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Global Telecom Industry after the Emergence of Cloud Communications

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Abstract— in many ICT (Information communication technology) trends recent years the one with the greatest influence on the future of telecom industry is cloud computing. Telecom industry has played important role in the establishment of cloud computing industry. In this paper, we are going to study new business opportunity of telecom industry after the emergence of new technologies using cloud computing. We have also discussed new business model such as B2B, M2M and B2C in the field of telecommunication. The rise in data usage by the proliferation of mobile devices such as smart phones and tablets, is putting more pressure on the network of operators. In this paper we have studied different cloud computing services which can be used to drive growth in ICT services and related network areas. We hope this paper to make contribution on enhancing practical understanding of cloud computing and open new opportunity for the telecom industry.

Keywords— Information communication technology, cloud computing, B2B(Business to Business), M2M(Machine to Machine), Telecom industry.

I. INTRODUCTION

The information and communication technology (ICT) sectors have emerged as important growth engines for the world economy. Almost all the businesses today – across sectors – use IT & Telecom for the streamlining of their operations and processes, and for operational excellence. We understand that the biggest challenge for IT & Telecom companies is to take strategic decisions on where and how to participate in emerging markets. Now days whether small enterprise or big enterprise all are becoming distributed across multiple locations and employees are mobile in nature, multi-location presence means multiple hard-ware deployments at each location and connecting them over expensive networks. The concept of cloud computing has been widely discussed and defined in a number of ways. Perhaps the most generally accepted definition has been put forth by the US Government's National Institute of Standards and Technology [1]. The exact definition is not really important, however; it's the new and changing business models enabled by the emergence of the different technologies associated with cloud computing that really count. As cloud computing emerges as new big things in information and technology, more and more applications and data are being moved from user premises and equipment to the internet. Without access networks, services and data will not be available for the users, and being connected is becoming a necessity. Telecom industries are most ambitious about technology and customer experience innovation. And have realised, the key to success is the adoption of emerging technologies such as social, mobile, analytics (big data) and cloud computing .Telecommunication using cloud computing has been designed precisely to address these challenges of connecting the businesses to their customers regardless of location and with relevant information related to that customer retrieved from the CRMs. Cloud computing gives telecom sectors new opportunities to move up in the information and communication technology (ICT) value chain.

II. CLOUD COMPUTING CHARACTERISTIC AND SERVICE MODELS

The National Institute of Standards and Technology (NIST) defines cloud computing as a model that helps enable ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (eg, networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.[1] This cloud model promotes availability and is composed of five essential characteristics, three service models, and four deployment models.

A. Cloud Characteristics :

- **On-demand self-service:** A consumer can unilaterally obtain computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service provider.
- **Broad network access:** Cloud capabilities are available over a network and can be accessed through standard mechanisms that promote use by (multiple) client platforms (e.g., mobile phones, laptops, and personal digital assistants (PDAs)).
- **Resource pooling:** One of the great strengths of cloud computing is that the provider is able to pool computing resources, such as storage, processing, memory, network Potential benefits for companies in adopting cloud computing over internal IT based resources include agility, location independence, scalability and reliability.

Since companies are not required to build and maintain IT infrastructure, provisioning of cloud-based resources according to business demands allows them to be more agile. The on-demand scalability of cloud means such organisations are now no longer required to engineer their systems for peak load levels or maintain systems that record only 10 to 20% of usage in non-peak hours. Additionally, overall costs are greatly reduced thus lowering entry barriers for SMEs. The location independence feature of cloud, allows companies to access systems using a web browser without space and time constraints, from an internet-friendly device of their choice. Cloud also allows companies to enhance data security by centralising it and to improve reliability through the use of multiple redundant sites. Bandwidth, and virtual machines, to serve multiple consumers with different physical and virtual resources dynamically assigned and reassigned according to the consumer demand. The subscriber generally has no control over or knowledge of the exact location of the provided resources.

- **Rapid elasticity:** IT capabilities can be rapidly and elastically provisioned, in some cases automatically, according to the scale required. To the consumer, the capabilities available often appear to be unlimited and can be purchased in any quantity at any time.
- **Measured service:** Cloud systems automatically control and optimise resource use by filtering service appropriately by its type. Resource use is monitored, controlled, and reported, providing transparency for both the provider and consumer of the service. An easy way to comply with the conference paper formatting requirements is to use this document as a template and simply type your text into it.[2]

B. Service Models:

- **Software as a service (SaaS):** This model allows the consumer to use provider's applications running on a cloud infrastructure. Applications can be accessed from various client devices through a thin client interface such as web-based e-mail. The consumer does not manage or control underlying cloud infrastructure, including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific application configuration settings.
- **Platform as a service (PaaS):** PaaS allows the consumer to deploy onto the cloud infrastructure consumer-created or acquired applications created using programming languages and tools supported by the provider. The consumer does not manage or control the underlying cloud infrastructure, including network, servers, operating systems, or storage, but has control over the deployed applications and possibly application hosting environment configurations.
- **Infrastructure as a service (IaaS):** This model allows the consumer to obtain processing, storage, networks, and other fundamental computing resources and be able to deploy and run a range of software. The consumer does not manage or control the underlying cloud infrastructure but controls operating systems, storage and deployed applications and may have limited control of select networking components (eg, host firewalls).[1,2]

C. Choosing an Infrastructure:

- **Private cloud:** Operated solely for an organisation, a private cloud may be managed by the organisation or a third party and may exist on or off the premises.
- **Public cloud:** The infrastructure is made available to the general public or a large industry group and owned by an organisation selling cloud services.
- **Community cloud:** A community cloud is shared by several organisations and supports a specific community that has shared concerns (e.g., mission, security requirements, policy, and compliance considerations). It may be managed by the organisations or a third party and may exist on or off premises. For example, a state government may set-up a community cloud infrastructure for all its separate organisations to pool resources.
- **Hybrid cloud:** This infrastructure combines two or more clouds (private, community, or public) that remain unique entities but are bound together by standardised or proprietary technology that enables data and application portability (eg, cloud bursting, or a dynamic redistribution of resources between clouds to handle the demand surge and balance loads).[2]

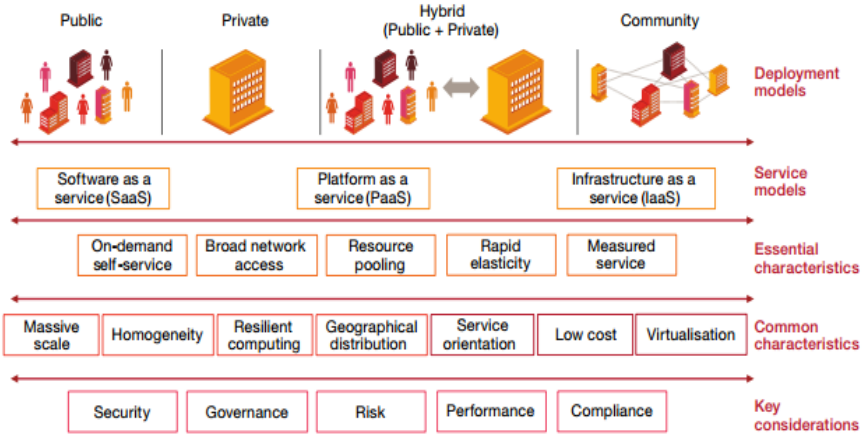

Fig.1 cloud computing characteristics and their different service models [2]

III. CLOUD COMMUNICATIONS

Cloud computing services, platforms and infrastructure can benefit telecom service providers and provide Web-based applications to enterprise customers if carriers address challenges like security and performance to differentiate them and cut operations costs. Competition, cost pressures, and the demand for services and applications anytime, anywhere, and on any device are forcing telecom service providers to consider alternative delivery models to acquire and deliver IT services demanded by their customers. Service providers regard their networks as a strategic asset capable of driving incremental revenue and increased profitability, but how do they extract maximum value from that asset? This is where a cloud computing services model has an advantage for service providers over their current enterprise IT models. With a cloud computing services model, service providers can insert themselves into the value chain by redefining their roles to expand beyond connectivity and provide services. These are the following reason why telecom industry should capitalize on cloud computing for their business and for their customers:

- Cloud computing has the potential to affect service providers total operational costs by reducing the hardware and software requirements of their current networks and platforms. Network architectures that build on optimization and consolidation are a key interest -- also, increasingly, a requirement -- for all service providers. Cloud computing platforms also enable enterprises to provision an infrastructure and add computing capacity on demand. This elasticity promotes rapid deployment of solutions and allows service providers to scale their infrastructure based on demand and consequently to improve time to market for new services. **As shown in fig 2.[1]**
- With more employees scattered in global offices or telecommuting, Web-based services and applications are perfect for the rapidly changing enterprise workplace. Service providers can increase their revenue and market share and capitalize on Web-based application services by communicating and promoting the tangible business benefits to their customers. Mobile communication, accelerated developments in broadband networking, open source technologies, and Web 2.0 have made on-demand services more reliable and affordable [3]. Using cloud-based services, businesses can store more data than on private computer systems, allowing them to save on the processing power and hard disk space required for desktop software while giving them access to an unlimited number of applications. Additional benefits for businesses -- and selling points for service providers -- include lower costs, improved system performance, reduced software cost, instant software updates, data reliability, universal data access, and hardware/device independence. [2]
- The managed services market is one of the fastest growing segments in the IT industry, and service providers are uniquely positioned to capitalize on it. Cloud computing offers service providers an ideal model for developing managed services because they already have the scalable engine to build scalable services. By assuming an end-to-end position (application to end user) in the cloud computing value chain, the service provider can improve and add significant quality of service to user-to-application experiences. This network-based approach to service assurance can position service providers to capitalize on the software revenue market related to the use of the applications -- a market that network providers have yet to fully explore and utilize. **As shown in fig 3.**
- With typical data center costs running approximately 25% of total IT budgets, service providers are under pressure to find cost-efficient business solutions and models to operate their data centers. A cloud computing data center model enables rapid innovation, scalability and support of core enterprise functions, resulting in significant economies of scale. OpEx and CapEx savings are realized through the standardization of systems and software components. A cloud computing data center reduces the need for additional hardware, software and facilities, as well as automation of server, network, storage, operating systems and middleware provisioning, and security issues, all of which are costly and time-consuming functions. A cloud computing platform also increases the utilization of servers, which can range from 20% to 70%, resulting in a decrease in required infrastructure. This hardware reduction translates to a dramatic drop in some associated operations expenditures: rack space, real estate, power and cooling. And let's not forget the cost savings associated with continuity and data center longevity. The average life expectancy of a large data center is 12 years. With the cost of developing a data center at approximately $500 million, cloud computing becomes both a business and operational value.
- The current economic climate has forced service providers to take a hard look at their business models and how they differentiate themselves from their competitors. The old business model was about cost-per-bit, but in the new paradigm, service providers realize they have to focus on what makes them stand out. Delivering cloud-based consumer and business-critical applications with solid service-level agreements (SLAs) will not only allow service providers to differentiate themselves but will maximize the value of the network while promoting a new business model .Moving to a cloud-based platform poses challenges and concerns for service providers. Dealing with standards, security, performance, data compliance aligned with procedures and operations, and availability issues are just a few of the organizational and technical challenges they'll have to address to make cloud computing a true value proposition. Service providers can leverage their reputations and solid performances to offer reliable, comprehensive and secure cloud services. Most importantly, service providers can show value by strongly emphasizing that cloud computing allows enterprises to focus on other aspects of their businesses without having to concentrate resources on IT, server updates, and maintenance issues -- a win-win service offering for both service providers and their customers. And last but certainly not least, by ensuring the value of services delivered via cloud computing, service providers not only deliver business value to their users but increase and extend their sustainability. **As shown in fig 4.**

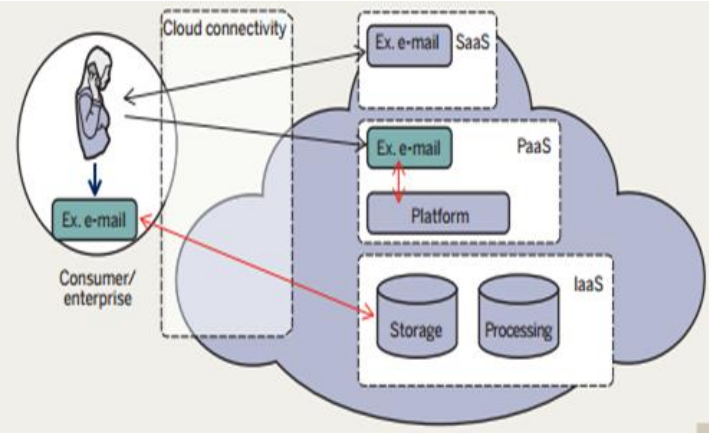

Fig. 2 the roles of cloud provider [1]

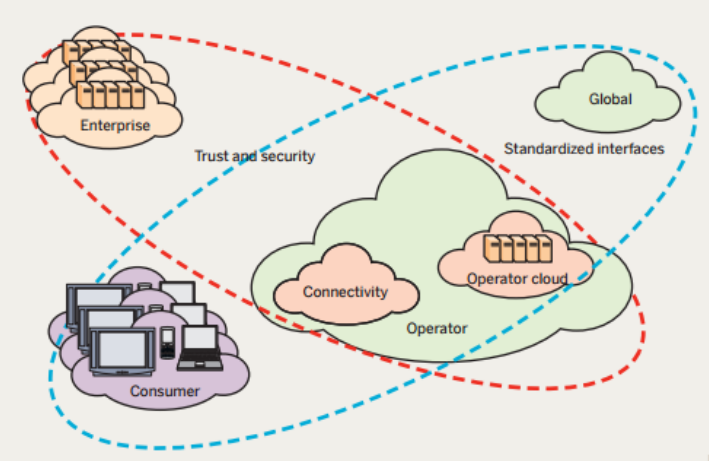

Fig. 3 opportunities afforded by cloud computing [2]

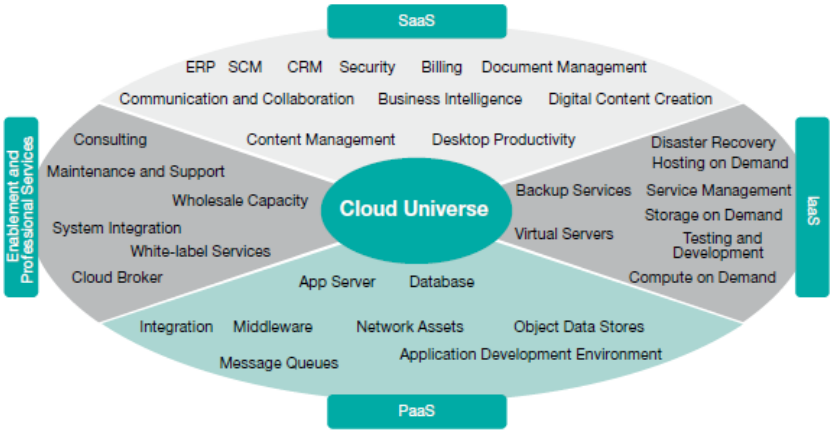

Fig 4: Universe of potential cloud services [4]

IV. NEW BUSINESS OPPORTUNITIES OF TELECOM INDUSTRY

PSTN (Public Switched telephone Network) and mobile operators across the developed world are faced with the prospect of increasing pressure on their voice and data revenues. Telecom industries are also facing a strong challenge from over-the-top Internet players who have been taking an increasing share of the consumer spend on digital media and communications. These developments are forcing telecom to identify new revenue streams for the future. Consequently, they are looking at entering new sectors that hold revenue potential, while being able to leverage their existing assets. While telecom have entered into a variety of new services involving content, advertising and cloud computing, among others, some of the more exciting opportunities lie in healthcare, energy, and automotive. These hold significant potential for telecom industry to enter and create a whole new ecosystem where they can place themselves at the center, and in the process generate significant value in the future. However, in order to tap into this potential, telecom industry will need to adopt different go-to-market strategies for different service opportunities. Telecom industry will need to assimilate changes in how they have traditionally operated their organizational structures if they are to effectively address upcoming opportunities and challenges. Some potential services that telecom industry can offer in these sectors are as follows:

A. Telecom Opportunity in Health Care Industry:

Opportunities in healthcare are closely tied to the critical role that the industry occupies in both the developed as well as developing markets. In developed markets, healthcare-spend as a percentage of GDP varies between 8-11% [6] such significant spending indicates a sizable opportunity across the healthcare value chain. Service offerings in the healthcare market can be classified as consumer services and enterprise solutions. Consumer services primarily involve delivering healthcare offerings to retail consumers, spanning the traditional healthcare value chain **(see Figure 5)**. These services include remote diagnostics, continuous monitoring, self-monitoring and home-emergency solutions, e-health record solutions and awareness services. The opportunity for telecom operators primarily lies in creating services where connectivity adds significant value to the overall experience.

	Diagnosis	Treatment	Rehabilitation	Management	Prevention
Telecom Operator	▪ Remote diagnosis using specialized hand-held devices that require connectivity ▪ e-health systems rely heavily on a telco's network assets	▪ Mobile and tele-health systems allow for continuous monitoring of patients and constant communication requires high Quality of Service that telcos can offer	▪ Telcos are better positioned than OTT players to deploy healthcare solutions that allow for self-monitoring and home emergency monitoring solutions	▪ Telcos would need to develop healthcare record management solutions that are robust and easy to use	▪ Prevention of disease is closely tied to patient education that telcos offer in a limited way through help lines
OTT Players	▪ OTT players can offer services only on standardized devices such as mobile phones with mobile Internet	▪ OTT players will have to rely on Internet Service Providers to offer high Quality of Service for device communication	▪ OTT players will need to develop an ecosystem that would support healthcare systems and monitoring	▪ OTT players with their personal health record solutions offer the ability to collate a patient's medical records and organize them effectively	▪ OTT players have a potential edge, given their increasing number of touch-points including email, instant messaging, social networking where they can spread the message

Area of strength

Fig 5: Comparison of Relative Advantages of Telecom and OTT (Over the Top Players) in Health Care Industry**. [5]**

B. Telecom Opportunities in Energy:

The energy industry finds itself in times of rapidly increasing demand and end-user costs. Demand for global energy is estimated to be more than doubling in the time period 1980-2030. [7] Similarly, electricity costs in the UK are estimated to have grown at a CAGR of over 11% during the period 2005-2009.[7] These developments are forcing utility service providers to look for solutions that can help both utilities and consumers manage energy in a more efficient manner. This need is largely addressed by the emergence of smart grid technologies, and primarily through the smart meter **(sees Figure 6)**.

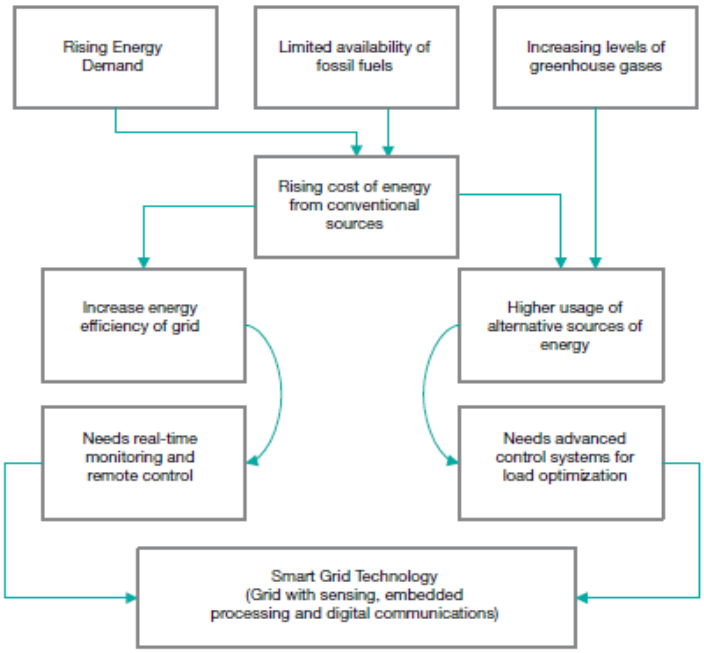

Fig 6: Need Served by Small Grid Technology [5]

C. Telecom for the B2B & M2M Future:

B2B ICT markets will grow attractively in the coming years, and telecom is in a good position to shape them. A number of possible strategies could pay off for telecom seeking to grow in this space **(see fig 7)**. Broadly speaking, telecom can map their strategies along the two halves of their B2B client base. M2M plays can include remote healthcare services, smart metering for utilities, and vehicle asset tracking for logistics and field service providers. Telecoms players can create more value by leveraging their network assets, large customer bases, and distributed field forces. Success here will require excellence in partnering capabilities, with many of the aptitudes telecom will need to secure lying far outside their core businesses. Telecom will also need to adopt a culture of innovation to move them from simply passive infrastructure providers to platform and solutions providers. [8]

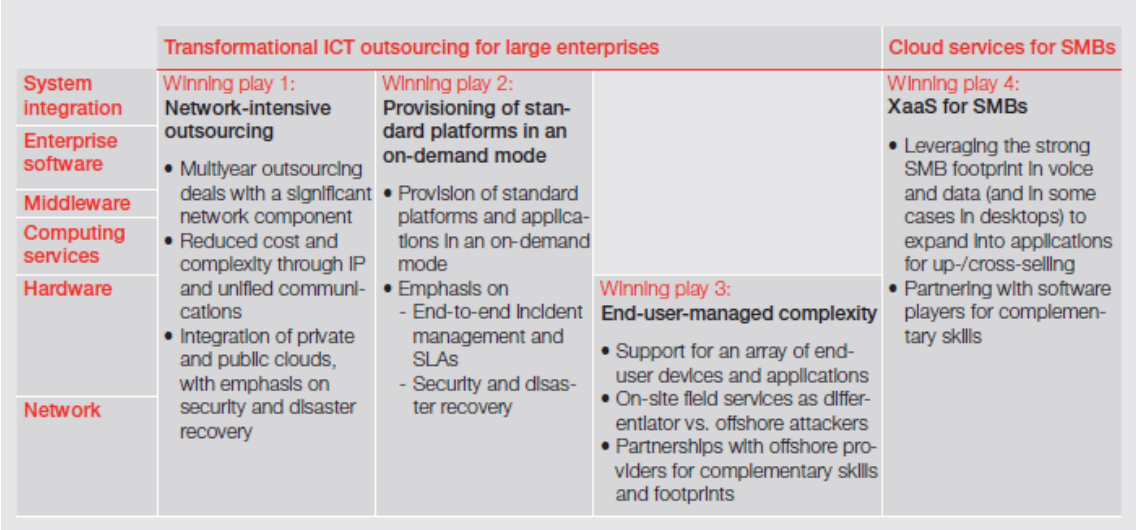

Fig 7: B2B and M2M services using Telecom [8]

V. CONCLUSIONS

The telecoms sector is the largest industry in terms of employment in the world and therefore developments in this sector have far reaching impact. In recent years all types of organisations are set to dramatically transform by adopting new technology-enabled options such as social media, mobile computing, and analytics and cloud computing. These developments are forcing telecom to identify new revenue streams for the future. Consequently, they are looking at entering new sectors that hold revenue potential, while being able to leverage their existing assets. While telecom industries have entered into a variety of new services involving content, advertising and cloud computing, among others, some of the more exciting opportunities lie in healthcare, energy, and automotive. These hold significant potential for telecom to enter and create a whole new ecosystem where they can place themselves at the center, and in the process generate significant value in the future.

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