THE UNIVERSITY OF DODOMA

COLLEGE OF INFORMATICS AND VIRTUAL EDUCATION

CN 211: NETWORKING PROTOCAL

NAME	REG NO	COURSE
FREDRICK BRIGHTON	T/UDOM/2020/06791	**BCS-CS**
EMMANUEL L MUNISHI	T/UDOM/2020/07070	**BCS - CS**
EMMANUEL SANGALE	T/UDOM/2020/09476	**BCS - CS**
ANUARI IDDI ISSA	T/UDOM/2020/00345	**BCS-CE**

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

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

Available = 172.168.0.0/16

1) L2 (5000 Hosts)

$2^{13}-2$ = 8190 hosts

2^3 = 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

2) L1 (4000 Hosts)

$2^{12}-2$ = 4094 hosts

2^4 = 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

3) L3 (2000 Hosts)

$2^{11}-2=2046$ hosts

$2^5=32$ 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

4) L4 (500 Hosts)

$2^9-2=510$ hosts

$2^6=64$ 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 |

5)   L4 (50 Hosts)

2^6-2= 62 hosts

2^{10}= 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

2^3 = 8 – 2 = 6 hosts

Subnets = 2^5 = 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

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

!

!

!

!

!

!

!

!

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

!

!

!

!

!

!

!

!

ip cef

no ipv6 cef

!

!

!

!

!

!

!

```
!
!
!
!
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!
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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

!

!

!

!

!

!

!

!

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

!

!

!

!

!

!

!

!

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

!

!

!

!

!

!

!

!

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

!

!

!

!

!

!

!

```
!
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