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Cloud Computing

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Abstract: ***"Cloud" computing – a relatively recent term, defines the paths ahead in computer science world. Being built on decades of research it utilizes all recent achievements in virtualization, distributed computing, utility computing, and networking. It implies a service oriented architecture through offering software's and platforms as services, reduced information technology overhead for the end-user, great flexibility, reduced total cost of ownership, on demand services and many other things. This paper is a brief survey based of readings on "cloud" computing and it tries to address, and future works. Cloud Computing frequently is taken to be a term that simply renames common technologies and techniques that we have come to know in IT. It may be interpreted to mean data centre hosting and then subsequently dismissed without catching the improvements to hosting called utility computing that permit near real-time, policy-based control of computing resources.***
Keywords:- computing,virtualization,workflow, service-oriented

I. INTRODUCTION

Cloud computing is the next generation in computation. Maybe Clouds can save the world; possibly people can have everything they need on the cloud. Cloud computing is the next natural step in the evolution of on-demand information technology services and products. The Cloud is a metaphor for the Internet, based on how it is depicted in computer network diagrams, and is an abstraction for the complex infrastructure it conceals. It is a style of computing in which IT-related capabilities are provided "as a service", allowing users to access technology-enabled services from the Internet (i.e., the Cloud) without knowledge of, expertise with, or control over the technology infrastructure that supports them.

Email was probably the first service on the "cloud". As the computing industry shifts toward providing Platform as a Service (PaaS) and Software as a Service (SaaS) for consumers and enterprises to access on demand regardless of time and location, there will be an increase in the number of Cloud platforms available. But it seems that Cloud computing cannot save the universe. Cloud computing cannot run for President. Cloud computing is a very specific type of computing that has very specific benefits. But it has specific negatives as well. And it does not serve the needs of real businesses to hear only the hype about cloud computing – both positive and negative. One thing that is hoped to be accomplished with this paper is not only a clear picture of what the cloud does extremely well and a brief overview of them, but also a short survey on their criteria and challenges ahead of them.computing represents a different way to architect and remotely manage computing resources. One has only to establish an account with Microsoft or Amazon or Google to begin building and deploying

application systems into a cloud. These systems can be, but certainly are not restricted to being, simplistic. They can be web

applications that require only http services. They might require a relational database. They might require web service infrastructure and message queues. There might be need to interoperate with CRM or e-commerce application services, necessitating construction of a custom technology stack to deploy into the cloud if these services are not already provided there. They might require the use of new types of persistent storage that might never have to be replicated because the new storage technologies build in required reliability. They might require the remote hosting and use of custom or 3rd party software systems. And they might require the capability to programmatically increase or decrease computing resources as a function of business intelligence about resource demand using virtualization. While not all of these capabilities exist in today's clouds, nor are all that do exist fully automated, a good portion of them can be provisioned.

II. BACKGROUND

A. Cyber infrastructure

"The comprehensive infrastructure needed to capitalize on dramatic advances in information technology has been termed cyber infrastructure" . The term "cyber infrastructure" describes the new research environments that support advanced data acquisition, data storage, data management, data integration, data mining, data visualization and other computing and information processing services over the Internet. In scientific usage, cyber infrastructure is a technological solution to the problem of efficiently connecting data, computers, and people with the goal of enabling derivation of novel scientific theories and knowledge. "Cyber infrastructure makes applications dramatically easier to develop and deploy, thus expanding the feasible scope of applications possible within budget and organizational constraints, and shifting the scientist's and engineer's effort away from information technology development and concentrating it on scientific and engineering research. Cyber infrastructure also increases efficiency, quality, and reliability by capturing commonalities among application needs, and facilitates the efficient sharing of equipment and services".

B. Service Oriented Architecture

SOA is a way of reorganizing a portfolio of previously soloed software applications and support infrastructure into an interconnected set of services, each accessible through standard interfaces and messaging protocols. Once all the elements of enterprise architecture are in place, existing and future applications can access these services as necessary without the need of convoluted point-to-point solutions based on inscrutable proprietary protocols. This architectural approach is particularly applicable when multiple applications running on varied technologies and platforms need to communicate with each other. In this way, enterprises can mix and match services to perform business transactions with minimal programming effort.

C. Workflows

A workflow is a depiction of a sequence of operations, declared as work of a person, work of a simple or complex mechanism, work of a group of persons, work of an organization of staff, or machines. Workflow may be seen as any abstraction of real work, segregated in workshare, work split or whatever types of ordering.

A workflow is a model to represent real work for further assessment, e.g., for describing a reliably repeatable sequence of operations. More abstractly, a workflow is a pattern of activity enabled by a systematic organization of resources, defined roles and mass, energy and information flows, into a work process that can be documented and learned. Workflows are designed to achieve processing intents of some sort, such as physical transformation, service provision, or information processing. A workflow can be represented by a directed graph that represents data-flows that connect loosely and tightly coupled (and often asynchronous) processing components.

D. Virtualization

Virtualization is a framework or methodology of dividing the resources of a computer into multiple execution environments, by applying one or more concepts or technologies such as hardware and software partitioning, time-sharing, partial or complete machine simulation, emulation, quality of service, and many others. It allows abstraction and isolation of lower-level functionalities and underlying hardware.

III. TYPES OF CLOUDS

Cloud providers typically centre on one type of cloud functionality provisioning: Infrastructure, Platform or Software / Application, though there is potentially no restriction to offer multiple types at the same time, which can often be observed in PaaS (Platform as a Service) providers which offer specific applications too, such as Google App Engine in combination with Google Docs. Due this combinatorial capability, these types are also often referred to as "components". This is mostly due to

the fact that some application areas overlap and are therefore difficult to distinguish. As an example, platforms typically have to provide access to resources indirectly, and thus are sometimes confused with infrastructures.

The following list identifies the main types of clouds (currently in use):

A. Cloud) Infrastructure as a Service (IaaS)

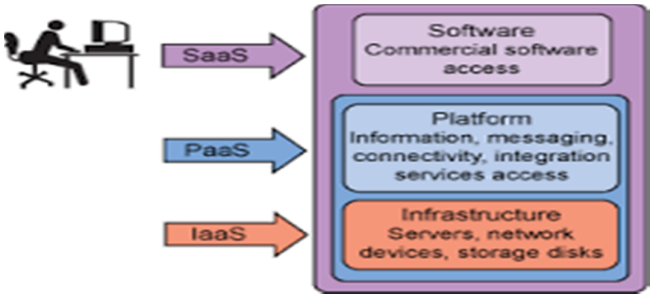
It also referred to as Resource Clouds, provide (managed and scalable) resources as services to the user – in other words, they basically provide enhanced virtualisation capabilities. Accordingly, different resources may be provided via a service interface: Data & Storage Clouds deal with reliable access to data of potentially dynamic size, weighing resource usage with access requirements and / or quality definition. Examples: Amazon S3, SQL Azure. As shown in following fig:-

B. (Cloud) Platform as a Service (PaaS)

It provide computational resources via a platform upon which applications and services can be developed and hosted. PaaS typically makes use of dedicated APIs to control the behaviour of a server hosting engine which executes and replicates the execution according to user requests (e.g. access rate). As each provider exposes his / her own API according to the respective key capabilities, applications developed for one specific cloud provider cannot be moved to another cloud host – there are however attempts to extend generic programming models with cloud capabilities (such as MS Azure). Examples: Force.com, Google App Engine, Windows Azure (Platform).

C. (Clouds) Software as a Service (SaaS)

It also sometimes referred to as Service or Application Cloud are offering implementations of specific business functions and business processes that are provided with specific cloud capabilities, i.e. they provide applications / services using a cloud infrastructure or platform, rather than providing cloud features themselves. Often, kind of standard application software functionality is offered within cloud. Examples: Google Docs, Salesforce CRM, SAP Business by Design. As shown in following fig.



IV. DEPLOYMENT TYPES (CLOUD USAGE)

Similar to P/I/SaaS, clouds may be hosted and employed in different fashions, depending on the use case, respectively the business model of the provider. There has been a tendency of clouds to evolve from private, internal solutions (private clouds) to manage the local infrastructure and the amount of requests e.g. to ensure availability of highly requested data.

We can hence distinguish between the following deployment types:

A. Private Clouds

They are typically owned by the respective enterprise and / or leased. Functionalities are not directly exposed to the customer, though in some cases services with cloud enhanced features may be offered – this is similar to (Cloud) Software as a Service from the customer point of view. Example: eBay.

B. Public Clouds

Enterprises may use cloud functionality from others, respectively offer their own services to users outside of the company. Providing the user with the actual capability to exploit the cloud features for his / her own purposes also allows. Example: Amazon, Google Apps, and Windows Azure.

C. Hybrid Clouds

Hybrid clouds consist of a mixed employment of private and public cloud infrastructures so as to achieve a maximum of cost reduction through outsourcing whilst maintaining the desired degree of control over e.g. sensitive data by employing local private clouds.

D. Community Clouds

Community Clouds as such are still just a vision, though there are already indicators for such development, e.g. through Zimory [12] and RightScale [13]. Community clouds show some overlap with GRIDs technology (see e.g. Reservoir).

E. Special Purpose Clouds

Specialized functionalities are provided e.g. by the Google App Engine which provides specific capabilities dedicated to distributed document management. Similar to general service provisioning (web based or not), it can be expected that future systems will provide even more specialized capabilities to attract individual user areas, due to competition, customer demand and available expertise.

V. PRIVACY & SECURITY IN CLOUDS

Strongly related to the issues concerning legislation and data distribution is the concern of data protection and other potential security holes arising from the fact that the resources are shared between multiple tenants and the location of the resources being potentially unknown. In particular sensitive data or protected applications are critical for outsourcing issues. In some use cases, theinformation that a certain industry is using the infrastructure at all is enough information for industrial espionage.

VI. CLOUD SUPPORT TOOLS

Such tools would cover issues related to:

A. Supporting to build up new platforms easily
B. New programming models and tools that deal with distribution and control
C. Enhanced features for provisioning, including respecting business obligations
D. Improved security and data protection
E. Efficient data management
F. Energy efficiency on all layers
G. Easy mash-ups of clouds exposing a single user interface etc.

VII. CURRENT WORKS

Currently there are various cloud systems on both academic and industrial world are being built. Following is a brief review of what is undergoing presently.

A. Academia

1) Eucalyptus:- Eucalyptus is an open source software framework developed by University of California – Santa Barbara for cloud computing that implements what is commonly referred to as Infrastructure as a Service (IaaS); systems that give users the ability to run and control entire virtual machine instances deployed across a variety physical resources.

2) Nimbus :- Nimbus provides compute capability in the form of Xen virtual machines (VMs) that are deployed on physical nodes of the University of Chicago TeraPort cluster (currently 16 nodes) using the Nimbus software. The Nimbus cloud is available to all members of scientific community wanting to run in the cloud.

B. Enterprise

These days enterprise Clouds consisting of hundreds of thousands of computing nodes are common (Amazon EC2 [27], Google App Engine [15], Microsoft Live Mesh [28]) and hence federating them together leads to a massive scale environment. It seems that all leading IT companies have understood the importance of cloud computing and its great future needs and they are moving toward it no matter what happens.

VIII. CLOUDS IN THE FUTURE INTERNET AND CONCLUSION

The Future Internet covers all research and development activities dedicated to realizing tomorrow's internet, i.e. enhancing a networking infrastructure which integrates all kind of resources, usage domains etc. As such, research related to cloud technologies form a vital part of the Future Internet research agenda. Confusions regarding the aspects covered by cloud computing with respect to the Future Internet mostly arise from the broad scope of characteristics assigned to "clouds", as is the logical consequence of the re-branding boom some years ago. In other words, as a technological realisation driven by an economic proposition, cloud infrastructures would offer capabilities that enable relevant aspects of the future internet, in particular related to scalability, reliability and adaptability. At the same time, the cloud concept addresses multiple facets of these functionalities. Use of cloud services creates a growing interdependence among both public and private sector entities and the individuals served by these entities. This paper provides a snapshot of risk areas specific to cloud services and those that apply more generally in an online environment which clients of cloud service providers should be aware of.

Clouds offer the opportunity to build data observatories with data, software and expertise together to solve problems such as those associated with economic modelling, climate change, terrorism, healthcare and epidemics etc. Clouds could assist greatly in the e-government agenda by providing information in one place to the citizen, together with software to manipulate the data. One of the other aspects of the cloud which is left is the social aspect of it. The Cloud is going to happen but which services should be offered on the cloud and for whom. What happens if smaller IT companies start to offer their services on the cloud and no one uses them?! I believe that everything eventually can move to the Cloud. The question is if users are ready for that and if it's the right move and this need must be addressed.

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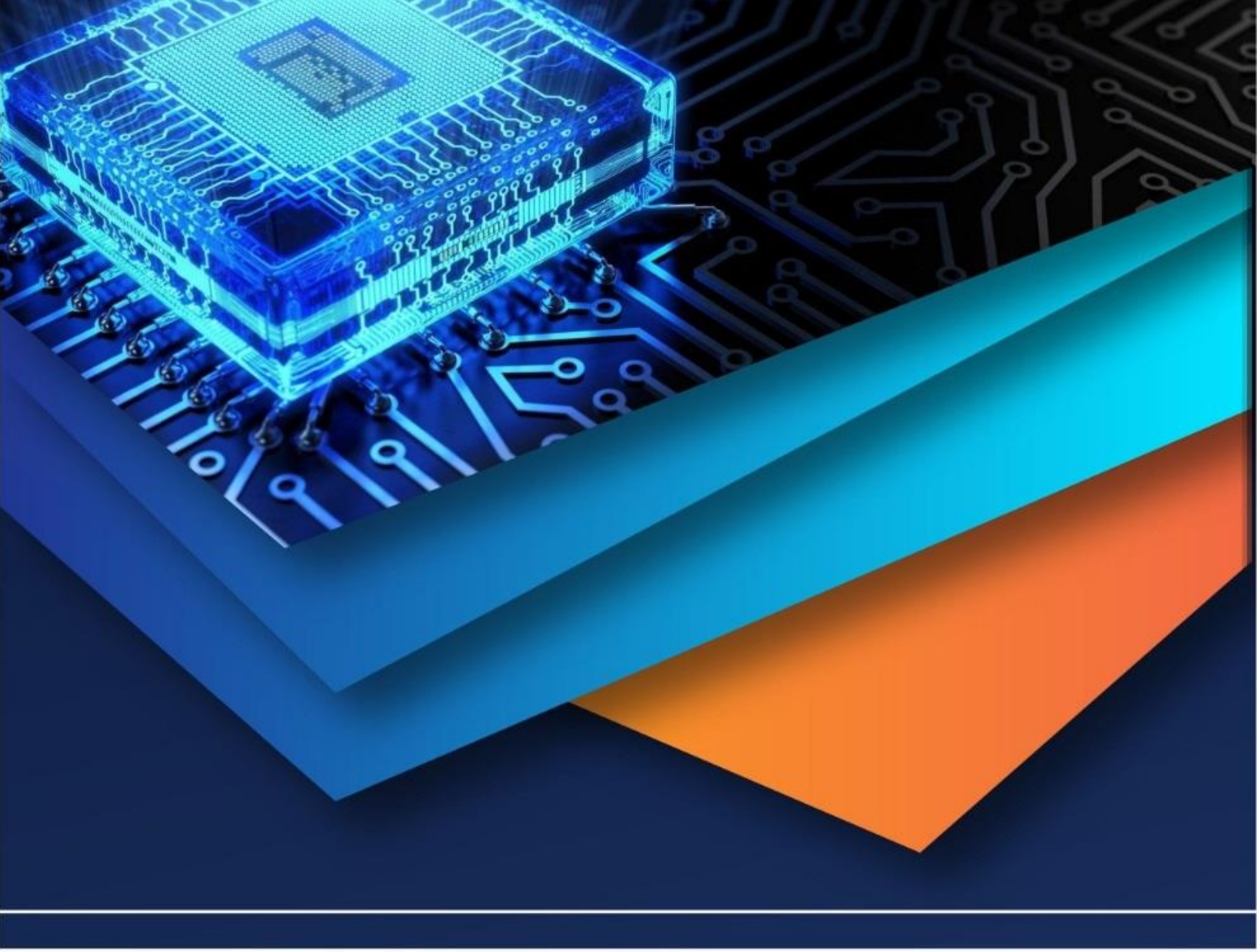

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