ITS 323 – SUMMARY FOR IP ADDRESSES

1   Dotted Decimal Notation

An IP address is 32 bits in binary. The dotted decimal notation is a convenient way to write a 32 IP address.

1.1   Convert from 32 bit binary to Dotted Decimal Notation

32 bit binary	01101000110100010011110110101001
Split into four 8-bit parts	01101000 11010001 00111101 10101001
Convert each part into decimal	104 209 61 169
Join, separated by dots	104.209.61.169

1.2   Convert from Dotted Decimal Notation to 32 bit binary

Dotted decimal notation	104.209.61.169
Convert each part to binary	01101000.11010001.00111101.10101001
Remove dots and join	01101000110100010011110110101001

2   Special Addresses

A 32 bit IP address is split into a Network portion and a Host portion. The Network portion identifies a network on the Internet, and the Host portion identifies a host on that network.

There are special cases for the Host portion which cannot be used to identify a computer. There are also special cases for the Network portion, which cannot be used to identify a network or computer. These special cases apply in both Classful and Classless addressing.

2.1   Network Address

The address of a network for a computer is determined by taking the Network portion of the computers IP address, and setting the Host portion to all 0's.

IP address	01101000110100010011110110101001
Network portion	01101000
Host portion	110100010011110110101001
Network address	01101000000000000000000000000000
	104.0.0.0

2.2   Broadcast Address

The address used in order to send an IP datagram to all hosts on a particular network. Determined by taking the Network portion of the computers IP address, and setting the Host portion to all 1's.

IP address	01101000110100010011110110101001
Network portion	01101000
Host portion	110100010011110110101001
Broadcast address	01101000111111111111111111111111
	104.255.255.255

2.3 Local Address (Loopback)

The address used for a computer to communicate with itself. Determined by the first 8 bits of the IP address being 01111111. The remaining 24 bits can be any value.

Example   01111111000000000000000000000001

127.0.0.1

2.4 All 1's Address

The address used for a computer to send an IP datagram to all computers on the current network. All 32 bits are 1.

Example   11111111111111111111111111111111

255.255.255.255

2.5 All 0's Address

The source address used for a computer to send a datagram if it does not yet have an IP address. All 32 bits are 0.

Example   00000000000000000000000000000000

0.0.0.0

3 Classful Addressing

Class of IP address is determined by first bits (we consider only Classes A, B and C):

Class A: first bit is 0

Class B: first two bits are 10

Class C: first three bits are 110

The class indicates where the 32 bits are split between Network portion and Host portion.

Class A: split after 8 bits (last 24 bits are Host portion)

Class B: split after 16 bits (last 16 bits are Host portion)

Class C: split after 24 bits (last 8 bits are Host portion)

4 Classless Addressing

The split between Network portion and Host portion is determined by a 32 bit subnet mask. The subnet mask is a sequence of 1 bits followed by a sequence of 0 bits. The 1 bits indicate that the corresponding bits in the IP address are the Network portion. For example, if there are 18 1 bits followed by 14 0 bits, the Network portion is the first 18 bits and the Host portion is the last 14 bits of the IP address.

IP address	01101000110100010011110110101001
Subnet mask	11111111111111111100000000000000
Network portion	011010001101000100
Host portion	11110110101001
Short Notation	/18 (meaning 18 1's in subnet mask)