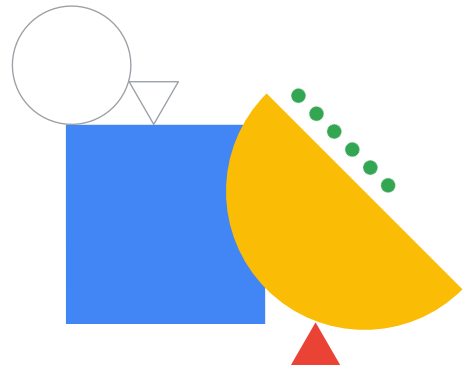


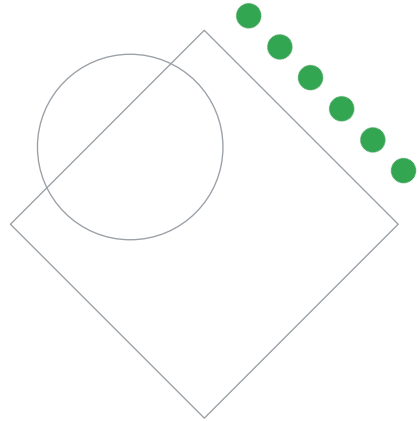
# Preparing for Your Associate Cloud Engineer Journey

Module 2: Planning and Configuring Cloud Solutions



Welcome to Module 2: Planning and Configuring Cloud Solutions.

## Review and study planning

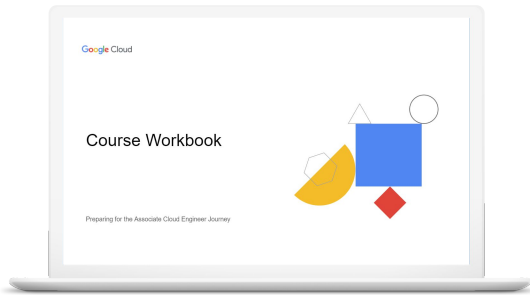


Google Cloud

Now let's review the diagnostic questions together, paying attention to the areas where you need to focus your study time. Some of this may be content you're already very familiar with, while other aspects may be new to you.

# Your study plan:

## Planning and configuring cloud solutions



- 2.1 Planning and estimating using the Pricing Calculator
- 2.2 Planning and configuring compute resources
- 2.3 Planning and configuring data storage options
- 2.4 Planning and configuring network resources

Google Cloud

Just like we did with the previous module, we'll approach this review by looking at the objectives of this exam section and the questions you just answered about each one. We'll introduce an objective, briefly review the answers to the related questions, then talk about where you can find out more in the learning resources and/or in Google Cloud documentation. As we go through each section objective, use the page in your workbook to mark the specific documentation, courses (and modules!), and quests you'll want to emphasize in your study plan.

## 2.1 | Planning and estimating using the Pricing Calculator

Google Cloud

At the start of this module we discussed how an Associate Cloud Engineer would plan and configure Cymbal Superstore's cloud applications and some of the considerations involved. Google's pricing calculator can help you estimate costs and make decisions about compute and storage choices, as you saw in the first diagnostic question.

## 2.1 Diagnostic Question 01 Discussion



The projected amount of cloud storage required for Cymbal Superstore to enable users to post pictures for project reviews is 10 TB of immediate access storage in the US and 30 TB of storage for historical posts in a bucket located near Cymbal Superstore's headquarters. The contents of this bucket will need to be accessed once every 30 days. You want to estimate the cost of these storage resources to ensure this is economically feasible.

What should you do?

- A. Use the pricing calculator to estimate the costs for 10 TB of regional Standard storage, 30 TB of regional Coldline storage, and egress charges for reads from storage.
- B. Use the pricing calculator to estimate the price for 10 TB of regional Standard storage, 30 TB of regional Nearline storage, and ingress charges for posts to the bucket.
- C. Use the pricing calculator to estimate the price for 10 TB of multi-region standard storage, 30 TB for regional Coldline storage, and ingress charges for posts to the bucket.
- D. Use the pricing calculator to estimate the price for 10 TB of multi-region Standard storage, 30 TB for regional Nearline, and egress charges for reads from the bucket.

Google Cloud

### Question:

The projected amount of cloud storage required for Cymbal Superstore to enable users to post pictures for project reviews is 10 TB of immediate access storage in the US and 30 TB of storage for historical posts in a bucket located near Cymbal Superstore's headquarters. The contents of this bucket will need to be accessed once every 30 days. You want to estimate the cost of these storage resources to ensure this is economically feasible. What should you do?

A. Use the pricing calculator to estimate the costs for 10 TB of regional Standard storage, 30 TB of regional Coldline storage, and egress charges for reads from storage.

Feedback: Incorrect. The storage is US which indicates multi-region storage instead of regional Standard storage. The 30-day requirement points to Nearline storage, not Coldline.

B. Use the pricing calculator to estimate the price for 10 TB of regional Standard storage, 30 TB of regional Nearline storage, and ingress charges for posts to the bucket.

Feedback: Incorrect. The storage is US which indicates multi-region storage instead of regional Standard storage and ingress (data writes) is free. There are no costs associated with ingress.

C. Use the pricing calculator to estimate the price for 10 TB of multi-region standard storage, 30 TB for regional Coldline storage, and ingress charges for posts to the bucket.

Feedback: Incorrect. The 30-day requirement points to Nearline storage, not Coldline and ingress (data writes) is free, there are no costs associated with ingress.

\*D. Use the pricing calculator to estimate the price for 10 TB of multi-region standard storage, 30 TB for regional Nearline, and egress charges for reads from the bucket.

Feedback: Correct! Data storage pricing is based on the amount of data and storage type. Standard storage is immediately available. Nearline storage is for data accessed roughly every 30 days. Egress is the amount of data read from the bucket and is also chargeable.

**Where to look:** <https://cloud.google.com/products/calculator/>

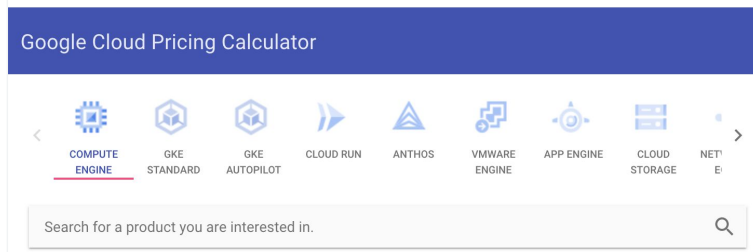
**Content mapping:**

- Instructor-led Training/OnDemand
  - Essential Google Cloud Infrastructure
    - M3 Virtual Machines
  - Architecting with Google Compute Engine
    - M6 Resource Management

**Summary:**

Explanation/summary on the following slides.

# Pricing Calculator



<https://cloud.google.com/products/calculator/>

1

Select a product from scrolling list at top of the form

2

Form for each product will show expense variables

3

Enter target configuration in form

4

Submit each section to add to your overall estimate

Google Cloud

<https://cloud.google.com/products/calculator/>

The Pricing Calculator is a multi-section form that lets you estimate the costs of different cloud services based on how you are going to use and configure them. For example, you can estimate costs of implementing a database in Cloud SQL, object storage in Cloud Storage, data warehouse needs using BigQuery, among others.

Once you have some possible configurations in mind, you can use the pricing calculator to estimate costs for the different products you will be using.

# Pricing Calculator

**Total Estimated Cost: USD 4,958.48 per 1 month**

Estimate Currency  
USD - US Dollars ▼

Adjust Estimate Timeframe

1 day 1 week 1 month 1 quarter 1 year 3 years

EMAIL ESTIMATE

SAVE ESTIMATE

Total estimated cost:  
daily, weekly, monthly,  
quarterly, yearly and  
3-year increments

Cost is only an estimate

Question to ask:  
How closely your  
estimated usage  
matches your actual  
usage?

Not a binding contract,  
just a planning tool

Keep in mind pricing estimates generated by the calculator are not binding in any way. Please just use them as a planning tool. Real costs are going to be determined by actual usage.



## 2.1 | Planning and estimating using the Pricing Calculator

### Courses

#### [Architecting with Google Compute Engine](#)

- M3 Virtual Machines
- M6 Resource Management



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#### [Essential Google Cloud Infrastructure: Foundation](#)

- M3 Virtual Machines

#### [Essential Google Cloud Infrastructure: Core Services](#)

- M3 Resource Management



### Documentation

[Google Cloud Pricing Calculator](#)

Now that we've reviewed the diagnostic question related to Section 2.1, let's take a moment to consider resources that can help you build your knowledge and skills in this area.

The concepts in the diagnostic questions we just reviewed are covered in these modules and in this documentation. You'll find this list in your workbook so you can take a note of what you want to include later when you build your study plan. Based on your experience with the diagnostic questions, you may want to include some or all of these in your plan.

<https://cloud.google.com/products/calculator/>

## 2.2 | Planning and configuring compute resources

Considerations include:

- Selecting appropriate compute choices for a given workload  
(e.g., Compute Engine, Google Kubernetes Engine, Cloud Run, Cloud Functions)
- Using preemptible VMs and custom machine types as appropriate

Google Cloud

A cloud architect will typically design a cloud solution. As an Associate Cloud Engineer, it's important for you to be able to plan and configure compute resources to align with Google recommended practices. That means you should be comfortable with the different compute options available in Google Cloud and when to use each one.

You encountered these types of considerations in the following questions:

Question 2: Differentiate between available compute options in Google Cloud.

Question 3: Determine when to use serverless solutions such as Cloud Run, e.g. code focus, quick development, minimal overhead.

Question 4: Determine when to use Google Compute Engine, e.g. more control, OS level dependencies, customization.

Question 5: Determine when to use Kubernetes Engine, e.g. platform independence, deployment velocity, container management.

## 2.2 | Diagnostic Question 02 Discussion



Cymbal Superstore decides to migrate their supply chain application to Google Cloud. You need to configure specific operating system dependencies.

What should you do?

- A. Implement an application using containers on Cloud Run.
- B. Implement an application using code on App Engine.
- C. Implement an application using containers on Google Kubernetes Engine.
- D. Implement an application using virtual machines on Compute Engine.

Google Cloud

### Question:

Cymbal Superstore decides to migrate their supply chain application to Google Cloud. You need to configure specific operating system dependencies. What should you do?

A. Implement an application using containers on Cloud Run.

Feedback: Incorrect. Cloud Run deploys containers in Google Cloud without you specifying the underlying cluster or deployment architecture.

B. Implement an application using code on App Engine.

Feedback: Incorrect. App Engine is a platform as a service for deployment of your code on infrastructure managed by Google. You don't manage operating system dependencies with App Engine.

C. Implement an application using containers on Google Kubernetes Engine.

Feedback: Incorrect. Google Kubernetes Engine is a container management platform as a service and doesn't give you control over operating system dependencies.

\* D. Implement an application using virtual machines on Compute Engine.

Feedback: Correct! Compute Engine gives you full control over operating system choice and configuration.

### Where to look:

<https://cloud.google.com/blog/products/compute/choosing-the-right-compute-option-in-gcp-a-decision-tree>

**Content mapping:**

- Instructor-led Training/OnDemand
  - Google Cloud Fundamentals: Core Infrastructure
    - M3 Virtual Machines in the Cloud
  - Architecting with Google Compute Engine
    - M3 Virtual Machines

**Summary:**

There are five distinct ways to interact with compute resources in Google Cloud. They can be divided into server-based services, where manage and pay for infrastructure, and serverless options, where you just pay for execution time.

# Infrastructure as a service:



## Google Compute Engine

Virtual machines running in Google's global data centers

Use When You Need...

- Complete control
- Ability to make OS level changes
- To be able to move to the cloud without rewriting your code
- To use custom VM images

Typical Use Cases

- Any workload requiring a specific OS or configuration
- On-premises software that you want to run in the cloud



## Google Kubernetes Engine

Logical infrastructure powered by [Kubernetes](#), the open source container orchestration system

- No dependencies on a specific OS
- Increased velocity and operability
- To manage containers in production

- Containerized workloads
- Cloud-native distributed systems
- Hybrid applications

Google Cloud

Compute Engine and Google Kubernetes Engine are server-based.

## Platform as a service:



### Google App Engine

Flexible, zero-ops platform  
for building apps

#### Use When You Need...

- To just focus on writing code
- Developer velocity
- To minimize operational overhead

#### Typical Use Cases

- Web sites
- Apps (of course!)
- Gaming back ends
- IoT applications



### Google Cloud Run

Deploy code or containers that  
listens for requests or events

- Scales to meet demand
- Pay for what you use
- Supports API endpoints

- Web frameworks
- Microservices



### Google Cloud Functions

Serverless execution environment for  
building and connecting cloud services

- For event-driven workloads
- Scales to meet demand
- Minimal configuration

- Statistical analysis
- Image thumbnail generation
- Post a comment to a Slack channel  
after a GitHub commit

Google Cloud

App Engine, Cloud Functions, and Cloud Run are serverless options, where you focus on code and Google manages the underlying hardware and operating system for you.

## 2.2 | Diagnostic Question 03 Discussion



Cymbal Superstore decides to pilot a cloud application for their point of sale system in their flagship store. You want to focus on code and develop your solution quickly, and you want your code to be portable.

How do you proceed?

- A. SSH into a Compute Engine VM and execute your code.
- B. Package your code to a container image and post it to Cloud Run.
- C. Implement a deployment manifest and run `kubectl` apply on it in Google Kubernetes Engine.
- D. Code your solution in Cloud Functions.

Google Cloud

### Question:

Cymbal Superstore decides to pilot a cloud application for their point of sale system in their flagship store. You want to focus on code and develop your solution quickly, and you want your code to be portable. How do you proceed?

A. SSH into a Compute Engine VM and execute your code.

Feedback: Incorrect. Configuring SSH connectivity to a Compute Engine VM does not meet the focus on code requirement of this scenario.

\*B. Package your code to a container image and post it to Cloud Run.

Feedback: Correct! Cloud Run provides serverless container management. It lets you focus on code and you can deploy your solution quickly.

C. Implement a deployment manifest and run `kubectl` apply on it in Google Kubernetes Engine.

Feedback: Incorrect. Google Kubernetes Engine requires you to build and manage resources of a cluster to host your container in GKE. This does meet the requirement of focusing on code.

D. Code your solution in Cloud Functions.

Feedback: Incorrect. Cloud Functions manages your code as short, executable functions and does not manage your code in containers, which are more portable.

**Where to look:** <https://cloud.google.com/hosting-options>

**Content Mapping:**

- Instructor-led Training/OnDemand
  - Google Cloud Fundamentals: Core Infrastructure
    - M6 Applications in the Cloud

**Summary:**

The three serverless compute options available in Google Cloud are App Engine, Cloud Run, and Cloud Functions. All of these services abstract the underlying infrastructure so you can focus on code. You only pay for how long your application runs.

This is different than Compute Engine and GKE. In Compute Engine you implement and manage virtual machines that your apps run on. With GKE you implement and manage clusters of compute nodes you deploy your container images to.

App Engine has two environments: standard and flexible. Standard provides a sandbox environment and totally abstracts the infrastructure for you. The flexible environment gives you more choices for deploying your app. It supports more languages, supports different runtimes, and lets you load dependencies you need in the underlying architecture.

Cloud Run, which is also serverless, enables you to run stateless containers via web requests and Google Cloud service events. Cloud Run operates using Knative, an open-source, Kubernetes-based platform. It builds, deploys, and manages modern serverless workloads. Cloud Run gives you the choice of running your containers either fully-managed or in your own GKE cluster.



## 2.2 Diagnostic Question 04 Discussion



An application running on a highly-customized version of Ubuntu needs to be migrated to Google Cloud. You need to do this in the least amount of time with minimal code changes.

How should you proceed?

- A. Create Compute Engine Virtual Machines and migrate the app to that infrastructure.
- B. Deploy the existing application to App Engine.
- C. Deploy your application in a container image to Cloud Run.
- D. Implement a Kubernetes cluster and create pods to enable your app.

Google Cloud

### Question:

An application running on a highly-customized version of Ubuntu needs to be migrated to Google Cloud. You need to do this in the least amount of time with minimal code changes. How should you proceed?

**\*A. Create Compute Engine Virtual Machines and migrate the app to that infrastructure**

Feedback: Correct! Compute Engine is a great option for quick migration of traditional apps. You can implement a solution in the cloud without changing your existing code.

B. Deploy the existing application to App Engine.

Feedback: Incorrect. You would need to change your code to run it on App Engine.

C. Deploy your application in a container image to Cloud Run.

Feedback: Incorrect. You would need to re-engineer the current app to work in a container environment.

D. Implement a Kubernetes cluster and create pods to enable your app.

Feedback: Incorrect. You would need to build and manage your Kubernetes cluster, and re-engineer the current app to work in a container environment.

**Where to look:** <https://cloud.google.com/hosting-options>,  
<https://cloud.google.com/compute/docs/tutorials>

### **Content Mapping:**

- Instructor-led Training/OnDemand
  - Google Cloud Fundamentals: Core Infrastructure
    - M3 Virtual Machines in the Cloud
  - Architecting with Google Compute Engine
    - M3 Virtual Machines

### **Summary:**

Compute Engine is Google Cloud's infrastructure-as-a-service offering. It gives you maximum flexibility of developing on a virtual machine (VM). It does require more management than serverless options, though.

A VM has an operating system. You choose how and if it autoscales. Autoscaling can add more machines based on monitored performance thresholds.

A common use case for Compute Engine is migrating an enterprise application designed to run on a server infrastructure. If you set up an architecture similar to your on-premise solution you can port your code quite easily.

To monitor performance you can connect Cloud Logging and Monitoring from the operations suite.

## 2.2 Diagnostic Question 05 Discussion



You want to deploy a microservices application. You need full control of how you manage containers, reliability, and autoscaling, but don't want or need to manage the control plane.

- A. Cloud Run
- B. App Engine
- C. Google Kubernetes Engine
- D. Compute Engine

Which compute option should you use?

Google Cloud

### Question:

You want to deploy a microservices application. You need full control of how you manage containers, reliability, and autoscaling, but don't want or need to manage the control plane. Which compute option should you use?

A. Cloud Run

Feedback: Incorrect. Cloud Run does not give you full control over your containers.

B. App Engine

Feedback: Incorrect. App Engine does not give you full control over your containers.

\*C. Google Kubernetes Engine

Feedback: Correct! Google Kubernetes Engine gives you full control of container orchestration and availability.

D. Compute Engine

Feedback: Incorrect. Deploying in Compute Engine would require you to load and manage your own container management software.

**Where to look:** <https://cloud.google.com/docs/choosing-a-compute-option>

### Content mapping:

- Instructor-led Training/OnDemand

- Google Cloud Fundamentals: Core Infrastructure
  - M5 Containers in the Cloud
- Getting Started with GKE
  - M2 Introduction to Containers and Kubernetes
- Quests
  - Set Up and Configure a Cloud Environment in Google Cloud (<https://www.qwiklabs.com/quests/119>)

**Summary:**

GKE is a platform-as-a-service offering for running containerized applications in the cloud. Google manages the control plane for you, under your administrative control. Containers abstract application dependencies from the host operating system. This makes container architectures highly portable. It saves costs compared to implementing multiple VMs on a host hypervisor, which each requiring a copy of the operating system. Kubernetes lets you orchestrate code in containers.

If you have containerized applications that use a native Kubernetes architecture in your on-premise environment, it can be straightforward to migrate to Google Cloud.

## 2.2 | Planning and configuring compute resources

### Courses

#### [Google Cloud Fundamentals: Core Infrastructure](#)

- M3 Virtual Machines in the Cloud
- M5 Containers in the Cloud
- M6 Applications in the Cloud

#### [Getting Started with Google Kubernetes Engine](#)

- M2 Introduction to Containers and Kubernetes

#### [Architecting with Google Compute Engine](#)

- M3 Virtual Machines



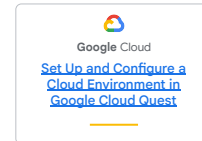
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#### [Essential Google Cloud Infrastructure: Foundation](#)

- M3 Virtual Machines



### Skill Badges



### Documentation

[Choosing the right compute option in GCP: a decision tree](#)

[Application Hosting Options](#)

[Tutorials | Compute Engine Documentation](#)

Let's take a moment to consider resources that can help you build your knowledge and skills in this area.

The concepts in the diagnostic questions we just reviewed are covered in these modules, skill badge, and documentation. You'll find this list in your workbook so you can take a note of what you want to include later when you build your study plan. Based on your experience with the diagnostic questions, you may want to include some or all of these in your plan.

<https://cloud.google.com/blog/products/compute/choosing-the-right-compute-option-in-gcp-a-decision-tree>

<https://cloud.google.com/hosting-options>

<https://cloud.google.com/compute/docs/tutorials>

## 2.3 | Planning and configuring data storage options

Considerations include:

- Product choice  
(e.g., Cloud SQL, BigQuery, Firestore, Cloud Spanner, Cloud Bigtable)
- Choosing storage options  
(e.g., Zonal persistent disk, Regional balanced persistent disk, standard, Nearline, Coldline, Archive)

Google Cloud

Along with compute resources, an Associate Cloud Engineer needs to be able to plan and configure data storage in Google Cloud. That requires understanding of the different product choices and storage options, and how to make recommended choices for a given use case.

You encountered these types of considerations in the following questions:

Question 6: Associate Google Cloud data services with modern data constructs, e.g. relational, non-relational or no-sql, object or warehouse.

Question 7: List the storage classes available for cloud storage including regional, multiregional, near and cold line.

Question 8: Differentiate between relational databases and data warehouses, e.g. relational databases can be transactional, while data warehouses are analytical and based on historical data.

## 2.3 | Diagnostic Question 06 Discussion



Cymbal Superstore needs to analyze whether they met quarterly sales projections. Analysts assigned to run this query are familiar with SQL.

- A. BigQuery
- B. Cloud SQL
- C. Cloud Spanner
- D. Cloud Firestore

What data solution should they implement?

Google Cloud

### Question:

Cymbal Superstore needs to analyze whether they met quarterly sales projections. Analysts assigned to run this query are familiar with SQL. What data solution should they implement?

\*A. BigQuery

Feedback: Correct! BigQuery is Google Cloud's implementation of a modern data warehouse. BigQuery analyzes historical data and uses a SQL query engine.

B. Cloud SQL

Feedback: Incorrect. Cloud SQL is optimized for transactional reads and writes. It is not a good candidate for querying historical data as described in the scenario.

C. Cloud Spanner

Feedback: Incorrect. Cloud Spanner is an SQL-compatible relational database, but it is not built for analyzing historical data.

D. Cloud Firestore

Feedback: Incorrect. Cloud Firestore is a NoSQL document database used to define entities with attributes. It is not a good choice for the analysis of historical data as described in the scenario.

**Where to look:** <https://cloud.google.com/storage-options/>

**Content mapping:**

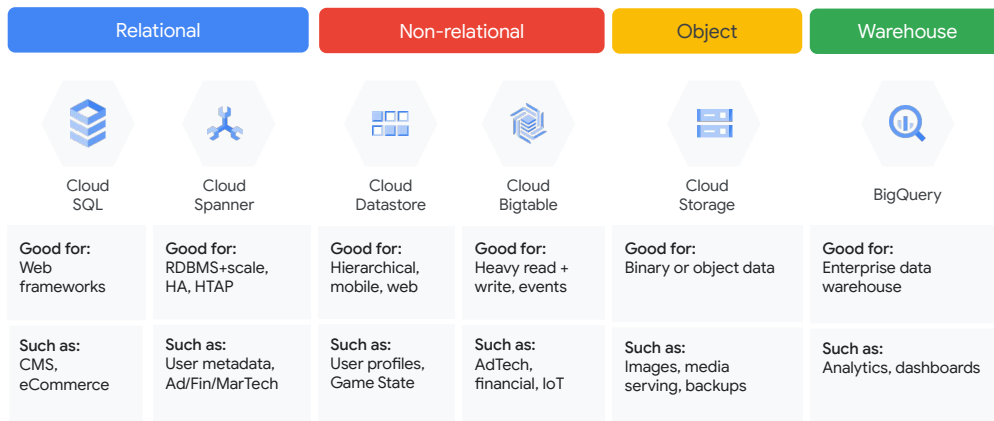
- Instructor-led Training/OnDemand
  - Google Cloud Fundamentals: Core Infrastructure
    - M4 Storage in the Cloud
  - Architecting with Google Compute Engine
    - M5 Storage and Database Services
- Quests
  - Perform Foundational Infrastructure Tasks in Google Cloud (<https://www.qwiklabs.com/quests/118>)

**Summary:**

Explanation/summary on the following slide.



# Comparing Data Storage and Database Options



Google Cloud

This question relates to Google Cloud data services and what data construct they are based on.

Firestore and Cloud Bigtable are NoSQL implementations. Firestore is a document database that supports entities and attributes. Cloud Big Table is based on column families where rows of data are referenced by a key that combines commonly queried columns. Related columns can additionally be organized into column families such as username and address.

Cloud Storage is Google Cloud's recommended object storage service. Think of pictures and videos, as well as file objects with an implicit schema, such as logs and csv files.

Google's relational database offerings include Cloud SQL and Cloud Spanner. Use them when you need a transactional processing system you can query with SQL. Cloud SQL is a managed version of databases you can implement on-premises, while Cloud Spanner is horizontally scalable and globally available.

BigQuery is a serverless distributed query engine that is primarily used as a modern data warehouse. It does have a native storage format but can also query external data where it resides. You interact with it by using a form of SQL. Keep in mind its native storage format is not a good solution for a backend store for an application. It does, however, improve performance of analytical queries you run against it using the query engine.

## 2.3 | Diagnostic Question 07 Discussion



Cymbal Superstore's supply chain application frequently analyzes large amounts of data to inform business processes and operational dashboards.

- A. Archive
- B. Coldline
- C. Nearline
- D. Standard

What storage class would make sense for this use case?

Google Cloud

### Question:

Cymbal Superstore's supply chain application frequently analyzes large amounts of data to inform business processes and operational dashboards. What storage class would make sense for this use case?

A. Archive

Feedback: Incorrect. Archive storage is the best choice for data that you plan to access less than once a year.

B. Coldline

Feedback: Incorrect. Dashboards need current data to analyze. Coldline is good for storing data accessed only every 90 days.

C. Nearline

Feedback: Incorrect. Dashboards need current data to analyze. Nearline is good for storing data accessed only every 30 days.

\*D. Standard. Correct. Standard storage is best for data that is frequently accessed ("hot" data) and/or stored for only brief periods of time. In addition, co-locating your resources by selecting the regional option maximizes the performance for data-intensive computations and can reduce network charges.

**Where to look:** <https://cloud.google.com/storage/docs/storage-classes>

**Content mapping:**

- Instructor-led Training/OnDemand
  - Google Cloud Fundamentals: Core Infrastructure
    - M4 Storage in the Cloud
  - Architecting with Google Compute Engine
    - M5 Storage and Database Services
- Quests
  - Perform Foundational Infrastructure Tasks in Google Cloud (<https://www.qwiklabs.com/quests/118>)

**Summary:**

Explanation/summary on the following slide.

## Storage Classes and use cases summary

	Standard	Nearline	Coldline	Archive
Use when you need...	<ul style="list-style-type: none"><li>• No retrieval cost</li><li>• No minimum storage duration</li></ul>	<ul style="list-style-type: none"><li>• Very low cost per GB stored and can accept higher per-operation costs</li><li>• 30-day minimum storage duration</li></ul>	<ul style="list-style-type: none"><li>• Even lower cost per GB stored and can accept higher per-operation costs</li><li>• 90-day minimum storage duration</li></ul>	<ul style="list-style-type: none"><li>• Lowest cost per GB stored and can accept the highest per-operation costs</li><li>• 365-day minimum storage duration</li></ul>
Typical use cases	"Hot" data and/or stored for only brief periods of time like data-intensive computations	Infrequently (i.e., no more than once per month) accessed data. Ideal for back-up and serving long-tail multimedia content.	Very infrequently accessed data - ie, once a year. Typically this is for disaster recovery, or for financial data that has to be kept for a certain length of time to meet regulatory needs.	Data archiving, online backup, and disaster recovery

Google Cloud

Data location and storage class affect the availability and cost of storing your data in Cloud Storage. You can choose regional, dual-region, and multi-regional location options. Storage classes include Standard, Nearline, Coldline and Archive storage. The different storage classes determine pricing based on how long your data is stored and how often you access it.

Standard storage is the default storage class. Data stored using this class is immediately available. It is the recommended storage class for frequently accessed data. You should locate your data in the same region as the services you are going to use to ingest and analyze the data to reduce latency as much as possible. Specifying a dual-region location that includes the region where your application resides will still give you low latency, but your data will also be available in another region in case of an outage. Extending your storage settings to a multi-region will make data available over a large geographic area such as US, Europe, or Asia.

The other storage classes implement ways to store infrequently accessed data. Nearline storage is for data that is only accessed around every 30 days. Coldline storage is for data that is only accessed around once every quarter, or 90 days. Archive storage is long-term storage for data accessed only once a year. These storage classes have optimized pricing, but also expect you to keep your data in them for the minimum limits specified above. If you access your data before the minimum

amount of time you will be charged a data access fee.

## 2.3 | Diagnostic Question 08 Discussion



Cymbal Superstore has a need to populate visual dashboards with historical time-based data. This is an analytical use-case.

Which two storage solutions could they use?

- A. BigQuery
- B. Cloud Storage
- C. Cloud Firestore
- D. Cloud SQL
- E. Cloud Bigtable

Google Cloud

### Question:

Cymbal Superstore has a need to populate visual dashboards with historical time-based data. This is an analytical use-case. Which two storage solutions could they use?

#### \*A. BigQuery

Feedback: Correct! BigQuery is a data warehouse offering optimized to query historical time-based data. BigQuery can run queries against data in its own column-based store or run federated queries against data from other data services and file stores.

#### B. Cloud Storage

Feedback: Incorrect. Cloud Storage is a large object store and is not queryable. It is not transactional or analytical.

#### C. Cloud Firestore

Feedback: Incorrect. Cloud Firestore is a transactional NoSQL store where you define attribute key-value pairs describing an entity.

#### D. Cloud SQL

Feedback: Incorrect. Cloud SQL is a transactional relational database optimized for

both reads and writes used in an operational context, but not for analyzing historical data.

**\*E. Cloud Bigtable**

Feedback: Correct! Cloud Bigtable is a petabyte scale, NoSQL, column family database with row keys optimized for specific queries. It is used to store historic, time-based data and answers the need for this requirement.

**Where to look:** <https://cloud.google.com/load-balancing>

**Content Mapping:**

- Instructor-led Training/OnDemand
  - Google Cloud Fundamentals: Core Infrastructure
    - M3 Virtual Machines in the Cloud
  - Architecting with Google Compute Engine
    - M2 Virtual Networks
    - M9 Load Balancing and Autoscaling

**Summary:**

Explanation/summary on the following slide.

## Comparing storage options: use cases

	Firestore	Cloud Bigtable	Cloud Storage	Cloud SQL	Cloud Spanner	BigQuery
Type	NoSQL document	NoSQL wide column	Blobstore	Relational SQL for OLTP	Relational SQL for OLTP	Relational SQL for OLAP
Best for	Storing, syncing, and querying data	"Flat" data, Heavy read/write, events, analytical data	Structured and unstructured binary or object data	Web frameworks, existing applications	Large-scale database applications (> ~2 TB)	Interactive querying, offline analytics
Use cases	Mobile, web, and server development	AdTech, Financial and IoT data	Images, large media files, backups	User credentials, customer orders	Whenever high I/O, global consistency is needed	Data warehousing

Google Cloud

Two common workloads required in a modern business environment are transactional workloads and analytical workloads.

Transactional workloads are optimized for more writes and updates than reads. Transactional means either all parts of an update happen or none of them do. For example, think of the importance of making sure deposits and withdrawals are recorded in a financial system. Both of these are part of one transaction.

Relational database management systems are commonly used for applications that are transactional in nature. Relational database services used to support transactional systems in Google Cloud include Cloud SQL and Cloud Spanner.

Cloud SQL is a managed database service that gives you access to common database types you might implement in your own infrastructure, like MySQL or PostgreSQL. It is implemented on virtual machines in the cloud with different options for size and availability.

Cloud Spanner shards your database across a cluster of database nodes, offering strong consistency and global availability. It is a fully managed service, so you don't need to worry about underlying virtual machines.

The other type of workload is analytical. It is based on querying historical data that doesn't change often, and is optimized for reads. BigQuery is a good option for this kind of workload.



## 2.3 | Planning and configuring data storage options

### Courses

[Google Cloud Fundamentals: Core Infrastructure](#)

- M4 Storage in the Cloud

[Architecting with Google Compute Engine](#)

- M5 Storage and Database Services



[Essential Google Cloud Infrastructure: Core Services](#)

- M2 Storage and Database Services



### Skill Badges



### Documentation

[Cloud Storage Options](#)

[Storage classes](#)

[Data lifecycle | Cloud Architecture Center](#)

Let's take a moment to consider resources that can help you build your knowledge and skills in this area.

The concepts in the diagnostic questions we just reviewed are covered in these modules, skill badge, and documentation. You'll find this list in your workbook so you can take a note of what you want to include later when you build your study plan. Based on your experience with the diagnostic questions, you may want to include some or all of these in your plan.

<https://cloud.google.com/storage-options/>

<https://cloud.google.com/storage/docs/storage-classes>

<https://cloud.google.com/architecture/data-lifecycle-cloud-platform>

## 2.4 | Planning and configuring network resources

Considerations include:

- Differentiating load balancing options
- Identifying resource locations in a network for availability
- Configuring Cloud DNS

Google Cloud

Together with compute and storage decisions, an associate cloud architect should be able to plan and configure network resources in Google Cloud - including load balancing, resource locations, and Cloud DNS.

You explored these types of tasks in the following questions:

Question 9: Match Google Cloud load balancing options to the appropriate TCP layer: Global https: Layer 7, Global SSL: Layer 4: Global TCP Proxy: Layer.

Question 10: List regional load balancing options and when to use each one: regional, regional internal (for use inside a VPC).

## 2.4 Diagnostic Question 09 Discussion



Cymbal Superstore is piloting an update to its ecommerce app for the flagship store in Minneapolis, Minnesota. The app is implemented as a three-tier web service with traffic originating from the local area and resources dedicated for it in us-central1. You need to configure a secure, low-cost network load-balancing architecture for it.

How do you proceed?

- A. Implement a premium tier pass-through external https load balancer connected to the web tier as the frontend and a regional internal load balancer between the web tier and backend.
- B. Implement a proxied external TCP/UDP network load balancer connected to the web tier as the frontend and a premium network tier ssl load balancer between the web tier and the backend.
- C. Configure a standard tier proxied external https load balancer connected to the web tier as a frontend and a regional internal load balancer between the web tier and the backend.
- D. Configure a proxied SSL load balancer connected to the web tier as the frontend and a standard tier internal TCP/UDP load balancer between the web tier and the backend.

Google Cloud

### Question:

Cymbal Superstore is piloting an update to its ecommerce app for the flagship store in Minneapolis, Minnesota. The app is implemented as a three-tier web service with traffic originating from the local area and resources dedicated for it in us-central1. You need to configure a secure, low-cost network load-balancing architecture for it. How do you proceed?

A. Implement a premium tier pass-through external https load balancer connected to the web tier as the frontend and a regional internal load balancer between the web tier and backend.

Feedback: Incorrect. Premium external https load balancer is global and more expensive. All the resources for the scenario are in the same region. Also, https load balancer is proxied, not pass-through.

B. Implement a proxied external TCP/UDP network load balancer connected to the web tier as the frontend and a premium network tier ssl load balancer between the web tier and the backend.

Feedback: Incorrect. TCP/UDP is a pass-through balancer. Premium tier SSL is global and is not the proper solution between web and backend within a region.

\*C. Configure a standard tier proxied external https load balancer connected to the web tier as a frontend and a regional internal load balancer between the web tier and the backend.

Feedback: Correct! A standard tier proxied external load balancer is effectively a

regional resource. A regional internal load balancer doesn't require external IPs and is more secure.

D. Configure a proxied SSL load balancer connected to the web tier as the frontend and a standard tier internal TCP/UDP load balancer between the web tier and the backend.

Feedback: Incorrect. SSL load balancer is not a good solution for web front ends. For a web frontend, you should use an HTTP/S load balancer (layer 7) whenever possible.

**Where to look:**

<https://cloud.google.com/load-balancing/docs/load-balancing-overview>

**Content Mapping:**

- Instructor-led Training/OnDemand
  - Google Cloud Fundamentals: Core Infrastructure
    - M3 Virtual Machines in the Cloud
  - Architecting with Google Compute Engine
    - M2 Virtual Networks
    - M9 Load Balancing and Autoscaling

**Summary:**

Explanation/summary on the following slide.

# Google VPC offers a suite of load balancing options

Global HTTP(S)	Global SSL Proxy	Global TCP Proxy	Regional	Regional internal
Layer 7 load balancing based on load	Layer 4 load balancing of non-HTTPS SSL traffic based on load	Layer 4 load balancing of non-SSL TCP traffic	Load balancing of any traffic (TCP, UDP)	Load balancing of traffic inside a VPC
Can route different URLs to different backends	Supported on specific port numbers	Supported on specific port numbers	Supported on any port number	Use for the internal tiers of multi-tier applications

Google Cloud

An important consideration when designing an application accessed by end users is load balancing. Load balancing takes user requests and distributes them across multiple instances of your application. This helps to keep your application from experiencing performance issues if there is a spike in user activity.

Load balancing options available in Google Cloud can be divided into those that operate at layer 7 of the OSI model and those that operate at layer 4 of the stack. As a review, layer 7 is the application layer of the protocol stack. It is where applications, or processes, share data with each other. It uses lower levels of the stack to pipe connections to other processes. The hypertext transfer protocol (http) and file transfer protocol (ftp) are examples of Layer 7 protocols. Layer 4 of the OSI model encapsulates host-to-host communication in both the Transport and Network levels.

Google cloud offers both internal and external load balancers. The external load balancers include https, SSL, and TCP load balancers. Internal load balancers include TCP/UDP, http(s), and network pass-through load balancers.

The http(s) load balancers live at Layer 7 of the OSI model. TCP/UDP, SSL and network load balancers reside at Layer 4 of the OSI model.

In Google Cloud, load balancers can be proxied or pass-through. Proxied load balancers terminate connections and proxy them to new connections internally. Pass-through load balancers pass the connections directly to the backends.

## 2.4 | Diagnostic Question 10 Discussion



What Google Cloud load balancing option runs at Layer 7 of the TCP stack?

- A. Global http(s)
- B. Global SSL Proxy
- C. Global TCP Proxy
- D. Regional Network

Google Cloud

### Question:

What Google Cloud load balancing option runs at Layer 7 of the TCP stack?

\*A. Global http(s)

Feedback: Correct! https(s) is an application protocol, so it lives at layer 7 of the TCP stack.

B. Global SSL Proxy

Feedback: Incorrect. SSL is a layer 4 load balancer.

C. Global TCP Proxy

Feedback: Incorrect. TCP is a layer 4 load balancer.

D. Regional Network

Feedback: Incorrect. Regional network is a layer 4 load balancer.

**Where to look:** <https://cloud.google.com/architecture/data-lifecycle-cloud-platform>

### Content mapping:

- Instructor-led Training/OnDemand
  - Google Cloud Fundamentals: Core Infrastructure
    - M4 Storage in the Cloud

- Architecting with Google Compute Engine
  - M5 Storage and Database Services

**Summary:**

Explanation/summary on the following slide.



## Summary of load balancers

Load balancer	Traffic type	Global/ Regional	External/ Internal	External ports for load balancing
HTTP(S)	HTTP or HTTPS	Global IPv4 IPv6	External	HTTP on 80 or 8080; HTTPS on 443
SSL Proxy	TCP with SSL offload			25, 43, 110, 143, 195, 443, 465, 587, 700, 993, 995, 1883, 5222
TCP Proxy	<ul style="list-style-type: none"> <li>TCP without SSL offload</li> <li>Does not preserve client IP addresses</li> </ul>			25, 43, 110, 143, 195, 443, 465, 587, 700, 993, 995, 1883, 5222
Network TCP/UDP	<ul style="list-style-type: none"> <li>TCP/UDP without SSL offload</li> <li>Preserves client IP addresses</li> </ul>	Regional IPv4	Internal	Any
Internal TCP/UDP	TCP or UDP			Any
Internal HTTP(S)	HTTP or HTTPS			HTTP on 80 or 8080; HTTPS on 443

Google Cloud

When load balancing in a particular region, external connectivity to your front ends can happen through an external http(s) load balancer with the proper forwarding rules and the standard networking tier. For connectivity internal to your defined vpc network, you should use the internal https and internal TCP/UDP load balancing options. As an Associate Cloud Engineer, you'll need to be familiar with when to use each option.

## 2.4 | Planning and configuring network resources

### Courses

#### [Google Cloud Fundamentals: Core Infrastructure](#)

- M3 Virtual Machines in the Cloud

#### [Architecting with Google Compute Engine](#)

- M2 Virtual Networks
- M9 Load Balancing and Autoscaling



#### [Essential Google Cloud Infrastructure: Foundation](#)

- M2 Virtual Network

#### [Elastic Google Cloud Infrastructure: Scaling and Automation](#)

- M2 Load Balancing and Autoscaling



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### Documentation

#### [Cloud Load Balancing overview](#)

#### [Cloud Load Balancing](#)

Let's take a moment to consider resources that can help you build your knowledge and skills in this area.

The concepts in the diagnostic questions we just reviewed are covered in these modules and in this documentation. You'll find this list in your workbook so you can take a note of what you want to include later when you build your study plan. Based on your experience with the diagnostic questions, you may want to include some or all of these in your plan.

<https://cloud.google.com/load-balancing/docs/load-balancing-overview>

<https://cloud.google.com/load-balancing>