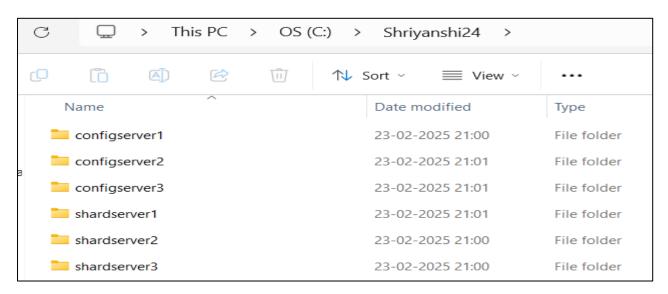# PRACTICAL 7

SHARDING IN MONGODB

You are a database administrator tasked with setting up MongoDB sharding to handle a growing dataset. You need to configure a MongoDB sharded cluster with the following requirements:

· One Config Server (Replica set)

· Two Shard Servers

· One Mongos Router

· Sharding enabled for a database and collection

Create 6 folders in drive**.**

Initialize MongoDB Config Servers

mongod --configsvr --port=1230 --replSet="replica-set1" --dbpath="C:\Shriyanshi24\configserver1"

mongod --configsvr --port=1240 --replSet="replica-set1" --dbpath="C:\Shriyanshi24\configserver2"

mongod --configsvr --port=1250 --replSet="replica-set1" --dbpath="C:\Shriyanshi24\configserver3"

```
C:\Windows\System32>mongod --configsvr --port=1250 --replSet="replica-set1" --dbpath="C:\Shriyanshi24\configserver3"
{"t":{"$date":"2025-02-23T20:35:04.112+05:30"},"s":"I",  "c":"CONTROL",  "id":23285,   "ctx":"-","msg":"Automatically d
sabling TLS 1.0, to force-enable TLS 1.0 specify --sslDisabledProtocols 'none'"}
{"t":{"$date":"2025-02-23T20:35:05.083+05:30"},"s":"I",  "c":"NETWORK",  "id":4915701, "ctx":"thread1","msg":"Initializ
d wire specification","attr":{"spec":{"incomingExternalClient":{"minWireVersion":0,"maxWireVersion":17},"incomingIntern
lClient":{"minWireVersion":0,"maxWireVersion":17},"outgoing":{"minWireVersion":6,"maxWireVersion":17},"isInternalClient
```

Connect using mongosh

mongosh --host="localhost:1230"

```
C:\Windows\System32>mongosh --host="localhost:1230"
Current Mongosh Log ID: 67bb39347f3d892af5fa4213
Connecting to:          mongodb://localhost:1230/?directConnection=
4.0
Using MongoDB:          6.0.3
Using Mongosh:          2.4.0

For mongosh info see: https://www.mongodb.com/docs/mongodb-shell/
```

rs.initiate({

  _id:"replica-set1",

  configsvr:true,

  members:[

    {_id:0, host:"localhost:1230"},

    {_id:1, host:"localhost:1240"},

    {_id:2, host:"localhost:1250"}]})

```
test> rs.initiate({
... _id:"replica-set1",
... configsvr:true,
... members:[
... {_id:0,host:"localhost:1230"},
... {_id:1,host:"localhost:1240"},
... {_id:2,host:"localhost:1250"}
... ]
... })
{ ok: 1, lastCommittedOpTime: Timestamp({ t: 1740323214, i: 1 }) }
```

Configure Shards

mongod --shardsvr --port=1330 --dbpath="C:\Shriyanshi24\shardserver1" --replSet="replica-set2"

```
C:\Windows\System32>mongod --shardsvr --port=1330 --dbpath="C:\Shriyanshi24\shardserver1" --replSet="replica-set2"
{"t":{"$date":"2025-02-23T20:37:15.726+05:30"},"s":"I",  "c":"CONTROL",  "id":23285,   "ctx":"thread1","msg":"Automatic
lly disabling TLS 1.0, to force-enable TLS 1.0 specify --sslDisabledProtocols 'none'"}
{"t":{"$date":"2025-02-23T20:37:15.726+05:30"},"s":"I",  "c":"NETWORK",  "id":4915701, "ctx":"thread1","msg":"Initializ
d wire specification","attr":{"spec":{"incomingExternalClient":{"minWireVersion":0,"maxWireVersion":17},"incomingIntern
lClient":{"minWireVersion":0,"maxWireVersion":17},"outgoing":{"minWireVersion":6,"maxWireVersion":17},"isInternalClient
:true}}}
{"t":{"$date":"2025-02-23T20:37:15.728+05:30"},"s":"I",  "c":"NETWORK",  "id":4648602, "ctx":"thread1","msg":"Implicit
CP FastOpen in use."}
```

mongod --shardsvr --port=1340 --dbpath="C:\Shriyanshi24\shardserver2" --replSet="replica-set2"

```
C:\Windows\System32>mongod --shardsvr --port=1340 --dbpath="C:\Shriyanshi24\shardserver2" --replSet="replica-set2"
{"t":{"$date":"2025-02-23T20:37:45.694+05:30"},"s":"I",  "c":"NETWORK",  "id":4915701, "ctx":"-","msg":"Initialized wire
 specification","attr":{"spec":{"incomingExternalClient":{"minWireVersion":0,"maxWireVersion":17},"incomingInternalClie
":{"minWireVersion":0,"maxWireVersion":17},"outgoing":{"minWireVersion":6,"maxWireVersion":17},"isInternalClient":true}
}
{"t":{"$date":"2025-02-23T20:37:45.698+05:30"},"s":"I",  "c":"CONTROL",  "id":23285,   "ctx":"thread1","msg":"Automatica
lly disabling TLS 1.0, to force-enable TLS 1.0 specify --sslDisabledProtocols 'none'"}
{"t":{"$date":"2025-02-23T20:37:45.699+05:30"},"s":"I",  "c":"NETWORK",  "id":4648602, "ctx":"thread1","msg":"Implicit
CP FastOpen in use."}
```

mongod --shardsvr --port=1350 --dbpath="C:\Shriyanshi24\shardserver3" --replSet="replica-set2"

```
C:\Windows\System32>mongod --shardsvr --port=1350 --dbpath="C:\Shriyanshi24\shardserver3" --replSet="replica-set2"
{"t":{"$date":"2025-02-23T20:38:06.691+05:30"},"s":"I",  "c":"CONTROL",  "id":23285,   "ctx":"-","msg":"Automatically di
sabling TLS 1.0, to force-enable TLS 1.0 specify --sslDisabledProtocols 'none'"}
{"t":{"$date":"2025-02-23T20:38:06.692+05:30"},"s":"I",  "c":"NETWORK",  "id":4915701, "ctx":"-","msg":"Initialized wire
 specification","attr":{"spec":{"incomingExternalClient":{"minWireVersion":0,"maxWireVersion":17},"incomingInternalClie
t":{"minWireVersion":0,"maxWireVersion":17},"outgoing":{"minWireVersion":6,"maxWireVersion":17},"isInternalClient":true}
}}
{"t":{"$date":"2025-02-23T20:38:07.639+05:30"},"s":"I",  "c":"NETWORK",  "id":4648602, "ctx":"thread1","msg":"Implicit
CP FastOpen in use."}
```

Connect using mongosh

mongosh --host="localhost:1330"

```
C:\Windows\System32>mongosh --host="localhost:1330"
Current Mongosh Log ID: 67bb39eac735bd2fd4fa4213
Connecting to:          mongodb://localhost:1330/?directConnection
4.0
Using MongoDB:          6.0.3
Using Mongosh:          2.4.0

For mongosh info see: https://www.mongodb.com/docs/mongodb-shell/

------
```

rs.initiate({

    _id:"replica-set2",

    members: [

        {_id: 0, host: "localhost:1330"},

        {_id: 1, host: "localhost:1340"},

```
{_id: 2, host: "localhost:1350"}]})
```

```
test> rs.initiate({ _id: "replica-set2", members: [ { _id: 0, host: "localhost:1330" }, { _id: 1, host: "localhost:1340"
}, { _id: 2, host: "localhost:1350" }] })
{ ok: 1 }
replica-set2 [direct: secondary] test>
```

Initialize a Query Router which is a mongos process.

mongos --port=1210 --configdb="replica-set1/localhost:1230,localhost:1240,localhost:1250"

```
C:\Windows\System32>mongos --port=1210 --configdb="replica-set1/localhost:1230,localhost:1240,localhost:1250"
{"t":{"$date":"2025-02-23T20:42:43.382+05:30"},"s":"I",  "c":"CONTROL", "id":23285,   "ctx":"-","msg":"Automa
sabling TLS 1.0, to force-enable TLS 1.0 specify --sslDisabledProtocols 'none'"}
{"t":{"$date":"2025-02-23T20:42:44.409+05:30"},"s":"I",  "c":"NETWORK", "id":4915701, "ctx":"thread1","msg":"
d wire specification","attr":{"spec":{"incomingExternalClient":{"minWireVersion":0,"maxWireVersion":17},"incor
lClient":{"minWireVersion":0,"maxWireVersion":17},"outgoing":{"minWireVersion":17,"maxWireVersion":17},"isInte
":true}}}
```

Now, Connect Shards and Query Router

mongosh --host="localhost:1210"

```
C:\Windows\System32>mongosh --host="localhost:1210"
Current Mongosh Log ID: 67bb3b076001c01959fa4213
Connecting to:          mongodb://localhost:1210/?directConnection=t
pName=mongosh+2.4.0
Using MongoDB:          6.0.3
Using Mongosh:          2.4.0

For mongosh info see: https://www.mongodb.com/docs/mongodb-shell/
```

 # Add Shard Replica Set to Sharded Cluster

sh.addShard("replica-set2/localhost:1330,localhost:1340,localhost:1350")

```
[direct: mongos] test> sh.addShard("replica-set2/localhost:1330,localhost:1340,localhost:1350")
{
  shardAdded: 'replica-set2',
  ok: 1,
  '$clusterTime': {
    clusterTime: Timestamp({ t: 1740323722, i: 8 }),
    signature: {
      hash: Binary.createFromBase64('AAAAAAAAAAAAAAAAAAAAAAAAAAA=', 0),
      keyId: Long('0')
    }
  },
  operationTime: Timestamp({ t: 1740323722, i: 8 })
}
```

Enable Sharding on a Specific Database of Shards Replica Set

```
[direct: mongos] test> sh.enableSharding("practice")
{
  ok: 1,
  '$clusterTime': {
    clusterTime: Timestamp({ t: 1740323817, i: 5 }),
    signature: {
      hash: Binary.createFromBase64('AAAAAAAAAAAAAAAAAAAAAAAAAAA=', 0),
      keyId: Long('0')
    }
  },
  operationTime: Timestamp({ t: 1740323817, i: 3 })
}
```

```
[direct: mongos] test> sh.status()
shardingVersion
{ _id: 1, clusterId: ObjectId('67bb3999d36f80453c57dd87') }
---
shards
[
  {
    _id: 'replica-set2',
    host: 'replica-set2/localhost:1330,localhost:1340,localhost:1350',
    state: 1,
    topologyTime: Timestamp({ t: 1740323722, i: 5 })
  }
]
---
active mongoses
[ { '6.0.3': 1 } ]
---
autosplit
{ 'Currently enabled': 'yes' }
---
balancer
{
  'Currently running': 'no',
  'Currently enabled': 'yes',
  'Failed balancer rounds in last 5 attempts': 0,
  'Migration Results for the last 24 hours': 'No recent migrations'
}
---
```

Now connect to the localhost in mongodb compass

And create database and collection and import dummy data

Creating index

```
[direct: mongos] test> show collections

[direct: mongos] test> use demo
switched to db demo
[direct: mongos] demo> show collections
zips
[direct: mongos] demo> db.zips.createIndex({"Origin_population":"hashed"})
Origin_population_hashed
```

demo.zips   319.6k   1
                                                              DOCUMENTS INDEXES

| Documents | Aggregations | Schema | Explain Plan | **Indexes** | Validation |

⟳ Refresh   **Create Index**

Name and Definition	↕	Type	↕	Size	↕	Usage	↕	Properties	↕
⟩ Origin_population_hashed		HASHED ⓘ		2.4 MB		0 (since Sun Feb 23 2025)			
⟩ _id_		REGULAR ⓘ		8.9 MB		3 (since Sun Feb 23 2025)		UNIQUE ⓘ	

```
[direct: mongos] demo> db.zips.createIndex({"Origin_population":"hashed"})
Origin_population_hashed
[direct: mongos] demo> sh.shardCollection("demo.zips",{ Origin_population : "hashed"})
{
  collectionsharded: 'demo.zips',
  ok: 1,
  '$clusterTime': {
    clusterTime: Timestamp({ t: 1740326404, i: 26 }),
    signature: {
      hash: Binary.createFromBase64('AAAAAAAAAAAAAAAAAAAAAAAAAAA=', 0),
      keyId: Long('0')
    }
  },
  operationTime: Timestamp({ t: 1740326404, i: 22 })
}
```

Data is been sharded.

sh.status()

```
{
  database: {
    _id: 'demo',
    primary: 'replica-set2',
    partitioned: false,
    version: {
      uuid: UUID('a2f979b3-9074-42d4-8ce3-e7ebb20b0840'),
      timestamp: Timestamp({ t: 1740324562, i: 1 }),
      lastMod: 1
    }
  },
  collections: {
    'demo.zips': {
      shardKey: { Origin_population: 'hashed' },
      unique: false,
      balancing: true,
      chunkMetadata: [ { shard: 'replica-set2', nChunks: 1 } ],
      chunks: [
        { min: { Origin_population: MinKey() }, max: { Origin_population: MaxKey() }, 'on shard': 're
ica-set2', 'last modified': Timestamp({ t: 1, i: 0 }) }
      ],
      tags: []
    }
  }
},
```