Google Developer Student Clubs

Power of Cloud to Connect Your Community

#TechforGoodWorkshop

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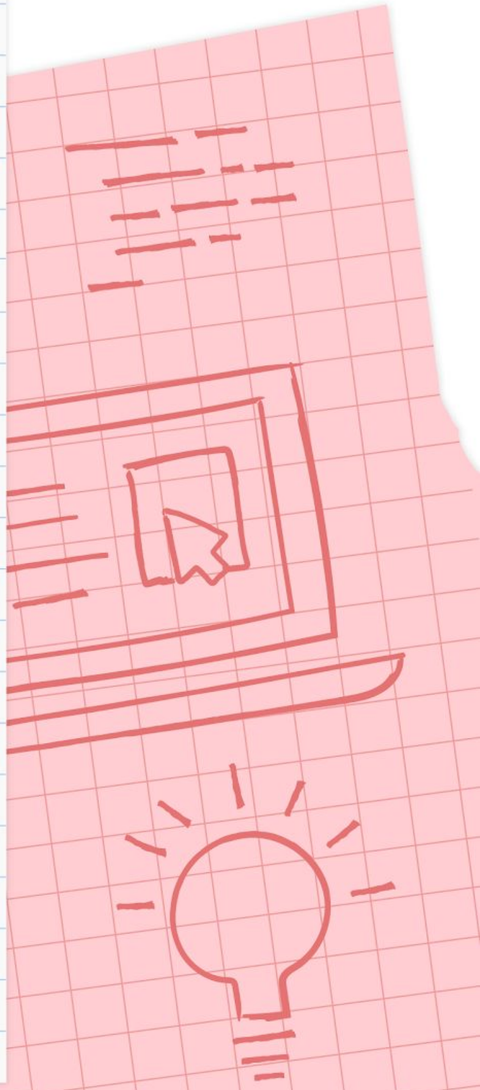
Jae Ho Lee

Jia Wei Lee



#TechforGood Workshops & Fireside Chats

Dec 2021

Digital Trends: From Pandemic to Endemic Fireside Chat
15 Dec (7:00 PM)

Power of Cloud to Connect Your Community Workshop
22 Dec (8:00 PM)

Jan 2022

Portfolio Website in 2 Hours Workshop
12 Jan (8:00 PM)

Hey Google! Teach me Computer Vision! Workshop
18 Jan (8:00 PM)

Second Fireside Chat
19 Jan (7:00 PM)

Jan 2022

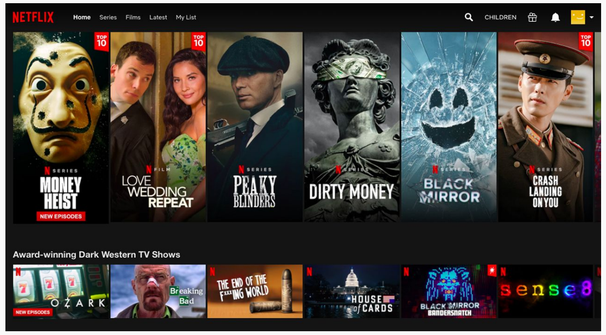
Hey Google! Tell me about Natural Language Processing! Workshop
26 Jan (8:00 PM)

#TechforGood

Google Developer Student Clubs


SPEAK UP
SPEAK UP
SPEAK UP
SPEAK UP
SPEAK UP
IT'S TIME TO
SPEAK UP
SPEAK UP
SPEAK UP
SPEAK UP
SPEAK UP
SPEAK UP

What is Cloud?



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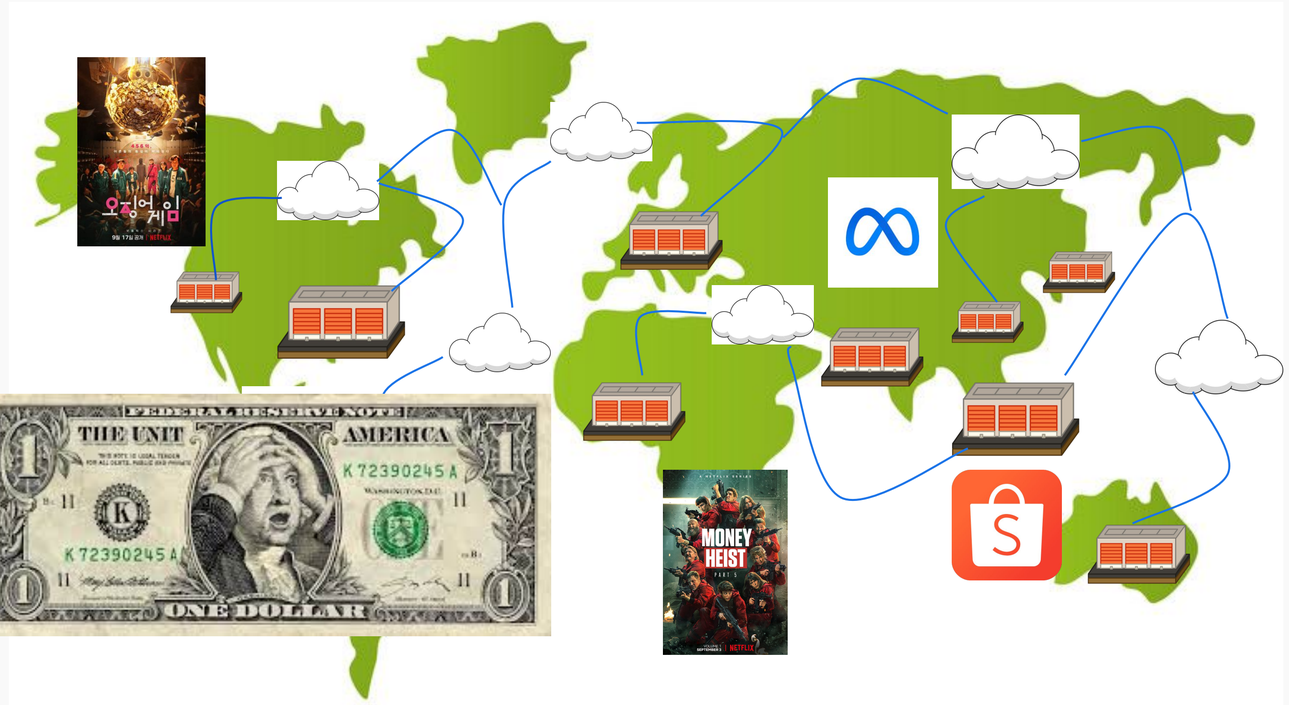

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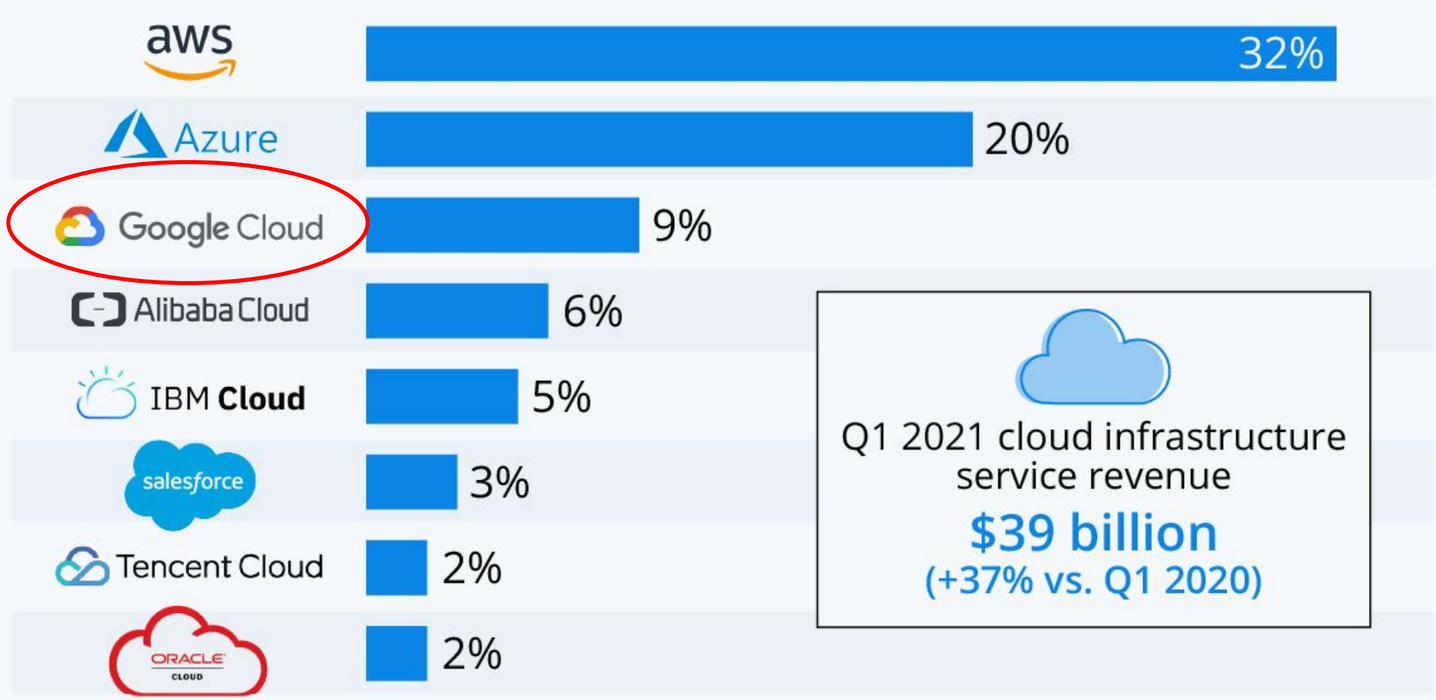
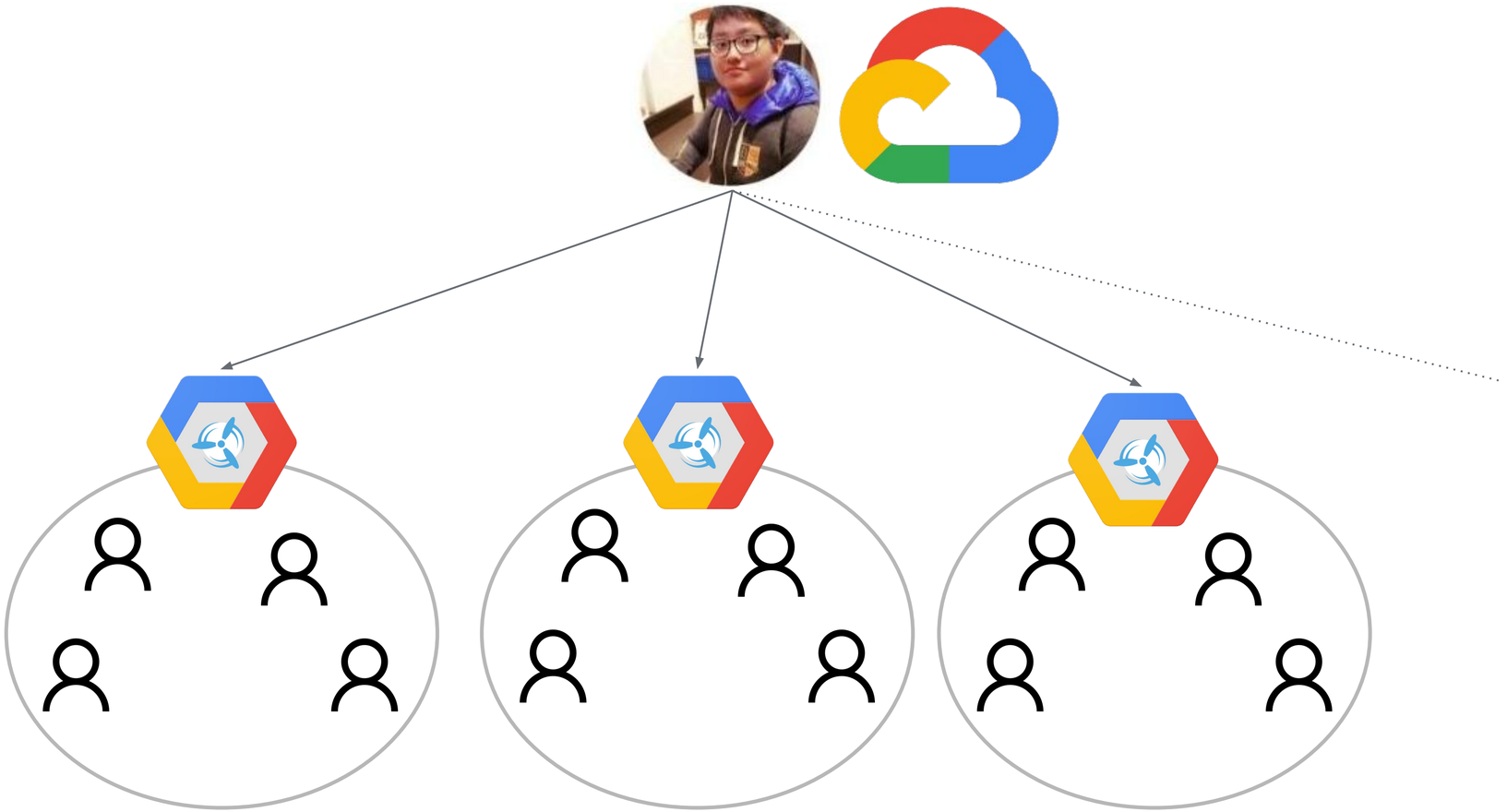


Google Cloud Project (GCP)



Follow our steps closely!!! Be considerate! Let's make this experience enjoyable for everyone!


Let’s go to
Google Cloud
Console!

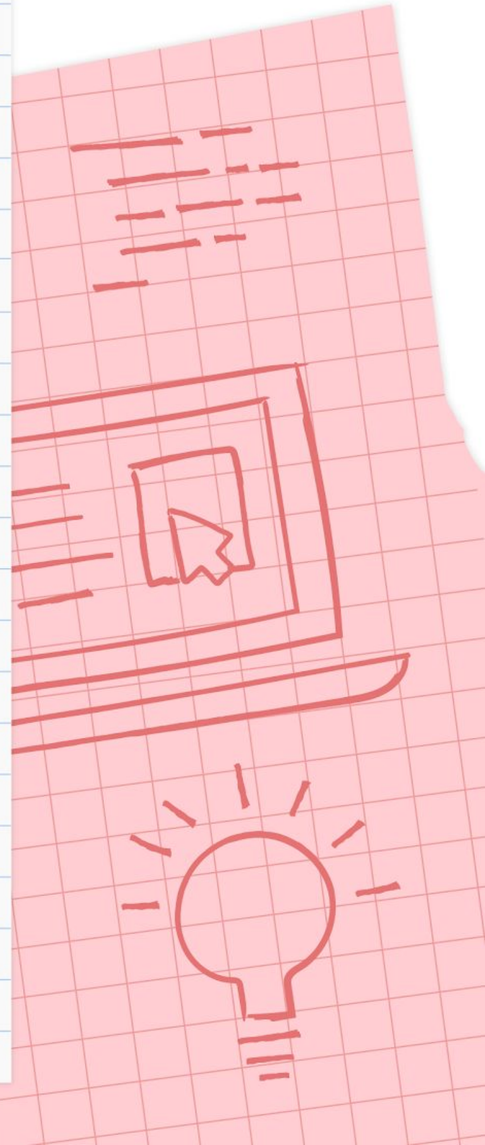
Workshop Flow

- Virtual Machines (VM)
- Docker
- Google Firestore and Storage
- Kubernetes
- Stackdriver Monitoring

Resources

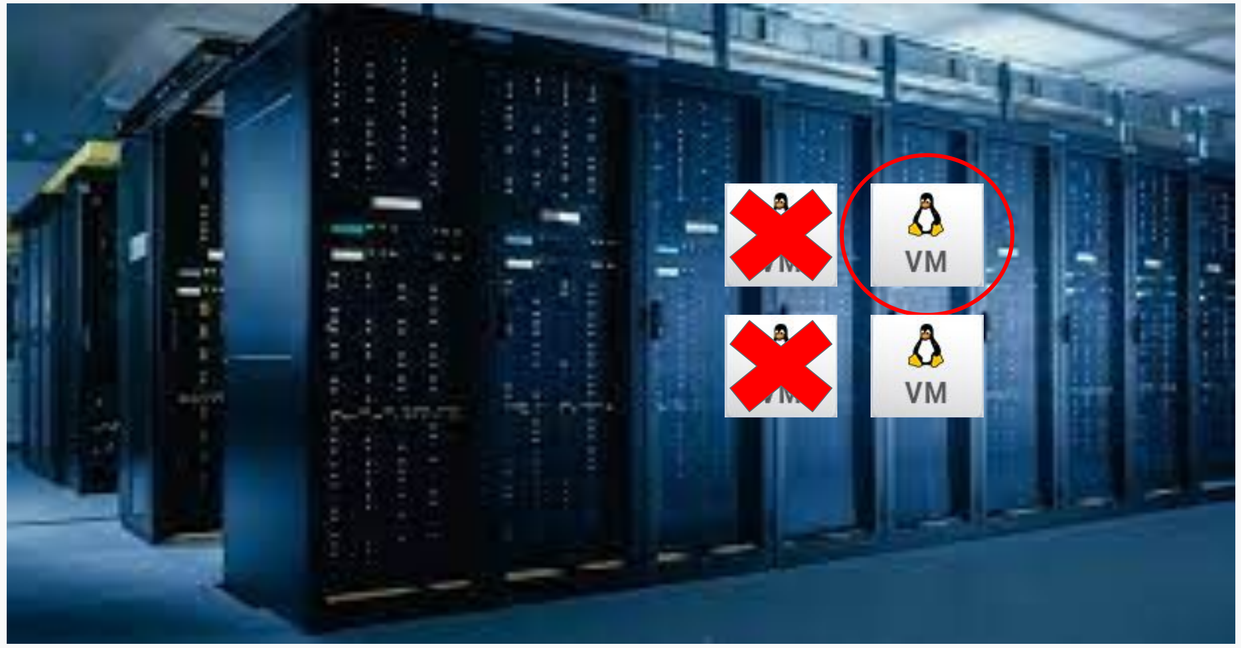
Slides:
https://tinyurl.com/DSCWorkshopCloudSlides

Github Repo:
https://github.com/GDSC-NUS/Cloud_Workshop_Repo



What is VM?

It is just like your computer!



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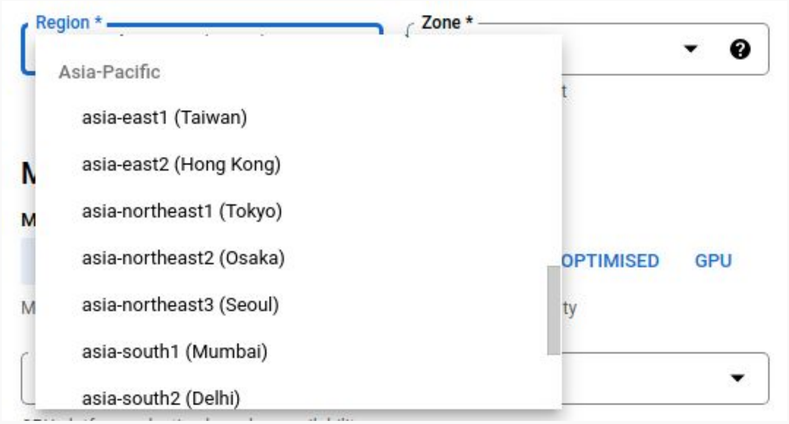
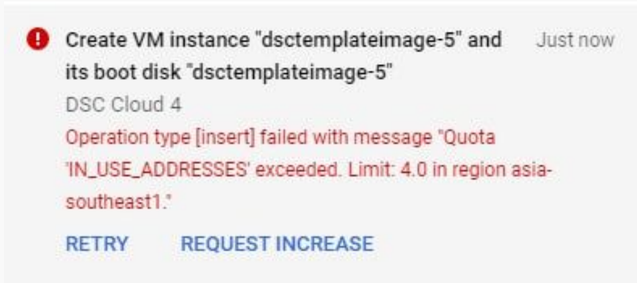
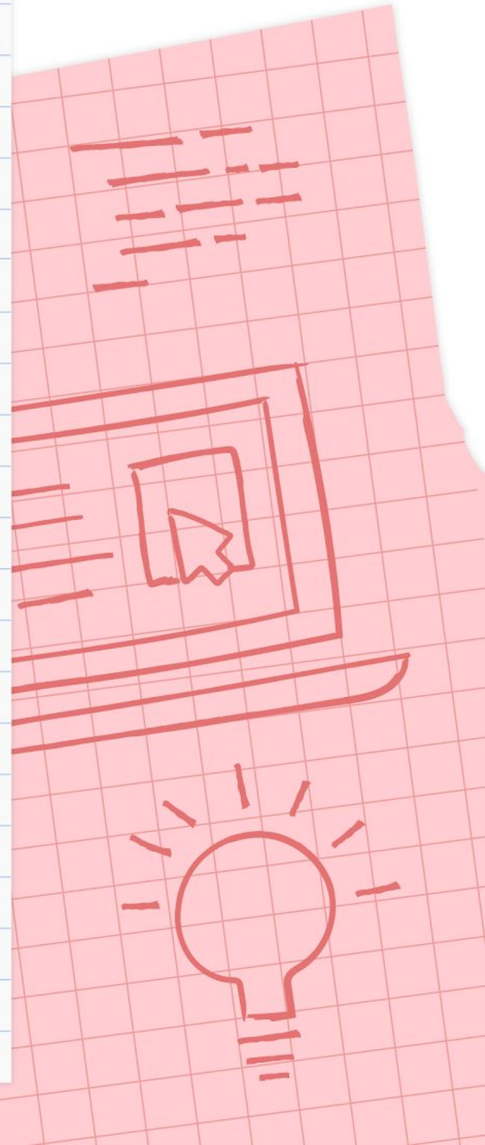
VM Region

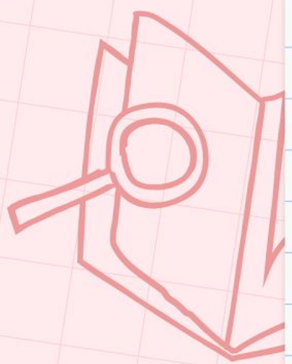
Try to choose a **unique region!**



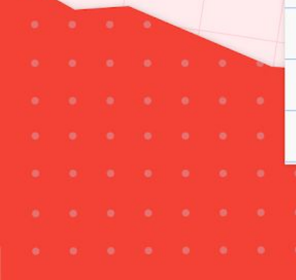


With free trial account, you **cannot have more than 4 VMs** with the **same region**

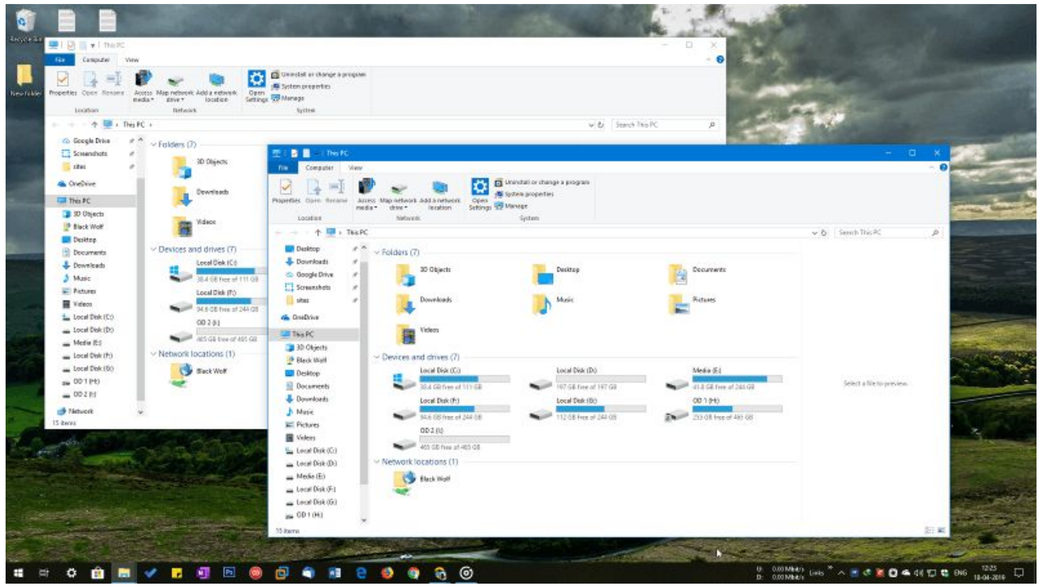




Let’s go
create a VM!



Graphical User Interface (GUI) vs Command Line Interface (CLI)



```
[root@localhost ~]# ping -q fa.wikipedia.org
PING text.pmtpa.wikimedia.org (208.80.152.2) 56(84) bytes of data.
^C
--- text.pmtpa.wikimedia.org ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 540.528/540.528/540.528/0.000 ms
[root@localhost ~]# pwd
/root
[root@localhost ~]# cd /var
[root@localhost var]# ls -la
total 72
drwxr-xr-x. 18 root root 4096 Jul 30 22:43 .
drwxr-xr-x. 23 root root 4096 Sep 14 20:42 ..
drwxr-xr-x.  2 root root 4096 May 14 00:15 account
drwxr-xr-x. 11 root root 4096 Jul 31 22:26 cache
drwxr-xr-x.  3 root root 4096 May 18 16:03 db
drwxr-xr-x.  3 root root 4096 May 18 16:03 empty
drwxr-xr-x.  2 root root 4096 May 18 16:03 games
drwxrwx--T.  2 root gdm  4096 Jun  2 18:39 gdm
drwxr-xr-x. 38 root root 4096 May 18 16:03 lib
drwxr-xr-x.  2 root root 4096 May 18 16:03 local
lrwxrwxrwx.  1 root root   11 May 14 00:12 lock -> ../run/lock
drwxr-xr-x. 14 root root 4096 Sep 14 20:42 log
lrwxrwxrwx.  1 root root   10 Jul 30 22:43 mail -> spool/mail
drwxr-xr-x.  2 root root 4096 May 18 16:03 nis
drwxr-xr-x.  2 root root 4096 May 18 16:03 opt
drwxr-xr-x.  2 root root 4096 May 18 16:03 preserve
drwxr-xr-x.  2 root root 4096 Jul  1 22:11 report
lrwxrwxrwx.  1 root root    6 May 14 00:12 run -> ../run
drwxr-xr-x. 14 root root 4096 May 18 16:03 spool
drwxrwxrwt.  4 root root 4096 Sep 12 23:50 tmp
drwxr-xr-x.  2 root root 4096 May 18 16:03 yp
[root@localhost var]# yum search wiki
Loaded plugins: langpacks, presto, refresh-packagekit, remove-with-leaves
rpmfusion-free-updates                                   | 2.7 kB     00:00
rpmfusion-free-updates/primary_db                        | 206 kB     00:04
rpmfusion-nonfree-updates                                | 2.7 kB     00:00
updates/metalink                                         | 5.9 kB     00:00
updates                                                  | 4.7 kB     00:00
updates/primary_db                    73% [==========          ]  62 kB/s | 2.6 MB     00:15 ETA
```

Terminal

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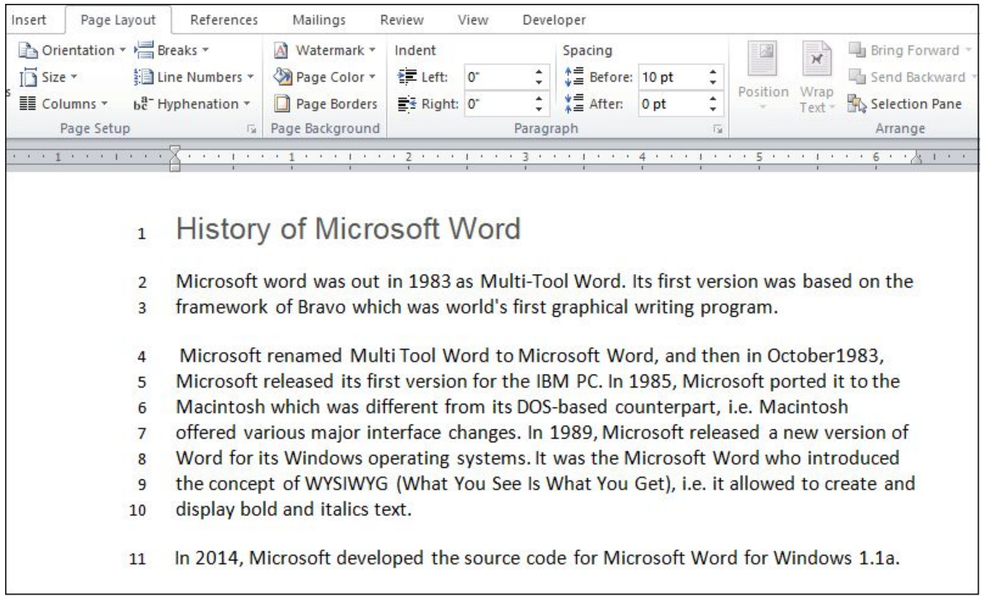
Commands

ls	List all your files in the current directory
mkdir *[folder]*	Create a new folder
rmdir *[folder]*	Remove a folder
cd *[folder]*	Go into a folder
cd ..	Go back out of a folder
pwd	Print out current directory

Word Document vs Vi Editor




```
" Vim syntax support file
" Maintainer:   Bram Moolenaar <Bram@vim.org>
" Last Change:  2001 Sep 12

" This file sets up the default methods for highlighting.
" It is loaded from "synload.vim" and from Vim for ":syntax reset".
" Also used from init_highlight().

if !exists("syntax_cmd") || syntax_cmd == "on"
  " ":syntax on" works like in Vim 5.7: set colors but keep links
  command -nargs=* SynColor hi <args>
  command -nargs=* SynLink hi link <args>
else
  if syntax_cmd == "enable"
    " ":syntax enable" keeps any existing colors
    command -nargs=* SynColor hi def <args>
    command -nargs=* SynLink hi def link <args>
  elseif syntax_cmd == "reset"
    " ":syntax reset" resets all colors to the default
    command -nargs=* SynColor hi <args>
    command -nargs=* SynLink hi! link <args>
  else
```

vi *[filename]*	Create/edit a text editor

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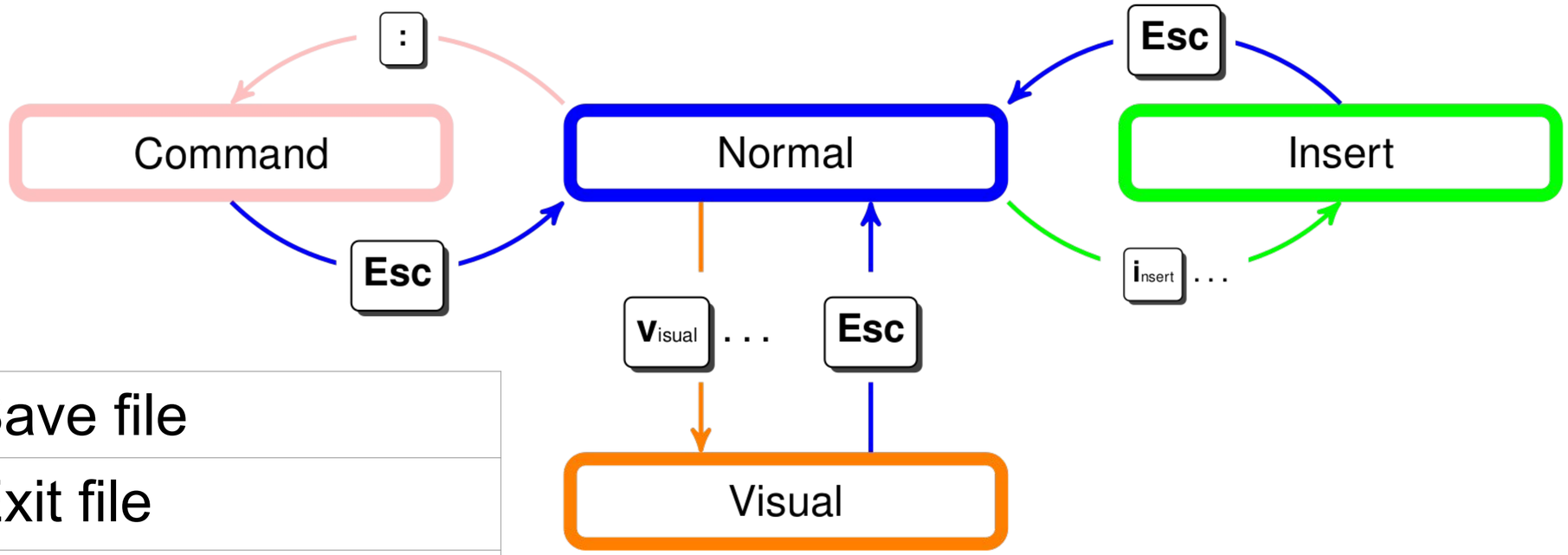
Vi Modes



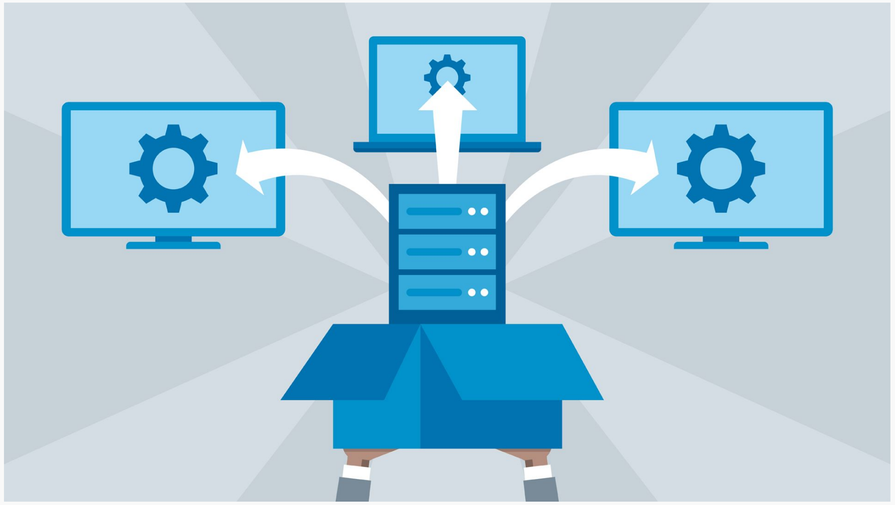
:w	Save file
:q	Exit file
:wq	Save and exit file

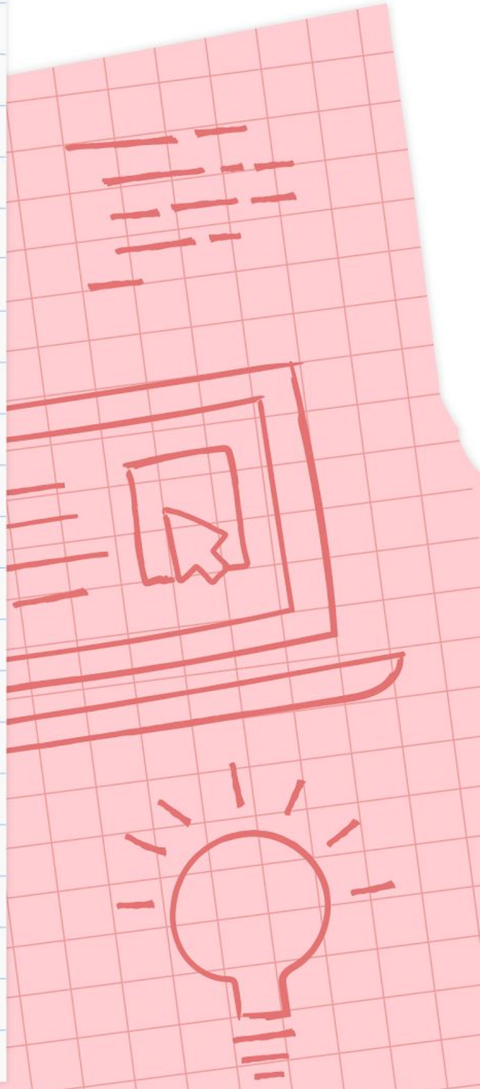
More Commands...

cat *[filename]*	Print out the text file content
[click on tab]	Autocomplete
mv *[file loc] [new loc]*	Move a file
rm *[filename]*	Remove a file
clear	Erase past codes out of view
exit	Close the terminal

What is deployment?

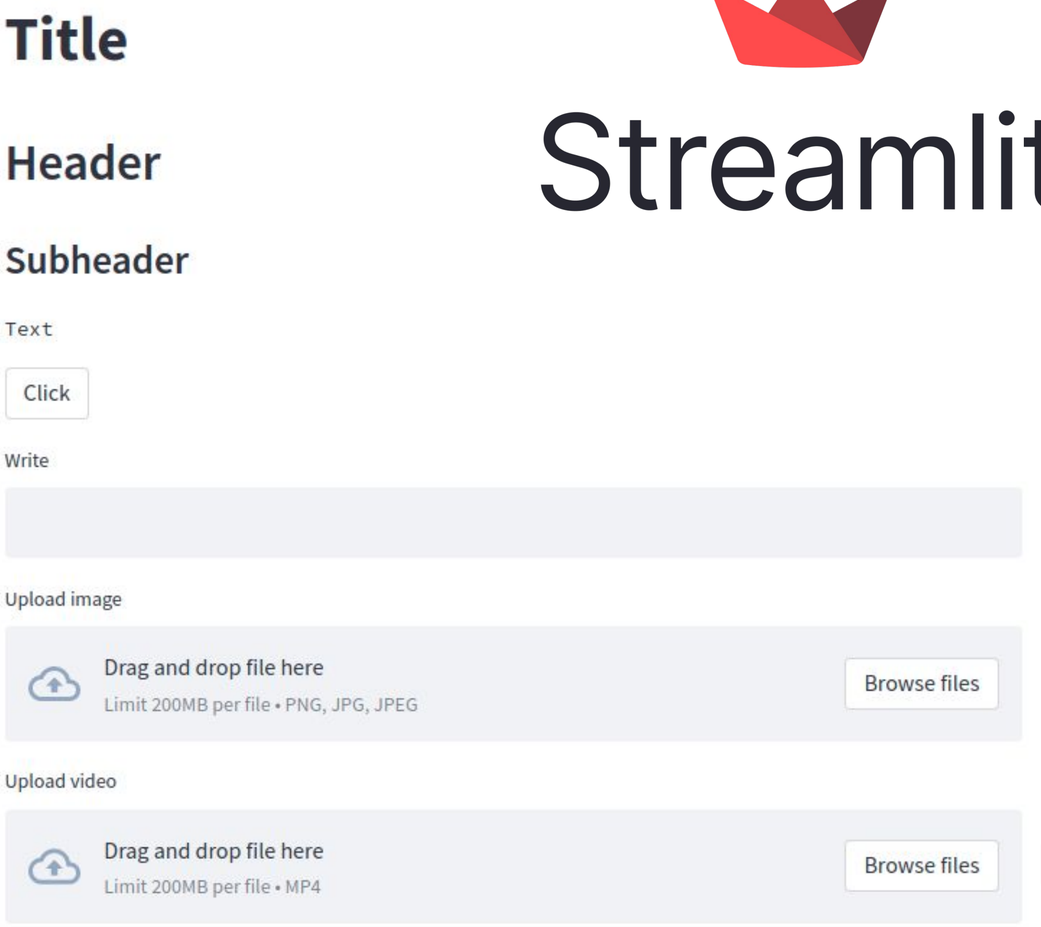
Moving your work to the **live** environment, where **real users** can access your service





Streamlit

```python
#!/usr/bin/env python3
import streamlit as st
from PIL import Image

st.title("Title")
st.header("Header")
st.subheader("Subheader")
st.text("Text")

# button
clicked = st.button("Click")
if clicked:
    st.write("Button clicked")

# text input
text = st.text_input("Write")
if text:
    st.write("You typed {}".format(text))

# image file uploader
photo = st.file_uploader("Upload image", ["png", "jpg", "jpeg"])
if photo != None:
    image = Image.open(photo)
    st.image(image)

# video file uploader
video = st.file_uploader("Upload video", ["mp4"])
if video != None:
    st.video(video)

# https://docs.streamlit.io/library/api-reference
```



Streamlit

streamlit run *[filename]*

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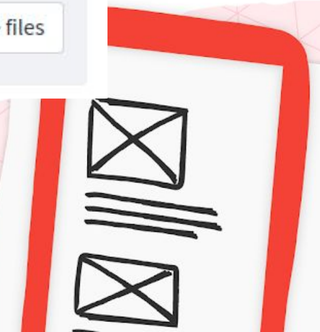

Let’s deploy a website!

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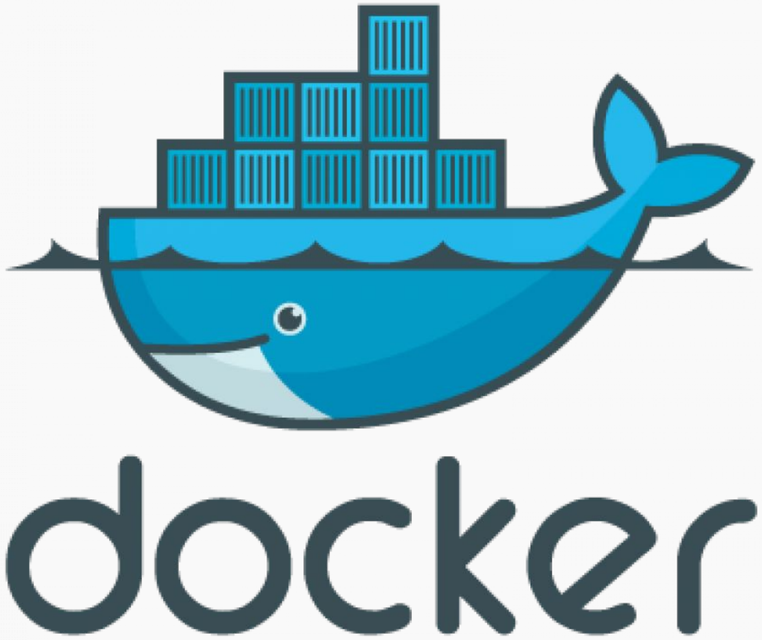
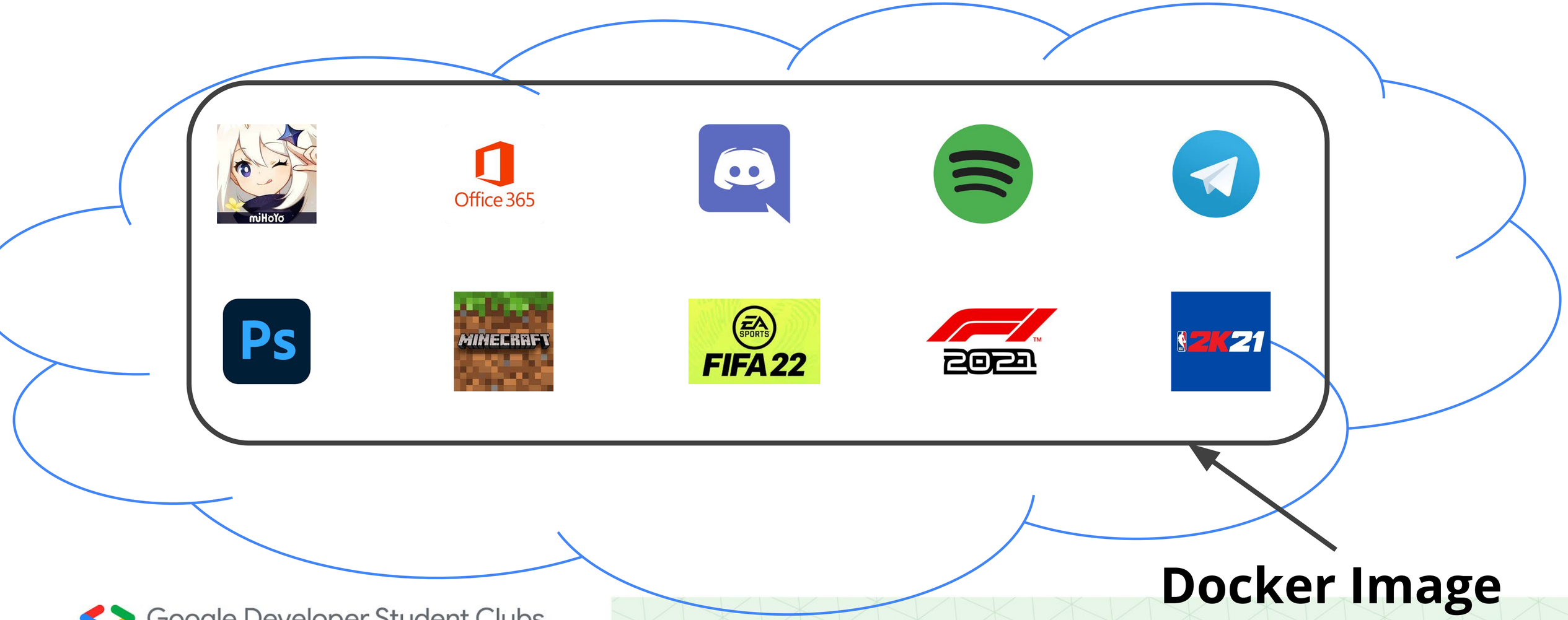
Docker and Container



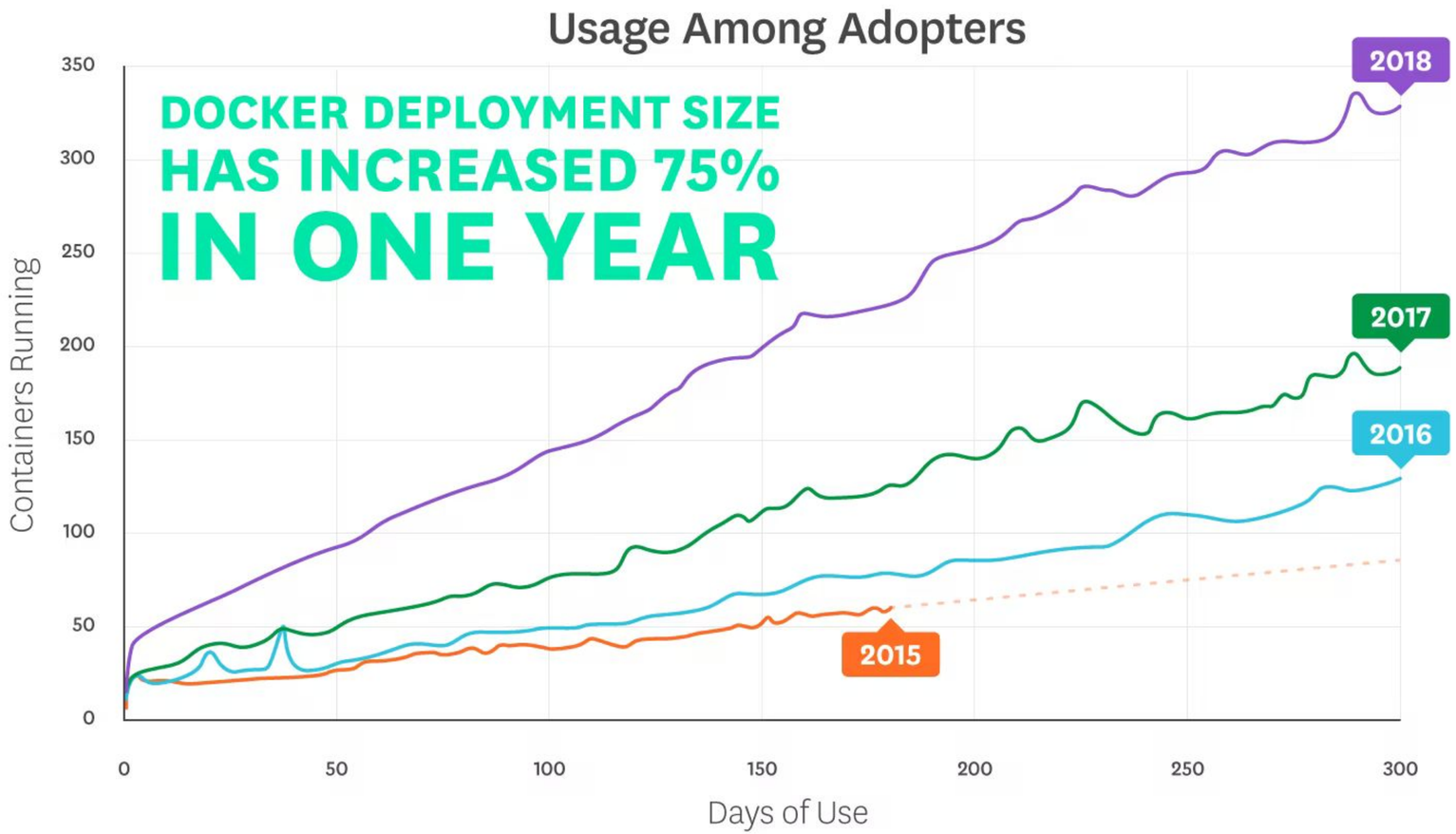
What is a container?

Computer

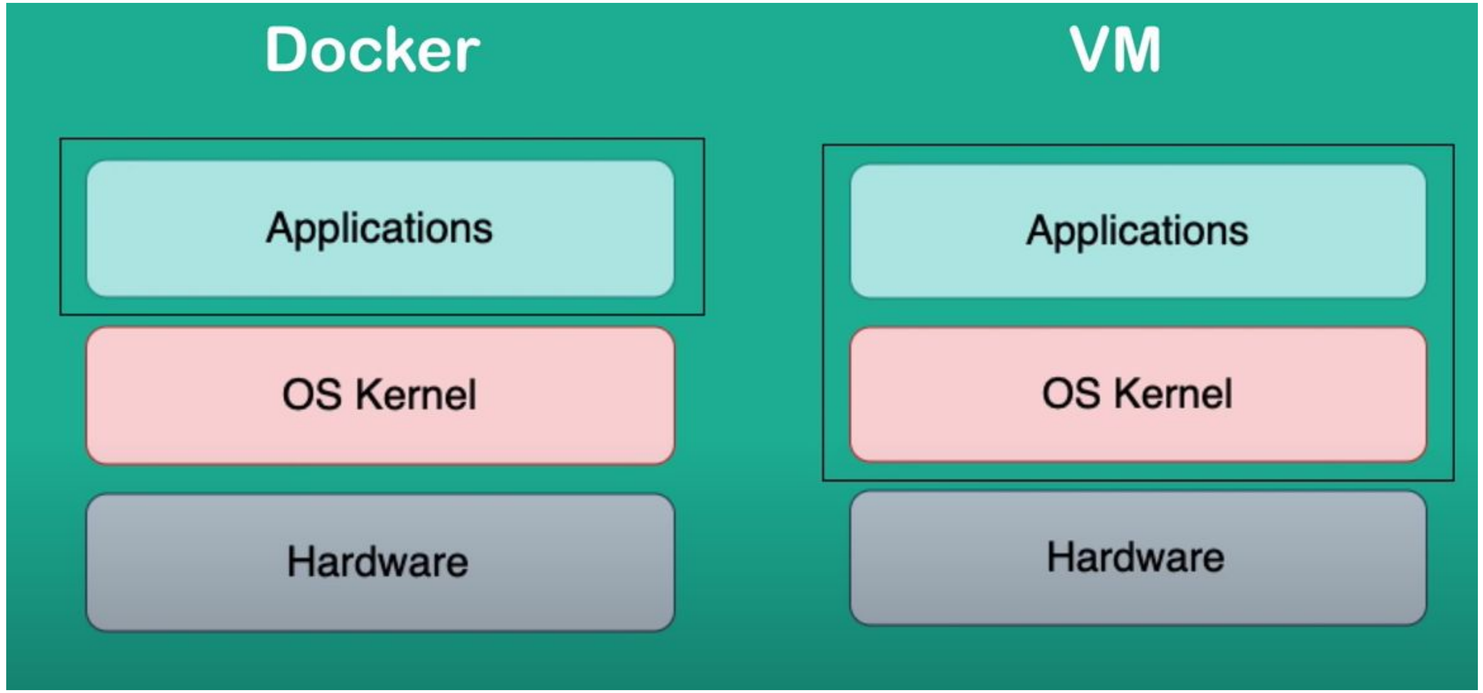
What is a container?



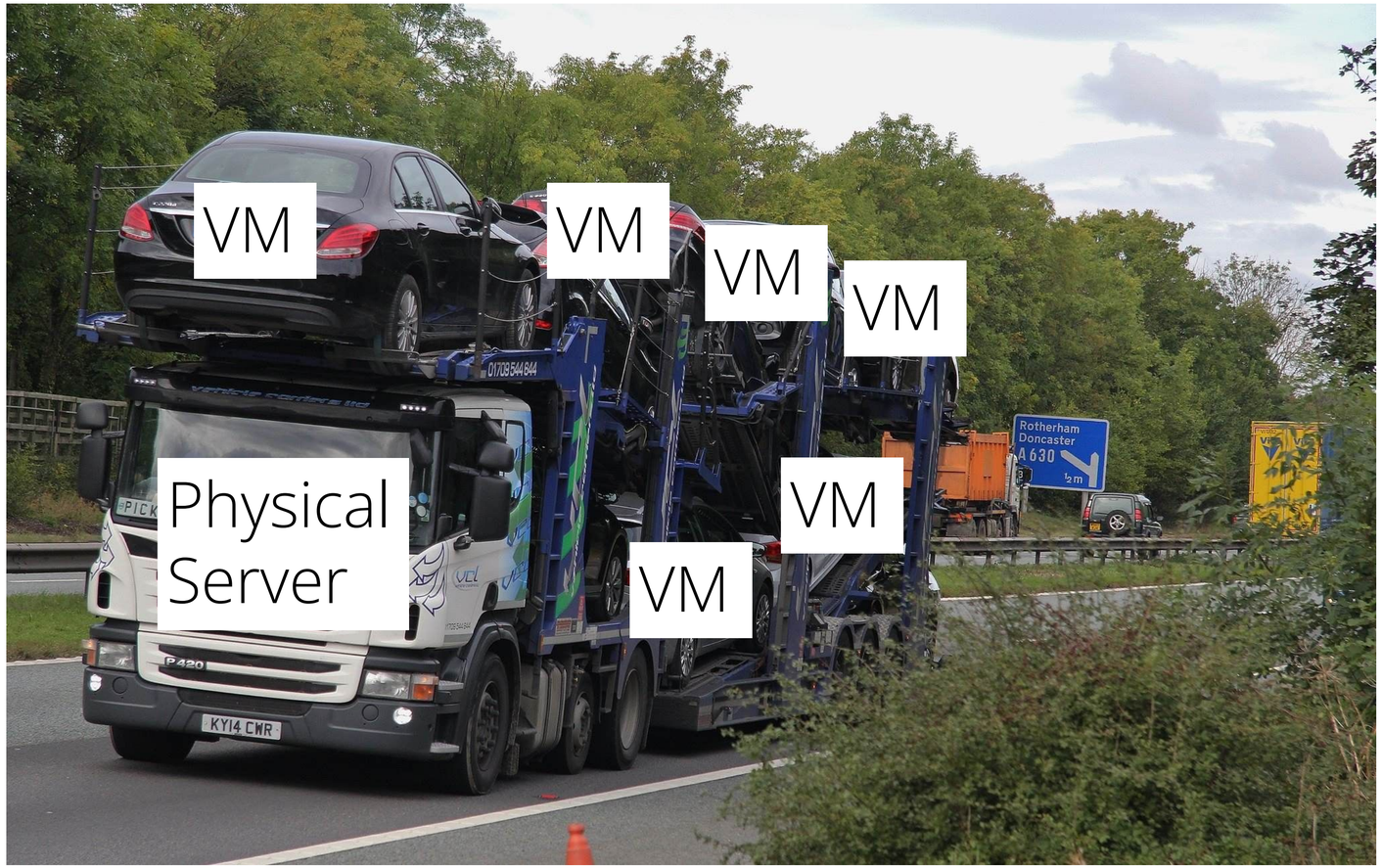
What is a container?



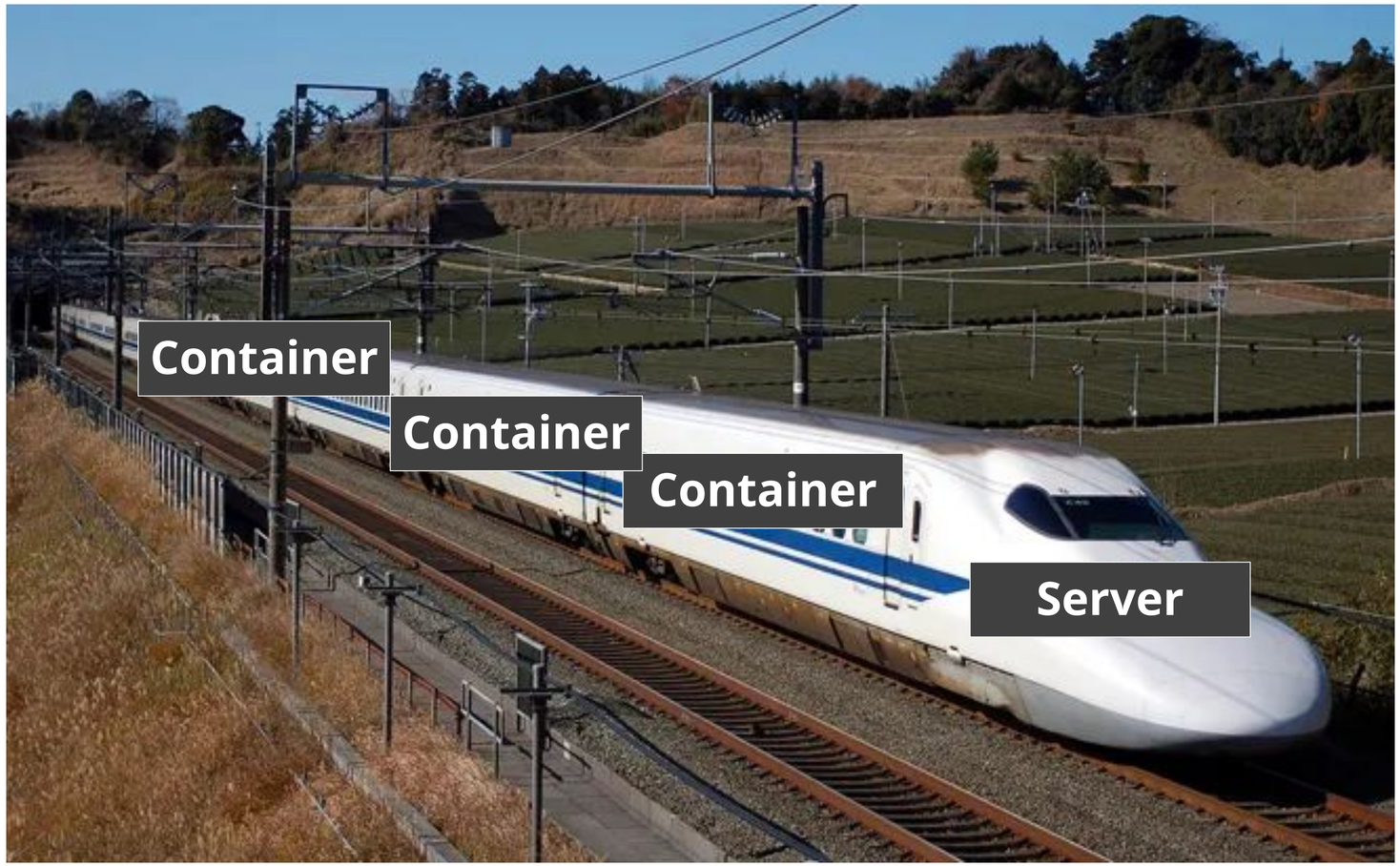
Docker container vs Virtual Machine



Docker container vs Virtual Machine



Docker container vs Virtual Machine



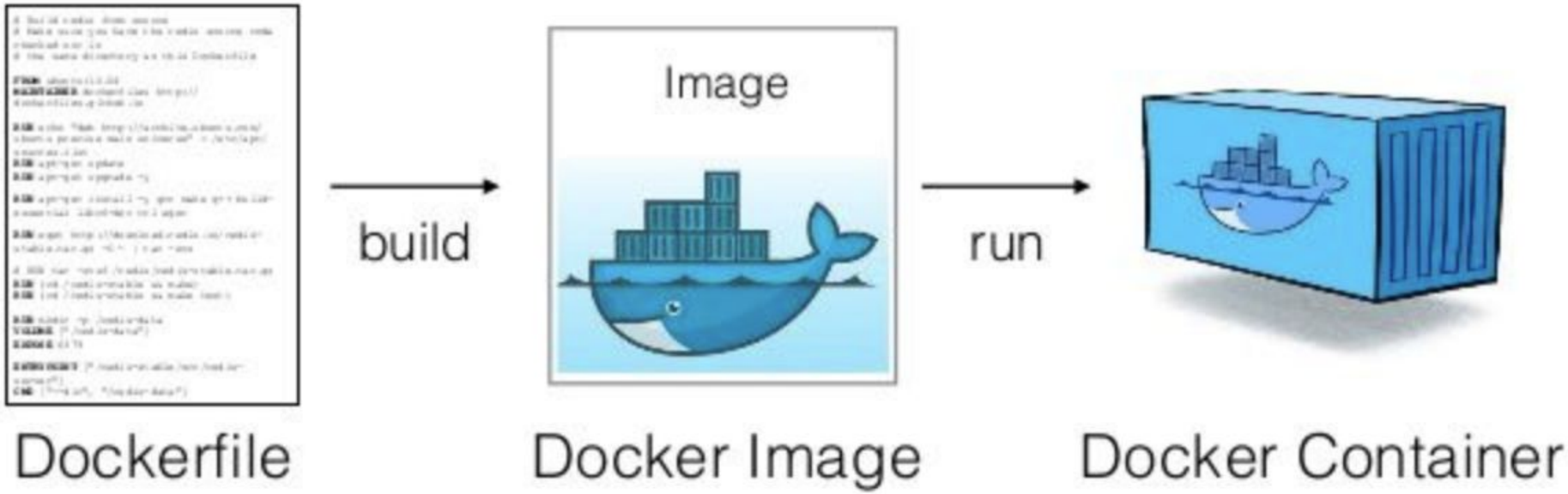
Advantages of Docker containers

- **Smaller** size than virtual machine
- **Faster** startup time than virtual machine
- **Portability**

What is Docker?

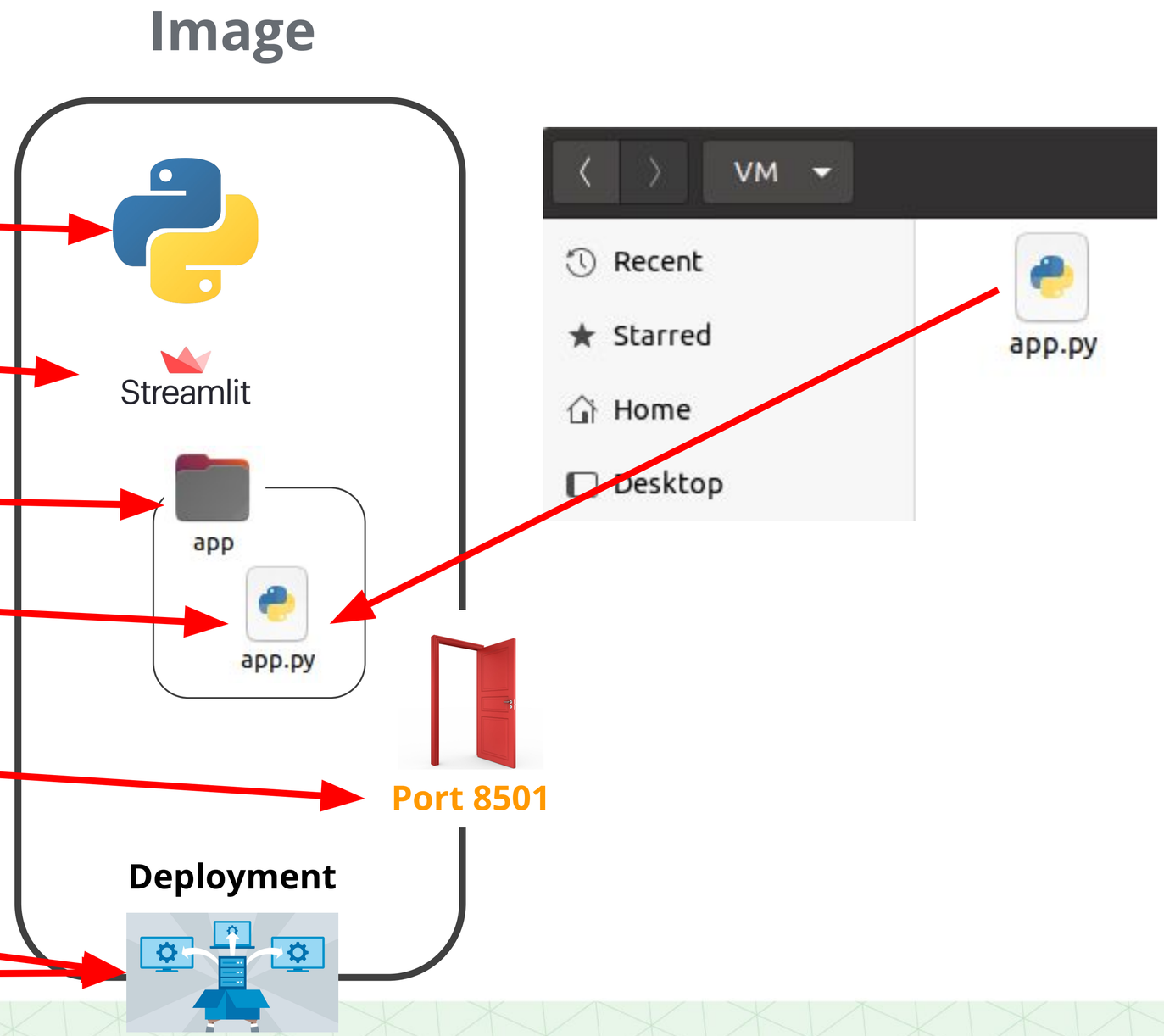
Docker is just a **tool** to run/build/deploy container application.

Docker components



Dockerfile

```dockerfile
# FROM scratch if not importing an image
FROM python:3


# using pip to install streamlit library
RUN pip install streamlit


# Set working directory as "app"
WORKDIR /app

# Copy our "app.py" to the working directory
COPY ./app.py /app


# expose port 8501 for streamlit
EXPOSE 8501


# create an entry point to make our image executable
ENTRYPOINT ["streamlit", "run"]

# run the application -> [ENTRYPOINT] [CMD] -> "streamlit run app.py"
CMD ["app.py"]
```



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Let’s create a Docker image!

sudo docker build -t *[name] [path]*	Build an image
sudo docker image ls	List all available images
sudo docker run -p *[host port:container port] [name]*	Run an image with ports

Firestore and Storage

What is a database?

- Database is a place that can **store large** amounts of data.
- It supports **fast retrieval** of data from huge amounts of data.

Supermarket analogy

Can you tell me where is the **potato chips** located at?

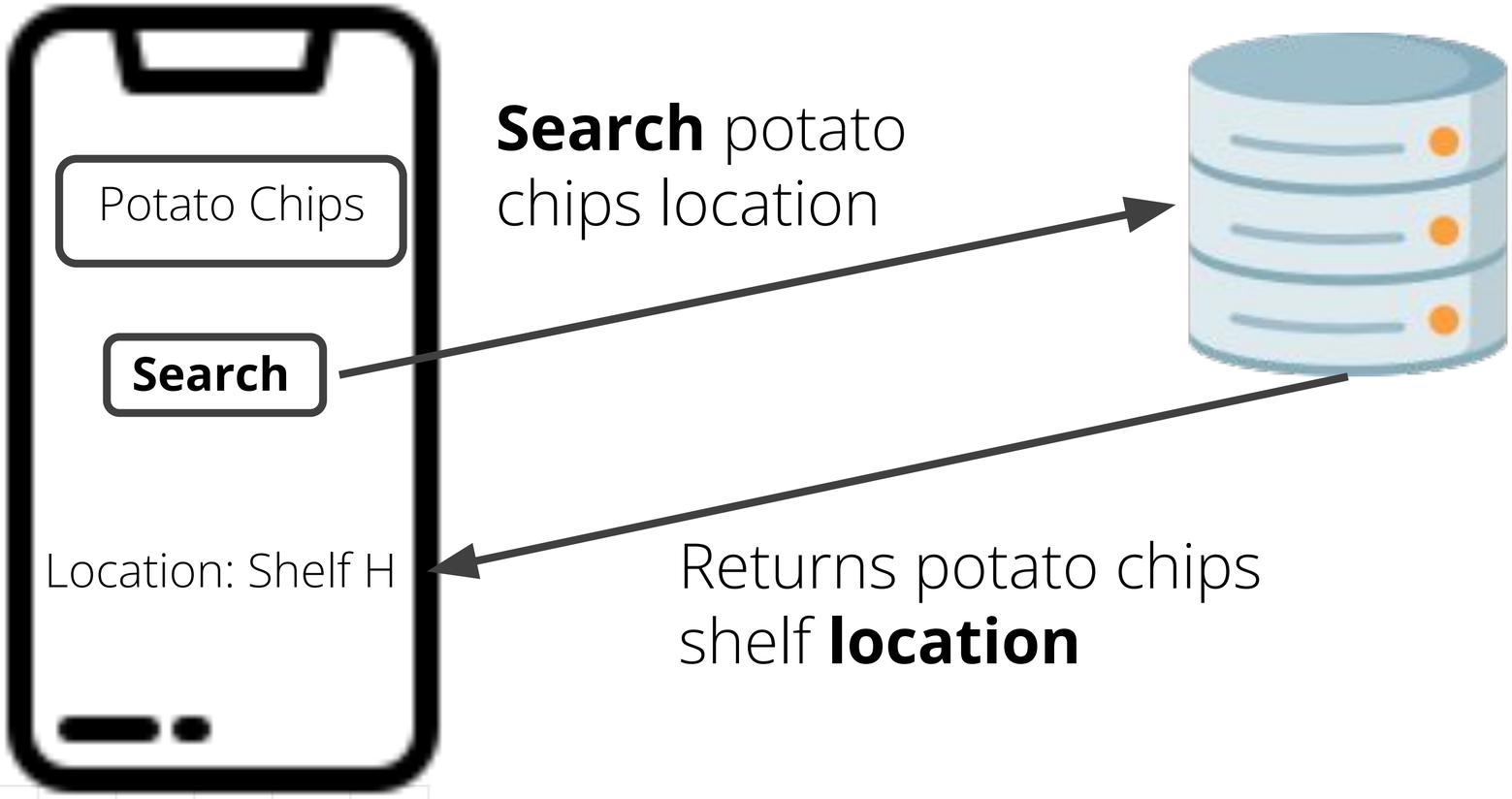
Customer

Sure, let me check it for you using my mobile app.

It’s located at **shelf H**, just 2 shelf away from us.

Staff (you)

Supermarket analogy



Database

Relating to spreadsheets

	A	B	C
1	ID	Name	Email
2	1	Adam	adam@gmail.com
3	2	Baron	baron@gmail.com
4	3	Alex	alex@gmail.com
5			
6			
7			

Users

Fig 1. Spreadsheets

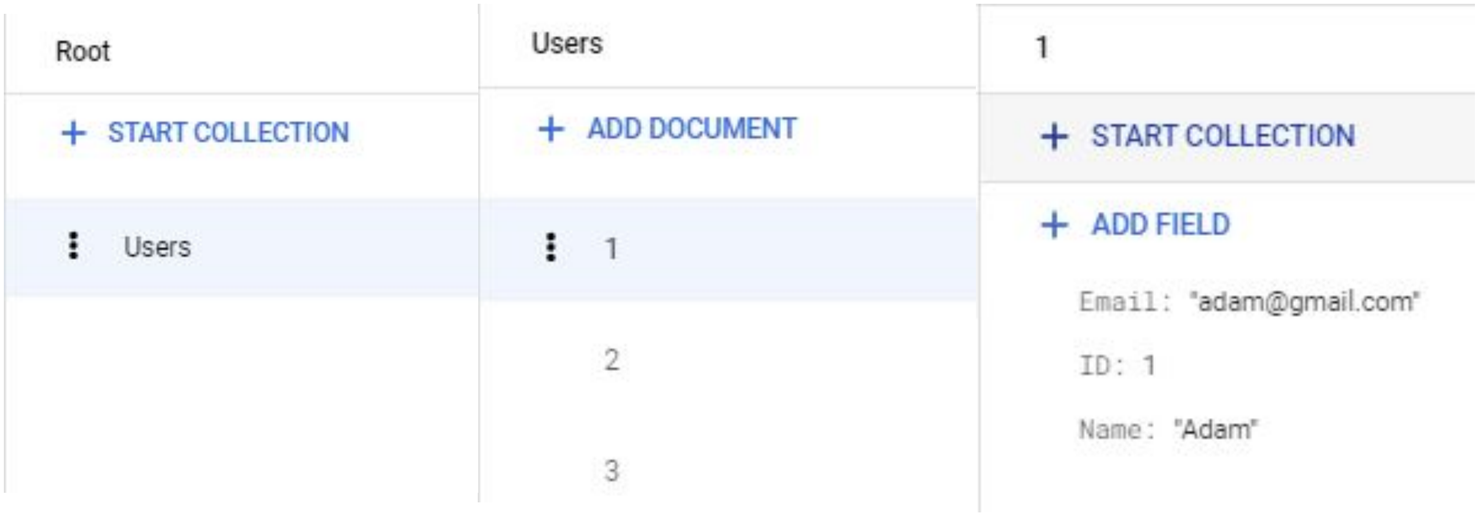
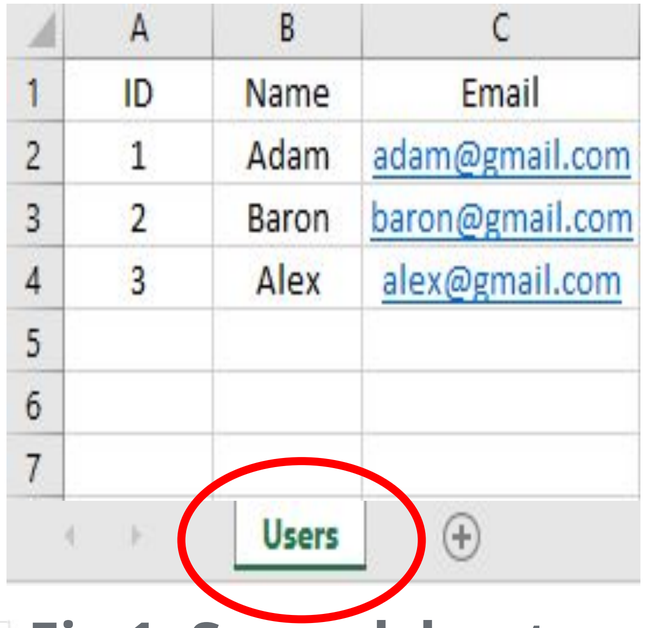


Fig 2. GCP Firestore

Collection vs Sheet



	A	B	C
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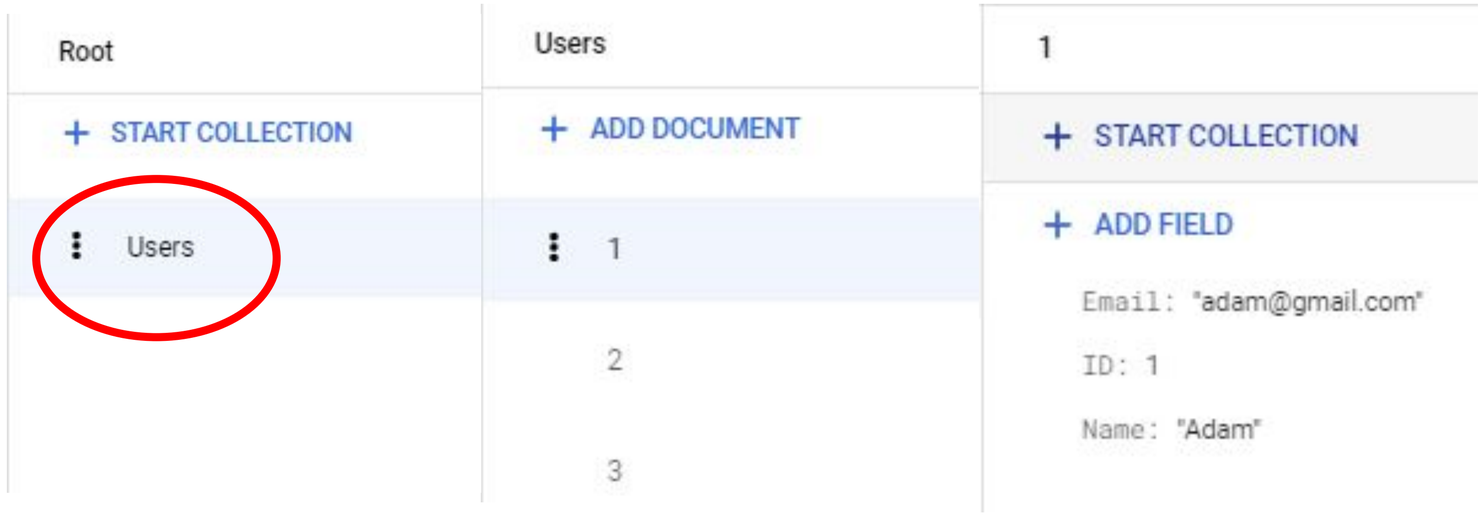
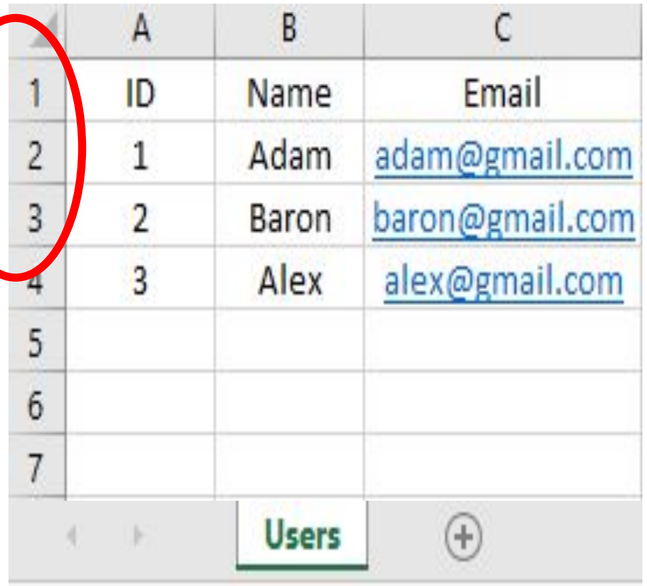


Fig 2. GCP Firestore

Rows vs Document



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Users

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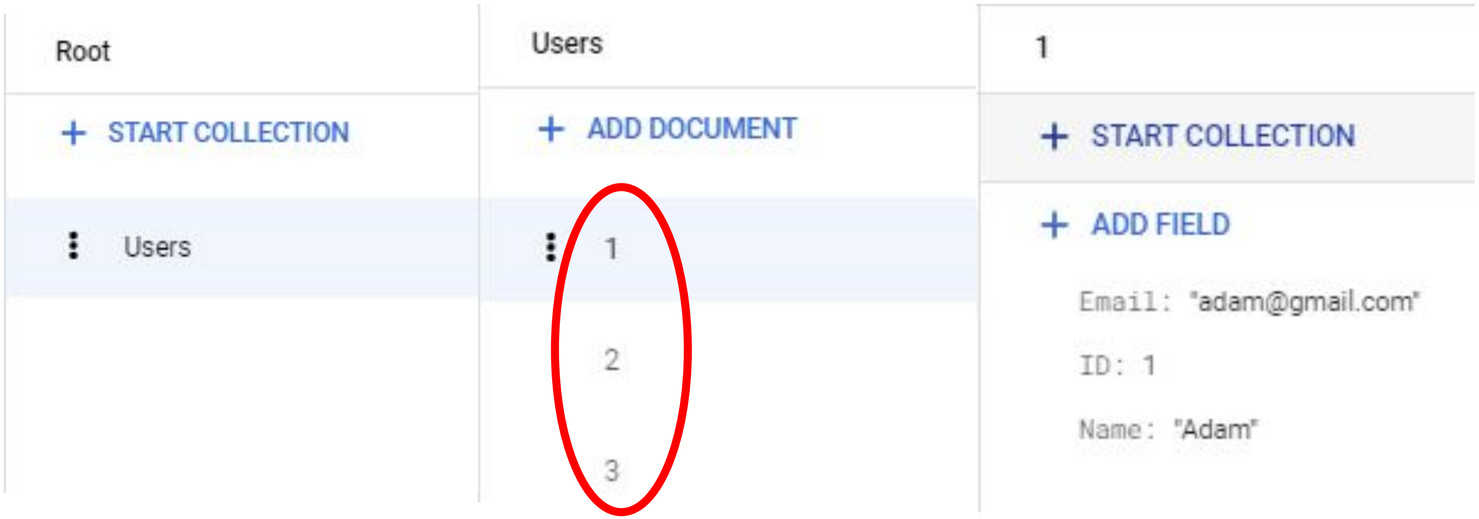
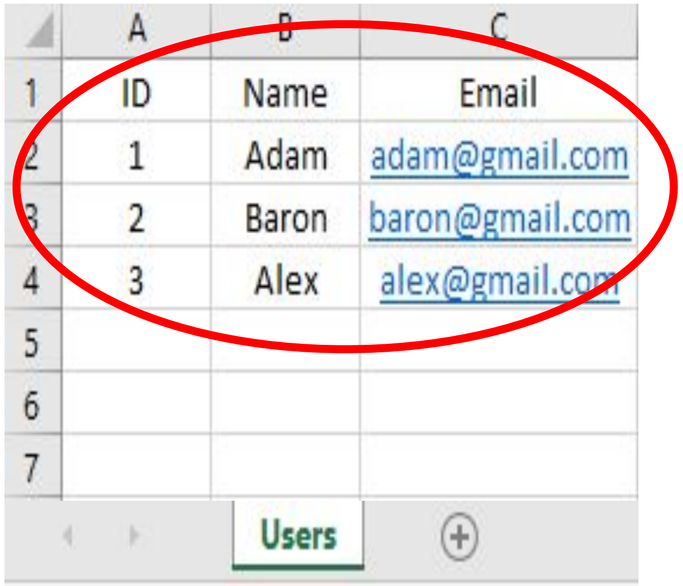


Fig 2. GCP Firestore

Columns vs Fields



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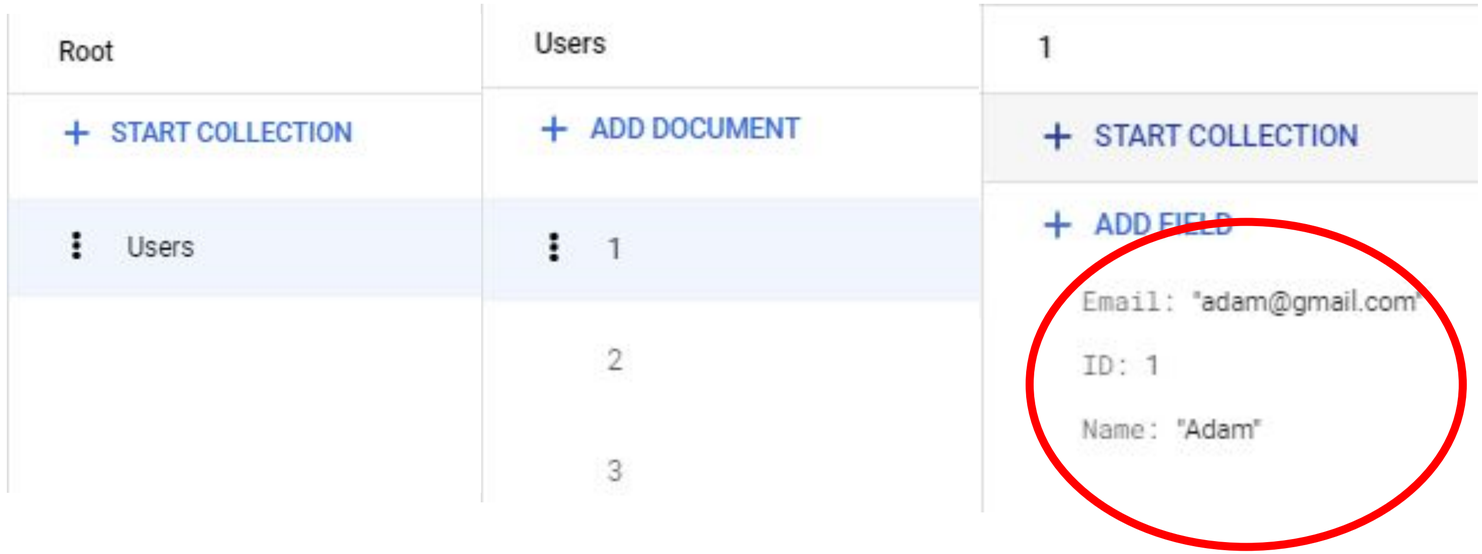
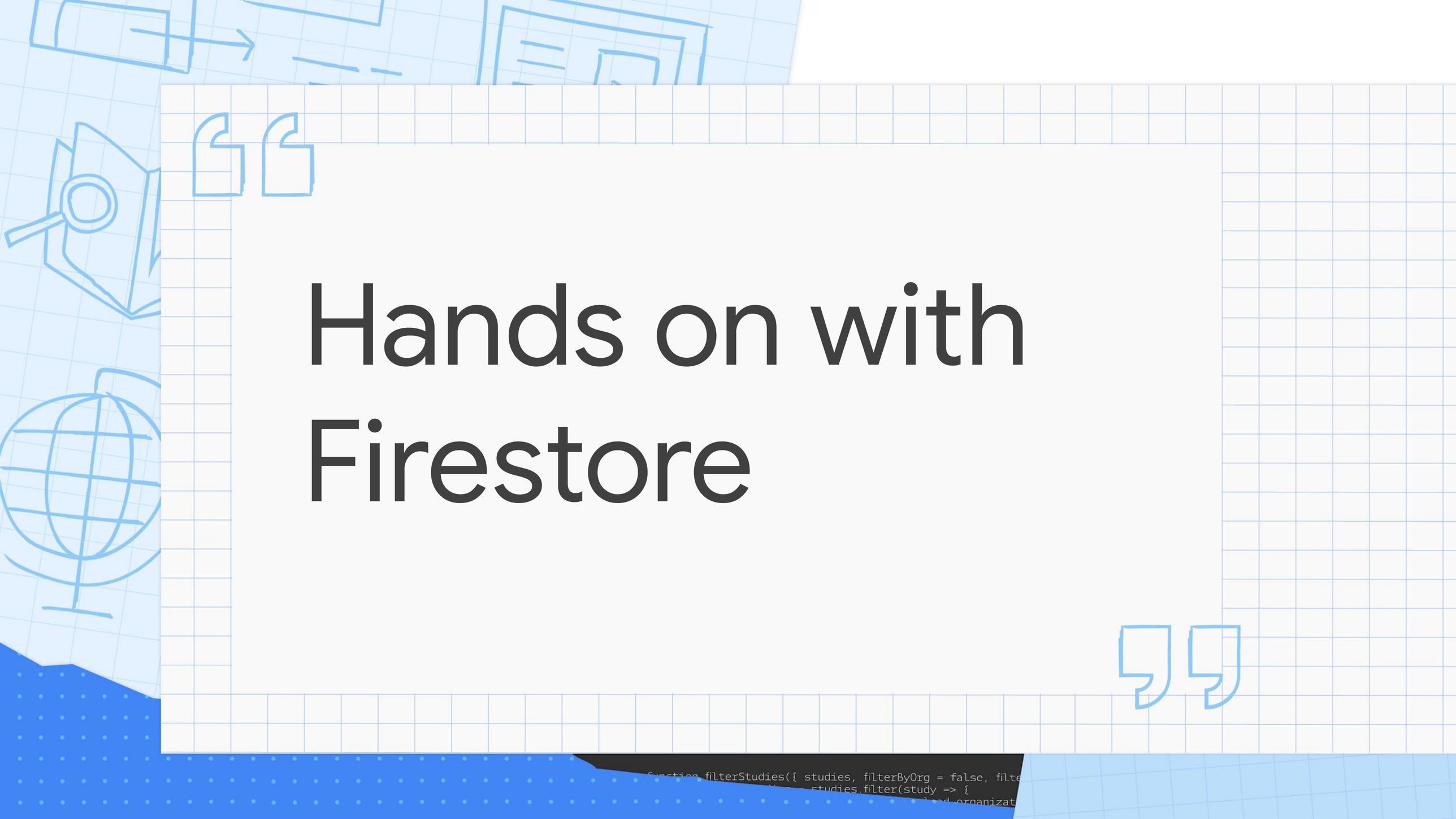
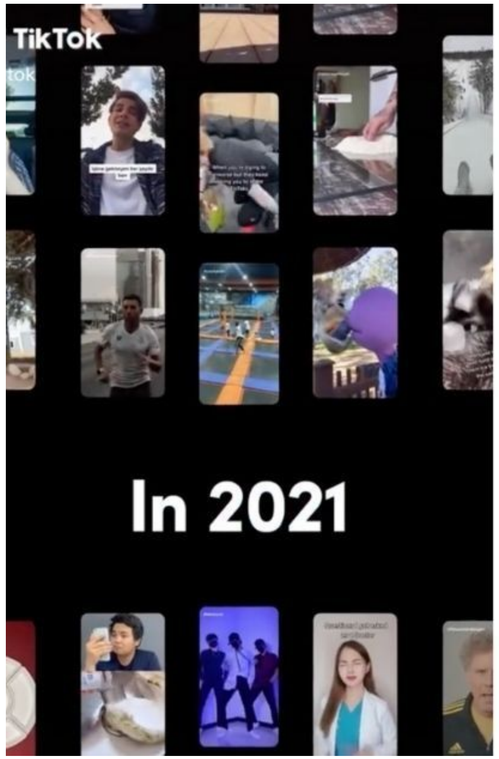


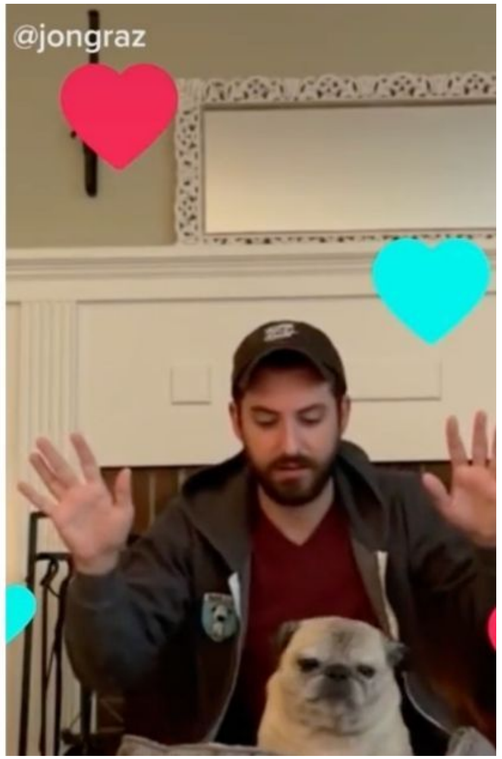
Fig 2. GCP Firestore

Hands on with Firestore

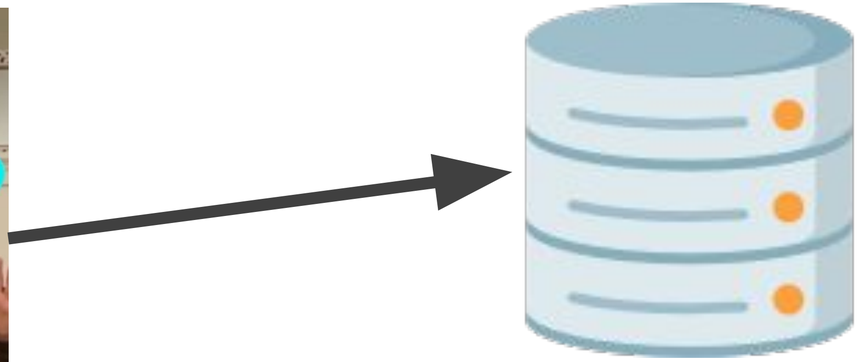


How would you store Tiktok videos?



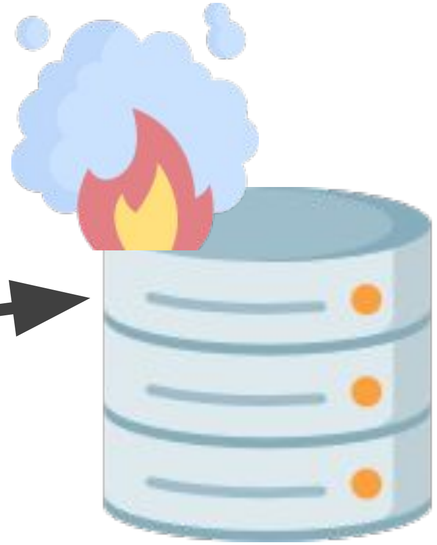


Store them in database?



Storing a **few** videos in database may work.

What if there are billions of Tiktok videos?



1,000,000,000 of Tiktok videos

It will be very **resource intensive** for the database

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What is object storage?

`A storage that stores large unstructured data`

Examples of **unstructured data**

- Images
- Videos
- Sensor data
- Any unstructured data you want to store

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What makes object storage special?

Customizable Metadata

Created Date
Owner
Location
Size

X-ray file

Created Date
Owner
Location
Size
Patient Name
Date of Birth
Injury details
Area of body
Doctor in Charge

X-ray object

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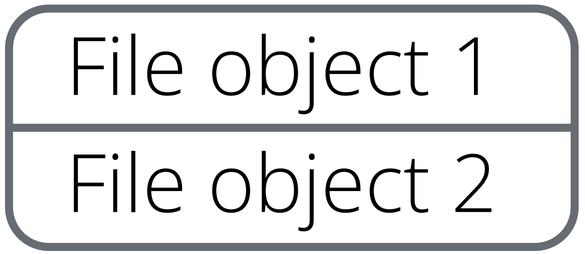
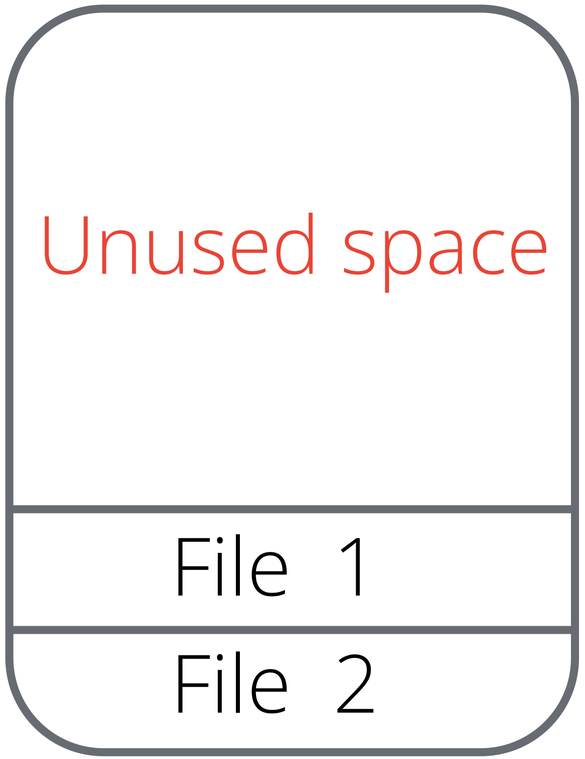
What makes object storage special?

Pay for only what you need, and it's affordable



Object storage



Typical storage

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How does object storage works?

It uses **bucket** to store all the unstructured data

Any unstructured data you want to store

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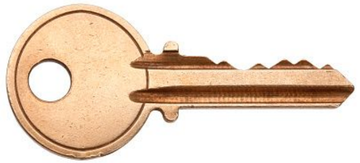
Credentials for our app

Our App need to have credentials to interact with GCP

Our App



credentials.
json

Cloud
Firestore

Google Cloud
Storage

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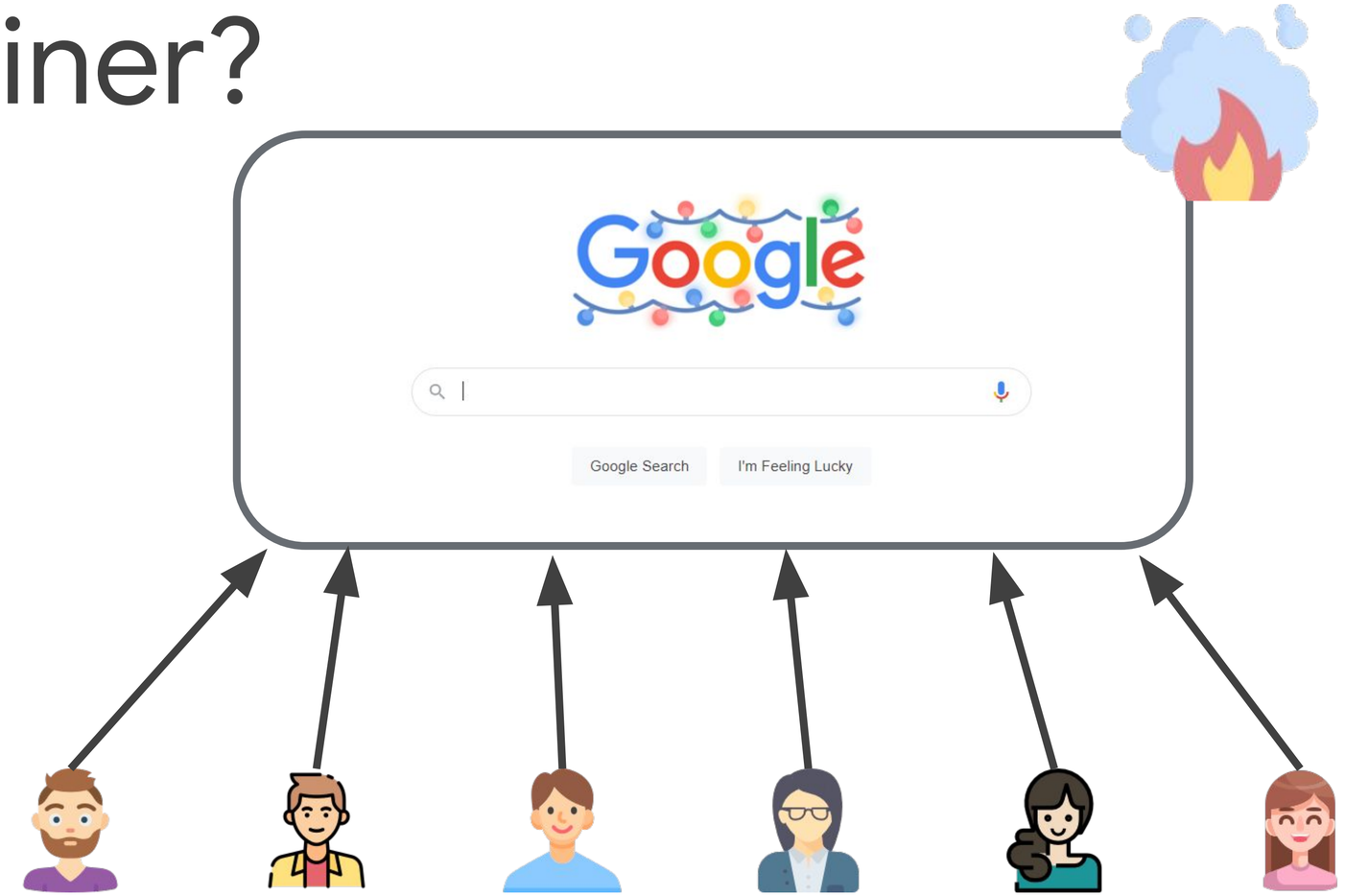
Let’s go
create a bucket!

Break Time!

We learnt about Docker containers just now..

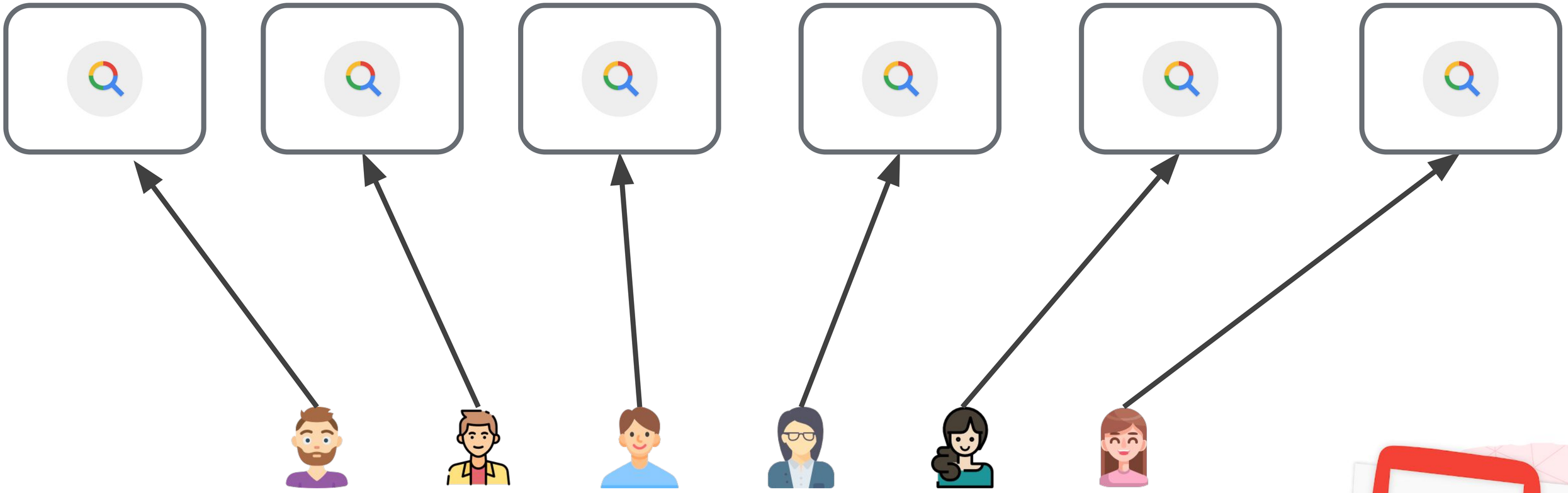
What if Google search is deployed in only 1 container?



4,000,000,000 users

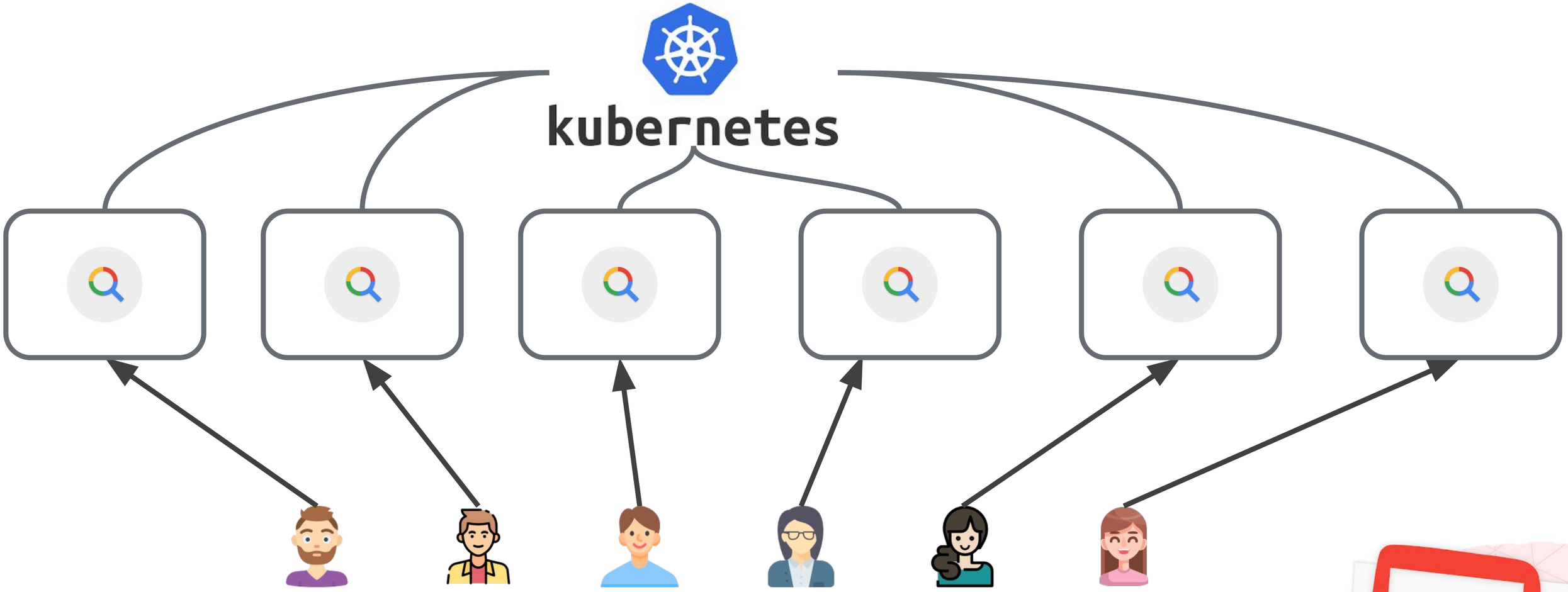
Need many containers to support Google Search

A lot of containers



4,000,000,000 users

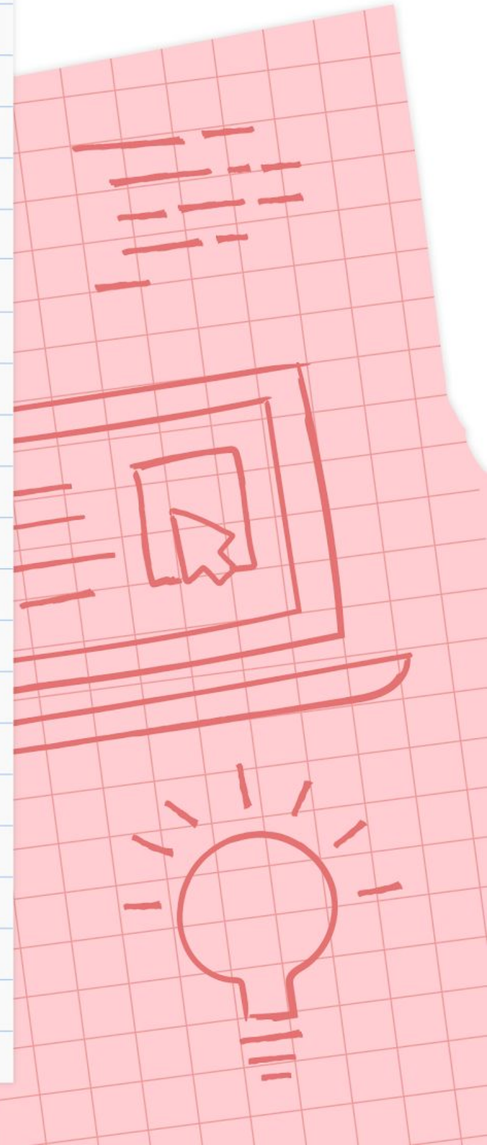
How to manage so many containers?



4,000,000,000 users

Kubernetes

Makes **management** of containers efficiently.



Musical orchestra analogy

Basic kubernetes components

1. Pod
2. Deployment
3. Node
4. Service
5. Cluster

Smallest unit

Largest unit

kubernetes

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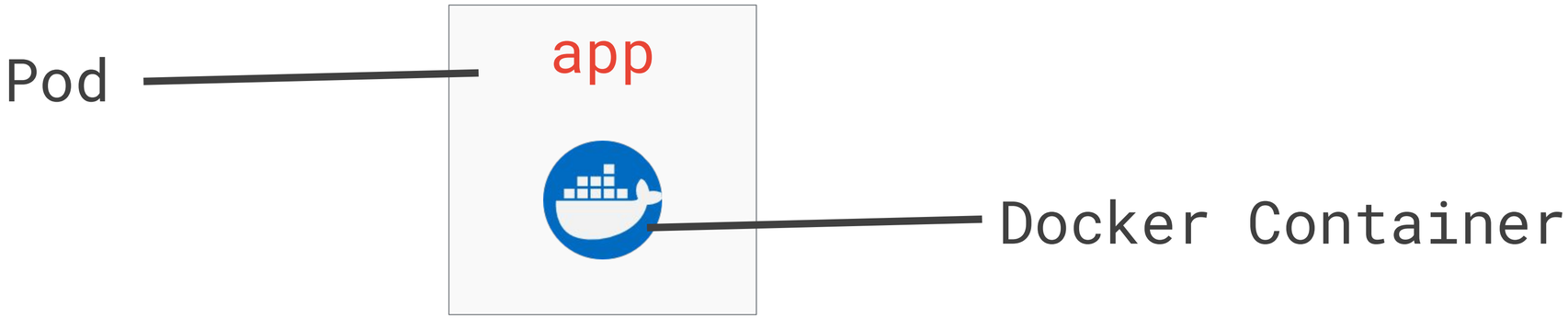
What is a pod?

Smallest component of Kubernetes

Usually 1 application container per **pod**



What is deployment?

Blueprint for the pods using a configuration file

Replicate to many pods

Deployment configuration file

Replicate multiple pods

Pod 1

app

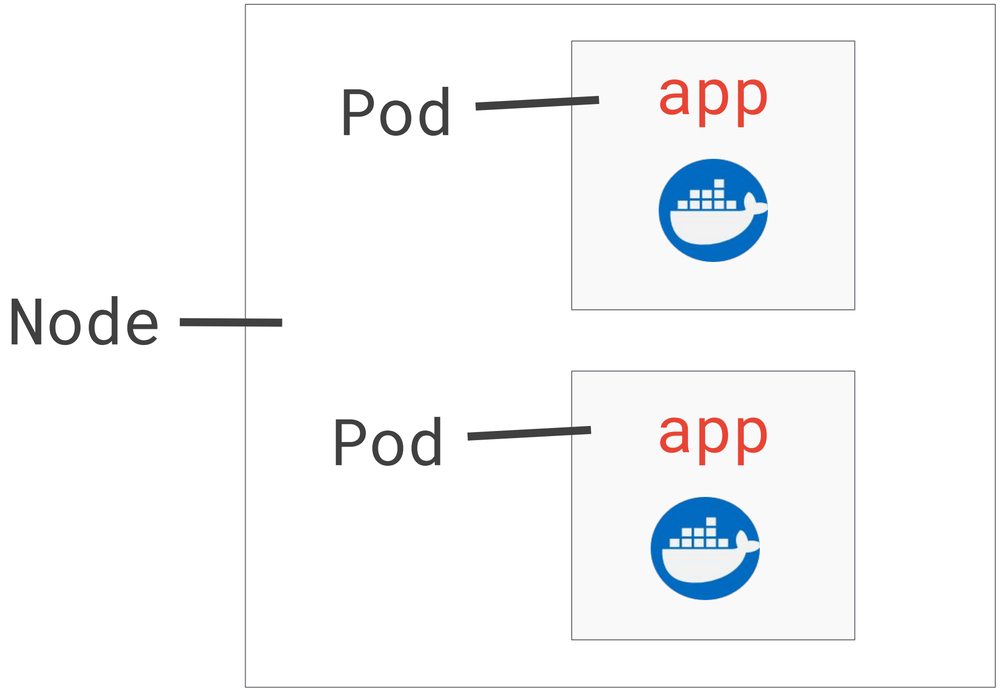
Pod 2

app

What is a node?

`Basically it's a virtual machine (VM)`

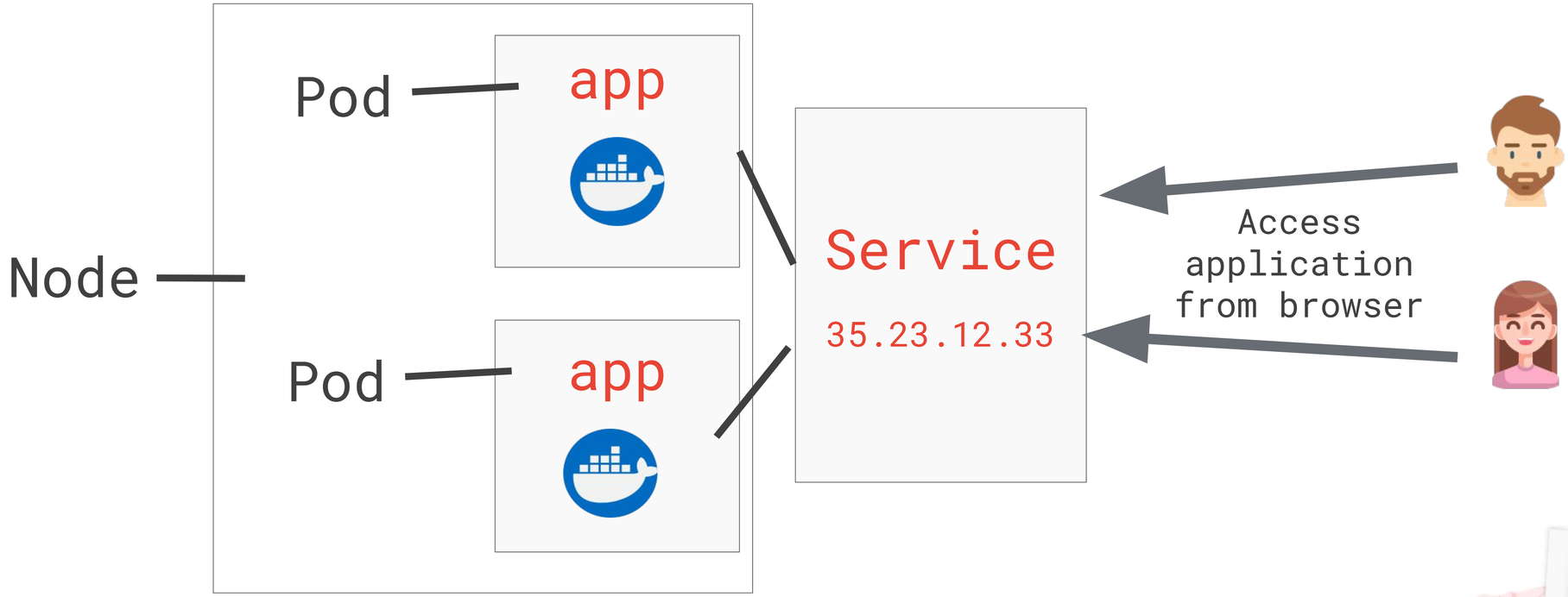
It can contain **1 or more** pods



What is a service?

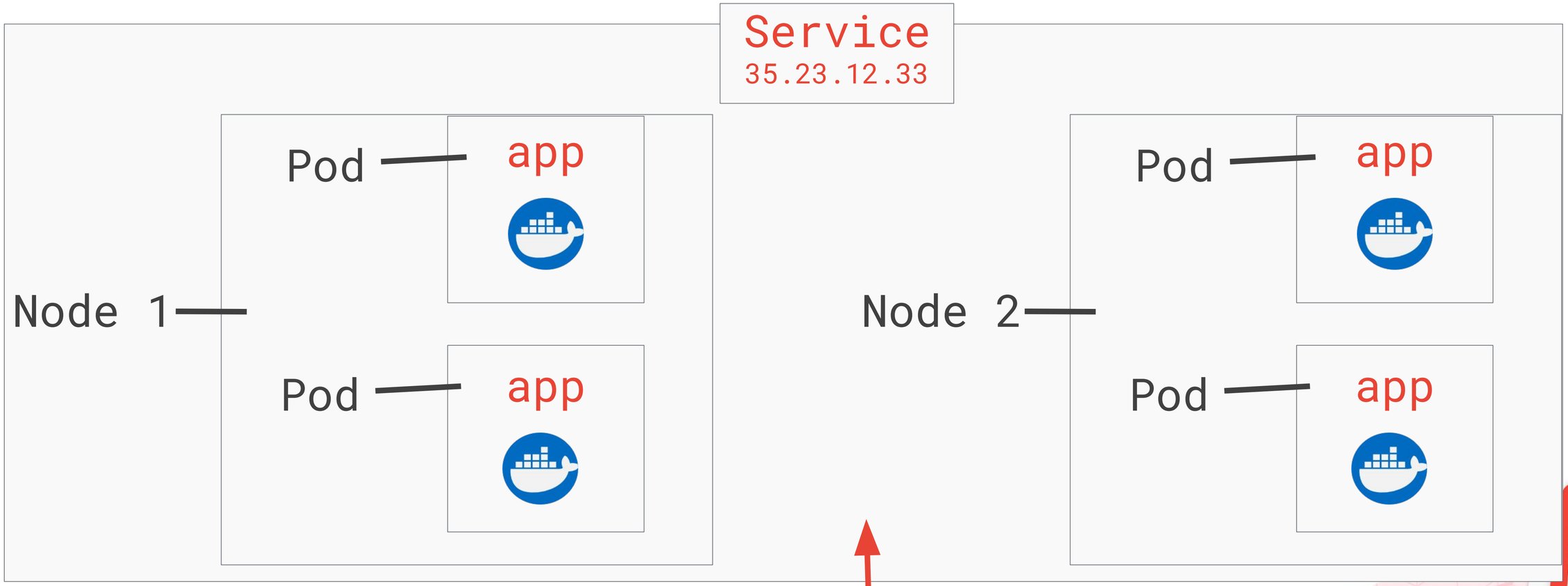
Allow users to **access** our application (pod) from browser

It's just a static **IP address**



What is a cluster?

A single system made up of **1 or more nodes** and other components



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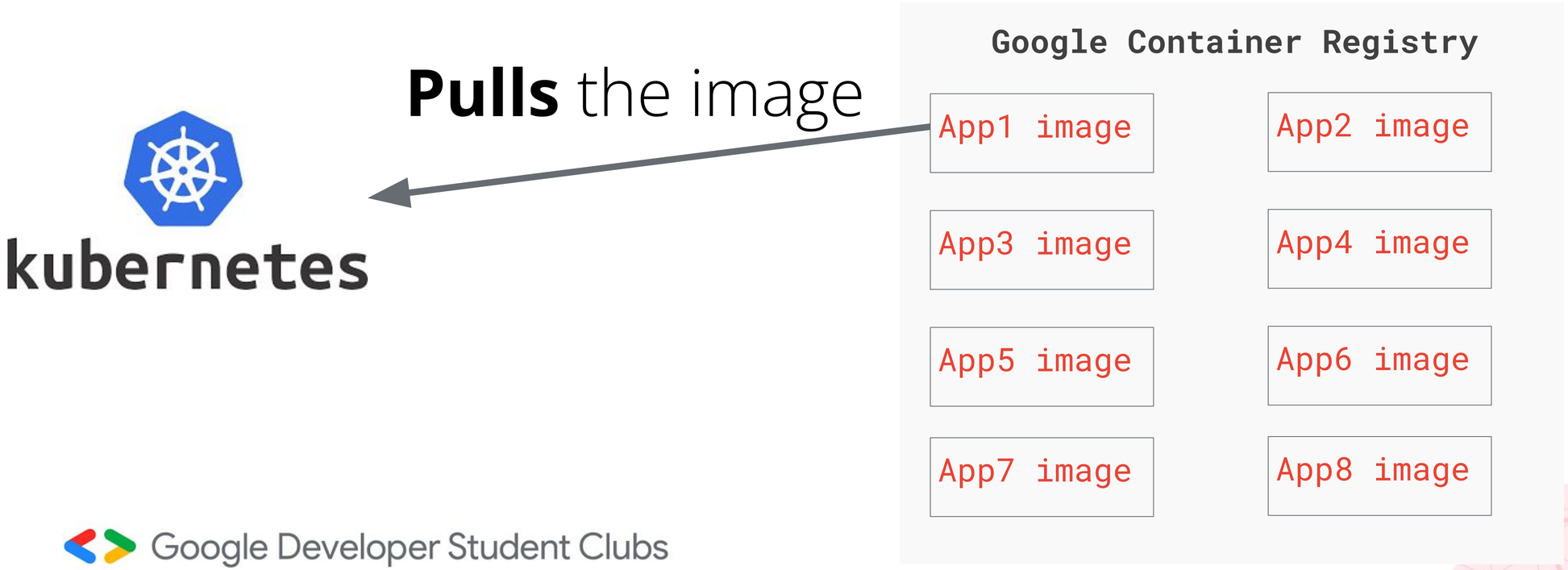
Google Container Registry

- A platform for you to **store and manage** your Docker images
- Kubernetes **retrieves** your Docker image from it



Docker commands

To build and push to the Google Container Registry

docker build -t gcr.io/PROJECT-ID/IMAGE_NAME .
docker push gcr.io/PROJECT-ID/IMAGE_NAME

Hands on with Kubernetes

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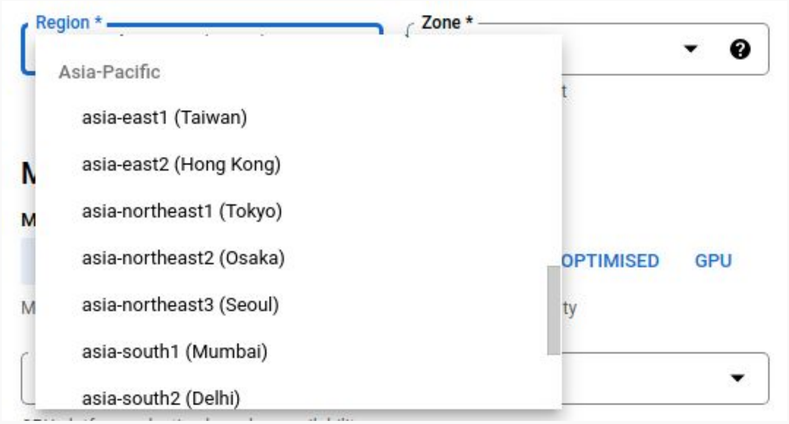
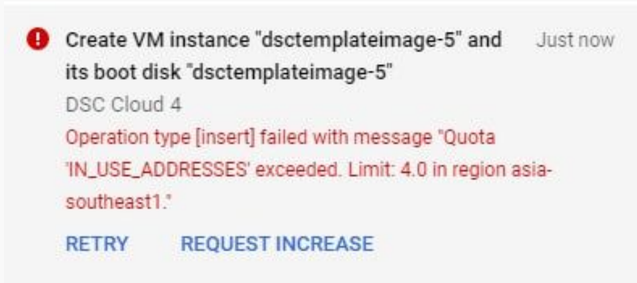
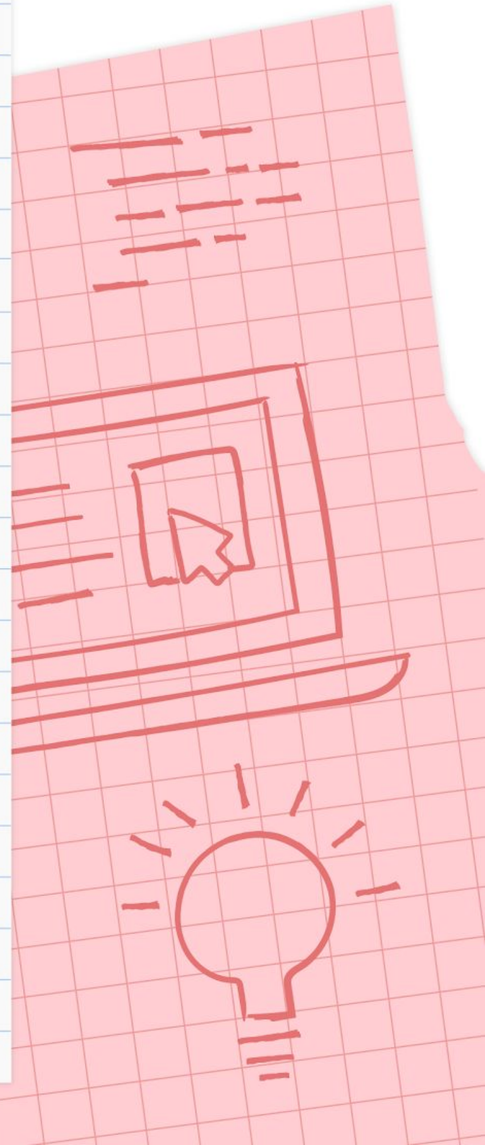
VM Region

Try to choose a **unique region!**





With free trial account, you **cannot have more than 4 VMs** with the **same region**



Limited quotas for Kubernetes Clusters

You cannot create more than 3 clusters in location asia-southeast1-a; to create more than 3, you must request an increase of your Google Compute Engine quota for region asia-southeast1 to 25 CPUs or more.

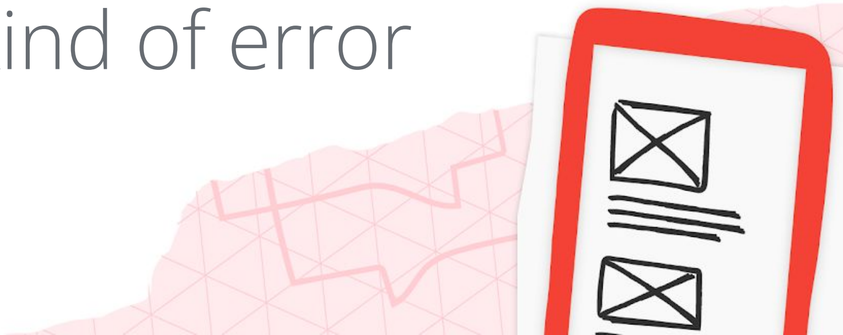
Create Kubernetes Engine cluster "cluster-5" 3 minutes ago

DSC Cloud 4

Insufficient regional quota to satisfy request: resource "IN_USE_ADDRESSES": request requires '1.0' and is short '1.0'. project has a quota of '4.0' with '0.0' available. View and manage quotas at https://console.cloud.google.com/iam-admin/quotas?usage=USED&project=dsc-cloud-4.

RETRY

Choose a **different unique region** like US, Europe, Australia if you encounter this kind of error



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Deployment configuration file

Use YAML file.

```
template:
  metadata:
    labels:
      app: "APP_NAME"
  spec:
    containers:
    - name: "APP_NAME-1"
      image: "IMAGE_NAME_URL"
```

YAML file

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Specify your image name source

```
template:
  metadata:
    labels:
      app: "APP_NAME"
  spec:
    containers:
    - name: "APP_NAME-1"
      image: "IMAGE_NAME_URL"
```

Specify the number of pods

```yaml
apiVersion: "apps/v1"
kind: "Deployment"
metadata:
  name: "APP_NAME"
  namespace: "default"
  labels:
    app: "APP_NAME"
spec:
  replicas: 2
```


Specify the min and max number of pods

```
minReplicas: 2
maxReplicas: 4
metrics:
- type: "Resource"
  resource:
    name: "cpu"
    targetAverageUtilization: 80
```

Specify the ports

```
ports:
  - name: http
    protocol: TCP
    port: 80
    targetPort: 8501
  - name: https
    protocol: TCP
    port: 443
    targetPort: 8501
```

Kubernetes Command

```
kubectl apply -f [FILE_NAME].yaml
```

Connect to cluster before running this command!

#TechforGood Workshops & Fireside Chats

Dec 2021

Digital Trends: From Pandemic to Endemic Fireside Chat
15 Dec (7:00 PM)

Power of Cloud to Connect Your Community Workshop
22 Dec (8:00 PM)

Jan 2022

Portfolio Website in 2 Hours Workshop
12 Jan (8:00 PM)

Hey Google! Teach me Computer Vision! Workshop
18 Jan (8:00 PM)

Second Fireside Chat
19 Jan (7:00 PM)

Jan 2022

Hey Google! Tell me about Natural Language Processing! Workshop
26 Jan (8:00 PM)

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