Advanced SUSE Linux Enterprise Server Administration (Course 3038)

Chapter 2

Configure the Network Manually

Objectives

- Understand Linux Network Terms
- Set Up Network Devices with the ip Tools
- Save Device Settings to a Configuration File
- Set Up Routing with the ip Tool

Objectives (continued)

- Save Routing Settings to a Configuration File
- Configure Host Name and Name Resolution
- Test the Network Connection with Command-Line Tools

Understand Linux Network Terms

- Device
  - Network adapter built into the system
- Link
  - Used by command-line tool ip to refer to the connection of a device to the network
- Address
  - IP address assigned to a device
- Broadcast
  - Refers to the broadcast address of a network
- Route
  - Path IP packet takes from source to destination host

Set Up Network Devices with the ip Tool

- Command-line ip tool
  - Changes the network card configuration
- Used to perform the following tasks
  - Display the Current Network Configuration
  - Change the Current Network Configuration

Display the Current Network Configuration

- IP address setup
  - Syntax
    - ip address show

```
DA1:~ # ip address show
1: lo: <LOOPBACK,UP> mtu 16436 qdisc noqueue
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 brd 127.255.255.255 scope host lo
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,NOTRAILERS,UP> mtu     1500
    qdisc pfifo_fast qlen 1000
    link/ether 00:30:05:4b:98:85 brd ff:ff:ff:ff:ff:ff
    inet 10.0.0.2/24 brd 10.0.0.255 scope global eth0
    inet6 fe80::230:5ff:fe4b:9885/64 scope link
       valid_lft forever preferred_lft forever
3: sit0: <NOARP> mtu 1480 qdisc noqueue
    link/sit 0.0.0.0 brd 0.0.0.0
```

Display the Current Network Configuration (continued)

- Device attributes
  - Syntax
    - ip link show

```
1: lo: <LOOPBACK,UP> mtu 16436 qdisc noqueue
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: eth0: <BROADCAST,MULTICAST,NOTRAILERS,UP> mtu 1500 qdisc  pfifo_fast qlen 1000
    link/ether 00:30:05:4b:98:85 brd ff:ff:ff:ff:ff:ff
3: sit0: <NOARP> mtu 1480 qdisc noqueue
    link/sit 0.0.0.0 brd 0.0.0.0
```

  - Possible attributes
    - UP, LOOPBACK
    - BROADCAST, POINTOPOINT
    - MULTICAST, PROMISC

Display the Current Network Configuration (continued)

- Device statistics
  - Syntax
    - ip –s link show eth0

```
2: eth0: <BROADCAST,MULTICAST,NOTRAILERS,UP> mtu 1500 qdisc pfifo_fast  qlen 1000
    link/ether 00:30:05:4b:98:85 brd ff:ff:ff:ff:ff:ff
    RX: bytes  packets  errors  dropped overrun mcast
    849172787  9304150  0       0       0       0
    TX: bytes  packets  errors  dropped carrier collsns
    875278145  1125639  0       0       0       0
```

  - Information displayed
    - Bytes, packets, errors
    - Dropped, overrun, mcast
    - Carrier, collsns, compressed

Change the Current Network Configuration

- Assign an IP address to a device
  - ip address add 10.0.0.2/24 brd + dev eth0
  - Verify assigned IP address
    - ip address show dev eth0
- Delete the IP address from a device
  - ip address del 10.0.0.2 dev eth0
- Change device attributes
  - ip link set device attribute
  - Enable/Disable a network device
    - ip link set eth0 up/down

Save Device Settings to a Configuration File

- Changes made with ip are temporary
- Network device configuration files
  - Stored in directory /etc/sysconfig/network
  - Filenames consist of ifcfg-eth-id- and the hardware address of the device
- Set up a device with YaST first
  - Then make changes in the configuration file
- ip link show
  - Displays hardware address for each Ethernet device

Configure a Device Statically

- Content of a configuration file example

```
BOOTPROTO='static'
MTU=''
REMOTE_IPADDR=''
STARTMODE='onboot'
UNIQUE='oxTw.AKbXsqnOlA9'
_nm_name='bus-pci-0000:02:08.0'
BROADCAST='149.44.171.255'
IPADDR='10.0.0.2'
NETMASK='255.255.255.0'
NETWORK='10.0.0.0'
```

Configure a Device Dynamically with DHCP

- Set the BOOTPROTO option to dhcp
  - BOOTPROTO='dhcp'
- You don't need to set any other options

Start and Stop Configured Devices

- Disable device eth0
  - ifdown eth0
- Enable device eth0
  - ifup eth0

Set Up Routing with the ip Tool

- Use ip tool to
  - View the Routing Table
  - Add Routes to the Routing Table
  - Delete Routes from the Routing Table

View the Routing Table

- Syntax
  - ip route show

```
10.0.0.0/24 dev eth0  proto kernel  scope link  src \ 10.0.0.2
169.254.0.0/16 dev eth0  scope link
127.0.0.0/8 dev lo  scope link
default via 10.0.0.1 dev eth0
```

- Routing table content varies
  - Depending on the setup of your machine
  - You have at least two entries
    - One route to the local network to which the system is connected
    - One route to the default gateway for all other packets

Add Routes to the Routing Table

- Set a route to the locally connected network
  - ip route add 10.0.0.0/24 dev eth0
- Set a route to a different network
  - ip route add 149.44.171.0/24 via 10.0.0.100
- Set a default route
  - ip route add default via 10.0.0.1

Delete Routes from the Routing Table

- Syntax
  - ip route delete 149.44.171.0/24 dev eth0

Save Routing Settings to a Configuration File

- Routing settings made with the ip tool are temporary
- Routes configuration file
  - /etc/sysconfig/network/routes
- Typical configuration file example

```
149.44.171.0 10.0.0.100 255.255.255.0 eth-id-00:30:05:4b:98:85
default 10.0.0.8 - -
```

Configure Host Name and Name Resolution

- Objectives
  - Set the Host and Domain Name
  - Configure Name Resolution

Set the Host and Domain Name

- Host name is configured in the file /etc/HOSTNAME
- The content of the file is similar to the following:
  - da2.digitalairlines.com

Configure Name Resolution

- Name resolution is configured in the file /etc/resolv.conf
- Content of the file is similar to the following:

```
search digitalairlines.com
nameserver 10.0.0.1
nameserver 10.10.0.1
nameserver 10.0.10.1
```

- File contains two types of entries
  - search
  - nameserver

Test the Network Connection with Command-Line Tools

- Test network connection by doing the following:
  - Use ping to Test Network Connections
  - Use traceroute to Trace Network Packets

Use ping to Test Network Connections

- Tool ping
  - Checks network connections between two hosts
- Syntax
  - ping 10.0.0.1
- Information displayed
  - The size of an ICMP datagram
  - The IP address of the target system
  - The sequence number of each datagram
  - The TTL (time to live) of the datagram
  - The Round Trip Time

Use ping to Test Network Connections (continued)

Table 2-1

Option	Description
-c *count*	The number of packets to be sent. After this number has been reached, ping is terminated.
-I *device_addr*	Specifies the network device to be used on a computer with several network devices.
-i *seconds*	Specifies the number of seconds to wait between individual packet shipments. The default setting is 1 second.
-f	(Flood ping) Packets are sent one after another at the same rate as the respective replies arrive. Only root can use this option. For normal users the minimum time is 200 milliseconds.
-l *preload*	Sends packets without waiting for a reply.
-n	The numerical output of the IP address. Address resolutions to host names are not carried out.
-t *ttl*	Sets the Time To Live for packets to be sent.
-w *maxwait*	Specifies a timeout in seconds, before ping exits regardless of how many packets have been sent or received.
-b	Sends packets to the broadcast address of the network.

Use traceroute to Trace Network Packets

- Diagnosis tool traceroute
  - Checks the routing between different networks
  - Sends packets with an increasing TTL value to the destination host
- Syntax
  - traceroute pluto.example.com

```
traceroute to pluto.example.com (192.168.2.1), 30 hops max,
40 byte packets
1 sun.example.com (192.168.0.254) 0 ms 0 ms 0 ms
2 antares.example.com (192.168.1.254) 14 ms 18 ms 14 ms
3 pluto.example.com (192.168.2.1) 19 ms * 26 ms
```

Exercise 2-1 Configure the Network Connection Manually

- In this exercise, you will do the following:
  - Part I: Note the Current Network Configuration
  - Part II: Delete the Current Network Setup with YaST
  - Part III: Configure the Network Manually
  - Part IV: Save the Network Connection to Interface and Hardware Configuration Files

Summary

- Hosts use network devices linked to the network
  - To communicate with other computers
- Each network device has at least one IP address
  - That may be configured using the ip command
- Network interface and IP information is stored in the /etc/sysconfig/network directory
- Different IP networks are connected via routers
- Each host contains a hostname
  - Stored in the /etc/HOSTNAME file

Summary (continued)

- Connect to network resources by name
  - A host contains the addresses of up to three name servers in the /etc/resolv.conf file
- The ping and traceroute commands
  - Use datagrams to test network communication and routing