STACK 2022

Do more with your data, with less

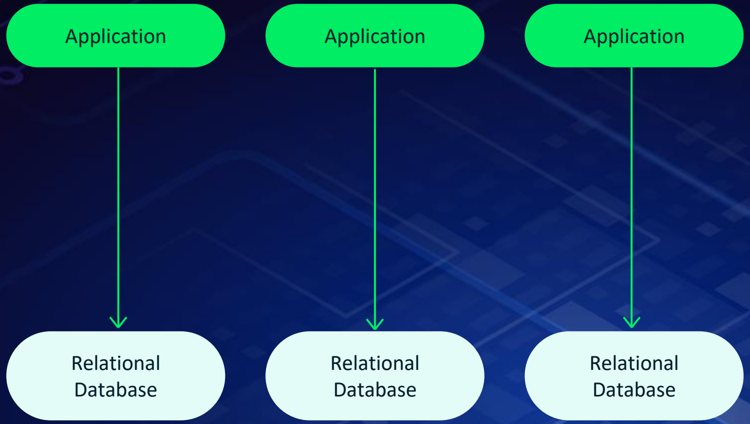
Derrick Chua, Senior Solutions Architect
MongoDB

The typical data infrastructure is still built around legacy relational databases

Relational databases are optimized to solve a different set of problems

Data structures clash with modern data and the objects developers work with

Rigidity makes experimenting and iterating on applications difficult



Application

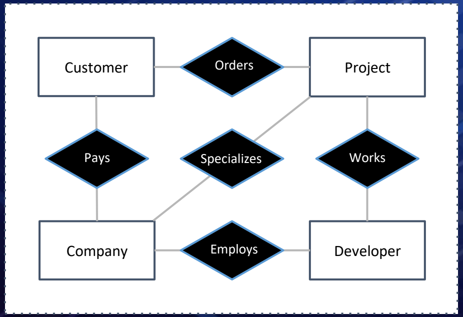
Application

Application

Relational Database

Relational Database

Relational Database



Customer

Orders

Project

Pays

Specializes

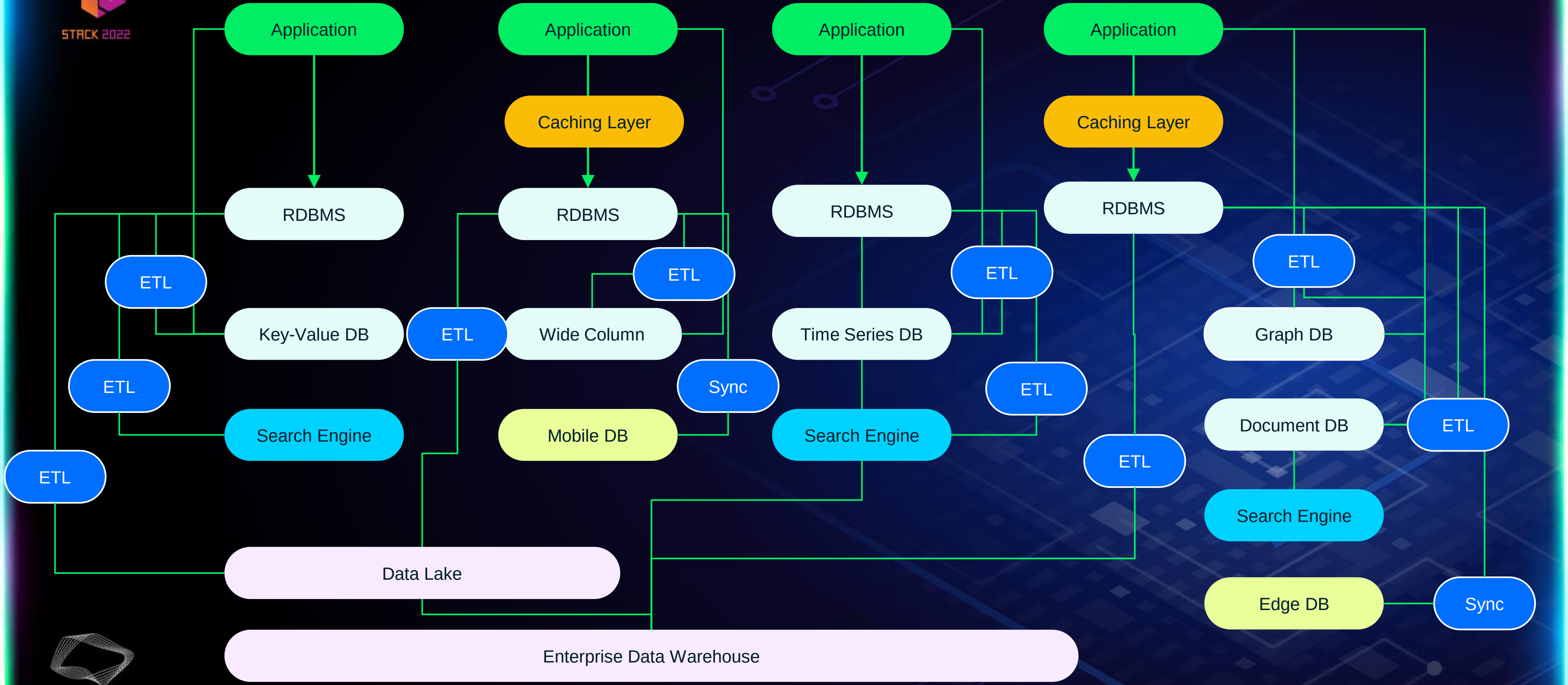
Works

Company

Employs

Developer

STACK 2022



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Fragmented developer experience

Multiple operational and security models to rationalize

Significant data integration effort required

Unnecessary data duplication

Developer Data Platform

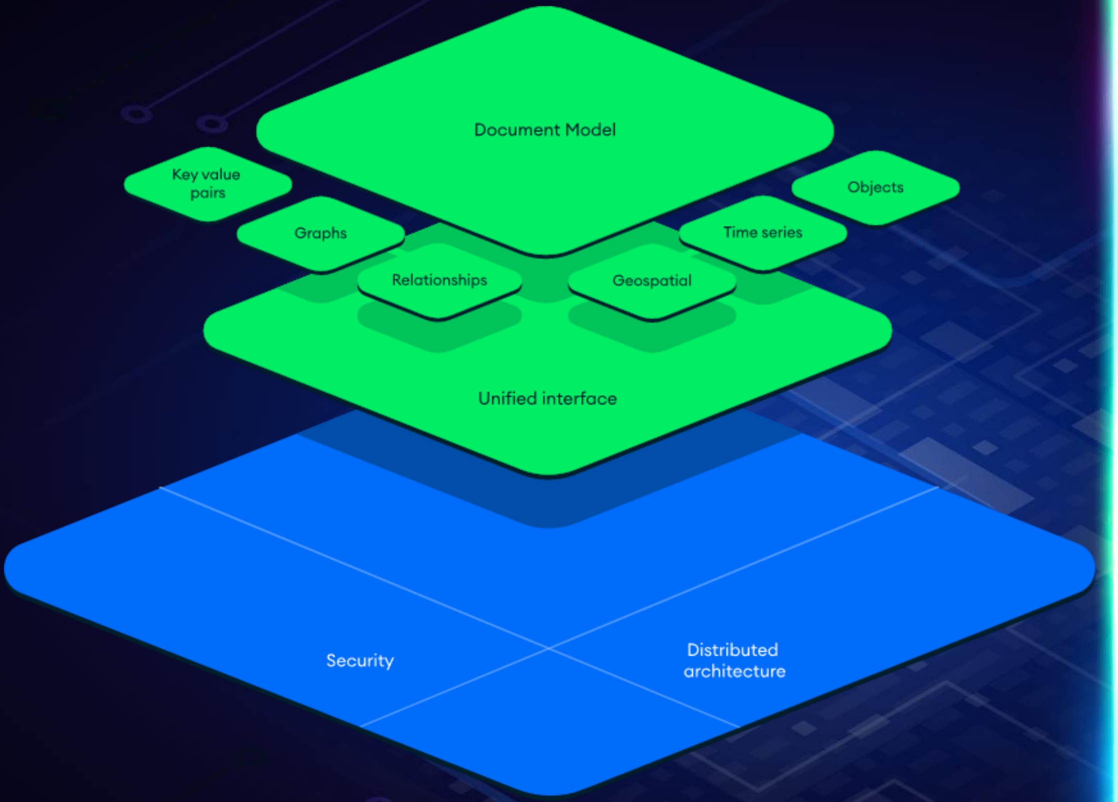
Built around a modern, distributed database built for developers

Data model that maps to how developers think/code; flexible while allowing data governance when needed

Strongly consistent, support for ACID transactions

One easy query interface for a variety of workloads

Advanced security & data distribution capabilities

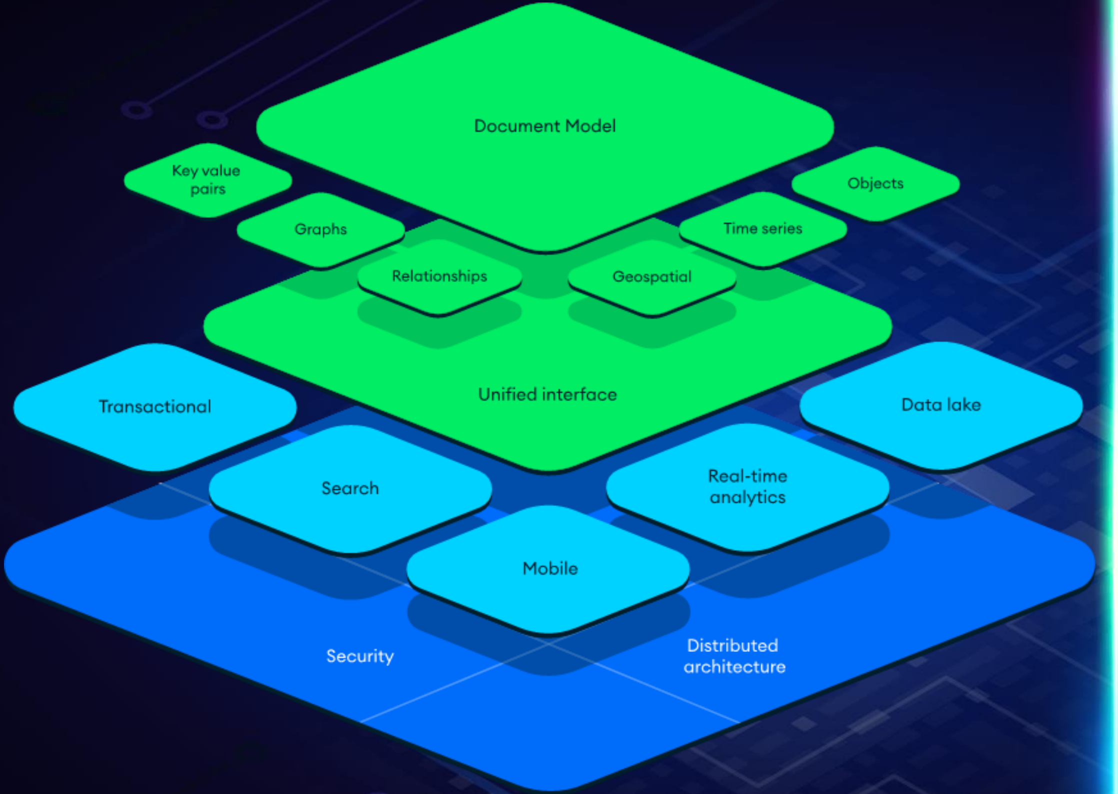


Address a range of application use cases w/o adding complexity

Able to support full-text search functionality for delivering a fast and relevant user experience

Able to support data on mobile devices/at the edge w/o having to manually sync data

Able to deliver real-time analytics on live data w/o having to move data back & forth

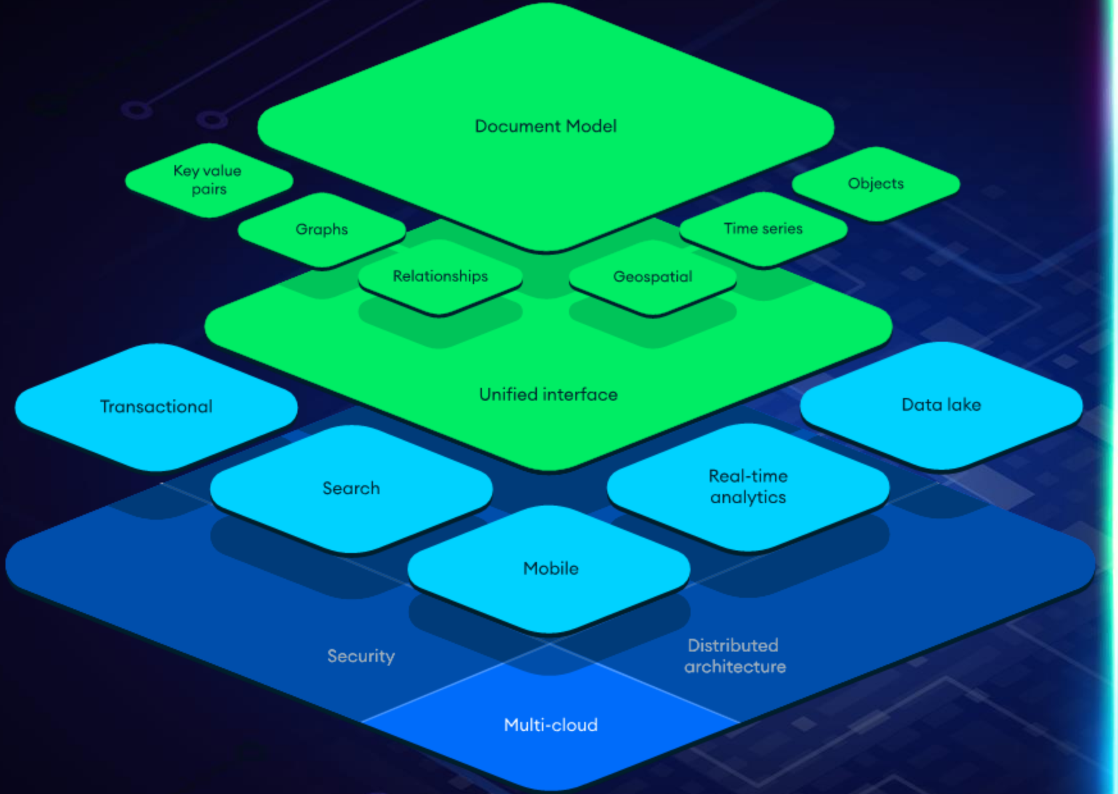


Run anywhere—start on-premises, migrate to the cloud, multi-cloud

The flexibility to deploy in over 90 regions across 3 cloud providers

Database that extends across multiple clouds; get the best from each provider with no lock-in

Seamlessly migrate from on-premises to cloud w/o code rewrites



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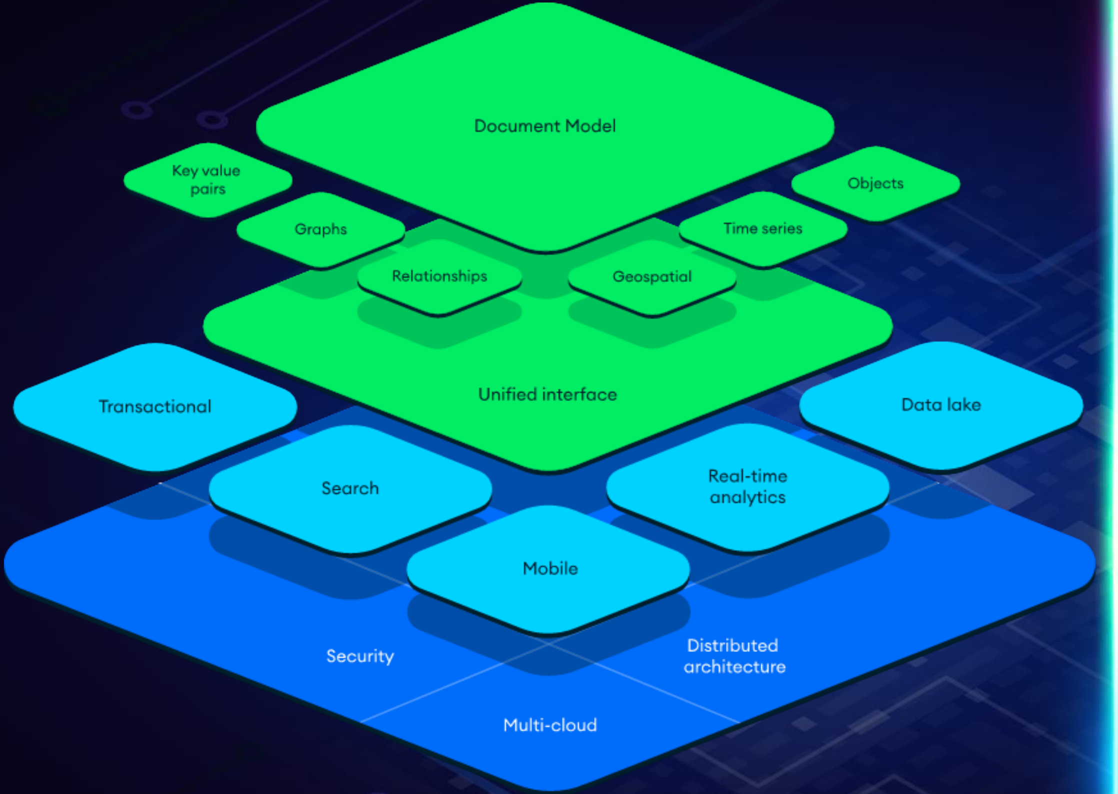
MongoDB.

Do more with your data with

One interface.
For any application.
Anywhere.



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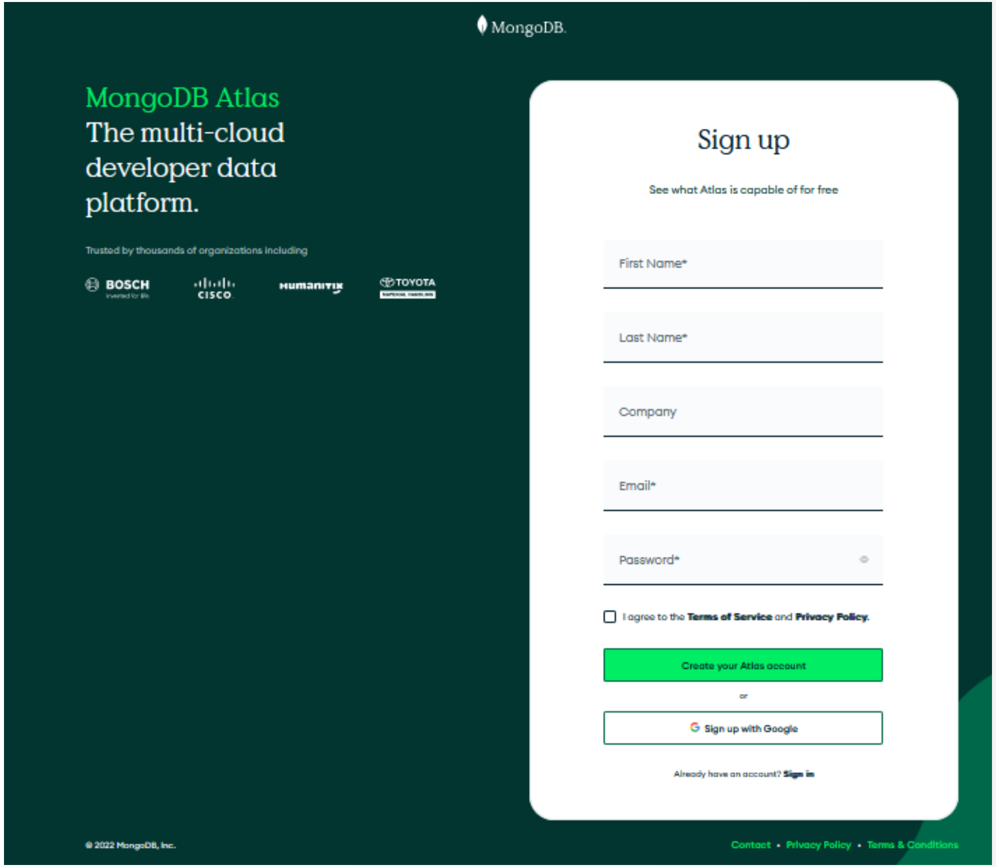
Hands On:

Get your free (forever) Atlas Cluster

1. Sign up at cloud.mongodb.com



MongoDB.

MongoDB Atlas
The multi-cloud developer data platform.

Trusted by thousands of organizations including

Sign up

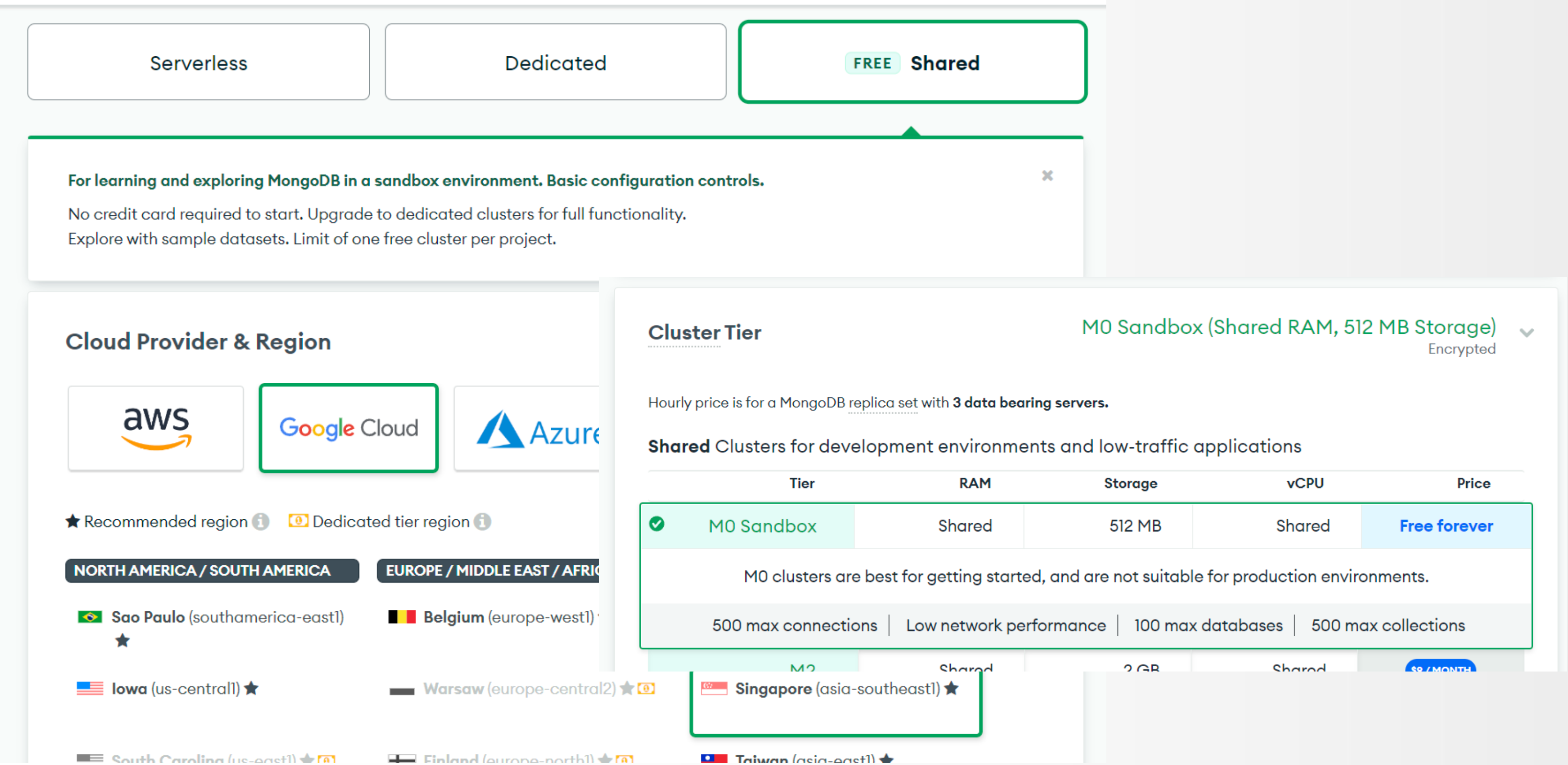
See what Atlas is capable of for free

□ I agree to the **Terms of Service** and **Privacy Policy**.

Already have an account? **Sign in**

© 2022 MongoDB, Inc.

2. Create free forever M0 cluster



Serverless | Dedicated | FREE Shared

For learning and exploring MongoDB in a sandbox environment. Basic configuration controls.

No credit card required to start. Upgrade to dedicated clusters for full functionality.
Explore with sample datasets. Limit of one free cluster per project.

Cloud Provider & Region

★ Recommended region ⓘ Dedicated tier region ⓘ

NORTH AMERICA / SOUTH AMERICA | EUROPE / MIDDLE EAST / AFRIC

Sao Paulo (southamerica-east1) ★	Belgium (europe-west1)	
Iowa (us-central1) ★	Warsaw (europe-central2) ★	Singapore (asia-southeast1) ★
South Carolina (us-east1) ★	Finland (europe-north1) ★	Taiwan (asia-east1) ★

Cluster Tier

M0 Sandbox (Shared RAM, 512 MB Storage)
Encrypted

Hourly price is for a MongoDB replica set with **3 data bearing servers.**

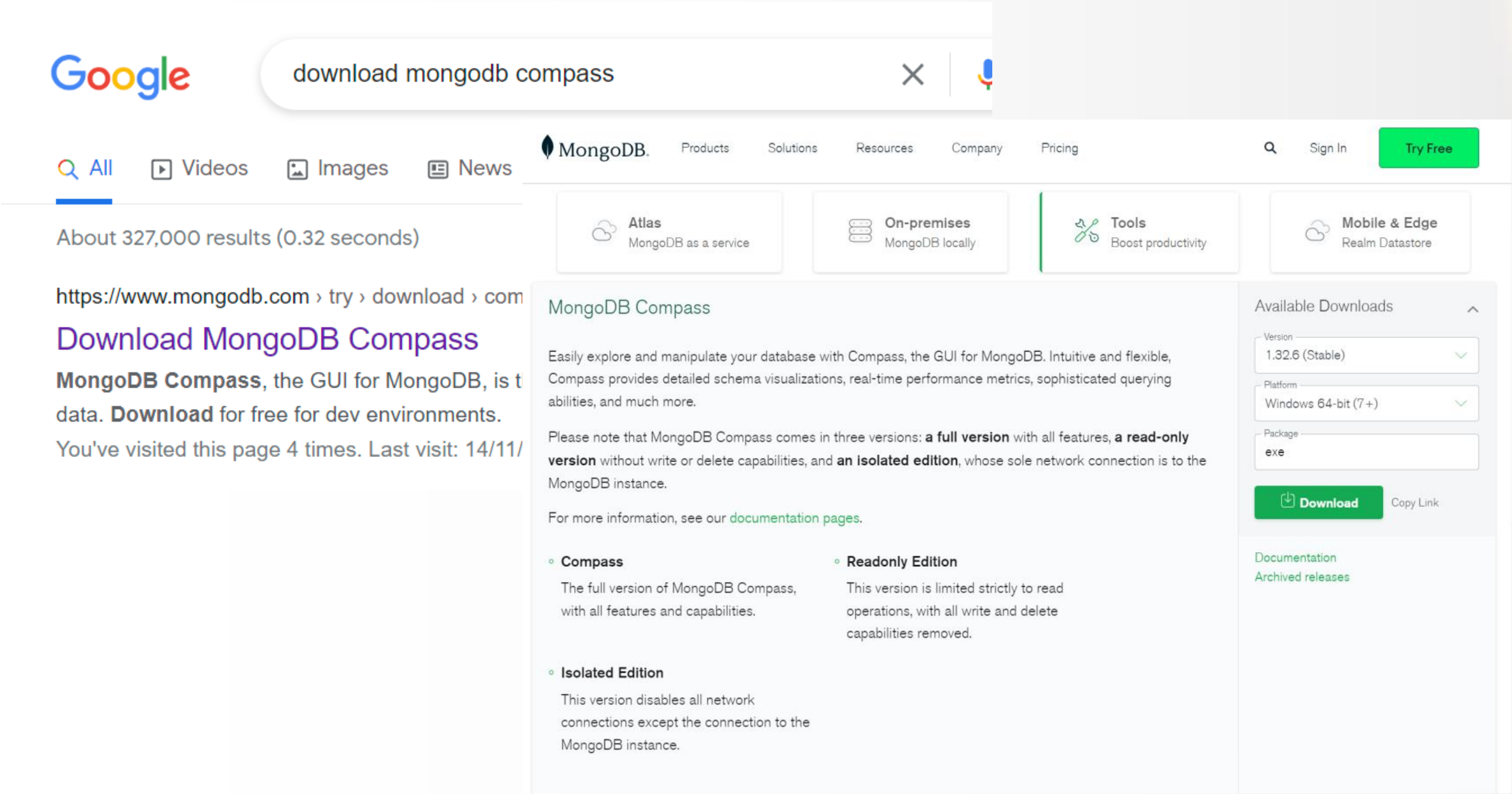
Shared Clusters for development environments and low-traffic applications

Tier	RAM	Storage	vCPU	Price
✓ M0 Sandbox	Shared	512 MB	Shared	Free forever
M2	Shared	2 GB	Shared	$9 / MONTH

M0 clusters are best for getting started, and are not suitable for production environments.

500 max connections | Low network performance | 100 max databases | 500 max collections

3. Install MongoDB Compass



download mongodb compass

About 327,000 results (0.32 seconds)

https://www.mongodb.com › try › download › com

Download MongoDB Compass

MongoDB Compass, the GUI for MongoDB, is t
data. **Download** for free for dev environments.
You've visited this page 4 times. Last visit: 14/11/

MongoDB Compass

Easily explore and manipulate your database with Compass, the GUI for MongoDB. Intuitive and flexible, Compass provides detailed schema visualizations, real-time performance metrics, sophisticated querying abilities, and much more.

Please note that MongoDB Compass comes in three versions: **a full version** with all features, **a read-only version** without write or delete capabilities, and **an isolated edition**, whose sole network connection is to the MongoDB instance.

For more information, see our documentation pages.

- **Compass**
  The full version of MongoDB Compass, with all features and capabilities.
- **Readonly Edition**
  This version is limited strictly to read operations, with all write and delete capabilities removed.
- **Isolated Edition**
  This version disables all network connections except the connection to the MongoDB instance.

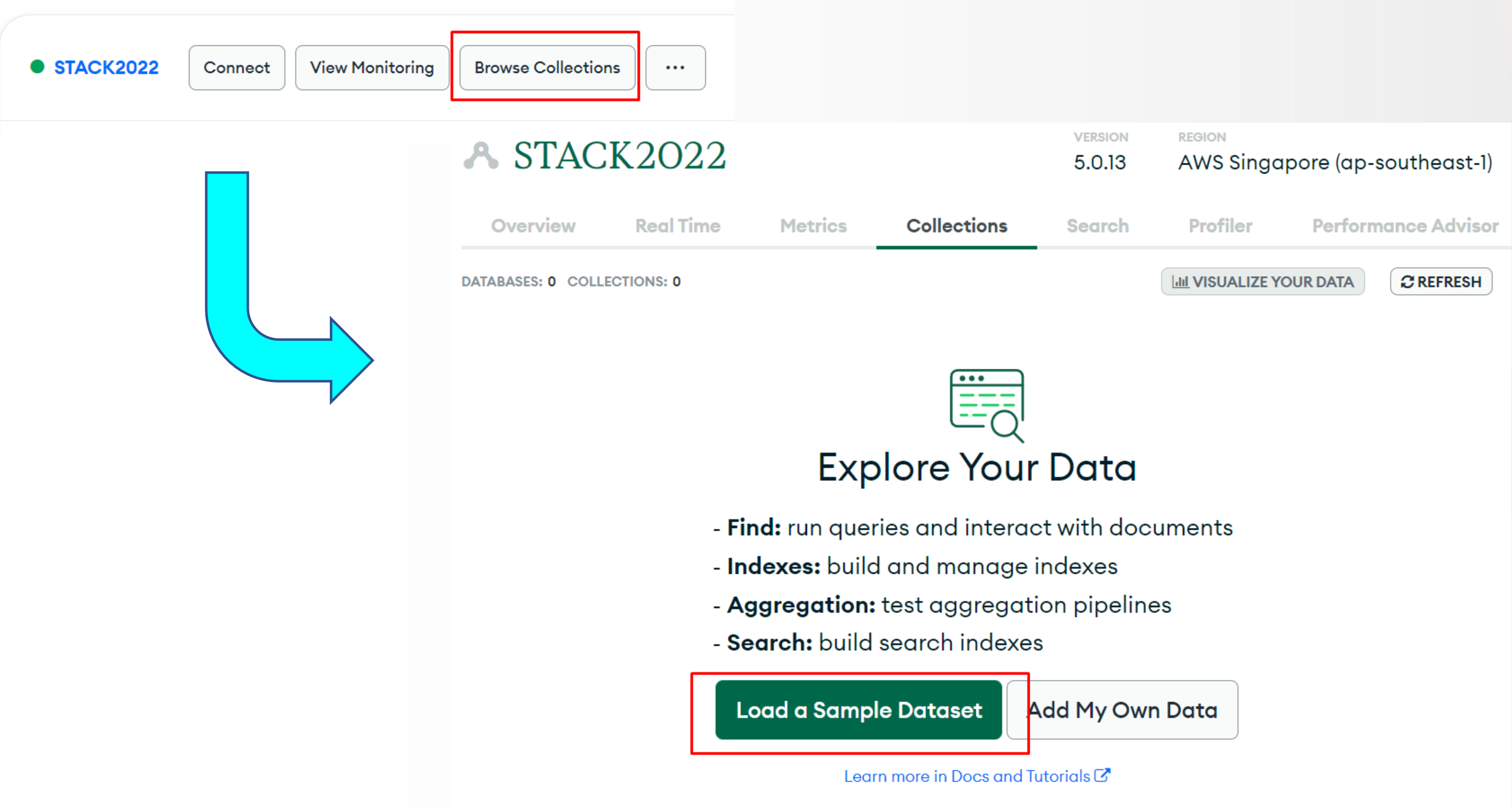
Available Downloads

Version: 1.32.6 (Stable)

Platform: Windows 64-bit (7+)

Package: exe

4. Load sample data



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VERSION 5.0.13

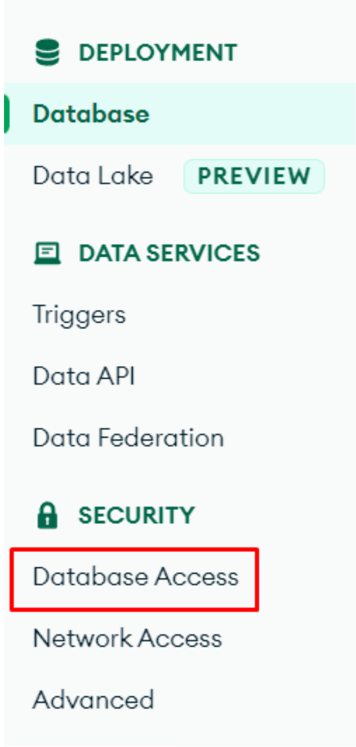
REGION AWS Singapore (ap-southeast-1)

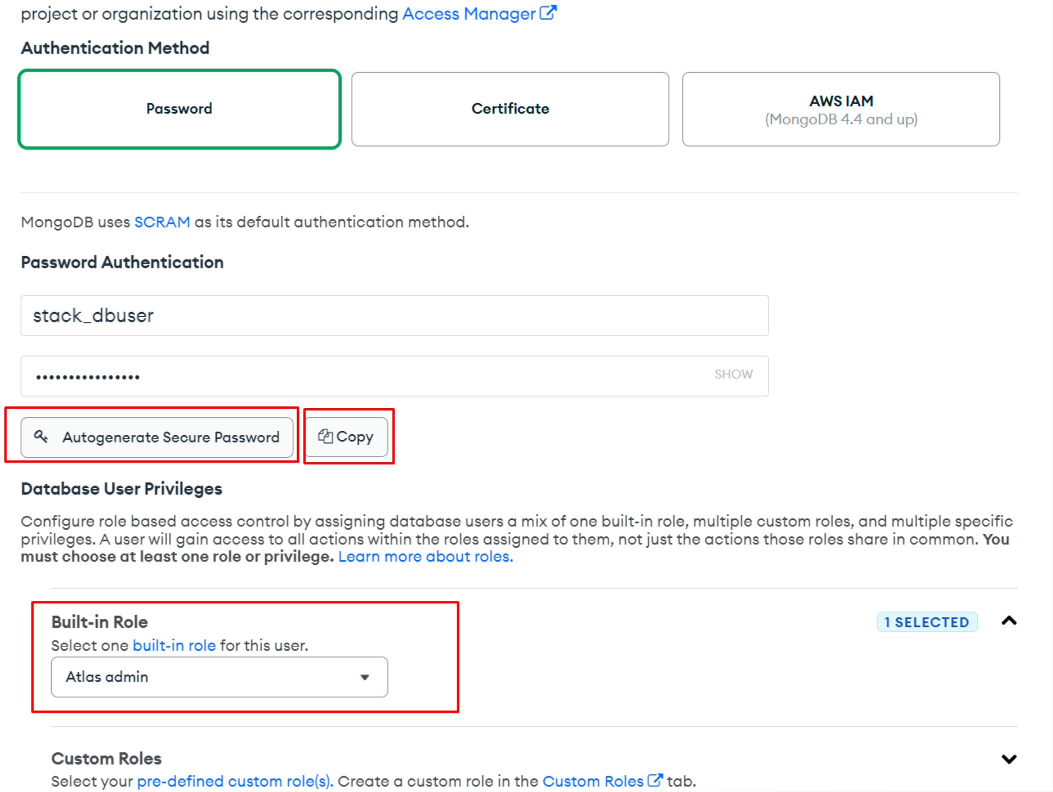
DATABASES: 0 COLLECTIONS: 0

Explore Your Data

- **Find:** run queries and interact with documents
- **Indexes:** build and manage indexes
- **Aggregation:** test aggregation pipelines
- **Search:** build search indexes

5. Add database user





project or organization using the corresponding Access Manager

Authentication Method

MongoDB uses SCRAM as its default authentication method.

Password Authentication

stack_dbuser

••••••••••••••••

Database User Privileges

Configure role based access control by assigning database users a mix of one built-in role, multiple custom roles, and multiple specific privileges. A user will gain access to all actions within the roles assigned to them, not just the actions those roles share in common. **You must choose at least one role or privilege.** Learn more about roles.

Built-in Role

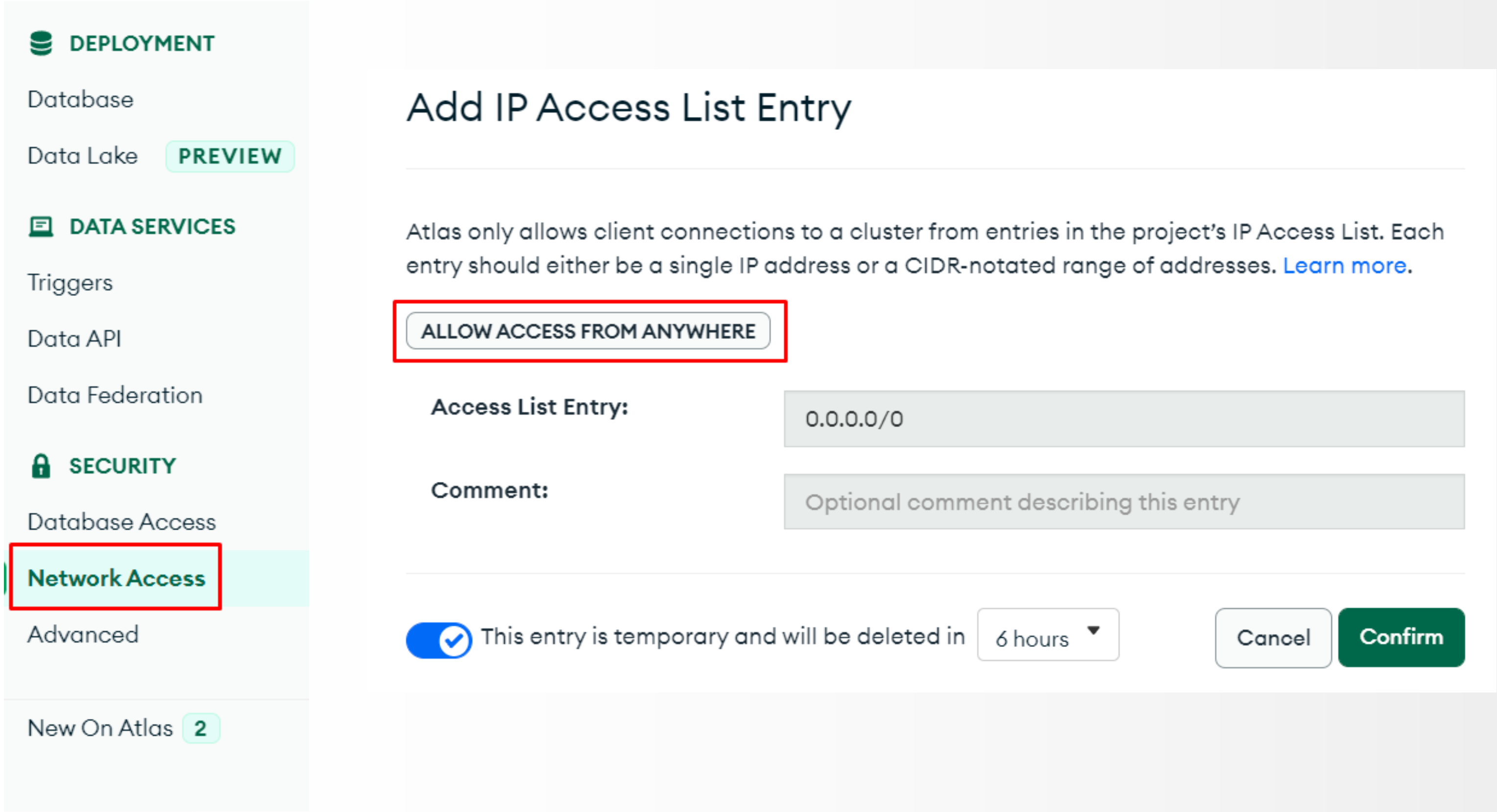
Select one built-in role for this user.

Atlas admin

Custom Roles

Select your pre-defined custom role(s). Create a custom role in the Custom Roles tab.

6. Open network access



Add IP Access List Entry

Atlas only allows client connections to a cluster from entries in the project's IP Access List. Each entry should either be a single IP address or a CIDR-notated range of addresses. Learn more.

ALLOW ACCESS FROM ANYWHERE

Access List Entry: 0.0.0.0/0

Comment: Optional comment describing this entry

This entry is temporary and will be deleted in 6 hours

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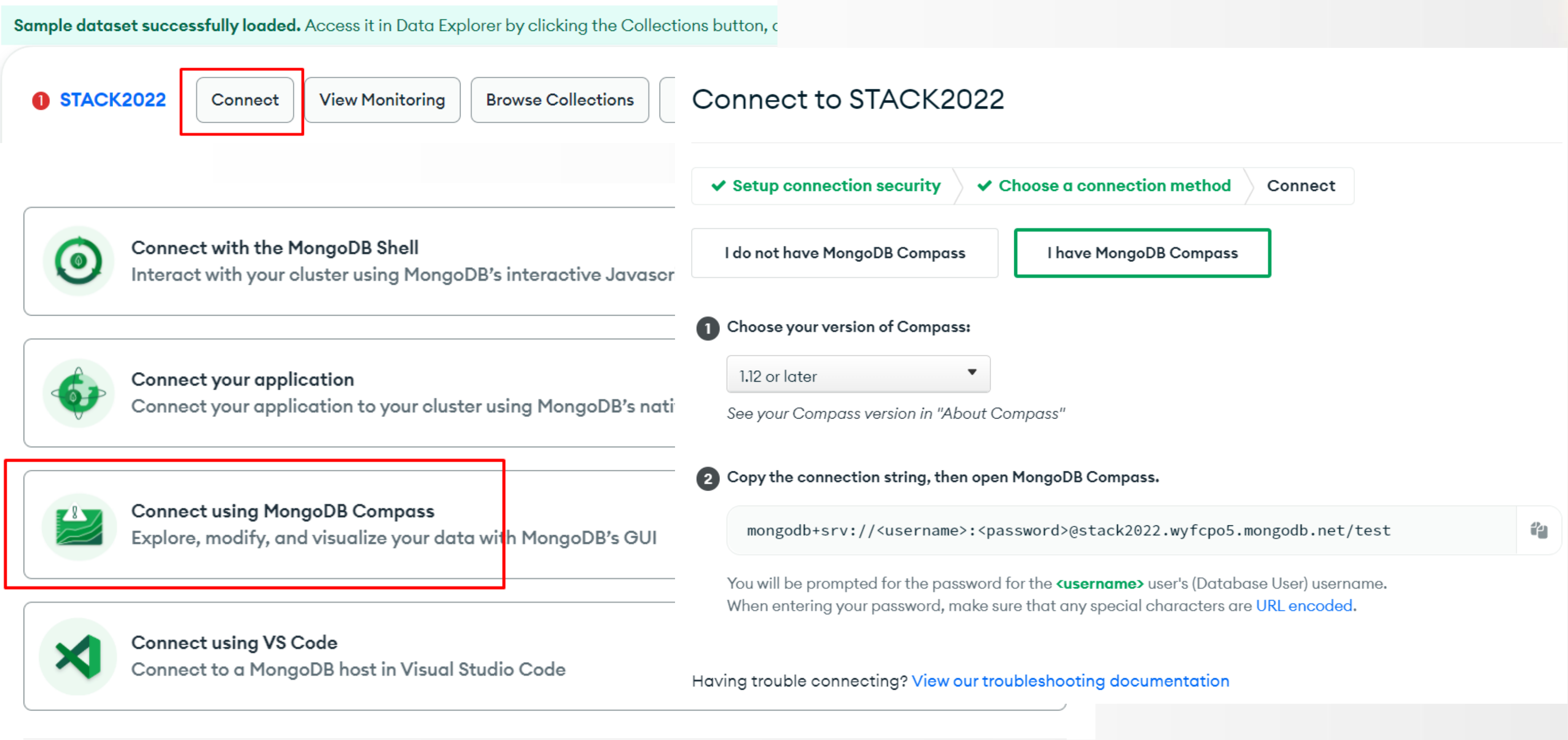
7. View dataset with Compass



Sample dataset successfully loaded. Access it in Data Explorer by clicking the Collections button, c

Connect with the MongoDB Shell
Interact with your cluster using MongoDB's interactive Javascr

Connect your application
Connect your application to your cluster using MongoDB's nati

Connect using MongoDB Compass
Explore, modify, and visualize your data with MongoDB's GUI

Connect using VS Code
Connect to a MongoDB host in Visual Studio Code

Connect to STACK2022

✓ Setup connection security
✓ Choose a connection method
Connect
I do not have MongoDB Compass
I have MongoDB Compass

1 **Choose your version of Compass:**

1.12 or later

See your Compass version in "About Compass"

2 **Copy the connection string, then open MongoDB Compass.**

```
mongodb+srv://<username>:<password>@stack2022.wyfcpo5.mongodb.net/test
```

You will be prompted for the password for the **<username>** user's (Database User) username. When entering your password, make sure that any special characters are URL encoded.

Having trouble connecting? View our troubleshooting documentation

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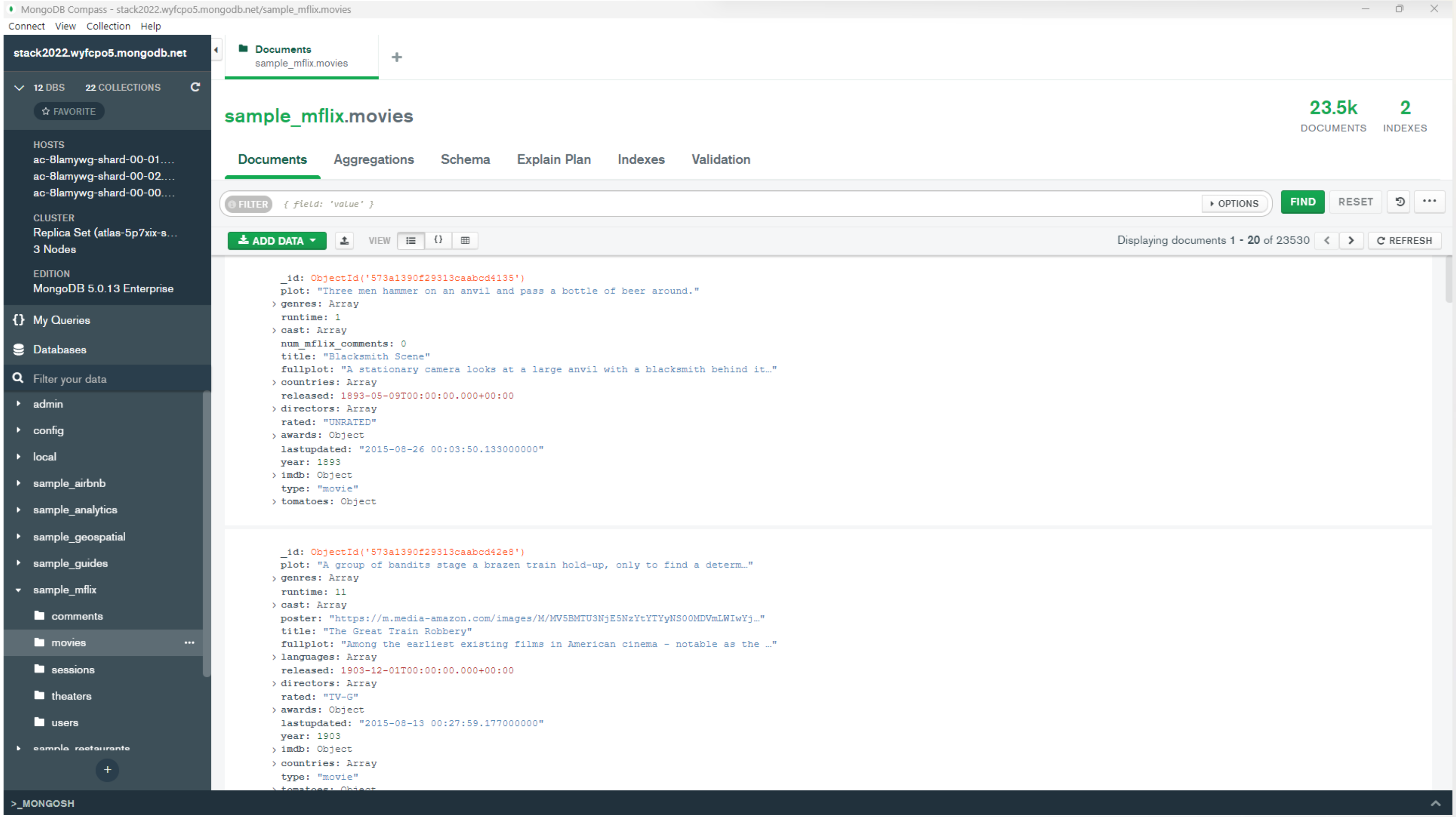


stack2022.wyfcpo5.mongodb.net

12 DBS 22 COLLECTIONS

HOSTS
ac-8lamywg-shard-00-01.…
ac-8lamywg-shard-00-02.…
ac-8lamywg-shard-00-00.…

CLUSTER
Replica Set (atlas-5p7xix-s…
3 Nodes

EDITION
MongoDB 5.0.13 Enterprise

- admin
- config
- local
- sample_airbnb
- sample_analytics
- sample_geospatial
- sample_guides
- sample_mflix
  - comments
  - movies
  - sessions
  - theaters
  - users
- sample_restaurants

sample_mflix.movies

23.5k DOCUMENTS 2 INDEXES

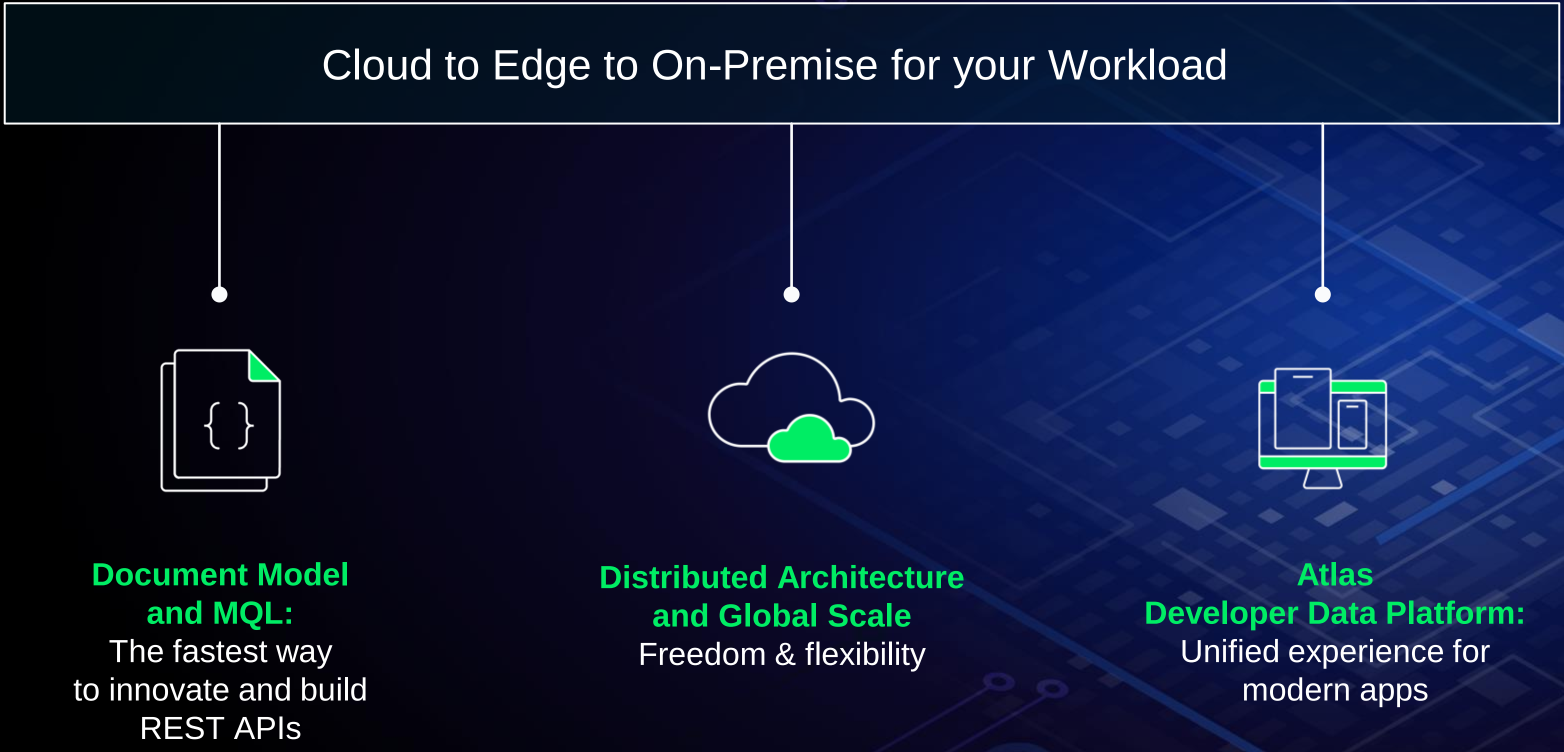
Displaying documents 1 - 20 of 23530

```
  _id: ObjectId('573a1390f29313caabcd4135')
  plot: "Three men hammer on an anvil and pass a bottle of beer around."
> genres: Array
  runtime: 1
> cast: Array
  num_mflix_comments: 0
  title: "Blacksmith Scene"
  fullplot: "A stationary camera looks at a large anvil with a blacksmith behind it…"
> countries: Array
  released: 1893-05-09T00:00:00.000+00:00
> directors: Array
  rated: "UNRATED"
> awards: Object
  lastupdated: "2015-08-26 00:03:50.133000000"
  year: 1893
> imdb: Object
  type: "movie"
> tomatoes: Object
```

```
  _id: ObjectId('573a1390f29313caabcd42e8')
  plot: "A group of bandits stage a brazen train hold-up, only to find a determ…"
> genres: Array
  runtime: 11
> cast: Array
  poster: "https://m.media-amazon.com/images/M/MV5BMTU3NjE5NzYtYTYyNS00MDVmLWIwYj…"
  title: "The Great Train Robbery"
  fullplot: "Among the earliest existing films in American cinema - notable as the …"
> languages: Array
  released: 1903-12-01T00:00:00.000+00:00
> directors: Array
  rated: "TV-G"
> awards: Object
  lastupdated: "2015-08-13 00:27:59.177000000"
  year: 1903
> imdb: Object
> countries: Array
  type: "movie"
> tomatoes: Object
```

MongoDB

MongoDB: Database for Modern Apps



Cloud to Edge to On-Premise for your Workload

Document Model and MQL:
The fastest way to innovate and build REST APIs

Distributed Architecture and Global Scale
Freedom & flexibility

Atlas Developer Data Platform:
Unified experience for modern apps

Mission Critical and General Purpose

Expressive Query Language & Secondary Indexes

ACID Transactions

Enterprise Security & Management

Native data structures & Idiomatic drivers

Scale & Distribution

Laptop, your data center, multi-cloud

Traditional **Relational** Strengths

Additional **NoSQL** and **Big Data** Strengths and Innovations

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The evolution of MongoDB

2015

3.0 & 3.2

Doc-Level Concurrency
RAFT / Fast Failover
$lookup
Ops Manager
Compression
≤50 replicas
Aggregation ++
Encrypted and In-Memory storage engines
BI Connector
Compass

WiredTiger (Acquisition + Integration)

2016

3.4

Views Graph Processing Zones
++Aggregation ++ Auto-balancing ++ Linearizable
Reads Decimal Intra-cluster
Compression Log Redaction
Spark Connector ++ BI
Connector ++

MongoDB Atlas

2017

3.6

Change Streams
Retryable Writes
Schema Validation Expressive
$lookUp
Query Expressivity
Causal Consistency Consistent
Sharded Secondary Reads
Query Advisor
End to End Compression
WiredTiger 1m+ Collections
MongoDB BI Connector ++
R Driver
Charts (post GA)
Atlas X-Region Replication Atlas
Auto Storage Scaling

2018

4.0

Replica set transactions

Atlas global clusters

40% Faster Shard Migrations
Atlas HIPAA
Atlas LDAP
Atlas Audit
Atlas Enc. Storage Engine
Atlas Backup Snapshots
Type Conversions
Snapshot Reads
Non-Blocking Sec. Reads
SHA-2 & TLS 1.1+
Compass Agg Pipeline Builder
Compass Export to Code
Free Monitoring Cloud Service
Ops Manager K8s Beta

ACID (Transactions)

2019

4.2

Distributed Transactions
Client-Side Field Level Encryption
Materialized Views
Wildcard Indexes
Global PIT Reads
Large Transactions
Mutable Shard Key Values
Atlas Data Lake (Beta)
Atlas Auto Scaling (Beta)
Atlas Search (Beta)
Multi-CAs
Expressive Updates
Apache Kafka Connector
MongoDB Charts GA
Retryable Reads & Writes
New Index Builds
10x Faster stepDown
Storage Node Watchdog
Zstandard Compression

2020

4.4

Union
Custom Agg Expressions
Refinable Shard Keys
Compound Hashed Shard Keys
Mirrored Reads
Hedged Reads
Resumable Initial Sync
Time-Based Oplog Retention
Simultaneous Indexing
Hidden Indexes
Streaming Replication
Global Read/Write Concerns
Rust & Swift Drivers GA
TLS 1.3 & Faster Client Auth
OCSP Stapling
Kerberos Utility
Atlas Online Archive
Auto-Scaling
Schema Recommendations
AWS IAM Auth & Atlas x509
Federated Queries
Multi-cloud clusters

Multi-Cloud

2021-2022

5.x

Time Series collections
Clustered indexes
Window functions
Live resharding
Client-Side FLE KMIP & cloud KMS
Atlas Serverless (preview)
Atlas Search fast facets, function scores, synonyms
Long running snapshot reads
Sharded $lookup & $graphlookup
Majority write concern default
4x faster initial sync
Schema validation diagnostics
New MongoDB Shell GA
Resumable index builds
Rewritten Swift driver
Rewritten C# LINQ provider and .NET Analyzer
PyMongoArrow API
New accumulator operators
Charts on Data Lake
x509 certificate rotation
Auditing ++
Atlas K8S controller
Ops Manager migration wizard

Stable API & Rapid Releases

2022-2023

6.x

Queryable encryption (preview)
Atlas Serverless GA
Column store indexes
Cluster-to-cluster sync
Independent analytic nodes scaling
Flexible sync GA
Asymmetric sync preview
Kotlin and Flutter SDKs for Realm
$lookup perf improvements
Atlas CLI GA
Atlas Data API GA
Secondary index on measurements for time series
Time series read perf +
Atlas Data Lake with fully managed storage
Atlas Data Federation
Atlas Charts dashboard embedding
Atlas SQL interface
Encrypted audit log
Change streams improvements
Announcement of relational to MongoDB migrator

Developer Data Platform

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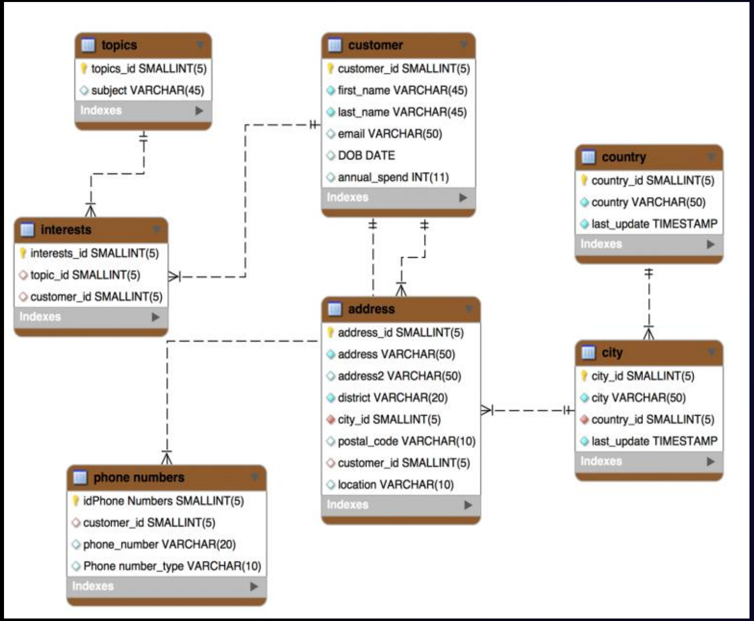
Document model - intuitive and fast



```
{
  "_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]}},
+    {...}
  ],
  "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

Document model - adapt to changes flexibly

```
{
  "_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]}},
+    {...}
  ],
"dob" : ISODate("1977-04-01T05:00:00Z"),
  "retirement_fund" : NumberDecimal("1292815.75")

}
```

```
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    "first" : "John",
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  "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")
}
```

Add new fields dynamically at runtime

Document data model

Naturally maps to objects in code

- Eliminates requirements to use ORMs
- Breaks down complex interdependencies between developer and DBAs teams

Represent data of any structure

- Polymorphic: each document can contain different fields
- Modify the schema at any time

Strongly typed for ease of processing

- Over 20 binary encoded JSON data types

```
{
  "_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" : [
         -0.109081, 51.5065752]}},
+   {...}
  ],
  "dob" : ISODate("1977-04-01T05:00:00Z"),
  "retirement_fund" : NumberDecimal("1292815.75")
}
```

Access by idiomatic drivers in all major programming language

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

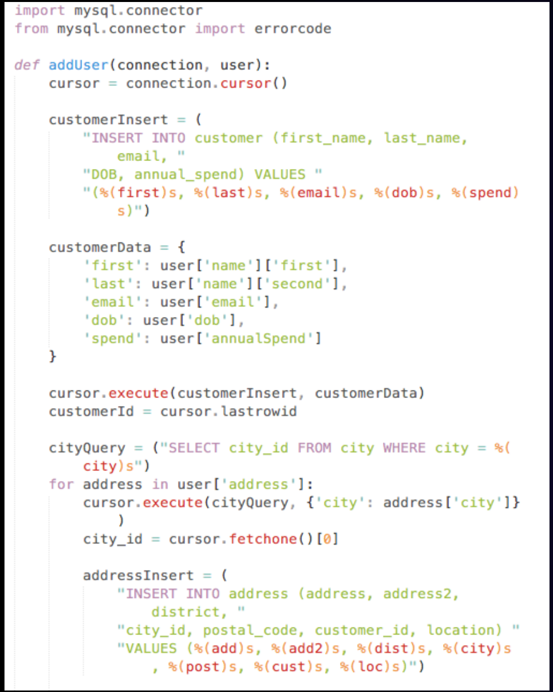
Identify all existing documents that do not comply

Model and query data any way you need

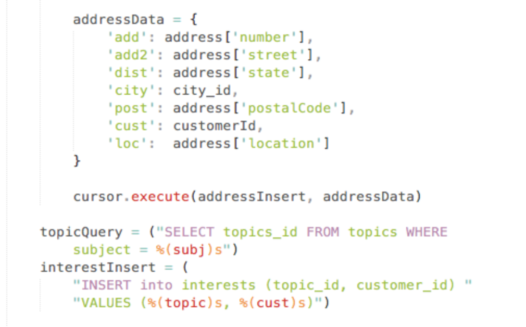
All wrapped in a single API, giving a consistent experience for any workload

- JSON Documents
- Tabular
- Key-Value
- Text
- Geospatial
- Graph
- File Storage
- Events

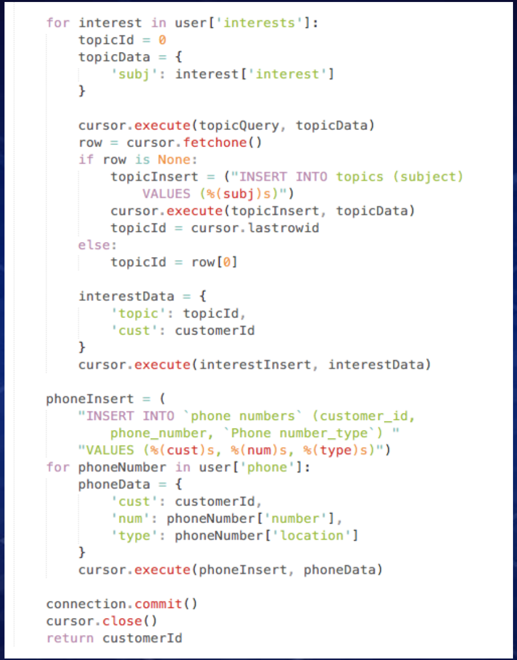
SQL needed to insert a customer



```
import mysql.connector
from mysql.connector import errorcode

def addUser(connection, user):
    cursor = connection.cursor()

    customerInsert = (
        "INSERT INTO customer (first_name, last_name,
            email, "
        "DOB, annual_spend) VALUES "
        "(%(first)s, %(last)s, %(email)s, %(dob)s, %(spend)
            s)")

    customerData = {
        'first': user['name']['first'],
        'last': user['name']['second'],
        'email': user['email'],
        'dob': user['dob'],
        'spend': user['annualSpend']
    }

    cursor.execute(customerInsert, customerData)
    customerId = cursor.lastrowid

    cityQuery = ("SELECT city_id FROM city WHERE city = %(
        city)s")
    for address in user['address']:
        cursor.execute(cityQuery, {'city': address['city']}
            )
        city_id = cursor.fetchone()[0]

        addressInsert = (
            "INSERT INTO address (address, address2,
                district, "
            "city_id, postal_code, customer_id, location) "
            "VALUES (%(add)s, %(add2)s, %(dist)s, %(city)s
                , %(post)s, %(cust)s, %(loc)s)")
```



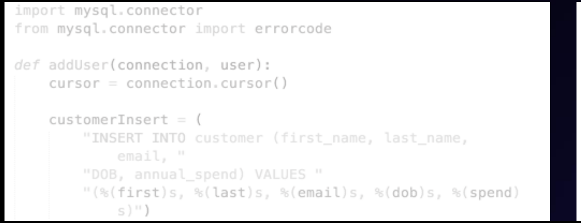
```
        addressData = {
            'add': address['number'],
            'add2': address['street'],
            'dist': address['state'],
            'city': city_id,
            'post': address['postalCode'],
            'cust': customerId,
            'loc':  address['location']
        }

        cursor.execute(addressInsert, addressData)

    topicQuery = ("SELECT topics_id FROM topics WHERE
        subject = %(subj)s")
    interestInsert = (
        "INSERT into interests (topic_id, customer_id) "
        "VALUES (%(topic)s, %(cust)s)")
```



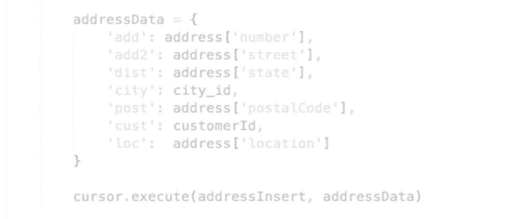
```
    for interest in user['interests']:
        topicId = 0
        topicData = {
            'subj': interest['interest']
        }

        cursor.execute(topicQuery, topicData)
        row = cursor.fetchone()
        if row is None:
            topicInsert = ("INSERT INTO topics (subject)
                VALUES (%(subj)s)")
            cursor.execute(topicInsert, topicData)
            topicId = cursor.lastrowid
        else:
            topicId = row[0]

        interestData = {
            'topic': topicId,
            'cust': customerId
        }
        cursor.execute(interestInsert, interestData)

    phoneInsert = (
        "INSERT INTO `phone numbers` (customer_id,
            phone_number, `Phone number_type`) "
        "VALUES (%(cust)s, %(num)s, %(type)s)")
    for phoneNumber in user['phone']:
        phoneData = {
            'cust': customerId,
            'num': phoneNumber['number'],
            'type': phoneNumber['location']
        }
        cursor.execute(phoneInsert, phoneData)

    connection.commit()
    cursor.close()
    return customerId
```

CODE SNIPPET: HTTPS://GIT.IO/VPNXX

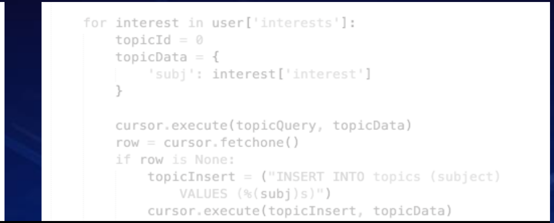
MongoDB requires just two lines of code



```
import mysql.connector
from mysql.connector import errorcode

def addUser(connection, user):
    cursor = connection.cursor()

    customerInsert = (
        "INSERT INTO customer (first_name, last_name,
            email, "
        "DOB, annual_spend) VALUES "
        "(%(first)s, %(last)s, %(email)s, %(dob)s, %(spend)
            s)")
```

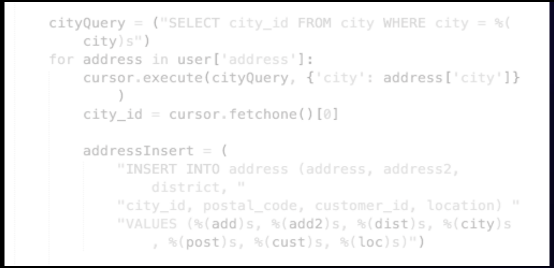


```
        addressData = {
            'add': address['number'],
            'add2': address['street'],
            'dist': address['state'],
            'city': city_id,
            'post': address['postalCode'],
            'cust': customerId,
            'loc':  address['location']
        }

        cursor.execute(addressInsert, addressData)
```

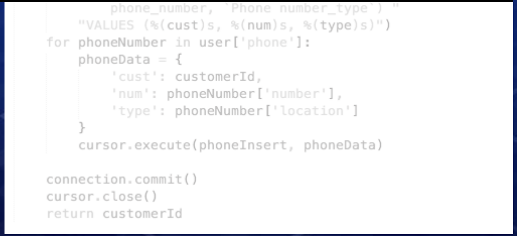


```
    for interest in user['interests']:
        topicId = 0
        topicData = {
            'subj': interest['interest']
        }

        cursor.execute(topicQuery, topicData)
        row = cursor.fetchone()
        if row is None:
            topicInsert = ("INSERT INTO topics (subject)
                VALUES (%(subj)s)")
            cursor.execute(topicInsert, topicData)
```

```
def addUser(database, user):
  return database.customers.insert_one(user).inserted_id
```



```
    cityQuery = ("SELECT city_id FROM city WHERE city = %(
        city)s")
    for address in user['address']:
        cursor.execute(cityQuery, {'city': address['city']}
            )
        city_id = cursor.fetchone()[0]

        addressInsert = (
            "INSERT INTO address (address, address2,
                district, "
            "city_id, postal_code, customer_id, location) "
            "VALUES (%(add)s, %(add2)s, %(dist)s, %(city)s
                , %(post)s, %(cust)s, %(loc)s)")
```



```
            phone_number, `Phone number_type`) "
        "VALUES (%(cust)s, %(num)s, %(type)s)")
    for phoneNumber in user['phone']:
        phoneData = {
            'cust': customerId,
            'num': phoneNumber['number'],
            'type': phoneNumber['location']
        }
        cursor.execute(phoneInsert, phoneData)

    connection.commit()
    cursor.close()
    return customerId
```

CODE SNIPPETS: SQL example and MongoDB example

Aggregations

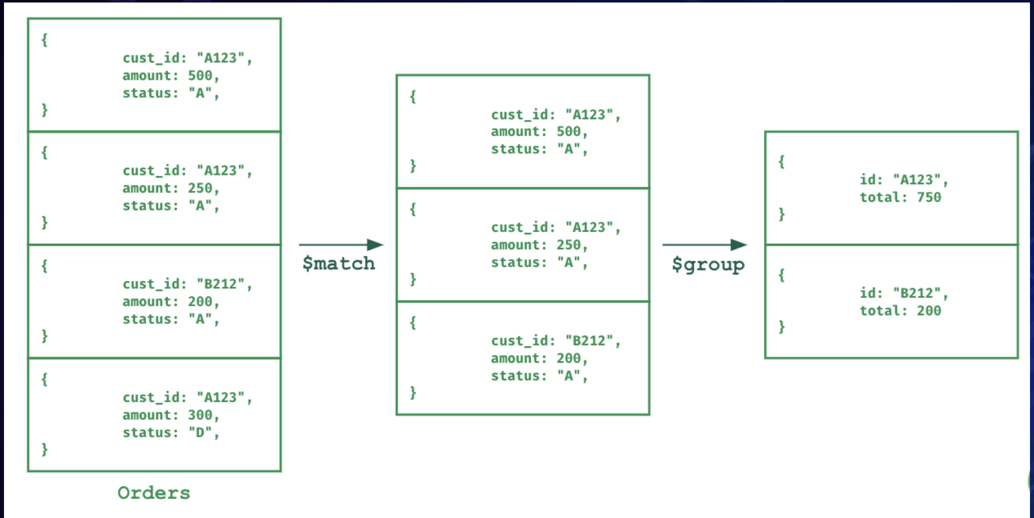
Advanced data processing pipeline for transformations
and analytics

Multiple stages

Similar to a unix pipe
- Construct modular, composable processing pipelines

Rich Expressions

Example Aggregation Command on the Orders Collection:



```
{
    cust_id: "A123",
    amount: 500,
    status: "A",
}
{
    cust_id: "A123",
    amount: 250,
    status: "A",
}
{
    cust_id: "B212",
    amount: 200,
    status: "A",
}
{
    cust_id: "A123",
    amount: 300,
    status: "D",
}
```

Orders

$match

```
{
    cust_id: "A123",
    amount: 500,
    status: "A",
}
{
    cust_id: "A123",
    amount: 250,
    status: "A",
}
{
    cust_id: "B212",
    amount: 200,
    status: "A",
}
```

$group

```
{
    id: "A123",
    total: 750
}
{
    id: "B212",
    total: 200
}
```

$match stage
$group stage

```
db.orders.aggregate( [
     {$match: { status: "A" } },
      {$group: { _id: "$cust_id", total: { $sum: "$amount" } } }
] )
```

STACK 2022

Aggregation features

A feature rich framework for data transformation and Analytics

Pipeline Stages

- $match
- $group
- $facet
- $geoNear
- $graphLookup
- $lookup
- $merge
- $project
- $search
- $sort
- $setWindowFields
- $unionWith
- $unwind
- ...and more

Operators

- Mathematical

  $add, $abs, $subtract, $multiply, $divide, $log, $log10, $stdDevPop, $stdDevSam, $avg, $sqrt, $pow, $sum, $zip, $convert, $round, etc.

- Array

  $push, $reduce, $reverseArray, $addToSet, $arrayElemAt, $slice, etc.

- Conditionals

  $and, $or, $eq, $lt, $lte, $gt, $gte, $cmp, $cond, $switch, $in, etc.

- Temporal

  Window Functions

  $dateAdd, $dateDiff, $dateSubtract, $dateTrunc

  $dateFromParts, $dateToParts, $dateFromString, $dateToString, $dayOfMonth, $isoWeek, $minute, $month, $year, etc.

- String

  $toUpper, $toLower, $substr, $strcasecmp, $concat, $split, etc.

- Literals

  $exp, $let, $literal, $map, $type, etc.

- Regex

  $regexFind, $regexMatch, etc

- Trigonometry

  $sin, $cos, $degreesToRadians, etc.

- Custom Aggregation Expressions

PRACTICAL MONGODB AGGREGATIONS EBOOK

GOVTECH
SINGAPORE

Fully indexable

Fully featured secondary indexes - document optimized - extended beyond RDBMS experiences

Index Types

Primary Index
- Every Collection has a primary key index

Compound Index
- Index against multiple keys in the document

MultiKey Index
- Index into arrays

Wildcard Index
- Auto-index all matching fields, sub-documents & arrays

Text Indexes
- Support for text searches. Atlas Search offers Lucene-based inverted indexes

GeoSpatial Indexes
- 2d & 2dSphere indexes for spatial geometries

Clustered Indexes
- For time series collections, pre-sorted by timestamp for low latency querie

Index Features

TTL Indexes
- Single Field indexes, when expired delete the document

Unique Indexes
- Ensures value is not duplicated

Partial Indexes
- Expression based indexes, allowing indexes on subsets of data

Case Insensitive Indexes
- Supports text search using case insensitive search

Sparse Indexes
- Only index documents which have the given field

Transactional data guarantees

For many apps, single document transactions meet the majority of needs

```
  _id: 12345678
> name: Object
> address: Array
> phone: Array
  email: "john.doe.@mongodb.com"
  dob: 1966-07-30 01:00:00:000
v interests:Array
        0: "Cycling"
        1: "IoT"
```

MongoDB multi-doc ACID transactions

Multi-node transactional guarantees delivered at scale

- Multi-statement, familiar relational syntax
- Easy to add to any application
- Multiple documents in 1 or many collections and databases, across replica sets and sharded clusters

ACID guarantees

Snapshot isolation, all or nothing execution

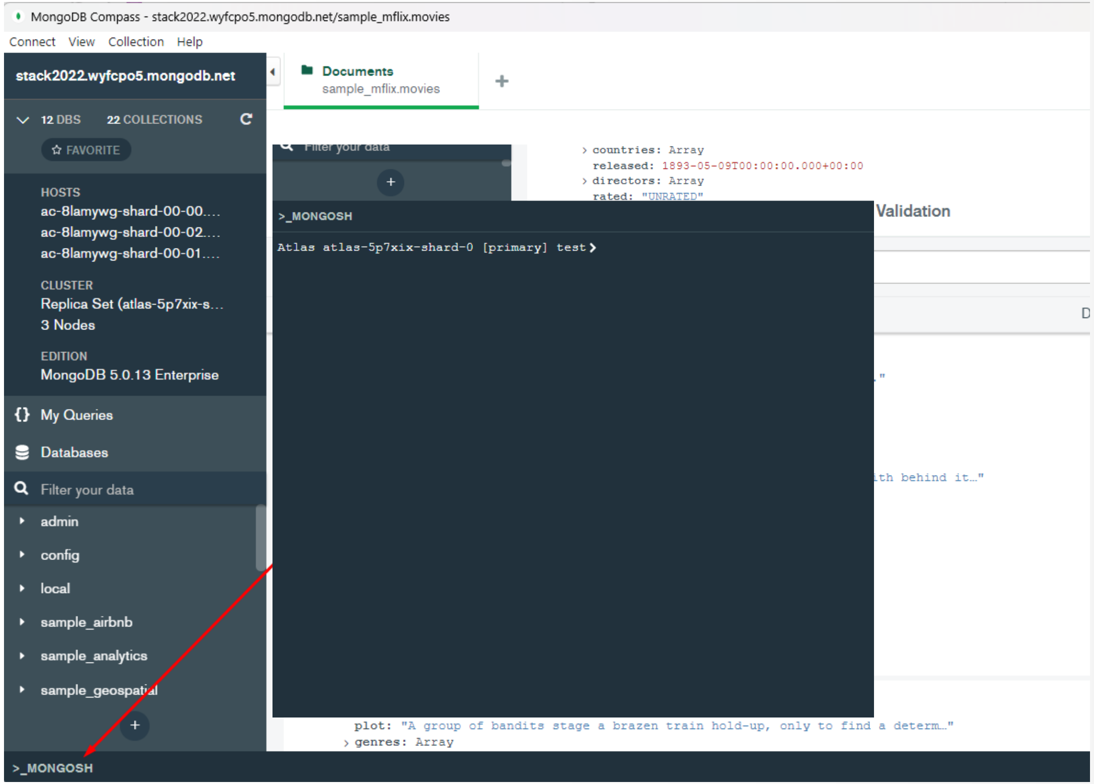
```
with client.start_session() as s:

    s.start_transaction()

    collection_one.insert_one(doc_one, session=s)

    collection_two.insert_one(doc_two, session=s)

    s.commit_transaction()
```

STACK 2022

Hands On:

MongoDB Flexible Schema and MQL

1. Activate mongosh in Compass



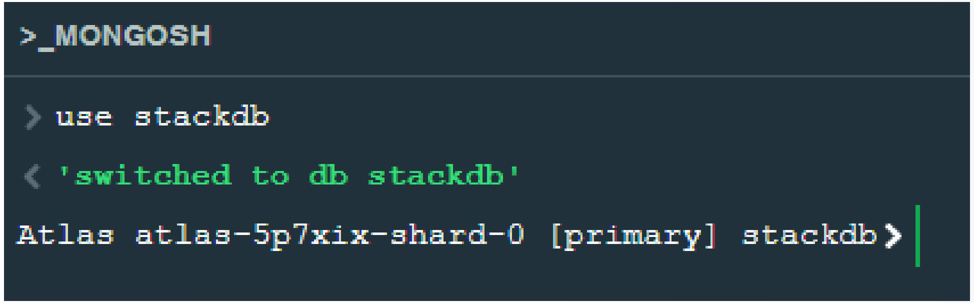
```
› countries: Array
  released: 1893-05-09T00:00:00.000+00:00
› directors: Array
  rated: "UNRATED"
```

```
Atlas atlas-5p7xix-shard-0 [primary] test❯
```

```
ith behind it…"
  plot: "A group of bandits stage a brazen train hold-up, only to find a determ…"
› genres: Array
```

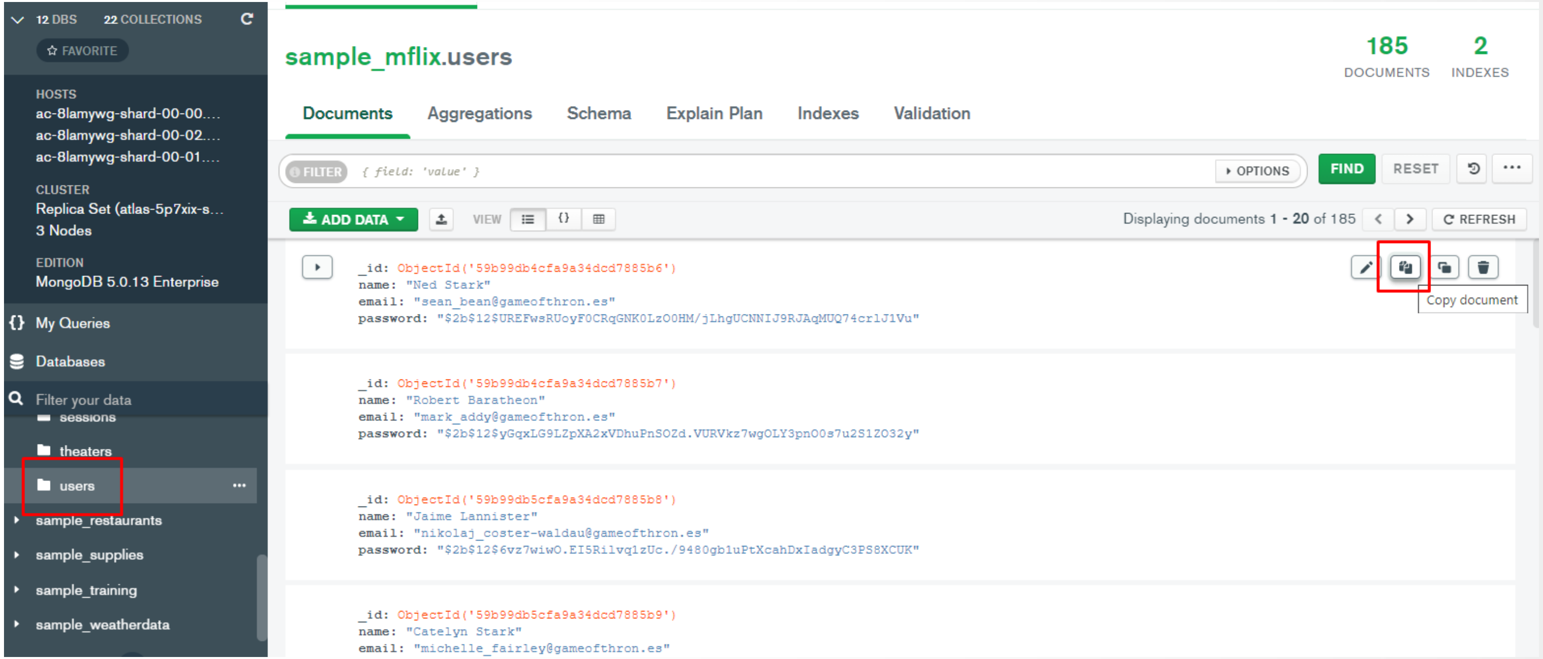
2. Switch context to “stackdb”

Note: “stackdb” does not exist but it is ok… trust me…



```
> use stackdb
< 'switched to db stackdb'
Atlas atlas-5p7xix-shard-0 [primary] stackdb>
```

3. Copy a document from sample data



HOSTS
ac-8lamywg-shard-00-00....
ac-8lamywg-shard-00-02....
ac-8lamywg-shard-00-01....

CLUSTER
Replica Set (atlas-5p7xix-s...
3 Nodes

EDITION
MongoDB 5.0.13 Enterprise

sample_mflix.users

185 DOCUMENTS
2 INDEXES

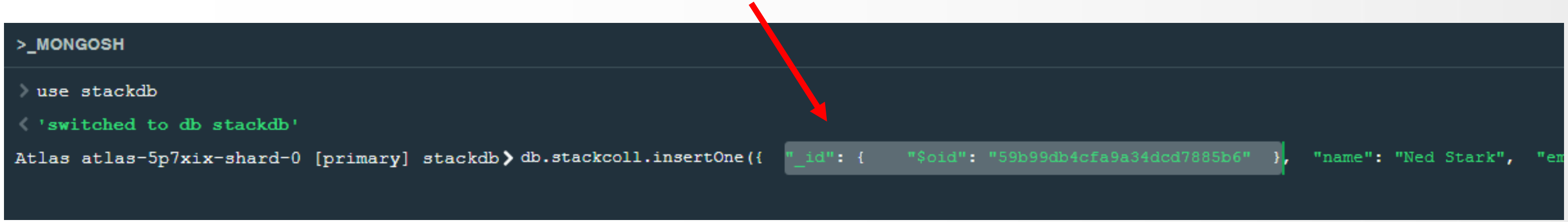
Displaying documents 1 - 20 of 185

```
_id: ObjectId('59b99db4cfa9a34dcd7885b6')
name: "Ned Stark"
email: "sean_bean@gameofthron.es"
password: "$2b$12$UREFwsRUoyF0CRqGNK0LzO0HM/jLhgUCNNIJ9RJAqMUQ74crlJ1Vu"

_id: ObjectId('59b99db4cfa9a34dcd7885b7')
name: "Robert Baratheon"
email: "mark_addy@gameofthron.es"
password: "$2b$12$yGqxLG9LZpXA2xVDhuPnSOZd.VURVkz7wgOLY3pnO0s7u2S1ZO32y"

_id: ObjectId('59b99db5cfa9a34dcd7885b8')
name: "Jaime Lannister"
email: "nikolaj_coster-waldau@gameofthron.es"
password: "$2b$12$6vz7wiwO.EI5Rilvq1zUc./9480gb1uPtXcahDxIadgyC3PS8XCUK"

_id: ObjectId('59b99db5cfa9a34dcd7885b9')
name: "Catelyn Stark"
email: "michelle_fairley@gameofthron.es"
```

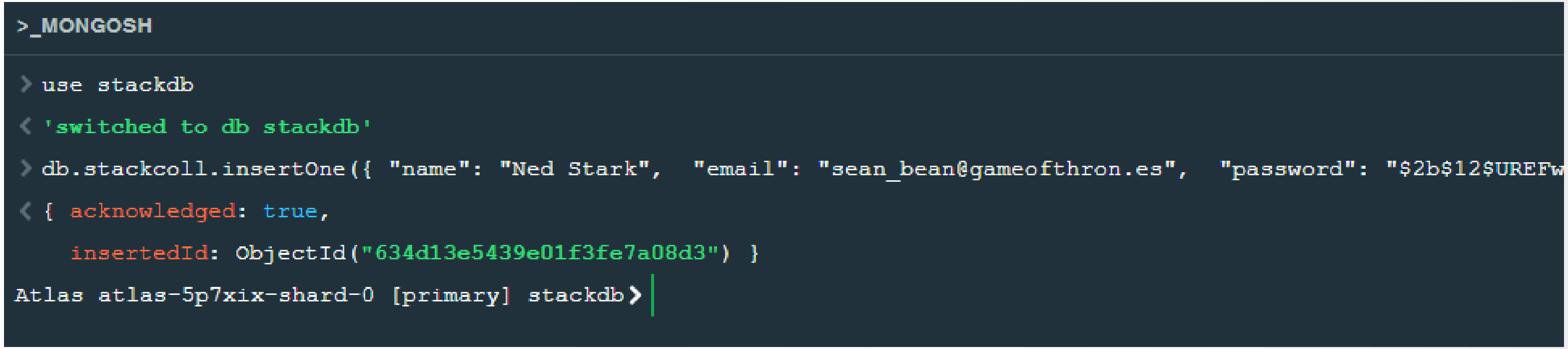
4. Insert copied document into “stackcoll”

Note: “stackcoll” does not exist but it is ok… trust me again…

Remove this _id field

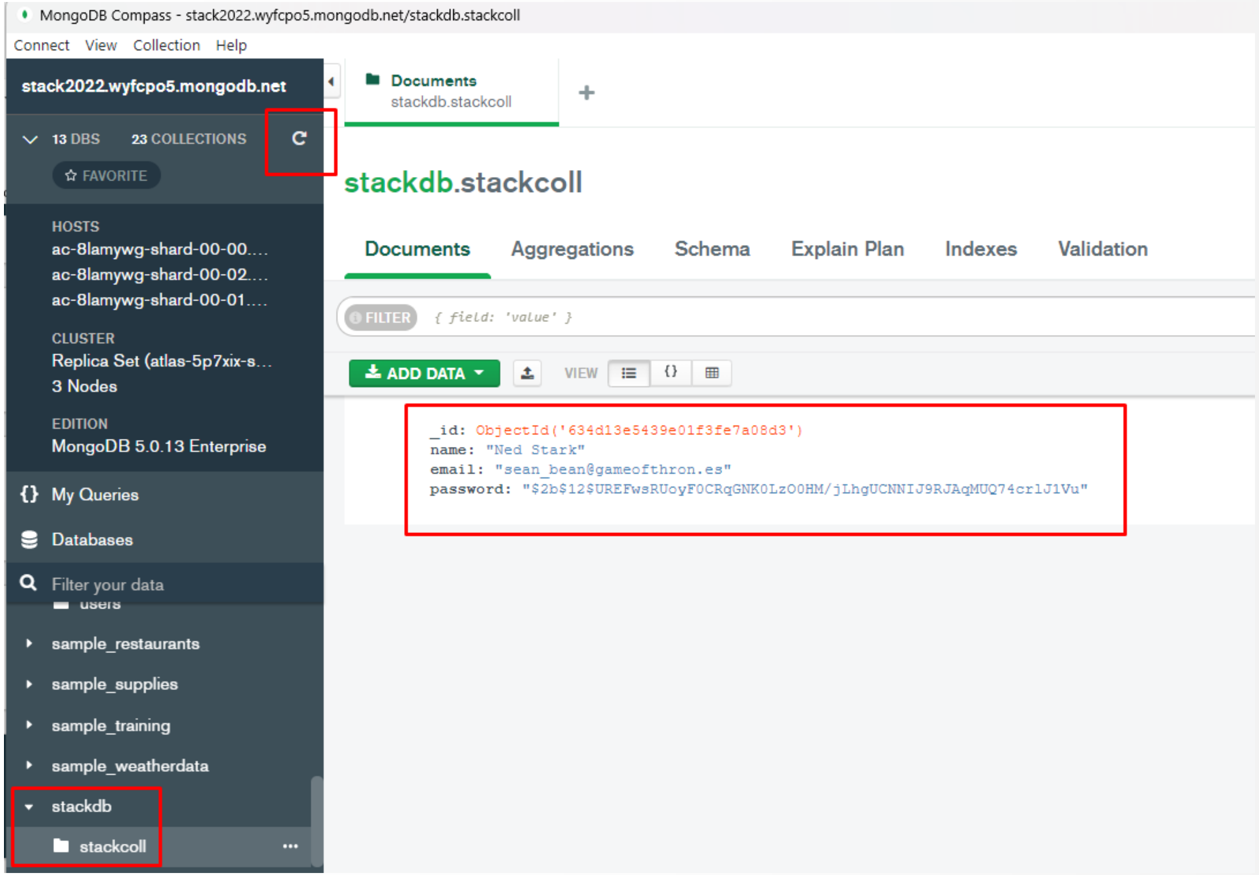


```
>_MONGOSH

> use stackdb
< 'switched to db stackdb'
Atlas atlas-5p7xix-shard-0 [primary] stackdb> db.stackcoll.insertOne({  "_id": {    "$oid": "59b99db4cfa9a34dcd7885b6"  },  "name": "Ned Stark",  "em
```



```
>_MONGOSH

> use stackdb
< 'switched to db stackdb'
> db.stackcoll.insertOne({ "name": "Ned Stark",  "email": "sean_bean@gameofthron.es",  "password": "$2b$12$UREFw
< { acknowledged: true,
    insertedId: ObjectId("634d13e5439e01f3fe7a08d3") }
Atlas atlas-5p7xix-shard-0 [primary] stackdb>
```

5. Refresh and check stackdb and stackcoll



MongoDB Compass - stack2022.wyfcpo5.mongodb.net/stackdb.stackcoll

stack2022.wyfcpo5.mongodb.net

13 DBS 23 COLLECTIONS

HOSTS
ac-8lamywg-shard-00-00....
ac-8lamywg-shard-00-02....
ac-8lamywg-shard-00-01....

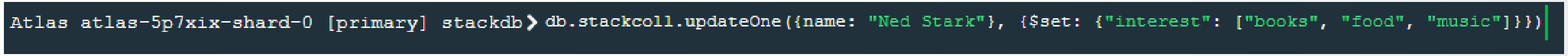
CLUSTER
Replica Set (atlas-5p7xix-s...
3 Nodes

EDITION
MongoDB 5.0.13 Enterprise

stackdb.stackcoll

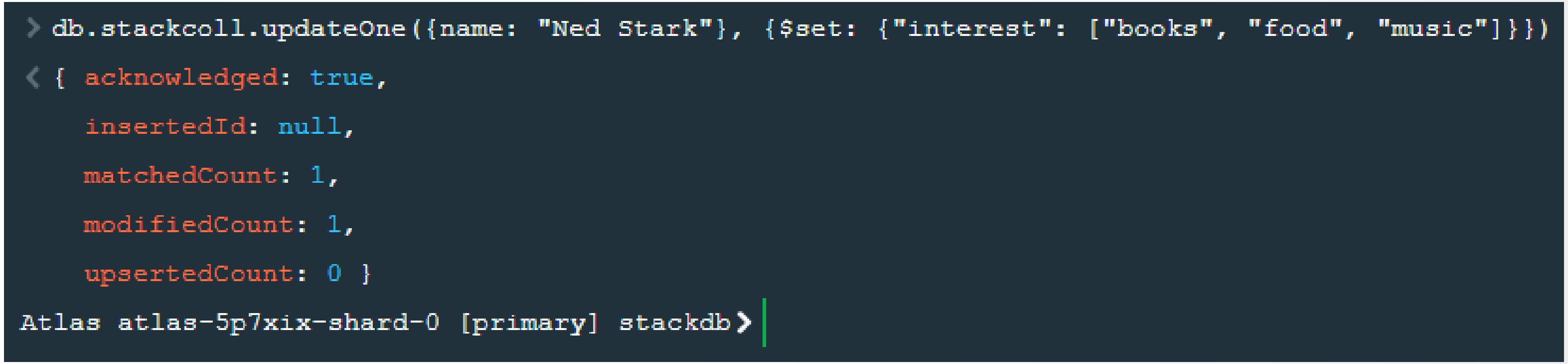
```
_id: ObjectId('634d13e5439e01f3fe7a08d3')
name: "Ned Stark"
email: "sean_bean@gameofthron.es"
password: "$2b$12$UREFwsRUoyF0CRqGNK0LzO0HM/jLhgUCNNIJ9RJAqMUQ74crlJ1Vu"
```

7. Update Ned’s profile to include an array of interest



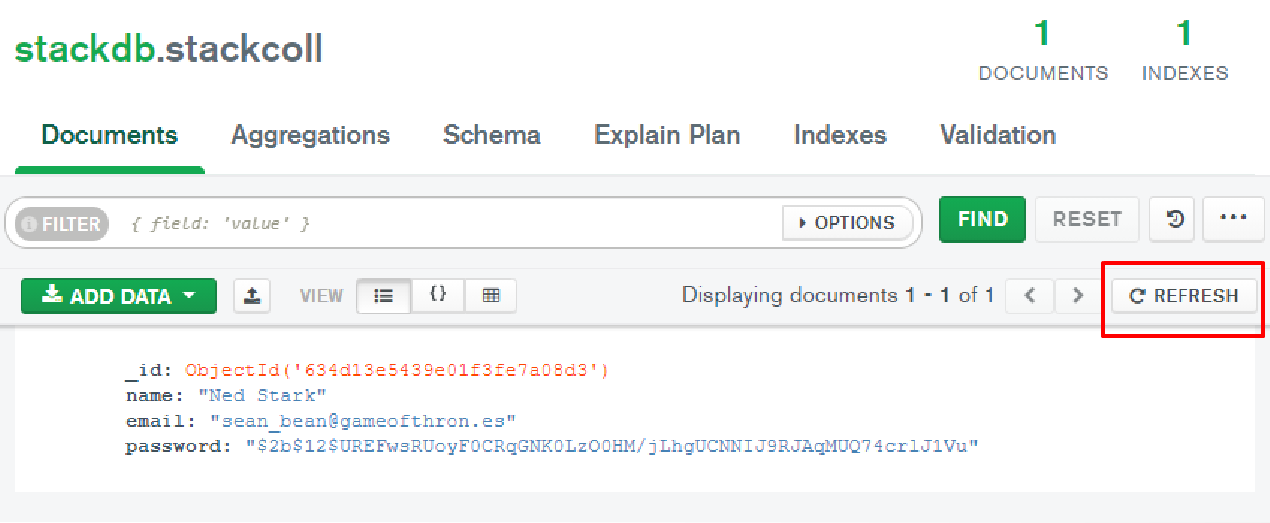
```
Atlas atlas-5p7xix-shard-0 [primary] stackdb> db.stackcoll.updateOne({name: "Ned Stark"}, {$set: {"interest": ["books", "food", "music"]}})
```

```
db.stackcoll.updateOne(
 {name: "Ned Stark"},
 {$set: {"interest": ["books", "food", "music"]}}
)
```

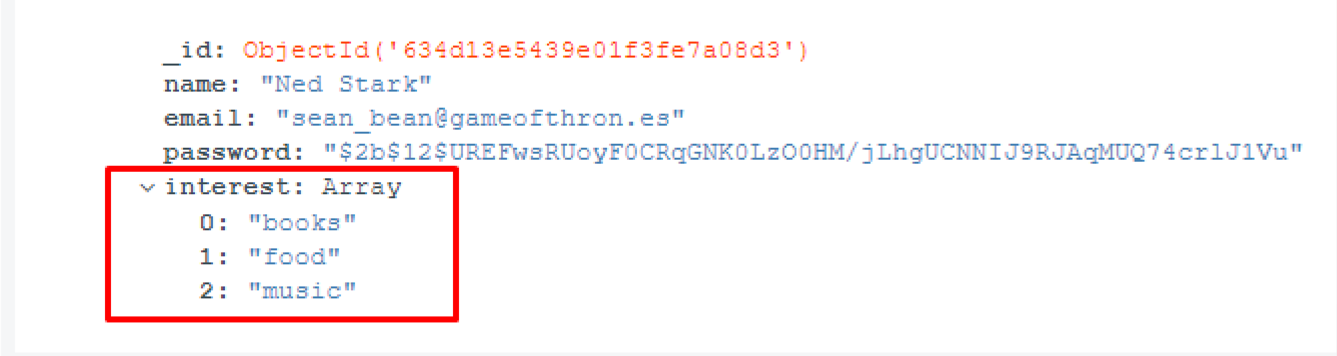


```
> db.stackcoll.updateOne({name: "Ned Stark"}, {$set: {"interest": ["books", "food", "music"]}})
< { acknowledged: true,
    insertedId: null,
    matchedCount: 1,
    modifiedCount: 1,
    upsertedCount: 0 }
Atlas atlas-5p7xix-shard-0 [primary] stackdb>
```

8. Refresh and check stackcoll

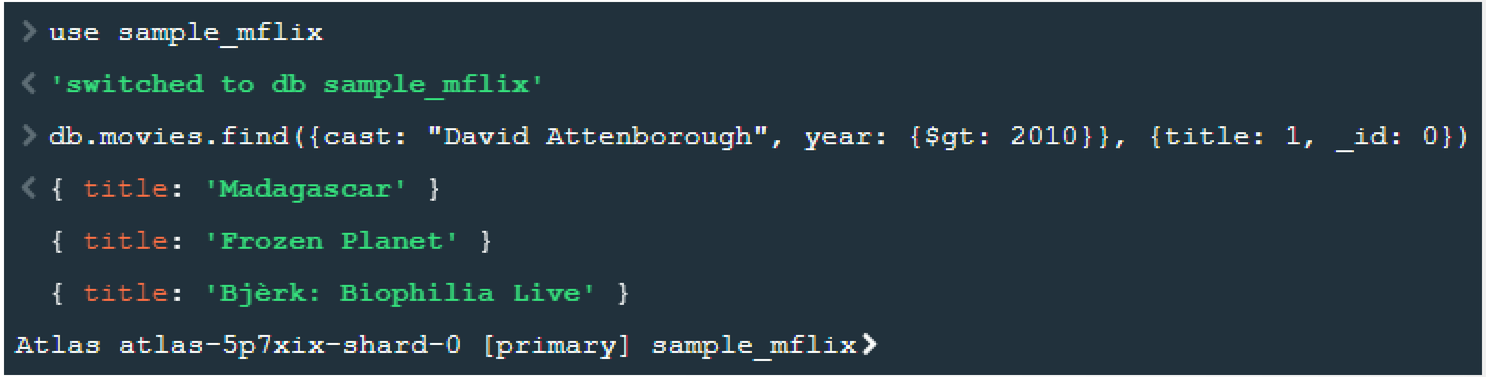


```
_id: ObjectId('634d13e5439e01f3fe7a08d3')
name: "Ned Stark"
email: "sean_bean@gameofthron.es"
password: "$2b$12$UREFwsRUoyF0CRqGNK0LzO0HM/jLhgUCNNIJ9RJAqMUQ74crlJ1Vu"
```



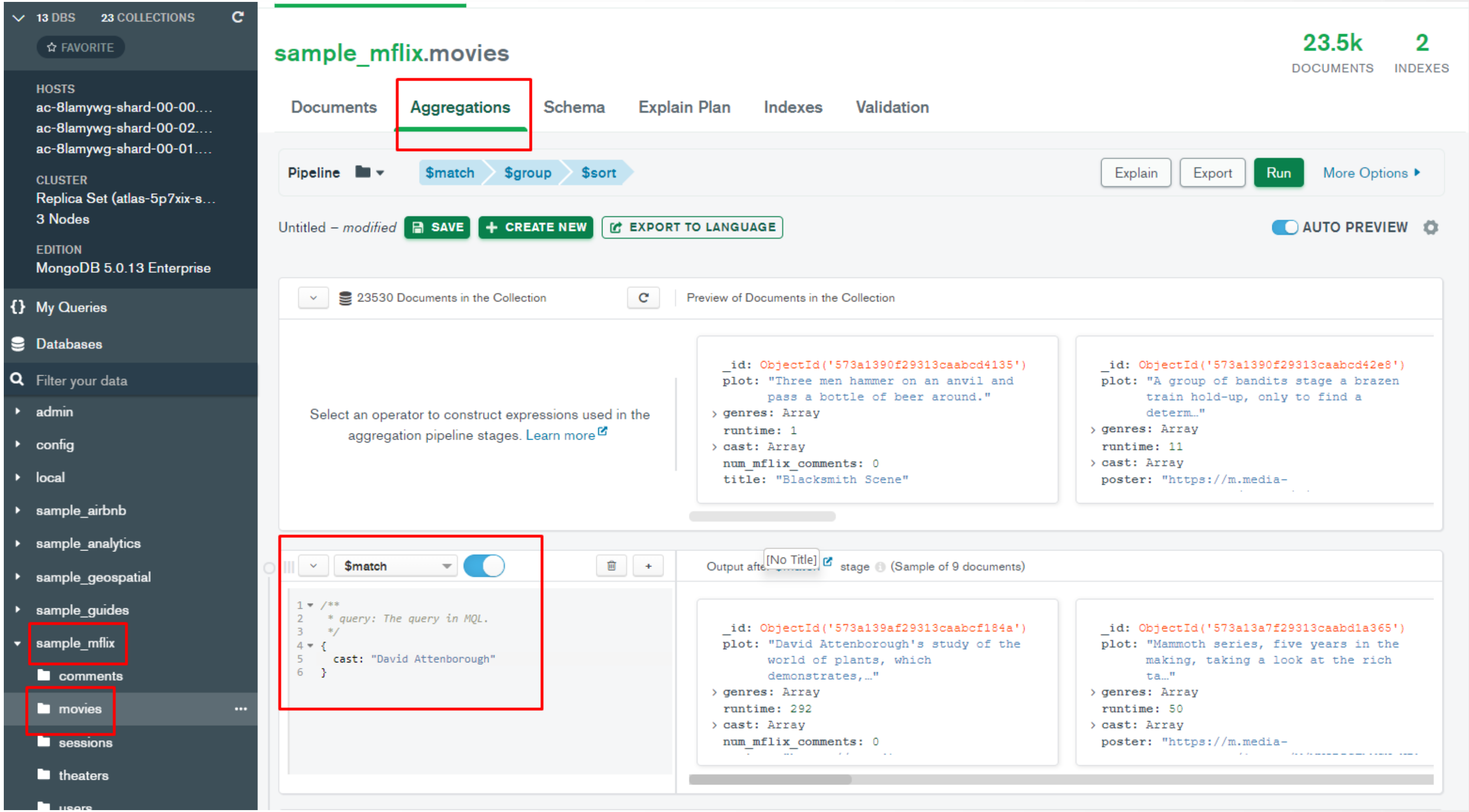
```
  _id: ObjectId('634d13e5439e01f3fe7a08d3')
  name: "Ned Stark"
  email: "sean_bean@gameofthron.es"
  password: "$2b$12$UREFwsRUoyF0CRqGNK0LzO0HM/jLhgUCNNIJ9RJAqMUQ74crlJ1Vu"
⌄ interest: Array
    0: "books"
    1: "food"
    2: "music"
```

9: Query for movies featuring “David Attenborough”, made after 2010 and return only the title



```
> use sample_mflix
< 'switched to db sample_mflix'
> db.movies.find({cast: "David Attenborough", year: {$gt: 2010}}, {title: 1, _id: 0})
< { title: 'Madagascar' }
  { title: 'Frozen Planet' }
  { title: 'Bjèrk: Biophilia Live' }
Atlas atlas-5p7xix-shard-0 [primary] sample_mflix>
```

10. Find the number of movies featuring “David Attenborough” per year, sorted by year in ascending order (1)



Select an operator to construct expressions used in the aggregation pipeline stages. Learn more

```
_id: ObjectId('573a1390f29313caabcd4135')
plot: "Three men hammer on an anvil and
      pass a bottle of beer around."
> genres: Array
runtime: 1
> cast: Array
num_mflix_comments: 0
title: "Blacksmith Scene"
```

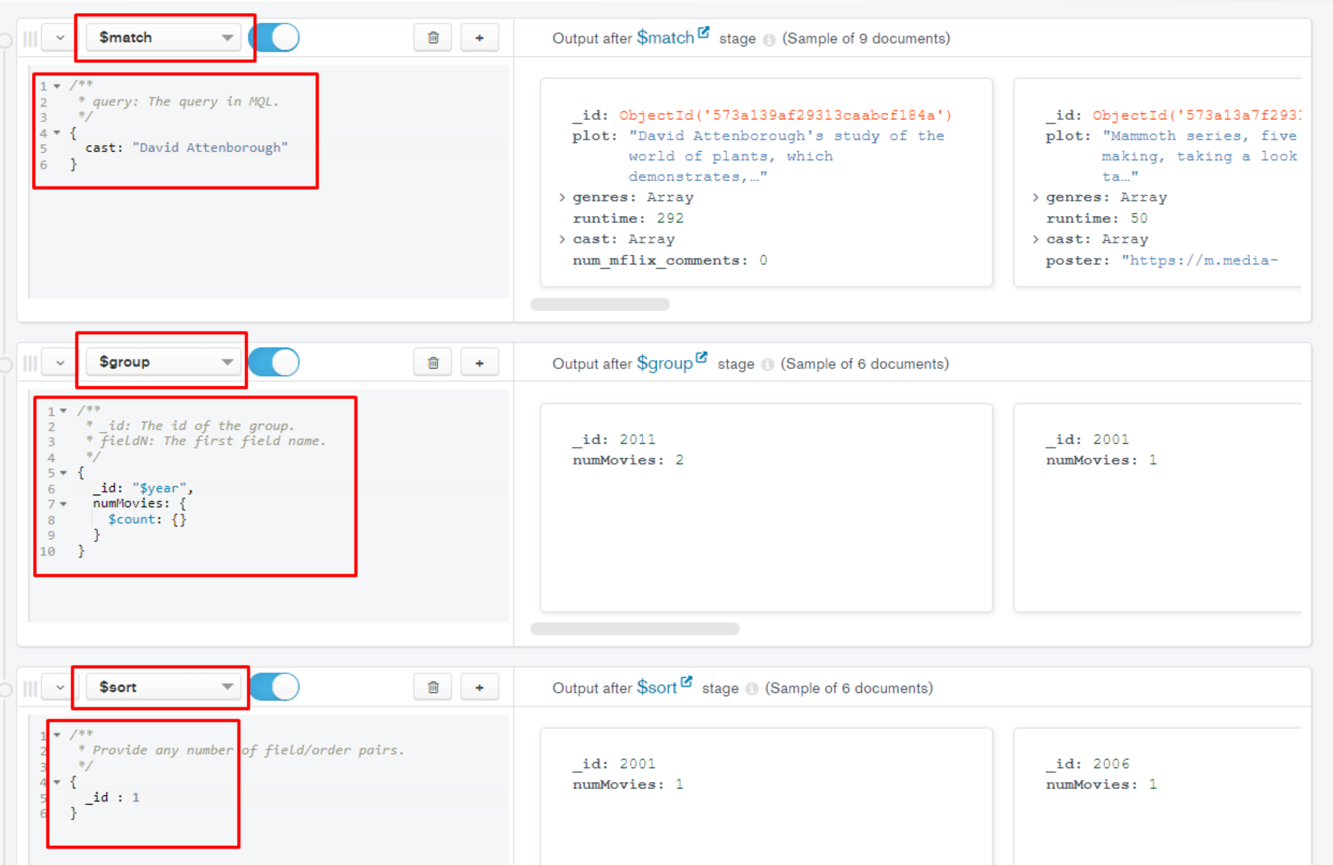
```
_id: ObjectId('573a1390f29313caabcd42e8')
plot: "A group of bandits stage a brazen
      train hold-up, only to find a
      determ…"
> genres: Array
runtime: 11
> cast: Array
poster: "https://m.media-
```

```
/**
 * query: The query in MQL.
 */
{
  cast: "David Attenborough"
}
```

```
_id: ObjectId('573a139af29313caabcf184a')
plot: "David Attenborough's study of the
      world of plants, which
      demonstrates,…"
> genres: Array
runtime: 292
> cast: Array
num_mflix_comments: 0
```

```
_id: ObjectId('573a13a7f29313caabd1a365')
plot: "Mammoth series, five years in the
      making, taking a look at the rich
      ta…"
> genres: Array
runtime: 50
> cast: Array
poster: "https://m.media-
```

10. Find the number of movies featuring “David Attenborough” per year, sorted by year in ascending order (2)



```
/**
 * query: The query in MQL.
 */
{
  cast: "David Attenborough"
}
```

Output after $match stage (Sample of 9 documents)

```
_id: ObjectId('573a139af29313caabcf184a')
plot: "David Attenborough's study of the
      world of plants, which
      demonstrates,…"
› genres: Array
runtime: 292
› cast: Array
num_mflix_comments: 0
```

```
_id: ObjectId('573a13a7f293
plot: "Mammoth series, five
      making, taking a look
      ta…"
› genres: Array
runtime: 50
› cast: Array
poster: "https://m.media-
```

```
/**
 * _id: The id of the group.
 * fieldN: The first field name.
 */
{
  _id: "$year",
  numMovies: {
    $count: {}
  }
}
```

Output after $group stage (Sample of 6 documents)

```
_id: 2011
numMovies: 2
```

```
_id: 2001
numMovies: 1
```

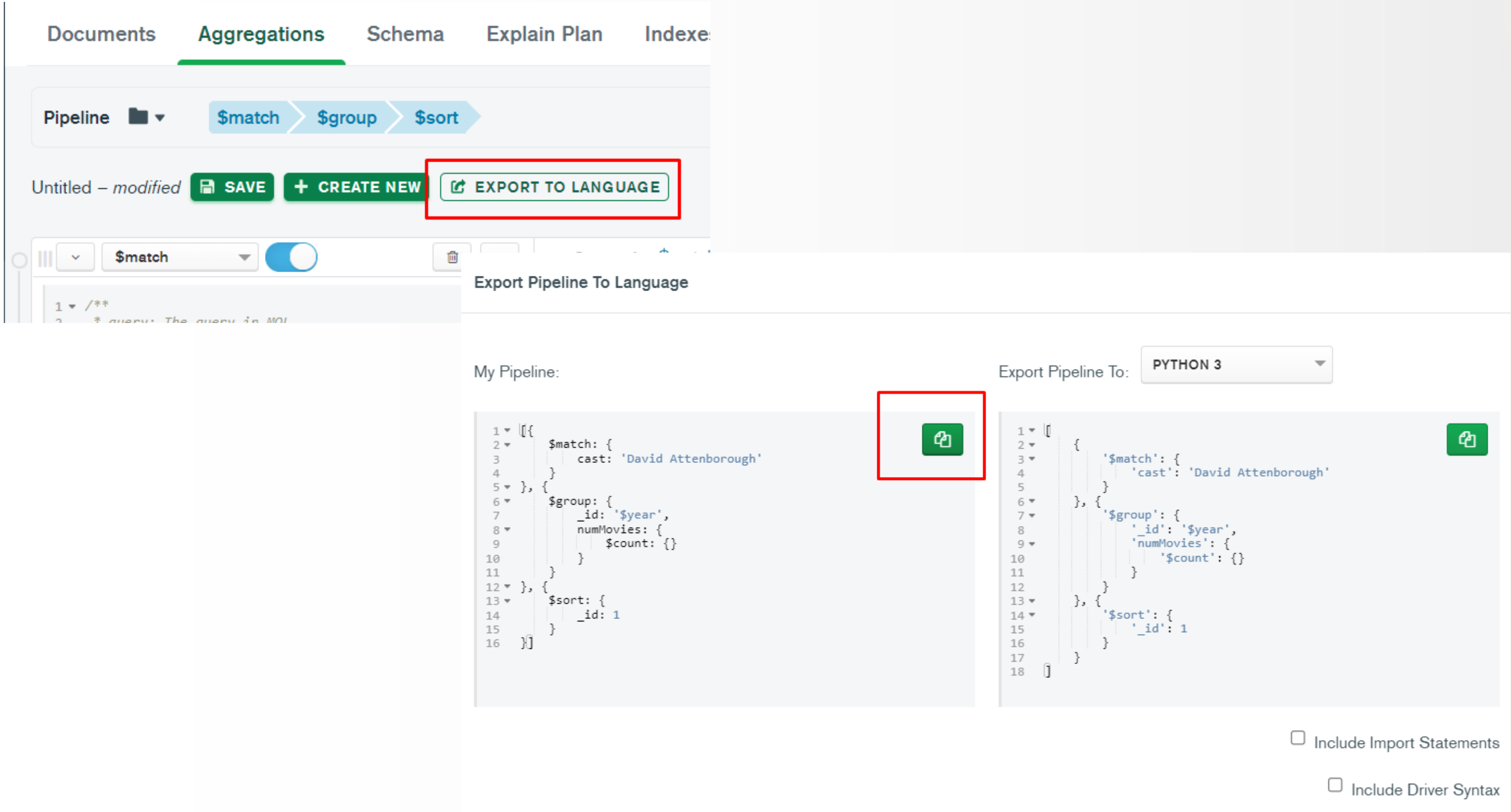
```
/**
 * Provide any number of field/order pairs.
 */
{
  _id : 1
}
```

Output after $sort stage (Sample of 6 documents)

```
_id: 2001
numMovies: 1
```

```
_id: 2006
numMovies: 1
```

10. Find the number of movies featuring “David Attenborough” per year, sorted by year in ascending order (3)



```
/**
 * query: The query in MQL
```

My Pipeline:

```
[{
    $match: {
        cast: 'David Attenborough'
    }
}, {
    $group: {
        _id: '$year',
        numMovies: {
            $count: {}
        }
    }
}, {
    $sort: {
        _id: 1
    }
}]
```

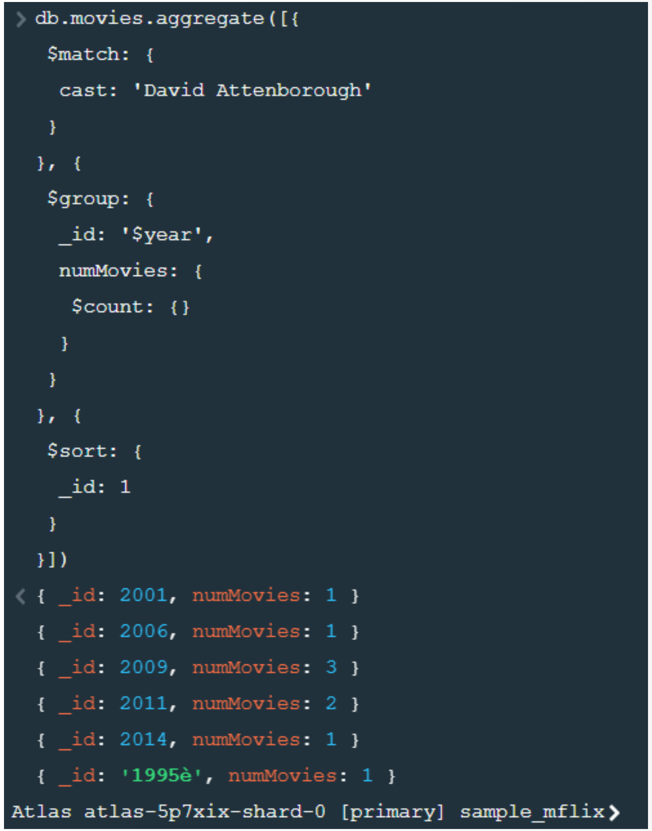
Export Pipeline To: PYTHON 3

```
[
    {
        '$match': {
            'cast': 'David Attenborough'
        }
    }, {
        '$group': {
            '_id': '$year',
            'numMovies': {
                '$count': {}
            }
        }
    }, {
        '$sort': {
            '_id': 1
        }
    }
]
```

□ Include Import Statements

□ Include Driver Syntax

10. Find the number of movies featuring “David Attenborough” per year, sorted by year in ascending order (4)



```
> db.movies.aggregate([{
   $match: {
    cast: 'David Attenborough'
   }
  }, {
   $group: {
    _id: '$year',
    numMovies: {
     $count: {}
    }
   }
  }, {
   $sort: {
    _id: 1
   }
  }])
< { _id: 2001, numMovies: 1 }
  { _id: 2006, numMovies: 1 }
  { _id: 2009, numMovies: 3 }
  { _id: 2011, numMovies: 2 }
  { _id: 2014, numMovies: 1 }
  { _id: '1995è', numMovies: 1 }
Atlas atlas-5p7xix-shard-0 [primary] sample_mflix>
```

MongoDB:
HA and Scalability

MongoDB Replica Sets – self healing HA

Replica Set — 3 to 50 copies

Self-healing

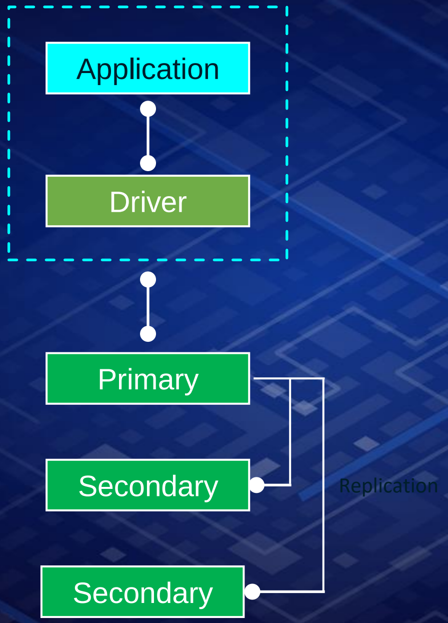
- Typical failover in 5 seconds or less
- Retryable reads and writes to catch temporary exceptions

Data center aware, tunable durability, and consistency

Addresses availability considerations:

- High Availability
- Disaster Recovery
- Maintenance

Workload Isolation: operational & analytics



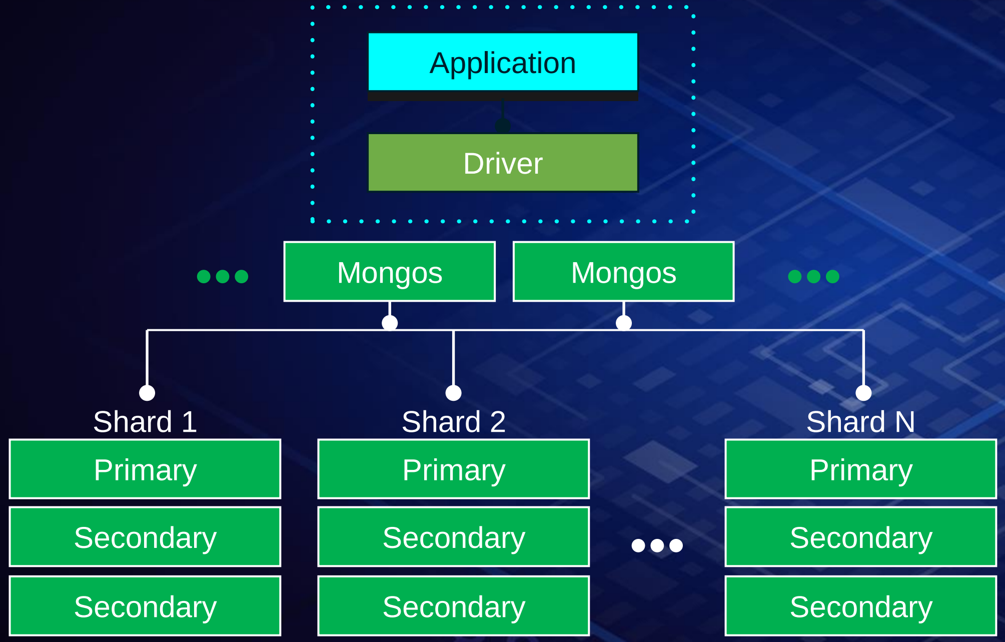
Automated sharding – scale with your modern apps

Horizontal scalability

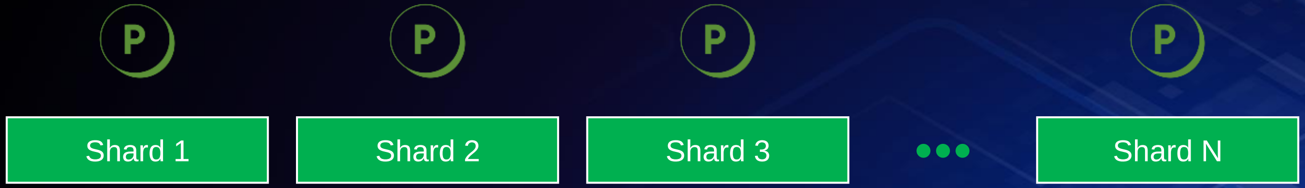
Sharding

High availability

Replica sets



Cost effective at any scale



Native-Sharding for horizontal scale-out

- Automatically scale beyond the constraints of a single node
- Application transparent
- Scale, refine, rebalance, and reshard data at any time
- Unlike NoSQL systems that randomly spray data across a cluster, MongoDB exposes multiple data distribution policies (hashed, ranged, zoned) to optimize for query patterns and locality

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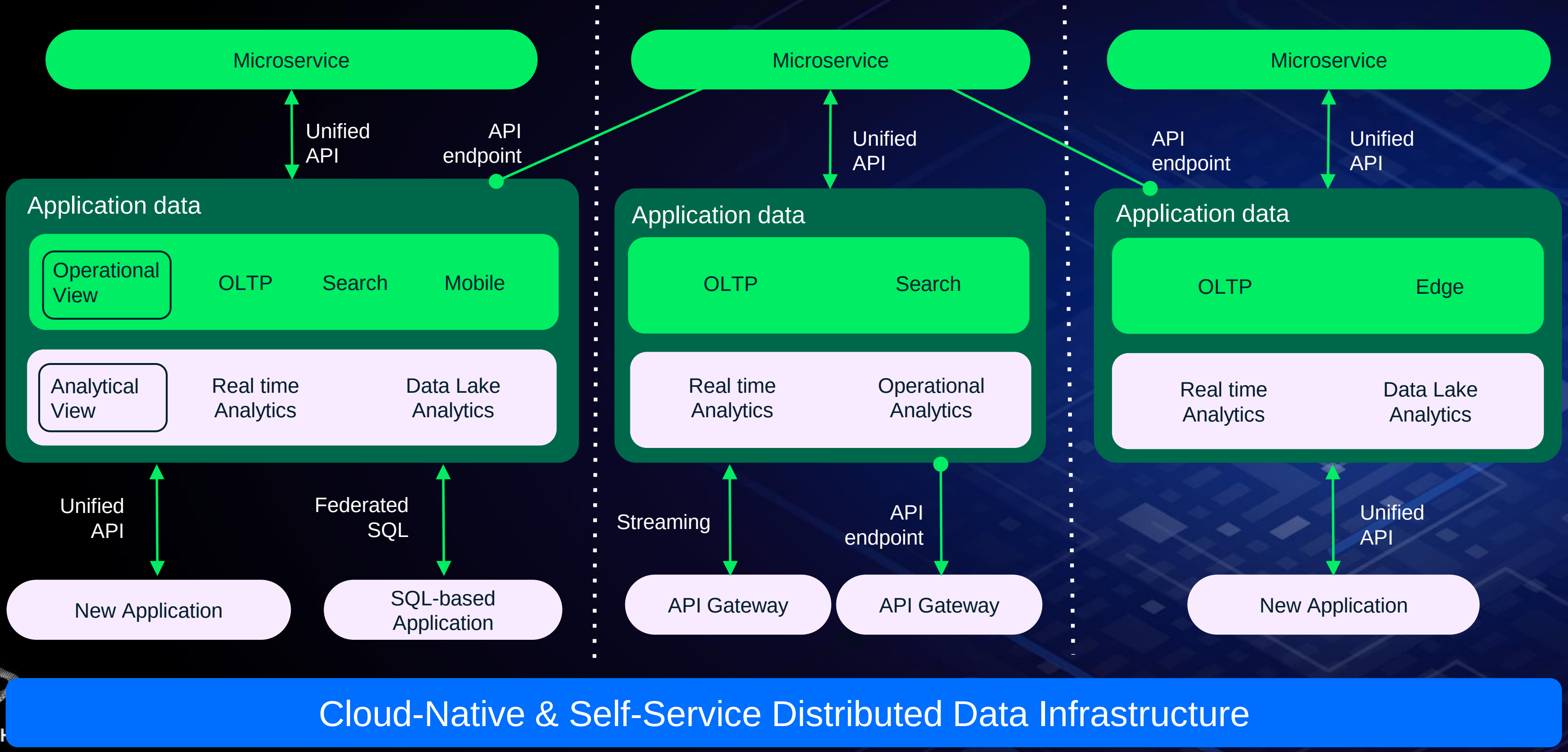
Atlas Developer Data Platform

GOVTECH
SINGAPORE

Our developer data platform allows you to support a wide range of application and analytics workloads



Atlas Search

Integrated and fully managed

Available with every 4.2+ cluster on Atlas

No need for a separate search architecture

Simple to use

Create indexes with the Atlas UI or API

$search queries are MongoDB aggregations

Rich search capabilities

Built on Apache Lucene

Fine-tune relevance with dozens of features

Atlas Data Federation

Simplify Data Workflows

Seamlessly aggregate data and persist the results to their preferred storage location without complex data pipelines.

Power Real-Time Apps

Federate queries across Atlas and AWS S3 without data movement or transformation.

Get Faster Insights

Convert MongoDB data to a columnar file format and output to S3 to be consumed by downstream teams.

Atlas Charts

Fast to visualize

Built for the document model

No ETL, data movement or duplication required

Easy to start and share

Integrated with MongoDB Atlas

Interactive dashboards with secure sharing

Powerful insights + experiences

No-code aggregation, runs on secondary nodes

Embed charts in apps via IFrame or SDK

Realm Mobile Database

Lightweight, fully-featured and object-oriented database embedded on device

Object-oriented database that developers find easy and intuitive to work with

Enables offline mode and on-device client-side compute

Live objects which means no need to write code to check the client-side data store for changes in user’s data

Database can be encrypted with a single API call

Atlas Device Sync

Saves time and code

Automatic conflict resolution

No need to work with REST or an ORM

Optimized for mobile

Works for any mobile device or platform

Resource-efficient, offline-first

Fully serverless

Native integration with MongoDB Atlas

Scales with you as app usage changes

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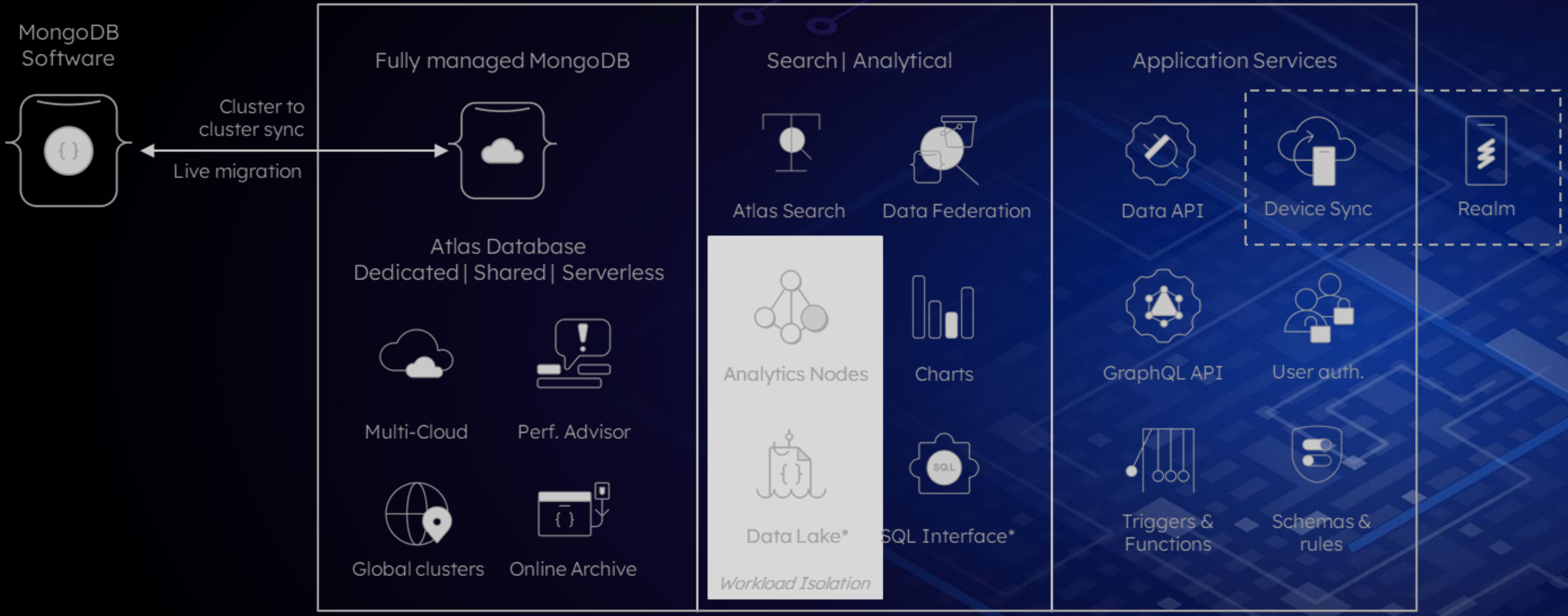
Atlas Developer Data Platform



MongoDB Software

Cluster to cluster sync

Live migration

Fully managed MongoDB

Atlas Database
Dedicated | Shared | Serverless

Multi-Cloud

Perf. Advisor

Global clusters

Online Archive

Search | Analytical

Atlas Search

Data Federation

Analytics Nodes

Charts

Data Lake*

SQL Interface*

Workload Isolation

Application Services

Data API

Device Sync

Realm

GraphQL API

User auth.

Triggers & Functions

Schemas & rules

Developer tooling: MongoDB Compass, VS Code Integration, MongoDB shell, idiomatic drivers in dozens of programming languages, CLI & Programmatic API for MongoDB Atlas

Integrations to broader application ecosystem: Kafka Connector, Spark Connector, Kubernetes Operator, Terraform Provider, and many more.

GOVTECH
SINGAPORE

Atlas Search

With a database you know exactly what you want. When you use search you are open to suggestions

Query vs Search

Query

```
find {title: "Batman Returns"}
//Title is exactly “Batman Returns”
```

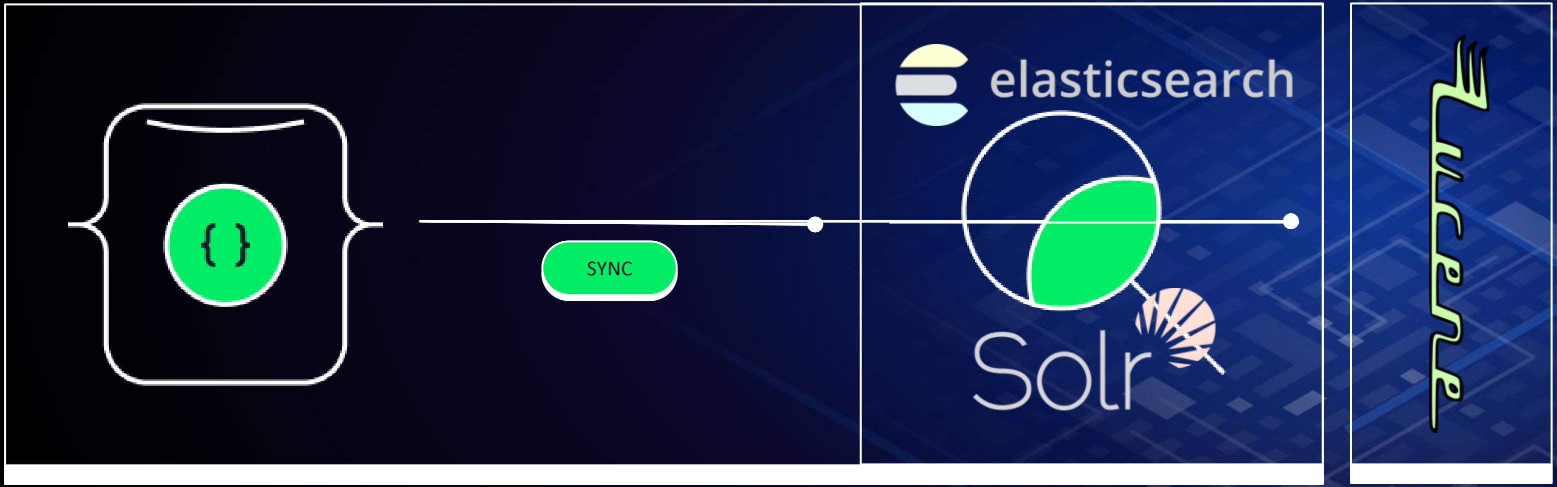
```
sort {ratings: -1}
//Sorted by specific field, “ratings”
```

Search

```
$search {title: "batman returns"}
//Title has some variations of
“batman”, “returns” or both
```

```
//By default sorted according to
relevance score
```

Challenge with search

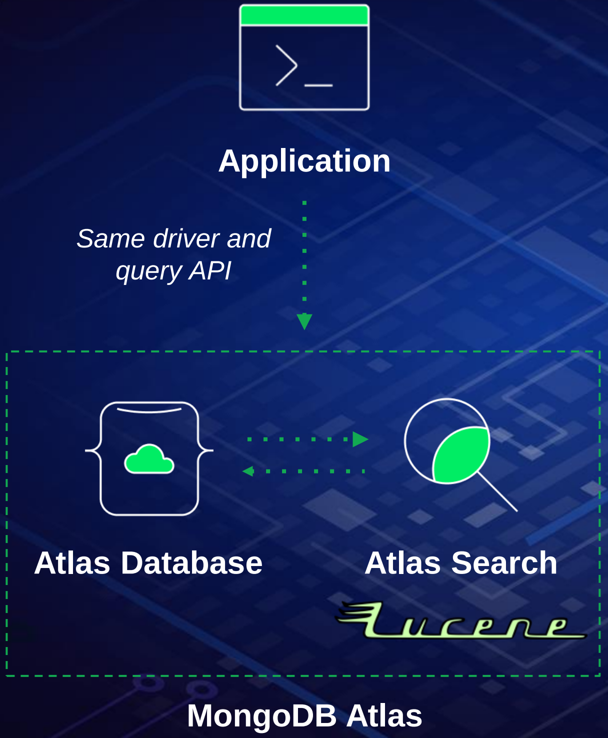


MongoDB Atlas: integrated DB and search

- ✓ **Higher developer productivity**
  Build database and search features using the same query API

- ✓ **Simplified data architecture**
  Automatic data synchronization, even as your data and schema changes

- ✓ **Fully managed platform**
  Get the security, performance, and reliability of Atlas



Rich Search Features

Atlas Search offers many features to fine-tune your search results to help users find what they need, including:

- Fuzzy search
- Autocomplete
- Highlighting
- Filters and facets
- moreLikeThis
- Multi-data type support (text, numerical, boolean, geospatial, etc.)
- Multi-language support
- Relevance based and custom scoring
- Synonyms

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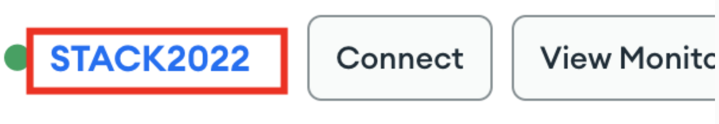
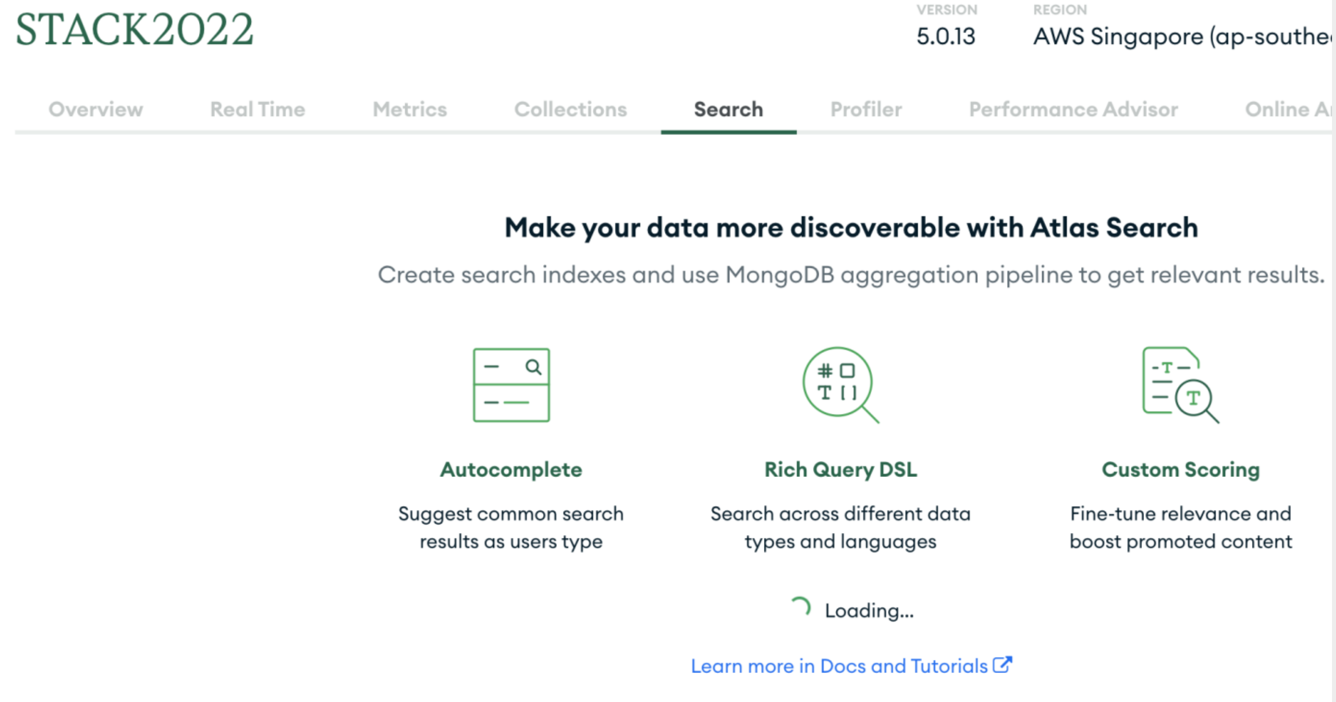
Hands On:

Atlas Search (Part 1)

1. Go to your cluster search page





STACK2022

VERSION 5.0.13

REGION AWS Singapore (ap-southe

Make your data more discoverable with Atlas Search

Create search indexes and use MongoDB aggregation pipeline to get relevant results.

Autocomplete

Suggest common search results as users type

Rich Query DSL

Search across different data types and languages

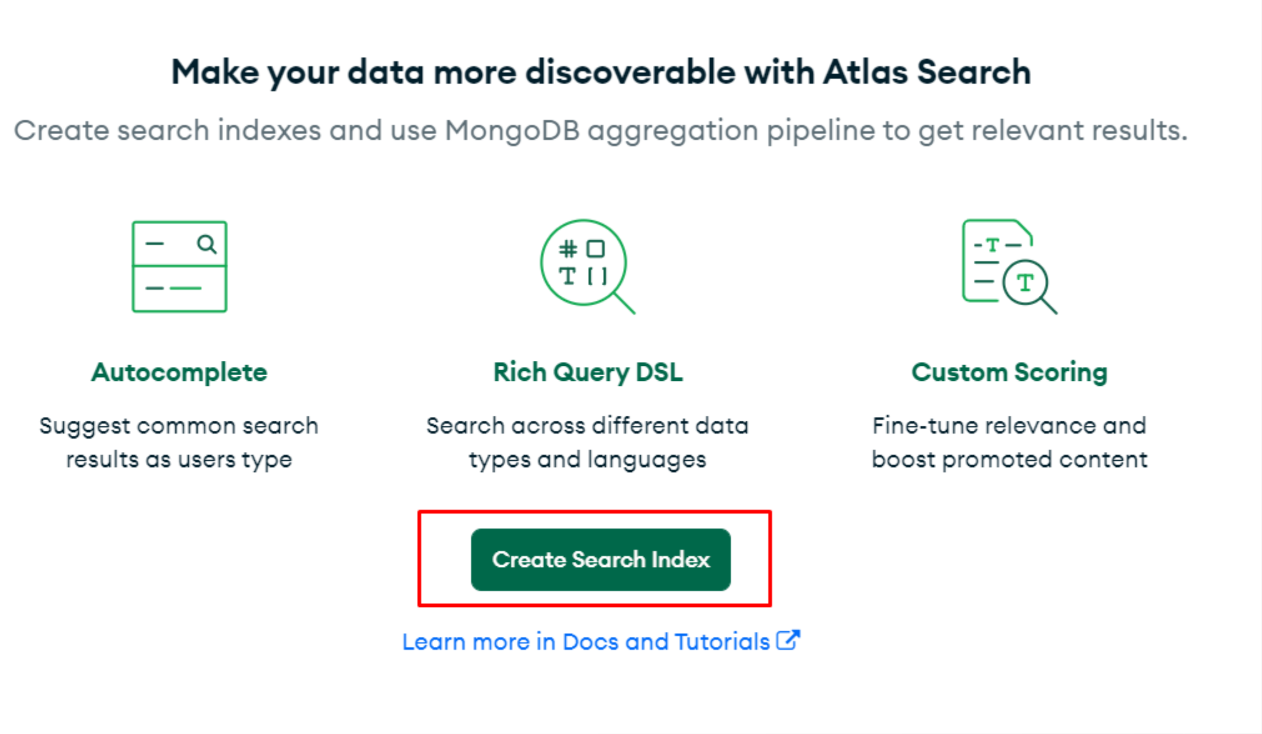
Custom Scoring

Fine-tune relevance and boost promoted content

Loading...

Learn more in Docs and Tutorials

2. Create search index



Make your data more discoverable with Atlas Search

Create search indexes and use MongoDB aggregation pipeline to get relevant results.

Autocomplete

Suggest common search results as users type

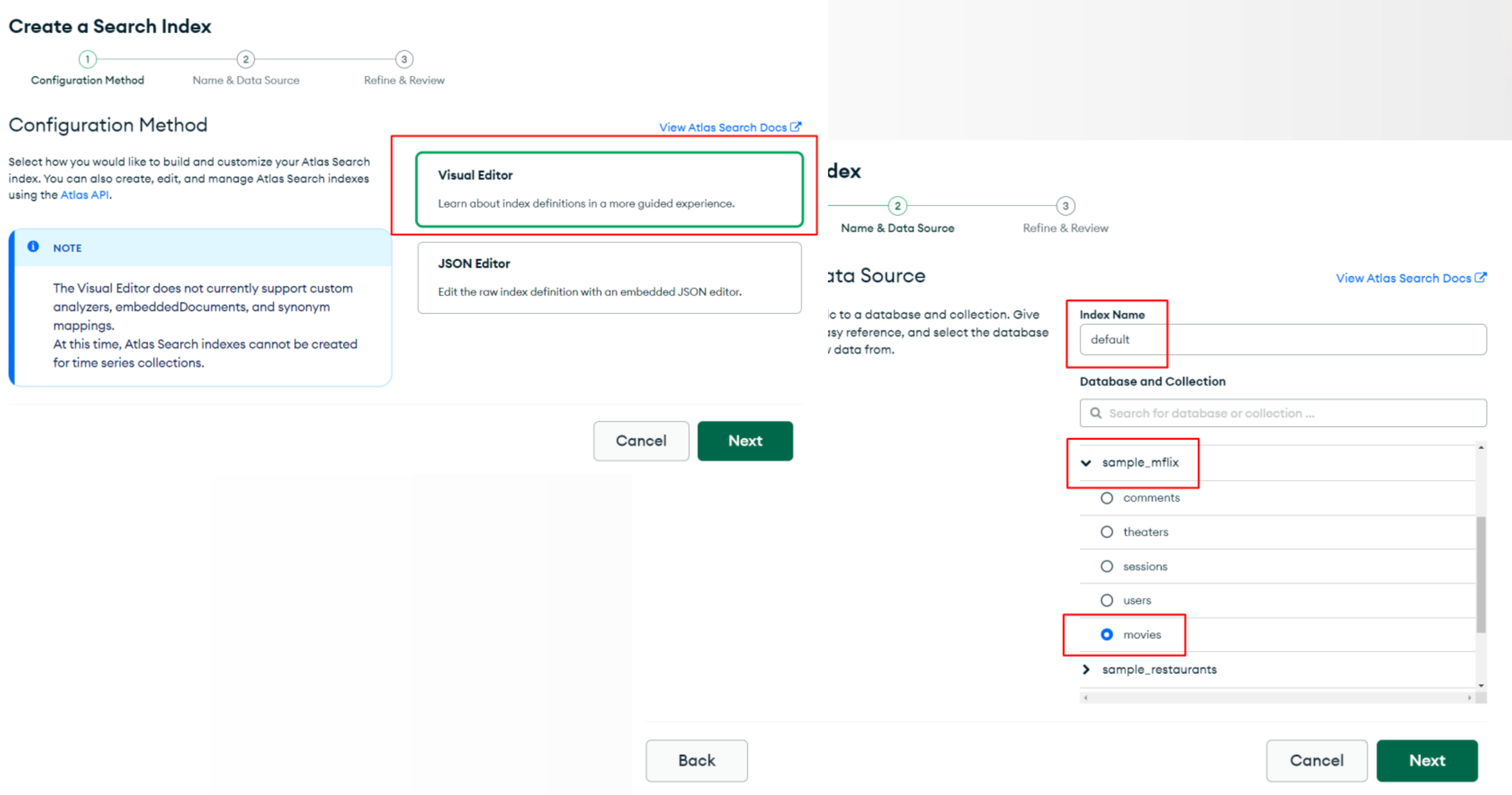
Rich Query DSL

Search across different data types and languages

Custom Scoring

Fine-tune relevance and boost promoted content

3. Select collection to index



Create a Search Index

Configuration Method

Select how you would like to build and customize your Atlas Search index. You can also create, edit, and manage Atlas Search indexes using the Atlas API.

NOTE

The Visual Editor does not currently support custom analyzers, embeddedDocuments, and synonym mappings.
At this time, Atlas Search indexes cannot be created for time series collections.

Visual Editor

Learn about index definitions in a more guided experience.

JSON Editor

Edit the raw index definition with an embedded JSON editor.

dex

ata Source

ic to a database and collection. Give
sy reference, and select the database
data from.

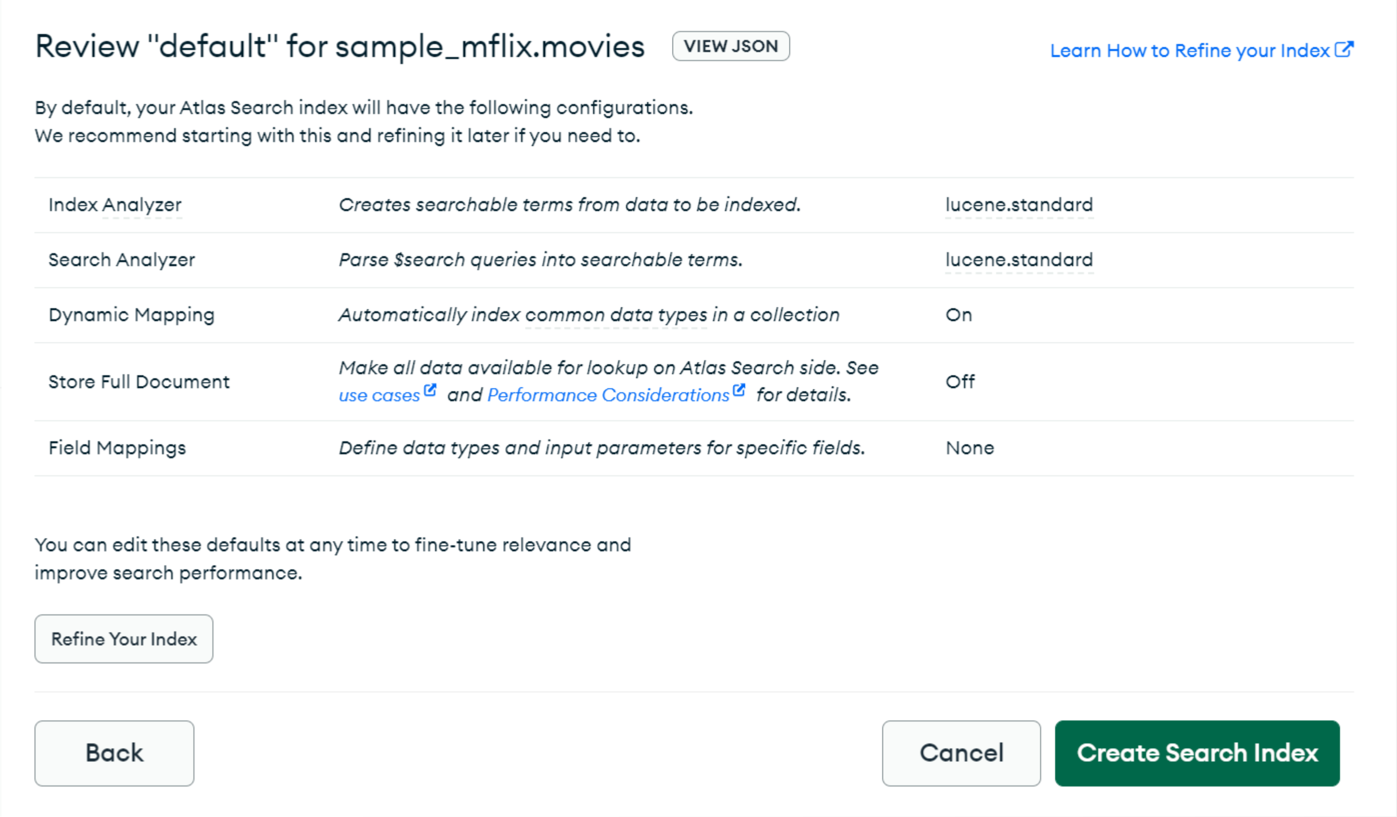
Index Name: default

Database and Collection

sample_mflix
- ○ comments
- ○ theaters
- ○ sessions
- ○ users
- ● movies

sample_restaurants

4. Create search index (for real)



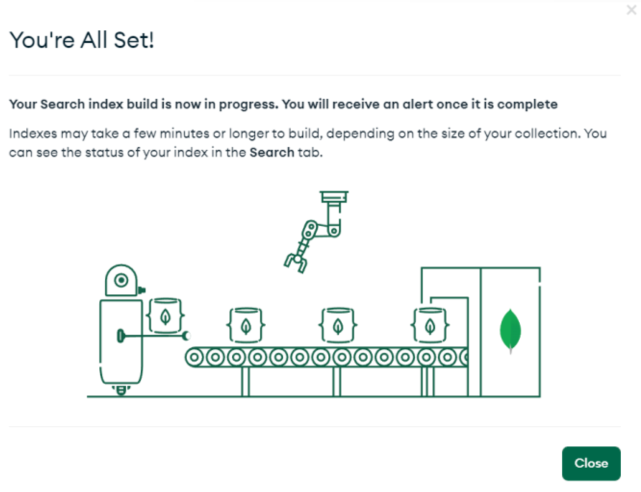
Review "default" for sample_mflix.movies

By default, your Atlas Search index will have the following configurations.
We recommend starting with this and refining it later if you need to.

Index Analyzer	*Creates searchable terms from data to be indexed.*	lucene.standard
Search Analyzer	*Parse $search queries into searchable terms.*	lucene.standard
Dynamic Mapping	*Automatically index common data types in a collection*	On
Store Full Document	*Make all data available for lookup on Atlas Search side. See use cases and Performance Considerations for details.*	Off
Field Mappings	*Define data types and input parameters for specific fields.*	None

You can edit these defaults at any time to fine-tune relevance and improve search performance.

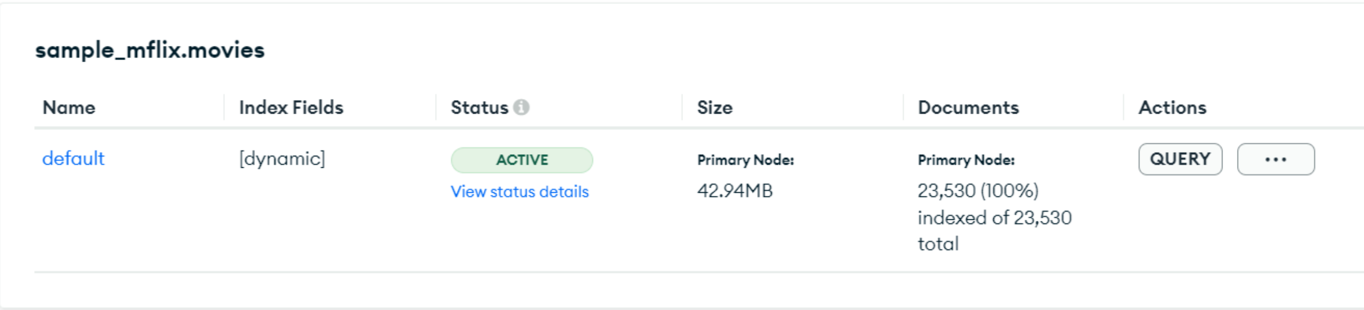
5. Wait



You're All Set!

Your Search index build is now in progress. You will receive an alert once it is complete

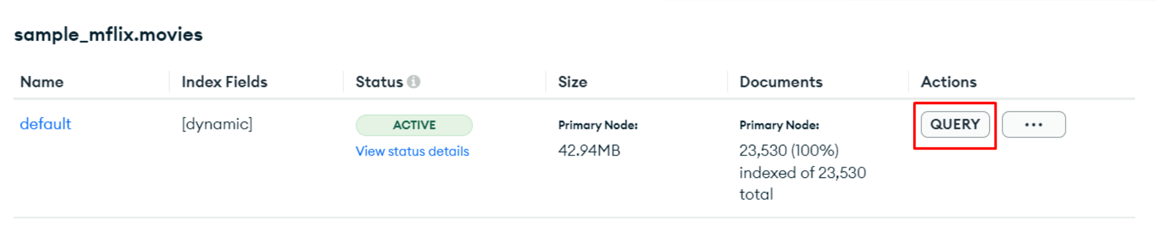
Indexes may take a few minutes or longer to build, depending on the size of your collection. You can see the status of your index in the **Search** tab.



sample_mflix.movies

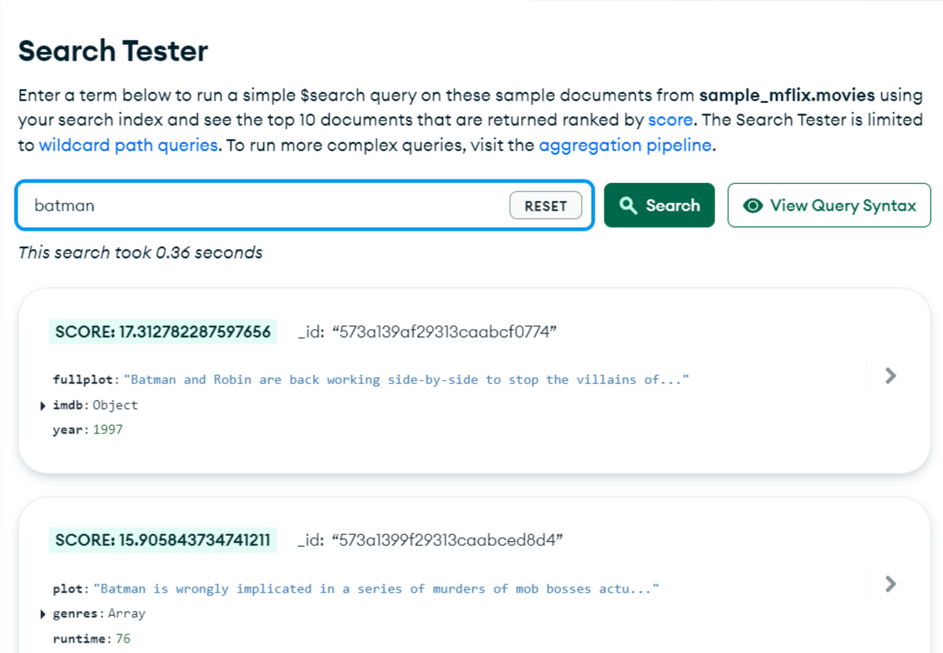
Name	Index Fields	Status	Size	Documents	Actions
default	[dynamic]	ACTIVE View status details	**Primary Node:** 42.94MB	**Primary Node:** 23,530 (100%) indexed of 23,530 total	QUERY ···

6. Search



sample_mflix.movies

Name	Index Fields	Status	Size	Documents	Actions
default	[dynamic]	ACTIVE View status details	Primary Node: 42.94MB	Primary Node: 23,530 (100%) indexed of 23,530 total	QUERY ···



Search Tester

Enter a term below to run a simple $search query on these sample documents from **sample_mflix.movies** using your search index and see the top 10 documents that are returned ranked by score. The Search Tester is limited to wildcard path queries. To run more complex queries, visit the aggregation pipeline.

This search took 0.36 seconds

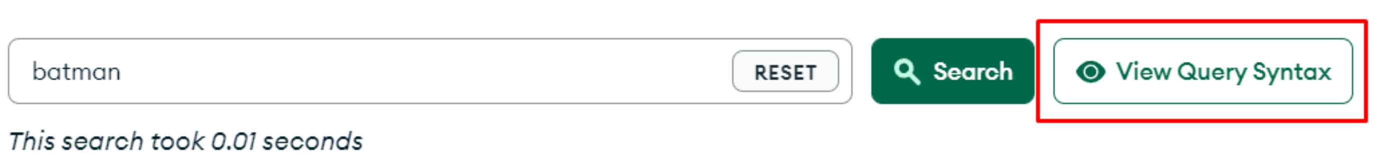
SCORE: 17.312782287597656 _id: “573a139af29313caabcf0774”

```
fullplot: "Batman and Robin are back working side-by-side to stop the villains of..."
▸ imdb: Object
year: 1997
```

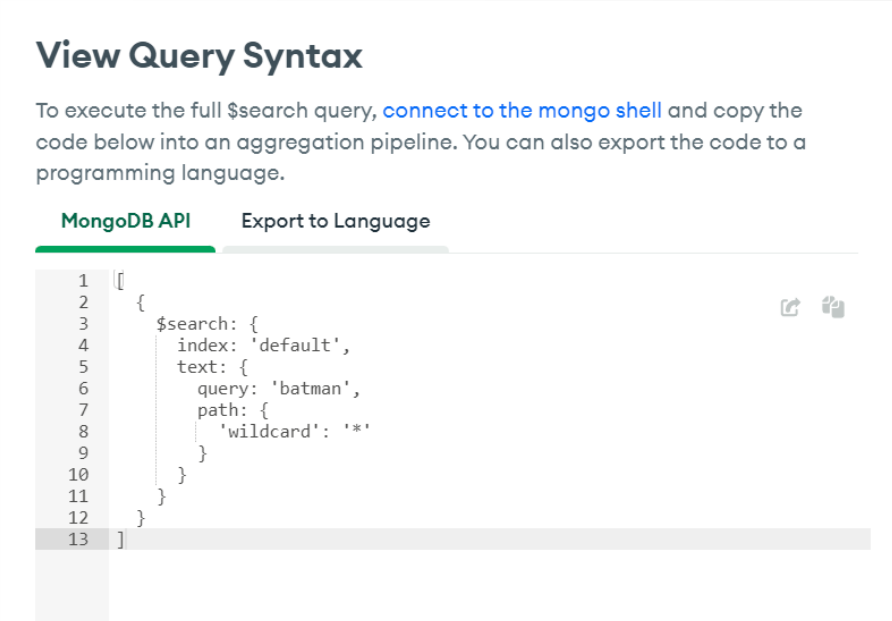
SCORE: 15.905843734741211 _id: “573a1399f29313caabced8d4”

```
plot: "Batman is wrongly implicated in a series of murders of mob bosses actu..."
▸ genres: Array
runtime: 76
```

7. View query syntax



This search took 0.01 seconds



View Query Syntax

To execute the full $search query, connect to the mongo shell and copy the code below into an aggregation pipeline. You can also export the code to a programming language.

```
[
  {
    $search: {
      index: 'default',
      text: {
        query: 'batman',
        path: {
          'wildcard': '*'
        }
      }
    }
  }
]
```

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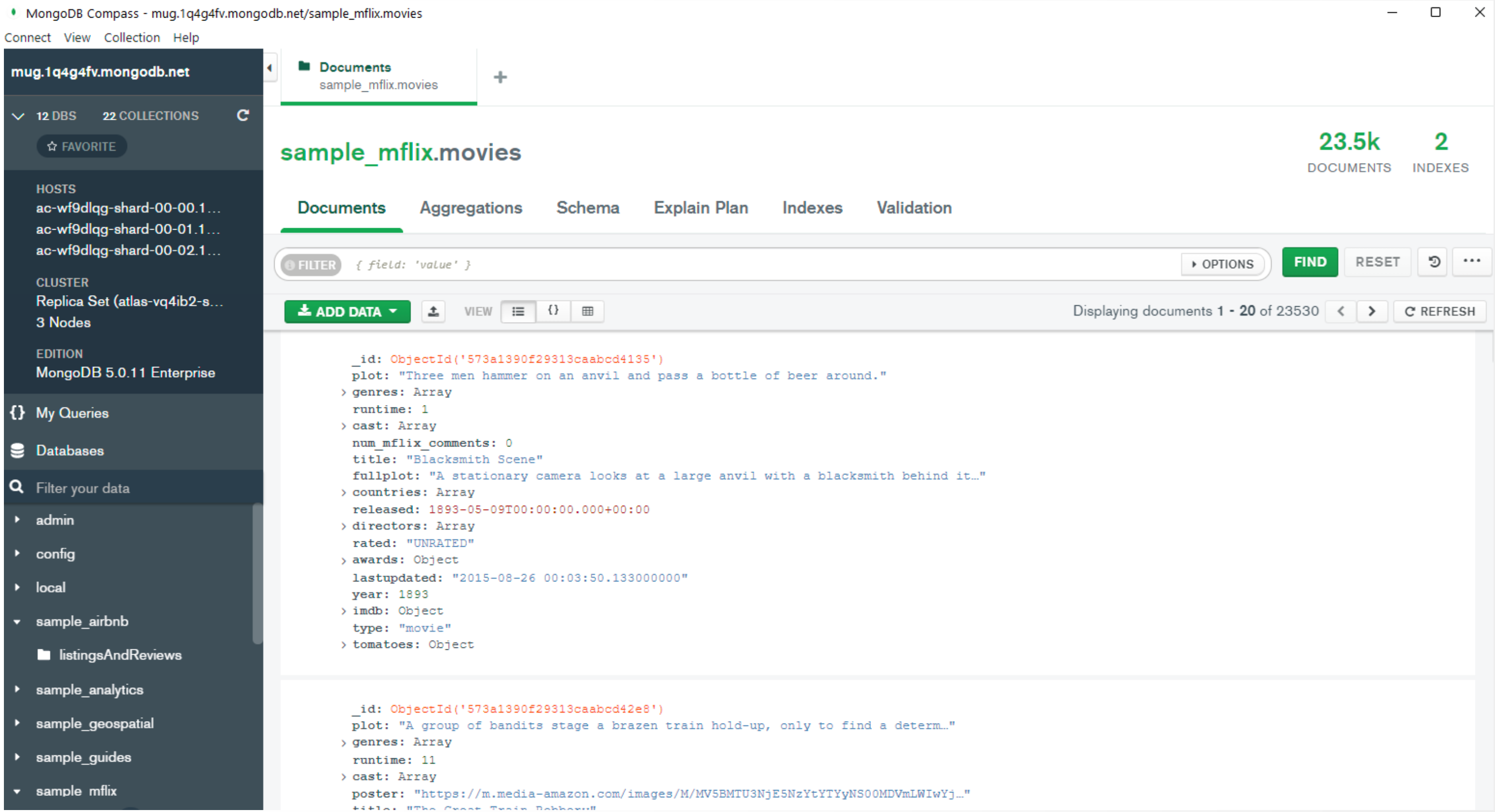
Hands On:

Atlas Search (Part 2)

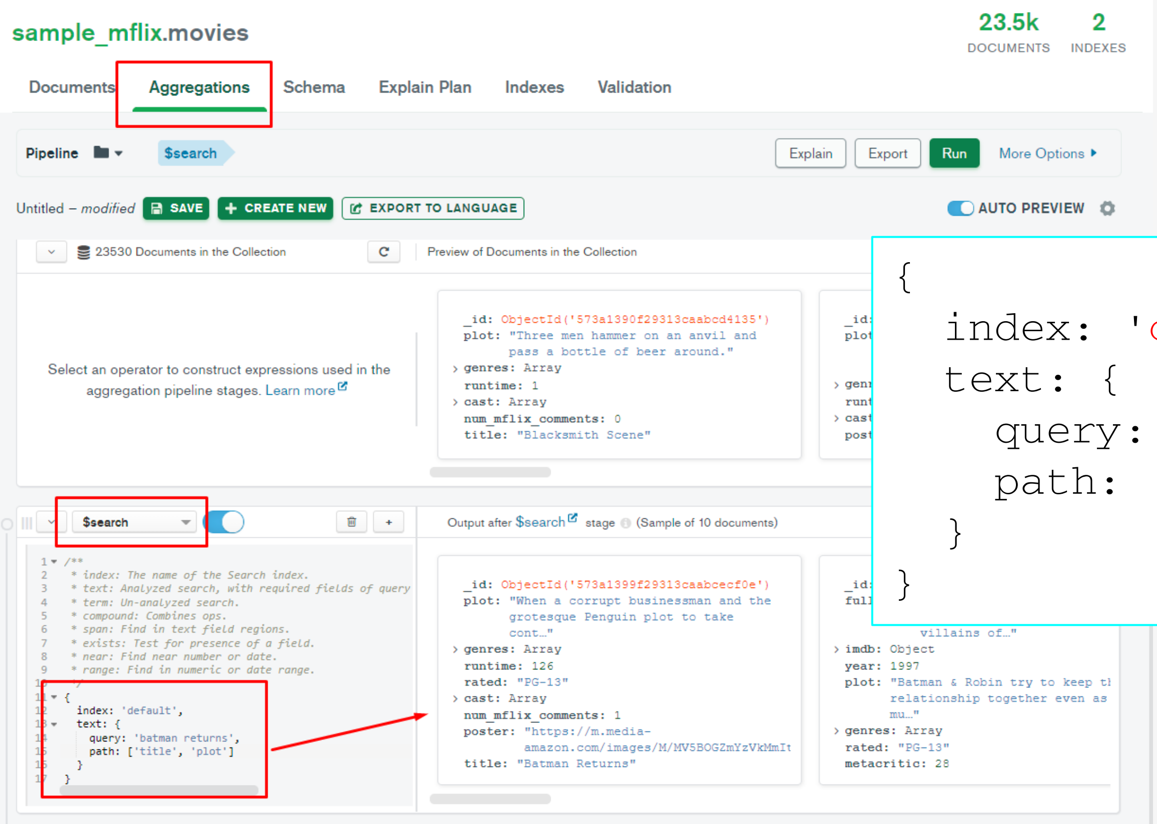
1. Connect to cluster with Compass



```
  _id: ObjectId('573a1390f29313caabcd4135')
  plot: "Three men hammer on an anvil and pass a bottle of beer around."
> genres: Array
  runtime: 1
> cast: Array
  num_mflix_comments: 0
  title: "Blacksmith Scene"
  fullplot: "A stationary camera looks at a large anvil with a blacksmith behind it…"
> countries: Array
  released: 1893-05-09T00:00:00.000+00:00
> directors: Array
  rated: "UNRATED"
> awards: Object
  lastupdated: "2015-08-26 00:03:50.133000000"
  year: 1893
> imdb: Object
  type: "movie"
> tomatoes: Object
```

```
  _id: ObjectId('573a1390f29313caabcd42e8')
  plot: "A group of bandits stage a brazen train hold-up, only to find a determ…"
> genres: Array
  runtime: 11
> cast: Array
  poster: "https://m.media-amazon.com/images/M/MV5BMTU3NjE5NzYtYTYyNS00MDVmLWIwYj…"
  title: "The Great Train Robbery"
```

2. Let’s try a simple search query



Select an operator to construct expressions used in the aggregation pipeline stages. Learn more

```
_id: ObjectId('573a1390f29313caabcd4135')
plot: "Three men hammer on an anvil and
      pass a bottle of beer around."
> genres: Array
runtime: 1
> cast: Array
num_mflix_comments: 0
title: "Blacksmith Scene"
```

```
_id:
plot
> genr
runt
> cast
post
```

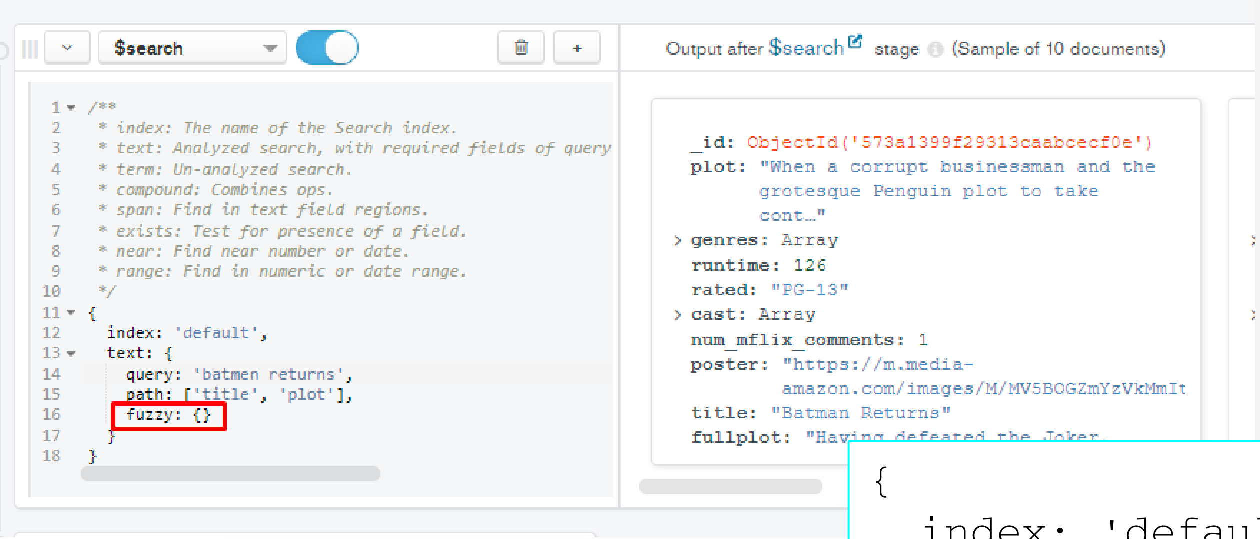
```
/**
 * index: The name of the Search index.
 * text: Analyzed search, with required fields of query
 * term: Un-analyzed search.
 * compound: Combines ops.
 * span: Find in text field regions.
 * exists: Test for presence of a field.
 * near: Find near number or date.
 * range: Find in numeric or date range.
 */
{
  index: 'default',
  text: {
    query: 'batman returns',
    path: ['title', 'plot']
  }
}
```

```
_id: ObjectId('573a1399f29313caabcecf0e')
plot: "When a corrupt businessman and the
      grotesque Penguin plot to take
      cont…"
> genres: Array
runtime: 126
rated: "PG-13"
> cast: Array
num_mflix_comments: 1
poster: "https://m.media-
        amazon.com/images/M/MV5BOGZmYzVkMmIt
title: "Batman Returns"
```

```
_id:
full
      villains of…"
> imdb: Object
year: 1997
plot: "Batman & Robin try to keep tl
      relationship together even as
      mu…"
> genres: Array
rated: "PG-13"
metacritic: 28
```

```
{
  index: 'default',
  text: {
    query: 'batman returns',
    path: ['title', 'plot']
  }
}
```

3. Add autocorrect to the search

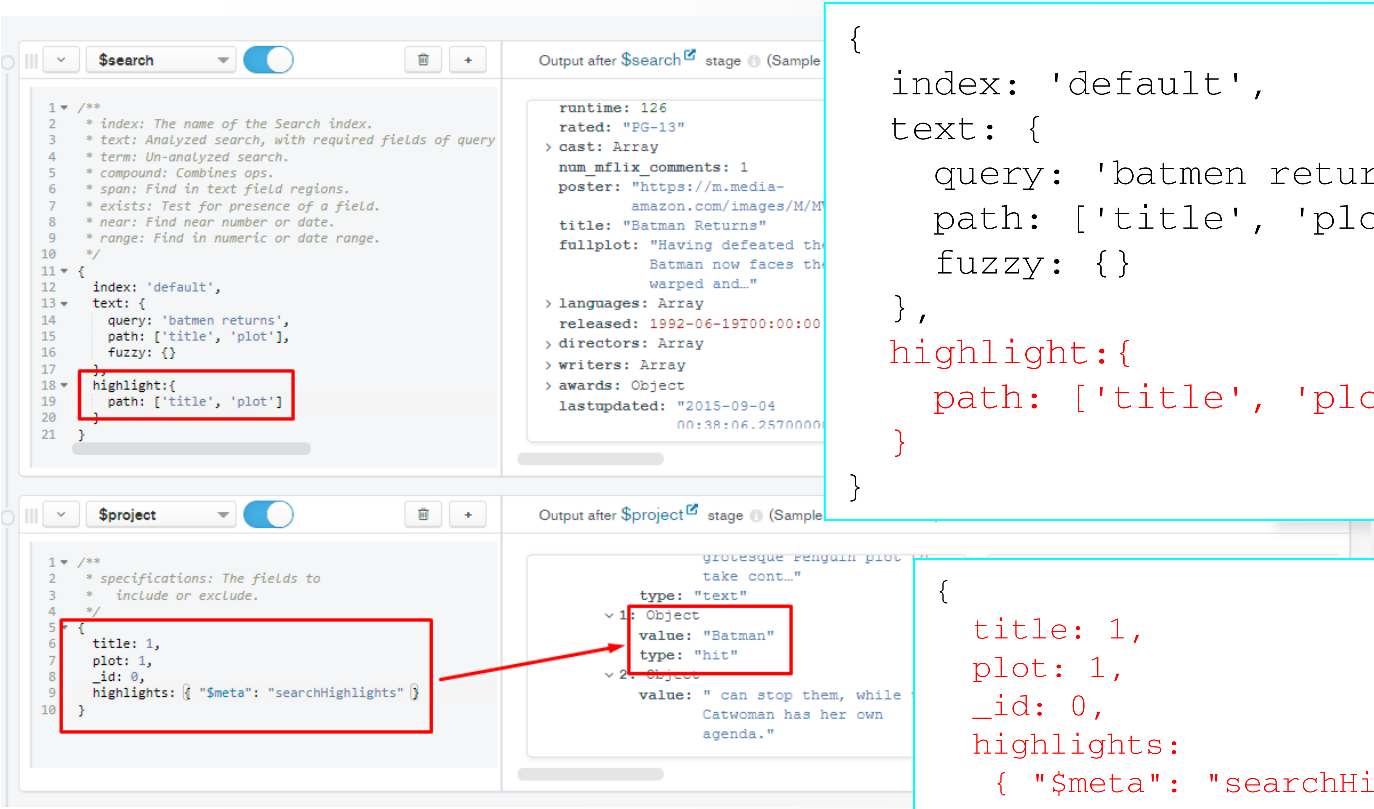


```
/**
 * index: The name of the Search index.
 * text: Analyzed search, with required fields of query
 * term: Un-analyzed search.
 * compound: Combines ops.
 * span: Find in text field regions.
 * exists: Test for presence of a field.
 * near: Find near number or date.
 * range: Find in numeric or date range.
 */
{
  index: 'default',
  text: {
    query: 'batmen returns',
    path: ['title', 'plot'],
    fuzzy: {}
  }
}
```

```
_id: ObjectId('573a1399f29313caabcecf0e')
plot: "When a corrupt businessman and the
      grotesque Penguin plot to take
      cont…"
> genres: Array
runtime: 126
rated: "PG-13"
> cast: Array
num_mflix_comments: 1
poster: "https://m.media-
        amazon.com/images/M/MV5BOGZmYzVkMmIt
title: "Batman Returns"
fullplot: "Having defeated the Joker…
```

```
{
  index: 'default',
  text: {
    query: 'batmen returns',
    path: ['title', 'plot'],
    fuzzy: {}
  }
}
```

4. Now we add keyword highlighting


$search
Output after $search stage (Sample
$project
Output after $project stage (Sample

```
/**
 * index: The name of the Search index.
 * text: Analyzed search, with required fields of query
 * term: Un-analyzed search.
 * compound: Combines ops.
 * span: Find in text field regions.
 * exists: Test for presence of a field.
 * near: Find near number or date.
 * range: Find in numeric or date range.
 */
{
  index: 'default',
  text: {
    query: 'batmen returns',
    path: ['title', 'plot'],
    fuzzy: {}
  },
  highlight:{
    path: ['title', 'plot']
  }
}
```

```
  runtime: 126
  rated: "PG-13"
> cast: Array
  num_mflix_comments: 1
  poster: "https://m.media-
          amazon.com/images/M/M
  title: "Batman Returns"
  fullplot: "Having defeated the
            Batman now faces the
            warped and…"
> languages: Array
  released: 1992-06-19T00:00:00
> directors: Array
> writers: Array
> awards: Object
  lastupdated: "2015-09-04
               00:38:06.2570000
```

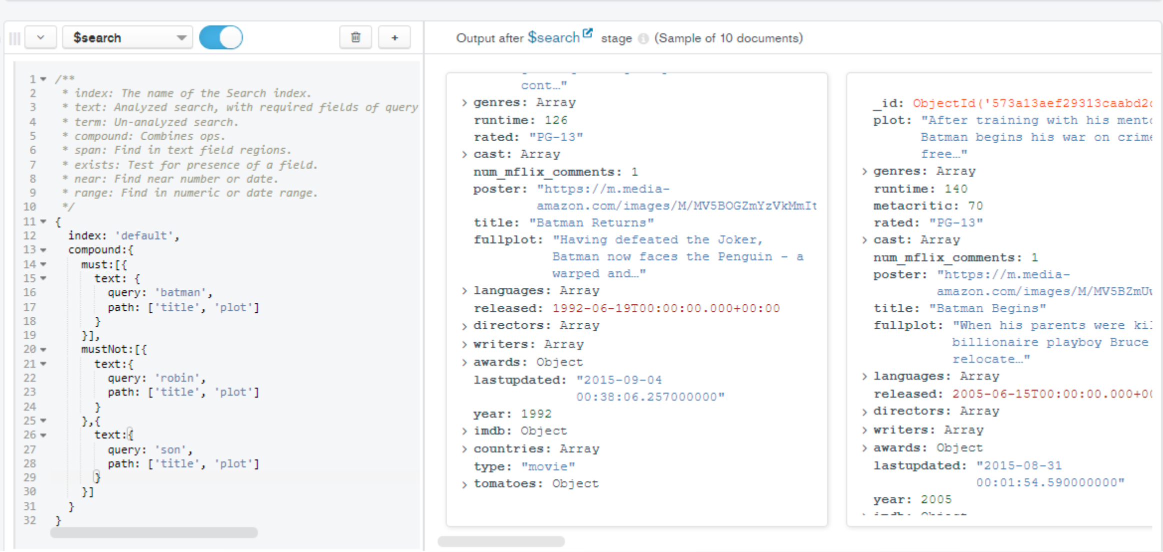
```
/**
 * specifications: The fields to
 *   include or exclude.
 */
{
  title: 1,
  plot: 1,
  _id: 0,
  highlights: { "$meta": "searchHighlights" }
}
```

```
                grotesque Penguin plot t
                take cont…"
          type: "text"
      ⌄ 1: Object
          value: "Batman"
          type: "hit"
      ⌄ 2: Object
          value: " can stop them, while t
                 Catwoman has her own
                 agenda."
```

```
{
  index: 'default',
  text: {
    query: 'batmen returns',
    path: ['title', 'plot'],
    fuzzy: {}
  },
  highlight:{
    path: ['title', 'plot']
  }
}
```

```
{
  title: 1,
  plot: 1,
  _id: 0,
  highlights:
   { "$meta": "searchHighlights" }
}
```

5. I like Batman but not Robin



```
/**
 * index: The name of the Search index.
 * text: Analyzed search, with required fields of query
 * term: Un-analyzed search.
 * compound: Combines ops.
 * span: Find in text field regions.
 * exists: Test for presence of a field.
 * near: Find near number or date.
 * range: Find in numeric or date range.
 */
{
  index: 'default',
  compound:{
    must:[{
      text: {
        query: 'batman',
        path: ['title', 'plot']
      }
    }],
    mustNot:[{
      text:{
        query: 'robin',
        path: ['title', 'plot']
      }
    },{
      text:{
        query: 'son',
        path: ['title', 'plot']
      }
    }]
  }
}
```

```
        cont…"
> genres: Array
  runtime: 126
  rated: "PG-13"
> cast: Array
  num_mflix_comments: 1
  poster: "https://m.media-
          amazon.com/images/M/MV5BOGZmYzVkMmIt
  title: "Batman Returns"
  fullplot: "Having defeated the Joker,
            Batman now faces the Penguin - a
            warped and…"
> languages: Array
  released: 1992-06-19T00:00:00.000+00:00
> directors: Array
> writers: Array
> awards: Object
  lastupdated: "2015-09-04
               00:38:06.257000000"
  year: 1992
> imdb: Object
> countries: Array
  type: "movie"
> tomatoes: Object
```

```
  _id: ObjectId('573a13aef29313caabd2
  plot: "After training with his ment
        Batman begins his war on crim
        free…"
> genres: Array
  runtime: 140
  metacritic: 70
  rated: "PG-13"
> cast: Array
  num_mflix_comments: 1
  poster: "https://m.media-
          amazon.com/images/M/MV5BZmU
  title: "Batman Begins"
  fullplot: "When his parents were ki
            billionaire playboy Bruce
            relocate…"
> languages: Array
  released: 2005-06-15T00:00:00.000+0
> directors: Array
> writers: Array
> awards: Object
  lastupdated: "2015-08-31
               00:01:54.590000000"
  year: 2005
```

```
{
  index: 'default',
  compound:{
    must:[{
      text: {
        query: 'batman',
        path:
          ['title', 'plot']
      }
    }],
    mustNot:[{
      text:{
        query: 'robin',
        path:
          ['title', 'plot']
      }
    },{
      text:{
        query: 'son',
        path:
          ['title', 'plot']
      }
    }]
  }
}
```

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THANK YOU

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