

Cloud Backup & Recovery Techniques of Cloud Computing and a Comparison between AWS and Azure Cloud

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Abstract - Cloud Back-up is an assortment of service through which cloud computing assets and infrastructure are familiar with make, alter, control and reestablish data, offerings or application back-up. This is executed remotely over the net. Cloud Back-up may additionally refer to as online backup or remote backup. Cloud backup is hugely flexible and scalable in scaling up and down on runtime. In this paper, we discover few current techniques which can be effective answers in the shape of "Online Data Backup and Recovery Techniques". The goal of this paper is to outline the competent data backup recovery strategies which might be utilized in cloud computing domain. This paper compares the capabilities of two crucial cloud vendors Amazon Web Services (AWS) and Microsoft's Windows Azure, and helps one to determine the cloud supplier appropriate for their necessities to migrate their application.

Key Words: Cloud Computing, Back-up, Privacy, Parity Cloud, Amazon AWS, Microsoft Azure.

1. INTRODUCTION

1.1 What is cloud computing?

Cloud Computing means storing & accessing data or records, programs over the net or that data synced with other information over the web. Cloud Computing is likewise a utility service which it provides access to technical resources powered by experts. Using an internet connection, anywhere, anytime cloud computing can be executed. Cloud computing includes exclusive kinds of offerings over the net [1]. There are three sorts of cloud computing: first is public cloud, second is private cloud and third is hybrid cloud. Public cloud offerings are used for improvement structures and net servers. You pay for the wide variety of hours you want to use the cloud and exit when work is completed. Private cloud gives privacy. Private cloud structures are built-in residence and have a place with you and your business. It provides advanced level of privacy. In hybrid clouds you can manipulate inner database and utilize open cloud when needed. The main gain of cloud computing service is data security. It

keeps your data safe and make positive that the data does no longer fall into the incorrect hands. As we know, simple data backup technology has many reliability and security issues. Even simple backup techniques aren't convenient and reliable. Therefore, to overcome the problem of easy data backup and retrieval, a greater safer and effective system is needed like HSDRT [2], PCS [3], ERGOT, Linux Box [2], Cold and Hot back-up approach [2], SBBR [4] etc. It provides excessive secrecy safety and trustworthiness.

1.2 What is data backup and recovery techniques?

Data backup and recovery is the event of loss, and the configuration of a systems that allow data recovery due to data loss. Data backup calls for computer data to be achieved and copied so we can access these data when deletion or corruption of data. Most of the times data backup can't restore all of its data of a system and settings. Today massive amounts of data can be backed up when using cloud storage, which doesn't mean archiving on a local system's hard drive or using external storage. In particular, mobile devices can be set up using cloud technology, which allows data to be retrieved automatically. This is finished remotely over the internet. Cloud backup is also known as online backup and remote backup. Online backup is likewise a third- party service over the internet.

1.3 What is amazon web services [AWS] cloud?

AWS is a cloud computing platform well developed and provided by amazon that includes a combination of IaaS, SaaS, PaaS offerings. AWS offerings can provide corporation tools which include compute power, database storage and content delivery services. AWS allows companies and developers to use net services to create applications. AWS is the most comprehensive and widely adopted cloud platform inside the world. AWS supplied more than 175 fully integrated data center services. AWS helps corporations with various types of workloads like game development, data processing, storage, achievement, development and many more. If you wish to start an organization, you

will need servers as a way to be based on your demand. AWS provides a feature that allows you to select the server of your choice. It will save your time, money and potential. The features of AWS are flexibility, cost-effective, scalable and elastic, secure and experienced. This look at Amazon Web Services (AWS) elastic compute cloud (EC2) types of Linux instances c4.8xlarge [6] AWS launched in 2006. AWS does not offer the exceptional hybrid cloud support. AWS is greater mature cloud surroundings for massive data. In AWS, machines can be access separately. AWS allows lengthy time period data archiving and retrieval. In AWS, safety is supplied the usage of described roles with permission manage feature.

1.4 What is Microsoft Azure cloud?

Azure is a Microsoft's cloud computing platform. It is designed to create, configure and managed various applications and various services through a huge network of data center provided by Microsoft. It was released as Windows Azure on February 1,2010 later renamed as Microsoft Azure on March 25,2014. Azure is the foundation of data fleeing in the cloud. The platform of Azure is net - based technology. Azure provides fast development of applications [6]. Azure is a distributed platform. SaaS, PaaS, IaaS services are compatible with many other programming languages, frameworks, and tools that may include third-party systems. This type of OS behind technology is called Microsoft Azure. It helps to keep your fabric layer running. There are two deployment models used for Microsoft Azure cloud resources:

- Classic Deployment Model – In this model, all resources of Microsoft Azure were managed individually. Like, SQL database, virtual machine, etc.
- Azure Resource Manager – In this model, the users can create different groups for related utilities with an intention to deploy, manage and monitor the closely coupled resources.

To subscribe to the Azure, you need to use number of Microsoft Live accounts (Live, Hotmail, Outlook) and credit card. The user can Purchase the necessary resources in the cloud, after completing registration in cloud. Azure popular storage has many troubles for massive data, and consequently we want top rate storage. Azure is a less mature environment for big data. Machines are gathered into cloud carrier and reply to the equal area name with more than a few ports. Azure does no longer provide any long time

period data archiving and recovery choice. Azure gives safety through offering permissions.

2. PAPER SELECTION

To select the relevant papers, based on our area of interest, we followed a paper selection process.

We first formulated keywords. These keywords are based on the main terms in our area of interest. We use two types of keywords

1) General keywords

- i. IEEE Explore
- ii. Google scholar

The general keywords are those keywords which are used in a universal context, i.e. technologies, present technology, technology industry, advantage, disadvantage of current technology.

The domain specific keywords consist of all those keywords which are specific to our area of interest (domain specific) i.e. AWS, Azure and services of AWS and Azure.

To further search the papers based on our keywords we have used two types of digital libraries

By following this, process we got a lot of papers. To further select final set of papers we read the abstract of all papers and based on the information given in the abstract we selected our final set of papers. Only those papers were selected whose abstract showed some relevant to our work.

3. LITERATURE SURVEY

The main pro of backup system is compared to a local manual backup which means the data is saved at offsite. When the files are backed up locally on a file server so there may be a threat of loss of data. Now the larger companies could afford the offsite back. With using cloud computing, cheap bandwidth and lower storage costs, both individually and small businesses can create affordable backup systems. The brand-new backup and recovery technologies can provide the great performance in unrestricted situations like cost, security, redundancy and short-term recovery. This paper organized as follows: Remote data backup server [2]. The existing methods that are used in cloud computing domain.

3.1 Remote data backup server

A remote backup server is a network enabled hardware, software and solution package designed to store, manage and provide data backup services over the internet. It provides business services with computers, servers and other devices that are connected directly. It has data encryption, protection, recovery solutions and internet connectivity option [5].

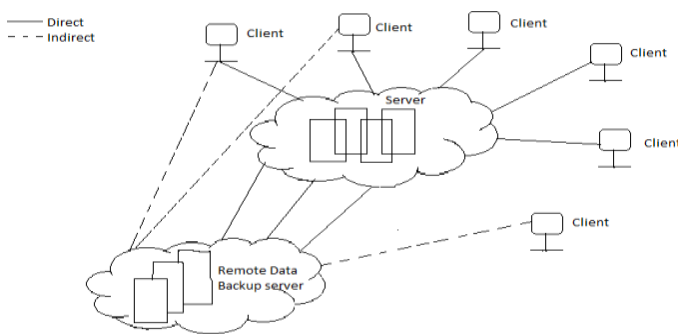


Fig. 1. Remote data Backup Server and Architecture [8]

Here, the remote data backup server stores the data from the main cloud that is located on the remote. Central repository forgotten its data then it makes use of remote repository. Data can be collected from the remote repository with the help of remote data backup server [2].

3.2 Existing methods

Here, many techniques that are used to create backup and recovery. HSDRT [2], PCS [3], ERGOT, Linux, Cold and Hot backup approach [2], SBBR [4]. All of these techniques give high security and reliability. The cost of all of these methods is very high.

High security distribution and rake technology (HSDRT) [2] is an efficient system for mobile devices like smartphones, laptops, etc. The cost of implementation is more. This technique is totally innovative. It is extensively used in distributed data transfer mechanism with high-speed encryption technology. The system is divided in two parts, the first is backup and second is restoration access. It is an innovative file back-up technique. The system is split in two parts, the primary is backup and second is recovery. In the backup sequence, when the data center receives the data for a backup, it encrypts the encoded ones, divides them into pieces and then copies some of that data to

meet the specified recovery rate according to the level of predefined service. In the second stage, the pieces again encrypt by the data center and distributes them in random order to client nodes. At the same time, the data center sends the metadata used to decrypt the fragment range. Metadata are made up of encryption keys for both stages, various related fragmentation, duplication and distribution information. In the recovery process, it is the recovery process when some disasters occur or periodically, the monitoring server starts the recovery order. Collect the encrypted fragmentation of many suitable clients, such as the rack reception process, and the second step will entire the decryption, merge and decrypt and decryption in reverse order [2]. Despite of these processes, the monitoring server can retrieve the original data that must be backed up. This model does have some obstacles and, therefore, this model cannot be declared as a suitable answer for backup and recovery retrieval. First, to make complete full use of the HS-DRT processor, it miles necessary to have net applications properly configured to use the HS-DRT engine. Second, when the number of duplicate copies of file data increases, the performance of the corresponding processor for running the net application will be degraded [2].

Parity cloud service (PCS) [3] is similarly easy, simple and reliable. It is more beneficial for data recovery which is fully based on parity recovery service. This technique is easier among all techniques. PCS retrieves data with greater probability. Exclusive-OR() is used for buying parity information. PCS has a low recovery cost 4 and can retrieve data with very high probability. Many internet service providers (ISPs) provide cloud storage services for its users and the service is regarded as a solid web service for users, that offers high trustworthiness, suitability and low price [3]. Offers high reliability, convenience and low cost. For data retrieval, PCS uses the new virtual disk generation technology in the user's system for data backup, creates parity groups on virtual disks, and stores parity data from the parity group in the cloud.

The relatively efficient rounding based on the classification is primarily based on semantic analysis. It supports the discovery of services in cloud computing. It could not focus on the complexity of the time. In our words, this is not a backup technology, but it does provide an effective way to recover data. It was based on three components: DHT, a Son, a measure of meaningful similarity between service descriptions.

The DHT (Distributed Hash board) protocol, which we use to declare a description of the semantic service mentioned by the ontology concepts. A SON (Semantic Overlay Network), allows the grouping which has meaningfully similar service descriptions [2]. SON is constructed incrementally, as an advertising and marketing service product through DHT.

Linux Boxes [2] has a simple method for data backup and restoration with minimal charge. There is a low stage of safety. It is possible to easily migrate from one cloud provider to some other using Linux Boxes. The data communication will be encrypted and protected. It is affordable to all customers and Small and Medium Business (SMB). This solution eliminates customer dependence on ISPs and their associated backup costs. A simple hardware box can do all this at a low cost called simple Linux box that will synchronize data from the cloud service provider to the user at the block / file level. The application will interact with the cloud over a secure channel, look for updates and synchronize them with local storage [2]. We have found the restriction that is not only the user can backup the data, but also synchronize the entire virtual machine, which somehow consumes the bandwidth because each time a backup is made, the whole VM will be backed up.

Technique of *cold and hot backup service* [2] is based on triggers. It is activated when service failures are detected and will not be activated when the service is available. Within the hot backup service (HBSRS) replacement strategy throughout the implementation of backup services in dynamic mode. And then it gives the results of the services that will be adopted for the successful implementation of the service structure. Between CSBRS and HSBRS, the hot backup service reduces the recovery time [2]. As backup services and basic services run at the same time, the cost of recovery increases.

The resources of the *shared backup router* (SBBR) [4] target on significant cost reduction and router failure. It refers to the logical IP connectivity that did not change even after the router failed and also provides the network management system with multilayer signalling [2]. It cannot include the concept of optimization with cost reduction.

3.3 AWS Pros and Cons

Its largest strengths are Amazon global coverage & huge toolset with the biggest data center and biggest range of services, over 100. It is highly flexible.

- It is very flexible
- It provides instant scalability
- It uses pay-per-use and pay-as-you-go pricing models
- It mainly focuses on security (AWS shared responsibility model)
- It gives regular and frequent updates of obtainable services and applications
- It provides user-friendly support

Other weaknesses of Azure are:

- There is a lack of security restriction.
- Also, there is lack of proper execution of the services due to technical faults

Some agencies may find Amazon AWS too complicated in an experience that there are too many services and apps that you may probably manipulate. For this client will need to buy business tier support, which carries up to a 10% premium on the client's overall AWS spend. Almost all business clients require a personalized agreement and significant terms-and-conditions negotiation.

3.4 Microsoft Azure Pros and Cons

Microsoft Azure is Amazon Web Services strongest competitor. AWS controls the most important piece of the infrastructure-as-a-service pie, but Microsoft Azure is slowly ultimate the gap.

- Highly scalable & secure
- High operational performance
- Lots of cost-efficient options for businesses
- Focus on IaaS and PaaS
- Strong hybrid options
- Open source support

Weaknesses of Azure are:

- Comparatively hard to use and manage
- Expensive (compared to AWS and GCP)
- Pay-as-you-go is additionally billed Poor DevOps Support.

Table 3.5: Literature review of the existing technologies

In below Literature survey, table represents the existing technologies including articles and research papers selected according to our research strategy.

Paper Title	Authors	Descriptions	Results	Drawbacks / Limitations
Data backup and recovery techniques for cloud server using block algorithm [1]	R. V. Gandhi et al	The back-up and recovery techniques which is developed in cloud computing that are HSDRT, PCS, ERGOT, Linux Box, Cold & Hot backup strategy etc.	There are many advantages and disadvantages of these cloud computing techniques.	In earlier days, the amount of large data is created in electronic format, to maintain that data there is need of data recovery services.
Online data back-up and disaster recovery techniques in cloud computing: A review [2]	Ms. Kruti Sharma et al	This article is to summarize the powerful data backup and recovery techniques that used in cloud computing.	All these techniques are able to provide best performances under all uncontrolled circumstances.	there are some techniques in which cost increases gradually as data increases.
Parity Cloud Service: A Privacy-Protected Personal Data Recovery Service, [3]	Chi- won Song, Sungmin Park, Dong- wook Kim, Sooyong Kang	In this paper we study the parity cloud service.	It is easy, simple and reliable.	It has a low recovery cost.
Recovery Time Analysis for the Shared Backup Router Resources (SBRR) Architecture [4]	Eleni Palkopoulou, Dominic A. Schupke, Thomas Bauscherty	In this paper we study on shared backup router resources (SBRR).	It concerns with cost reduction works even if router fails.	The problem of Inconsistency which reduces the performance.
Seed Block Algorithm: A Remote Smart Data Back-up Technique for Cloud Computing [5]	Ms. Kruti Sharma, Prof. Kavita R Singh	In this paper, it shows the remote smart data back-up techniques in cloud computing.	Using these techniques, we focus on various types of data backup and recovery techniques.	Can not access data without internet and full data recovery take some time as it is fast and easy to recover small group of data.
A Comparison of Amazon Web Services and Microsoft Azure Cloud Platforms for High Performance Computing [6]	Charlotte Kotas et al	The comparison between the AWS and Azure cloud providers through their services.	We can get the performance computing between AWS and Azure.	The most cost competitive solution depends on the application to be run.
A Comparative Study of Amazon Web Service and	Rajiv BV et al	This paper compares features of two cloud service providers,	After comparison between AWS and Azure, we get the	AWS does have general cloud computing issues when you move to a cloud such as a downtime, limited

Windows Azure [7]		Amazon Web Services (AWS) and Microsoft's Azure.	best cloud service provides.	control, and backup protection.
Seed block algorithm: Remote Smart Data-Backup Technique for Cloud Computing [8]	Mr. Kailas Pophale et al	To provide data recovery services in this paper introduces the remote smart data backup techniques.	We study the recently used backup & recovery technique used in cloud computing domain.	Large amount of data not maintain without data recovery services.

4. COMPARISON BETWEEN AWS AND AZURE CLOUD

4.1 Storage comparison of AWS and Azure cloud

One of the biggest blessings of cloud computing is the increased storage capacity. Like most features, every platform is robust in specific ways. As an example, Aws takes the prize for a wide variety of storage options, whilst Azure has extra specialized solutions, such as Data Lake, designed especially for large, data-rich applications. This platform includes many forms of databases, with azure supplying the widest vary and sizes. Backups are critical protection and restoration characteristic [9]. Aws has Glacier; however, azure is the entirely platform that gives some of backup solutions, at the side of archival storage.

AWS storage services:

This is an environment in the place AWS is deep down to provide a hybrid platform via its storage gateway. Gateway presents a secondary file storage choice with Glacier, Amazon's sole backup feature. Users can store simple storage with S3 or contain objects for larger containers with their elastic feature; It works in conjunction with E2B. Additionally, elastic file storage expands its capacity as it creates files, which is best for firms that produce large amounts of data. Aws additionally offers a range of SQL-compatible databases, the ElastiCache function to supply extra memory and data transfer carrier [9].

Azure storage services:

Azure presents a fanatical storage alternative known as blob storage. This unstructured object based totally on REST and is reserved for object storage. Like AWS, they additionally have options for large-scale data storage and high-volume, complex workloads, alongside their queue storage and data lake storage. The platform

additionally, offers customers a wide variety of databases, which assist three distinctive SQL-based formats, and their data warehouse offers them space to increase. The support Azure gives for SQL is no longer restricted to storage. Their server stretch database is a hybrid that provides storage on and off premises for businesses that use Microsoft SQL Server for your business, however can use different protocols in the cloud [9]. This is the solely agency of the three to have a backup healing system, adding to its standard and archive backup copies.

4.2 Computation comparison of AWS and Azure Cloud

The truth that Aws had seven years of advantage creates it a more prominent & experienced business cloud platform. AWS and Azure cloud business service providers has advantages and disadvantages that may vary accordance to their personal needs and conditions. It has greater reach and availability of services, and has dominated the market in view that its launch. Windows has the gain of intrinsical compatibility, as most corporations already rely upon Microsoft merchandise for day by day commercial enterprise operations. There are three components that are common across both the platforms, with high scalability, billing per second, speed, security and agility [9].

AWS compute features:

Amazon Elastic Computing Cloud is the primary computing service. E2C integrates with most of Amazon's net services, promotion consistency and excessive degree of flexibility, allowing database administrators to optimize costs. The scalable cloud platform approves you to increase or decrease the scale in minutes, and has the capability to set up hundreds of server situations at the pace of light. Aws

make use of computerized scaling screen to screen your application using machine learning and scaling to potential in accordance to your current needs except increasing costs. They additionally promise 99.99% availability as phase of their Service Level Agreement (SLA). Amazon Elastic Container Service (Amazon ECS) scalable container orchestration supports Docker containers through a series of API calls. With this capability, you can start or end Docker-enabled applications, check the status of your application, manipulate the IP address of the website, block and unlock and access security groups, IAM roles, CloudTrail logs, and CloudFormation templates. There is additionally an ECS registration feature and a container service for Kubernetes [10]. For Computing, the main AWS solution is its EC2 instance, which offers scalable computing on demand and can be customized for different options.

Azure compute features:

Azure's computing elements are based totally on network of virtual machines to allow a number of IT solutions, including development, testing, data center extension and application implementation. It is based totally on an os platform which is accessible with Linux, Windows Servers, SQL Server, Oracle and SAP. Azure has provided a hybrid model which combines the cloud such as local & public that can be merged into global load balances [9]. Azure Kubernetes Service (AKS) is a serverless container system that lets in to deploy & manage containerized applications quickly. It provides continuous experience of integration and continuous delivery (CI / CD), protection and corporate governance to unify different groups operating in a digital workplace fee on a single platform. For computing, Azure is based on virtual machines with multiple different equipment like cloud offerings and resource supervisor which helps to install applications on the cloud.

4.3 Networking comparison of AWS and Azure Cloud

AWS Networking:

AWS provides virtual private cloud (VPC) so that users can create separate networks within the cloud. Inside VPC, users can create subnets, route tables, network gateways and ranges of private IP addresses [10].

Azure Networking:

Microsoft provides a virtual network (VNET) that gives users the ability to create separate networks and subnets, route tables, network gateways and private IP address ranges [10]. Each firms offer solutions to expand the on-premise knowledge center into the cloud and firewall choice.

4.4 Database comparison of AWS and Azure Cloud

AWS Database:

AWS has a relational database as a service by using RDS, for NoSQL it uses Dynamo DB and caching it uses Elastic cache. Mostly all cloud suppliers offer capability to implement a database in both SQL and NoSQL solutions.

Azure Database:

For the relational database it has SQL database, MYSQL, and PostgreSQL and for caching purpose it uses Cosmos DB for NoSQL solutions and Redis Cache.

4.5 Pricing comparison of AWS and Azure Cloud

Pricing is challenging to analyse with every of these companies, however there are some similarities and differences. AWS and Azure provides a free level of carrier with confirmed options, and cost all demand for the assets you use [9].

AWS pricing:

There is not lots of transparency here, even though the platform offers its clients a price calculator. The pricing shape is so complicated that we suggest the usage of third-party management application to assist you navigate your alternatives and consist of costs [9]. They give 750 hours of EC2 service per month for 12 months as section of their free tier.

Azure pricing:

This is the other platform the place getting professional guidance. Pricing choices are primarily situational in an effort to meet the special wishes of every customer. Like AWS, Azure presents 750 hours per year of the addition of Windows or Linux B1S from its main

computing platform, VMs, per 12 months [9] (it's free to try, which is excellent for company that desires to "test the waters" From the cloud).

4.6 AWS and Azure Deploying Apps

AWS Deploying Apps:

AWS gives similar solutions with Elastic Beanstalk, Batch, Lambda, Container service etc.

Azure Deploying Apps:

Azure has various app deployment tools as cloud services, container service, functions, batch, app services etc.

4.7 AWS and Azure Open Source Developers

AWS Open Source Developers:

AWS is a smart option for open source developers because it permits Linux users and provides various integrations selections for numerous open source applications.

Azure Open Source Developers:

Azure has the ability for users to use active directory account to sign up the Azure cloud platform and run the .net framework on any operating systems.

5. RESULTS

With the above comparison and variations, both cloud systems are found to be, i.e. AWS and Azure have powerful features and any one of them is difficult to pick. AWS is more flexible and offers additional features but Azure is an excellent choice when it comes to hybrid cloud and integration with Microsoft stack. Organizations can therefore choose any of the cloud platform as per their needs. Amazon AWS had started the earliest when nobody else had thought it was possible to rent storage and computing as a service and it would be such a huge business. Hence it has a competitive advantage over cloud players because it has been researching more on cloud technologies.

CONCLUSIONS AND FUTURE WORK

In this paper, we explore few recent techniques that are the powerful solutions in the form of "Online Data

Backup and Recovery Techniques". The objective of this paper is to summarize the powerful data backup recovery techniques that are utilized in cloud computing domain. With the above comparison and variations, both cloud systems are found to be, i.e. AWS and Azure have powerful features and any one of them is difficult to pick.

ACKNOWLEDGEMENT

My sincere thanks to Dr.R.P Soni, Dean of Faculty of Computer Applications and IT, Prof. Tripti Dodiya and Prof. Ankita Kanojiya. I would like to express my deep and sincere gratitude to my research supervisor, Prof. Deepti Ameta, Faculty of Computer Applications and Information Technology, GLS University, Ahmedabad for giving me the opportunity to do research and providing invaluable guidance throughout this research. Her dynamism, vision, sincerity and motivation have deeply inspired me. She has taught me the methodology to carry out the research and to present the research works as clearly as possible. It was a great privilege and honor to work and study under her guidance. I am extremely grateful for what she has offered me.

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BIOGRAPHIES



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