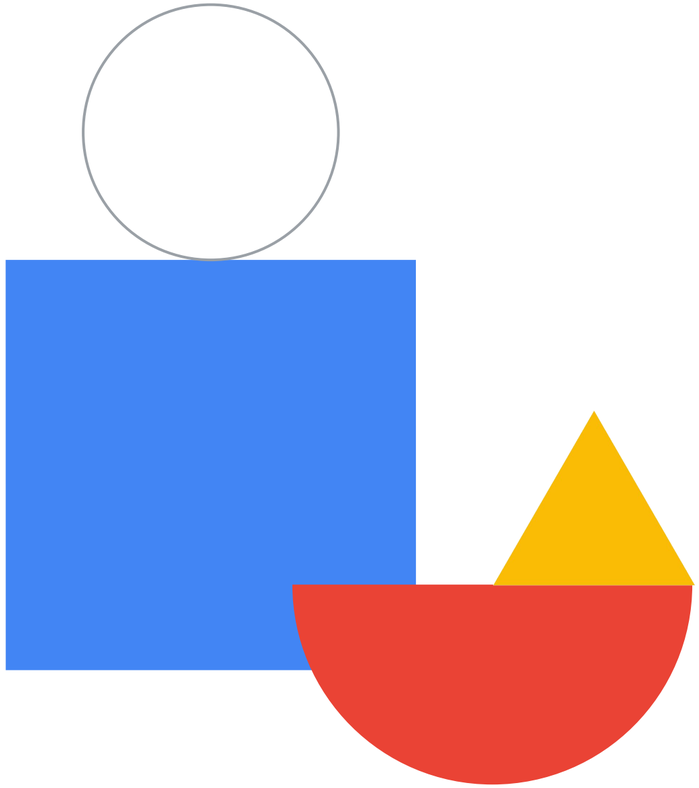
Google Cloud



Preparing for Your Professional Cloud Architect Journey

Module 1: Designing and Planning a Cloud Solution Architecture

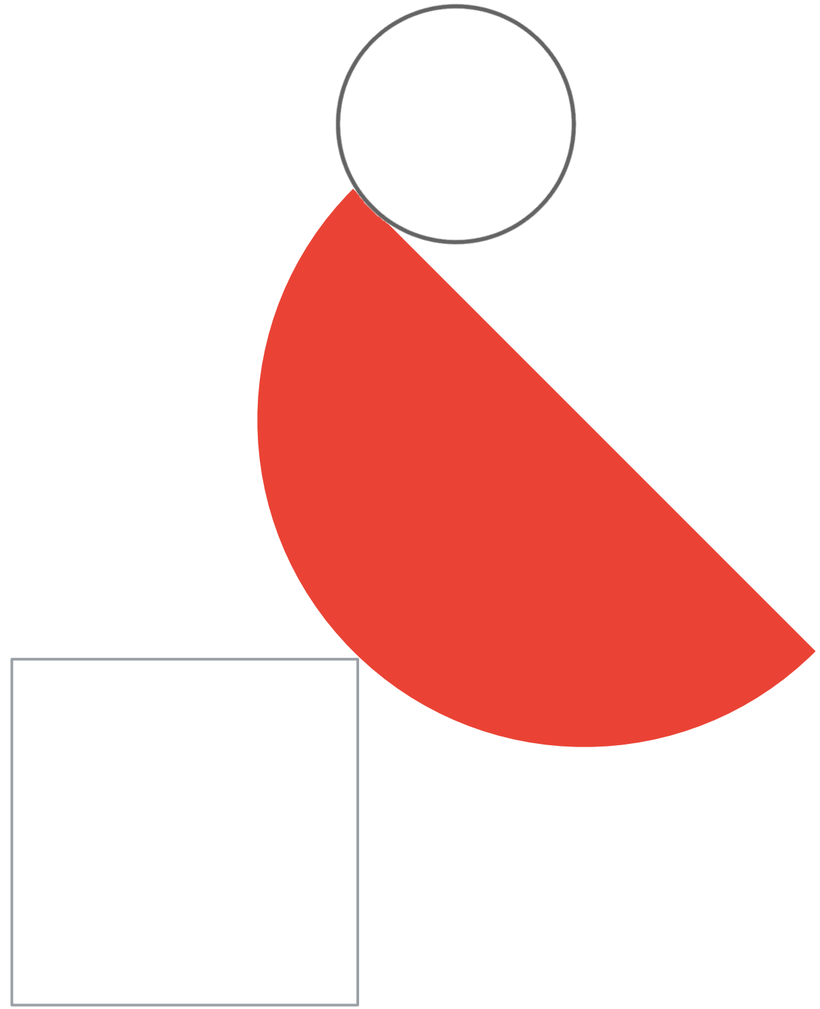
Module agenda

01 Designing Cymbal Direct’s cloud architecture

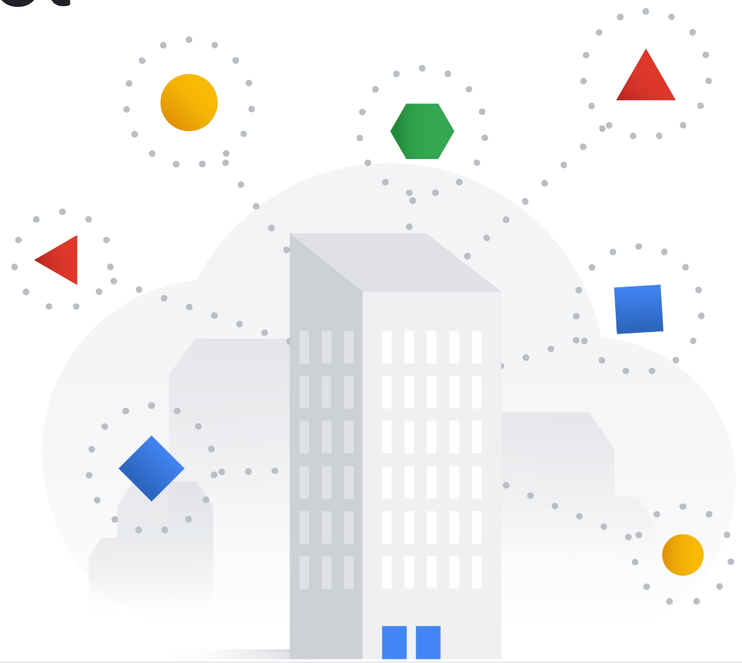
02 Diagnostic questions

03 Review and study planning

Designing Cymbal Direct's cloud architecture



Architecting a solution for Cymbal Direct in Google Cloud



- Designing a solution architecture that meets business requirements.
- Designing a solution infrastructure that meets technical requirements.
- Designing network, storage, and compute resources.
- Creating a migration plan.
- Envisioning future solution improvements.

Cymbal Direct

Cymbal Direct’s existing environment

Delivery by Drone

- Their website frontend, pilot, and truck management systems run on **Kubernetes.**
- Positional data for drone and truck location is kept in a **MongoDB** database clusters
- Drones stream video to virtual machines via stateful connection

Purchase & Product APIs

- APIs are simply built into **monolithic apps**, and were not designed for partner integration.
- APIs are running on **Ubuntu linux VMs**

Social Media Highlighting

- Single SuSE linux VM
- MySQL DB
- Redis
- Python

Cymbal Direct’s business requirements

- Scale to handle additional demand when expanding into test markets
- Streamline development
- Spend developer time on core business functionality as much as possible
- Let partners order directly via API
- Deploy the social media highlighting service and ensure appropriate content

Cymbal Direct’s technical requirements

- Managed services
- Container-based workloads
- Highly scalable environment
- Standardization where possible
- Existing virtualization infrastructure refactored over time
- Secure partner integration
- Streaming IoT data

Putting it together: Existing environment

Existing environment

Website frontend, pilot, and truck management systems run on Kubernetes

Technical requirements

Business requirements

Proposed product/ solution

* One row of a much larger spreadsheet

Putting it together: Technical requirements

Existing environment

Website frontend, pilot, and truck management systems run on Kubernetes

Technical requirements (does it...?)

- Move to managed services wherever possible
- Ensure that developers can deploy container based workloads to testing and production environments in a highly scalable environment.
- Standardize on containers where possible

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Putting it together

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Business requirements (does it...?)

- Easily scale to handle additional demand when needed?
- Streamline development?

Proposed product/ solution

?

* One row of a much larger spreadsheet

Potential solutions

Existing environment

Website frontend, pilot, and truck management systems run on Kubernetes

Technical requirements (does it...?)

- Move to managed services wherever possible
- Ensure that developers can deploy container based workloads to testing and production environments in a highly scalable environment.
- Standardize on containers where possible

Business requirements (does it...?)

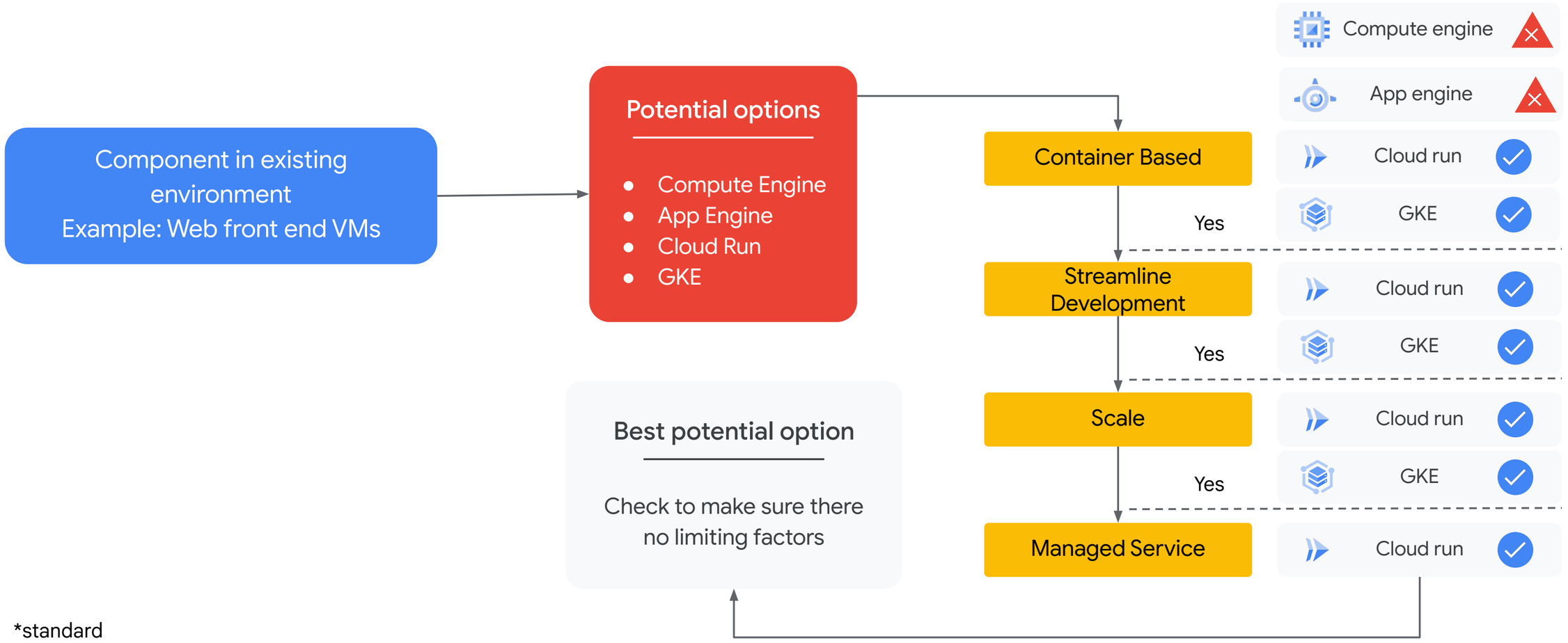
- Easily scale to handle additional demand when needed?
- Streamline development?

Proposed product/ solution

- Global HTTP(s) Load Balancer
- GKE
- Separate projects
- Migration type: lift and shift
- Replace GKE with Cloud Run for website (future)

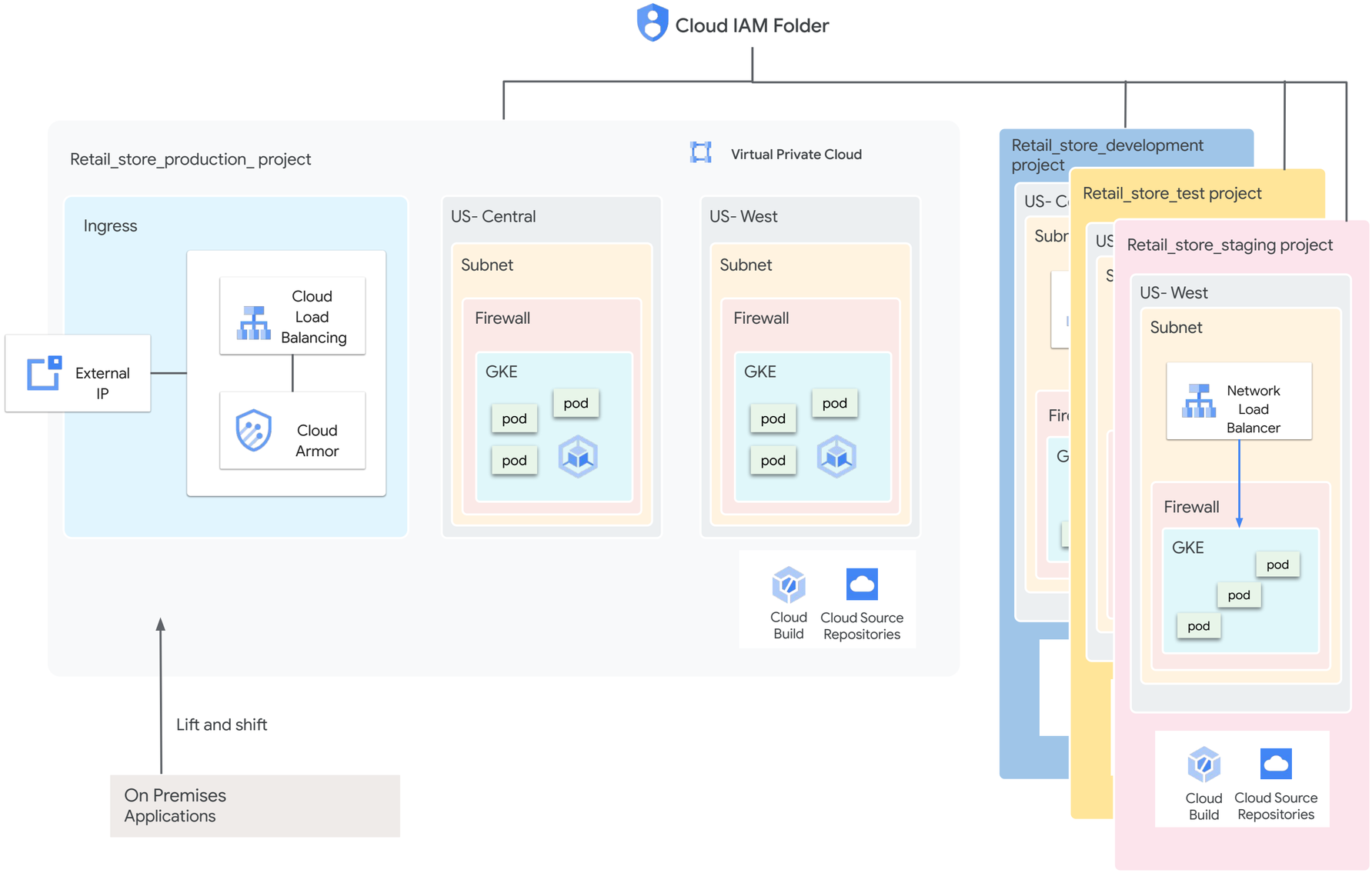
* One row of a much larger spreadsheet

Decision flow diagram

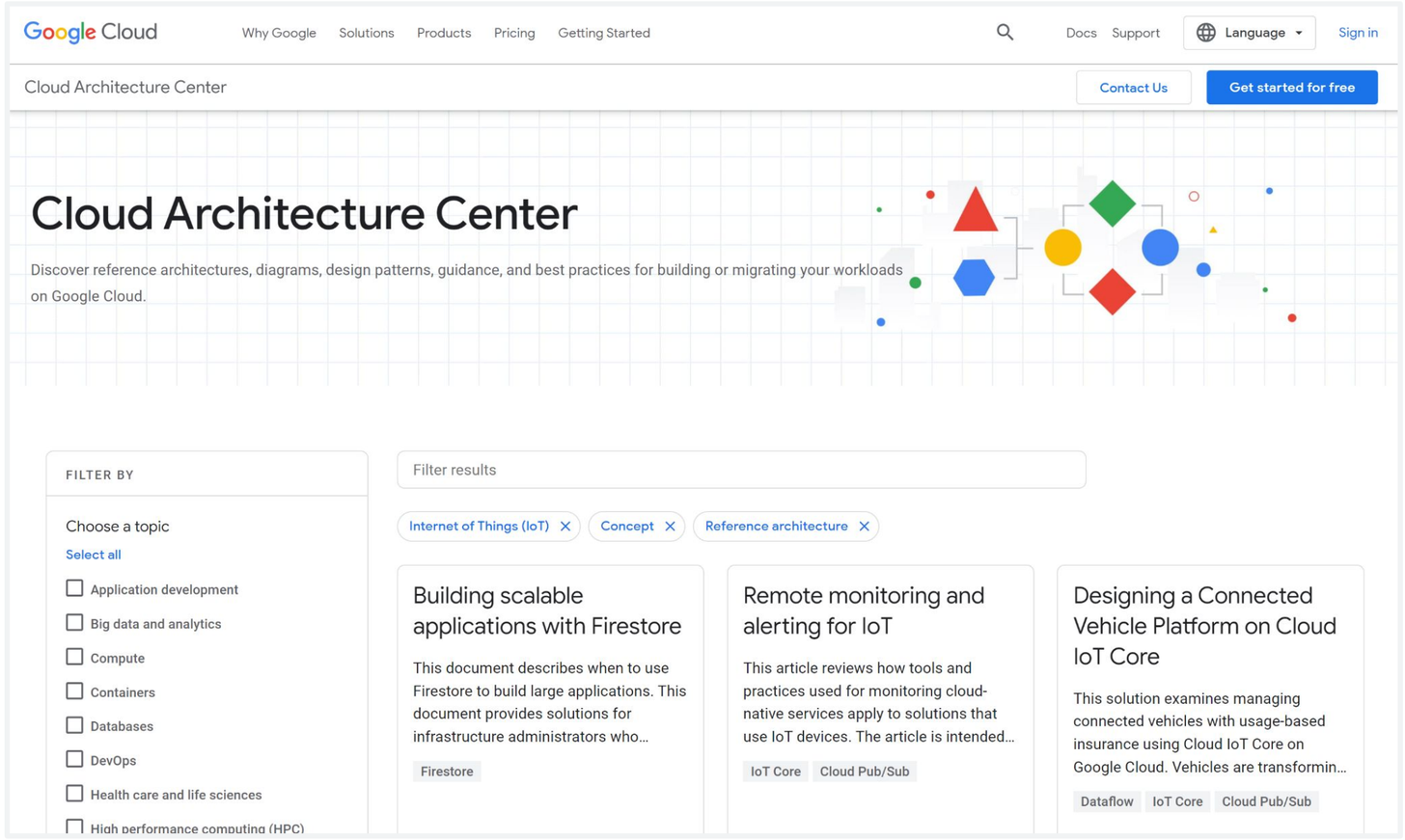


*standard

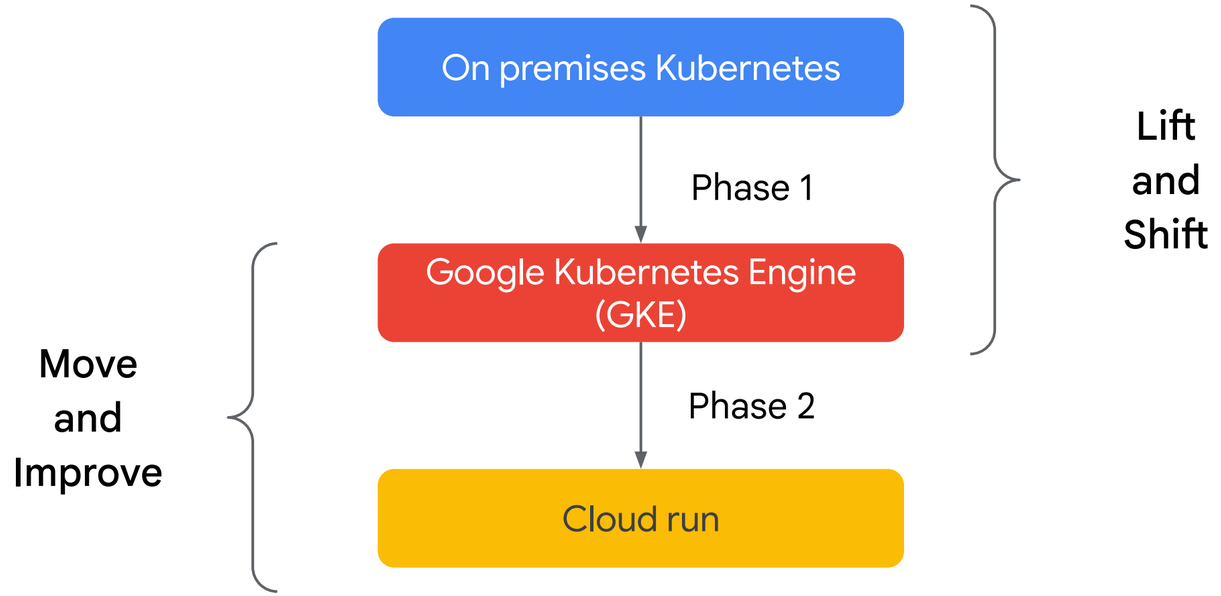
Simplified project structure for Cymbal Retail



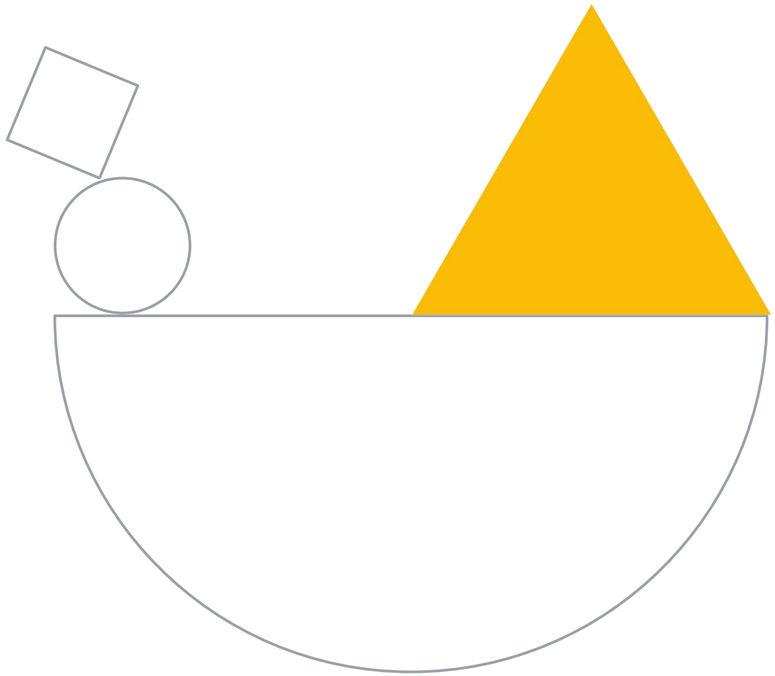
Planning your solution



Planning for migration and the future



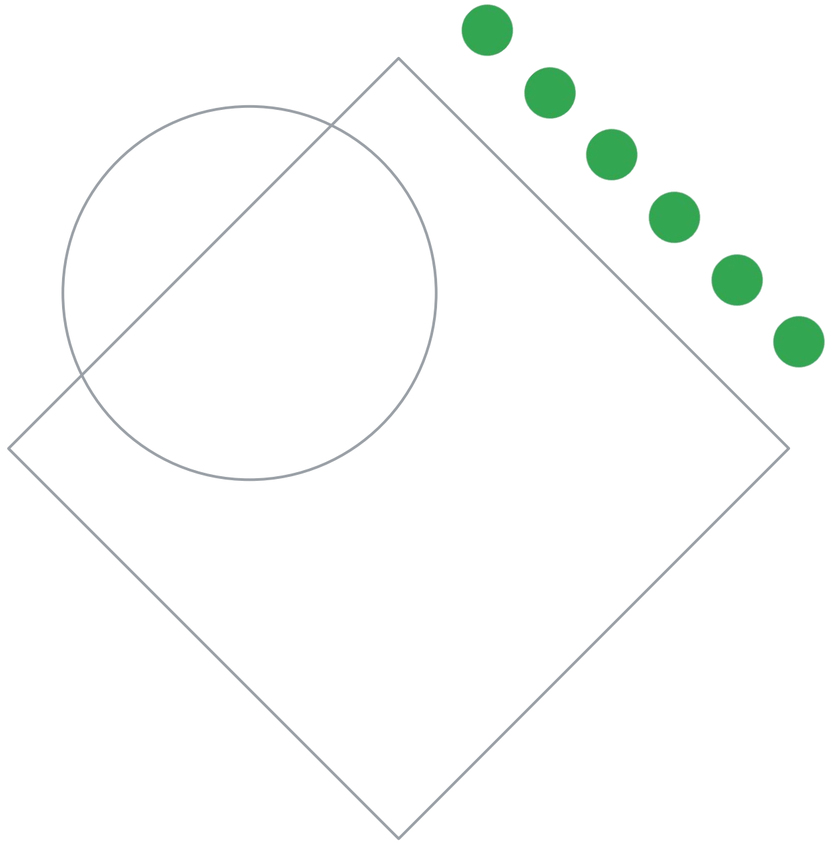
Diagnostic questions



Please complete the diagnostic questions now

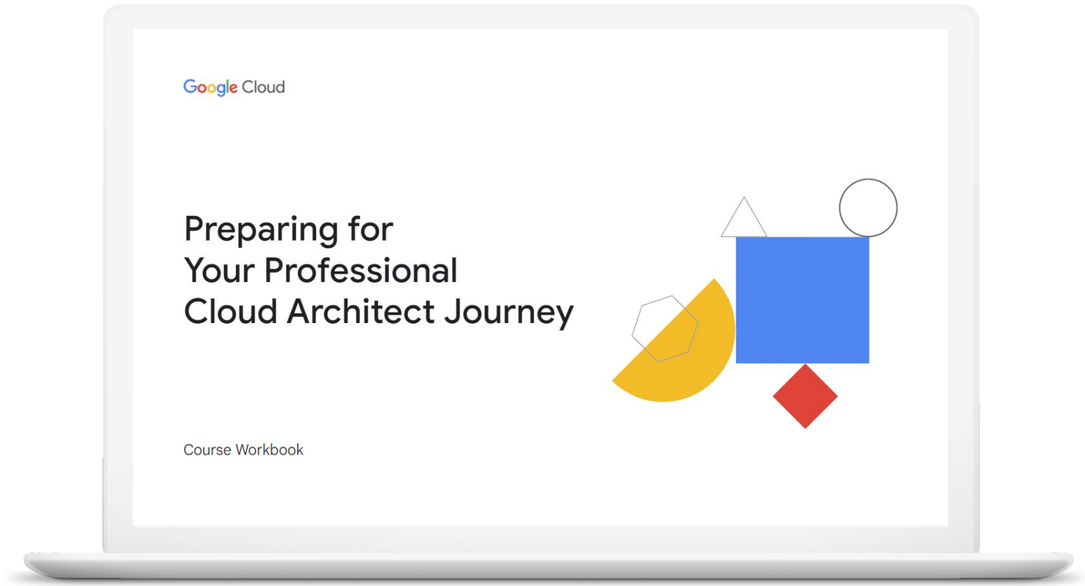
- Forms are provided for you to answer the diagnostic questions
- The instructor will provide you a link to the forms
- The diagnostic questions are also available in the workbook

Review and study planning



Your study plan:

Designing and planning a cloud solution architecture



1.1 Designing a solution infrastructure that meets business requirements

1.2 Designing a solution infrastructure that meets technical requirements

1.3 Designing network, storage, and compute resources

1.4 Creating a migration plan

1.5 Envisioning future solution improvements

1.1 Designing a solution infrastructure that meets business requirements

Considerations include:

- Business use cases and product strategy
- Cost optimization
- Supporting the application design
- Integration with external systems
- Movement of data
- Design decision trade-offs
- Build, buy, modify, or deprecate
- Success measurements (e.g., key performance indicators [KPI], return on investment [ROI], metrics)
- Compliance and observability

1.1 Diagnostic Question 02 Discussion

Customers need to have a g**ood experience** when accessing your web application so they will continue to use your service. You want to **define key performance indicators (KPIs)** to establish a service level objective (SLO).

Which KPI could you use?

A. Eighty-five percent of customers are **satisfied users**
B. Eighty-five percent of **requests succeed when aggregated over 1 minute**
C. **Low latency** for > 85% of requests when aggregated over 1 minute
D. Eighty-five percent of **requests are successful**

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D. Eighty-five percent of **requests are successful**

1.1 Designing a solution infrastructure that meets business requirements

Resources to start your journey

Google Cloud Architecture Framework: System design

SRE Books

1.2 Designing a solution infrastructure that meets technical requirements

Considerations include:

- High availability and failover design
- Elasticity of cloud resources with respect to quotas and limits
- Scalability to meet growth requirements
- Performance and latency

1.2 Diagnostic Question 03 Discussion

Cymbal Direct developers have written a new application. Based on initial usage estimates, you decide to run the application on **Compute Engine instances with 15 Gb of RAM and 4 CPUs.** These instances **store persistent data locally.** After the application runs for several months, historical data indicates that the **application requires 30 Gb of RAM**. Cymbal Direct management wants you to make adjustments that will **minimize costs.**

What should you do?

A. Stop the instance, and then use the command gcloud compute instances **set-machine-type VM_NAME --machine-type e2-standard-8.** Start the instance again.

B. Stop the instance, and then use the command gcloud compute instances **set-machine-type VM_NAME --machine-type e2-standard-8.** Set the instance's metadata to: **preemptible: true**. Start the instance again.

C. Stop the instance, and then use the command gcloud compute instances **set-machine-type VM_NAME --machine-type 2-custom-4-30720**. Start the instance again.

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1.2 Designing a solution infrastructure that meets technical requirements

Resources to start your journey

Google Cloud Architecture Framework: System design

1.3 Designing network, storage, and compute resources

Considerations include:

- Integration with on-premises/multicloud environments
- Cloud-native networking (VPC, peering, firewalls, container networking)
- Choosing data processing technologies
- Choosing appropriate storage types (e.g., object, file, databases)
- Choosing compute resources (e.g., preemptible, custom machine type, specialized workload)
- Mapping compute needs to platform products

1.3 Diagnostic Question 04 Discussion

You are creating a new project. You plan to set up a Dedicated interconnect between two of your data centers in the near future and want to ensure that your resources are only deployed to the **same regions** where your data centers are located. You need to make sure that you **don't have any overlapping IP addresses** that could cause conflicts when you set up the interconnect. You want to use **RFC 1918 class B address space.**

What should you do?

A. Create a new project, **leave the default network in place**, and then use the default 10.x.x.x network range to create subnets in your desired regions.

B. Create a new project, delete the default VPC network, **set up an auto mode VPC network**, and then use the default 10.x.x.x network range to create subnets in your desired regions.

C. Create a new project, delete the default VPC network, **set up a custom mode VPC network**, and then use IP addresses in the **172.16.x.x address range** to create subnets in your desired regions.

D. Create a new project, delete the default VPC network, **set up the network in custom mode**, and then use IP addresses in the **192.168.x.x address range** to create subnets in your desired zones. **Use VPC Network Peering** to connect the zones in the same region to create regional networks.

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1.3 Diagnostic Question 07 Discussion

Cymbal Direct is evaluating database options to store the **analytics data** from its experimental drone deliveries. You're currently using a small cluster of MongoDB NoSQL database servers. You want to move to a **managed NoSQL database service with consistent low latency that can scale throughput seamlessly and can handle the petabytes of data** you expect after expanding to additional markets.

What should you do?

A. Extract the data from MongoDB. Insert the data into **Firestore** using Datastore mode.

B. Create a **Bigtable** instance, extract the data from MongoDB, and insert the data into Bigtable.

C. Extract the data from MongoDB. Insert the data into **Firestore** using Native mode.

D. Extract the data from MongoDB, and insert the data into **BigQuery**.

1.3 Diagnostic Question 07 Discussion

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1.3 Designing network, storage, and compute resources

Resources to start your journey

[Choose and manage compute | Architecture Framework | Google Cloud]

[Design your network infrastructure | Architecture Framework | Google Cloud]

[Select and implement a storage strategy | Architecture Framework | Google Cloud]

[Google Cloud documentation]

1.4 Creating a migration plan

Considerations include:

- Integrating solutions with existing systems
- Migrating systems and data to support the solution
- Software license mapping
- Network planning
- Testing and proofs of concept
- Dependency management planning

1.4 Diagnostic Question 09 Discussion

You are working in a mixed environment of VMs and Kubernetes. **Some of your resources are on-premises, and some are in Google Cloud.** Using containers as a part of your CI/CD pipeline has sped up releases significantly. You want to start **migrating some of those VMs to containers** so you can get similar benefits. You want to **automate the migration process** where possible.

What should you do?

A. **Manually create a GKE cluster**, and then use **Migrate to Containers (Migrate for Anthos)** to set up the cluster, import VMs, and convert them to containers.

B. Use **Migrate to Containers (Migrate for Anthos)** to automate the creation of **Compute Engine instances** to import VMs and convert them to containers.

C. **Manually create a GKE cluster.** Use **Cloud Build** to import VMs and convert them to containers.

D. Use **Migrate for Compute Engine** to import VMs and convert them to containers.

1.4 Diagnostic Question 09 Discussion

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1.4 Creating a migration plan

Resources to start your journey

[Migrate to Containers | Google Cloud]

[Migration to Google Cloud: Choosing your migration path]

[Migrating to the cloud: a guide and checklist]

[Cloud Migration Products & Services]

[Application Migration | Google Cloud]

1.5 Envisioning future solution improvements

Considerations include:

- Cloud and technology improvements
- Evolution of business needs
- Evangelism and advocacy

1.5 Diagnostic Question 10 Discussion

Cymbal Direct has created a proof of concept for a social integration service that highlights images of its products from social media. **The proof of concept is a monolithic application** running on a single SuSE Linux virtual machine (VM). **The current version requires increasing the VM's CPU and RAM in order to scale.** You would like to **refactor the VM so that you can scale out instead of scaling up.**

What should you do?

A. **Move the existing codebase and VM provisioning scripts to git**, and attach external persistent volumes to the VMs.

B. Make sure that the application declares any **dependent requirements** in a requirements.txt or equivalent statement so that they can be referenced in a startup script. Specify the startup script in a **managed instance group** template, and use an autoscaling policy.

C. Make sure that the application declares any **dependent requirements** in a requirements.txt or equivalent statement so that they can be referenced in a startup script, and **attach external persistent volumes to the VMs**.

D. **Use containers instead of VMs**, and use a **GKE autoscaling deployment.**

1.5 Diagnostic Question 10 Discussion

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D. **Use containers instead of VMs**, and use a **GKE autoscaling deployment.**

1.5 Envisioning future solution improvements

Resources to start your journey

[Twelve-factor app development on Google Cloud | Cloud Architecture Center]

Knowledge Check 1

What could Cymbal Direct use to estimate costs for their Google Cloud environment?

A. Average Compute Instance CPU utilization

B. Cloud Pricing Calculator

C. KPIs

D. ROI

Knowledge Check 1

What could Cymbal Direct use to estimate costs for their Google Cloud environment?

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Knowledge Check 2

If you have a business requirement to minimize costs, what are two things you could do?

A. Follow Google's rightsizing recommendations

B. Cap costs by creating a budget in Google Cloud

C. Do not run instances when they are not being used

D. Migrate to Kubernetes from VMs

E. Use a managed service

Knowledge Check 2

If you have a business requirement to minimize costs, what are two things you could do?

A. Follow Google's rightsizing recommendations

B. Cap costs by creating a budget in Google Cloud

C. Do not run instances when they are not being used

D. Migrate to Kubernetes from VMs

E. Use a managed service

Appendix

1.1 Diagnostic Question 01 Discussion

Cymbal Direct drones continuously send data during deliveries. You need to process and analyze the incoming telemetry data. **After processing, the data should be retained, but it will only be accessed once every month or two.** Your CIO has issued a directive to incorporate managed services wherever possible. You want a **cost-effective solution to process the incoming streams of data.**

What should you do?

A. Ingest data with IoT Core, process it with **Dataprep,** and store it in a **Coldline Cloud Storage bucket.**

B. Ingest data with IoT Core, and then publish to Pub/Sub. Use **Dataflow** to process the data, and store it in a **Nearline Cloud Storage bucket.**

C. Ingest data with IoT Core, and then publish to Pub/Sub. Use **BigQuery** to process the data, and store it in a **Standard Cloud Storage bucket.**

D. Ingest data with IoT Core, and then store it in **BigQuery.**

1.3 Diagnostic Question 05 Discussion

Cymbal Direct is working with Cymbal Retail, a separate, autonomous division of Cymbal with different staff, networking teams, and data center. Cymbal Direct and Cymbal Retail are **not in the same Google Cloud organization**. Cymbal Retail needs access to Cymbal Direct's web application for making bulk orders, but the **application will not be available on the public internet**. You want to ensure that **Cymbal Retail has access to your application with low latency**. You also want to avoid **egress network charges** if possible.

What should you do?

A. Verify that the subnet range Cymbal Retail is using **doesn't overlap** with Cymbal Direct's subnet range, and then **enable VPC Network Peering for the project.**

B. If Cymbal Retail does not have access to a Google Cloud data center, **use Carrier Peering** to connect the two networks.

C. Specify Cymbal Direct's project as the **Shared VPC** host project, and then configure Cymbal Retail's project as a service project.

D. Verify that the subnet Cymbal Retail is using has the **same** IP address range with Cymbal Direct's subnet range, and then **enable VPC Network Peering for the project.**

1.3 Diagnostic Question 06 Discussion

Cymbal Direct's employees will use **Google Workspace**. Your current on-premises network **cannot meet the requirements to connect** to Google's public infrastructure.

What should you do?

A. Order a **Dedicated Interconnect** from a Google Cloud partner, and ensure that proper routes are configured.

B. Connect the network to a Google point of presence, and enable **Direct Peering.**

C. Order a **Partner Interconnect** from a Google Cloud partner, and ensure that proper routes are configured.

D. Connect the on-premises network to Google’s public infrastructure via a partner that supports **Carrier Peering.**

1.3 Diagnostic Question 08 Discussion

You are working with a client who is using **Google Kubernetes Engine (GKE)** to migrate applications from a virtual machine–based environment to a microservices-based architecture. Your client has a **complex legacy application that stores a significant amount of data on the file system of its VM.** You do not want to re-write the application to use an external service to store the file system data.

What should you do?

A. In Cloud Shell, create a YAML file defining your **Deployment** called deployment.yaml. Create a Deployment in GKE by running the command `kubectl apply -f deployment.yaml`

B. In Cloud Shell, create a YAML file defining your **Container** called build.yaml. Create a Container in GKE by running the command `gcloud builds submit –config build.yaml .`

C. In Cloud Shell, create a YAML file defining your **StatefulSet** called statefulset.yaml. Create a StatefulSet in GKE by running the command `kubectl apply -f statefulset.yaml`

D. In Cloud Shell, create a YAML file defining your **Pod** called pod.yaml. Create a Pod in GKE by running the command `kubectl apply -f pod.yaml`