



TP5: Camada de Transporte e Aplicações de Rede

João Alves, A91646

Ivo Lima, A90214

Rúben Machado, A91656

PL2 Grupo 5

Parte 1

1.

Comando usado (aplicação)	Protocolo de transporte (se aplicável)	Porta de atendimento (se aplicável)
ping	Não é aplicável	Não aplicável
tracert	Não é aplicável	Não é aplicável
telnet	TCP	23
ftp	TCP	21
browser/http	TCP	80
nslookup	UDP	53
ssh	TCP	22

```
Source      Destination  Protocol  Length  Info
C:\> Linha de comandos
Microsoft Windows [Version 10.0.19042.685]
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C:\Users\ivomi>ping marco.uminho.pt

Pinging marco.uminho.pt [193.136.9.240] with 32 bytes of data:
Reply from 193.136.9.240: bytes=32 time=7ms TTL=61
Reply from 193.136.9.240: bytes=32 time=5ms TTL=61
Reply from 193.136.9.240: bytes=32 time=16ms TTL=61
Reply from 193.136.9.240: bytes=32 time=2ms TTL=61

Ping statistics for 193.136.9.240:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 16ms, Average = 7ms

C:\Users\ivomi>
```

O **ping** não é aplicável porque ele não passa pela camada TCP e/ou UDP.

```
C:\WINDOWS\system32>tracert cisco.di.uminho.pt

Tracing route to cisco.di.uminho.pt [193.136.19.254]
over a maximum of 30 hops:

  1    15 ms    1 ms    1 ms  172.26.254.254
  2     3 ms    1 ms    1 ms  172.16.2.1
  3    38 ms    2 ms    2 ms  cisco.di.uminho.pt [193.136.19.254]

Trace complete.
```

O **traceroute** não é aplicável uma vez que utilizamos uma máquina Windows e o comando *tracert* o pacote vai por ICMP.

```

> Frame 170: 66 bytes on wire (528 bits), 66 bytes captured (528 bits) on interface \Device\NPF_{462EEF
> Ethernet II, Src: ComdaEnt_ff:94:00 (00:d0:03:ff:94:00), Dst: IntelCor_07:88:a2 (3c:6a:a7:07:88:a2)
✓ Internet Protocol Version 4, Src: 193.136.9.33, Dst: 172.26.1.65
    0100 .... = Version: 4
    .... 0101 = Header Length: 20 bytes (5)
> Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
    Total Length: 52
    Identification: 0x0001 (1)
> Flags: 0x00
    Fragment Offset: 0
    Time to Live: 252
    Protocol: TCP (6)
    Header Checksum: 0x46be [validation disabled]
    [Header checksum status: Unverified]
    Source Address: 193.136.9.33
    Destination Address: 172.26.1.65
> Transmission Control Protocol, Src Port: 23, Dst Port: 50338, Seq: 1, Ack: 1, Len: 12
> Telnet

```

telnet

ftp							
No.	ftp	Source	Destination	Protocol	Length	Info	
	ftp-data	7060	193.136.19.10	172.26.1.65	FTP	323	Response: 220----- Welcome to Pure-FTPd [privsep] [TLS]
17	10.834905	172.26.1.65	193.136.19.10	FTP	68	Request: OPTS UTF8 ON	
19	10.836806	193.136.19.10	172.26.1.65	FTP	77	Response: 200 OK, UTF-8 enabled	
35	20.185996	172.26.1.65	193.136.19.10	FTP	70	Request: USER anonymous	
36	20.191301	193.136.19.10	172.26.1.65	FTP	732	Response: 230-Welcome to	


```

<
> Ethernet II, Src: ComdaEnt_ff:94:00 (00:d0:03:ff:94:00), Dst: IntelCor_07:88:a2 (3c:6a:a7:07:88:a2)
✓ Internet Protocol Version 4, Src: 193.136.19.10, Dst: 172.26.1.65
    0100 .... = Version: 4
    .... 0101 = Header Length: 20 bytes (5)
> Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
    Total Length: 309
    Identification: 0x85da (34266)
> Flags: 0x40, Don't fragment
    Fragment Offset: 0
    Time to Live: 61
    Protocol: TCP (6)
    Header Checksum: 0x34fb [validation disabled]
    [Header checksum status: Unverified]
    Source Address: 193.136.19.10
    Destination Address: 172.26.1.65
✓ Transmission Control Protocol, Src Port: 21, Dst Port: 50550, Seq: 1, Ack: 1, Len: 269
    Source Port: 21
    Destination Port: 50550
    [Stream index: 1]

```

ftp

522	4.336235	192.168.1.92	193.136.9.240	TCP	66	52168 → 80 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 WS=256 SACK_PERM=1
523	4.336551	192.168.1.92	193.136.9.240	TCP	66	52169 → 80 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 WS=256 SACK_PERM=1
527	4.349883	193.136.9.240	192.168.1.92	TCP	66	80 → 52168 [SYN, ACK] Seq=0 Ack=1 Win=29200 Len=0 MSS=1460 SACK_PERM=1 WS=128
528	4.349883	193.136.9.240	192.168.1.92	TCP	66	80 → 52169 [SYN, ACK] Seq=0 Ack=1 Win=29200 Len=0 MSS=1460 SACK_PERM=1 WS=128
529	4.349979	192.168.1.92	193.136.9.240	TCP	54	52168 → 80 [ACK] Seq=1 Ack=1 Win=131328 Len=0
530	4.350053	192.168.1.92	193.136.9.240	TCP	54	52169 → 80 [ACK] Seq=1 Ack=1 Win=131328 Len=0
533	4.358343	192.168.1.92	23.97.153.169	TCP	66	52170 → 443 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 WS=256 SACK_PERM=1
535	4.374163	52.114.76.37	192.168.1.92	TCP	54	443 → 52164 [ACK] Seq=2002 Ack=29114 Win=2053 Len=0

.... 0101 = Header Length: 20 bytes (5)
> Differentiated Services Field: 0x30 (DSCP: AF12, ECN: Not-ECT)
Total Length: 52
Identification: 0x0000 (0)
> Flags: 0x40, Don't fragment
Fragment Offset: 0
Time to Live: 51
Protocol: TCP (6)
Header Checksum: 0xba17 [validation disabled]
[Header checksum status: Unverified]
Source Address: 193.136.9.240
Destination Address: 192.168.1.92
▼ Transmission Control Protocol, Src Port: 80, Dst Port: 52168, Seq: 0, Ack: 1, Len: 0
Source Port: 80
Destination Port: 52168
[Stream index: 8]
[TCP Segment Len: 0]
Sequence Number: 0 (relative sequence number)
Sequence Number (raw): 420071607

browser/http

udp						
No.	Time	Source	Destination	Protocol	Length	Info
49	25.410934	172.26.1.65	193.137.16.65	DNS	86	Standard query 0x0001 PTR 65.16.137.193.in-addr.arpa
50	25.413546	193.137.16.65	172.26.1.65	DNS	391	Standard query response 0x0001 PTR 65.16.137.193.in-addr.arpa PTR dns3.uminho.pt NS dns3.uminho.pt
51	25.419562	172.26.1.65	193.137.16.65	DNS	91	Standard query 0x0002 A www.uminho.pt.eduroam.uminho.pt
52	25.421722	193.137.16.65	172.26.1.65	DNS	145	Standard query response 0x0002 No such name A www.uminho.pt.eduroam.uminho.pt SOA dns.uminho.pt
53	25.422062	172.26.1.65	193.137.16.65	DNS	91	Standard query 0x0003 AAAA www.uminho.pt.eduroam.uminho.pt
54	25.424203	193.137.16.65	172.26.1.65	DNS	145	Standard query response 0x0003 No such name AAAA www.uminho.pt.eduroam.uminho.pt SOA dns.uminho.pt
55	25.424691	172.26.1.65	193.137.16.65	DNS	83	Standard query 0x0004 A www.uminho.pt.uminho.pt
56	25.427095	193.137.16.65	172.26.1.65	DNS	137	Standard query response 0x0004 No such name A www.uminho.pt.uminho.pt SOA dns.uminho.pt
57	25.427617	172.26.1.65	193.137.16.65	DNS	83	Standard query 0x0005 AAAA www.uminho.pt.uminho.pt
58	25.429925	193.137.16.65	172.26.1.65	DNS	137	Standard query response 0x0005 No such name AAAA www.uminho.pt.uminho.pt SOA dns.uminho.pt
59	25.430443	172.26.1.65	193.137.16.65	DNS	73	Standard query 0x0006 A www.uminho.pt
60	25.432975	193.137.16.65	172.26.1.65	DNS	345	Standard query response 0x0006 A www.uminho.pt A 193.137.9.114 NS dns.uminho.pt NS dns3.uminho.pt
61	25.433927	172.26.1.65	193.137.16.65	DNS	73	Standard query 0x0007 AAAA www.uminho.pt
62	25.436128	193.137.16.65	172.26.1.65	DNS	127	Standard query response 0x0007 AAAA www.uminho.pt SOA dns.uminho.pt
71	32.806063	172.26.1.65	193.137.16.65	DNS	77	Standard query 0xd366 A www.messenger.com

▼ Internet Protocol Version 4, Src: 172.26.1.65, Dst: 193.137.16.65
0100 = Version: 4
.... 0101 = Header Length: 20 bytes (5)
> Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
Total Length: 77
Identification: 0xd5c5 (54725)
> Flags: 0x00
Fragment Offset: 0
Time to Live: 128
Protocol: UDP (17)
Header Checksum: 0xe5b4 [validation disabled]
[Header checksum status: Unverified]
Source Address: 172.26.1.65
Destination Address: 193.137.16.65
▼ User Datagram Protocol, Src Port: 52602, Dst Port: 53
Source Port: 52602
Destination Port: 53
Length: 57
Checksum: 0x7182 [unverified]

nslookup

1	0.000000	172.26.1.65	193.136.9.240	SSH	70 Client: Encrypted packet (len=16)
3	0.045889	172.26.1.65	193.136.9.240	SSH	94 Client: Encrypted packet (len=40)
5	0.050040	193.136.9.240	172.26.1.65	SSH	94 Server: Encrypted packet (len=40)
6	0.050292	172.26.1.65	193.136.9.240	SSH	110 Client: Encrypted packet (len=56)
8	0.142176	193.136.9.240	172.26.1.65	SSH	126 Server: Encrypted packet (len=72)

<					
v Internet Protocol Version 4, Src: 172.26.1.65, Dst: 193.136.9.240 0100 = Version: 4 0101 = Header Length: 20 bytes (5) > Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT) Total Length: 56 Identification: 0x0a9a (2714) > Flags: 0x40, Don't fragment Fragment Offset: 0 Time to Live: 128 Protocol: TCP (6) Header Checksum: 0x7752 [validation disabled] [Header checksum status: Unverified] Source Address: 172.26.1.65 Destination Address: 193.136.9.240					
v Transmission Control Protocol, Src Port: 50340, Dst Port: 22, Seq: 1, Ack: 1, Len: 16 Source Port: 50340 Destination Port: 22					

ssh

2. O TCP é o protocolo mais usado isto porque fornece garantia na entrega de todos os pacotes entre um PC emissor e um PC recetor. O UDP é um protocolo mais simples e por si só não fornece garantia na entrega dos pacotes. No entanto, esse processo de garantia de dados pode ser simplesmente realizado pela aplicação em si (que usa o protocolo UDP) e não pelo protocolo.

Parte 2

1. /etc/resolv.conf consiste na indicação dos servidores de DNS.

```
core@XubunCORE:~$ cat /etc/resolv.conf
# Dynamic resolv.conf(5) file for glibc resolver(3) generated by resolvconf(8)
#     DO NOT EDIT THIS FILE BY HAND -- YOUR CHANGES WILL BE OVERWRITTEN
nameserver 192.168.1.254
search lan
core@XubunCORE:~$ grep "nameserver" /etc/resolv.conf
nameserver 192.168.1.254
core@XubunCORE:~$
```

- 2.

```
core@XubunCORE:~$ nslookup google.com
Server:          192.168.1.254
Address:         192.168.1.254#53

Non-authoritative answer:
Name:   google.com
Address: 216.58.201.142

core@XubunCORE:~$
```

```
core@XubunCORE:~$ nslookup google.pt
Server:          192.168.1.254
Address:         192.168.1.254#53

Non-authoritative answer:
Name:   google.pt
Address: 216.58.201.131

core@XubunCORE:~$
```

Estes endereços possuem sim IPv6.

```
core@XubunCORE:~$ host google.pt
google.pt has address 216.58.209.67
google.pt has IPv6 address 2a00:1450:4003:801::2003
google.pt mail is handled by 30 alt2.aspmx.l.google.com.
google.pt mail is handled by 50 alt4.aspmx.l.google.com.
google.pt mail is handled by 10 aspmx.l.google.com.
google.pt mail is handled by 20 alt1.aspmx.l.google.com.
google.pt mail is handled by 40 alt3.aspmx.l.google.com.
core@XubunCORE:~$ host google.com
google.com has address 216.58.215.142
google.com has IPv6 address 2a00:1450:4003:805::200e
google.com mail is handled by 30 alt2.aspmx.l.google.com.
google.com mail is handled by 20 alt1.aspmx.l.google.com.
google.com mail is handled by 50 alt4.aspmx.l.google.com.
google.com mail is handled by 40 alt3.aspmx.l.google.com.
google.com mail is handled by 10 aspmx.l.google.com.
core@XubunCORE:~$
```

3.

```
core@XubunCORE:~$ dig ns aaum.pt

; <<>> DiG 9.8.1-P1 <<>> ns aaum.pt
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 39431
;; flags: qr rd ra; QUERY: 1, ANSWER: 2, AUTHORITY: 0, ADDITIONAL: 0

;; QUESTION SECTION:
;aaum.pt.                IN      NS

;; ANSWER SECTION:
aaum.pt.                 50765   IN      NS      ns3.dropagency.com.
aaum.pt.                 50765   IN      NS      ns4.dropagency.com.

;; Query time: 13 msec
;; SERVER: 192.168.1.254#53(192.168.1.254)
;; WHEN: Thu Jan  7 22:16:38 2021
;; MSG SIZE rcvd: 75

core@XubunCORE:~$
```

Para o aaum.pt

```
core@XubunCORE:~$ dig ns map.edu.pt

;; <<>> DiG 9.8.1-P1 <<>> ns map.edu.pt
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 5784
;; flags: qr rd ra; QUERY: 1, ANSWER: 4, AUTHORITY: 0, ADDITIONAL: 0

;; QUESTION SECTION:
;map.edu.pt.                IN      NS

;; ANSWER SECTION:
map.edu.pt.                10776   IN      NS      dns2.uminho.pt.
map.edu.pt.                10776   IN      NS      dns.uminho.pt.
map.edu.pt.                10776   IN      NS      marco.uminho.pt.
map.edu.pt.                10776   IN      NS      dns3.uminho.pt.

;; Query time: 14 msec
;; SERVER: 192.168.1.254#53(192.168.1.254)
;; WHEN: Thu Jan  7 22:18:38 2021
;; MSG SIZE  rcvd: 111
```

Para o **map.edu.pt**

4. Os parametros temporais associados são:

Refresh:

É o número de segundos após os quais os servidores de nomes secundários devem consultar o mestre para o registro SOA, para detectar mudanças de zona.

Retry:

O número de segundos após os quais os servidores de nomes secundários devem tentar novamente solicitar o número de série do mestre se o mestre não responder. Deve ser menor que atualizar.

Expire:

O número de segundos após os quais os servidores de nomes secundários devem parar de responder à solicitação para esta zona se o mestre não responder. Este valor deve ser maior que a soma de Atualizar e Tentar novamente.

Minimum:

Tempo de vida para fins de cache negativo. Originalmente, este campo tinha o significado de um valor TTL mínimo para registros de recursos nesta zona; foi alterado para seu significado atual pela RFC 2308.


```
core@XubunCORE:~$ nslookup ccg.pt
Server:          192.168.1.254
Address:         192.168.1.254#53

Non-authoritative answer:
Name:   ccg.pt
Address: 193.136.14.98
```

```
core@XubunCORE:~$ nslookup
> set q=soa
ccg.pt>
Server:          192.168.1.254
Address:         192.168.1.254#53

Non-authoritative answer:
ccg.pt
    origin = ns1.ccg.pt
    mail addr = hostmaster.ccg.pt
    serial = 2017290851
    refresh = 720
    retry = 90
    expire = 36000
    minimum = 360

Authoritative answers can be found from:
>
```

5.

```
core@XubunCORE:~$ host di.uminho.pt
di.uminho.pt has address 193.136.19.38
di.uminho.pt mail is handled by 10 mx2.uminho.pt.
di.uminho.pt mail is handled by 0 mx.uminho.pt.
core@XubunCORE:~$ host marcelo@presidencia.pt
Host marcelo@presidencia.pt not found: 3(NXDOMAIN)
core@XubunCORE:~$
```

```
core@XubunCORE:~$ nslookup 2001:690:a00:1036:1113::247
Server:      192.168.1.254
Address:     192.168.1.254#53

Non-authoritative answer:
7.4.2.0.0.0.0.0.0.0.0.3.1.1.1.6.3.0.1.0.0.a.0.0.9.6.0.1.0.0.2.ip6.arpa      n
ame = www.fccn.pt.

Authoritative answers can be found from:

core@XubunCORE:~$ nslookup 193.136.9.240
Server:      192.168.1.254
Address:     192.168.1.254#53

Non-authoritative answer:
240.9.136.193.in-addr.arpa          name = marco.uminho.pt.

Authoritative answers can be found from:

core@XubunCORE:~$
```

7. A expressão **Non-authoritative answer** indica que o servidor não saiu pela rede para descobrir o endereço, mas utilizou os dados que tinha guardado no cache (depósito) depois da primeira interrogação. Em contrapartida uma resposta autoritativa vem de um servidor de nomes considerado autoritativo para o domínio para o qual está retornando um registro (um dos servidores de nomes na lista do domínio que você pesquisou)