Intelligent Customer Experience Management

Nirmal K George, Marketing Manager, Tata Elxsi
Asha S Nair, Manager, Tata Elxsi
Johns Babu, Senior Engineer, Tata Elxsi

TABLE OF CONTENTS

INTRODUCTION

Due to the increased availability of the internet and its higher bandwidth, we are becoming more and more dependent on connected devices such as laptops, tablets, mobiles, cameras, game boxes, etc. at home. This introduces new challenges of managing and controlling these home devices. This white paper will explain how these challenges can be effectively managed by the home device management system.

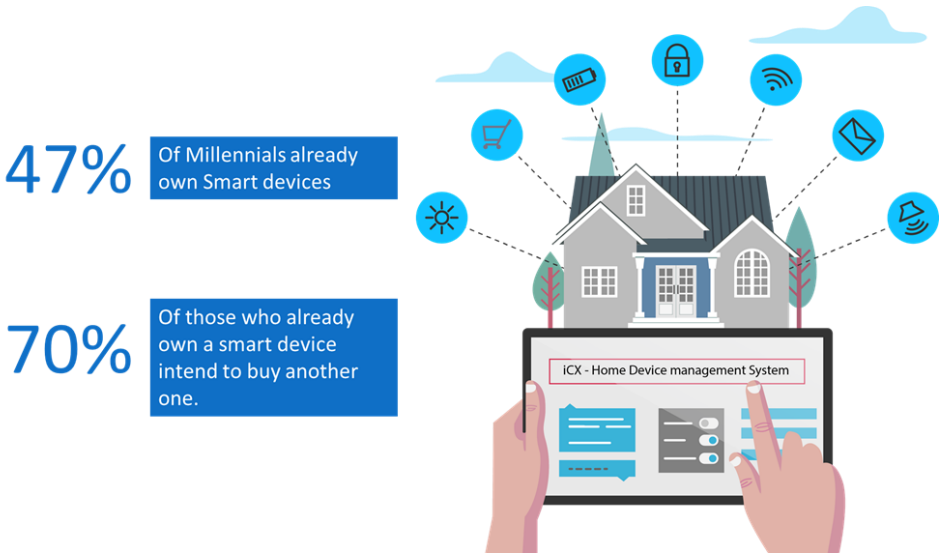

Figure 1: Digitized Home - Stats & Facts

HOME DEVICE MANAGEMENT CHALLENGES

Managing gateway and devices

In the current world, home is a hub of many connected devices such as mobiles, tablets, personal laptops, gaming consoles, cameras, and so on. Each member at home depends on more than one connected device for their daily activities. In this scenario, Wireless home gateway is becoming the critical device that powers all of them, and it is essential to be able to control and manage this gateway. As the number of devices has increased, manually managing internet connectivity is also not practical. Also maintaining and configuring gateway devices at present requires knowledge in basic networking concepts.

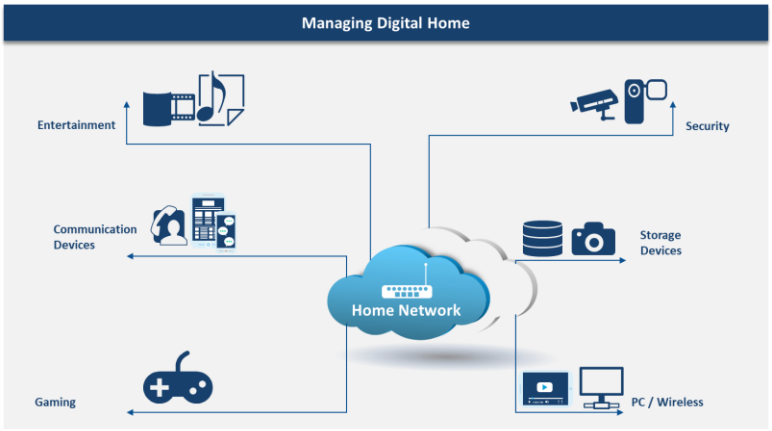

Figure 2: Managing Digital Home

Restricted Access

Easier availability of content via the internet and other sources has heightened the demand for parental control methods to restrict content access. Restricting access helps in cases when children are exposed to inappropriate content accidentally. Monitoring may be useful but it is not practical. “Studies done in the past have shown that about 82% of children are exposed to inappropriate content before age 11”. In addition to the content restriction, there is a need to control the amount of time a child spends online. Even adults can be the victim of phishing and spam attacks.

Figure 3: Restricted Access - Parental Control

Remote Management

As the technology is developing, everything is at our fingertips. Likewise, the user needs to manage and monitor his home network remotely. S/He needs to be notified of events occurring in his network such as a new device getting connected, over usage of data, etc.

Figure 4: Remote Management - Home Environment

Connectivity Issues

We are very much dependent on these connected devices in our day-to-day activities and cannot afford any glitch in the connectivity or bandwidth. Environmental issues affecting the performance of the Wi-Fi can also pose challenges to the consumer. Getting the above issues resolved through customer support is not a pleasant experience. The user wants to know the possible causes of the problem and corrections without getting into the nitty-gritty.

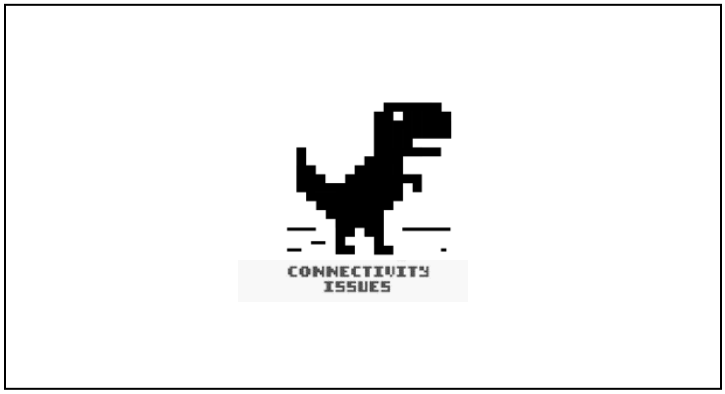

Figure 5: Connectivity Issues

KEY SOLUTION CONSIDERATIONS

Most of the commercial device management solutions available are based on the TR-069 protocol. This was used mainly for firmware management, provisioning, and troubleshooting of CPEs. Due to advancements in technology, we have seen an exponential rise in the number and type of devices to be managed. This requires a lot of message exchanges for proper device management, which affects the user experience.

TR-369 is a standard developed by the Broadband Forum to create an interoperable, easily managed, and application enabled connected device ecosystem. The protocol applies to a wide variety of network-enabled devices including gateways, routers, STBs and voice systems, Wi-Fi access points and mesh systems. It is considered to be the enhanced version of the TR-069 protocol. Advantages of TR-369 are

- Always on
- Low payload
- Low response time
- End to end security
- Network agnostic device management
- Horizontally scalable

REMOTE MANAGEMENT SYSTEM – WHAT IS IT?

Remote Management System(RMS) is a highly available, device-agnostic, and always-connected device management solution. RMS constitutes of three main components

- Management agent running in the CPE(Gateway) device
- TR-369 based scalable Management server which provides a mechanism to communicate with the agent running in the CPE devices
- Tailor-made Web/Mobile applications for all stakeholders

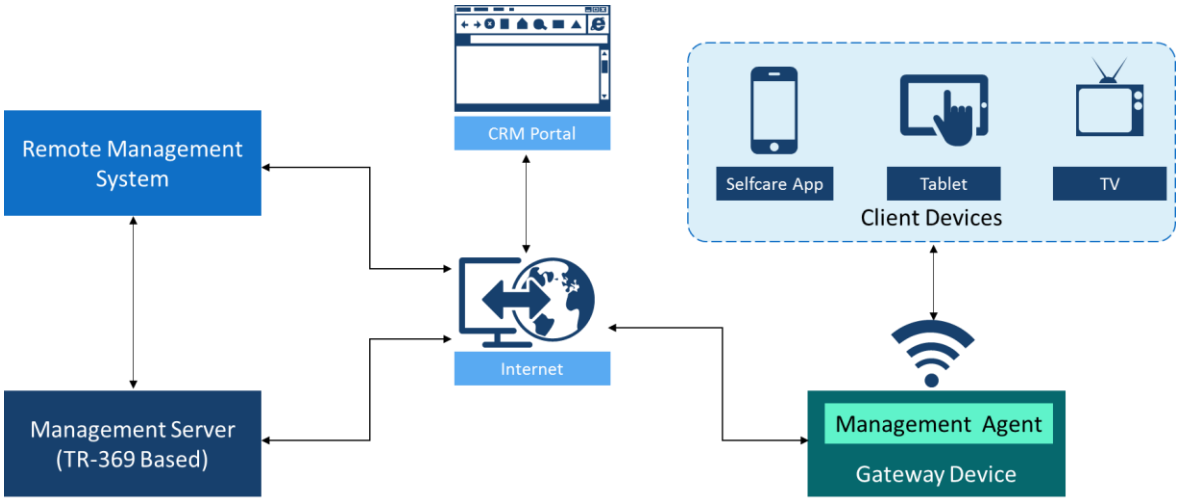

Figure 6: Remote Management System

TR-369 describes a framework and protocol to establish a highly available connection between CPE devices and a managing server. The Remote Management server implements TR-369 architecture. The Remote Management server is developed using a scalable, micro-service architecture. Individual services handle the communication with CPE devices, the API interface with the outside world, notifications from the CPE devices, and more.

The device communication and management are handled by the agent running in the CPE devices. It has two significant functions – provide a persistent communication with the server and a TR-181 data model implementation which is used to interact with the device (get/set necessary parameters from the device, e.g. details of all devices connected to the CPE Wi-Fi, Wi-Fi parameters such as signal strength, bandwidth, channel, SSID etc.).

The agent further has a provision to send a notification for a set of TR-181 parameters, e.g. the user will be notified every time a new device connects to the gateway. These notifications are collected by RMS and forwarded to necessary applications.

RMS platform provides tailored Web/Mobile applications for specific users. This includes

- Application portal for technicians and call center executives to remotely debug and fix CPE device issues
- Self-care mobile application for the customer to manage and control his device

Portals for OEM and device application developers to push new software releases/patches remotely with minimal hassle

RMS FOR HOME DEVICE MANAGEMENT

Let's take a look at the problems that we mention at the beginning of the document and how RMS fixes them.

a) **Managing Gateway Devices** – Self Care App will interface with the RMS server to manage and monitor the gateway device at home. The devices connected to the gateway can be grouped and managed seamlessly.
b) **Control of Access** – RMS agent includes an extended set of parental control parameters that can be used to completely block the connectivity of the devices for a particular period. It also provides for rules to block specific sites based on their address or any keywords that they may have. RMS also provides a mechanism to enable safe browsing by reconfiguring DNS.
c) **Manage Remotely** – The RMS server has public network access, and all the CPEs connected to it can be managed remotely from anywhere (the user doesn't need to be in his/her home network to manage and control the gateway device).
d) **Connectivity Issues** – The RMS Agent has parameters to control and view the signal strength, channel congestion, bandwidth, and much more details of the gateway and the connected devices. Self-care app will notify if any of these parameters degrades and the user can take appropriate steps to rectify the issue (switch to a separate channel to reduce channel congestion, position his/her device for better signal strength, etc.)

Some additional parameters that can be controlled by RMS are as follows:

- Get the gateway status such as total memory being used, CPU utilization, temperature, network interfaces, and their details

List all the process running in the gateway, and their features such as memory and CPU utilization, process ID, etc.

- Reboot, restore, factory reset, restart/shut down the Wi-Fi or any other network interfaces associated with the gateway
- Show software and hardware details of the gateway
- Set notifications for new device connection, exceeding the daily connectivity limit of any device, etc.
- The TR-181 data model can further be extended to add any new features. It merely involves updating the agent handlers for the new parameters.

In short, the home device management solution will help the user to seamlessly manage and monitor the home network from any location.

.

CONCLUSION

Home Device Management is a growing requirement in the current world arising from the increasing use of networked home devices. Remote Management System should provide a holistic, device agnostic and remote management solution that enables the users to have

- Seamless Device Management
- Safe and secure browsing modes
- Easy to use tools to control the devices
- Real-Time updates on device status
- Self-healing by simple steps

ABOUT TATA ELXSI

Tata Elxsi is a leading provider of design and technology services for product engineering and solutions across industries including Broadcast, Communications, Healthcare, Transportation along with emerging technologies such as IoT (Internet of Things), Big Data Analytics, Cloud, Mobility, Virtual Reality, and Artificial Intelligence.

Tata Elxsi's Intelligent Customer Experience Management platform provides a set of services to improve Customer Experience and also enhances Operational Efficiency. Tata Elxsi offers domain knowledge and expertise in AI, Data analytics and device management standards which are key enablers in realizing solutions for improving customer experience and reducing operational costs through automation, remote monitoring and management of devices.

REFERENCES

1. Broadband Forum technical report describing CPE Management through an ACS server used in legacy systems (TR-069:https://www.broadband-forum.org/technical/download/TR-069_Amendment-6.pdf)
2. Broadband Forum technical report describing a framework to manage a CPE (TR-369:https://www.broadband-forum.org/technical/download/TR-369_Corrigendum-2.pdf)
3. Broadband Forum technical report describing standard parameters/data models that can be used for managing/troubleshooting the device (TR-181: https://www.broadband-forum.org/technical/download/TR-181_Issue-2_Amendment-12.pdf)