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Building Flexibility in IT Infrastructure using Cloud based Architectures – Challenges and Benefits in the Insurance Sector

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1. Introduction

Insurance is one of the cornerstones of the modern day financial services sector. As such, a thriving Insurance sector is not only evidence of an efficient financial services sector, but it is also a key enabler of a healthy economy. This growth has in major part been enabled by application of the Information Technology (Murrell, Berg & Einspruch, 2008) which has acted not only as a facilitator but also as a means by which the sector has greatly enhanced its ability to serve its customer. With the advent of the modern human society, basic essential services are commonly provided such that everyone can easily obtain access to them. Consumers want to pay service providers based on their usage of these utility services. The service sector has seen this transformation of pay-as-per-use which has revolutionized the way the service sector is organized. Now, the same concept is being extended to the use of Information Technology services by a company. Thus, the advent of the concept of cloud based architectures.

This paper presents the 21st century vision of computing along with its key elements and its application in the Insurance Sector. As a new technology, Cloud based architectures face the skepticism quite common among the academia and industry relating to a nascent technology. Also, this paper discusses the key challenges the Insurance Sector needs to counter to ensure the adoption of Cloud based architectures and the benefits it can offer that can help companies gain a competitive advantage in this highly volatile marketplace.

1.1 Purpose

The purpose of this paper is to understand Cloud based architectures and how they can be used to provide flexibility to Information Technology Infrastructure in the Insurance domain, thereby providing a company the ability to quickly adapt to the changing customer needs and gain a competitive advantage in the highly volatile marketplace.

1.2 Objectives

The main objectives of this paper are to

- Understand “Cloud Computing” and its variants.
- Understand the Benefits that an Insurance Sector can accomplish using Cloud Based architectures.
- Understand the challenges associated with the adoption of Cloud Based architectures in the Insurance Sector

This paper aims to set base for the acceptance, planning, implementation, challenges, benefits and key performance indicators for Cloud Computing Architectures in the Insurance Sector.

1.3 Importance of the Purpose

The business environment today is increasingly demanding, competitive and global. Only the dynamic and evolving company will survive in such environment. Stable and slow-moving firms which rely on the existence of secure, unchanging markets for products will not be successful in this environment (Mumford, 1995). Also, in a highly turbulent marketplace such as the Insurance sector, it is essential that a company constantly strives to meet the changing customer needs. This implies that the company must remain amoebic and all its systems evolve not only in their reaction to customer needs but also in the anticipation of the changes in customer needs (Anand, De & Datta, 2009). Information Technology can greatly enable the much desired flexibility in a company and also ensure its immediate survival as well as long term success.

The idea of cloud computing has been around for a while, with the birth of application software providers. But Cloud Based Architectures are a reality today that is transforming the way IT can create and enhance business value. Virtualization is one such technology that allows many instances of an operating system, or many different operating systems, to run on one server. However, with every new technology, the key question is the adoption of the technology. Though, Cloud Computing promises many benefits, there are a number of issues that need to be addressed. This paper takes a step in this direction and aims to highlight some of the key elements that define the adoption, implementation and success of Cloud Computing in the Insurance Sector. One of India's largest Insurance companies was studied and its approach/ challenges and benefits for the implementation of this technology were observed and some of those findings are presented in this paper.

2.0 Literature Review

2.1 Information Technology trends that led to Cloud Computing

This vision of the computing utility based on the service provisioning model anticipates the massive transformation of the entire computing industry in the 21st century whereby computing services will be readily available on demand, like other utility services available in today's society. Similarly, computing service users (consumers) need to pay providers only when they access computing services. In addition, consumers no longer need to invest heavily or encounter difficulties in building and maintaining complex IT infrastructure. Over the years, new computing paradigms have been proposed and adopted, with the emergence of technological advances such as multi-core processors and networked computing environments, to edge closer toward achieving this grand vision. The new computing paradigms include cluster computing, Grid computing, P2P computing, service computing, market-oriented computing, and most recently Cloud computing. All these paradigms promise to provide certain attributes or capabilities in order to realize the possibly 1 trillion dollars worth of the utility/pervasive computing industry as quoted by Sun Microsystems co-founder Bill Joy.

A Grid (Kesselman & Foster, 1999) enables the sharing, selection, and aggregation of a wide variety of geographically distributed resources including supercomputers, storage systems, data sources, and specialized devices owned by different organizations for solving large-scale resource-intensive problems in science, engineering, and commerce. Inspired by the electrical power Grid's pervasiveness, ease of use, and reliability (Chetty & Buyya, 2002), the motivation of Grid computing was initially driven by large-scale, resource (computational and data)-intensive scientific applications that required more resources than a single computer (PC,

workstation, supercomputer, or cluster) could have provided in a single administrative domain. Figure 2.2 summarizes some of the most important trends leading to the evolution of Cloud based architectures.

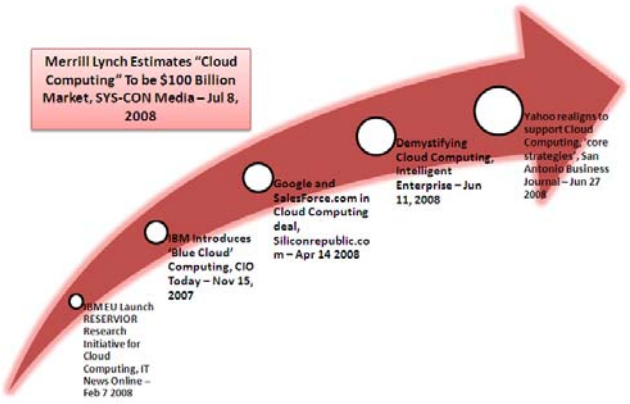

Figure 2.2: Depicts the key events that led to the development of Cloud Based Architectures

Today, the latest paradigm to emerge is that of Cloud computing (Weiss, 2007) which promises reliable services delivered through next-generation data centers that are built on compute and storage virtualization technologies. The Cloud appears to be a single point of access for all the computing needs of consumers. The consumers are assured that the Cloud infrastructure is very robust and will always be available at any time. The issue standing in the way is the rapid adoption of the technology to tackle all the IT problems of a company.

2.2 Cloud Computing – New Term / Old Concepts

Cloud computing is an umbrella term used to describe the use of computing services that are hosted on a network and used by computers without having to specify servers or systems. Though it may appear that Cloud Computing is a new concept, however, on careful analysis we can relate it to the simplest of internet methodologies. The simple web mail is one such example. Foley (2009) defines cloud computing as on-demand access to virtualized IT resources that are hosted outside of your own data center shared by others simple to use paid for via subscription and accessed over the web.

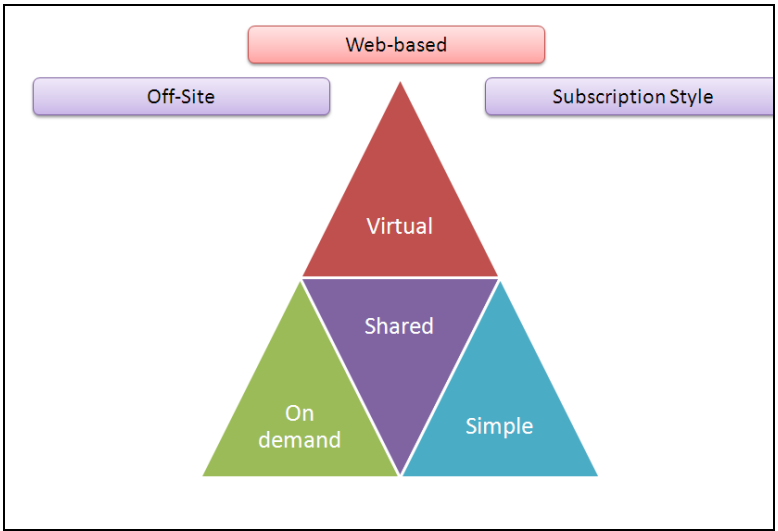

Figure 2.2a: Depicts the key technologies that comprise of the cloud computing platform

The figure 2.2a depicts the different technologies that comprise cloud based architectures. The underlying basis of these technologies is that they are web-based, subscription based and off-site. By ***Web-based***, one implies that the application is made available via the World Wide Web, the term ***Off-site*** implies that the IT resources being accessed are not in-house and present in a separate data center. That means, a company need not buy the servers and storage, it can use the IT infrastructure and pay for example month-to-month such as ***subscriptions*** giving the company a lot of cost advantage. Given these underlying technologies, the supporting technologies form the inner triangle. These are primarily ***Virtual,*** where IT resources in the cloud can be assembled with drag-and-drop ease. Employing virtualization, cloud service providers let you assemble software stacks of data-bases; Web Servers, operating systems, storage and networking then manage them as virtual servers. The second supporting technology is ***On-demand,*** where **'**In the cloud' a company can add and subtract resources, including number and type of processors, amount of memory, network bandwidth, gigabytes of storage, and 32-bit or 64-bit architectures. With the ***Shared resources,*** Cloud Computing offers the advantage of economies of scale with many service providers using a multitenant architecture to squeeze workloads from multiple customers onto the same physical machines. This approach makes Cloud Computing relatively, ***Simple*** with many of the cloud service providers-whether they specialize in application hosting, storage, or compute cycles – Helping a company configure resources in a few minutes, using an interface that doesn't require a system administrator to understand. These all features and supporting technologies make Cloud Computing a panacea to answer the worries of raising IT Expenditures to support organizations.

As one of the hottest concepts in Information Technology today 'Cloud Computing' proposes to transform the way IT is consumed and managed. Figure 2.2b depicts some of the major benefits Cloud computing platforms promise an enterprise.

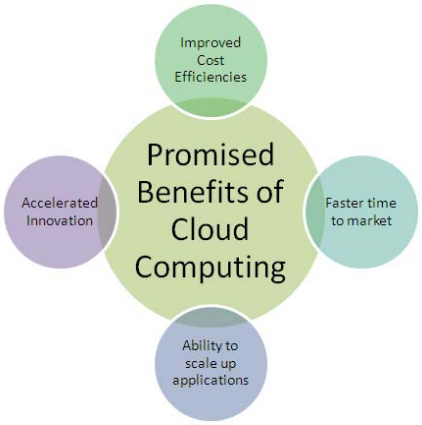

Figure 2.2b: Depicting the benefits than Cloud Computing promises to offer

While the market is abundant with the hype and confusion, the underlying potential is real-and is beginning to be realized. In particular SaaS applications and public cloud platforms have already gained traction with small and startup businesses. These offerings enable companies to gain fast, easy, low-cost access to systems that would otherwise cost them millions of dollars to build. Simply defined, *cloud computing* refers to computational resources ('computing') made accessible as scalable, on-demand services over a network (the 'cloud'). And yet, cloud computing is far from simple. It embraces a confluence of concepts-virtualization, service-orientation, elasticity, multi-tenancy, and pay-as-you-go – manifesting as a broad range of cloud services, technologies, and approaches in today's marketplace. The cloud computing framework has for main components as depicted in figure 2.3b below.

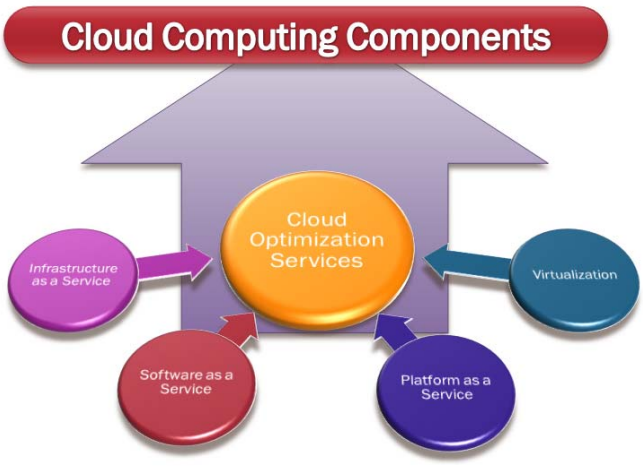

Figure 2.3b: The diagram depicts the different cloud computing components and their relation to each other

The first namely, ***virtualization technology*** can be thought of as the facilitating technology for making cloud computing a reality. By abstracting software from its underlying hardware, virtualization lays the foundation for **enabled pooled,**

shareable, just-in-time infrastructure. Gartner group describes virtualization as the 'highest impact trend changing infrastructure' – a fitting description for the technology that gave birth to the current cloud computing frenzy (Gartner Group, *Virtualization Changes Virtually Everything, March 2008*). The many variants of Cloud Computing are typically, ***Software as a Service, Infrastructure-as-a-service and Platform-as-a-Service.*** The concept of "software as a service" started to circulate with Finch, 1999. Infrastructure-as-a-service (IaaS) describes the category of cloud computing offering that make basic computational resources – such as storage, disk space, and servers – available as on-demand services. To date, IaaS has seen heaviest adoption among small to mid-sized businesses that don't have the resources or economies of scale to build out large IT infrastructures. The enterprise ready examples of cloud computing are in the SaaS category, where complete end-user applications are deployed, managed, and delivered over the web. This gives organizations the agility to bring services to the market quickly and frees them from dependence on internal IT cycles. The final piece of the cloud computing framework, cloud optimization services provide performance, scale and reliability for all of the previously-described components of cloud computing. They enable cloud offerings to operate across an unpredictable and unreliable internet while delivering the robust levels of service required by enterprises. The value of cloud optimization services can be understood as a direct function of application adoption, speed, uptime, and security. Without optimization services, cloud offerings are at the mercy of the Internet and its many bottlenecks – and the resulting poor performance has a direct impact on the bottom line. Thus, cloud optimization is essential for cloud computing services to be able to meet enterprise computing requirements.

2.4 Insurance Sector in India

Insurance is a financial arrangement that redistributes the costs of unexpected losses. Insurance involves the transfer of potential losses to an insurance pool. Generally, only a small percentage of insured candidates suffer losses.Life insurance activity in its modern form started in India in 1818 to provide for English widows when Oriental life Insurance Company was incorporated at Calcutta. Today, Insurance is a Rs. 400 billion business in India and together with banking services adds about 7% to India's gross domestic product (GDP). India has the highest number of life insurance policies in force in the world, yet more than three fourth of India's insurance population has no life insurance cover. The penetration of the insurance is very low in India and the rural market has still been largely left unattended due to the different needs of these customers (lower premium, different elements for insurance). There are today more than a dozen big companies competing in the space.

3.0 Building Flexibility in IT Infrastructure using Cloud based architectures – Challenges and Benefits in the Insurance Sector

3.1 Information Technology as an Enabler in the Insurance Sector

There is an evolutionary change in the technology that has revolutionized the entire Insurance sector. Insurance industry is a data-rich industry, thus necessitating the need for establishing large amount of IT infrastructure. The insurance companies today must meet the need of the hour for more and more personalized approach for handling its customers. Today managing the customer intelligently is very critical for the insurer especially in a very competitive environment. With the explosion of Website and greater access to direct product or policy information, there is a need to develop better techniques to give customers a truly personalized experience. IT

infrastructure can greatly enhance the ability of a company to prepare, respond and counter the forces in the market. Thus, IT can play a strategic role in ensuring the immediate survival and long term success of a company.

3.2 Benefits of Cloud based architectures for the Insurance Sector

There's no doubt that cloud computing offers significant advantages to businesses, particularly small businesses and startups. Precious startup capital can be eked out of the initial years by paying low monthly charges for just the software and services that a company needs, when they need them. This offers a startup the same software that multinationals use without having to invest in an IT infrastructure and IT personnel from the word go. Figure 3.2 summarizes these benefits below. There are a number of benefits an Insurance sector organization can achieve using Cloud computing infrastructures.

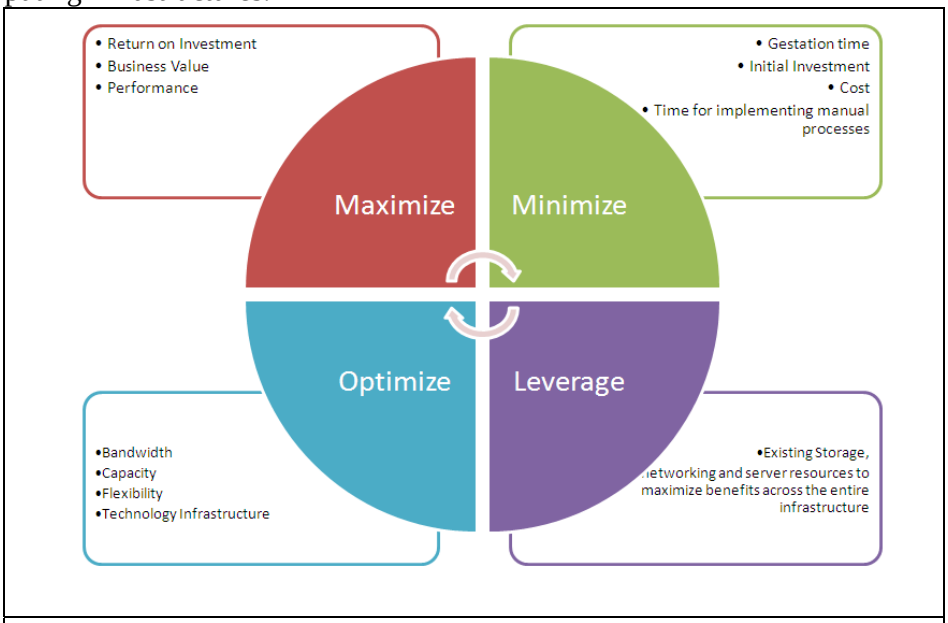

Figure 3.2: Depicting the key benefits of Cloud Computing based architectures for the Insurance sector

Cloud Computing can ***maximize the business value*** for an organization. Vendors, like HP, and third-party services provide skillful expertise when IT staff has limited experience. These specialized service professionals can drive out costs, improve ROI, reduce the risk of downtime and increase flexibility across the business. Moreover, the organization can ***maximize performance***, by creating a balanced architecture with hardware that has comparable performance capabilities, administrators can maximize the potential of each component and ensure high performance. Using cloud based architectures; a company ***can optimize its technology infrastructure*** by designing a virtualization strategy that goes beyond servers to include storage, networking and management, IT managers can share and pool resources from across the infrastructure. This convergence of storage, networking and server resources maximizes virtualization's benefits across the entire infrastructure and greatly increases the flexibility of the data center. Thus the organization can ***achieve optimal flexibility.*** By moving to a bladed infrastructure with shared storage, a company can break free of multiple configurations, providing the flexibility to take one configuration and expand its memory, network capacity and storage when needed. This enables standardization on fewer hardware configurations for more applications.

And, it allows for better use of storage by pooling and sharing it. Moreover can organization can ***optimize bandwidth and capacity across different workloads.*** A single, large high-bandwidth network connection with virtualized links to servers and storage distributes bandwidth where it is needed most. In turn, this increases flexibility in how virtual machines allocate capacity for different workloads. This will ensure s**peed *network configurations,*** which allows server administrators to independently manage server blades and their connectivity, while accelerating deployment of applications or business services. In turn, the network simply follows the application, regardless of the location of the physical or virtual server.

All these ensure high levels of scalability and performance with storage optimized storage where customer environments can sufficiently meet the capacity utilization, performance, management, and availability requirements exerted by virtualization on the infrastructure in order to meet these unique demands. Thus, the organization can **leverage on existing storage resources.** A company can ***minimize the cost and time of implementing manual processes*** by leveraging on existing management solutions that enable automated workflows that allow you to design templates for many frequently repeated tasks for specific applications. The entire infrastructure life cycle can be automated, from provisioning through retirement, and cuts weeks out of the provisioning effort in the process. This can greatly reduce the initial investment required for setting up the IT infrastructure and also reduce the long gestation period before the IT infrastructure works to its full potential.

3.3 Challenges for the Insurance Sector and Implementation of Cloud architectures

Creating an Information Technology infrastructure plan for an Insurance company isn't just adopting the latest technologies. It is a proactive decision which will decide the fate of a company. The choice of technology is a balancing act between numerous competing forces acting on the sector as a whole. Cloud Computing architectures themselves pose a number of risks that require careful assessment, prevention, preparation and mitigation of risks. Despite the rising interest in cloud based services and benefits they offer organizations have been adopting a cautious approach towards developing these services. Some of the main challenges posed by adopting cloud based architectures are given below. While some of these challenges are generic there are certain unique challenges this technology poses because of which its adoption in the Insurance sector becomes a critical decision for an organization. One of the major issues that can greatly impede the adoption of Cloud Based architectures for some time is security. Since data will be stored outside the premises, the access to this data is a cause of concern for organizations to adopt cloud based services. With data being stored remotely, the organization has no control over the security of this data since it is the cloud vendor who enforces the security and compliance measures. Another issue relating to the security aspect of cloud computing is compliance. Within its premises, an organization can have several policies governing the storage of data, the way data is accessed and the level of access granted to various stakeholders. In a cloud scenario, the cloud vendor may have its own set of compliance regulations which could be designed to suit a variety of customers deploying that cloud services. "Customers are worried about the safety of their business critical data at the hands of an outsourced operator in a remote data center not controlled by them, Also in several industries, there are legal and regulatory requirements which do-not allow company sensitive data to be stored outside", explains Kompalli of SAP Labs India.

One of the primary issues in India continues to be bandwidth. Three main elements decide on the bandwidth – availability, price and quality. Bandwidth in India, just like in many developing countries is low. Moreover, power availability poses an even greater challenge that greatly hinders vendors from offering cloud based services from within India. Interoperability and vendor lock-in are key issues for organizations looking to offer cloud services and for those looking to adopt them. A cloud vendor may have proprietary file, application and data formats defined for customers deploying its cloud services. On one hand, this requires the customer to re-write his applications to port them on the cloud; on the other, this renders him dependent on the cloud for his data and applications. Having the infrastructure internal to the organization ensures that demands in terms of performance, security of applications and data, network speed and latency are met. However, if data and applications are stored in a third party data center, the vendor will be required to provide an additional level of assurance that requirements will be met, well within the costs. Cloud computing also impact a company's growth and overheads too. Once a company has a significant number of users on a cloud computing platform they are at risk from price rises from the hosting companies. Companies may then find that moving away from a hosted service to their own infrastructure and data is technically and managerial a significant challenge.

Thus, the decision to utilize cloud computing architectures for building flexibility in the company has more of a strategic decision wherein a number of issues need to be addressed rather than a technical one.

4.0Major Findings

4.1Managerial Implications of Cloud based architectures in the Insurance Sector

Enterprises currently employ Cloud services in order to improve the scalability of their services and to deal with bursts in resource demands. However, at present, service providers have inflexible pricing, generally limited to flat rates or tariffs based on usage thresholds, and consumers are restricted to offerings from a single provider at a time. Also, many providers have proprietary interfaces to their services thus restricting the ability of consumers to swap one provider for another. Consumers have their own utility functions that cover factors such as deadlines, fidelity of results, and turnaround time of applications. They are also constrained by the amount of resources that they can request at any time, usually by a limited budget. Consumers also have their own limited IT infrastructure that is generally not completely exposed to the Internet. The idea of utility markets for computing resources has been around for a long time. Recently, many research projects such as SHARP (Fu, Chase, Chun, Schwab & Vahdat, 2003), Tycoon (Lai, Rasmusson, Adar, Zhang, & Huberman, 2005), Bellagio (AuYoung, Chun, Snoeren & Vahdat, 2004), and Shirako (Irwin, Chase, Grit, Yumerefendi, Becker & Yocum 2006) have come up with market structures for trading in resource allocations. However, significant challenges persist in the universal application of such markets. Enterprises currently employ conservative IT strategies and are unwilling to shift from the traditional controlled environments. Cloud computing uptake has only recently begun and many systems are in the proof-of concept stage. Regulatory pressures also mean that enterprises have to be careful about where their data gets processed, and therefore, are not able to employ Cloud services from an open market. This could be mitigated through SLAs that specify strict constraints on the location of the resources. Thus for the Insurance

Sector, Cloud computing platforms need a legal framework for agreements which is a research issue that is out of scope of themes pursued in this paper.

4.2 Conclusions

Cloud computing is a new and promising paradigm delivering Information Technology 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 tried to understand the benefits that the Insurance Sector can derive from the immense potential of Cloud computing architectures. Furthermore, interaction protocols needs to be extended to support interoperability between different Cloud service providers. As Cloud platforms become ubiquitous, we expect the need for internetworking them to create a market oriented global Cloud exchange for trading services. Several challenges need to be addressed to realize this vision. Finally, we need to address regulatory and legal issues, which go beyond technical issues and this paper attempts to build an initial framework for highlighting some of these issues.

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