

# Exploration: Assigning IP Addresses

## Introduction

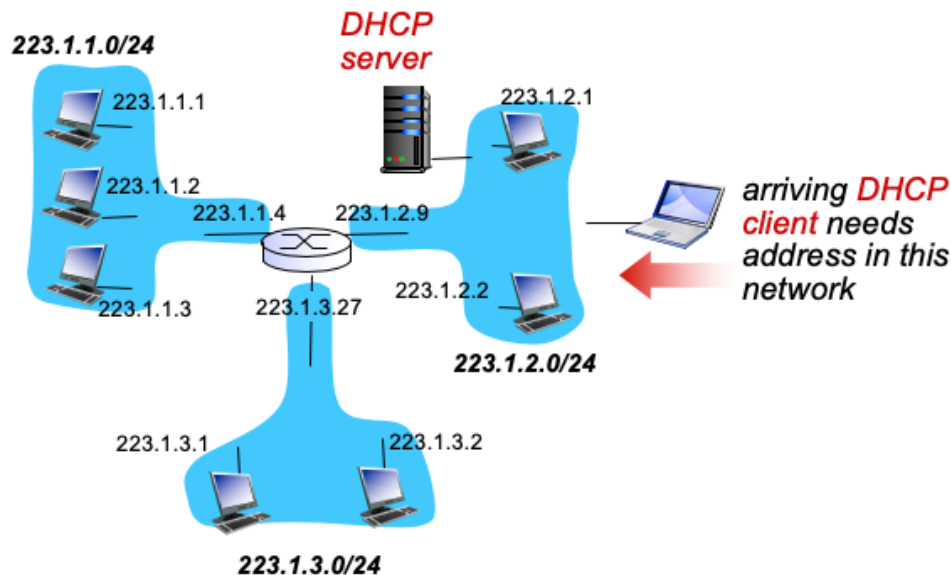


This exploration will focus on how IP addresses are assigned. We will focus specifically on Dynamic Host Configuration Protocol (DHCP), and also IP address distribution.

Host IP address assignment can be done in several ways. First, a system admin can always hard-code IP address for each host in the network. This is of course, time-consuming.

## DHCP

DHCP will automate the process of IP address configuration. DHCP is an application layer protocol, utilized in a client-server environment. With DHCP, hosts can dynamically “lease” IP address from a server when joining the network. IP address can be reused by other hosts if released, and the IP lease can be renewed while the host is still connected.



## IP Address Allocation

Addresses in the Internet are not used efficiently, Less than 20% of possible addresses are actually assigned. OSU is like most organizations, using 8,000-10,000 out of a possible  $2^{16}$  (= 65, 536) available addresses.

There are concerns about IPv4 address space being exhausted. We currently have 2.4+ billion users, and there are 4.2 billion addresses, with many reserved.

There are currently two solutions, both of which are in use.

### IP address sharing

Multiple hosts can use one IP address with Network Address Translation (NAT ... more on this later).

### IPv6 (more later)

For more on DHCP, including the basic protocol functionality, be sure to watch the video lecture, then test your knowledge with the Self-Check exercises below.

## Video Lecture

## Assigning IP Addresses



**CS 372 Lecture**

**Assigning IP addresses**

- DHCP
- IP address distribution

Note: Many of the lecture slides are based on presentations that accompany *Computer Networking: A Top Down Approach*, 6th edition, by Jim Kurose & Keith Ross, Addison-Wesley, 2013.

**Oregon State University**




([PDF \(https://oregonstate.instructure.com/courses/1798856/files/83165211/download?wrap=1\)](https://oregonstate.instructure.com/courses/1798856/files/83165211/download?wrap=1) )  
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## Self-Check Exercises

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Why does an arriving DHCP client have to broadcast its hardware address?

 Turn

Card 1 of 3



Drag the words into the correct boxes

Give the steps undergone when a new device enters a DHCP-enabled network.

1.

2.

3.

4.

The new device sends a “DHCP request” message, again to the MAC broadcast address, requesting an IP address.

A DHCP-enabled server will pick up this message and send back a “DHCP offer” message to the MAC address of the new device.

The DHCP-enabled server, in response, sends a “DHCP acknowledgement” message, including a new complete IP address for the device, to the device’s hardware address. It also records the relationship between this IP address, and the device’s hardware address, in a table.

A new device attaches to a network. It broadcasts a “DHCP discover” message on the MAC broadcast address later we’ll learn this is FF FF FF FF FF FF, containing its own MAC address.

 Reuse  Embed



## Resources

- [IP Configuration](https://www.sas.upenn.edu/~jasonrw/IPConfiguration.htm) [\\_ \(https://www.sas.upenn.edu/~jasonrw/IPConfiguration.htm\)](https://www.sas.upenn.edu/~jasonrw/IPConfiguration.htm)

- Find your computer's IP address [\\_\(https://kb.iu.edu/d/aapa\)](https://kb.iu.edu/d/aapa)