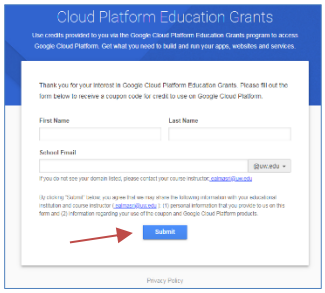
Platform web address: https://cloud.google.com/. To retrieve the main dashboard, click on Console.

INTRODUCTION TO GOOGLE CLOUD PLATFORM (GCP)

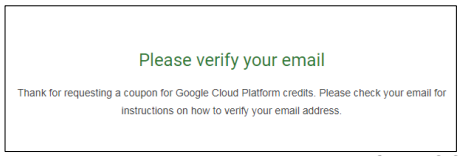
- Google Cloud Platform (GCP) provides access to physical resources such as computers, hard disk drives and other virtual resources (i.e. virtual machines).
- These resources are residing in Google data centers around the world.
- As a developer, you can selectively choose the regions where you wish to deploy your applications.
- To get an idea about what is Google's data center, visit this link (from Google).
- Some cloud platforms offer free trials. However, many platform providers require credit card verification for trial (e.g. AWS and Azure, Oracle Cloud, among others).
- To give students a chance to learn about creating, maintaining and deploying web applications on cloud platform environment, GCP Education thankfully has granted TCSS 460 students with educational credits to work with the GCP platform *(more instructions on how to use these credits will be provided in this example)*.
- Nearly all cloud platforms provide similar services but they vary in the degree to which these services are offered.
- Some of the common cloud platform providers are GCP, AWS, MS Azure, IBM Cloud, Oracle Cloud, among others.
- When working with features offered on a cloud platform, whether in terms of software or hardware, these features are provided as ***services***.
- In GCP, some of available services include, for example,
    - Compute Engine → a ***high-performance*** virtual machine
    - Cloud Storage → storage
    - Cloud SQL → DBMs offered as services (e.g. MySQL, PostgreSQL, SQL Server, etc.)
    - Vision AI → Automated Machine Learning (AutoML) and Vision API (for image processing)
    - API Management → manage deployed APIs
    - Containers → "package" an application in which it is abstracted from environment (decoupling)
        - Example: Kubernetes (supports up to 5000 nodes)
        - Example: Docker (supports 2000+ nodes)
    - Internet of Things → Cloud IoT Core

Log out from any Google account before proceeding to Step 1.
Ensure that you sign out from all Google accounts.

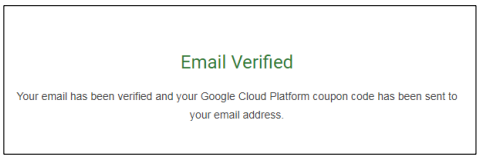
1. CREATE AN ACCOUNT WITH GOOGLE CLOUD PLATFORM



1 You should have received an email from the instructor through your uw.edu email account with the subject "TCSS 460: Google Cloud Platform Coupon". In this email, a link to retrieve a coupon is provided. Click on the "Student Coupon Retrieval Link." A new window will appear requesting more information: (a) First Name, (b) Last Name and (c) School Email (*you only need enter your **UW userid***). Complete the form and then click **Submit**. A message will appear indicating that an email has been sent.

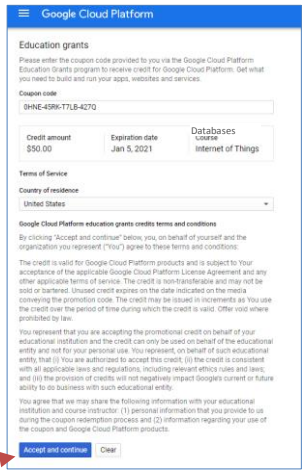


2 You should then receive an email regarding the status of the GCP Education Grant Request. The email contains a link to **verify** your email address. Click on the link (which will open a new window) to verify your email address. A message will appear indicating that your email has been verified.



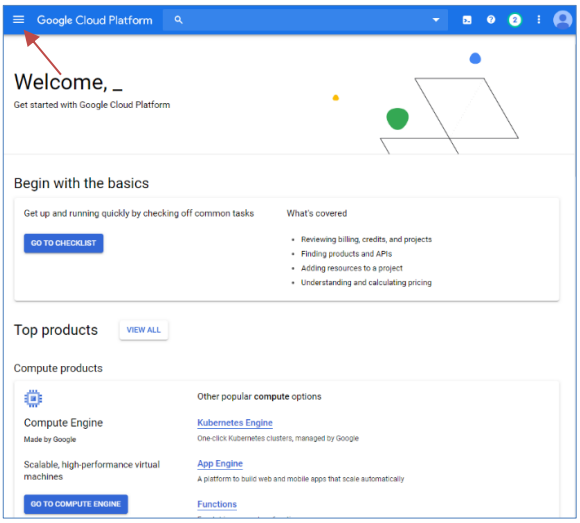
If you do not receive the verification email, check the spam/junk folder and/or contact the instructor.

3 Once an email address is verified, you will receive a **second** email with a coupon code to redeem in order to use the Google Cloud Platform. **Click** on the **link** provided in the email to redeem the coupon. A new window will open prompting to login into Google. **Click** on "**Use another account**" and enter your uw.edu email (uw_userid@uw.edu), then click **Next**. Google will redirect to the UW login page. Enter your UW credentials and then click **Sign in**.



Once you are logged in, GCP will display a page titled **Education grants** and will prompt you to read the GCP Education Grants Terms and Conditions. Review the terms and conditions. Then, **click** the button **Accept and continue** *(do not change the coupon code)*. GCP will then attempt to create a project (may take 1-2 mins).

4 GCP will display a dashboard of the platform which defaults to the **welcome** section.



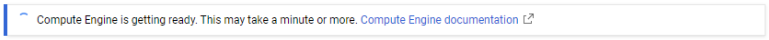
If you plan to use GCP for the project, please ensure that you leave some credit to complete the examples. After completing this example, you should be able to know how much credit approximately is required per example.

The **Billing** section from the top-left navigation menu enables you keep track of your GCP remaining credits for your account.

The navigation menu (top, upper left corner) provides links to all GCP services. Scroll down to become familiar with the various GCP services.

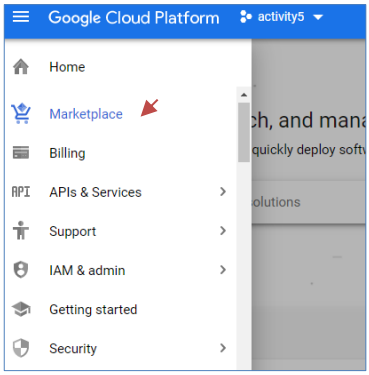
2. CREATING A VIRTUAL MACHINE (VM) INSTANCE THROUGH GCP'S MARKETPLACE

1 From the top-left navigation menu, click on **Compute Engine** and then select VM Instances. You may receive the following message:

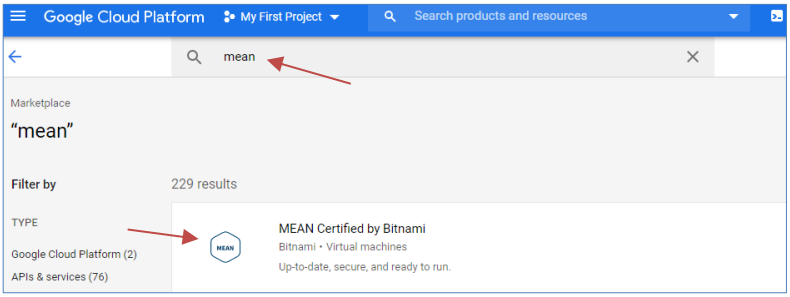


Wait until the process of setting up the compute engine is completed.

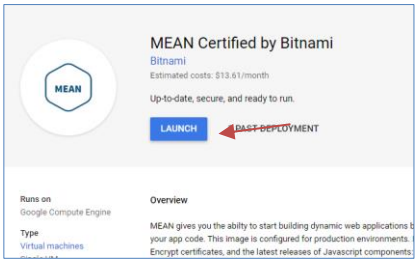
GCP provides a **marketplace** which contains tools that enhance the productivity of creating and deploying applications on the platform. One of these tools is the Google Cloud Launcher which simplifies running 3rd party applications. For this example, we would like to run Node.js and Express. This requires a number of tools such as a HTTP web server, server-side scripting, among others. To simplify the process of deploying web applications, a number of software stacks exist. These software stacks contain programs and components bundled altogether. A list of these software bundles can be found in this link. We will use the MEAN software bundle which contains **M**ongoDB, **E**xpress.js, **A**ngularJS (or **A**ngular), and **N**ode.js. GCP makes is it simple to create and deploy a virtual machine containing MEAN. To accomplish this, we will use the **Google Cloud Marketplace**.



From the GCP navigation menu, click on **Marketplace**. Then, search for "**MEAN** ". Click on **MEAN Certified by Bitnami** to deploy it as a virtual machine.

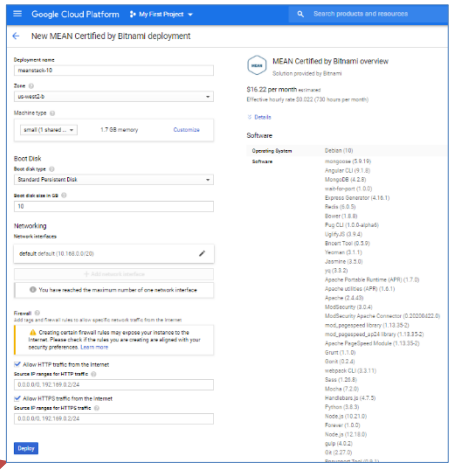


2 This MEAN stack is estimated to cost $16.22/month on the compute engine. Click on **Launch (on Compute Engine)**.



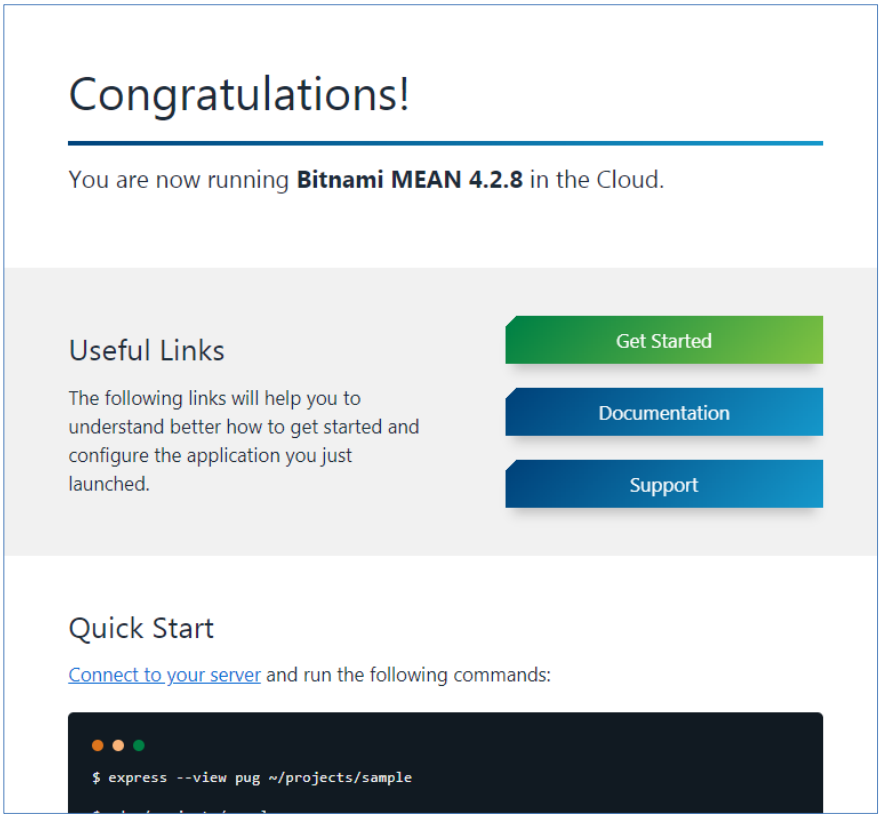
3 A form will appear for creating a new MEAN deployment. Name the **instance** as **tcss460-mean**. On the right panel of the page, you should see a list of the software that is automatically "bundled" in this version of MEAN. It includes, for example, Apache, Angular, Python, Node.js, MongoDB, among many others.

Keep the rest of the **default settings**. **Accept** the GCP Marketplace Terms and Conditions (if any) and then click **Deploy**.

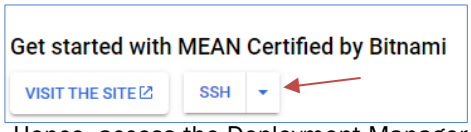


4 Once the deployment of MEAN is completed, you will receive a notification via email and you can now access the web server running on GCP. **Note** the **site address**, admin password and admin user. The site address is the public ip address that can now access your virtual machine instance running the MEAN stack. The admin password is the temporary password for accessing the admin user account. *Copy this information as it will be needed for future steps.*

Click on **Visit the site** button. A new window will appear with a redirection notice. Click on the ip_address link to visit your web site for this VM running on GCP (it is publically available) where now the **homepage** of the server is running. You should see an Apache2 Debian Default Page as shown below. Congratulations! You have now configured a virtual machine which is publicly accessible through the GCP.



5 You can access the compute engine VM instance from the **GCP Console | navigation menu | Deployment Manager** or via **navigation menu | Compute Engine | VM Instances**. Accessing the VM tcss460-mean via the Deployment Manager provides you access to deployment details such as external IP, temporary password, among other important details. Hence, access the Deployment Manager and then, click on **tcss460-mean** VM name. Then, under the section **Get started with MEAN Certified by Bitnami | Suggested next steps, click on the link to access SSH terminal.**



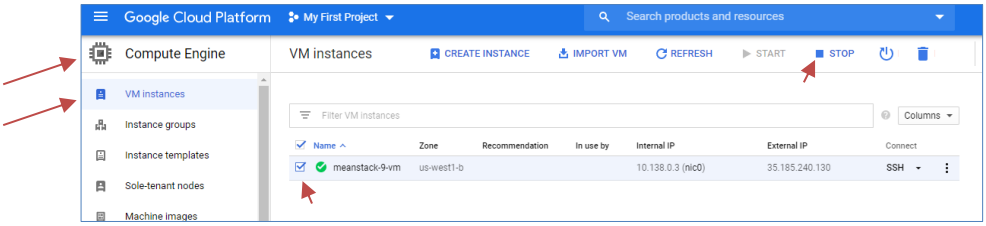
Now you are ready to write node.js code. Happy Coding!

After completing the example, please ensure that you **STOP** virtual machine to avoid accumulating resource usage and **losing remaining GCP credit**. You may need this credit for your next example or course assignment.

You are encouraged to frequently view the Billing section (GCP | navigation menu | **Billing**) to determine the remaining credit you have.

To turn off or stop a virtual machine instance, navigate to the GCP Console | navigation menu | Compute Engine | VM Instance. Then, select the virtual machine instance and from the top menu click **STOP**. You can always restart the virtual machine when necessary in the same process but by clicking the START button to start a VM.

*To **Stop** a VM instance:*



*To **Start** a VM instance:*