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Research Article

Improving Server Efficiency using VM Consolidation and Migration

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Abstract

Cloud storage is a cloud computing model in which data is accumulated on remote servers accessed from the internet. Cloud is sustained, promoted and guided by a cloud storage service provider on a storage server that is built on virtualization procedure. A cloud application is a software program where cloud based and local components attempt mutually. The cloud server routinely is posted in a remote data centre fulfilled by a third party cloud service infrastructure provider. Virtualization is one of the mean to designate the cloud resource precisely. The exploit of the system can be upgraded by using local negotiation based Virtual Machine (VM) consolidation mechanism. To assign the resources, VM migration and Self destruction entrance are resolved. Self destruction intend run out the space when it is pristine for prolonged time. By using co-located strategy, the VM is generated by assemble the pristine space from alternative VM. The pristine storage can be reborned by automatic memory control framework.

Keywords: Advanced Encryption Standard; VM monitoring; VM migration; Service-level agreement; Self destruction.

Introduction

Cloud Computing is use of hardware and software package to deliver a service over a network. The user will access files and user application from any devices. VM Consolidation is to enhance the energy potency. VM consolidation migrates the running VM from underutilized physical resources to alternative resources to scale back the energy consumption. It conjointly involves live migration, is that the capability of transferring a VM between physical servers with a detailed to zero down time is associative economical thanks to improve utilization of resource and energy potency in cloud knowledge centres. Cloud application server usually area unit settled in a very remote knowledge centre operate by a third-party cloud services infrastructure supplier. Cloud based application takes could cover email, file storage and sharing, order entry, Inventory management, data processing, client relationship management (CRM), knowledge assortment or money accounting feature. VM consolidation in cloud computing could be a terribly huge challenge. The aim of this paper is to model VM consolidation mistreatment associate open stack (open supply cloud) in such some way, to scale back power consumption whereas creating the utmost use of resource on the ability on physical server. VM is associate emulation of a specific automatic data processing system. In cloud computing, virtual machine migration could be a great tool for migration software package instance across multiple physical machines. It accustomed load equalisation, fault management, low level maintenances and cut back energy consumption.

In recent years, there have been major significant researches in data center energy efficiency. The most of research focus on VM consolidation methods as an emerging solution to save energy in cloud data centers. The main idea in the existing VM consolidation approaches is to use live migration to consolidate VMs periodically [1-3]. These approaches reduce the power consumption by packing the existing VMs into fewer PMs and switching the idle PMs into a power saving mode. Sandpiper [4] is a system that is enabled to detect over-utilized PMs and creates a new mapping of

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physical resources to virtual resources. To detect overloaded PMs, Sandpiper collects VM and PM usage statistics, constructs profiles of resource usage and then uses the prediction techniques. Bobroff et al [5] Presents a dynamic server migration and consolidation algorithm which uses time series forecasting techniques and bin packing heuristic to minimize the number of PMs required to support a workload. Their algorithm does not take into account the number of migrations required to a new placement. A VM consolidation algorithm should incorporate both performance and power considerations into its decision making on new VM placement.

For this purpose, Sercon [6] considers a threshold value to prevent CPU's PM from reaching 100% utilization that leads to performance degradation. Therefore, it tries to keep the total usage of a PM below the threshold value. However, setting static thresholds are not efficient for an environment with dynamic workloads, in which different types of applications may run on a PM. Therefore, the threshold value should be tuned for each workload type and level to allow the consolidation task to perform efficiently. Beloglazov and Buyya [7] proposed adaptive upper and lower thresholds based on the statistical analysis of the historical data. A VM consolidation method can minimize the number of service-level agreement (SLA) violations by forecasting future resource utilization. Our previous works in [8,9] use prediction model to forecast PMs' utilization. If the predicted usage exceeds of the available capacity of a PM, some VMs are reallocated to other PMs for avoiding a SLA violation. Moreover, a resource usage prediction algorithm is presented in [10] to predict the system usage by interpolating what follows after the identified patterns from the historical data.

This algorithm uses a set of historical data to identify similar usage patterns to a current window of records that occurred in the past. In addition, a lot of research has been done on designing heuristic algorithms for solving the VM consolidation as a bin packing problem. This problem is known to be NP-hard, and there are many heuristic algorithms to solve it. In [11] the authors survey the existing greedy methods in order to tackle one-dimensional bin-packing problem. Among the most popular heuristics, the First Fit (FF) algorithm which places each item into the first bin in where it will fit. The second popular heuristic algorithm is the Best Fit (BF) which puts each item into the filled bin in which it fits. Moreover, the FF and BF heuristics can be improved by applying a specific order of items such as First Fit Decreasing (FFD) and Best Fit Decreasing (BFD). However, the classical bin packing algorithms cannot be used directly for VM consolidation and they should be modified for applying to the consolidation problem. Therefore, pMapper [12] applies a modified version of the FFD heuristic to perform server consolidation.

The proposed algorithm

The modules used to proposed system are cloud resource framework, SLA prediction, VM monitoring, Co-located VM, Self-destruction.

Cloud resources framework

Initialize the cloud system using multiple members such as cloud user, physical machine and virtual machine. Cloud resource framework is shown in fig. 1. Physical machine is responsible for allocate the resources in cloud system.

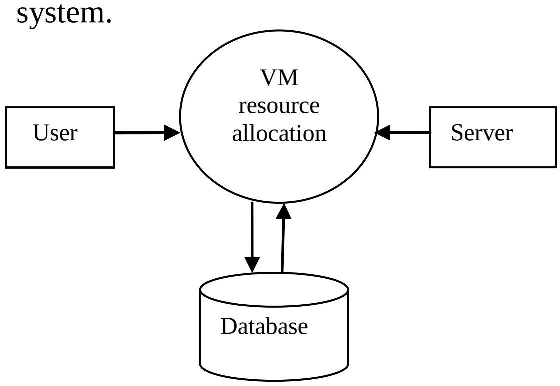


Fig. 1. Cloud resource framework

SLA prediction

A SLA could be a contract between physical machine and its users that documents what resources the physical machine can furnish and defines the performances standards (Fig. 2). Input the SLA values to physical machine to assign the resources.

VM monitoring

Cloud service providers check the user as individual or company and analyze the authorization of users. It contains two-sub modules such as VM prediction and migration plan (Fig. 3). VM prediction is used to know about the details of allocated spaces and free spaces in storage environment. VM migration plan is used to shift the control from one VM to another VM.

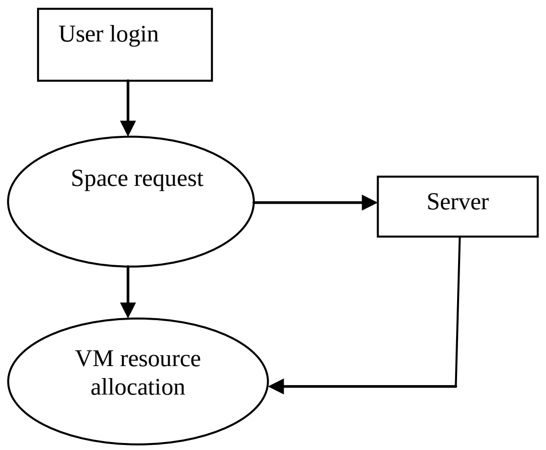


Fig. 2. SLA prediction

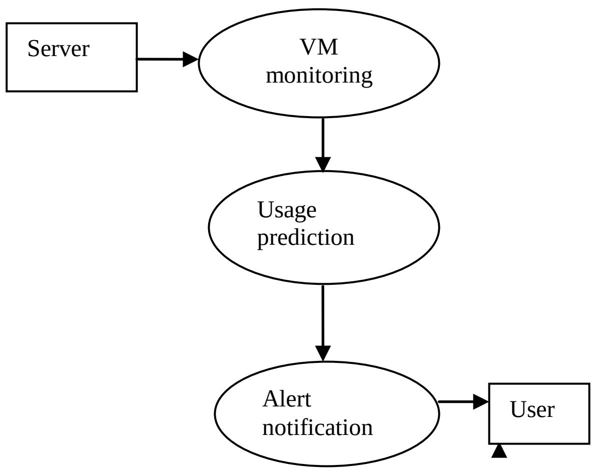


Fig. 3. VM monitoring

VM migration

Analyze the pending small spaces in each VM check the user SLA with available spaces. If the spaces are not enough means, combine pending spaces to create new VM spaces. It based on this migration, physical machine allocate resources in new spaces (Fig. 4).

Self-destruction

It calculates the time to live variable to predict the validity of each user (Fig. 5). If validity date is end means, send alert before one day for extending the resources space. It user is extend the resources means, allocate space in VM machine otherwise eliminate all resources which are allocated in VM for users.

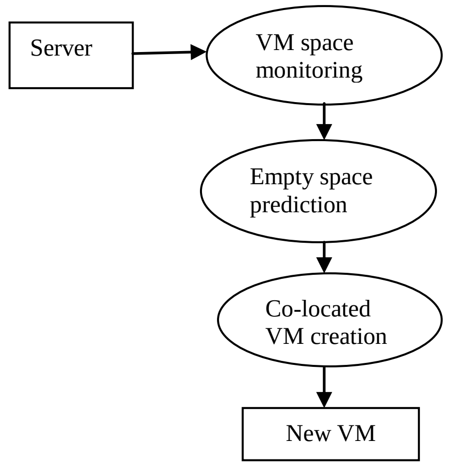


Fig. 4. VM migration

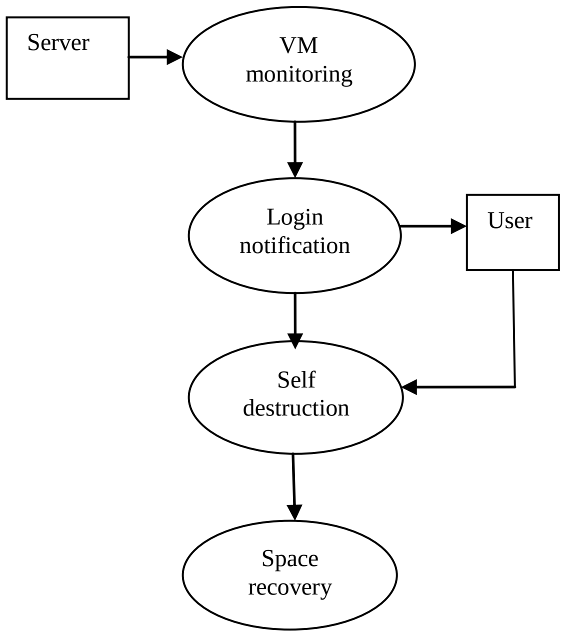


Fig. 5. Self destruction

System architecture

The data owner will request the space to the cloud. The data user will access the request, the data user can't able to storage the file, it can only search and access the file in the cloud storage. The SLA is the agreement between the cloud service provider and the user. SLA will monitor the virtual machine (VM) for security purpose, the form of encrypted (Fig. 6). To decrypt the data, the original data is decrypted by using the key in the data owner.

By verifying the key, the data is encrypted using Advanced Encryption Standard (AES). The data user will access the file through decryption and download the file. By using the VM monitoring, the usage of the space is monitored. When the data user does not use the space for the prolonged time, it will intimate the user to login the space provided to them.

When the user does not response to the intimate, the cloud will intimate two to three times to the user. If the user does not response to any of this intimation, the cloud will assume that there is no need of space to the user and it automatically empty the space by using self destruction approach.

The user want to recover the data, it will be backup and recovered. By using the co-located scheme, the empty spaces by various virtual machines are consolidated and create a new virtual machine to the user who request for the space.

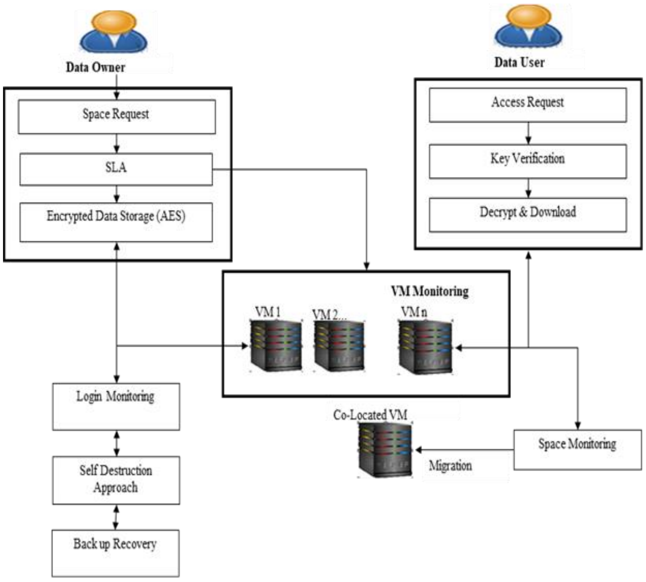


Fig. 6. Co located scheme of VM migration

AES algorithm

The AES cipher is additionally called the block cipher. No prospering attack has been reportable on AES. Some benefits of AES area unit simple to implement on 8-bit design processors and effective implementation on 32-bit design processors. Additionally, all operations area unit easy (e.g., XOR, permutation and substitution). AES cryptography is performed in multiple rounds. Every spherical has four main steps as well as sub-byte, shift row, combine column and add spherical key. Sub-byte is that the substitution of bytes from a look-up table. Shift row is that the shifting of rows per computer memory unit length. Combine column is multiplication over Galois field matrix. Finally, within the add spherical key step, the output matrix of combine column is XORed with the spherical key. The amount of rounds used for cryptography depends on the key size. For a 128-bit key, these four steps area unit applied to nine rounds, wherever the tenth spherical does not think about the combo column step. Since all steps area unit algorithm, decipherment is the reverse of cryptography.

Algorithm procedure

The rule begins with associate Add spherical key stage followed by nine spherical of 4 stages and a tenth round of 3 stages. This is applicable for each coding and decoding with the exception that every stage of a around the decoding rule is that the inverse of its counterpart within the coding rule. The four stages are as follows:

1. Substitute bytes
2. Shift rows
3. Combine Columns
4. Add Spherical Key

The tenth spherical merely leaves out the Combination Columns stage. The primary 9 rounds of the decoding rule consist of the following:

1. Inverse Shift rows
2. Inverse Substitute bytes
3. Inverse Add Spherical Key
4. Inverse Combine Columns

Again, the tenth spherical merely leaves out the Inverse Combine Columns stage. Every of those stages can currently be thought about in additional detail.

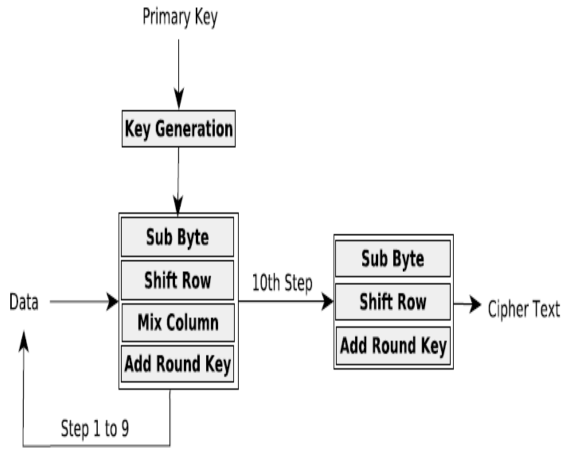
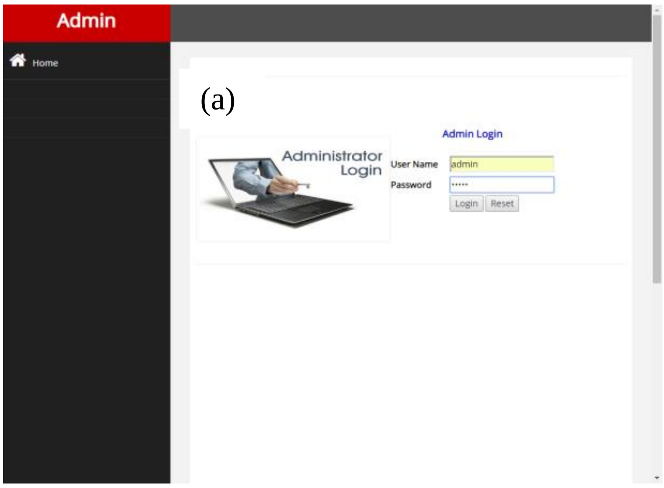


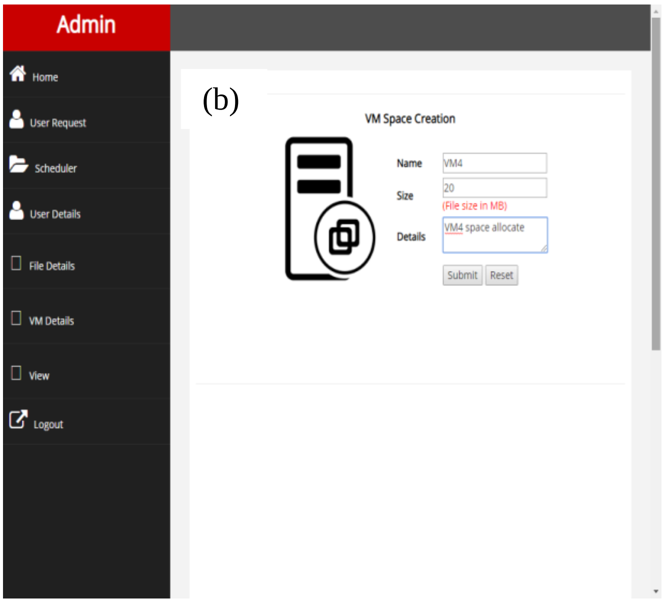
Fig. 7. AES Algorithm for 128 bit key

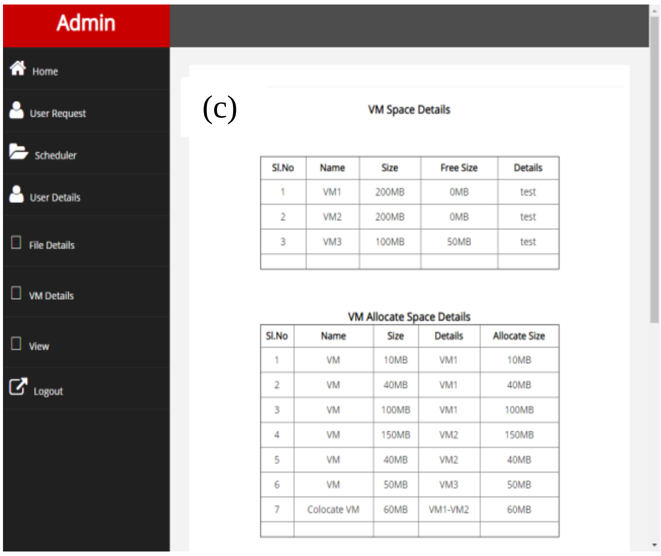
Experimental setup

The processor used in this approach is Dual core processor 2.6.0 GHZ with RAM of 2GB. The front end and back end are PHP and MySQL

SERVER. Experimental setup and results are shown in fig. 8 (a) to (f).





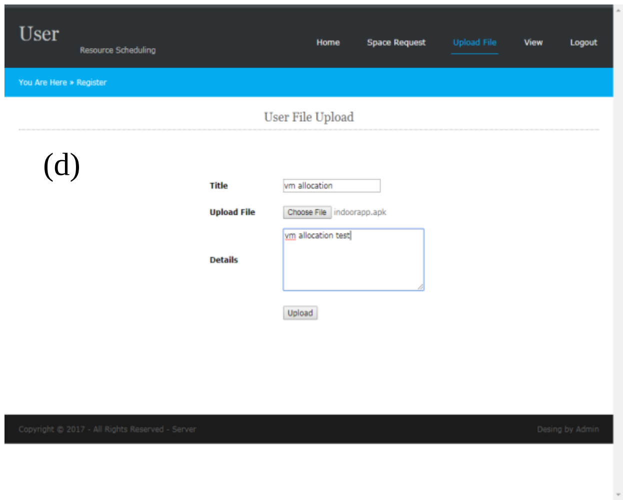


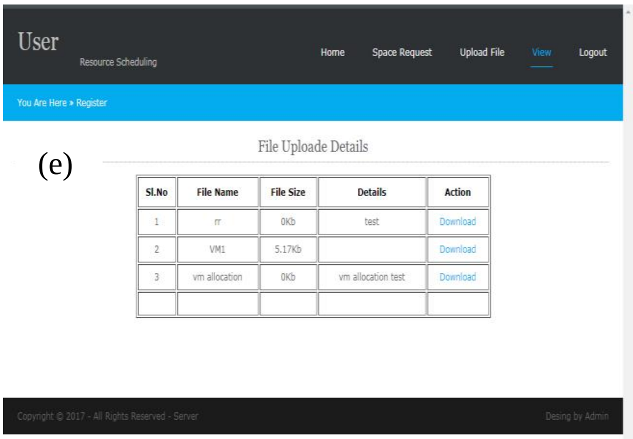
VM Space Details

Sl.No	Name	Size	Free Size	Details
1	VM1	200MB	0MB	test
2	VM2	200MB	0MB	test
3	VM3	100MB	50MB	test

VM Allocate Space Details

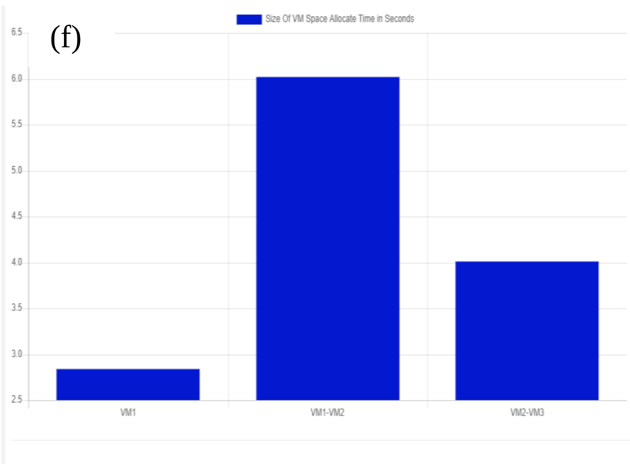
Sl.No	Name	Size	Details	Allocate Size
1	VM	10MB	VM1	10MB
2	VM	40MB	VM1	40MB
3	VM	100MB	VM1	100MB
4	VM	150MB	VM2	150MB
5	VM	40MB	VM2	40MB
6	VM	50MB	VM3	50MB
7	Colocate VM	60MB	VM1-VM2	60MB





File Uploade Details

Sl.No	File Name	File Size	Details	Action
1	rr	0Kb	test	Download
2	VM1	5.17Kb		Download
3	vm allocation	0Kb	vm allocation test	Download



In future, the works are often extended to implement the planned approach in a very real time cloud setting by considering economy based mostly pre-emption policies, and implement varied VM provisioning planning approaches to boost the energy consumptions.

Conclusions

A Resource Allocation System (RAS) in Cloud Computing are often seen as any mechanism that aims to ensure that the applications necessities square measures attended to properly by the provider's infrastructure. Beside this guarantee to the developer, resource allocation mechanisms ought to additionally think about this standing of every resource within the Cloud atmosphere, so as to use algorithms to higher apportion physical and/or virtual resources to developers' applications, so minimizing the operational price of the cloud atmosphere. Our system multiplexes virtual to physical resources adaptively supported the dynamical demand. We tend to use the Migration technique to mix VMs with completely different resource characteristics befittingly so the capacities of servers square measures well utilized. Projected algorithmic program achieves each overload shunning and inexperienced computing for systems with multi resource constraints.

Conflicts of interest

Authors declare no conflict of interest.

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