Installing DNS Server in Linux

Before we dive into setting up your DNS server, it's important to understand the key DNS record types you'll encounter. These records tell the DNS server how to translate domain names and IP addresses.

- **A (Address) Record:** Maps a domain name to an IPv4 address.
- **AAAA (IPv6 Address) Record:** Maps a domain name to an IPv6 address.
- **PTR (Pointer) Record:** Maps an IP address to a domain name, used for reverse DNS lookups.
- **NS (Name Server) Record:** Specifies the authoritative DNS servers for a domain.
- **SOA (Start of Authority) Record:** Provides administrative information about the zone, including the primary name server, email of the domain administrator, and zone parameters.

Understanding these records will help you configure your DNS zones correctly. Setting up a DNS server using BIND (Berkeley Internet Name Domain) is a foundational skill for network administrators. This guide walks through the process step-by-step, using the example of the domain contoso.com.

DNS (Domain Name System) translates human-readable domain names (like contoso.com) into IP addresses (like 192.168.1.1). It also supports reverse lookups, translating IP addresses back into domain names.

1. Install BIND

Debian, Ubuntu	sudo apt install bind9 bind9utils bind9-doc
Red Hat, CentOS, Fedora	sudo dnf install bind bind-utils
OpenSUSE	sudo zypper install bind bind-utils
Arch	sudo pacman -S bind

- Ensure you have root or sudo privileges when installing packages.

2. Configure Zone Files

Zone files define DNS records for your domain and its reverse mappings.

A. Forward Zone File: /etc/bind/db.contoso.com

```
$TTL 604800
@ IN SOA contoso.com. root.contoso.com (
        4         ; Serial
        604800    ; Refresh
        86400     ; Retry
        2419200   ; Expire
        604800  ) ; Negative Cache TTL


@      IN     NS   ns.contoso.com.
@      IN     A    192.168.1.1
@      IN     AAAA 2001:db8::1

server IN     A    192.168.1.1
server IN     AAAA 2001:db8::1
ns     IN     AAAA 2001:db8::1
ns     IN     A    192.168.1.1
```

B. Reverse Zone File (IPv4): /etc/bind/db.192

```
$TTL 604800
@       IN      SOA     ns.contoso.com. root.contoso.com. (
        2        ; Serial
        604800   ; Refresh
        86400    ; Retry
        2419200  ; Expire
        604800 ) ; Negative Cache TTL

@       IN      NS  ns.
1       IN      PTR ns.contoso.com.
1       IN      PTR contoso.com.
1       IN      PTR server.contoso.com.
```

C. Reverse Zone File (IPv6): /etc/bind/db.2001

```
$TTL 86400
$ORIGIN 0.0.0.0.0.0.0.0.8.b.d.0.1.0.0.2.ip6.arpa.

@       IN      SOA     contoso.com.    root.contoso.com. (
        3               ; Serial
        604800          ; Refresh
        86400           ; Retry
        2419200         ; Expire
        604800  )       ; Negative Cache TTL

@       IN      NS      ns.contoso.com.
1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0  IN  PTR        contoso.com.
1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0  IN  PTR        server.contoso.com.
1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0  IN  PTR        ns.contoso.com.
```

3. Define Zones in BIND

Edit /etc/bind/named.conf.local to include your zones:

```
//
// Do any local configuration here
//
zone "contoso.com" {
        type master;
        file "/etc/bind/db.contoso.com";
};

zone "1.168.192.in-addr.arpa" {
        type master;
        file "/etc/bind/db.192";
};

zone "0.0.0.0.0.0.0.0.8.b.d.0.1.0.0.2.ip6.arpa" {
        type master;
        file "/etc/bind/db.2001";
};
```

4. Test DNS Configuration

Use named-checkzone and named-checkconf:

```
root@server:/etc/bind# named-checkzone contoso.com /etc/bind/db.contoso.com
zone contoso.com/IN: loaded serial 4
OK
root@server:/etc/bind# named-checkzone 1.168.192.in-addr.arpa /etc/bind/db.192
zone 1.168.192.in-addr.arpa/IN: loaded serial 2
OK
root@server:/etc/bind# named-checkzone 0.0.0.0.0.0.0.0.8.b.d.0.1.0.0.2.ip6.arpa /etc/bind/db.2001
zone 0.0.0.0.0.0.0.0.8.b.d.0.1.0.0.2.ip6.arpa/IN: loaded serial 3
OK
root@server:/etc/bind# named-checkconf
root@server:/etc/bind# _
```

5. Restart BIND

```
root@server:/etc/bind# systemctl restart bind9
root@server:/etc/bind# _
```

6A. Test using NSLOOKUP

```
root@server:/etc/bind# nslookup
> set type=any
> contoso.com
Server:         ::1
Address:        ::1#53

contoso.com
        origin = contoso.com
        mail addr = root.contoso.com.contoso.com
        serial = 4
        refresh = 604800
        retry = 86400
        expire = 2419200
        minimum = 604800
contoso.com     nameserver = ns.contoso.com.
Name:   contoso.com
Address: 192.168.1.1
Name:   contoso.com
Address: 2001:db8::1
> 2001:db8::1
Server:         ::1
Address:        ::1#53

1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.8.b.d.0.1.0.0.2.ip6.arpa        name = ns.contoso.com.
1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.8.b.d.0.1.0.0.2.ip6.arpa        name = contoso.com.
1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.8.b.d.0.1.0.0.2.ip6.arpa        name = server.contoso.com.
> 192.168.1.1
Server:         ::1
Address:        ::1#53

1.1.168.192.in-addr.arpa        name = contoso.com.
1.1.168.192.in-addr.arpa        name = ns.contoso.com.
1.1.168.192.in-addr.arpa        name = server.contoso.com.
>
```

6B. Test using DIG

```
root@server:/etc/bind# dig contoso.com

; <<>> DiG 9.20.15-1~deb13u1-Debian <<>> contoso.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 47419
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 1232
; COOKIE: 654d09e5306a7c0401000000694f163f5f6b492050090c25 (good)
;; QUESTION SECTION:
;contoso.com.                   IN      A

;; ANSWER SECTION:
contoso.com.            604800  IN      A       192.168.1.1

;; Query time: 0 msec
;; SERVER: ::1#53(::1) (UDP)
;; WHEN: Fri Dec 26 18:11:59 EST 2025
;; MSG SIZE  rcvd: 84

root@server:/etc/bind# dig -x 192.168.1.1

; <<>> DiG 9.20.15-1~deb13u1-Debian <<>> -x 192.168.1.1
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 19189
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 3, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 1232
; COOKIE: a4bd881e24d0f37a01000000694f164654692bcc6031ae47 (good)
;; QUESTION SECTION:
;1.1.168.192.in-addr.arpa.      IN      PTR

;; ANSWER SECTION:
1.1.168.192.in-addr.arpa. 604800 IN     PTR     server.contoso.com.
1.1.168.192.in-addr.arpa. 604800 IN     PTR     contoso.com.
1.1.168.192.in-addr.arpa. 604800 IN     PTR     ns.contoso.com.

;; Query time: 0 msec
;; SERVER: ::1#53(::1) (UDP)
;; WHEN: Fri Dec 26 18:12:06 EST 2025
;; MSG SIZE  rcvd: 144

root@server:/etc/bind#
```

```
root@server:/etc/bind# dig -x 2001:db8::1

; <<>> DiG 9.20.15-1~deb13u1-Debian <<>> -x 2001:db8::1
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 31346
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 3, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 1232
; COOKIE: 4c5e8ec43d8c412d01000000694f166534d03e5d1fb15535 (good)
;; QUESTION SECTION:
;1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.8.b.d.0.1.0.0.2.ip6.arpa. IN PTR

;; ANSWER SECTION:
1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.8.b.d.0.1.0.0.2.ip6.arpa. 86400 IN PTR ns.contoso.com.
1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.8.b.d.0.1.0.0.2.ip6.arpa. 86400 IN PTR server.contoso.com.
1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.8.b.d.0.1.0.0.2.ip6.arpa. 86400 IN PTR contoso.com.

;; Query time: 0 msec
;; SERVER: ::1#53(::1) (UDP)
;; WHEN: Fri Dec 26 18:12:37 EST 2025
;; MSG SIZE  rcvd: 192

root@server:/etc/bind#
```

6C. Test using PING

```
root@server:/etc/bind# ping contoso.com
PING contoso.com (2001:db8::1) 56 data bytes
64 bytes from server.contoso.com (2001:db8::1): icmp_seq=1 ttl=64 time=0.020 ms
64 bytes from server.contoso.com (2001:db8::1): icmp_seq=2 ttl=64 time=0.049 ms
64 bytes from server.contoso.com (2001:db8::1): icmp_seq=3 ttl=64 time=0.054 ms
64 bytes from server.contoso.com (2001:db8::1): icmp_seq=4 ttl=64 time=0.040 ms
^C
--- contoso.com ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3284ms
rtt min/avg/max/mdev = 0.020/0.040/0.054/0.013 ms
root@server:/etc/bind# ping 192.168.1.1
PING 192.168.1.1 (192.168.1.1) 56(84) bytes of data.
64 bytes from 192.168.1.1: icmp_seq=1 ttl=64 time=0.041 ms
64 bytes from 192.168.1.1: icmp_seq=2 ttl=64 time=0.053 ms
64 bytes from 192.168.1.1: icmp_seq=3 ttl=64 time=0.038 ms
^C
--- 192.168.1.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2152ms
rtt min/avg/max/mdev = 0.038/0.044/0.053/0.006 ms
root@server:/etc/bind# ping 2001:db8::1
PING 2001:db8::1 (2001:db8::1) 56 data bytes
64 bytes from 2001:db8::1: icmp_seq=1 ttl=64 time=0.136 ms
64 bytes from 2001:db8::1: icmp_seq=2 ttl=64 time=0.040 ms
64 bytes from 2001:db8::1: icmp_seq=3 ttl=64 time=0.040 ms
64 bytes from 2001:db8::1: icmp_seq=4 ttl=64 time=0.053 ms
^C
--- 2001:db8::1 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3116ms
rtt min/avg/max/mdev = 0.040/0.067/0.136/0.040 ms
root@server:/etc/bind#
```