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Ejercicio 1

a) Configuramos el maestro esclavo

Escenario:



Configuramos los forwarders del servidor principal y en el secundario

The image shows two screenshots of terminal windows from Oracle VM VirtualBox, demonstrating the configuration of BIND forwarders in the /etc/bind/named.conf.options file.

Top Screenshot (Debian12Miguel): The terminal shows the nano editor with the following configuration highlighted in a red box:

```
forwarders {
    192.168.20.1; 192.168.20.2;
};
```

Bottom Screenshot (Debian12Secundario): The terminal shows the nano editor with the same configuration highlighted in a red box:

```
forwarders {
    192.168.20.1; 192.168.20.2;
};
```

Both screenshots show the nano editor interface with various keyboard shortcuts listed at the bottom, such as ^G Ayuda, ^O Guardar, ^W Buscar, ^K Cortar, ^T Ejecutar, ^X Salir, ^R Leer fich., ^E Reemplazar, ^U Pegar, and ^J Justificar.

Configuraremos el servidor primario el maestro, indicándole que es el maestro

```

GNU nano 7.2 /etc/bind/named.conf.local
zone "miguelliro" {
    type master;
    file "/etc/bind/db.directa";
    allow-query { any; };
    also-notify { 192.168.20.2; };
    allow-transfer { 192.168.20.2; };
};

zone "20.168.192.in-addr.arpa" {
    type master;
    file "/etc/bind/db.inversa";
    allow-query { any; };
    also-notify { 192.168.20.2; };
    allow-transfer { 192.168.20.2; };
};

zone "0.0.0.0.2.0.0.8.b.d.0.1.0.0.2.ip6.arpa" {
    type master;
    file "/etc/bind/db.inversaIPv6";
    allow-query { any; };
    also-notify { 192.168.20.2; };
    allow-transfer { 192.168.20.2; };
};

```

Configuramos la zona directa del primario añadiendo la IP del secundario

```

GNU nano 7.2 /etc/bind/db.directa
;
; BIND data file for local loopback interface
;
$TTL      604800
@         IN      SOA      debian.miguelliro. root.miguelliro. (
                20231108      ; Serial
                60             ; Refresh
                60             ; Retry
                600            ; Expire
                604800 )      ; Negative Cache TTL
;
@         IN      NS       debian.miguelliro.
@         IN      A        192.168.20.1
@         IN      AAAA     2001:db8:20::1

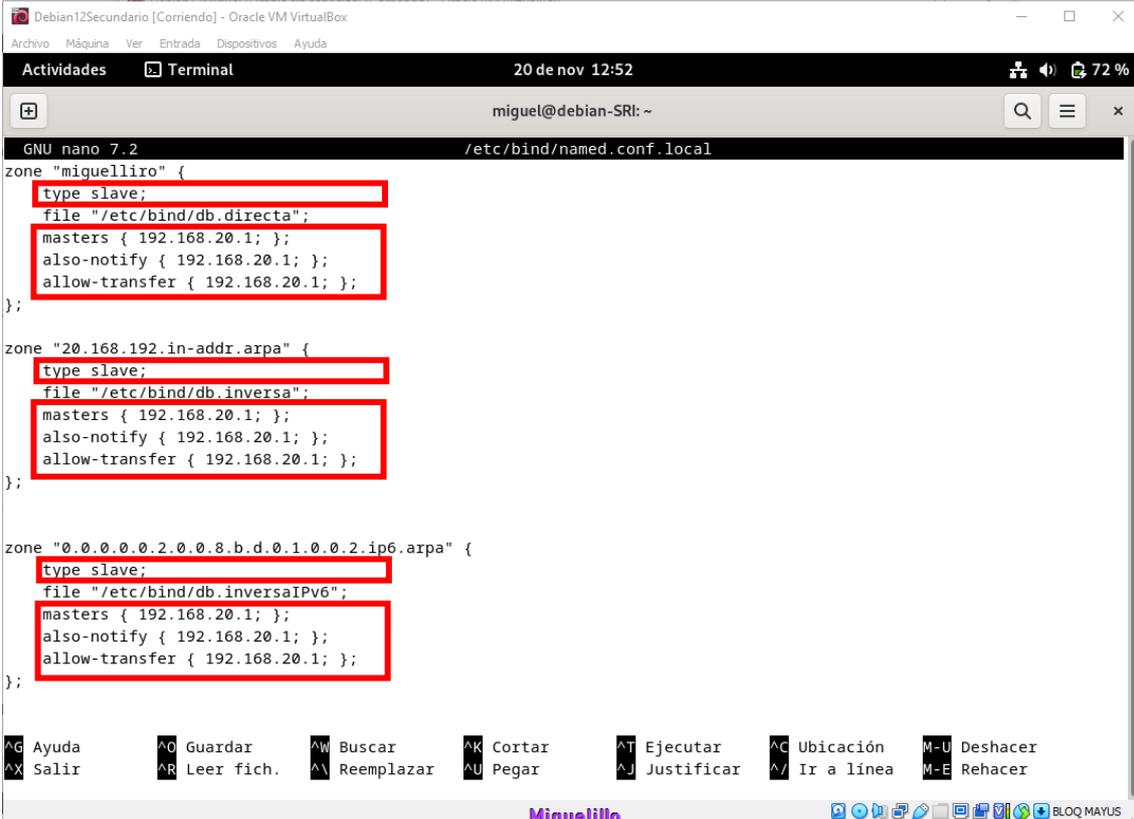
debian    IN      A        192.168.20.1
cliente   IN      A        192.168.20.10

debian    IN      AAAA     2001:db8:20::1
cliente   IN      AAAA     2001:db8:20::10
cliente2  IN      AAAA     2001:db8:20::11

debian2   IN      A        192.168.20.2
debian2   IN      AAAA     2001:db8:20::2

```


Configuramos en el esclavo



```
Debian12Secundario [Corriendo] - Oracle VM VirtualBox
Archivo Máquina Ver Entrada Dispositivos Ayuda
Actividades Terminal 20 de nov 12:52 72 %
miguel@debian-SRI: ~
GNU nano 7.2 /etc/bind/named.conf.local
zone "miguelliro" {
    type slave;
    file "/etc/bind/db.directa";
    masters { 192.168.20.1; };
    also-notify { 192.168.20.1; };
    allow-transfer { 192.168.20.1; };
};

zone "20.168.192.in-addr.arpa" {
    type slave;
    file "/etc/bind/db.inversa";
    masters { 192.168.20.1; };
    also-notify { 192.168.20.1; };
    allow-transfer { 192.168.20.1; };
};

zone "0.0.0.0.2.0.0.8.b.d.0.1.0.0.2.ip6.arpa" {
    type slave;
    file "/etc/bind/db.inversaIPv6";
    masters { 192.168.20.1; };
    also-notify { 192.168.20.1; };
    allow-transfer { 192.168.20.1; };
};

^G Ayuda      ^O Guardar    ^W Buscar    ^K Cortar    ^T Ejecutar   ^C Ubicación  M-U Deshacer
^X Salir      ^R Leer fich. ^_ Reemplazar ^U Pegar     ^J Justificar ^/ Ir a línea  M-E Rehacer

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```

b) Capturas transferencias Copia Completa

116	10.598093	192.168.20.2	192.168.20.1	DNS	141 Zone change notification 0x7709 SOA 20.168.192.in-addr.arpa SOA debian.miguelillo
117	10.598247	192.168.20.1	192.168.20.2	TCP	74 53 → 35697 [SYN, ACK] Seq=0 Ack=1 Win=65232 Len=0 MSS=1220 SACK_PERM TSval=3352638044 TSecr=3139555351 WS=128
118	10.598332	192.168.20.1	192.168.20.2	TCP	74 53 → 43339 [SYN, ACK] Seq=0 Ack=1 Win=65232 Len=0 MSS=1220 SACK_PERM TSval=3352638044 TSecr=3139555351 WS=128
119	10.598594	192.168.20.2	192.168.20.1	TCP	66 35697 → 53 [ACK] Seq=1 Ack=1 Win=64768 Len=0 TSval=3139555352 TSecr=3352638044
120	10.598679	192.168.20.2	192.168.20.1	TCP	66 43339 → 53 [ACK] Seq=1 Ack=1 Win=64768 Len=0 TSval=3139555352 TSecr=3352638044
121	10.598745	192.168.20.2	192.168.20.1	DNS	126 Standard query 0xd2fb AXFR 0.0.0.0.2.0.0.8.b.d.0.1.0.0.2.ip6.arpa
122	10.598795	192.168.20.2	192.168.20.1	DNS	96 Standard query 0x9006 AXFR miguelillo
123	10.598891	192.168.20.1	192.168.20.2	DNS	83 Zone change notification response 0x7709 SOA 20.168.192.in-addr.arpa
124	10.599183	192.168.20.1	192.168.20.2	TCP	66 53 → 35697 [ACK] Seq=1 Ack=61 Win=65280 Len=0 TSval=3352638045 TSecr=3139555352

Si analizamos los paquetes se puede ver como en ello viene incluido una comunicación entre ambos servidores

Wireshark interface showing packet 123: 83 bytes on wire (664 bits), 83 bytes captured (664 bits) on interface -, id 0. The packet is a Domain Name System (query) response for transaction ID 0x7709. It is a Zone change notification response for the SOA record of 20.168.192.in-addr.arpa. The response includes details such as Name, Type, Class, Time to live, Data length, Primary name server, Responsible authority's mailbox, Serial Number, Refresh Interval, Retry Interval, Expire limit, and Minimum TTL.

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Wireshark interface showing packet 116: 141 bytes on wire (1128 bits), 141 bytes captured (1128 bits) on interface -, id 0. The packet is a Domain Name System (query) request for transaction ID 0x7709. It is a Zone change notification request for the SOA record of 20.168.192.in-addr.arpa. The request includes details such as Name, Type, Class, Time to live, Data length, Primary name server, Responsible authority's mailbox, Serial Number, Refresh Interval, Retry Interval, Expire limit, and Minimum TTL.

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Se sincronizan los servidores

[Debian12Secundario-1 Ethernet0 to Debian12Miguel-1 Ethernet0]
 Archivo Edición Visualización Ir Captura Analizar Estadísticas Telefonía Wireless Herramientas Ayuda

No.	Time	Source	Destination	Protocol	Length	Info
1861	3276.523831	192.168.20.2	192.168.20.1	DNS	85	Standard query 0x6360 SOA miguelliro OPT
1862	3276.524583	192.168.20.1	192.168.20.2	DNS	195	Standard query response 0x6360 SOA miguelliro SOA debian.miguelliro NS debian.miguelliro A 192.168.20.1 AAAA 2001:db8:20::1 OPT

> Frame 1862: 195 bytes on wire (1560 bits), 195 bytes captured (1560 bits) on interface -, id 0
 > Ethernet II, Src: PcsCompu_17:9b:22 (08:00:27:17:9b:22), Dst: PcsCompu_d7:d0:34 (08:00:27:d7:d0:34)
 > Internet Protocol Version 4, Src: 192.168.20.1, Dst: 192.168.20.2
 > User Datagram Protocol, Src Port: 53, Dst Port: 42410
 > Domain Name System (response)
 Transaction ID: 0x6360
 > Flags: 0x8480 Standard query response, No error
 Questions: 1
 Answer RRs: 1
 Authority RRs: 1
 Additional RRs: 3
 > Queries
 > Answers
 > miguelliro: type SOA, class IN, mname debian.miguelliro
 > Authoritative nameservers
 > miguelliro: type NS, class IN, ns debian.miguelliro
 > Additional records
 > debian.miguelliro: type A, class IN, addr 192.168.20.1
 > debian.miguelliro: type AAAA, class IN, addr 2001:db8:20::1
 > <Root>: type OPT
[\[Request In: 1861\]](#)
 [Time: 0.000752000 seconds]

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Paquetes de transferencia

Trasferencia de zona directa, aquí podemos ver como aparecen todos los nombres de la zona directa junto con sus direcciones IP

[Debian12Secundario-1 Ethernet0 to Debian12Miguel-1 Ethernet0]
 Archivo Edición Visualización Ir Captura Analizar Estadísticas Telefonía Wireless Herramientas Ayuda

No.	Time	Source	Destination	Protocol	Length	Info
122	10.598795	192.168.20.2	192.168.20.1	DNS	96	Standard query 0x9006 AXFR miguelliro
123	10.598891	192.168.20.1	192.168.20.2	DNS	83	Zone change notification response 0x7709 SOA 20.168.192.in-addr.arpa
126	10.600956	192.168.20.1	192.168.20.2	DNS	463	Standard query response 0xd2fb AXFR 0.0.0.0.2.0.0.8.b.d.0.1.0.0.2.ip6.arpa SOA miguelliro NS miguelliro PTR debian.miguelliro PTR debian2.miguelliro PTR cliente.miguelliro PTR clien...
128	10.600570	192.168.20.1	192.168.20.2	DNS	460	Standard query response 0x9006 AXFR miguelliro SOA debian.miguelliro NS debian.miguelliro A 192.168.20.1 AAAA 2001:db8:20::1 AAAA 2001:db8:20::10 A 192.168.20.10 AAAA 2001:db8:20::11 ...
146	11.096882	192.168.20.2	192.168.20.1	DNS	151	Zone change notification 0x1ae5 SOA 0.0.0.0.2.0.0.8.b.d.0.1.0.0.2.ip6.arpa SOA miguelliro

> Frame 128: 460 bytes on wire (3680 bits), 460 bytes captured (3680 bits) on interface -, id 0
 > Ethernet II, Src: PcsCompu_17:9b:22 (08:00:27:17:9b:22), Dst: PcsCompu_d7:d0:34 (08:00:27:d7:d0:34)
 > Internet Protocol Version 4, Src: 192.168.20.1, Dst: 192.168.20.2
 > Transmission Control Protocol, Src Port: 53, Dst Port: 43339, Seq: 1, Ack: 31, Len: 394
 > Domain Name System (response)
 Length: 392
 Transaction ID: 0x9006
 > Flags: 0x8480 Standard query response, No error
 Questions: 1
 Answer RRs: 13
 Authority RRs: 0
 Additional RRs: 0
 > Queries
 > Answers
 > miguelliro: type SOA, class IN, mname debian.miguelliro
 > miguelliro: type NS, class IN, ns debian.miguelliro
 > miguelliro: type A, class IN, addr 192.168.20.1
 > miguelliro: type AAAA, class IN, addr 2001:db8:20::1
 > cliente.miguelliro: type AAAA, class IN, addr 2001:db8:20::10
 > cliente.miguelliro: type A, class IN, addr 192.168.20.10
 > cliente2.miguelliro: type AAAA, class IN, addr 2001:db8:20::11
 > cliente3.miguelliro: type AAAA, class IN, addr 2001:db8:20::12
 > debian.miguelliro: type AAAA, class IN, addr 2001:db8:20::1
 > debian.miguelliro: type A, class IN, addr 192.168.20.1
 > debian2.miguelliro: type A, class IN, addr 192.168.20.2
 > debian2.miguelliro: type AAAA, class IN, addr 2001:db8:20::2
 > miguelliro: type SOA, class IN, mname debian.miguelliro
[\[Request In: 122\]](#)
 [Time: 0.001775000 seconds]

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Transferencia de zona inversa, aquí podemos ver como parecen todas las direcciones IP junto con sus nombre

The screenshot shows a Wireshark capture of a DNS response. The packet list pane shows a 'Standard query response' from 192.168.20.1 to 192.168.20.2. The packet details pane shows the 'Domain Name System (response)' section with a length of 395 bytes. The packet bytes pane shows the raw data of the DNS response, including the header and the answer section with multiple PTR records.

Copia incremental

Vemos el estado del número serial en el fichero de zona directa

The screenshot shows a terminal window with the GNU nano 7.2 editor open to the file /etc/bind/db.directa. The file contains BIND zone data for a local loopback interface. The SOA record is highlighted with a red box, showing the serial number 20231108. The terminal window also shows a list of keyboard shortcuts at the bottom.

Modificamos el número serial para indicar que se ha modificado y añadimos una línea en este caso la de **incremen**

Debian12Miguel (Limpia sin servicios) [Corriendo] - Oracle VM VirtualBox

Archivo Máquina Ver Entrada Dispositivos Ayuda

```

Actividades Terminal 20 de nov 22:25
miguel@debian-SRI: ~
GNU nano 7.2 /etc/bind/db.directa
;
; BIND data file for local loopback interface
;
$TTL 604800
@      IN      SOA      debian.miguelliro. root.miguelliro. (
                20231120      ; Serial
                60           ; Refresh
                60           ; Retry
                600          ; Expire
                604800 )     ; Negative Cache TTL
@      IN      NS      debian.miguelliro.
@      IN      A       192.168.20.1
@      IN      AAAA    2001:db8:20::1

debian  IN  A  192.168.20.1
cliente IN  A  192.168.20.10
incremen IN A  192.168.20.15

```

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Realizamos los mismos pasos para la zona inversa

Debian12Miguel (Limpia sin servicios) [Corriendo] - Oracle VM VirtualBox

Archivo Máquina Ver Entrada Dispositivos Ayuda

```

Actividades Terminal 20 de nov 22:29
miguel@debian-SRI: ~
GNU nano 7.2 /etc/bind/db.inversa *
;
; BIND reverse data file for local loopback interface
;
$TTL 60400
@      IN      SOA      debian.miguelliro. root.miguelliro. (
                20231120      ; Serial
                60           ; Refresh
                60           ; Retry
                600          ; Expire
                604800 )     ; Minimum TTL

@      in      NS      debian.miguelliro.

1      IN      PTR     debian.miguelliro.
10     IN      PTR     cliente.miguelliro.
2      IN      PTR     debian2.miguelliro.
15     IN      PTR     incremen.miguelliro.

```

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Podemos ver como ha cambiado el serial en el status

```

Debian12Miguel [Limpia sin servicios] [Comando] - Oracle VM VirtualBox
Actividades Terminal 20 de nov 22:31 miguel@debian-SRI: ~
• named.service - BIND Domain Name Server
  Loaded: loaded (/lib/systemd/system/named.service; enabled; preset: enabled)
  Active: active (running) since Mon 2023-11-20 22:29:50 CET; 2s ago
  Docs: man:named(8)
  Main PID: 2231 (named)
  Status: "running"
  Tasks: 4 (limit: 2293)
  Memory: 33.0M
  CPU: 43ms
  CGroup: /system.slice/named.service
          └─2231 /usr/sbin/named -f -u bind

nov 20 22:29:50 debian-SRI named[2231]: network unreachable resolving './NS/IN': 2001:500:2::c#53
nov 20 22:29:50 debian-SRI named[2231]: network unreachable resolving './NS/IN': 2001:7fd:195#53
nov 20 22:29:50 debian-SRI named[2231]: network unreachable resolving './NS/IN': 2001:7fe:159#53
nov 20 22:29:50 debian-SRI named[2231]: network unreachable resolving './NS/IN': 2001:503:c27::2:30#53
nov 20 22:29:50 debian-SRI named[2231]: network unreachable resolving './NS/IN': 2001:500:a8::e#53
nov 20 22:29:50 debian-SRI named[2231]: client 0x7fcad7853368 192.168.20.2#43417 (migueliro): transfer of 'migueliro/IN': IXFR version not in journal, falling back to AXFR
nov 20 22:29:50 debian-SRI named[2231]: client 0x7fcad7853368 192.168.20.2#43417 (migueliro): transfer of 'migueliro/IN': AXFR-style IXFR started (Serial: 20231120)
nov 20 22:29:50 debian-SRI named[2231]: client 0x7fcad7853368 192.168.20.2#43417 (migueliro): transfer of 'migueliro/IN': AXFR-style IXFR ended: 1 messages, 14 records, 417 bytes, 0.001 secs (417000 bytes/sec)
nov 20 22:29:50 debian-SRI named[2231]: client 0x7fcad72a5168 192.168.20.2#5866: received notify for zone 'migueliro'
nov 20 22:29:51 debian-SRI named[2231]: timed out resolving './DNSKEY/IN': 192.168.20.2#53
  
```

Vemos como hace la transferencia de zona directa

```

[Debian12Secundario-1 Ethernet0 to Debian12Miguel-1 Ethernet0]
No. Time Source Destination Protocol Length Info
2128 4437.385895 192.168.20.2 192.168.20.1 DNS 85 Standard query 0x21a4 SOA migueliro OPT
2129 4437.385899 192.168.20.1 192.168.20.2 DNS 195 Standard query response 0x21a4 SOA migueliro SOA debian.migueliro NS debian.migueliro A 192.168.20.1 AAAA 2001:db8:20::1 OPT
213 4437.387948 192.168.20.2 192.168.20.1 DNS 144 Standard query 0x0bf5 IXFR migueliro SOA debian.migueliro
2135 4437.388589 192.168.20.1 192.168.20.2 DNS 485 Standard query response 0x0bf5 IXFR migueliro SOA debian.migueliro NS debian.migueliro A 192.168.20.1 AAAA 2001:db8:20::1 AAAA 2001:db8:20::10 A 192.168.20.10 AAAA 2001:db8:20::11
2140 4437.389719 192.168.20.2 192.168.20.1 DNS 118 Zone change notification 0x6ef6 SOA migueliro SOA debian.migueliro

> Frame 2135: 485 bytes on wire (3880 bits), 485 bytes captured (3880 bits) on interface -, id 0
> Ethernet II, Src: PcsCompu_17:9b:22 (08:00:27:17:9b:22), Dst: PcsCompu_47:d0:34 (08:00:27:d7:d0:34)
> Internet Protocol Version 4, Src: 192.168.20.1, Dst: 192.168.20.2
> Transmission Control Protocol, Src Port: 53, Dst Port: 43417, Seq: 1, Ack: 79, Len: 419
  Domain Name System (response)
  Length: 417
  Transaction ID: 0x0bf5
  Flags: 0x8480 Standard query response, No error
  Questions: 1
  Answer RRs: 14
  Authority RRs: 0
  Additional RRs: 0
  > Queries
  > Answers
  > migueliro: type SOA, class IN, mname debian.migueliro
  > migueliro: type NS, class IN, ns debian.migueliro
  > migueliro: type A, class IN, addr 192.168.20.1
  > migueliro: type AAAA, class IN, addr 2001:db8:20::1
  > cliente.migueliro: type AAAA, class IN, addr 2001:db8:20::10
  > cliente2.migueliro: type AAAA, class IN, addr 192.168.20.10
  > cliente2.migueliro: type AAAA, class IN, addr 2001:db8:20::11
  > cliente3.migueliro: type AAAA, class IN, addr 2001:db8:20::12
  > debian.migueliro: type AAAA, class IN, addr 2001:db8:20::1
  > debian.migueliro: type A, class IN, addr 192.168.20.1
  > debian2.migueliro: type A, class IN, addr 192.168.20.2
  > debian2.migueliro: type AAAA, class IN, addr 2001:db8:20::2
  > incremen.migueliro: type A, class IN, addr 192.168.20.15
  > migueliro: type SOA, class IN, mname debian.migueliro
  [Request In: 2131]
  [Time: 0.000741000 seconds]
  
```

Vemos como hace la transferencia de zona directa

```

[Debian12Secundario-1 Ethernet0 to Debian12Miguel-1 Ethernet0]
No. Time Source Destination Protocol Length Info
2112 4436.885695 192.168.20.2 192.168.20.1 DNS 167 Standard query 0x85ee IXFR 20.168.192.in-addr.arpa SOA debian.migueliro
2114 4436.886345 192.168.20.1 192.168.20.2 DNS 308 Standard query response 0x85ee IXFR 20.168.192.in-addr.arpa SOA debian.migueliro NS debian.migueliro
2117 4436.887068 192.168.20.2 192.168.20.1 DNS 141 Zone change notification 0x3a9b SOA 20.168.192.in-addr.arpa SOA debian.migueliro
2120 4436.889039 192.168.20.1 192.168.20.2 DNS 82 Standard query 0x6e3a DNSKEY <Root> OPT
2121 4436.889218 192.168.20.1 192.168.20.2 DNS 83 Zone change notification response 0x3a9b SOA 20.168.192.in-addr.arpa

> Frame 2114: 308 bytes on wire (2464 bits), 308 bytes captured (2464 bits) on interface -, id 0
> Ethernet II, Src: PcsCompu_17:9b:22 (08:00:27:17:9b:22), Dst: PcsCompu_47:d0:34 (08:00:27:d7:d0:34)
> Internet Protocol Version 4, Src: 192.168.20.1, Dst: 192.168.20.2
> Transmission Control Protocol, Src Port: 53, Dst Port: 34057, Seq: 1, Ack: 102, Len: 242
  Domain Name System (response)
  Length: 240
  Transaction ID: 0x85ee
  Flags: 0x8480 Standard query response, No error
  Questions: 1
  Answer RRs: 7
  Authority RRs: 0
  Additional RRs: 0
  > Queries
  > Answers
  > 20.168.192.in-addr.arpa: type SOA, class IN, mname debian.migueliro
  > 20.168.192.in-addr.arpa: type NS, class IN, ns debian.migueliro
  > 1.20.168.192.in-addr.arpa: type PTR, class IN, debian.migueliro
  > 10.20.168.192.in-addr.arpa: type PTR, class IN, cliente.migueliro
  > 15.20.168.192.in-addr.arpa: type PTR, class IN, incremen.migueliro
  > 2.20.168.192.in-addr.arpa: type PTR, class IN, debian2.migueliro
  > 20.168.192.in-addr.arpa: type SOA, class IN, mname debian.migueliro
  [Request In: 2112]
  [Time: 0.000650000 seconds]
  
```

Comprobación en un cliente



```
Debian12_2 (Limpia) [Corriendo] - Oracle VM VirtualBox
Archivo Máquina Ver Entrada Dispositivos Ayuda
Actividades Terminal 20 de nov 22:49
miguel@debian-SRI: ~
n 1000
link/ether 08:00:27:9e:b4:ba brd ff:ff:ff:ff:ff:ff
inet 192.168.20.10/24 brd 192.168.20.255 scope global noprefixroute enp0s3
    valid_lft forever preferred_lft forever
inet6 2001:db8:2::10/64 scope global noprefixroute
    valid_lft forever preferred_lft forever
inet6 fe80::a00:27ff:fe9e:b4ba/64 scope link noprefixroute
    valid_lft forever preferred_lft forever
miguel@debian-SRI:~$ nslookup
> 192.168.20.15
15.20.168.192.in-addr.arpa      name = incremen.miguelliro.
> incremen.miguelliro.
Server:      192.168.20.2
Address:     192.168.20.2#53

Name:   incremen.miguelliro
Address: 192.168.20.15
> 192.168.20.15
15.20.168.192.in-addr.arpa      name = incremen.miguelliro.
-----
```