CSE3151

COMPUTER NETWORKS

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Course Contents

Medium Access Sublayer: Pure and slotted ALOHA, Persistent and Non persistent CSMA, CSMA with collision detection and collision free protocols, IEEE standard 802.3 and Ethernet.

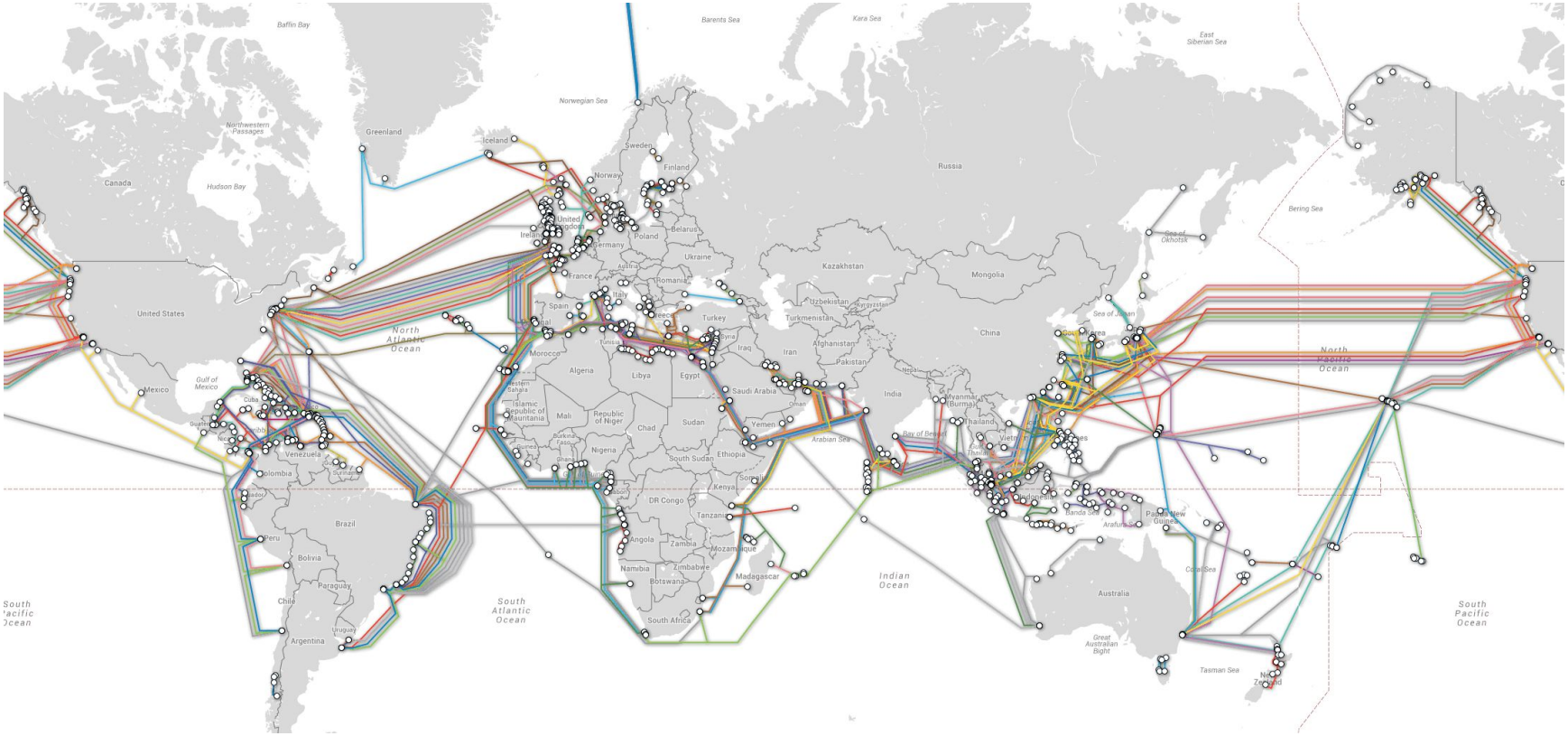
Data Link Layer: Types of errors, framing, error detection & correction methods; Flow control, Stop & wait ARQ, Go-Back- N ARQ, Selective repeat ARQ, HDLC.

Network Layer: Internet address, classful address, subnetting, static vs. dynamic routing, shortest path algorithm, flooding, distance vector routing, link state routing, ARP, RARP, IP, ICMP.

Transport Layer: UDP, TCP, Connection management, Addressing, Establishing and Releasing Connection, Congestion control algorithm, Flow control and Buffering, Multiplexing.

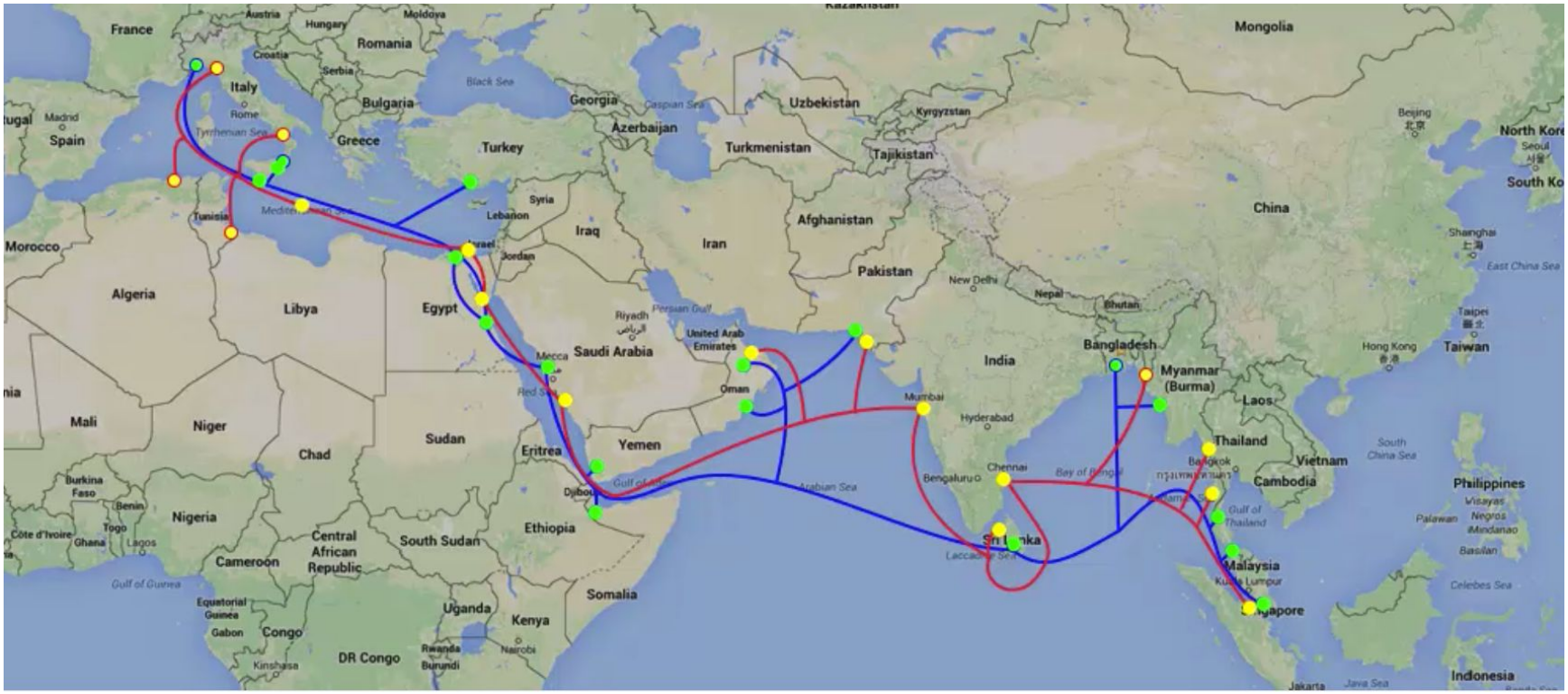
Presentation Layer: Data Compression techniques, Frequency Dependent Coding, Context Dependent Encoding.

Internetworks



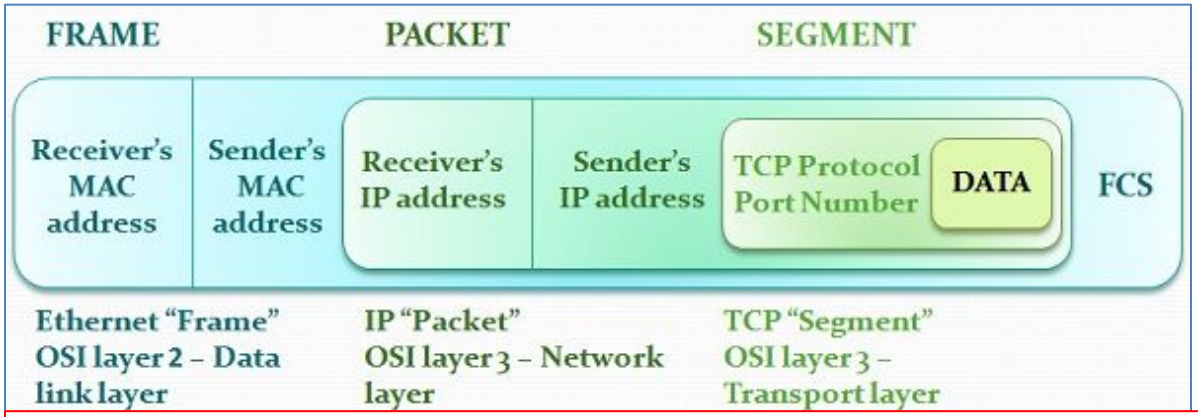
https://www.submarinecablemap.com/

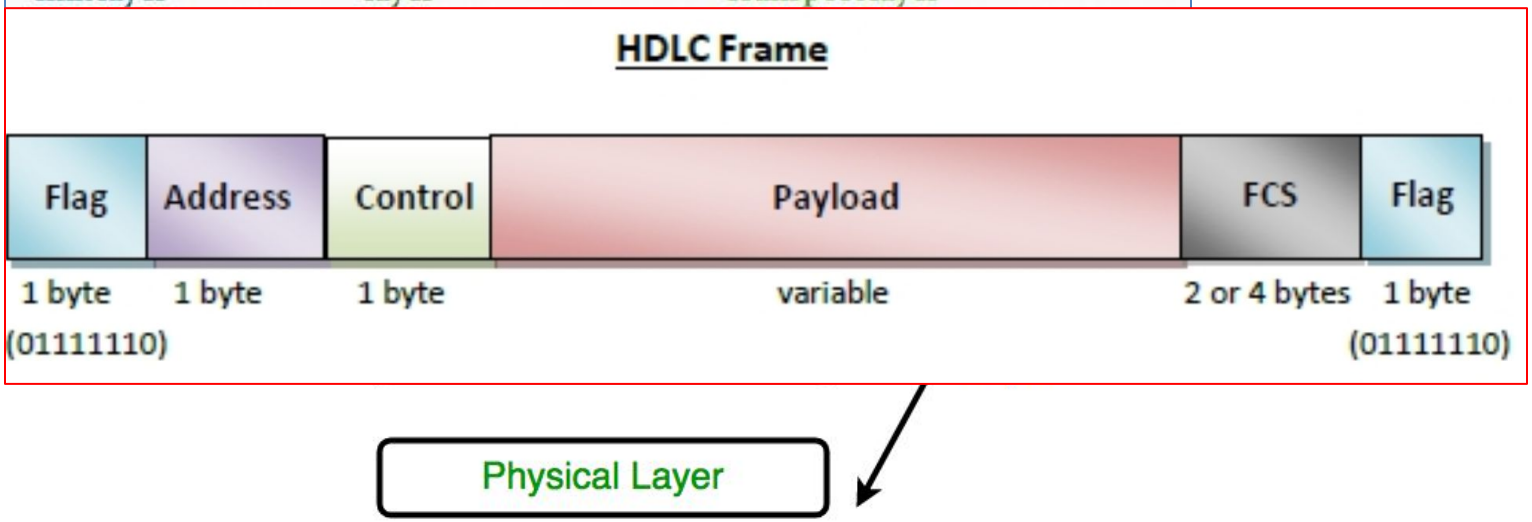
Internetworks



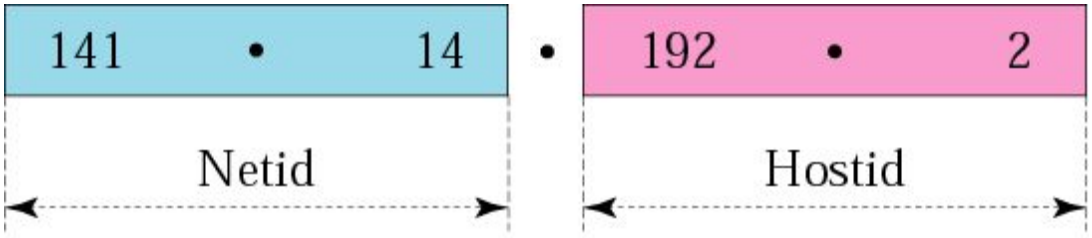

Optical Fiber Network of BTCL
Route Shown in Red Line
(Updated Upto June -2014)
North
WEST BENGAL INDIA
SEA-ME-WE-4
Submarine Cable
Present Capacity 200 Gbps
BAY OF BENGAL
LEGEND
BOUNDARIES
HEAD QUARTERS
PHYSICAL FEATURES
NATURAL FEATURES
Scale
BTCL

Main Story

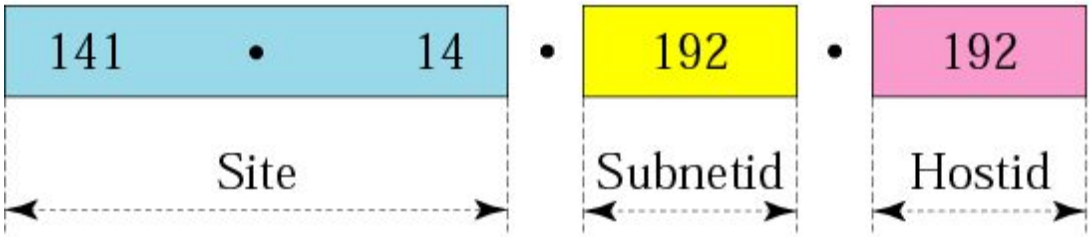

FRAME
PACKET
SEGMENT
Receiver's MAC address
Sender's MAC address
Receiver's IP address
Sender's IP address
TCP Protocol Port Number
DATA
FCS
Ethernet "Frame" OSI layer 2 – Data link layer
IP "Packet" OSI layer 3 – Network layer
TCP "Segment" OSI layer 3 – Transport layer


HDLC Frame
Flag
Address
Control
Payload
FCS
Flag
1 byte
1 byte
1 byte
variable
2 or 4 bytes
1 byte
(01111110)
(01111110)
Physical Layer

Addresses in a network with and without subnetting



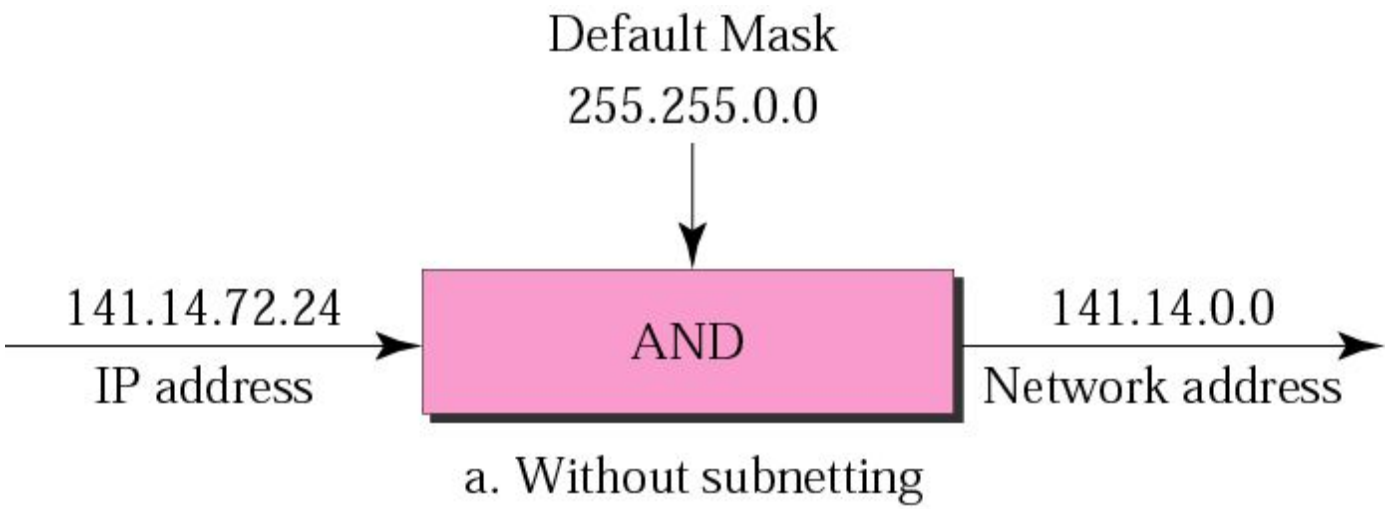
a. Without subnetting



b. With subnetting

Figure 5-5

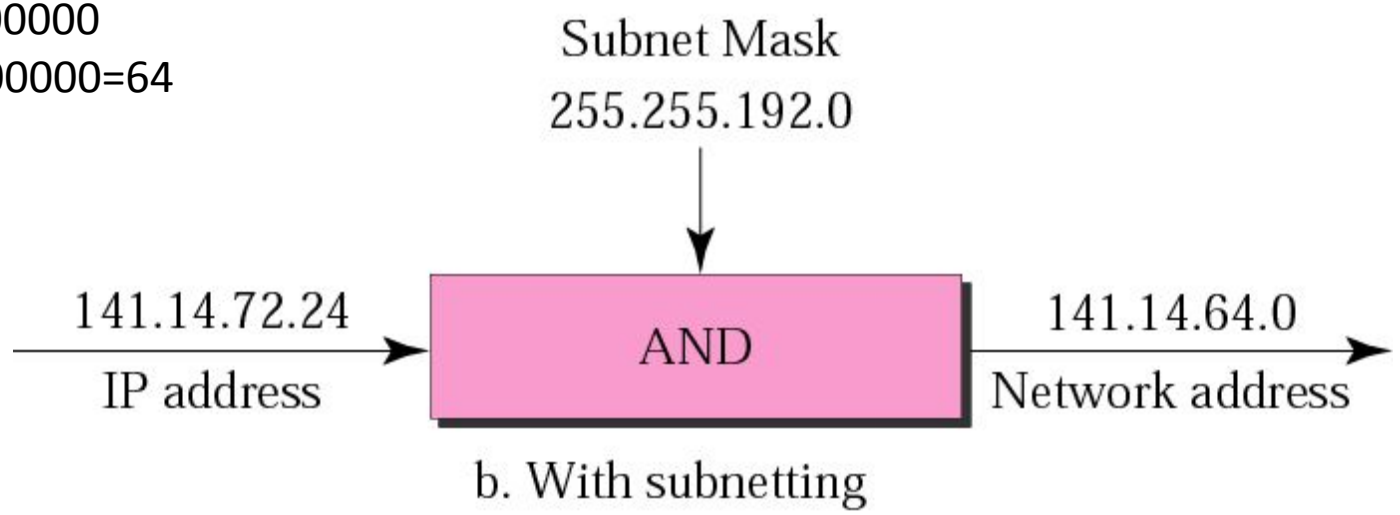
Default mask and subnet mask



72 =01001000

192 =11000000

01000000=64



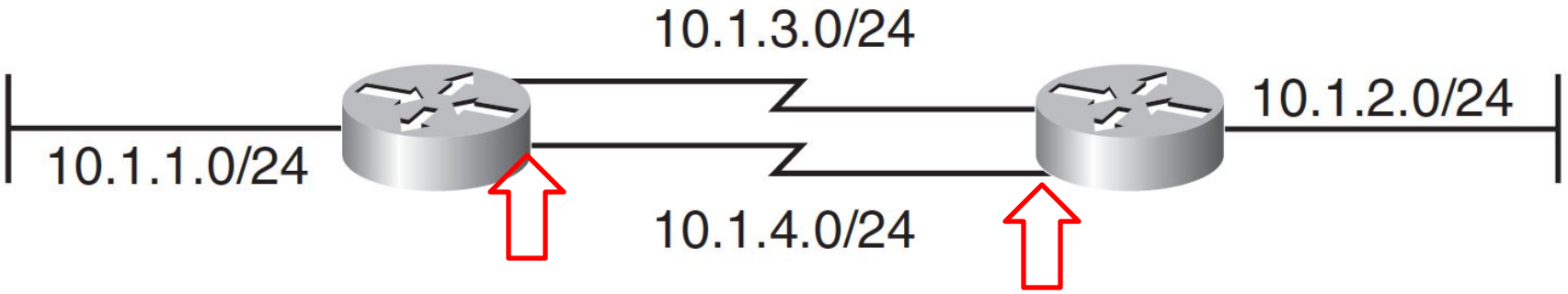
VARIABLE-LENGTH BLOCKS

Address Space

103.120.110.0/24	**University** of **Rajshahi**	256
103.79.117.0/24	**University** of **Rajshahi**	256
103.99.176.0/23	**University** of **Rajshahi**	512
103.99.176.0/24	**University** of **Rajshahi**	256

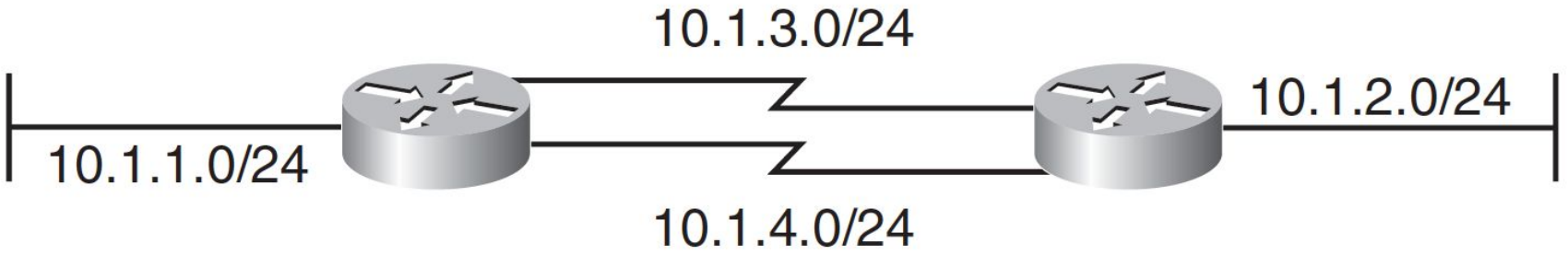
Variable-Length Subnet Masks

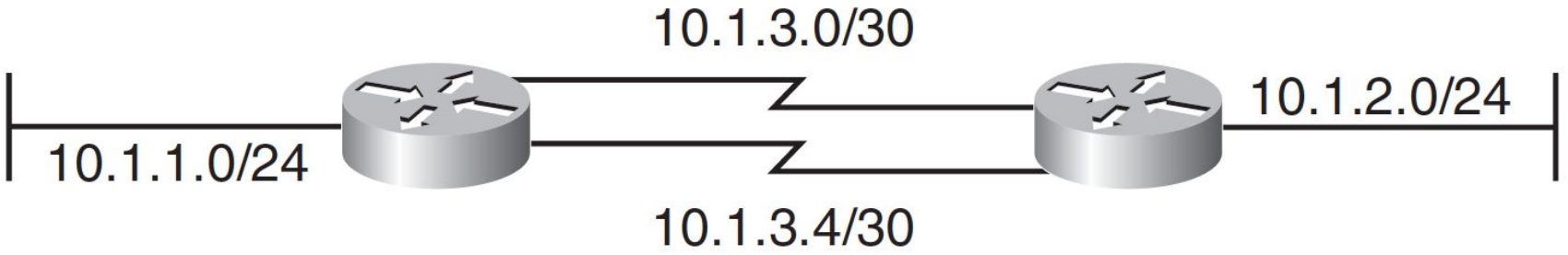
- Variable-Length Subnet Masks –VLSM



up to $2^8 - 2 = 254$ hosts can be addressed.

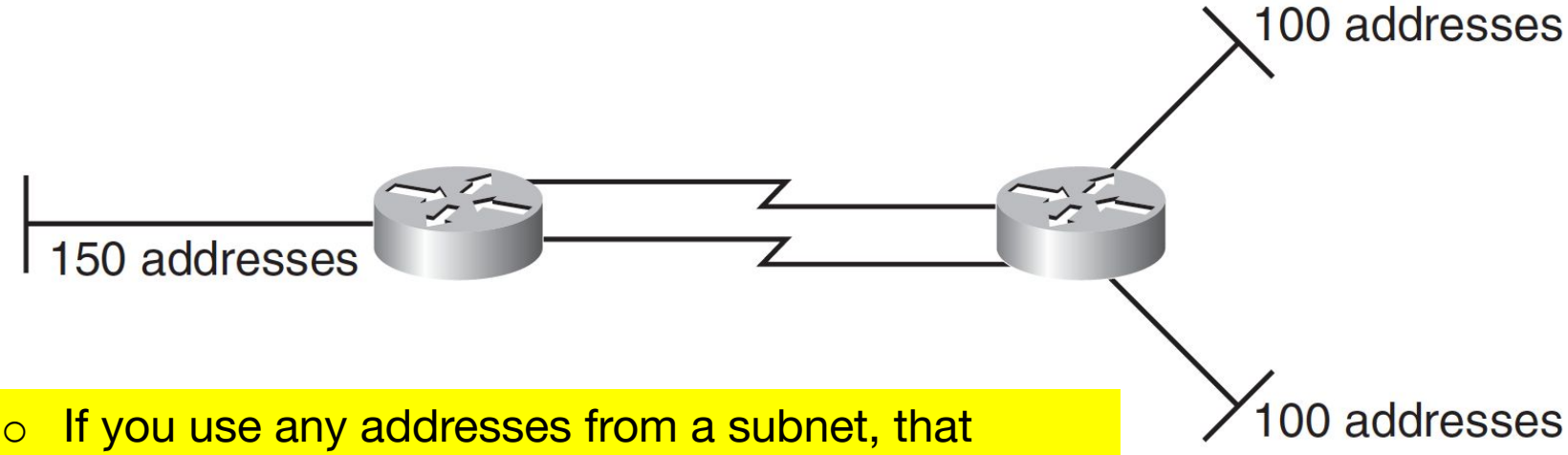
Variable-Length Subnet Masks





Variable-Length Subnet Masks

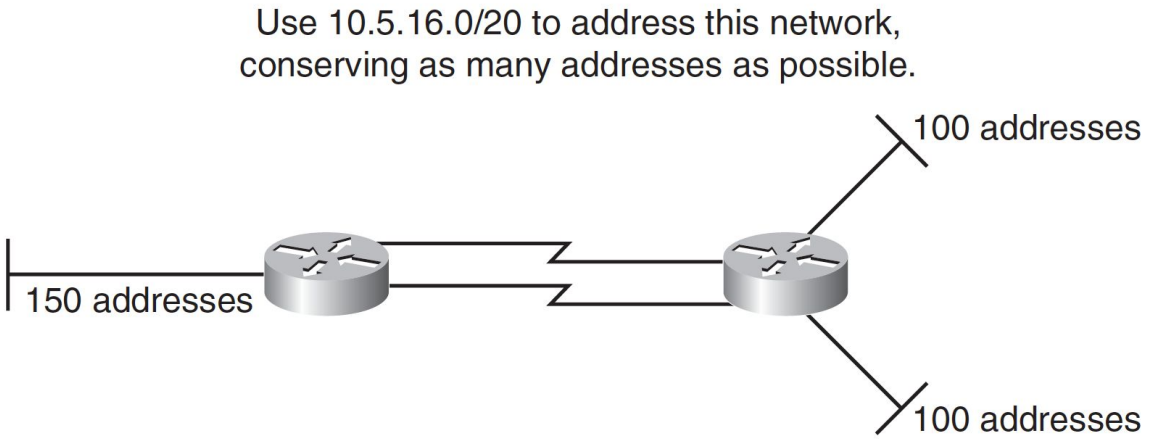
Use 10.5.16.0/20 to address this network, conserving as many addresses as possible.



- If you use any addresses from a subnet, that subnet should not be further subnetted.

10.5.16.0/20

Network bits	Original subnet bits	Original host bits
10 .	5 . 0001	0000 . 0000 0000



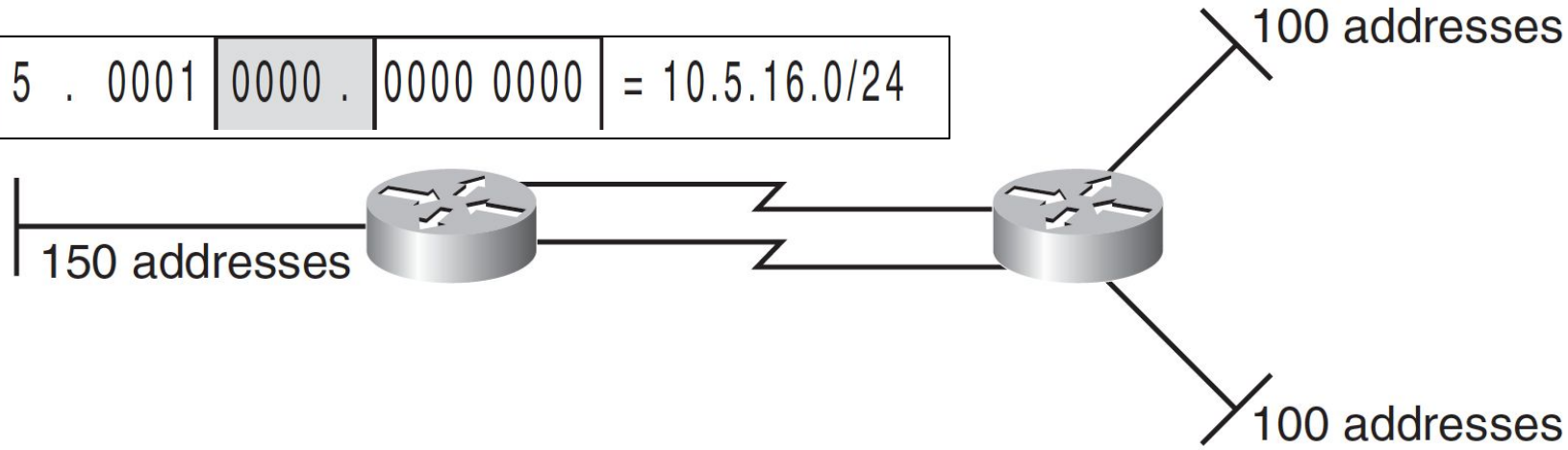
- For the left LAN, **150** addresses are needed;
  - rounding up to the next power of 2 gives 256.
  - Because $2^8 = 256$, 8 host bits are needed.
- For the other two LANs, 100 addresses are needed;
  - rounding up to the next power of 2 gives 128.
  - Because $2^7 = 128$, 7 host bits are needed for each LAN.
- The WANs require 2 host bits each.

- Because at most 8 host bits are needed, the 10.5.16.0/20 address can be further subnetted into sixteen /24 subnets (leaving 8 host bits)

10.5.16.0/20

Network bits	Original subnet bits	Original host bits		
10 .	5 . 0001	0000 .	0000 0000	
		Additional subnet bits	host bits	
10 .	5 . 0001	0000 .	0000 0000	= 10.5.16.0/24
10 .	5 . 0001	0001 .	0000 0000	= 10.5.17.0/24
10 .	5 . 0001	0010 .	0000 0000	= 10.5.18.0/24
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.
10 .	5 . 0001	1111 .	0000 0000	= 10.5.31.0/24

10 .	5 . 0001	0000 .	0000 0000	= 10.5.16.0/24

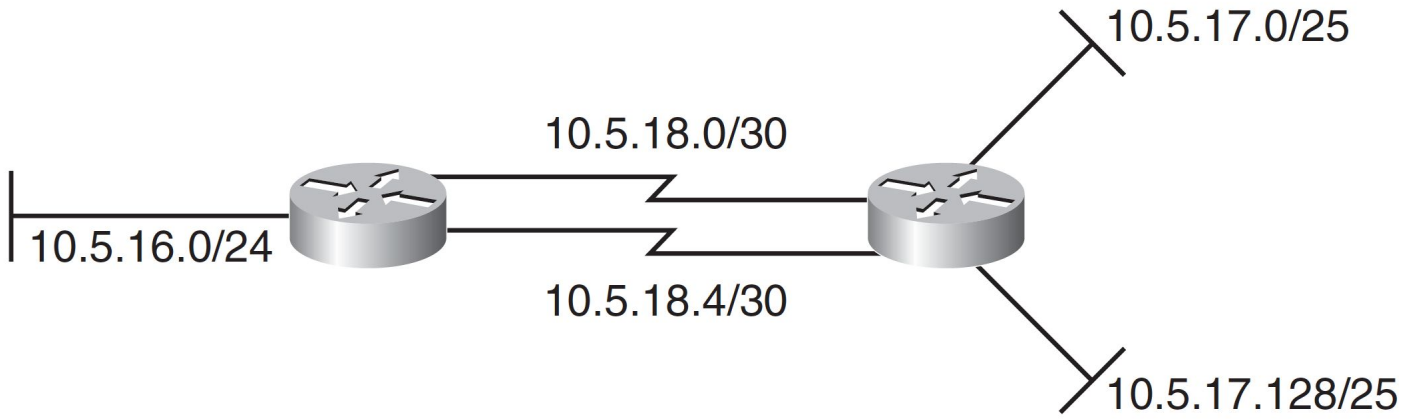


10.5.17.0/24

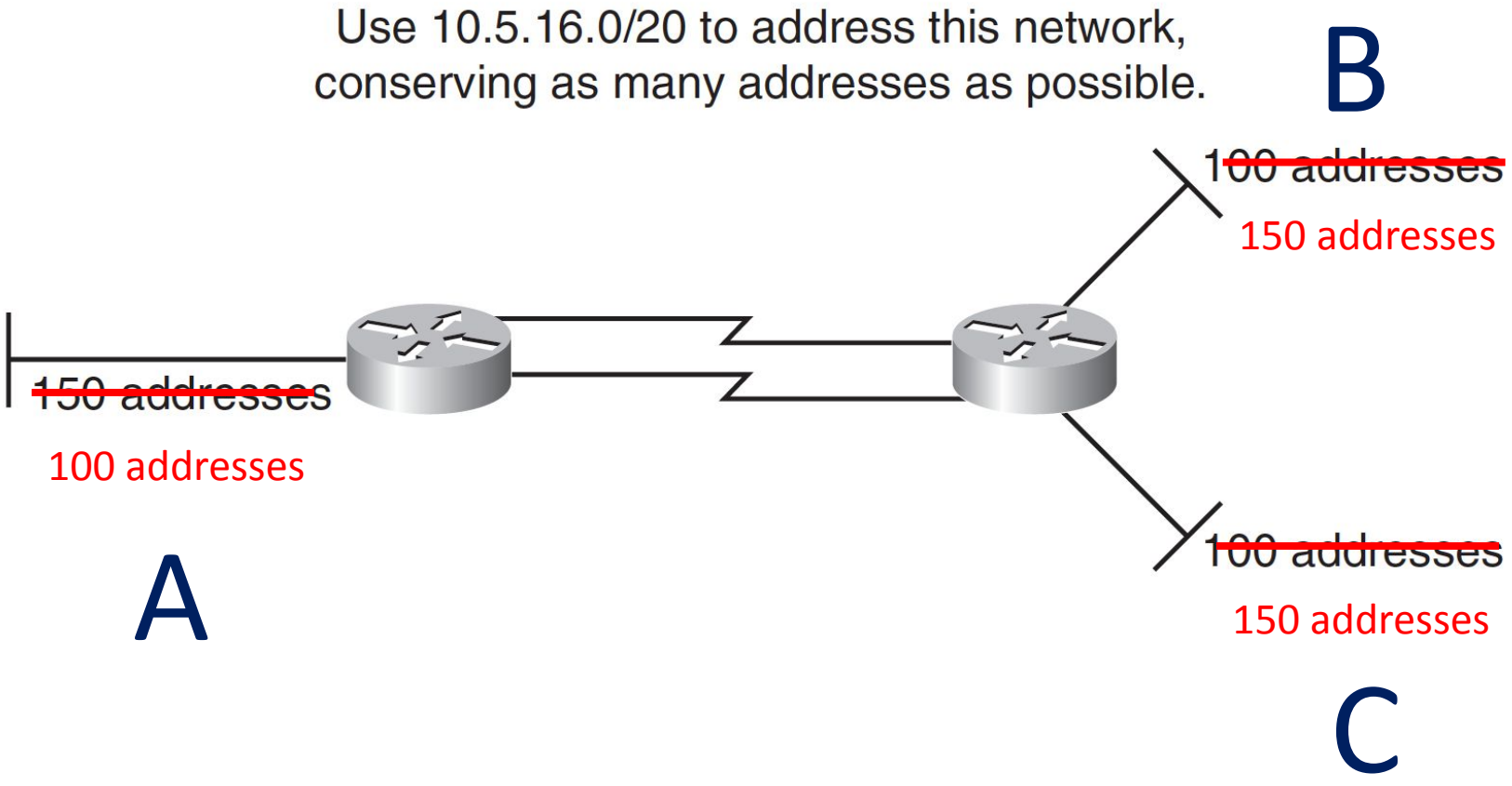
Network bits	Subnet bits		VLSM subnet bits	host bits	
10	. 5 . 0001 0001	.	0	000 0000	
10	. 5 . 0001 0001	.	0	000 0000	= 10.5.17.0/25
10	. 5 . 0001 0001	.	1	000 0000	= 10.5.17.128/25

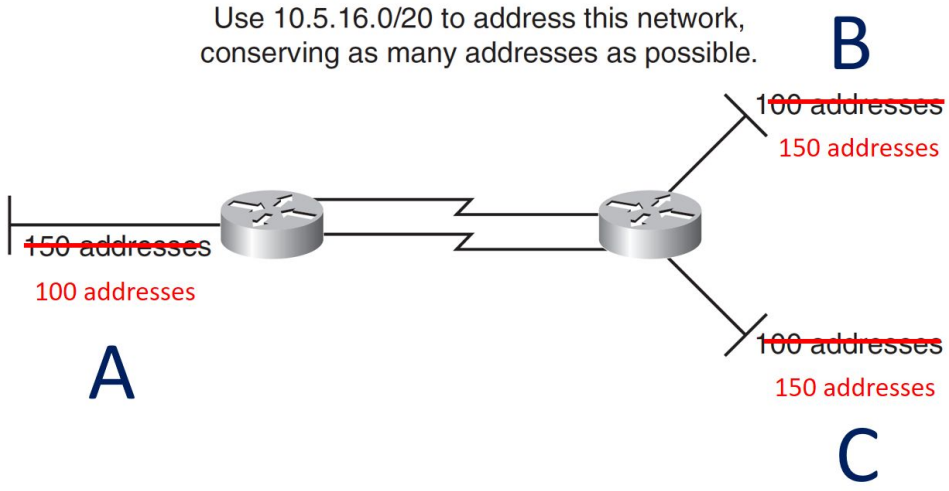
10.5.18.0/24

Network bits	Subnet bits			VLSM subnet bits	host bits	
10	5	0001 0010	0 000 0000			
10	5	0001 0010	000000	00	=	10.5.18.0/30
10	5	0001 0010	000001	00	=	10.5.18.4/30
10	5	0001 0010	000010	00	=	10.5.18.8/30
.	.	.	.	.		.
.	.	.	.	.		.
.	.	.	.	.		.
10	5	0001 0010	111111	00	=	10.5.18.252/30



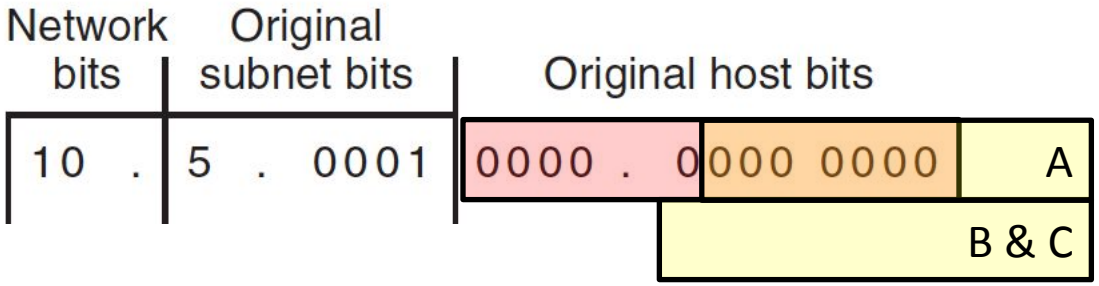
Report Submission





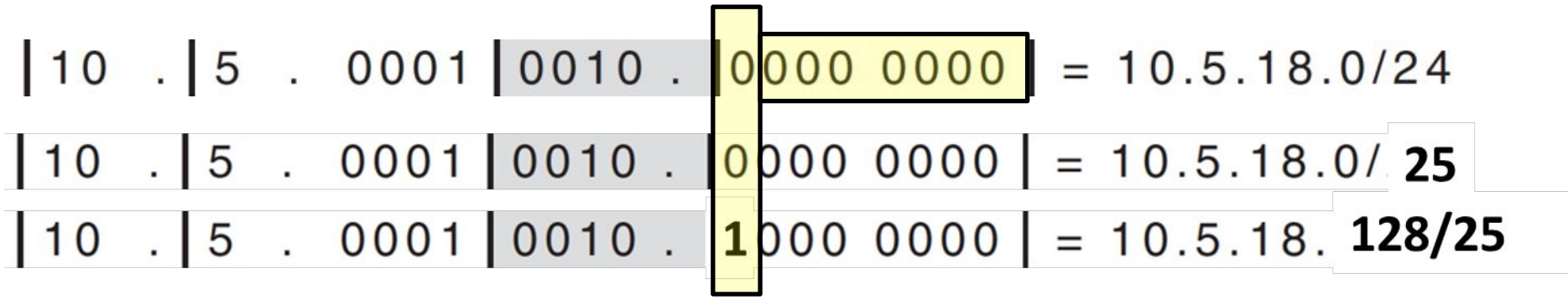
- For the **B & C** LAN, **150** addresses are needed;
  - rounding up to the next power of 2 gives 256.
  - Because $2^8 = 256$, 8 host bits are needed.
- For the **A** LANs, 100 addresses are needed;
  - rounding up to the next power of 2 gives 128.
  - Because $2^7 = 128$, 7 host bits are needed for each LAN

10.5.16.0/20



10.5.16.0/20

Network bits	Original subnet bits	Original host bits		
10 .	5 . 0001	0000 .	0000 0000	
		Additional subnet bits	host bits	
10 .	5 . 0001	0000 .	0000 0000	= 10.5.16.0/24
10 .	5 . 0001	0001 .	0000 0000	= 10.5.17.0/24
10 .	5 . 0001	0010 .	0000 0000	= 10.5.18.0/24
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.
10 .	5 . 0001	1111 .	0000 0000	= 10.5.31.0/24


10 . 5 . 0001 0010 . 0000 0000 = 10.5.18.0/24
10 . 5 . 0001 0010 . 0000 0000 = 10.5.18.0/ 25
10 . 5 . 0001 0010 . 1000 0000 = 10.5.18. 128/25

10.5.**19**.0/24

Network bits	Subnet bits			VLSM subnet bits	host bits	
10	. 5 .	0001 0011	. 0 000 0000			
10	. 5 .	0001 0011	.	000000	00	= 10.5.**19**.0/30
10	. 5 .	0001 0011	.	000001	00	= 10.5.**19**.4/30
10	. 5 .	0001 0011	.	000010	00	= 10.5.**19**.8/30
.	. .	.		.	.	.
.	. .	.		.	.	.
.	. .	.		.	.	.
10	. 5 .	0001 0011	.	111111	00	= 10.5.**19**.252/30