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NoSQL – Assignment 2

Create Shard using MongoDB

Config server – {27010,27011,27012}

Shard server – {27020,27021,27022}

Mongos router- 27015

Step 1: start config server

```
C:\Program Files\MongoDB\Server\3.6\bin>mongod --configsvr --replSet asif --port 27010 --dbpath \data\rs1
2019-01-11T09:49:39.127-0700 I CONTROL [initandlisten] MongoDB starting : pid=6328 port=27010 dbpath=\data\rs1 64-bit host=DESKTOP-TCPMOLH
2019-01-11T09:49:39.128-0700 I CONTROL [initandlisten] targetMinOS: Windows 7/Windows Server 2008 R2
2019-01-11T09:49:39.129-0700 I CONTROL [initandlisten] db version v3.6.9
2019-01-11T09:49:39.129-0700 I CONTROL [initandlisten] git version: 167861a164723168adfaaa866f310cb94010428f
2019-01-11T09:49:39.129-0700 I CONTROL [initandlisten] OpenSSL version: OpenSSL 1.0.2o-fips 27 Mar 2018
2019-01-11T09:49:39.129-0700 I CONTROL [initandlisten] allocator: tcmalloc
2019-01-11T09:49:39.129-0700 I CONTROL [initandlisten] modules: none
2019-01-11T09:49:39.129-0700 I CONTROL [initandlisten] build environment:
2019-01-11T09:49:39.129-0700 I CONTROL [initandlisten] distmod: 2008plus-ssl
2019-01-11T09:49:39.130-0700 I CONTROL [initandlisten] distarch: x86_64
2019-01-11T09:49:39.130-0700 I CONTROL [initandlisten] target arch: x86_64
```

```
C:\Program Files\MongoDB\Server\3.6\bin>mongod --configsvr --replSet asif --port 27011 --dbpath \data\rs2
2019-01-11T09:50:12.597-0700 I CONTROL [initandlisten] MongoDB starting : pid=7648 port=27011 dbpath=\data\rs2 64-bit host=DESKTOP-TCPMOLH
2019-01-11T09:50:12.598-0700 I CONTROL [initandlisten] targetMinOS: Windows 7/Windows Server 2008 R2
```

```
C:\Program Files\MongoDB\Server\3.6\bin>mongod --configsvr --replSet asif --port 27012 --dbpath \data\rs3
2019-01-11T09:50:42.007-0700 I CONTROL [initandlisten] MongoDB starting : pid=7744 port=27012 dbpath=\data\rs3 64-bit host=DESKTOP-TCPMOLH
2019-01-11T09:50:42.008-0700 I CONTROL [initandlisten] targetMinOS: Windows 7/Windows Server 2008 R2
```

```
> rs.initiate({_id:"asif",members:[{_id:0,host:"localhost:27010"},{_id:1,host:"localhost:27011"},{_id:2,host:"localhost:27012"}]})
{
  "ok" : 1,
  "operationTime" : Timestamp(1547225544, 1),
  "$gleStats" : {
    "lastOpTime" : Timestamp(1547225544, 1),
    "electionId" : ObjectId("000000000000000000000000")
  },
  "$clusterTime" : {
    "clusterTime" : Timestamp(1547225544, 1),
    "signature" : {
      "hash" : BinData(0,"AAAAAAAAAAAAAAAAAAAAAAAA"),
      "keyId" : NumberLong(0)
    }
  }
}
```

Step 2: start shard server one by one

```
C:\Program Files\MongoDB\Server\3.6\bin>mongod --shardsvr --replSet srd1 --port 27020 --dbpath \data\rs4
2019-01-11T09:53:17.750-0700 I CONTROL [initandlisten] MongoDB starting : pid=7516 port=27020 dbpath=\data\rs4 64-bit host=DESKTOP-TCPMOLH
2019-01-11T09:53:17.750-0700 I CONTROL [initandlisten] targetMinOS: Windows 7/Windows Server 2008 R2
2019-01-11T09:53:17.750-0700 I CONTROL [initandlisten] db version v3.6.9
2019-01-11T09:53:17.751-0700 I CONTROL [initandlisten] git version: 167861a164723168adfaaa866f310cb94010428f
2019-01-11T09:53:17.751-0700 I CONTROL [initandlisten] OpenSSL version: OpenSSL 1.0.2o-fips 27 Mar 2018
2019-01-11T09:53:17.751-0700 I CONTROL [initandlisten] allocator: tcmalloc
2019-01-11T09:53:17.751-0700 I CONTROL [initandlisten] modules: none
2019-01-11T09:53:17.751-0700 I CONTROL [initandlisten] build environment:
2019-01-11T09:53:17.751-0700 I CONTROL [initandlisten] distmod: 2008plus-ssl
2019-01-11T09:53:17.751-0700 I CONTROL [initandlisten] distarch: x86_64
2019-01-11T09:53:17.751-0700 I CONTROL [initandlisten] target arch: x86_64
```

```
C:\Program Files\MongoDB\Server\3.6\bin>mongod --shardsvr --replSet srd1 --port 27021 --dbpath \data\rs5
2019-01-11T09:53:53.840-0700 I CONTROL [initandlisten] MongoDB starting : pid=9516 port=27021 dbpath=\data\rs5 64-bit host=DESKTOP-TCPMOLH
2019-01-11T09:53:53.840-0700 I CONTROL [initandlisten] targetMinOS: Windows 7/Windows Server 2008 R2
2019-01-11T09:53:53.841-0700 I CONTROL [initandlisten] db version v3.6.9
```

```
C:\Program Files\MongoDB\Server\3.6\bin>mongod --shardsvr --port 27022 --replSet srd1 --dbpath \data\rs6
2019-01-11T09:54:33.257-0700 I CONTROL [initandlisten] MongoDB starting : pid=9504 port=27022 dbpath=\data\rs6 64-bit host=DESKTOP-TCPMOLH
2019-01-11T09:54:33.257-0700 I CONTROL [initandlisten] targetMinOS: Windows 7/Windows Server 2008 R2
2019-01-11T09:54:33.258-0700 I CONTROL [initandlisten] db version v3.6.9
```

```
> rs.initiate({_id:"srd1",members:[{_id:0,host:"localhost:27020"},{_id:1,host:"localhost:27021"},{_id:2,host:"localhost:27022"}]})
{ "ok" : 1 }
srd1:OTHER> exit
bye
```

Step 3: Start the mongos instance by specifying the configuration server

```
C:\Program Files\MongoDB\Server\3.6\bin>mongos --configdb asif/localhost:27010,localhost:27011,localhost:27012 --port 27015
2019-01-11T09:56:31.346-0700 I CONTROL [main]
2019-01-11T09:56:31.346-0700 I CONTROL [main] ** WARNING: Access control is not enabled for the database.
2019-01-11T09:56:31.348-0700 I CONTROL [main] ** Read and write access to data and configuration is unrestricted.
2019-01-11T09:56:31.350-0700 I CONTROL [main]
2019-01-11T09:56:31.350-0700 I CONTROL [main] ** WARNING: This server is bound to localhost.
2019-01-11T09:56:31.351-0700 I CONTROL [main] ** Remote systems will be unable to connect to this server.
2019-01-11T09:56:31.352-0700 I CONTROL [main] ** Start the server with --bind_ip <address> to specify which IP
2019-01-11T09:56:31.352-0700 I CONTROL [main] ** addresses it should serve responses from, or with --bind_ip_all to
2019-01-11T09:56:31.353-0700 I CONTROL [main] ** bind to all interfaces. If this behavior is desired, start the
2019-01-11T09:56:31.353-0700 I CONTROL [main] ** server with --bind_ip 127.0.0.1 to disable this warning.
```

Step 4: use shell to connect mongos and if we have Server A and Server B which needs to be added to the cluster, issue the below commands

```
C:\Program Files\MongoDB\Server\3.6\bin>mongo --port 27015
MongoDB shell version v3.6.9
connecting to: mongod://127.0.0.1:27015/
Implicit session: session { "id" : UUID("4ca0ebe0-1a06-49e6-95d2-1da43b5d981a") }
MongoDB server version: 3.6.9
Server has startup warnings:
2019-01-11T09:56:31.346-0700 I CONTROL [main]
2019-01-11T09:56:31.346-0700 I CONTROL [main] ** WARNING: Access control is not enabled for the database.
2019-01-11T09:56:31.348-0700 I CONTROL [main] ** Read and write access to data and configuration is unrestricted.
2019-01-11T09:56:31.350-0700 I CONTROL [main]
2019-01-11T09:56:31.350-0700 I CONTROL [main] ** WARNING: This server is bound to localhost.
2019-01-11T09:56:31.351-0700 I CONTROL [main] ** Remote systems will be unable to connect to this server.
2019-01-11T09:56:31.352-0700 I CONTROL [main] ** Start the server with --bind_ip <address> to specify which IP
2019-01-11T09:56:31.352-0700 I CONTROL [main] ** addresses it should serve responses from, or with --bind_ip_all to
2019-01-11T09:56:31.353-0700 I CONTROL [main] ** bind to all interfaces. If this behavior is desired, start the
2019-01-11T09:56:31.353-0700 I CONTROL [main] ** server with --bind_ip 127.0.0.1 to disable this warning.
2019-01-11T09:56:31.354-0700 I CONTROL [main]
mongos> sh.addShard("srd1/localhost:27020");
{
  "shardAdded" : "srd1",
  "ok" : 1,
  "operationTime" : Timestamp(1547225835, 1),
  "$clusterTime" : {
    "clusterTime" : Timestamp(1547225835, 1),
    "signature" : {
      "hash" : BinData(0,"AAAAAAAAAAAAAAAAAAAAAAAAAAAA="),
      "keyId" : NumberLong(0)
    }
  }
}
mongos> sh.addShard("srd1/localhost:27021");
{
  "shardAdded" : "srd1",
  "ok" : 1,
  "operationTime" : Timestamp(1547225836, 1),
  "$clusterTime" : {
    "clusterTime" : Timestamp(1547225836, 1),
    "signature" : {
      "hash" : BinData(0,"AAAAAAAAAAAAAAAAAAAAAAAAAAAA="),
      "keyId" : NumberLong(0)
    }
  }
}
mongos> sh.addShard("srd1/localhost:27022");
```

Step 5: Import airport data in database

```
C:\Program Files\MongoDB\Server\3.6\bin>mongoimport -d db -c airports --type csv --file book2.csv --headerline --port 27015
2019-01-11T22:58:51.601+0530 connected to: localhost:27015
2019-01-11T22:58:53.563+0530 [...] db.airports 100KB/4.67MB (2.1%)
2019-01-11T22:58:56.562+0530 [#.....] db.airports 288KB/4.67MB (6.0%)
2019-01-11T22:58:59.564+0530 [#####] db.airports 476KB/4.67MB (10.0%)
2019-01-11T22:59:02.562+0530 [#####] db.airports 1.11MB/4.67MB (23.8%)
2019-01-11T22:59:05.563+0530 [#####] db.airports 1.80MB/4.67MB (38.7%)
2019-01-11T22:59:08.563+0530 [#####] db.airports 2.60MB/4.67MB (55.7%)
2019-01-11T22:59:11.562+0530 [#####] db.airports 3.45MB/4.67MB (73.9%)
2019-01-11T22:59:14.562+0530 [#####] db.airports 4.21MB/4.67MB (90.1%)
2019-01-11T22:59:17.562+0530 [#####] db.airports 4.67MB/4.67MB (100.0%)
2019-01-11T22:59:17.954+0530 [#####] db.airports 4.67MB/4.67MB (100.0%)
2019-01-11T22:59:17.954+0530 imported 50000 documents
```

Step 6: Enable sharding for the database. So, if we need to shard the airport database, issue the below command

```
mongos> sh.enableSharding("db");
{
  "ok" : 1,
  "operationTime" : Timestamp(1547227899, 5),
  "$clusterTime" : {
    "clusterTime" : Timestamp(1547227899, 5),
    "signature" : {
      "hash" : BinData(0,"AAAAAAAAAAAAAAAAAAAAAAAAAAAA="),
      "keyId" : NumberLong(0)
    }
  }
}
```

```
mongos> db.airports.createIndex({"ArrTime":1});
{
  "raw" : {
    "srd1/localhost:27020,localhost:27021,localhost:27022" : {
      "createdCollectionAutomatically" : false,
      "numIndexesBefore" : 1,
      "numIndexesAfter" : 2,
      "ok" : 1
    }
  },
  "ok" : 1,
  "operationTime" : Timestamp(1547229256, 2),
  "$clusterTime" : {
    "clusterTime" : Timestamp(1547229256, 2),
    "signature" : {
      "hash" : BinData(0,"AAAAAAAAAAAAAAAAAAAAAAAAAAAA="),
      "keyId" : NumberLong(0)
    }
  }
}
mongos> sh.shardCollection("db.airports",{"ArrTime":1})
{
  "collectionsharded" : "db.airports",
  "collectionUUID" : UUID("38db5a88-04c7-4ac5-a2f3-eeef85f335f8b"),
  "ok" : 1,
  "operationTime" : Timestamp(1547229274, 7),
  "$clusterTime" : {
    "clusterTime" : Timestamp(1547229274, 7),
    "signature" : {
      "hash" : BinData(0,"AAAAAAAAAAAAAAAAAAAAAAAAAAAA="),
      "keyId" : NumberLong(0)
    }
  }
}
```

1) updateOne() :

load.js

```
var before=new Date()
```

```
db.airports.updateOne({"DepTime":556},{ $set: {"Dest":"USA"} }).explain("executionStats")
```

```
var after=new Date()
```

```
exec_time=after-before
```

```
print(exec_time+"ms")
```

```
mongos> load("time.js")
1014ms
true
mongos>
```

2) updateMany() :

```
db.airports.updateMany({"DepTime":556}, { $set: { UniqueCarrier: "YZ" } })
```

```
mongos> db.airports.updateMany({"DepTime":556}, { $set: { UniqueCarrier: "YZ" } })
{ "acknowledged" : true, "matchedCount" : 11, "modifiedCount" : 11 }
mongos> load("time.js")
2ms
true
mongos>
```

3) find()

a) lte

```
db.airports.find({"DepTime":{$lte:556}}).explain('executionStats')
```

```
mongos> db.airports.find({"DepTime":{$lte:556}})
{ "_id" : ObjectId("5c38d25f801cc3d58b1c4f7b"), "Year" : 2008, "Month" : 1, "DayOfMonth" : 3, "DayOfWeek" : 4, "DepTime" : 555, "CRSDepTime" : 600, "ArrTime" : 1001, "CRSArrTime" : 1015, "UniqueCarrier" : "WN", "FlightNum" : 2813, "TailNum" : "N761RR", "ActualElapsedTime" : 186, "CRSElapsedTime" : 195, "AirTime" : 172, "ArrDelay" : -14, "DepDelay" : -5, "Origin" : "PHX", "Dest" : "MDW", "Distance" : 1444, "TaxiIn" : 5, "TaxiOut" : 9, "Cancelled" : 0, "CancellationCode" : "", "Diverted" : 0, "CarrierDelay" : "NA", "WeatherDelay" : "NA", "NASDelay" : "NA", "SecurityDelay" : "NA", "LateAircraftDelay" : "NA" }
{ "_id" : ObjectId("5c38d25f801cc3d58b1c4f7b"), "Year" : 2008, "Month" : 1, "DayOfMonth" : 5, "DayOfWeek" : 6, "DepTime" : 47, "CRSDepTime" : 2040, "ArrTime" : 151, "CRSArrTime" : 2145, "UniqueCarrier" : "WN", "FlightNum" : 505, "TailNum" : "N435WN", "ActualElapsedTime" : 64, "CRSElapsedTime" : 65, "AirTime" : 51, "ArrDelay" : 246, "DepDelay" : 247, "Origin" : "BWI", "Dest" : "PVD", "Distance" : 328, "TaxiIn" : 5, "TaxiOut" : 8, "Cancelled" : 0, "CancellationCode" : "", "Diverted" : 0, "CarrierDelay" : 3, "WeatherDelay" : 0, "NASDelay" : 0, "SecurityDelay" : 0, "LateAircraftDelay" : 243 }
{ "_id" : ObjectId("5c38d25f801cc3d58b1c4f7b"), "Year" : 2008, "Month" : 1, "DayOfMonth" : 6, "DayOfWeek" : 7, "DepTime" : 22, "CRSDepTime" : 2040, "ArrTime" : 241, "CRSArrTime" : 2300, "UniqueCarrier" : "WN", "FlightNum" : 3939, "TailNum" : "N658SW", "ActualElapsedTime" : 79, "CRSElapsedTime" : 80, "AirTime" : 54, "ArrDelay" : 221, "DepDelay" : 222, "Origin" : "LAX", "Dest" : "TUS", "Distance" : 451, "TaxiIn" : 3, "TaxiOut" : 22, "Cancelled" : 0, "CancellationCode" : "", "Diverted" : 0, "CarrierDelay" : 0, "WeatherDelay" : 0, "NASDelay" : 0, "SecurityDelay" : 0, "LateAircraftDelay" : 221 }
{ "_id" : ObjectId("5c38d25f801cc3d58b1c4f7b"), "Year" : 2008, "Month" : 1, "DayOfMonth" : 7, "DayOfWeek" : 1, "DepTime" : 553, "CRSDepTime" : 600, "ArrTime" : 755, "CRSArrTime" : 820, "UniqueCarrier" : "WN", "FlightNum" : 1832, "TailNum" : "N427WN", "ActualElapsedTime" : 122, "CRSElapsedTime" : 140, "AirTime" : 108, "ArrDelay" : -25, "DepDelay" : -7, "Origin" : "BWI", "Dest" : "MDW", "Distance" : 787, "TaxiIn" : 6, "TaxiOut" : 8, "Cancelled" : 0, "CancellationCode" : "", "Diverted" : 0, "CarrierDelay" : "NA", "WeatherDelay" : "NA", "NASDelay" : "NA", "SecurityDelay" : "NA", "LateAircraftDelay" : "NA" }
{ "_id" : ObjectId("5c38d25f801cc3d58b1c4f7b"), "Year" : 2008, "Month" : 1, "DayOfMonth" : 7, "DayOfWeek" : 1, "DepTime" : 110, "CRSDepTime" : 2125, "ArrTime" : 220, "CRSArrTime" : 2235, "UniqueCarrier" : "WN", "FlightNum" : 727, "TailNum" : "N683SW", "ActualElapsedTime" : 70, "CRSElapsedTime" : 70, "AirTime" : 57, "ArrDelay" : 225, "DepDelay" : 225, "Origin" : "MCI", "Dest" : "OKC", "Distance" : 313, "TaxiIn" : 4, "TaxiOut" : 9, "Cancelled" : 0, "CancellationCode" : "", "Diverted" : 0, "CarrierDelay" : 0, "WeatherDelay" : 0, "NASDelay" : 0, "SecurityDelay" : 0, "LateAircraftDelay" : 225 }
{ "_id" : ObjectId("5c38d25f801cc3d58b1c4f7b"), "Year" : 2008, "Month" : 1, "DayOfMonth" : 7, "DayOfWeek" : 1, "DepTime" : 22, "CRSDepTime" : 2110, "ArrTime" : 142, "CRSArrTime" : 2225, "UniqueCarrier" : "WN", "FlightNum" : 1973, "TailNum" : "N693SW", "ActualElapsedTime" : 80, "CRSElapsedTime" : 75, "AirTime" : 61, "ArrDelay" : 197, "DepDelay" : 192, "Origin" : "MDW", "Dest" : "BNA", "Distance" : 395, "TaxiIn" : 8, "TaxiOut" : 11, "Cancelled" : 0, "CancellationCode" : "", "Diverted" : 0, "CarrierDelay" : 0, "WeatherDelay" : 5, "NASDelay" : 5, "SecurityDelay" : 0, "LateAircraftDelay" : 187 }
{ "_id" : ObjectId("5c38d25f801cc3d58b1c4f7b"), "Year" : 2008, "Month" : 1, "DayOfMonth" : 7, "DayOfWeek" : 1, "DepTime" : 41, "CRSDepTime" : 2135, "ArrTime" : 320, "CRSArrTime" : 25, "UniqueCarrier" : "WN", "FlightNum" : 3927, "TailNum" : "N621SW", "ActualElapsedTime" : 99, "CRSElapsedTime" : 110, "AirTime" : 81, "ArrDelay" : 175, "DepDelay" : 186, "Origin" : "MDW", "Dest" : "PHL", "Distance" : 668, "TaxiIn" : 7, "TaxiOut" : 11, "Cancelled" : 0, "CancellationCode" : "", "Diverted" : 0, "CarrierDelay" : 175, "WeatherDelay" : 0, "NASDelay" : 0, "SecurityDelay" : 0, "LateAircraftDelay" : 0 }
```



```

mongos> db.airports.find({"DepTime":{"$lte:556}}).explain('executionStats')
{
  "queryPlanner" : {
    "mongosPlannerVersion" : 1,
    "winningPlan" : {
      "stage" : "SINGLE_SHARD",
      "shards" : [
        {
          "shardName" : "srd1",
          "connectionString" : "srd1/localhost:27020,localhost:27021,localhost:27022",
          "serverInfo" : {
            "host" : "DESKTOP-TCPMOLH",
            "port" : 27021,
            "version" : "3.6.9",
            "gitVersion" : "167861a164723168adfaaa866f310cb94010428f"
          },
          "plannerVersion" : 1,
          "namespace" : "db.airports",
          "indexFilterSet" : false,
          "parsedQuery" : {
            "DepTime" : {
              "$lte" : 556
            }
          },
          "winningPlan" : {
            "stage" : "SHARDING_FILTER",
            "inputStage" : {
              "stage" : "COLLSCAN",
              "filter" : {
                "DepTime" : {
                  "$lte" : 556
                }
              },
              "direction" : "forward"
            },
            "rejectedPlans" : [ ]
          }
        }
      ]
    },
    "executionStats" : {
      "nReturned" : 26,
      "executionTimeMillis" : 1131,
      "totalKeysExamined" : 0,
      "totalDocsExamined" : 50000,
      "executionStages" : {
        "stage" : "SINGLE_SHARD",
        "nReturned" : 26,

```

b) gte

db.airports.find({"DepTime":{"\$gte:556}}).explain('executionStats')

```

mongos> db.airports.find({"DepTime":{"$gte:556}})
{ "_id" : ObjectId("5c38d253801cc3d58e1caa64"), "Year" : 2008, "Month" : 1, "DayOfMonth" : 3, "DayOfWeek" : 4, "DepTime" : 706, "CRSDepTime" : 705, "ArrTime" : 807, "CRSArrTime" : 810, "UniqueCarrier" : "WN", "FlightNum" : 68, "TailNum" : "N497WN", "ActualElapsedTime" : 61, "CRSElapsedTime" : 65, "AirTime" : 51, "ArrDelay" : -3, "DepDelay" : 1, "Origin" : "ISP", "Dest" : "BWI", "Distance" : 220, "TaxiIn" : 3, "TaxiOut" : 7, "Cancelled" : 0, "CancellationCode" : "", "Diverted" : 0, "CarrierDelay" : "NA", "WeatherDelay" : "NA", "NASDelay" : "NA", "SecurityDelay" : "NA", "LateAircraftDelay" : "NA" }
{ "_id" : ObjectId("5c38d253801cc3d58e1caa59"), "Year" : 2008, "Month" : 1, "DayOfMonth" : 3, "DayOfWeek" : 4, "DepTime" : 1620, "CRSDepTime" : 1620, "ArrTime" : 1639, "CRSArrTime" : 1655, "UniqueCarrier" : "WN", "FlightNum" : 810, "TailNum" : "N648SW", "ActualElapsedTime" : 79, "CRSElapsedTime" : 95, "AirTime" : 70, "ArrDelay" : -16, "DepDelay" : 0, "Origin" : "IND", "Dest" : "MCI", "Distance" : 451, "TaxiIn" : 3, "TaxiOut" : 6, "Cancelled" : 0, "CancellationCode" : "", "Diverted" : 0, "CarrierDelay" : "NA", "WeatherDelay" : "NA", "NASDelay" : "NA", "SecurityDelay" : "NA", "LateAircraftDelay" : "NA" }
{ "_id" : ObjectId("5c38d253801cc3d58e1caa5c"), "Year" : 2008, "Month" : 1, "DayOfMonth" : 3, "DayOfWeek" : 4, "DepTime" : 1426, "CRSDepTime" : 1430, "ArrTime" : 1426, "CRSArrTime" : 1425, "UniqueCarrier" : "WN", "FlightNum" : 829, "TailNum" : "N476WN", "ActualElapsedTime" : 60, "CRSElapsedTime" : 55, "AirTime" : 39, "ArrDelay" : 1, "DepDelay" : -4, "Origin" : "IND", "Dest" : "MDW", "Distance" : 162, "TaxiIn" : 9, "TaxiOut" : 12, "Cancelled" : 0, "CancellationCode" : "", "Diverted" : 0, "CarrierDelay" : "NA", "WeatherDelay" : "NA", "NASDelay" : "NA", "SecurityDelay" : "NA", "LateAircraftDelay" : "NA" }
{ "_id" : ObjectId("5c38d253801cc3d58e1caa6f"), "Year" : 2008, "Month" : 1, "DayOfMonth" : 3, "DayOfWeek" : 4, "DepTime" : 1008, "CRSDepTime" : 1005, "ArrTime" : 1234, "CRSArrTime" : 1255, "UniqueCarrier" : "WN", "FlightNum" : 543, "TailNum" : "N736SA", "ActualElapsedTime" : 146, "CRSElapsedTime" : 170, "AirTime" : 135, "ArrDelay" : -21, "DepDelay" : 3, "Origin" : "ISP", "Dest" : "MDW", "Distance" : 972, "TaxiIn" : 5, "TaxiOut" : 6, "Cancelled" : 0, "CancellationCode" : "", "Diverted" : 0, "CarrierDelay" : "NA", "WeatherDelay" : "NA", "NASDelay" : "NA", "SecurityDelay" : "NA", "LateAircraftDelay" : "NA" }
{ "_id" : ObjectId("5c38d253801cc3d58e1caa6a"), "Year" : 2008, "Month" : 1, "DayOfMonth" : 3, "DayOfWeek" : 4, "DepTime" : 1422, "CRSDepTime" : 1255, "ArrTime" : 1657, "CRSArrTime" : 1610, "UniqueCarrier" : "WN", "FlightNum" : 188, "TailNum" : "N215WN", "ActualElapsedTime" : 155, "CRSElapsedTime" : 195, "AirTime" : 143, "ArrDelay" : 47, "DepDelay" : 87, "Origin" : "ISP", "Dest" : "FLL", "Distance" : 1093, "TaxiIn" : 6, "TaxiOut" : 6, "Cancelled" : 0, "CancellationCode" : "", "Diverted" : 0, "CarrierDelay" : 40, "WeatherDelay" : 0, "NASDelay" : 0, "SecurityDelay" : 0, "LateAircraftDelay" : 7 }
{ "_id" : ObjectId("5c38d253801cc3d58e1caa6b"), "Year" : 2008, "Month" : 1, "DayOfMonth" : 3, "DayOfWeek" : 4, "DepTime" : 1954, "CRSDepTime" : 1925, "ArrTime" : 2230, "CRSArrTime" : 2235, "UniqueCarrier" : "WN", "FlightNum" : 1754, "TailNum" : "N243WN", "ActualElapsedTime" : 165, "CRSElapsedTime" : 190, "AirTime" : 155, "ArrDelay" : 4, "DepDelay" : 29, "Origin" : "ISP", "Dest" : "FLL", "Distance" : 1093, "TaxiIn" : 3, "TaxiOut" : 7, "Cancelled" : 0, "CancellationCode" : "", "Diverted" : 0, "CarrierDelay" : "NA", "WeatherDelay" : "NA", "NASDelay" : "NA", "SecurityDelay" : "NA", "LateAircraftDelay" : "NA" }
{ "_id" : ObjectId("5c38d253801cc3d58e1caa6c"), "Year" : 2008, "Month" : 1, "DayOfMonth" : 3, "DayOfWeek" : 4, "DepTime" : 636, "CRSDepTime" : 635, "ArrTime" : 921, "CRSArrTime" : 945, "UniqueCarrier" : "WN", "FlightNum" : 2275, "TailNum" : "N454WN", "ActualElapsedTime" : 165, "CRSElapsedTime" : 190, "AirTime" : 147, "ArrDelay" : -24, "DepDelay" : 1, "Origin" : "ISP", "Dest" : "FLL", "Distance" : 1093, "TaxiIn" : 5, "TaxiOut" : 13, "Cancelled" : 0, "CancellationCode" : "", "Diverted" : 0, "CarrierDelay" : "NA", "WeatherDelay" : "NA", "NASDelay" : "NA", "SecurityDelay" : "NA", "LateAircraftDelay" : "NA" }

```

```

mongo> db.airports.find({"DepTime":{"$gte:556}}).explain('executionStats')
{
  "queryPlanner" : {
    "mongosPlannerVersion" : 1,
    "winningPlan" : {
      "stage" : "SINGLE_SHARD",
      "shards" : [
        {
          "shardName" : "srd1",
          "connectionString" : "srd1/localhost:27020,localhost:27021,localhost:27022",
          "serverInfo" : {
            "host" : "DESKTOP-TCPMOLH",
            "port" : 27021,
            "version" : "3.6.9",
            "gitVersion" : "167861a164723168adfaaa866f310cb94010428f"
          },
          "plannerVersion" : 1,
          "namespace" : "db.airports",
          "indexFilterSet" : false,
          "parsedQuery" : {
            "DepTime" : {
              "$gte" : 556
            }
          },
          "winningPlan" : {
            "stage" : "SHARDING_FILTER",
            "inputStage" : {
              "stage" : "COLLSCAN",
              "filter" : {
                "DepTime" : {
                  "$gte" : 556
                }
              },
              "direction" : "forward"
            },
            "rejectedPlans" : [ ]
          }
        ]
      ],
      "executionStats" : {
        "nReturned" : 49350,
        "executionTimeMillis" : 329,
        "totalKeysExamined" : 0,
        "totalDocsExamined" : 50000,
        "executionStages" : {
          "stage" : "SINGLE_SHARD",
          "nReturned" : 49350,
          "executionTimeMillis" : 329,
          "totalKeysExamined" : 0,
          "totalDocsExamined" : 50000,
          "totalChildMillis" : NumberLong(305),
          "shards" : [
            {
              "shardName" : "srd1",
              "executionSuccess" : true,
              "executionStages" : {

```

c) \$all

db.airports.find({"Dest":{"\$all:["IND"]}})

```

mongo> db.airports.find({"Dest":{"$all:["IND"]}})
{ "_id" : ObjectId("5c38d253801cc3d58elcaad7"), "Year" : 2008, "Month" : 1, "DayOfMonth" : 3, "DayOfWeek" : 4, "DepTime" : 2255, "CRSDepTime" : 1820, "ArrTime" : 509, "CRSArrTime" : 55, "UniqueCarrier" : "WN", "FlightNum" : 1924, "TailNum" : "N761RR", "ActualElapsedTime" : 194, "CRSElapsedTime" : 215, "AirTime" : 176, "ArrDelay" : 254, "DepDelay" : 275, "Origin" : "LAS", "Dest" : "IND", "Distance" : 1591, "TaxiIn" : 9, "TaxiOut" : 9, "Cancelled" : 0, "CancellationCode" : "", "Diverted" : 0, "CarrierDelay" : 0, "WeatherDelay" : 0, "NASDelay" : 0, "SecurityDelay" : 8, "LateAircraftDelay" : 246 }
{ "_id" : ObjectId("5c38d253801cc3d58elcaad8"), "Year" : 2008, "Month" : 1, "DayOfMonth" : 3, "DayOfWeek" : 4, "DepTime" : 1129, "CRSDepTime" : 1050, "ArrTime" : 1757, "CRSArrTime" : 1725, "UniqueCarrier" : "WN", "FlightNum" : 3920, "TailNum" : "N464WN", "ActualElapsedTime" : 208, "CRSElapsedTime" : 215, "AirTime" : 179, "ArrDelay" : 32, "DepDelay" : 39, "Origin" : "LAS", "Dest" : "IND", "Distance" : 1591, "TaxiIn" : 8, "TaxiOut" : 21, "Cancelled" : 0, "CancellationCode" : "", "Diverted" : 0, "CarrierDelay" : 32, "WeatherDelay" : 0, "NASDelay" : 0, "SecurityDelay" : 0, "LateAircraftDelay" : 0 }
{ "_id" : ObjectId("5c38d253801cc3d58elcac44"), "Year" : 2008, "Month" : 1, "DayOfMonth" : 3, "DayOfWeek" : 4, "DepTime" : 1838, "CRSDepTime" : 1810, "ArrTime" : 1259, "CRSArrTime" : 1230, "UniqueCarrier" : "WN", "FlightNum" : 4, "TailNum" : "N674AA", "ActualElapsedTime" : 81, "CRSElapsedTime" : 80, "AirTime" : 63, "ArrDelay" : 29, "DepDelay" : 28, "Origin" : "MCI", "Dest" : "IND", "Distance" : 451, "TaxiIn" : 8, "TaxiOut" : 10, "Cancelled" : 0, "CancellationCode" : "", "Diverted" : 0, "CarrierDelay" : 3, "WeatherDelay" : 0, "NASDelay" : 1, "SecurityDelay" : 0, "LateAircraftDelay" : 25 }
{ "_id" : ObjectId("5c38d253801cc3d58elcac97"), "Year" : 2008, "Month" : 1, "DayOfMonth" : 3, "DayOfWeek" : 4, "DepTime" : 802, "CRSDepTime" : 750, "ArrTime" : 1001, "CRSArrTime" : 955, "UniqueCarrier" : "WN", "FlightNum" : 2222, "TailNum" : "N263WA", "ActualElapsedTime" : 119, "CRSElapsedTime" : 125, "AirTime" : 104, "ArrDelay" : 6, "DepDelay" : 12, "Origin" : "JAX", "Dest" : "IND", "Distance" : 688, "TaxiIn" : 7, "TaxiOut" : 8, "Cancelled" : 0, "CancellationCode" : "", "Diverted" : 0, "CarrierDelay" : "NA", "WeatherDelay" : "NA", "NASDelay" : "NA", "SecurityDelay" : "NA", "LateAircraftDelay" : "NA" }
{ "_id" : ObjectId("5c38d253801cc3d58elcacac"), "Year" : 2008, "Month" : 1, "DayOfMonth" : 3, "DayOfWeek" : 4, "DepTime" : 1139, "CRSDepTime" : 1140, "ArrTime" : 1481, "CRSArrTime" : 1405, "UniqueCarrier" : "WN", "FlightNum" : 629, "TailNum" : "N476WA", "ActualElapsedTime" : 142, "CRSElapsedTime" : 145, "AirTime" : 123, "ArrDelay" : -4, "DepDelay" : -1, "Origin" : "MCO", "Dest" : "IND", "Distance" : 828, "TaxiIn" : 8, "TaxiOut" : 11, "Cancelled" : 0, "CancellationCode" : "", "Diverted" : 0, "CarrierDelay" : "NA", "WeatherDelay" : "NA", "NASDelay" : "NA", "SecurityDelay" : "NA", "LateAircraftDelay" : "NA" }
{ "_id" : ObjectId("5c38d253801cc3d58elcacad"), "Year" : 2008, "Month" : 1, "DayOfMonth" : 3, "DayOfWeek" : 4, "DepTime" : 1912, "CRSDepTime" : 1840, "ArrTime" : 2149, "CRSArrTime" : 2105, "UniqueCarrier" : "WN", "FlightNum" : 3256, "TailNum" : "N859SM", "ActualElapsedTime" : 157, "CRSElapsedTime" : 145, "AirTime" : 126, "ArrDelay" : 44, "DepDelay" : 32, "Origin" : "MCO", "Dest" : "IND", "Distance" : 828, "TaxiIn" : 8, "TaxiOut" : 23, "Cancelled" : 0, "CancellationCode" : "", "Diverted" : 0, "CarrierDelay" : 31, "WeatherDelay" : 0, "NASDelay" : 12, "SecurityDelay" : 0, "LateAircraftDelay" : 1 }

```

```

mongos> db.airports.find({"Dest":{"$all:["IND"]}}).explain("executionStats")
{
  "queryPlanner" : {
    "mongosPlannerVersion" : 1,
    "winningPlan" : {
      "stage" : "SINGLE_SHARD",
      "shards" : [
        {
          "shardName" : "srd1",
          "connectionString" : "srd1/localhost:27020,localhost:27021,localhost:27022",
          "serverInfo" : {
            "host" : "DESKTOP-TCPMOLH",
            "port" : 27021,
            "version" : "3.6.9",
            "gitVersion" : "167861a164723168adfaaa866f310cb94010428f"
          },
          "plannerVersion" : 1,
          "namespace" : "db.airports",
          "indexFilterSet" : false,
          "parsedQuery" : {
            "Dest" : {
              "$eq" : "IND"
            }
          },
          "winningPlan" : {
            "stage" : "SHARDING_FILTER",
            "inputStage" : {
              "stage" : "COLLSCAN",
              "filter" : {
                "Dest" : {
                  "$eq" : "IND"
                }
              },
              "direction" : "forward"
            },
            "rejectedPlans" : [ ]
          }
        }
      ]
    },
    "executionStats" : {
      "nReturned" : 246,
      "executionTimeMillis" : 1119,
      "totalKeysExamined" : 0,
      "totalDocsExamined" : 50000,
    }
  }
}

```

d) \$elemMatch

```
db.airports.findOne({"ArrTime":{"$elemMatch":{"$gte:2200}}})
```

```

mongos> db.airports.find({"ArrTime":{"$elemMatch":{"$gte:2200}}})).explain('executionStats')
{
  "queryPlanner" : {
    "mongosPlannerVersion" : 1,
    "winningPlan" : {
      "stage" : "SINGLE_SHARD",
      "shards" : [

```

```

      "executionStats" : {
        "nReturned" : 0,
        "executionTimeMillis" : 1097,
        "totalKeysExamined" : 4028,
        "totalDocsExamined" : 4028,
        "executionStages" : {
          "stage" : "SINGLE_SHARD",
          "nReturned" : 0,
          "executionTimeMillis" : 1097,
          "totalKeysExamined" : 4028,
          "totalDocsExamined" : 4028,

```

e) slice :

```
db.airports.find({"ArrTime":{"$gt:2000}},{"TailNum":{"$slice:3}}).explain('executionStats')
```

```
mongos> db.airports.find({"ArrTime":{"$gt:2000}},{"TailNum":{"$slice:3}}).explain('executionStats')
{
  "queryPlanner" : {
    "mongosPlannerVersion" : 1,
    "winningPlan" : {
      "stage" : "SINGLE_SHARD",
      "shards" : [
        {
          "shardName" : "srd1",
          "connectionString" : "srd1/localhost:27020,localhost:27021,localhost:27022",
          "serverInfo" : {
            "host" : "DESKTOP-TCPMOLH",
            "port" : 27021,
            "version" : "3.6.9",
            "gitVersion" : "167861a164723168adfaaa866f310cb94010428f"
          }
        }
      ]
    },
    "rejectedPlans" : [ ]
  },
  "executionStats" : {
    "nReturned" : 9982,
    "executionTimeMillis" : 1213,
    "totalKeysExamined" : 9982,
    "totalDocsExamined" : 9982,
    "executionStages" : {
      "stage" : "SINGLE_SHARD",
      "nReturned" : 9982,
      "executionTimeMillis" : 1213,
      "totalKeysExamined" : 9982,
      "totalDocsExamined" : 9982,
      "totalChildMillis" : NumberLong(187),
      "shards" : [
        {
          "shardName" : "srd1",
```

f) \$exists :

```
mongos> db.airports.find({"DepTime":{"$exists:true,$in:[22]}})
{ "_id" : ObjectId("5c38d25d801cc3d58e1cd189"), "Year" : 2008, "Month" : 1, "DayOfMonth" : 6, "DayOfWeek" : 7, "DepTime" : 22, "CRSDepTime" : 2040, "ArrTime" : 241, "CRSArrTime" : 2300, "UniqueCarrier" : "WN", "FlightNum" : 3939, "TailNum" : "N583SM", "ActualElapsedTime" : 79, "CRSElapsedTime" : 80, "AirTime" : 54, "ArrDelay" : 221, "DepDelay" : 222, "Origin" : "LAX", "Dest" : "TUS", "Distance" : 451, "TaxiIn" : 3, "TaxiOut" : 22, "Cancelled" : 0, "CancellationCode" : "", "Diverted" : 0, "CarrierDelay" : 0, "WeatherDelay" : 0, "NASDelay" : 0, "SecurityDelay" : 0, "LateAircraftDelay" : 221 }
{ "_id" : ObjectId("5c38d25f801cc3d58e1cdf7b"), "Year" : 2008, "Month" : 1, "DayOfMonth" : 7, "DayOfWeek" : 1, "DepTime" : 22, "CRSDepTime" : 2110, "ArrTime" : 142, "CRSArrTime" : 2225, "UniqueCarrier" : "WN", "FlightNum" : 1973, "TailNum" : "N583SM", "ActualElapsedTime" : 80, "CRSElapsedTime" : 75, "AirTime" : 61, "ArrDelay" : 197, "DepDelay" : 192, "Origin" : "MDW", "Dest" : "BNA", "Distance" : 395, "TaxiIn" : 8, "TaxiOut" : 11, "Cancelled" : 0, "CancellationCode" : "", "Diverted" : 0, "CarrierDelay" : 0, "WeatherDelay" : 5, "NASDelay" : 5, "SecurityDelay" : 0, "LateAircraftDelay" : 187 }
mongos>
```

```
mongos> db.airports.find({"DepTime":{"$exists:true,$in:[22]}}).explain('executionStats')
{
  "queryPlanner" : {
    "mongosPlannerVersion" : 1,
    "winningPlan" : {
      "stage" : "SINGLE_SHARD",
      "shards" : [
        {
          "shardName" : "srd1",
```



```

    "executionStats" : {
      "nReturned" : 2,
      "executionTimeMillis" : 92,
      "totalKeysExamined" : 0,
      "totalDocsExamined" : 50000,
      "executionStages" : {
        "stage" : "SINGLE_SHARD",
        "nReturned" : 2,
        "executionTimeMillis" : 92,
        "totalKeysExamined" : 0,
        "totalDocsExamined" : 50000,
        "totalChildMillis" : NumberLong(92),
        "shards" : [

```

g) find(). limit()

```

mongo> db.airports.find({"DepTime":{$gt:606}}).limit(5)
{ "_id" : ObjectId("5c38d253801cc3d58elcaa64"), "Year" : 2008, "Month" : 1, "DayOfMonth" : 3, "DayOfWeek" : 4, "DepTime" : 706, "CRSDepTime" : 705, "ArrTime" : 807, "CRSArrTime" : 810, "UniqueCarrier" : "WN", "FlightNum" : 68, "TailNum" : "N497WN", "ActualElapsedTime" : 61, "CRSElapsedTime" : 65, "AirTime" : 51, "ArrDelay" : -3, "DepDelay" : 1, "Origin" : "ISP", "Dest" : "BWI", "Distance" : 220, "TaxiIn" : 3, "TaxiOut" : 7, "Cancelled" : 0, "CancellationCode" : "", "Diverted" : 0, "CarrierDelay" : "NA", "WeatherDelay" : "NA", "NASDelay" : "NA", "SecurityDelay" : "NA", "LateAircraftDelay" : "NA" }
{ "_id" : ObjectId("5c38d253801cc3d58elcaa59"), "Year" : 2008, "Month" : 1, "DayOfMonth" : 3, "DayOfWeek" : 4, "DepTime" : 1620, "CRSDepTime" : 1620, "ArrTime" : 1639, "CRSArrTime" : 1655, "UniqueCarrier" : "WN", "FlightNum" : 810, "TailNum" : "N648SM", "ActualElapsedTime" : 79, "CRSElapsedTime" : 95, "AirTime" : 70, "ArrDelay" : -16, "DepDelay" : 0, "Origin" : "IND", "Dest" : "MCI", "Distance" : 451, "TaxiIn" : 3, "TaxiOut" : 6, "Cancelled" : 0, "CancellationCode" : "", "Diverted" : 0, "CarrierDelay" : "NA", "WeatherDelay" : "NA", "NASDelay" : "NA", "SecurityDelay" : "NA", "LateAircraftDelay" : "NA" }
{ "_id" : ObjectId("5c38d253801cc3d58elcaa5c"), "Year" : 2008, "Month" : 1, "DayOfMonth" : 3, "DayOfWeek" : 4, "DepTime" : 1426, "CRSDepTime" : 1430, "ArrTime" : 1426, "CRSArrTime" : 1425, "UniqueCarrier" : "WN", "FlightNum" : 829, "TailNum" : "N476WN", "ActualElapsedTime" : 60, "CRSElapsedTime" : 55, "AirTime" : 39, "ArrDelay" : 1, "DepDelay" : -4, "Origin" : "IND", "Dest" : "MDW", "Distance" : 162, "TaxiIn" : 9, "TaxiOut" : 12, "Cancelled" : 0, "CancellationCode" : "", "Diverted" : 0, "CarrierDelay" : "NA", "WeatherDelay" : "NA", "NASDelay" : "NA", "SecurityDelay" : "NA", "LateAircraftDelay" : "NA" }
{ "_id" : ObjectId("5c38d253801cc3d58elcaa6f"), "Year" : 2008, "Month" : 1, "DayOfMonth" : 3, "DayOfWeek" : 4, "DepTime" : 1008, "CRSDepTime" : 1005, "ArrTime" : 1234, "CRSArrTime" : 1255, "UniqueCarrier" : "WN", "FlightNum" : 543, "TailNum" : "N736SA", "ActualElapsedTime" : 146, "CRSElapsedTime" : 170, "AirTime" : 135, "ArrDelay" : -21, "DepDelay" : 3, "Origin" : "ISP", "Dest" : "MCO", "Distance" : 972, "TaxiIn" : 5, "TaxiOut" : 6, "Cancelled" : 0, "CancellationCode" : "", "Diverted" : 0, "CarrierDelay" : "NA", "WeatherDelay" : "NA", "NASDelay" : "NA", "SecurityDelay" : "NA", "LateAircraftDelay" : "NA" }
{ "_id" : ObjectId("5c38d253801cc3d58elcaa6a"), "Year" : 2008, "Month" : 1, "DayOfMonth" : 3, "DayOfWeek" : 4, "DepTime" : 1422, "CRSDepTime" : 1255, "ArrTime" : 1657, "CRSArrTime" : 1610, "UniqueCarrier" : "WN", "FlightNum" : 188, "TailNum" : "N215WN", "ActualElapsedTime" : 155, "CRSElapsedTime" : 195, "AirTime" : 143, "ArrDelay" : 47, "DepDelay" : 87, "Origin" : "ISP", "Dest" : "FLL", "Distance" : 1093, "TaxiIn" : 6, "TaxiOut" : 6, "Cancelled" : 0, "CancellationCode" : "", "Diverted" : 0, "CarrierDelay" : 40, "WeatherDelay" : 0, "NASDelay" : 0, "SecurityDelay" : 0, "LateAircraftDelay" : 7 }
mongo>

```

```

mongo> db.airports.find({"DepTime":{$gt:606}}).limit(5).explain('executionStats')
{
  "queryPlanner" : {
    "mongosPlannerVersion" : 1,
    "winningPlan" : {
      "stage" : "SINGLE_SHARD",
      "shards" : [
        {
          "shardName" : "srd1",
          "connectionString" : "srd1/localhost:27020,localhost:27021,localhost:27022",

```

```

    "executionStats" : {
      "nReturned" : 5,
      "executionTimeMillis" : 1007,
      "totalKeysExamined" : 0,
      "totalDocsExamined" : 5,
      "executionStages" : {
        "stage" : "SINGLE_SHARD",
        "nReturned" : 5,
        "executionTimeMillis" : 1007,
        "totalKeysExamined" : 0,
        "totalDocsExamined" : 5,
        "totalChildMillis" : NumberLong(0),

```

4) MapReduce() :

```
mongos> var mapFunction1 = function() {emit(this._id, this.Distance); };
mongos> var reduceFunction1 = function(kId, kDistance) {
...           return Array.sum(kDistance);
...           };
mongos>
mongos> db.airports.mapReduce(    mapFunction1,    reduceFunction1,    { out: "map_reduce_example" }    )
{
  "result" : "map_reduce_example",
  "counts" : {
    "input" : NumberLong(50000),
    "emit" : NumberLong(50000),
    "reduce" : NumberLong(0),
    "output" : NumberLong(50000)
  },
  "timeMillis" : 26647,
  "timing" : {
    "shardProcessing" : 15786,
    "postProcessing" : 10861
  },
  "shardCounts" : {
    "srd1/localhost:27020,localhost:27021,localhost:27022" : {
      "input" : 50000,
      "emit" : 50000,
      "reduce" : 0,
      "output" : 50000
    }
  },
  "postProcessCounts" : {
    "srd1/localhost:27020,localhost:27021,localhost:27022" : {
      "input" : NumberLong(50000),
      "reduce" : NumberLong(0),
      "output" : NumberLong(50000)
    }
  },
  "ok" : 1,
  "operationTime" : Timestamp(1547274459, 2262),
  "$clusterTime" : {
    "clusterTime" : Timestamp(1547274459, 2262),
    "signature" : {
      "hash" : BinData(0,"AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA="),
      "keyId" : NumberLong(0)
    }
  }
}
```

5) Aggregate() :

```
mongos> db.airports.aggregate([ { $group : { _id : { "Origin": "$Origin", "Dest": "$Dest", "outbound" : { $sum : 1 } } }, { $sort : { outbound : -1 } }, { $limit : 5 } ] );
{ "_id" : { "Origin" : "HOU", "Dest" : "DAL", "outbound" : 418 } }
{ "_id" : { "Origin" : "DAL", "Dest" : "HOU", "outbound" : 412 } }
{ "_id" : { "Origin" : "OAK", "Dest" : "LAX", "outbound" : 296 } }
{ "_id" : { "Origin" : "LAX", "Dest" : "OAK", "outbound" : 294 } }
{ "_id" : { "Origin" : "LAS", "Dest" : "PHX", "outbound" : 282 } }
mongos>
```

```
mongos> db.airports.explain('executionStats').aggregate([ { $group : { _id : {"Origin": "$Origin", "Dest": "$Dest"}, "outbound" : { $sum: 1 } } }, { $sort : { outbound : -1 } }, { $limit:5 } ] );
{
  "splitPipeline" : null,
  "shards" : {
    "srd1" : {
      "host" : "localhost:27021",
      "stages" : [
        {
          "$cursor" : {
            "query" : {
              "fields" : {
                "Dest" : 1,
                "Origin" : 1,
                "_id" : 0
              },
              "queryPlanner" : {
                "plannerVersion" : 1,
                "namespace" : "db.airports",
                "indexFilterSet" : false,
                "parsedQuery" : {
                  "winningPlan" : {
                    "stage" : "SHARDING_FILTER",
                    "inputStage" : {
                      "stage" : "COLLSCAN",
                      "direction" : "forward"
                    }
                  },
                  "rejectedPlans" : [ ]
                }
              },
              "executionStats" : {
                "executionSuccess" : true,
                "nReturned" : 50000,
                "executionTimeMillis" : 294,
                "totalKeysExamined" : 0,
                "totalDocsExamined" : 50000,

```