



Computer Networking Mini Project

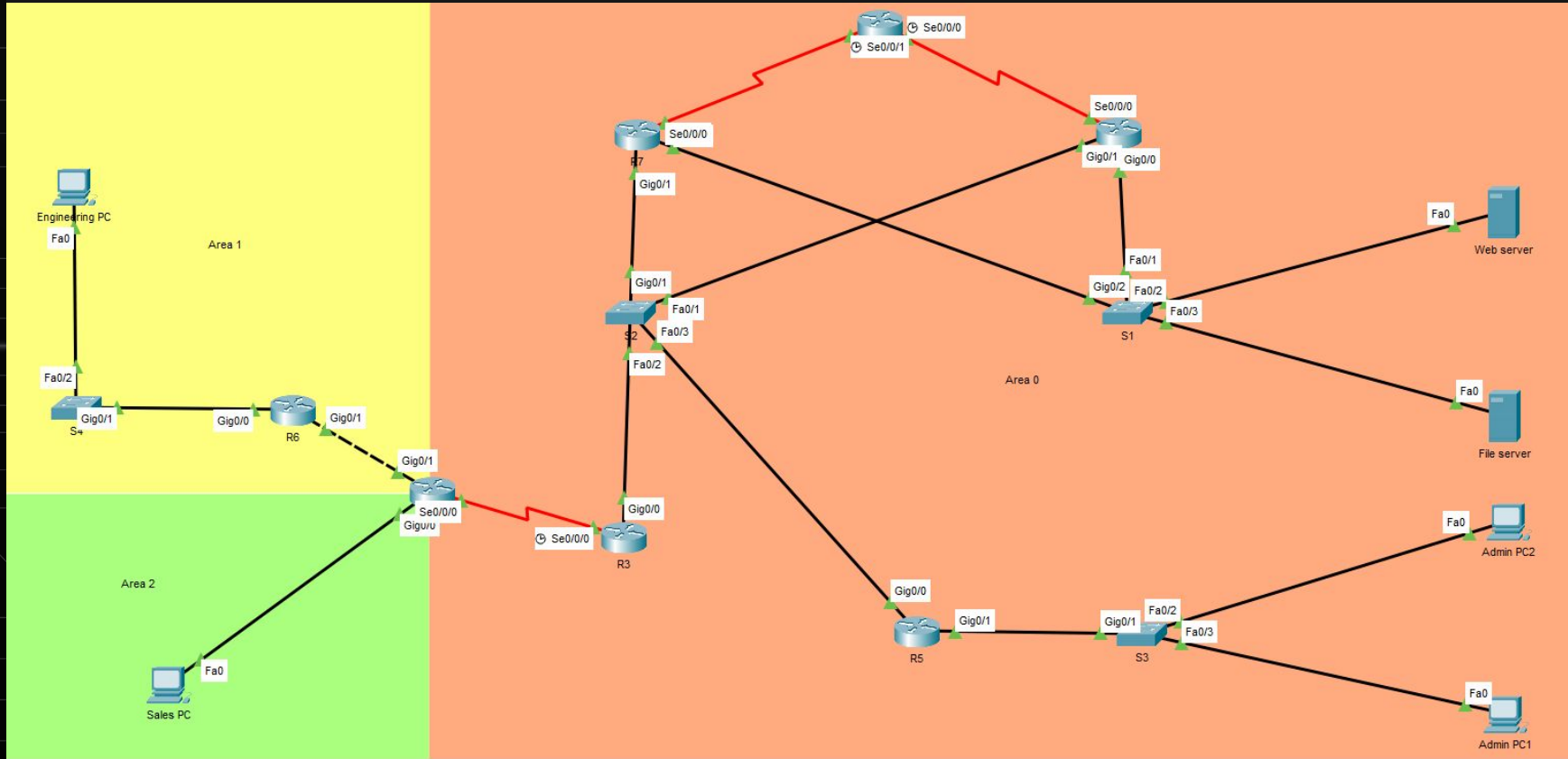
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Logical Diagram



Privileged EXEC Mode Password (Encrypted): Class

IP Addressing Allocation

Number of host Addresses Required	Network Address	Subnet Mask	Max Number of Hosts Possible	Network Name
56	185.35.60.0	255.255.255.192	62	Engineering
12	185.35.60.64	255.255.255.240	14	Sales
10	185.35.60.80	255.255.255.240	14	Server
8	185.35.60.96	255.255.255.240	14	Admin
3	185.35.60.112	255.255.255.248	6	WAN 1
2	185.35.60.120	255.255.255.252	2	WAN 2
2	185.35.60.124	255.255.255.252	2	WAN 3
2	220.220.125.0	255.255.255.252	2	ISP
2	210.210.125.0	255.255.255.252	2	ISP Redundancy

Router Configuration

Location: Engineering Office

Router Name: R6

Interface port number	Description	DTE/DCE	Network Name	Interface address	Subnet Mask
G0/0	Engineering Office	-	Engineering	185.35.60.1	255.255.255.192
G0/1	R6 to R4	-	WAN 3	185.35.60.126	255.255.255.252

Location: Sales Office

Router Name: R4

Interface port number	Description	DTE/DCE	Network Name	Interface address	Subnet Mask
G0/0	Sales Office	-	Sales	185.35.60.65	255.255.255.240
G0/1	R4 to R6	-	WAN 3	185.35.60.125	255.255.255.252
S0/0/0	R4 to R3	DTE	WAN 2	185.35.60.122	255.255.255.252

Location: Administration Office

Router Name: R5

Interface port number	Description	DTE/DCE	Network Name	Interface address	Subnet Mask
G0/0	R5 to R2 & R3	-	WAN 1	185.35.60.115	255.255.255.248
G0/1	Admin Office	-	Admin	185.35.60.97	255.255.255.240

Location: Main Building

Router Name: R2

Interface port number	Description	DTE/DCE	Network Name	Interface address	Subnet Mask
G0/0	Servers	-	Server	185.35.60.81	255.255.255.240
G0/1	R2 to R3 & R5	-	WAN 1	185.35.60.113	255.255.255.248
S0/0/0	R2 to R1	DTE	ISP	220.220.125.2	255.255.255.252

Router Configuration

Location: Main Building

Router Name: R3

Interface port number	Description	DTE/DCE	Network Name	Interface address	Subnet Mask
G0/0	R3 to R2 & R5	-	WAN 1	185.35.60.114	255.255.255.248
S0/0/0	R3 to R4	DCE	WAN 2	185.35.60.121	255.255.255.252

Location: ISP

Router Name: R1

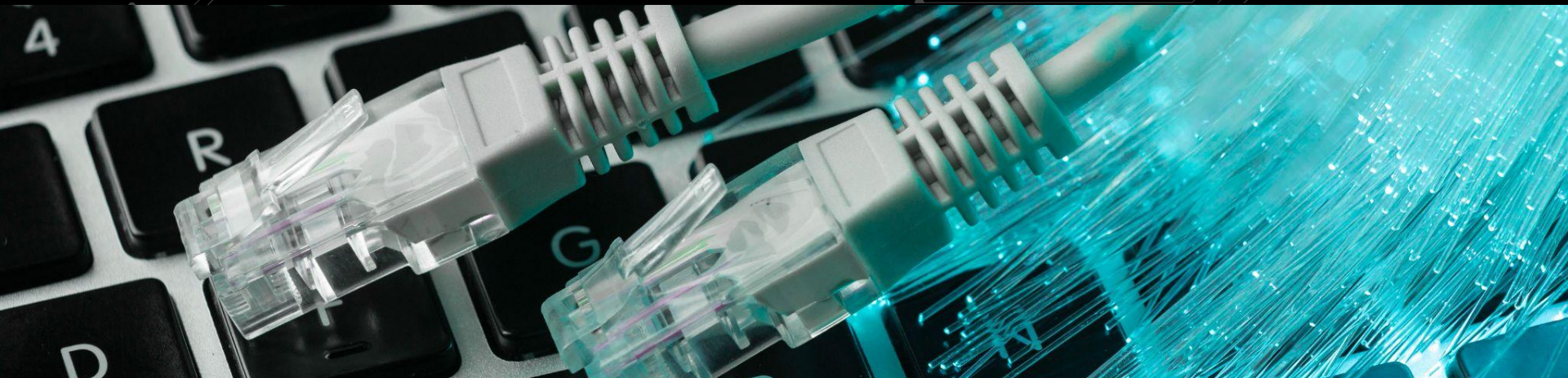
Interface port number	Description	DTE/DCE	Network Name	Interface address	Subnet Mask
S0/0/0	R1 to R2	DCE	ISP	220.220.125.1	255.255.255.252
S0/0/1	R1 to R7	DCE	ISP Redundancy	210.210.125.1	255.255.255.252

Location: Main Building

Router Name: R7

Interface port number	Description	DTE/DCE	Network Name	Interface address	Subnet Mask
G0/0	Servers	-	Server	185.35.60.84	255.255.255.240
G0/1	R2 to R3 & R5	-	WAN 1	185.35.60.116	255.255.255.248
S0/0/0	R2 to R1	DTE	ISP Redundancy	210.210.125.2	255.255.255.252

Router 1



OSPF Implementation

- None -

IP Protocol

- None -

IP Route

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is not set

185.35.0.0/16 is variably subnetted, 7 subnets, 4 masks
S 185.35.60.0/26 [1/0] via 220.220.125.2
[1/0] via 210.210.125.2
S 185.35.60.64/28 [1/0] via 220.220.125.2
[1/0] via 210.210.125.2
S 185.35.60.80/28 [1/0] via 220.220.125.2
[1/0] via 210.210.125.2
S 185.35.60.96/28 [1/0] via 220.220.125.2
[1/0] via 210.210.125.2
S 185.35.60.112/29 [1/0] via 220.220.125.2
[1/0] via 210.210.125.2
S 185.35.60.120/30 [1/0] via 220.220.125.2
[1/0] via 210.210.125.2
S 185.35.60.124/30 [1/0] via 220.220.125.2
[1/0] via 210.210.125.2
210.210.125.0/24 is variably subnetted, 2 subnets, 2 masks
C 210.210.125.0/30 is directly connected, Serial0/0/1
L 210.210.125.1/32 is directly connected, Serial0/0/1
220.220.125.0/24 is variably subnetted, 2 subnets, 2 masks
C 220.220.125.0/30 is directly connected, Serial0/0/0
L 220.220.125.1/32 is directly connected, Serial0/0/0

```

Current configuration : 1660 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname R1
!
enable secret 5 $1$mERr$9cTjUIEqNGurQiFU.ZeCi1
enable password cisco
!
no ip cef
no ipv6 cef
!
license udi pid CISCO1941/K9 sn FTX15244N8K-
!
spanning-tree mode pvt
!
interface GigabitEthernet0/0
no ip address
duplex auto
speed auto
shutdown
!
interface GigabitEthernet0/1
no ip address
duplex auto
speed auto
shutdown
!
interface Serial0/0/0
ip address 220.220.125.1 255.255.255.252
ip ospf hello-interval 20
ip ospf dead-interval 80
clock rate 64000
!
interface Serial0/0/1
ip address 210.210.125.1 255.255.255.252
clock rate 64000
!
interface Vlan1
no ip address
shutdown
!
router rip
!
ip classless

```

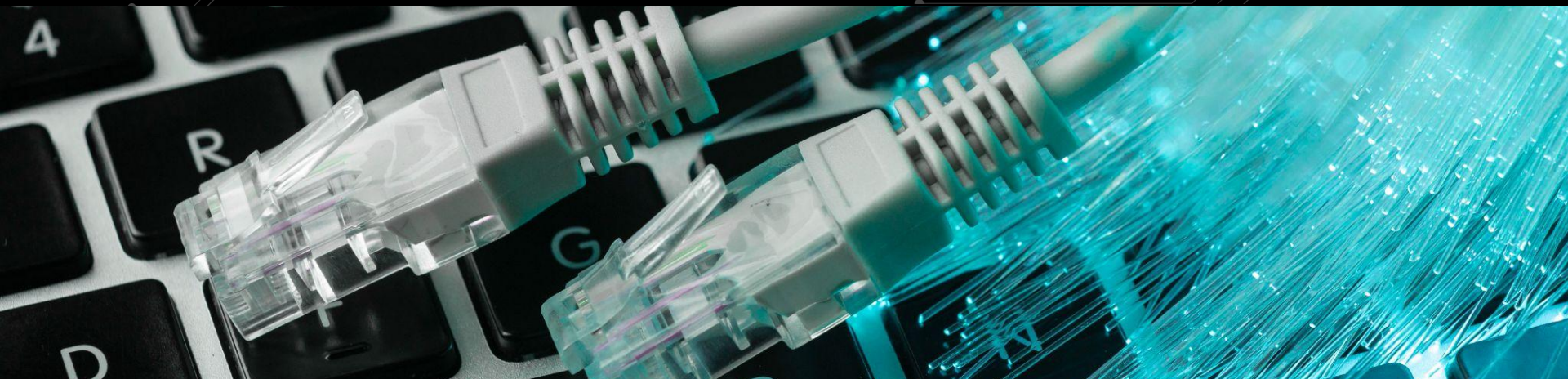
```

ip route 185.35.60.0 255.255.255.192 220.220.125.2
ip route 185.35.60.64 255.255.255.240 220.220.125.2
ip route 185.35.60.80 255.255.255.240 220.220.125.2
ip route 185.35.60.96 255.255.255.240 220.220.125.2
ip route 185.35.60.112 255.255.255.248 220.220.125.2
ip route 185.35.60.120 255.255.255.252 220.220.125.2
ip route 185.35.60.124 255.255.255.252 220.220.125.2
ip route 185.35.60.0 255.255.255.192 210.210.125.2
ip route 185.35.60.64 255.255.255.240 210.210.125.2
ip route 185.35.60.80 255.255.255.240 210.210.125.2
ip route 185.35.60.96 255.255.255.240 210.210.125.2
ip route 185.35.60.112 255.255.255.248 210.210.125.2
ip route 185.35.60.120 255.255.255.252 210.210.125.2
ip route 185.35.60.124 255.255.255.252 210.210.125.2
!
ip flow-export version 9
!
line con 0
!
line aux 0
!
line vty 0 4
login
!
end

```

Running Configuration

Router 2



OSPF Implementation

```
Routing Process "ospf 40" with ID 9.9.9.9
Supports only single TOS(TOS0) routes
Supports opaque LSA
SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
Number of external LSA 2. Checksum Sum 0x00a2c6
Number of opaque AS LSA 0. Checksum Sum 0x000000
Number of DCbitless external and opaque AS LSA 0
Number of DoNotAge external and opaque AS LSA 0
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
External flood list length 0
  Area BACKBONE(0)
    Number of interfaces in this area is 2
    Area has no authentication
    SPF algorithm executed 17 times
    Area ranges are
    Number of LSA 10. Checksum Sum 0x05e769
    Number of opaque link LSA 0. Checksum Sum 0x000000
    Number of DCbitless LSA 0
    Number of indication LSA 0
    Number of DoNotAge LSA 0
    Flood list length 0
```

IP Protocol

```
Routing Protocol is "ospf 40"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 9.9.9.9
  It is an autonomous system boundary router
  Redistributing External Routes from,
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    185.35.60.80 0.0.0.15 area 0
    185.35.60.112 0.0.0.7 area 0
  Routing Information Sources:
    Gateway         Distance         Last Update
    4.4.4.4          110             00:14:20
    6.6.6.6          110             00:14:50
    7.7.7.7          110             00:14:19
    8.8.8.8          110             00:14:20
    9.9.9.9          110             00:14:23
  Distance: (default is 110)
```


IP Route

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is 185.35.60.116 to network 0.0.0.0

185.35.0.0/16 is variably subnetted, 9 subnets, 5 masks

O IA	185.35.60.0/26	[110/66]	via 185.35.60.122,	01:00:39,	Serial0/0/0	
O IA	185.35.60.64/28	[110/65]	via 185.35.60.122,	01:00:39,	Serial0/0/0	
O	185.35.60.80/28	[110/2]	via 185.35.60.116,	01:00:19,	GigabitEthernet0/0	
			[110/2]	via 185.35.60.113,	01:00:19,	GigabitEthernet0/0
O	185.35.60.96/28	[110/2]	via 185.35.60.115,	01:00:19,	GigabitEthernet0/0	
C	185.35.60.112/29		is directly connected,		GigabitEthernet0/0	
L	185.35.60.114/32		is directly connected,		GigabitEthernet0/0	
C	185.35.60.120/30		is directly connected,		Serial0/0/0	
L	185.35.60.121/32		is directly connected,		Serial0/0/0	
O IA	185.35.60.124/30	[110/65]	via 185.35.60.122,	01:00:39,	Serial0/0/0	
O*E2	0.0.0.0/0	[110/1]	via 185.35.60.116,	01:00:19,	GigabitEthernet0/0	
			[110/1]	via 185.35.60.113,	01:00:19,	GigabitEthernet0/0

```

Current configuration : 1312 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname R2
!
enable secret 5 $1$mERr$9cTjUIEqNGurQiFU.ZeCi1
enable password cisco
!
no ip cef
no ipv6 cef
!
license udi pid CISCO1941/K9 sn FTX1524APQ3-
!
spanning-tree mode pvt
!
interface GigabitEthernet0/0
ip address 185.35.60.81 255.255.255.240
duplex auto
speed auto
standby version 2
standby 1 ip 185.35.60.85
standby 1 priority 150
standby 1 preempt
!
interface GigabitEthernet0/1
ip address 185.35.60.113 255.255.255.248
duplex auto
speed auto
standby version 2
standby 2 ip 185.35.60.117
standby 2 priority 150
standby 2 preempt
!
interface Serial0/0/0
ip address 220.220.125.2 255.255.255.252
ip ospf hello-interval 20
ip ospf dead-interval 80
!
interface Serial0/0/1
no ip address
clock rate 2000000
shutdown
!
interface Vlan 1

```

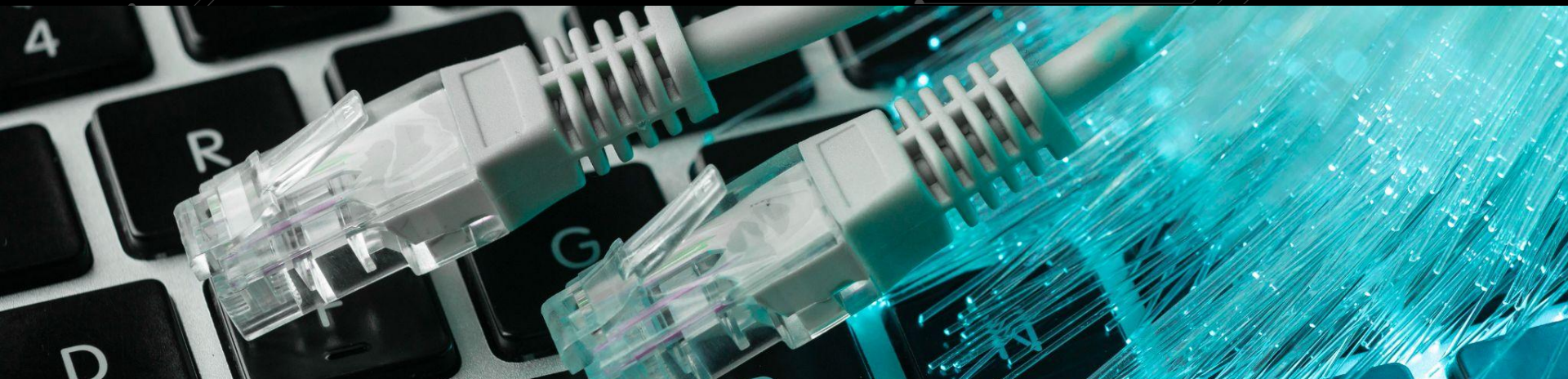
```

no ip address
shutdown
!
router ospf 40
router-id 9.9.9.9
log-adjacency-changes
network 185.35.60.80 0.0.0.15 area 0
network 185.35.60.112 0.0.0.7 area 0
default-information originate
!
router rip
!
ip classless
ip route 0.0.0.0 0.0.0.0 220.220.125.1
!
ip flow-export version 9
!
no cdp run
!
line con 0
!
line aux 0
!
line vtty 0 4
login
!
end

```

Running Configuration

Router 3



OSPF Implementation

```
Routing Process "ospf 40" with ID 7.7.7.7
Supports only single TOS(TOS0) routes
Supports opaque LSA
SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
Number of external LSA 2. Checksum Sum 0x00a2c6
Number of opaque AS LSA 0. Checksum Sum 0x000000
Number of DCbitless external and opaque AS LSA 0
Number of DoNotAge external and opaque AS LSA 0
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
External flood list length 0
  Area BACKBONE(0)
    Number of interfaces in this area is 2
    Area has no authentication
    SPF algorithm executed 17 times
    Area ranges are
    Number of LSA 10. Checksum Sum 0x05e769
    Number of opaque link LSA 0. Checksum Sum 0x000000
    Number of DCbitless LSA 0
    Number of indication LSA 0
    Number of DoNotAge LSA 0
    Flood list length 0
```

IP Protocol

```
Routing Protocol is "ospf 40"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 7.7.7.7
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    185.35.60.112 0.0.0.7 area 0
    185.35.60.120 0.0.0.3 area 0
  Routing Information Sources:
    Gateway         Distance      Last Update
    4.4.4.4          110          00:01:14
    6.6.6.6          110          00:01:44
    7.7.7.7          110          00:01:13
    8.8.8.8          110          00:01:15
    9.9.9.9          110          00:01:18
  Distance: (default is 110)
```

IP Route

```
R2#show ip route
```

```
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP  
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area  
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2  
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP  
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area  
* - candidate default, U - per-user static route, o - ODR  
P - periodic downloaded static route
```

```
Gateway of last resort is 220.220.125.1 to network 0.0.0.0
```

```
185.35.0.0/16 is variably subnetted, 9 subnets, 5 masks
```

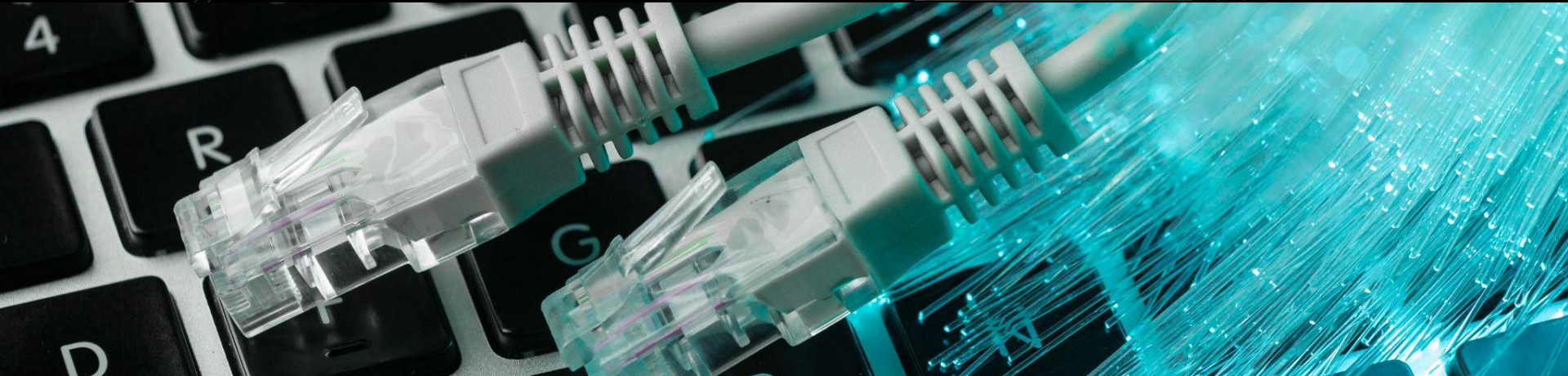
```
O IA 185.35.60.0/26 [110/67] via 185.35.60.114, 00:46:38, GigabitEthernet0/1  
O IA 185.35.60.64/28 [110/66] via 185.35.60.114, 00:46:38, GigabitEthernet0/1  
C 185.35.60.80/28 is directly connected, GigabitEthernet0/0  
L 185.35.60.81/32 is directly connected, GigabitEthernet0/0  
O 185.35.60.96/28 [110/2] via 185.35.60.115, 00:46:38, GigabitEthernet0/1  
C 185.35.60.112/29 is directly connected, GigabitEthernet0/1  
L 185.35.60.113/32 is directly connected, GigabitEthernet0/1  
O 185.35.60.120/30 [110/65] via 185.35.60.114, 00:46:38, GigabitEthernet0/1  
O IA 185.35.60.124/30 [110/66] via 185.35.60.114, 00:46:38, GigabitEthernet0/1  
220.220.125.0/24 is variably subnetted, 2 subnets, 2 masks  
C 220.220.125.0/30 is directly connected, Serial0/0/0  
L 220.220.125.2/32 is directly connected, Serial0/0/0  
S* 0.0.0.0/0 [1/0] via 220.220.125.1
```

```
Current configuration : 1051 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname R3
!
enable secret 5 $1$mERr$9cTjUIEqNGurQiFU.ZeCi1
enable password cisco
!
no ip cef
no ipv6 cef
!
license udi pid CISCO1941/K9 sn FTX152458UM-
!
spanning-tree mode pvst
!
interface GigabitEthernet0/0
ip address 185.35.60.114 255.255.255.248
duplex auto
speed auto
!
interface GigabitEthernet0/1
no ip address
duplex auto
speed auto
shutdown
!
interface Serial0/0/0
ip address 185.35.60.121 255.255.255.252
ip ospf hello-interval 20
ip ospf dead-interval 80
clock rate 64000
!
interface Serial0/0/1
no ip address
clock rate 2000000
shutdown
!
interface Vlan1
no ip address
shutdown
!
router ospf 40
router-id 7.7.7.7
log-adjacency-changes
```

```
network 185.35.60.112 0.0.0.7 area 0
network 185.35.60.120 0.0.0.3 area 0
!
ip classless
!
ip flow-export version 9
!
no cdp run
!
line con 0
!
line aux 0
!
line vty 0 4
login
!
end
```

Running Configuration

Router 4



OSPF Implementation

```
Routing Process "ospf 40" with ID 6.6.6.6
Supports only single TOS(TOS0) routes
Supports opaque LSA
It is an area border router
SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
Minimum LSA interval 5 secs, Minimum LSA arrival 1 secs
Number of external LSA 2, Checksum Sum 0x00a2c6
Number of opaque AS LSA 0, Checksum Sum 0x000000
Number of DCbitless external and opaque AS LSA 0
Number of DoNotAge external and opaque AS LSA 0
Number of areas in this router is 3, 3 normal 0 stub 0 nssa
External flood list length 0
  Area BACKBONE(0)
    Number of interfaces in this area is 1
    Area has no authentication
    SPF algorithm executed 12 times
    Area ranges are
    Number of LSA 10, Checksum Sum 0x05e769
    Number of opaque link LSA 0, Checksum Sum 0x000000
    Number of DCbitless LSA 0
    Number of indication LSA 0
    Number of DoNotAge LSA 0
    Flood list length 0
  Area 1
    Number of interfaces in this area is 1
    Area has no authentication
    SPF algorithm executed 10 times
    Area ranges are
    Number of LSA 10, Checksum Sum 0x060a6c
    Number of opaque link LSA 0, Checksum Sum 0x000000
    Number of DCbitless LSA 0
    Number of indication LSA 0
    Number of DoNotAge LSA 0
    Flood list length 0
  Area 2
    Number of interfaces in this area is 1
    Area has no authentication
    SPF algorithm executed 7 times
    Area ranges are
    Number of LSA 9, Checksum Sum 0x0427ba
    Number of opaque link LSA 0, Checksum Sum 0x000000
    Number of DCbitless LSA 0
    Number of indication LSA 0
    Number of DoNotAge LSA 0
    Flood list length 0
```

IP Protocol

```
Routing Protocol is "ospf 40"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 6.6.6.6
  Number of areas in this router is 3, 3 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    185.35.60.120 0.0.0.3 area 0
    185.35.60.124 0.0.0.3 area 1
    185.35.60.64 0.0.0.15 area 2
  Routing Information Sources:
    Gateway         Distance      Last Update
    4.4.4.4          110          00:28:11
    5.5.5.5          110          00:28:17
    6.6.6.6          110          00:29:00
    7.7.7.7          110          00:28:10
    8.8.8.8          110          00:28:11
    9.9.9.9          110          00:28:15
  Distance: (default is 110)
```


IP Route

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is 185.35.60.121 to network 0.0.0.0

185.35.0.0/16 is variably subnetted, 10 subnets, 5 masks

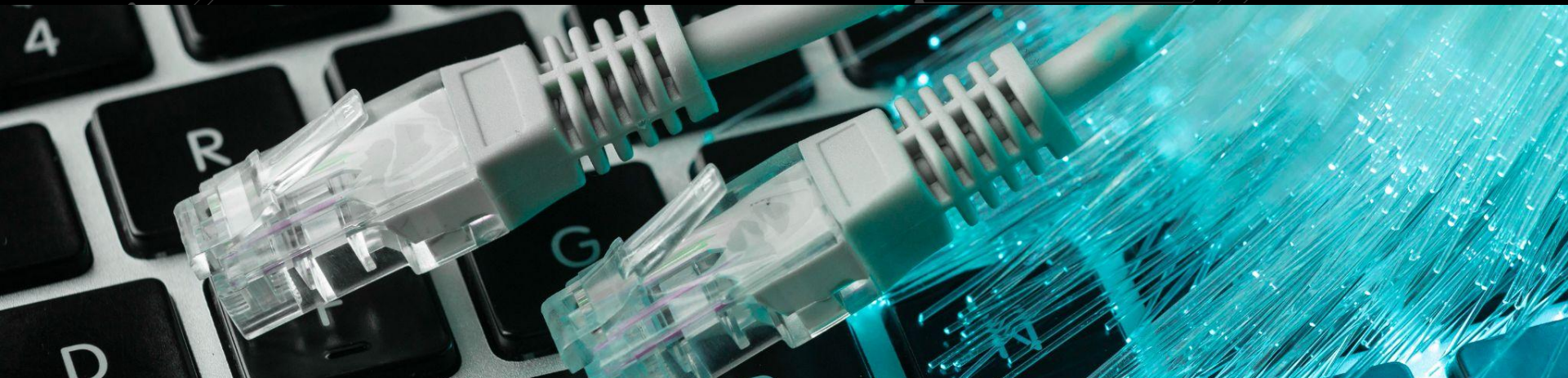
```
O      185.35.60.0/26 [110/2] via 185.35.60.126, 01:57:35, GigabitEthernet0/1
C      185.35.60.64/28 is directly connected, GigabitEthernet0/0
L      185.35.60.65/32 is directly connected, GigabitEthernet0/0
O      185.35.60.80/28 [110/66] via 185.35.60.121, 01:57:15, Serial0/0/0
O      185.35.60.96/28 [110/66] via 185.35.60.121, 01:57:15, Serial0/0/0
O      185.35.60.112/29 [110/65] via 185.35.60.121, 01:57:15, Serial0/0/0
C      185.35.60.120/30 is directly connected, Serial0/0/0
L      185.35.60.122/32 is directly connected, Serial0/0/0
C      185.35.60.124/30 is directly connected, GigabitEthernet0/1
L      185.35.60.125/32 is directly connected, GigabitEthernet0/1
O*E2  0.0.0.0/0 [110/1] via 185.35.60.121, 01:57:15, Serial0/0/0
```

```
Current configuration : 1087 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname R4
!
enable secret 5 $1$mERr$9cTjUIEqNGurQiFU.ZeCi1
enable password cisco
!
no ip cef
no ipv6 cef
!
license udi pid CISCO1941/K9 sn FTX1524ZOMY-
!
spanning-tree mode pvt
!
interface GigabitEthernet0/0
ip address 185.35.60.65 255.255.255.240
duplex auto
speed auto
!
interface GigabitEthernet0/1
ip address 185.35.60.125 255.255.255.252
duplex auto
speed auto
!
interface Serial0/0/0
ip address 185.35.60.122 255.255.255.252
ip ospf hello-interval 20
ip ospf dead-interval 80
!
interface Serial0/0/1
no ip address
clock rate 2000000
shutdown
!
interface Vlan1
no ip address
shutdown
!
router ospf 40
router-id 6.6.6.6
log-adjacency-changes
network 185.35.60.120 0.0.0.3 area 0
network 185.35.60.124 0.0.0.3 area 1
```

```
network 185.35.60.64 0.0.0.15 area 2
!
ip classless
!
ip flow-export version 9
!
no cdp run
!
line con 0
!
line aux 0
!
line vty 0 4
login
!
end
```

Running Configuration

Router 5



OSPF Implementation

```
Routing Process "ospf 40" with ID 8.8.8.8
Supports only single TOS(TOS0) routes
Supports opaque LSA
SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
Number of external LSA 2. Checksum Sum 0x00a2c6
Number of opaque AS LSA 0. Checksum Sum 0x000000
Number of DCbitless external and opaque AS LSA 0
Number of DoNotAge external and opaque AS LSA 0
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
External flood list length 0
  Area BACKBONE(0)
    Number of interfaces in this area is 2
    Area has no authentication
    SPF algorithm executed 16 times
    Area ranges are
    Number of LSA 10. Checksum Sum 0x05e769
    Number of opaque link LSA 0. Checksum Sum 0x000000
    Number of DCbitless LSA 0
    Number of indication LSA 0
    Number of DoNotAge LSA 0
    Flood list length 0
```

IP Protocol

```
Routing Protocol is "ospf 40"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 8.8.8.8
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    185.35.60.96 0.0.0.15 area 0
    185.35.60.112 0.0.0.7 area 0
  Routing Information Sources:
    Gateway         Distance         Last Update
    4.4.4.4          110              00:07:30
    6.6.6.6          110              00:08:01
    7.7.7.7          110              00:07:30
    8.8.8.8          110              00:07:30
    9.9.9.9          110              00:07:34
  Distance: (default is 110)
```


IP Route

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is 185.35.60.116 to network 0.0.0.0

185.35.0.0/16 is variably subnetted, 9 subnets, 5 masks

```
O IA    185.35.60.0/26 [110/67] via 185.35.60.114, 01:06:45, GigabitEthernet0/0
O IA    185.35.60.64/28 [110/66] via 185.35.60.114, 01:06:45, GigabitEthernet0/0
O       185.35.60.80/28 [110/2] via 185.35.60.116, 01:06:45, GigabitEthernet0/0
        [110/2] via 185.35.60.113, 01:06:45, GigabitEthernet0/0
C       185.35.60.96/28 is directly connected, GigabitEthernet0/1
L       185.35.60.97/32 is directly connected, GigabitEthernet0/1
C       185.35.60.112/29 is directly connected, GigabitEthernet0/0
L       185.35.60.115/32 is directly connected, GigabitEthernet0/0
O       185.35.60.120/30 [110/65] via 185.35.60.114, 01:06:45, GigabitEthernet0/0
O IA    185.35.60.124/30 [110/66] via 185.35.60.114, 01:06:45, GigabitEthernet0/0
O*E2 0.0.0.0/0 [110/1] via 185.35.60.116, 01:06:45, GigabitEthernet0/0
        [110/1] via 185.35.60.113, 01:06:45, GigabitEthernet0/0
```

```

Current configuration : 999 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname R5
!
enable secret 5 $1$mERr$9cTjUIEqNGurQIFU.ZeCi1
enable password cisco
!
no ip cef
no ipv6 cef
!
license udi pid CISCO1941/K9 sn FTX1524V0V2-
!
spanning-tree mode pvt
!
interface GigabitEthernet0/0
ip address 185.35.60.115 255.255.255.248
duplex auto
speed auto
!
interface GigabitEthernet0/1
ip address 185.35.60.97 255.255.255.240
duplex auto
speed auto
!
interface Serial0/0/0
no ip address
clock rate 2000000
shutdown
!
interface Serial0/0/1
no ip address
clock rate 2000000
shutdown
!
interface Vlan1
no ip address
shutdown
!
router ospf 40
router-id 8.8.8.8
log-adjacency-changes
network 185.35.60.96 0.0.0.15 area 0
network 185.35.60.112 0.0.0.7 area 0

```

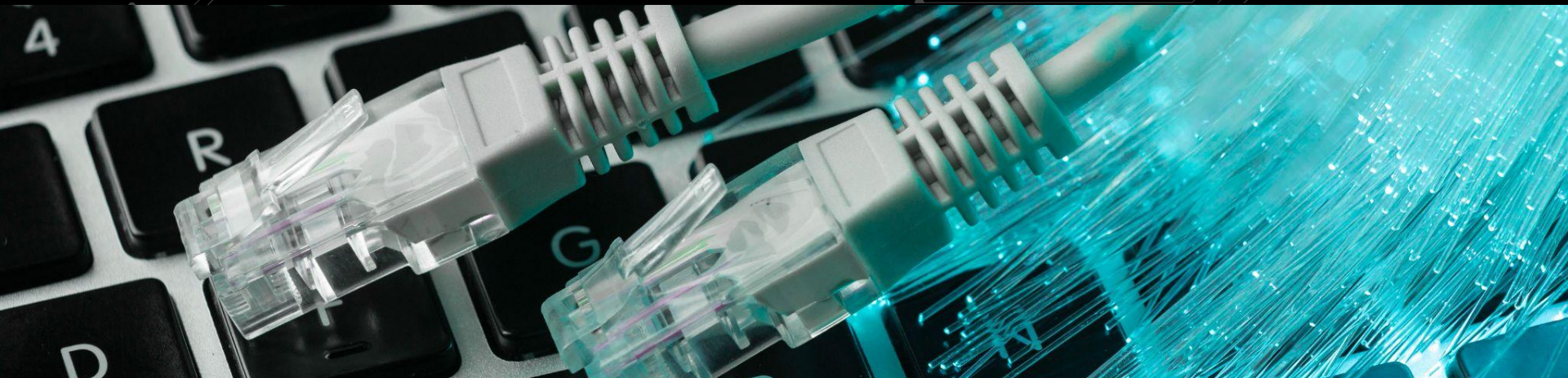
```

!
ip classless
!
ip flow-export version 9
!
no cdp run
!
line con 0
!
line aux 0
!
line vty 0 4
login
!
end

```

Running Configuration

Router 6



OSPF Implementation

```
Routing Process "ospf 40" with ID 5.5.5.5
Supports only single TOS(TOS0) routes
Supports opaque LSA
SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
Number of external LSA 2. Checksum Sum 0x00a2c6
Number of opaque AS LSA 0. Checksum Sum 0x000000
Number of DCbitless external and opaque AS LSA 0
Number of DoNotAge external and opaque AS LSA 0
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
External flood list length 0
  Area 1
    Number of interfaces in this area is 2
    Area has no authentication
    SPF algorithm executed 20 times
    Area ranges are
    Number of LSA 10. Checksum Sum 0x060a6c
    Number of opaque link LSA 0. Checksum Sum 0x000000
    Number of DCbitless LSA 0
    Number of indication LSA 0
    Number of DoNotAge LSA 0
    Flood list length 0
```

IP Protocol

```
Routing Protocol is "ospf 40"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 5.5.5.5
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    185.35.60.0 0.0.0.63 area 1
    185.35.60.124 0.0.0.3 area 1
  Routing Information Sources:
    Gateway         Distance         Last Update
    5.5.5.5          110             00:04:20
    6.6.6.6          110             00:04:21
  Distance: (default is 110)
```

IP Route

Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
* - candidate default, U - per-user static route, o - ODR
P - periodic downloaded static route

Gateway of last resort is 185.35.60.125 to network 0.0.0.0

185.35.0.0/16 is variably subnetted, 9 subnets, 5 masks

C 185.35.60.0/26 is directly connected, GigabitEthernet0/0
L 185.35.60.1/32 is directly connected, GigabitEthernet0/0
O IA 185.35.60.64/28 [110/2] via 185.35.60.125, 02:03:02, GigabitEthernet0/1
O IA 185.35.60.80/28 [110/67] via 185.35.60.125, 02:02:42, GigabitEthernet0/1
O IA 185.35.60.96/28 [110/67] via 185.35.60.125, 02:02:42, GigabitEthernet0/1
O IA 185.35.60.112/29 [110/66] via 185.35.60.125, 02:02:42, GigabitEthernet0/1
O IA 185.35.60.120/30 [110/65] via 185.35.60.125, 02:03:02, GigabitEthernet0/1
C 185.35.60.124/30 is directly connected, GigabitEthernet0/1
L 185.35.60.126/32 is directly connected, GigabitEthernet0/1
O*E2 0.0.0.0/0 [110/1] via 185.35.60.125, 02:02:42, GigabitEthernet0/1

```

Current configuration : 1010 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname R6
!
enable secret 5 $1$mERr$9cTjUIEqNGurQiFU.ZeCi1
enable password cisco
!
no ip cef
no ipv6 cef
!
license udi pid CISCO1941/K9 sn FTX1524180Z-
!
spanning-tree mode pvst
!
interface GigabitEthernet0/0
ip address 185.35.60.1 255.255.255.192
duplex auto
speed auto
!
interface GigabitEthernet0/1
ip address 185.35.60.126 255.255.255.252
duplex auto
speed auto
!
interface Serial0/0/0
no ip address
clock rate 2000000
shutdown
!
interface Serial0/0/1
no ip address
clock rate 2000000
shutdown
!
interface Vlan1
no ip address
shutdown
!
router ospf 40
router-id 5.5.5.5
log-adjacency-changes
network 185.35.60.0 0.0.0.63 area 1
network 185.35.60.124 0.0.0.3 area 1

```

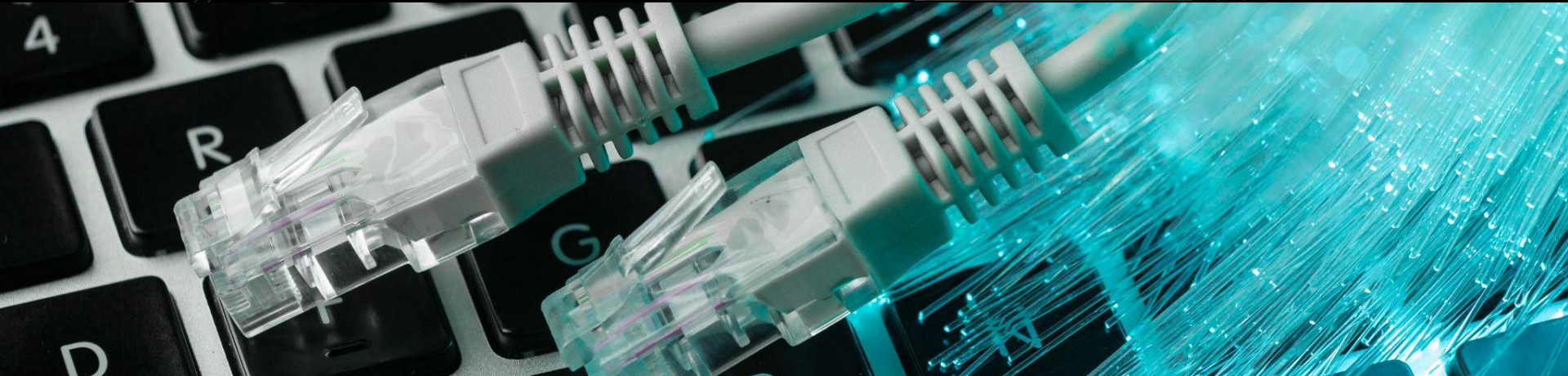
```

!
router rip
!
ip classless
!
ip flow-export version 9
!
no cdp run
!
line con 0
!
line aux 0
!
line vty 0 4
login
!
end

```

Running Configuration

Router 7



OSPF Implementation

```
Routing Process "ospf 40" with ID 4.4.4.4
Supports only single TOS(TOS0) routes
Supports opaque LSA
SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
Number of external LSA 2. Checksum Sum 0x00a2c6
Number of opaque AS LSA 0. Checksum Sum 0x000000
Number of DCbitless external and opaque AS LSA 0
Number of DoNotAge external and opaque AS LSA 0
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
External flood list length 0
  Area BACKBONE(0)
    Number of interfaces in this area is 2
    Area has no authentication
    SPF algorithm executed 17 times
    Area ranges are
    Number of LSA 10. Checksum Sum 0x05e769
    Number of opaque link LSA 0. Checksum Sum 0x000000
    Number of DCbitless LSA 0
    Number of indication LSA 0
    Number of DoNotAge LSA 0
    Flood list length 0
```

IP Protocol

```
Routing Protocol is "ospf 40"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 4.4.4.4
  It is an autonomous system boundary router
  Redistributing External Routes from,
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    185.35.60.80 0.0.0.15 area 0
    185.35.60.112 0.0.0.7 area 0
  Routing Information Sources:
    Gateway         Distance         Last Update
    4.4.4.4          110              00:24:36
    6.6.6.6          110              00:25:07
    7.7.7.7          110              00:24:36
    8.8.8.8          110              00:24:37
    9.9.9.9          110              00:24:41
  Distance: (default is 110)
```


IP Route

```
R7#show ip route
```

```
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
```

```
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
```

```
N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
```

```
E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
```

```
i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
```

```
* - candidate default, U - per-user static route, o - ODR
```

```
P - periodic downloaded static route
```

```
Gateway of last resort is 210.210.125.1 to network 0.0.0.0
```

```
185.35.0.0/16 is variably subnetted, 9 subnets, 5 masks
```

```
O IA 185.35.60.0/26 [110/67] via 185.35.60.114, 00:53:31, GigabitEthernet0/1
```

```
O IA 185.35.60.64/28 [110/66] via 185.35.60.114, 00:53:31, GigabitEthernet0/1
```

```
C 185.35.60.80/28 is directly connected, GigabitEthernet0/0
```

```
L 185.35.60.84/32 is directly connected, GigabitEthernet0/0
```

```
O 185.35.60.96/28 [110/2] via 185.35.60.115, 00:53:41, GigabitEthernet0/1
```

```
C 185.35.60.112/29 is directly connected, GigabitEthernet0/1
```

```
L 185.35.60.116/32 is directly connected, GigabitEthernet0/1
```

```
O 185.35.60.120/30 [110/65] via 185.35.60.114, 00:53:31, GigabitEthernet0/1
```

```
O IA 185.35.60.124/30 [110/66] via 185.35.60.114, 00:53:31, GigabitEthernet0/1
```

```
210.210.125.0/24 is variably subnetted, 2 subnets, 2 masks
```

```
C 210.210.125.0/30 is directly connected, Serial0/0/0
```

```
L 210.210.125.2/32 is directly connected, Serial0/0/0
```

```
S* 0.0.0.0/0 [1/0] via 210.210.125.1
```

```

Current configuration : 1195 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname R7
!
enable secret 5 $1$mERr$9cTjUIEqNGurQiFU.ZeCi1
enable password cisco
!
ip cef
no ipv6 cef
!
license udi pid CISCO1941/K9 sn FTX1524Q262-
!
spanning-tree mode pvt
!
interface GigabitEthernet0/0
ip address 185.35.60.84 255.255.255.240
duplex auto
speed auto
standby version 2
standby 1 ip 185.35.60.85
standby 1 preempt
!
interface GigabitEthernet0/1
ip address 185.35.60.116 255.255.255.248
duplex auto
speed auto
standby version 2
standby 2 ip 185.35.60.117
standby 2 preempt
!
interface Serial0/0/0
ip address 210.210.125.2 255.255.255.252
!
interface Serial0/0/1
no ip address
clock rate 2000000
shutdown
!
interface Vlan1
no ip address
shutdown
!
router ospf 40

```

```

router-id 4.4.4.4
log-adjacency-changes
network 185.35.60.80 0.0.0.15 area 0
network 185.35.60.112 0.0.0.7 area 0
default-information originate
!
router rip
!
ip classless
ip route 0.0.0.0 0.0.0.0 210.210.125.1
!
ip flow-export version 9
!
line con 0
!
line aux 0
!
line vtty 0 4
login
!
end

```

Running Configuration

Future Recommendations



Network Monitoring & Management System

Develop an effective network monitoring and management system to get real-time information regarding the health and performance of the network. This may include tools like SNMP (Simple Network Management Protocol) used for devices' monitoring, bandwidth utilization tracking, detection of possible bottlenecks, and alerting on anomalies. By identifying problems proactively with historical data analysis, the IT team can optimize network performance in planning for capacity expansion as well as promptly responding to any incidents.



Security Enhancement

Improve network security by integrating high-end security measures like intrusion detection and prevention systems (IDS/IPS), next generation firewalls, and encryption protocols for securing communications between remote offices and the main office. As the business grows, robust cybersecurity becomes more important to secure sensitive data alongside preventing unauthorized access.

Budget Cost to Implement Proposed Network

- Routers & Switches:
 - 7 Cisco 1941 Routers = 7 x S\$1000
 - 4 Cisco 2960 Switches = 4 x S\$500
- Computers & Servers:
 - 38 Computers = 38 x S\$1000
 - 20 Servers = 20 x S\$3000
- Cables:
 - S\$500
- Delivery and Setup:
 - S\$500

Estimated Total Cost:

$S\$7000 + S\$2000 + S\$38000 + S\$60000 + S\$500 + S\$500 = \text{S\$108000}$

Keep in mind that this is just a rough estimate, the actual costs can vary significantly depending on the location.

Thanks!

Do you have any questions?

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yourwebsite.com



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