



Computer Engineering Department
Engineering Department

Academic Year: 2021-2022

Class: S.Y.B.Tech Sem.: 4 Course: CEN

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AIM:	To configure a DNS server using the bind9 package
THEORY:	<p>What is a DNS server?</p> <p>The Domain Name System (DNS) is the phonebook of the Internet. When users type domain names such as 'google.com' or 'nytimes.com' into web browsers, DNS is responsible for finding the correct IP address for those sites. Browsers then use those addresses to communicate with origin servers or CDN edge servers to access website information. This all happens thanks to DNS servers: machines dedicated to answering DNS queries.</p> <p>How Does a DNS Work?</p> <p>The DNS is responsible for converting the hostname, what we commonly refer to as the website or web page name, to the IP address. The act of entering the domain name is referred to as a DNS query and the process of finding the corresponding IP address is known as DNS resolution. DNS queries can be of three types: recursive query, iterative query or non-recursive query.</p> <ol style="list-style-type: none">1. Recursive query – These are queries where a DNS server has to respond with the requested resource record. If a record cannot be found, the DNS client has to be shown an error message.2. Iterative query – These are queries for which the DNS client will continue to request a response from multiple DNS servers until the best response is found, or an error or timeout occurs. If the DNS server is unable to find a match for the query, it will refer to a DNS server authoritative for a lower level of the domain namespace. This referral address is then queried by the



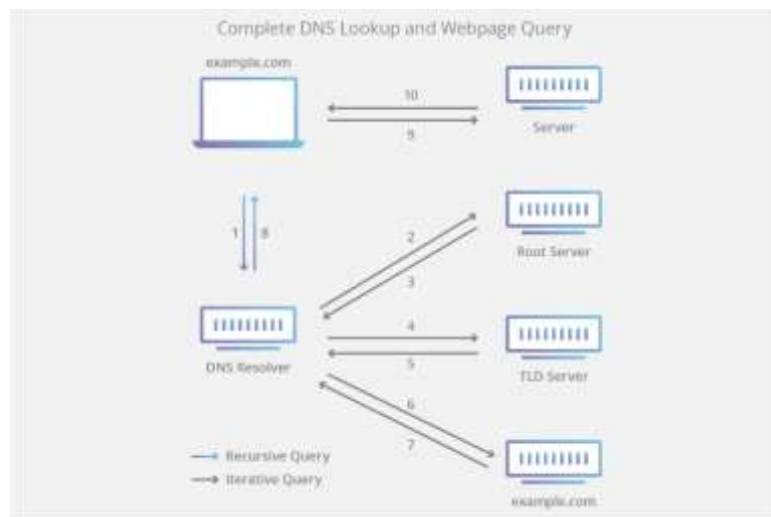
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DNS client and this process continues with additional DNS servers.

3. Non-recursive query – these are queries which are resolved by a DNS resolver when the requested resource is available, either due to the server being authoritative or because the resource is already stored in cache.



Primary and Secondary DNS Servers

In most cases, a primary and a secondary DNS server are configured on your router or computer when you connect to your internet service provider. There are two DNS servers in case one of them happens to fail, in which case the second is used to resolve hostnames you enter.

Protecting Yourself From DNS Attacks

There are two things you should do to avoid becoming a victim of a DNS settings attack. The first is to install antivirus software so that malicious programs are caught before they can do any damage.

The second is to pay close attention to the appearance of important websites you visit regularly. If you visit one and the site looks off in some way—maybe the images are all different or the site's colors have changed, or menus don't



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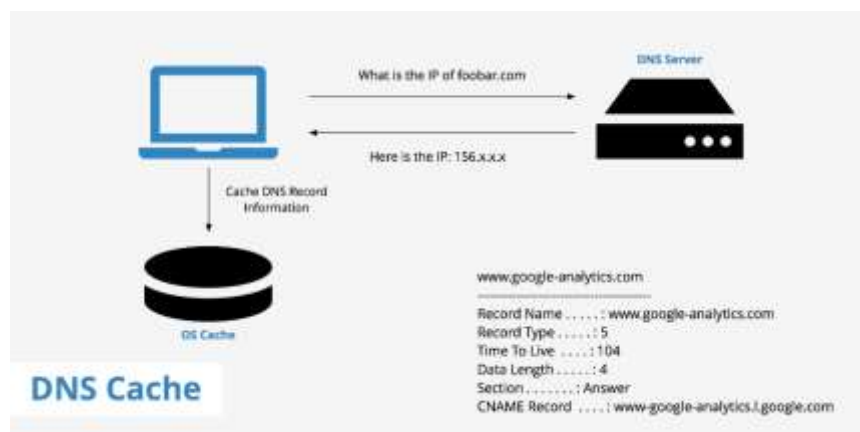
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look right, or you find misspellings (hackers can be dreadful spellers)—or you get an "invalid certificate" message in your browser, it might be a sign that you're on a faked website.

DNS Caching

DNS caching is the process of storing DNS data on the DNS records closer to a requesting client to be able to resolve the DNS query earlier. This avoids the problem of additional queries further down the chain and improves web page load times and reduces bandwidth consumption.

The amount of time that the DNS records are stored in DNS cache is called time to live or TTL.



DNS Server

EXECUTION:

Finding the IP address of the Ubuntu linux machine

```
pratik@pratik-VirtualBox:/$ ifconfig
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 10.0.2.15 netmask 255.255.255.0 broadcast 10.0.2.255
    inet6 fe80::d0d4:2be1:c15d:2234 prefixlen 64 scopeid 0x20<link>
    ether 08:00:27:36:0f:c1 txqueuelen 1000 (Ethernet)
    RX packets 140284 bytes 210246856 (210.2 MB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 17320 bytes 1112737 (1.1 MB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Local Loopback)
    RX packets 375 bytes 33979 (33.9 KB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 375 bytes 33979 (33.9 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```



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Installing the bind9 package

```
[04/05/22]seed@VM:~$ sudo apt-get install bind9 bind9utils
Reading package lists... Done
Building dependency tree
Reading state information... Done
bind9utils is already the newest version (1:9.10.3.dfsg.P4-8ubuntu1.7).
bind9 is already the newest version (1:9.10.3.dfsg.P4-8ubuntu1.7).
0 upgraded, 0 newly installed, 0 to remove and 3 not upgraded.
[04/05/22]seed@VM:~$
```

Writing into files /etc/bind/named.conf

```
Open  [v] *named.conf /etc/bind Save [≡] -
1 include "/etc/bind/named.conf.options";
2 include "/etc/bind/named.conf.local";
3 # comment out
4 # include "/etc/bind/named.conf.default-zones";
5 # addS|
6 include "/etc/bind/named.conf.internal-zones";
7 include "/etc/bind/named.conf.external-zones";
```

Writing into file /etc/bind/named.conf

```
named.conf:internal-zones (/etc/bind) - gedit
named.conf:internal-zones
Save
Open a file
for internal section
view "internal" {
    match-clients {
        localhost;
        10.0.0.0/24;
    };
    # set zone for internal
    zone "srv.world" {
        type master;
        file "/etc/bind/srv.world.ian";
        allow-update { none; };
    };
    # set zone for internal "note"
    zone "0.0.10.in-addr.arpa" {
        type master;
        file "/etc/bind/0.0.10.db";
        allow-update { none; };
    };
    include "/etc/bind/named.conf.default-zones";
};
Plain Text Tab Width: 8 Ln 23, Col 1 INS
```



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Writing into file /etc/bind/conf.external-zones

```
conf.external-zones (/etc/bind) - gedit
named.conf
/etc/

# create new
# define for external section
view "external" {
    match-clients { any; };
    # allow any query
    allow-query { any; };
    # prohibit recursions
    recursion no;
    # set zone for external
    zone "srv.world" {
        type master;
        file "/etc/bind/srv.world.wan";
        allow-update { none; };
    };
    # set zone for external *note
    zone "80.0.16.172.in-addr.arpa" {
        type master;
        file "/etc/bind/80.0.16.172.db";
        allow-update { none; };
    };
};
```

Writing into /etc/bind/named.conf.options

```
named.conf.options
/etc/bind/

options {
    directory "/var/cache/bind";

    // If there is a firewall between you and nameservers you want
    // to talk to, you may need to fix the firewall to allow multiple
    // ports to talk. See http://www.kb.cert.org/vuls/id/800113

    // If your ISP provided one or more IP addresses for stable
    // nameservers, you probably want to use them as forwarders.
    // Uncomment the following block, and insert the addresses replacing
    // the all-0's placeholder.

    // forwarders {
    //     0.0.0.0;
    // };

    # query range you allow
    allow-query { localhost; 10.0.0.0/24; };
    # the range to transfer zone files
    allow-transfer { localhost; 10.0.0.0/24; };
    # recursion range you allow
    allow-recursion { localhost; 10.0.0.0/24; };

    //=====
    // If BIND logs error messages about the root key being expired,
    // you will need to update your keys. See https://www.isc.org/bind-keys
    //=====
    dnssec-validation auto;

    auth-nxdomain no;    # conform to RFC1035
    # change if not use IPV6
    listen-on-v6 { none; };
};

Loading file "/etc/bind/named.conf.options"... Plain Text
```



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Create zone files that servers resolve IP address from domain name.

Writing into /etc/bind/srv.world.ian

```
Open ▾ [icon]
$TTL 86400
@ IN SOA dlp.srv.world. root.srv.world. (
    2016042101 ;Serial
    3600       ;Refresh
    1800       ;Retry
    604800     ;Expire
    86400      ;Minimum TTL
)
# define name server
IN NS dlp.srv.world.
# define name server's IP address
IN A 172.16.0.82
# define mail exchanger
IN MX 10 dlp.srv.world.

# define IP address of a hostname
dlp IN A 127.0.0.1
```

Create zone files that servers resolve domain names from IP address.

Writing into /etc/bind/0.0.10.db

```
Open ▾ [icon]
$TTL 86400
@ IN SOA dlp.srv.world. root.srv.world. (
    2016042101 ;Serial
    3600       ;Refresh
    1800       ;Retry
    604800     ;Expire
    86400      ;Minimum TTL
)
# define name server
IN NS dlp.srv.world.

# define the range of this domain included
IN PTR srv.world.
IN A 255.255.255.248

# define hostname of an IP address
82 IN PTR dlp.srv.world.
```




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Writing into /etc/bind/1.0.16.172.db

```
$TTL 86400
@ IN SOA dlp.srv.world. root.srv.world. (
    2016042101 ;Serial
    3600       ;Refresh
    1800       ;Retry
    604800     ;Expire
    86400      ;Minimum TTL
)

# define name server
IN NS      dlp.srv.world.

# define the range of this domain included
IN PTR     srv.world.
IN A       255.255.255.248

# define hostname of an IP address
82 IN PTR  dlp.srv.world.
```

Change DNS setting to refer to local DNS.

```
# change to own
nameservers:
    addresses: [10.0.2.15]
```

```
sudo systemctl restart ifup@ens3 bind9
```

Try to resolve Name or Address normally.

```
Terminal
[04/05/22]seed@VM:~$ sudo systemctl restart ifup@ens3 bind9
[04/05/22]seed@VM:~$ dig dlp.srv.world

;; <<>> DiG 9.10.3-P4-Ubuntu <<>> dlp.srv.world
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 10498
;; flags: qr rd ra; QUERY: 1, ANSWER: 2, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
;; EDNS: version: 0, flags:; udp: 512
;; QUESTION SECTION:
;dlp.srv.world.                IN      A

;; ANSWER SECTION:
dlp.srv.world.                21496   IN      CNAME   dns.srv.world.
dns.srv.world.                21496   IN      A       180.43.145.38

;; Query time: 8 msec
;; SERVER: 127.0.1.1#53(127.0.1.1)
;; WHEN: Tue Apr 05 13:46:49 EDT 2022
;; MSG SIZE rcvd: 76

[04/05/22]seed@VM:~$
```



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```
Terminal File Edit View Search Terminal Help
:: Query time: 8 msec
:: SERVER: 127.0.1.1#53(127.0.1.1)
:: WHEN: Tue Apr 05 13:46:49 EDT 2022
:: MSG SIZE rcvd: 76

[04/05/22]seed@VM:~$ dig -x 10.0.2.15

; <<>> DiG 9.10.3-P4-Ubuntu <<>> -x 10.0.2.15
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NXDOMAIN, id: 5053
;; flags: qr rd ra; QUERY: 1, ANSWER: 0, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
;; EDNS: version: 0, flags:; udp: 512
;; QUESTION SECTION:
;15.2.0.10.in-addr.arpa.          IN      PTR

;; Query time: 6 msec
;; SERVER: 127.0.1.1#53(127.0.1.1)
;; WHEN: Tue Apr 05 13:53:41 EDT 2022
;; MSG SIZE rcvd: 51

[04/05/22]seed@VM:~$
```

CONCLUSION: Learnt how to use a DNS server and understood how to configure the DNS server using the bind9 package. Learnt what is the basic usage of DNS server. Learnt how to configure using the server-world.info and got the correct output.