VOLUME-7, ISSUE-12, DECEMBER-2018 • PRINT ISSN No 2277 - 8160

Original Research Paper

Computer Science

# AN IMPROVED APPROACH FOR CLOUD COMPUTING BY OPTIMAL UTILIZATION OF RESOURCE WITH HIGH PERFORMANCE COMPUTATION

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**ABSTRACT** High performance computing improves usability and scalability of data processing over cloud. When used with different type of data having large size values with higher processing requirements, its compulsory for us to provide better range machines. Conventionally, HPC outperforms much low capacity system when used with cloud processing over data centers. But it requires a physical setup that involves purchasing, transport, wiring and configuration that could take weeks to implement. Our proposed algorithm setup can be done in matter of minutes and is better in processing for energy efficiency. My algorithm uses VM migration to achieve load balance for tightly coupled parallel applications executing in virtualized environments that suffer from interfering jobs. While restoring load balance, it not only reduces the timing penalty caused by interfering jobs, but also reduces energy consumption significantly. My result will show significant improvement in energy consumption level and thus comparison will be based on number of migrations and energy consumption in watt.

**KEYWORDS** : High performance computing, cloud computing, virtualization, migration.

## I. INTRODUCTION

High performance computing is the use of parallel processing for running advanced application programs efficiently, reliably and quickly. HPC functions above 1012 floating point operation per second. The most common users of HPC systems are scientific researchers, engineers and academic institutions. Some government agencies, particularly the military, also rely on HPC for complex applications. High-performance computing (HPC) evolved due to meet increasing demands for processing speed. HPC brings together several technologies such as computer architecture, algorithms, programs and electronics, and system software under a single canopy to solve advanced problems effectively and quickly. A highly efficient HPC system requires a high-bandwidth, low-latency network to connect multiple nodes and clusters.

## II. Cloud Computing

Cloud computing is delivery of hosted service over internet.Cloud computing is used for storing & accessing data & program over internet.User only pay on duration of usage. . It allows creating, configuring and customizing application online. Cloud can provide over the Internet. . Cloud providing to run applications such as email, web conferring, and customer relationship management. Virtualization is the techniques which divides physical machine into several completely isolated machine known as virtual machine.

## III. HPC+CLOUD

HPC has a unique set of requirements that might not fit into standard clouds. However, plenty of commercial options, including cloud-like services, provide the advantages of real HPC without the capital expense of buying hardware.The advantage of pay-as-you-go computing has been an industry goal for many years. In HPC Users can construct their own operating system instance and run it in a cloud whenever they need computational resources. In addition to cloud computing, cloud storage also can be used independently or combined with OS instances. Cloud computing would seem to be an HPC user's dream offering almost unlimited storage and instantly available and scalable computing resources, all at a reasonable metered cost. For all but the basic HPC applications, however, the use of a typical cloud needs a bit of due diligence because remote HPC services can range from shared HPC clusters to fully virtualized cloud environments.A "traditional" cloud offers features that are attractive to the general public. These services comprise single, loosely coupled instances (an instance of an OS running in a virtual environment) and storage systems backed by service level agreements (SLAs) that provide the end user guaranteed levels of service

## IV. Virtualization & Migration

VM migration refers to process of moving a running virtual machine or application between different physical machine without disconnecting to client or application. Memory , storage and network connectivity of the VM are transferred from the original guest to the destination

### Minimizing downtime

- Reduce size of VM state
- Pre copy static pairs
- Demand copy static pairs
- Hot-copy dynamic parts

### Needs & Goals of VM migration :

- Optimize resource use
- Increase throughput
- Minimize response time
- Avoid overloading of single resource
- Cost efficiency
- Scalability & Flexibility
- Fault tolerance
- Migration time

## V. Problem Statement

HPC with Cloud has many challenges like overheat of computing multiple migration of virtual machine and managing multiple desperate node over SDN user collbration base method need to be improved

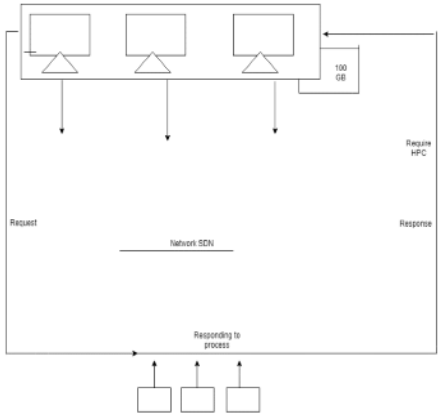


**Figure 1:Problem statement**

## v. LITERATURE SURVEY

### Paper 1

### High Performance Computing On the Cloud via HPC+Cloud software framework

Traditional High Performance Computing (HPC) clusters built to

handle big data processing have inherent weaknesses that can be overcome by migrating to a more flexible cloud computing environment In this paper propose solution called HPC+Cloud that enables enterprises to migrate to,and subsequently manage,high performance computing on the cloud High Performance Computing as a service is the pay –per-use –model compared to intial capital investment ,the operational cost ,and proper underutilization of traditional HPC systems, having to pay for only what is used and only when it is needed equates to large financial savings for users. HPC+Cloud architecture is the ability to scale the HPC cluster by provisioning new virtual processing nodes from the cloud on an on-demand basis. All the advantages of the hybrid cloud are inherited by the proposed HPC+Cloud paradigm but with lesser administrative overhead compared to a traditional hybrid cloud since a user does not need to create and manage a private cloud on premise. Firstly, the framework has to determine if the process is scalable, not all HPC processes can be scaled to the cloud as there are vendor limitations as well as privacy and legal concerns. Secondly, the framework should only move HPC processes to the cloud if local HPC systems have reached a preconfigured utilization threshold The third precondition for process

migration to happen is that the framework can only move one of three types of processes .this article proposes an implementation of a hybrid cloud environment called HPC+Cloud which provides a framework for automating HPC tasks between local resources and the public cloud. HPC clusters as new nodes can be provisioned from the cloud on an on demand basis without purchasing additional hardware.

**Paper 2**

**OPTIMIZATION OF PERFORMANCE AND SCHEDULING OF HPC APPLICATIONS IN CLOUD USING CLOUDSIM AND SCHDULING APPROACH**

Cloud computing is emerging as a promising alternative to supercomputers for some high performance computing applications. In this paper, a novel heuristics for online application –aware job scheduling in multi-platform environments is presented.

Clouds can act as a cost-effective and timely solution to the needs of some academic and commercial HPC users.CLOUDQAL is aquality model is to propose for cloud servicesLightweight virtualization reduces the overhead of network virtualization by grating VMs native accesses to physical network interfaces. The advantages of proposed System are:

- Better turnaround time for job
- Assign job to least loaded platform
- Good performance in cloud

in the system architecture cloudsim act as virtualization mechanism to maintain the efficient and availability of the data's into serverIn the module design in the proposed system are cloud computing module, Resource Management module, Virtualization module, Cloudqual for HPC and Optimizing Cloud for HPC

**Paper 3**

**Distributed Shared Memory based Live VM Migration**

In this paper they propose a pre-copy live VM migration using Distributed Shared Memory(DSM) computing modelThe setup is built using two identical computation node to construct the environment services architecture namely the virtualization infrastructure ,the shared storage server, and the DSM and High performance Computing Cluster.In this model downtime is reduced by 50% in the idle workload of Windows VM and 66% in case of Ubuntu Linux idle workload In general this model not only reduces the downtime and the total amount of data sent,but also does not degrade other metrics like the total migration time and application performance In this System architecture runs four services which work in a cooperative way to handle the live VM migration of XenServer hypervisor in an optimized way In this paper logical modules as layer architecture to build the VM migration The first part is the shared storage NFS Protocol, which is a transparent protocol that allows the shared storage server update to be synchronized with all virtual members. Second part is Virtualization Infrastructure using Citrix XenServer version 6.2 hypervisor which is used to create the virtual machines, and managed by Citrix Xen-Center management console Third part is the HPC Cluster Distributed Memory with message Passing Fourth part is the Distributed Shared Memory framework This paper future work is to integrate the DSM HPC Cluster with the VM migration as one unit

**Paper 4**

Customized HPC Cluster Software Stack on QCT Developer Cloud Quanta Cloud Technology (QCT)customized HPC cluster software stack including system provisioning ,core HPC services ,development tools ,and optimized applications and libraries which are distributed as pre-built and validated binaries and are meant to seamlessy layer on the top popular Linux distributions with the integration conventions define by OpenHPC project The architecture of QCT HPC Cluster Software Stack is Intentionally modular to allow end users to pick and choose from provided components, as well as to foster a community of open contribution.The system architecture used for any HPC Cluster has several network:

1. In-band internal management Ethernet network
2. Out-ot-Bans power control and console Ethernet network
3. High-performance low –latency network or fabric
4. A Shared or optional dedicated network for parallel file system service

In this paper presented an overview of QCT HPC Cluster tool kits with QCT HPC Culster Software stack ,a customized and layered based collections of software components used for rapidly bulid a HPC Cluster System and run tests on QCT Developer CloudIn the future ,we will actively participate in OpenHPC community and work with professionals to focused on optimizing software components and user applications for OpenHPC Future efforts focus on providing automation for more advanced configuration and tuning to address scalabillty , power management, and high availability concerns

**Paper 5**

**Towards Application –centric Fairness in Multi-Tenant Clouds with Adaptive CPU Sharing Model**

In this paper Adaptive CPU Sharing approach that reduces co-tenants interference and provides predicatable application performanceOur approach is to monitor the progress of submitted application at runtime, tracks the slowdown of individual application at runtime, track the slowdown of individual application and applies adjustment until convergence we predicted application performance degradation by creating a mathematical relationship between high-level application performance and low –level machine eventsOur approach helps mitigate co-tenant interference and reduces unfairness by minimizing the overall application slowdownsIn this paper Adaptive CPU Sharing approach that reduces co-tenants interference and provides predicatable application performanceOur approach is to monitor the progress of submitted application at runtime, tracks the slowdown of individual application at runtime, track the slowdown of individual application and applies adjustment until convergence we predicted application performance degradation by creating a mathematical relationship between high-level application performance and low –level machine eventsOur approach helps mitigate co-tenant interference and reduces unfairness by minimizing the overall application slowdowns

**Paper 6**

**Spartan and NEMO: Two HPC-Cloud Hybrid Implementations**

In this paper they suggest two approaches to make HPC resources

available in a dynamically reconfigurable hybrid HPC/Cloud architectureThe first approach, from the University of Melbourne, generates a consistent compute node operating system image with variation in the virtual hardware specification. The second approach, from the University of Freiburg, deploys a cloud-client on the HPC compute nodes, so the HPC hardware can run Cloud-Workloads for backfilling free compute slots On top of the HPC configuration it enables users to run virtual machines as standard compute jobs (VM jobs). To run virtual machines on every compute node on the cluster the KVM hypervisor is on each of these nodes. This architecture enables users to run compute jobs on bare metal through the resource manager (bare metal jobs) or inside a virtual machine (VM job) without partitioning the cluster into two parts. In this paper they used University of Freiburg three workloads:

1 job Submission via Moab scheduler without running a resource manager client in the VM.,
2 job Submission via Moab scheduler with a resource manager client (Torque) running in the VM
3 job Submission via OpenStack Dashboard/API.

At the University of Freiburg, there are three job submission alternatives. There is one use case where users provide their VM images themselves. These VM images cannot be trusted and therefore they are not allowed to access cluster resources like parallel storage or user home directories. A second use case is when the user submits classic compute jobs to a different software environment on the cluster. The software environment is represented by a VM in this caseThe third use case is when the user submits compute jobs simply by creating a VM via the OpenStack web interface (Horizon) or OpenStack API. The two systems illustrates the need for compute processing to be close as possible to the data.

## VII. CONCLUSION:

HPC cloud computing is challenging area that supports to deal with heavy workload in cost effective environment . A huge number of computation and memory requirement is big challenge with HPC It is Comparatively much faster so the problem of migration between large cluster over multiple server is addressed in this research we have tried to provide a new hybrid architecture for higher number of nodes for large amount throughput. We are accepting new architecture is comparatively efficient flexible and cost-effective

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