Energy Efficiency Reliability and Availability of Real Time Task in Cloud Based Environment

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Abstract - Green computing is the study of Designing, Manufacturing, Engineering and deposing of computing device in a way that reduces their environmental infects. Green computing also called as Green Technology is the environmentally responsible use of computers and related resources. Search practices include the implementation of Energy-Efficient central processing units (CPU), servers and peripherals as well as reduced resource consumption and proper disposal of electronic waste (E-waste).In existing system they focus on the problem of energy consumption when providing fault tolerance. Xia et al focus to find out the scheduling solution for minimizing the network power consumption of down link C-RAN. Bertossi et al considers both backup over booking and deallocation to reduce system overhead. These works are designed for homogenous systems and not suitable for heterogeneous system. In our proposed system the work as been done on dynamic energy-efficient fault-tolerant scheduling for real time task. Both energy conservation and fault tolerant is considered while meeting the real time requirement. We first analyze the CPU schedulability of real time task and also find out the weather condition to reduce the energy consumption. Our work brings substantial improvement in energy efficiency and task guarantee ratio. Our proposed system shows excellent performance in energy consumption based on the CPU scheduling and weather condition.

Keywords - Green Computing, Energy Efficiency, CPU Schedulability, Fault-Tolerant, De allocation, Heterogeneous System.

I. INTRODUCTION

Green computing is the study of Designing, Manufacturing, Engineering and deposing of computing device in a way that reduces their environmental infects. Green computing also called as Green Technology, is the environmentally responsible use of computers and related resources. Search practices include the implementation of Energy-Efficient central processing units (CPU), servers and peripherals as well as reduced resource consumption and proper disposal of electronic waste (E-waste).

The goals of green computing are similar to green chemistry, it will reduce the use of hazardous materials and maximize energy efficiency, recyclability or biodegradability of defunct products and also factory waste. Every day we see advancements in computer technology. There are many companies producing motherboards, printers, video cards, monitors, etc. Processors and graphics cards need a lot of power to run. Supercomputers, which have an array of processors, consume power in quantities capable of running an electric train. Overall, this has an indirect impact on our environment, as electricity is not a renewable source of energy.

Even when we leave our desktop open, it consumes a lot of energy. Earlier, this was not much of a worry, but as there has been an exponential increase in number of computers, the problem has increased manifold. Similarly, today everything has gone online, be it e-bill, to e-learning, and many more. In 2012, every day 2.5 exabytes (2.5×1018) of data were created online. The storage of this data needs more servers and data centres, which leads to greater energy consumption and waste generation.

II. DISPOSAL OF E-WASTE

While new computers are being made every day, old computers are being discarded- thus creating a lot of e-waste. This is something that will go on and on, as there is still a huge scope for advancements in this field. When we throw away our old computers to buy new ones, we are just adding to the e-waste. There is no recycle bin in real life where we can dump e-waste and make them just disappear. Burning the waste e-products will release harmful gases.

A study by Queensland University, Australia, indicates that sitting in front of a printer all day is almost equal to smoking. Add to that the amount of printing we do every day, which leads to cutting of more trees. What effect that has we know very well. Just as we do our bit in protecting our environment by planting trees, recycling etc., we also need to look at reducing waste, especially e-waste, and here is where green computing comes.

III. GREEN COMPUTING

Green computing is the study and practice of environmentally sustainable computing. Now, this ranges from its manufacturing, to its use and disposal. Industrialization and human life has reached that point where we cannot just go back to simpler times which caused little harm to the environment. But green computing can minimize the negative effect on the environment without compromising on modern-day needs. The goals and ideology of green computing are simple.

- Reduce the use of hazardous materials in manufacturing computing devices.
- Maximize energy efficiency during the product's lifetime.
- Promote the recyclability or biodegradability of unusable products and factory waste.

Green computing can be anything from efficient algorithms, proper utilization of resources, abstraction of computer resources, power management, energy efficient display options to electronic waste recycling, computer reuse, online storage of data (replacing hard disks), energy efficient LCD monitors, telecommuting etc.

IV. LITERATURE SURVEY

Q. Wang, D. Chen, N. Zhang, Z. Qin, and Z. Qin, LACS: A lightweight label-based access control scheme in IoT-based 5G caching context,'' IEEE Access, vol. 5, pp. 4018_4027, 2017.

To protect caching from sabotage and to further ensure its reliability, we propose a new lightweight label-based access control scheme (LACS) that authenticates the authorized fog nodes to ensure protection. Specifically, the LACS can authenticate the fog nodes by verifying the integrity of the shared files that are embedded label values, and only the authenticated fog nodes can access the caching service. The analysis shows that the proposed scheme is verifiable (the malicious fog node cannot cheat the caching server to pretend to be a legal node) and efficient in both computation and verification.

A.Abrol and R. K. Jha, ``Power optimization in 5G networks: A step towards GrEEn communication,'' IEEE Access, vol. 4, pp. 1355_1374, 2016.

In this paper, we have surveyed various techniques for the power optimization of the upcoming 5G networks. The primary focus is on the use of relays and small cells to improve the energy efficiency of the network. We have discussed the various scenarios of relaying for the next-generation networks. Along with this, the importance of simultaneous wireless power and information transfer, massive multiple input multiple output, and millimeter waves has been analyzed for 5G networks.

Q. Xu, Z. Su, Q. Zheng, M. Luo, and B. Dong, ``Secure content delivery with edge nodes to save caching resources for mobile users in green cities,'' IEEE Trans. Ind. Informat., vol. 14, no. 6, pp. 2550_2559, Jun. 2018.

First, we present a reverse auction game to encourage edge nodes to cooperatively provide caching services with incentives. With the model, mobile users can determine the candidate of edge node to cache content based on the interaction between mobile users and edge nodes. Second, a trust management method is designed to evaluate the reliability of the selected candidate of edge node by considering the direct trust evaluation. Finally, extensive simulations show that the proposal can save energy with a secure content delivery where both the delay to obtain the content and the caching ratio can be improved compared with the conventional methods.

J. Wu, M. Dong, K. Ota, J. Li, and Z. Guan, ``Big data analysis-based secure cluster management for optimized control plane in software-defined networks,'' IEEE Trans. Netw. Service Manag., vol. 15, no. 1, pp. 27_38, Mar. 2018.

This paper proposes a big data analysis-based secure cluster management architecture for the optimized control plane. A security authentication scheme is proposed for cluster management. Moreover, we propose an ant colony optimization approach that enables big data analysis scheme and the implementation system that optimizes the control plane. Simulations and comparisons show the feasibility and efficiency of the proposed scheme. The proposed scheme is significant in improving the security and efficiency SDN control plane.

W. Xia, J. Zhang, T. Q. S. Quek, S. Jin, and H. Zhu, ``Energy-efficient task scheduling and resource allocation in downlink C-RAN,'' in Proc. IEEE Wireless Commun. Netw. Conf. (WCNC), Apr. 2018, pp. 1_6.

To deal with timescale challenge, we introduce approximate results of the joint NPC minimization problem according to large system analysis and turn it into a slow timescale issue because the approximations are only dependent on statistical channel information. We propose an iterative coordinate descent algorithm based on branch-and-bound algorithm to find solutions to the joint NPC minimization problem. Numerical results show that the NPC decreases as the delay constraint increases but increases if the execution efficiency or computing capability of servers is degraded.

Q. Liu, T. Han, N. Ansari, and G. Wu, ``On designing energy-efficient heterogeneous cloud radio access networks,'' IEEE Trans. Green Commun. Netw., vol. 2, no. 3, pp. 721_734, Sep. 2018.

We develop a network energy consumption model that characterizes the energy consumption of radio access points, fronthaul, and the BBU pool in H-CRAN. Based on the network energy consumption model, we formulate the NEE optimization problem with the consideration of the capacity constrained fronthaul. The NEE optimization problem is a mixed integer non-linear programming problem. We propose the H-CRAN energy-efficient radio resource management (HERM) algorithm to solve the

NEE optimization problem efficiently. Various properties of the proposed solution are derived and extensive simulations are conducted. The simulation results show that the HERM algorithm significantly improves the NEE of H-CRAN.

A.Botta,W. de Donato, V. Persico, and A. Pescapé, ``Integration of Cloud computing and Internet of Things: A survey,'' Future Gener. Comput. Syst., vol. 56, pp. 684_700, Mar. 2016.

In this paper, we focus our attention on the integration of Cloud and IoT, which is what we call the CloudIoT paradigm. Many works in literature have surveyed Cloud and IoT separately and, more precisely, their main properties, features, underlying technologies, and open issues. However, to the best of our knowledge, these works lack a detailed analysis of the new CloudIoT paradigm, which involves completely new applications, challenges, and research issues. To bridge this gap, in this paper we provide a literature survey on the integration of Cloud and IoT. Starting by analyzing the basics of both IoT and Cloud Computing, we discuss their complementarity, detailing what is currently driving to their integration.

F. Zhang, G. Liu, X. Fu, and R. Yahyapour, ``A survey on virtual machine migration: Challenges, techniques, and open issues,'' IEEE Commun. Surveys Tuts., vol. 20, no. 2, pp. 1206_1243, 2nd Quart., 2018.

In this paper, we first give an overview of VM migration and discuss both its benefits and challenges. VM migration schemes are classified from three perspectives: 1) manner; 2) distance; and 3) granularity. The studies on non-live migration are simply reviewed, and then those on live migration are comprehensively surveyed based on the three main challenges it faces: 1) memory data migration; 2) storage data migration; and 3) network connection continuity. The works on quantitative analysis of VM migration performance are also elaborated. With the development and evolution of cloud computing, user mobility becomes an important motivation for live VM migration in some scenarios (e.g., fog computing).

J. A. Stankovic, ``Misconceptions about real-time computing: A serious problem for next-generation systems,'' Computer, vol. 21, no. 10, pp. 10_19, Oct. 1988.

This paper defines real-time computing and states and dispels the most common misconceptions about it. He discusses the fundamental technical issues of real-time computing. He examines specification and verification, scheduling theory, operating systems, programming languages and design methodology, distributed databases, artificial intelligence, fault tolerance, architectures, and communication.

A. Yadav, O. A. Dobre, and N. Ansari, ``Energy and traf_c aware full-duplex communications for 5G systems,'' IEEE Access, vol. 5, pp. 11278_11290, 2017.

For a new energy consumption model and high interference scenario, which arises due to full-duplex communications, we formulate energy and load aware resource management optimization problem under the energy causality and total transmit power constraints of the small-cell base station and uplink user equipments. In particular, the problem minimizes the data queue length of each network user equipment by jointly designing the beam formers, power, and sub-carrier allocation and their scheduling. Owing to the non-convexity of the problem, a global solution is inefficient; thus, we opt for the successive parametric convex approximation method to obtain a sub-optimal solution. This method solves for the convex approximate of the non-convex problem in each iteration and leads to faster convergence. For practical implementation, we further develop a distributed algorithm by using the dual decomposition framework, which relies on limited exchange of information between the involved base stations.

IV. GREEN COMPUTING IN INDIA

In India, green computing has not yet had a major impact, even though it has been a topic of keen interest and research among scholars. Many papers have been published in international journals regarding green computing by Indian scientists, but little application can be seen in practice. There has been no special course dedicated to green computing in Indian universities, though recently, some of them have added green computing as a part of the curriculum. Proper regulations should be implemented by government laws to establish certain standards. Efficient storage of data should be made the norm for large corporate houses. Large data centres, for example, may adopt alternate methods like using renewable energy. Air conditioning has become a necessity to keep the servers cool. As we know, air-conditioners are a major source of chlorofluoro carbons (CFCs) which contribute to the green house effect and deplete the protective ozone layer. Innovative ideas like using mineral oil based cooling systems can be tried out wherever possible. Incentives must be given to companies that adopt.

V. GREEN COMPUTING METHODS

One major problems faced in India is the lack of awareness of green computing. IT professionals might have some knowledge about it, but what about other computer users? The younger generation is more into high graphics computer games, which needs high power display cards that consume more energy. Customers should be informed about the effects of their actions.

Proper awareness campaigns should be carried out and people should be advised to choose greener options at every step. Disposal of electronics should be minimized as much as possible, for they add to the huge pile of trash already present. If necessary, it should be mandatory to

attach information about efficient usage and disposal with every computing device and its accessories. Similar information, such as energy ratings up to 5 stars, is already available for household appliances. Extending this practice to computer products will enable them to choose an energy-efficient product.

Computer users can follow certain simple steps to slightly modify their usage habits. This will minimise the negative impact on the environment. Some examples are:

- Checking product information for energy-efficiency before buying.
- Buying only those products with specifications that suit your needs – for example, someone who uses mostly office software may not need high power graphic cards that are more suited for games.
- Switch off devices, including peripherals like printers, when not using for long periods.
- Limit power intensive usage like games and videos.
- Find an optimum display setting for monitors that will conserve energy.
- Reduce printing as much as possible. Print on both sides to reduce paper wastage.
- Periodically perform thorough maintenance checks on devices.
- Try to share additional storage such as hard-disks with others.
- Reuse accessories like chargers, etc. to the maximum extent possible.
- Dispose unusable computing devices responsibly by handing them over to e-waste disposal centres.
- Avoid buying newer products/versions unless necessary. The prospect of green computing is huge.

There are broad fields to work on, and the results will surely be worth it. But proper awareness is needed along with stricter regulations. So, let's buckle up, and do our bit to make the planet greener.

In existing system they focus on the problem of energy consumption when providing fault tolerance. Xia et al focus to find out the scheduling solution for minimizing the network power consumption of down link C-RAN. Bertossi et al considers both backup over booking and deallocation to reduce system overhead. These works are designed for homogenous systems and not suitable for heterogeneous system.

In our proposed system the work as been done on dynamic energy-efficient fault-tolerant scheduling for real time task. Both energy conservation and fault tolerant is considered while meeting the real time requirement. I first analyze the CPU schedulability of real time task and also find out the weather condition to reduce the energy consumption. Our work brings substantial improvement in energy efficiency and task guarantee ratio. Our proposed system shows excellent performance in energy

consumption based on the CPU scheduling and weather condition.

VI. EXISTING SYSTEM

In existing system, they focus on the problem of how to reduce the energy consumption when providing fault tolerance and proposed a novel primary-backup-based fault-tolerant scheduling architecture for real-time tasks in the cloud environment.

1. Drawbacks

- Energy-Efficient fault-tolerant scheduling algorithm for real-time tasks (EFTR) proposed via Simulation Experiments.
- As energy costs are increasing, while availability dwindles, there is a need to shift focus from optimizing data centre resource management for pure performance alone to optimizing for energy efficiency while maintaining high service level performance.

VII. PROPOSED SYSTEM

We propose the cloud service through a new middleware Green Broker that manages the selection of the greenest Cloud provider to serve the user's request. A green request can be of three types i.e., software, platform or infrastructure. 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.

1. Advantages

- Green Cloud Infrastructure has become a key environmental concern keeping in view of energy consumption and carbon emission in 5G network. The key driver technology for energy efficient Clouds is "Virtualization", process of presenting a logical grouping or subset of computing resources so that they can be accessed in ways that give benefits over the original configuration.
- PUE and cooling efficiency of Cloud data center which is providing the 5G network 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.

VIII. RESEARCH METHODOLOGY DATA SOURCE

1. Data Set

In this paper, we collect two different attributes 1. Weather Condition & 2. CPU Power Consumption to reduce the energy consumption. The Weather Condition having 5 attributes namely

- Temperature
- Outlook
- Humidity
- Windy
- Play

And it has contains 14 instances. The sum of weight is: 14. In weather Condition we consider the 1) Hot 2) Mild and 3) Cool Weather Condition. Based on these attributes and instance we can calculate the energy level and power utilization level. In high temperature weather condition the power and energy utilization must be high. Based on the instance result, the power and energy level also based on the weather condition.
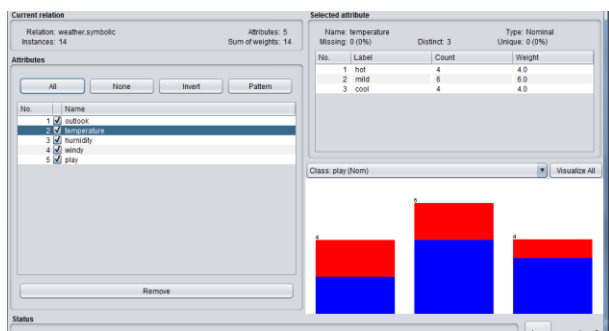

Fig 1. Weather Condition

2. CPU Power Consumption

Secondly, we taken the power consumption based on the CPU Attributes namely

- MYCT
- MMIN
- MMAX
- CACH
- CLASS

And it is having 209 instances, the static calculation based on the Minimum value, Maximum Value, Mean and StdDev.
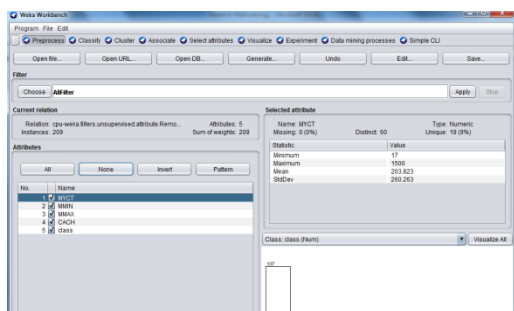

Fig 2. CPU Power Consumption.

3. Weka Tool

The Waikato Environment for Knowledge Analysis (WEKA) is a machine learning toolkit introduced by Waikato University, New Zealand. At the time of the project's inception in 1992. WEKA would not only provide a toolbox of learning algorithms, but also a framework inside which researchers could implement new algorithms without having to be concerned with supporting infrastructure for data manipulation and scheme evaluation. It can be run on Windows, Linux and Mac.

It consists of collection of machine learning algorithms for implementing data mining tasks. Data can be loaded from various sources, including files, URLs and databases. Supported file formats include WEKA"s own ARFF format, CSV, Lib SVM"s format, and C4.5"s format. The second panel in the Explorer gives access to WEKA"s classification and regression algorithms [12]. The corresponding panel is called "Classify" because regression techniques are viewed as predictors of "continuous classes". By default, the panel runs a cross validation for a selected learning algorithm on the dataset that has been prepared in the Pre-process panel to estimate predictive performance.

5. Sample Size

5.1 Myct

Fig. 3 Myct Value.

5.2 MMIN

Fig. 4 MMIN Value.

5.3 MMAX

| Name: MMAX | | Type: Numeric |
| Missing: 0 (0%) | Distinct: 23 | Unique: 6 (3%) |

Statistic	Value
Minimum	64
Maximum	64000
Mean	11796.153
StdDev	11726.564

Fig . 5 MMAX Value.

5.4 CACH

| Name: CACH | | Type: Numeric |
| Missing: 0 (0%) | Distinct: 22 | Unique: 4 (2%) |

Statistic	Value
Minimum	0
Maximum	256
Mean	25.206
StdDev	40.629

Fig.6 CACH Value.

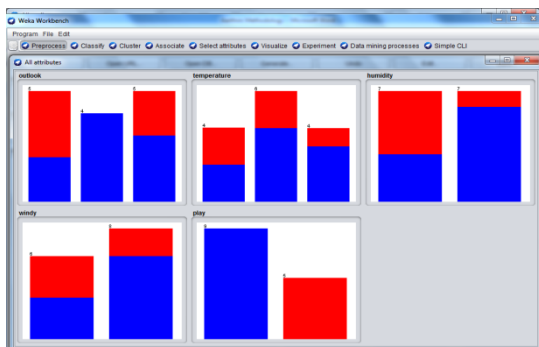## IX. RESULT

1. Weather Condition

Fig. 7 Weather Condition Graph.
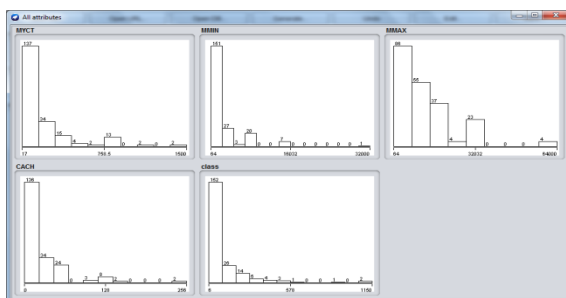
2.Cpu Power Consumption

Fig .8 CPU Power Consumption Graph.

X. CONCLUSION

In our system, the work as been done on dynamic energy-efficient fault-tolerant scheduling for real time task. Both energy conservation and fault tolerant is considered while meeting the real time requirement. We first analyze the CPU schedulability of real time task and also find out the weather condition to reduce the energy consumption. Our work brings substantial improvement in energy efficiency and task guarantee ratio. Our proposed system shows excellent performance in energy consumption based on the CPU scheduling and weather condition.

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