A REVIEW ON THE TECHNIQUES USED IN THE MIGRATION OF VIRTUAL MACHINE

Anu Thind
Assistant Professor
Chandigarh Engineering College-CGC Landran

Abstract

Virtualization plays a main role in the cloud computing technology. Usually in cloud computing, users share the data there in the clouds like application etc., but with virtualization users shares the communications. A general technique to enhance the energy proficiency of a datacenter is VM placement by coordinating the quantity of dynamic servers to the present needs of the VMs and setting the remaining servers in low-control standby modes using SLA violations .In cloud computing environments, cloud service users consume cloud resources as a service and pay for service use. Before a cloud provider provisions a service to a consumer, the cloud provider and consumer (or broker) need to establish a service level agreement. Live migration has been extensively used in load balancing, energy decrease and active resizing to increase availability and hardware conservation. This causes removal of a huge number of redundant memory pages resulting in an increase in the total migration time and downtime.

Keywords: Virtual Machine, Offline Migration, Load Balancing, Availability and Maintenance.

I. Introduction

Migration refers to the reallocation of VMs from one physical machine to another one at runtime. Prerequisites are communication and an instance of the hypervisor on both source and target physical machine. The migration process induces a time interval in which the guest system is inactive. Highly dynamic virtualization solutions including VM migration are state of the art for the server market, but cannot be applied to embedded systems for lack of real-time response time guarantees. Most existing virtualization solutions for embedded systems assign VMs statically to physical machines, although virtualization's architectural abstraction and encapsulation of guest systems facilitate migration significantly. Benefits of migration are an increased reliability if applied in order to continue the functioning of a guest despite a hardware failure or a balanced load, especially for adaptive systems and systems that allow the addition of software at runtime. Target architecture of this work are homogeneous multiprocessor platforms and distributed systems of multiple identical processors, each operating on its

own random access memory, but connected via a network. The hosted guests are embedded systems characterized by tight resource and real-time constraints, which benefit from the integration of multiple software stacks including OS, such as control units in industrial automation systems. The applicability of VM migration as a fault tolerance technique is examined. To improve the reliability, migration is performed as a Service restoration in response to hardware faults that prevent the system within the VM to comply with the functional and/or real-time specification. These faults are external to hypervisor and VM. In case of partially failed physical machines, if the hardware failure still allows for saving and transfer of the state of the VM, its operation can be continued on another physical machine.

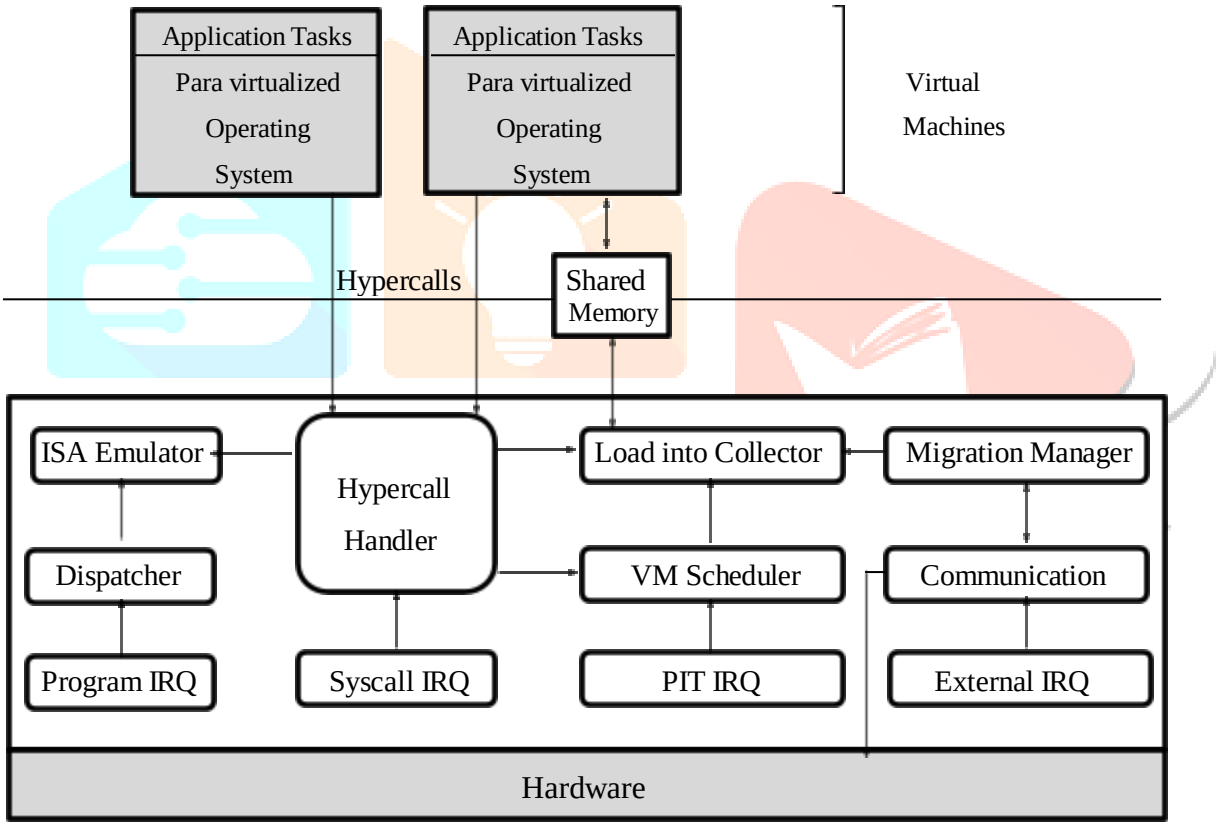


Figure no: 1.1 Software Architecture of the Hypervisor

Table no: 1 Advantages and Disadvantages of Migration

Advantages	Disadvantages
1. Traditional and linguistic diversity:	**Racial conflict:**

• Considered an appreciated resource • Over 200 vernaculars spoken here • A rich mix of civilizations, cultures, languages and beliefs: **multiculturalism** is now considered a defining characteristic of Aust's identity. • A rich mix of societies, cultures, Languages and Food, music, and customs enrich our lifestyle.	• There are those who are a threat to Australia's Anglo-Celtic background. • Some groups are categorized against eg. Sudanese people in Tamworth.
2. Economic benefits: • Create wealth and employ for all Australian + invest in economy, (29% small businesses) owned/operated by overseas born. • Create extra tax revenue for the government particularly significant in the ageing Society. • Significant language skills and understanding of other values boosts our links /Business openings overseas. • As a migrant's length of stay increases, their incomes rises and they are less reliant on services.	**Economic costs:** • A drain on the economy because they require support services. • Take jobs from Australians. • Harm our Stability of Payments (Trade dealing rest of the world).
3. Geopolitical advantages: • Migration policy is a sensitive topic and accepting migrants recovers our Foreign relations and standing international community. Australia's rejection of the White Australia Policy and more open migration policy have enabled it to build mutual and multilateral links such as APEC and ASIAN. • Australia is certain by the Refugee Agreement to accept immigrants.	**Geopolitical disadvantages** • Australia's hard line on people running out of SE Asia has Created some friction with our close nationals. • The Pacific Solution (processing/ impeding asylum seekers on islands outside the migration zone) has Drawn disapproval from the United Nations.

II. Virtualization

Virtualization plays a main role in cloud computing technology. Usually in cloud computing, users share the data [1] there in the clouds like applications etc., but with virtualization users share the communications. The main tradition in using Virtualization Technology is usually the cloud providers who offer the applications with the normal versions to their cloud users, for understanding. If the next version of that claim is released, then the cloud supplier has to provide the newest version to their cloud users and virtually it is possible but it is more costly. To overcome this difficulty, we use virtualization technology. As a result, the server and the software function where cloud benefactors have to pay the money on magazine or annual basis [2]. Mostly Virtualization means, organizing multiple operating systems on a single machine but allocating all the hardware resources. And it helps us to give the pool of IT resources so that we share these IT resources in order to get profit in the business. Virtualization means more than one virtual machines on single physical machine. Virtualization is generally useful to handle workload balancing between physical machines in data centre when available resources are not sufficient for Virtual Machines [3].

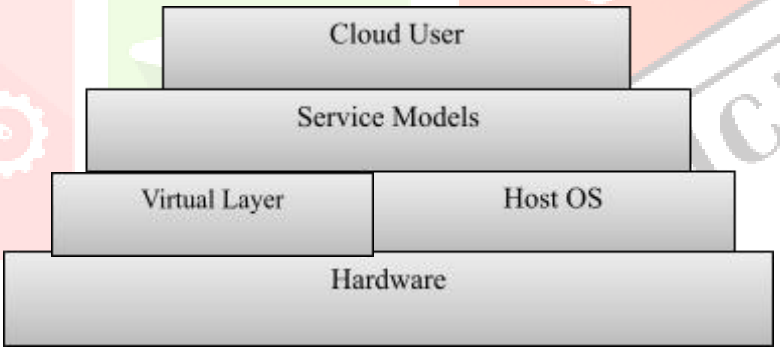


Figure no: 2 Virtual Model

Live Migration is a procedure of migration, virtual machines move from one corporal machine to another. In offline immigration process is stopped till the virtual machine can remain on target machine and in live relocation user can execute [4] without interruption. Live migration is a migration during which the

VM seems to be approachable all the time from clients' perspective. Live migration is a key retailing point for state-of-the-art virtualization technologies. It has attracted important attention in recent years.

Through the Virtual Machines Migration Process, few concerns are yet to be fully addressed. Couple of them are:

(a) Increase in migration downtime: Migration downtime is time for which the user waits to remain on a virtual machine.

(b) Calculation of migration time:

Migration time is total time compulsory for migration of virtual machines and to start it on the target machine.

III. Difference between Embedded System and Normal System In terms of Virtual Machine Migration

Embedded System

- CPUs for embedded systems are providing progressively better rapidity and capacity at lower cost. At the same time, embedded system software is more complex.
- The result is growing pressure to move from assembly language to higher level languages such as C, C++ or COBOL. This can now be realized without losing the considerable investment in existing assembler encryption by using the Fermat Migration Service.
- This system originally written for IBM Mainframe Assembler has now been improved to enable systems printed in Assembler on other processors to benefit from totally automatic migration to Assembly languages such as C, C++ or COBOL.
- The use of input and output parser technology means that it is relatively easy for SML to tune the Fermat Migration Service to provide provision to many different processors and specific versions of assembler in use by customs today. The resultant generated code is restructured for easy on-going maintenance by customer programmers; it is then compiled for the target mainframe using standard supported compilers and optimizers.

Normal System

- The process of transferring data between storage types, formats, or computer systems. It is a key consideration for any system application, upgrade, or consolidation. Data migration is usually performed programmatically to achieve a mechanical migration, freeing up human resources from tedious tasks. Data migration occurs for a variety of reasons, counting server or storage

Equipment substitutes, maintenance or upgrades, application migration, website consolidation and data centre relocation.

- To achieve an effective data migration procedure, data on the old system is planned to the new system applying a design for data extraction and data loading. The design relates old data formats to the new system's presentations and requirements. Programmatic data migration may involve many phases but it minimally includes data abstraction where data is read from the old system and data loading where data is written to the new system.

IV. Issues of Virtual Machine

(1) May consequence into service interruption

(2) May result in destruction of overall system behavior.

To migrate a VM between two hosts, the virtual machine's entire state has to be transferred from the source to the target host. VM contains the permanent storage, volatile storage, the state of connected devices and the internal state of the virtual CPUs permanent storage does not need to be moved because it is provided via network-attached storage. The state of the CPUs and the virtual devices having a few kilobytes of data can be simply sent to the target host. The main problem in live migration is to transfer chief memory (i.e. Volatile storage) because it comprises several gigabytes.

V. Memory transfer Division

Memory Transfer is divided into three steps:

1) Push phase: Positive pages are pushed in advance to the [6] new purpose before the source virtual machine moves to destination. Some changed pages are present to confirm consistency.

2) Stop and copy phase: It is an easy way in which the source virtual machine is stationary at source and complete Virtual machine is copied or stimulated to destination and then resumed at destination.

3) Pull phase: In the pull phase virtual machine starts implementation on the destination machine and if it necessitates a page that has not been copied, then this page is drawn across the network from the source virtual machine.

Purpose of this paper is to appraise some of the existing live migration techniques.

VI. Live Migration Techniques

The most commonly used live migration methods are:

(a) Pre-copy approach

(b) Post-copy approach.

(c) Stop and Copy Phase

Pre-copy serves the mixture of push phase with stop [7] and copy point as shown in Figure no.2 Post-copy serves a mixture of

pull phase with stop and copy phase as shown in Figure no. 3.

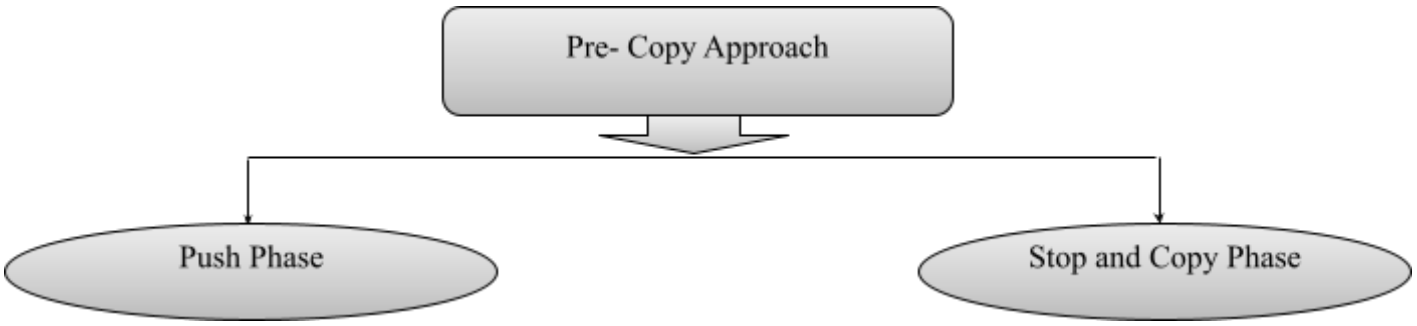


Figure no: 2 Pre-Copy Approach

1) Pre-copy Approach: In pre-copy approach pages of memory are iteratively copied from the source machine to the terminal host, all deprived of ever stopping the completion of the virtual machine being travelled. Pre-copy is a live migration approach. The pre-copy algorithm planned by [2] uses an iterative push phase, followed by a minimal stop-and copy. The iterative environment of the algorithm is the consequence of what is known as dirty pages: memory pages that have been modified in the Source host subsequently the last page transfer must be sent again to the destination host. At first, iteration i will commerce with less dirty pages and then iteration i − 1. Unfortunately, the available bandwidth and workload characteristics will make it so that some pages will be updated at a faster rate than the rate at which they can be relocated to the terminal host. At that point, the stop-and-copy procedure must be executed. A 5-step view of the pre-copy technique is shown in Figure 4.

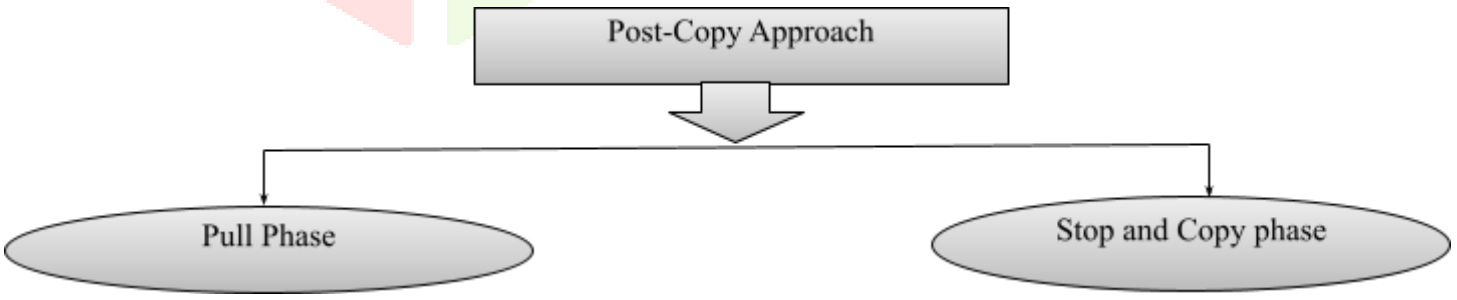


Figure no: 3 Post-copy approach

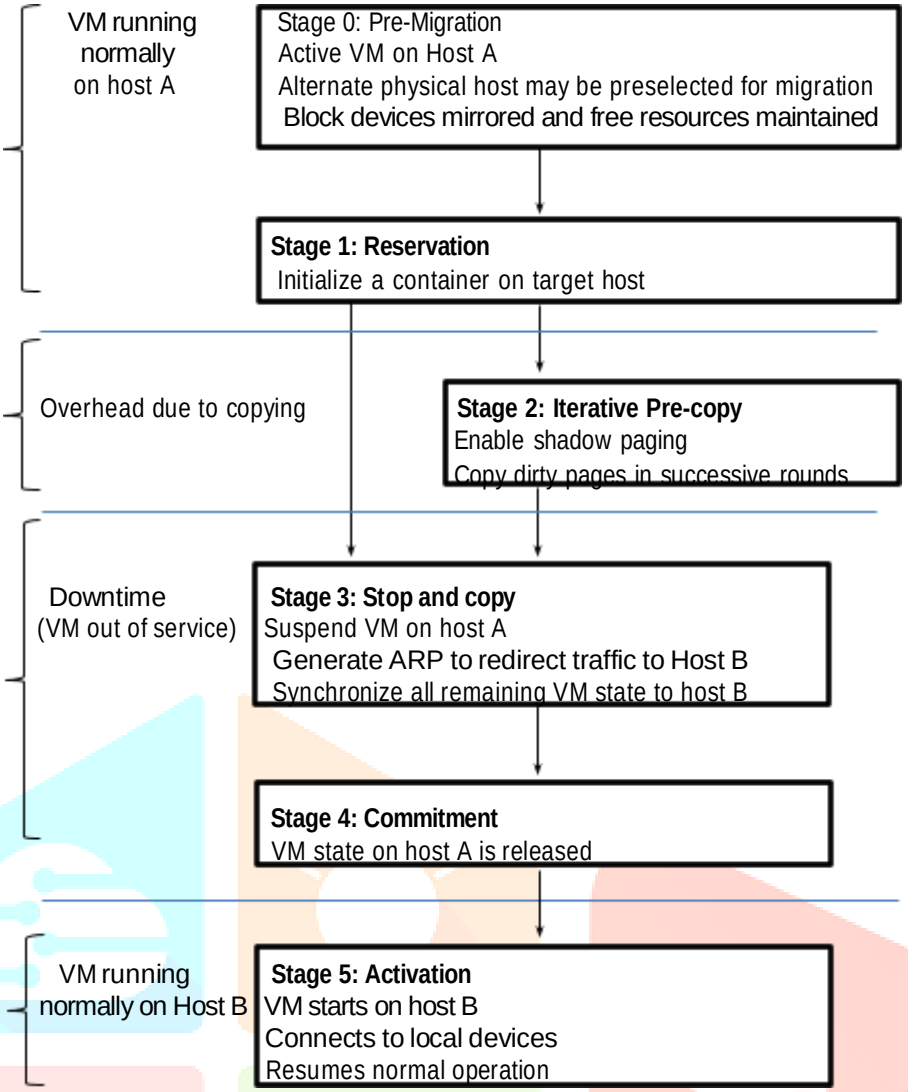
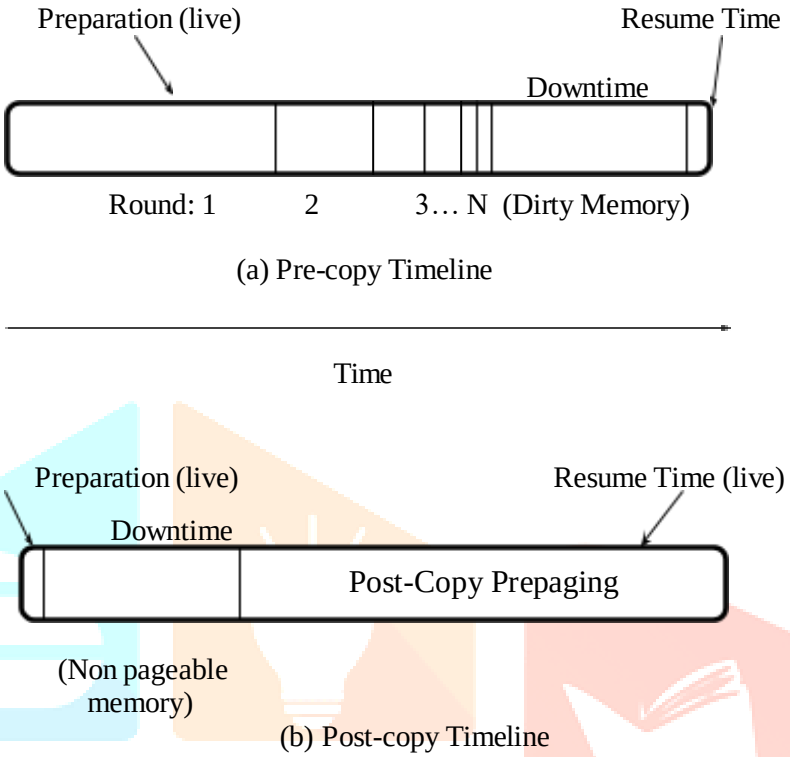


Figure no: 4 Pre-Copy Algorithm

(2) Post-copy Approach: In the post-copy approach each memory page is transported only once, which is the main advantage over pre-copy approach. Pre-copy approach delivers high reliability against system fault. Because it covers copy of the memory pages in both sides, whereas in the post-copy approach recollection page can be found at one side only.

Post-copy relocation defers the memory transmission phase until after the VM's CPU state has already been transferred to the target and restarted there. As opposed to pre-copy, where the source host handles client requests during the migration process, post-copy delegates service implementation to the destination host. In the most basic form, post-copy first suspends the migrating VM at the foundation node, copies negligible processor state to the target node, resumes the virtual machine at the goal node, and begins attractive memory pages from the source over the network. Variants of post-copy arise in terms of the way pages

are fetched. The main advantage of this approach is that each memory page is transferred at most once, thus side-stepping the duplicate transmission overhead of pre-copy [5]. Figure 5 contrasts the pre-copy and the post-copy procedure timelines.



(a) Pre-copy Timeline

(b) Post-copy Timeline

Figure no: 5 Pre-copy and Pose Copy Timeline

V. Related Work

In K.Ye, et al.[8],2010 studied energy efficiency from the performance perspective. Author presented a virtual efficiency. Then they investigate the possible performance overheads caused by server consolidation and live migration of virtual machine technology. Their experiment results concluded that both the two technologies can effectively implement energy-saving goals. But live migration o f virtual machines incurs performance overheads. In **D.Jayasinghe, et al. [9], 2011** focused on how to improve presentation and accessibility of services hosted on IaaS clouds. They arrived with structural constraint aware virtual machine placement (SCAVP) that supported three types of constraints: demand, communication and availability. But there

machine based Energy Efficient data centre architecture for cloud computing. Efficient consolidation and migration strategies can improve the energy

is a problem of Virtual Machine placement, they formalized that Virtual Machine placement is a NP hard problem.

In **C. L. T. Man and M. Kayashima [10], 1998** gave the idea of finding optimal placement of virtual machines. Virtual Machine placement on a number of physical servers is one kind of bin packing problem, as discussed by K.Ye, which is known as an NP-hard. Author proposed the use of a heuristic algorithm to solve this difficulty where virtual machines play the roles of personal desktops. Proposed algorithm that is PBA (pattern-based allocation) can be used to reduce the number of corporeal servers required for hosting a certain number of virtual desktops. With this algorithm, the number of servers required for introducing virtual desktops is reduced. But, research work is mainly concentrated on desktop infrastructure, not on the overall cloud environment for implementing virtual machine placements. In **S. Chetenet al.[11],2010** defined the placement algorithm for Virtual Machines (VMs) in a rack. But the drawback of these algorithms was that they save data centre power consumption but not overall data centre, which allocates various possessions such as memory, bandwidth, processing power, etc. from a corporeal machine (PM) to VMs such that the number of PMs (Physical Machine) used is minimized. They proposed two algorithms, Reduction to the Set Cover problem, LP formulation. But the problem of placing virtual machines is still there, that is when, where and how to migrate virtual machines for energy efficiency of the cloud. In **S.Esfandiarpoor and A.Pahlavan [12],2013** considered four energy-aware resource management algorithms for virtualized data centers so that total energy consumption of data centers is minimized. Author proposed a new algorithm (OBFD), which sorts list of VMs in decreasing order of their required MIPS instead of current CPU utilizations. After ranking VMs, it tried to find the best server for each VM that leads to the minimum increase of power consumption of the data centre. They gave placement algorithm by considering rack utilization, Place virtual machines rack by network power consumption and it considers only racks.

Table no: 2 Virtual Machine Migration Different techniques

Virtual Machine Migration techniques	Conclusion	Advantages	Disadvantages
Pre-Copy Approach	Virtual memory is first moved to the destination and after that processor state gets removed.	Migration Interruption is less than a second.	Above due to duplicate page transfer.
Post-Copy Approach	First it travels the VM's execution states then all memory pages are removed only once during the whole migration process.	Memory pages relocated only once.	Interruption is more than pre-copy
Time-series calculation technique	It probably repeatedly updated high dirty pages in the past and transmits them in the last round of iteration.	Less number of Iterations, a lesser amount of down time and migration time and smaller measure pages transferred.	Approach deliberate Only high dirty pages.

VI. Conclusion

Virtual machine migration for real-time systems is a method of great and so far unexploited potential. Virtualization's presented a basic virtual machine migration method for real-time systems on homogeneous multiprocessor stands. A reliability analysis based on a combinatorial model was used to quantify abstraction and encapsulation enable migration and it can be applied in order to last the functioning of a subsystem despite a hardware disappointment. This article the reliability increase. The industrialized architecture is characterized by a distributed design and announcement between the virtualized operating system

and the hypervisor in order to provide the required scheduling information.

References

1. Aiash, Mahdi, Glenford Mapp, and Orhan Gemikonakli. "Secure live virtual machines migration: issues and solutions." Advanced Information Networking and Applications Workshops (WAINA), 2014 28th International Conference on. IEEE, 2014.
2. Beloglazov, Anton, and Rajkumar Buyya. "Energy efficient allocation of virtual machines in cloud data centres." Cluster, Cloud and Grid Computing (CCGrid), 2010 10th IEEE/ACM International Conference on. IEEE, 2010.
3. Galloway, Michael, Gabriel Loewen, and Susan Vrbsky. "Performance Metrics of Virtual Machine Live Migration." Cloud Computing (CLOUD), 2015 IEEE 8th International Conference on. IEEE, 2015.
4. Groesbrink, Stefan. "Virtual Machine Migration as a Fault Tolerance Technique for Embedded Real-Time Systems." Software and Communications, 2010, pp.171-178.
9. D.Jayasinghe, C.Pu, T. Eilam, Security and Reliability-Companion (SERE-C), 2014 IEEE Eighth International Conference on. IEEE, 2014.
5. Gutierrez-Garcia, J. Octavio, and Adrian Ramirez-Nafarrate. "Policy-based agents for virtual machine migration in cloud data centres." Services Computing (SCC), 2013 IEEE International Conference on. IEEE, 2013.
6. Hu, Bolin, et al. "A time-series based precopy approach for live migration of virtual machines." Parallel and Distributed Systems (ICPADS), 2011 IEEE 17th International Conference on. IEEE, 2011.
7. Pasumarthy, Sarat Chandra. "Live Migration of Virtual Machines in the Cloud: An Investigation by Measurements." (2015).
8. K.Ye, D.Huang, X.Jiang, H.Chen, S.Wu, "Virtual Machine Based Energy-Efficient Data Center Architecture for Cloud Computing: A Performance Perspective", IEEE/ACM International Conference on Green Computing

M.Steinder, I.Whalley, E.Snible, "Improving Performance and Availability of Services Hosted on IaaS Clouds with Structural

Constraint-aware Virtual Machine Placement", IEEE InternationalConference on Services Computing, 2011, pp.72-79.

10. Goldberg, David E., and John H. Holland. "Genetic algorithms and machine learning." Machine learning 3.2 (1988): 95-99.
11. . S.Cheten, J. J.Geevarghese, Karthik R, "Placement Algorithm for Virtual Machines", 2010, pp.1-6.
12. S.Esfandiarpoor, A.Pahlavan, M.Goudarzi, "Virtual Machine Consolidation for Data centre Energy Improvement", Computer Engineering Department, SharifUniversity of Technology, Tehran, Iran,9 feb 2013.