Linux for Devices

Module-2, Lecture-1

By: Dr. A K Yadav (9911375598)
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Introduction to networking in Linux

- Wired network
- Wireless network
- Three types of Linux systems
- 1. Desktop/laptop networking
- 2. Server networking
- 3. Enterprise networking

Configuring Networking for Desktops

- General activities that occur when Linux is set to automatically connect to the Internet with NetworkManager:
- Activate network interfaces
- Request DHCP service
- Get response from DHCP server
  - ✓IP address
  - ✓Subnet mask
  - ✓Lease time
  - ✓Domain name server
  - ✓Default gateway
- Update local network settings

Checking your network interfaces

- Checking your network from NetworkManager
- Checking your network from the command line
- Viewing network interfaces: ip addr show, ifconfig wlan0
- Checking connectivity to remote systems: ping
- Checking routing information: route, traceroute google.com
- Viewing the host and domain names: hostname, dnsdomainname

- Configuring network interfaces
- Configuring a network proxy connection
- Configuring Networking for Servers
  - Using system-config-network
- Configuring Networking in the Enterprise

Configuring Networking for Servers


```
# service NetworkManager stop
# service network restart
# chkconfig NetworkManager off
# chkconfig network on
```

```
# systemctl stop NetworkManager.service
# systemctl disable NetworkManager.service
# service network restart
# chkconfig network on
```

system-config-network

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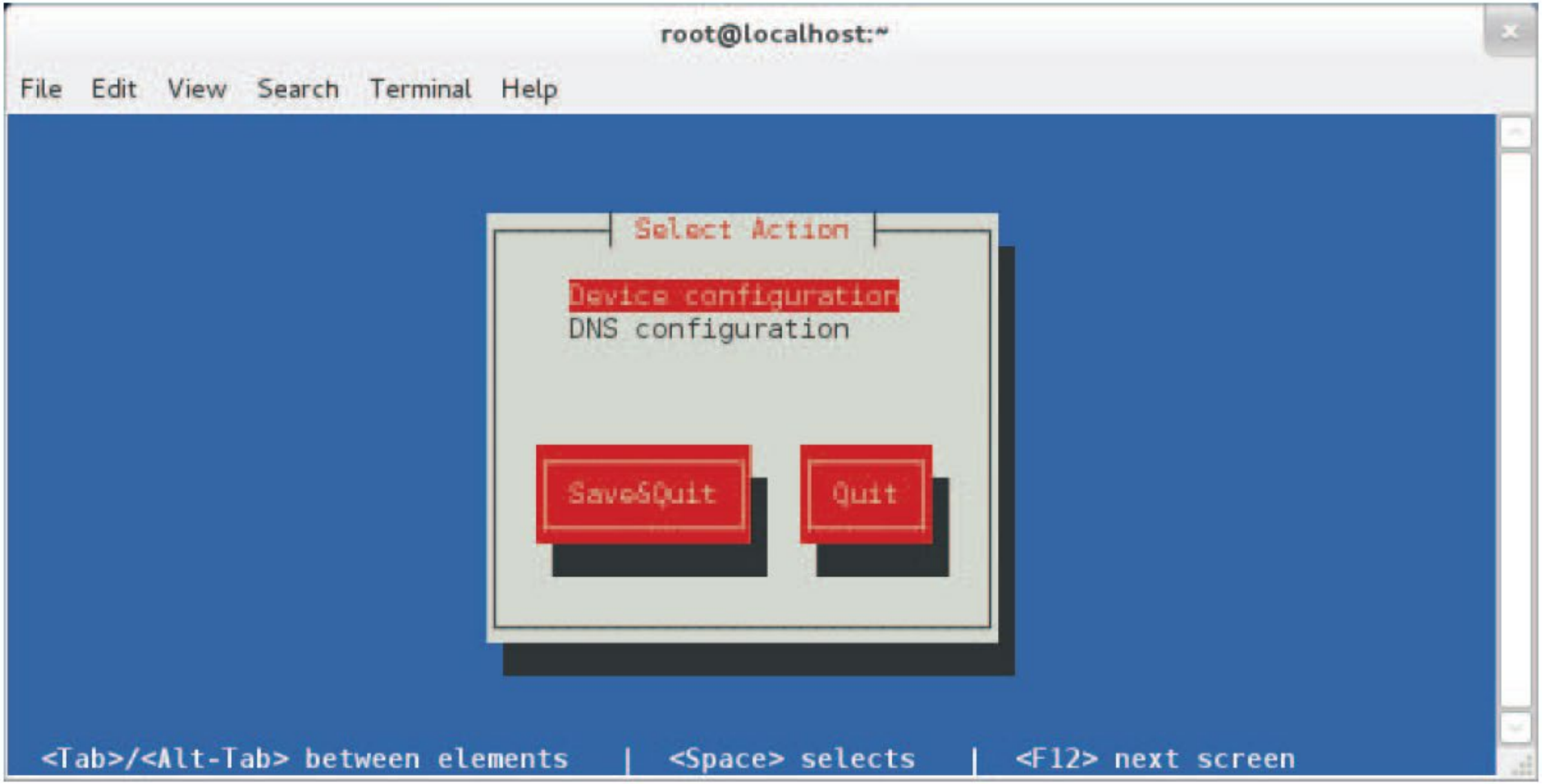
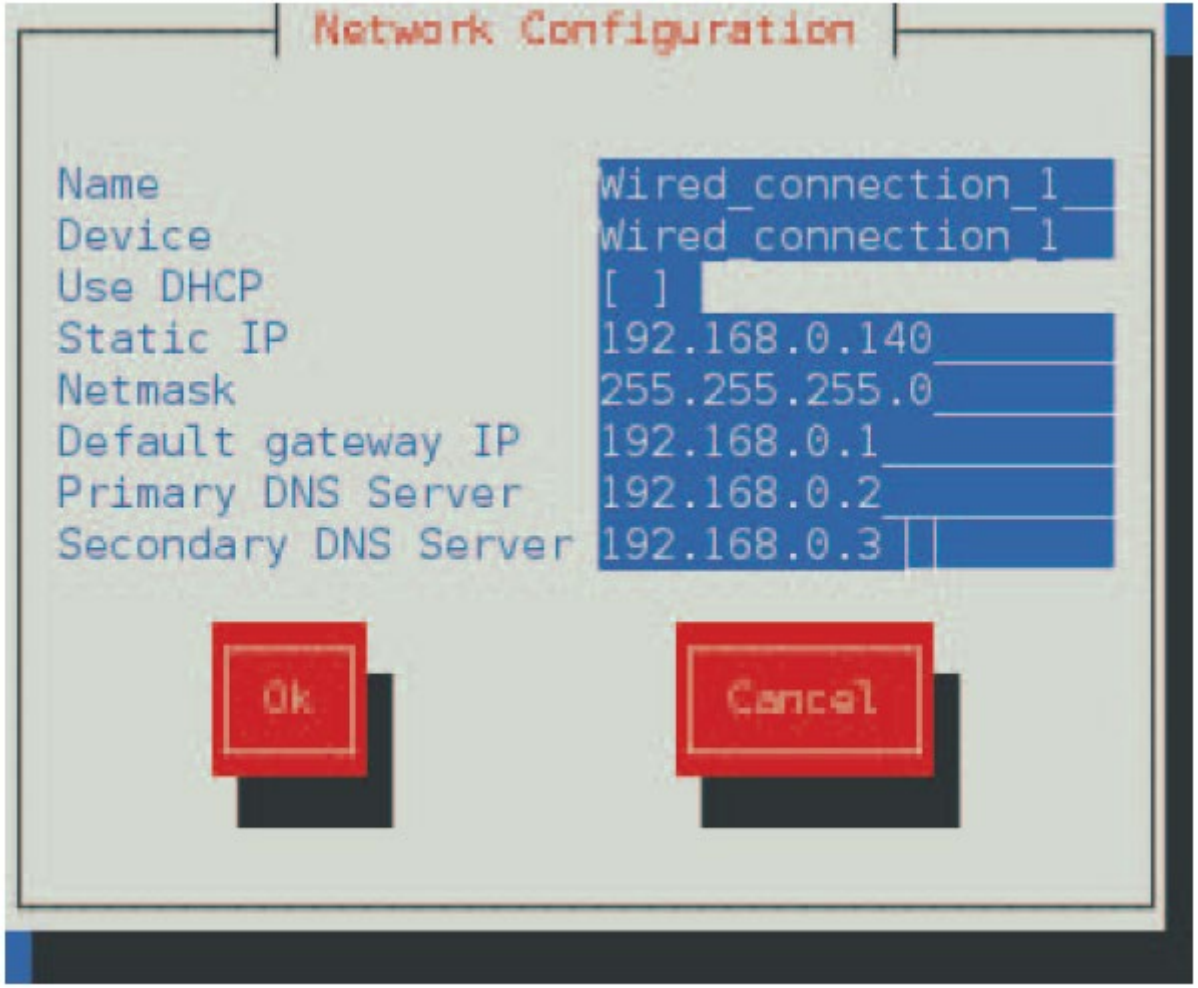
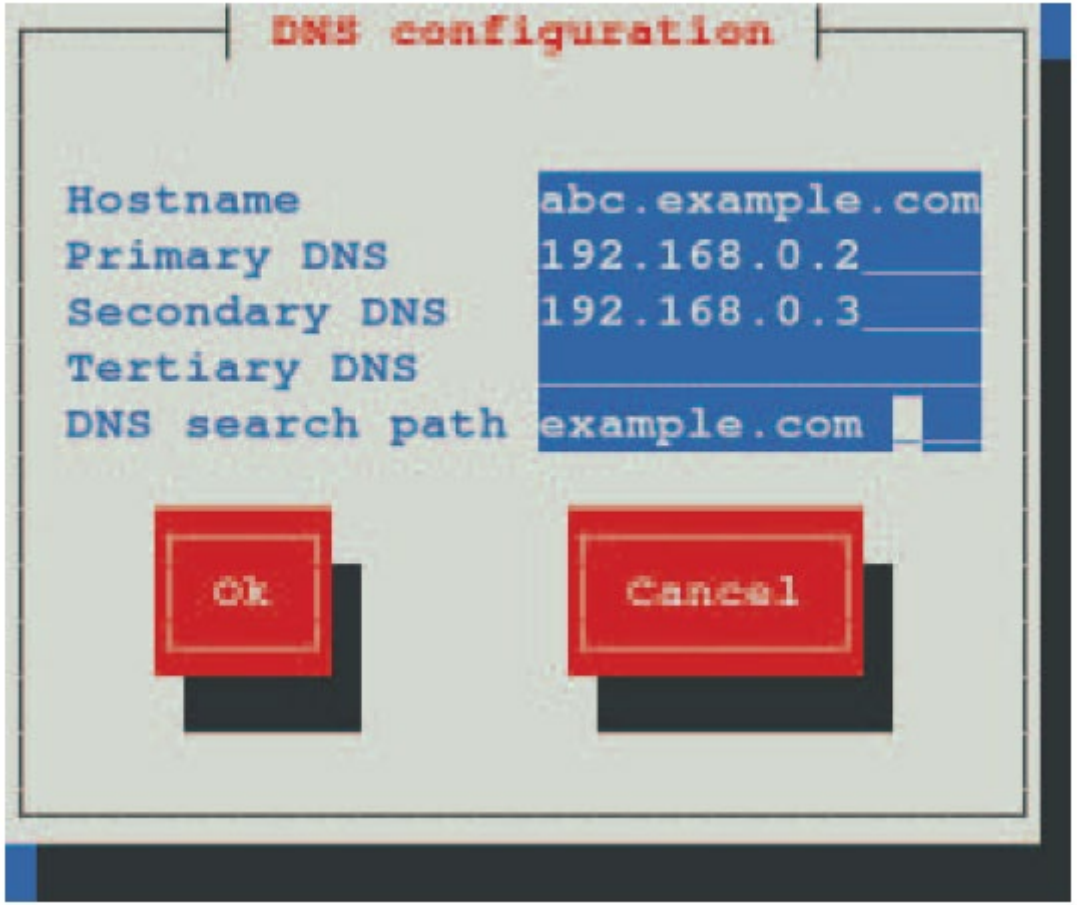


Choosing device configuration



Choosing DNS configuration



Linux for Devices

Module-2, Lecture-2

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system-config-network

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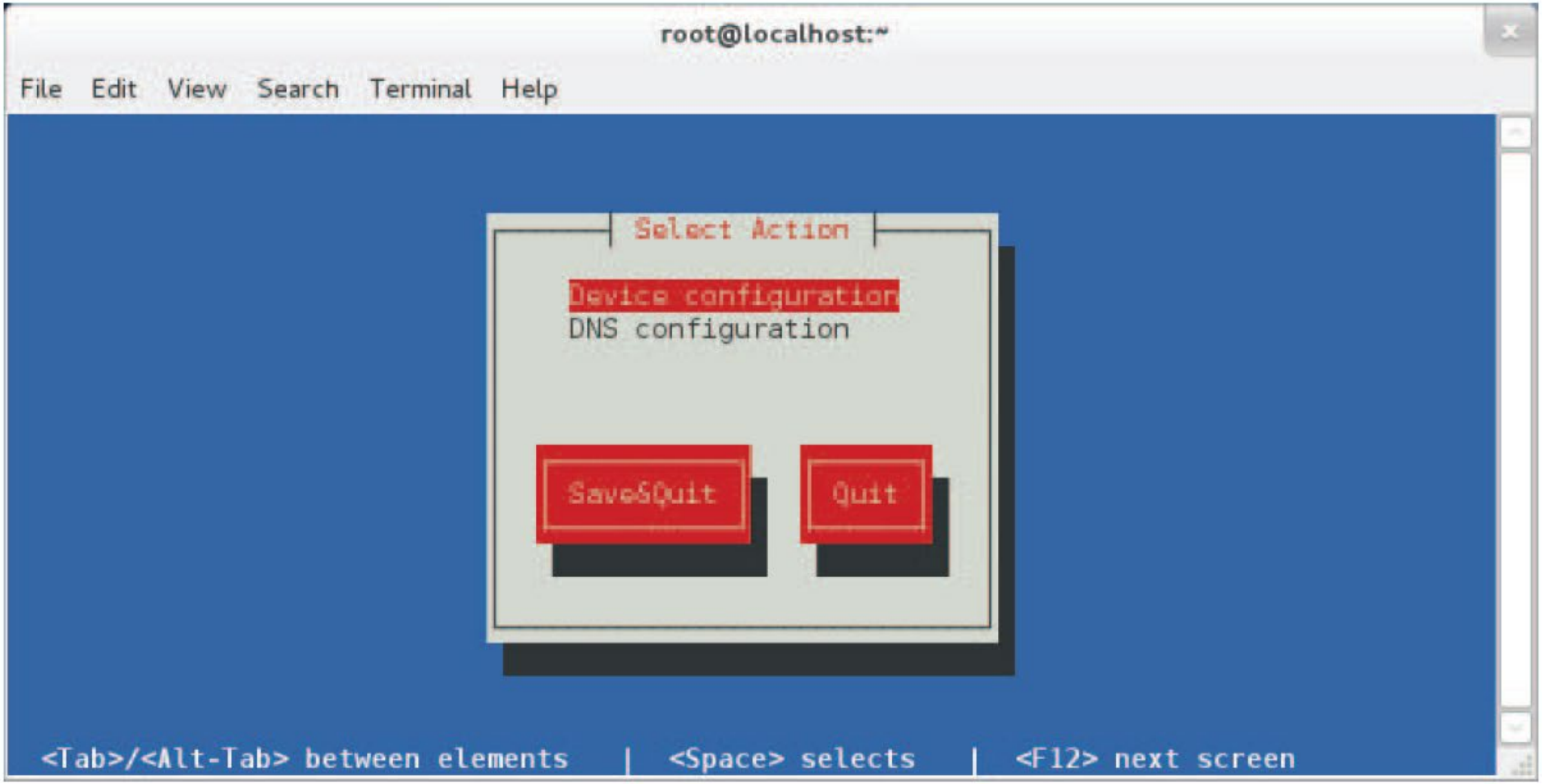
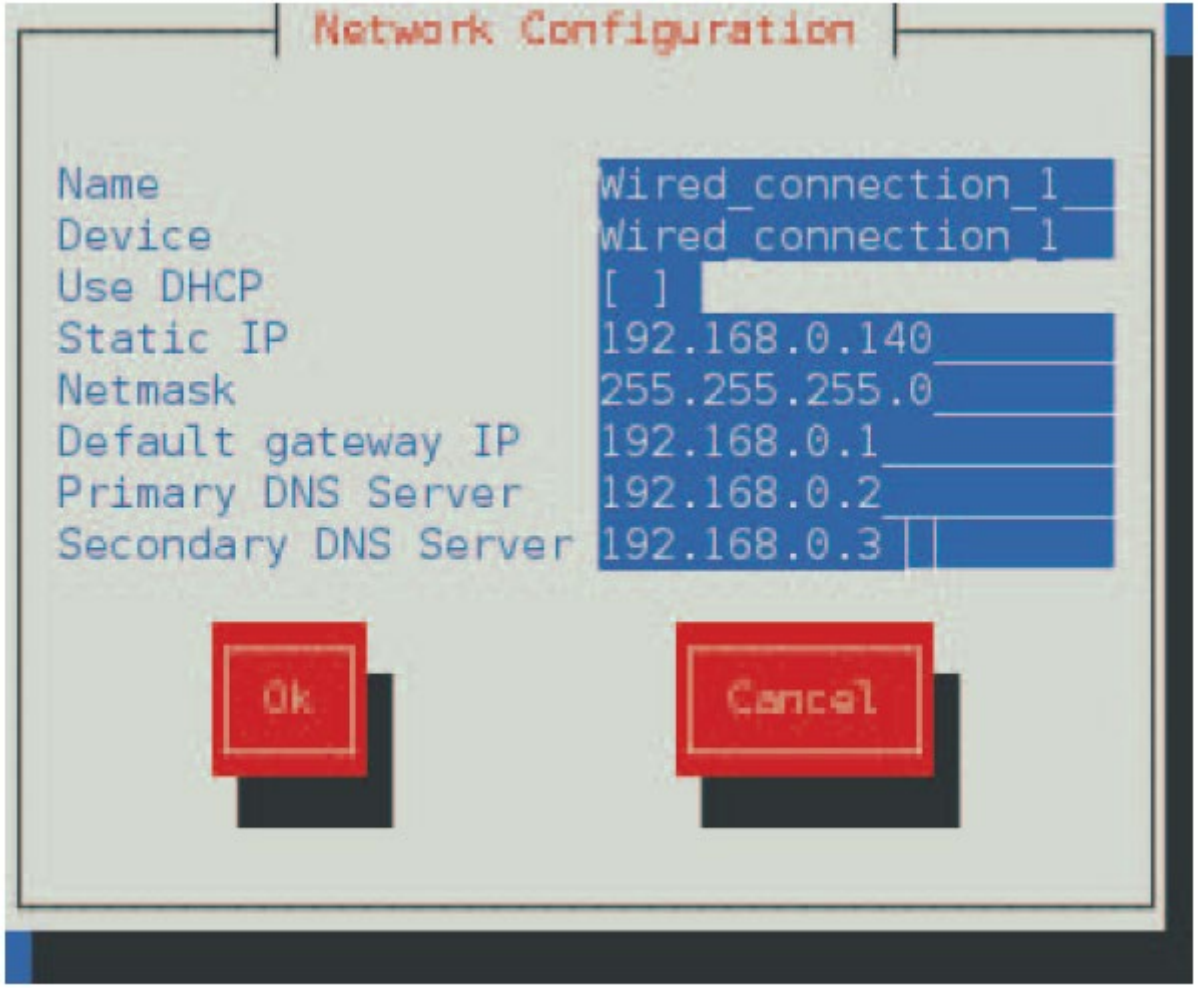
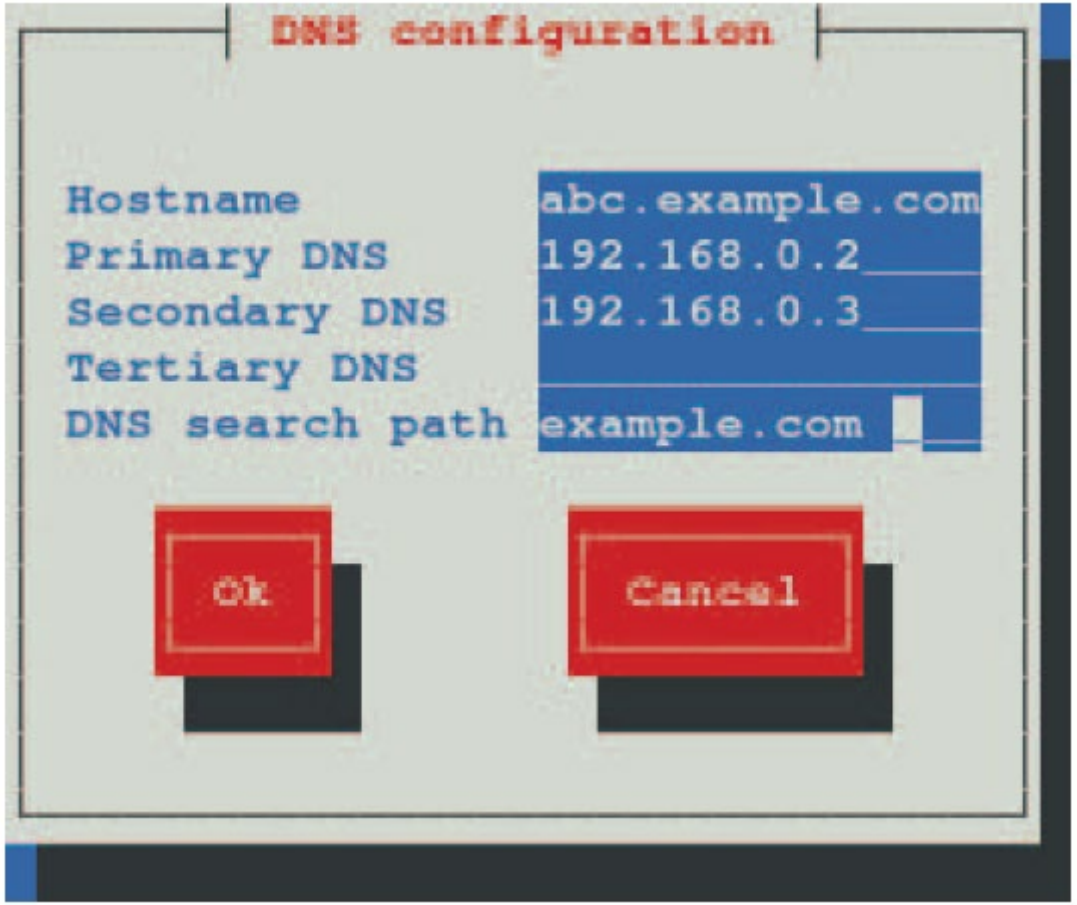


Choosing device configuration



Choosing DNS configuration



Understanding networking configuration files

- Network interface files: /etc/sysconfig/network-scripts/ifcfg-[interface]

```
DEVICE=eth0
HWADDR=F0:DE:F1:28:46:D9
TYPE=Ethernet
BOOTPROTO=dhcp
ONBOOT=yes
NM_CONTROLLED=no
USERCTL=no
```

```
DEVICE=eth1
HWADDR=00:1B:21:0A:E8:5E
TYPE=Ethernet
BOOTPROTO=none
ONBOOT=yes
NM_CONTROLLED=no
USERCTL=no
IPADDR=192.168.0.140
NETMASK=255.255.255.0
GATEWAY=192.168.0.1
```

- For other settings you can use in ifcfg files, check the sysconfig.txt file in the /usr/share/doc/initscripts-* directory.

- /etc/sysconfig/network file

```
NETWORKING=yes
HOSTNAME=abc.example.com
GATEWAY=192.168.0.1
```

- /etc/hosts file

```
127.0.0.1    localhost.localdomain    localhost
::1          mycomputer     chris   localhost6.localdomain6  localhost6
192.168.0.201  node1.example.com node1 joe
192.168.0.202  node2.example.com node2 sally
```

- /etc/resolv.conf file

```
# Generated by NetworkManager
nameserver 192.168.0.2
nameserver 192.168.0.3
```

- /etc/nsswitch.conf

```
hosts:      files dns
```

Configuring Networking in the Enterprise

- Configuring Linux as a router
- Configuring Linux as a DHCP server
- Configuring Linux as a DNS server
- Configuring Linux as a proxy server
- Configuring VLANs in Linux

Linux for Devices

Module-2, Lecture-3

By: Dr. A K Yadav (9911375598)
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File Transfer Protocol (FTP)

- Understanding FTP
- Installing the vsftpd FTP Server
- Starting the vsftpd Service
- Securing Your FTP Server
- Opening up your firewall for FTP
- Allowing FTP access in TCP wrappers
- Configuring Your FTP Server

Linux for Devices

Module-2, Lecture-3

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Study of Docker

- Docker founded by Solomon Hykes in 2010 as dotCloud
- Docker is an open-source containerization platform. It enables developers to package applications into containers—standardized executable components combining application source code with the operating system (OS) libraries and dependencies required to run that code in any environment

Study of Docker

- Docker is a set of platform as a service products that use OS-level virtualization to deliver software in packages called containers. Containers are isolated from one another and bundle their own software, libraries and configuration files; they can communicate with each other through well-defined channels
- Docker is an open platform for developing, shipping, and running applications. Docker enables you to separate your applications from your infrastructure so you can deliver software quickly. With Docker, you can manage your infrastructure in the same ways you manage your applications.

Linux for Devices

Module-2, Lecture-4

By: Dr. A K Yadav (9911375598)
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Domain Name System (DNS)

- Each computer connected to a TCP/IP network, such as the Internet, is identified by its own IP address.
- IP addresses are difficult to remember, so a domain name version of each IP address is also used to identify a host.
- A domain name consists of two parts, the hostname and the domain
- The hostname is the computer's specific name, and the domain identifies the network of which the computer is a part

- The domains usually have extensions that identify the type of host.
- For example, .edu is used for educational institutions and .com is used for businesses.
- International domains usually have extensions that indicate the country they are in, such as .de for Germany, .au for Australia and .in for India.
- The combination of a hostname, domain, and extension forms a unique name by which a computer can be referenced.
- The domain can be split into further subdomains.

- To provide the service of translating domain addresses to IP addresses, databases of domain names were developed and placed on their own servers.
- To find the IP address of a domain name, you send a query to a name server, which then looks up the IP address for you and sends it back.
- In a large network, several name servers can cover different parts of the network.
- If a name server cannot find a particular IP address, it sends the query on to another name server that is more likely to have it.

/etc/hosts

```
127.0.0.1               localhost.localdomain localhost turtle.mytrek.com
::1                     localhost6.localdomain6  localhost6
192.168.0.1             turtle.mytrek.com
192.168.0.2             rabbit.mytrek.com
192.168.34.56           pango1.mytrain.com
```

/etc/resolv.conf

```
search  mytrek.com   mytrain.com
nameserver  192.168.0.1
nameserver  192.168.0.3
```

/etc/host.conf

Option	Description
`order`	Specifies sequence of name resolution methods: **`hosts`** Checks for name in the local **/etc/host** file **`bind`** Queries a DNS name server for an address **`nis`** Uses Network Information Service protocol to obtain an address
`alert`	Checks addresses of remote sites attempting to access your system; you turn it on or off with the **`on`** and **`off`** options
`nospoof`	Confirms addresses of remote sites attempting to access your system
`trim`	Checks your localhost's file; removes the domain name and checks only for the hostname; enables you to use only a hostname in your host file for an IP address
`multi`	Checks your localhost's file; allows a host to have several IP addresses; you turn it on or off with the **`on`** and **`off`** options

/etc/host.conf

```
# host.conf file
# Lookup names in host file and then check DNS
order bind host
# There are no multiple addresses
multi off
```

/etc/nsswitch.conf: Name Service Switch

File	Description
aliases	Mail aliases, used by Sendmail
ethers	Ethernet numbers
group	Groups of users
hosts	Hostnames and numbers
netgroup	Networkwide list of hosts and users, used for access rules; C libraries before glibc 2.1 only support netgroups over NIS
network	Network names and numbers
passwd	User passwords
protocols	Network protocols
publickey	Public and secret keys for SecureRPC used by NFS and NIS+
rpc	Remote procedure call names and numbers
services	Network services
shadow	Shadow user passwords

TABLE 34-8 NSS-Supported Files

Service	Description
files	Checks corresponding **/etc** file for the configuration (for example, **/etc/hosts** for hosts); this service is valid for all files
db	Checks corresponding **/var/db** databases for the configuration; valid for all files except **netgroup**
compat	Valid only for **passwd**, **group**, and **shadow** files
dns	Checks the DNS service; valid only for **hosts** file
nis	Checks the NIS; valid for all files
nisplus	NIS version 3
hesiod	Uses Hesiod for lookup

TABLE 34-9 NSS Configuration Services

/etc/nsswitch.conf

```
# /etc/nsswitch.conf
#
# An example Name Service Switch config file.
passwd:                 db files nisplus nis
shadow:                 db files nisplus nis
group:                  db files nisplus nis
hosts:                  files nisplus dns
bootparams:             nisplus [NOTFOUND=return] files
ethers:                 files
netmasks:               files
networks:               files
protocols:              files
rpc:                    files
services:               files
netgroup:               nisplus
publickey:              nisplus
automount:              files
aliases:                files nisplus
```

Dynamic host configuration Protocol (DHCP)

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Linux for Devices

Module-2, Lecture-5

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- IPv6 Stateless Autoconfiguration
- Generating the Local Address
- Generating the Full Address
- Router Renumbering
- IPv6 Stateful Autoconfiguration: DHCPv6
- Linux as an IPv6 Router: radvd
- DHCP for IPv4

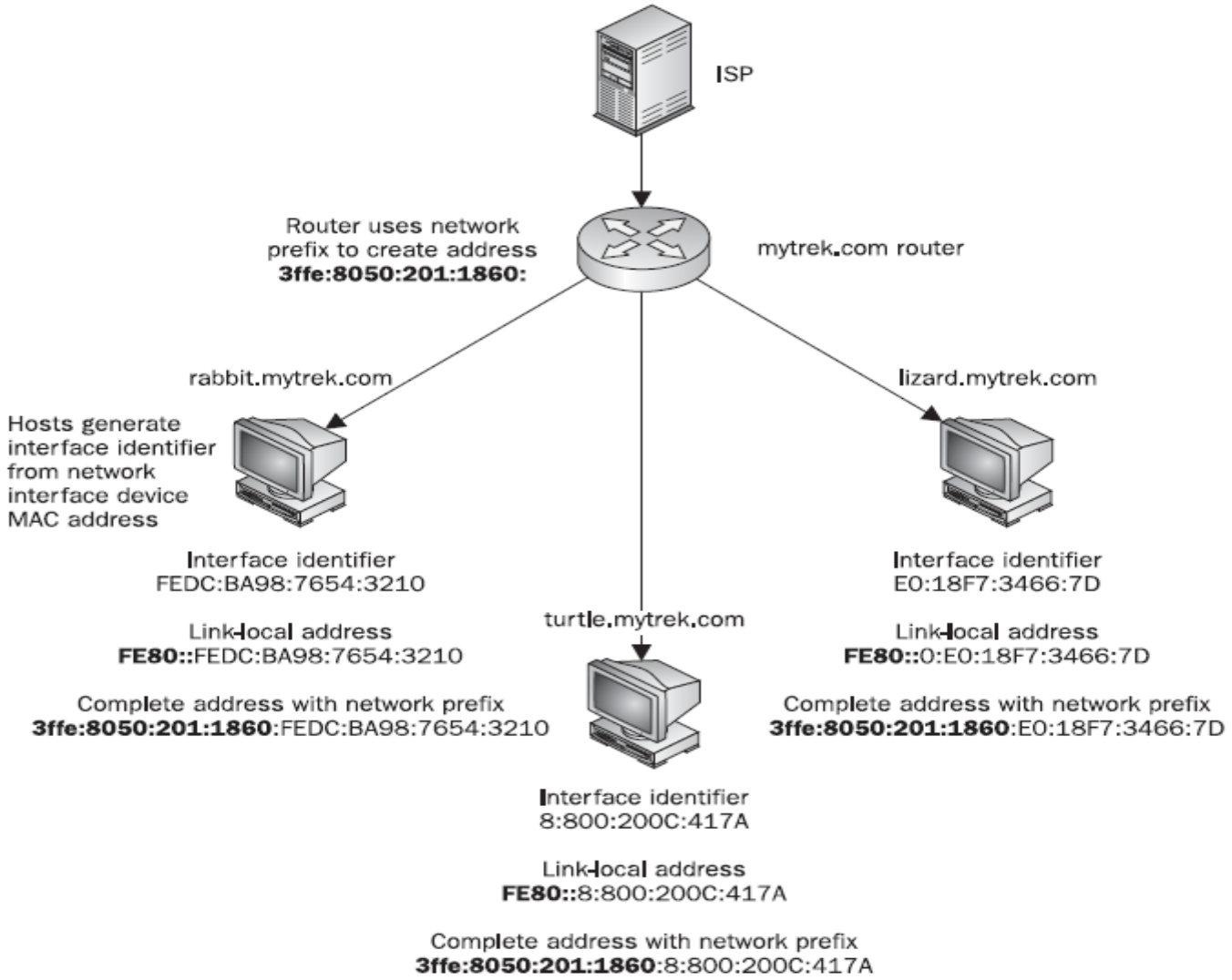

Figure 35-1 Stateless IPv6 address autoconfiguration

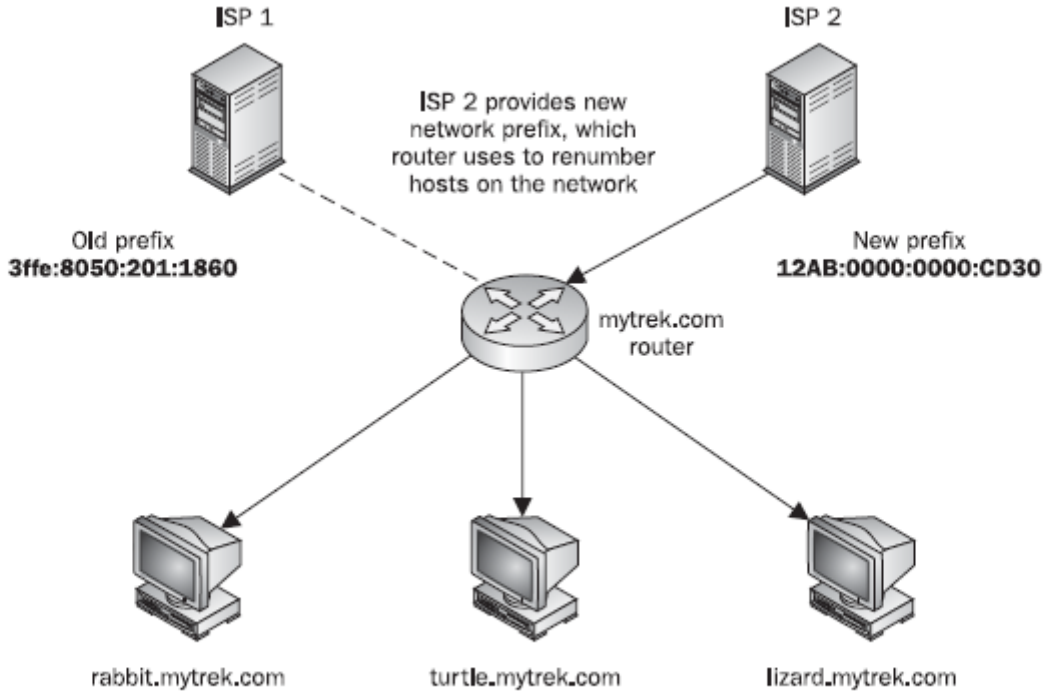

FIGURE 35-2 Router renumbering with IPv6 autoconfiguration

Linux as an IPv6 Router: radvd


```
interface eth0 {
     AdvSendAdvert on;
          prefix fec0:0:0:0::/64
          {
          AdvOnLink on;
          AdvAutonomous on;
          };
};
```

DHCP for IPv4

- Configuring DHCP IPv4 Client Hosts
- Configuring the DHCP IPv4 Server
- Dynamic IPv4 Addresses for DHCP
- DHCP Dynamic DNS Updates
- DHCP Subnetworks
- DHCP Fixed Addresses

Linux for Devices

Module-2, Lecture-6

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Linux for Devices

Module-2, Lecture-7

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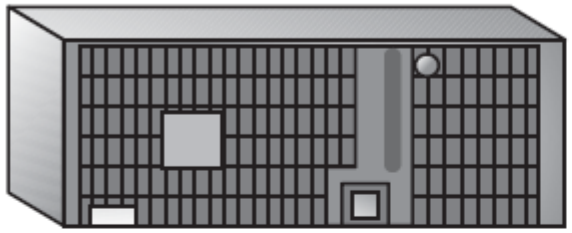
Network file system

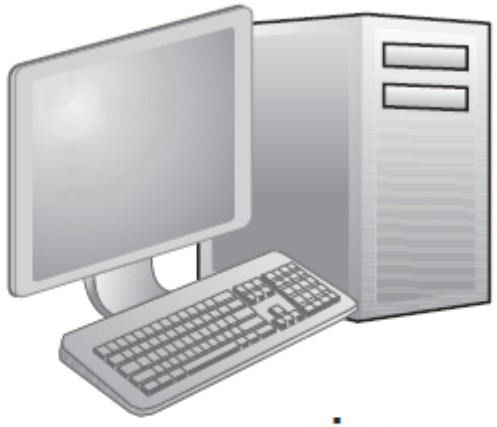
- An NFS file server provides an easy way to share large amounts of data among the users and computers in an organization.
- An administrator of a Linux system that is configured to share its filesystems using NFS must perform the following tasks to set up NFS:

1. Set up the network
2. Start the NFS service
3. Choose what to share from the server.
4. Set up security on the server
5. Mount the filesystem on the client.

/etc/exports file:
/apps/bin pins(rw) maple(rw) spruce(rw)

 # mount -t nfs oak:/apps/bin /oak/apps





oak

/

apps/

bin/

file1 file2 file3

pine

/

oak/

apps/

- Above figure illustrates a Linux file server using NFS to share (export) a filesystem and a client computer mounting the filesystem to make it available to its local users.
- In this example, a computer named oak makes its /apps/bin directory available to clients on the network (pine, maple, and spruce) by adding an entry to the /etc/exports file.
- The client computer (pine) sees that the resource is available and mounts the resource on its local filesystem at the mount point /oak/apps, after which any files, directories, or subdirectories from /apps/bin on oak are available to users on pine.