

For following domain names, recursive queries will be done:

- google.maps.com
- group.mercedes-benz.de

1 Domain name 1: google.maps.com

1.1 Steps

1.1.1 Search in root server

Search in root server for TLD .com.

```
tomasz@tomasz-Aspire-A515-54G:~$ dig @f.root-servers.net com NS

; <<>> DiG 9.18.18-0ubuntu0.22.04.1-Ubuntu <<>> @f.root-servers.net com NS
; (2 servers found)
;; global options: +cmd
;; Got answer:
;; ->HEADER<<- opcode: QUERY, status: NOERROR, id: 38607
;; flags: qr rd; QUERY: 1, ANSWER: 0, AUTHORITY: 13, ADDITIONAL: 27
;; WARNING: recursion requested but not available

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 1472
;; QUESTION SECTION:
;com.                                IN      NS

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

;; ADDITIONAL SECTION:
i.gtld-servers.net. 172800 IN      A        192.43.172.30
i.gtld-servers.net. 172800 IN      AAAA     2001:503:39c1::30
e.gtld-servers.net. 172800 IN      A        192.12.94.30
e.gtld-servers.net. 172800 IN      AAAA     2001:502:1ca1::30
a.gtld-servers.net. 172800 IN      A        192.5.6.30
a.gtld-servers.net. 172800 IN      AAAA     2001:503:a83e::2:30
d.gtld-servers.net. 172800 IN      A        192.31.80.30
d.gtld-servers.net. 172800 IN      AAAA     2001:500:856e::30
j.gtld-servers.net. 172800 IN      A        192.48.79.30
j.gtld-servers.net. 172800 IN      AAAA     2001:502:7094::30
f.gtld-servers.net. 172800 IN      A        192.35.51.30
f.gtld-servers.net. 172800 IN      AAAA     2001:503:d414::30
g.gtld-servers.net. 172800 IN      A        192.42.93.30
g.gtld-servers.net. 172800 IN      AAAA     2001:503:eea3::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
b.gtld-servers.net. 172800 IN      A        192.33.14.30
b.gtld-servers.net. 172800 IN      AAAA     2001:503:231d::2:30
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
m.gtld-servers.net. 172800 IN      A        192.55.83.30
m.gtld-servers.net. 172800 IN      AAAA     2001:501:b1f9::30

;; Query time: 16 msec
;; SERVER: 192.5.5.241#53(f.root-servers.net) (UDP)
;; WHEN: Wed Jan 24 17:11:11 CET 2024
;; MSG SIZE rcvd: 828

tomasz@tomasz-Aspire-A515-54G:~$
```

Figure 1: Searching in root server for TLD .com

1.1.2 Search for google.com

```
tomasz@tomasz-Aspire-A515-54G:~$ dig @i.gtld-servers.net google.com NS

; <<>> DiG 9.18.18-0ubuntu0.22.04.1-Ubuntu <<>> @i.gtld-servers.net google.com NS
; (2 servers found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 37797
;; 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:
;google.com.                IN      NS

;; AUTHORITY SECTION:
google.com.                 172800  IN      NS      ns2.google.com.
google.com.                 172800  IN      NS      ns1.google.com.
google.com.                 172800  IN      NS      ns3.google.com.
google.com.                 172800  IN      NS      ns4.google.com.

;; ADDITIONAL SECTION:
ns2.google.com.             172800  IN      AAAA     2001:4860:4802:34::a
ns2.google.com.             172800  IN      A        216.239.34.10
ns1.google.com.             172800  IN      AAAA     2001:4860:4802:32::a
ns1.google.com.             172800  IN      A        216.239.32.10
ns3.google.com.             172800  IN      AAAA     2001:4860:4802:36::a
ns3.google.com.             172800  IN      A        216.239.36.10
ns4.google.com.             172800  IN      AAAA     2001:4860:4802:38::a
ns4.google.com.             172800  IN      A        216.239.38.10

;; Query time: 35 msec
;; SERVER: 192.43.172.30#53(i.gtld-servers.net) (UDP)
;; WHEN: Wed Jan 24 17:13:45 CET 2024
;; MSG SIZE rcvd: 287
```

Figure 2: Searching for google.com

Query google.com has been found on ns2.google.com. Next step would be search in ns2.google.com for maps.google.com.

1.1.3 Search for maps.google.com

```
tomasz@tomasz-Aspire-A515-54G:~$ dig @ns2.google.com maps.google.com

; <<>> DiG 9.18.18-0ubuntu0.22.04.1-Ubuntu <<>> @ns2.google.com maps.google.com
; (2 servers found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 52544
;; flags: qr aa rd; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1
;; WARNING: recursion requested but not available

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

;; ANSWER SECTION:
maps.google.com.           300     IN      A        142.250.186.206

;; Query time: 55 msec
;; SERVER: 216.239.34.10#53(ns2.google.com) (UDP)
;; WHEN: Wed Jan 24 17:15:40 CET 2024
;; MSG SIZE rcvd: 60

tomasz@tomasz-Aspire-A515-54G:~$
```

Figure 3: Searching for maps.google.com

On name server ns2.google.com a maps.google.com has been found. It's IP address (IPv4) is 142.250.186.206.

2 Domain name 2: group.mercedes-benz.de

2.1 Steps

2.1.1 Search in root server

```
tomasz@tomasz-Aspire-A515-54G:~$ dig @f.root-servers.net de NS

; <<>> DiG 9.18.18-0ubuntu0.22.04.1-Ubuntu <<>> @f.root-servers.net de NS
; (2 servers found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 31200
;; flags: qr rd; QUERY: 1, ANSWER: 0, AUTHORITY: 6, ADDITIONAL: 13
;; WARNING: recursion requested but not available

;; OPT PSEUDOSECTION:
;; EDNS: version: 0, flags:; udp: 1472
;; QUESTION SECTION:
;de.                                IN      NS

;; AUTHORITY SECTION:
de.      172800  IN      NS      a.nic.de.
de.      172800  IN      NS      f.nic.de.
de.      172800  IN      NS      l.de.net.
de.      172800  IN      NS      n.de.net.
de.      172800  IN      NS      s.de.net.
de.      172800  IN      NS      z.nic.de.

;; ADDITIONAL SECTION:
a.nic.de. 172800  IN      A       194.0.0.53
a.nic.de. 172800  IN      AAAA    2001:678:2::53
f.nic.de. 172800  IN      A       81.91.164.5
f.nic.de. 172800  IN      AAAA    2a02:568:0:2::53
l.de.net. 172800  IN      A       77.67.63.105
l.de.net. 172800  IN      AAAA    2001:668:1f:11::105
n.de.net. 172800  IN      A       194.146.107.6
n.de.net. 172800  IN      AAAA    2001:67c:1011:1::53
s.de.net. 172800  IN      A       195.243.137.26
s.de.net. 172800  IN      AAAA    2003:8:14::53
z.nic.de. 172800  IN      A       194.246.96.1
z.nic.de. 172800  IN      AAAA    2a02:568:fe02::de

;; Query time: 15 msec
;; SERVER: 192.5.5.241#53(f.root-servers.net) (UDP)
;; WHEN: Wed Jan 24 17:16:32 CET 2024
;; MSG SIZE rcvd: 401
```

Figure 4: Searching in root server for TLD .de

2.1.2 Search mercedes-benz.de

```
tomasz@tomasz-Aspire-A515-54G:~$ dig @a.nic.de mercedes-benz.de NS

; <<>> DiG 9.18.18-0ubuntu0.22.04.1-Ubuntu <<>> @a.nic.de mercedes-benz.de NS
; (2 servers found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 63988
;; flags: qr rd; QUERY: 1, ANSWER: 0, AUTHORITY: 4, ADDITIONAL: 5
;; WARNING: recursion requested but not available

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 1472
;; QUESTION SECTION:
;mercedes-benz.de.                IN      NS

;; AUTHORITY SECTION:
mercedes-benz.de.                86400   IN      NS      ns1.corpinter.net.
mercedes-benz.de.                86400   IN      NS      ns2.corpinter.net.
mercedes-benz.de.                86400   IN      NS      ns3.corpinter.net.
mercedes-benz.de.                86400   IN      NS      ns4.corpinter.net.

;; ADDITIONAL SECTION:
ns2.corpinter.net.               86400   IN      A        141.113.8.53
ns2.corpinter.net.               86400   IN      AAAA     2a03:9e42:e202:1001::53
ns4.corpinter.net.               86400   IN      A        141.113.168.53
ns4.corpinter.net.               86400   IN      AAAA     2a03:9e41:e101:1001::53

;; Query time: 35 msec
;; SERVER: 194.0.0.53#53(a.nic.de) (UDP)
;; WHEN: Wed Jan 24 17:18:32 CET 2024
;; MSG SIZE rcvd: 255

tomasz@tomasz-Aspire-A515-54G:~$
```

Figure 5: Searching for mercedes-benz.de

2.1.3 Search for group.mercedes-benz.de

```
tomasz@tomasz-Aspire-A515-54G:~$ dig @ns1.corpinter.net group.mercedes-benz.de A

; <<>> DiG 9.18.18-0ubuntu0.22.04.1-Ubuntu <<>> @ns1.corpinter.net group.mercedes-benz.de A
; (2 servers found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 42124
;; flags: qr aa rd; QUERY: 1, ANSWER: 2, AUTHORITY: 0, ADDITIONAL: 1
;; WARNING: recursion requested but not available

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
; COOKIE: fa19e50a652662f08b30670665b138c48e8980bf92cd8a12 (good)
;; QUESTION SECTION:
;group.mercedes-benz.de.          IN      A

;; ANSWER SECTION:
group.mercedes-benz.de. 3600    IN      CNAME    group-redir.mercedes-benz.com.
group-redir.mercedes-benz.com. 3600    IN      CNAME    group-redir.mercedes-benz.com.edgekey.net.

;; Query time: 27 msec
;; SERVER: 141.113.0.53#53(ns1.corpinter.net) (UDP)
;; WHEN: Wed Jan 24 17:20:20 CET 2024
;; MSG SIZE rcvd: 177
```

Figure 6: Searching for group.mercedes-benz.de

Domain name group.mercedes-benz.de is an alias for group-redir.mercedes-benz.com. On the next line there is an information that group-redir.mercedes-benz.com is also an alias. Although, a step-by-step query has been done.

2.1.4 Search for group-redir.mercedes-benz.com

```
tomasz@tomasz-Aspire-A515-54G:~$ dig group-redir.mercedes-benz.com A
; <<>> DiG 9.18.18-0ubuntu0.22.04.1-Ubuntu <<>> group-redir.mercedes-benz.com A
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 6654
;; flags: qr rd ra; QUERY: 1, ANSWER: 4, AUTHORITY: 0, ADDITIONAL: 3
;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 65494
;; QUESTION SECTION:
;group-redir.mercedes-benz.com. IN      A

;; ANSWER SECTION:
group-redir.mercedes-benz.com. 10 IN      CNAME    group-redir.mercedes-benz.com.edgekey.net.
group-redir.mercedes-benz.com.edgekey.net. 10 IN CNAME e40844.dsca.akamaiedge.net.
e40844.dsca.akamaiedge.net. 10 IN      A        2.16.16.165
e40844.dsca.akamaiedge.net. 10 IN      A        2.16.16.169

;; ADDITIONAL SECTION:
e40844.dsca.akamaiedge.net. 10 IN      AAAA     2a02:26f0:f700:12::210:10a9
e40844.dsca.akamaiedge.net. 10 IN      AAAA     2a02:26f0:f700:12::210:10a5

;; Query time: 0 msec
;; SERVER: 127.0.0.53#53(127.0.0.53) (UDP)
;; WHEN: Wed Jan 24 17:22:23 CET 2024
;; MSG SIZE rcvd: 238
```

Figure 7: Searching for group-redir.mercedes-benz.com

2.1.5 Search for group-redir.mercedes-benz.com.edgekey.net

```
tomasz@tomasz-Aspire-A515-54G:~$ dig group-redir.mercedes-benz.com.edgekey.net A
; <<>> DiG 9.18.18-0ubuntu0.22.04.1-Ubuntu <<>> group-redir.mercedes-benz.com.edgekey.net A
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 44176
;; flags: qr rd ra; QUERY: 1, ANSWER: 3, AUTHORITY: 0, ADDITIONAL: 1
;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 65494
;; QUESTION SECTION:
;group-redir.mercedes-benz.com.edgekey.net. IN A

;; ANSWER SECTION:
group-redir.mercedes-benz.com.edgekey.net. 7128 IN CNAME e40844.dsca.akamaiedge.net.
e40844.dsca.akamaiedge.net. 20 IN      A        2.16.16.165
e40844.dsca.akamaiedge.net. 20 IN      A        2.16.16.169

;; Query time: 23 msec
;; SERVER: 127.0.0.53#53(127.0.0.53) (UDP)
;; WHEN: Wed Jan 24 17:23:25 CET 2024
;; MSG SIZE rcvd: 139
```

Figure 8: Searching for group-redir.mercedes-benz.com

2.1.6 Search for e40844.dsca.akamaiedge.net

```
tomasz@tomasz-Aspire-A515-54G:~$ dig e40844.dsca.akamaiedge.net A
; <<>> DiG 9.18.18-0ubuntu0.22.04.1-Ubuntu <<>> e40844.dsca.akamaiedge.net A
;; global options: +cmd
;; Got answer:
;; ->HEADER<<- opcode: QUERY, status: NOERROR, id: 18709
;; flags: qr rd ra; QUERY: 1, ANSWER: 2, AUTHORITY: 0, ADDITIONAL: 1
;; OPT PSEUDOSECTION:
;; EDNS: version: 0, flags:; udp: 65494
;; QUESTION SECTION:
;e40844.dsca.akamaiedge.net.      IN      A
;; ANSWER SECTION:
e40844.dsca.akamaiedge.net. 20 IN      A      2.16.16.165
e40844.dsca.akamaiedge.net. 20 IN      A      2.16.16.169
;; Query time: 27 msec
;; SERVER: 127.0.0.53#53(127.0.0.53) (UDP)
;; WHEN: Wed Jan 24 17:24:13 CET 2024
;; MSG SIZE rcvd: 87
```

Figure 9: Searching for group e40844.dsca.akamaiedge.net

Domain e40844.dsca.akamaiedge.net has address 2.16.16.165. Domain name group.mercedes-benz.com is an alias. Final address found in a query is 2.16.16.165.