LPIC-1 TRAINING COURSE

Topic 109: Networking Fundamentals

Objectives

- Demonstrate a proper understanding of TCP/IP network fundamentals
- View, change and verify configuration settings on client hosts
- Troubleshoot networking issues on client hosts
- Configure DNS on client host

Configuring with DHCP

- DHCP clients on Linux: ***pump***, ***dhclient*** or ***dhcpcd***
  - Usually runs at system bootup
- On Red Hat and Fedora: set **`BOOTPROTO=dhcp`** (***/etc/sysconfig/network-scripts/ifcfg-ethX***)
- On Ubuntu: set **`iface ethX inet dhcp`** (***/etc/network/interfaces***)
- Manually run a DHCP client: **`dhclient ethX`**

Configuring with a Static IP Address

- Temporarily set (not saved on reboot):
  - Setting IP Address and network mask:
    `ifconfig` *`iface`* `up` *`addr`* `netmask` *`mask`*
  - View the current setting:
    `ifconfig` *`iface`*
  - Setting default route:
    `route add default gw` *`addr`*
  - View the routing table:
    `route`
- Example:

```
ifconfig eth0 up 10.4.16.223 netmask 255.255.255.0
route add default gw 10.4.16.1
```

Configuring Static IP Address (cont')

- Permanently set:
  - on Red Hat, edit ***/etc/sysconfig/network-scripts/ifcfg-ethX***

```
DEVICE=ethX
BOOTPROTO=static
IPADDR=<IP Address>
NETMASK=<Netmask>
GATEWAY=<Gateway IP>
ONBOOT=yes
```

  - On Ubuntu: edit ***/etc/network/interfaces***

Configuring Routing

- Routing configuration file:
  /etc/sysconfig/network/routes
- ***route*** command:
  route {add | del} [-net | -host] *target* [netmask *mask*] [gw *gw*] [reject] [[dev] *iface*]
  - Example:
    route add –net 172.20.0.0 netmask 255.255.255.0 gw 172.21.1.1
- Enable packet forwarding (for system acting as a router):
  # echo "1" > proc/sys/net/ipv4/ip_forward

ifup and *ifdown* commands

- Useful for verifying network settings
- **`ifup iface`**: bring interfaces up and configure it with paramaters read from ***/etc/sysconfig/network-scripts/ifcfg-ethX***
- **`ifdown iface`**: bring interface down

Configuring Hostname

- Temporarily set: **`hostname`** ***`hostname`***
- Automatically set at boot time: edit ***/etc/sysconfig/network***, ***/etc/hostname*** or ***/etc/HOSTNAME***

Exercise

1. View information about your local network settings for all your network interfaces
2. View your routing table information
3. Use ping to test connectivity to both local and remote computer
4. Bring down the local Ethernet
5. Repeat steps 1-3
6. Bring the local Ethernet connection back up and set it IP Address as found in step 1
7. Repeat steps 1-3
8. Restore the default route with information found in step 2
9. Repeat steps 1-3

Hints to Exercise

1. View information about your local network settings for all your network interfaces
   - *Hint:* **`ifconfig`**
2. View your routing table information
   - *Hint:* **`netstat -r`**
3. Use **ping** to test connectivity to both local and remote computer
   - *Hint:*
     ```
     ping <IP_on_the_same_network>
     ping <IP_on_different_network>
     ```
4. Bring down the local Ethernet
   - *Hint:* **`ifdown eth0`**
5. Repeat steps 1-3
6. Bring the local Ethernet connection back up and set it IP Address as found in step 1
   - *Hint:* **`ifconfig eth0 up <IPAddress> netmask <NETMASK>`**
7. Repeat steps 1-3
8. Restore the default route with information found in step 2
   - *Hint:* **`route add default gw <GATEWAY>`**
9. Repeat steps 1-3

Configuring Client-side DNS

- Configuring local DNS resolve: edit ***/etc/hosts***
  <IP Address> <Hostname>
- Configuring DNS server: edit ***/etc/resolv.conf***
  nameserver <IP Address>
- Linux normally performs lookups in ***/etc/hosts*** before using DNS
  - You can modify this behavior by editing the **hosts** line in ***/etc/nsswitch.conf***
    hosts: files dns
- Verifying DNS lookup: ***nslookup, host, dig, whois***

Exercise

1. Review the name-lookup order of your system
2. Configuring your system to you 8.8.8.8 as DNS server
3. Verify your DNS configuration with ***nslookup*** for the hostname ***google.com***
4. Edit your ***/etc/hosts*** file and add a new line that describes **google.com** as **192.168.0.1**.
5. Repeat step 3
6. What can you do to make your system using DNS server before looking in ***/etc/hosts*** file? Do it!

Hints to Exercise

1. Review the name-lookup order of your system
   - *Hint:* `cat /etc/nsswitch.conf`
2. Configuring your system to you 8.8.8.8 as DNS server
   - *Hint:* `echo “nameserver 8.8.8.8”>>/etc/resolv.conf`
3. Verify your DNS configuration with ***nslookup*** for the hostname ***google.com***
   - *Hint:* `nslookup google.com`
4. Edit your ***/etc/hosts*** file and add a new line that describes **google.com** as **192.168.0.1**.
   - *Hint:* `echo “192.168.0.1  google.com” >> /etc/hosts`
5. Repeat step 3
6. What can you do to make your system using DNS server before looking in ***/etc/hosts*** file? Do it!
   - *Hint: change* ***/etc/nsswitch.conf*** *to:* `hosts:  dns files`

Diagnosing Network Connections

- Testing basic connectivity with ***ping*** :
  `ping [-c num] Destination`
- Tracing a route with ***traceroute***:
  `traceroute [-n] Destination`
- Checking network status with ***netstat***:
  `netstat [-i] [-r] [-M] [-p] [-a]`
- Examining raw network traffice with ***tcpdump***
  `tcpdump [-A] [-D] [-n] [-v] [-w file]`
- Testing open port on remote system:
  `telnet destination port`

Thank You !

BACKUP SLIDES