

CMPU4021 Distributed Systems

Assignment

Publishing date: 24th October 2019

Due Date: 21st of November 2019, 11:30am

This assignment represents the practical assessment for this subject, 30% of the overall mark.

For this assignment you are required to design and implement a distributed application that is a simulator of an electronic **auction system**.

There will be **multiple clients and a server**. The server will offer items for sale. The client module will allow the user to bid for items. An item is sold to the highest bidder. Your code will enable users only to bid for items – it will not conduct actual purchase transactions.

The server should also allow a client to create items for sale, i.e. create new auction.

Deliverables: Source code, Design Document, Demo

Client Requirements

- The clients should be able to use the ALL services offered by the auction server.

Clients should:

- Connects to the server. The item currently being offered for sale and the current bid or a (or reserve price) are displayed.
- Enter the bid. The amount entered should be greater than the current highest bid.
- After a new bid is placed, the amount of the new bid must be displayed on the client's window/console.
- Be able to create items for sale, i.e. create new auction.

Server Requirements

The server should offer the following services:

- Join auction
- Leave auction
- Bid on an item.
- List auction items
- Create new auctions

The server should:

- Receive connections from multiple clients.
- Register new clients, while enforcing the unique username policy for each client.
- After a client connects, notify the client which item is currently on sale and the highest bid (or reserve price).
- Specify the bid period. Max allowed 1 minute. When a new bid is raised, the bid period is reset back.
- When a new bid is placed, all clients are notified immediately. Clients should be notified about the time left for bidding (when appropriate).
- If the bid period elapses without a new bid, then the auction for this item closes. The successful bidder (if any) is chosen and all clients are notified.
- When an auction for one item finishes, another item auctioning should start. Minimum of 5 items should be auctioned, one after another.
- Any item not sold should be auctioned again (automatically).

The server should be able to:

- Allow client to include new items on sale (i.e. create new auctions) in the auction server *while the auction is running*
- Run and manage newly created auctions
- Support concurrent multiple clients connections

Implementation

The assignment **must** be implemented using **Java sockets**. Java multithreading, locks and monitors should be used where necessary. Basic Java JDK should be used. It should work with Java version 8. No additional libraries/packages should be used. If data storage is necessary, **files** should be used.

Submission

You must provide a design document which describes your architecture setup. The document should **not exceed 3 pages**, and must include the following:

- Your **name** and **student number**.
- The subject title, i.e. **Distributed Systems**
- The assignment title i.e. **Assignment**
- The date, i.e. **21st of November 2019**
- The following declaration: **"I declare that this work, which is submitted as part of my coursework, is entirely my own, except where clearly and explicitly stated."**
- A clear statement (provide the command line example) of how to start the server and clients (i.e. setup).

If your documentation does not include all these details, it will not be marked, and you will be considered as having failed to submit the assessment.

What should you submit?

1. The design document. It **MUST** be submitted as **ONE** word/pdf document.
2. **Code** (.java, .class and .bat files)
3. Put all the web pages (code) and the assignment document in a directory named **YOURNAME (i.e. John Smith)**, **ZIP it** and upload it in WebCourses by **11:30am, 21st of November 2019**.

Your code **must** include the **server.bat** and **client.bat** batch files. They will specify (contain) the command line for starting the server and clients respectively. All code must be compiled and ready to run, when `server.bat` and `client.bat` are executed.

Example of the `server.bat` file:

```
rem Usage: java AuctionServer port
java -classpath . AuctionServer 1234
```

Example of the `client.bat` file:

```
rem Usage: java AuctionClient host port name
java -classpath . AuctionClient localhost 1234 john
```

Note1: 'rem' – comments;

Assessment Criteria

Failure to provide code, documentation or demo will result in a mark of 0%.

You will be penalised an absolute value of 10% for every day that your assignment is late.

The program **must** be demo-ed in the labs. The demos will be scheduled.

Marking Scheme

- Requirements implementation (60%)
- General coding (error handling, comments) (13%)
- Design document (7%)
- Quality of the outcome (10%)
- Setup/Demo (10%)