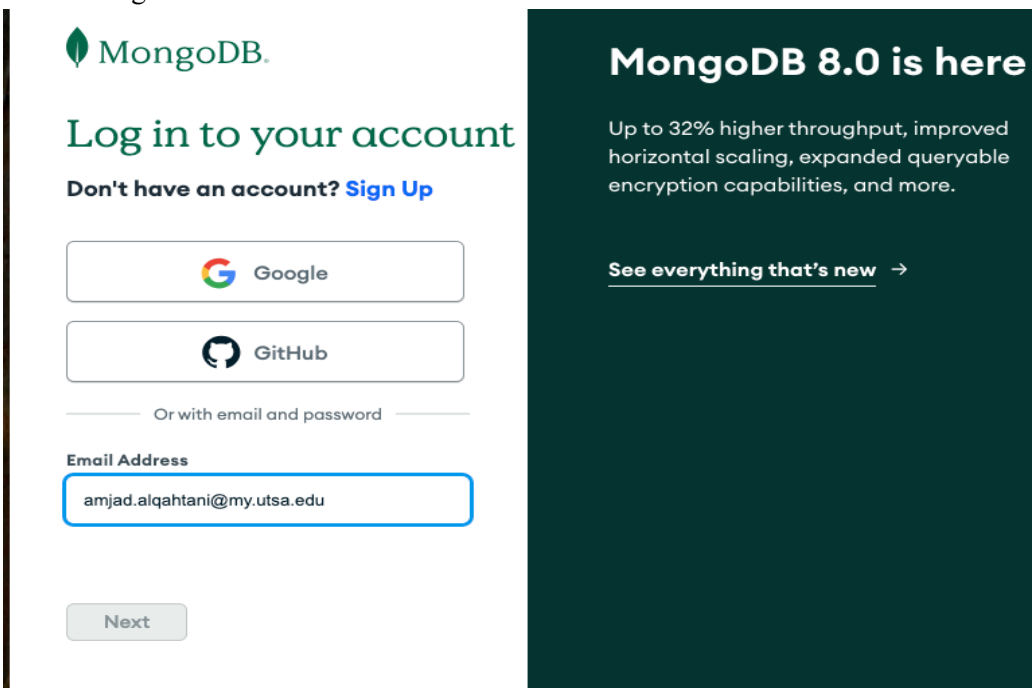
Experiment Note: MongoDB Using YCSB Benchmarks

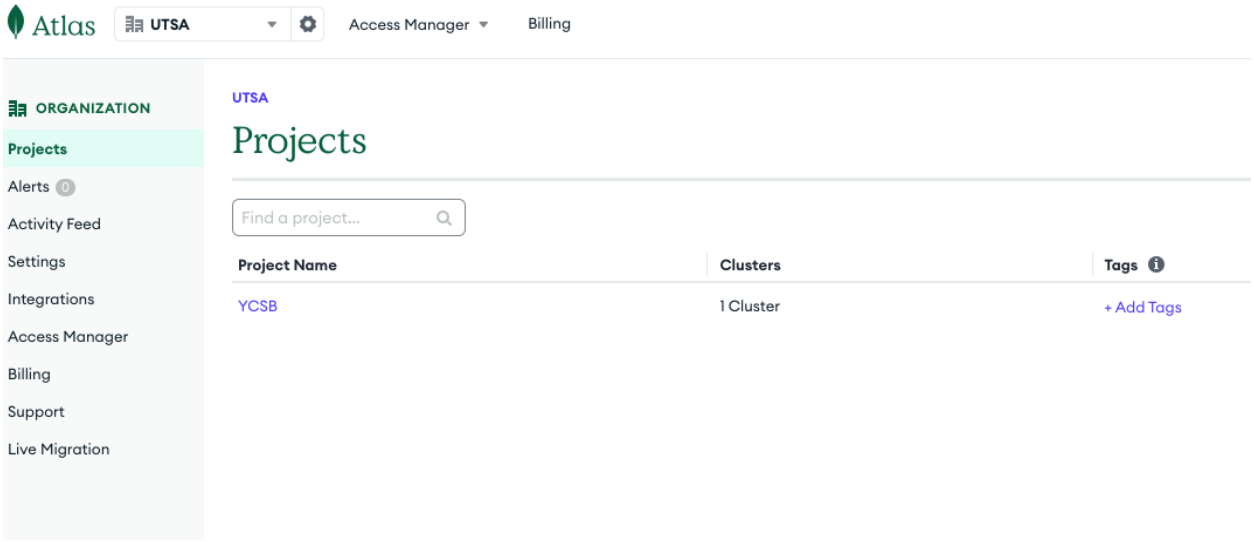
Group 8: Amjad Alqahtani, Caleb Alva, Nicholas Winkelmann
Cloud Computing Final Project
Course Professor: Dr. Glenn Brown
University of Texas at San Antonio

Sign Up or Log In to MongoDB Atlas

1. Visit the MongoDB Atlas
    a. https://www.mongodb.com/cloud/atlas
2. Create an account
3. Login



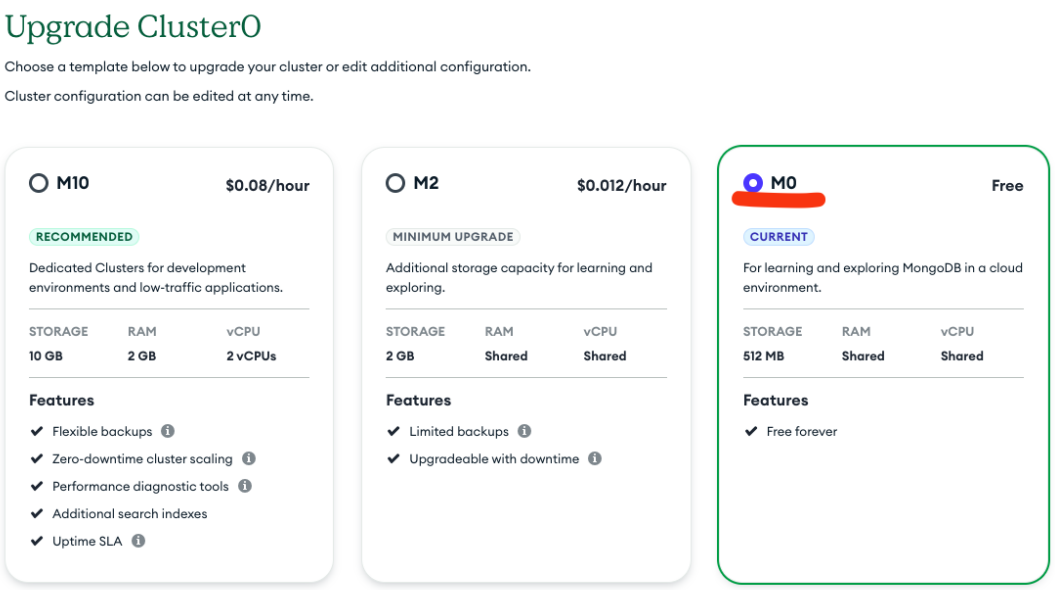
4. Create a new cluster and a new project named YCSB



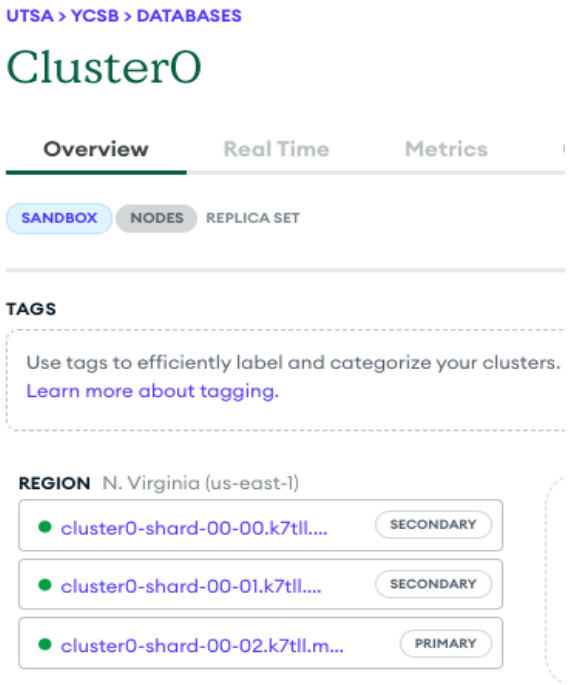
Hardware and Environment

Virtual Machine Specifications:

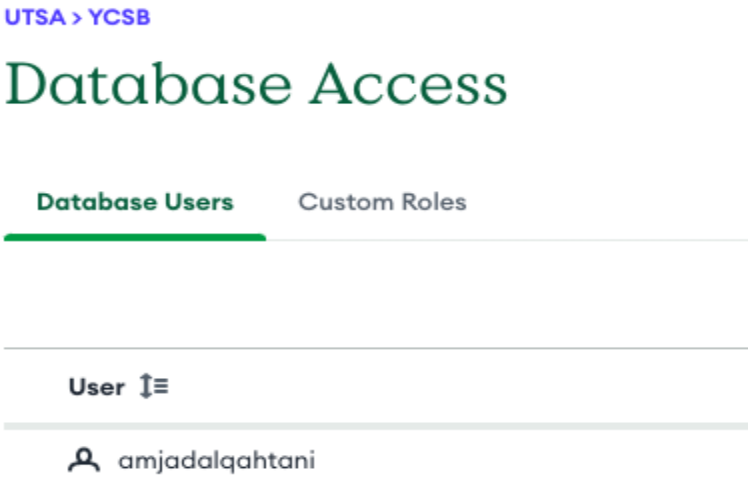
1. vCPUs:
    a. Shared (no dedicated vCPUs; performance depends on the shared cluster environment).
    b. RAM: Shared (memory resources are shared among multiple tenants on the same hardware).
    c. Storage: 512 MB (allocated storage limit for the M0 Sandbox cluster).
    d. Network Bandwidth: Shared bandwidth with no specific throughput guarantees.
2. Database Cluster Configuration Cluster
    a. Tier: M0 Sandbox (Free Tier)
        i. Designed for learning and exploration, with limited resources.
    b. Replica Set: 3 nodes
        i. Data is replicated across 3 nodes to ensure availability and fault tolerance.
    c. Region: AWS / N. Virginia (us-east-1)
        i. Hosted on Amazon Web Services in the Northern Virginia region.
    d. Type: Replica Set (Single Cluster)
        i. Supports a basic MongoDB deployment with replication for data redundancy.



Cluster Overview

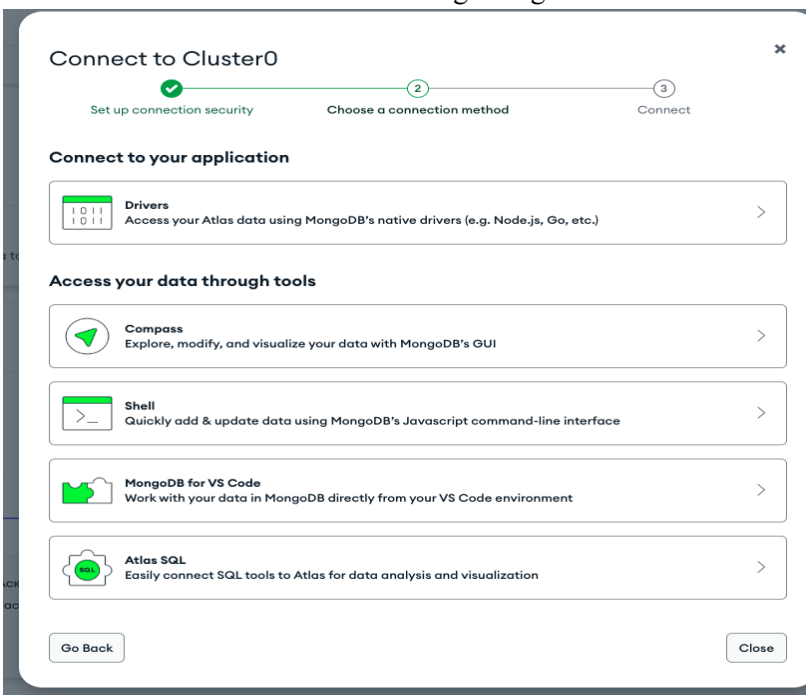


Create Database

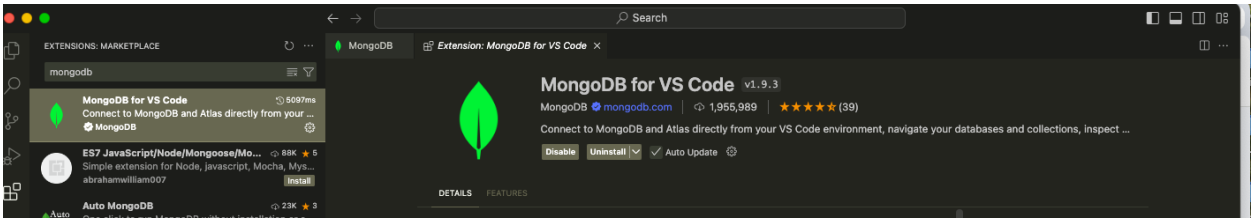


Connect to Your Cluster

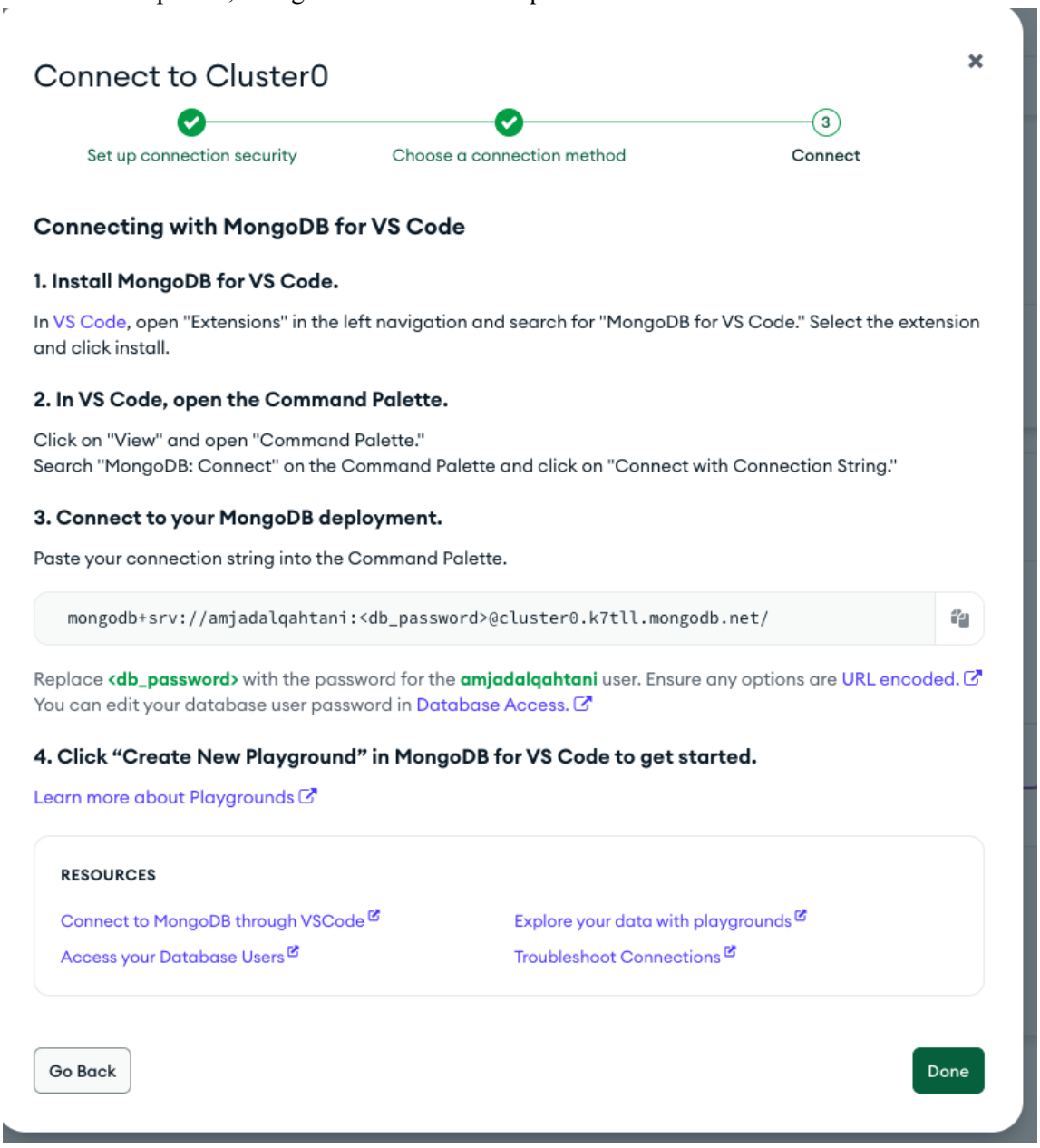
1. We connect to the cluster using MongoDB for VS Code



2. Install MongoDB extension

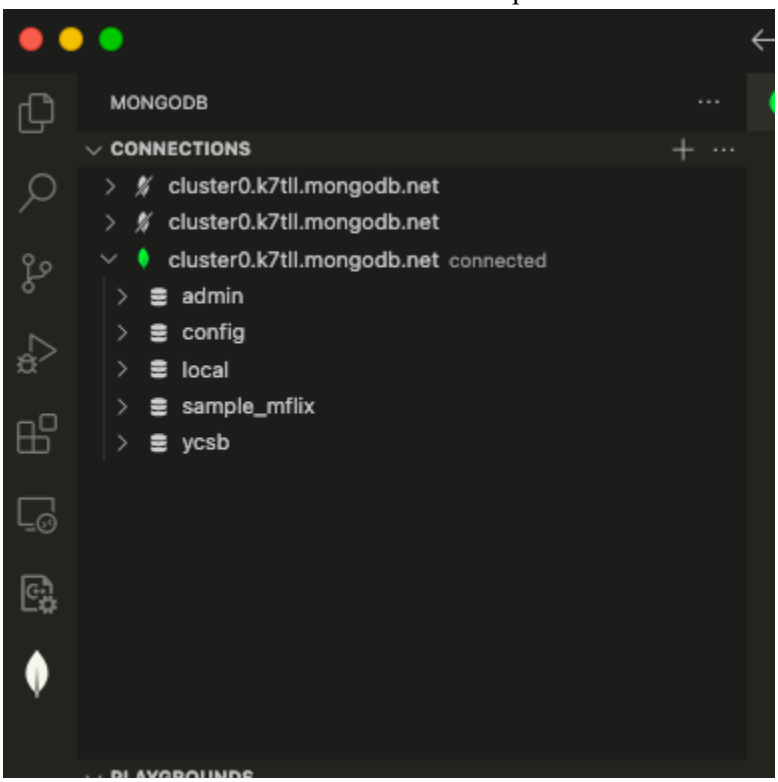


3. Press on view palette, MongoDB connection and place the connection link



This is the connection link for our project
mongodb+srv://amjadalqahtani:<db_password>@cluster0.k7tll.mongodb.net/
Change the db_password with Julia2017

You will be connected to the cluster at this point.



Steps and environment for reproducing our results:

Clone the YCSB on your local machine.

1. clone YCSB https://github.com/mongodb-labs/YCSB/tree/main/ycsb-mongodb
2. cd YCSB-Mongodb/ycsb-mongodb

Install MongoDB on local machine

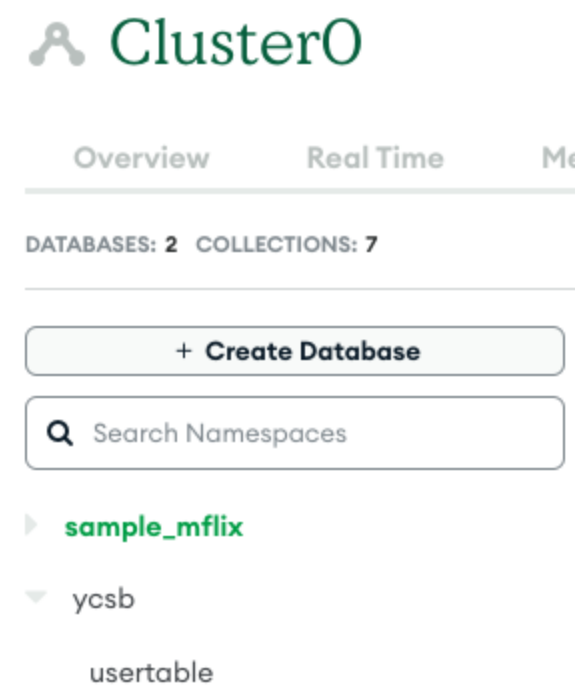
1. https://www.mongodb.com/docs/manual/installation/
2. We have mac laptops
3. https://www.mongodb.com/docs/manual/tutorial/install-mongodb-on-os-x/
4. To verify the successful installation, we run the version mongod –version

```
MacBookPro:finalproject salemalqahtani$ mongod --version
db version v8.0.1
Build Info: {
    "version": "8.0.1",
    "gitVersion": "fcbe67d668fff5a370e2d87b9b1f74bc11bb7b94",
    "modules": [],
    "allocator": "system",
    "environment": {
        "distarch": "x86_64",
        "target_arch": "x86_64"
    }
}
```

5. Install Java and Maven
   JAVA: https://www.oracle.com/java/technologies/downloads/?er=221886
   Maven: brew install maven
6. To verify the successful installation, we run the version for java and maven.
   MacBookPro:finalproject amjadalqahtani$ java -version
   java version "23.0.1" 2024-10-15
   Java(TM) SE Runtime Environment (build 23.0.1+11-39)
   Java HotSpot(TM) 64-Bit Server VM (build 23.0.1+11-39, mixed mode, sharing)
   MacBookPro:finalproject amjadalqahtani$ mvn -version
   Apache Maven 3.9.9 (8e8579a9e76f7d015ee5ec7bfcdc97d260186937)
   Maven home: /usr/local/Cellar/maven/3.9.9/libexec
   Java version: 23.0.1, vendor: Homebrew, runtime:
   /usr/local/Cellar/openjdk/23.0.1/libexec/openjdk.jdk/Contents/Home
   Default locale: en_US, platform encoding: UTF-8
   OS name: "mac os x", version: "15.1", arch: "x86_64", family: "mac"
   MacBookPro:finalproject amjadalqahtani$
7. Fix the path
   a. export M2_HOME=/usr/local/maven
   b. export PATH=${M2_HOME}/bin:${PATH}

YCSB Load Workload on MongoDB Cluster

./bin/ycsb load mongodb -s -P workloads/workloada -p "mongodb.url=mongodb+srv://amjadalqahtani:Julia2017@cluster0.k7tll.mongodb.net/test"



YCSB run Workload on MongoDB Cluster

Command to run YCSB A:

./bin/ycsb run mongodb -s -P workloads/workloada -p "mongodb.url=mongodb+srv://amjadalqahtani:Julia2017@cluster0.k7tll.mongodb.net/ycsb" > outputWorkloadA.txt

Command to run YCSB B:

./bin/ycsb run mongodb -s -P workloads/workloadb -p "mongodb.url=mongodb+srv://amjadalqahtani:Julia2017@cluster0.k7tll.mongodb.net/ycsb" > outputWorkloadB.txt

Command to run YCSB C:
./bin/ycsb run mongodb -s -P workloads/workloadc -p "mongodb.url=mongodb+srv://amjadalqahtani:Julia2017@cluster0.k7tll.mongodb.net/ycsb" > outputWorkloadC.txt

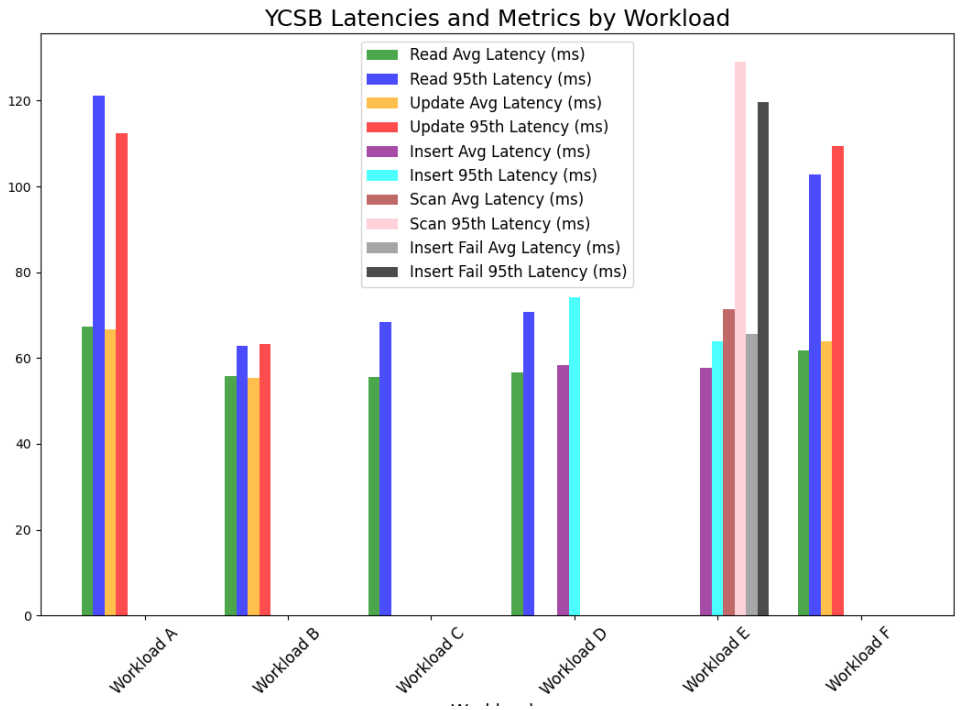
Command to run YCSB D:
./bin/ycsb run mongodb -s -P workloads/workloadd -p "mongodb.url=mongodb+srv://amjadalqahtani:Julia2017@cluster0.k7tll.mongodb.net/ycsb" > outputWorkloadD.txt

Command to run YCSB E:
./bin/ycsb run mongodb -s -P workloads/workloade -p "mongodb.url=mongodb+srv://amjadalqahtani:Julia2017@cluster0.k7tll.mongodb.net/ycsb" > outputWorkloadE.txt

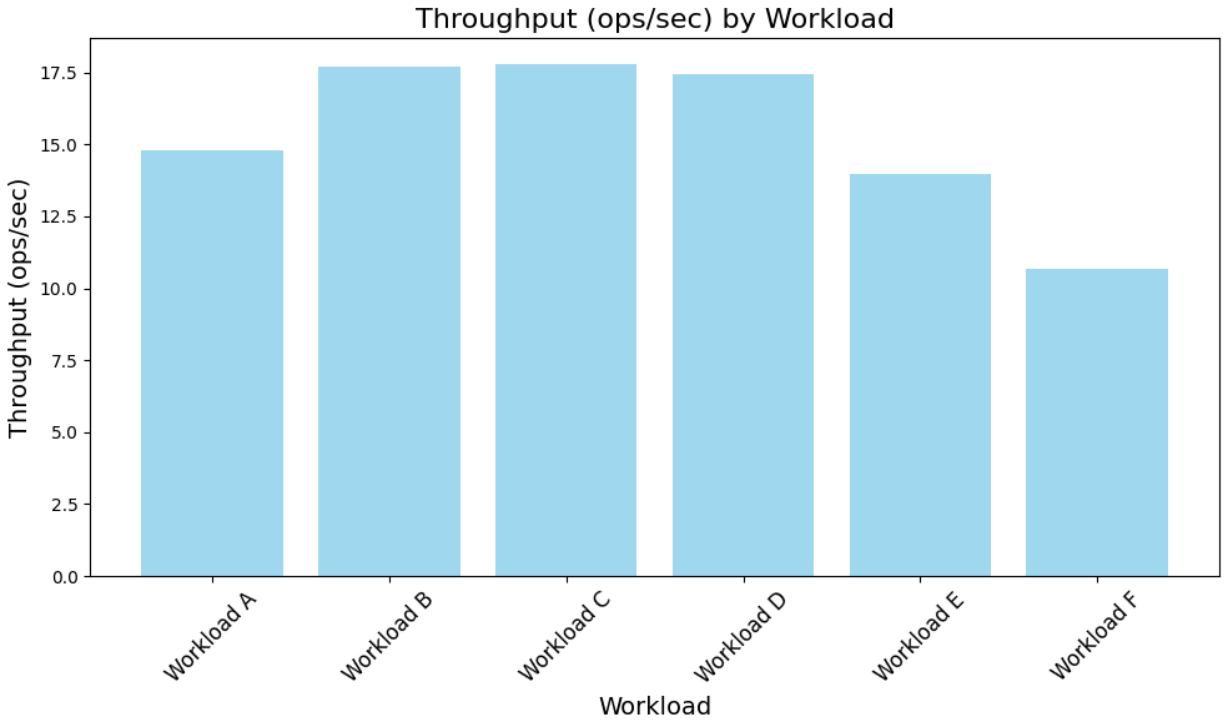
Command to run YCSB F:
./bin/ycsb run mongodb -s -P workloads/workloadf -p "mongodb.url=mongodb+srv://amjadalqahtani:Julia2017@cluster0.k7tll.mongodb.net/ycsb" > outputWorkloadF.txt

Results

1. Latency



2. Throughput



Future Work:

Using different Workload like KV benchmark workload