Minimising the Energy Constraints for Implementing Green Cloud Storage in Cloud Computing

Vijaya Kumar A V
Research Scholar,

Dr. Yogesh Kumar Sharma
Associate Professor, HOD/Research Coordinator,

Department Of Computer Science and Engineering,
Shri JJT University , Jhunjhunu, India

ABSTRACT: *Cloud based services ranging from servers, storage solutions, business applications, Software-as-a-service and Infrastructure-as-a-service – will all contribute to leveraged IT management leading to decreased e-waste illustrating a direct correlation between cloud computing and going green. A Microsoft Study showed in whitepaper gives further evidence that cloud computing helps companies move in the direction of being ecofriendly and green . Cloud computing and its obvious advantages are hard to ignore: decreased costs, enhanced efficiencies, optimized data centre management, better application performance, environmental friendliness, increased capacities and flexible provisioning. The users submit their Cloud service requests in the green cloud architecture with the help of a new Green Broker a middleware that manages the selection of the greenest Cloud provider to serve the user's request. This paper deals with the issues involved in implementing the Green cloud storage architecture and providing the cloud services to the user in eco friendly environment*

KEYWORDS : DataCenters, Directory, Green Cloud, Green Broker

I.INTRODUCTION

Cloud storage enables energy and resource efficiency through virtualization, or the foundational technology for the infrastructure. By this the consumers can run multiple system operations on a single server. Its true that by usage of less equipments for more workload consumes less energy, resulting less carbon or gas footprint left by the company.
The data centres are run by the less fossil fuels and valuable resources .the most widely implemented IT in making a company green is through the By creating an infrastructure that runs multiple operations on a simple and very few servers, companies are not only protecting the environment but also saving a little money in the process.

The New architectures proposed by the Storage Networking Industry Association (SNIA) working parallel reduces the amount of physical storage required by data centers. The interworking of these locations helps in lowering the energy, maximizing the power usage and minimizing the usage of the water to cool the buildings

Benefits of Cloud storage:

- Investment on capital and storage devices is not required
- Technical experts are not required to maintain the storage, backup, replication and most importantly during the disaster management.
- Collaborative working improves in sharing the data exploring globally

By choosing to go with a green web hosting service, larger companies can reduce their energy consumption, saving an average of $2.2 billion annually. This will also reduce annual carbon emissions to the equivalent of nearly 200 million barrels of oil each year. In 2010, according to the survey conducted by the Microsoft showed that if a 100-person company utilized green cloud storage, they could lower their energy consumption and carbon emissions by more than 90 percent Of course, when it comes to the cloud, it is true that IT professionals are not thinking hard in making their companies go greener; instead, they are finding ways to increase their productivity and lower overall monthly expenses . as the cloud providers designing their products more cost-effective, more IT Companies are much interested in utilizing their services. Companies asking for a green cloud service has to check with Green Broker, which is a middle-ware service that manages the some of the greenest providers to help in developing a program which meets the best needs of the enterprise.

II. Cloud Storage Reference Model

The appeal of cloud storage is due to some of the same attributes that define other cloud services: pay as you go, the illusion of infinite capacity (elasticity), and the simplicity of use/management [1]. It is therefore important that any interface for cloud storage support these attributes, while allowing for a multitude of business cases and offerings, long into the future. The model created and published by the Storage Networking Industry Association (SNIA) [1,2] shows multiple types of cloud data storage interfaces are able to support both legacy and new applications. All of the interfaces allow storage to be provided on demand, drawn from a pool of resources. The capacity is drawn from a pool of storage capacity provided by storage services. The data services are applied to individual data elements as determined by the data system metadata. Metadata specifies the data requirements on the basis of individual data elements or on groups of data elements (containers).

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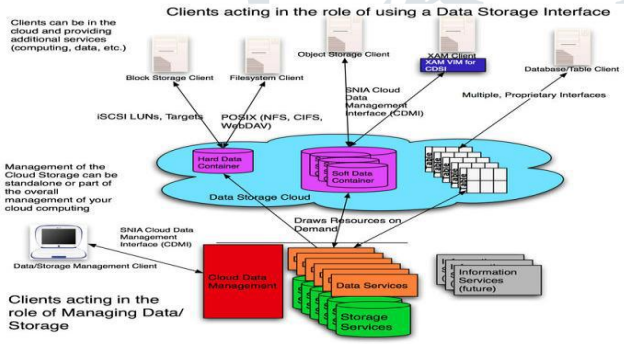

Figure 1 Storage Reference Model

Cloud information Management Interface (CDMI) is that the useful interface that applications can use to make, retrieve, update and delete information parts from the cloud. As a part of this interface the consumer are going to be ready to discover the capabilities of the cloud storage giving and use this interface to manage containers and also the information that's placed in them. In addition, metadata can be set on containers and their contained data elements through this interface. It is expected that the interface will be able to be implemented by the majority of existing cloud storage offerings today. This can be done with an adapter to their existing proprietary interface, or by implementing the interface directly. In addition, existing client libraries such as eXtensible Access Method (XAM) can be adapted to this interface as show in Figure 1

III.Green Cloud Architecture

Green cloud is a strategy that refers to the environmental benefits that information technology (IT) services delivered over the Internet can offer to the society. The term combines the words green -- meaning environmentally friendly -- and cloud, the traditional symbol for the Internet and the shortened name for a type of service delivery model known as cloud computing. In the green Cloud design, users submit their Cloud service requests through a brand new middleware inexperienced Broker that manages the choice of the greenest Cloud supplier to serve the user's request. A green request will

be of 3 varieties i.e., software, platform or infrastructure. The Cloud suppliers will register their services within the sort of "green offers" to a public directory that is accessed by green Broker.

The green offers consist of green services, pricing and time when it should be accessed for least carbon emission. Green Broker gets the current status of energy parameters for using various Cloud services from Carbon Emission Directory. The Carbon Emission Directory maintains all the data related to energy efficiency of Cloud service. This data may include PUE and cooling efficiency of Cloud datacenter which is providing the service, the network cost and carbon emission rate of electricity, Green Broker calculates the carbon emission of all the Cloud providers who are offering the requested Cloud service. Then, it selects the set of services that will result in least carbon emission and buy these services on behalf users. The Green Cloud framework is designed to make their service clean by keeping track of overall energy usage of serving a user request. It relies on two main components, Carbon Emission Directory and Green Cloud offers. A user can use Cloud to access any of these three types of services (SaaS, PaaS, and IaaS), and therefore process of serving them should also be energy efficient. In other words, from the Cloud provider side, each Cloud layer needs to be "Green" conscious.

SaaS Level: Since SaaS providers mainly offer software installed on their own datacenters or resources from IaaS providers, the SaaS providers need to model and measure energy efficiency of their software design, implementation, and deployment. For serving users, the SaaS provider chooses the datacenters which are not only energy efficient but also near to users.

PaaS level: PaaS providers offer in general the platform services for application development. The platform facilitates the development of applications which ensures system wide energy efficiency. Platforms itself can be designed to have various code level Optimizations which can cooperate with underlying complier in energy efficient execution of applications.

IaaS level: Providers in this layer plays most crucial role in the success of whole Green Architecture. They use latest technologies for IT and cooling systems to have most energy efficient infrastructure. By using virtualization and consolidation, the energy consumption is further reduced by switching-off unutilized server. Various energy meters and sensors are installed to calculate the current energy efficiency of each IaaS providers and their sites. This information is advertised regularly by Cloud providers in Carbon Emission Directory. The Cloud provider designs various green offers and pricing schemes for providing incentive to users to use their services during off-peak or maximum energy-efficiency hour

IV. Research Issues In Green Computing

Energy is that the most precious resource of that a big portion is currently consumed to produce power to computers and computing interfaces. High performance parallel and distributed systems that embrace information centers, super computers, real time systems so on, needs high quantity of power provides and additionally desires air-conto stay them cool. The zoom in computing is incredibly quickly increasing the consumption of natural resources like oil and coal which could result in energy shortage. These problems are raised by the researchers from time to time and therefore the potential measures area unit being taken. Still there area unit severalareas nevertheless to be explored. Here we have a tendency to gift some notable areas of analysis in inexperienced computing [2]:

- **New Optimization Techniques in Performance-Energy-Temperature Aware Computing:**

The exponential growth in computing activity and also the rising concern for energy conservation have created energy potency in computers a technological issue of prime importance [8].

The balance between Performance-Energy-Temperatures ought to be done so we have a tendency to get most advantages. planning techniques that square measure a lot offavorable for inexperienced computing that embrace performance, energy and temperature and square measure most significant for energy potency.

➢ **New high-efficiency data center:**

Energy potency is far a lot of correct in larger information centers as compared to the smaller information centers. completely different standards area unit shaped to livethe potency of information centers. Standards like power usage Effectiveness (PUE) that is outlined because the ration of total facility power divided by IT instrumentationpower. It states the number of power consumed by the power that is employed to power the IT instrumentation. thus it's quiet difficult to create the larger informationcenters power economical [2].

➢ **Developing Green Maturity Model:**

Full instrumentation life cycle is a crucial space for inexperienced maturity model, with energy reduction because the best live of greenness. the requirement of maturity models for instrumentation, IT organizations, and computing techniques is a problemthat has been addressed by some researchers however is proscribed to specific areas. inexperienced maturity model for virtualization [6] depicts that every level describes the degree of inexperienced characteristics.

➢ **Information Resource Tier Optimization:**

The information resource tier signifies direction systems within the world computation world. For example- databases, directories, file-systems, and flat files. It conjointlyconsists the combination completely different|of various} info structures in order thatdifferent databases are often analyzed regardless of their storing mechanisms and arrangement [3,4].

➢ **Wireless Sensor Network for Data Center Cooling:**

Data centre cooling is the major issue to be taken care of in power consumption. Data centers which are the backbone of computing organization must be reliable and available at any point of time, but measuring the effectives and maintaining the baseline is the major issue. In such a situation wireless sensors play a vital role in managing data centres power management[5].

V. Green cloud computing solutions

Energy efficiency is the prime parameter which should be considered in data centre planning and building phases. Some of the possible solutions are listed below:

A. Research and select the right energy supplier:

Selecting the most affordable energy supplier is the most important and a major decision for controlling and managing data centres energy consumption. Through research one can select the best supplier which can provides clean energy source and guarantees that the data centre uses reliable, greener power that does not cost the nature [7].

B. Lowering the cooling costs by using outside air: 40% of energy costs accounts for the cooling of data centres. Using natural surroundings and Reducing the impact of sunlight makes a big change in the heating of the data canters. For Example: The Toronto data center where PEER 1 uses a system activated by outside temperatures lowering below 10 degrees Celsius. Reaching these conditions occur, from a local well air is drawn into cool water which cools IT equipment in the facility [7].

C. Adapting existing structures rather than re build: Adapting the "reuse" approach for the construction of the data centers provide many benefits. Steps for the reuse of the existing structures such as buildings will reduce the construction time and cost. If there are any functional or environmental reasons, then only these structures needs to be changed [7].

D. Planning space intelligently: Planning the data centre design guarantees the most effective use of space and minimizes the Over utilization of power and cooling.

E. Building data centre energy efficiency into procurement strategies:

Energy efficiency of the data centres can be increased by carefully selecting the purchase of IT equipment. Selecting the criteria during purchase ensures better performance of hardware at technical as well as green level.

F. Dynamic Provisioning: Reducing computing resource waste by additional accurately and matching server capability with demand. faced with difficulties in accurately predicting demand, IT managers usually over apportion server, storage, and networking infrastructure. Cloud suppliers have additional correct and dedicated means that for observance and predicting demand, permitting them to avoid inessential over-allocation of infrastructure for bigger potency and property. economical provisioning happens on the consumer finish as well: the pay-as-you-go nature of cloud computing, at the side of self-service, encourages shoppers to consume solely what the y want, with consumption turned off at expiration times

VI. Conclusion

This paper contributes to the services that are provided by the cloud providers in a efficient manner such that the eco friendly precautions are implemented in cloud computing. Cloud computing issues are being identified and suggested the recommendation in implement the green cloud by minimizing the energy constraints at the service providers end. Limiting computing resource waste by more precisely and matching server capacity on demand Later this can also be implemented at the client side in maintaining the environmental friendly atmosphere.

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