

TP - DNS

Con el fin de poder obtener resultados comparables entre sí, para la ejecución de cada comando dig se utiliza el alias www.facebook.com. A su vez, para la comparación entre terminal y Wireshark solo se utilizará una captura de pantalla de las respuestas para este último debido a que la respuesta contiene todos los campos de la query.

Ejecución recursiva:

Al utilizar el flag +recurse, se le indica al servidor DNS que debe resolver recursivamente la solicitud o query. Esto significa que, en caso de no tener la respuesta guardada en caché, el servidor DNS es el encargado de realizar las sucesivas consultas a root, TLD y authoritative servers.



```

❏ ~ dig www.facebook.com +recurse

; <<>> DiG 9.18.24 <<>> www.facebook.com +recurse
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 14449
;; flags: qr rd ra; QUERY: 1, ANSWER: 2, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 512
;; QUESTION SECTION:
;www.facebook.com.                IN      A

;; ANSWER SECTION:
www.facebook.com.                2774    IN      CNAME   star-mini.c10r.facebook.com.
star-mini.c10r.facebook.com.    55      IN      A       31.13.94.35

;; Query time: 13 msec
;; SERVER: 192.168.0.1#53(192.168.0.1) (UDP)
;; WHEN: Sat Mar 30 17:23:08 -03 2024
;; MSG SIZE rcvd: 90
```

El header posee tres flags los cuales significan, respectivamente, que se está observando una response, que se desea que la query sea resuelta de forma recursiva y que el servidor DNS consultado soporta la realización de queries recursivas.

A su vez, se observa que se obtuvieron dos respuestas: una indicando que el alias www.facebook.com corresponde al canonical name (CNAME) star-mini.c10r.facebook.com, y otra indicando que dicho canonical name corresponde a la dirección IPv4 31.13.94.35 (el record obtenido es de tipo A lo cual indica v4 de IP mientras que si fuese un record AAAA la respuesta sería una dirección IPv6).

No.	Time	Source	Destination	Protocol	Length	Info
22	3.198563850	192.168.0.118	192.168.0.1	DNS	101	Standard query 0x3871 A www.facebook.com OPT
23	3.212197015	192.168.0.1	192.168.0.118	DNS	134	Standard query response 0x3871 A www.facebook.com CNAME star-mini.c10r.facebook.com A 31.13.94.35 OPT
70	16.935129129	192.168.0.118	192.168.0.1	DNS	93	Standard query 0x3ebb A espresso-pa.clients6.google.com
71	16.935133541	192.168.0.118	192.168.0.1	DNS	93	Standard query 0xf2a4 AAAA espresso-pa.clients6.google.com

<pre> 4 Frame 23: 134 bytes on wire (1072 bits), 134 bytes captured (1072 bits) on interface any, id 0 Linux cooked capture v1 Internet Protocol Version 4, Src: 192.168.0.1, Dst: 192.168.0.118 User Datagram Protocol, Src Port: 53, Dst Port: 34463 Domain Name System (response) Transaction ID: 0x3871 Flags: 0x180 Standard query response, No error 1... .. = Response: Message is a response .000 0... .. = Opcode: Standard query (0) 0... .. = Authoritative: Server is not an authority for domain 0... .. = Truncated: Message is not truncated 1... .. = Recursion desired: Do query recursively 1... .. = Recursion available: Server can do recursive queries 0... .. = Z: reserved (0) 0... .. = Answer authenticated: Answer/authority portion was not authenticated by the server 0... .. = Non-authenticated data: Unacceptable 0000 = Reply code: No error (0) Questions: 1 Answer RRs: 2 Authority RRs: 0 Additional RRs: 1 Queries www.facebook.com: type A, class IN Name: www.facebook.com (Name Length: 16) (Label Count: 3) Type: A (1) (Host Address) Class: IN (0x0001) Answers www.facebook.com: type CNAME, class IN, cname star-mini.c10r.facebook.com Name: www.facebook.com Type: CNAME (5) (Canonical NAME for an alias) Class: IN (0x0001) Time to live: 2774 (46 minutes, 14 seconds) Data length: 17 CNAME: star-mini.c10r.facebook.com star-mini.c10r.facebook.com: type A, class IN, addr 31.13.94.35 Name: star-mini.c10r.facebook.com Type: A (1) (Host Address) Class: IN (0x0001) Time to live: 55 (55 seconds) Data length: 4 Address: 31.13.94.35 Additional records <Root>: type OPT Name: <Root> Type: OPT (41) UDP payload size: 512 Higher bits in extended RCODE: 0x00 EDNS0 version: 0 Z: 0x0000 0... .. = DO bit: Cannot handle DNSSEC security RRs .000 0000 0000 0000 = Reserved: 0x0000 Data length: 0 [Request ID: 22] [Time: 0.013633965 seconds] </pre>	<pre> 0000 00 00 00 01 00 06 e4 c0 e2 42 bd dd 00 00 08 00B..... 0010 45 00 00 76 7c b5 40 00 40 11 3b fa c0 a8 00 01 E..v @.0..... 0020 c0 a8 00 76 0c 35 86 9f 00 62 5a 10 38 71 81 80v5...bZ8q... 0030 00 01 00 02 00 00 00 01 03 77 77 77 08 66 61 63www.fac... 0040 65 62 6f 6f 6b 63 63 6f 64 00 00 01 00 01 c0 8cebook.co m... 0050 00 65 00 01 00 00 8a d6 00 11 69 73 74 61 72 2dstar-... 0060 64 69 6e 69 04 63 31 30 72 c0 10 c0 2e 00 01 00 mini.c10 r..... 0070 01 00 00 00 37 00 04 1f 0d 5e 23 00 00 29 02 007...?#... 0080 00 00 00 00 00 00 </pre>
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Si se compara la respuesta obtenida de realizar dig a www.facebook.com con la de realizarlo a facebook.com, se puede observar que la response en este caso no devuelve en su respuesta el CNAME record. Esto se debe a que el authoritative DNS server de facebook.com no contiene un CNAME record cuyo authoritative DNS server contiene el A record con la IP buscada, sino que directamente posee el A record recién mencionado.

Cabe destacar que si bien esta ejecución no se realizó con el flag +recurse, la query aún así fue realizada de forma recursiva por defecto ya que su header posee los mismos flags que en la consulta original.

```

dig facebook.com

<<>> DiG 9.18.24 <<>> facebook.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 39229
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
;; EDNS: version: 0, flags;; udp: 1232
;; QUESTION SECTION:
;facebook.com.                IN      A

;; ANSWER SECTION:
facebook.com.                 29      IN      A      31.13.94.35

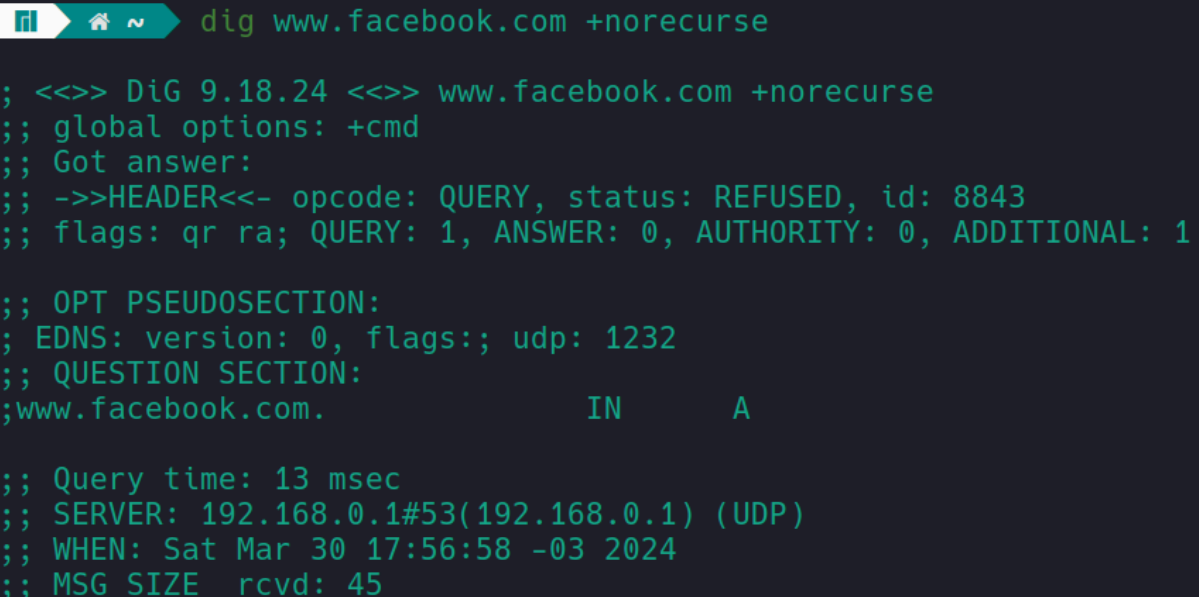
;; Query time: 13 msec
;; SERVER: 192.168.0.1#53(192.168.0.1) (UDP)
;; WHEN: Sat Mar 30 17:49:07 -03 2024
;; MSG SIZE rcvd: 57

```

Ejecución Iterativa:

La ejecución iterativa funciona de la misma forma que la recursiva, con la salvedad de que es el cliente el que realiza las sucesivas solicitudes DNS en caso de ser necesarias. De esta forma, en caso de no tener cacheada la respuesta, cada consulta devolverá una referencia de a quien se le debe realizar la siguiente query para llegar a la respuesta.

Rápidamente se puede observar que la query falló retornando un status refused. Esto quiere decir que en alguna de las queries realizadas, el cliente no posee los permisos necesarios para llevarla a cabo de forma directa.



```
❏ ~ dig www.facebook.com +norecurse

; <<>> DiG 9.18.24 <<>> www.facebook.com +norecurse
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: REFUSED, id: 8843
;; flags: qr ra; QUERY: 1, ANSWER: 0, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 1232
;; QUESTION SECTION:
;www.facebook.com.          IN      A

;; Query time: 13 msec
;; SERVER: 192.168.0.1#53(192.168.0.1) (UDP)
;; WHEN: Sat Mar 30 17:56:58 -03 2024
;; MSG SIZE rcvd: 45
```

Si es un defecto se elige un servidor particular en donde realizar la búsqueda, el resultado es el esperado.

```

dig @a.ns.facebook.com www.facebook.com +norecurse

; <<>> DiG 9.18.24 <<>> @a.ns.facebook.com www.facebook.com +norecurse
; (2 servers found)
; global options: +cmd
; Got answer:
; ->HEADER<- opcode: QUERY, status: NOERROR, id: 41050
; flags: qr aa; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

; OPT PSEUDOSECTION:
; EDNS: version: 0, flags;; udp: 1232
; QUESTION SECTION:
;www.facebook.com.                IN      A

; ANSWER SECTION:
www.facebook.com.                 3600    IN      CNAME   star-mini.c10r.facebook.com.

; Query time: 43 msec
; SERVER: 129.134.30.12#53(a.ns.facebook.com) (UDP)
; WHEN: Sun Mar 31 10:13:22 -03 2024
; MSG SIZE rcvd: 74

```

No.	Time	Source	Destination	Protocol	Length	Info
5	0.002416026	192.168.0.118	129.134.30.12	DNS	101	Standard query 0x42a2 A www.facebook.com OPT
1	0.000000000	192.168.0.118	192.168.0.1	DNS	79	Standard query 0x72e0 A a.ns.facebook.com
2	0.000005524	192.168.0.118	192.168.0.1	DNS	79	Standard query 0xe7ef AAAA a.ns.facebook.com
3	0.001543423	192.168.0.1	192.168.0.118	DNS	95	Standard query response 0x72e0 A a.ns.facebook.com A 129.134.30.12
4	0.001617895	192.168.0.1	192.168.0.118	DNS	107	Standard query response 0xe7ef AAAA a.ns.facebook.com AAAA 2a03:2880:f0fc::face:b00c:0:35
6	0.003557724	129.134.30.12	192.168.0.118	DNS	115	Standard query response 0x42a2 A www.facebook.com CNAME star-mini.c10r.facebook.com OPT

▶ Frame 6: 118 bytes on wire (944 bits), 118 bytes captured (944 bits) on interface any, id 0
 ▶ Linux cooked capture v1
 ▶ Internet Protocol Version 4, Src: 129.134.30.12, Dst: 192.168.0.118
 ▶ User Datagram Protocol, Src Port: 53, Dst Port: 46388
 Source Port: 53
 Destination Port: 46388
 Length: 82
 Checksum: 0xd635 [unverified]
 [Checksum Status: Unverified]
 [Stream index: 1]
 [Timestamps]
 UDP payload (74 bytes)
 Domain Name System (response)
 Transaction ID: 0x42a2
 Flags: 0x8400 Standard query response, No error
 1... .. = Response: Message is a response
 000 0... .. = Opcode: Standard query (0)
 ...1... .. = Authoritative: Server is an authority for domain
 ...0... .. = Truncated: Message is not truncated
 ...0... .. = Recursion desired: Don't do query recursively
 ...0... .. = Recursion available: Server can't do recursive queries
 ...0... .. = Z: reserved (0)
 ...0... .. = Answer authenticated: Answer/authority portion was not authenticated by the server
 ...0... .. = Non-authenticated data: Unacceptable
 ...0000 = Reply code: No error (0)
 Questions: 1
 Answer RRs: 1
 Authority RRs: 0
 Additional RRs: 1
 Queries
 ▶ www.facebook.com: type A, class IN
 Answers
 ▶ Additional records
 [Request In: 5]
 [Time: 0.047551698 seconds]

```

0000  00 00 00 01 00 00 e4 c0 e2 42 bd dd 00 00 08 00  ...B...
0010  45 00 00 66 a3 0d 40 00 54 11 22 c9 81 86 1e 0c  E-f@T...
0020  c0 a8 00 76 00 35 b5 34 00 52 06 35 42 a2 84 00  ...v54-R5...
0030  00 01 00 01 00 00 00 01 63 77 77 77 08 66 61 63  ...www.fac
0040  65 62 6f 6f 6b 03 63 6f 6d 00 00 01 00 01 c0 0c  ebook.co m...
0050  00 05 00 01 00 00 0e 10 00 11 09 73 74 61 72 2d  ...star-
0060  6d 69 6e 69 64 63 31 30 72 c0 10 00 00 29 04 00  mini.c10 r...
0070  00 00 00 00 00 00

```

Como se puede observar, por la naturaleza de la consulta hecha a través de un DNS server particular (a.ns.facebook.com), a la hora de ejecutar la query en búsqueda del canonical name de www.facebook.com, primero se debe obtener la dirección IP del servidor mencionado. Es por esto que se puede observar que inmediatamente después de ser detectada la query de www.facebook.com en Wireshark, se disparan dos nuevas queries en búsqueda de un record A o AAAA de a.ns.facebook.com para poder traducir este hostname en una dirección IPv4 o IPv6.

Ejecución Verborrágica:

La ejecución verborrágica provee información detallada sobre la ejecución del comando, indicando el paso a paso realizado para resolver la query original.

```

➥ dig 9.18.24 www.facebook.com +trace +recursive
;; global options: +cmd
39485 IN NS b.root-servers.net.
39485 IN NS b.root-servers.net.
39485 IN NS m.root-servers.net.
39485 IN NS f.root-servers.net.
39485 IN NS j.root-servers.net.
39485 IN NS l.root-servers.net.
39485 IN NS c.root-servers.net.
39485 IN NS k.root-servers.net.
39485 IN NS e.root-servers.net.
39485 IN NS l.root-servers.net.
39485 IN NS d.root-servers.net.
39485 IN NS a.root-servers.net.
39485 IN NS h.root-servers.net.
SdgKcL20Jm5u0C9q4gAtG00R6SechocFAe1l AYwK1Sh0W7f/UheafnK7f7/euryH8gLozU5U7bNo0o5mmdm/ qC1t502Xtq/58rEtNqR24158Wf6qWnfH7rMkwiYU2YV11ChqZl ecq5d46dcU6wfkQ9J32368abPvY7H65tJCZwJ6L9pQ/7M9h5Y8 y1Y7/gm=
; Received 525 bytes from 192.168.8.1#53:192.168.8.1 in 13 ms

com. 172880 IN NS a.gtld-servers.net.
172880 IN NS b.gtld-servers.net.
172880 IN NS c.gtld-servers.net.
172880 IN NS d.gtld-servers.net.
172880 IN NS e.gtld-servers.net.
172880 IN NS f.gtld-servers.net.
172880 IN NS g.gtld-servers.net.
172880 IN NS h.gtld-servers.net.
172880 IN NS i.gtld-servers.net.
172880 IN NS j.gtld-servers.net.
172880 IN NS k.gtld-servers.net.
172880 IN NS l.gtld-servers.net.
172880 IN NS m.gtld-servers.net.
66480 IN DS 1918 13 2 3ACB8BC2BFF41258A68A4913894240341522D946B8DA0C291F20307 1707885A
66480 IN RRSIG DS 6 1 65488 20240408042170800 20240328040804 39893 F0sJ22D9HCYc15f9wGmU8dy7C7k4q4dK3vHfP/0U8wUir sYdJmU8dcZUsh6C78qyettetw=+B1Jd5d9P023qW/bwHwM +3Y5eY7fTq1
; Received 1176 bytes from 199.78.3.42#53(l.root-servers.net) in 36 ms

facebook.com. 172880 IN NS a.ns.facebook.com.
facebook.com. 172880 IN NS b.ns.facebook.com.
facebook.com. 172880 IN NS c.ns.facebook.com.
facebook.com. 172880 IN NS d.ns.facebook.com.
XKRPJG67LJREFEFH84390QIT88N. 66480 IN NS3C3 1 1 0 - CkQZDSM4127HQ8N3JMS61048UL8G5 NS SDA R5G1G DN5KEG N5EC3PARAM
XKRPJG67LJREFEFH84390QIT88N. 66480 IN NS3C3 1 1 0 - 20240408042170800 20240328040804 39893 C/QL7ACDS9eaurCchL2B6urwFQ3MT/FPIJ3I2UXHhLp748rW6 83u9G0iP0hZjx17L1n1c10vzYrm=
178698H4BV405J0GK3u2J2TGO8N9EU. 66480 IN NS3C3 1 1 0 - 178698H1GCH8R5CQFQ8N8XU5V9P7V NS DS R5G1G
178698H4BV405J0GK3u2J2TGO8N9EU. 66480 IN NS3C3 1 1 2 86488 202404080426055 202403280316555 4534 com. ZWqZrr+oR54Ytvfqs0EzV1fWqZLEQRFP3F5B4A0kta6t6n3JQJ43 B5uf8zJUCR0VVK7J1KBZKJ7V85LUa=
; Received 645 bytes from 192.25.14.3#53(b.gtld-servers.net) in 193 ms

; UDP setup with 2a03:2880:f8fd:face:b80c::35451(2a03:2880:f8fd:face:b80c::8:35) for www.facebook.com failed: network unreachable.
; no servers could be reached

; UDP setup with 2a03:2880:f8fd:face:b80c::35451(2a03:2880:f8fd:face:b80c::8:35) for www.facebook.com failed: network unreachable.
; no servers could be reached

; UDP setup with 2a03:2880:f8fd:face:b80c::35451(2a03:2880:f8fd:face:b80c::8:35) for www.facebook.com failed: network unreachable.
; no servers could be reached

```

Se puede observar como primero se obtienen los distintos name servers (NS) para los servidores DNS root. A partir de estos es que se obtienen múltiples top-level domain (TLD) servers y a partir de los cuales se obtienen los authoritative servers.

Se debe notar que la respuesta obtenida es nuevamente un CNAME record ya que www.facebook.com se traduce a este canonical name y este canonical name es luego traducido a la dirección IP correspondiente, como se pudo apreciar anteriormente.

Ejecución Autorizada:

El flag +authority permite obtener los authoritative servers de una dirección.

```
dig @a.root-servers.net www.facebook.com +authority

; <<>> DiG 9.18.24 <<>> @a.root-servers.net www.facebook.com +authority
; (2 servers found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 43019
;; flags: qr rd; QUERY: 1, ANSWER: 0, AUTHORITY: 13, ADDITIONAL: 27
;; WARNING: recursion requested but not available

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;www.facebook.com.                IN      A

;; AUTHORITY SECTION:
com.                172800  IN      NS      e.gtld-servers.net.
com.                172800  IN      NS      b.gtld-servers.net.
com.                172800  IN      NS      j.gtld-servers.net.
com.                172800  IN      NS      m.gtld-servers.net.
com.                172800  IN      NS      i.gtld-servers.net.
com.                172800  IN      NS      f.gtld-servers.net.
com.                172800  IN      NS      a.gtld-servers.net.
com.                172800  IN      NS      g.gtld-servers.net.
com.                172800  IN      NS      h.gtld-servers.net.
com.                172800  IN      NS      l.gtld-servers.net.
com.                172800  IN      NS      k.gtld-servers.net.
com.                172800  IN      NS      c.gtld-servers.net.
com.                172800  IN      NS      d.gtld-servers.net.

;; ADDITIONAL SECTION:
e.gtld-servers.net. 172800  IN      A        192.12.94.30
e.gtld-servers.net. 172800  IN      AAAA     2001:502:1ca1::30
b.gtld-servers.net. 172800  IN      A        192.33.14.30
b.gtld-servers.net. 172800  IN      AAAA     2001:503:231d::2:30
j.gtld-servers.net. 172800  IN      A        192.48.79.30
j.gtld-servers.net. 172800  IN      AAAA     2001:502:7094::30
m.gtld-servers.net. 172800  IN      A        192.55.83.30
m.gtld-servers.net. 172800  IN      AAAA     2001:501:b1f9::30
i.gtld-servers.net. 172800  IN      A        192.43.172.30
i.gtld-servers.net. 172800  IN      AAAA     2001:503:39c1::30
f.gtld-servers.net. 172800  IN      A        192.35.51.30
f.gtld-servers.net. 172800  IN      AAAA     2001:503:d414::30
a.gtld-servers.net. 172800  IN      A        192.5.6.30
a.gtld-servers.net. 172800  IN      AAAA     2001:503:a83e::2:30
g.gtld-servers.net. 172800  IN      A        192.42.93.30
g.gtld-servers.net. 172800  IN      AAAA     2001:503:eea3::30
h.gtld-servers.net. 172800  IN      A        192.54.112.30
h.gtld-servers.net. 172800  IN      AAAA     2001:502:8cc::30
l.gtld-servers.net. 172800  IN      A        192.41.162.30
l.gtld-servers.net. 172800  IN      AAAA     2001:500:d937::30
k.gtld-servers.net. 172800  IN      A        192.52.178.30
k.gtld-servers.net. 172800  IN      AAAA     2001:503:d2d::30
c.gtld-servers.net. 172800  IN      A        192.26.92.30
c.gtld-servers.net. 172800  IN      AAAA     2001:503:83eb::30
d.gtld-servers.net. 172800  IN      A        192.31.80.30
d.gtld-servers.net. 172800  IN      AAAA     2001:500:856e::30

;; Query time: 149 msec
;; SERVER: 198.41.0.4#53(a.root-servers.net) (UDP)
;; WHEN: Sun Mar 31 14:00:34 -03 2024
;; MSG SIZE rcvd: 841
```

No.	Time	Source	Destination	Protocol	Length/Info
1	0.000000000	192.168.0.118	192.168.0.1	DNS	88 Standard query 8xbf93 A a.root-servers.net
2	0.000000001	192.168.0.118	192.168.0.1	DNS	88 Standard query 8xb998 AAAA a.root-servers.net
3	0.001614656	192.168.0.1	192.168.0.118	DNS	96 Standard query response 8xbf93 A a.root-servers.net A 198.41.0.4
4	0.001767975	192.168.0.1	192.168.0.118	DNS	100 Standard query response 8xb998 AAAA a.root-servers.net AAAA 2001:503:ba3e::2:30
5	0.002679834	192.168.0.118	198.41.0.4	DNS	101 Standard query 8xa80b A www.facebook.com OPT
6	0.011100011	192.168.0.1	192.168.0.118	DNS	105 Standard query response 8xa80b A www.facebook.com NS a.gtld-servers.net NS b.gtld-servers.net NS c.gtld-servers.net NS d.gtld-servers.net NS e.gtld-servers.net NS f.gtld-servers.net NS g.gtld-servers.net NS h.gtld-servers.net NS i.gtld-servers.net NS j.gtld-servers.net NS k.gtld-servers.net NS l.gtld-servers.net NS m.gtld-servers.net NS n.gtld-servers.net NS o.gtld-servers.net NS p.gtld-servers.net NS q.gtld-servers.net NS r.gtld-servers.net NS s.gtld-servers.net NS t.gtld-servers.net NS u.gtld-servers.net NS v.gtld-servers.net NS w.gtld-servers.net NS x.gtld-servers.net NS y.gtld-servers.net NS z.gtld-servers.net NS *

<pre> * Frame 6: 885 bytes on wire (7080 bits), 885 bytes captured (7080 bits) on interface any, id 0 * Linux cooked capture v1 * Internet Protocol Version 4, Src: 198.41.0.4, Dst: 192.168.0.118 * User Datagram Protocol, Src Port: 53, Dst Port: 54263 Source Port: 53 Destination Port: 54263 Length: 840 Checksum: 89c37 [Unverified] Checksum Status: Unverified Stream index: 1 Time stamps: UDP payload (841 bytes) Domain Name System (response) Transaction ID: 0xa80b Flags: 0x0100 Standard query response, No error 0x00000000 = Response Message is a response 0x00000000 = Opcode: Standard query (0) 0x00000000 = Authoritative: Server is not an authority for domain 0x00000000 = Truncated: Message is not truncated 0x00000000 = Recursion desired: Do query recursively 0x00000000 = Recursion available: Server can't do recursive queries 0x00000000 = Z: reserved (0) 0x00000000 = Answer authenticated: Answer/authority portion was not authenticated 0x00000000 = Non-authenticated data: Unacceptable 0x00000000 = Reply code: No error (0) Questions: 1 Answer RRs: 0 Authority RRs: 13 Additional RRs: 27 Queries: www.facebook.com: type A, class IN Authoritative nameservers: -> 0x00000000 NS class IN, ns a.gtld-servers.net Name: com Type: NS (2) (authoritative Name Server) Class: IN (0x0001) Time to live: 172800 (2 days) Data length: 28 Name Servers: a.gtld-servers.net com: type NS, class IN, ns a.gtld-servers.net com: type NS, class IN, ns b.gtld-servers.net com: type NS, class IN, ns c.gtld-servers.net com: type NS, class IN, ns d.gtld-servers.net com: type NS, class IN, ns e.gtld-servers.net com: type NS, class IN, ns f.gtld-servers.net com: type NS, class IN, ns g.gtld-servers.net com: type NS, class IN, ns h.gtld-servers.net com: type NS, class IN, ns i.gtld-servers.net com: type NS, class IN, ns j.gtld-servers.net com: type NS, class IN, ns k.gtld-servers.net com: type NS, class IN, ns l.gtld-servers.net com: type NS, class IN, ns m.gtld-servers.net com: type NS, class IN, ns n.gtld-servers.net com: type NS, class IN, ns o.gtld-servers.net com: type NS, class IN, ns p.gtld-servers.net com: type NS, class IN, ns q.gtld-servers.net com: type NS, class IN, ns r.gtld-servers.net com: type NS, class IN, ns s.gtld-servers.net com: type NS, class IN, ns t.gtld-servers.net com: type NS, class IN, ns u.gtld-servers.net com: type NS, class IN, ns v.gtld-servers.net com: type NS, class IN, ns w.gtld-servers.net com: type NS, class IN, ns x.gtld-servers.net com: type NS, class IN, ns y.gtld-servers.net com: type NS, class IN, ns z.gtld-servers.net com: type NS, class IN, ns *.gtld-servers.net Additional records: Request: 1c: 53 Time: 0.151426977 seconds </pre>	<pre> 0000 00 00 00 01 00 06 c4 c0 e2 42 bd dd 00 00 00 00B..... 0010 45 00 03 05 2a 3a 00 00 36 11 cc 02 c6 29 00 04 E.e.: 6... 0020 c0 a8 00 76 00 35 d3 b0 03 51 1c 37 00 00 01 00 v.9.: 0.7... 0030 00 01 00 00 00 00 00 1b 03 77 77 00 00 01 63 www.fac 0040 65 d4 0f 00 00 03 63 6f 6d 00 01 01 00 c0 30 19 book.co 0050 00 02 00 01 00 02 a3 00 00 14 01 05 0c 67 74 6c e.gtl 0060 64 20 73 05 72 76 05 72 73 03 6e 65 74 00 c0 19 d-server s.net 0070 00 02 00 01 00 02 a3 00 00 04 01 02 c0 30 c0 19 b.g 0080 00 02 00 01 00 02 a3 00 00 04 01 0a c0 30 c0 19 j.g 0090 00 02 00 01 00 02 a3 00 00 04 01 0d c0 30 c0 19 d.g 00a0 00 02 00 01 00 02 a3 00 00 04 01 09 c0 30 c0 19 i.g 00b0 00 02 00 01 00 02 a3 00 00 04 01 06 c0 30 c0 19 f.g 00c0 00 02 00 01 00 02 a3 00 00 04 01 01 c0 30 c0 19 a.g 00d0 00 02 00 01 00 02 a3 00 00 04 01 07 c0 30 c0 19 h.g 00e0 00 02 00 01 00 02 a3 00 00 04 01 08 c0 30 c0 19 b.g 00f0 00 02 00 01 00 02 a3 00 00 04 01 0c c0 30 c0 19 l.g 0100 00 02 00 01 00 02 a3 00 00 04 01 03 c0 30 c0 19 c.g 0110 00 02 00 01 00 02 a3 00 00 04 01 04 c0 30 c0 2e d.g 0120 00 01 00 01 00 02 a3 00 00 04 c0 0c 5e 1e c0 2e c.g 0130 00 1c 00 01 00 02 a3 00 00 10 20 01 05 02 1c a3 0140 00 00 00 00 00 00 00 00 30 c0 de 00 01 00 01 0.N 0150 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 0160 00 02 a3 00 00 10 20 01 05 03 23 1d 00 00 00 00 0170 00 00 00 02 00 30 c0 5e 00 01 00 01 00 02 a3 00 0 0180 00 04 c0 30 47 1e c0 5e 00 1c 00 01 00 02 a3 00 p 0190 00 10 20 01 05 02 70 04 00 00 00 00 00 00 00 01a0 30 c0 de 00 01 00 01 00 02 a3 00 00 00 00 c0 27 0.n 01b0 53 1e c0 de 00 1c 00 01 00 02 a3 00 00 10 20 01 S.n 01c0 05 01 1f 00 00 00 00 00 00 00 00 30 c0 7e 0 01d0 00 01 00 01 00 02 a3 00 00 04 c0 2b ac 1e c0 7e 0 01e0 00 1c 00 01 00 02 a3 00 00 10 20 01 05 03 30 c1 9 01f0 00 00 00 00 00 00 00 00 30 c0 de 00 01 00 01 0 0200 00 02 a3 00 00 04 c0 23 33 1e c0 de 01 00 01 00 4.3 0210 00 02 a3 00 00 10 20 01 05 03 04 14 00 00 00 00 0220 00 00 00 00 30 c0 9e 00 01 00 01 00 02 a3 00 0 0230 00 04 c0 05 00 1e c0 9e 00 1c 00 01 00 02 a3 00 0240 00 10 20 01 05 03 a8 3e 00 00 00 00 00 00 02 0250 5d 1e c0 de 00 1c 00 01 00 02 a3 00 00 04 c0 2a 0 0260 05 03 0e c0 00 00 00 00 00 00 00 30 c0 be 0 0270 00 01 00 01 00 02 a3 00 00 04 c0 30 70 1e c0 be 6p 0280 00 1c 00 01 00 02 a3 00 00 10 20 01 05 02 00 01 0290 00 00 00 00 00 00 00 00 30 c0 de 00 01 00 01 02a0 00 02 a3 00 00 04 c0 29 a2 1e c0 de 01 00 01 02b0 00 02 a3 00 00 10 20 01 05 00 09 37 00 00 00 00 7 02c0 00 00 00 00 30 c0 de 00 01 00 01 00 02 a3 00 0 02d0 00 04 c0 34 b2 1e c0 de 00 1c 00 01 00 02 a3 00 4 02e0 00 10 20 01 05 03 8d 2d 00 00 00 00 00 00 00 02f0 00 30 c0 de 00 01 00 01 00 02 a3 00 00 04 c0 1a 0 0300 5c 1e c0 de 00 1c 00 01 00 02 a3 00 00 10 20 01 V 0310 05 03 03 c0 00 00 00 00 00 00 00 30 c0 fe 0 0320 00 01 00 01 00 02 a3 00 00 04 c0 1f 50 1e c0 fe P 0330 00 1c 00 01 00 02 a3 00 00 10 20 01 05 00 05 6e a 0340 00 00 00 00 00 00 00 00 30 00 00 29 10 00 00 0 0350 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 0360 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 0370 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 </pre>
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En este caso, se consultaron los authoritative servers de www.facebook.com dentro de a.root-servers.net. Si se realiza la misma query pero dentro de alguno de los servidores encontrados, se puede observar que se obtiene un nivel más profundo de la búsqueda del alias www.facebook.com:

```

dig @a.gtld-servers.net facebook.com +authority

;<<>> DiG 9.18.24 <<>> @a.gtld-servers.net facebook.com +authority
; (2 servers found)
; global options: +cmd
; Got answer:
; -->HEADER<-- opcode: QUERY, status: NOERROR, id: 23159
; flags: qr rd; QUERY: 1, ANSWER: 0, AUTHORITY: 4, ADDITIONAL: 9
; WARNING: recursion requested but not available

; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
; QUESTION SECTION:
;facebook.com.                IN      A

; AUTHORITY SECTION:
facebook.com.                  172800  IN      NS      a.ns.facebook.com.
facebook.com.                  172800  IN      NS      b.ns.facebook.com.
facebook.com.                  172800  IN      NS      c.ns.facebook.com.
facebook.com.                  172800  IN      NS      d.ns.facebook.com.

; ADDITIONAL SECTION:
a.ns.facebook.com.             172800  IN      A        129.134.30.12
a.ns.facebook.com.             172800  IN      AAAA     2a03:2880:f0fc::face:b00c:0:35
b.ns.facebook.com.             172800  IN      A        129.134.31.12
b.ns.facebook.com.             172800  IN      AAAA     2a03:2880:f0fd::face:b00c:0:35
c.ns.facebook.com.             172800  IN      A        185.89.218.12
c.ns.facebook.com.             172800  IN      AAAA     2a03:2880:f1fc::face:b00c:0:35
d.ns.facebook.com.             172800  IN      A        185.89.219.12
d.ns.facebook.com.             172800  IN      AAAA     2a03:2880:f1fd::face:b00c:0:35

; Query time: 166 msec
; SERVER: 192.5.6.30#53(a.gtld-servers.net) (UDP)
; WHEN: Sun Mar 31 14:03:47 -03 2024
; MSG SIZE rcvd: 284

```

Esto quiere decir que en cualquiera de los servidores encontrados, desde a.ns.facebook.com hasta d.ns.facebook.com, se puede obtener el canonical name de www.facebook.com o bien la dirección IP de facebook.com.