Task Migration Based Fault Tolerant Scheme for Cloud Computing

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Abstract- Cloud computing may be a approach of computing wherever service is provided across the web mistreatment the models and levels of abstraction. Several analysis problems area unit needed to be absolutely addressed in cloud like Fault tolerance, advancement management, advancement programming, security, etc. Fault Tolerance in cloud may be a major concern to ensure the supply and dependability of essential services further as application execution. So as to attenuate failure impact on the system and application execution, failures ought to be anticipated and proactively handled. The task of providing fault tolerance as a service needs the service supplier to appreciate generic fault tolerance mechanisms specified the client's applications deployed in virtual machine instances will transparently get fault tolerance properties. To this aim, we tend to outline ft−unit because the basic module that applies a coherent fault tolerance mechanism to a continual system failure at the graininess of a VM instance. The notion of ft−unit is predicated on the observation that the impact of hardware failures on client's applications will be handled by applying fault tolerance mechanisms directly at the virtualization layer than the applying itself.

Keywords – Cloud Computing, Cloud design, Virtualization, Distributed Computing.

I. INTRODUCTION

Cloud computing may be a comprehensive answer delivers IT as a service. It's a web based mostly computing answer wherever shared resources area unit provided like electricity. The pliability of cloud computing may be operate of allocating resource on demand. Cloud computing is that the combination of grid computing and utility computing. Cloud computing has the potential to form irreversible changes in however computers area unit used round the world. it's a delivery of computing and storage capability as a service to a community of end-to-end recipients. [1]

Cloud computing may be a approach of computing wherever service is provided across the web mistreatment the models and levels of abstraction. Several analysis problems area unit are absolutely addressed in cloud like Fault tolerance, advancement management, advancement programming, security, etc. Grid computing may be a federation of laptop resources from multiple body domains to succeed in a typical goal in an exceedingly single task to resolve the grand challenge drawback like biological process, monetary modeling etc. Grid computing is sharing of coordinated resources in an exceedingly dynamic atmosphere during which multi-institutional organizations concerned. [1]

The major layers in cloud design traumatize the various components of the cloud applications. The components of the cloud includes computer, mobile or alternative handheld devices accustomed hook up with the cloud over net, varied servers that area unit accustomed settle for the shopper requests and supply services to them from the cloud, the tools specific to the varied cloud applications like info, hardware resources, applications etc. and at last an information center and broker applications which give the authentication, authorization, privacy and sharing of resources to the varied users of the cloud. [6]
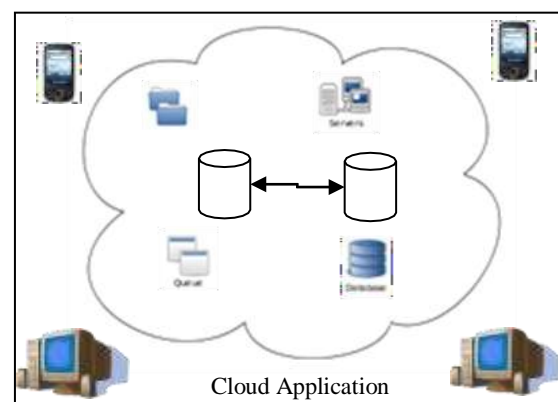

Figure 1: Cloud Computing

According to the usage of the cloud it's either public, non-public or hybrid cloud. Once a Cloud is formed on the market in an exceedingly pay-per-use manner to the general public, we tend to decision it a Public Cloud and therefore the service being sold-out is Utility Computing. Once the services area unit reserved for a few specific organization then the cloud is taken into account as non-public cloud and it works for specific organization. A number of the user minded applications like looking carts, banking services etc needs each behaviors of Public and personal Clouds, such clouds area unit termed as Hybrid Clouds. [6] Cloud computing may be a wide space network based mostly computing, wherever shared resources like software package, and knowledge area unit provided to computers and alternative devices whenever a shopper demands them either as paid or free services.

On the idea of the higher than discussion, platforms like YouTube, Vimeo, Flickr, Slideshare and Skype area unit enclosed in an exceedingly list of cloud applications – platforms that hold your information (images, video, shows, voice) and manages all thus you don't got to worry regarding them.

A. Merits & Demerits of Cloud Computing

Merits of cloud computing area unit too several to enlist nearly a couple of larger blessings of the cloud computing area unit as follows:

1. Cloud computing facilitates the equal flow of knowledge between the outsourced and outsourcing services.

2. information Center idea permits for centralized information assortment and therefore all the users get equal quantity of updated information.

3. the simple flow of knowledge permits the host organization associate degree assurance to the staff regarding their work and data management.

The major issues with cloud computing is as follows:

1. ends up in management issues

2. Disagreement at intervals the data technology departments

3. The webmaster can got to came upon new systems for managing the conflict

4. Further communication system and its configurations area unit needed, so there's another company concerned within the business may not get affected.

5. Businesses that traumatize responsive information are involved regarding safety of their mechanism [2]
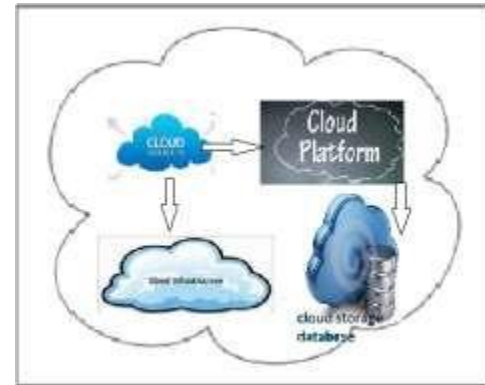
II. ARCHITECTURE OF CLOUD COMPUTING

Figure 2: Architecture of Cloud

Cloud design is consisting of multiple resources operating for cloud altogether with one another having loose coupling between them so the system won't have direct dependencies and any of the half will be additional, updated or modified just in case of requirement/failure while not moving the remainder of the system. It involves each hardware and software package applications in [1,2,3].

For loose coupling between the varied applications over the cloud messages queues area unit used so dependencies between them are manageable.

The Cloud Computing design is that the structure of the system, that consists of on-premise and cloud resources, services, middleware, and software package elements, their geo-location, their outwardly visible properties and therefore the relationships between them. Within the space of cloud computing, protection depends on having the correct design for the correct application. Organizations should perceive the individual needs of their applications, and if already employing a cloud platform, perceive the corresponding cloud design.

A cloud computing design consists of a face and a face. They hook up with one another through a network, typically the

web. The face is that the aspect the pc user, or client, sees. the rear finish is that the "cloud" section of the system. [2,3]

Cloud Computing Architecture

Front End

This requires managing the shopper aspect resources like network; shopper application downloads created mistreatment varied languages like HTML, JS, XML, JSON etc. internet services like email correspondence programs use internet browsers like Google Chrome, Firefox, Microsoft's net someone or Apple's expedition. alternative forms of systems have some distinctive applications which give network access to its purchasers like traveler applications, ftp purchasers etc.

Back End

Various servers running over the cloud, information Center and information Center Broker applications, Server Disks, Network Infrastructure, varied applications to manage communication with the shopper, process shopper requests, connecting with face application etc area unit unbroken during this class of face design of cloud computing. teams of those clouds build a full cloud ADPS. the foremost classes of applications area unit any style of internet applications program like video games to applications for processing, software package development and diversion. Usually, each application would have its individual dedicated server for services.

In current cloud design a central server is established that is employed for administering the complete system, observation client's demand further as traffic to confirm that everything of system runs with none drawback. A rule set is employed to manage the server activities typically referred to as protocols that area unit followed by this server and it uses a special style of software package familiar termed as middleware.

Middleware is associate degree intermediate application that permits computers that area unit connected on networks to speak with one another. Several firms that area unit service suppliers want many storage devices. The cloud ADPS should have a duplicate of all the information of its client's. RAID is employed for information backup and management over the cloud. [4]

III.   APPLICATIONS & ISSUES IN CLOUD COMPUTING

A.   Application

Fault Tolerance may be a major concern to ensure the supply and dependability of essential services further as application execution. so as to attenuate failure impact on the system and application execution, failures ought to be anticipated and proactively handled. Fault tolerant techniques area unit accustomed predict the failure in acceptable action. Fault tolerance is one in every of the vital key problems in cloud. it's involved with all the techniques necessary to alter a system to tolerate software package faults remaining within the system when its development. the most edges of implementing fault tolerance in cloud computing embrace failure recovery, lesser cost, enhanced performance metrics etc. once multiple instances of associate degree application area unit running on many virtual machines and one in every of the server goes down, there exists a fault and it's enforced by fault tolerance. [1]

B.   Area Problem

We contemplate a extremely complicated and distributed infrastructure that involves the subsequent main stakeholders.

1) Infrastructure supplier (IP): the entity that builds a Cloud computing infrastructure and realizes a service minded computing resources delivery theme.

2) Shopper (C): the entity that uses the infrastructure provider's service to deploy its applications. A shopper meets its dependability and availableness goals by creating use of the service offered by the fault tolerance service supplier.

3) Fault tolerance service supplier (SP): the entity that gives fault tolerance support to applications supported the client's needs. We tend to assume that the service supplier is trusty by each the infrastructure supplier and therefore the shopper.

As associate degree example, we tend to contemplate a shopper providing a web-based banking service that permits its customers to perform fund transfers and manage their accounts over the web. The shopper implements the banking service as a multitier application where: 1) the information tier uses the storage service offered by the informatics to store and retrieve its client data, and 2) the applying tier uses

the IP's reckon service to method its operations and reply to client queries. this technique design permits the banking service to fulfill its variable business demands with relevance quantifiability and snap of computing resources. [1]

However, a failure within the IP's system will have high implications on the dependability and availableness of the banking service. Moreover, a failure within the storage server could have a considerably higher impact than a failure in one in every of many reckon nodes. This means that every tier of the banking application needs completely different fault tolerance properties, and therefore the needs could modification over time supported the business demands. However, mistreatment ancient ways, fault tolerance properties of the banking service stay constant throughout its life cycle. Therefore, within the client's perspective, it's easier to interact with the SP, specify its dependability and availableness needs supported business wants, and transparently get desired fault tolerance properties for its applications.

C. Approachs to implement Fault Tolerance

For fault tolerance in cloud we've many ways applied and basic reasons for a similar are careful. This work proposes a way to use pre-measures in situ of taking care once a fault happens within the system.

III. EXISTING SYSTEM

There are a unit varied faults which might occur in cloud computing. Supported the fault tolerance policies varied fault tolerance techniques will be used like advancement level and task level.

A. Proactive fault tolerance: The principle of proactive fault tolerance policies is to avoid recovery from faults, errors and predict the failure and proactively replace the suspected elements from alternative operating elements. a number of the techniques supported these policies area unit Pre-emptive migration and software package Rejuvenation. a. Pre-emptive Migration: Proactive fault tolerance mistreatment pre-emptive migration depends on a circuit management mechanism wherever application is continually monitored and analyzed. b. software package Rejuvenation: it's a method that styles the system for periodic reboots. It restarts the overall system with clean state.

B. Reactive fault tolerance: Reactive fault tolerance policies cut back the result of failures on application execution once the failure effectively happens. There area unit varied techniques that area unit supported these policies like checkpoint/Restart, Replay and rehear. a. Check pointing/Restart: once a task fails, it's allowed to be restarted from the recently checked pointed state instead of from the start. it's associate degree economical task level fault tolerance technique for running applications. b. Replication: Replication based mostly technique is one in every of the favored fault tolerance techniques. Reproduction suggests that multiple copies. Replication may be a method of maintaining completely different copies of an information item or object. In the replication techniques, request from shopper is forwarded to 1 of reproduction among the set of replicas. Varied task replicas area unit run on completely different resources, for the execution to succeed until the whole replicated task isn't crashed. Replication adds redundancy within the system. It will be enforced mistreatment tools similar to HAProxy, Hadoop and AmazonEC2.

Consistencies among reproduction, reproduction management, reproduction on demand, and degree of reproduction etc area unit some vital problems in replication based mostly fault tolerance technique. A replication protocol should make sure the consistency among all replicas of a similar object. Multiple copies of same entity causes drawback of consistency because of update of any copy by one in every of the user.

Primary-backup replication, pick and primary-per partition protocol area unit a number of the replication protocol. sizable amount of replicas can increase the value of maintaining the consistency.

C. Task Resubmission: it's the foremost wide used fault tolerance technique in current scientific advancement systems. Whenever a failing task is detected, it's resubmitted either to the same or to a unique resource at a runtime.

Fault Tolerance may be a configuration that forestalls a laptop or network device from failing within the event of sudden the configuration of various systems and system running out of memory or disc space. The combination of fault tolerance measures with programming gains a lot of importance. Scientific workflows use distributed heterogeneous resources in cloud interface

area unit typically onerous to program. This paper explains task replication technique and simulation of cloud computing systems. [1]

The collection and prompt analysis of synchrophasor measurements may be a key step towards sanctionative the longer term sensible grid, during which grid management applications would be deployed to observe and react showing intelligence to ever-changing conditions. The potential exists to slash inefficiencies and to adaptively reconfigure the grid to require higher advantage of renewable, coordinate and contribute to reactive power, and to scale back the danger of ruinous large-scale outages. However, to appreciate this potential, variety of technical challenges should be overcome. we tend to describe a ceaselessly active, timely observation framework that we've created, architected to support a large vary of grid-control applications in an exceedingly normal manner designed to leverage cloud computing. Cloud computing systems bring vital blessings, as well as associate degree elastic, extremely on the market and efficient reckon infrastructure well-suited for this application. We tend to believe that by showing however challenges of dependability, timeliness, and security will be addressed whereas investing cloud standards, our work initiate for wider exploitation of the cloud by the sensible grid community. This research paper characterizes a PMU-based state-estimation application, explains however the required system maps to a cloud design, identifies limitations within the normal cloud infrastructure relative to the requirements of this use case, and so shows however we tend to adapt the fundamental cloud platform choices with subtle technologies of our own to attain the desired levels of usability, fault tolerance, and correspondence [2].

The most common benchmarks for cloud computing area unit the Terasort benchmark and therefore the YCSB benchmark. Though these benchmarks area unit quite helpful, they weren't designed for information warehouse systems and connected OLAP technologies. During this paper, first, we tend to gift cloud computing and information warehouse systems. Then, we tend to argue that TPC-H benchmark -the most distinguished benchmark for call web, mismatches cloud principle (scalability, flexibility, pay-per-use, fault-tolerance features) and client Relationship Management principle (end-user satisfaction and worth of Service features). Finally, we tend to gift new needs for implementing a benchmark for information warehouse systems within the cloud. The planned needs ought to permit

a good comparison of various cloud systems providers' offerings. [3]

The increasing quality of Cloud computing as gorgeous different to classic IP systems has exaggerated the importance of its correct and continuous operation even within the presence of faulty elements. during this paper, we tend to introduce associate degree innovative, system-level, standard perspective on making and managing fault tolerance in Clouds. we tend to propose a comprehensive high-level approach to shading the implementation details of the fault tolerance techniques to application developers and users by suggests that of an ardent service layer. Particularly, the service layer permits the user to specify and apply the required level of fault tolerance, and doesn't need data regarding the fault tolerance techniques that area unit on the market within the visualized Cloud and their implementations. [4]

SLAs area unit common suggests that to outline specifications and needs of cloud computing services, wherever the secure availableness is one in every of the foremost vital parameters. Fulfilling the stipulated availableness could also be dear, because of the value of failure recovery software package, and therefore the quantity of physical instrumentality required to deploy the cloud applications. Thus, a relevant question for cloud suppliers is: a way to guarantee the SLA availableness in an exceedingly value economical way? This paper studies completely different fault tolerance techniques on the market within the market, associate degreed it proposes the employment of an hybrid management to own full management over the SLA risk, mistreatment solely the required resources so as to stay a value economical operation. This paper shows a way to model the likelihood distribution of the accumulated period, and the way this may be employed in the planning of hybrid policies. Mistreatment specific case studies, this paper illustrate a way to implement the planned hybrid policies, and it shows the obtained value saving by mistreatment them. This paper takes advantage of the cloud computing flexibility, and it opens the door to the employment of dynamic management policies to succeed in performance objectives in ICT systems. [5]

V. PROPOSED WORK

This outline work elaborates the potential reasons of faults occurring within the cloud ADPS. Fault tolerance

mechanism being applied in cloud is said with task migration techniques.

There area unit varied faults which might occur in cloud computing. supported the fault tolerance policies varied fault tolerance techniques will be used like advancement level and task level.

A. Proactive fault tolerance: The principle of proactive fault tolerance policies is to avoid recovery from faults, errors and predict the failure and proactively replace the suspected elements from alternative operating elements. a number of the techniques supported these policies area unit Pre-emptive migration and software package Rejuvenation.

B. Reactive fault tolerance: Reactive fault tolerance policies cut back the result of failures on application execution once the failure effectively happens. There are a unit varied techniques that area unit supported these policies like checkpoint/Restart, Replay and rehear.

c. Task Resubmission: it's the foremost wide used fault tolerance technique in current scientific advancement systems. Whenever a failing task is detected, it's resubmitted either to the same or to a unique resource at a runtime.

The complete fault tolerance shall be preventively performed in following steps:

Step 1: many virtual machines shall be created over the cloud created mistreatment Cloudsim machine.

Step 2: every virtual machine shall be allotted with several applications through the cloudlets.

Step 3: Load on virtual machines shall be half-tracked mistreatment the ceaselessly running thread.

Step 4: If the load will increase to a threshold worth then the cloudlets shall be migrated to a different virtual machine that is comparatively free.

Step 5: pursuit of the virtual machine hundreds shall be done through a world resource that is shareable to all or any of the virtual machines.

Step 6: Task shall be migrated with the most effective match technique shall be used for migration to avoid the quickly occurring on a specific virtual machine.

Step 7: Threshold shall be set by pursuit the speed of load being applied over the cloud and can be adjusted dynamically.

Best match rule

Best Fit Algorithm

Algorithm for allocate (n)
{
    size (block) = n + size(header)
    Scan free list for the smallest block with nWords >= size(block)
    If block not found
        Failure (time for garbage collection!)
    Else if free block nWords >= size(block) + threshold*
        Split into the free block and an in-use block
            Free block nWords = Free block nWords - size(block)
        In-use block nWords = size(block)
            Return pointer to in-use block
    Else
        Unlink block from free list
        Return pointer to block
    *Threshold must be at least size(header) + 1 to leave room for header and link
    Threshold may be set higher to combat fragmentation
}

Allocation time is O(K) (K = number of blocks in free list)

VI. CONCLUSION

The planned add this paper is to supply a mechanism of fault tolerance in cloud atmosphere. The task of providing fault tolerance as a service needs the service supplier to appreciate generic fault tolerance mechanisms specified the client's applications deployed in virtual machine instances will transparently get fault tolerance properties.

The planned ft−unit is that the basic module, that applies a coherent fault tolerance mechanism to a continual system failure at the graininess of a VM instance. The notion of ft−unit is predicated on the observation that the impact of hardware mechanisms directly at the virtualization layer than the applying itself. Proactive Fault Tolerance is usually desirable approach of handling shopper applications however complexities concerned within the same at the side of the performance compromises makes it value analysis space.

The planned work is predicted to perform the most effective because the resources area unit managed at one location and every migration are ready to find succeeding on the market VM ahead and therefore the migration time won't be exaggerated for looking succeeding on the market resource.

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