MASTER IN COMPUTER SCIENCE

Distributed Systems
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Assignment 1

Due: October 20, 2020, 13:00

Exercise 1

A server program written in one language (for example, C++) provides the implementation of a remote file system service that is intended to be accessed by a client program that may be written in a different language (for example, Java). The client and server computers may have different hardware, but all of them are attached to the Internet. Describe the problems in detail due to each of the five aspects of *heterogeneity*, namely *Networks, Computer Hardware, Operating System, Programming Languages,* and *Multiple Developers.* These issues need to be solved to make it possible for a client object to invoke a method on the server object.

Exercise 2

An open distributed system allows new resource-sharing services such as the remote file system in Exercise 1 to be added and accessed by a variety of client programs. Discuss in the context of this example, to what extent the needs of *openness* differ from those of *heterogeneity*.

Exercise 3

Suppose that the operations of the remote file system are separated into two categories – public operations that are available to all users and protected operations that are available only to certain named users. State all of the problems (six or more) involved in ensuring that only the named users can use a protected operation. Supposing that access to a protected operation provides information that should not be revealed to all users, what further problems arise?

Exercise 4

a) Identify and describe *advantages* and *disadvantages* of distributed systems when compared to centralized systems.
b) In an effort to describe the degree of distribution of resources, distributed systems are also divided into two subgroups: loosely coupled systems and tightly coupled systems. Explain the differences between these two groups.