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CLOUD COMPUTING

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ABSTRACT: This article explores and describes Cloud computing and the new shift that rises with it. Elucidating the challenges of Information Technology, this study finds that Cloud computing is a bypass that interconnect every sphere of our life and business. Cloud computing as a result of diffrent actions, and capacities have their own limitations. Professional discourse community affiliations deppendes on our engagement. and complex power relations. Cloud computing was created as a desire of IT experts to increase capacity and add a new capability to their own systems without investing in new infrastructure and the need to train new staff and / or purchase new licensed programs. The advent of Cloud computing increases the capabilities of IT. Advances in computer and telecommunications technologies have improved the capabilities of data transmission, storage, protection, processing, and security. Analysts and experts dealing with security and cloud computing still have different ways of understanding and defining it. Implications for research and about cloud computing are explored in this article.

KEYWORDS: Information technology/IT, Cloud, Cloud computing

I. INTRODUCTION

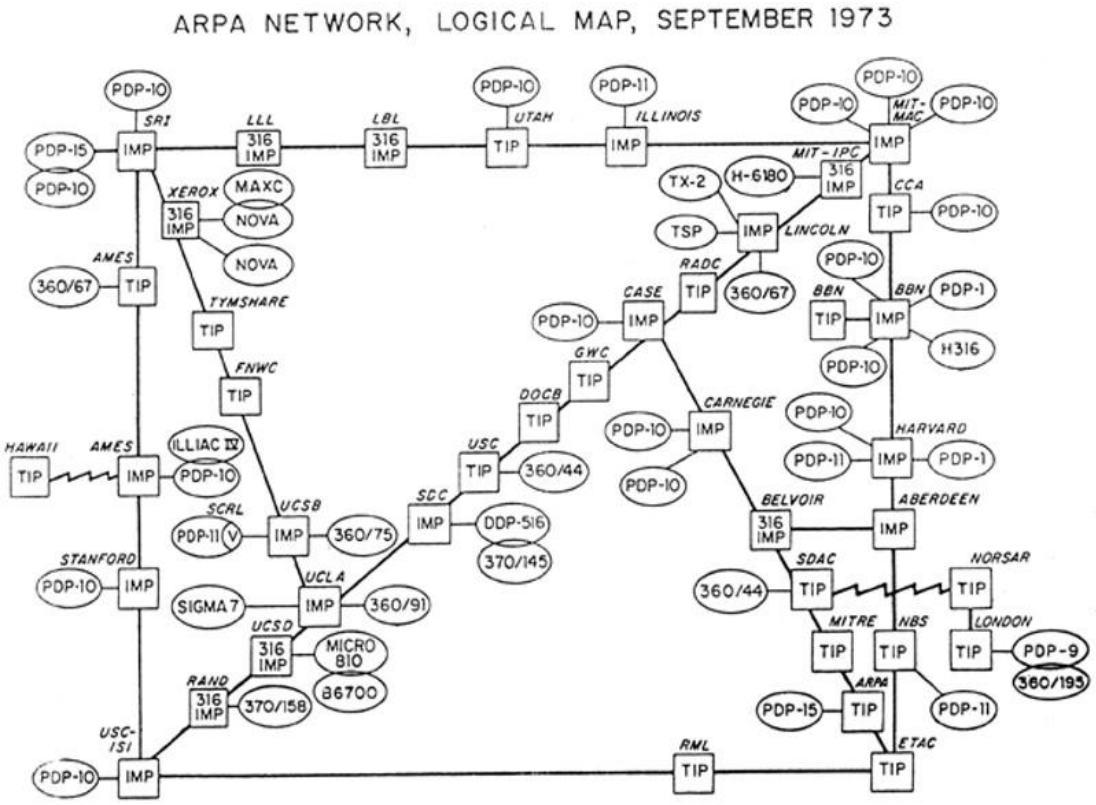
Cloud computing is the availability of on-demand computing systems, especially data storage and computing power, without direct active management by users. The term is generally used to describe data centers available to many users via the Internet. Large clouds, often have functions distributed in more locations than central servers. If the connection to the user is relatively close, it can be marked as a marginal server. Clouds can be limited to a single organization (enterprise cloud), available to many organizations (public cloud), or a combination of both (hybrid cloud). Cloud computing relies on resource sharing to achieve coherence and economies of scale of resources used. Technology is increasingly moving into the so-called cloud It's not just a fashion - the transition from traditional software models to software as a service, or SaaS, has been gaining momentum over the past ten years. Looking ahead, the next decade of cloud computing promises even more ways to collaborate from anywhere, using mobile devices. If we ask a question - what is cloud computing, we can provide this answer - cloud computing is a type of outsourcing, data storage and processing. Users access applications and files by logging in from any device that has Internet access. Information and programs are organized by outsiders and are located on a global network of secure data centers, rather than on a user's hard drive. This frees up processing power, facilitates sharing and collaboration, and provides secure remote access no matter where the user is or which device is being used. Cloud computing is a more efficient way to deliver computing resources. With Cloud computing, and subscription-based service environments - users pay a monthly fee instead of buying licenses. Software and platforms are managed by the provider and are constantly updated for maximum performance and security. Computer power is remote instead of centralized, so users can take advantage of additional capacity if jobs are on the rise and further developed. Multiple people can access a shared program or file and collaborate in a real time from different locations. Proponents of public and hybrid clouds note that cloud computing allows companies to avoid or minimize IT infrastructure costs, that is, to avoid investment costs in infrastructure. There is a shift that argues that Cloud computing allows businesses to use their applications faster, with improved manageability and less maintenance, and that it allows IT teams to tailor resources more quickly to meet fluctuating and unpredictable demand. Cloud providers typically use a "pay-as-you-go" model, which can lead to unexpected operating costs if administrators / users are unfamiliar with cloud pricing models.

The essence of Cloud computing is to enable users to take advantage of all these new technologies, without the need for deep knowledge or expertise for each of them. The cloud aims to reduce costs and help customers focus on their core business, rather than being hampered by IT barriers. The main technology for cloud computing is

virtualization. Virtualization software separates a physical computing device into one or more "virtual" devices, each of which can be easily used and managed to perform computational tasks. With operating system-level virtualization, which essentially creates a scalable system of multiple independent computing devices, unusable computing resources can be allocated and used more efficiently. Virtualization provides the agility needed to accelerate IT operations and reduces costs by increasing infrastructure usage. Autonomous computing automates the process through which a user can provide resources on demand. By minimizing user involvement, automation speeds up the process, reduces labor costs, and reduces the possibility of human error. Cloud computing use a concept from service computing to provide metrics for the services used. Cloud computing tries to solve QoS (Quality of Service) and reliability problems of other computer network models. Cloud computing was popularized by Amazon.com which released its Elastic Compute Cloud product in 2006, references to the term "cloud computing" appeared as early as 1996, with the first known mention in Compaq's internal document.

The cloud symbol has been used to represent computer equipment networks in the original ARPANET since 1977. and CSNET until 1981 - both the predecessor and the Internet itself. The word cloud was used as a metaphor for the internet, and a standardized cloud-like form was used to denote the network on telephone schemes. More exploration about cloud computing will be present in the chapters as it follows.

Early history: During the 1960s, the initial concepts of time sharing became popular through the Remote Job Entry. This terminology has been mostly associated with a large manufacturer such as IBM and DEC. Full-time sharing solutions were available in the early 1970s on Multics platforms (on GE hardware), Cambridge CTSS, and the earliest UNIX ports (on DEC hardware). Yet the "data center" model in which customers sent jobs to operators to work on IBM mainframes was predominantly prevalent.



Picture-logical map of ARPANET from 1973.1

During the 1990s, telecommunications companies, which had previously offered primarily point-to-point data sets, began offering virtual private network (VPN) services with comparable quality of service, but on a lower cost. By shifting traffic as they saw fit to balance server usage, they could use network bandwidth more efficiently.

[1] Source : https://www.computerhistory.org/internethistory/1970s/

They started using the symbol in the cloud to mark the point of demarcation between what the provider was responsible for and what part the users was responsible for. Cloud computing has expanded this boundary to include all servers as well as network infrastructure. As computers became more diffuse, scientists and technologists explored ways to make great computing power available to more users through time exchange. They experimented with algorithms to optimize infrastructure, platforms, and applications to prioritize processors and increase efficiency for end users. Cloud computing has been around since 2000. In August 2006, Amazon established a subsidiary of Amazon Web Services and introduced its Elastic Compute Cloud (EC2). In April 2008, Google released the Google App Engine in beta. In early 2008, NASA's OpenNebula, enhanced in the European Commission-funded RESERVOIR project, became the first open-source software for the deployment of private and hybrid clouds and for the cloud federation.

By the mid-2008, Gartner saw an opportunity for cloud computing "to shape the relationship between consumers of IT services, those who use IT services, and those who sell them" and noted that "organizations are moving from a company-owned hardware and software resources to use by service-based models "so will" a projected shift toward computing, which will result in dramatic growth in IT products in some areas and significant reductions in other areas. In 2008, the U.S. National Science Foundation launched a cluster research program to fund academic research using Google-IBM technology to analyze large amounts of data

What is a cloud?

Picture –cloud2

Cloud is a very commonly used metaphor for a set of data centers. When it is used in conjunction with the term "computing", the term takes on a new meaning. There are several types of different definitions of cloud computing. We get the main access to our own data by accessing the "cloud", which takes place through web browsers or applications designed to access the "cloud". The term Cloud computing is evolving and will not stop with its changes. Its definitions, examples of use, technologies that support it, problems, risks and benefits will be constantly updated through various future technologies and ways of maintaining them. One of the main characteristics of the cloud is agility for organizations, because cloud computing can increase user flexibility in

[2] Source: *https://mind-core.com/wp-content/uploads/2019/03/cloud-computing-made-simple-1024x638.png*

re-providing, adding or expanding technology infrastructure resources. Cost reduction is required by cloud providers. The public cloud delivery model converts capital costs (e.g., server purchases) into operating costs. This reportedly reduces barriers to cloud entry, as the infrastructure is usually provided by a third party and does not have to be purchased for one-time or infrequent intensive computing tasks. The price based on utility computers, as it is often called, is "fine-grained", with usage-based billing options. Likewise, less in-house IT skills are required to implement projects that use cloud computing. The state-of-the-art e-FISCAL project repositories contain several articles that discuss cost aspects in more detail, most of which conclude that cost savings depend on the type of activities supported and the type of infrastructure available. Device and location independence allows users to access systems using a web browser regardless of their location or the device they use (e.g. PC, mobile phone). Because the infrastructure is off-site (usually provided by a third party) and accessed over the Internet, users can connect to it from anywhere. Maintaining cloud computing applications is easier because they do not have to be installed on every user's computer and can be accessed from different locations (e.g. different work locations while traveling, etc.).

Multitenancy enables the sharing of resources and costs across a large number of users, which enables:

• centralization of infrastructure in locations with lower costs (such as real estate, electricity, etc.);

• peak load capacity is increased (users do not need engineering and payment for resources and equipment to meet their highest possible load levels);

• usage and efficiency improvements for systems, which are often used only 10-20%.

Performance is monitored by IT professionals on the part of service providers, and consistent and loosely connected architectures are created using web services as a system interface. Productivity can be increased when multiple users can work on the same data at the same time, instead of waiting to be saved and emailed. Time can be saved because information does not have to be re-entered when the fields are paired, nor do users have to install application software updates on their computer. Reliability is enhanced by the use of multiple redundant locations, making a well-designed cloud computing environment conducive to business continuity and disaster recovery. Scaliability and resilience of the service is provided through a dynamic ("on-demand") environment based on a self-service basis in near real time (Note - VM startup time varies by VM type, location, OS and cloud providers), without users having to work for peak loads. This gives the possibility of scaling when there is a need to increase or decrease, if resources are not used. New approaches to elasticity management include the use of machine learning techniques to propose efficient elasticity models. Security can be improved due to data centralization, increased security-focused resources, etc., but concerns may persist due to loss of control over certain sensitive data and lack of security for stored cores. Security is often just as good or better than other traditional systems, in part because service providers are able to devote resources to solving security problems, which many clients cannot afford or that lack the technical skills to solve.

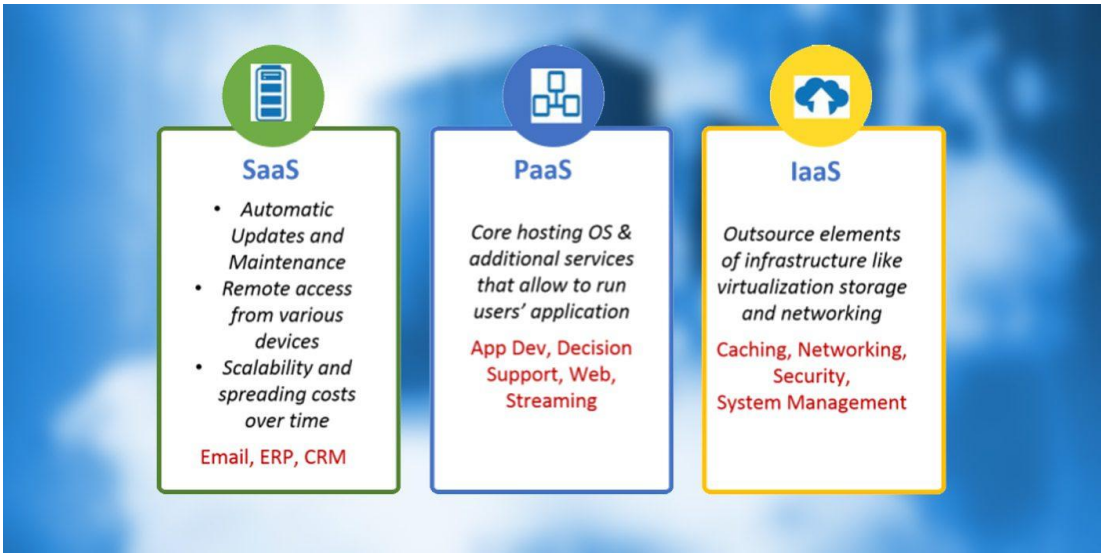
However, the complexity of security is greatly increased when the data is distributed over a wider area or across multiple devices, as well as in multi-company systems, shared by unrelated users. In addition, user access to security audit logs can be difficult or impossible. Private cloud installations are partly motivated by the desire of users to maintain control over the infrastructure and avoid losing control over information security.

The National Institute of Standards and Technology, in defining cloud computing, identifies "five essential characteristics": Self-service on request. The consumer can unilaterally provide computing capabilities, such as server time and network storage, as needed, automatically without the need for human interaction with each service provider. Wide area access. The capabilities are available over the network and are available through standard mechanisms, which promote the use of heterogeneous client platforms (e.g. mobile phones, tablets, laptops and workstations). Pooling resources. Provider computing resources are pooled to serve multiple consumers using a multiple-user model, with different physical and virtual resources, which are dynamically allocated and reallocated according to consumer demand. Fast elasticity. Capabilities can be resiliently secured and released, in some cases automatically, in order to expand rapidly outwards and inwards, in proportion to demand. To consumers, the options available for booking often seem limitless and can be appropriated at any time in any quantity. Measured service. Cloud systems automatically control and optimize resource usage using the ability to measure at a certain level of abstraction appropriate to the type of service (e.g., storage, processing,

bandwidth, and active user accounts). The use of resources can be monitored, controlled and reported, ensuring transparency for both the provider and the service user.

II. SERVICE MODEL OF CLOUD

Although the service-oriented architecture advocates "everything as a service" (with the acronyms EaaS or XaaS, or simply aas), cloud computing providers offer their "services" according to different models, three of which are standard NIST models: infrastructure as a service (IaaS), platform as a service (PaaS) and software as a service (SaaS). These models offer increasing abstraction - they are therefore often presented as layers: infrastructure, platform and software as a service, but they do not have to be connected. For example, a SaaS implemented on physical machines (bare metal) can be provided without the use of basic PaaS or IaaS layers and vice versa, a program can be run on IaaS and accessed directly, without wrapping it as SaaS.



Picture-servise model of cloud3

INFRASTRUCTURE AS A SERVICE (IAAS) : Infrastructure as a Service "(IaaS) refers to online services that provide a high-level APIs, which are used to dereference various low-level details of the underlying network infrastructure, such as physical computing resources, location, data partitioning, scaling, security, backup etc. Various hypervisors within the cloud operating system can support a large number of virtual machines and the ability to scale services up and down according to different user requirements.Linux containers work in isolated partitions of a single Linux kernel, which runs directly on physical hardware.Linux cgroups and namespaces are the core Linux core technologies used to isolate, protect and manage containers.Containerization offers better performance than virtualization because there is no additional hypervisor load.Also, container capacity changes dynamically with computer load, which eliminates the problem of over-reservation and allows charge for new to use. IaaS clouds often offer additional resources, such as a virtual machine disk image library, a raw file storage block, file or object storage, a firewall, load balancers, IP addresses, virtual local area networks (VLANs), and software packages. NIST's definition of cloud computing describes IaaS as "where the consumer is able to deploy and run arbitrary software, which may include operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure, but has control over operating systems, storage and applied applications and possibly limited control of selected network components. " IaaS-cloud providers supply these resources on demand from their large groups of equipment installed in data centers. To connect to a wide area, users can use the Internet or cloud media (dedicated virtual private networks). To deploy their applications, users

[3] Source: https://www.cloudoptics.io/development/2017/11/07/understanding-shared-security-responsibility-model-of-public-cloud/

in the cloud install operating system images and their application software on the cloud infrastructure. In this model, the cloud user patches and maintains operating systems and application software. Cloud providers typically account for IaaS services based on service computing: costs reflect the amount of resources allocated and spent.

III. PLATFORM AS A SERVICE (PAAS)

Paas is the opportunity provided to the consumer and applies to cloud-created applications or created applications that are created using programming languages, libraries, services and tools supported by the provider. The consumer does not manage or control the underlying cloud infrastructure, including network, servers, operating systems, or storage, but has control over the applications implemented and possibly the configuration settings for the application hosting environment. PaaS vendors offer a development environment for application developers. The provider typically develops development tools and standards and distribution and payment channels. In PaaS models, cloud providers provide a computing platform, usually including an operating system, a programming language execution environment, a database, and a web server. Developers develop and run their software on a cloud platform instead of directly purchasing and managing the underlying hardware and software layers. With some PaaS, basic computing and storage resources automatically match to meet application requirements, so the cloud user does not have to manually allocate resources. Some data integration and management vendors also use specialized PaaS applications as data delivery models. Examples include iPaaS (integration platform as a service) and dPaaS (data platform as a service). iPaaS allows users to develop, execute, and manage integration streams. Under the iPaaS integration model, users initiate the development and implementation of integrations without installing or managing any hardware or middleware. dPaaS delivers integration and data management products as a fully managed service. Under the dPaaS model, the PaaS provider, not the customer, manages program development and execution by building applications for clients. dPaaS users access data through a data visualization tool.

SOFTWARE AS A SERVICE (SAAS) : The opportunity provided to the consumer is to use provider applications that run on the cloud infrastructure. Applications can be accessed from a variety of client devices through a client interface, such as a web browser (e.g., Web-based email) or a program interface. The consumer does not manage or control the underlying cloud infrastructure, including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific user configuration settings. In the software-as-a-service (SaaS) model, users gain access to application software and databases. Cloud service providers manage the infrastructure and platforms that run applications. SaaS is sometimes referred to as "software on demand" and is usually paid on a "pay per use" basis or a subscription is used. In the SaaS model, cloud providers install and manage cloud application software, and cloud users access cloud software. Cloud users do not manage the cloud infrastructure and platform on which the application runs. This eliminates the need to install and run the application on cloud users' computers, which simplifies maintenance and support. Cloud applications differ from other applications in their scalability - which can be achieved by cloning tasks to multiple virtual machines at runtime to meet changing work needs. Load balancers distribute work across a set of virtual machines. This process is transparent to the user in the cloud, who sees only one access point. To accommodate a large number of cloud users, cloud applications can be multitenant, meaning that each machine can serve more than one cloud user organization.

The pricing model for SaaS applications is usually a monthly or annual flat fee per user, so prices become scalable and adjustable if users are added or removed at any time. Proponents argue that SaaS gives a business entity the potential to reduce IT operating costs by outsourcing hardware and software to maintain and support cloud services. This allows businesses to shift the cost of IT operations away from hardware / software spending and staff costs, towards meeting other goals. In addition, with central applications, updates can be published without the need for users to install new software. One disadvantage of SaaS comes with storing user data on a cloud server. As a result, unauthorized access to data could occur if adequate protection mechanisms do not exist.

MOBILE "BACKEND" AS A SERVICE (MBAAS) : In the mobile "backend" as a service model, also known as the backend as a service (BaaS), a web application and a mobile application development program have a way to connect their applications to cloud storage and cloud computing services. Services include customer management, push notifications, integration with social networking services and more. This is a relatively new model in cloud computing, with most BaaS start-ups from 2011 or later, but trends suggest that these services are gaining significant mainstream traction with corporate consumers.

IV. SERVERLESS COMPUTING

Serverless computing is a cloud code execution model in which a cloud service provider fully manages the startup and shutdown of virtual machines as needed to serve requests, and requests are charged by an abstract measure of the resources needed to meet requests, not by virtual machine, by the hour. . Despite the name, it doesn't actually involve running code without a server. Serverless computing is so named because the business or person who owns the system does not have to buy, rent, or provide servers or virtual machines to run the back-end code.

FUNCTION AS A SERVICE (FAAS) : A function as a service (FaaS) is a remote procedural call hosted by a service, which uses server-free computing, to allow the setting of individual functions in the cloud that are triggered in response to events. FaaS is included in the broader server-free computation term, but expressions can also be used interchangeably.

6 big companies that succeeded with cloud computing4

In the business world, many SME as well as large companies succeeded in with the cloud computing, but the data shows that these companies really did it:

1.General electric –began with digital transformation in 2014, and a few years later give their hand to Amazon web service as a favorite provider for host 2.000 cloud based apps and services.

2.Kroger- as a grocery retail keeps a many projects in the cloud. Their providers are Amazon and Microsoft.

3.Hoteltonight-they have many options for, aas well as hiring a lot of cloud-related positions.

4.eBay-in 2018. eBay begin to use Google cloud options, and they can access to google options from the different places in the world.

5.Meals on Wheels-nonprofit organization that use Microsoft 365 and provides services to large number of people, in one point of the work, they save up more then 500.000 US dollars.

6.Fitbit-smart watch brands that begin to use cloud computing in 2019, in order to appeal to more people.

As the examples shows, many profit and nonprofit organization use a cloud computing. It is because there is more advantages then disadvantages, such as: flexibility, efficiency, strategic values, etc.

V. CONCLUSION

In todays digital world when SME companies want to have smaller hardware and maintenance expenses and their own infrastructure, and large companies want to decrease financial expenses, the question that arises is which solutions are suitable for each type of user - both small and large, without everyone having a minimum capital investment. The answer to this question is given by cloud technologies on which cloud services are based. Throughout history, it has been obvious that this type of service should have emerged, given the rapidly expanding IT industry that requires very fast responses and solving technical problems, with as little financial outlay as possible. Currently in the world there are three (main) competitors in the provision of cloud services and they have similarities and differences, but according to all available information, they have worked and continue to work to increase reliability in providing their own cloud services. However, it is commendable to say that Bosnia and Herzegovina also has its own cloud providers and that from the aspect of offering cloud services it is absolutely not lagging behind, both technologically and in terms of price.

All this is supported by the fact that Cloud services themselves are much more reliable than the user has their own infrastructure, and although they also face certain challenges and vulnerabilities. Day to day, it is working on improvements which is usually not the case with on-site infrastructure. This directly proves the hypothesis that end users should switch to the use of cloud services and cloud technologies, since they are widely used in the world, and require very little investment, are easy to maintain and it is easier for users to scale services with aspects of their quantity (both increase and decrease). Due to the extremely high cost-effectiveness of cloud services themselves, and the high level of reliability, each user should consider using them to optimize their own IT processes, as well as significant financial savings.

[4] Source: https://www.smartdatacollective.com/6-big-companies-that-succeeded-with-cloud-computing/

So, are you ready for the Cloud?

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