**Northeastern University**

CS 6650 Scalable Dist Systems

**Homework Set #1** [100 points]

**GOAL:** An introductory understanding of Dist Sys and Java client server programming.

***INSTRUCTIONS: Please provide clear explanations I your own sentences, directly answering the question, demonstrating your understanding of the question and its solution, in depth, with sufficient detail. Submit your solutions [PDF preferred]. Include your full name. Do not email the solutions.***

1. Study **Chapter 2 Systems Models** Coulouris Book [10 points]

Answer the folowing questions using explanation and diagrams as needed:

2.11

2.14

1. Please refer to the 2 articles (PDF) on Middleware for Distributed Systems. [10 points]

See Fig 1. layers of Middleware

What is middleware for Dist Systmes/ What are its uses (list and explain).

Consider a multiplayer game as a Dist Sys. It is played on 4 players PCs and a Game Server.

What are the heterogeneous elements among these 5 systems at each layer? Give examples to ilustarte this (e. g. MacOs on PC1; Linux on PC 2 etc.) and then explain how middleware helps here.

1. **From Chapter 3** Coulouris Book **Networking** [20 points]

Answer the folowing questions using explanation and diagrams as needed:

3.1

3.7 part (ii) ONLY (*i.e.,* FTP)

1. Study **Chapter 13 Java Socket Programming** from this book

**Object-Oriented Programming with Java: Essentials and Applications** Authors Buyya, Selvi and Chu

[2009] Tata McGraw Hill [PDF posted in Lecture 1 Folder]

13.22 In your own words, explain what the Tannenbaum text book’s Layer cake cut diagram is about (pg 78 Figure 2.16: Client-server organizations in a two-tiered architecture), providing 2 examples each for the 5 architectural models shown (e. g. a Web app, A client-server app, Youtube etc.) [10 points]

13.23 What is a port? List some well-known ports and explain the applications associated with them. [5 points]

1. Study Dist Sys Design Goals.pdf. Consider the architecture of Twitter. What do the Goals and Transparencies desicribed in this paper mean in the context of Twitter? Why are they important? Explain with a diagram. [10 points]

**From Chapter 4 Coulouris Book**

1. Answer the following questions using explanation and diagrams as needed. No implementation needed.
2. 4.2 [5 points]
3. 4.15 [10 points]
4. **Java Socket Programming implementation** [25 points]

The goal of this assignment is to implement a TCP client and server. You can use Java. Your TCP or UDP client/server will communicate over the network and exchange data.

The server will start in passive mode listening for a transmission from the client. The client will then start and contact the server (on a given IP address and port number). The client will pass the server a string (eg: “network”) up to 80 characters in length.

On receiving a string from a client, the server should: 1) reverse all the characters, and 2) reverse the capitalization of the strings (“network” would now become “KROWTEN”).

The server should then send the string back to the client. The client will display the received string and exit.

Example

Starting the server:

Assume that you started a server on machine 128.111.49.44, listening to port number 32000. The syntax should look like the following:

csil-machine1> server 32000 <enter>

(in this line, “server” will be replaced by one of the names given below in the Submission Section)

Starting the client:

csil-machine2> client 128.111.49.44 32000 <enter>

(in this line, “client” will be replaced by one of the names given below)

Enter text: This is my text to be changed by the SERVER <enter>

Response from server: revres EHT YB DEGNAHC EB OT TXET YM SI SIHt

csil-machine2>

At this point (after receiving one line to be reversed), the server and client should both exit.

[Credits: Prof. K. C. Almeroth UCSB]