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Schemes for Distributed Computing Environment Based on Cloud Computing Technology for Ministry of Regional Municipalities and Water Resources (MRMWR) Oman

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Abstract-This work developed two Schema for distributed computing environment based on cloud computing technology to organize a dynamic load balancing in complex virtual computing . As well as analyzed and discussed problems, characteristics, architectures and applications of various approaches to building the operating environment for user access and for running applications in a distributed computing environment based on cloud computing technology. The aim of this work is to improve the efficiency of distributed computing in the cloud system, to introduce an approach to represent the operating environment for the organization of secure user access to computing control and development principles that run demanding applications in a distributed computing environment based on cloud computing technology. To achieve this goal, new methodology have been developed for running applications in the cloud, allowing to increase the overall performance of heterogeneous software and hardware systems .The designed method allows organizing an effective computer system that allows for dynamic balancing of computing nodes of the cloud computing environment due to migration processes, not data.

Keywords— cloud computing technology, Distributed Computing, Dynamic load balancing

I. INTRODUCTION

Ministry of Regional Municipality and Water Resources (MRMWR),[1] Government of Oman is guided by a vision for sustainable development aimed at satisfying development requirements in sultanate of Oman. The Ministry is working on the provision of infrastructure in different Wilayats such as internal roads, lighting, beautification and urban development and construction of facilities of various services such as markets, parks and gardens. The Ministry is also responsible for the development of water resources through water exploration and construction of various types of dams and maintenance of springs and aflaj.The ministry has developed application architecture to support the business functions of MRMWR. The MRMWR Application architecture contains three categories:

(1) Business Core Systems
(2) Business Support Systems
(3) Middleware.

MRMWR is looking forward to improve the various services (G2C, G2B, G2G and G2E) relate to the core business functions and streamline the organisational processes for the service delivery. Therefore the proposed schemes in this work could support MRMWR to consider cloud computing features to achieves their goals .

[2][3]In today's economy one of the most important conditions for success functioning of companies and enterprises becomes effective manage their costs. Automation of production processes and implementation information technologies in organizational management are the most important factors in reducing costs . At the same time one cannot recognize that the cost of maintenance of automated systems control and information processing. At this regard, One promising ways to solve problems of this kind are actions to use cloud computing. [4][5][6] Cloud computing - is a computing model in which resources such as processing control, storage, networking and software are abstracted and are provided as a service on the Internet for a remote user. Provide access to the resource allocation, dynamic and virtually infinite scalability in solving specific problems. The benefits of cloud computing include performance, cost savings, high availability, and easy scalability.

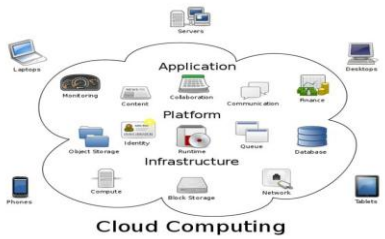

Fig. 1 Cloud Computing [7]

Cloud systems are service oriented i.e. To provide consumers with quality services. Accordingly, the allocated Several models of Service are: Infrastructure as a Service (IaaS)

A. IaaS Providing customers with a variety of IT resources

As a rule IaaS model includes infrastructure of virtual server, storage, network. such service can be found in Amazon, Google ,IBM e.t.c. IaaS provides the user with ample opportunity to configuring the service, but at the same time, it is difficult to achieve high quality service. To avoid this problem, many providers offer a range of templates to provide virtual infrastructure and different models.

Fig. 2 Iaas [8]

B. PlatformasaService(PaaS) -PaaS Provides access to software platform. users can create and publish their own applications based on this platform, they have access to resource management of lower level (operating system, datawarehouse,etc.).DuetosignificantdifferencesineachAPIPlatform-specific migration of applications from one PaaS solutions is usually impossible. This fact has led some internet service providers (ISPs) to reflect the development of a universal interface of PaaS. The main effect to benefit the customer in selecting this model is cost savings ,related to the maintenance of physical infrastructure and hardware computer network, as well as system and server software, such service can be found in (Google app engine ,Azure)

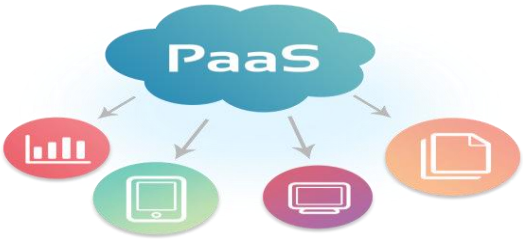

Fig. 3 Paas [9]

C. *Software as a Service (SaaS)*

- SaaS provides software. In this model, users have access only to the functions of necessary software via net. The SaaS model is already being used to deliver applications edit documents and presentations, project management, CRM. such service can be found in Google Apps

Fig. 4 SaaS [10]

D. Grid computing and cloud computing

The concept of grid computing and cloud computing leads to new concept called virtualization . [11] Some researchers believe that the main difference between grid computing and cloud computing is virtualization . While

grid systems provide a high load of computing resources by distributing a specific task for a few compute nodes, cloud computing are on the path of execution of multiple tasks on the same server as virtual machines. In addition, there are features in the main use cases of grid and cloud computing. While the grid is mainly used to solve problems for a limited period of time, cloud computing is mainly focused on providing long-term services

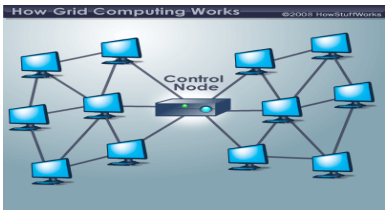

Fig. 5 How Grid Computing Works [12]

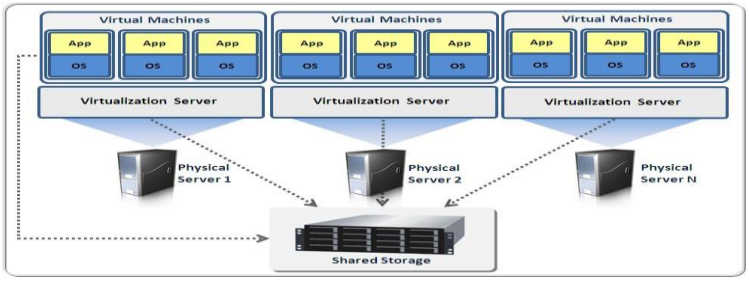

Fig. 6 Virtualization

Thus, this work cassume that the grid and cloud computing complement each other. Grid Interfaces and protocols can provide interaction between the cloud resources or cloud platforms to provide the union. A higher level of abstraction provided by the cloud platform, can help users in organizing the Grid systems transparent and easy provisioning of Grid platforms and to attract new user groups to the use of such resources.

II. PROBLEM DEFINITION

The implementation of cloud computing raises a number of unsolved scientific problems preventing the full use of all potential advantages of this approach. First, the desire to create a universal cloud inevitably faced with the need to operate in a heterogeneous environment and thus to organize users' access to their individual applications without compromising performance.Secondly, in the cloud when accessing an arbitrary number of users , increases several problems of ensuring a high degree of safety and reliability to protection specific data. Therefore, the problem of data security and resources in cloud computing is one of the critical issues. Safety of the entire system depends on the security software interfaces for resource management, virtual machines and services. Starting from the authentication and authorization procedures and ending with encryption.Software Interfaces should provide maximum protection against unauthorized attacks. Therefore security in the cloud is necessary to provide a convenient and uniform conduct of authorized access to resources, taking into account their use and protection of resources and data from unauthorized use.Thirdly, to enable practical use of a heterogeneous cloud environment in different areas is necessary to organize a universal system that run individual applications. Given that these problems are still not completely solved, we can assume the topic of this research work is practically significant.

E. Research Methods

Research methods based on modern principles of parallel and distributed processing, data transmission in computer systems, the protection of computer systems on modern technologies of software design on the reliability of information systems theory, stochastic processes and threads submit your final version, after your paper has been accepted, prepare it in two-column format, including figures and tables.

F. Purpose of this Work

The aim of this work is to improve the efficiency of distributed computing in the cloud system, by creating the operating environment for the organization of secure user access to computing power and the development of principles run demanding applications in a distributed computing environment based on cloud computing technology. To achieve this goal, the following tasks have been developed .

1. A methodology for running applications in the cloud, allowing to increase the overall performance of heterogeneous software and hardware systems.

2. An approach to the construction of the operating environment, providing secure access for users demanding applications in a heterogeneous distributed cloud computing environment.

III. SCHEMES FOR DISTRIBUTED COMPUTING

To increased scalability and overall performance of distributed computing environment in the cloud , a problem appears to affect the performance ; load balancing.Balancing can be static and dynamic, to start the task, even during work tasks. A very serious problem is the dynamic load balancing. Dynamic balancing used to redistribute the task that already running. In this instance the migration process can move a process from one machine to another without having to restart the process from the beginning. In fact, applications designed to process large amounts of data, it is necessary to use methods of load balancing by migrating data processing. This work intends to propose scheme to organize a dynamic load balancing in virtual computing system.Based on several experiments results developed in the literatures [14] to comparing the execution time when multiplying matrices and to comparing latency of messages. Using migration processes and without migration the obtained results allow to compare the execution of the actual processes for high-performance matrix multiplication framed PVM in a heterogeneous environment, as well as to compare the effectiveness of the interaction of multiple processes within the MPI virtual cluster. It is shown that the performance of various tests using PVM and MPI without migration process was significantly lower than their performance to the migration process. These results clearly demonstrate the benefits of using the priority migration process.This approach provides a significant acceleration and high performance for concurrent and multi-tasking. It is a central element of this work approach.In order to overcome certain difficulties in the systems with the scalability of cloud computing, we will use dynamic load balancing based on the migration processes between the virtual processors, not the data in the standard system.

G. Schema for Driving a distributed computing systems

A new approach have been developed to build the operating environment, providing secure user access to intensive applications in distributed cloud computing environment,The proposed methodology to run applications in cloud environments, allowing to increase the overall performance of heterogeneous software and hardware systems. For this purpose a complex software products must investigated in detail . The following figure shows the new scheme proposed by us ,distributed computing systems based on cloud computing technology. We manage heterogeneous resources and combine computing power under the control of the hypervisor in a single cloud infrastructure. Although the idea of creating a virtual machine under the user is not new, the virtual machine in the cloud opens up new opportunities. Even heterogeneous systems they can do the same, and hence to cluster. The size of a virtual cluster can dynamically increase or decrease. The virtual cluster can quickly switch in the running time from one user to another user. But the central problem of cloud computing - the inability to control computer processes, and hence the impossibility of dynamic balancingFig. 7 Represents The scheme of distributed computing systems based on cloud computing technology as standard cloud computing system using flow control.

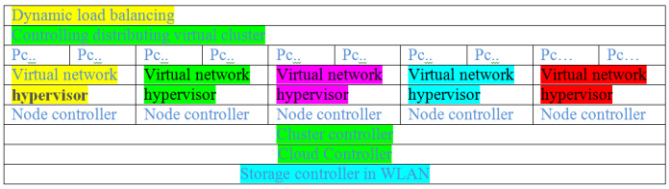

Fig. 7 Schema for Driving a distributed computing systems based on cloud computing technology

Fig. 7 Represents The scheme of distributed computing systems based on cloud computing technology as standard cloud computing system using flow control. Since the flows can be substantially irregular, and the load on the individual cores is irregular, which greatly reduces the productivity of the whole system. To eliminate such defect , load balancing is used .The proposed approach in this work enabling applications aimed at processing large amounts of data, using the methods of load balancing by migrating data processing in virtual clusters.

The proposed formula have been developed to compute the performance of system with migration process and withoutmigrationPerformanceComputingSystemP(S)withoutmigrationprocesses:

P (S) = P (n, x, u, q, y), where

P (S) = the performance of the entire system,

n = number of cores ,

x = the performance of a single core,

u = performance communications environment,

q = the efficiency of the program code,
y = productivity data processing algorithms,
adding new argument that specifies the operation to the migration process ,produce new formula to compute the Performance Computing System P (S) with migration processes:
P (S) = F (n, x, u, q, y, m), with m = migration processes. The cluster is constantly trying to align the load units due to dynamic migration processes of great load nodes to nodes with a smaller load. Users run their applications, and the system is transparent to them seeking free resources in the cluster and distributes the processes among the available nodes, thereby increasing overall performance. This approach will bring new opportunities for the division of computing power and other resources, such as memory and information channels.

H. Scheme of the virtual cloud cluster

In order to organize such migration between the nodes in the cloud system, functional virtual cluster environment with a single operating system image (SSI) can be implemented, therefore automatically parallelizing tasks between nodes as demonstrated in figure 8.

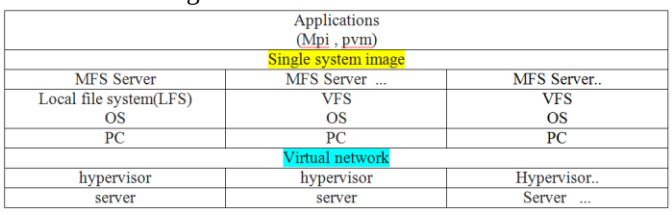

Fig. 8 Scheme of the virtual cloud cluster with a single operating system image

The single operating system image environment with the help of using uses a distributed file system. It provides a unified view of all files on all mounted file systems on all nodes in the cluster as if they are all within a single file system. As a result of this technique its organizing an effective computer system, allowing for the first time to perform dynamic balancing of computing nodes of the cloud computing environment due to migration processes, not data.The Scheme of the virtual cloud cluster with a single operating system image will provide a strong interaction between parallel processes and management that effectively addressed through cloud technology , even for very system tasks . As a result of this approach, allows creating distributed computing systems based on cloud computing technology. Such systems are characterized by high reliability, low cost, and performance, which could be an ideal approaching.

IV. CONCLUSION

The main directions of improvement of computer systems is to improve their performance, increase reliability anddecrease price / performance. A new approach designed to create the operating environment of cloud computing ,will improve overall performance of heterogeneous software and hardware systems in the average order by adapting the architecture of each individual virtual machine for a specific user application. The designed method allows organizing an effective computer system that allows for dynamic balancing of computing nodes of the cloud computing environment due to migration processes, not data.

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