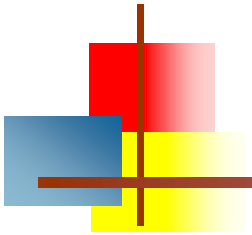
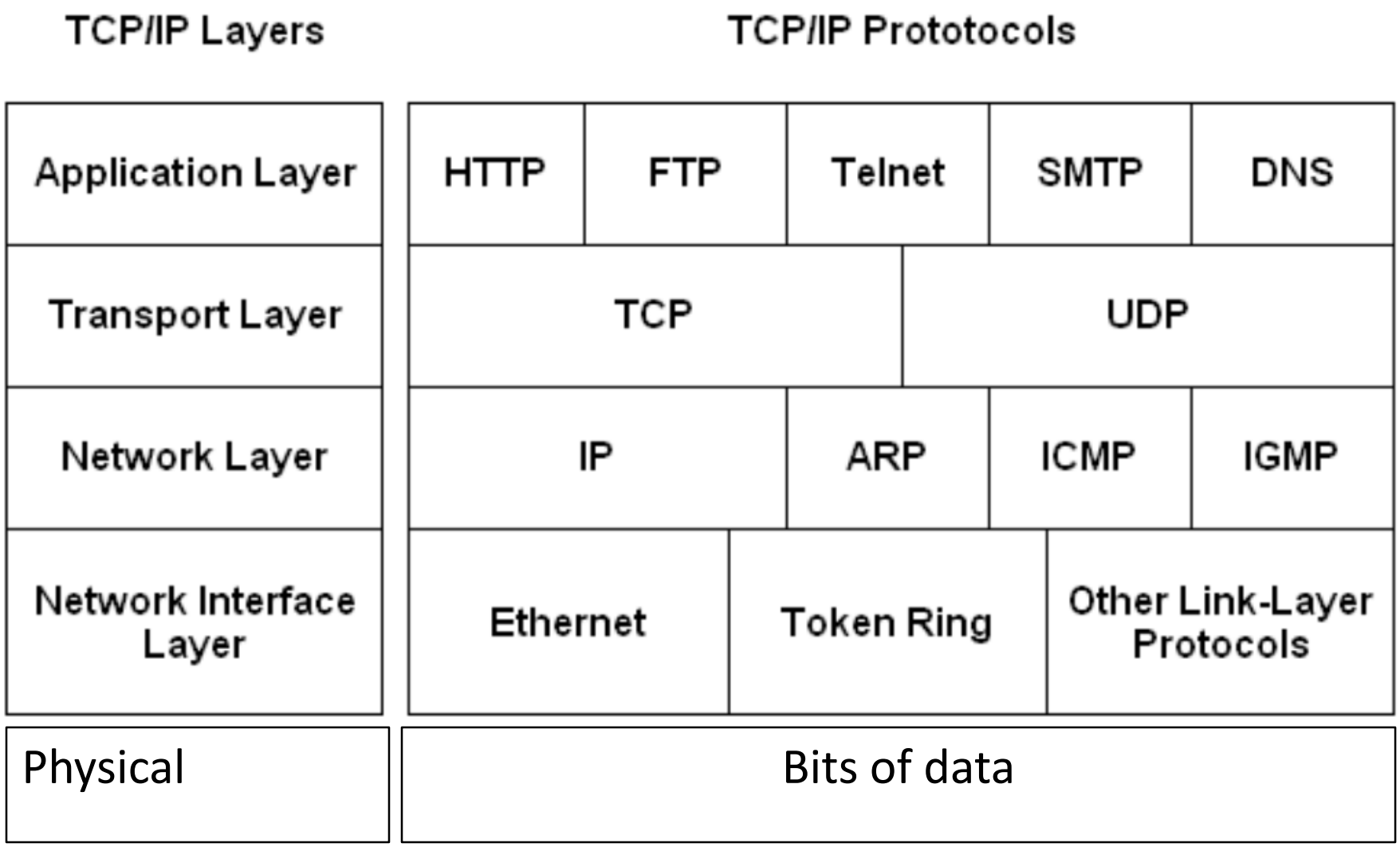
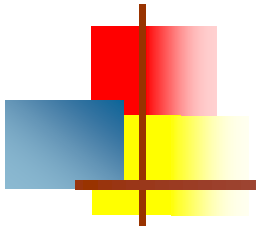


Introduction to Networks & Distributed Computing
CECS 327

IP (Internet Protocol) Addressing





IP (Internet Protocol) Addressing

IP addressing is an addressing scheme that provides the illusion of a large, seamless network for users.

IP addressing is:

- an abstraction
- a uniform addressing scheme
- used by higher-layer protocols
- used by applications

IP (Internet Protocol) Addressing

An **IP address** does not identify a specific computer. Instead, each IP address identifies a connection between a computer and a network.

A computer with multiple network connections (e.g., a router) must be assigned one IP address for each connection.

IPv4 addresses are:

- Virtual (they are only understood by software)
- Used for all communication in TCP/IP
- 32-bit integers*
- Unique for each host

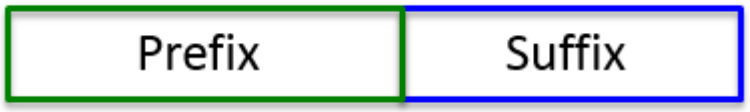
***Note:**

- IPv4 uses 32-bit IP addresses.
- IPv6 uses 128-bit IP addresses.

IP (Internet Protocol) Addressing

IP addresses are divided into two parts

- ***Prefix*** -- which identifies the network
- ***Suffix*** -- which identifies the host



The ***Internet Assigned Number Authority*** is the global authority that has control over the assignment a unique prefix to each network.

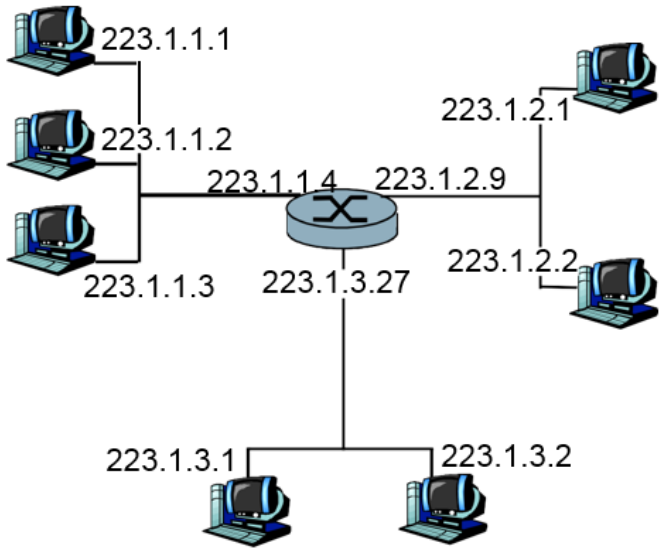
A *local administrator* assigns a unique suffix to each host.

The IP hierarchy guarantees that:

- Each computer is assigned a unique address.
- Suffixes can be assigned locally without global coordination.

IP (Internet Protocol) Addressing

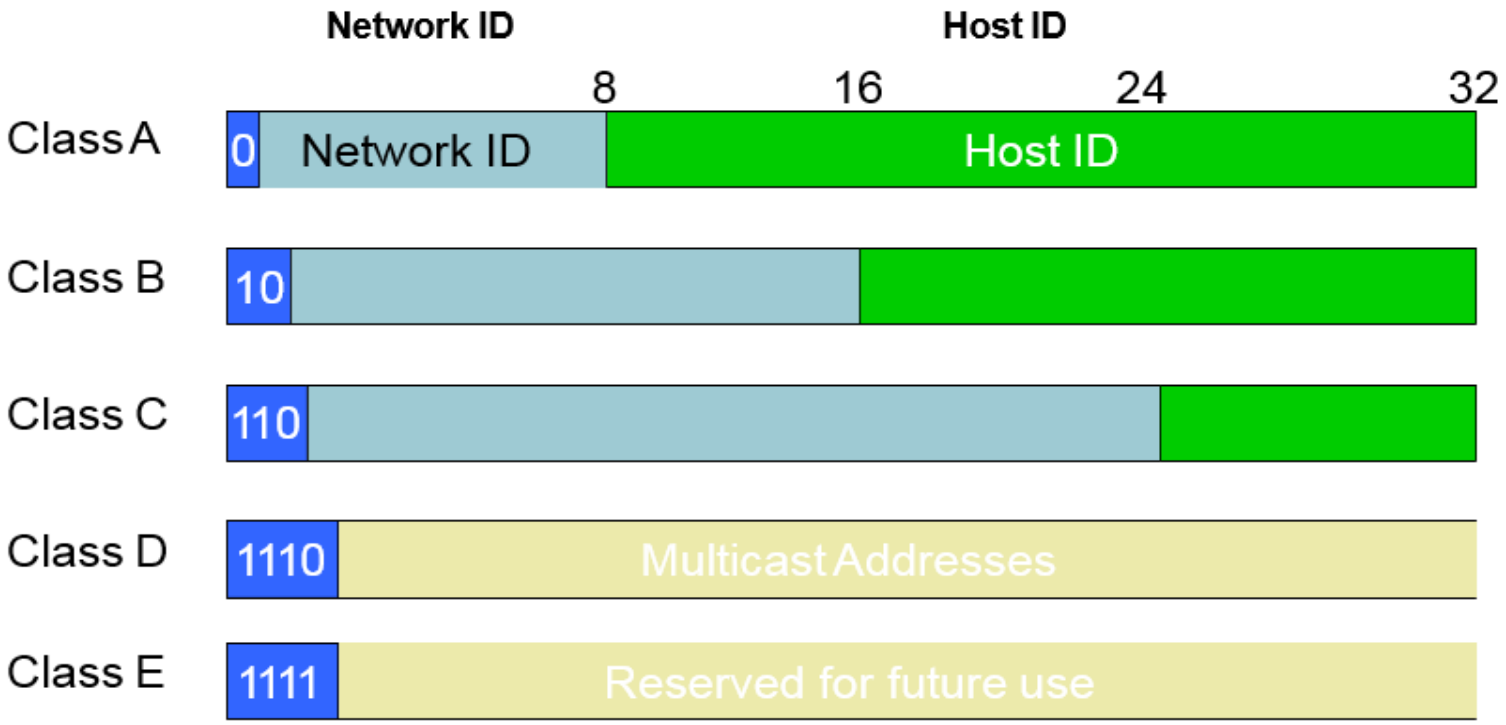
- **IP address**: 32-bit identifier for host, router interface
- **Interface**: connection between host/router and physical link
  - router's typically have multiple interfaces
  - host typically has one interface
  - IP addresses associated with each interface



223.1.1.1 = 11011111 00000001 00000001 00000001

223 1 1 1

IP (Internet Protocol) Addressing



The initial bits determine the class of the address.

The class determines the boundary between prefix and suffix.

IP (Internet Protocol) Addressing

Classes of Addresses

The maximum network size is determined by the class of the address:

- **Class A** -- large
- **Class B** -- medium
- **Class C** -- small

Class	Range of Values
A	0 through 127
B	128 through 191
C	192 through 223
D	224 through 239
E	240 through 255

First Four Bits Of Address	Table Index (in decimal)	Class of Address
0000	0	A
0001	1	A
0010	2	A
0011	3	A
0100	4	A
0101	5	A
0110	6	A
0111	7	A
1000	8	B
1001	9	B
1010	10	B
1011	11	B
1100	12	C
1101	13	C
1110	14	D
1111	15	E

IP (Internet Protocol) Addressing

Dotted Decimal Notation

Dotted decimal notation is used:

as shorthand for IP addresses.

to let humans avoid binary numbers.

octet
= byte
= 8-bits

Dotted decimal notation represents each octet in decimal separated by dots.

32-bit Binary Number	Equivalent Dotted Decimal
10000001 00110100 00000110 00000000	129 . 52 . 6 . 0
11000000 00000101 00110000 00000011	192 . 5 . 48 . 3
00001010 00000010 00000000 00100101	10 . 2 . 0 . 37
10000000 00001010 00000010 00000011	128 . 10 . 2 . 3
10000000 10000000 11111111 00000000	128 . 128 . 255 . 0

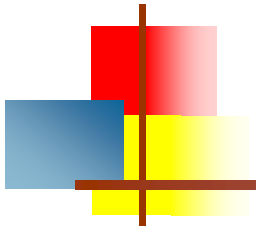
For dotted decimal notation:

There are four decimal values per 32-bit address.

Each decimal number:

-- Represents eight bits

-- Has a value between 0 and 255



References

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- Computer Networks, Fifth Edition: A Systems Approach (The Morgan Kaufmann Series in Networking).
- Computer Networks and Internets (5th Edition)
- Some slides by Dr. Tracy Bradley Maples