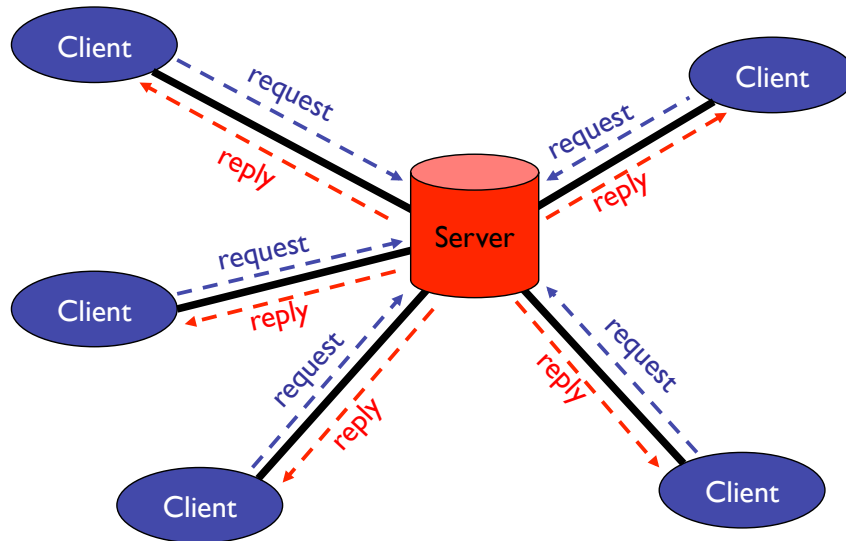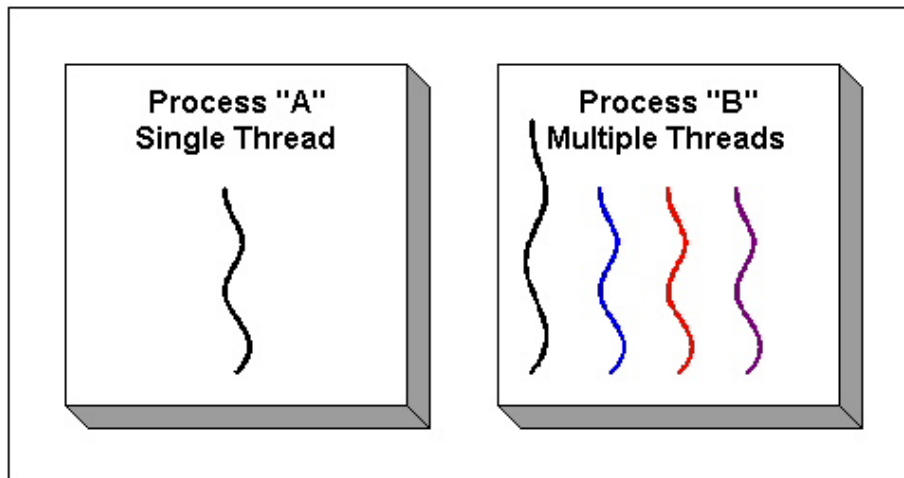# Client-Server Architecture

Processes and Threads

Creating Processes and Threads

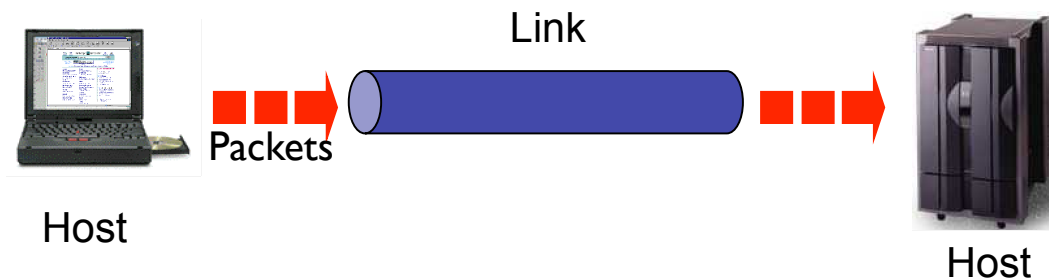- Processes:
  - `int fork()`

- Threads:
```
int pthread_create(pthread_t *thr,
      const pthread_attr_t *attr,
      void *(*start_routine) (void*),
      void *arg)

      attr: usually NULL
      start_routine: function to execute
      arg: argument to function
```

A Basic Network Connection

Link

Packets

Host

Host

Bandwidth vs. Latency

1 Byte Object

	Prop delay: 1 ms	Prop delay: 100 ms
Bandwidth: 1 Mbps	1,008 µs	100,008 µs
Bandwidth: 100 Mbps	1,000 µs	100,000 µs

10 MB Object

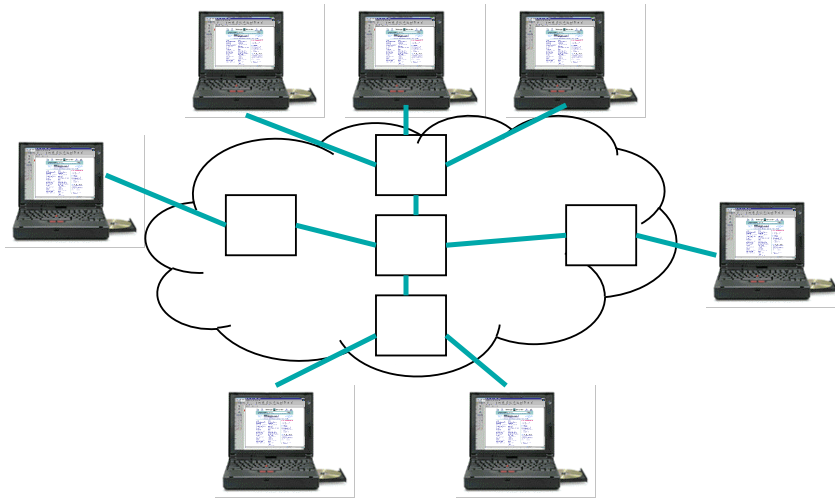|	Prop delay: 1 ms	Prop delay: 100 ms
Bandwidth: 1 Mbps	80.001 s	80.1 s
Bandwidth: 100 Mbps	.801 s	.9 s

Basic Connection Types

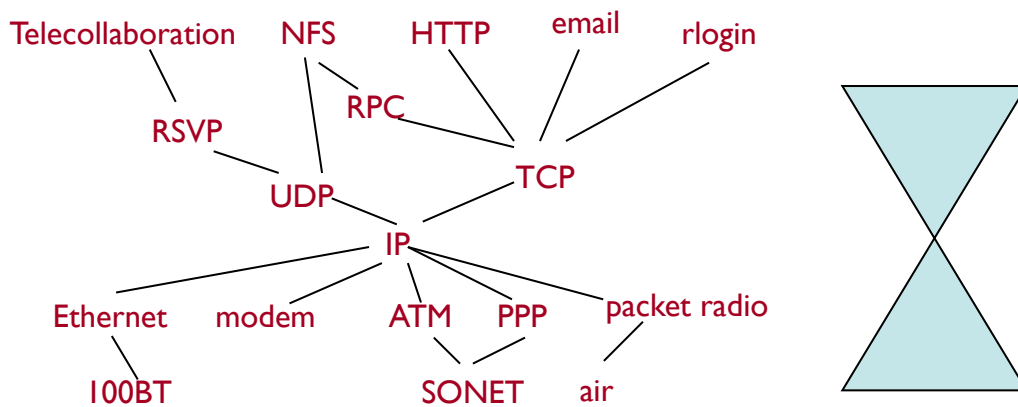### Point to Point

Multiple access (broadcast)

Switched Networks

Sean Barker

Interconnection of Networks

Sean Barker

OSI Model

Function		Example
Ultimate data destination	Application ← - - - - - - → Application	Web browser
Format conversion	Presentation ← - - - - - - → Presentation	ASCII/XDR
Interaction across presentation	Session ← - - - - - - → Session	Restartable file transfer
Reliable, ordered delivery	Transport ← - - - - - - → Transport	TCP
Routing/ Internetworking	Network ← - - - - - - → Network	IP
Data framing over links	Data link ← - - - - - - → Data link	Ethernet, WiFi
Bits on the wire	Physical ←————————→ Physical	SONET, 100BT

IP Hourglass

Telecollaboration   NFS   HTTP   email   rlogin

RPC

RSVP

TCP

UDP

IP

Ethernet   modem   ATM   PPP   packet radio

100BT   SONET   air

Protocol Encapsulation

Sender   Receiver
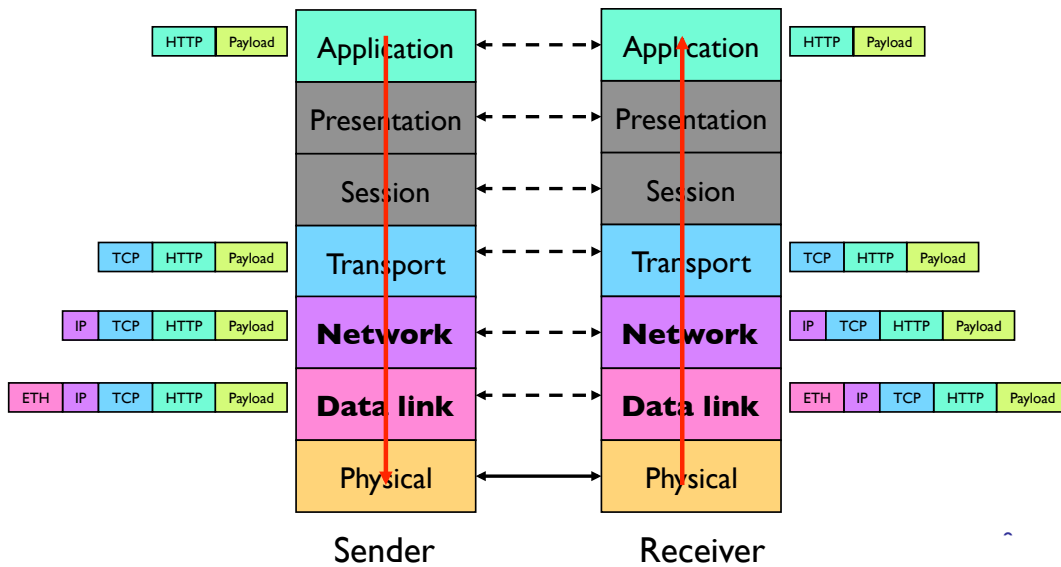
Ethernet/Wifi (Data Link, Layer 2)

Preamble	Dst Addr	Src Addr	Length/Type	DATA	Error Check

IP	TCP	HTTP	Payload
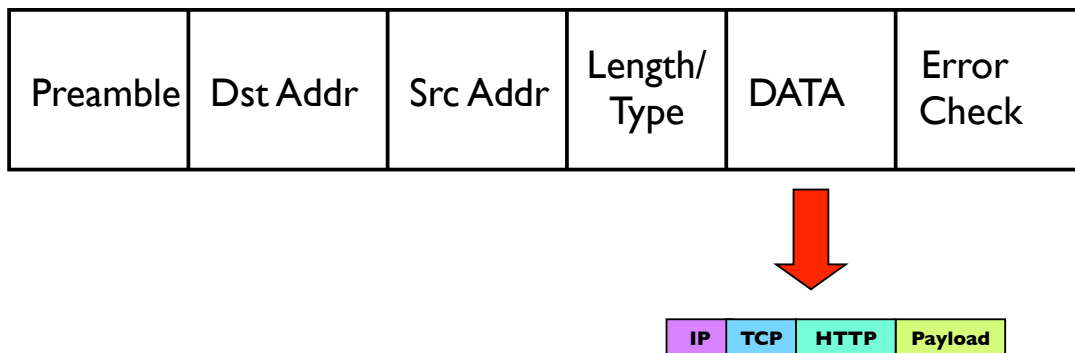
Internet Protocol (Network, Layer 3)

Version	HLen	TOS	Length		
Identification			Flags	Offset	
TTL		Protocol	Header Checksum		
Source IP Addr					
Destination IP Addr					
Options (variable)			Pad (variable)		
Data			TCP	HTTP	Payload