# Fundamentals of Software Engineering

# (M1l322908)

# Week 6 Lab Exercise: Computer Systems Architecture

## Objectives:

To investigate the use of tiers in computer systems architecture.

## Task 1:

In this task you will investigate the use of a 'Fat Client' application in single-tier architecture and also as the client tier in a two tier architecture where the tiers are separated logically. All of this work must be undertaken in a VMware virtual machine.

a)

Start VMware Player. Double click on SEBE-Win7x86 (32-bit) Ent virtual machine via Windows Explorer. (The .vmx file)

b)

In the Virtual machine check that there is a folder called :

C:\work\netbeansfirstyear\TieredLabApplication

Navigate to this folder.

c)

Execute the application **TieredLab** application which should now be in the TieredLabApplication folder. The file name for the application is **TieredLab.jar**.

The Application should look the same as the screen capture below.
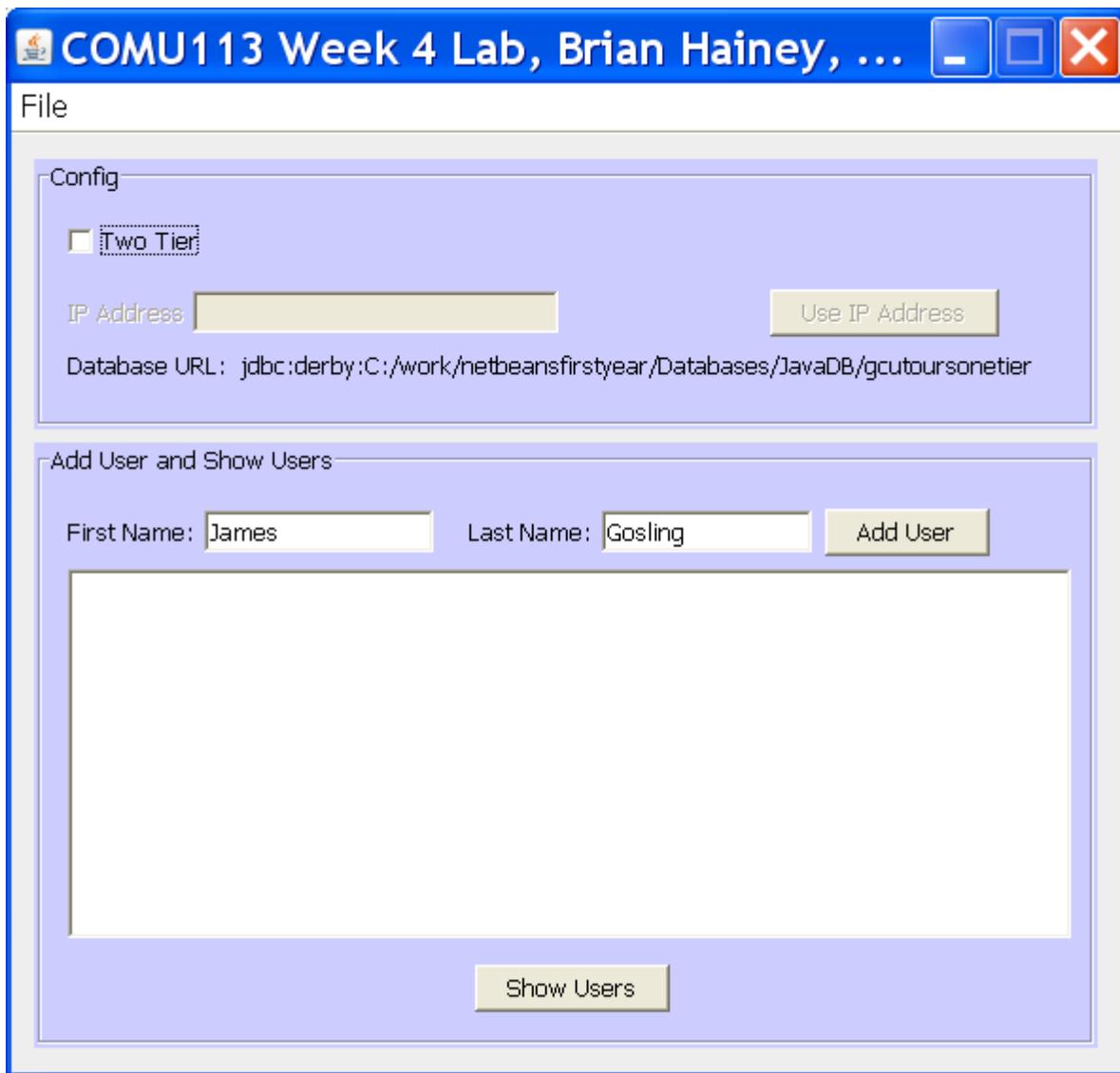
Do you know why the application has the extension 'jar'?

You will see from the application user interface that it can be configured for two-tier or single-tier operation. With the application in single-tier mode view the users currently present in the database using the "Show Users button to do this". Add some additional users and check that they have been added by again viewing the list of users. In single tier mode the application has exclusive use of the database and both the database functionality and the application reside in a single tier.

d)

Now configure the application for two-tier mode. Attempt to view the users present in the database. You will find that your attempt to view the list of users fails since the database server that executes in the second tier has not yet been started.

Start the application NetBeans 8.0 and then start the JavaDB database.

*To start the JavaDB database :*

*Click the services tab in NetBeans*

*Click on the + next to Databases*

*Right Click JavaDB and select Start Server*

*Starting JavaDB using Netbeans is one of many possible ways in which the database server can be started.*

You should now be able to view the list of users as well as add users to the database in two-tier mode. You will encounter another way to start the JavaDB Database in task 2.

Switch between single-tier and two-tier mode and check that you are accessing two different databases by comparing the list of users present. In two-tier mode the TieredLab application runs in the client tier and the database server in the server tier. Both tiers are running on the same operating system host in this case under the control of VMWare. This means that the tiers are logically separated, not physically separated.

## Task 2:

In this task you will investigate the use of the 'Fat Client' application in two-tier mode where the tiers are separated physically. To achieve this you will download the database and the database files to the host computer and install them onto the Host Computer rather than onto the Virtual machine. The 2 files should be called :

TieredLabDatabasesHost.exe

And

DatabasescriptsHost2016.zip

a)

Download from Blackboard the databases files and unzip them onto the Host Computer.

When you are asked where to extract to enter c:\

Make sure that you end up with the folder structure which follows.

C:\work\netbeansfirstyear\Databases\JavaDB\gcutoursonetier

And

C:\work\netbeansfirstyear\Databases\JavaDB\gcutourstwotier

Now create a folder called Databasescripts as shown below.

C:\Databasescripts

Now download the database scripts file from Blackboard to the host PC and unzip them into the folder Databasescripts.

You should now have the following files

C:\Databasescripts\JavaDB

C:\Databasescripts\derby

C:\Databasescripts\startNetWorkServer

C:\Databasescripts\stopNetWorkServer

Open a command window in the Databasescripts directory. (Right Click on the Databasescripts folder and select CMD Shell). If right clicking does not produce an option to create a command window, Click Start | Run and enter cmd when prompted. Change directory so that you are situated in c:\databasescripts.

Use cd c:\databasescripts

To achieve this.

If you have unpacked the database script files into the Databasescripts directory you should now be able to Type

*startNSH2016*

at the command prompt to start the JavaDB Database

If you encounter any problems ask your instructor for some help.

b)

Determine the IP address of your host machine. This is usually shown on the desktop but can also be found by running the **ipconfig** application in a command window. Ask your supervisor for advice if you have any problems. Make a note of the IP address you will need to make use of it shortly. The IP address should be a number such as 10.15.1.94

c)

Start the **TieredLab** application in the VMWare machine and configure it for two-tier mode. Configure the URL used to connect to the database with the IP address of your host machine. View the users and add users to the database as you did in task one. Seek the help of your lab supervisor if you have any problems. The database now being accessed is different from either of the two databases accessed in Task 1. Since you have just downloaded it from Blackboard it contains only the initial set of users. Since the database server is running on the host PC and the 'Fat Client' application in running in the Virtual PC under the control of VMware the architecture involved is two-tier with the tiers physically separated.  The tiers and not literally physically separated but for our purposes they operate as if they are. You may wish to discuss this with your supervisor.

## Task 3:

The purpose of this task is to allow you to determine if it's possible for the client application (Tieredlab.jar) running in the Virtual machine to access either of the database servers now running on your system.

Where are the 2 Database servers ? One should be running in the Host Machine and the other should be running in the Virtual machine.

a)

In the Tieredlab application running in the virtual machine, change the IP address for the database URL so that you can again accessing the server tier in the VMware image.

To do this you will need to enter 127.0.0.1 for the IP address.

Check that you can add users and view the current list of users.

b)

Change the IP address for the database URL so that you can access the server tier on the host machine.

To do this you will need to enter the IP Address of the Host Machine. You should hopefully have made a note of this. If not use the IPConfig command from the command line to obtain this address again.

Check that you can add users and view the current list of users. Check that the database being accessed is different from that accessed in section a).

## Task 4:

This final task allows you to investigate a two tier architecture where the tiers are literally separated physically. In this case, the server tier will be located on the host PC of one of your fellow students.

a) Form a group with two or three of the other students present during this lab session.

b) Ask the other students in your group for the IP address of their host PC and use this to configure the **TieredLab** application for a different student in your group.

c) Check that you can add and view users for the chosen server tier and that it is indeed the database server running on the specific PC for the student who provided the IP address.

## Task 5:

Review the activities that you have carried out and produce a series of sketches that capture the various tiered architectures that you have investigated.

## Note

In order to allow the database application to run in the host, the following line

Permission java.net.SocketPermission "localhost:1527-", listen

was added to the jre\lib\security\java.policy file in the Java installation on the Host. This is needed to allow the database application to listen on a specific port to handle connections.