Google Cloud Platform

Associate Cloud Engineer Crash Course

By: Ryan Dymek

Who's Ryan Dymek?

- Over 20+ years Industry experience
- Pre-Cloud career path consisted of Infrastructure and Security focus
- Wrote my first program in BASIC in 1989, Learned C & C++, Pascal and Turbo Pascal in early '90s
- Started working with AWS in 2009, and GCP in 2016
- Have consulted and advised 20+ companies on the fortune 500 list

What I WILL cover in this course

- Elements most relevant to the Exam
- Tips for what and where to focus your studies
- Discussion topics that may be hard to find or are less known
- Tons of resources!
- Understanding. Many people that learn the cloud start with product knowledge, but don't truly *understand* what the cloud and GCP is all about

What this course isn't or won't cover...

- This is not a substitute for your own hands-on – experiment in your own accounts, use How-To guides, Quickstarts and do labs in Qwiklabs
- This is not a magic-bullet for passing the exam, but I hope to demystify it and give you the tools to pass
- Labs – We will not have any labs in this course but I will help you identify labs that are useful for you to do on your own outside of the time we have

Resources

Additional resources for this class can be found here. This link is revised regularly to provide additional, new, and revised resources

https://leandev.fyi/gcp-ace2020

Agenda – Day 1

- Segment 1: Introduction to cloud, GCP, and the Exam
- Segment 2: Setting up a GCP environment
- Segment 3: Planning and configuring a cloud solution
- Segment 4a: Deploying and Implementing a cloud solution (part A)
- Day 1 Wrap-Up

Agenda – Day 2

- Segment 4b: Deploying and Implementing a cloud solution (part B)
- Segment 5: Management and Operations
- Segment 6: Configuring access and security
- Segment 7: Design, SRE, and DevOps Principles
- Testing Notes, Wrap-Up, and final Q&A

Segment 1: Introduction to cloud, Google Cloud Platform, and the Exam

What is the “Cloud”?

- Isn’t it just someone else's datacenter?
- Isn’t the cloud just a modern day colocation facility?
- Let's take a look at what Google says about these questions.

https://cloud.google.com/about/locations

Public Cloud vs Private Cloud

GCP, AWS, Azure are all “Public Clouds”

Private Cloud = You own the cloud, its your datacenter!

Does “public cloud” mean that all my stuff is public, and that everything is accessible over the Internet?

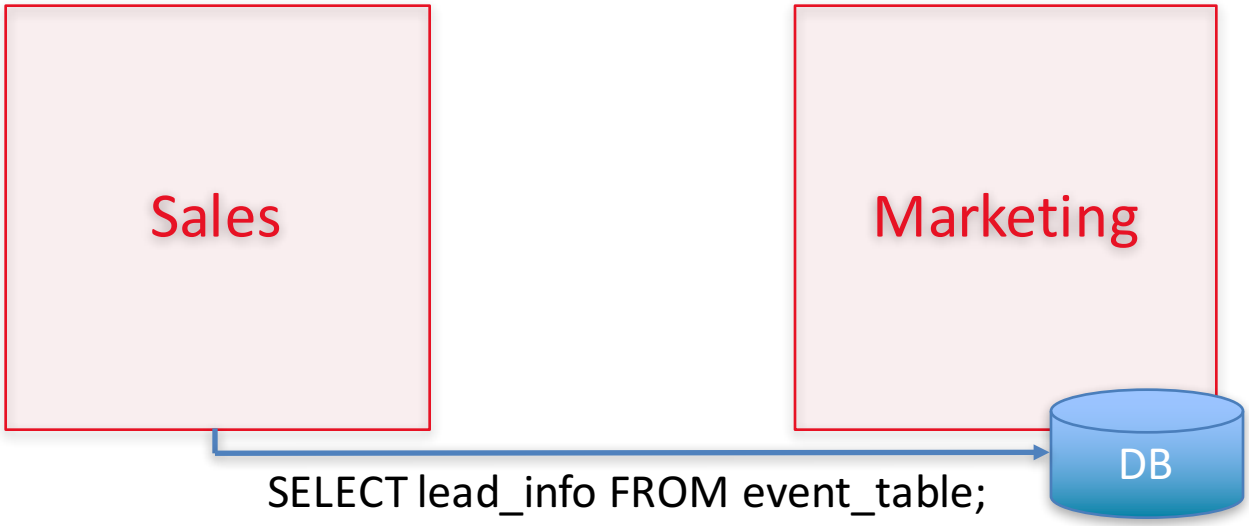
Being shared and “public”, is it easier to compromise something in the public cloud than a private datacenter / private cloud?

API's and why they're important

Consider the following scenario…

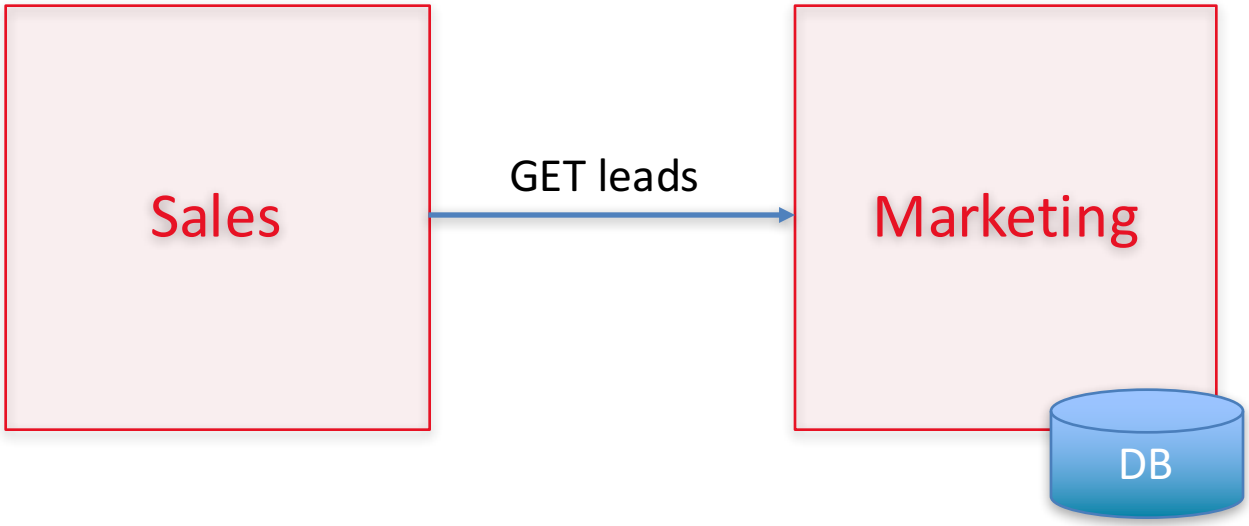
Sales CRM needs to integrate with the Marketing CRM

Integrating 2 CRM's without API

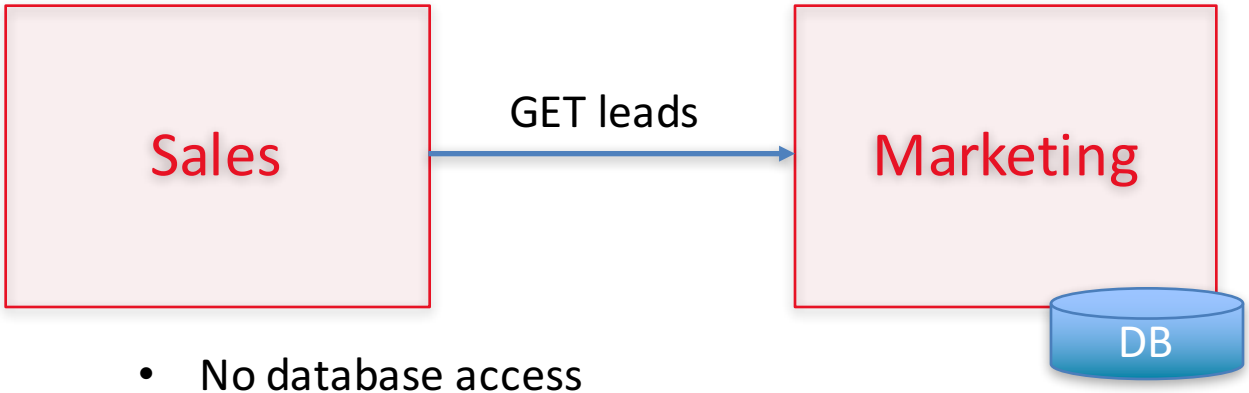


Imagine 100's or even 1000's of integrations like this…

Integrating 2 CRM's with API



Integrating 2 CRM's with API



- No database access
- No knowledge of database type or tables
- Data can be abstracted: only expose what you want
- Security advantages
- Simplicity advantages
- Changes are abstracted

API First Design

Millions of *additions* (deployments) yet nothing changes… how?

What are these terms?

SaaS

PaaS

IaaS

Now let's ignore them…

This exam is all about *Implementing*

GCP Associate Cloud Engineer certification:
Implementation, Deployment, and Management

GCP Professional Cloud Architect certification:
Design, Plan & Optimize

Exam Details

Duration: 2 Hours

Fee: $125 USD

Exam Format: Multiple choice & Multiple Select

Exam Delivery Options:

- Online-Proctored
- Onsite-Proctored

Prerequisites: None

Recommended experience:

- 6+ Months hands-on experience with Google Cloud

Exam Tips and Preparation

- Pace yourself – timing is important
- Run through the easiest, shortest questions first and then go back to the more complex questions when you have time (flag questions for follow-up)
- Always focus on the business requirements if the question provides them
- No partial credit for multiple answer questions!
- You can't take notes during the exam, you must work in your head

Exam Tips and Preparation - Continued

- Some questions may not be scored, so don't let yourself get hung up on any single question, it *may* not even count – come back to it if you have time!
- Passing scores or percentages are not formerly defined by Google, but it is estimated by many to be around the 80% mark
- During your preparation, study your weakest topics early and often

Exam Resources

- The Exam Guide: https://cloud.google.com/certification/guides/cloud-engineer/
- Product Documentation: https://cloud.google.com/docs/
- Free Online Practice Exam: https://cloud.google.com/certification/practice-exam/cloud-engineer
- Qwiklabs quests
- Official Google Cloud Certified Associate Cloud Engineer Study Guide published by Wiley
- Your own GCP Account – Free to create an account, and receive up to $300 in free credits to experiment with. Plus use the *free tier!*

Qwiklabs Quests & Labs

- Quest: GCP Essentials
- Quest: Baseline: Infrastructure
- Quest: Cloud Engineering
- Quest: Networking in the Google Cloud
- Quest: Kubernetes in the Google Cloud
- Hands-on lab: Cloud Run - Hello Cloud Run
- Hands-on lab: Deploying an Application to App Engine Flexible

https://google.qwiklabs.com

Fundamental GCP Technologies and Methodologies to…

understand

Networking & Infrastructure

- VPC's, subnets, interfaces, firewalls and tags
- Cloud Interconnect, Dedicated Interconnect, Partner Interconnect, Direct Peering, Carrier Peering, CDN Interconnect, and Cloud VPN
- HTTP(s) and Network Load Balancing
- VPC Peering
- GCP *Projects* and their relationship to the infrastructure / VPC's
- Cloud CDN, Load Balancers, and Google Cloud Endpoints purpose in your infrastructure
- API Access in your Infrastructure
- Regions and Zones
- Edge Locations
- Cloud NAT
- BGP Basics (ASN's, eBGP vs iBGP, Neighbors, Route summary, etc.)

Datastores / Data Analytics

- VM Persistent Disk vs Local SSD
- Cloud Storage and all associated storage classes
- Cloud SQL
- Cloud Spanner
- BigTable
- BigQuery
- Firestore
- Dataproc
- Dataflow
- Memorystore
- Pub/Sub
- Filestore

Compute

- Compute Engine:
  - Virtual Machines
  - Images
  - Types
  - Sole-tenant
  - Interfaces
  - Firewalls
  - Tags
- App Engine Standard & App Engine Flexible
- Cloud Run
- Cloud Functions
- Google Kubernetes Engine (GKE)

Security

- Identity and Access Management (IAM)
  - Primitive roles vs Custom Roles
  - Principle of least access
  - Service Accounts
  - Projects & Resource Hierarchy
- Firewalls
- Routing
- IP Addresses and Firewalls
- API Access Control
- IAM roles for billing

Costs

- Always consider data transfer!
- Operational overhead?
- Sustained Use & Committed Use Discounts
- Second, Minutes and Hours – Oh my!
- Per API Call? Too many calls and sloppy or inefficient code design
- Ryan's Exam Tip: The 5 cost considerations
  - Storage, Network (Data Transfer), Operations (I/O), Service Charge, Feature Charges

Consider this…

Which vehicle will win this race?

Ford F150 Pickup

(stock)

VS

Ferrari

The question specifics matter tremendously. Do not "skim" the question. Make sure you fully understand it first…

but at face value!

Infrastructure or API Considerations

- Cost
- Operational Overhead
- Flexibility
- Fault Tolerance / High Availability
- Security Implications
- Scaling
- Tightly Coupled vs Decoupled
- Asynchronous vs Synchronous Processing

5 Cost Considerations

- Storage
- Network
- Operations
- Service charge
- Features

Segment 2: Setting up a GCP environment

Projects

- Project ID: Custom, Globally Unique
- Project Name: Custom, not unique
- Project number: Assigned, Globally Unique

API's

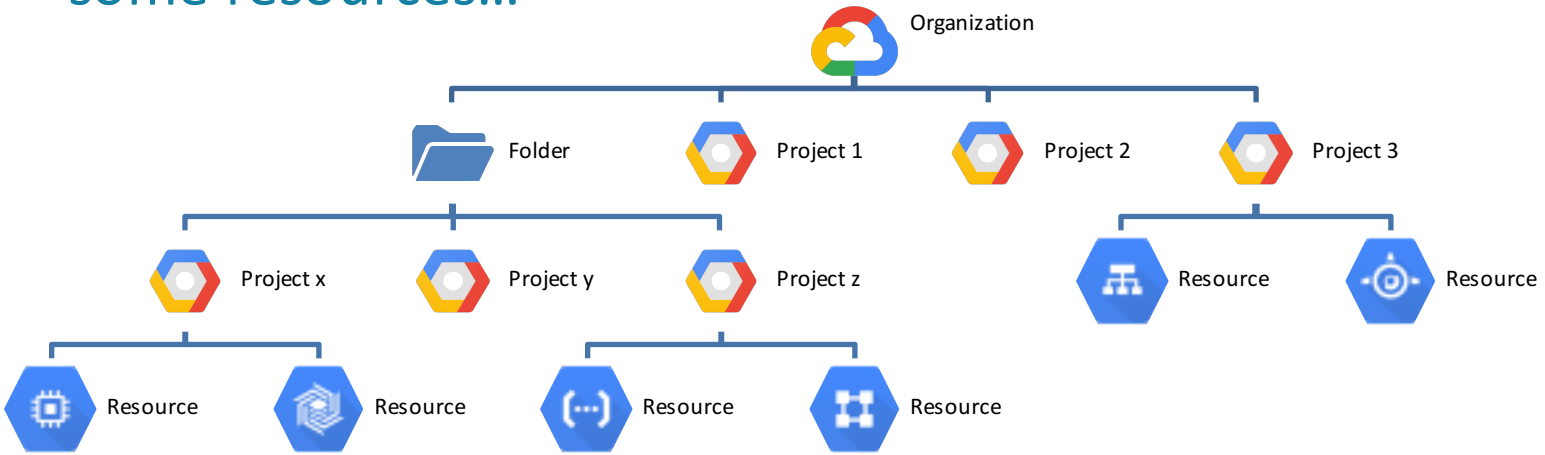
- VPC's relationship to GCP API's
- Is there connectivity to the API?
- API's are enabled within a Project
- Understand what the particular API does – read the docs!\
- https://developers.google.com/apis-explorer

Permission Hierarchy

- Policies are “Inherited” from parents
- A less restrictive parent policy will override a more restrictive resource policy (Lets talk about this to fully understand)
- Policies are set on a resource
- Each policy contains a set of roles and members

Resource Hierarchy

Let's create a project and some resources…



Roles

- Primitive
  - Owner
  - Editor
  - Viewer
  - Billing Administrator
- Predefined
  - Provided by Google for common job-related tasks
- Custom

Ways to interact with GCP

- GCP Web Console
- Cloud Shell
- Cloud SDK
- REST-based API’s

GCP Cloud Shell

- Provisioned via a container
- Persistent $HOME Storage (5GB)
- Secure and fully authenticated via automatic key management
- Some useful admin tools pre-installed:
  - MySql client
  - Kubernetes
  - Docker
  - Bash, sh, emacs, vim, and nano
- Developer tools pre-installed:
  - Java
  - Go
  - Python
  - Node.js
  - PHP
  - Ruby
  - git
  - Mercurial

GCP Utilities

- *gcloud*: Utility to run most GCP commands from the CLI
- *gsutil*: Utility to run Google Cloud Storage commands
- *kubectl*: Utility to run Kubernetes commands
- bq: Utility to run BigQuery commands

Qwiklabs Recommended Quests:

- Using the Cloud SDK Command Line

*These utilities are all pre-installed and ready for use in the Cloud Shell. Keep in mind the need to have the necessary API's enabled.

GCP Client Libraries & Utilities

- Google Cloud SDK
  https://cloud.google.com/sdk
  - Available for local install, as a Docker Image, or in Cloud Shell
  - Cloud Client Libraries & Google API Client Libraries included

- Cloud Client Libraries
  https://cloud.google.com/apis/docs/cloud-client-libraries

- Google API Client Libraries
  https://developers.google.com/api-client-library

Operations (Formerly Stackdriver)

- Multi-Cloud Monitoring: Will monitor GCP resources, as well as AWS and On-Prem
- Integrated built-in monitoring of common GCP services & resources
- Monitors and stores metrics and logs
- Provides statistical analysis and dashboards

Qwiklabs Recommended Quests:

- Cloud Logging
- Google Cloud's Operations Suite
- Google Cloud's Operations Suite on GKE

Billing

- Billing Accounts
- Projects are linked to a billing account
- Budgets and Alerts*
  - Don’t wait for your monthly bill to see a surprise!
  - **Does not set a cap on API usage!**

*Set up budgets and alerts right away, especially if sandboxing!

Segment 3: Planning and configuring a cloud solution

General Pricing

- Cloud Pricing Calculator
  https://cloud.google.com/products/calculator/
- Remember the 5 Cost Considerations!
  - Storage
  - Network / Data Transfer
  - Operations
  - Service Charge
  - Feature Charge
- GCP Free Tier
  20+ Always free products (up to monthly limits)
  https://cloud.google.com/free/
- Free Credit ($300) for new customers

Instance Pricing

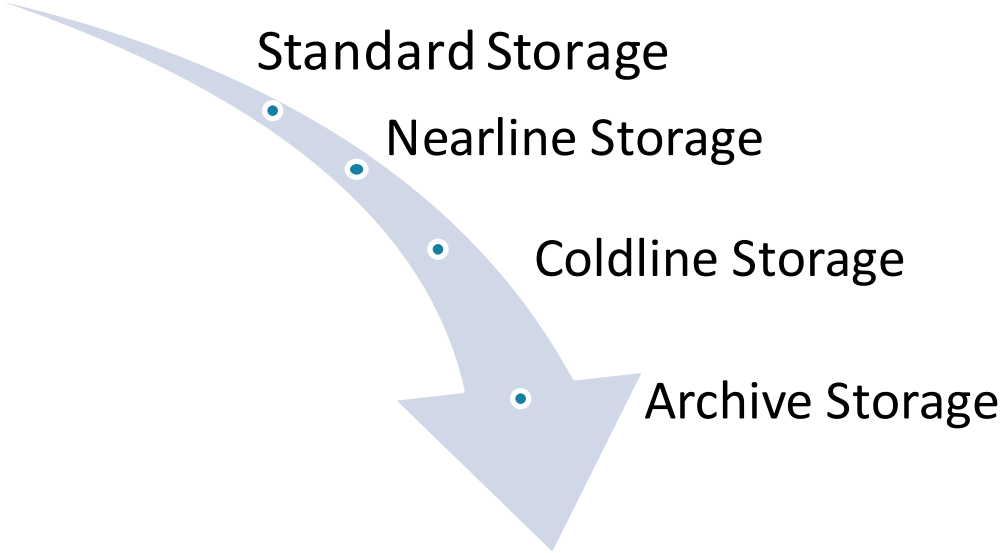
- Preemptible Instances
  - 24 hour Maximum Runtime
  - Will vary from day to day, zone to zone
  - No SLA
  - Free tier credits do not apply
  - Notified via a ACPI G2 Soft Off signal, after 30 seconds an ACPI G3 Mechanical Off signal is sent to the OS
- Sustained Use Discount
- Committed Use Discounts
- Billed by the second, with 1 min minimum
- Premium Images*

Google Cloud Storage Classes

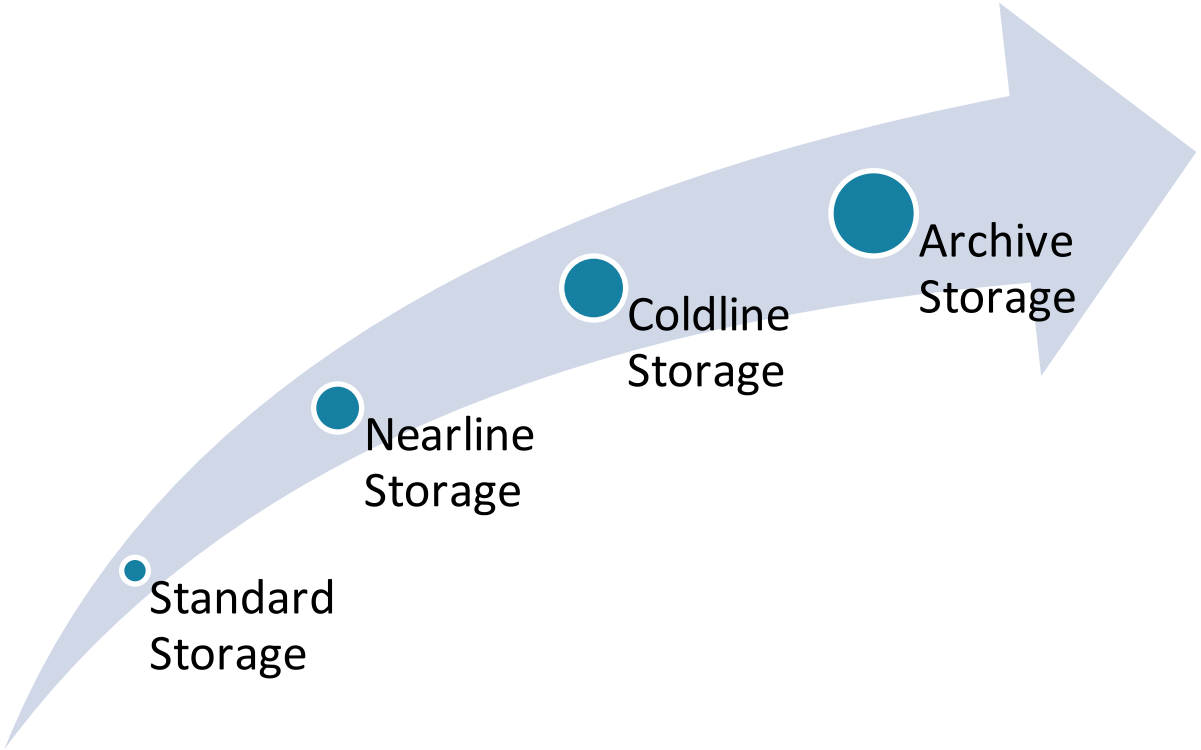
- Multi-Regional
- Regional
- Nearline
- Coldline

Storage Price vs Retrieval (Operation) Price

Storage Charges by Storage Class



Operational Charges by Storage Class



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- App Engine Standard & App Engine Flexible
- Cloud Run
- Cloud Functions
- Google Kubernetes Engine (GKE)

Infrastructure How-To Guides

- VPC How-To Guides
  https://cloud.google.com/vpc/docs/how-to
- Load Balancing How-To Guides
  https://cloud.google.com/load-balancing/docs/how-to
- Compute Engine How-To Guides
  https://cloud.google.com/compute/docs/how-to

Segment 4a: Deploying and Implementing a cloud solution (Part A)

Compute Engine

Let's build a VM using Compute Engine

- Virtual Machines
- Disks
- Managed Instance Groups (MIG)
- Instance Templates
- Firewalls
- Tags

Kubernetes Engine (GKE)

- What are containers?
- What is Docker?
- Where can I learn more about Docker specifically?
- What is Kubernetes?
- Microservices
- Kubernetes Pods

Docker & Kubernetes Resources

- Docker
  https://www.docker.com/play-with-docker
  https://labs.play-with-docker.com/

- GKE How-To
  https://cloud.google.com/kubernetes-engine/docs/how-to

- Play with Kubernetes
  https://labs.play-with-k8s.com/

- Kubernetes Tutorials
  https://kubernetes.io/docs/tutorials/

Segment 4b: Deploying and Implementing (Part B)

Google App Engine

App Engine Standard

- Specific versions of Java, Python, PHP and Go
- 60s Request Timeout
- No local file access
- Autoscale
- Scales to zero
- Startup is seconds

App Engine Flexible

- Modify runtime via a dockerfile
- 60m Request Timeout
- Local file access (ephemeral storage)
- Startup is Minutes

Google Cloud Functions

- Runtimes: Javascript, Python or Go
- Create stateless, single-purpose* functions for event handling
- Event sources can trigger the function
  - Pub/Sub events, Cloud Storage object changes, etc.
- Build event driven pipelines
- Build serverless microservices

*Per Site Reliability Engineering standards, though one *could* build a function to have more than one purpose, the best-practice design would be to write functions as a smaller, single-purpose function

Types of storage, what to choose?

- Could more than one storage solution be used?
  - E.g. Cloud SQL for transactional writes and Memorystore with Redis for sub-millisecond reads
- Analytics (OLAP) could (should?) be separate from transactional workloads (OLTP)
- Columnar vs Row Storage
- Object Storage vs File vs Block storage
- Databases as storage?

Data Storage Solutions

- Database options
  https://cloud.google.com/products/databases

- Storage options
  https://cloud.google.com/products/storage

Let's create some resources

Deployment Manager

- Configuration File
- Templates (Python or Jinja)
- Multiple templates, of multiple languages may be imported into a single deployment / configuration file

Deployment Manager How-To:
https://cloud.google.com/deployment-manager/docs/how-to

Segment 5: Management and Operations

Managing Compute Resources

Know how to:

- Create, delete, update VMs
- Work with snapshots
  - Block Level
  - Delta's (changed blocks)
- Work with images
  - Custom Images
  - Sharing Images across projects
  - Use within a Managed Instance Group (MIG)

Managing Kubernetes Engine (GKE)

Know how to:

- View cluster inventory
- Work with Image Repos
- Work with nodes and pods
  - `> gcloud container clusters get-credentials`
  - `> kubectl get pods`
  - `> kubectl expose deployments`
- Work with Services

*It's a good idea to know how to do the above in both the web console, as well as the necessary *gcloud* or *kubectl* commands

Managing Data Solutions

- Understanding interfacing with:
  CloudSQL, BigQuery, Cloud Spanner, Cloud Datastore, Cloud Bigtable
- You don't need to be an expert with all DB's, but understand what is required to query them – API's, ODBC with SQL, etc.
- Backing up and restoring data instances for CloudSQL
- Set object lifecycle management policies on Cloud Storage

Managing Network Resources

- Adding a subnet to an existing VPC
- Expanding CIDR blocks – Subnets can have more than one range of addresses and do not require them to be contiguous
- You cannot shrink subnets, only expand
- VPN and Interconnect Options

Monitoring and Logging

- Understand how to setup and manage Stackdriver
- Stackdriver alerts and custom metrics
- Viewing and filtering logs in Stackdriver
- Use cloud diagnostics for application issues

Segment 6: Configuring access and security

Identity and Access Management

- Permissions are not applied directly to a user, but rather Roles are
- IAM roles
  - Primitive, Custom and Predefined Roles
  - Permissions
  - Organization or Project specific
  - Assignment in the Organization, Project, and resource hierarchy

Service Accounts

- Special accounts that belong to a VM or Application
- Used by the VM or Application without the user
- Associated with a keypair
- User-Managed vs Google-Managed
- Is a resource and has IAM policies attached

Cloud Audit Logs

Audit logs contain:

- Admin / GCP User Activity
- System Events
- Data Access

Viewed through Stackdriver and Activity

Segment 7: Design, SRE, and DevOps Principles

Notes on Design vs Implementation

- Remember that Design is not the primary focus of this exam; however, everything has an element of design
- Site Reliability Engineering
- DevOps is a culture, not CI/CD (though it leverages CI/CD)
- This exam is less about design and architecture, and more about being able to actually implement and manage the environment

Recommended Enterprise Guidelines

- Understand the relationship between your organizational hierarchy and the resource hierarchy and the implications
- GCP *Project* and *Resource* structure
- Implement the principle of least access
- Centralize network control – Decouple network administration from project administration via use of Shared VPCs
- Realize network controls are a small fraction of your overall controls. Policies, roles, service accounts, and API endpoints account for most of your access control

CI/CD, Deployment & Release Management

- Deployment Manager
  - Structure your templates around operational needs
  - Decoupled units of deployments
  - Isolated by App, department, security needs, etc
  - Consider use of CI/CD pipelines with separate environments (e.g. Dev, Test, Prod)
  - Variables
  - JSON, YAML, Python, or Jinja
  - Configuration -> Templates -> Resources

Consider my PCA course!

Are you interested in expanding your certification to the Google Certified Professional Cloud Architect?

I have an upcoming course on it in September, reserve your seat!

Let's review what we've covered

- Segment 1: Introduction to cloud, GCP, and the Exam
- Segment 2: Setting up a GCP environment
- Segment 3: Planning and configuring a cloud solution
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- Segment 6: Configuring access and security
- Segment 7: Design, SRE, and DevOps Principles
- …. And this… Segment 8: Prepping for the exam!

Practice

- Your own GCP Account – use free services, and possibly be willing to pay for some
  - Set Billing Alerts & Budgets to avoid surprises
  - Review Billing Reports to learn about costs
  - Understand how you pay for things
  - Understand the free tier
  - Perform the “how-to” guided steps, as well as Quickstarts
- Use Qwiklabs and do Quests outlined for this certification
  - Credit based or Subscription

Consider another cert!

- Get a 2 for 1 on your study efforts!
  **You'll still have to pay for 2 exams though, sorry ☹
- Google Cloud Platform Professional Cloud Architect Crash Course – I have an upcoming course! Look at the schedule and reserve your spot
- Studying for the Cloud Engineer can assist in the Professional Cloud Architect Certification and vice versa
- Consider taking both the same day!
- Knowing the products and implementation details will help you in designing much larger, more complicated solutions!
- The Associate Cloud Engineer is not necessarily easier than the Professional Cloud Architect, but involves less design and more hands-on

Q & A

Lets Connect!

https://www.linkedin.com/in/ryandymek

Thank You!