DISTRIBUTED SYSTEMS – TRAN HAI ANH

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Class: ICT02

**Class Exercises Module: Distributed Systems Chapter 1: Overview of Distributed Systems**

Question 1: What is the role of middleware in a distributed system?

It is the software layer that lies between the operating system and the applications on each side of a distributed computer network.

Question 2: Explain what is meant by (distribution) transparency, and give examples of different types of transparency.

Transparency “is the concealment from the user of the separation of components of a distributed system so that the system is perceived as a whole”.

**Access Transparency** – Local and Remote access to the resources should be done with same efforts and operations. It enables local and remote objects to be accessed using identical operations.

**Location transparency** – User should not be aware of the location of resources. Wherever is the location of resource it should be made available to him as and when required.

**Migration transparency** – It is the ability to move resources without changing their names.

**Replication Transparency** – In distributed systems to achieve fault tolerance, replicas of resources are maintained. The Replication transparency ensures that users cannot tell how many copies exist.

**Concurrency Transparency** – As in distributed system multiple users work concurrently, the resource sharing should happen automatically without the awareness of concurrent execution by multiple users.

**Failure Transparency** – Users should be concealed from partial failures. The system should cope up with partial failures without the users awareness.

**Parallelism transparency** - Activities can happen in parallel without users knowing

Question 3: Why is it sometimes so hard to hide the occurrence and recovery from failures in a distributed system?

It is generally impossible to detect whether a server is actually down, or that it is simply slow in responding.

Question 4: Why is it not always a good idea to aim at implementing the highest degree of transparency possible?

Aiming at the highest degree of transparency may lead to a considerable loss of performance

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Question 5: What is an open distributed system and what benefits does openness provide?

An Open Distributed System is made up of components that may be obtained from a number of different sources, which together work as a single distributed system.

Benefits:

Expandability, which is the ability to expand vertically and horizontally in terms of both hardware and software. In open distributed systems it allows at add new devices or clients to the current system. This means that both old and new user would be able to share more resources amongst each other.

Improve Performance would be another benefit which openness would provide. In open distributed systems would have specific processing devices to manage requests from client devices which mean there would be more efficiency thus improving performance.

Reliability is another benefit which openness provide. So when the system is more open which means we can expand more and also it is more scalable because of that when we expand it becomes more reliable. For example if a section of the system fails the other section would most likely take over and so it makes it more reliable.

Availability of resources would also be improved as a distributed system would have used techniques such as replication to store resources. If a event such as loss of a resource there would be immediate recovery as there are replicas available to fill in.

Question 6: Describe precisely what is meant by a scalable system.

A scalable system is a system that is flexible with its number of components.

Question 7: Scalability can be achieved by applying different techniques. What are these techniques?

- Good program structure (how easy is the program to understand and expand to support new roles)

- Provision for multiple users and concurrent database access and editing (to avoid database lockup, access denial, corruption or data loss)

- Security provisions for both user access and database integrity

- Ability to run as a distributed application on multiple servers and databases across multiple time zones

- Database backup, correction and restore

- Language and cultural provisions

- Provision for inter-communication with 3rd party applications either by exposing a well managed program interface or subscribing to industry standards

- Resource usage and hardware/operating system dependencies

- Real-time performance