Innopolis University

SYSTEM AND NETWORKING ENGINEERING

Classical Internet Applications

LABORATORY REPORT 4

Domain Name System (2)

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Contents

1 Introduction

There are several DNS server types. Some of the differences between DNS servers are functional or relational. The following DNS server types are distinguished by functionality: Authoritative, Caching, and Forwarding. The following DNS server types differ relationally: Master (Primary), Slave (Secondary), Public, and Private servers. An area of one or more subdomains that have been delegated for management is called a DNS zone. A DNS server can be of any type or can combine several.

In addition, the domain name space is partitioned into areas (zones) to manage multiple sub-levels of domain independently. It is a good practice to implement well-organized boundaries of delegation.

Initial Settings:

- My settings:
    1. IP-address: **188.130.155.46/27**
    2. DNS implementation: **Unbound+NSD**
    3. Domain: **st13.os3.su**
    4. Delegated subdomain: **sub.st12.os3.su**
- Partner settings:
    1. IP-address: **188.130.155.45/27**
    2. DNS implementation: **BIND**
    3. Domain: **st12.os3.su**
    4. Delegated subdomain: **sub.st13.os3.su**

2 Reverse Zone Files

DNS is also used to look up hostnames by IP address.
Questions

1. Why is that useful?

   Answer:

   The most common use is for implementing reverse DNS lookups. It allows servers to place domain names within log entries, make informed spam handling decisions, and display easy-to-read details about other devices.

2. Configuring

   (a) Set up your own reverse zone for your IPv4 subnet (Figure 1, Figure 2)

```
zone:
        name: "155.130.188.in-addr.arpa"
        zonefile: "188.130.155.zone"
```

Figure 1: nsd.conf file

```
; Reverse Zone File

$ORIGIN 155.130.188.in-addr.arpa.
$TTL 1800

; Start Of Authority
@       IN      SOA     ns1.st13.os3.su.        vkaser.st13.os3.su. (
                        2017090600      ;serial number
                        3600            ;refresh
                        900             ;retry
                        1209600         ;expire
                        1800            ;ttl
                        )

; Name server
        IN      NS      ns1.st13.os3.su.

; PTR records
46      IN      PTR     ns1.st13.os3.su.
```

Figure 2: Reverse Zone File

   (b) Show that a reverse lookup works (Figure 3)

3. If Niels had been here and he had not yet implemented the reverse zone delegation, what information would you need to give him so that he can implement it?

   Answer:

   Domain name and IP address.

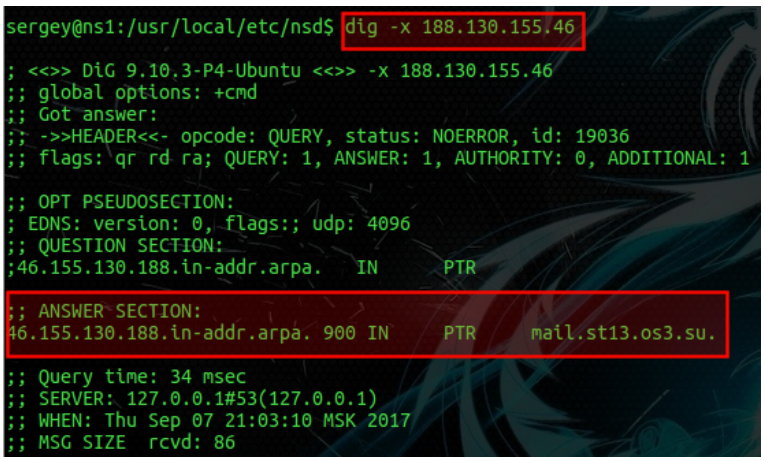

Figure 3: Reverse Query

3 Delegating Your Own Zone

4. How did you set up the subdomains and their delegation?

   (a) How did you set up the subdomains in your zone file?
   Add two records in the forward zone file:

```
            IN      NS      sub.st13.os3.su.
sub         IN      A       188.130.155.45
```

   (b) What **nsd.conf** options did you add or change?
   Add the following lines in the **unbound.conf** file:

```
stub-zone:
        name: "sub.st13.os3.su"
        stub-addr: 188.130.155.45
```

   Add the following lines in the **nsd.conf** file:

```
#       SLAVE
zone:
        name: "sub.st13.os3.su"
        zonefile: "st13.os3.su.zone"
        allow-notify: 188.130.155.45 NOKEY
        request-xfr: 188.130.155.45 NOKEY
```

   (c) Show the results of the tests that you performed.

```
$ dig sub.st13.os3.su -t SOA

; <<>> DiG 9.10.3-P4-Ubuntu <<>> sub.st13.os3.su -t SOA
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 56373
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 1, ADDITIONAL: 2
```

```
;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;sub.st13.os3.su.                IN      SOA

;; ANSWER SECTION:
sub.st13.os3.su.         86400   IN      SOA     ns1.sub.st13.os3.su. admin.
    sub.st13.os3.su. 24 7200 900 1857600 8400

;; AUTHORITY SECTION:
sub.st13.os3.su.         79715   IN      NS      ns1.sub.st13.os3.su.

;; ADDITIONAL SECTION:
ns1.sub.st13.os3.su.     79715   IN      A       188.130.155.45

;; Query time: 0 msec
;; SERVER: 127.0.0.1#53(127.0.0.1)
;; WHEN: Sun Sep 10 18:26:47 MSK 2017
;; MSG SIZE  rcvd: 120
```

3.1 Setting Up A Slave Server

5. (a) How did you set up the slave nameserver?

   Answer:

   I created zone file **sub.st12.os3.su.zone** and added it to nsd configuration file. In addition, I created new stub-zone in the unbound configuration file.

   (b) Show the changes to the configuration files that you made.

   unbound.conf file:

```
stub-zone:
        name: "sub.st12.os3.su"
        stub-addr: 127.0.0.1@3453
```

nsd.conf file:

```
#       MASTER
zone:
        name: "sub.st12.os3.su"
        zonefile: "sub.st12.os3.su.zone"
        notify: 188.130.155.45 NOKEY
        provide-xfr: 188.130.155.45 NOKEY
```

sub.st12.os3.su.zone file:

```
$ORIGIN sub.st12.os3.su.
$TTL 10

; Start Of Authority
@       IN      SOA     ns1.sub.st12.os3.su.    admin.sub.st12.os3.su. (
                        1234            ;serial number
                        3600            ;refresh
                        900             ;retry
                        1209600         ;expire
                        10              ;ttl
                        )
; Name Server
        IN      NS      ns1.sub.st12.os3.su.
```

```
; A records for name servers
@       IN      A       188.130.155.46
ns1     IN      A       188.130.155.46
www     IN      A       188.130.155.46
```

6. What happens if the primary nameserver for the subdomain fails?

   Answer:

   The Secondary nameserver will continue to respond to queries as long as the zone file created by the Master exists.

7. Considering that the slave nameserver is also the delegating nameserver, explain why this is essentially a bad setup?

   Answer:

   If the Secondary name server fails, the primary name server will not know any information about the subdomain.

4 Zone Transfers

8. Show the output of the DNS tool.

```
sergey@ns1:~$ dig axfr sub.st12.os3.su @st12.os3.su

; <<>> DiG 9.10.3-P4-Ubuntu <<>> axfr sub.st12.os3.su @st12.os3.su
;; global options: +cmd
sub.st12.os3.su.        10      IN      SOA     ns1.sub.st12.os3.su. admin.sub.
    st12.os3.su. 5678 3600 900 1209600 10
sub.st12.os3.su.        10      IN      A       188.130.155.46
sub.st12.os3.su.        10      IN      NS      ns1.sub.st12.os3.su.
ns1.sub.st12.os3.su.    10      IN      A       188.130.155.46
www.sub.st12.os3.su.    10      IN      A       188.130.155.46
sub.st12.os3.su.        10      IN      SOA     ns1.sub.st12.os3.su. admin.sub.
    st12.os3.su. 5678 3600 900 1209600 10
;; Query time: 0 msec
;; SERVER: 188.130.155.45#53(188.130.155.45)
;; WHEN: Sun Sep 10 20:37:43 MSK 2017
;; XFR size: 6 records (messages 1, bytes 192)
```

9. Describe the steps in the transfer process.

   Answer:

   The zone will be transferred during one of the following scenarios:

   - When starting the DNS Service on the secondary DNS server
   - When the refresh time expires
   - When changes are saved to the Primary Zone file and there is a Notify List (using serial number of SOA record)

   The secondary DNS server initiates query for a zone. The primary DNS server answers the request for a Zone Transfer.

10. What information did the slave server receive?

    Answer: The copy of the Primary DNS Zone file.

11. Show the changes you had to make to your configuration. (Figure 4)

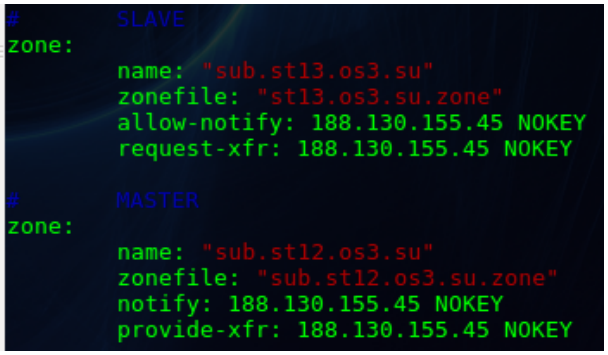

Figure 4: nsd.conf file

5 Conclusion

Most servers that are involved with implementing DNS are specialized for certain functions. The type of DNS server will mostly depend on the demands and what type of problem needs to be solved.

6 References

[1] Man page: unbound

[2] Man page: unbound.conf

[3] Man page: nsd

[4] Man page: nsd.conf

[5] Man page: nsd-control

[6] Man page: unbound-control