## <https://www.cloudskillsboost.google/public_profiles/efc27e34-0728-4d85-af99-808c749073c7>

## **1.0 Introducing Google Cloud**

## Google Cloud offers four main kinds of services:Compute, Storage, Big Data, and Machine Learning.

## Focuses mostly on the first two, together with Google Virtual Private Cloud (VPC) networking.

## This module orients learners to the basics of Google Cloud.

## It traces the evolution of cloud computing and explains what is unique about Google's approach to it.

## The module introduces the key structural concepts of regions and zones.

## Welcome to Google Cloud Fundamentals: Core Infrastructure

## Introducing Google Cloud

## [What's new?](https://www.youtube.com/watch?v=5zwQoc1ggM0) 1 minute

## [Welcome to GCP Fundamentals](https://www.youtube.com/watch?v=EHpaHQaUZgE) 1 minute

## [What is cloud computing?](https://www.youtube.com/watch?v=TpW2zkqQt0A) 1 minute

## [How did we get here?](https://www.youtube.com/watch?v=Ntxkz-ltIqo) 1 minute

## [Every company is a data company](https://www.youtube.com/watch?v=LOTX6MRzuQU) 1 minute

## [Quiz : Cloud Computing Services](https://www.cloudskillsboost.google/course_sessions/729736/quizzes/104953)

* + Does a cloud computing service let you scale your resource use up and down? Yes
    - The cloud provider has a pool of resources and lets you use more or less on demand.
  + To get resources from a cloud computing provider, is working with a person at the provider required? No
    - Cloud computing resources are available on-demand and self-service. (An exception: cloud computing providers typically set some limits on the amount of resources a customer can consume by default, to help customers avoid accidental runaway resource usage and charges. These limits can be raised by the cloud provider.)

## [GCP computing architectures](https://www.youtube.com/watch?v=SJRLrX4AM7A) 1 minute

## [The Google network](https://www.youtube.com/watch?v=56uudRNwnlw) 1 minute

## [GCP regions and zones](https://www.youtube.com/watch?v=jJ-OxyocAr4) 1 minute

## [Environmental responsibility](https://www.youtube.com/watch?v=ZF3Mirqwwt8) 1 minute

## [Google offers customer-friendly pricing](https://www.youtube.com/watch?v=GLxTaDThPCA)

## [Open APIs](https://www.youtube.com/watch?v=0Gpbyqj2ptM) 1 minute

## [Quiz : GCP Regions and Zones](https://www.cloudskillsboost.google/course_sessions/729736/quizzes/104960)

* + Why might a GCP customer use resources in several zones within a region? For improved fault tolerance
    - As part of building a fault-tolerant application, you can spread your resources across multiple zones in a region.
  + Why might a GCP customer use resources in several regions around the world?
    - To bring their applications closer to users around the world, and for improved fault tolerance

## [Why choose Google Cloud](https://www.youtube.com/watch?v=sglui70elWk) 1 minute

## [Multi-layered security approach](https://www.youtube.com/watch?v=YYxJrbtJY4A) 3 minutes

## [**Budgets and Billing**](https://www.youtube.com/watch?v=kekfOK8tc_U)

* gcp provides 4 tools to help budgets and alerts, billing export, reports and quotas
* 1.budgets and alert
  + define budgets either per billing account or per gcp project
  + a budget can be a fixed limit or you can tie it to another metric
  + Graphical user interface, text, application, email

    Description automatically generated
    - for example a percentage of the previous month spend
  + to be notified when costs approach your budget limit create an alert
    - for example with a budget limit of 20,000$ and an alert set at ninety percent
    - you'll receive a notification alert when your expenses reach 18,000$
  + alerts are generally set at 50%, 90% and a 100% but you can customize that
* 2. Billing export
  + store detailed billing information in places where it's easy to retrieve for more detailed analysis such as a bigquery data set or a cloud storage bucket
  + Graphical user interface, application

    Description automatically generated
* 3. reports is a visual tool in the gcp console that allows you to monitor your expenditure
* Graphical user interface, application, website

  Description automatically generated
* 4. quotas which protect both account owners and the gcp community as a whole
  + quotas are designed to prevent the over-consumption of resource whether because of error or malicious attack
  + Graphical user interface, application

    Description automatically generated
  + 2 types of quotas, rate and allocation quotas both get applied at the level of the gcp project
    - rate quotas reset after a specific time,
      * for example by default the Kubernetes engine service sets a quota of a thousand calls to its api from each gcp project every 100 seconds after that 100 seconds the limit is reset
    - allocation quotas on the other hand govern the number of resources you can have in your projects
      * for example by default each gcp project has a quota allowing it no more than five virtual private cloud networks

## [Quiz : Introducing Google Cloud Platform](https://www.cloudskillsboost.google/course_sessions/729736/quizzes/104964)

## What kind of customer benefits most from billing by the second for cloud resources such as virtual machines? Customers who create and run many virtual machines

## Choose fundamental characteristics of cloud computing. (4 correct responses).

## Customers can scale their resource use up and down

## Customers pay only for what they use or reserve

## Resources are available from anywhere over the network

## Computing resources available on-demand and self-service

## What type of cloud computing service lets you bind your application code to libraries that give access to the infrastructure your application needs? Platform as a Service

## What type of cloud computing service provides raw compute, storage, and network, organized in ways that are familiar from physical data centers? Infrastructure as a Service

## Choose a fundamental characteristic of devices in a virtualized data center.

## They are manageable separately from the underlying hardware.

## Which statement is true about the zones within a region?

## The zones within a region have fast network connectivity among them.

# 2.0 Getting Started with Google Cloud

# GCP customers use projects to organize the resources they use. They use Google Cloud Identity and Access Management (IAM) to control who can do what with those resources.

# They use any of several technologies to connect with GCP.

# This module covers each of these topics, and it introduces a service called Cloud Launcher that is an easy way to get started with GCP.

# Getting Started with Google Cloud

# I[ntroduction](https://www.youtube.com/watch?v=xFxLCwFL004) 2 minutes

# [The Google Cloud resource hierarchy](https://www.youtube.com/watch?v=gg75Wma4brk) 5 minutes

# [Quiz : The Google Cloud Platform resource hierarchy](https://www.cloudskillsboost.google/course_sessions/729736/quizzes/104968)

# Your company has two GCP projects, and you want them to share policies. What is the less error-prone way to set this up?

# Place both projects into a folder, and define the policies on the folder.

# True or false: Google manages every aspect of Google Cloud Platform customers' security. False

# Google Cloud Platform manages the lower layers of the security stack, such as physical security, and gives customers tools for managing the higher layers.

# Choose the correct completion: Services and APIs are enabled on a per-\_\_\_\_\_\_\_\_\_\_ basis. Project

# [Identity and Access Management (IAM)](https://www.youtube.com/watch?v=hKtEd5efLk8) 3 minutes

# [IAM roles](https://www.youtube.com/watch?v=jBYJzZH_ZE0) 3 minutes

# [Interacting with Google Cloud](https://www.youtube.com/watch?v=ECP8MpbuDTI) 4 minutes

# [Cloud Marketplace (formerly Cloud Launcher)](https://www.youtube.com/watch?v=qoekFgfkVa4)

# [Demonstration:Getting Started with Cloud Launcher](https://www.youtube.com/watch?v=hK1hEZrTsAo) 2 minutes

# [Google Cloud Fundamentals: Getting Started with Cloud Marketplace](https://www.cloudskillsboost.google/course_sessions/729736/labs/104974) 25 minutes

* use Cloud Marketplace to quickly and easily deploy a LAMP stack on a Compute Engine instance.
* The Bitnami LAMP Stack provides a complete web dev env for Linux that can be launched in 1 click.

|  |  |
| --- | --- |
| **Component** | **Role** |
| Linux | Operating system |
| Apache HTTP Server | Web server |
| MySQL | Relational database |
| PHP | Web application framework |
| phpMyAdmin | PHP administration tool |

* In the GCP Console, on the **Navigation menu**, click **Marketplace,**.In the search bar, type LAMP
* In the search results, click **LAMP Packaged by Bitnami** On the LAMP page, click **Launch**.
* For **Zone**, select the deployment zone that Qwiklabs assigned to you.
  + Leave the remaining settings as their defaults. Click **Deploy**.
  + The status of the deployment: **lampstack-1 is being deployed** to **k-1 has been deployed**.
  + After the software is installed, a summary of the details for the instance, is displayed.

## Task 3: Verify your deployment

* + Click the **Site address** link in the right pane to view your new site.
  + On the GCP Console, under **Get started with LAMP Packaged by Bitnami**, click **SSH**.
  + In a new window, a secure login shell session on your virtual machine appears.
  + SSH window, to change the current working directory to /opt/bitnami, execute the following command: cd /opt/bitnami
  + To copy the phpinfo.php script from the installation directory to a publicly accessible location under the web server document root, execute the following command: sudo sh -c 'echo "<?php phpinfo(); ?>" > apache2/htdocs/phpinfo.php'
  + The phpinfo.php script displays your PHP configuration.
  + To close the SSH window, execute the following command: exit
  + Open a new browser tab.
  + Type the following URL, and replace SITE\_ADDRESS with the URL in the **Site address** field in the right pane of the **lampstack** page. http://SITE\_ADDRESS/phpinfo.php
  + A summary of the PHP configuration of your server is displayed.
  + Close the **phpinfo** tab.
* [Quiz : Getting Started with Google Cloud Platform](https://www.cloudskillsboost.google/course_sessions/729736/quizzes/104975)

# \*True or False\*: In Google Cloud IAM: if a policy applied at the project level gives you Owner permissions, your access to an individual resource in that project might be restricted to View permission if someone applies a more restrictive policy directly to that resource. False

# Policies are a union of those applied on resource itself and those inherited from higher levels in the hierarchy. If a parent policy is \*\*less\*\* restrictive, it overrides a more restrictive policy applied on the resource. If a parent policy is \*\*more\*\* restrictive, it does not override a less restrictive policy applied on the resource. Therefore, access granted at a higher level in the hierarchy cannot be taken away by policies applied at a lower level in the hierarchy.

# Which statement is true about billing for solutions deployed using Cloud Marketplace (formerly known as Cloud Launcher)?

# You pay only for the underlying GCP resources you use, with the possible addition of extra fees for commercially licensed software.

# What is the difference between IAM primitive roles and IAM predefined roles?

# Primitive roles affect all resources in a GCP project. Predefined roles apply to a particular service in a project.

# \*True or False\*: All Google Cloud Platform resources are associated with a project. True

# How do GCP customers and Google Cloud Platform divide responsibility for security?

# Google takes care of the lower parts of the stack, and customers are responsible for the higher parts.

# Consider a single hierarchy of GCP resources. Which of these situations is possible? (Choose all that are correct. Choose 3 responses.)

# There is an organization node, and there is at least one folder.

# There is an organization node, and there are no folders.

# There is no organization node, and there are no folders.

# Which of these values is globally unique, permanent, and unchangeable, but chosen by the customer? The project ID

# Service accounts are used to provide which of the following? (Choose all that are correct. Choose 3 responses.)

# A way to allow users to act with service account permissions

# A way to restrict the actions a resource (such as a VM) can perform

# Authentication between Google Cloud Platform services

**3.0 Virtual Machines in the Cloud**

* Compute Engine lets you run virtual machines on Google’s global infrastructure.
* This module covers how Compute Engine works, with a focus on Google virtual networking.
* Virtual Machines in the Cloud
* [Introduction](https://www.youtube.com/watch?v=yaVyS7x-wl0) 1 minute
* [Virtual Private Cloud (VPC) Network](https://youtu.be/m30ZlSpy5tc) 1 minute
* [Quiz : Virtual Private Cloud (VPC) Network](https://www.cloudskillsboost.google/course_sessions/729736/quizzes/104979)
  + True or false: If you increase the size of a subnet in a custom VPC network, the IP addresses of virtual machines already on that subnet might be affected. False
    - You can dynamically increase the size of a subnet in a custom network by expanding the range of IP addresses allocated to it. Doing that doesn’t affect already configured VMs.
  + True or false? In Google Cloud VPCs, subnets have regional scope. True
    - VPC subnets can span the zones that make up a region. This is beneficial because your solutions can incorporate fault tolerance without complicating your network topology.
* [Compute Engine](https://youtu.be/88UGz9C_xlg) 4 minutes
* [Quiz : Compute Engine](https://www.cloudskillsboost.google/course_sessions/729736/quizzes/104981)
  + What is the main reason customers choose Preemptible VMs? To reduce cost.
    - The per-hour price of preemptible VMs incorporates a substantial discount.
  + True or false: You can create Compute Engine virtual machines from the command line. True
    - It's advantageous to create VM from a cmd line when you want their configurations to be scripted and repeatable. The gcloud command, provided by Google Cloud as part of the GCP SDK, can create virtual machines with parameters you specify.
* [Important VPC capabilities](https://youtu.be/2bwYPN8uXms) 7 minutes
* [Demonstration:Getting Started with Compute Engine](https://youtu.be/sUuboimzalA) 5 minutes

## [Google Cloud Fundamentals: Getting Started with Compute Engine](https://www.cloudskillsboost.google/course_sessions/729736/labs/104984) 25 minutes

## Task 2. Create a virtual machine using the GCP Console

* + - In the **Navigation menu**, click **Compute Engine** > **VM instances**. Click **CREATE INSTANCE**.
    - On the **Create an Instance** page, for **Name**, type my-vm-1.
    - For **Region** and **Zone**, select the region and zone assigned by Qwiklabs.
    - For **Machine type**, accept the default.
    - For **Boot disk**, if the **Image** shown is not **Debian GNU/Linux 10 (Buster)**, click **Change** and select **Debian GNU/Linux 10 (Buster)**.
    - Leave the defaults for **Identity and API access** unmodified.
    - For Firewall, click **Allow HTTP traffic**.
    - Leave all other defaults unmodified.
    - To create and launch the VM, click **Create**.

## Task 3. Create a virtual machine using the gcloud command line

* + - In GCP console, on the top right toolbar, click the Open Cloud Shell button.
    - To display a list of all the zones in the region gcloud compute zones list | grep.
    - Your completed command will look like this: gcloud compute zones list | grep us-central1
    - Choose a zone from that list other than the zone to which Qwiklabs assigned you. For example, if Qwiklabs assigned you to region us-central1 and zone us-central1-a you might choose zone us-central1-b.
    - To set your default zone, enter this partial cmd gcloud config set compute/zone followed by the zone. gcloud config set compute/zone us-central1-b
  + To create a VM instance called **my-vm-2** in that zone, execute this command:
    - gcloud compute instances create "my-vm-2" \
    - --machine-type "n1-standard-1" \
    - --image-project "debian-cloud" \
    - --image-family "debian-10" \
    - --subnet "default"
  + To close the Cloud Shell, execute the following command: exit

## Task 4. Connect between VM instances

* + - In the **Navigation menu**, click **Compute Engine > VM instances**. see the 2 VM instances you created, each in a different zone.
    - Notice that the Internal IP addresses of these two instances share the first three bytes in common. They reside on the same subnet in their Google Cloud VPC even though they are in different zones.
    - Cmd prompt on the **my-vm-2** instance, click **SSH** in its row in the **VM instances** list.
      * Use the ping cmd to confirm that **my-vm-2** can reach **my-vm-1** over the network: ping my-vm-1.us-central1-a
      * Notice that the output of the ping command reveals that the complete hostname of **my-vm-1** is **my-vm-1.us-central1-a.c.PROJECT\_ID.internal**, where PROJECT\_ID is the name of your GCP project. GCP automatically supplies Domain Name Service (DNS) resolution for the internal IP addresses of VM instances.
      * Press **Ctrl+C** to abort the ping command.
    - Use the **ssh** command to open a command prompt on **my-vm-1**:ssh my-vm-1.us-central1-a
    - enter **yes** to confirm that you do.
    - At the command prompt on **my-vm-1**, install the Nginx web server:
      * sudo apt-get install nginx-light -y
      * Use the **nano** editor to add a custom message to the homepage of the web server:
        + sudo nano /var/www/html/index.nginx-debian.html
        + Use the arrow keys to move the cursor to the line just below the h1 header. Add text like this, and replace YOUR\_NAME with your name:

Hi from YOUR\_NAME

* + - * + Press **Ctrl+O** and then press **Enter** to save your edited file, and then press **Ctrl+X** to exit the nano text editor.
        + Confirm that the web server is serving your new page. At the command prompt on **my-vm-1**, execute this command: curl http://localhost/
        + The response will be the HTML source of the web server's home page
        + To exit the command prompt on **my-vm-1**, execute this command: exit
    - You will return to the command prompt on **my-vm-2**
    - To confirm that **my-vm-2** can reach the web server on **my-vm-1**, at the command prompt on **my-vm-2**, execute this command: curl http://my-vm-1.us-central1-a/
    - The response will again be the HTML source of the web server's home page, including your line of custom text.
    - In the **Navigation menu**, click **Compute Engine > VM instances**.
      * Copy the External IP address for **my-vm-1** and paste it into the address bar of a new browser tab.
      * You will see your web server's home page, including your custom text.
      * **Note:**If you forgot to click **Allow HTTP traffic** when you created the **my-vm-1** VM instance, your attempt to reach your web server's home page will fail. You can add a [firewall rule](https://cloud.google.com/vpc/docs/firewalls) to allow inbound traffic to your instances, although this topic is out of scope for this course.
* [Quiz : Google Compute Engine and Networking](https://www.cloudskillsboost.google/course_sessions/729736/quizzes/104985)
  + A GCP customer wants to load-balance traffic among the back-end VMs that form part of a multi-tier application. Which load-balancing option should this customer choose?
    - The regional internal load balancer
  + How do VPC routers and firewalls work? They are managed by Google as a built-in feature.
  + Choose an application that would be suitable for running in a Preemptible VM.
    - A batch job that cannot be checkpointed and restarted
  + How do Compute Engine customers choose between big VMs and many VMs?
    - Use big VMs for in-memory databases and CPU-intensive analytics; use many VMs for fault tolerance and elasticity
  + \*True or False\*: Google Cloud Load Balancing allows you to balance HTTP-based traffic across multiple Compute Engine \*regions.\* True
    - With GC Load Balancing, your application presents a single front-end to the world.
  + For which of these interconnect options is a Service Level Agreement available?
    - Dedicated Interconnect
  + Which statement is true about Google VPC networks and subnets?
    - Networks are global; subnets are regional
  + An application running in a Compute Engine virtual machine needs high-performance scratch space. Which type of storage meets this need? Local SSD

**4.0 Storage in the Cloud**

* core storage options:Cloud Storage, Cloud SQL, Cloud Spanner, Cloud Datastore, and Google Bigtable.
* Storage in the Cloud
* [Introduction to Google Cloud Storage Options](https://youtu.be/H7wByyWFJRA) 1 minute
* [Cloud Storage](https://youtu.be/njNZomdQ8U4) 4 minutes
* [Cloud Storage interactions](https://youtu.be/IFEOg6WgJnk) 5 minutes
* [Quiz : Cloud Storage](https://www.cloudskillsboost.google/course_sessions/729736/quizzes/104990)
  + Why would a customer consider the Coldline storage class?
    - To save money on storing infrequently accessed data.
    - Billed at a low monthly storage rate, although a fee is assessed on retrievals.
  + True or false: Cloud Storage is well suited to providing the root file system of a Linux virtual machine. False
    - It’s object storage rather than file storage. Compute Engine virtual machines use Persistent Disk storage to contain their file systems.
  + Your Cloud Storage objects live in buckets. Which of these characteristics do you define on a per-bucket basis? Choose all that are correct (3 correct answers).
    - A globally-unique name. A geographic location. A default storage class
* [Google Cloud Bigtable](https://youtu.be/st5w9awpXfk) 4 minutes
* [Quiz : Cloud Bigtable](https://www.cloudskillsboost.google/course_sessions/729736/quizzes/104992)
  + True or false: Each table in NoSQL databases such as Cloud Bigtable has a single schema that is enforced by the database engine itself. False
    - NoSQL databases such as Cloud Bigtable are suitable when all items in the database needn't have their integrity checked by a database schema. Why not? Maybe you want your database items to contain variable fields, or maybe because you simply want your application to manage database integrity.
  + Some developers think of Cloud Bigtable as a persistent hashtable. What does that mean?
    - Each item in the database can be sparsely populated, and is looked up with a single key.
* [Google Cloud SQL and Google Cloud Spanner](https://youtu.be/Fzb9t9tn35M) 4 minutes
* [Quiz : Cloud SQL and Cloud Spanner](https://www.cloudskillsboost.google/course_sessions/729736/quizzes/104994)
  + Which database service can scale to higher database sizes? Cloud Spanner.
    - Cloud Spanner can scale to petabyte database sizes, while Cloud SQL is limited by the size of the database instances you choose. At the time this quiz was created, the maximum was 10,230 GB.
  + Which database service presents a MySQL or PostgreSQL interface to clients? Cloud SQL.
    - Each Cloud SQL database is configured at creation time for either MySQL or PostgreSQL. Cloud Spanner uses ANSI SQL 2011 with extensions.
  + Which database service offers transactional consistency at global scale? Cloud Spanner.
    - Cloud Spanner offers transactional consistency at global scale.
* [Google Cloud Datastore 1 minute](https://youtu.be/19OqMq617cY)
* [Quiz : Cloud Datastore](https://www.cloudskillsboost.google/course_sessions/729736/quizzes/104996)
  + How are Cloud Datastore and Cloud Bigtable alike? Choose all that are correct (2 correct answers) They are both NoSQL databases. They are both highly scalable.
  + True or false: Cloud Datastore databases can span App Engine and Compute Engine applications. True.
* [Comparing Storage Options](https://youtu.be/IRLqBF7gxJI) 3 minutes
* [Demonstration:Getting Started with Cloud Storage and Cloud SQL](https://youtu.be/cdQD3zfPzLI) 10 minutes
* [Google Cloud Fundamentals: Getting Started with Cloud Storage and Cloud SQL](https://www.cloudskillsboost.google/course_sessions/729736/labs/104999) 50 minutes
  + Task 2: Deploy a web server VM instance
    - on the Navigation menu->Compute Engine > VM instances -> Click Create Instance.
      * Name - bloghost
      * For Region and Zone, select the region and zone assigned by Qwiklabs.
      * For Machine type, accept the default.
      * For Boot disk, if the Image shown is not Debian GNU/Linux 9 (stretch), click Change and select Debian GNU/Linux 9 (stretch).
      * Leave the defaults for Identity and API access unmodified.
      * For Firewall, click Allow HTTP traffic.
      * Click Networking, disks, security, management, sole … to open that section dialog.
      * Click Management to open that section of the dialog.
      * the Automation section, and enter the script as the value for Startup script:
        + apt-get update
        + apt-get install apache2 php php-mysql -y
        + service apache2 restart
      * Leave the remaining settings as their defaults, and click Create.
    - On the VM instances page, copy the bloghost VM instance's internal and external IP addresses to a text editor for use later in this lab.

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| Graphical user interface, text, application, email  Description automatically generated | Graphical user interface, text, application, email  Description automatically generated |
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* + Task 3: Create a Cloud Storage bucket using the gsutil command line
    - click Activate Cloud Shell . If a dialog box appears, click Continue.
    - For convenience, enter your chosen location into an environment variable called LOCATION. Enter one of these commands:
      * export LOCATION=US Or export LOCATION=EU Or export LOCATION=ASIA
    - In Cloud Shell, the DEVSHELL\_PROJECT\_ID environment variable contains your project ID. Enter this command to make a bucket named after your project ID:
      * gsutil mb -l $LOCATION gs://$DEVSHELL\_PROJECT\_ID
      * If prompted, click Authorize to continue.
    - Retrieve a banner image from a publicly accessible Cloud Storage location:
      * gsutil cp gs://cloud-training/gcpfci/my-excellent-blog.png my-excellent-blog.png
    - Copy the banner image to your newly created Cloud Storage bucket:
      * gsutil cp my-excellent-blog.png gs://$DEVSHELL\_PROJECT\_ID/my-excellent-blog.png
    - Modify the Access Control List of the object you just created so that it is readable by everyone:
      * gsutil acl ch -u allUsers:R gs://$DEVSHELL\_PROJECT\_ID/my-excellent-blog.png
  + Task 4: Create the Cloud SQL instance
    - Console, on the Navigation menu -> click SQ -> Click Create instance. -> select MySQL.
      * For Instance ID, type blog-db, and for Root password type a pwd of your choice.
      * Select Single zone and set the region and zone assigned by Qwiklabs.
      * This is the same region and zone into which you launched the bloghost instance. The best performance is achieved by placing the client and the database close to each other.
      * Click Create Instance.
    - Click on the name of the instance, blog-db, to open its details page.
      * From the SQL instances details page, copy the Public IP address.
    - Click on Users menu on the left-hand side, and then click ADD USER ACCOUNT.
      * For User name/Password, type blogdbuser
      * Click ADD to add the user account in the database.
    - Click the Connections tab, and then click Add network.
      * If you are offered the choice between a Private IP connection and a Public IP connection, choose Public IP for purposes of this lab.
      * The Add network button may be grayed out if the user account creation is not yet complete.
      * For Name, type web front end
      * For Network, type the external IP address of your bloghost VM instance, followed by /32. The result will look like this: 35.192.208.2/32
    - Click Done to finish defining the authorized network.
    - Click Save to save the configuration change.
    - Graphical user interface, text, application, email

      Description automatically generated
  + Task 6: Configure an application in a Compute Engine instance to use a Cloud Storage object
    - In the GCP Console, click Cloud Storage > Browser -> Click on the bucket.
    - In this bucket, there is an object called my-excellent-blog.png. Copy the Public URL.
    - If you not see the "Public link", from Cloud Shell, change the object's Access Control list with the gsutil acl ch command was successful.
  + Task 5: Configure an application in a Compute Engine instance to use Cloud SQL
    - On the Navigation menu -> click Compute Engine > VM instances -> click SSH
    - In your ssh session on bloghost, change your working directory to the document root of the web server: cd /var/www/html
    - Use the nano text editor to edit a file called index.php: sudo nano index.php
    - Paste the content below into the file:
      * <html>
      * <head><title>Welcome to my excellent blog</title></head>
      * <body>
      * <img src='https://storage.googleapis.com/qwiklabs-gcp-0005e186fa559a09/my-excellent-blog.png'>
      * <h1>Welcome to my excellent blog</h1>
      * <?php
      * $dbserver = "CLOUDSQLIP";
      * $dbuser = "blogdbuser";
      * $dbpassword = "DBPASSWORD";
      * // In a production blog, we would not store the MySQL
      * // password in the document root. Instead, we would store it in a
      * // configuration file elsewhere on the web server VM instance.
      * $conn = new mysqli($dbserver, $dbuser, $dbpassword);
      * if (mysqli\_connect\_error()) {
      * echo ("Database connection failed: " . mysqli\_connect\_error());
      * } else {
      * echo ("Database connection succeeded.");
      * }
      * ?>
      * </body></html>
      * replace CLOUDSQLIP/ DBPASSWORD with the Cloud SQL instance Public IP address/password.
    - Press Ctrl+O, and then press Enter to save your edited file.
    - Press Ctrl+X to exit the nano text editor.
    - Restart the web server: sudo service apache2 restart
  + Open a new web browser tab, access the bloghost VM instance's external IP address followed by /index.php. The URL will look like this: 35.192.208.2/index.php
* [Quiz : Google Cloud Platform Storage Options](https://www.cloudskillsboost.google/course_sessions/729736/quizzes/105000)
  + Your application needs to store data with strong transactional consistency, and you want seamless scaling up. Which storage option is the best choice for your applicatio? Cloud Spanner
  + Your application needs a relational database, and it expects to talk to MySQL. Which storage option is the best choice for your application? Cloud SQL
  + You are developing an application that transcodes large video files. Which storage option is the best choice for your application? Cloud Storage
  + Which statement is true about objects in Cloud Storage?
    - They are immutable, and new versions overwrite old unless you turn on versioning.
  + How do the Nearline and Coldline storage classes differ from Multi-regional and Regional? Choose all that are correct (2 responses).
    - Nearline and Coldline assess additional retrieval fees.
    - Nearline and Coldline assess lower storage fees.
  + You manufacture devices with sensors and need to stream huge amounts of data from these devices to a storage option in the cloud. Which Google Cloud Platform storage option is the best choice for your application? Cloud Bigtable
  + Which GCP storage service is often the ingestion point for data being moved into the cloud, and is frequently the long-term storage location for data? Cloud Storage
  + You are building a small application. If possible, you'd like this application's data storage to be at no additional charge. Which service has a free daily quota, separate from any free trials?
    - Cloud Datastore

**5.0 Containers in the Cloud**

* Containers are simple and interoperable, and they enable seamless, fine-grained scaling.
* K8s is an orchestration layer for containers. K8s Engine is K8s as a service, a scalable managed offering that runs on Google’s infrastructure.
* You direct the creation of a cluster, and K8s Engine schedules your containers into the cluster and manages them automatically, based on requirements you define.
* This module explains how K8s Engine works and how it helps deploy applications in containers.
* Containers in the Cloud
* [Containers, Kubernetes, and Kubernetes Engine](https://youtu.be/nzhOw3oLLAY)
* [Quiz : Containers](https://www.cloudskillsboost.google/course_sessions/729736/quizzes/105003)
  + True or false: each container has its own instance of an operating system. False.
    - Containers start much faster than VMs and use fewer resources, because each container does not have its own instance of the OS.
  + Containers are loosely coupled to their environments. What does that mean? Choose all the statements that are true. (3 correct answers)
    - Containers are easy to move around.
    - Containers abstract away unimportant details of their environments.
    - Deploying a containerized application consumes less resources and is less error-prone than deploying an application in virtual machines.
* [Introduction to Kubernetes and GKE](https://youtu.be/--Um2qodBwA) 12 minutes
* [Introduction to Hybrid and Multi-Cloud Computing (Anthos)](https://youtu.be/q5T-k2u-FDQ) 7 minutes
* [Quiz : Kubernetes](https://www.cloudskillsboost.google/course_sessions/729736/quizzes/105006)
  + What is a Kubernetes cluster?
    - A group of machines where Kubernetes can schedule workloads
    - A K8s cluster is a group of machines where K8s can schedule containers in pods. The machines in the cluster are called “nodes.”
  + What is a Kubernetes pod? A group of containers
    - In K8s, a group of one or more containers is called a pod. Containers in a pod are deployed together. They are started, stopped, and replicated as a group. The simplest workload that Kubernetes can deploy is a pod that consists only of a single container.
* [Quiz : Kubernetes Engine](https://www.cloudskillsboost.google/course_sessions/729736/quizzes/105007)
  + Where do the resources used to build Kubernetes Engine clusters come from? Compute Engine
    - Because the resources used to build K8s Engine clusters come from Compute Engine, K8s Engine gets to take advantage of Compute Engine’s and Google VPC’s capabilities.
  + True or false: Google keeps K8s Engine refreshed with successive versions of K8s. True.
    - The K8s Engine team periodically performs automatic upgrades of your cluster master to newer stable versions of Kubernetes, and you can enable automatic node upgrades too.
* [Lab Introduction - Getting Started with Kubernetes Engine](https://youtu.be/qMSsOZqv9n0) 1 minute
* [Demo:Getting Started with Kubernetes Engine](https://youtu.be/PoqJYF6EPIg) 6 minutes
* [Google Cloud Fundamentals: Getting Started with GKE 36](https://www.cloudskillsboost.google/course_sessions/729736/labs/105010) minutes
  + Task 2: Confirm that needed APIs are enabled
    - In the GCP Console, on the Navigation menu -> click APIs & Services.
    - Enabled APIs - Kubernetes Engine API, Container Registry API
  + Task 3: Start a Kubernetes Engine cluster
    - In GCP console, on the top right toolbar, click the Activate Cloud Shell button.
    - For convenience, place the zone into an environment variable called MY\_ZONE. At the Cloud Shell prompt, type this partial command: export MY\_ZONE=us-central1-a
    - Start a Kubernetes cluster managed by Kubernetes Engine. Name the cluster webfrontend and configure it to run 2 nodes:
      * gcloud container clusters create webfrontend --zone $MY\_ZONE --num-nodes 2
    - After the cluster is created, check installed K8s version : kubectl version
    - The gcloud container clusters create command automatically authenticated kubectl for you.
    - On the Navigation menu -> click Compute Engine > VM Instances -> View running nodes.
  + Task 4: Run and deploy a container
    - From your Cloud Shell prompt, launch a single instance of the nginx container. (Nginx is a popular web server.) kubectl create deploy nginx --image=nginx:1.17.10
      * In K8s, all containers run in pods. This use of the kubectl create command caused K8s to create a deployment consisting of a single pod containing the nginx container. A K8s deployment keeps a given number of pods up and running even in the event of failures among the nodes on which they run. In this command, you launched the default number of pods, which is 1.
    - View the pod running the nginx container: kubectl get pods
    - Expose the nginx container to the Internet: kubectl expose deployment nginx --port 80 --type LoadBalancer
      * K8ss created a service and an external load balancer with a public IP address attached to it. The IP address remains the same for the life of the service. Any network traffic to that public IP address is routed to pods behind the service: in this case, the nginx pod.
    - View the new service: kubectl get services
      * You can use the displayed external IP address to test and contact the nginx container remotely.
    - Open a new web browser tab and paste your cluster's external IP address into the address bar. The default home page of the Nginx browser is displayed.
    - Scale up the number of pods running on your service: kubectl scale deployment nginx --replicas 3
      * Scaling up a deployment is useful when you want to increase available resources for an application that is becoming more popular.
    - Confirm that Kubernetes has updated the number of pods: kubectl get pods
    - Confirm that your external IP address has not changed: kubectl get services
    - Return to the web browser tab in which you viewed your cluster's external IP address. Refresh the page to confirm that the nginx web server is still responding.
* [Quiz : Containers, Kubernetes, and Kubernetes Engine](https://www.cloudskillsboost.google/course_sessions/729736/quizzes/105011)
  + Does GCP offer its own tool for building containers (other than the ordinary docker command)? Yes; the GCP-provided tool is an option, but customers may choose not use it.
  + \*True or False:\* K8s allows you to manage container clusters in multiple cloud providers. True
  + Where do your K8s Engine workloads run? In clusters built from Compute Engine VMs
  + In Kubernetes, what does "pod" refer to? A group of containers that work together
  + \*True or False:\* Google Cloud Platform provides a secure, high-speed container image storage service for use with Kubernetes Engine. True
  + Identify two reasons for deploying applications using containers. (Choose 2 responses.)
    - Simpler to migrate workloads
    - Consistency across development, testing, production environments

**6.0 Applications in the Cloud**

* App Engine is a Platform-as-a-Service ("PaaS") offering.
* The App Engine platform manages the hardware and networking infrastructure required to run your code. App Engine provides built-in services that many web applications need.
* This module describes how App Engine works.
* Applications in the Cloud
* [Introduction; introduction to App Engine](https://youtu.be/yAQznpyQ8aw) 1 minute
* [Quiz : App Engine](https://www.cloudskillsboost.google/course_sessions/729736/quizzes/105014)
  + True or false: App Engine is a better choice for a web application than for long-running batch processing. True.
    - App Engine will scale your application automatically in response to the amount of traffic it receives. That’s why App Engine is especially suited for applications where the workload is highly variable, like a web application.
  + True or false: App Engine just runs applications; it doesn't offer any services to the applications it runs. False.
    - App Engine offers NoSQL databases, in-memory caching, load balancing, health checks, logging, and user authentication to applications running in it.
* [Google App Engine Standard Environment](https://youtu.be/ZZP-KcZg-XY) 3 minutes
* [Google App Engine Flexible Environment](https://youtu.be/gyi9r0tWyGM) 2 minutes
* [Quiz : App Engine Flexible and Standard Environments](https://www.cloudskillsboost.google/course_sessions/729736/quizzes/105017)
  + True or false: App Engine Flexible Environment applications let their owners control the geographic region where they run. True.
  + Which of these criteria would make you choose App Engine Flexible Environment, rather than Standard Environment, for your application? Choose all that are correct (2 correct responses).
    - Wider range of choices for application language
      * At the time of this writing, App Engine Standard Environment supports Java, Python, PHP, and Go, but in the Flexible Environment, you upload your own runtime to run code in a language of your choice.
    - Ability to ssh in
* [Google Cloud Endpoints and Apigee Edge](https://youtu.be/_r6AwzyzgEw) 3 minutes
* [Demonstration:Getting Started with App Engine](https://youtu.be/snL4rzIf_Ok) 3 minutes
* [Google Cloud Fundamentals: Getting Started with App Engine](https://www.cloudskillsboost.google/course_sessions/729736/labs/105020) 20 minutes
  + In GCP console, on the top right toolbar, click the Open Cloud Shell button.
    - It takes a few moments to provision and connect to the environment. When you are connected, you are already authenticated, and the project is set to your PROJECT\_ID. For example:
    - gcloud is the command-line tool for Google Cloud Platform. It comes pre-installed on Cloud Shell and supports tab-completion.
    - You can list the active account name with this command: gcloud auth list
    - You can list the project ID with this command: gcloud config list project
  + Task 1: Initialize App Engine
    - Initialize your App Engine app with your project and choose its region:
    - gcloud app create --project=$DEVSHELL\_PROJECT\_ID
    - When prompted, select the region where you want your App Engine application located.
    - Clone the source code repository for a sample application in the hello\_world directory:
      * git clone https://github.com/GoogleCloudPlatform/python-docs-samples
    - Navigate to the source directory:
      * cd python-docs-samples/appengine/standard\_python3/hello\_world
  + Task 2: Run Hello World application locally
    - In this task, run the Hello World application in a local, virtual environment in Cloud Shell.
    - Execute the following command to download and update the packages list.
      * sudo apt-get update
    - Set up a virtual environment in which you will run your application. Python virtual environments are used to isolate package installations from the system.
      * sudo apt-get install virtualenv
      * If prompted [Y/n], press Y and then Enter.
      * virtualenv -p python3 venv
    - Activate the virtual environment. source venv/bin/activate
    - Navigate to your project directory and install dependencies.
      * pip install -r requirements.txt
    - Run the application: python main.py
    - In Cloud Shell, click Web preview (Web Preview) > Preview on port 8080 to preview the application.
    - To end the test, return to Cloud Shell and press Ctrl+C to abort the deployed service.
  + Verify that the app is not deployed. on the Navigation menu -> click App Engine > Dashboard.
  + Task 3: Deploy and run Hello World on App Engine
    - To deploy your application to the App Engine Standard environment:
    - Navigate to the source directory:
      * cd ~/python-docs-samples/appengine/standard\_python3/hello\_world
    - Deploy your Hello World application. gcloud app deploy
    - If prompted "Do you want to continue (Y/n)?", press Y and then Enter.
    - This app deploy command uses the app.yaml file to identify project configuration.
      * Note: If you get a Gaia propagation related error message, re-run the gcloud app deploy command.
    - Launch your browser to view the app at http://YOUR\_PROJECT\_ID.appspot.com
      * gcloud app browse
    - Copy and paste the URL into a new browser window.
  + Task 4: Disable the application
    - App Engine offers no option to Undeploy an application. After an application is deployed, it remains deployed, although you could instead replace the application with a simple page that says something like "not in service."
    - However, you can disable the application, which causes it to no longer be accessible to users.
    - on the Navigation menu -> click App Engine > Settings -> Click Disable application.
    - Refresh the browser, you'll get a 404 error.
* [Quiz : Applications in the Cloud](https://www.cloudskillsboost.google/course_sessions/729736/quizzes/105021)
  + You want to gradually decompose a pre-existing monolithic application, not implemented in GCP, into microservices. Which GCP service should you choose? Apigee Edge
  + You want to support developers who are building services in GCP through API logging and monitoring. Which GCP service should you choose? Cloud Endpoints
  + Which statements are true about App Engine? Choose all that are true (2 correct answers).
    - App Engine manages the hardware and networking infrastructure required to run your code.
    - It is possible for an App Engine application's daily billing to drop to zero.
  + Name 3 advantages of using the App Engine Flexible Environment over App Engine Standard. Choose all that are true (3 correct answers).
    - You can install third-party binaries. You can SSH in to your application
    - Your application can write to local disk
  + Name 3 advantages of using the App Engine Standard Environment over App Engine Flexible. Choose all that are true (3 correct answers).
    - Google provides and maintains runtime binaries
    - Billing can drop to zero if your application is idle. Scaling is finer-grained
  + You want to do business analytics and billing on a customer-facing API. Which GCP service should you choose? Apigee Edge

**7.0 Developing, Deploying and Monitoring in the Cloud**

* Popular tools for development, deployment, and monitoring just work in GCP.
* Customers also have options for tools in each of these three areas that are tightly integrated with GCP.
* This module covers those tools.
* [Developing, Deploying, and Monitoring in the Cloud](https://www.cloudskillsboost.google/course_sessions/729736/documents/105022)
* [Development in the cloud](https://youtu.be/m5NncUabwMM) 3 minutes
* [Quiz : Development in Cloud](https://www.cloudskillsboost.google/course_sessions/729736/quizzes/105024)
  + Why would a developer choose to store source code in Cloud Source Repositories? Choose all the answers that are correct (2 correct answers).
    - To keep code private to a GCP project. CAR integrates with Google Cloud IAM.
    - To reduce work. CSR manages the hosting infrastructure for you.
* [Deployment:Infrastructure as code](https://youtu.be/JDewwB_xJ-A) 1 minute
* [Quiz : Cloud Functions](https://www.cloudskillsboost.google/course_sessions/729736/quizzes/105026)
  + What is the advantage of putting event-driven components of your application into Cloud Functions?
    - Cloud Functions handles scaling these components seamlessly.
    - Your code executes whenever an event triggers it, no matter whether it happens rarely or many times per second. That means you don't have to provision compute resources to handle these operations.
* [Monitoring:Proactive instrumentation](https://youtu.be/VLxbGAys5MU) 2 minutes
* [Demonstration:Getting Started with Deployment Manager and Stackdriver](https://www.cloudskillsboost.google/course_sessions/729736/video/105028) 9 minutes
* [Google Cloud Fundamentals: Getting Started with Deployment Manager and Cloud Monitoring](https://www.cloudskillsboost.google/course_sessions/729736/labs/105029) 45 min
  + Task 2: Confirm that needed APIs are enabled
    - In the GCP Console, on the Navigation menu -> click APIs & services -> enabled APIs:
      * Cloud Deployment Manager v2 API
      * Cloud Runtime Configuration API, Stackdriver monitoring API
  + Task 3: Create a Deployment Manager deployment
    - the Open Cloud Shell button (Activate Cloud Shell). Click Continue.
    - complete command will look similar to this: export MY\_ZONE=us-central1-a
    - download an editable Deployment Manager template:
      * gsutil cp gs://cloud-training/gcpfcoreinfra/mydeploy.yaml mydeploy.yaml
    - use the sed command to replace the PROJECT\_ID placeholder string:
      * sed -i -e "s/PROJECT\_ID/$DEVSHELL\_PROJECT\_ID/" mydeploy.yaml
    - use the sed command to replace the ZONE placeholder string:
      * sed -i -e "s/ZONE/$MY\_ZONE/" mydeploy.yaml
    - View the mydeploy.yaml file, with your modifications, with this command:
      * cat mydeploy.yaml
      * The file will look something like this:
        + resources:
        + - name: my-vm
        + type: compute.v1.instance
        + properties:
        + zone: us-central1-a
        + machineType: zones/us-central1-a/machineTypes/n1-standard-1
        + metadata:
        + items:
        + - key: startup-script
        + value: "apt-get update"
        + disks:
        + - deviceName: boot
        + type: PERSISTENT
        + boot: true
        + autoDelete: true
        + initializeParams:
        + sourceImage: https://www.googleapis.com/compute/v1/projects/debian-cloud/global/images/debian-9-stretch-v20180806
        + networkInterfaces:
        + - network: https://www.googleapis.com/compute/v1/projects/qwiklabs-gcp-dcdf854d278b50cd/global/networks/default
        + accessConfigs:
        + - name: External NAT
        + type: ONE\_TO\_ONE\_NAT
    - Build a deployment from the template:
      * gcloud deployment-manager deployments create my-first-depl --config mydeploy.yaml
      * When the deployment operation is complete, the gcloud command displays a list of the resources named in the template and their current state.
    - Confirm that the deployment was successful. Compute Engine > VM instances -> my-vm.
    - Click on the VM instance's name to open its VM instance details screen.
      * Scroll down to the Custom metadata section. Confirm that the startup script you specified in your Deployment Manager template has been installed.
  + Task 4: Update a Deployment Manager deployment
    - Return to your Cloud Shell prompt. edit the mydeploy.yaml file: nano mydeploy.yaml
    - Find the line that sets the value of the startup script, value: "apt-get update", and edit it so that it looks like this: value: "apt-get update; apt-get install nginx-light -y"
    - Press Ctrl+O and then press Enter to save file. Press Ctrl+X to exit the nano text editor.
    - Return to your Cloud Shell prompt. Enter this command to cause Deployment Manager to update your deployment to install the new startup script:
      * gcloud deployment-manager deployments update my-first-depl --config mydeploy.yaml
      * Wait for the gcloud command to display a message confirming that the update operation was completed successfully.
    - click Compute Engine > VM instances -> Click on the my-vm details pane.
      * Scroll down to the Custom metadata section. Confirm that the startup script has been updated to the value you declared in your Deployment Manager template.
  + Task 5: View the Load on a VM using Cloud Monitoring
    - click Compute Engine > VM instances. Select the checkbox for my-vm and click on STOP.
    - Click on the VM instance's name to open its VM instance details screen.
    - Click on EDIT (pencil icon).
      * Scroll down to the bottom of the page and select Compute Engine default service account from Service account dropdown.
        + Select Allow full access to all Cloud APIs for Access scopes.
    - Click on Save.
    - Now, restart the VM by clicking on Start the VM instance details screen page.
    - click Compute Engine > VM instances -> open the my-vm instance -> click SSH.
      * In the ssh session on my-vm, execute this command to create a CPU load:
        + dd if=/dev/urandom | gzip -9 >> /dev/null &
        + This Linux pipeline forces the CPU to work on compressing a continuous stream of random data.
      * Leave the window containing your SSH session.
    - Create a Monitoring workspace
      * You will now setup a Monitoring workspace that's tied to your Qwiklabs GCP Project. The following steps create a new account that has a free trial.
      * In the Google Cloud Platform Console, click on Navigation menu > Monitoring.
        + Wait for your workspace to be provisioned.
        + When the Monitoring dashboard opens, your workspace is ready.
        + Click on Settings fronthe left panel and confirm that the GCP project which Qwiklabs created for you is shown under the GCP Projects section.
        + Run the commands shown on screen in the SSH window of your VM instance to install both the Monitoring and Logging agents.

curl -sSO https://dl.google.com/cloudagents/install-monitoring-agent.sh

sudo bash install-monitoring-agent.sh

curl -sSO https://dl.google.com/cloudagents/install-logging-agent.sh

sudo bash install-logging-agent.sh

* + - Once both of the agents have been installed on your project's VM, click Metrics Explorer under the main Cloud Monitoring menu on the far left.
      * In the Metric pane of Metrics Explorer, select the resource type VM instance and the metric CPU usage.
      * In the resulting graph, notice that CPU usage increased sharply a few minutes ago.
    - Terminate your workload generator. Return to your ssh session on my-vm and enter this command: kill %1
* [Quiz : Developing, Deploying, and Monitoring in the Cloud](https://www.cloudskillsboost.google/course_sessions/729736/quizzes/105030)
  + Why might a GCP customer choose to use Deployment Manager?
    - Deployment Manager is an infrastructure management system for GCP resources.
  + You want to define alerts on your GCP resources, such as when health checks fail. Which is the best GCP product to use? Stackdriver Monitoring
  + Which statements are true about Stackdriver Logging? Choose all that are true (2 statements)
    - Stackdriver Logging lets you define metrics based on your logs.
    - Stackdriver Logging lets you view logs from your applications, and filter and search on them.
  + Why might a GCP customer choose to use Cloud Source Repositories?
    - They don't want to host their own git instance, and they want to integrate with IAM permissions.
  + Why might a GCP customer choose to use Cloud Functions?
    - Their application contains event-driven code that they don't want to have to provision compute resources for.

**8.0 Big Data and Machine Learning in the Cloud**

* GCP's big-data and machine learning offerings are intended to help customers get the most out of data.
* These tools are intended to be simple and practical to embed in your applications.
* This module describes the available big-data and machine learning services and explains the usefulness of each.
* [Big Data and Machine Learning in the Cloud](https://www.cloudskillsboost.google/course_sessions/729736/documents/105031)
* [Introduction to Big Data and Machine Learning](https://youtu.be/Qd4su19ooNE) 1 minute
* [Google Cloud Big Data Platform](https://youtu.be/1K-aKHcx4Ms) 3 minutes
* [Cloud Dataflow](https://youtu.be/NGnL1rTlCPI) 2 minutes
* [BigQuery](https://youtu.be/Yc2aTPqvzVY) 2 minutes
* [Cloud Pub/Sub and Cloud Datalab](https://youtu.be/4xdp0_V6u44) 3 minutes
* [Google Cloud Machine Learning Platform](https://youtu.be/imTG3p2H2VU) 3 minutes
* [Machine learning APIs](https://youtu.be/D27TVDfjEN8) 2 minutes
* [Demonstration:Getting Started with BigQuery](https://youtu.be/zVZRdFuwmNo) 2 minutes
* [Google Cloud Fundamentals: Getting Started with BigQuery](https://www.cloudskillsboost.google/course_sessions/729736/labs/105040) 30 minutes
  + Overview
    - In this lab, you load a web server log into a BigQuery table. After loading the data, you query it using the BigQuery web user interface and the BigQuery CLI.
    - BigQuery helps you perform interactive analysis of petabyte-scale databases, and it enables near-real time analysis of massive datasets. It offers a familiar SQL 2011 query language and functions.
    - Data stored in BigQuery is highly durable. Google stores your data in a replicated manner by default and at no additional charge for replicas. With BigQuery, you pay only for the resources you use. Data storage in BigQuery is inexpensive. Queries incur charges based on the amount of data they process: when you submit a query, you pay for the compute nodes only for the duration of that query. You don't have to pay to keep a compute cluster up and running.
    - Using BigQuery involves interacting with a number of Google Cloud Platform resources, including projects (covered elsewhere in this course), datasets, tables, and jobs. This lab introduces you to some of these resources, and this brief introduction summarizes their role in interacting with BigQuery.
    - Datasets: A dataset is a grouping mechanism that holds zero or more tables. A dataset is the lowest level unit of access control. Datasets are owned by GCP projects. Each dataset can be shared with individual users.
    - Tables: A table is a row-column structure that contains actual data. Each table has a schema that describes strongly typed columns of values. Each table belongs to a dataset.
    - Objectives. In this lab, you learn how to perform the following tasks:
      * Load data from Cloud Storage into BigQuery.
      * Perform a query on the data in BigQuery.
  + Task 2: Load data from Cloud Storage into BigQuery
    - The Navigation menu -> click BigQuery then click Done.
    - Create a new dataset within your project by clicking on View actions icon next to your project ID in the Explorer section. Then select Create dataset.
      * In the Create Dataset dialog, for Dataset ID, type logdata.
      * For Data location, select United States (US). Click CREATE DATASET.
      * Create a new table in the logdata to store the data from the CSV file.
    - Expand you project ID, and click on View actions icon next to the logdata dataset. Then select Create Table.
      * On the Create Table page, in the Source section:
      * For Create table from, choose select Google Cloud Storage, and in the field, type cloud-training/gcpfci/access\_log.csv.
      * Verify File format is set to CSV.
      * Note: When you have created a table previously, the Create from Previous Job option allows you to quickly use your settings to create similar tables.
      * In the Destination section:
        + For Dataset name, leave logdata selected.
        + For Table name, type accesslog.
        + For Table type, Native table should be selected.
        + Under Schema section, check the Auto detect.
        + Accept the remaining default values and click Create table.
      * BigQuery creates a load job to create the table and upload data into the table.
    - (Optional) To track job progress, click Job History.
    - When the load job is complete, click logdata > accesslog.
      * On the table details page, click Details to view the table properties, and then click Preview to view the table data.
      * Each row in this table logs a hit on a web server. The first field, string\_field\_0, is the IP address of the client. The fourth through ninth fields log the day, month, year, hour, minute, and second at which the hit occurred. In this activity, you will learn about the daily pattern of load on this web server.
  + Task 3: Perform a query on the data using the BigQuery web UI
    - use the BigQuery web UI to query the accesslog table you created previously.
    - In the query EDITOR, type (or copy-and-paste) the following query:
    - Because you told BigQuery to automatically discover the schema when you load the data, the hour of the day during which each web hit arrived is in a field called int\_field\_6.
      * select int64\_field\_6 as hour, count(\*) as hitcount from logdata.accesslog group by hour order by hour
      * Click RUN and examine the results.
    - Notice that the Query Validator tells you that the query syntax is valid (green check) and indicates how much data the query will process. The amount of data processed allows you to determine the price of the query using the Cloud Platform Pricing Calculator.
  + Task 4: Perform a query on the data using the bq command
    - use the bq command in Cloud Shell to query the accesslog table you created previously.
    - click Activate Cloud Shell Activate Cloud Shell then click Continue. Run the cmd
      * bq query "select string\_field\_10 as request, count(\*) as requestcount from logdata.accesslog group by request order by requestcount desc"
    - The first time you use the bq command, it caches your GCP, and then asks you to choose your default project. Choose the project that Qwiklabs assigned you to. Its name will look like qwiklabs-gcp- followed by a hexadecimal number.
    - The bq command then performs the action requested on its command line.
* Quiz : Big Data and Machine Learning
  + Name three use cases for Cloud Pub/Sub (Select 3 answers).
    - Analyzing streaming data. Internet of Things applications. Decoupling systems
  + Name two use cases for Google Cloud Dataflow (Select 2 answers).
    - Extract, Transform, and Load (ETL). Orchestration
  + What is TensorFlow?
    - An open-source software library that’s useful for building machine learning applications
  + What does the Cloud Natural Language API do?
    - It analyzes text to reveal its structure and meaning.
  + Name two use cases for Google Cloud Dataproc (Select 2 answers).
    - Migrate on-premises Hadoop jobs to the cloud
    - Data mining and analysis in datasets of known size
  + Which statements are true about BigQuery? Choose all that are true (2 statements).
    - BigQuery lets you run fast SQL queries against large databases.
    - BigQuery is a good choice for data analytics warehousing.
  + Name three use cases for the Google Cloud Machine Learning Platform (Select 3 answers).
    - Fraud detection
    - Sentiment analysis
    - Content personalization

**9.0 Summary and Review**

* This module reviews the GCP services covered in this course and reminds learners of the differences among them. The module compares GCP compute services, GCP storage services, and important Google VPC networking capabilities.
* [Review 4](https://youtu.be/MnM8br9WBGM) minutes
* [Quiz : Summary and Review](https://www.cloudskillsboost.google/course_sessions/729736/quizzes/105043)
  + Which compute service lets customers supply chunks of code, which get run on-demand in response to events, on infrastructure wholly managed by Google? Cloud Functions
  + Which compute service lets customers focus on their applications, leaving most infrastructure and provisioning to Google, while still offering various choices of runtime? App Engine
  + Which compute service lets customers run VMs that run on Googl's infrastructure? Compute Eng
  + Which compute service lets customers deploy their applications in containers that run in clusters on Google's infrastructure? Kubernetes Engine
  + Which of these storage needs is best addressed by Cloud Datastore?
    - Structured objects, with transactions and SQL-like queries
  + Which of these storage needs is best addressed by Cloud Spanner?
    - A relational database with SQL queries and horizontal scalability
  + Which of these storage needs is best addressed by Cloud Storage? Immutable binary objects
  + Choose a simple way to let a VPN into your Google VPC continue to work in spite of routing changes, Cloud Router
  + Which of these storage needs is best addressed by Cloud Bigtable?
    - Structured objects, with lookups based on a single key
  + For what kind of traffic would the regional load balancer be the first choice? Choose all that are correct (2 answers).
    - TCP traffic on arbitrary port numbers. UDP traffic
* Next steps 1 minute