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Placing Virtual Machines to Optimize Gamer Satisfaction andProvider Net Profit

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Abstract

Cloud gaming, sometimes called gaming on demand is a type of online gaming. Computer games have to become very popular, e.g., gamers spent billions of USD on computer games, hardware, and accessories. With cloud gaming, the gamers can play to the latest computer games anywhere and anytime, while the game developers can optimize their games for a specific PC configuration.The service providers have to not only design the systems to meet the gamers' needs but also take error resiliency, scalability, and the resource allocation into the considerations. Optimizing cloud gaming experience is not an easy task. To optimize the problem, Virtualization and Green Computing is used to optimize the gamer satisfaction and provider profit. The mechanism prevent overload in the system effectively while saving energy used. The Trace driven Simulation and experiment results demonstrate that our mechanism achieves good performance.

Keywords: Cloud gamers, Live migration, Green computing**.**

INTRODUCTION

The on-demand gaming services is offers to many gamers using heterogeneous client computers, including the game consoles, desktops, laptops and smart phones increasingly more service to providers push computer games to powerful cloud servers and stream the game scenes to a simple application running on the client computers .In Such on-demand the game services are referred to as cloud gaming by various companies, such as Gaikai, Ubitus, and the On Live. In Market research predicts that the cloud gaming market is going to grow to 8 billion USD by 2017 and some leading game development companies have seriously considered this is the new opportunity. To Offering cloud gaming services in a commercially viable way is, however, the very challenging as demonstrated by On Lives' financial difficulty. The main challenge for cloud gaming providers is to find the best tradeoff between two contradicting objectives: reducing the hardware investment and increasing the gaming Quality of- Experience (QoE).The Satisfactory gaming QoE demands for high-end to the hardware, which may incur huge financial burden; meanwhile, using to the low-end hardware leads to less pleasing the gaming QOE, which may to drive gamers away from the

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cloud gaming services. Moreover, the different game genres impose diverse hardware requirements, which may result in the insufficient or wasted hardware resources if server resources are not well planned. In this paper, we study the problem of efficiently consolidating multiple cloud gaming servers on a physical machine using modern virtual machines (VMs), such as VirtualMachineware and the Virtual Box, in order to provide high gaming QOE in a cost-effective way.

The server diversity renders the dilemma of finding the best tradeoff between profit and QOE even harder. Since cloud gaming services push games to the cloud servers, the server consolidation enables to the dynamic resource allocation among game servers serving multiple gamers for better overall performance and lower operational cost.

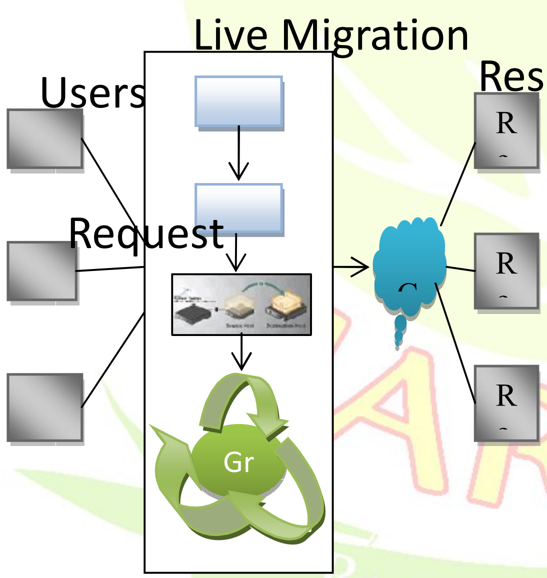

Fig.1.The architecture of cloud gaming service.

The considered problem is a variation of the virtual network embedding problem [6], and thus is NP Complete. The existing solutions for network embedded problems [6], [7], [8], [9], [10], however, are designed for computational/storage intensive applications,Its without taking the real-time requirements of the cloud gaming (and other highly interactive applications) into consideration. In particular, unlike the computational/storage intensive applications that demand for high CPU or disk throughput and cloud games demand for high QOE, in terms of responsiveness, precision, and fairness [11], [12], [13].

2. General Cloud Applications

Optimizing general cloud applications has been studied in cloud environments. For example, Zaman et al. [15] is propose an auction-based mechanism for dynamic provision and allocation of VMs to maximize the provider's profit and improves the total utilization of the cloud resources. Lin et al. [16] is formulate the data replication problem in the clouds as a mathematical optimization problem and propose several algorithms for the I/O intensive applications. Different from these two studies [15], [16], we optimize the real-time cloud games with an objective of maximizing the provider's profit by QOE-aware algorithms while optimizing the gaming quality at the same time. Marzolla et al. [17] utilize the live migration technology to move the VMs away from the lightly loaded physical servers and thus the empty servers can be switched to the low-power mode. Ferreto et al. [18] is create a dynamic server consolidation algorithm with migration control and avoid unnecessary migrations to reduce the number of powered on servers and migration cost. Chen et al. [19] is find that virtual machines do not usually use all their resources, and they create an algorithm which is also considers the migration cost according to the records of migration history for saving energy. Speitkamp and Bichler [20] present a heuristic solution which approximates the optimal solution by not only considering the cost but also determining whether the problem size can be optimally solved. Nathuji et al. [21] is create a performance interference model and classify the applications into different resource bounds using historical data. The applications are consolidated on the physical servers for better Quality of Service (QOS). Zhu and Tung [22] also consider their interference and implement a system to determine the placement of VMs to avoid the interference and meet the desired QOS values.

2.1 Cloud Games

The benefits of game server consolidation have been studied for certain game genres. For example, Lee and Chen [23] address the server consolidation problem for Massively Multiplayer Online Role-Playing Game (MMORPG). In particular, they propose a zone-based algorithm to leverage spatial locality of gamers in order to reduce the hardware requirements at the servers.

Duong et al. [24] and Wu et al. [25] are complementary to our work, as they concentrate on minimizing the queuing delay of a cloud gaming system, while it focus on the user experience during the game sessions.

For example, Duong et al. [24] develop resource provisioning and waiting queue scheduling algorithm to admit selective incoming gamers for the best profit under user-specified maximal waiting times. Wu et al. [25] is also propose an online control algorithm to quickly serve users in the waiting queue. Compared to their work, then optimize the gaming QOE after a user is admitted in the system; such QOE maximization is more important, as the gamers typically can only tolerate a few minutes of the waiting time, but each game session may last for the hours. Most of the cloud gaming systems, including Galician, Ubitus, and On Live are proprietary and closed, and thus measuring the cloud gaming performance and the QOS on them is hard, if not impossible. We employ Gaming Anywhere [14] for our experiments, is an open cloud gaming system. In particular, we use Gaming Anywhere to derive the performance and theQoS models for different games on different Virtual machines, and to develop VM placement algorithm.

3. System Overview

The existing system of the cloud gaming platform consists of S physical servers, P gamers, and the broker. Each physical server hosts several Virtual machines, while every VM runs a game and the game server (GS). Several physical servers are mounted on a rack, and the multiple racks are connected to an aggregation switch. Then the aggregation switches are then connected to the Internet via a core switch. The Physical servers are distributed in several data centers at diverse location. The broker is the core of our proposal. The broker consists of the resource monitor and to implements to the VM placement algorithm. It is responsible to 2 points.

(i) Monitor the server workload and the network conditions.
(ii) To Place the VMs of individual gamers on physical servers to achieve the tradeoff between QOE (Quality of Experience) and cost that is most suitable to the cloud gaming service.

The disadvantages of the existing system areEnergyconsumption is high, High hardware investment. And Communication overhead

The proposed system uses virtualization technology to allocate data center resources dynamically based on application demands and support green computing by optimizing the number of servers in use. We introduce the concept of “skewness” to measure the unevenness in the multidimensional resource utilization of the server. By minimizing skewness, we can combine different types of workloads nicely and improve the overall utilization of server resources. When the resource utilization of the active servers is too low, some of them can be turned off to save the energy. This is handled in our green computing algorithm.

In this system uses the skewness metric to combine VMs with different resource characteristics appropriately so that the capacities of servers are well utilized.The games may have to resource requirements, including CPU, GPU, and memory, while the paths between gamers and their associated servers have to the heterogeneous network resources, such as the latency and bandwidth.

The advantages of the proposed system are

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(i) Click and play
(ii) Constant Upgrades-Improving a game console is impossible, and upgrading your PC is expensive and time consuming
(iii) Reduces the investment needed
(iv) Reduces the power consumption

4. Cloud Games Modules

By minimizing the skewness, we can combine to different types of workloads nicely and improve the overall utilization of server resources. When the resource utilization of active servers is too low, some of them can be turned off to save the energy. This is handled in our green computing algorithm. The proposed system multiplexes virtual to physical resources adaptively based on the changing demand. The proposed system uses the skewness metric to combine VMs with different resource characteristics appropriately so that the capacities of servers are well utilized. The proposed algorithm achieves both overload avoidance and green computing for systems with multi-resource constraints.

There are 3 types:

*Hot and Cold Spots
* Hot Spot Migration
* Green Computing Algorithm

(i) Hot and Cold Spots

Define a server as the hot spot if the utilization of any of its resources is above a hot threshold. This is indicating that the server is overloaded and to hence some VMs running on it should be migrated away. Define a server as the cold spot if the utilizations of all its resources are below a cold threshold. This is indicate that the server is mostly idle and the potential candidate to turn off to save energy.

(ii) Hot Spot Mitigation

For each server p, first decide which of its VMs should be migrated away. Sort the list of the hot spots in the system in descending temperature (i.e., we handle the hottest one first). The hottest virtual machine is migrated away. By migrate the VM can reduce the server's temperature the mos

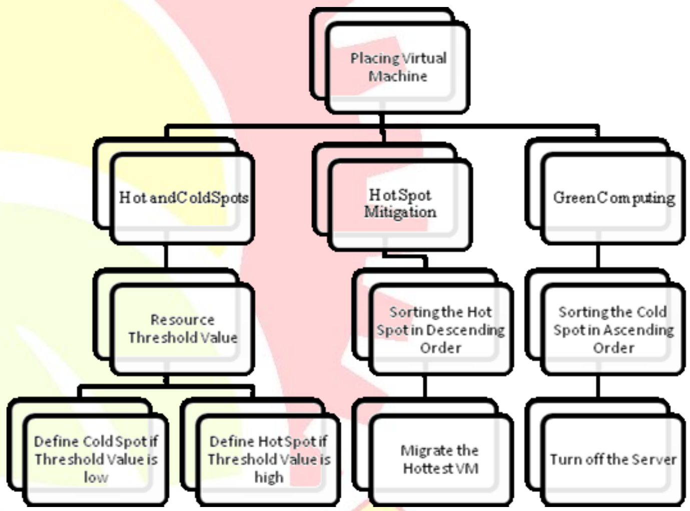

Fig. 2. Modules of cloud gaming service

(iii) Green Computing Algorithm

Green computing algorithm is to reduce the number of active servers during low load without sacrificing performance either now or in the future. Our green computing algorithm is to invoked when the average utilizations of all resources on active servers are below the green computing threshold. Sort the list of the cold spots in the system based on the ascending order of their memory size.

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4.1 Features of the Proposed System

1. It can easily access data can be restricted.
2. Sensitive data can be prevented from being copied on to a remote employee home computer.
3. They are hosted in a data center little or no downtime.
4. It is a separate storage device.
5. Some of them can be turned off to save the energy. This is handled in our green computing algorithm

5. Conclusion Future Work

The new and most useful mechanism for business users who are using virtual machine cloud servers. To avoid the problem of server constraints, overload and resource allocation. Based upon our demands to get the resource allocation by vm live migration techniques. And the energy consumption made by green Computing technology.

6. Future Work

We demonstrate the use of load prediction algorithms for the cloud platforms, using a two-step approach of the load trend tracking followed by load prediction, using the cubic spline Interpolation, and the hot spot detection algorithm for sudden spikes. Such algorithm is integrated into the autonomic management framework of the cloud platform can be used to ensure that the SaaS sessions, virtual desktops or VM pools are autonomic ally provisioned on demand, in an elastic of the manner. Results indicate that the algorithms are able to match representative SaaS load trends accurately. This approach is suitable to the support different load decision systems on the cloud platforms with highly variable trends in demand, and is characterized by the moderate computational complexity compatible to run-time decisions.

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