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Secure Data Management in Cloud Computing

Ms. T.SUMATHI[1], Mr. P. SRINIVASULU[2]

[1]*M.Tech 2ndyear, Dept. of CSE, Visvodaya Engineering College, Kavali, India*
[2]*Associate Professor, Dept. of CSE, Visvodaya Engineering College , Kavali, India*

Abstract—Cloud computing is just like the weather; it blows this way and that, and no one really knows exactly where it's going or what the cloud will cover. But looking into a murky crystal ball, one can see trends in cloud computing that deserve attention. Cloud computing may be ill-defined, but it's here to stay and it's having important effects upon the competitive landscape. Sand Hill Group's "Leaders in the Cloud" study found 44 percent of IT executives that have adopted cloud solutions are either currently running or planning to run private clouds, and that number will reach 54 percent in three years. Every major technology vendor—including HP, IBM, Microsoft, Red Hat, BMC, CA, Cisco, VMware, and Oracle—and many emerging players—such as, Cloud scaling, Nimbula, Cloud.com, Right Scale, and EnStratus—are getting into the game of turning enterprise data centers into highly scalable, cost efficient, and automated private cloud environments.

Key words— Cloud Computing, Data Storage, Security, Privacy

I. INTRODUCTION

Cloud computing means storing and accessing data and programs are over the Internet instead of your computer's hard drive. The cloud is just a metaphor for the Internet. It goes back to the days of flowcharts and presentations that would represent the gigantic server-farm communications of the Internet as nothing but a puffy, white cumulonimbus cloud, accepting connections and doing out information as it floats. When you store data on or run programs from the hard drive, that is called local storage and computing. Everything you need is physically close to you, which means accessing your data is fast and easy, for that one computer, or others on the local network. Working off your hard drive is how the computer industry functioned for decades. Cloud computing is a technology that keep up data and its application by using internet and central remote servers [1]. Cloud computing can be considered a new computing paradigm with implications for greater flexibility and availability at lower cost. Because of this, cloud computing has been receiving a good deal of attention lately. Cloud computing services can be private, public or hybrid.

Public: Public clouds are owned and operated by companies that use them to offer rapid access to affordable computing resources to other organizations or individuals. With public cloud services, users don't need to obtain hardware, software or supporting infrastructure, which is owned and managed by providers. .Private: A private cloud is owned and operated by a single company that controls the way virtualized resources and automated services are customized and used by various lines of business and constituent groups. Private clouds exist to take advantage of many of cloud's efficiencies, while providing more control of resources and steering clear of multi-tenancy.

Hybrid:A hybrid cloud uses a private cloud foundation combined with the strategic use of public cloud services. The reality is a private cloud can't exist in isolation from the rest of a company's IT resources and the public cloud. Most companies with private clouds will evolve to manage workloads across data centres, private clouds and public clouds—thereby creating hybrid clouds.

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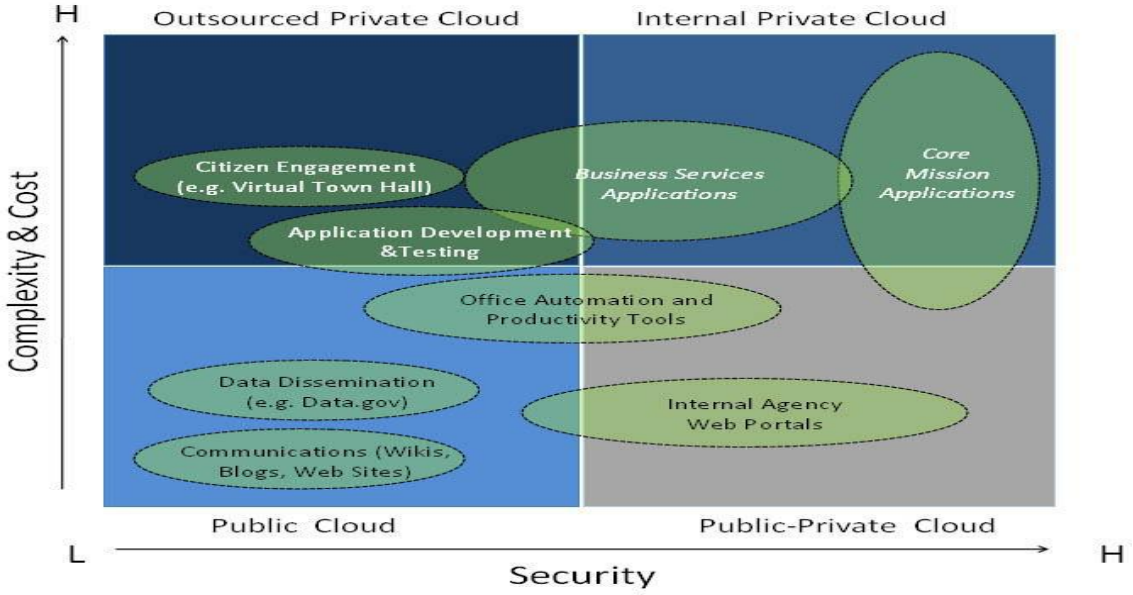

II. LITERATURE SURVEY

Current security controls should be implemented according to quality, threat, and vulnerability risk assessment matrices[7]. While cloud security concerns can be grouped into any number of proportions (Gartner names seven[8] while the Cloud Security Alliance identifies fourteen areas of concern[9]) these dimensions have been aggregated into three general areas: Security and Privacy, Compliance, and Legal or Contractual Issues[10]. In order to solve this problem, many schemes are proposed under different systems and security models. In all these works, great efforts are made to design solutions that meet various requirements: high scheme efficiency,. Stateless verification, unbounded use of queries and retrieve ability of data, etc. Considering the role of the verifier in the model, all the schemes presented before fall into two categories: private verifiability and public verifiability. Although schemes with private verifiability can achieve higher scheme efficiency, public verifiability allows anyone, not just the client (data owner), to challenge the cloud server for correctness of data storage while keeping no private information [2]. Then, consumers are able to delegate the evaluation of the service performance to an independent third party auditor (TPA), without devotion of their computation resources. In the cloud, the clients themselves are unreliable or cannot afford the overhead of performing frequent integrity checks [3]. Thus, for practical use, it seems more rational to equip the verification protocol with public verifiability, which is expected to play a more important role in achieving economy of scale for Cloud Computing. That is, the outsourced data themselves should not be required by the verifier for the verification purpose [4]. Open Security Architecture (OSA) provides free frameworks that are easily integrated in applications, for the security architecture community. Its patterns are based on schematics that show the information traffic flow for a particular implementation as well as policies implemented at each step for security reasons [6].

III. EXISTING SYSTEM

Cloud computing is the long dreamed vision of computing as a utility, where data owners can remotely store their data in the cloud to enjoy on-demand high-quality applications and services from a shared pool of configurable computing resources. While data outsourcing relieves the owners of the burden of local data storage and maintenance, it also eliminates their physical control of storage dependability and security, which traditionally has been expected by both enterprises and individuals with high service-

level requirements. In order to facilitate rapid deployment of cloud data storage service and recover security assurances with outsourced data dependability, efficient methods that enable on-demand data correctness verification on behalf of cloud data owners have to be designed. In this research to propose that publicly auditable cloud data storage is able to help this growing cloud economy become fully established. With public audit ability, a trusted entity with expertise and capabilities of data owners do not possess can be delegated as an external audit party to assess the risk of outsourced data when needed [14]. Such an auditing service not only helps save data owners computation resources but also provides a transparent yet cost-effective method for data owners to gain trust in the cloud. To describe the approaches and system requirements that should be brought into consideration, and outline challenges that need to be resolved for such publicly auditable secure cloud storage service to become a reality.

The Network Methodology of this thesis is:

- Authentication module
- Web server identification
- Encryption
- Web server updation
- Decryption
- Data verification

IV. PROPOSED SYSTEM

3.1. Large enterprises are building their own private clouds.

IBM, for instance, announced its “Blue Cloud” initiative two years ago. The company has already built 13 massive datacenters around the world and is adding more every quarter. Private cloud services are run in datacenters managed by third parties such as Amazon.com, but also in private datacenters on company property managed by corporate IT staffs. Private clouds address the security concerns of large enterprises. They're scalable, growing and shrinking as needed. They're also managed centrally in a virtualized environment.Enterprises have begun initiatives to build private clouds to reap the same benefits of scale, agility, and cost efficiencies of public clouds such as Amazon and Google while maintaining security, privacy, governance, and control over their IT infrastructure. But making a transition to a private cloud is not an easy task because no single vendor provides all the best of breed and cost effective components necessary to build a private cloud. Customers need to evaluate and select a wide variety of vendors and technologies to build private clouds. Internal IT teams need to learn and/or buy the technological expertise and navigate the organizational, operational, and cultural issues to make the transformation. This whitepaper presents the top strategies designed to help you successfully deploy a private cloud.

3.2. Cloud computing will shift the skills needed by IT workers

Private Clouds Make Business Sense Large enterprises have billions of dollars invested in IT infrastructure. It will take several years to fully amortize and depreciate those assets. Furthermore, this infrastructure represents a heterogeneous mix of platforms, including mainframes, databases, applications and services. Thousands of applications—at least 20-30 percent of which are mission-critical—still run on old-world hardware that is tightly coupled to other applications and infrastructure. Therefore, not all applications will be able to move to the public clouds. With public clouds, enterprises are also concerned about lock-in and whether they can meet their needs in terms of security, scalability, compliance, cost, performance and latency. This lack of control over mission-critical assets and concerns about security and privacy are driving many enterprises to build their own private clouds.

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The need for private clouds, though, varies depending upon the goals of the individual enterprise. There are some consistent themes however that i see from our work with large companies:

- Business Agility (capture existing opportunity, cycle time improvements)
- Compelling Corporate Events (movement of Data Centers, End-Of-Life apps, Mergers & Acquisitions)
- Responsiveness to the Business (IT/Business Alignment, "Sanctioned" improvement)
- Strategic Business Opportunity (Business model (r)evolution, global expansion, new markets)
- Consumerization of IT (always on, always accessible)
- Financial Considerations (cost savings, chargeback, consumption transparency)

Large Enterprises today have access to the same cloud technologies, automation tools, sustainability tools, containerized data centers, and other options that public cloud vendors use. With these powerful cloud building blocks, there is no reason why enterprises cannot leverage private clouds to significantly decrease IT maintenance and operational costs while increasing business innovation and agility, particularly for strategic and mission-critical applications that drive business value.

Many companies have made foundational investments in cloud building blocks such as virtualized infrastructures and some level of automation and workflow for targeted use cases. However, in order to fully achieve some of the promise of a private cloud infrastructure, enterprises must drive towards:

- End-to-end automated management
- Service orchestration
- End-user self service, and elasticity

Additionally, many large customers are evaluating their global data center strategy. They should do this in conjunction with building a private cloud computing strategy to ensure that their infrastructure capabilities meet the strategic needs of the business and application stakeholders going forward.

3.2.1 Cohesive Cross-Functional Strategy Essential for Success

The architecture of a well-structured private cloud initiative goes far beyond the technical components and encompasses shifts in key support and business processes while also fundamentally impacting the ways that organizations arrange human capital. The far-reaching impact of moving to a private cloud forces us to think first about the importance of corporate governance. Although the benefits of moving to a private cloud are often compelling, it puts pressure on the organization to address governance issues in a new light. This includes dealing with issues such as asset ownership, financial accounting standards, and capital investment. Business validation begins to take on a commercial perspective versus departmental or business unit oriented. In order to execute on a successful cloud initiative, enterprises must build a program strategy that encompasses people, process and technical transformation (see graphic below). Best structured with a Cloud Program Office (CPO), this function should create and manage the organizational strategic blueprint for all Cloud Initiatives. Once the strategic vision is created, the CPO then begins to focus on building the proper transformational framework under which the cloud initiatives will operate. This framework should include 3 critical elements of the change process: organization, process and technology. For each of these 3 areas, a realistic assessment needs to be done to evaluate the organization's readiness and maturity to aggressively pursue and realize the benefits associated with the strategic vision. From there a transformational roadmap is generated that is then managed by the CPO holistically across all functions.

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It's no longer enough for a CIO to oversee rollouts, integrations and development projects. Instead, IT professionals need to focus on extracting the most business value from new technologies. Cloud computing helps them shed the burdens of technological implementation and concentrate on business processes. At the staffer level, coding and development skills will take a back seat to project management, quality assurance testing, business analysis and other high-level abstract thinking.

4.3. IT departments will shrink as users go directly to the cloud for IT resources

In his book, "The Big Switch: Rewiring the World, From Edison to Google" (W.W. Norton, 2008), Nicholas Carr all but declares the pending death of IT. “In the long run, the IT department is unlikely to survive, at least in its familiar form,” he writes. “It will have little left to do once the bulk of business computing shifts out of private data centers and into ‘the cloud.’ Business units and even individual employees will be able to control the processing of information directly, without the need for legions of technical specialists.”

Service Catalog: A Critical Component of Private Clouds One of the critical starting points in the journey towards a stronger authority model is in the creation, implementation and adoption of a service catalog specifically geared towards the business and technical services that will be supported by the private cloud. Often, this requires a deep understanding of the underlying business objectives tied to applications that will reside within the private cloud. These objectives inherently influence the thinking around issues such as service levels, performance and availability criteria, and reporting. As the corporate enterprise moves to a structured service catalog, the catalog will then serve as the vehicle to assist with the implementation and realization of corporate governance. automate the catalog will provide for the ability to build services (both user based and technical services), present those services based on entitlement, and orchestrate complex workflow based upon those services. It is through this integration of the user requests with orchestrated workflow that the corporate enterprise team can begin to envision and realize the benefits of a lifecycle private cloud management model. As i think about the lifecycle model, the catalog will give us guidance on the technical and process elements that will be important to architect adequately. With the emergence of many vendor cloud solutions, the industry is driving towards pre-integrated frameworks to support the implementation of private clouds. This is a step in the right direction in terms of philosophy but falls short in some key areas that will be important to most enterprises. On the positive side, the concept of pre-integration implies a well thought out and constructed view of an end-to-end management model for those cloud based services. Most enterprises will need to go beyond this, however, and examine the need for integration. with existing process

models, services and technical architectures. Examples of this include can be found in the following areas:

- Convergence of operational processes and personnel to support the new architectural framework while maintaining existing infrastructure
- Integration with existing monitoring and management tools
- Evolution of architectural standards to incorporate emerging cloud models
- Integration with reporting, financial, and asset systems

Application Strategy Integral to Private Cloud Initiatives The application component of the cloud strategy presents a significant opportunity to realize the promise of cloud computing.While many companies have invested in virtualization architectures as an enabler of private cloud solutions, few companies have really invested in a fundamental transformation of their application landscape. Many companies have implemented an Infrastructure as a Service layer and begun the process to migrate their existing applications to that infrastructure. For those clients, methodology and skills around application profiling, assessment, workload sizing and migration processes becomes important. A more capable component of cloud deceit in the refactoring of applications and the establishment of a Platform as a Service layer within the private cloud. Many companies are starting to evaluate the strategic approach to their application frameworks, from building a maintenance approach for legacy applications while implementing new services on modern application platforms. As corporations seek to leverage the promise of flexibility and scalability with cloud capabilities, it is in the integration of these Platform frameworks with the Infrastructure components that provides long-term strategic value by enabling application mobility and portability.

How to Jumpstart Your Journey to Private Clouds The progress towards private cloud really spans organizational, process, and technical layers. Companies should consider the following steps to ensure a successful transition to private cloud deployments:

- Establish a program strategy that provides a strategic vision and guiding principles for the corporate initiative along with program management resourcing, tracking, and oversight.
- As part of the program strategy, develop clear business objectives and use those to guide and influence corporate behavior.

  Establish an enhanced governance structure, supported by a sanctioned service catalog. Once the service catalog is envisioned, the orchestration of lifecycle management functions becomes an enabler for agility and operational cost savings.
- Assess your application portfolio and map out your application transformation roadmap. This becomes the differentiator that helps companies drive innovation and differentiation in their overall business model.

Other dimensions that need to be considered include:

- Convergence of support processes and personnel to support the new architectural framework while maintaining existing infrastructure
- Integration with existing monitoring and management tools
- Evolution of architectural standards to incorporate emerging cloud models
- Integration with reporting, financial, and asset systems
- Application profiling, assessment, workload sizing and migration processes

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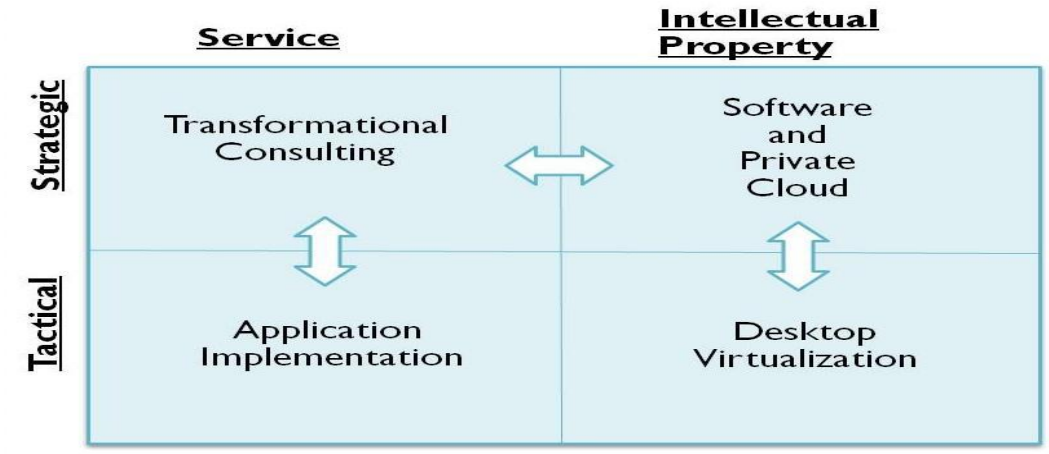
Following these guidelines, companies can drive a successful private cloud initiative and gain the many benefits that flow from it:

- Reduce capital costs by sharing IT resources among business units and departments
- Maximize utilization and reduce redundancies
- Reduce administrative costs by automated workload management
- Improve end-user satisfaction by self-service portals
- Get better tracking of costs and usage by metering and charge-back

Cloud Technology Partners™ (cloudTP™) transforms businesses with cloud solutions.
Enterprise IT is in the midst of a dramatic transformation, similar to the one seen during mainframe to client-server days. Large inflexible data centers are being replaced by pools of virtual servers and storage that can be located anywhere (in private or public clouds) and accessed over a network at anytime. Complex on-premise software applications are being transformed into easy-to-use subscription-based applications delivered as a service. Cloud computing is the biggest technology wave in several decades. Enterprises must act now to build cloud solutions that will transform their business in the coming decade. Our core strategic transformation consulting service provides enterprises with a tailored cloud strategy and road map towards successful cloud adoption.



Potential cloud solutions into a more specific value proposition tailored for each client. At a tactical level, i provide services around application implementation which I deliver with the help of our partners. Application implementation spans a broad range of services including application migration and development, vendor evaluation, and energy resource management. A more strategic approach involves creating software, methodologies, and tools for building private clouds and automating/speeding up the process of migrating applications to it. Our solutions include private cloud build-out, application transformation methodology, and energy resource management tools. As cloud technologies mature, desktop virtualization is the next logical extension. cloudTP will be ready to meet that need as that technology matures.

4.4. Concerns about information security will abate as CIOs “get” the cloud paradigm

The idea of storing critical business data on a third-party server to which multiple “tenants” have access seems inherently insecure. Better to keep that data in house, many IT professionals think. But what CFO keeps the corporate treasury locked in a safe in his office? Banks store everyone’s money together and

people go in and out of banks all day long, knowing they're safer places to keep money than under mattresses. It's security procedures that matter, not physical walls between deposits of data.

4.5. Professional services will be bundled with commodity cloud service

Today, cloud computing is just another way to pay for hardware and software. But a few SaaS vendors are partnering with professional services firms to provide expertise that makes applications actually useful. Salesforce.com'sSuccessforce services let customers connect with either a Salesforce consultant or one of the company's partners, such as Accenture or Deloitte. NetSuite allows its professional services partners to implement its services as software that is provided on-demand to NetSuite clients. H&R Block's Tango consumer online tax-preparation service, for $70, includes unlimited round-the-clock access to tax experts. Tomorrow's cloud will contain human intelligence as well as computational power.

4.6. SMBs, as well as large enterprises, will be run on the cloud

Vendors such as NetSuite are leasing all the computing power and applications that SMBs need, such as Microsoft's Great Plains software, for far less than the cost of acquiring and implementing all the hardware, software and personnel required to run Great Plains in-house.

4.7. Cloud-computing resources will become more customizable.

Today, the paradigm of cloud computing is its implementation of best practices in standard ways. But that limits cloud computing to common-ground applications such as CRM. Extremely complex custom applications that provide competitive advantage, such as a travel reservation system, can't be implemented on a cloud's paradoxically flexible yet rigid platform. In the future, though, cloud-computing vendors will make their applications more customizable by end users.

4.8. Large enterprises will become part-time cloud-computing vendors.

Enterprises are maintaining huge IT infrastructures, often with excess capacity. To unlock the value in that investment, corporate IT departments will create clouds within their IT infrastructure and lease cloud power to suppliers and customers. This is exactly what Amazon.com is doing with its S3.

4.9. Cloud computing will unleash innovation

Local constraints on energy costs and capacities; space requirements for IT infrastructure; and up-front costs will disappear as companies become able to tap computing resources situated anywhere on the planet. A datacenter parked next to a hydroelectric dam — perhaps also owned by the datacenter — will be cheaper and more reliable than one in midtown Manhattan. Transformational IT projects that were stalled by localized constraints will move forward

4.10. The browser will be all the desktop software you need.

Local applications will become passé and PCs will become slimmer, more agile gateways to the cloud where the heavy lifting is done. Client-server computing will return under a new name.

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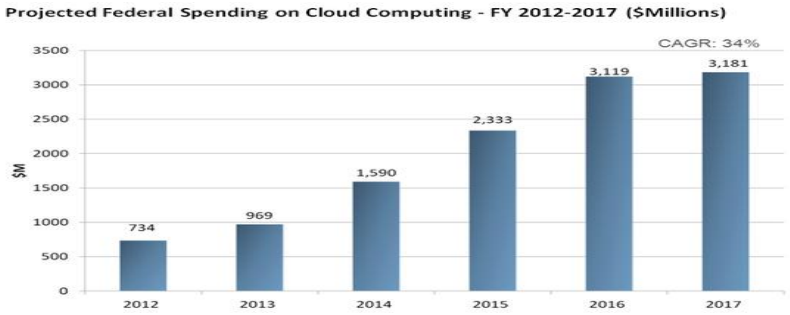
V. RESULTS

How big the cloud computing is

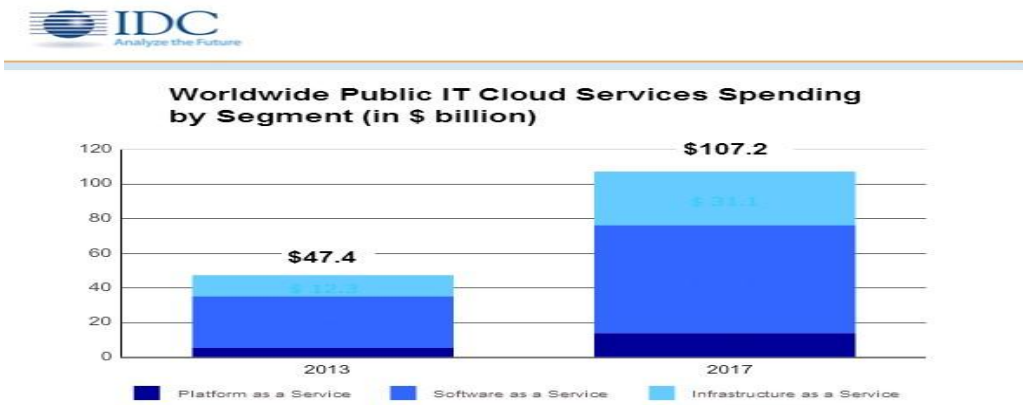
Previously it is about 16 Billion only but according to the current trend it is up to 42 Billion. The development is under a rapid process.

Spending on cloud computing



From the above figure i can see the complete IT industry spending on the cloud computing. And the percentage of the Development is up to 27%

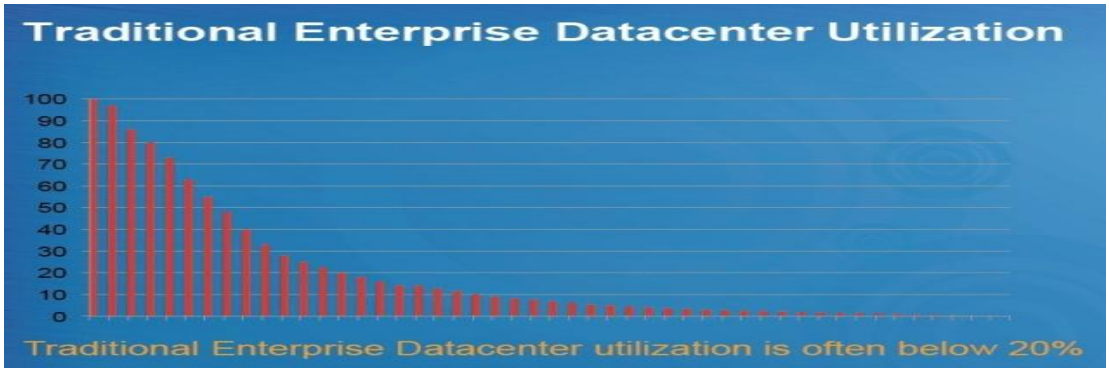
World wide IT spending on cloud



Here i can see that the cloud is mostly used for storing the apps in the server so the usage of the applications will be done easily. That is the main reason for industries using cloud.

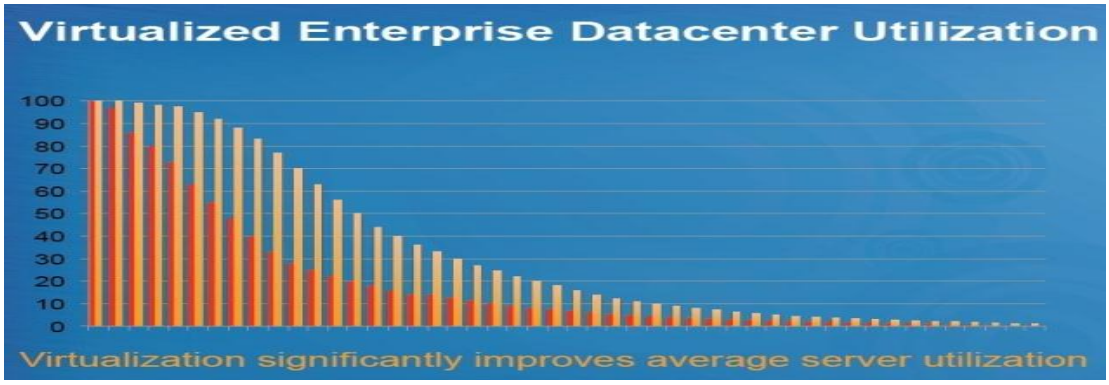
Data Centric utilization

Traditional Enterprise data centric utilization

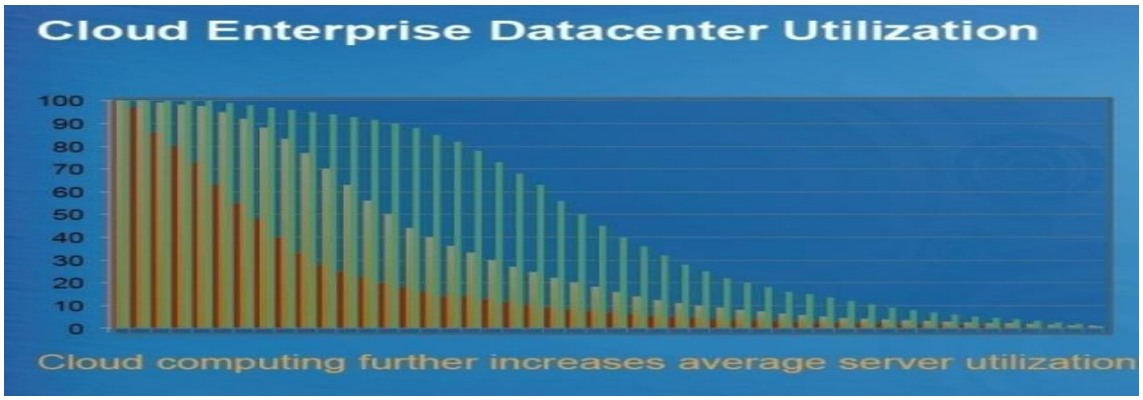


The traditional enterprise is below 20% so the users will not specify this.

Virtualized enterprise data centric utilisation



Cloud enterprise data centric utilization



VI. CONCLUSIONS

Cloud computing is revolutionizing how information technology resources and services are used and managed, but the revolution always comes with new problemIn the future, i will extend our research by providing implementations and producingresults to justify our concepts of security for cloud computing. According to the problem of data security in cloud data storage, this is essentially to distributed storage system. To achieve the assurances of cloud data integrity and availability and enforce the quality of dependable cloud storage service for users, an effective and flexible distributed scheme with explicit dynamic data support, including block update, delete, and append is proposed. I rely on erasure-correcting codein the file distribution preparation to provide redundancy parityvectors and guarantee the data dependability. By utilizing the homomorphic token with distributed verification of erasure coded data, our scheme achieves the integration of storage correctness insurance and data error localization, i.e., whenever data corruption has been detected during the storage correctness verification across the distributed servers, i can almost guarantee the simultaneous identification of the misbehaving server(s). An interesting question in this model is if i can construct a scheme to achieve both public verifiability and storage correctness assurance of dynamic data. Besides,along with our research on dynamic cloud data storage, I also plan to investigate the problem of fine-grained data error localization.

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AUTHORS

[1]Ms.T.SUMATHI received B. Tech in Computer Science and Engineering from the Geethanjali institute of science &technology affiliated to the Jawaharlal Nehru technological university Anantapur, in 2013, and pursing M.Tech in Computer Science and Engineering from Visvodaya engineering college affiliated to the Jawaharlal Nehru technological university Anantapur in 2015, respectively.

[2]Mr.SRINIVASULU PATHAKAMURI has received his mca degree at rvr & jc college of engg., guntur affiliated to acharyanagarjuna university in 2000 and m.tech degree in computer science from rgm college of engg. &technology, nandyal affiliated to the jawaharlal nehru technological university anantapur in 2008.