# Introduction to TCP/IP

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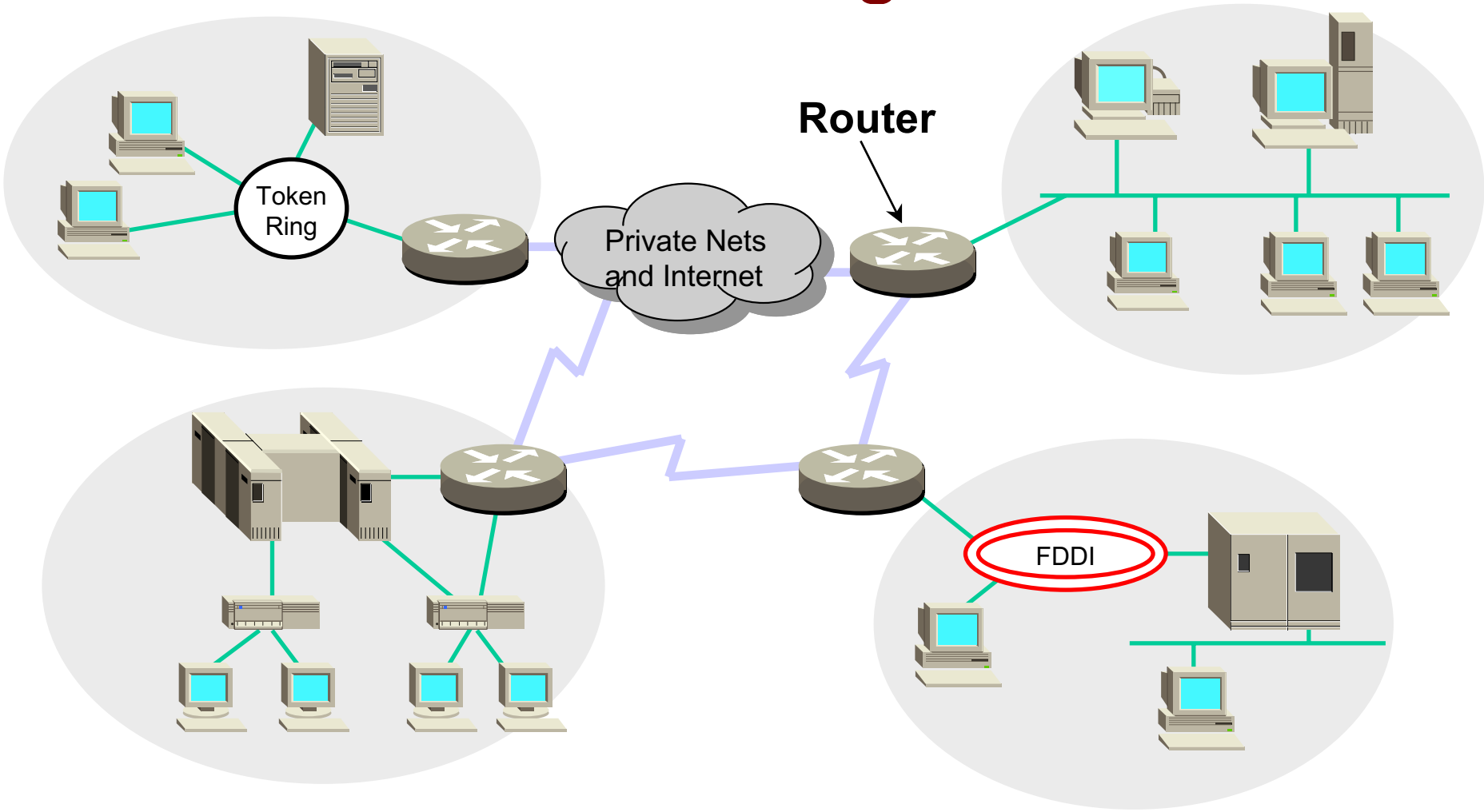
# What is TCP/IP

- Transmission Control Protocol/Internet Protocol
- TCP/IP refers to an entire suite of networking protocols, developed for use on the Internet
- TCP and IP are certainly two of the most important

# TCP/IP Characteristics

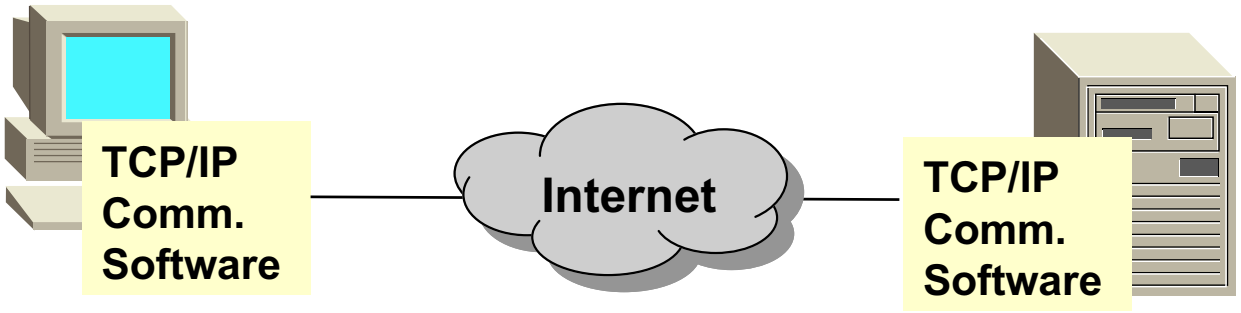
- TCP/IP provides the services necessary to interconnect computers and to interconnect networks, creating the Internet
- Independence from underlying network topology, physical network hardware, and OS
- Unique IP Address
- Universal connectivity through out the network
- Standardize high-level protocols

# TCP/IP Internetworking



# TCP/IP Networking Software

- TCP/IP protocol suites define a set of universal communication services
- Services can be implemented in a standardized manner in the networking software, normally bundled with OS



# TCP/IP implementations

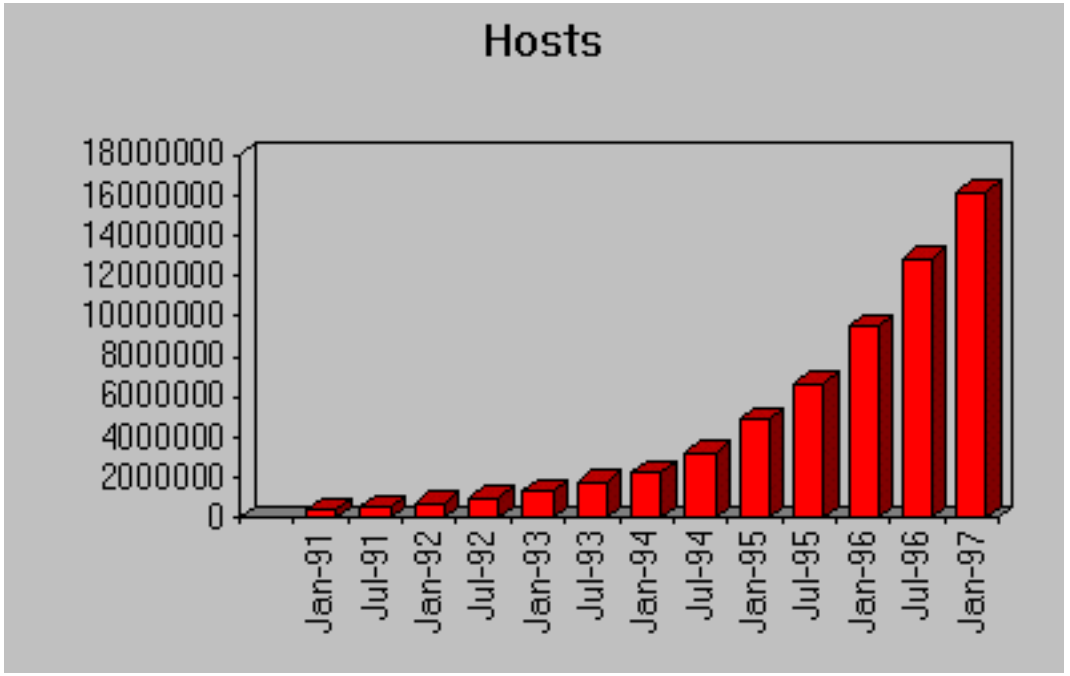
- 1983 4.2BSD- first widely available TCP/IP release
- 1986 4.3BSD- performance improvements
- 1988 4.3BSD Tahoe- add slow start, congestion avoidance and fast retransmit
- 1990 4.3BSD Reno- add TCP header prediction, SLIP compression, new routing table
- 1993 4.4 BSD- add multicasting

# TCP/IP and Internet

- 1957 USSR sputnik, USA established ARPA
- 1969 ARPA funded ARPANET
- 1971 Network with 15 nodes
- 1974 Cerf/Kahn Protocol
- 1973 Ethernet (Ph.D Dissertation Bob Metcalfe)
- 1982/83 TCP/IP as a core protocol
- 1983 4.2 BSD Unix with TCP/IP from UCB

# Internet growth

| Year | #Hosts |
|---|---|
| 69 | 4 |
| 84 | 1024 |
| 87 | 28174 |
| 90 | 313000 |
| 91 | 617000 |
| 92 | 1.1M |
| 93 | 2.0M |
| 94 | 3.8M |
| 95 | 6.6M |
| 96 | 12.8M |
| 1/97 | 16M |



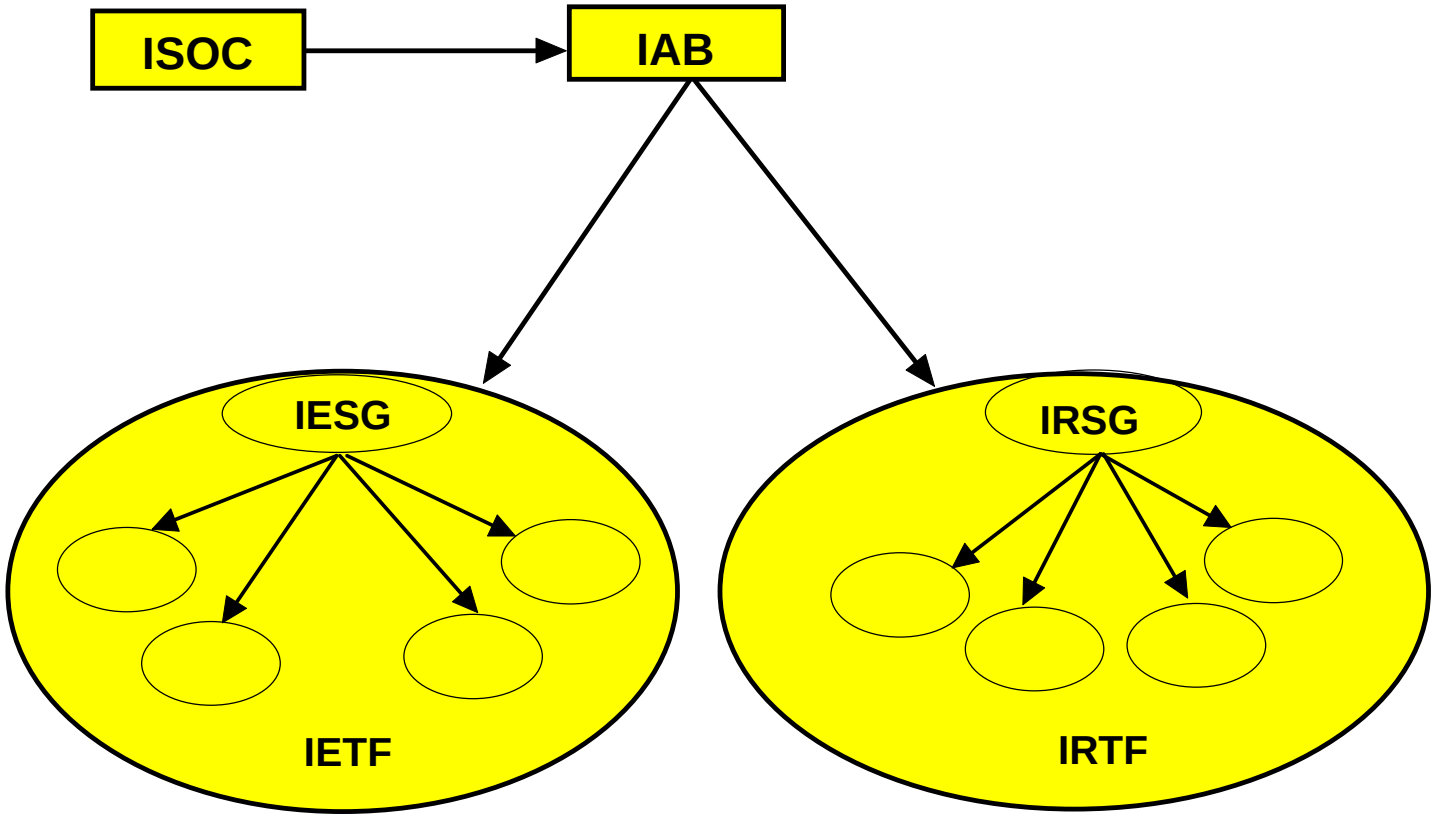
# Internet

- **Internet - the world-wide group of networks combined with TCP/IP**
- **internet - groups of networks tied together (or internetworking)**
- **Who control the Internet?**
  - **no single administrative organization**
  - **IETF determines standards**
  - **industry also preemptively determines standards**

# Internet Technical Bodies

- **ISOC - Internet Society**. Professional society to promote, support the use of Internet
- **IAB - Internet Architecture Board**. Responsible for technical oversight and coordination
- **IETF - Internet Engineering Task Force**. Development of current protocols and specifications for standardization. Meets 3 times a year, organized in working groups
- **IRTF - Internet Research Task Force**. Research oriented for future.

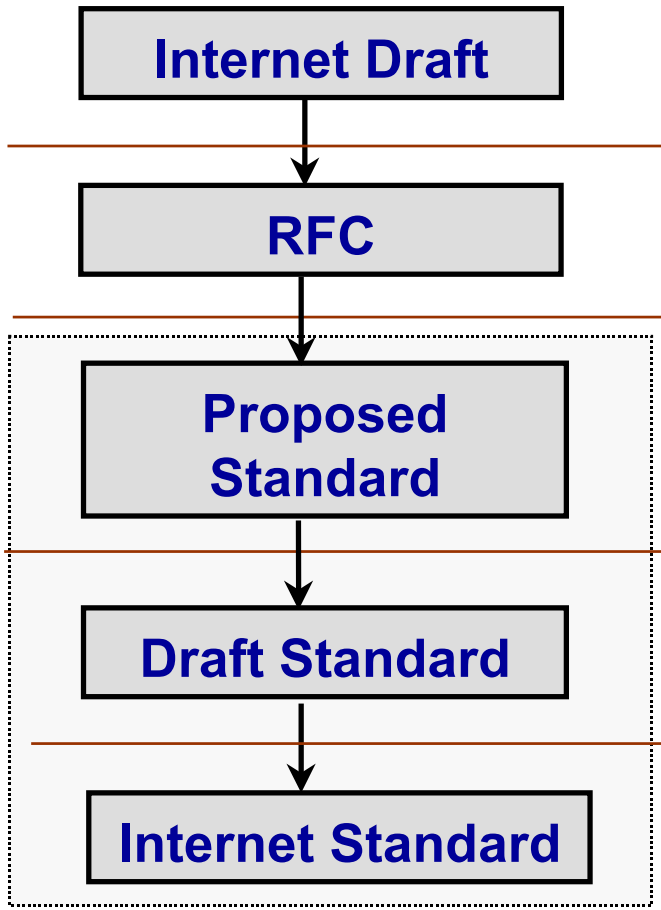
# Internet Technical Bodies Structure



# Internet Administrations

- DDN - the US Defense Data Network is the government organization that has overall responsibility for administrating the Internet
  - DDN NIC (Network Information Center)
    - assigns unique names and addresses
    - collects and distributes information about TCP/IP protocols
  - IANA Internet Assigned Numbers Authority
    - assigns value for network parameters, name of services, identifiers
  - NOC (Network Operations Center)
    - manages communication links

# Internet Standard Process




draft version for informal review and comment

official publication for Internet standard and other publications

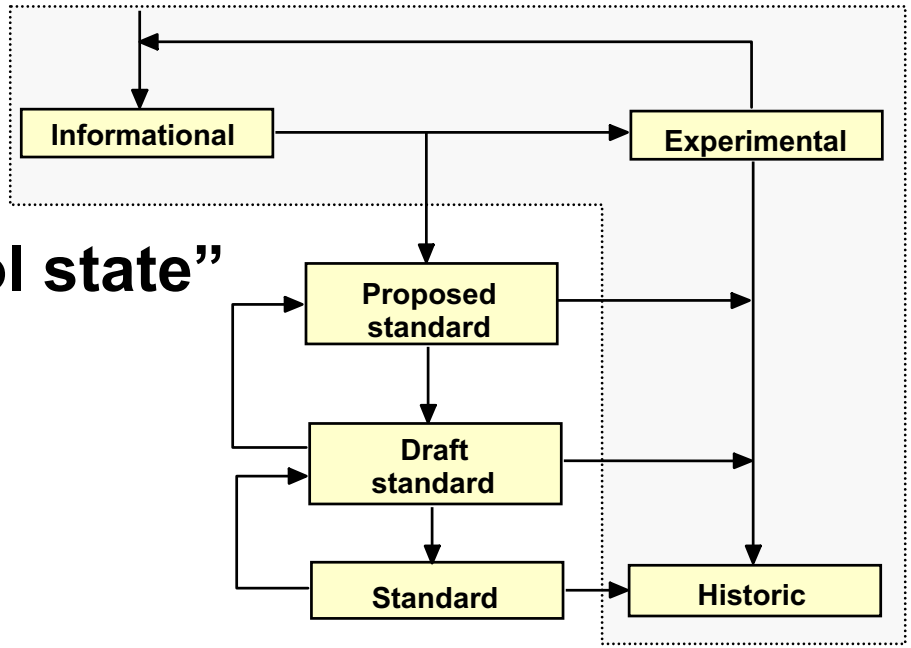
entry-level, protocol specifications should be stable technically

at least 2 independence and interoperable implementation that test all specification functions

have had significant field use and clear community interest in production use.

# Non-standards track

- specification may not be intended to be an Internet Standard
- labeled with one of three “off-track” maturity level:
  - Historic
  - Informational
  - Experimental
- known as “protocol state”



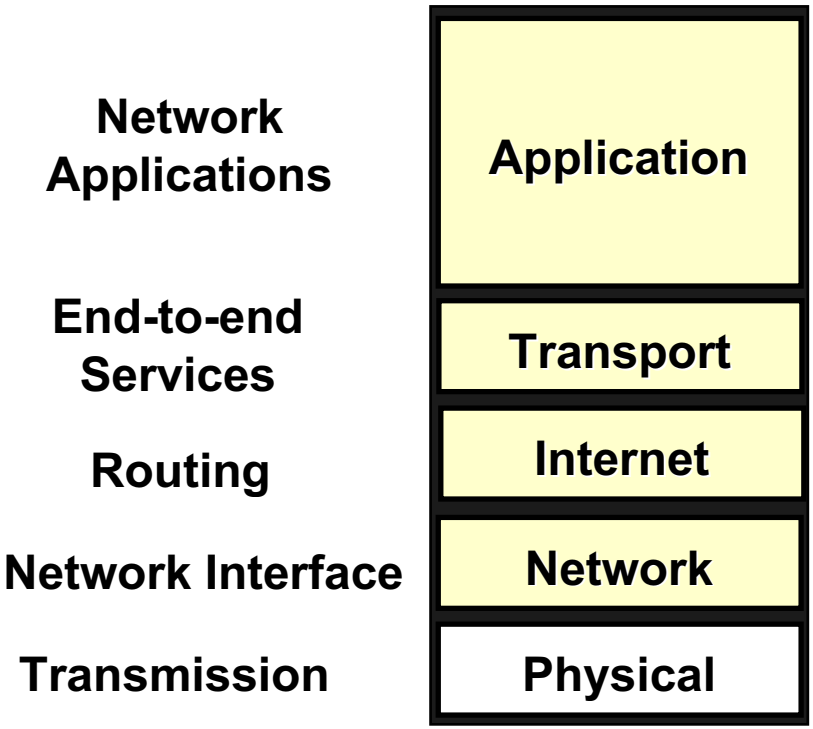
# Internet documents

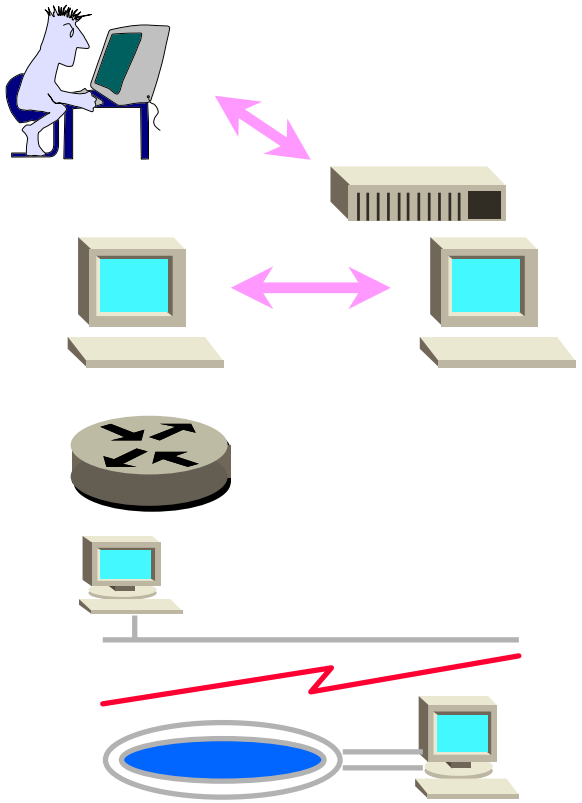
- RFC
  - number with RFC XXXX, more than 2500 now
  - updated RFCs are published with new RFC numbers
  - not all RFCs describe protocols, not all RFCs are used
  - ftp://ftp.nectec.or.th/pub/mirrors/rfc, ftp://ds.internic.net/rfc
- BCP (Best Current Practice)
  - RFC's subseries designed to be a way to standardization practice
- STD (STandDard)
  - official Internet standard
- FYI (For Your Information)
  - RFCs series that do not contain protocol specifications

# Important RFC

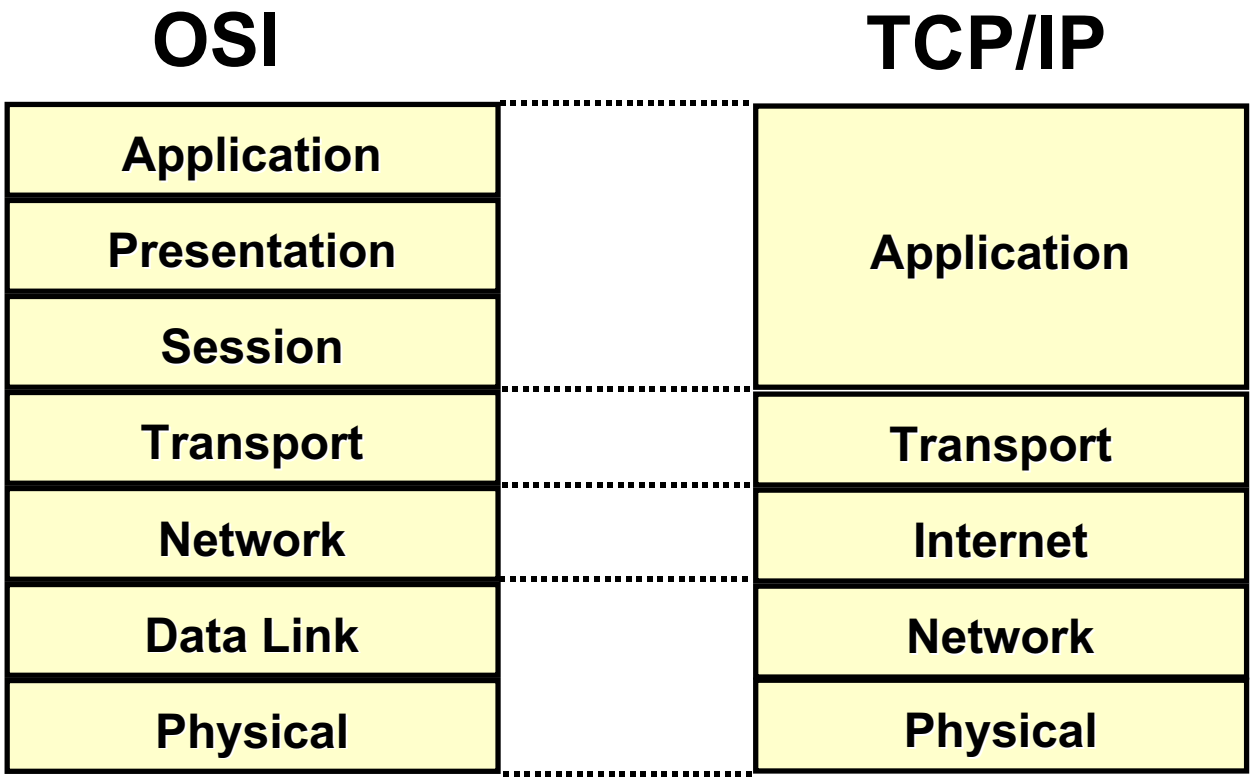
- RFC2300 Internet Official Protocol Standards (STD0001)
- RFC1340 Assigned Numbers (STD0002)
- RFC1122 Requirements for Internet hosts-communication layers (STD0003)
- RFC1123 Requirements for Internet hosts-Application and Support (STD0003)

# TCP/IP Architectural Layers

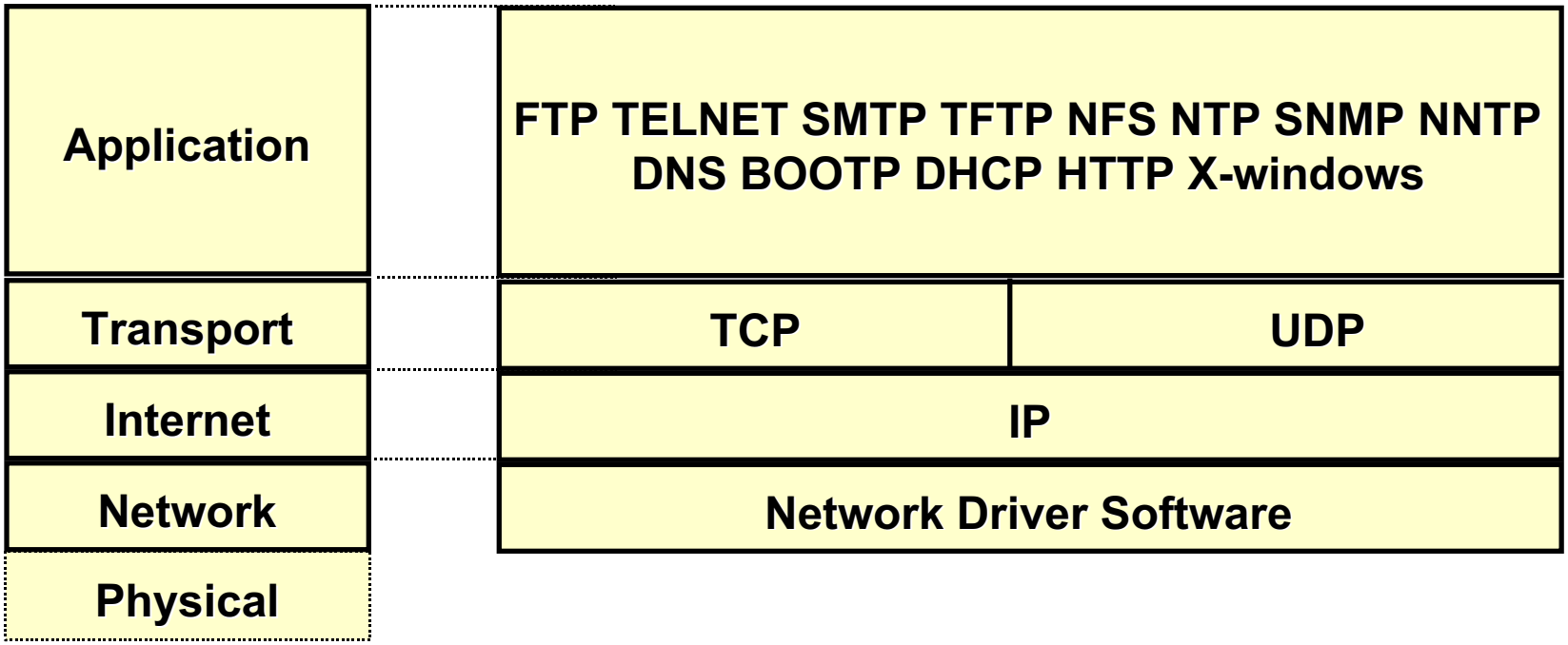


# TCP/IP and OSI



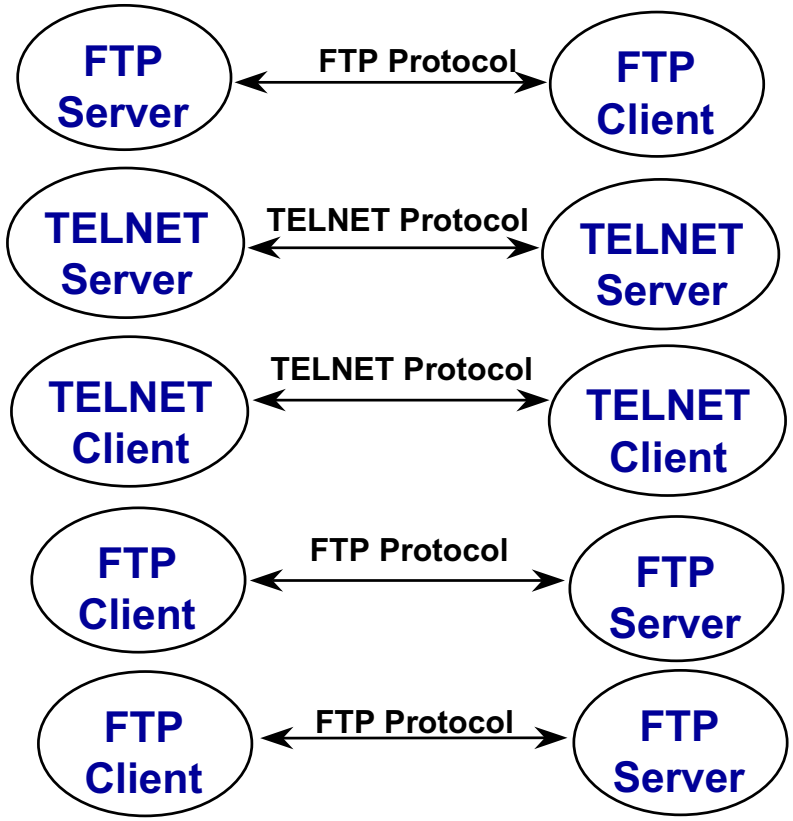
# TCP/IP majors protocols



# Communications Protocols

- A Communication protocol that provides a data transfer service can be either connection-oriented or connectionless
  - Connection-oriented --A connection is generated before the data is exchanged (e.g. TCP)
  - Connectionless -- Try its best to delivery data, no need to establish connection (e.g. UDP)

# Client-Server Relationships




- One application component, called Server, provides a well- defined services for application components running, called client
- Clients make a request for a services by transmitting data to the server
- Servers reply by sending data back to the client

# How TCP/IP handles protocols