ITS323 – IP Addressing Summary

1 Dotted Decimal Notation

An IP address is a 32–bit binary value. The dotted decimal notation is a convenient way to write a 32–bit 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 (or subnet) 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.

The method for splitting the 32 bits of an IP address into Network and Host portions has changed over the years, e.g. from classful to subnetting to classless. In Section 3 classless addressing is explained.

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	`11010001001111011010100`
Network address	`01101000000000000000000000000000`
	104.0.0.0

2.2 Directed 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	11010001001111011010100 1
Broadcast address	01101000111111111111111111111111
	104.255.255.255

2.3 Local Broadcast Address

The address used for a computer to send an IP datagram to all computers on the same network that the host is currently attached to. All 32 bits are 1.

Example 11111111111111111111111111111111
255.255.255.255

2.4 Loopback Address

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

2.5 Startup Source 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 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 (binary)	11111111111111111100000000000000
Subnet mask (dotted decimal notation)	255.255.192.0
Subnet mask (slash dotation)	/18
Network portion	011010001101000100
Host portion	11110110101001