# 04

# A "STARTEGY" FOR IOT

**IoT is an opportunity for the foundation of new businesses in the future connected society.**

In just a few years, tens of billions of devices will be spread around the world, demanding ubiquitous network access, IoT specific functionalities, data management enablers and monetization services, in order to make the IoT vision real and sustainable. Operators have a huge opportunity to move up in the value chain by becoming key technological partners in the IoT market thus promoting the creation of useful services to verticals, enterprises and end-users. But the time to act is now.

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# Introduction

We are facing a new digital revolution that will have remarkable impacts on future societies. The gap between the virtual and the physical world is thinning. A massive spread of small 'intelligent' objects with communication capabilities is starting to bring into reality the Internet of Things (IoT) vision, impacting the citizens daily lives in an outstanding way.

IoT is the base for the 4th Industrial Revolution by permitting the optimization of the manufacturing processes through an intelligent control of industrial machinery. Moreover new services are arising in the health domain allowing for effective remote care of patients and elderly people. Transports will also be deeply affected: the trend of connected cars will foster the creation of new services making the mobility much easier, faster and safer. IoT will also extend the domotic concept towards a complete and efficient house automation. Within cities there will be also major improvements in order to promote a sustainable usage of its resources and infrastructures.

There are some key market drivers for the IoT growth: devices are cheaper, network access is becoming ubiquitous and new vertical services emerge everyday, creating disruptive business streams. Forecasts are impressive: "The worldwide market for IoT solutions [is forecasted] to grow from $1.9 trillion in 2013 to $7.1 trillion in 2020" [1]; "IoT hardware and connectivity revenues are growing at about 10-20% annually, while apps, analytics and services are growing even more rapidly at 40-50% per year" [2].

In this new digital era, devices will require not only convergent connectivity, but also intelligent IoT functionalities, data management enablers and monetization capabilities to facilitate the creation of smarter and innovative services. Communications Service Providers (CSPs) are in a privileged position to become key players in the IoT sphere. They can provide the core infrastructural components required to support the new business opportunities. Additionally, CSPs can use IoT to enter in vertical domains that have been traditionally out of their scope of business thus opening the doors to a huge market. Now is the time to act.

# Main Trends

Several trends are emerging in the IoT arena, with high potential to facilitate and accelerate its adoption. From the perspective of CSPs, three of them must be highlighted: **Smart Cities, Low Power Wide Area Networks (LPWANs) and Embedded SIM Card (eSIM)**.

According to the United Nations, by 2050, 66% of the world population is expected to live in cities [3]. IoT has the potential to revolutionize several activities within city planning and control. Additionally, it promises to increase sustainability, safety and to make the cities more *liveable* places, through a countless set of new services (e.g. street lighting management, waste management, intelligent road monitoring, traffic congestion monitoring and management, etc.). Smart Cities are characterized by the application of information and communication technologies in the management of the urban spaces providing enhanced quality of citizens daily lives. The advent of IoT makes it possible to have a much more dynamic control of the city, based on information gathered from sensors spread all over the neighbourhoods and also the ones carried on personal devices, in particularly, those embedded in mobile phones or wearables. This new source of information will feed the "city data lake" allowing to infer the user and environmental situation thus enabling the full real time control of cities, making them smarter. For instance, it will be possible to adapt the infrastructures of urban spaces to cope with the daily growing movement of people and cars: sidewalks will enlarge during rush hours (e.g. entry and exit of schools); the road will adapt the direction of lanes according to the peak hours; traffic lights will set its own state to respond to the city dynamics; and public lighting will react based on the environmental context.

The Internet of Things requires wide area data connectivity for its deployment and, in specific scenarios, it also mandates low cost and long battery life in order to allow for the effective implementation of services. LPWANs technologies are a possible answer, since they enable a cost effective deployment and maintenance of services requiring

large coverage and long battery duration. Currently, several technologies compete in this emerging space, some proprietary (e.g. SIGFOX, OnRamp/RPMA) and other open or partially open (e.g. LoRa, Weightless, DASH7). Traditional telco standardization bodies are also working to have available standards for this specific IoT connectivity segment, namely 3GPP (EC-GSM, LTE-M, NB-CIoT) and ETSI (LTN). Different technologies are already there but the market is still unclear in respect to specific adoption.

GSMA eSIM specification (Embedded UICC- eUICC) is a standard for the "over the air" remote provisioning and management of operator subscriptions. Although the final technical specifications have not yet been concluded, it is expected that in the next years eSIMs will gradually replace the traditional SIMs. The eSIM brings key benefits to stakeholders in the M2M (Machine-To-Machine) and consumer electronics space. It is not coincidence that both Apple and Samsung are engaged in talks with GSMA to adopt eSIM standards. eSIMs solve the challenge of managing devices in the field (remotely located, geographically spread, often hermetically sealed and hard to reach) and simplifies the manufacturing processes related with equipment requiring SIMs. eSIMs will be major achievements, for instance, for the automotive industry where future cars will be connected regardless of its manufacturing region. The eUICC specification will for sure accelerate the development of M2M and IoT markets.

# Market

CSPs have a strong opportunity to shape the IoT reality by becoming key technological partners, supported by trustful customer relationship and typical connectivity offers. IoT enablement and vertical value-added services bring new opportunities for telcos to create value and generate higher revenues, moving up in the value chain. However, new over-the-top (OTT) **competitors are arriving at the market**. Bosch, Amazon, and many other players are running for the IoT business. Figure 1 presents a small sample of IoT Application Enablement players.


**FIGURE 1** IoT enablement platforms market

As in other areas of the competitive CSP landscape, imagination has to be used in order to create a collaborative competition approach, instead of a pure competition strategy.

# IoT Enablement

## Vision and Positioning

The leading CSPs are **key players in the IoT domain** making possible the **Smart Cities materialization and the operational optimization across all industrial domains (verticals), materializing a connected society**. To make this vision happen, it is crucial to assume a long-term strategy to successfully address the IoT opportunity.

From the CSP perspective, the technological value chain of IoT encompasses 5 key layers, as shown in Figure 2:

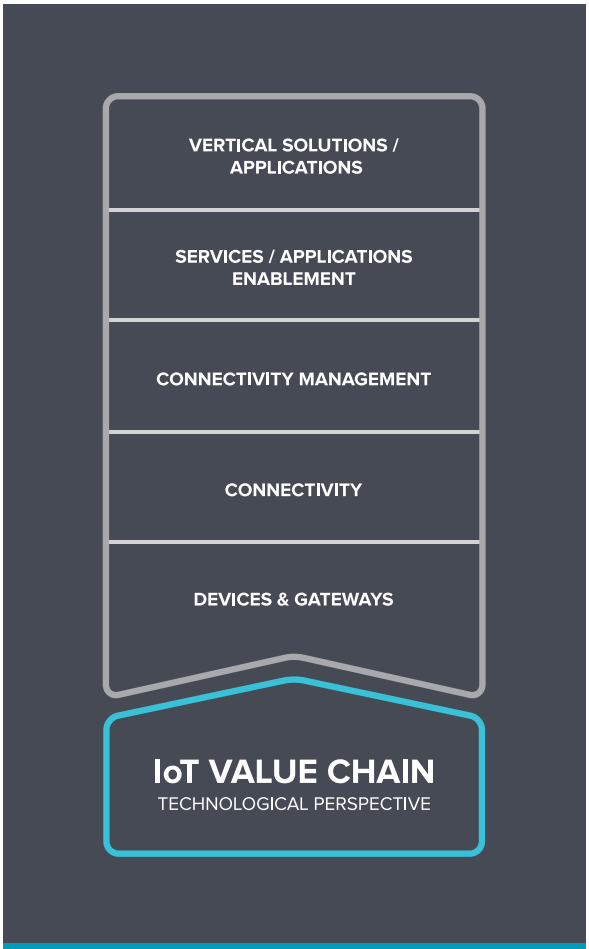


**FIGURE 2** IoT Technological Value Chain

Devices and Gateways layer refers to all equipment required to collect sensor information, actuate in the environment and link with the wired or wireless telco-based network. The Connectivity layer deals with all communication infrastructures regarding its specificities (fixed, mobile, LPWAN, etc.). The Connectivity Management allows for the management, monitoring, troubleshooting and support to the M2M connectivity over multi-technology networks (traditional landline and cellular and also new IoT low power WANs).

The next layer is the core of IoT: Services and Applications Enablement offers solutions by providing a layer of API offer allowing the abstraction of the device specificities from the applications. This typically includes capabilities for data gathering, mediation, transformation, storage, monetization and other telco-based functionalities.

Finally, Vertical Solutions and Applications provides specific service logic, making available useful IoT solutions to the market.

In the IoT playfield, CSPs are typically involved in the connectivity layers, but to increase their business margins from IoT they need to move up in the value chain. For that they must create an **Application Enablement ecosystem**.

## Strategy

The strategy to achieve the CSPs vision passes by moving forward the typical telco-based connectivity offering towards **the creation of a carrier-grade IoT Enablement Framework** tailored to stimulate the creation of new businesses transversal to all domains of activity. It typically includes core services to manage devices and applications allowing secure data exchange, functionalities to process, store and analyze data from devices and, finally, services to monetize IoT events and services.

Moreover, it is mandatory to promote **an ecosystem of technological partners, fostering the creation of innovative services** in order to rapidly answer to future society demands. The promotion of a creative environment where different knowledge areas intersect is crucial to create new business opportunities and bring up innovative business models in the connected society.

The strategy rollout shall follow an evolutionary approach, with well-defined steps, making it possible to evolve the framework and ecosystem, while always considering realistic timeframes and agendas. The materialization of these key vectors can run in parallel but always ensuring a gradual progression.

## Carrier-grade IoT Enablement Framework

Figure 3 presents a high level view of the carrier-grade IoT framework.

The rationale behind this framework is to answer

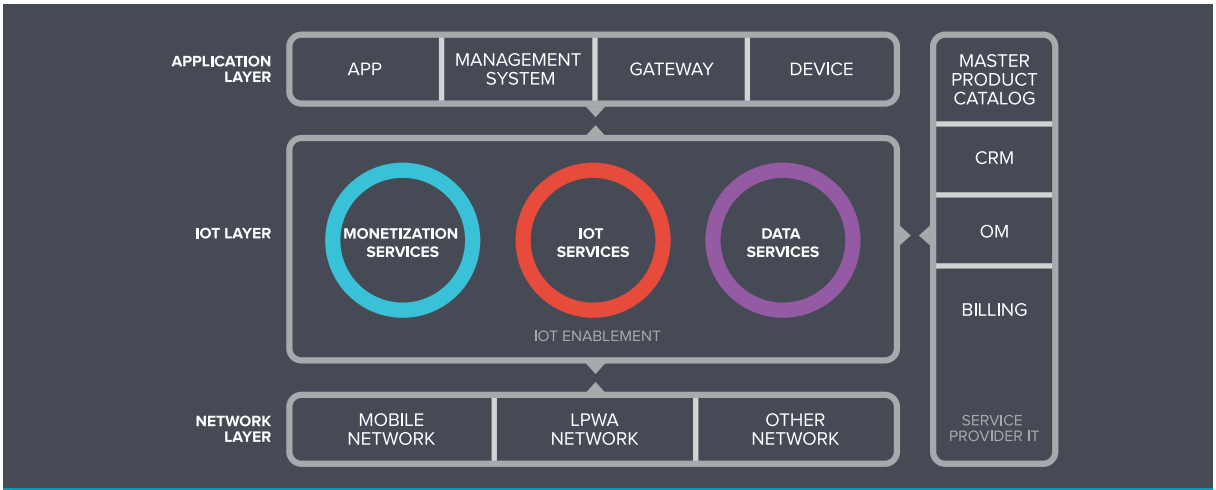


**FIGURE 3** Carrier-grade IoT Enablement Framework

the typical telco-based requirements in terms of business and operational perspectives, by providing cloud-based open APIs that support different technologies and protocols easing the end-to-end system integration. Moreover, it shall have a cost effective horizontally scalable architecture. It shall also provide elastic data storage capacity with enhanced security and access rights management mechanisms. By design, the solution must provide a set of transversal services to ensure its efficient operation, administration and maintenance. Moreover, it must be built to allow the integration with the existing operators' ecosystem.

This infrastructural framework must cope with all related IoT, Data and Monetization services that are key enablers to support the implementation of the different verticals, and which constitute one of the major differentiation points a CSP can present to the market.

## IoT Services

IoT Services (Figure 4) are the foundation of the IoT Application Enablement Ecosystem. They provide the main capabilities required to deal with devices and IoT applications.

The Device and the App Inventory components include functionalities to control their full lifecycle process. The Device Management component provides mechanisms to carry out device configurations, firmware updates, fault and performance monitoring. The Register and Discovery component capabilities are mandatory to let devices and applications become known by the system during runtime phase. The Rules Engine must provide the required skills to allow subscriptions to rules-based metadata events and respective notifications. Finally, the Device Interaction component gives support to synchronous and asynchronous communications, making possible the exchange of information between devices and applications.

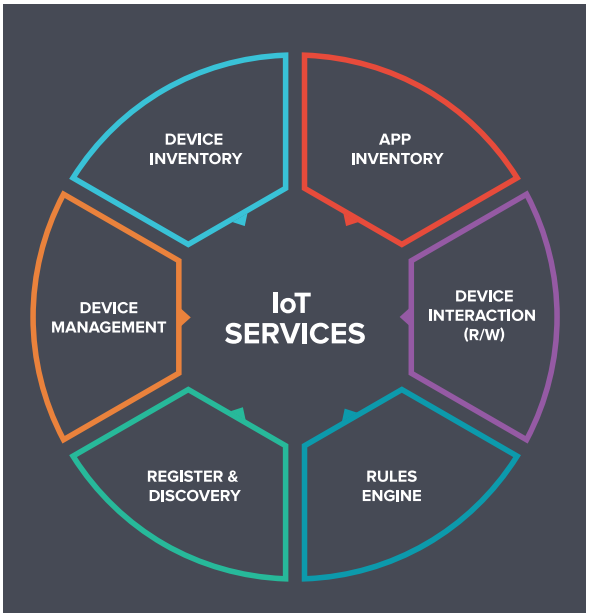


**FIGURE 4** IoT Services

## Data Services

Data related services (e.g. big data) have the potential to generate a significant part of the revenues in the IoT, and CSPs should start seeing it as a competitive asset which can be enriched with other data sources of the existing ecosystem, contributing to its positioning as an innovator (Figure 5). There are several examples where IoT links to big data. For instance, UPS, a major logistics company, uses sensor information and big data analytics to reduce idling times, fuel consumption, and harmful emissions. It continuously processes data gathered from more than 200 data points for each vehicle in a fleet of more than 80.000 vehicles, leading to major efficiency achievements [4].

Data services components provide a set of functionalities required to extract useful information from the data gathered or received from devices. Following the TM Forum Big Data Analytics Reference Model [5], the ecosystem shall support near real time event processing and data analytics for information extraction. But for that a set of specialized capabilities are required.

The Data Ingestion component ensures formatting and normalization of data and its integration with heterogeneous data sources. The Data Management capabilities deal with the enrichment of the data collected in order to make it more powerful. There is of course the need to store not only IoT data but also data from other sources of information. This is the core task of the Data Storage capability. The Near RT Event Processing component allows for the processing of streaming data in near real time. Finally, the Data Analysis component makes it possible to compute batch data allowing the extraction of metrics and automatic report generation. Figure 5 presents the core Data Services module.

## Monetization Services

Increased complexity in service offerings and innovative business models progressively require advanced monetization capabilities. CSPs are recognized as strong implementers of those business models, whilst benefiting from a strong trust relationship with customers.

The Monetization Services module (Figure 6) aims at providing capabilities to support scalable and event-agnostic charging of IoT services, enabling different business models in a multi-industry environment. It makes possible, for instance, charging the service based on the devices connected, on the number

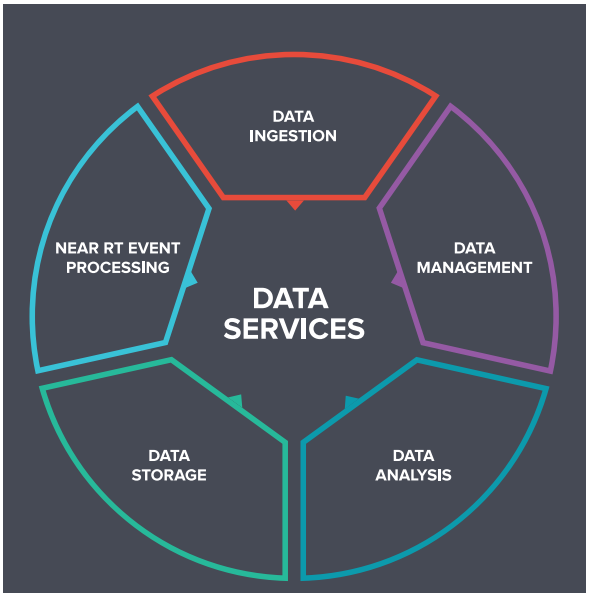


**FIGURE 5** Data Services

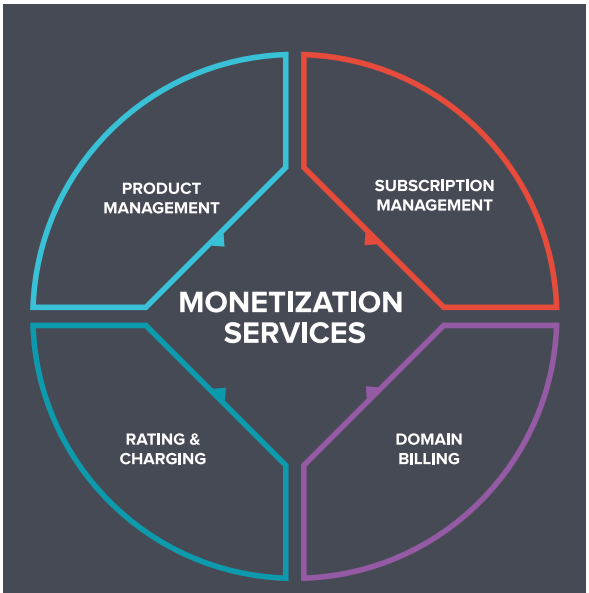


**FIGURE 6** Monetization Services

of messages exchanged or on the space used for storage. To this end, it is mandatory to build a product ecosystem to integrate the monetization of IoT services with business and operational processes of the Service Provider.

The Product Management component includes the tools for designing business offers, controlling the product lifecycle and that allows for product catalog management. Subscription Management functionalities support the management of the customer subscription lifecycle, the adherence to concrete offers and the configuration and execution of all related provisioning flows. The Rating and Charging component provides functionalities that configure charging and rating rules and allow for account charges both in online and offline modes. Moreover, it can provide Top Up Management, enabling the advanced payment of IoT services. Finally, the Domain Billing component allows the generation of billing items related with IoT services usage.

### IoT Ecosystem Environment

The IoT Ecosystem Environment encompasses the means and initiatives to boost the IoT landscape through the creation of key partnerships with stakeholders from all the value chain in order to create a fast response capability for Smart Cities and other vertical sectors opportunities (Figure 7).

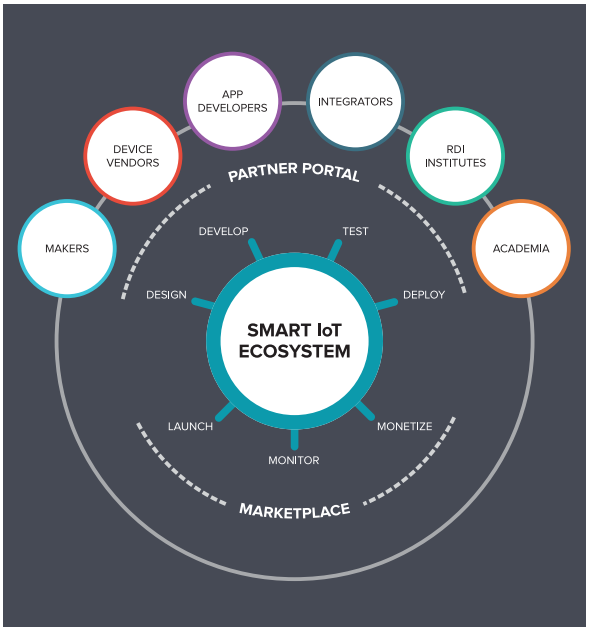


**FIGURE 7** IoT Ecosystem

The concept of an IoT Ecosystem also intends to encourage the creation of a makers' community by linking with academia and RDI institutions in order to foster the emergence of new businesses and revenue streams. Moreover, the IoT environment shall include the tools for easing the development, making available documentation and handbooks, SDKs (Service Development Kits) for devices and applications integration, developer tools (e.g. Sandboxes) and support for creators. For the Application Enablement expansion, it is also crucial the creation of a device certification programme to support plug and play equipment.

## Altice Labs' Role

Leveraging its experience and know-how in the area of M2M communications, monetization platforms and IoT RDI Projects, Altice Labs has a **strong opportunity to become a key IoT player on any CSP ecosystem**, enabling the emergence of a connected society and smart world.

To achieve this ambitious objective, the strategy encompasses the coherent combination of the following three key vectors: the evolution of the existing M2M managed connectivity solutions, integration with IoT LPWANs and the integration of IoT App Enablement components. The main goal is to build and integrate platforms and tools giving the CSP a complete experience of the IoT business, supporting monetization of convergent offers while combining different types of IoT connectivity and services.

## Closing Remarks

In only a few years, tens of billions of devices with communication capabilities will be spread all over the world leading to an amazing transformation in the society. IoT connects the physical world to the Internet making possible the creation of revolutionary services across all domains of activity.

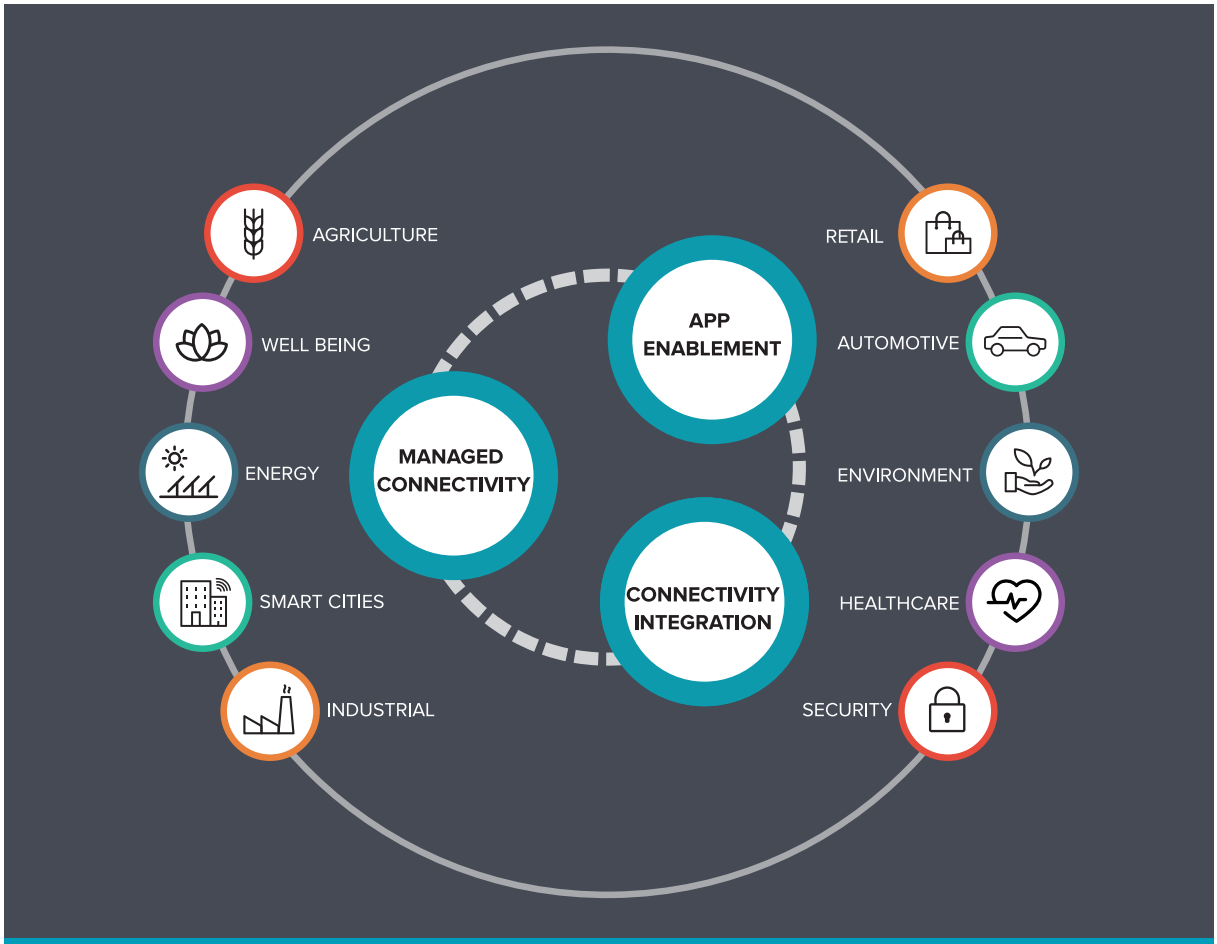


**FIGURE 8** Altice Labs' strategy IoT key vectors

IoT will affect our everyday life by bringing new value to the digital age; it will enable the foundation of a new society where things will be used to improve people's quality of life.

CSPs must become key players in the IoT revolution. They need to lead this transformation by promoting the definition of an appropriate ecosystem skilled enough to answer future society needs. Moreover, they are in the best position to provide the required infrastructure to support new business opportunities. IoT capabilities, data management enablers and monetization assets are key components of an IoT framework, regardless the domain of activity.

IoT is happening now. There is a new and huge market out there. Operators need to move forward and seize this gigantic opportunity.

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