

Networking

What You Will Learn

- Determining your IP address
- ip and ifconfig utilities
- hostnames
- DNS and name resolution
- /etc/hosts
- /etc/nsswitch.conf

What You Will Learn

- Network ports
- DHCP
- Static IP addresses
- ifup / ifdown
- GUI / TUI tools

Determining Your IP Address

- `ip address`
 - `ip addr`
 - `ip a`
 - `ip address show` or `ip a s`

```
# ip address
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast
state UP qlen 1000
    link/ether 08:00:27:43:f5:18 brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.122/24 brd 192.168.1.255 scope global dynamic eth0
        valid_lft 84249sec preferred_lft 84249sec
    inet6 fe80::a00:27ff:fe43:f518/64 scope link
        valid_lft forever preferred_lft forever
```

Determining Your IP Address

- `ifconfig`

```
# ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 192.168.1.122  netmask 255.255.255.0  broadcast
192.168.1.255
        inet6 fe80::a00:27ff:fe43:f518  prefixlen 64  scopeid
0x20<link>
        ether 08:00:27:43:f5:18  txqueuelen 1000  (Ethernet)
        RX packets 82371  bytes 95773879 (91.3 MiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 32907  bytes 3386585 (3.2 MiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

lo:  flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0

...
```

hostnames

- human-readable name for an IP address
 - webprod01 = 10.109.155.174

DNS hostnames

- FQDN = fully qualified domain name
 - webprod01.mycompany.com
- TLD
 - .com, .net, .org, etc.
- Domains
 - below (to the left of) TLD
- sub-domain
 - below (to the left of) the domain
 - webprod01.ny.us.mycompany.com

Displaying the hostname

```
$ hostname
```

```
webprod01
```

```
$ uname -n
```

```
webprod01
```

```
$ hostname -f
```

```
webprod01.mycompany.com
```

Setting the hostname

```
# hostname webprod01
```

```
# echo 'webprod01' > /etc/hostname
```

```
# vi /etc/sysconfig/network  
HOSTNAME=webprod01
```

Resolving DNS Names

- host
- dig

```
$ host www.mycompany.com
```

```
webprod01.mycompany.com has address 1.2.1.6
```

```
$ host 1.2.1.6
```

```
6.1.2.1.in-addr.arpa domain name pointer  
www.mycompany.com.
```

```
$
```

The /etc/hosts file

- Format:
 - IP FQDN alias(es)
 - 10.11.12.13 webprod02.mycorp.com webprod02
- Now you can refer to the host by name.
 - webprod02.mycorp.com OR webprod02
- /etc/hosts is local to your linux system. It does not propagate to the rest of the network.

Sample /etc/hosts file

```
127.0.0.1      localhost
1.2.1.6        webprod01.mycompany.com webprod01
10.11.12.14    webprod02.mycompany.com webprod02
10.11.12.15    webprod03.mycompany.com webprod03
10.11.13.7     dbcluster
```

/etc/nsswitch.conf

- NSS = Name Service Switch
- Controls the search order for resolutions

```
hosts: files dns
```

```
hosts: files nis dns
```

Network Ports

- When a service starts it binds itself to a port.
- Ports 1 - 1,023 are well-known ports.
 - 22 - SSH
 - 25 - SMTP
 - 80 - HTTP
 - 143 - IMAP
 - 389 - LDAP
 - 443 - HTTPS
- `https://www.mybank.com`

/etc/services

- Maps port names to port numbers

```
ssh      22/tcp    # SSH Remote Login Protocol
smtp     25/tcp    # SMTP
https    80/tcp    # http
ldap     389/tcp  # LDAP
https    443/tcp  # http protocol over TLS/SSL
```

DHCP

- Dynamic Host Configuration Protocol
- DHCP servers assign IP address to DHCP clients
 - IP Address
 - netmask
 - gateway
 - DNS servers

DHCP

- Each IP is "leased" from the pool of IP addresses the DHCP server manages.
 - The lease expiration time is configurable on the DHCP server. (1hr, 1day, 1 week, etc.)
 - The client must renew the lease if it wants to keep using the IP address. If no renewal is received, the IP is available to other DHCP clients.

Configuring a DHCP Client - RHEL

`ifconfig -a` or `ip link`

`/etc/sysconfig/network-scripts/ifcfg-DEVICE`

`/etc/sysconfig/network-scripts/ifcfg-eth0`

`/etc/sysconfig/network-scripts/ifcfg-enp5s2`

`BOOTPROTO=dhcp`

Configuring a DHCP Client - Ubuntu

```
/etc/network/interfaces
```

```
auto eth0
```

```
iface eth0 inet dhcp
```

Assigning a Static IP Address - RHEL

/etc/sysconfig/network-scripts/ifcfg-eth0

DEVICE=eth0

BOOTPROTO=static

IPADDR=10.109.155.174

NETMASK=255.255.255.0

NETWORK=10.109.155.0

BROADCAST=10.109.155.255

GATEWAY=10.109.155.1

ONBOOT=yes

Assigning a Static IP Address - Ubuntu

/etc/network/interfaces

```
auto eth0
iface eth0 inet static
    address 10.109.155.174
    netmask 255.255.255.0
    gateway 10.109.155.1
```

Manually Assigning an IP Address

Format:

```
ip address add IP[/NETMASK] dev NETWORK_DEVICE
```

```
ip address add 10.11.12.13 dev eth0
```

```
ip address add 10.11.12.13/255.255.225.0 dev eth0
```

```
ip link set eth0 up
```


Manually Assigning an IP Address

Format:

```
ifconfig NETWORK_DEVICE addr netmask SUBNET_MASK
```

```
ifconfig eth0 10.11.12.13
```

```
ifconfig eth0 10.11.12.13 netmask 255.255.255.0
```

```
ifconfig eth0 up
```

ifup / ifdown

- Can be used instead of ifconfig / ip
- Distribution dependent
- Uses configuration files
- Examples:

```
ifup eth0
```

```
ifup enp5s2
```

```
ifdown eth0
```

```
ifdown enp5s2
```

GUI / TUI Tools

- RedHat
 - nmtui
 - system-config-network
- SUSE
 - YaST
- Ubuntu
 - No official tool available

Summary

- Determining your IP address
- ip and ifconfig utilities
- hostnames
- DNS and name resolution
- /etc/hosts
- /etc/nsswitch.conf

Summary

- Network ports
 - well-known / privileged
 - unprivileged
- DHCP
- Static IP addresses
- ifup / ifdown
- GUI / TUI tools
 - nmtui, system-config-network, YaST