

# Single-area OSPF Configuration

## Brief introduction

OSPF is a link-state routing protocol. The versions in use are OSPFv2 (for IPv4 routing) and OSPFv3 (including IPv6 routing). The router using OSPF records the following:

- neighbors (adjacency database) => `show ip ospf neighbor`
- topology (link-state database) => `show ip ospf database`
- routing information (forwarding database) => `show ip route ospf`

The router network can be divided into several *areas*, with area 0 being the backbone. The routing tables are then shorter and number of packets sent is lower. If there is only one area (Single-area OSPF), it is just the area 0.

## Show commands

The routers R1 and R2 are configured, check the configuration:

IPv4:

```
show ip route
show ip route ospf
show ip route summary
show ip route 10.12.0.0
show running-config
show ip protocols
show ip ospf neighbor
show ip ospf database
show ip ospf interface g0/0
show ip ospf interface brief ;not functional in the Packet Tracer
```

IPv6:

```
show ipv6 route
show ipv6 route ospf
show ipv6 route summary
show ipv6 route 2001:0:0:12::
show running-config
show ipv6 protocols
show ipv6 ospf neighbor
show ipv6 ospf database
show ipv6 ospf interface g0/0
```

## Configure the router R3:

- for the console line (line con 0):
  - set synchronous logging

```
logging sync
```

- disable DNS lookup

```
no ip domain lookup
```

- for the s0/0/1 interface:
  - IPv4 address 10.13.0.2 with mask 255.255.0.0
  - IPv6 address 2001:0:0:13::2/64
  - IPv6 link-local address fe80::3 and activate the interface
- for the g0/0 interface:
  - IPv4 address 10.23.0.2 with mask 255.255.0.0
  - IPv6 address 2001:0:0:23::2/64
  - IPv6 link-local address fe80::3 and activate the interface
- for the g0/2 interface (leading to the PC):
  - IPv4 address 10.33.0.1 with mask 255.255.0.0
  - IPv6 address 2001:0:0:33::1/64
  - IPv6 link-local address fe80::3 and activate the interface

## Test connectivity

from R3 to R1 and R2 using the ping command.

## Configure OSPF for IPv4 (i.e. OSPFv2) on R3:

We can have multiple OSPF processes on the router, each of them has its process ID. We can use e.g. 1.

All networks connected to the router and intended for routing are marked for routing using the `network` command with the following syntax:

```
network address inverse_mask area area_number
```

*Passive interfaces* can be determined. The passive interface leads to network with no other OSPF router, so no OSPF administration packets will be sent over this interface.

In the configuration, we set the *router ID* which seems like IP address. Possibilities for the router-id:

- the lowest IPv4 address is used as the router-id,
- the (lowest) loopback IPv4 address is used, if any loopback is set,
- we can determine the router-id by command, as follows.

```
configure terminal
  router ospf 1                ; protocol OSPF, process 1
    router-id 3.3.3.3         ; setting ID for routing purposes
    network 10.13.0.0 0.0.255.255 area 0 ; OSPF uses an inverse mask
    network 10.23.0.0 0.0.255.255 area 0
    network 10.33.0.0 0.0.255.255 area 0
    passive-interface g0/2    ; no router => no LSA packets sent
  end
```

```
sh ip proto
sh ip ospf neigh
sh ip ospf int s0/0/1
sh run
sh ip route
```

If the router-id is changed by command later during while routing is in operation, the following command should be used right after:

```
Router# clear ip ospf process
```

## Configure OSPF for IPv6 on R3:

Turn on IPv6 unicast routing:

```
ipv6 unicast-routing
```

Configure IPv6 OSPF (i.e. OSPFv3):

```
configure terminal
  ipv6 unicast-routing        ; enable IPv6 routing
  ipv6 router ospf 1
    router-id 3.3.3.3
    passive-interface g0/2
  exit
  int s0/0/1
    ipv6 ospf 1 area 0
  int g0/0
    ipv6 ospf 1 area 0
  int g0/2
    ipv6 ospf 1 area 0
  ; router-id and passive interface are configured for the both versions
end
```

```
sh ipv6 proto
sh ipv6 ospf neigh
sh ipv6 ospf int s0/0/1
sh run
sh ipv6 route
sh ipv6 route ospf
```