SER 321 B Session

SI Session

Tuesday, November 5th 2024

10:00 am - 11:00 am MST

Agenda

- Sockets!
  - Match Steps with Code
  - Discuss “Handling the Client”
  - Examine Port Allocation
- JSON Matching

SI Session Expectations

Thanks for coming to the **SER 321** SI session. We have a packed agenda and we are going to try to get through as many of our planned example problems as possible. This session will be recorded and shared with others.

- If after this you want to see additional examples, please visit the drop-in tutoring center.
- We will post the link in the chat now and at the end of the session.
  - tutoring.asu.edu
- Please keep in mind we are recording this session and it will be made available for you to review 24-48 hours after this session concludes.
- Finally, please be respectful to each other during the session.

Interact with us:

Zoom Features

Zoom Chat

- Use the chat feature to interact with the presenter and respond to presenter's questions.
- Annotations are encouraged

SER 321
Client Socket

Steps for the **Client Socket**

1.
2.
3.
4.
5.
6.
7.
8.

Assign 3-1 Starter Code

SER 321
Client Socket

1. Define Params
2. Create Socket
3. **C ONLY** Create a struct for the address
4. Establish Connection
5. Send Message
6. Receive Message
7. Repeat #5 and #6 as needed
8. Close Socket

```
class SockClient {
  static Socket sock = null;  4 usages
  static String host = "localhost";  2 usages
  static int port = 8888;  2 usages
  static OutputStream out;  2 usages
  // Using and Object Stream here and a Data Stream as return. Could both b
  // to show the difference. Do not change these types.
  static ObjectOutputStream os;  4 usages
  static DataInputStream in;  3 usages
  public static void main (String args[]) {

    if (args.length != 2) {...}

    try {
      host = args[0];
      port = Integer.parseInt(args[1]);
    } catch (NumberFormatException nfe) {
      System.out.println("[Port|sleepDelay] must be an integer");
      System.exit( status: 2);
    }

    try {
      connect(host, port); // connecting to server
      System.out.println("Client connected to server.");
      boolean requesting = true;
      while (requesting) {
        System.out.println("What would you like to do: 1 - echo, 2 - add, 3
        Scanner scanner = new Scanner(System.in);
        int choice = Integer.parseInt(scanner.nextLine());
        // You can assume the user put in a correct input, you do not need
        // You can assume the user inputs a String when asked and an int wh
        JSONObject json = new JSONObject(); // request object
        switch(choice) {
          case 0:
            System.out.println("Choose quit. Thank you for using our servic
            requesting = false;
            break;
          case 1:
            System.out.println("Choose echo, which String do you want to se
            String message = scanner.nextLine();
            json.put("type", "echo");
            json.put("data", message);
            break;
          case 2:
```

```
        if(!requesting) {
          continue;
        }

        // write the whole message
        os.writeObject(json.toString());
        // make sure it wrote and doesn't get cached in a buffer
        os.flush();

        // TODO: handle the response
        // - not doing anything other than printing payload
        // !! you will most likely need to parse the response for th
        String i = (String) in.readUTF();
        JSONObject res = new JSONObject(i);
        System.out.println("Got response: " + res);
        if (res.getBoolean( key: "ok")){
          if (res.getString( key: "type").equals("echo")) {
            System.out.println(res.getString( key: "echo"));
          } else {
            System.out.println(res.getInt( key: "result"));
          }
        } else {
          System.out.println(res.getString( key: "message"));
        }
      }
      // want to keep requesting services so don't close connection
      //overandout();

    } catch (Exception e) {
      e.printStackTrace();
    }
  }
```

SER 321
Server Socket

Steps for the **Server Socket**

1.
2.
3.
4.
5.
6.
7.
8.
9.

SER 321
Server Socket

Java handles a few steps for us…

1. Define Params
2. Create Socket
3. **C ONLY** Create a struct for the address
3-5. Mark Socket to Listen
5. Mark Socket to Listen for Connections
6. Wait for Connection
7. Handle Client Connection
8. Close Client Connection
9. Continue Listening for Connections

Assign 3-1 Starter Code

SER 321

Server Socket

1. Define Params
2. Create Socket
3-5. Mark Socket to Listen
6. Wait for Connection
7. Handle Client Connection
8. Close Client Connection
9. Continue Listening

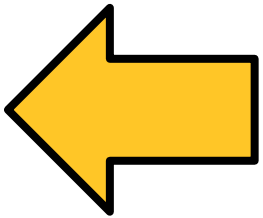
```
public static void main (String args[]) {

  if (args.length != 1) {
    System.out.println("Expected arguments: <port(int)>");
    System.exit( status: 1);
  }

  try {
1   port = Integer.parseInt(args[0]);
  } catch (NumberFormatException nfe) {
    System.out.println("[Port|sleepDelay] must be an integer");
    System.exit( status: 2);
  }

  try {
    //open socket
2 & 3-5 ServerSocket serv = new ServerSocket(port);
    System.out.println("Server ready for connections");

    /** Simple loop accepting one client and calling handling one request. */

9   while (true){
      System.out.println("Server waiting for a connection");
6     sock = serv.accept(); // blocking wait
      System.out.println("Client connected");
```

Assign 3-1 Starter Code

SER 321
Server Socket

What needs to be done here?

1. Define Params
2. Create Socket
3-5. Mark Socket to Listen
6. Wait for Connection
7. Handle Client Connection
8. Close Client Connection
9. Continue Listening



1

2

3

4

5

Assign 3-1 Starter Code

Echo_Java

SER 321

Server Socket

What needs to be done here?

Is input
from the client
or
to the client ?

1. Define Params

```
// setup the object reading channel
in = new ObjectInputStream(sock.getInputStream());

// get output channel
OutputStream out = sock.getOutputStream();

// create an object output writer (Java only)
os = new DataOutputStream(out);
```

1

2

3

4

5

```
clientSock = sock.accept(); // blocking wait
PrintWriter out = new PrintWriter(clientSock.getOutputStream(), autoFlush: true);
InputStream input = clientSock.getInputStream();
System.out.println("Server connected to client");
```

Assign 3-1 Starter Code

SER 321
Server Socket

What needs to be done here?

```
static void overandout() {
  try {
    os.close();
    in.close();
    sock.close();
  } catch(Exception e) {e.printStackTrace();}

}
```

```
try {
  s = (String) in.readObject();
} catch (Exception e) {
  System.out.println("Client disconnect");
  connected = false;
  continue;
}
```

1. Create input/output streams
2.
3.
4.
5.

Assign 3-1 Starter Code

SER 321

Server Socket

What needs to be done here?

```
JSONObject res = isValid(s);

if (res.has( key: "ok")) {
  writeOut(res);
  continue;
}

JSONObject req = new JSONObject(s);

res = testField(req,  key: "type");
if (!res.getBoolean( key: "ok")) {
  res = noType(req);
  writeOut(res);
  continue;
}
```

```
public static JSONObject isValid(String json) {
  try {
static JSONObject testField(JSONObject req, String key){
  JSONObject res = new JSONObject();

  // field does not exist
  if (!req.has(key)){
    res.put("ok", false);
    res.put("message", "Field " + key + " does not exist in request");
    return res;
  }
  return res.put("ok", true);
}
      return res;
    }
  }
  return new JSONObject();
}
```

Assign 3-1 Starter Code

Echo_Java

SER 321

Server Socket

What needs to be done here?

```
int numr = input.read(clientInput,  off: 0, bufLen);
```

```
String received = new String(clientInput,  offset: 0, numr);
System.out.println("read from client: " + received);
out.println(received);
```

```
if (req.getString( key: "type").equals("echo")) {
  res = echo(req);
} else if (req.getString( key: "type").equals("add")) {
  res = add(req);
} else if (req.getString( key: "type").equals("addmany")) {
  res = addmany(req);
} else {
  res = wrongType(req);
}
writeOut(res);
```

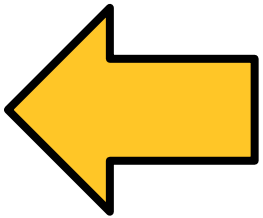
1. Create input/output streams
2. Check for disconnect
3. Check Protocol
4.
5.

Assign 3-1 Starter Code

SER 321
Server Socket

What needs to be done here?

1. Define Params
2. Create Socket
3-5. Mark Socket to Listen
6. Wait for Connection
7. Handle Client Connection
8. Close Client Connection
9. Continue Listening



1 Create input/output streams

2 Check for disconnect

3 Check Protocol

4 Read Headers

5 Handle Accordingly

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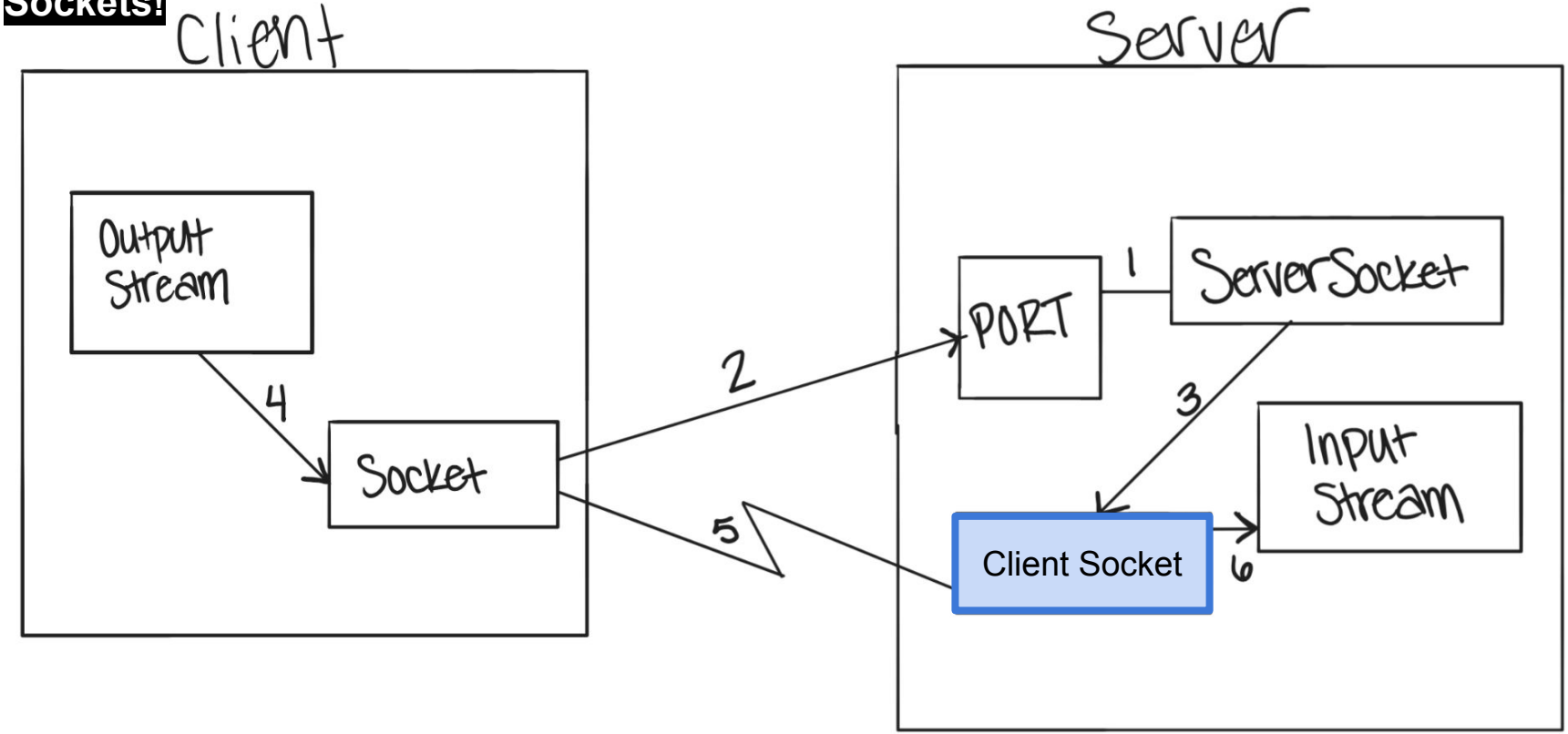
Sockets!



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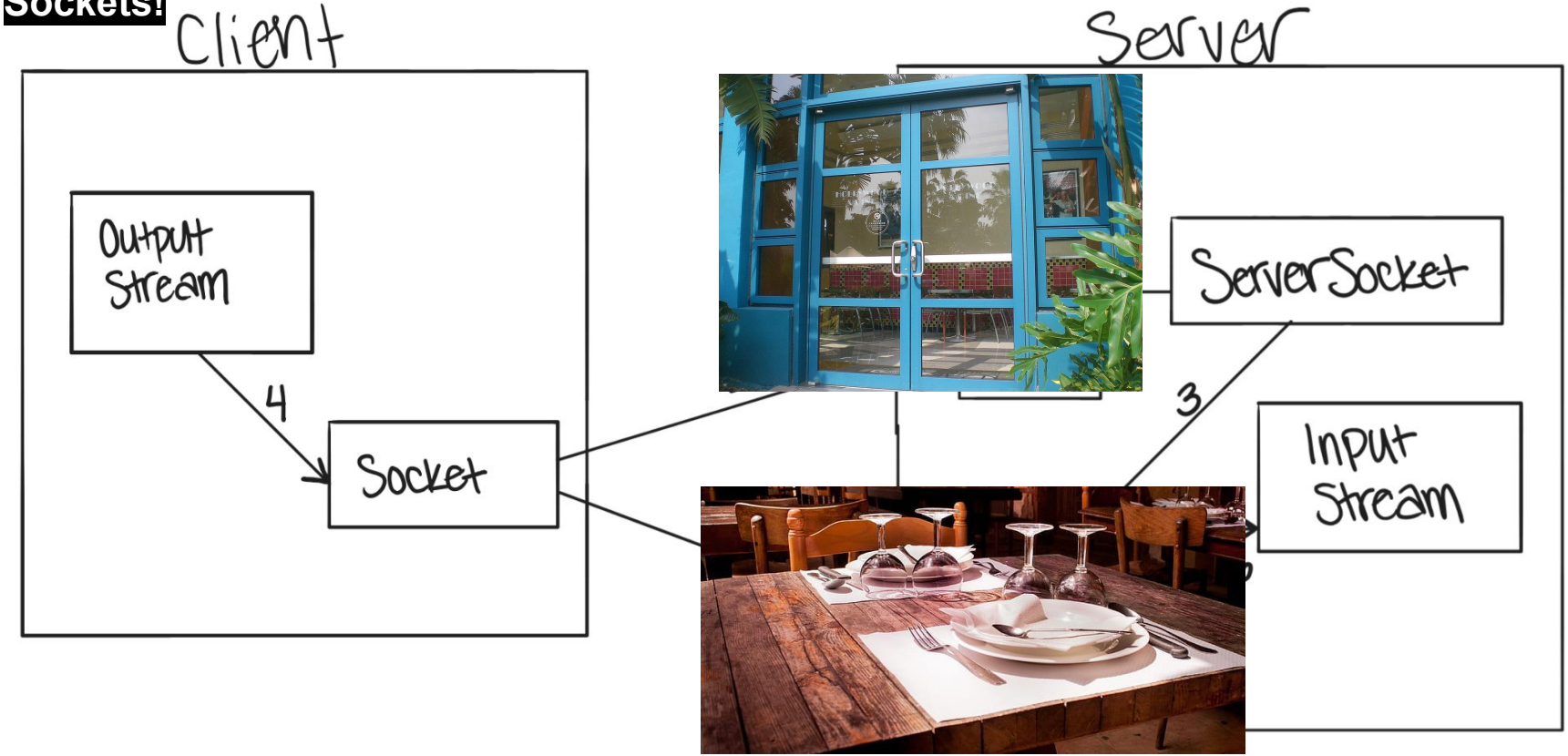
Sockets!



SER 321

Sockets!

Original

Sockets/Echo_Java

```java
try {
        if (args.length != 1) {
                System.out.println("Usage: gradle runServer -Pport=9099");
                System.exit( status: 0);
        }
        int port = -1;
        try {
                port = Integer.parseInt(args[0]);
        } catch (NumberFormatException nfe) {
                System.out.println("[Port] must be an integer");
                System.exit( status: 2);
        }
        Socket clientSock;
        ServerSocket sock = new ServerSocket(port);
        System.out.println("Server ready for connections");

        int bufLen = 1024;
        byte clientInput[] = new byte[bufLen]; // up to 1024 bytes in a message.
        while(true) {
                System.out.println("Server waiting for a connection");
                clientSock = sock.accept(); // blocking wait
                PrintWriter out = new PrintWriter(clientSock.getOutputStream(), autoFlush: true);
                InputStream input = clientSock.getInputStream();
                System.out.println("Server connected to client");
                int numr = input.read(clientInput, off: 0, bufLen);
                while (numr != -1) {
                  String received = new String(clientInput, offset: 0, numr);
                  System.out.println("read from client: " + received);
                  out.println(received);
                  numr = input.read(clientInput, off: 0, bufLen);
                }
```

Client

```java
String host = args[0];
Socket server = new Socket(host, port);
System.out.println("Connected to server at " + host + ":" + port);
InputStream input = server.getInputStream();
OutputStream output = server.getOutputStream();
BufferedReader stdin = new BufferedReader(new InputStreamReader(System.in));
```

SER 321
Sockets!

Modification

Sockets/Echo_Java

```java
try {
        if (args.length != 1) {...}
        int port = -1;
        try {
                port = Integer.parseInt(args[0]);
        } catch (NumberFormatException nfe) {
                System.out.println("[Port] must be an integer");
                System.exit( status: 2);
        }
        Socket clientSock;
        ServerSocket sock = new ServerSocket(port);
        System.out.println("Server ready for connections");
        System.out.println("Server is listening on port: " + port);
        System.out.println("-----");
        System.out.println("Values of the ServerSocket Object:");
        System.out.println("Inet Address: " + sock.getInetAddress());
        System.out.println("Local Port: " + sock.getLocalPort());

        int bufLen = 1024;
        byte clientInput[] = new byte[bufLen]; // up to 1024 bytes in a message.
        while(true) {
                System.out.println("Server waiting for a connection");
                clientSock = sock.accept();             // blocking wait

                PrintWriter out = new PrintWriter(clientSock.getOutputStream(), autoFlush: true);
                InputStream input = clientSock.getInputStream();
                System.out.println("Server connected to client");
                System.out.println("-----");
                System.out.println("Values of the Client Socket Object after Connection:");
                System.out.println("\tInet Address: " + clientSock.getInetAddress());
                System.out.println("\tLocal Address: " + clientSock.getLocalAddress());
                System.out.println("\tLocal Port: " + clientSock.getLocalPort());
                System.out.println("\tAllocated Client Socket (Port): " + clientSock.getPort());

                int numr = input.read(clientInput, off: 0, bufLen);
```

Client

```java
String host = args[0];
Socket server = new Socket(host, port);
System.out.println("Connected to server at " + host + ":" + port);
System.out.println("Values of the Socket Object for the Server:");
System.out.println("\tHost: " + server.getLocalAddress());
System.out.println("\tPort: " + server.getPort());
System.out.println("\tLocal Port: " + server.getLocalPort());
InputStream input = server.getInputStream();
OutputStream output = server.getOutputStream();
BufferedReader stdin = new BufferedReader(new InputStreamReader(System.in));
```

SER 321

Sockets!

```
> Task :runServer
Server ready for connections
Server is listening on port: 9099
-----
Values of the ServerSocket Object:
Inet Address: 0.0.0.0/0.0.0.0
Local Port: 9099
Server waiting for a connection
<==========----> 75% EXECUTING [10s]
> :runServer
```

Sockets/Echo_Java

```
try {
        if (args.length != 1) {...}
        int port = -1;
        try {
                port = Integer.parseInt(args[0]);
        } catch (NumberFormatException nfe) {
                System.out.println("[Port] must be an integer");
                System.exit( status: 2);
        }
        Socket clientSock;
        ServerSocket sock = new ServerSocket(port);
        System.out.println("Server ready for connections");
        System.out.println("Server is listening on port: " + port);
        System.out.println("-----");
        System.out.println("Values of the ServerSocket Object:");
        System.out.println("Inet Address: " + sock.getInetAddress());
        System.out.println("Local Port: " + sock.getLocalPort());

        int bufLen = 1024;
        byte clientInput[] = new byte[bufLen]; // up to 1024 bytes in a message.
        while(true) {
                System.out.println("Server waiting for a connection");
                clientSock = sock.accept();             // blocking wait

                PrintWriter out = new PrintWriter(clientSock.getOutputStream(), autoFlush: true);
                InputStream input = clientSock.getInputStream();
                System.out.println("Server connected to client");
                System.out.println("-----");
                System.out.println("Values of the Client Socket Object after Connection:");
                System.out.println("\tInet Address: " + clientSock.getInetAddress());
                System.out.println("\tLocal Address: " + clientSock.getLocalAddress());
                System.out.println("\tLocal Port: " + clientSock.getLocalPort());
                System.out.println("\tAllocated Client Socket (Port): " + clientSock.getPort());

                int numr = input.read(clientInput, off: 0, bufLen);
```

Client

```
Socket server = new Socket(host, port);
System.out.println("Connected to server at " + host + ":" + port);
System.out.println("Values of the Socket Object for the Server:");
System.out.println("\tHost: " + server.getLocalAddress());
System.out.println("\tPort: " + server.getPort());
System.out.println("\tLocal Port: " + server.getLocalPort());
InputStream input = server.getInputStream();
OutputStream output = server.getOutputStream();
BufferedReader stdin = new BufferedReader(new InputStreamReader(System.in));
```

SER 321

Sockets!

```
> Task :runServer
Server ready for connections
Server is listening on port: 9099
-----
Values of the ServerSocket Object:
Inet Address: 0.0.0.0/0.0.0.0
Local Port: 9099
Server waiting for a connection
Server connected to client
-----
Values of the Client Socket Object after Connection:
        Inet Address: /127.0.0.1
        Local Address: /127.0.0.1
        Local Port: 9099
        Allocated Client Socket (Port): 60296
<==========----> 75% EXECUTING [1m 13s]
> :runServer
```

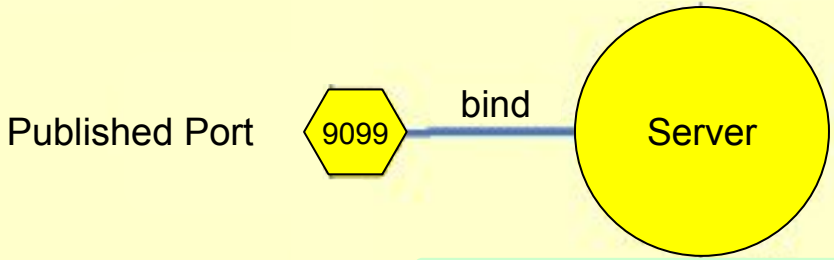
Sockets/Echo_Java

```
> Task :runClient
Connected to server at localhost:9099
Values of the Socket Object for the Server:
        Host: /127.0.0.1
        Port: 9099
        Local Port: 60296
String to send>
<==========----> 75% EXECUTING [31s]
> :runClient
```

```
try {
        if (args.length != 1) {...}
        int port = -1;
        try {

        } catch

        }
        Socket
        ServerS
        System.
        System.
        System.
        System.
        System.
        System.

        int buf
        byte cl
         hile(t
                                                    System.out.println("Server waiting for a connection");
                                                    clientSock = sock.accept();                // blocking wait

                                                    PrintWriter out = new PrintWriter(clientSock.getOutputStream(), autoFlush: true);
                                                    InputStream input = clientSock.getInputStream();
                                                    System.out.println("Server connected to client");
                                                    System.out.println("-----");
                                                    System.out.println("Values of the Client Socket Object after Connection:");
                                                    System.out.println("\tInet Address: " + clientSock.getInetAddress());
                                                    System.out.println("\tLocal Address: " + clientSock.getLocalAddress());
                                                    System.out.println("\tLocal Port: " + clientSock.getLocalPort());
                                                    System.out.println("\tAllocated Client Socket (Port): " + clientSock.getPort());

                                                    int numr = input.read(clientInput, off: 0, bufLen);
```

SER 321
Sockets!

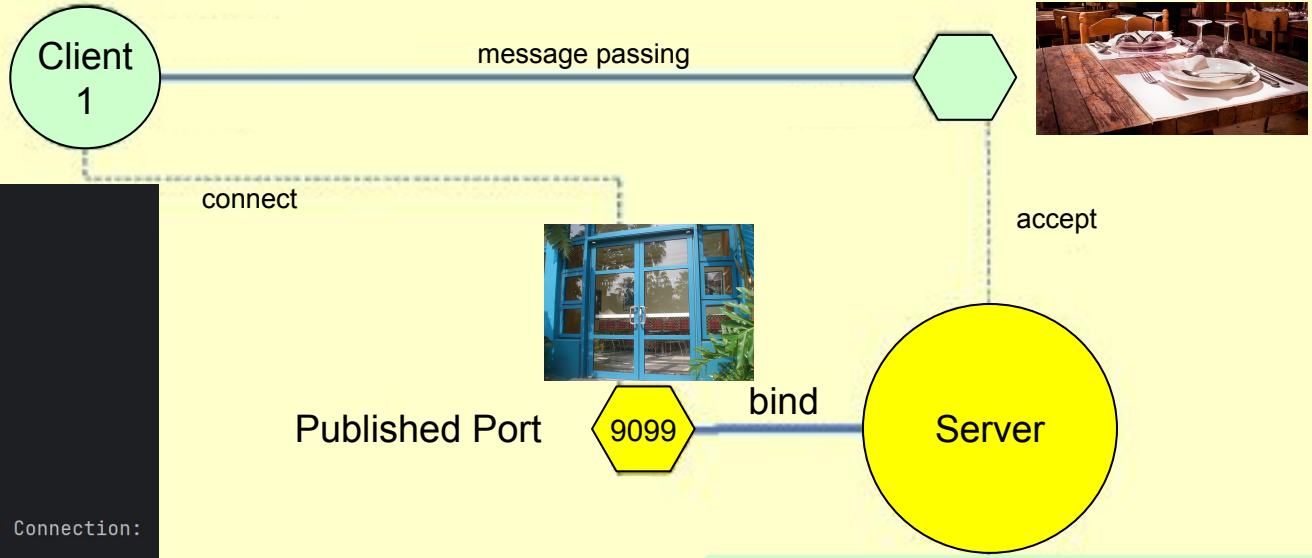
```
> Task :runServer
Server ready for connections
Server is listening on port: 9099
-----
Values of the ServerSocket Object:
Inet Address: 0.0.0.0/0.0.0.0
Local Port: 9099
Server waiting for a connection
Server connected to client
-----
Values of the Client Socket Object after Connection:
        Inet Address: /127.0.0.1
        Local Address: /127.0.0.1
        Local Port: 9099
        Allocated Client Socket (Port): 60296
<==========----> 75% EXECUTING [2m 36s]
> :runServer
```




```
> Task :runClient
Connected to server at localhost:9099
Values of the Socket Object for the Server:
        Host: /127.0.0.1
        Port: 9099
        Local Port: 60296
String to send>
<==========----> 75% EXECUTING [2m 18s]s]
> :runClient
```

Design of an RFID Vehicle Authentication System: A Case Study for Al-Nahrain University Campus - Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/figure/Client-and-Server-Socket-Ports_fig4_282671198

SER 321
Sockets!




```
> Task :runServer
Server ready for connections
Server is listening on port: 9099
-----
Values of the ServerSocket Object:
Inet Address: 0.0.0.0/0.0.0.0
Local Port: 9099
Server waiting for a connection
Server connected to client
-----
Values of the Client Socket Object after Connection:
        Inet Address: /127.0.0.1
        Local Address: /127.0.0.1
        Local Port: 9099
        Allocated Client Socket (Port): 60296
<==========----> 75% EXECUTING [2m 36s]
> :runServer
```

```
> Task :runClient
Connected to server at localhost:9099
Values of the Socket Object for the Server:
        Host: /127.0.0.1
        Port: 9099
        Local Port: 60296
String to send>
<==========----> 75% EXECUTING [2m 18s]s]
> :runClient
```

Design of an RFID Vehicle Authentication System: A Case Study for Al-Nahrain University Campus - Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/figure/Client-and-Server-Socket-Ports_fig4_282671198

Assign 3-1 Starter Code

SER 321

JSON

Which of the following would be a valid response?

```
{
    "type" : "echo", -- echoes the initial response
    "ok" : <bool>, -- true or false depending on request
    "echo" : <String>,  -- echoed String if ok true
    "message" : <String>,  -- error message if ok false
}
```

Echo General Response

A.
```
{
    “type” : “echo”,
    “echo” : <String>
}
```

B.
```
{
    “type” : “echo”,
    “ok” : false,
    “echo” : <String>
}
```

C.
```
{
    “type” : “echo”,
    “message” : <String>
}
```

D.
```
{
    “type” : “echo”,
    “ok” : true,
    “echo” : <String>
}
```

Assign 3-1 Starter Code

SER 321

JSON

Which of the following would be a valid response?

```
{
    "type" : "echo", -- echoes the initial response
    "ok" : <bool>, -- true or false depending on request
    "echo" : <String>,  -- echoed String if ok true
    "message" : <String>,  -- error message if ok false
}
```

Echo General Response

Why are the others invalid?

A.
```
{
    “type” : “echo”,
    “echo” : <String>
}
```

B.
```
{
    “type” : “echo”,
    “ok” : false,
    “echo” : <String>
}
```

C.
```
{
    “type” : “echo”,
    “message” : <String>
}
```

D.
```
{
    “type” : “echo”,
    “ok” : true,
    “echo” : <String>
}
```

Assign 3-1 Starter Code

SER 321

JSON

Which of the following would be a valid response?

```
{
    "type" : "echo", -- echoes the initial response
    "ok" : <bool>, -- true or false depending on request
    "echo" : <String>,  -- echoed String if ok true
    "message" : <String>,  -- error message if ok false
}
```

Echo General Response

A.
```
{
    “type” : “echo”,
    “ok” : false,
    “echo” : <String>
}
```

B.
```
{
    “type” : “echo”,
    “ok” : false,
    “message” : <String>
}
```

C.
```
{
    “type” : “echo”,
    “ok” : false
}
```

D.
```
{
    “type” : “echo”,
    “ok” : true,
    “message” : <String>
}
```

Assign 3-1 Starter Code

Which of the following would be a valid response?

SER 321

JSON

```
{
    "type" : "echo", -- echoes the initial response
    "ok" : <bool>, -- true or false depending on request
    "echo" : <String>,  -- echoed String if ok true
    "message" : <String>,  -- error message if ok false
}
```

Echo General Response

Why are the others invalid?

A.
```
{
    “type” : “echo”,
    “ok” : false,
    “echo” : <String>
}
```

B.
```
{
    “type” : “echo”,
    “ok” : false,
    “message” : <String>
}
```

C.
```
{
    “type” : “echo”,
    “ok” : false
}
```

D.
```
{
    “type” : “echo”,
    “ok” : true,
    “message” : <String>
}
```

SER 321

Scratch Space

Upcoming Events

SI Sessions:

- Thursday, November 7th at 7:00 pm MST
- ~~Sunday, November 10th at 7:00 pm MST~~ **CANCELLED - Happy Veteran's Day!**
- Tuesday, November 12th at 10:00 am MST

Review Sessions:

- Sunday, December 1st at 7:00 pm MST - **2 hour Review Session**
- Tuesday, December 3rd at 10:00 am MST - **Q&A Session**

Questions?

Survey:

https://asuasn.info/ASNSurvey

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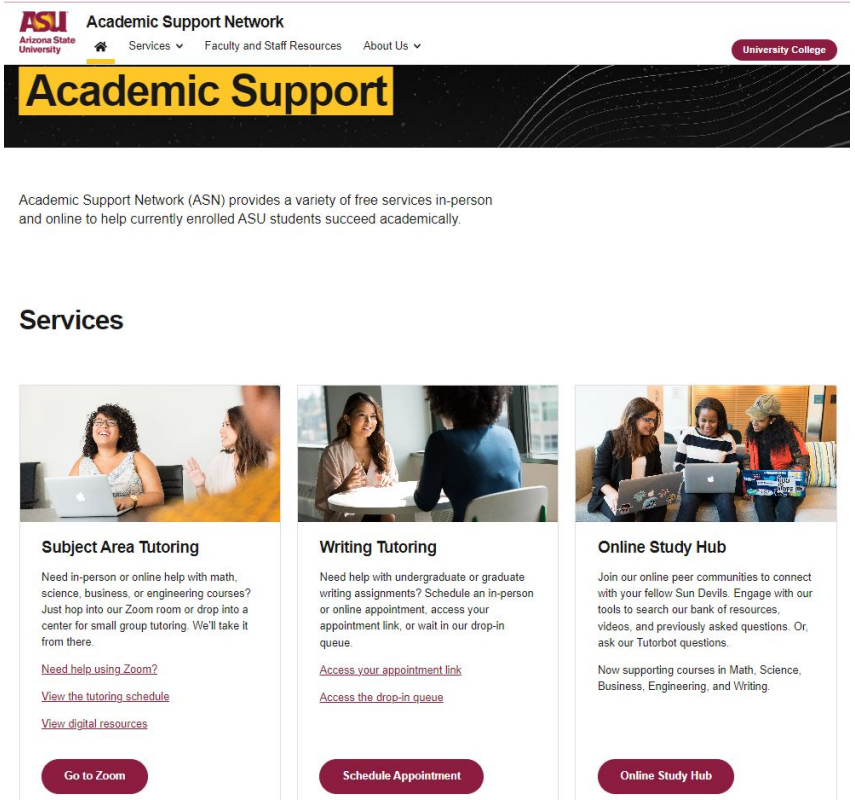
More Questions?

Check out our other resources!

tutoring.asu.edu

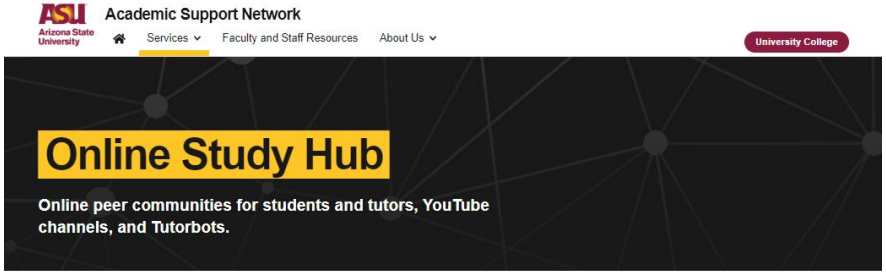


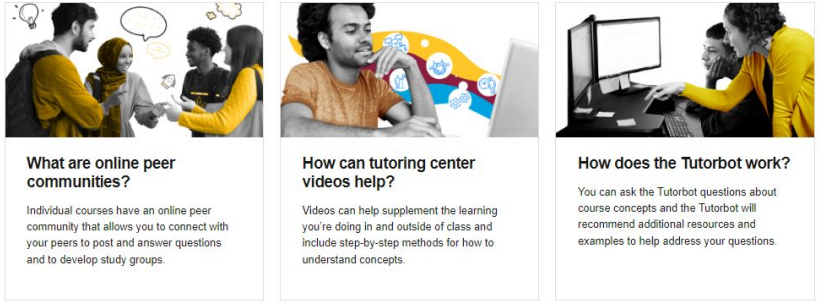
1. **Click on ‘Go to Zoom’ to log onto our Online Tutoring Center.**
2. **Click on ‘View the tutoring schedule’ to see when tutors are available for specific courses.**

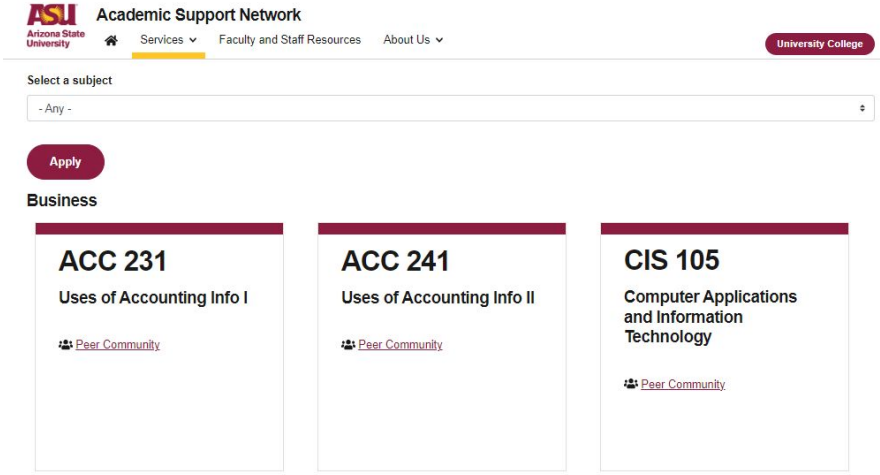
More Questions?

Check out our other resources!

tutoring.asu.edu/online-study-hub



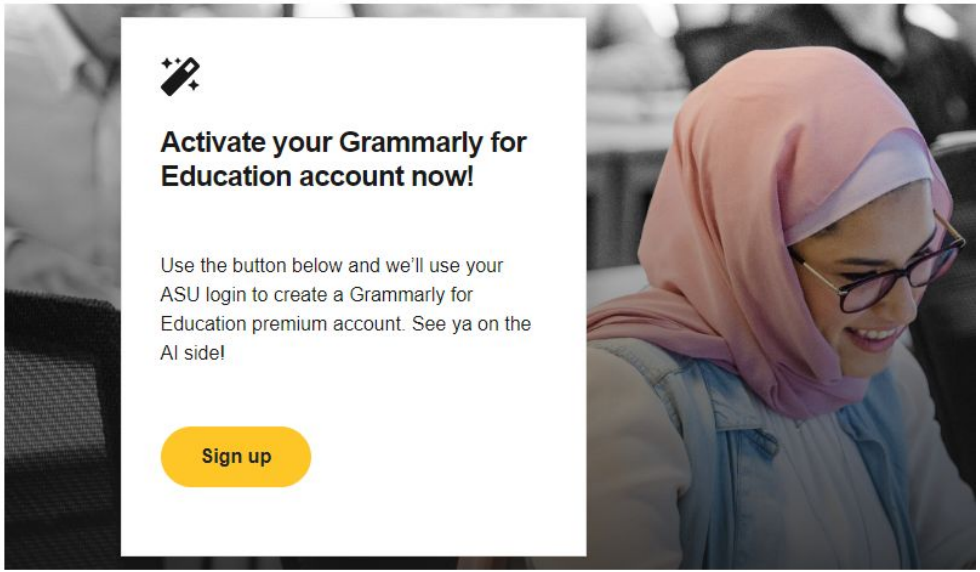




Don't forget to check out the Online Study Hub for additional resources!

Expanded Writing Support Available

Including Grammarly for Education, at no cost!



tutoring.asu.edu/expanded-writing-support

*Available slots for this pilot are limited

Additional Resources

- Course Repo
- Gradle Documentation
- GitHub SSH Help
- Linux Man Pages
- OSI Interactive
- MDN HTTP Docs
  - Requests
  - Responses
- JSON Guide
- org.json Docs
- javax.swing package API
- Swing Tutorials