A Study on Fault Tolerance Solution

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❖ Reliability and availability of nodes during execution of critical service applications is a major concern which may otherwise affect the quality of service provided by the cloud service providers.

❖ In order to reduce the impact of failure when an application runs on the cloud, there should be mechanism to anticipate the failures so that failures can be proactively addressed.

❖ One way of providing fault tolerance is to schedule multiple copies of a task on different virtual machines

❖ In cloud computing there are two types of fault tolerance reactive and proactive.

➢ Reactive fault tolerance means to remove the fault after it occurs. Basically reactive fault tolerance reduces the effects of error on application execution.

➢ Proactive fault tolerance refers to avoiding faults, errors and failures by predicting them in advance.

❖ We identify three types of failure in a cloud platform: hardware failure, VM failure and application failure.

❖ A failure represents the condition in which the system deviates from fulfilling its intended functionality or the expected behavior. A failure happens due to an error; that is, due to reaching an invalid system state.

❖ Fault tolerance is a setup or configuration that prevents a computer or network device from failing in the event of an unexpected problem or error.

❖ The existing fault tolerance technique in cloud computing considers various parameters: throughput, response-time, scalability, performance, availability, usability, reliability, security.

❖ Some of the fault tolerance techniques are, Fault masking, Reconfigruration, Check Pointing, Job Maigration, Replication, Self-Healing, Safety-bag checks, S-Guard, Retry, Task Resubmission.

❖ One of the most widely adopted methods in to achieve fault tolerance against crash faults is replication. Replication: Critical system components are duplicated using additional hardware, software and network resources in such a way that a copy of the critical components is available even after a failure happens.

❖ In data replication mechanism in distributed computing can be classified into two groups: static mechanisms where the replication strategy is predetermined and well defined while dynamic replication mechanisms automatically creates and deletes replicas according to changing access patterns.

❖ There are two strategies for replication: active and passive.

➢ In active replication, all the replicas are simultaneously invoked and each replica processes the same request at the same time. This implies that all the replicas have the same system state at any given point of time and it can continue to deliver its service even in case of a single replica failure.

➢ In passive replication, only one processing unit (the primary replica) processes the requests while the backup replicas only save the system state during normal execution periods. Backup replicas take over the execution process only when the primary replica fails.

❖ Due to replication, cost for renting in cloud resources increase. But it is really required to avoid catastrophic loss. With the number of new replicas increasing, the system maintenance cost will significantly increase, and too many replicas may not increase the availability, but cause unnecessary spending instead.