

Purpose

The purpose of this exercise is to create snapshots of your instance as backups and use these snapshots to create additional instances.

A *snapshot* is a GCP object that contains the files from a disk. Don't confuse this with screenshot, which is a image you use to document some activity in the exercise.

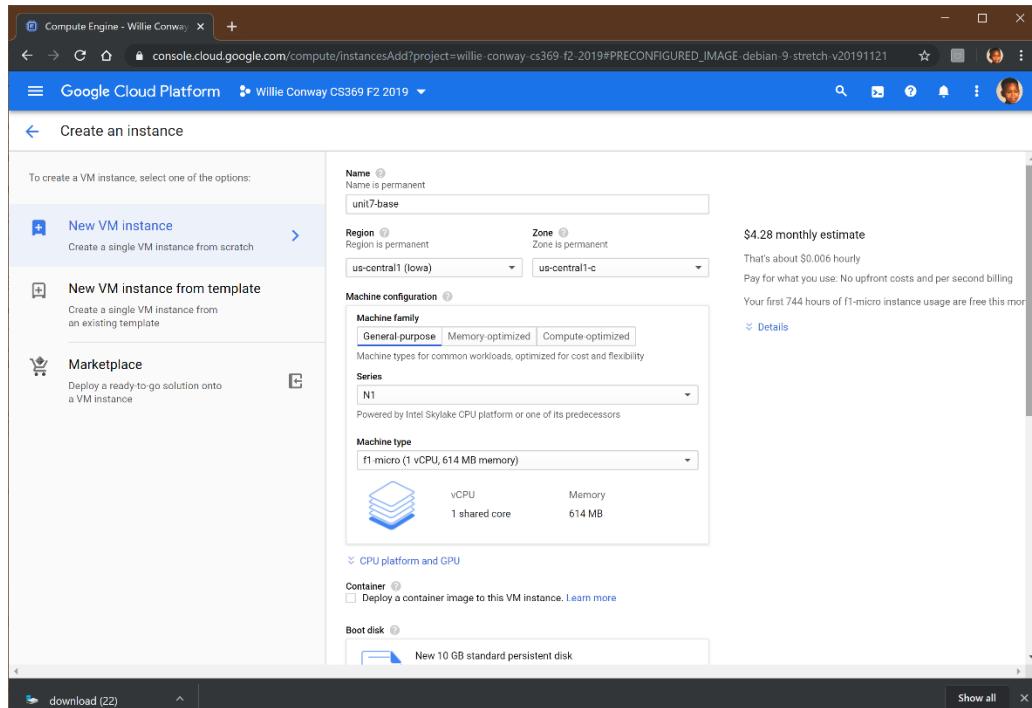
Preparation

Read <https://cloud.google.com/compute/docs/disks/create-snapshots> (Links to an external site.) to get an idea of the process. You use snapshots as a way of backing up disks used by your instances.

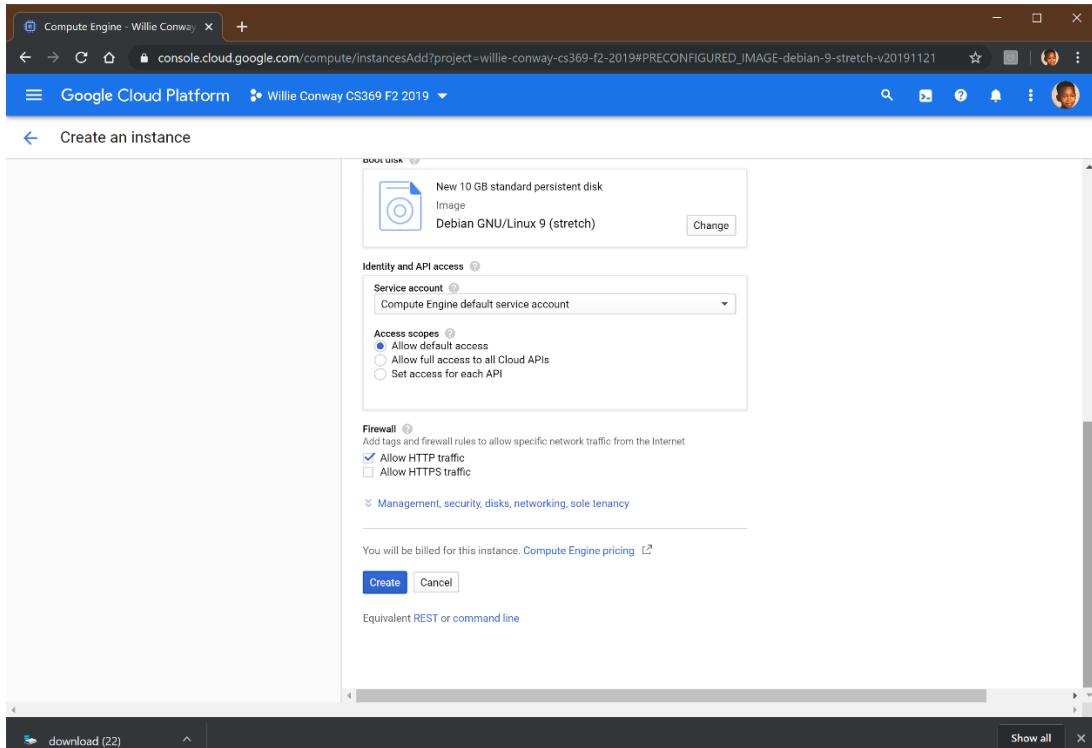
Assignment

Create a Word document that contains your screenshots and explanations of what you are doing.

1. Create a new instance called unit7-base (f1-micro, standard persistent disk, allow http traffic), then install nginx and add your name and unit 7 to the index page.



(Creating a new instance called unit7-base(f1-micro,standard persistent disk, allow http traffic.)

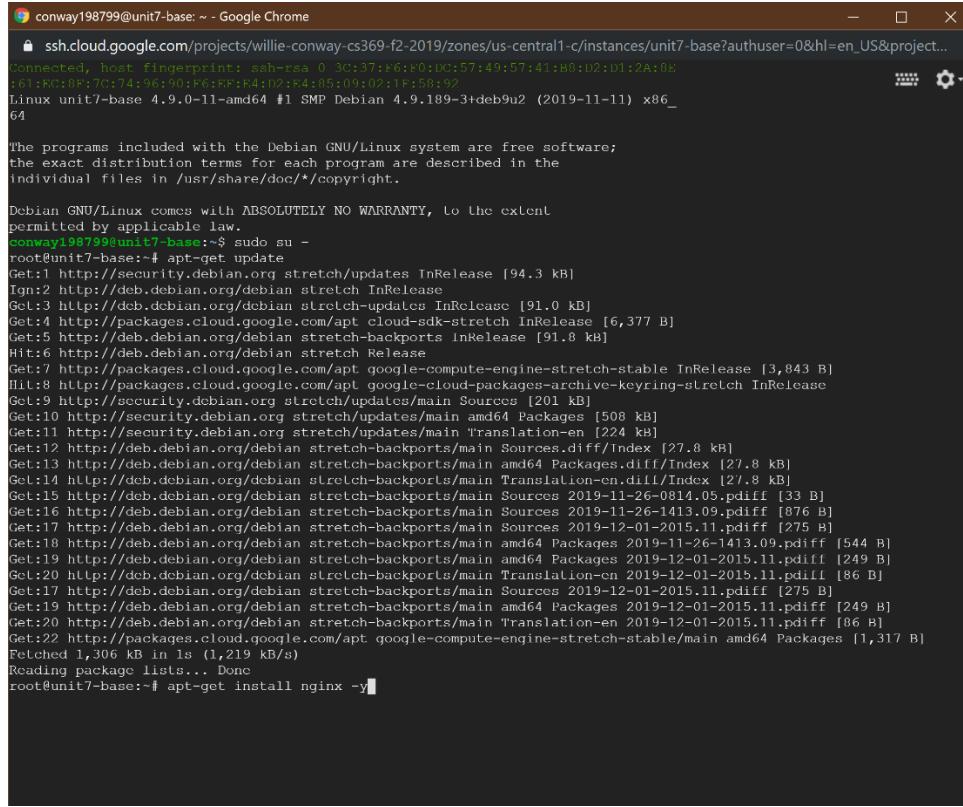


(Selecting Create.)

The screenshot shows the 'VM instances' list in the Google Cloud Platform. A red arrow points to the 'Connect' column for the 'unit7-base' instance, which has an SSH icon. The left sidebar shows other Compute Engine options like Instance groups, Instance templates, Sole-tenant nodes, Disks, Snapshots, Images, TPUs, Committed use discounts, Metadata, Health checks, Zones, Network endpoint groups, and Marketplace.

Name	Zone	Recommendation	In use by	Internal IP	External IP	Connect
gcelab2	us-central1-c			10.128.0.2 (nic0)	173.255.116.136	SSH
unit7-base	us-central1-c			10.128.0.3 (nic0)	34.68.201.17	SSH

(Instance unit7-base is running.)



```
conway198799@unit7-base: ~ - Google Chrome
ssh.cloud.google.com/projects/willie-conway-cs369-f2-2019/zones/us-central1-c/instances/unit7-base?authuser=0&hl=en_US&project...
Connected, host fingerprint: ssh-rsa 0 3C:37:F6:F0:DC:57:40:57:41:B0:D2:D1:2A:0E
:61:EF:0F:7C:74:96:90:F6:EF:84:D2:E4:05:09:02:1F:58:92
Linux unit7-base 4.9.0-11-amd64 #1 SMP Debian 4.9.189-3+deb9u2 (2019-11-11) x86_64

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

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
conway198799@unit7-base:~$ sudo su -
root@unit7-base:~# apt-get update
Get:1 http://security.debian.org stretch/updates InRelease [94.3 kB]
Ign:2 http://deb.debian.org/debian stretch InRelease
Get:3 http://dcb.debian.org/dcbian stretch-updates InRelease [91.0 kB]
Get:4 http://packages.cloud.google.com/apt cloud-sdk-stretch InRelease [6,377 B]
Get:5 http://deb.debian.org/debian stretch-backports InRelease [91.8 kB]
Hit:6 http://deb.debian.org/debian stretch Release
Get:7 http://packages.cloud.google.com/apt google-compute-engine-stretch-stable InRelease [3,843 B]
Hit:8 http://packages.cloud.google.com/apt google-cloud-packages-archive-keyring-stretch InRelease
Get:9 http://security.debian.org stretch/updates/main Sources [201 kB]
Get:10 http://security.debian.org stretch/updates/main amd64 Packages [508 kB]
Get:11 http://security.debian.org stretch/updates/main Translation-en [224 kB]
Get:12 http://deb.debian.org/debian stretch-backports/main Sources.diff/Index [27.8 kB]
Get:13 http://deb.debian.org/debian stretch-backports/main amd64 Packages.diff/Index [27.8 kB]
Get:14 http://dcb.debian.org/dcbian stretch-backports/main Translation-en.diff/Index [27.8 kB]
Get:15 http://dcb.debian.org/dcbian stretch-backports/main Sources 2019-11-26-0814.05.pdiff [33 B]
Get:16 http://deb.debian.org/debian stretch-backports/main Sources 2019-11-26-1413.09.pdiff [876 B]
Get:17 http://deb.debian.org/debian stretch-backports/main Sources 2019-12-01-2015.11.pdiff [275 B]
Get:18 http://deb.debian.org/debian stretch-backports/main amd64 Packages 2019-11-26-1413.09.pdiff [544 B]
Get:19 http://deb.debian.org/debian stretch-backports/main amd64 Packages 2019-12-01-2015.11.pdiff [249 B]
Get:20 http://dcb.debian.org/dcbian stretch-backports/main Translation-en 2019-12-01-2015.11.pdiff [86 B]
Get:17 http://deb.debian.org/debian stretch-backports/main Sources 2019-12-01-2015.11.pdiff [275 B]
Get:19 http://deb.debian.org/debian stretch-backports/main amd64 Packages 2019-12-01-2015.11.pdiff [249 B]
Get:20 http://deb.debian.org/debian stretch-backports/main Translation-en 2019-12-01-2015.11.pdiff [86 B]
Get:22 http://packages.cloud.google.com/apt google-compute-engine-stretch-stable/main amd64 Packages [1,317 B]
Fetched 1,306 kB in 1s (1,219 kB/s)
Reading package lists... Done
root@unit7-base:~# apt-get install nginx -y
```

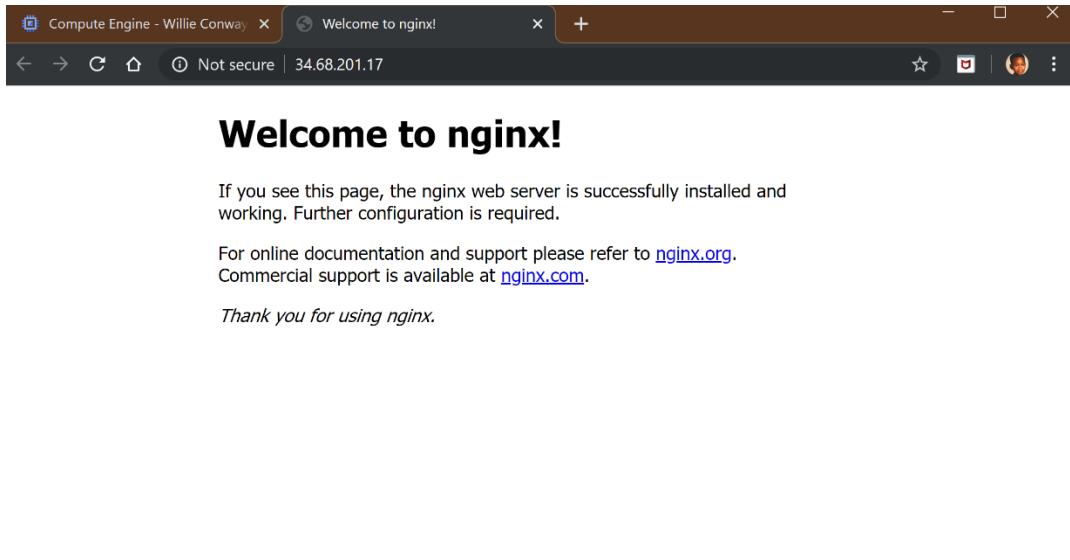
(Installing nginx with the command apt-get install nginx -y.)

```

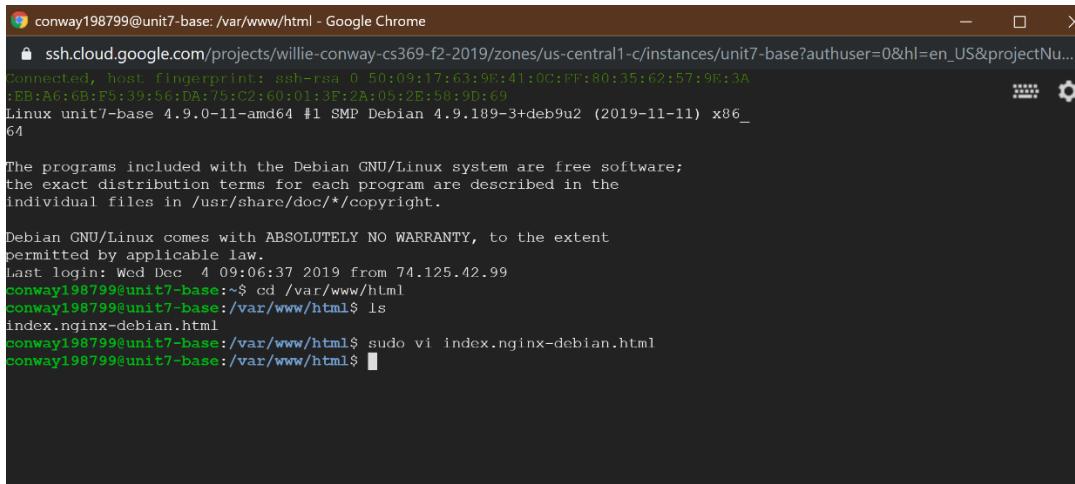
conway198799@unit7-base: ~ - Google Chrome
ssh.cloud.google.com/projects/willie-conway-cs369-f2-2019/zones/us-central1-c/instances/unit7-base?authuser=0&hl=en_US&project...
Unpacking xml2-core (0.17) ...
Setting up libjpeg62-turbo:amd64 (1:1.5.1-2) ...
Setting up geoip-database (201/0512-1) ...
Setting up libjbig0:amd64 (2.1-3.1+bd2) ...
Setting up fonts-dejavu-core (2.37-1) ...
Setting up nginx-common (1.10.3-1+deb9u3) ...
Created symlink /etc/systemd/system/multi-user.target.wants/nginx.service → /lib/systemd/system/nginx.service.
Setting up libnginx-mod-http-subs-filter (1.10.3-1+deb9u3) ...
Setting up libtiff5:amd64 (4.0.8-2+deb9u4) ...
Setting up sgml-base (1.29) ...
Setting up libgeoip1:amd64 (1.6.9-4) ...
Setting up libicu57:amd64 (57.1-6+deb9u3) ...
Setting up libxml2:amd64 (2.9.4) ...
Setting up libxslt1.1:amd64 (1.1.29-2.1+deb9u1) ...
Processing triggers for libc-bin (2.24-11+deb9u4) ...
Processing triggers for systemd (232-25+deb9u2) ...
Setting up libnginx-mod-http-auth-pam (1.10.3-1+deb9u3) ...
Setting up libnginx-mod-http-dav-ext (1.10.3-1+deb9u3) ...
Setting up libnginx-mod-mail (1.10.3-1+deb9u3) ...
Processing triggers for man-db (2.7.6.1-2) ...
Setting up libnginx-mod-http-xslt-filter (1.10.3-1+deb9u3) ...
Setting up libnginx-mod-http-upstream-fair (1.10.3-1+deb9u3) ...
Setting up libxmlcp6:amd64 (1:1.1.2-3) ...
Setting up xml-core (0.17) ...
Setting up libnginx-mod-http-geoip (1.10.3-1+deb9u3) ...
Setting up libxml1-data (2:1.6.4-3+deb9u1) ...
Setting up libxaudio0:amd64 (1:1.0.8-1) ...
Setting up libwebp6:amd64 (0.5.2-1) ...
Setting up fontconfig-config (2.11.0-6.7) ...
Setting up libnginx-mod-stream (1.10.3-1+deb9u3) ...
Setting up libnginx-mod-http-echo (1.10.3-1+deb9u3) ...
Setting up libxcb1:amd64 (1.12-1) ...
Setting up libfontconfig1:amd64 (2:11.0-6.7+b1) ...
Setting up libxml1-6:amd64 (2:1.6.4-3+deb9u1) ...
Setting up libxml2:amd64 (1:3.5.12-1) ...
Setting up libqd3:amd64 (2.2.4-2+deb9u5) ...
Setting up libnginx-mod-http-image-filter (1.10.3-1+deb9u3) ...
Setting up nginx-full (1.10.3-1+deb9u3) ...
Setting up nginx (1.10.3-1+deb9u3) ...
Processing triggers for libc-bin (2.24-11+deb9u4) ...
Processing triggers for sgml-base (1.29) ...
root@unit7-base:~# ps auxw | grep nginx
root      2228  0.0  0.2 159540  1632 ?        Ss   08:29  0:00 nginx: master process /usr/sbin/nginx -g daemon on
; master process on;
www-data   2229  0.0  0.5 159872  3348 ?        S    08:29  0:00 nginx: worker process
root      2251  0.0  0.1 12780   964 pts/0   S+   08:30  0:00 grep nginx
root@unit7-base:~#

```

(Checking to see if nginx installed with the ps auxw | grep nginx command.)



(Click on the External IP address for unit7-base to see if nginx opening web page pops up.)

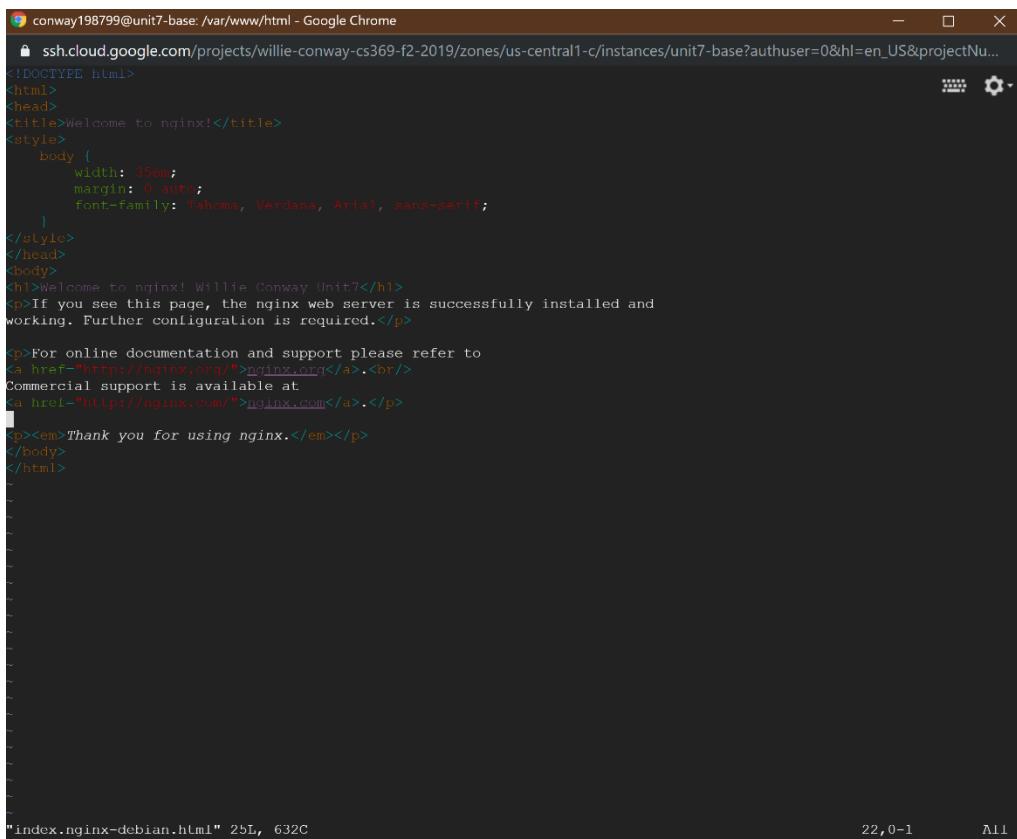


```
conway198799@unit7-base: /var/www/html - Google Chrome
ssh.cloud.google.com/projects/willie-conway-cs369-f2-2019/zones/us-central1-c/instances/unit7-base?authuser=0&hl=en_US&projectNu...
Connected, host fingerprint: ssh-rsa 0 50:09:17:63:9E:41:0C:FF:80:35:62:57:9E:3A
:EB:A6:6B:F9:39:56:DA:75:C2:60:01:3F:2A:05:2E:58:9D:69
Linux unit7-base 4.9.0-11-amd64 #1 SMP Debian 4.9.189-3+deb9u2 (2019-11-11) x86_64

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the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Wed Dec 4 09:06:37 2019 from 74.125.42.99
conway198799@unit7-base:~$ cd /var/www/html
conway198799@unit7-base:/var/www/html$ ls
index.nginx-debian.html
conway198799@unit7-base:/var/www/html$ sudo vi index.nginx-debian.html
conway198799@unit7-base:/var/www/html$
```

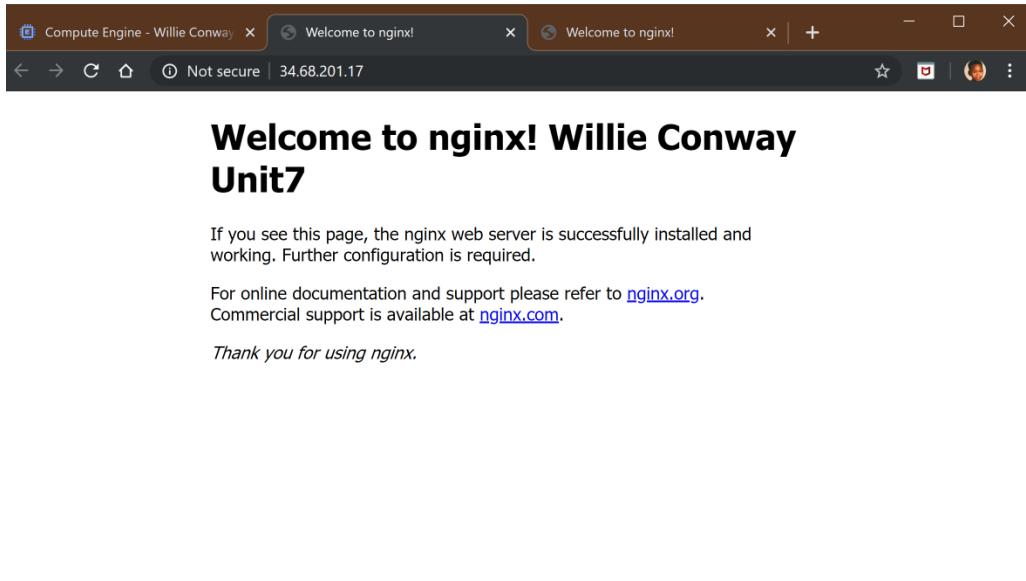
(Using the command `sudo vi index.nginx-debian.html` to edit nginx opening web page.)



```
conway198799@unit7-base: /var/www/html - Google Chrome
ssh.cloud.google.com/projects/willie-conway-cs369-f2-2019/zones/us-central1-c/instances/unit7-base?authuser=0&hl=en_US&projectNu...
<!DOCTYPE html>
<html>
<head>
<title>Welcome to nginx!</title>
<style>
body {
    width: 35em;
    margin: 0 auto;
    font-family: Tahoma, Verdana, Arial, sans-serif;
}
</style>
</head>
<body>
<h1>welcome to nginx! Willie Conway Unit7</h1>
<p>If you see this page, the nginx web server is successfully installed and
working. Further configuration is required.</p>
<p>For online documentation and support please refer to
<a href="http://nginx.org/">nginx.org</a>. <br/>
Commercial support is available at
<a href="http://nginx.com/">nginx.com</a>.</p>
<p><em>Thank you for using nginx.</em></p>
</body>
</html>
```

"index.nginx-debian.html" 25L, 632C 22,0-1 All

(Adding my name and unit 7 to the nginx opening webpage to say "Welcome to nginx! Willie Conway Unit 7.")



(Name and Unit 7 added to nginx opening webpage.)

2. Shut down your instance

Name	Zone	Recommendation	In use by	Internal IP	External IP	Connect
goelab2	us-central1-c			10.128.0.2 (nic0)	173.255.116.136	SSH
unit7-base	us-central1-c			10.128.0.5 (nic0)	None	SSH

(shutting down instance unit7-bae with sudo shutdown -h now command.)

3. Create a snapshot.

The screenshot shows the Google Cloud Platform Compute Engine Snapshots interface. On the left, a sidebar lists various Compute Engine services: VM instances, Instance groups, Instance templates, Sole-tenant nodes, Disks, Snapshots (which is selected and highlighted in blue), Images, TPUs, Committed use discounts, Metadata, Health checks, Zones, Network endpoint groups, Marketplace, and more. The main content area is titled "Compute Engine Snapshots" and contains a brief description: "You can take a snapshot of a Compute Engine persistent disk to quickly back up the disk so you can recover lost data, transfer contents to a new disk, or make static data available to multiple nodes." Below the description is a prominent blue "Create snapshot" button.

(Creating a snapshot.)

The screenshot shows the "Create a snapshot" dialog box. The left sidebar remains the same as the previous screenshot. The main form fields are as follows:

- Name**: A text input field containing "snapshot-1-unit7".
- Description (Optional)**: A text input field containing "Unit 7 - nginx installed".
- Source disk**: A dropdown menu showing "unit7-base".
- Location**: A dropdown menu with two options: "Multi-regional" (unchecked) and "Regional" (checked). The selected option is "us-central1 (Iowa) (default)".
- Labels**: An optional input field with a "+ Add label" button.
- Encryption type**: A section indicating "This snapshot will be encrypted using disk encryption settings".
- Encryption type**: A section indicating "Google managed".
- Notes**: A note stating "You will be billed for this snapshot. [Compute Engine pricing](#)".
- Buttons**: Two buttons at the bottom: "Create" (in blue) and "Cancel".

(Setting all the fields for creating first snapshot for unit7-base called snapshot-1-unit7, then selecting create. This will restore the VM to a particular point of when I installed nginx.)

The screenshot shows the Google Cloud Platform Compute Engine Snapshots page. The left sidebar has 'Compute Engine' selected under 'VM instances'. The main area shows a table of snapshots. One row is selected, showing details: Name: snapshot-1-unit7, Location: us-central1, Snapshot size: 535.73 MB, Creation time: Dec 4, 2019, 4:33:09 AM, Creation type: Manual, Source disk: unit7-base, Disk size: 10 GB. A tooltip message says 'Create snapshot schedules to automatically back up your data.' with a 'Learn more about creating snapshot schedules' link.

(Created snapshot-1-unit7.)

4. Start your instance, install php, test your instance to be sure it runs info.php.

The screenshot shows the Google Cloud Platform VM instances page. The left sidebar has 'Compute Engine' selected under 'VM instances'. The main area shows a table of VM instances. Two instances are listed: 'gcelab2' (Zone: us-central1-c, Internal IP: 10.128.0.2 (nic0), External IP: 173.255.116.136, Connect via SSH) and 'unit7-base' (Zone: us-central1-c, Internal IP: 10.128.0.5 (nic0), External IP: None, Connect via SSH). A context menu is open for the 'unit7-base' instance, listing options: Start, Stop, Reset, Delete, View network details, and View logs.

(Starting instance unit7-base.)

The screenshot shows the Google Cloud Platform Compute Engine interface. The left sidebar is titled 'Compute Engine' and contains options for 'VM instances', 'Instance groups', 'Instance templates', 'Sole-tenant nodes', and 'Disks'. The main area is titled 'VM instances' and lists two instances:

Name	Zone	Recommendation	In use by	Internal IP	External IP	Connect
gcelab2	us-central1-c			10.128.0.2 (nic0)	173.255.116.136	SSH
unit7-base	us-central1-c			10.128.0.5 (nic0)	34.67.130.217	SSH

(unit7-base is up and running.)

```
conway198799@unit7-base: ~ - Google Chrome
ssh.cloud.google.com/projects/willie-conway-cs369-f2-2019/zones/us-central1-c/instances/unit7-base?authuser=0&hl=en
Connected, host fingerprint: ssh-rsa 0 50:09:17:63:9E:41:0C:FF:80:35:62:57:9E:3A
:EB:A6:6B:F5:39:56:DA:75:C2:60:01:3F:2A:05:2E:58:9D:69
Linux unit7-base 4.9.0-11-amd64 #1 SMP Debian 4.9.189-3+deb9u2 (2019-11-11) x86_64

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individual files in /usr/share/doc/*copyright.

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permitted by applicable law.
Last login: Wed Dec  4 09:22:57 2019 from 74.125.42.41
conway198799@unit7-base:~$ sudo apt install php-fpm php-mysql
```

(Installing php.)

```
conway198799@unit7-base: ~ - Google Chrome
ssh.cloud.google.com/projects/willie-conway-cs369-f2-2019/zones/us-central1-c/instances/unit7-base?authuser=0&hl=en_US&projectNumber=4306592926...
Creating config file /etc/php/7.0/mods-available/iconv.ini with new version
Creating config file /etc/php/7.0/mods-available/pdo.ini with new version
Creating config file /etc/php/7.0/mods-available/phar.ini with new version
Creating config file /etc/php/7.0/mods-available/posix.ini with new version
Creating config file /etc/php/7.0/mods-available/shmop.ini with new version
Creating config file /etc/php/7.0/mods-available/sockets.ini with new version
Creating config file /etc/php/7.0/mods-available/sysvmsg.ini with new version
Creating config file /etc/php/7.0/mods-available/sysvsem.ini with new version
Creating config file /etc/php/7.0/mods-available/sysvshm.ini with new version
Creating config file /etc/php/7.0/mods-available/Tokenizer.ini with new version
Setting up php7.0-mysql (7.0.33-0+deb9u6) ...
Creating config file /etc/php/7.0/mods-available/mysqlnd.ini with new version
Creating config file /etc/php/7.0/mods-available/mysqli.ini with new version
Creating config file /etc/php/7.0/mods-available/pdo_mysql.ini with new version
Setting up php7.0-readline (7.0.33-0+deb9u6) ...
Creating config file /etc/php/7.0/mods-available/readline.ini with new version
Setting up php7.0-opcache (7.0.33-0+deb9u6) ...
Creating config file /etc/php/7.0/mods-available/opcache.ini with new version
Setting up php7.0-json (7.0.33-0+deb9u6) ...
Creating config file /etc/php/7.0/mods-available/json.ini with new version
Setting up php7.0-mysql (1:7.0+49) ...
Setting up php7.0-cli (7.0.33-0+deb9u6) ...
update-alternatives: using /usr/bin/php7.0 to provide /usr/bin/php (php) in auto mode
update-alternatives: using /usr/bin/phar7.0 to provide /usr/bin/phar (phar) in auto mode
update-alternatives: using /usr/bin/phar.phar7.0 to provide /usr/bin/phar.phar (phar.phar) in auto mode
Creating config file /etc/php/7.0/cli/php.ini with new version
Setting up php7.0-fpm (7.0.33-0+deb9u6) ...
Creating config file /etc/php/7.0/fpm/php.ini with new version
Created symlink /etc/systemd/system/multi-user.target.wants/php7.0-fpm.service → /lib/systemd/system/php7.0-fpm.service.
Setting up php-fpm (1:7.0+149) ...
Processing triggers for systemd (232-25+deb9u12) ...
conway198799@unit7-base:~$ php -v
PHP 7.0.33-0+deb9u6 (cli) (built: Oct 24 2019 18:50:20) ( NTS )
Copyright (c) 1995-2017 The PHP Group
Zend Engine v3.0.0, Copyright (c) 1998-2017 Zend Technologies
with Zend OPcache v7.0.33-0+deb9u6, Copyright (c) 1999-2017, by Zend Technologies
conway198799@unit7-base:~$
```

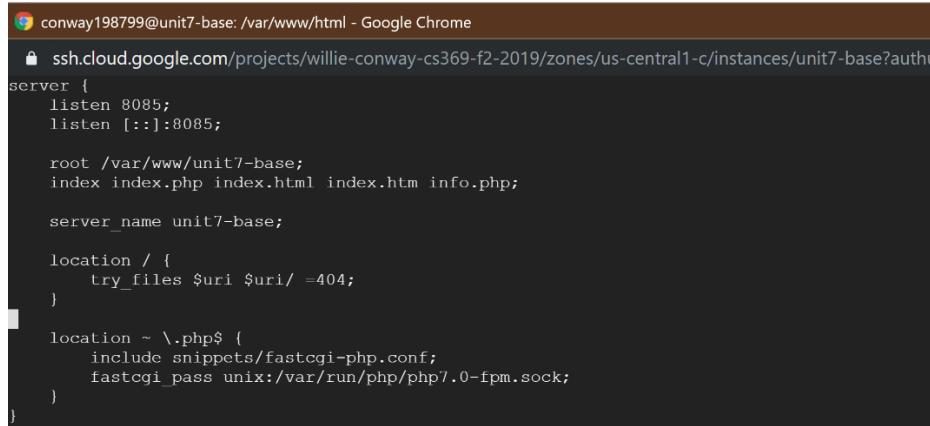
(*checking to see if php installed with php -v*)

```
conway198799@unit7-base: ~ - Google Chrome
ssh.cloud.google.com/projects/willie-conway-cs369-f2-2019/zones/us-central1-c/instances/unit7-base?authuser=0&hl=en_US&projectNumber=4306592926...
Connected, host fingerprint: ssh-rsa 0 50:09:17:63:9E:41:0C:FF:80:35:62:57:9E:3A
t:EB:AA:61:6B:F5:39:56:D4:75:C2:60:01:3F:2A:05:2E:58:9D:69
Linux unit7-base 4.9.0-11-amd64 #1 SMP Debian 4.9.189-3+deb9u2 (2019-11-11) x86_64

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Last login: Wed Dec 4 20:11:56 2019 from 74.125.42.99
conway198799@unit7-base:~$ sudo mkdir /var/www/unit7-base
conway198799@unit7-base:~$ ls
conway198799@unit7-base:~$ sudo vi /etc/nginx/sites-available/test
conway198799@unit7-base:~$
```

(*Opening /etc/sites-available/test config file.*)



```

conway198799@unit7-base: /var/www/html - Google Chrome
ssh.cloud.google.com/projects/willie-conway-cs369-f2-2019/zones/us-central1-c/instances/unit7-base?authuser=0&hl=en_US&projectNumber=113240111111
server {
    listen 8085;
    listen [::]:8085;

    root /var/www/unit7-base;
    index index.php index.html index.htm info.php;

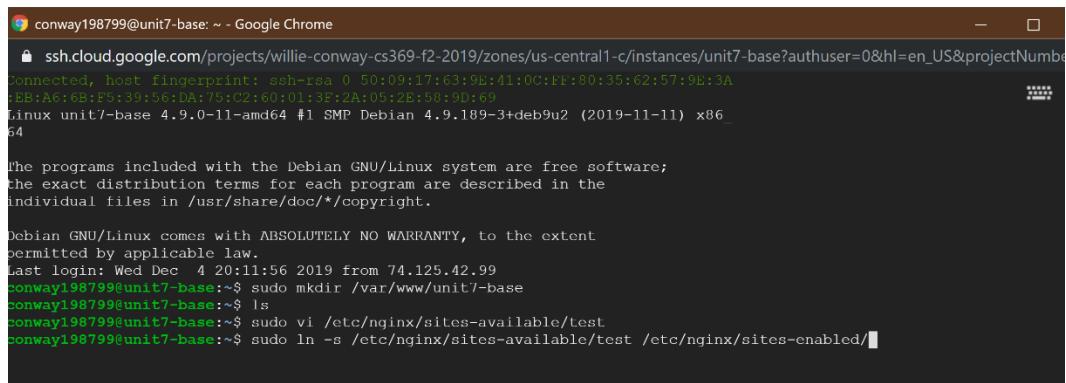
    server_name unit7-base;

    location / {
        try_files $uri $uri/ =404;
    }

    location ~ \.php$ {
        include snippets/fastcgi-php.conf;
        fastcgi_pass unix:/var/run/php/php7.0-fpm.sock;
    }
}

```

(Setting config file to listen on port 8085 to run php.info.)



```

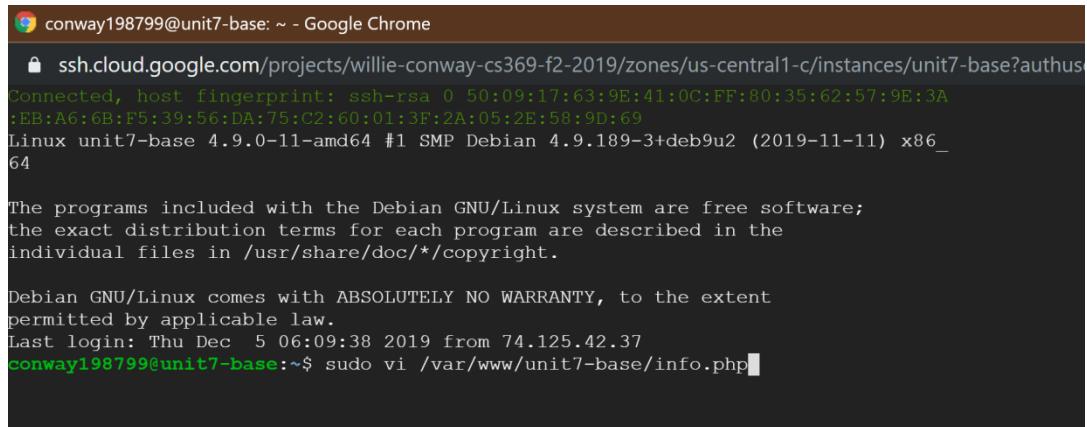
conway198799@unit7-base: ~ - Google Chrome
ssh.cloud.google.com/projects/willie-conway-cs369-f2-2019/zones/us-central1-c/instances/unit7-base?authuser=0&hl=en_US&projectNumber=113240111111
Connected, host fingerprint: ssh-rsa 0 50:09:17:63:9E:41:0C:FF:80:35:62:57:9E:3A
:EB:A6:6B:F5:39:56:DA:75:C2:60:01:3F:2A:05:2E:58:9D:69
Linux unit7-base 4.9.0-11-amd64 #1 SMP Debian 4.9.189-3+deb9u2 (2019-11-11) x86_64

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permitted by applicable law.
Last login: Wed Dec  4 20:11:56 2019 from 74.125.42.99
conway198799@unit7-base:~$ sudo mkdir /var/www/unit7-base
conway198799@unit7-base:~$ ls
conway198799@unit7-base:~$ sudo vi /etc/nginx/sites-available/test
conway198799@unit7-base:~$ sudo ln -s /etc/nginx/sites-available/test /etc/nginx/sites-enabled/█

```

(Creating symbolic link with ln -s /etc/nginx/sites-available/test /etc/nginx/sites-enabled/.)



```

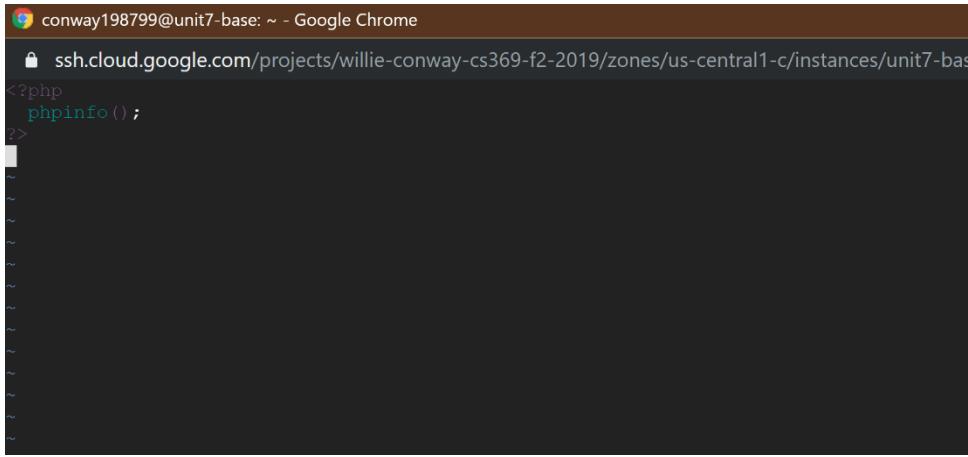
conway198799@unit7-base: ~ - Google Chrome
ssh.cloud.google.com/projects/willie-conway-cs369-f2-2019/zones/us-central1-c/instances/unit7-base?authuser=0&hl=en_US&projectNumber=113240111111
Connected, host fingerprint: ssh-rsa 0 50:09:17:63:9E:41:0C:FF:80:35:62:57:9E:3A
:EB:A6:6B:F5:39:56:DA:75:C2:60:01:3F:2A:05:2E:58:9D:69
Linux unit7-base 4.9.0-11-amd64 #1 SMP Debian 4.9.189-3+deb9u2 (2019-11-11) x86_64

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the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Thu Dec  5 06:09:38 2019 from 74.125.42.37
conway198799@unit7-base:~$ sudo vi /var/www/unit7-base/info.php█

```

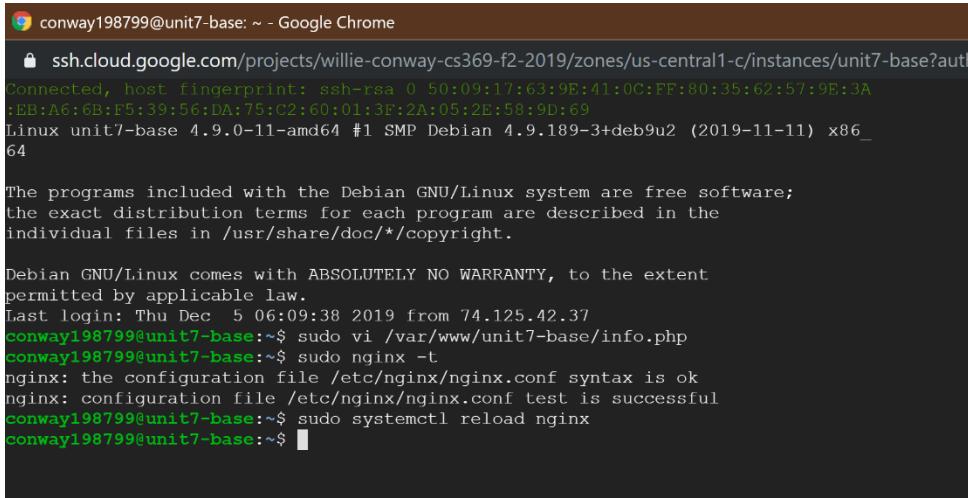
(Creating info.php file.)



```
conway198799@unit7-base: ~ - Google Chrome
ssh.cloud.google.com/projects/willie-conway-cs369-f2-2019/zones/us-central1-c/instances/unit7-base
<?php
    phpinfo();
?>
```

The terminal window shows the output of a PHP info page. The output is very long and mostly consists of the word "PHP" repeated many times.

(Saving info.php file.)

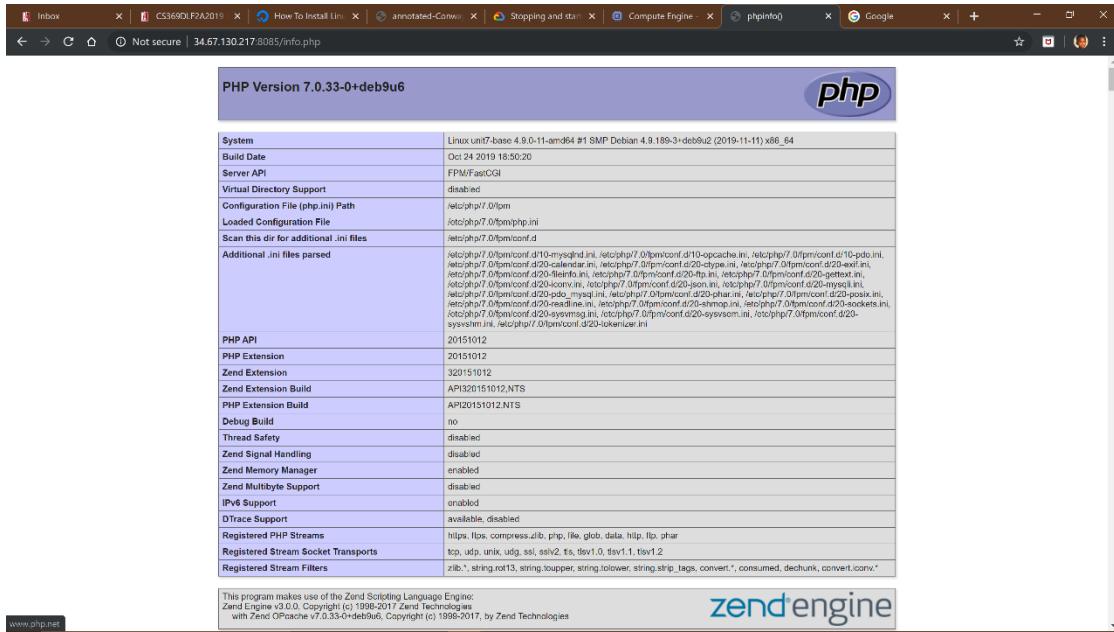


```
conway198799@unit7-base: ~ - Google Chrome
ssh.cloud.google.com/projects/willie-conway-cs369-f2-2019/zones/us-central1-c/instances/unit7-base?auth
Connected, host fingerprint: ssh-rsa 0 50:09:17:63:9E:41:0C:FF:80:35:62:57:9E:3A
:EB:A6:6B:F5:39:56:DA:75:C2:60:01:3F:2A:05:2E:58:9D:69
Linux unit7-base 4.9.0-11-amd64 #1 SMP Debian 4.9.189-3+deb9u2 (2019-11-11) x86_
64

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

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Thu Dec  5 06:09:38 2019 from 74.125.42.37
conway198799@unit7-base:~$ sudo vi /var/www/unit7-base/info.php
conway198799@unit7-base:~$ sudo nginx -t
nginx: the configuration file /etc/nginx/nginx.conf syntax is ok
nginx: configuration file /etc/nginx/nginx.conf test is successful
conway198799@unit7-base:~$ sudo systemctl reload nginx
conway198799@unit7-base:~$
```

(Reloading nginx with sudo systemctl reload nginx.)



(info.php runs on ip address and port 8085)

5. Shut down your instance

The screenshot shows two windows side-by-side. On the left, a terminal window on a Google Cloud Compute Engine instance (unit7-base) shows the user running the command `sudo shutdown -h now`. On the right, a Google Cloud Platform Compute Engine dashboard shows a list of VM instances. One instance, `gcelab2`, is listed as running, while another instance, `unit7-base`, is listed as stopped.

(shutting down unit7-base instance.)

6. Create another snapshot.

Create a snapshot

Name Name is permanent
snapshot-2-unit7

Description (Optional)
Unit 7- php installed

Source disk unit7-base

Location Multi-regional
 Regional
us-central1 (Iowa) (default)

Labels (Optional)
+ Add label

This snapshot will be encrypted using disk encryption settings

Encryption type
Google managed

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

Create **Cancel**

(Creating snapshot-2-unit7 and applying the following fields as I did in the first snapshot. This will restore a VM to a particular point from when I installed php.)

Snapshots

Name	Location	Snapshot size	Creation time	Creation type	Source disk	Disk size
snapshot-1-unit7	us-central1	535.73 MB	Dec 4, 2019, 4:33:09 AM	Manual	unit7-base	10 GB
snapshot-2-unit7	us-central1	81.97 MB	Dec 5, 2019, 2:49:41 AM	Manual	unit7-base	10 GB

(List of snapshots, showing snapshot-1-unit7 and snapshot-2-unit7.)

- Start your instance, install a prebuilt php web site (see below). Test your website. Take a screenshot showing the home page of the simple php website and the URL (ip address) you used to access the page.

(Starting instance.)

```

ssh.cloud.google.com/projects/willie-conway-cs369-f2-2019/zones/us-central1-c/instances/unit7-base?authuser=0&hl=en_US&projectNum...
connected, host fingerprint: ssh-rsa 0 50:09:17:63:9c:41:0c:f8:35:62:b7:9d:3a
Linux unit7-base 4.9.0-11-amd64 #1 SMP Debian 4.9.189-3+deb9u2 (2019-11-11) x86_64

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

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Thu Dec 5 07:38:05 2019 from 74.125.42.96
conway198799@unit7-base:~$ sudo apt-get update
Hit:1 http://security.debian.org stretch/updates InRelease
Hit:2 http://packages.cloud.google.com/apt cloud-sdk-stretch InRelease
Hit:3 http://packages.cloud.google.com/apt google-compute-engine-stretch-stable InRelease
Ign:4 http://deb.debian.org/debian stretch InRelease
Get:5 http://deb.debian.org/debian stretch-updates InRelease [91.0 kB]
Hit:6 http://packages.cloud.google.com/apt google-cloud-packages-archive-keyring-stretch InRelease
Get:7 http://deb.debian.org/debian stretch-backports InRelease [91.8 kB]
Hit:8 http://deb.debian.org/debian stretch Release
Fetched 183 kB in 0s (269 kB/s)
Reading package lists... Done
conway198799@unit7-base:~$ sudo apt-get install unzip
Reading package lists... Done
Building dependency tree
Reading state information... Done
Suggested packages:
  zip
The following NEW packages will be installed:
  unzip
0 upgraded, 1 newly installed, 0 to remove and 0 not upgraded.
Need to get 172 kB of archives.
After this operation, 559 kB of additional disk space will be used.
Get:1 http://deb.debian.org/debian stretch/main amd64 unzip amd64 6.0-21+deb9u2 [172 kB]
Fetched 172 kB in 0s (2,991 kB/s)
Selecting previously unselected package unzip.
(Reading database ... 38476 files and directories currently installed.)
Preparing to unpack .../unzip 6.0-21+deb9u2 amd64.deb ...
Unpacking unzip (6.0-21+deb9u2) ...
Processing triggers for mime-support (3.60) ...
Setting up unzip (6.0-21+deb9u2) ...
Processing triggers for man-db (2.7.6.1-2) ...
conway198799@unit7-base:~$ 
```

(Installing unzip to VM instance using sudo apt-get install unzip.)

```

conway198799@unit7-base: /var/www/prebuilt - Google Chrome
ssh.cloud.google.com/projects/willie-conway-cs369-f2-2019/zones/us-central1-c/instances/unit7-base?authuser=0&hl=en_US&projectNu...
Connected, host fingerprint: ssh-rsa 0 50:09:17:63:9E:41:0C:FF:80:35:62:57:9E:3A
:EB:A6:6B:F5:39:56:D4:75:C2:60:01:3F:2A:05:2E:58:9D:69
Linux unit7-base 4.9.0-11-amd64 #1 SMP Debian 4.9.189-3+deb9u2 (2019-11-11) x86_64

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individual files in /usr/share/doc/*copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Thu Dec  5 18:34:51 2019 from 74.125.42.97
conway198799@unit7-base:~$ ls
simple-php-website-master.zip
conway198799@unit7-base:~$ sudo mkdir /var/www/prebuilt
conway198799@unit7-base:~$ sudo cp simple-php-website-master.zip /var/www/prebuilt
conway198799@unit7-base:~$ cd /var/www/prebuilt
conway198799@unit7-base:~/var/www/prebuilt$ ls
simple-php-website-master.zip
conway198799@unit7-base:~/var/www/prebuilt$ sudo unzip simple-php-website-master.zip
Archive: simple-php-website-master.zip
a2792bc6352c08badc2041130b0a2b20fe915325
  creating: simple-php-website-master/
  extracting: simple-php-website-master/.gitignore
  inflating: simple-php-website-master/.htaccess
  creating: simple-php-website-master/content/
  extracting: simple-php-website-master/content/404.shtml
  inflating: simple-php-website-master/content/about-us.shtml
  inflating: simple-php-website-master/content/contact.shtml
  inflating: simple-php-website-master/content/home.shtml
  inflating: simple-php-website-master/content/products.shtml
  creating: simple-php-website-master/includes/
  inflating: simple-php-website-master/includes/config.php
  inflating: simple-php-website-master/index.php
  inflating: simple-php-website-master/readme.md
  creating: simple-php-website-master/template/
  inflating: simple-php-website-master/template/style.css
  inflating: simple-php-website-master/template/template.php
conway198799@unit7-base:~/var/www/prebuilt$ ls
simple-php-website-master simple-php-website-master.zip
conway198799@unit7-base:~/var/www/prebuilt$ 

```

(Uploaded the simple-php-website-master.zip file to VM instance. Creating directory /var/www/prebuilt, copying the uploaded simple-php-website-master.zip to /var/www/prebuilt directory. Changing into /var/www/prebuilt before unzipping the zip file so that all contents can extract into the /var/www/prebuilt directory. Using ls command to check if contents extracted over into the /var/www/prebuilt directory.

```

conway198799@unit7-base: /var/www/prebuilt - Google Chrome
ssh.cloud.google.com/projects/willie-conway-cs369-f2-2019/zones/us-central1-c/instances/unit7-base?authuser=0&hl=en_US&projectNu...
Connected, host fingerprint: ssh-rsa 0 50:09:17:63:9E:41:0C:FF:80:35:62:57:9E:3A
:EB:A6:6B:F5:39:56:D4:75:C2:60:01:3F:2A:05:2E:58:9D:69
Linux unit7-base 4.9.0-11-amd64 #1 SMP Debian 4.9.189-3+deb9u2 (2019-11-11) x86_64

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the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Thu Dec  5 19:07:45 2019 from 74.125.177.36
conway198799@unit7-base:~$ sudo cp -a /var/www/prebuilt/simple-php-website-master/. /var/www/prebuilt
conway198799@unit7-base:~$ cd /var/www/prebuilt
conway198799@unit7-base:~/var/www/prebuilt$ ls
content includes index.php readme.md simple-php-website-master template
conway198799@unit7-base:~/var/www/prebuilt$ sudo rm -r simple-php-website-master
conway198799@unit7-base:~/var/www/prebuilt$ ls
content includes index.php readme.md template
conway198799@unit7-base:~/var/www/prebuilt$ sudo vi /etc/nginx/sites-available/prebuilt.config

```

(Instead of going from directory to directory, I used the cp -a command to copy all contents from the /var/www/prebuilt/simple-php-website-master directory to /var/www/prebuilt. This way the files will be easier to access. After I used the sudo rm -r command to remove the /var/www/prebuilt/simple-php-website-master directory. Used ls command to confirm file transfer, then prepared to create a /etc/nginx/sites-available/prebuilt.config file.)

```

conway198799@unit7-base: /var/www/prebuilt - Google Chrome
ssh.cloud.google.com/projects/willie-conway-cs369-f2-2019/zones/us-central1-c/instances/unit7-base

server {
    listen 8084;
    listen [::]:8084;

    root /var/www/prebuilt;
    index index.php index.html index.htm info.php;

    server_name prebuilt;

    location / {
        try_files $uri $uri/ =404;
    }

    location ~ \.php$ {
        include snippets/fastcgi-php.conf;
        fastcgi_pass unix:/var/run/php/php7.0-fpm.sock;
    }
}

```

(Creating prebuilt.config file to listen on port 8084.)

```

conway198799@unit7-base: ~ - Google Chrome
ssh.cloud.google.com/projects/willie-conway-cs369-f2-2019/zones/us-central1-c/instances/unit7-base?authuser=0&hl=en_US&r
Connected, host fingerprint: ssh-rsa 0 50:09:17:63:9E:41:0C:FF:80:35:62:57:9E:3A
:EB:A6:6B:Fb:39:56:D4:75:C2:60:01:3F:2A:05:2E:5b:9D:69
Linux unit7-base 4.9.0-11-amd64 #1 SMP Debian 4.9.189-3+deb9u2 (2019-11-11) x86_
64

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

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Thu Dec  5 19:22:38 2019 from 74.125.42.164
conway198799@unit7-base:~$ sudo ln -s /etc/nginx/sites-available/prebuilt.config /etc/nginx/sites-enabled/
conway198799@unit7-base:~$ ls /etc/nginx/sites-available
default prebuilt.config test
conway198799@unit7-base:~$ ls /etc/nginx/sites-enabled
default prebuilt.config test
conway198799@unit7-base:~$ sudo nginx -t
nginx: the configuration file /etc/nginx/nginx.conf syntax is ok
nginx: configuration file /etc/nginx/nginx.conf test is successful
conway198799@unit7-base:~$ sudo systemctl reload nginx
conway198799@unit7-base:~$ 

```

(Creating symbolic link using ln -s /etc/nginx/sites-available/prebuilt.config /etc/nginx/sites-enabled/. Then testing to make sure configuration file is ok with sudo nginx -t, and reloading nginx with sudo systemctl reload nginx.)

```

conway198799@unit7-base: /var/www/prebuilt/includes - Google Chrome
ssh.cloud.google.com/projects/willie-conway-cs369-f2-2019/zones/us-central1-c/instances/unit7-base?authuser=0&hl=en_US&r
Connected, host fingerprint: ssh-rsa 0 50:09:17:63:9E:41:0C:FF:80:35:62:57:9E:3A
:EB:A6:6B:Fb:39:56:D4:75:C2:60:01:3F:2A:05:2E:5b:9D:69
Linux unit7-base 4.9.0-11-amd64 #1 SMP Debian 4.9.189-3+deb9u2 (2019-11-11) x86_
64

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

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Thu Dec  5 20:31:58 2019 from 74.125.42.224
conway198799@unit7-base:~$ cd /var/www/prebuilt/includes
conway198799@unit7-base:/var/www/prebuilt/includes$ ls
config.php functions.php
conway198799@unit7-base:/var/www/prebuilt/includes$ sudo vi config.php

```

(Changing into /var/www/prebuilt/includes directory to edit config.php file.)

```

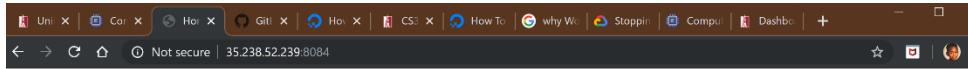
conway198799@unit7-base: /var/www/prebuilt/includes - Google Chrome
ssh.cloud.google.com/projects/willie-conway-cs369-f2-2019/zones/us-central1-c/instances/unit7-base?authuser=0&hl=en

<?php

/**
 * Used to store website configuration information.
 *
 * @var string or null
 */
function config($key = '')
{
    $config = [
        'name' => 'Simple PHP Website',
        'site url' => '',
        'pretty url' => false,
        'nav menu' => [
            '' => 'Home',
            'aboutus' => 'About Us',
            'products' => 'Products',
            'contact' => 'Contact',
        ],
        'template_path' => 'template',
        'content_path' => 'content',
        'version' => 'v3.0',
    ];
    return isset($config[$key]) ? $config[$key] : null;
}

```

(Changing 'pretty url' => true to 'pretty url' => false)



Simple PHP Website

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Home

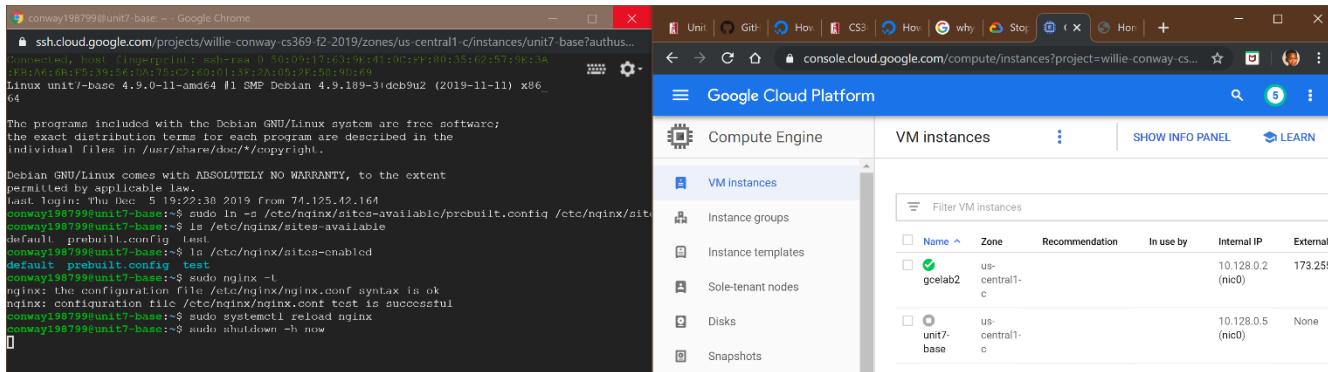
This is **home** page. Lorem Ipsum is simply dummy text of the printing and typesetting industry. Lorem Ipsum has been the industry's standard dummy text ever since the 1500s, when an unknown printer took a galley of type and scrambled it to make a type specimen book. It has survived not only five centuries, but also the leap into electronic typesetting, remaining essentially unchanged. It was popularised in the 1960s with the release of Letraset sheets containing Lorem Ipsum passages, and more recently with desktop publishing software like Aldus PageMaker including versions of Lorem Ipsum.

It is a long established fact that a reader will be distracted by the readable content of a page when looking at its layout. The point of using Lorem Ipsum is that it has a more-or-less normal distribution of letters, as opposed to using 'Content here, content here', making it look like readable English. Many desktop publishing packages and web page editors now use Lorem Ipsum as their default model text, and a search for 'lorem ipsum' will uncover many web sites still in their infancy. Various versions have evolved over the years, sometimes by accident, sometimes on purpose (injected humour and the like).

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v3.0

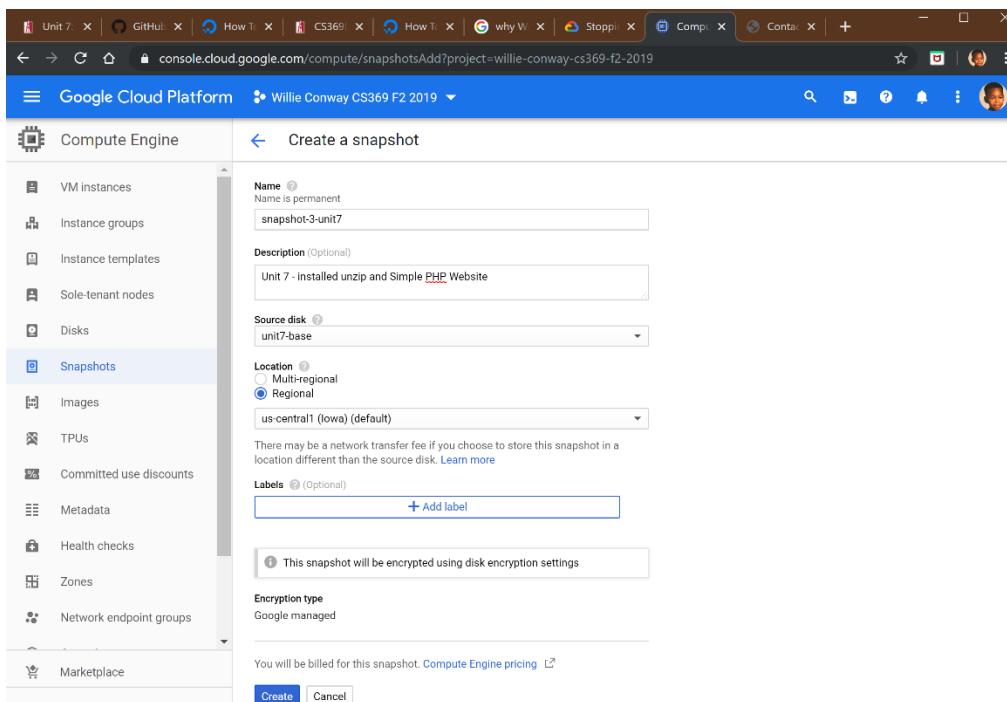
(Simple PHP Website is accessible with ip address on port 8084.)

8. Then shut down your instance.



(Shutting down instance unit7-base.)

9. Create a third snapshot. When it is finished, take a screenshot showing all three snapshots and their sizes.



(Creating snapshot-3-unit7 for unit7-base. This will restore the VM to a particular point of when I installed unzip and Simple PHP Website.)

The screenshot shows the Google Cloud Platform Compute Engine Snapshots page. The left sidebar has 'Compute Engine' selected, and 'Snapshots' is the active tab. A 'CREATE SNAPSHOT' button is at the top right. Below it, a message encourages creating snapshot schedules. The main area displays a table of snapshots:

Name	Location	Snapshot size	Creation time	Creation type	Source disk	Disk size
snapshot-1-unit7	us-central1	535.73 MB	Dec 4, 2019, 4:33:09 AM	Manual	unit7-base	10 GB
snapshot-2-unit7	us-central1	81.97 MB	Dec 5, 2019, 2:49:41 AM	Manual	unit7-base	10 GB
snapshot-3-unit7	us-central1	71.83 MB	Dec 5, 2019, 3:53:02 PM	Manual	unit7-base	10 GB

(List of all 3 snapshots.)

At this point, you have three snapshots, one for each stage of the installation process. Now it is time to create instances using these snapshots. See <https://cloud.google.com/compute/docs/instances/create-start-instance#createsnapshot> (Links to an external site.) for information on this process.

10. Create a new instance named unit7-copy. Instead of creating it with a new disk, use a snapshot instead.

The screenshot shows the 'Create an instance' page for a 'New VM instance'. The 'Name' field is set to 'unit7-copy'. The 'Region' is 'us-central1 (Iowa)' and the 'Zone' is 'us-central1-c'. Under 'Machine configuration', the 'Machine family' is 'General-purpose' (selected), and the 'Series' is 'N1'. The 'Machine type' is 'f1-micro (1 vCPU, 614 MB memory)'. The 'Boot disk' section shows a 'New 10 GB standard persistent disk'.

(Create a new instance named unit7-copy.)

Boot disk

Select an image or snapshot to create a boot disk; or attach an existing disk

OS images Application images Custom images **Snapshots** Existing disks

- snapshot-1-unit7**
Created on Dec 4, 2019, 4:33:09 AM from source disk unit7-base
- snapshot-2-unit7**
Created on Dec 5, 2019, 2:49:41 AM from source disk unit7-base
- snapshot-3-unit7**
Created on Dec 5, 2019, 3:53:02 PM from source disk unit7-base

Can't find what you're looking for? Explore hundreds of VM solutions in [Marketplace](#)

Boot disk type [?](#)

Size (GB) [?](#)

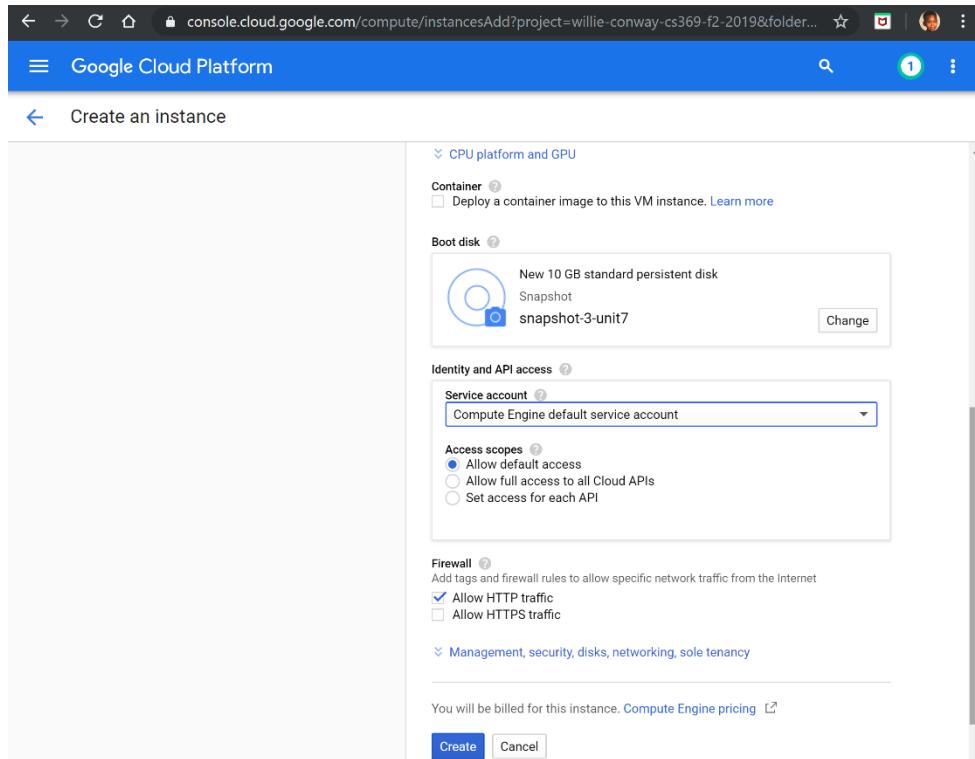
Standard persistent disk

10

Select

Cancel

(Selecting snapshot-3-unit7 from Boot disk > Snapshots.)

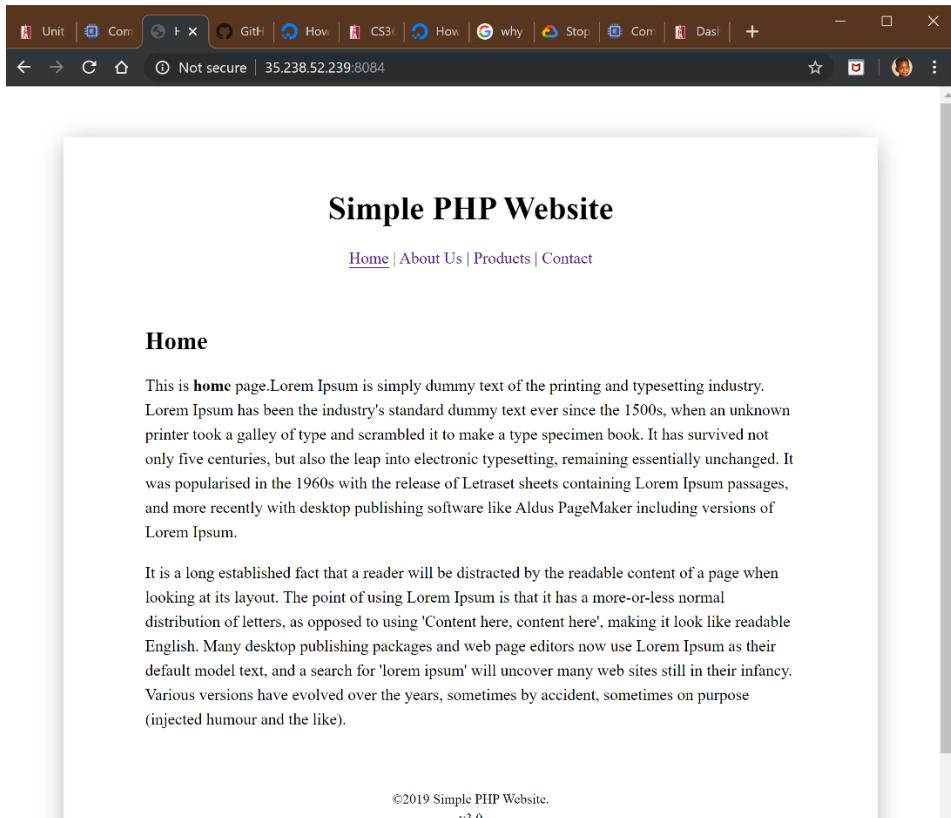


(Allowing HTTP traffic then creating instance unit7-copy.)

Name	Zone	Recommendation	In use by	Internal IP	External IP	Connect
gcelab2	us-central1-c			10.128.0.2 (nic0)	173.255.116.136	SSH
unit7-base	us-central1-c			10.128.0.5 (nic0)	None	SSH
unit7-copy	us-central1-c			10.128.0.6 (nic0)	35.238.52.239	SSH

(Screenshot of all instances.)

11. Test your new instance. When you click on the External IP link and specify the new port number, you should see a web site that behaves exactly like the one you built originally. Take a screenshot of your simple php web site, showing your IP address and the home page.



(Testing instance unit7-copy ip address and port 8084 to see if I can still connect to the Simple PHP Website.)

12. Take a screenshot of your current instances

Name	Zone	Recommendation	In use by	Internal IP	External IP	Connect
gcelab2	us-central1-c			10.128.0.2 (nic0)	173.255.116.136	SSH
unit7-base	us-central1-c			10.128.0.5 (nic0)	None	SSH
unit7-copy	us-central1-c			10.128.0.6 (nic0)	None	SSH

(Screenshot of shutting down unit7-base and unit7-copy instance. Plus, this a screenshot of all instances.)

Name	Zone	Recommendation	In use by	Internal IP	External IP	Connect
gcelab2	us-central1-c			10.128.0.2 (nic0)	173.255.116.136	SSH
unit7-base	us-central1-c			10.128.0.5 (nic0)	146.148.68.191	SSH
unit7-copy	us-central1-c			10.128.0.6 (nic0)	35.202.52.249	SSH

(Out of curiosity decided to start all instances. To see I have different external ip addresses.)

Simple PHP Website

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Home

This is **home** page. Lorem Ipsum is simply dummy text of the printing and typesetting industry. Lorem Ipsum has been the industry's standard dummy text ever since the 1500s, when an unknown printer took a galley of type and scrambled it to make a type specimen book. It has survived not only five centuries, but also the leap into electronic typesetting, remaining essentially unchanged. It was popularised in the 1960s with the release of Letraset sheets containing Lorem Ipsum passages, and more recently with desktop publishing software like Aldus PageMaker including versions of Lorem Ipsum.

It is a long established fact that a reader will be distracted by the readable content of a page when looking at its layout. The point of using Lorem Ipsum is that it has a more-or-less normal distribution of letters, as opposed to using 'Content here, content here', making it look like readable English. Many desktop publishing packages and web page editors now use Lorem Ipsum as their default model text, and a search for 'lorem ipsum' will uncover many web sites still in their infancy. Various versions have evolved over the years, sometimes by accident, sometimes on purpose (injected humour and the like).

(Tested to new ip address and port 8084 and the Simple PHP Website still works.)

Snapshots taken at regular intervals (daily, weekly, hourly) or after major changes, like adding new software, provide backups of your work which can be used to create new instances in the future.

At the end of your Word document, include the answers to the following questions:

1. Why are the snapshots of the same disk dramatically different sizes and why do they seem to get smaller even after adding software to the system?

Snapshots are incremental and automatically compressed, so you can create regular snapshots on a persistent disk faster and at a much lower cost than if you regularly created a full image of the disk. Incremental snapshots work in the following manner.

- *The first successful snapshot of a persistent disk is a full snapshot that contains all the data on the persistent disk.*
- *The second snapshot only contains any new data or modified data since the first snapshot. Data that hasn't changed since snapshot 1 isn't included. Instead, snapshot 2 contains references to snapshot 1 for any unchanged data.*
- *Snapshot 3 contains any new or changed data since snapshot 2 but won't contain any unchanged data from snapshot 1 or 2. Instead, snapshot 3 contains references to blocks in snapshot 1 and snapshot 2 for any unchanged data.*

This repeats for all subsequent snapshots of the persistent disk. Snapshots are always created based on the last successful snapshot taken.

Compute Engine stores multiple copies of each snapshot across multiple locations with automatic checksums to ensure the integrity of your data.

2. In a sentence or two, what did you learn? *This was an interesting exercise. It kind of reminds me of the CS351 Operating Systems, where I first used Ubuntu operating system using a Linux VM instance to take a snapshot. I used to think it was just a screenshot until I realized it was just a copy of the disk file at given point in time. Snapshots provide a change log for the virtual disk and are used to restore a VM to a particular point in time when a failure or system error occurs. I learn there's more to the boot disk than just applying an operating system. I learn different methods of recovering and allowing a virtual machine's disks to be isolated from write activity so that they can be backed up.*
3. In a sentence or two, what did you like about this project? *The most interesting thing I liked about this project was being able to understand the concept of the snapshots in vm instances. I like how making a copy of a instance, I can still have access to my webpages. It really copies that data over.*
4. In a sentence or two, what did you find confusing or would like to see done differently regarding this project? *The only thing that I found confusing about this project was trying to find the config.php file. I had to look in all the directories pf the downloaded Simple PHP Website, until realized it was in the /var/www/prebuilt/includes directory. I then changed the 'pretty url' => true, to 'pretty url' => false, so that all my webpages would work on the Simple PHP Website.*