Cloud Resources Optimization for Delivering IP-Television Services through Virtualization

Ms. Rashmi G N
Dept. of Computer Science & Engineering
Sapthagiri College of Engineering
Banglore, India
E-Mail-rashmign.reddy@gmail.com

Abstract – Cloud computing is a new infrastructure environment that delivers on the promise of supporting on-demand services in a flexible manner by scheduling bandwidth, storage and compute resources on the fly. IP-Television services like Video On Demand (VoD) and Live broadcast TV requires substantial bandwidth and compute resources to meet the real time requirements and to handle the very bursty resource requirements for each of these services and need to allow these IPTV services to co-exist on a common infrastructure by taking advantage of virtualization. One of the biggest challenge that service providers face today is IP-based video delivery has dramatically increased the demands placed on service provider resources, service provider provision their resources for peak demands of each service across the subscriber population. In this paper, the proposed system uses optimization algorithm (finite-horizon) which provides the minimum number of servers needed to fulfill all requests for IPTV services, which uses the cost functions (maximum, concave and convex cost functions) reflecting the cost of providing service. The proposed system will expect results with a reduce load on server and also provides with limited usage of resources.

Keywords – ***Cloud computing, Video-on-Demand, IP-Television, cloud optimization.***

I. INTRODUCTION

The cloud computing is the practice of using a network of remote servers hosted on the Internet to store, manage, and process data, rather than a local server or a personal computer. It can be defined as the use of new or existing computing hardware and virtualization technologies to form a shared infrastructure that enables web-based value added services [1].

IP-Television is a system through which television services are delivered using the Internet protocol suite over a packet-switched network [2] such as the Internet, instead of being delivered through traditional terrestrial, satellite signal and cable. In IPTV service, this technology is used as that of Internet Services. In this service the TV channels are encoded in IP format and delivered to TV using a Smart Electrical Electronic Device. The IPTV Service also includes Video on Demand cloud services which are similar to watching Video CDs / DVDs using a VCD/DVD/CD player. Movies, different channels, Instructional Videos and other content shall be available to customers in the IPTV Services. This IPTV through a broadband connection. IPTV is not video over the public Internet.

IP-Television services are classified into three main groups:

- **Live Television (Live TV)**
- **Time-Shifted Television**
- **Video on demand (VOD)**

The main goal is to take advantage of the difference in workloads of the different IPTV services to better utilize the deployed servers in cloud. For example, Video-on-Demand (VoD) is also supported by service providers, with each request being served by a server using a unicast stream. Compared to ICC (Instant Channel Change) in Live Television workload which is very bursty and has a large peak to average ratio, VoD has a relatively steady load and imposes "not so stringent" delay bounds. By taking advantage of statistical multiplexing across these services, we can minimize the resource requirements for supporting these combined services: We can satisfy the peak of the sum of the demands of the services, rather than the sum of the peak demand of each service when they are handled independently.

In this Paper, we can propose optimization algorithm [3] is to study how efficiently minimize the number of servers required by using When there are multiple services (in this context, VoD and LiveTV ICC) that coexist in same cloud infrastructure and if some services have very high peak to average ratios, multiplexing can help to reduce the total resource requirements in cloud and reduce the cost.

II. CLOUD IPTV ARCHITECTURE

Fig. 1 shows a cloud-based architecture for providing on-demand services such as LiveTV and VoD services.

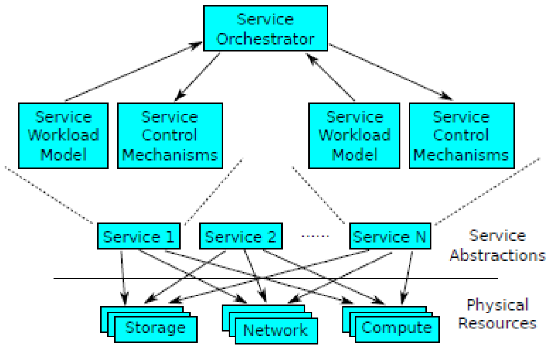

Fig. 1 Cloud IPTV Architecture

For each service, we first establish a workload model, that predicts the volume of incoming requests over time and (thus the resource needed at a given point in time to satisfy these requirements In the context of IPTV, apart from the regular diurnal pattern that exists for all services, LiveTV ICC [6] has a large number of correlated requests arriving periodically. Second, our architecture allows each service to expose a set of control mechanisms for varying the resource requirements without sacrificing service quality. Virtualization enables many of these control mechanisms. For example, after speeding up VOD content delivery, we can simply pause the VOD-related VMs, and dynamically allocate VMs [7] to handle the LiveTV ICC workload.

The top of our architecture is a service orchestrator that takes the individual workload models of all the services as input. Effectively, the orchestrator acts as an supervisor that 1) Understands the resource requirements of each service, and 2) decides on the adaptation methods to reduce the overall resource consumption. We can plan to address this as an optimization problem.

Typically LiveTV and VoD services are operated using dedicated servers, while this paper considers, the operating multiple services by careful rebalancing of resources within the same cloud infrastructure.

III. PROPOSED ALGORITHM

The Proposed algorithm uses finite horizon i,e dynamic optimization algorithm[4] . It works as follows:

1. Incoming requests to the service provider are grouped on the basis of their type– deadline constrained or low cost requirement.
2. After initial grouping they are prioritized according to deadline or profit. This is required because the requests with shorter deadline need to be scheduled first and similarly the requests resulting in more profit should be scheduled on lost cost machines. Thus, the prioritizing parameter is different based on the nature or type of request.

3. a. For each prioritized request in deadline constrained group –

i. Turnaround time at each resource is calculated taking following parameters into account.
- Waiting time
- Task length
- Processing Power of virtual machine

ii. The virtual machine with minimum turnaround time that is capable to execute the request is selected and requests is scheduled for execution on that machine.

iii. Waiting time and resource capacity of selected machine are updated accordingly.

b. For cost based group

i. Virtual Machine are selected on the basis of processing power of machine and its cost

ii. For each virtual machine cloudlets from the group are scheduled till the resource capacity is permitted.

iii. Resource capacity and waiting time are updated accordingly.

The Turnaround Time is calculated as follows [5]:

Turnaround Time = Resource Waiting Time +

Request Length / Proc. Power of Resource

The Cost of the requests is calculated as follows:

Cost of Request = (Request length / Proc Power of

Resource) * Resource Cost

There have been multiple efforts in the past on modelling to estimate the resource requirements for serving arrivals within a certain delay constraint, especially in the context of voice processing, including VoIP assuming Poisson processes.. Our optimization algorithm computes the minimum number of servers needed based on the sum of the peaks of the composite workload. We also need to examine the amount of server resources required as the deadline constraint is varied. We then examine the benefit of multiplexing diverse services on a common infrastructure, and show how by dynamically adjusting the resources provided to a particular service while delaying the other service can bring significant savings in resource requirements in comparison to provisioning resources for each of the services independently [8]. This would reflect the amount of 'cloud resources' required with multiple services such as LiveTV and VoD in the cloud infrastructure.

IV. CONCLUSION

In this paper, we have studied that how an IPTV service can leverage cloud computing to schedule resources in an optimal manner and how IPTV service providers can take an advantage of virtualized cloud infrastructure to better utilize deployed resources while still meeting the strict time deadlines for each individual service. We have used LiveTV ICC and VoD as examples of IPTV services that can run on same virtualized infrastructure. Our paper also describes cloud IPTV architecture. We propose a optimization

ISSN: 2278-0181

algorithm provided a generalized framework for computing the resources required to support multiple services with deadline and compute the number of servers required based on a cost function.

REFERENCES

[1] J. Gison, R. Rondeau, D. Eveleigh and Qing Tan, "Benefits and challenges of three cloud computing service models," in Proc. IEEE Int. Conf. Computational Aspects of Social Networks (CASoN), Nov. 2012, pp.198-205.

[2] A. Punchihewa and A. M. De Silva, "Tutorial on IPTV and its latest developments," in Proc. IEEE Int. Conf. Information and Automation for Sustainability (ICIAFs), Dec. 2010.

[3] V. Aggarwal, V. Gopalakrishnan, R. Jana, K. K. Ramakrishnan and V. Vaishampayan, "Optimizing cloud resources for delivering IPTV services through virtualization," in Proc. IEEE Int. Conf. Communication Systems and Networks (COMSNETS), Jan. 2012.

[4] R. Kanday, "A Survey on Cloud Computing Security," IEEE Int. Conf on Computing Sciences (ICCS), Sept. 2012, pp.302-311.

[5] U. Moghe, P. Lakkadwala and D. K. Mishra, "Cloud computing: Survey of different utilization techniques," in Proc. IEEE Int. Conf. Software Engineering (CONSEG), Sept.2012.

[6] D. Banodkar, K. K. Ramakrishnan, S. Kalyanaraman, A. Gerber and O. Spatscheck, "Multicast instant channel change in IPTV system, " Proc. IEEE COMSWARE, Jan. 2008.

[7] V. Aggarwal, X. Chen, V. Gopalakrishnan, R. Jana, K. K. Ramakrishnan and V. Vaishampayan, "Exploiting virtualization for delivering cloud-based IPTV services," in Proc. IEEE Conf. Computer Communications Workshops (INFOCOM WKSHPS), Apr. 2011.

[8] H. A. Lagar-Cavilla, J. A.Whitney, A. Scannell, R. B. P. Patchin, S.M. Rumble, E. de Lara, M. Brudno, andM. Satyanarayanan, "SnowFlock: Virtual machine cloning as a first class cloud primitive, " ACM Trans. Comput. Syst. (TOCS), 2011.