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IOT Platforms: A Brief Study

Chaitra Acharya
M.Tech Student, National Institute of Engineering, Mysuru, India

Abstract
Internet is one of the most important and powerful creations in all of human history. The internet is basically an informal term for the world-wide communication network of computers more specifically called the network of networks. Internet not only links computers but also people through them. It was primarily designed to share information between networks. In today's world people use internet for a variety of reasons: from browsing for information to chatting and even online services like shopping, banking, video conferencing and so forth. As the years progress, the services provided by the Internet grows endless. The "Internet of Things" refers to the concept that the Internet is no longer just a global network for people to communicate with one another using computers, but it is also a platform for devices to communicate electronically with the world around them. IoT represents the next evolution of the Internet, taking a huge leap in its ability to gather, analyse, and distribute data that we can turn into information, knowledge, and, ultimately, wisdom. There are a variety of IoT platforms like Thingspeak, Grovestreams, Thingworx, Xively and so on which provide IoT services to the users for a price.

Keywords
Internet of Things, IoT Architecture, Web of Things, Thingspeak, Grovestreams, Thingworx.

I. Introduction

The **Internet of Things** (IoT) is a system of physical objects that can be monitored, controlled or interacted with by electronic devices which communicate over various networking interfaces, and eventually can be connected to the wider Internet. The Internet of Things provides access to a broad range of embedded devices and web services. The Internet of Things (IoT) is emerging as the third wave in the development of the Internet. The IoT has the potential to connect 10 times as many (28 billion) objects to theInternet by 2020, ranging from bracelets to cars.

II. INTERNET-OF-THINGS

The Internet of Things, or IoT, refers to the set of devices and systems that interconnect real-world sensors and actuators to the Internet. This provides an endless list of applications including Internet connected cars, wearable devices including health and fitness monitoring devices, smart meters and smart objects, home automation systems and lighting controls, smartphones, wireless sensor networks for monitoring weather, floods and so on as shown in Fig. 1.

Fig. 1: IoT Applications

An IoT platform is essentially what makes IoT happen for your device. It is the application that connects it with the cloud and the corresponding output device. The reference architecture for the IoT as shown in Fig.2 consists of a set of components[1]. Layers can be realized by means of specific technologies, and we will discuss options for realizing each component. There are also some cross-cutting/vertical layers such as access/identity management.

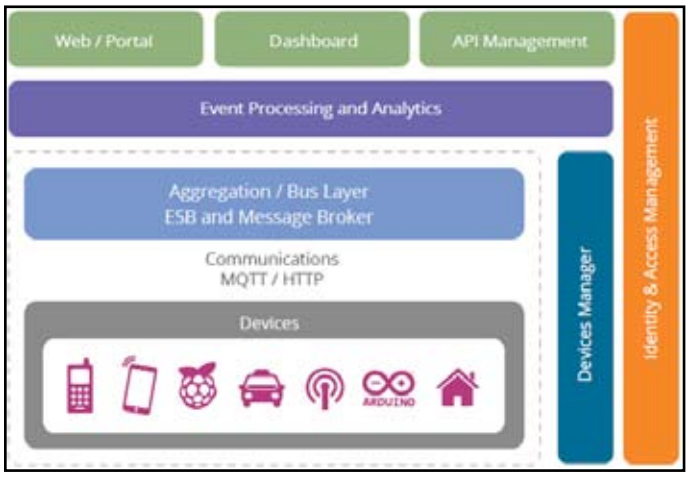

Fig.2: IoT Reference Architecture.

III. Web of Things

The Web of Things (wot) is a term used to describe approaches, software architectural styles and programming patterns that allow real-world objects to be part of the World Wide Web. The Web of Things provides an Application Layer that simplifies the creation of Internet of Things applications. While the IoT has been busy resolving networking problems, the Web of Things relies exclusively on application level protocols and tools. Mapping any device into a Web mindset makes the Web of Things agnostic to the physical and transport layer protocols used by devices. The IoT Versus Web of Things is shown in figure 3[2].

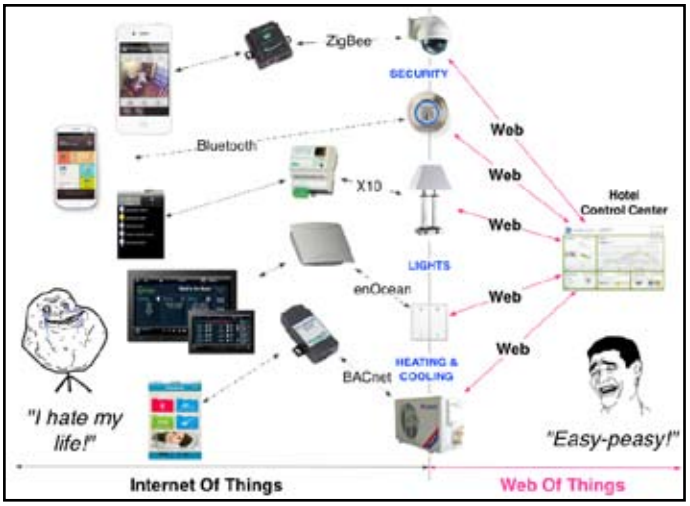

Fig. 3: IoT versus Web of Things.

By 2020, over 30 billion connected things, with over 200 billion with intermittent connections are forecast. Key technologies here include embedded sensors, image recognition and NFC. By 2015, in more than 70% of enterprises, a single executable will oversee all Internet connected things. This becomes the Internet of Everything as shown in Fig 4.

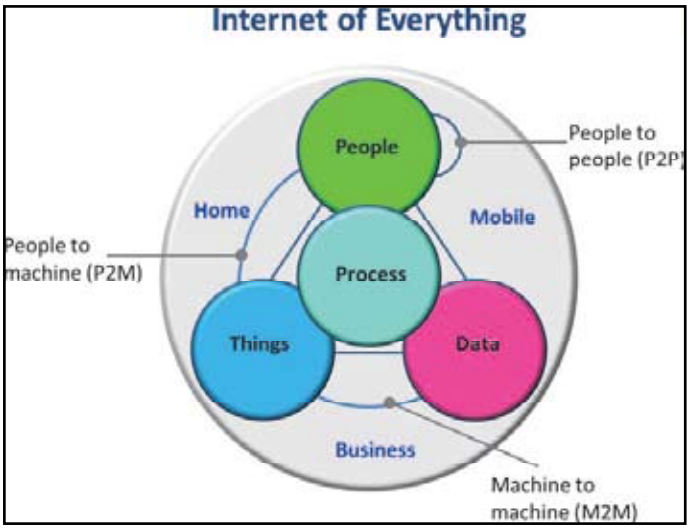

Fig. 4: Internet of Everything.

IV. IOT and Big Data

Another application of IOT is in Big Data field where business executives have suddenly embraced IoT and are building strategies that promise to transform their companies by leveraging the power of real-time information and machine learning. IoT initiatives are appearing with robust business plans, complete with funding. IoT has become the killer app for big data. To understand why IoT and big data go hand in hand, we must understand the underlying technologies. There are four major categories of technology used to implement IoT. At the lowest level is called fog or edge computing as shown in Fig 5. The "fog" is comprised of many types of connected devices and sensors that communicate data in real time. These devices are enabled by a variety of communication technologies and protocols[3].

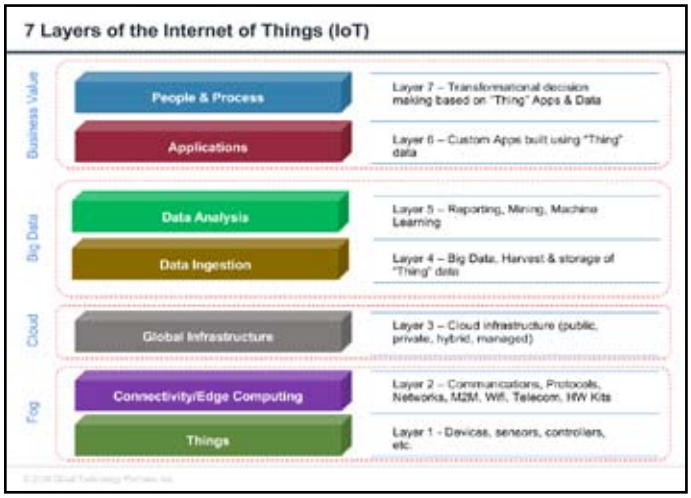

Fig. 5: IoT and Big Data layers.

V. Thingspeak

ThingSpeak is an application platform for the Internet of Things. It is an open source "Internet of Things" application and API to store and retrieve data from things using HTTP over the Internet or via a Local Area Network. With ThingSpeak, the user can create sensor logging applications, location tracking applications, and a social network of things with status updates. The features of ThingSpeak include: real-time data collection, data processing, visualizations, apps, and plugins. ThingSpeak enables sensors, instruments, and websites to send data to the cloud to store in a channel as shown in Fig 6[4]. Once data is in a ThingSpeak channel, we can analyze and visualize it, calculate new data or interact with social media, web services and other devices.

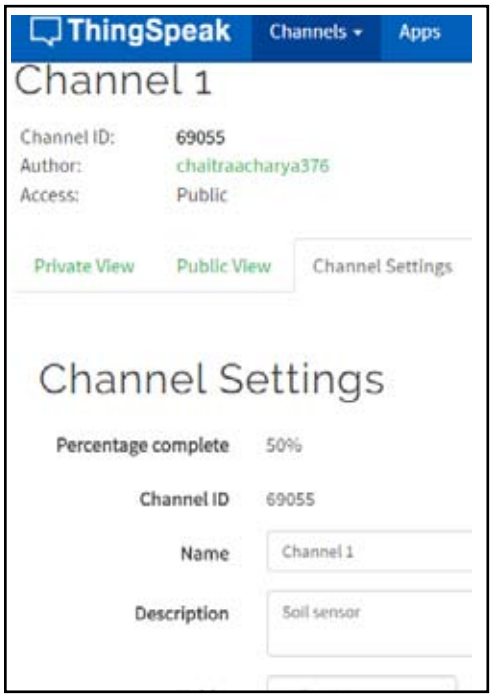

Fig. 6: Channel creation in Thingspeak.

Once a channel is created, it appears on the screen as shown in Fig 7.

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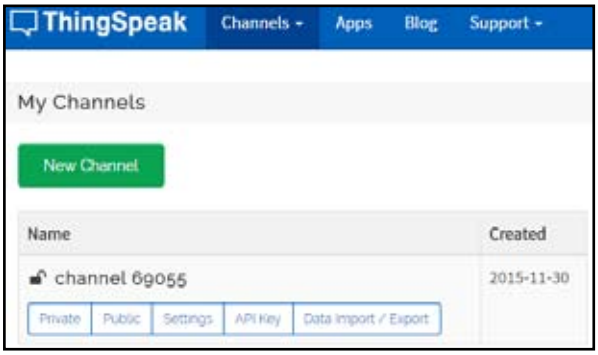

Fig. 7: Channel 69055 created by user.

After channel creation we can upload sensor values and observe it as shown in Fig 8.

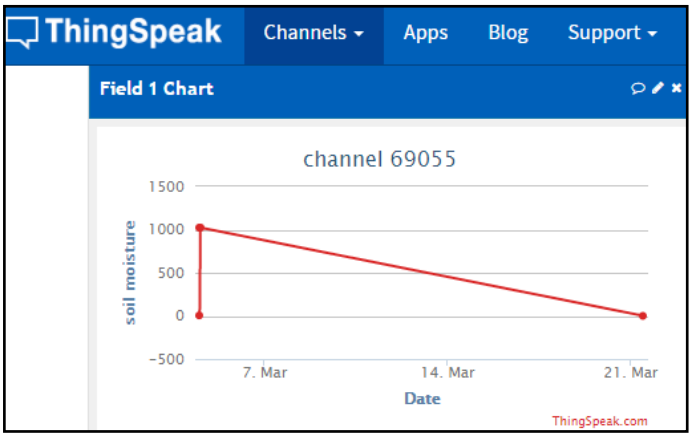

Fig. 8: Uploaded sensor values.

V. Grovestreams

GroveStreams is one the most powerful platforms in the cloud providing near real-time decision making capabilities to millions of users and devices. GroveStreams is a young, but clear-headed IoT analytics vendor whose technology was designed to solve the ease-of-deployment problem from the get-go. The aim of GroveStreams is to minimize deployment times by having an integrated, end-to-end, IoT-specific analytics platform that handles data ingestion, analytic calculation definition and analytics visualization and doesn't require writing script or code. . GroveStreams is also designed to handle the volume and breadth of streaming data that is common within IoT systems. In particular, it can aggregate hundreds or thousands of event streams and then display them in a few graphical metrics to provide top-level views of complex system operation. The platform can store up to 80 million data points per raw input stream, so longitudinal analytics have a lot of headroom. Sample granularity can accommodate five samples per second. JSON encapsulation is supported, with each RESTful PUT API call capable of up to 230MB in the message body, so good flexibility to consume a wide range of IoT device data.
Because the platform is cloud-deployed, they are continuously enhancing the product. Their most recent addition allows authorization to be centrally managed and applied for user groups and communities. Hierarchical authorization rights can be applied to mirror responsibilities in a hierarchically managed organization.
Some of the advantages of this platform are:

- Simple to put data in and take data out of the store.
- Built with Big Data technology. Scales to nearly unlimited size.
- A user can get started with a Free account.Pricing is data driven.
- Location/Map integration is also available.
- The roll-up stream data is a really efficient way to get to the data needed.
- It is possible to run very complex expressions on any stream in the store.
- Blueprinting an organization makes setting up new organizations really easy.
- Users can get alerts upon arrival for alarm type streams.
- The dashboards to visualize the data are really good and easy to use.

An account needs to be created before the uploading of data is allowed. Users can start with a free account as shown in Fig 9[5].

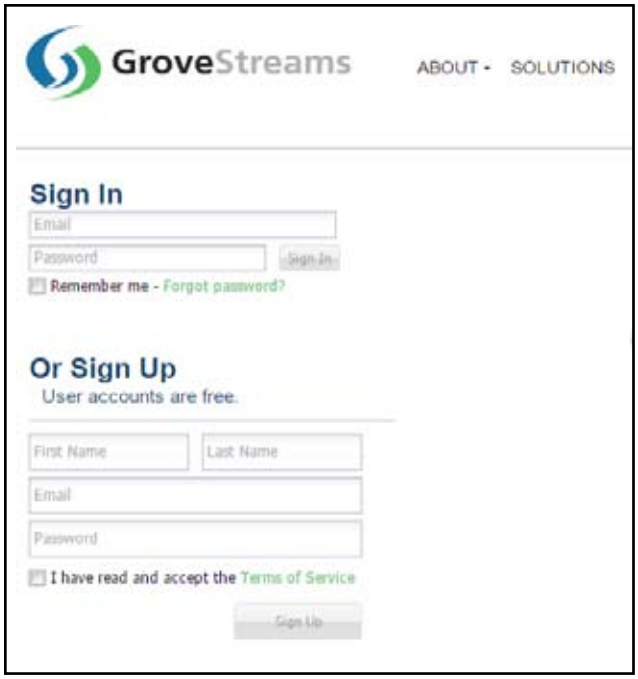

Fig. 9: Create free account on Grovestreams.

Once account and new organization is created, the image shown in Fig 10 is shown.

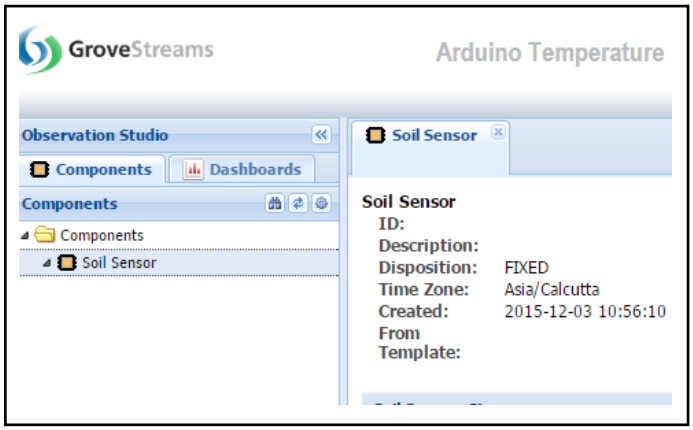

Fig. 10: Organization named Arduino Temperature created to display soil sensor value.

The next step is to create a GroveStreamsQuickStartSmartApp which will then display the temperature values as shown in below example in Fig 11.

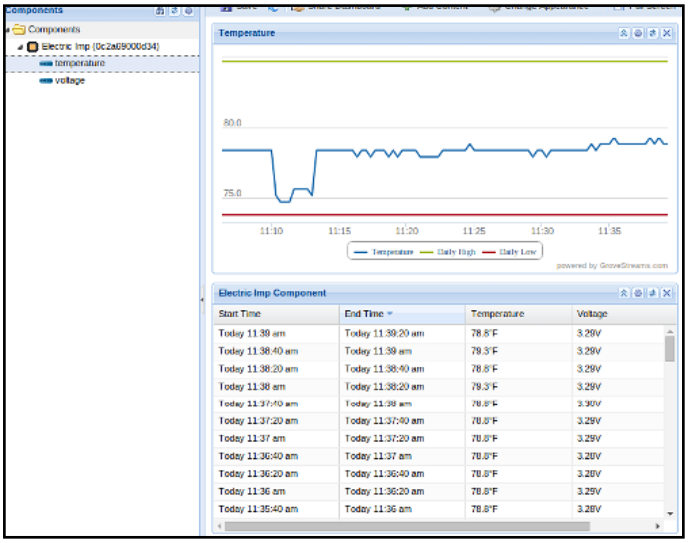

Fig. 11: Temperature values displayed.

VI. Thingworx

ThingWorx is the First IoT Platform Designed to Build and Run the Applications of the Connected World. ThingWorx reduces the time, cost, and risk required to build innovative Machine-to-Machine (M2M) and Internet of Things (IoT) applications. ThingWorx accelerates IoT application development by compressing the design-develop-deploy cycle – reducing time to market and spurring innovation. Cloud, On-Premise, Federated, or Embedded – ThingWorx lets us deploy exactly the way we want to fit the needs of any scenario.

ThingWorx enables rapid creation of end-to-end "smart" applications for a wide range of markets including: Smart Agriculture, Smart Cities, Smart Grid, Smart Water, Smart Buildings, and Telematics. It allows developers to quickly connect their ecosystems, create & deploy applications, analyze their "things" and deliver powerful user experiences across different devices – all from one, integrated platform[6].

ThingWorx IoT Platform Capabilities are:

- Flexible Connectivity Options: ThingWorx "inclusive" connectivity strategy maximizes market opportunity and minimizes integration efforts.
- Model-Based Development: Reduces development time by 10times.
- Codeless Mashup Builder: Facilitates rapid creation of IoT applications.
- ThingWorx SQUEAL™ (Search, Query, & Analysis): With the interactive search capabilities of ThingWorx SQUEAL, users can now correlate data that delivers answers to key business questions. Pertinent and related collaboration data, line-of-business system records, and equipment data get returned in a single search, speeding problem resolution and enabling innovation.
- ThingWorx Composer makes it easy to model the things, business logic, visualization, data storage, collaboration, and security required for a connected application.

VII. Conclusions

Internet of Things is growing to be an everyday part of our life. From home and industrial automation to crop monitoring to healthcare and transportation automation, it has made a huge impact on people's lives. There exist a variety of IoT platforms each of which have distinct features. The one thing which binds all these platforms together is how these platforms read sensor data and then upload these values over the Internet for storage in the cloud thereby reducing user effort and making lives easier. With alerts and tweets, notifications can be sent to mobile phones using apps on these platforms.

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