

Serviços de Rede 1 – **Lesson 6 - Practices**

2019-2020

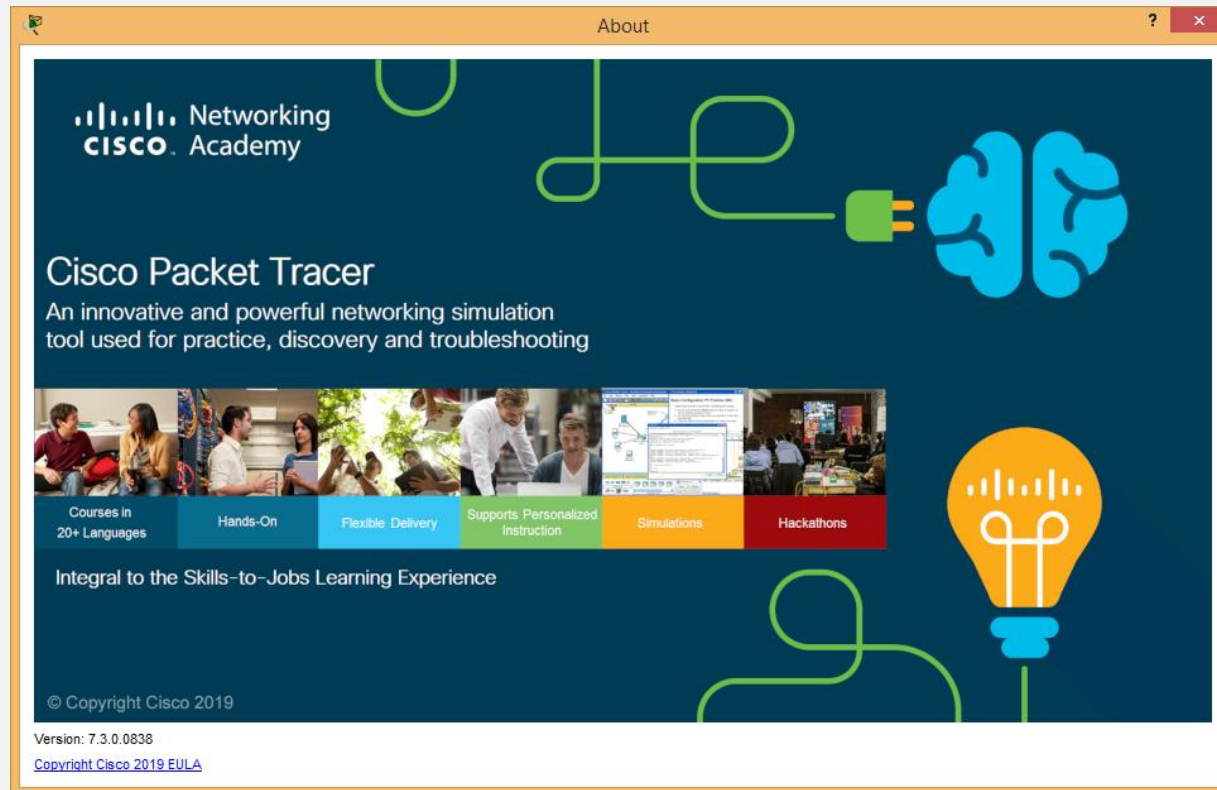
Instituto Politécnico de Coimbra

Departamento de Engenharia Informática



Pre - Requirements

- You have installed the Cisco Packet Tracer version 7.3.0

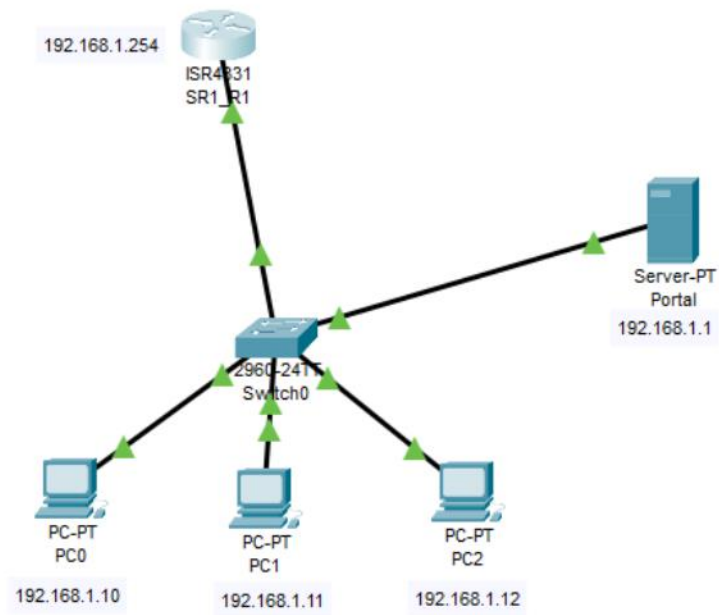


Proof of worksheet resolution

- After completing the resolution of the exercised, you must send by email to pgeirinh@isec.pt the two files resulting from the simulation.
- The files must have the following name:
First name_last name_6_ex1 and *First name_last name_6_ex2*

Exercise 1 - Configure DNS on a router

Exercise 1



Exercise 1

- Make the topology of the previous slide in the Packet Tracer simulator.
- The router name is SR1_R1 and the enable password is “sr1”.
- The IP addresses of the machines (PC, Server and Router) are defined in the drawing and are to be placed manually. The network is 192.168.1.0 / 24.
- Place the description on the Giga0 / 0/0 interface as “LAN Interface”.
- Disable on the router the possibility of it making DNS queries.
- Test the connectivity of the router to the PCs and to the server.
- Defines the possibility of reaching machines by name when on the router. Test that connection. **Note:** This is not having a DNS service....

Exercise 1

- Place the router as a DNS server on a PC. Enter simulation mode by activating only the display of DNS packages. What is up?
- Unfortunately, Packet Tracer does not have the command to enable the router as a DNS Server (ip dns server). So we have to find another solution....
- Save the file as *First name_last name_6_ex1*

How To

Placing hosts on a Router

SR1_R1

Physical Config **CLI** Attributes

IOS Command Line Interface

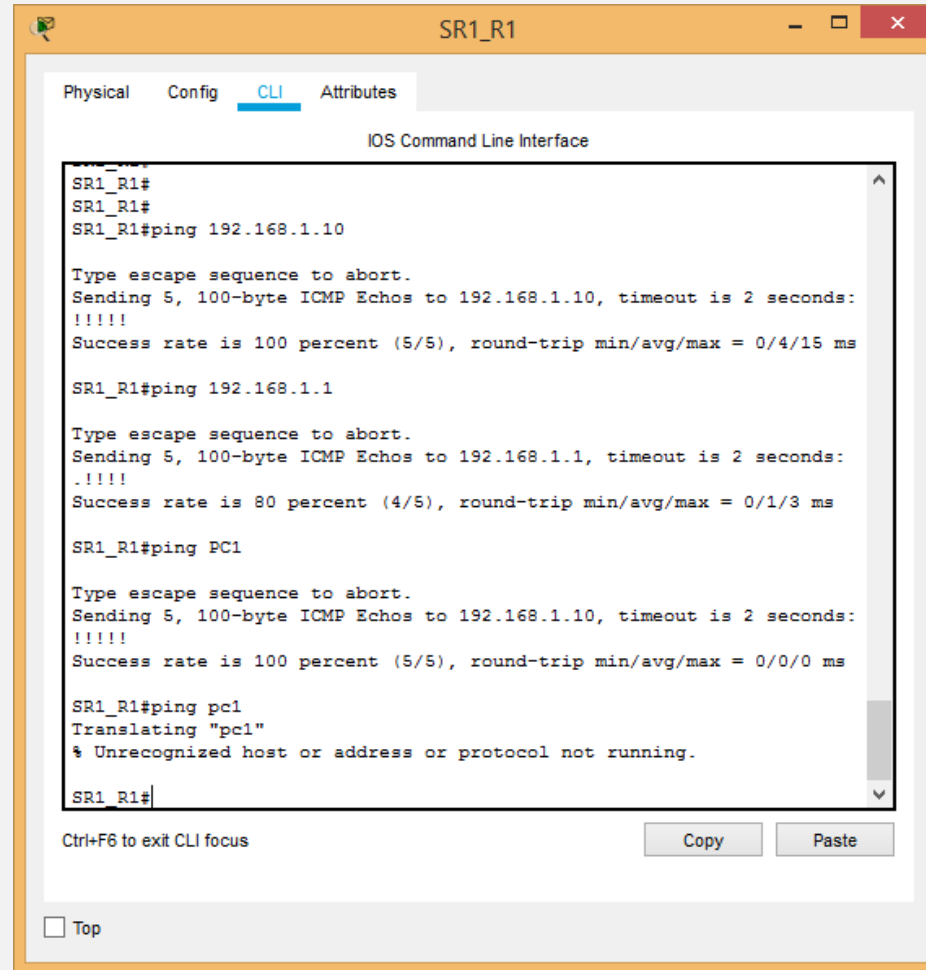
```
SR1_R1(config-if)#
SR1_R1(config-if)#exit
SR1_R1(config)#ip ?
  access-list      Named access-list
  cef               Cisco Express Forwarding
  default-gateway  Specify default gateway (if not routing IP)
  default-network  Flags networks as candidates for default routes
  dhcp             Configure DHCP server and relay parameters
  domain           IP DNS Resolver
  domain-lookup    Enable IP Domain Name System hostname translation
  domain-name      Define the default domain name
  flow-export       Specify host/port to send flow statistics
  forward-protocol Controls forwarding of physical and directed IP
  broadcasts
  ftp              FTP configuration commands
  host              Add an entry to the ip hostname table
  local            Specify local options
  name-server       Specify address of name server to use
  nat              NAT configuration commands
  route            Establish static routes
  routing          Enable IP routing
  scp              Scp commands
  ssh              Configure ssh options
  tcp              Global TCP parameters
SR1_R1(config)#ip host PC1 192.168.1.10
SR1_R1(config)#ip host PC2 192.168.1.11
SR1_R1(config)#ip host PC3 192.168.1.12
SR1_R1(config)#
```

Ctrl+F6 to exit CLI focus

Copy Paste

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Test connectivity



The screenshot shows a network simulator window titled "SR1_R1" with tabs for Physical, Config, CLI, and Attributes. The CLI tab is active, displaying the IOS Command Line Interface. The user has entered several commands: "SR1_R1#", "SR1_R1#", "SR1_R1#ping 192.168.1.10", "SR1_R1#ping 192.168.1.1", "SR1_R1#ping PC1", and "SR1_R1#ping pc1". The output shows successful pings to 192.168.1.10 and 192.168.1.1, and a failed ping to "pc1" due to an unrecognized host.

```
SR1_R1#
SR1_R1#
SR1_R1#ping 192.168.1.10

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.10, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/4/15 ms

SR1_R1#ping 192.168.1.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.1, timeout is 2 seconds:
..!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/1/3 ms

SR1_R1#ping PC1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.1.10, timeout is 2 seconds:
!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

SR1_R1#ping pc1
Translating "pc1"
% Unrecognized host or address or protocol not running.

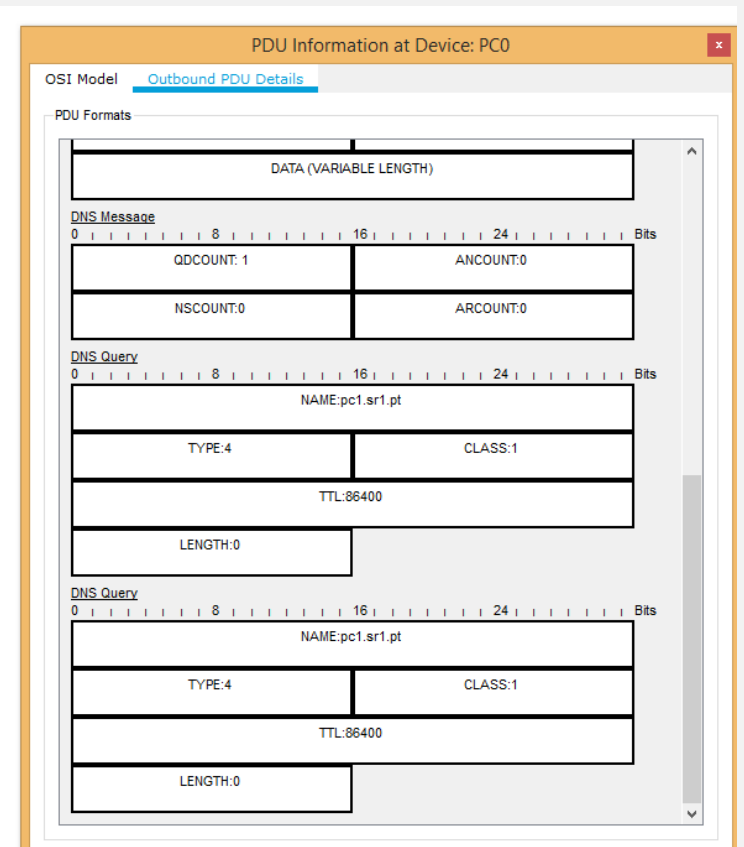
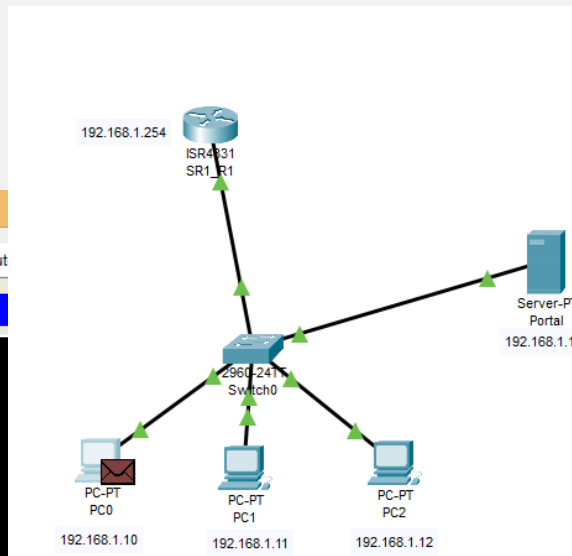
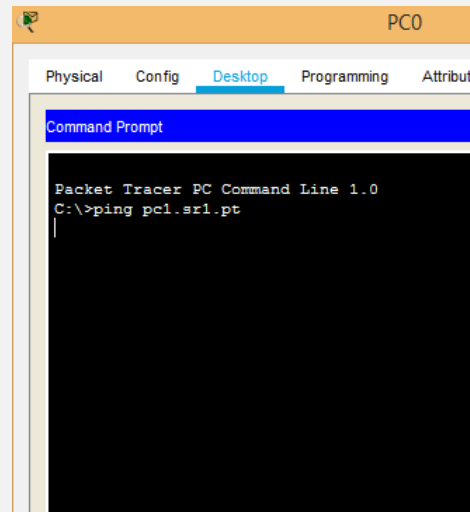
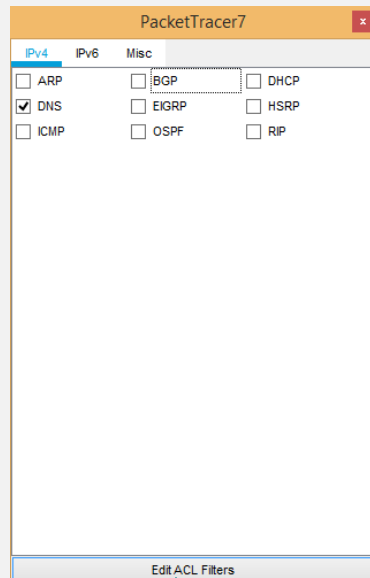
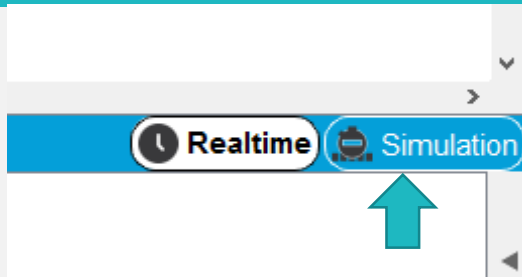
SR1_R1#
```

Ctrl+F6 to exit CLI focus

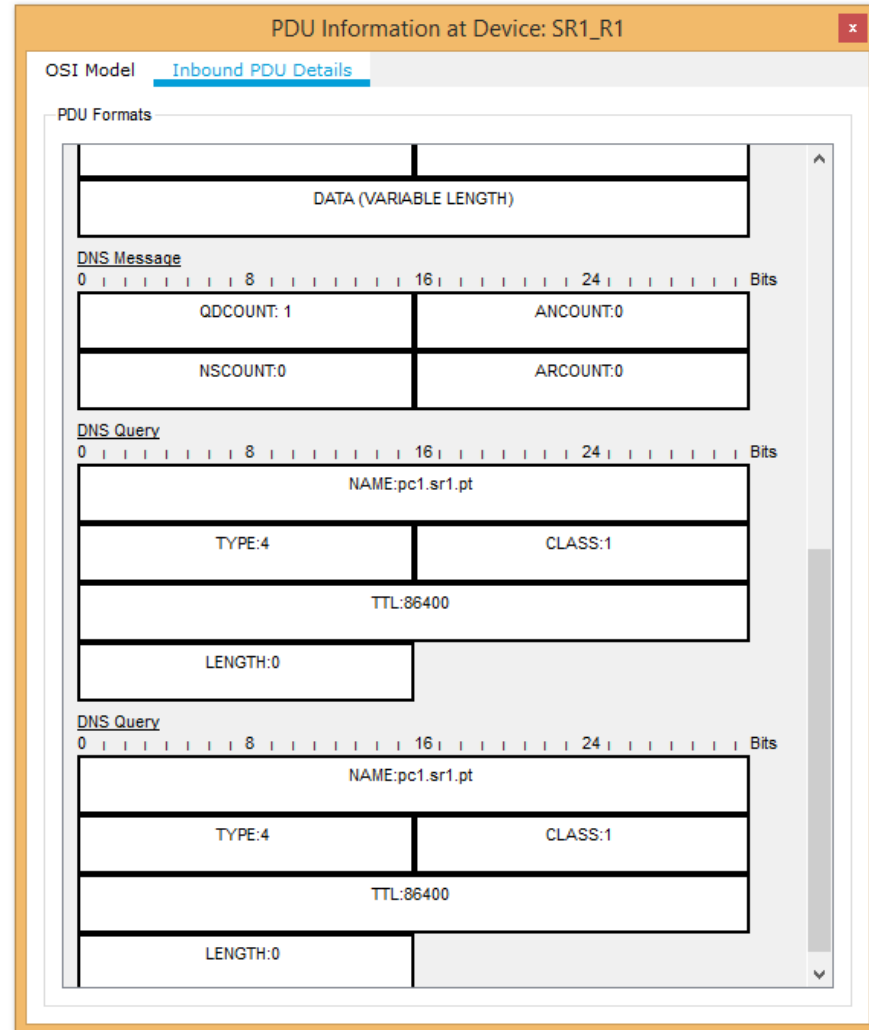
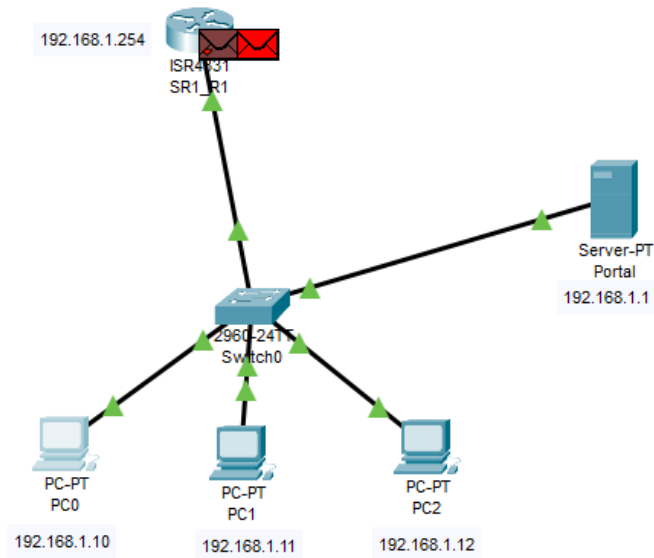
Copy Paste

☐ Top

Simulation



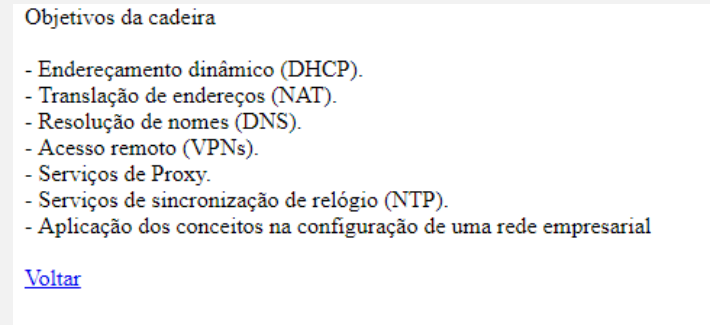
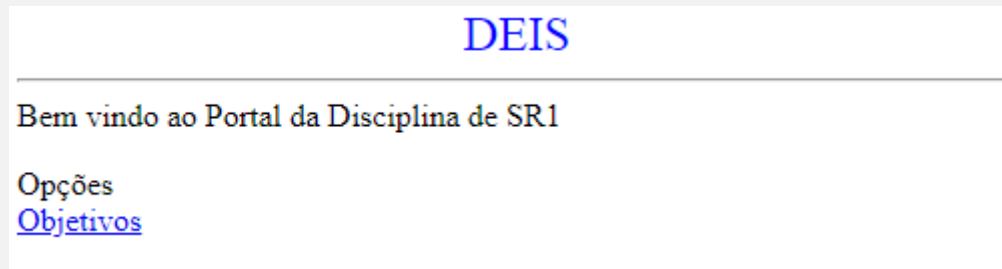
Simulation



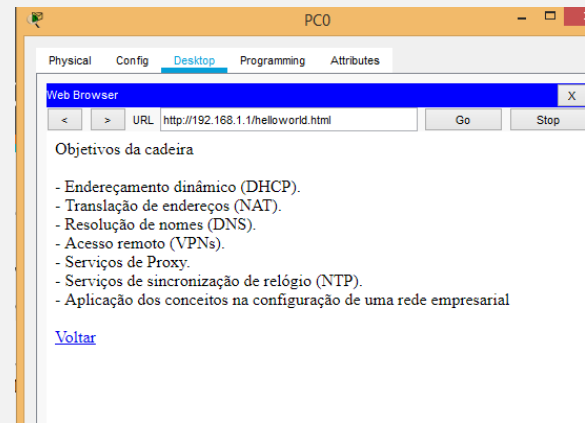
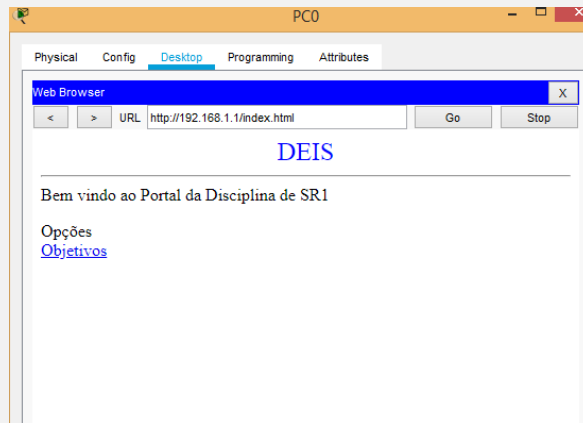
Exercise 2 - Configuring DNS in Packet Tracer

Exercise 2

- Disable all www server services except HTTP.
- Configure the entry page so that it looks like this and the objectives page for the chair:

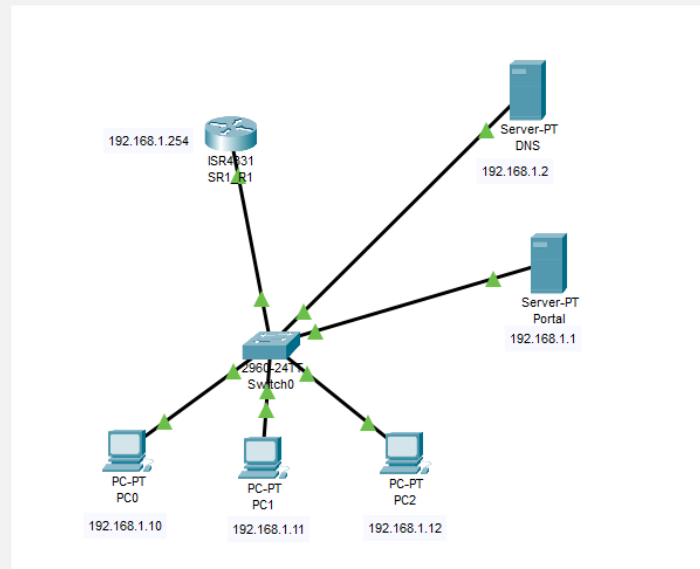


- Test a PC's access to this page



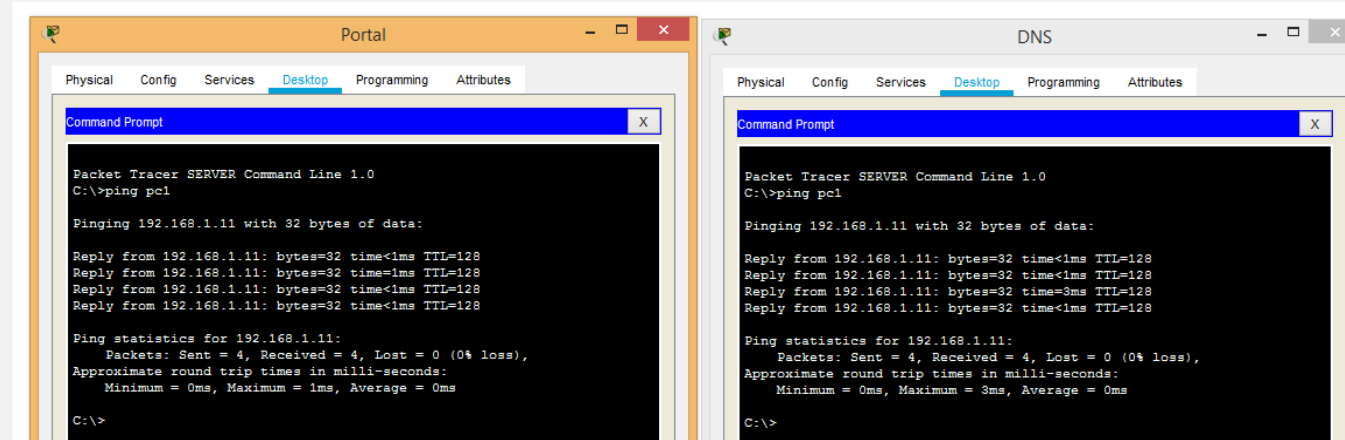
Exercise 2

- Place a new server in the topology. It should be at 192.168.1.2 and with the DNS name
- Test your network connection.
- Disable all services on this new server except DNS.
- Add a type A record to the DNS server so that PC1 can be reached by name.



Exercise 2

- Make the necessary changes to all machines on the network (PC and servers) so that you can reach PC1 by name. Test on everyone.



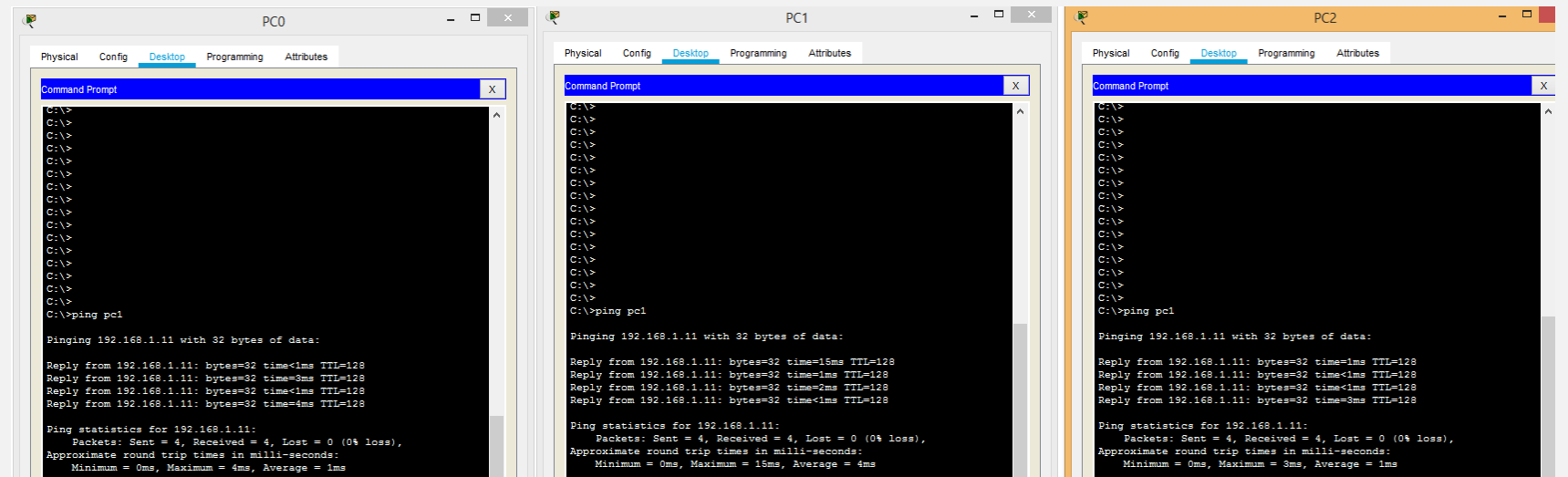
The image shows two side-by-side screenshots of the Packet Tracer Desktop tab for the 'Portal' server. Both screenshots show a Command Prompt window with the following output:

```
Packet Tracer SERVER Command Line 1.0
C:\>ping pc1

Pinging 192.168.1.11 with 32 bytes of data:

Reply from 192.168.1.11: bytes=32 time<1ms TTL=128
Reply from 192.168.1.11: bytes=32 time<1ms TTL=128
Reply from 192.168.1.11: bytes=32 time<1ms TTL=128
Reply from 192.168.1.11: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.1.11:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms
C:\>
```



The image shows three side-by-side screenshots of the Packet Tracer Desktop tab for PC0, PC1, and PC2. Each screenshot shows a Command Prompt window with the following output:

```
Packet Tracer SERVER Command Line 1.0
C:\>ping pc1

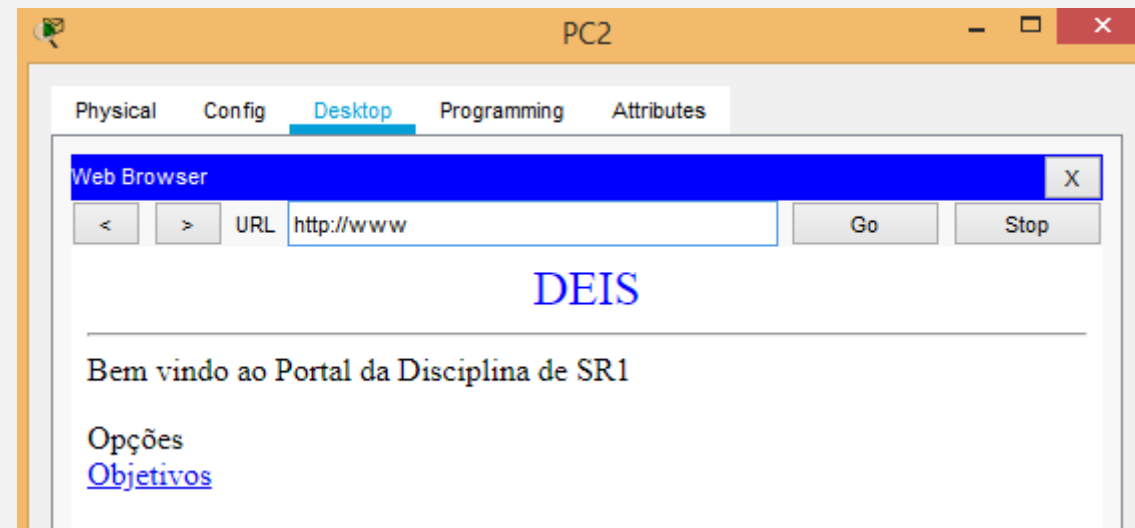
Pinging 192.168.1.11 with 32 bytes of data:

Reply from 192.168.1.11: bytes=32 time<1ms TTL=128
Reply from 192.168.1.11: bytes=32 time<1ms TTL=128
Reply from 192.168.1.11: bytes=32 time<1ms TTL=128
Reply from 192.168.1.11: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.1.11:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 4ms, Average = 1ms
C:\>
```

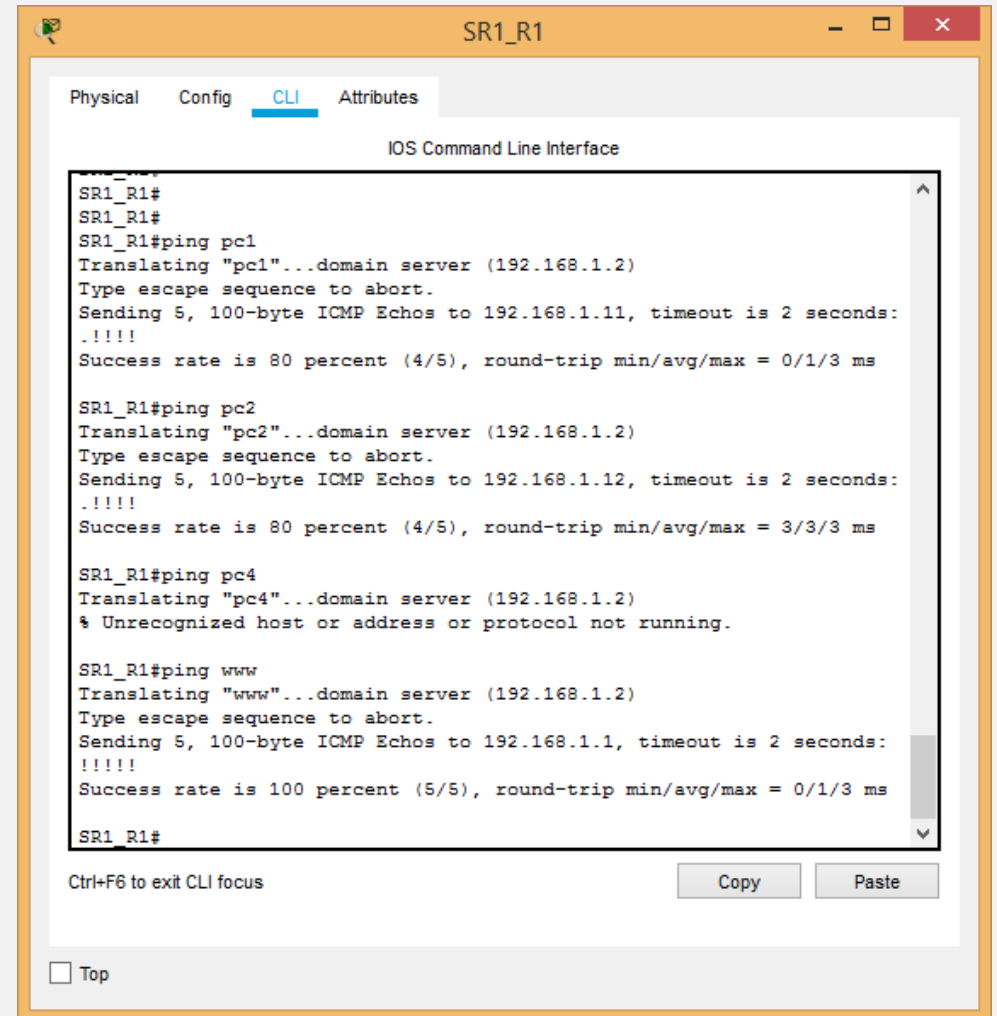

Exercise 2

- Configure your DNS server to be able to reach all devices on your network by name.
- Test if you can reach the www server by name.



Exercise 2

- Delete the settings from the hosts you had configured on your router. Enable the possibility for it to make DNS queries.
- Change the configuration of the router to use the 192.168.1.2 as a DNS server and thus be able to reach the machines on your network by name.



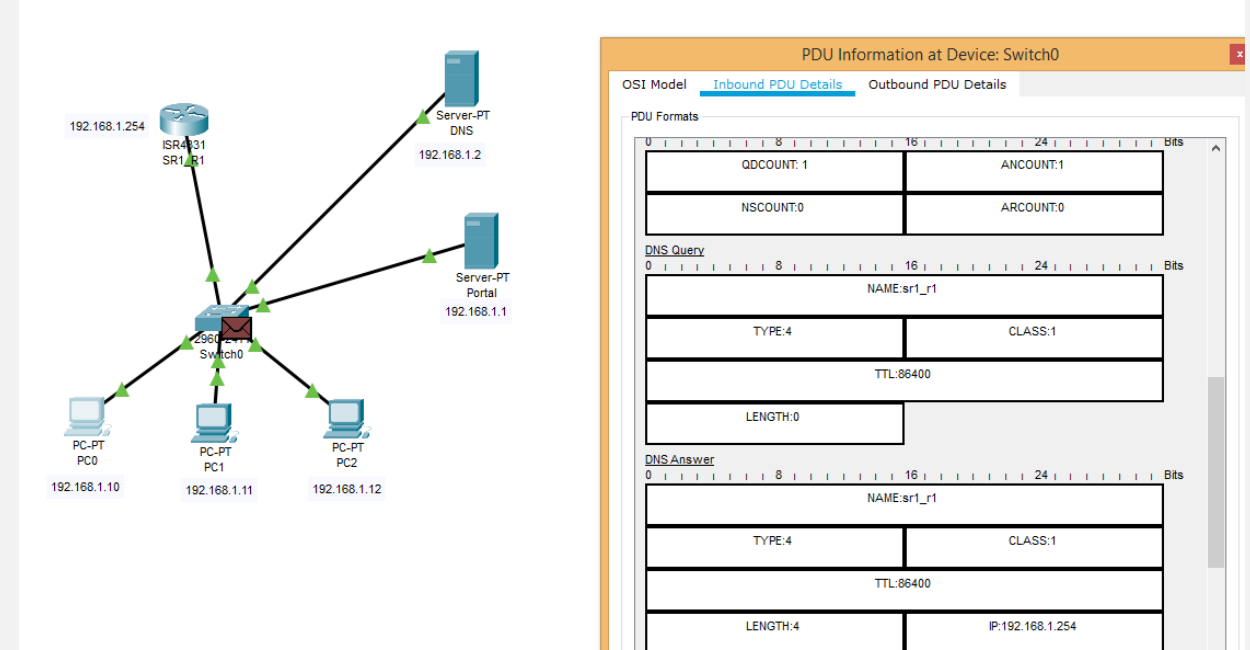
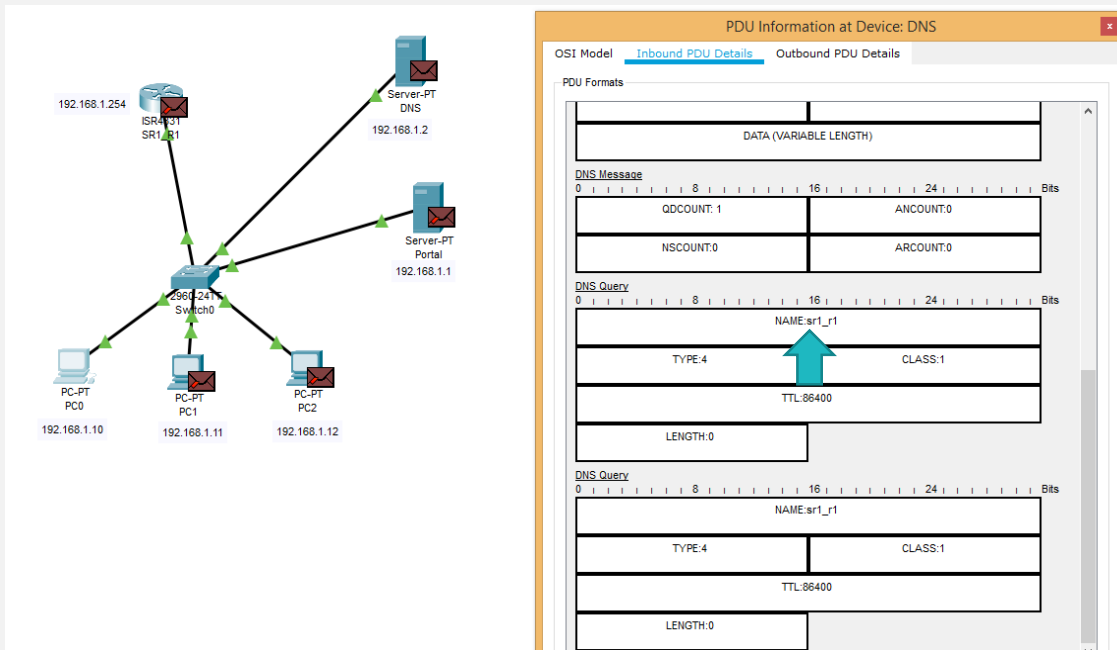
The screenshot shows the SR1_R1 router's CLI interface. The 'CLI' tab is selected, and the 'IOS Command Line Interface' window is open. The following commands and their outputs are visible:

```
SR1_R1#  
SR1_R1#  
SR1_R1#ping pc1  
Translating "pc1"...domain server (192.168.1.2)  
Type escape sequence to abort.  
Sending 5, 100-byte ICMP Echos to 192.168.1.11, timeout is 2 seconds:  
.....  
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/1/3 ms  
  
SR1_R1#ping pc2  
Translating "pc2"...domain server (192.168.1.2)  
Type escape sequence to abort.  
Sending 5, 100-byte ICMP Echos to 192.168.1.12, timeout is 2 seconds:  
.....  
Success rate is 80 percent (4/5), round-trip min/avg/max = 3/3/3 ms  
  
SR1_R1#ping pc4  
Translating "pc4"...domain server (192.168.1.2)  
% Unrecognized host or address or protocol not running.  
  
SR1_R1#ping www  
Translating "www"...domain server (192.168.1.2)  
Type escape sequence to abort.  
Sending 5, 100-byte ICMP Echos to 192.168.1.1, timeout is 2 seconds:  
.....  
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/1/3 ms  
  
SR1_R1#
```

At the bottom of the CLI window, there is a 'Ctrl+F6 to exit CLI focus' message, 'Copy' and 'Paste' buttons, and a 'Top' button.

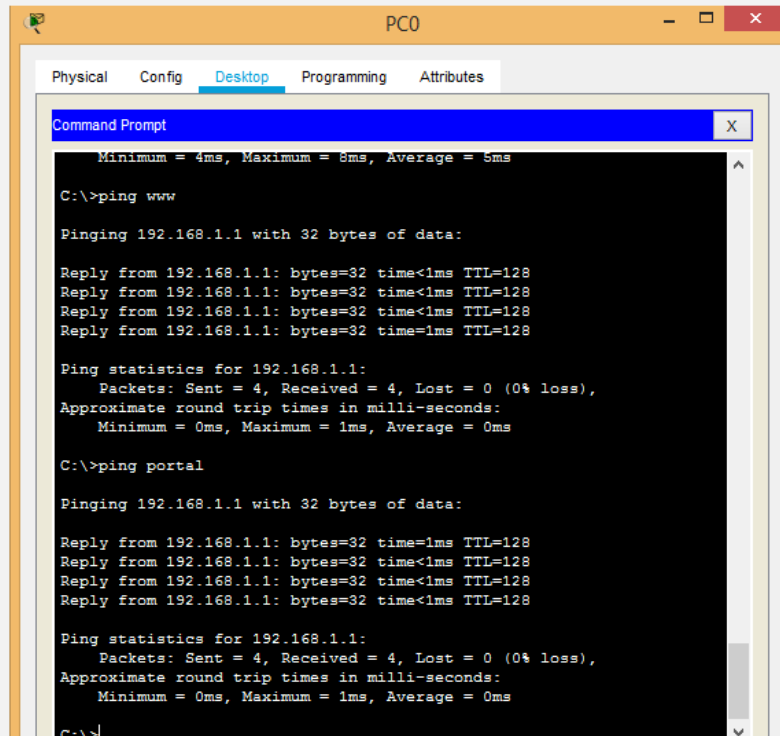
Exercise 2

- Place a new record on your DNS server for the router (name SR1_R1).
- Enter simulation mode and analyze the resulting DNS packets when you ping PC0 to the Router by name.



Exercise 2

- Make the necessary change to your DNS server so that the 192.168.1.1 server can be reached by the name of www and portal.

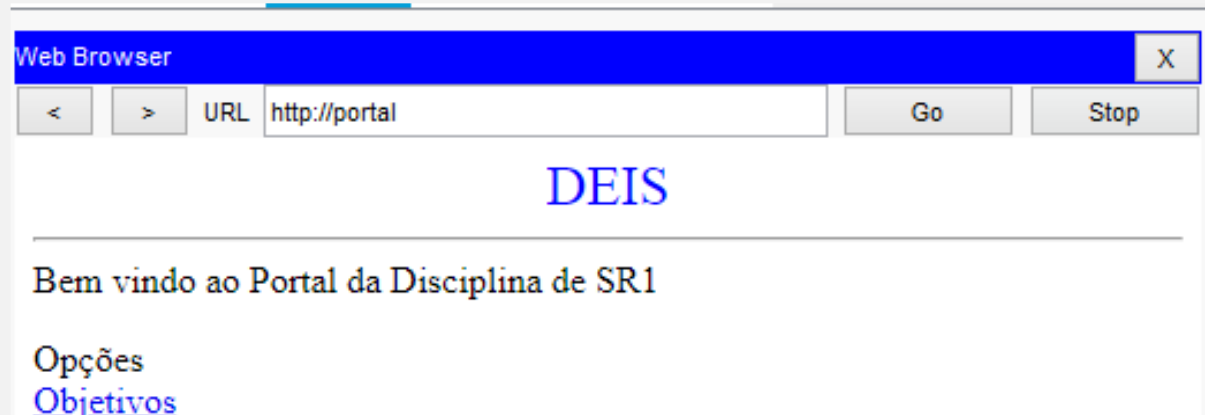
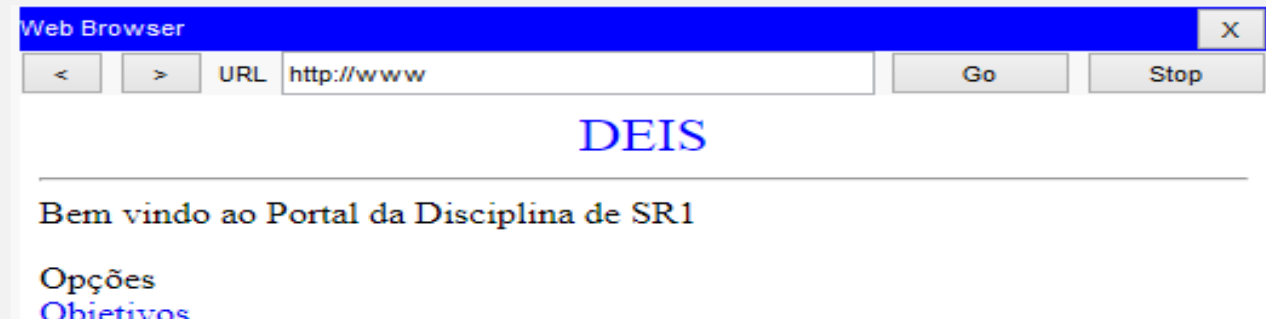


PC0

Physical Config Desktop Programming Attributes

Command Prompt

```
Minimum = 4ms, Maximum = 8ms, Average = 5ms  
C:\>ping www  
Pinging 192.168.1.1 with 32 bytes of data:  
Reply from 192.168.1.1: bytes=32 time<1ms TTL=128  
Reply from 192.168.1.1: bytes=32 time<1ms TTL=128  
Reply from 192.168.1.1: bytes=32 time<1ms TTL=128  
Reply from 192.168.1.1: bytes=32 time<1ms TTL=128  
Ping statistics for 192.168.1.1:  
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  
Approximate round trip times in milli-seconds:  
Minimum = 0ms, Maximum = 1ms, Average = 0ms  
C:\>ping portal  
Pinging 192.168.1.1 with 32 bytes of data:  
Reply from 192.168.1.1: bytes=32 time<1ms TTL=128  
Reply from 192.168.1.1: bytes=32 time<1ms TTL=128  
Reply from 192.168.1.1: bytes=32 time<1ms TTL=128  
Reply from 192.168.1.1: bytes=32 time<1ms TTL=128  
Ping statistics for 192.168.1.1:  
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),  
Approximate round trip times in milli-seconds:  
Minimum = 0ms, Maximum = 1ms, Average = 0ms  
C:\>
```

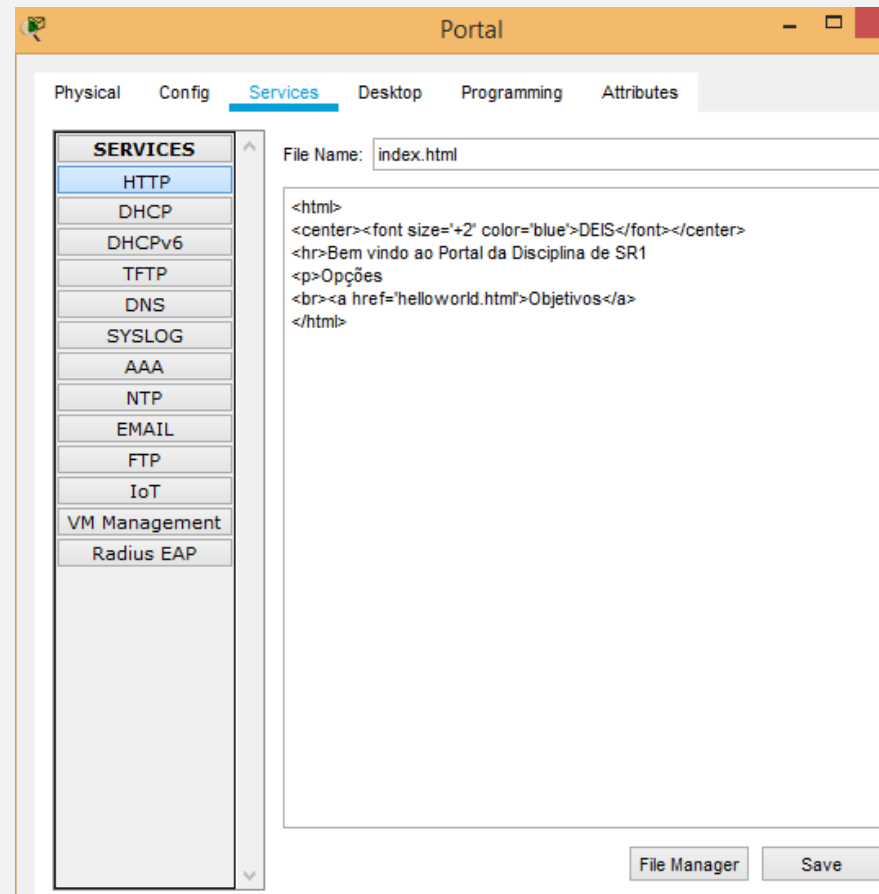
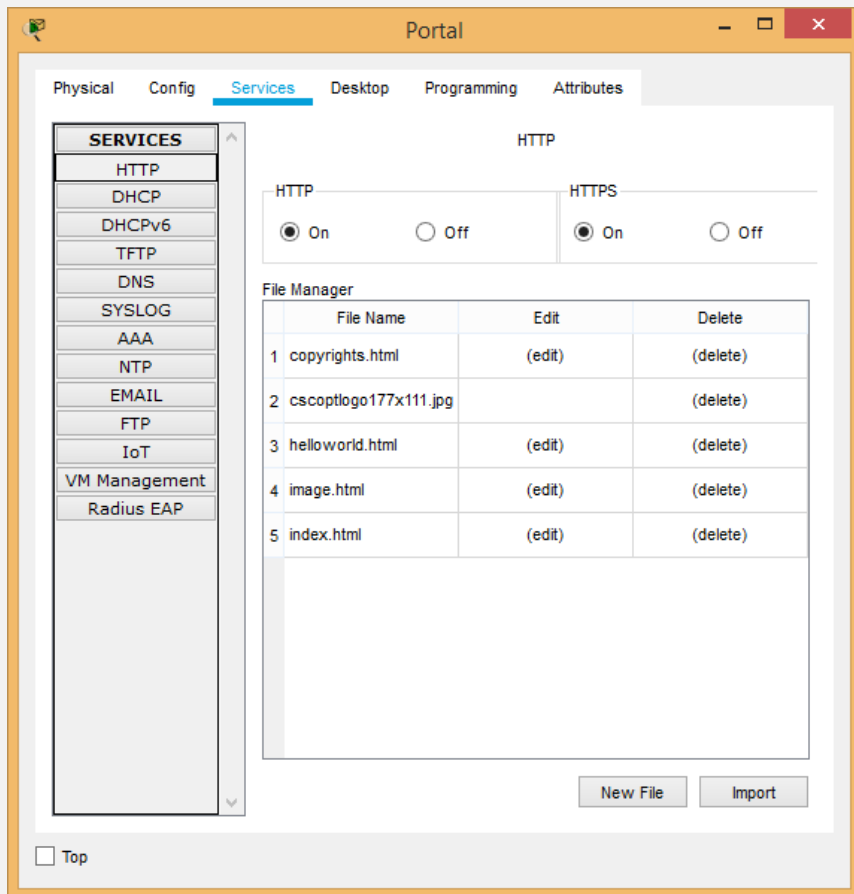


Exercise 2

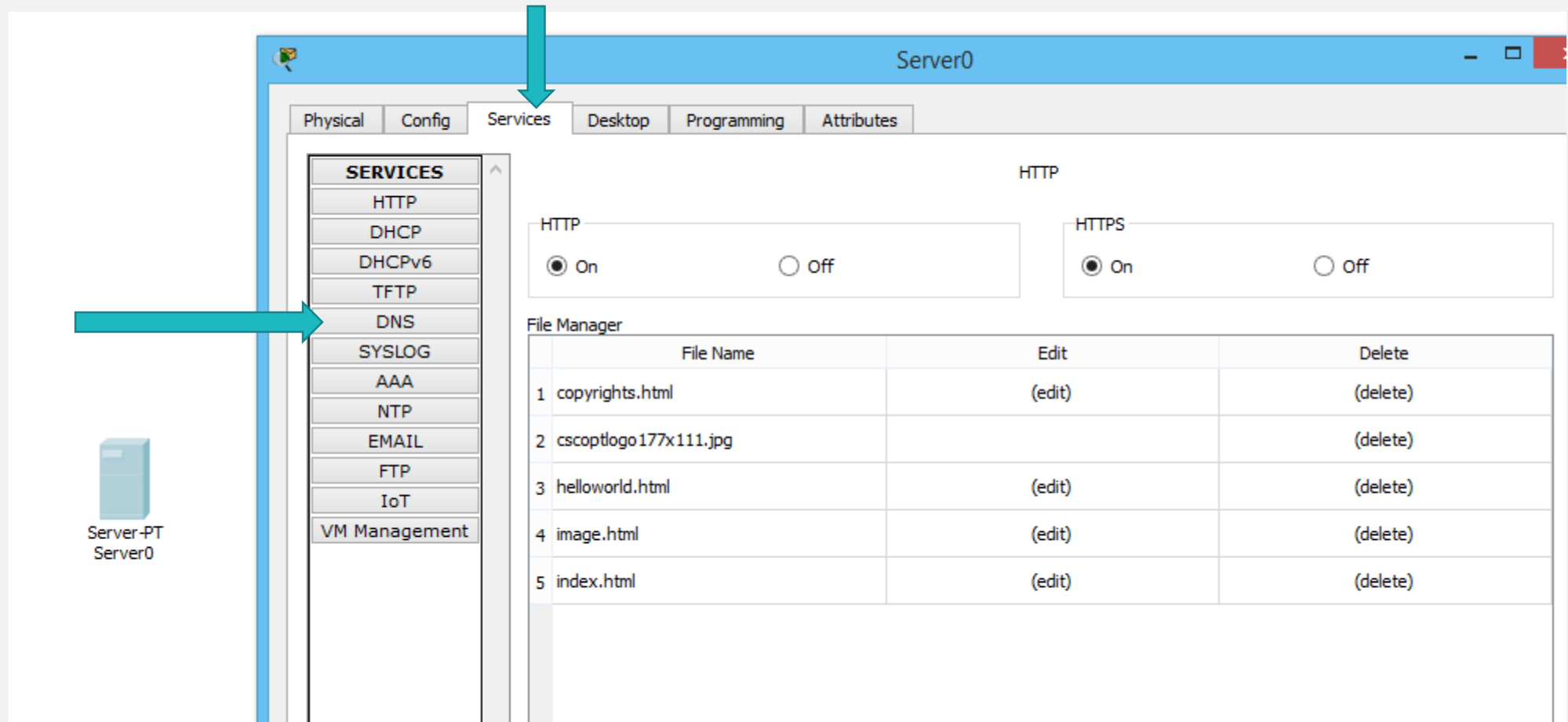
- Create the SOA record and fill in the typical values.
- Use the **nslookup** command on PC1 to see if your server is responding correctly:
 - Make a type A query and see what IP it indicates to PC0
 - Make a type A query and see which IP it indicates for the Portal
 - Make a type A query and see what IP it indicates for www
- Save the file as *First name_last name_6_ex2*
- Note: The nslookup command is very limited in Packet Tracer

How To

Configure the Web Server



Configure the DNS Service



The screenshot displays the configuration interface for a server named 'Server0'. The 'Services' tab is active, and the 'DNS' service is selected in the left-hand menu. A teal arrow points to the 'DNS' option in the menu, and another teal arrow points to the 'Services' tab. The main content area shows the configuration for the selected service, with 'HTTP' and 'HTTPS' options visible. Below these, a 'File Manager' table lists several files.

Server0

Physical Config **Services** Desktop Programming Attributes

SERVICES

- HTTP
- DHCP
- DHCPv6
- TFTP
- DNS**
- SYSLOG
- AAA
- NTP
- EMAIL
- FTP
- IoT
- VM Management

HTTP

HTTP ☒ On ☐ Off

HTTPS ☒ On ☐ Off

File Manager

	File Name	Edit	Delete
1	copyrights.html	(edit)	(delete)
2	cscoptlogo177x111.jpg		(delete)
3	helloworld.html	(edit)	(delete)
4	image.html	(edit)	(delete)
5	index.html	(edit)	(delete)

Server-PT
Server0

Configure the DNS Service

Server0

Physical Config **Services** Desktop Programming Attributes

SERVICES

- HTTP
- DHCP
- DHCPv6
- TFTP
- DNS**
- SYSLOG
- AAA
- NTP
- EMAIL
- FTP
- IoT
- VM Management

DNS

DNS Service ☐ On ☒ Off

Resource Records

Name Type **A Record**

Address

Add Save Remove

No.	Name	Type	Detail
-----	------	------	--------

DNS Cache

☐ Top

DNS

Physical Config **Services** Desktop Programming Attributes

SERVICES

- HTTP
- DHCP
- DHCPv6
- TFTP
- DNS**
- SYSLOG
- AAA
- NTP
- EMAIL
- FTP
- IoT
- VM Management
- Radius EAP

DNS

DNS Service ☒ On ☐ Off

Resource Records

Name Type **A Record**

Address

Add Save Remove

No.	Name	Type	Detail
0	dns	A Record	192.168.1.2
1	pc0	A Record	192.168.1.10
2	pc1	A Record	192.168.1.11
3	pc2	A Record	192.168.1.12
4	sr1	SOA	ServerName:dns MailBox :admin@sr1.pt Expiry :360000 Refresh :3600 Retry :600 MinTTL :86400
5	www	A Record	192.168.1.1

DNS Cache

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DNS records

- **SOA** - Start of Authority - defines the general characteristics of the zone
 - **NAMESERVER**: indicates the authoritative DNS server for that zone;
 - **MNAME** - domain name of the nameserver (eg isec.pt);
 - **RNAME** - email address of the zone administrator (domain);
 - **SERIAL** - version of the zone file. This value must be increased whenever any part of the information in the zone file is changed. The commonly used tacit is to write a number with the date format (year / month / day / version - 0..99): 2001053000.
 - **REFRESH** - periodicity (in seconds) with which the secondary servers consult the primary to check the current version of the zone. Typical value: 3600 = 1h
 - **RETRY** - Periodicity (in seconds) with which the secondary servers repeat the attempt to verify the serial number of the master file after failing a contact. Typical value: 600 = 10m
 - **EXPIRE** - Maximum limit (in seconds) for replica retention of the zone without being able to ascertain the serial number. After this value expires, the secondary can no longer answer for the zone. Typical value: 3600000 -> 42d;
 - **MINIMUM TTL** - defines how long the record for that zone must remain in the cache of a DNS server before an update is made. Typical value: 864000 -> 10d

DNS records

- **A** - host address - this is the basic type that matches a canonical name to an IP address (For IP V4)
- **AAAA** - same as above but for IP V6.
- **CNAME** - maps an alias name to a true or canonical domain name. It is particularly useful for providing alternative names that correspond to the different services of the same machine
- **MX** - Mail Exchanger - Informs the IPs of the SMTP servers of a domain. This type of record has as its particularity one more field, which informs the priority of the SMTP server. The lower the value, the higher the priority ..
- **PTR** - Pointer (IP => name) - Associates an IP address with a hostname for reverse DNS resolution.
- **SRV** - Service Location - used to identify computers hosting specific services
- **NS** - domain name - Informs the IPs of the authoritative DNS servers in a domain.
- **TXT** - You can store any information in text format. Initially created to store comments or information about the domain, today it is widely used by anti-spam tools.

nslookup

- It is a tool, which exists on Windows and Linux, and which is used to obtain information about DNS records for a given domain, machine or IP.
- In a standard query, the DNS server defined on the machine's network card is the one consulted, and responds with information about the domain or machine searched.
- The information "Non-authoritative answer" means that the DNS server used does not answer for this domain, in other words, this means that an external query was made to the DNS servers. Imagine that you are at your home making a query about an ISEC machine, if your server is to answer that question the answer will be Non-authoritative answer if it is the ISEC server it will be Authoritative answer.

nslookup

- The type of inquiry you want is defined by the command set q =
 - **A**
 - A simple inquiry requesting the IP address corresponding to a computer
 - **CNAME**
 - A given computer may have several DNS names. One of these is the canonical name (or canonical name).
 - **MX**
 - An inquiry concerning the mail exchanger.
 - **PTR**
 - A PTR survey, which demonstrates reverse resolution (inverse or reverse). Notice the somewhat odd way in which the survey was introduced, which is partly because IP addresses have the most significant part on the left side while DNS addresses have it on the right side of the address.

nslookup

```
C:\Users\Pedro Geirinhas>nslookup
Default Server: vodafonegw
Address: 192.168.1.1

> sapo.pt
Server: vodafonegw
Address: 192.168.1.1

Non-authoritative answer:
Name: sapo.pt
Addresses: 2001:8a0:2102:c:213:13:146:142
          213.13.146.142

> www.isec.pt
Server: vodafonegw
Address: 192.168.1.1

Non-authoritative answer:
Name: www.isec.pt
Address: 193.137.78.72

> set q=Mx
> isec.pt
Server: vodafonegw
Address: 192.168.1.1

Non-authoritative answer:
isec.pt MX preference = 20, mail exchanger = prmxmx1.isec.pt
isec.pt MX preference = 30, mail exchanger = prmxmx1.isec.pt
isec.pt MX preference = 10, mail exchanger = prmxmx1.isec.pt
isec.pt MX preference = 40, mail exchanger = prmxmx2.isec.pt

isec.pt nameserver = ns2.isec.pt
isec.pt nameserver = ns.isec.pt
prmxmx1.isec.pt internet address = 193.137.78.24
prmxmx2.isec.pt internet address = 193.137.78.26
ns2.isec.pt internet address = 193.137.78.3
ns.isec.pt internet address = 193.137.78.1
> set q=Mx
> sapo.pt
Server: vodafonegw
Address: 192.168.1.1

Non-authoritative answer:
sapo.pt MX preference = 5, mail exchanger = mx.ptmail.sapo.pt

sapo.pt nameserver = ns.sapo.pt
sapo.pt nameserver = dns01.sapo.pt
sapo.pt nameserver = ns2.sapo.pt
sapo.pt nameserver = dns02.sapo.pt
mx.ptmail.sapo.pt internet address = 212.55.154.36
ns.sapo.pt internet address = 212.55.154.202
ns2.sapo.pt internet address = 212.55.154.194
dns01.sapo.pt internet address = 213.13.28.116
dns02.sapo.pt internet address = 213.13.30.116
dns01.sapo.pt AAAA IPv6 address = 2001:8a0:2106:4:213:13:28:116
dns02.sapo.pt AAAA IPv6 address = 2001:8a0:2206:4:213:13:30:116
>
```

```
C:\Users\Pedro Geirinhas>nslookup
Default Server: vodafonegw
Address: 192.168.1.1

> set q=SOA
> isec.pt
Server: vodafonegw
Address: 192.168.1.1

Non-authoritative answer:
isec.pt
      primary name server = ns.isec.pt
      responsible mail addr = sysadmin.isec.pt
      serial = 2020041501
      refresh = 28800 (8 hours)
      retry = 3600 (1 hour)
      expire = 604800 (7 days)
      default TTL = 86400 (1 day)

isec.pt nameserver = ns2.isec.pt
isec.pt nameserver = ns.isec.pt
ns.isec.pt internet address = 193.137.78.1
ns2.isec.pt internet address = 193.137.78.3
>
```

```
C:\Users\Pedro Geirinhas>nslookup
Default Server: vodafonegw
Address: 192.168.1.1

>
> set q=A
> www.isec.pt
Server: vodafonegw
Address: 192.168.1.1

Non-authoritative answer:
Name: www.isec.pt
Address: 193.137.78.72
```

```
C:\Users\Pedro Geirinhas>nslookup
Default Server: vodafonegw
Address: 192.168.1.1

> server ns2.isec.pt
Default Server: ns2.isec.pt
Address: 193.137.78.3

> www.isec.pt
Server: ns2.isec.pt
Address: 193.137.78.3

Name: www.isec.pt
Address: 193.137.78.72
```

Questions

