



Taking your K8s app to the cloud

Cloud-native Cassandra series



LEVEL
UP
with the

DataStax
Developers

Buckle up and Register for each week

LIVE hands-on workshop </> **FREE**

Cloud-Native Series Part 1:
An Easy Backend for your Application

Multiple Dates | NoSQL | Beginner

LEVEL UP DataStax Developers

WED, JAN 6 5:00 PM

Cloud-Native Series - An Easy Backend for your application

#ScienceTech #Seminar



HOMEWORK

LIVE hands-on workshop </> **FREE**

Cloud-Native Series Part 2:
Connecting Kubernetes and Apache Cassandra

Multiple Dates | NoSQL | Beginner

LEVEL UP DataStax Developers

WED, JAN 13 5:00 PM

Cloud-Native Series - Connecting Cassandra and Kubernetes

#ScienceTech #Seminar



HOMEWORK

LIVE hands-on workshop </> **FREE**

Cloud-Native Series Part 3:
Taking your Application to the Cloud

Multiple Dates | NoSQL | Beginner

LEVEL UP DataStax Developers

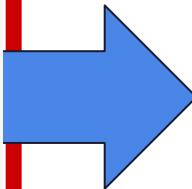
WED, JAN 20 5:00 PM

Cloud-Native Series - Deploying your k8s apps to the Cloud

#ScienceTech #Seminar



HOMEWORK



Certification Vouchers

Thanks for joining our 3 week series! Congratulations, you have earned a certification voucher 🎉

How to claim:

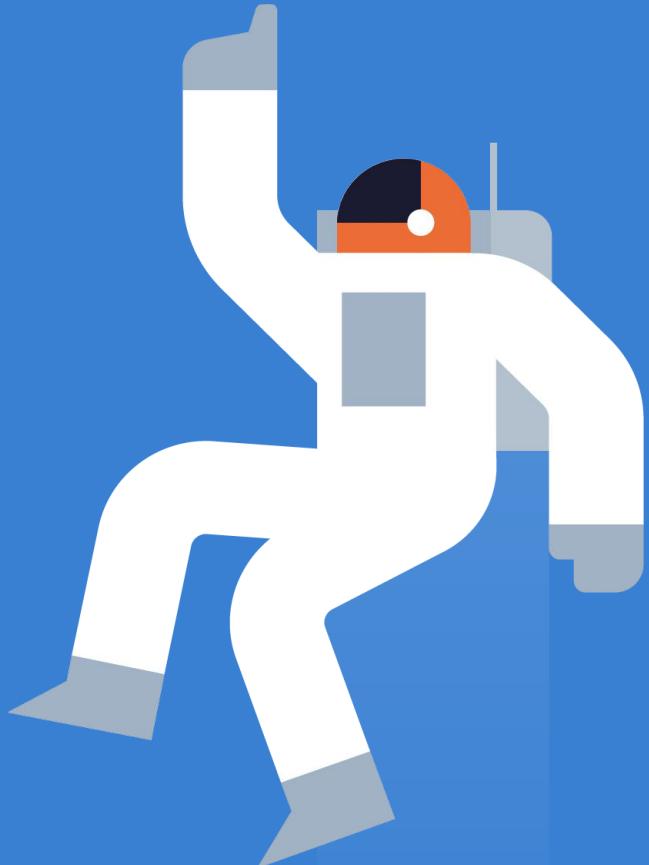


Stay until the end of today's workshop to receive the form to claim your FREE certification voucher.

Once you have submitted the form, you will receive your voucher within **5 working days**

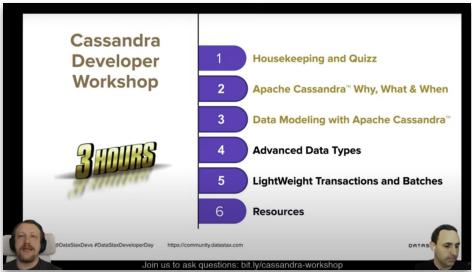
Taking your app to the cloud

1. Housekeeping and Setup
2. Cloud Computing Overview
3. Cloud Providers and Services
4. Deploy our Application in GKE 1
5. Deploy our Application in GKE 2
6. Wrap up

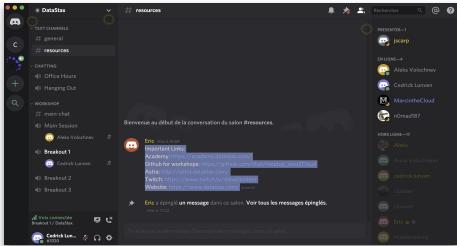


Housekeeping

Courses: youtube.com/DataStaxDevs



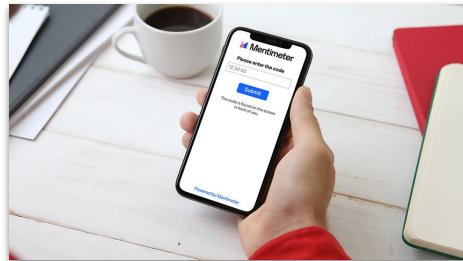
Questions: bit.ly/cassandra-workshop



Runtime: (demo)



Quizz: menti.com



menti.com

50 33 92 0

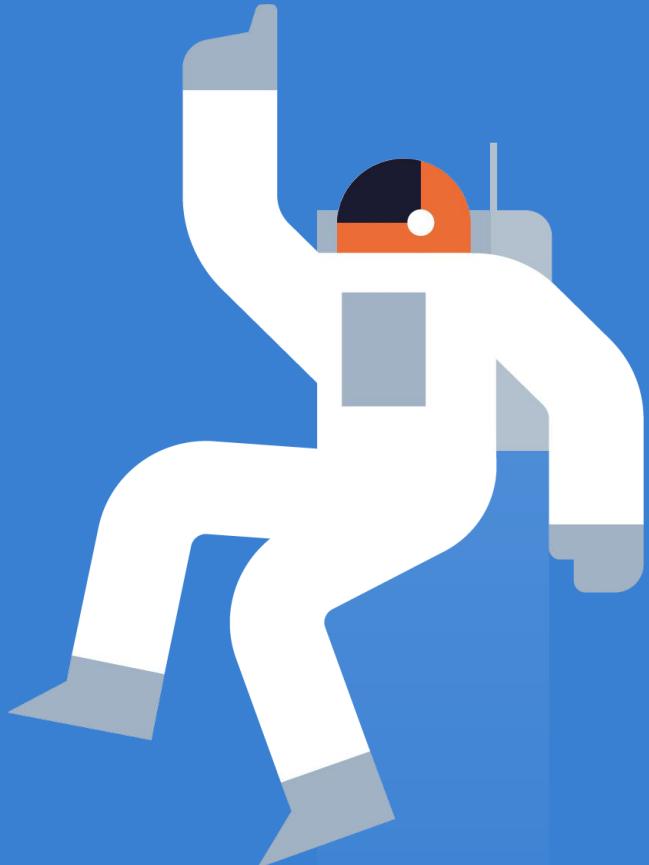


Available on the iPhone
 App Store

GET IT ON
 Google play

Taking your app to the cloud

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Cloud Computing

- On-demand availability of computer system resources, especially data storage (cloud storage) and computing power, without direct active management by the user.
- Becomes popular in 2006 with creation of Amazon web services (AWS) and their first service Elastic Cloud Computing



There is no cloud
it's just someone else's computer

Principles

On-demand Self-service

Rapid Flexibility

Resource Pooling

Elastic Scalability

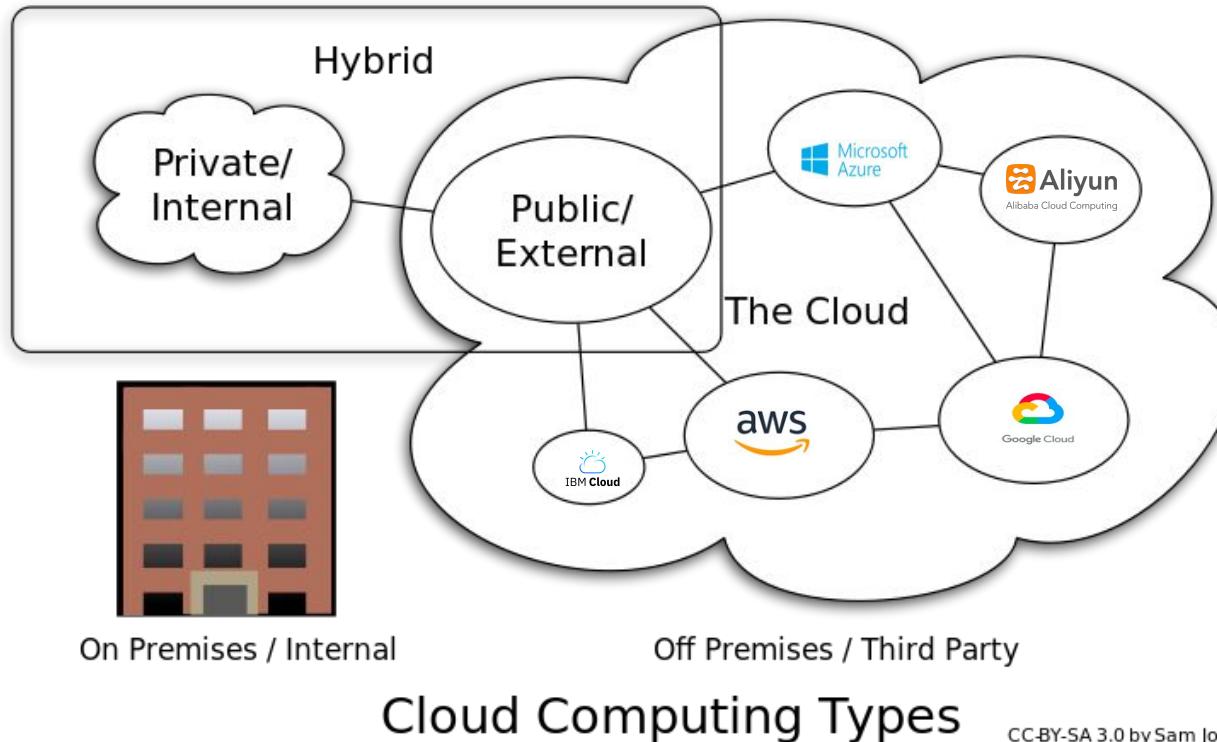
Pay as you Go

Global Availability / Distribution

Programmable Management

Measured Service

Deployment Models

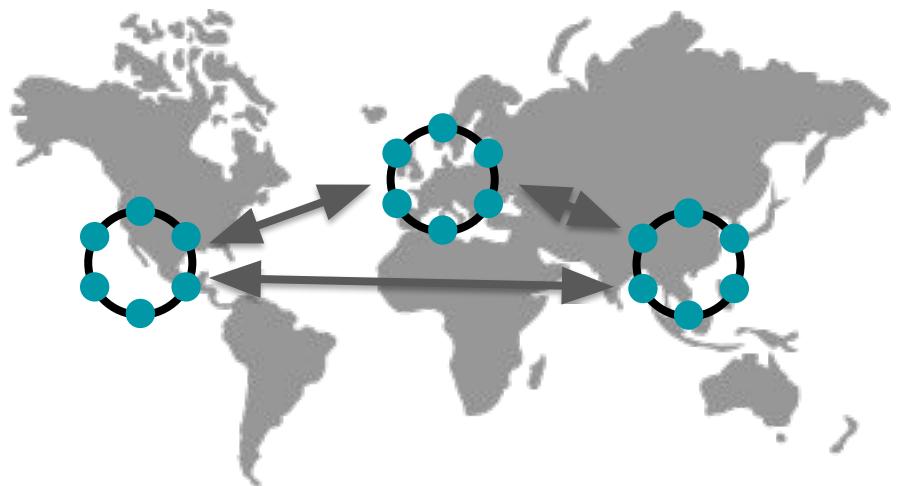


- PUBLIC-CLOUD
- PRIVATE-CLOUD
- HYBRID-CLOUD
- MULTI-CLOUD

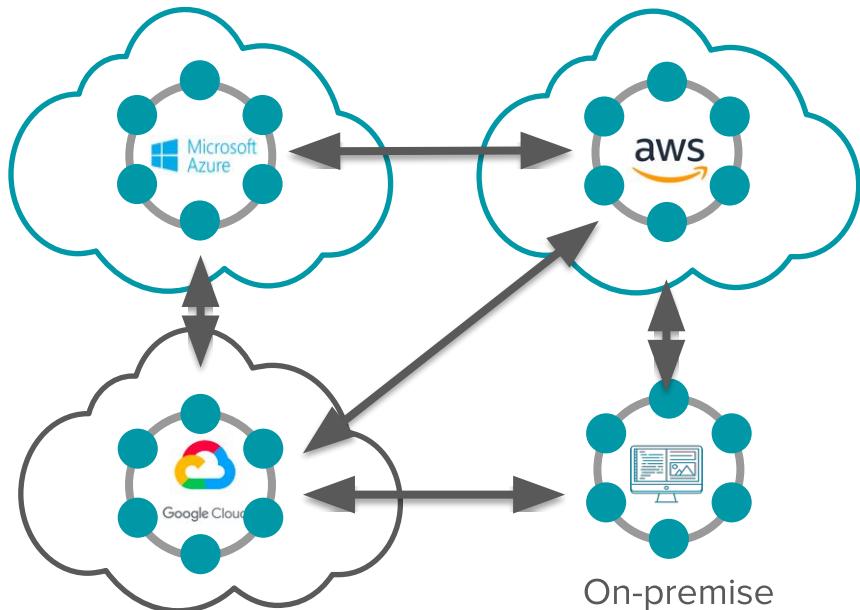
CC-BY-SA 3.0 by Sam Johnston

Cassandra fit Cloud Deployments?

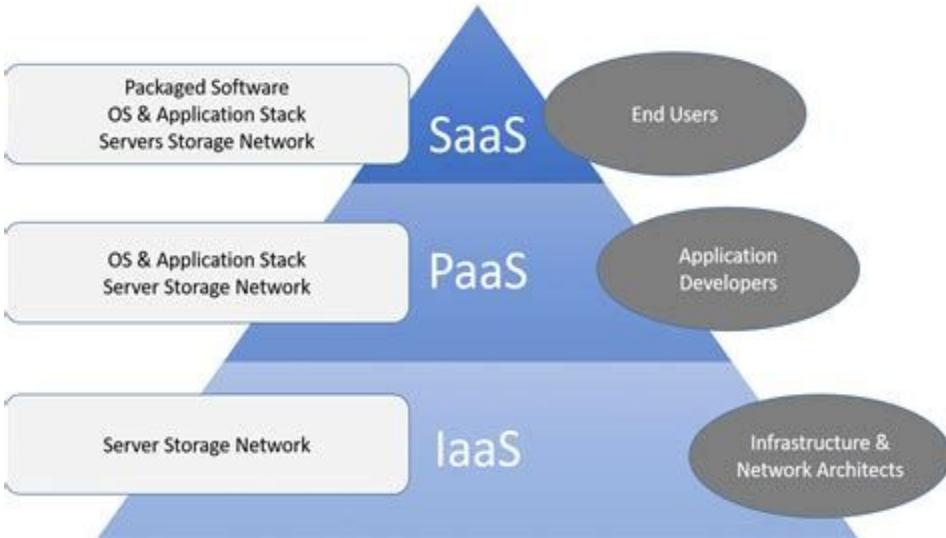
- Geographic Distribution



- Hybrid-Cloud and Multi-Cloud



Cloud Service Models



- **Software-as-a-Service:** applications running on a cloud infrastructure. The applications are accessible from various client devices through either a thin client interface, such as a web browser or a program interface.
- **Platform-as-a-Service:** deploy onto the cloud infrastructure consumer-created or acquired applications created using programming languages, libraries, services, and tools supported by the provider.
- **Infrastructure-as-a-Service:** APIs to abstract various low-level details of underlying network infrastructure like physical computing resources, location, data partitioning, scaling, security, backup,

Cloud Service Models

Packaged Software
OS & Application Stack
Servers Storage Network

SaaS

End Users

OS & Application Stack
Server Storage Network

PaaS

Application Developers

Server Storage Network

IaaS

Infrastructure &
Network Architects



Astra

workday

shopify

heroku

CLOUD FOUNDRY

amazon
web services
Elastic Beanstalk

Google
App Engine

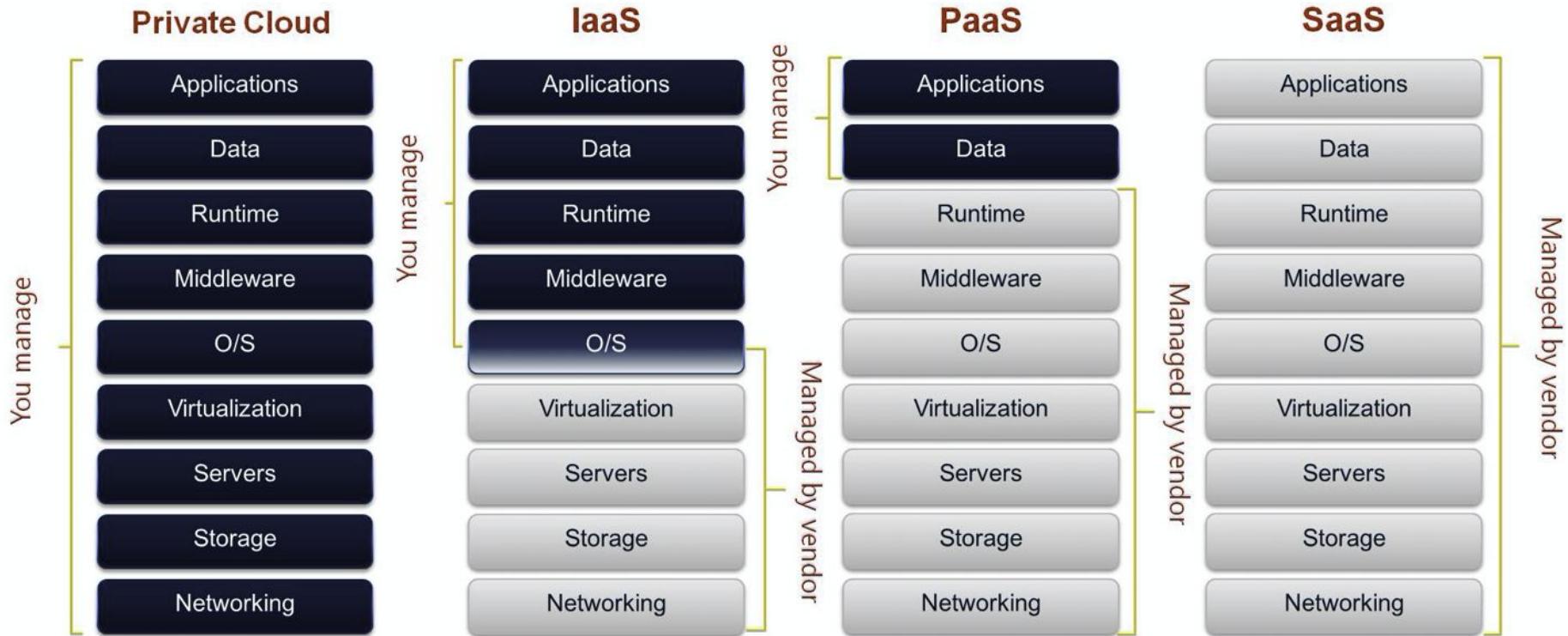
OPENSIFT

amazon
web services™

o

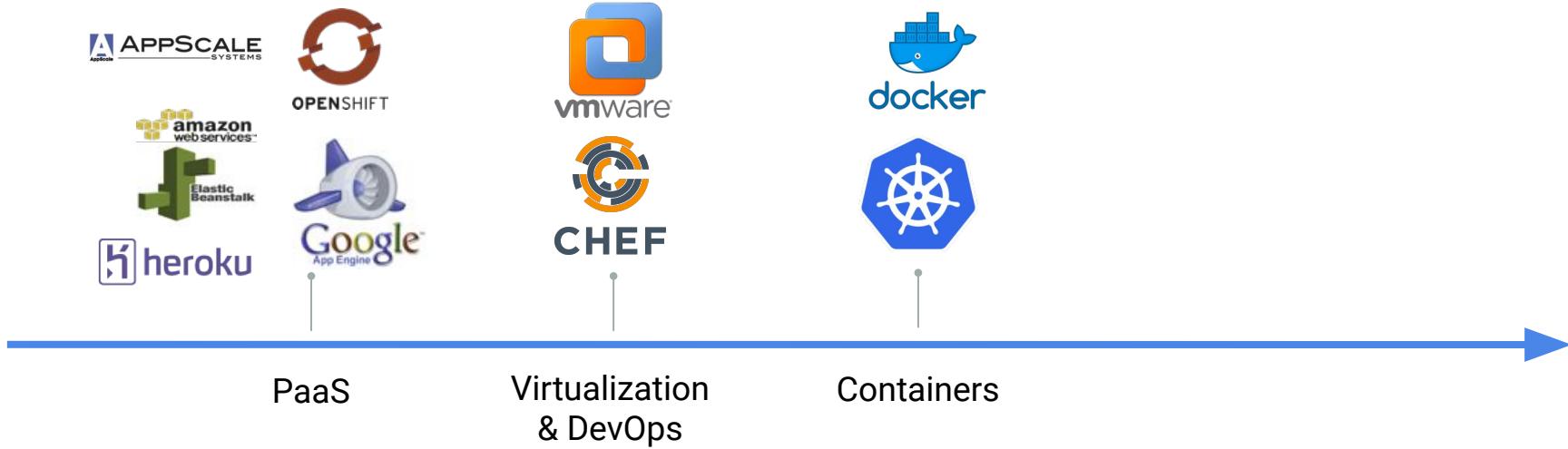
Azure

Google
Cloud Platform



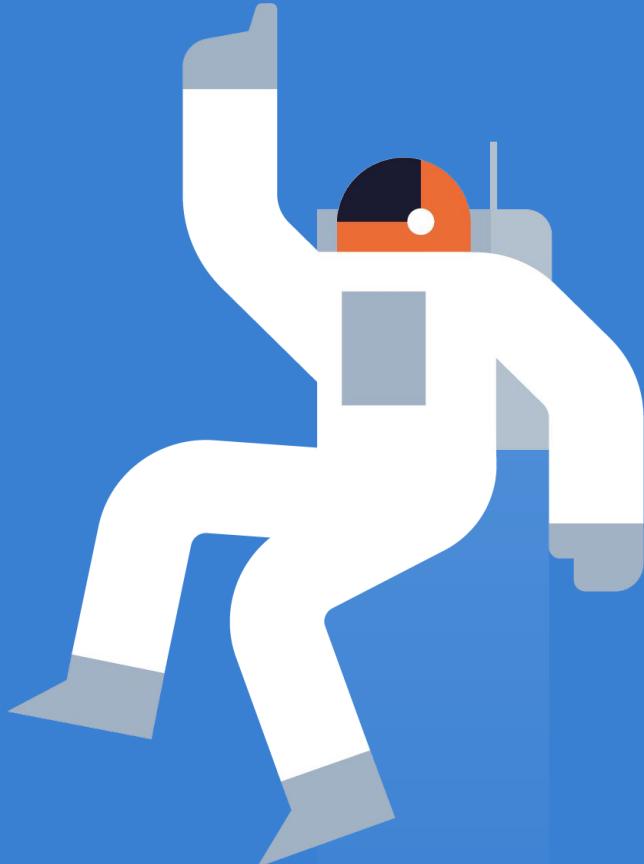


From PaaS to Containers-as-a-service (CaaS)



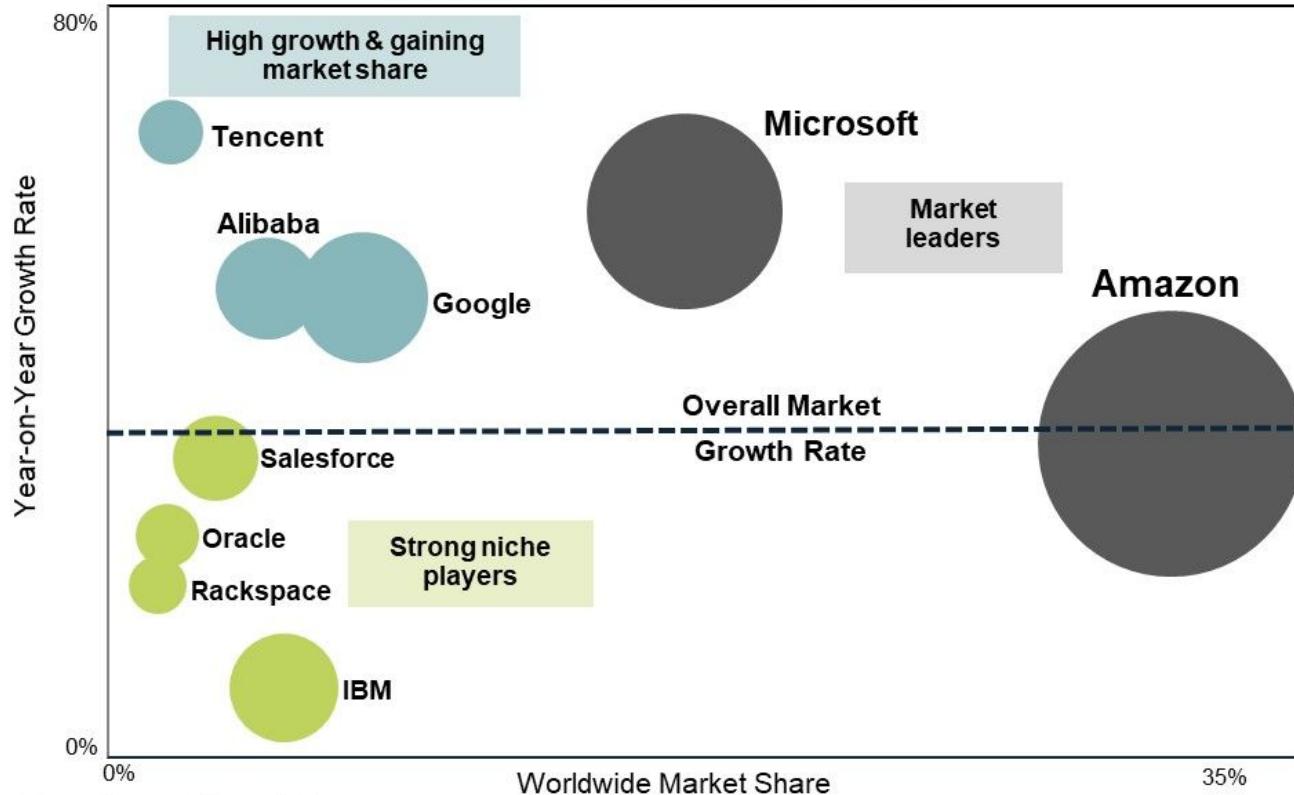
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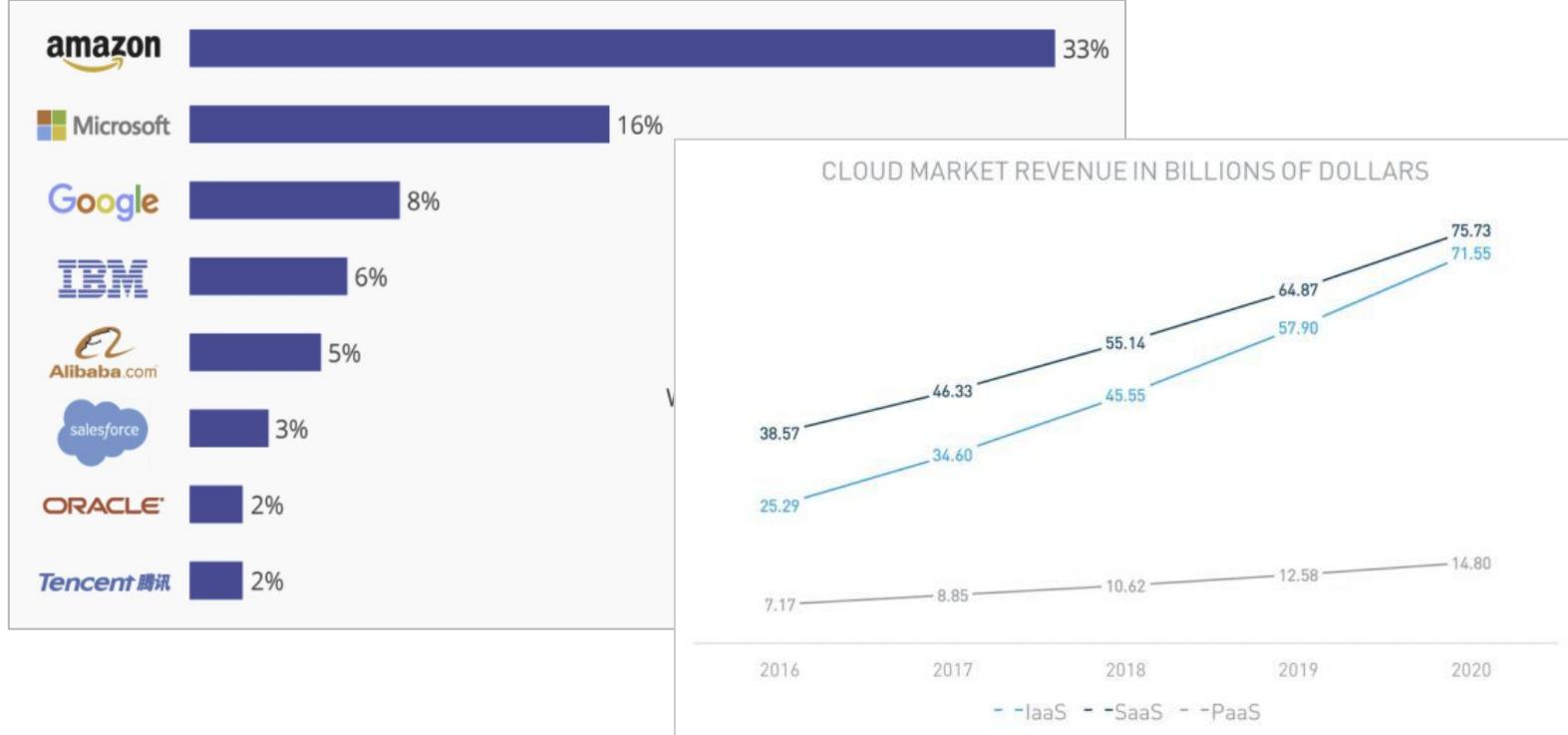
Cloud Provider Competitive Positioning

(IaaS, PaaS, Hosted Private Cloud - Q4 2019)

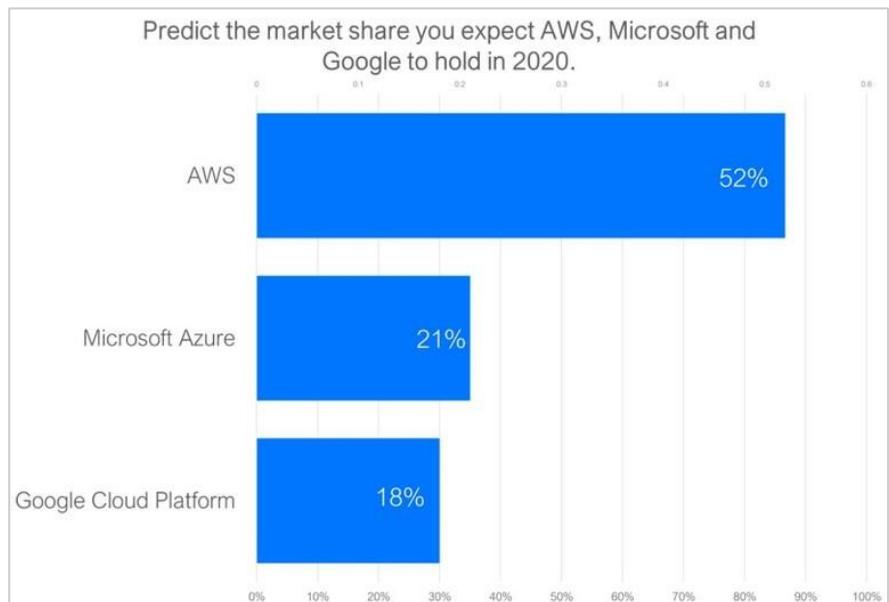
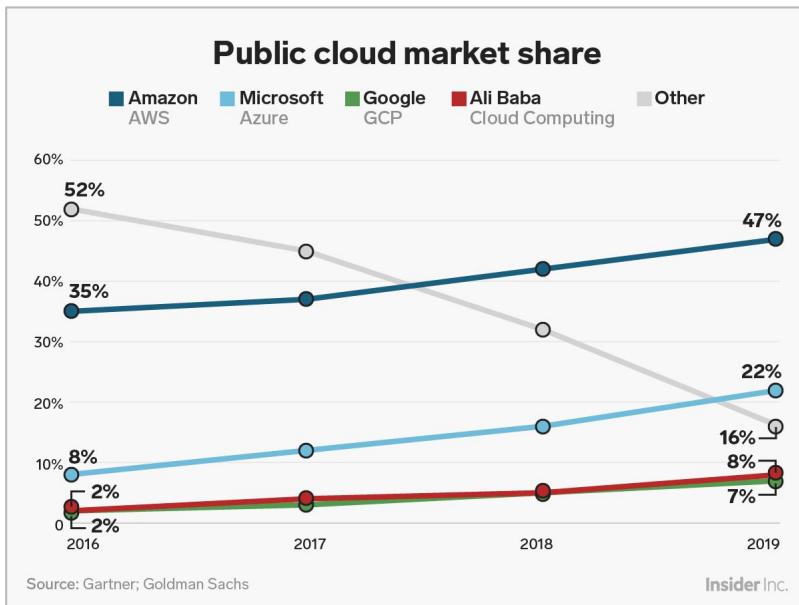


Source: Synergy Research Group

Cloud Market Revenue



Public Cloud Market Share

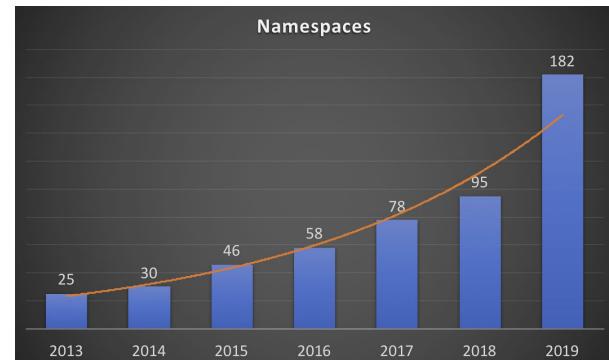




Amazon Web Services (AWS)



- Created in 2006
- Global Infrastructure
 - 24 regions
 - 77 Availability zones
- ~250 Services



Amazon Web Services (AWS) LINK



Analytics



Application Integration



AR & VR



AWS Cost Management



Blockchain



Business Applications



Compute



Containers



Customer Engagement



Database



Developer Tools



End User Computing



Game Tech



Internet of Things



Machine Learning



Management & Governance



Media Services



Migration & Transfer



Mobile



Networking & Content Delivery



Quantum Technologies



Robotics



Satellite



Security, Identity & Compliance



Storage

10 AWS services you should know about



- **Compute**



Compute

- IaaS: AWS Elastic Compute Cloud (EC2)
- PaaS: AWS Elastic Beanstalk
- FaaS: AWS Lambda

- **Containers**



Containers

- Amazon Elastic Container Service (ECS)
- Amazon Elastic Kubernetes Service (EKS)
- Amazon Fargate (serverless)

- **Storage**



Storage

- Amazon Simple Storage Service (S3)
- Amazon Elastic Block Store (EBS)
- Amazon Elastic File System (EFS)

- **Networking**



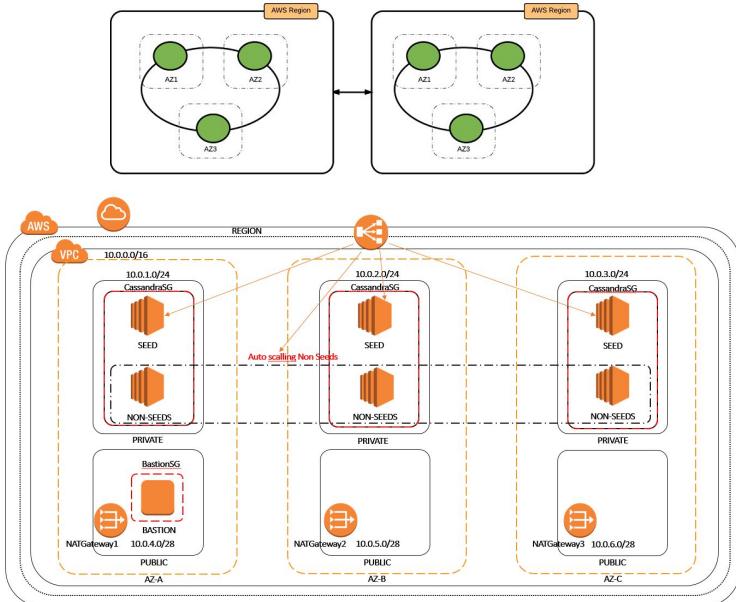
Networking & Content Delivery

- Amazon VPC
- Amazon Route 53
- Amazon CloudFront

Deploy Cassandra on AWS



- **IaaS**
 - Instantiate EC2 and install Cassandra
 - Prebuilt Images and AMI for Apache Cassandra
- **PaaS**
 - Amazon Marketplace
 - DataStax DMS
- **SaaS**
 - Use ASTRA on AWS instances
 - Amazon Keyspaces
- **CaaS**
 - Use cass-operator in EKS



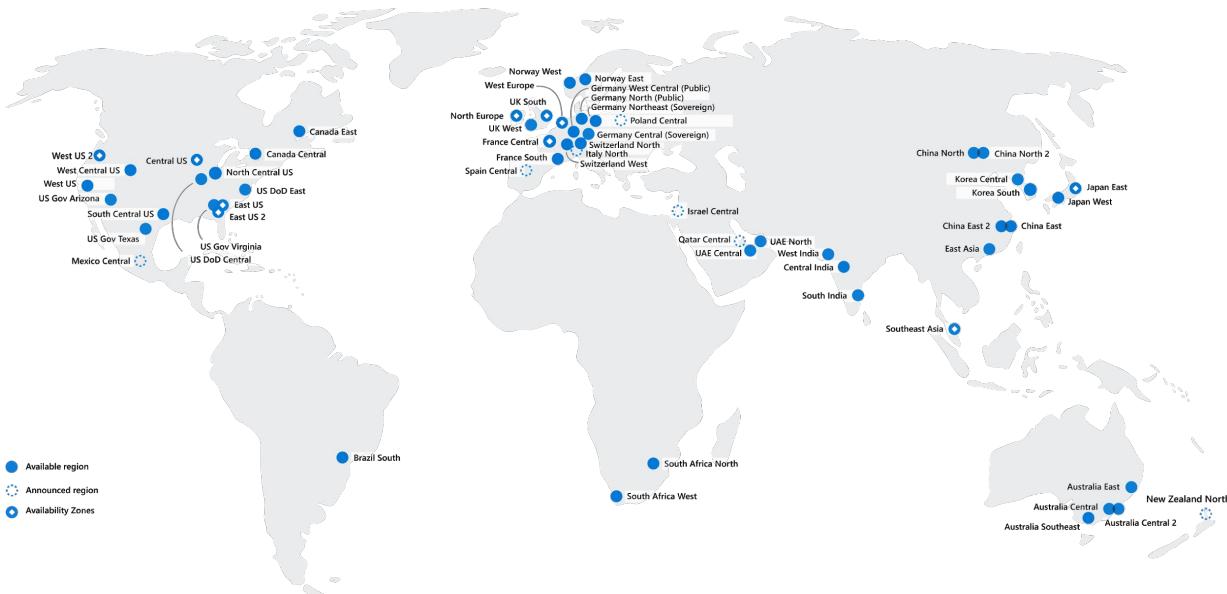


Microsoft Azure



Azure

Microsoft Azure



- Created in 2010
- Global Infrastructure
 - **40 regions**
 - **50 Availability zones**

Microsoft Azure Services



Platform Services

Security & Management <ul style="list-style-type: none">PortalActive DirectoryMulti-Factor AuthenticationAutomationKey VaultStore / MarketplaceVM Image Gallery & VM Depot	Compute <ul style="list-style-type: none">Cloud ServicesService FabricBatchRemote App	Web and Mobile <ul style="list-style-type: none">Web AppsAPI AppsAPI ManagementMobile AppsLogic AppsNotification Hubs	Developer Services <ul style="list-style-type: none">Visual StudioAzure SDKTeam ProjectApplication Insights	Hybrid Operations <ul style="list-style-type: none">Azure AD Connect HealthAD Privileged Identity ManagementBackupOperational InsightsImport/ExportSite RecoveryStorSimple
	Integration <ul style="list-style-type: none">Storage QueuesBiztalk ServicesHybrid ConnectionsService Bus	Analytics & IoT <ul style="list-style-type: none">HDInsightMachine LearningData FactoryEvent HubsStream AnalyticsMobile Engagement	Data <ul style="list-style-type: none">SQL DatabaseSQL Data WarehouseRedis CacheSearchDocumentDBTables	
	Media & CDN <ul style="list-style-type: none">Media ServicesContent Delivery Network (CDN)			

Infrastructure Services

Compute <ul style="list-style-type: none">Virtual MachinesContainers	Storage <ul style="list-style-type: none">BLOB StorageAzure FilesPremium Storage	Networking <ul style="list-style-type: none">Virtual NetworkLoad BalancerDNSExpress RouteTraffic ManagerVPN GatewayApplication Gateway
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10 Microsoft Azure Services you should know



- **Compute**

- IaaS: Azure virtual machines
- PaaS: Azure App Service
- FaaS: Azure Functions
- CaaS: Azure Kubernetes services (AKS)



- **Databases**

- Cosmos DB

- **Storage**

- Disk Storage (blocks)
- Azure Blob Storage (objects)

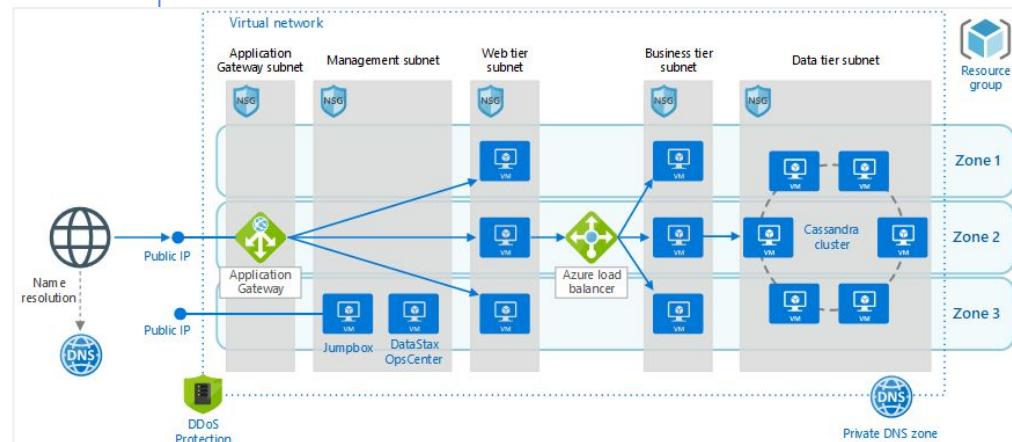
- **Networking**

- Azure Virtual Network (Vnet)
- Azure CDN
- Azure DNS

Deploy Cassandra on Azure



- **IaaS**
 - Create virtual machines and install Cassandra
 - Prebuilt Images for Apache Cassandra
- **PaaS**
 - Azure Marketplace (managed service)
 - DataStax DMS
- **SaaS**
 - Use ASTRA on Azure (beta)
 - CosmosDB(-ish)
- **CaaS**
 - Use cass-operator in AKS





Google
Cloud Platform

Google Cloud Platform

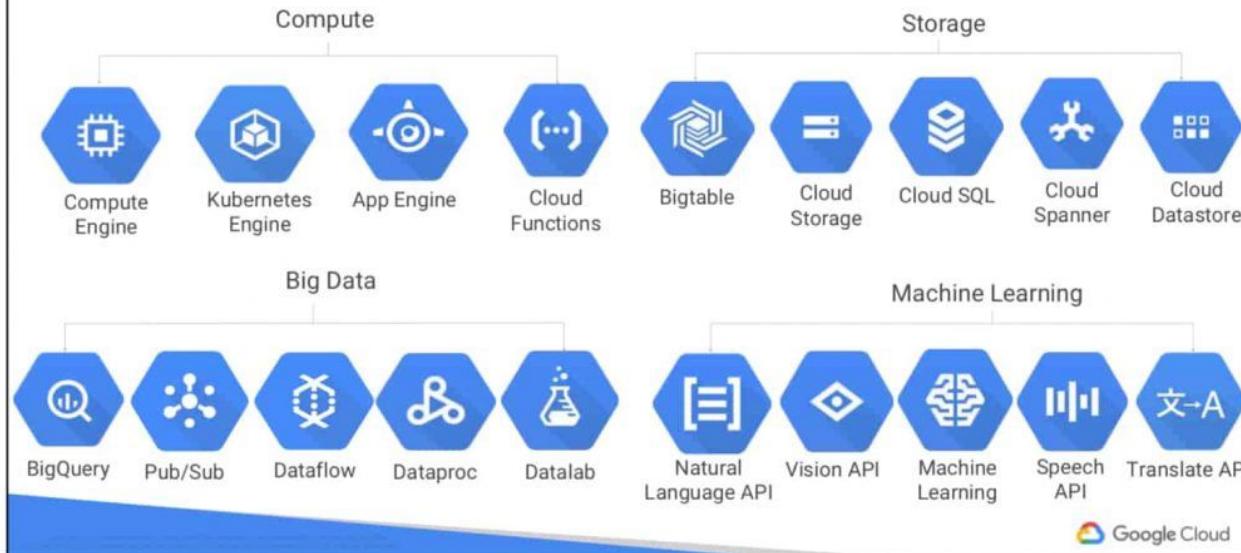


- Created in 2008
- Global Infrastructure
 - **24 regions**
 - **73 Availability zones**
- **34 “Services”**
 - Compute
 - Storage
 - Big Data
 - Machine Learning
 - etc.

GCP Services



Google Cloud Platform offers services for getting value from data



10 GCP Services you should know

- **Compute**

- IaaS: Compute engine (machines)
- PaaS: Application engine (run apps)
- FaaS: Cloud functions (serverless)
- CaaS: Kubernetes Engine



- **Data Analytics**

- Google Big Query



- **Storage**

- Persistent Disk (blocks)
- Google Cloud Storage (objects)



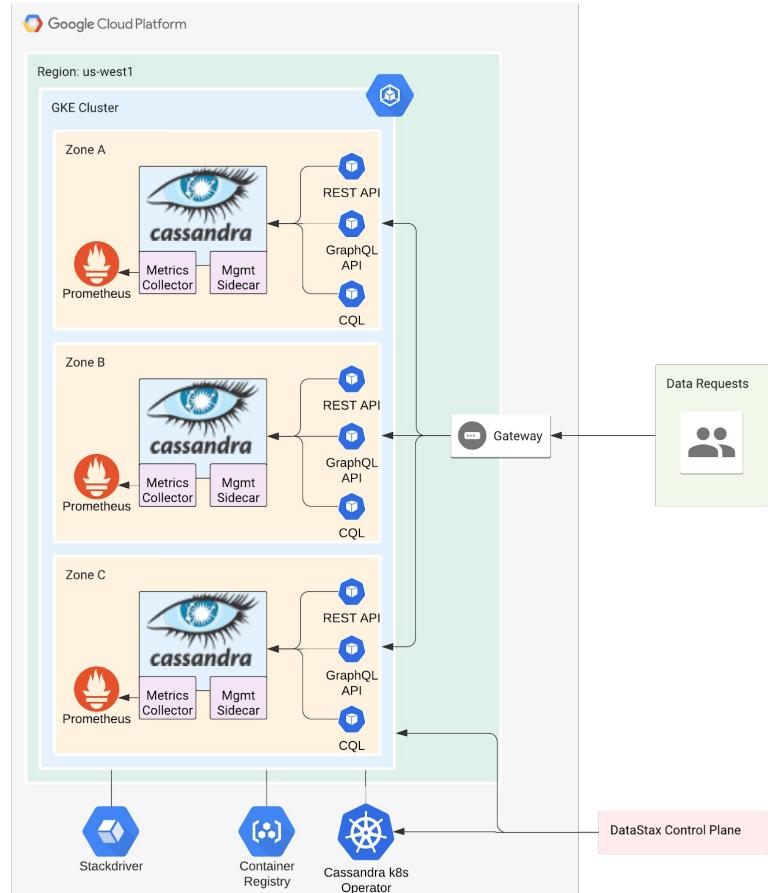
- **Network**

- Google Virtual Private Cloud
- Google CDN
- Google Cloud DNS



Deploy Cassandra on GCP

- **IaaS**
 - Use Google Compute Engine
 - <https://github.com/DSPN/google-compute-engine-dse>
 - Prebuilt Images for Apache Cassandra
- **PaaS**
 - Google Cloud Launcher (Marketplace)
 - DataStax DMS
- **The SaaS way**
 - Use ASTRA targetting GCP
 - Use ASTRA from google cloud console
- **The CaaS/KaaS way**
 - Use the cass-operator in GKE

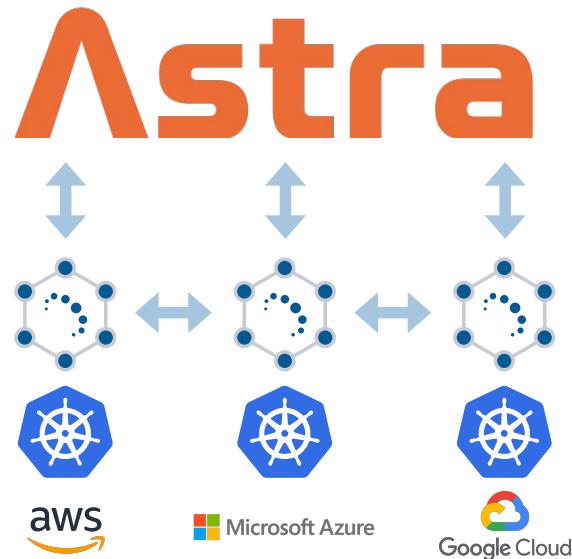


DataStax Astra!

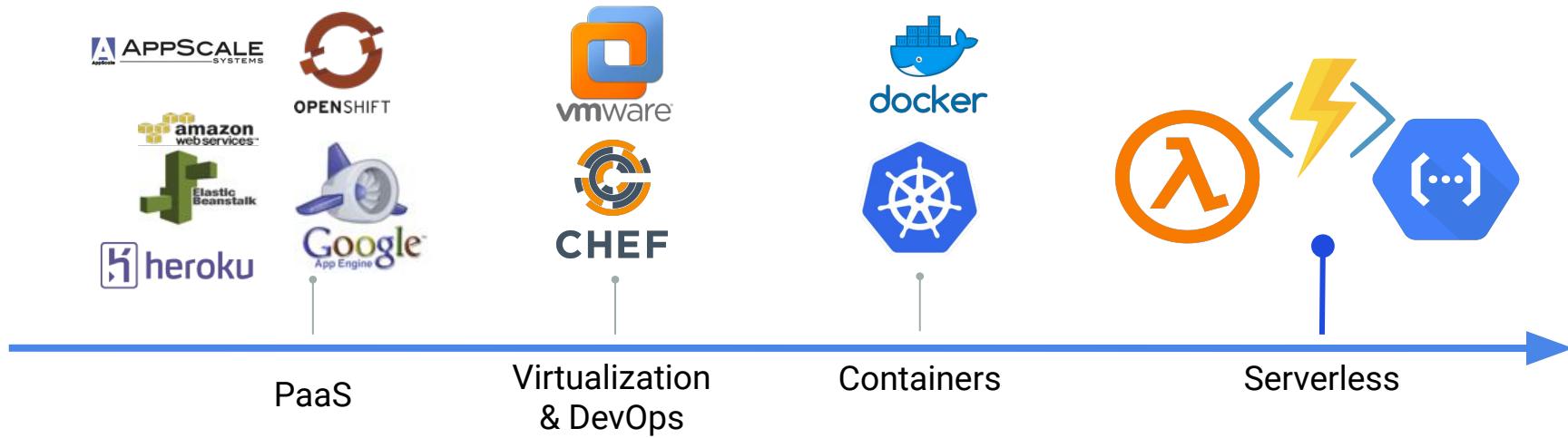
Cassandra made easy in the cloud

Build multi-cloud, multi-region applications with zero lock-in, zero-ops, massively scalable database as-a-service.

The power and reliability of Apache Cassandra combined with rich data APIs and optimized for developers building cloud-native applications.



From Containers to Function-as-a-service (FaaS)



Serverless

Cloud Provider
serverless offerings



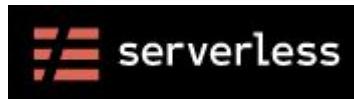
AWS Lambda



Google Cloud Functions



Cloud Agnostic
serverless tooling



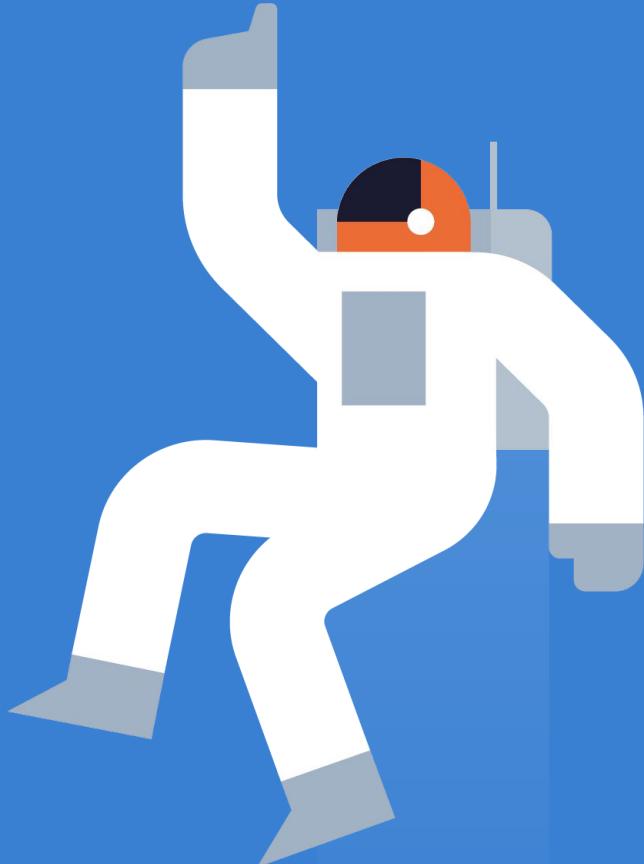
Serverless Best Practice with Driver

1. Create the driver connection to the database outside of the function entrypoint
2. Be aware of the number of client connections to your database
3. Consider the query characteristics compared to the function runtime
4. Optionally reduce startup time by disabling driver metadata & pooling warmup
5. Disable the driver heartbeats that ping idle connections
6. Move the data access and business logic away from the function entrypoint

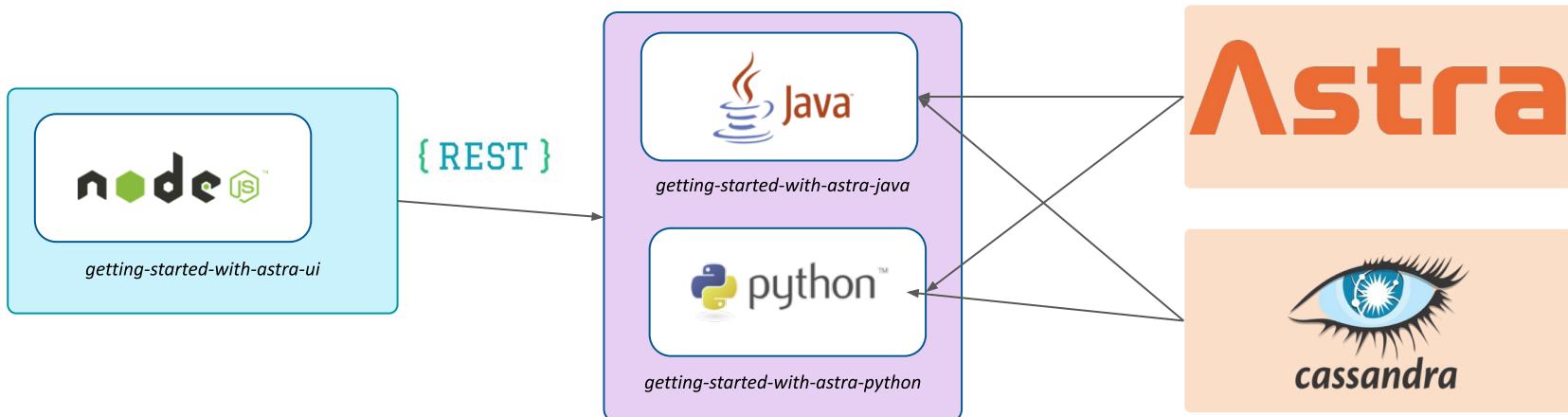


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Logical Architecture of our Application



Exercise 1

Google Cloud Platform

Exercise 1 - Minimal deployment

Explore the cluster

We have three worker nodes:

```
$ kubectl get nodes
NAME           STATUS   ROLES      AGE   VERSION
gke-my-first-cluster-1-default-pool-b98b0390-4zfw  Ready    <none>   6m20s  v1.17.9-gke.600
gke-my-first-cluster-1-default-pool-b98b0390-jvnw   Ready    <none>   6m19s  v1.17.9-gke.600
gke-my-first-cluster-1-default-pool-b98b0390-jw8m   Ready    <none>   6m18s  v1.17.9-gke.600
```

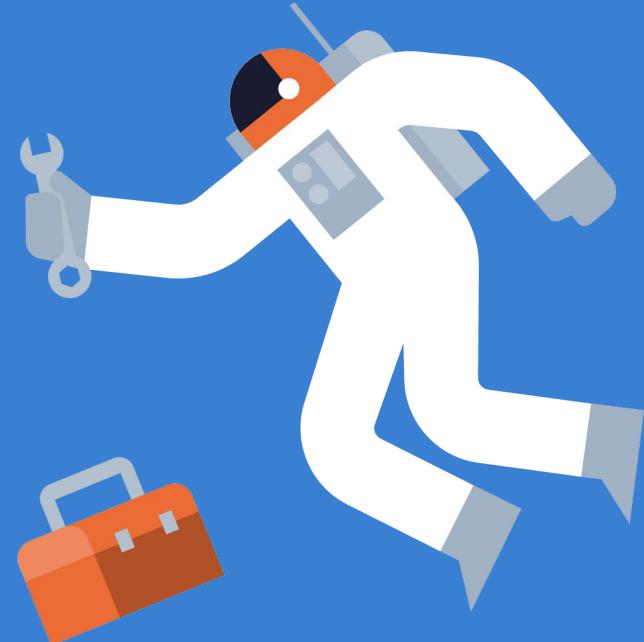
To get to the external IP addresses:

```
$ kubectl get nodes -o wide
NAME           STATUS   ROLES      AGE   VERSION   INTERNAL-IP   EXTERNAL-IP
RSION CONTAINER-RUNTIME
gke-my-first-cluster-1-default-pool-b98b0390-4zfw  Ready    <none>   6m37s  v1.17.9-gke.600  10.128.0.3   35.238.50.14
          docker://19.3.6
gke-my-first-cluster-1-default-pool-b98b0390-jvnw   Ready    <none>   6m36s  v1.17.9-gke.600  10.128.0.2   35.225.144.2
          docker://19.3.6
gke-my-first-cluster-1-default-pool-b98b0390-jw8m   Ready    <none>   6m35s  v1.17.9-gke.600  10.128.0.4   130.211.127.
          docker://19.3.6
```

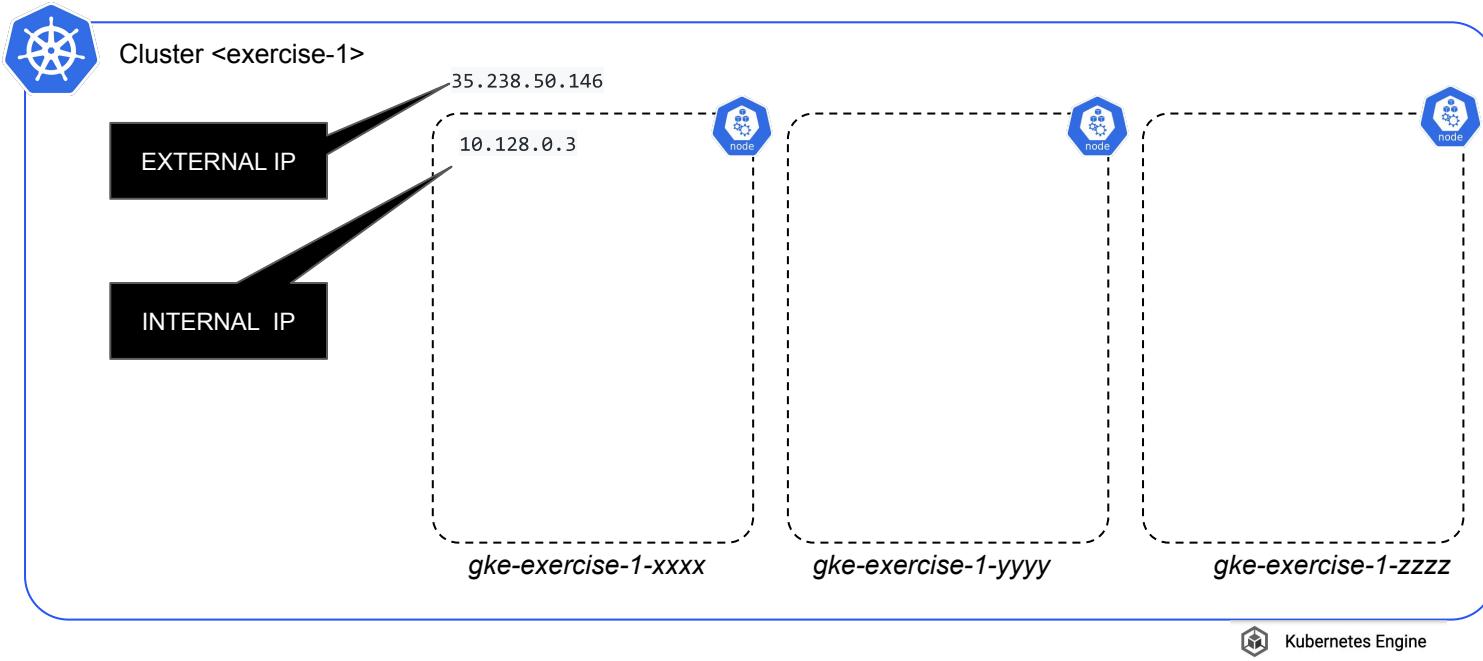
We will need the external IP addresses to access our cluster from anywhere.

Optional: Publish your application to docker hub

Before you can create pods using your application docker images, you need to publish them to an accessible repository. I published them to Dockerhub, so that you can use them for your pods.



Project <workshop-week3>

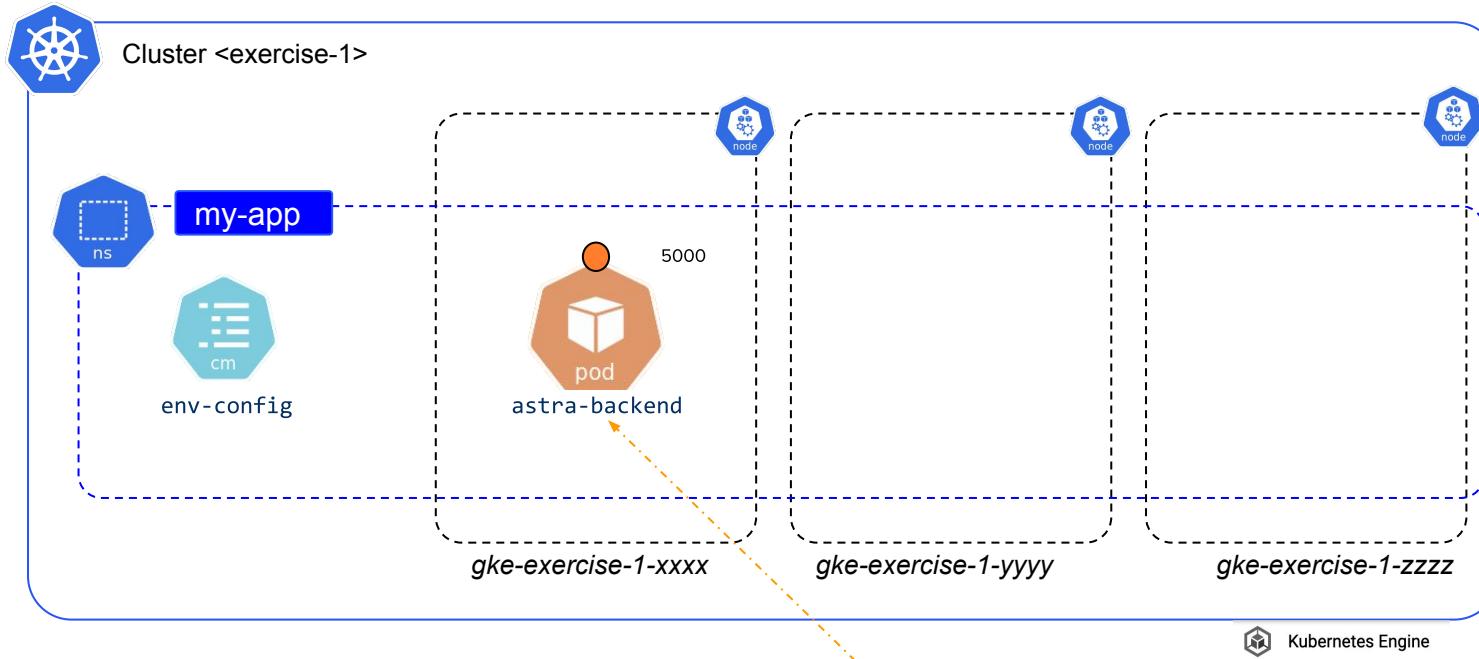


Docker Registry

DataStax Developers

Billing bucket + Billing export

Project <workshop-week3>



Billing bucket + Billing export

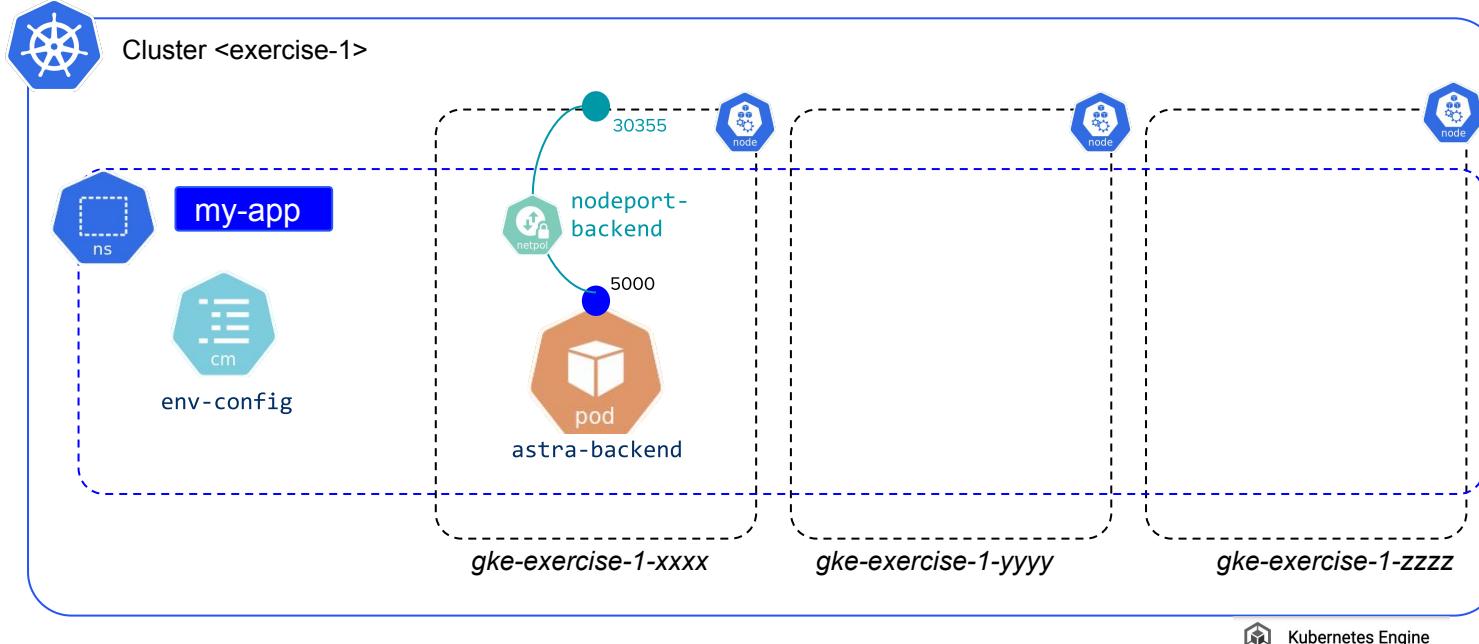
Kubernetes Engine

datastaxdevs/app-to-cloud:backend



DataStax Developers

Project <workshop-week3>



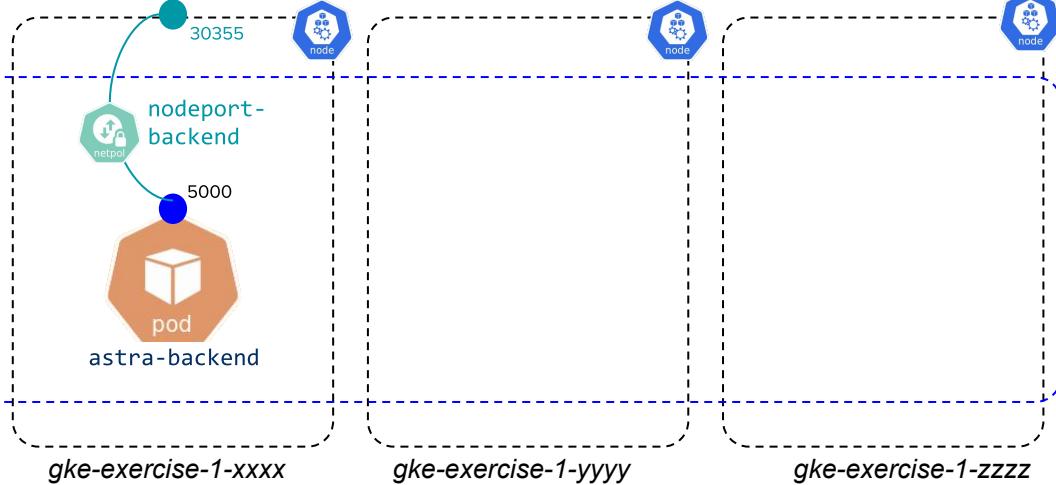
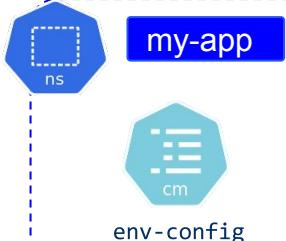
DataStax Developers

Billing bucket + Billing export

Project <workshop-week3>



Cluster <exercise-1>



Billing bucket + Billing export

Kubernetes Engine



DataStax Developers

Project <workshop-week3>



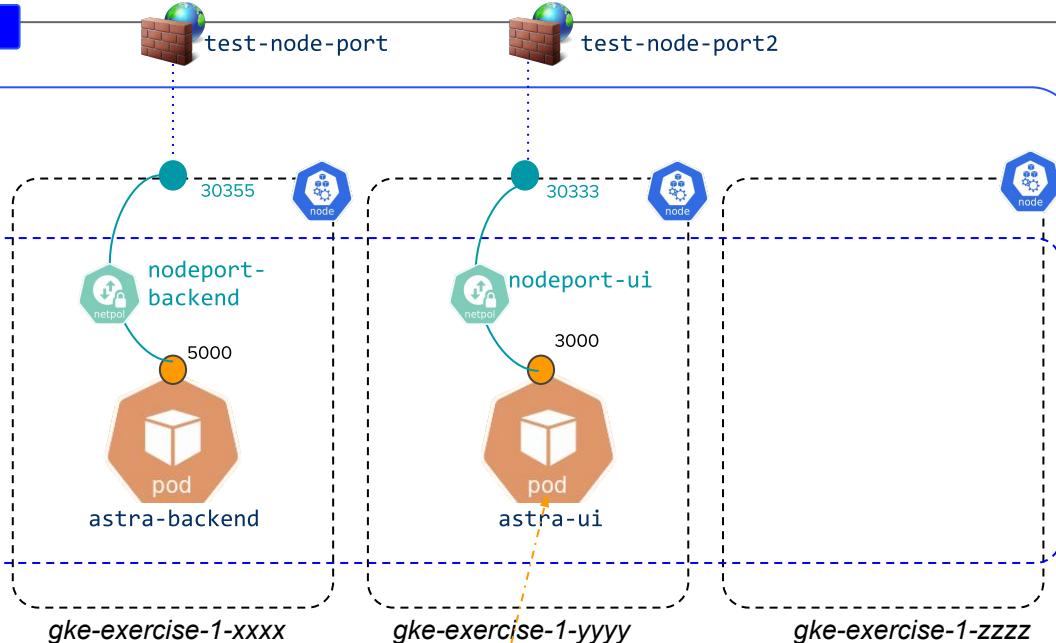
Cluster <exercise-1>



my-app



env-config



Billing bucket + Billing export



Kubernetes Engine



DataStax Developers

Happiness!



≡ DATASTAX Getting Started with Astra LAUNCH NEW JOURNEY

Connect to your Astra Database

Please enter the following information to connect to your Astra instance

Database User Name*
`todouser`

Database Password*
`*****`

Keyspace*
`todoapp`

secure-connect-devworkshopdb.zip

TEST CONNECTION SAVE

Current Spacecraft Location

X: 0 km
Y: 0 km
Astra Table:
`spacecraft_location_over_time`

Spacecraft Temperature over Time

Test Successful

Spacecraft Speed over Time

Speed: 0 km/h
Table: `spacecraft_speed_over_time`

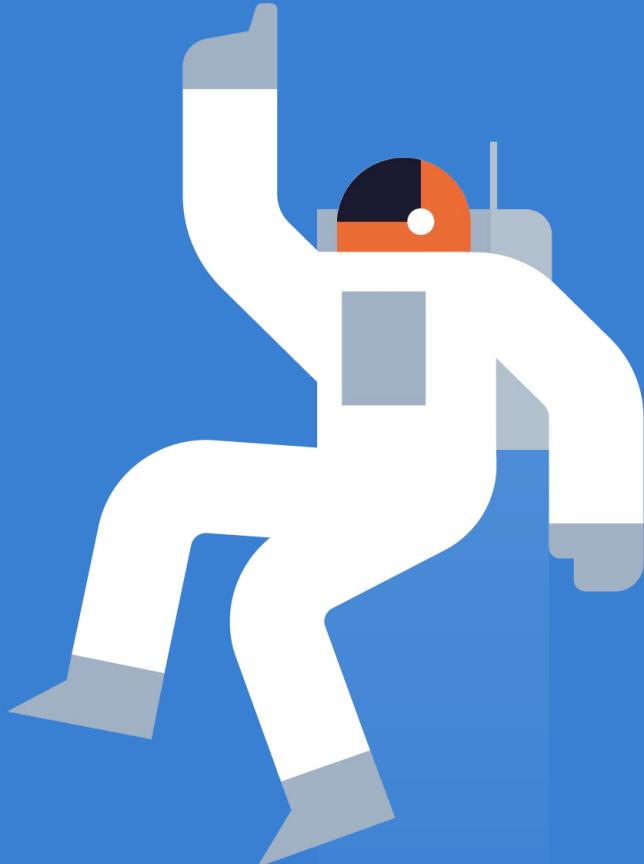
Spacecraft Pressure over Time

Pressure: 0 kPa
Astra Table:
`spacecraft_pressure_over_time`

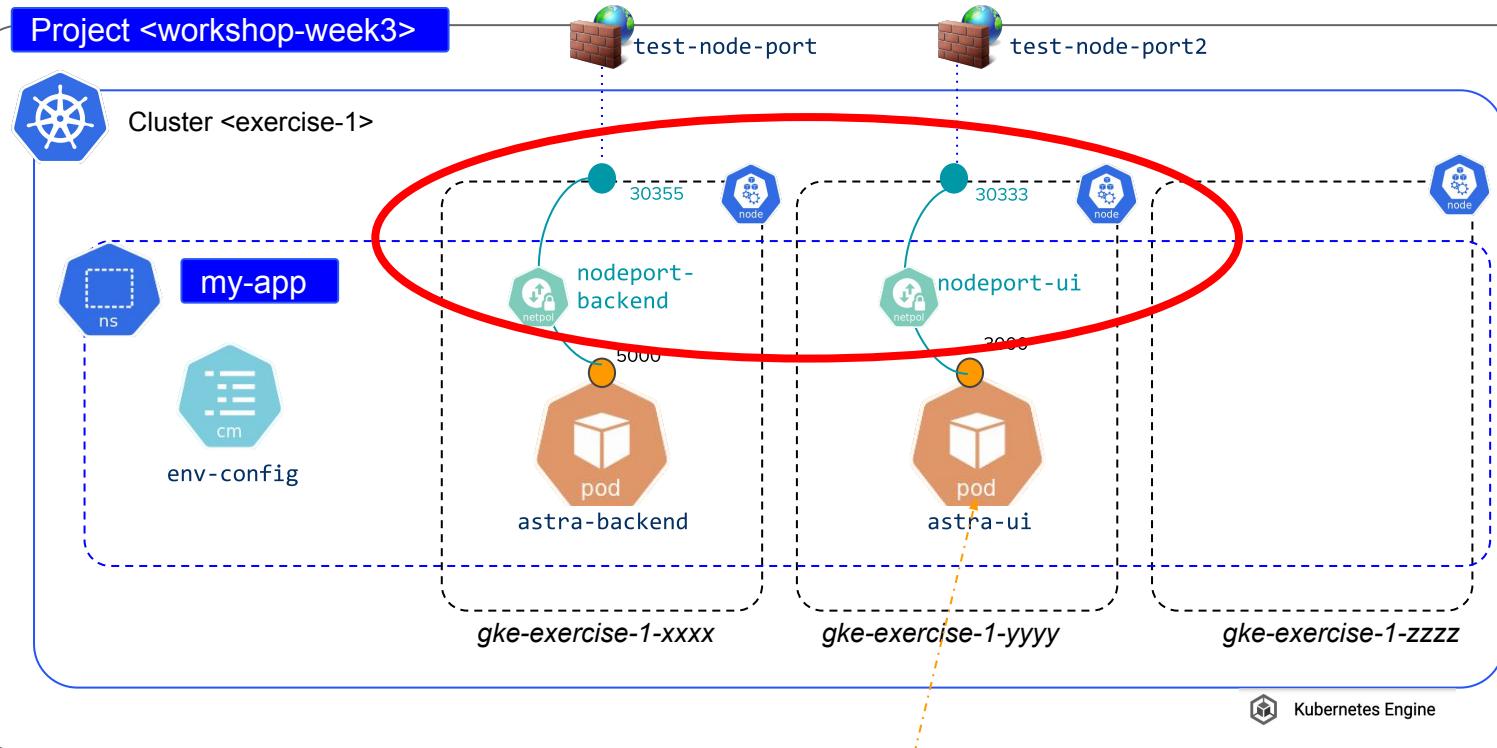
The screenshot shows the DataStax Astra Getting Started interface. It features a central modal window titled "Connect to your Astra Database" with fields for Database User Name, Database Password, and Keyspace. Below the modal are three circular dashboards: "Spacecraft Temperature over Time" (green), "Spacecraft Speed over Time" (black), and "Spacecraft Pressure over Time" (red). A green banner at the bottom left of the dashboard area says "Test Successful". To the right, there's a sidebar for "Current Spacecraft Location" showing coordinates X: 0 km and Y: 0 km, with an "Astra Table" listed as "spacecraft_location_over_time". The top navigation bar includes the DataStax logo, a "LAUNCH NEW JOURNEY" button, and a user profile icon.

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Project <workshop-week3>



Billing bucket + Billing export

Kubernetes Engine



datastaxdevs/app-to-cloud:frontend

DataStax Developers

Primitives Services



Ingress is a collection of rules that allow inbound connections to reach the endpoints defined by a backend.



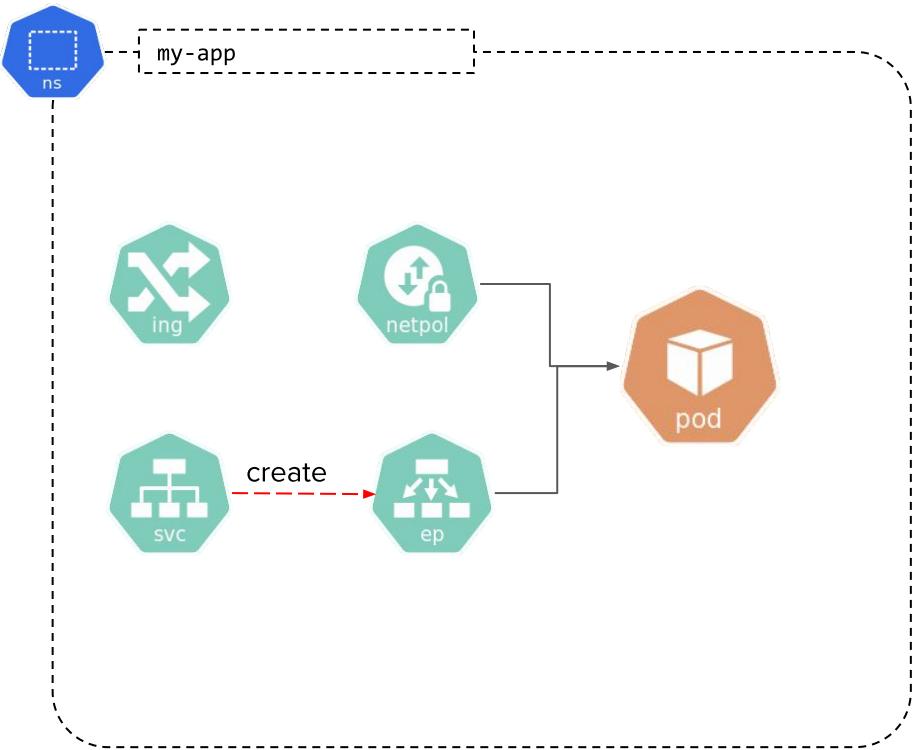
Service is a named abstraction of software service with ports to listen on and selector to determine which pods will answer requests.



EndPoint is a collection of endpoints that implement the actual service..



NetworkPolicy: Describes what network traffic is allowed for a set of Pods.



Exercise 2

Google Cloud Platform

Exercise 2 - Deployments and Load Balancers

Nodeports are easy to set up, but they have a big disadvantage: they are bound to a particular kubernetes worker node. If a pod gets deleted and recreated, it might get scheduled on a different worker node, and we won't be able to reach it anymore via the nodeport.

A way to abstract this node binding is to deploy the pods as deployments and to use load balancer services to address the pods in the deployment and correctly route any external traffic.

Let's reconfigure our kubernetes cluster for this exercise:

```
kubectl delete namespace my-app
```

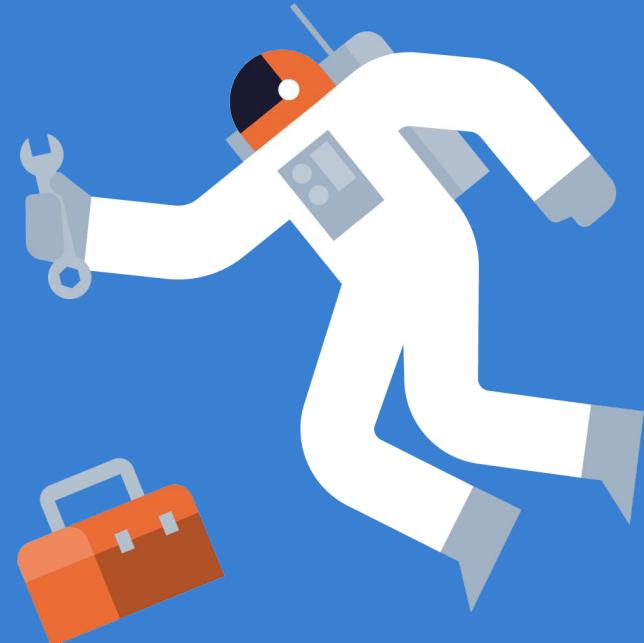
Wait a moment until all pods and services are deleted.

1 - Recreate a namespace

```
kubectl create namespace my-app
```

2 - Create separate config map for backend

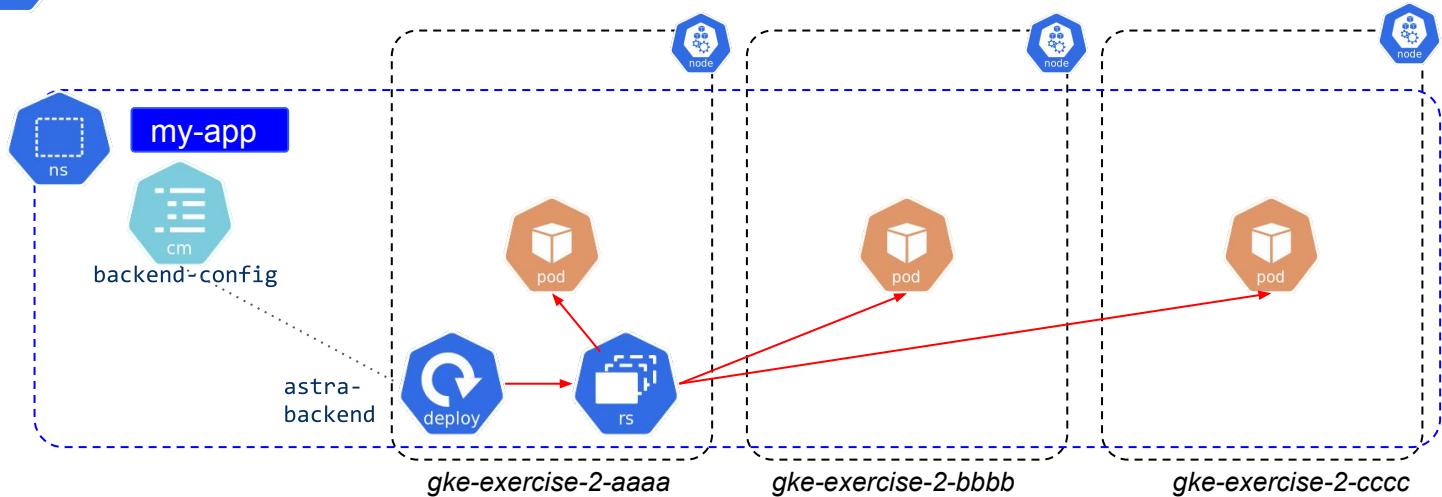
```
touch backendConfig.yaml
```



Project <workshop-week3>



Cluster <exercise-2>



Kubernetes Engine

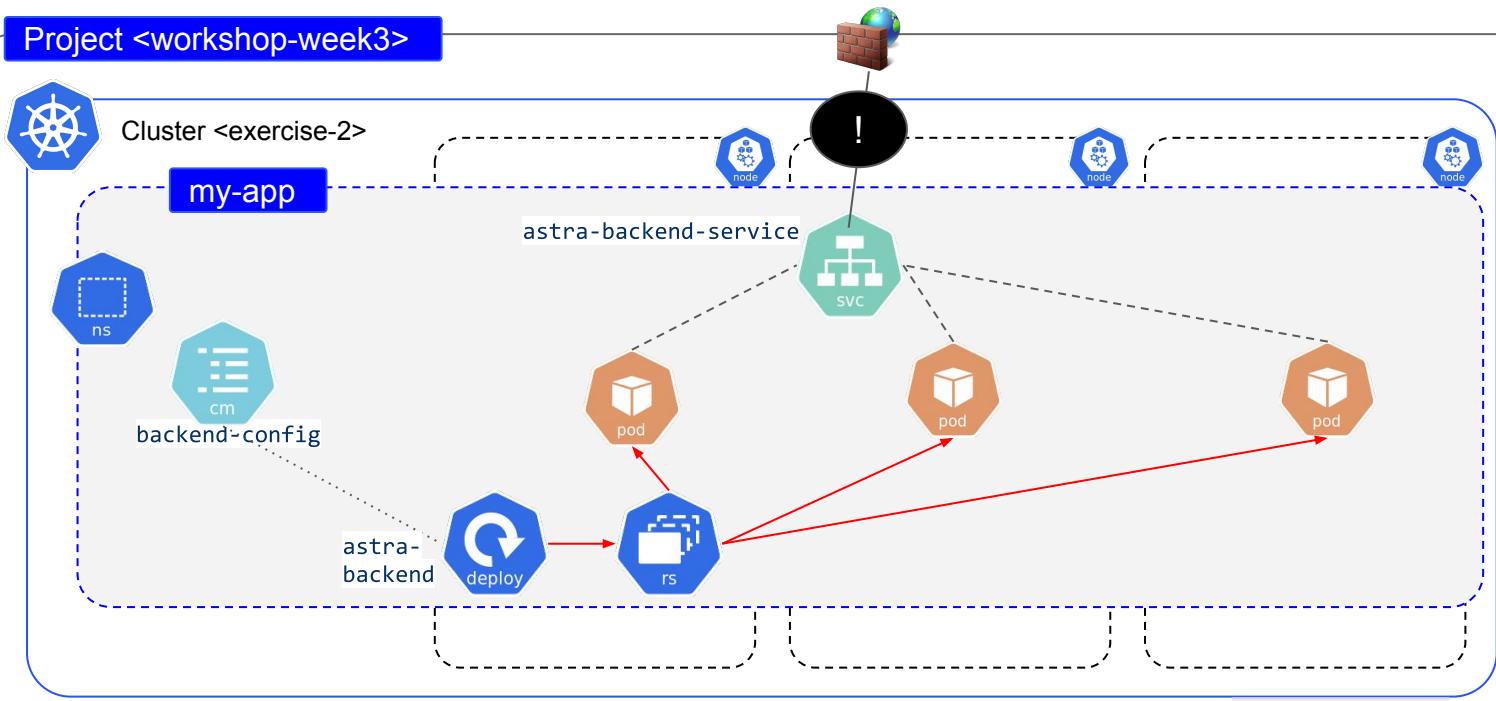


Docker Registry

DataStax Developers

Billing bucket + Billing export

Project <workshop-week3>



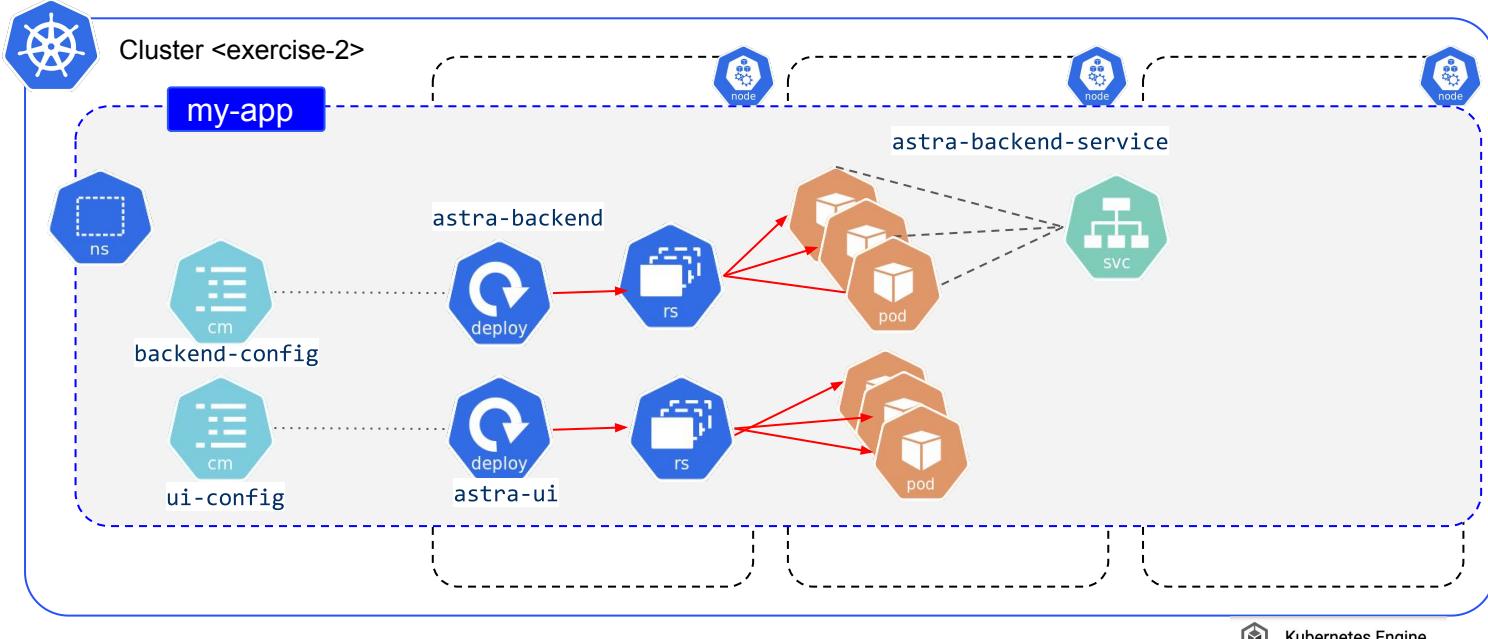
DataStax Developers



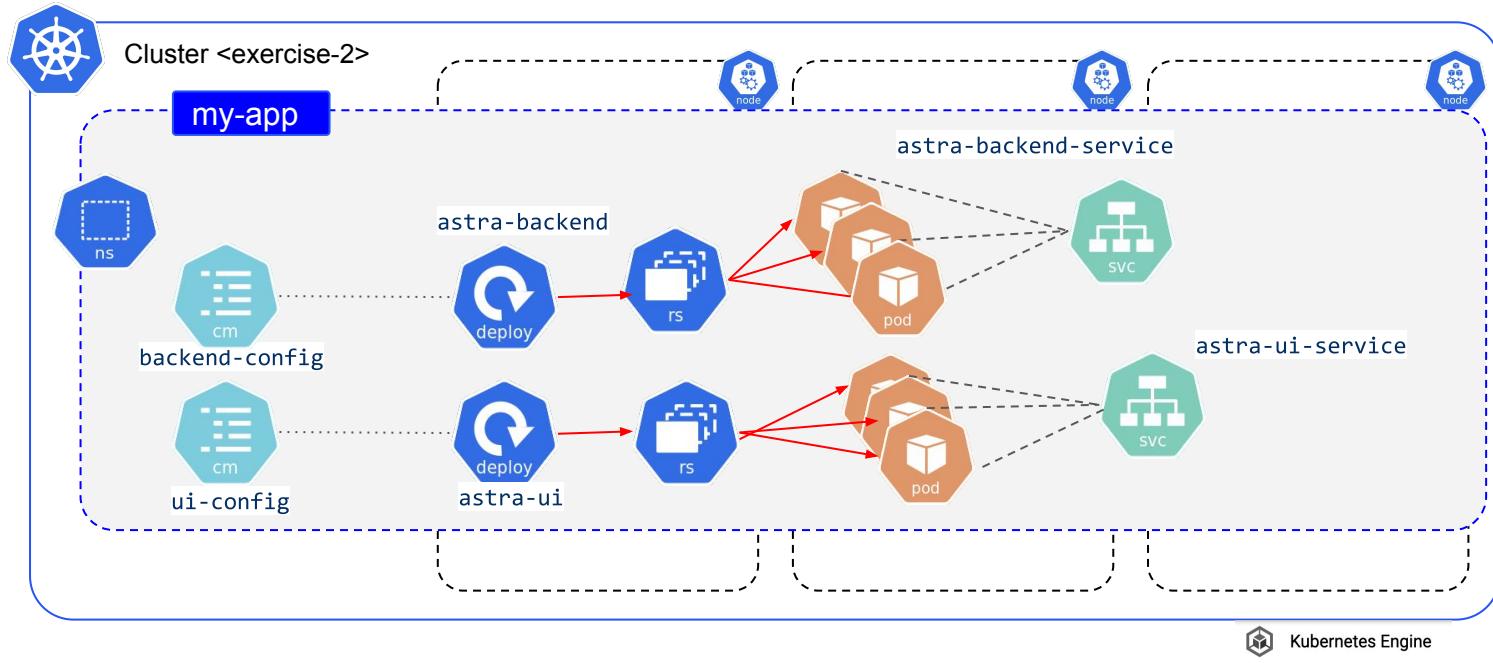
Billing bucket + Billing export



Project <workshop-week3>



Project <workshop-week3>



Kubernetes Engine



Happiness, again!



≡ DATASTAX Getting Started with Astra LAUNCH NEW JOURNEY

Connect to your Astra Database

Please enter the following information to connect to your Astra instance

Database User Name *
todouser

Database Password *

Keyspace *
todoapp

secure-connect-devworkshopdb.zip

TEST CONNECTION SAVE

Current Spacecraft Location

X: 0 km
Y: 0 km
Z: 0 km

Astra Table:
spacecraft_location_over_time

Spacecraft Health

Temperature: 70% **Test Successful**

Speed: 0 km/h

Table: **spacecraft_speed_over_time**

Pressure: 0 kPa

Astra Table:
spacecraft_pressure_over_time

The screenshot shows the DataStax Astra web interface. A modal window titled "Connect to your Astra Database" is open, prompting for database user name ("todouser"), password (redacted), and keyspace ("todoapp"). Below the modal are three circular progress bars: "Spacecraft Health" (70%, "Test Successful"), "Speed" (0 km/h, "Table: spacecraft_speed_over_time"), and "Pressure" (0 kPa, "Astra Table: spacecraft_pressure_over_time"). On the right, a sidebar displays the "Current Spacecraft Location" with coordinates X: 0 km, Y: 0 km, Z: 0 km, and an "Astra Table: spacecraft_location_over_time".

menti.com

50 33 92 0

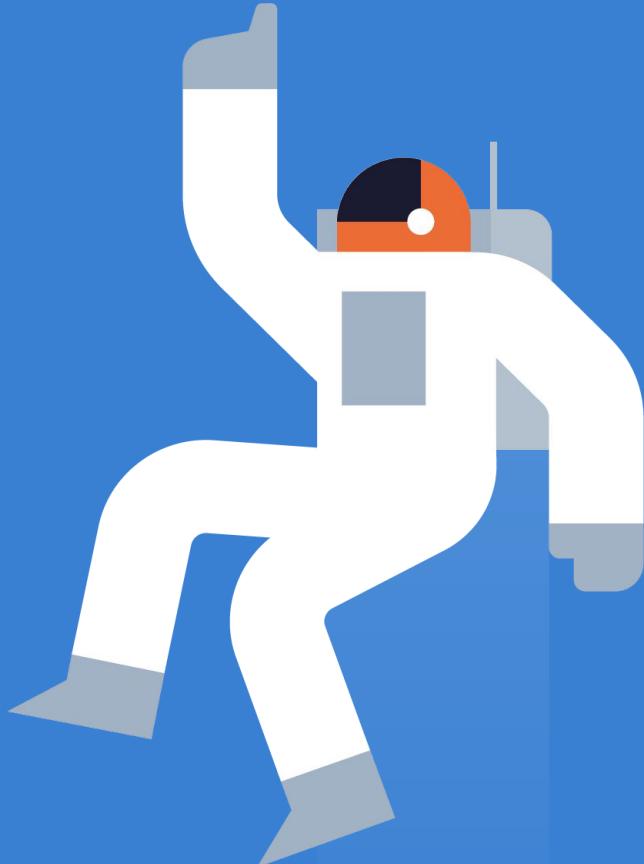


Available on the iPhone
 App Store

GET IT ON
 Google play

Taking your app to the cloud

1. Housekeeping and Setup
2. Cloud Computing Overview
3. Cloud Providers and Services
4. Deploy our Application in GKE 1
5. Deploy our Application in GKE 2
6. Wrap up



Certification Vouchers

Thanks for joining our 3 week series! Congratulations, you have earned a certification voucher 🎉

How to claim:



Fill in the form NOW!

<https://bit.ly/GET-VOUCHER>

Once you have submitted the form, you will receive your voucher within **5 working days**

Each voucher allows 2 attempts. 1 voucher per person.

HomeWork

No, seriously! I know you earned the voucher but knowledge is more important 

<https://github.com/DataStax-Academy/taking-your-k8s-to-cloud>

README.MD

Porting the application to Cloud

license Apache-2.0 chat 208 online

Summary

Go Cloud Native with your app. In this repository, you'll find everything you need related to week 3 of the Cassandra Workshop Series Winter 2021.

Materials

- Workshop recordings
 - First run ([Aleks Volochnev, David Gilardi](#)) youtu.be/poRdqN2wT_8
 - Second run ([Aleks Volochnev, Cedrick Lunven](#)) youtu.be/A-G9nli8kCw
- [Presentation](#)
- [Discord Chat](#)

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Thank you!



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