Servers & Clients

Objectives

By the end of this session, you should be able to:

- Introduction
- Network Access
- Database Access
- The Database Client
- Server Commands

Introduction

- MongoDB Atlas is a powerful cloud version of MongoDB, offering performance, security, and flexibility for clients.
- cloud infrastructure provides many benefits for users, it also increases the security risk associated with data stored in the cloud.
- One of the advantages of the MongoDB Atlas service is that many security features are enabled by default.
- To configure access to your project's database, there are two key aspects
  - Network access: Configures IP network access
  - Database access: Configures users and database roles

Network Access

- Network access is a low-level security configuration that's available for databases deployed in the Atlas Cloud.
- The (TCP/IP) is the transport protocol used by all applications to reliably communicate data packets over the internet.
- Both IPv4 and IPv6 are used to specify the complete address of a device on the internet.
- Any device connected on the internet needs a unique IP address in order to communicate with other servers they are called public IP.
- Private IP addresses these are more commonly used in corporate environments that need to limit their employees' access to a private network.
- The Domain Name Server (DNS) is the solution for resolving hostnames on the internet.
- The default TCP port for MongoDB Server is 27017.MongoDB Atlas free tier, the default TCP port cannot be changed. This is the limitation of Atlas server.

Network Access

- Internally, MongoDB stores documents in a special binary format called Binary JSON (BSON).
- The Wire Protocol is MongoDB's solution to encapsulate BSON data into network packets that can be sent over the internet.
- MongoDB Atlas consists of three methods to manage network access, which can be accessed using the following tabs
  - IP Access List
  - Peering
  - Private Endpoint
- IP Access List helps the Atlas administrator to specify a list of valid IP addresses that are allowed to connect to the MongoDB database.
- Network peering is another method of controlling network access on the Atlas Cloud infrastructure, which is different from an IP access list.

Database Access

- Database access control verifies user authentication credentials, such as the username and password.
- The validation of user identity is an essential aspect of database security and is necessary in order to protect data integrity and confidentiality.
- The following are some authentication mechanisms, each one with a different technology and level of security
  - Password Authentication
  - X.509 Certificate Authentication
- Database access covers the following aspects of database security:
  - Database users
  - Database roles

  The Atlas administrator can decide to add temporary user accounts. A temporary user account is an account that is valid only for a limited period.

Database Privileges and Roles

- Database authorization is the part of database security that covers privileges and roles for MongoDB databases.
- A privilege (or action) is the right to perform a particular action or operation within the MongoDB database on a specific database resource.
- Multiple database privileges can be grouped within a role.
- Roles can have a global or local scope:
    - GLOBAL: This role applies to all MongoDB databases and collections.
    - Database: This role applies only to a specific database name.
    - Collection: This role applies only to a specific collection name within a database. It has the most restrictive scope.
- There are a few predefined database roles, and for each role, there is a list of specific privileges assigned.
- These are predefined in the Atlas application 1.Atlas Admin 2. Read and write to Any Database 3. Only read any Database

The Database Client

- A database client is a software application that is designed to do the following
  - Connect to a MongoDB database server
  - Request information from the database server
  - Modify data by sending MongoDB CRUD requests
  - Send other database commands to the database server

MongoDB clients depending on the purpose for which they were created:

- Basic: With the database software, basic clients provide an interactive application to work with the database server.
- Data-oriented: It usually provides a Graphical User Interface (GUI), and the tools that assist you to efficiently query, aggregate, and modify data.
- Drivers: These are designed to provide the interface between the MongoDB database and another software system, such as a general-use programming language. The main use of drivers is in software development and application deployments.

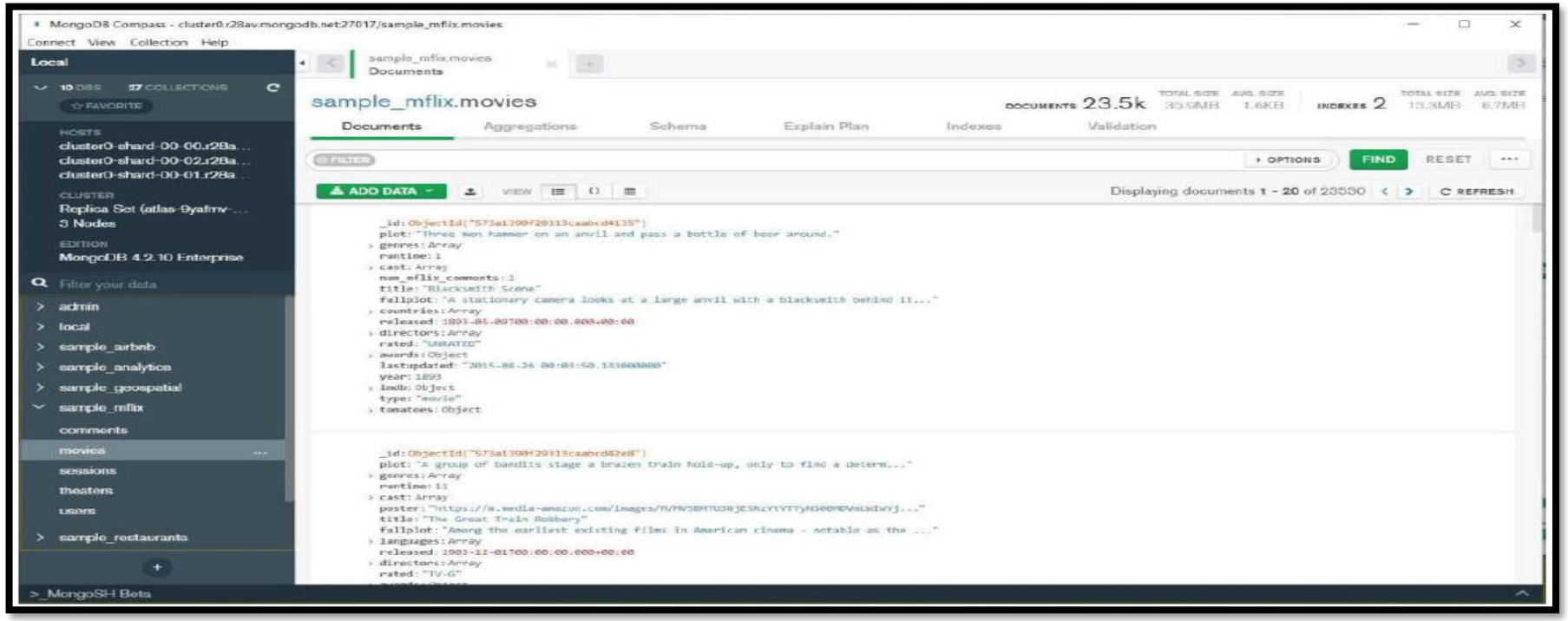
Connection String

- A connection string is nothing more than a method to identify the database service address and its parameters so that clients can connect to the server over the network.
- It is important because without a connection string, the client would have no clue how to connect to the database service.
- Here is the general format of a MongoDB connection string: mongodb+srv:// user:pass@hostname:port/database_name?options.
- The simplest way to connect to a MongoDB database is to use the mongo shell.
- The mongo shell offers a simple terminal mode client for a MongoDB database.

```
C:\>mongo --help
MongoDB shell version v4.4.0
usage: mongo [options] [db address] [file names (ending in .js)]
db address can be:
  foo                   foo database on local machine
  192.168.0.5/foo       foo database on 192.168.0.5 machine
  192.168.0.5:9999/foo  foo database on 192.168.0.5 machine on port 9999
  mongodb://192.168.0.5:9999/foo  connection string URI can also be used
Options:
  --ipv6                                enable IPv6 support (disabled by
....
```

MongoDB Compass

- MongoDB Compass is a graphical tool for data visualization in MongoDB.
- It is installed together with MongoDB Server installation, as MongoDB Compass is part of the standard distribution.
- MongoDB Compass has a query builder graphical interface that greatly simplifies the work of creating complex JSON database queries.



Server Commands

- MongoDB is a database server that has clients that connect to the server over the network.
- The main advantage of the client-server architecture is that the server consolidates control data management, user security, and concurrency for parallel access.
- The database server manages the database, while clients are used by applications or users to query data from the database.
- There is also a separation of physical and logical structures.
- Physical Structure :The physical structure of the database consists of computing resources allocated for MongoDB Server, such as processor threads, memory allocation, and database file storage.

Physical Structure

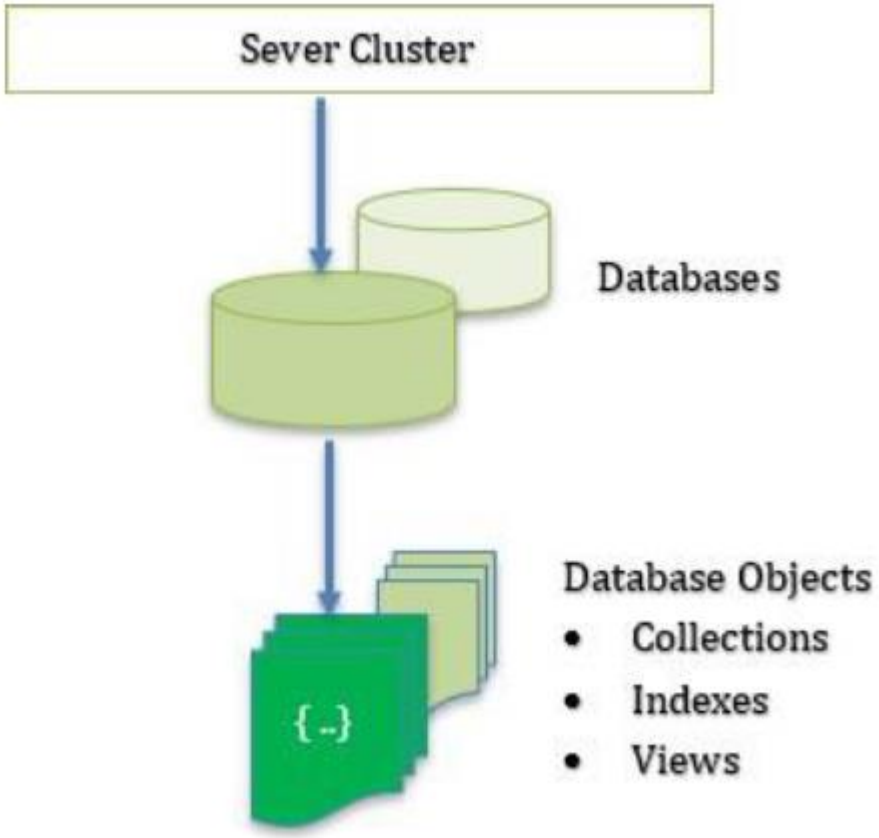
- Data Files : These are files used for database collections and other database objects. MongoDB has a configurable storage engine for data files, and WiredTiger is a high-performance storage engine, that has been introduced in MongoDB since version 3.0.

- Oplog : These are files used for transaction replication between cluster members

- Other Files : These are files such as config files, database logs, and audit files.

Logical Structure

- The logical structure of the database consists of databases, collections, and other database objects



Server Commands

- In a client-server database server architecture clients send requests to the database server and MongoDB Server executes the requests on the server side.
- While MongoDB Server has many functions, there are a few different categories

  - CRUD operations : Database Create, Read, Update, Delete (CRUD) operations are commands that modify data documents.

  - Database Commands : These are all the commands that differ from data queries and CRUD operations.

- Database commands have other functions, such as database management, security, and replication.

Summary

- In this session, you learned about:
  - Basics of Atlas service management.
  - As security is a very important aspect of cloud computing, controlling network access and database access is essential for the Atlas platform.
  - We now be able to set up new users and grant permissions to database resources
- In the next chapter, we will introduce you to the world of MongoDB query syntax.