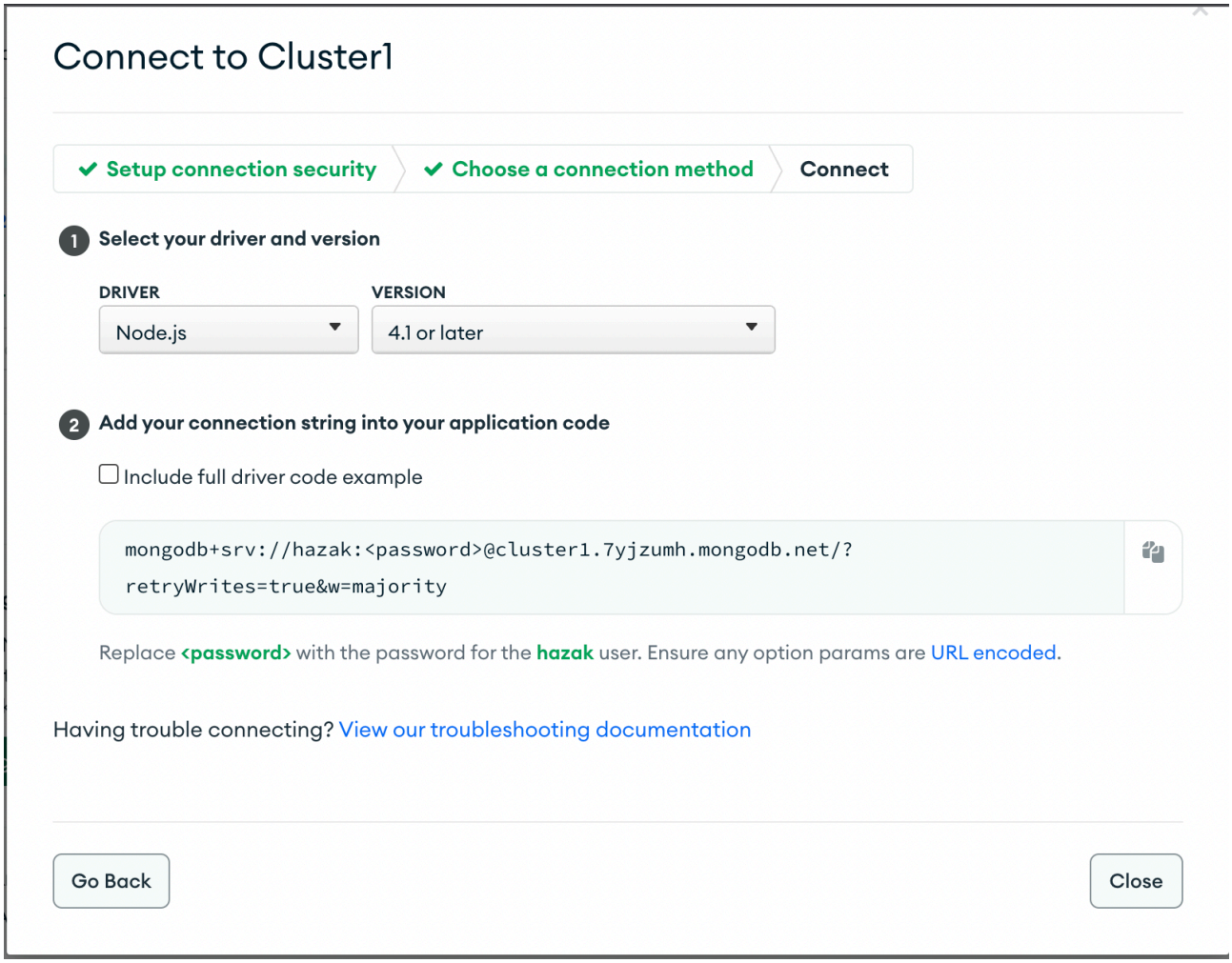
Dropit Shopping

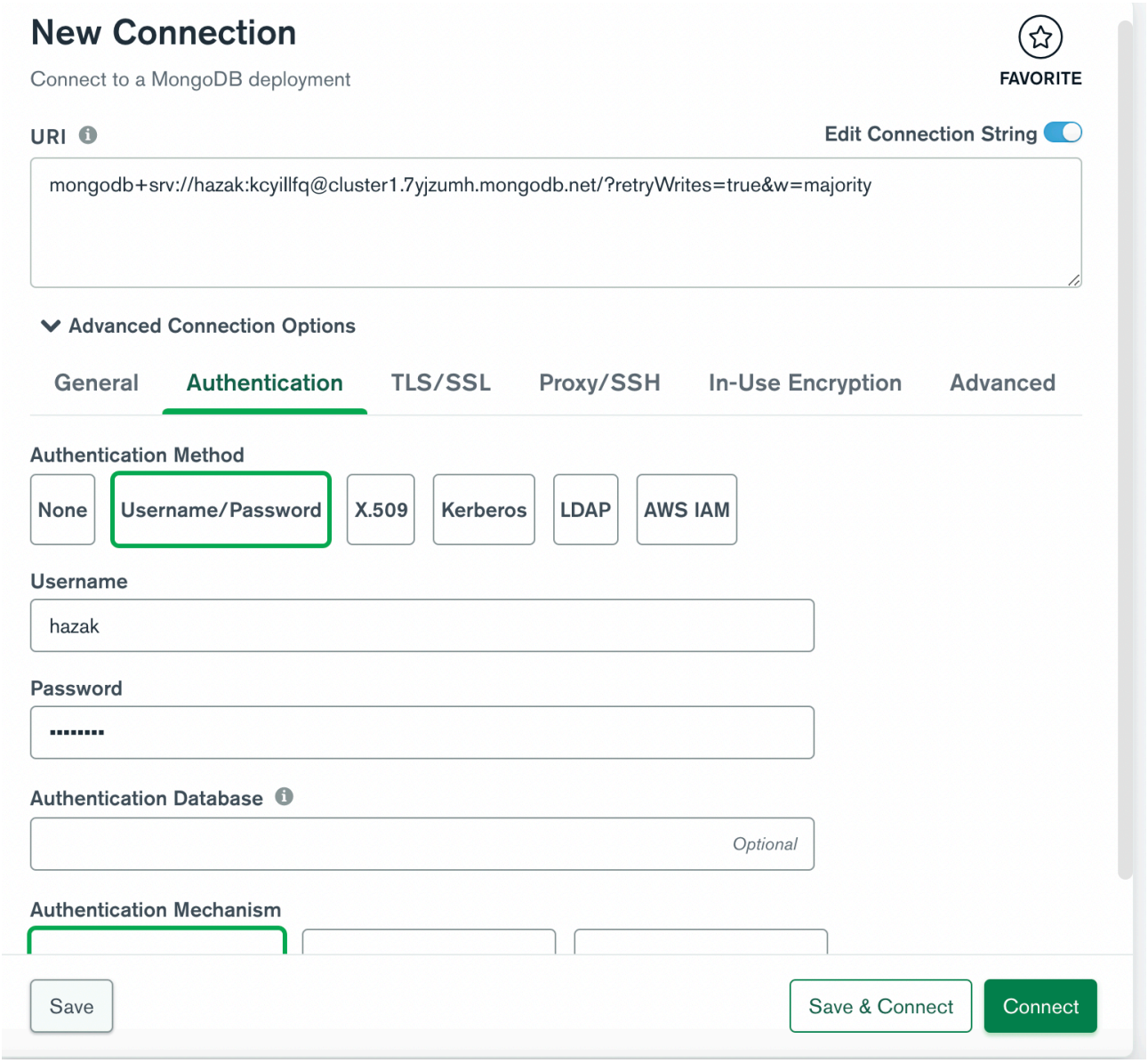
Home assignment

1. Prerequisite

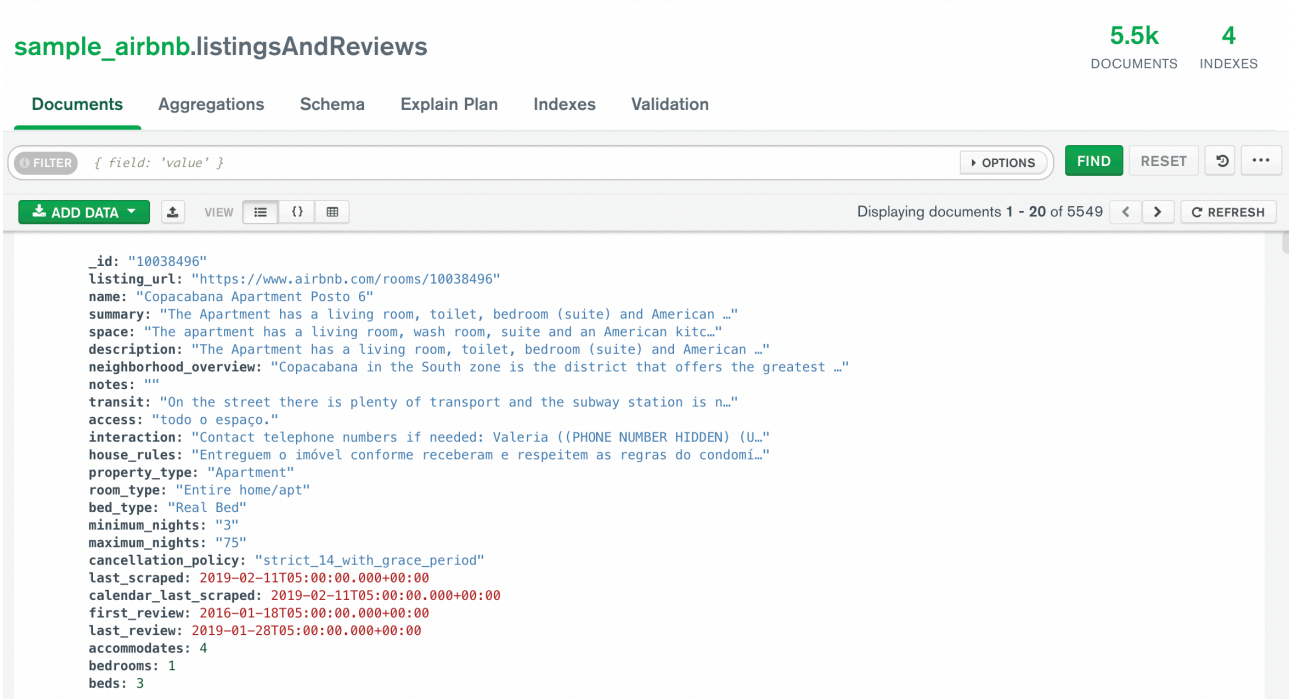
- Create Atlas account
- Get the connection string of the atlas account



- Use Mongodb Compass for downloading the database locally
  - Mongodb Compass connection



- Exporting the sample_airbnb locally



2. Project Tree

- **deploymentAndService/**
  - Mongodb-depl.yaml
  - Mongo-express-depl.yaml

- **secret/**
  - mong-secret.yaml

- **jobs/**
  - mongo-dump.yaml
  - mongo-import.yaml

- Mongoldb-express-rest-api-example
- listingsAndReviews.csv

“**deploymentAndService**” folder will create a deployment and a service for MongoDB and Express application

“**secret**” folder will store confidential information like username and password

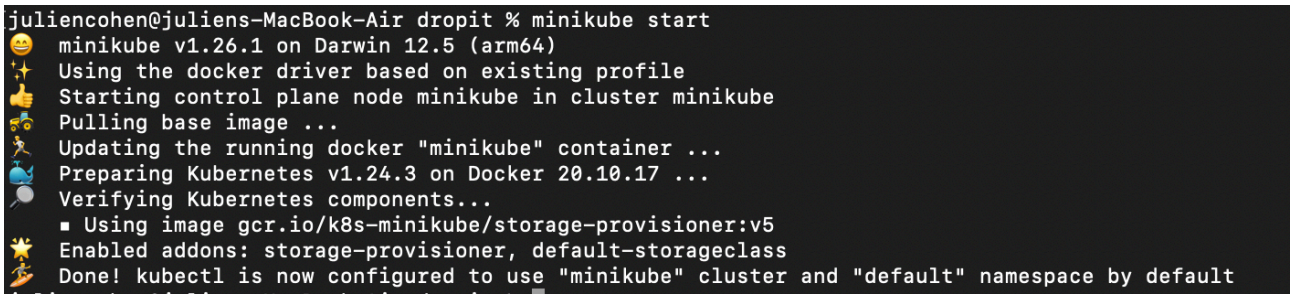
“**jobs**” folder contains jobs for importing and dumping the Database. The particularity of a job is too create a specific pod, execute a task and delete the pod.

“**Mongoldb-express-rest-api-example**” folder will contain our express application.
We will use it for building an image and using this image in our Kubernetes deployment

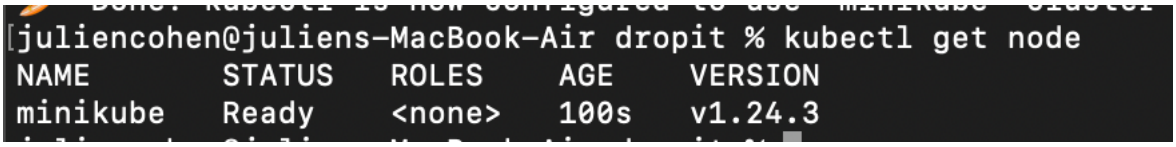
“**listingsAndReviews.csv**” file represent our local database in a CSV format

3. Node initialization

This project is running on a Minikube environment.
So first we are going to create our Node with minikube



Then we check that our minikube node has been created successfully



4. Import the provided db dump into the local DB

A. Deployment and Service of the MongoDB application

- mong-secret.yml

```
apiVersion: v1
kind: Secret
metadata:
    name: mongodb-secret
type: Opaque
data:
    mongo-root-username: dXNlcm5hbWU=
    mongo-root-password: cGFzc3dvcmQ=
```

Here we added mongo username and password in a base64 encoded format
mongo-root-username: username
mongo-root-password: password

- Apply the secret

```
juliencohen@juliens-MacBook-Air dropit % kubectl apply -f secret/mong-secret.yaml
secret/mongodb-secret created
juliencohen@juliens-MacBook-Air dropit % kubectl get secret
NAME             TYPE     DATA   AGE
mongodb-secret   Opaque   2      6s
```

- mongodb-depl.yaml

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: mongodb-deployment
  labels:
    app: mongodb
spec:
  replicas: 1
  selector:
    matchLabels:
      app: mongodb
  template:
    metadata:
      labels:
        app: mongodb
    spec:
      containers:
      - name: mongodb
        image: mongo
        ports:
        - containerPort: 27017
        env:
        - name: MONGO_INITDB_ROOT_USERNAME
          valueFrom:
            secretKeyRef:
              name: mongodb-secret
              key: mongo-root-username
        - name: MONGO_INITDB_ROOT_PASSWORD
          valueFrom:
            secretKeyRef:
              name: mongodb-secret
              key: mongo-root-password
```

Here we can see that we will create a deployment of a mongodb image and we will add username and password env variable in our pod.

- Mongodb service

```
apiVersion: v1
kind: Service
metadata:
  name: mongodb-service
spec:
  selector:
    app: mongodb
  type: LoadBalancer
  ports:
    - protocol: TCP
      port: 27017
      targetPort: 27017
      nodePort: 30001
~
```

Here the service will create an external IP that is useful for the communication between pods.

- Lets apply these configurations

Information about our mongo deployment

```
juliencohen@juliens-MacBook-Air dropit % kubectl get deploy
NAME                READY   UP-TO-DATE   AVAILABLE   AGE
mongodb-deployment   1/1     1            1           6s
juliencohen@juliens-MacBook-Air dropit % kubectl describe deploy mongodb-deployment
Name:                   mongodb-deployment
Namespace:              default
CreationTimestamp:      Wed, 17 Aug 2022 12:32:12 +0300
Labels:                 app=mongodb
Annotations:            deployment.kubernetes.io/revision: 1
Selector:               app=mongodb
Replicas:               1 desired | 1 updated | 1 total | 1 available | 0 unavailable
StrategyType:           RollingUpdate
MinReadySeconds:        0
RollingUpdateStrategy:  25% max unavailable, 25% max surge
Pod Template:
  Labels:  app=mongodb
  Containers:
   mongodb:
    Image:      mongo
    Port:       27017/TCP
    Host Port:  0/TCP
    Environment:
      MONGO_INITDB_ROOT_USERNAME:  <set to the key 'mongo-root-username' in secret 'mongodb-secret'>  Optional: false
      MONGO_INITDB_ROOT_PASSWORD:  <set to the key 'mongo-root-password' in secret 'mongodb-secret'>  Optional: false
    Mounts:                        <none>
  Volumes:                         <none>
Conditions:
  Type           Status  Reason
  ----           ------  ------
  Available      True    MinimumReplicasAvailable
  Progressing    True    NewReplicaSetAvailable
OldReplicaSets:  <none>
NewReplicaSet:   mongodb-deployment-67dcfb9c9f (1/1 replicas created)
Events:
  Type    Reason             Age   From                   Message
  ----    ------             ----  ----                   -------
  Normal  ScalingReplicaSet  21s   deployment-controller  Scaled up replica set mongodb-deployment-67dcfb9c9f to 1
```

Here is a good practice to check our deployment with a “kubectl describe” command line
We can see information about the image, the replicaset and the environment variables that we created.

Information about our mongo service

```
juliencohen@juliens-MacBook-Air dropit % kubectl get svc
NAME              TYPE           CLUSTER-IP      EXTERNAL-IP   PORT(S)           AGE
kubernetes        ClusterIP      10.96.0.1       <none>        443/TCP           13d
mongodb-service   LoadBalancer   10.108.104.10   <pending>     27017:30001/TCP   10m
juliencohen@juliens-MacBook-Air dropit % kubectl descrive svc mongodb-service
error: unknown command "descrive" for "kubectl"

Did you mean this?
        describe
juliencohen@juliens-MacBook-Air dropit % kubectl describe svc mongodb-service
Name:                     mongodb-service
Namespace:                default
Labels:                   <none>
Annotations:              <none>
Selector:                 app=mongodb
Type:                     LoadBalancer
IP Family Policy:         SingleStack
IP Families:              IPv4
IP:                       10.108.104.10
IPs:                      10.108.104.10
Port:                     <unset>  27017/TCP
TargetPort:               27017/TCP
NodePort:                 <unset>  30001/TCP
Endpoints:                172.17.0.3:27017
Session Affinity:         None
External Traffic Policy:  Cluster
Events:                   <none>
```

We can see here on our mongoldb-service that we have a **CLUSTER-IP**
The **EXTERNAL-IP** is set to pending because we are working on a **minikube** environment
on a real environment an **EXTERNAL-IP** will be set.

On the “**kubectl describe**” command output we can see interesting information about the name of the service the IP address, the port, the type of the service.

Information about the pod that has been created by our deployment

```
Start Time:   Wed, 17 Aug 2022 12:32:13 +0300
Labels:       app=mongodb
              pod-template-hash=67dcfb9c9f
Annotations:  <none>
Status:       Running
IP:           172.17.0.3
IPs:
  IP:           172.17.0.3
Controlled By:  ReplicaSet/mongodb-deployment-67dcfb9c9f
Containers:
  mongodb:
    Container ID:   docker://835ffe87e4b6c195fd205b561387a38655d403c764a120abc9c4690e2fe977e9
    Image:          mongo
    Image ID:       docker-pullable://mongo@sha256:4200c3073389d5b303070e53ff8f5e4472efb534340d28599458ccc24f378025
    Port:           27017/TCP
    Host Port:      0/TCP
    State:          Running
      Started:      Wed, 17 Aug 2022 12:32:17 +0300
    Ready:          True
    Restart Count:  0
    Environment:
      MONGO_INITDB_ROOT_USERNAME:  <set to the key 'mongo-root-username' in secret 'mongodb-secret'>  Optional: false
      MONGO_INITDB_ROOT_PASSWORD:  <set to the key 'mongo-root-password' in secret 'mongodb-secret'>  Optional: false
    Mounts:
      /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-dfxkg (ro)
Conditions:
  Type              Status
  Initialized       True
  Ready             True
  ContainersReady   True
  PodScheduled      True
Volumes:
  kube-api-access-dfxkg:
    Type:                    Projected (a volume that contains injected data from multiple sources)
    TokenExpirationSeconds:  3607
    ConfigMapName:           kube-root-ca.crt
    ConfigMapOptional:       <nil>
    DownwardAPI:             true
QoS Class:                   BestEffort
Node-Selectors:              <none>
Tolerations:                 node.kubernetes.io/not-ready:NoExecute op=Exists for 300s
                             node.kubernetes.io/unreachable:NoExecute op=Exists for 300s
Events:
  Type    Reason     Age   From               Message
  ----    ------     ----  ----               -------
  Normal  Scheduled  15m   default-scheduler  Successfully assigned default/mongodb-deployment-67dcfb9c9f-5rdrt to minikube
  Normal  Pulling    15m   kubelet            Pulling image "mongo"
  Normal  Pulled     15m   kubelet            Successfully pulled image "mongo" in 3.510281335s
  Normal  Created    15m   kubelet            Created container mongodb
  Normal  Started    15m   kubelet            Started container mongodb
```

The Events part is interesting here because we can see that the pod has been create, the mongo image has been pulled and the container has been started

B. MongoDB import job

We are going to create a job that will create a pod and execute a mongoimport command line

- Mongo-import.yaml

```
apiVersion: batch/v1
kind: Job
metadata:
  name: mongodb-import
  labels:
    app: mongodb
spec:
  backoffLimit: 5
  activeDeadlineSeconds: 100
  template:
    spec:
      containers:
      - name: mongoimport
        image: mongo
        args:
          - /bin/sh
          - '-c'
          - mongoimport --host mongodb-service -u username -p password --authenticationDatabase admin --type csv -d  sample_airbnb -c listingsAndReviews --headerline --drop /db/listingsAndReviews.csv
        volumeMounts:
          - name: db-volume
            mountPath: /db
      volumes:
        - name: db-volume
          hostPath:
            path: /mnt/vpath
      restartPolicy: OnFailure
~
```

The interesting information here is the mongoimport command line that will import the csv file in the /db folder.
A volume will be created “/db” that will refer to the /mnt/vpath from our minikube node.

Before apply this configuration file we have to create the vpath folder and add our csv file

`minikube cp listingsAndReviews.csv /mnt/vpath/listingAndReviews.csv`

Now that our csv file exist in our Node on /mnt/vpath we can apply the job file

```
juliencohen@juliens-MacBook-Air dropit % kubectl logs mongodb-import-k754f
2022-08-17T10:07:33.308+0000    connected to: mongodb://mongodb-service/
2022-08-17T10:07:33.309+0000    dropping: sample_airbnb.listingsAndReviews
2022-08-17T10:07:35.442+0000    5555 document(s) imported successfully. 0 document(s) failed to import.
```

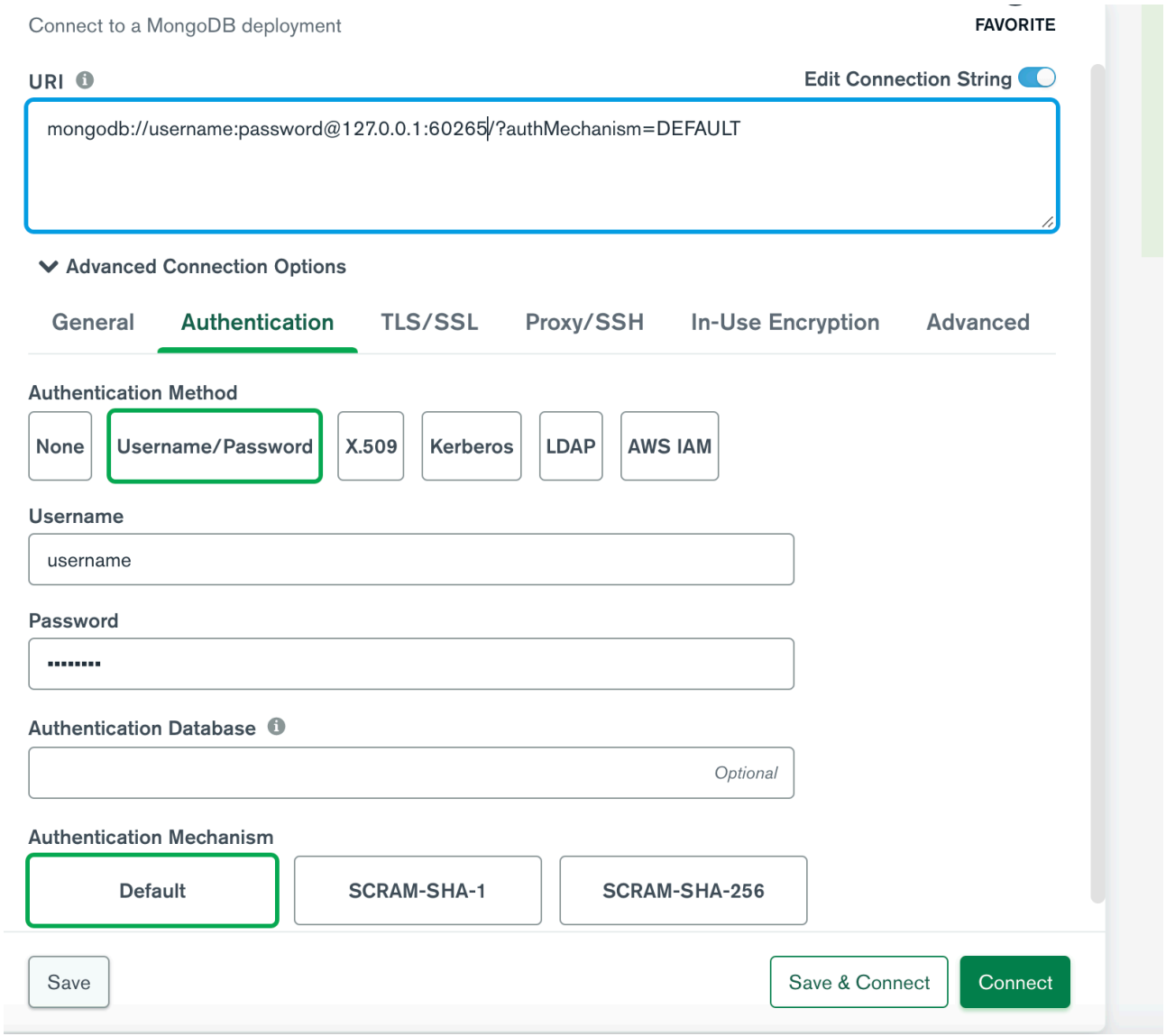
When we are checking the logs of the pod created by the job we can see that 5555 documents have been imported

Lets use mongodb compass for checking that our database has been added successfully

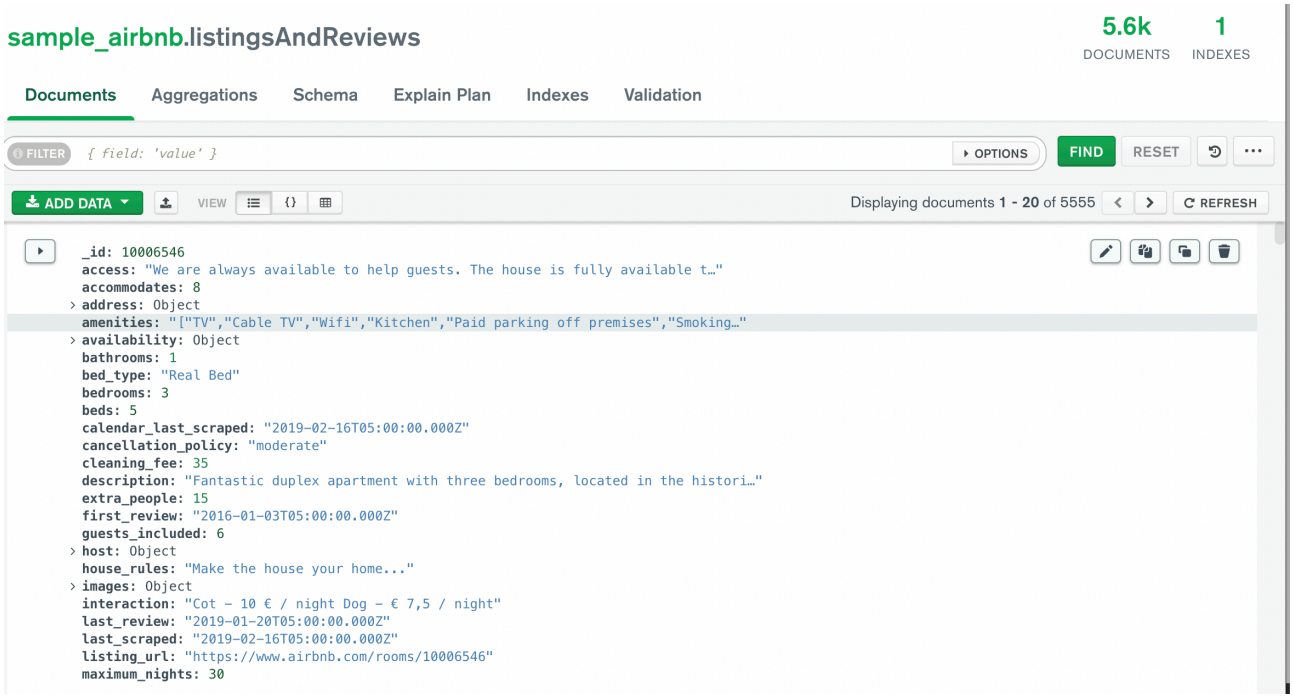
First we create a tunnel for accessing to our mongodb locally

```
juliencohen@juliens-MacBook-Air dropit % minikube service mongodb-service
|-----------|-----------------|-------------|---------------------------|
| NAMESPACE |      NAME       | TARGET PORT |            URL            |
|-----------|-----------------|-------------|---------------------------|
| default   | mongodb-service |       27017 | http://192.168.49.2:30001 |
|-----------|-----------------|-------------|---------------------------|
🏃  Starting tunnel for service mongodb-service.
|-----------|-----------------|-------------|------------------------|
| NAMESPACE |      NAME       | TARGET PORT |          URL           |
|-----------|-----------------|-------------|------------------------|
| default   | mongodb-service |             | http://127.0.0.1:60265 |
|-----------|-----------------|-------------|------------------------|
🎉  Opening service default/mongodb-service in default browser...
❗  Because you are using a Docker driver on darwin, the terminal needs to be open to run it.
```

Then we use the url for connecting on compass



In the picture below we can see that the database exist on our mongodb pod



5. API calls and saving result in CSV

A. Set up the mongodb-express-rest-api-example

The purpose is to do API calls for inserting and listings records.
So only the server part is interesting we will not use the frontend part of the project.

Below the tree of the server folder:

- config.env
- **db/**
  - conn.js
- **node_modules/**
- package-lock.json
- package.json
- **routes/**
  - record.js
- server.js

The config.env file will have important information about the db url and the port

```
ATLAS_URI=mongodb://username:password@mongodb-service/?authMechanism=DEFAULT
PORT=5001
```

The conn.js file will use the connection string url and the connection to the sample_airbnb database

The record.js file define the routes that we will use for inserting a record and to get all the records

The server.js file is the main file for running the nodejs server

Once all the project is configured we are going to build an image with Docker and push it in a docker hub repository

B. Creation of an image for our deployment

In the root of the project we will create a Dockerfile:

```
FROM node

RUN mkdir -p /home/app

COPY . /home/app

WORKDIR /home/app/server

CMD ["node", "server.js"]
~
```

Then we will create a build and push in a docker hub repo

docker build -t mongodb-express:1.0 .
docker tag d98844cf2a2c cohenj55/mongodb-express
docker push cohenj55/mongodb-express

C. Deployment and service express application

- Express-mongo-depl.yaml

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: express-deployment
  labels:
    app: mongodb-express
spec:
  replicas: 1
  selector:
    matchLabels:
      app: mongodb-express
  template:
    metadata:
      labels:
        app: mongodb-express
    spec:
      containers:
      - name: mongodb-express
        image: cohenj55/mongodb-express
        ports:
        - containerPort: 5001
```

So here we can see that we are going to deploy the image that we have created where “cohenj55” is my docker hub username

- Lets have a look now on the express service configuration

```
---
apiVersion: v1
kind: Service
metadata:
  name: mongodb-express-service
spec:
  selector:
    app: mongodb-express
  type: LoadBalancer
  ports:
    - protocol: TCP
      port: 5001
      targetPort: 5001
      nodePort: 30002
~
```

- Information about the pod that has been created by the deployment

```
                        node.kubernetes.io/unreachable:NoExecute op=Exists for 300s
Events:
  Type    Reason     Age    From               Message
  ----    ------     ----   ----               -------
  Normal  Scheduled  2m13s  default-scheduler  Successfully assigned default/express-deployment-6855787d7b-255v9 to minikube
  Normal  Pulling    2m12s  kubelet            Pulling image "cohenj55/mongodb-express"
  Normal  Pulled     2m7s   kubelet            Successfully pulled image "cohenj55/mongodb-express" in 4.913249835s
  Normal  Created    2m7s   kubelet            Created container mongodb-express
  Normal  Started    2m7s   kubelet            Started container mongodb-express
```

So here we can see that the image has been pulled correctly and the container start.

```
juliencohen@juliens-MacBook-Air deploymentAndServices % kubectl logs express-deployment-6855787d7b-255v9
Successfully connected to MongoDB.
Server is running on port: 5001
```

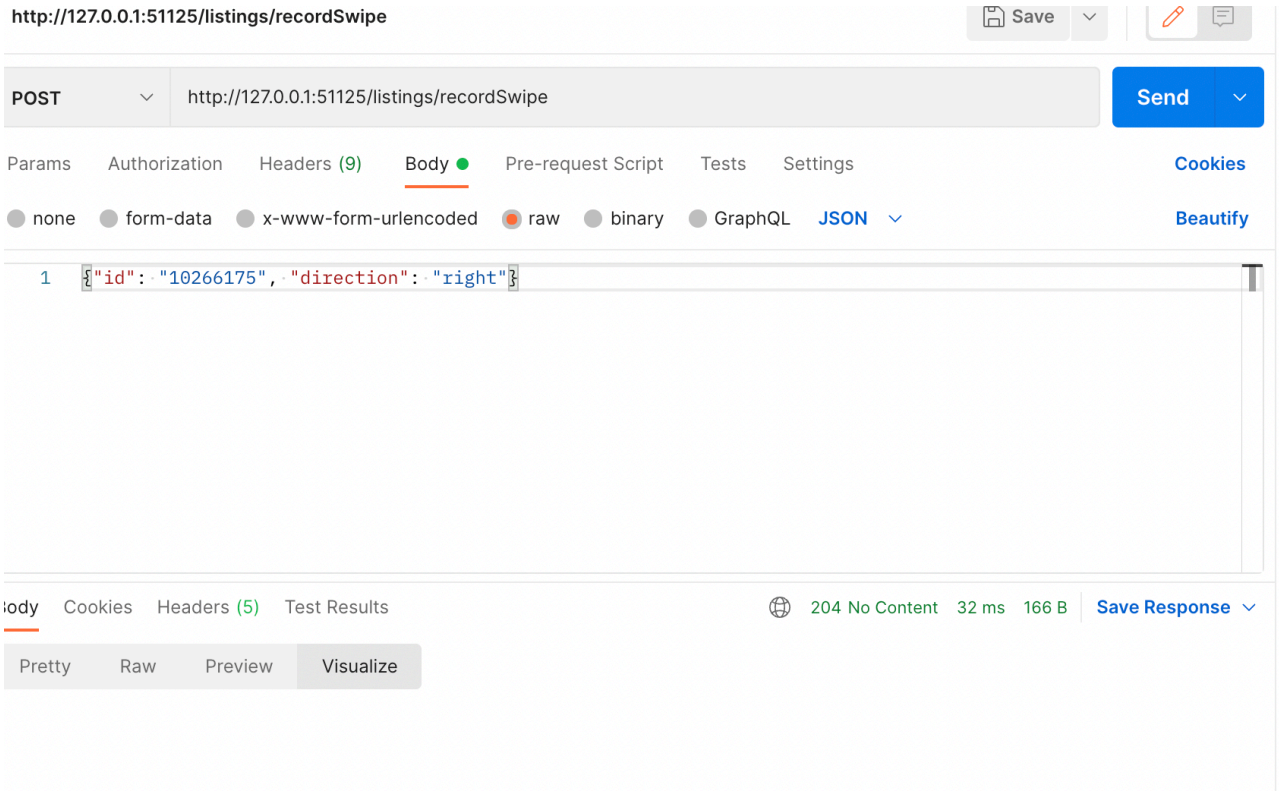
In the picture above we can see that the server is running on the port 5001.

Now we are going to create a tunnel for accessing to our express pod locally

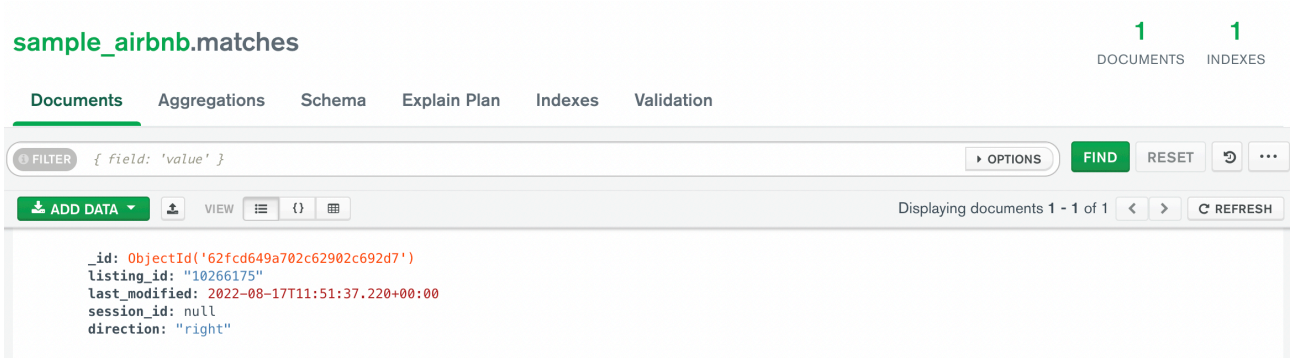
```
juliencohen@juliens-MacBook-Air dropit % minikube service mongodb-express-service
|-----------|--------------------------|-------------|---------------------------|
| NAMESPACE |          NAME            | TARGET PORT |            URL            |
|-----------|--------------------------|-------------|---------------------------|
| default   | mongodb-express-service  |        5001 | http://192.168.49.2:30002 |
|-----------|--------------------------|-------------|---------------------------|
🏃  Starting tunnel for service mongodb-express-service.
|-----------|--------------------------|-------------|------------------------|
| NAMESPACE |          NAME            | TARGET PORT |          URL           |
|-----------|--------------------------|-------------|------------------------|
| default   | mongodb-express-service  |             | http://127.0.0.1:51125 |
|-----------|--------------------------|-------------|------------------------|
🎉  Opening service default/mongodb-express-service in default browser...
❗  Because you are using a Docker driver on darwin, the terminal needs to be open to run it.
```

D. API call - adding records and listings records

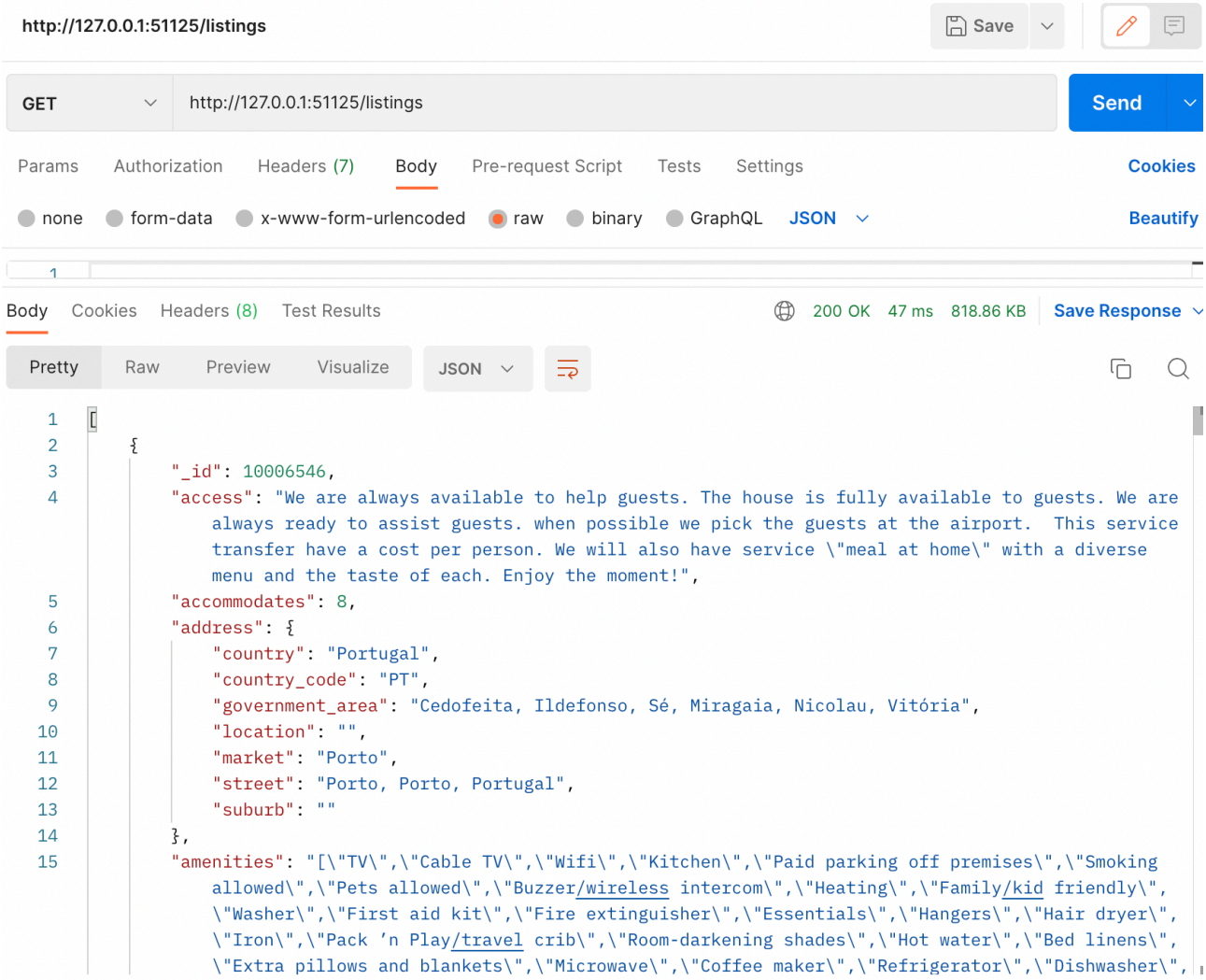
- Postman for adding a new record



- Checking in mongodb compass if a new record has been added



- Postman for listings all records



Now that we added a new record and listed all the records we are going to export it

- Mongo-dump.yaml

```
apiVersion: batch/v1
kind: Job
metadata:
  name: mongodb-dump
  labels:
    app: mongodb
spec:
  backoffLimit: 5
  activeDeadlineSeconds: 100
  template:
    spec:
      containers:
      - name: mongodump
        image: mongo
        args:
          - /bin/sh
          - '-c'
          - mongodump --host mongodb-service -u username -p password --authenticationDatabase admin --db sample_airbnb --out /db
        volumeMounts:
          - name: db-volume
            mountPath: /db
      volumes:
        - name: db-volume
          hostPath:
            path: /mnt/vpath
      restartPolicy: OnFailure
~
~
~
~
```

This job

will create a pod and perform a mongodump and save the export in the /db folder of the pod.
Here we can see that a volume is attached where /mnt/vpath will be the host path
So the db will be saved in the /mnt/vpath of my minikube node.

- logs pod created by the job

```
juliencohen@Juliens-MacBook-Air jobs % kubectl logs mongodb-dump-g2nf7
2022-08-17T13:20:54.128+0000    writing sample_airbnb.listingsAndReviews to /db/sample_airbnb/listingsAndReviews.bson
2022-08-17T13:20:54.130+0000    writing sample_airbnb.matches to /db/sample_airbnb/matches.bson
2022-08-17T13:20:54.131+0000    done dumping sample_airbnb.matches (1 document)
2022-08-17T13:20:54.401+0000    done dumping sample_airbnb.listingsAndReviews (5555 documents)
```

Lets check in minikube if the dump exist in the /mnt/vpath folder

```
docker@minikube:~$ ls -la /mnt/vpath/sample_airbnb/
total 93984
drwxr-xr-x 2 root root     4096 Aug 17 13:20 .
drwxr-xr-x 3 root root     4096 Aug 17 13:20 ..
-rw-r--r-- 1 root root 96215462 Aug 17 13:20 listingsAndReviews.bson
-rw-r--r-- 1 root root      185 Aug 17 13:20 listingsAndReviews.metadata.json
-rw-r--r-- 1 root root      103 Aug 17 13:20 matches.bson
-rw-r--r-- 1 root root      174 Aug 17 13:20 matches.metadata.json
```

So here we can see that the data has been successfully exported

Conclusion

Here we create a node with a mongodb and express pod
The pods can communicate between them for doing the API calls.
We can still improve it with adding an nginx reverse proxy because here the API calls are done directly on the express pod. If we add a reverse proxy server we could add some filtering rules That will be a good practice for avoiding users requesting directly on the express pod.

For the mongoimport and the mongoexport we decide to create a job, but in a production environment it will makes more sense to do a cron job that will backup the database every day for example.