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ASSIGNMENT # 4

CNET

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CS-E

Question # 1

ISP block: 200.100.150.0/21

Part (a)

Number of addresses = $2^{32-21} = 2^{11} = 2048$

Address Range = 200.100.150.0 – 200.100.157.255

Part (b)

organization (1)
200.100.150.0/23 → 200.100.150.0
200.100.151.255

organization (2)
200.100.152.0/30 → 200.100.152.0
200.100.153.255

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Organization (3)

200.100.50.0/23 → 200.100.50.0 → 200.100.51.255

Step 2

2 organization (150 each)

organization (4)

200.100.56.0/24

200.100.56.0 → 200.100.56.255

Organization (5)

200.100.57.0/24 → 200.100.57.0 →

200.100.57.255

Step 3

4 organizations (30 add each)

need 128 blocks 132 addresses each)

128 in total, No space left for Allocation

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(b)

Org 1 → 123

200.100.1.0 — 200.100.51.255

Block size 512

org 2 → /23

200.100.52.0 → 200.100.53.255

Block size = 512

org 3 → /23

200.100.14.0 → 200.100.15.255

Block size = 512

Org 4 ~~E~~ /24

200.100.16.0 → 200.100.16.255

Block size = 256

org 5 → 200.100.17.0 → 200.100.17.255 /24

Block size = 256

No unallocated addresses as ~~not~~ all /24 blocks have fully allocated.

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Forwarding and address dist tables

Address distribution Table

Org	Subnets	Range
1	200.100.56.0/23	200.100.56.0 – 200.100.57.255
2	200.100.52.0/23	200.100.52.0 – 200.100.53.255
3	200.100.54.0/23	200.100.54.0 – 200.100.55.255
4	200.100.56.0/24	200.100.56.0 – 200.100.56.255
5	200.100.57.0/24	200.100.57.0 – 200.100.57.255

Forwarding table

Dest Address	subnet	Next hop
200.100.56.0	/23	org1
200.100.52.0	/23	org 2
200.100.54.0	/23	org 3
200.100.56.0	/24	org 4
200.100.57.0	/24	org 5

The router uses subnet to forward packets to convert organization based on destination ip address.

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Question #2

a) Block size 72.15.40.0 /26

$= 2^{32-26} = 64$

Range = 72.15.40.0 to 72.15.40.63

b) Block size = 64

R: 72.15.40.64 to 72.15.40.127

c) Block size = 128

R: 72.15.40.128 to 72.15.40.255

d) 72.15.41.0 /24

Block size = 256

Range = 72.15.41.0 to 72.15.41.255

Combining all ranges.

72.15.40.0 → 72.15.41.255

Total addresses = 512

required network bits = 127

Block = 72.15.40.0 /23

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Question # 3

(a)

NAT modifies IP addresses & port number of packets, which make it difficult to pass behind NAT devices for to communicate directly

Dynamic mapping Many NAT implementations use dynamic port forward which means internal ip addresses of a peer may change overtime

In band communication :- block unsolicited inband traffic

multiple peer :. Identifying becomes challenging behind NAT.

Solutions:

1) Peer first learn about their own public ip and ports assigned by their NAT routers using STUN

2) Traversal using Relays around NAT. When Direct P2P not possible. it turn relay Data through a third party server to facilitate communication.

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- UPnP (universal Plug and Play)
  Allow devices behind NAT
  to automatically configure the router to
  open specific port enabling direct p2p

Terminology:
NAT Traversal: Technique used to be
facilitate communication b/w peers behind NAT.

ICE: Interactive connectivity establishment is
a framework that help establish the best
possible connection b/w peers using
STUN & TURN

Question #4

Subnet: 203.0.113.128/26
prefix: 203.0.113.128/26

Subnet mask: 255.255.255.192 or /26
which mean 64 ip address per subnet.
Range of Addresses:
Start Addresses = 203.0.113.128
End Addresses = 203.0.113.191

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e.g b/w 203.0.113.129 & 203.0.113.190

The network address 203.0.113.128 and Broadcast 113.191 can't be assigned to host

(b) The ISP own the Block 203.0.113.0/26 which has a total of 64 addresses since $2^{(32-26)} = 64$

Create 5 subnets with a prefix of 128 starting from 203.0.113.0/28

1st Subnet = 203.0.113.0/28
2nd Subnet = 203.0.113.16/28
3rd Subnet = 203.0.113.32/28
4th subnet = 203.0.113.48/28
5th subnet = 203.0.113.64/28

Question 5

Given IP = 198.51.100.0/24

Subnets	interfaces	host bits	masks
1	50	64 = 26 = 6	/26
2	100	128 = 7	/25
3	30	32 = 5	/27
4	10	16 = 4	/28

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Prefixes

198. 51. 100. 0/26
198. 51. 100. 64/26
198. 51. 100. 192/27
198. 51. 100. 224/28

Question #7

(a)

- monitor all going NAT device
- record all the ip identification of observed packets
- identifying unique sequence of IPs

(b)

Previous technique fails as

1) no longer sequential IP
2) symmetric NAT generate more IPs for each destination

(c)

challenges

- segments might have same IPs
- if NAT modify original IPs, sequence is disturb.

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Technique
:- Reassemble fragmented packets before analysis
:- combine ip id.

d)
UDP doesn't have sequence number

modification
Distinguish host by unique source ports

Question # 7

a) MTU = 1500 bytes ip header = 20 bytes
max payload = MTU - 20 = 1480 bytes
Datagram total size = 13120 bytes
payload's total size = 13120 - 20 = 13100 bytes
Fragment = $\frac{13100}{1480} = 9$

Size of 1st seg = 1500 bytes
last segment = 1120 bytes

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b)

	Id No	MF flag	Flag offset	Total length
1	8721	1	0	1500
2	8721	1	185	1500
3	8721	1	370	1502
4	8721	1	555	1500
5	8721	1	740	1500
6	8721	1	925	1500
7	8721	1	1110	1500
8	8721	1	1295	1500
9	8721	0	1480	1120

c) if DF=1 the datagram would not be defragmented and the entire size will be discarded/lost

Question #8

Class C

custom subnet mask = largest subnet (Boston + RSO)

company has 19 host, will need $2^5 = 32$, so the mask is = 255.255.255.224 (/27)

min subnets = 3

Host address in largest subnet = 14 hosts (/27)

Subnets (largest to smallest)

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1) Bolton + RSG) 14 hosts
2) B.(NY) 7 host
3) Router (A-B)

if range of Router A (fa 0/0)
192.168.1.1 - 192.168.1.30

if range of NY

192.168.1.33 - 192.168.1.46

if range of RA - RB
192.168.1.49 - 192.168.1.50.