CN_LAB_3_Assignment

CE_055

Aim:- To learn IP subnetting, Address Aggregation.

- Task1:-

The starting granted block of addresses is 14.24.74.0/24.
Suppose we need 3 sub-block of addresses to use three subnet.

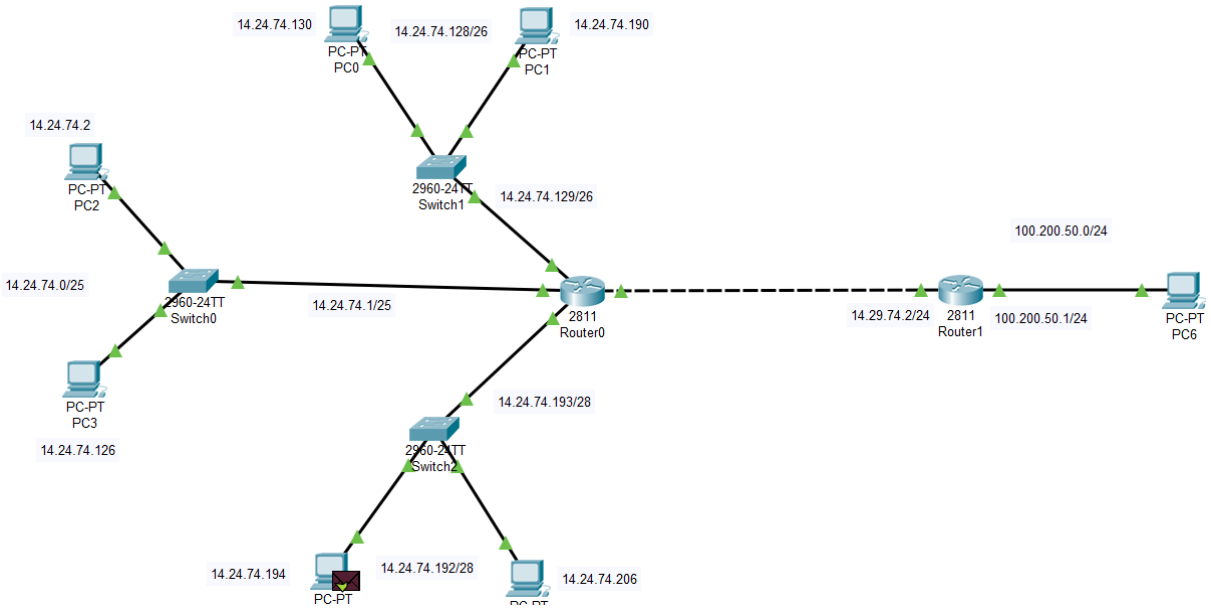
- First block:- 120 addresses
- Second block:- 60 addresses
- Third block:- 10 addresses

Allocated total addresses:- 256
First address:- 14.24.74.0/24 Last address:- 14.24.74.255/24

First block:-
120 addresses => near 128 => 2^7 => (32 – 7) => 25 bit mask
First address:- 14.24.74.0/25 Last address:- 14.24.74.127/25

Second block:-
60 addresses => near 64 => 2^6 => (32 – 6) => 26 bit mask
First address:- 14.24.74.128/26 Last address:- 14.24.74.191/26

Third block:-
10 addresses => near 16 => 2^4 => (32 – 4) => 28 bit mask
First address:- 14.24.74.192/28 Last address:- 14.24.74.207/28



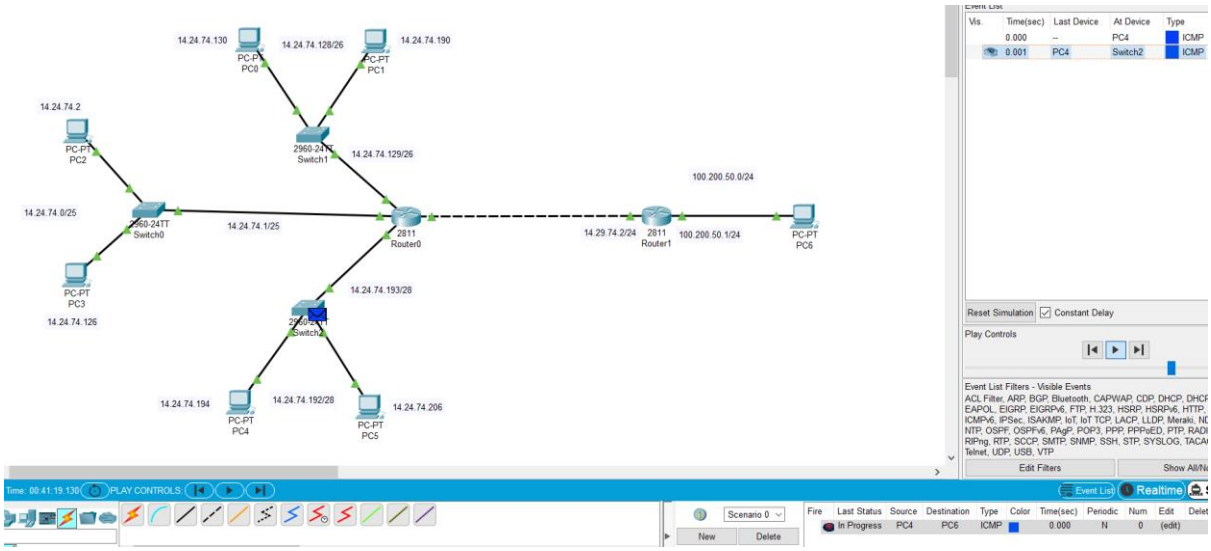
- Message transmission from pc4 to pc6:-

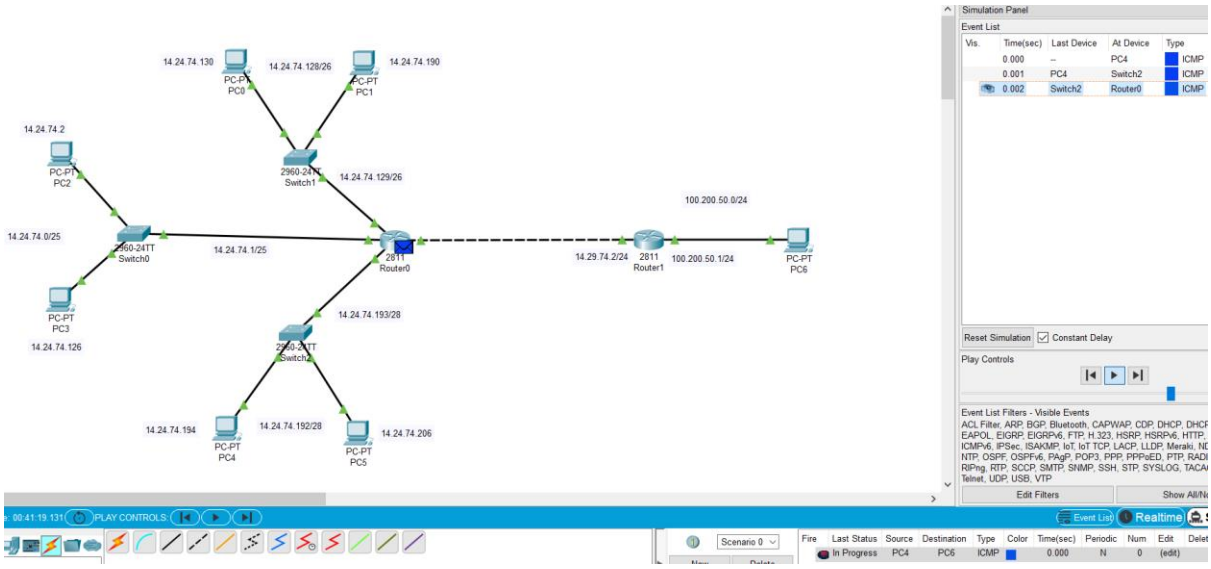
  Pc4 => swtch2 => router0 => router1 => pc6 => return pc4
  Routing table for router1 and router0 respectively:-

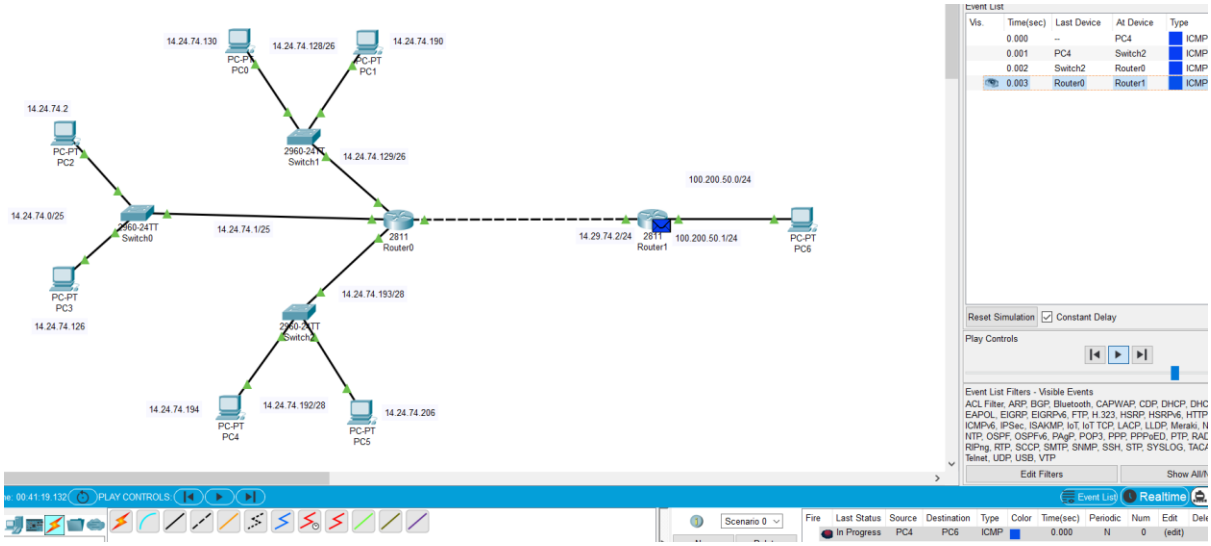
Interface	Network id	Mask	Next hop
1	14.24.74.0	255.255.255.128	14.29.74.1
2	14.24.74.128	255.255.255.192	14.29.74.1
3	14.24.74.192	255.255.255.240	14.29.74.1

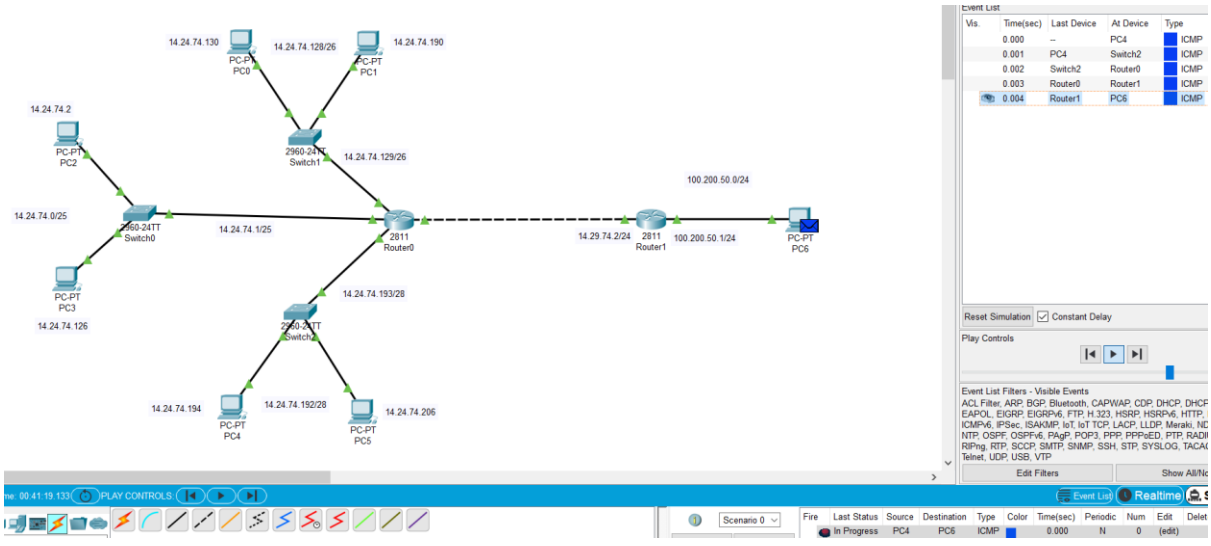
Router0:-

Interface	Network id	mask	Next hop
4	100.200.50.0	255.255.255.0	14.29.74.2






14.24.74.130
14.24.74.128/26
14.24.74.190
PC-PT PC0
PC-PT PC1
14.24.74.2
PC-PT PC2
2960-24TT Switch1
14.24.74.129/26
100.200.50.0/24
14.24.74.0/25
2960-24TT Switch0
14.24.74.1/25
2811 Router0
14.29.74.2/24
2811 Router1
100.200.50.1/24
PC-PT PC6
PC-PT PC3
14.24.74.126
14.24.74.193/28
2960-24TT Switch2
14.24.74.194
14.24.74.192/28
14.24.74.206
PC-PT PC4
PC-PT PC5
Event List
Vis. Time(sec) Last Device At Device Type
0.000 -- PC4 ICMP
0.001 PC4 Switch2 ICMP
0.002 Switch2 Router0 ICMP
0.003 Router0 Router1 ICMP
Reset Simulation
Constant Delay
Play Controls
Event List Filters - Visible Events
Edit Filters
Show All/N
PLAY CONTROLS:
Realtime
Scenario 0
Fire Last Status Source Destination Type Color Time(sec) Periodic Num Edit Dele
In Progress PC4 PC6 ICMP 0.000 N 0 (edit)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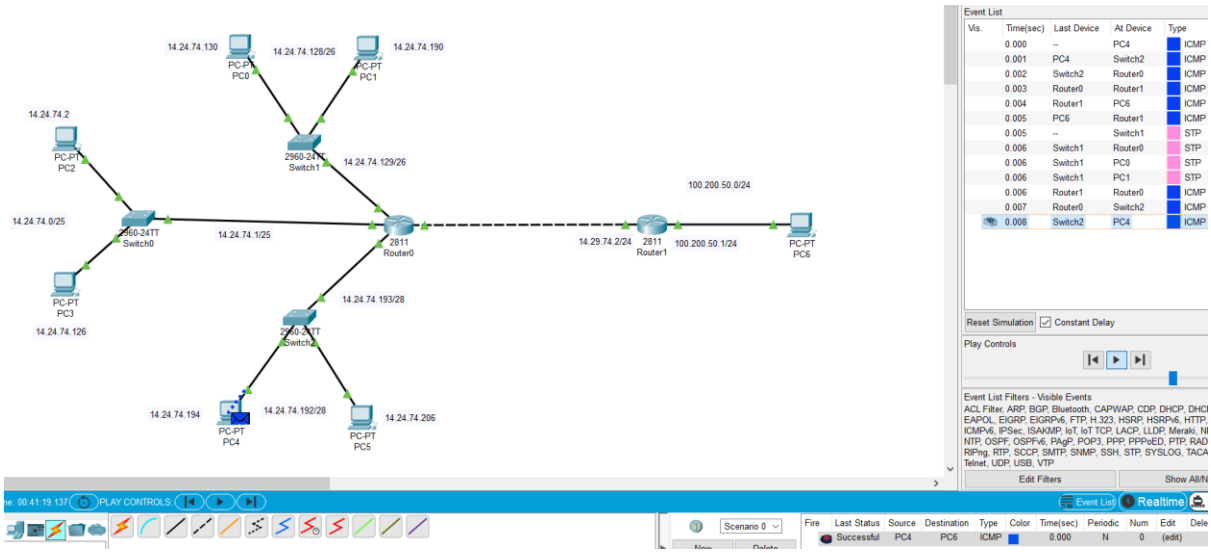
0.004 Router1 PC6 ICMP
Reset Simulation
Constant Delay
Play Controls
Event List Filters - Visible Events
Edit Filters
PLAY CONTROLS:
Realtime
Scenario 0
Fire Last Status Source Destination Type Color Time(sec) Periodic Num Edit Delet
In Progress PC4 PC6 ICMP 0.000 N 0 (edit)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14.24.74.190
PC-PT PC0
PC-PT PC1
14.24.74.2
PC-PT PC2
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14.24.74.129/26
100.200.50.0/24
14.24.74.0/25
2960-24TT Switch0
14.24.74.1/25
2811 Router0
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2811 Router1
100.200.50.1/24
PC-PT PC6
PC-PT PC3
14.24.74.126
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14.24.74.192/28
14.24.74.206
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PC-PT PC5
Event List
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0.000 -- PC4 ICMP
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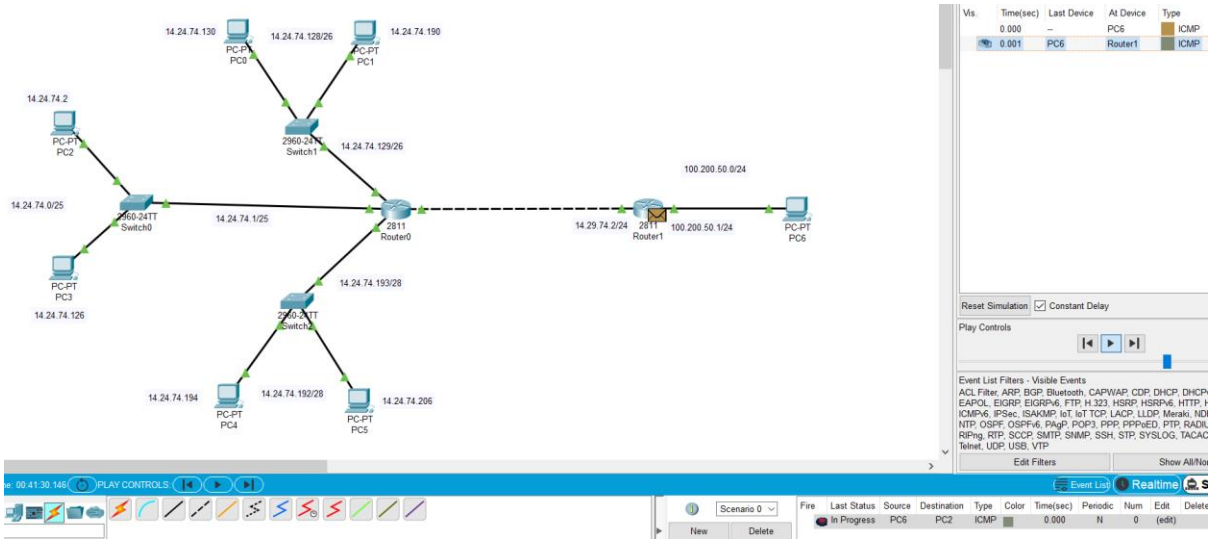
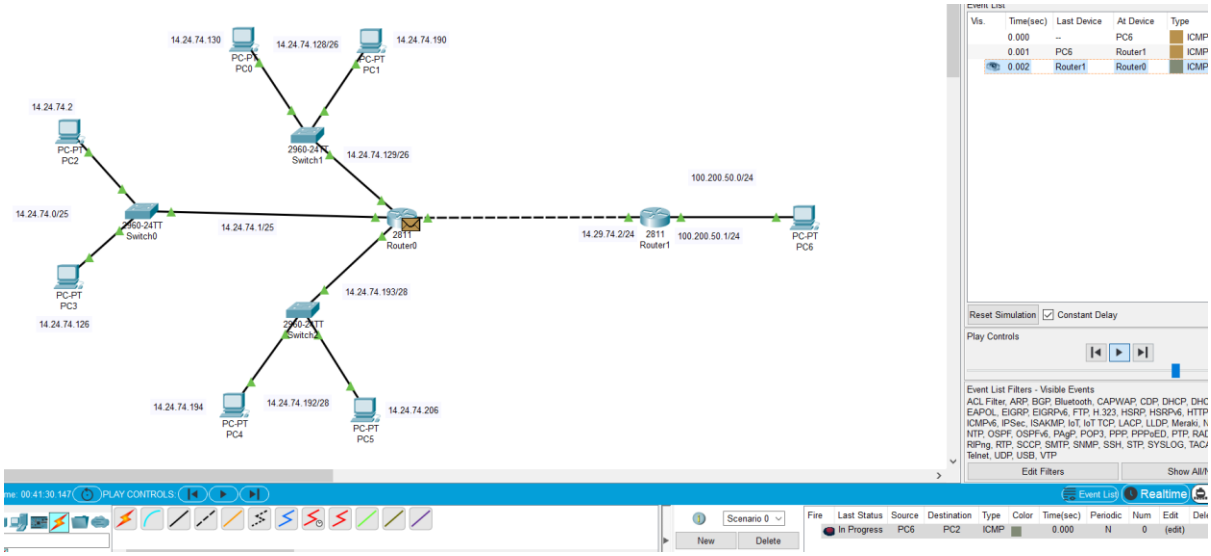
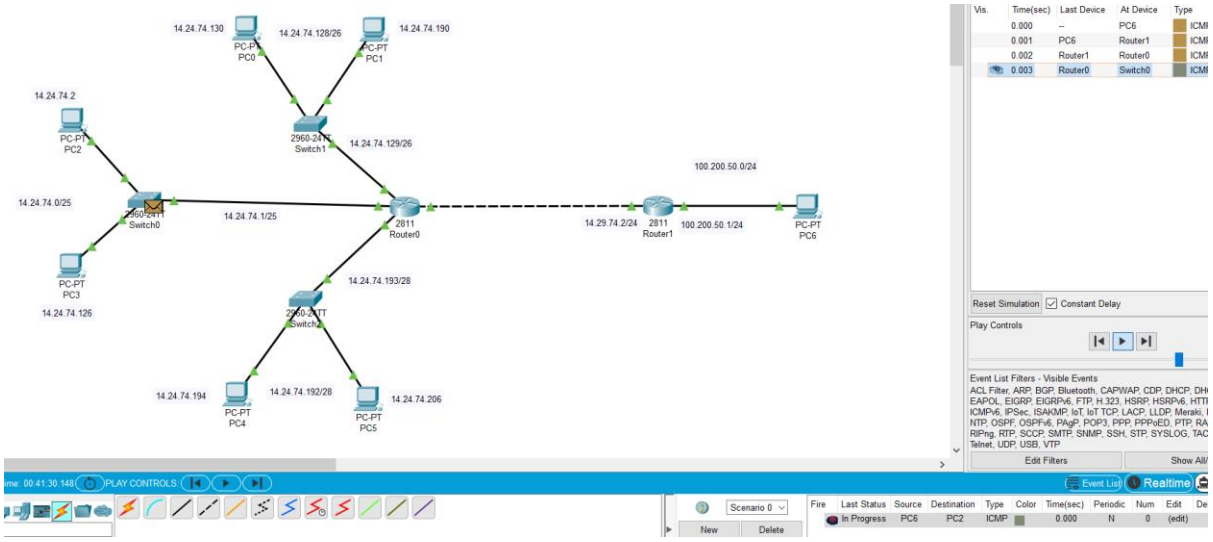
0.002 Switch2 Router0 ICMP
0.003 Router0 Router1 ICMP
0.004 Router1 PC6 ICMP
0.005 PC6 Router1 ICMP
0.005 -- Switch1 STP
0.006 Switch1 Router0 STP
0.006 Switch1 PC0 STP
0.006 Switch1 PC1 STP
0.006 Router1 Router0 ICMP
0.007 Router0 Switch2 ICMP
0.008 Switch2 PC4 ICMP
Reset Simulation
Constant Delay
Play Controls
Event List Filters - Visible Events
Edit Filters
PLAY CONTROLS:
Realtime
Scenario 0
Fire Last Status Source Destination Type Color Time(sec) Periodic Num Edit Dele
Successful PC4 PC6 ICMP 0.000 N 0 (edit)

- Message transmission from pc6 to pc2:-

  Pc6 to router1
  Router1 to router0
  Router0 to switch0
  Switch0 to pc2
  Return success



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14.24.74.0/25
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2811 Router1
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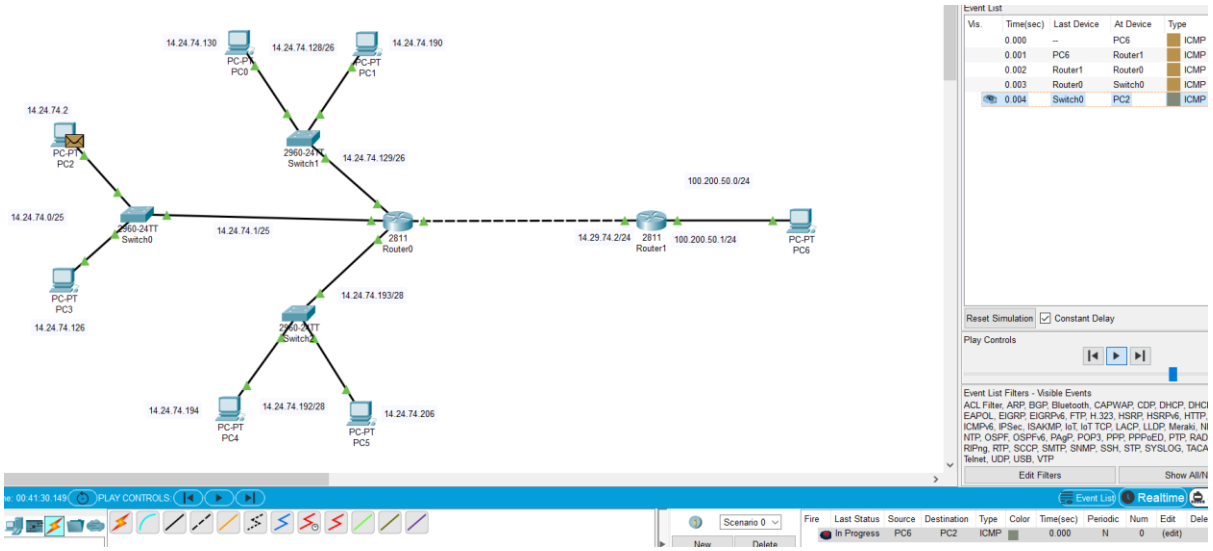
PC-PT PC6
PC-PT PC3
14.24.74.126
14.24.74.193/28
2960-24TT Switch2
14.24.74.194
14.24.74.192/28
14.24.74.206
PC-PT PC4
PC-PT PC5
Vis.
Time(sec)
Last Device
At Device
Type
0.000 -- PC6 ICMP
0.001 PC6 Router1 ICMP
0.002 Router1 Router0 ICMP
0.003 Router0 Switch0 ICMP
Reset Simulation
Constant Delay
Play Controls
Event List Filters - Visible Events
Edit Filters
Show All/
PLAY CONTROLS:
Event List
Realtime
Scenario 0
New
Delete
Fire
Last Status
Source
Destination
Type
Color
Time(sec)
Periodic
Num
Edit
In Progress PC6 PC2 ICMP 0.000 N 0 (edit)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14.24.74.190
PC-PT PC0
PC-PT PC1
14.24.74.2
PC-PT PC2
2960-24TT Switch1
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100.200.50.0/24
14.24.74.0/25
2960-24TT Switch0
14.24.74.1/25
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14.29.74.2/24
2811 Router1
100.200.50.1/24
PC-PT PC6
PC-PT PC3
14.24.74.126
14.24.74.193/28
2960-24TT Switch2
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14.24.74.192/28
14.24.74.206
PC-PT PC4
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Event List
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Time(sec)
Last Device
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Type
0.000 -- PC6 ICMP
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0.002 Router1 Router0 ICMP
0.003 Router0 Switch0 ICMP
0.004 Switch0 PC2 ICMP
Reset Simulation
Constant Delay
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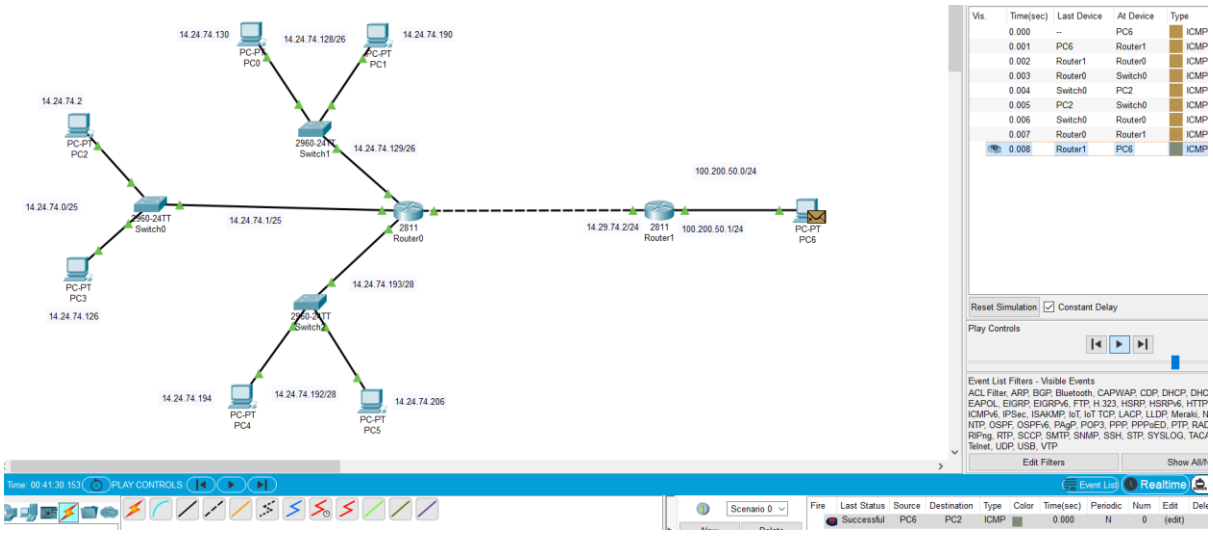
New
Delete
Fire
Last Status
Source
Destination
Type
Color
Time(sec)
Periodic
Num
Edit
In Progress PC6 PC2 ICMP 0.000 N 0 (edit)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14.24.74.2
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14.24.74.0/25
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PC-PT PC6
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PC-PT PC4
PC-PT PC5
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0.002 Router1 Router0 ICMP
0.003 Router0 Switch0 ICMP
0.004 Switch0 PC2 ICMP
0.005 PC2 Switch0 ICMP
0.006 Switch0 Router0 ICMP
0.007 Router0 Router1 ICMP
0.008 Router1 PC6 ICMP
Reset Simulation
Constant Delay
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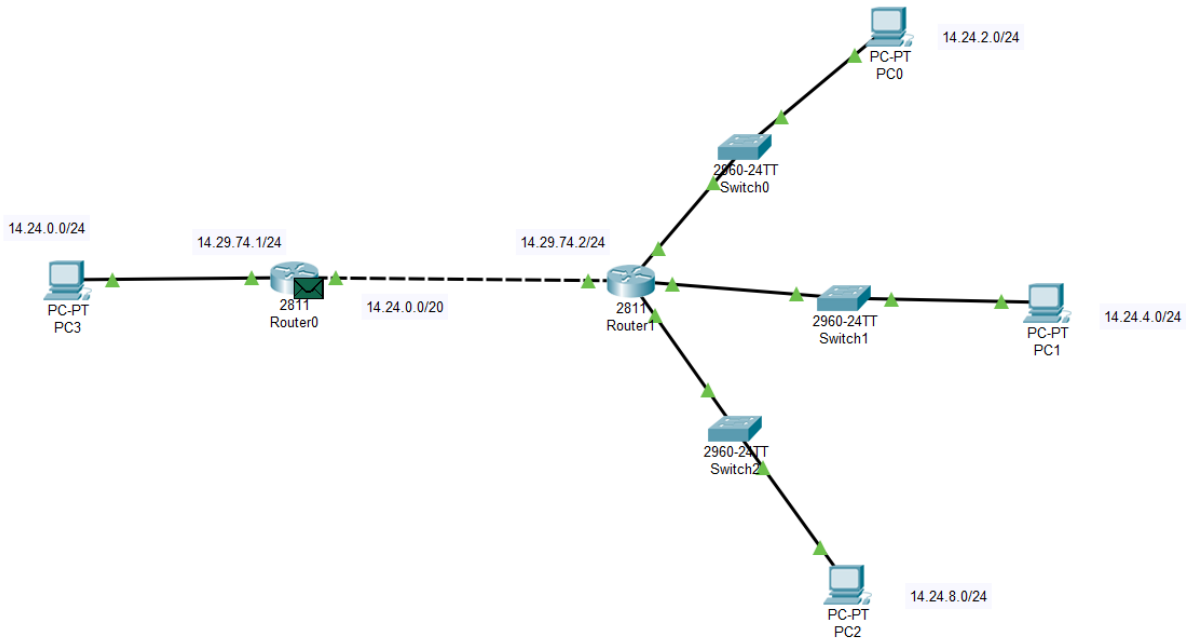
Event List Filters - Visible Events
Edit Filters
Show All/
PLAY CONTROLS:
Event List
Realtime
Scenario 0
Fire
Last Status
Source
Destination
Type
Color
Time(sec)
Periodic
Num
Edit
Successful PC6 PC2 ICMP 0.000 N 0 (edit)

- Task2:- Address Aggregation

Aggregation joins multiple IP prefixes into a single larger prefix to reduce routing table.



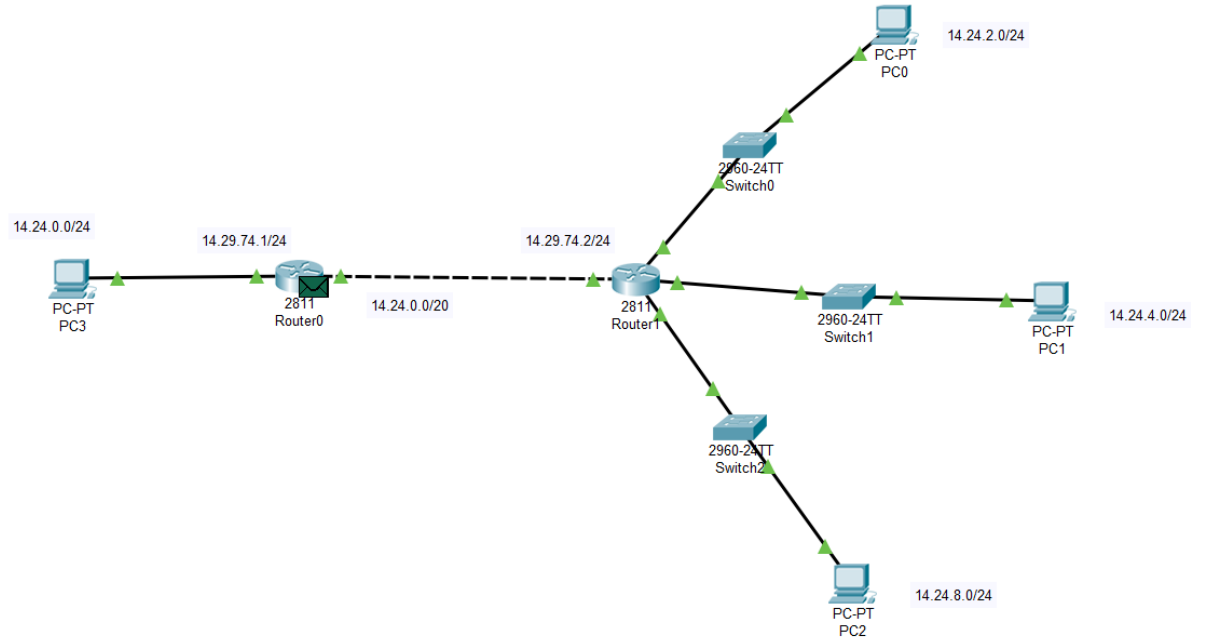
- Pc0:- IP 14.24.2.2/24, Pc1:- IP 14.24.4.4/24, Pc2:- IP 14.24.8.8/24
- In Pc0:- 14.24.00000010.2
- In Pc1:- 14.24.00000100.4
- In Pc2:- 14.24.00001000.8
- From the left side we can see that there are 8 + 8 + 4 => 20 bits common.
- So for the message transmission event from pc3 to pc0 or pc1 or pc2 there is 20 bit mask.
  255.255.240.0
  - if we perform '&' operation between pc0/1/2 ip and mask we get:-
  Entry point:- 14.24.0.0/20

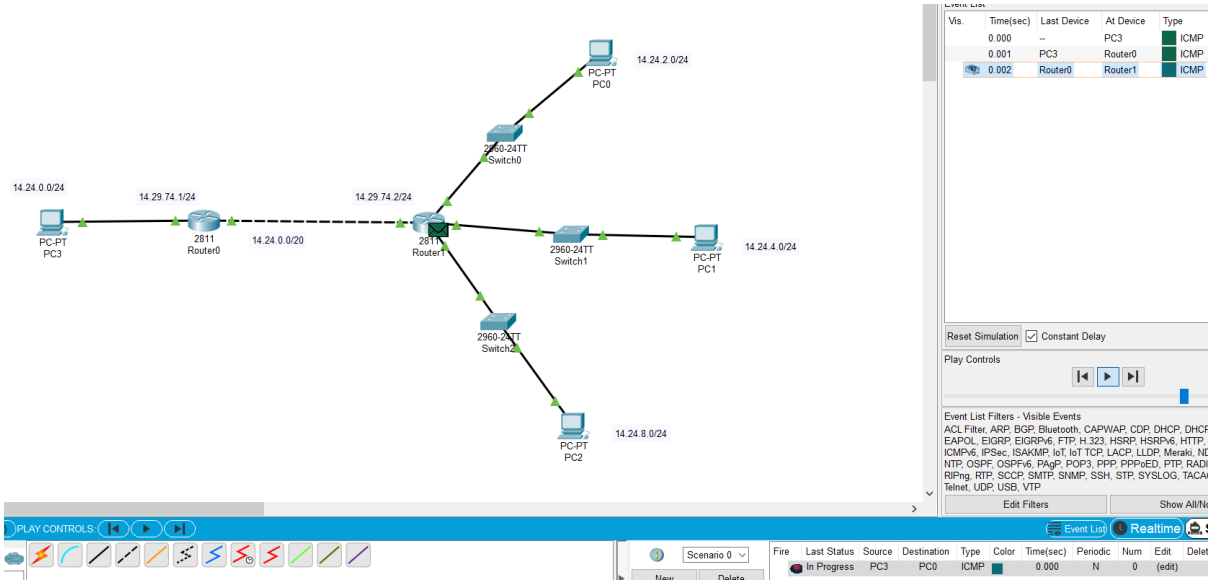
- Routing table for router0:-

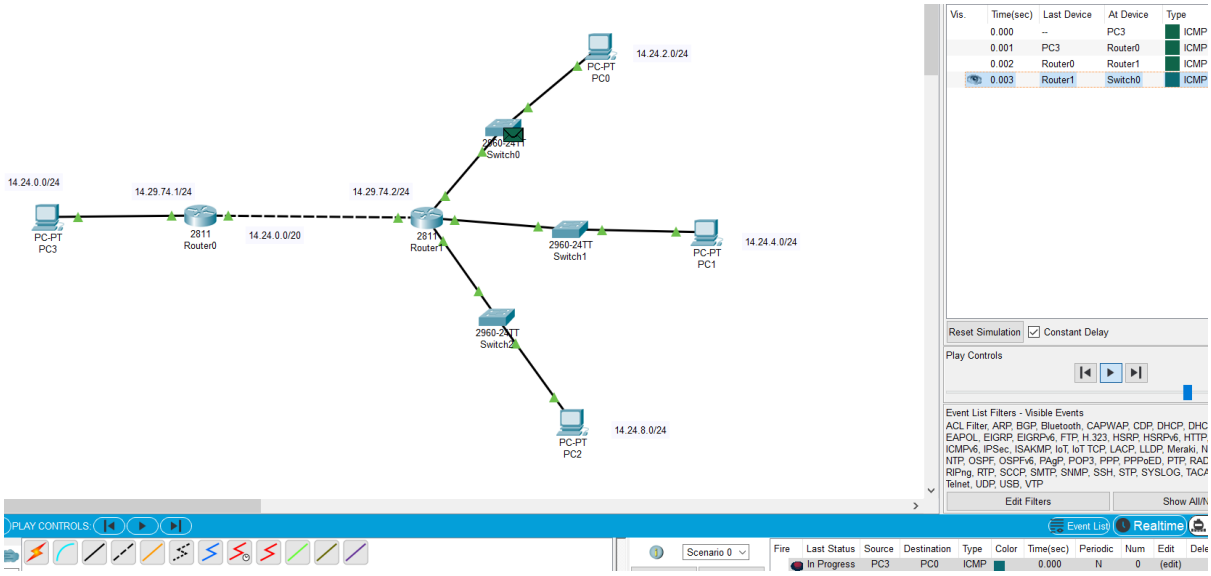
Interface	Network id	Mask	Next hop
-	14.24.0.0	255.255.240.0	14.29.74.2

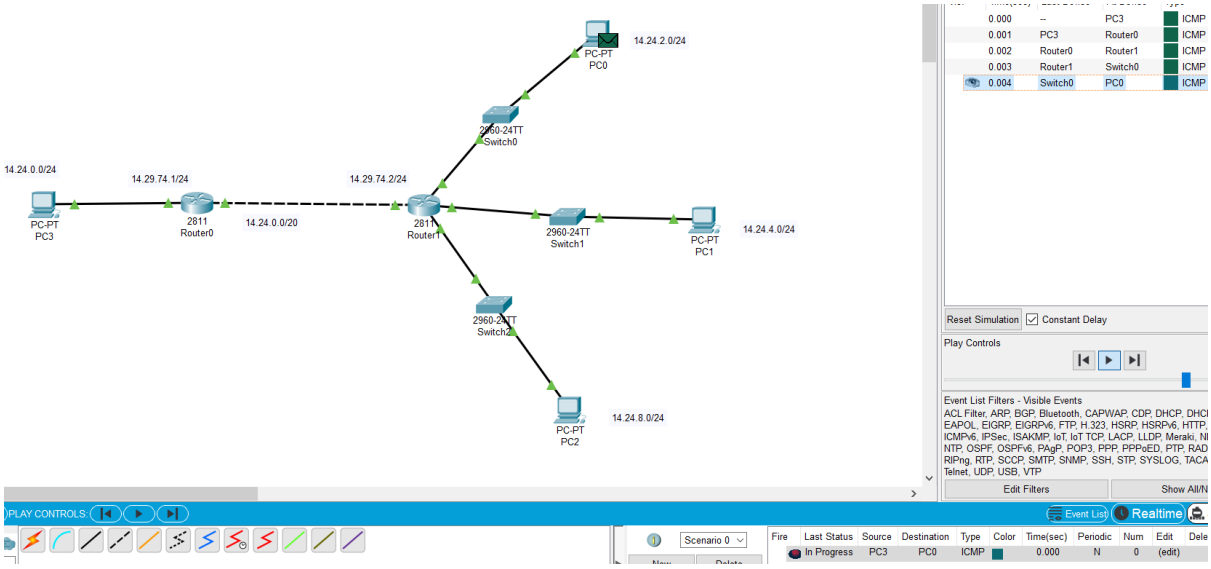
- Message transmission from pc3 to pc0:-

  Pc3 => router0 => router1 => swtch0 => pc0 => return success






14.24.2.0/24
PC-PT PC0
2960-24TT Switch0
14.24.0.0/24
14.29.74.1/24
14.29.74.2/24
PC-PT PC3
2811 Router0
14.24.0.0/20
2811 Router1
2960-24TT Switch1
PC-PT PC1
14.24.4.0/24
2960-24TT Switch2
PC-PT PC2
14.24.8.0/24
Vis. Time(sec) Last Device At Device Type
0.000 -- PC3 ICMP
0.001 PC3 Router0 ICMP
0.002 Router0 Router1 ICMP
0.003 Router1 Switch0 ICMP
Reset Simulation
Constant Delay
Play Controls
Event List Filters - Visible Events
Edit Filters
PLAY CONTROLS:
Event List
Realtime
Scenario 0
Fire Last Status Source Destination Type Color Time(sec) Periodic Num Edit
In Progress PC3 PC0 ICMP 0.000 N 0 (edit)


14.24.2.0/24
PC-PT PC0
2960-24TT Switch0
14.24.0.0/24
14.29.74.1/24
14.29.74.2/24
PC-PT PC3
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14.24.0.0/20
2811 Router1
2960-24TT Switch1
PC-PT PC1
14.24.4.0/24
2960-24TT Switch2
PC-PT PC2
14.24.8.0/24
0.000 -- PC3 ICMP
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Reset Simulation
Constant Delay
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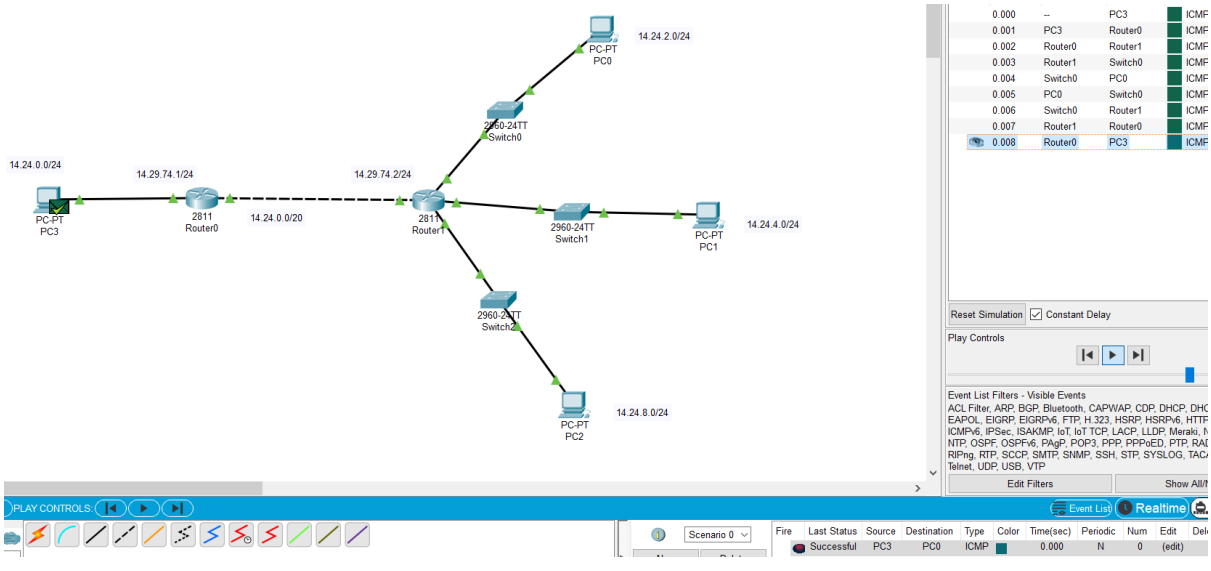
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Edit Filters
PLAY CONTROLS:
Event List
Realtime
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Fire Last Status Source Destination Type Color Time(sec) Periodic Num Edit
Successful PC3 PC0 ICMP 0.000 N 0 (edit)

- Task3:- Unsolved example 40 from chapter-5

Que:- A large number of consecutive IP address are available starting at 198.16.0.0. Suppose that four organizations, A, B, C, and D, request 4000, 2000, 4000, and 8000 addresses, respectively, and in that order. For each of these, give the first IP address assigned, the last IP address assigned, and the mask in the w.x.y.z/s notation.

Ans:-
Large consecutive IP address starting with 198.16.0.0
There are 4 organization:-
- A:- request 4000 addresses
- B:- request 2000 addresses
- C:- request 4000 addresses
- D:- request 8000 addresses

- **For A:-**
  Request 4000 addresses the round this number => 4096
  Take log base2 (4096) => 12
  So, 12 are host bits and remaining (32 – 12) => 20 bits are network bits
  So, from network bit subnet mask have 20 bits
  198.16.0.0/20

  IP of A / starting IP:-
  198.16.0.0 and mask:- 255.255.240.0

  11000110.00010000.0000 – 0000.00000000
  11111111.11111111.1111 – 0000.00000000

  12 bits of right hand side for host this bits are free to change so the last IP is => when they all last 12 bits are 1.

  11000110.00010000.0000 – 1111.11111111 => 198.16.15.255

  First IP:- 198.16.0.0, Last IP:- 198.16.15.255, 198.16.0.0/20

- **For B:-**
  Request 2000 addresses the round this number => 2048
  Take log base2 (2048) => 11
  So, 11 are host bits and remaining (32 – 11) => 21 bits are network bits
  So, from network bit subnet mask have 21 bits
  First IP of B should be bigger by al least 1 than last IP of A.

Last IP A:- 11000110.00010000.00001111.11111111
+ 1

First IP B:- 11000110.00010000.00010000.00000000 => 198.16.16.0

IP of B / starting IP:-
198.16.16.0 and mask:- 255.255.248.0

11000110.00010000.00010 - 000.00000000
11111111.11111111.11111 - 000.00000000

11 bits of right hand side for host this bits are free to change so the last IP is => when they all last 11 bits are 1.

11000110.00010000.00010 - 111.11111111 => 198.16.23.255

First IP:- 198.16.16.0, Last IP:- 198.16.23.255, 198.16.16.0/21

- **For C:-**
Request 4000 addresses the round this number => 4096
Take log base2 (4096) => 12
So, 12 are host bits and remaining (32 – 12) => 20 bits are network bits
So, from network bit subnet mask have 20 bits
First IP of C should be bigger by al least 1 than last IP of B.

Last IP B:- 11000110.00010000.00010111.11111111
+ 1

11000110.00010000.00011000.00000000

Apply 20 bit mask:-
11000110.00010000.0001 - 1000.00000000
11111111.11111111.1111 - 0000.00000000

There is a problem we have 1 in out host bit. There for we can not use all 12 bit but can use only 11 bits => 2048 addresses. If we turn 1 into 0 then we collide with ip address which is provided to organization B.
So, push 1 into the network side by incrementing.

n/w ID:- 11000110.00010000.0001
+ 1

11000110.00010000.0010

First IP of C:- 11000110.00010000.00100000.00000000 => 198.16.32.0

12 bits of right hand side for host this bits are free to change so the last IP is => when they all last 12 bits are 1.

11000110.00010000.0010 - 1111.11111111 => 198.16.47.255

First IP:- 198.16.32.0, Last IP:- 198.16.47.255, 198.16.32.0/20

- **For D:-**
  Request 8000 addresses the round this number => 8192
  Take log base2 (8192) => 13
  So, 13 are host bits and remaining (32 – 13) => 19 bits are network bits
  So, from network bit subnet mask have 19 bits
  First IP of D should be bigger by al least 1 than last IP of C.

  Last IP C:- 11000110.00010000.00101111.11111111
  + 1

  11000110.00010000.00110000.00000000

  Apply 19 bit mask
  11000110.00010000.001 - 10000.00000000
  11111111.11111111.111 - 00000.00000000

  There is a problem we have 1 in out host bit. There for we can not use all 13 bit but can use only 12 bits => 4096 addresses. If we turn 1 into 0 then we collide with ip address which is provided to organization C.
  So, push 1 into the network side by incrementing.

  n/w ID:- 11000110.00010000.001
  + 1

  11000110.00010000.010
  First IP of D:- 11000110.00010000.01000000.00000000 => 198.16.64.0

  13 bits of right hand side for host this bits are free to change so the last IP is => when they all last 13 bits are 1.

  11000110.00010000.010 - 11111.11111111 => 198.16.95.255

  First IP:- 198.16.64.0, Last IP:- 198.16.95.255, 198.16.64.0/19