BOOTP

Used by a diskless client to boot from a machine on the same cable.

1) Broadcast a bootp request.

2) Server receives a request packet.
Packet has senders ethernet address and "blank" source IP address.

Server has a table:

Ethernet address IP address File to send

Server ships to client:
IP address and operating system loader

Operating system loader:
downloads and unpacks the kernel
sets up a RAM disk
downloads the initrd into the ram disk.

Client boots, then usually NFS mounts stuff from the server.

DHCP

Dynamic Host Configuration Protocol

Backwards compatible with `BOOTP`

Dynamically configure your IP number.
Client can boot, but doesn't know about it's IP.
Useful for client machines that move between subnets.

Simple setup (single cable) needs:

Broadcast "I need an IP address"

DHCP responds server: IP address, netmask.

Address is leased for a period of time.
Permanent leases are allowed.

DHCP server also sends client the IP numbers for default router and DNS server

Linux Client

```
# File /etc/rc.d/rc.inet1
# The following is not necessary and can be
dangerous
# HOSTNAME=‘cat /etc/HOSTNAME‘
# Attach the loopback device.
/sbin/ifconfig lo 127.0.0.1
/sbin/route add -net 127.0.0.0 netmask 255.0.0.0 lo
#/sbin/ifconfig  ---eliminated
#/sbin/route     ---eliminated
/usr/sbin/dhcpcd
```

Note: `dhcpcd` is a daemon, every 3 hours it will contact the server to renew the IP address lease.

`mkdir /etc/dhcpc`
In this directory `dhcpcd` builds files it got from the dhcp server.
One file is `resolv.conf`
Setting your DNS server
`rm /etc/resolv.conf`
`ln -s /etc/dhcpc/resolv.conf /etc/resolv.conf`
You use the dhcp specified resolver.

Server: needs kernel: enable multicast.
possibly by: `route add -host 255.255.255.255 eth0`

`dhcpd` gets data from `dhcpd.conf`

For each subnet servered there must be a subnet record.

```
subnet 134.139.137.0 netmask 255.255.255.192 {
  option routers 134.139.137.1;
  range 134.139.137.40 134.139.137.62;
}
```

The range is mandatory.
These numbers may be assigned.
If the subnet is behind a gateway,
you must list the gateway (router).

diskless boot

```
group {
  filename "lightclient.os"
  next-server 134.139.45.7
  host lab101 { hardware ethernet 0:0:1d:93:6:a6;}
  host lab102 { hardware ethernet 0:0:1d:93:6:c3;}
}
```

Must name file that has the operating system and server with that file.
If no server name is given, the DHCP server has the file.

DHCP Across Gateways

DHCP server must assign an address on the appropriate subnet.

Client does not have the subnet number,
but the router does.

1) DHCP relay: the router sees the DHCP broadcast
attachs the "subnet of origin"
includes clients ethernet number in packet
forwards packet to the DHCP server
DHCP server assigns address and returns answer to router.
Router sends to local machine (by ethernet number).

2) DHCP router: router does DHCP and it knows the subnet of origin.

Trivial File Transfer Protocol

A small version of ftp for remote booting.

Client: `tftp`
Server: `in.tftpd`

The client is simple enough to be built into the operating system loader and/or the boot ROM.

The server has little security (be cautious).
`-l` use if you are not running from inetd.
`-s` chroot to this directory when you run
`-v` verbose logging
`-r` don't allow clients to set this option

PXE

The operating system loader: `pxelinux.0`

Usually found in `/tftpboot`.
Config files found in `pxelinux.cfg` directory

Config file search:
1) My ethernet (MAC) address
2) My shortened ethernet address (repeat)
3) Default

Config file:
Similar to the lilo config.
Boot menu is allowed.
Text messages may be displayed