# Mithibai College Department of Computer Science

# M.Sc. (Data Science and AI) Practical 6: Replication using MongoDB

Date:-07/02/2025 Submission Date:- 14/02/2025

## Write-up: -

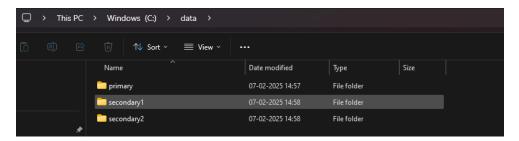
- Replication
- Replication Architecture
- Replication benefits and limitations

# Implement Replication

You are a database administrator for a company, and you need to set up a MongoDB replica set to ensure high availability and data redundancy. Perform the following tasks:

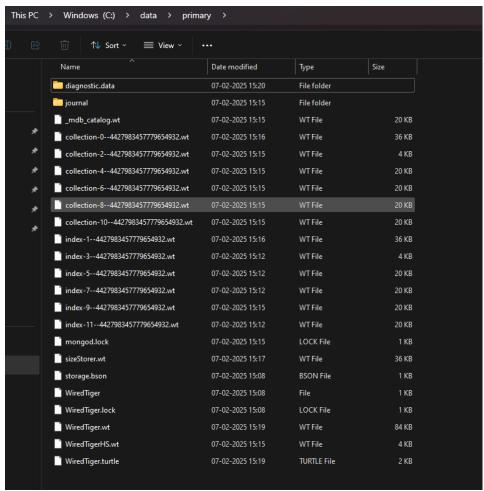
- Initialize a replica set with three nodes on different ports (27017, 27018, 27019).
- Check the status of the replica set.
- Add a new secondary node to the existing replica set.
- Simulate a failover scenario by stepping down the primary and observing the election of a new primary.
- Check replication status and read from a secondary node using readPreference

# Create folders for the respective servers that you want to represent

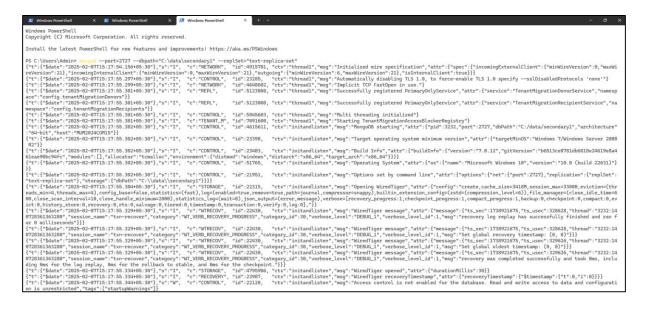


mongod --port=2717 --dbpath="C:\data\primary" --replSet="text-replica-set"





mongod --port=2727 --dbpath="C:\data\secondary1" --replSet="text-replica-set"



mongod --port=2737 --dbpath="C:\data\secondary2" --replSet="text-replica-set"

## Initialization of primary server and adding secondary members to it

mongosh --host="localhost:2717"

```
Windows PowerShell

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PS C:\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Users\Use
```

## rs.initiate();

```
test> rs.initiate();
{
  info2: 'no configuration specified. Using a default configuration for the set',
  me: 'localhost:2717',
  ok: 1
}
text-replica-set [direct: other] test> |
```

## rs.add({host:"localhost:2727"});

# rs.add({host:"localhost:2737"});

#### rs.status();

```
text-replica-set [direct: primary] test> rs.status();
  set: 'text-replica-set',
date: ISODate('2025-02-07T10:01:02.992Z'),
  myState: 1,
  term: Long('1'),
   syncSourceHost:
   syncSourceId: -1
  heartbeatIntervalMillis: Long('2000'),
  majorityVoteCount: 2,
  writeMajorityCount: 2
  votingMembersCount: 3
  writableVotingMembersCount: 3,
     ptimes: {
    lastCommittedOpTime: { ts: Timestamp({ t: 1738922458, i: 1 }), t: Long('1') },
    lastCommittedWallTime: ISODate('2025-02-07T10:00:58.632Z'),
    readConcernMajorityOpTime: { ts: Timestamp({ t: 1738922458, i: 1 }), t: Long('1') },
    appliedOpTime: { ts: Timestamp({ t: 1738922458, i: 1 }), t: Long('1') },
    durableOpTime: { ts: Timestamp({ t: 1738922458, i: 1 }), t: Long('1') },
    lastAppliedWallTime: ISODate('2025-02-07T10:00:58.632Z'),
    lastDurableWallTime: ISODate('2025-02-07T10:00:58.632Z')
   lastStableRecoveryTimestamp: Timestamp({ t: 1738922399, i: 1 }),
  electionCandidateMetrics: {
      lastElectionReason: 'electionTimeout'
      lastElectionDate: ISODate('2025-02-07T09:54:08.920Z'),
      electionTerm: Long('1'),
      lastCommittedOpTimeAtElection: { ts: Timestamp({ t: 1738922048, i: 1 }), t: Long('-1') },
      lastSeenOpTimeAtElection: { ts: Timestamp({ t: 1738922048, i: 1 }), t: Long('-1') },
      numVotesNeeded: 1,
     priorityAtElection: 1,
electionTimeoutMillis: Long('10000'),
newTermStartDate: ISODate('2025-02-07T09:54:08.943Z'),
      wMajorityWriteAvailabilityDate: ISODate('2025-02-07T09:54:08.958Z')
```

```
members: [
     _id: 0,
name: 'localhost:2717',
    name:
    health: 1,
    state: 1,
stateStr: 'PRIMARY',
    uptime: 906,
    optime: { ts: Timestamp({ t: 1738922458, i: 1 }), t: Long('1') },
    optimeDate: ISODate('2025-02-07T10:00:58.000Z'),
    lastAppliedWallTime: ISODate('2025-02-07T10:00:58.632Z'),
    lastDurableWallTime: ISODate('2025-02-07T10:00:58.632Z'),
    syncSourceHost: '',
    syncSourceId: -1,
    infoMessage: ''
    electionTime: Timestamp({ t: 1738922048, i: 2 }),
    electionDate: ISODate('2025-02-07T09:54:08.000Z'),
    configVersion: 5,
    configTerm: 1,
    self: true,
    lastHeartbeatMessage: ''
    _id: 1, name: 'localhost:2727',
    health: 1,
    state: 2,
    stateStr: 'SECONDARY'.
    uptime: 311,
    optime: { ts: Timestamp({ t: 1738922458, i: 1 }), t: Long('1') },
optimeDurable: { ts: Timestamp({ t: 1738922458, i: 1 }), t: Long('1') },
optimeDate: ISODate('2025-02-07T10:00:58.000Z'),
    optimeDurableDate: ISODate('2025-02-07T10:00:58.000Z')
    lastAppliedWallTime: ISODate('2025-02-07T10:00:58.632Z'),
    lastDurableWallTime: ISODate('2025-02-07T10:00:58.632Z'),
    lastHeartbeat: ISODate('2025-02-07T10:01:01.870Z'),
    lastHeartbeatRecv: ISODate('2025-02-07T10:01:01.868Z'),
    pingMs: Long('0'),
    lastHeartbeatMessage: ''
    syncSourceHost: 'localhost:2717',
    syncSourceId: 0,
    infoMessage: ''
    configVersion: 5,
    configTerm: 1
  3,
```

```
_id: 2,
name: 'localhost:2737',
     health: 1,
     state: 2,
     stateStr: 'SECONDARY',
     uptime: 196,
     optime: { ts: Timestamp({ t: 1738922458, i: 1 }), t: Long('1') },
optimeDurable: { ts: Timestamp({ t: 1738922458, i: 1 }), t: Long('1') },
optimeDate: ISODate('2025-02-07T10:00:58.000Z'),
     optimeDurableDate: ISODate('2025-02-07T10:00:58.000Z'),
     lastAppliedWallTime: ISODate('2025-02-07T10:00:58.632Z'), lastDurableWallTime: ISODate('2025-02-07T10:00:58.632Z'),
     lastHeartbeat: ISODate('2025-02-07T10:01:01.869Z')
     lastHeartbeatRecv: ISODate('2025-02-07T10:01:01.835Z'),
     pingMs: Long('0'),
     lastHeartbeatMessage: ''
     syncSourceHost: 'localhost:2727',
     syncSourceId: 1, infoMessage: '',
     configVersion: 5,
     configTerm: 1
  }
1.
ok: 1,
 '$clusterTime': {
  clusterTime: Timestamp({ t: 1738922458, i: 1 }),
  signature: {
     hash: Binary.createFromBase64('AAAAAAAAAAAAAAAAAAAAAAAAAA-', 0),
     keyId: Long('0')
  3
3,
operationTime: Timestamp({ t: 1738922458, i: 1 })
```

## mongosh --host="localhost:2727"

```
indows PowerShell opyright (C) Microsoft Corporation. All rights reserved.
Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows
PS C:\Users\Admin> mongash —host="localhost:2727"
Current Mongosh Log ID: 67a5db9580a21b02b6228fb4
 For mongosh info see: https://docs.mongodb.com/mongodb-shell/
         The server generated these descript marriags when howelves.

2825-02-07715:77:55.34440-63:8 : Access control is not enabled for the database. Read and write access to data and configuration is unrestricted.
2825-02-07715:17:55.3440-63:80: This server is bound to localhost. Remote systems will be unable to connect to this server. Start the server with —bind_ip <a href="https://doi.org/10.1001/journal-pi.el/">https://doi.org/10.1001/journal-pi.el/</a> to specify which IP addresses it should see responses from, or with —bind_ip_all to blind to all interfaces. If this behavior is desired, start the server with —bind_ip_all to blind to all interfaces. If this behavior is desired, start the server with —bind_ip_all to blind to all interfaces. If this behavior is desired, start the server with —bind_ip_all to blind to all interfaces. If this behavior is desired, start the server with —bind_ip_all to blind to all interfaces. If this behavior is desired, start the server with —bind_ip_all to blind to all interfaces. If this behavior is desired, start the server with —bind_ip_all to blind to all interfaces. If this behavior is desired, start the server with —bind_ip_all to blind to all interfaces. If this behavior is desired, start the server with —bind_ip_all to all to blind to all interfaces. If this behavior is desired, start the server with —bind_ip_all to all this saming
```

## mongosh --host="localhost:2737"

```
🗷 Windows Fovershell X 🕷 mongosh mongodity/focalhex X 🕷 mongosh mongodity/focalhex X 🕷 mongosh mongodity/focalhex X 🕷 mongosh mongodity/focalhex X 🕷 windows Fovershell X 🖎 windows Fovershell 
   PS C:\Users\dmin> mongosh —host="localhost:2737"
Current Mongosh Log ID: 67a5db9e2bebc282a9228Fb4
Connecting to: mongosh:/localhost:2737/7directConnection=true&serverSelectUsing MongoB8: 7.0.12
Using MongoBh: 2.2.15
mongosh: 2.3.9 is available for download: https://www.mongodb.com/try/download/shell
   For mongosh info see: https://docs.mongodb.com/mongodb-shell/
          The server generated these startup marnings when booting
2025-02-07115:18:52.613405:303 *coccess control is not enabled for the database. Read and write access to data and configuration is unrestricted
2025-02-07115:18:52.614405:30: This server is bound to localhost. Remote systems will be unable to connect to this server. Start the server with —bind_ip <address> to specify which IP addresses it should s
rve responses from, or with —bind_ip_all to bind to all interfaces. If this behavior is desired, start the server with —bind_ip_127.0.0.1 to disable this marning
text-replica-set [direct: secondary] test>
```

## Now, go to primary instance and type the following command show dbs;

```
text-replica-set [direct: primary] test> show dbs;
       80.00 KiB
admin
config 212.00 KiB
local
       436.00 KiB
text-replica-set [direct: primary] test>
```

# Go to secondary1 and type the same command show dbs;

```
text-replica-set [direct: secondary] test> show dbs;
        80.00 KiB
config 276.00 KiB
local
       404.00 KiB
text-replica-set [direct: secondary] test>
```

# Go to secondary2 instance and type the same command show dbs;

```
text-replica-set [direct: secondary] test> show dbs;
admin
       80.00 KiB
config 276.00 KiB
local
      404.00 KiB
text-replica-set [direct: secondary] test>
```

## Adding a database in primary server and creating a table with a record and using find()

use practice16

```
text-replica-set [direct: primary] test> use practice16 switched to db practice16 text-replica-set [direct: primary] practice16>
```

db.users.insert({"name": "nida", "rollno": "L016"});

```
text-replica-set [direct: primary] practice16> db.users.insert({"name": "nida", "rollno": "L016"});
DeprecationWarning: Collection.insert() is deprecated. Use insertOne, insertMany, or bulkWrite.
{
   acknowledged: true,
   insertedIds: { '0': ObjectId('67a5ddb0c0fc424a84228fb5') }
}
text-replica-set [direct: primary] practice16> |
```

db.users.find();

Now, go to secondary1 server and type the following command

use practice16;
db.users.find();

Now, go to secondary2 server and type the following command

use practice16;
db.users.find();

Now, add more records in primary

db.users.insertMany([{ "name": "firdaus", "rollno": "L007" }, { "name": "sushmita", "rollno": "L032" }, { "name": "aamina", "rollno": "L033" }]);

```
text-replica-set [direct: primary] practice16> db.users.insertMany([
   acknowledged: true,
   insertedIds: {
     '0': ObjectId('67a5dfe8c0fc424a84228fb6'),
     '1': ObjectId('67a5dfe8c0fc424a84228fb7'),
     '2': ObjectId('67a5dfe8c0fc424a84228fb8')
   }
} text-replica-set [direct: primary] practice16>
```

Check if the records are visible in secondary1 and secondary2

## **Update Command in primary server**

db.users.updateOne({name: "nida"}, {\$set:{email: "khannida488@gmail.com"}}); db.users.find({name:"nida"});

```
text-replica-set [direct: primary] practice16> db.users.updateOne({name: "nida"}, {$set:{email: "khannida488@gmail.com"}});
{
    acknowledged: true,
    insertedId: null,
    matchedCount: 1,
    modifiedCount: 1,
    upsertedCount: 0
}
text-replica-set [direct: primary] practice16> db.users.find({name:"nida"});
[
    {
        id: ObjectId('67a5ddb0c0fc424a84228fb5'),
        name: 'nida',
        rollno: 'L016',
        email: 'khannida488@gmail.com'
}
]
text-replica-set [direct: primary] practice16>
```

Check if the update happened in secondary1 and secondary2

#### **Delete command in primary server**

db.users.deleteOne({"name":"sushmita"});
db.users.find();

```
text-replica-set [direct: primary] practice16> db.users.deleteOne({"name":"sushmita"});
{ acknowledged: true, deletedCount: 1 }
text-replica-set [direct: primary] practice16> db.users.find();
 {
   _id: ObjectId('67a5ddb0c0fc424a84228fb5'),
   name: 'nida'
   rollno: 'L016'
   email: 'khannida488@gmail.com'
   _id: ObjectId('67a5dfe8c0fc424a84228fb6'),
   name: 'firdaus',
   rollno: 'L007'
   _id: ObjectId('67a5dfe8c0fc424a84228fb8'),
   name: 'aamina',
   rollno: 'L033'
 }
text-replica-set [direct: primary] practice16>
```

Check if the delete command worked in secondary1 and secondary2

```
text-replica-set [direct: secondary] practice16> db.users.find();
    _id: ObjectId('67a5ddb0c0fc424a84228fb5'),
   name: 'nida',
   rollno: 'L016',
   email: 'khannida488@gmail.com'
    _id: ObjectId('67a5dfe8c0fc424a84228fb8'),
   name: 'aamina',
   rollno: 'L033'
 },
    _id: ObjectId('67a5dfe8c0fc424a84228fb6'),
   name: 'firdaus',
   rollno: 'L007'
 }
text-replica-set [direct: secondary] practice16>
```

```
text-replica-set [direct: secondary] practice16> db.users.find();
    _id: ObjectId('67a5ddb0c0fc424a84228fb5'),
    name: 'nida',
   rollno: 'L016'.
    email: 'khannida488@gmail.com'
  },
    _id: ObjectId('67a5dfe8c0fc424a84228fb8'),
    name: 'aamina',
   rollno: 'L033'
    _id: ObjectId('67a5dfe8c0fc424a84228fb6'),
    name: 'firdaus',
   rollno: 'L007'
text-replica-set [direct: secondary] practice16>
```