**Home Automation Using the Internet of Things (IoT)**

## Applications of home automation

Rebuilding consumer expectations, home automation has been projected to target wide array applications for the new digital consumer. Some of the areas where consumers can expect to see home automation led IoT-enabled connectivity are:

* Lighting control
* HVAC
* Lawn/Gardening management
* Smart Home Appliances
* Improved Home safety and security
* Home air quality and water quality monitoring
* Natural Language-based voice assistants
* Better Infotainment delivery
* AI-driven digital experiences
* Smart Switches
* Smart Locks
* Smart Energy Meters

The list is still not exhaustive and will evolve over the time to accommodate new IoT use cases.

Now that you are familiar with home automation applications, let’s have a detailed look at what components are involved in building a typical home automation prototype.

## Home automation components

We have talked about them before, but, let’s clearly separate them into components that would finally help you build a realistic model of what major components are involved in building a smart home. The major components can be broken into:

* IoT Sensors
* IoT Gateways
* IoT Protocols
* IoT Firmware
* IoT Cloud and Databases
* IoT Middleware (if required)

## Home Automation Sensors

There are probably thousands of such sensors out there that can be a part of this list. Since this is an introduction towards smart home technology, we will keep it brief. We will break down IoT sensors for home automation by their sensing capabilities:

* Temperature sensors
* Lux sensors
* Water level sensors
* Air composition sensors
* Video cameras for surveillance
* Voice/Sound sensors
* Pressure sensors
* Humidity sensors
* Accelerometers
* Infrared sensors
* Vibrations sensors
* Ultrasonic sensors

## Video cameras for surveillance and analytics

A range of webcams and cameras specific to Hardware development kits are usually used in such scenarios. Hardware with USB ports offers to integrate and camera module to build functionalities.

But, utilizing USB ports in not very efficient, especially in the case of real-time video transfer or any kind of video processing.

Take RaspberryPi for example, it comes with a camera module (Pi cam) that connects using a flex connector directly to the board without using the USB port. This makes the Pi cam extremely efficient.

## Humidity sensors for Home Automation

These sensors bring the capability of sensing humidity/RH levels in air for smart homes. The accuracy and sensing precision depends a lot on multiple factors including the overall sensor design and placement.

But certain sensors like DHT22 and 11 built for rapid prototyping would always perform poorly when compared to high-quality sensors like HIH6100 and Dig RH.

While building a product to sense humidity levels, ensure that there’s no localized layer of humidity that is obscuring the actual results. Also, keep into consideration that in certain small spaces, the humidity might be too high at one end as compared to the others.

## Home Automation Protocols

* Bluetooth low energy or Bluetooth Smart: Wireless protocol with mesh capabilities, security, data encryption algorithms and much more. Ideal for IoT-based products for smart homes.
* Zigbee: Low cost, mesh networked and low power radio frequency based protocol for IoT. Different Zigbee versions don’t talk to each other.
* X10: A legacy protocol that utilizes powerline wiring for signaling and control
* Insteon: Communicates with devices both wirelessly and with wires
* Z-wave: Specializes in home automation with an emphasis on security
* Wifi: Needs no explanation
* UPB: Uses existing power lines installed in a home, reduces costs
* Thread: A royalty-free protocol for smart home automation, uses a 6lowpan

## Open source IoT platforms and frameworks for Home Automation

Looking forward to doing a quick and dirty prototype? There’s no need to write down everything from scratch. Thanks to a bunch of awesome contributions by people like we have open source platforms that can get your home automation products up and running in no time.

Our favorites are:

* Home Assistant
* Calaos
* Domoticz
* OpenHAB: Supports Raspberry Pi, written in Java and has design tools to build your own mobile apps by tweaking UI.
* OpenMotics[Asked their developer, waiting for them to respond(dev confirmed)]
* LinuxMCE
* PiDome
* MisterHouse
* Smarthomatic

## OpenHAB for Smart home automation

OpenHAB is a home automation and IoT gateway framework for smart homes. Similar to Home Assistant, OpenHAB works nicely with Raspberry Pi and comes with their own design tools to create a UI for your home automation product.

An understanding architecture of OpenHAB:

* Modularity: It is realized with the bundle concept
* Runtime dynamics: so that software components can be managed at the runtime
* Service orientation: there are services for various components to speak with each other and exchange information

Further relying on the OGSi framework, it leverages the following layers stacked together:

* Modular layer: Manages dependencies between bundles
* Life cycle layer: controls the life cycle of the bundles
* Service layers: defines a dynamic model of communication between various modules
* Actual services: this is the application layer, using all other layers
* Security layer: optional, leverages Java 2 security architecture and manages permissions from different modules

OpenHAB features:

* Plugin framework
* Rules engine
* Logging mechanism
* UI abstraction: A tree structure for UI Widgets, Item UI providers, and dynamic UI configuration
* UI implementations are available for the web, Android, and iOS
* Designer tools availability

OpenHAB has been primarily only been observed as a project for the hobbyist programmer, even many parts of openhab.org convey the same. But, we have observed a different effort in the recent times from OpenHAB into building the developer economy for building IoT smart homes.

Impressive enough that some open platform out there is thinking about system services, Cron jobs, logging, etc.

Further, looking at the frameworks and technologies that openHAB will support: Node.Js, Express.Js, Nginx, MongoDB, Redis, Socket.IO

Unlike Home Assistant’s vast integrability, openHAB is currently limited to:

* IFTTT
* Amazon Alexa
* AWS EC2 [AWS Multi-AZ isn’t compatible for multiple time zone availability]
* MQTT support

OpenHAB is extremely powerful, but at the same time very limited in terms of integration. The team behind openHAB is extremely promising and have already conveyed their plans to open up openHAB to other integration capabilities very shortly.

## Calaos for Home Automation

Calaos was developed initially by a company that was closed back in 2013, but the home automation since then has lived and is being maintained and upgraded by developers. While now being open source, it facilitates premade source code to:

* Create sweet home environment
* Control music
* Automation rules that focus on time, mood or ambiance
* Easy configuration

Calaos supports the following hardware:

* Premoboard
* Cubieboard
* RaspberryPi
* Intel-based machines

Their lack of support towards developing private IoT applications restricts their usage by developers to build high-quality solutions for consumers.

## Domoticz for Home Automation

Domoticz allows you to monitor and configure your devices and sensors with the simplest possible design. Impressive enough that the entire project is extremely lightweight, it further is backed by high integrability with third parties and features like auto learning switches.

This platform has been designed to work with operating systems like Linux and Windows.

Protocol capabilities of Domoticz include:  Z-wave, Bluetooth, Apple Homekit, X10 and MQTT

Hardware integration capabilities of Domoticz:

* RFXCOM Transceiver
* ESP2866 Wifi module
* P1 smart meter
* Youless meter
* Pulse counters
* 1-Wire
* Philips Hue
* Essent E thermostat

Domiticz can be used to create any sort of services that you can think of, ranging from a smart weather device to a Telegram bot.

## Domoticz architecture

Currently, very few people know about the architecture of Domoticz, making it extremely difficult to build applications on it without taking unnecessary risks in building the product itself.

For example, the entire design of general architecture feels a little weird when you look at the concept of a sensor to control to an actuator. It seems to be missing.

Building advanced application with Domoticz can be done using C++, lula, PHP, shell, etc.

## Blockchain in IoT for connected home

Consumers, especially those who grew up in the digital era understand the importance of privacy and security more than millennials. With the evolution of IoT, security has taken center stage for realistic deployment scenarios.

Deployment of Blockchain into home networks can easily be done with a $35 raspberry pi. A blockchain secured layer between devices and gateways can be implemented without massive revamp of the existing code base.

Simply put, blockchain as a technology that would be an implementation that most users won’t even know about, but will play a huge role in future to reassure them with revolutionary and new business models like dynamic renting for Airbnb.

So far, interoperability issues and broken protocols seemed to have hampered the growth of IoT-based smart homes.

But, as technology is progressing and more and more computing power can be generated with very low powered devices, home automation will gradually become a technology that will easy for us to build and develop for on a daily basis.