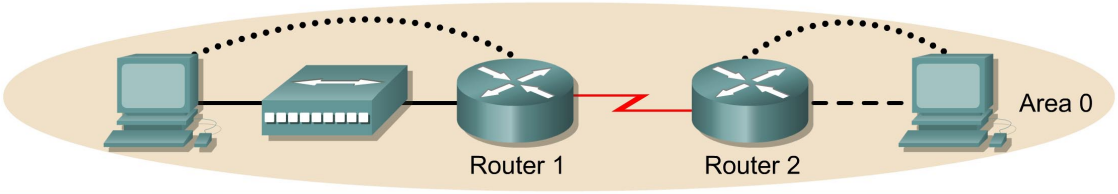
Lab 2.3.1 Configuring the OSPF Routing Process – 2500 Series



Router Designation	Route Name	Enable Secret Password	Enable, VTY, and Console Passwords	Routing Protocol	Network Statements
Router 1	Berlin	class	cisco	OSPF	192.168.1.128 192.168.15.0
Router 2	Rome	class	cisco	OSPF	192.168.15.0 192.168.0.0

Router Designation	IP Host Table Entry	FastEthernet 0 Address/ Subnet Mask	Interface Type Serial 0	Serial 0 Address/Subnet Mask	Interface Type Serial 1	Serial 1 Address/Subnet Mask
Router 1	Rome	192.168.1.129/26	DCE	192.168.15.1/30	NA	No address
Router 2	Berlin	192.168.0.1/24	DTE	192.168.15.2/30	NA	No address

Note: The IP Host Table Entry column contents indicate the name(s) of the other router(s) in the IP host table.

Straight-through cable		Console (Rollover)	
Serial cable		Crossover cable	

Objective

- Setup an IP addressing scheme for OSPF area 0.
- Configure and verify Open Shortest Path First (OSPF) routing.

Background/Preparation

Cable a network similar to the one shown in the diagram. Any router that meets the interface requirements displayed on the above diagram may be used. For example, router series 800, 1600, 1700, 2500, and 2600 or any such combination can be used. Please refer to the chart at the end of the lab to correctly identify the interface identifiers to be used based on the equipment in the lab. The configuration output used in this lab is produced from 1721 series routers. Any other router used may produce slightly different output. Perform the following steps on each router unless specifically instructed otherwise.

Start a HyperTerminal session.

Note: Go to the erase and reload instructions at the end of this lab. Perform those steps on all routers in this lab assignment before continuing.

Step 1 Configure the routers

On the routers, enter the global configuration mode and configure the hostname as shown in the chart. Then configure the console, virtual terminal and enable secret passwords. Next configure the

interfaces according to the chart. Finally, configure the IP hostnames. Do not configure the routing protocol until specifically told to. If there are any problems configuring the router basics, refer to prior lab “Review of Basic Router Configuring with RIP”.

Router1

```
Router>enable
Router#configure terminal
Router(config)#hostname BERLIN

BERLIN(config)#enable secret class
BERLIN(config)#line console 0
BERLIN(config-line)#password cisco
BERLIN(config-line)#login
BERLIN(config-line)#line vty 0 4
BERLIN(config-line)#password cisco
BERLIN(config-line)#login
BERLIN(config-line)#exit
BERLIN(config)#interface serial 0
BERLIN(config-if)#ip address 192.168.15.1 255.255.255.252
BERLIN(config-if)#clock rate 64000
BERLIN(config-if)#no shutdown
BERLIN(config-if)#exit
BERLIN(config)#interface ethernet 0
BERLIN(config-if)#ip address 192.168.1.129 255.255.255.192
BERLIN(config-if)#no shutdown
BERLIN(config-if)#exit
BERLIN(config)#ip host ROME 192.168.0.1 192.168.15.2
```

Router2

```
Router>enable
Router#configure terminal
Router(config)#hostname ROME

ROME(config)#enable secret class
ROME(config)#line console 0
ROME(config-line)#password cisco
ROME(config-line)#login
ROME(config-line)#line vty 0 4
ROME(config-line)#password cisco
ROME(config-line)#login
ROME(config-line)#exit
ROME(config)#interface serial 0
ROME(config-if)#ip address 192.168.15.2 255.255.255.252
ROME(config-if)#no shutdown
ROME(config-if)#exit
ROME(config)#interface ethernet 0
ROME(config-if)#ip address 192.168.0.1 255.255.255.0
ROME(config-if)#no shutdown
ROME(config-if)#exit
ROME(config)#ip host BERLIN 192.168.1.129 192.168.15.1
```

Step 2 Save the configuration information from the privileged EXEC command mode

```
BERLIN#copy running-config startup-config
Destination filename [startup-config]? [Enter]
```

a. Why save the running configuration to the startup configuration?

So that the router will keep the configuration when it is reset

Step 3 Configure the hosts with the proper IP address, subnet mask, and default gateway

a. Each workstation should be able to ping the attached router. Troubleshoot as necessary. Remember to assign a specific IP address and default gateway to the workstation. If running Windows 98, check by using **Start** >**Run** > **winipcfg**. If running Windows 2000, check by using the **ipconfig** command in a DOS window.

b. At this point the workstations will not be able to communicate with each other. The following steps will demonstrate the process required to get communication working using OSPF as the routing protocol.

```
Host connected to router Rome
IP Address:              192.168.0.2
Subnet mask:             255.255.255.0
Default gateway:         192.168.0.1

Host connected to router Berlin
IP Address:              192.168.1.130
Subnet mask:             255.255.255.128
Default gateway:         192.168.1.129
```

Step 4 View the routers configuration and interface information

a. At the privileged EXEC mode prompt type:

```
Berlin#show running-config
```

b. Using the **show ip interface brief** command, check the status of each interface.

c. What is the state of the interfaces on each router?

Berlin:

Ethernet 0: Up

Serial 0: Up

Serial 1: Down

Rome:

Ethernet 0: Up

Serial 0: Up

Serial 1: Down

d. Ping from one of the connected serial interfaces to the other.

Was the ping successful? Yes

e. If the ping was not successful, troubleshoot the router configuration, until the ping is successful.

Step 5 Configure OSPF routing on router Berlin

a. Configure an OSPF routing process on router Berlin. Use OSPF process number 1 and ensure all networks are in area 0.

```
Berlin(config)#router ospf 1
Berlin(config-router)#network 192.168.1.128 0.0.0.63 area 0
Berlin(config-router)#network 192.168.15.0 0.0.0.3 area 0
Berlin(config-router)#end
```

b. Examine the routers running configurations files.

c. Did the IOS version automatically add any lines under router OSPF 1? Yes

d. If so, what did it add? log-adjacency-changes

e. If there were no changes to the running configuration, type the following commands:

```
Berlin(config)#router ospf 1
Berlin(config-router)#log-adjacency-changes
Berlin(config-router)#end
```

f. Show the routing table for the Berlin router.

```
Berlin#show ip route
```

g. Are there any entries in the routing table? No

h. Why? OSPF is not configured on Rome

Step 6 Configure OSPF routing on router Rome

a. Configure an OSPF routing process on router Rome. Use OSPF process number 1 and ensure all networks are in area 0.

```
Rome(config)#router ospf 1
Rome(config-router)#network 192.168.0.0 0.0.0.255 area 0
Rome(config-router)#network 192.168.15.0 0.0.0.3 area 0
Rome(config-router)#end
```

b. Examine the Rome running configuration files.

c. Did the IOS version automatically add any lines under router OSPF 1? Yes

d. If so, what did it add? log-adjacency-changes

e. If there were no changes to the running configuration, type the following commands:

```
Rome(config)#router ospf 1
Rome(config-router)#log-adjacency-changes
Rome(config-router)#end
```

f. Show the routing table for the Rome router:

```
Rome#show ip route
```

g. Are there any OSPF entries in the routing table now? Yes

h. What is the metric value of the OSPF route?

It varies, the default with bandwidth on serial set to 128kb gives a net cost of 782.

i. What is the VIA address in the OSPF route? 192.168.15.1

j. Are routes to all networks shown in the routing table? Yes

k. What does the O mean in the first column of the routing table?

The route was learned by OSPF.

Step 7 Test network connectivity

a. Ping the Berlin host from the Rome host. Was it successful? Yes

b. If not troubleshoot as necessary.

Once the previous steps are completed, log off by typing **exit**, and turn the router off. Then remove and store the cables and adapter.

Erasing and reloading the router

Enter into the privileged EXEC mode by typing **enable**.

If prompted for a password, enter **class**. If that does not work, ask the instructor for assistance.

```
Router>enable
```

At the privileged EXEC mode, enter the command **erase startup-config**.

```
Router#erase startup-config
```

The responding line prompt will be:

```
Erasing the nvram filesystem will remove all files! Continue?
[confirm]
```

Press **Enter** to confirm.

The response should be:

```
Erase of nvram: complete
```

Now at the privileged EXEC mode, enter the command **reload**.

```
Router#reload
```

The responding line prompt will be:

```
System configuration has been modified. Save? [yes/no]:
```

Type **n** and then press **Enter**.

The responding line prompt will be:

```
Proceed with reload? [confirm]
```

Press **Enter** to confirm.

In the first line of the response will be:

```
Reload requested by console.
```

After the router has reloaded the line prompt will be:

```
Would you like to enter the initial configuration dialog? [yes/no]:
```

Type **n** and then press **Enter**.

The responding line prompt will be:

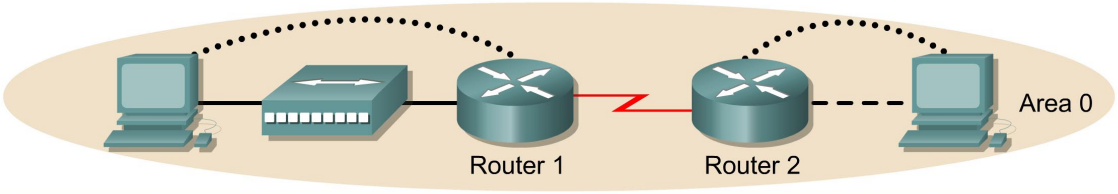
```
Press RETURN to get started!
```

Press **Enter**.

Now the router is ready for the assigned lab to be performed.

Router Interface Summary				
Router Model	Ethernet Interface #1	Ethernet Interface #2	Serial Interface #1	Serial Interface #2
800 (806)	Ethernet 0 (E0)	Ethernet 1 (E1)		
1600	Ethernet 0 (E0)	Ethernet 1 (E1)	Serial 0 (S0)	Serial 1 (S1)
1700	FastEthernet 0 (FA0)	FastEthernet 1 (FA1)	Serial 0 (S0)	Serial 1 (S1)
2500	Ethernet 0 (E0)	Ethernet 1 (E1)	Serial 0 (S0)	Serial 1 (S1)
2600	FastEthernet 0/0 (FA0/0)	FastEthernet 0/1 (FA0/1)	Serial 0/0 (S0/0)	Serial 0/1 (S0/1)
In order to find out exactly how the router is configured, look at the interfaces. This will identify what type and how many interfaces the router has. There is no way to effectively list all of the combinations of configurations for each router class. What is provided are the identifiers for the possible combinations of interfaces in the device. This interface chart does not include any other type of interface even though a specific router may contain one. An example of this might be an ISDN BRI interface. The string in parenthesis is the legal abbreviation that can be used in IOS command to represent the interface.				

Lab 2.3.1 Configuring the OSPF Routing Process – 2600 Series



Router Designation	Route Name	Enable Secret Password	Enable, VTY, and Console Passwords	Routing Protocol	Network Statements
Router 1	Berlin	class	cisco	OSPF	192.168.1.128 192.168.15.0
Router 2	Rome	class	cisco	OSPF	192.168.15.0 192.168.0.0

Router Designation	IP Host Table Entry	FastEthernet 0 Address/ Subnet Mask	Interface Type Serial 0	Serial 0 Address/Subnet Mask	Interface Type Serial 1	Serial 1 Address/Subnet Mask
Router 1	Rome	192.168.1.129/26	DCE	192.168.15.1/30	NA	No address
Router 2	Berlin	192.168.0.1/24	DTE	192.168.15.2/30	NA	No address

Note: The IP Host Table Entry column contents indicate the name(s) of the other router(s) in the IP host table.

Straight-through cable		Console (Rollover)	
Serial cable		Crossover cable	

Objective

- Setup an IP addressing scheme for OSPF area 0.
- Configure and verify Open Shortest Path First (OSPF) routing.

Background/Preparation

Cable a network similar to the one shown in the diagram. Any router that meets the interface requirements displayed on the above diagram may be used. For example, router series 800, 1600, 1700, 2500, and 2600 or any such combination can be used. Please refer to the chart at the end of the lab to correctly identify the interface identifiers to be used based on the equipment in the lab. The configuration output used in this lab is produced from 1721 series routers. Any other router used may produce slightly different output. Perform the following steps on each router unless specifically instructed otherwise.

Start a HyperTerminal session.

Note: Go to the erase and reload instructions at the end of this lab. Perform those steps on all routers in this lab assignment before continuing.

Step 1 Configure the routers

On the routers, enter the global configuration mode and configure the hostname as shown in the chart. Then configure the console, virtual terminal and enable secret passwords. Next configure the

interfaces according to the chart. Finally, configure the IP hostnames. Do not configure the routing protocol until specifically told to. If there are any problems configuring the router basics, refer to prior lab “Review of Basic Router Configuring with RIP”.

```
Router1
Router>enable
Router#configure terminal
Router(config)#hostname BERLIN

BERLIN(config)#enable secret class
BERLIN(config)#line console 0
BERLIN(config-line)#password cisco
BERLIN(config-line)#login
BERLIN(config-line)#line vty 0 4
BERLIN(config-line)#password cisco
BERLIN(config-line)#login
BERLIN(config-line)#exit
BERLIN(config)#interface serial 0/0
BERLIN(config-if)#ip address 192.168.15.1 255.255.255.252
BERLIN(config-if)#clock rate 64000
BERLIN(config-if)#no shutdown
BERLIN(config-if)#exit
BERLIN(config)#interface fastEthernet 0/0
BERLIN(config-if)#ip address 192.168.1.129 255.255.255.192BERLIN(config-
if)#no shutdown
BERLIN(config-if)#exit
BERLIN(config)#ip host ROME 192.168.0.1 192.168.15.2

Router2
Router>enable
Router#configure terminal
Router(config)#hostname ROME
ROME(config)#enable password cisco
ROME(config)#enable secret class
ROME(config)#line console 0
ROME(config-line)#password cisco
ROME(config-line)#login
ROME(config-line)#line vty 0 4
ROME(config-line)#password cisco
ROME(config-line)#login
ROME(config-line)#exit
ROME(config)#interface serial 0/0
ROME(config-if)#ip address 192.168.15.2 255.255.255.252
ROME(config-if)#no shutdown
ROME(config-if)#exit
ROME(config)#interface fastEthernet 0/0
ROME(config-if)#ip address 192.168.0.1 255.255.255.0
ROME(config-if)#no shutdown
ROME(config-if)#exit
ROME(config)#ip host BERLIN 192.168.1.129 192.168.15.1
```

Step 2 Save the configuration information from the privileged EXEC command mode

```
BERLIN#copy running-config startup-config
Destination filename [startup-config]? [Enter]
```

a. Why save the running configuration to the startup configuration?

So that the router will keep the configuration when it is reset

Step 3 Configure the hosts with the proper IP address, subnet mask, and default gateway

a. Each workstation should be able to ping the attached router. Troubleshoot as necessary. Remember to assign a specific IP address and default gateway to the workstation. If running Windows 98, check by using **Start** >**Run** > **winipcfg**. If running Windows 2000, check by using the **ipconfig** command in a DOS window.

b. At this point the workstations will not be able to communicate with each other. The following steps will demonstrate the process required to get communication working using OSPF as the routing protocol.

```
Host connected to router Rome
IP Address:              192.168.0.2
Subnet mask:             255.255.255.0
Default gateway:         192.168.0.1

Host connected to router Berlin
IP Address:              192.168.1.130 (can't use 128 address of subnet)
Subnet mask:             255.255.255.128
Default gateway:         192.168.1.129
```

Step 4 View the routers configuration and interface information

a. At the privileged EXEC mode prompt type:

```
Berlin#show running-config
```

b. Using the **show ip interface brief** command, check the status of each interface.

c. What is the state of the interfaces on each router?

Berlin:

FastEthernet 0: Up

Serial 0: Up

Serial 1: Down

Rome:

FastEthernet 0 Up

Serial 0: Up

Serial 1: Down

d. Ping from one of the connected serial interfaces to the other.

Was the ping successful? Yes

e. If the ping was not successful, troubleshoot the router configuration, until the ping is successful.

Step 5 Configure OSPF routing on router Berlin

a. Configure an OSPF routing process on router Berlin. Use OSPF process number 1 and ensure all networks are in area 0.

```
Berlin(config)#router ospf 1
Berlin(config-router)#network 192.168.1.128 0.0.0.63 area 0
Berlin(config-router)#network 192.168.15.0 0.0.0.3 area 0
Berlin(config-router)#end
```

b. Examine the routers running configurations files.

c. Did the IOS version automatically add any lines under router OSPF 1? Yes

d. If so, what did it add? log-adjacency-changes

e. If there were no changes to the running configuration, type the following commands:

```
Berlin(config)#router ospf 1
Berlin(config-router)#log-adjacency-changes
Berlin(config-router)#end
```

f. Show the routing table for the Berlin router.

```
Berlin#show ip route
```

g. Are there any entries in the routing table? No

h. Why? OSPF is not configured on Rome.

Step 6 Configure OSPF routing on router Rome

a. Configure an OSPF routing process on router Rome. Use OSPF process number 1 and ensure all networks are in area 0.

```
Rome(config)#router ospf 1
Rome(config-router)#network 192.168.0.0 0.0.0.255 area 0
Rome(config-router)#network 192.168.15.0 0.0.0.3 area 0
Rome(config-router)#end
```

b. Examine the Rome running configuration files.

c. Did the IOS version automatically add any lines under router OSPF 1? Yes

d. If so, what did it add? log-adjacency-changes

e. If there were no changes to the running configuration, type the following commands:

```
Rome(config)#router ospf 1
Rome(config-router)#log-adjacency-changes
Rome(config-router)#end
```

f. Show the routing table for the Rome router:

```
Rome#show ip route
```

g. Are there any OSPF entries in the routing table now? Yes

h. What is the metric value of the OSPF route?

It varies, the default with bandwidth on serial set to 128kb gives a net cost of 782.

i. What is the VIA address in the OSPF route? 192.168.15.1

j. Are routes to all networks shown in the routing table? Yes

k. What does the O mean in the first column of the routing table? The route was learned by OSPF.

Step 7 Test network connectivity

a. Ping the Berlin host from the Rome host. Was it successful? Yes

b. If not troubleshoot as necessary.

Once the previous steps are completed, log off by typing **exit**, and turn the router off. Then remove and store the cables and adapter.

Erasing and reloading the router

Enter into the privileged EXEC mode by typing **enable**.

If prompted for a password, enter **class**. If that does not work, ask the instructor for assistance.

```
Router>enable
```

At the privileged EXEC mode, enter the command **erase startup-config**.

```
Router#erase startup-config
```

The responding line prompt will be:

```
Erasing the nvram filesystem will remove all files! Continue?
[confirm]
```

Press **Enter** to confirm.

The response should be:

```
Erase of nvram: complete
```

Now at the privileged EXEC mode, enter the command **reload**.

```
Router#reload
```

The responding line prompt will be:

```
System configuration has been modified. Save? [yes/no]:
```

Type **n** and then press **Enter**.

The responding line prompt will be:

```
Proceed with reload? [confirm]
```

Press **Enter** to confirm.

In the first line of the response will be:

```
Reload requested by console.
```

After the router has reloaded the line prompt will be:

```
Would you like to enter the initial configuration dialog? [yes/no]:
```

Type **n** and then press **Enter**.

The responding line prompt will be:

```
Press RETURN to get started!
```

Press **Enter**.

Now the router is ready for the assigned lab to be performed.

Router Interface Summary				
Router Model	Ethernet Interface #1	Ethernet Interface #2	Serial Interface #1	Serial Interface #2
800 (806)	Ethernet 0 (E0)	Ethernet 1 (E1)		
1600	Ethernet 0 (E0)	Ethernet 1 (E1)	Serial 0 (S0)	Serial 1 (S1)
1700	FastEthernet 0 (FA0)	FastEthernet 1 (FA1)	Serial 0 (S0)	Serial 1 (S1)
2500	Ethernet 0 (E0)	Ethernet 1 (E1)	Serial 0 (S0)	Serial 1 (S1)
2600	FastEthernet 0/0 (FA0/0)	FastEthernet 0/1 (FA0/1)	Serial 0/0 (S0/0)	Serial 0/1 (S0/1)
In order to find out exactly how the router is configured, look at the interfaces. This will identify what type and how many interfaces the router has. There is no way to effectively list all of the combinations of configurations for each router class. What is provided are the identifiers for the possible combinations of interfaces in the device. This interface chart does not include any other type of interface even though a specific router may contain one. An example of this might be an ISDN BRI interface. The string in parenthesis is the legal abbreviation that can be used in IOS command to represent the interface.				

