

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.

Name	Date modified	Type
configserver1	23-02-2025 21:00	File folder
configserver2	23-02-2025 21:01	File folder
configserver3	23-02-2025 21:01	File folder
shardserver1	23-02-2025 21:01	File folder
shardserver2	23-02-2025 21:00	File folder
shardserver3	23-02-2025 21:00	File folder

Initialize MongoDB Config Servers

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

```
C:\Windows\System32>mongod --configsvr --port=1230 --replSet="replica-set1" --dbpath="C:\Shriyanshi24\configserver1"
{"t":{"$date":"2025-02-23T21:34:30.943+05:30"},"s":"I", "c":"NETWORK", "id":4915701, "ctx":"-", "msg":"Initialized wire
specification", "attr":{"spec":{"incomingExternalClient":{"minWireVersion":0,"maxWireVersion":17},"incomingInternalClient":{"minWireVersion":0,"maxWireVersion":17},"outgoing":{"minWireVersion":6,"maxWireVersion":17},"isInternalClient":true}}}
{"t":{"$date":"2025-02-23T21:34:30.959+05:30"},"s":"I", "c":"CONTROL", "id":23285, "ctx":"thread1", "msg":"Automatically disabling TLS 1.0, to force-enable TLS 1.0 specify --sslDisabledProtocols 'none'"}
{"t":{"$date":"2025-02-23T21:34:31.980+05:30"},"s":"I", "c":"NETWORK", "id":4648602, "ctx":"thread1", "msg":"Implicit TCP FastOpen in use."}
```

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

```
C:\Windows\System32>mongod --configsvr --port=1240 --replSet="replica-set1" --dbpath="C:\Shriyanshi24\configserver2"
{"t":{"$date":"2025-02-23T20:34:43.192+05:30"},"s":"I", "c":"NETWORK", "id":4915701, "ctx":"thread1", "msg":"Initialize
d wire specification", "attr":{"spec":{"incomingExternalClient":{"minWireVersion":0,"maxWireVersion":17},"incomingInternalClient":{"minWireVersion":0,"maxWireVersion":17},"outgoing":{"minWireVersion":6,"maxWireVersion":17},"isInternalClient":true}}}
{"t":{"$date":"2025-02-23T20:34:43.193+05:30"},"s":"I", "c":"CONTROL", "id":23285, "ctx":"thread1", "msg":"Automatically disabling TLS 1.0, to force-enable TLS 1.0 specify --sslDisabledProtocols 'none'"}
{"t":{"$date":"2025-02-23T20:34:44.163+05:30"},"s":"I", "c":"NETWORK", "id":4648602, "ctx":"thread1", "msg":"Implicit TCP FastOpen in use."}
```

```
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-shriyanshi",
  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":{"$date":"2025-02-23T20:37:15.726+05:30"},"s":"I", "c":"CONTROL", "id":23285, "ctx":"thread1","msg":"Automatically disabling TLS 1.0, to force-enable TLS 1.0 specify --sslDisabledProtocols 'none'"}
{"t":{"$date":"2025-02-23T20:37:15.726+05:30"},"s":"I", "c":"NETWORK", "id":4915701, "ctx":"thread1","msg":"Initialized wire specification","attr":{"spec":{"incomingExternalClient":{"minWireVersion":0,"maxWireVersion":17},"incomingInternalClient":{"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":{"$date":"2025-02-23T20:37:45.694+05:30"},"s":"I", "c":"NETWORK", "id":4915701, "ctx":"-", "msg":"Initialized wire specification","attr":{"spec":{"incomingExternalClient":{"minWireVersion":0,"maxWireVersion":17},"incomingInternalClient":{"minWireVersion":0,"maxWireVersion":17},"outgoing":{"minWireVersion":6,"maxWireVersion":17},"isInternalClient":true}}}
{"t":{"$date":"2025-02-23T20:37:45.698+05:30"},"s":"I", "c":"CONTROL", "id":23285, "ctx":"thread1","msg":"Automatically 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":{"$date":"2025-02-23T20:38:06.691+05:30"},"s":"I", "c":"CONTROL", "id":23285, "ctx":"-", "msg":"Automatically disabling TLS 1.0, to force-enable TLS 1.0 specify --sslDisabledProtocols 'none'"}
{"t":{"$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},"incomingInternalClient":{"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":{"$date":"2025-02-23T20:42:43.382+05:30"},"s":"I", "c":"CONTROL", "id":23285, "ctx":"-", "msg":"Automatically enabling TLS 1.0, to force-enable TLS 1.0 specify --sslDisabledProtocols 'none'"}
{"t":{"$date":"2025-02-23T20:42:44.409+05:30"},"s":"I", "c":"NETWORK", "id":4915701, "ctx":"thread1", "msg":"Received new wire specification", "attr":{"spec":{"incomingExternalClient":{"minWireVersion":0,"maxWireVersion":17},"incomingInternalClient":{"minWireVersion":0,"maxWireVersion":17},"outgoing":{"minWireVersion":17,"maxWireVersion":17},"isInternal":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=true&appName=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('AAAAAAAAAAAAAAAAAAAAAAAAAAAA=', 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('AAAAAAAAAAAAAAAAAAAAAAAAAAAA=', 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

New Connection

Connect to a MongoDB deployment

URI ⓘ

Edit Connection String ☒

mongodb://localhost:1210

> Advanced Connection Options

Save

Save & Connect

Connect

And create database and collection and import dummy data

Create Database

Database Name

demo

Collection Name

zips

> Advanced Collection Options (e.g. Time-Series, Capped, Clustered collections)

Cancel

Create Database

Import

To Collection demo.zips

☒ Passenger ID
String

☒ First Name
String

☒ Last Name
String

10856	Edithe	Leggis
43872	Elwood	Catt
42633	Darby	Felgate
78493	Dominica	Pyle
82072	Bay	Pencost
39630	Lora	Durbann
11940	Rand	Bram
26470	Perceval	Dallosso
29447	Aleda	Pigram
75035	Burlie	Schustl

Importing documents... Stop

63,000 / -95,679

Cancel

Importing...

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

319.6k1

DOCUMENTSINDEXES

DocumentsAggregationsSchemaExplain PlanIndexesValidation

RefreshCreate 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('AAAAAAAAAAAAAAAAAAAAAAAAAAAA=', 0),
      keyId: Long('0')
    }
  },
  operationTime: Timestamp({ t: 1740326404, i: 22 })
}
```

Data is been sharded.

```
{
  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': 'replica-set2', 'last modified': Timestamp({ t: 1, i: 0 }) }
      ],
      tags: []
    }
  }
},
```