DevOps Exercises

Session 3: Web Servers, DNSSEC, and Configuring Slave DNS

Student Name: Mehdi Daneshvar

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1- What are the differences between the Nginx and Apache web servers?

Nginx and Apache are two popular open-source web servers, but they differ significantly in their design and use cases:

- **Architecture:**
  - **Apache:** Uses a process-driven model, where each request is handled by a separate thread or process. This can lead to higher memory usage, especially under heavy traffic.
  - **Nginx:** Employs an event-driven and asynchronous architecture, allowing it to handle multiple connections efficiently with low resource consumption.
- **Performance:**
  - **Apache:** Performs well for dynamic content with its modules like mod_php. However, it may struggle with static content under heavy loads.
  - **Nginx:** Excels at serving static content quickly due to its event-driven nature and optimized resource usage.
- **Configuration:**
  - **Apache:** Offers flexibility with per-directory configurations using `.htaccess` files, suitable for shared hosting.
  - **Nginx:** Relies on a central configuration file, which can be less flexible but results in faster performance.
- **Use Cases:**
  - Apache is often chosen for setups requiring dynamic content handling or complex configurations.
  - Nginx is preferred for high-performance scenarios, reverse proxying, or handling large numbers of concurrent connections.

2- What is DNSSEC?

DNSSEC (Domain Name System Security Extensions) is a suite of protocols that enhances the security of the DNS by adding cryptographic signatures to DNS records.

- **Purpose:** It protects users from DNS spoofing or man-in-the-middle attacks by ensuring that the responses to DNS queries are authentic and have not been tampered with.
- **How It Works:**
  - DNSSEC uses public key cryptography to sign DNS data.
  - Each DNS zone has a pair of keys: a private key to sign records and a public key to verify them.
  - When a DNS query is made, the resolver can verify the digital signature to ensure data integrity.
- **Limitations:**
  - It does not encrypt DNS queries, so data privacy is not guaranteed.

3- Setup Slave DNS Server

This guide explains how to set up a **Master** and **Slave** DNS server with the domain `mehdi-daneshvar.ir`.

Step 1: Install BIND on the Master Server

1. Install BIND on the master server:

   ```
   sudo apt install bind9
   ```

2. Configure the Zone for `mehdi-daneshvar.ir`:
   Add the following zone definition in the master server's configuration file (e.g., `/etc/bind/named.conf.local`):

   ```
   zone "mehdi-daneshvar.ir" {
       type master;
       file "/etc/bind/db.mehdi-daneshvar.ir";
       allow-transfer { 192.168.40.25; }; # Slave DNS server IP
   };
   ```

3. Create the Zone File:
   Use the template below to create `/etc/bind/db.mehdi-daneshvar.ir`:

   ```
   $TTL    86400
   @       IN      SOA     ns1.mehdi-daneshvar.ir. admin.mehdi-
   daneshvar.ir. (
                        2024120901 ; Serial
                        3600       ; Refresh = 1h
                        1800       ; Retry = 30m
                        1209600    ; Expire = 14d
                        86400 )    ; Minimum TTL = 24h
    ; Name Servers
   ```

```
@       IN      NS      ns1.mehdi-daneshvar.ir.
@       IN      NS      ns2.mehdi-daneshvar.ir.

; A Records
ns1     IN      A       192.168.40.26
ns2     IN      A       192.168.40.25
@       IN      A       192.168.40.20
```

4. Restart the BIND Service on the Master Server:

```
sudo systemctl restart bind9
```

Step 2: Install BIND on the Slave Server

1. Install BIND on the slave server:

```
sudo apt install bind9
```

2. Configure the Slave Zone:
   Add a slave zone in the configuration file of the slave server (e.g., `/etc/bind/named.conf.local`):

```
zone "mehdi-daneshvar.ir" {
    type slave;
    file "/var/cache/bind/db.mehdi-daneshvar.ir";
    masters { 192.168.40.26; }; # Master DNS server IP
};
```

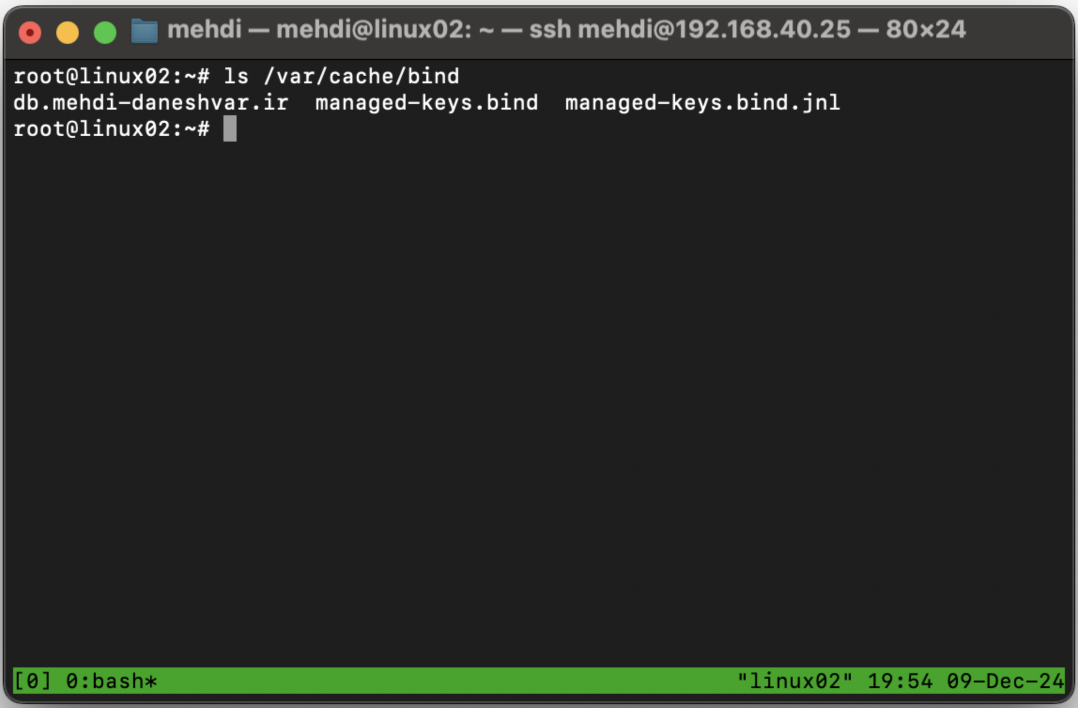
3. Restart the BIND Service on the Slave Server:

```
sudo systemctl restart bind9
```

Step 3: Test the Setup

1. On the **Slave Server**, verify that it has received the zone data from the master:

```
ls /var/cache/bind/
```

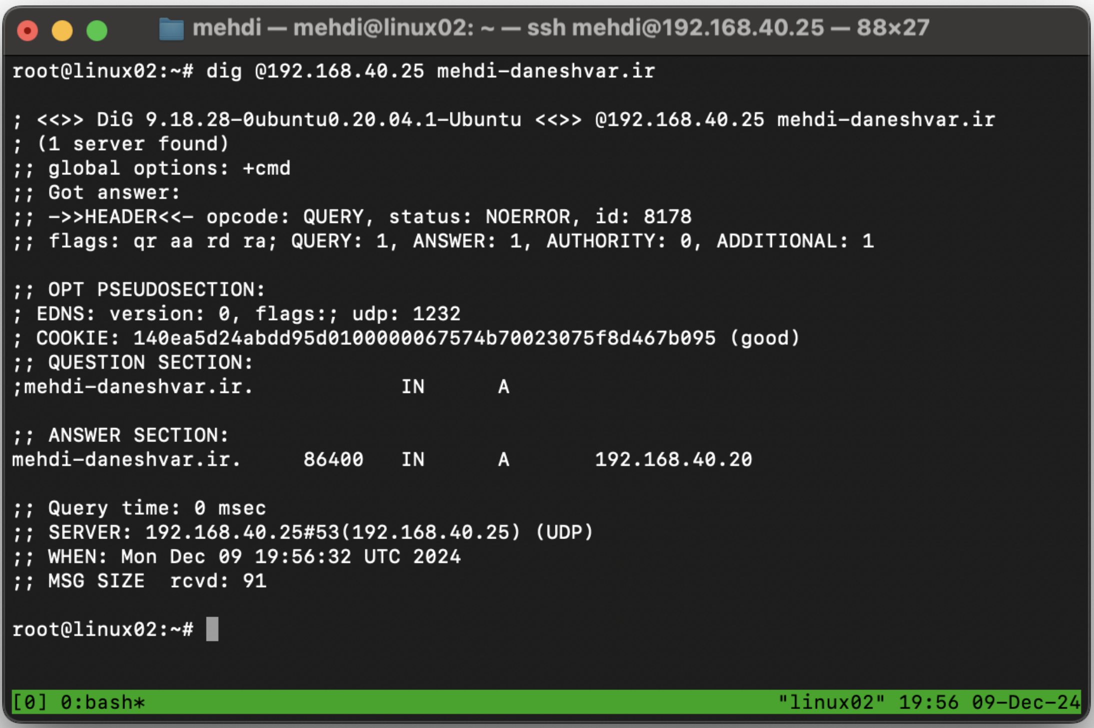


```
root@linux02:~# ls /var/cache/bind
db.mehdi-daneshvar.ir  managed-keys.bind  managed-keys.bind.jnl
root@linux02:~# 
```

```
[0] 0:bash*                                         "linux02" 19:54 09-Dec-24
```

2. Use `dig` to query the domain from the **Slave Server**:

```
dig @192.168.40.25 mehdi-daneshvar.ir
```



```
root@linux02:~# dig @192.168.40.25 mehdi-daneshvar.ir

; <<>> DiG 9.18.28-0ubuntu0.20.04.1-Ubuntu <<>> @192.168.40.25 mehdi-daneshvar.ir
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 8178
;; flags: qr aa rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 1232
; COOKIE: 140ea5d24abdd95d0100000067574b70023075f8d467b095 (good)
;; QUESTION SECTION:
;mehdi-daneshvar.ir.            IN      A

;; ANSWER SECTION:
mehdi-daneshvar.ir.     86400   IN      A       192.168.40.20

;; Query time: 0 msec
;; SERVER: 192.168.40.25#53(192.168.40.25) (UDP)
;; WHEN: Mon Dec 09 19:56:32 UTC 2024
;; MSG SIZE  rcvd: 91

root@linux02:~# 

[0] 0:bash*                                                    "linux02" 19:56 09-Dec-24
```

Notes

- Make sure that the `allow-transfer` option in the master server allows the slave's IP address.
- Ensure firewall rules allow DNS traffic (port 53) between the master and slave servers.
- Always use appropriate serial numbers in the zone file for updates to propagate correctly.