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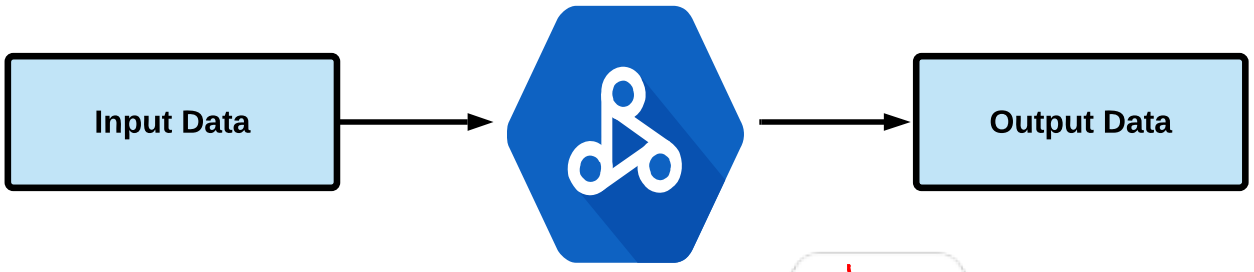
Dataproc Overview

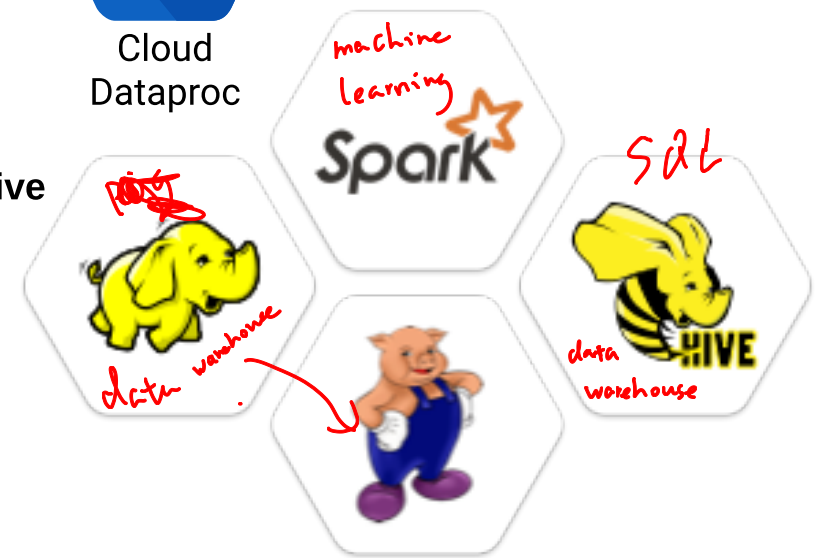
Next

What is Cloud Dataproc?

It's another transformation and data processing serv.



Cloud Dataproc



Hadoop ecosystem:

- Hadoop, Spark, Pig, Hive
- Lift and shift to GCP

Managed version of hadoop and spark

Managed Hadoop/Spark Stack

Custom Code
Monitoring/Health
Dev Integration
Manual Scaling
Job Submission
Google Cloud Connectivity
Deployment
Creation

all managed by Proc!

Dataproc facts:

- On-demand, managed Hadoop and Spark clusters
- Managed, but not **no-ops**:
  - Must configure cluster, not auto-scaling (need to watch storage)
  - Greatly reduces administrative overhead
  - (still need to set up)
- Integrates with other Google Cloud services:
  - Separate data from the cluster - save costs
- Familiar Hadoop/Spark ecosystem environment:
  - Easy to move existing projects
- Based on Apache Bigtop distribution:
  - Hadoop, Spark, Hive, Pig
- HDFS available (but maybe not optimal)
- Other ecosystem tools can be installed as well via initialization actions (such as Kafka, jupyter notebook.)

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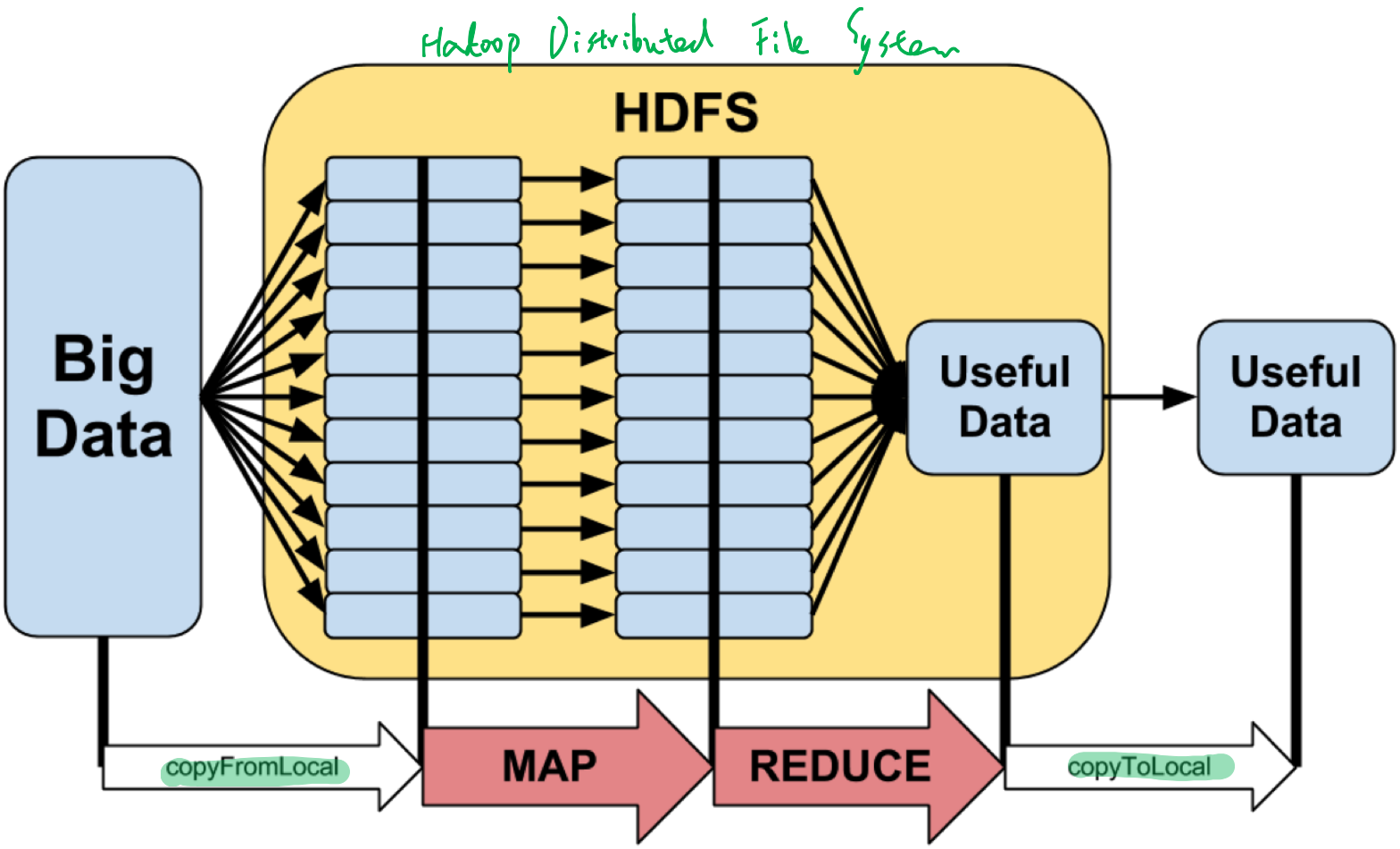
What is MapReduce?

- Simple definition:
  - Take big data, distribute it to many workers (map)
  - Combine results of many pieces (reduce)
- Distributed/parallel computing



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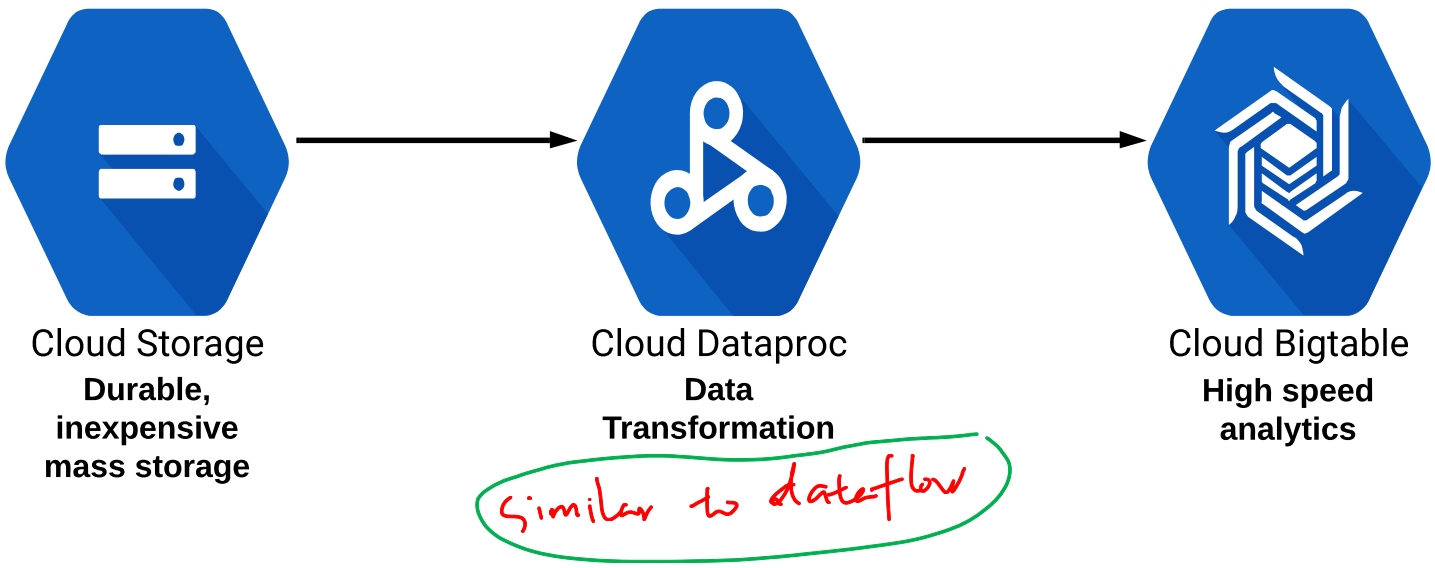
Pricing:

- **Standard Compute Engine machine type pricing + managed Dataproc premium**
- **Premium = $0.01 per vCPU core/hour**

Machine type	Virtual CPUs	Memory	Dataproc
n1-highcpu-2	2	1.80GB	$0.020
n1-highcpu-4	4	3.60GB	$0.040
n1-highcpu-8	8	7.20GB	$0.080
n1-highcpu-16	16	14.40GB	$0.160
n1-highcpu-32	32	28.80GB	$0.320
n1-highcpu-64	64	57.60GB	$0.640

Data Lifecycle Scenario

Data Ingest, Transformation, and Analysis



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exam topic

Identity and Access Management (IAM):

- **Project level only** (to all clusters) (primitive and predefined roles)
- Cloud Dataproc Editor, Viewer, Worker
- Editor - Full access to create/delete/edit clusters/jobs/workflows
- Viewer - View access only
- Worker - Assigned to service accounts:
  - Read/write GCS, write to Cloud Logging

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Configure Dataproc Cluster

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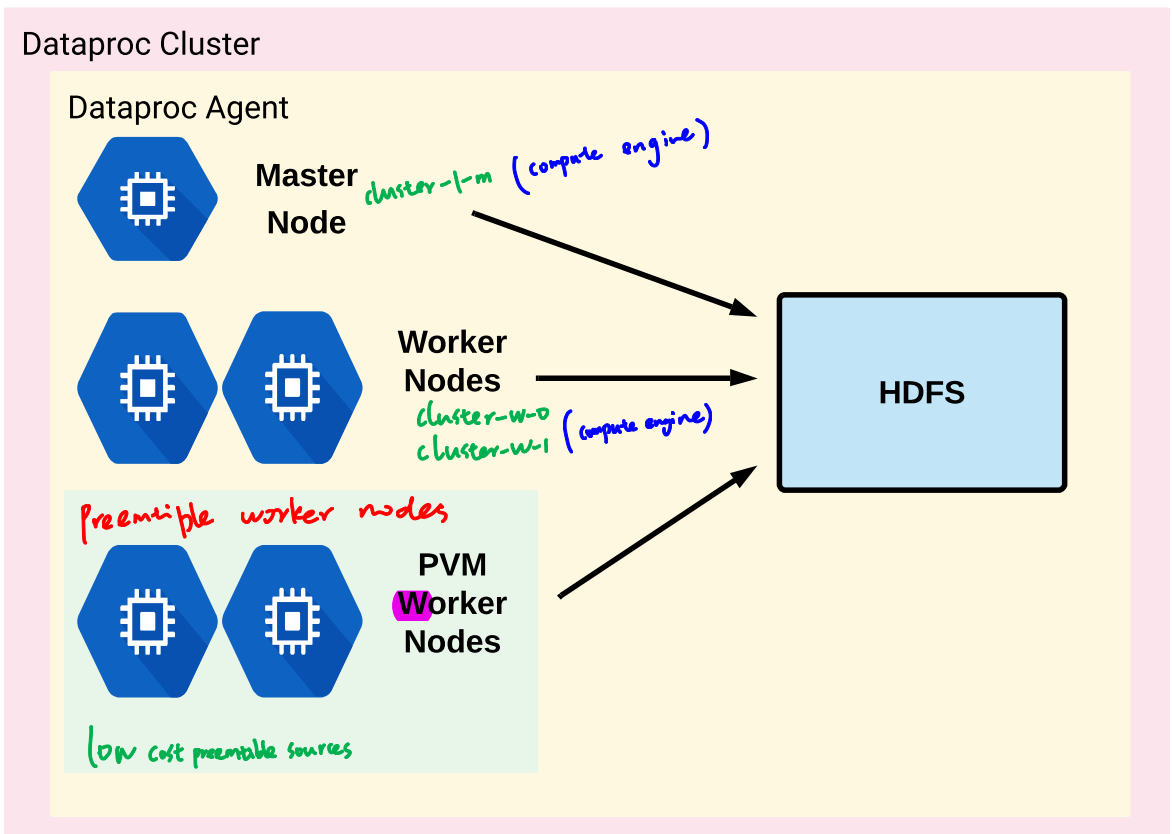
Create cluster: (gcloud command)

- gcloud dataproc clusters create [cluster_name] --zone [zone_name]
- Configure master node, worker nodes:
  - Master contains YARN resource manager
  - YARN = Yet Another Resource Negotiator

Updating clusters:

- Can only change # workers/preemptible VM's/labels/toggle graceful decommission
- Automatically reshards data for you
- gcloud dataproc clusters update [cluster_name] --num-workers [#] --num-preemptible-workers [#]



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Configure Dataproc Cluster

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Preemptible VM's on Dataproc:

- Excellent low-cost worker nodes
- Dataproc manages the entire leave/join process:
  - No need to configure startup/shutdown scripts
  - Just add PVM's...and that's it
- No assigned disks for HDFS (only disk for caching)
- Want a mix of standard + PVM worker nodes

Access your cluster:

- SSH into master - same as any compute engine instance
- gcloud compute ssh [master_node_name]

Access via web - 2 options:

- Open firewall ports to your network (8088, 9870)
- Use SOCKS proxy - does not expose firewall ports

port / Port

8088 : access to Hadoop cluster

9870 : Hadoop files

SOCKS proxy configuration:

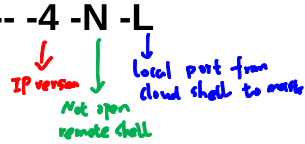
- SSH to master to enable port forwarding:
  - gcloud compute ssh *master-host-name* --project=*project-id* --zone=*master-host-zone* -- -D 1080 -N
- Open new terminal window - launch web browser with parameters (varies by OS/browser):
  - "/Applications/Google Chrome.app/Contents/MacOS/Google Chrome" --proxy-server="socks5://localhost:1080" --host-resolver-rules="MAP * 0.0.0.0 , EXCLUDE localhost" --user-data-dir=/tmp/*cluster1-m*
- Browse to http://[master]:port:
  - 8088 - Hadoop
  - 9870 - HDFS

exam

Using Cloud Shell (must use for each port):

- gcloud compute ssh *master-host-name* --project=*project-id* --zone *master-host-zone* -- -4 -N -L *port1*:*master-host-name*:*port2*
- Use Web Preview to choose port (8088/9870)

No exam



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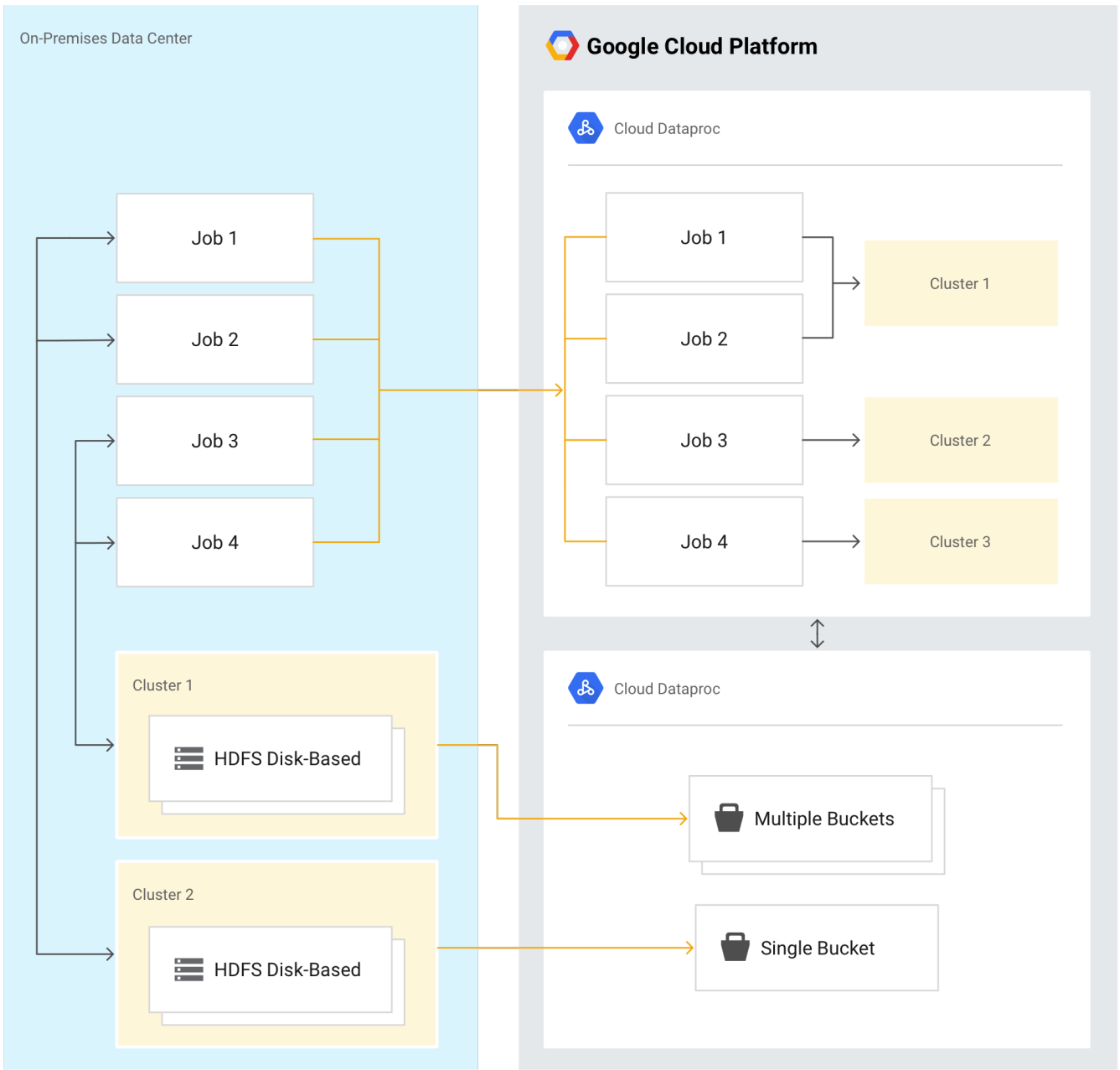
Migrating to Cloud Dataproc

What are we moving/optimizing?

- **Data (from HDFS)**
- **Jobs (pointing to Google Cloud locations)**
- **Treating clusters as ephemeral (temporary) rather than permanent entities**



Install Cloud Storage connector to connect to GCS (Google Cloud Storage).

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Migration Best Practices:

- Move data first (generally Cloud Storage buckets):
  - Possible exceptions:
    - Apache HBase data to Bigtable
    - Apache Impala to BigQuery
    - Can still choose to move to GCS if Bigtable/BQ features not needed
- Small-scale experimentation (proof of concept):
  - Use a subset of data to test
- Think of it in terms of ephemeral clusters
- Use GCP tools to optimize and save costs

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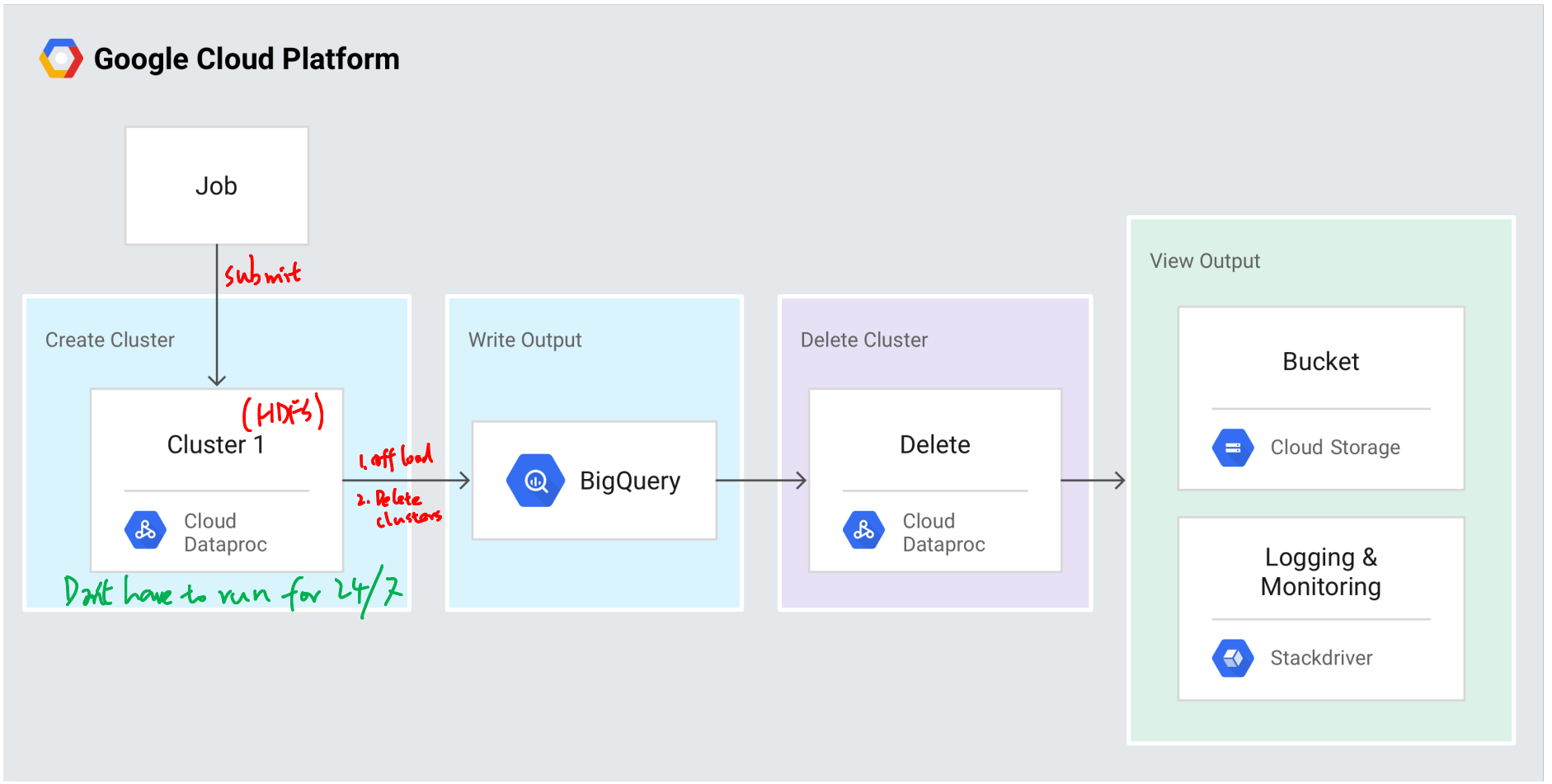
Optimize for the Cloud ("Lift and Leverage")

Separate storage and compute (cluster):

- **Save on costs:**
  - **No need to keep clusters to keep/access data**
- **Simplify workloads:**
  - **No shaping workloads to fit hardware**
  - **Simplify storage capacity**
- **HDFS --> Google Cloud Storage**
- **Hive --> BigQuery**
- **HBase --> Bigtable**



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exam topic: How to ...

Converting from HDFS to Google Cloud Storage:

1. Copy data to GCS:
   - Install connector or copy manually for on-prem
2. Update file prefix in scripts:
   - From **hdfs://** to **gs://**
3. Use Dataproc, and run against/output to GCS

The end goal should be to eventually move toward a cloud-native and serverless architecture (Dataflow, BigQuery, etc.).

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Best Practices for Cluster Performance

Dataproc Performance Optimization

exam topic

(GCP-specific)

- Keep data close to your cluster
  - Place Dataproc cluster in the same region as storage bucket

multi-region ~~single region~~

- Larger persistent disk = better performance
  - Consider using SSD over HDD – slightly higher cost
- Allocate more VM's
  - Use preemptible VM's to save on costs

however, More VM's will come at a higher cost than larger disks if more disk throughput is needed