

A Report
on
Cloud Computing for Rural Banking

*Submitted in partial fulfillment of the
requirement for the award of the degree of*

Bachelor of Computer Applications



(Established under Galgotias University Uttar Pradesh Act No. 14 of 2011)

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CANDIDATE'S DECLARATION

We hereby certify that the work which is being presented in the project, entitled “**Cloud Computing for Rural Banking**” in partial fulfillment of the requirements for the award of the **Bachelor of Technology (B.Tech)** submitted in the School of Computing Science and Engineering of Galgotias University, Greater Noida, is an original work carried out during the period of 4 months, 2021 to December and 2021, under the supervision of **Mr. S.P. Ramesh** , Department of Computer Science and Engineering/Computer Application and Information and Science, of School of Computing Science and Engineering , Galgotias University, Greater Noida .

The matter presented in the project has not been submitted by me/us for the award of any other degree of this or any other places.

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This is to certify that the above statement made by the candidates is correct to the best of my knowledge.

Mr. S.P. Ramesh
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CERTIFICATE

The Project Viva-Voce examination of Sahil Singh(19SCSE1010080), Vaibhav Kumar Singh(19SCSE1010512) has been held on_____and his/her work is recommended for the award of **Bachelor of Technology (B.Tech)**

Signature of Examiner(s)

Signature of Supervisor(s)

Signature of Project Coordinator

Signature of Dean

Date: November, 2013

Place: Greater Noida

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ABSTRACT

The Rural Banking introduced in villages to give good and better services to the people for the development of their agriculture sector or to help for their small-scale business. The banking sector in India has witnessed a complete transformation both in its functioning and delivery of services to their customers. The banking services in rural areas helps in developing economic factor that changed the profile of the village and the life of its residents. The rural banking plays a major role in the economic development of a country cannot be overlooked. The main goal is based on Cloud computing to help rural banking. Today technology being the main driving force for businesses has made banking customers to sit back at home and run their accounts without walking into the banks for anything and everything. As the advancement of technology has taken place with immense use of internet, mobile phones and online bill payments banking sector in India has a new facet altogether. The cloud computing is one of the developing technology which is being use by all industrial domain in the IT field. In this paper, I proposed the concept of using cloud computing to develop a banking system for rural areas. The cloud plays a key role in the bank's efforts to transform its business and operating model. From a technical viewpoint, the cloud automatically assembles, integrates and configures technology resources to meet business goals. In business terms, it eliminates the need for a physical infrastructure to be present at each location from where the bank operates, thus making it easier for the bank to deploy services rapidly and at a lesser cost. It considers various factors such as lack of devices and amenities in rural areas and provides efficient functionality to fulfil those gaps. It uses the latest variations of cloud computing technology for filling in the various technological gaps in village areas. The new technologies had made banks to offer new services and products to its customers, which would help improve economic activities.

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Acronyms

| | |
|--------|--|
| B.Tech | Bachelor of Technology |
| SCSE | School of Computer Science Engineering |
| CS | Computer Science |
| | |
| | |
| | |

CHAPTER-1

Introduction

Joseph Carl Robnett Licklider in the 1960s developed Cloud Computing through his work on ARPSNET to communicate with people and data from any place at any time. In 1983, CompuServe presented its users as a minimum amount of disk space which can be used to collect any files they see select upload Simply put, what is Cloud working outcomputer resources distribution - including servers, database, networking, storage, software, analytics and smart-internet (“cloud”) to provide rapid change, flexible resources, and economics of scale. Cloud delivery computer resources such as servers, storage, website, networks, software, statistics, intelligence, and moreover, over the clouds (Inernet). Cloud Computing provides alternatives to the local data center.

Cloud computing is an emerging new computing paradigm for turning in computing offerings. It represents a shift away from computing as a product this is bought, to computing as a carrier this is delivered to purchasers from the cloud. The definition of cloud computing provided with the aid of The national Institute of standards and technology (NIST)[1], because it covers, in our opinion, all the vital aspects of cloud computing: Cloud computing is a version for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g. networks, servers, garage, applications and offerings) that may be speedily provisioned and launched with minimal management attempt or provider provider interaction. The idea of cloud computing become collectively proposed by means of Google and IBM in 2007.

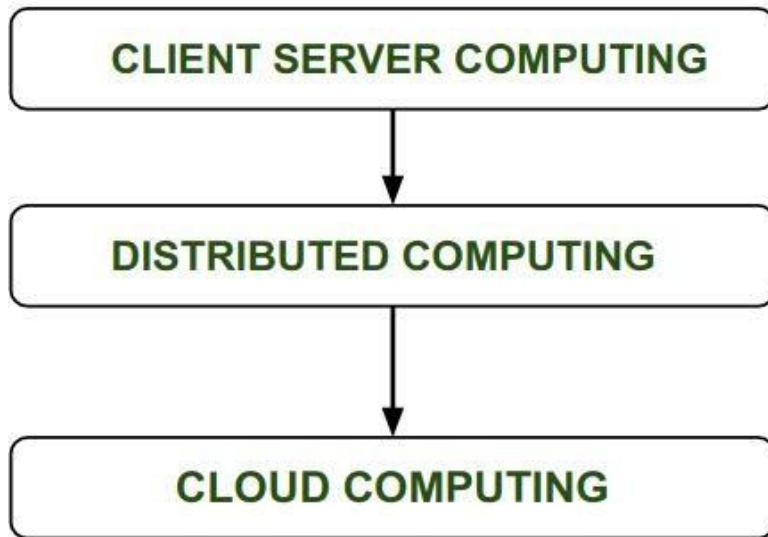
In only phrases, cloud computing approach storing and accessing the information and packages on remote servers which are hosted on net instead of laptop’s difficult pressure or neighborhood server. Cloud computing is also referred as internet based computing.

In Simplest terms, cloud computing means storing and accessing the data and programs on remote servers that are hosted on internet instead of computer’s hard drive or local server. Cloud computing is also referred as Internet based computing.

Cloud Computing :

Cloud Computing referred as the accessing and storing of data and provide services related to computing over the internet. It simply referred as it remote services on the internet manage and access data online rather than any local drives. The data can be anything like images, videos, audios, documents, files etc.

History of Cloud Computing :In this, we will discuss the history of Cloud computing. And also cover the history of client server computing, distributed computing, and cloud computing. Before Computing was come into existence, client Server Architecture was used where all the data and control of client resides in Server side. If a single user want to access some data, firstly user need to connect to the server and after that user will get appropriate access. But it has many disadvantages. So, After Client Server computing, Distributed Computing was come into existence, in this type of computing all computers are networked together with the help of this, user can share their resources when needed. It also has certain limitations. So in order to remove limitations faced in distributed system, cloud computing was emerged.



During 1961, John MacCharty delivered his speech at MIT that “Computing Can be sold as a Utility, like Water and Electricity.” According to John MacCharty it was a brilliant idea. But people at that time don’t want to adopt this technology. They thought the technology they are using efficient enough for them. So, this concept of computing was not appreciated much so and very less will research on it. But as the time fleet the technology caught the idea after few years this idea is implemented. So, this is implemented by Salesforce.com in 1999.

This company started delivering an enterprise application over the internet and this way the boom of Cloud Computing was started.

In 2002, Amazon started Amazon Web Services (AWS), Amazon will provide storage, computation over the internet. In 2006 Amazon will launch Elastic Compute Cloud Commercial Service which is open for Everybody to use.

After that in 2009, Google Play also started providing Cloud Computing Enterprise Application as other companies will see the emergence of cloud Computing they also started providing their cloud services. Thus, in 2009, Microsoft launch Microsoft Azure and after that other companies like Alibaba, IBM, Oracle, HP also introduces their Cloud Services. In today the Cloud Computing become very popular and important skill.

Deployment models of cloud:

The cloud deployment version identifies the precise form of cloud surroundings primarily based on ownership, scale, and get entry to, as well as the cloud’s nature and reason. The place of the servers you’re making use of and who controls them are described by means of a cloud deployment

version. It specifies how your cloud infrastructure will appearance, what you may trade, and whether you may be given services or will need to create the whole lot your self. Relationships between the infrastructure and your customers are also defined through cloud deployment sorts.

Cloud computing is Internet-based computing in which a shared pool of resources is available over broad network access, these resources can be provisioned or released with minimum management efforts and service provider interaction.

Types of Cloud:

Public cloud

Private cloud

Hybrid cloud

Community cloud

PUBLIC CLOUD

The public cloud makes it viable for anyone to get admission to structures and services. the general public cloud may be much less relaxed as it's miles open for everyone. the public cloud is one wherein cloud infrastructure offerings are provided over the internet to the overall people or essential enterprise companies. The infrastructure on this cloud model is owned through the entity that promises the cloud services, not by way of the patron. it's far a kind of cloud website hosting that lets in customers and customers to without problems access systems and services.

PRIVATE CLOUD

The personal cloud deployment model is the complete opposite of the general public cloud deployment version. It's a one-on-one surroundings for a single user (customer). there may be no need to percentage your hardware with anyone else. The distinction among non-public and public cloud is in the way you take care of all the hardware. it's also known as the "inner cloud" & it refers back to the potential to get entry to systems and offerings within a given border or corporation. The cloud platform is carried out in a cloud-based cozy surroundings that is blanketed via powerful firewalls and beneath the supervision of an corporation's IT department.

HYBRID CLOUD

By way of bridging the public and private worlds with a layer of proprietary software, hybrid cloud computing gives the exceptional of both worlds. With a hybrid answer, you can host the app in a secure surroundings at the same time as taking benefit of the public cloud's price savings. agencies can move records and applications between one-of-a-kind clouds the use of a mixture of or extra cloud deployment strategies, relying on their desires.

COMMUNITY CLOUD

It permits systems and offerings to be available via a set of businesses. it's far a distributed device that is created via integrating the services of different clouds to cope with the precise needs of a community, enterprise, or business. The infrastructure of the network may be shared between the corporation which has shared issues or duties. it's miles typically managed by means of a third party or by way of the mixture of 1 or more agencies inside the community.

Public Cloud

Cloud Computing infrastructure shared to public by service provider over the internet. It supports multiple customers i.e, enterprises.

Multi-Tenancy i.e, Data of many enterprise are stored in shared environment but are isolated. Data is shared as per rule, permission and security.

Cloud service provider provides all the possible services and hardware as the user-base is world. Different people and organization may need different services and hardware. Services provided must be versatile.

It is hosted at Service Provider site.

It is connected to the public internet.

Scalability is very high, and reliability is moderate.

Cloud service provider manages cloud and customers use them.

It is cheaper than private cloud.

Security matters and dependent on service provider.

Performance is low to medium.

Private Cloud

Cloud Computing infrastructure shared to private organisation by service provider over the internet. It supports one enterprise.

Single Tenancy i.e, Data of single enterprise is stored.

Specific hardware and hardware as per need of enterprise are available in private cloud.

It is hosted at Service Provider site or enterprise.

It only supports connectivity over the private network.

Scalability is limited, and reliability is very high.

Managed and used by single enterprise.

It is costlier than public cloud.

It gives high class of security.

Performance is high.

Public Cloud

It has shared servers.

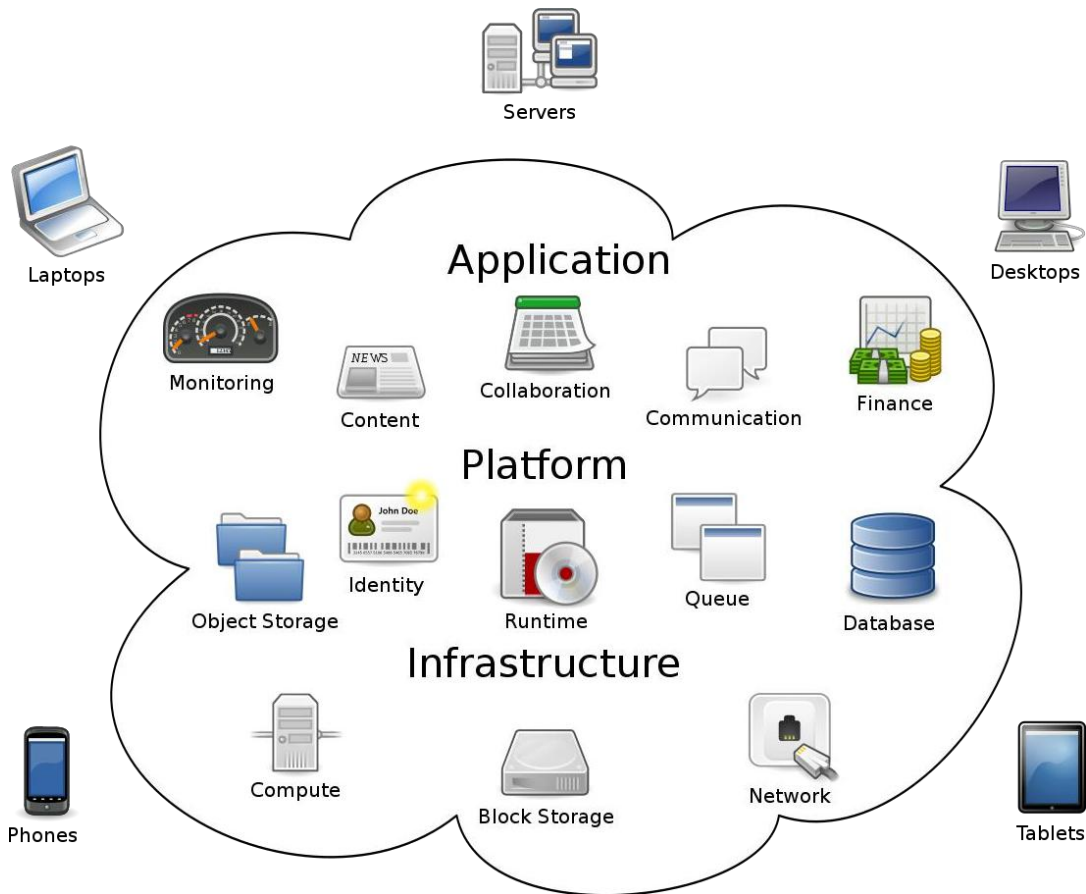
Example : Amazon web service (AWS) and Google AppEngine etc.

Private Cloud

It has dedicated servers.

Example : Microsoft KVM, HP, Red Hat & VMWare etc.

CLOUD BASED SERVICES



Software as a service (SaaS)

Software-as-a-service (SaaS) is a manner of handing over offerings and applications over the internet. Instead of putting in and retaining software, we in reality get admission to it via the net, releasing ourselves from the complicated software program and hardware control. It gets rid of the need to put in and run programs on our very own computer systems or in the information facilities putting off the fees of hardware as well as software program renovation.

Platform as a service (PaaS)

PaaS is a class of cloud computing that offers a platform and environment to permit developers to construct applications and services over the net. PaaS services are hosted inside the cloud and accessed by customers simply through their net browser.

A PaaS provider hosts the hardware and software on its own infrastructure. As a end result, PaaS frees users from having to install in-house hardware and software to develop or run a brand new application. thus, the improvement and deployment of the application take vicinity unbiased of the hardware.

Infrastructure as a service (IaaS)

Infrastructure as a carrier (IaaS) is a service version that delivers pc infrastructure on an outsourced foundation to assist numerous operations. normally IaaS is a carrier where infrastructure is supplied as an outsource to businesses which include networking gadget, devices, database, and internet servers.

it is also referred to as hardware as a provider (HaaS). IaaS clients pay on a in keeping with-consumer foundation, normally through the hour, week, or month. a few vendors also price clients based on the amount of digital gadget space they use.

It simply gives the underlying running structures, security, networking, and servers for developing such applications, offerings, and for deploying development gear, databases, and so on.

Difference between IAAS, PAAS and SAAS :

| Basis Of | IAAS | PAAS | SAAS |
|----------------------------|--|--|--|
| Stands for | Infrastructure as a services. | Platform as a services. | Software as a services. |
| Uses | IAAS is used by network architects. | PAAS is used by developer. | SAAS is used by end user. |
| Access | IAAS give access to the resources like virtual machines and virtual storage. | PAAS give access to run time environment to deployment and development tools for application. | SAAS give access to the end user. |
| Model | It is service model that provide visualized computing resources over internet. | It is a cloud computing model that delivers tools that is used for development of application. | It is a service model in cloud computing that host software make available for client. |
| Technical understanding. | It required technical knowledge. | In which you required knowledge of subject to understand basic setup. | There is no requirement about technicalities to company handle everything. |
| Popularity. | It is popular between developer and researchers. | It popular between developer who focus on the development of apps and scripts. | It is popular between consumer and company.such as file sharing, email and networking. |
| Cloud services. | Amazon web services, sun, vcloud express. | Facebook, and google search engine. | M.S office web, Facebook and google apps. |
| Enterprise services. | AWS virtual private cloud. | Microsoft azure. | IBM cloud analysis. |
| Outsourced cloud services. | Salesforced. | Force.com, Gigaspaces. | AWS, terremark |

Benefits of cloud computing

Cost Saving

After you're on the cloud, clean access in your company's statistics will keep money and time in task startups. And, for folks that are involved that they will grow to be paying for capabilities that they neither want nor need, maximum cloud-computing offerings are pay as you pass. The pay-as-you-pass device also applies to the facts storage area needed to provider your stakeholders and customers, which means that you will get exactly as a good deal area as you need, and now not be charged for any area which you don't

Security

Many organizations have protection worries on the subject of adopting a cloud-computing solution. after all, while files, programs, and other information aren't stored securely onsite, how can you realize that they are being covered? If you can remotely access your facts, then what is preventing a cybercriminal from doing the identical element? well, quite a piece, sincerely.

Flexibility

Your business has simplest a finite amount of focus to divide among all of its duties. in case your cutting- edge IT answers are forcing you to commit too much of your interest to computer and statistics-garage troubles, then you definately aren't going so as to deal with attaining enterprise dreams and satisfying customers. then again, through counting on an outside employer to attend to all IT hosting and infrastructure, you may have extra time to dedicate closer to the components of your business that at once have an effect on your bottom line.

Mobility

Cloud computing allows cellular get admission to to company records via smartphones and devices, which, thinking about over 2.6 billion smartphones are being used globally today, is a fantastic way to ensure that no person is ever ignored of the loop. workforce with busy schedules, or who live an extended way faraway from the corporate office, can use this option to preserve immediately up to date with customers and co- employee.

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Increased collaboration

In case your enterprise has personnel or extra, then you definitely ought to be making collaboration a pinnacle precedence. in any case, there isn't always tons point to having a team if it's miles unable to paintings like a team. Cloud computing makes collaboration a simple method. team participants can view and percentage information effortlessly and securely across a cloud-based platform. a few cloud-based offerings even offer collaborative social areas to connect personnel throughout your enterprise, consequently growing hobby and engagement.

Disaster recovery

One of the elements that contributes to the fulfillment of a commercial enterprise is manage. alas, irrespective of how in control your agency may be when it comes to its own approaches, there'll constantly be things which are completely from your control, and in ultra-modern market, even a small amount of unproductive downtime will have a resoundingly negative effect. Downtime in your offerings leads to misplaced productivity, sales, and brand popularity.

Automatic software updates

For the ones who have plenty to get achieved, there isn't always something extra nerve-racking than having to watch for gadget updates to be set up. Cloud-primarily based programs routinely refresh and replace themselves, in place of forcing an IT department to carry out a manual corporation huge replace. this saves treasured IT group of workers time and money spent on outdoor IT session.

CHALLENGES OF CLOUD COMPUTING



Security and Privacy

Protection and privacy of facts is the largest task to cloud computing. safety and privateness troubles may be triumph over by using encryption, protection hardware and safety programs.

Portability

This is another project to cloud computing that packages need to easily be migrated from one cloud company to any other. There must not be dealer lock-in. however, it isn't always but made feasible due to the fact every of the cloud provider makes use of exceptional trendy languages for their platforms.

Interoperability

It way the software on one platform should be able to contain services from the opposite systems. it's far made feasible thru web services, however growing such web offerings could be very complicated.

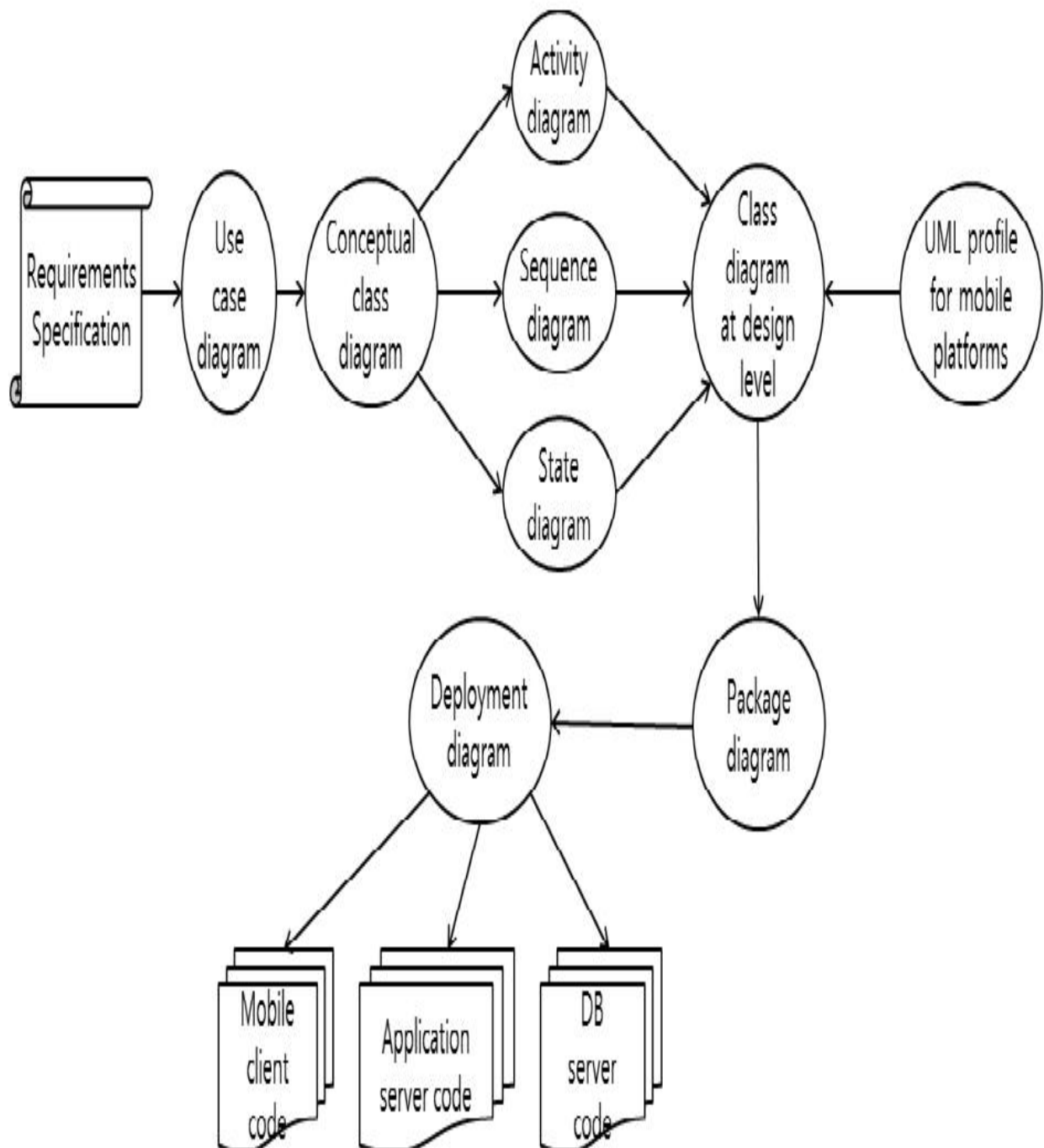
Computing Performance

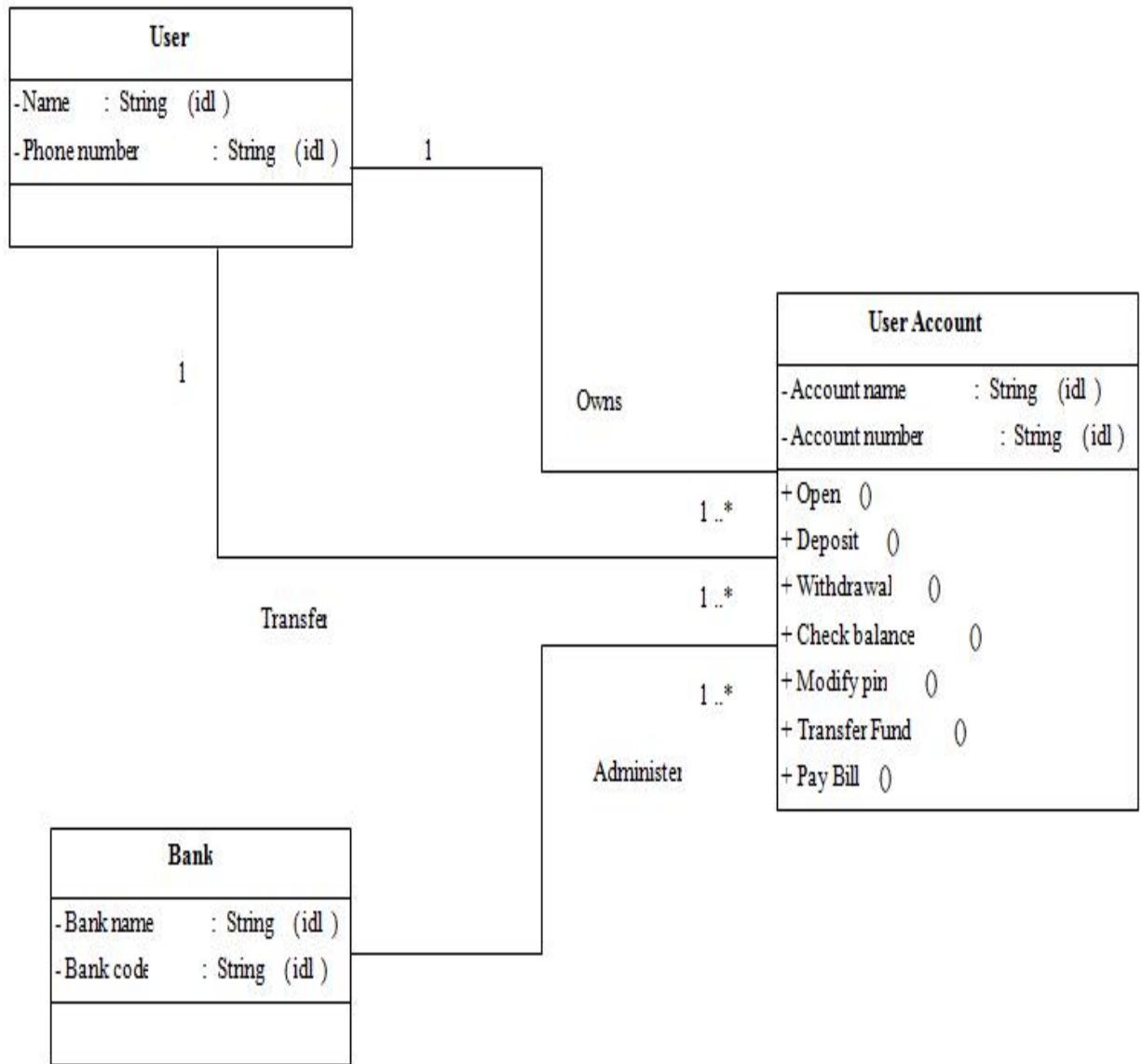
Statistics intensive packages on cloud calls for high network bandwidth, which ends up in high value. Low bandwidth does no longer meet the desired computing performance of cloud utility.

Reliability and Availability

It is necessary for cloud systems to be reliable and robust because most of the businesses are now becoming dependent on services provided by third-party.

UML DIAGRAM FOR CLOUD COMPUTING





Motivation towards Cloud in recent time

Cloud computing is not a new idea but it is an evolution of some old paradigm of distributed computing. The advent of the enthusiasm about cloud computing in recent past is due to some recent technology trend and business models [5].

7 Cloud Computing

1. High demand of interactive applications – Applications with real time response and with capability of providing information either by other users or by nonhuman sensors gaining more and more popularity today. These are generally attracted to cloud not only because of high availability but also because these services are generally data intensive and require analyzing data across different sources.
2. Parallel batch processing – Cloud inherently supports batch-processing and analyzing tera-bytes of data very efficiently. Programming models like Google’s map-reduce [18] and Yahoo!’s open source counterpart Hadoop can be used to do these hiding operational complexity of parallel processing of hundreds of cloud computing servers.
3. New trend in business world and scientific community – In recent times the business enterprises are interested in discovering customers needs, buying patterns, supply chains to take top management decisions. These require analysis of very large amount of online data. This can be done with the help of cloud very easily. Yahoo! Homepage is a very good example of such thing. In the homepage they show the hottest news in the country. And according to the users’ interest they change the ads and other sections in the page. Other than these many scientific experiments need very time consuming data processing jobs like LHC (Large Hadron Collider). Those can be done by cloud.
4. Extensive desktop application – Some desktop applications like Matlab, Mathematica are becoming so compute intensive that a single desktop machine is no longer enough to run them. So they are developed to be capable of using cloud computing to perform extensive evaluations.

4.1 Comparison between Cloud Computing and Grid Computing

Most of the cloud architectures are built on Grid architecture and utilizes its service. Grid is also a form of distributed computing architecture where organizations owning data centers collaborate with each other to have mutual benefit. Although if apparently seen it seems that cloud computing is no different from its originator in the first look but there are substantial difference between them in spite of so many similarities [12]. The relation between Grid and cloud computing

4.2 Relation between Cloud Computing and Utility Computing

The cloud users enjoy utility computing model for interacting with cloud service providers. This Utility computing is essentially not same as cloud computing. Utility computing is the aggregation of computing resources, such as computation and storage, as a metered service similar to a traditional public utility like electricity, water or telephone network. This service might be provided by a dedicated computer cluster specifically built for the purpose of being rented out, or even an under-utilized supercomputer. And cloud is one of such option of providing utility computing to the users.

4.3 Types of utility cloud services

Utility computing services provided by the cloud provider can be classified by the type of the services.

These services are typically represented as XaaS where we 10 Cloud Computing Table 1: Comparison between Grid & Cloud computing Characteristics Grid Computing Cloud Computing Business Model Adopts project oriented business model. The participating parties agree to share a certain amount of resource with others and gain the opportunity of using all other grids' resources. Uses Pay-as-you-go model. Resource Management Schedules dedicated resources by a queuing service. Until all the resources are available as specified by the LRM (Local Resource Manager) the job waits in the queue. Thus interactive and latency intensive applications are not executed efficiently in grid. Share all resources simultaneously to all the users at the same time. This allows latency intensive and interactive applications run naively in cloud. Virtualization No virtualization, as the data centers are handled by the individual organizations of their own. So they generally manage those usually physically but not by virtualization. Although there are some efforts being given by some companies like Nimbus for virtualization to make dynamic deployment and abstraction available. For cloud computing one of the essential components is virtualization. This is for providing abstraction and encapsulation to the users of the cloud. Application model Executing tasks may be small or large, loosely coupled or tightly coupled, compute intensive or data intensive. Supports only loosely coupled and transaction oriented, mostly interactive jobs. Security model Grids build on the assumption that resources are heterogeneous and dynamic. Thus security is engineered in fundamental grid infrastructure. Cloud security is now in its infancy.

Chapter 2

Literature Survey

Literature survey

The prevailing device uses client/server utility patron/server is a program dating in which the client requests a service or useful resource from the server. it's far a dispensed application surroundings that distributes responsibilities or workloads between the vendors of a aid or carrier, known as servers, and provider requests, referred to as clients. The customer establishes a connection to the server over a local location network or wide-place network, consisting of the internet. A server device is a bunch this is jogging one or greater server programs which percentage their sources with clients. A consumer does not percentage any of its sources, however requests a server's for a records. customers consequently initiate communicate classes with servers which wait for incoming requests. an automatic Teller gadget is basically a customer-server machine. The financial institution's significant computer is the server, and maintains records approximately the debts of all of the customers. The ATM is the consumer. whilst you take a look at your bank account from your computer, client program in your computer forwards a request to a server software at the bank. That program may additionally in turn ahead a request to its personal consumer application, which then sends a request to a database server at another financial institution computer. as soon as your account stability have been retrieved from the database, it's far returned lower back to the bank information purchaser, which in flip serves it back to the patron to your personal displays the statistics to you. The server ought to manage three instructions Withdrawal: subtract an amount from the account (and return the new stability) question: go back the account balance to the customer be a easy iterative server that is it handles handiest one related patron at a time. The customer ought to connect to the server whilst it is started allow the consumer to carry out any of those capabilities and consequently disconnect from the server.

Proposed System

The cloud performs a key function inside the bank's efforts to transform its commercial enterprise and operating version. From a technical viewpoint, the cloud routinely assembles, integrates and configures era resources to satisfy commercial enterprise goals. In enterprise phrases, it gets rid of the need for a bodily infrastructure to be gift at every area from where the bank operates, for this reason making it easier for the bank to deploy services unexpectedly and at a lesser price. due to its more advantageous computing power and potential, the cloud can store data and actual time records about purchaser preferences that can help a bank in product and/or carrier customization. the use of this saved records, the banks can customise client interactions and provide their customers a completely unique experience.

The cloud also can assist banks to streamline operations. by way of aligning commercial enterprise, operations and generation, it enables banks to drive higher growth and earnings margins and expanded flexibility. The cloud additionally allows banks to scale up IT sources on-demand for expanding its enterprise operations. Banks also can reply to patron and market needs much faster and hastily modify techniques, products and services to in shape the converting desires. This creates an environment of innovation, aggressive differentiation and also speeds up time to market.

Banks are imparting internet banking and shifting the charge characteristic to the cloud, surely because of the exceptional promise of price financial savings, efficiency and reliability. with the aid of

Identify applicable funding agency here. If none, delete this text box.

Transferring the charge characteristic to cloud, banks can fend off the hazard of disintermediation from Telco's and different cellular price provider providers. bills are a huge source of sales for the banks and banks will not permit it move off that easily. moving bills to the cloud no longer simplest eases the pressures at the financial institution from the point of view of handling a wholly IT setup for this however also blessings their customers.

Popular Cloud Applications: A Case study

A Case study Applications using cloud computing are gaining popularity day by day for their high availability, reliability and utility service model. Today many cloud providers are in the IT market. Of those Google App-Engine, Windows Azure and Amazon EC2, S3 are prominent ones for their popularity and technical perspective.

Amazon EC2 and S3 Services Amazon Elastic Computing (EC2)

is one of the biggest organizations to provide Infrastructure as a Service. They provide the computer architecture with XEN virtual machine. Amazon EC2 is one of the biggest deployment of XEN architecture to date. The clients can install their suitable operating system on the virtual machine. EC2 uses Simple Storage Service (S3) for storage of data. Users can hire suitable amount CPU power, storage, and memory without any upfront commitment. Users can control the entire software stack from kernel upwards. The 13 Cloud Computing architecture has two components one is the EC2 for computing purposes and S3 is for storage purposes [14].

Simple Storage Service:

S3 can be thought as a globally available distributed hash table with high-level access control. Data is stored in name/value pairs. Names are like UNIX file names and the value can be object having size up-to 5 GB with up-to 4K of metadata for each object. All objects in Amazon's S3 must fit into the global namespace. This namespace consists of a "bucket name" and an "object name". Bucket names are like user names in traditional email account and provided by Amazon on first come first serve basis. An AWS (Amazon Web Services) account can have maximum of 100 buckets. Data to S3 can be sent by SOAP based API or with raw HTTP "PUT" commands. Data can be retrieved using SOAP HTTP or BitTorrent. While using BitTorrent the S3 system operates as both tracker and the initial seeder. There are also some tools available which enables the users to view S3 as a remote file system. Upload download rate from and to S3 is not that much exiting. One developer from Germany reported experiencing 10-100 KBps. This rate can go up-to 1-2 MBps on the higher side depending on the time of the day. Although the speed is not that much fascinating it is good enough for delivering web objects and for backup purposes although for doing computation it is not suitable. Amazon S3 has a very impressive support for privacy, integrity and short term availability. Long term availability is unknown as this depends on the internal commitment of Amazon data centers. Data privacy can be obtained by encrypting the data to be stored. But this encryption is to be done by the user before storing the data in S3. One can use SSL with HTTPS to connect to S3 for more security but this usage of SSL increases upload/download time also. Data integrity can be achieved by checking end to end MD5 checking. When an object is stored into S3 then it returns MD5 of that object. One can easily

check it with previously computed hash value to guarantee data integrity. Short term availability depends upon the Amazon's connectivity and load on its server at that instant. Once the data is actually in the S3 then it is Amazon's responsibility to take care of its availability. They claim that the data is backed up on multiple hard drives in multiple data centers but doesn't guarantee this by any Service Level Agreement. There is no backup or recovery mechanism if the user accidentally deletes any data. Amazon has a very impressive scheme of authentication in comparison to other cloud services. Every AWS account has an Access Key ID and a Secret Key. Cloud Computing The ID is of 20 characters and the Key is a character string. When signing HMAC is first computed for the sign request parameters using that Key. And in the Amazon server that HMAC is again computed and compared with the value previously computed in the client side. These requests also include timestamp to prevent replay attacks. • Elastic Compute Cloud: As the name implies EC2 rents cloud of computers to the users with flexibility of choosing the configuration of the virtual machine like RAM size, local disk size, processor speeds etc. Machines that deliver EC2 services are actually virtual machines running on top of XEN platform. Users can store a disk image inside S3 and create a virtual machine in EC2 using tools provided by Amazon. This virtual machine can be easily instantiated using a java program and can also be monitored. As EC2 is based on XEN it supports any linux distribution as well as other OSs. Amazon does not promise about reliability of the EC2 computers. Any machine can crash at any moment and they are not backed up. Although these machine generally don't crash according to the experience of the users but it is safe to use S3 to store information which is more reliable and replicated service. EC2 security model is similar to that of S3. The only difference is that the commands are signed with an X 509 private key. But this key is downloaded from AWS account so the security depends fundamentally on the AWS username and password.

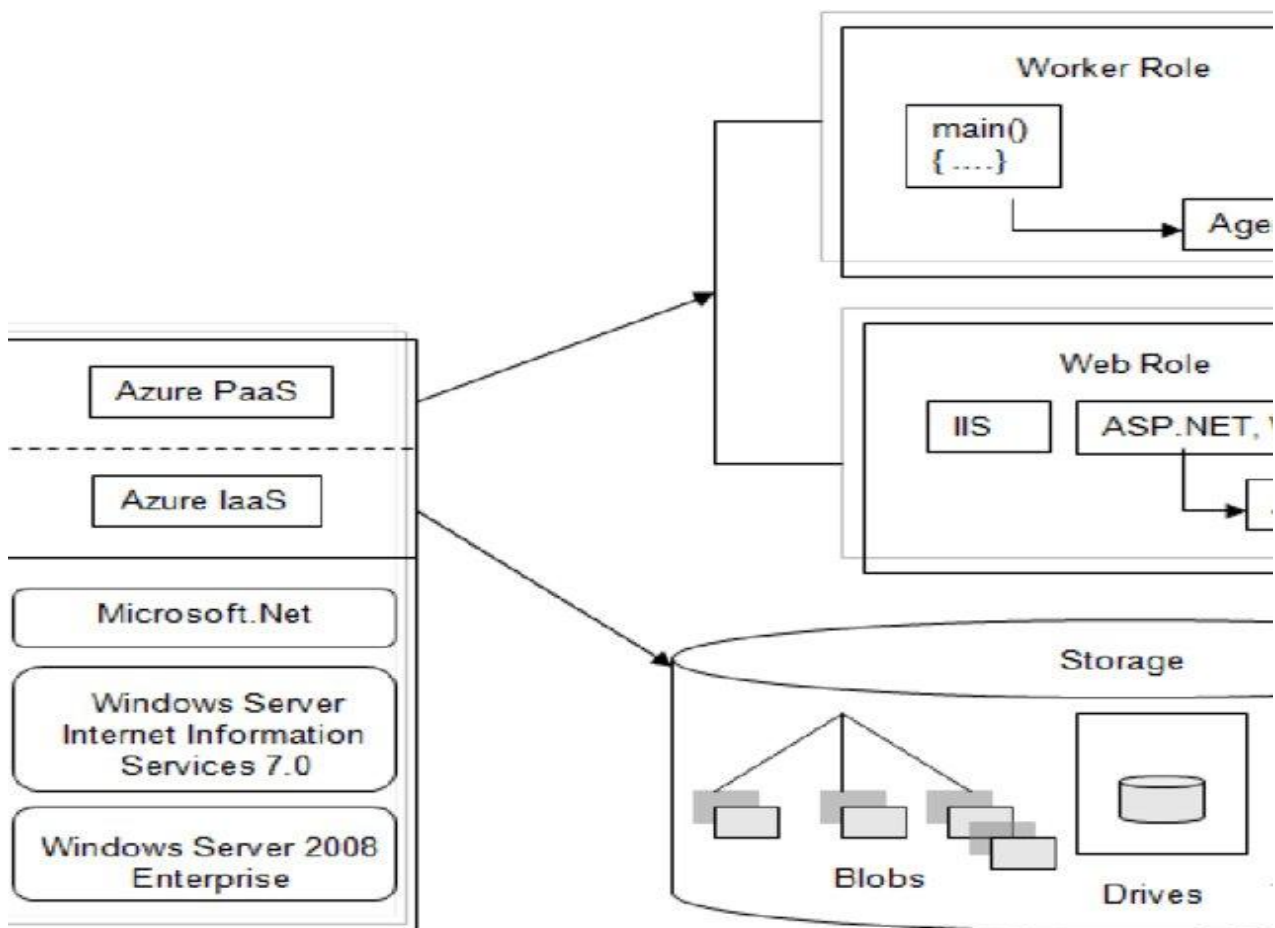
Google App-Engine Google App-Engine

Google App-Engine Google App-Engine is a platform for developing and deploying web applications in Google's architecture. This provides Platform as a Service to the cloud users. In 2008 Google App-Engine was first released as beta version. Languages supported by Google App-Engine are python, java and any extension of JVM languages. App Engine requires developers to use only languages which are supported by it and this is also applied with APIs and frameworks. Now Google App-Engine allows storing and retrieving data from a Big Table non-relational database. App Engine applications are expected to be request-reply based. Google App engine provides automatic scalability, persistent data storage service. Data store features a query engine and transaction capabilities. These applications are easy to scale as traffic and data storage need to grow so the cloud user doesn't have to worry about the spikes in the traffic or data. These applications are generally suitable for social networking start-ups, event-based websites catering to seasonal Cloud Computing events or institutions (schools, colleges, universities, government agencies) etc.

Windows Azure Windows Azure

Windows Azure Windows Azure is an intermediate in the spectrum of flexibility vs programmer convenience. These systems use .NET libraries to facilitate language independent managed environment. This service falls under the category of Platform as a Service. Though it is actually in between complete application framework like Google App-Engine and hardware virtual machines like EC2. Azure applications run on machines in Microsoft data centers. By using this service customers can use it to run applications and store data on internet accessible machines owned by Microsoft. windows Azure platform provides three fundamental components - compute component, storage component and fabric component. Basic components of Windows Azure are shown in Figure 5. • The Compute Service: The primary goal of this platform is to support a large number of simultaneous users. (Microsoft also said that they would use Azure to build their SaaS applications which motivated

many potential users.) To allow applications to scale out Microsoft uses multiple instances of that applications on virtual machines provided by Hypervisor. Developers use Windows Azure portal through Web browser, and use Windows live ID to sign in into his/her hosting account or storage account or both. Two different types of Azure instance is available: Web role instance and Worker role instances. – Web role instance: As the name implies this type of instance can accept HTTP or HTTPS requests. For this facility Microsoft uses IIS (Internet Information Services) as a web server inside the VM provided. Developers can build applications using ASP.NET, Windows Communication Foundation (WCF) or any other .NET technology or native codes also like C++, PHP or java based technologies also supported in Azure. Azure scales applications by running multiple instances without any affinity with a particular Web role instance. So it is perfectly natural for an Azure application to serve multiple requests from a single user by multiple instances. So this requires to write the client state in the Azure storage after each client request. – Worker role instance: This type of instances are very similar to that of Web role instances. But unlike the Web role instances these don't have IIS configured. They can be configured to run executable of users' right. Worker role instance is more likely to function like a background job. Web role instances can be used to accept request from the users and then they can be processed by Worker role instances in a later point of time. For a compute intensive work many Worker role instances can run in parallel. Logging and monitoring of Azure applications is made easy by provision of application wide log. a developer can collect performance related information like measure of CPU usage, store crash dumps in the storage. Azure doesn't give the developer the freedom to use his/her own VM image for Windows Azure. The platform maintains its own Windows. Applications in Azure run only in user mode - no administrative access isn't allowed here. So Windows Azure can update the operating system in each VM without any concern of affecting the applications running on it. This approach separates administrative work from the user domain. • The Storage Service: Applications running in Azure uses storage of different types:



Cloud Computing – Blobs:

This is used for storing binary data in a simple hierarchy. Blobs can have associated metadata with them. A user account can have one or more containers and these containers have one or more blobs. – Storage tables: Blobs provide mechanisms for unstructured data but for more structured purposes tables are more suitable. These tables are nothing like tables in a traditional database. They are actually stored in a group of entities. These tables can be accessed by using ADO.NET Data Services. SQL is not preferable for scale out issues. – Queue : This is not a structure like tables or blobs to store data but these queues are used to store messages about tasks to be performed by Worker role instance. These tasks are written by Web role instances on receiving request from clients. A Worker role instance waiting on that queue can read the message and perform the task it specifies. All data in the Windows Azure storage is replicated three times for providing fault tolerance. Azure also keeps backups in geographically distributed data centers. Windows Azure storage can be accessed by any Windows Azure application as well as any application hosted at another cloud platform. All the blobs, tables, queues are named using URIs and can be accessed by HTTP methods calls. Some applications have inherent need for relational databases. This is provided in the form of SQL Azure. This is build on Microsoft SQL Server. This data can be accessed via ADO.NET or by other Windows data access interfaces.

• The Fabric:

All Windows Azure application and all of the data stored in Azure Storage live are physically happen inside some of the data centers handled by Microsoft. In the data centers the set of machines dedicated to Azure are organized into a fabric. These machines are managed by fabric controller. These are replicated in five to seven machines. These controllers are aware of every Windows Azure application running in that fabric and also owns all the resources like computers, switches, load balancers etc. Controllers monitors, decides which resources to allocate to new applications looking at the configuration file with the application. They also monitor the running applications.

Cloud Computing Application in Indian context

Today most of the studies in cloud computing is related to commercial benefits. But this idea can also be successfully applied to non-profit organizations and to the social benefit. In the developing countries like India Cloud computing can bring about a revolution in the field of low cost computing with greater efficiency, availability and reliability. Recently in these countries e-governance has started to flourish. Experts envisioned that utility based computing has a great future in egovernance. Cloud computing can also be applied to the development of rural life in India by building information hubs to help the concerned people with greater access to required information and enable them to share their experiences to build new knowledge bases.

E-Governance

F-E-Governance is an interface between Government and public or this can be an interface between two governments or between government and business organizations
Objectives are generally to improve efficiency and effectiveness to serve public demand and to save costs for online services. This requires Government to have the will to decentralize the responsibilities and processes and start to have faith on electronic and internet systems. E-government is a form of e-business in governance and refers to the processes and structures needed to deliver electronic services

to the public (citizens and businesses), collaborate with business partners and to conduct electronic transactions within an organizational entity. This E-Governance can be greatly improved by utility computing

Impact of Technology in E-governance -

- **24/7 Service Model** – Systems and services require high availability. Get the citizens feel that Government is always at their service.
- **Need for Content** – Web contents should be regularly updated and the information provided to the public should be sufficient. Respective departments should be responsible for providing the information.
- **Human Resource** – Building these IT skilled resources would need properly trained personals. This would make government to compete with other private organizations. 19 Cloud Computing
- **Security** – Sensitive Government data is to be highly secured. Policies are to be taken seriously maintained and designed.
- **Privacy** – Personal data should be given sufficient privacy. It can be a difficult issue if data is stored across different departments and computer systems.

Recently Government of India have taken initiative and launched several projects to facilitate people with better mechanism of governance using IT as a tool. They have launched projects like Gyan Ganga, e-Gram [17] to leverage the strength of connectivity. Gyan Ganga is one of the initiatives of the Government of Gujrat to ensure wireless Internet connectivity to 18000 villages in Gujrat. This project is based on corDECT a technology based on Wireless Local Loop (WLL). Rural citizens are provided with facilities like browsing emails, Internet, land records, rural job opportunities, status of various government projects, information about local weather, soil and consult with experts to increase productivity in agriculture, to have answer to their queries about veterinary and health care. Gyan Ganga comes with other facilities with on-line registration of various applications, on-line public grievance form, information on Government projects etc.

• Application life cycle management –

Applications are generally developed in evolutionary manner and changes should be consistent across all the departments and up gradation should be performed when the system is functioning.

- **Software licensing** – Software should be licensed for each and every department terminal. This incurs a large amount of establishment cost.

• Scalability –

Traditional centralized systems have inherent weakness towards the aspect of scalability.

- **Security** –

This is the most crucial aspect for e-governance. Government information is highly sensitive. So they should be highly secured. For the traditional systems all the systems across all the departments should have sufficient security. 20 Cloud Computing Most of these disadvantages are addressed by cloud computing

- **Scalability** –

Cloud computing by design supports scalability. The data centers have enough computing and storage capacity to cope up with the spike demand.

- **Modifiable** –

Applications hosted in cloud can be modified internally without too much concern of the end users. Change in one place would reflect in all the places inherently and it would be consistent.

- **Data logging** – This central facility can be very useful for locating any fault in the system. Logging can also be used for detecting unauthorized usage checking or detecting compromization.

- **Availability** –

Cloud services are well known for high availability. If any data center is down for any reason there is hot backup ready to work immediately. Virtual machine migration is used to great extend in this situation to facilitate load balancing in case of failure of some systems.

- **Reliability** –

Replication and migration of instances across data centers make the reliability of the system very high in the cloud scenario.

- **Physical disaster recovery** –

Backup policies can be very useful for physical disaster avoidance and this is inherent to the cloud system. Data is stored in different physical location so that hot backup can be provided whenever needed.

- **Policy management** –

Polices can be managed in a centralized fashion. This is helpful for introducing Government policies readily unlike the present scenario.

- **Legacy software** –

An already developed software can be moved to cloud with minor changes some times. So the Government doesn't incur cost for developing applications which it already has.

- **Pay model** –

Cloud providers' pay-as-you-use model enables the customer (Government) to reduce cost of deployment and control the usage.

- **Reduce power consumption** –

Adaptation of cloud reduces power consumption in different offices and usage of power is concentrated in the data center only. But also that is not the concern of the government as those data centers are to be handled by the third party who provides cloud services. 21 Cloud Computing Though it seems that cloud computing is indispensable for e-government but there are many issues related to Cloud Computing application

- **Security Concern** –

Government works are highly security sensitive and the policies sometimes must not be go into public. But in cloud computing scenario security is not properly implemented today. So this is a big concern.

- **Policy Concern**

– Government has certain policies but the third party cloud provider may have contradicting policies.

- **Lack of faith in networks** –

Many government departments don't have that much trust in networks and internet. So they would not jump into accepting cloud computing

Rural development

In the context of rural development cloud computing can also be used to success for its centralized storage and computing facility and utility based pay model. As per 72.2% of total Indian population resides in rural areas. According to the survey conducted by “Hole in the Wall project” computer literacy among boys and girls of age group 8-14 in rural area varies across the regions of India. It is 40- 50% in most of the regions. So the computer literacy is not a concern in rural India and also in it shown that learning rate is pretty high for computer literacy. Agriculture is India’s biggest employment source, accounting for 52% employment in India

And agricultural sector contributes to 20% of country’s total GDP. So it is very important to make a serious attempt to develop rural India. Rural development can be in the form of education, agriculture, health, culture or in any other fields. Now a days most of the villages have some access to electricity and cellular phone. So there is technical feasibility of establishing computer systems. But the mentality of the people haven’t been changed that much and that’s why the spread of personal computer is not that much significant in the villages. We think this growth rate can be enhanced if the computing system is really cheap, easy to operate with minimum level of knowledge, without upfront commitment and more essentially if the system is helpful to enhance their life style. The main aim of the system is to make the people in rural areas to have access to recent technology and with the help of the computing system enhance their standard of living and also this would lead to a grater good of developing the nation.

- **Availability** –

Many of the services should be available always like health etc. These availability issues are not that well handled by the traditional web services as they are handled typically by a single server and thus the server downtime is always there to happen.

- **The villagers have to own a PC** – To use traditional web services through internet the villagers need to own a PC which would increase their investment. Then the issues of need for technical experts for software/hardware installation and maintenance are needed. But naturally the number of such experts is very less in number in the remote village. Upgradation of software or hardware would be a problem both economically and technically. With the help of cloud computing this can be made possible. We’ll now discuss the technological and economic advantages for using cloud.

- **No upfront commitment** – The villagers need not to invest too much to buy computing system and commit. But instead they can have very low cost terminals with basic functionality of I/O and have a network access.

- **No maintenance issues** – The users need not to be an expert for maintenance. This solves the unavailability of technical experts in the remote villages as the maintenance issues are handled by the cloud provider explicitly.

- **Upgraded version of hardware and software** – The users always use the upgraded version of software and hardware as maintained by the cloud provider. This reduces the cost of up gradation.

- **On-demand resource allocation** – The virtual resources can be extended as needed. If the user needs more resource then it is provided on demand basis.

- **Utility computing model** – The economic model used by the cloud is pay-asyou-use. This enables the users handle the cost they have to pay. By using cloud computing model some improvement of the current system is possible to bring about social and as well as economic prospect in rural India.

- **Share knowledge and build knowledge base** – Most of the agriculture related issues are generally local and they can’t be solved by general expertise. So it happens many times that the so called experts are not the right person to answer the problems but instead the local farmers are better in understanding. 23 Cloud Computing So in these situations better solution can be given by the local

experts. If these local experts access a common space to share their knowledge then others eventually come to know about the solution. Thus a knowledge base can be build which would represent the issues in that local scenario. It is like building Wikipedia.

- **Health and medical services** – In the developing countries like India one of the concern of Rural health care is in spite of best intention from both the medical professionals and patients a practical challenge is faced for difficulties of communications among interested parties. This issue can be solved using cloud computing in an appropriate way. Consultation among doctors around the world make sharing of knowledge possible and takes telemedicine to the next level, creating a network that goes beyond the one-to-one, patient-to-patient, patient-to-doctor or doctor-to-doctor interactions. In this way a patient suffering from a particular disease can be better treated by consulting with doctors within region and also outside who may have more experience with such a case.

- **Education in remote areas** – Education in rural areas can be enhanced with the help of distance education. Education can be provided in different languages and with respect to different curriculum with the aid of e-learning components. Students can be encouraged to build their own multimedia presentations. These can be hosted in the cloud. This type of approach encourage the students to concentrate more on learning and representing the material and also that would build the knowledge in the cloud for other students to refer. This is possible with the aid of cloud computing with greater reliability and availability.

- **Government decision making** – Looking at the common knowledge base the Government can have a fair knowledge of the local situation and take adoptive steps.

- **Access to Information hub** – Government can provide relevant information such as land revenue data, weather data, soil information etc. through these cloud services to the people concerned.

All these things are possible with right initiative. These may need customizing the original cloud services. Some generally unpopular services like Desktop as a Service may make sense in these scenario which essentially tells about providing the users a virtual desktop environment. But deployment of cloud services in rural areas have some issues associated with it

- The first and foremost issue for the deployment of internet based services in rural India is the availability of electricity and networks. Currently there are a number of initiatives underway to explore alternative to wired Internet, including WiFi, Wi Max, satellite-based Internet connectivity. Such an effort is made by Midas Communication technologies and Indian Institute of Madras in the name of cor DECT which is a wireless access system. It provides simultaneously voice and 35-70kbps Internet access to wireless subscriber. Another effort is [19] where the authors modified traditional WiFi to make it efficiently work in long distance suitable in the context of rural area.

- **Optimization due to data locality** –

Store the data where it is mostly used is known as the data locality. This is very helpful for optimization purpose. This can be done by establishing data centers in rural India. But the cost of power and bandwidth may not be cheap in many places. So for those places some efficiency and economic trade off should be obeyed.

India is now world's 2nd fastest growing economy. As per World Bank survey, by this year the growth rate of India's economy would be faster than currently fastest economy China. In India there is very large scope of applying IT in domestic level and that encouraged the cloud providers to establish cloud services in India. Today companies like Reliance, TATA, Zenith Computers, Wipro Technologies, Net magic Solutions, and Reliance are providing cloud services in India successfully. These companies can grasp the huge market in the rural India as well as making social development

Conclusion

In the future, Cloud technology and statistics, mobile technology and big data will allow banks to open value from existing data and risk management procedures managing and driving customer engagement. For profit in standard development processes, measurement and cloud-enabled partnerships, banks will be able to create new products and Innovative and service offerings for their customers. Cloud structure also provides flexibility on shipping models, therefore; making banks into faster and responding to market changes should be faster as well transform their businesses. Regarding cloud security affected, in most cases, embedded security measures location by global cloud providers may be potent than those in the internal systems of most banks. This is the future banking in the clouds has a great promise. You are already in the banks emerging markets use the cloud to reach non-bankers population by donating mobile and electronic banking services. Undoubtedly, the potential for expansion using the clouds are not over the banks in the years to come.

CHAPTER-2 Introduction Reference

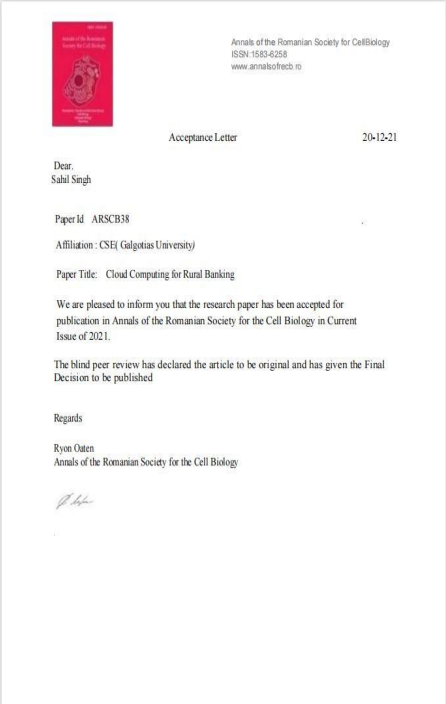
Publication/ Screen Shots

The screenshot displays a web browser window with the URL <https://cmt3.research.microsoft.com/GlobConET2022/Submission/Summary/145>. The page title is "Submission Summary". The content is organized into a table-like structure with the following details:

| | | |
|---------------------|---|---|
| Conference Name | IEEE IAS Global Conference on Emerging Technologies (GlobConET) | Print Email |
| Track Name | Track IV. Big data and Cloud Computing | |
| Paper ID | 145 | |
| Paper Title | Cloud Computing for Rural Banking | |
| Abstract | <p>The agricultural Banking introduced in villages to give exact and better offerings to the human beings for the development of their agriculture area or to help for his or her small-scale business. The banking sector in India has witnessed a complete transformation each in its functioning and transport of offerings to their customers. The banking services in rural regions allows in growing monetary component that modified the profile of the village and the life of its citizens. the rural banking plays a main position in the economic improvement of a rustic can not be not noted. the principle intention is based on Cloud computing to help rural banking. today era being the principle using force for groups has made banking clients to sit down again at home and run their bills without strolling into the banks for some thing and the entirety. because the advancement of technology has taken location with great use of net, cell telephones and on line bill payments banking quarter in India has a new side altogether. The cloud computing is one of the developing generation that is being use by all business domain in the IT field. on this paper, I proposed the concept of the use of cloud computing to increase a banking machine for rural regions. The cloud plays a key function in the financial institution's efforts to convert its enterprise and working version. From a technical perspective, the cloud routinely assembles, integrates and configures technology assets to fulfil enterprise goals. In business terms, it eliminates the want for a bodily infrastructure to be gift at every vicinity from in which the financial institution operates, hence making it simpler for the financial institution to installation offerings unexpectedly and at a lesser value.</p> | |
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| Submission Files | Researchpaper_BT3006.pdf (309.1 Kb, 12/21/2021, 9:49:03 PM) | |
| Supplementary Files | Researchpaper_BT3006.doc (198.1 Kb, 12/21/2021, 9:52:25 PM) | |

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Acceptance Letter 20-12-21

Dear,
Sahil Singh

Paper Id ARSCB38
Affiliation : CSH Galgotias University
Paper Title : Cloud Computing for Rural Banking

We are pleased to inform you that the research paper has been accepted for publication in Annals of the Romanian Society for the Cell Biology in Current Issue of 2021.

The blind peer review has declared the article to be original and has given the Final Decision to be published

Regards
Ryon Oaten
Annals of the Romanian Society for the Cell Biology

REFERENCES

- [1] The sentence punctuation follows
- [2] Shaily Malik et al., "Cloud Computing - A Hope For The Rural India", International Journal of Computer Applications (0975 - 8887) Volume 1 – No. 20,2010
- [3] Micheal Miller, Cloud Computing, 2008, Edition
- [4] Cloud Analyst <http://www.cloudbus.org/cloudsim>
- [5] Piracy rates in India <http://www.bsa.org/country.aspx>
- [6] [http://www.netmagicsolutions.com/blog/cloudcomputing-and-the-faith#.V8WVoDYko2w/Nitin Mishra](http://www.netmagicsolutions.com/blog/cloudcomputing-and-the-faith#.V8WVoDYko2w/NitinMishra)
- [7] <http://www.thehindubusinessline.com/info-tech/banksconsider-cloud-computing-to-improve-efficiency> cutcosts/article2577074.ece/Priya Nair
- [8] [http://www.bankingtech.com/236322/six-reasons-whycloud-computing-will-transform-the-way-banks-serveclients-and-the-five-hurdles-to-overcome/bank tech](http://www.bankingtech.com/236322/six-reasons-whycloud-computing-will-transform-the-way-banks-serveclients-and-the-five-hurdles-to-overcome/banktech)
- [9] <http://www.mapsofindia.com/my-india/business/how>technology-can-help-in-making-rural-bankingprofitable/Sanchita Paul
- [10] S. Wang, K. Yan, et al., "Towards a Load Balancing in a three-level cloud computing network," Computer Science and Information Technology (ICCSIT), 2010 3rd IEEE International Conference on, vol. 1,2010, pp
- [11] W. Lin and D. Qi, "Research on Resource Self-Organizing Model for Cloud Computing," in Proc. IEEE International Conference on Internet Technology and Applications, 2010, pp. 1– 5.

CHAPTER 3 SYSTEM REQUIREMENTS

For running Cloud services, adhere to the recommended CPU and memory requirements for a CES node even when installing Cloud services on an NSD node. For more information, see <http://www.ibm.com/support/knowledgecenter/STXKQY/gpfsclustersfaq.html>.

The hardware requirements for Cloud services are:

Any standard x86 64-bit servers or Power® Linux nodes that run supported Linux distributions.

The minimum size that is required for the /var/MCStore folder is 12 GB.

Note: For better performance, it is recommended to have a minimum of 2 CPU socket server of the latest Intel variety with at least 128 GB of memory.

A high CPU count promotes better cloud tiering throughput because although object storage can be slow in I/O operations per thread, object storage can support many threads. Use sixteen or more CPUs when you select your hardware.

Cloud tiering services demand a large amount of memory, which is why the minimum recommended memory size is 128 GB. Memory size requirements increase if the number of files increases, as you add files on the cloud means you must increase the memory that is on your system. For larger deployments, it is recommended that you use 10 - 20 times as much memory that is required so the Cloud services can cache its directory database data.

- **Hardware requirements for Cloud services**
You must meet certain hardware requirements to be able to install and use Cloud services on the IBM Spectrum Scale cluster.
- **Software requirements for Cloud services**
You must meet certain software requirements to be able to install and use Cloud services on the IBM Spectrum Scale cluster.
- **Network considerations for Cloud services**
This topic describes the network considerations that you need to follow for installing Cloud services on your IBM Spectrum Scale cluster.
- **Cluster node considerations for Cloud services**
This topic describes the cluster considerations that need to be followed before you install Cloud services on the IBM Spectrum Scale cluster.
- **IBM Cloud Object Storage considerations**
This topic describes about the points that you need to consider before you use IBM Cloud™ Object Storage as the object storage provider.
- **Firewall recommendations for Cloud services**
This topic describes the firewall recommendations that you need to follow to be able to implement Cloud services on your cluster.
- **Performance considerations**
While default configurations on the IBM Spectrum Scale and Cloud services work for the migration and recall of data, some adjustments might be required for optimized performance. This topic addresses some of such adjustments that will likely have the most significant effect on performance.
- **Security considerations**
You can integrate Cloud services with IBM® Security Key Lifecycle Manager (ISKLM) to provide security to the data that is stored on the cloud storage tier, or you can use the native key manager provided with the Cloud services.

- **Planning for maintenance activities**
Cloud services has five key maintenance activities that need to take place. Some are for keeping normal day-to-day operations going and some are contingencies for service restoration in case of a disaster.
- **Backup considerations for Transparent cloud tiering**
You must adhere to some guidelines for backing up files that need to be migrated to a cloud storage tier.
- **Quota support for tiering**
Transparent cloud tiering supports container-level quotas in ways that are described here.
- **Client-assisted recalls**
Non-gateway nodes can have an extended client which can service the recalls locally.

