School of Computing Technologies

ISYS1101/ 1102 Database Applications

Week 8: Tute/Lab – Getting Started with MongoDB

Semester 2 2022

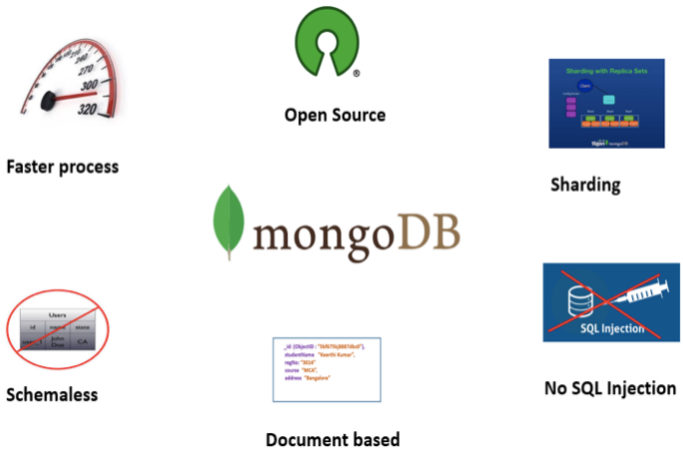
1 Objective

While tutors are conducting demos, please use the time to work through the following activities. The objective of this tute/lab session is to explore the features of MongoDB, learn how to build a document collection and retrieve data from a collection, and how to build a web database application with MongoDB backend.

NoSQL databases, such as MongoDB® (mongodb.com), were created in response to the limitations of traditional relational database technology. When compared against relational databases, NoSQL databases are more scalable and provide superior performance, and their data model addresses several shortcomings of the relational model.

The advantages of NoSQL include being able to handle:

- First and foremost, it is very easy to install and setup the MongoDB.
- The very basic feature of MongoDB is that it is a schema-less database. Since MongoDB is schema-free, your code defines your schema.
- Large volumes of structured, semi-structured, and unstructured data;
- Agile development;
- Inherently secure because no sql injection can be made.
- Compared to RDBMS, NOSQL database systems are light-weight, very little overheads, and, has a smaller memory footprint and as a result, provide a far superior performance.
- Horizontal scaling (sharding) – The support for Sharding is one of its key features. Sharding is the process of storing the data in different machines and MongoDB's ability to process the data, as and when the size of the data grows. This results in the horizontal scaling.
- Replication -- Auto data replication is also supported in NoSQL databases by default. Hence, if one DB server goes down, data is restored using its copy created on another server in network.



(https://www.studytonight.com/mongodb/advantages-of-mongodb)

Today, companies leverage NoSQL databases for a growing number of use cases. NoSQL databases also tend to be open-source and that means a relatively low-cost way of developing, implementing and sharing software.

Companies choose MongoDB for developing modern applications as it offers the advantages of relational databases along with the innovations of NoSQL.

In the second half of the Database Application course, we explore the features of MongoDB, learn how to build a document collection and retrieve data from a collection, and how to build a web database application with MongoDB backend.

In the second assignment you will build an application using MongoDB backend. The activities in this tute/lab session will assist you to learn the basics required to start your assignment work.

2 Preparation Tasks

MongoDB is not available on School's servers or on mydesktop.rmit.edu.au. However, we can do all of the activities in these lab sessions and assignment activities on Mongo Atlas, their cloud-based database deployment. Mongo Atlas (https://www.mongodb.com/cloud/atlas) fully managed database-as-a-service (DBaaS) offering. It has a free tier that is suited for learning and exploring MongoDB in a sandbox environment.

In this course, you will make full use of this free-tier offering of the MongoDB installation.

In order to use the Mongo Atlas, you are required to have two components:

1. A database deployed on Mongo Atlas
2. Mongo Compass desktop client.

In this preparation task, we will complete the deployment/ installation of these two components.

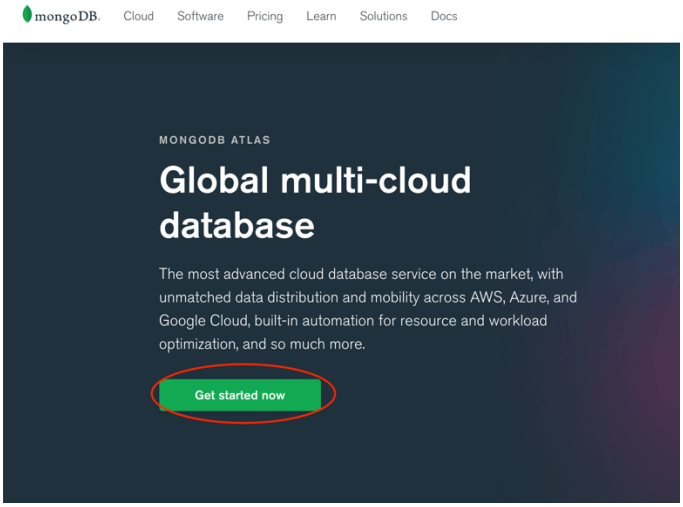
There are many alternative MongoDB clients available. However, Mongo Compass is custom-built for accessing MongoDB databases and comes with both a GUI and a Mongo Shell.

While you are free to choose any client application, we highly recommend the Mongo Compass.

2.1 Create and deploy an Atlas Cluster

MongoDB Atlas provides an easy way to host and manage your data in the cloud. This tutorial guides you through creating an Atlas cluster, connecting to it, inserting data, and querying data.

Visit: https://www.mongodb.com/cloud/atlas to get it started.

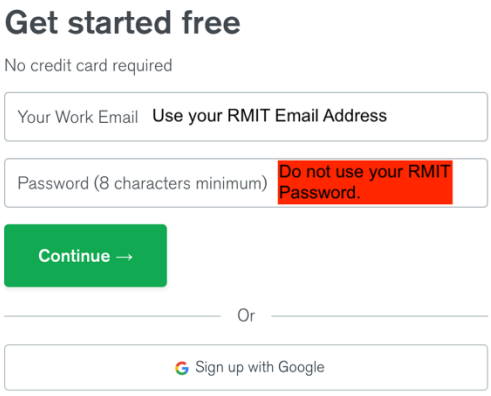


Follow these steps:

Step 1: Create an Atlas Account

You can register for an Atlas account using your Google Account (if you have one) or using your RMIT student email address. We recommend you use your RMIT student email address to create a new Atlas account. However, you should not use the same password as your RMIT password.

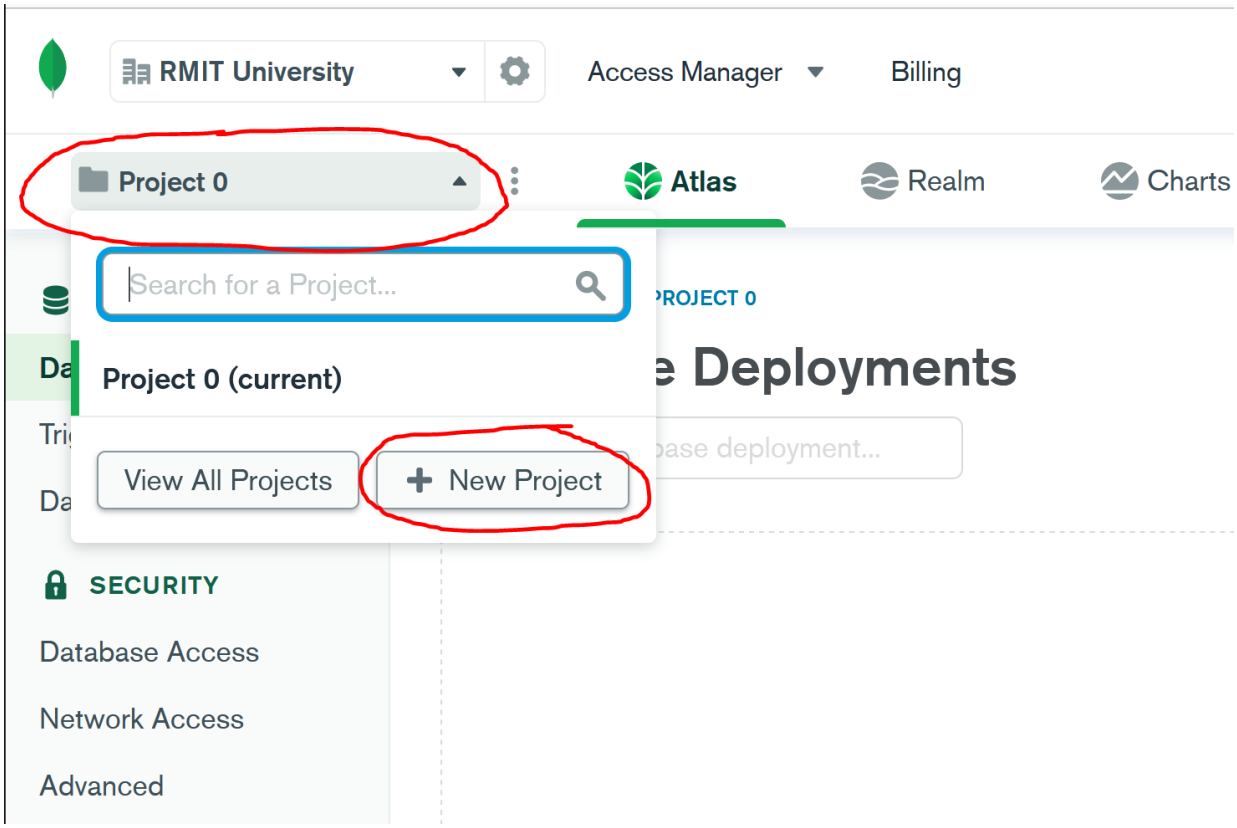
	Atlas does not use RMIT's single sign-on.



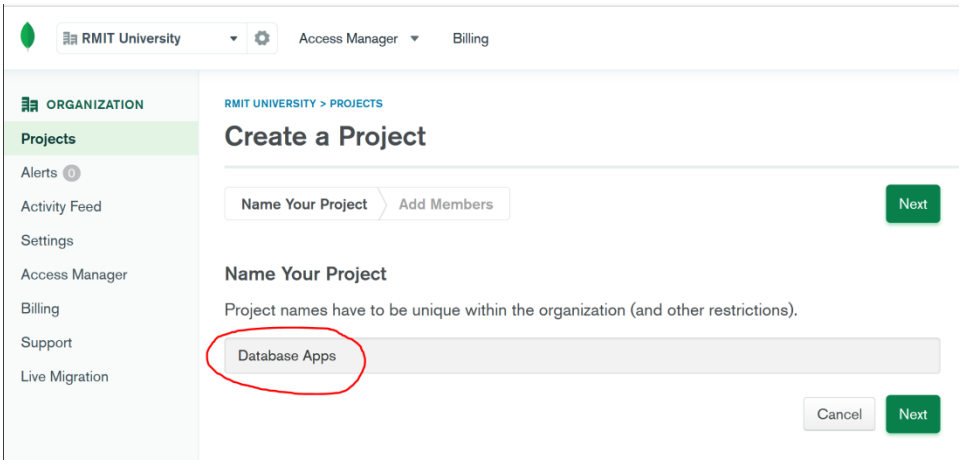
Enter your details and as the company, enter "RMIT University".

You will receive an email from Mongo Atlas to verify your identity. Simply follow the steps described in the email, and you will be ready to go.

Once your account is created, the next step is to create a project.



Name your project as "Database Apps" and click next to create your project.

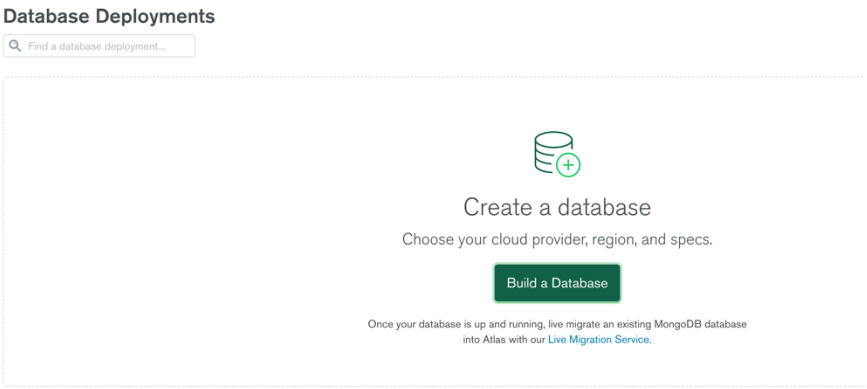


Step 2: Deploy a Free Cluster

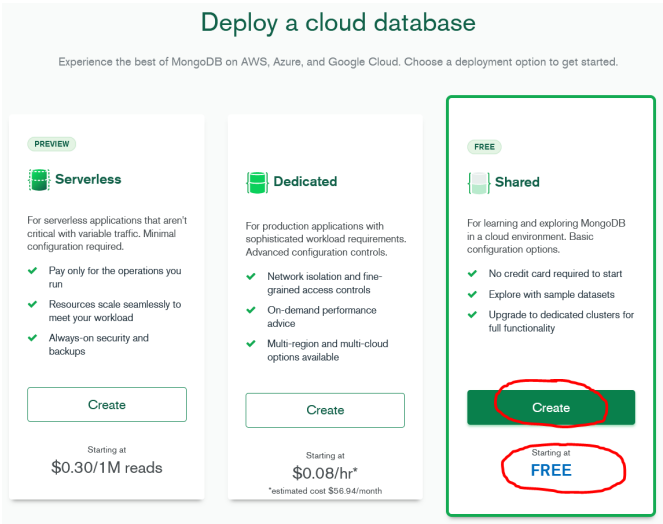
Atlas free clusters provide a small-scale development environment to host your data. Free clusters never expire, and provide access to a subset of Atlas features and functionality.

Log into Atlas, at https://www.mongodb.com/cloud/atlas

Click ***Build a Database***.

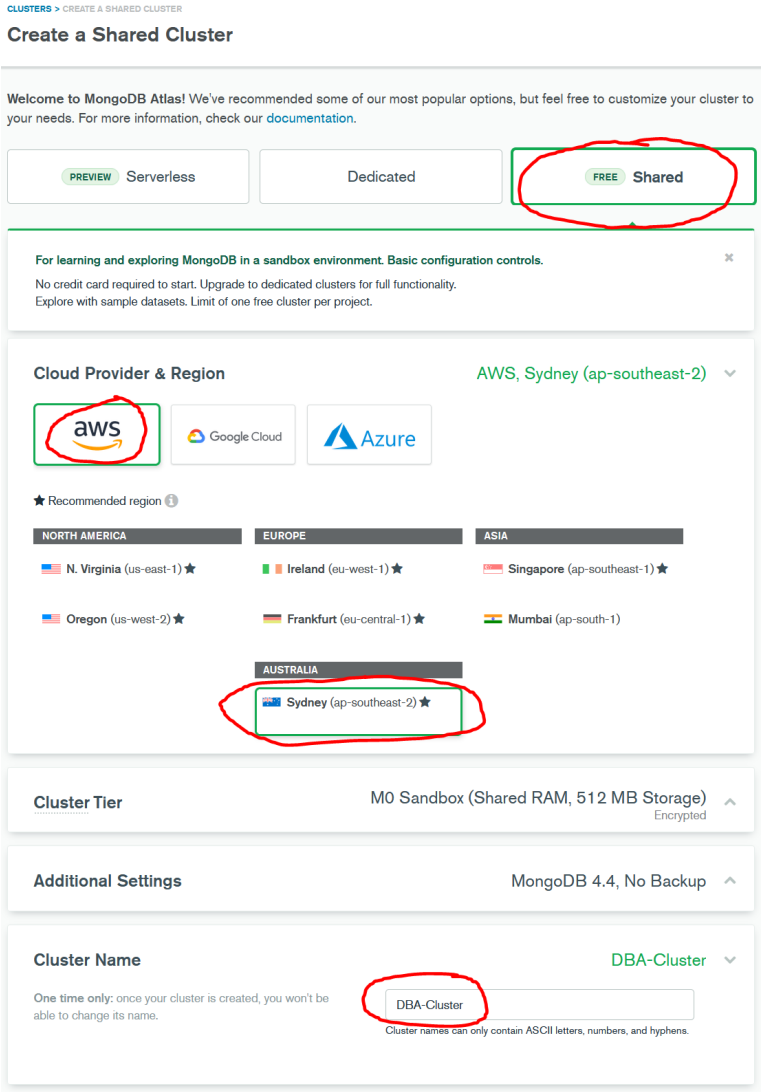


Choose the Free and Hobby option. Choose M0 Sandbox tier that gives you free 350MB storage space, one virtual CPU and shared RAM. (other higher-spec'ed options are not free).



Choose the Free and Shared option.

Select your preferred *Cloud Provider & Region*.
Cloud Provider: AWS
Region: Sydney (ap-southeast-2)

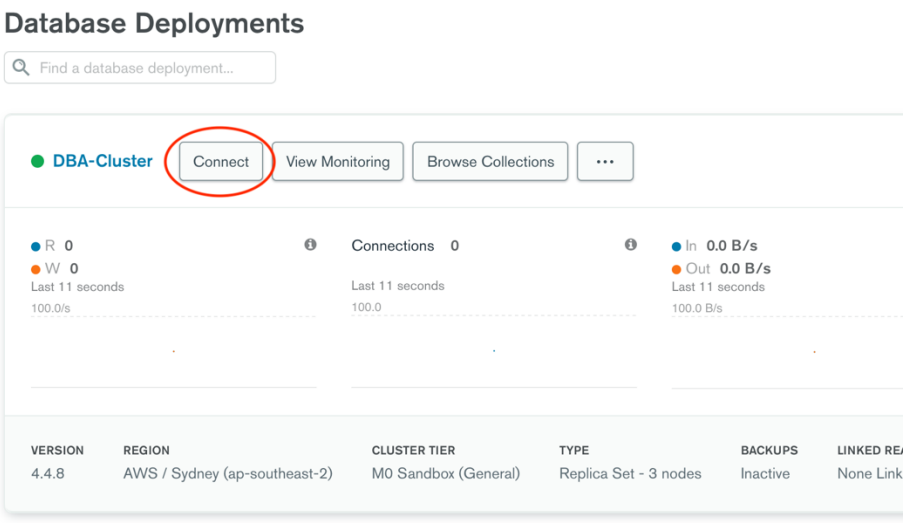


Give a suitable name (say: DBA-Cluster) to your newly created database cluster.

Click “Create Cluster” button.

The deployment will take a few minutes.

Once your 3-server database cluster is created, click on Connect to configure connection settings.

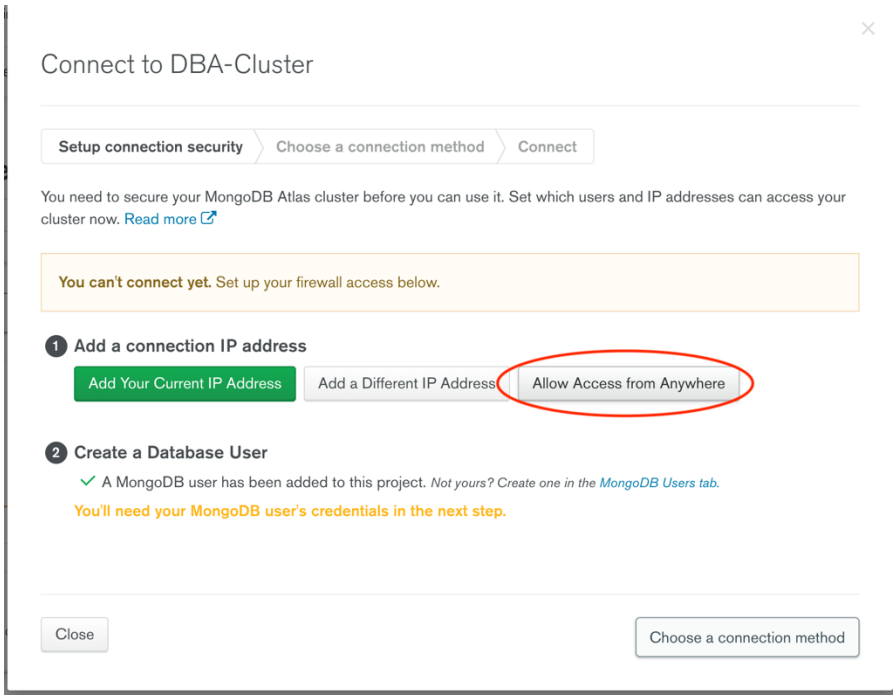


Under "Add a connection IP address", choose "Allow Access from Anywhere" option. This is not the most secured access method and should not be used with real database deployments. However, assuming that you connect this database from many dynamically-allocated IP addresses (e.g. university network, free wifi at library, home wifi), it is acceptable for this sandbox environment.

On next page, default IP address 0.0.0.0/0 is shown.

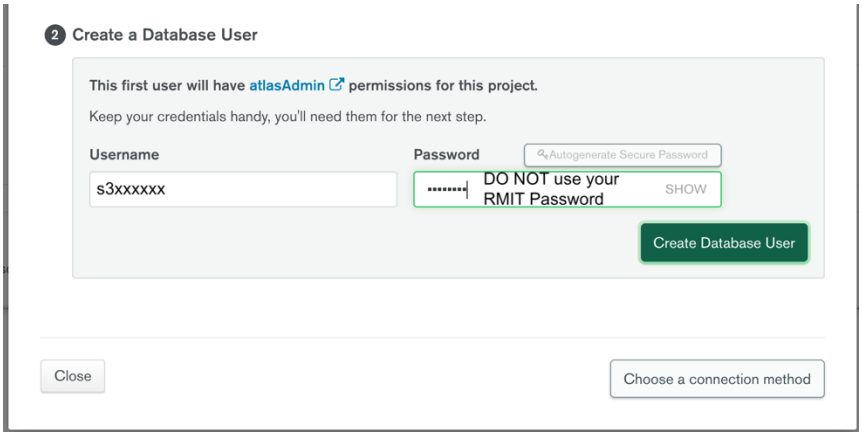
0.0.0.0/0 denotes allowing access from anywhere.

Click on "Add IP Address" button.

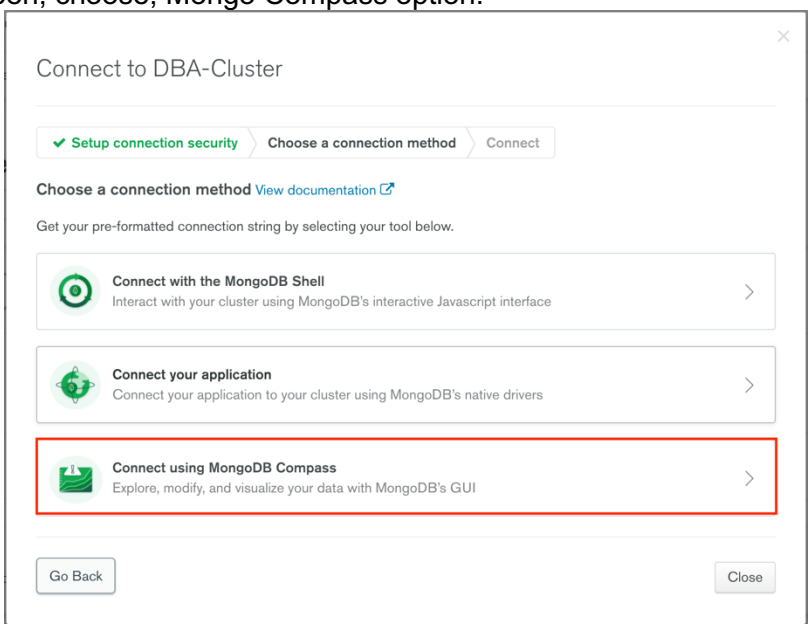


Create a Database User:

Use your student number and a separate password to create a database user. This user will be the admin user of your database cluster. You will be able to create more users later. However, to complete the configuration process, you will need at least one user.



Then, on next screen, choose, Mongo Compass option.



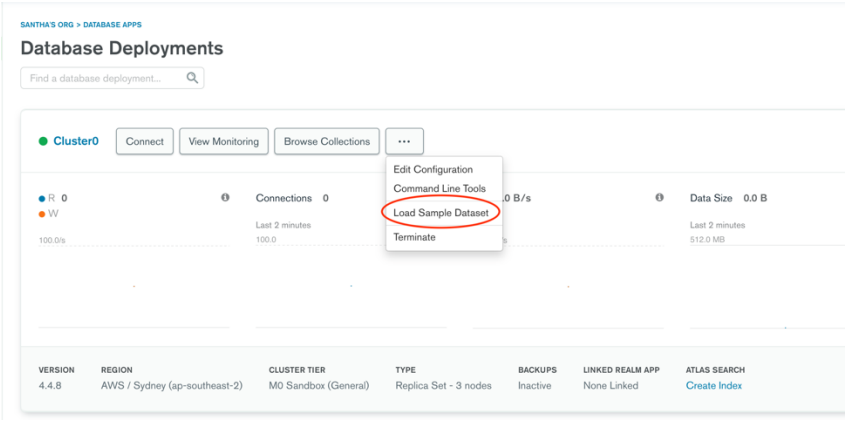
Note down the connection string. It will be used in the next section when you configure your Mongo Compass desktop client. It should be similar to:
`mongodb+srv://s3xxxxxx:<password>@dba-cluster.wr0r0.mongodb.net/test`

If you haven't downloaded the Mongo Compass Desktop Client, at this page, you will get a link to the installation pack. You can download it directly, from Mongodb website, too.

Step 3: Load a sample dataset

MongoDB has several sample datasets containing real-life data. One of them is a subset of AirBnB data set. It contains an exact replica of the backend database used in AirBnB website.

Click on the three dots on Database Deployment page and choose “Load Sample Dataset” option.



This data set is about 350MB large and will take a substantially long time to load up. (depending on the server load, it can take more than 15 minutes).

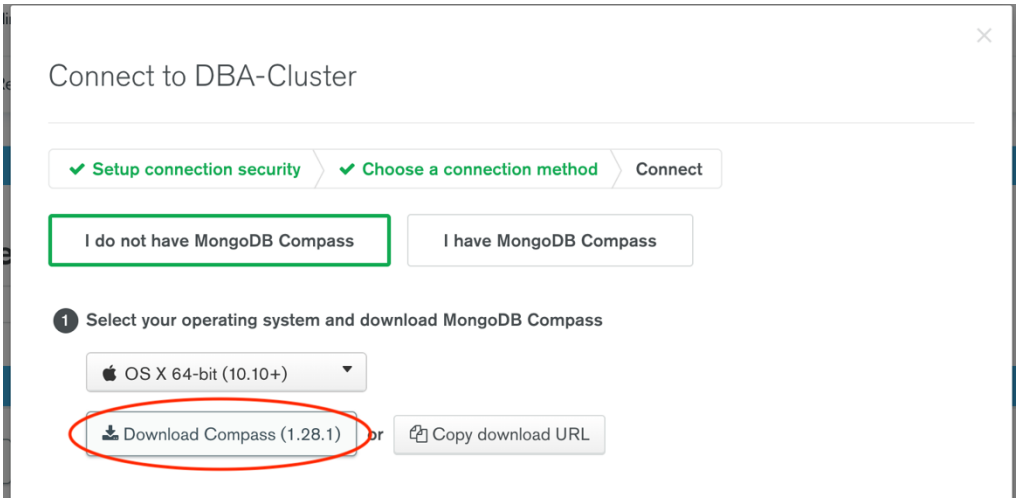
While this is happening on the “cloud”, you can start the installation of the Mongo Compass desktop client.

2.2 Install Mongo Compass Desktop Client

In the previous step when you set up the Atlas Connection settings, you have presented with a link to download the installation package (each operating system will have their own ways of download and install applications).

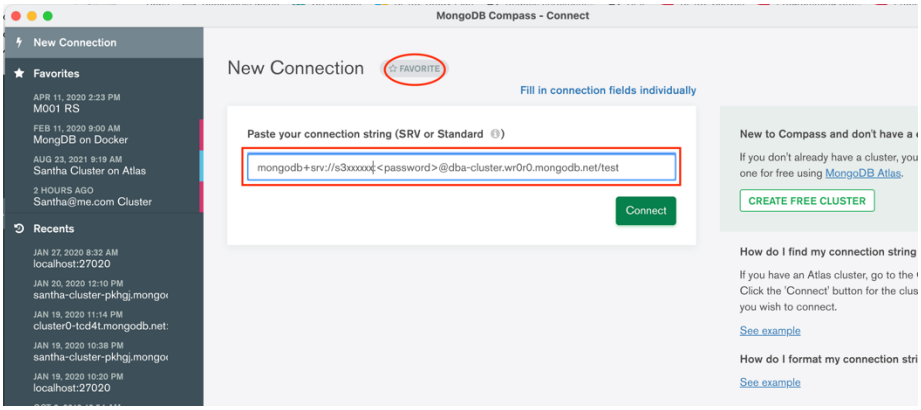
Download and install the application as per operating system’s application installation guidelines.

You may have to grant to run applications downloaded from third parties.



Start the application.

On main menu, choose Connect → Connect to option.

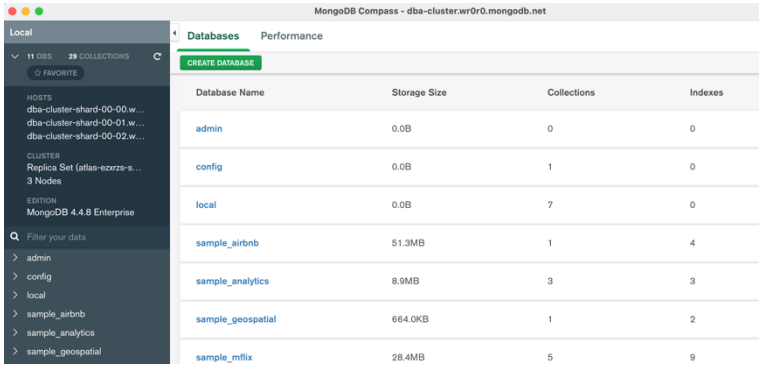


Enter the connection string you copied while configuring your Database cluster.

Replace <password> with the password you previously set up.

It is good idea to tick this connection as a “favourite”, so it will be saved and you are not required to enter the connection string every time you log in.

Now, you are ready to use your newly deployed database cluster.

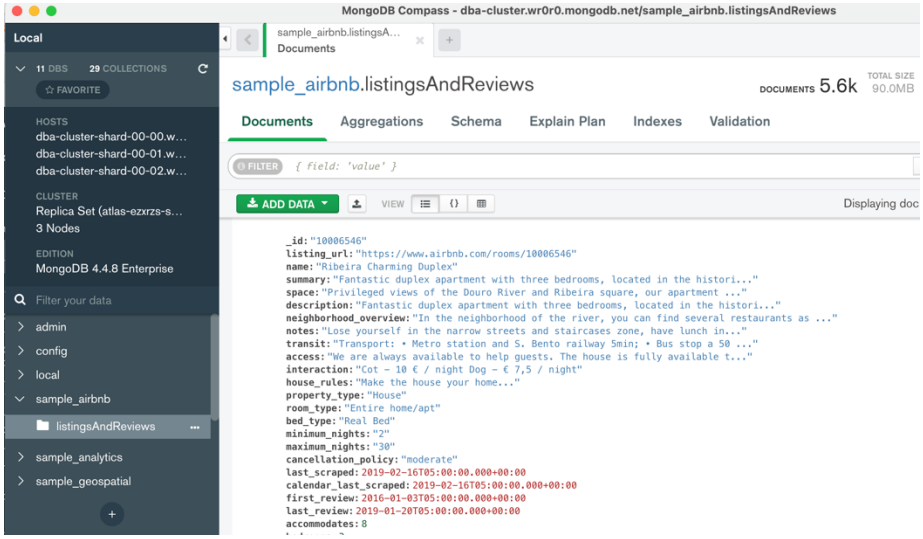


3 Working with MongoDB

3.1 Exploring AirBnB database

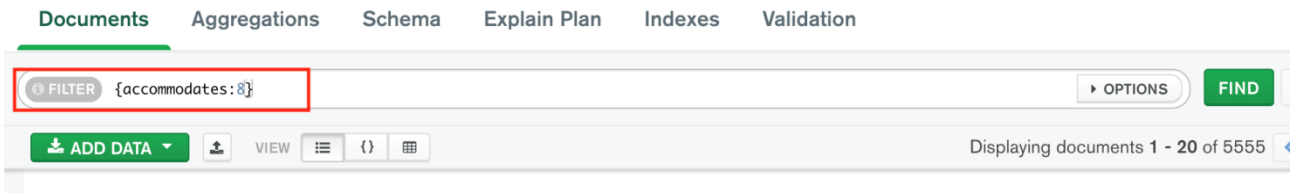
The Mongo Compass allows you to browse and query document collections/databases on Mongo Atlas.

e.g. To browse ***listingsAndReviews*** collection, click the name of the database (***sample_airbnb***) from left menu, and choose the document collection from the dropdown list.



To filter on various filtering conditions, you can enter your filter condition here:
e.g. Find properties that can accommodate (exactly) 8 people.

```
Filter: {accommodation : 8}
```



e.g. Find Apartments that can accommodate 4 people. Display the property names and addresses only.

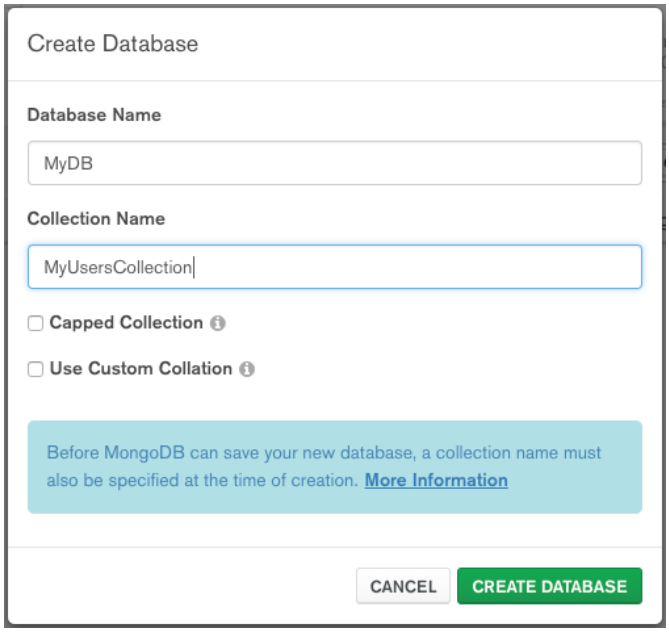
```
Filter: {accommodates:4, property_type : "Apartment"}
Project: {name: 1, address:1, _id:0}
```

3.2 Creating a small document collection

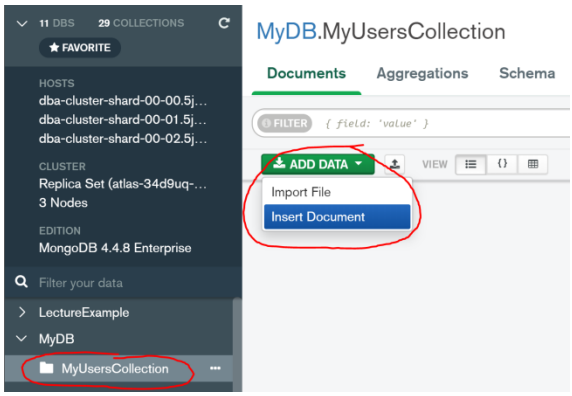
In this activity, we create a new database and a new document collection and populate it with few documents.
Open MongoDB Compass, on the main window, click the “Create Database” button at the bottom left corner (Hover the mouse over “+” symbol).

On the “Create Database” dialog box, enter

	Database Name: MyDB Collection Name: MyUsersCollection Leave the tick boxes unticked



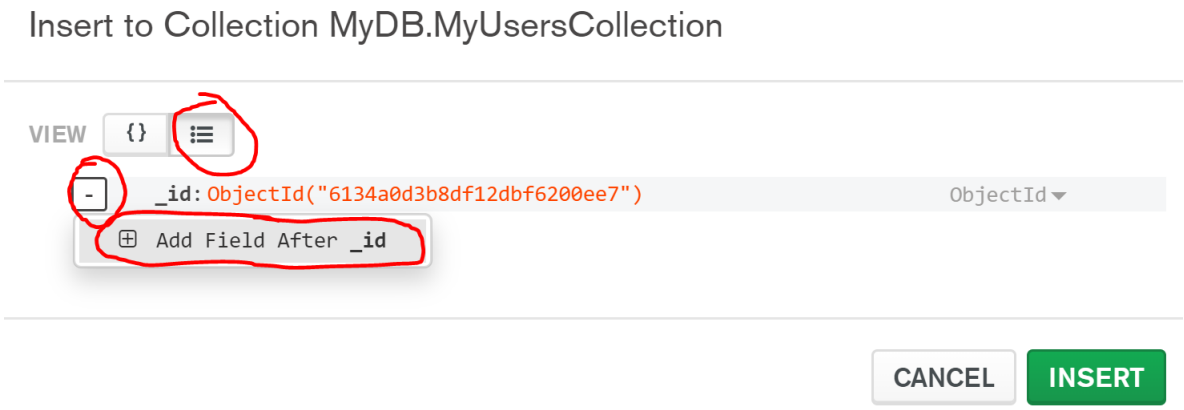
The new database with a new blank collection should appear on database list.



Click on “Insert Document” button to insert a new document.

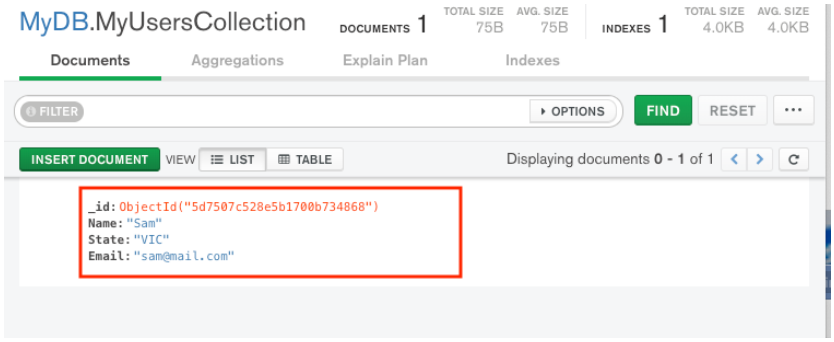
When clicked, a document insertion template will appear with the document number already generated.
By default it goes into the raw comma separated file format view where you can populate the data:

Alternatively you can go into the structured list format:



Populate the template with the rest of the data. You are required to enter both field name AND data for the field.

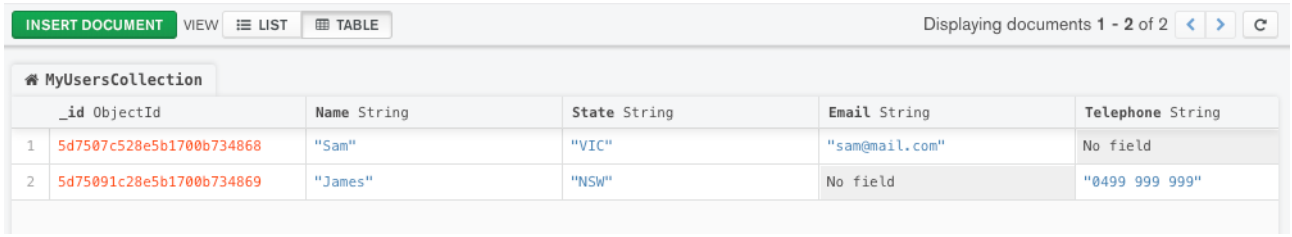
The new document should appear on your document browser window:



Insert another document. This time, with Name, State, and Telephone.

Did you already notice a difference between (schema-based) relational database model and (schema-less) NOSQL model?

You can browse the document collection, as a list, a table or in raw file format:

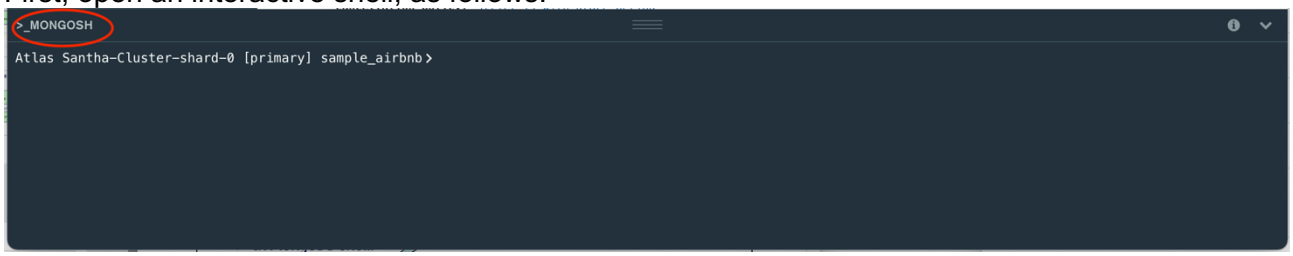


3.3 Access the database via MongoDB Shell

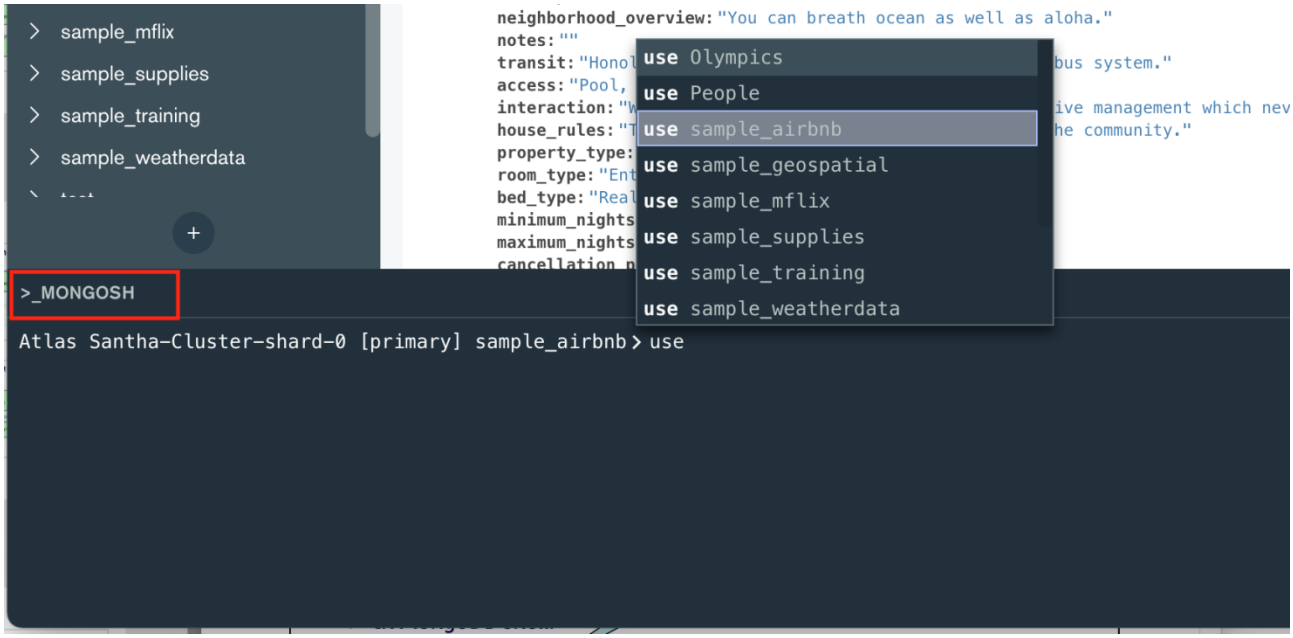
We can interact with the database via a command-line utility, called MongoDB Shell. The current version of Mongo Compass has in-built MongoDB shell.

Click on the small icon at the bottom left corner (“>MONGOSH”).

First, open an interactive shell, as follows:



At the prompt on Mongo Shell, try out the following Mongo Shell commands.



Activity 1: Check the list of databases.

	> show databases

Activity 2: Use one of the databases

	> use sample_airbnb

IMPORTANT: Unlike Oracle, MongoDB is case sensitive. So, sample_airbnb is different to SAMPLE_AirBnB or Sample_AIRBNB and so on. Use the exact case as displayed on Activity 1.

Activity 3: Check the list of collections.

	> show collections

Activity 4: Check the contents of the 'listingsAndReviews' collection.

	> db.listingsAndReviews.find()

Exercise:

Redo all the exercises in Section 3.2, this time using the Mongo Shell commands. Refer to lecture slides for corresponding Mongo Shell commands.