

Chapter 14

Configuring Linux Network Services

Part 1

DHCP and DNS service

Content

- Configuring a DHCP server on Linux
- Configuring a DNS server on Linux
- Configuring the Apache Web server on Linux
- Configuring Samba on Linux
- Configuring printing on Linux
- Configuring basic network services with xinetd
- Configuring NFS on Linux Using NIS on Linux
- Accessing
- Configuring remote access on Linux

Content

- Network services on Linux are made using Linux daemons
- You need to perform **Three actions** following
 - **Install** the appropriate daemon
 - Modify the daemon's **configuration file**, usually saved in /etc, to configure how it behaves
 - **Start /stop/restart** the service using the appropriate init script in the /etc/init.d (SuSE)

DHCP service

- Overview
- Install
- Configure
- Example

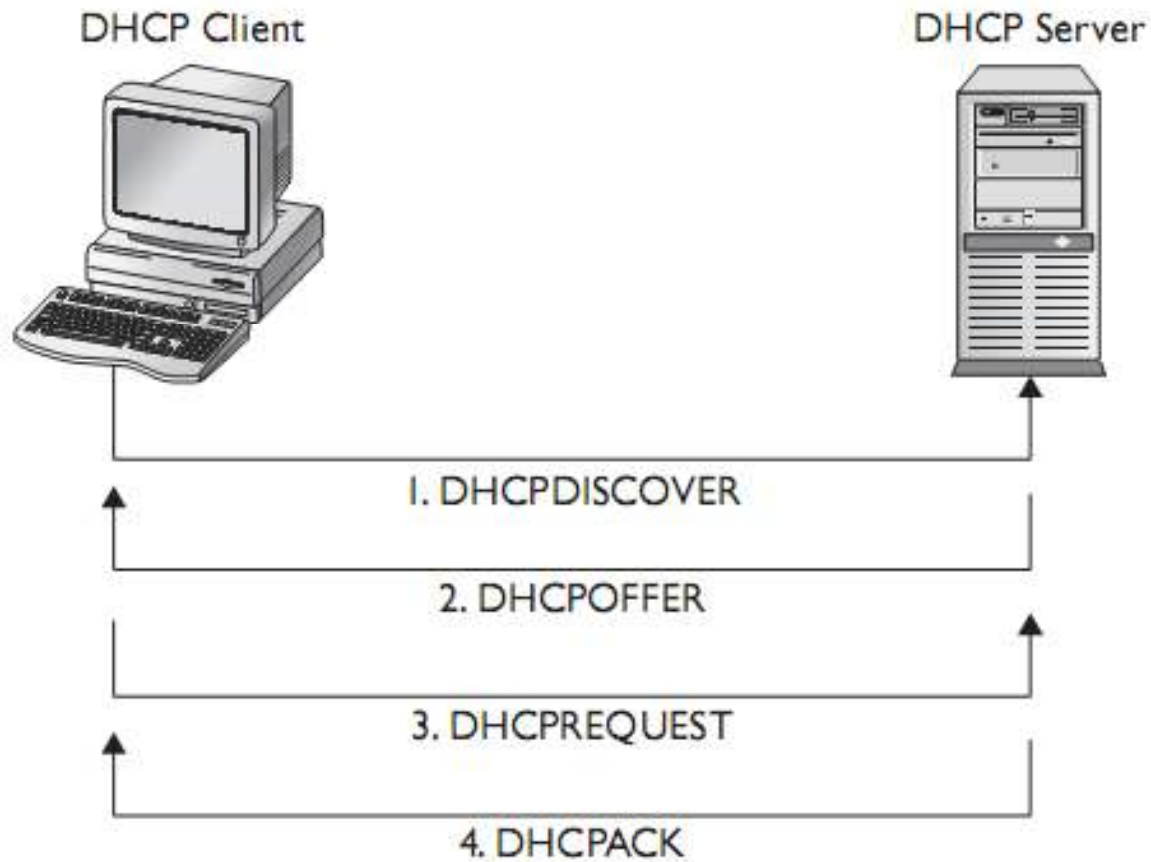
DHCP service Overview

- The DHCP service automatically assign IP address to hosts when they boot up
 - IP address is selected that is the next available address from the range
 - IP address is assigned to the host in the fixed period of time, called a lease (in seconds)
 - The DHCP service can configured to deliver an IP address, a subnet mask, and the IP address of DNS server and the default gateway router

DHCP service Overview

- DHCP is a client-server protocol
 - Defined in RFC2131
 - DHCP is implemented by a DHCP service running on the host (DHCP server) and a DHCP client running on the remains of hosts
- The DHCP client and the DHCP server communicate with each other using the process in this figure

DHCP service Overview

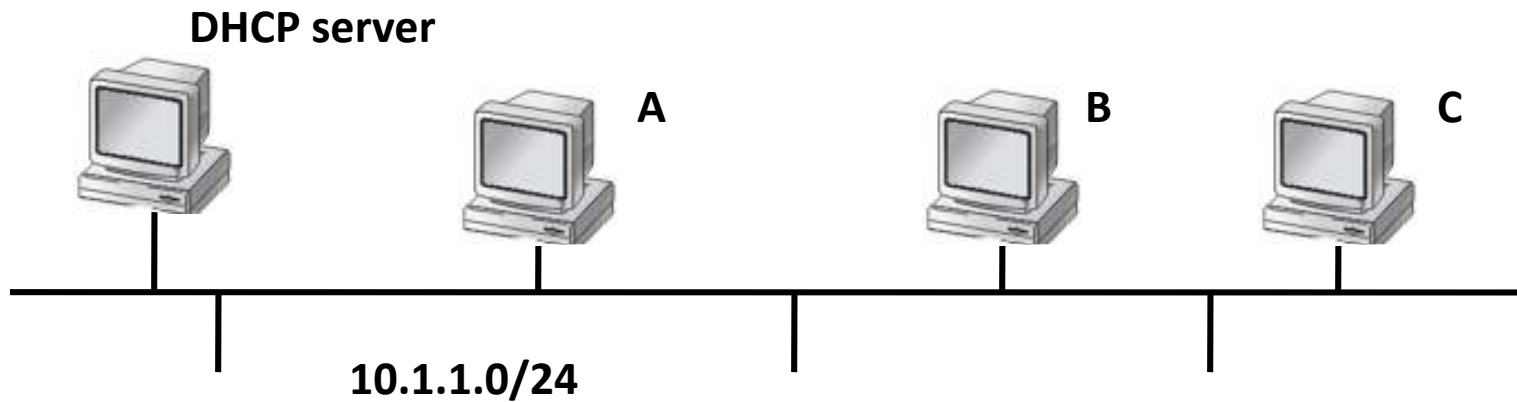


DHCP service

Overview

- When a host that is configured with the DHCP client is booted, it sends out a **DHCPDISCOVER** broadcast.
- The DHCP server receives the broadcast and selects an IP address from its range of available addresses and sends back to the host in a **DHCPOFFER** message. (*)
- The DHCP client reviews the offers, and then selects the offer it wants to accept. The DHCP client then sends a **DHCPREQUEST** broadcast that informs the DHCP server it has accepted, and also informs the other DHCP servers (if exists) it has rejected.
- The DHCP server whose offer was accepted responds to the client to the client with a **DHCPACK** message, which contains : IP address, Subnet mask, ..., lease information.

DHCP service Implementation



DHCP service

Implementation on the DHCP server

- Installing the dhcpd Daemon

dhcp

dhcp-server

dhcp-tools

- Configuring the dhcpd Daemon by the **`/etc/dhcpd.conf`** file
- Start the dhcpd Daemon by running **`/etc/init.d/dhcpd start`**

DHCP service

Implementation on the DHCP clients

- Installing the dhcp client

dhcpcd

dhcp-client

- Configuring the dhcp client by the

/etc/dhclient.conf file

- Invoke the request for IP address by running

dhclient <interface>

DHCP service

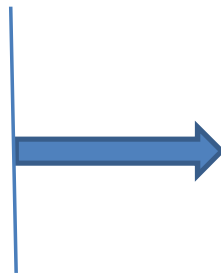
Installing the dhcpd Daemon

- Installs the following packages on the DHCP server:

dhcp

dhcp-server

dhcp-tools



The dhcpd init script file
 /etc/init.d/dhcpd
The binary file
 /usr/sbin/dhcpd
The configure file
 /etc/dhcpd.conf
...

DHCP service

Configuring the dhcpd Daemon

- The **/etc/dhcpd.conf** file consists:
 - The global options
 - Domain name
 - Domain name servers
 - Default lease time, Max lease time
 -
 - The subnet statements for every network it is attached to
 - Range of address
 - Routers, subnet-mask
 - Default lease time, Max lease time
 - The specific host statements (assign a fixed address)
 -
 - ...

<View details by enter man dhcpd and man dhcpd.conf >

```
# cat /etc/dhcpd.conf
option domain-name "example-company.com";
option domain-name-servers 10.1.1.3, 10.1.1.4;
```

```
max-lease-time 3600;
default-lease-time 600;
ddns-update-style none;
```

```
subnet 10.1.1.0 netmask 255.255.255.0 {
    option routers 10.1.1.1;
    option subnet-mask 255.255.255.0;
    range 10.1.1.10 10.1.1.50;
    default-lease-time 14400;
    max-lease-time 172800;

    host ns1 {
        hardware ethernet 00:04:ac:3f:45:9f;
        fixed-address 10.1.1.3;
    }
}
```

```
subnet 10.1.2.0 netmask 255.255.255.0 {
}
```

The global options

The statements for the
10.1.1.0/24 network
segment

The statements for the
10.1.2.0/24 network
segment

DHCP service

Management dhcpd Daemon

- Start dhcp service

```
/etc/init.d/dhcpd start
```

Or

```
service dhcpd start
```

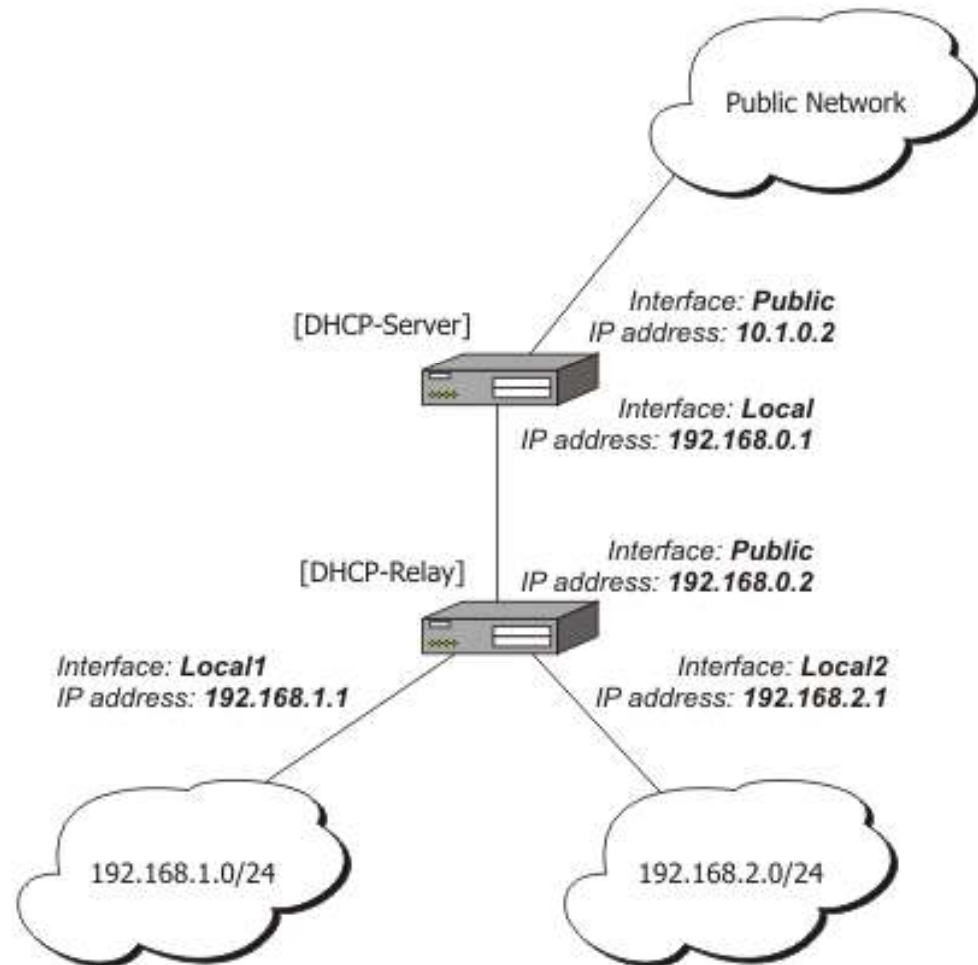
Or

```
rcdhcpd start
```

DHCP service

DHCP relay

- DHCP servers can provide IP addresses for multiple subnets.
- DHCP relay agents allow DHCP clients on subnets to communicate with DHCP servers
 - usually installed on routers



DHCP service

DHCP relay

- On the DHCP server
 - Open the **/etc/dhcpd.conf** file, add the subnets that DHCP server supply
 - Open the **/etc/sysconfig/dhcpd** file, check the interface listening dhcp clients
 - Add the **default gateway** to the routing table of the DHCP server as a result it communicate with the dhcp clients on the subnets

DHCP service

DHCP relay

- On the DHCP relay
 - Operate as a **router**
 - Install the package : **dhcp-relay**
 - Open the **/etc/sysconfig/dhcrelay** file, check the interfaces listening dhcp clients, IP address of DHCP server
 - Start service by running **service dhcrelay start**

DNS service

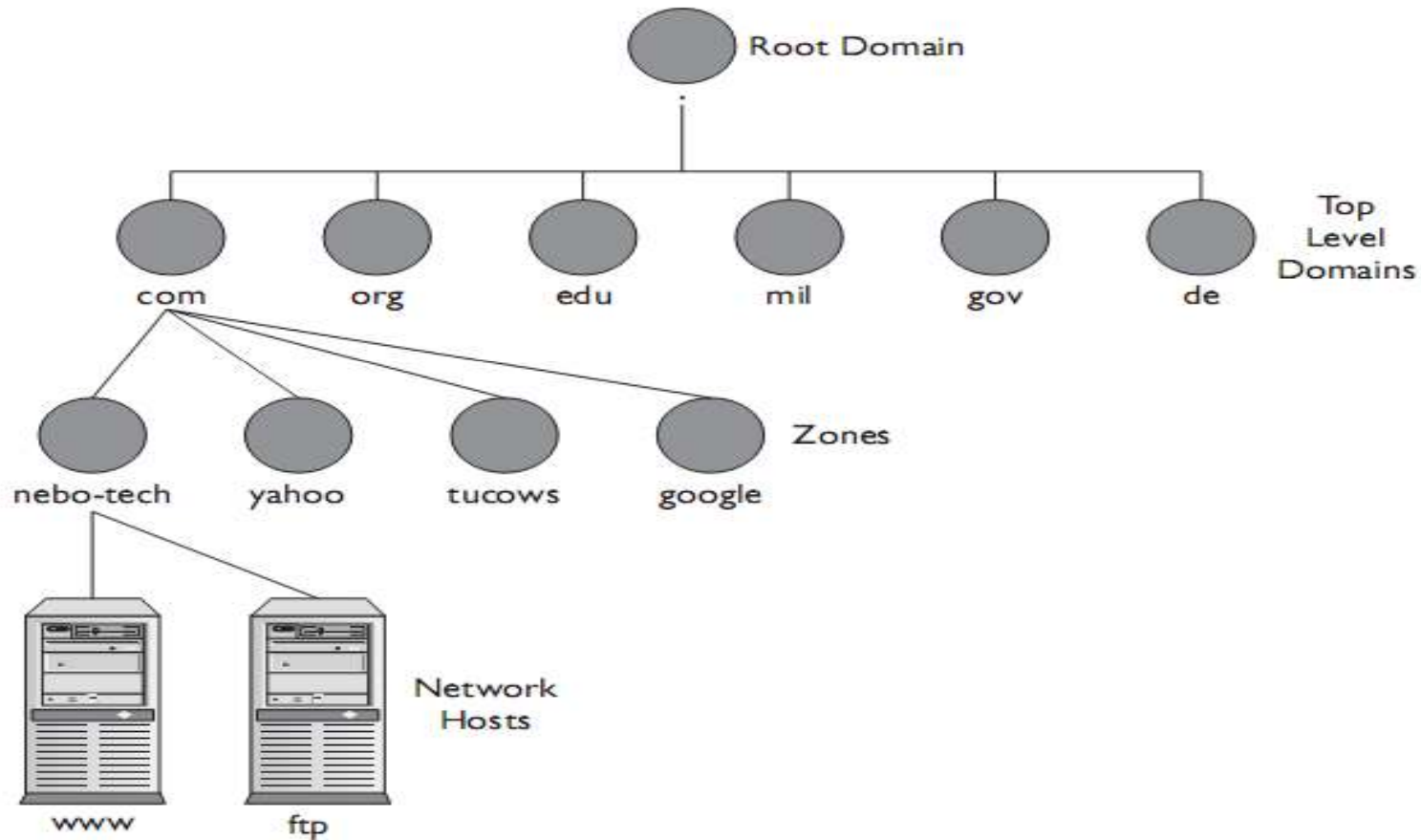
- DNS service
 - To be the service that be used to resolve domain names into IP addresses (and vice versa)
 - TCP protocol, Port 53
 - DNS service and hosts files
 - The **/etc/host.conf** file

```
order  hosts, bind
multi  on
```

Domain Name System (DNS)

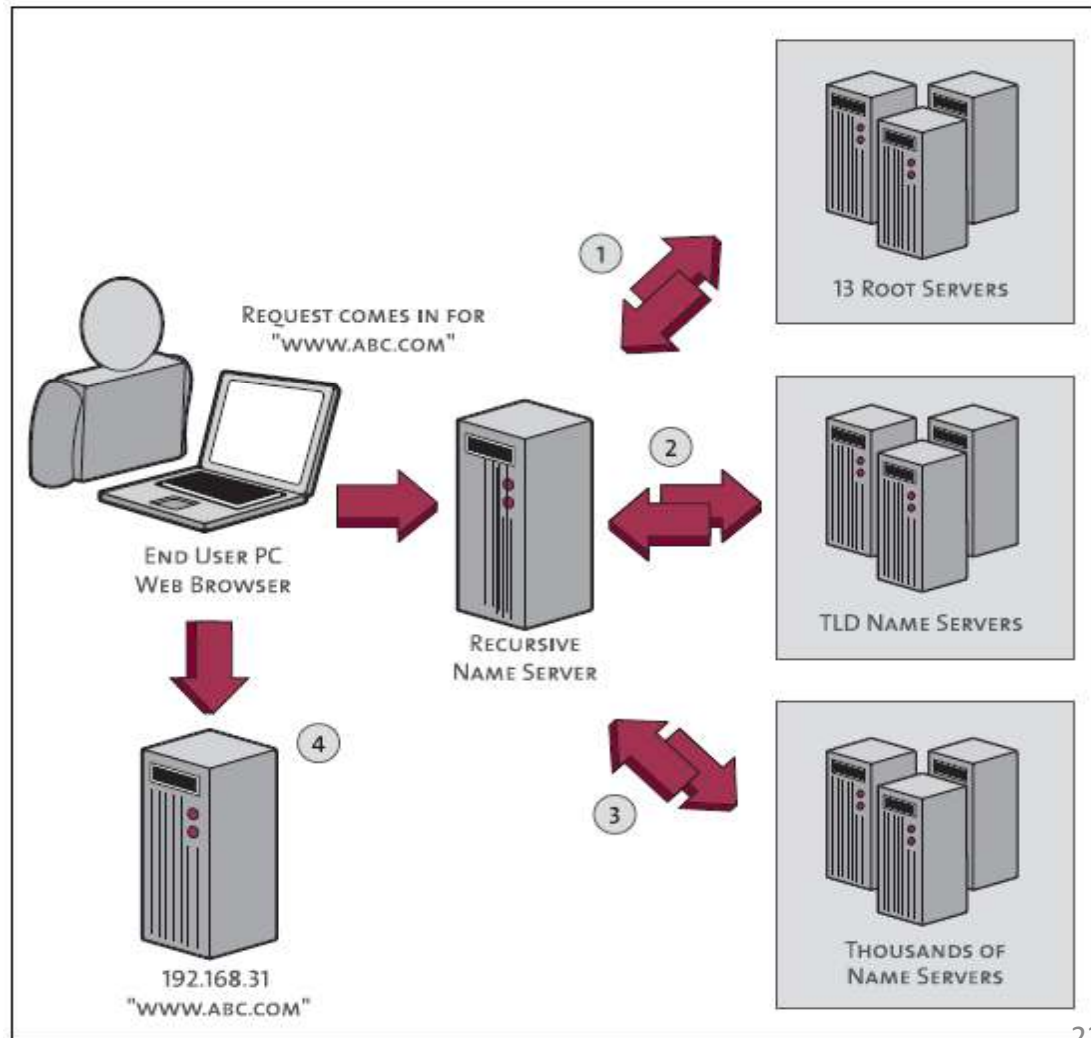
- DNS is a hierarchical and distributed database containing various types data, including host names and domain names
- The names form a hierarchical tree structure
 - A Fully Qualified Domain Name (FQDN) of the host,
ex. **www.nebo-tech.com.**
www.hui.edu.vn.

Domain Name System (DNS)



Domain Name System (DNS)

How DNS works



DNS servers

- DNS server (name server)
 - Stores data of the domain that it is “authoritative”
 - Serves the request for resolve the name from all clients
 - Communicates the other name servers
 - Caches lookups for other domains
- Classification
 - Master name servers
 - Slave name servers
 - Cache-only name servers
- Forward lookup and reverse lookup
 - DNS servers can perform to resolve a hostname into an IP address , or resolve an IP address into a host name

Tools

- Tools can used to test grammar for the configuration files

named-checkconf **/etc/named.conf**

named-checkzone **zone_name** **zone_file**

- Tools can used to send name resolution requests to named daemon

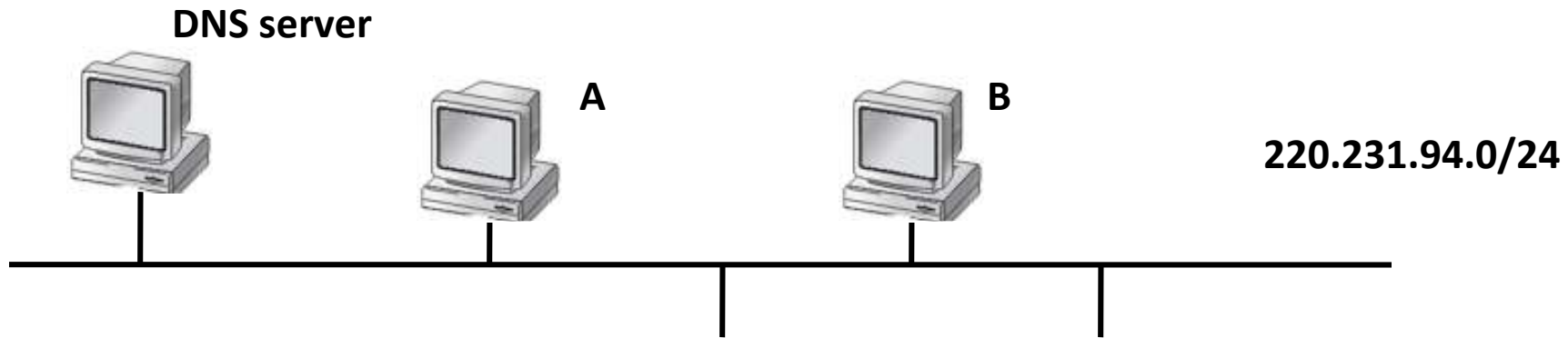
host

nslookup

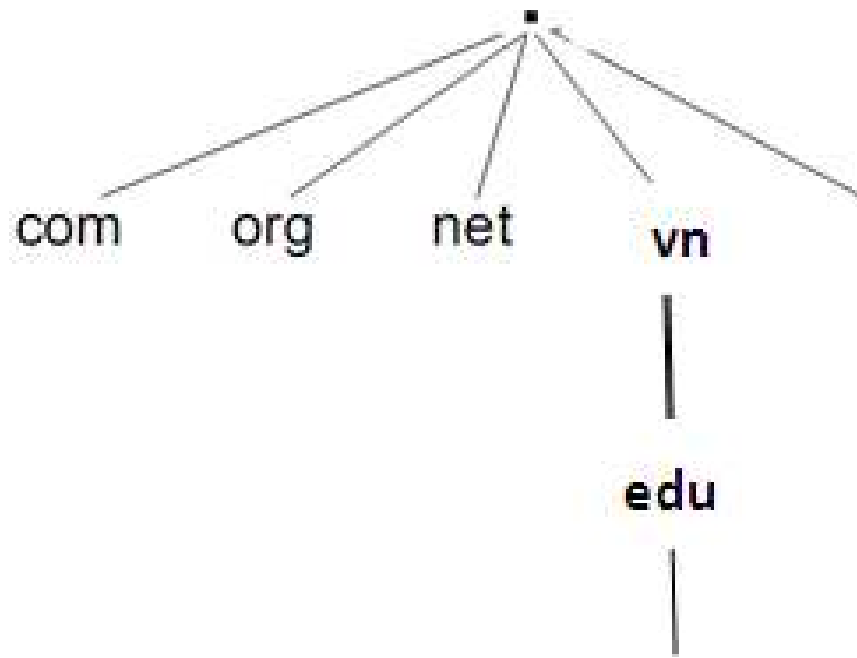
dig

Example

- Domain `cse.hui.edu.vn`.



DNS server : 220.231.94.1 nscse
Client A : 220.231.94.2 client1
Client B : 220.231.94.3 client2



hui 220.231.93.0/24

www.hui.edu.vn
 egov.hui.edu.vn
 nshui.hui.edu.vn



cse 220.231.94.0/24



220.231.94.1
220.231.94.2
220.231.94.3

nscse.cse.hui.edu.vn
 client1.cse.hui.edu.vn
 client2.cse.hui.edu.vn

Example Implementation

- Assign IP addresses, and hostnames to the clients
 - Test connections by :
 - ping <destination_IP_address>
 - ping <destination_hostname> (-> result ?)
- Install and configure the DNS server
 - Test on the DNS server
- Configure the DNS clients
 - Test by sending queries from the clients

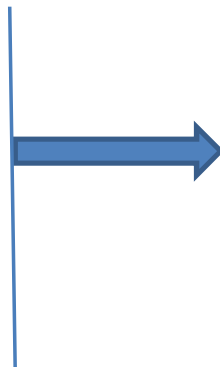
Install and configure the DNS server

- (1) Install a *named* daemon by installing *BIND* package
- (2) Configure the named Daemon
- (3) Make **zone files** for this domain
 - The forward-lookup and the reverse-lookup zone file
 - Test grammar
- (4) Start named daemon
- (5) Test on the DNS server

Install and configure the DNS server

- (1) On the DNS server, you need to install a **named** daemon by installing **BIND package**.

- **bind**
- **bind-chrootenv**
- **bind-libs**
- **bind-utils**



The named init script file
 /etc/init.d/named
The binary file
 /usr/sbin/named
The configure file
 /etc/named.conf

...

Install and configure the DNS server

- (2) Configure the named Daemon
 - **/etc/named.conf** file
 - Include the directives : options, logging , zone

Install and configure the DNS server

```
# A description of all available options can be found in
# /usr/share/doc/packages/bind/misc/options.

options {

    # The directory statement defines the name server's working directory
    directory "/var/lib/named";

    # Write dump and statistics file to the log subdirectory.  The
    # pathnames are relative to the chroot jail.

    dump-file "/var/log/named_dump.db";
    statistics-file "/var/log/named.stats";

    # The forwarders record contains a list of servers to which queries
    # should be forwarded.  Enable this line and modify the IP address to
    # your provider's name server.  Up to three servers may be listed.

    #forwarders { 192.0.2.1; 192.0.2.2; };

    # Enable the next entry to prefer usage of the name server declared i
```

n

./named.conf lines 14-35/137 29%

Install and configure the DNS server

```
# The following zone definitions don't need any modification. The first one
# is the definition of the root name servers. The second one defines
# localhost while the third defines the reverse lookup for localhost.

zone "." in {
    type hint;
    file "root.hint";
};

zone "localhost" in {
    type master;
    file "localhost.zone";
};

zone "0.0.127.in-addr.arpa" in {
    type master;
    file "127.0.0.zone";
};

# Include the meta include file generated by createNamedConfInclude. This
# includes all files as configured in NAMED_CONF_INCLUDE_FILES from
# /etc/sysconfig/named

./named.conf lines 105-127/137 91%
```

Install and configure the DNS server

- (2) Configure the named Daemon
 - Add the zones for “cse.hui.edu.vn” domain

```
zone “cse.hui.edu.vn” in {  
    type master;  
    file “cse.hui.zone” ;  
};  
zone “94.231.220.in-addr.arpa” in {  
    type master;  
    file “reverse.cse.hui.zone”;  
};
```

Install and configure the DNS server

- (3a) Make the forward-lookup zone file for this domain

```
# cat /var/lib/named/cse.hui.zone
; Default TTL
$TTL 86400
;NAME      TTL      CLASS   TYPE      RDATA
@          IN       IN      SOA       nscse.cse.hui.edu.vn. root.cse.hui.edu.vn. (
                                2002061001 ; Serial
                                3600           ; Refresh
                                300            ; Retry
                                3600000        ; Expire
                                86400         ) ; Minimum TTL
                                IN          NS       nscse.cse.hui.edu.vn.
nscse     IN       A       220.231.94.1
client1   IN       A       220.231.94.2
client2   IN       A       220.231.94.3
```

Install and configure the DNS server

- (3b) Make the reverse-lookup zone file for this domain

```
# cat /var/lib/named/reverse.cse.hui.zone
; Default TTL
$TTL 86400
;NAME      TTL      CLASS      TYPE      RDATA
@          IN       IN         SOA       nscse.cse.hui.edu.vn. root.cse.hui.edu.vn. (
                2002061001 ; Serial
                3600           ; Refresh
                300            ; Retry
                3600000        ; Expire
                86400         ) ; Minimum TTL
                IN         NS         nscse.cse.hui.edu.vn.
1          IN         PTR        nscse.cse.hui.edu.vn.
2          IN         PTR        client1.cse.hui.edu.vn.
3          IN         PTR        client2.cse.hui.edu.vn.
```

Install and configure the DNS server

- (3c) Test grammar

```
named-checkconf /etc/named.conf
```

```
named-checkzone cse.hui.edu.vn /var/lib/named/cse.hui.zone
```

- (4) Start named daemon

```
rcnamed start
```

- (5) Test on the DNS server:

- Open the **/etc/resolv.conf**, add the line:

```
nameserver 127.0.0.1
```

- Lookup the domain name

```
nslookup nscse.cse.hui.edu.vn
```

```
nslookup 220.231.94.1
```

Configure the DNS clients

- Open the **/etc/resolv.conf** , adding the line
nameserver 220.231.94.1
domain cse.hui.edu.vn
- Update the /etc/named.conf file

```
# The listen-on record contains a list of local network interfaces to
# listen on.  Optionally the port can be specified.  Default is to
# listen on all interfaces found on your system.  The default port is
# 53.

listen-on port 53 { 127.0.0.1;any; };

# The allow-query record contains a list of networks or IP addresses
# to accept and deny queries from.  The default is to allow queries
# from all hosts.

allow-query { 127.0.0.1;any; };
```

Test lookups from the clients

```
nslookup nscse.cse.hui.edu.vn
```

```
nslookup 220.231.94.1
```

```
ping nscse.cse.hui.edu.vn
```