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Era of Cloud Computing: A New Insight To Hybrid Cloud

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Abstract

Cloud computing has become an increasingly prevalent topic in the recent years. However, each and every explanation of cloud computing and its terminologies don't reach to a great number of beginners in IT sectors. This research paper is a layout of the literature analysis and it includes the proposals and discussions regarding the cloud computing and its networks. It introduces cloud computing along with its evolution and benefits it has to offer. The paper also explains the details and classifications of the concepts associated with cloud computing; and thereby throws light on the advancement in cloud computing and its efficiency in various fields. The findings identifies various commercial sectors where cloud computing has been widely adopted in contrast to other sectors which has not yet reaped its benefits. The paper compares and contrasts the various cloud computing applications like DropBox, Google Drive and SkyDrive, and follows an elaborate discussion about SkyDrive, hybrid cloud computing and the way it is influencing management strategies in Indian industrial sectors.

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Keywords: SkyDrive, hybrid, DropBox, Google Drive, models;

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1. Introduction

Over the past few years, cloud computing has been receiving much attention as a new computing paradigm for providing flexible and on-demand infrastructures, platforms, and software as services. Cloud computing as the name suggests is a technology through will exchange of information and software management could be done through "virtual "means [14]. As in other programming languages also, virtual technology is used to minimize the storage area and increase the speed of operations. Cloud computing allows users to use computer technology without the installation in their computers. It enables users to access their files or data from any computer having an internet connection. Cloud computing provides more efficient computing by centralizing data storage, processing and bandwidth. This technology focuses on virtualization of the host server or the main controlling computer. This server acts as a communication network through which information could be shared. The information can be stored, retrieved and shared as and when required through a widespread global platform.

2. Methodology

The following are the research questions addressed in this paper:

- How much is cloud computing adopted in IT sectors, government agencies, schools and colleges?
- How much is cloud computing emerging through the past few years in terms of new technological development?
- What are the applications and details regarding various services provided by companies based on cloud computing?
- Which cloud computing application has wide range of features and the best option for public use?
- How can hybrid cloud be utilized in large and medium scale industries?

This study is a qualitative and quantitative analysis of cloud computing and its adoption and application in various sectors of commercial firms. The research is a critical literature review based on secondary data. This paper emphasizes on summarizing the various facts including application of cloud computing in real-world model. Specifically, apart from reviewing studies that directly address cloud computing, this systematic review also covers general computing and IT journal papers, conference proceedings, books, industrial white papers, and technical reports.

3. Evolution of cloud computing

Evolution of cloud computing started during 1980's from the complex and extended roots of Information Technology (IT) sector [4]. With the emergence of network and internet technologies in the 1990's, users could connect their PC's with other computers and servers to exchange information and documents as well as to use remote applications [10]. But still a common server or a key was not emerging for sharing information on a global platform.

In early 2000's, with the support of new technologies like Web 2.0 and distributed computing , users can get accessed to a set of external and shared computer resources through an electronic grid over an Ethernet or the Internet. Cloud computer came into picture portraying an IT service model, which delivers a set of convenient, on demand and configurable computing services and resources to clients over a network in a self-service fashion, independent of device and location service provider interaction.

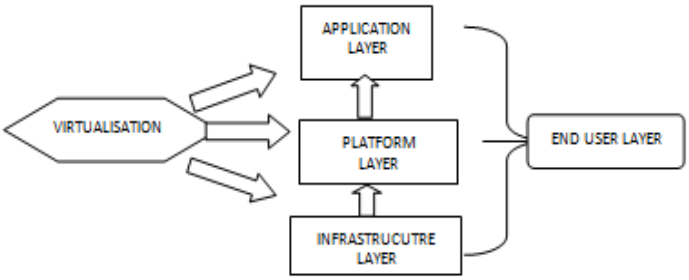

Fig.1: Distribution of cloud computing services

4. Hybrid cloud computing

Both private and public clouds are efficient and sufficient enough in their fields, but, during large scale development process and sharing agendas, there is a requirement for more specific and broad accessed sharing of information and data [10]. A hybrid cloud computing model deals with the hybridization or intermixing of private and public cloud for a more prominent and efficient working of clouds. In the simplest terms, the hybrid model is primarily a private cloud that allows an organization to tap into a public cloud as and when required for sharing of information. This model provides a more efficient means of keeping data and applications secure. However in contrast to a purely public cloud model, the hybrid cloud can provide a higher level of security for sensitive data and instances where companies are affected by industries and financial regulations. This is the most utility oriented technique and most used model in the business oriented sectors. The cloud model allows companies to adjust the amount of computing power used based on their individual fluctuation in actual usage. So for companies that have a lot of variation in their computing needs, a hybrid model makes them much quicker by using a public cloud for times where more computing capacity is needed. Generally, adding public space to a company's cloud model is a much easier proposition than growing its private cloud to meet mounting needs. In this way, a hybrid is more cost efficient in providing world –class computing power that is available anytime, anywhere without as big a budget commitment as a private cloud. There are various ways to mend a hybrid cloud. This includes selection of the required applications and other services to be interconnected with the cloud technology and redistribution and sharing of information.

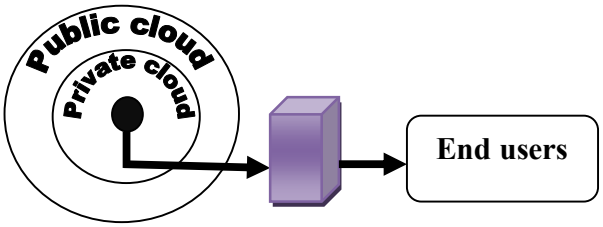

Fig .2 : Hybridization of the private and public cloud computing in one unit which provides new sharing methodology to organizations.

5. Application and Architecture:

Hybrid clouds offer the cost and scale benefits of public clouds, while also offering the security and control of private clouds. In hybrid cloud, an organization provides and manages some resources in-house and some out-house [15].

5.1 Case Study On Hybrid Cloud Providers: Vmware

Hybrid Cloud Services From Vmware And Vmware Vcloud Air Network Service Provider Partners Are Built On The Foundation Of Vmware Vsphere. Applications Can Be Written, Deployed And Managed On The Underlying Vsphere Platform That Provides Security, Reliability, And Performance Similar To The

Current Vmware Infrastructure [16].

5.2 Hybrid Cloud Use Cases

Increasing development and innovations in the cloud environment leads to work on some conditions that would improve the cloud infrastructure. Depending on the user or clients requirements the workloads can be evaluated to move to hybrid cloud [15] [17] [18].

5.2.1 Development/testing

Examples: application development and pre production testing

- To satisfy the need of the developer for an swift, dynamic environment to develop and test applications.
- To reduce the cost to test environment for reflecting its lower performance and availability requirements.
- To streamline application portability between test and production environments.

5.2.2 Extend existing applications

Examples: email, collaboration software, data analytics, and business intelligence

- For migrating packaged applications to a hybrid cloud that is compatible with specific data center, without recoding or reconfigurations.
- To delegate the hosting of packaged applications to refocus it resources on projects with higher value and more complex needs.
- To free up existing on-premises resources and staff for more value added projects.

5.2.3 Disaster recovery

Examples: secondary backup and archiving site

- To avoid the exorbitant expense of replicating the environment which is protected to another site of a core it.
- To prevent service disruption in a single-site it deployment.
- To utilize a low-cost remote storage facility over a fully synchronized active site, to be leveraged in the event of service disruption.

5.2.4 Modernize enterprise applications

Examples: traditional three-tier architecture applications such as java

- To support critical applications in a cloud environment with high levels of security, performance, availability and compliance.
- To protect sensitive data onsite and transfer non sensitive data and application tiers to hybrid cloud.
- To host virtual desktops having services that simplifies delivery of windows desktops and applications to any device, anywhere.

5.2.5 Create next-generation applications

Examples: cloud native and mobile applications based on development frameworks, such as spring and ruby on rails

- To support new cloud and e-commerce applications having different resource requirements.
- Developing mobile applications which are accessible from any device with integration to onsite back-end systems.
- Delivering applications scalable to meet demand and unpredictable spikes in traffic.

6. Advantages of hybrid cloud over public and private cloud

- The capital expense of the organization's infrastructure is reduced; all the needs are outsourced to public cloud providers [15] [17] [18].
- As the need for investment is removed, there is a reduced cost; hence resource allocation is improved.

- At different stages of the lifecycle of application the infrastructure cost is reduced. Offers both the controls available in a private cloud deployment along with the ability to rapidly scale using public cloud.
- Cloud-bursting is supported.
- Increases opportunity from the ability to leverage public clouds, hence overall organizational agility is improved.

7. Solutions for security issues in Hybrid cloud

With the increasing use of cloud, the data stored in it increases and the security, privacy and authentication of information is important. The storage of the data along with transfer of data to different platform and users is a tedious and sensitive task. If there is any data leakage occurs it may lead to catastrophic results.
Hence, given below are few methods or techniques for prevention of the data loss and leakages with data security as main motive [18]:

Technique	Description
Data Handling Mechanism	• **Confidential Data Is Classified** • **Geographical Location Of The Data Is Defined** • **Policies For Data Destruction Is Defined**
Data Security Migration	• **Personal Data Is Encrypted** • **Sensitive Data Avoided In Cloud**
Standardization	• **Standardization Should Be Maintained While Data Tracking And Handling**
Accountability	• **Data Loss, Leakage Or Privacy Violation In Business May Be Dangerous** • **Audit Needed In Each Step To Increase Trust**

8. SkyDrive v/s Google drive v/s DropBox: -

There are various applications that have been designed taking cloud computing as a platform. The widely used applications are namely SkyDrive, Google drive and Drop box. Given below is a brief comparison between these applications, so as to conclude for a more user-friendly and effective application for users.

DropBox:

- Free storage provided is 2GB.
- Extra 500 MB for suggesting people to Drop box.
- Maximum space can be 20GB.
- Used in windows, Mac OS, android, blackberry, Linux and iOS.
- Packages of 100GB at app. Rs 500, 200GB at Rs. 1000 and 500GB at Rs. 2500 monthly.
- Annual package saves 17% of money.
- Supports Microsoft Office files, Apple Work files, audio/video files, images, and PDF files
- Groups can be formed ranging from 5 to 50 members.
- Flexible centralized management.

Google drive:

- Free space of 5GB.
- Readily available along with Gmail account.
- Used in windows, Mac OS, iOS and Android.

- Supports Adobe Illustrator (.AI) and Photoshop (.PSD) files, Autodesk AutoCAD files and Scalable Vector Graphics files
- Additional space ranging from 25GB to 16TB.
- Packages of 25GB at app. Rs. 125, 100GB at Rs. 250, 200GB at Rs. 500, 400GB at Rs. 1000, 1TB at Rs. 2500, 2TB at Rs. 5000, 4TB at Rs. 10000, 8TB at Rs. 20000 and 16TB at Rs. 40000.

SkyDrive:

- Cheapest of all services.
- Free storage of 7GB.
- Used in windows, Mac OS, iOS and Android.
- Supports music and video files like .MP4, .WMV and PowerPoint files.
- Additional packages available for 50GB, 100GB and 200GB.
- High speed compared to others.
- More user-friendly, attracts wide range of users.

From the above mentioned features and packages, SkyDrive seems to be a more widely used and cost effective option for general public whereas; drop box is most suitable for business or industrial purposes. Sky drive has various features that can be used conveniently on a day to day basis with high speed technology. Hence, we go for a wide description about SkyDrive keeping into mind the usability on a vast scenario.

9. SkyDrive: -

Sky drive is Microsoft software officially known as Microsoft SkyDrive. It was earlier known as Windows Live SkyDrive and Windows Live Folders. It is basically a file hosting service that allows users to upload and synchronize files to cloud storage and then access them from a web browser or their local device. It is a part of the Windows Live range of online services and allows users to keep the files private, share them with contacts, or make the files public. Publicly shared files do not require a Microsoft account to access. Microsoft added a new facility on the SkyDrive technology of accessing photos and videos publicly shared on the cloud. The major advantage of the SkyDrive service is its storage capacity. It offers 7GB of free storage for new users and, for one year, an additional 3GB of free storage to students. This service can easily be downloaded from any outsource free of cost. Moreover, Microsoft provides various other services associated with the SkyDrive which can be downloaded by spending limited amount.

STORAGE PLAN	DESCRIPTION
SkyDrive +50	**Adds 50GB to free storage amount**
SkyDrive +100	**Adds 100GB to free storage amount**
SkyDrive +200	**Adds 200GB to free storage amount**

Fig.3 : SkyDrive storage plans

10. Adoption of cloud computing in various sectors and data analysis:-

❖ Asian countries

Cloud computing has proven to be a vast technological advancement in various industrial sectors [2]. But still there are various sectors which have left cloud computing untouched maybe due to the various technicalities associated with its usage. Given below is the statistics about the cloud computing and its usage in IT sectors.

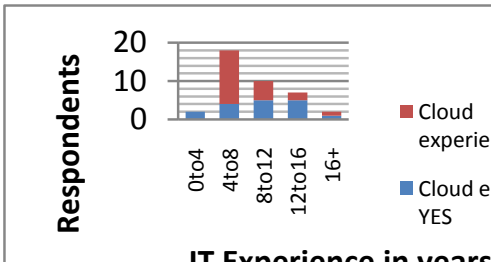

Fig.4 : A graph on the experience of IT professional on cloud computing

According to the data we can see that, there are various respondents who are gaining knowledge and exposure to cloud computing with their increasing experience in IT sectors. But the graph is abruptly decreasing at various places. This may be due to the extensive development in the cloud computing that the adoption took a bit of time along with its understanding.

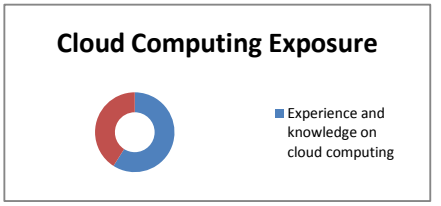

Fig.5: A pie chart on the cloud computing exposure of IT professionals

The pie chart shows the variation between the IT professionals having wide knowledge and experience about cloud computing and those who are still new in this sector. The majority of respondents are located in western countries and the remaining 20% are from India. All respondents have international IT working experience of them had previously worked with clients in diverse manufacturing industries and service sectors. The bar chart indicates that the vast majority of the respondents have more than 4 years of IT industrial experience [4]. A significant percentage of people have practical experience in cloud computing. Moreover, the pie chart indicates that the respondents, who do not have practical cloud experience, still have good knowledge about cloud computing or at least understand the basic concepts of this advanced IT model.

❖ **Western counties**

Apart from the widespread technological developments in western countries, cloud computing has also risen up to a vast dimension including its broad usage in companies, schools and other government sectors [3].

	Companies		
	Large companies	Mid-sized companie	Small companies
2011	37%	21%	21%
2012	44%	40%	42%
Inc.	+7%	+19%	+21%
	Governments		Medical Institutions
2011	Federal government	Regional governmen	
2012	29%	23%	30%
Inc.	42%	27%	35%
	+13%	+4%	+5%

Fig.6: Statistical data of the growth of cloud computing from 2011 to 2012 in western countries.

This survey data represents the percentage of adoption of cloud computing in western countries. Among companies, small companies have adopted cloud computing the most. Among schools, elementary, middle and high schools have adopted cloud computing the most. Among government, federal government has adopted cloud computing the most. When the companies, schools, government and medical institutions are compared it is found that companies and other organizations have adopted cloud computing to a large extent. Cloud computing is adopted the least in medical institutions. This may be due to various reasons such as service reliability, data security, system users and other financial issues.

11. Cloud computing in large enterprises in India :-

Cloud computing is witnessing robust adoption across the world.

- **Personal use**

  Apart from the extensive use of cloud computing in organizations, it is seen that this technology is also widely used in personal levels of the executives.

  - 73% IT professional say that personal use of cloud computing in mobile and other apps in this manner influences the decision of other organizations to adopt cloud computing [13].
  - 61% of cloud users agree that employee use of cloud apps/mobile devices is making their organization move faster to the cloud.
  - 68% say that employees' requests for cloud services have increased over the last two years.
  - 27% say that operating units are buying cloud services without involving IT.
  - 66% of IT professionals say their personal use of cloud has influenced their recommendations to their organizations about moving to the cloud

12. Growing trend of cloud adoption:-

Since the invention to the implementation, there has been a constant growth in cloud development and management.

IT companies and other organizations are taking various steps to increase cloud computing techniques [12] [13] [14].

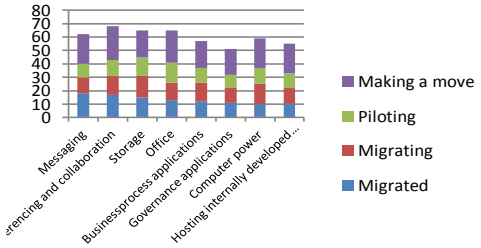

Fig.7: Graph of growth, and changes encountered in various sectors of cloud computing.

13. Statistical data of cloud adoption in Indian organizations

Most of the IT related organizations are situated in India, hence cloud computing was highly adopted in Indian organizations. There has been a significant increase in the percentage of companies using cloud computing in 2011 to those in 2012 [12] [13] [14].

	Large business	Higher education	Small business	Medium business	Healthcare	State and local government
Percentage of organizations implementing or maintaining cloud computing 2012:	44%	43%	42%	40%	35%	27%
Percentage of organizations implementing or maintaining cloud computing 2011:	37%	34%	21%	21%	30%	23%

Fig.8: Statistical data of growth of cloud computing in Indian sectors.

14. Further discussions and implications:

According to the EC study –"Advances in cloud Expert Group Report- Future Cloud Computing", the future IT infrastructure is growing extremely in size and heterogeneity. An increasing number of users make use of online services of all kinds and more and more applications exploit the benefits of data and code outsourcing for improved maintenance and availability [2].

The results of this study have important practical and research implications. Beginners in IT sectors as well as IT professionals can use the data provided as well as the technical information to make a check on the minute details or refreshing the basic knowledge to a greater depth. The findings of this study also provide useful and valuable insights to support CEO's, and in-house IT managers in the process of strategic planning and decision making towards successful cloud computing adoption and usage. In research terms, this study is simply enhancing the previous studies by providing a crisp and overall detailed overview of cloud computing to its adoption and usage in various IT sectors and other organizations throughout the world. This research also contributes to the existing knowledge of cloud computing.

To promptly solve the problems and prevent recurrences, it is necessary to build a collaborative system between cloud computing and customer firms.

15. Conclusion

In recent years cloud computing has become a vibrant and rapidly expanding area of research and development. Cloud computing services can provide IT functionality to small and large organizations alike. Through the research, it has been seen that the SaaS has been proved to be most efficient in terms of sustainability, data assurance and financial services due to the flexibility provided with the Software as a service. These days Google Apps and Zoho Office are most wide spread among various cloud services.

In the research data provided in the paper, it can be seen that the Indian organizations, especially the large IT sectors have most efficiently adopted cloud computing, therefore improving and developing the services for further use to other industries also.

In this article, we started by introduction of cloud computing, types, adoption in various sectors of organizations, including Asian and Western countries and the growth of cloud computing since 2011.
Along with the current research efforts, we encourage more insight and development of innovative solutions to address the various open research issues that we have identified in this work.

16. Future work

This research will be continued further by implementation of hybrid cloud in the educational sector. Initially, a public and a public cloud would be developed for each institution; then the project would be collaborated

with an international organization that is working for the educational sector and improving the system of education throughout the globe. There would be a hybrid cloud which would be formed from merging the public cloud of all the Indian educational institutions and some part of their private cloud. This cloud would be given to the international organization, where the hybrid cloud would be analyzed upon looking for the loopholes in the educational system, suggesting more number of innovative courses to the Indian education, and sharing of the study materials, new emerging fields and areas of research. This would be a stepping stone to achieve uniformity in the educational system throughout the globe with better facilitated research and knowledge transfer. The students moving from one country to other for higher education will not face any kind of discrepancy in their studies.

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