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INTERNET OF THINGS (IOT) IN HOUSEHOLD ITEMS

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One of the most important technologies of the 21st century is **IoT (Internet of Things)**. The real-world things/Physical objects could be connected over a network and activities like controlling, monitoring of the objects with the data collection is possible with minimum human intervention. This technology helps to build a smart and secured home.

Essentially the objects are with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet. we can connect everyday objects— household appliances like washing machine, Television, Fan, Air conditioner, Fridge, car, water heater, baby monitor etc. to the internet via embedded devices and can have seamless communication is possible between people, processes, and things.

Key words

IoT - Internet of Things SaaS - Software as a Service
RFID - Radio frequency identification

Cloud - Platform to store applications, store and steam data etc. seamlessly.

Introduction

In early 90's the embedded programing language Java was invented by James Gosling for a similar kind of **IoT** requirement but in 1999 the **IoT** term was coined by Kevin Ashton, and he put together an architecture for it. He proposed (RFID) Radio frequency identification chips into the objects and tracked them over internet.

In 2008 and 2009 IoT was fully conceived and currently over 25 billion connected devices are in the world.

Now the IoT comes with prebuilt applications/ software-as-a-service (SaaS) applications that can collect, analyze and present captured IoT sensor data to the users via dashboards.

This IoT technology was made possible widely due to low-cost and low-power sensor technology, low-cost computing, mobile technologies for access, cloud for low-cost data storage with good availability and Big data for data analytics etc.

The affordable and reliable sensors are making IoT technology possible for more manufacturers. Now IoT programing is done in Java, C, C++, Python, PHPoC, Java script etc.

There is a forecast of 50 billion devices/things connected to internet in 2023.

The scope of the IOT is not limited to connecting things to the internet. IOT allows devicesappliances & machines to communicate and exchange data while executing meaning full applications towards a common user.
Data that is processed in IOT contextualized processed useful information. The IOT applicationsextract and process data from lower level by required filtering, categorizing, condensing and contextualizing the information. The extracted information is then structured and organized to understand the connected system and the respective user. During the data processing a context isadded to give detail meaning to the data.
The IOT applications span across wide range of domains like Retail, Homes, Environment,Cities, Agriculture, Logistics, Energy system etc.

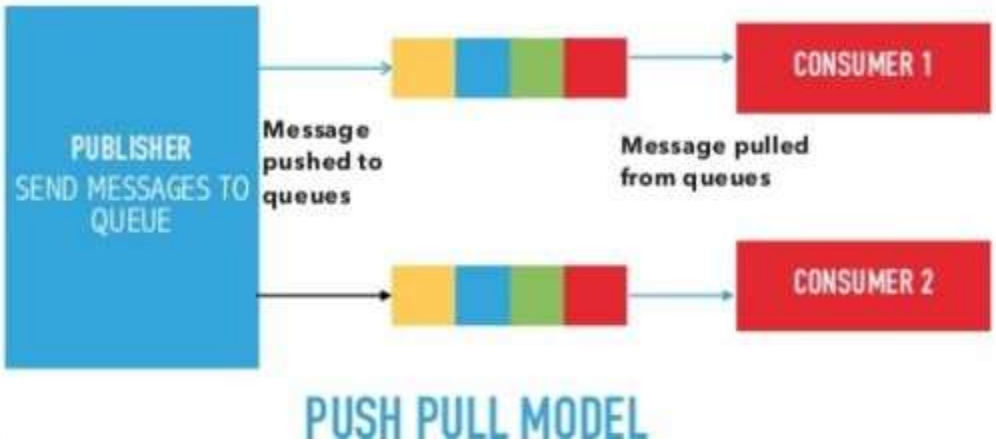
To achieve a common goal on IOT the definition is carved as “IoT is a dynamic global network infrastructure with a protocol with capabilities like self-configuring, standard and interoperable. Also, it should be having physical and virtual identities with intelligent interfaces and seamless connection with the network and other devices in the network.”

The functional blocks of IOT

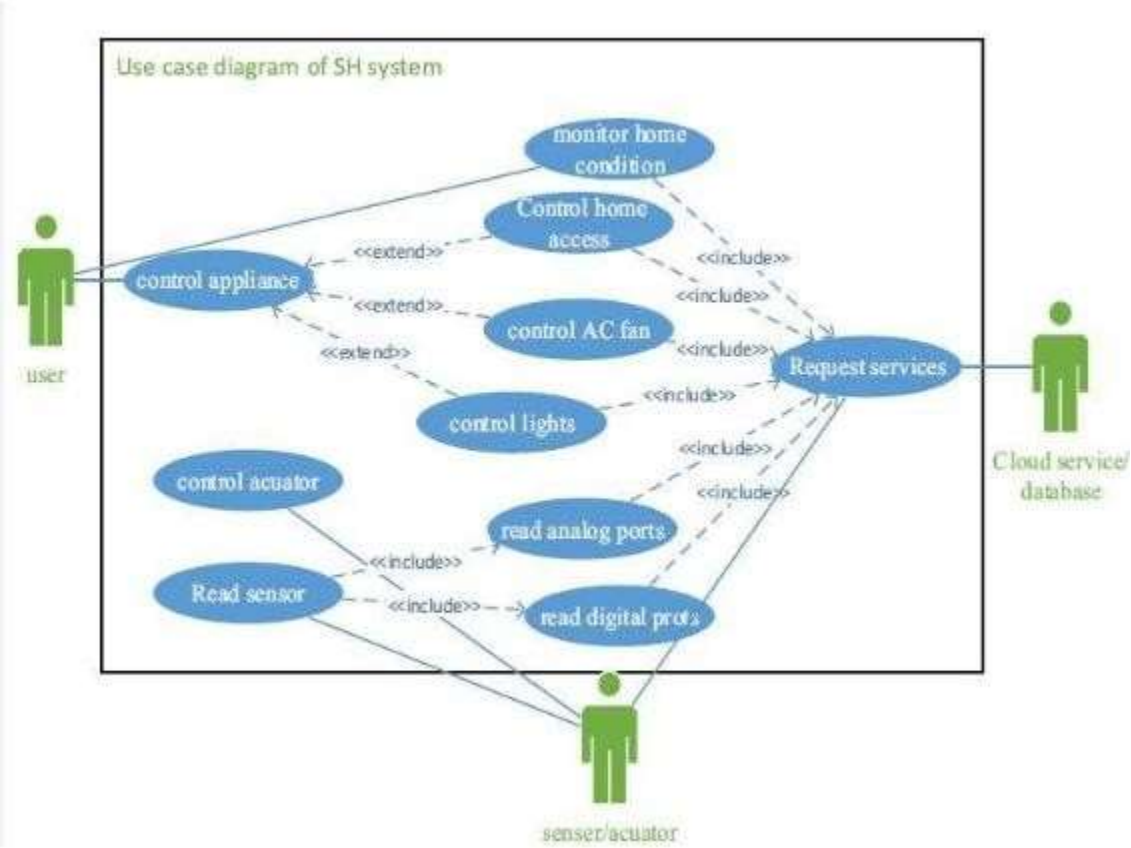
Device: Have sensor, actuation, monitoring and control functions
Communication: Communication across devices and network.
Services: The required services are like: Device monitoring, device control, data publishing anddevice

discovery
Management: About governing the IOT systems
Security: Authorization, authentication, data integrity and data security
Application: The front-end interface application where users can monitor and control variousaspects of IOT.

The general communication model of IoT



The use case diagram of a smart home system



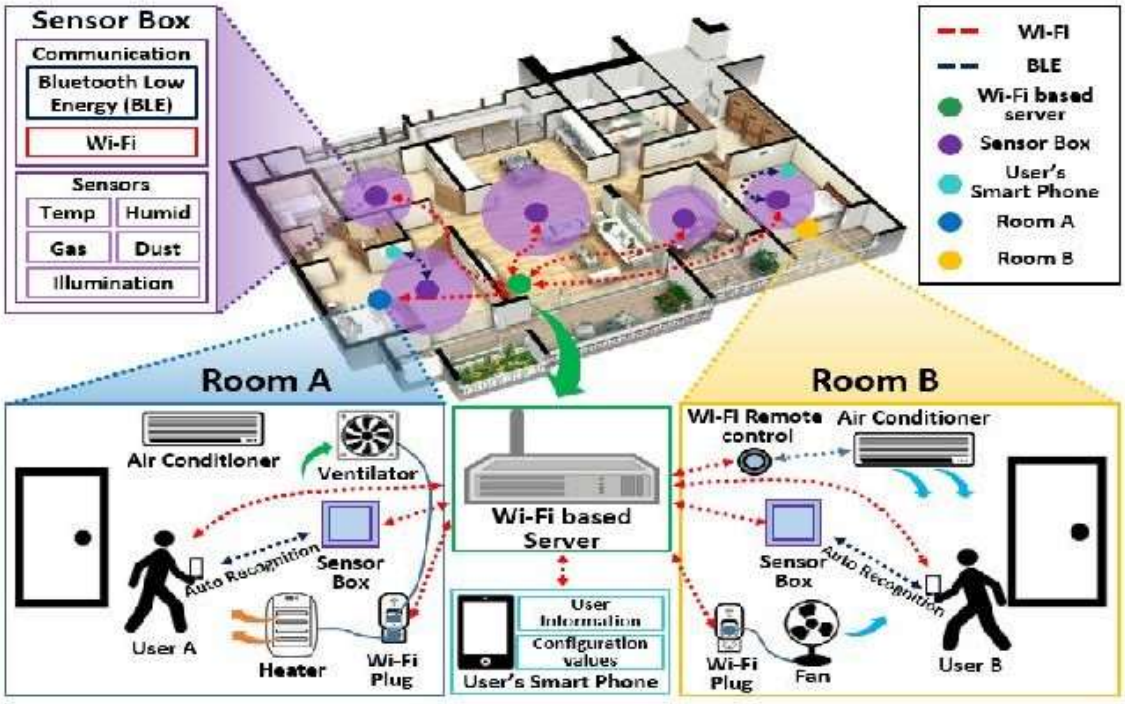
Some of the major household items which are enabled with IOT

1) Air Conditioner
2) Water heater
3) Fridge
4) Smart lights
5) Intrusion detection

6) Smoke/Gas detectors
7) Fans etc.

IOT enabled Air Conditioner

IOT enabled Air Conditions are smart one with feature like we can operate them and control the functions through our smartphone or tablet. We can control the room temperature andschedule the AC to be switched on or off at a particular time of the day through an app that we can download on our smart device.



The following are the salient features of IOT enabled Air Conditioner

- IOT Air Conditioner can be connected through mobile devices using internet, Wi-Fi.
- Users can manage temperature. Re-mode, fan speed, swing direction, etc.., using smartphone app.
- Manager the AC after leaving the house.
- Cool any room before we arrive home.
- We can set 7-day schedule & timer to match our daily lifestyle.
- Respond to open doors and windows.
- Capture and organize data about use patterns.
- Saves up to 40% of the electric costs.
- Monitor and set usage limits by room to prevent overuse.
- Activate parental controls.
- Voice devices like Alexa, etc.., can also be used to communicate to AC.
- Create AC activity schedules and plan based on your routine or upcoming plans, helpingyou run your units more efficiently.
- The data collected from IOT over a period of time can be stored in cloud environment(Amazon web services (AWS))

Streamlined Maintenance

Both IoT and conventional air conditioners need maintenance from time to time.
Cleaning the coils, keeping the filter clean, and clearing the outdoor unit of debris are all thingsthat

should be done to keep any AC running smoothly. However, an AC that is connected to theInternet of Things has one obvious advantage when it comes to maintenance: it can self- diagnose. Each part of an IoT AC has its own address. When one of these parts fails, the systemwill be alerted and the appropriate measures can be taken. A traditional AC won't let you knowthat there's a problem until it's too late.

IOT enabled Water Heater

IoT enabled water heaters are with high efficiency and can be switched on/off, scheduledmonitored and operated from anywhere in the world using a mobile app.

The following are some of the salient features of IoT enabled water heaters.

- IOT Water Heater can be connected through mobile devices via Wi-Fi.
- Users can set schedule time for on/off, temperature, etc.,
- Users can sync in real time using smart phone.
- Users can set custom bathing mode.
- Users can have voice control operations.
- Digital Temperature Control
- Auto Cut Off
- Self-Diagnosis
- Smart Alert
- It helps you to monitor power & heating by changing its color.
- Digital display & feather touch control just add to the convenience along with LEDIndicator.

IoT Smart lights

Smart lighting for homes helps in saving energy by adapting the lighting to the ambient conditions and switching on/off or dimming the lights when needed. Smart lights with sensors for occupancy, temperature, lux level etc. can be configured to adapt the lighting based on the ambient conditions sensed to provide a good ambiance.

The intelligent IoT lighting uses wireless switches to avoid directly connecting light to the module. The bulbs can be connected to a network and monitored and controlled from the cloud. You can manage individual lights or groups of lights based on things like occupation, outside lights, and times via the web or mobile app.

Smart lighting uses IoT-enabled sensors, bulbs, or adapters to enable users to use their smartphones or smart home management platform to manage their homes or offices. Smart lights can be operated on schedules or triggered by sound or motion via an external device such as a smartphone or an intelligent assistant.

IoT enabled Intrusion detection

Intrusion detection systems in home use security cameras and sensors to detect the intrusions andraise alerts. Alerts could be in the form of SMS or an e-mail to the user. Advanced systems can even send detailed alerts such as an image grab or a short video clip sent as an email attachment.

IoT enabled Smoke / Gas detector

Smoke detectors are installed in homes to detect smoke that is typically an early sign of fire. Smoke detectors use optical detection, ionization, or air sampling techniques to detect smoke.
Alerts raised by smoke detectors can be in the form of signals to a fire alarm system. Gas detectors can detect the presence of harmful gases such as Corban Monoxide, liquid petroleumgas.

IoT Washing Machine

IoT enabled washing machines collects the data like water flow, temperature, load, cycle timingand the status of status etc. in real time manner and controls these parameters through a mobile app.
The following are some of the salient features of the IoT enabled washing machines.

- Wi-Fi / Bluetooth / NF transmission.
- You can control the operation by selecting the most used programs and learn to optimizeyour washing habits by reading the statistics provided by the intelligence of the internal counters, which are graphically represented by a specially developed app.
- Intelligent washing machines will help you step by step to recommend the most suitable program based on previous interactions and, if you are allowed to do so, they remember it, thus improving the performance of the machine.
- In addition, verbal interaction also makes it easier to make simple requests in natural language, wait for a response and follow the instructions provided. Thus, it is possible to“talk” directly to the intelligent washing machine and find the most appropriate programin just a few steps.
- An application will suggest the ideal wash for any type of garment, fabric, color or evendegree of soiling using standard classifications.
- It is possible to select the best program for clothes from dozens of different wash cycles,adapting them to the most typical washes related to the different habits and lifestyles andhobbies of all kinds that also affect the condition of our clothes when they are washed repeatedly: gymnastics, handicrafts, work clothes, baby care, etc.
- This section includes all the functions that allow you to program the wash, so that you can decide exactly when, at what time or under what conditions you want one or morewash cycles to start or end.
- The washing machine lineup can be connected with Samsung smart devices such as Galaxy smartphones, Smart TVs and Family Hub refrigerators as well as voice devicessuch as Alexa and Google Home to give users a seamless connected living experience.
- Troubleshooting Machines can detect issues and maintenance jobs that need doing, andnotify you instantly via the app.
- Check how much energy your washing machine is using in real time.
- It collects data and stores it in the cloud.
- IOT Washing Machine can also monitor temperature.

IoT Fans

The following are some of the salient features of the IoT enabled fans.

- IOT Fans in home comes with smart plus technology.
- IOT Fans can be connected via app, remote, Google assistant Alexa etc...,
- One can manage speed, modes, timer, integrated lighting etc...,
- IOT Fans include features like
- Fan Scheduling
- Built in timer.
- Reverse Rotation
- Turbo Mode
- Scene Switching Light
- Breeze Mode

- Sleep Mode
- IOT Fans can be connected through mobile using internet, Wi-Fi or Bluetooth.

IOT Fridge

The following are some of the salient features of the IoT enabled fridge.

- IOT Fridge can be connected to mobile devices.
- IOT Fridge comes with built in touchscreen.
- The touchscreen is used to monitor the fridge about its temperature etc.
- Wi-Fi Connectivity. ...
- Interior Camera. ...
- Shopping List. ...
- Built-In Browser. ...
- Recipe Database. ...
- Entertainment. ...
- Whiteboard
- IoT-based smart fridge automatically logs in food and communicates with users by SMSof current storage, expiration date, nutrition, and recommended receipts.
- Customize temperature by drawer or compartment.
- Use interior cameras while at the store to double-check if you're low on milk or eggs.
- Alert you when the water filter needs to be changed.
- Turn the ice maker on or off from your smartphone.
- Use the touchscreen or voice commands to add items to your weekly
- List and sync them to your smartphone in real-time.
- Create individual profiles for each family member to send them personal notes and to-dolists.
- Utilizing a remote monitoring system ISA were able to automate temperature control in its IoT enabled refrigeration and display cabinets, for the first time. An online monitoringsystem sends alarm notifications when the temperature fluctuates outside of a set range, thereby ensuring enterprises get the opportunity to react to problems quickly, if theyoccur.
- The monitoring system works in real-time. Predictive maintenance helps detect problemsat an early stage while ensuring equipment downtime is minimized. The temperature ranges can be adjusted depending on the customer's requirements and the local climate/environment.