Technology Icebreaker

https://tinyurl.com/mdb-welcome

At the end of today, you will have the tools to build an app like this!

MongoDB & Google Cloud Workshop

mongoDB. Atlas

Jim Blackhurst, Solutions Architect, MongoDB
Ronan Bohan, Solutions Architect, MongoDB

Natasha Wilson, Marketing Northern Europe, MongoDB
PJ Singh, Director Partners NEUR, MongoDB

Bradley Wilson Hunt, Service Delivery Manager, FACEIT
Emanuele Massara, Software Engineer, FACEIT

mongoDB. Google Cloud

Logistics

Rest Rooms: Outside this room, on the right

WIFI: *GoogleGuest-V4* (no password)

Create accounts:

- cloud.mongodb.com
- cloud.google.com

Detailed Agenda

9.00 - 9.20	Networking
	• with breakfast snacks, tea, coffee
9.20 - 9.30	Logistics and program
9.30 - 9.45	MongoDB & GCP Overview
9.45 - 10.00	Technical Overview
	• Best Way to Work with Data
	• Intelligently Place Data Where You Need It
	• Freedom to Run Anywhere
10.00 - 10.15	Atlas Overview and Demo
10.15 - 10.30	Break
10.30 - 11.00	FaceIT Presentation
11.00 - 11.30	CRUD
11.30 - 12.30	Change Streams on Google Cloud
	• Concepts
	• Build demo together
12.30 - 13.00	MongoDB Charts
13.00 - 13.15	Closing Remarks with Q&A
	• MongoDB, Google & attendees
13.15 - 14.00	Lunch / Networking

MongoDB and GCP Overview

PJ Singh - Director Partners NEUR

mongoDB. Google Cloud

Who is MongoDB?

1500+ Employees

100+ Countries

15,000+ Customers

70m+ Downloads

40 Offices Globally

Nasdaq: MDB

Create competitive advantage

Reduce risk

Accelerate time to value

Lower costs

Intelligent Operational Data **Platform**

Best for modern data

Intelligent placement

Run Anywhere

HSBC

AutoTrader

BARCLAYS

FACEIT
CHALLENGE YOUR GAME

HM Revenue & Customs

compare themarket™

RBS

MongoDB Atlas on GCP

MongoDB Technical Overview

Cases for Change

MongoDB is a modern, operational database that supports a polyglot data strategy – on-premise and in the cloud. This allows us to drive several business critical topics with our customers.

Cloud Data Strategy
Leveraging the right data platforms as part of your overall cloud strategy helps to avoid vendor lock-in.

Legacy Modernization
Current legacy technology stacks can't cope with the range of new business requirements – we can help you modernise in a highly efficient and effective way.

Mainframe Offloading
Reduce cost and MIPS on legacy mainframes and enable data to be leveraged for new use cases.

Single View
Provide a holistic view of data entities (e.g. customer) across multiple underlying, disconnected source systems.

Operational Intelligence
Solving the problem of deriving value from existing EDW or Hadoop-based data lake solutions in real-time

Internet of Things (IoT)
MongoDB can help you overcome Scalability & Performance issues that are not being met by many current IoT solutions.

Distributed Ledger/Blockchain
MongoDB is the ideal database/persistence layer for enterprise-grade Distributed Ledger applications.

Leading modern general purpose database

Adobe Creative Cloud	ADP HR Mobile Application	amadeus Real-Time Travel Search	AstraZeneca Mobile Drug Applications	BARCLAYS Mobile Banking	Bell Multi-Screen TV
BOSCH Internet of Things Platform	Capital One Predictive Messaging	Checkr Background Checks as a Service	cisco Order Capture	coinbase Cryptocurrency Platform	DHA Logistics Modernization
DELL E-Commerce System	U.S. Immigration and Customs Enforcement Entry Decision System	DWP Digital Social Security Benefits Program	VA U.S. Department of Veterans Affairs Mobile App for Patient Data	ebay Product Catalog	EPIC GAMES Gaming Platform
experian health Single View of Patient	Genentech Genetic Analysis	Goldman Sachs Online Lending	HM Revenue & Customs Online Tax Returns	Morgan Stanley Swap Equities Management	new balance Real-Time Analytics
OTTO E-Commerce Personalization	pitney bowes E-Commerce Platform	salesforce Marketing Cloud	sky Video Streaming	splunk> Log Metadata Store	sprinklr Social Media Management
SQUARESPACE Website Platform	STAPLES Product Catalog	Symantec. Identity Theft Protection	FACEIT CHALLENGE YOUR GAME Gaming Platform	T-Mobile Subscriber QoS	URBN URBAN OUTFITTERS INC. Shopping Cart

The evolution of MongoDB (2019)

3.2

Document Validation
$lookup
Fast Failover
Simpler Scalability
Aggregation ++
Encryption At Rest
In-Memory Storage Engine
BI Connector
MongoDB Compass
APM Integration
Auto Index Builds
Backups to File System

3.4

Linearizable reads
Intra-cluster compression
Read only views
Log Redaction
Graph Processing
Decimal
Collations
Faceted Navigation
Aggregation ++
Auto-balancing ++
ARM, Power, zSeries
BI & Spark Connectors ++
Compass ++
LDAP Authorization
Encrypted Backups
Cloud Foundry Integration

3.6

Change Streams
Retryable Writes
Expressive Array Updates
Query Expressivity
Causal Consistency
Consistent Sharded Sec. Reads
Ops Manager ++
Query Advisor
Schema Validation
End to End Compression
IP Whitelisting
Default Bind to Localhost
Sessions
WiredTiger 1m+ Collections
Expressive $lookUp
R Driver
Atlas Cross Region Replication
Atlas Auto Storage Scaling

4.0

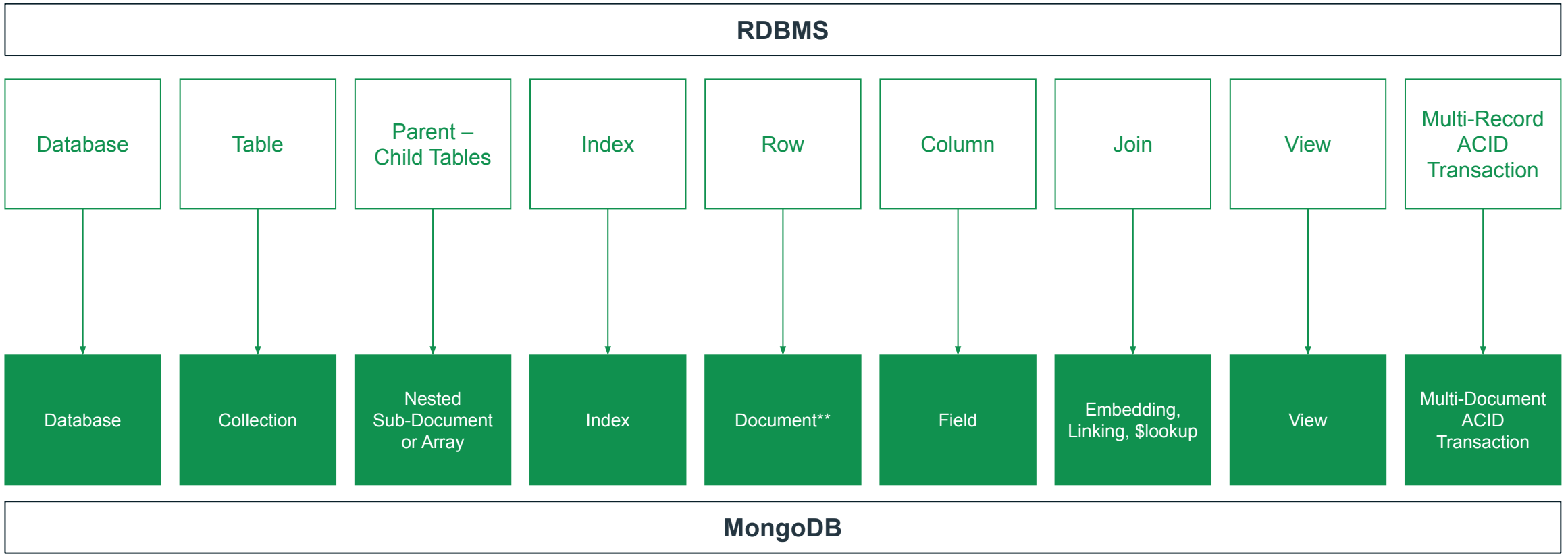
Replica Set Transactions
Atlas Global Clusters
Atlas HIPAA
Atlas LDAP
Atlas Audit
Atlas Enc. Storage Engine
Atlas Backup Snapshots
Type Conversions
40% Faster Shard Migrations
Snapshot Reads
Non-Blocking Sec. Reads
SHA-2
TLS 1.1+
Compass Agg Pipeline Builder
Compass Export to Code
Charts Beta
Free Monitoring Cloud Service
Ops Manager K8s Beta
MongoDB Stitch GA
MongoDB Mobile Beta

4.2

Distributed Transactions
Global Point in Time Reads
Large Transactions
Mutable Shard Key Values
Atlas Data Lake
Atlas Auto Scaling
Atlas Full-Text Search
Atlas ISO Compliance
Atlas Service Broker
Field Level Encryption
Multi-CAs & Online Rotation
On-Demand Materialized Views
Wildcard Indexes
Agg Pipeline ++
Expressive Updates
Apache Kafka Connector
MongoDB Charts GA
Retryable Reads & Writes
New Index Builds
10x Faster stepDown
Storage Node Watchdog
Zstandard Compression
Ops Manager Headless Backup
Ops Manager K8s GA
Ops Manager Single Agent

Some Terminology

A comparison



** Proper document schema design yields more entity data per document than found in a relational database row

Why MongoDB?

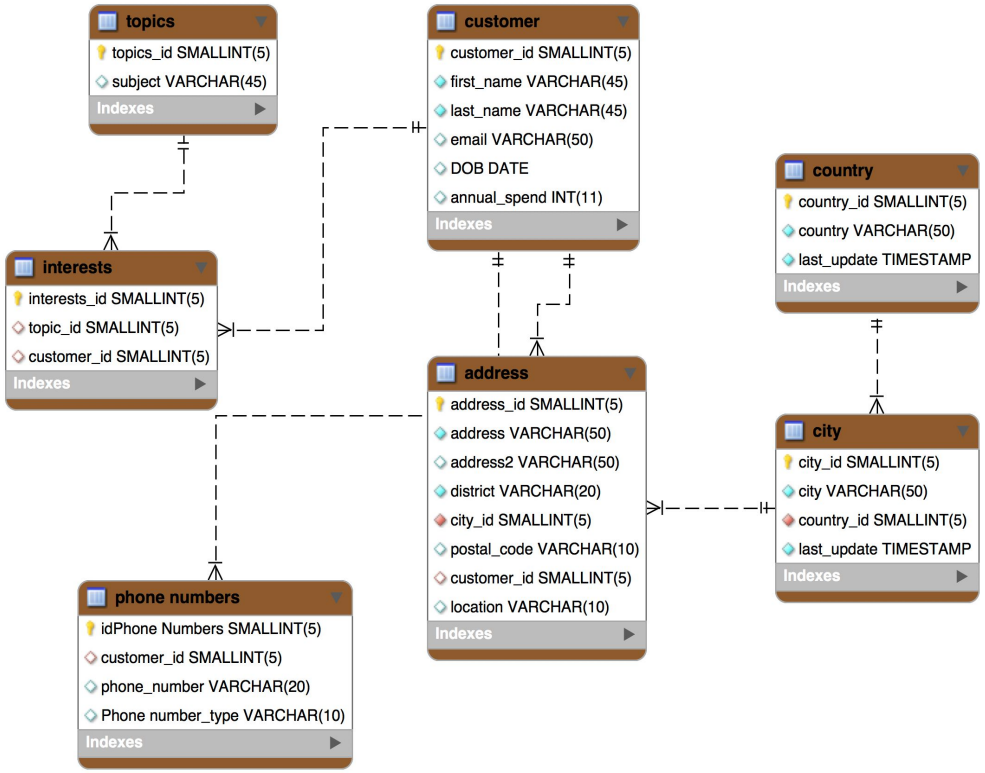
Intelligent Operational Data Platform

Best way to
work with data

Intelligently put data
where you need it

Freedom to
run anywhere

Easy: Contrasting data models




```
{
  "_id" : ObjectId("5ad88534e3632e1a35a58d00"),
  "name" : {
    "first" : "John",
    "last" : "Doe" },
  "address" : [
    { "location" : "work",
      "address" : {
        "street" : "16 Hatfields",
        "city" : "London",
        "postal_code" : "SE1 8DJ"},
      "geo" : { "type" : "Point", "coord" : [
        51.5065752,-0.109081]}},
+   {...}
  ],
  "phone" : [
    { "location" : "work",
      "number" : "+44-1234567890"},
+   {...}
  ],
  "dob" : ISODate("1977-04-01T05:00:00Z"),
  "retirement_fund" : NumberDecimal("1292815.75")
}
```

Tabular (Relational) Data Model

Related data split across multiple records and tables

Document Data Model

Related data contained in a single, rich document

Flexible: Adapt to change

```
{
  "_id" : ObjectId("5ad88534e3632e1a35a58d00"),
  "name" : {
    "first" : "John",
    "last" : "Doe" },
  "address" : [
    { "location" : "work",
      "address" : {
        "street" : "16 Hatfields",
        "city" : "London",
        "postal_code" : "SE1 8DJ"},
      "geo" : { "type" : "Point", "coord" : [
        51.5065752,-0.109081]}},
+   {...}
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```

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      "address" : {
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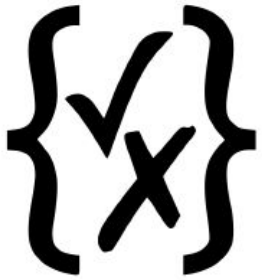
+   {...}
  ],
  "phone" : [
    { "location" : "work",
      "number" : "+44-1234567890"},
+   {...}
  ],
  "dob" : ISODate("1977-04-01T05:00:00Z"),
  "retirement_fund" : NumberDecimal("1292815.75")
}
```

Add new fields dynamically at runtime

Flexible: Govern



JSON Schema

Enforces strict schema structure over a complete collection for data governance & quality

- Builds on document validation introduced by restricting new content that can be added to a document
- Enforces presence, type, and values for document content, including nested array
- Simplifies application logic

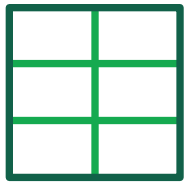
Tunable: enforce document structure, log warnings, or allow complete schema flexibility

Queryable: identify all existing documents that do not comply

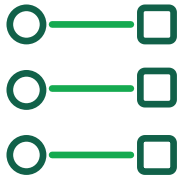
Versatile:

Multiple data models, rich query functionality

JSON Documents



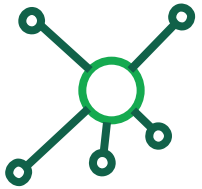
Tabular



Key-Value

Text

Geospatial



Graph

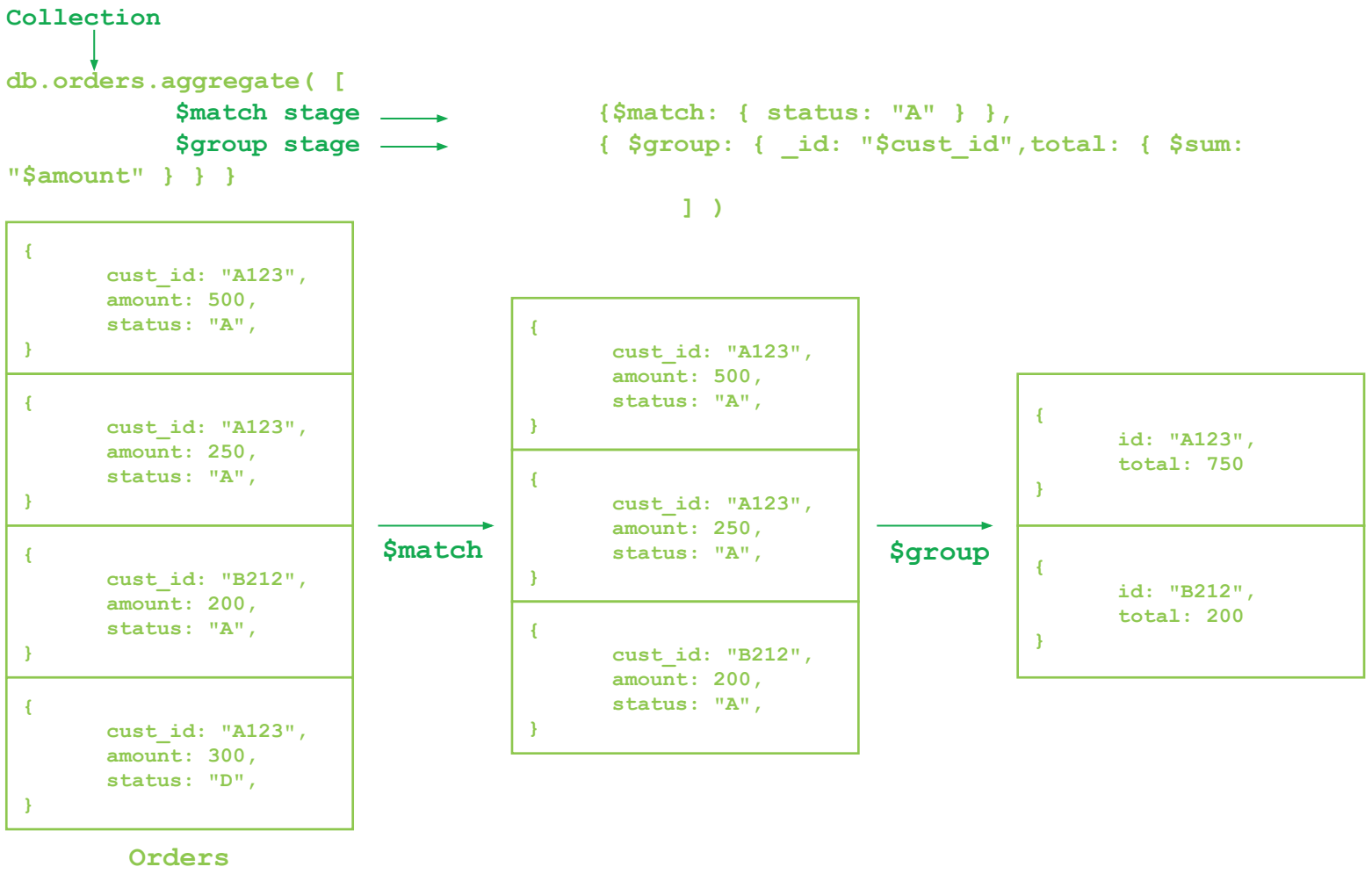
Rich Queries

Point | Range | Geospatial | Faceted Search | Aggregations | JOINs | Graph Traversals

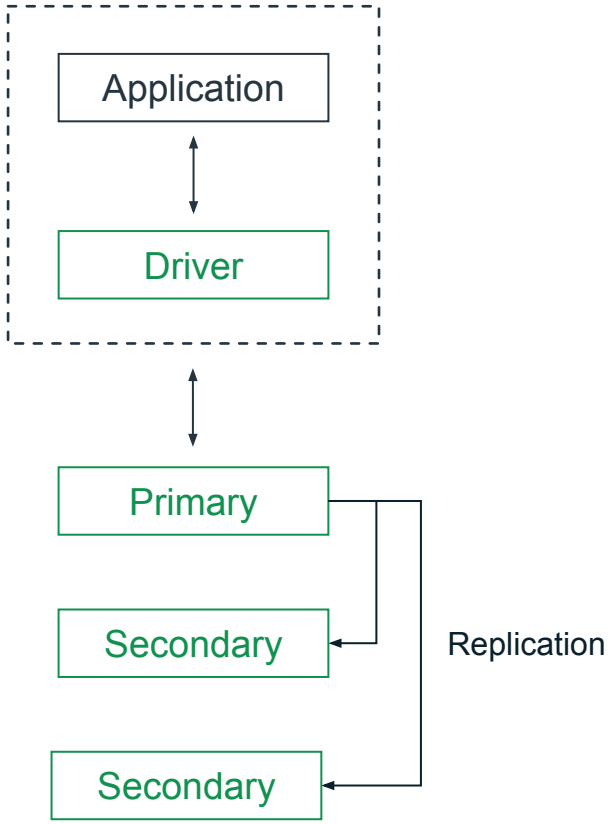
Aggregations

Advanced data processing pipeline for transformations and analytics

- Multiple stages
- Similar to a unix pipe
  - Build complex pipeline by chaining commands together
- Rich Expressions



MongoDB Replica Sets



Replica Set – 2 to 50 copies

Self-healing

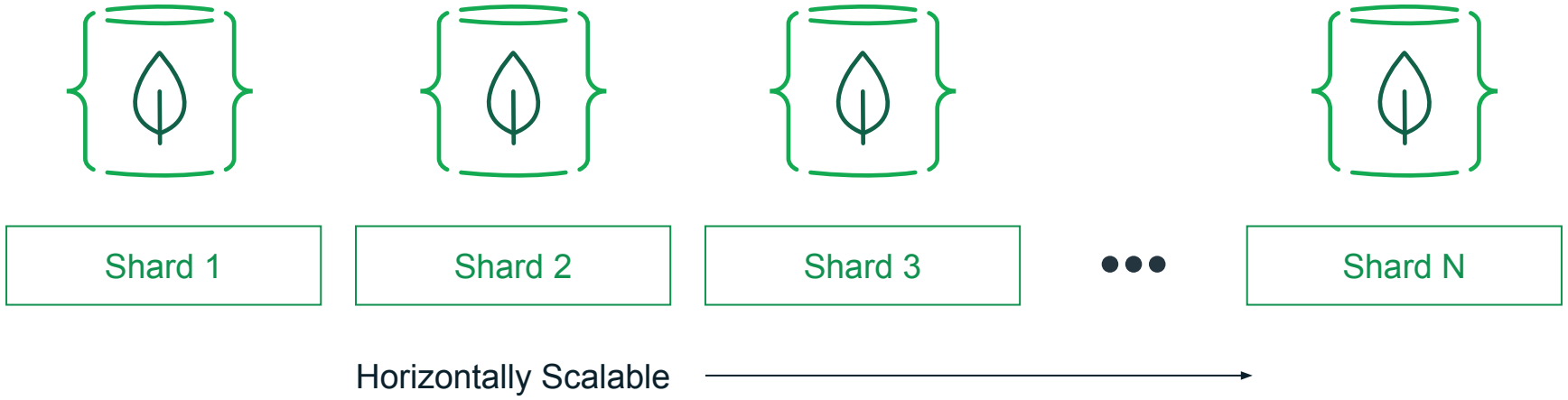
Data Center Aware

Addresses availability considerations:

- High Availability
- Disaster Recovery
- Maintenance

Workload Isolation: operational & analytics

Scaling MongoDB: Automatic Sharding



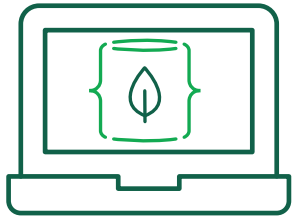
Multiple sharding policies: hashed, ranged, zoned

Increase or decrease capacity as you go

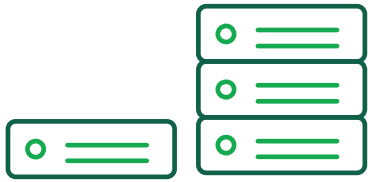
Automatic balancing for elasticity

Freedom to run anywhere

Local



On-premises
Server & Mainframe



Private cloud

Hybrid cloud

Public cloud

Fully managed cloud service

- Database that runs the same everywhere
- Leverage the benefits of a multi-cloud strategy
- Global coverage
- Avoid lock-in

Convenience: same codebase, same APIs, same tools, wherever you run

Atlas

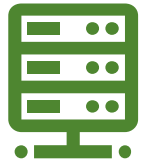
unlocks **agility** and **reduces cost**

Self-service and elastic

Global and highly available

Secure by default

Comprehensive monitoring



Managed backup

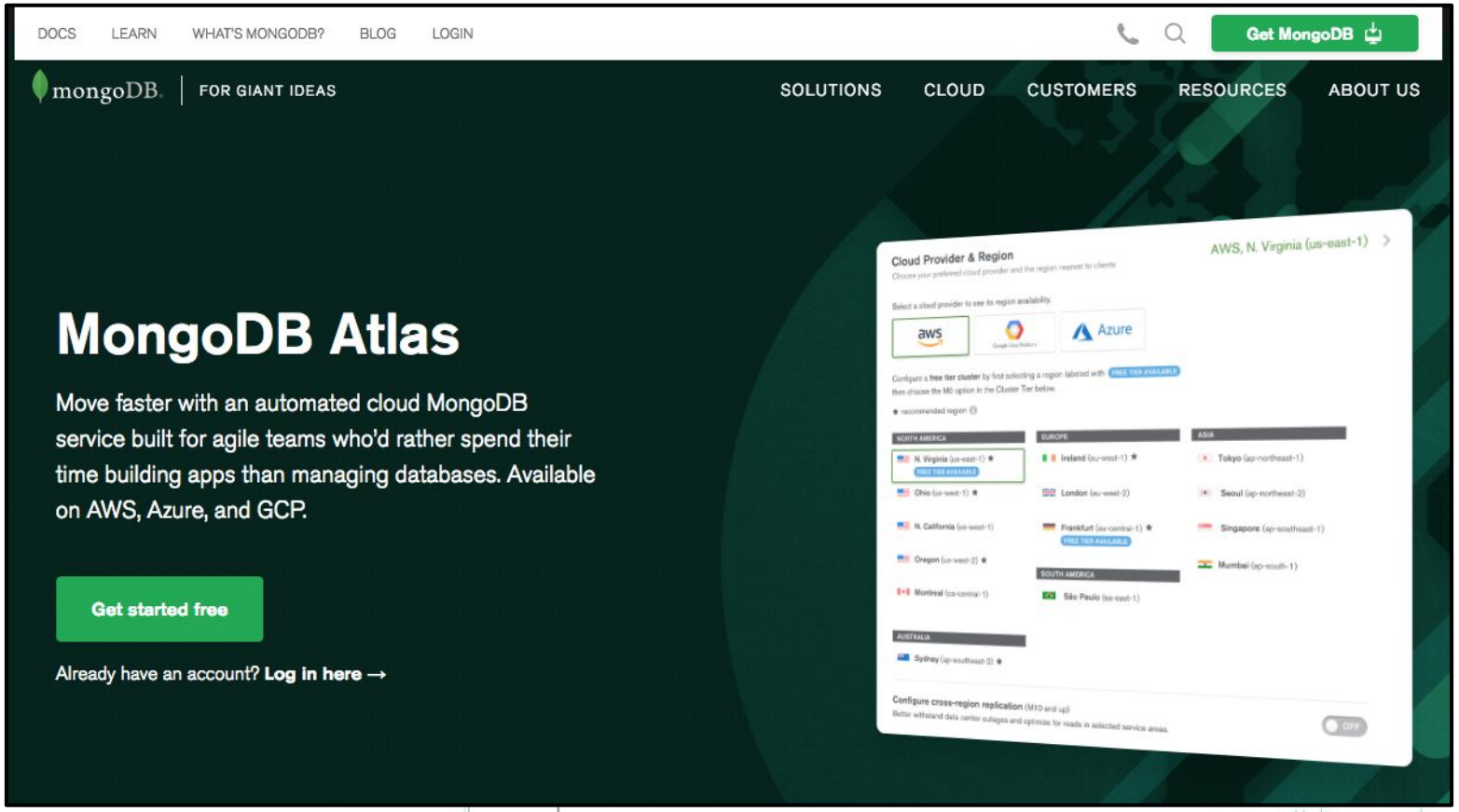
Cloud agnostic

Serving global audiences with MongoDB

Atlas Demo

Sign Up for Free

https://cloud.mongodb.com/



Break

(15 mins)

- Create an account on MongoDB Atlas (http://cloud.mongodb.com)
  - Deploy a free M0 cluster in GCP Belgium
- Create a user (in 'Database Access') and add entry to IP whitelist
  - Install Sample Data into cluster

- Download Compass from tinyurl.com/mongodb-compass

(Optional)

FACEIT on MongoDB Atlas

Let us tell you a story

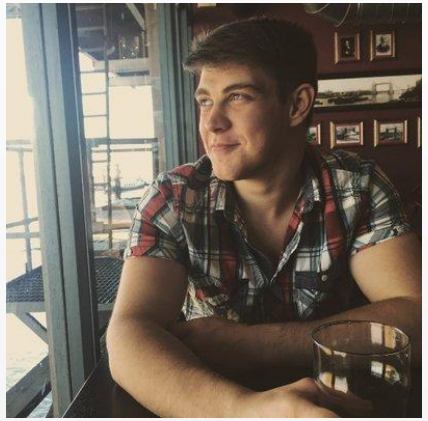
mongoDB. Google Cloud

Who are we?

Emanuele Massara

https://uk.linkedin.com/in/emanuelemassara

https://twitter.com/emas80

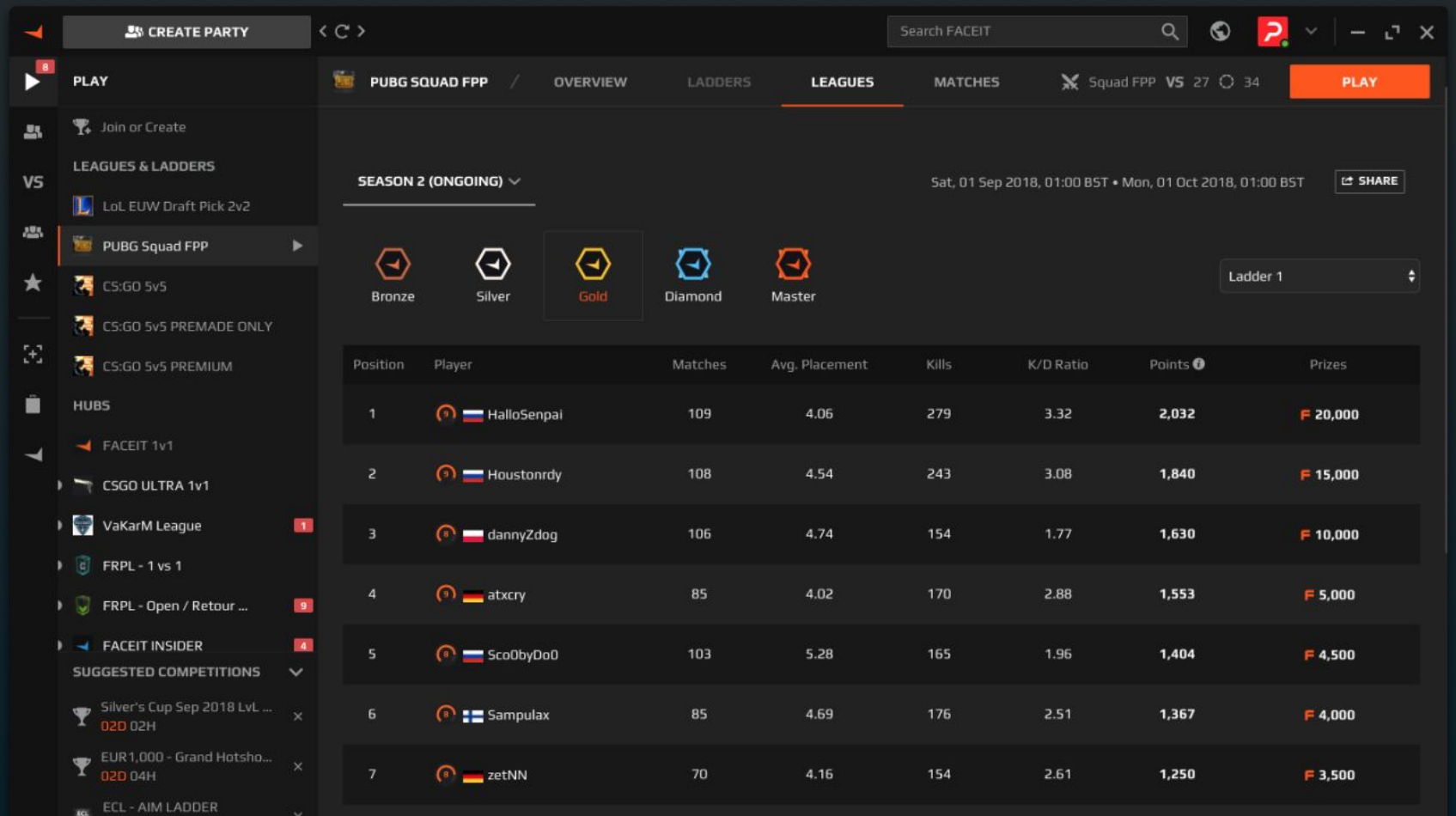


Bradley Wilson-Hunt

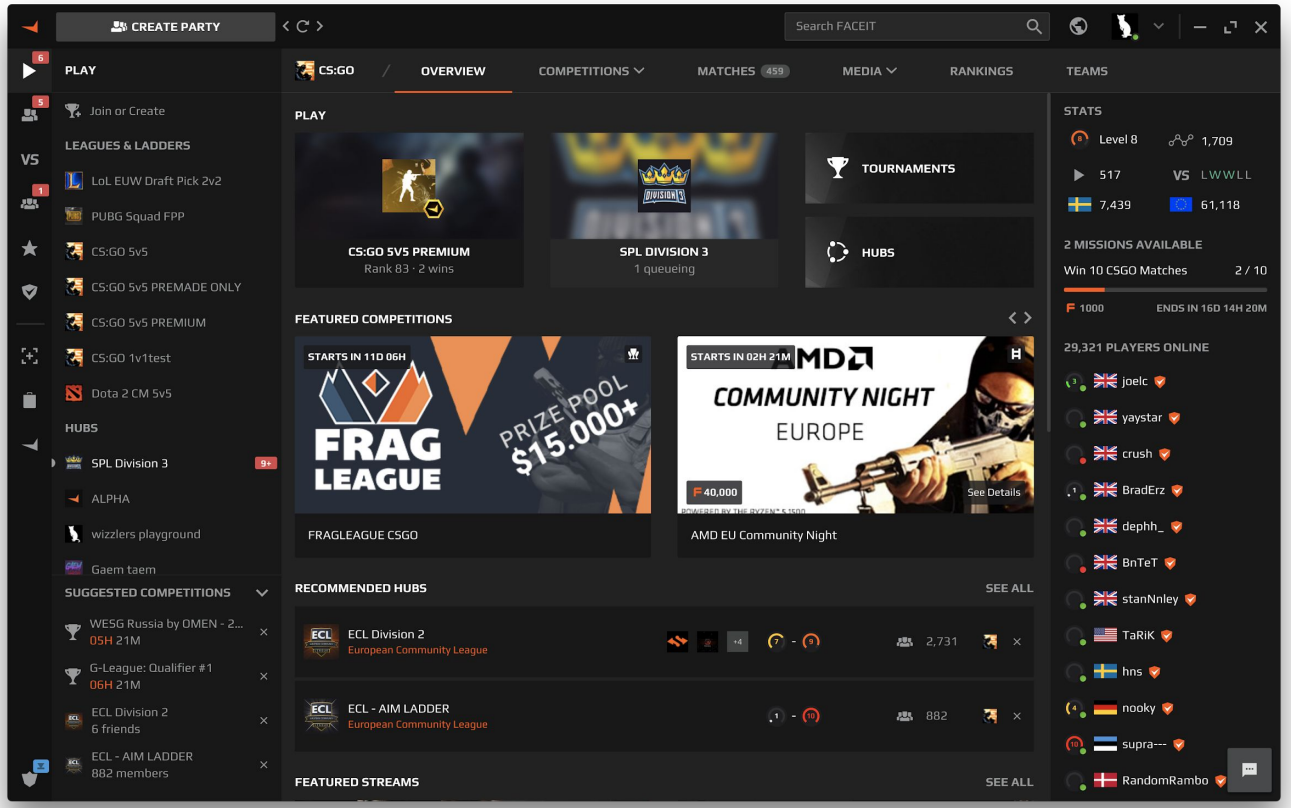
https://uk.linkedin.com/in/bradley-wilson-hunt-342153109

https://twitter.com/braderzwh

What is FACEIT?



The leading competitive platform in esports



15,000,000
USERS

125,000
DAILY PEAK CONCURRENT USERS

40,000,000
MONTHLY SESSIONS

3,000,000
MONTHLY UNIQUE VISITORS

mongoDB

A bit of context

Migrating FACEIT platform from AWS to GCP

- Business Target to reduce costs
- Starting a strong partnership

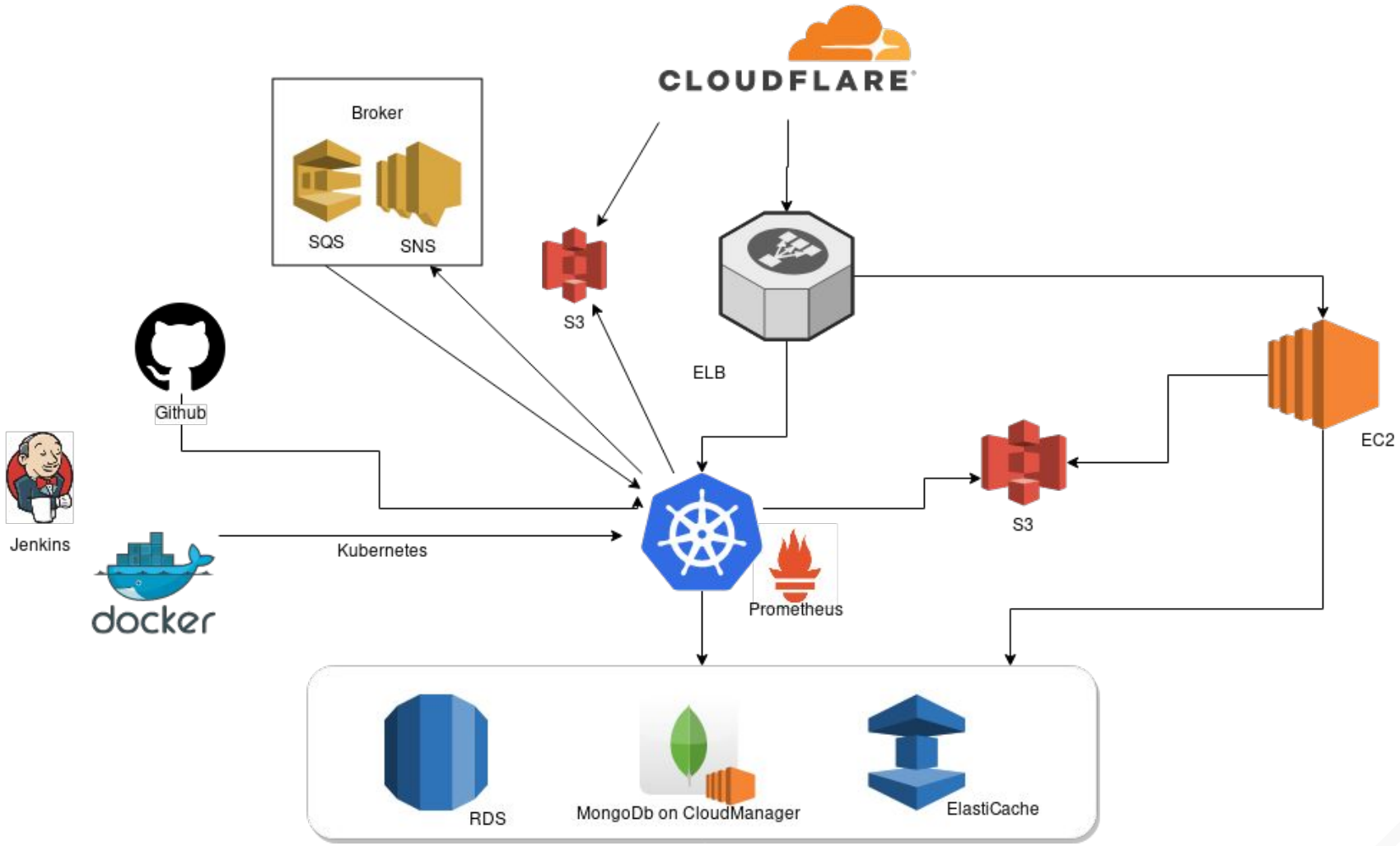
Opportunity to review the setup

- Small company that grew fast

Small ops team (2), many devs (30-40)

- Fast pace of development

Architecture Overview back then



mongoDB setup

mongoDB main database

Started with mongoDB 2.2

- Went through several updates and migrations

CloudManager, 2 replicasets, mongoDB 3.2

- r3.8xlarge (32VCPU, 244GB of RAM), 1.2TB data (uncompressed)
- r3.2xlarge (8CPU, 61GB of RAM), 1TB data (uncompressed)

20+ services (and databases) to migrate

Why mongoDB Atlas?

We evaluated different options:

- Kubernetes
- GCP

Good relations and support

- Current setup was the result of a migration

How did we do it?

Downtime not an option

- 20+ services that need to be swapped at the same time
- All running into Kubernetes

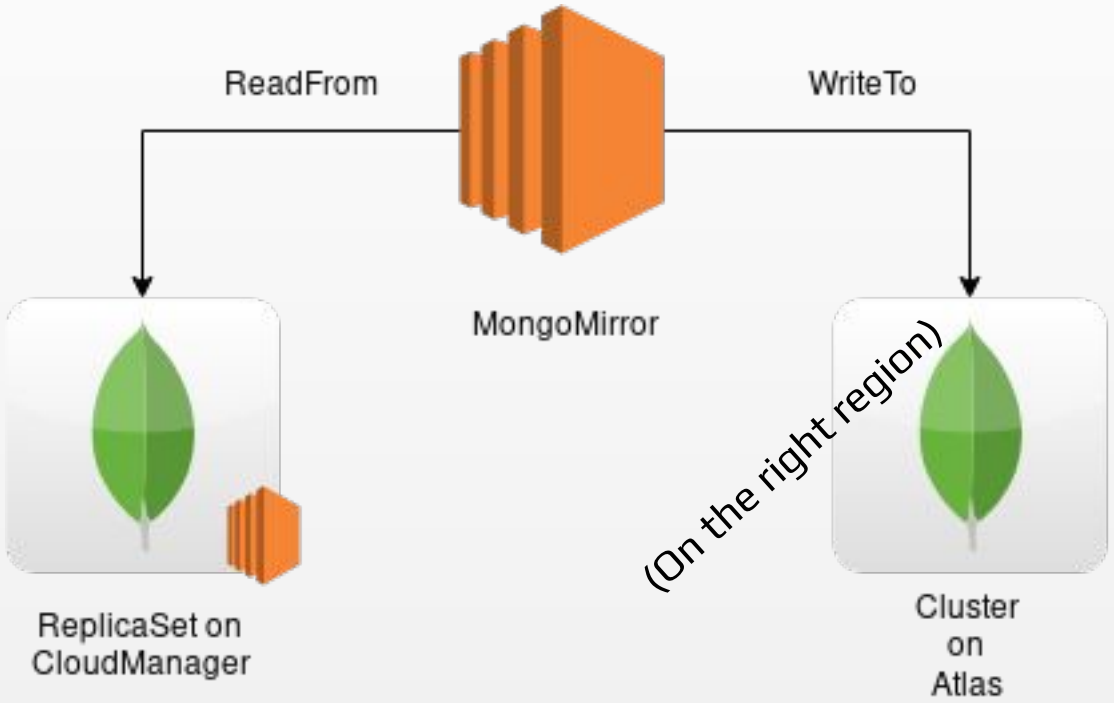
Steps

- Create all the mongo users calling Atlas API
- Start MongoMirror
  - We could split 2 rs in multiple clusters on Atlas
- Restart the applications

Issues faced

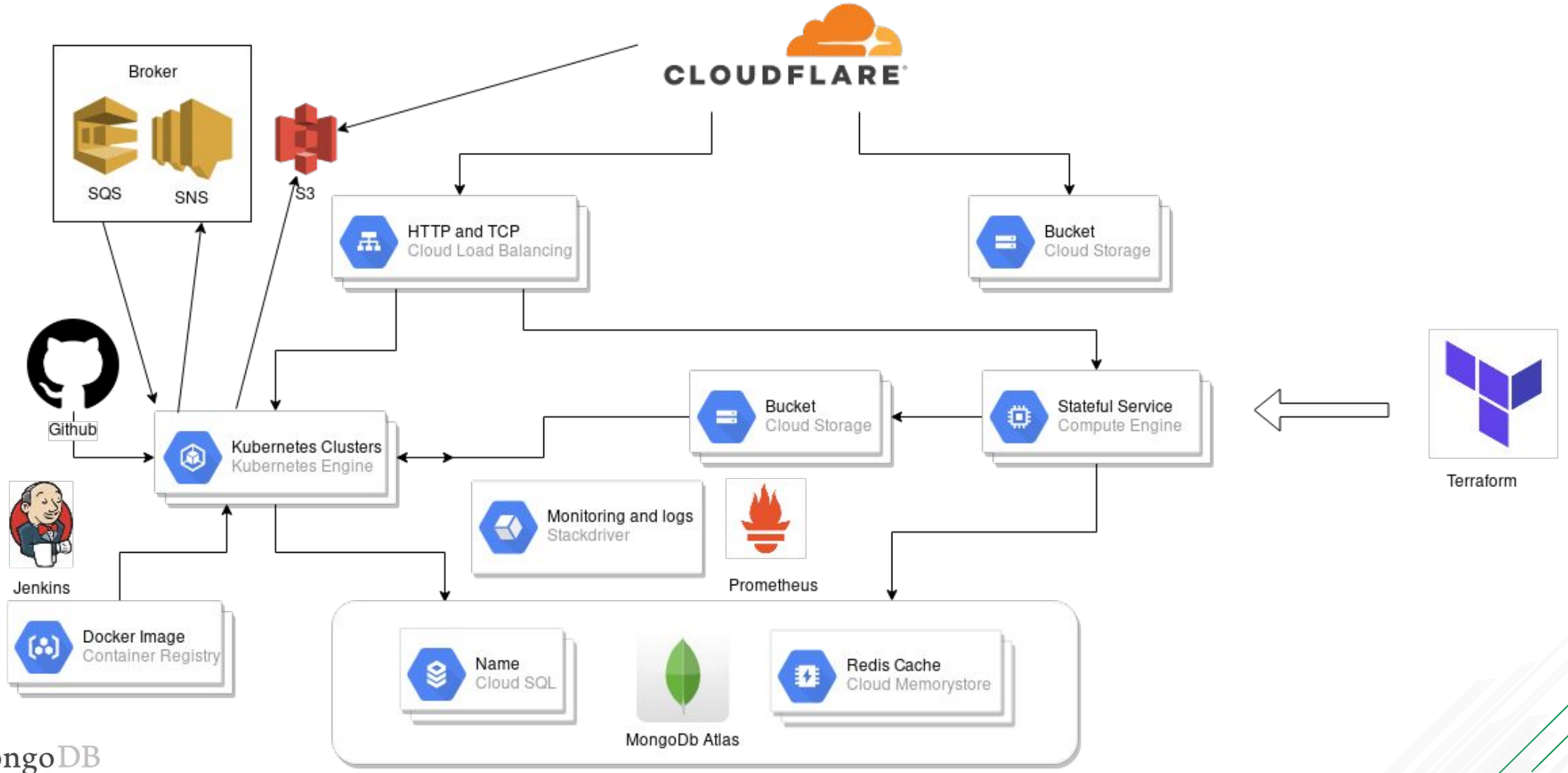
- Initially moved to the wrong region
- problems with indexes, we had to recreate them!

Mongo Mirror



- Instance running
  - We run it on AWS
- You can run it on all the databases, or just on a single one
- It syncs the data and it creates the indexes
- It took between 8 and 12 hours to sync each cluster, because of the indexes

The new FACEIT



mongoDB

Current mongoDB setup

7 clusters for prod

- From M30 to M50
- Split from the initial 2 based on use case/usage
- About 1,8TB (uncompressed)

Fully monitored on Atlas

- Disk size auto increase
- Backups
- Minor version updates and security fixes

Upgrade to 3.4 after the migration

- By simply pressing a button
- 3.6 planned for January, 4.0 for 2020/Q2

How Atlas has improved

Rolling index builds

- It was just announced when we migrated

Maintenance windows

- Still by project

Backups Snapshots on GCP

Query Profiler

Index suggestions

They listen to the feedbacks!

New things we want to try

4.0 and 4.2 migration by 2020/Q2

Terraform for the clusters setup

- UI is good, but scripting is better!

Database user credentials

- Not completely satisfied on how we are handling it now
- Stronger integration with vault.

Transactions

Global Clusters

Thank you!

Ps. We're hiring!

https://corporate.faceit.com/available-jobs/

Atlas Workshop

mongoDB. Google Cloud

EXERCISE:
MONGODB COMPASS & CRUD

PreReqs for Exercise...

Deploy a MongoDB Atlas Cluster

- free-tier M0
- Go to https://www.mongodb.com/cloud/atlas

@Google in Belgium

Secure the cluster, e.g. user and IP whitelisting

Understand the basic features of Atlas

Let's do it!

Download and Install Compass Enterprise:

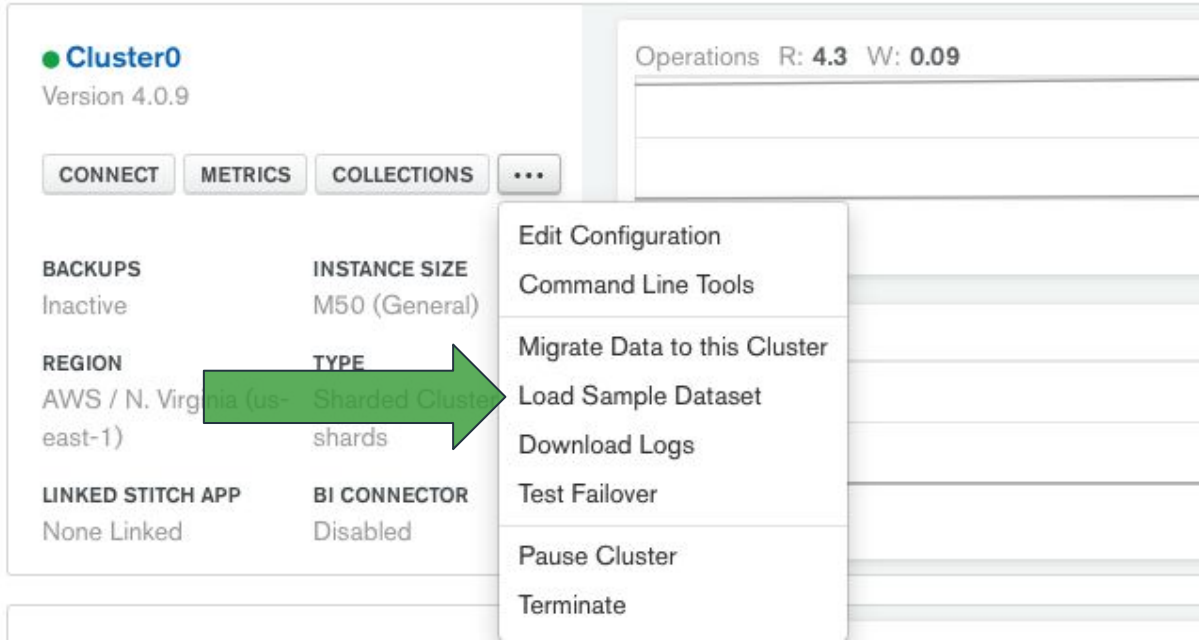
- tinyurl.com/mongodb-compass
- Connect to Atlas with Compass

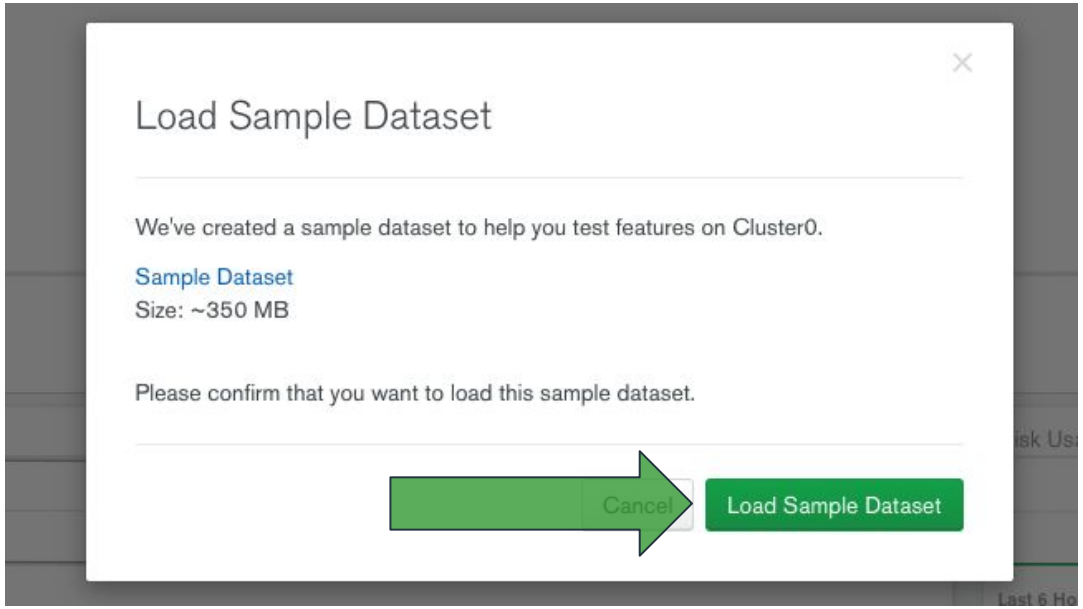
or

Use Atlas Data Explorer & Aggregation Builder

- Used in the web browser, no install
- Can do 80+% of this session

Import the sample data





We will now be using `sample_mflix.movies` database from now on

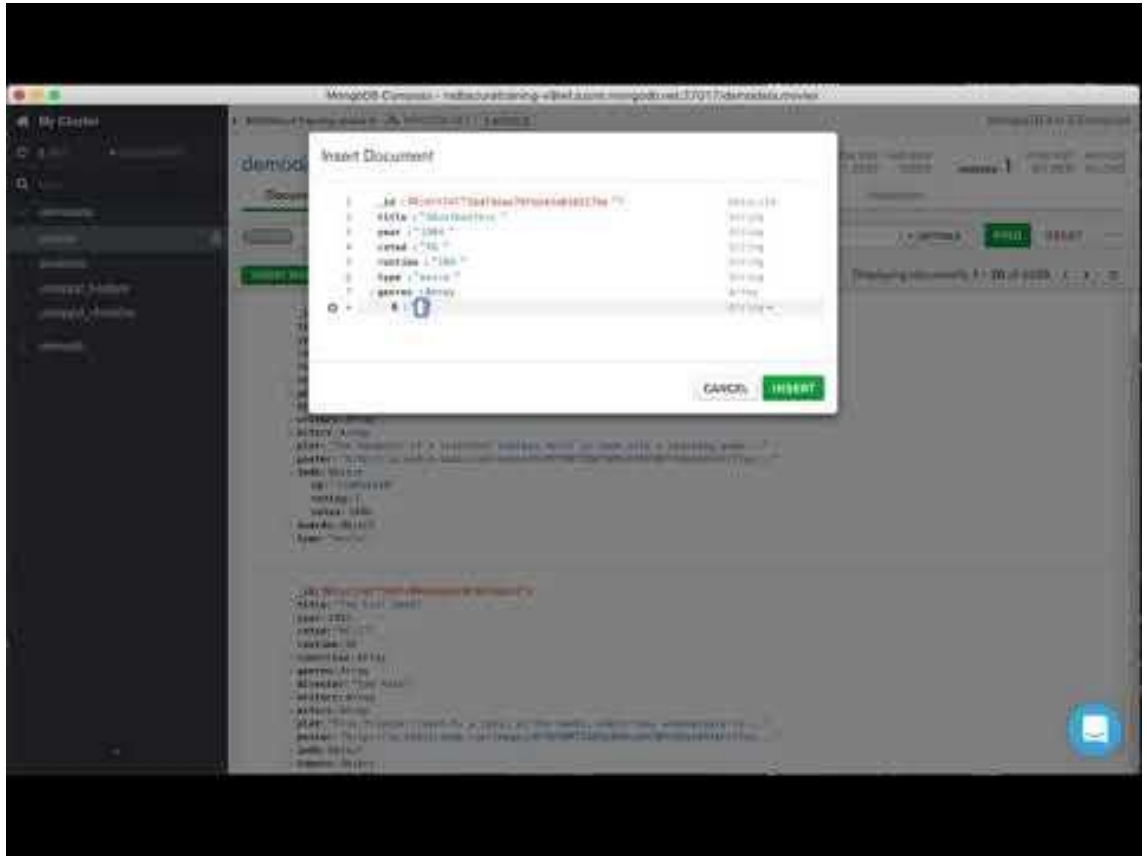
Connection Strings

Note: If you click “Connect” on the cluster in Atlas, then choose “Compass,” it will automatically detect the connection string and fill out the details for you when you launch Compass

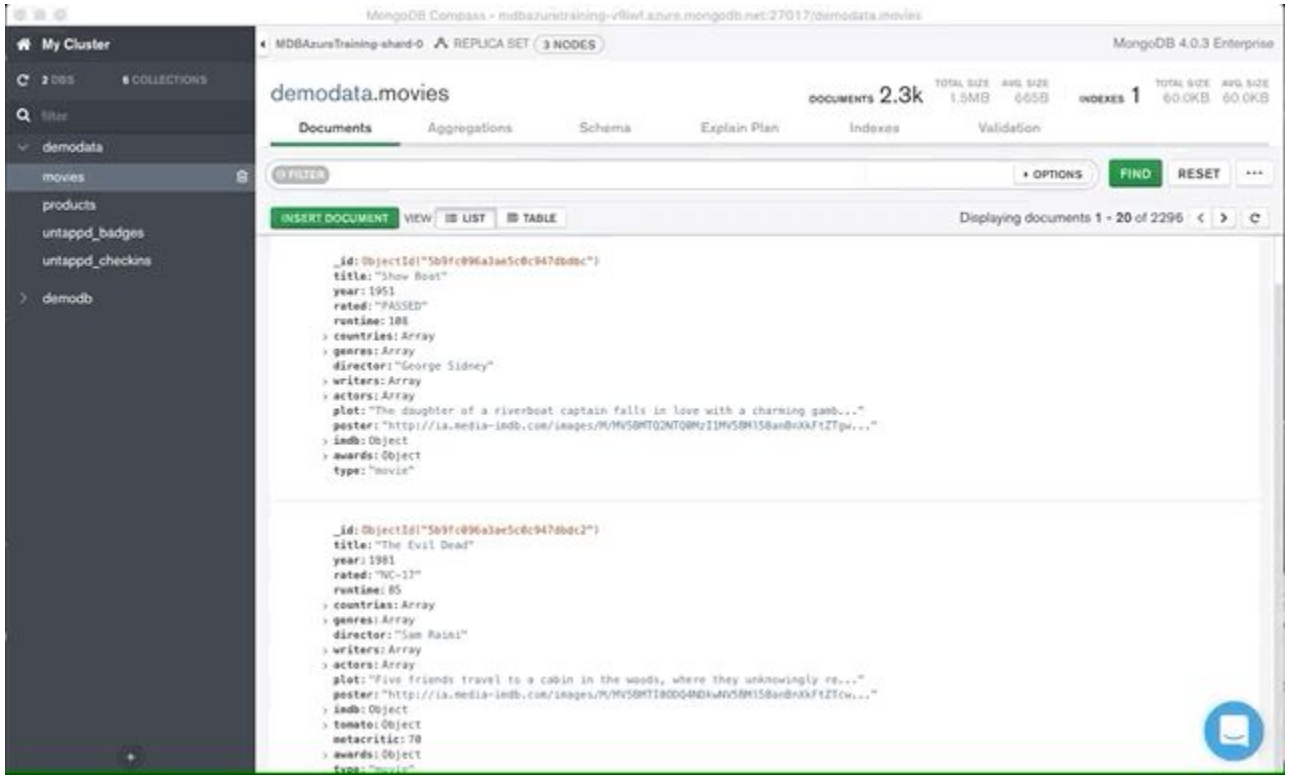
Key	**Value**
Server	<<insert your server details here>>
SRV Record	Yes
Authentication	Username / Password
Username	<<insert your username that you created>>
Password	<<insert your password that you created>>
Auth DB	admin

CRUD: Let's create

```
db.movies.insertOne(
{
    "title": "Ghostbusters",
    "year": 1984,
    "rated": "PG",
    "runtime": 105,
    "type": "movie",
    "genres": ["comedy", "action"] ,
    "director": "Ivan Reitman",
    "writers": ["Dan Aykroyd", "Harold Ramis"]
}
)
```



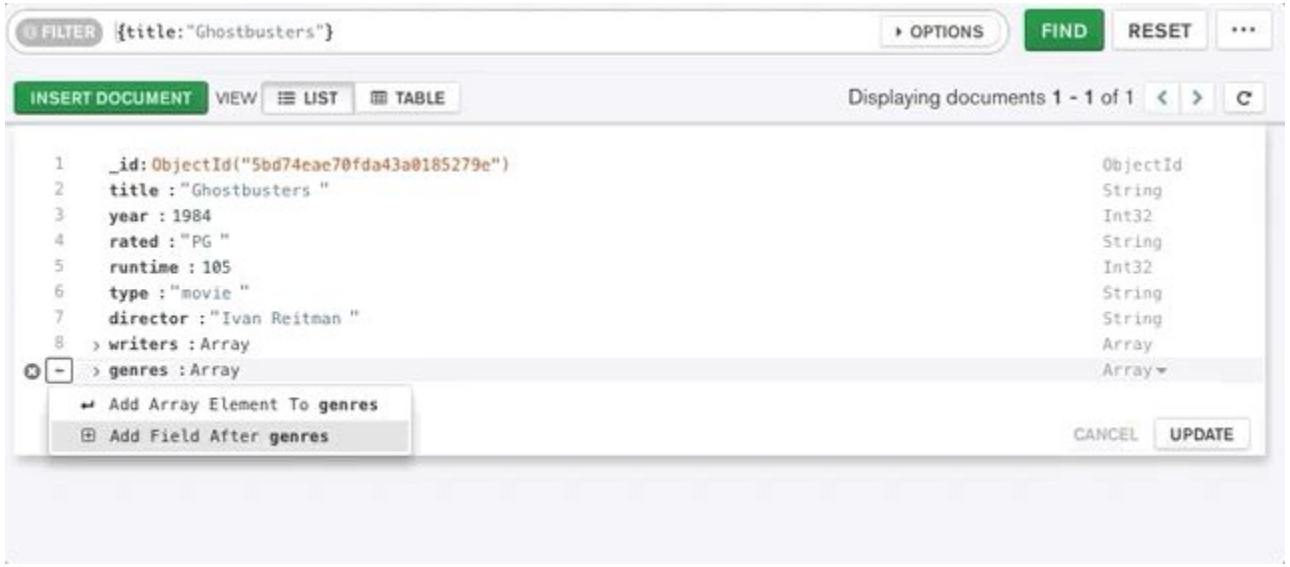
CRUD: LET'S READ...




```
db.movies.findOne()
db.movies.find().pretty()
```

```
db.movies.find({title:"Ghostbusters"})
```

CRUD: LET'S UPDATE...




```
db.movies.updateOne(
   {
    title: "Ghostbusters"
   },
   {
    $set: {
        imdb: { id: "tt0087332", rating: 7.8, votes: 312798 }
    }
   }
)
```

CRUD: LET'S DELETE...


```
db.movies.deleteOne(
{
    title: "Ghostbusters"
}
)
```


mongoDB®


QU
IZ

CRUD: Final Quiz

Query	What's the Question?

CRUD: Final Quiz

Query	What's the Question?
`db.movies.find( {year: 1987} )`	

CRUD: Final Quiz

Query	What's the Question?
`db.movies.find( {year: 1987} )`	movies from 1987

CRUD: Final Quiz

Query	What's the Question?
`db.movies.find( {year: 1987} )`	movies from 1987
`db.movies.find( {genres: "Comedy"} )`	

CRUD: Final Quiz

Query	What's the Question?
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CRUD: Final Quiz

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`db.movies.find( {genres: ["Comedy"]} )`	

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`db.movies.find( {year: 1987} )`	movies from 1987
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`db.movies.find( {genres: "Comedy"} )`	"Comedy" as one of their genres
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CRUD: Final Quiz

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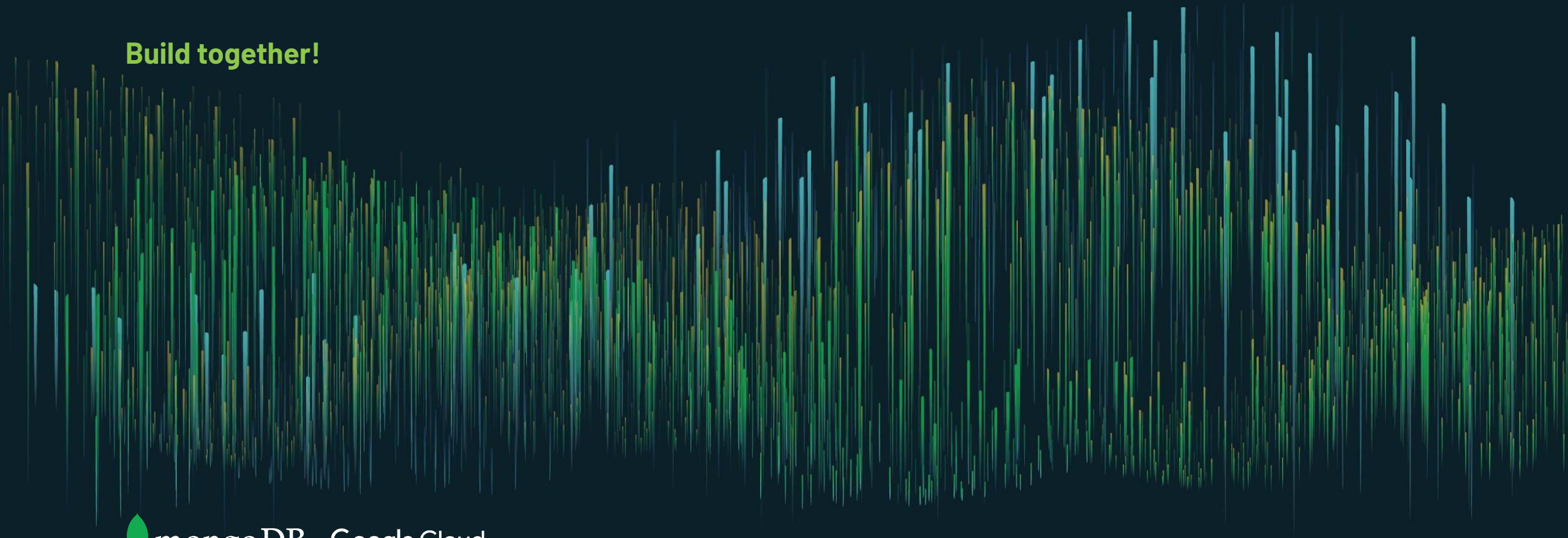
`db.movies.find( {title: {$regex: '^Dr. Strangelove'}} )`	Title starting with "Dr. Strangelove"

MongoDB Change Streams & Google Cloud AI/ML APIs

Build together!

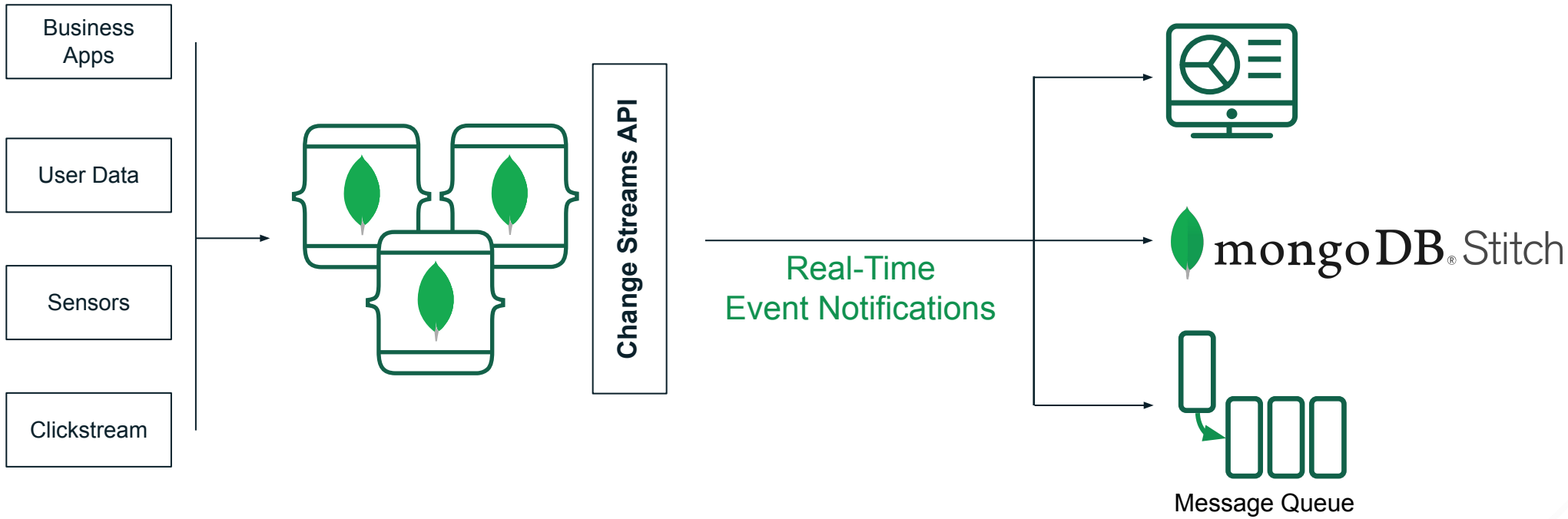


mongoDB. Google Cloud

After this exercise, you should be able to...

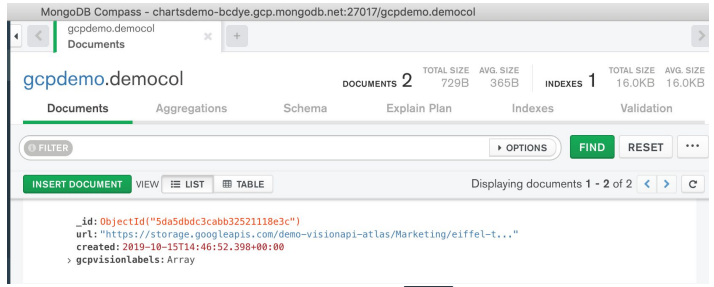
- Understand what MongoDB Change Streams are
- Deploy compute instances within Google Cloud
- Find and enable AI/ML APIs within Google Cloud
- Connect to Change Streams
- Call authenticated Google Cloud APIs and update MongoDB documents accordingly

Versatile: MongoDB Change Streams

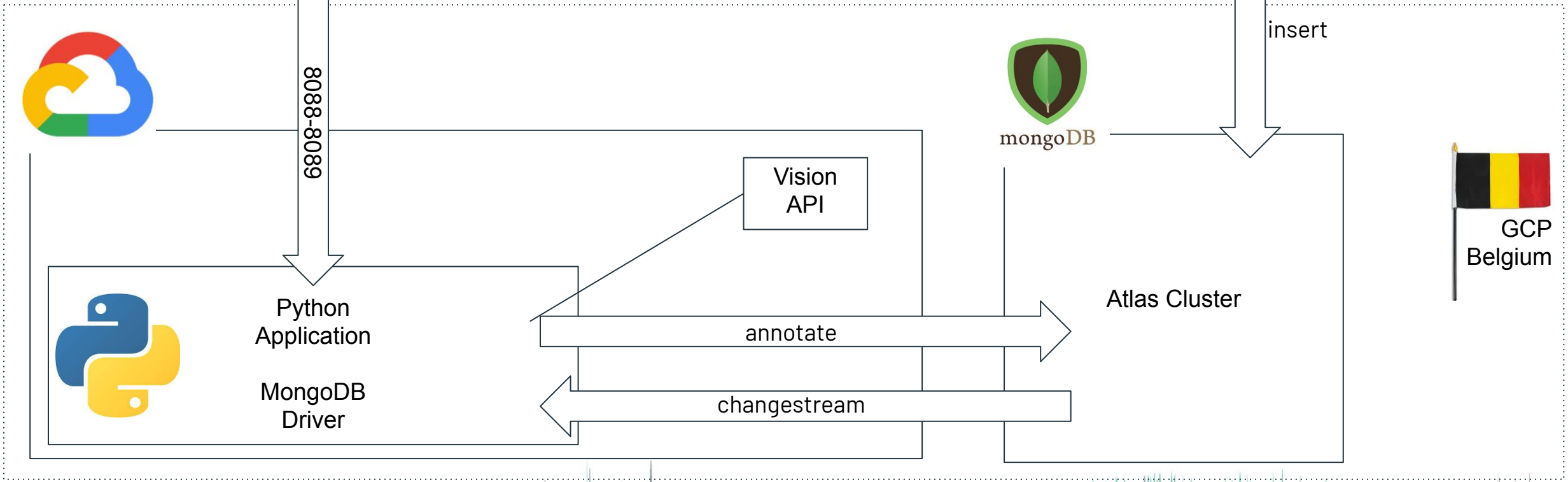


Enabling developers to build
reactive, real-time services

GCP MongoDB Integration: What we will build



MongoDB Compass



Change Stream in Python

```
21
22      # configure connection to mongodb
23      conn = pymongo.MongoClient(cfg['DEFAULT']['_URI'])
24      handle = conn[cfg['DEFAULT']['_DBNAME']][cfg['DEFAULT']['_COLNAME']]
25
```

```
74          # connect to a change stream
75          change_stream = handle.watch()
76          # every change in the db
77          for change in change_stream:
78              # can be insert, update, replace (Compass)
79              if change["operationType"] == "insert":
80                  # make sure it had a URL attribute
81                  if "url" in change["fullDocument"]:
```

Homework: Change Streams & GCP AI/ML APIs

- Follow along at:
  - https://github.com/rbohan/MongoDBAtlas-GCP-AIMLv2
  - Shortened Link: https://tinyurl.com/mdb-code
- Scroll to the “Low Level Readme” section to follow along step-by-step

Extra Credit

Make it pretty

Host your image with Google Cloud Cloud Storage Buckets

Google Cloud CLIs

Natural Language API

Document design

Find another Google Cloud AI/ML API

Include authentication

Google Assistant

Instance authentication for API rather than `.json` file

Deadline:
COB, Monday December 16, 2019

To: natasha@mongodb.com
Subject: GCP London contest
Include: github/gitlab address.

Prize to Win

EXERCISE: AGGREGATION FRAMEWORK

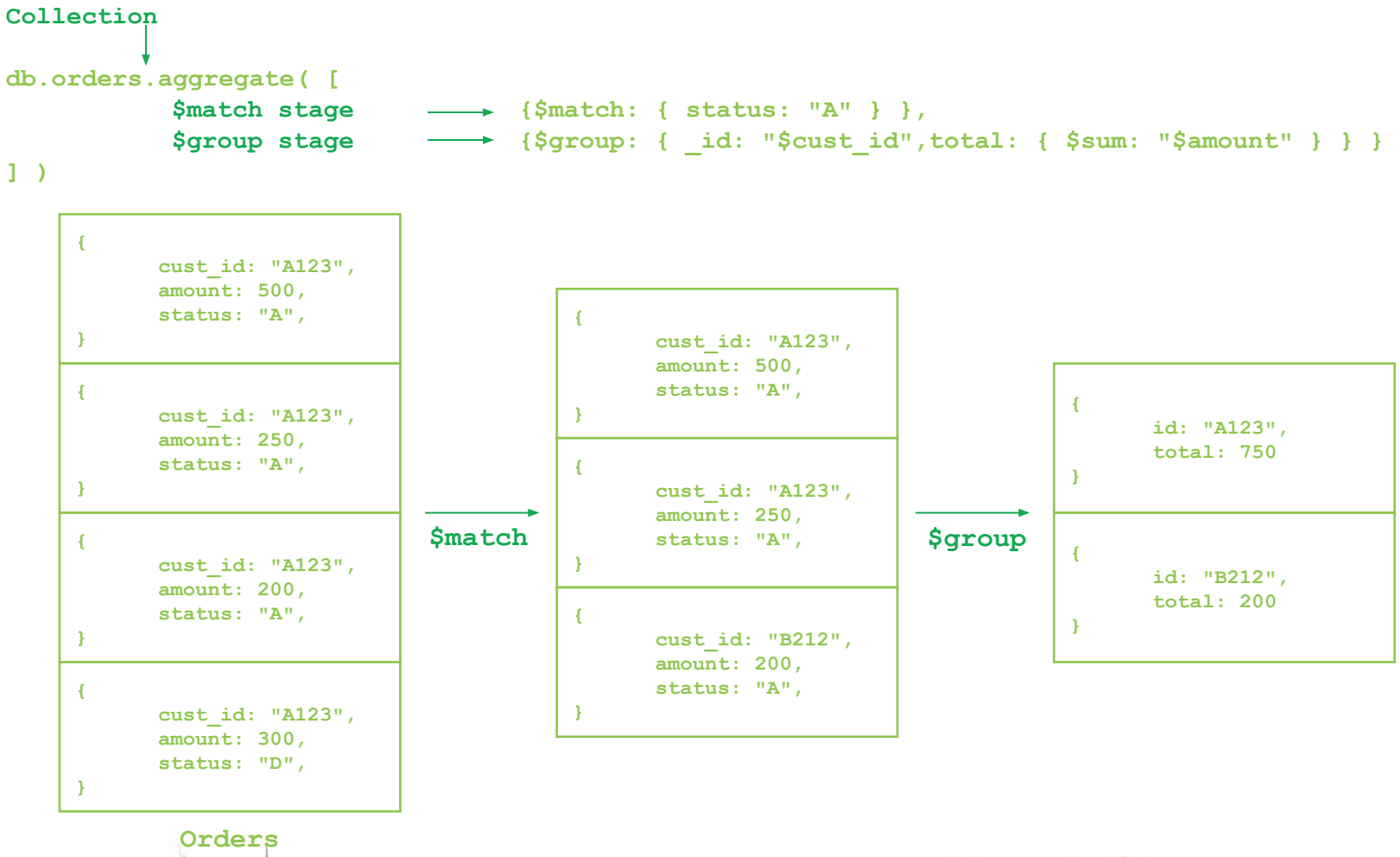
At the end of this Exercise, you should be able to...

- Have a basic understanding of what the aggregation framework is
- Write some basic queries using the aggregation framework

Aggregations

Advanced data processing pipeline for transformations and analytics

- Multiple stages
- Similar to a unix pipe
  - Build complex pipeline by chaining commands together
- Rich Expressions



Aggregation Features

A feature rich analytical framework

Pipeline Stages

- $match
- $group
- $facet
- $geoNear
- $graphLookup
- $lookup
- $project
- $sort
- $unwind

Operators

- Mathematical
  - $add, $abs, $substract, $multiply, $divide, $log, $log10, $stdDevPop, $stdDevSam, $avg, $sqrt, $pow, $sum, $zip, etc.
- Array
  - $push, $reduce, $reverseArray, $addToSet, $arrayElemAt, $slice, etc.
- Conditionals
  - $and, $or, $eq, $lt, $lte, $gt, $gte, $cmp, $cond, $switch, $in, etc
- Date
  - $dateFromParts, $dateToParts, $dateFromString, $dateToString, $dayOfMonth, $isoWeek, $minute, $month, $year, etc.
- String
  - $toUpper, $toLower, $substr, $strcasecmp, $concat, $split, etc.
- Laterals
  - $exp, $let, $literal, $map, $type, etc

Let's play with Aggregation Pipeline Builder in Compass or Atlas

mongoDB. Google Cloud

Sample Aggregation

Top 3 directors and their win count

```
[
    { '$unwind': {
        'path': '$directors'
    },
    { '$group': {
        '_id': '$directors',
        'wins': {
          '$sum': '$awards.wins'
        }
      }
    },
    { '$sort': { 'wins': -1 } },
    { '$limit': 3 }
]
```

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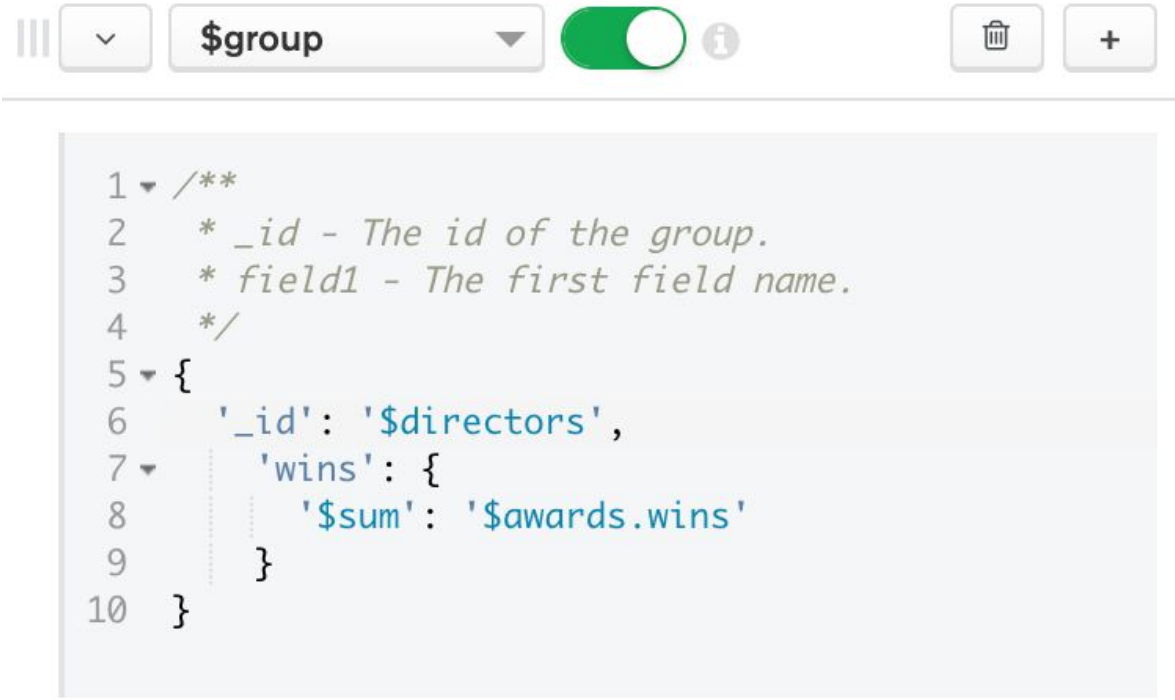

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]
```

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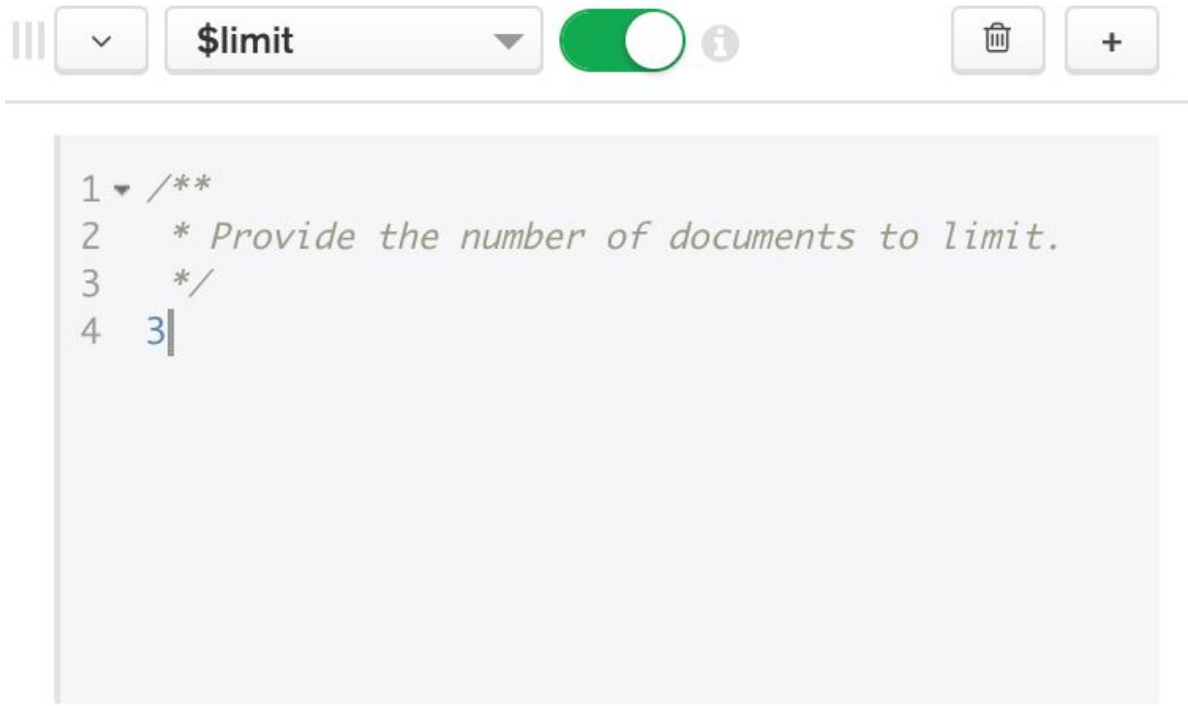

Sample Aggregation

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    { '$group': {
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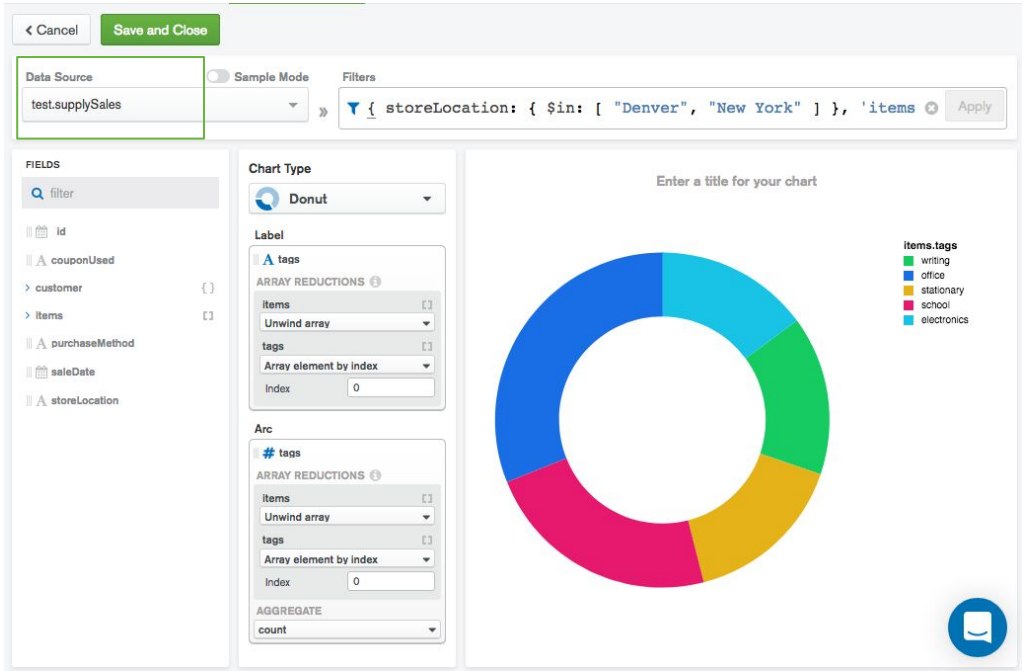
        'wins': {
          '$sum': '$awards.wins'
        }
      }
    },
    { '$sort': { 'wins': -1 } },
    { '$limit': 3 }
]
```

Aggregation Output

```
{ "_id" : "Steven Spielberg", "wins" : 699 }
{ "_id" : "Martin Scorsese", "wins" : 587 }
{ "_id" : "Alfonso Cuarèn", "wins" : 577 }
```

MongoDB Charts

MongoDB Charts: Create, Visualize, Share



Work with complex data

Connect to data sources securely. Filter. Sample. Visualize.

Share dashboards and collaborate

Exercise 5: Charts Visualisation - Step 1

Add the Data Collection as a Data Source

1. In MongoDB Atlas, click on **Charts** on the left side
2. Click the **Data Sources** tab
3. Click **New Data Source**
4. Select your Atlas Deployment in your project
5. Click **Connect**
6. Select the `sample_mflix.movies` collection
7. Click Set **Permissions**, leave the permissions as the default
8. Click **Publish Data Source**

Exercise 5: Charts Visualisation - Step 2

Create a New Dashboard

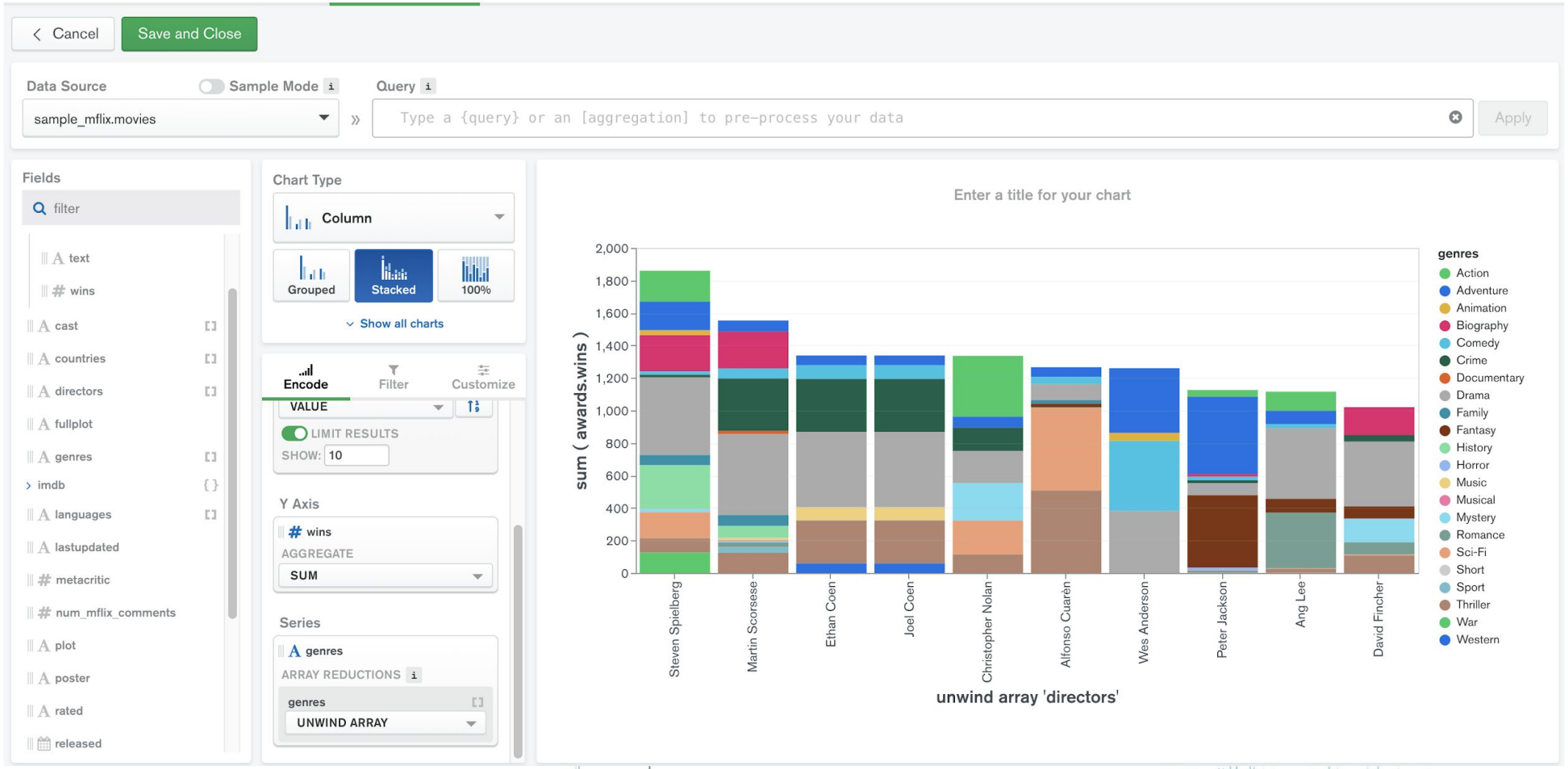
1. Click the **Dashboards** tab
2. Click the **New Dashboard** button
3. Enter the Title: `Movie Details`
4. Click **Create**

Exercise 5: Charts Visualisation - Step 3

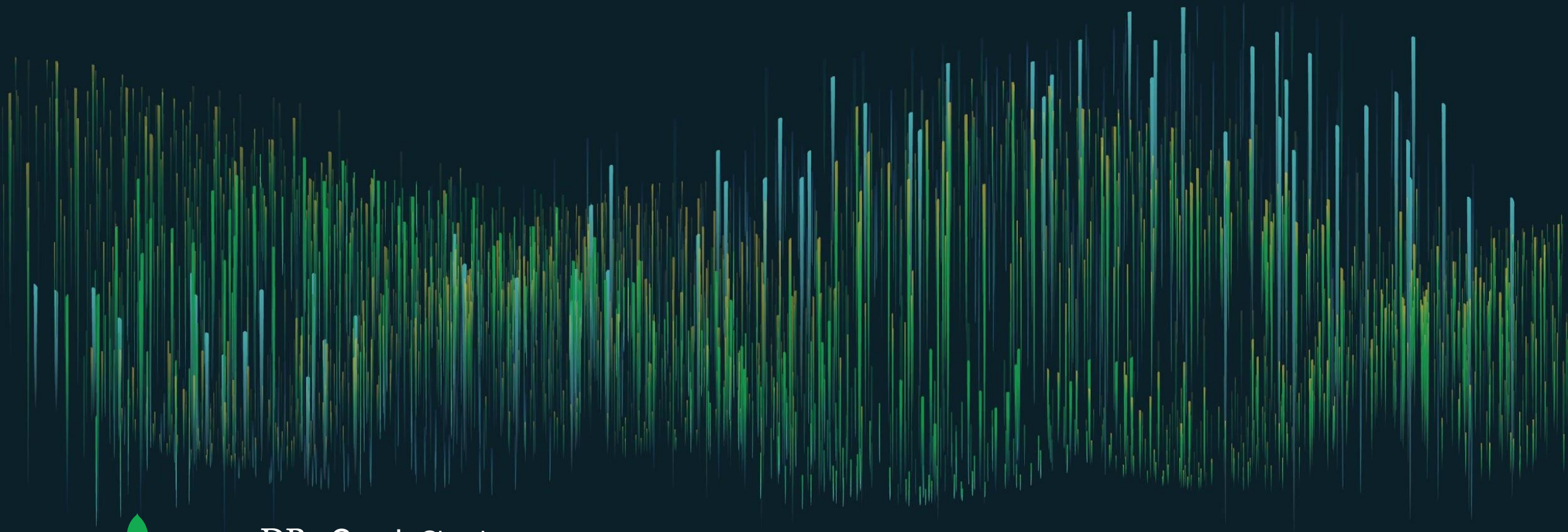
Create Chart Showing Directors with the Most Awards

1. Click **Add Chart**
2. In the Data Source dropdown, select `movies.movies`
3. Select Chart Type: **Column / Stacked**
4. X Axis: `directors`
   a. Array Reduction: Unwind Array
   b. Sort By: Descending
   c. Limit: 10
5. Y Axis: `awards.wins`
   a. Aggregate: sum
6. Series: `genres`
   a. Array Reduction: Unwind Array
7. Title: `Directors with Most Awards, Split by Genre`
8. Click **Save and Close**

Charts Workshop - Summary

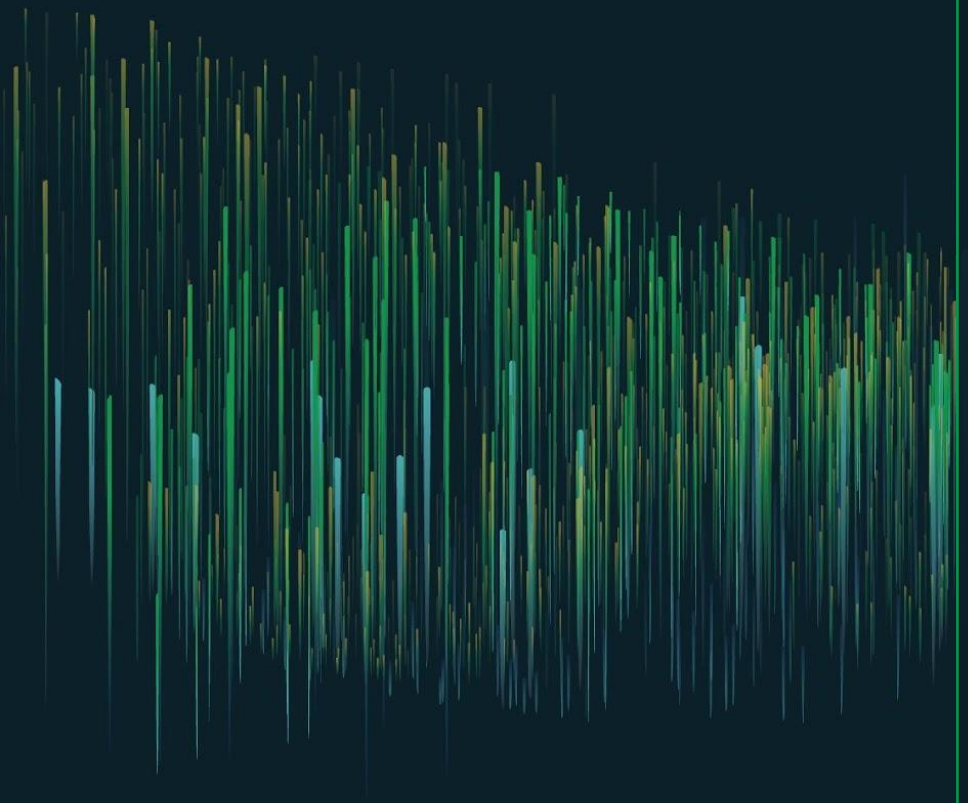


Thank you!



mongoDB. Google Cloud

Your MongoDB Team:



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@jimthree

Ronan Bohan (Solutions Architect)

ronan@mongodb.com