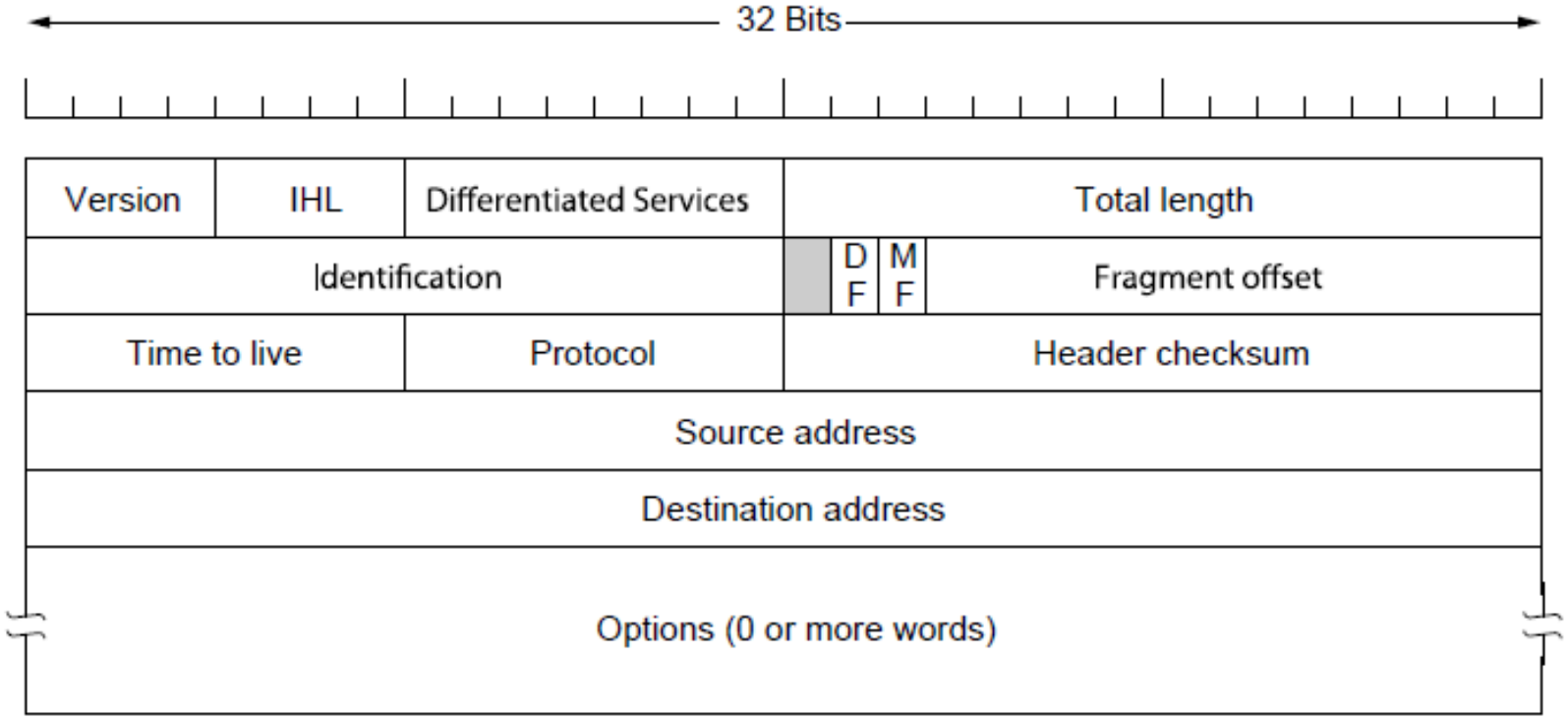
Additional Slides from

Computer Networks

by Tanenbaum and Wetheral

The IP Version 4 Protocol (1)



The IPv4 (Internet Protocol) header.

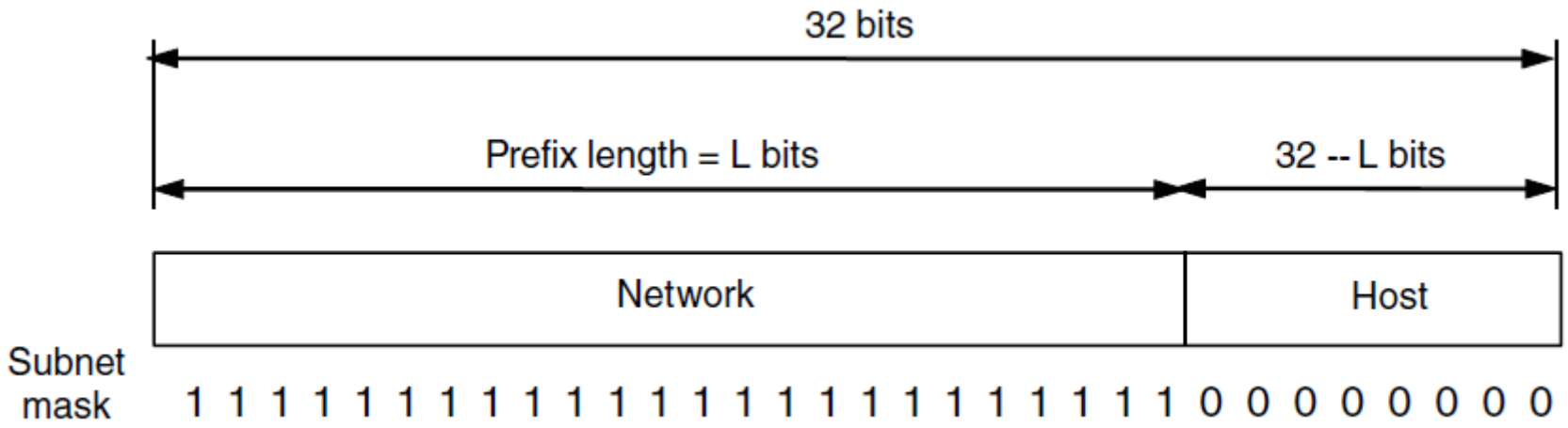
The IP Version 4 Protocol (2)

Option	Description
Security	Specifies how secret the datagram is
Strict source routing	Gives the complete path to be followed
Loose source routing	Gives a list of routers not to be missed
Record route	Makes each router append its IP address
Timestamp	Makes each router append its address and timestamp

Some of the IP options.

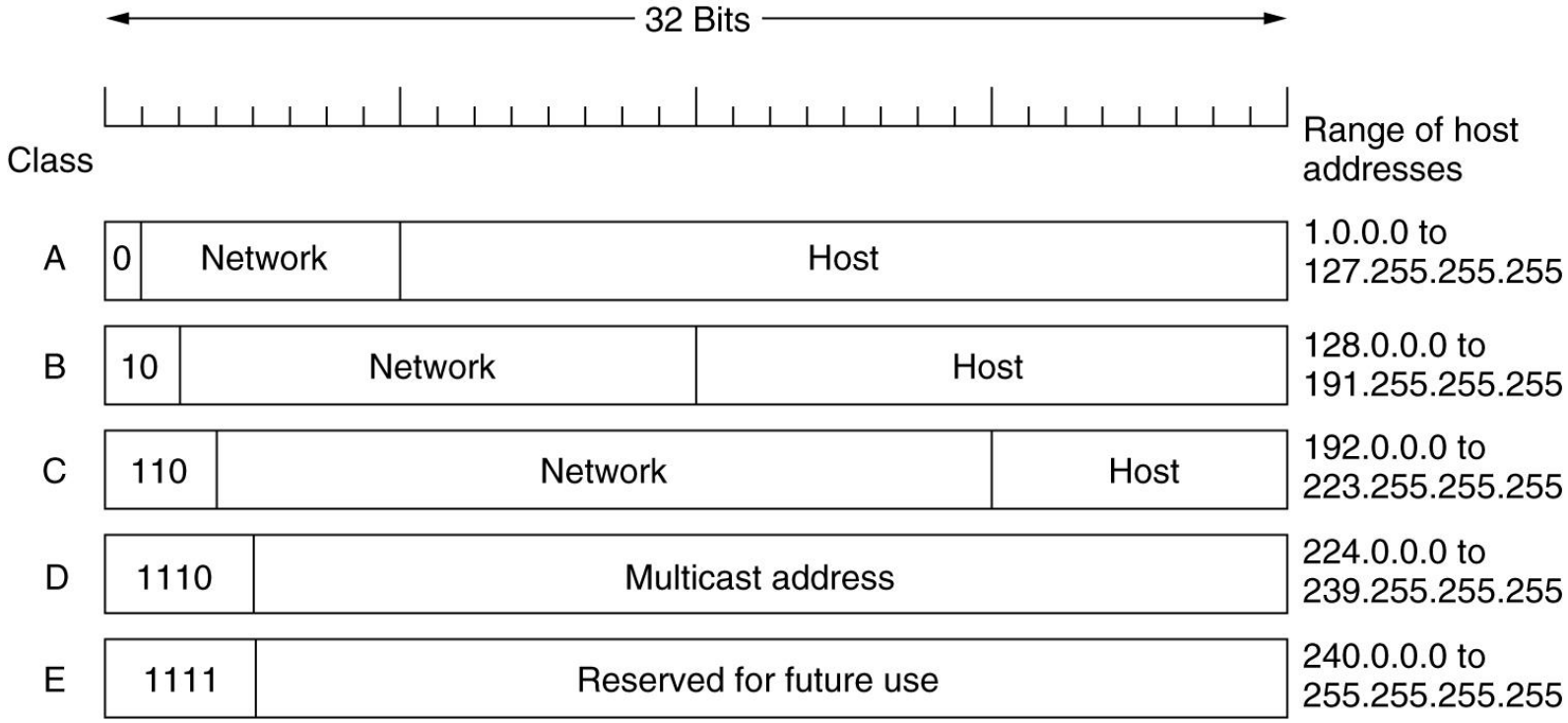
IP Addresses (1)

IP addresses are written in dotted decimal notation like 128.208.2.51



An IP prefix.

IP Addresses



A: 128 networks with 16 million hosts
B: 16384 networks with 64K hosts
C: 2 million networks with 256 hosts

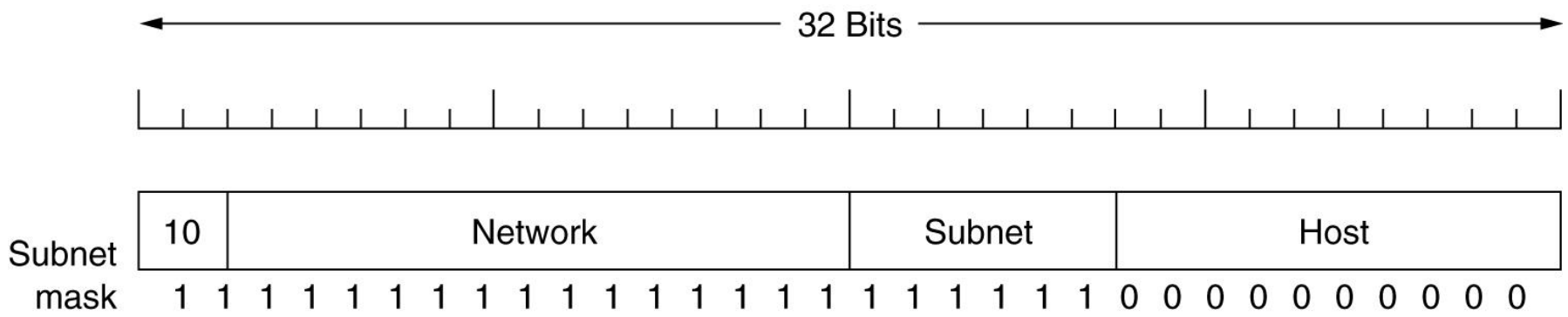
IP address formats.

Subnets

- Hard to put all hosts on a single network.
- Soln: Split a network into smaller parts (*subnets*) for internal use which still acts like a single network to the outside world
- Subnetting is not visible outside the network.

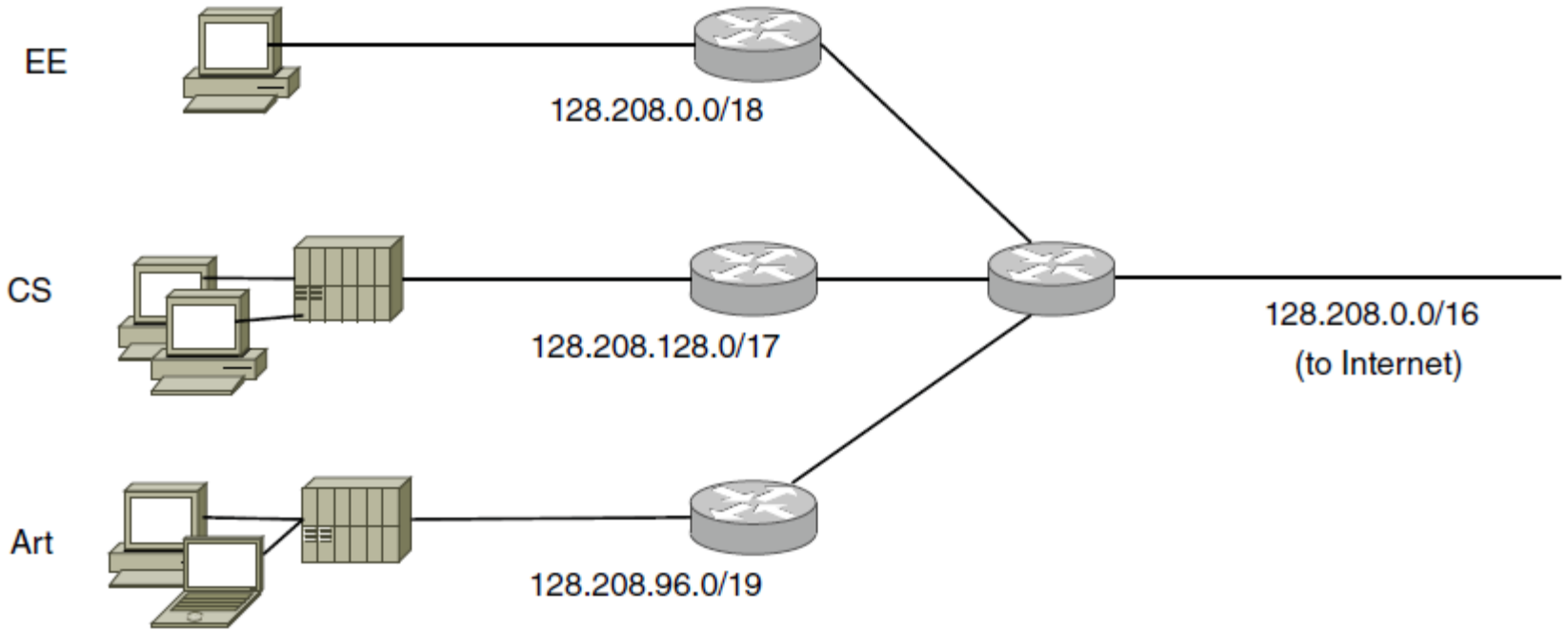
Subnets

- Host number in the IP packet is partitioned into (subnet+host)



Ex: A class B network subnetted into 64 subnets.

IP Addresses (2)



Splitting an IP prefix into separate networks with subnetting.
Outside the network, subnetting is not visible.

CIDR- Classless InterDomain Routing

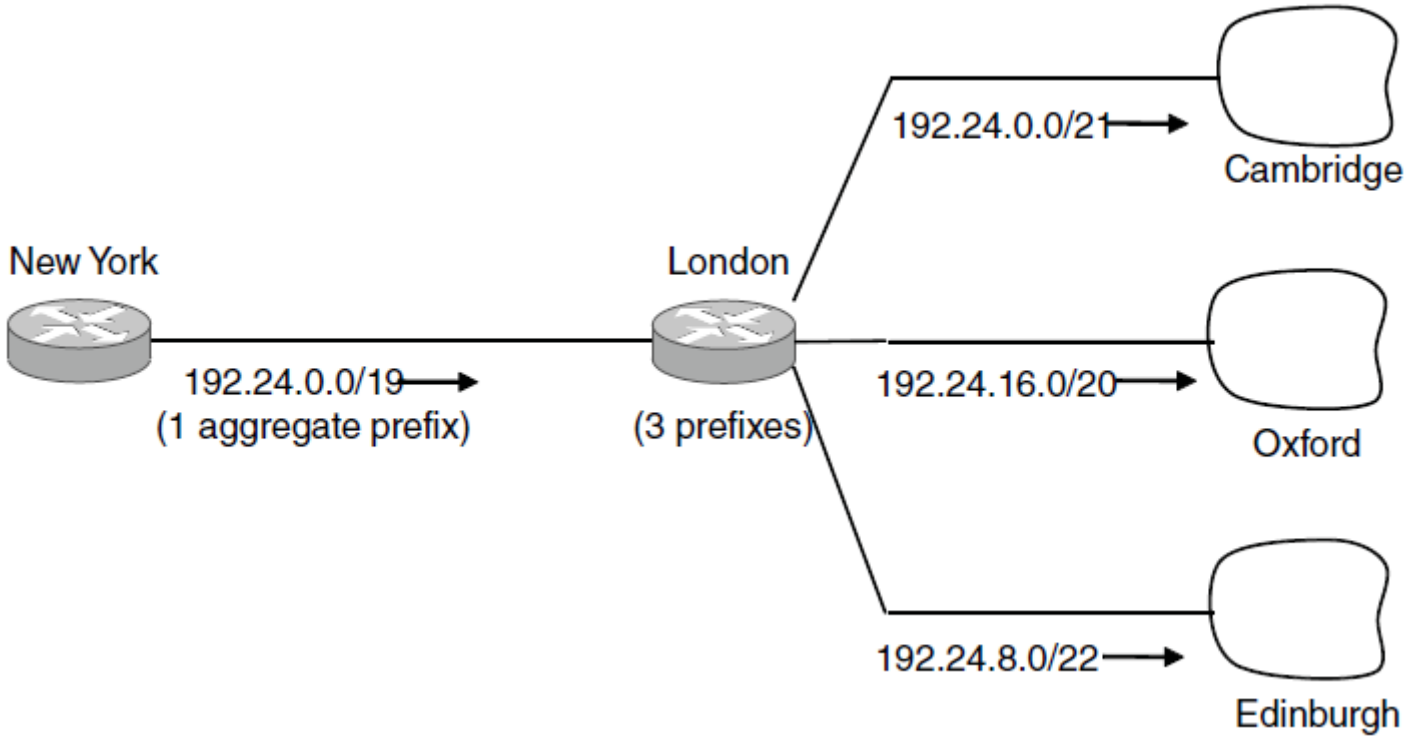
-Aim is to reduce the size of the routing tables.
-Default entry is possible for outgoing link. However, a university router must have an entry for each of its subnets.
-The problem is worse for ISPs.
-To reduce the size of the routing tables we can apply the same insight like subnetting.
-We combine the addresses with the same prefixes into a single prefix, called route aggregation.

IP Addresses (3)

University	First address	Last address	How many	Prefix
Cambridge	194.24.0.0	194.24.7.255	2048	194.24.0.0/21
Edinburgh	194.24.8.0	194.24.11.255	1024	194.24.8.0/22
(Available)	194.24.12.0	194.24.15.255	1024	194.24.12/22
Oxford	194.24.16.0	194.24.31.255	4096	194.24.16.0/20

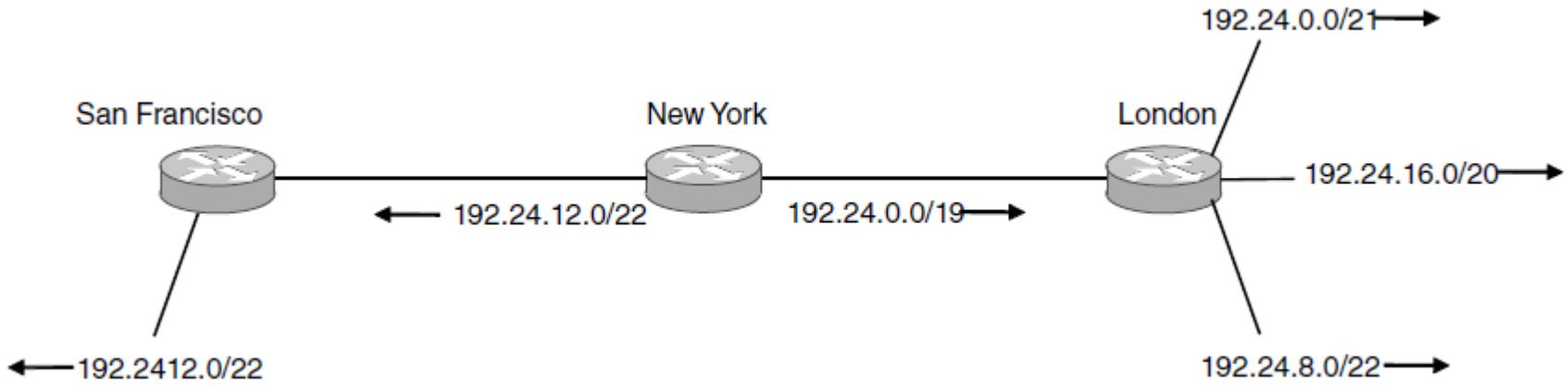
A set of IP address assignments

IP Addresses (4)



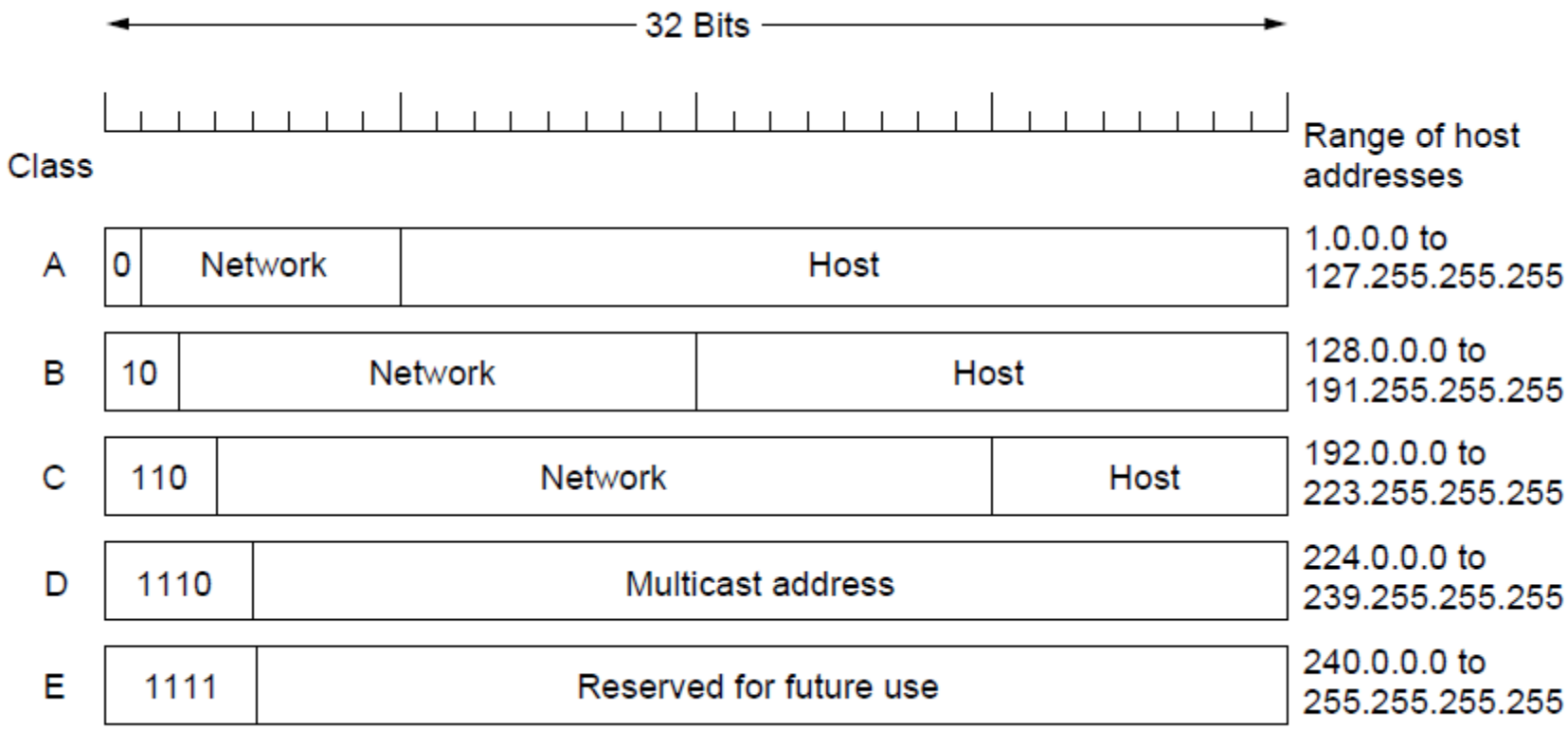
Aggregation of IP prefixes

IP Addresses (5)



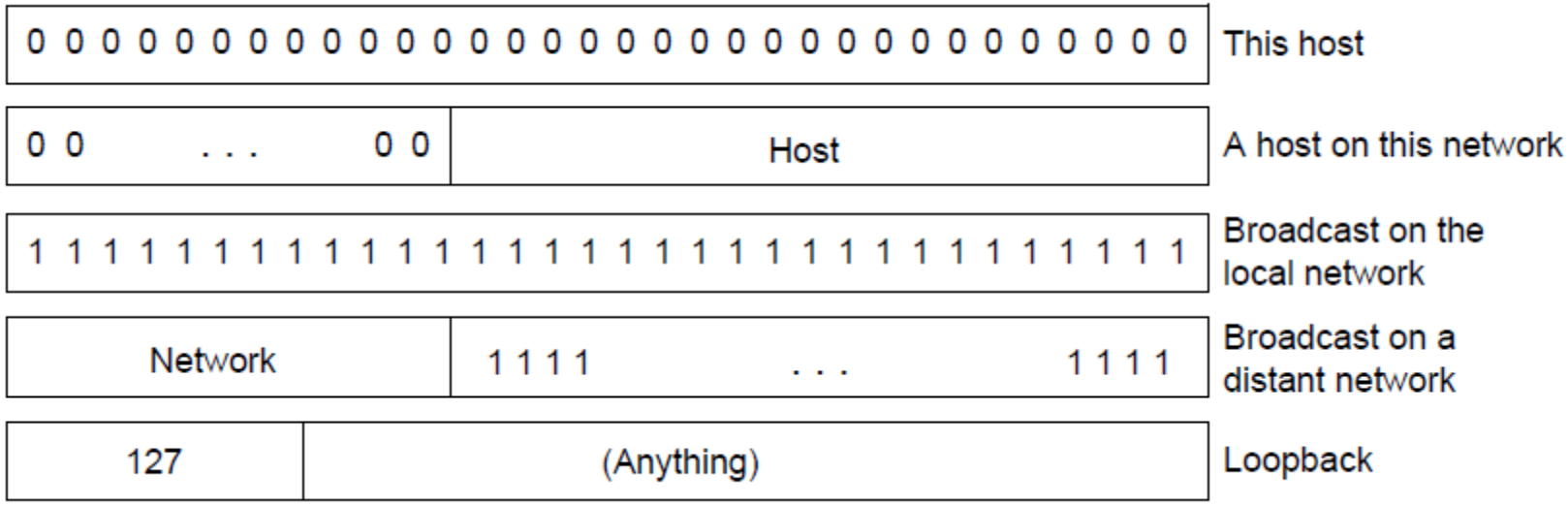
Longest matching prefix routing at the New York router.

IP Addresses (6)



IP address formats

IP Addresses (7)



Special IP addresses