Title

OSPF protocol's configuration

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Description

The OSPF configuration is performed only via CLI. A separate command shell with several modes is used to configure the OSPF protocol (Figure 1). The transition to each mode is performed using commands having the same name as the mode. A detailed description of the commands is available in the Technical documentation.

NOTE

An configuration example is given for the InfiLINK 2x2, InfiMAN 2x2 families devices, pay attention to the name of the radio interface on your devices during the scheme implementation.

Mode name	Description

Basic	The basic OSPF mode is used to analyze the output of the diagnostic commands and to switch to the configuration mode.
	
	Switching to the basic mode is performed from the WANFleX command shell using the "ospf" command.
	
	`BS_1#1> ospf`
	`OSPF>`

OSPF configuration	The configuration mode allows to manage the OSPF service running on the device and to proceed to the additional configuration modes: router, interfaces or route-maps.
	
	The switching to the OSPF configuration mode is performed from the basic mode using the "config" command.
	
	`OSPF> config`
	`OSPF(config)#`

OSPF router configuration	In the router configuration mode, the basic OSPF settings can be performed. This mode allows to configure the networks, the areas, the router ID, etc.
	
	The switching to the OSPF router configuration mode is performed from the configuration mode using the "router" command.
	
	`OSPF(config)# router`
	`OSPF(config-router)#`

OSPF interface configuration	The OSPF interface configuration mode allows to configure the protocol settings related to a specific interface.
	
	The switching to the OSPF interface configuration mode is performed from the configuration mode using the "interface IFNAME" command.
	
	`OSPF(config)# interface rf5.0`
	`OSPF(config-if)#`

Route-maps configuration	The route-maps configuration mode allows to configure the rules that should be applied to the announced or received OSPF routes.
	
	The switching to the OSPF route-map configuration mode is performed from the configuration mode using the rule creation command "route-map WORD (deny|permit) <1-65535>".
	
	`OSPF(config)# route-map MAP permit 10`
	`OSPF(config-route-map)#`

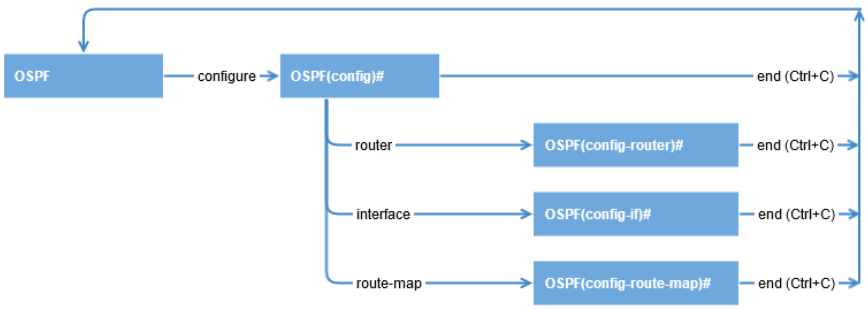

Figure 1 - Switching between the OSPF command shell modes

Each OSPF shell mode provides help by displaying the full list of supported commands. To display the list use the "help" command.

The routing table can be displayed using one of the following commands:

```
From WANFleX command shell:
BS_1#1> netstat -r

From OSPF command shell:
OSPF> show route

From ARDA command shell:
ARDA> show route
```

Network scheme with one OSPF area

In order to demonstrate how to configure the OSPF protocol and analyze the output of the diagnostic commands, let's take a look at the example in (Figure 2):

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- The network consists of three wireless devices BS1, CPE2 and CPE3 configured as routers.
- The wireless devices are part of the OSPF backbone area 0 (only one OSPF area is present in this setup).
- BS1 has an external link for connecting to the LAN-1 network.
- The CPE3 router is connected to the external router R1.To make R1's router networks available, static routes to the networks 192.168.5.0/28 and 192.168.6.0/28 have been added to CPE3.
- Routers BS1, CPE2 and CPE3 use as identifiers the addresses assigned to the loopback interface: 192.168.0.1/32, 192.168.0.2/32 and 192.168.0.3/32.

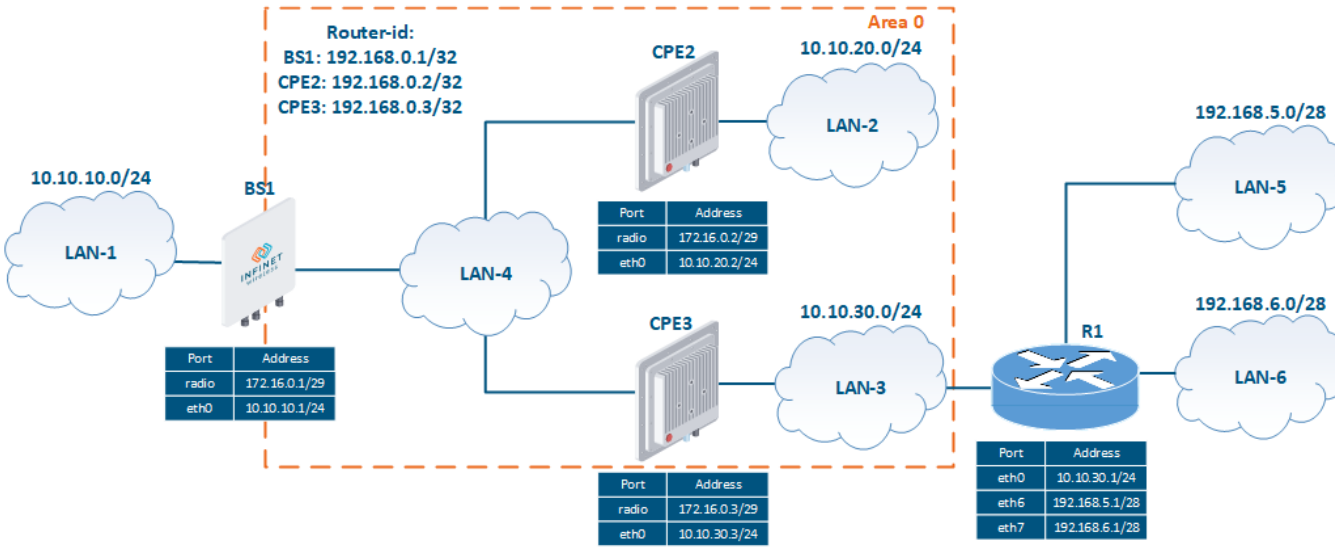

Figure 2 - Network scheme with one OSPF area

Pre-configuration

Description	Perform a preliminary configuration of the wireless devices, consisting of the following steps: • Configure the device IDs. • Remove the svi1 interface. • Assign IP addresses to network interfaces, according to the scheme. • Add static entries to the routing table. • Disable switching. • Establish the wireless links.

BS1	`Set the device ID`
	`system prompt BS_1`
	
	`Remove the svi1 interface`
	`ifc svi1 destroy`
	
	`Assign IP addresses`
	`ifc eth0 10.10.10.1/24`
	`ifc rf5.0 172.16.0.1/29`
	`ifc lo0 192.168.0.1/32`
	
	`Disable switching`
	`switch stop`
	
	`Establish wireless links`
	`rf rf5.0 band 20`
	`rf rf5.0 freq 5000`
	
	`mint rf5.0 -name "BS_1"`
	`mint rf5.0 -type master`

CPE2	`Set the device ID`
	`system prompt CPE_2`
	
	`Remove the svi1 interface`
	`ifc svi1 destroy`
	
	`Assign IP addresses`
	`ifc eth0 10.10.20.2/24`
	`ifc rf5.0 172.16.0.2/29`
	`ifc lo0 192.168.0.2/32`
	
	`Disable switching`
	`switch stop`
	
	`Establish the wireless link`
	`mint rf5.0 -name "CPE_2"`
	`mint rf5.0 -type slave`
	`mint rf5.0 prof 1 -band 20 -freq 5000 -type slave`

CPE3	`Set the device ID`
	`system prompt CPE_3`
	
	`Remove the svi1 interface`
	`ifc svi1 destroy`
	
	`Assign IP addresses`
	`ifc eth0 10.10.30.3/24`
	`ifc rf5.0 172.16.0.3/29`
	`ifc lo0 192.168.0.3/32`
	
	`Add static routes`
	`route add 192.168.5.0/28 10.10.30.1`
	`route add 192.168.6.0/28 10.10.30.1`
	
	`Disable switching`
	`switch stop`
	
	`Establish the wireless link`
	`mint rf5.0 -name "CPE_3"`
	`mint rf5.0 -type slave`
	`mint rf5.0 prof 1 -band 20 -freq 5000 -type slave`

OSPF configuration

Title

Description	Configure the OSPF protocol according to the scheme. **Step 1:** start OSPF. **Step 2:** set the router IDs. The identifiers will be equal to the IP addresses assigned to the loopback interface. **Step 3:** define the interfaces where OSPF should be started. All the interfaces are connected to the backbone area according to the scheme. On the BS1 and CPE3 routers, define the networks assigned to the device's interfaces that should take part in OSPF. On the CPE2 router, set all the networks using only one entry 0.0.0.0/0. This entry includes all networks and enables the OSPF support on all router's interfaces; when a device's interface is connected to a new network, this network will be immediately announced via OSPF. This approach doesn't require additional OSPF configuration, but decreases the control over the announcements. In addition, this command advertises the address 127.0.0.1/32 that is assigned to the loopback interface and does not announce the address 192.168.0.2/32, therefore, this network must be additionally specified. **Step 4:** perform the redistribution of the directly connected networks to the BS1 router and of the static routes on the CPE3 router. **Step 5:** configure passive interfaces. The eth0 interface of CPE3 is connected to the external router R1, so no neighboring relation should be established on this interface. Network 10.10.30.0/24 associated with the eth0 interface must be announced via OSPF, so the eth0 interface must be set as passive.

BS1	`Start OSPF`
	`ospf start`
	
	`Set the router-id`
	`ospf`
	`config`
	`router`
	`router-id 192.168.0.1`
	
	`Start OSPF on the interfaces`
	`ospf`
	`config`
	`router`
	`network 172.16.0.0/29 area 0.0.0.0`
	`network 192.168.0.1/32 area 0.0.0.0`
	
	`Redistribution of the connected routes`
	`ospf`
	`config`
	`router`
	`redistribute connected`

CPE2	`Start OSPF`
	`ospf start`
	
	`Set the router-id`
	`ospf`
	`config`
	`router`
	`router-id 192.168.0.2`
	
	`Start OSPF on the interfaces`
	`ospf`
	`config`
	`router`
	`network 0.0.0.0/0 area 0.0.0.0`
	`network 192.168.0.2/32 area 0.0.0.0`

CPE3	`Start OSPF`
	`ospf start`
	
	`Set the router-id`
	`ospf`
	`config`
	`router`
	`router-id 192.168.0.3`
	
	`Start OSPF on the interfaces`
	`ospf`
	`config`
	`router`
	`network 10.10.30.0/24 area 0.0.0.0`
	` network 172.16.0.0/29 area 0.0.0.0`
	` network 192.168.0.3/32 area 0.0.0.0`
	
	`Redistribute the static routes`
	`ospf`
	`config`
	`router`
	`redistribute kernel`
	
	`Configure the passive interfaces`
	`passive-interface eth0`

Command output analysis

Neighbors list

Description	Analyze the neighbors. The routers are connected through the 172.16.0.0/29 network, which is a broadcast segment (using the MINT protocol), so: • CPE3 is elected as DR, its router-id being the highest. • CPE2 is elected as BDR, its router-id being the highest after CPE3. • BS1 becomes DROther. • The routers have established Full relations.

BS1	`OSPF> show neighbor`
	
	`Neighbor ID  Pri  State  Dead Time  Address  Interface  RXmtL RqstL DBsmL`
	`192.168.0.2  1  Full/Backup  00:00:38  172.16.0.2  rf5.0:172.16.0.1 0  0  0`
	`192.168.0.3  1  Full/DR  00:00:38  172.16.0.3  rf5.0:172.16.0.1 0  0  0`

CPE2	`OSPF> show neighbor`
	
	`Neighbor ID  Pri  State  Dead Time  Address  Interface  RXmtL RqstL DBsmL`
	`192.168.0.1  1  Full/DROther  00:00:33  172.16.0.1  rf5.0:172.16.0.2 0  0  0`
	`192.168.0.3  1  Full/DR  00:00:35  172.16.0.3  rf5.0:172.16.0.2 0  0  0`

Title

CPE3

```
OSPF> show neighbor

Neighbor ID     Pri   State           Dead Time   Address         Interface            RXmtL
RqstL DBsmL
192.168.0.1       1   Full/DROther    00:00:31    172.16.0.1      rf5.0:172.16.0.3
0     0     0
192.168.0.2       1   Full/Backup     00:00:37    172.16.0.2      rf5.0:172.16.0.3
0     0     0
```

LSDB content

Description

Analyze the LSDB. Since the scheme contains one area, the LSDB output on all the routers will be identical:

- **LSA type 1** (Router Link States): the LSDB contains three LSAs type 1, one from each of the area routers. Note that each LSA can contain a lot of information. For example, the LSA type 1 generated by CPE2 contains information about the neighbors, about the 172.16.0.0/29 and 10.10.20.0/24 networks and its own identifier.
- **LSA type 2** (Net Link States): CPE3 as DR has generated one LSA type 2.
- **LSA type 5** (AS External Link States): by default, one LSA type 5 is generated for each external route, therefore the LSDB contains three LSAs type 5, one for each external network: the routes to the networks 192.168.5.0/28 and 192.168.6.0/28 were generated during the redistribution of the CPE3's static routes and the route to network 10.10.10.0/24 is generated by BS1 during the redistribution as a directly connected network.

BS1, CPE2, CPE3

```
OSPF> show database

       OSPF Router with ID (192.168.0.1)(192.168.0.1)

                Router Link States (Area 0.0.0.0)

Link ID         ADV Router      Age  Seq#       LS-Age Link count
192.168.0.1     192.168.0.1      202 0x80000008   7442 2
192.168.0.2     192.168.0.2      201 0x80000008   7405 3
192.168.0.3     192.168.0.3      204 0x8000000a   7407 3

                Net Link States (Area 0.0.0.0)

Link ID            ADV Router      Age  Seq#       LS-Age Routers
172.16.0.3/29      192.168.0.3      204 0x80000006   7407 3

                AS External Link States

Link ID         ADV Router      Age  Seq#       LS-Age Route
10.10.10.0      192.168.0.1      122 0x80000007   7442 E2 10.10.10.0/24      [0x0]
192.168.5.0     192.168.0.3      169 0x80000007   7407 E2 192.168.5.0/28     [0x0]
192.168.6.0     192.168.0.3      299 0x80000007   7407 E2 192.168.6.0/28     [0x0]
```

Routing table

Description

The routing tables of the wireless devices contain entries for each subnet shown in the scheme. This means that the devices have successfully exchanged the routing information and added it to the FIB.

Note that the addresses of the loopback interfaces do not depend on the link state, therefore they can be used to manage the devices in redundant networks.

BS1

```
BS_1#1> netstat -r
Routing tables
Destination        Gateway            Flags     Refs     Use  Interface
10.10.10.0/24      link#2             UC           0       0  eth0
10.10.20.0/24      172.16.0.2         UG3          0       0  rf5.0
10.10.30.0/24      172.16.0.3         UG3          0       0  rf5.0
127.0.0.1          127.0.0.1          UH           3     141  lo0
172.16.0.0/29      link#3             UC           0       0  rf5.0
192.168.0.1        192.168.0.1        UH           0       0  lo0
192.168.0.2        172.16.0.2         UGH3         0       0  rf5.0
192.168.0.3        172.16.0.3         UGH3         0       0  rf5.0
192.168.5.0/28     172.16.0.3         UG3          0       0  rf5.0
192.168.6.0/28     172.16.0.3         UG3          0       0  rf5.0
224.0.0.0/8        127.0.0.1          UGS          1    1561  lo0
```

CPE2

```
AS_2#2> netstat -r
Routing tables
Destination        Gateway            Flags     Refs     Use  Interface
10.10.10.0/24      172.16.0.1         UG3          0       0  rf5.0
10.10.20.0/24      link#2             UC           0       0  eth0
10.10.30.0/24      172.16.0.3         UG3          0       0  rf5.0
127.0.0.1          127.0.0.1          UH           3      50  lo0
172.16.0.0/29      link#3             UC           0       0  rf5.0
192.168.0.1        172.16.0.1         UGH3         0       0  rf5.0
192.168.0.2        192.168.0.2        UH           0       0  lo0
192.168.0.3        172.16.0.3         UGH3         0       0  rf5.0
192.168.5.0/28     172.16.0.3         UG3          0       0  rf5.0
192.168.6.0/28     172.16.0.3         UG3          0       0  rf5.0
224.0.0.0/8        127.0.0.1          UGS          1    2037  lo0
```

CPE3

```
AS_3#1> netstat -r
Routing tables
Destination        Gateway            Flags     Refs     Use  Interface
10.10.10.0/24      172.16.0.1         UG3          0       0  rf5.0
10.10.20.0/24      172.16.0.2         UG3          0       0  rf5.0
10.10.30.0/24      link#2             UC           0       0  eth0
127.0.0.1          127.0.0.1          UH           3     155  lo0
172.16.0.0/29      link#3             UC           0       0  rf5.0
192.168.0.1        172.16.0.1         UGH3         0       0  rf5.0
192.168.0.2        172.16.0.2         UGH3         0       0  rf5.0
192.168.0.3        192.168.0.3        UH           0       0  lo0
192.168.5.0/28     10.10.30.1         UGS          0       0  eth0
192.168.6.0/28     10.10.30.1         UGS          0       0  eth0
224.0.0.0/8        127.0.0.1          UGS          1    1745  lo0
```

Network scheme with several OSPF areas

Let's look at the example of a network scheme using several OSPF areas (Figure 3):

- The network consists of four wireless devices BS1, CPE2, CPE3 and CPE4, configured in the router mode.
- The wireless devices are part of three OSPF areas:
  - area 0: routers BS1 and CPE2 are connected to this area. The BS1 router has an external network connection;
  - area 3: routers BS1 and CPE3 are connected to this area, the area's type is NSSA. The CPE3 router has an external link with router R1 and two static routes to the networks 192.168.5.0/28 and 192.168.6.0/28;
  - area 4: routers BS1 and CPE4 are connected to this area, the area's type is Stub.
- Routers BS1, CPE2, CPE3 and CPE4 use the addresses assigned to the loopback interface as identifiers: 192.168.0.1/32, 192.168.0.2/32, 192.168.0.3/32 and 192.168.0.4/32.

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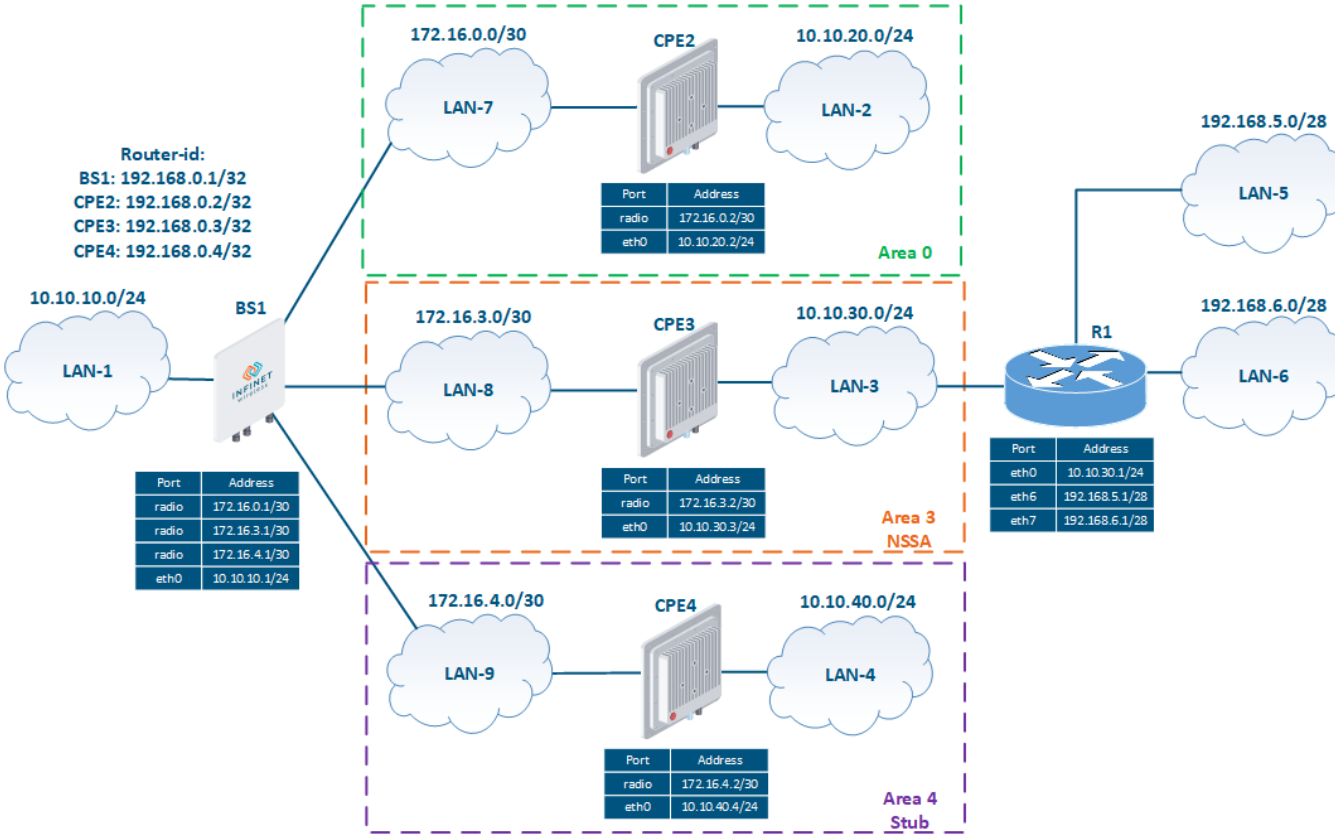

Figure 3 - Network scheme with several OSPF areas

Pre-configuration

Description	Perform a preliminary configuration of the wireless devices consisting of the following steps: • Configure the router IDs. • Remove the svi1 interface. • Assign IP addresses to network interfaces, according to the scheme. • Add static entries to the routing table. • Disable switching. • Establish the wireless links.

Title

BS1	Set the device ID system prompt BS_1 Remove the svi1 interface ifc svi1 destroy Assign IP addresses ifc eth0 10.10.10.1/24 ifc rf5.0 172.16.0.1/30 ifc rf5.0 172.16.3.1/30 ifc rf5.0 172.16.4.1/30 ifc lo0 192.168.0.1/32 Disable switching switch stop Establish the radio link rf rf5.0 band 20 rf rf5.0 freq 5000 mint rf5.0 -name "BS_1" mint rf5.0 -type master
CPE2	Set the device ID system prompt CPE_2 Remove the svi1 interface ifc svi1 destroy Assign IP addresses ifc eth0 10.10.20.2/24 ifc rf5.0 172.16.0.2/30 ifc lo0 192.168.0.2/32 Disable switching switch stop Establish the radio link mint rf5.0 -name "CPE_2" mint rf5.0 -type slave mint rf5.0 prof 1 -band 20 -freq 5000 -type slave

CPE3	`Set the device ID`
	`system prompt CPE_3`
	
	`Remove the svi1 interface`
	`ifc svi1 destroy`
	
	`Assign IP addresses`
	`ifc eth0 10.10.30.3/24`
	`ifc rf5.0 172.16.3.2/30`
	`ifc lo0 192.168.0.3/32`
	
	`Add static routes`
	`route add 192.168.5.0/28 10.10.30.1`
	`route add 192.168.6.0/28 10.10.30.1`
	
	`Disable switching`
	`switch stop`
	
	`Establish the radio link`
	`mint rf5.0 -name "CPE_3"`
	`mint rf5.0 -type slave`
	`mint rf5.0 prof 1 -band 20 -freq 5000 -type slave`

CPE4	`Set the device ID`
	`system prompt CPE_4`
	
	`Remove the svi1 interface`
	`ifc svi1 destroy`
	
	`Assign IP addresses`
	`ifc eth0 10.10.40.4/24`
	`ifc rf5.0 172.16.4.2/30`
	`ifc lo0 192.168.0.4/32`
	
	`Disable switching`
	`switch stop`
	
	`Establish the radio link`
	`mint rf5.0 -name "CPE_4"`
	`mint rf5.0 -type slave`
	`mint rf5.0 prof 1 -band 20 -freq 5000 -type slave`

OSPF configuration

Description	Let's configure the OSPF protocol according to the scheme. **Step 1:** start OSPF. **Step 2:** configure the router IDs. The identifiers will be equal to the IP addresses assigned to the loopback interface. **Step 3:** define the interfaces where OSPF should be started. All the interfaces are connected to the backbone area according to the scheme. **Step 4:** define the area types: area 3 - NSSA, area 4 - Stub. Note that the area type must be configured on all the routers connected to that area, otherwise they will not establish neighboring relations. **Step 5:** perform the redistribution of the directly connected networks on the BS1 router and of the static routes on the CPE3 router. **Step 6:** configure passive interfaces.

Title

BS1

```
Start OSPF
ospf start

Set the router-id
ospf
config
router
router-id 192.168.0.1

Start OSPF on the interfaces
ospf
config
router
network 172.16.0.0/30 area 0.0.0.0
network 172.16.3.0/30 area 0.0.0.3
network 172.16.4.0/30 area 0.0.0.4
network 192.168.0.1/32 area 0.0.0.0

Set the area types
ospf
config
router
area 0.0.0.3 nssa
area 0.0.0.4 stub

Redistribute the connected routes
ospf
config
router
redistribute connected
```

CPE2

```
Start OSPF
ospf start

Set the router-id
ospf
config
router
router-id 192.168.0.2

Start OSPF on the interfaces
ospf
config
router
network 10.10.20.0/24 area 0.0.0.0
network 172.16.0.0/30 area 0.0.0.0
network 192.168.0.2/32 area 0.0.0.0
```

CPE3

```
Start OSPF
ospf start

Set the router-id
ospf
config
router
router-id 192.168.0.3

Start OSPF on the interfaces
ospf
config
router
network 10.10.30.0/24 area 0.0.0.3
network 172.16.3.0/30 area 0.0.0.3
network 192.168.0.3/32 area 0.0.0.3

Set the area types
ospf
config
router
area 0.0.0.3 nssa

Redistribute the static routes
ospf
config
router
redistribute kernel

Set the passive interfaces
passive-interface eth0
```

CPE4

```
Start OSPF
ospf start

Set the router-id
ospf
config
router
router-id 192.168.0.4

Start OSPF on the interfaces
ospf
config
router
network 10.10.40.0/24 area 0.0.0.4
network 172.16.4.0/30 area 0.0.0.4
network 192.168.0.4/32 area 0.0.0.4

Set the area types
ospf
config
router
area 0.0.0.4 stub

Redistribute the static routes
ospf
config
router
redistribute kernel
```

Command output analysis

Title

Neighbors list

Description	Let's analyze the neighbors list. The routers are connected by the MINT network, but each wireless connection has its own subnet. Routers CPE2, CPE3 and CPE4 have established a neighboring relation only with BS1, which means that a neighboring relation can be established only within one area. Routers CPE2, CPE3 and CPE4 are selected as DR, BS1 - BDR, as BS1's router ID is the lowest.

BS1	`OSPF> show neighbor`
	
	`Neighbor ID Pri State Dead Time Address Interface RXmtL RqstL DBsmL`
	`192.168.0.2 1 Full/DR 00:00:32 172.16.0.2 rf5.0:172.16.0.1 0 0 0`
	`192.168.0.3 1 Full/DR 00:00:34 172.16.3.2 rf5.0:172.16.3.1 0 0 0`
	`192.168.0.4 1 Full/DR 00:00:32 172.16.4.2 rf5.0:172.16.4.1 0 0 0`

CPE2	`OSPF> show neighbor`
	
	`Neighbor ID Pri State Dead Time Address Interface RXmtL RqstL DBsmL`
	`192.168.0.1 1 Full/Backup 00:00:32 172.16.0.1 rf5.0:172.16.0.2 0 0 0`

CPE3	`OSPF> show neighbor`
	
	`Neighbor ID Pri State Dead Time Address Interface RXmtL RqstL DBsmL`
	`192.168.0.1 1 Full/Backup 00:00:31 172.16.3.1 rf5.0:172.16.3.2 0 0 0`

CPE4	`OSPF> show neighbor`
	
	`Neighbor ID Pri State Dead Time Address Interface RXmtL RqstL DBsmL`
	`192.168.0.1 1 Full/Backup 00:00:37 172.16.4.1 rf5.0:172.16.4.2 0 0 0`

LSDB content

Title

Description

Let's analyze the LSDB. Unlike in the case of the scheme with one area, in this example the set of LSAs for each area will be different.

Area 0:

- **LSA type 1** (Router Link States): The LSDB contains two LSAs type 1, from each area router.
- **LSA type 2** (Net Link States): CPE2 as DR, has generated one LSA type 2.
- **LSA type 3** (Summary Link States): the LSDB contains 6 LSAs type 3 about the networks in different areas.
- **LSA type 4** (ASBR-Summary Link States): CPE3 is ASBR and it is located in area 3, so it redistributes the static routes. BS1 generates an LSA type 4 for area 0 with information about the location of the ASBR (CPE3).
- **LSA type 5** (AS External Link States): By default, one LSA type 5 is generated for each external route, therefore the LSDB contains three LSAs type 5 containing the routes to the external networks: the routes to the networks 192.168.5.0/28 and 192.168.6.0/28 were generated during the redistribution of CPE3's static routes, while the route to network 10.10.10.0/24 is generated by BS1 during the redistribution as a directly connected network. Since area 3 is an NSSA, LSAs type 5 about the networks 192.168.5.0/28 and 192.168.6.0 /28 for area 0 are generated by the BS1 to replace the LSA type 7 from CPE3.

Area 3:

- **LSA type 1** (Router Link States): The LSDB contains two LSAs type 1, from each area router.
- **LSA type 2** (Net Link States): CPE3 as DR generates one LSA type 2.
- **LSA type 3** (Summary Link States): the LSDB contains 7 LSAs type 3 about the networks in different areas, similar to area 0. The difference is in the LSA with a default route generated by BS1 for area 3.
- **LSA type 5** (AS External Link States): the CPE3 router generates 2 LSAs type 5 with information about the static routes (redistribution). The presence of these LSAs in the LSDB is formal, since CPE3 converts them to LSA type 7 and forwards them to the neighbors.
- **LSA type 7** (NSSA-external Link States): the external routes are transmitted using LSA type 7 in NSSA type areas, so the LSDB includes three LSAs of this type.

Area 4:

- **LSA type 1** (Router Link States): The LSDB contains two LSAs type 1, one from each area router.
- **LSA type 2** (Net Link States): CPE4 as DR generates one LSA type 2.
- **LSA type 3** (Summary Link States): the LSDB contains 7 LSAs type 3 about the networks in different areas and one LSA type 3, with a default route. Stub areas do not support the distribution of the routes towards the external networks, which are replaced by the default route distribution in LSA type 3.

Note: routers CPE2, CPE3 and CPE4 use only LSAs generated for areas 0, 3, and 4. BS1's LSDB includes LSAs for all areas, since BS1 is ABR and it is set at the border of all three areas.

BS1

```
OSPF> show database

       OSPF Router with ID (192.168.0.1)(192.168.0.1)

                Router Link States (Area 0.0.0.0)

Link ID         ADV Router      Age  Seq#       LS-Age Link count
192.168.0.1     192.168.0.1      235 0x80000003    246 2
192.168.0.2     192.168.0.2      232 0x80000005    243 3

                Net Link States (Area 0.0.0.0)

Link ID            ADV Router      Age  Seq#       LS-Age Routers
172.16.0.2/30      192.168.0.2      244 0x80000001    243 2

                Summary Link States (Area 0.0.0.0)

Link ID         ADV Router      Age  Seq#       LS-Age Route
10.10.30.0      192.168.0.1      237 0x80000001    237 10.10.30.0/24
10.10.40.0      192.168.0.1      237 0x80000001    237 10.10.40.0/24
172.16.3.0      192.168.0.1      245 0x80000001    245 172.16.3.0/30
172.16.4.0      192.168.0.1      245 0x80000001    245 172.16.4.0/30
192.168.0.3     192.168.0.1      237 0x80000001    237 192.168.0.3/32
192.168.0.4     192.168.0.1      237 0x80000001    237 192.168.0.4/32

                ASBR-Summary Link States (Area 0.0.0.0)

Link ID         ADV Router      Age  Seq#       LS-Age
192.168.0.3     192.168.0.1      237 0x80000001    237

                Router Link States (Area 0.0.0.3 [NSSA])
```

```
Link ID         ADV Router      Age  Seq#       LS-Age Link count
192.168.0.1     192.168.0.1      236 0x80000003    246 1
192.168.0.3     192.168.0.3      224 0x80000005    243 3

                Net Link States (Area 0.0.0.3 [NSSA])

Link ID            ADV Router      Age  Seq#       LS-Age Routers
172.16.3.2/30      192.168.0.3      244 0x80000001    243 2

                Summary Link States (Area 0.0.0.3 [NSSA])

Link ID         ADV Router      Age  Seq#       LS-Age Route
0.0.0.0         192.168.0.1      245 0x80000001    245 0.0.0.0/0
10.10.20.0      192.168.0.1      237 0x80000001    237 10.10.20.0/24
10.10.40.0      192.168.0.1      237 0x80000001    237 10.10.40.0/24
172.16.0.0      192.168.0.1      245 0x80000001    245 172.16.0.0/30
172.16.4.0      192.168.0.1      245 0x80000001    245 172.16.4.0/30
192.168.0.1     192.168.0.1      240 0x80000001    240 192.168.0.1/32
192.168.0.2     192.168.0.1      237 0x80000001    237 192.168.0.2/32
192.168.0.4     192.168.0.1      237 0x80000001    237 192.168.0.4/32

                NSSA-external Link States (Area 0.0.0.3 [NSSA])

Link ID         ADV Router      Age  Seq#       LS-Age Route
10.10.10.0      192.168.0.1      243 0x80000004    246 E2 10.10.10.0/24      [0x0]
192.168.5.0     192.168.0.3      244 0x80000002    243 E2 192.168.5.0/28     [0x0]
192.168.6.0     192.168.0.3      244 0x80000002    243 E2 192.168.6.0/28     [0x0]

                Router Link States (Area 0.0.0.4 [Stub])

Link ID         ADV Router      Age  Seq#       LS-Age Link count
192.168.0.1     192.168.0.1      231 0x80000003    246 1
192.168.0.4     192.168.0.4      215 0x80000005    243 3

                Net Link States (Area 0.0.0.4 [Stub])

Link ID            ADV Router      Age  Seq#       LS-Age Routers
172.16.4.2/30      192.168.0.4      244 0x80000001    243 2

                Summary Link States (Area 0.0.0.4 [Stub])

Link ID         ADV Router      Age  Seq#       LS-Age Route
0.0.0.0         192.168.0.1      245 0x80000001    245 0.0.0.0/0
10.10.20.0      192.168.0.1      237 0x80000001    237 10.10.20.0/24
10.10.30.0      192.168.0.1      237 0x80000001    237 10.10.30.0/24
172.16.0.0      192.168.0.1      245 0x80000001    245 172.16.0.0/30
172.16.3.0      192.168.0.1      245 0x80000001    245 172.16.3.0/30
192.168.0.1     192.168.0.1      240 0x80000001    240 192.168.0.1/32
192.168.0.2     192.168.0.1      237 0x80000001    237 192.168.0.2/32
192.168.0.3     192.168.0.1      237 0x80000001    237 192.168.0.3/32

                AS External Link States

Link ID         ADV Router      Age  Seq#       LS-Age Route
10.10.10.0      192.168.0.1      243 0x80000004    246 E2 10.10.10.0/24      [0x0]
192.168.5.0     192.168.0.1      207 0x80000002    239 E2 192.168.5.0/28     [0x0]
192.168.6.0     192.168.0.1      207 0x80000002    239 E2 192.168.6.0/28     [0x0]
```

Title

CPE2

```
OSPF> show database

       OSPF Router with ID (192.168.0.2)(192.168.0.2)

                Router Link States (Area 0.0.0.0)

Link ID         ADV Router      Age  Seq#       LS-Age Link count
192.168.0.1     192.168.0.1       61 0x80000003     68 2
192.168.0.2     192.168.0.2       56 0x80000005     96 3

                Net Link States (Area 0.0.0.0)

Link ID            ADV Router      Age  Seq#       LS-Age Routers
172.16.0.2/30      192.168.0.2       68 0x80000001     68 2

                Summary Link States (Area 0.0.0.0)

Link ID         ADV Router      Age  Seq#       LS-Age Route
10.10.30.0      192.168.0.1       63 0x80000001     62 10.10.30.0/24
10.10.40.0      192.168.0.1       63 0x80000001     62 10.10.40.0/24
172.16.3.0      192.168.0.1       71 0x80000001     68 172.16.3.0/30
172.16.4.0      192.168.0.1       71 0x80000001     68 172.16.4.0/30
192.168.0.3     192.168.0.1       63 0x80000001     62 192.168.0.3/32
192.168.0.4     192.168.0.1       63 0x80000001     62 192.168.0.4/32

                ASBR-Summary Link States (Area 0.0.0.0)

Link ID         ADV Router      Age  Seq#       LS-Age
192.168.0.3     192.168.0.1       63 0x80000001     62

                AS External Link States

Link ID         ADV Router      Age  Seq#       LS-Age Route
10.10.10.0      192.168.0.1       69 0x80000004     68 E2 10.10.10.0/24      [0x0]
192.168.5.0     192.168.0.1       65 0x80000002     64 E2 192.168.5.0/28     [0x0]
192.168.6.0     192.168.0.1       65 0x80000002     64 E2 192.168.6.0/28     [0x0]
```

CPE3

```
OSPF> show database

       OSPF Router with ID (192.168.0.3)(192.168.0.3)

                Router Link States (Area 0.0.0.3 [NSSA])

Link ID         ADV Router      Age  Seq#       LS-Age Link count
192.168.0.1     192.168.0.1      157 0x80000003    163 1
192.168.0.3     192.168.0.3      142 0x80000005    182 3

                Net Link States (Area 0.0.0.3 [NSSA])

Link ID            ADV Router      Age  Seq#       LS-Age Routers
172.16.3.2/30      192.168.0.3      163 0x80000001    163 2

                Summary Link States (Area 0.0.0.3 [NSSA])

Link ID         ADV Router      Age  Seq#       LS-Age Route
0.0.0.0         192.168.0.1      166 0x80000001    163 0.0.0.0/0
10.10.20.0      192.168.0.1      158 0x80000001    157 10.10.20.0/24
10.10.40.0      192.168.0.1      158 0x80000001    157 10.10.40.0/24
172.16.0.0      192.168.0.1      166 0x80000001    163 172.16.0.0/30
172.16.4.0      192.168.0.1      166 0x80000001    163 172.16.4.0/30
192.168.0.1     192.168.0.1      161 0x80000001    160 192.168.0.1/32
192.168.0.2     192.168.0.1      158 0x80000001    157 192.168.0.2/32
192.168.0.4     192.168.0.1      158 0x80000001    157 192.168.0.4/32

                NSSA-external Link States (Area 0.0.0.3 [NSSA])

Link ID         ADV Router      Age  Seq#       LS-Age Route
10.10.10.0      192.168.0.1      164 0x80000004    163 E2 10.10.10.0/24      [0x0]
192.168.5.0     192.168.0.3      163 0x80000002    182 E2 192.168.5.0/28     [0x0]
192.168.6.0     192.168.0.3      163 0x80000002    182 E2 192.168.6.0/28     [0x0]

                AS External Link States

Link ID         ADV Router      Age  Seq#       LS-Age Route
192.168.5.0     192.168.0.3      163 0x80000002    182 E2 192.168.5.0/28     [0x0]
192.168.6.0     192.168.0.3      163 0x80000002    182 E2 192.168.6.0/28     [0x0]
```

Title

CPE4

```
OSPF> show database

       OSPF Router with ID (192.168.0.4)(192.168.0.4)

                Router Link States (Area 0.0.0.4 [Stub])

Link ID         ADV Router      Age  Seq#       LS-Age Link count
192.168.0.1     192.168.0.1      194 0x80000003    205 1
192.168.0.4     192.168.0.4      176 0x80000005    216 3

                Net Link States (Area 0.0.0.4 [Stub])

Link ID            ADV Router      Age  Seq#       LS-Age Routers
172.16.4.2/30      192.168.0.4      205 0x80000001    205 2

                Summary Link States (Area 0.0.0.4 [Stub])

Link ID         ADV Router      Age  Seq#       LS-Age Route
0.0.0.0         192.168.0.1      208 0x80000001    205 0.0.0.0/0
10.10.20.0      192.168.0.1      200 0x80000001    199 10.10.20.0/24
10.10.30.0      192.168.0.1      200 0x80000001    199 10.10.30.0/24
172.16.0.0      192.168.0.1      208 0x80000001    205 172.16.0.0/30
172.16.3.0      192.168.0.1      208 0x80000001    205 172.16.3.0/30
192.168.0.1     192.168.0.1      203 0x80000001    202 192.168.0.1/32
192.168.0.2     192.168.0.1      200 0x80000001    199 192.168.0.2/32
192.168.0.3     192.168.0.1      200 0x80000001    199 192.168.0.3/32
```

Routing table

Description

The routing tables of the wireless devices contain entries about each subnet shown in the scheme. This means that the devices have successfully exchanged the routing information and added it to the FIB.

The main difference between the routing tables of the devices are the routes to the external networks: on some routers there is a direct route to the network, and on others a default route.

Note: the addresses of the loopback interfaces do not depend on the link state, therefore they can be used to manage the devices in redundant networks.

BS1

```
BS_1#1> netstat -r
Routing tables
Destination        Gateway            Flags     Refs     Use  Interface
10.10.10.0/24      link#2             UC          0        0  eth0
10.10.20.0/24      172.16.0.2         UG3         0        0  rf5.0
10.10.30.0/24      172.16.3.2         UG3         0        0  rf5.0
10.10.40.0/24      172.16.4.2         UG3         0        0  rf5.0
127.0.0.1          127.0.0.1          UH          3      465  lo0
172.16.0.0/30      link#3             UC          0        0  rf5.0
172.16.3.0/30      link#3             UC          0        0  rf5.0
172.16.4.0/30      link#3             UC          0        0  rf5.0
192.168.0.1        192.168.0.1        UH          0        0  lo0
192.168.0.2        172.16.0.2         UGH3        0        0  rf5.0
192.168.0.3        172.16.3.2         UGH3        0        0  rf5.0
192.168.0.4        172.16.4.2         UGH3        0        0  rf5.0
192.168.5.0/28     172.16.3.2         UG3         0        0  rf5.0
192.168.6.0/28     172.16.3.2         UG3         0        0  rf5.0
224.0.0.0/8        127.0.0.1          UGS         1    11852  lo0
```

CPE2

```
AS_2#2> netstat -r
Routing tables
Destination        Gateway            Flags     Refs     Use  Interface
10.10.10.0/24      172.16.0.1         UG3          0        0  rf5.0
10.10.20.0/24      link#2             UC           0        0  eth0
10.10.30.0/24      172.16.0.1         UG3          0        0  rf5.0
10.10.40.0/24      172.16.0.1         UG3          0        0  rf5.0
127.0.0.1          127.0.0.1          UH           3      396  lo0
172.16.0.0/30      link#3             UC           0        0  rf5.0
172.16.3.0/30      172.16.0.1         UG3          0        0  rf5.0
172.16.4.0/30      172.16.0.1         UG3          0        0  rf5.0
192.168.0.1        172.16.0.1         UGH3         0        0  rf5.0
192.168.0.2        192.168.0.2        UH           0        0  lo0
192.168.0.3        172.16.0.1         UGH3         0        0  rf5.0
192.168.0.4        172.16.0.1         UGH3         0        0  rf5.0
192.168.5.0/28     172.16.0.1         UG3          0        0  rf5.0
192.168.6.0/28     172.16.0.1         UG3          0        0  rf5.0
224.0.0.0/8        127.0.0.1          UGS          1    15881  lo0
```

CPE3

```
AS_3#1> netstat -r
Routing tables
Destination        Gateway            Flags     Refs     Use  Interface
default            172.16.3.1         UG3          0        0  rf5.0
10.10.10.0/24      172.16.3.1         UG3          0        0  rf5.0
10.10.20.0/24      172.16.3.1         UG3          0        0  rf5.0
10.10.30.0/24      link#2             UC           0        0  eth0
10.10.40.0/24      172.16.3.1         UG3          0        0  rf5.0
127.0.0.1          127.0.0.1          UH           3      534  lo0
172.16.0.0/30      172.16.3.1         UG3          0        0  rf5.0
172.16.3.0/30      link#3             UC           0        0  rf5.0
172.16.4.0/30      172.16.3.1         UG3          0        0  rf5.0
192.168.0.1        172.16.3.1         UGH3         0        0  rf5.0
192.168.0.2        172.16.3.1         UGH3         0        0  rf5.0
192.168.0.3        192.168.0.3        UH           0        0  lo0
192.168.0.4        172.16.3.1         UGH3         0        0  rf5.0
192.168.5.0/28     10.10.30.1         UGS          0        0  eth0
192.168.6.0/28     10.10.30.1         UGS          0        0  eth0
224.0.0.0/8        127.0.0.1          UGS          1     9339  lo0
```

CPE4

```
AS_4#1> netstat -r
Routing tables
Destination        Gateway            Flags     Refs     Use  Interface
default            172.16.4.1         UG3          0        0  rf5.0
10.10.20.0/24      172.16.4.1         UG3          0        0  rf5.0
10.10.30.0/24      172.16.4.1         UG3          0        0  rf5.0
10.10.40.0/24      link#2             UC           0        0  eth0
127.0.0.1          127.0.0.1          UH           3      271  lo0
172.16.0.0/30      172.16.4.1         UG3          0        0  rf5.0
172.16.3.0/30      172.16.4.1         UG3          0        0  rf5.0
172.16.4.0/30      link#3             UC           0        0  rf5.0
192.168.0.1        172.16.4.1         UGH3         0        0  rf5.0
192.168.0.2        172.16.4.1         UGH3         0        0  rf5.0
192.168.0.3        172.16.4.1         UGH3         0        0  rf5.0
192.168.0.4        192.168.0.4        UH           0        0  lo0
224.0.0.0/8        127.0.0.1          UGS          1     3138  lo0
```

Additional materials

Webinars

Title

1. Typical scenario of routing setting using Infinet Wireless devices. Part II

Other

1. Ifconfig command (interfaces configuration)
2. ARDA (Aqua Router Daemon)
3. OSPF command
4. netstat command