**Distributed Systems Job Scheduler Using Largest Available Server**

Luke Glover - #45965587

Jarrod Adair - #45432260

Frederick Jack – #45511020

**Introduction**

Introduction (½ page): What this project (focusing on Stage 1) is about, including the goal of the project and Stage 1.

Distributed systems are comprised of components that can be present in different locations but still function as one; coming in many different types and sizes, ranging from single machines with multiple cores to data center with millions of servers spread globally, making distributed systems one of the indispensable concepts of the modern computing age. When dealing with these multiple distributed components acting towards a similar goal under one or more constraints, Scheduling is considered the key technique for ensuring the efficient use of computer resources.

This distributed systems project, focusing on task 1, is about building a “Vanilla” client in the Java language that is compatible with the ds-sim server simulator provided. This required us to build a job scheduler client that could schedule jobs via discrete sequences of commands sent over a communication layer, with the goal to dispatch every job to the largest server available in each simulation.

In a distributed system job allocation is very important for the efficient use of resources. Scheduling is a decision-making process that typically uses an optimizing algorithm for dispatching of jobs. This project is implementing a client-side job scheduler working with a distributed systems server simulator. The task of Stage 1 of the project is to schedule and dispatch every job to the largest server available in each simulation. The client is connected through a socket, so it is language independent, but this implementation is written in Java. The goal of this stage of the project is to successfully run and scheduled all available jobs without failures.

**System Overview**

System overview (½ page): high-level description of the system (both client-side simulator and server-side simulator with the focus being your client-side simulator), preferably, with a figure (your own, not one in ds-sim User Guide) showing the workflow/working of the system.

At a high level, the system is started by having the pre-compiled server listen for a connection and the client initialising that connection with the server thought java sockets provided by a library. This socket acts as the medium that allows the Client and Server to connect via TCP protocol (Transfer Control Protocol) and send messages about job information back and forth. The Client’s core functionality is essentially a large loop that functions as a state machine. Firstly, the Client initiates a connection the Server via the handshaking state code and directly proceeds into authentication. The Server then reads the specified configuration file and writes a ds-system.xml file which contains the servers that are available for the Client to use. The Client will read the ds-system.xml file to find out that information. After initialisation, the event loop sends a ready message which the server replies with a single jobs details for the client to submit for scheduling. For state 1, the Client then sends a command to the Server for it to process the job with the largest server it has available and once the Server has processed a job, it sends a completion message and repeats this process until there are no new jobs and the Server tells the client it has no more jobs. Finally, the Client then sends a quit command to the Server and closes the connection. The output the scheduling is stored in a ds-jobs.xml file and it contains information about each job’s scheduling as well as other information.

The process is started by the Client initiating a connection with the Server through a socket. The socket is the middleware that connects the Client and Server and allows them to send messages to each other. A Java socket uses TCP (Transfer Control Protocol) to create a connection. The steps are that the Server sends a single job with details to the client for scheduling. The Client then sends a command to the Server for it to process the job with the largest server it has available. Once the Server has processed a job it sends a completion message, and this process repeats until there are no new jobs and the Server tells the client it has no more jobs. The Client then sends a quit command to the Server and closes the connection. The output the scheduling is stored in a ds-jobs.xml file and it contains information about each job process.

![Diagram

Description automatically generated]()

As showed in the figure above the distributed system has six components.

socket – is the process that connects the client and server through a local host on port 50000.

server – also known as ds-server, simulates a cloud server and is written in C. The socket allows the client-server connection to exist without having the same language.

configuration file - contain the information about jobs such as the submit time, job ID, estimated run time and the resource requirements needed to process.

ds-system.xml file - contains the information about the servers available: how many of a particular server the bootup time the cost and the server resource specs.

client – program written to receive messages from server and to act as a job scheduler.

ds-jobs.xml file – contains the output of processed job after the connection is closed.

**Design**

Design (1 page): design philosophy, considerations and constraints, functionalities

of each simulator component focusing on the client-side simulator.

**Implementation**

Implementation (2 pages): brief description of any implementation specific information including technologies, techniques, software libraries and data.

structures used. How each of components/functions of your simulator is implemented including who oversees which function(s) and how they have led the design and development.

**References**

GitHub Repo: <https://github.com/Luke-Glover/DS-Sim-Client.git>

References including project git repository/wiki, e.g., GitHub and Bitbucket.

\* The numbers of pages for each section are also a suggestion.