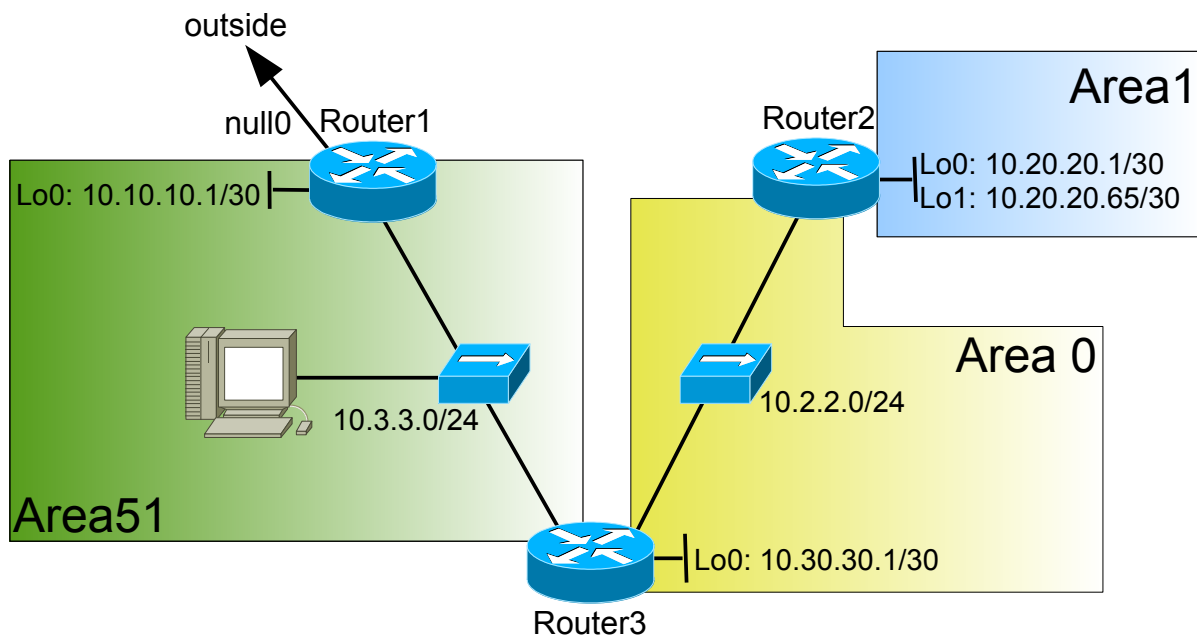universidade de aveiro
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ARQUITETURA E GESTÃO DE REDES

LABORATORY GUIDE

Objectives

- OSPFv2 with multiple areas

OSPFv2 with Multiple Areas

1. Configure the network of the above figure, taking into account the different OSPF areas:
 - Networks 10.2.2.0/24 and 10.30.30.0/30 are in <u>area 0</u>:

```
Router3(config)# router ospf 1
Router3(config-router)# network 10.2.2.0 0.0.0.255 area 0
Router3(config-router)# network 10.30.30.0 0.0.0.3 area 0
---
Router2(config)# router ospf 1
Router2(config-router)# network 10.2.2.0 0.0.0.255 area 0
```
- Networks 10.20.20.0/30 and 10.20.20.64/30 belong to <u>area 1</u>:
```
Router2(config)# router ospf 1
Router2(config-router)# network 10.20.20.0 0.0.0.3 area 1
Router2(config-router)# network 10.20.20.64 0.0.0.3 area 1
```
 - Networks 10.3.3.0/24 and 10.10.10.0/30 belong to <u>area 51</u>:
```
Router3(config)# router ospf 1
Router3(config-router)# network 10.3.3.0 0.0.0.255 area 51
---
Router1(config)# router ospf 1
Router1(config-router)# network 10.3.3.0 0.0.0.255 area 51
Router1(config-router)# network 10.10.10.0 0.0.0.3 area 51
```
Verify the routing tables and analyze the OSPF databases (commands `show ip ospf database`, `show ip ospf database router`, `show ip ospf database network`), including the *Summary Net Link States* database with the command `show ip ospf database summary`

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2. Configure Router2 to summarize the networks for area 1 and advertise this summary route to area 0 by issuing the following commands:
```
Router2(config)# router ospf 1
Router2(config-router)# area 1 range 10.20.20.0 255.255.255.0
```
Re-verify the routing tables of Router1 and Router3 and explain the results obtained.

3. Configure an external route from Router1 to outside the OSPF domain (using the null0 interface for testing purposes) and redistribute it into the OSPF process. Simulate the Router1 connection to the outside LAN 193.1.1.0/24 by configuring a static route using the following command:

```
Router1(config)# ip route 193.1.1.0 255.255.255.0 null0
```

Configure Router1 to redistribute static routes into the OSPF process using the following commands:

```
Router1(config)# router ospf 1
Router1(config-router)# redistribute static subnets
                              !subnets - forces the redistribution of classless networks
```

By using the `show ip ospf` command verify what type of OSPF routers are Router1, Router2 and Router3. Re-verify the routing tables of Router2 and Router3 and explain the results obtained, particularly their Type 2 (E2) routes. Do they have the same cost? How can you interpret that since both paths are different?

---

4. On Router1 configure the static routes redistribution as Type 1 (E1) routes, using the following commands:

```
Router1(config)# router ospf 1
Router1(config-router)# redistribute static subnets metric-type 1
```

Re-verify again the routing tables of Router2 and Router3. What are the new metrics for this route?

---

5. On Router2, configure another *loopback* interface that simulate Internet connectivity (next figure). Create and advertise a default route using the following commands:

```
Router2(config)# interface loopback 2
Router2(config-if)# ip address 10.0.0.1 255.255.255.252
Router2(config)# router ospf 1
Router2(config-router)# default-information originate always
```

Check the routing tables on Router1 and Router3 and explain what type of OSPF route has been added and what its metric is. Using the ping command, confirm that the default route is working properly.

---

6. Connect a new router (Router 4) as depicted in the following figure and make the necessary configurations. Check the routing table at Router 4. Does it contain any OSPF routes? Why? Using the `show ip ospf neighbor` command, verify that Router1 and Router4 established successful adjacencies between them.
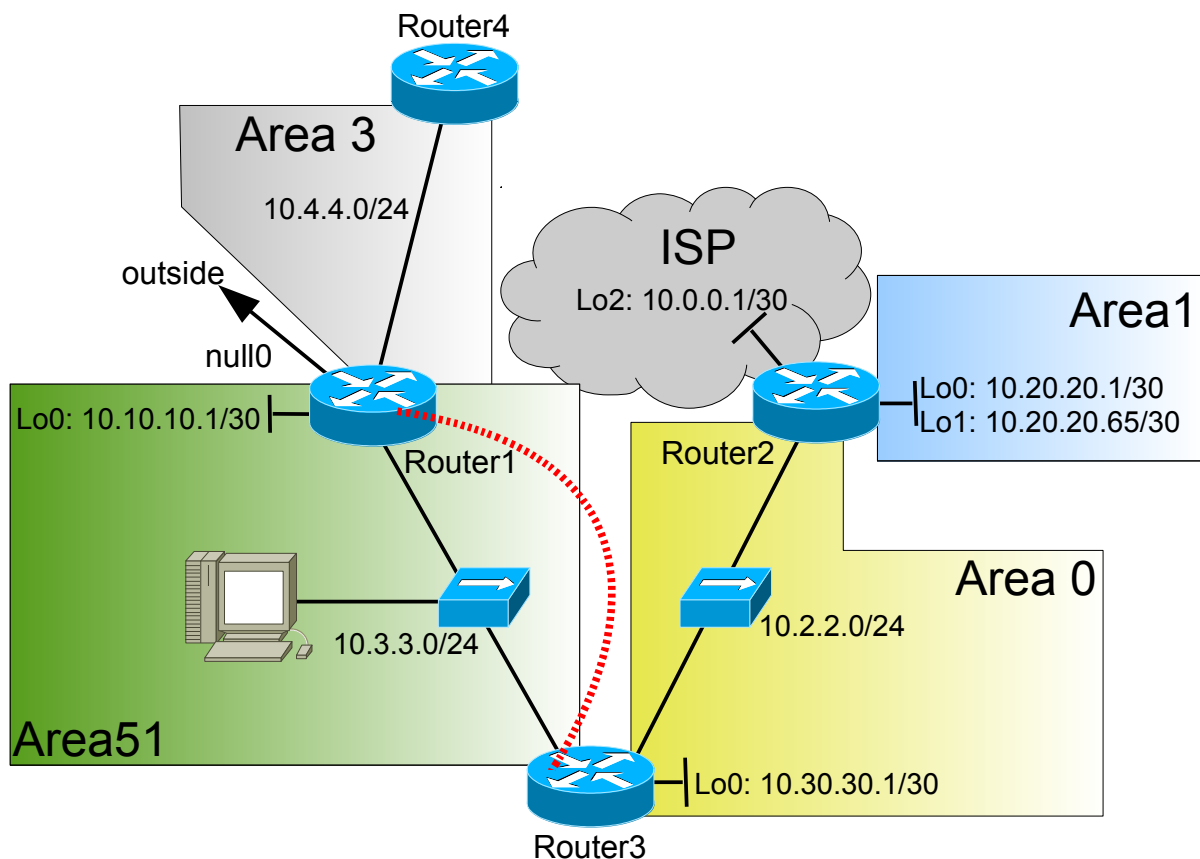
7. To enable full connectivity (Area3 must have a direct virtual connection to Area0), configure a virtual link between Router 1 and Router 3 (Router 1 is the ABR for Area 3 and Router 3 is the ABR for Area 0, therefore, the transit area between Area 3 and Area 0 will be Area 51) using the following configuration commands:

```
Router1(config)# router ospf 1
Router1(config-router)# area 51 virtual-link <Router3_ID>
```

Note that Router 3 must be identified by its router ID.

```
Router3(config)# router ospf 1
Router3(config-router)# area 51 virtual-link <Router1_ID>
```

Check the routing table of Router1. Is everything working correctly? Using `show ip ospf virtual-links` command on Router1, verify the state of the virtual link.

---

8. In order to verify the bootstrap process of OSPF in a multiple area scenario. Start a capture in the network 10.3.3.0/24 and reset the OSPF process in Router3 with the command:

```
Router3# clear ip ospf process
        yes
```

Analyze the captured OSPF packets with emphasis on the LS types.