



Lecture 13

Java SE Database Programming



presentation

Java Programming – Software App Development

Cristian Toma

D.I.C.E/D.E.I.C – Department of Economic Informatics & Cybernetics
www.dice.ase.ro



Cristian Toma – Business Card



Cristian Toma

IT&C Security Master

Dorobantilor Ave., No. 15-17
010572 Bucharest - Romania
<http://ism.ase.ro>
cristian.toma@ie.ase.ro
T +40 21 319 19 00 - 310
F +40 21 319 19 00



Agenda for Lecture 13





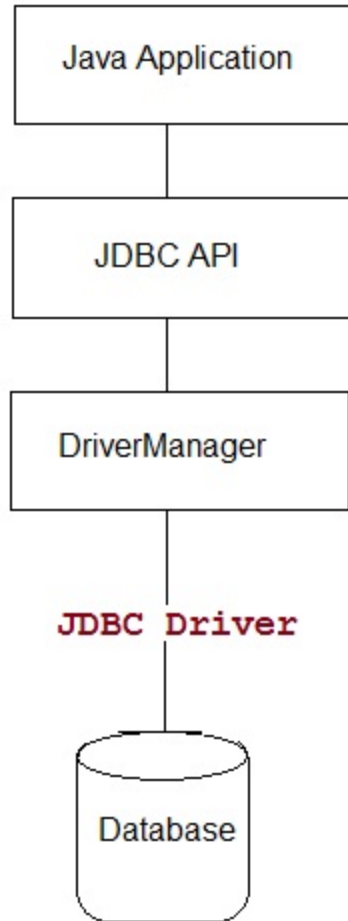
JDBC Driver Types, JDBC API

JDBC Concepts



1. JDBC Concepts

JDBC Concepts:



Java Database Connectivity (JDBC) is an Application Programming Interface(API) used to connect Java application with Database. JDBC is used to interact with various type of Database such as Oracle, MS Access, My SQL and SQL Server (even SQLite). JDBC can also be defined as the platform-independent interface between a relational database and Java programming. It allows Java program to execute SQL statement and retrieve result from database.

What's new in JDBC 4.0

JDBC 4.0 is new and advance specification of JDBC. It provides the following advance features

- Connection Management
- Auto loading of Driver Interface.
- Better exception handling
- Support for large object
- Annotation in SQL query.

1. JDBC Concepts

JDBC Driver Types:

JDBC Driver

JDBC Driver is required to process SQL requests and generate result. The following are the different types of driver available in JDBC.

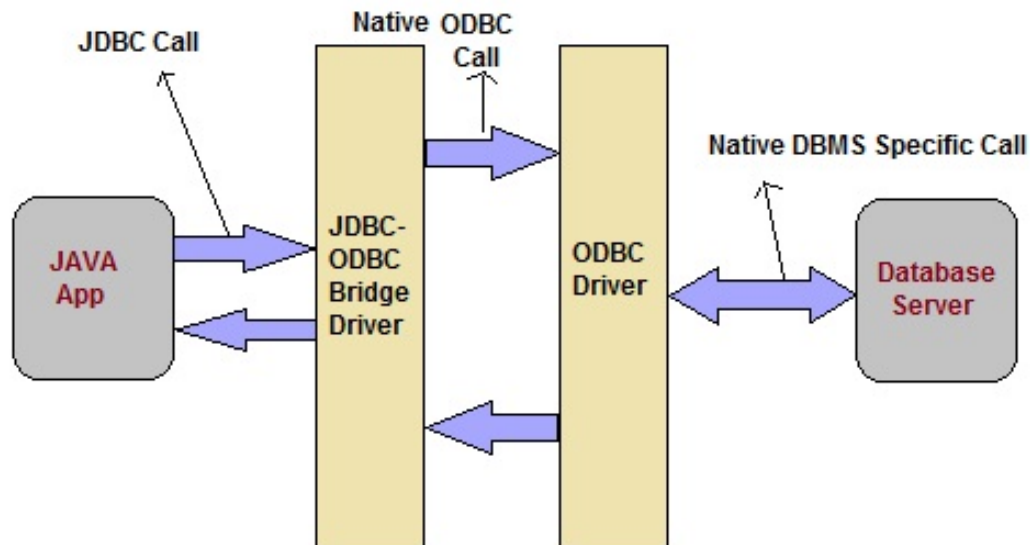
- **Type-1 Driver** or **JDBC-ODBC bridge**
- **Type-2 Driver** or **Native API Partly Java Driver**
- **Type-3 Driver** or **Network Protocol Driver**
- **Type-4 Driver** or **Thin Driver**

1. JDBC Concepts

JDBC Driver 1:

JDBC-ODBC bridge

Type-1 Driver act as a bridge between JDBC and other database connectivity mechanism(ODBC). This driver converts JDBC calls into ODBC calls and redirects the request to the ODBC driver.



Advantage

- Easy to use
- Allow easy connectivity to all database supported by the ODBC Driver.

Disadvantage

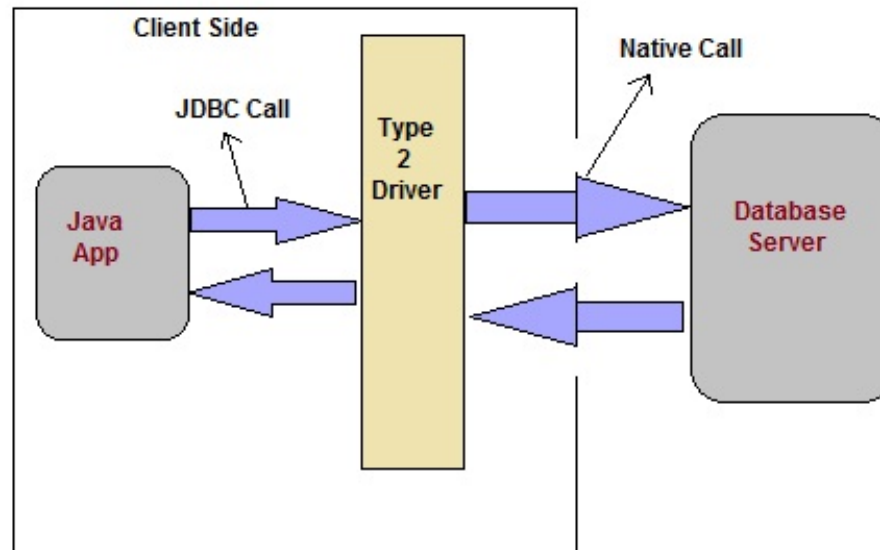
- Slow execution time
- Dependent on ODBC Driver.
- Uses Java Native Interface(JNI) to make ODBC call.

1. JDBC Concepts

JDBC Driver 2:

Native API Driver

This type of driver make use of Java Native Interface(JNI) call on database specific native client API. These native client API are usually written in C and C++.



Advantage

- faster as compared to **Type-1 Driver**
- Contains additional features.

Disadvantage

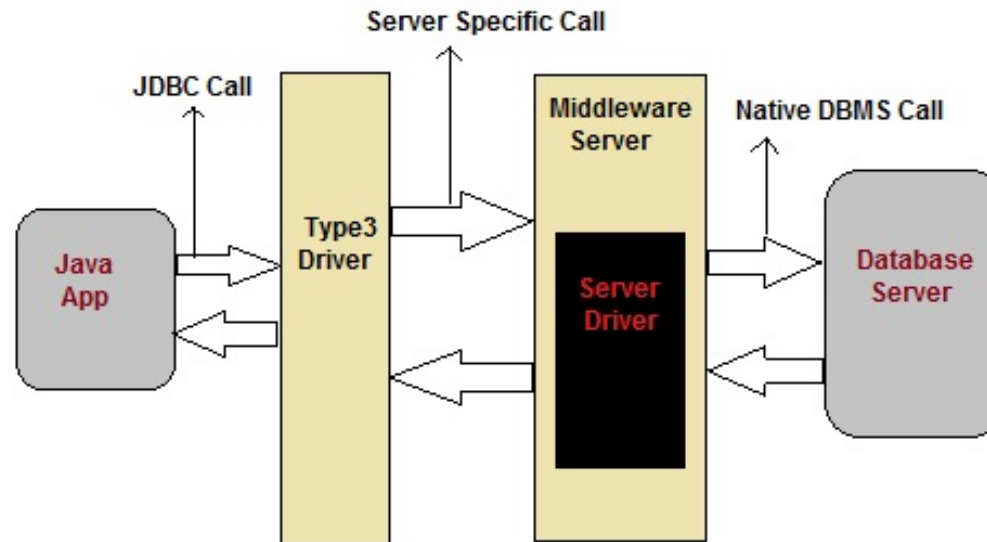
- Requires native library
- Increased cost of Application

1. JDBC Concepts

JDBC Driver 3:

Network Protocol Driver

This driver translates the JDBC calls into a database server independent and Middleware server-specific calls. The Middleware server further translates JDBC calls into database specific calls.



Advantage

- Does not require any native library to be installed.
- Database Independency.
- Provide facility to switch over from one database to another database.

Disadvantage

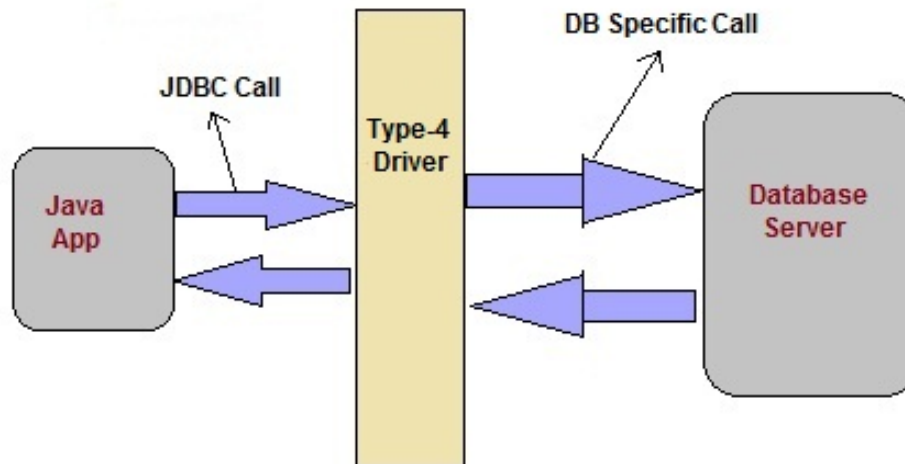
- Slow due to increase number of network call.

1. JDBC Concepts

JDBC Driver 4:

Thin Driver

This is Driver called Pure Java Driver because. This driver interact directly with database. It does not require any native database library, that is why it is also known as Thin Driver.



Advantage

- Does not require any native library.
- Does not require any Middleware server.
- Better Performance than other driver.

Disadvantage

- Slow due to increase number of network call.

1. JDBC Concepts

JDBC API:

java.sql package

This package includes classes and interfaces to perform almost all JDBC operations such as creating and executing SQL queries.

Important classes and interface of java.sql package

classes/interface	Description
<code>java.sql.BLOB</code>	Provide support for BLOB(Binary Large Object) SQL type.
<code>java.sql.Connection</code>	creates a connection with specific database
<code>java.sql.CallableStatement</code>	Execute stored procedures
<code>java.sql.CLOB</code>	Provide support for CLOB(Character Large Object) SQL type.
<code>java.sql.Date</code>	Provide support for Date SQL type.
<code>java.sql.Driver</code>	create an instance of a driver with the DriverManager.
<code>java.sql.DriverManager</code>	This class manages database drivers.
<code>java.sql.PreparedStatement</code>	Used to create and execute parameterized query.
<code>java.sql.ResultSet</code>	It is an interface that provides methods to access the result row-by-row.
<code>java.sql.Savepoint</code>	Specify savepoint in transaction.
<code>java.sql.SQLException</code>	Encapsulate all JDBC related exception.
<code>java.sql.Statement</code>	This interface is used to execute SQL statements.

1. JDBC Concepts

JDBC API:

javax.sql package

This package is also known as JDBC extension API. It provides classes and interface to access server-side data.

Important classes and interface of `javax.sql` package

classes/interface	Description
<code>javax.sql.ConnectionEvent</code>	Provide information about occurrence of event.
<code>javax.sql.ConnectionEventListener</code>	Used to register event generated by PooledConnection object.
<code>javax.sql.DataSource</code>	Represent the DataSource interface used in an application.
<code>javax.sql.PooledConnection</code>	provide object to manage connection pools.

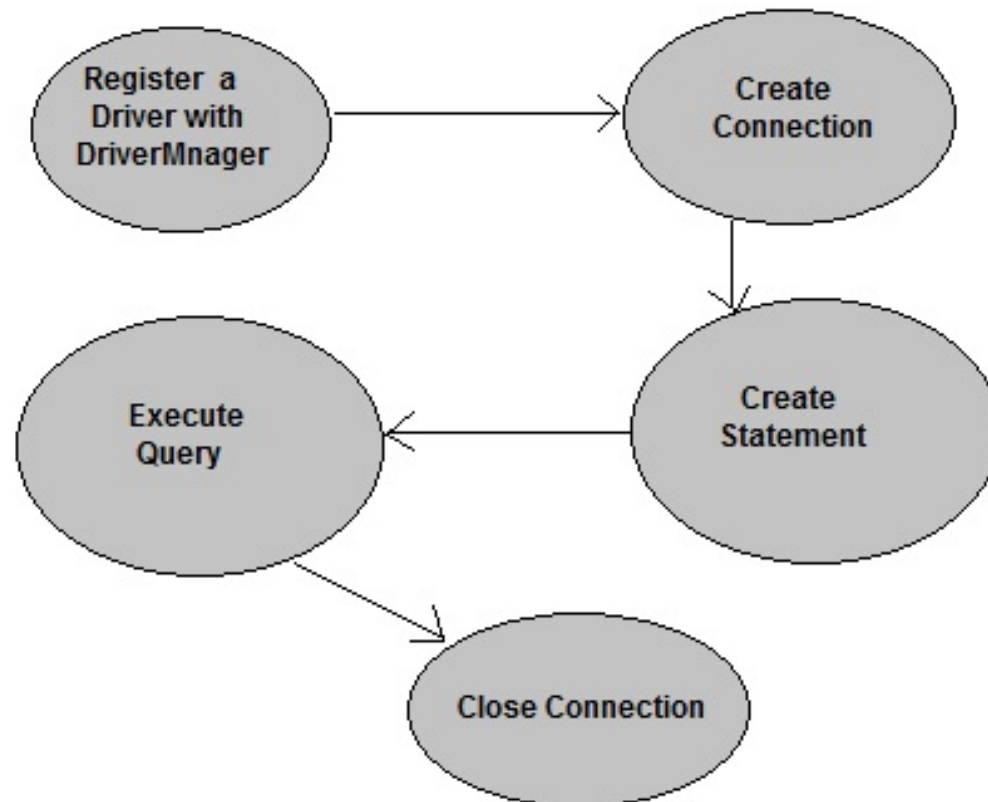
1. JDBC Concepts

JDBC Steps:

Steps to connect a Java Application to Database

The following 5 steps are the basic steps involve in connecting a Java application with Database using JDBC.

1. Register the Driver
2. Create a Connection
3. Create SQL Statement
4. Execute SQL Statement
5. Closing the connection



1. JDBC Concepts

1 - JDBC Steps:

Register the Driver

`Class.forName()` is used to load the driver class explicitly.

Example to register with JDBC-ODBC Driver

```
Class.forName("sun.jdbc.odbc.JdbcOdbcDriver");
```

Create a Connection

`getConnection()` method of **DriverManager** class is used to create a connection.

Syntax

```
getConnection(String url)
getConnection(String url, String username, String password)
getConnection(String url, Properties info)
```

Example establish connection with Oracle Driver

```
Connection con = DriverManager.getConnection
    ("jdbc:oracle:thin:@localhost:1521:XE","username","password");
```

1. JDBC Concepts

2 - JDBC Steps:

Create SQL Statement

`createStatement()` method is invoked on current **Connection** object to create a SQL Statement.

Syntax

```
public Statement createStatement() throws SQLException
```

Example to create a SQL statement

```
Statement s=con.createStatement();
```

1. JDBC Concepts

3 - JDBC Steps:

Execute SQL Statement

`executeQuery()` method of **Statement** interface is used to execute SQL statements.

Syntax

```
public ResultSet executeQuery(String query) throws SQLException
```

Example to execute a SQL statement

```
ResultSet rs=s.executeQuery("select * from user");
while(rs.next())
{
    System.out.println(rs.getString(1)+" "+rs.getString(2));
}
```


1. JDBC Concepts

4 - JDBC Steps:

Closing the connection

After executing SQL statement you need to close the connection and release the session. The `close()` method of **Connection** interface is used to close the connection.

Syntax

```
public void close() throws SQLException
```

Example of closing a connection

```
con.close();
```

1. NoSQL Concepts

MongoDB is an open-source document database and leading NoSQL database. MongoDB is written in C++. 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.

1. NoSQL Concepts

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 <code>_id</code> provided by mongodb itself)
Database Server and Client	
Mysqld/Oracle	mongod
mysql/sqlplus	mongo

1. NoSQL Concepts

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.

1. NoSQL Concepts

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
- 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

1. NoSQL Concepts

Install MongoDB in Ubuntu

```
$ sudo apt-key adv --keyserver hkp://keyserver.ubuntu.com:80 --recv  
0C49F3730359A14518585931BC711F9BA15703C6
```

```
$ echo "deb http://repo.mongodb.org/apt/ubuntu trusty/mongodb-org/testing multiverse" |  
sudo tee /etc/apt/sources.list.d/mongodb-org-3.4.list
```

```
$ sudo apt-get update
```

```
$ sudo apt-get install -y mongodb
```

```
$ sudo service mongodb start
```

```
$ sudo service mongodb stop
```

```
### $ telnet localhost 27017
```

```
$ sudo find / -name mongo
```

```
$ mongo
```

```
> db.stats()
```

1. NoSQL Concepts – 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.

1. NoSQL Concepts – Data Modelling

Data Modelling Example

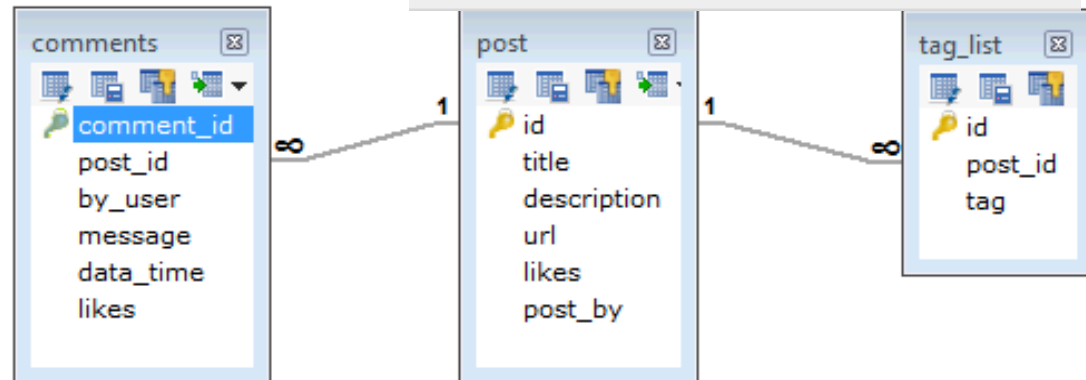
Suppose a client needs a database design for his blog/website and see the differences between RDBMS and MongoDB schema design. Website has the following requirements.

- 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.

<https://www.tutorialspoint.com/mongodb/index.htm>

```
{
  _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
    }
  ]
}
```



1. NoSQL Hands-On

The use Command – CREATE DATABASE

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.

1. NoSQL Hands-On

The dropDatabase() Method – DELETE DATABASE

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
```

The `createCollection()` Method – CREATE COLLECTION <-> "TABLE"

MongoDB `db.createCollection(name, options)` is used to create collection. 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 <code>_id</code> field.s 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.

1. NoSQL Hands-On

The createCollection() Method – CREATE COLLECTION <-> "TABLE"

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

1. NoSQL Hands-On

The drop() Method – DELETE COLLECTION <-> "TABLE"

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.

1. NoSQL Concepts

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** – timestamp. 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.

1. NoSQL Hands-On

The insert() Method – INSERT DOCUMENT <-> "TUPLE/ROW"

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.

1. NoSQL Hands-On

The insert() Method – INSERT DOCUMENT <-> “TUPLE/ROW”

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 you specify **_id** then it will replace whole data of document containing **_id** as specified in **save()** method.

1. NoSQL Hands-On

The **find()** Method – QUERY DOCUMENT <-> “TUPLE/ROW”

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.

1. NoSQL Hands-On

The find() Method – QUERY DOCUMENT <-> “TUPLE/ROW”

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

1. NoSQL Hands-On

The find() Method – QUERY DOCUMENT <-> “TUPLE/ROW” with AND

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( { $and: [ {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( { $and:[{"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.

1. NoSQL Hands-On

The find() Method – QUERY DOCUMENT <-> “TUPLE/ROW” with OR 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"
}
```

1. NoSQL Hands-On

The find() Method – QUERY DOCUMENT <-> “TUPLE/ROW” with AND + OR Together

Example

The following example will show the documents that have likes greater than 10 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"
}
```

1. NoSQL Hands-On

The **update()** Method – UPDATE DOCUMENT <-> "TUPLE/ROW"

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.

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

Syntax

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

```
>db.COLLECTION_NAME.update(SELECTION_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})
```

1. NoSQL Hands-On

The **save()** Method – SAVE/UPDATE DOCUMENT <-> “TUPLE/ROW”

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 shown below –

```
>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" } >
```

1. NoSQL Hands-On

The remove() Method – DELETE DOCUMENT <-> "TUPLE/ROW"

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(DELETION_CRITERIA)
```

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"}
```


1. NoSQL Hands-On

The find() Method – PROJECTION of COLLECTION <-> "TABLE"

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.

MongoDB's **find()** method, exposed in **QUERY DOCUMENT** section, 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.

Section Conclusion

Fact: **Java is suitable for Databases**

In few **samples** it is simple to understand: JDBC API, NoSQL programming and remember databases concepts.

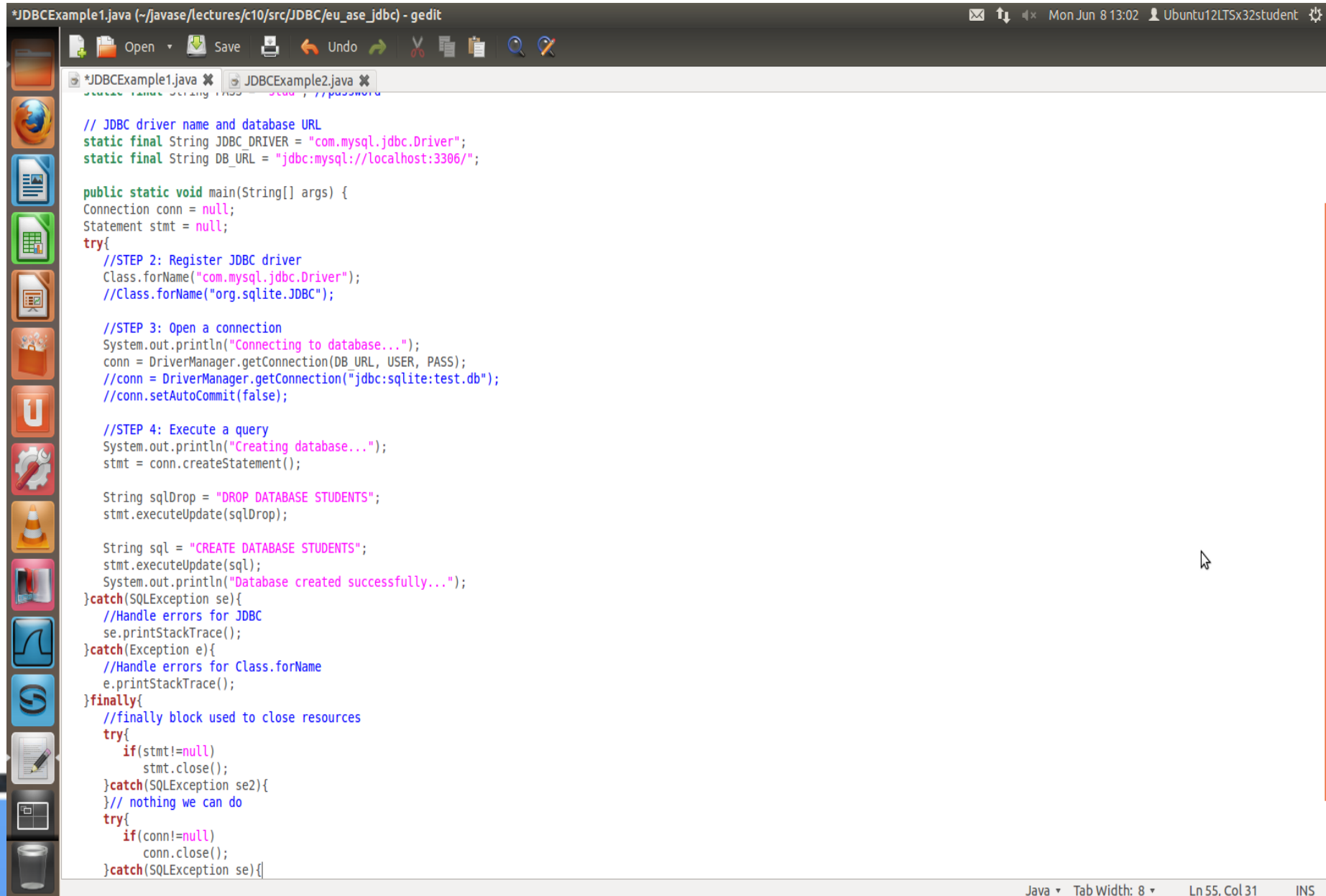




Java SQLite – SQL Insert, Select, Update, Delete + NoSQL - MongoDB

Java SQLite/MySQL JDBC & NoSQL-MongoDB Programming

2. JDBC Programming

A screenshot of a gedit text editor window titled '*JDBCExample1.java (~/.javase/lectures/c10/src/JDBC/eu_ase_jdbc) - gedit'. The window shows a Java file named 'JDBCExample1.java' with the following code:

```
// JDBC driver name and database URL
static final String JDBC_DRIVER = "com.mysql.jdbc.Driver";
static final String DB_URL = "jdbc:mysql://localhost:3306/";

public static void main(String[] args) {
    Connection conn = null;
    Statement stmt = null;
    try{
        //STEP 2: Register JDBC driver
        Class.forName("com.mysql.jdbc.Driver");
        //Class.forName("org.sqlite.JDBC");

        //STEP 3: Open a connection
        System.out.println("Connecting to database...");
        conn = DriverManager.getConnection(DB_URL, USER, PASS);
        //conn = DriverManager.getConnection("jdbc:sqlite:test.db");
        //conn.setAutoCommit(false);

        //STEP 4: Execute a query
        System.out.println("Creating database...");
        stmt = conn.createStatement();

        String sqlDrop = "DROP DATABASE STUDENTS";
        stmt.executeUpdate(sqlDrop);

        String sql = "CREATE DATABASE STUDENTS";
        stmt.executeUpdate(sql);
        System.out.println("Database created successfully...");
    } catch (SQLException se) {
        //Handle errors for JDBC
        se.printStackTrace();
    } catch (Exception e) {
        //Handle errors for Class.forName
        e.printStackTrace();
    } finally {
        //finally block used to close resources
        try {
            if (stmt != null)
                stmt.close();
        } catch (SQLException se2) {}
        // nothing we can do
    } finally {
        try {
            if (conn != null)
                conn.close();
        } catch (SQLException se) {}
    }
}
```

The editor interface includes a sidebar with application icons, a menu bar with 'Open', 'Save', 'Undo', and 'Redo', and a status bar at the bottom showing 'Java', 'Tab Width: 8', 'Ln 55, Col 31', and 'INS'. The system tray at the top right shows the date 'Mon Jun 8 13:02' and the user 'Ubuntu12LTSx32student'.

2. JDBC Programming

JDBCExample2.java (~/.javase/lectures/c10/src/JDBC/eu_ase_jdbc) - gedit

Mon Jun 8 13:02 Ubuntu12LTSx32student

```
public static void main(String[] args) {
    Connection conn = null;
    Statement stmt = null;
    try{
        //STEP 2: Register JDBC driver
        Class.forName("com.mysql.jdbc.Driver");

        //STEP 3: Open a connection
        System.out.println("Connecting to a selected database...");
        conn = DriverManager.getConnection(DB_URL, USER, PASS);
        System.out.println("Connected database successfully...");

        //STEP 4: Execute a query
        System.out.println("Creating table in given database...");
        stmt = conn.createStatement();

        String sql = "CREATE TABLE REGISTRATION " +
            "(id INTEGER not NULL, " +
            " first VARCHAR(255), " +
            " last VARCHAR(255), " +
            " age INTEGER, " +
            " PRIMARY KEY ( id ))";

        stmt.executeUpdate(sql);
        System.out.println("Created table in given database...");
    }catch(SQLException se){
        //Handle errors for JDBC
        se.printStackTrace();
    }catch(Exception e){
        //Handle errors for Class.forName
        e.printStackTrace();
    }finally{
        //finally block used to close resources
        try{
            if(stmt!=null)
                conn.close();
        }catch(SQLException se){
            //do nothing
        }
        try{
            if(conn!=null)
                conn.close();
        }catch(SQLException se){
            se.printStackTrace();
        }
    }
}
```

Java Tab Width: 8 Ln 59, Col 14 INS

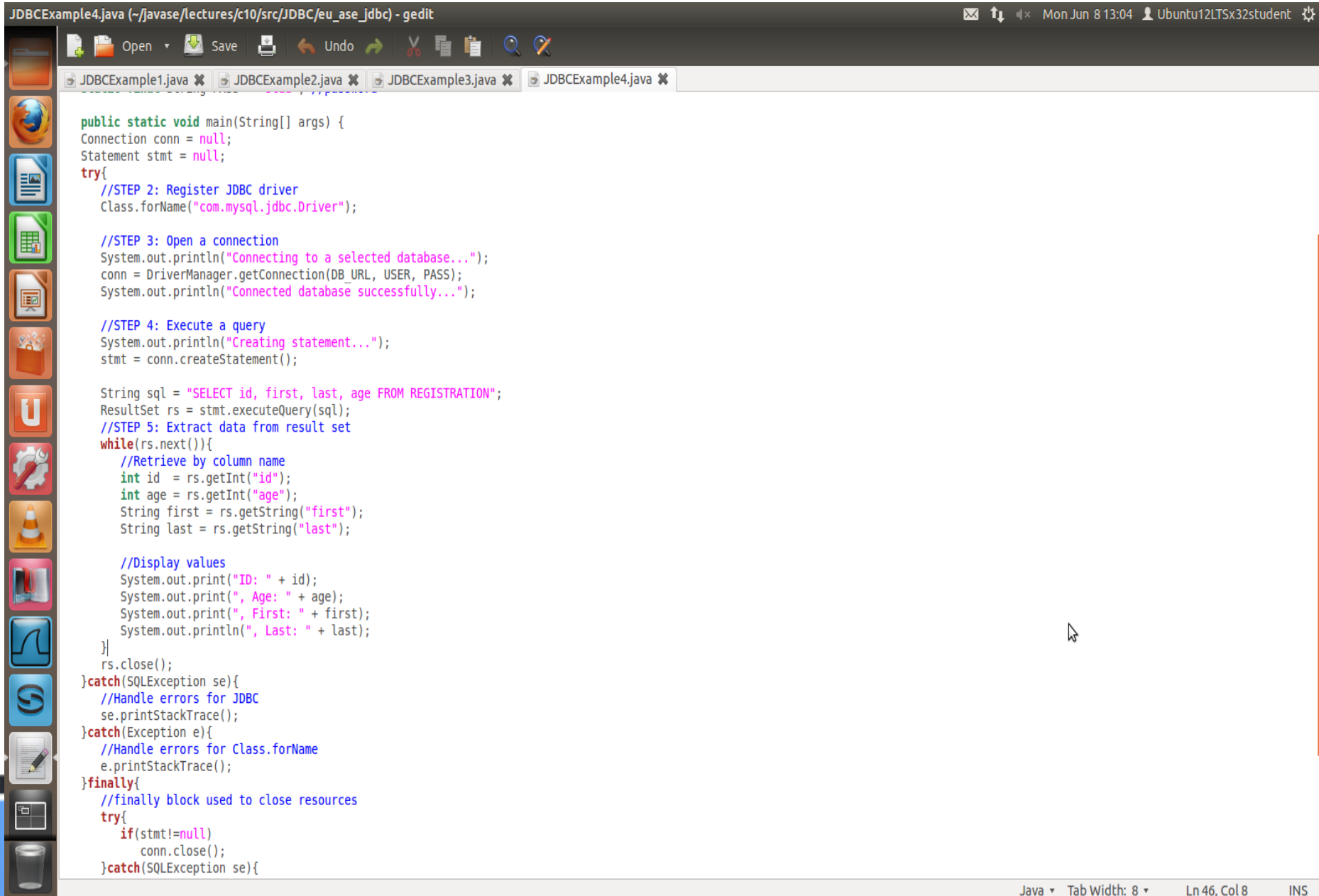
2. JDBC Programming

JDBCExample3.java (~/.javase/lectures/c10/src/JDBC/eu_ase_jdbc) - gedit

```
public class JDBCExample3 {  
    // JDBC driver name and database URL  
    static final String JDBC_DRIVER = "com.mysql.jdbc.Driver";  
    static final String DB_URL = "jdbc:mysql://localhost:3306/STUDENTS";  
  
    // Database credentials  
    static final String USER = "root"; //username  
    static final String PASS = "stud"; //password  
  
    public static void main(String[] args) {  
        Connection conn = null;  
        Statement stmt = null;  
        try{  
            //STEP 2: Register JDBC driver  
            Class.forName("com.mysql.jdbc.Driver");  
  
            //STEP 3: Open a connection  
            System.out.println("Connecting to a selected database...");  
            conn = DriverManager.getConnection(DB_URL, USER, PASS);  
            System.out.println("Connected database successfully...");  
  
            //STEP 4: Execute a query  
            System.out.println("Inserting records into the table...");  
            stmt = conn.createStatement();  
  
            String sql = "INSERT INTO REGISTRATION " +  
                "VALUES (100, 'Zara', 'Ali', 18)";  
            stmt.executeUpdate(sql);  
            sql = "INSERT INTO REGISTRATION " +  
                "VALUES (101, 'Mahnaz', 'Fatma', 25)";  
            stmt.executeUpdate(sql);  
            sql = "INSERT INTO REGISTRATION " +  
                "VALUES (102, 'Zaid', 'Khan', 30)";  
            stmt.executeUpdate(sql);  
            sql = "INSERT INTO REGISTRATION " +  
                "VALUES (103, 'Sumit', 'Mittal', 28)";  
            stmt.executeUpdate(sql);  
            System.out.println("Inserted records into the table...");  
  
        } catch (SQLException se) {  
            //Handle errors for JDBC  
            se.printStackTrace();  
        } catch (Exception e) {  
            //Handle errors for Class.forName  
            e.printStackTrace();  
        } finally {  
            //finally block used to close resources  
        }  
    }  
}
```

Java ▾ Tab Width: 8 ▾ Ln 35, Col 58 INS

2. JDBC Programming



```
JDBCExample4.java (~/.javase/lectures/c10/src/JDBC/eu ase_jdbc) - gedit
public static void main(String[] args) {
    Connection conn = null;
    Statement stmt = null;
    try{
        //STEP 2: Register JDBC driver
        Class.forName("com.mysql.jdbc.Driver");

        //STEP 3: Open a connection
        System.out.println("Connecting to a selected database...");
        conn = DriverManager.getConnection(DB_URL, USER, PASS);
        System.out.println("Connected database successfully...");

        //STEP 4: Execute a query
        System.out.println("Creating statement...");
        stmt = conn.createStatement();

        String sql = "SELECT id, first, last, age FROM REGISTRATION";
        ResultSet rs = stmt.executeQuery(sql);
        //STEP 5: Extract data from result set
        while(rs.next()){
            //Retrieve by column name
            int id = rs.getInt("id");
            int age = rs.getInt("age");
            String first = rs.getString("first");
            String last = rs.getString("last");

            //Display values
            System.out.print("ID: " + id);
            System.out.print(", Age: " + age);
            System.out.print(", First: " + first);
            System.out.println(", Last: " + last);
        }
        rs.close();
    }catch(SQLException se){
        //Handle errors for JDBC
        se.printStackTrace();
    }catch(Exception e){
        //Handle errors for Class.forName
        e.printStackTrace();
    }finally{
        //finally block used to close resources
        try{
            if(stmt!=null)
                conn.close();
        }catch(SQLException se){
```

Java Tab Width: 8 Ln 46, Col 8 INS

Section Conclusions

Please review:

- JDBC API,
- NoSQL library and,
- Database Programming.

JDBC Programming
for easy sharing



Java Relational & NoSQL

Communicate & Exchange Ideas



Questions & Answers!

But wait...

There's More!





Thanks!



Java SE – Java Standard Edition Programming
End of Lecture 13 – Database Programming

