SMART HOME
Home Automation | Safety & Security | Energy Management

By Prodapt Solutions
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OVERVIEW

A smart home is equipped with a special connected platform enabling its occupants to remotely control and program an array of automated home electronic devices. For 2020, the smart homes market revenue in the Americas is projected to grow to 22.4 billion US dollars up from 7.19 billion US dollars in 2013, at a CAGR of 17.62 %. For 2017, the number of installed smarthome systems is expected to grow to more than 31 million, at a CAGR of 55 %. Technavio’s analysts forecast the smart home M2M market in Western Europe to grow at a CAGR of 47.11% over the period 2015-2019.

North America currently accounts for the highest market share as this region has the maximum adoption of smart home systems. The Asia-Pacific smart home market is estimated to grow at the highest growth rate amongst all regions, backed by its resilient GDP growth and the growing real estate market.

AT&T launched Digital Life, which gives consumers control to secure and manage their homes from virtually anywhere using their smartphones, tablets, or computers, and now even from their connected car. The foundation of Digital Life is complete home security with 24/7 professional monitoring that allows consumers to know what is happening at their home or where an event has occurred. Through US-based monitoring centers owned and operated by AT&T, professionals will respond to emergencies as well as alert police and fire authorities.

The customers can check if their children have returned home safe. Also, it gives video alert to know who has arrived where and when; plus alerts on smoke, motion, and high temperature. In addition, it gives a look at what is happening with a live feed from cameras inside the house. All of this can be done from anywhere anytime.

The purpose of this white paper is to serve as a background for a deeper engagement on how Prodapt can enable safety and security for the connected home to create a unique user experience and monetize the data collected in that process. Detailed technology considerations have been intentionally omitted.

Key drivers of the smart home market are increased requirements of consumers for convenience, safety & security, demand for energy efficient solutions, lighting control systems, home appliances, and home entertainment. The solution allows for remote home management at any time, on any screen, in real time.
SAFETY AND SECURITY

- Alarms on motion detection and live video to see who or what is moving
- Burglar alarms to nearby police stations
- Notification on door open, window locks, and access control
- Alarms on possible fire by detecting temperature and carbon monoxide
- Secure your pets with their current location information with the help of a wearable

ENERGY MANAGEMENT

- Better control on usage of energy such as water, electricity, oil, and gas
- Customer loyalty programs can be offered to customers with optimum usage of electricity and water
- Reduce energy consumption and save money by ensuring that lights, and heating/cooling systems are turned off when there’s no one at home

HVAC AND LIGHTING CONTROL

- Automatic control of the home or building for heating, ventilation and air conditioning based on the external temperature
- Automatic control of lights based on people’s availability
- Proactive maintenance of appliances even before they are worn out
- Greener environment for living with less carbon emission from appliances

SMART APPLIANCES

- Remotely monitor the fridge, which gives the list of vegetables, provisions available inside with their date of expiry
- Schedule the washing machine during period of the day when the energy consumption cost is low and also monitor its functionality
- Remotely control the lights and fans in the house using smartphones

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HEALTH CARE

- Immediate healthcare especially for aged people at the click of a button
- Sensors to monitor the heart rate, pulse rate and proactively inform the doctor of the health status

Terminology: Acronyms and Abbreviations

<table>
<thead>
<tr>
<th>#</th>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>1</td>
<td>IoT</td>
<td>Internet of Things</td>
</tr>
<tr>
<td>2</td>
<td>M2M</td>
<td>Machine to Machine</td>
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<tr>
<td>3</td>
<td>RF</td>
<td>Radio Frequency</td>
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</table>

DEVICE REQUIREMENTS

<table>
<thead>
<tr>
<th>Area</th>
<th>Functional Requirements</th>
<th>Sensors Required</th>
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<tbody>
<tr>
<td>Safety and Security</td>
<td>Video Surveillance</td>
<td>IP Camera</td>
</tr>
<tr>
<td></td>
<td>Access Control</td>
<td>Pin Key Access</td>
</tr>
<tr>
<td></td>
<td>Intrusion Detection</td>
<td>Door, Window, and Motion Sensors</td>
</tr>
<tr>
<td></td>
<td>Alarm</td>
<td>Alarm Device</td>
</tr>
<tr>
<td></td>
<td>Panic Button</td>
<td>Panic Button</td>
</tr>
<tr>
<td></td>
<td>Smoke Detector</td>
<td>Smoke Sensor</td>
</tr>
<tr>
<td></td>
<td>Auto Gate</td>
<td>Auto Gate Sensor</td>
</tr>
<tr>
<td>Energy Management</td>
<td>Energy Monitoring</td>
<td>Smart Meter</td>
</tr>
<tr>
<td></td>
<td>Energy Alerts</td>
<td></td>
</tr>
<tr>
<td>Home Automation</td>
<td>Environmental Control &amp; Monitoring</td>
<td>Temperature &amp; Humidity Sensor</td>
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<tr>
<td></td>
<td></td>
<td>CO Sensor</td>
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<tr>
<td></td>
<td></td>
<td>Light Actuator + Dimmer</td>
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<tr>
<td></td>
<td></td>
<td>Fan Actuator + Dimmer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HVAC - Actuator With Temp Control for AC + Water Heater</td>
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<tr>
<td></td>
<td></td>
<td>Smart Sockets</td>
</tr>
<tr>
<td></td>
<td>Media Control</td>
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</tbody>
</table>
## USE CASES

<table>
<thead>
<tr>
<th>ACTORS</th>
<th>PRECONDITIONS</th>
<th>PROCESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place – Bob’s home</td>
<td>Telco service provider offers safe home security solution on Prodapt’s IoT platform</td>
<td>Bob is provided with login credentials and a set of devices based on his package</td>
</tr>
<tr>
<td>Devices – Prodapt M2M gateway, sensors, IP camera, actuators</td>
<td>M2M gateway and devices installed at Bob’s home. Smart Home mobile apps launched in respective app stores.</td>
<td>Technician installs the devices with M2M gateway and ensures the devices are connected</td>
</tr>
<tr>
<td>Users – Bob and his family</td>
<td>Bob downloads the mobile app for remotely controlling the devices and receiving alerts, intimations etc.</td>
<td>Bob to get alerts &amp; notifications based on the rules configured</td>
</tr>
<tr>
<td>Solution provider – telco, device manufacturer</td>
<td>Bob has subscribed to the home safety &amp; security solution from the service provider</td>
<td>Dashboard view helps the solution provider and Bob to have an overall view and better control of home</td>
</tr>
<tr>
<td>Technology - Prodapt IoT &amp; Analytics Platform</td>
<td>Configuration of default rules for Bob and his family</td>
<td>IoT management platforms ensure that all sensor data, as appropriate, are sent to relevant stakeholders</td>
</tr>
</tbody>
</table>

### Bob at office checking his home

![Bob at office checking his home](image-url)
USECASE #1: HOME ALONE CHILD

- Bob and his wife leave for work after dropping their daughter at school.
- Bob uses his Smart Home mobile interface to remotely monitor his home by enabling motion detection at various rooms and at front door.
- When Bob’s daughter enters home, Bob gets a notification or email saying that motion is detected with the snapshot of the image captured in his front IP camera; the image happens to be of his daughter.
- An hour later, Bob receives a smoke alert from his kitchen and he looks at the live stream of kitchen camera to guide his daughter.

USECASE #2: DETECTING BURGLAR ENTRY

- On a night, a burglar enters Bob’s home by breaking one of the windows.
- Sensors on the window get triggered and an alert is sent to Bob’s mobile, which goes unnoticed as Bob is in deep sleep.
- Smart Home system detecting window break followed by motion detection, correlates both the events, switches on a high-decibel alarm, and sends an intimation to the police station with location information.
- Bob wakes up immediately hearing the high-decibel alarm and switches on all the lights using the Smart Home solution mobile app, and watches what is happening around his house using the live stream of the various IP cameras placed around his house.
- In the meanwhile, police officers also arrive at Bob’s home using the location information and catch hold of the burglar, and Bob proceeds to sleep at peace.

PROPOSED SOLUTION
Home security automation primarily provides services to the consumers in the areas of home monitoring, home security, intrusion detection, and home control. Such a system will typically include the following components:

Smart devices for specific uses – smoke detectors, motion sensors, high-decibel alarms, door/window sensors, thermostats – using connectivity technologies such as, ZigBee, Bluetooth, Power Line, Z-Wave.

Home network gateway collects data and transfers it to the Synapt IoT platform. The gateway is an intelligent integration point with the ability to support a variety of home automation protocols. Display of data to various authorized users for monitoring, control, reporting, billing of the home devices through multiple user-friendly interfaces like web, mobile apps, SMS, etc.

### TARGETED CUSTOMERS

<table>
<thead>
<tr>
<th>Targeted Customer</th>
<th>Functionality</th>
<th>Solution Offerings</th>
</tr>
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<tbody>
<tr>
<td><strong>Communication Service Providers</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>One solution</td>
<td>Single, integrated solution taking advantage of IoT</td>
</tr>
<tr>
<td></td>
<td>Resell these services to other B2B customers such as real-estate owners</td>
<td>Web and mobile applications for B2B customers</td>
</tr>
<tr>
<td></td>
<td>Service to end users</td>
<td>Web and mobile applications for B2C end users, who have directly subscribed to the service from telcos. Manage their home at the click of a button from mobile applications</td>
</tr>
<tr>
<td></td>
<td>Leverage the ability to aggregate large amounts of data around customers, and</td>
<td>Data analytics aiding in making business decisions for telcos and their customers</td>
</tr>
<tr>
<td></td>
<td>make business decisions based on the aggregation and analytics</td>
<td></td>
</tr>
<tr>
<td><strong>Facility Management</strong></td>
<td>A typical home owner association managing the resources, such as swimming pool,</td>
<td>Solution supported in web application and mobile application</td>
</tr>
<tr>
<td></td>
<td>gym, library, etc., using M2M solutions</td>
<td></td>
</tr>
</tbody>
</table>
Targeted customer | Functionality | Solution offerings
---|---|---
Community Living | A typical community such as old-age homes, which would monitor the heart rate, pulse rate, etc., and proactively inform the doctor of the health status and also provide medical support at the click of a button | Healthcare being a separate vertical, it is also supported as part of the connected home solution

Real Estate - Construction Companies | New houses can be M2M-enabled with any or all of the offerings such as HVAC, safety and security, energy management, waste management, etc. | Solution supports any industry vertical

**BENEFITS**

**For Communication Service Providers**
- Reduced cost of failure and proactive maintenance visits by remote monitoring and analytics
- Less machine downtime enabling better productivity
- Time of technicians and service staff is effectively utilized
- Real-time and accurate information delivered to stakeholders for better business decisions
- Faster time to market for new device introductions
- Support for a flexible business model to satisfy consumers
- Happy customer / end users

**For End Users**
- Enhanced security by providing instant alerts during possible theft or burglary
- Relax by ensuring their kids and old parents are safe at home
- Alert in case of any emergency such as fire
- Save energy and contribute to an eco-friendly environment
TECHNOLOGICAL CONSIDERATION ON PROJECT DEPLOYMENT

Prodapt’s IoT solution for connected home could be deployed on the cloud and the mobile applications, and can be made available for download.

There are primarily two parts to a deployment, the first part focuses on the collection of data from various home devices and protocols to a central home network gateway. The home network gateway, in most of the cases, resides within the residential premises and provides two-way access to data and commands.

The second part focuses on analysis and usage of the collected data. There could be various kinds of interfaces provided to end users depending on the usage, for instance, web interface, SMS alerts to the consumers, interface to a call center to support the consumer base and to answer the queries.

Prerequisites

- Launch mobile apps in app store
- Devices such as sensors, cameras and M2M gateway should be available with connectivity

Challenge

- Data connectivity within the house for the devices and data connectivity for the mobile app

Technology Selection

Technology to connect the sensors and devices to the M2M gateway can be either of ZigBee, Z-Wave, Bluetooth, or Wi-Fi. A short comparison of these technologies will help in selecting the right protocol for device communication to the gateway.
<table>
<thead>
<tr>
<th>ZigBee</th>
<th>Bluetooth</th>
<th>Wi-Fi</th>
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<tbody>
<tr>
<td>Low cost, low power, wireless mesh network</td>
<td>Uses very little power compared to Wi-Fi. Designed for low power consumption with short-range communications.</td>
<td>Many smart home products eschew Wi-Fi connectivity.</td>
</tr>
<tr>
<td>The operational range is 10-75m</td>
<td>The operational range of Bluetooth is 10m</td>
<td>Can reach up to 46 m indoors and 92 m outdoors</td>
</tr>
<tr>
<td>Allows up to 254 nodes</td>
<td>Allows up to 8 slave nodes in a basic master-slave piconet setup</td>
<td></td>
</tr>
<tr>
<td>Battery life is 100-1000 days</td>
<td>Battery life is 1-7 days</td>
<td>Would require devices to have a dedicated power source or a long-lasting battery.</td>
</tr>
<tr>
<td>The signals aren’t directly compatible with any mainstream computing device such as a smartphone, tablet, or laptop. So, the bulbs and motion sensors need to communicate with a hub that is either connected to home network via Wi-Fi or through an Ethernet cable plugged into to an internet router.</td>
<td>Supported in smartphone, tablet, or laptop</td>
<td>Supported in smartphone, tablet, or laptop</td>
</tr>
</tbody>
</table>
BUSINESS MODELS

Prodapt IoT platform supports creating business models to satisfy different needs of the customer. For example, Prodapt IoT platform Smart Home solution can be modelled with following business plans:

Plan Name: Basic
Supported Devices: IP camera at two locations, three motion sensors, and two smoke detectors

Plan Name: Silver
Supported Devices: IP camera at three locations, four motion sensors, three smoke detectors, three glass break sensors, and four smart light controls

Plan Name: Gold
Supported Devices: IP camera at four locations, five motion sensors and four smoke detectors, high-decibel alarm, five glass break sensors and five smart light controls

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