

1.112.3

TCP/IP configuration and troubleshooting

Weight 7

Linux Professional Institute Certification — 102

Angus Lees `gus@inodes.org` Geoffrey Robertson
`ge@ffrey.com` Nick Urbanik `nicku@nicku.org`

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Topic 112 Networking Fundamentals [14]

Where we are up to

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Description of Objective

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Candidates should be able to view, change and verify configuration settings and operational status for various network interfaces. This objective includes manual and automatic configuration of interfaces and routing tables. This especially means to add, start, stop, restart, delete or reconfigure network interfaces. It also means to change, view or configure the routing table and to correct an improperly set default route manually. Candidates should be able to configure Linux as a DHCP client and a TCP/IP host and to debug problems associated with the network configuration.

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Key files, terms, and utilities include: I

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`/etc/HOSTNAME` or `/etc/hostname` — a text file holding the hostname

`/etc/hosts` — a file mapping IP addresses ↔ hostnames

`/etc/networks` — an obsolete file that maps only classful network addresses ↔ names

`/etc/host.conf` — an obsolete file replaced by `nsswitch`

`/etc/resolv.conf` — configuration file used when system looks up a name or address

`/etc/nsswitch.conf` — name service switch configuration file: determines how system looks up name and various other things

`ifconfig` — a command to show and configure network interfaces

`route` — a command to show and configure network routes

`dhcpcd`, `dhcpcclient`, `pump` — DHCP clients

Key files, terms, and utilities include: II

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`host` — a program to query and debug DNS servers

`hostname` (`domainname`, `dnsdomainname`) —
commands to show the hostname, and NIS
domain settings

`netstat` — a command that shows what service is
listening on what port

`ping` — sends ICMP `ECHO_REQUEST` to hosts,
displays time it takes to get an answer

`traceroute` — command to show the path that a network
connection takes, showing routes along the way

`tcpdump` — packet sniffer command that displays the
contents of packets received on a network
interface

the network scripts run during system initialization.

TCP/IP Configuration and Troubleshooting

Resources of Interest

Linux Networking HOWTO by Joshua Drake : `http://tldp.org/HOWTO/Net-HOWTO/index.html`

Linux Ethernet-Howto by Paul Gortmaker : `http://tldp.org/HOWTO/Ethernet-HOWTO.html`

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ifconfig – Low level network config

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Network interface configuration

```
$ sudo ifconfig eth0 192.168.7.26 netmask  
255.255.255.0 broadcast 192.168.7.255 ←  
$ sudo ifconfig eth0 down ←
```

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route – Low level network config

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```
$ sudo route add -net 192.168.7.0 netmask  
255.255.255.0 dev eth0 ←
```

```
$ sudo route add default gw 192.168.7.1 ←
```

View routing table: `$ route -n ←`

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Ports in use	<code>netstat -a -u -t</code>
Routing table	<code>netstat -r</code>
Interfaces	<code>netstat -i</code>
Multicast groups	<code>netstat -g</code>
Masqueraded connections	<code>netstat -M</code>
Statistics	<code>netstat -s</code>

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Network debugging

ping

- ▶ Try to bounce an ICMP packet off a host
- ▶ Good for reachability, round trip delay, packet loss

tracert

- ▶ Show the network path to a particular host
- ▶ Good for testing routing problems, “which ISP screwed up”

tcpdump

- ▶ Dump raw network traffic
- ▶ Exceptional for diagnosing network problems involving a particular host

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tcpdump is your friend, learn to use it

```
$ sudo tcpdump -i ppp0 not port ssh
tcpdump: listening on ppp0
21:54:32.913475 10.0.128.107.1024 > 10.0.128.97.domain: 20147+ A?
fatso.urnet.com.au. (36) (DF)
21:54:33.102745 10.0.128.97.domain > 10.0.128.107.1024: 20147* 1/3/3
(178) (DF)
21:54:33.103766 10.0.128.107 > 203.26.250.2: icmp: echo request (DF)
21:54:33.352745 203.26.250.2 > 10.0.128.107: icmp: echo reply
21:54:34.102912 10.0.128.107 > 203.26.250.2: icmp: echo request (DF)
21:54:34.302745 203.26.250.2 > 10.0.128.107: icmp: echo reply
21:56:09.908636 10.0.128.107.1068 > 203.26.250.2.www:
S 1245080954:1245080954(0) win 5840 <mss 1460,sackOK,timestamp
5047727 0,nop,wscale 0> (DF) [tos 0x10]
21:56:10.052743 203.26.250.2.www > 10.0.128.107.1068:
S 3633684004:3633684004(0) ack 1245080955 win 5792 <mss
1460,sackOK,timestamp 409734147 5047727,nop,wscale 0> (DF)
21:56:10.052869 10.0.128.107.1068 > 203.26.250.2.www: . ack 1 win 5840
<nop,nop,timestamp 5047742 409734147> (DF) [tos 0x10]
21:56:12.977510 10.0.128.107.1068 > 203.26.250.2.www: P 1:2(1) ack 1
win 5840 <nop,nop,timestamp 5048034 409734147> (DF) [tos 0x10]
```

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/etc/HOSTNAME or /etc/hostname

- ▶ System scripts set the hostname from one of these files during boot, using the **hostname** command.
- ▶ **dnsdomainname**, **ypdomainname**, **nisdomainname** and **domainname** are variations on **hostname**
- ▶ **domainname** gives the NIS domainname, **NOT the DNS domain**

/etc/nsswitch.conf

“Name Service Switch” configuration

```
passwd:          compat
group:           compat
shadow:          compat

hosts:           files dns
networks:        files

protocols:       db files
services:        db files
ethers:          db files
rpc:             db files

netgroup:        nis
```

/etc/networks

- ▶ Labels for network addresses
- ▶ Only supports class A, B or C addresses (not CIDR)
- ▶ Rarely used or kept up to date `localnet 192.168.1.0`

- ▶ Hostname to IP address mapping, mostly superseded by DNS
- ▶ Still matters before DNS is running

```
127.0.0.1 localhost
192.168.1.1 cat.pasture.com.au cat
```

```
# The following lines are desirable for IPv6 capable hosts
```

```
::1          ip6-localhost ip6-loopback
fe00::0     ip6-localnet
ff00::0     ip6-mcastprefix
ff02::1     ip6-allnodes
ff02::2     ip6-allrouters
ff02::3     ip6-allhosts
```

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/etc/host.conf — Resolver configuration

- ▶ Various keywords to tweak non-DNS-specific resolver behaviour
- ▶ Rarely modified; most options no longer relevant
- ▶ See `$ man host.conf` ↔

```
order hosts,bind
multi on
```

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/etc/resolv.conf — DNS configuration

- ▶ DNS configuration for resolver
- ▶ Nameserver defaults to `127.0.0.1`, search suffix defaults to DNS domain name

```
search pasture.com.au
nameserver 10.0.128.97
```

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Debugging DNS with `host`

- ▶ **host** performs various DNS queries

```
host [options] hostname [server]
```

- ▶ Common options:

- v verbose

- l list all hosts in a domain (using AXFR)

- t query type (“-t any” is useful)

- ▶ “Dynamic Host Control Protocol” configures networking details, DNS, etc automatically by querying a “DHCP server”
- ▶ Various DHCP clients:
 - `dhcpcd` Comes with ISC DHCP server, highly configurable
 - `dhcpcd`
 - `pump` Simple DHCP client written by RedHat
 - `udhcpc` Very small DHCP client

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