

**MONOGRAFIA DEL CURSO DE PROFUNNDIZACIÓN DE REDES CISCO**

**ELIECER MESIAS LOPEZ**

**UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA UNAD  
Escuela de Ciencias básicas Tecnologías e Ingenierías  
Programa Ingeniería de sistemas  
Cali – Colombia  
2013**

**MONOGRAFIA DEL CURSO DE PROFUNNDIZACIÓN DE REDES CISCO**

**ELIECER MESIAS LOPEZ**

**Monografía para optar al título de ingeniero de sistemas con especialización  
en redes CISCO CCNA 1 y CCNA 2**

**Presentado a:**  
Ing. Gerardo Granados Acuña

**UNIVERSIDAD NACIONAL ABIERTA Y A DISTANCIA UNAD  
Escuela de Ciencias básicas Tecnologías e Ingenierías  
Programa Ingeniería de sistemas  
Cali – Colombia  
2013**

**NOTA DE ACEPTACION**

---

---

---

---

**Presidente del jurado**

---

**Jurado**

---

**Jurado**

## TABLA DE CONTENIDO

1. RESUMEN	5
2. JUSTIFICACION	6
3. OBJETIVOS	7
2.1. GENERAL	7
2.2. ESPECÍFICOS	7
3. CASO DE ESTUDIO CCNA 1	8
SOLUCION	10
CONFIGURACION DE LAS DIRECCIONES IP EN CADA ROUTER	13
USO DEL COMANDO DESCRIPTION EN CADA ROUTER	16
ESTABLECER CONTRASEÑA A CADA ROUTER	20
CONFIGURAR LOS SERIALES	21
CONFIGURAR PROTOCOLO DE ENRUTAMIENTO RIP V2	24
ARCHIVOS EXPORTADOS CON EL COMANDO SHOW RUNNING-CONFIG	24
4. CASO DE ESTUDIO CCNA 2	30
5. CONCLUSIONES	43
6. BIBLIOGRAFIA	44

## 1. RESUMEN

En este documento se presentan dos casos de estudio planteados en el curso de profundización de CISCO CCNA1 y CCNA2, permitiendo la resolución de estos, con el objetivo de afianzar los conocimientos adquiridos durante el curso acerca de la implementación de redes LAN y WAN, es importante presentar una síntesis de cada uno de los casos presentados, con el fin de instruir al lector acerca del proceso realizado

En el primer caso se plantea la problemática de la empresa COMERCIANES S.A. donde se desea implementar una solución de red WAN entre cinco diferentes ciudades usando routers con conexión serial para su interconexión, para solucionar el caso planteado se utilizó el protocolo de enrutamiento RIP versión 2, haciendo uso de VLSM para generar las diferentes subredes, satisfaciendo así, las necesidades de interconexión de cada departamento, para la simulación de la red WAN se realizan conexiones seriales DCE a un CLOCK RATE DE 56000, estableciendo así una simulación satisfactoria entre los diferentes puntos de nuestra red.

Por otra parte se plantea un segundo caso de interconexión entre Routers definiendo un esquema de direccionamiento OSPF y enrutamiento estático (loopback), del mismo modo se utiliza VLSM para la división en las subredes; asimismo la interconexión se realiza mediante puertos seriales con enlace DCE y Fast Ethernet usando cables de conexión directo dependiendo la clase de los dispositivos.

Como se puede observar, este desarrollo requirió del esfuerzo del estudiante para la resolución de dichos casos, donde aplicando las temáticas vistas a lo largo del curso, se cumplió a satisfacción con el propósito de esta actividad, además haciendo uso de la herramienta Packet tracer, donde se emulan todas las situaciones que se requieren durante la formación académica.

## **2. JUSTIFICACION**

En la actualidad se evidencia un gran desarrollo en el área de las redes de comunicaciones de datos, por este motivo se hace imprescindible la existencia de personas dedicadas y especializadas en este campo; los actuales profesionales de esta área no dan abasto con la cantidad de necesidades de las organizaciones y los inconvenientes de seguridad asimismo como la implementación de nuevas soluciones; con el crecimiento de la economía y la generación de nuevas PYMES, se hace imperativo contar con mayor cantidad de personal calificado que atienda estos mercados emergentes, del mismo modo las nuevas tecnologías que llegan a nuestro país como la comunicación por 4G.

Este documento muestra el desarrollo que el aspirante a obtenido mediante este curso de profundización, mejorando notablemente sus conocimientos, competencias y evidenciando mediante los casos de estudio aquí contenidos su proceso de aprendizaje, del mismo modo se aprecia el empeño que los tutores tuvieron con el fin de apoyar estos procesos de formación permitiendo que cada persona enfrentara sus dificultades y plantearan soluciones a partir de posibles problemas que se puedan presentar.

### **3. OBJETIVOS**

#### **2.1. General**

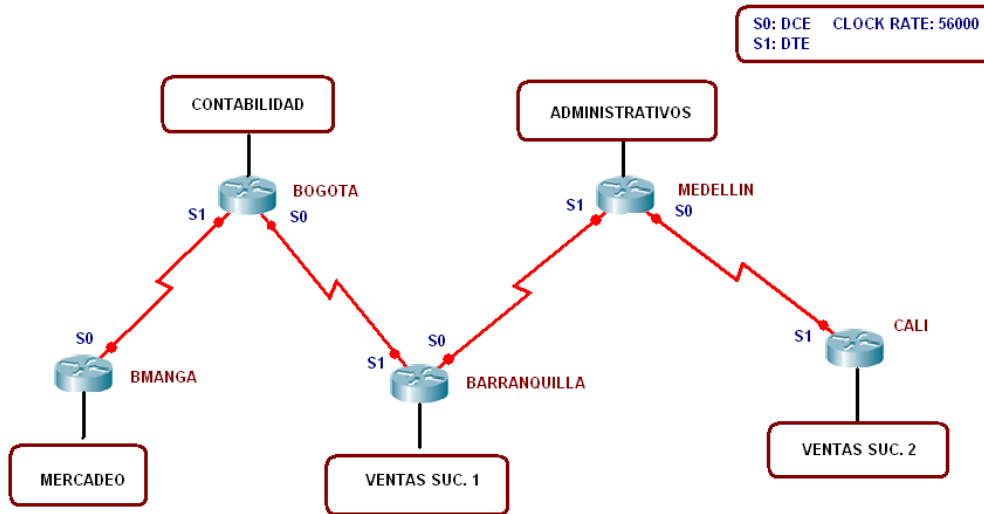
Plantear soluciones a los casos de estudios propuestos, haciendo uso de los temas estudiados durante el curso de profundización de redes CISCO y determinando elementos propios que se deben usar en cada caso.

#### **2.2. Específicos**

- Diseñar una solución óptima a los casos de estudio propuestos en la plataforma de educación de redes CISCO.
- Reconocer los conceptos de enrutamiento aplicables a las redes, específicamente en los casos de estudio propuestos.
- Analizar los tipos de problemas que se pueden presentar para el planteamiento de una solución de telecomunicaciones.

### 3. CASO DE ESTUDIO CCNA 1

Una empresa denominada COMERCIANTES S.A. desea implementar una red WAN acorde con la estructura que se ilustra en la siguiente figura.



La cantidad de host requeridos por cada una de las LAN es la siguiente:

Contabilidad	:	15
Mercadeo	:	10
Ventas Sucursal 1	:	30
Ventas Sucursal 2	:	40
Administrativos	:	25

Se desea establecer cada uno de los siguientes criterios:

Protocolo de enrutamiento : RIP Versión 2

Todos los puertos seriales 0 (S0) son terminales DCE Todos los puertos seriales 1 (S1) son terminales DTE



Definir la tabla de direcciones IP indicando por cada subred los siguientes elementos:

### **Por cada LAN**

1. Dirección de Red
2. Dirección IP de Gateway
3. Dirección IP del Primer PC
4. Dirección IP del último PC
5. Dirección de Broadcast
6. Máscara de Subred

### **Por cada conexión serial**

1. Dirección de Red
2. Dirección IP Serial 0 (Indicar a qué Router pertenece)
3. Dirección IP Serial 1 (Indicar a qué Router pertenece)
4. Dirección de Broadcast
5. Máscara de Subred

En cada Router configurar:

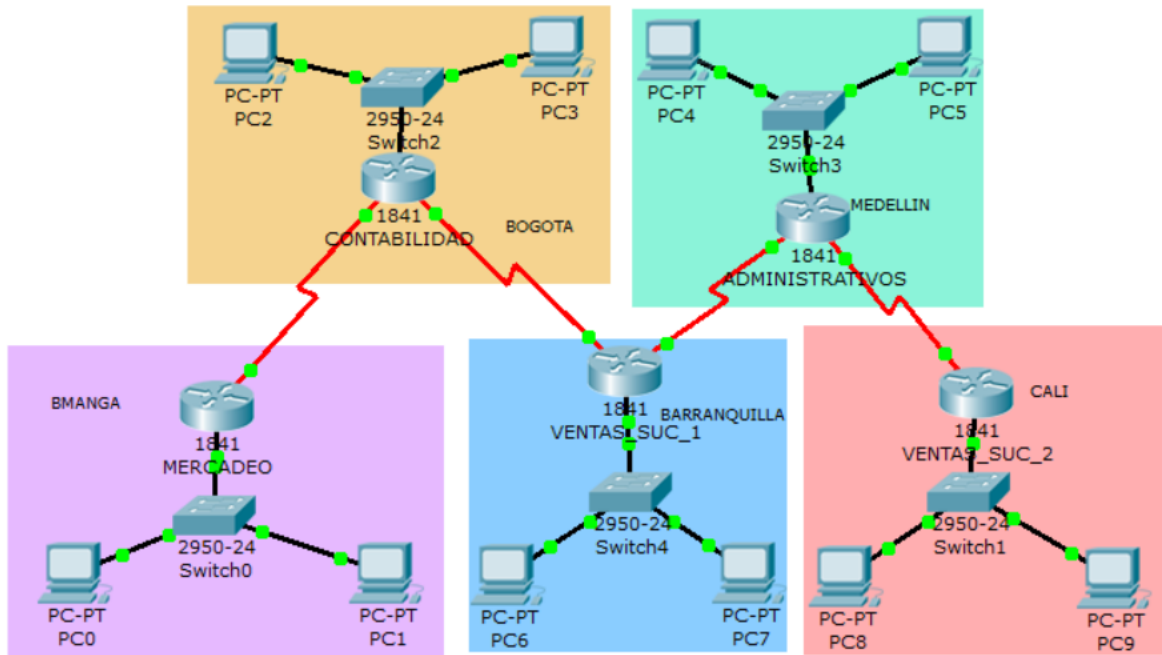
1. Nombre del Router (Hostname)
2. Direcciones IP de las Interfaces a utilizar
3. Por cada interface utilizada, hacer uso del comando DESCRIPTION con el fin de indicar la función que cumple cada interface. Ej. Interfaz de conexión con la red LAN Mercadeo.
4. Establecer contraseñas para: CON 0, VTY, ENABLE SECRET. Todas con el Password: CISCO
5. Protocolo de enrutamiento a utilizar: RIP Versión 2

Se debe realizar la configuración de la misma mediante el uso de Packet Tracer, los routers deben ser de referencia 1841 y los Switches 2950. Por cada subred se deben dibujar solamente dos Host identificados con las direcciones IP correspondientes al primer y último PC acorde con la cantidad de equipos establecidos por subred.

El trabajo debe incluir toda la documentación correspondiente al diseño, copiar las configuraciones finales de cada Router mediante el uso del comando Show Running-config, archivo de simulación en Packet Tracer y verificación de funcionamiento de la red mediante el uso de comandos: Ping y Traceroute.

## SOLUCION

Como primer paso se realiza la conexión de la simulación en Packet Tracer de la siguiente forma



En esta figura se muestra sombreada cada ciudad con el fin de facilitar una mejor visualización en el proceso; según la información suministrada podemos observar la cantidad de host requeridos por cada sub red

Y se reorganizan de la siguiente forma

Departamento	Cantidad de host
Ventas Sucursal 2	40
Ventas Sucursal 1	30
Administrativos	25
Contabilidad	15
Mercadeo	10

Usando una dirección clase C 192.168.0.0/ 24 podemos realizar el siguiente subneteo.

Red	Dirección de red	Dirección de Broadcast	Mascara de subred	Primera	Ultima
Ventas Sucursal 2	192.168.0.0	192.168.0.63	255.255.255.192	192.168.0.1	192.168.0.62
Ventas Sucursal 1	192.168.0.64	192.168.0.95	255.255.255.224	192.168.0.65	192.168.0.94
Administrativos	192.168.0.96	192.168.0.127	255.255.255.224	192.168.0.97	192.168.0.126
Contabilidad	192.168.0.128	192.168.0.159	255.255.255.224	192.168.0.129	192.168.0.158
Mercadeo	192.168.0.160	192.168.0.175	255.255.255.240	192.168.0.161	192.168.0.174
Serial 1	192.168.0.176	192.168.0.179	255.255.255.252	192.168.0.177	192.168.0.178
Serial 2	192.168.0.180	192.168.0.183	255.255.255.252	192.168.0.181	192.168.0.182
Serial 3	192.168.0.184	192.168.0.187	255.255.255.252	192.168.0.185	192.168.0.186
Serial 4	192.168.0.188	192.168.0.191	255.255.255.252	192.168.0.189	192.168.0.190

## CONFIGURACION DE LOS HOSTNAME EN CADA ROUTER

### Configurar el HOSTNAME en el Router de Cali

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname CALI
CALI(config)#exit
CALI#
%SYS-5-CONFIG_I: Configured from console by console

CALI#
CALI#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
CALI#
```

### Configurar el HOSTNAME en el Router de Medellín

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname MEDELLIN
MEDELLIN(config)#exit
MEDELLIN#
```

```
%SYS-5-CONFIG_I: Configured from console by console
```

```
MEDELLIN#  
MEDELLIN#copy running-config startup-config  
Destination filename [startup-config]?  
Building configuration...  
[OK]  
MEDELLIN#
```

## **Configurar el HOSTNAME en el Router de Bogotá**

```
Router>enable  
Router#configure terminal  
Enter configuration commands, one per line. End with CNTL/Z.  
Router(config)#hostname BOGOTA  
BOGOTA(config)#exit  
BOGOTA#  
%SYS-5-CONFIG_I: Configured from console by console
```

```
BOGOTA#  
BOGOTA#copy running-config startup-config  
Destination filename [startup-config]?  
Building configuration...  
[OK]  
BOGOTA#
```

## **Configurar el HOSTNAME en el Router de Barranquilla**

```
Router>enable  
Router#configure terminal  
Enter configuration commands, one per line. End with CNTL/Z.  
Router(config)#hostname BARRANQUILLA  
BARRANQUILLA(config)#exit  
BARRANQUILLA#  
%SYS-5-CONFIG_I: Configured from console by console
```

```
BARRANQUILLA#  
BARRANQUILLA#copy running-config startup-config  
Destination filename [startup-config]?  
Building configuration...  
[OK]  
CALI#
```

## **Configurar el HOSTNAME en el Router de Bucaramanga**

```
Router>enable  
Router#configure terminal
```

```
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname BMANGA
BMANGA(config)#exit
BMANGA#
%SYS-5-CONFIG_I: Configured from console by console
```

```
BMANGA#
BMANGA#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BMANGA#
```

## **CONFIGURACION DE LAS DIRECCIONES IP EN CADA ROUTER**

### **Configurar la dirección IP en el Router de Cali**

```
CALI>enable
CALI#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
CALI(config)#interface FastEthernet0/0
CALI(config-if)#ip address 192.168.0.1 255.255.255.192
CALI(config-if)#no shutdown

%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed
state to up

CALI(config-if)#exit
CALI(config)#exit
CALI#
%SYS-5-CONFIG_I: Configured from console by console

CALI#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
CALI#
```

### **Configurar la dirección IP en el Router de Medellín**

```
MEDELLIN>enable
MEDELLIN#configure terminal
```

```

Enter configuration commands, one per line.  End with CNTL/Z.
MEDELLIN(config)#interface FastEthernet0/0
MEDELLIN(config-if)#ip address 192.168.0.97 255.255.255.224
MEDELLIN(config-if)#no shutdown

%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed
state to up

MEDELLIN(config-if)#exit
MEDELLIN(config)#exit
MEDELLIN#
%SYS-5-CONFIG_I: Configured from console by console

MEDELLIN#
MEDELLIN#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
MEDELLIN#

```

## Configurar la dirección IP en el Router de Bogotá

```

BOGOTA >enable
BOGOTA #configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
BOGOTA (config)#interface FastEthernet0/0
BOGOTA (config-if)#ip address 192.168.0.129 255.255.255.224
BOGOTA (config-if)#no shutdown

%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed
state to up

BOGOTA (config-if)#exit
BOGOTA (config)#exit
BOGOTA #
%SYS-5-CONFIG_I: Configured from console by console

BOGOTA#
BOGOTA#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]

```

BOGOTA#

## Configurar la dirección IP en el Router de Barranquilla

```
BARRANQUILLA>enable
BARRANQUILLA#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
BARRANQUILLA(config)#interface FastEthernet0/0
BARRANQUILLA(config-if)#ip address 192.168.0.65 255.255.255.224
BARRANQUILLA(config-if)#no shutdown

%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed
state to up

BARRANQUILLA#
BARRANQUILLA#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BARRANQUILLA#
```

## Configurar la dirección IP en el Router de Bucaramanga

```
BMANGA>enable
BMANGA #configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
BMANGA(config)#interface FastEthernet0/0
BMANGA(config-if)#ip address 192.168.0.161 255.255.255.240
BMANGA(config-if)#no shutdown

%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed
state to up

BMANGA#
BMANGA#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BMANGA#
```

## USO DEL COMANDO DESCRIPTION EN CADA ROUTER

### Comando description de router Cali

```
CALI>enable
CALI#configure terminal
CALI(config)#interface fastEthernet 0/0
CALI(config-if)#description "Red Lan CALI"
CALI(config-if)#exit
CALI(config)#
CALI(config)#interface serial 0/0/1
CALI(config-if)#description "Red WAN - Cali/Medellin"
CALI(config-if)#exit
CALI(config)#exit
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed
state to up

CALI(config-if)#exit
CALI(config)#exit
CALI#
%SYS-5-CONFIG_I: Configured from console by console

CALI#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
CALI#
```

### Comando description de router Medellín

```
MEDELLIN>enable
MEDELLIN#configure terminal
MEDELLIN(config)#interface fastEthernet 0/0
MEDELLIN(config-if)#description "Red LAN MEDELLIN"
MEDELLIN(config-if)#exit
MEDELLIN(config)#
MEDELLIN(config)#interface serial 0/0/1
MEDELLIN(config-if)#description "Red WAN - Medellin/Cali "
MEDELLIN(config-if)#exit
MEDELLIN(config)#interface serial 0/0/0
MEDELLIN(config-if)#description "Red WAN - Medellin/Barranquilla "
MEDELLIN(config-if)#exit
MEDELLIN(config)#exit
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
```



%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

MEDELLIN(config-if)#exit

MEDELLIN(config)#exit

MEDELLIN#

%SYS-5-CONFIG\_I: Configured from console by console

MEDELLIN#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

MEDELLIN#

## Comando description de router Bogotá

```
BOGOTA>enable
BOGOTA#configure terminal
BOGOTA(config)#interface fastEthernet 0/0
BOGOTA (config-if)#description "Red LAN BOGOTA"
BOGOTA(config-if)#exit
BOGOTA(config)#
BOGOTA(config)#interface serial 0/0/0
BOGOTA(config-if)#description "Red WAN - Bogotá/Bmanga "
BOGOTA(config-if)#exit
BOGOTA(config)#interface serial 0/0/1
BOGOTA(config-if)#description "Red WAN - Bogota/Barranquilla "
BOGOTA(config-if)#exit
BOGOTA(config)#exit
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed
state to up

BOGOTA(config-if)#exit
BOGOTA(config)#exit
BOGOTA#
%SYS-5-CONFIG_I: Configured from console by console

BOGOTA#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BOGOTA#
```

## Comando description de router Barranquilla

```
BARRANQUILLA>enable
BARRANQUILLA #configure terminal
BARRANQUILLA(config)#interface fastEthernet 0/0
BARRANQUILLA(config-if)#description "Red LAN MEDELLIN"
BARRANQUILLA(config-if)#exit
BARRANQUILLA(config)#
BARRANQUILLA(config)#interface serial 0/0/1
BARRANQUILLA(config-if)#description "Red WAN - Medellin/Cali "
BARRANQUILLA(config-if)#exit
BARRANQUILLA(config)#interface serial 0/0/0
BARRANQUILLA(config-if)#description "Red WAN - Barranquilla/Medellin"
BARRANQUILLA(config-if)#exit
BARRANQUILLA(config)#exit
```

```
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed
state to up

BARRANQUILLA(config-if)#exit
BARRANQUILLA(config)#exit
BARRANQUILLA #
%SYS-5-CONFIG_I: Configured from console by console

BARRANQUILLA#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BARRANQUILLA#
```

## **Comando description de router Bucaramanga**

```
BMANGA>enable
BMANGA#configure terminal
BMANGA(config)#interface fastEthernet 0/0
BMANGA(config-if)#description "Red LAN BUCARAMANGA "
BMANGA(config-if)#exit
BMANGA(config)#
BMANGA(config)#interface serial 0/0/0
BMANGA(config-if)#description "Red WAN - Bucaramanga/Bogota "
BMANGA(config-if)#exit
BMANGA(config)#exit
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed
state to up

BMANGA(config-if)#exit
BMANGA(config)#exit
BMANGA#
%SYS-5-CONFIG_I: Configured from console by console

BMANGA#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BMANGA#
```

## **ESTABLECER CONTRASEÑA A CADA ROUTER**

### **Establecer contraseña de router Cali**

```
CALI>enable
CALI#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
CALI(config)#line console 0
CALI(config-line)#password cisco
CALI(config-line)#login
CALI(config-line)#exit
CALI(config)#exit
CALI#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
CALI #
```

### **Establecer contraseña de router Medellín**

```
MEDELLIN>enable
MEDELLIN#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
MEDELLIN(config)#line console 0
MEDELLIN(config-line)#password cisco
MEDELLIN(config-line)#login
MEDELLIN(config-line)#exit
MEDELLIN(config)#exit
MEDELLIN#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
MEDELLIN#
```

### **Establecer contraseña de router Bogotá**

```
BOGOTA>enable
BOGOTA#config terminal
Enter configuration commands, one per line.  End with CNTL/Z.
BOGOTA(config)#line console 0
BOGOTA(config-line)#password cisco
BOGOTA(config-line)#login
BOGOTA(config-line)#exit
BOGOTA(config)#exit
BOGOTA#copy running-config startup-config
Destination filename [startup-config]?
```

Building configuration...

[OK]

BOGOTA#

## **Establecer contraseña de router Bucaramanga**

```
BMANGA>enable
```

```
BMANGA#config terminal
```

```
Enter configuration commands, one per line. End with CNTL/Z.
```

```
BMANGA(config)#line console 0
```

```
BMANGA(config-line)#password cisco
```

```
BMANGA(config-line)#login
```

```
BMANGA(config-line)#exit
```

```
BMANGA(config)#exit
```

```
BMANGA#copy running-config startup-config
```

```
Destination filename [startup-config]?
```

```
Building configuration...
```

```
[OK]
```

```
BMANGA #
```

## **Establecer contraseña de router Barranquilla**

```
BARRANQUILLA>enable
```

```
BMANGA#config terminal
```

```
Enter configuration commands, one per line. End with CNTL/Z.
```

```
BARRANQUILLA(config)#line console 0
```

```
BARRANQUILLA(config-line)#password cisco
```

```
BARRANQUILLA(config-line)#login
```

```
BARRANQUILLA(config-line)#exit
```

```
BARRANQUILLA(config)#exit
```

```
BARRANQUILLA#copy running-config startup-config
```

```
Destination filename [startup-config]?
```

```
Building configuration...
```

```
[OK]
```

```
BARRANQUILLA#
```

## **CONFIGURAR LOS SERIALES**

### **Configura serial de router Cali**

```
CALI>enable
```

```
CALI#configure terminal
```

```
Enter configuration commands, one per line. End with CNTL/Z.
```

```
CALI(config)#interface Serial0/0/1
```

```
CALI(config-if)#no shutdown
```

```
CALI(config-if)#clock rate 9600
```

```
This command applies only to DCE interfaces
```

```
CALI(config-if)#ip address 192.168.0.177 255.255.255.252
```

```
CALI(config-if)#exit
CALI(config)#exit
CALI#
%SYS-5-CONFIG_I: Configured from console by console
copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
CALI#
```

## Configura serial de router Medellin

```
MEDELLIN>enable
MEDELLIN #configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
MEDELLIN (config)#interface Serial0/0/1
MEDELLIN (config-if)#no shutdown
MEDELLIN (config-if)#clock rate 9600
This command applies only to DCE interfaces
MEDELLIN (config-if)#ip address 192.168.0.178 255.255.255.252
MEDELLIN (config-if)#exit
MEDELLIN (config)#exit
MEDELLIN #
%SYS-5-CONFIG_I: Configured from console by console
MEDELLIN (config)#interface Serial0/0/0
MEDELLIN (config-if)#no shutdown
MEDELLIN (config-if)#clock rate 9600
This command applies only to DCE interfaces
MEDELLIN (config-if)#ip address 192.168.0.181 255.255.255.252
MEDELLIN (config-if)#exit
MEDELLIN (config)#exit
MEDELLIN #
%SYS-5-CONFIG_I: Configured from console by console

copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
MEDELLIN #
```

## Configura serial de router Barranquilla

```
BARRANQUILLA>enable
BARRANQUILLA#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
BARRANQUILLA(config)#interface Serial0/0/1
BARRANQUILLA(config-if)#no shutdown
BARRANQUILLA(config-if)#clock rate 9600
This command applies only to DCE interfaces
BARRANQUILLA(config-if)#ip address 192.168.0.185 255.255.255.252
BARRANQUILLA(config-if)#exit
BARRANQUILLA(config)#exit
```

```

BARRANQUILLA#
%SYS-5-CONFIG_I: Configured from console by console
BARRANQUILLA(config)#interface Serial0/0/0
BARRANQUILLA(config-if)#no shutdown
BARRANQUILLA(config-if)#clock rate 9600
This command applies only to DCE interfaces
BARRANQUILLA(config-if)#ip address 192.168.0.181 255.255.255.252
BARRANQUILLA(config-if)#exit
BARRANQUILLA(config)#exit
BARRANQUILLA#
%SYS-5-CONFIG_I: Configured from console by console

copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BARRANQUILLA#

```

## Configura serial de router Bogotá

```

BOGOTA>enable
BOGOTA #configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
BOGOTA(config)#interface Serial0/0/1
BOGOTA(config-if)#no shutdown
BOGOTA(config-if)#clock rate 9600
This command applies only to DCE interfaces
BOGOTA(config-if)#ip address 192.168.0.185 255.255.255.252
BOGOTA(config-if)#exit
BOGOTA(config)#exit
BOGOTA #
%SYS-5-CONFIG_I: Configured from console by console
BOGOTA(config)#interface Serial0/0/0
BOGOTA(config-if)#no shutdown
BOGOTA(config-if)#clock rate 9600
This command applies only to DCE interfaces
BOGOTA(config-if)#ip address 192.168.0.189 255.255.255.252
BOGOTA(config-if)#exit
BOGOTA(config)#exit
BOGOTA #
%SYS-5-CONFIG_I: Configured from console by console

copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BOGOTA#

```

## Configura serial de router Bucaramanga

```

BMANGA>enable
BMANGA#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.

```

```

BMANGA(config)#interface Serial0/0/0
BMANGA(config-if)#no shutdown
BMANGA(config-if)#clock rate 9600
This command applies only to DCE interfaces
BMANGA(config-if)#ip address 192.168.0.190 255.255.255.252
BMANGA(config-if)#exit
BMANGA(config)#exit
BMANGA #
%SYS-5-CONFIG_I: Configured from console by console
copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
BMANGA#

```

## CONFIGURAR PROTOCOLO DE ENRUTAMIENTO RIP v2

```

ROUTER>en
ROUTER#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
ROUTER(config)#router rip
ROUTER(config-router)#network 192.168.0.0
ROUTER(config-router)#version 2
ROUTER(config-router)#no auto-summary
ROUTER(config-router)#exit
ROUTER(config)#exit
ROUTER #

```

## Archivos exportados con el comando Show Running-config

### Cali

```

!
version 12.4
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname CALI
!
spanning-tree mode pvst
!
interface FastEthernet0/0
description " Red Lan CALI"
ip address 192.168.0.1 255.255.255.192
duplex auto
speed auto
!
interface FastEthernet0/1
no ip address
duplex auto
speed auto
shutdown
!
interface Serial0/0/0

```



```

no ip address
clock rate 2000000
shutdown
!
interface Serial0/0/1
description "Red WAN - Cali/Medellin"
ip address 192.168.0.177 255.255.255.252
!
interface Vlan1
no ip address
shutdown
!
router rip
version 2
network 192.168.0.0
no auto-summary
!
ip classless
!
line con 0
password cisco
login
line vty 0 4
login
!
end

```

## **Bogotá**

```

!
version 12.4
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname BOGOTA
!
spanning-tree mode pvst
!
interface FastEthernet0/0
ip address 192.168.0.129 255.255.255.224
duplex auto
speed auto
!
interface FastEthernet0/1
no ip address
duplex auto
speed auto
shutdown
!
interface Serial0/0/0
ip address 192.168.0.189 255.255.255.252
!
interface Serial0/0/1
ip address 192.168.0.185 255.255.255.252
clock rate 2000000
!
interface Vlan1
no ip address
shutdown
!
router rip
version 2

```

```
network 192.168.0.0
no auto-summary
!
ip classless
!
line con 0
line vty 0 4
  login
!
end
```

## Medellin

```
!  
version 12.4  
no service timestamps log datetime msec  
no service timestamps debug datetime msec  
no service password-encryption  
!  
hostname MEDELLIN  
!  
spanning-tree mode pvst  
!  
interface FastEthernet0/0  
 ip address 192.168.0.126 255.255.255.224  
 duplex auto  
 speed auto  
!  
interface FastEthernet0/1  
 no ip address  
 duplex auto  
 speed auto  
 shutdown  
!  
interface Serial0/0/0  
 ip address 192.168.0.181 255.255.255.252  
!  
interface Serial0/0/1  
 ip address 192.168.0.178 255.255.255.252  
 clock rate 64000  
!  
interface Vlan1  
 no ip address  
 shutdown  
!  
router rip  
 version 2  
 network 192.168.0.0  
 no auto-summary  
!  
ip classless  
!  
line con 0  
line vty 0 4  
 login  
!  
end
```

## Barranquilla

```
!  
version 12.4  
no service timestamps log datetime msec  
no service timestamps debug datetime msec  
no service password-encryption  
!  
hostname BARRANQUILLA  
!  
spanning-tree mode pvst  
!
```

```

interface FastEthernet0/0
 ip address 192.168.0.65 255.255.255.224
 duplex auto
 speed auto
 !
interface FastEthernet0/1
 no ip address
 duplex auto
 speed auto
 shutdown
 !
interface Serial0/0/0
 ip address 192.168.0.182 255.255.255.252
 clock rate 64000
 !
interface Serial0/0/1
 ip address 192.168.0.186 255.255.255.252
 !
interface Vlan1
 no ip address
 shutdown
 !
router rip
 version 2
 network 192.168.0.0
 no auto-summary
 !
ip classless
 !
line con 0
line vty 0 4
 login
 !
end

```

## **Bucaramanga**

```

!
version 12.4
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname MERCADEO
!
spanning-tree mode pvst
!
interface FastEthernet0/0
 ip address 192.168.0.161 255.255.255.240
 duplex auto
 speed auto
 !
interface FastEthernet0/1
 no ip address
 duplex auto
 speed auto
 shutdown
 !
interface Serial0/0/0
 ip address 192.168.0.190 255.255.255.252
 clock rate 64000
 !

```

```
interface Serial0/0/1
  no ip address
  clock rate 2000000
  shutdown
!
interface Vlan1
  no ip address
  shutdown
!
router rip
  version 2
  network 192.168.0.0
  no auto-summary
!
ip classless
!
line con 0
line vty 0 4
  login
!
end
```

## 4. CASO DE ESTUDIO CCNA 2

### Objetivos de aprendizaje:

1. Diseñar y documentar un esquema de direccionamiento según los requisitos.
2. Aplicar una configuración básica a los dispositivos.
3. Configurar una prioridad de routers y RID.
4. Configurar el enrutamiento OSPF
5. Desactivación de las actualizaciones de enrutamiento en las interfaces adecuadas.
6. Verificación de la completa conectividad entre todos los dispositivos de la topología.

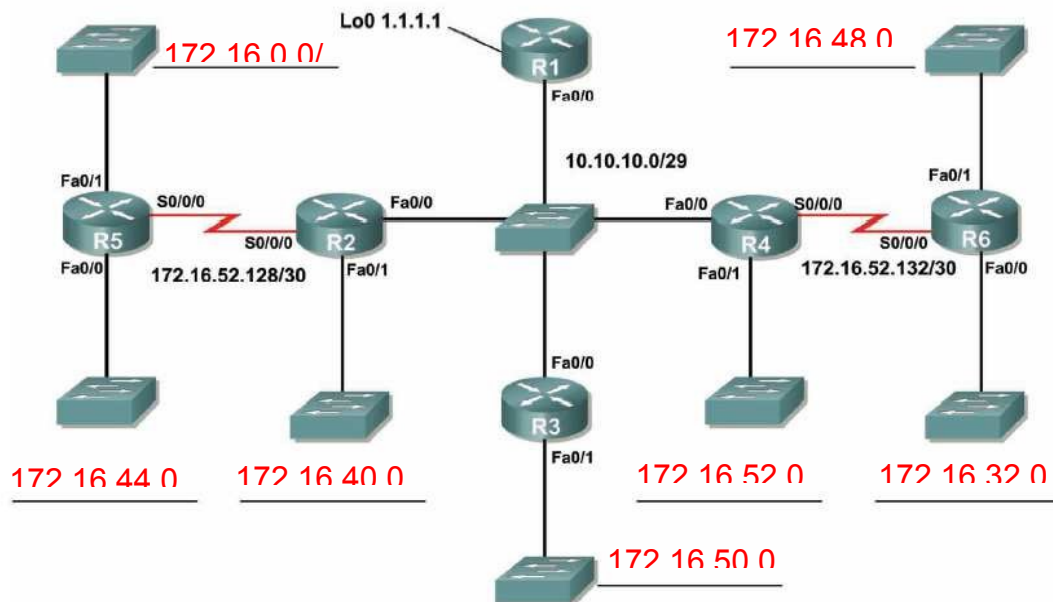
### Enunciado Principal del caso de estudio

Se desea diseñar todo el esquema de enrutamiento para la topología que se ilustra en la siguiente figura, acorde con las pautas establecidas en cada una de las tareas que se definen a continuación. El estudiante deberá realizar el diseño completo y documentarlo indicando paso a paso la solución del mismo y las estrategias que utilizó para alcanzar el objetivo.

#### Tarea 1:

#### Diseño y documentación de un esquema de direccionamiento

Diagrama de topología



Utilice la 172.16.0.0/16 para crear un esquema de direccionamiento eficiente que cumpla los siguientes requisitos:

Nombre de host	Interfaz	Cantidad de hosts
R2	Fa0/1	1000
R3	Fa0/1	400
R4	Fa0/1	120
R5	Fa0/1	6000
R5	Fa0/0	800
R6	Fa0/1	2000
R6	Fa0/0	500

**NOTA:** observe que se han establecido las direcciones IP correspondientes a la interfaz Fa0/0 en los routers R1, R2, R3 y R4 tal como se ilustra en la siguiente tabla.

Dispositivo	Interfaz	Dirección IP	Máscara de subred
R1	Fa0/0	10.10.10.1	255.255.255.248
	Loopback0	1.1.1.1	255.255.255.255
R2	Fa0/0	10.10.10.2	255.255.255.248
	Fa0/1	172.16.40.1	255.255.252.0
	S0/0/0	172.16.52.130	255.255.255.252
R3	Fa0/0	10.10.10.3	255.255.255.248
	Fa0/1	172.16.50.1	255.255.254.0
R4	Fa0/0	10.10.10.4	255.255.255.248
	Fa0/1	172.16.52.1	255.255.255.128
	S0/0/0	172.16.52.133	255.255.255.252
R5	Fa0/0	172.16.0.1	255.255.224.0
	Fa0/1	172.16.44.1	255.255.252.0
	S0/0/0	172.16.52.129	255.255.255.252
R6	Fa0/0	172.16.32.1	255.255.248.0
	Fa0/1	172.16.48.1	255.255.254.0
	S0/0/0	172.16.52.134	255.255.255.252

Se debe tener en cuenta que para establecer las direcciones IP para cada subred debe hacer uso de VLSM e identificar para cada una de ellas las siguientes direcciones IP:

1. Dirección de Subred
2. Dirección de Gateway
3. Dirección IP del primer PC de la subred
4. Dirección IP de último PC requerido en la subred. (Por ejemplo: Si la subred posee 800 host, cuál será la dirección IP del Host 800)
5. Dirección de Broadcast
6. Máscara de Subred

Red	Dirección de subred	Dirección de Gateway	Primera dirección IP	Ultima dirección IP	Broadcast	Mascara de subred
R5-1	172.16.0.0	172.16.0.1	172.16.0.2	172.16.0.1	172.16.31.255	255.255.224.0
R6-1	172.16.32.0	172.16.32.1	172.16.32.2	172.16.32.1	172.16.39.255	255.255.248.0
R2	172.16.40.0	172.16.40.1	172.16.40.2	172.16.40.1	172.16.43.255	255.255.252.0
R5-2	172.16.44.0	172.16.44.1	172.16.44.2	172.16.44.1	172.16.47.255	255.255.252.0
R6-2	172.16.48.0	172.16.48.1	172.16.48.2	172.16.48.1	172.16.49.255	255.255.254.0
R3	172.16.50.0	172.16.50.1	172.16.50.2	172.16.50.1	172.16.51.255	255.255.254.0
R4	172.16.52.0	172.16.52.1	172.16.52.2	172.16.52.1	172.16.52.127	255.255.255.128

**Tarea 2:**  
**Aplicación de una configuración básica.**

**Paso 1:** En cada router, utilice el siguiente cuadro para completar las configuraciones básicas de contraseñas del router.

Contraseña de consola	Contraseña de VTY	Contraseña secreta de enable	Frecuencia de reloj (si corresponde)
cisco	cisco	cisco	56000

```
R?>en
R?#conf t
R?(config)#enable secret cisco
R?(config)#line console 0
R?(config-line)#password cisco
R?(config-line)#login
R?(config)#exit
R?(config)#line vty 0 4
R?(config-line)#password cisco
R?(config-line)#login
```



### **Tarea 3: Configurar el enrutamiento OSPF**

**Paso 1:** Configurar el enrutamiento OSPF en cada router.

#### **R1**

```
router ospf 1
 network 172.26.48.0 0.0.7.255 area 0
 network 172.16.32.0 0.0.1.255 area 0
 network 172.16.52.132 0.0.0.3 area 0
 default-information originate
```

#### **R2**

```
router ospf 1
 network 10.10.10.0 0.0.0.7 area 0
 network 172.16.52.128 0.0.0.3 area 0
 network 172.16.40.0 0.0.3.255 area 0
 default-information originate
```

#### **R3**

```
router ospf 1
 network 10.10.10.0 0.0.0.7 area 0
 network 172.16.50.0 0.0.1.255 area 0
 default-information originate
```

#### **R4**

```
router ospf 1
 network 10.10.10.0 0.0.0.7 area 0
 network 172.16.52.132 0.0.0.3 area 0
 default-information originate
```

#### **R5**

```
router ospf 1
 network 172.16.0.0 0.0.31.255 area 0
 network 172.26.44.0 0.0.3.255 area 0
 network 172.16.52.128 0.0.0.3 area 0
 default-information originate
```

#### **R6**

```
router ospf 1
 network 172.26.48.0 0.0.7.255 area 0
 network 172.16.32.0 0.0.1.255 area 0
 network 172.16.52.132 0.0.0.3 area 0
 default-information originate
```

**Paso 2:** Verifique que se hayan aprendido todas las rutas.

**Tarea 4:  
Ajuste refinado de OSPF**

**Paso 1:** Utilice las siguientes pautas para completar esta tarea:

- R1 nunca participará en una elección DR/BDR.
- R2 siempre será el DR
- R3 y R4 tendrán la misma prioridad de 100.  
ip ospf priority 100
- R4 debe ser siempre el BDR

**NOTA: SE DEBEN ESTABLECER TODAS LAS PRIORIDADES EN FA0/0**

**Paso 2:** Fuerce una elección DR/DBR.

**Tarea 5:  
Configuración de un loopback**

**Paso 1:** En R1 configure un loopback con una dirección 1.1.1.1/32.

```
interface Loopback0
ip address 1.1.1.1 255.255.255.255
```

**Paso 2:** Cree una ruta por defecto al loopback

```
ip route 0.0.0.0 0.0.0.0 Loopback0
```

**Paso 3:** Propague la ruta con actualizaciones OSPF.

```
default-information originate
```

**Tarea 6:  
Visualización de las actualizaciones OSPF.**

**Paso 1:** Ingrese al modo Simulación

**Paso 2:** Seleccione solamente OSPF en el filtro.

**Paso 3:** Visualice las actualizaciones.

**Tarea 7:  
Entrega final del Informe**

El informe a entregar debe contener los siguientes elementos:

1. Portada
2. Justificación
3. Objetivos
4. Informe correspondiente al desarrollo del caso de estudio según las

tareas establecidas en el transcurso del documento

5. Configuración final de cada uno de los dispositivos, describiéndose en detalle cada uno de los elementos que lo conforman. Por ejemplo, descripción de la configuración de interfaces, configuración del protocolo de enrutamiento, etc.
6. Conclusiones
7. Archivo de simulación en Packet Tracer

- **Tabla de enrutamiento**

### R1

Gateway of last resort is 0.0.0.0 to network 0.0.0.0

```
1.0.0.0/32 is subnetted, 1 subnets
C    1.1.1.1 is directly connected, Loopback0
10.0.0.0/29 is subnetted, 1 subnets
C    10.10.10.0 is directly connected, FastEthernet0/0
172.16.0.0/16 is variably subnetted, 6 subnets, 5 masks
O    172.16.0.0/19 [110/66] via 10.10.10.2, 00:02:08, FastEthernet0/0
O    172.16.32.0/21 [110/66] via 10.10.10.4, 00:02:08, FastEthernet0/0
O    172.16.40.0/22 [110/2] via 10.10.10.2, 00:02:08, FastEthernet0/0
O    172.16.50.0/23 [110/2] via 10.10.10.3, 00:02:08, FastEthernet0/0
O    172.16.52.128/30 [110/65] via 10.10.10.2, 00:02:08, FastEthernet0/0
O    172.16.52.132/30 [110/65] via 10.10.10.4, 00:02:08, FastEthernet0/0
S*  0.0.0.0/0 is directly connected, Loopback0
```

### R2

Gateway of last resort is 10.10.10.1 to network 0.0.0.0

```
10.0.0.0/29 is subnetted, 1 subnets
C    10.10.10.0 is directly connected, FastEthernet0/0
172.16.0.0/16 is variably subnetted, 6 subnets, 5 masks
O    172.16.0.0/19 [110/65] via 172.16.52.129, 00:04:05, Serial0/0/0
O    172.16.32.0/21 [110/66] via 10.10.10.4, 00:03:20, FastEthernet0/0
C    172.16.40.0/22 is directly connected, FastEthernet0/1
O    172.16.50.0/23 [110/2] via 10.10.10.3, 00:03:20, FastEthernet0/0
C    172.16.52.128/30 is directly connected, Serial0/0/0
O    172.16.52.132/30 [110/65] via 10.10.10.4, 00:03:20, FastEthernet0/0
O*E2 0.0.0.0/0 [110/1] via 10.10.10.1, 00:03:20, FastEthernet0/0
```

### R3

Gateway of last resort is 10.10.10.1 to network 0.0.0.0

```
10.0.0.0/29 is subnetted, 1 subnets
C    10.10.10.0 is directly connected, FastEthernet0/0
172.16.0.0/16 is variably subnetted, 6 subnets, 5 masks
O    172.16.0.0/19 [110/66] via 10.10.10.2, 00:04:12, FastEthernet0/0
O    172.16.32.0/21 [110/66] via 10.10.10.4, 00:04:22, FastEthernet0/0
O    172.16.40.0/22 [110/2] via 10.10.10.2, 00:04:12, FastEthernet0/0
C    172.16.50.0/23 is directly connected, FastEthernet0/1
O    172.16.52.128/30 [110/65] via 10.10.10.2, 00:04:12, FastEthernet0/0
O    172.16.52.132/30 [110/65] via 10.10.10.4, 00:04:22, FastEthernet0/0
O*E2 0.0.0.0/0 [110/1] via 10.10.10.1, 00:04:12, FastEthernet0/0
```

## R4

Gateway of last resort is 10.10.10.1 to network 0.0.0.0

```
    10.0.0.0/29 is subnetted, 1 subnets
C       10.10.10.0 is directly connected, FastEthernet0/0
    172.16.0.0/16 is variably subnetted, 7 subnets, 6 masks
O       172.16.0.0/19 [110/66] via 10.10.10.2, 00:04:53, FastEthernet0/0
O       172.16.32.0/21 [110/65] via 172.16.52.134, 00:05:28, Serial0/0/0
O       172.16.40.0/22 [110/2] via 10.10.10.2, 00:04:53, FastEthernet0/0
O       172.16.50.0/23 [110/2] via 10.10.10.3, 00:04:53, FastEthernet0/0
C       172.16.52.0/29 is directly connected, FastEthernet0/1
O       172.16.52.128/30 [110/65] via 10.10.10.2, 00:04:53, FastEthernet0/0
C       172.16.52.132/30 is directly connected, Serial0/0/0
O*E2 0.0.0.0/0 [110/1] via 10.10.10.1, 00:04:53, FastEthernet0/0
```

## R5

Gateway of last resort is 172.16.52.130 to network 0.0.0.0

```
    10.0.0.0/29 is subnetted, 1 subnets
O       10.10.10.0 [110/65] via 172.16.52.130, 00:05:13, Serial0/0/0
    172.16.0.0/16 is variably subnetted, 7 subnets, 5 masks
C       172.16.0.0/19 is directly connected, FastEthernet0/0
O       172.16.32.0/21 [110/130] via 172.16.52.130, 00:05:13, Serial0/0/0
O       172.16.40.0/22 [110/65] via 172.16.52.130, 00:06:03, Serial0/0/0
C       172.16.44.0/22 is directly connected, FastEthernet0/1
O       172.16.50.0/23 [110/66] via 172.16.52.130, 00:05:13, Serial0/0/0
C       172.16.52.128/30 is directly connected, Serial0/0/0
O       172.16.52.132/30 [110/129] via 172.16.52.130, 00:05:13, Serial0/0/0
O*E2 0.0.0.0/0 [110/1] via 172.16.52.130, 00:05:13, Serial0/0/0
```

## R6

Gateway of last resort is 172.16.52.133 to network 0.0.0.0

```
    10.0.0.0/29 is subnetted, 1 subnets
O       10.10.10.0 [110/65] via 172.16.52.133, 00:05:53, Serial0/0/0
    172.16.0.0/16 is variably subnetted, 7 subnets, 5 masks
O       172.16.0.0/19 [110/130] via 172.16.52.133, 00:05:43, Serial0/0/0
C       172.16.32.0/21 is directly connected, FastEthernet0/0
O       172.16.40.0/22 [110/66] via 172.16.52.133, 00:05:43, Serial0/0/0
C       172.16.48.0/23 is directly connected, FastEthernet0/1
O       172.16.50.0/23 [110/66] via 172.16.52.133, 00:05:43, Serial0/0/0
O       172.16.52.128/30 [110/129] via 172.16.52.133, 00:05:43, Serial0/0/0
C       172.16.52.132/30 is directly connected, Serial0/0/0
O*E2 0.0.0.0/0 [110/1] via 172.16.52.133, 00:05:43, Serial0/0/0
```

- **Configuración de interfaces**

## R1

```
FastEthernet0/0 is up, line protocol is up
  Internet address is 10.10.10.1/29, Area 0
  Process ID 1, Router ID 1.1.1.1, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DROTHER, Priority 1
  Designated Router (ID) 172.16.52.133, Interface address 10.10.10.4
  Backup Designated Router (ID) 172.16.50.1, Interface address 10.10.10.3
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:05
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
```

```
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 3, Adjacent neighbor count is 2
  Adjacent with neighbor 172.16.52.133 (Designated Router)
  Adjacent with neighbor 172.16.50.1 (Backup Designated Router)
Suppress hello for 0 neighbor(s)
```

## R2

```
FastEthernet0/0 is up, line protocol is up
  Internet address is 10.10.10.2/29, Area 0
  Process ID 1, Router ID 172.16.52.130, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DROTHER, Priority 1
  Designated Router (ID) 172.16.52.133, Interface address 10.10.10.4
  Backup Designated Router (ID) 172.16.50.1, Interface address 10.10.10.3
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:05
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 3, Adjacent neighbor count is 2
    Adjacent with neighbor 172.16.52.133 (Designated Router)
    Adjacent with neighbor 172.16.50.1 (Backup Designated Router)
  Suppress hello for 0 neighbor(s)
FastEthernet0/1 is up, line protocol is up
  Internet address is 172.16.40.1/22, Area 0
  Process ID 1, Router ID 172.16.52.130, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 172.16.52.130, Interface address 172.16.40.1
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:04
  Index 2/2, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
Serial0/0/0 is up, line protocol is up
  Internet address is 172.16.52.130/30, Area 0
  Process ID 1, Router ID 172.16.52.130, Network Type POINT-TO-POINT, Cost: 64
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:03
  Index 3/3, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1, Adjacent neighbor count is 1
    Adjacent with neighbor 172.16.52.129
  Suppress hello for 0 neighbor(s)
```

## R3

```
FastEthernet0/0 is up, line protocol is up
  Internet address is 10.10.10.3/29, Area 0
  Process ID 1, Router ID 172.16.50.1, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State BDR, Priority 100
  Designated Router (ID) 172.16.52.133, Interface address 10.10.10.4
```

```

Backup Designated Router (ID) 172.16.50.1, Interface address 10.10.10.3
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
  Hello due in 00:00:08
Index 1/1, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 3, Adjacent neighbor count is 3
  Adjacent with neighbor 172.16.52.133 (Designated Router)
  Adjacent with neighbor 1.1.1.1
  Adjacent with neighbor 172.16.52.130
Suppress hello for 0 neighbor(s)
FastEthernet0/1 is up, line protocol is up
Internet address is 172.16.50.1/23, Area 0
Process ID 1, Router ID 172.16.50.1, Network Type BROADCAST, Cost: 1
Transmit Delay is 1 sec, State DR, Priority 1
Designated Router (ID) 172.16.50.1, Interface address 172.16.50.1
No backup designated router on this network
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
  Hello due in 00:00:08
Index 2/2, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 0, Adjacent neighbor count is 0
Suppress hello for 0 neighbor(s)

```

## R4

```

FastEthernet0/0 is up, line protocol is up
Internet address is 10.10.10.4/29, Area 0
Process ID 1, Router ID 172.16.52.133, Network Type BROADCAST, Cost: 1
Transmit Delay is 1 sec, State DR, Priority 100
Designated Router (ID) 172.16.52.133, Interface address 10.10.10.4
Backup Designated Router (ID) 172.16.50.1, Interface address 10.10.10.3
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
  Hello due in 00:00:05
Index 1/1, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 3, Adjacent neighbor count is 3
  Adjacent with neighbor 172.16.50.1 (Backup Designated Router)
  Adjacent with neighbor 1.1.1.1
  Adjacent with neighbor 172.16.52.130
Suppress hello for 0 neighbor(s)
Serial0/0/0 is up, line protocol is up
Internet address is 172.16.52.133/30, Area 0
Process ID 1, Router ID 172.16.52.133, Network Type POINT-TO-POINT, Cost: 64
Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
No designated router on this network
No backup designated router on this network
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
  Hello due in 00:00:05
Index 2/2, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1, Adjacent neighbor count is 1
  Adjacent with neighbor 172.16.52.134
Suppress hello for 0 neighbor(s)

```

## R5

```
FastEthernet0/0 is up, line protocol is up
  Internet address is 172.16.0.1/19, Area 0
  Process ID 1, Router ID 172.16.52.129, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 172.16.52.129, Interface address 172.16.0.1
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:02
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
Serial0/0/0 is up, line protocol is up
  Internet address is 172.16.52.129/30, Area 0
  Process ID 1, Router ID 172.16.52.129, Network Type POINT-TO-POINT, Cost: 64
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:02
  Index 2/2, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1, Adjacent neighbor count is 1
    Adjacent with neighbor 172.16.52.130
  Suppress hello for 0 neighbor(s)
```

## R6

```
FastEthernet0/0 is up, line protocol is up
  Internet address is 172.16.32.1/21, Area 0
  Process ID 1, Router ID 172.16.52.134, Network Type BROADCAST, Cost: 1
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 172.16.52.134, Interface address 172.16.32.1
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:09
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 0, Adjacent neighbor count is 0
  Suppress hello for 0 neighbor(s)
Serial0/0/0 is up, line protocol is up
  Internet address is 172.16.52.134/30, Area 0
  Process ID 1, Router ID 172.16.52.134, Network Type POINT-TO-POINT, Cost: 64
  Transmit Delay is 1 sec, State POINT-TO-POINT, Priority 0
  No designated router on this network
  No backup designated router on this network
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    Hello due in 00:00:08
  Index 2/2, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1, Adjacent neighbor count is 1
    Adjacent with neighbor 172.16.52.133
  Suppress hello for 0 neighbor(s)
```

- **Resumen de interfaces**

### R1

Interface	IP-Address	OK?	Method	Status	Protocol
FastEthernet0/0	10.10.10.1	YES	manual	up	up
FastEthernet0/1	unassigned	YES	unset	administratively down	down
Loopback0	1.1.1.1	YES	manual	up	up
Vlan1	unassigned	YES	unset	administratively down	down

### R2

Interface	IP-Address	OK?	Method	Status	Protocol
FastEthernet0/0	10.10.10.2	YES	manual	up	up
FastEthernet0/1	172.16.40.1	YES	manual	up	up
Serial0/0/0	172.16.52.130	YES	manual	up	up
Serial0/0/1	unassigned	YES	unset	administratively down	down
Vlan1	unassigned	YES	unset	administratively down	down

### R3

Interface	IP-Address	OK?	Method	Status	Protocol
FastEthernet0/0	10.10.10.3	YES	manual	up	up
FastEthernet0/1	172.16.50.1	YES	manual	up	up
Vlan1	unassigned	YES	unset	administratively down	down

### R4

Interface	IP-Address	OK?	Method	Status	Protocol
FastEthernet0/0	10.10.10.4	YES	manual	up	up
FastEthernet0/1	172.16.52.1	YES	manual	up	up
Serial0/0/0	172.16.52.133	YES	manual	up	up
Serial0/0/1	unassigned	YES	unset	administratively down	down
Vlan1	unassigned	YES	unset	administratively down	down

### R5

Interface	IP-Address	OK?	Method	Status	Protocol
FastEthernet0/0	172.16.0.1	YES	manual	up	up
FastEthernet0/1	172.16.44.1	YES	manual	up	up
Serial0/0/0	172.16.52.129	YES	manual	up	up
Serial0/0/1	unassigned	YES	unset	administratively down	down
Vlan1	unassigned	YES	unset	administratively down	down

### R6

Interface	IP-Address	OK?	Method	Status	Protocol
FastEthernet0/0	172.16.32.1	YES	manual	up	up
FastEthernet0/1	172.16.48.1	YES	manual	up	up
Serial0/0/0	172.16.52.134	YES	manual	up	up
Serial0/0/1	unassigned	YES	unset	administratively down	down
Vlan1	unassigned	YES	unset	administratively down	down

- **Configuración de protocolo de enrutamiento**

### R1

```

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 1.1.1.1
  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:
 10.10.10.0 0.0.0.7 area 0
Routing Information Sources:
 Gateway          Distance      Last Update
 1.1.1.1          110           00:01:44
 172.16.50.1      110           00:01:45
 172.16.52.129    110           00:02:20
 172.16.52.130    110           00:01:45
 172.16.52.133    110           00:01:45
 172.16.52.134    110           00:02:19
Distance: (default is 110)

```

## R2

```

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 172.16.52.130
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    10.10.10.0 0.0.0.7 area 0
    172.16.52.128 0.0.0.3 area 0
    172.16.40.0 0.0.3.255 area 0
  Routing Information Sources:
   Gateway          Distance      Last Update
  1.1.1.1          110           00:03:18
  172.16.50.1      110           00:03:19
  172.16.52.129    110           00:03:53
  172.16.52.130    110           00:03:18
  172.16.52.133    110           00:03:18
  172.16.52.134    110           00:03:52
Distance: (default is 110)

```

## R3

```

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 172.16.50.1
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    10.10.10.0 0.0.0.7 area 0
    172.16.50.0 0.0.1.255 area 0
  Routing Information Sources:
   Gateway          Distance      Last Update
  1.1.1.1          110           00:03:41
  172.16.50.1      110           00:03:41
  172.16.52.129    110           00:04:16
  172.16.52.130    110           00:03:41
  172.16.52.133    110           00:03:41
  172.16.52.134    110           00:04:15
Distance: (default is 110)

```

## R4

```

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set

```

```

Router ID 172.16.52.133
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
Maximum path: 4
Routing for Networks:
  10.10.10.0 0.0.0.7 area 0
  172.16.52.132 0.0.0.3 area 0
Routing Information Sources:
  Gateway          Distance      Last Update
  1.1.1.1          110          00:04:02
  172.16.50.1     110          00:04:03
  172.16.52.129   110          00:04:37
  172.16.52.130   110          00:04:02
  172.16.52.133   110          00:04:02
  172.16.52.134   110          00:04:36
Distance: (default is 110)

```

## R5

```

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 172.16.52.129
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    172.16.0.0 0.0.31.255 area 0
    172.26.44.0 0.0.3.255 area 0
    172.16.52.128 0.0.0.3 area 0
  Routing Information Sources:
    Gateway          Distance      Last Update
    1.1.1.1          110          00:04:22
    172.16.50.1     110          00:04:23
    172.16.52.129   110          00:04:57
    172.16.52.130   110          00:04:23
    172.16.52.133   110          00:04:23
    172.16.52.134   110          00:04:56
  Distance: (default is 110)

```

## R6

```

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 172.16.52.134
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
    172.26.48.0 0.0.7.255 area 0
    172.16.32.0 0.0.1.255 area 0
    172.16.52.132 0.0.0.3 area 0
  Routing Information Sources:
    Gateway          Distance      Last Update
    1.1.1.1          110          00:04:47
    172.16.50.1     110          00:04:48
    172.16.52.129   110          00:05:23
    172.16.52.130   110          00:04:48
    172.16.52.133   110          00:04:48
    172.16.52.134   110          00:05:21
  Distance: (default is 110)

```

## **5. CONCLUSIONES**

A partir de los casos de estudio se puede determinar que el uso de los protocolos de enrutamiento, son bastante importantes en una especialista en redes, porque estos permiten la comunicación entre diferentes segmentos de red; por otra parte es imprescindible el reconocimiento de los conceptos de networking y routing para la implementación de soluciones de red.

## 6. BIBLIOGRAFIA

*Connections: Larrabee, Michael Abrash, Intel, Dr. Dobb's and me.* (4 de Abril de 2009). Recuperado el 1 de Octubre de 2012, de Real Time Rendering: <http://www.realtimerendering.com/blog/connections-larrabee-michael-abrash-intel-dr-dobbs-and-me/>

ARIGANELLO, E. (2008). *REDES CISCO: GUÍA DE ESTUDIO PARA LA CERTIFICACIÓN CCNA 640-802*. RA-MA EDITORIAL.

*CCNA Exploration 4.0 Aspectos Básicos de Networking 4.0.* (s.f.).

*CCNA Exploration 4.0 Conceptos y protocolos de enrutamiento.* (s.f.).

*IP Addressing and Subnetting.* (s.f.).