Online ISSN : 0975-4172
Print ISSN : 0975-4350
DOI : 10.17406/GJCST

Global Journal

of Computer Science and Technology: B

Cloud & Distributed

A Brief Survey

Supporting SMEs during the Risk

Highlights

Dynamic Congestion Control

Distributed Service Broker Policy

Discovering Thoughts, Inventing Future

Volume 16 Issue 3 Version 1.0

Global Journal of Computer Science and Technology: B
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Volume 16 Issue 3 (Ver. 1.0)

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Global Journal of Computer Science and Technology: B
Cloud and Distributed
Volume 16 Issue 3 Version 1.0 Year 2016
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 0975-4172 & Print ISSN: 0975-4350

Supporting SMEs during the Risk Assessment Stage of Platform as a Service Cloud Selection: A Case Study of SMEs in the West Midlands, UK

By Katie Wood
University of Wolverhampton

Abstract- The Cloud Computing (CC) paradigm has become popular among Small to Medium size Enterprises (SMEs) due to the promise of cost effective access to the latest applications via a Cloud Service Provider (CSP). There are many factors and pitfalls of Cloud Computing adoption as well as benefits to SMEs which have been highlighted through a research project that involved SMEs from the West Midlands UK. This paper outlines the challenges SMEs face when considering Platform as a Service (PaaS) adoption, and highlights that lack of understanding of the technology has either meant SMEs have not adopted Cloud Computing or have experienced difficulties with the adoption as important considerations where not evaluated.

Keywords: small medium enterprises (SMEs), cloud computing, platform as a service (PaaS), risk assessment.

GJCST-B Classification: C.2.1, C.2.4, D.1.3

Supporting SMEs during the Risk Assessment Stage of Platform as a Service Cloud Selection: A Case Study of SMEs in the West Midlands, UK

Katie Wood

Abstract- The Cloud Computing (CC) paradigm has become popular among Small to Medium size Enterprises (SMEs) due to the promise of cost effective access to the latest applications via a Cloud Service Provider (CSP). There are many factors and pitfalls of Cloud Computing adoption as well as benefits to SMEs which have been highlighted through a research project that involved SMEs from the West Midlands UK. This paper outlines the challenges SMEs face when considering Platform as a Service (PaaS) adoption, and highlights that lack of understanding of the technology has either meant SMEs have not adopted Cloud Computing or have experienced difficulties with the adoption as important considerations where not evaluated. Through a comprehensive investigation a theoretical framework – Cloud Step followed by an interactive tool – PaaS Cloud Dial have been developed to aid SMEs in understanding what factors need to be considered prior adoption of PaaS. Both have been validated through work with SMEs and the findings obtained from the validation procedure indicated that both the framework and application are valuable and suitable in supporting SMEs risk assessment and decision making process regrading Cloud adoption.

Keywords: small medium enterprises (SMEs), cloud computing, platform as a service (PaaS), risk assessment.

I. Introduction

Rapid developments in Information Technology (IT), and the increase demand for more effective and lower computing costs, has led to the emergence of the latest form of distributed computing systems; known as Cloud Computing. As this study will outline this form of technology might minimize the cost for individuals and businesses of using computerization resources, through contract payment to a third-party service provider (TPSP) Cloud Service Provider (CSP). Through Cloud Computing the user can spend less time and resources on managing complex IT systems which means more investment can be focused on the core business activities as outlined by Klunder (2011). Potentially, this could reduce infrastructure maintenance costs and improve the efficient management of an IT system. As data that was once housed under consumers' own administrative and security domain, can now be redirected and placed under the domain of the CSP. Yet the physical location of data is still critical and can negatively impact a business. According to Zissis (2012) Businesses require on demand access to data and the legal complexities surrounding location and access to data needs to be understood. Security issues have emerged from multitenancy. Therefore issues surrounding security and accessibility should be identified and acknowledged. There have been several reports and publications outlining the benefits of Cloud Computing adoption; including reports by Fujitsu (2011) and IMB (2009). Yet, as Morgan (2013) highlights there are also concerns and factors that are hindering adoption [5]. Security, loss of control and the blurred lines between responsibility and ownership of data as well as capability to deal with issues on the systems are key concerns that need to be factored into the decision or using Cloud Computing.

Many businesses are keen to adopt Cloud Computing solutions, given the possible benefits outlined above. However, the lack of skills and understanding in the workforce to fully appreciate what is involved in deploying and using Clouds is creating a barrier to Cloud adoption. This is further explained by [6] who states for Cloud technology to achieve its potential, there needs to be a clear understanding of the various issues involved, both from the perspectives of the providers and the consumers of the technology. As Cloud Computing is still an immature technology the concept and meaning of 'Cloud Computing' remains fairly unclear. Each Cloud is unique as businesses and end users' requirements differ; therefore how a Cloud is implemented and used will vary. There is limited education and training in businesses to educate staff about Cloud Computing, resulting in users not being fully aware of the associated risks of using this type of technology, especially in areas such as how to detect and respond to security threats and breaches. This is demonstrated through findings from SMEs participates within this study as well as from literature gathering.

As this paper will show, some SMEs have opted for Cloud before completing a risk assessment or being aware of the drawbacks of the technology. This paper focuses on the findings from work undertaken with SMEs in the West Midlands regrading Cloud Computing adoption. There was significant evidence to suggest that

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lack of sufficient support and training for SMEs to aid them in selecting the most appropriate Cloud. The paper introduces Cloud Step, which is a framework to guide SMEs during the risk assessment process and The PaaS Adoption Dial which provides SMEs the opportunists to self-evaluate their awareness of key Cloud considerations. The paper is organized as followed: Section 2 provides an overview of the project and cloud adoption in SMEs in the West Midlands. Section 3 presents key themes and challenges and discusses the initial work completed involving SMEs. It highlights some for the results that have since been taken into consideration in the development of the supporting framework. This is followed by Section 4, which provides in depth insight into the framework through outlining the different steps and rationale. Section 5 discusses the predictor analysis tool. Section 6 summaries and concludes this paper and proposes future work

II. Defining SMEs

There are varying definitions of SMEs worldwide as SMEs are classified differently in different countries. For example The Open Group (2015) states that SMEs are classed due to their size. This includes their assents, number of employees and financial turnover. In the UK, to be classed as SMEs, the business has to meet two out of three of the following criteria:

- Turnover of less than £25m,
- Less than 250 employees
- Assets of less than £12.5m. Department of Business, Innovation and Skills (2012)

The European Commission (2012) established the European definition of SME as "The category of micro, small and medium-sized enterprises (SMEs) is made up of enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding 50 million euro and/or an annual balance sheet total not exceeding 43 million euro." The European Commission (2015) considers "SMEs and entrepreneurship as key to ensuring economic growth, innovation, job creation, and social integration in the EU. In 2013, there were 4.9 million businesses in the UK, over 99% of which were small and medium enterprises Ward (2014) resulting in employment for 32% of the UK workforce and contributing to the annual turnover by 18% Ward (2014) and (Henniger (2015). SMEs are essential to the UK economy development and growth, job creation and integration through their position in national and international markets. For SMEs having a smaller budget than larger businesses is always an issue, however through cloud computing SMEs can benefit from the same resources as larger businesses thus become more competitive. As businesses tend to be cost focus and interested in the possible cost saving through this technology, the actual migration and deployment time and costs tend to be neglected. This point is further illustrated by Zenga (2010) through explaining that for SMEs the cost in terms of money and time in migrating can impede any potential benefits. It could be assumed that lack of awareness and education is contributing towards SMEs being unprepared for the amount of work required during this stage.

A major characteristic attributed to SMEs is flexibility Levy [9]. Therefore SMEs have a distinctive advantage over larger organisations through "responsive, flexible, flat structured and simple" European Commission (2015) organisational environment. According to Lobel (2015) a third of UK SMEs have grown over the past two year and the role of technology has allowed SMEs to 'scale up' and become more competitive. However, there are contradicting reports and claims over how successful and how much SMEs are embracing cloud technologies.

A survey conducted by Vmware suggested in 2011 that "60 per cent of small and medium-sized enterprises (SMEs) across Europe have adopted some internet-based IT services." Henniger (2015) Therefore, based on this, UK SME are deemed as slower to adopt Cloud Computing. It has since been reported in 2015 that UK SMEs are in fact taking the lead in cloud adoption [13]. This is based on an independent research study of just under 3,000 SME leaders across the UK, the USA, France, Germany, the Netherlands and Belgium [14]. The findings show that "just under half of UK SMEs (47%) are now using at least one cloud business software tool." Exact [14] argues that SMEs are using cloud computing services but would suggest most are using SaaS. What is clear is that UK SMEs are increasingly embracing the technology but it is unclear if SMEs are using cloud technologies to their full potential and the selection is suitable to meet the business requirements.

III. Cloud Related Issues

Cloud Computing has reshaped the IT industry and has also had a significant impact on a range of other sectors such as education and services. A study conducted by the Economist Intelligence Unit and IBM showed that among 572 business leaders surveyed, almost three quarters indicate their companies have piloted, adopted or substantially implemented Cloud in their organizations and 90% expect to have done so in three years as outlined by Levy (2015). This statement clearly outlines that cloud adoption will continue to grow and there has been evidence in the UK in recent years of businesses and public services moving to the cloud, for examples the UK Government G-Cloud system. Many businesses are keen to adopt Cloud technologies given the possible cost saving benefits. However, the lack the skills and understanding in the workforce to fully

appreciate what is involved in deploying and using clouds. This may be due to the fact it is still unclear what is really meant by the term Cloud Computing'. Each Cloud is different, and unique to meet the requirements of that business or end user. There is limited education and training in businesses to educate staff about Cloud, resulting in users not being fully aware of the associated risks of using this type of technology, especially in areas such as national security and government services. Users lack understanding of how to detect and respond to security threats and breaches. Many assume the CSP is fully responsibility for dealing with such issues, which is not the case. Evidence suggests that PaaS adoption is becoming more accepted Mac Gregor (1998) Lobel (2015) and is on the rise The fact there is no standard application programming interface (API) currently available means that some developers and users have concerns and require guidance in ensuring the right PaaS environment is selected.

The Marketing Donut (2015) reported that security is a prime concern for any user of Cloud Computing [19]. According to Carstensen [20] the security concerns associated with Cloud Computing present a significant challenge for organizations who are attempting to understand how to move their products and services into the Cloud environment. It is vital that all organizations understand the potential risks in order to keep their company safe whilst gaining the benefits from using the Cloud. Many risks associated with Cloud Computing would often have legal implications for organizations and it is vital that knowledge is provided to the Cloud consumer and controls are put in place in order to overcome these risks.

Cloud may have the capabilities of vastly changing the approaches of implementation, usage and management of computing systems for both the public and private sector. The foundations of cloud infrastructure provide more flexibility and dynamism in the computing infrastructure than pervious forms of distributed systems. The requirements and demands from users for cloud services vary, resulting in complex design and deployment of resources, and therefore places barriers for adoption for those businesses that might not have advance IT skills. The scope of this particular research undertaken was to examine the lack of SMEs understanding of the requirements during the migration and deployment on a Platform as a Service (PaaS) for the perspective of the business to evaluate if poor or misconfiguration could result in security issues. Through highlighting the role of configuration management in PaaS and identifying potential security vulnerabilities that may be encountered due to mis-configuration provides evidence to show where SMEs users need support. This data then allowed for a generic migration and deployment risk assessment process to be developpped to provide SMEs with a suitable framework that can be used as a cross reference during the initial deployment and migration of applications onto a PaaS.

IV. Reserch Appoarch

Qualitative research methods were used in this study to identify SMEs backgrounds, understanding of Cloud terminology and actual use of Cloud solutions. The primarily used to focus on the development of PaaS for testing proposes to analysis security and usability issues during the deployment and migration stages. The research design framework (Figure 1) shows the road map undertaken in this project. The roadmap highlights the key factor identification, development of questionnaires, interviews and Cloud environment and the collection and analysis of quantitative data. Before showing how these feed into the initial framework and prediction tool.

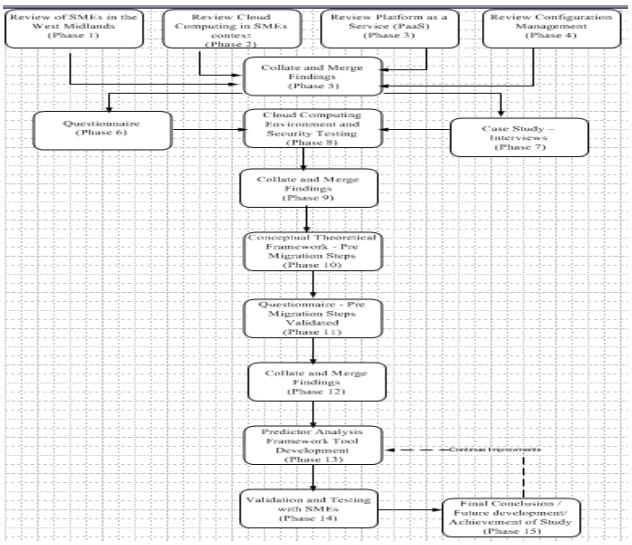

Figure 1: Roadmap of research phases

Questionnaires were used twice in this research study. The first questionnaire was used in Phase 1 and a range of open and close questions where used to gather information to assess the attitudes, opinions and technological awareness of SMEs participants in order to identify any common themes and concerns from this target audience. The particular target audience selected for this project were all SMEs that relied heavily on IT. For example financial systems and software uses. Therefore, it is assumed that all participants had a good awareness and experience of IT. The second questionnaire was designed and produced during Phase 2 and was used to assess SMEs views on the produced post migration steps that had been produced based on collection and analyses of data from the different approaches used

V. Framework

Findings from the project highlighted that SMEs have encountered a series of issues relating to the selection and deployment of different Cloud solutions, partly due to the lack of guidance available to aid the decision process. Based on the findings, the following

step model (Fig. 2) provides a logical structure to support the initial migration and deployment through a series of essential criteria steps that SMEs should follow to ensure suitable migration and deployment of their selected Cloud.

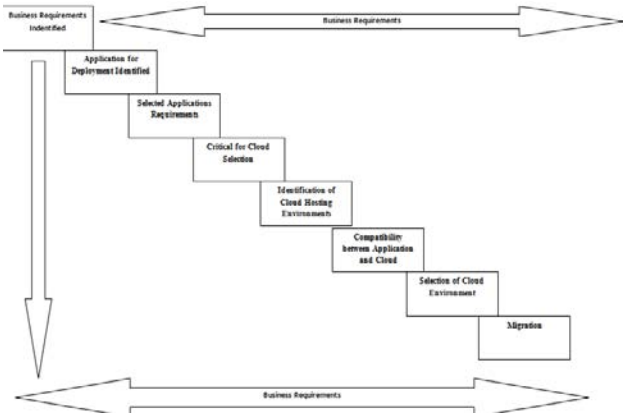

Figure 2: Cloud Step Framework

This framework is an appropriate and logical approach to support SMEs during the decision making process over selection a suitable Cloud solution as well as to ensure a series of stages are taken to ensure suitable transition to a PaaS to reduce security related issues.

VI. PaaS Adoption Dial

The PaaS Adoption Dial acts as a risk assessment supporting tool that has been designed based on findings from work with SMEs in the West Midlands. PaaS Adoption Dial allows businesses to self-evaluate this current progress towards improving PaaS their understanding and requirements prior to the full adoption and implementing of a PaaS solution. This provides SMEs the opportunity to self-assess their suitability to adopt PaaS solutions into their business, based on their level of awareness of core considerations. Therefore this tool can significantly reduce an organisation's vulnerability through highlyghting areas that require more understanding or support before committing to a PaaS adoption. The PaaS Adoption Dial was developed in java script and uploaded onto a server as a web application. This allowed SMEs to gain access to the application via a web link and to complete the task when required. SMEs can access this application through the link below.
http://www.scit.wlv.ac.uk:8080/cloudadoptiondial/

That application was built to include several parts that included an introduction to the application, the PaaS Cloud Adoption Dial and PaaS Adoption Recommendation Results.

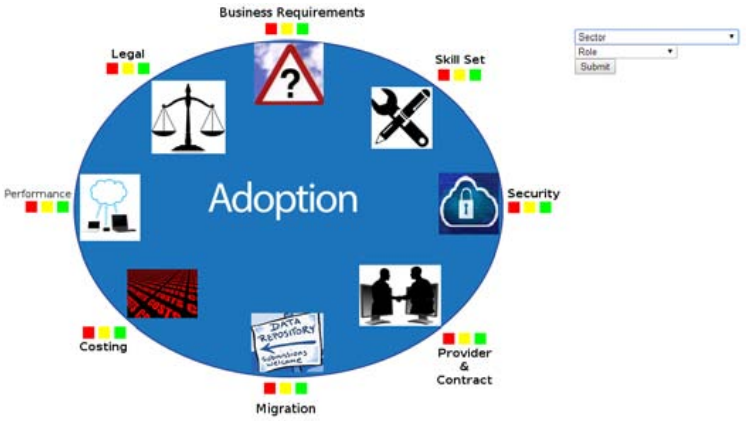

Figure 3: PaaS Adoption Dial

VII. Conclusion and Future Work

This paper presented a discussion of concepts and ideas surrounding Cloud adoption. The PaaS Adoption Dial tool is currently being used by SMEs in the local region. The author is awaiting feedback for the SMEs to evaluate if this tool has supported in allowing SMEs to assess their own position and suitability in adopting different Cloud solutions based on the business requirements and understanding of the technology. As Cloud is a rapidly changing area, the plan for future work is to re-evaluate the PaaS Adoption Dial position in terms of categories as well as to get other SMEs from different regions of the UK and internationally to use the tool to see if PaaS adopting and understanding varies.

References Références Referencias

1. Carstensen, J., Golden, B. and Morgenthal, J. (2012) Cloud computing assessing the risks [online]. Cambridgeshire: IT Governance Publishing [Accessed 8 December2014]. Available at: <https: //www.dawsonera.com/>.

2. Department of Business, Innovation and Skills. (2012)'Collection Mid-sized businesses. https://www.gov.uk/government/collections/mid-sized-businesses. [Accessed 21 November 2015].
3. European Commission (2012) 'What is an SME?' http://ec.europa.eu/growth/smes/business-friendly-environment/sme-definition/index_en.htm [accessed 19 November 2015]
4. European Commission (2015) [accessed 19 November 2015] http://ec.europa.eu/growth/smes/
5. Henniger, C E, Aleyizous, P J. Oates, C, J. Cheng. R 'Sustainable Supply Chain Management in the Slow-Fashion Industry.'
6. IT PRO 'UK SMEs lag behind Euro cloud adoption.'
7. Levy, M. & Powell, P. (2005). Strategies for growth in SMEs: the role of information systems and information technology. Butterworth-Heinemann,
8. Lobel. B (2015) 'A third of UK SMEs have grown over the past two year' http://www.smallbusiness.Co.uk/news/outlook/2489261/a-third-of-uk-smes-have-grown-over-past-two-years.thtml
9. MacGregor R.C., Bunker D. J. & Waugh, P. (1998). Electronic Commerce and Small/Medium Enterprises (SMEs) in Australia: An Electronic Data Interchange (EDI) Pilot Study. Proceedings of the 11th International Bled Electronic Commerce Conference, Slovenia, June 1998. Marston, S., Li, Z., Bandyopadhyay, S., Zhang, J. and Ghalsasi, A., 2011.'Cloud computing—The business perspective. Decision support systems', 51(1), pp.176-189.
10. Sustainable Fashion Supply Chain Management. Volume 1 of the series Springer Series in Supply Chain Management pp 129-153. http://link.Springer.com/chapter/10.1007/978-3-319-12703-3_7 [Accessed 21 November 2015]
11. The Marketing Donut (18 Sept 2015) 'UK takes the lead on cloud adoption' http://www.marketingdonut.co.uk/news/marketing/uk-smes-take-the-lead-in-cloud-adoption [Accessed 21 November 2015]
12. The Open Group 'Maximizing the Value of Cloud for Small-Medium Enterprises: Key SME Characteristics (Business and IT) O[8] http://www.opengroup.Org/cloud/cloud/cloud_sme/characteristics.htm [Assessed 19 November 2015]
13. Zebga, S. X, Xie, X. M, Tam, C. M (2010) Relationship between cooperation networks and innovation performance of SMEs. Technovation, 30 (3), 181-194.

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Global Journal of Computer Science and Technology: B
Cloud and Distributed
Volume 16 Issue 3 Version 1.0 Year 2016
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 0975-4172 & Print ISSN: 0975-4350

Dynamic Congestion Control in Network Layer for Advanced Cloud Computing

By K.Rangaswam, Dr. C. Rajabhusana & G. Ramasubbareddy
Chaitanya Bharathi Institute of Technology

Abstract- Cloud computing becoming attractive tool for delivering web-based services. It can enable rapid development and dynamic scaling and it offers flexible powerful but low cost distribution infrastructure. In paper we proposed new infrastructure capabilities to support dynamic networks. In the network layer Allocation of resource at specific locations and those sites are connects by backbone supporting provisional virtual links. Each location constructs one data center for processing of resource specified by function. Application controller updates the distribution information and multicast to access nodes for load balancing of flow of packets and regulating the traffic flow within application cluster to avoid congestion.

Keywords: *load balance, cluster, virtual output queues, resource allocation.*

GJCST-B Classification: *C.2.1, C.2.4, D.1.3*

Dynamic Congestion Control in Network Layer for Advanced Cloud Computing

K.Rangaswam [α], Dr. C. Rajabhusana [σ] & G. Ramasubbareddy [ρ]

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Keywords: load balance, cluster, virtual output queues, resource allocation.

I. Introduction

Cloud computing is being widely adapted across many industry sectors with adapted with security concern.Net- work layer in the clouding computing face a congestion problem, not able balancing the load. In existing network layer resource allocation is biggest problem, due to that regulation of the traffic is very difficult. In this proposed paper introduces application controller to act as centralized operator for the balancing the load, regulating the traffic over the clusters. In these dynamic networks always updated information multicast to each region. The basic structure of network is through access node make a user interface to application servers. In same layer application controller plays a major role to control the congestion by using suitable techniques. The backbone routers are always communicating with data path services and forwarding multicast message and also subscription of the updates. The cloud will be divided in to multiple clusters, every cluster have data centers switches. The application server receive the updated news, observe the its server object locations and subscribe server implicitly to required multicasts. Finally the subscription done by the observing the traffic.

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II. Dynamic Network in Cloud Computing

The Dynamic networks are support new infrastructure capabilities. These networks easy to allocate the resource at specific region and share load equally that means in which location have a less traffic allocate the path through that direction. Regulating the traffic by updated messages. Here consider portion of dynamic network. The figure consists of Data center, Application node, provisional Virtual link and Virtual output queues.

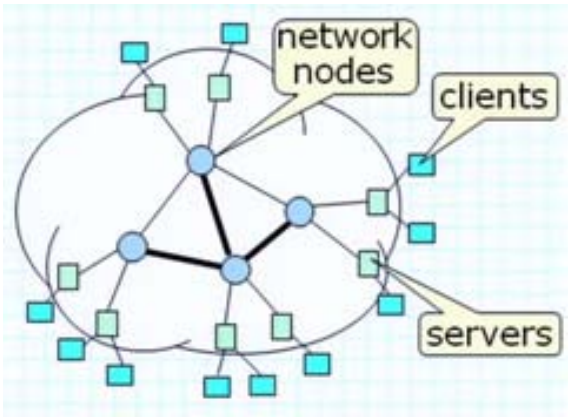

Figure 1

It support internet scale traffic volumes with router like latency, and flexible for high performance packet process. If require all sites are connected by backbone supporting the provisional virtual link.

Data center

Each Data center processor having cluster process resource specified by function, Data center consists of multiple stages for scalabiliy, each system with 1k-100k servers.

The additional edge capabilities are load balancing of flow or packets, regulating traffic flow within application cluster for avoiding congestion, multicast the packet forwarding within cluster.

III. Application Components

Overall Application Components are:

1. Access nodes
2. Application Controller
3. Application Server
4. Backbone Node

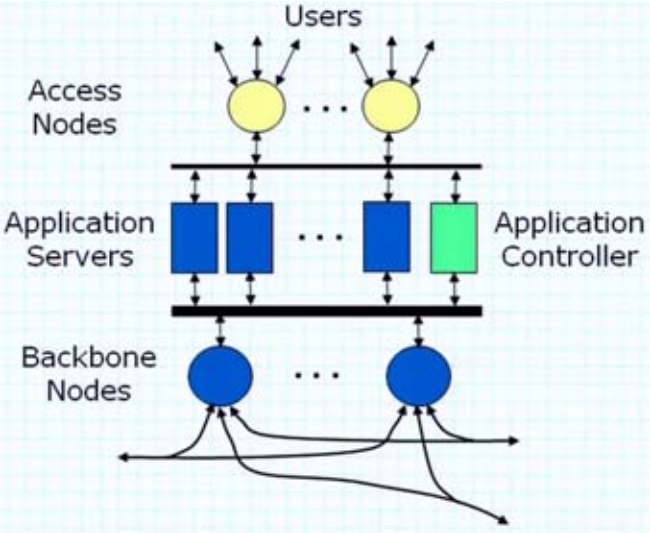

Figure 2

a) Access Node

Access nodes are User interface functions to pass the request and get the responses from servers. Each node has multiple user connections are directly connected with the respected servers.

Access node is part of the cluster and cluster is the portion of the data center.

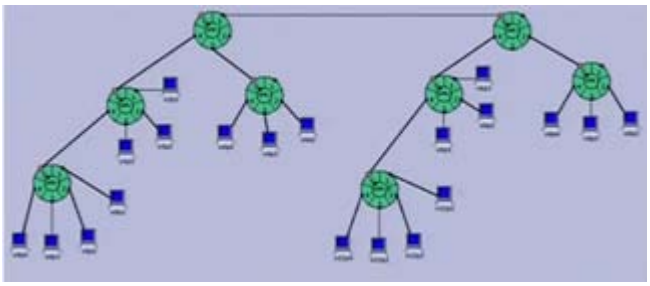

Figure 3

b) Application controller

It is system session level control. It will be create the sessions, increment multicast tree routing and controlling the updated information it distribute multicast message to all the regions in the cluster.

c) Data center switching Issues

Each switching center have multiple connection for scalability, switching center directly connected with other switching centers .it have multiple path to it neighboring switching centers. finally the performance is increases.

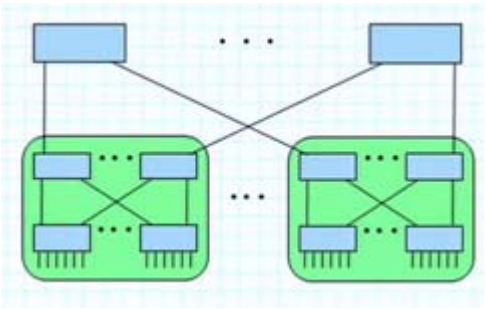

Figure 4

d) Controlling the updated distribution

For example divide the game in to multiple regions with multicast per region, and send object update on multicast for the region, receive state visible region. the server subscribe the regions as needed or network node can observe implicitly to required multicast. The subscription done by observing the traffic. When the server subscriber, starts for receiving updates: no coordination with sender required, send full updates periodically at lower rate

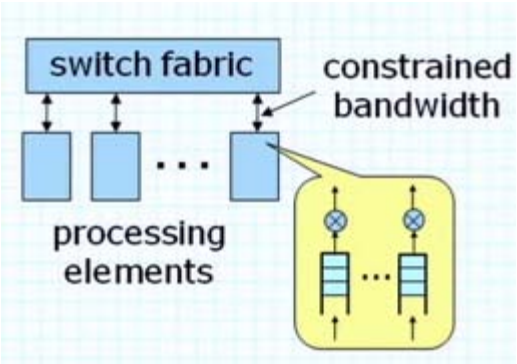

Figure 5

Regulating the traffic with cluster for avoid congesting outgoing interface to processing elements (PE) The PE's create virtual output queues. And dynamically VOQ rate will be adjusted. VOQ rate is adjusted to prevent output congestion while optimizing the performance.

e) Backbone Nodes

Backbone node provides data path services. To make a communication between any to data centers. And it can also multicast message forward and subscription. The nodes are act as intermediate nodes just share the message and subscription for following notifications.

IV. Conclusion

Each location constructs data center for processing of resource specified by function. Application controller updates the distribution information and multicast to access nodes for load balancing of flow of packets and regulating the traffic flow within application cluster to avoid congestion. The

processing elements create the virtual output queues to adjust to prevent output congestion. Finally reduce the congestion into minimal level in adaptive network layer in cloud computing

References Références Referencias

1. T. Ristenpart, E. Tromer, H. Shacham, and S. Savage, Hey, You, Get Off of My Cloud:Exploring Information Leakage in Third-Party Compute Clouds .In CCS, 2009.
2. F. Hao, T.V. Lakshman, S. Mukherjee, and H. Song, Enhancing Dynamic Cloud-based Services using Network Virtualization, In VISA, 2009.
3. C. Guo, G. Lu, D. Li, H. Wu, X. Zhang, Y. Shi, C. Tian, Y. Zhang, and S. Lu, BCube: A High Performance, Server-centric Network Architecture for Modular Data Centers. In ACM SIGCOMM, 2009.
4. P. Mell and T. Grance, "The NIST Definition of Cloud Computing," September 2011: http://csrc.nist.gov/publications/nistpubs/800-145/SP800-145.pdf, acessed 30 November 2012.
5. T. Koponen , M. Casado , N. Gude , J. Stribling , L. Poutievski , M. Zhu , R. Ramanathan , Y. Iwata , H. Inoue , T. Hama , S. Shenker, "Onix: A Distributed Control Platform for Large- scale Production Networks", in Proc. OSDI, 2010.
6. R. Niranjan Mysore, A. Pamboris, N. Farrington, N. Huang, P. Miri, S. Radhakrishnan, V. Subramanya, A. Vahdat, "PortLand: A Scalable Fault-Tolerant Layer 2 Data Center Network Fabric,"ACM SIGCOMM Comput. Communi., vol. 39, no. 4, pp. 39-50, October 2009.

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Global Journal of Computer Science and Technology: B
Cloud and Distributed
Volume 16 Issue 3 Version 1.0 Year 2016
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 0975-4172 & Print ISSN: 0975-4350

A Brief Survey of Cloud Computing

By Hibatullah Alzahrani
Saudi Arabian Cultural Mission

Abstract- Cloud computing is among the most promising technologies of the recent days, with the potential to reach $ 204 billion by the end of 2016. Almost all major tech companies provide cloud services of one sort or another like computing clusters and cloud storage. Cloud services can be provisioned as Software as a Service (SaaS), Platform as a Service (PaaS) or Infrastructure as a Service (IaaS) and they can be deployed as private, community, public or hybrid clouds. Cloud computing provides several advantages like ease-of-deployment, no maintenance and up-front costs, and rapid and efficient scalability. But it does pose several challenges with regards to security of data and privacy issues, and many security sensitive companies tend to shy away from cloud services due to this very reason

Keywords: cloud-computing, computing, storage, SaaS, PaaS, IaaS, scalable, cheap, privacy issues.

GJCST-B Classification: C.2.1, C.2.4, D.1.3

Strictly as per the compliance and regulations of:

A Brief Survey of Cloud Computing

Hibatullah Alzahrani

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Keywords: cloud-computing, computing, storage, SaaS, PaaS, IaaS, scalable, cheap, privacy issues.

I. Introduction

Cloud computing, along with big data, is the biggest buzz of tech world these days. Just like Internet and Web took the world by storm in 1990s and early 2000s, and smart phones have shaped the new world order in communication in last decade or so, cloud computing is also expected to revolutionize the way in which businesses would be conducted and services would be provided to potential consumers. Almost all major tech giants like Microsoft, Google, Amazon and Apple provide cloud services to their consumers and even to other major businesses – for instance Netflix uses Amazon Web Services for hosting their streaming services. The cloud industry grew by 16.5% last year and is expected to rise to $204B by the end of 2016 according to tech research company Gartner Inc. [1]. But despite all its hype and usage, the concept of cloud computing is pretty elusive and its definition quite vague. In simplistic terms, cloud provides remote computing and storage services from a pool of shared resources to its consumers. Much more precise definition is provided by NIST [2] as:

"*Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (such as, networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction*."

II. Brief History of Cloud Computing

The idea of cloud computing is nothing new and its basic premise remains the same as it was several decades ago – to provide remote or local on-demand storage and computing services to consumers. Even though many people believe that Cloud Computing is a fairly recent phenomenon, it has its roots in the ideas conceived in 1960s. J.C.R. Licklider of ARPANET is widely attributed as the first one to introduce the idea of "intergalactic computer network" in 1969, a machine which can be accessed from anywhere in the world. But even before him, in 1961, John McCarthy floated the idea of computation being provided as public service just like any other service, a concept he named as "utility computing" [3], and in many ways, this is exactly what cloud computing is these days. Through the 1960's and 70's, large banks of computers provided so-called "time-sharing" services to local and remote users. In the 1980's and early 90's, large distributed data centers became commonplace in large corporations. There wasn't any significant breakthrough until Internet became fairly common and easily accessible. Saalesforce.com [4] in 1999 was the first company to provide enterprise level applications to their customers through web. The next major breakthrough was the introduction of Amazon Web Services (AWS) [5] in 2002 which provided a multitude of cloud services like storage and computing. In 2006, Amazon introduced Elastic Compute Cloud, widely known as EC2 clusters [6], which enabled small and medium companies and even individuals to rent-off their servers to perform the desired computation. Same year, Amazon also introduced Simple Storage Service (S3) [7] to allow consumers to store their data online or on "cloud". After that, all major tech players jumped in the "cloud" wagon, providing cloud services of various kinds. In 2009, Google introduced "Google Apps" [8] as add-ons with its chrome browser which enabled developers to make their product and then host it on Google servers as web application. At about the same time, Microsoft and Apple launched their cloud storage products – OneDrive [9] and ICloud [10]. Microsoft also launched Microsoft Azure [11] which lets consumers use it for variety of purposes from online storage to databases, web APIs to full-fledged web applications to fully hosted Linux and Windows virtual machines. As time goes on, more and more players are entering this arena and with the passage of time, cloud technology is expected to get cheaper and much more accessible and useful, especially for tech-startups and entrepreneurs.

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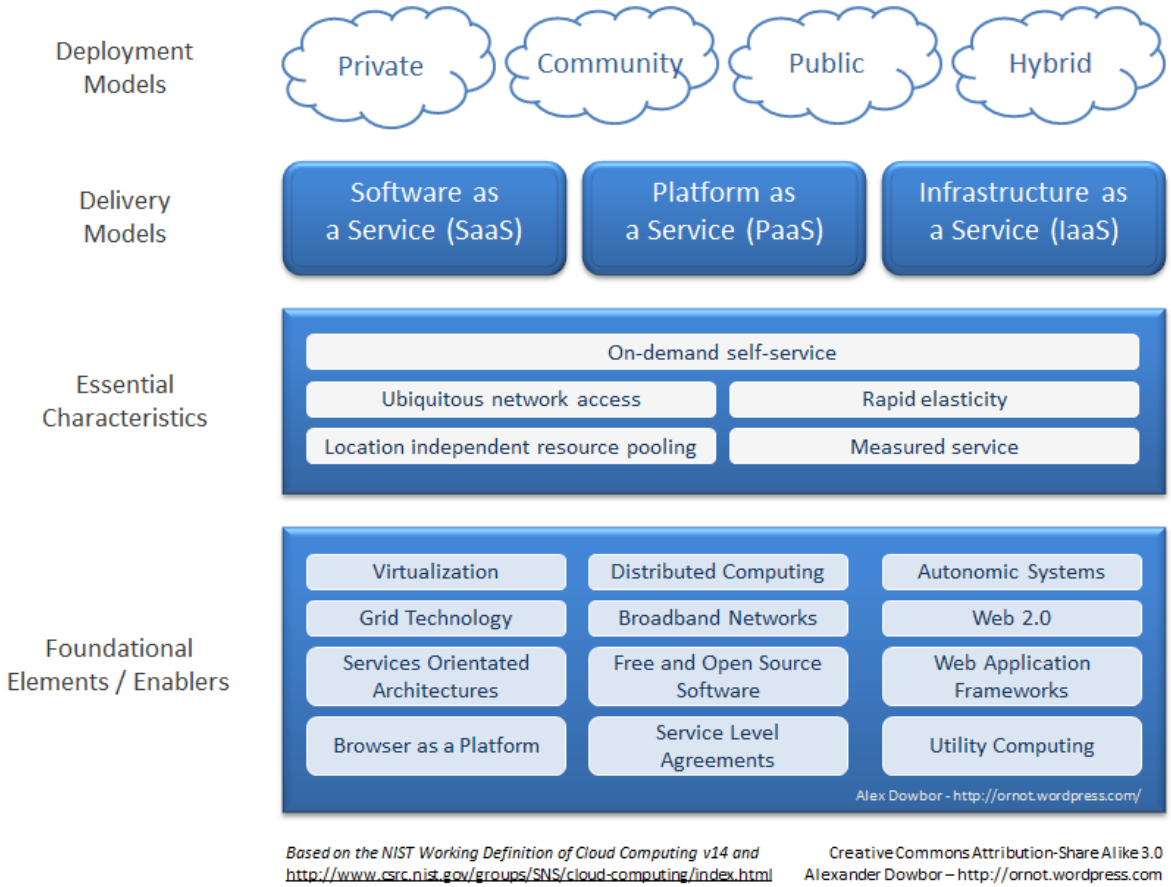

Figure 1: Cloud Computing Architecture

III. Five Essential Characteristics of Cloud-Computing

NIST, in its 16th and final Definition of Cloud Computing, codenamed SP (Special Publication) 800-145 [2], has highlighted five key characteristics that every cloud technology should incorporate. They are:

1. *On-demand Self-Service:* The consumer should be able to change the provisioned computing capabilities like number of cloud clusters and online storage unilaterally, without the intervention of human service provider.
2. *Broad Network Access*: Cloud services should be easily available through standard Internet mechanisms on all kinds of devices like mobiles, desktops, laptops, workstations etc.
3. *Resource Pooling*: It must be able to serve multiple consumers concurrently in location-independent way from same physical resources which are separated on logical level in a secure manner.
4. *Rapid Elasticity*: Resources should be provisioned and released on demand, and at any point of time, the consumer should have exactly the amount of resources he needs for his product. In essence, consumer should be able to scale up and down the resources, remove or add users, provision for more machines or storage in a seamless manner, and to him the resources should seem to be infinite, any amount of which can be provisioned at any point of time.
5. *Measured Service*: Cloud services should follow the pay-as-you-go pricing model. All consumption and usage of cloud resources should be monitored, logged and reported to consumer accordingly, and controlled from both sides under some agreement. A user should only be charged for what he used and also if there are limits on usage per user, it is the responsibility of service provider that such limits are not breached under normal circumstances.

IV. Cloud Computing Service Models

There are three service models for Cloud Computing, depending on how a service is provided to the user, how much control user have over the resources and what kind of resources user has requested. These are:

1. *Software as a Service (SaaS):* In SaaS, consumers are provided with the capability to access and use service provider's application running on cloud infrastructure. Its standard definition is given as:

"*Software deployed as a hosted service and accessed over the Internet*." [12].

Figure 2: Three Cloud-Service Models

Users can access the software through a web-browser based interface or any other thin interface like ftp or some client-side application. Users normally subscribe to these services on monthly or yearly basis, and they have little control over these applications. Examples include Microsoft Office 365, Microsoft Skype, Google Apps, and Sales force.

2. *Platform as a Service (PaaS):* Platform as a Service provides the user with the capability to develop, deploy and manage their applications on hosted platform. PaaS service provider usually controls resources like storage and computation power and application is exposed to its potential users through application programming interfaces (APIs) and some other form of graphical or command-line interface. The consumer does not have control over the underlying infrastructure like servers, storage type and size, operating system and number of processors, but can only control the deployed application and its configuration. Examples include Web-hosting services like Microsoft Azure Web Services, Amazon Web Services and Heroku [13] App Hosting platform.
3. *Infrastructure as a Service (IaaS):* Infrastructure as a Service provides virtual and physical servers as well as network and storage resources on consumers' discretion. The consumer does not have access over the underlying cloud infrastructure like type and power of servers but he can commission as much resources as he likes in terms of storage and computing power. He also has the choice to run the operating system of his own choice. Examples include Amazon EC2 clusters, Microsoft Azure (which provides both Linux and Windows VM). Similarly, cloud storage is a special example of IaaS where consumers are only concerned with the storage space.

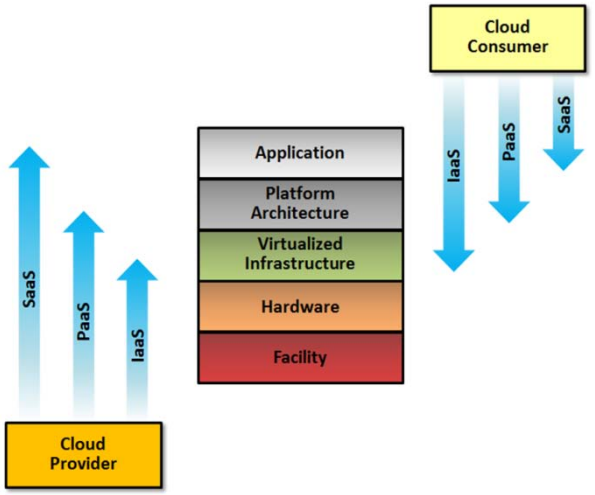

Figure 3: Control of Consumer for Each Service Model

V. Cloud Computing Deployment Models

1. *Private Cloud:* In private cloud, the cloud infrastructure is used exclusively by a single private entity like a business enterprise or a single company and can only be accessed by its employees and executives. The company can manage, own and operate the cloud services by itself or they can be out-sourced to a third party. The main advantage of this deployment is that safety and security of company's data and other vital information is ensured as no one from the outside world has access to the cloud.
2. *Community Cloud:* In community cloud, the cloud infrastructure is shared by a community of organizations which have common goals and are working on similar projects. So in that case, it makes sense to have a shared environment accessible by all relevant people with specific privileges designated to them. The infrastructure can be owned and managed by one or more or all of the organizations involved or it can be outsourced to a third party.
3. *Public Cloud:* The public cloud is open to access to general public and it can be owned by a business, a university or a government institution. A public cloud is owned by the cloud service provider at its own premises. Most SaaS providers use this deployment to serve their consumers, e.g. all cloud storage providers use public cloud model to allocate storage from a shared resource pool. It is also the most common model encountered by people, and most people believe this is the only cloud model.

4. *Hybrid Cloud:* Hybrid cloud model is composed of two or more distinct cloud infrastructures (private or public) which exist as separate entities but are linked together through some standardization and protocols. Such models are usually used when businesses require some secure infrastructure for their storage but other tasks can be done on public or community cloud infrastructures.

VI. Advantages of Cloud-Computing

1. *Savings in Up-front Costs:* For most cloud services, there are no up-front deployment and purchase costs. Almost all cloud services follow pay-as-you-go pricing model, in which consumers are only charged for whatever they services they use for fixed amount of time.
2. *Ease of Scaling:* Cloud services can easily be scaled up and down according to the consumer's desire. For instance, cloud storage capability can be increased up to TBs or it can be as low as some GBs.
3. *No Maintenance Costs:* Cloud services have no maintenance costs, as it is the duty of cloud service provider to ensure the smooth and seamless working of underlying infrastructure. The consumer only has to pay for the services he used, and when servers wear-off or data drives fail, it is the service provider who has to bear the expenses for replacement.
4. *Always-On Availability:* Cloud services are always available to the users as long as they are connected to the Internet. There are some scheduled maintenance outage periods but such incidents are notified to users several days before and usually span a few hours at most. In some free or less expensive cloud services, there can be a maximum usage period for the user. For instance, the free account for Heroku Web Hosting platform provides 16 hours of up-time for the web application daily and 8 hours of outage period, but such outages are not continuous and are managed intelligently by the cloud service provider.
5. *Reliability:* Cloud services are pretty reliable in the sense that there is no need to worry about the potential data loss due to disk failure or break in computation task due to server failure or power outage. Cloud service providers use full back-up plans to ensure the integrity of data.

VII. Disadvantages of Cloud-Computing

1. *Security of Data:* The biggest question mark on cloud services is the security of data. Usually cloud service providers ensure excellent security mechanisms to prevent any leak of personal or other vital data, but such incidents have happened in the past. Last year, there was a massive leak of data in ICloud storage, where ICloud accounts of several celebrities were hacked and their private pictures posted online. This is the biggest disadvantage of cloud – you are putting your data online where other people can potentially access it in case of some breach. This is the prime reason many enterprise level companies shy away from using cloud and despite the success of cloud in capturing the market of small and mid-level companies, it has little share in big corporate level companies.
2. *Downtimes:* Most cloud services remain available 24/7 but for some services there are scheduled time-outs. This can be due to periodic maintenance or as explained earlier, sometimes the service provider only commits for a limited period of time per day.
3. *Limited Control:* Consumers have very little control over their products in the cloud. The most control they have is in the IaaS (Infrastructure as a Service) model, in which they can provision whole VMs and customize them according to their needs. But they still don't have any say over the underlying infrastructure. In SaaS, they have the least control as they can only configure certain parts of the application but they have no control over anything else.
4. *Network Dependency:* Another major disadvantage of cloud is its dependency on the Internet, or some other local network in case of private clouds. Even though Internet has become ubiquitous in the developed world, it is still finding its feet in the developing countries. So using cloud for your products essentially means you are ignoring that part of the world population which is without Internet, and for some products they can be a major demographic. Moreover, despite 3G and 4G data services in smartphones, people are still not very fond of using mobile data and essentially for data intensive applications they prefer to use Wi-Fi, which is not always available everywhere.
5. *No Legal Liability for Vendors:* Even though cloud service providers host the users' data and other sensitive information and provide the best available security, they take no liability in case of potential breach. There are also legal complications involved in cases where data is stored in servers located in some other country and the question arises as to laws of which country would apply on provision and privacy of data. For instance, if the government of native country decides to gain access to that data in case of some criminal or civil proceedings, and the laws of country where data serves are actually located prohibits any such intrusion, the cloud

service provider is faced with a dilemma and does not know which laws to follow. Without any international standardization, such problems will arise from time to time and thus both cloud service providers and users have to walk on a thin line.

VIII. Some Real-Life Examples

1. *Amazon EC2 Clusters* – virtual servers for storage & computing
2. *Microsoft Azure* – provides over 50 cloud services (both PaaS & SaaS)
3. *Microsoft Office 365 & Google Docs* – SaaS
4. *OneDrive, Google Drive, iCloud, Dropbox* – Cloud Storage

IX. Conclusion

Cloud computing is one of the most exciting technologies in the recent decade with potential to grow much more rapidly as Internet access becomes more and more ubiquitous. Its ease of use, low maintenance and up-front costs and ease of scaling makes it the perfect candidate for many start-up businesses in the modern entrepreneurial world. But security of private data remains a big concern and in the absence of concrete laws to decide whether the liability of data leaks is on the service providers or not, the consumers are bound to take precautionary measures themselves and use cloud on their own risk. Nevertheless, cloud computing is here to stay for the foreseeable future and it would be prudent for many businesses to adopt it.

References Références Referencias

1. http://www.gartner.com/newsroom/id/3188817
2. http://csrc.nist.gov/publications/nistpubs/800-145/SP800-145.pdf
3. https://computinginthecloud.wordpress.com/2008/09/25/utility-cloud-computingflashback-to-1961-prof-john-mccarthy/
4. https://www.salesforce.com/
5. https://aws.amazon.com/
6. Barr, Jeff (August 25, 2006). "Amazon EC2 Beta". Amazon Web Services Blog.
7. Amazon S3, Cloud Computing Storage for Files, Images, Videos. Aws.amazon.com (2006-03-01).
8. Sanderson, Dan (2009). Programming Google App Engine: Build and Run Scalable Web Apps on Google's Infrastructure. O'ReillyMedia ISBN 978-0-596-52272-8.
9. Thurrott, Paul (June 27, 2007). "Windows Live 2007: A Look at the Next Generation". Paul Thurrott's SuperSite for Windows. Penton Media. Archived from the original on June 29, 2007.
10. "Press Info – Apple Introduces iCloud". Apple June 6, 2011.
11. https://azure.microsoft.com/
12. Frederick Chong, Gianpaolo Carraro, "Architecture Strategies for Catching the Long Tail", Microsoft Corporation, April2006.http://msdn.microsoft.com/enus/library/aa479069.aspx
13. https://www.heroku.com/

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Global Journal of Computer Science and Technology: B
Cloud and Distributed
Volume 16 Issue 3 Version 1.0 Year 2016
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 0975-4172 & Print ISSN: 0975-4350

Cloud Computing based on RFID Internet of Things

By Mr. R. Venkatesan & Dr. C. Chandrasekar
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Abstract- The Internet of things is through the radio frequency identification (RFID), infrared sensors, GPS, laser scanners and other information sensing device, as agreed in the agreement, any items and Internet connection, the exchange of information and communication, to realize intelligent identification, location, with a network tracking, monitoring and management. The core of cloud computing is the high-speed information processing and transmission, its core idea is that large amounts of computing resources connected by a network of unified management and scheduling, constitute a computing resource pool to users on demand service. The three components of RFID system include the reader, antenna and the tag. The paper put forward the novel analysis model of Cloud computing based on RFID Internet of things.

Keywords: internet of things, RFID, cloud computing.

GJCST-B Classification: I.4.1, C.2.5

Strictly as per the compliance and regulations of:

Cloud Computing based on RFID Internet of Things

Mr. R. Venkatesan [α] & Dr. C. Chandrasekar [σ]

*Abstract-*The Internet of things is through the radio frequency frequency identification (RFID), infrared sensors, GPS, laser scanners and other information sensing device, as agreed in the agreement, any items and Internet connection, the exchange of information and communication, to realize intelligent identification, location, with a network tracking, monitoring and management. The core of cloud computing is the high-speed information processing and transmission, its core idea is that large amounts of computing resources connected by a network of unified management and scheduling, constitute a computing resource pool to users on demand service. The three components of RFID system include the reader, antenna and the tag. The paper put forward the novel analysis model of Cloud computing based on RFID Internet of things.

Keywords: internet of things, RFID, cloud computing.

I. Introduction

Internet of Things refers is to various information sensing equipment, and it is such as radio frequency identification (RFID) a huge network device, infrared sensors, global position system, laser scanner, gas sensors and other devices and Internet combined form. The purpose is to let all of the items are connected together; facilitate the identification, management and control. Can say, the Internet of things is the pan connected in network technology to build up object - based Internet, the connection may contain any time, any place and any connection object.

Sensing layer and the development of networking applications based primarily through radio frequency identification (RFID) system to achieve automatic collection of RFID tags and identification [1]. RFID tags attached to the items can be tracked, thereby achieving global circulation, perception and information system connected to an electronic code to read the label (Electronic Product Code EPC), and enter the network information system. IOT network layer will build on the existing mobile communication networks and the Internet, based on the perception layer collected upload data storage, query, analysis, mining, understanding and perception data based decision-making and behavior, and to achieve this series of data management and processing is the core EPC middleware, which acts as the network layer of things important part of the past and provide various services for the application layer basis.

Cloud computing refers to the IT infrastructure delivery and usage patterns, through the network to on-demand, easy extension ways to obtain needed resources; generalized cloud computing service delivery and usage patterns, through the network to on-demand, scalable way to obtain the desired service. This service can be IT and software, Internet, but also other services. The core idea of cloud computing, the computing resources connected by a network of unified management and scheduling, constitute a computing resource pool to users on demand service. Provide the resources of the network are called "cloud". "The cloud" resources can be extended indefinitely in the user's view is, and you can access at any time, as needed, to expand, pay per use. Industrial grade three layered cloud: cloud software platform, cloud, cloud equipment.

The Internet of things is the Internet of connected things. This has two meanings: first, the core and foundation of the Internet of things is still the Internet, is the extension and expansion on the basis of Internet; second, the extension and expansion of the client to any goods and goods between, the exchange of information and communication. Cloud security through a large number of client network of software behavior in the network anomaly detection, to obtain up-to-date information, malicious Internet Trojan program, pushed to the Server end of the automatic analysis and processing, then the solution of virus and Trojan distributed to each client. The paper put forward the novel analysis model of Cloud computing based on RFID Internet of things.

II. Development Internet of Things Based on RFID

The reader is the most important infrastructure, RFID system in one aspect, the weak electromagnetic signals RFID tag returns through the antenna RF module into the read write device is converted to digital signals, and then through the reader of the digital signal processing unit for processing plastic necessary for its, the demodulating returned from information, complete the RFID tags identification or read / write operations; on the other hand, upper layer middleware and application software and reader interact, realize the operation instruction execution and data upload.

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The system has the advantages of simple structure, low technical difficulty, more in line with China's national conditions. The mobile is currently operating payment systems without major changes, only in the mobile payment platform on the increase in the RFID data support system and GPRS gateway can, can make full use of the existing resources of mobile network.

The Internet of things to a new generation of IT technology fully used in all walks of life, in particular, is the embedded sensors and equipment to the power grid, railway, bridge, tunnel, highway, building, water supply system, dam, oil and gas pipelines and other objects, and then the "Internet of things" and the Internet to integrate existing, implementation the integration of human society and the physical system, the integration of network, there are super powerful center computer group, to implement the management and control of the real-time integration within the network of personnel, machinery, equipment and infrastructure, on this basis, the human can manage the production and life in a more precise and dynamic way, reach "wisdom" state, improve resource utilization and productivity, improve the relationship between man and nature [2].

Based on the RFID design of the microprocessor, the key information may not contain any encryption in ROM, but it does contain enough I/O, access control, encryption programs, and other information, these destructive attacks in non vital. Therefore, for the use of microprocessor RFID design, recommended by the FLASH or EEPROM non-volatile memory stored procedures, as is shown by equation1.

$$k_i = \hat{k}_i \Big/ \sqrt{\sum_{i=1}^{t} \hat{k}_i^2}$$

Includes two kinds of antennas in RFID systems, a class is the RFID antenna on the label, because it has and RFID tags are integrated into a whole, so no separate discussion, another kind is the reader antenna, which can be built into the reader, RF can also write through coaxial cable and read the output port connected to. The use of integrated antenna transceiver separation technology is to realize the transmitting and receiving function. Importance of antenna in RFID system is often neglected by people, in the practical application; the design parameters of the antenna are the main factors affecting the RFID system identification range. High performance of the antenna not only has good impedance matching characteristics, also need according to the characteristics of application environment for directional properties, polarization and frequency characteristics of special design.

In this paper, by analyzing the mobile payment development present situation and combining with China's national conditions, puts forward the scheme of implementation and the overall framework for GPRS mobile payment system based on RFID technology [3]. Compared with the existing domestic mobile payment system, the system has the characteristics of high efficiency, convenient, reliable; at the same time, compared with other RFID based mobile payment system, more in line with China's national conditions, the system has the advantages of simple structure, make full use of existing resources and mobile network; taking into account is currently in the integrated test stage. The Internet of things needs many sensors, this must have an infrastructure, such as paved roads, and this is the first step. Distributed sensor, how to collect data, after collecting data how to manage, how search data, how to find the data structure analysis, this is the biggest problem. We now just put sensors in 'complex', do this step, but only the 'network', to form a complete network. The application of RFID end user interface, to assist the user to read and write instructions and the logic of the middleware setup, gradually transforms the RFID atomic events for business users can understand, and demonstrate the use of visual interface, as is shown by figure1.

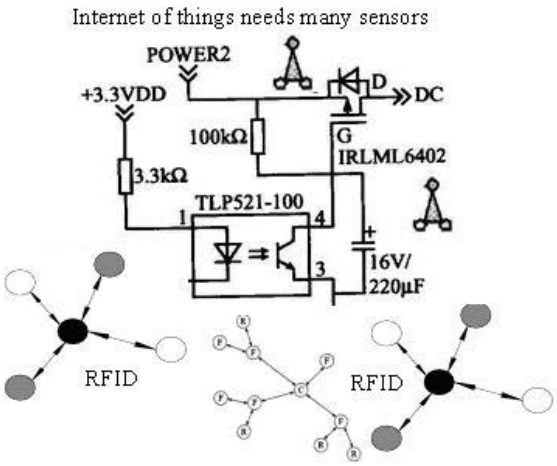

Figure 1: Development Internet of Things based on RFID

Due to the current RFID standard is not unified, and the Chinese national standard has not yet issued, taking into account the mobile payment application characteristics of short distance, low cost: the frequency of 13.56MHz RFID technology. With reference to the frequency point: ISO/IEC 10536, ISO/IEC 15693, ISO/IEC 14443 TYPE A/B and ISO/IEC 18000-3. Two standard is widely applied at present is ISO/IEC 15693 and ISO/IEC 14443 TYPE A/B. ISO/IEC 15693 belongs to the loose coupling of RFID standard, the read range is about 0~1m, and is compatible with the ISO/IEC 18000-3 standard. But the communication rate is relatively low, the single side carrier at low 6.62kbits/s,

high speed 26.48kbits/s; double subcarrier is respectively 6.67kbits/s and 26.69kbits/s.

Only when the read and write device, RFID can play its role. RFID reading and writing device with RFID card reader, RFID reader, RFID reader module, currently on the market the high price of CY-TZB-203, CY-TZB-208, YW-201 and YW-601U and YW-601R etc.. These devices can be RFID data read or write, and do good encryption. Long distance is CY-RFS-205; CY-RFS-209, WV-CID1500, and WV-VID1500 distance can be up to 1.5 kilometers.

One is the application layer, data processing, it covers every field of national economy and society, including electricity, medical, transportation, environmental protection, bank, logistics, industry, agriculture, city management, home furnishing life, its function can include payment, monitoring, security, location, inventtory, forecast, for the government, enterprises, social organizations, individuals, families. This is the Internet as an important manifestation of depth information. Another is the terminal equipment layer, providing man-machine interface [4]. The Internet of things is "matter is net", but in the end is to people-oriented, operation and control or the needs of people, but here the man-machine interface has been far beyond human computer interaction concept, but refers to various kinds of equipment and people with the application with the interaction is shown by equation2.

$$H = [u_1 \;\; u_2] \cdot diag(\lambda_1, \lambda_2) \cdot [u_1 \;\; u_2]^T$$

RFID power consumption is an important issue in the process of chip design, the series solution of higher efficiency, more suitable for integrated circuit design. But in terms of security, the parallel scheme is a more ideal choice: the parallel discharge circuit will change the power supply ripple amplitude and control in the smallest possible range, making the supply current consumption fluctuation suppression in after the rectifier circuit. The AC signal can not reflect such antennas at both ends of any internal base band system (mainly is the microprocessor) state difference.

The RFID system at least comprises two parts of the electronic tag and reader. RFID readers (Reader) for wireless communication through the antenna and RFID tag, can achieve a write operation to the tag identification codes and memory data read or. The typical reader contains a high frequency module (transmitter and receiver), the control unit and the reader antenna. RFID read and write can be roughly divided into the following several low-frequency reader, high-frequency reader, UHF reader, dual frequency reader, the 433MHz active reader. The working principle of RFID: radio frequency identification system, electronic label also known as radio frequency tags, transponder, data carrier; the reader is also known as the readout device, scanner, communicator, reader (depending on whether the wireless electronic tag can overwrite data).

For a general sense of the IC industry chain, to the bad chips on the wafer testing stage removed to reduce unnecessary waste of the back-end processing, RFID chip is no exception. According to the RFID for a general sense of the IC industry chain, to the bad chips on the wafer testing stage removed to reduce unnecessary waste of the back-end processing, RFID chip is no exception. According to the characteristics of RFID chip, wafer testing include: RF performance testing, function testing and memory test. As with ordinary chips, if with the help of chip function to test logic and memory chip, the test will substantially increase the cost of. Usually adopt the principle of equivalent test design test state additional to quickly finish. Because the test state provides fast, comprehensive access to the memory mechanism, it is necessary to complete the on wafer testing, the testing state permanently closed.

RFID ultra high frequency (UHF) tags for electromagnetic inverse scattering (Backscatter) characteristics, the metal (Metal) and liquid (Liquid) and other environmental sensitive, can lead to passive tag the working frequency (Passive tag) to the metal surfaces or liquid environment for work, but these problems with the development of technology has been fully resolved, for example, (SONTEC) label company that developed can well read application of passive tags in metal or liquid environment, to facilitate the deployment of RFID in the environment or application case.

$$f(x) = \frac{1}{2\delta^2} e - \frac{(x - \overline{m_y})^2}{2\delta^2}$$

Internet of things networking by communication layered system architecture, including perceptual extension system, transmission system, operation management system and a variety of applications, support differrrent communication protocols at different levels [5]. Power system (MEMS) system on chip (SOC), the rapid development of technology, wireless communication and low power embedded, bred a wireless sensor network (Wireless Sensor Networks, WSN), and its low power consumption, low cost, distributed and self-organization characteristics has brought a revolution in information perception. Wireless sensor network is deployed in the monitoring area by the large number of cheap micro sensor nodes, through wireless communication to form a multi hop ad hoc network.

RFID Tag Package Technology and equipment: such as packaging technology based on low temperature hot pressing, optimization design of precision mechanism, multi physical quantity detection and control, high speed and high precision motion control,

equipment fault diagnosis and repair, as well as online detection technology. The RFID tag integration: matching techniques such as between the chip and the antenna and special material attached to the three party, the label processing consistency technology etc.. Reader: such as dense reader technology, anti-interference technology, low cost and miniaturization reader integration technology, as well as the reader security authentication technology.

$$x' = \frac{a_1 x + a_2 y + a_3}{a_7 x + a_8 y + 1}$$

$$y' = \frac{a_4 x + a_5 y + a_6}{a_7 x + a_8 y + 1}$$

RFID middleware plays a mediating role between RFID hardware and the application program, a set of general application program interface provided by the application program can use middleware (API), which can realize the connection to the RFID reader. In this way, even if the storage RFID tag data database software or back-end application increase or by other software or replaced, read and write RFID reader types increase occurs, the application end without modification can also handle, solve the many to many connection maintenance complexity.

The RFID tag by coupling components and chips, each label is the only electronic coding, attached to the object on the target object. The package can have different forms, such as the common form of credit cards and small round form etc.. From the energy point of view, the label can be divided into two types: passive tags and active tags. Passive tags itself with no power, when reading device to read on the label, energy generation antenna emits radio contact to RFID label, its light weight, small volume, life can be very long, but the transmission distance is limited. Active tags the battery energy, the identification distance is long, but its high price and short service life.

III. Research of Cloud Computing based on RFID

Cloud computing platform provides basic operating environment EPC application services and middleware system; meet the definition of service, the three aspects of service management and service call request [6]. Define the running environment of service support; the user can service definition to meet business needs. Service management major provides for assembly, service choreography, regulatory and other functions, to meet the definition of a particular business process. While the service calls for service calls the user provided unified interface, convenient for the user to use cloud computing platform service. But in the use of complex enterprise, cloud computing, and not very good software architecture. In essence, in the abstract level, service is located in the middle of business and technology.

Service oriented software architecture design one must understand the dynamic relationship between business requirements and can provide services, on the other hand, also want to understand the relationship between service and providing the services of the underlying technology.

$$u'(x_1, x_2) = \sum_{s=-n}^{n} \sum_{t=-n}^{n} w(s,t) u(x_1 + s, x_2 + t)$$

The core of cloud computing is the high-speed information processing and transmission, its core idea is that large amounts of computing resources connected by a network of unified management and scheduling, constitute a computing resource pool to users on demand service. Simply put, the transmission network information in real time is something the reality of the existence of the real-time information, and the cloud computing more virtualization, which usually via the Internet provides dynamically scalable and often virtualized resources.

RFID tags are commonly known as electronic tags, also known as the transponder (tag, transponder, responder), according to the working mode can be divided into active and passive (You Yuan) (Wu Yuan) two categories, this paper mainly studies the passive RFID tag and system. Passive RFID tag consists of tags and tag antenna or coil, realize the communication between the reader and the use of inductive coupling or electromagnetic backscatter coupling principle.

Radio frequency label information written by wired contact mode, generally called the label information into the device programmer. The ability to tag information to the contact type usually has repeatedly rewriting [7]. For example, in the written lorry tag information use is this way. Tags in the complete information after injection, usually need to write entrance closed up, in order to meet the application on the moisture-proof, waterproof, anti fouling and other requirements.

The upload data, the reader will RFID tag for atomic events to filter or a simple filter conditions, the processing for the reader the event after the upload, data exchange between the flow to reduce and middleware and application software, therefore also integrated microprocessor and embedded system in many reader, the part of the middleware functions, such as signal state control, parity error checking and correction. Future reader presents intelligent, miniature-zation and integration trend, will also have the front control more powerful, such as direct and other Indus-trial equipment field interaction even as the controller for on-line scheduling.

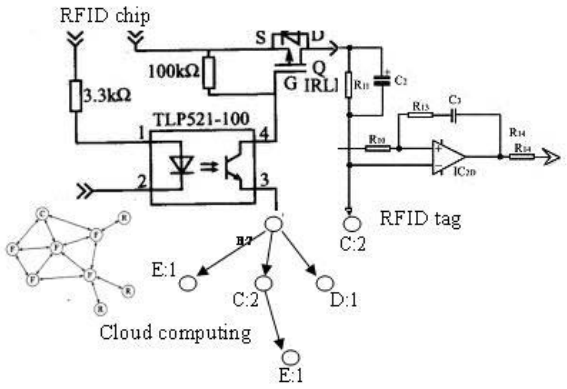

Figure 2: The structure of Cloud Computing based on RFID

Cloud computing operating system, also known as cloud computing center, cloud operating system OS, is the whole management system of cloud computing data center (some people think that cloud computing system comprises a cloud terminal operating system, all kinds of mobile phone operating system, such as the now popular little difference between single machine, operating system and the first do not do here discussion), it refers to the frame on the server, storage, network and other hardware resources and single operating system, middleware, database based software management huge basic hardware, soft resources on the cloud platform of integrated management system.

Cloud computing is a computing model based on the Internet, the remote data center, tens of thousands of computer and server connected to a computer cloud. Therefore, cloud computing can even let you experience the 10 trillion times per second computing power, have so strong power can be simulated nuclear explosion, forecast and market development trend of climate change. User's access data center computer, laptop, mobile phone etc, operate according to their own needs.

In the use of microprocessor RFID, also need to consider the software designers to improve code efficiency abuse CPU components (such as the address counter) safety problems caused by the behavior of the. The program counter for each instruction cycle auto increment, if be used for reading and writing memory address generator, attack only prevent processors to implement JUMP, CALL and RETURN instructions disturb the reading order can be normal. That is slightly with laser cutting some circuit connection; change the instruction decoder, the program counter circuit can realize the full access to memory.

$$K_N(x) = (2\pi)^{-d/2} \exp(-\frac{1}{2}\|x\|^2)$$

Cloud computing refers to the delivery of services and the use mode, refers to the network to on-demand, scalable way to obtain the desired service. This service can be IT and software, related to the Internet, or any other service. This pool of resources is called "cloud". "Cloud" is a virtual computing resources can be self maintenance and management, usually for some large-scale server cluster, including the calculation of servers, storage servers, broadband resources etc.. Cloud computing will all the computing resources together, and realized by software automatic control, without human involvement [8]. This makes the application provider does not need to worry about trivial details, to be more focused on their own business, is conducive to innovation and cost reduction.

IV. The Novel Analysis Model of Cloud Computing based on rfid Internet of Things

This paper presents a computing platform cloud based RFID network architecture, the operator can compute platform abstraction computation and storage resources by using cloud, integration middleware services, dynamic allocation to require the use of the user or the application, development business applications need according to the standard application program interface call resources required for the on the cost, with the total amount of use of resources is proportional to the throughput of the system rather than a check than. So the user can only care of the business logic implementation, operators can deploy various applications and services to the cloud computing platform and platform through the cloud computing control panel or interface provides application service.

In a simple RFID system, combined with existing network technology, database technology, middleware technology, to build a network consisting of a large number of readers and numerous mobile label, larger things become the development trend of RFID technology than Internet [9]. The Internet of things is widely used in many fields, in intelligent transportation, environmental protection, the work of the government, public security, security, intelligent home furnishing fire, industrial monitoring, elderly care, personal health etc.

$$\mu_m(\alpha(k)|\mathcal{R}_k) := \sum_{k \in \mathcal{R}_k} p(k) s_0(k) \beta(k) + \alpha(k)$$
$$= \beta \mu_{s_0} + \alpha$$

Cloud computing has three levels, the first is the infrastructure as a service (IAAS), is mainly responsible for communications, computing, storage and other infrastructure capacity; the two platform as a service (PAAS), is mainly responsible for development platform; the three is the software as a service (SAAS), is mainly

responsible for providing application and software services. In order to realize the application of "cloud computing", first of all need to develop the industrial chain, this has to go through a very long process; second, many new technical backing, for support, business model can be fully established.

Cloud computing is equivalent to the next Internet; also some people said that the Internet of things is equivalent to the next Internet, even bigger than the current internet. But in fact, want to do like the Internet now so fire, even bigger than the Internet now, also need a very long time to. Cloud computing and the Internet of things will be integrated, the Internet of things is extended to an angle of the material world, cloud computing is the processing, management, decision-making background is responsible for the Internet of things collected information processing platform, both need to combine.

These data need to be gathered to a certain storage and processing facilities through the wireless sensor network, broadband Internet, and the use of cloud computing to carry these tasks have very significant price advantage; from the quality perspective, the use of cloud computing facilities in the data processing, analysis, mining, can be more rapid, accurate, intelligent of the physical world management and control, so that people can more timely, fine management of the physical world, so as to achieve the "wisdom" of the state, greatly improve the utilization rate of resources and the level of social productive forces. It can be seen by Figure3, the cloud computing cost performance with its powerful processing capability, storage capability and high ratio, naturally become the network support platform.

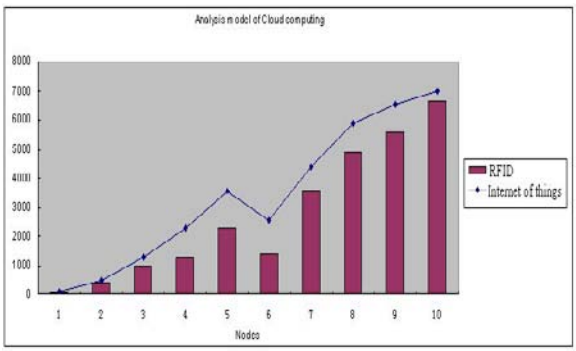

Figure 3: Comparison novel analysis model of Cloud computing based on RFID with Internet of things

The emergence of cloud computing will have a revolutionary impact on the future development of IT industry and information industry. It will be centralized to decentralized, management ability, revolutionizing business ecosystem. Cloud computing and cloud on both sides of the traditional model of end it has incomparable advantage, provide more services for internal developers and business users in the cloud side, enhance the usage efficiency of infrastructure and resources deployment flexibility. In the end, the ability to rapidly deploy applications and services, and it is according to need to adjust the service volume. From the successful case of the current cloud computing can be seen in this technology greatly improves the performance of the Internet information technology, has the huge computation and memory cost advantage, make the IT resources and capacity configuration like utilities as required, convenient use, low price. China Mobile has the world's largest user data warehouse.

V. Conclusion

Sensors on the content networking acquisition timing information needs to be transmitted through the network, because of its large and huge, forming a mass of information, in the process of transmission, in order to ensure the accuracy and timeliness of data, must adapt to a variety of heterogeneous networks and protocols. Also, the Internet of things not only provides the connection of the sensor, it's also has the ability to implement the intelligent processing, intelligent control of objects. The Internet of things sensor and intelligent processing combination, the use of cloud computing, pattern recognition and intelligent technology, expand its application areas. Information obtained from the sensors in the analysis, processing and handling of meaningful data, in order to adapt to different needs of users not, find new applications and application mode.

The paper put forward the novel analysis model of Cloud computing based on RFID Internet of things. RFID tag stores a unique code to mark the reality of objects, the business process related information stored in a data container, when the code is used as the query value to obtain relevant information through the network. RFID technology can also identify multiple tags, fast recognition speed, combined with Internet technology, can realize the information sharing in the global range.

References Références Referencias

1. YANG Zhexi, XUE Huacheng, *IJACT*, **2013**, 5(3), 282-289.
2. Bing Li, A Meina Song, Junde Song, *AISS*, **2012**,4(5), 283-291.
3. Zhang Qing-hui, Cheng Heng-feng, Xu Hong, *IJACT*, **2011,** 3(10), 9-4.
4. Kai-jian Liang, Quan Liang, *AISS*, **2012**, 4(17),174 - 182,.
5. Qunfa Cui, Yanwei Tian and Hejun Yao. *Journal of Chemical and Pharmaceutical Research* ,**2014**,6(1), 394-401.
6. Haiyan Liu, Jiahua Wei, Zenggang Xiong, Guangqian Wang, *AISS*, **2012**, 4(23), 531-39.
7. Sunong Wu, *AISS*, **2012**, 4(22), 690-697.
8. Guo Wang, Dong Dai, *JCIT*, **2013**, 8(4), 618 - 626.

9. Bi Tian Shu, Chen Jin Meng and Sun Meng. *Journal of Chemical and Pharmaceutical Research*, 2013, 5(12), 612-618.

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Global Journal of Computer Science and Technology: B
Cloud and Distributed
Volume 16 Issue 3 Version 1.0 Year 2016
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 0975-4172 & Print ISSN: 0975-4350

Distributed Service Broker Policy Algorithm for Logistics over Cloud

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Abstract- Logistics information system focuses on flow of information with storage and services of goods supply from the origin point to consumption point of organization. Logistics information system makes this flow more efficient with the help of cloud. Cloud computing manages the logistics information system centrally. The centralized data center keeps the track of information distribution which creates network congestion and overloading on data center when various requests of users from different regions occur at same time. So, the data center needs to be maintained effectively for better performance.This paper presents the distributed service broker policy to implement centralized data center and proposes distributed data center for logistics information system over cloud.

Keywords: logistics information system, distributed service broker policy algorithm, cloud computing.

GJCST-B Classification : H.4.2 C.1.4

Strictly as per the compliance and regulations of:

Distributed Service Broker Policy Algorithm for Logistics over Cloud

Shivani Dubey [α] & Sunayana Jain [σ]

Abstract- Logistics information system focuses on flow of information with storage and services of goods supply from the origin point to consumption point of organization. Logistics information system makes this flow more efficient with the help of cloud. Cloud computing manages the logistics information system centrally. The centralized data center keeps the track of information distribution which creates network congestion and overloading on data center when various requests of users from different regions occur at same time. So, the data center needs to be maintained effectively for better performance. This paper presents the distributed service broker policy to implement centralized data center and proposes distributed data center for logistics information system over cloud. This paper also presents the result of distributed service broker policy algorithm to reduce network congestion, higher latency and cost due to large number of demand of particular service in distributed data center for logistics.

Keywords: logistics information system, distributed service broker policy algorithm, cloud computing.

I. Introduction

A big organization mostly provides global logistics services distributed over the different geographical locations in the world. Cloud computing provides centralized data center policy for sharing the resources among the logistics partners and users. For example, a supplier sets up a vendor portal by using private cloud and this portal allows other user to access information through their login id and password in secure manner. The logistics users and cloud providers have main issue is that how the logistics information system can be best utilized by using cloud computing. Logistics information system is a interconnected process which is involved in provision of product, distribution of product and service packages required by end users in supply chain. Every organization is investigating how the cost and time can be reduced in each phase of logistics in collaboration of logistics partners and users. Distribution of information for suppliers and users is very important issue in logistics management. In order to manage logistics effectively, the use of cloud computing is increasingly become extremely important. Information is distributed at right location; right time within minimum cost is satisfactory level of all the suppliers and users in logistics management. A data center is a large cluster of computers containing thousand servers by any organization. The data center provides a variety of service, hosting distributed file system, storage, trans mission of large amount of data. Cloud service providers facilitate different services using large scaling with cost effectiveness and time efficient in cloud environment [1]. Cloud computing is advanced technology which contributes in cost and time optimization by providing software, platform, infrastructure as a services for logistics via internet. There are so many centralized architectures and policies for utilizing logistics in better form. In this paper, we propose a distributed architecture and distributed service broker policy algorithm for reducing the increment of cost and latency for logistics information system over cloud. Logistics information system is a process of planning and organizing of resources related to logistics information collection, storage, execution and distribution [2]. So, the coordination of suppliers, logistics partners and users for distributing information should be implemented for improving the logistics utilization in supply chain.

II. Literature Review

Cloud computing is an advanced technology to optimize logistics information system by using its infrastructure, platform and software solutions through the internet. Cloud computing is gifted to give cloud based service for developing financial and operational services in logistics management. Cloud computing infrastructure as a service provides cost effective service to the users who can save their cost by using services of cloud service providers or third party on the rental basis. There are various proposed approaches and architecture in a queue to implement the logistics for better utilization of logistics information system over cloud. Xiaona Ren et.al. (2011) proposed a prediction based algorithm which is called exponential smoothing forecast based on weighted least connection to handle the long connectivity applications. This algorithm calculates the load on the server from different parameters like, CPU utilization, memory, number of connections and size of disk occupation [3]. Li Yi Peng (2011) focused on the impact of cloud computing on information sharing in supply chain. This paper has analytical study of real time information sharing based on cloud computing by using simulation model to calculate the expected advantage of cloud for complex

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supply chain [4]. Joerg Leukel and Stefan Kirn (2011) proposed a service oriented approach adopted by cloud computing to provide interconnected operations in supply chain [5]. Maik Linder et. al (2011) introduced a new idea of cloud supply chain to analyze different types of information requires in each process of supply chain [6]. Sunderaswarn, Squicciarini and Lin (2012) provided a brokerage based approach for cloud service selection. They proposed a novel brokerage based architecture in the Cloud, where the Cloud brokers is responsible for the service selection and design [7]. Thomas Schramm et.al (2012) analyzed the concept of cloud computing in supply chain. This paper identified six questions for decision makers to adopt new technology which gives significant impact on supply chain [8]. Jyotsana Ojha (2012) also presented centralized cloud environment which manages all storage and computing resources centrally and this centrally environment creates network congestion [9]. Choy and Ganasekaran (2013) presented a brief literature review on logistics information system for decision making process to reduce the human errors and high cost of operational efficiency [10]. Deepak Kapgate (2014) presented a static service broker policy algorithm which improved increment of over loading on the data center and increment of data center transfer cost and response time [11]. Damian Daniluk and Bernhard Holtankamp (2015) defined the adoption of cloud in logistics mall for implementing the IT services and logistics processes [12]. Logistics information system uses centralized and distributed environment for communication, information distribution among the logistics partners and users. As though many centralized and distributed environment improvement in logistics information system has taken place over a period of time reflects lack of advancement of centralized policy which lower cost and latency to maintain and distribute information in different regions of country.

III. Centralized and Distributed Data Center for Logistics

With the facility of anytime and anywhere cloud computing services provide resource sharing of its services in logistics management. Logistics information sharing is demand driven globally so it should be perfect centralized when a local data center handles the job request its local supply chain system. Cloud computing manages storage and resources centrally over the different regions. The centralized data center manages track on delivery information by using centralized policy approach. There so many data center selection and load balancing technique to reduce the data transfer cost and latency for logistics information system over cloud.. Distributed data center (DDC) provides a distributed set of machines that are running at different locations, connected to a single network. Distributed datacenter uses distributed computing, storage and network resources from multiple locations into a single resource pool. By using flexibility, scheduling, scalability and automation techniques, this resource pool can provide users with service and access on demand making a better utilization of resources [13]. The infrastructure of global logistics information serves hundreds of thousands of customers in more than hundred countries. The logistics companies are expanding to help their customer achieve lower latency and higher speed and low latency network. There are two main issues for choosing cloud computing environment in centralized and distributed policy for logistics information system:

- *Cost:* Due to overloading of user's requests, the transfer cost of virtual machine will be increased.
- *Time efficiency:* Multiple users give requests globally which creates time delay between the request and response. So, there is possibility of incrimination of latency.

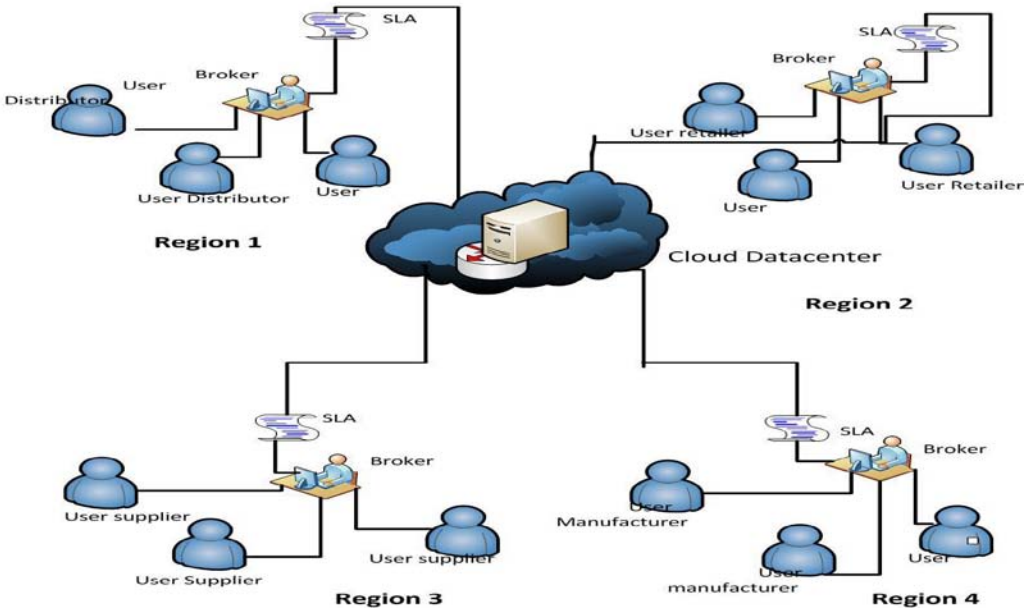

Figure1: Centralized data center for LIS over Cloud

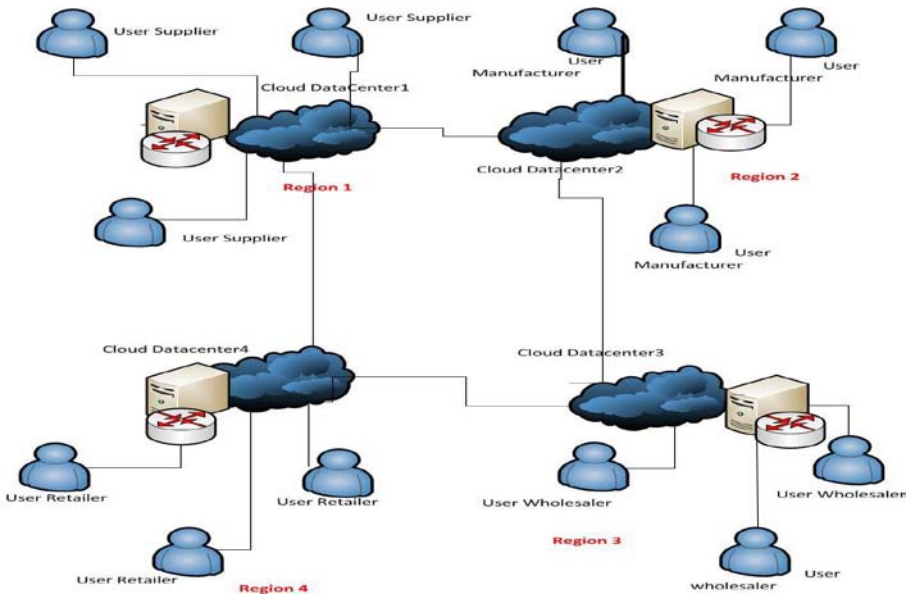

Figure 2: Distributed Data Center for LIS over Cloud

IV. Cloud Sim and Cloud Analyst

Cloud Sim is an event driven simulator built upon GridSim. It uses Java programming language. It is a modeling framework or simulation tool on cloud computing infrastructure [14]. It is an advance platform for using model of large data centers, unlimited of virtual machines, service brokers, scheduling and allocation policies of large scaling cloud platform. Cloud Sim is used for virtual machine (VM) management with three operations; host overload detection, VM selection techniques and VM placement techniques [15]. Cloud Analyst is based on Cloud Sim for evaluating performance and cost of large geographical distributed cloud system which have heavy load of users on different parameters. It has also graphical user interface (GUI) and hardware parameters like storage, main memory, bandwidth, distance etc. for giving simulation results included cost, response time, data center processing time and overloading on data center in table and chart forms [16]. Cloud Analyst conducts a simulation experiments based

on series of parameters verification in systematic and easy manner. The user request routing is very important task in cloud computing. The user request routing is a simulation tools in cloud analyst [17].

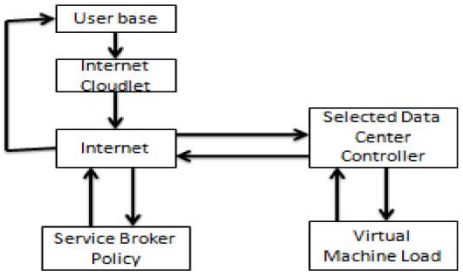

Figure 3: User Request Routing in Cloud Analyst

- *User Base:* It is a group of users and generates traffic that represents the users in simulation. It generates an internet cloudlet with application Id for each application and also includes name of the user base.
- *Internet Cloudlet:* It is used to specify a set of user requests and it also contains the application ID, name of the user base, size of request and input and output files.
- *Internet:* It is used to implement routing behavior
- *Selected Data Center Controller (DCC):* It is used to control data center activities.
- *Service Broker Policy:* it is used to decide which data center should be selected to provide the services to requests from the user base.
- *Virtual Machine Load Balancer:* It is used for load balancing policy by data centers when the serving allocation is requested.

V. Problem Formulation

The main purpose of this paper is to enhance and implement the collaboration of logistics partners and users for information sharing with operating effectiveness. Cloud computing provides advance effectiveness of operating information by using infrastructure as a service. In logistics information system, the transmission of information is a big problem among the different logistics partner and users by using cloud service provider. Every suppliers, logistics partners and users want to share information in real time manner. Cloud computing has highly efficient service for transferring the data and also provide information sharing in real time by using different cloud services. Only the problem is that how users access the services and applications floated around the cloud. Applications are moved from one physical location to another in geographical region in distributed data center. So, there are issues raised like, scalability, accuracy, latency, loading and cost of virtualization in distributed data center. Cloud computing gain higher user satisfaction and increase resource utilization for logistics information system. There are various techniques used for the centralized and distributed data center with their added limitations and benefits respectively. In centralized data center the location of data center to the requests is based on proximity based routing, which randomly selects data center into multiple data center in the same region so there will be possibility of different selection each time. This type of result can be difficult to interpret for the researchers and developers and the cost of transferring data will be increased in such a random selection of data center.

VI. Proposed Dsbp Algorithm

Distributed service broker policy algorithm is used for distributed data center where each region has its own data center and analysis how the response time will decrease when using data center selection based policy that user base request will executed on the nearest data center. So the nearest data center which has higher position in the proximity list response the request of user base. Proximity based service broker allows to the region selection based on the higher position in the proximity list and any data center of the selected region is then selected randomly for the user requests to be processed.

The steps of proposed DSBP algorithm:

1. Select the region
2. Calculate number of Data Center in selected region
3. If there is single Data Center then send the request to that specific Data Center
4. If there are multiple Data Center, select the nearest Data Center with minimum communication delay and maximum usable bandwidth between user base (client) and nearest data center in selected region
5. Find out the upcoming request in data center
6. Send the request to selected nearest data center
7. Analyze the result

The proposed DSBP algorithm is implemented by using Cloud Analyst simulation kit and analyzes the result graphically. The implemented algorithm is modified with respect to the centralized data center

based service proximity algorithm. The pseudo code of the proposed DSBP algorithm is mentioned below:

1. Get the Datacenter index of selected region
2. regionaList ← regional Data center Index.get (region) // store regionlist of selected
3. data centre
4. if regiona List is not NULL then
5. list Size← size (regionalist)
6. if listSize is 1 then
7. dcName← regionalist.get(0)
8. else
9. for all pt in dc Total Cost List do
10. pt= p+ Bandwidth cost // p is cost of DC in VMcost list
11. if (dc Total Cost List. get (smallest) > dc Toatal Cost List. get (pt)) then smallest=pt;
12. end if
13. end for
14. dc Name ←regionalist. get (smallest)
15. end if
16. end if
17. return dc name

Datacenter Index is index of datacenter in a selected region. p is VMCOST in cost list and dc Total Cost = storage*storage cost + memory* memory cost + bandwidth*bandwidth cost. Storage, memory and available bandwidth are predefined in Data center. In DSBP scheduling is done in a such way that if more than one datacenters exists in the same region, the job request will be executed on datacenter which have lowest cost in terms of total cost, which is combined cost of virtual machine and data transfer cost.

VII. Experimental Result and Analysis

We configure the simulation by using centralized and distributed data center which receives user base request from selected regions. For getting efficient performance in terms of response time we test the centralized and distributed architecture for logistics with following parameters:

Table1: User request configuration of data center DC1

Data center id	Region	Memory	Storage	Available Bandwidth	Number of processor	Processor speed
DC1	0	2048	1000000	1000	3	1000

In the above table DC1 is data center located in region which id is 0 and the physical hardware capabilities parameters are given.

Table 2: Cost configuration of data center DC1

VM cost	Memory cost	Storage cost	Bandwidth cost
0.01	0.05	0.01	0.01
Number of virtual machines (VMs) = 5	Memory =512	Images = 10000	Bandwidth = 1000

Table.2 represents the internal hardware cost of data center DC1. Each parameter have its own cost in terms of VM cost, memory cost, storage cost and bandwidth cost by using cloud service provider services.

Table 3: User request configuration of data center DC1 to DC6

Data center id	Region	Memory	Storage	Available Bandwidth	Number of processor	Processor speed
DC1	0	2048	1000000	1000	3	1000
DC2	1	2048	1000000	1000	3	1000
DC3	2	2048	1000000	1000	3	1000
DC4	3	2048	1000000	1000	3	1000
DC5	4	2048	1000000	1000	3	1000
DC6	5	2048	1000000	1000	3	1000

In the above table DC1 is data center located in region which id is 0 and the physical hardware capabilities parameters are given.

Table 4: Cost configuration of data center DC1

VM cost	Memory cost	Storage cost	Bandwidth cost
0.01	0.05	0.01	0.01
Number of virtual machines (VMs) = 5	Memory =512	Images = 10000	Bandwidth = 1000

Table.4 represents the same service broker policy which is closed data center or proximity based service broker policy and same round robin load balancing across VM in single data center means cloudlet execution on VM in single host according to round robin manner. Now we obtain that the average time and average cost according to overall response time of user base request and response time of each user given by selected region. The requirement of efficient time in logistics is most important task because each part of logistics depends upon each other for sharing information among the logistics partners and users. In centralized data center, we can see that load is increasing due to various user bases across various regions and executed on a single data center DC1. Global logistics is distributed in nature where various logistics partners and users connected with other users at various locations or regions. In centralized data center there is possibility of high response time by using single data center among the logistics partners and users. It will be in sufficient for logistics because each parts of logistics should get response timely. In the below graph presentation we can analyze the performance of response times of different configuration of user bases in centralized and distributed data center.

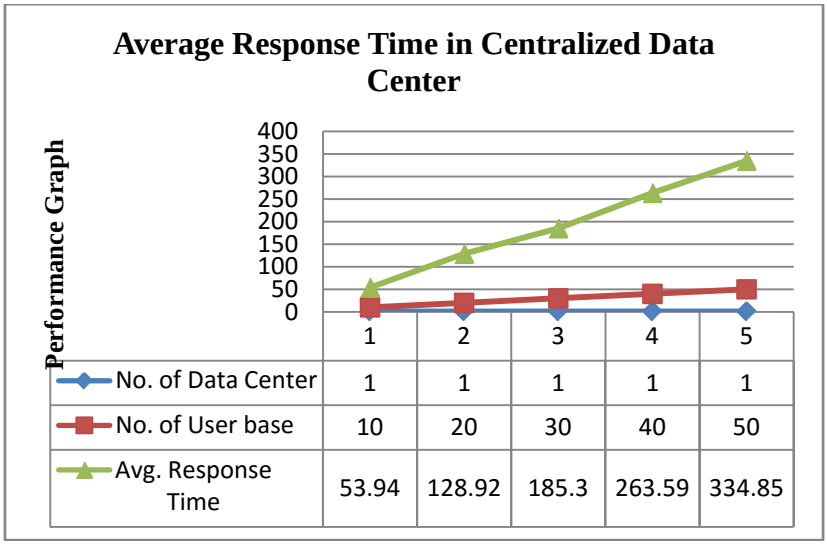

Figure 4: Performance graph in terms of response time of Centralized Data Center

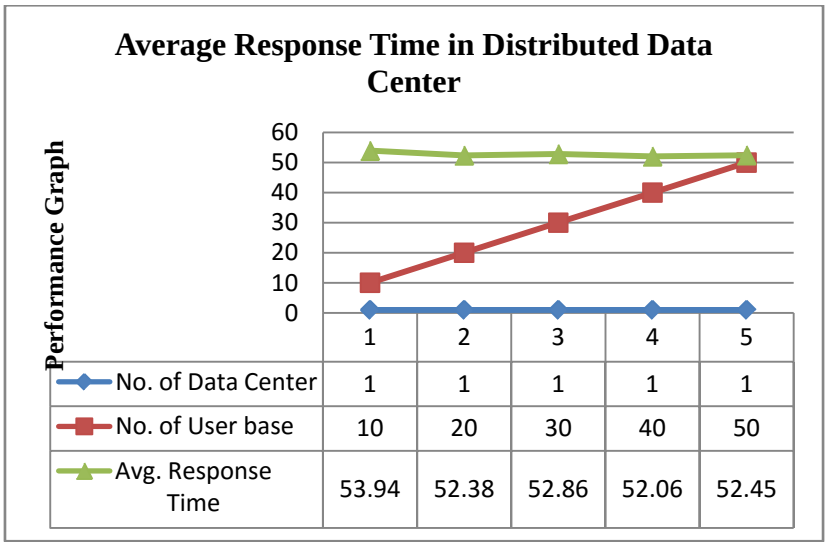

Figure 5: Performance graph in terms of response time of Centralized Data Center

According to the comparison of above two graphs we can analysis that when the number of user base request or job when increases, the response time of the request decreases rapidly. This decreasing response time comes due to heavy load of job request from various regions in centralized data center. Proposed distributed service broker policy in distributed data center allows that local data center takes request from its own region and don't face workload on its server because each local data center performs its action and gives the efficient response time. Here we also found that various response times from different region are also approximately same. Hence provide a scalable solution when the number of user request is increasing.

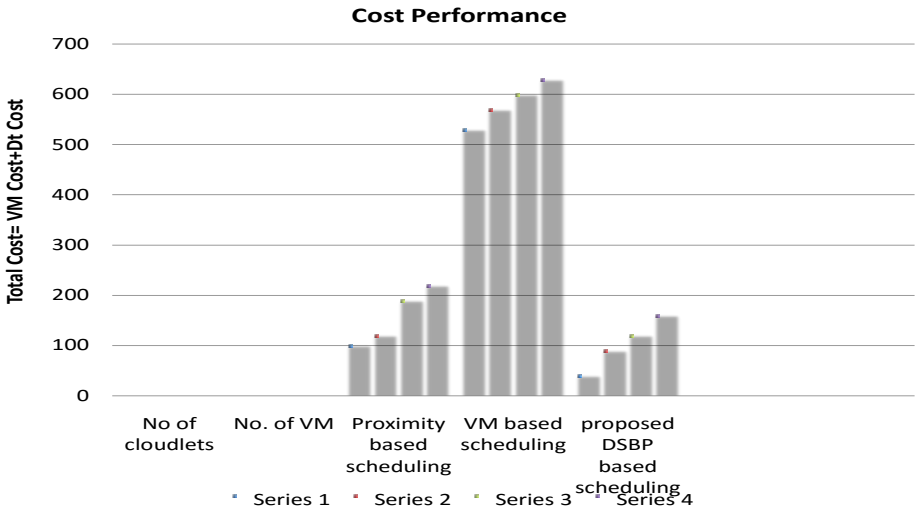

Figure 6: Cost performance graph using different data center selection scheduling algorithm

In above cost performance graph, figure.7 present that distributed service broker policy algorithm have least cost of data center in comparison to other service broker policy of centralized data center selection scheduling, where we take number of cloudlet on x axis while number of cost of data center on y axis. According to the graph performance of average response times and cost, the following results are included:

- The distributed data center will give fast response time and minimum cost than centralized one. So distributed data center scheme is highly suitable for logistics information system or information delivery in global logistics.
- In distributed data center scheme, if proposed DSBP algorithm will be selected, the output will be time efficient and cost effectiveness in selection of data center in terms of virtual machine cost and data transfer cost.
- The overall implementation of proposed DSBP algorithm will be better efficient for selection of data center in logistics information system by using cloud simulators.

VIII. Conclusion

Logistics is an initial stage for adopting cloud for its IT based services. Distributed data center architecture gives the efficient response time and effective cost service in comparison to centralized data center in the selected region. The result shows the distributed service broker policy algorithm uses proximity based routing policy and virtual machine based algorithms to improve the infrastructure of logistics information system over cloud. Cloud Sim and Cloud Analyst help to simulate the performance of response time and data transfer cost based on infrastructure as a service of cloud for logistics information system. In future, time and cost can be reduced by using some distributed routing algorithms on these cloud simulators to make researchers and developers to predict real time implementation of logistics information system over cloud.

References Références Referencias

1. Devyaniba Chudasama, Namisha Trivedi, Richa Sinha, Cost effective selection of Data Center by Proximity based routing policy for Service Brokering in Cloud Environment, International Journal of Computer Technology & Applications, Nov-Cec 2012, vol.3(6), 2057-2059.
2. H.G. Wu and S. Dunn, Environmentally Responsible logistics systems[J], International Journal of Physical and Logistics Management, 199525(2):20
3. Xiaona Ren, A dynamic load balancing strategy for cloud computing platform based on exponential smoothing forecast, IEEE international Conference on Cloud Computing and Intelligence Systems, 15-17 Sept.2011, ISBN: 978-161284-203-5

4. Li Yi Peng, 2011. The Impact of Cloud Computing based Information Sharing on Supply Chain. In Proc. of the International Conference on Management of e-Commerce and e-Government, IEEE Computer Society, 5-6 Nov. 2011, Hubei China, pp. 173-175.
5. Joerg Leukel, Stefan Kirn, A Service Oriented Approach to Freight Routing in Intermodal Transport Systems, University of Hohenheim.
6. MaiK Lindner, Fermn Galan, Clovis Chapman, Sturt Clayman, Daniel Henriksson and Erik Elmroth, The Cloud Supply Chain: A framework for Information, Monitoring, Accounting and Billing, International Journals, 2011.
7. Sundareswaran S, Squicciarini A, Lin D, A brokerage-based approach for cloud service selection, in 5th International Conference on Cloud Computing, CLOUD'12, Honolulu, USA: IEEE; 2012.pp 558-565
8. Thomas Schramn, Jonathan Wright, Drik Seng and Drek Jones, Six questions every supply cahin executive should ask about cloud computing, Accenture research paper, 2012
9. Joytsana Ojha, Distributed Environment of Cloud for Supply Chain Management, International Journal of Engineering and Innovative Technology, 2012, Vol. 1, Issue 4, pp. 50-55
10. Choy K.L, Gunasekaran A. (2013), Impact of Information Technology on the performance of logistics industry: the case of Hong Kong and Pearl Delta region, Journal of the Operational Research Society, vol.65(6), 904-916
11. Deepak Kapgate, Efficient Service Broker Algorithm for Data Center Selection in Cloud Computing, International Journal of Computer Science and Mobile Computing, vol. 3, issue.1, jan-2014, ISSN 2320-088x
12. D.Danilik, B. Holtkamp, (2015), Logistics Mall-A Cloud Platform for Logistics, Springer International Publishing Switzerland, 10.1007/978-3-319-13404-82
13. Mohammed Radi, Efficient Service Broker Policy For Large Scale Cloud Environments, International Journal of Computer Science Issues IJCSI, vol.12, issue.1, no.1, 2015
14. Dhaval Limbani, Bhavesh Oza, (2012), A Proposed Service Broker Strategy in Cloud Analyst for Cost effective Data Center Selection, International Journal of Engineering Research and Applications, vol.2, issue.1, pages:793-797, Feb2012
15. Hetal V. Patel, Ritesh Patel, Cloud Analyst: An Insight of Service Broker Policy, International Journal of Advanced Research in Computer and Communication Engineering, vol.4, issue.1, Jan-2015
16. Calheiros, R.N., et al., CloudSim: a toolkit for modelling and simulation of cloud computing environments and evaluation of resource provisioning algorithms, Software: Practice and Experience, 2011.41(1): p.23-50
17. Sunny Nandwani, Mohit Achhra, Raveena Shah, Aditi Tamrakar, K.K. Joshi, Sowmiya Raksha, (2015), Analysis of Service Broker and Load balancing in Cloud Computing, India Technical Research Organization, vol.2, issue.4, ISSN:2393-8374
18. Kunal Kishor, Vivek Thapar, An Efficient Service Broker Algorithm for Data Center Selection in Cloud Computing, International Journal of Computer Science and Technology, vol.2, issue.4, ISSN: 2347-8578.

Global Journal of Computer Science and Technology: B
Cloud and Distributed
Volume 16 Issue 3 Version 1.0 Year 2016
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 0975-4172 & Print ISSN: 0975-4350

The Contemporary Review of Notable Cloud Resource Scheduling Strategies

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Abstract- Cloud computing has become a revolutionary development that has changed the dynamics of business for the organizations and in IT infrastructure management. While in one dimension, it has improved the scope of access, reliability, performance and operational efficiency, in the other dimension, it has created a paradigm shift in the way IT systems are managed in an organizational environment. However, with the increasing demand for cloud based solutions, there is significant need for improving the operational efficiency of the systems and cloud based services that are offered to the customers. As cloud based solutions offer finite pool of virtualized on-demand resources, there is imperative need for the service providers to focus on effective and optimal resource scheduling systems that could support them in offering reliable and timely service, workload balancing, optimal power efficiency and performance excellence.

GJCST-B Classification: J.5

Strictly as per the compliance and regulations of:

The Contemporary Review of Notable Cloud Resource Scheduling Strategies

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Abstract- Cloud computing has become a revolutionary development that has changed the dynamics of business for the organizations and in IT infrastructure management. While in one dimension, it has improved the scope of access, reliability, performance and operational efficiency, in the other dimension, it has created a paradigm shift in the way IT systems are managed in an organizational environment. However, with the increasing demand for cloud based solutions, there is significant need for improving the operational efficiency of the systems and cloud based services that are offered to the customers. As cloud based solutions offer finite pool of virtualized on-demand resources, there is imperative need for the service providers to focus on effective and optimal resource scheduling systems that could support them in offering reliable and timely service, workload balancing, optimal power efficiency and performance excellence. There are numerous models of resource scheduling algorithms that has been proposed in the earlier studies, and in this study the focus is upon reviewing varied range of resource scheduling algorithms that could support in improving the process efficiency. In this manuscript, the focus is upon evaluating various methods that could be adapted in terms of improving the resource scheduling solutions.

I. Introduction

Information and cloud computing technology solutions has become an integral factor of today's communication systems and there are phenomenal developments in terms of how the companies are depending upon vivid range of information systems network for handling the business operations. Also, the volume of data that is generated by the companies is turning out to be a potential solution for the organizations. The volume of internet access and the big data solutions that are being implemented is creating a significant need for the organizations to focus upon varied kinds of data.

Such developments have eventually led to the rising demands of cloud computing solutions [1] [2]. The scope of computing resource capabilities and easy access to the data with increased mobility are the key solutions offered by cloud computing [3] and there are varied ways in which the cloud based solutions are offered to the users by the service providers. [4] [5].

Despite the fact that the cloud computing is similar to the process of grid computing and cluster computing models, in terms of characteristics that are common to parallel computing, but the usage of virtualization for resource management is a significant development [6] which facilitates in effective services as a utility model [7].

The scope of computing and accessibility to information has become much easier and the cost of managing IT systems to has come down significantly, which is not feasible in the traditional computing environment [2].

With the emerging trends of cloud computing solutions, there are numerous research studies that are being carried out in varied dimensions of cloud computing adaptation like focusing on increasing the operational scope of cloud computing, and predominantly the factor of virtualization. In the market oriented utility service stream like cloud computing, it is very important to focus upon optimally scheduling resources to reap potential benefits from the implementation [8].

In the SLA's between the service providers and end users, the emphasis is more on optimal scheduling of resources as the key deliverable of cloud computing services offered. [9]. Underestimating or unrealistic planning and provision of resources are leading to complexities [10]. In the dimension of optimum outcome, addressing the power efficient requirements, focusing on improving operational efficiency of the systems are becoming a major challenge for offering QoS requirements of the service. [11].

The process of improving the resource scheduling in cloud services has to focus upon identifying the suitable resources that are essential for scheduling an appropriate workload within time and also in terms of increasing the effective resource utilization process. In the other dimension, the quantum of resources availed for service offering also has to be minimal in terms of workload, ensuring required levels of service quality. To generate effective resource schedu- ling, best ways of mapping the resource workload is very important.

The second objective which plays a significant role in the resource scheduling process is to focus upon identifying the appropriate and suitable workload which can facilitate in scheduling multiple workloads which can address the QoS requirements like the CPU utilization, reliability, security and availability in the process of cloud services [12]. Hence it is very important that the resource scheduling focus upon the execution time for

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every distinct workload and also predominantly for improving the overall performance which is depending upon the kind of workload like either the heterogeneous workloads or the homogenous workloads. [13].

There is extensive research and development in the process of cloud resource scheduling, and from the review of literature it is imperative that resource scheduling is one of the significant challenges facing the development of cloud based solutions. [14] [15]. The issue of Nondeterministic Polynomial Optimization Problem [16] [17] is considered to be one of the key challenges in the process of cloud resource scheduling, as NP-hard issues rise the usage by number of variables that are using the deterministic algorithm for exhaustive search. There are significant chances that there is dimensionality breakdown envisaged when the algorithms that solve relatively routine cloud scheduling problem. The issues are compounded when there is some kind of proliferation, ambition and complexity in terms of cloud computing.

Adapting an Evolutionary Computation Algorithm for tackling the cloud resource scheduling has grabbed the attention of researchers, as such a method can offer an effective solution to hard problems in the scheduling [18],[19],[20],[21],[22]. The efficacy of such systems in resource scheduling at grid computing levels [23], such algorithms have gained momentum for application in the cloud resource scheduling too [24] [25].

The surveys that are conducted on effective scheduling in cloud computing [26] [27] [28] [29] [26] and some of the methods like the "interconnected cloud computing" [30], not much of algorithms have been discussed in the process. In this study, the focus is on assessing the issues and systematic review of the existing models of cloud resource scheduling solutions that are being adapted in the cloud computing environment. The study focus on following key aspects.

- Taxonomic structure evaluation using the scheduling levels of hierarchy
- The clarity on the scope of cloud scheduling complications
- Survey of state-of-art approaches for handling cloud scheduling by evaluating the pros and cons
- Suggestions pertaining to how the various approach for varied levels of hierarchy of cloud resource scheduling is taking place.
- Analyzing the challenges pertaining to potential future research directions and real-time, adaptive dynamic, and distributed scheduling models.

II. Nomenclature of the Resource Scheduling in Cloud Computing

a) Resource Scheduling

In cloud resource scheduling among the key challenges that are envisaged in the process, dispersion, heterogeneity of resources and uncertainties are some of the key issues that are not addressed using the traditional resource scheduling algorithms (RSAs) [31] and it is imperative that there is need for making cloud oriented solutions that are more efficient in terms of caring the cloud environment properties. In the process of resource scheduling, the key stages are Resource Mapping, Resource Execution and Resource Monitoring.

Initially, the cloud consumer focus on the workload that is pending for execution, and followed by the process of mapping the workloads for right resources are carried out, using the QoS requirements agreed upon in the SLAs section of optimizing QoS parameters. Some of the important parameters like CPU utilization, throughput, memory utilization and other such factors are usually considered in the resource scheduling for all the cloud users in the network.

The prerogative of resource execution is to focus on allocating appropriate resources for suitable workloads on time, as the applications can focus on utilizing the resources effectively. Whilst executing a specific workload, the monitoring agent has to check the current workload. If the value of Required Resources (RRs) are higher than the value of Provided Resources (PRs) then it demands more resources. In such instances, the reserve resource pool maintained has to be used for providing the required resources using the rescheduling process, to achieve successful execution of the workload. Once the workload is completed, the resources that are free are released to the resource pool and the scheduler can focus on allocation the resources to execute new workloads. If efficient monitoring and utilization of computing resources are in place, it can help in improving the performance optimization. Thus it is imperative that there is need for effective and comprehensive intelligent monitoring agent for analyzing the performance of resource execution.

Profoundly, the SLAs should comprise information on varied deviations and scope defined from achieving the appropriate quality attributes. Cloud provider's SLA shall provide indication of the deviation of service if any, scope of feasibility for change and the factors to be considered whilst compensating any kind of unexpected outages [32]. To denote the CPU and Memory utilization, the resource monitoring agent is engaged, which collects the resource usage by evaluating performance metrics. It is very essential that the cloud provider have to focus on retaining adequate number of resources for delivering the continuous service to cloud consumer while addressing peak load.

Resource monitoring process shall be adapted for handling key QoS requirements whilst performing the workload execution. Two significant aspects of resource monitoring are about how the consumer prefers the execution of their workload with minimal cost and time, and without deviating from SLA's and the other in terms

of how the provider plans to execute the workload with minimum resources.

Resource Monitoring is essential for analyzing performances both in terms of physical and virtual performance, as the resource utilization evaluation can lead to more effective ways of handling the processes. Also, the resource monitoring process can be adapted for handling varied factors like the security, reliability, approach and effectiveness, and confidentiality.

In the other way, the scope of achieving the process where the resources to be used for the process has to be minimum for a workload while adhering to the quality metrics of workload can be achieved only when the resource monitoring is effectively carried out. The process of deciding upon acquiring or releasing resources for workload, computing activities that are essential to be mapped for the cloud resources for improving the performance, as one of the key deliverables from the service provider is to focus on adhering to the compliance to SLA conditions pertaining to resource scheduling. [32].

From the above factors, it is imperative that there is need for effective resource scheduling algorithm that can support in managing the fluctuations for requirements in the workload and also towards maximizing utilization. To ensure that the resource scheduling requirements are effective, appropriate number of resources are to be deployed for executing the current load by addressing the challenges of under-loading or over-loading conditions..

b) Hierarchy of Cloud Resources Scheduling

In the process of resource management in a cloud computing environment, scheduling can be developed at varied levels of service stacks hierarchy. The architecture models of IaaS, PaaS, and SaaS stacks shall be adapted for classifying cloud scheduling problems in to the process of scheduling the application level, scheduling in virtualization layer and scheduling in the deployment layers. Table 1 indicates the hierarchy of cloud resources scheduling and the scope of scheduling process at varied hierarchy levels.

In terms of preceding the categories on the basis of high-level framework and taxonomy fro the cloud resource scheduling program, the low-level taxonomy can be achieved from varied range of scheduling objectives. Considering the implications like the deadlines and the budget constraints of the cloud users and also the resource needs that are to be balanced at a maximal rate by the service providers, the category of application layer resource scheduling is categorized in to further set of sub categories

- —"scheduling for user,"
- —"scheduling for provider efficiency," and
- —"scheduling for negotiation."

Table1: Nomenclature of the resource scheduling in cloud Computing

Nomenclature of the resource Scheduling	
Scheduling Approach	Objectives
Scheduling at Software layer	User QoS, Provider Efficiency, Negotiation
Scheduling at Platform Layer	Load Balance, Energy Efficiency Cost Effectiveness
Scheduling at Infrastructure Layer	Service Placement, Partner Federation, Data Routing

In the further process, at the scheduling levels in the virtualization layer, the challenges are predominantly about scheduling the Virtual Machines (VMs) and the Physical Machines (PMs) that has efficient load balance, level of conservation and the term of cost effectiveness. Hence the following sub categories are aimed in the process

- Scheduling for cost effectiveness
- Scheduling to ensure energy conservation
- Scheduling on basis of load balancing

And the deployment category of the scheduling process are sub categorized as

- Scheduling for partner federation
- Schedule for service placement
- Scheduling for data routing.

III. Review of Notable Cloud Resource Scheduling Strategies of Contemporary Solutions

Numerous scheduling algorithms are available for routine challenges in the cloud computing [34] [35] [36]. The algorithms that are offered in the models are little exhaustive in nature but can be very resourceful if the scheduling problem is manageable by converting to a combinational optimization problem like the Linear Programming [37] [38].

Integer Programming (IP) [39], and the Integer Linear Programming (ILP) [40] and the constraint satisfaction problem [41] are very effective models, but considering the NP-hard problem, cloud scheduling has to be addressed with enumerative approaches that can focus on increased dimensionality in terms of number of variables that are to be optimized.

a) Bargaining Based Resource Scheduling

Resource scheduling models has been developed by many of the earlier studies. Radu et.al [42] proposed CDA (Continuous Double Auction) model for distributed environment, which can support in executing scientific application where the negotiation between the place between resources and the scheduler, by focusing on self-limitation and aggressiveness.

Scientific applications have the dependent tasks for which the output of one task is highly dependent on the other task. From the test results of implementing CDA model in CloudSim, the reduced time for completion and the reduced scope of relative error is imperative, but the model is more effective for homogenous workloads.

Lin et.al [43] developed a theoretical dynamic auction mechanism that can be very resourceful for handling the capacity distribution for evaluating the peak and off-peak demands depending on the capacity. Such mechanism supports in addressing the issues of computation capacity, but the model not focus on issues pertaining to any kind of deviation in SLA violation. Zhangjun et.al [44] has discussed market oriented based resource scheduling algorithm which contains the service and the task levels for dynamic resources for scheduling and assigning the task to service and the task to VM too. Such a method reduces the scope of operational costs for data centers and towards optimizing the makespan.

Mohsen et.al [45] has proposed market-oriented adaptive resource scheduling mechanisms for cost and time optimization in addition to addressing the deadlines for execution time. Such mechanism estimated the cost and time depending on completion time for different workloads on the basis of respective policies, but the process is limited only to one single IaaS provider that has uniform price.

Tdavid et.al [46] has proposed a model of distribution negotiation based resource scheduling model that focus on bargaining and attains higher utility. Such resource scheduling model can be resourceful for heterogeneous environment for improving the resource capabilities, cost and also time for completion. Seokho et.al [47] focus on the SLA oriented flexible negotiation that is based on resource scheduling pattern, and considers the crux of tradeoff among utilities for improving the speed and finding an effective service provider for quality performance service. Despite that the method has been resourceful in reducing SLA violations, still in terms of SLAs deviation there is rise in the kind of deviations.

b) Compromised Cost and Time based Resource Scheduling

The scheduling models that are proposed based on compromised cost and time has been proposed in some studies. Ganesh et.al [48] focused on pricing oriented scheduling algorithms, in which two self-evident bargaining methodologies has been discussed. Raiffa Bargaining Solution and Nash Bargaining solutions that are proposed in the study works on independent workflows.

Teng et.al [49] has worked an equilibrium resource scheduling technique for forecasting the prospect price even before knowing the competitors bidding information which has shown good results in the implementation on Cloudsim. HCOC (Hybrid Cloud Optimized Cost) model is proposed by Luiz et.al [50] which works on resource scheduling mechanism for addressing the problem of resource requirements that executes the workflows on the basis of budget and execution time, by focusing on adequate resource depending on QoS requirements.

In another model proposed by Ke et.al [51], the model emphasize on cost time based resource scheduling in which the cost constrained workflows are taken in to account, and execution time and cost for QoS parameters are considered.

c) Cost Based Resource Scheduling

Ana et. al [52] developed a model using the constraint resource algorithm, in which the First Come First Serve (FCFS) model has been adapted for reducing the cost, time required for completion and also for improving the CPU performance, still the challenge of starvation is a challenge in this model.

Ruben et.al [53] worked on optimization problem for imposing conditions like execution of job in a multi-provider hybrid cloud environment, depending on the requirements of data transmission, CPU and the memory, for categorization of non-provider and movable workloads.

Zhipiao et.al [54] has discussed an SLA aware genetic algorithm for resource scheduling mechanism that works on addressing the current requirement of varied applications based on virtual resources offered by third party infrastructure on lease model. Model has been effective in addressing the SLA violations and also in improving resource utilization and profit along with cost.

d) Dynamic and Adaptive Approaches forResource Scheduling

Ye et.al [57] developed a model of community aware resource scheduling technique with intension of reducing waiting time and average job slowdown time even without prior knowledge of real-time processing, for varied nodes being part of decentralized scheduling manner. Gaun et.al [58] has worked on queuing theory oriented model for improving the interval time average in an non interactive deadline-bound workload.

Altino et.al [59] has proposed failure and power aware resource scheduling model which works on reducing power consumption and adhering to SLAs. The levels of proactive fault-tolerance approaches used for decision making are effective in terms of handling failures for controlling the shared nodes.

Jiayin et.al [60] has proposed feedback based scheduling model for reducing any kind of resource contention issues using job preemption process. Ayasan et.al [61] has worked on Hadoop cluster based resource scheduling technique for calculating job arrival rate and also the execution time for making right decisions towards effective scheduling. The Hadoop system constituting a cluster, and is a combination of

linked resources, is organized in to files and based on the file classification method for every job, the decision of whether a reduce task or map task is decided. Algorithm in the model focuses upon satisfaction of minimum share of requirements for all the users and fairness among the users in the system.

Zhen et.al [64] worked on virtualization oriented dynamic resource allocation mechanism for improving the server utilization. Skewness algorithm is adapted for estimating the disproportion in multi-dimensional utilization of a processor using hotspot mitigation. One of the key limitations in the model is about live migration related developments.

e) Energy Based Resource Scheduling

Energy based resource scheduling models are also profound solutions that has been worked in various models. Joseph et. al [65] has proposed a SLA aware machine learning based resource scheduling model for map reduction applications. In the proposed model, the exact solver depending on mixed linear programming aims to forecast the resource consumption based on current workload for executing varied tasks and responses time (taskSLA) for a workload and also taking in to account the contention among tasks that are executed on same resource.

Moreno et.al [66] focused upon the model of EASY (Energy Aware reconfiguration of software Systems) which is a QoS oriented resource scheduling technique towards reducing the power consumption. The model works on on-line algorithm for adjusting the processing speed of individual devices in dynamic manner to ensure that the average system response time is maintained well within the predefined threshold, while minimizing the total power consumption too

Yan et al. [67] in his study has proposed the model of controlled dependence graph which relies on the energy aware resource scheduling model for executing the HPC applications that are carried out with deadlines and also with scope of minimal energy consumption, in the distributed environment. Approximation of design and also the multiprocessor based scheduling algorithms are devised to address the problem based on the analysis and worst case performance assessment. Also, based on energy consumption, the desired deadline of tasks and pricing scheme is also designed for better execution.

In the other models [68] [69] [70] [71], there are numerous workload based resource scheduling policies that has been proposed for process improvement and also increasing the energy efficient methods adaptation. However, one of the focus areas in the models are about green revolution and improved performance.

f) Hybrid Approaches forResource Scheduling

Hybrid based resource scheduling solutions are developed considering varied metrics in to account. In many of the hybrid models that are proposed, the emphasis has been more on combination of data transfer, computational costs, and reduced cost factors. In the models that are proposed with Hybrid oriented approach, [72] [73] [74] the emphasis is on selection of resources from the public cloud for developing effective solutions on the basis of cloud based characteristics for task.

g) Heuristic and Meta-heuristic Approaches for Resource Scheduling

Heuristic based resource scheduling algorithms are very popular and in some of the models that are developed on heuristic methods, varied levels of heuristic methods were adapted for implementation [75] [76] [77] [78] for developing contemporary solutions using various kinds of algorithms. Distribution of resources to the workloads on the basis of requirements for reducing the execution time has been the focal point in the aforesaid models.

Raju et.al [79] proposed ACO and Cuckoo search for hybrid resource scheduling policy for reducing the completion time. Paulin et.al [80] proposed firefly oriented resource scheduling technique for improving the load balancing and also for execution time. Also, some of the parameters like load index, access rate, memory usage, processing time are some of the key factors that are taken in to consideration. Some of the other models like GA based [81] PSO based [82] [83] models discussed the scope of using specific algorithm models for reducing the execution time, and towards improving user's satisfaction.

In [84] [85] [86] [87], also, there were numerous models of GA solutions that are proposed for handling the independent and divisible tasks for cloud computing environment. The models assert the fact that GA approach could be resourceful in handling the user costs together, and also in terms of improving the resourcefulness in a cloud computing environment.

Also, in [88] [89], the models pertaining to adapting the cloud resources with GA-based approach by focusing on virtual resources for scheduling has been proposed with impressive test outcomes. In [90] the model focus on using VM match and execution orders for resource scheduling.

A general framework of using ACO to schedule user tasks is as follows, each ant uses M steps to construct a solution. In the i^{th} step to schedule the i^{th} task T_i, the ant uses pheromone and heuristic information to choose the suitable resource R_j. After M steps, all the M tasks have been scheduled on different resources.

Taking stock of above factors, in [91] [92] there are many scheduled M tasks one by one for the cloud resources, using the scheme as at every step for the task can be scheduled on the basis of resources that are set. The heuristic information based on users QoS metrics for user cost, system reliability, response and security are adapted for guiding the ant for selecting

optimal resource which is proposed in [92] [93]. The tasks were classified in to varied categories are bound to be adapted on cloud resources using ACO optimization.

In terms of load balancing for resource scheduling in [103], Nishant et.al proposes an optimized load balancing method using the ACO based algorithm. In extensive of the aforesaid model, in [104] the model has been extended with another objective of provider efficiency oriented scheduling of resource utilization.

Wen et.al [105] has focused on improving the cloud resource utilization ratio by scheduling the cloud resources on the basis of hybrid algorithm comprising ACO and PSO. One of the key objectives of developing provider efficiency for oriented scheduling is to work on energy consumption for the cloud center [106]. Such tasks are usually scheduled using modified GA along with local search for optimizing the energy consumption and for reaping potential benefits from the outcome in terms saving energy, by using the combination of ACO and Cuckoo search. [107]. The ACO approach that is adapted as main framework and the application of CS rather than heuristic information for finding the next resource for task is an effective outcome.

h) Observations

From the review of the studies, it is evident that despite of numerous models that are proposed, majority of them are probabilistic rather than deterministic. Also not every scope and parameter of QoS metrics in SLAs are assured in the existing models. In this research review, the focus is upon reviewing the earlier models in the area of cloud resource scheduling and the QoS metrics adapted in the process of effective resource management. It is also evident that by using some of the effective evolutionary models of resource scheduling algorithms, the operational efficiency of resource scheduling can be improved to great extent.

IV. Conclusion

Information systems management has become an integral part of organizational process and with the kind of fast emerging computational solutions and methods like the cloud computing solutions, the efficacy of the systems has increased standards of accessibility, flexibility and scalability. In the contemporary scenario, organizations are keen on adapting cloud based solutions for the information systems management in the context of various reasons like the ease of access to data, reduced cost of operations. And IT infrastructure management related costs going down, and the flexibility in terms of managing the data in third party services. However, one of the significant factors that make a vital role in the success of adapting the cloud computing process is about the Service Level Agreements with the service provider for offering the reliable services.

Despite the fact that there are many factors that impact the service quality, one of the profound factors that impact the cloud solution efficacy is about resource scheduling process in the cloud services. There are numerous models that have been proposed in the earlier models. It is imperative from the review of extensive literature on the varied models of cloud based resource scheduling algorithms, that in the case of majority of models that are proposed, they are probabilistic models rather than being a deterministic models.

Considering the fact that the current models have high levels of computational complexities and the rising standards and requirements of cloud based solutions, there is significant need for focusing on more effective solutions that could be adapted for resource scheduling. Using some of the effective methods like CUCKOO search, TABU search and other such contemporary evolutionary algorithms, the process of resource scheduling can be improvised to great extent. If such a contemporary solution could be achieved it can support in improving the efficiency and attaining the optimal resource scheduling process in the cloud services and also in terms of reducing the linear complexity in the systems.

References

1. Dragland. 2013. Big data, for better or worse: 90% of world's data generated over last two years. Science Daily (May 2013).
2. N. Toosi, R. N. Calheiros, and R. Buyya. 2014. Interconnected cloud computing environments: Challenges, taxonomy, and survey. ACM Computing Surveys 47, 1 (2014), 1–47.
3. Z. H. Zhang and X. J. Zhang. 2010. A load balancing mechanism based on ant colony and complex network theory in open cloud computing federation. In Proceedings of the 2nd International Conference on Industrial Mechatronics and Automation. 240–243.
4. Foster, Y. Zhao, I. Raicu, and S. Lu. 2008. Cloud computing and grid computing 360-degree compared. In Proceedings of the Grid Computing Environments Workshop, 1–10.
5. F. Xu, F. M. Liu, H. Jin, and A. V. Vasilakos. 2014. Managing performance overhead of virtual machines in cloud computing: A survey, state of the art, and future directions. Proceedings of the IEEE 102, 1 (2014), 11–31.
6. T. Grandison, E. M. Maximilien, S. Thorpe, and A. Alba. 2010. Towards a formal definition of a computing cloud. In Proceedings of the IEEE 6th World Congress on Services. 191–192.
7. R. Buyya, C. S. Yeo, S. Venugopal, J. Broberg, and I. Brandicc. 2009. Cloud computing and emerging IT platforms: Vision, hype, and reality for delivering

computing as the 5th utility. Future Generation Computer Systems 25 (2009), 599–616.
8. M. Armbrust, A. Fox, R. Griffith, A. D. Joseph, R. Katz, et al. 2010. A view of cloud computing. Communications of the ACM 53, 4 (2010), 50–58.
9. H. Morshedlouand M. R.Meybodi. 2014. Decreasing impact of SLA violations: A proactive resource allocation approach for cloud computing environments. IEEE Transactions on Cloud Computing 2, 2 (2014), 156– 167.
10. M. D. Dikaiakos, G. Pallis, D. Katsaros, P. Mehra, and A. Vakali. 2009. Cloud computing: Distributed Internet computing for IT and scientific research. IEEE Internet Computing 13, 5 (2009), 10–13.
11. J. Baliga, R. W. A. Ayre, K. Hinton, and R. S. Tucker. 2011. Green cloud computing: Balancing energy in processing, storage, and transport. Proceedings of the IEEE 99, 1 (2011), 149–167.
12. Singh, S., Chana, I.: QoS-aware autonomic resource management in cloud computing: a systematic review. ACM Comput. Surv. 48(3), 39 (2015)
13. Singh, S., Chana, I.: Cloud resource provisioning: survey, status and future research directions. Knowl. Inf. Syst. 44, 1–50 (2015)
14. L. Heilig and S. Vob. 2014. A scientometric analysis of cloud computing literature. IEEE Transactions on Cloud Computing 2, 3 (2014), 266–278.
15. N. Toosi, R. N. Calheiros, and R. Buyya. 2014. Interconnected cloud computing environments: Challenges, taxonomy, and survey. ACM Computing Surveys 47, 1 (2014), 1–47.
16. T. A. L. Genez, L. F. Bittencourt, and E. R. M. Madeira. 2012. Workflow scheduling for SaaS/PaaS cloud providers considering two SLA levels. In Proceedings of the IEEE Network Operations and Management Symposium. 906–912.
17. J. L. Xu, J. Tang, K. Kwiat, W. Y. Zhang, and G. L. Xue. 2013. Enhancing survivability in virtualized data centers: A service-aware approach. IEEE Journal on Selected Areas in Communications 31, 12 (2013), 2610–2619.
18. T. Back, M. Emmerich, and O. M. Shir. 2008. Evolutionary algorithms for real world applications. IEEE Computational Intelligence Magazine 3, 1 (2008), 64–67.
19. J. Zhang, Z. H. Zhan, Y. Lin, N. Chen, Y. J. Gong, J. H. Zhong, H. Chung, Y. Li, and Y. H. Shi. 2011c. Evolutionary computation meets machine learning: A survey. IEEE Computational Intelligence Magazine 6, 4 (2011), 68–75.
20. Y. L. Li, Z. H. Zhan, Y. J. Gong, W. N. Chen, J. Zhang, and Y. Li. 2014. Differential evolution with an evolution path: A DEEP evolutionary algorithm. IEEE Transactions on Cybernetics, DOI: 10.1109/TCYB. 2014.2360752
21. N. Chen, W. N. Chen, Y. J. Gong, Z. H. Zhan, J. Zhang, Y. Li, and Y. S. Tan. 2014. An evolutionary algorithm with double-level archives for multiobjective optimization. IEEE Transactions on Cybernetics, DOI: 10.1109/TCYB.2014.2360923
22. Y. H. Li, Z. H. Zhan, S. J. Lin, J. Zhang, and X. N. Luo. 2015c. Competitive and cooperative particle swarm optimization with information sharing mechanism for global optimization problems. Information Sciences 293 (2015), 370–382.
23. J. Yu, R. Buyya, and K. Ramamohanarao. 2008. Workflow scheduling algorithms for grid computing. Metaheuristics for Scheduling in Distributed Computing Environments Studies in Computational Intelligence 146 (2008), 173–214.
24. Jennings and R. Stadler. 2014. Resource management in clouds: Survey and research challenges. Journal of Network Systems Management 1–53.
25. M. A. Rodriguez and R. Buyya. 2014. Deadline based resource provisioning and scheduling algorithm for scientific workflows on clouds. IEEE Transactions on Cloud Computing 2, 2 (2014), 222–235.
26. J. Baliga, R. W. A. Ayre, K. Hinton, and R. S. Tucker. 2011. Green cloud computing: Balancing energy in processing, storage, and transport. Proceedings of the IEEE 99, 1 (2011), 149–167.
27. K. Bardsiri and S. M. Hashemi. 2012. A review of workflow scheduling in cloud computing environment. International Journal of Computer Science and Management Research 1, 3 (2012), 348–351.
28. H. Kaur and M. Singh. 2012. Review of various scheduling techniques in cloud computing. International Journal of Networking & Parallel Computing 1, 2 (2012).
29. Y. Chawla and M. Bhonsle. 2012. A study on scheduling methods in cloud computing. International Journal of Emerging Trends & Technology in Computer Science 1, 3 (2012), 12–17.
30. F. Xu, F. M. Liu, H. Jin, and A. V. Vasilakos. 2014. Managing performance overhead of virtual machines in cloud computing: A survey, state of the art, and future directions. Proceedings of the IEEE 102, 1 (2014), 11–31.
31. Singh, S., Chana, I.: QRSF: QoS-aware resource scheduling framework in cloud computing. J. Supercomput. 71(1), 241–292 (2015)
32. Singh, S., Chana, I.: Cloud resource provisioning: survey, status and future research directions. Knowl. Inf. Syst. 44, 1–50 (2015)
33. N. Toosi, R. N. Calheiros, and R. Buyya. 2014. Interconnected cloud computing environments: Challenges, taxonomy, and survey. ACM Computing Surveys 47, 1 (2014), 1–47.
34. K. Bardsiri and S. M. Hashemi. 2012. A review of workflow scheduling in cloud computing environment. International Journal of Computer Science and Management Research 1, 3 (2012), 348–351.
35. H. Kaur and M. Singh. 2012. Review of various scheduling techniques in cloud computing. Interna-

tional Journal of Networking & Parallel Computing 1, 2 (2012).
36. Y. Chawla and M. Bhonsle. 2012. A study on scheduling methods in cloud computing. International Journal of Emerging Trends & Technology in Computer Science 1, 3 (2012), 12–17.
37. S. Kumar and P. Balasubramanie. 2012. Dynamic scheduling for cloud reliability using transportation problem. Journal of Computer Science 8, 10 (2012), 1615–1626.
38. Speitkamp and M. Bichler. 2010. A mathematical programming approach server consolidation problems in virtualized data centers. IEEE Transactions on Services Computing 3, 4 (2010), 266–278.
39. Q. Li and Y. K. Guo. 2010. Optimization of resource scheduling in cloud computing. In Proceedings of the 12th International Symposium on Symbolic and Numeric Algorithms for Scientific Computing. 315–320.
40. T. A. L. Genez, L. F. Bittencourt, and E. R. M. Madeira. 2012. Workflow scheduling for SaaS/PaaS cloud providers considering two SLA levels. In Proceedings of the IEEE Network Operations and Management Symposium. 906–912.
41. H. N. Van, F. D. Tran, and J. Menaud. 2010. Performance and power management for cloud infrastructures. In Proceedings of the IEEE 3rd International Conference on Cloud Computing. 329–336.
42. Prodan, R., Wieczorek, M., Fard, H.M.: Double auction based scheduling of scientific applications in distributed grid and cloud environments. J. Grid Comput. 9(4), 531– 548 (2011)
43. Lin, W.-Y., Lin, G.-Y., Wei, H.-Y.: Dynamic auction mechanism for cloud resource allocation. In: 2010 10th IEEE/ACM International Conference on Cluster, Cloud and Grid Computing (CCGrid), pp. 591–592. IEEE (2010)
44. Wu, Z., Liu, X., Ni, Z., Yuan, D., Yang, Y.: A market-oriented hierarchical scheduling strategy in cloud workflow systems. J. Supercomput. 63 (1), 256–293 (2013)
45. Salehi, M.A., Buyya, R.: Adapting market-oriented scheduling policies for cloud computing. In: Algorithms and Architectures for Parallel Processing, pp. 351–362. Springer, Berlin (2010)
46. An, B., Lesser, V., Irwin, D., Zink, M.: Automated negotiation with decommitment for dynamic resource allocation in cloud computing. In: Proceedings of the 9th International Conference on Autonomous Agents and Multiagent Systems: volume 1, vol. 1, pp. 981–988. International Foundation for Autonomous Agents and Multiagent Systems (2010)
47. Son, S., Jun, S.C.: Negotiation-based flexible SLA establishment with SLA-driven resource allocation in cloud computing. In: 2013 13th IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing (CCGrid), pp. 168–171. IEEE (2013)
48. Iyer, G.N., Veeravalli, B.: On the resource allocation and pricing strategies in Compute Clouds using bargaining approaches. In: 2011 17th IEEE International Conference on Networks (ICON), pp. 147–152. IEEE (2011)
49. Teng, F., Magoules, F.: Resource pricing and equilibrium allocation policy in cloud computing. In: 2010 IEEE 10th International Conference on Computer and Information Technology (CIT), pp. 195–202. IEEE (2010)
50. Bittencourt, L.F., Madeira, E.R.M.: HCOC: a cost optimization algorithm for workflow scheduling in hybrid clouds. J. Internet Serv. Appl. 2(3), 207–227 (2011)
51. Liu, K., Jin, H., Chen, J., Liu, X., Yuan, D., Yang, Y.: A compromised-time-cost scheduling algorithm in SwinDeW-C for instance-intensive cost-constrained
52. Oprescu, A., Kielmann, T.: Bag-of-tasks scheduling under budget constraints. In: 2010 IEEE Second International Conference on Cloud Computing Technology and Science (CloudCom), pp. 351–359. IEEE (2010)
53. Van den Bossche, R., Vanmechelen, K., Broeckhove, J.: Cost-optimal scheduling in hybrid iaas clouds for deadline constrained workloads. In: 2010 IEEE 3rd International Conference on Cloud Computing (CLOUD), pp. 228–235. IEEE (2010)
54. Liu, Z., Wang, S., Sun, Q., Zou, H., Yang, F.: Cost-aware cloud service request scheduling for SaaS providers. Comput. J. 57(2), bxt009 (2013)
55. Su, S., Li, J., Huang, Q., Huang, X., Shuang, K., Wang, J.: Cost-efficient task scheduling for executing large programs in the cloud. Parallel Comput. 39(4), 177–188 (2013)
56. Moschakis, I.A., Karatza, H.D.: Performance and cost evaluation of Gang Scheduling in a Cloud Computing system with job migrations and starvation handling. In: 2011 IEEE Symposium on Computers and Communications (ISCC), pp. 418–423. IEEE (2011)
57. Huang, Y., Bessis, N., Norrington, P., Kuonen, P., Hirsbrunner, B.: Exploring decentralized dynamic scheduling for grids and clouds using the community-aware scheduling algorithm. Futur. Gener. Comput. Syst. 29(1), 402–415 (2013)
58. Le, G., Xu, K., Song, J.: Dynamic resource provisioning and scheduling with deadline constraint in elastic cloud. In: 2013 International Conference on Service Sciences (ICSS), pp. 113–117. IEEE (2013)
59. Sampaio, A.M., Barbosa, J.G.: Dynamic power-and failure-aware cloud resources allocation for sets of independent tasks. In: 2013 IEEE International Conference on Cloud Engineering (IC2E), pp. 1–10. IEEE (2013)
60. Li, J., Qiu, M., Niu, J., Gao, W., Zong, Z., Qin, X.: Feedback dynamic algorithms for preemptable job scheduling in cloud systems. In: 2010 IEEE/WIC/

ACM International Conference on Web Intelligence and Intelligent Agent Technology (WI-IAT), vol. 1, pp. 561–564. IEEE (2010)
61. Rasooli, A., Down, D.: An adaptive scheduling algorithm for dynamic heterogeneous Hadoop systems. In: Proceedings of the 2011 Conference of the Center for Advanced Studies on Collaborative Research, pp. 30–44. IBM Corp (2011)
62. Lee, Z., Wang, Y., Zhou, W.: A dynamic priority scheduling algorithm on service request scheduling in cloud computing. In: 2011 International Conference on Electronic and Mechanical Engineering and Information Technology (EMEIT), vol. 9, pp. 4665–4669. IEEE (2011)
63. Hwang, J., Wood, T.: Adaptive dynamic priority scheduling for virtual desktop infrastructures. In: Proceedings of the 2012 IEEE 20th International Workshop on Quality of Service, p. 16. IEEE Press (2012)
64. Xiao, Z., Song, W., Qi, C.: Dynamic resource allocation using virtual machines for cloud computing environment. IEEE Trans. Parallel Distrib. Syst. 24(6), 1107– 1117 (2013)
65. Rahman, M., Hassan, R., Ranjan, R., Buyya, R.: Adaptive workflow scheduling for dynamic grid and cloud computing environment. Concurr. Comput.: Pract. Exp. 25(13), 1816–1842 (2013)
66. Marzolla, M., Mirandola, R.: Dynamic power management for QoS-aware applications. Sustain. Comput.: Inf. Syst. 3(4), 231–248 (2013)
67. Ma, Y., Gong, B., Sugihara, R., Gupta, R.: Energyefficient deadline scheduling for heterogeneous systems. J. Parallel Distrib. Comput. 72(12), 1725–1740 (2012)
68. Ying, C., Jiong, Y.: Energy-aware genetic algorithms for task scheduling in cloud computing. In: 2012 Seventh ChinaGrid Annual Conference (ChinaGrid), pp. 43–48. IEEE (2012)
69. Kim, N., Cho, J., Seo, E.: Energy-credit scheduler: an energy-aware virtual machine scheduler for cloud systems. Futur. Gener. Comput. Syst. 32, 128–137 (2014)
70. Yassa, S., Chelouah, R., Kadima, H., Granado, B.: Multi-objective approach for energy-aware workflow scheduling in cloud computing environments. Sci. World J. 2013(Article ID 350934), 13 (2013). doi:10.1155/2013/350934
71. Chen, C., He, B., Tang, X.: Green-aware workload scheduling in geographically distributed data centers. In: CloudCom, pp. 82–89 (2012). doi:10.1155/2013/350934
72. Van den Bossche, R., Vanmechelen, K., Broeckhove, J.: Cost-efficient scheduling heuristics for deadline constrained workloads on hybrid clouds. In: Cloud Computing Technology and Science (CloudCom), 2011 IEEE Third International Conference on, pp. 320–327. IEEE (2011)
73. Calheiros, R.N., Buyya, R.: Cost-effective provisioning and scheduling of deadline-constrained applications in hybrid clouds. In:Web Information Systems Engineering- WISE 2012, pp. 171–184. Springer, Berlin (2012)
74. Kumar, B.A., Ravichandran, T.: Time and cost optimization algorithm for scheduling multiple workflows in hybrid clouds. Eur. J. Sci. Res. 89(2), 265–275 (2012)
75. Xu, G., Ding, Y., Zhao, J., Hu, L., Fu, X.: A novel artificial bee colony approach of live virtual machine migration policy using Bayes theorem. Sci.World J. 2013(Article ID 369209), 13 (2013). doi:10.1155/2013/369209
76. Song, X., Gao, L., Wang, J.: Job scheduling based on ant colony optimization in cloud computing. In: 2011 International Conference on Computer Science and Service System (CSSS), pp. 3309–3312. IEEE (2011)
77. Nishant, K., Sharma, P., Krishna, V., Gupta, C., Singh, K.P., Rastogi, R.: Load balancing of nodes in cloud using ant colony optimization. In: 2012 UKSim 14th International Conference on Computer Modelling and Simulation (UKSim), pp. 3–8. IEEE (2012)
78. Bitam, S.: Bees Life Algorithm for job scheduling in cloud computing. In: International Conference on Computing and Information Technology. ICCIT, pp 186–191 (2012)
79. Raju, R., Babukarthik, R.G., Chandramohan, D., Dhavachelvan, P., Vengattaraman, T.: Minimizing the makespan using Hybrid algorithm for cloud computing. In: 2013 IEEE 3rd International Advance Computing Conference (IACC), pp. 957–962. IEEE (2013)
80. Szabo, C., Sheng, Q.Z., Kroeger, T., Zhang, Y., Jian, Y.: Science in the cloud: allocation and execution of dataintensive scientific workflows. J. Grid Comput. 12(2), 245–264 (2014)
81. Morariu, O., Morariu, C., Borangiu, T.: A genetic algorithm for workload scheduling in cloud based e-learning. In: Proceedings of the 2nd International Workshop on Cloud Computing Platforms, p. 5. ACM (2012)
82. Somasundaram, T.S., Govindarajan, K.: CLOUDRB: a framework for scheduling and managing High-Performance Computing (HPC) applications in science cloud. Futur. Gener. Comput. Syst. 34, 47–65 (2014)
83. Netjinda, N., Sirinaovakul, B., Achalakul, T.: Cost optimal scheduling in IaaS for dependent workload with particle swarm optimization. J. Supercomput. 68(3), 1579–1603 (2014)
84. H. Zhao, S. S. Zhang, Q. F. Liu, J. Xie, and J. C. Hu. 2009. Independent tasks scheduling based on genetic algorithm in cloud computing. In Proceedings of the 5th International Conference on Wire-

less Communications, Networking and Mobile Computing, 1–4.
85. P. Kumar and A. Verma. 2012. Independent task scheduling in cloud computing by improved genetic algorithm. International Journal of Advanced Research in Computer Science and Software Engineering 2, 5 (2012), 111–114.
86. G.N. Gan, T. L. Huang, and S. Gao. 2010. Genetic simulated annealing algorithm for task scheduling based on cloud computing environment. In Proceedings of the International Conference on Intelligent Computing and Integrated Systems. 60–63.
87. J.W. Ge and Y. S. Yuan. 2013. Research of cloud computing task scheduling algorithm based on improved genetic algorithm. In Proceedings of the 2nd International Conference on Computer Science and Electronics Engineering. 2134–2137.
88. Barrett, E. Howley, and J. Duggan. 2011. A learning architecture for scheduling workflow applications in the cloud. In Proceedings of the 9th IEEE European Conference on Web Services. 83–90.
89. Z. Ye, X. F. Zhou, and A. Bouguettaya. 2011. Genetic algorithm based QoS-Aware service compositions in cloud computing. Database Systems for Advanced Applications, Lecture Notes in Computer Science, Volume 6588. Springer, Berlin, 321–334.
90. Szabo and T. Kroeger. 2012. Evolving multi-objective strategies for task allocation of scientific workflows on public clouds. In Proceedings of the IEEE World Congress on Computation Intelligence. 1–8.
91. S. Banerjee, I. Mukherjee, and P. K. Mahanti. 2009. Cloud computing initiative using modified ant colony framework. World Academy of Science, Engineering and Technology 56 (2009), 221–224.
92. H. Liu, D. Xu, and H. K. Miao. 2011. Ant colony optimization based service flow scheduling with various QoS requirements in cloud computing. In Proceedings of the 1st ACIS International Symposium on Software and Network Engineering. 53–58.
93. L. N. Zhu, Q. S. Li, and L. N. He. 2012. Study on cloud computing resource scheduling strategy based on the ant colony optimization algorithm. International Journal of Computer Science Issues 9, 5 (2012), 54–58.
94. S. Pandey, L. L. Wu, S. M. Guru, and R. Buyya. 2010. A particle swarm optimization-based heuristic for scheduling workflow applications in cloud computing environments. In Proceedings of the 24th IEEE International Conference on Advanced Information Networks and Applications. 400–407.
95. Z. J. Wu, Z. W. Ni, L. C. Gu, and X. Liu. 2010. A revised discrete particle swarm optimization for cloud workflow scheduling. In Proceedings of the International Conference on Computational Intelligence and Security. 184–188.
96. W. N. Chen and J. Zhang. 2012. A set-based discrete PSO for cloud workflow scheduling with user-defined QoS constraints. In Proceedings of the IEEE International Conference on Systems, Man, and Cybernetics. 773–778.
97. L. Z. Guo, S. G. P. Zhao, S. G. Shen, and C. Y. Jiang. 2012. A particle swarm optimization for data placement strategy in cloud computing. Information Engineering and Applications, Lecture Notes in Electrical Engineering, 323–330.
98. M. A. Rodriguez and R. Buyya. 2014. Deadline based resource provisioning and scheduling algorithm for scientific workflows on clouds. IEEE Transactions on Cloud Computing 2, 2 (2014), 222–235.
99. H. H. Li, Y. W. Fu, Z. H. Zhan, and J. J. Li. 2015a. Renumber strategy enhanced particle swarm optimization for cloud computing resource scheduling. In Proceedings of the IEEE Congress on Evolution Computation, in press.
100. H. H. Li, Z. G. Chen, Z. H. Zhan, K. J. Du, and J. Zhang. 2015b. Renumber coevolutionarymultiswarm particle swarm optimization for multi-objective workflow scheduling on cloud computing environment. In Proceedings of the Genetic Evolutionary Computation Conference.
101. Z. H. Zhan, J. Li, J. Cao, J. Zhang, H. Chung, and Y. H. Shi. 2013. Multiple populations for multiple objectives: A coevolutionary technique for solving multiobjective optimization problems. IEEE Transactions on Cybernetics 43, 2 (2013), 445–463.
102. K. Zhu, H. G. Song, L. J. Liu, J. Z. Gao, and G. J. Cheng. 2011. Hybrid genetic algorithm for cloud computing applications. In Proceedings of the IEEE Asia-Pacific Services Computing Conference. 182–187.
103. K. Nishant, P. Sharma, V. Krishna, C. Gupta, K. P. Singh, N. Nitin, and R. Rastogi. 2012. Load balancing of nodes in cloud using ant colony optimization. In Proceedings of the 14th International Conference on Computer Modelling and Simulation. 3–8.
104. Q. C. Lv, X. X. Shi, and L. Z. Zhou. 2012. Based on ant colony algorithm for cloud management platform resources scheduling. In Proceedings of the World Automation Congress. 1–4.
105. X. T. Wen, M. H. Huang, and J. H. Shi. 2012. Study on resources scheduling based on ACO algorithm and PSO algorithm in cloud computing. In Proceedings of the 11th International Symposium on Distributed Computing and Applications to Business, Engineering & Science. 219–222.
106. G. Shen and Y. Q. Zhang. 2011. A shadow price guided genetic algorithm for energy aware task scheduling on cloud computers. In Proceedings of the International Conference on Advances in Swarm Intelligence. Lecture Notes in Computer Science, Volume 6728. Springer, Berlin, 522–529.
107. X. L. Wang, Y. P. Wang, and H. Zhu. 2012. Energy-efficient multi-job scheduling model for cloud com-

puting and its genetic algorithm. Mathematical Problems in Engineering, Article ID 589243, 1–16.
108. R. G. Babukarthik, R. Raju, and P. Dhavachelvan. 2012. Energy-aware scheduling using hybrid algorithm for cloud computing. In Proceedings of the 3rd International Conference on Computing Communication & Networking Technologies. 1–6.

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Global Journal of Computer Science and Technology: B
Cloud and Distributed
Volume 16 Issue 3 Version 1.0 Year 2016
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 0975-4172 & Print ISSN: 0975-4350

Comparative Analysis of Mapreduce Framework for Efficient Frequent Itemset Mining in Social Network Data

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Abstract- Social networking sites are the virtual community for sharing information among the people. It raises its pularity tremendously over the past few years. Many social networking sites like Twitter, Facebook, WhatsApp, Instragram, LinkedIn generates tremendous amount data. Mining such huge amount of data can be very useful. Frequent itemset mining plays a significant role to extract knowledge from the dataset. Traditional frequent itemsets method is ineffective to process this exponential growth of data almost terabytes on a single computer. Map Reduce framework is a programming model that has emerged for mining such huge amount of data in parallel fashion. In this paper we have discussed how different MapReduce techniques can be used for mining frequent itemsets and compared each other's to infer greater scalability and speed in order to find out the meaningful information from large datasets.

Keywords: social networks, frequent itemsets mining, apriori algorithm, mapreduce framework, eclat algorithm.

GJCST-B Classification: C.1.4,C.2.1,C.2.4 J.4

Strictly as per the compliance and regulations of:

Comparative Analysis of Mapreduce Framework for Efficient Frequent Itemset Mining in Social Network Data

Suman Saha [α] & Md. Syful Islam Mahfuz [σ]

Abstract- Social networking sites are the virtual community for sharing information among the people. It raises its popularity tremendously over the past few years. Many social networking sites like Twitter, Facebook, WhatsApp, Instragram, LinkedIn generates tremendous amount data. Mining such huge amount of data can be very useful. Frequent itemset mining plays a significant role to extract knowledge from the dataset. Traditional frequent itemsets method is ineffective to process this exponential growth of data almost terabytes on a single computer. Map Reduce framework is a programming model that has emerged for mining such huge amount of data in parallel fashion. In this paper we have discussed how different MapReduce techniques can be used for mining frequent itemsets and compared each other's to infer greater scalability and speed in order to find out the meaningful information from large datasets.

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I. Introduction

Social network is a virtual network that allows peoples to create a public profile into under a domain so that peoples can communicate with each other's within that network. It has obtained remarkable attention in the last few years. Many social networking sites such as Twitter, Facebook, WhatsApp, Instragram, LinkedIn, Google+ through the internet are frequently used by the people. People can share information, news and many others through these social networks. Facebook is the most popular social sites which had more than 1.59 billion people in as of their last quarter [11]. Other sites like Instagram had 400 million peoples in September 2015, Twitter had 320 million peoples in March 2016, Google+ had 300 million peoples in October 2013, and LinkedIn had 100 million peoples in October 2015 [11]. Analysis can be performed over such Big data which plays a significant role to improve the productivity of different companies in both public and private sector. Storing huge amount of data won't have any value without KDD (Knowledge process in Database) which is process of finding information from database and extracted knowledge can be used for making effective business decision [12]. Frequent itemsets mining is a popular method to extract the frequent itemset over a dataset. It also plays an important role in mining associations, correlation, sequential patterns, causality, episodes, multidimensional patterns, max patterns, partial periodicity, emerging patterns and many other significant data mining tasks [2].

II. Research Background

Social networks generates huge amount of data possibly terabytes or more. These multidimensional data often referred to as Big data. So it is not efficient technique for mining such Big data on a single machine because of its limited memory space, RAM speed, and Processor capacity. So researchers have emphasized on parallelization for mining such data set to improve the mining performance. But there are several issues related with parallelization such as load balancing, partition the data, distribution of data, Job assignment, and data monitoring that need to solve. MapReduce framework has been introduced to solve this problem effectively. Cloud computing provides unlimited cheap storage and computing power so that it provides a platform for the storage and mining mass data [1].

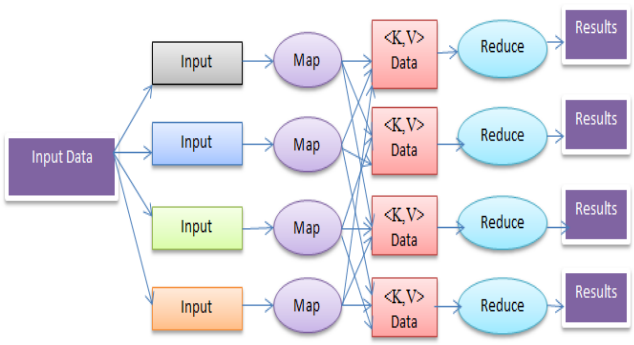

Figure 1: MapReduce Framework

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MapReduce framework was proposed by Google in 2014. It is used for processing a large amount of data in parallel manner. It hides the problems like parallelization, fault tolerance, data distribution, and load balancing which allow users to focus on the problem without worrying about parallelization details [1]. Basically MapReduce framework works on key-value pairs. The input data is divided into several parts and stored into the different nodes. It uses two functions, one is map function and another is reducing function. Map function takes key-value pairs from each node as input and generates key-value pairs which indicate local frequent item set as output. Reduce function takes these local frequent itemsets as input and combine these key-value pair and generates output as key-value pairs which indicates the global frequent item set. The above process can be easily and effectively implement by using Hadoop MapReduce frame.

Hadoop MapReduce is a software framework for easily writing applications which process vast amounts of data (multi-terabyte data-sets) in-parallel on large clusters (thousands of nodes) of commodity hardware in a reliable, fault-tolerant manner [13]. Hadoop is open software that built on Hadoop Distributed File Systems (HDFS). MapReduce framework and HDFS are running on the same node.

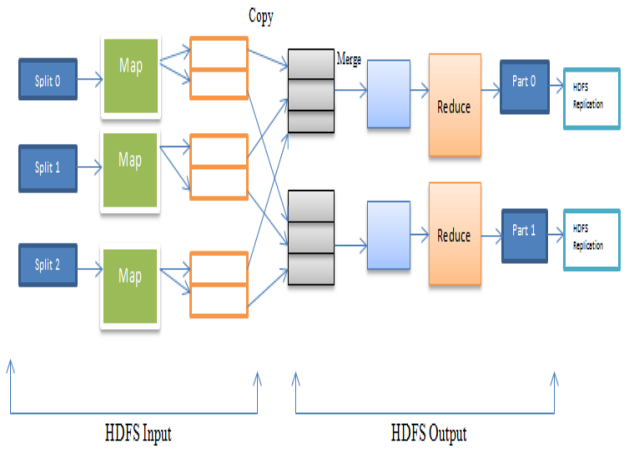

Figure 2: Hadoop MapReduce Framework

In MapReduce, a large dataset is broken into multiple blocks. Each block is stored on distinct nodes to form cluster. In Figure 2, dataset is partitioned into three blocks. Multiple maps (here three maps) are running simultaneously on different parts called split .One maps for each blocks. A local disk is used to store the output of the each map. A local disk has multiple partitions where output of maps is stored in all partitions. One partition corresponds to each reducer in the framework. Then one partition of each local disk is copied into each reducer. Here output maps are stored into three local disks. Each disk has two partitions. Partitions of the local disk are copied into two reducers.

III. Preliminaries

a) Problem Definition

Let D be a database that contains N transactions. Assume that we have S number of nodes. Database D with N transactions is divided into P equal sized blocks $\{D_1, D_2, D_{3.....}, D_P\}$ automatically and assign each of the block D_i to the nodes. Each of the nodes contains N/P transactions. Consider an itemset I in the database D. Then I.supportCount indicates the global supportCount of I in D. We can call I is globally frequent if it satisfy the following conditions

supportCount $\geq s \times N$ where s is the given minimum support threshold.

b) Data Layout

Consider an itemset $I = \{I_1, I_2, I_3, I_4, I_5\}$ and D be database with 5 transactions $\{t_1, t_2, t_3, t_4, t_5\}$. Data Layout can be Horizontal Layout or Vertical Layout. Horizontally formatted data can be easily converted to Vertical format by scanning the database once. Following figures shows how Horizontal or Vertical can be represented of the above itemset and database transactions.

TID	Itemset
t_1	I_1, I_3, I_4
t_2	I_1, I_2, I_4, I_5
t_3	I_1, I_5
t_4	I_1, I_4, I_5
t_5	I_2, I_3, I_5

Horizontal Layout

Item	TID set
I_1	t_1, t_2, t_3, t_4
I_2	t_2, t_5
I_3	t_1, t_5
I_4	t_1, t_2, t_4
I_5	t_2, t_3, t_4, t_5

Vertical Layout

Figure 3: Data Layout

These two different formats have the different way of counting the support of the itemset. In horizontal data format, whole database needs to scan k times to determine the support of itemset. For example, if we want to count the support of the itemset $I = \{I_1, I_2, I_3, I_4, I_5\}$ then we need to scan the all transactions from t_1 to t_5. After scanning then we get the support for the item $I_1 = 4$, $I_2 = 2$, $I_3 = 3$, $I_4 = 3$, $I_5 = 4$. In the similar way, if want to find the support of the 2-itemset for example (I_1, I_5) then again we need to scan the database and get support (I_1, I_5) is 3. But if we consider the vertical format then it needs only intersection of the TID list of itemset to get the support of the itemset. For example, If we want to get the support of both I_1, I_5 then we have to perform the intersection operation of $\{t_1, t_2, t_3, t_4\}$ with $\{t_2, t_3, t_4, t_5\}$ and get output of $\{t_2, t_3, t_4\}$. So support (I_1, I_5) is 3. So vertical data format reduces the number of times to scan the database very effectively.

c) Apriori Algorithm

Apriori algorithm is used for frequent itemsets mining and association rule learning over transactional databases [16]. It was proposed by R. Agrawal and Srikant in 1994. Apriori uses a Breadth-first search approach where frequent subsets are extended one

item at a time, and groups of candidates are tested against the data. At first scanning the database D and count each item. Items that satisfy the minimum support are conceded frequent 1-itemset.Then generates candidates of 2-freqeunt itemset from frequent 1-itemset. Scan the database again for counting the frequency of candidate 2- itemset, compare candidate support count with minimum support and determine the 2-frequent itemset. In the similar way we can determine the frequent k-itemset and generates candidate k+1 itemsets by applying support and threshold conditions. Apriori algorithm is two-step process one is join and another is prune. Candidate k-itemset is generated by joining the k-1 frequent itemset. And monotonic property is exploited to prune the candidates which are infrequent [5]. This process continues until the candidate itemset is not NULL. Limitations of Apriori algorithm are finding the each frequent itemset requires one full scan of the database and candidate generation generates large number subsets.

d) Eclat Algorithm

Eclat algorithm was proposed by ZAKI in 2000 for finding frequent itemset. Eclat uses vertical formatted data rather than horizontal layout. As a result no need to scan the database to find the support of (k+1) itemsets, for k>=1 which achieves a good performance. Eclat is based on depth-first search to traverse the prefix tree. Eclat algorithm is very much similar with Apriori algorithm. Similar to Apriori frequent 1-itemset is generated by scanning the database D. Candidate 2-itemset are generated from frequent 1-itemset. Frequent 2-freqeunt itemset are generated from candidate 2-itemset by clipping the infrequent itemsets. This process continues until candidate itemset is not NULL. Different thing of Eclat from Apriori is that Eclat algorithm partition the search space and creates multiple non overlapping sub spaces. Monotonic property states that if an itemset or path in the tree is infrequent then all of its sub-trees are infrequent and same are pruned; only frequent itemsets are considered as prefix which gets added in a tree [5].Same prefix type's itemsets are categorized to the same class and candidate itemsets can be conducted only in the same class. Equivalence classes improve the efficiency of collecting candidate itemsets and also minimize the occupation of storage space. Eclat algorithm has the following limitations 1) Generation of candidate itemset is more than of Apriori because prior knowledge may not enough to clip the candidate itemsets. 2) If the itemset is much long then a great deal of time is needed to determine whether two itemset can be joined or not. 3) For the itemset of larger transactions, calculation of intersection is not much efficient. Although Eclat has some limitations but it has high efficiency and very effective.

IV. Different Mapreduce Technique for Finding Frequent Itemsets

a) PAriori algorithm

Parallel implementation of Apriori algorithm is very easy to implement in Map Reduce framework [23]. The whole database is partitioned into subparts and subparts are assigned into different node. As a result parallel counting of each node is possible. Combiner calculate locally intermediate sum of the data to reduce the data size and transformed over the network. Hash tables are used to check the data items that satisfy minimum support. These frequent itemset are stored in hash table and assigned to all the working processes. After that reducer finds the global frequent itemsets from the local itemset. These global frequent itemset at step i are inputted to the mapper for the next step i+1 and repeat the same procedure. Before inputted to the mapper, candidate itemset are generated from the global itemset and apply prune technique on the candidate itemset to reduce its size. Following figure shows the parallel implementation of Apriori algorithm for finding the frequent itemsets.

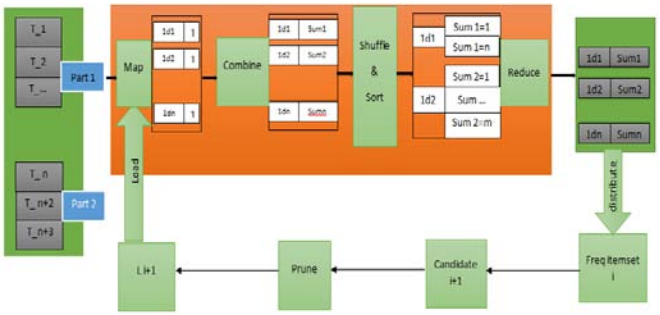

Figure 4: Parallel implementation of Apriori algorithm

b) MRApriori algorithm

Parallel implementation algorithm provides good scalability but repeated scanning of the whole database is still needed. MRAriori improves over the PAriori is that it needs only one full scan of the database. It scans only the intermediate data repeatedly that generally reduces per iteration. Singh (2014) proposed the MapReduce Apriori algorithm for finding the frequent itemsets [24]. Two main parts of Apriori algorithm. One is generating candidate itemsets and another is generating frequent itemsets from candidate itemsets. MRApriori algorithm is based on HDFS. HDFS divides the entire database into blocks and blocks are assigned to the different mappers running on multiple nodes. The input to the mappers is the (key, value) pairs where key is the transactional ID and value is the list of items. Output of the mappers is also (key', value') pairs where key' is the item in the transaction and value' is 1.Combiner performs the local for the key' of the same key value and inputted to the shuffle and exchange part. In shuffle and exchange part, given output from the combiner it makes a list of items of the form (key', list

(value")) pairs and passes to the reducers. Reducers takes the pairs as inputs, sum up the values of respective keys and outputs the pairs (key', value"') pairs where key' is item and value"'as support count must satisfy the minimum support threshold. By merging the the outputs from all reducers frequent 1-itemset can be generated. If we find the frequent 2-itemsets then at first candidate 2-itemsets will be generated and then we have to find out frequent 2-itemsets from the candidate itemsets. To find the frequent k-itemsets, frequent 1-itemsets are inputted to the mapper and mapper generated candidate k-itemsets. A candidate itemsets is selected as key and value is 1 if mapper finds that item in the transaction list which is assigned to the mapper. All the remaining procedures are same.

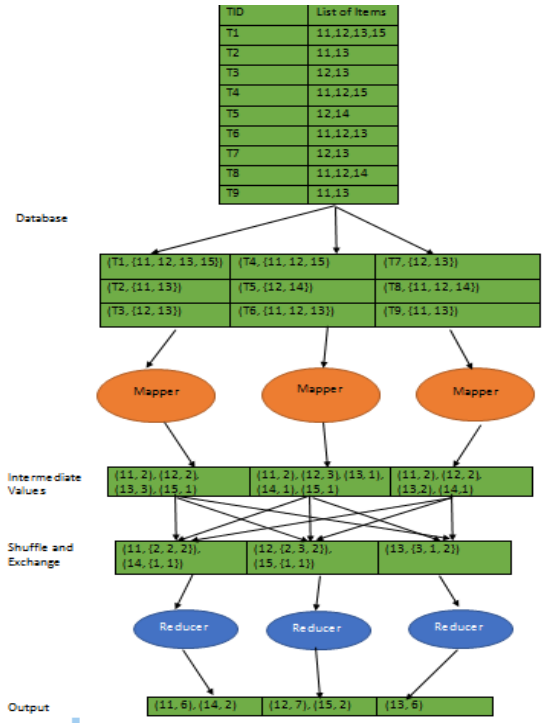

Figure 5: MRAriori procedure

c) *Parallel FP-growth Algorithm*

Parallel FP-Growth is the parallel version of FP-Growth [21]. Let we have N different computers. In sharding, Database DB transaction is partitioned into different parts called shard and stored on N different computers. In parallel counting step, generate the support values for all the items in DB using Map-Reduce pass. Each mapper loads a shard and discovers the Vocabulary I. Finally result is stored in F-list. Divide the all the items in F-list and generate group-dependent G-list in grouping items during grouping items step.

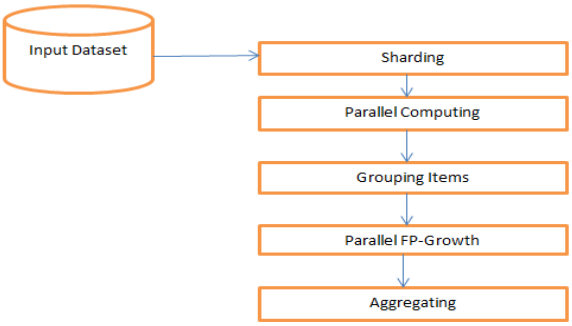

Figure 6: Block diagram of Parallel FP-Growth approach

Both F-list and G-list are small in size and possible to compute in a single computer. Each G-list has unique identifier (g_id).Parallel FP-growth works in two steps: one is mapper and another is reducer. Group dependent transactions are generated in mapper step. At first mapper reads the G-list. Each mapper is fed one shard and gives outputs of one or more key-value pairs where key indicates the group_id and value indicate the generated group dependent transaction list. For each group_id, map reducer creates a shard of group dependent transactions from all group dependent transactions. Then reduces processes each shard one after another. During the process, at first it creates a local FP tree and then growth its conditional FP-trees recursively while it may generates discovered pattern during this process. Finally results in parallel FP-growth are aggregating to generate the final result.

d) *Balanced FP-Growth*

Balanced FP-growth consists of two rounds of Map Reduce [22]. In Balanced FP-Growth, two major improvements are done over the Parallel FP-Growth. One is balanced partition of the database D to improve the parallelization and other is no aggregating operation is needed for finding frequent itemsets. Balanced FP-Growth consists of the following steps:

Sharding: Partition the database D into successive partitions and assigned into the different nodes. If we use Hadoop Map Reduce then just copy the database into the Hadoop Distributed File System. Hadoop automatically perform the Sharding.

Parallel Counting: One MapReduce technique is used for counting the entire items. One shard is inputted to exactly one mapper. The input is <key, value= Ti> pair to the mapper where Ti ⊂ database transaction. and output is also <key', value'> pair. Reducer calculates the sum of all the values that have the same key' and outputs <key', sum (values')> pair. Output of this phase frequent items called F-lists that is sorted in descending order based on frequency.

Balanced Grouping: To improve the parallelization of the overall mining, balanced grouping partition the F-list into G-list and balanced the load among the groups. It can be divided into two steps.

i. *Mining the load estimation:* In this step, estimate the load unit which is amount of work of running FP-Growth on conditional pattern base of each frequent item

ii. *Balanced Partition:* In this step, fairly partition the load units among different groups.

Parallel FP Growth: This step uses MapReduce phase again. In map phase, Original database D transactions are transformed to new group dependent transactions and construct FP tree. And the reducer recursively done the FP-Growth on the group dependent transactions in the reduce phase.

e) Dist-Eclat

In general, we partition the large database into equal sized sub database. Then mining the sub databases separately and combined them to obtain local frequent item sets. Finally all local frequent item sets are combined and use prune method to obtain global frequent item sets. As a result this approach comes with large communication cost and is prohibitive to implement in Hadoop. For effective mining and overcome this situation Distributed version of Eclat (Dist-Eclat) partition the search space rather than data space [20]. Dist-Eclat use depth first search approach for finding frequent item sets. As a result we need to store only limited number candidate item sets in memory.

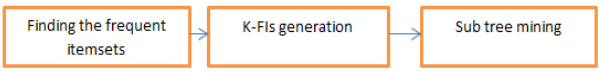

Figure 7: Dist-Eclat Procedure

Dist-Eclat works in the following three steps:

Finding the frequent item sets: At first vertical database is equally partitioned to create the sub database called shards and assigned them to the mappers. Mappers find the local frequent item sets from the shards. Combined all local frequent item sets which is done input of the reduce phase.

K-FIs Generation: This step generates k^{th} frequent itemsets. Each mapper is assigned the combined form of local frequent item sets. Then mapper finds the kth sized superset of the items using Eclat method. Finally a reducer assigns the frequent itemsets to the individual mappers.

Subtree mining: Eclat algorithm is used for mining the prefix tree from the assigned subsets.

f) BigFIM

There are some limitations associated with Dist-Eclat method. Firstly in Dist-Eclat, mapper needs the whole datasets to generate FIs. As a result large number tid-list may not fit in the memory. Secondly, mapper needs the complete dataset for mining the sub tree which is prohibitive in this Dist-Eclat. To overcome this limitation, BigFIM method can be used [20]. It is combination of both Apriori and Eclat algorithm for mining the large dataset. BigFIM consists of the following steps:

Generating k-FIs: BigFIM overcomes the difficulties arises for large tid list by constructing k-FIs using Apriori algorithm. At first database is partitioned into sub parts and each mapper receives sub part of the database. Mapper use Apriori algorithm to find out the local frequent item set. These local frequent item set inputted to the reduce function. Reducer combines all local frequent item set, pruned the item set and find out the global frequent item set. This global frequent item set are redistributed to all mappers as a candidate item set for the next step. This process is repeated to k times to find the k+1 FIs

Finding Potential Extensions: This step obtains tid-lists for (k+1)-FIs. Local tid-list are collected from all mappers by the reducer and combines them for generating global tid-list. And assign the computed global tid-list as a complete prefix groups to the mappers.

SubtreeMining: Here, mapper performed on individual prefix groups. Eclat algorithm is applied to mine the prefix groups as conditional database that fits into a memory for frequent item set.

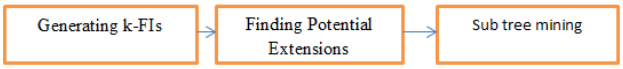

Figure 8: BigFIM Procedure

g) ClustBigFIM

ClustBigFIM provides the hybrid approach which is the combination of parallel k-means, Apriori, and Eclat algorithm [5]. It gives an approximate result that is very much close to original result with faster speed. ClustBigFIM has the following four steps for finding frequent itemsets from large datasets.

i. *Find Clusters*

At first clusters are generated using parallel k-means algorithm based on Compute_Dist function and combiner function.

ii. *Finding K-FIs*

Apriori algorithm is used for mining generated clusters in step 1.Mapper find the local support and Reducer calculate the global supports.Upto certain length k, Apriori used to find frequent k-length itemsets. But for higher length k+1, use pruning technique on the candidate itemsets to generate frequent itemsets.

iii. *Generate Single Global TID list*

From the generated prefixes, built a prefix tree and obtain tid_lists for k+1 frequent itemsets .Mappers computes the local tid_lists and reducer compute the single global tid_lists.

iv. *Subtree Mining*

Prefix groups are assigned to the mappers which is the conditional database that fits completely into the memory. Subtrees are mined independently by

the mappers using depth first search. Longer frequent itemsets as prefixes are used for better load balancing.

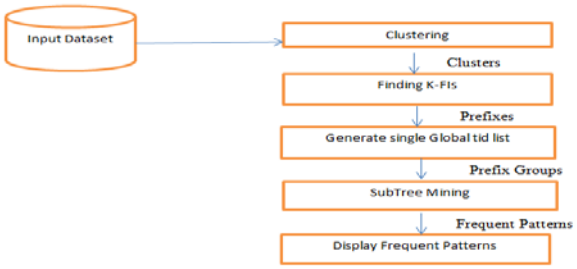

Figure 9: ClustBig FIM Procedure

V. Comparative Analysis

PApriori algorithm is very easy to implement in Map Reduce framework. It provides good performance and efficient for large database. But user needs to give number of reducers and repeated scanning of the full database in PApriori. MRApriori technique overcomes this situation of repeated scanning. It scans only the intermediate data repeatedly that generally reduces per iteration. It is also efficient and provides good performance for large database. But processing time of MRAprioi is same as PAriori. No significant reduction was done for faster execution in MRApriori over PApriori. Parallel version of Parallel-FP Growth is scalable. But if we consider this technique based on memory and speed then it is not efficient. Balanced FP-Growth is improved version of Parallel- FP Growth. It balances the load distributed among the nodes. And also executes faster than the parallel FP-Growth using singletons. But the way this technique partition the search space is not efficient. Dist-Eclat is distributed version of Eclat. Advantage of this technique is its faster execution of processing. But it is not scalable. To overcome the limitation of Dist-Eclat, BigFIM technique was proposed. BigFIM is the combination of both technique Apriori and Eclat. It removes the scalability problem of Dist-Eclat but it is not as much faster as Dist-Eclat. ClustBigFIM overcomes the speed problem of BigFIM. It is also hybrid approach that is combination of parallel k-means, Apriori, and Eclat algorithm. Advantage of this technique is that it requires less time than BigFIM for execution. It is also scalable. Table shows the comparison results of various MapReduce techniques interms of speed, scalability and execution time. Both Balanced FP-Growth and ClustBigFIM technique have high speed up, high scalability and less execution time but in Balanced FP-Growth partition the search space is not efficient.

Table 1: Comparative analysis

MapReduce Technique	Speedup	Scalability	Execution Time
PAriori	Low	High	More
MRApriori	High	High	More
Parallel FP-Growth	High	High	More
Balanced FP-Growth	High	High	Less
Dist-Eclat	High	Low	Less
BigFIM	Low	High	Less
ClustBigFIM	High	High	Less

VI Conclusion

Social network generated tremendous amount of data. So frequent itemset mining on these Big data can be extremely useful. But traditional mining methods become ineffective for mining such data because of large resource criteria and excess communication cost. MapReduce programming model as a parallel programmming model has emerged for mining such Bigdata. In this paper we analyses and studied different types of MapReduce technique such as PApriori, MRApriori, Parallel FP-Growth, Balanced FP-Growth, Dist-Eclat, BigFIM, ClustBigFIM etc. From the above discussion ClustBigFIM gives better result among all of them based on faster execution and scalability.

References Références Referencias

1. Farzanyar, Zahra, and Nick Cercone(2013). Efficient mining of frequent itemsets in social network data based on MapReduce framework. In Proceedings of the 2013 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining, pp. 1183-1188. ACM.
2. Le Zhou; Zhiyong Zhong; Jin Chang; Junjie Li; Huang, J.Z.; Shengzhong Feng(2010). Balanced parallel FP-Growth with MapReduce," Information Computing and Telecommunications (YCICT), 2010 IEEE Youth Conference on , vol., no., pp.243,246.
3. J Manyika, M Chui, B Brown, J Bughin, R Dobbs, C Roxburgh, AH Byers (2011). Big data: The next frontier for innovation, competition, and productivity. McKinsey Global Institute, 1-137.
4. R. Agrawal and R. Srikant(1994).Fast Algorithms for Mining Association Rules in Large Databases. In: Proceedings of the Twentieth International Conference on Very Large Databases (VLDB), pp. 487-499.
5. S.Gole and B. Tidke (2015). Frequent Itemset Mining for Big data in Social Media using ClusBig FIM algorithm. International Conference on Pervasive Computing (ICPC).

6. D. Khanaferov, C. Lue and T. Wang (2014). Social Network Data Mining Using Natural Language Processing and Density Based Clustering", IEEE international Conference on Semantic Computing.
7. J. Dean and S. Ghemawat: Mapreduce (2004). Simplified Data Processing on Large Clusters. In: Proceedings of the Sixth Symposium on Operating System Design and Implementation (OSDI), pp. 137-150.
8. Zhang, Zhigang, Genlin Ji, and Mengmeng Tang (2013). MREclat: An Algorithm for Parallel Mining Frequent Itemsets. In Advanced Cloud and Big Data (CBD), 2013 International Conference on, pp. 177-180. IEEE.
9. Yahya, Othman, Osman Hegazy, and Ehab Ezat (2012). An efficient implementation of Apriori algorithm based on Hadoop- Mapreduce model.
10. Moens, Sandy, Emin Aksehirli, and Bart Goethals (2013). Frequent itemset mining for big data. In Big Data, 2013 IEEE International Conference on, pp. 111-118.
11. http://www.adweek.com/socialtimes/heres-how- ny-people-are-on-facebook-instagram-twitter-other-big-social-networks/637205.
12. Usama Fayyad, Gregory Piatetsky-Shapiro, and Padhraic Smyth (1996). The KDD process for extracting useful knowledge from volumes of data. Commun. ACM 39, 11, 27-34.
13. https://hadoop.apache.org/docs/r1.2.1/mapred_tutorial.html.
14. http://www.drdobbs.com/database/hadoop-the-lay-of-the-land/240150854.
15. M. J. Zaki and K. Gouda (2003). Fast vertical mining using diffsets. Proceedings of the ninth ACM SIGKDD international conference on Knowledge discovery and data mining, New York, USA, pp. 326- 335.
16. https://en.wikipedia.org/wiki/Apriori_algorithm
17. N. Li, L. Zeng, Q. He, and Z. Shi (2012). Parallel implementation of Apriori algorithm based on MapReduce. In Proc. SNPD, pages 236–241.
18. J. Ekanayake, H. Li, B. Zhang, T. Gunarathne, S.-H. Bae, J. Qiu, and G. Fox. Twister (2010). A runtime for iterative MapReduce. In Proc. HPDC, pages 810–818. ACM.
19. Zhiyong Ma, Juncheng Yang, Taixia Zhang and Fan Liu (2016). An Improved Eclat Algorithm for Mining Association Rules Based on Increased Search Strategy "International Journal of Database Theory and Application Vol.9, No.5 , pp.251-266 .
20. Moens, S.; Aksehirli, E.; Goethals, B. (2013). Frequent Itemset Mining for Big Data," Big Data, 2013 IEEE International Conference on , vol., no., pp.111-118, doi: 10.1109/BigData.2013.6691742
21. L. Zhou, Z. Zhong, J. Chang, J. Li, J. Huang, and S. Feng(2010). Balanced parallel FP-Growth with MapReduce. In Proc. YC-ICT, pages 243–246.
22. Dawen Xia, Yanhui Zhou, Zhuobo Rong, and Zili Zhang, IPFP (2013). An improved parallel FP-Growth Algorithm for Frequent Itemset Mining, isiproceedings.org.
23. Suhel Hammoud (2011). MapReduce Network Enabled Algorithms for Classification Based on Association Rules", Brunel University.
24. S.Singh,R. Garg, P.K.Mishra (2014). Review of Apriori Based Algorithms on MapReduce Framework", ICC.

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3. Submission of Manuscripts,

4. Manuscript's Category,

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19. Know what you know: Always try to know, what you know by making objectives. Else, you will be confused and cannot achieve your target.

20. Use good quality grammar: Always use a good quality grammar and use words that will throw positive impact on evaluator. Use of good quality grammar does not mean to use tough words, that for each word the evaluator has to go through dictionary. Do not start sentence with a conjunction. Do not fragment sentences. Eliminate one-word sentences. Ignore passive voice. Do not ever use a big word when a diminutive one would suffice. Verbs have to be in agreement with their subjects. Prepositions are not expressions to finish sentences with. It is incorrect to ever divide an infinitive. Avoid clichés like the disease. Also, always shun irritating alliteration. Use language that is simple and straight forward. put together a neat summary.

21. Arrangement of information: Each section of the main body should start with an opening sentence and there should be a changeover at the end of the section. Give only valid and powerful arguments to your topic. You may also maintain your arguments with records.

22. Never start in last minute: Always start at right time and give enough time to research work. Leaving everything to the last minute will degrade your paper and spoil your work.

23. Multitasking in research is not good: Doing several things at the same time proves bad habit in case of research activity. Research is an area, where everything has a particular time slot. Divide your research work in parts and do particular part in particular time slot.

24. Never copy others' work: Never copy others' work and give it your name because if evaluator has seen it anywhere you will be in trouble.

25. Take proper rest and food: No matter how many hours you spend for your research activity, if you are not taking care of your health then all your efforts will be in vain. For a quality research, study is must, and this can be done by taking proper rest and food.

26. Go for seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

27. Refresh your mind after intervals: Try to give rest to your mind by listening to soft music or by sleeping in intervals. This will also improve your memory.

28. Make colleagues: Always try to make colleagues. No matter how sharper or intelligent you are, if you make colleagues you can have several ideas, which will be helpful for your research.

29. Think technically: Always think technically. If anything happens, then search its reasons, its benefits, and demerits.

30. Think and then print: When you will go to print your paper, notice that tables are not be split, headings are not detached from their descriptions, and page sequence is maintained.

31. Adding unnecessary information: Do not add unnecessary information, like, I have used MS Excel to draw graph. Do not add irrelevant and inappropriate material. These all will create superfluous. Foreign terminology and phrases are not apropos. One should NEVER take a broad view. Analogy in script is like feathers on a snake. Not at all use a large word when a very small one would be sufficient. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Amplification is a billion times of inferior quality than sarcasm.

32. Never oversimplify everything: To add material in your research paper, never go for oversimplification. This will definitely irritate the evaluator. Be more or less specific. Also too, by no means, ever use rhythmic redundancies. Contractions aren't essential and shouldn't be there used. Comparisons are as terrible as clichés. Give up ampersands and abbreviations, and so on. Remove commas, that are, not necessary. Parenthetical words however should be together with this in commas. Understatement is all the time the complete best way to put onward earth-shaking thoughts. Give a detailed literary review.

33. Report concluded results: Use concluded results. From raw data, filter the results and then conclude your studies based on measurements and observations taken. Significant figures and appropriate number of decimal places should be used. Parenthetical remarks are prohibitive. Proofread carefully at final stage. In the end give outline to your arguments. Spot out perspectives of further study of this subject. Justify your conclusion by at the bottom of them with sufficient justifications and examples.

34. After conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print to the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects in your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form, which is presented in the guidelines using the template.
- Please note the criterion for grading the final paper by peer-reviewers.

Final Points:

A purpose of organizing a research paper is to let people to interpret your effort selectively. The journal requires the following sections, submitted in the order listed, each section to start on a new page.

The introduction will be compiled from reference matter and will reflect the design processes or outline of basis that direct you to make study. As you will carry out the process of study, the method and process section will be constructed as like that. The result segment will show related statistics in nearly sequential order and will direct the reviewers next to the similar intellectual paths throughout the data that you took to carry out your study. The discussion section will provide understanding of the data and projections as to the implication of the results. The use of good quality references all through the paper will give the effort trustworthiness by representing an alertness of prior workings.

Writing a research paper is not an easy job no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record keeping are the only means to make straightforward the progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear

· Adhere to recommended page limits

Mistakes to evade

- Insertion a title at the foot of a page with the subsequent text on the next page
- Separating a table/chart or figure - impound each figure/table to a single page
- Submitting a manuscript with pages out of sequence

In every sections of your document

· Use standard writing style including articles ("a", "the," etc.)

· Keep on paying attention on the research topic of the paper

· Use paragraphs to split each significant point (excluding for the abstract)

· Align the primary line of each section

· Present your points in sound order

· Use present tense to report well accepted

· Use past tense to describe specific results

· Shun familiar wording, don't address the reviewer directly, and don't use slang, slang language, or superlatives

· Shun use of extra pictures - include only those figures essential to presenting results

Title Page:

Choose a revealing title. It should be short. It should not have non-standard acronyms or abbreviations. It should not exceed two printed lines. It should include the name(s) and address (es) of all authors.

Abstract:

The summary should be two hundred words or less. It should briefly and clearly explain the key findings reported in the manuscript--must have precise statistics. It should not have abnormal acronyms or abbreviations. It should be logical in itself. Shun citing references at this point.

An abstract is a brief distinct paragraph summary of finished work or work in development. In a minute or less a reviewer can be taught the foundation behind the study, common approach to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Yet, use comprehensive sentences and do not let go readability for briefness. You can maintain it succinct by phrasing sentences so that they provide more than lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study, with the subsequent elements in any summary. Try to maintain the initial two items to no more than one ruling each.

- Reason of the study - theory, overall issue, purpose
- Fundamental goal
- To the point depiction of the research
- Consequences, including definite statistics - if the consequences are quantitative in nature, account quantitative data; results of any numerical analysis should be reported
- Significant conclusions or questions that track from the research(es)

Approach:

- Single section, and succinct
- As a outline of job done, it is always written in past tense
- A conceptual should situate on its own, and not submit to any other part of the paper such as a form or table
- Center on shortening results - bound background information to a verdict or two, if completely necessary
- What you account in an conceptual must be regular with what you reported in the manuscript
- Exact spelling, clearness of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else

Introduction:

The **Introduction** should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable to comprehend and calculate the purpose of your study without having to submit to other works. The basis for the study should be offered. Give most important references but shun difficult to make a comprehensive appraisal of the topic. In the introduction, describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will have no attention in your result. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here. Following approach can create a valuable beginning:

- Explain the value (significance) of the study
- Shield the model - why did you employ this particular system or method? What is its compensation? You strength remark on its appropriateness from a abstract point of vision as well as point out sensible reasons for using it.
- Present a justification. Status your particular theory (es) or aim(s), and describe the logic that led you to choose them.
- Very for a short time explain the tentative propose and how it skilled the declared objectives.

Approach:

- Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done.
- Sort out your thoughts; manufacture one key point with every section. If you make the four points listed above, you will need a least of four paragraphs.

- Present surroundings information only as desirable in order hold up a situation. The reviewer does not desire to read the whole thing you know about a topic.
- Shape the theory/purpose specifically - do not take a broad view.
- As always, give awareness to spelling, simplicity and correctness of sentences and phrases.

Procedures (Methods and Materials):

This part is supposed to be the easiest to carve if you have good skills. A sound written Procedures segment allows a capable scientist to replacement your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt for the least amount of information that would permit another capable scientist to spare your outcome but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section. When a technique is used that has been well described in another object, mention the specific item describing a way but draw the basic principle while stating the situation. The purpose is to text all particular resources and broad procedures, so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step by step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

- Explain materials individually only if the study is so complex that it saves liberty this way.
- Embrace particular materials, and any tools or provisions that are not frequently found in laboratories.
- Do not take in frequently found.
- If use of a definite type of tools.
- Materials may be reported in a part section or else they may be recognized along with your measures.

Methods:

- Report the method (not particulars of each process that engaged the same methodology)
- Describe the method entirely
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures
- Simplify - details how procedures were completed not how they were exclusively performed on a particular day.
- If well known procedures were used, account the procedure by name, possibly with reference, and that's all.

Approach:

- It is embarrassed or not possible to use vigorous voice when documenting methods with no using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result when script up the methods most authors use third person passive voice.
- Use standard style in this and in every other part of the paper - avoid familiar lists, and use full sentences.

What to keep away from

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings - save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part a entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Carry on to be to the point, by means of statistics and tables, if suitable, to present consequences most efficiently.You must obviously differentiate material that would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matter should not be submitted at all except requested by the instructor.

Content

- Sum up your conclusion in text and demonstrate them, if suitable, with figures and tables.
- In manuscript, explain each of your consequences, point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation an exacting study.
- Explain results of control experiments and comprise remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or in manuscript form.

What to stay away from

- Do not discuss or infer your outcome, report surroundings information, or try to explain anything.
- Not at all, take in raw data or intermediate calculations in a research manuscript.
- Do not present the similar data more than once.
- Manuscript should complement any figures or tables, not duplicate the identical information.
- Never confuse figures with tables - there is a difference.

Approach

- As forever, use past tense when you submit to your results, and put the whole thing in a reasonable order.
- Put figures and tables, appropriately numbered, in order at the end of the report
- If you desire, you may place your figures and tables properly within the text of your results part.

Figures and tables

- If you put figures and tables at the end of the details, make certain that they are visibly distinguished from any attach appendix materials, such as raw facts
- Despite of position, each figure must be numbered one after the other and complete with subtitle
- In spite of position, each table must be titled, numbered one after the other and complete with heading
- All figure and table must be adequately complete that it could situate on its own, divide from text

Discussion:

The Discussion is expected the trickiest segment to write and describe. A lot of papers submitted for journal are discarded based on problems with the Discussion. There is no head of state for how long a argument should be. Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implication of the study. The purpose here is to offer an understanding of your results and hold up for all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of result should be visibly described. Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved with prospect, and let it drop at that.

- Make a decision if each premise is supported, discarded, or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."
- Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work
- You may propose future guidelines, such as how the experiment might be personalized to accomplish a new idea.
- Give details all of your remarks as much as possible, focus on mechanisms.
- Make a decision if the tentative design sufficiently addressed the theory, and whether or not it was correctly restricted.
- Try to present substitute explanations if sensible alternatives be present.
- One research will not counter an overall question, so maintain the large picture in mind, where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

- When you refer to information, differentiate data generated by your own studies from available information
- Submit to work done by specific persons (including you) in past tense.
- Submit to generally acknowledged facts and main beliefs in present tense.

Please carefully note down following rules and regulation before submitting your Research Paper to Global Journals Inc. (US):

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- To guard yourself and others from possible illegal use please do not permit anyone right to use to your paper and files.

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Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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ISSN 9754350