Introduction to DHCP

Networks Three

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Overview

Overview

Basic configuration

Basic Network Configuration

We generally configure hosts with a few standard items of network configuration.

- IP address
- Network mask
- Gateway address
- DNS server addresses
- Others: syslog servers, proxy servers, NTP servers, etc.

We don't want to do this manually if we have very many (i.e., more than one) host on our network. We can use the Dynamic Host Configuration Protocol (DHCP) to manage this.

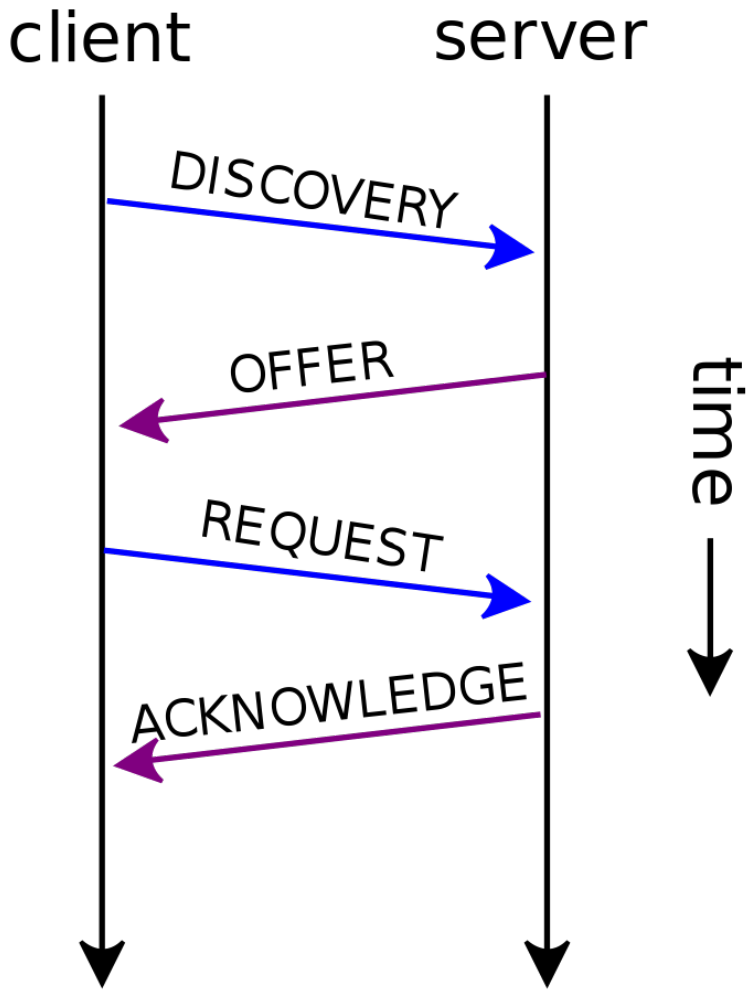
DHCP Lease

- The client outcome of the DHCP process is a *Lease*.
- A lease is a package of configuration information that the client is allotted for a specified period of time.

DHCP Process

- A DHCP client needing a lease begins by sending a DHCPDISCOVER to the broadcast address, 255.255.255.255 with source address 0.0.0.0.
- DHCP servers respond to DHCPDISCOVER messages with DHCPOFFER messages. The offers contain suggested network configuration parameters.
- The client accepts one offer by sending a DHCPREQUEST message to the offering server.
- The server responds with a DHCPACK containing the lease time and other parameters. If the client request was flawed it responds with a DHCPNAK instead.
- The client checks that the proposed address is available by checking ARP. If the address is already in use it complains to the server with a DHCPDECLINE message.
- The client may later renew or release the lease with a DHCPRENEW or DHCPRELEASE message.

DHCP Process



DHCP Relay

- Since the broadcast DHCPDISCOVER messages don't cross network boundaries, DHCP doesn't work across them.
- We get around this by running DHCP relay servers that relay DHCP messages to and from a central server.

DHCP Software

- The ISC DHCP server package is the preferred server implementation on *nix servers.
- Microsoft provides a server implementation for its server OSs.

Security Concerns

- Rogue DHCP servers
- Unauthorised clients getting access to information
- Denial of Service by exhausting the address pool.

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Step 1: Plan

We need to answer the following questions:

- What is our overall network topology?
- On what networks will we serve DHCP?
- What are our service level requirements?
- For each network
  - How many clients will we serve?
  - What is their usage profile?
  - Are there any machines that need static addresses?

Planning, cont.

We also need specific information to serve to clients

- The location's domain name
- Client IP address ranges
- DNS server addresses
- Gateway addresses
- Subnet masks, broadcast addresses
- Possibly others

OpenBSD server setup

- The ISC DHCP server, *dhcpd*, is installed by default.
- The configuration file is `/etc/dhcpd.conf`
- We also need to enable the server by setting flags in `/etc/rc.conf.local`

A simple scenario

Suppose we have an OpenBSD server

- connected to an external interface on 10.25.0.0/16
- connected to an internal interface on 192.168.1.0/24
- we want to serve DHCP on to clients on the internal network

What goes in `dhcpd.conf`?

Internal network with a static host

```
option domain-name "foo.org.nz";
option domain-name-servers 10.50.1.80, 10.50.1.82;
default-lease-time 86400;
max-lease-time 259200;
authoritative;

subnet 10.25.0.0 netmask 255.255.0.0 { }

subnet 192.168.1.0 netmask 255.255.255.0 {
    range 192.168.1.100  192.168.1.200;
    option routers 192.168.1.1;


    host bob {
        hardware-ethernet 00:A0:78:6E:8E:A1;
        fixed-address 192.168.1.10;
    }
}
```

Global options

The first five lines specify global options that apply to every network we serve, unless overridden later.

Domain name

```
option domain-name "foo.org.nz";
```

This tells clients to append our domain name to unqualified hostnames, i.e. `ssh bar` goes to `bar.foo.bar.nz`.

DNS servers

```
option domain-name-servers 10.50.1.80, 10.50.1.82;
```

Tell the clients to use these DNS servers for resolving.

Lease times

```
default-lease-time 86400

max-lease-time 259200
```

By default, our clients get a one day lease. They can request a longer one, and we will allow up to three days.

Authoritative

```
authoritative;
```

Our server is the authoritative source of network configuration on its networks. If a client request a lease renewal that this server does not recognise, it will direct the client to drop that lease and obtain a new one.

Networks

Next, we create a configuration block for every network. There are network-specific options, and we can override global options.

External network

```
subnet 10.25.0.0 netmask 255.255.0.0 {}
```

Even though we won't serve DHCP on this subnet, it's good practice to create an empty block for it. Since it's directly connected to the server, dhcpd should know about it.

Internal network

```
subnet 192.168.1.0 netmask 255.255.255.0 {
range 192.168.1.100 - 192.168.1.200;
option routers 192.168.1.1;
```

We will issue clients addresses in teh above range and direct them to use `192.168.1.1` as their default gateway.

A Static Host

```
host bob {
    hardware-ethernet 00:A0:78:6E:8E:A1;
    fixed-address 192.168.1.10;
}
```

The host `bob` gets a fixed address based on the MAC address.

Finished configuration

```
option domain-name "foo.org.nz";
option domain-name-servers 10.50.1.80, 10.50.1.82;
default-lease-time 86400;
max-lease-time 259200;
authoritative;

subnet 10.25.0.0 netmask 255.255.0.0 { }

subnet 192.168.1.0 netmask 255.255.255.0 {
    range 192.168.1.100  192.168.1.200;
    option routers 192.168.1.1;


    host bob {
        hardware-ethernet 00:A0:78:6E:8E:A1;
        fixed-address 192.168.1.10;
    }
}
```

Questions?