MODUL PRAKTIKUM
DATABASE OBJEK TERDISTRIBUSI (DOT)

OLEH

IR. NIZIRWAN ANWAR, MT

TRI ISMARDIKO WIDYAWAN, S.KOM, M.KOM

PROGRAM STUDI TEKNIK INFORMATIKA
FAKULTAS ILMU KOMPUTER
UNIVERSITAS ESA UNGGUL
2017

DAFTAR ISI

MODUL PRAKTIKUM

MODUL 1
DATABASE OBJEK TER-DISTRIBUSI

1. MongoDB – Overview

MongoDB is a cross-platform, document oriented database that provides, high performance, high availability, and easy scalability. MongoDB works on concept of collection and document.

Database

Database is a physical container for collections. Each database gets its own set of files on the file system. A single MongoDB server typically has multiple databases.

Collection

Collection is a group of MongoDB documents. It is the equivalent of an RDBMS table. A collection exists within a single database. Collections do not enforce a schema. Documents within a collection can have different fields. Typically, all documents in a collection are of similar or related purpose.

Document

A document is a set of key-value pairs. Documents have dynamic schema. Dynamic schema means that documents in the same collection do not need to have the same set of fields or structure, and common fields in a collection's documents may hold different types of data.

The following table shows the relationship of RDBMS terminology with MongoDB.

RDBMS	MongoDB
Database	Database
Table	Collection
Tuple/Row	Document
column	Field
Table Join	Embedded Documents
Primary Key	Primary Key (Default key _id provided by mongodb itself)
Database Server and Client	
Mysqld/Oracle	mongod
mysql/sqlplus	mongo

Sample Document

Following example shows the document structure of a blog site, which is simply a comma separated key value pair.

```
{
   _id: ObjectId(7df78ad8902c)
   title: 'MongoDB Overview',
   description: 'MongoDB is no sql database',
   by: 'tutorials point',
   url: 'http://www.tutorialspoint.com',
   tags: ['mongodb', 'database', 'NoSQL'],
   likes: 100,
   comments: [
      {
         user:'user1',
         message: 'My first comment',
         dateCreated: new Date(2011,1,20,2,15),
         like: 0
      },
      {
         user:'user2',
         message: 'My second comments',
         dateCreated: new Date(2011,1,25,7,45),
         like: 5
      }
   ]
}
```

_id is a 12 bytes hexadecimal number which assures the uniqueness of every document. You can provide _id while inserting the document. If you don't provide then MongoDB provides a unique id for every document. These 12 bytes first 4 bytes for the current timestamp, next 3 bytes for machine id, next 2 bytes for process id of MongoDB server and remaining 3 bytes are simple incremental VALUE.

2. MongoDB – Advantages

Any relational database has a typical schema design that shows number of tables and the relationship between these tables. While in MongoDB, there is no concept of relationship.

Advantages of MongoDB over RDBMS

- **Schema less**: MongoDB is a document database in which one collection holds different documents. Number of fields, content and size of the document can differ from one document to another.
- Structure of a single object is clear.
- No complex joins.
- Deep query-ability. MongoDB supports dynamic queries on documents using a document-based query language that's nearly as powerful as SQL.
- Tuning.
- Ease of scale-out: MongoDB is easy to scale.
- Conversion/mapping of application objects to database objects not needed.
- Uses internal memory for storing the (windowed) working set, enabling faster access of data.

Why Use MongoDB?

- Document Oriented Storage: Data is stored in the form of JSON style documents.
- Index on any attribute
- Replication and high availability
- Auto-sharding
- Rich queries
- Fast in-place updates
- Professional support by MongoDB

Where to Use MongoDB?

- Big Data
- Content Management and Delivery
- Mobile and Social Infrastructure
- User Data Management
- Data Hub

3. MongoDB – Environment

Let us now see how to install MongoDB on Windows.

Install MongoDB on Windows

To install MongoDB on Windows, first download the latest release of MongoDB from http://www.mongodb.org/downloads. Make sure you get correct version of MongoDB depending upon your Windows version. To get your Windows version, open command prompt and execute the following command.

```
C:\>wmic os get osarchitecture
OSArchitecture
64-bit
C:\>
```

32-bit versions of MongoDB only support databases smaller than 2GB and suitable only for testing and evaluation purposes.

Now extract your downloaded file to c:\ drive or any other location. Make sure the name of the extracted folder is mongodb-win32-i386-[version] or mongodb-win32-x86_64-[version]. Here [version] is the version of MongoDB download.

Next, open the command prompt and run the following command.

```
C:\>move mongodb-win64-* mongodb
    1 dir(s) moved.
C:\>
```

In case you have extracted the MongoDB at different location, then go to that path by using command **cd FOOLDER/DIR** and now run the above given process.

MongoDB requires a data folder to store its files. The default location for the MongoDB data directory is c:\data\db. So you need to create this folder using the Command Prompt. Execute the following command sequence.

```
C:\>md data
C:\md data\db
```

If you have to install the MongoDB at a different location, then you need to specify an alternate path for **\data\db** by setting the path **dbpath** in **mongod.exe**. For the same, issue the following commands.

In the command prompt, navigate to the bin directory present in the MongoDB installation folder. Suppose my installation folder is **D:\set up\mongodb**

```
C:\Users\XYZ>d:
D:\>cd "set up"
D:\set up>cd mongodb
D:\set up\mongodb>cd bin
D:\set up\mongodb\bin>mongod.exe --dbpath "d:\set up\mongodb\data"
```

This will show **waiting for connections** message on the console output, which indicates that the mongod.exe process is running successfully.

Now to run the MongoDB, you need to open another command prompt and issue the following command.

```
D:\set up\mongodb\bin>mongo.exe
MongoDB shell version: 2.4.6
connecting to: test
>db.test.save( { a: 1 } )
>db.test.find()
{ "_id" : ObjectId(5879b0f65a56a454), "a" : 1 }
>
```

This will show that MongoDB is installed and run successfully. Next time when you run MongoDB, you need to issue only commands.

```
D:\set up\mongodb\bin>mongod.exe --dbpath "d:\set up\mongodb\data"
D:\set up\mongodb\bin>mongo.exe
```

Install MongoDB on Ubuntu

Run the following command to import the MongoDB public GPG key –

```
sudo apt-key adv --keyserver hkp://keyserver.ubuntu.com:80 --recv 7F0CEB10
```

Create a /etc/apt/sources.list.d/mongodb.list file using the following command.

```
echo 'deb http://downloads-distro.mongodb.org/repo/ubuntu-upstart dist 10gen'
   | sudo tee /etc/apt/sources.list.d/mongodb.list
```

Now issue the following command to update the repository –

```
sudo apt-get update
```

Next install the MongoDB by using the following command –

```
apt-get install mongodb-10gen=2.2.3
```

In the above installation, 2.2.3 is currently released MongoDB version. Make sure to install the latest version always. Now MongoDB is installed successfully.

Start MongoDB

```
sudo service mongodb start
```

Stop MongoDB

```
sudo service mongodb stop
```

Restart MongoDB

```
sudo service mongodb restart
```

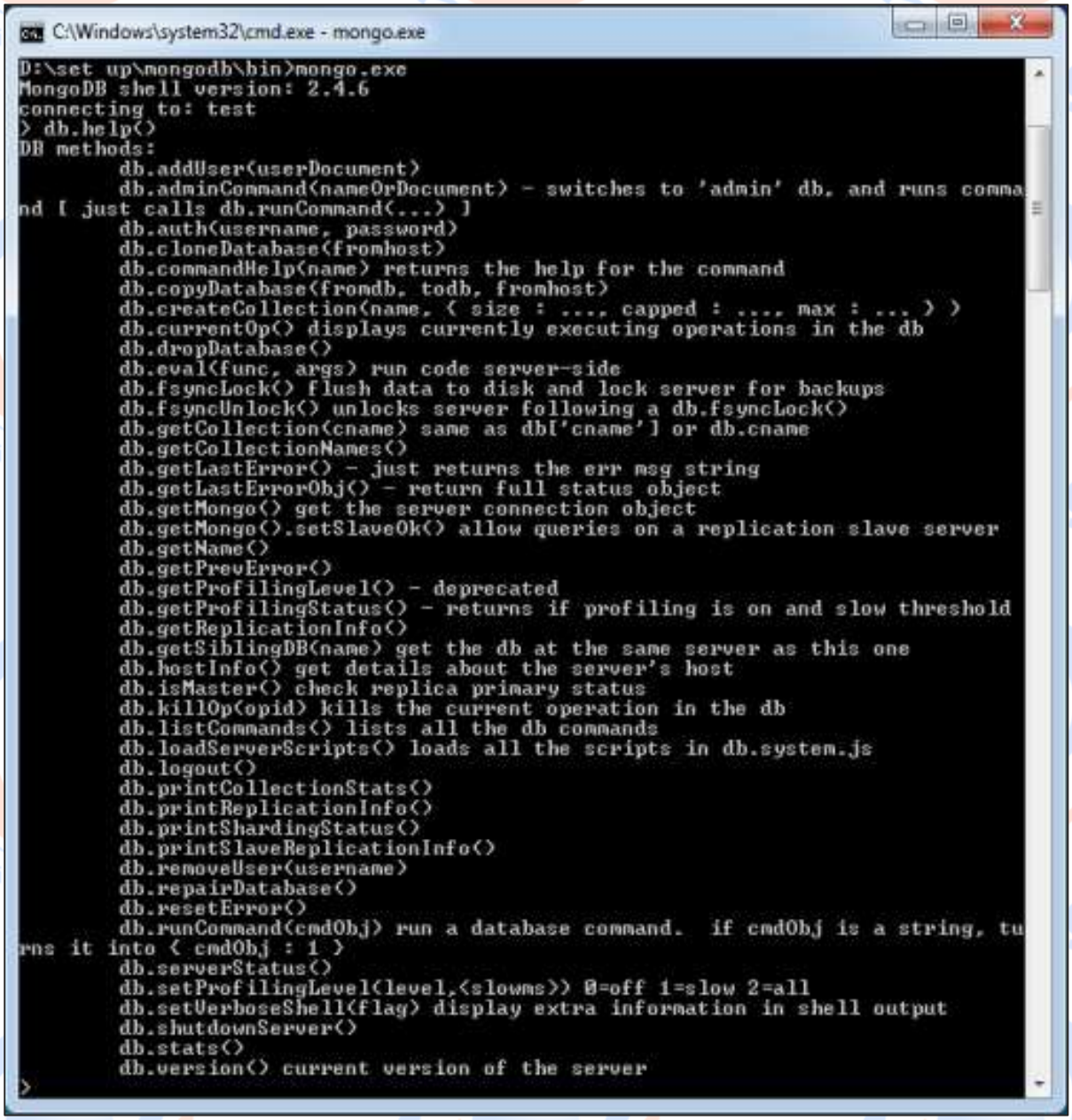
To use MongoDB run the following command.

```
mongo
```

This will connect you to running MongoDB instance.

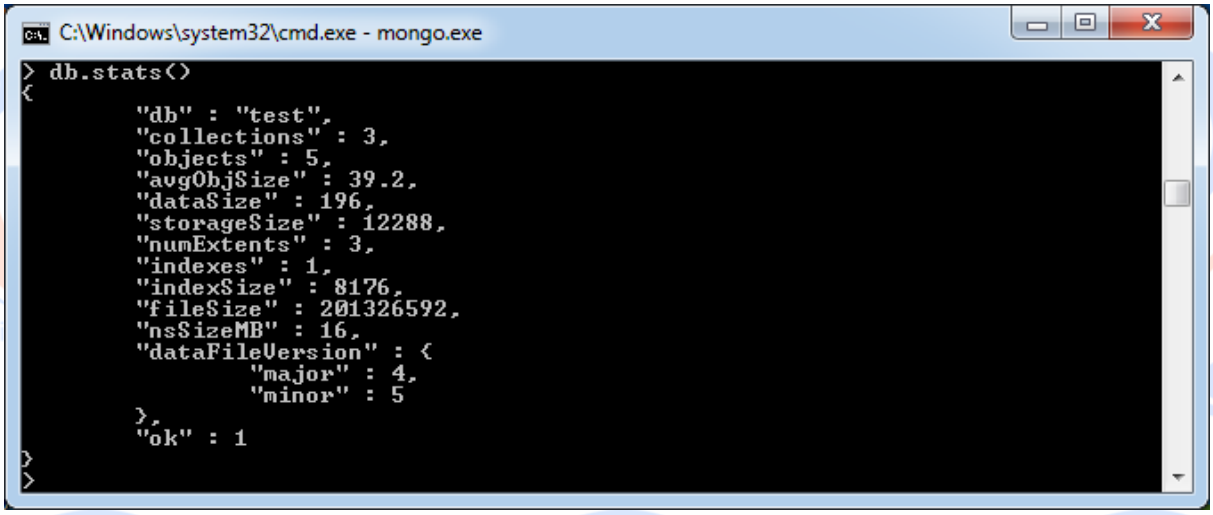
MongoDB Help

To get a list of commands, type **db.help()** in MongoDB client. This will give you a list of commands as shown in the following screenshot.



MongoDB Statistics

To get stats about MongoDB server, type the command **db.stats()** in MongoDB client. This will show the database name, number of collection and documents in the database. Output of the command is shown in the following screenshot.



MODUL 2

DATABASE OBJEK TER-DISTRIBUSI

4. MongoDB – Data Modelling

Data in MongoDB has a flexible schema.documents in the same collection. They do not need to have the same set of fields or structure, and common fields in a collection's documents may hold different types of data.

Some considerations while designing Schema in MongoDB

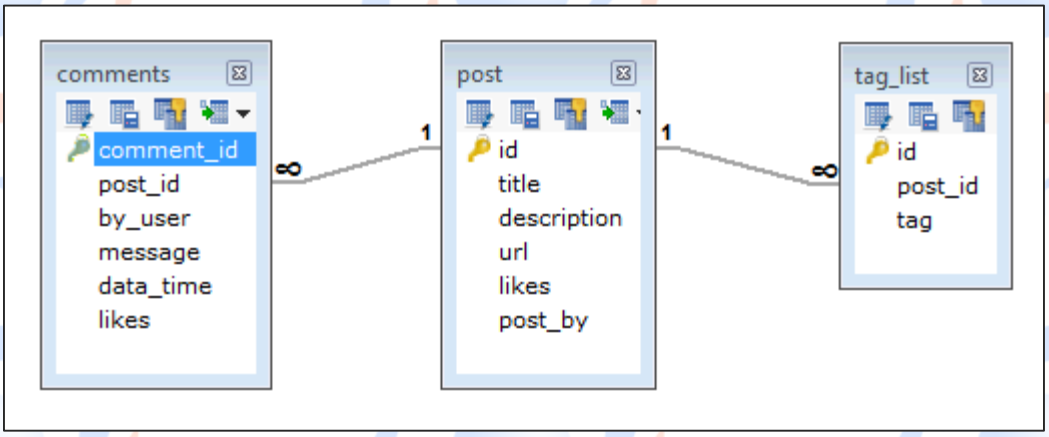
- Design your schema according to user requirements.
- Combine objects into one document if you will use them together. Otherwise separate them (but make sure there should not be need of joins).
- Duplicate the data (but limited) because disk space is cheap as compare to compute time.
- Do joins while write, not on read.
- Optimize your schema for most frequent use cases.
- Do complex aggregation in the schema.

Example

Suppose a client needs a database design for his blog/website and see the differences between RDBMS and MongoDB schema design. Website has the following requirements.

- Every post has the unique title, description and url.
- Every post can have one or more tags.
- Every post has the name of its publisher and total number of likes.
- Every post has comments given by users along with their name, message, data-time and likes.
- On each post, there can be zero or more comments.

In RDBMS schema, design for above requirements will have minimum three tables.



While in MongoDB schema, design will have one collection post and the following structure:

```
{
   _id: POST_ID
   title: TITLE_OF_POST,
   description: POST_DESCRIPTION,
   by: POST_BY,
   url: URL_OF_POST,
   tags: [TAG1, TAG2, TAG3],
   likes: TOTAL_LIKES,
   comments: [
      {
         user:'COMMENT_BY',
         message: TEXT,
         dateCreated: DATE_TIME,
         like: LIKES
      },
      {
         user:'COMMENT_BY',
         message: TEXT,
         dateCreated: DATE_TIME,
         like: LIKES
      }
   ]
}
```

So while showing the data, in RDBMS you need to join three tables and in MongoDB, data will be shown from one collection only.

5. MongoDB – Create Database

In this chapter, we will see how to create a database in MongoDB.

The use Command

MongoDB **use DATABASE_NAME** is used to create database. The command will create a new database if it doesn't exist, otherwise it will return the existing database.

Syntax

Basic syntax of **use DATABASE** statement is as follows:

```
use DATABASE_NAME
```

Example

If you want to create a database with name **<mydb>**, then **use DATABASE** statement would be as follows:

```
>use mydb
switched to db mydb
```

To check your currently selected database, use the command **db**

```
>db
mydb
```

If you want to check your databases list, use the command **show dbs**.

```
>show dbs
local     0.78125GB
test      0.23012GB
```

Your created database (mydb) is not present in list. To display database, you need to insert at least one document into it.

```
>db.movie.insert({"name":"tutorials point"})
>show dbs
local      0.78125GB
mydb       0.23012GB
test       0.23012GB
```

In MongoDB default database is test. If you didn't create any database, then collections will be stored in test database.

6. MongoDB – Drop Database

In this chapter, we will see how to drop a database using MongoDB command.

The dropDatabase() Method

MongoDB **db.dropDatabase()** command is used to drop a existing database.

Syntax

Basic syntax of **dropDatabase()** command is as follows:

```
db.dropDatabase()
```

This will delete the selected database. If you have not selected any database, then it will delete default 'test' database.

Example

First, check the list of available databases by using the command, **show dbs**.

```
>show dbs
local      0.78125GB
mydb       0.23012GB
test       0.23012GB
>
```

If you want to delete new database **<mydb>**, then **dropDatabase()** command would be as follows:

```
>use mydb
switched to db mydb
>db.dropDatabase()
>{ "dropped" : "mydb", "ok" : 1 }
>
```

Now check list of databases.

```
>show dbs
local      0.78125GB
test       0.23012GB
>
```

7. MongoDB – Create Collection

In this chapter, we will see how to create a collection using MongoDB.

The createCollection() Method

MongoDB **db.createCollection(name, options)** is used to create collection.

Syntax

Basic syntax of **createCollection()** command is as follows:

```
db.createCollection(name, options)
```

In the command, **name** is name of collection to be created. **Options** is a document and is used to specify configuration of collection.

Parameter	Type	Description
Name	String	Name of the collection to be created
Options	Document	(Optional) Specify options about memory size and indexing

Options parameter is optional, so you need to specify only the name of the collection. Following is the list of options you can use:

Field	Type	Description
capped	Boolean	(Optional) If true, enables a capped collection. Capped collection is a fixed size collection that automatically overwrites its oldest entries when it reaches its maximum size. **If you specify true, you need to specify size parameter also.**
autoIndexID	Boolean	(Optional) If true, automatically create index on _id field. Default value is false.
size	number	(Optional) Specifies a maximum size in bytes for a capped collection. **If capped is true, then you need to specify this field also.**
max	number	(Optional) Specifies the maximum number of documents allowed in the capped collection.

While inserting the document, MongoDB first checks size field of capped collection, then it checks max field.

Examples

Basic syntax of **createCollection()** method without options is as follows:

```
>use test
switched to db test
>db.createCollection("mycollection")
{ "ok" : 1 }
>
```

You can check the created collection by using the command **show collections**.

```
>show collections
mycollection
system.indexes
```

The following example shows the syntax of **createCollection()** method with few important options:

```
>db.createCollection("mycol", { capped : true, autoIndexID : true, size :
6142800, max : 10000 } )
{ "ok" : 1 }
>
```

In MongoDB, you don't need to create collection. MongoDB creates collection automatically, when you insert some document.

```
>db.tutorialspoint.insert({"name" : "tutorialspoint"})
>show collections
mycol
mycollection
system.indexes
tutorialspoint
>
```

MODUL 3

DATABASE OBJEK TER-DISTRIBUSI

8. MongoDB – Drop Collection

In this chapter, we will see how to drop a collection using MongoDB.

The drop() Method

MongoDB's **db.collection.drop()** is used to drop a collection from the database.

Syntax

Basic syntax of **drop()** command is as follows:

```
db.COLLECTION_NAME.drop()
```

Example

First, check the available collections into your database **mydb**.

```
>use mydb
switched to db mydb
>show collections
mycol
mycollection
system.indexes
tutorialspoint>
```

Now drop the collection with the name **mycollection**.

```
>db.mycollection.drop()
true
>
```

Again check the list of collections into database.

```
>show collections
mycol
system.indexes
tutorialspoint
>
```

drop() method will return true, if the selected collection is dropped successfully, otherwise it will return false.

9. MongoDB – Datatypes

MongoDB supports many datatypes. Some of them are:

- **String**: This is the most commonly used datatype to store the data. String in MongoDB must be UTF-8 valid.
- **Integer**: This type is used to store a numerical value. Integer can be 32 bit or 64 bit depending upon your server.
- **Boolean**: This type is used to store a boolean (true/ false) value.
- **Double**: This type is used to store floating point values.
- **Min/Max Keys**: This type is used to compare a value against the lowest and highest BSON elements.
- **Arrays**: This type is used to store arrays or list or multiple values into one key.
- **Timestamp**: ctimestamp. This can be handy for recording when a document has been modified or added.
- **Object**: This datatype is used for embedded documents.
- **Null**: This type is used to store a Null value.
- **Symbol**: This datatype is used identically to a string; however, it's generally reserved for languages that use a specific symbol type.
- **Date**: This datatype is used to store the current date or time in UNIX time format. You can specify your own date time by creating object of Date and passing day, month, year into it.
- **Object ID**: This datatype is used to store the document's ID.
- **Binary data**: This datatype is used to store binary data.
- **Code**: This datatype is used to store JavaScript code into the document.
- **Regular expression**: This datatype is used to store regular expression.

10. MongoDB – Insert Document

In this chapter, we will learn how to insert document in MongoDB collection.

The insert() Method

To insert data into MongoDB collection, you need to use MongoDB's **insert()** or **save()**method.

Syntax

The basic syntax of **insert()** command is as follows –

```
>db.COLLECTION_NAME.insert(document)
```

Example

```
>db.mycol.insert({
   _id: ObjectId(7df78ad8902c),
   title: 'MongoDB Overview',
   description: 'MongoDB is no sql database',
   by: 'tutorials point',
   url: 'http://www.tutorialspoint.com',
   tags: ['mongodb', 'database', 'NoSQL'],
   likes: 100
})
```

Here **mycol** is our collection name, as created in the previous chapter. If the collection doesn't exist in the database, then MongoDB will create this collection and then insert a document into it.

In the inserted document, if we don't specify the _id parameter, then MongoDB assigns a unique ObjectId for this document.

_id is 12 bytes hexadecimal number unique for every document in a collection. 12 bytes are divided as follows –

```
_id: ObjectId(4 bytes timestamp, 3 bytes machine id, 2 bytes process id, 3
bytes incrementer)
```

To insert multiple documents in a single query, you can pass an array of documents in insert() command.

Example

```
>db.post.insert([
   {
      title: 'MongoDB Overview',
      description: 'MongoDB is no sql database',
      by: 'tutorials point',
      url: 'http://www.tutorialspoint.com',
      tags: ['mongodb', 'database', 'NoSQL'],
      likes: 100
   },
   {
      title: 'NoSQL Database',
      description: 'NoSQL database doesn't have tables',
      by: 'tutorials point',
      url: 'http://www.tutorialspoint.com',
      tags: ['mongodb', 'database', 'NoSQL'],
      likes: 20,
      comments: [
         {
            user:'user1',
            message: 'My first comment',
            dateCreated: new Date(2013,11,10,2,35),
            like: 0
         }
      ]
   }
])
```

To insert the document you can use **db.post.save(document)** also. If you don't specify **_id** in the document then **save()** method will work same as **insert()** method. If the save() method.

11. MongoDB – Query Document

In this chapter, we will learn how to query document from MongoDB collection.

The find() Method

To query data from MongoDB collection, you need to use MongoDB's **find()**method.

Syntax

The basic syntax of **find()** method is as follows:

```
>db.COLLECTION_NAME.find()
```

find()method will display all the documents in a non-structured way.

The pretty() Method

To display the results in a formatted way, you can use **pretty()** method.

Syntax

```
>db.mycol.find().pretty()
```

Example

```
>db.mycol.find().pretty()
{
    "_id": ObjectId(7df78ad8902c),
    "title": "MongoDB Overview",
    "description": "MongoDB is no sql database",
    "by": "tutorials point",
    "url": "http://www.tutorialspoint.com",
    "tags": ["mongodb", "database", "NoSQL"],
    "likes": "100"
}
>
```

Apart from find() method, there is **findOne()** method, that returns only one document.

RDBMS Where Clause Equivalents in MongoDB

To query the document on the basis of some condition, you can use following operations

Operation	Syntax	Example	RDBMS Equivalent
Equality	{<key>:<value>}	db.mycol.find({"by":"tutorials point"}).pretty()	where by = 'tutorials point'
Less Than	{<key>:{$lt:<value>}}	db.mycol.find({"likes":{$lt:50}}).pretty()	where likes < 50
Less Than Equals	{<key>:{$lte:<value>}}	db.mycol.find({"likes":{$lte:50}}).pretty()	where likes <= 50
Greater Than	{<key>:{$gt:<value>}}	db.mycol.find({"likes":{$gt:50}}).pretty()	where likes > 50
Greater Than Equals	{<key>:{$gte:<value>}}	db.mycol.find({"likes":{$gte:50}}).pretty()	where likes >= 50
Not Equals	{<key>:{$ne:<value>}}	db.mycol.find({"likes":{$ne:50}}).pretty()	where likes != 50

AND in MongoDB

Syntax

In the **find()** method, if you pass multiple keys by separating them by ',' then MongoDB treats it as **AND** condition. Following is the basic syntax of **AND** −

```
>db.mycol.find({key1:value1, key2:value2}).pretty()
```

Example

Following example will show all the tutorials written by 'tutorials point' and whose title is 'MongoDB Overview'.

```
>db.mycol.find({"by":"tutorials point","title": "MongoDB Overview"}).pretty()
{
    "_id": ObjectId(7df78ad8902c),
    "title": "MongoDB Overview",
    "description": "MongoDB is no sql database",
    "by": "tutorials point",
    "url": "http://www.tutorialspoint.com",
```

```
   "tags": ["mongodb", "database", "NoSQL"],
   "likes": "100"
}
>
```

For the above given example, equivalent where clause will be **' where by='tutorials point' AND title = 'MongoDB Overview' '**. You can pass any number of key, value pairs in find clause.

OR in MongoDB

Syntax

To query documents based on the OR condition, you need to use **$or** keyword. Following is the basic syntax of **OR** −

```
>db.mycol.find(
   {
      $or: [
         {key1: value1}, {key2:value2}
      ]
   }
).pretty()
```

Example

Following example will show all the tutorials written by 'tutorials point' or whose title is 'MongoDB Overview'.

```
>db.mycol.find({$or:[{"by":"tutorials point"},{"title": "MongoDB
Overview"}]}).pretty()
{
   "_id": ObjectId(7df78ad8902c),
   "title": "MongoDB Overview",
   "description": "MongoDB is no sql database",
   "by": "tutorials point",
   "url": "http://www.tutorialspoint.com",
   "tags": ["mongodb", "database", "NoSQL"],
   "likes": "100" } >
```

Using AND and OR Together

Example

The following example will show the documents that have likes greater than 100 and whose title is either 'MongoDB Overview' or by is 'tutorials point'. Equivalent SQL where clause is **'where likes>10 AND (by = 'tutorials point' OR title = 'MongoDB Overview')'**

```
>db.mycol.find({"likes": {$gt:10}, $or: [{"by": "tutorials point"},
   {"title": "MongoDB Overview"}]}).pretty()
{
   "_id": ObjectId(7df78ad8902c),
   "title": "MongoDB Overview",
   "description": "MongoDB is no sql database",
   "by": "tutorials point",
   "url": "http://www.tutorialspoint.com",
   "tags": ["mongodb", "database", "NoSQL"],
   "likes": "100" }
>
```

MODUL 4

DATABASE OBJEK TER-DISTRIBUSI

12. MongoDB – Update Document

MongoDB's **update()** and **save()** methods are used to update document into a collection. The update() method updates the values in the existing document while the save() method replaces the existing document with the document passed in save() method.

MongoDB Update() Method

The update() method updates the values in the existing document.

Syntax

The basic syntax of **update()** method is as follows:

```
>db.COLLECTION_NAME.update(SELECTIOIN_CRITERIA, UPDATED_DATA)
```

Example

Consider the mycol collection has the following data.

```
{ "_id" : ObjectId(5983548781331adf45ec5), "title":"MongoDB Overview"}
{ "_id" : ObjectId(5983548781331adf45ec6), "title":"NoSQL Overview"}
{ "_id" : ObjectId(5983548781331adf45ec7), "title":"Tutorials Point Overview"}
```

Following example will set the new title 'New MongoDB Tutorial' of the documents whose title is 'MongoDB Overview'.

```
>db.mycol.update({'title':'MongoDB Overview'},{$set:{'title':'New MongoDB
Tutorial'}})
>db.mycol.find()
{ "_id" : ObjectId(5983548781331adf45ec5), "title":"New MongoDB Tutorial"}
{ "_id" : ObjectId(5983548781331adf45ec6), "title":"NoSQL Overview"}
{ "_id" : ObjectId(5983548781331adf45ec7), "title":"Tutorials Point Overview"}
>
```

By default, MongoDB will update only a single document. To update multiple documents, you need to set a parameter 'multi' to true.

```
>db.mycol.update({'title':'MongoDB Overview'},
   {$set:{'title':'New MongoDB Tutorial'}},{multi:true})
```

MongoDB Save() Method

The **save()** method replaces the existing document with the new document passed in the save() method.

Syntax

The basic syntax of MongoDB **save()** method is –

```
>db.COLLECTION_NAME.save({_id:ObjectId(),NEW_DATA})
```

Example

Following example will replace the document with the _id '5983548781331adf45ec7'.

```
>db.mycol.save(
   {
      "_id" : ObjectId(5983548781331adf45ec7), "title":"Tutorials Point New
Topic",
         "by":"Tutorials Point"
   }
)
>db.mycol.find()
{ "_id" : ObjectId(5983548781331adf45ec5), "title":"Tutorials Point New Topic",
   "by":"Tutorials Point"}
{ "_id" : ObjectId(5983548781331adf45ec6), "title":"NoSQL Overview"}
{ "_id" : ObjectId(5983548781331adf45ec7), "title":"Tutorials Point Overview"}
>
```

13. MongoDB – Delete Document

In this chapter, we will learn how to delete a document using MongoDB.

The remove() Method

MongoDB's **remove()** method is used to remove a document from the collection. remove() method accepts two parameters. One is deletion criteria and second is justOne flag.

- **deletion criteria**: (Optional) deletion criteria according to documents will be removed.
- **justOne**: (Optional) if set to true or 1, then remove only one document.

Syntax

Basic syntax of **remove()** method is as follows:

```
>db.COLLECTION_NAME.remove(DELLETION_CRITTERIA)
```

Example

Consider the mycol collection has the following data.

```
{ "_id" : ObjectId(5983548781331adf45ec5), "title":"MongoDB Overview"}
{ "_id" : ObjectId(5983548781331adf45ec6), "title":"NoSQL Overview"}
{ "_id" : ObjectId(5983548781331adf45ec7), "title":"Tutorials Point Overview"}
```

Following example will remove all the documents whose title is 'MongoDB Overview'.

```
>db.mycol.remove({'title':'MongoDB Overview'})
>db.mycol.find()
{ "_id" : ObjectId(5983548781331adf45ec6), "title":"NoSQL Overview"}
{ "_id" : ObjectId(5983548781331adf45ec7), "title":"Tutorials Point Overview"}
>
```

Remove Only One

If there are multiple records and you want to delete only the first record, then set **justOne** parameter in **remove()** method.

```
>db.COLLECTION_NAME.remove(DELETION_CRITERIA,1)
```

Remove All Documents

If you don't specify deletion criteria, then MongoDB will delete whole documents from the collection. **This is equivalent of SQL's truncate command.**

```
>db.mycol.remove()
>db.mycol.find()
>
```

14. MongoDB – Projection

In MongoDB, projection means selecting only the necessary data rather than selecting whole of the data of a document. If a document has 5 fields and you need to show only 3, then select only 3 fields from them.

The find() Method

MongoDB's **find()** method, explained in MongoDB Query Document accepts second optional parameter that is list of fields that you want to retrieve. In MongoDB, when you execute **find()** method, then it displays all fields of a document. To limit this, you need to set a list of fields with value 1 or 0. 1 is used to show the field while 0 is used to hide the fields.

Syntax

The basic syntax of **find()** method with projection is as follows:

```
>db.COLLECTION_NAME.find({},{KEY:1})
```

Example

Consider the collection mycol has the following data

```
{ "_id" : ObjectId(5983548781331adf45ec5), "title":"MongoDB Overview"}
{ "_id" : ObjectId(5983548781331adf45ec6), "title":"NoSQL Overview"}
{ "_id" : ObjectId(5983548781331adf45ec7), "title":"Tutorials Point Overview"}
```

Following example will display the title of the document while querying the document.

```
>db.mycol.find({},{"title":1,_id:0})
{"title":"MongoDB Overview"}
{"title":"NoSQL Overview"}
{"title":"Tutorials Point Overview"}
>
```

Please note **_id** field is always displayed while executing **find()** method, if you don't want this field, then you need to set it as 0.

15. MongoDB – Limit Records

In this chapter, we will learn how to limit records using MongoDB.

The Limit() Method

To limit the records in MongoDB, you need to use **limit()** method. The method accepts one number type argument, which is the number of documents that you want to be displayed.

Syntax

The basic syntax of **limit()** method is as follows:

```
>db.COLLECTION_NAME.find().limit(NUMBER)
```

Example

Consider the collection myycol has the following data.

```
{ "_id" : ObjectId(5983548781331adf45ec5), "title":"MongoDB Overview"}
{ "_id" : ObjectId(5983548781331adf45ec6), "title":"NoSQL Overview"}
{ "_id" : ObjectId(5983548781331adf45ec7), "title":"Tutorials Point Overview"}
```

Following example will display only two documents while querying the document.

```
>db.mycol.find({},{"title":1,_id:0}).limit(2)
{"title":"MongoDB Overview"}
{"title":"NoSQL Overview"}
>
```

If you don't specify the number argument in **limit()** method then it will display all documents from the collection.

MongoDB Skip() Method

Apart from limit() method, there is one more method **skip()** which also accepts number type argument and is used to skip the number of documents.

Syntax

The basic syntax of **skip()** method is as follows:

```
>db.COLLECTION_NAME.find().limit(NUMBER).skip(NUMBER)
```

Example

Following example will display only the second document.

```
>db.mycol.find({},{"title":1,_id:0}).limit(1).skip(1)
{"title":"NoSQL Overview"}
>
```

Please note, the default value in **skip()** method is 0.

MODUL 5

DATABASE OBJEK TER-DISTRIBUSI

16. MongoDB – Sort Records

In this chapter, we will learn how to sort records in MongoDB.

The sort() Method

To sort documents in MongoDB, you need to use **sort()** method. The method accepts a document containing a list of fields along with their sorting order. To specify sorting order 1 and -1 are used. 1 is used for ascending order while -1 is used for descending order.

Syntax

The basic syntax of **sort()** method is as follows:

```
>db.COLLECTION_NAME.find().sort({KEY:1})
```

Example

Consider the collection myycol has the following data.

```
{ "_id" : ObjectId(5983548781331adf45ec5), "title":"MongoDB Overview"}
{ "_id" : ObjectId(5983548781331adf45ec6), "title":"NoSQL Overview"}
{ "_id" : ObjectId(5983548781331adf45ec7), "title":"Tutorials Point Overview"}
```

Following example will display the documents sorted by title in the descending order.

```
>db.mycol.find({},{"title":1,_id:0}).sort({"title":-1})
{"title":"Tutorials Point Overview"}
{"title":"NoSQL Overview"}
{"title":"MongoDB Overview"}
>
```

Please note, if you don't specify the sorting preference, then **sort()** method will display the documents in ascending order.

17. MongoDB – Indexing

Indexes support the efficient resolution of queries. Without indexes, MongoDB must scan every document of a collection to select those documents that match the query statement. This scan is highly inefficient and require MongoDB to process a large volume of data.

Indexes are special data structures, that store a small portion of the data set in an easy-to-traverse form. The index stores the value of a specific field or set of fields, ordered by the value of the field as specified in the index.

The ensureIndex() Method

To create an index you need to use ensureIndex() method of MongoDB.

Syntax

The basic syntax of **ensureIndex()** method is as follows().

```
>db.COLLECTION_NAME.ensureIndex({KEY:1})
```

Here key is the name of the file on which you want to create index and 1 is for ascending order. To create index in descending order you need to use -1.

Example

```
>db.mycol.ensureIndex({"title":1})
>
```

In **ensureIndex()** method you can pass multiple fields, to create index on multiple fields.

```
>db.mycol.ensureIndex({"title":1,"description":-1})
>
```

ensureIndex() method also accepts list of options (which are optional). Following is the list:

Parameter	Type	Description
background	Boolean	Builds the index in the background so that building an index does not block other database activities. Specify true to build in the background. The default value is **false**.
unique	Boolean	Creates a unique index so that the collection will not accept insertion of documents where the index key or keys match an existing value in the index. Specify true to create a unique index. The default value is **false**.

name	String	The name of the index. If unspecified, MongoDB generates an index name by concatenating the names of the indexed fields and the sort order.
dropDups	Boolean	Creates a unique index on a field that may have duplicates. MongoDB indexes only the first occurrence of a key and removes all documents from the collection that contain subsequent occurrences of that key. Specify true to create unique index. The default value is **false**.
sparse	Boolean	If true, the index only references documents with the specified field. These indexes use less space but behave differently in some situations (particularly sorts). The default value is **false**.
expireAfterSeconds	Integer	Specifies a value, in seconds, as a TTL to control how long MongoDB retains documents in this collection.
v	Index Version	The index version number. The default index version depends on the version of MongoDB running when creating the index.
weights	Document	The weight is a number ranging from 1 to 99,999 and denotes the significance of the field relative to the other indexed fields in terms of the score.
default_language	String	For a text index, the language that determines the list of stop words and the rules for the stemmer and tokenizer. The default value is **english**.
language_override	String	For a text index, specify the name of the field in the document that contains, the language to override the default language. The default value is language.

18. MongoDB – Aggregation

Aggregations operations process data records and return computed results. Aggregation operations group values from multiple documents together, and can perform a variety of operations on the grouped data to return a single result. In SQL count(*) and with group by is an equivalent of mongodb aggregation.

The aggregate() Method

For the aggregation in MongoDB, you should use **aggregate()** method.

Syntax

Basic syntax of **aggregate()** method is as follows:

```
>db.COLLECTION_NAME.aggregate(AGGREGATE_OPERATION)
```

Example

In the collection you have the following data:

```
{
   _id: ObjectId(7df78ad8902c)
   title: 'MongoDB Overview',
   description: 'MongoDB is no sql database',
   by_user: 'tutorials point',
   url: 'http://www.tutorialspoint.com',
   tags: ['mongodb', 'database', 'NoSQL'],
   likes: 100
},
{
   _id: ObjectId(7df78ad8902d)
   title: 'NoSQL Overview',
   description: 'No sql database is very fast',
   by_user: 'tutorials point',
   url: 'http://www.tutorialspoint.com',
   tags: ['mongodb', 'database', 'NoSQL'],
   likes: 10
},
{
   _id: ObjectId(7df78ad8902e)
```

```
   title: 'Neo4j Overview',
   description: 'Neo4j is no sql database',
   by_user: 'Neo4j',
   url: 'http://www.neo4j.com',
   tags: ['neo4j', 'database', 'NoSQL'],
   likes: 750
},
```

Now from the above collection, if you want to display a list stating how many tutorials are written by each user, then you will use the following **aggregate()** method:

```
> db.mycol.aggregate([{$group : {_id : "$by_user", num_tutorial : {$sum :
1}}}])
{
   "result" : [
      {
         "_id" : "tutorials point",
         "num_tutorial" : 2
      },
      {
         "_id" : "Neo4j",
         "num_tutorial" : 1
      }
   ],
   "ok" : 1
}
>
```

Sql equivalent query for the above use case will be **select by_user, count(*) from mycol group by by_user**.

In the above example, we have grouped documents by field **by_user** and on each occurrence of by_user previous value of sum is incremented. Following is a list of available aggregation expressions.

Expression	Description	Example
$sum	Sums up the defined value from all documents in the collection.	db.mycol.aggregate([{$group : {_id : "$by_user", num_tutorial : {$sum : "$likes"}}}])

$avg	Calculates the average of all given values from all documents in the collection.	db.mycol.aggregate([{$group : {_id : "$by_user", num_tutorial : {$avg : "$likes"}}}])
$min	Gets the minimum of the corresponding values from all documents in the collection.	db.mycol.aggregate([{$group : {_id : "$by_user", num_tutorial : {$min : "$likes"}}}])
$max	Gets the maximum of the corresponding values from all documents in the collection.	db.mycol.aggregate([{$group : {_id : "$by_user", num_tutorial : {$max : "$likes"}}}])
$push	Inserts the value to an array in the resulting document.	db.mycol.aggregate([{$group : {_id : "$by_user", url : {$push: "$url"}}}])
$addToSet	Inserts the value to an array in the resulting document but does not create duplicates.	db.mycol.aggregate([{$group : {_id : "$by_user", url : {$addToSet : "$url"}}}])
$first	Gets the first document from the source documents according to the grouping. Typically this makes only sense together with some previously applied "$sort"-stage.	db.mycol.aggregate([{$group : {_id : "$by_user", first_url : {$first : "$url"}}}])
$last	Gets the last document from the source documents according to the grouping. Typically this makes only sense together with some previously applied "$sort"-stage.	db.mycol.aggregate([{$group : {_id : "$by_user", last_url : {$last : "$url"}}}])

Pipeline Concept

In UNIX command, shell pipeline means the possibility to execute an operation on some input and use the output as the input for the next command and so on. MongoDB also supports same concept in aggregation framework. There is a set of possible stages and each of those is taken as a set of documents as an input and produces a resulting set of documents (or the final resulting JSON document at the end of the pipeline). This can then in turn be used for the next stage and so on.

Following are the possible stages in aggregation framework:

- **$project:** Used to select some specific fields from a collection.
- **$match:** This is a filtering operation and thus this can reduce the amount of documents that are given as input to the next stage.

- **$group:** This does the actual aggregation as discussed above.
- **$sort:** Sorts the documents.
- **$skip:** With this, it is possible to skip forward in the list of documents for a given amount of documents.
- **$limit:** This limits the amount of documents to look at, by the given number starting from the current positions.
- **$unwind:** This is used to unwind document that are using arrays. When using an array, the data is kind of pre-joined and this operation will be undone with this to have individual documents again. Thus with this stage we will increase the amount of documents for the next stage.

MODUL 6

DATABASE OBJEK TER-DISTRIBUSI

19. MongoDB – Replication

Replication is the process of synchronizing data across multiple servers. Replication provides redundancy and increases data availability with multiple copies of data on different database servers. Replication protects a database from the loss of a single server. Replication also allows you to recover from hardware failure and service interruptions. With additional copies of the data, you can dedicate one to disaster recovery, reporting, or backup.

Why Replication?

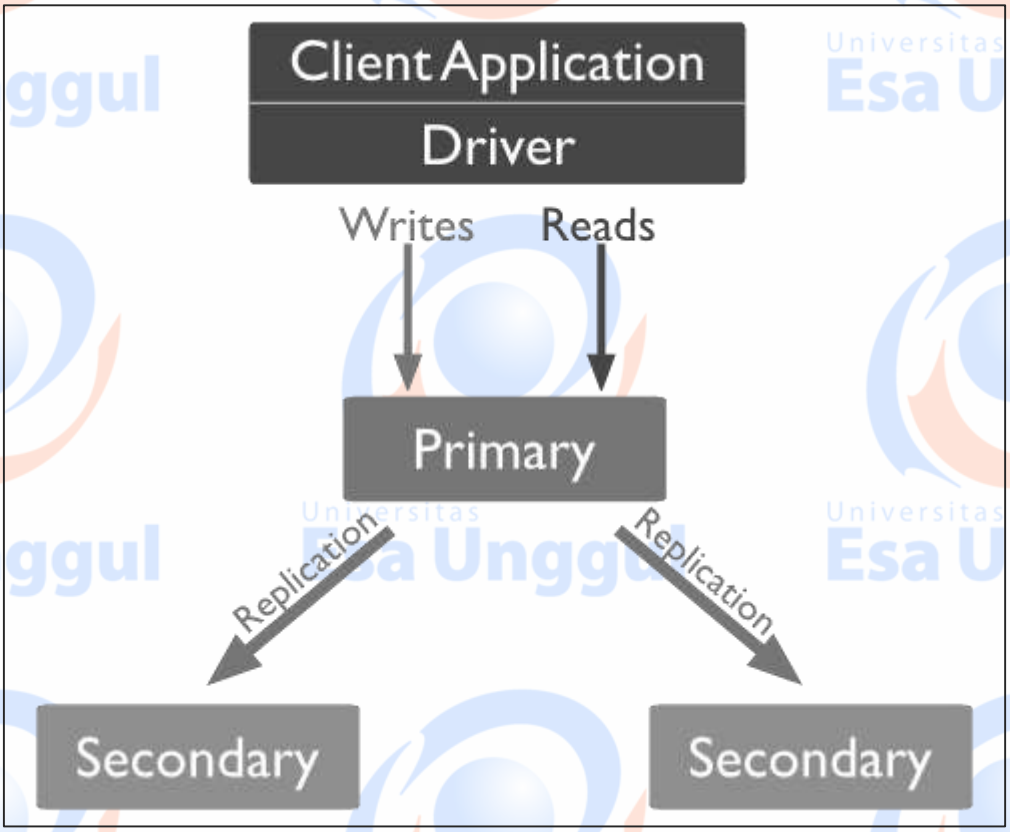
- To keep your data safe
- High (24*7) availability of data
- Disaster recovery
- No downtime for maintenance (like backups, index rebuilds, compaction)
- Read scaling (extra copies to read from)
- Replica set is transparent to the application

How Replication Works in MongoDB

MongoDB achieves replication by the use of replica set. A replica set is a group of **mongod** instances that host the same data set. In a replica, one node is primary node that receives all write operations. All other instances, such as secondaries, apply operations from the primary so that they have the same data set. Replica set can have only one primary node.

- Replica set is a group of two or more nodes (generally minimum 3 nodes are required).
- In a replica set, one node is primary node and remaining nodes are secondary.
- All data replicates from primary to secondary node.
- At the time of automatic failover or maintenance, election establishes for primary and a new primary node is elected.
- After the recovery of failed node, it again joins the replica set and works as a secondary node.

A typical diagram of MongoDB replication is shown in which client application always interact with the primary node and the primary node then replicates the data to the secondary nodes.



Replica Set Features

- A cluster of N nodes
- Any one node can be primary
- All write operations go to primary
- Automatic failover
- Automatic recovery
- Consensus election of primary

Set Up a Replica Set

In this tutorial, we will convert standalone MongoDB instance to a replica set. To convert to replica set, following are the steps:

- Shutdown already running MongoDB server.
- Start the MongoDB server by specifying -- replSet option. Following is the basic syntax of --replSet:

```
mongod --port "PORT" --dbpath "YOUR_DB_DATA_PATH" --replSet
"REPLICA_SET_INSTANCE_NAME"
```

Example

```
mongod --port 27017 --dbpath "D:\set up\mongodb\data" --replSet rs0
```

- It will start a mongod instance with the name rs0, on port 27017.
- Now start the command prompt and connect to this mongod instance.
- In Mongo client, issue the command **rs.initiate()** to initiate a new replica set.
- To check the replica set configuration, issue the command **rs.conf()**. To check the status of replica set issue the command **rs.status()**.

Add Members to Replica Set

To add members to replica set, start mongod instances on multiple machines. Now start a mongo client and issue a command **rs.add()**.

Syntax

The basic syntax of **rs.add()** command is as follows:

```
>rs.add(HOST_NAME:PORT)
```

Example

Suppose your mongod instance name is **mongod1.net** and it is running on port **27017**. To add this instance to replica set, issue the command **rs.add()** in Mongo client.

```
>rs.add("mongod1.net:27017")
>
```

You can add mongod instance to replica set only when you are connected to primary node. To check whether you are connected to primary or not, issue the command **db.isMaster()** in Mongo client.

20. MongoDB – Sharding

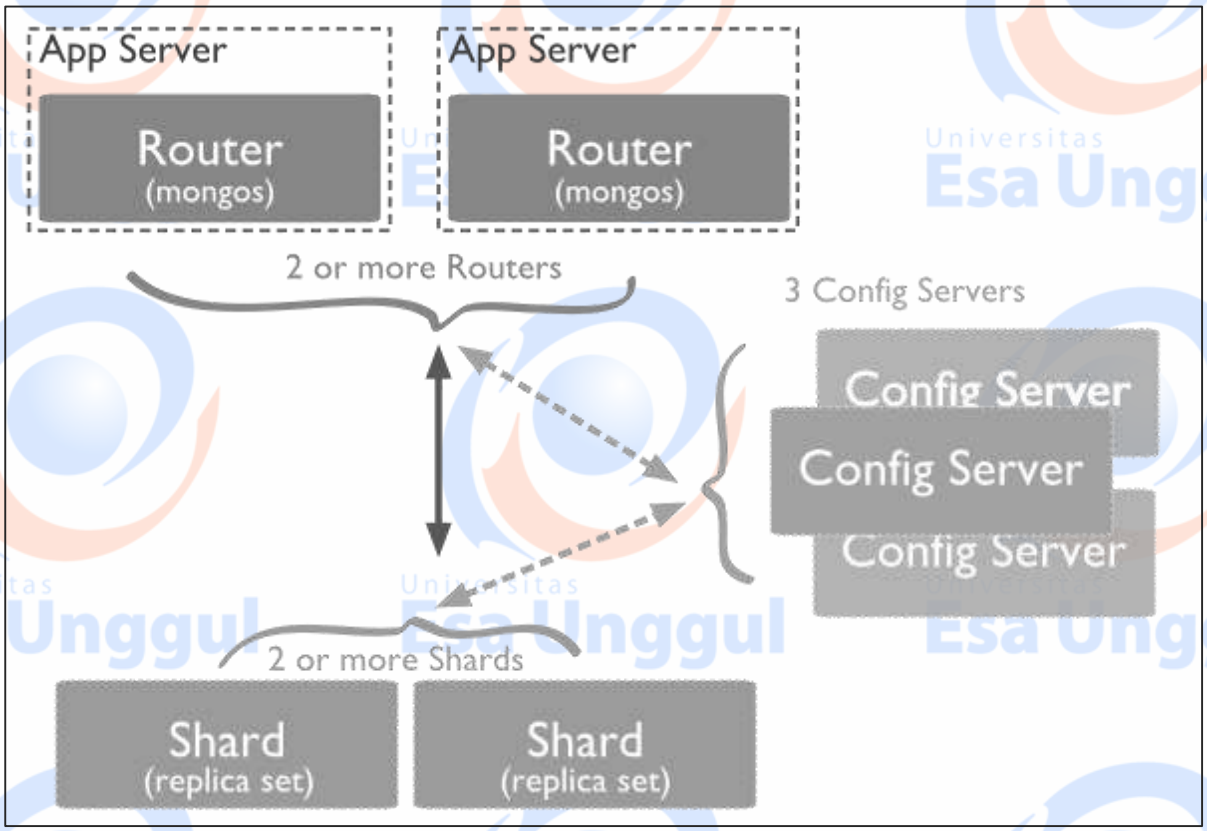
Sharding is the process of storing data records across multiple machines and it is MongoDB's approach to meeting the demands of data growth. As the size of the data increases, a single machine may not be sufficient to store the data nor provide an acceptable read and write throughput. Sharding solves the problem with horizontal scaling. With sharding, you add more machines to support data growth and the demands of read and write operations.

Why Sharding?

- In replication, all writes go to master node
- Latency sensitive queries still go to master
- Single replica set has limitation of 12 nodes
- Memory can't be large enough when active dataset is big
- Local disk is not big enough
- Vertical scaling is too expensive

Sharding in MongoDB

The following diagram shows the sharding in MongoDB using sharded cluster.



In the following diagram, there are three main components:

- **Shards**: Shards are used to store data. They provide high availability and data consistency. In production environment, each shard is a separate replica set.

- **Config Servers**: Config servers store the cluster's metadata. This data contains a mapping of the cluster's data set to the shards. The query router uses this metadata to target operations to specific shards. In production environment, sharded clusters have exactly 3 config servers.

- **Query Routers**: Query routers are basically mongo instances, interface with client applications and direct operations to the appropriate shard. The query router processes and targets the operations to shards and then returns results to the clients. A sharded cluster can contain more than one query router to divide the client request load. A client sends requests to one query router. Generally, a sharded cluster have many query routers.

21. MongoDB – Create Backup

In this chapter, we will see how to create a backup in MongoDB.

Dump MongoDB Data

To create backup of database in MongoDB, you should use **mongodump**command. This command will dump the entire data of your server into the dump directory. There are many options available by which you can limit the amount of data or create backup of your remote server.

Syntax

The basic syntax of **mongodump** command is as follows:

```
>mongodump
```

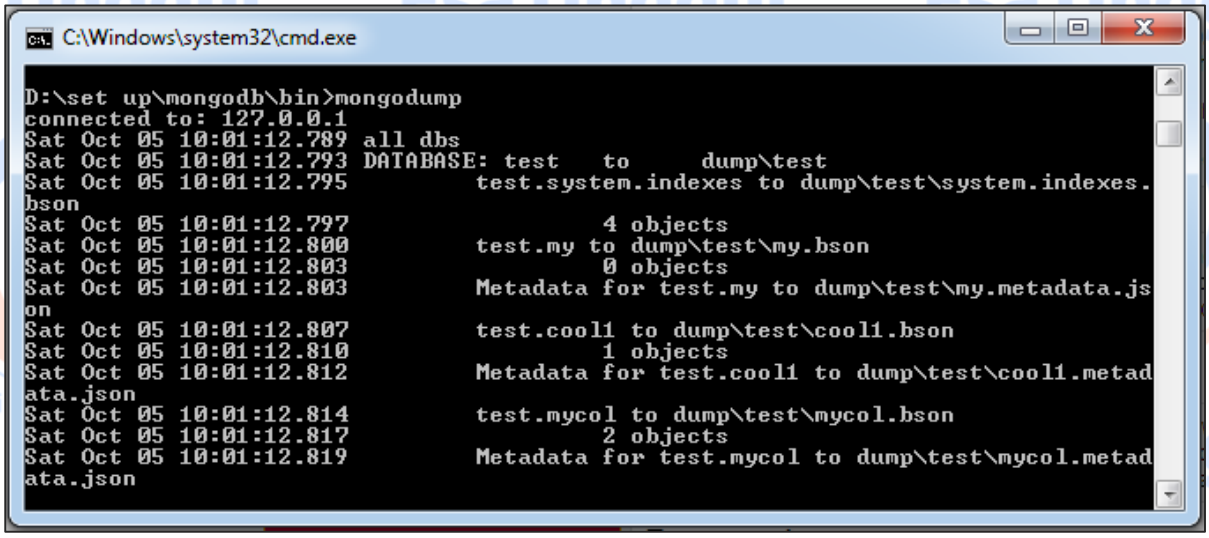
Example

Start your mongod server. Assuming that your mongod server is running on the localhost and port 27017, open a command prompt and go to the bin directory of your mongodb instance and type the command **mongodump**

Consider the mycol collection has the following data.

```
>mongodump
```

The command will connect to the server running at **127.0.0.1** and port **27017** and back all data of the server to directory **/bin/dump/**. Following is the output of the command:



Following is a list of available options that can be used with the **mongodump** command.

This command will backup only specified database at specified path.

Syntax	Description	Example
mongodump --host HOST_NAME --port PORT_NUMBER	This command will backup all databases of specified mongod instance	mongodump --host tutorialspoint.com --port 27017
mongodump --dbpath DB_PATH --out BACKUP_DIRECTORY		mongodump --dbpath /data/db/ --out /data/backup/
mongodump --collection COLLECTION --db DB_NAME	This command will backup only specified collection of specified database.	mongodump --collection mycol --db test

Restore Data

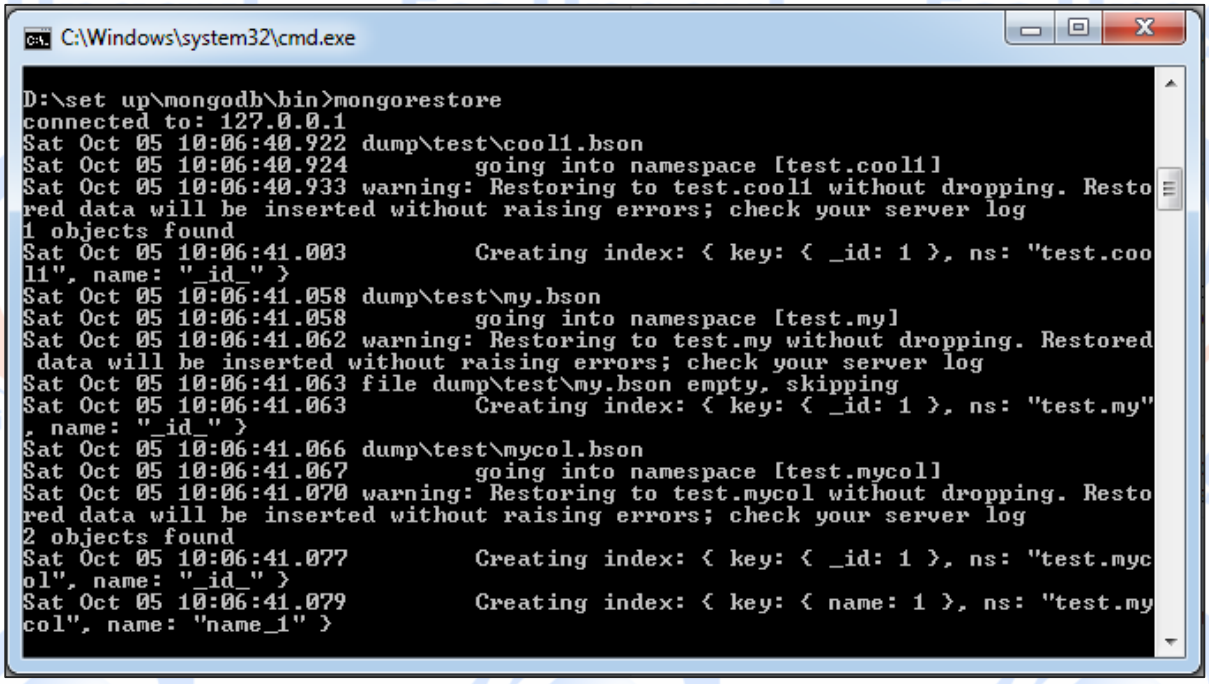
To restore backup data MongoDB's **mongorestore** command is used. This command restores all of the data from the backup directory.

Syntax

The basic syntax of **mongorestore** command is:

```
>mongorestore
```

Following is the output of the command:



MODUL 7

DATABASE OBJEK TER-DISTRIBUSI

22. MongoDB – Deployment

When you are preparing a MongoDB deployment, you should try to understand how your application is going to hold up in production. It's a good idea to develop a consistent, repeatable approach to managing your deployment environment so that you can minimize any surprises once you're in production.

The best approach incorporates prototyping your setup, conducting load testing, monitoring key metrics, and using that information to scale your setup. The key part of the approach is to proactively monitor your entire system - this will help you understand how your production system will hold up before deploying, and determine where you will need to add capacity. Having insight into potential spikes in your memory usage, for example, could help put out a write-lock fire before it starts.

To monitor your deployment, MongoDB provides some of the following commands:

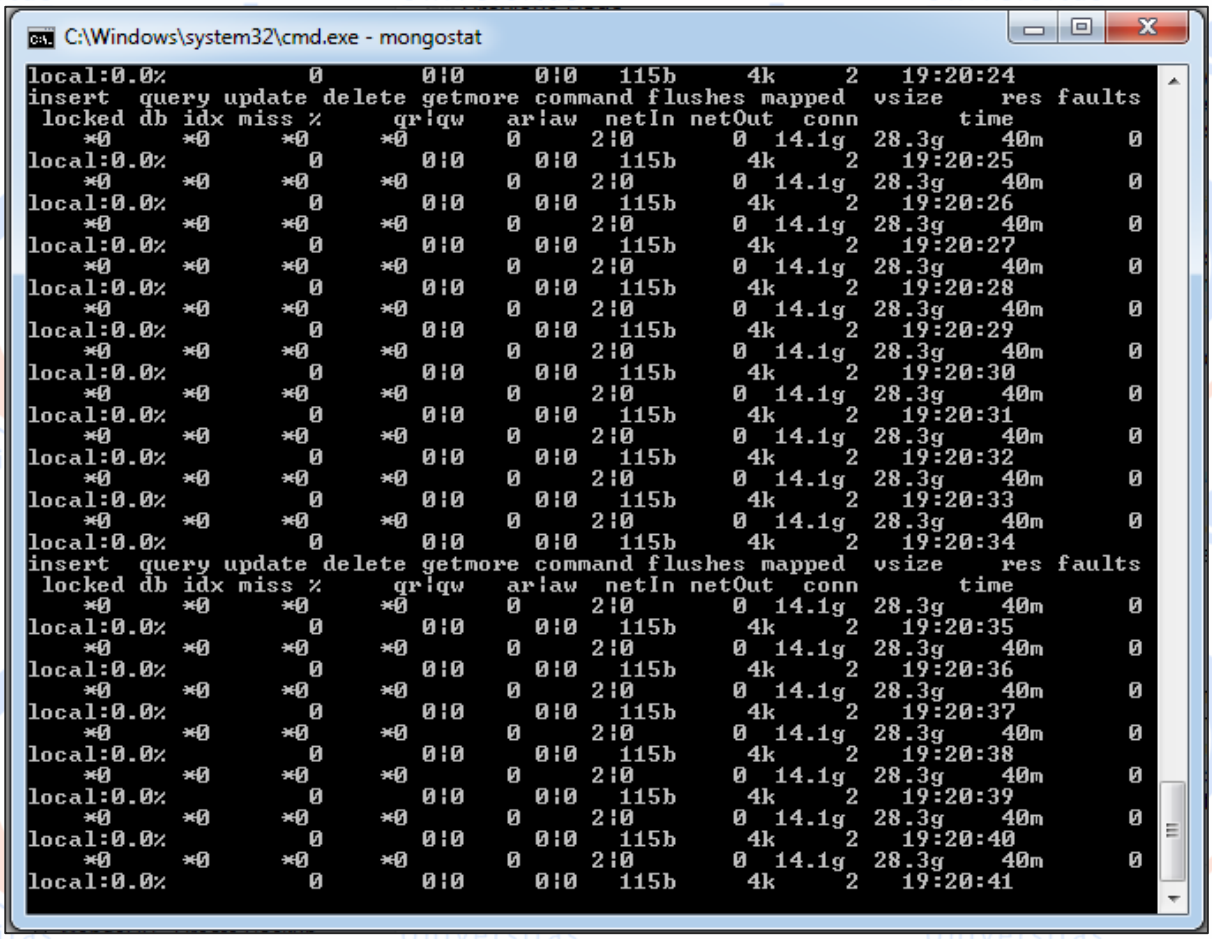
mongostat

This command checks the status of all running mongod instances and return counters of database operations. These counters include inserts, queries, updates, deletes, and cursors. Command also shows when you're hitting page faults, and showcase your lock percentage. This means that you're running low on memory, hitting write capacity or have some performance issue.

To run the command, start your mongod instance. In another command prompt, go to **bin** directory of your mongodb installation and type **mongostat**.

```
D:\set up\mongodb\bin>mongostat
```

Following is the output of the command:



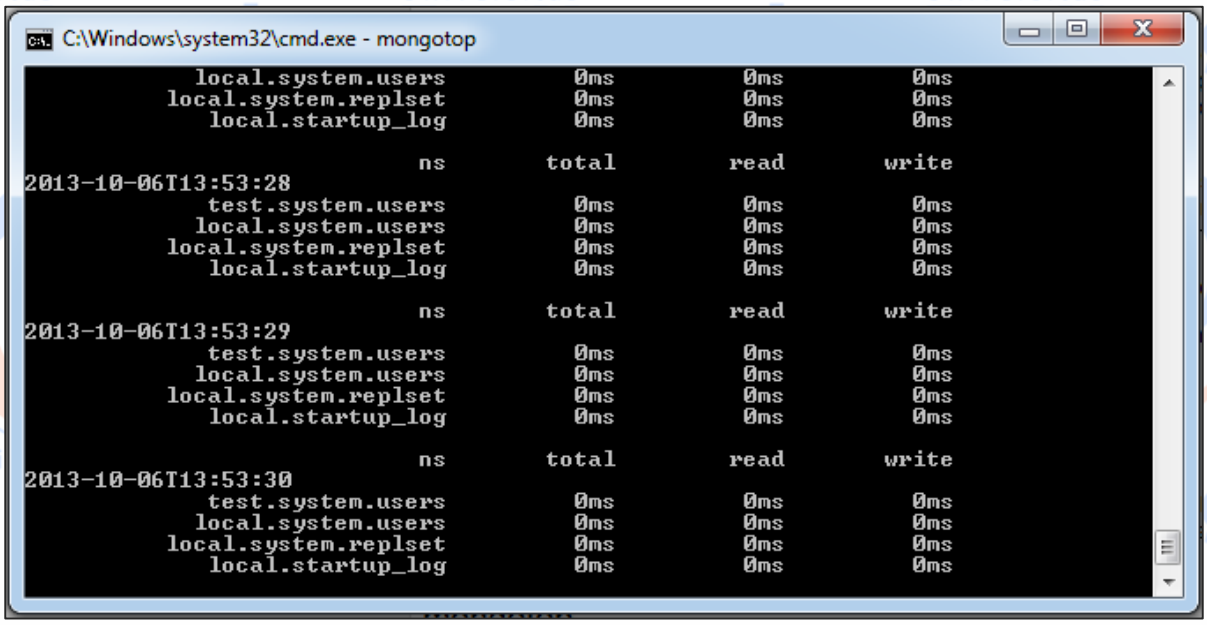
mongotop

This command tracks and reports the read and write activity of MongoDB instance on a collection basis. By default, **mongotop** returns information in each second, which you can change it accordingly. You should check that this read and write activity matches your application intention, and you're not firing too many writes to the database at a time, reading too frequently from a disk, or are exceeding your working set size.

To run the command, start your mongod instance. In another command prompt, go to **bin** directory of your mongodb installation and type **mongotop**.

```
D:\set up\mongodb\bin>mongotop
```

Following is the output of the command:



To change **mongotop** command to return information less frequently, specify a specific number after the mongotop command.

```
D:\set up\mongodb\bin>mongotop 30
```

The above example will return values every 30 seconds.

Apart from the MongoDB tools, 10gen provides a free, hosted monitoring service, MongoDB Management Service (MMS), that provides a dashboard and gives you a view of the metrics from your entire cluster.

23. MongoDB – Java

In this chapter, we will learn how to set up MongoDB JDBC driver.

Installation

Before you start using MongoDB in your Java programs, you need to make sure that you have MongoDB JDBC driver and Java set up on the machine. You can check Java tutorial for Java installation on your machine. Now, let us check how to set up MongoDB JDBC driver.

- You need to download the jar from the path Download mongo.jar. Make sure to download the latest release of it.
- You need to include the mongo.jar into your classpath.

Connect to Database

To connect database, you need to specify the database name, if the database doesn't exist then MongoDB creates it automatically.

Following is the code snippet to connect to the database:

```
import com.mongodb.client.MongoDatabase;
import com.mongodb.MongoClient;
import com.mongodb.MongoCredential;

public class ConnectToDB {
   public static void main( String args[] ) {
      // Creating a Mongo client
      MongoClient mongo = new MongoClient( "localhost" , 27017 );

      // Creating Credentials
      MongoCredential credential;
      credential = MongoCredential.createCredential("sampleUser", "myDb",
"password".toCharArray());
      System.out.println("Connected to the database successfully");

      // Accessing the database
      MongoDatabase database = mongo.getDatabase("myDb");
      System.out.println("Credentials ::"+ credential);
   }
}
```

Now, let's compile and run the above program to create our database myDb as shown below.

```
$javac ConnectToDB.java
$java ConnectToDB
```

On executing, the above program gives you the following output.

```
Connected to the database successfully
Credentials ::MongoCredential{mechanism=null, userName='sampleUser',
source='myDb', password=<hidden>, mechanismProperties={}}
```

Create a Collection

To create a collection, **createCollection()** method of **com.mongodb.client.MongoDatabase** class is used.

Following is the code snippet to create a collection –

```
import com.mongodb.client.MongoDatabase;
import com.mongodb.MongoClient;
import com.mongodb.MongoCredential;

public class CreatingCollection {
   public static void main( String args[] ) {
      // Creating a Mongo client
      MongoClient mongo = new MongoClient( "localhost" , 27017 );

      // Creating Credentials
      MongoCredential credential;
      credential = MongoCredential.createCredential("sampleUser", "myDb",
"password".toCharArray());
       System.out.println("Connected to the database successfully");

      //Accessing the database
      MongoDatabase database = mongo.getDatabase("myDb");

      //Creating a collection
      database.createCollection("sampleCollection");
      System.out.println("Collection created successfully");
   }
}
```

On compiling, the above program gives you the following result –

```
Connected to the database successfully
Collection created successfully
```

Getting/Selecting a Collection

To get/select a collection from the database, **getCollection()** method of **com.mongodb.client.MongoDatabase** class is used.

Following is the program to get/select a collection –

```
import com.mongodb.client.MongoCollection;
import com.mongodb.client.MongoDatabase;
import org.bson.Document;
import com.mongodb.MongoClient;
import com.mongodb.MongoCredential;

public class selectingCollection {
   public static void main( String args[] ) {
      // Creating a Mongo client
      MongoClient mongo = new MongoClient( "localhost" , 27017 );

      // Creating Credentials
      MongoCredential credential;
      credential = MongoCredential.createCredential("sampleUser", "myDb",
"password".toCharArray());
      System.out.println("Connected to the database successfully");

      // Accessing the database
      MongoDatabase database = mongo.getDatabase("myDb");

      // Creating a collection
      System.out.println("Collection created successfully");

      // Retieving a collection
      MongoCollection<Document> collection = database.getCollection("myCollection");
      System.out.println("Collection myCollection selected successfully");
   }
}
```

On compiling, the above program gives you the following result –

```
Connected to the database successfully
Collection created successfully
Collection myCollection selected successfully
```

Insert a Document

To insert a document into MongoDB, **insert()** method of **com.mongodb.client.MongoCollection** class is used.

Following is the code snippet to insert a document –

```
import com.mongodb.client.MongoCollection;
import com.mongodb.client.MongoDatabase;
import org.bson.Document;

import com.mongodb.MongoClient;
import com.mongodb.MongoCredential;

public class InsertingDocument {
   public static void main( String args[] ) {
      // Creating a Mongo client
      MongoClient mongo = new MongoClient( "localhost" , 27017 );

      // Creating Credentials
      MongoCredential credential;
      credential = MongoCredential.createCredential("sampleUser", "myDb",
"password".toCharArray());
      System.out.println("Connected to the database successfully");

      // Accessing the database
      MongoDatabase database = mongo.getDatabase("myDb");

      // Retrieving a collection
      MongoCollection<Document> collection = database.getCollection("sampleCollection");
      System.out.println("Collection sampleCollection selected successfully");

      Document document = new Document("title", "MongoDB")
         .append("id", 1)
```

```
            .append("description", "database")
            .append("likes", 100)
            .append("url", "http://www.tutorialspoint.com/mongodb/")
            .append("by", "tutorials point");

         collection.insertOne(document);
         System.out.println("Document inserted successfully");
      }
}
```

On compiling, the above program gives you the following result –

```
Connected to the database successfully
Collection sampleCollection selected successfully
Document inserted successfully
```

Retrieve All Documents

To select all documents from the collection, **find()** method of **com.mongodb.client.MongoCollection** class is used. This method returns a cursor, so you need to iterate this cursor.

Following is the program to select all documents –

```
import com.mongodb.client.FindIterable;
import com.mongodb.client.MongoCollection;
import com.mongodb.client.MongoDatabase;

import java.util.Iterator;
import org.bson.Document;
import com.mongodb.MongoClient;
import com.mongodb.MongoCredential;

public class RetrievingAllDocuments {
   public static void main( String args[] ) {
      // Creating a Mongo client
      MongoClient mongo = new MongoClient( "localhost" , 27017 );

      // Creating Credentials
      MongoCredential credential;
```

```
      credential = MongoCredential.createCredential("sampleUser", "myDb",
"password".toCharArray());
      System.out.println("Connected to the database successfully");

      // Accessing the database
      MongoDatabase database = mongo.getDatabase("myDb");

      // Retrieving a collection
      MongoCollection<Document> collection =
database.getCollection("sampleCollection");
      System.out.println("Collection sampleCollection selected successfully");

      // Getting the iterable object
      FindIterable<Document> iterDoc = collection.find();
      int i = 1;

      // Getting the iterator
      Iterator it = iterDoc.iterator();

      while (it.hasNext()) {
         System.out.println(it.next());
         i++;
      }
   }
}
```

On compiling, the above program gives you the following result –

```
Document{{_id=5967745223993a32646baab8, title=MongoDB, id=1,
description=database, likes=100, url=http://www.tutorialspoint.com/mongodb/,
by=tutorials point}}

Document{{_id=7452239959673a32646baab8, title=RethinkDB, id=2,
description=database, likes=200, url=http://www.tutorialspoint.com/rethinkdb/,
by=tutorials point}}
```

Update Document

To update a document from the collection, **updateOne()** method of **com.mongodb.client.MongoCollection** class is used.

Following is the program to select the first document –

```
import com.mongodb.client.FindIterable;
import com.mongodb.client.MongoCollection;
import com.mongodb.client.MongoDatabase;
import com.mongodb.client.model.Filters;
import com.mongodb.client.model.Updates;
import java.util.Iterator;
import org.bson.Document;

import com.mongodb.MongoClient;
import com.mongodb.MongoCredential;

public class UpdatingDocuments {
   public static void main( String args[] ) {
      // Creating a Mongo client
      MongoClient mongo = new MongoClient( "localhost" , 27017 );

      // Creating Credentials
      MongoCredential credential;
      credential = MongoCredential.createCredential("sampleUser", "myDb",
"password".toCharArray());
      System.out.println("Connected to the database successfully");

      // Accessing the database
      MongoDatabase database = mongo.getDatabase("myDb");

      // Retrieving a collection
      MongoCollection<Document> collection = database.getCollection("sampleCollection");
      System.out.println("Collection myCollection selected successfully");

      collection.updateOne(Filters.eq("id", 1), Updates.set("likes", 150));
      System.out.println("Document update successfully...");

      // Retrieving the documents after updation
      // Getting the iterable object
```

```
      FindIterable<Document> iterDoc = collection.find();
      int i = 1;

      // Getting the iterator
      Iterator it = iterDoc.iterator();

      while (it.hasNext()) {
         System.out.println(it.next());
         i++;
      }
   }
}
```

On compiling, the above program gives you the following result –

```
Document update successfully...
Document{{_id=5967745223993a32646baab8, title=MongoDB, id=1,
description=database, likes=150, url=http://www.tutorialspoint.com/mongodb/,
by=tutorials point}}
```

Delete a Document

To delete a document from the collection, you need to use the **deleteOne()** method of the **com.mongodb.client.MongoCollection** class.

Following is the program to delete a document –

```
import com.mongodb.client.FindIterable;
import com.mongodb.client.MongoCollection;
import com.mongodb.client.MongoDatabase;
import com.mongodb.client.model.Filters;

import java.util.Iterator;
import org.bson.Document;
import com.mongodb.MongoClient;
import com.mongodb.MongoCredential;

public class DeletingDocuments {
   public static void main( String args[] ) {
      // Creating a Mongo client
      MongoClient mongo = new MongoClient( "localhost" , 27017 );
```

```
      // Creating Credentials
      MongoCredential credential;
      credential = MongoCredential.createCredential("sampleUser", "myDb",
"password".toCharArray());
      System.out.println("Connected to the database successfully");

      // Accessing the database
      MongoDatabase database = mongo.getDatabase("myDb");

      // Retrieving a collection
      MongoCollection<Document> collection = database.getCollection("sampleCollection");
      System.out.println("Collection sampleCollection selected successfully");

      // Deleting the documents
      collection.deleteOne(Filters.eq("id", 1));
      System.out.println("Document deleted successfully...");

      // Retrieving the documents after updation
      // Getting the iterable object
      FindIterable<Document> iterDoc = collection.find();
      int i = 1;

      // Getting the iterator
      Iterator it = iterDoc.iterator();

      while (it.hasNext()) {
         System.out.println("Inserted Document: "+i);
         System.out.println(it.next());
         i++;
      }
   }
}
```

On compiling, the above program gives you the following result –

```
Connected to the database successfully
Collection sampleCollection selected successfully
Document deleted successfully...
```

Dropping a Collection

To drop a collection from a database, you need to use the **drop()** method of the **com.mongodb.client.MongoCollection** class.

Following is the program to delete a collection –

```
import com.mongodb.client.MongoCollection;
import com.mongodb.client.MongoDatabase;

import org.bson.Document;

import com.mongodb.MongoClient;
import com.mongodb.MongoCredential;

public class DropingCollection {
   public static void main( String args[] ) {
      // Creating a Mongo client
      MongoClient mongo = new MongoClient( "localhost" , 27017 );

      // Creating Credentials
      MongoCredential credential;
      credential = MongoCredential.createCredential("sampleUser", "myDb",
"password".toCharArray());

      System.out.println("Connected to the database successfully");

      // Accessing the database
      MongoDatabase database = mongo.getDatabase("myDb");

      // Creating a collection
      System.out.println("Collections created successfully");

      // Retieving a collection
      MongoCollection<Document> collection = database.getCollection("sampleCollection");

      // Dropping a Collection
      collection.drop();
      System.out.println("Collection dropped successfully");
```

```
   }
}
```

On compiling, the above program gives you the following result –

```
Connected to the database successfully
Collection sampleCollection selected successfully
Collection dropped successfully
```

Listing All the Collections

To list all the collections in a database, you need to use the **listCollectionNames()** method of the **com.mongodb.client.MongoDatabase** class.

Following is the program to list all the collections of a database –

```
import com.mongodb.client.MongoDatabase;
import com.mongodb.MongoClient;
import com.mongodb.MongoCredential;

public class ListOfCollection {
   public static void main( String args[] ) {
      // Creating a Mongo client
      MongoClient mongo = new MongoClient( "localhost" , 27017 );

      // Creating Credentials
      MongoCredential credential;
      credential = MongoCredential.createCredential("sampleUser", "myDb",
"password".toCharArray());

      System.out.println("Connected to the database successfully");

      // Accessing the database
      MongoDatabase database = mongo.getDatabase("myDb");
      System.out.println("Collection created successfully");
      for (String name : database.listCollectionNames()) {
         System.out.println(name);
     }
   }
}
```

On compiling, the above program gives you the following result –

```
Connected to the database successfully
Collection created successfully
myCollection
myCollection1
myCollection5
```

Remaining MongoDB methods **save(), limit(), skip(), sort()** etc. work same as explained in the subsequent tutorial.

DAFTAR PUSTAKA

MongoDB Tutorial https://www.tutorialspoint.com/mongodb/ di-akses tanggal 31 Agustus 2017 di Jakarta

P M. Tamer Özsu and Patrick Valduriez, (2011), Principles of Distributed Database Systems, Third Edition, Springer Publishing ISBN 978-1-4419-8833-1

Ajay D. Kshemkalyani and Mukesh Singhal, (2008), Distributed Computing - Principles, Algorithms, and Systems, Cambridge University Press, ISBN-13 978-0-511-39341-9