System Identity

What makes one node different from an other?

- Hostname
- IP Address
- Link-Level Address

Link-Level Address

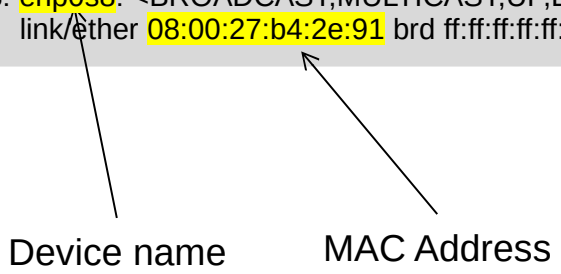
- Hardware, Ethernet, or MAC address
- **Should** be globally unique
- **Must** be unique within a LAN segment
- Set by hardware vendor at the factory
- Set by VirutalBox software -> easy to have duplicates!!!

Inspect Link-Level Address

```
# ip link
```

Sample output from w01:

```
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode DEFAULT group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP mode DEFAULT group default qlen 1000
    link/ether 08:00:27:48:be:6b brd ff:ff:ff:ff:ff:ff
3: enp0s8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP mode DEFAULT group default qlen 1000
    link/ether 08:00:27:b4:2e:91 brd ff:ff:ff:ff:ff:ff
```



IP Address

- IP-V4 or IP-V6
- **Must** be unique within **the** Internet (aka the “open internet”)
- Special addresses deemed “non-routable”
  - 10.0.0.0/8 (255.0.0.0)
  - 172.16.0.0/12 (255.240.0.0)
  - 192.168.0.0/16 (255.255.0.0)
  - These use NAT when connecting to **the** Internet

Inspect IP Address

```
# ip addr
```

Sample output from w01:

```
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    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP qlen 1000
    link/ether 08:00:27:56:ce:36 brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global eth0
    inet6 fe80::a00:27ff:fe56:ce36/64 scope link
        valid_lft forever preferred_lft forever
3: enp0s8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP qlen 1000
    link/ether 08:00:27:a3:c4:37 brd ff:ff:ff:ff:ff:ff
    inet 10.1.1.10/24 brd 10.1.1.255 scope global eth1
    inet6 fe80::a00:27ff:fea3:c437/64 scope link
        valid_lft forever preferred_lft forever
```

How many NICs does w01 have?
Are any on the Open Internet?
What is 127.0.0.1?

Managing Network Connections

- Interactively with ip command
  - Will not survive a reboot
- Network Manager program
  - GUI, TUI, or CLI
  - Default for RHEL 8
- Configuration files
  - Suitable for some servers
  - Popular with ‘old admins’ and Debian

Network Manager

- Runs as a daemon
- We tell the daemon what to do with one of three programs
  - GUI (Graphical User Interface)
  - TUI (Text User Interface)
  - CLI (Command Line Interface)

Network Manager - Terms

Device – a network or WIFI card *(can be a virtual device)*

Connection – a set of configuration settings which can be applied to a device

Connections are applied to devices.

Most servers have a one and only one connection per device.

CLI - Operations

Stop all networking

```
nmcli networking off
```

Start all networking

```
nmcli networking on
```

Show all connections

```
nmcli connection show
```

Stop one connection

```
nmcli connection down enp0s3
```

Start one connection

```
nmcli connection up enp0s3
```

CLI – Operations (cont)

Show details for one connection

```
nmcli connection show enp0s3
```

Set a static IP address for enp0s3

```
nmcli connection modify enp0s3 ipv4.method manual
nmcli connection modify enp0s3 ipv4.addresses 10.1.1.20/24
```

Set enp0s3 to be a DHCP client

```
nmcli connection modify enp0s3 ipv4.method auto
```

Hostname

- One per system
- Can be anything, usually:
  w01.example.com
  Or
  W01
- No direct link to IP address

Set hostname

- Run the `hostname` command
  - Will not survive a reboot
- Define in the **/etc/hostname** file
  - Read by start up scripts
  - Requires reboot
- Use Network Manager

```
nmcli general hostname s01
```

Nice names with /etc/hosts

- Simple file to map human friendly names to IP addresses and back
- Suitable for small, internal networks
- Does not scale well

Sample:

```
# cat /etc/hosts
```

```
127.0.0.1   localhost localhost.localdomain localhost4
::1         localhost localhost.localdomain localhost6
10.1.1.20   s01
10.1.1.10   w01 wAlice
```

IP Address

List of names (do not need to match host names)

udev

- Device manager for the kernel
- Tries to keep device names (enp0s3, enp0s8) constant
- Network card device names are based on hardware location

Reference

Man pages of interest

```
man ip

man nmcli
```