TCP/IP Protocol

Some Background

- Two parts to an address
  - Network Segment Address
    - The particular network
  - Network Node Address
    - The device on a particular network segment
- Routers are used to link networks

Network Addressing

Physical Topology

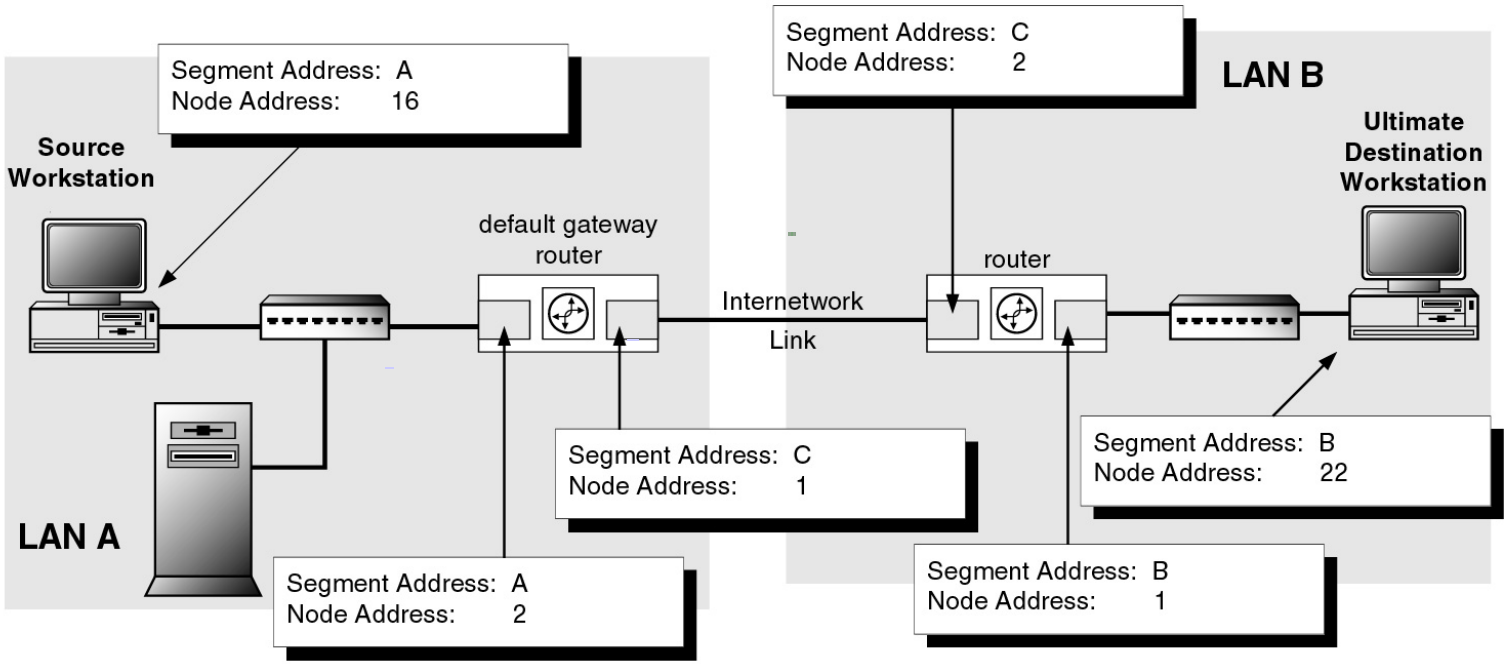

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FIG: 04-02

Routing

- Routing is used to move packets between Network Segments
- Encapsulate/de-encapsulate is used to place a packet within the appropriate frame.

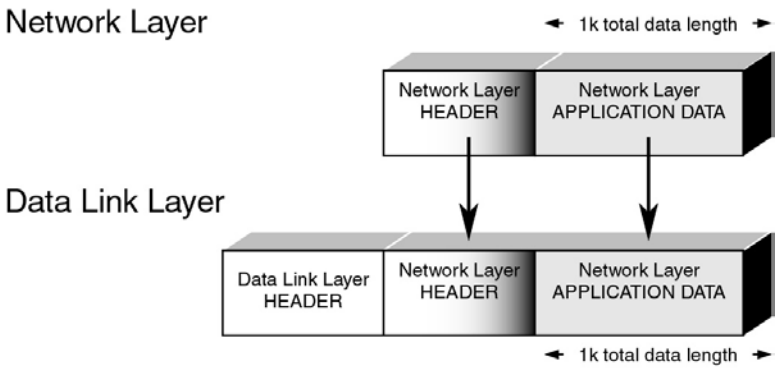

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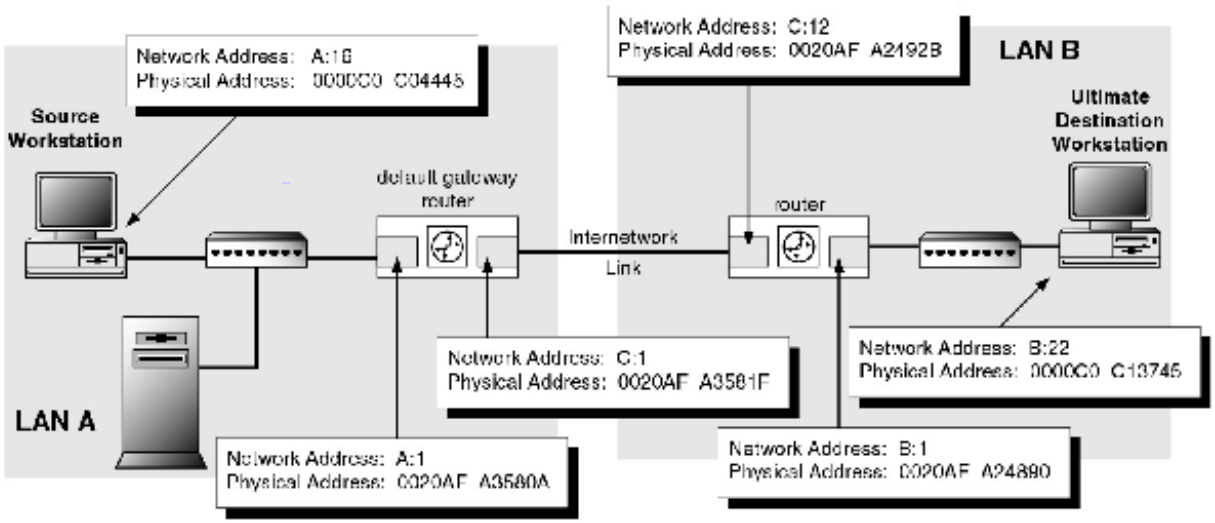
FIG: 04-06

Routing

- Routing performs address processing



TCP/IP Protocol

- The world's most popular network protocol.
- Pre-dates the OSI model
- Functionally equivalent at the layer 4 level and 7 (no level 5 and 6)
- The current version is IPV4 with IPV6 being tested

TCP/IP & OSI Model

Layer	OSI	INTERNET	Data Format	Protocols
7	Application	Application	Messages or Streams	TELNET FTP TFTP SMTP SNMP CMOT MIB
6	Presentation			
5	Session	Transport or Host-Host	Transport Protocol Packets	TCP UDP
4	Transport			
3	Network	Internet	IP Diagrams	IP
2	Data Link	Network Access	Frames	
1	Physical			

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FIG: 04-19

IP Addressing

- The IP address identifies the network segment and the particular node
- The address must be interpreted using the subnet mask. For example:

  24.5.22.155

  255.0.0.0

IP Addressing

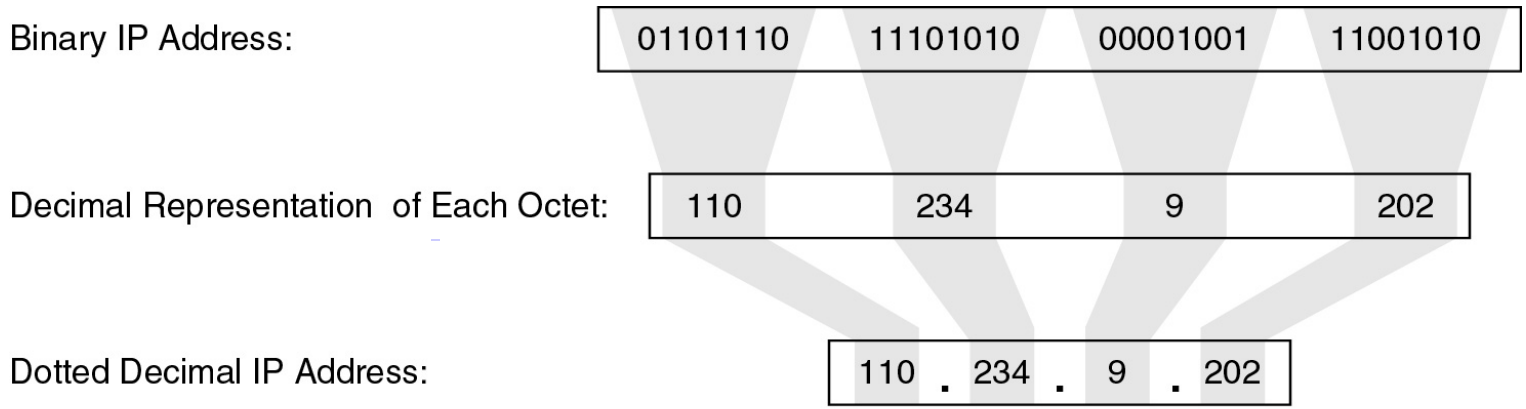

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FIG: 04-21

IP Address Classes

CLASS A

Class ID	Network ID	Host ID
0 (1 bit)	126 different Network IDs (7 bits)	16,777,214 different Host IDs (24 bits)

address packet totals to 32 bits

CLASS B

Class ID	Network ID	Host ID
1 0 (2 bits)	16,382 different Network IDs (14 bits)	65,534 different Host IDs (16 bits)

address packet totals to 32 bits

CLASS C

Class ID	Network ID	Host ID
1 1 0 (3 bits)	2,097,150 different Network IDs (21 bits)	254 different Host IDs (8 bits)

address packet totals to 32 bits

NOTE: The contents of each CLASS ID segment is constant for each CLASS.

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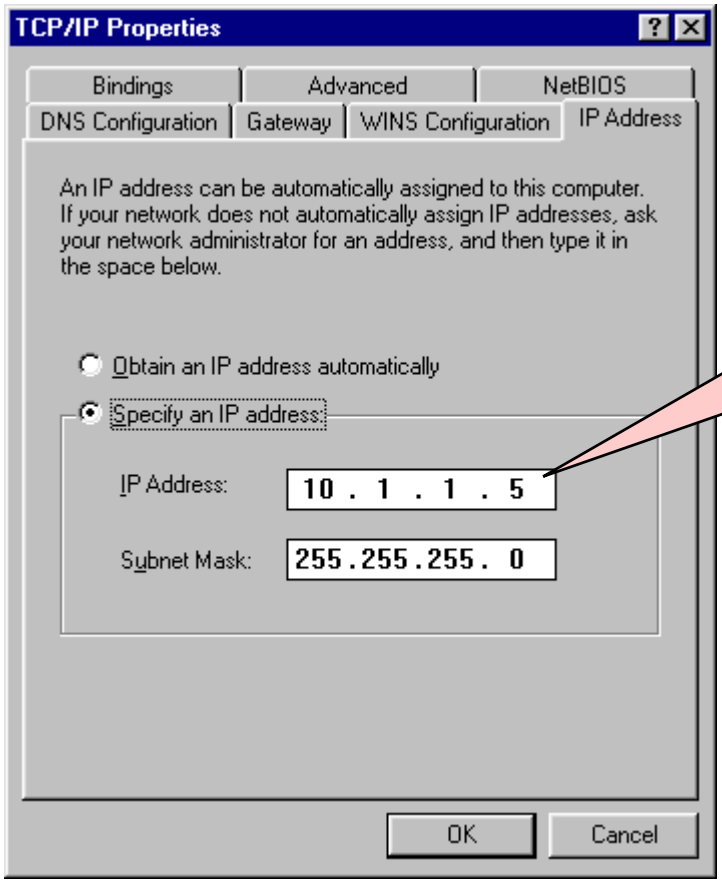
FIG: 04-24

IP Addressing

- IP addresses are shown in dotted decimal notation.
- The binary address, octet, is converted to a decimal number between 0 and 255

Binary Number	**0**	**1**	**1**	**0**	**1**	**1**	**1**	**0**
Decimal Value	**128**	**64**	**32**	**16**	**8**	**4**	**2**	**1**
Decimal Number				**110**				

IP Addressing



An IP Address is a UNIQUE identifier assigned to EVERY device on a network. It is used to allow communications between devices on a network

An IP Address is 32 bits (or 4 bytes) in length

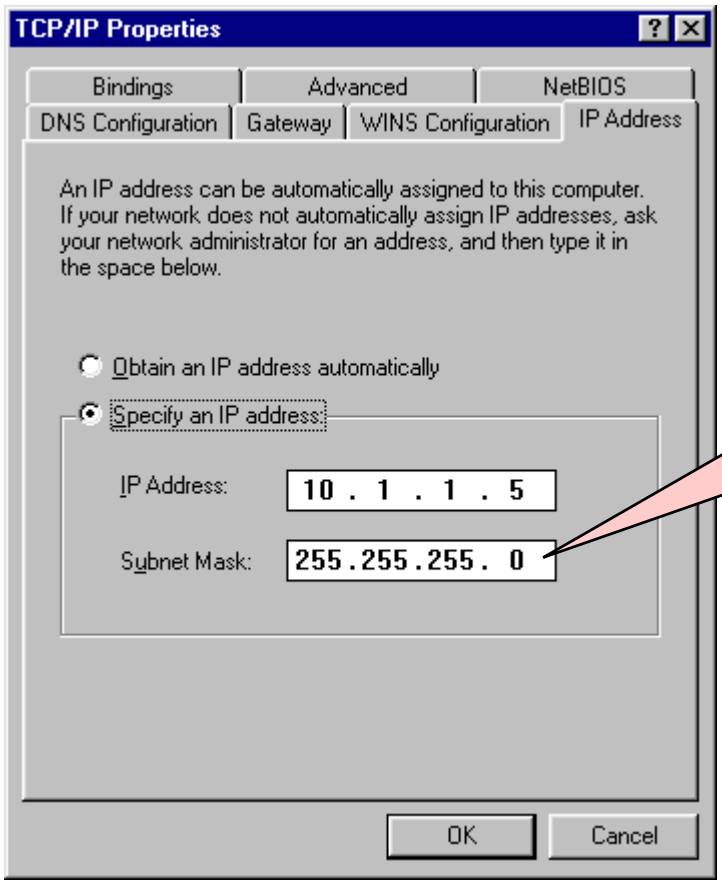
It takes the form of
N.N.N.N
where N is a number from 0 to 255

i.e. 142.4.56.89

Subnet Mask

- A 32 bit number divided into octets where each octet has a value of 0-255
- Represents a logical boundary between the Network and Host addresses in an IP network
- All IP Addresses have an associated Network Mask
- We see dotted decimal representation of 4 octets
- Configured Statically or Dynamically
- Examples:
  - –255.255.255.0 is the same as
  - –11111111.11111111.11111111.00000000

Subnet Mask



A Network Mask is associated with an IP Address and defines a boundary IP devices use to determine whether or not packets need to be forwarded to a Gateway

A Network Mask is 32 bits (or 4 bytes) in length

It takes the form of
N.N.N.N
where N is a number from 0 to 255

i.e. 255.255.255.0

Subnet Mask

- Default Mask for a Class A Network is 255.0.0.0,
- Default Mask for a Class B Network is 255.255.0.0,
- Default Mask for a Class C Network is 255.255.255.0
- The Network Mask indicates how many bits are being used for the Network Portion of an Address

IP Routing

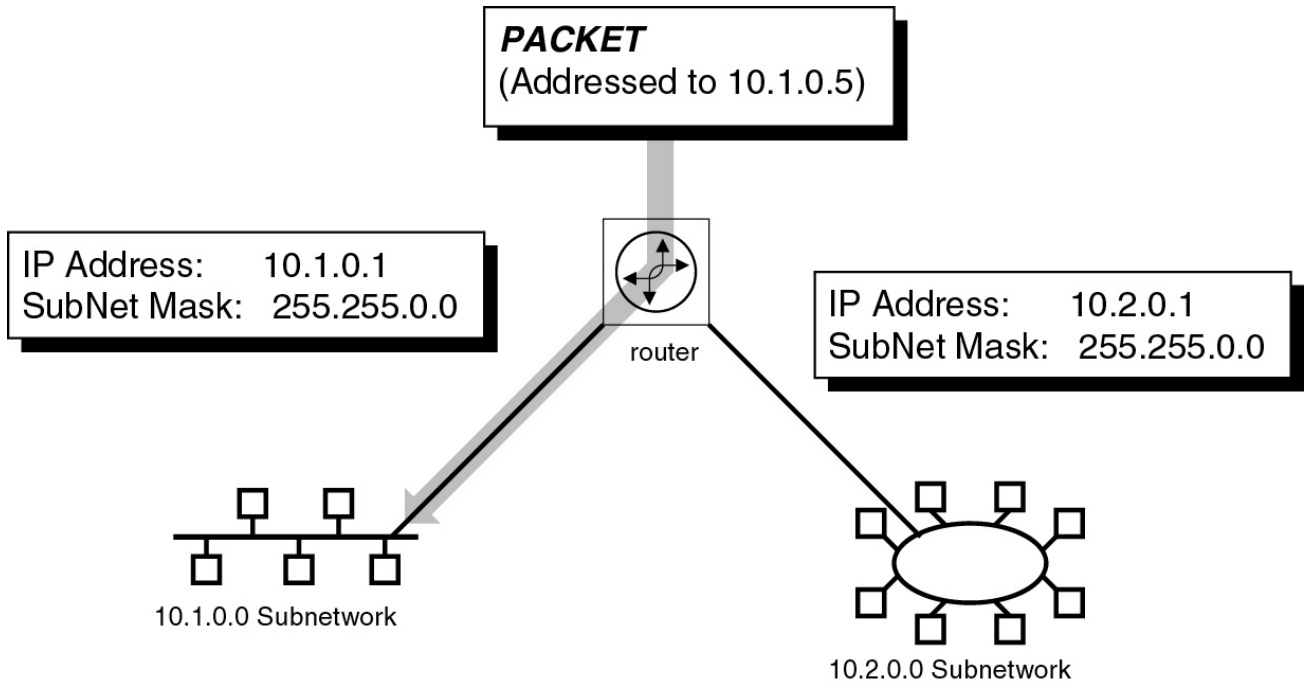


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FIG: 04-26

IP Version 6

- Improvements
  - Larger addressing space
    - IPv4 is 4 octets, IPv6 is 16 octets
  - Performance enhancements
  - Authentication and encryption supported

Layer 4 Protocols

- TCP
  - Connection oriented
  - Reliable
- UDP
  - Connectionless
  - Un-reliable

TCP Reliability

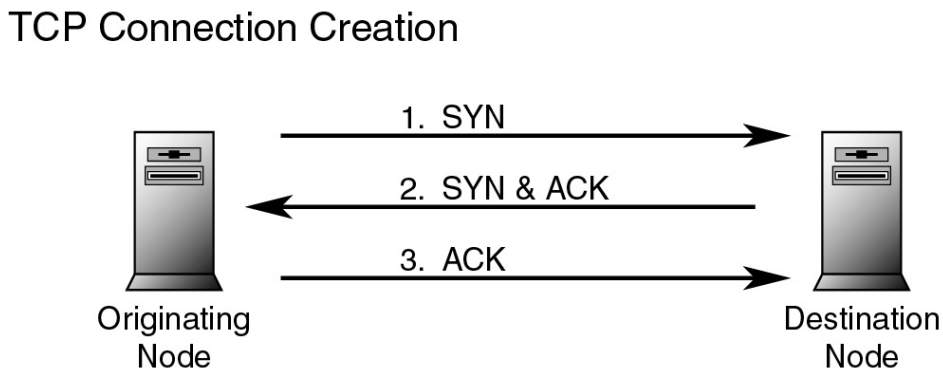

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FIG: 04-38

Questions