IMPLEMENTING OPENSTACK CLOUD PLATFORM:
OPPORTUNITIES, CHALLENGES & SOLUTION
ABSTRACT
This whitepaper details some of the challenges faced by communication service providers (CSP) and how CSPs can leverage their existing infrastructure to differentiate and build a new revenue stream by way of offering cloud services using OpenStack.

CSPs could explore a couple of initiatives such as open source based tools, building software defined datacenter and automating the cloud operations thus enabling them to offer a secure, scalable and affordable cloud services at 40-60% lesser costs and in a short span of time. With our proprietary Cloud Endeavour Solution Framework, CSPs can quickly build OpenStack based cloud services platform.

BUSINESS CHALLENGES
Communication industry is one of the engines of a nation’s economic growth. Tele-density and connectivity are touted as one of the indicators of a nation’s progress. In today’s economy, with the rapidly converging & transforming world of data and internet connectedness, the CSPs across the world are in a shakeout mode as the end users are becoming more internet and mobile savvy. Data is clearly the future in the emerging “Data centric” environment. Communication Services Providers (CSPs) have daunting challenges some of which are described below:

» **Stiff Competition**: Every CSP looks to woo customers from the competitor. With the number of players increasing, CSPs have to clearly innovate and differentiate with their services. In a competitive atmosphere innovation helps CSPs to sustain market share and to remain competitive.

» **Declining Revenues**: Due to stiff competition, CSPs have experienced a decline in per user revenue, while the increased teledensity & new user base adding additional revenue. As more customers are part of the network, per user revenue from existing customers is steadily declining. The reasons for these declining trends could be attributed to strong technological advancements in mobile devices, internet technologies, highly competitive market forces and increasing choices for customers.

» **Exceedingly demanding customer base**: With ever-changing and increasing nature of customer choices, different flavors of phones and a host of features, the customers are demanding more services from CSPs such as access to their data, applications and the sudden demand often creates spikes in network infrastructure and the CSPs who are unable to keep up the service level quickly lose customers to competitors, and this is a frightening trend with the CSP market.

» **Barriers in delivering good customer experience**: A few factors such as spectrum regulation, minimal bandwidth guarantee rules, legacy systems for billing and customer support, support operations highly dependent on expensive customer service agents and thousands of variegated distribution centers, it’s becoming increasingly complex to deliver a superior customer experience.

» **Churn Management**: Currently remarkably few CSPs have better churn management systems in place. Without a good churn management system, CSPs will have no clues on gaining user related intelligence such as knowing why users switch to another service provider or to make customer centric offers. This mandates the CSPs to look for advanced data technologies such as Big Data, Data mining tools and predictive analytics. Through this, CSPs can gain a lot of insights about their user base helping them to develop a competitive edge in a crowded market. Churn management is one of the strategic tool to control competition which when used rightly can win more loyal customers for CSPs.
Enterprise mobility: In emerging markets there is growing demand for custom enterprise mobility solutions and services, and a number of service providers are putting teams and solutions in place to address this need. With most SMEs and many large enterprises continuing to rely on often inadequate consumer services, there remains a serious challenge and opportunity for service providers and vendors to build the required infrastructure and services to meet the enterprise mobility demands. The challenges that the CSPs face today are unique and multifaceted, requiring innovative solutions to address them. Cloud Computing is a once-in-a-generation opportunity for CSPs for transforming business and win the market.

TECHNICAL CHALLENGES

Although most of the CSPs have benefited internally from virtualization, current CSP datacenters are not cloud technology ready, and some of them pose serious technical challenges to offer Cloud services. Current virtualization scenario in the datacenter adds complexity, scale and management challenges, and these challenges also reflect in other portions of the datacenter viz., for application delivery, storage networks and network traffic management.

For example, putting more physical machines to virtual environment adds tremendous stress on networks and storage thus making the datacenter not effective for cloud services. Without proper consideration of long term technical and business impact, designing an internal cloud services platform will be a less fruitful project initiative to CSPs. As more and more enterprises and SMB customers embrace cloud based services for their application needs, the current IT infrastructure need to be tuned to encounter the technical and operational challenges.

If CSPs are considering proprietary cloud enablement platform, they should be prepared for a lock in and shell out more license fees, hence making it a hugely expensive and risky proposition for building an internal cloud platform. Let’s look into some of the technical challenges that CSPs face to offer cloud services.
**Performance and Availability:** Once the number of virtual machines that can run on a server reaches a saturation point, it will lead to performance issues causing the application and storage network to deplete at a much faster rate. As more virtual machines are running together on a single host by sharing single hardware network resources and streaming together through software switch—this will minimize the no of available network resources for the virtualized application. This can lead to overall network performance issues, reduced bandwidth, and increased latency. Even smaller issues such as IP address availability can be impacted within the network. This kind of situation poses challenges to the Datacenter operations to ensure performance and availability.

**Overflowing Storage:** As CSPs spearhead virtualization initiatives and perform server consolidation, they fail to account and manage the capacity and performance of SAN. As more and more virtual machines are added, SAN demands more admin resources time, sucks up all the energy and drains the IT budget as the CSPs start to scale to meet the customer demands and meet performance expectations. As the CSPs start offering more services such as virtualized desktop service, it will be an immense burden on the storage. There is no point in wasting time in storage appliances because the entire architecture is not ready for dynamic distributed computing and storage.

**Network congestion:** One of the key challenges as CSPs start scaling large data centers is that the cost of providing the same communication bandwidth between an arbitrary pair of servers grows in proportion to the size of the cluster thus, creating a network congestion problem; these challenges have to be taken into account for designing datacenter for offering cloud services.

**Beyond voice, data and value-added services:** Voice remains the main revenue and profit generator in the emerging markets. As more users start consuming data through the mobile devices, CSPs have a new technical challenge to ensure quality of service (QoS) both for voice and data. Ensuring superior service for voice and data combined requires a different approach towards the data center architecture. Communication service providers realized that CSPs must make serious investments to capture the data and provide value added services like mobile content, applications, mobile commerce and banking services. This poses a serious technical challenge and needs to be addressed for offering cloud services. The combined challenges also offer new opportunities to CSPs to differentiate by innovating on two corner stones of a modern datacenter, namely on the Network and Storage.
CLOUD ENDEAVOUR SOLUTION FRAMEWORK - FEATURES

At ALTEN Calsoft Labs, we have created a Cloud Endeavour Solution Framework to enable CSPs to build internal cloud for employees and customers and offer cloud based services using OpenStack. Cloud Endeavour Solution Framework is open hardware, software, networking and API integration consulting service combining the complete solution design approach through ecosystem of tools and services and a proven delivery model for building an OpenStack based cloud platform to offer Cloud services.

The emergence of new data center technologies, the rapid convergence of voice, video and data, the explosion of e-commerce and enterprise mobility across different industries have resulted in computer networks dramatically changing and becoming increasingly complex.

CSPs can play a catalyst role in the rapidly growing world of cloud computing. In addition, the IP infrastructure and componentized nature of the software used by communication service providers is ideal for offering cloud services. Emerging technologies like IP multimedia subsystems (IMS) and next-generation networks (NGN) service architectures will further strengthen their position in the new world of cloud computing.

The trends leading to Cloud opportunities are depicted in the figure below:

With Cloud Endeavour Solution Framework, CSPs can quickly build OpenStack based internal Cloud and roll out cloud services. OpenStack enables any CSP with decent sized data center to offer cloud based virtual machines (VMs) and other cloud services on pay as they use (rental) basis. Most importantly existing infrastructure can be transformed to offer cloud services. By enabling the existing infrastructure and internally powering the cloud solution platform, whole catalogue of Cloud services can be offered to end users. Using OpenStack at the core and with Cloud Endeavour Solution Framework, CSPs can rollout cloud offerings at 40% lesser costs than purchasing expensive proprietary tools.

Cloud Endeavour Solution Framework is designed to help CSPs quickly build cloud services offerings and fully manageable by their in-house team.
Some of the advantages of our solution are:

» Data center operations become easier for both internal and external users
» Scale-in/out operations as per business demand
» No need for upfront shelling out of capital for building new datacenter, build capacity as you scale.
» Differentiate offerings through building software defined Compute, Storage, Network and application services available through self-service portals.

CLOUD ENDEAVOUR SOLUTION FRAMEWORK - COMPONENTS

Cloud Endeavour Solution Framework is a mix & match and extension of tools designed using OpenStack based projects. OpenStack being an open source based cloud operating system CSPs can leverage it for building private and public cloud environments. It gives flexibility and scope for extending some features to offer customized solutions. With Cloud Endeavour Solution Framework CSPs quickly get the ability to build applications required for cloud service differentiation that promises all the vital components required to build a “Serviceable, Scalable & Secure Cloud”, addressing existing and foreseen challenges in building a fully functional custom Internal Cloud Services Platform. Using Cloud Endeavour Solution Framework, we help you to address the critical issues at the initial stage and arrive at a clear solution roadmap and business strategy.

The diagram below depicts the Cloud Endeavor Solution Framework components:

At the core of our Cloud Endeavour Solution Framework, we use OpenStack projects namely (Nova, Swift, Quantum and Horizon) to make the datacenter wherever possible software defined and build the core cloud platform to offer Compute, Storage and Network services. By automating operations, we bring DevOps flexibility and better user experience to consume different Compute, storage and network & application services through the dashboard.

Once the initial cloud design is complete, we extend the capabilities of the cloud by integrating custom applications. Based on the CSPs identified needs and requirements, custom applications are assembled allowing faster development of additional features and complete control on the source code thus enabling the CSPs to release new features as per the new release cycles. CSPs can leverage their internal and ALTEN Calsoft Labs’ engineering resources for speeding up the development efforts and quickly go to market with different set of cloud services.
The custom applications allow building a CSP specific services integration layer, which consists of all the critical applications required for cloud services enablement and enable software defined, compute, network, storage management. As users start consuming services, the solution allows complete flexibility to control the data center operations and scale services as per the growth.

The entire solution implementation follows a road map thus enabling the CSP to get best results at each stage to see the outcome of the solution and quickly act on the feedback for continuous improvement.

**CLOUD ENDEAVOUR SOLUTION FRAMEWORK - DELIVERY ROADMAP**

We start building cloud services platform based on the specific requirements of the CSP and our adoption path enables CSPs to build and roll out cloud services faster than the competition.

The following delivery path is arrived at keeping different CSP environments and constraints in mind.

**CLOUD ENDEAVOUR SOLUTION FRAMEWORK - BENEFITS**

**Quickly offer new catalogue of services:** The spurt in the adoption of cloud services by CSPs has opened up new revenue streams and service lines. By designing a catalog of suitable services, the CSP can create new revenue streams and services opening up techniques to retain existing customers and also win new customer base. Some of the new service lines are:

- **Easily Scale Services based on business needs:** As CSPs open up the infrastructure to third party applications and implement new billing models like pay per use there arises a need for a scalable cloud infrastructure. CSPs networks and IT operations are managed separately leading to inefficiencies in the operations & network infrastructure. With Cloud Endeavour Solution Framework the service providers can build a totally converged (compute + storage + network) virtualized cloud layer, allowing to easily scale services.

- **Churner prediction:** Using the power of Big Data and custom analytics which uses decision tree and neural network techniques, the CSPs can develop an effective churn management solution. The solution can be extended to deliver accurate churn prediction models by using some of existing data sources in an enterprise, like customer demographics, billing information, contract/service status, app access logs, and service change logs.

- **Know your customer (KYC):** The KYC solution empowers CSPs to answer questions like: what are the customer needs, what can be sold & what to prioritize and offer the right kind of offers reaching right set of customers using various analytics built into the solution. CSPs can gain a better understanding of their customers and improve services to reach highest customer satisfaction levels, gain insights based on the usage pattern, analyze & review metrics and in compliant to privacy regulations.
Transform your Data center into Green & Software defined: Activists and consumers are demanding greener initiatives from their CSPs. Tomorrow’s data centers must be 100% green indicating that datacenters offering cloud services should consume low cost green energy. This could be achieved by usage of certain open technologies and operational best practices viz., combining new technologies like flash memory, we can reduce dependency on fossil fuels. With the increased no of users and data, high use of virtualization technologies at various levels (Compute, storage, and network) layers, enterprises face huge challenge in managing the servers and storage. Hence, there is a need for future datacenters to be software defined and automated for efficient and smooth operations.

High level of security: Virtualization and Software defined nature of the datacenter imposes different levels of security measures and networking functions such as intrusion detection, firewalls on the converged physical hardware platform and secure configuration by network administrators.

Open Source tools-No software lock-ins: Our solution is built on OpenStack, a completely, flexible open source platform that provides no software lock-ins. CSPs get the complete customization flexibility and options of mix and match of other tools such as Hadoop and Cassandra.

Big Data Analytics Ready: CSPs start generating larger amount of data including network and customer data in their day to day business transactions. Our solution integrates with big data solutions easily and gets the required insights to deliver better products and better customer experience for the customers.
CONCLUSION

Cloud Computing is a once in a generation opportunity for CSPs. There is a serious business shift from the traditional model of on-premise based IT consumption to cloud based consumption of services because of the unprecedented growth of the internet and changing business models. As more and more SMBs & enterprises start adopting internet & mobile technologies, there is an upswing in moving their business communication and applications to virtualized IT and cloud based environments. This change will bring in tremendous opportunities and challenges for CSPs to roll out cloud services.

Fast to market and first mover advantage is critical for CSPs to win this new era of cloud computing.

We at Calsoft Labs, using Cloud Endeavour Solution Framework, help CSPs speed up efforts to launch cloud services and win new markets. Our solution leverages open source tool OpenStack projects to quickly build integrated custom cloud Services platform giving complete flexibility and cost advantages to CSPs for rolling out a catalogue of cloud services to customers.

SUCCESS STORY

At ALTEN Calsoft Labs, we developed a solution to one of our customers who are a leading provider of cloud based virtual networking solutions for CSPs. Our solution enabled the customer to offer a platform as a service (PaaS) capability to CSPs, for providing enterprise mobile security through hardware appliance and virtual instances running in a cloud environment.

Our engineering team built a custom cloud platform to offer a full suite of network applications and security as a cloud service leveraging OpenStack projects. We worked on delivering new set of features, build new applications on the platform, business, operations and technical support and new customer on boarding services.

The customer was able to leverage our flexible delivery models along with our engineering and support team working from onsite/offshore locations. We helped the customer to quickly go to market with a unique cloud based services offering.