Making Data Pipelines easy

With Dataproc and Composer

Julian Joseph, Feb 15, 2023

Analytics Vidhya

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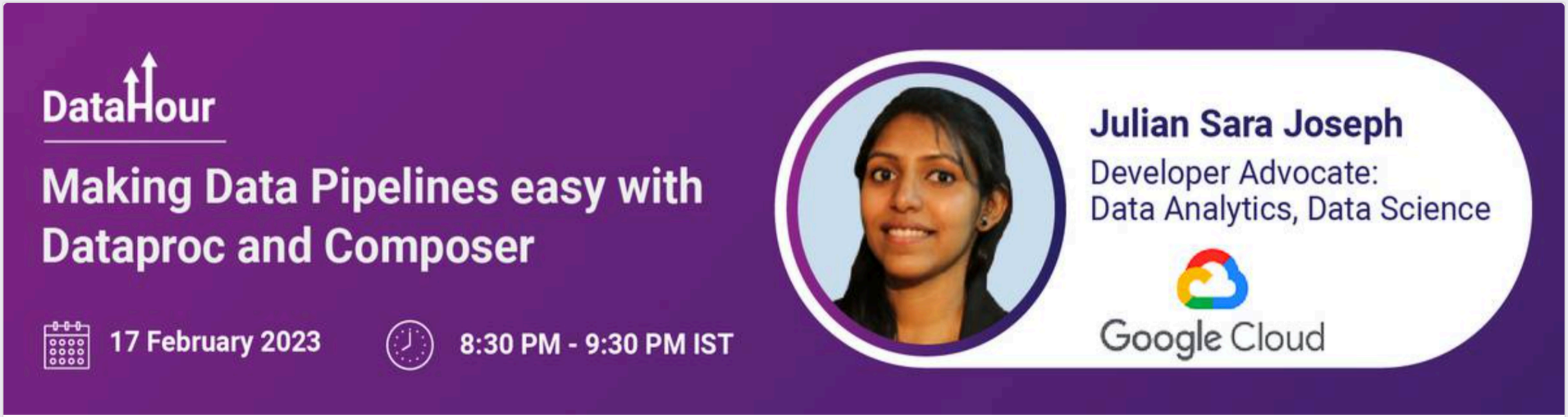

DataHour: Making Data Pipelines Easy with Dataproc and Composer

Online 17-02-2023 08:30 PM to 17-02-2023 09:30 PM

4303
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Knowledge and Learning.
Prizes

STARTS IN

16 HOURS 33 MIN 5 SEC

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In this session

Topics

- Dataproc
  - Personal Story
  - Intro to Dataproc
  - Serverless Spark
  - Demo on Serverless Spark
- Composer
  - Dags and operators
  - Demo - Composer for Dataproc Serverless workloads
- Q&A

A walk down memory lane

Startup

- 2016
  - Data Engineer in a small product team
  - Our client was in retail and the Data was in TBs and it was sent weekly.
  - ETL - It was our job to create deltas and make aggregates before storing the data for our DS team
- 2018
  - 2nd Client - Data was in PBs
  - Our spark jobs needed varying levels of compute power
  - Still manually triggering cron jobs weekly to start the spark jobs

Cron jobs

```
  GNU nano 4.8                                  /etc/crontab
SHELL=/bin/sh
PATH=/usr/local/sbin:/usr/local/bin:/sbin:/bin:/usr/sbin:/usr/bin

# Example of job definition:
# .---------------- minute (0 - 59)
# |  .------------- hour (0 - 23)
# |  |  .---------- day of month (1 - 31)
# |  |  |  .------- month (1 - 12) OR jan,feb,mar,apr ...
# |  |  |  |  .---- day of week (0 - 6) (Sunday=0 or 7) OR sun,mon,tue,wed,thu,fri,sat
# |  |  |  |  |
# *  *  *  *  * user-name command to be executed
17 *    * * *   root    cd / && run-parts --report /etc/cron.hourly
25 6    * * *   root    test -x /usr/sbin/anacron || ( cd / && run-parts --report /etc/cron.daily )
47 6    * * 7   root    test -x /usr/sbin/anacron || ( cd / && run-parts --report /etc/cron.weekly )
52 6    1 * *   root    test -x /usr/sbin/anacron || ( cd / && run-parts --report /etc/cron.monthly>

^G Get Help  ^O Write Out  ^W Where Is  ^K Cut Text  ^J Justify  ^C Cur Pos  M-U Undo
^X Exit      ^R Read File  ^\ Replace   ^U Paste Text ^T To Spell ^  Go To Line M-E Redo
```

We needed

Break down business problems into actionable items

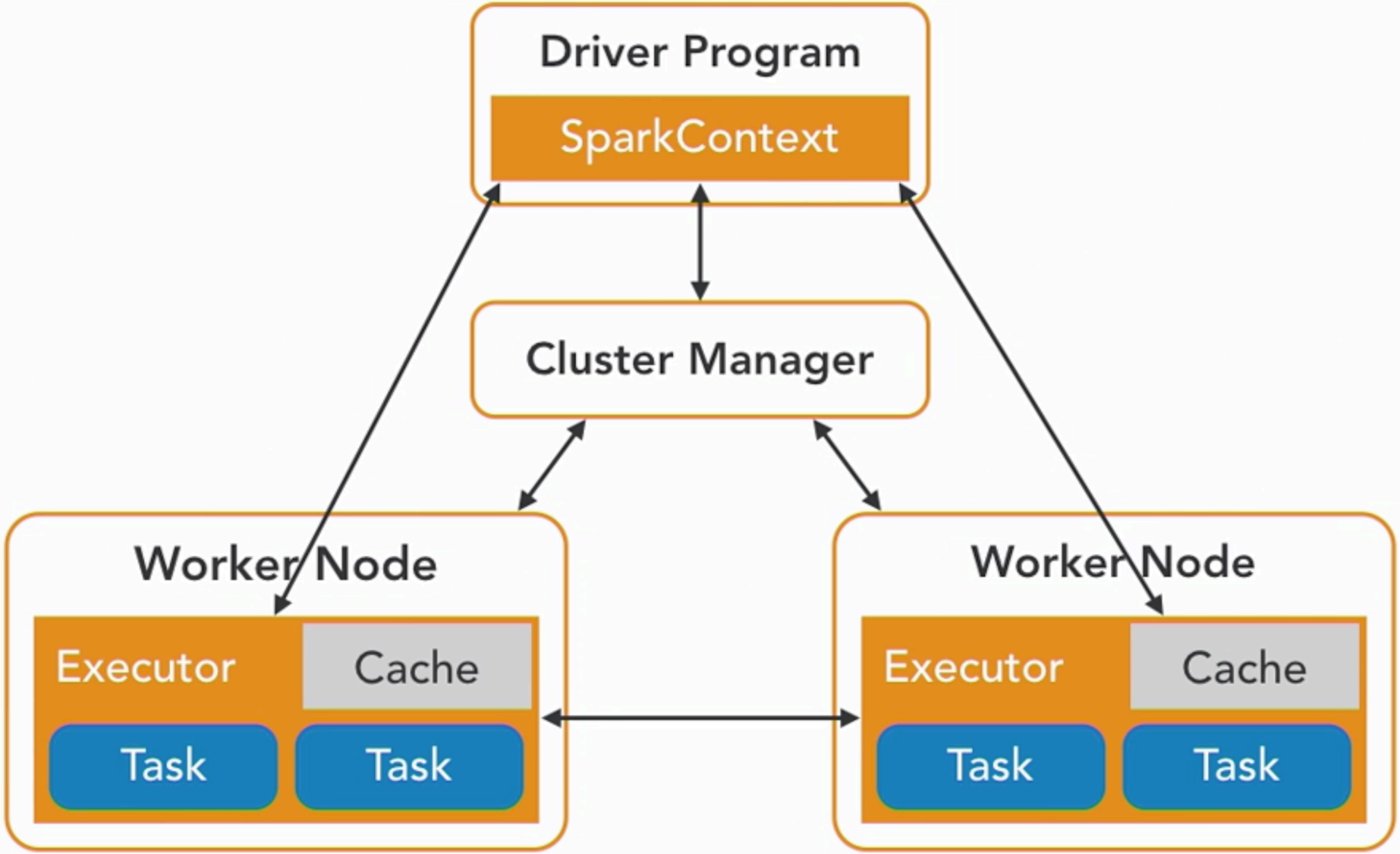
- Auto scaling clusters/nodes + Cost effective (Small budget team) - ??
- Automation of our cron jobs -??

Why Spark

Data Pipelines were working just fine with HDFS right?

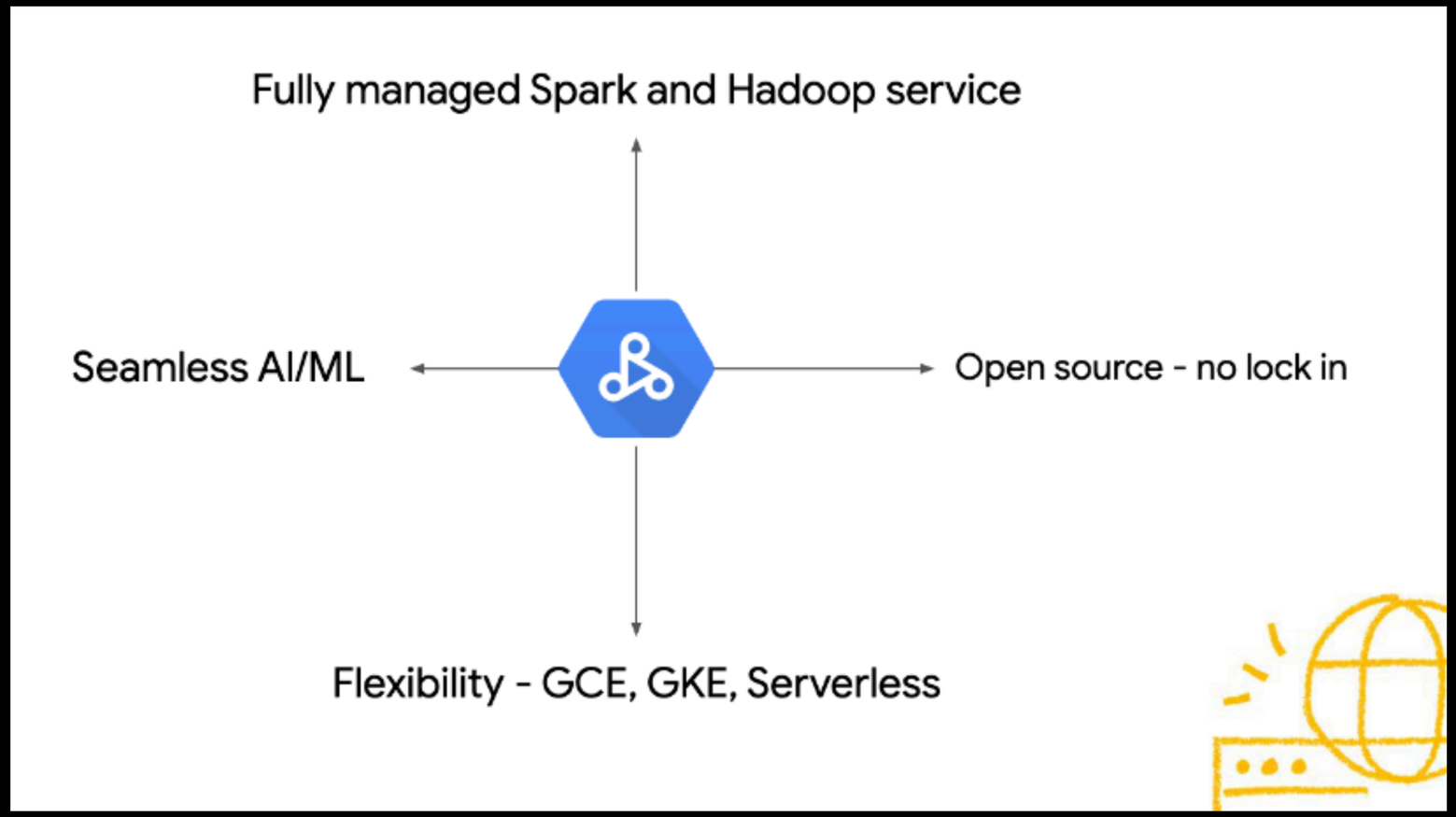
- In 2004 - MapReduce Algorithm was released
- In 2006 - Hadoop based on MapReduce was released
- In 2009 - UC Berkely developed Spark - Given to Apache Software Foundation
- Chief difference - Spark and MapReduce - Spark processes and keeps data in memory for all subsequent steps - without writing to or reading from disk!

Spark Components



Enter Dataproc on Google Cloud

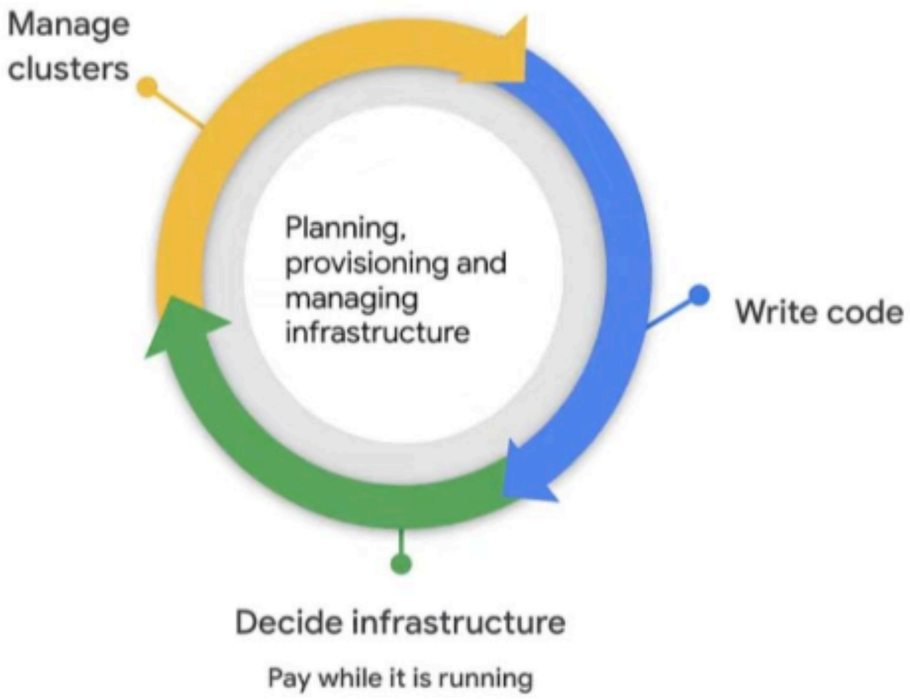
Or EMR on AWS



Demo time - Dataproc Cluster Intro - Swipe


Google Cloud Platform
Low Cost
Low Rate & Billed By The Minute
Less Waiting
Clusters Start & Stop in < 90 Sec
Minimal Ops
We Manage Spark and Hadoop
Higher Scale & Productivity
Lower Cost & Complexity
Google Cloud Dataproc
Easier To Use
Manage Jobs With Easy Tools
Up To Date
Recent Spark and Hadoop Releases
Cloud Native
Integrated w/ Google Cloud Products

What's better than Dataproc ? Serverless Spark!



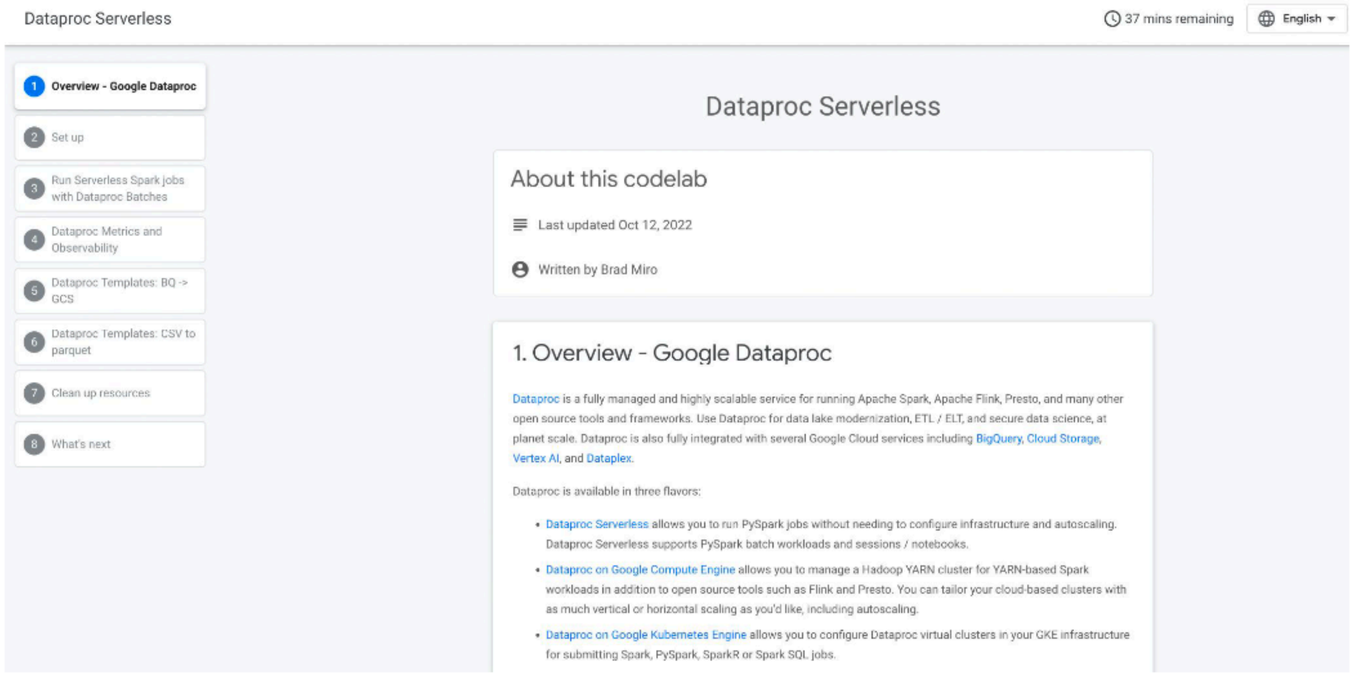
- ✓ Job auto-scales
- ✓ No infrastructure to tune
- No clusters to manage
- Only pay for the job duration

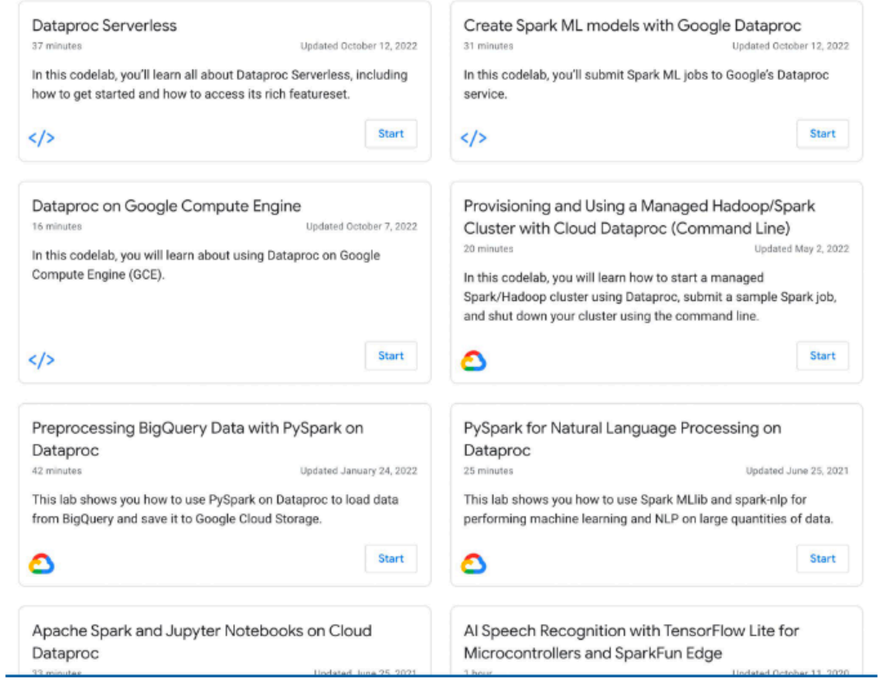
Focus on Spark, not infrastructure

Dataproc serverless demo - Swipe

Dive deeper with codelabs

Head over to g.co/codelabs/dataproc-serverless to gain hands-on experience

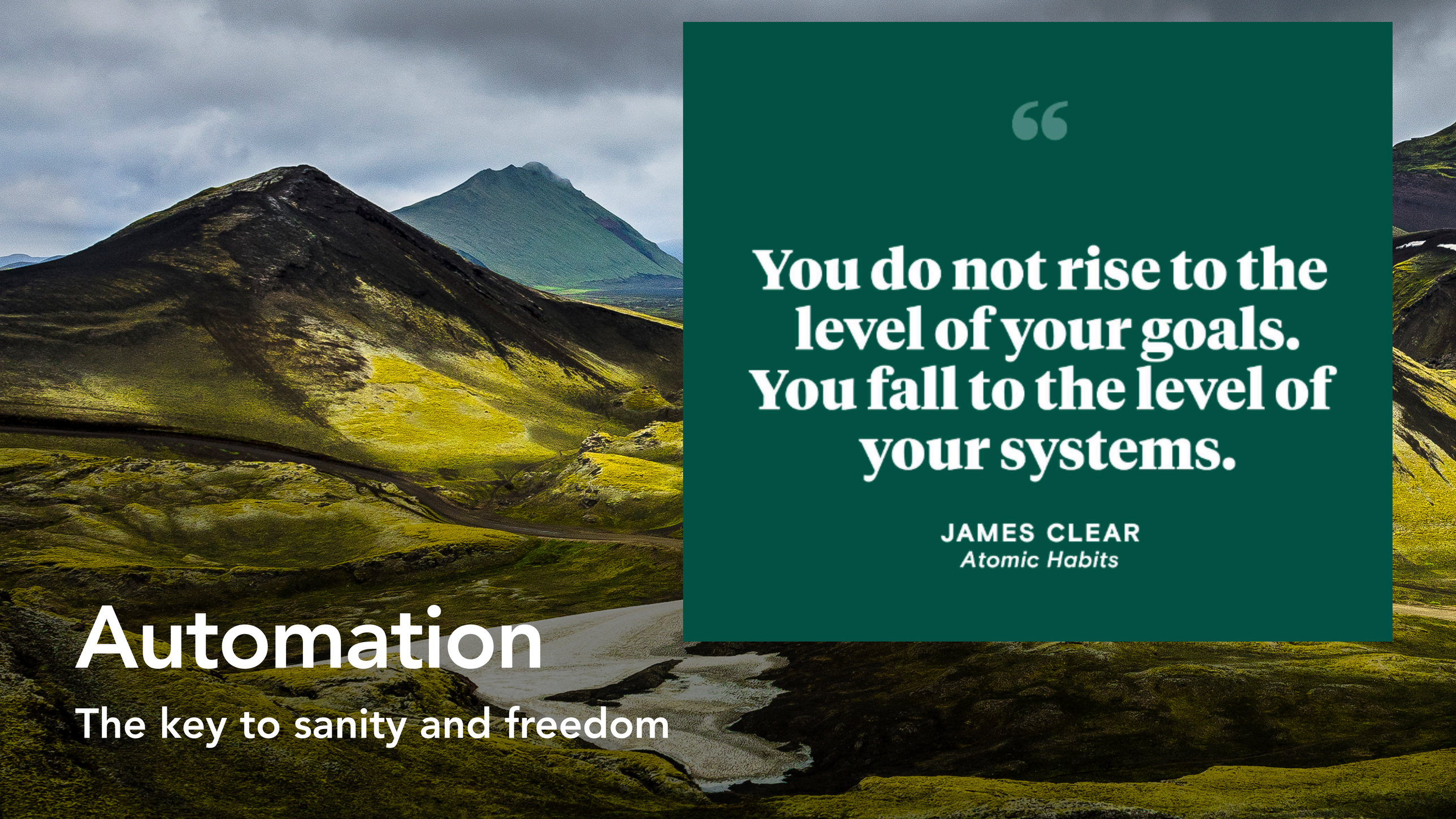




We needed

Break down business problems into actionable items

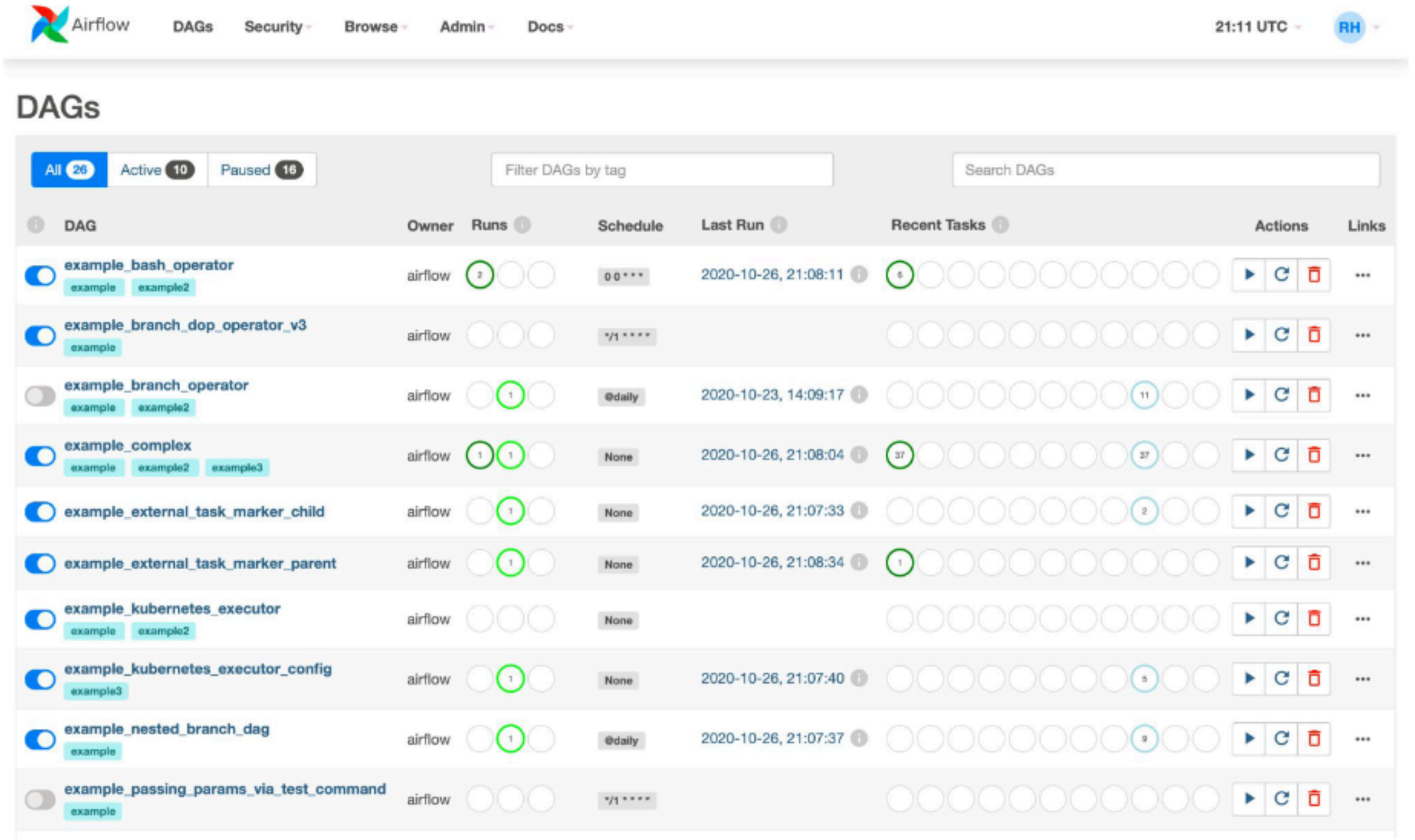
- Auto scaling clusters/nodes + Cost effective (Small budget team)
  - Dataproc and Dataproc Serverless
- Automation of our cron jobs
  - ??



Automation

The key to sanity and freedom

Enter Airflow



I wish I knew of this in 2016

DAGs

What are they ?

what we will look for in the airflow DAG list

```
with DAG(
    "my_dag_name", start_date=pendulum.datetime(2021, 1, 1, tz="UTC"),
    schedule_interval="@daily", catchup=False
) as dag:
    op = EmptyOperator(task_id="task")
```

Any operator can be used

DAGs

```python
"""Example DAG demonstrating the usage of the BashOperator."""

import datetime
from airflow import DAG
from airflow.operators.bash import BashOperator

with DAG(
    dag_id='GCS_BQ_bash_operator',
    schedule_interval='0 0 * * *',
    start_date=datetime.datetime(2022, 8, 18),
    dagrun_timeout=datetime.timedelta(minutes=60),
    tags=['gcs', 'bq'],
) as dag:
    run_this_1 = BashOperator(
        task_id='run_first',
        bash_command='bq mk mydataset',
    )
    run_this_2 = BashOperator(
        task_id='run_after',
        bash_command='bq load --autodetect --source_format=CSV mydataset.mytable gs://bucket_name/table_name.xls',
    )

    run_this_3 = BashOperator(
        task_id='run_last_for_cleanup',
        bash_command='bq rm airflowTPCH',
    )

    run_this_1 >> run_this_2 >> run_this_3

if __name__ == "__main__":
    dag.cli()
```

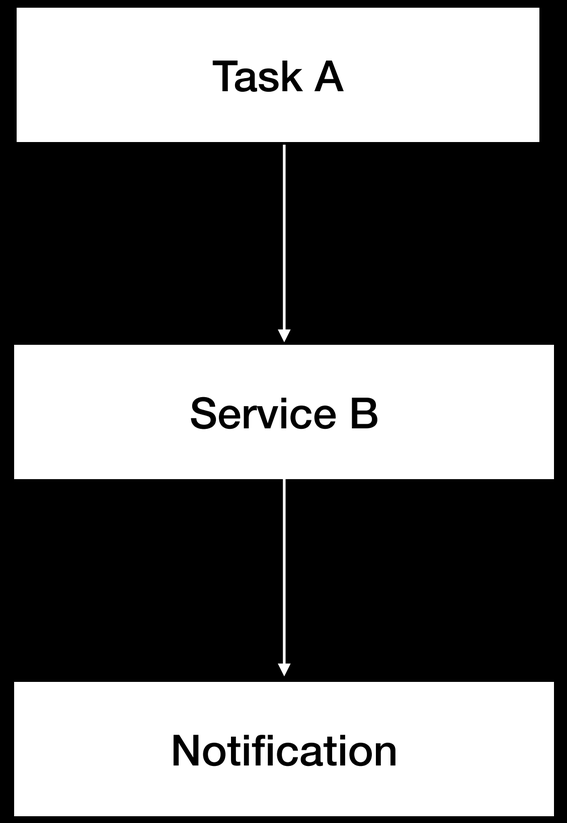
Tasks
Happy flow

1. No status (scheduler created empty task instance)
2. Scheduled (scheduler determined task instance needs to run)
3. Queued (scheduler sent task to executor to run on the queue)
4. Running (worker picked up a task and is now running it)
5. Success (task completed)

```python
with DAG('my_dag', start_date=datetime(2016, 1, 1)) as dag:
    task_1 = DummyOperator('task_1')
    task_2 = DummyOperator('task_2')
    task_1 >> task_2 # Define dependencies
```

Composer

- Why
- Under the hood
- Dataproc Operators demo



Why Composer

Did someone say multi-cloud?

- Managed Airflow
- Focus on your workflows and not your infrastructure
- Since its based on open-source framework your workflows can be multi-cloud and/or on-prem
- Uses Python - so no new lang

Under the hood

- Airflow workers are executed on GKE clusters
- Airflow metadata is stored on Cloud SQL
- Airflow Webserver runs as an App Engine Flex which is protected by an Identity Aware Proxy

Composer | Environments | CREATE | DELETE

Filter | Filter environments

Name	Location	Composer version	Airflow version	Creation time	Update time	Airflow webserver	DAG list NEW	Logs	DAGs folder	Labels
testing-bq	us-central1	2.0.23	2.2.5	8/18/22, 12:12 PM	8/18/22, 12:12 PM	None	DAGs	Logs	None	None

Airflow webserver	DAG list NEW	Logs	DAGs folder	Labels
Airflow	DAGs	Logs	DAGs	None

Go here to see the airflow dashboard

Add your DAG python file in this folder

Dataproc - Composer demo - Swipe

Recap

Solutions we found for our problems

- Auto scaling clusters/nodes + Cost effective (Small budget team)
  - Dataproc
- Automation of our cron jobs
  - Composer

Further reading

- jsj14.medium.com
- Composer codelabs
- Documentation

Thank you

Please take 3 seconds to fill a feedback form for me - bit.ly/julian-feedback

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- justjulian14 
- juliansarajoseph

Be smarter and less scared of complex things.