TRANSFORMING DATA AND DEVELOPMENT PROCESS IN CLOUD ENVIRONMENT

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ABSTRACT

Cloud computing is a subscription-based service, which provides on demand scalable and elastic services to its customers using virtualization technology. In the real-world environment, cloud computing plays a crucial role which provides different kinds of services through the Internet to the cloud users, according to the requirements. A cloud service provider is an organization that offers IT-related resources, infrastructure and network services to other individuals and ensuring the on-going operation of the overall cloud infrastructure. Due to the distributive feature of computing, cloud environment is receiving greater interest in both academic and industry communities. Personal information can be outsourced by the cloud owners to the cloud server and made use of by the cloud user on public clouds with essential authorization. In order to get the specified outcome, users heavily rely upon the cloud information retrieval mode. Several research works have been conducted in the field of data retrieval employing a keyword dictionary and SQL-like encrypted queries. But an effective ranking of complex query creates considerable challenges.

Keywords: *Cloud computing, cloud environment, cloud service, IT infrastructure.*

INTRODUCTION

Cloud computing is a category of a computing system which delivers different services to its clients via an Internet connection. The cloud computing model provides users a lot of services such as shared resources, computing capabilities, heterogeneous network access, device and location independence, scalable and elastic services, on-demand self-services and flexible access, thus lowering the capital investments in Information Technology (IT) infrastructure and software. Cloud computing provides services depending on the requirement of the user based on their business needs. It assists in accumulating and accessing of data and application software over the Internet and facilitates Information Technology in improving the data-sharing abilities for personal applications. It permits endeavors to speed up applications with enhanced supervision and reduced maintenance and assists IT to effectively regulate resources for maintaining business profits. In other words, cloud computing allows suitable, on-demand network access to a collective number of organizable computing resources which operate with minimal service provider interaction.

LITERATURE REVIEW

Victor Chang (2022) Over the years, there has been a heavy reliance on cloud computing as IT has innovated through time. In recent times cloud computing has grown monumentally. Many organizations rely on this technology to perform their business as usual and use it as a backbone of their companies' IT infrastructure. This paper investigates the organizational adaptation for cloud computing technology

- reviewing case studies from various institutions and companies worldwide to provide a detailed analysis of innovative techniques with cloud computing. We investigate the features and delivery approaches cloud computing offers and the potential challenges and constraints we face when adopting cloud computing into the business setting. **Magnus Karlsson (2021)** Researches on the Internet of Things (IoT) and cloud computing have been pervasive in both the academic and industrial world. IoT and cloud computing are seen as cornerstones to digital transformation in the industry. However, restricted by limited resources and the lack of expertise in information and communication technologies, small- and medium-sized enterprises (SMEs) have difficulty in achieving digitalization of their business. In this paper, we propose a reference framework for SMEs to follow as a guideline in the journey of digital transformation. The framework features a three-stage procedure that covers business, technology, and innovation, which can be iterated to drive product and business development.

Rui Wang (2021) In recent years, cloud computing technology has been extensively employed in various industries of society. Many enterprises generally use cloud computing technology to store data in computer hard disk and mobile hard disk. Cloud computing technology has grown the pace of local computer and data processing, and put forward the function of distributed storage for data storage, which speeds up the transformation of computer Internet mode. It is an instant service. Through the unique fixed matching mode, different client data and resources are sorted out and transmitted to the cloud to realize the calculation of big message and ensure the accuracy of the consequences.

Hiral B. Patel (2021) Cloud computing has become the embraced in the computer world. Cloud implementation is the process of creating a virtual computing environment. Deployment in the cloud provides organizations with flexible and scalable virtual computing resources. A cloud deployment model is the type of architecture in which a cloud system is deployed. These models differ in terms of administration, ownership, access control, and security protocols. This paper describes the different types of cloud computing service models and deployment models; it also gives us a comparative study of various clouds using many factors. The comparison is simply based on various factors such as reliability, cost, data control, workload, performance, and many other cloud parameters.

A M Patrusova (2020) As network data rates increase, so does the spread of virtualization. Each type of cloud fits better or worse to a certain task. The paper details the major types of clouds currently in use and their deployment models. The paper can be useful to both simple users and information security professionals to deploy both private home family clouds and cloud computing systems of large corporations.

Cloud computing driving transformations

Cloud services are already transforming the business models of companies around the world—from small startups and medium-size firms to large multinational enterprises. Cloud Computing offers new capabilities for innovation and entrepreneurship, lowering the bar for new entrants and facilitating experimentation. At the same time, it raises the scale

required to be an effective computing infrastructure provider, and customer expectations of service flexibility and costs are undergoing a sea change. For advanced industrial countries, Cloud Computing provides new opportunities for innovation and entrepreneurship, and promises substantial efficiency gains. For developing countries, Cloud services open up new possibilities to enter international markets and find niches in global value networks. As with the previous computing platforms—mainframes, PCs, and networks of PCs—Cloud computing is becoming a baseline for national and corporate IT infrastructure against which other forms of infrastructure and service delivery must be measured.

Cloud Computing empowers digital business transformation

In order to be competitive, and to bring an added value to the company, each company should embrace the digital transformation process when required, to upgrade their old IT infrastructure into a new one. Beyond adopting cloud solutions, a company should integrate new forms of technologies that speed up, automate and improve business, such as Artificial Intelligence, Machine Learning, Big Data Analytics, and the Internet of Things (IoT), etc. Considering that these technologies require heavy computational power and storage space, Cloud Computing comes as a solution to integrate these technologies.

Cloud computing as a dynamic utility

Traditional utility services provide the same resource to all consumers. The electricity company does not care whether their electrons are used to charge the batteries of an electric car or to run a heater. Neither choice demands that the supplier generate different 'types' of electrons. Traditional definitions of 'utility' also refer to the critical nature of these resource provisions for the effective functioning of the economy or society. The regulated nature of traditional utilities—through public rules and standards—recognizes the unique economic role of the resources: that all members of society should enjoy equal access to these resources, (contingent on minimum tariff payments), and that providers tend to be monopolies or limited oligopolies.

Cloud providers: provisioning cloud services

Cloud Providers, who provide services from their Cloud Datacenter fall into three broad types according to their technical architecture type. Figure 1, Panel B, shows how Cloud providers with different architecture types entail different business models. We start with the bottom right corner. Infrastructure services—commonly referred to as Infrastructure as a Service (IaaS)—is virtual, Cloud-based replacements for physical hardware such as processors and hard drives. For example, Amazon offers virtual servers accessed through web interfaces, for which users pay by the hour per virtual processor. These virtual servers mimic the attributes of physical servers, although in reality the underlying processing power can be distributed over a large number of physical servers. They provide the flexibility of renting truly massive amounts of processing power for short amounts of time.

METHODOLOGY

Due to the loss of governance and compliance of the cloud services, the trust factor of the services is declined. The distributed cloud computing are used to provide a virtual system which works like a local desktop. But the information stored in the virtual systems are maintained and

controlled by the CSP. Network virtualization in cloud computing is a method of combining the available resources in a network by splitting up the available bandwidth into different channels, each being separate and distinguished. They can be either assigned to a particular server or device or stay unassigned completely — all in real time. The idea is that the technology disguises the true complexity of the network by separating it into parts that are easy to manage much like your segmented hard drive makes it easier for you to manage files.

RESULTS

This section provides the experimental setup and the results obtained by the proposed method. Feasible area graph plotting using the LPA algorithm is shown in Figure 3.5. From the given data set QWS, a particular service x (Storage Service) is chosen and the parameters values for that service are shown in Table 1. The cloud services available within the feasible region are identified as most trusted. The cloud services available beyond the feasible region is identified as less trusted cloud services.

Table 1: Attributes value from QWS dataset for a service (Storage Service)

Service No	Response Time ms	Availability %	Throughput bits/sec	Successability %	Reliability (MTBF – Mean Time Between Failure)	Compliance (Tying together governance and audit standards)	Latency ms
1	59.58	77	8.8	78	67	100	3.95
2	60.05	77	9.1	77	67	100	4.1
3	65.4	92	6.8	92	67	100	8.25
4	229.79	89	7.4	89	67	100	41.32
5	305.37	87	8	87	67	100	90.95
6	123.45	86	7.2	87	67	100	5.8
7	227.53	90	7.1	90	67	100	40.16
8	79.65	61	13.3	61	67	100	2.75
9	247.05	89	6.6	89	67	100	55.1
10	57.4	66	12	66	67	100	5.

	2		.5				31
11	62.05	72	10.2	73	67	100	6.05
12	60.84	70	10.5	71	67	100	5.95
13	263.89	87	7	88	67	100	70.52
14	64.75	86	7.8	86	67	100	7.95
15	71.21	71	10.7	71	67	100	6
16	243	89	7	90	67	100	49.11
17	60.47	78	9.2	79	67	100	4.47
18	248.32	89	7.3	90	67	100	50.11
19	61.42	80	8.6	81	67	100	4.95
20	64.2	80	9.	81	67	100	5.
	8		1				78
21	217.05	91	7.3	91	67	100	28
22	61.42	79	8.9	80	67	100	5.37
23	121.15	88	6.4	89	67	100	8.2
24	226.58	90	7.2	91	67	100	37.37
25	58.21	62	13.3	63	67	100	4.68

Based on the Table 2 for example, the attributes Availability Vs Throughput and Latency Vs Response time are considered. These values are identified for the cloud service x (storage Service). For maximized feasible values, the values above the threshold line are considered and for minimized feasible values, the values below the threshold line are considered. The threshold line is selected as linear separations of the values. This can be extended for other parameters and for n number of cloud services.

Table 2: Cluster of Cloud services obtained from Table 1

Selected service number	Response Time ms	Latency ms	Selected service number	Availability	Throughput

1	59.58	3.95	6	61	13.3
2	60.05	4.1	10	66	12.5
3	65.4	8.25	25	62	13.3
8	79.65	2.75	3	92	6.8
10	57.42	5.31	4	89	7.4
11	62.05	6.05	5	87	8
12	60.84	5.95	6	86	7.2
14	64.75	7.95	7	90	7.1
15	71.2	6	9	89	6.6
	1				
17	60.47	4.47	13	87	7
19	61.42	4.95	14	86	7.8
20	64.28	5.78	16	89	7
22	61.42	5.37	18	89	7.3
25	58.21	4.68	19	80	9.1
			23	88	6.4
			25	90	7.3

The highlighted rows of the Table 2 shows the cluster of cloud services based on either minimized or maximized objective functions. Maximization of availability and throughput cluster [4, 5, 14, 18, 19, 25]. Where 4, 5, 14, 18, 19, and 25 are selected service numbers. Minimization of response time and latency cluster [1, 2, 17, 19, 25]. Where 1, 2, 17, 19 and 25 are selected service numbers. [19 and 25] is the common cluster of cloud services.

Accuracy Calculation

Linear programming algorithm is coming under the category of supervised machine learning algorithms. Here the objective

function belongs to linear class. Hence the accuracy measurement of this model is measured based on the squared error method under linear regression model. The mathematical model of squared error method is shown in equation (3.11). By substituting the values to the equation (1) the Table 4 is obtained. This average trust calculation using LPA archives 91.2% of accuracy.

$$Squared\ error\ (SE) = \sum_{i=1}^{n} \epsilon_i^2 \qquad (1)$$

Where, n is number of cloud services and $\epsilon_i = actual\ value - predicted\ value$. In this model for each cloud service seven parameters from QWS data set is compared.

15	105	101.9	9.61 = 10	90
Average %				91.2

Similarly squared error measurement is calculated for the algorithms AHP, SMI and RV methods. The objective function implementation using LPA was found to be efficient in terms of accuracy, when compared to Ranking voting method.

The number of cloud services compared using different algorithms for trust calculation. The accuracy of other algorithms instable when the sample size of cloud service is increased. But the accuracy of the LPA algorithm is stable even if the sample size is increased. Table 4 presents the accuracy for varying the sample size of cloud services.

Table 3: Squared error measurement of accuracy

Number of cloud services	Actual value	Predicted value	Squared Error	Accuracy %
2	14	10.9	9.61 =10	90
5	35	31.5	12.25 = 12	88
7	49	46.3	7.29=7	93
10	70	67.7	5.29=5	95

Table 4 Accuracy measurement for varying sample size of cloud services

Number of cloud Services	Ranking Voting (RV) in %	AHP in %	SMI in %	LPA method in %
2	70	75	88	90

5	72	75	85	88
7	80	85	84	93
10	85	73	80	95
15	73	88	75	90

Similar to LPA, the other algorithm (Ranking voting, AHP and SMI) accuracy are measured and their values are shown in Table 4.

CONCLUSION

In the cloud environment, cloud data storage is obtained by permitting the users to access the cloud for online data storage and distribution for high-quality applications. The data encryption methods are used in cloud data storage to secure the data in cloud servers. When the users send a search request to the cloud server, the relevant files are searched with respect to the query but the cloud data search on encrypted file is a significant task which has to be considered for efficient data sharing. In many of the existing research works, storage overhead with integrity and encryption computation cost remained constant while performing data sharing for dynamic groups. Few research works have been intended for attaining better user query retrieval performance. Different query retrieval mechanisms with multiple keyword extraction were designed to solve the difficulties. However, the rate and the time at which the retrieval takes place has to be addressed and ranking on complex query create significant challenges, while performing information retrieval using keyword and encrypted queries.

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