ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

Investigate Data Center Performance and QOS in IAAS Cloud Computing Systems using A Stochastic Model

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ABSTRACT:

Cloud data center management is a key problem due to the numerous and heterogeneous strategies that can be applied, ranging from the VM placement to the federation with other clouds. Performance evaluation of cloud computing infrastructures is required to predict and quantify the cost-benefit of a strategy portfolio and the corresponding quality of service (QOS) experienced by users. Such analyses are not feasible by simulation or on-the-field experimentation, due to the great number of parameters that have to be investigated. In this paper, we present an analytical model, based on stochastic reward nets (SRNs), that is both scalable to model systems composed of thousands of resources and flexible to represent different policies and cloud-specific strategies. Several performance metrics are defined and evaluated to analyze the behavior of a cloud data center: utilization, availability, waiting time, and responsiveness. A resiliency analysis is also provided to take into account load bursts. Finally, a general approach is presented that, starting from the concept of system capacity, can help system managers to opportunely set the data center parameters under different working conditions.

Index Terms:

Cloud computing, stochastic reward nets, cloud-oriented performance metrics, resiliency, responsiveness.

I. INTRODUCTION:

Cloud computing is the use of computing resources (hardware and software) that are delivered as a service over a network (typically the Internet). The name comes from the common use of a cloud-shaped symbol as an abstraction for the complex infrastructure it contains in system diagrams. Cloud computing entrusts remote services with a user's data, software and computation.

Cloud computing consists of hardware and software resources made available on the Internet as managed third-party services. These services typically provide access to advanced software applications and high-end networks of server computers.

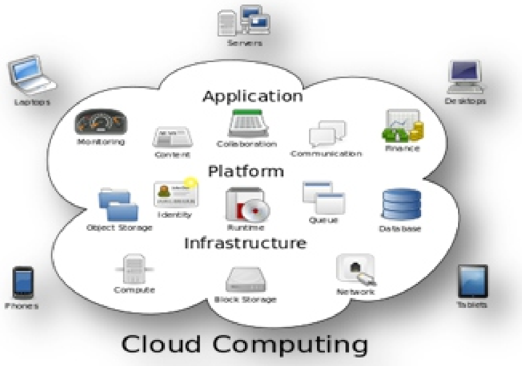

Fig 1.1 Structure of cloud computing

The goal of cloud computing is to apply traditional supercomputing, or high-performance computing power, normally used by military and research facilities, to perform tens of trillions of computations per second, in consumer-oriented applications such as financial portfolios, to deliver personalized information, to provide data storage or to power large, immersive computer games. The cloud computing uses networks of large groups of servers typically running low-cost consumer PC technology with specialized connections to spread data-processing chores across them. This shared IT infrastructure contains large pools of systems that are linked together. Often, virtualization techniques are used to maximize the power of cloud computing.Cloud Computing comprises three different service models, namely Infrastructure-as-a-Service (IAAS), Platform-as-a-Service (PAAS), and Software-as-a-Service (SAAS). The three service models or layer are completed by an end user layer that encapsulates the end user perspective on cloud services.

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The model is shown in figure below. If a cloud user accesses services on the infrastructure layer, for instance, she can run her own applications on the resources of a cloud infrastructure and remain responsible for the support, maintenance, and security of these applications herself.

II. PURPOSE OF THE PROJECT:

Performance evaluation of Cloud Computing infrastructures is required to predict and quantify the cost-benefit of a strategy portfolio and the corresponding Quality of Service (QoS) experienced by users. Such analyses are not feasible by simulation or on-the-field experimentation, due to the great number of parameters that have to be investigated. In this paper, we present an analytical model, based on Stochastic Reward Nets (SRNs), that is both scalable to model systems composed of thousands of resources and flexible to represent different policies and cloud-specific strategies. Several performance metrics are defined and evaluated to analyze the behavior of a Cloud data center: utilization, availability, waiting time, and responsiveness.

III. EXISTING SYSTEM:

In order to integrate business requirements and application level needs, in terms of Quality of Service (QoS), cloud service provisioning is regulated by Service Level Agreements (SLAs): contracts between clients and providers that express the price for a service, the QoS levels required during the service provisioning, and the penalties associated with the SLA violations. In such a context, performance evaluation plays a key role allowing system managers to evaluate the effects of different resource management strategies on the data center functioning and to predict the corresponding costs/benefits.

Cloud systems differ from traditional distributed systems. First of all, they are characterized by a very large number of resources that can span different administrative domains. Moreover, the high level of resource abstraction allows to implement particular resource management techniques such as VM multiplexing or VM live migration that, even if transparent to final users, have to be considered in the design of performance models in order to accurately understand the system behavior. Finally, different clouds, belonging to the same or to different organizations, can dynamically join each other to achieve a common goal, usually represented by the optimization of resources utilization. This mechanism, referred to as cloud federation, allows to provide and release resources on demand thus providing elastic capabilities to the whole infrastructure.

IV. PROPOSED SYSTEM:

A stochastic model, based on Stochastic Reward Nets (SRNs), that exhibits the above mentioned features allowing to capture the key concepts of an IaaS cloud system. The proposed model is scalable enough to represent systems composed of thousands of resources and it makes possible to represent both physical and virtual resources exploiting cloud specific concepts such as the infrastructure elasticity. With respect to the existing literature, the innovative aspect of the present work is that a generic and comprehensive view of a cloud system is presented. Low level details, such as VM multiplexing, are easily integrated with cloud based actions such as federation, allowing investigating different mixed strategies. An exhaustive set of performance metrics are defined regarding both the system provider (e.g., utilization) and the final users (e.g., responsiveness).

IV.I SYSTEM ARCHITECTURE:

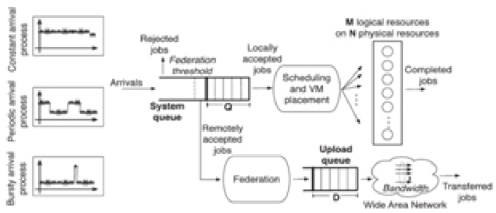

Fig: 3.3 System Architecture

IV.II SYSTEM STUDY:

» Systems analysis is a problem solving technique that decomposes a system into its component pieces for the purpose of the studying how well those component parts work and interact to accomplish their purpose

» Systems analysis is the study of sets of interacting entities, including computer systems analysis. According to the Merriam-Webster dictionary, systems analysis is “the process of studying a procedure or business in order to identify its goals and purposes and create systems and procedures that will achieve them in an efficient way”.

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» Analysis and synthesis, as scientific methods, always go hand in hand; they complement one another. Every synthesis is built upon the results of a preceding analysis, and every analysis requires a subsequent synthesis in order to verify and correct its results.
» This field is closely related to requirements analysis or operations research. It is also "an explicit formal inquiry carried out to help someone (referred to as the decision maker) identify a better course of action and make a better decision

IV.III. FEASIBILITY STUDY:

The feasibility of the mission is analyzed on this phase and industry notion is put forth with an extraordinarily general plan for the task and a few cost estimates. In the course of process evaluation the feasibility be taught of the proposed approach is to be carried out. That is to ensure that the proposed procedure shouldn't be a burden to the enterprise. For feasibility evaluation, some understanding of the important requirements for the procedure is principal.Three key considerations involved in the feasibility analysis are

» ECONOMICAL FEASIBILITY
» TECHNICAL FEASIBILITY
» SOCIAL FEASIBILITY

V. INPUT AND OUTPUT DESIGN:
INPUT DESIGN:

The input design is the link between the information system and the user. It comprises the developing specification and procedures for data preparation and those steps are necessary to put transaction data in to a usable form for processing can be achieved by inspecting the computer to read data from a written or printed document or it can occur by having people keying the data directly into the system. . Input Design considered the following things:
What data should be given as input?

How the data should be arranged or coded?

The dialog to guide the operating personnel in providing input?

Methods for preparing input validations and steps to follow when error occur?

OUTPUT DESIGN:

A quality output is one, which meets the requirements of the end user and presents the information clearly. In this project we are displaying the results in the text area of user interface. Output is generated when user take an action performed like pressing the button with respect to the function.

VI.CONCLUSION AND FUTURE WORK:

In this paper, we have presented a stochastic model to evaluate the performance of an IAAS cloud system. Several performance metrics have been defined, such as availability, utilization, and responsiveness, allowing us to investigate the impact of different strategies on both provider and user point of views. In a market-oriented area, such as the cloud computing, an accurate evaluation of these parameters is required to quantify the offered QOS and opportunely manage SLAs. Future works will include the analysis of autonomic techniques able to change on-the-fly the system configuration to react to a change on the working conditions. We will also extend the model to represent PAAS and SAAS cloud systems and to integrate the mechanisms needed to capture VM migration and data center consolidation aspects that cover a crucial role in energy saving policies.

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