

## Assignment 7

### Code

```
from flask import Flask, jsonify, request

app = Flask(__name__)
num_win = 0
num_loss = 0
num_tie = 0

@app.route('/help', methods = ['GET'])
def help():
    return jsonify({'Routes available': [{ 'name': 'addwin', 'method': 'POST'}, { 'name': 'addloss', 'method': 'POST'}, { 'name': 'addtie', 'method': 'POST'}, { 'name': 'score', 'method': 'GET'}]})

@app.route('/addwin', methods = ['POST'])
def addwin():
    global num_win
    num_win+=1
    return jsonify({'Win Count': num_win})

@app.route('/addloss', methods = ['POST'])
def addloss():
    global num_loss
    num_loss+=1
    return jsonify({'Loss Count': num_loss})

@app.route('/addtie', methods = ['POST'])
def addtie():
    global num_tie
    num_tie+=1
    return jsonify({'Tie Count': num_tie})

@app.route('/score', methods = ['GET'])
def score():
    return jsonify({'Win': num_win, 'Loss': num_loss, 'Tie': num_tie})

# driver function
if __name__ == '__main__':
    app.run(debug = True)
```

### Output

GET

http://127.0.0.1:5000/help

Send

Query

Headers<sup>2</sup>

Auth

Body

Tests

Query Parameters

☐

parameter

value

Status: 200 OKSize: 277 BytesTime: 5 ms

Response

Headers<sup>4</sup>

Cookies

Results

Docs<sup>New</sup>

{}

≡

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

"Routes available": [

{

"method": "POST",

"name": "addwin"

},

{

"method": "POST",

"name": "addloss"

},

{

"method": "POST",

"name": "addtie"

},

{

"method": "GET",

"name": "score"

}

]

Copy

POST

http://127.0.0.1:5000/addwin

Send

Query

Headers<sup>2</sup>

Auth

Body

Tests

Query Parameters

☐

parameter

value

Status: 200 OKSize: 21 BytesTime: 4 ms

Response

Headers<sup>4</sup>

Cookies

Results

Docs<sup>New</sup>

{}

≡

1

2

3

"Win Count": 2

POST

http://127.0.0.1:5000/addtie

Send

Query

Headers<sup>2</sup>

Auth

Body

Tests

Query Parameters

☐

parameter

value

Status: 200 OKSize: 21 BytesTime: 5 ms

Response

Headers<sup>4</sup>

Cookies

Results

Docs<sup>New</sup>

{}

≡

1

2

3

"Tie Count": 1

POST

http://127.0.0.1:5000/addrloss

Send

Query

Headers<sup>2</sup>

Auth

Body

Tests

Query Parameters

☐

parameter

value

Status: 200 OK

Size: 22 Bytes

Time: 6 ms

Response

Headers<sup>4</sup>

Cookies

Results

Docs<sup>New</sup>

{ }

≡

1

2

3

"Loss Count": 4

GET

http://127.0.0.1:5000/score

Send

Query

Headers<sup>2</sup>

Auth

Body

Tests

Query Parameters

☐

parameter

value

Status: 200 OK

Size: 42 Bytes

Time: 5 ms

Response

Headers<sup>4</sup>

Cookies

Results

Docs<sup>New</sup>

{ }

≡

1

2

3

4

5

"Loss": 4,

"Tie": 1,

"Win": 2

## Assignment 6

### Code

Publisher.java

```
package pubsub;
```

```
import javax.jms.*;
import org.apache.activemq.ActiveMQConnection;
import org.apache.activemq.ActiveMQConnectionFactory;

public class Publisher {
    private static String url = ActiveMQConnection.DEFAULT_BROKER_URL;
```

```
    public static void main(String[] args) throws JMSException {
        ConnectionFactory connectionFactory = new
ActiveMQConnectionFactory(url);
        Connection connection = connectionFactory.createConnection();
        connection.start();
        // JMS messages are sent and received using a Session. We will
        // create here a non-transactional session object. If you want
        // to use transactions you should set the first parameter to 'true'
        Session session = connection.createSession(false,
Session.AUTO_ACKNOWLEDGE);
        Topic topic = session.createTopic("India");
        MessageProducer producer = session.createProducer(topic);
        // We will send a small text message saying 'Hello'
        TextMessage message = session.createTextMessage();
        message.setText("Score is 200/5");
        // Here we are sending the message!
        producer.send(message);
        System.out.println("Sent message " + message.getText() + "");
        connection.close();
```

```
        ConnectionFactory connectionFactory1 = new
ActiveMQConnectionFactory(url);
        Connection connection1 = connectionFactory1.createConnection();
        connection1.start();
        // JMS messages are sent and received using a Session. We will
        // create here a non-transactional session object. If you want
        // to use transactions you should set the first parameter to 'true'
        Session session1 = connection1.createSession(false,
Session.AUTO_ACKNOWLEDGE);
```

```

        Topic topic1 = session1.createTopic("Australia");
        MessageProducer producer1 = session1.createProducer(topic1);
        // We will send a small text message saying 'Hello'
        TextMessage message1 = session1.createTextMessage();
        message1.setText("Score is 190/6");
        // Here we are sending the message!
        producer1.send(message1);
        System.out.println("Sent message " + message1.getText() + "");
        connection1.close();
    }
}

```

Subscriber.java

```

package pubsub;

import java.io.IOException;
import javax.jms.*;
import org.apache.activemq.ActiveMQConnection;
import org.apache.activemq.ActiveMQConnectionFactory;

public class Subscriber {
    // URL of the JMS server
    private static String url = ActiveMQConnection.DEFAULT_BROKER_URL;

    // Name of the topic from which we will receive messages from = " CL9"
    public static void main(String[] args) throws JMSException {
        // Getting JMS connection from the server
        ConnectionFactory connectionFactory = new
        ActiveMQConnectionFactory(url);
        Connection connection = connectionFactory.createConnection();
        connection.start();
        Session session = connection.createSession(false,
        Session.AUTO_ACKNOWLEDGE);
        Topic topic = session.createTopic("India");
        MessageConsumer consumer = session.createConsumer(topic);
        MessageListener listner = new MessageListener() {
            public void onMessage(Message message) {
                try {
                    if (message instanceof TextMessage) {
                        TextMessage textMessage = (TextMessage)
message;
                        System.out.println("Received message: " +
textMessage.getText() + "");
                    }
                } catch (JMSException e) {
                    System.out.println("Caught:" + e);
                }
            }
        };
    }
}

```

```

        e.printStackTrace();
    }
}
};
consumer.setMessageListener(listner);
try {
    System.in.read();
} catch (IOException e) {
    e.printStackTrace();
}
connection.close();
}
}

```

### Subscriber2.java

```

package pubsub;

import java.io.IOException;
import javax.jms.*;
import org.apache.activemq.ActiveMQConnection;
import org.apache.activemq.ActiveMQConnectionFactory;

public class Subscriber2 {
    // URL of the JMS server
    private static String url = ActiveMQConnection.DEFAULT_BROKER_URL;

    // Name of the topic from which we will receive messages from = " CL9"
    public static void main(String[] args) throws JMSException {
        // Getting JMS connection from the server
        ConnectionFactory connectionFactory = new
        ActiveMQConnectionFactory(url);
        Connection connection = connectionFactory.createConnection();
        connection.start();
        Session session = connection.createSession(false,
        Session.AUTO_ACKNOWLEDGE);
        Topic topic = session.createTopic("Australia");
        MessageConsumer consumer = session.createConsumer(topic);
        MessageListener listner = new MessageListener() {
            public void onMessage(Message message) {
                try {
                    if (message instanceof TextMessage) {
                        TextMessage textMessage = (TextMessage)
message;
                        System.out.println("Received message: " +
textMessage.getText() + "");
                    }
                }
            }
        }
    }
}

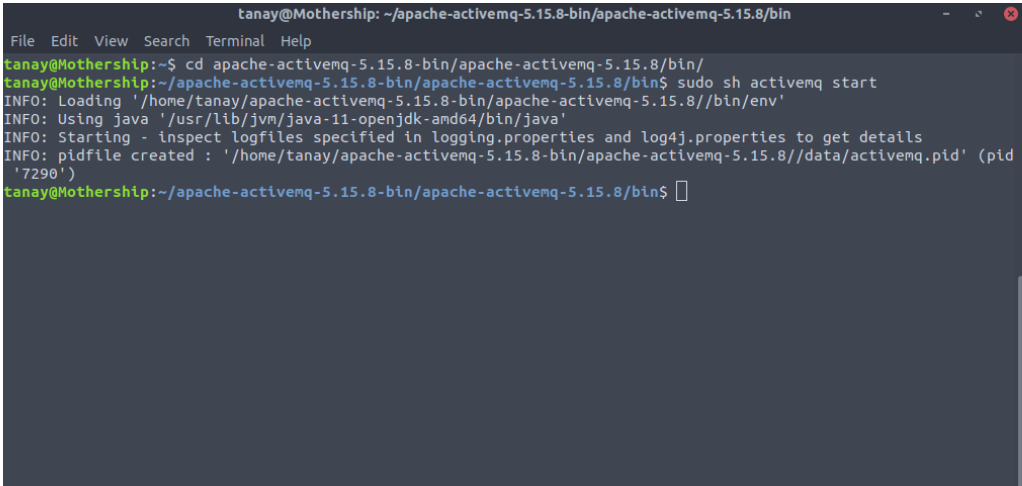
```

```

    } catch (JMSEException e) {
        System.out.println("Caught:" + e);
        e.printStackTrace();
    }
}
};
consumer.setMessageListener(listner);
try {
    System.in.read();
} catch (IOException e) {
    e.printStackTrace();
}
connection.close();
}
}
}

```

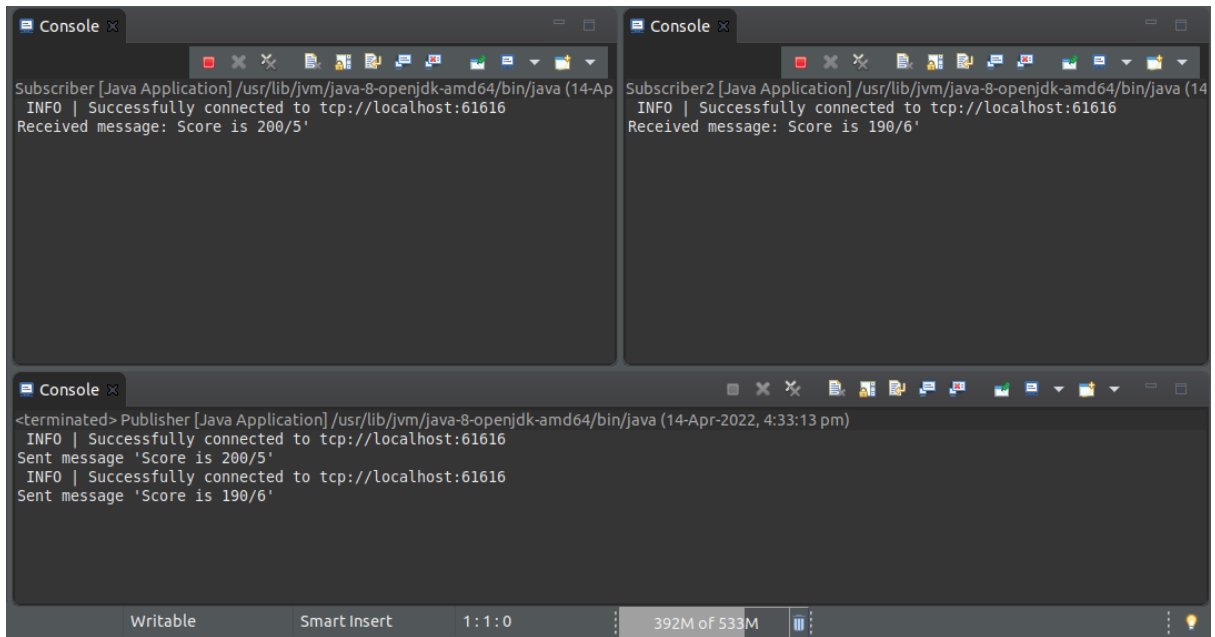
## Output



```

tanay@Mothership: ~/apache-activemq-5.15.8-bin/apache-activemq-5.15.8/bin
File Edit View Search Terminal Help
tanay@Mothership:~$ cd apache-activemq-5.15.8-bin/apache-activemq-5.15.8/bin/
tanay@Mothership:~/apache-activemq-5.15.8-bin/apache-activemq-5.15.8/bin$ sudo sh activemq start
INFO: Loading '/home/tanay/apache-activemq-5.15.8-bin/apache-activemq-5.15.8/bin/env'
INFO: Using java '/usr/lib/jvm/java-11-openjdk-amd64/bin/java'
INFO: Starting - inspect logfiles specified in logging.properties and log4j.properties to get details
INFO: pidfile created : '/home/tanay/apache-activemq-5.15.8-bin/apache-activemq-5.15.8/data/activemq.pid' (pid
'7290')
tanay@Mothership:~/apache-activemq-5.15.8-bin/apache-activemq-5.15.8/bin$ 

```





## Assignment 5

### Code

#### 1. SOAP

```
/*
 * Click nbfs://nbhost/SystemFileSystem/Templates/Licenses/license-default.txt to
change this license
 * Click
nbfs://nbhost/SystemFileSystem/Templates/WebServices/EjbWebService.java to edit
this template
 */
package org.me.stringmanip;

import javax.jws.WebService;
import javax.jws.WebMethod;
import javax.jws.WebParam;
import javax.ejb.Stateless;

/**
 *
 * @author tanay
 */
@WebService(serviceName = "Stringop")
@Stateless()
public class Stringop {

    /**
     * Web service operation
     */
    @WebMethod(operationName = "concat")
    public String concat(@WebParam(name = "a") String a, @WebParam(name =
"b") String b) {
        //TODO write your implementation code here:
        String res = a.concat(b);
        return res;
    }

    /**
     * Web service operation
     */
    @WebMethod(operationName = "length")
    public int length(@WebParam(name = "a") String a) {
        //TODO write your implementation code here:
        return a.length();
    }
}
```

```

/**
 * Web service operation
 */
@WebMethod(operationName = "upper")
public String upper(@WebParam(name = "a") String a) {
    //TODO write your implementation code here:
    return a.toUpperCase();
}

/**
 * Web service operation
 */
@WebMethod(operationName = "lower")
public String lower(@WebParam(name = "a") String a) {
    //TODO write your implementation code here:
    return a.toLowerCase();
}

/**
 * Web service operation
 */
@WebMethod(operationName = "compare")
public String compare(@WebParam(name = "a") String a, @WebParam(name =
"b") String b) {
    //TODO write your implementation code here:
    int comp = a.compareTo(b);
    String msg = "";
    if(comp==0)
    {
        msg = "Both are equal";
    }
    else if(comp<0)
    {
        msg = "Second string is lexicographically greater";
    }
    else
    {
        msg = "First string is lexicographically greater";
    }
    return msg;
}
}

```

## 2. REST

```

/*

```

*\* Click nbfs://nbhost/SystemFileSystem/Templates/Licenses/license-default.txt to change this license*

*\* Click*

*nbfs://nbhost/SystemFileSystem/Templates/WebServices/GenericResource.java to edit this template*

*\*/*

**package** org.me.stringopsrest;

**import** javax.ws.rs.core.Context;

**import** javax.ws.rs.core.UriInfo;

**import** javax.ws.rs.Produces;

**import** javax.ws.rs.Consumes;

**import** javax.ws.rs.GET;

**import** javax.ws.rs.Path;

**import** javax.ws.rs.PUT;

**import** javax.ws.rs.PathParam;

**import** javax.ws.rs.core.MediaType;

*/\*\**

*\* REST Web Service*

*\**

*\* @author tanay*

*\*/*

**@Path**("generic")

**public class** GenericResource {

**@Context**

**private** UriInfo context;

*/\*\**

*\* Creates a new instance of GenericResource*

*\*/*

**public** GenericResource() {

}

*/\*\**

*\* Retrieves representation of an instance of  
org.me.stringopsrest.GenericResource*

*\* @return an instance of java.lang.String*

*\*/*

**@GET**

**@Produces**(MediaType.APPLICATION\_XML)

**public** String getXml() {

*//TODO return proper representation object*

**return** "<hi>Hello</hi>";

*//new UnsupportedOperationException();*

}

```

/**
 * PUT method for updating or creating an instance of GenericResource
 * @param content representation for the resource
 */
@PUT
@Consumes(MediaType.APPLICATION_XML)
public void putXml(String content) {
}

@GET
@Path("/concat/{a},{b}")
public String concat(@PathParam("a") String a,@PathParam("b") String b)
{
    String res = a.concat(b);
    return res;
}

@GET
@Path("/compare/{a},{b}")
public String compare(@PathParam("a") String a,@PathParam("b") String b)
{
    int comp = a.compareTo(b);
    String msg = "";
    if(comp==0)
    {
        msg = "Both are equal";
    }
    else if(comp<0)
    {
        msg = "Second string is lexicographically greater";
    }
    else
    {
        msg = "First string is lexicographically greater";
    }
    return msg;
}

@GET
@Path("/length/{a}")
public int length(@PathParam("a") String a)
{
    return a.length();
}

@GET
@Path("/upper/{a}")
public String upper(@PathParam("a") String a) {

```

```

        //TODO write your implementation code here:
        return a.toUpperCase();
    }

    @GET
    @Path("/lower/{a}")
    public String lower(@PathParam("a") String a) {
        //TODO write your implementation code here:
        return a.toUpperCase();
    }
}

```

## Output

Activities Google Chrome Thu Apr 14, 4:24:23 PM

Stringop Web Service Tester x +

localhost:8080/Stringop/Stringop?Tester

### Stringop Web Service Tester

This form will allow you to test your web service implementation ([WSDL File](#))

To invoke an operation, fill the method parameter(s) input boxes and click on the button labeled with the method name.

**Methods :**

public abstract java.lang.String org.me.stringmanip.Stringop.upper(java.lang.String)  
 (to upper method)

public abstract java.lang.String org.me.stringmanip.Stringop.lower(java.lang.String)  
 (to lower method)

public abstract int org.me.stringmanip.Stringop.length(java.lang.String)  
 (I am a long sentence)

public abstract java.lang.String org.me.stringmanip.Stringop.concat(java.lang.String,java.lang.String)  
 (pi, ct)

public abstract java.lang.String org.me.stringmanip.Stringop.compare(java.lang.String,java.lang.String)  
 (abc, qaw)

## upper Method invocation

### Method parameter(s)

Type	Value
java.lang.String	to upper method

### Method returned

java.lang.String : "TO UPPER METHOD"

### SOAP Request

```
<?xml version="1.0" encoding="UTF-8"?><S:Envelope xmlns:S="http://schemas.xmlsoap.org/soap/envelope/" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
  <SOAP-ENV:Header/>
  <S:Body>
    <ns2:upper xmlns:ns2="http://stringmanip.me.org/">
      <a>to upper method</a>
    </ns2:upper>
  </S:Body>
</S:Envelope>
```

### SOAP Response

```
<?xml version="1.0" encoding="UTF-8"?><S:Envelope xmlns:S="http://schemas.xmlsoap.org/soap/envelope/" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
  <SOAP-ENV:Header/>
  <S:Body>
    <ns2:upperResponse xmlns:ns2="http://stringmanip.me.org/">
      <return>TO UPPER METHOD</return>
    </ns2:upperResponse>
  </S:Body>
</S:Envelope>
```

## lower Method invocation

### Method parameter(s)

Type	Value
java.lang.String	to lower method

### Method returned

java.lang.String : "to lower method"

### SOAP Request

```
<?xml version="1.0" encoding="UTF-8"?><S:Envelope xmlns:S="http://schemas.xmlsoap.org/soap/envelope/" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
  <SOAP-ENV:Header/>
  <S:Body>
    <ns2:lower xmlns:ns2="http://stringmanip.me.org/">
      <a>to lower method</a>
    </ns2:lower>
  </S:Body>
</S:Envelope>
```

### SOAP Response

```
<?xml version="1.0" encoding="UTF-8"?><S:Envelope xmlns:S="http://schemas.xmlsoap.org/soap/envelope/" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
  <SOAP-ENV:Header/>
  <S:Body>
    <ns2:lowerResponse xmlns:ns2="http://stringmanip.me.org/">
      <return>to lower method</return>
    </ns2:lowerResponse>
  </S:Body>
</S:Envelope>
```

## length Method invocation

### Method parameter(s)

Type	Value
java.lang.String	i am a long sentence

### Method returned

int : "20"

### SOAP Request

```
<?xml version="1.0" encoding="UTF-8"?><S:Envelope xmlns:S="http://schemas.xmlsoap.org/soap/envelope/" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
  <SOAP-ENV:Header/>
  <S:Body>
    <ns2:length xmlns:ns2="http://stringmanip.me.org/">
      <a>i am a long sentence</a>
    </ns2:length>
  </S:Body>
</S:Envelope>
```

### SOAP Response

```
<?xml version="1.0" encoding="UTF-8"?><S:Envelope xmlns:S="http://schemas.xmlsoap.org/soap/envelope/" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
  <SOAP-ENV:Header/>
  <S:Body>
    <ns2:lengthResponse xmlns:ns2="http://stringmanip.me.org/">
      <return>20</return>
    </ns2:lengthResponse>
  </S:Body>
</S:Envelope>
```

## concat Method invocation

### Method parameter(s)

Type	Value
java.lang.String	pi
java.lang.String	ct

### Method returned

java.lang.String : "pict"

### SOAP Request

```
<?xml version="1.0" encoding="UTF-8"?><S:Envelope xmlns:S="http://schemas.xmlsoap.org/soap/envelope/" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
  <SOAP-ENV:Header/>
  <S:Body>
    <ns2:concat xmlns:ns2="http://stringmanip.me.org/">
      <a>pi</a>
      <b>ct</b>
    </ns2:concat>
  </S:Body>
</S:Envelope>
```

### SOAP Response

```
<?xml version="1.0" encoding="UTF-8"?><S:Envelope xmlns:S="http://schemas.xmlsoap.org/soap/envelope/" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
  <SOAP-ENV:Header/>
  <S:Body>
    <ns2:concatResponse xmlns:ns2="http://stringmanip.me.org/">
      <return>pict</return>
    </ns2:concatResponse>
  </S:Body>
</S:Envelope>
```

## compare Method invocation

### Method parameter(s)

Type	Value
java.lang.String	abc
java.lang.String	qaw

### Method returned

java.lang.String : "Second string is lexicographically greater"

### SOAP Request

```
<?xml version="1.0" encoding="UTF-8"?><S:Envelope xmlns:S="http://schemas.xmlsoap.org/soap/envelope/" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
  <SOAP-ENV:Header/>
  <S:Body>
    <ns2:compare xmlns:ns2="http://stringmanip.me.org/">
      <a>abc</a>
      <b>qaw</b>
    </ns2:compare>
  </S:Body>
</S:Envelope>
```

### SOAP Response

```
<?xml version="1.0" encoding="UTF-8"?><S:Envelope xmlns:S="http://schemas.xmlsoap.org/soap/envelope/" xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
  <SOAP-ENV:Header/>
  <S:Body>
    <ns2:compareResponse xmlns:ns2="http://stringmanip.me.org/">
      <return>Second string is lexicographically greater</return>
    </ns2:compareResponse>
  </S:Body>
</S:Envelope>
```

WADL : [http://localhost:8080/Assignment5\\_REST/webresources/application.wadl](http://localhost:8080/Assignment5_REST/webresources/application.wadl)

## Test RESTful Web Services

### Assignment5\_REST

- generic
  - length([a])
  - upper([a])
  - lower([a])
  - compare([a],[b])
  - concat([a],[b])

Select a node on the navigation bar (on the left side of this page) to test.



Activities Google Chrome Thu Apr 14, 4:26:35 PM

Test RESTful Web Service localhost:8080/Assignment5\_REST/test-resbeans.html

WADL: http://localhost:8080/Assignment5\_REST/webresources/application.wadl

### Test RESTful Web Services

Assignment5\_REST

generic

length(a)

upper(a)

lower(a)

compare(a),(b)

concat(a),(b)

Assignment5\_REST > generic > length > {a}

Resource: generic/length/{a}  
(http://localhost:8080/Assignment5\_REST/webresources/generic/length/{a})

Choose method to test: GET (▼) Test

a: I am a long sentence

Custom Request Headers

Status: 200 (OK)

Response:

Tabular View Raw View Sub-Resource Headers Http Monitor

28

Activities Google Chrome Thu Apr 14, 4:26:44 PM

Test RESTful Web Service localhost:8080/Assignment5\_REST/test-resbeans.html

WADL: http://localhost:8080/Assignment5\_REST/webresources/application.wadl

### Test RESTful Web Services

Assignment5\_REST

generic

length(a)

upper(a)

lower(a)

compare(a),(b)

concat(a),(b)

Assignment5\_REST > generic > upper > {a}

Resource: generic/upper/{a}  
(http://localhost:8080/Assignment5\_REST/webresources/generic/upper/{a})

Choose method to test: GET (▼) Test

a: to upper

Custom Request Headers

Status: 200 (OK)

Response:

Tabular View Raw View Sub-Resource Headers Http Monitor

TO UPPER

Activities Google Chrome Thu Apr 14, 4:26:52 PM

Test RESTful Web Service localhost:8080/Assignment5\_REST/test-resbeans.html

WADL: http://localhost:8080/Assignment5\_REST/webresources/application.wadl

### Test RESTful Web Services

Assignment5\_REST

- generic
  - length(a)
  - upper(a)
  - lower(a)
  - compare(a),(b)
  - concat(a),(b)

Assignment5\_REST > generic > lower > (a)

Resource: generic/lower(a)  
(http://localhost:8080/Assignment5\_REST/webresources/generic/lower(a))

Choose method to test: GET (▼)

a:

Status: 200 (OK)

Response:

TO LOWER

Activities Google Chrome Thu Apr 14, 4:27:05 PM

Test RESTful Web Service localhost:8080/Assignment5\_REST/test-resbeans.html

WADL: http://localhost:8080/Assignment5\_REST/webresources/application.wadl

### Test RESTful Web Services

Assignment5\_REST

- generic
  - length(a)
  - upper(a)
  - lower(a)
  - compare(a),(b)
  - concat(a),(b)

Assignment5\_REST > generic > compare > (a),(b)

Resource: generic/compare(a),(b)  
(http://localhost:8080/Assignment5\_REST/webresources/generic/compare(a),(b))

Choose method to test: GET (▼)

a:   
b:

Status: 200 (OK)

Response:

Second string is lexicographically greater

Activities Google Chrome Thu Apr 14, 4:27:11 PM

Test RESTful Web Service localhost:8080/Assignment5\_REST/test-resbeans.html

WADL: http://localhost:8080/Assignment5\_REST/webresources/application.wadl

### Test RESTful Web Services

Assignment5\_REST

- generic
  - length(a)
  - upper(a)
  - lower(a)
  - compare(a),(b)
  - concat(a),(b)

Assignment5\_REST > generic > compare > {a},{b}

Resource: generic/compare/{a},{b}  
(http://localhost:8080/Assignment5\_REST/webresources/generic/compare/{a},{b})

Choose method to test: GET (▼)

a:   
b:

Status: 200 (OK)

Response:

Both are equal

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Test RESTful Web Service localhost:8080/Assignment5\_REST/test-resbeans.html

WADL: http://localhost:8080/Assignment5\_REST/webresources/application.wadl

### Test RESTful Web Services

Assignment5\_REST

- generic
  - length(a)
  - upper(a)
  - lower(a)
  - compare(a),(b)
  - concat(a),(b)

Assignment5\_REST > generic > concat > {a},{b}

Resource: generic/concat/{a},{b}  
(http://localhost:8080/Assignment5\_REST/webresources/generic/concat/{a},{b})

Choose method to test: GET (▼)

a:   
b:

Status: 200 (OK)

Response:

pi ct

## Assignment 4

### Code

Bully.java

```
import java.io.InputStream;
import java.io.PrintStream;
import java.util.Scanner;

public class Bully {
    static int num_proc = 6;
    static boolean[] state = new boolean[num_proc];
    static int coordinator = 0;

    public static void elect(int startid)
    {
        int tmpcoord = startid;
        int i=startid;
        int j=i+1;
        for ( i=startid; i<num_proc ; i++) {
            for ( j = i+1; j<num_proc ; j++) {
                if(state[i]==true) {
                    System.out.println("\nMessage sent from "+i+" to "+j);
                }
            }
            for ( j = i+1; j<num_proc ; j++) {
                if(state[j]==true && state[i] == true) {
                    System.out.println("\nOK sent from "+j+" to "+i);
                    tmpcoord = j;
                }
            }
        }
        coordinator = tmpcoord;
        System.out.println("\nCoordinator is "+coordinator);
    }

    public static void bringUp(int proc_id)
    {
        state[proc_id]=true;
        elect(proc_id);
    }

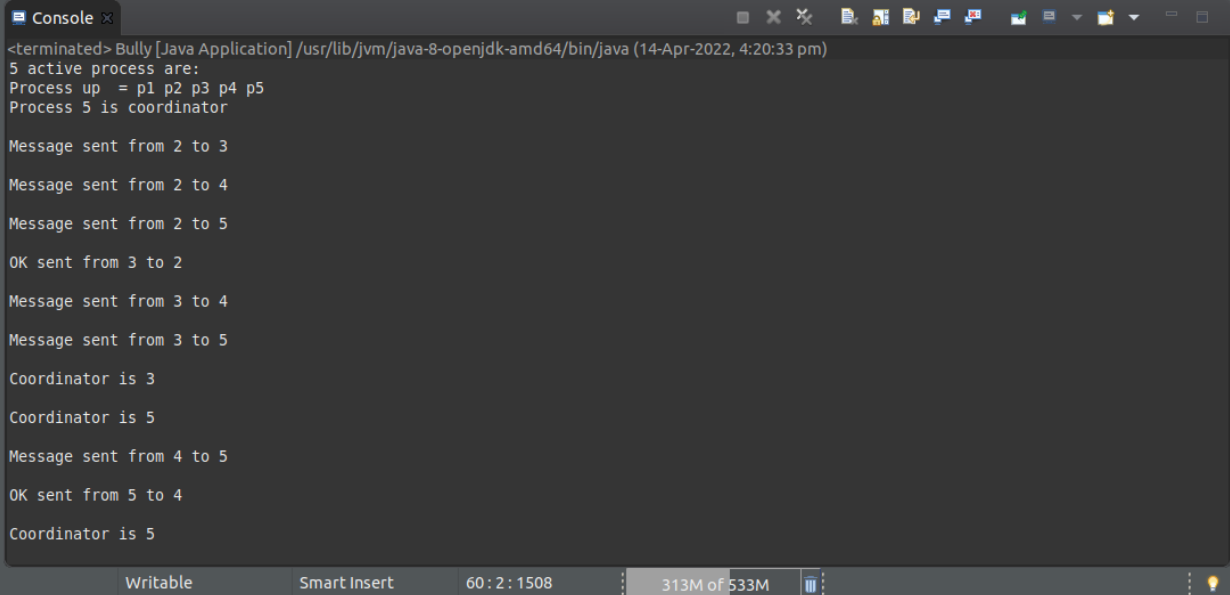
    public static void bringDown(int proc_id)
    {
        state[proc_id]=false;
    }
}
```

```

    public static void main(String[] args) {
        int choice;
        Scanner sc = new Scanner(System.in);
        for (int i = 0; i < Bully.num_proc; ++i) {
            Bully.state[i] = true;
        }
        // Bully.coordinator = 5;
        System.out.println("5 active process are:");
        System.out.println("Process up = p1 p2 p3 p4 p5");
        System.out.println("Process 5 is coordinator");
        Bully.bringDown(5);
        Bully.bringDown(4);
        Bully.elect(2);
        Bully.bringUp(5);
        Bully.bringUp(4);
    }
}

```

## Output



```

<terminated> Bully [Java Application] /usr/lib/jvm/java-8-openjdk-amd64/bin/java (14-Apr-2022, 4:20:33 pm)
5 active process are:
Process up = p1 p2 p3 p4 p5
Process 5 is coordinator

Message sent from 2 to 3
Message sent from 2 to 4
Message sent from 2 to 5
OK sent from 3 to 2
Message sent from 3 to 4
Message sent from 3 to 5
Coordinator is 3
Coordinator is 5
Message sent from 4 to 5
OK sent from 5 to 4
Coordinator is 5

```

## Assignment 3

### Code

urlreader.idl

```
module URLReaderApp
{
    interface URLReader
    {
        long urlbytes(in string url);
        oneway void shutdown();
    };
};
```

URLReaderObj.java

```
import URLReaderApp.*;
import org.omg.*;

import java.io.InputStream;
import java.net.MalformedURLException;
import java.net.URL;
import java.util.*;

public class URLReaderObj extends URLReaderApp.URLReaderPOA {
    private org.omg.CORBA.ORB orb;

    public void setORB(org.omg.CORBA.ORB orb2) {
        orb=orb2;
    }
    @Override
    public int urlbytes(String url) {
        URL url2;
        int length=0;
        try {
            url2 = new URL(url);
            InputStream is = null;
            is = url2.openStream();
            length = is.available();
            if (is != null)
                is.close();
        } catch (Exception e) {
            // TODO Auto-generated catch block
            e.printStackTrace();
        }
        return length;
    }
}
```

```

        @Override
        public void shutdown() {
            // TODO Auto-generated method stub
            orb.shutdown(false);
        }
    }
}

```

#### StartServer.java

```

import URLReaderApp.*;
//import org.omg.*;
import org.omg.CORBA.ORB;
import org.omg.CORBA.ORBPackage.InvalidName;
import org.omg.CosNaming.NameComponent;
import org.omg.CosNaming.NamingContextExt;
import org.omg.CosNaming.NamingContextExtHelper;
import org.omg.PortableServer.POA;
import org.omg.PortableServer.POAHelper;

import java.util.*;

public class StartServer {
    public static void main(String args[]) {
        try {
            //      init orb
            ORB orb = ORB.init(args, null);
            //      reference to POAHelper
            POA rootpoa =
            POAHelper.narrow(orb.resolve_initial_references("RootPOA"));
            //      activate poamanager
            rootpoa.the_POAManager().activate();

            //      make servant
            URLReaderObj urlreadobj = new URLReaderObj();
            //      register with orb
            urlreadobj.setORB(orb);

            //      Get object reference from servant
            org.omg.CORBA.Object ref =
            rootpoa.servant_to_reference(urlreadobj);
            //      get href ie helper reference
            URLReader href = URLReaderHelper.narrow(ref);

            //
            org.omg.CORBA.Object objref =
            orb.resolve_initial_references("NameService");

```

```
//
    NamingContextExt ncRef = NamingContextExtHelper.narrow(objref);

    NameComponent path[] = ncRef.to_name("ABC");
    ncRef.rebind(path, href);

    while(true)
        orb.run();

    } catch (Exception e) {
        // TODO Auto-generated catch block
        e.printStackTrace();
    }

}

}
```

#### StartClient.java

```
import URLReaderApp.*;
//import org.omg.*;
import org.omg.CORBA.ORB;
import org.omg.CORBA.ORBPackage.InvalidName;
import org.omg.CosNaming.NamingContextExt;
import org.omg.CosNaming.NamingContextExtHelper;

import java.util.*;

public class StartClient {
    public static void main(String args[]) {
        try {
            ORB orb = ORB.init(args,null);
            org.omg.CORBA.Object objref =
            orb.resolve_initial_references("NameService");
            NamingContextExt ncRef = NamingContextExtHelper.narrow(objref);

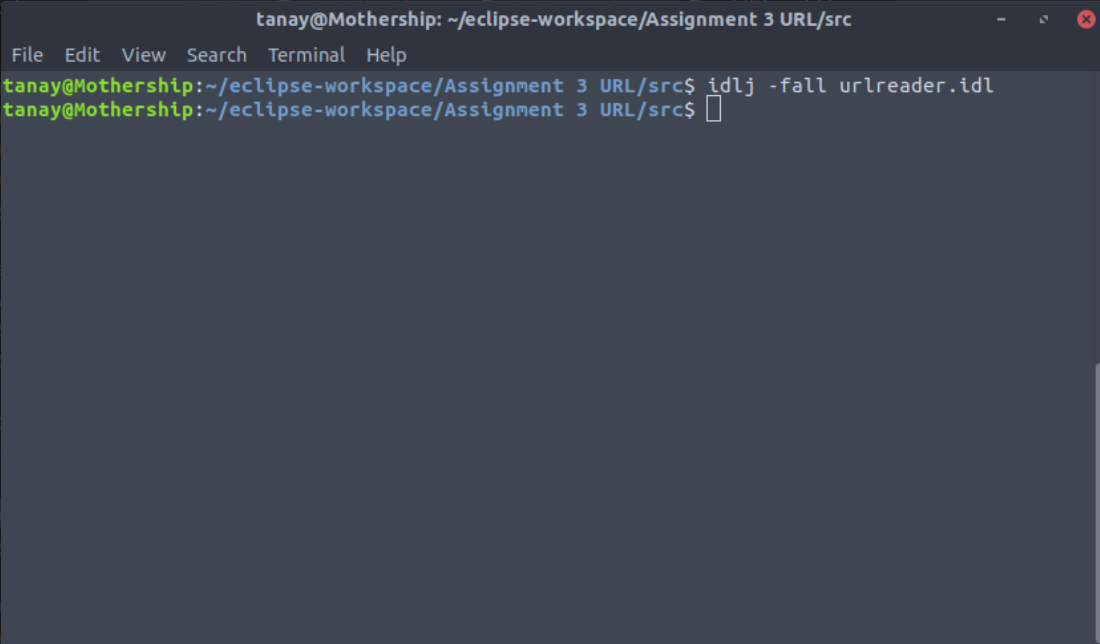
            URLReader urlobj =
            URLReaderHelper.narrow(ncRef.resolve_str("ABC"));

            Scanner s = new Scanner(System.in);
            while(true) {
                System.out.println("Enter url:");
                String surl = s.nextLine();
                int len = urlobj.urlbytes(surl);
                System.out.println("Bytes got are url:"+ len);
            }
        }
    }
}
```



```
    }  
    } catch (Exception e) {  
        // TODO Auto-generated catch block  
        e.printStackTrace();  
    }  
}  
}
```

## Output



```
tanay@Mothership: ~/eclipse-workspace/Assignment 3 URL/src  
File Edit View Search Terminal Help  
tanay@Mothership:~/eclipse-workspace/Assignment 3 URL/src$ idlj -fall urlreader.idl  
tanay@Mothership:~/eclipse-workspace/Assignment 3 URL/src$
```

```
tanay@Mothership: ~/eclipse-workspace/Assignment 3/src
File Edit View Search Terminal Help
tanay@Mothership:~/eclipse-workspace/Assignment 3/src$ orbd -ORBInitialPort 1050
&
[1] 2607
tanay@Mothership:~/eclipse-workspace/Assignment 3/src$
```

```
Console x
StartClient (1) [Java Application] /usr/lib/jvm/java-8-openjdk-amd64/bin/java (14-Apr-2022) Terminate
Enter url:
https://www.google.com
Bytes got are url:284
Enter url:
https://geeksforgeeks.org
Bytes got are url:15402
Enter url:
https://www.amazon.in
Bytes got are url:0
Enter url:
https://en.wikipedia.org
Bytes got are url:13036
Enter url:
```

148M of 256M

## Assignment 2

### Code

MPIAverge.java

```
import mpi.MPI;
import java.util.*;

public class MPIAverage {
    public static void main(String args[]) {

        //Initialize and finalize
        MPI.Init(args);

        int root = 0;

        //Rank and Size
        int size = MPI.COMM_WORLD.Size();
        int rank = MPI.COMM_WORLD.Rank();

        int arrsize = 8;
        int chunksize = arrsize/size;

        if(rank == root) {
            System.out.println("\nSize of MPI Communicator : "+size);
        }
        System.out.println("\nThis process has rank "+rank);

        int sendbuf[] = new int[arrsize];
        double recdoublebuff[] = new double[size];

        Random ran = new Random();

        // Generating random array in root process
        if(rank == root) {
            for(int i=0;i<arrsize;i++) {

                sendbuf[i] = ran.nextInt(100);
            }
            for(int i=0;i<arrsize;i++)
            {

                System.out.print(sendbuf[i]+" ");
            }
        }
        int rcvbuf[] = new int[chunksize];
```

```

//scatter data
MPI.COMM_WORLD.Scatter(sendbuf, 0, chunksize, MPI.INT,
                        recvbuf, 0, chunksize, MPI.INT,
                        root);

//Calc average of subset in every process
System.out.println("\nProcess "+rank+" has data: \n");
double sum = 0.0;

for (int num: recvbuf) {
    System.out.print(num+ " ");
    sum += num;
}

double average[] = new double[1];
average[0] = (sum / recvbuf.length);

//gater data to root process
MPI.COMM_WORLD.Gather(average, 0, 1, MPI.DOUBLE,
                      recdoublebuff, 0, 1, MPI.DOUBLE,
                      root);

//display the doubled data
if(rank == root) {
    System.out.println("\nThe root process "+rank+" has data: ");
    for(int i=0;i<size;i++)
        System.out.print(recdoublebuff[i]+" ");

    double tempsum = 0.0;

    for (double num: recdoublebuff) {
        tempsum += num;
    }

    System.out.println("\nThe average of the data is "+(tempsum /
recdoublebuff.length));

}

MPI.Finalize();
}
}

//javac -source 1.8 -target 1.8 -cp $MPJ_HOME/lib/mpj.jar MPIAverage.java
//$MPJ_HOME/bin/mpjrun.sh -np 4 MPIAverage

```

# Output

```
tanay@Mothership: /media/tanay/PIZZA/CL9/eclipse-workspace/Assignment 2/src
File Edit View Search Terminal Help
tanay@Mothership: /media/tanay/PIZZA/CL9/eclipse-workspace/Assignment 2/src$ export MPJ_HOME=/home/tanay/mpj-v0.44
tanay@Mothership: /media/tanay/PIZZA/CL9/eclipse-workspace/Assignment 2/src$ javac -source 1.8 -target 1.8 -cp $MPJ_HOME/lib/mpj.jar MPIAverage.java
warning: [options] bootstrap class path not set in conjunction with -source 8
1 warning
tanay@Mothership: /media/tanay/PIZZA/CL9/eclipse-workspace/Assignment 2/src$ $MPJ_HOME/bin/mpjrun.sh -np 4 MPIAverage
MPJ Express (0.44) is started in the multicore configuration
This process has rank 1
Size of MPI Communicator : 4
This process has rank 0
96 65 1 87 83 35 10 23
This process has rank 3
This process has rank 2
Process 0 has data:
96 65
Process 2 has data:
83 35
Process 3 has data:
10 23
Process 1 has data:
1 87
The root process 0 has data:
80.5 44.0 59.0 16.5
The average of the data is 50.0
tanay@Mothership: /media/tanay/PIZZA/CL9/eclipse-workspace/Assignment 2/src$
```

## Assignment 1B

### Code

#### 1. Calc.java

```
import java.rmi.*;

public interface Calc extends Remote{
    public double calcpow(int x,int y)throws RemoteException;
}
```

#### 2. CalcRemote.java

```
import java.rmi.*;
import java.rmi.server.*;
public class CalcRemote extends UnicastRemoteObject implements Calc{
    CalcRemote()throws RemoteException{
        super();
    }
    public double calcpow(int x,int y)
    {
        return Math.pow(x, y);
    }
}
```

#### 3. Server.java

```
import java.rmi.*;
import java.rmi.server.*;
import java.rmi.registry.*;
public class Server extends CalcRemote {

    public Server() throws RemoteException {}

    public static void main(String[] args) {
        try{
            Calc stub=new CalcRemote();
            Naming.rebind("rmi://localhost:5000/calculate",stub);
            System.err.println("Server ready");
        }
        catch(Exception e){
            System.out.println(e);
        }
    }
}

//rmiregistry 5000
```

#### 4. Client1.java

```
import java.rmi.registry.*;
import java.rmi.*;
import java.rmi.server.*;
import java.util.*;
public class Client1{
    private Client1()throws RemoteException {}
    public static void main(String[] args) {
        try{
            Calc
            stub=(Calc)Naming.lookup("rmi://localhost:5000/calculate");
            Scanner sc = new Scanner(System.in);

            int a,b,choice;
            while(true){
                System.out.println("\nEnter your base and power");
                System.out.println("Enter 1st number");
                a = sc.nextInt();
                System.out.println("Enter 2nd number");
                b = sc.nextInt();
                System.out.println("Result of "+a+" and "+b+" is
"+stub.calcpow(a,b));
            }
        }
        catch(Exception e){
            System.out.println(e);
        }
    }
}
```

#### 5. Client2.java

```
import java.rmi.registry.*;
import java.rmi.*;
import java.rmi.server.*;
import java.util.*;
public class Client2{
    private Client2()throws RemoteException {}
    public static void main(String[] args) {
        try{
            Calc
            stub=(Calc)Naming.lookup("rmi://localhost:5000/calculate");
            Scanner sc = new Scanner(System.in);

            int a,b,choice;
            while(true){
                System.out.println("\nEnter your base and power");
```

```

        System.out.println("Enter 1st number");
        a = sc.nextInt();
        System.out.println("Enter 2nd number");
        b = sc.nextInt();
        System.out.println("Result of "+a+" and "+b+" is
"+stub.calcpow(a,b));
    }
}
catch(Exception e){
    System.out.println(e);
}
}
}

```

## Output

A terminal window titled 'tanay@Mothership: ~/eclipse-workspace/Assignment 1-B/src'. The command 'rmiregistry' has been entered at the prompt.

Three Eclipse console windows are shown, each running a Java application. The first two windows, 'Client1' and 'Client2', show the user entering base and power values and receiving the calculated result. The third window, 'Server (1)', shows the server is ready.

```

Client1 [Java Application] /usr/lib/jvm/java-8-openjdk-amd64/bin/java (14-Apr-2022, 4:03:13 pm)
Enter your base and power
Enter 1st number
5
Enter 2nd number
3
Result of 5 and 3 is 125.0

Enter your base and power
Enter 1st number

Client2 [Java Application] /usr/lib/jvm/java-8-openjdk-amd64/bin/java (14-Apr-2022, 4:03:13 pm)
Enter your base and power
Enter 1st number
6
Enter 2nd number
4
Result of 6 and 4 is 1296.0

Enter your base and power
Enter 1st number

Server (1) [Java Application] /usr/lib/jvm/java-8-openjdk-amd64/bin/java (14-Apr-2022, 4:03:13 pm)
Server ready

```



# Assignment 1A

## Code

### 1. TCP

ServerTCP.java

*// A Java program for a Server*

**import** java.net.\*;

**import** java.io.\*;

**import** java.lang.Math;

**public class** ServerTCP

{

*//initialize socket and input stream*

**private** Socket socket = **null**;

**private** ServerSocket server = **null**;

**private** DataInputStream in = **null**;

**private** DataOutputStream out = **null**;

*// constructor with port*

**public** ServerTCP(**int** port)

{

*// starts server and waits for a connection*

**try**

{

server = **new** ServerSocket(port);

System.out.println("Server started");

**int** i = 1;

**while** (**true**) {

**try** {

System.out.println("Waiting for a client ...");

socket = server.accept();

System.out.println("Client "+i+" accepted");

ServerThread st = **new** ServerThread(socket,"Client  
"+String.valueOf(i));

i++;

st.start();

} **catch** (Exception e) {

System.out.println("connetion error");

}

}

}

**catch**(IOException i)

{

```

        System.out.println(i);
    }
}

public static void main(String args[])
{
    ServerTCP server = new ServerTCP(5000);
}
}

class ServerThread extends Thread{
    int a = 0, b = 0;
    DataInputStream in = null;
    DataOutputStream out = null;
    Socket socket = null;
    String clientnum = "";
    public ServerThread(Socket s, String clientnum) {
        socket = s;
        this.clientnum = clientnum;
    }

    public void run() {
        try {

            in = new DataInputStream(socket.getInputStream());
            out = new DataOutputStream(socket.getOutputStream());

            a = in.readInt();
            b = in.readInt();

            System.out.println("Recieved Base and Power. Answer is: "+
Math.pow(a,b));

        } catch (IOException ie) {
            System.out.println("socket close error");
        }
    }
}

```

ClientTCP.java

*// A Java program for a Client*

```

import java.net.*;
import java.io.*;
import java.math.*;

```

```
import java.util.*;
```

```
public class ClientTCP1
```

```
{
```

```
    // initialize socket and input output streams
```

```
    private Socket socket = null;
```

```
    private DataInputStream input = null;
```

```
    private DataInputStream in = null;
```

```
    private DataOutputStream out = null;
```

```
    // constructor to put ip address and port
```

```
    public ClientTCP1(String address, int port)
```

```
    {
```

```
        // establish a connection
```

```
        try
```

```
        {
```

```
            socket = new Socket(address, port);
```

```
            System.out.println("Connected");
```

```
            // takes input from terminal
```

```
            input = new DataInputStream(System.in);
```

```
            in = new DataInputStream(socket.getInputStream());
```

```
            // sends output to the socket
```

```
            out = new DataOutputStream(socket.getOutputStream());
```

```
        }
```

```
        catch(UnknownHostException u)
```

```
        {
```

```
            System.out.println(u);
```

```
        }
```

```
        catch(IOException i)
```

```
        {
```

```
            System.out.println(i);
```

```
        }
```

```
        Scanner sc= new Scanner(System.in);
```

```
        int a=0,b=0;
```

```
        while (a != -1)
```

```
        {
```

```
            System.out.print("Enter base: ");
```

```
            a= sc.nextInt();
```

```
            System.out.print("Enter power: ");
```

```
            b= sc.nextInt();
```

```
            System.out.println("Sending Base and Power to Server");
```

```
            try
```

```

        {
            out.writeInt(a);
            out.writeInt(b);
        }
        catch(IOException i)
        {
            System.out.println(i);
        }
    }
    // close the connection
    try
    {
        System.out.println("Closing connection");
        input.close();
        out.close();
        socket.close();
    }
    catch(IOException i)
    {
        System.out.println(i);
    }
}

public static void main(String args[])
{
    ClientTCP1 client = new ClientTCP1("127.0.0.1", 5000);
}
}

```

## 2. UDP

ServerUDP.java

*//Java program to illustrate Server side  
 //Implementation using DatagramSocket*

```

import java.io.IOException;
import java.net.DatagramPacket;
import java.net.DatagramSocket;
import java.net.InetAddress;
import java.net.SocketException;

```

```

public class ServerUDP

```

```

{
    public static void main(String[] args) throws IOException
    {
        // Step 1 : Create a socket to listen at port 1234
        DatagramSocket ds = new DatagramSocket(1234);
    }
}

```

```

byte[] receive = new byte[65535];

DatagramPacket DpReceive = null;
while (true)
{
    if (data(receive).equals("bye"))
    {
        System.out.println("Client sent bye.....EXITING");
        break;
    }

    // Step 2 : create a DatagramPacket to receive the data.
    DpReceive = new DatagramPacket(receive, receive.length);

    // Step 3 : receive the data in byte buffer.
    ds.receive(DpReceive);
    String[] s = data(receive).split("\\s+");

    System.out.println("Base:-" + Integer.valueOf(s[0]));
    System.out.println("Power:-" + Integer.valueOf(s[1]));
    double c =
Math.pow(Integer.valueOf(s[0]), Integer.valueOf(s[1]));

    System.out.println("Answer:-" + c);

    // Exit the server if the client sends "bye"

    // Clear the buffer after every message.
    receive = new byte[65535];
}
}

// A utility method to convert the byte array
// data into a string representation.
public static String data(byte[] a)
{
    if (a == null)
        return null;
    StringBuilder ret = new StringBuilder();
    int i = 0;
    while (a[i] != 0)
    {
        ret.append((char) a[i]);
        i++;
    }
}

```

```

        return ret.toString();
    }
}

```

ClientUDP.java

*//Java program to illustrate Client side  
 //Implementation using DatagramSocket*

```

import java.io.IOException;
import java.net.DatagramPacket;
import java.net.DatagramSocket;
import java.net.InetAddress;
import java.util.Scanner;

public class ClientUDP1
{
    public static void main(String args[]) throws IOException
    {
        Scanner sc = new Scanner(System.in);

        // Step 1:Create the socket object for  

        // carrying the data.
        DatagramSocket ds = new DatagramSocket();

        InetAddress ip = InetAddress.getLocalHost();
        byte buf[] = null;

        // loop while user not enters "bye"
        System.out.println("Enter Base and Power: <base power>");
        while (true)
        {

            String eqn = sc.nextLine();

            if (eqn.equals("bye"))
                break;

            buf = eqn.getBytes();

            DatagramPacket DpSend = new DatagramPacket(buf,
buf.length, ip, 1234);

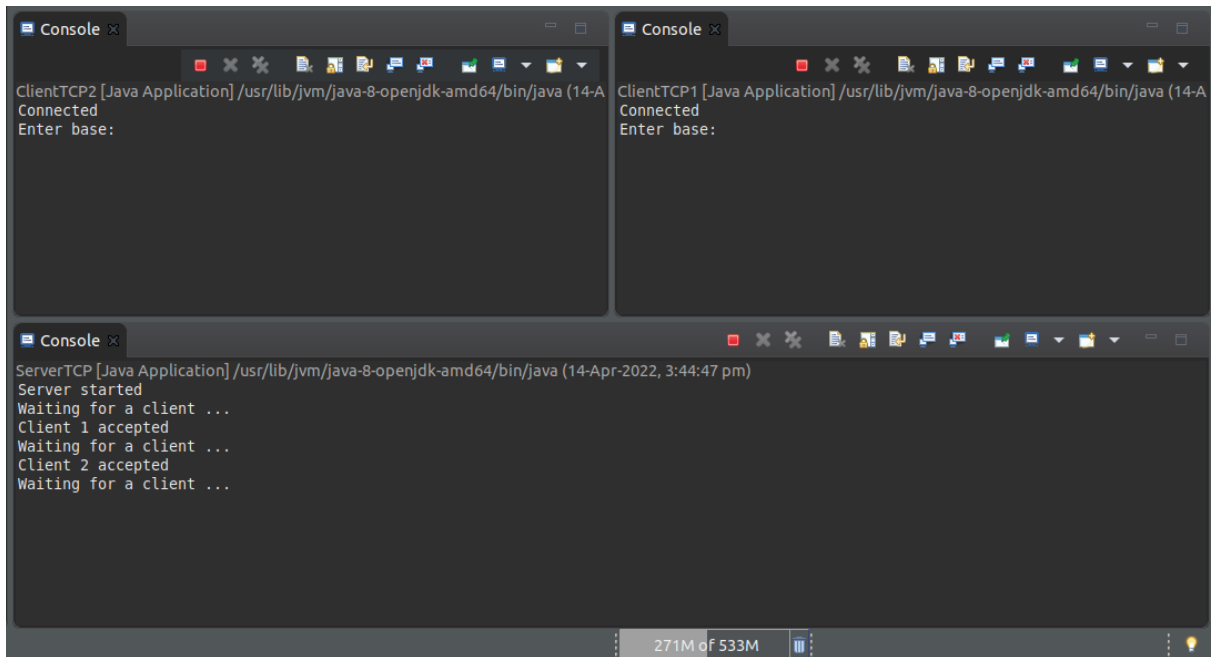
            ds.send(DpSend);

        }
    }
}

```

# Output

## TCP



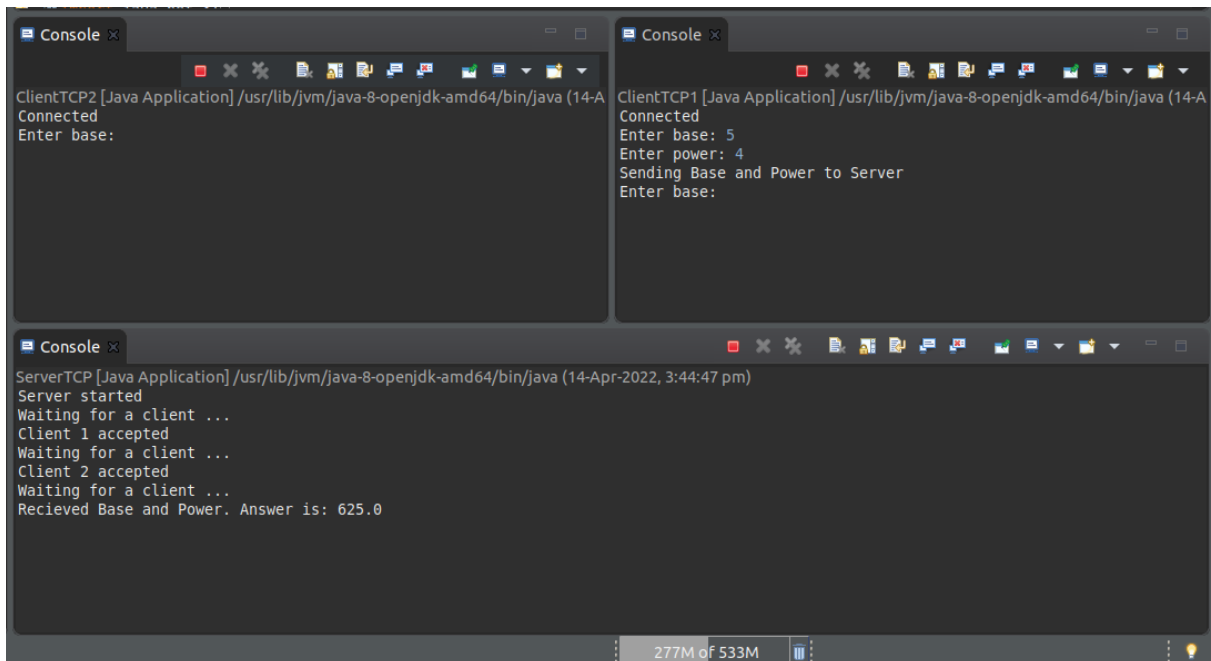
The screenshot shows three terminal windows. The top-left window is titled 'ClientTCP2 [Java Application] /usr/lib/jvm/java-8-openjdk-amd64/bin/java (14-A)' and contains the text 'Connected' and 'Enter base:'. The top-right window is titled 'ClientTCP1 [Java Application] /usr/lib/jvm/java-8-openjdk-amd64/bin/java (14-A)' and also contains 'Connected' and 'Enter base:'. The bottom window is titled 'ServerTCP [Java Application] /usr/lib/jvm/java-8-openjdk-amd64/bin/java (14-Apr-2022, 3:44:47 pm)' and shows the server's output: 'Server started', 'Waiting for a client ...', 'Client 1 accepted', 'Waiting for a client ...', 'Client 2 accepted', and 'Waiting for a client ...'. The bottom status bar indicates '271M of 533M'.

```
ClientTCP2 [Java Application] /usr/lib/jvm/java-8-openjdk-amd64/bin/java (14-A)
Connected
Enter base:

ClientTCP1 [Java Application] /usr/lib/jvm/java-8-openjdk-amd64/bin/java (14-A)
Connected
Enter base:

ServerTCP [Java Application] /usr/lib/jvm/java-8-openjdk-amd64/bin/java (14-Apr-2022, 3:44:47 pm)
Server started
Waiting for a client ...
Client 1 accepted
Waiting for a client ...
Client 2 accepted
Waiting for a client ...

271M of 533M
```



The screenshot shows the same three terminal windows as above, but with more output. The top-left window (ClientTCP2) still shows 'Connected' and 'Enter base:'. The top-right window (ClientTCP1) now shows 'Enter base: 5', 'Enter power: 4', 'Sending Base and Power to Server', and 'Enter base:'. The bottom window (ServerTCP) shows the server receiving the data: 'Waiting for a client ...', 'Client 1 accepted', 'Waiting for a client ...', 'Client 2 accepted', 'Waiting for a client ...', and 'Recieved Base and Power. Answer is: 625.0'. The bottom status bar indicates '277M of 533M'.

```
ClientTCP2 [Java Application] /usr/lib/jvm/java-8-openjdk-amd64/bin/java (14-A)
Connected
Enter base:

ClientTCP1 [Java Application] /usr/lib/jvm/java-8-openjdk-amd64/bin/java (14-A)
Connected
Enter base: 5
Enter power: 4
Sending Base and Power to Server
Enter base:

ServerTCP [Java Application] /usr/lib/jvm/java-8-openjdk-amd64/bin/java (14-Apr-2022, 3:44:47 pm)
Server started
Waiting for a client ...
Client 1 accepted
Waiting for a client ...
Client 2 accepted
Waiting for a client ...
Recieved Base and Power. Answer is: 625.0

277M of 533M
```

The image shows three terminal windows from an IDE. The top-left window, titled 'Console', shows the execution of 'ClientTCP2'. It displays the path '/usr/lib/jvm/java-8-openjdk-amd64/bin/java (14-A)' and the state 'Connected'. It then shows the user entering 'base: 5' and 'power: 2', followed by the message 'Sending Base and Power to Server' and a prompt 'Enter base:'. The top-right window, also titled 'Console', shows 'ClientTCP1' with similar output, but with 'base: 5' and 'power: 4'. The bottom window, titled 'Console', shows 'ServerTCP' with the path '/usr/lib/jvm/java-8-openjdk-amd64/bin/java (14-Apr-2022, 3:44:47 pm)'. It shows the server starting, waiting for clients, accepting 'Client 1' and 'Client 2', and then receiving data. The received data is shown as 'Recieved Base and Power. Answer is: 625.0' and 'Recieved Base and Power. Answer is: 25.0'. The status bar at the bottom indicates '320M of 533M'.

```
ClientTCP2 [Java Application] /usr/lib/jvm/java-8-openjdk-amd64/bin/java (14-A)
Connected
Enter base: 5
Enter power: 2
Sending Base and Power to Server
Enter base:

ClientTCP1 [Java Application] /usr/lib/jvm/java-8-openjdk-amd64/bin/java (14-A)
Connected
Enter base: 5
Enter power: 4
Sending Base and Power to Server
Enter base:

ServerTCP [Java Application] /usr/lib/jvm/java-8-openjdk-amd64/bin/java (14-Apr-2022, 3:44:47 pm)
Server started
Waiting for a client ...
Client 1 accepted
Waiting for a client ...
Client 2 accepted
Waiting for a client ...
Recieved Base and Power. Answer is: 625.0
Recieved Base and Power. Answer is: 25.0
```

## UDP

The image shows three terminal windows from an IDE. The top-left window, titled 'Console', shows the execution of 'ClientUDP1'. It displays the path '/usr/lib/jvm/java-8-openjdk-amd64/bin/java (14-A)' and the prompt 'Enter Base and Power: <base power>'. The top-right window, also titled 'Console', shows 'ClientUDP2' with the same prompt. The bottom window, titled 'Console', shows 'ServerUDP' with the path '/usr/lib/jvm/java-8-openjdk-amd64/bin/java (14-Apr-2022, 3:46:40 pm)'. The status bar at the bottom indicates '319M of 533M'.

```
ClientUDP1 [Java Application] /usr/lib/jvm/java-8-openjdk-amd64/bin/java (14-A)
Enter Base and Power: <base power>

ClientUDP2 [Java Application] /usr/lib/jvm/java-8-openjdk-amd64/bin/java (14-A)
Enter Base and Power: <base power>

ServerUDP [Java Application] /usr/lib/jvm/java-8-openjdk-amd64/bin/java (14-Apr-2022, 3:46:40 pm)
```



