

Data Communications and Networking

Lab 4 - DHCP and NAT

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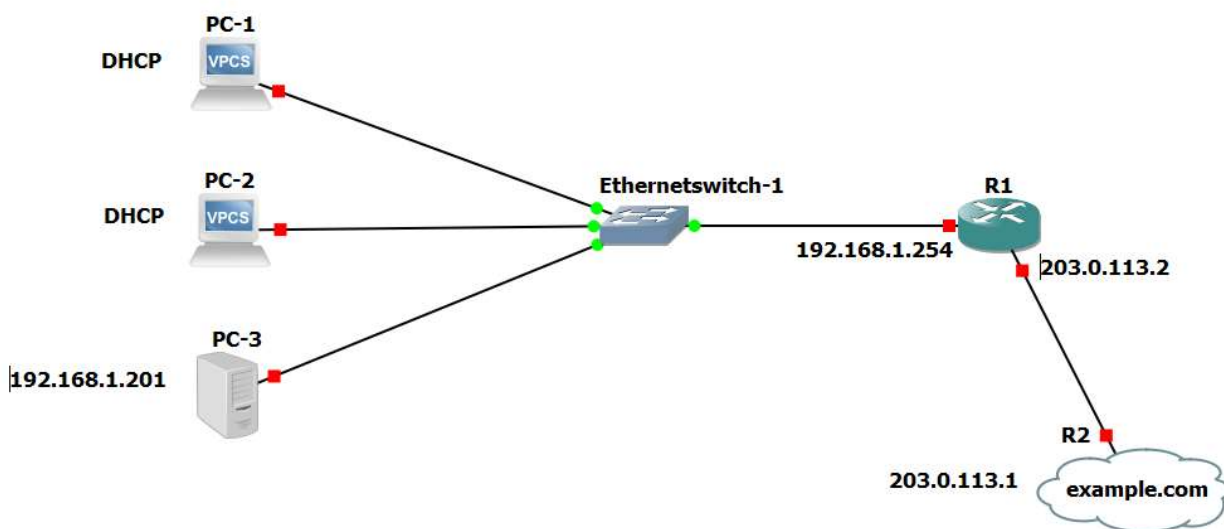
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Introduction

This is the fourth assessed lab exercise. The first four exercises together make up 10% of your final mark for the course.

You should work through the worksheet below in the week before the lab, taking a screenshot of the network(s) that you have built at the end of each Part of the instructions. When the instructions ask you to answer a question (e.g. “Can they ping each other?”), make a note of your answer. We suggest you put your notes and screenshots into a word processor like LibreOffice, then you can easily produce a single PDF file to submit.

Part 1: Topology Configuration



This network represents a typical small office network, with a few PCs, a single small router, and a connection to the Internet.

Start by building the above topology, configuring its IP addresses as indicated. Configure PC-1 and PC-2 to obtain their IP addresses using DHCP (we'll set up a DHCP server in part 2). The “cloud” here represents a server on the Internet; use a VPC for this (with a custom icon if you like!), **not** the GNS3 NAT icon. Do not configure any sort of routing. Make sure that any pair of hosts on the same link with statically-assigned IP addresses can ping each other.

The command `show ip interface brief` can be used to double-check that all interfaces are properly configured and are “up”.

Use the `write` command on each router to save your modifications. Use `save` on a VPC to save its configuration.

Part 2: DHCP Server

Configure R1's internal interface, facing the switch, to act as a DHCP server with the following settings:

- IP address range: 192.168.1.1 to 192.168.1.200
- Domain name: f29dc.hw.ac.uk
- DNS server: 1.1.1.1 (this is CloudFlare's public DNS server)
- Default gateway: 192.168.1.254

You will need to do some research to identify the right IOS commands to use. See [Cisco's DHCP server guide](#). The Cisco documentation is very comprehensive; it's often best to scroll to the examples at the end first, then look back to see what the individual commands do. You may also like to look at the videos about this topic on LinkedIn Learning.

Check that the VPCs can now obtain an address with DHCP. Test connectivity between the different VPCs, and make sure they can ping each other.

Part 3: NAT

This network has three PCs, but only one public IP address (203.0.113.2). The router will use NAT to allow all the PCs to share that address when accessing the Internet. You need to configure R1 to run a NAT in such a way that all VPCs share the same IP address 203.0.113.2 to get to the Internet server at 203.0.113.1.

To find the appropriate commands, see [Cisco's NAT guide](#). There are many types of NAT; in this case, you want what Cisco call “dynamic NAT”, where a variable number of private addresses can share a single public address.

Once you've got NAT set up, check that all the PCs can ping the Internet server. Use `show ip nat translations` on R1 to see the NAT mappings that have been set up. Try using Wireshark to observe the traffic on both sides of R1, so you can see the effect that NAT has on the packets.

Submission and marking

When you have completed the exercise, submit your screenshots and notes to the Lab 4 assignment on Canvas (preferably as a single PDF file). You are allowed to submit multiple times.

We will go through these screenshots and answers with you individually in the lab and give you feedback on them.