
NoSQL

The NoSQL DBMS

NoSQL:

- A fast, portable, open-source RDBMS
- A derivative of the RDB database system
- Based on the “operator/stream paradigm”

- One common interpretation of NoSQL is “not only SQL” or like “non-relational”

NoSQL

- NoSQL is designed for distributed data stores where very large scale of data storing needs (for example Google or Facebook which collects terabits of data every day for their users).
- These type of data storing may not require fixed schema, avoid join operations and typically scale horizontally.

RDBMS

- Structured and organized data
- Structured query language (SQL)
- Data and its relationships are stored in separate tables.
- Data Manipulation Language, Data Definition Language
- Tight Consistency

NoSQL

- Stands for Not Only SQL
- No declarative query language
- No predefined schema
- Key-Value pair storage, Column Store, Document Store, Graph databases
- Eventual consistency rather ACID property
- Unstructured and unpredictable data
- Prioritizes high performance, high availability and scalability

NoSQL Examples

Hbase	Cassandra	Hypertable	Accumulo	Amazon SimpleDB		SciDB	Stratosphere	flare
Cloudata	BigTable	QD Technology		SmartFocus	KDI	Alterian	Cloudera	C-Store
Vertica	Qbase-MetaCarta		OpenNeptune	HPCC	Mongo DB	CouchDB	Clusterpoint ServerTerrastore	
Jackrabbit	OrientDB	Perservere	CoudKit	Djondb	SchemaFreeDB		SDB	JasDB
RaptorDB	ThruDB	RavenDB	DynamoDB	Azure Table Storage		Couchbase Server		Riak
LevelDB	Chordless	GenieDB	Scalaris	Tokyo	Kyoto Cabinet	Tyrant	Scalien	
Berkeley DB	Voldemort	Dynomite	KAI	MemcacheDB	Faircom C-Tree		HamsterDB	STSdb
Tarantool/Box	Maxtable	Pincaster	RaptorDB	TIBCO Active Spaces		allegro-C	nessDBHyperDex	
Mnesia	LightCloud	Hibari	BangDB	OpenLDAP/MDB/Lightning		Scality	Redis	
KaTree	TomP2P	Kumofs	TreapDB	NMDB	luxio	actord	Keyspace	
schema-free	RAMCloud	SubRecord	Mo8onDb	Dovetaildb	JDBM	Neo4	InfiniteGraph	
Sones	InfoGrid	HyperGraphDB		DEX	GraphBase	Trinity	AllegroGraph	BrightstarDB
Bigdata	Meronymy	OpenLink Virtuoso		VertexDB	FlockDB	Execom IOG	Java Univ Netwrk/Graph Framework	
OpenRDF/Sesame		Filament	OWLim	NetworkX	iGraph	Jena	SPARQL	OrientDb
ArangoDB	AlchemyDB	Soft NoSQL Systems		Db4o	Versant	Objectivity	Starcounter	
ZODB	Magma	NEO	PicoList	siaqodb	Sterling	Morantex	EyeDB	
HSS Database	FramerD	Ninja Database Pro		StupidDB	KiokuDB	Perl solution	Durus	
GigaSpaces	Infinispan	Queplix	Hazelcast	GridGain	Galaxy	SpaceBase	JoafipCoherence	
eXtremeScale	MarkLogic Server		EMC Documentum xDB		eXist	Sedna	BaseX	Qizx
Berkeley DB XML		Xindice	Tamino	Globals	Intersystems Cache		GT.M	EGTM
U2	OpenInsight	Reality	OpenQM	ESENT	jBASE	MultiValue	Lotus/Domino	
eXtremeDB	RDM Embedded		ISIS Family	Prevayler	Yserial	Vmware vFabric GemFire		Btrieve
KirbyBase	Tokutek	Recutils	FileDB	Armadillo	illuminate Correlation Database			FluidDB
Fleet DB	Twisted Storage		Rindo	Sherpa	tin	Dryad	SkyNet	Disco
MUMPS	Adabas	XAP In-Memory Grid		eXtreme Scale		MckoiDDB	Mckoi SQL Database	
Oracle Big Data Appliance		Innostore	FleetDB	No-List	KDI	Perst	IODB	

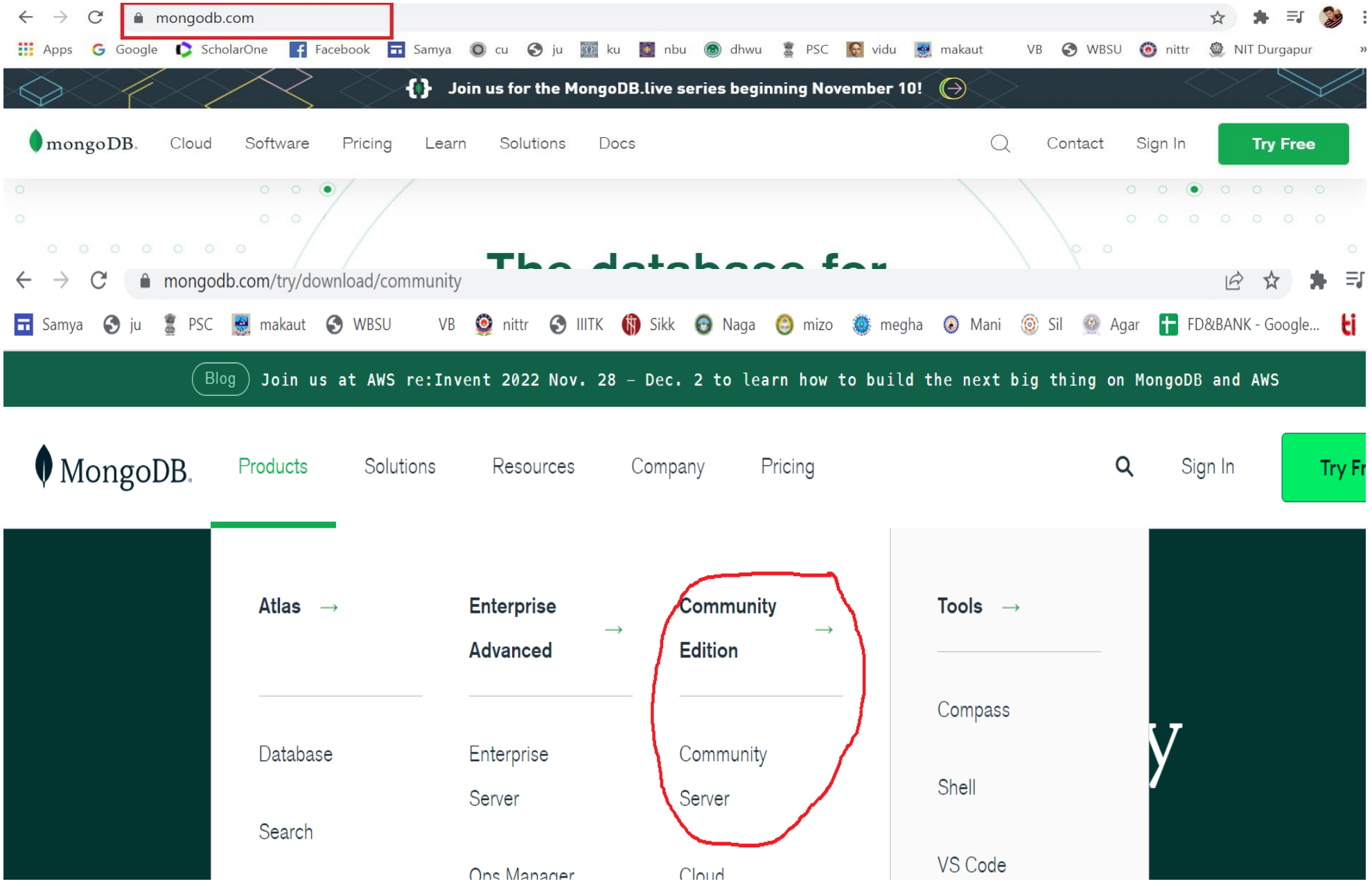
MongoDB

- MongoDB is a document database designed for ease of development and scaling.
- MongoDB offers both a *Community* and an *Enterprise* version of the database.

- A record in MongoDB is a document, which is a data structure composed of field and value pairs.
- MongoDB documents are similar to JSON objects.
- The values of fields may include other documents, arrays, and arrays of documents.

The advantages of using document database are:
•Documents (i.e. objects) correspond to native data types in many programming languages.
•Embedded documents and arrays reduce need for expensive joins.
•Dynamic schema supports fluent polymorphism.

Installing MongoDB



Go to: www.mongodb.com

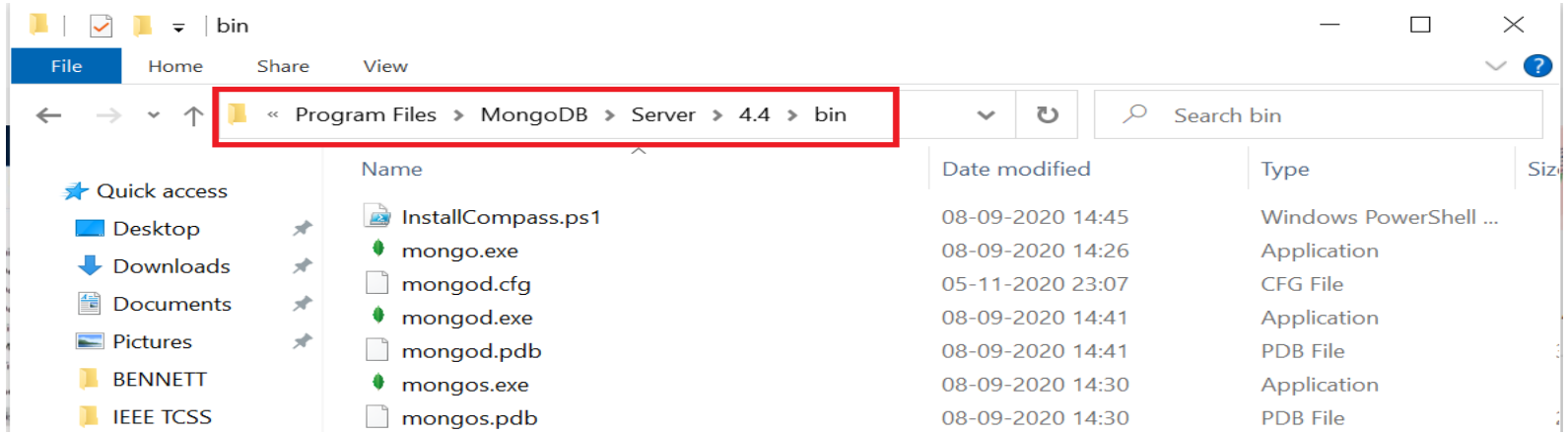
Then go to Community Edition -> Community Server

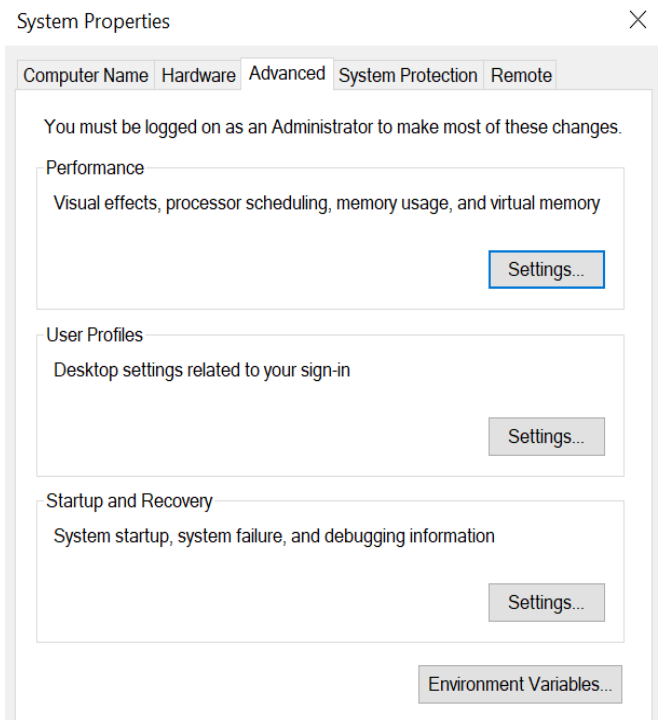
Select version and platform

Then Click Download

Installing Steps

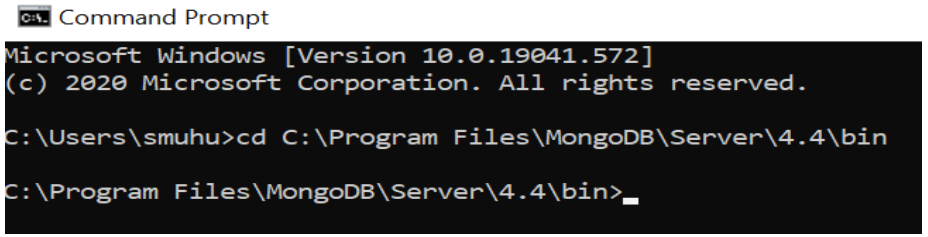
- Run downloaded .msi file
- Install complete version
- Install MongoDB as service (by default)
- Keep data directory and log directory as it is
- Install MongoDB compass
- Wait for installation to finish.



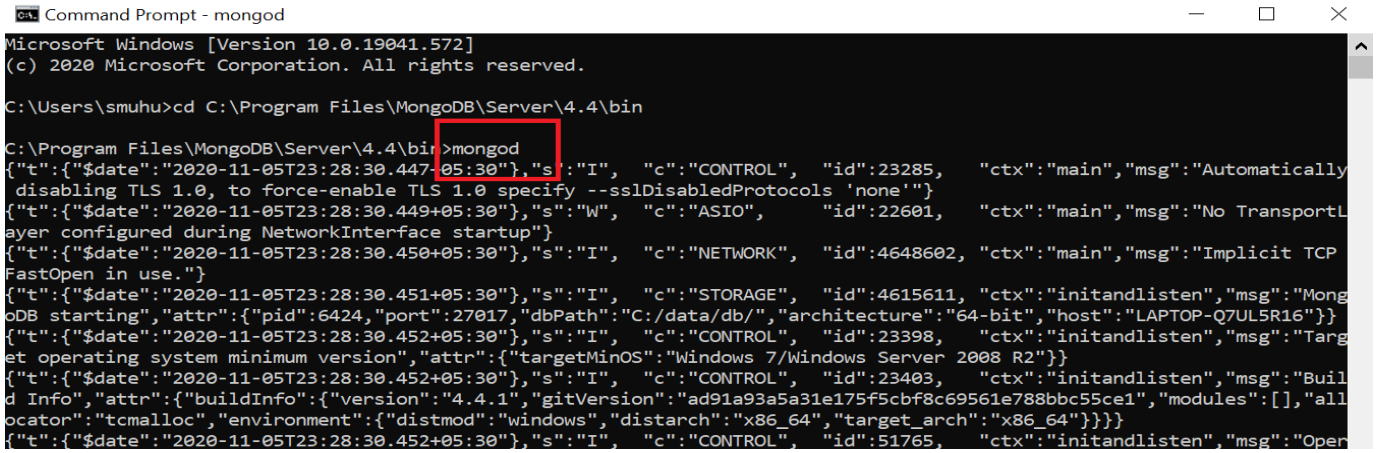


1. Copy the path 2. Click environment variables 3. System variable 4. Add path 5. Add the address (upto bin) 6. save this
2. A) Now go to C folder B) Create 'data' folder C) within data create 'db' folder

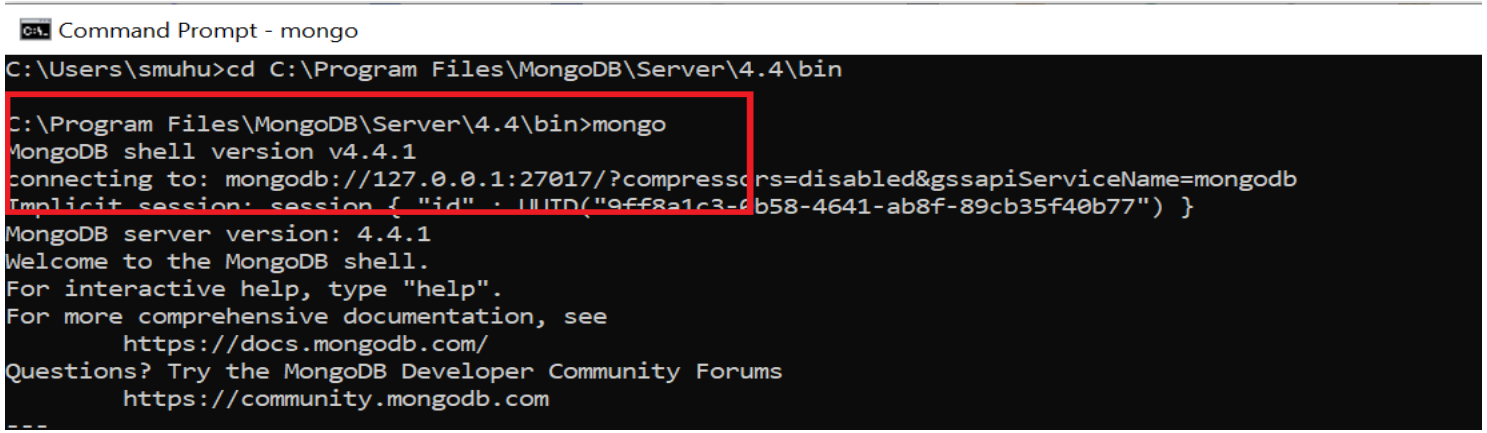
Run Command promt



Go to the bin folder



Open command prompt. Command is mongod. It will start the mongo demon



Open another command prompt. Command is "mongo". It will start the mongo shell. Now you can write programs of NoSQL.

Shell script will show ">" sign

Commands

Show Databases
> Show dbs

```
> show dbs
admin    0.000GB
bennett  0.000GB
config   0.000GB
local    0.000GB
mapdb    0.000GB
```

Create new database
> Use database_name
> Use thapar

```
> use thapar
switched to db thapar
>
```

Create collection
Here collection represents table
>db.createCollection("table_name")
>db.createCollection("testable")

```
> db.createCollection("testtable")
{ "ok" : 1 }
>
```

```
> use another
switched to db another
> show dbs
admin    0.000GB
bennett  0.000GB
config   0.000GB
local    0.000GB
mapdb    0.000GB
thapar   0.000GB
```

Lets create another database named "another"

Show databases
It will not show "another" as no table or collection is created

```
> db.createCollection("Extra")
{ "ok" : 1 }
> show dbs
admin    0.000GB
another  0.000GB
bennett  0.000GB
config   0.000GB
local    0.000GB
mapdb    0.000GB
thapar   0.000GB
> db.dropDatabase()
{ "dropped" : "another", "ok" : 1 }
> show dbs
admin    0.000GB
bennett  0.000GB
config   0.000GB
local    0.000GB
mapdb    0.000GB
thapar   0.000GB
>
```

Insert a collection "Extra"

Now show databases will show "another"

For delete database use
>db.dropDatabase()

Show the databases again

"another" database is deleted

Commands

Go to the database
See all the collection
Presents using
>show collections
For delete
>db.collection_name.drop()

```
> use thapar
switched to db thapar
> show collections
testtable
> db.testtable.drop()
true
> show collections
>
```

```
> db.testtable.insertOne({"id":1, "name":"ABC","dept":"CSE"})
{
        "acknowledged" : true,
        "insertedId" : ObjectId("5fa4514a8bda3bca99bae594")
}
>
```

Insert 1 data into the collection/table using "insertOne" operation

```
@(shell):1:1
> db.testtable.insertMany([{"id":1, "name":"ABC","dept":"CSE"},{"id":2,"name":"PQR","dept":"CSE"}])
{
        "acknowledged" : true,
        "insertedIds" : [
                ObjectId("5fa452e68bda3bca99bae595"),
                ObjectId("5fa452e68bda3bca99bae596")
        ]
}
>
```

Insert many data into the collection using "insertMany" operation

Db.tablename.insertMany([{ }, { }, { }])

Commands

Retrieve data
>db.table_name.find();

```
> db.testtable.find()
{ "_id" : ObjectId("5fa452e68bda3bca99bae595"), "id" : 1, "name" : "ABC", "dept" : "CSE" }
{ "_id" : ObjectId("5fa452e68bda3bca99bae596"), "id" : 2, "name" : "PQR", "dept" : "CSE" }
```

Select some particular value
>db.table_name.find({attribute: {$option: value}})

```
> db.testtable.find({id:{$eq:2}})
{ "_id" : ObjectId("5fa452e68bda3bca99bae596"), "id" : 2, "name" : "PQR", "dept" : "CSE" }
>
```

You can find details in the following website:
https://docs.mongodb.com/manual/tutorial/query-documents/
https://docs.mongodb.com/manual/reference/operator/query/

List of options available

Name	Description
$eq	Matches values that are equal to a specified value.
$gt	Matches values that are greater than a specified value.
$gte	Matches values that are greater than or equal to a specified value.
$in	Matches any of the values specified in an array.
$lt	Matches values that are less than a specified value.
$lte	Matches values that are less than or equal to a specified value.
$ne	Matches all values that are not equal to a specified value.
$nin	Matches none of the values specified in an array.

Commands

Delete row
>db.table_name.deleteMany({attribute:value})

```
> db.testtable.deleteMany({ name : "ABC" })
{ "acknowledged" : true, "deletedCount" : 1 }
```

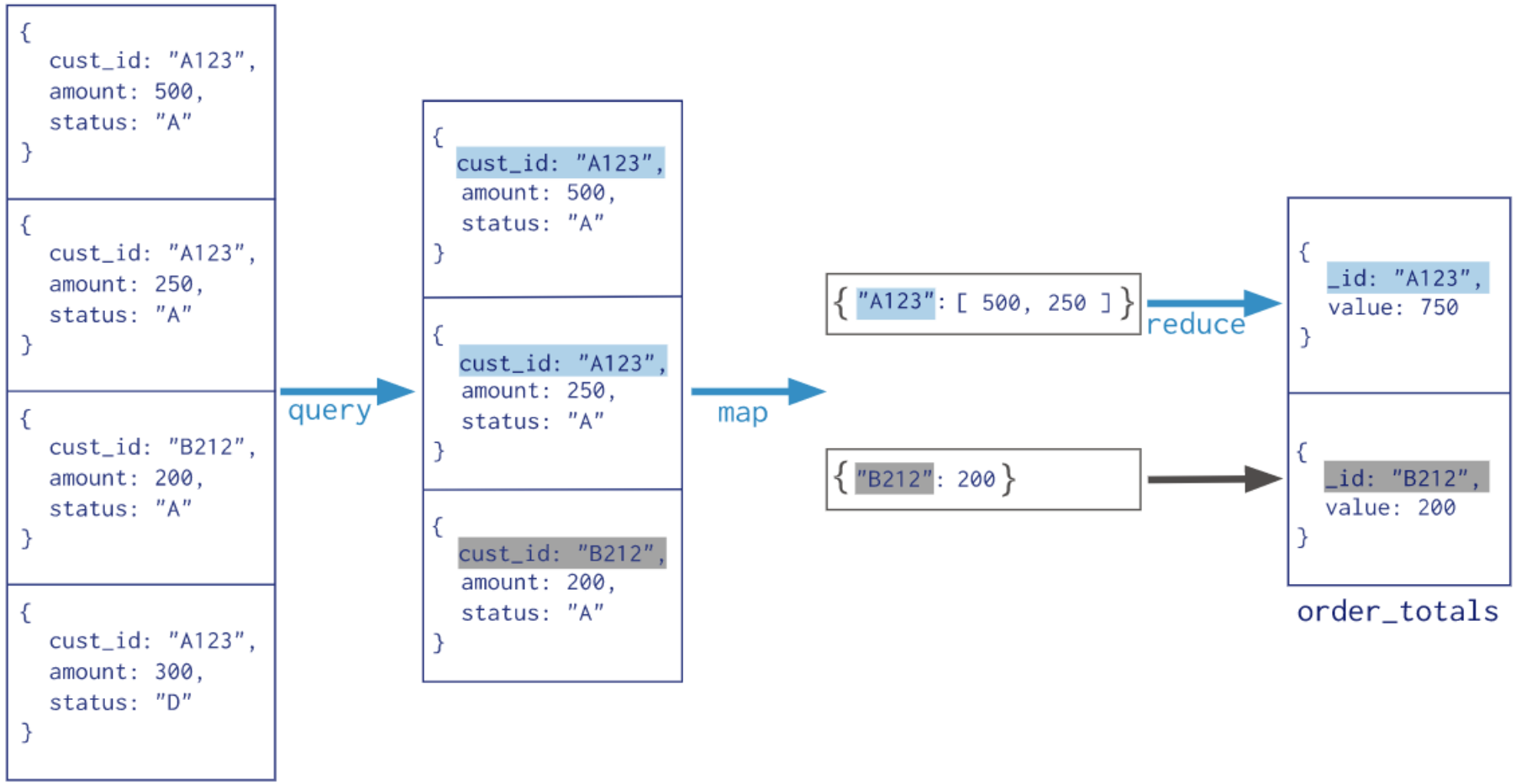
Again show the records
>db.table_name.find()
the record with the name "ABC" has been deleted.

```
> db.testtable.find()
{ "_id" : ObjectId("5fa452e68bda3bca99bae596"), "id" : 2, "name" : "PQR", "dept" : "CSE" }
>
```

`db.collection.updateOne()`	Updates at most a single document that match a specified filter even though multiple documents may match the specified filter. *New in version 3.2.*
`db.collection.updateMany()`	Update all documents that match a specified filter. *New in version 3.2.*
`db.collection.replaceOne()`	Replaces at most a single document that match a specified filter even though multiple documents may match the specified filter.

Different types of update options available

MapReduce Example

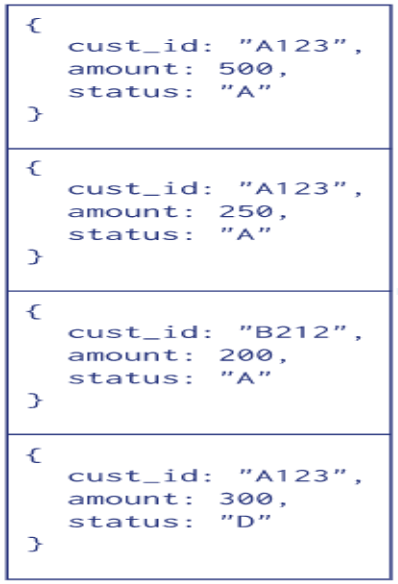


Source: https://docs.mongodb.com/manual/aggregation/

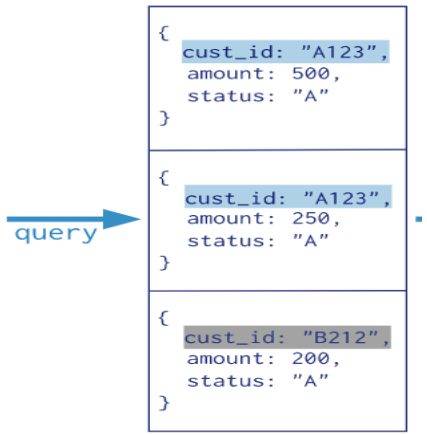
MapReduce Example

Create a database

Create collection "cust"




```
> use mapdb
switched to db mapdb
> db.createCollection("cust")
{ "ok" : 1 }
> db.cust.insertMany([{"id":"A123","amount":500,"status":"A"},{"id":"A123","amount":250,"status":"A"},{"id":"B212",
"amount":200,"status":"A"},{"id":"A123","amount":300,"status":"D"}])
{
        "acknowledged" : true,
        "insertedIds" : [
                ObjectId("5fa501d9bfc8ebf4554384ce"),
                ObjectId("5fa501d9bfc8ebf4554384cf"),
                ObjectId("5fa501d9bfc8ebf4554384d0"),
                ObjectId("5fa501d9bfc8ebf4554384d1")
        ]
}
>
```



Use aggregate function. Take the data of "A" and sum the amount based on "id"

```
> db.cust.aggregate([{$match:{status:"A"}},{$group:{_id:"$id",total:{$sum:"$amount"}}}])
{ "_id" : "A123", "total" : 750 }
{ "_id" : "B212", "total" : 200 }
>
```

Reference

http://www.strozzi.it/cgi-bin/CSA/tw7/I/en_US/nosql/Home%20Page

Manual: https://docs.mongodb.com/manual