altice labs

Connected life the path to a smarter ecosystem

Connected home; Smart home; Matter; IoT

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Introduction

Network commoditization was one of the critical causes forcing telecom operators to change from connectivity providers toward technology companies. Operators expend high amounts of money on evolving the infrastructure. The investments in wireless technology (3G, 4G, 5G, and others), including spectrum acquisition and the shift to fiber networks, significantly impact TELCO wallets. Moreover, the business and operation support systems require evolutions to cope with the new technologies and services enabling a customer journey of excellence.

Today, connectivity is still a TELCO-based business with limited growth in mature markets. But the bet is to go beyond it and to move up in the value chain. TELCOS aim to shift from communications service providers to technology service providers (i.e., TECHCO), seeking new sources of revenue. The mindset change must appeal to technological agility supported by new partnerships that bring innovative expertise.

Following this trend, Altice Labs presented the path to a more innovative ecosystem by developing a dynamic home environment for Altice Group's product portfolio. Besides indoor connectivity, Altice Labs' solution is easy to use and integrates security, health, entertainment, and energy seamlessly.

Trends at home

Societal change

The COVID-19 pandemic changed the way people live. Despite technological advances, people's mindset has remained unchanged for years. However, the forced isolation period experienced made things possible, overcoming years of distrust!

Suddenly, most of us started working from home, changing the city dynamics. People could now work far from the urban space, reducing daily pendular movements. In this new reality, there is no place for traffic jams, and a decrease in fuel-based pollution can finally occur.

E-commerce sales increased when consumers in lockdown started buying their essential products from home. We began to shop primarily online with new consumption patterns influenced by the different routines; we made our closets into small stores to ensure that nothing essential would be missing. We can even download hardware by using 3D printers. The gym trainer became a personal avatar, the cinema is in our living room, and some special events are now experienced on the computer.

This new digital life is picking up people from all generations; it is as natural as breathing for young people. However, despite the growing digital literacy, the same cannot be said for older people. Nevertheless, supported by user experience-based systems, digital interaction can be made smooth enough to become fully inclusive, and the home will be the 'sweet home'.

Technological evolution

Information and communication technology evolution support connected life, where virtual and physical are merged in a digital world. The vast processing capacity, memory, and storage allow us to cope with the big data storm. Sensor information from internet of things (IoT) devices, the digitalization of processes, social networks, the smart city, and Industry 4.0 trends made it necessary to handle data in different formats and rhythms. Cloud computing provides dynamic resources for businesses, while edge offers the same assets for those with location requirements. The available capabilities enriched with artificial intelligence (AI) algorithms allow us to extend the reality, even if indoor environments.

These technological developments impact how we live at home. Sensors and actuators are now part of our lives. The advent of low-cost devices with communication capabilities made IoT a considerable success in the home domain. Saving energy is now more manageable using intelligent smart plugs, light switches and bulbs, and simple mobile apps that can control everything. The smartphone can easily control light intensity, color, and choreography, creating a unique environment. It is now possible to detect water leaks by spreading a few devices around critical spots. Safety valves can seal to prevent further damage whenever a leak is detected. And AI, with all its flavors, allows different service offers. With the computer vision revolution, AI-based cameras bring surveillance to the next level. Technology can now identify objects, persons, events, or situations. These capabilities significantly impact the correct functioning of the security system by avoiding raising false alarms and confusing a bird with a robber. Voice-based devices are changing the way we interact with objects. Supported by advanced algorithms, smart speakers allow relating with devices on distinct levels of interaction. Basic versions of these devices can understand a simple set of commands, enabling specific equipment control. But they are now becoming personal assistants, controlling more than devices, even reaching the management of the daily schedules. Amazon and Google personal assistants are invading homes and do not seem to be in the mood to move anytime soon.

Matter:
the unifying smart home standard

Despite all technological evolution, smart home adoption is slow due to a lack of universal standards. As soon as end-users start their smart home brave journey in some ecosystem, it will be very difficult to join other ecosystems to fully benefit from all potential smart home capabilities due to the vendor-lock effect. On the other hand, there is engineering/cost overhead for device makers to support and certify their devices for multiple ecosystems.

Matter [1] is an emerging Connectivity Standards Alliance (CSA) standard being adopted by all major players of the smart home ecosystem, including Amazon, Apple, Google, Comcast, Tuya, Samsung, etc. The Matter standard aims to be a seal of trust for end-users by ensuring that devices securely work seamlessly together and can be controlled by any Matter-enabled application and voice assistant/ smart speaker.

The Matter protocol is designed on top of a universal IPv6-based network infrastructure. The first version supports Ethernet, Wi-Fi, and Thread networks, while Bluetooth low energy (BLE) is used to commission new devices. In Matter, Thread [2] is the recommended protocol to be used by low-power devices. Like ZigBee, Thread operates in the 2.4 GHz band but can natively work on top of a Matter IPv6 network with an open application layer. A Thread border router network functionality is needed to interconnect Thread with Wi-Fi and Ethernet sub-networks, but multiple Ethernet sub-networks can co-exist in the Matter network (see **Figure 1**).

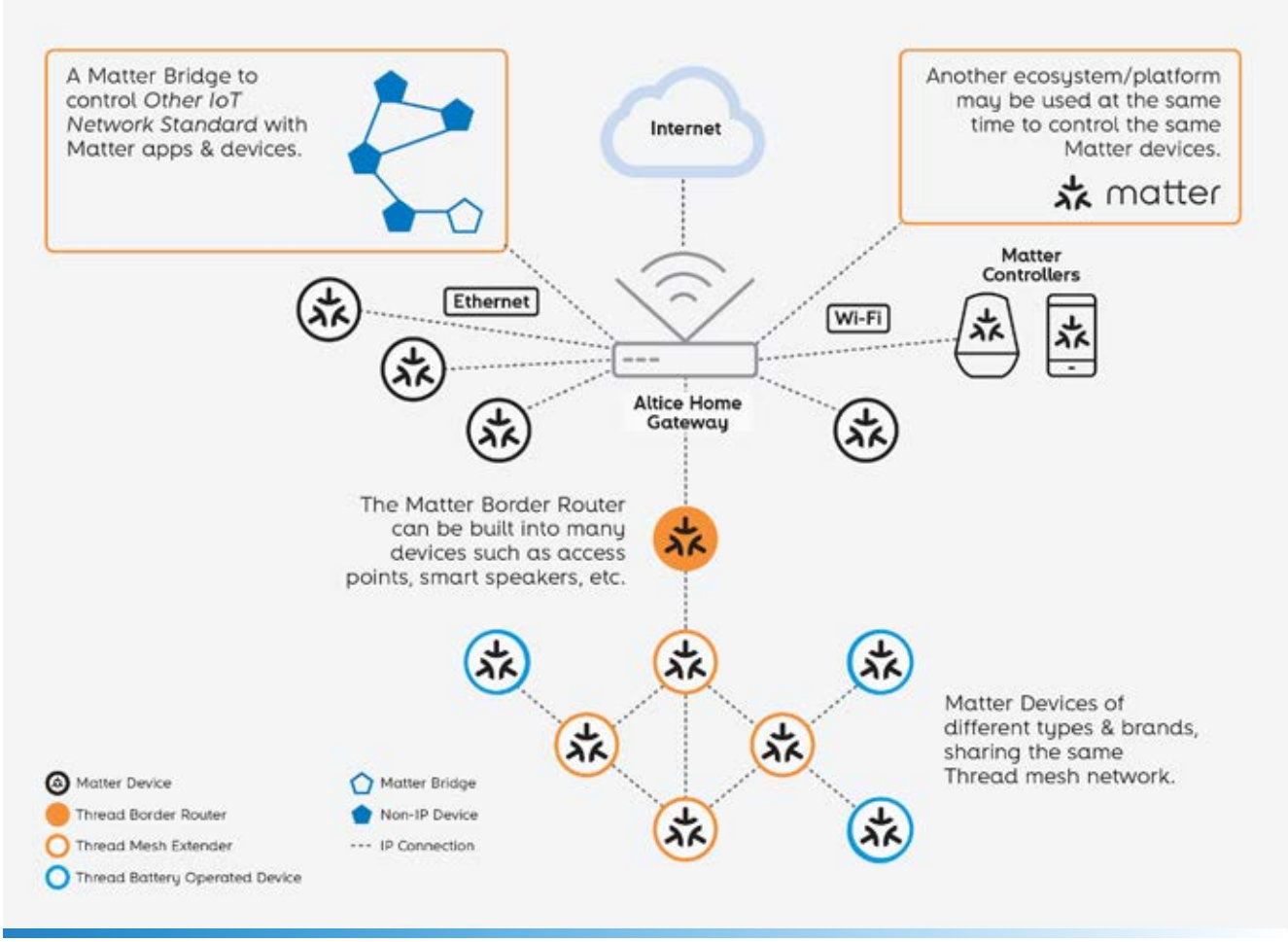

Figure 1 – Matter network topology

The multi-domain concept is one of the most promising Matter concepts by enabling device sharing on multiple ecosystems, which means that the same device can be controlled by different applications and voice assistants. To securely interact, devices must be in the same security domain: the Matter fabric. Thus, the multi-domain concept implies that each device can be in multiple fabrics.

The initial Matter specification was released in early October 2022, and the first Matter devices were certified end of 2022.

Altice connected home

Altice Home [3] aims to be a key solution to create new sources of revenues for TELCOS by providing not only the traditional smart home services (e.g., remote monitoring and management of connected devices and systems) but all services potentially delivered by TELCOS to residential customers, including smart connectivity and smart energy management. Although the solution targets residential households, it can also target smart office and smart building markets. In the end, Altice Home aims to be the focal point of service delivery to residential, as well as small and home offices (SOHO) or small and medium enterprises (SME) segment markets. It is designed to be agile and to evolve quickly according to market demand, new business opportunities, and breakthrough technologies. Despite the complex ecosystem of technologies and business goals, Altice Home is human-centric. Anyone can benefit and make the most out of it. No one is left behind by promoting, from the very beginning, digital inclusion and equitable access to all Altice Home benefits.

Considering the wide range of technologies and the level of complexity needed to implement and maintain a complete and innovative smart home solution such as Altice Home, it is critical to adopt a strategy to ensure the product's self-sustainability in a market where big players, like Google and Amazon, are fighting to lead. Altice Home does not aim to compete with the big smart home ecosystems directly but to support as much as possible all major ecosystems and to integrate with some of its advanced features, like AI-powered voice assistants, and leveraging some TELCO key assets to differentiate from other smart home service providers, such as:

Customers not having to purchase and install dedicated smart home hubs since the Altice Home gateway provides all the connectivity features needed to support Matter standard-compliant home devices.

Better customer support, since TELCOS are best positioned to troubleshoot customers' connectivity issues and to provide local services such as on-site assistance and installation.

Privacy and personal data management, as TELCOS are more trusted in this capability.

Altice Home features

The Altice Home solution is a turnkey connected home solution where the ease of use and integration turn customers' houses into an extension of their way of life. Examples of included core features are:

Device management, which includes onboarding, setup, device status management, and device control.

Real-time device monitoring and telemetry.

Multiple homes management, to allow users to control devices from different houses with the same smart home account.

Users' management to control users' access to smart home features and devices.

Alerts and notifications to keep users informed about the most relevant events, including occurrences that may require immediate attention, like intrusions or fire alerts.

Automation is at the core of Altice Home's solution and is based on the scenario concept. Scenarios allow users to set conditions (including voice commands, device-triggered events, and time-of-day events) and automatically execute one or more actions on the home environment by creating new and personal applications for their smart devices. These may be, for example:

- 'Good morning' scenario – the user programs a set of tasks to take place when he wakes up, like turning on the bedside light while the Altice butler salutes him.
- 'Lights on' – set the lights to turn on when someone enters the room and to turn it off when leaving.
- 'Welcome home' – a pre-configured scenario that occurs whenever one arrives at home.
- 'Movies Night' scenario – dim the lights when the smart set-top box (STB) starts playing and turn the lights back on when he pauses the movie.
- 'Good Night' scenario – the user sets up what happens when he goes to bed (e.g., turn off his bedside lamp and turn on an exterior light or the one in the hallway).

On top of Altice Home's core features, different types of user needs are supported by several kinds of devices, grouped into packs (addons).

The **Comfort pack** includes a comprehensive set of low costs devices that are easy to install and set up using the mobile app, including smart lights, smart plugs, and IP cameras (as shown in **Figure 2**).

Figure 2 – Altice Home comfort devices

The **Smart Security pack** provides key information about different types of physical threats and risks in the household, like intrusion, fire, gas leak, and carbon monoxide detection. When potential risks are detected, emergency alerts and warnings are triggered (e.g., smart sirens), and the user is notified through different channels, including push notifications, SMS, and voice calls. The storage of the videos recorded by IP cameras in the cloud is a premium feature of this pack. **Figure 3** shows some security devices associated with this pack.

Figure 3 – Altice Home security devices

The **Smart Connectivity pack** is a key differentiator between Altice Home solution and other connected home offers, by leveraging the full control of the home network with a set of functionalities, including zero-touch devices setup, prevention of connectivity issues, and a fully protected home network from cyberattacks. Furthermore, it allows the management of all kinds of connected devices at home, including non-IoT devices, and full internet access control.

The **Smart Energy and Sustainability pack** is designed to enable energy consumption savings at home and reduce, in general, the household carbon footprint. It includes an energy dashboard displaying the energy consumption and energy production information, and a set of advanced features to optimize energy management, such as automating the start and stop of highly energy-consuming activities (e.g., laundry, dishwashing, and electric vehicles chargers) according to the most convenient and cheaper time of the day.

The **Entertainment pack** allows the management of entertainment services in the home, including STB and associated remote control devices, as well as making it more fun with the playback of music or video in scenarios' configuration.

The **Wellbeing pack** includes continuous and real-time care of all household members, notably elderly and children care. It sends alerts to the caregiver when some anomaly is detected about an elderly or sick person.

A single app strategy ensures the best service possible in a single place, including the control and status of all types of connected devices, and a richer set of automation by having centralized access to all kinds of events and capabilities.

Altice Home architecture

The Altice Home system is built upon a micro-services-oriented architecture, applied in a smart home as a service delivery model which can be hosted on public or private cloud infrastructures. Altice Home is a multi-tenant solution where more than one TELCO operator can use the same instance of it. Each tenant can be spread across different regions to improve service and data locality, and comply to regulatory issues. Moreover, the system is designed to have weak dependencies on TELCOS' OSS and BSS systems, notably identity providers and provisioning systems.

The overall global high-level architecture is represented in **Figure 4** (on the next page), where the major functional elements are highlighted:

Open API services

Exposes the northbound API to be used by the different client apps, including mobile apps, customer care portals, OSS/BSS systems, and voice assistants.

Smart home core

Comprised of different microservices, message brokers, and data persistence implementing business logic to handle IoT devices. Major smart home microservices are home and customer inventory, devices and services inventory, home configuration manager, device automation manager, analytics, back-office, identity and access management, etc.

Smart connectivity element

Based on Altice Labs' smart mesh Wi-Fi cloud management solution to control the home gateway, Wi-Fi extenders, and all devices connected to the home network. It provides home network cybersecurity features, including device recognition, network and browsing protection, etc., as well as advanced smart connectivity features like parental control and traffic prioritization.

IP camera services

Provide advanced video-related services for IP camera devices, including live-stream session management, cloud video recordings, storage for audio/video (AV) recorded files, AV stream server to manage playback sessions of recorded AV files, encryption keys management, etc.

Device manager

Handles device registration and over-the-air (OTA) firmware management consistently across IoT and non-IoT devices. Smart home device manager comprises a multiprotocol adaptation layer to facilitate the integration with smart home ecosystem clouds like Tuya and Phillips Hue.

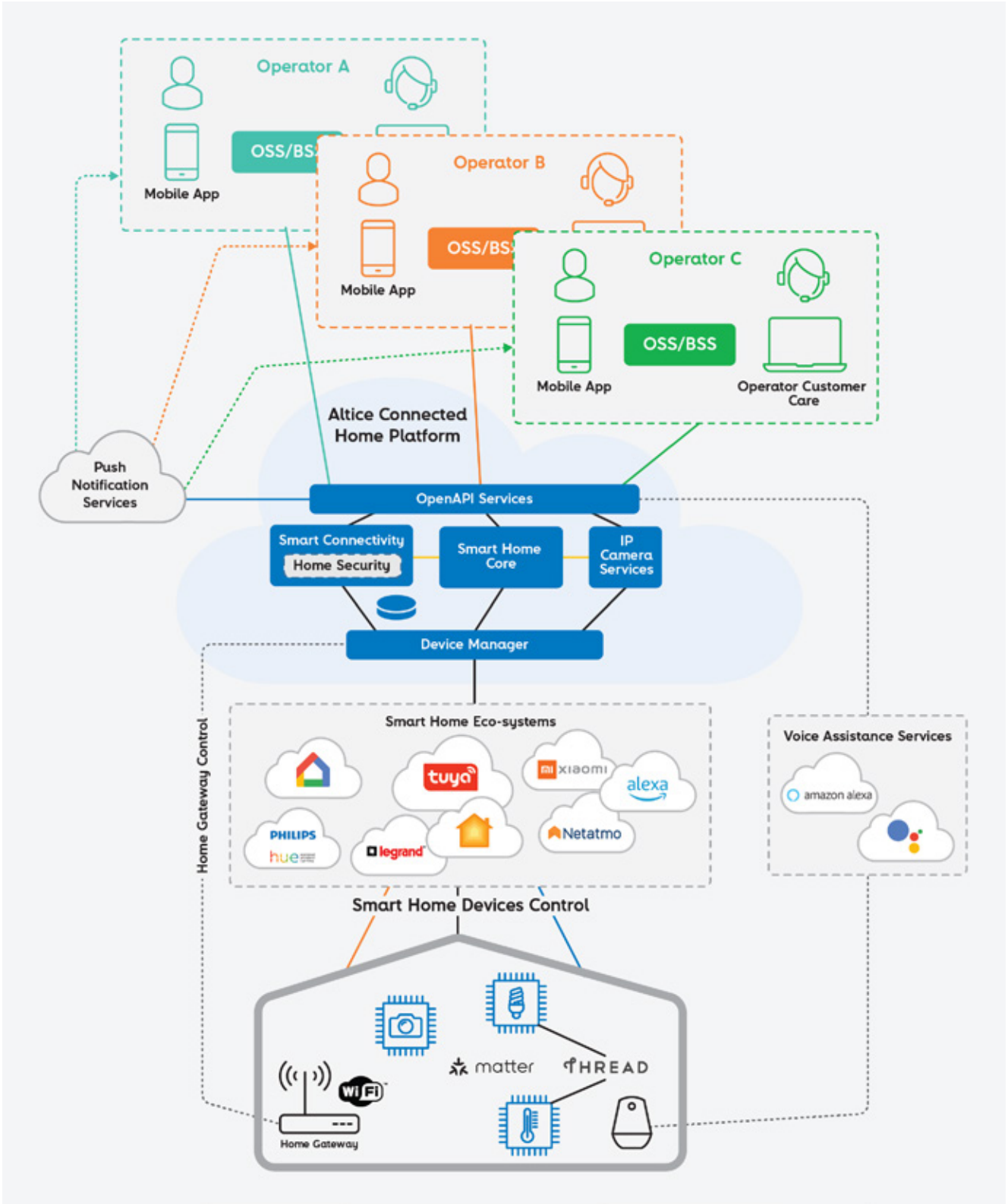

Figure 4 – Altice Home high-level architecture

Altice Home applications: mobile app and customer care portal

Altice Home's applicational solution comprises two main front-end applications: the mobile app, to be used by end-users, and the customer care portal, to be used by the Altice Group operating companies to support end-users. More applications are planned, including end-users applications to run on web browsers, smart displays, STB, and smart TVs. Altice Home user experience (UX) designed for these applications focuses on what is essential to ensure end-users will not get lost in the set of available features.

The mobile app plays a crucial part in the user journey into Altice Home. This app is a unique control platform that offers a complete overview of the connected home, as well as full control of all smart devices. The experience is designed to be unique and available across devices and platforms, from mobile (Android and iOS devices, as shown in **Figure 5**) to voice command devices and TV, in the future. An integrated vision and unified experience is provided to control all the devices and systems.

Figure 5 – Altice Home mobile app

The customer care portal, depicted in **Figure 6**, is critical to differentiate Altice Home from other connected home products. It is designed to be used by customer care agents, technical back office, and business analysts. The portal is a unique control platform for operating companies, offering a complete overview of the customer's smart home environment and full control of his smart devices. It provides features to manage customer accounts, premium features subscribed, the different homes in the account, and all devices in each home. The customer care portal also provides a firmware manager tool and EU GDPR management, supporting various business KPI and business analytics reports.

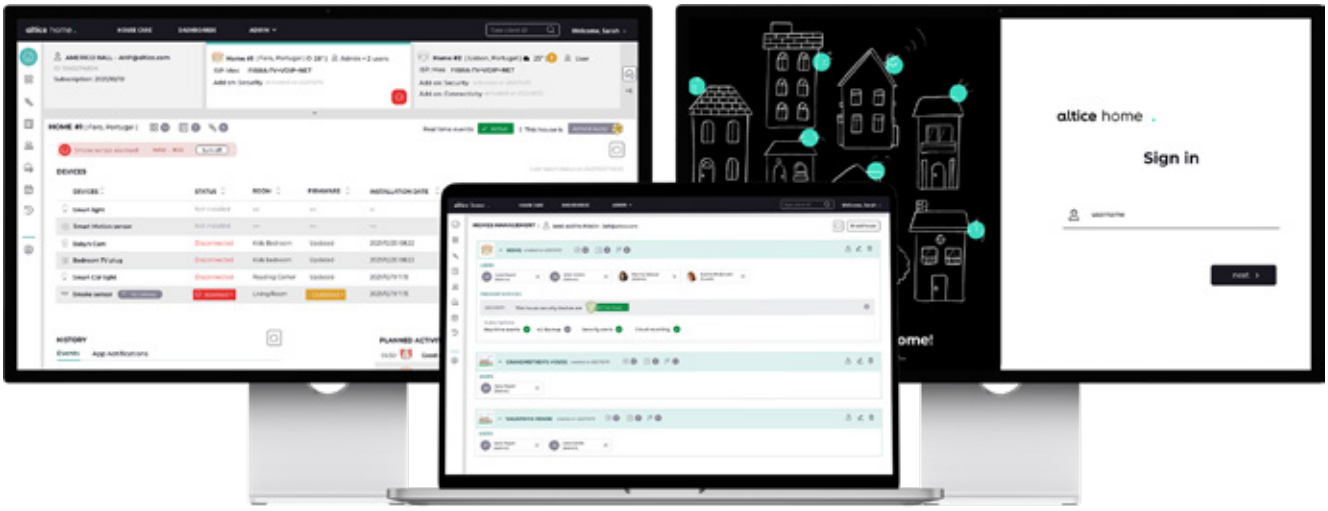

Figure 6 – Altice Home customer care portal

Conclusions

The societal changes and technological evolutions opened the doors to new ways of life, where the digital is now the glue between physical and virtual environments. More intelligent ecosystems will appear, making available innovative services running on top of the evolved connectivity.

TELCOS need to adapt to this new world and lead the change. To streamline the business and optimize operations, all lead to believe that the transformation will be made towards the technological companies' model. It is critical to ensure technical agility while creating new partnerships to bring innovative expertise. Enriching the TELCOS catalog by quickly adding new digital-based services supported by enhanced networks is mandatory.

In this path, Altice Home encompasses all services potentially delivered by TELCOS to residential home customers, including smart connectivity and intelligent energy management, ensuring agility and fast evolving according to market demand, innovative business opportunities, and new technologies. To achieve this goal, Altice Home is embracing Matter as a key technology to drive Altice Group towards an innovative TECHCO ecosystem.

References

[1] Matter Specification, Version 1.0, Connectivity Standards Alliance, 2022, [Online]. Available: https://csa-iot.org/all-solutions/matter/

[2] OpenThread, open-source implementation of Thread, [Online]. Available: https://openthread.io/

[3] Altice Home, [Online]. Available: https://www.alticelabs.com/products/smart-home/

Acronyms

3D	Three-dimensional
3G	Third generation mobile networks
4G	Fourth generation mobile networks
5G	Fifth generation mobile networks
AI	Artificial Intelligence
Android	Mobile operating sustem developed by Google
API	Application Programming Interface
AV	Audio/Video
BLE	Bluetooth Low Energy
Bluetooth	A wireless technology standard for exchanging data over short distances using short-wavelength ultra-high frequency radio waves
BSS	Business Support System
COVID-19	Coronavirus disease 2019
CSA	Connectivity Standards Alliance
EU	European Union
GDPR	General Data Protection Regulation
iOS	Mobile operating system created and developed by Apple Inc
IoT	Internet of Things
IP	Internet Protocol
IPv6	Internet Protocol version 6
KPI	Key Performance Indicators
OSS	Operation Support System
OTA	Over-the-Air
SME	Small and Medium Enterprises
SOHO	Small Office, Home Office
STB	Set-Top Box
TECHCO	TECHnological Companies, as opposed to or an evolution of TELCOS
TELCO/ TELCOS	Telecommunication Operators
Thread	IPv6-based networking protocol for IoT

TV	Television
UX	User Experience
Wi-Fi	IEEE 802.11x - Wireless Network (Wi-Fi Alliance)
ZigBee	IEEE 802.15.4-based open global standard for wireless technology for M2M networks

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