Google Cloud Instance Configuration

CS 3113, Spring 2019

This tutorial goes through how to set up your own Google Compute Engine (GCE) instance to work on the assignments. Each student will have $50 in credit for use during the semester. Please try to use the resources judiciously. Adding additional credits is a bit difficult. When you sign up for GCP the first time, you also receive $300 credits from Google that you can use for the course.

You will connect to the Google cloud through a terminal or shell. This is the standard way of interacting with *nix family systems. This tutorial will also help you set up your own terminal access.

SSH

The Secure SHell (SSH) provides a range of secure access tools to remote machines. For this class, we will be using it to establish a terminal (command-line) connection to your virtual machine instance.

We are using key-based authentication to your compute instances. This means that access will be linked to specific computers and accounts that you will be accessing your instance from. Also, you will not use a password for access (unless your local private key is encrypted).

Configuring SSH on your Laptop: Unix (OSX, Linux)
Installation: ssh is typically installed by default under these OSes.

Configuration: If you already have a ~/**.ssh/id_rsa.pub** in your home (user) directory, then you are done. You can check for this file by typing:
```
ls ~/.ssh/id_rsa.pub
```

Otherwise, generate a public/private key pair on your local machine. At the command line, type:
```
ssh-keygen
```

> It is okay to use an empty passphrase, but doing so means that your private key is unencrypted (this is often okay, since it is stored on your local machine only, but is a problem if your laptop is compromised).

## Configuring SSH on your Laptop: Windows
Installation:
- Install PuTTY: https://www.ssh.com/ssh/putty/windows/

Configuration:
- Use the puttygen to generate a public/private key pair
    - See https://www.ssh.com/ssh/putty/windows/puttygen
    - Save both the public and private keys to a file. It is important that you safeguard the private key (do not share it!)
- Use putty to connect to your instance. To take this step, you will first need to set up and configure your instance (described below).
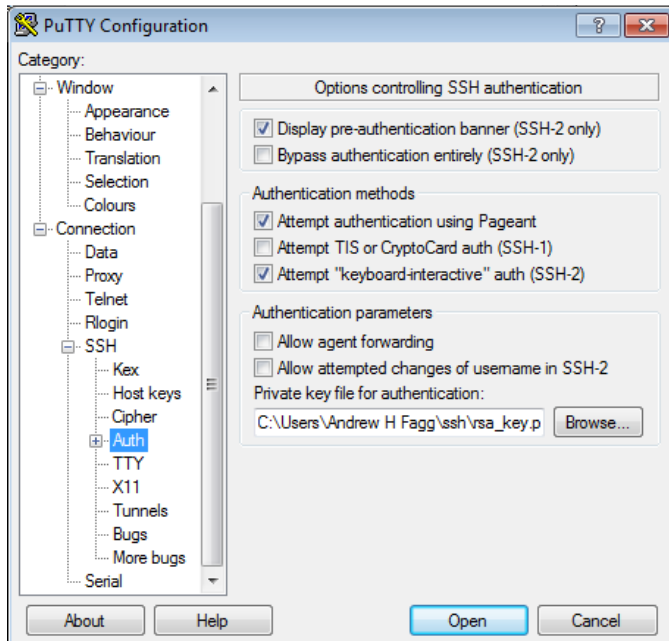
In the PuTTY Configuration WIndow:
- Insert the **static IP address** of your instance. You will not have this until setting up your instance.
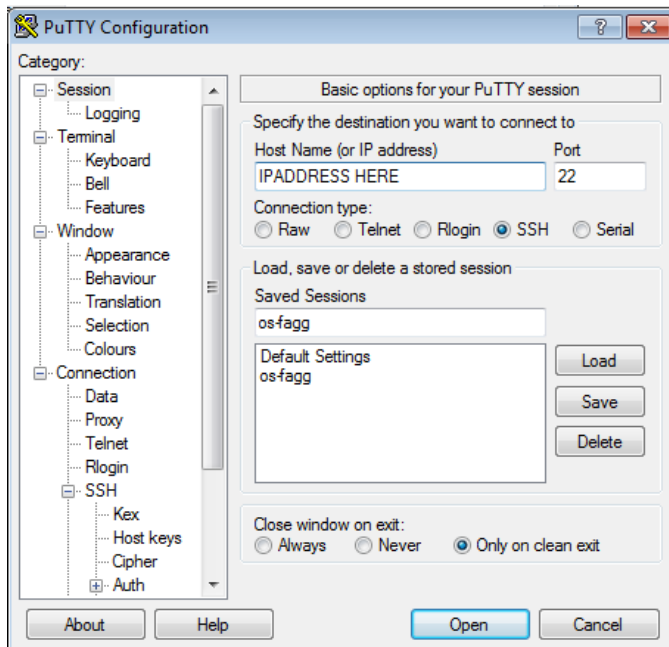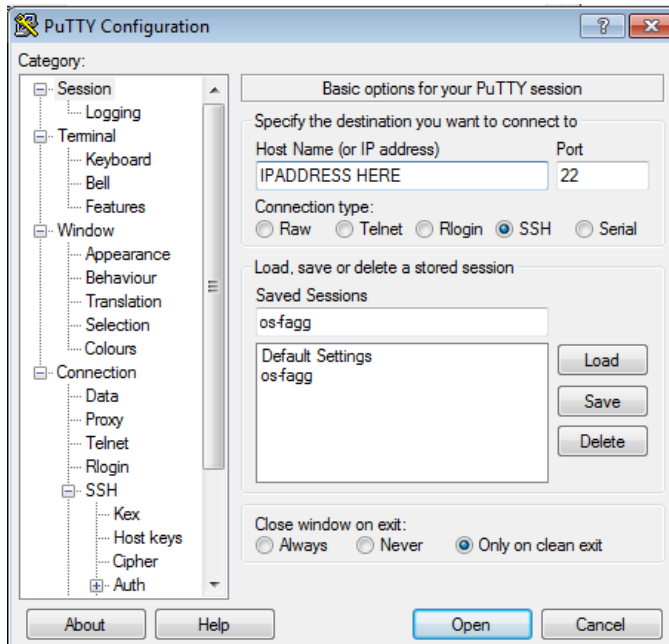
- Select Connection > Data from the left-hand menu.
- Add your instance user name to the *Auto-login username* field.
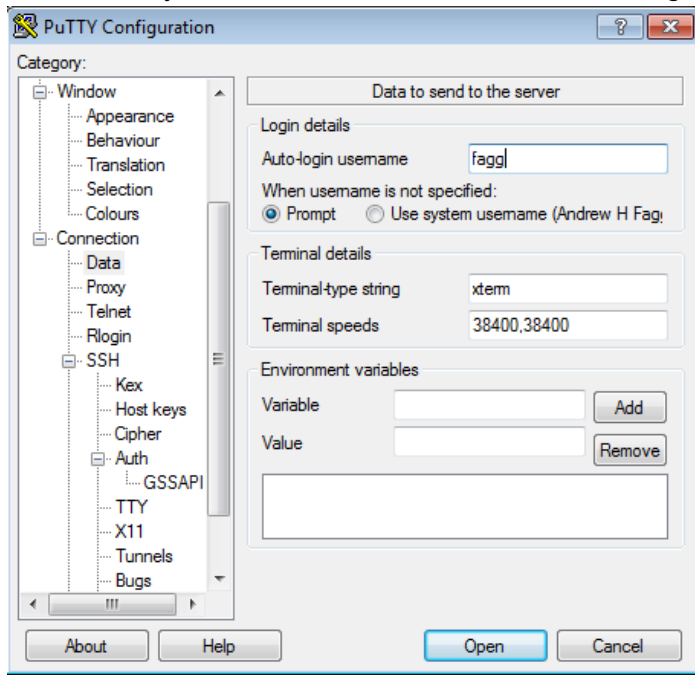
- Select Connection > SSH > Auth from the left-hand menu.
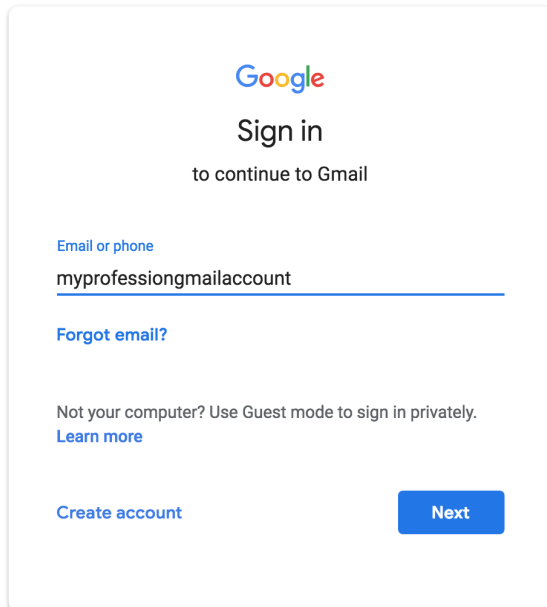- Browse to and select the private ssh key file

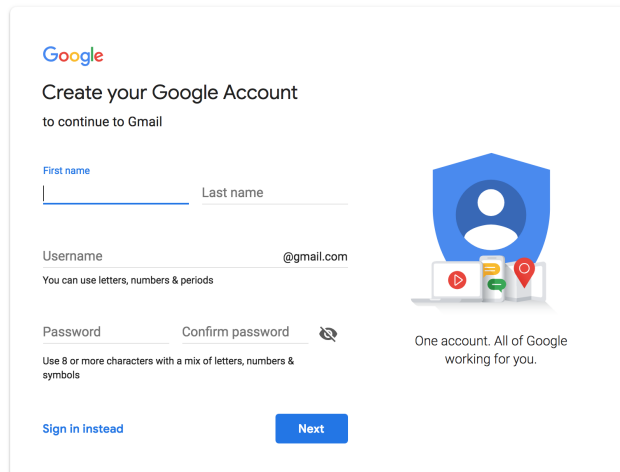- Save your session so you can recall these settings quickly.

Google Cloud Account

Create a Gmail account if you haven't already at https://gmail.google.com

- An email has been sent to you by the OS instructors containing information on how to create and apply Google Cloud Credits. Be sure you are logged into a Gmail account that you would like to use for this course. Fill in your OU email. You will have to verify your email.

Cloud Platform Education Grants

Use credits provided to you via the Google Cloud Platform Education Grants program to access Google Cloud Platform. Get what you need to build and run your apps, websites and services.
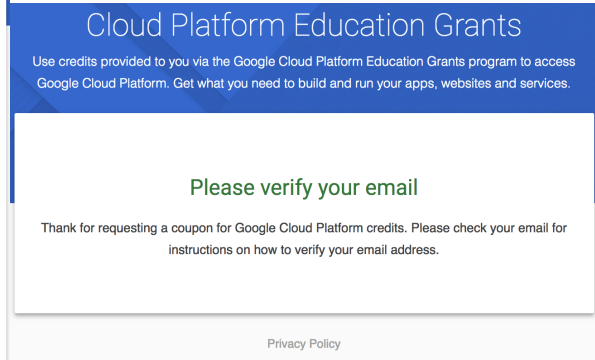
Thank you for your interest in Google Cloud Platform Education Grants. Please fill out the form below to receive a coupon code for credit to use on Google Cloud Platform.

First Name   **Last Name**

School Email

[   ] @ou.edu

If you do not see your domain listed, please contact your course instructor: cgrant@ou.edu

By clicking "Submit" below, you agree that we may share the following information with your educational institution and course instructor (cgrant@ou.edu): (1) personal information that you provide to us on this form and (2) information regarding your use of the coupon and Google Cloud Platform products.

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Thank for requesting a coupon for Google Cloud Platform credits. Please check your email for instructions on how to verify your email address.

Privacy Policy

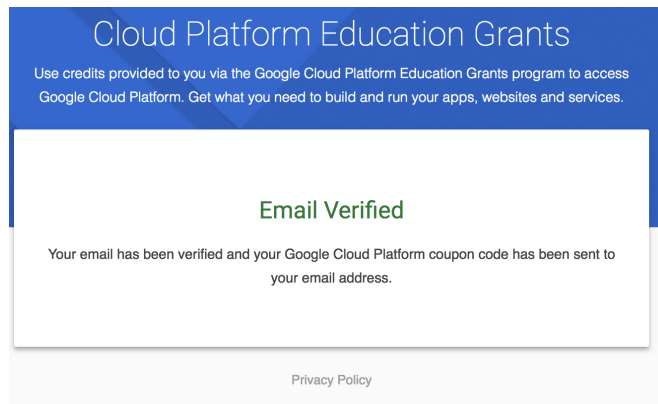You will then get an email that you can click to verify your account.

Dear
Christan,

Thank you for your
 interest in downloading a Google Cloud Platform Coupon Code. Please click on this
link
 to verify your email address and a code will be sent to your email account.

Instructor Name:
 Christan Grant
Email
 Address: cgrant@ou.edu
School:
Univeristy of Oklahoma
Course/project:
CS 3113 Operating Systems

If you have any questions, please
 contact your course instructor as listed above.

Thanks,
Google Cloud Platform Education
 Grants Team

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Your email has been verified and your Google Cloud Platform coupon code has been sent to your email address.

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You can then check your email for an additional email that has the coupon and lets you apply the coupon.

Education grants

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Coupon code

0BVT-ATFP-TX4A-UC44

Credit amount	Expiration date	Course
$50.00	Aug 20, 2019	CS 3113 Operating Systems

Country of residence

United States

Please email me updates regarding feature announcements, performance suggestions, feedback surveys and special offers.

○ Yes ● No

Google Cloud Platform education grants credits terms and conditions

By clicking "Accept and continue" below, you, on behalf of yourself and the organization you represent ("You") agree to these terms and conditions:

The credit is valid for Google Cloud Platform products and is subject to Your acceptance of the applicable Google Cloud Platform License Agreement and any other applicable terms of service. The credit is non-transferable and may not be sold or bartered. Unused credit expires on the date indicated on the media conveying the promotion code. The credit may be issued in increments as You use the credit over the period of time during which the credit is valid. Offer void where prohibited by law.

You represent that you are accepting the promotional credit on behalf of your educational institution and the credit can only be used on behalf of the educational entity and not for your personal use. You represent, on behalf of such educational entity, that (i) You are authorized to accept this credit; (ii) the credit is consistent with all applicable laws and regulations, including relevant ethics rules and laws; and (iii) the provision of credits will not negatively impact Google's current or future ability to do business with such educational entity.

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Accept and continue   Clear

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Click
[here]
to redeem.

Course/Project Information
Instructor Name:
Christan Grant
Email Address:
cgrant@ou.edu
School:
Univeristy of Oklahoma
Course/project:
CS 3113 Operating Systems
Activation Date:
8/20/2018
Redeem By:
12/20/2018
Coupon Valid Through:
8/20/2019

Accept and continue. At this point you will receive the $50 in coupons for the google cloud.

Billing

Overview   CS 3113 Operating Systems ▾   ✏ RENAME BILLING ACCOUNT

- Overview
- Budgets & alerts
- Billing export
- Reports

Billing account ID: 015772-3DABE9-059CAE

Credits

$50.00
Credits remaining
Out of $50.00

358
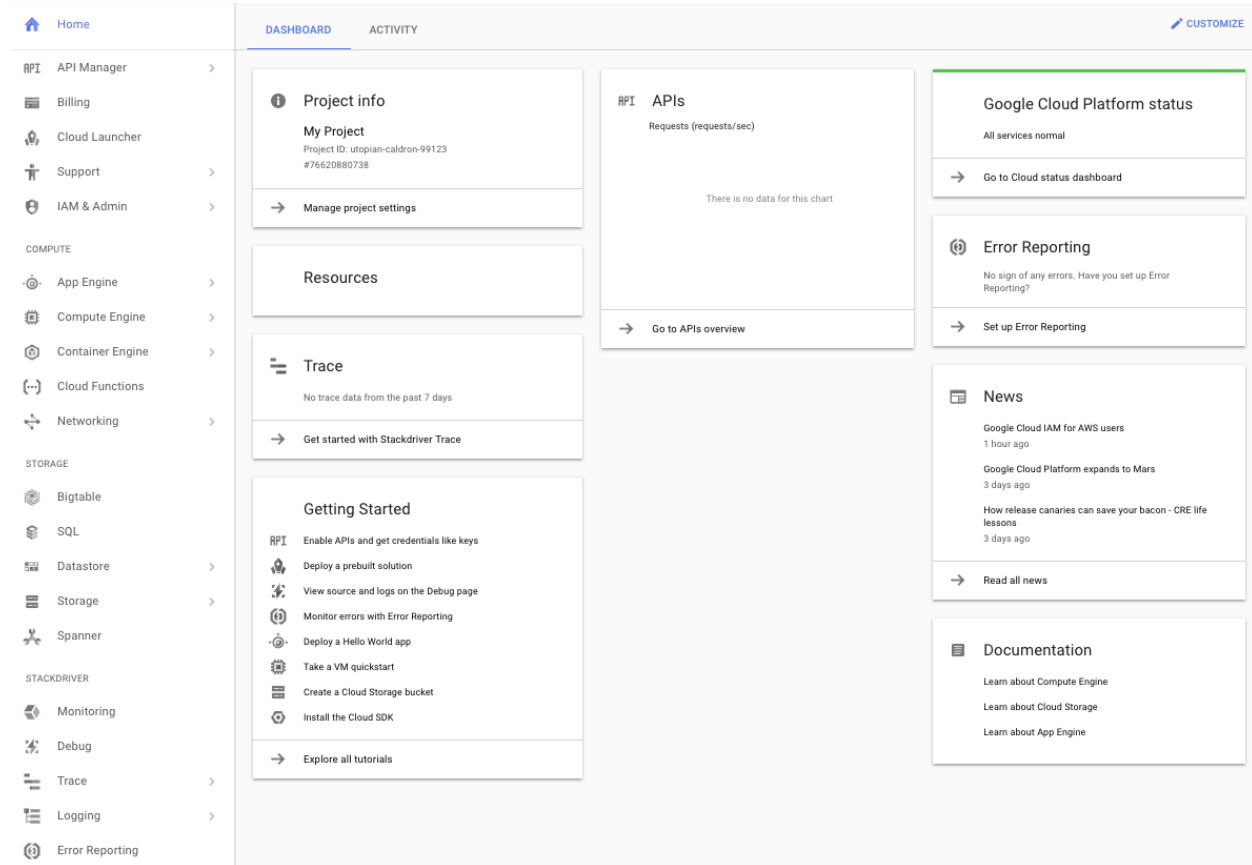Days remaining
Ends Aug 20, 2019

Projects linked to this billing account

There are no projects linked to this billing account.

Compute Console

The compute console is where you will be creating and manipulating your virtual machine instance(s). This can be reached at https://console.cloud.google.com

The main console/dashboard looks like the following:

The console lists your active projects to which virtual machines are attached. Initially, you have one project with a default name (*My Project*). To change the name of your project, click on Manage project settings on the Project info button and save your changes.

Creating/Configuring Your Virtual Machine Instance

Create Your Instance

From the left-hand side of your Google cloud console, select *Compute Engine*

From Compute Engine / VM Instances, in the pop-up select *CREATE*
- (For those returning to the Google cloud console select: *CREATE INSTANCE*)

You will mostly use the defaults, but change:
- Machine type: micro (this is changeable later)
- Boot disk: select "Ubuntu 18.10"
- Firewall: Allow HTTP and HTTPS traffic
- Region: us-central1-c
- All full access to all Cloud APIs

Note that the f1-mico *(0.6 GB 1 shared vCPU)* instance will be free --- it will not cost more than the free tier. There are several zone options, so you can choose the one where you would like your virtual instance to live. The closest zone is us-central1, this zone is located in Council Bluffs, Iowa. Set your zone to **us-central1-c** they will have the configurations we need.

Then click CREATE

After the instance is created: Select the instance from the "VM instances" list. You can view your instances here: https://console.cloud.google.com/compute/instances

Reserving an External, Static IP

If the instance is currently running, click on "STOP"

Click on "EDIT"

Reserve a static IP address:
https://console.cloud.google.com/networking/addresses/add
- Network service tier: Premium
- Region: select us-central1
- Attach to: select your new instance
- Click "Reserve"

Configure ssh keys

Go back to your VM Instance Dashboard

- Select your instance
- Click "Edit"
- Under "SSH keys", click Add Item
- Copy your laptop public key (e.g. `id_rsa.pub`) onto your clipboard.
- Paste the key into the *SSH Key* text box. NOTE: your user ID at the end of the ssh key must match your google ID name. (i.e., myprofessionalgmailaccount@gmail.com). Also, make sure that your key does not include newlines when you are pasting it in.
- Click "Save" at the bottom of the page
- Add a second key. Paste the contents of the following file into the text box: https://oudalab.github.io/cs3113sp19/instance/id_rsa_cs3113.pub
- Note that you can add additional keys, for example, to support other local computers that you may be using
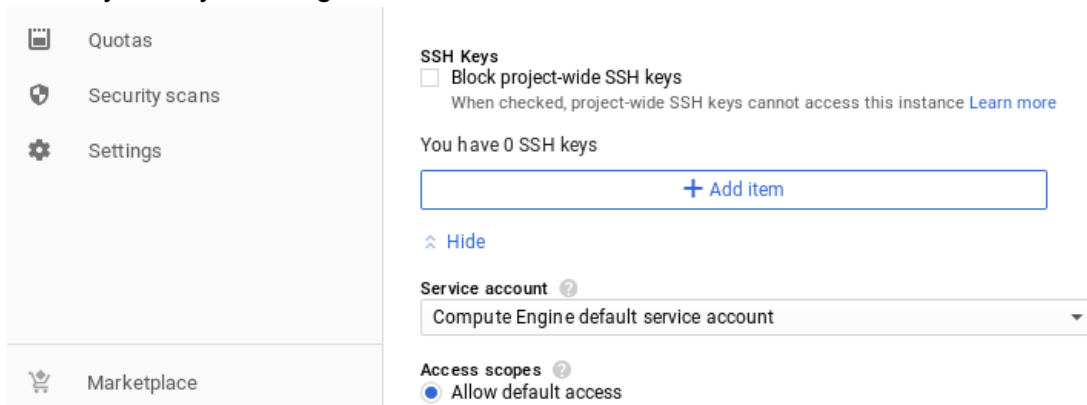
Start your instance:
- Click "Start" at the top of the page

Admin Access to your Instance

From the google cloud *VM Instance* page:
- Connect column: SSH: select *connect in browser window.*
- Wait for connection to be established (you will ultimately see a terminal window)
- You are now logged into the shell under your user ID.
- You can execute any command as the administrator (root) by prefacing the command with the *sudo* command. Doing this should be used only when necessary and with some degree of caution. However, at any time, you can delete your Instance (contents of the disk drive and all) and start again (of course, you will lose you prior work).

Configuring your Instance for the First Time

- Connect to your instance as the administrator.

- Update the current version of the OS and other software:

```
sudo apt update
sudo apt dist-upgrade -y
```

Generally, it is safe to answer 'Y' to the installation question. You should expect to do this from time to time. You can find the full script containing the installations we need on the course website: https://oudalab.github.io/cs3113sp19/instance/startup.sh

● Install additional software
```
sudo apt install -y emacs vim htop tmux tree ranger glances
sudo apt install -y gcc gdb make
sudo apt install -y valgrind strace
sudo apt install -y linux-tools-common linux-tools-generic
sudo apt install -y linux-tools-`uname -r`
sudo apt install -y libcap-dev
sudo apt install -y libacl1-dev
```

● Reboot your instance
```
sudo shutdown -r now
```

This is sometimes a necessary step after software installation (especially if your linux kernel version or other supporting libraries have been upgraded).

● Register your instance with the class: fill out the following form (this is homework zero!): https://goo.gl/forms/lurM8ZU4hf4iX2gV2

In response to your VM registration, we will verify that we are able to access your instance. Note that if we cannot access your instance, we cannot help you in configuring it and we cannot grade your assignments
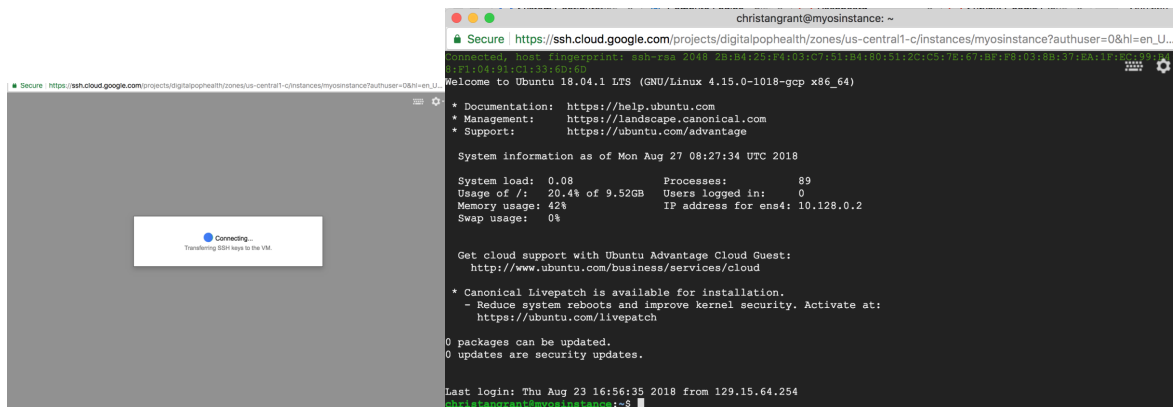
Connecting to your Instance

SSH to you Instance: Browser
The simplest method to connect to an instance to use the browser. The does not require any additional key configuration.

SSH to your Instance: Unix

In the terminal window on your local machine, type:

```
ssh <External Static IP address> -l <google account username>
```

Where:
- <External Static IP address> is the external static IP address of your VM instance
- <google account username> is your username on your instance

If everything is configured properly, you will now have a terminal connection to your instance.

SSH to your Instance: Windows

- Open putty
- Select your saved session
- Click *Open*

Putty will open up a new window. If everything is configured properly, you will now have a terminal connection to your instance.

CS 3113

Introduction to Operating Systems at OU

CS 3113, Fall 2018

O RLY?

CG and AHF