CSI3344 Distributed Systems

Workshop Solution 01

Q1. An alternative definition for a distributed system is that of a collection of independent computers providing the view of being a *single system*, that is, it is completely hidden from users that there are even multiple computers. Give an example where this view would come in very handy.

A: What immediately comes to mind is parallel computing. If one could design programs that run without any serious modifications on distributed systems that appear to be the same as non-distributed systems, life would be so much easier. Achieving a single-system view is by now considered virtually impossible when performance is in play.

Q2. What is the role of middleware in a distributed system?

A: It is to enhance the distribution transparency that is missing in network operating systems. In other words, middleware aims at improving the single-system view that a distributed system should have.

Q3. Explain what is meant by (distribution) transparency, and give examples of different types of transparency.

A: Distribution transparency is the phenomenon by which distribution aspects in a system are hidden from users and applications. Examples include access transparency (e.g., a GUI with folders, in such a situation the user does not know if the files in the folder are local or remote), location transparency (e.g., URLs which gives no clue about the location of the server), migration transparency (e.g., URL http://www.prenhall.com/index.html gives no clue as to whether index.html has always been at its current location or was recently moved there), relocation transparency (e.g., when mobile users continue to use their wireless laptops while moving from place to place without disconnecting), replication transparency (e.g.,resources may be replicated to increase availability or to improve performance by placing a copy close to the place where it is accessed), failure transparency (e.g., when an email is sent it does not tell the sender even if it did not go through), concurrency (e.g., the fact that users are not aware that computer resources are being used by many users at the same time).

Q4. What is an open distributed system and what benefits does openness provide?

A: An open distributed system offers services according to clearly defined rules. An open system is capable of easily interoperating with other open systems but also allows applications to be easily ported between different implementations of the same system. In other words, an open distributed system has the benefit of independence from individual vendors. It also has the ability to extend the software and hardware level.

Q5. Describe precisely what is meant by a scalable system. What techniques can be used to achieve scalability?

A: A system is scalable with respect to either its number of components, geographical size, or number and size of administrative domains, if it can grow in one or more of these dimensions without an unacceptable loss of performance.

Scaling can be achieved through distribution, replication, and caching.

(Scalable system is a system with the ability to remain effective when there is a significant increase in the number of resources and the number of users.

The techniques to achieve scalability are:

1. The use of replicated data
2. The associated technique of caching
3. The deployment of multiple servers to handle commonly performed task, enabling several similar task to be performed concurrently.)

End of Workshop Solution 01