**THE UNIVERSITY OF DODOMA**

**COLLEGE OF INFORMATICS AND VIRTUAL EDUCATION**

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**CN 211: NETWORKING PROTOCAL**

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IP address ---------- LAN

IP address --------- WAN

Available = 172.168.0.0/16

1. L2 (5000 Hosts)

-2= 8190 hosts

= 8 subnets

Mask = 255.255.224.0/19

Less Net Size of L2 172.168.0.0/19

**VLSM**

SubNo SubId Mask Hosts Net

0 172.168.0.0 /19 8190 L2

1 172.168.32.0 /19 8190 unused

2 **172.168.0.0** /19 8190 unused

1. L1 (4000 Hosts)

-2= 4094 hosts

= 16 subnets

Mask = 255.255.240.0/20

Less Net Size of L2 172.168.8.0/20

**VLSM**

SubNo SubId Mask Hosts Net

0 172.168.0.0 /19 8190 L2

1 172.168.32.0 /20 4094 L1

2 172.168.48.0 /20 4094 unused

3 172.168.96.0 /19 8190 unused

1. L3 (2000 Hosts)

-2= 2046 hosts

= 32 subnets

Mask = 255.255.248.0/21

Less Net Size of L2 172.168.8.0/21

**VLSM**

SubNo SubId Mask Hosts Net

0 172.168.0.0 /19 8190 L2

1 172.168.32.0 /20 4094 L1

2 172.168.48.0 /21 2046 L3

3 172.168.56.0 /21 2046 unused

4 172.168.0.0 /19 8190 unused

1. L4 (500 Hosts)

-2= 510 hosts

= 64 subnets

Mask = 255.255.252.0/23

Less Net Size of L2 172.168.56.0/23

**VLSM**

SubNo SubId Mask Hosts Net

0 172.168.0.0 /19 8190 L2

1 172.168.32.0 /20 4094 L1

2 172.168.48.0 /21 2046 L3

3 172.168.56.0 /22 510 L4

4 172.168.60.0 /22 510 unused

5 172.168.120.0 /22 510 unused

1. L4 (50 Hosts)

-2= 62 hosts

= 1024 subnets

Mask = 255.255.252.192/26

Less Net Size of L2 172.168.56.0/22

**VLSM**

SubNo SubId Mask Hosts Net

0 172.168.0.0 /19 8190 L2

1 172.168.32.0 /20 4094 L1

2 172.168.48.0 /21 2046 L3

3 172.168.56.0 /22 510 L4

4 172.168.60.0 /26 62 L5

5 172.168.60.64 /26 62 L6

6 172.168.60.128 /26 62 L7

7 172.168.60.192 /26 62 L8

8 172.168.61.0 /26 62 L9

**WAN LINKS**

192.46.100.0/29

All host = 32 – 29 = 3 bits

= 8 – 2 = 6 hosts

Subnets = = 32 subnets

ID Mask Hosts Net

192.46.100.0 /29 6 W1

192.46.100.8 /29 6 W2

192.46.100.16 /29 6 W3

192.46.100.24 /29 6 W4

**Reserved**

192.46.100.32 /29 6 W5

192.46.100.40 /29 6 W6

192.46.100.48 /29 6 W7

192.46.100.56 /29 6 W8

**Router Configuration**

**UDOM router**

!

version 12.2

no service timestamps log datetime msec

no service timestamps debug datetime msec

no service password-encryption

!

hostname Router

!

!

!

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!

ip cef

no ipv6 cef

!

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!

interface FastEthernet0/0

ip address 172.168.57.0 255.255.252.0

duplex auto

speed auto

!

interface FastEthernet1/0

ip address 172.168.49.0 255.255.248.0

duplex auto

speed auto

!

interface Serial2/0

ip address 192.168.100.2 255.255.255.248

!

interface Serial3/0

no ip address

encapsulation frame-relay

!

interface Serial3/0.101 point-to-point

ip address 192.168.100.49 255.255.255.248

frame-relay interface-dlci 101

!

interface Serial3/0.102 point-to-point

ip address 192.168.100.57 255.255.255.248

frame-relay interface-dlci 102

!

interface FastEthernet4/0

no ip address

shutdown

!

interface FastEthernet5/0

no ip address

shutdown

!

ip classless

ip route 172.168.32.0 255.255.240.0 192.168.100.1

ip route 172.168.0.0 255.255.224.0 192.168.100.1

ip route 172.168.120.160 255.255.255.224 192.168.100.50

ip route 192.168.100.24 255.255.255.248 192.168.100.50

ip route 172.168.61.128 255.255.255.192 192.168.100.26

ip route 172.168.61.192 255.255.255.192 192.168.100.26

ip route 172.168.60.64 255.255.255.192 192.168.100.50

ip route 192.168.100.40 255.255.255.248 192.168.100.50

ip route 192.168.100.16 255.255.255.248 192.168.100.41

ip route 172.168.61.64 255.255.255.192 192.168.100.18

ip route 172.168.120.224 255.255.255.224 192.168.100.41

ip route 172.168.62.0 255.255.255.192 192.168.100.41

ip route 172.168.120.128 255.255.255.224 192.168.100.58

ip route 172.168.60.192 255.255.255.192 192.168.100.58

ip route 192.168.100.8 255.255.255.248 192.168.100.58

ip route 172.168.61.0 255.255.255.192 192.168.100.9

ip route 172.168.60.128 255.255.255.192 192.168.100.9

ip route 172.168.62.64 255.255.255.192 192.168.100.18

!

ip flow-export version 9

!

!

!

no cdp run

!

!

!

!

!

!

line con 0

!

line aux 0

!

line vty 0 4

login

!

!

!

End

**U-R1 ROUTER**

!

version 12.2

no service timestamps log datetime msec

no service timestamps debug datetime msec

no service password-encryption

!

hostname Router

!

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!

!

!

!

!

ip cef

no ipv6 cef

!

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!

interface FastEthernet0/0

ip address 172.168.33.0 255.255.240.0

duplex auto

speed auto

!

interface FastEthernet1/0

ip address 172.168.1.0 255.255.224.0

duplex auto

speed auto

!

interface Serial2/0

ip address 192.168.100.1 255.255.255.248

clock rate 2000000

!

interface Serial3/0

no ip address

clock rate 2000000

shutdown

!

interface FastEthernet4/0

no ip address

shutdown

!

interface FastEthernet5/0

no ip address

shutdown

!

ip classless

ip route 172.168.56.0 255.255.252.0 192.168.100.2

ip route 172.168.48.0 255.255.248.0 192.168.100.2

ip route 192.168.100.48 255.255.255.248 192.168.100.2

ip route 172.168.60.64 255.255.255.192 192.168.100.50

ip route 172.168.120.160 255.255.255.224 192.168.100.50

ip route 192.168.100.24 255.255.255.248 192.168.100.50

ip route 172.168.61.128 255.255.255.192 192.168.100.26

ip route 172.168.61.192 255.255.255.192 192.168.100.26

ip route 192.168.100.40 255.255.255.248 192.168.100.50

ip route 172.168.60.64 255.255.255.192 192.168.100.41

ip route 192.168.100.16 255.255.255.248 192.168.100.41

ip route 172.168.120.224 255.255.255.224 192.168.100.41

ip route 192.168.100.56 255.255.255.248 192.168.100.2

ip route 172.168.120.128 255.255.255.224 192.168.100.58

ip route 192.168.100.8 255.255.255.248 192.168.100.58

ip route 172.168.60.192 255.255.255.192 192.168.100.58

ip route 172.168.61.0 255.255.255.192 192.168.100.9

ip route 172.168.60.128 255.255.255.192 192.168.100.9

ip route 172.168.62.64 255.255.255.192 192.168.100.18

ip route 172.168.61.64 255.255.255.192 192.168.100.18

!

ip flow-export version 9

!

!

!

no cdp run

!

!

!

!

!

!

line con 0

!

line aux 0

!

line vty 0 4

login

!

!

!

End

**CBE ROUTER**

!

version 12.2

no service timestamps log datetime msec

no service timestamps debug datetime msec

no service password-encryption

!

hostname Router

!

!

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!

!

ip cef

no ipv6 cef

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!

interface FastEthernet0/0

ip address 172.168.62.1 255.255.255.192

duplex auto

speed auto

!

interface FastEthernet1/0

ip address 172.168.120.225 255.255.255.224

duplex auto

speed auto

!

interface Serial2/0

ip address 192.168.100.17 255.255.255.248

!

interface Serial3/0

no ip address

encapsulation frame-relay

!

interface Serial3/0.301 point-to-point

ip address 192.168.100.41 255.255.255.248

frame-relay interface-dlci 301

!

interface Serial3/0.302 point-to-point

ip address 192.168.100.34 255.255.255.248

frame-relay interface-dlci 302

!

interface FastEthernet4/0

no ip address

shutdown

!

interface FastEthernet5/0

no ip address

shutdown

!

ip classless

ip route 172.168.61.64 255.255.255.192 192.168.100.18

ip route 172.168.120.128 255.255.255.224 192.168.100.33

ip route 172.168.60.192 255.255.255.192 192.168.100.33

ip route 192.168.100.8 255.255.255.248 192.168.100.33

ip route 172.168.61.0 255.255.255.192 192.168.100.9

ip route 172.168.60.128 255.255.255.192 192.168.100.9

ip route 192.168.100.48 255.255.255.248 192.168.100.42

ip route 172.168.56.0 255.255.252.0 192.168.100.49

ip route 172.168.48.0 255.255.248.0 192.168.100.49

ip route 192.168.100.0 255.255.255.248 192.168.100.49

ip route 172.168.0.0 255.255.224.0 192.168.100.1

ip route 172.168.32.0 255.255.240.0 192.168.100.1

ip route 172.168.60.64 255.255.255.192 192.168.100.42

ip route 172.168.120.160 255.255.255.224 192.168.100.42

ip route 192.168.100.24 255.255.255.248 192.168.100.42

ip route 172.168.61.192 255.255.255.192 192.168.100.26

ip route 172.168.61.128 255.255.255.192 192.168.100.26

ip route 172.168.62.64 255.255.255.192 192.168.100.18

!

ip flow-export version 9

!

!

!

no cdp run

!

!

!

!

!

!

line con 0

!

line aux 0

!

line vty 0 4

login

!

!

!

End

**C-R1 ROUTER**

!

version 12.2

no service timestamps log datetime msec

no service timestamps debug datetime msec

no service password-encryption

!

hostname Router

!

!

!

!

!

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!

!

ip cef

no ipv6 cef

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!

interface FastEthernet0/0

ip address 172.168.62.65 255.255.255.192

duplex auto

speed auto

!

interface FastEthernet1/0

ip address 172.168.61.65 255.255.255.192

duplex auto

speed auto

!

interface Serial2/0

ip address 192.168.100.18 255.255.255.248

clock rate 2000000

!

interface Serial3/0

no ip address

clock rate 2000000

shutdown

!

interface FastEthernet4/0

no ip address

shutdown

!

interface FastEthernet5/0

no ip address

shutdown

!

ip classless

ip route 192.168.100.40 255.255.255.248 192.168.100.17

ip route 172.168.120.160 255.255.255.224 192.168.100.42

ip route 172.168.60.64 255.255.255.192 192.168.100.42

ip route 192.168.100.24 255.255.255.248 192.168.100.42

ip route 172.168.61.192 255.255.255.192 192.168.100.26

ip route 172.168.61.128 255.255.255.192 192.168.100.26

ip route 172.168.120.224 255.255.255.224 192.168.100.17

ip route 192.168.100.32 255.255.255.248 192.168.100.17

ip route 172.168.120.128 255.255.255.224 192.168.100.33

ip route 192.168.100.8 255.255.255.248 192.168.100.33

ip route 172.168.60.192 255.255.255.192 192.168.100.33

ip route 172.168.61.0 255.255.255.192 192.168.100.9

ip route 172.168.60.128 255.255.255.192 192.168.100.9

ip route 172.168.62.0 255.255.255.192 192.168.100.17

ip route 172.168.60.192 255.255.255.192 192.168.100.17

ip route 192.168.100.48 255.255.255.248 192.168.100.42

ip route 172.168.56.0 255.255.252.0 192.168.100.49

ip route 172.168.48.0 255.255.248.0 192.168.100.49

ip route 192.168.100.0 255.255.255.248 192.168.100.49

ip route 172.168.32.0 255.255.240.0 192.168.100.1

ip route 172.168.0.0 255.255.224.0 192.168.100.1

!

ip flow-export version 9

!

!

!

no cdp run

!

!

!

!

!

!

line con 0

!

line aux 0

!

line vty 0 4

login

!

!

!

end

**BUNGE ROUTER**

!

version 12.2

no service timestamps log datetime msec

no service timestamps debug datetime msec

no service password-encryption

!

hostname Router

!

!

!

!

!

!

!

!

ip cef

no ipv6 cef

!

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!

interface FastEthernet0/0

ip address 172.168.120.161 255.255.255.224

duplex auto

speed auto

!

interface FastEthernet1/0

ip address 172.168.60.65 255.255.255.192

duplex auto

speed auto

!

interface Serial2/0

ip address 192.168.100.25 255.255.255.248

!

interface Serial3/0

no ip address

encapsulation frame-relay

!

interface Serial3/0.201 point-to-point

ip address 192.168.100.50 255.255.255.248

frame-relay interface-dlci 201

!

interface Serial3/0.202 point-to-point

ip address 192.168.100.42 255.255.255.248

frame-relay interface-dlci 202

!

interface FastEthernet4/0

no ip address

shutdown

!

interface FastEthernet5/0

no ip address

shutdown

!

ip classless

ip route 172.168.61.128 255.255.255.192 192.168.100.26

ip route 172.168.61.192 255.255.255.192 192.168.100.26

ip route 172.168.56.0 255.255.252.0 192.168.100.49

ip route 172.168.48.0 255.255.248.0 192.168.100.49

ip route 192.168.100.0 255.255.255.248 192.168.100.49

ip route 172.168.0.0 255.255.224.0 192.168.100.1

ip route 172.168.32.0 255.255.240.0 192.168.100.1

ip route 192.168.100.16 255.255.255.248 192.168.100.41

ip route 172.168.61.64 255.255.255.192 192.168.100.18

ip route 172.168.120.224 255.255.255.224 192.168.100.41

ip route 172.168.62.0 255.255.255.192 192.168.100.41

ip route 192.168.100.56 255.255.255.248 192.168.100.49

ip route 172.168.120.128 255.255.255.224 192.168.100.58

ip route 172.168.60.192 255.255.255.192 192.168.100.58

ip route 192.168.100.8 255.255.255.248 192.168.100.58

ip route 172.168.61.0 255.255.255.192 192.168.100.9

ip route 172.168.60.128 255.255.255.192 192.168.100.9

ip route 172.168.62.64 255.255.255.192 192.168.100.18

!

ip flow-export version 9

!

!

!

no cdp run

!

!

!

!

!

!

line con 0

!

line aux 0

!

line vty 0 4

login

!

!

!

end

**B-R1**

!

version 12.2

no service timestamps log datetime msec

no service timestamps debug datetime msec

no service password-encryption

!

hostname Router

!

!

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ip cef

no ipv6 cef

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!

interface FastEthernet0/0

ip address 172.168.61.129 255.255.255.192

duplex auto

speed auto

!

interface FastEthernet1/0

ip address 172.168.61.193 255.255.255.192

duplex auto

speed auto

!

interface Serial2/0

ip address 192.168.100.26 255.255.255.248

clock rate 2000000

!

interface Serial3/0

no ip address

clock rate 2000000

shutdown

!

interface FastEthernet4/0

no ip address

shutdown

!

interface FastEthernet5/0

no ip address

shutdown

!

ip classless

ip route 172.168.120.160 255.255.255.224 192.168.100.25

ip route 172.168.60.64 255.255.255.192 192.168.100.25

ip route 192.168.100.48 255.255.255.248 192.168.100.25

ip route 172.168.48.0 255.255.248.0 192.168.100.49

ip route 172.168.56.0 255.255.252.0 192.168.100.49

ip route 192.168.100.0 255.255.255.248 192.168.100.49

ip route 172.168.32.0 255.255.240.0 192.168.100.1

ip route 172.168.0.0 255.255.224.0 192.168.100.1

ip route 192.168.100.40 255.255.255.248 192.168.100.25

ip route 192.168.100.16 255.255.255.248 192.168.100.41

ip route 172.168.61.64 255.255.255.192 192.168.100.18

ip route 172.168.120.224 255.255.255.224 192.168.100.41

ip route 192.168.100.56 255.255.255.248 192.168.100.49

ip route 172.168.120.128 255.255.255.224 192.168.100.58

ip route 172.168.60.192 255.255.255.192 192.168.100.58

ip route 192.168.100.8 255.255.255.248 192.168.100.58

ip route 172.168.61.0 255.255.255.192 192.168.100.9

ip route 172.168.60.128 255.255.255.192 192.168.100.9

ip route 172.168.62.64 255.255.255.192 192.168.100.18

ip route 172.168.62.0 255.255.255.192 192.168.100.41

!

ip flow-export version 9

!

!

!

no cdp run

!

!

!

!

!

!

line con 0

!

line aux 0

!

line vty 0 4

login

!

!

!

end

**MIPANGO ROUTER**

!

version 12.2

no service timestamps log datetime msec

no service timestamps debug datetime msec

no service password-encryption

!

hostname Router

!

!

!

!

!

!

!

!

ip cef

no ipv6 cef

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!

interface FastEthernet0/0

ip address 172.168.60.193 255.255.255.192

duplex auto

speed auto

!

interface FastEthernet1/0

ip address 172.168.120.129 255.255.255.224

duplex auto

speed auto

!

interface Serial2/0

ip address 192.168.100.10 255.255.255.248

!

interface Serial3/0

no ip address

encapsulation frame-relay

clock rate 2000000

!

interface Serial3/0.203 point-to-point

ip address 192.168.100.33 255.255.255.248

frame-relay interface-dlci 203

!

interface Serial3/0.210 point-to-point

ip address 192.168.100.58 255.255.255.248

frame-relay interface-dlci 210

!

interface FastEthernet4/0

no ip address

shutdown

!

interface FastEthernet5/0

no ip address

shutdown

!

ip classless

ip route 172.168.60.128 255.255.255.192 192.168.100.9

ip route 172.168.61.0 255.255.255.192 192.168.100.9

ip route 192.168.100.16 255.255.255.248 192.168.100.34

ip route 172.168.61.64 255.255.255.192 192.168.100.18

ip route 172.168.120.224 255.255.255.224 192.168.100.34

ip route 172.168.62.0 255.255.255.192 192.168.100.34

ip route 172.168.56.0 255.255.252.0 192.168.100.57

ip route 172.168.48.0 255.255.248.0 192.168.100.57

ip route 192.168.100.0 255.255.255.248 192.168.100.57

ip route 172.168.0.0 255.255.224.0 192.168.100.1

ip route 172.168.32.0 255.255.240.0 192.168.100.1

ip route 192.168.100.48 255.255.255.248 192.168.100.57

ip route 172.168.60.64 255.255.255.192 192.168.100.50

ip route 172.168.120.160 255.255.255.224 192.168.100.50

ip route 192.168.100.24 255.255.255.248 192.168.100.50

ip route 172.168.61.192 255.255.255.192 192.168.100.26

ip route 172.168.61.128 255.255.255.192 192.168.100.26

ip route 172.168.62.64 255.255.255.192 192.168.100.18

!

ip flow-export version 9

!

!

!

!

!

!

!

!

line con 0

!

line aux 0

!

line vty 0 4

login

!

!

!

end

**M-R1 ROUTER**

!

version 12.2

no service timestamps log datetime msec

no service timestamps debug datetime msec

no service password-encryption

!

hostname Router

!

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!

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!

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ip cef

no ipv6 cef

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!

interface FastEthernet0/0

ip address 172.168.60.129 255.255.255.192

duplex auto

speed auto

!

interface FastEthernet1/0

ip address 172.168.61.1 255.255.255.192

duplex auto

speed auto

!

interface Serial2/0

ip address 192.168.100.9 255.255.255.248

clock rate 2000000

!

interface Serial3/0

no ip address

clock rate 2000000

shutdown

!

interface FastEthernet4/0

no ip address

shutdown

!

interface FastEthernet5/0

no ip address

shutdown

!

ip classless

ip route 172.168.60.192 255.255.255.192 192.168.100.10

ip route 172.168.120.128 255.255.255.224 192.168.100.10

ip route 192.168.100.32 255.255.255.248 192.168.100.10

ip route 192.168.100.16 255.255.255.248 192.168.100.34

ip route 172.168.61.64 255.255.255.192 192.168.100.18

ip route 172.168.120.224 255.255.255.224 192.168.100.34

ip route 172.168.62.0 255.255.255.192 192.168.100.34

ip route 192.168.100.56 255.255.255.248 192.168.100.10

ip route 172.168.56.0 255.255.252.0 192.168.100.57

ip route 172.168.48.0 255.255.248.0 192.168.100.57

ip route 192.168.100.0 255.255.255.248 192.168.100.57

ip route 172.168.32.0 255.255.240.0 192.168.100.1

ip route 172.168.0.0 255.255.224.0 192.168.100.1

ip route 192.168.100.48 255.255.255.248 192.168.100.57

ip route 172.168.120.160 255.255.255.224 192.168.100.50

ip route 172.168.60.64 255.255.255.192 192.168.100.50

ip route 192.168.100.24 255.255.255.248 192.168.100.50

ip route 172.168.61.192 255.255.255.192 192.168.100.26

ip route 172.168.61.128 255.255.255.192 192.168.100.26

ip route 172.168.62.64 255.255.255.192 192.168.100.18

!

ip flow-export version 9

!

!

!

!

!

!

!

!

line con 0

!

line aux 0

!

line vty 0 4

login

!

!

!

end