

Lab 2 – GCP VM Installs

Bowers, Winter 2021

Due 01/31/2021 at 11:59pm

For this lab we are going to work with Google Cloud to set up a micro-instance of a virtual machine. **Please read this guide carefully and follow along.** There will be homework questions seeded throughout this document asking you to take a screenshot here or there, report information, etc. and you won't be able to go back to it without starting over.

You can create as many VMs as you want, but keep in mind that your account will be charged for each moment a VM is online. **NOTE that you should never put your personal credit card information into the site. This is 100% free for you.**

The reason we're using a micro-instance is that it is free to your account, as long as you don't send/receive too much data.

Account Setup

You should have received an email forwarded from myself containing information for signing up for Google Cloud. Your OU email is required for the first form, as that will send you the coupon. This is what that first email should look like:

Dear Students,

Here is the URL you will need to access in order to request a Google Cloud Platform coupon. You will be asked to provide your school email address and name. An email will be sent to you to confirm these details before a coupon is sent to you.

[Student Coupon Retrieval Link](#)

- You will be asked for a name and email address, which needs to match the domain. A confirmation email will be sent to you with a coupon code.
- You can request a coupon from the URL and redeem it until:
5/7/2021
- Coupon valid through: **1/7/2022**
- You can only request ONE code per unique email address.

Please contact me if you have any questions or issues.

Thanks,

[Kate Bowers](#)

From your OU email, click on the “Student Coupon Retrieval Link.” Go through the steps and you should receive a second email in your OU email.

In your second email, click on the link to redeem the coupon. You should **hopefully** see this dialog message:

GCP disabled for this account

Google Cloud Platform must be enabled to continue. To do so, contact your administrator, or select or create a different account.

[CHOOSE A DIFFERENT ACCOUNT](#)

If you don’t get this dialog message, that’s fine. Either way, **make sure that you switch your account at the coupon redemption page to be your personal account, NOT YOUR OU ACCOUNT.**

The screenshot shows the Google Cloud Platform interface. The top navigation bar is blue with the Google Cloud Platform logo, a search icon, and a user profile icon. The main content area is titled "GCP credit application" and contains a form for applying for credits. The form has fields for "First name" (Kate), "Last name" (Bowers), "Account email" (katebowers3141@gmail.com), and "Coupon code". A "Terms and conditions" section is at the bottom with an "ACCEPT AND CONTINUE" button. An overlay window on the right shows the user's account information for "Kate Bowers" (katebowers3141@gmail.com) and "Kate Bowers" (katebowers@oakland.edu). The overlay includes a "Google Account" button, an "Add account" button, and a "Sign out" button.

Google Cloud Platform Select a project ▼

GCP credit application

Fill in the following information below to apply GCP credits to your account listed below

First name *
Kate

Last name *
Bowers

Account email
katebowers3141@gmail.com

Credits will be applied to this account. If you'd like to apply credits to a different account, specify your preference [here](#).

Coupon code *

Terms and conditions

The following [Terms of Service](#) apply to the credit you received for Google Cloud products.

[ACCEPT AND CONTINUE](#)

* Indicates required

Account Selection Overlay:

- Kate Bowers**
katebowers3141@gmail.com
[Privacy](#)
[Google Account](#)
- Kate Bowers**
katebowers@oakland.edu

[Add account](#) [Sign out](#)

Make sure your personal Gmail account is active, NOT YOUR OU account. Then fill out the GCP credit application. Make sure to copy over the coupon code included in the second email.



Welcome Kate!

Create and manage your Google Cloud Platform instances, disks, networks, and other resources in one place.

Country

United States

Terms of Service

☐ I agree to the [Google Cloud Platform Terms of Service](#), and the terms of service of [any applicable services and APIs](#).

AGREE AND CONTINUE

You might see a dialog message like this if you've never used GCP before. Agree to the terms of service and click Continue. It might take a minute, but now you should see the dashboard:

The screenshot shows the Google Cloud Platform (GCP) dashboard. At the top, a banner indicates a 90-day, \$300 free trial. Below this, the dashboard is divided into several sections. On the left is a navigation menu with categories like Home, Marketplace, Billing, APIs & Services, Support, IAM & Admin, Getting started, Security, Compliance, and Anthos. The main content area features a 'Get Started with Google Cloud Platform' banner with a 'TRY FOR FREE' button. Below the banner is a 'Top Products' section with four cards: Compute Engine, Cloud Storage, Cloud SQL, and Cloud Run. At the bottom, there are 'Engage' and 'Handy Links' sections. The 'Engage' section includes links to the Blog, Community, and Newsletter Signup. The 'Handy Links' section includes links to Download GCP Mobile App, Install the Cloud SDK, Documentation, and Support.

Your free trial is waiting: activate now to get \$300 credit to explore Google Cloud products. [Learn more](#)

DISMISS ACTIVATE

Google Cloud Platform My First Project Search products and resources

Home Marketplace Billing APIs & Services Support IAM & Admin Getting started Security Compliance Anthos

COMPUTE

App Engine Compute Engine Kubernetes Engine Cloud Functions Cloud Run VMware Engine

Dashboard Activity Recommendations

Get Started with Google Cloud Platform

90-day, \$300 free trial to get you started
Always free products to keep you going

TRY FOR FREE

Top Products

Compute Engine
Scalable, high-performance virtual machines

Cloud Storage
A powerful, simple and cost effective object storage service

Cloud SQL
A fully-managed MySQL/PostgreSQL database service

Cloud Run
Fully managed container engine for deploying and scaling containerized applications securely

Engage

Blog
Community
Newsletter Signup

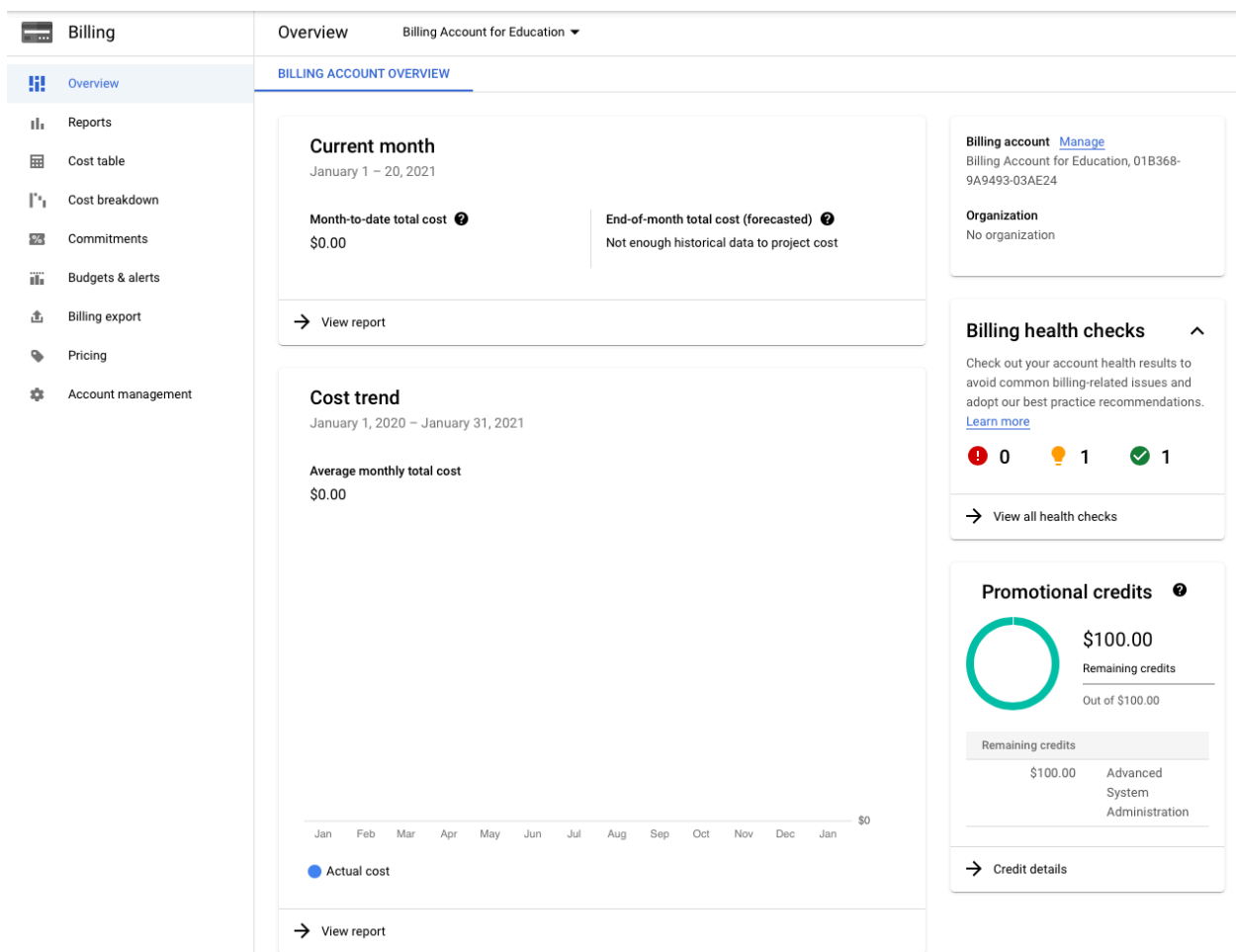
Handy Links

Download GCP Mobile App
Install the Cloud SDK
Documentation
Support

If you see the dialog message at the top saying you have a free trial for \$300 of credits, click **Dismiss**. If you click this, you may become ineligible for the \$50 in educational credits that I've already received for you. If you run out of money, I can request more for you, however it may take time for Google to process the request.

Okay, now you should have a billing account. You can access this at <http://cloud.google.com> now whenever you want to see how many credits you have left. You can also click the "Billing" link in the left pane from the screenshot above. Google Cloud itself is really outside the scope of this lab, however I'd recommend reading up on its capabilities (there are a LOT of really cool things you can do with it).

Your billing account page should look like this, except you'll see \$50 instead of \$100:



All of your Projects in GCP will be linked to this billing account. This is how cloud computing works.

Now we need to create a Project for the class. The project will contain all VMs related to the class (so, one Project will contain both the Windows and Ubuntu VMs). Click the GCP logo on the top left to bring you to the home page, or navigate to <https://console.cloud.google.com>.

The screenshot shows the Google Cloud Platform console dashboard for a project named "My First Project". The top navigation bar is blue and contains the Google Cloud Platform logo, the project name "My First Project" with a dropdown arrow, a search bar, and several utility icons. The left sidebar is a navigation menu with categories like Home, Marketplace, Billing, APIs & Services, Support, IAM & Admin, Getting started, Security, Compliance, Anthos, COMPUTE (App Engine, Compute Engine, Kubernetes Engine, Cloud Functions, Cloud Run, VMware Engine), STORAGE (Filestore, Storage, Data Transfer), DATABASES (Bigtable, Datastore, Database Migration, Firestore, Memorystore), and a "Pins appear here" notification. The main content area is titled "DASHBOARD" and includes tabs for "ACTIVITY" and "RECOMMENDATIONS". It features several widgets: "Project info" (showing project name, ID, and number), "API APIs" (showing requests per second), "Google Cloud Platform status" (showing all services normal), "Monitoring" (with links to alerting policies and uptime checks), "Error Reporting" (showing no errors), "News" (with recent articles), and "Documentation" (with links to Compute Engine, Cloud Storage, and App Engine). A "Getting Started" section at the bottom provides links to explore APIs, deploy solutions, add logging, monitor errors, deploy apps, take quickstarts, create storage buckets, create cloud functions, and install the SDK.

You should see a “My First Project” dropdown menu at the top, in the blue bar. Click on it.



Select a project

 NEW PROJECT

Search projects and folders

RECENT

ALL

Name	ID
✓  My First Project 	aqueous-charger-302322

Click on the “NEW PROJECT” in the top right corner of the dialog box.

New Project



You have 11 projects remaining in your quota. Request an increase or delete projects. [Learn more](#)

[MANAGE QUOTAS](#)

Project name *

Bowers-CSI3670-W2021



Project ID: bowers-csi3670-w2021. It cannot be changed later. [EDIT](#)

Location *



No organization

[BROWSE](#)

Parent organization or folder

CREATE

CANCEL

For the Project name, name your project **<LastName>-CSI3670-W2021**, where <LastName> is your last name without the angle brackets. Leave the organization alone. If prompted to enter a billing account, you should hopefully see a “Billing Account for Education” option. Choose that one. If you don’t see it, you may not have redeemed the credits correctly. Click “Create.”

You’ll be navigated back to your home page. In the top blue bar, choose your newly created project.

Select a project




 NEW PROJECT

Search projects and folders



RECENT

ALL

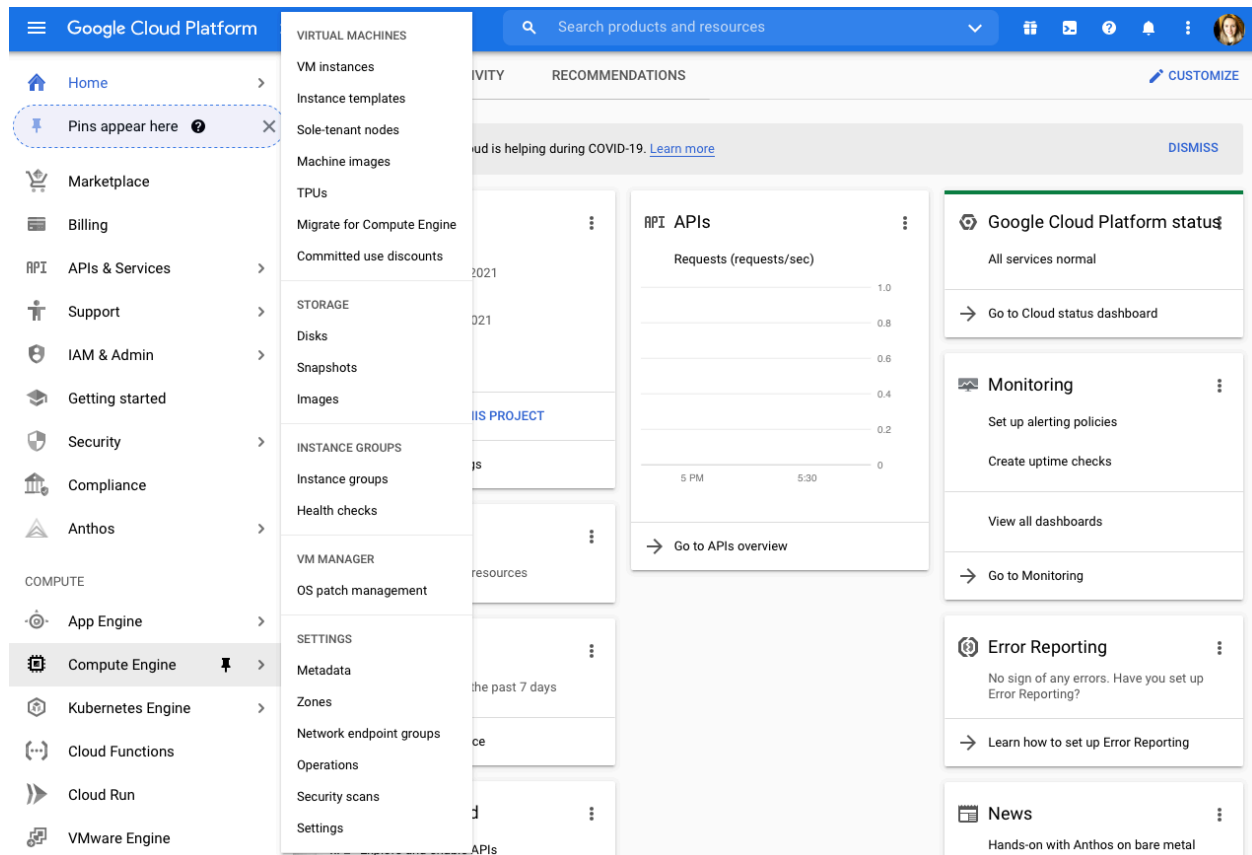
Name	ID
✓  Bowers-CSI3670-W2021 	bowers-csi3670-w2021
 My First Project 	aqueous-charger-302322

VM Setup

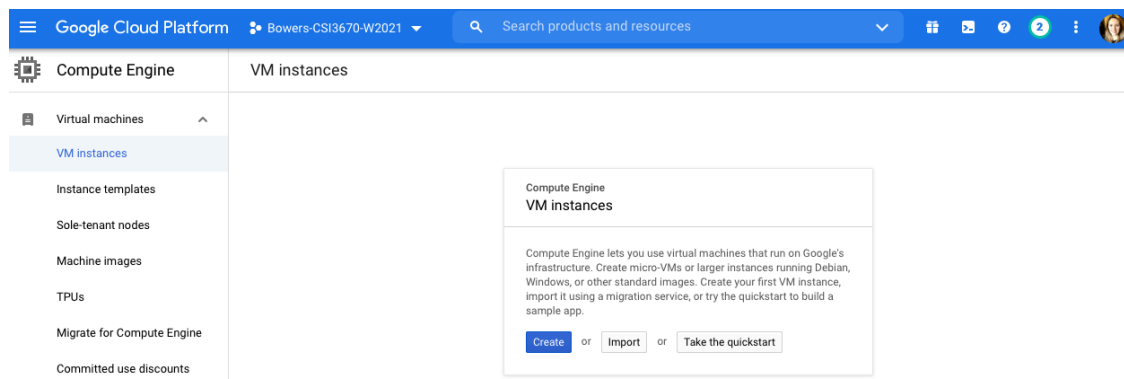
Now, you will create **two** VMs. The first will be a microinstance (similar to last semester if you had me for CSI 3660). The second will be Windows Server, to play with as a dev/test environment.

Ubuntu VM Creation

In the menu on the left of your homepage, click on Compute Engine.



It may take a few moments for the Compute Engine to initialize. Once it is done, click the Create button.



You'll be taken to the VM creation page. By default it looks like this:

Google Cloud Platform Bowers: CSI3670-W2021 Search products and resources

Create an instance

To create a VM instance, select one of the options:

- New VM instance**
Create a single VM instance from scratch
- New VM instance from template**
Create a single VM instance from an existing template
- New VM instance from machine image**
Create a single VM instance from an existing machine image
- Marketplace**
Deploy a ready-to-go solution onto a VM instance

Name ⓘ
Name is permanent
instance-1

Labels ⓘ (Optional)
+ Add label

Region ⓘ
Region is permanent
us-central1 (Iowa)

Zone ⓘ
Zone is permanent
us-central1-a

Machine configuration

Machine family
General-purpose | Compute-optimized | Memory-optimized | GPU
Machine types for common workloads, optimized for cost and flexibility

Series
E2
CPU platform selection based on availability

Machine type
e2-medium (2 vCPU, 4 GB memory)

vCPU
1 shared core

Memory
4 GB

GPUs
-

CPU platform and GPU

Confidential VM service ⓘ
☐ Enable the Confidential Computing service on this VM instance.

Container ⓘ
☐ Deploy a container image to this VM instance. [Learn more](#)

Boot disk ⓘ
New 10 GB standard persistent disk
Image
Debian GNU/Linux 10 (buster) [Change](#)

Identity and API access ⓘ
Service account ⓘ
Compute Engine default service account

Access scopes ⓘ
☒ Allow default access
☐ Allow full access to all Cloud APIs
☐ Set access for each API

Firewall ⓘ
Add tags and firewall rules to allow specific network traffic from the Internet
☐ Allow HTTP traffic
☐ Allow HTTPS traffic

Management, security, disks, networking, sole tenancy

\$24.86 monthly estimate
That's about \$0.034 hourly
Pay for what you use: No upfront costs and per second billing
[Details](#)

You will be billed for this instance. [Compute Engine pricing](#)

[Create](#) [Cancel](#)

Equivalent [REST](#) or [command line](#)

Name your VM **<lastname>-csi3670-ubuntu** (I did a different naming convention, however you want to structure it is fine). The region and zone should be us-central as shown, as this will affect the billing. You can play around with the machine type, location, etc. and see how it affects the cost changes on the right (but don't click Create yet). The beefier the machine, the more expensive. We're going to use a smaller model and keep things free.

Choose **N1** for the Series option and **f1-micro** for the Machine type. Note that now, to the right, you should see a dialog message that says “Your first 744 hours of f1-micro instance usage are free this month.” **If you do not use these options, you will be billed extra.**

Leave the Confidential VM service and Container options unchecked. For the Boot disk option, click Change. Under the Public images tab, choose Ubuntu for the Operating system and Ubuntu 20.10 for the Version. Change the Size to be 30GB and leave the Boot disk type as Standard persistent disk.

Boot disk

Select an image or snapshot to create a boot disk; or attach an existing disk. Can't find what you're

Public images	Custom images	Snapshots	Existing disks
---------------	---------------	-----------	----------------

Operating system

Ubuntu

Version

Ubuntu 20.10

amd64 groovy image built on 2021-01-19, supports Shielded VM features ?

Boot disk type ?

Standard persistent disk

Size (GB) ?

30

Once you have the same configurations, click Select at the bottom. Check the Allow HTTP and HTTPS traffic options. Your microinstance should look like the screenshot below (obviously with a different name):

Google Cloud Platform

Bowers-CSI3670-W2021

Search products and resources

Create an instance

To create a VM instance, select one of the options:

New VM instance

Create a single VM instance from scratch

New VM instance from template

Create a single VM instance from an existing template

New VM instance from machine image

Create a single VM instance from an existing machine image

Marketplace

Deploy a ready-to-go solution onto a VM instance

Name

Name is permanent

bowers-csi3670-microinstance-1

Labels

(Optional)

+ Add label

Region

Region is permanent

us-central1 (Iowa)

Zone

Zone is permanent

us-central1-a

Machine configuration

Machine family

General-purpose

Compute-optimized

Memory-optimized

GPU

Machine types for common workloads, optimized for cost and flexibility

Series

N1

Powered by Intel Skylake CPU platform or one of its predecessors

Machine type

f1-micro (1 vCPU, 614 MB memory)

vCPU

1 shared core

Memory

614 MB

GPUs

-

CPU platform and GPU

Confidential VM service

Enable the Confidential Computing service on this VM instance.

Container

Deploy a container image to this VM instance. [Learn more](#)

Boot disk

New 30 GB standard persistent disk

Image

Ubuntu 20.10

Change

Identity and API access

Service account

Compute Engine default service account

Access scopes

Allow default access

Allow full access to all Cloud APIs

Set access for each API

Firewall

Add tags and firewall rules to allow specific network traffic from the Internet

Allow HTTP traffic

Allow HTTPS traffic

Management, security, disks, networking, sole tenancy

You will be billed for this instance. [Compute Engine pricing](#)

Create

Cancel

Equivalent [REST](#) or [command line](#)

\$5.08 monthly estimate

That's about \$0.007 hourly

Pay for what you use: No upfront costs and per second billing

Your first 744 hours of f1-micro instance usage are free this month. [Learn](#)

Details

Click Create at the bottom. The VM instance creation will take a few minutes. Once it's done, you'll see a green checkmark.

VM instances

MANAGE ACCESS

SHOW INFO PANEL

LEARN

Name	Zone	Recommendation	In use by	Internal IP	External IP	Connect
<input type="checkbox"/> <input checked="" type="checkbox"/> bowers-csi3670-microinstance-1	us-central1-a			10.128.0.2 (nic0)	35.222.234.83	SSH

Once it's ready and you see a green checkmark, you can open the instance by clicking its name and looking at the details and monitoring tabs.

Go back to the VM instances screen (like the screenshot above) and click on the SSH at the right. Google Cloud makes SSH ridiculously easy to do in the browser. This will pop open an SSH window. Depending on your browser settings, it may see it as a popup window and try to block it. Once you allow the window to be opened, you might see something similar to this:

Do you want to initiate an SSH connection to VM instance 'bowers-csi3670-microinstance-1'?



Click Connect. This may take some time, but once the connection is established, you should see a screen similar to this:

```
* Documentation:  https://help.ubuntu.com
* Management:    https://landscape.canonical.com
* Support:       https://ubuntu.com/advantage

System information as of Wed Jan 20 23:09:38 UTC 2021

System load:  0.32               Processes:           97
Usage of /:   4.8% of 28.90GB    Users logged in:    0
Memory usage: 33%               IPv4 address for ens4: 10.128.0.2
Swap usage:   0%

0 updates can be installed immediately.
0 of these updates are security updates.

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

katebowers3141@bowers-csi3670-microinstance-1:~$
```

Yay! You are now in your Linux virtual machine. Now we should make sure our machine is up to date and install Apache. This is something that should be done fairly regularly to make sure things like security updates are applied to your software.

In the terminal run (without the dollar sign, I use the dollar sign to indicate that you should type a command into the shell):

```
$ sudo apt update && sudo apt upgrade
```

When prompted, type **y** and hit enter to accept. Once it's complete, type:

```
$ sudo apt-get install apache2
```

Again, type **y** and hit enter to accept.

Now it's time to put together the actual lab assignment. Create a Word document (Word is free for students, see the syllabus on Moodle if you don't have it installed yet) and type your name at the top.

In a browser, type `http://` followed by the external IP address of your GCP microinstance. You should see the Apache default page. Take a screenshot of this page, **including the IP address in your browser**, and paste the screenshot in the Word document beneath your name. See the screenshot on the next page for something similar.

That's it! You're done with your Ubuntu VM for now. Now, navigate back to the VM instances page in GCP Compute Engine. Check the box next to your VM instance and click the Stop (square) button at the top.

VM instances							MANAGE ACCESS		SHOW INFO PANEL	LEARN
Filter VM instances							Columns			
<input checked="" type="checkbox"/>	Name ^	Zone	Recommendation	In use by	Internal IP	External IP	Connect			
<input checked="" type="checkbox"/>	bowers-csi3670-microinstance-1	us-central1-a			10.128.0.2 (nic0)	35.222.234.83	SSH			

This step is important, since you will be billed while your VM is on or suspended. Make sure that when you click stop, your VM is in a safe state to be shut down (otherwise, use Suspend). If prompted with a dialog box to Stop VM instance, click Stop. Once the VM successfully shuts down, you should see it grayed out. You'll need to power it back on when you want to use it next.

VM instances							MANAGE ACCESS		SHOW INFO PANEL	LEARN
Filter VM instances							Columns			
<input checked="" type="checkbox"/>	Name ^	Zone	Recommendation	In use by	Internal IP	External IP	Connect			
<input checked="" type="checkbox"/>	bowers-csi3670-microinstance-1	us-central1-a			10.128.0.2 (nic0)	None	SSH			



Apache2 Ubuntu Default Page

It works!

This is the default welcome page used to test the correct operation of the Apache2 server after installation on Ubuntu systems. It is based on the equivalent page on Debian, from which the Ubuntu Apache packaging is derived. If you can read this page, it means that the Apache HTTP server installed at this site is working properly. You should **replace this file** (located at `/var/www/html/index.html`) before continuing to operate your HTTP server.

If you are a normal user of this web site and don't know what this page is about, this probably means that the site is currently unavailable due to maintenance. If the problem persists, please contact the site's administrator.

Configuration Overview

Ubuntu's Apache2 default configuration is different from the upstream default configuration, and split into several files optimized for interaction with Ubuntu tools. The configuration system is **fully documented in `/usr/share/doc/apache2/README.Debian.gz`**. Refer to this for the full documentation. Documentation for the web server itself can be found by accessing the **manual** if the `apache2-doc` package was installed on this server.

The configuration layout for an Apache2 web server installation on Ubuntu systems is as follows:

```
/etc/apache2/  
|-- apache2.conf  
|   |-- ports.conf  
|-- mods-enabled  
|   |-- *.load  
|   |-- *.conf  
|-- conf-enabled  
|   |-- *.conf  
|-- sites-enabled  
|   |-- *.conf
```

- `apache2.conf` is the main configuration file. It puts the pieces together by including all remaining configuration files when starting up the web server.
- `ports.conf` is always included from the main configuration file. It is used to determine the listening ports for incoming connections, and this file can be customized anytime.
- Configuration files in the `mods-enabled/`, `conf-enabled/` and `sites-enabled/` directories contain particular configuration snippets which manage modules, global configuration fragments, or virtual host configurations, respectively.
- They are activated by symlinking available configuration files from their respective *-available/ counterparts. These should be managed by using our helpers `a2enmod`, `a2dismod`, `a2ensite`, `a2dissite`, and `a2enconf`, `a2disconf`. See their respective man pages for detailed information.
- The binary is called `apache2`. Due to the use of environment variables, in the default configuration, `apache2` needs to be started/stopped with `/etc/init.d/apache2` or `apache2ctl`. **Calling `/usr/bin/apache2` directly will not work** with the default configuration.

Document Roots

By default, Ubuntu does not allow access through the web browser to *any* file apart of those located in `/var/www`, **public_html** directories (when enabled) and `/usr/share` (for web applications). If your site is using a web document root located elsewhere (such as in `/srv`) you may need to whitelist your document root directory in `/etc/apache2/apache2.conf`.

The default Ubuntu document root is `/var/www/html`. You can make your own virtual hosts under `/var/www`. This is different to previous releases which provides better security out of the box.

Reporting Problems

Please use the `ubuntu-bug` tool to report bugs in the Apache2 package with Ubuntu. However, check **existing bug reports** before reporting a new bug.

Please report bugs specific to modules (such as PHP and others) to respective packages, not to the web server itself.

Connect using your RDP client

Use a remote desktop protocol (RDP) client to connect to this instance. If you are running Windows on your local machine, use Remote Desktop Connection. Other operating systems might require you to use third-party software. The first time you connect, enter the username and password that you provided when you created the instance.

Note: You must configure the network firewall to open TCP port 3389 to enable RDP access.

[Download the RDP file if you will be using a 3rd-party client.](#)

CANCEL

Either download the RDP file or install the Chrome extension (<https://chrome.google.com/webstore/detail/chrome-remote-desktop/inomeogfingihgjilpeplalcfaighgai?hl=en>). If you're on Mac or Linux, look up how to connect via Remote Desktop.

Personally, I use a MacBook. I downloaded Microsoft Remote Desktop from the App Store and installed it. Then, in GCP, I downloaded the RDP file. When I opened Microsoft Remote Desktop, I navigated to the Settings dropdown menu, chose the option to Import from RDP file, and navigated to where the RDP file from my GCP microinstance downloaded. From there, I was able to open it. I also needed to go into System Preferences to enable remote connections for Microsoft Remote Desktop through my firewall settings. I also had to click the down-arrow next to RDP in the VM instances page to set my default password for my account.

Once you have access to the remote desktop, open up Windows Server. **Take a screenshot to demonstrate that you installed Windows Server correctly and are able to access the Desktop interface.** Paste this screenshot underneath the Ubuntu screenshot in your Word document.

Upload your Word or PDF document with the screenshots to Moodle.