Role of Telcos in Internet of Things

An IoT-Ignite Whitepaper

2017 January

ABSTRACT

The course of technological development is stirring towards pervasive connectivity and transformation of traditionally "mute" devices into connected, data generating, Internet of Things (IoT) devices. IoT development is mostly business driven and fundamentally different from any other technology initiative in the history. IoT is not a technology solution looking for business case, it is rather a targeted technology solution solving a business problem. According to many business intelligence reports IoT has a potential to generate huge added value through applications and resulting services. Companies around the world are and will continue to be in constant battle to capture the share of added value. The size of the share will predominantly be decided based on the position that a company has up on the value chain. In this whitepaper, the role of TelCos in IoT is investigated, major challenges are presented and possible business roles that TelCos can choose to have are analyzed. The case study is done on AT&T, as one of the leader TelCos in IoT.

BUSINESS PERSPECTIVES

Telecommunication service providers (TelCos), have dominated the business in the information and communication technology (ICT) industry throughout past three decades. Main reasons for this domination were based on high demand for communication medium, a mean to transport information from source to destination. For the most part, TelCos based their revenue streams on provision of voice calls and SMS services. Recently, with the emergence of smartphones as a form of mobile computation devices, and increase in amount of offered information, lifestyle and entertainment services delivered through the smartphone applications, TelCos started offering data plans to diversify their revenue sources. One can say with certainty that the business success of TelCos can be owed to provisioning of communication medium which has become rather commodity than luxury in modern times.

More recently, the work of telecommunication regulation agencies and various international agreements (e.g. lower roaming or no roaming rates) have caused the profits of telecommunication services to drop. Additionally, TelCos are facing competition from companies delivering alternative communication services. Namely, the developments in smartphone industry and software based services that came with it, have put dominant TelCos to test. Over-the-top (OTT)[1] content services alone have caused the decrease of revenues from voice calls and SMS, two main services that used to be revenue cornerstones of TelCos. In fact, in 2013, the number of exchanged OTT messages was larger than the number of exchanged SMS messages for the first time in history. OTT

---

[1] Over-the-top content (OTT) is the delivery of audio, video, and other media over the Internet without the involvement of a system operator

services under consideration include mobile email exchange, instant messaging and other social network applications offering the means of text, audio, video and media exchange. Mentioned services have utterly disrupted the way we communicate and predictions show that such trend will continue in future.

Mobile devices, in particular smartphones and tablets, in the context of telecommunications have become terminal devices of choice for TelCos not only because of their ability to provide means of communication but also because of their ability to act as delivery point of various digital services. Furthermore, due to the same reasons mobile devices also became important part of value creation in digital disruption. In order to fully understand the current TelCos situation and possible future directions it is important to look at the value chain and distribution of revenue of modern services. Traditional value chain of services directly or indirectly relating to TelCos show that much value was captured by infrastructure provisioning and device management links, directly affecting TelCos revenue streams. In the era of digital disruption and latest mobile computation advances the value chain has also changed. Among the development, infrastructure, device management, content and maintenance links the biggest value is contained within content link. Now TelCos face challenge of finding a way how to capture the full potential of content link and monetize on new digital services.

Digital services, as a part of digital economy, are diversified across industry, consumer, medical, finance, agriculture, retail domains and delivered to the end users though connected devices. Majority of connected devices today are mobile phones, tablets and laptops; however, this situation is expected to change in near future. According to the Ericsson Mobility Report dating from November 2016 [6], there is currently about 16B connected devices with mobile phones, tablets and laptops making up 10.3B of those devices, the rest, around 6B is made out of Internet of Things (IoT) devices. By 2022 the number of connected devices is expected to grow to 29B with distribution changing drastically. Namely, the number of mobile phones, tablets and laptops is expected to raise to 11.6B while the rest 17.4B of connected devices will be IoT devices.

The natural technological development is the one that leads to truly pervasive connectivity and transformation of traditionally "mute" devices into connected, data generating, IoT devices. Indeed, the most obvious expectations from IoT are technology based, however IoT is business driven and fundamentally different from any other technology initiative in the history of mankind. IoT is not a technology solution looking for business case, it is rather a targeted technology solution solving a business problem. Ideally, by connecting and orchestrating devices a business can become more adaptable to changing customer needs, can react faster to issues related to their products and services or can even prevent them at lower cost (predictive maintenance), create new business opportunities and increase productivity at all levels of the organization. By the help of IoT devices, businesses will be able to make and save money faster and more efficiently. The connected devices are expected to generate a total of 19T $ of added value [7] by 2020. For the scale comparison of this number it is important to note that currently traditional telecommunication market stands at 1.2T $ [8].

TelCos are currently in favourable position to capture a share of the added value market that will be generated by the implementation of IoT. The size of the share that will be captured by TelCos will definitely depend on the role of the TelCos in the chain of value. The possible roles are ranging from being a traditional connectivity provider (infrastructure) all the way to being an end-to-end solution provider (content based service delivery). Early indicators are pointing towards larger distribution of added value in

content domain of emerging applications, therefore TelCos must focus on creating new core capabilities around business solutions design and delivery, platform delivery and ecosystem building for success in IoT era.

CHALLENGES FOR TELCOS IN IOT

TelCos will face many challenges in the battle to capture IoT value. The diversity of these challenges lies in their nature. Challenges awaiting TelCos are of technical nature relating to the changing connectivity requirements (scale, speed, energy efficiency, purpose and manageability); Business challenges that are relating to the right management, investment and selection of partnerships; Strategic challenges relating to the decisions on the best future paths to take.

Technical challenges that TelCos face are originated at the changing connectivity requirements for IoT devices. Surely, speed and reliability requirements have been anticipated and addressed with the roll-out of 4th generation wireless mobile telecommunication networks, however, these networks have been designed on the licensed spectrum and primarily target high-quality mobile voice and data services. IoT devices of the future will be able to make use of 4th and future 5th generation networks in the applications such as traffic and safety control, industrial control applications, smart grid, remote heath care and remote manufacturing where reliability, low latency and large spectrum availability is of critical importance. On the other hand, massively rolled out IoT devices such as smart metering, smart agriculture, logistics, fleet management, retail, smart building and smart homes have different connectivity requirements such as low cost of connectivity modules and data transmission, low energy consumption, wide area coverage, efficient scalability and diversity.

The connectivity requirements of massively rolled out IoT devices are obviously not satisfied with the current cellular network installations. Current cellular network installations, EDGE, 2G, 3G and LTE are limiting the IoT applications due to their power-hungry protocol implementations, their still relatively high prices of the embedded modules, networking equipment and data transmission and poor coverage in the non-urban areas. In order to overcome the issues associated with current cellular networks, new type of networks are being installed that satisfy the mentioned IoT connectivity requirements. Those networks come under many different names such as LoRaWAN[TM], SIGFOX, NB-IOT, Weightless or RPMA. Looking beyond their different names and competitive characteristics all those networks are low power wide area networks (LPWAN) granting long battery life to nodes. These networks are based in the unlicensed band which lowers the price of communication and due to the narrow band nature, the reach of devices running these protocols is remarkable, up to 10 km with very small antennas. From TelCos perspective the first appearance of these networks was regarded as competition to cellular, however very soon TelCos started getting on board and utilizing these networks to satisfy changing connectivity requirements. For example, Orange [3] has announced and IoT platform based on the LoRaWAN[TM], Swisscom [4] has built a nationwide low power network for IoT devices based on the LoRaWAN[TM]and SK (South Korea) Telecom has undertaken similar step and also built nation-wide network based on LoRaWAN[TM]and already announced pricing rates for IoT

devices[5]. Similar strategic moves are also expected to be seen from other TelCos.

The examples of Orange, Swisscom and SK Telecom represent both the examples of water testing and planned actions toward the IoT monetization. Other TelCos that decide to take up similar path will face the challenges of unaccustomed low average revenue per device, non-uniform enterprise customer care needs, need for rapid scaling of network and platform capabilities, unpredictable application behavior and the need for global deployment. These challenges are associated with TelCos who decide to take the role of network *connectivity provider* for IoT. Other type of challenges awaiting TelCos can be identified based on the role that they are going to take in the IoT value chain. In general, types of business players in the IoT value chain can be boiled down to *embedded solution provider*, *connectivity provider*, *IoT platform provider*, *service (app) provider* and *IoT integrator*.

In the *embedded solution provider* domain, TelCos until now attained and will continue to attain the role of embedded technology distributor. Having the base in M2M technology, TelCos are capable of delivering solutions for secure provisioning, activation and device registration that are also needed for IoT devices. TelCos may also get involved in development of multi-protocol gateways which will become indispensable element of the IoT ecosystem. Biggest obstacle for TelCos to act as a embedded solution provider are the lack of product development capabilities and the field expertise. Not yet so evolved and still immature embedded technology standards require investment just to keep up with the technological pace. It looks like the best strategy for TelCos in this layer of value chain is to partner up with chip and device manufacturers and keep them in the loop as a part of their broader IoT solution. There are already such examples with AT&T & Emerson and Vodafone & Volkswagen.

As an *IoT platform* provider TelCos may try to enhance their M2M investments as IoT platforms or they may try to partner up with other platform providers. TelCos have already partnered up with cloud providers to offer cloud computing to their customers. One way or another Telcos have to come up with platform solution that will meet IoT requirements of aggregation, storage, processing, management and sharing of data. Building of platform will come with numerous challenges mainly associated with strong product management need and attaining of advanced software development capabilities with deep domain knowledge. TelCos may have difficulties of hiring best cloud software talent due to the lack of history in cloud development. Other challenges can be associated with the lack of cloud platform operational experience. Looking at these challenges it seems like it would be the best move for TelCos to partner up with platform providers and have those platforms tailor to their needs.

Service or app providers in IoT are often companies with niche offerings that are building specific solutions to solve narrow use cases. These companies usually have industry knowledge and domain expertise to provide application specific solution that creates insight and value, e.g. predictive maintenance of specific industry equipment such as pumps, generators or elevators. Early IoT service providers are mostly offering services in the form of device and cloud based monitoring app, however, next generation service providers will be providing advanced analytics and form of control based on the analytics results. For this goal to be accomplished and true value added services to be developed companies will need to have deep understanding of the domain specific challenge. TelCos typically don't have industry knowledge and domain expertise to become successful IoT service provider in this context, hence in order to capture value at this link of value chain, TelCos will have to relay on the either acquiring the companies with valuable service delivery or partnering with them through shared revenue models.

IoT end-to-end integration is the most complex and involving link of value chain. Integration in the IoT domain encompasses sensors, actuators, devices, middleware, gateways, cloud, analytics, user applications, etc. Integration often requires solution providers to have flexibility on hardware, software and domain knowledge level. Gartner [2] identifies systems integration as one of the top IoT adoption challenges for enterprises. It seems that TelCos may be successful as IoT integrators given their past success in M2M projects and ability to quickly come up with funds to acquire or upgrade physical assets (CapEx) to increase the scope of their operations. IoT solutions will be delivered through the cloud and offered under innovative business model such as pay-per-use and subscription based models. As such IoT solution will require most of all strong capital base and good financial status to damp out initially rough and slow return of investments. The biggest challenges of IoT integration projects for TelCos will be complexity and risk. TelCos that decide to take on such projects are expected to have great returns.

CASE STUDY - AT&T

Despite all the uncertainties regarding the adaptation of IoT and blurry business cases some TelCos have already partnered up with IoT platform providers. In this section AT&T examples is studied.

AT&T Inc. is an American multinational telecommunications conglomerate and largest telecom company in the world by revenue. As of 2016, it is also the 17thlargest mobile telecom operator in the world, with 130.4M mobile customers. Next to the phone, Internet and TV services AT&T also

has a portfolio of professional IoT service offerings including consulting, device lifecycle solutions, application solutions, managed services and support.

IoT consulting is related to the assessment of technology, device, connectivity and infrastructure, consulting services also cover opportunity analysis for specific business cases and roadmap building. Device lifecycle solutions service is based on the past M2M offerings of staging, testing and kitting, OEM warranty management, device replacement and field support for devices. Application solutions service is related to the architecture design, customer portal, end-user interface and operation optimization, these services are structured to offer systems integration, device connectivity software, and knowledge of business rules. Lastly managed services of advanced support are related to the solution management, monitoring, change management and operation optimization.

As a part of the IoT offering AT&T has partnered up with companies from industry to deliver and end-to-end IoT platform. The platform consists of IoT starter kit (embedded devices), IoT data plans (connectivity), M2X (cloud), Flow (app development) and AT&T Drive (connected car vertical). IoT starter kit is based on the LTE module and open hardware architecture to deliver solution that can be used to connect IoT products with AT&T's wireless broadband network. M2X provides time-series data storage, device management, message brokering, event triggering, alarming, geo-fencing, and data visualization for the industrial IoT products and services. In order to deliver M2X AT&T has partnered up with Citrusbyte, a cloud solution company. Together AT&T and Citrusbyte have built M2X, a developer focused ecosystem that simplifies IoT development and provides data analytics, visualization and management tools. These two companies also worked together on mHealth, a platform to help doctors, patients, and health care providers communicate and collaborate more effectively, and efficiently.

In order to create a vertical IoT solution Drive, AT&T took a step further and partnered up with multiple companies to deliver truly unified end-to-end solution. Drive is a connected car platform, modular solution that automakers can use to choose solutions ranging from connectivity to billing solutions to data analytics. AT&T partnership for Drive include car manufacturers GM, Audi, and Tesla to integrate its solution for wireless connectivity into their cars. Cisco sponsorship of the AT&T Foundry innovation center in Atlanta which will among other focus on connected car, Ericsson for the global application delivery framework, Accenture for telematics and big-data analytics, Amdocs for customized billing solutions, AccuWeather, iHeartRadio for music, and Streetline for apps for the AT&T Drive platform [1].

CONCLUSION

In this whitepaper, we presented the current business perspectives and challenges for TelCos in IoT. Emergence of IoT has profoundly changed the distribution of value along the value chain. It is predicted that the majority of the value will be contained in the content generating links. In IoT this means that the information or knowledge produced from the collected data is much more valuable than the provision of connectivity medium as it used to be the case in the history. That fact alone means that TelCos need to change their business and monetization strategies if they want to continue their domination in ICT business.

Globally changes already started taking effect and we analyze the moves of some of the most powerful TelCos such as Orange, Swisscom, SK Telecom and AT&T with particular focus on the AT&T's IoT platform. Throughout the analysis the insight to the solution architecture is given and common remarks about the platform requirements are outlined.

Major challenges awaiting TelCos in the IoT have both the technological and business nature. From the technological perspective, the challenges are originated at the connectivity requirements for IoT devices, such as;

- low cost of connectivity modules and data transmission

- low energy consumption

- wide area coverage

- efficient scalability

- diversity

From the business perspective, the general strategy of TelCos is to maintain the dominant role in the industry and to capture most of share of added value from IoT services. In order to do these TelCos need to assume different position up the chain value, other than being solely connectivity provider. Possible roles for TelCos and main challenges associated with these roles were identified as follows;

- embedded solution provider
- lack of product development capabilities
- lack of field expertise
- large investments to stay up-to-date
- connectivity provider
- IoT platform provider
- lack of strong product management
- lack advanced software development capabilities

- lack of domain knowledge
- lack of history in cloud development
- service provider
- lack of industry knowledge and domain expertise
- IoT integrator
- business case complexity
- business case risk

REFERENCES

[1] Cisco, AT&T drive http://www.cisco.com/

[2] Gartner, Market guide to IoT integration https://www.gartner.com/doc/3352439/market-guide-iot-integration

[3] Orange, Orange IoT Studio, http://orangeiotstudio.com/

[4] Swisscom, Swisscom Low Power Network, http://lpn.swisscom.ch/e/

[5] South Korea Telecom, LoRa press release, http://www.sktelecom.co.kr/en/press/detail.do?idx=1172
[6] Ericsson, Ericsson Mobility Report, November 2016 http://www.sktelecom.co.kr/en/press/detail.do?idx=1172

[7] Gartner http://www.gartner.com/newsroom/id/2636073

[8] IDC, McKinsey 2014

IoTignite

Varyap Meridian Ofis, I Blok,
Kat:11 Ofis:145
Barbaros Mahallesi, Mor Sümbül Sokak,
Ataşehir/İstanbul TURKEY

TÜBİTAK MAM Gebze Yerleşkesi
Teknoloji Serbest Bölgesi
Yeni Teknoloji Binaları B Blok 205-206
41470 Gebze/Kocaeli TURKEY

iot-ignite.com