Innopolis University

SYSTEM AND NETWORKING ENGINEERING

Distributed Systems

READING QUESTIONS 1

Introduction

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Readings:

Chapter 1. Distributed systems: principles and paradigms, Andrew S. Tanenbaum, Maarten Van Steen

Questions:

1. 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 even exist multiple computers. Give an example where this view would come in very handy.
   Answer:
   Suppose that some guy wants to decipher the message, encrypted not by a complicated algorithm, but very resource consuming. He could use a distributed system, like a supercomputer that would produce huge calculations and appear as one system.

2. What is the role of middleware in a distributed system?
   Answer:
   The middleware in a distributed system acts as an intermediary between applications of the distributed system and the local operating system on the computer. We can say that middleware is the same to a distributed system as what an operating system is to a computer: a manager of resources offering its applications to efficiently share and deploy those resources across a network.

3. Explain what is meant by (distribution) transparency, and give examples of different types of transparency.
   Answer:
   Distribution transparency means an ability to hide the fact that processes and resources of a distributed system are physically distributed across multiple computers possibly separated by large distances. Examples include access transparency, location transparency, migration transparency, relocation transparency, replication transparency, concurrency transparency, and failure transparency.

4. Why is it sometimes so hard to hide the occurrence of and recovery from failures in a distributed system?
   Answer:
   The main difficulty lies in the impossibility to distinguish between a dead process and a slowly responding one.

5. Why is it not always a good idea to aim at implementing the highest degree of transparency possible?
   Answer:
   Because there is a relationship between a high degree of transparency and the performance of a system. Striving for the high degree of transparency can lead to a significant loss of performance, which users do not want to accept.

6. What is an open distributed system and what benefits does openness provide?
   Answer:
   Open distributed system is a system that contains components that can be freely used or embedded in other systems using clearly defined rules which describe syntax and semantics of those services. Opennes adhere a mechanism by which two implementations of systems or components from different manufacturers can co-exist and work together but also allows applications to be easily ported between different implementations of the same system.

7. Describe precisely what is meant by a scalable system.
   Answer:
   A scalable system is a system that is able to grow in size, geographical and administrative dimensions without any noticeable loss of performance, communication delays and can still be easily managed.

8. Scalability can be achieved by applying different techniques. What are suitable techniques for size and geographical scaling? And for administrative scaling?
   Answer:
   Suitable techniques for size and geographical scaling are distribution, replication, caching and hiding of

communication latencies. For administrative scaling, this is partitioning and distribution.

9. We argued that distribution transparency may not be adequate for pervasive systems. This statement is not true for all types of transparencies. Give an example.
   Answer:
   There are several distribution transparencies that should be implemented for pervasive systems. Such as the relocation transparency and migration transparency. Because a pervasive system typically uses mobile systems that can be moved constantly from one access point to another, it is preferable for users to feel completely transparent.