Cloud Computing Platforms for Big Data Adoption and Analytics

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Abstract

Big Data is a data analysis technology empowered by late advances in innovations and engineering. In any case, big data involves a colossal responsibility of equipment and handling assets, making reception expenses of big data innovation restrictive to little and medium estimated organizations. Cloud computing offers the guarantee of big data execution to little and medium measured organizations. Big Data preparing is performed through a programming worldview known as MapReduce. Normally, execution of the MapReduce worldview requires organized joined stockpiling and equal preparing. The computing needs of MapReduce writing computer programs are frequently past what little and medium measured business can submit. Cloud computing is on-request network admittance to computing assets, given by an external element. Normal arrangement models for cloud computing incorporate platform as a service (PaaS), software as a service (SaaS), framework as a service (IaaS), and equipment as a service (HaaS).

Keywords: *Big data, cloud computing, private cloud, public cloud, hybrid cloud.*

1. Introduction

Big Data is a data analysis methodology enabled by a new generation of technologies and architecture which support high-speed data catch, stockpiling, and investigation (Villars, Olofson, and Eastwood, 2011). Data sources stretch out past the customary corporate database to incorporate email, cell phone yield, sensor-created data, and web- based media yield (Villars, Olofson, and Eastwood, 2011). Data are presently not limited to organized database records yet incorporate unstructured data – data having no standard arranging (Coronel, Morris, and Rob, 2013).

Big data and analytics require a lot of data stockpiling, preparing, and trade. The customary platforms for data examination, for example, data stockrooms, can only with significant effort or modestly scope to satisfy big data needs. Moreover, a large portion of the data is unstructured and unacceptable for customary social databases and data distribution centers. Platforms to handle big data require critical direct front venture. The strategies for handling big data depend on equal preparing models, like MapReduce, in which the preparing responsibility is spread across numerous CPUs on ware process hubs. The data is apportioned between the process hubs at run time, and the administration system handles between machine correspondence and machine disappointments. The most popular epitome of a MapReduce bunch, Hadoop, was intended to run on many machines that don't share memory or plates (the common nothing model). Then again, cloud computing is the ideal vehicle to scale to oblige such enormous volumes of data. Cloud computing can separate and overcome enormous volumes of data by utilizing dividing (putting away data in more than one district or accessibility zone).

Moreover, cloud computing can give cost efficiencies by utilizing ware process hubs and organization foundation, and requiring less executives (on account of normalizing the accessible contributions through the Cloud Service list), and developers (using obvious APIs). Notwithstanding, cloud computing conditions are worked for universally useful jobs and use asset pooling to give flexibility on request. So it appears to be that a cloud computing climate is appropriate for big data, given the common nothing model can be regarded. Be that as it may, there is another huge distinction, the intense unpredictability of big data jobs contrasted with average jobs in a cloud computing climate. Big Data requires gigantic measures of extra room. While the cost of capacity kept on declining, the assets expected to use big data can in any case present monetary troubles for little to medium measured organizations. A run of the mill big data stockpiling and examination framework will be founded on bunched network-joined capacity (NAS) (White, 2011). Bunched NAS framework requires arrangement of a few NAS "cases" with every NAS "case" involved a few stockpiling gadgets associated with a NAS gadget (White, 2011). The series of NAS gadgets are then interconnected to permit enormous sharing and looking of data (White, 2011).

Data stockpiling utilizing cloud computing is a feasible choice for little to medium measured organizations considering the utilization of Big Data scientific procedures. Cloud computing is on- request network admittance to computing assets which are regularly given by an external element and require little administration exertion by the

Manuscript received February 5, 2022
Manuscript revised February 20, 2022
https://doi.org/10.22937/IJCSNS.2022.22.2.36

business (IOS Press, 2011). Various structures and organization models exist for cloud computing, and these models and models can be utilized with different advancements and configuration draws near (IOS Press, 2011). Proprietors of little to medium estimated organizations who can't manage the cost of reception of grouped NAS innovation can consider various cloud computing models to meet their big data needs. Little to medium estimated entrepreneurs need to consider the right cloud computing to stay both cutthroat and beneficial.

2.1 Big data and the Cloud

The term big data is gotten from the way that the datasets are enormous to such an extent that run of the mill database frameworks can't store and dissect the datasets (Manyika et al., 2011). The datasets are enormous in light of the fact that the data is as of now not conventional organized data, yet data from many new sources, including email, online media, and Internet-open sensors (Manyika et al., 2011). The qualities of big data present data stockpiling and data examination difficulties to organizations.

An average model for in-house stockpiling of big data is grouped Network-Attached Storage (Sliwa, 2011). The arrangement would start with an organization connected capacity (NAS) case comprising of a few PCs appended to a PC utilized as the (NAS) gadget. A few NAS cases would be appended to one another through the PC utilized as the NAS gadget. Grouped NAS stockpiling is a costly possibility for a little to medium size business. A cloud services supplier can outfit the fundamental extra room for generously lower costs. Examining big data is finished utilizing a programming worldview called MapReduce (Eaton, Deroos, Deutsch, Lapis, and Zikopoulos, 2012). In the MapReduce worldview, an inquiry is made and data are planned to discover key qualities considered to identify with the question; the outcomes are then diminished to a dataset noting the question (Eaton, Deroos, Deutsch, Lapis, and Zikopoulos, 2012). The MapReduce worldview necessitates that colossal measures of data be examined. The planning is done simultaneously by each different NAS gadget; the planning requires equal handling. The equal handling needs of MapReduce are expensive, and require the design noted beforehand for capacity. The handling needs can be met by cloud-service suppliers.

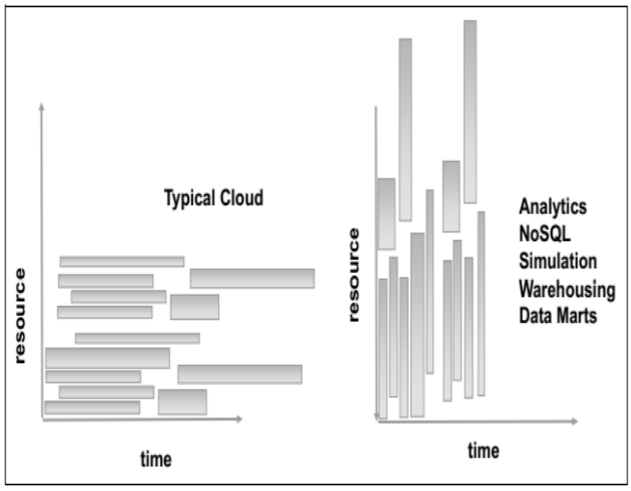

Fig. 1 Typical cloud computing

2.2 Workloads versus big data workloads

The three types of cloud computing are the public cloud, the private cloud, and the hybrid cloud. A public cloud is the pay-more only as costs arise services. A private cloud is inward data focal point of a business not accessible to the overall population yet in view of cloud structure. The half breed cloud is a mix of the public cloud and private cloud.
Three significant purposes behind little to medium measured organizations to utilize cloud computing for big data innovation execution are equipment cost decrease, handling cost decrease, and capacity to test the worth of big data. The significant concerns in regards to cloud computing are security and loss of control.

2.3 Cloud computing Platforms

Normal organization models for cloud computing incorporate platform as a service (PaaS), software as a service (SaaS), framework as a service (IaaS), and equipment as a service (HaaS). Cloud organization arrangements can offer types of assistance that organizations would somehow not have the option to manage. Organizations can likewise utilize cloud sending arrangements as a test measure prior to taking on another application or innovation vast.

There are a wide number of options for organizations utilizing the cloud for PaaS (Géczy, Izumi, and Hasida, 2012). Platform as a Service is the utilization of cloud computing to give platforms to the turn of events and utilization of custom applications (Salesforce.com, 2012). The PaaS arrangements incorporate application plan and

improvement instruments, application testing, forming, mix, organization, and facilitating, state the executives, and other related advancement devices (Géczy, Izumi, and Hasida, 2012). Organizations accomplish cost investment funds utilizing PaaS through normalization and high usage of the cloud-based platform across various applications (Oracle, 2012). Different benefits of utilizing PaaS incorporate bringing down chances by utilizing pretested advances, advancing shared services, further developing software security, and bringing down expertise necessities required for new frameworks improvement (Jackson, 2012). As identified with big data, PaaS gives organizations a platform to creating and utilizing custom applications expected to examine huge amounts of unstructured data for a minimal price and generally safe in a protected climate.

Software as a service furnishes organizations with applications that are put away and run on virtual workers – in the cloud (Cole, 2012). The business isn't charged for equipment, just for the data transmission for the time and number of clients vital (Cole, 2012). The principle benefit of SaaS is that the arrangement permits organizations to move the dangers related with software securing while at the same time moving IT from being receptive to proactive (Carraro and Chong, 2006). Advantages of utilizing SaaS are simpler software organization, programmed updates and fix the executives, software similarity across the business, simpler cooperation, and worldwide openness (Rouse, 2010a). Software as a Service gives organizations investigating big data demonstrated software answers for data examination. The distinction among SaaS and PaaS for this situation is that SaaS won't give a modified arrangement though PaaS will permit the organization to foster an answer customized to the organization's necessities.

In the IaaS model, a customer business will pay on a for every utilization reason for utilization of gear to help computing activities including capacity, equipment, workers, and systems administration hardware (Rouse, 2010b). Framework as a service is the cloud computing model getting the most consideration from the market, with an assumption for 25% of ventures intending to embrace a service supplier for IaaS (Cisco, 2009). Services accessible to organizations through the IaaS model incorporate fiasco recuperation, register as a service, stockpiling as a service, data focus as a service, virtual work area framework, and cloud exploding, which is giving pinnacle load ability to variable cycles (Cisco, 2009). Advantages of IaaS incorporate expanded monetary adaptability, selection of services, business dexterity, financially savvy versatility, and expanded security (Cisco, 2009). While not at this point being utilized as widely as

PaaS, SaaS, or IaaS, HaaS is a cloud service dependent on the model of time sharing on minicomputers and centralized computers from the 1960s and 1970s (ComputerWeekly.com, 2009). Time sharing formed into the act of oversaw services (ComputerWeekly.com, 2009). In an oversaw services circumstance, the oversaw service supplier (MSP) would distantly screen and control equipment situated at a customer's site as contracted (Rouse, 2007). An issue with oversaw services was an ideal need for some MSPs to give equipment on location to customers, the expense of which should have been incorporated into the MSP's expense (Rouse, 2007). The HaaS model permits the client to permit the equipment straightforwardly from the service supplier which reduces the related expenses (Rouse, 2007). Sellers in the HaaS field incorporate Google with its Chromebooks for Business, CharTec, and Equus (Panettieri, 2011).

2.4 Types of Clouds

Three types of clouds exist – the public cloud, the private cloud, and the hybrid cloud. A public cloud is the pay-more only as costs arise services recently examined accessible to the overall population (Armbrust et al., 2010). In a public cloud setup, a business doesn't possess the center innovation assets and services however rethinks these (Géczy, Izumi, and Hasida, 2012). A public cloud is viewed as an outer cloud (Aslam, Ullah, and Ansara, 2010).

A private cloud is inward data focus of a business that isn't accessible to the overall population however utilizes cloud structure (Armbrust et al., 2010). In a private cloud arrangement, assets and services are claimed by the business, with the services available inside the business through the intranet (Géczy, Izumi, and Hasida, 2012). Since the innovation is possessed and worked by the business, this kind of cloud is more costly than a public cloud, but on the other hand is safer (Géczy, Izumi, and Hasida, 2012). A private cloud is an inner cloud, dwelling inside the organization's firewall and overseen by the organization (Aslam, Ullah, and Ansara, 2010).

At the point when an organization utilizes a cross breed cloud, it utilizes a public cloud for certain assignments and a private cloud for different undertakings. When utilizing a mixture cloud model, an organization will utilize the public cloud to speed up additional undertakings that can't be handily run in the organization's data community or on its private cloud (Armbrust et al., 2010). A mixture cloud permits an organization to keep up with basic, private data and data inside it firewall while utilizing the public cloud for non-secret data (Aslam, Ullah, and Ansara, 2010). Figure 1 represents a mixture cloud. The private cloud piece of the mixture cloud is gotten to by organization representatives, both in the organization and out and about, and is kept up with by the inward innovation bunch. The

private cloud a piece of the cross breed cloud is additionally gotten to by the organization representatives yet is kept up with by outer service suppliers. Each part of the cross breed cloud can interface with the other piece.

Which Cloud for your Data?

The sort of cloud an organization utilizes relies on the organization's necessities and assets. The public cloud is viewed as the most un-secure of the three sorts, with services and assets ready to be gotten to over the Internet through conventions embraced by the supplier (Géczy, Izumi, and Hasida, 2012). The interchanges conventions embraced by the supplier are not really secure; the decision of utilizing secure or non-secure conventions is up to the gives (Géczy, Izumi, and Hasida, 2012). The public cloud is additionally the most un-exorbitant of the cloud types, with cost investment funds in the space of data innovation organization, the executives, and upkeep (Géczy, Izumi, and Hasida, 2012).

The private cloud offers types of assistance to organization representatives through an intranet (Géczy, Izumi, and Hasida, 2012). On the off chance that portable representatives can get to the private cloud, the entrance is normally through secure correspondence conventions (Géczy, Izumi, and Hasida, 2012). All services and assets gave are custom fitted to the requirements of the business, and the business has all out authority over the services and assets (Géczy, Izumi, and Hasida, 2012). Because of the monetary and HR expected to send, oversee, and keep up with the data innovation assets and services gave, the private cloud is the most costly kind of cloud (Géczy, Izumi, and Hasida, 2012).

At the point when a business utilizes a crossover cloud, the business claims its center data innovation assets and services and will have and give the assets and services in-house (Géczy, Izumi, and Hasida, 2012). Non-basic services are rethought and kept up with on a public cloud (Géczy, Izumi, and Hasida, 2012). Normally, center data innovation assets and services are crucial and are frequently classified (Géczy, Izumi, and Hasida, 2012). In this way, assets and services that should be secure are facilitated and kept up with on the private cloud, with the public cloud utilized for different services as an expense saving measure (Géczy, Izumi, and Hasida, 2012).

3. Cloud computing for Big Data Analytics

Cloud computing gives a climate to little to medium measured organizations to carry out big data innovation. Advantages that organizations can understand from big data incorporate execution improvement, dynamic help, and advancement in plans of action, items, and services (Manyika et al., 2011). Three significant explanations behind little to medium estimated organizations to utilize cloud computing for big data innovation execution are the capacity to lessen equipment costs, diminish handling costs, and to test the worth of big data prior to submitting huge organization assets. The significant concerns in regards to cloud computing are security and loss of control.

Platform as a Service is a cloud computing model that gives equipment cost investment funds. Equipment cost investment funds are gathered utilizing PaaS through normalization and high use of the cloud-based platform across various applications (Oracle, 2012). Organizations can likewise acknowledge equipment cost investment funds from the SaaS model since the business brings about no extra equipment costs for execution; the solitary expenses are for data transmission dependent on the time and number of clients (Cole, 2012). Equipment as a Service isn't at present utilized as regularly as different models, yet organizations can determine equipment cost reserve funds through the model since HaaS permits clients to permit the equipment straightforwardly from the service supplier (Rouse, 2007).

In-house handling of big data ordinarily requires utilization of the MapReduce programming worldview (Eaton et al., 2012). The equal handling needs of MapReduce involves a colossal responsibility of preparing power. Utilization of cloud computing for big data execution brings down the in-house handling power responsibility by moving the data preparing to the cloud.

The utilization of big data could give adequate advantage to a little to medium estimated organization to the degree that the business would submit assets to execute big data innovation in- house. Notwithstanding, the degree of advantage is hard to decide without some experience. Cloud computing execution of big data handling could furnish the business with defense to take on the innovation in-house. In the event that the advantage gathered from big data use on the cloud is critical, the business has set up motivation to take on the innovation in house. Something else, the business can proceed with cloud computing utilization of big data or depend on its present data preparing climate.

The upsides of cloud computing are tempered by two significant concerns – security and loss of control (Géczy, Izumi, and Hasida, 2012). While the public cloud gives the best costs investment funds, it likewise brings about the best security hazard and loss of control, since the entirety of the organization's big data is moved to the cloud service

supplier (Géczy, Izumi, and Hasida, 2012). In the event that the data being handled is viewed as strategic to the organization, the more costly private cloud, executed in-house, would furnish a safer climate with the organization keeping the crucial data in-house.

4. Implementation for the Cloud

Many aspects of big data require changes to the underlying IaaS cloud:

Support for mixed workloads

Traditionally, IaaS clouds are intended for universally useful jobs, (for example, middleware, application workers, and databases) and work on the rule of union and asset sharing. Nonetheless, big data and analytics responsibilities require extraordinary equipment, particularly with the common nothing engineering of big data frameworks. Certain big data frameworks depend on greatly equal preparing and quick circle I/O. Different arrangements depend on in-memory analytics to address prerequisites for constant investigation. Both of these situations require explicit equipment that isn't found in commonplace IaaS clouds.

Versatility

The immense idea of big data is an effectively perceived test. A current IaaS cloud will in all likelihood should be changed to give the degree of execution and data strength that undertakings require when handling always expanding volumes of data. This requires a major change in the plan of IaaS clouds. The ramifications range from the size of the cloud (number of figure hubs, number of plates per hub, etc) to the sort of organization interfaces utilized, the kind of process hubs utilized, and the partition of traffic between the register hubs.

Quick versatility

Big data even stretches the constraints of versatility given by a customary cloud. It probably won't be adequate to arrangement a VM in less than 60 minutes. Big data frameworks may require a few hundred VMs to be provisioned very quickly.

Systems administration

A proficient organization is vital for a big data group. Organizations in an IaaS cloud should be intended to furnish flexibility with various ways between register hubs for fast data move, and they should have the option to scale to deal with the bigger data volumes and throughput needed to help big data. Devoted organization ways may be needed for various sorts of data. For instance, separate ways may be needed for the trade of client data, big data, and the executives data. Furthermore, IaaS cloud suppliers may have to put resources into growing access organizations to permit quicker paces of data ingestion, and new tooling to ensure that they meet their QoS responsibilities.

Multi-occupancy

Confinement of responsibilities (or the VMs the jobs are running in) gains more noteworthy significance in big data frameworks, where execution is basic and the effect from a problematic adjoining responsibility may be excessively expensive. As well as disengaging VMs, big data arrangements require detachment at the laborer and data hub levels, as well. This is cultivated by utilizing either a circulated asset dealer, like Apache Mesos, or a bunch asset director system, like Apache Y ARN. This asset disengagement additionally empowers layered service level arrangements (SLAs) so that, for instance, creation responsibilities can be given higher need for assets while advancement and test jobs get lower need.

4.1 Big Data and Analytics in the Cloud

Thus, if the cloud computing climate can be altered effectively, big data and cloud can meet up valuably:

- The cloud motor can go about as the orchestrator giving quick flexibility.
- Big data arrangements can fill in as capacity back closes for the cloud picture inventory and huge scope example stockpiling.
- Big data arrangements can be jobs running on the cloud.
- However, for big data and the cloud to cooperate, many changes to the cloud are required:
- Computer chips for big data handling.

A Graphics Processing Unit (GPU) is a profoundly equal computing gadget initially intended for delivering illustrations. GPUs have advanced to become universally useful processors with many centers. They are considered more impressive than average CPUs for executing number juggling escalated (versus memory-concentrated) applications in which similar activities are done on numerous data components in equal design. Late exploration has investigated firmly incorporating CPUs and GPUs on a solitary chip. Thus, one alternative is to make an asset pool with unique process chips for elite computing for big data.

One more alternative of boosting computing limit with regards to big data in the cloud is to make an asset pool with multi-center CPUs, which can accomplish more prominent execution (as far as estimations each second) for every unit of electrical force that is devoured than their single-center reciprocals. With quad-center and hex-center CPUs now ordinary, this is the most alluring and practical approach to make devoted asset pools for big data preparing in a cloud.

Systems administration for big data preparing

With a need to deal with, conceivably, petabytes of multi-organized data with obscure and complex connections, the average organization plan in a cloud framework is as of now not adequate. Unique contemplations are needed for ingesting the data into a Hadoop bunch, with a devoted organization to permit equal preparing calculations, like MapReduce, to rearrange data between the register hubs.

At least the accompanying sorts of organization sections are required:
– Data: Dedicated to MapReduce applications with a transfer speed of 10 GB for lower inactivity and higher data transfer capacity.

– Admin: A different and devoted organization for the board of all figure hubs and traffic not identified with MapReduce.
– Management: A platform for an Integrated Management Module (IMM) (can alternatively share the VLAN subnet with the admin fragment).

Capacity for big data preparing

Probably the biggest change is to the capacity subsystem. These progressions can be tended to twoly:

– Disk Attached Storage (DAS): The process hubs are planned with multi-center item equipment with a huge cluster of nearby plates. The nearby circles don't utilize RAID and are utilized as a container of plates (JBOD). For this situation, underlying excess of big data document frameworks, like Hadoop Distributed File System (HDFS), is utilized since they are reproducing blocks across various hubs.

– A subsequent choice is to utilize another sort of capacity design that permits putting away and getting to data as items rather than records. Maybe than utilizing customary undertaking stockpiling, (for example, stockpiling region organization (SAN) or organization connected capacity (NAS),

which is then pooled and provisioned progressively), IaaS clouds are reached out to arrangement rack-mindful jobs and incorporate help for object stockpiling. A run of the mill IaaS cloud is portrayed on the left and an IaaS cloud that can uphold big data jobs is displayed on the right. The article stockpiling backing of the extended IaaS cloud empowers big data jobs to scale on a level plane and permits the put away items to be gotten to by any hub in the worker racks utilizing a completely qualified Uniform Resource Identifier (URI). Notwithstanding, the essential purpose of this stockpiling isn't to be utilized inside VMs for data handling.

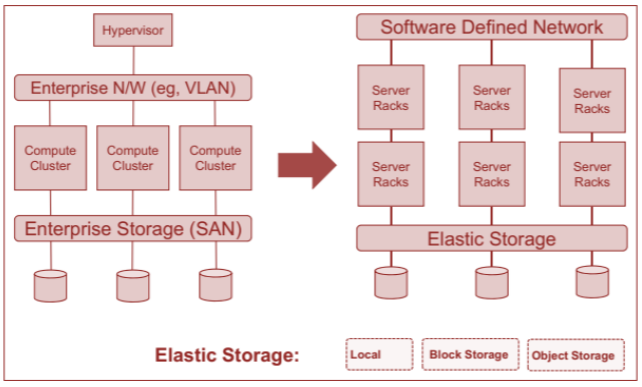

Fig. 1 Traditional versus.

5. Conclusion

Cloud computing enables businesses to implement big data technology with a reduced commitment of company resources. The handling abilities of the big data model could give new bits of knowledge to the business relating to execution improvement, dynamic help, and development in plans of action, items, and services. Advantages of executing big data innovation through cloud computing are cost reserve funds in equipment and preparing, just as the capacity to try different things with big data innovation

prior to making a generous responsibility of organization assets. A few models of cloud computing services are accessible to the organizations to consider, with each model having compromises between the advantage of cost reserve funds and the worries data security and loss of control.

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