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Cloud Computing and Dependency: An ERA of Computing

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Abstract: Cloud Computing offers an entirely new way of looking at IT infrastructure. Cloud Computing system fundamentally provide access to large pools of data and computational resources through a variety of interfaces similar in spirit to existing grid and programming system. Cloud Computing eliminates an up-front commitment by users, thereby allowing agencies to start small and increases hardware resources only when there is an increase in their needs.
Moreover,cloudcomputingprovidestheabilitytopayfor use of computing resources in a short term basis asneeded and release them asneeded. In this paper we focus on architecture, types of cloud services, characteristics, advantages & disadvantages and security of cloud computing.

Keywords:*CloudCompuitng, SaaS, PaaS, IaaS, Security.*

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I. INTRODUCTION

Cloud Computing is the next major computing trend that will match our enterprise and business need as well as personal lifestyle to computing capacity.
Cloud Computing is an emerging paradigm in the computer industry where the compuitng is moved to a cloud of computers. It has become one buzz words of the industry, cloud computing is internet-based computing using shared resources, software & information are provided to computers & others devices on demand, like the electricity grid.
Cloud computing is the outsourcing of your IT infrastructure via the internet rather than maintaing your own hardware and software environment. Cloud computing provides computing resources (such as processor compute time and data storage) on demand via a service provider. Cloud services are often compared in their nature to utility services such as gas or electricity.
According to NIST Cloud Computing is "A model for enabling convenient, on demand network access to a shared pool of configurable computing resources (eg. Networks, servers, storage, application and services) that can be rapidly provisioned and released with minimal management effort or services provider interaction"[1]. Forrester also defines Cloud computing as "A pool of abstracted, highly scalable and managed compute infrastructure capable of hosting end-customer application and billed by consumption".

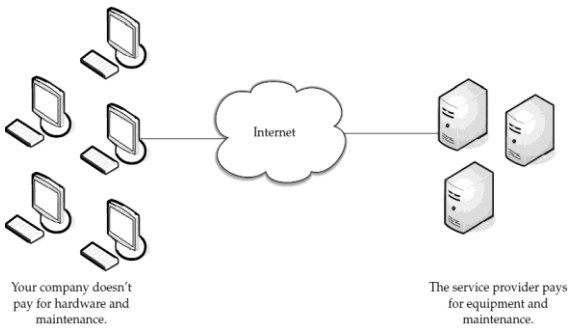

Fig. 1.Cloud Computing BasicDiagram.

Cloud is a term used as a metaphor for the WAN or any such large networked environment. It is a computing paradigm, where a large pool of systems are connected in private or public networks to provide dynamically scalable infrastructure for application, data and file storage. With the advent of this technology, the cost of computation, application hosting, content storage and delivery is reducedsignificantly.

II. ARCHITECTURE REQUIERMENTS OF CLOUD

The architecture required for cloud server environments are many servers with lots of storage that are running virtualization software so that several application programming interfaces (APIs) can be run at once. Virtualization is the key in optimizing server resources, often software noted previously known as VMware isutilized.
This allows for users to have a set standard for performance while running on the cloud, and could be an important factor in application programming instances. It is also important to

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note that most server environments will run a stable open source operating system such as Linux which is preferable to developers because of its inherent stability.Often times IT professionals will map out the architecture of the cloud as something that spills over from existing resources. Others will put the cloud in the middle, with the thin client on one end and the existing infrastructure place on the other side. In this way, the cloud is behaving as a buffer between resources.

This makes the cloud resources more of a "buffer" so that scalability can be utilized. By virtually integrating the cloud into the architecture of the enterprise it is easy to visualize how the cloud can provide for maximum flexibility as well as scalability and harness those resources as they are needed by the enterprise[2].

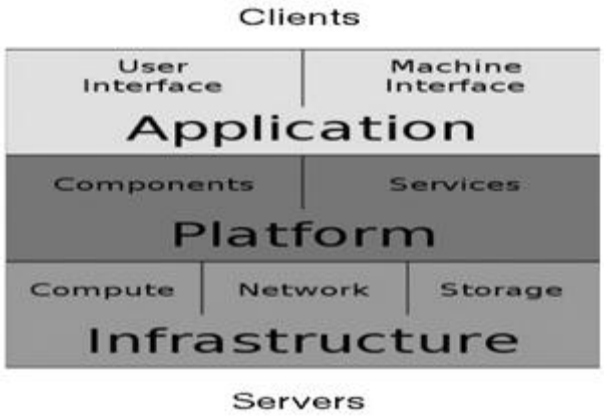

Fig. 2. Architecture Diagram of Cloud Computing.

The major building blocks of the cloud computing architecture are the referenced, technical and deployment operation blocks of architecture[3].

A.Referenced Architecture

1. Basis of documentation, projectcommunication.
2. Stakeholder and teamcommunication.
3. Payment, contract and costmodels.

B.Technical Architecture

1. Structuring according to XaaSStack.
2. Adopting cloud Platformparadigms.
3. Structuring cloud services and cloudcomponents.
4. Showing relationships and externalendpoints.
5. Middleware andcommunication.
6. Management andsecurity.

C.Deployment Operation Architecture

1. Geo-location check (Legal issues, exportcontrol).
2. Operation andmonitoring.

III. TYPES OF CLOUDSERVICES

The term services in cloud computing is the concept of being able to use reusable, fine-grained components across a vendor's network. This is widely known as "as a service."

A.SaaS (Software as a Service)

Is the most widely known and widely used form of cloud computing? It provides all the functions of a sophisticated traditional application to many customers and often thousands of users, but through a Web browser, not a "locally-installed" application. Little or no code is running on the Users local computer and the applications are usually tailored to full fill specific functions. SaaS eliminates customer worries about application servers, storage, application development and related, common concerns of IT.

Highest-profile examples are Salesforce.com, Google's Gmail and Apps, instant messaging from AOL, Yahoo and Google, and VoIP from Vonage and Skype.

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

Deliversvirtualizedserversonwhichcustomerscanrun existing applications or develop new ones without having to worry about maintaining the operating systems, server hardware, load balancing or computing capacity. These vendors provide APIs or development platformstocreateandrunapplicationsinthecloud–

e.g. using the Internet. Managed Service providers with application services provided to IT departments to monitor systems and downstream applications such as virus scanning for e-mail are frequently included in this category.

Well known providers would include Microsoft's Azure, Salesforce's Force.com, Google Maps, ADP Payroll processing, and US Postal Serviceofferings.

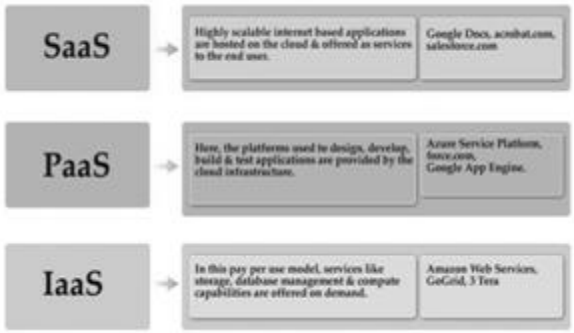

Fig. 3. Types of cloud services Diagram.

C.IaaS (Infrastructure as a Service)

Delivers utility computing capability, typically as raw virtual servers, on demand that customers configureand manage. Here Cloud Computing provides grids or clusters or virtualized servers, networks, storage and systems software, usually (but not always) in a multitenant

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architecture. IaaS is designed to augment or replace the functions of an entire data centre. Thissaves cost (time and expense) of capital equipment deployment but does not reduce cost of configuration, integration or management and these tasks must be performed remotely.

Vendors would include Amazon.com (Elastic Compute Cloud and Simple Storage), IBM and other traditional IT vendors[4].

IV. CHARACTERISTICS

Cloud computing exhibit five essential characteristics defined by NIST (National Institute of Standards and Technology)[1].

1. On-demand self-service. A consumer can unilaterally provision computingcapabilities.

2. Broad network access. Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick clientplatforms.

3. Resource pooling. The provider's computing resources are pooled to serve multiple consumers, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand.

4. Rapid elasticity. Capabilities can be rapidly and elastically provisioned, in some cases automatically, to quickly scale out and rapidly released to quickly scale in.

5. Measured service. Cloud systems automatically control and optimize resource use by leveraging a metering capability at some level of abstraction appropriate to the type of service[1].

But according to us cloud computing has a variety of characteristics main ones being as defined.

1. Shared Infrastructure Uses a virtualized software model, enabling the sharing of physical services, storage, and networking capabilities. The cloud infrastructure, regardless of deployment model, seeksto make the most of the available infrastructure across a number ofusers.

2. Dynamic Provisioning Allows for the provision of services based on current demand requirements. This is done automatically using software automation,enabling the expansion and contraction of service capability, as needed. This dynamic scaling needs to be done while maintaining high levels of reliability andsecurity.

3. Managed Metering Uses metering for managing and optimizing the service and to provide reporting and billing information. In this way, consumers are billed for services according to how much they have actually used during the billingperiod.

In short, cloud computing allows for the sharing and scalable deployment of services, as needed, from almost any location, and for which the customer can be billed based on actualusage.

V. ADVANTAGES &DISADVANTAGES

There is a huge amount of hype surrounding cloud computing but despite this more and more C-level executives and IT decision makers agree that it is a real technology option. It has moved from futuristic technology to a commercially viable alternative to running applications in-house.

Vendor organisations such as Amazon, Google, Microsoft and Salesforce.com have invested many millions in setting up cloud computing platforms that they can offer out to 3rd parties. They clearly see a big future for cloud computing.

Of course, no technology comes without a set of advantages and disadvantages so we've tried to sort to wheat from the chaff when it comes to the reality of cloud computing. In particular, one always has to be cautious in believing the claims of any specific vendor [5].

A.Reasons for Adopting Cloud Computing

1. Scalability As mentioned above, scalability is a key aspect of cloud computing. The ability of the platform to expand and contract automatically based on capacity needs (sometimes referred to as "elasticity"), and the charging model associated with this, are key elements that distinguish cloud computing from other forms of hosting. Cloud computing provides resources on- demand for many of the typical scaling points that an organisation needs including servers, storageand networking. The on-demand nature of cloud computing means that as your demand grows (or contracts) you can more easily match your capacity (and costs) to your demand. There is no need to over-provision for the peaks. At the software level cloud computing allows developers and IT operations to develop, deploy and runapplicationsthatcaneasilygrowcapacity,workfast and never or at least rarely fail, all without any concern as to the nature and location of the underlying infrastructure.Oneshouldn'tforgettheadvantagecloud computing can offer newer or smaller players. With easy access to a cost effective, flexible technology platform small competitors can punch well above their weight in terms of application capacity and scalability and can quickly turn into significantadversaries.

2. Cost Saving There is still some debate about whether there are real cost savings with cloud computing. McKinsey recently published a report claiming that there was no cost saving to be had and that, on the contrary, it could work out more expensive. This report has since been debunked by others claiming that it only focussed on one (failed) project and that it didn'taccuratelyreflectthetruecostofrunningsystems internally. On the other hand, a report by Forrester emphasises the fact that use of cloud computing matches

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cash flow to system benefits more appropriately than the traditional model. In the old way of doing things, a large investment is made early in the project prior to system build out, and well before the business benefits (presumably financial in some shape or form) are realised. This model is even more troubling given the risk factors associated with IT systems: they are notorious for failing to deliver their promised benefits, and a large percentage of projects end up scrapped due to poor user acceptance. With cloud computing you move from a capital investmentto an operational expense. Whilst cost won't be the only driver in the adoption of cloud computing it is often seen as the key factor. Clearly if a decision to adopt cloud computing (or not) is to be based primarily on the potential cost savings then the true cost of operating an application internally needs to be understood and this is something that most organisations are not good at. Many organisations home in on the cost of provisioning aserverinternally(includingsoftwarelicences)andend up comparing that with the cost of a cloud-based solution. This inevitably will lead to the conclusion that cloud computing is more expensive. In addition, most organisations' data centres are often oversized when they are built and typically will run at autilisation rate of less than 60%. It is also reckoned that over the four year life of a server, the combined facility, capital and operational expense will be up to four times greater than the cost of the server itself. One of the key advantages offered by cloud computing is that you can pay on a consumption basis e.g. per hour, per gigabyte etc. This has a huge impact on the economics. When a true comparison is done, using a fully costed model, the decision weighs more favourably towards cloud computing. And when the other advantages are taken into account then cloud computing can really stack up as a viableoption.

3. Business Agility One of the understated advantages of cloud computing is that it enables an organisation to be more agile. The speed at which new computing capacity can be requisitioned is a vital element of cloud computing. Adding additional storage, network bandwidth, memory, computing power etc can be done rapidly and often instantaneously. Most cloud providers employ infrastructure software that can easily add, move, or change an application with very little, if any, intervention by cloud provider personnel. This dynamic, elastic nature of cloud computing is what gives it a big advantage over an in-house data centre. Many internal IT departments have to work through procurement processes just to add additional capacity. Once the procurement has been authorised it can still takeweekstoacquireandracknewequipment.Inmany cases the demand for IT services is outstripping the ability of the IT department to manage using traditional practices. Cloud computing allows organisations to react more quickly to market conditions and to scale up and down as needed. New applications can be quickly released with lower up-front costs. The flexibility offered by cloud computing enables innovative ideas to be rapidly tried and tested without the need to divert existing IT staff from their daily routine. Increasingly people won't want to spend capital on these new ideas. They'll want to pay for them operationally. They may represent a new market, a new technique, a new set of standards, or a new set of technologies. If you're starting a new line of business, you can launch with a robust, state-of-the-art infrastructure without tying up limited capital. For development projects, organisations can provision multiple production-scale systems on demand in the cloud – saving time and expense over traditional testing scenarios and enabling faster handoff from development to operations. And when the project is finished they can be turned off again with nothing else to pay.

4. Built-in Disaster Recovery & Back-up Sites With cloud computing, the burden of managing technology is placed on the technology provider. It is their responsibility to provide built-in data protection, fault tolerance, self-healing and disaster recovery. Typical disaster recovery costs are estimated at twice the costof the infrastructure. With a cloud-based model, true disaster recovery is estimated to cost little more than one times the costs, a significant saving. Additionally, because cloud service providers replicate their data, even the loss of one or two data centres will not result in lost data.Cloud computing provides a high level of redundancy at a price point traditional managed solutions cannot match. Now every business can put a plan in place to ensure they are able to continue their business in the face of radical environment changes. Even the cloud computing cynics are agreed onthis.

5. Device & Location Independence Cloud computing is already enabling greater device independence, greater portability, and greater opportunities for interconnection and collaboration. With applications and data located in the cloud it becomes much easier to enable users to access systems regardless of their location or what device they are using. Teleworkers can be quickly brought online, remote offices canbe quicklyconnected,temporaryteamscanbeeasilysetup on site, and mobile access can be easily enabled. With the growing use of Smartphone's, netbooks and other hand-held devices there is also an increasing need for data access on the go. The success of devices such as the iPhone and its App store is also opening up a whole new world of mobile applications. Connecting these types of applications to data

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stores will be significantly easier through the cloud. Location-based applications will reach their potential through cloud computing. Many smartphones are now location-aware (using inbuilt GPS facilities) and we will increasingly see applications that take advantage of this capability. Cloud computing will facilitate innovation in many areas. Much of it will be driven by the ease with which different devices can connect to cloud-based applications.

As mentioned above, most internal data centres are oversized and don't run at anything like full capacity. Most servers run significantly below capacity (real world estimates of server utilisation in data centres range from 5% to 20%) yet they still consume close to the same amount of power and require the sameamount of cooling as a full capacity machine (granted that Virtualisation is changing this in some cases). A typical data centre consumes up to 100 times more power than an equivalent sized office building. The carbon footprint of a typical data centre is therefore a significant concern for manyorganisations.

In a cloud computing environment resources areshared across applications (and even customers) resulting in greater use of the resources for a similar energy cost. For corporations spread over different time zones the computing power lying idle at one geographic location (during off-work hours) could be harnessed at a location in a different time zone. This reduces not only the power consumption but also the amount of physical hardware required. With cloud computing virtual offices can be quickly set up. Employees can easily work from home. Travelling salespeople can have all their data available in any location without needing to visit the office. These are just some of the other examples of how the carbon footprint can bereduced.

B.Reasons for Avoiding Cloud Computing

1. Security In nearly every survey done about cloud computing the top reason given for not adopting it is a concern over security. Putting your business-critical data in the hands of an external provider still sends shivers down the spines of most CIOs. Only by giving up some control over the data can companies get the cost economies that are available. CIOs, along with other C-level executives, must decide if that trade-off is worthwhile. In deciding on the trade-off some of the questions to consider are What happens if the data stored or processed on a cloud machine gets compromised? Will we know? If we do not know, how will we notify our constituents, especially when data breach notification laws are in place? How will we know to improve our security? There is a school of thought that says that holding your data in the cloud is not much more insecure than having it on internal servers connected to the Internet. The recent case in the UK of a hacker who hacked his way into the US Government network shows that supposedly secure networks are just as likely to be breached. Companies need to be realistic about the level of security they achieve inside their own business, and how that might compare to a cloud provider. It's well known that more than 70% of intellectual property breaches are a result of attacks made inside the organisation. Clearlysecurity will be raised as a concern around cloud computing for many years to come. There is still some work to be done before more formalised standards are in place. Organisations like the Cloud Security Alliance are at the forefront of addressing these issues. In the same way that some banks took longer than others to offer internet banking facilities so it will be with cloud computing. Some organisations will evaluate the risks and adopt cloud computing quickly. Other more conservative organisations will hang back and watch developments.

2. Data Location & Privacy Data in a cloud computing environment has to exist on physical servers somewhere in the world and the physical location of those servers is important under many nations' laws. This is especially important for companies that do business across national boundaries, as different privacy and data management laws apply in different countries. For example, the European Union places strict limits on what data can be stored on its citizens and for how long. Many banking regulators also require customers' financial data to stay in their home country. Many compliance regulations require that data not be intermixed with other data, such as on shared servers or databases. In another example, Canada is concerned about its public sector projects being hosted on U.S.- based servers because under the U.S. Patriot Act, it could be accessed by the U.S. government. Some of the larger cloud providers (e.g. Microsoft, Google) have recognisedthisissueandarestartingtoallowcustomers to specify the location of their data. Another data issue to address is: What happens to your data in a legal entanglement? What if you miss paying a bill, or decide not to pay a bill for various reasons, like dissatisfaction with the service? Do you lose access to your data? This is something that can be addressed at the contract stage to ensure that the right safeguards are be put in place to prevent a provider from withholding access to your data.

3. Internet Dependency, Performance & Latency A concern for many organisations is that cloud computing relies on the availability, quality and performance of their internet connection. Dependency on an internet connection raises some key questions. What happens if we lose our internet connection? How long can we run our business? Moving an existing in-house application to the cloud will almost certainly have some trade-offs in terms of

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performance. Most existing enterprise applicationswon'thavebeendesignedwiththecloudin mind. Organisations considering investing in cloud computing will certainly have to factor in costs for improving the network infrastructure required to run applications in the cloud. On the plus side, bandwidth continues to increase and approaches such as dynamic caching, compression, pre-fetching and otherrelated web-acceleration technologies can result in major performance improvements for end users, often exceeding 50%. At the software level, applications will have to be architected for the cloud in order to achieve maximum performance. We're well down the road with thin-client, browser based applications but many of these would still need re-designing in order to benefit from a cloud environment. In reality the vast majority of applications don't require the levels of nano-second performance that might be impacted by putting them in the cloud. In the real world, scalability is likely to be a more important issue across more applications. Latency (the time taken, or delay, for a packet of data to get from one designated point to another) will undoubtedly be an issue for certain applications. Trading applications that require near-zero latency willprobably be run in-house for many years to come. One of the key problems with putting these applications in the cloud is that latency on the Internet is highly variable and unpredictable. There are many cloud computing commentators who claim that the cloud will never be able to support these types of applications. However, vendors such as Juniper and IBM are already demonstrating extremely low latency capabilities in the cloud so it's a case of watch thisspace.

4. Availability & Service Levels One of the most common concerns regarding cloud computing is the potential for down-time if the system isn't available for use. This is a critical issue for line-of-business apps, since every minute of downtime is a minute that some important business function can't be performed. Every minute of down-time can not only affect revenue but can also cause reputation damage. These concerns are further exacerbated by the recent highly public outages at some of the major cloud providers such Google, Salesforce.com and Amazon. As a counter to these concerns, cloud-computing advocates are quick to point outthatfewenterprisesITinfrastructuresareasgoodas those run by major cloud providers. Whilst highly public outages get lots of press coverage and help feed the views of the cloud computing cynics one needs to compare this against in-house outages which rarely get publicised. Just how many times per year are internal systems down and/or unavailable? How does this compare to a typical cloud computing scenario? Many companies thinking of adopting cloud computing will look to the service-level agreements (SLAs) to give them some comfort about availability. Surprisingly, some cloud providers don't even offer SLAs and many others offer inadequate SLAs (in terms of guaranteed uptime.) Cloud providers will need to get serious about offering credible SLAs if the growth of cloud computing is not to stall. Increased competition will help and will push the early entrants to provide greater assurances to their customers. Just because a provider says that they can deliver a particular service over the Web better than an internal IT organisation can doesn't make it necessarily true. And even if they can, how do you know they are doing that consistently and, if they aren't, what compensation is due back to the customer? Cynics will say service level agreements are not worth the paper they are written on. They will point out that an SLA doesn't necessarily assist in obtaininghigh quality uptime, but provides the basis for conflict negotiation when things don't go well.

5. Current Enterprise Applications Can't Be Migrated Easily Moving an existing application to a cloud platform is not as easy as it might first appear. Different cloud providers impose different application architectures which are invariably dissimilar to architectures of enterprise applications. So for a complex multitier application that depends on internal databases and that serves thousands of users with ever- changing access rights it's not going to be an easy switch-over to a cloud platform. In reality most organisations that adopt cloud computing will end up doing it with new applications. Existing applications will probablycontinue to run on-premise for some time. That's not to say that these applications can't be converted but that the costs of conversion will often outweigh the benefits. Amazon Web Services offers the most flexibility with regard to migrating applications becauseitprovisionsan"empty"imagethatyoucanput anything into. However, applications cannot be easily moved due to its idiosyncratic storage framework. With some other cloud platforms (e.g. Microsoft Azure) it may be possible to take existing applications and, with minimal effort, modify them to run in the cloud. Much will depend on the existing architecture of the application though. If it was developed using underlying "web services" then it is likely that it can be modified relatively easilyto run in the cloud. Whilst the lack of a convenient migration path for existing applications might hinder cloud computing adoption, in the longer termit is not going to be a permanent barrier. As more vendors build applications for cloud deployment so will the uptake of cloud computinggrow [5].

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VI. SECURITY ISSUES OF CLOUDCOMPUTING

According to the fact security is a major issue in cloud computing. Here are the some security facts for discuss on security issues. According to Ron Rivest "Cloud computing will become a focal point of our work in security"[6].

A.Breached Security Systems

SaaS (software as a service) and PaaS (platform as a service) providers all trumpet the robustness of their systems, often claiming that security in the cloud is tighter than in most enterprises. But the simple fact is that every security system that has ever been breached was once thought infallible. Google was forced to make an embarrassing apology when its Gmail service collapsed in Europe, while Salesforce.com is still smarting from a phishing attack in 2007 which duped a staff member into revealing passwords. While cloud service providers face similar security issues as other sorts of organizations, analysts warn that the cloud is becoming particularly attractive to cyber crooks. The richer the pot of data, the more cloud service providers need to do to protect it.

B.Data and information security

In the realm of multi-tenant data, you need to trust the cloud provider that your information will not be exposed. For their part, companies need to be vigilant about how passwords are assigned, protected and changed as examples. Cloud service providers typically work with numbers of third parties, and customers are advised to gain information about those companies which could potentially access their data. However, realistically, this could be easier said than done. An important measure of security often overlooked by companies is how much downtime a cloud service provider experiences. Ask to see service providers' reliability reports to determine whether these meet the requirements of the business. Exception monitoring systems is another important area which companies should ask their service providers about. An important consideration for cloud service customers, especially those responsible for highly sensitive data, is to find out about the hosting company used by the provider and if possible seek an independent audit of their security status. Customers typically do not seem to be as stringent about data and information security as one might think they should in manycases.

C.Distributed Cloud computingissues

Let's say that you use a particular cloud provider for your eCommerce web presence. But your checkout and credit card transaction capabilties may be carried out using different servers in different data centers or even by different cloud providers. This may be happening with or without the customer's knowledge. This type of computing distribution is a very common cloud provider model. Cloud providers may have dozens of servers in dozens of data centers in dozens of Countries. If communications between the various cloud provider services is not strongly encrypted and extremely secure, your data and information could be at risk.

D.Security Standards

In most SaaS offerings, the applications are constantly being tweaked and revised, a fact which raises more security issues for customers. Companies need to know, for instance, whether a software change might actually alter its security settings. The cloud is still very much a new frontier with very little in the way of specific standards for security or data privacy. In many ways cloud computing is in a similar position to where the recording industry found itself when it was trying to combat peer-to-peer file sharing with copyright laws created in the age of analogue. In terms of legislation, there's very little that is specifically written for cloud computing. As is frequently the case with disruptive technologies, the law lags behind the technology development for cloud computing. What's more, many are concerned that cloud computing remains at such an embryonic stage that the imposition of strict standards could do more harm than good. IBM, Cisco, SAP, EMC and several other leading technology companies created an 'Open Cloud Manifesto' calling formore consistent security and monitoring of cloud services. But the fact that none of the main cloud providers agreed to take part suggests that broad industry consensus may be some way off. There are a handful of existing web standards which companies in the cloud should know about. Chief among these is ISO27001, which is designed to provide the foundations for third party audit, and implements OECD principles governing security of information and network systems. The SAS70 auditing standard is also used by cloud serviceproviders.

E.Data Privacy

Everything communicated on the web has a long shelf life. A really, really long shelf life, making it virtually impossible to leave the past in the past. Once someone uses the Internet to send a message or document, they have little to no control over the data. Cloud computing is becoming more common as more people opt to use web-based word processors and e-mail programs, such as Google's online word processor, Docs, or Microsoft's forthcoming online version of Office. People tend to put a lot, and perhaps too much trust in the Internet. People go online to write notes to themselves, manage their calendars, share photos and manage contacts. And although storing information online means it's accessible from any computer, it also means it's in the "cloud," an enormous data center in cyberspace. In the Internet world, data never disappears. It has a potential to

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stay around forever. Much of the data is stored by third parties and because storage is so cheap, there's no reason to ever delete data. Hackers could potentially breach the stored data, compromising thousands of people's personal information. And as soon as that data has left the servers, where it goes could be anyone's guess. In July, 2009, a hacker calling himself Hacker Croll successfully infiltrated 310 business documents belonging to social networking site Twitter that were stored in Google Docs. The hacker then sent that information, including what he claimed were PayPal, Gmail, and Amazon accounts, to various technology blogs. And while a person has some control over information contained on their home computers, they should never believe that deleting a file actually means it's gone. The truth is that bits from the file still remain in the computer and can be recovered. The Internet is even more indestructible, leaving people with little control over information transmittedonline[7].

VII. FUTURE CONCLUSION OF CLOUDCOMPUTING

Cloud computing is a new and promising paradigm delivering IT services as computing utilities. As Clouds are designed to provide services to external users, providers need to be compensated for sharing their resources and capabilities. In this paper, we have proposed architecture for market-oriented allocation of resources within Clouds. We have also presented a vision for the creation of global Cloud exchange for trading services. Moreover, we have discussed some representative platforms for Cloud computing covering the state-of-the-art. In particular, we have presented various Cloud efforts in practice from the market oriented perspective to reveal its emerging potential for the creation of third-party services to enable the successful adoption of Cloud computing, such as meta- negotiation infrastructure for global Cloud exchanges and provide high performance content delivery via Storage Clouds'.

The state-of-the-art Cloud technologies have limited support for market-oriented resource management and they need to be extended to support: negotiation of QoS between users and providers to establish SLAs; mechanisms and algorithms for allocation of VM resources to meet SLAs; and manage risks associated with the violation of SLAs. Furthermore, interaction protocols needs to be extended to support interoperability between different Cloud service providers. In addition, we need programming environments and tools that allow rapid creation of Cloud applications.

Data Centers are known to be expensive to operate and they consume huge amounts of electric power. For example, the Google data center consumes power as much as a city such as San Francisco. As Clouds are emerging as next-generation data centers and aim to support ubiquitous service-oriented applications, it is important that they are designed to be energy efficient to reduce both their power bill and carbon footprint on the environment. To achieve this at software systems level, we need to investigate new techniques for allocation of resources to applications depending on quality of service expectations of users and service contracts established between consumers and providers [8].

As Cloud platforms become ubiquitous, we expect the needforinternetworkingthemtocreatemarket-oriented global Cloud exchanges for trading services. Several challenges need to be addressed to realize this vision. They include: market-maker for bringing service providersandconsumers;marketregistryforpublishing and discovering Cloud service providers and their services; clearing houses and brokers for mapping service requests to providers who can meet QoS expectations; and payment management and accounting infrastructure for trading services. Finally, we need to address regulatory and legal issues, which go beyond technical issues. Some of these issues are explored in related paradigms such as Grids and service-oriented computingsystems.

Hence, rather than competing, these past developments need to be leveraged for advancing Cloud computing. Also, Cloud computing and other related paradigms need to converge so as to produce unified and interoperable platforms for delivering IT services as the 5th utility to individuals, organizations, and corporations[9].

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