

Uses of Cloud Computing Security Measures in Covid Pandemic Situation

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Abstract - Businesses and other organisations have recommended their staff to work from home as a precaution in view of the recent outbreak of the new coronavirus COVID-19. However, due of remote work, employees have been exposed to new security vulnerabilities. Additionally, the number of data gathered from numerous sources has expanded due to the fast worldwide adoption of COVID-19. In order for workers to effectively complete their jobs when working from home, Cloud computing services are the primary method of computing for them. The cloud computing environment (CCE) is an unsung hero in the COVID-19 pandemic tragedy. It comprises of the quick service delivery methods that follow the development of quickly deployable data maintenance apps. Researchers continue to face challenges related to CCE research, including data security, making CCE apps accessible and making it easier for people to utilise CCE apps in their daily lives. It seems to be the first research to evaluate the effects of the COVID-19 pandemic on CCE in more detail. The risks of working from home while the COVID-19 epidemic is underway are also addressed in this article.

Keywords - Cloud Computing, COVID-19, Coronavirus, Big data privacy, Work from home

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INTRODUCTION

The COVID-19 coronavirus epidemic, which began in the Chinese province of Wuhan around the end of 2019, has expanded to every region of the globe and is affecting all aspects of human existence. All aspects of everyday life have been impacted by the pandemic's quick spread and deadly impact. The initial areas that were impacted by the COVID-19 pandemic were people's eating and hygiene habits, their physical proximity to one another, their work and school schedules, and the provision of health services. Due to the growing labor shortages, the manufacturing economy has also suffered on a worldwide scale. As a result, important adjustments have been made to the nations' strategic objectives and economic goals. The other activities were either prohibited or subject to limitations, However, where appropriate, face-to-face activities were shifted to digital platforms. There has been a shift away from traditional classroom education in favour of televised and internet-based virtual classes. Business meetings that used to take place in person have shifted online, and events like conferences and seminars have also been scheduled online.

In fact, using video call techniques, patient-doctor interviews for examinations as well as banking client services have begun to be conducted on digital platforms. The food and beverage industry, which was similarly impacted by these regulations, has begun to exclusively accept package orders. The pandemic has raised interest in electronic commerce platforms, which cater to face-to-face activities like shopping, and e-commerce as a percentage of overall trade volume has expanded dramatically (Güven, 2020). Even internet platforms are used by people to do their food shopping, particularly when weekend curfews are in effect. The proportion and significance of the logistics industry in the nation's economy have expanded as a result of the growth of cargo and transportation services (Kayçolu & Teker, 2020).

Cloud Computing

The term "cloud computing," which has gained popularity in recent years, refers to a technology that enables users to carry out tasks including data processing, application execution, and storage regardless of their physical location. When we talk

about cloud computing, we're talking about services that are always on and always accessible, according to Armutlu and Akçay (2013), may be scaled to meet user demands, and provide the chance to manage resources. Because the term "cloud" is used as an analogy to describe the internet, this technology is related with the idea of clouds (Seyrek, 2011). With its applications like rapid connections, broadband internet, and virtualization, Educators and students alike will see a significant shift as a result of this emerging technology. Most prominent cloud computing service providers are Amazon Web Services, Google Cloud Platform (GCP), Microsoft Azure, IBM, Oracle Cloud and SAP. Cloud computing services are frequently employed in banking, tourism, education, healthcare, and business sectors. With regard to education and healthcare, cloud computing services are being used to implement learning management systems (LMS) and learning platforms in the sectors of education and telemedicine in the healthcare sector.

LITERATURE REVIEW

David Mhlanga (2020) An investigation of how the COVID-19 epidemic affected the push for digital transformation in South African schools was undertaken by researchers. Assumption made by the researchers was that COVID-19's-imposed lockdown halted education in South Africa and throughout the world. The research monitored how often different institutions employed technologies from the Fourth Industrial Revolution (4IR) during the COVID-19 shutdown to gauge the effect. Information was gathered from secondary sources. These findings show that South Africa typically has certain areas of expertise that may push the educational industry into the 4IR, perhaps resulting in greater access. Although this pandemic has caused extensive human suffering, it has also offered an opportunity to examine the triumphs and failures of existing technologies, their costs, and how these technologies may be expanded to enhance access.

Lele A (2019) One of the cutting-edge technologies in every industry, cloud computing is referred to as the kind of computing that is sent through the internet. Using the internet to host and distribute diverse software and services is the core function of cloud computing. Cloud computing offers consumers the primary computational resources as a service based on their needs and requests. Larger storage capacity, high-performance servers, a variety of operating systems for a variety of platforms, and a network are the key computing resources. The user's need for these resources is growing every day, but the biggest disadvantage is security, which is seen as a very

severe issue in cloud computing. This essay has examined a number of clouds computing principles, including architecture, deployment techniques, kinds, and applications, as well as benefits and drawbacks. This paper's major objective is to increase understanding of cloud computing and the problems it presents for research in a variety of fields.

Cemal Aktürk (2021) The current coronavirus epidemic (COVID-19), which began in Wuhan, China at the end of 2019, has expanded around the globe and is affecting all aspects of life. Nearly three million individuals died as a result of the pandemic's worldwide spread, and millions more saw their health worsen. Additionally, curfews and other limitations were implemented to reduce the danger of COVID-19, and there were disruptions to people's communal lives in terms of work and school. In addition to this, personnel planning was modified in both the public and commercial sectors; remote work and flexible working arrangements were introduced. Due to these changes in corporate life, tasks including meetings, interviews, and client visits began to be performed online. The fact that a significant portion of the world's population is involved in education and the workforce and that these activities have been shifted to the online environment has raised interest in internet infrastructure and cloud computing. The foundation of cloud computing is the idea that internet-connected computers can handle tasks including data processing, data storage, and application execution. Along with offering platform services to apps created for the management and course of the pandemic, cloud computing is a digital infrastructure that provides substitute solutions for commercial and educational life throughout the epidemic. During the COVID-19 pandemic phase, the market share and profitability of companies that provide cloud computing services have increased dramatically. The COVID-19 method provides research on cloud computing technology based on these characteristics, and the study underlines the relevance of cloud computing technology. Additionally, the study offers advice to academics and educators who are working with the relevant material.

Gangadhar, V. R (2021) During the shutdown, cloud technology has shown its advantages. Due to a variety of factors, small and medium-sized enterprises are adversely harmed by pandemics. This report contrasts the status of SMEs who were adequately prepared for their digital transformation with those that were not. Installation and customization support is provided by Cloud Service Providers (CSPs). They handle all essential

maintenance and updates throughout the product life cycle. These specific cloud technology benefits for SMEs become increasingly important during the Pandemic crisis. Due to the importance of SMEs to our economy, cloud service providers are developing a variety of solutions to promote their use of cloud technology. Additionally, the pandemic era helped CSPs innovate their offerings. Due to an increase in cyberattacks and an increase in network traffic, optimising code was required for a better user experience. The Covid-19 epidemic has created new possibilities for cloud computing in the healthcare industry. Less social connection and increased everyday use of technological methods of communication have become the new norm. Incorporated with business continuity planning, cloud technology provided a fresh viewpoint during the COVID-19 pandemic. The 24/7 remote accessibility and cloud-based worker collaboration solutions reduce significant risks during natural catastrophes. SMEs who have not previously viewed cloud adoption as a possibility now have a chance to do so.

Pramod Kumar (2020) The trend of digitization in the current era of technology is transforming business globally. A whole new business computational ecosystem is being created as a result of the development of new technologies and breakthroughs. It's common to hear terms like Industry 4.0, blockchain technologies, 3D printing, machine learning, automation and artificial intelligence used by experts throughout the globe. Other sophisticated technologies include cloud computing, which provides near-infinite resources and is one of the most quickly growing technologies. For the sole purpose of familiarizing oneself with how computers operated prior to the introduction of cloud computing Server: Every firm had its own server around two decades ago. A server is a programme or device that makes its services accessible to other programmes or devices in the field of computer science and information technology. A server is simply a large computer with its own hardware, including a strong CPU that is capable of handling extremely high workloads from clients in the workplace. In order to run these servers, an operating system had to be installed on top of them. Everyone in the company will have WAN or LAN access to the information stored on the server, which will hold all of the organization's databases. These servers may hold stock records, transaction logs, application or email service data, or any other kind of data.

METHOD

Impact Of The Covid-19 Outbreak On Cce

In the absence of a new technology that replaces CCE, the link to COVID-19 remains one of continuity. Network services, applications, and IT infrastructure make up the CCE system. Virtualization technologies allow for the sharing of data centre (DC) resources. This is done by using on-demand, elastic, or instantaneous services and pricing. In addition, your power bill will include these. The graphical representation of CCE features is shown in Fig. 1. CCE has a lot of promise with this "computing as a utility" approach, much as electricity, gas, and water do. The potential is enormous with choices like plug and play or even a "pay as you go" approach. Customers are able to choose the infrastructure, platforms, and applications they need. Users do not need to make plans for IT expansion in the near future because of this possibility. Scalability and flexibility as a utility



Figure 1. Schematic definition of CCE.

instant access. As with every technology function, there will be security problems in terms of risks, trust, and hazards. CCE has to increase its security efforts in order to lessen or eliminate all of these flaws. There are two parts to the cloud model: 1) Those who supply cloud services, such as businesses or individuals, and such who utilise those services, such as CSPs. Additional potential components are the cloud broker and cloud auditor. Since more people are using new applications online, more security is required. Platform, hardware, software, and infrastructure are now all provided as a service as part of the CC model, and these service models are now referred to as a particular kind of service delivered. A platform as a service is one of the three categories, the other two being software and infrastructure. There are four distinct deployment models for clouds: Private, public, communal, and hybrid cloud computing are the four different subtypes. Depending on the model, the cloud may be used in a variety of ways. It's possible for clouds to differ in terms of size, services, location, demography, and security. Virtualization technology is used to implement CCE. Between an operating system, hardware, and software stacks lies the virtual machine monitor (VMM), sometimes known

as a hypervisor. Similar to a VMM, a controller is in charge of a system. Multi-tenancy is supported by this controller, which manages hardware resources. Multiple operating systems may run on the same hardware at the same time so that resources can be shared. This is known as multi-tenancy. In Fig. 2, the various models that were utilized to implement CCE are shown.

Customers that use the CC model also have access to solutions that streamline business operations and save costs. Service models like SaaS and PaaS are essential in CCE because of the rise of the COVID-19 pandemic, which requires more individuals to work or study remotely. Blackboard, CenturyTech, ClassDojo, and Google Classroom are among the learning management systems that UNESCO recommends educational institutions employ. Online courses are becoming increasingly popular as more schools and institutions go completely online, and Blackboard has put in place a number of infrastructure measures to help handle the additional traffic during the epidemic.

Businesses were obliged to move their services online in order to prevent the infection from spreading after the coronavirus turned the globe on its head and damaged almost all sectors. Due to government orders to stay at home, the final result was working remotely. As one of CCE's advantages is "pay as you go," using CCE services right immediately is the quick cure rather than investing in servers, software, and storage. The elastic properties of CCE resulted in an unanticipated overload on CCE components, whether legal or unlawful, as a result of their utilisation. Furthermore, it is common for CSP hardware, such as security measures and Internet bandwidth, to be overwhelmed. For instance, Netflix said that because of the congestion, During the outbreak of this disease, the quality of its streaming services will be lowered by 25%.

Security Risks Of Working From Home

The market for such business tactics was rare before the internet consumer enterprises were badly oversaturated. Home-to-X terminology has come to reality as a consequence of COVID-19. These include online learning, digital healthcare, cybersecurity, smart city logistics, teleconferencing, and telecommunications. There has been a steady rise in consumers' use of virtual-only collaboration, learning, and entertainment options since the closure of many office and educational facilities and the rise of stay-at-home demands. As stated in many nations throughout the globe, this "stay-at-home" condition to prevent the spread of this illness is not for a brief time and might

last for months. Therefore, bringing work home is essential for preserving productivity. In other words, both individually and virtually (virtually-together) at home, the work environment is transmitted. On the

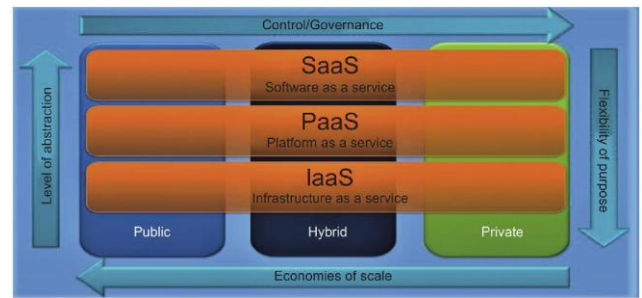


Figure. 2. CCE service models and development models.

On the other side, it will cause unanticipated harm and security problems. Home-to-X security problems may be divided into five new taxonomies, as shown in Fig. 3.

Data Privacy Issues

The COVID-19 situation has now created enormous volumes of data via the transactions of the various industries. Big data is an area that has the potential to grow in the future. There are several sources of data that may be used for medical purposes: patients, the viral genome, medications, clinical trials, social media, and even face-recognition data. All of these data may be cleverly used by researchers to slow the spread of the illness or find a treatment. Data must thus be properly handled and kept. The circumstances that led to this disaster are the present source of concern about this large number of data. There is a rising number of individuals who wish to be able to work from home, which means that they must store, transfer, utilise, and discard data saved on the internet, detachable hard drives, and flash memory cards. Data manipulation, duplication, and hacker exposure are all possible outcomes of any of these data transmission mechanisms. Home computers lack a backup application that can monitor newly added or modified data. The four pillars of data quality are accuracy, completeness, redundancy, and consistency. Regulations must be followed to the letter in order to keep legal issues at bay.

Another issue is the global interchange of data, which is governed by a variety of privacy, data protection, and data integrity laws and regulations in many nations. There is a risk of data loss and jurisdictional issues. If the traffic network gets clogged, the operation may be halted. In addition to

clarifying the location of data storage, additional legal criteria must be specified. Owners of data should be able to determine who has access to and is permitted to use it at all times, regardless of what security measures are put in place. All of the institution's security regulations must be followed to in order to maintain its safety. Although many virtual private networks (VPN) have been branded false and even dangerous, verification of their presence is necessary for data transfer security. As a result, only limited use of the binder should be allowed by both employers and employees. In order to transmit data securely, the communications channel will be encrypted and secured using the Internet protocol security (IPSec) technology. To keep the communications channel from overflowing with electricity, the data handling must be done using simple transport mechanisms.

Internet Quality Issues

One of the main initiatives for a massive and unprecedented digital revolution globally in 2020 is COVID-19. In an instant, the regular workday was replaced by a virtual one. As a result, There have been concerns regarding the future of social media and the internet as a result of its impact on how people use the internet and apps. Due to the unanticipated urgency and demand brought on by the coronavirus outbreak, Internet service providers have experienced some issues (ISPs). When utilizing programs from home, users reflect this in turn. Typically, In order to send music, video, and data efficiently, these apps need a fast Internet connection. Even though the Open Reach data for the same time period is much below the regular evening peaks, it can be seen in Figure 4. Up to 17 Tb/s is possible, and it's considered to be 10 times the average everyday demand.

These are necessary, but once the sessions are established, More than ever, it is essential to retain a high level of expertise. Streaming service quality has been hampered by the fact that millions of Britons are either studying or working from home during this outbreak. Throughout the outbreak, Netflix, which was the most popular streaming service, lowered the quality of its service because to overloads.

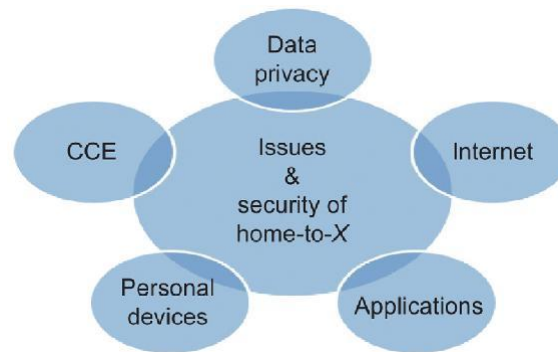


Figure 3. Issues and security issues of working from home.

For now, Internet service providers are reducing their workload by streaming media in standard definition (SD) rather than high definition (HD). Founder Zeus Kerravala (ZK) urged Cisco to use a 20% packet loss to minimise network congestion. Both systems were often brought to a halt by the test data from packet loss. Using the extra bandwidth, they were able to recover more rapidly when Zoom's rate dropped to 360 pixels. Afterward, Cisco decreased the resolution to 360 pixel-per-inch. Webex's algorithms took control when packet loss reached 20% and restored the video resolution to 720 pixels. However, zooming took a little longer than expected, and it did so after the trial time had expired. Figure 5 depicts the bandwidth consumption when Zoom and Webex are used together.

Applications Issues

As a side effect of the COVID-19 epidemic, social isolation has increased. This necessitates working or studying at home. Online meetings, work from home, and distant education are now all part of the mix. With the rapid acceptance of COVID-19, there was an abundance of structured and unstructured data, which necessitated the use of these applications and the need for high processing capacity. The use of several applications puts pressure on businesses to embrace new technology since it is impossible to process this volume of data without enough technical infrastructure and apps. According to a report by the investment firm Yunmi Partners, People can work together remotely even if they aren't physically in the same place, thanks to new technologies for remote collaboration. Among the most popular work applications on WeChat are WeChat Work, Ding Talk, and Lark, a sister app to TikTok. For example, in Fig. 4, the number of downloads and installs for America's Zoom jumped from 180 to 28 in only one month. The application's rapid growth has been

hindered by security weaknesses that have left it open to hackers and piracy.

During this self-quarantine time, ISPs in the UK are providing users with unrestricted access and increased bandwidth to the NHS websites. Customers of mobile and broadband Internet service provider Vodafone will have unrestricted access to NHS websites in the United Kingdom. Three UK mobile, Everything Everywhere Limited, and are all well-known to MailOnline.

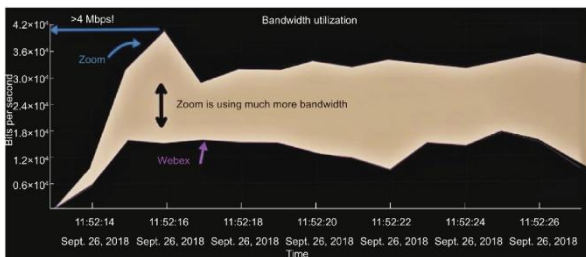


Figure 4. Bandwidth utilization between Zoom and Webex.

The NHS websites will also be accessible for free over O2's network. Phone2O2 UK LP Previously, Netflix said that it will reduce the quality of its streaming services by 25 percent. Responding to changing circumstances and rising interest in playing from home, the Pokémon Go smartphone game is constantly re-engineering itself. Examples of international applications that let people to work from home include the WeChat Work app from Tencent, the Lark app from Byte Dance, and the Ding Talk app from Alibaba. According to Sensor Tower's app rankings, Lark, Ding Talk, and WeChat Work all had a surge in downloads from January to February 2020.

Personal Devices Issues

Because of the coronavirus outbreak, people are repurposing old equipment to work from home. Many people who work from home don't know much about computer technology, much alone the security issues that go along with it. Security problems worsen when personal electronic devices, such as laptops, tablets, and desktop PCs, are reused. It's possible that these devices haven't been used in a while, necessitating upgrades to the operating system, antivirus software, installed applications, etc. Since they have already created harmful software to infiltrate devices, cybercriminals have identified an opportunity to take advantage of individuals. When accessing the servers at CCE for the purposes of using online programmes and downloading updates, all of these devices run the risk of being infected with malware (Botnets), which might result in serious harm to the devices. As a result

of increased Internet traffic brought on by malware, distributed denial of service (DDoS) assaults may occur.

CCE

As the viral epidemic expands around the world, more people will face social isolation, work-from-home circumstances, and other disturbances to their daily lives. When it comes to working from home, CCE is an underappreciated pioneer. Data storage and analysis systems must be able to handle a wide range of data collection and analysis speeds, but their scalability depends on the availability of necessary IT infrastructure. It is because to public cloud computing and its related technologies that we are seeing such a dramatic shift in the workplace and education. The valuation of many CCE stocks, including Zoom, will rise during the next quarters. The revenues of RingCentral, Inc., which provides a cloud-based set of communications capabilities, climbed 34% to \$902 million. In order to speed up the development of testing, CCE credits have been promised by AWS for the monitoring and study of the problem. Free use of its CCE is a way of doing this for them. The event is being attended by 35 businesses and labs.

To help fight this disease, Alibaba has provided its assistance because its cloud revenue topped 10 billion yuan for the first time. It grew by 62% in the third quarter (Q3) to 10.72 billion yuan. COVID-19 has affected almost every business, including tourism, healthcare, education, and CSPs. Many educational institutions have been forced to switch from conventional learning to distant learning as a result of this epidemic. In order to attend lectures and other classes at colleges and universities, students no longer visit the campus. To maintain contacts between professors and students during breaks, online distance learning services are crucial. Software developers' internet resources are essential in assisting all industries operating firms in these challenging and complicated times. Potentially even more work will go to internet apps' services as the scenario develops. In order to satisfy company demands and prevent financial losses, especially for education, they must act quickly. As a result, software has to be purchased by the education sector to enable uninterrupted remote instruction.

Table 1 Advantages and disadvantages of CCE characteristics.

CCE characteristics	Advantage	Disadvantage
On-demand self-service	Any time	-
Security	50% secure	50% not secure
Time to run service	Real time	-
Service availability	99.99%	Unexpected issues with X attacks
Resources expandable of VM	Elastic	Issues elastic with X attacks
Resources expandable of CCE	Scalability	-
Resources type	Heterogeneous	-
Environment work	Virtualization	-
Services cost	Low pay-as-you-use	High with X attacks
CCE down time	99.99% running	Unexpected issues down (electricity outages, X attacks)

Additionally, it offers an application development platform and online software. Mobile devices, including personal computers and smart gadgets, may connect to a website hosted in CC that is open for daily access. Cyberattacks show that CCE currently has a number of security concerns. The Cloud Security Alliance (CSA) claims that these assaults demonstrate how harmful DDoS attacks may be for CCE security. A very serious danger exists from DDoS attacks. As a result, by giving CCE security, you also provide CCE security over the website it hosts. A number of CCE's features, which are critical to web application services, might be dangerous if exploited by malicious attackers. Customers and CSPs both benefit from ensuring their rights are protected. A good example of this is the creation of a service level agreement (SLA) to ensure the quality of the service. The service level agreement (SLA) describes how a provider will provide a set of services and how the consumer will utilise those services. Each party's obligations and legal rights are all spelled out in detail.

CCE is a distributed service-oriented paradigm with a sizable infrastructure that consists of multi-domain, multi-operating, and multi-user systems. It often has greater protection against dangers and weaknesses, including DDoS and Edo's assaults. The possibility of resources being over-provisioned is one of the concerns. Over-provisioning may result in a denial-of-service situation because resources may not be available. Those who do their business from afar will feel the brunt of this. There are a variety of CCE VM users who may use the same or different physical hosts at the CCE centre since virtual machines (VMs) are used to provide virtual infrastructure. As a result, DoS/DDoS attacks may be successful against CCE. If an infected VM attempts a service denial assault on the physical host, it will have an effect on all the other VMs on that host as well. A DDoS attack is different from a DoS attack since it employs a network of resources instead of a single source.

CONCLUSION

Because to the COVID-19 epidemic, there is now a far greater reliance on CC apps and other technology. Tourism, healthcare, education, and other industries have all been affected by this pandemic crisis. COVID-19 is also being addressed as a precautionary measure, working from home could become more

prevalent in the long run. the disease. The number of data gathered from numerous sources has expanded along with the fast worldwide expansion of COVID-19. The growth in the as a result of the increased data volume, new surroundings, unique technologies, more data storage systems, and storage methods are required. The study also examines the security hazards associated with working from home. Due to the existing state of affairs' potential for exposing CCE and its users to various forms of assaults and of readiness to handle such an unexpected circumstance. Attacks like Edo's may be common for CCE during the COVID-19 era. Users who use unreliable Internet apps on their own home computers that may not have been updated or patched with the most recent security measures may be susceptible to various forms of assaults. Consequently, home-based employees may become the large volumes of data may be readily stolen (copied) by attackers. Therefore, addressing the security threats that CCE and its users face, as well as increasing users' awareness of the hazards connected with working from an unsecured Internet connection at home, is critical.

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