



Employing Desktop-as-a-Service (DaaS) for accessing data from Cloud with the help of Para-virtualization Technique

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Abstract

Desktop-as-a-Service (DaaS) in cloud computing means that user can access its own desktop services as well as services of other desktops located on remote servers. It is obvious that for accessing virtual desktops services, resources should be managed and utilized in judicious way. It requires concentration on factors like number of users actively working on one server, their priorities for accessing services, their interconnection among other users and many more.

Our aim is to achieve maximum resource utilization and throughput, maintain confidentiality and authentication without prohibiting Service Level Agreements (SLA's). The paper revolves around the feasibility of data access in cloud environment by considering various techniques, thus providing efficient access and customer satisfaction. It includes use of para-virtualization technique that is based on modification of operating system to provide services across multiple machines on remote servers. Various resource management strategies have already been practiced by previous researchers in field of cloud computing. Few of them are presented in this paper.

In this paper, a comparative study is made between features of traditional desktop-as-a-service model and para-virtualized desktop model which provides solution in favor of virtualization cloud environment.

Keywords:

Cloud computing, Desktop-as-a-Service (DaaS), resource management, virtualization and para-virtualization.

1. INTRODUCTION

The definition of cloud computing as per Gartner is "A style of computing where massively scalable IT facilitates capabilities is delivered as a service to external customers using information and communication technologies" [4].

Cloud computing is massive information technology that helps in performing large computational tasks in easier way. It provides services in seamless manner which means that users can use services according to their needs and pay for only those services that they use. Cloud computing deals with relocatable services, provides data for cost and centralized database of servers. Relocatable services mean that services can be provided to remote desktops on remote locations if data is available in cloud. So, it is very important that data must be present in cloud before accessing it.

The effect of cloud computing providers like Amazon, Google Docs is seen in mobile technology also. Using these applications in mobile phones require less computational complexity as compared to using them on computers. We use emails, galleries, Google apps, Microsoft live etc; all these are cloud platforms. For effective accessing of data, it is mandatory to bring transformation in traditional desktop services into virtual desktop clouds (VDC). The traditional desktop interface uses hardware and software installed tools. Without installing this software, we cannot access the required services. But concept of VDC removes this ambiguity of installation at various servers.

The following paper is categorized into following sections. Section 2 makes readers aware through concepts of virtualization and its importance in



today's fast world of technologies. Section 3 proposes system architecture model that employs desktop-as-a-service with the help of para-virtualization mechanism. It also lists various differences between traditional service model and proposed model. Section 4 concludes about respective paper.

Literature Survey

This section presents various resource management techniques to access desktop-as-a-service efficiently in cloud environment. It is known that multiple users accessing services of one server may lead to inaccurate results. That's why management of resources is crucial factor in achieving high resource utilization. Few strategies of resource management are as follows:

- Automatic workload provisioning [1]: - It improves resource utilization in clouds by using several modeling techniques. It uses decentralized virtual machines that monitor the flow of incoming requests by different users for accessing applications.
- Linear Scheduling Tasks and Resources (LSTR) [2]: - It is based on scheduling algorithms used in selecting criteria of operating system. The resources are distributed on basis of their priority and precedence level in cloud environment. It is done by selecting Quality of Service (QoS) parameters like cost, on demand etc. The resources having more demand will be processed first.
- Live migration of Virtual Machines [3]: - It deals with distribution of operating system resources across various remote servers connected to centralized data centers. It uses pre-copy approach that means before processing of tasks, some pages of memory are copied from source machine to remote hosts so that all resources falling in criteria of these pages must be accessed without

any hindrance. Data is transferred to virtual machines from source machine without human intervention.

2. CONCEPT OF VIRTUALIZATION AND ITS IMPORTANCE

Need of Virtualization: - Since current desktop-as-a-service models are suitable for performing computations in Local area networks (LAN's) environments. These environments have fixed bandwidth, less availability of bandwidth index, static allocation of resources and non-distributed data centers for handling customer requests.

So, there is need to extend this service of cloud computing to wide area networks (WAN's) that possess dynamic and scalable allocation of resources, high bandwidth index, large distributed databases environment and centralized data servers. It is best achieved through Virtualization technique that uses virtual machines (VM's) and each machine handle client requests simultaneously. Use of this technique increase efficiency in accessing data resources from cloud and improves resource utilization. It is elaborated further in upcoming section of paper.

Virtualization is defined as treating a single physical resource like operating system, storage devices to act as multiple virtual servers. We can say that single operating system is connected to multiple Virtual machines for performing tasks. Virtualization hides physical characteristics of resources from their clients.

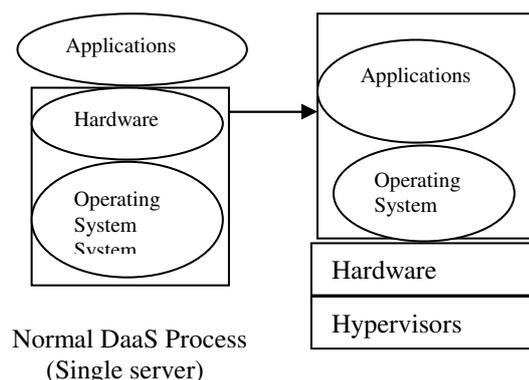




Fig 1: Process of Virtualization- A Server for multiple Applications/Operating System

In normal desktop-as-a-service cloud environment, operating system checks which servers have free resources to access the applications. Hypervisors are proven best for management of resources so that all clients can access data. They are set of programs that manage multiple operating system or multiple instances of single operating system. They manage CPU speed, memory and allocate resources according to operating system specifications.

2.1. Issues in Virtualization in Cloud computing

The top most issues that are governing every industry/ organizations are as follows:

- Virtualization backup and recovery: - Recovery from virtualized servers is little bit different from recovery from normal servers and databases. In virtualized servers, performing frequent backup may lead to loss of data from cloud. Although there are few backup vendors like Virtual Disk Development Kit (VDDK) for performing secure recovery but they are expensive and unavailable most of times.
- VM Sprawl: - Easy provision of virtual machines may lead to out of control of pop-up blockers on various cloud sites. The blockers will allow ads on sites simultaneously which leads to lack of management and handling of client requests.
- Virtual capacity planning: - To estimate future behaviors of resources, building budget and acquisition strategies, there are need to manage data efficiently by considering various factors like CPU memory usage, disk space and I/O functions.

- VM Stall: - Most companies are working on virtualized servers. Large number of virtual machines is increasing day by day due to virtualized deployment. VM Stall occurs due to lack of trust in administrators and performance management.
- Building a Private cloud: - Deploying services from virtual machines to private cloud is cumbersome task. It requires lot of infrastructure, geographical set-up and high investment. Also, there are no well defined strategies for building private cloud yet.

2.2 Types of Virtualization

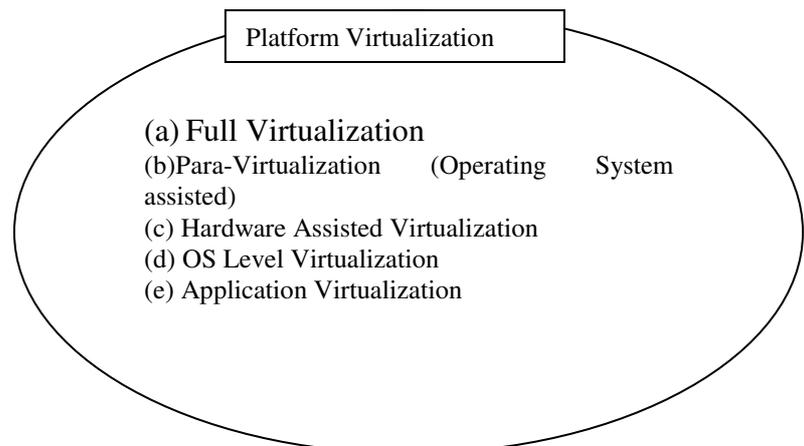


Fig 2: Types of Virtualization Techniques

- (a) Full Virtualization: - It is technique that provides complete simulation of machine using services of cloud environment. It leads to development of system in which all applications including operating system tags are executed on virtual machines. It is useful in ways:
 - Sharing single system among multiple servers.
 - Ensures scalability among multiple users and their resources.
 - Users are isolated from each other requests.



- Configures source machine according to client requests that satisfies productivity, reliability and security.

(b) Para-Virtualization: - Its aspects are written below:

- Para-virtualization involves modifying the OS kernel to replace non-virtualizable instructions with hyper calls that communicate directly with the virtualization layer hypervisor.
- Para-virtualization is different from full virtualization where the unmodified OS does not know it is virtualized and sensitive OS calls are trapped using binary translation.

(c) Hardware assisted virtualization: - It is also known as hardware accelerated virtualization or native virtualization. It works on basis of privileged instructions with new CPU execution mode and runs Virtual manager monitor to handle incoming client requests. Privileged and sensitive calls are set to automatically trap to the hypervisor, removing the need for either binary translation or para-virtualization.

(d) OS Level Virtualization: - It is technique that allows kernels for multiple user space instances where each OS is treated as single server. It creates isolated containers on physical server and OS instances that utilizes hardware, software and data center of thin cloud clients.

This virtualization is responsible for achieving live migration and load balancing of virtual machines.

(e) Application Virtualization: - Its aspects are shown below:

- Applications may run on different OS platforms, same OS of different framework.
- Improves portability and manageability of applications.

- Transforms all incoming requests into single client cloud using process of Encapsulation.

3. OUTLINE OF PROPOSED MODEL FOR ACCESSING DATA FROM CLOUD

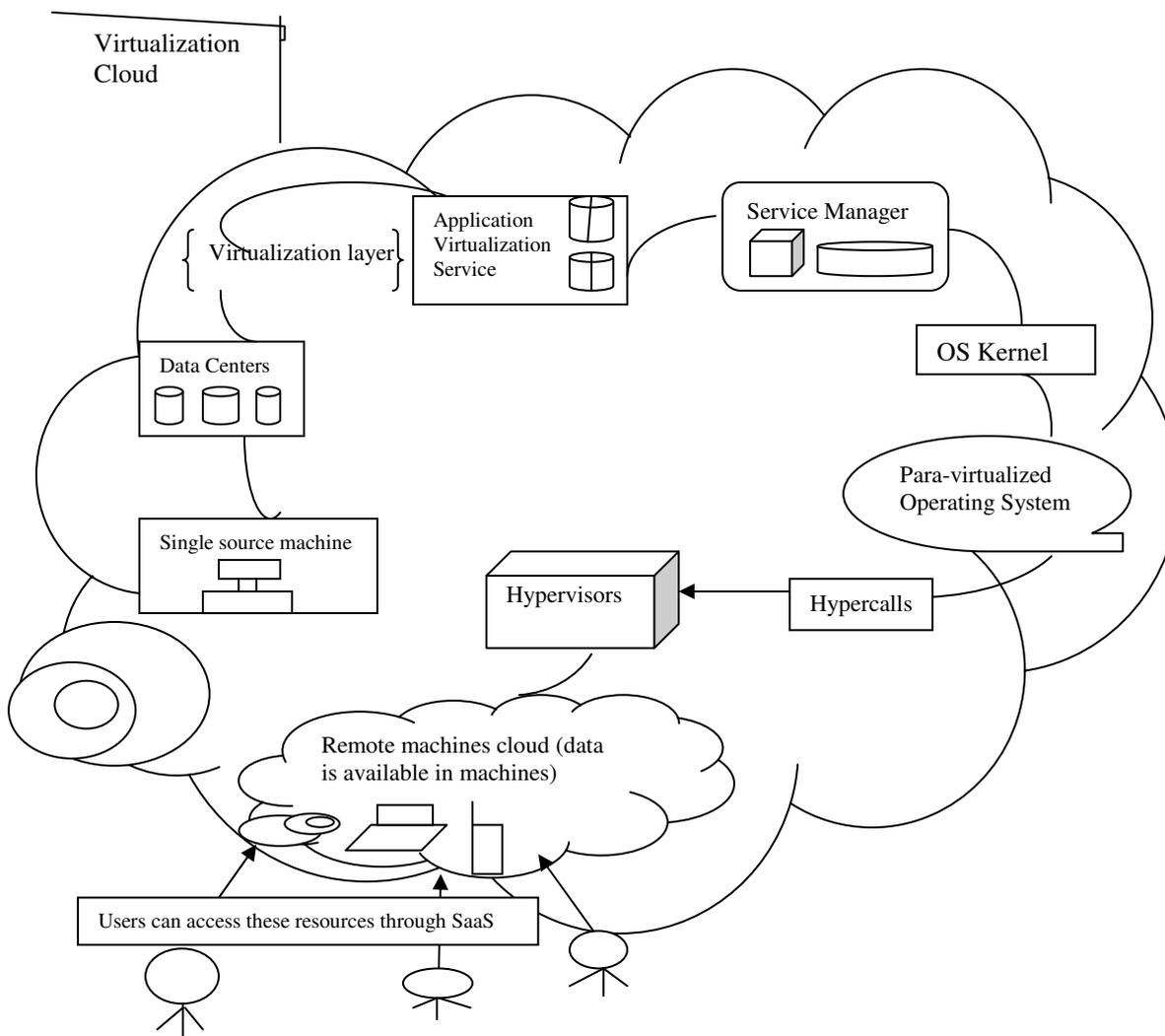


Fig 3: Systematic architecture employing Desktop-as-a-Service for accessing data from cloud using Para-Virtualization Technique

3.1 Aspects of aforementioned model

(a) Data is accessed from single source machine and is available to multiple remote machines through process of para-virtualization. It is operating system assisted virtualization.

(b) Servers connected to data center are allowed to enter virtualization environment.

(c) They are passed to application virtualizations service that follows Service Level Agreements (SLA's) factors like reliability, throughput, and durability etc thus reducing SLA violation.

(d) Service Manager is used that monitors the flow of resources arriving through application service layer. It monitors client request.

(e) All these requests are sent to operating system for further processing and computation. Since the requests may or may not suited to hardware specifications.

(f) For making them adaptable to operating system requirements, para-virtualized OS is used. It modifies OS kernel and replaces non compatible requests with hyper calls that communicates with hypervisor.



(g) As hypervisor is virtualization manager on physical hardware, so it fulfills multiple client requests for various resources and runs multiple applications.

(h) These resources are stored in form of various applications and are provided to multiple remote devices like laptops, mobile phones etc.

(i) Different user clients can now access these resources through SaaS.

3.2. Comparison between traditional DaaS and DaaS through para-virtualization technique in cloud environment

Traditional DaaS	Para-virtualized DaaS
(i) Multiple users accessing through one server causes inaccurate results and deadlock condition.	(i) Multiple users can access resources of one server through use of virtual machines (VM's)
(ii) Lack of resources will lead to higher waiting time in ready queue of OS kernel.	(ii) Hypervisors are used to ensure availability of resources according to incoming client requests thus reducing waiting time of OS.
(iii) High investment cost at service provider and increased SLA violation.	(iii) Application virtualization service provider provides services in accordance with factors of SLA.
(iv) Slow response time due to checking of non virtualizable requests.	(iv) Faster response time due to para-virtualized OS.
(v) Less resource utilization.	(v) Maximize resource utilization and efficiency due to virtualized environment.
(vi) Resource manager used in DaaS does not respond directly to OS requests.	(vi) Virtualization manager used in this method transforms OS requests directly into hyper calls.

Table 1: Traditional DaaS vs. Para-Virtualized DaaS

4. CONCLUSION

The paper describes use of para-virtualization technique for accessing data from desktop-as-a-service cloud environment. The efforts led by various researchers have analyzed various resource management strategies in order for effective handling of resources and client requests. Some of them are live migration of virtual machines, load balancing, scheduling



algorithms policy and many more. There are many virtualization techniques like Application virtualization, hardware virtualization, Platform virtualization etc. that are governing many enterprises and organizations. Out of them, the paper has introduced use of para-virtualization technique in existing desktop cloud model.

Virtualization is defined as treating a single physical resource like operating system, storage devices to act as multiple virtual servers. We can say that single operating system is connected to multiple Virtual machines for performing tasks. Virtualization hides physical characteristics of resources from their clients. The whole process showing how data is accessed from cloud environments is depicted here. It includes hypervisors or virtualization managers that controls the flow of incoming clients requests and refine them into separate cloud. Use of this technique leads to high scalability, high resource utilization, high bandwidth, dynamic allocation of resources, distributed data centers and less violation of SLA's.

Although there are few issues in virtualization technique but due to its easy access, inexpensive nature and reliability platform, it is still in demand among various companies and research centers.

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