Automatic VM Analytics Using Hybrid SPRNT Approach in Real Time
Cloud Environment
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ABSTRACT
Cloud computing is the computing of aggregation and involves storage with network resources into a single entity called “cloud” into which contains location independent of computing is performed. Cloud computing is an evolution of the Service-Oriented Architecture (SOA), virtualization and Utility Computing. In efficient resource management, the virtualized data center is always a practical concern and it has attracted significant attention. This allocation mechanism is desired to maximize the spaces for various cloud providers. This paper analyzes overbooking and automatic virtual machine from physical machine management to avoid resource over-provision problem according to its runtime demand. It proposes an automatic model to control the overbooking policy while it provides usages probability based on the performance and risk estimation. To cooperate with overbooking policy, it optimizes the VM placement with resource-aware strategy to satisfy application's QoS requirement. In this paper, Automated VM provisioning approach in which multiple VMs are consolidated and provisioned based on an approximation of their aggregate capacity needs. To implement cloud analytics in cloud computing in which it have reached the goal of attaining the overload avoidance and green computing concept successfully.

1. Introduction
In computing, virtualization means to create a virtual version of a device or resource, such as a server, storage device, network or even an operating system where the framework divides the resource into one or more execution environments. Even something as simple as partitioning a hard drive is considered virtualization because you take one drive and partition it to create two separate hard drives. Devices, applications and human users are able to interact with the virtual resource as if it were a real single logical resource. The term virtualization has become somewhat of a buzzword, and as a result the term is now associated with a number of computing technologies including the following:

- Storage virtualization: the amalgamation of multiple network storage devices into what appears to be a single storage unit. Storage virtualization is the pooling of physical storage from multiple network storage devices into what appears to be a single storage device that is managed from a central console.
- Server virtualization: the partitioning a physical server into smaller virtual servers. Server virtualization is the masking of server resources, including the number and identity of individual physical servers, processors, and operating systems, from server users.
- Operating system-level virtualization: a type of server virtualization technology which works at the operating system (kernel) layer.
- Network virtualization: using network resources through a logical segmentation of a single physical network. In computing, network virtualization is the process of combining hardware and software network resources and network functionality into a single, software-based administrative entity, a virtual network. Network virtualization involves platform virtualization, often combined with resource virtualization.
- Application virtualization - Application virtualization is software technology that encapsulates computer programs from the underlying operating system on which it is executed. A fully virtualized application is not installed in the traditional sense, although it is still executed as if it were. The application behaves at runtime like it is directly interfacing with the original operating system and all the resources managed by it, but can be isolated or sandboxed to varying degrees. The virtualization is defined in fig. 1.

Fig. 1. Virtualization Defined

For those more visually inclined...

Traditional Architecture

Virtual Architecture

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2. Related Work
Ahmed Ali, Eldin, et.al...[1] presented a cloud is an elastic execution environment of resources involving multiple stakeholders and providing a metered service at a specified
level of quality. One of the major benefits of using cloud computing compared to using an internal infrastructure is the ability of the cloud to provide its customers with elastic resources that can be provisioned on demand within seconds or minutes. These resources can be used to handle flash crowds.

Anthony Sulistio, et. al.,... [2] provided the main objective of resource management is to maximize profits by providing the right price for every product to different customers, and to periodically update the prices in response to market demands. Therefore, the resource provider can apply RM techniques to shift demands, and to ensure that resources are allocated to applications that are highly valued by the users. The result shows an increase in total revenue for resources that utilize RM over those that price their resources statically. In reality, users may cancel their reservations before starting time or by not submitting at all (no-show), due to reasons such as resource or network failures on the other end.

Anton Beloglazov, et. al,... [3] focused on the first sub problem—the problem of host overloads detection. Detecting when a host becomes overloaded directly influences the QoS, because if the resource capacity is completely utilized, it is highly likely that the applications are experiencing resource shortage and performance degradation. What makes the problem of host overload detection complex is the necessity to optimize the time-averaged behavior of the system, while handling a variety of heterogeneous workloads placed on a single host.

Carlos Vazquez, et.al,... [4] evaluate the proposal, the fuzzy risk assessment is included into the framework presented in, which only included a simple admission control technique. Those VMs simulate the execution of a dynamic workload made of different kind of applications (some of them with steady behavior and others with bursty one), profiled by using monitoring tools after running the real applications. The workload is a mixture of applications, following a Poisson distribution for submission rates.

Sijin He, et.al,... [5] Introduced an algorithm for improving resource utilization for cloud providers. It uses a multivariate probabilistic normal distribution model to select suitable PMs for VM re-allocation before a reconfiguration plan is generated, which leads to less number of VMs being re-allocated (i.e. less migration costs). We call this procedure as PM Candidate Selection (PMCS). Two heuristic metrics are considered, i.e. imbalance and volume, which exhibit multidimensional characteristics of VMs and PMs for achieving better resource utilization.

3. SPRNT Framework

A cloud computing system offers to its users the delusion of “infinite” computing and storage capability on an on-demand basis. New diversity of security vulnerability caused by competition between virtual I/O workloads - i.e., by invest the struggle for shared resources correlate degree individual may designed by limit the execution of a under attack application during a VM that shares an equivalent hardware. Specially, we have a propensity to specialize in I/O resources like hard-drive produce and/or system information calculate - that area unit essential for data-intensive applications. Implement an SPRNT framework on I/O resources such as hard-drive throughput and/or network bandwidth - which are critical for data-intensive applications. We design and implement SPRNT, a framework which use a suspiciously designed workload to acquire major delays on the targeted application and VM with minimum cost (i.e., resource consumption).While there are more number of users uses the application except an active tab other tab loading bandwidth to be stopped. The speeds of the ideal tab are reallocated to the new requested user. Then the user can uses the same application with the same speed. Then present the design and implementation of an automatic resource organization system that achieves a good balance between the two goals such as we expand a resource allocation system that can avoid excess in the system effectively while minimizing the number of servers used and introduce the idea of “fuzzy assessment” to calculate the uneven utilization of a server. By analyzing risk assessment, we can develop the overall consumption of servers in the face of multidimensional resource constraints. We plan overbooking algorithm that can confine the future resource usages of applications accurately without looking inside the VMs. The algorithm can capture the increasing trend of resource usage patterns and help reduce the placement churn significantly. In order to get an optimal solution for a simplified version of the resource allocation problem and an efficient heuristic this approach provides controller which gives the virtualization to storage network.

3.1 Hybrid SPRNT Framework

We planned for scheduling user request in virtual machines and also extend our approach to allocate the resources in MAC based authentication, automatic VM and analyze cloud analytics.

3.1.1 MAC address based authentication:

One of the key challenges is to design the cloud computing security architecture for storage environments. So using the technique for advancing the level of security we used is MACADDRESS cross verification. Since MAC address of every device is unique which helps in identifying the exact device using a cloud application. These features increased the security of an application. For maximal protection we have added a technique of MAC address verification which benefits the user in terms of authenticity. During sign up the MAC address is fetched and saved into database. Whenever the user Logins the MAC address get verified. If MAC address is matched the user of application is a genuine owner. If it doesn’t matches the application will not get opened.

3.1.2 Automated VM allocation

This level represents the risk aware admission controller. This paper implement MAC address based authentication framework. This framework is used to find a suitable server for task scheduling and calculate the fairness values to the Overbooking. Summarize over all running tasks capacity in VM environments. Evaluates the risk associated to the new incoming request by calling the fuzzy risk assessment module. Calculate the acceptance risk and the data center risk thresholds. Resource allocation is used to assign the available resources in an economic way. Resource distribution may be decided by using computer programs applied to a exact domain to without human intervention and dynamically allocate resources to applicants. User sends the request to the admission controller. The request may be resource request or file request. Admission controller analyzes the demands for user requests. Knowledge DB get data center behavior that is CPU, Memory and IO Utilization also analyze available running tasks and idle tasks, then calculate VM execution time and memory. Admission controller makes decision, whether it is accepted or not. If the service is accepted, request is sent to
overbooking scheduler to analyze horizontal elasticity in virtual machines.

If service is rejected, request is sent to risk assessment controller to analyze capacity of VM. Based on these following parameters, decision is made. Request(R) - CPU, memory, and I/O capacity required by the new incoming service. UnRequest (UR) - the difference between total data center capacity and the capacity requested by all running services. Free (F) - the difference between total data center capacity and the capacity used by all running services. The fuzzy assessment analyzes the risk threshold values and PID controller finds error values about machine status. Contains following errors such as present error (P), the accumulated error (I), and the prediction of future errors (D). Implement the self destruction prototype. In this approach, can set validity for accessing resources. And implement the system that contains alert at the time of resource validation become expired. Automatic alert system is helpful to user for extending alert at the time of resource validation become expired. If user may ignore this a destruction process is invoked periodically at each call. We implemented a proof-of-concept self destruction prototype. In this approach, can set validity for accessing resources.

3.1.3 Cloud Analytics

In this paper we additionally add cloud analytics approach to analyze service model which provides used spaces for users. Self-destructing data mainly aims at the user data’s data. All the data and their copies turn out to be destroyed or unreadable after a user-specified time, without any user involvement. Based on active storage framework, we use an object-based storage interface to store and manage the equally divided key. We implemented a proof-of-concept self destruction prototype. In this approach, can set validity for accessing resources. And implement the system that contains alert at the time of resource validation become expired. Automatic alert system is helpful to user for extending resources. If user may ignore this alert means, all resources automatically destructed to save resources. And also preserve user’s resources who are not access their resources in default time period.

Overbooking process analyzed based on following formula such as

\[
\text{risk}_i = \begin{cases} 
0 & \text{if } \text{Req}_i < \text{Unreq}_i \\
\frac{\text{Req}_i - \text{Unreq}_i}{\text{Free}_i} & \text{if } \text{Unreq}_1 < \text{Req}_i < \text{Free}_i \\
1 & \text{if } \text{Req}_i > \text{Free}_i 
\end{cases}
\]

The proposed system considers the process of resource management for a large-scale cloud environment. Such an environment includes the physical infrastructure and associated control functionality that enables the provisioning and management of cloud services. The perspective we take is that of a cloud service provider, which hosts sites in a cloud environment.

The pseudo code of the algorithm is:

**Optimized VM Scheduling**

Input: Memory Utilization
Output: A decision on whether to create a VM

1: if the Memory utilization history size > Threshold then
2: Convert the last memory utilization value to a state
3: Invoke the Multi-size Sliding Window estimation to obtain the probabilities
4: Invoke the OPVMS-OPT algorithm
5: return the decision by OPVMS-OPT
6: end if
7: return false

This algorithm is necessary to maximize the mean time between VM migrations initiated by the host overload detection algorithm, which can be achieved by maximizing each individual intermigration time interval. Therefore, we limit the problem formulation to a single VM migration, i.e., the time span of a problem instance is from the end of a previous VM migration and to the end of the next. Each VM allocated to a host at each one time utilizes a part of the CPU capacity determined by the application workload. The CPU utilization created over a period of time by a set of VMs allocated to a host constitutes the host’s workload. For the initial analysis, we assume that the workload is known a priori, stationary, and satisfies the Markov property.

**OPVMS-OPT algorithm**

Input: User Request data size
Output: A decision on whether to create VM or not
1: Build the objective and constraint functions
2: Invoke scheduling to find the m vector for virtual machine
3: if a feasible solution exists then
4: Extract the VM migration probability
5: if the probability is < 1 then
6: return false
7: end if
8: end if
9: return true

This algorithm refers to a control algorithm based on the model introduced in the Optimal Markov VM Overload Detection (MMOD-OPT) algorithm. We refer to the MMOD-OPT algorithm adapted to unknown non stationary workloads using the Multi-size Sliding Window workload estimation technique. In the online setting, the algorithm is invoked periodically at each time step to make a VM migration decision. In MMOD-OPT, a decision to migrate a VM is made only if either no feasible solution can be found, or the migration probability corresponding to the current state is 1. The justification for this is the fact that if a feasible solution exists and the migration probability is less than 1, then for the current conditions there is no hard requirement for an immediate migration of a VM.

4. Results and Simulation

Efficient resource management in the virtualized data center is always a practical concern and has attracted significant attention. In particularly, economic allocation mechanism is desired to maximize the revenue for commercial cloud providers. This paper uses overbooking from Revenue Management to avoid resource over-provisioning according to its runtime demand. We propose an economic model to control the overbooking policy while provide users probability based performance guarantee using risk estimation. To cooperate with overbooking policy, we optimize the VM placement with traffic-aware strategy to satisfy application’s QoS requirement.
We design fuzzy assessment and algorithm to achieve traffic localization in order to reduce network bandwidth consumption, especially the network bottleneck bandwidth, thus to accept more requests and increase the revenue in the future.

The simulation results show that our approach can greatly improve the request acceptance rate and increase the revenue by up to 87% while with acceptable resource confliction.

5. Conclusion
Cloud computing allows trade customers to level up and down their resource usage based on needs. A lot of the touted gains in the cloud model arise from resource multiplexing through virtualization technology. In this project, we present a system that uses virtualization technology to distribute data center resources dynamically based on application load and support green computing by optimizing the quantity of servers in use. We design a load prediction algorithm that can capture the future resource usages of applications accurately without looking inside the VMs. The algorithm can capture the rising trend of resource usage patterns and help reduce the placement churn significantly. We have implemented the resource management concept in cloud computing in which we have reached the goal of achieving the overload avoidance and green computing concept successfully. We have also used the distributed PID controller approach concept to combine the VM's so that all the servers are utilized. Our system multiplexes virtual to physical resources adaptively based on the changing demand. We use the fuzzy metric to combine VMs with different resource characteristics appropriately so that the capacities of servers are well utilized. Our algorithm achieves both overload avoidance and green computing for systems with multi resource constraints. For on-demand pricing is done as pay per-use basis but in reservation plan pricing is charged by onetime fee. With Reservation plan consumers could utilize the computing resources in a much cheaper amount than on demand plan.

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