INTERNET OF THINGS
Sruthi.R, B.E(CSE)
sruthireghu0422@gmail.com
Nehru Institute of Engineering and Technology
Subiqsha.P,B.E(CSE)
subiqshasasha83@gmail.com
Nehru Institute of Engineering and Technology

Abstract—The paper is all about the upcoming technology “Internet of things”. As it is one of the latest trend it deals with many real time and day-to-day objects. Internet of things exists because it is going to dominate all the other technologies including cloud computing. There is no fields of life where Internet of Things is not applied. In the coming years all the electronic, softwares, networks, machines and all the devices will be working with Internet of Things.

Keywords- IoT devices, Web of Things, Big Data.

I. INTRODUCTION

The network of physical objects such as devices, vehicles, buildings and some other things including embedded systems, software, and network connectivity are collectively called as “Internet of Things”. The Internet of Things becomes an instance of cyber systems, also for the technologies such as smart grids, Intelligent transportation and smart cities.

Kevin Ashton, a British entrepreneur coined the name “Internet of Things” in the year 1999. As a change IoT offers the advanced connectivity that goes beyond the machine-to-machine(M2M) communications.

II. EARLY HISTORY

In the early 1982, the concept of networked smart devices was discussed. A coke machine at Carnegie Melton university became the first internet-connected device.

Mark Weiser ’s seminar paper on “Ubiquitous computing”, “The computer of 21st century”, also the academic venues such as Ubicomp and Percomp produced the contemporary vision of Internet of Things.

IEEE spectrum as moving small packets of data to a large set of nodes, described by Reza Raji in 1994, so as to integrating and automating everything from home appliances to entire factories.

TABLE 1

<table>
<thead>
<tr>
<th>RANK</th>
<th>COUNTRY</th>
<th>DEVICES ONLINE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Korea</td>
<td>37.9</td>
</tr>
<tr>
<td>2</td>
<td>Denmark</td>
<td>32.7</td>
</tr>
<tr>
<td>3</td>
<td>Switzerland</td>
<td>29.0</td>
</tr>
<tr>
<td>4</td>
<td>US</td>
<td>24.9</td>
</tr>
<tr>
<td>5</td>
<td>Netherlands</td>
<td>24.7</td>
</tr>
<tr>
<td>6</td>
<td>Germany</td>
<td>22.4</td>
</tr>
<tr>
<td>7</td>
<td>Sweden</td>
<td>21.9</td>
</tr>
<tr>
<td>8</td>
<td>Spain</td>
<td>19.9</td>
</tr>
<tr>
<td>9</td>
<td>France</td>
<td>17.6</td>
</tr>
<tr>
<td>10</td>
<td>Portugal</td>
<td>16.2</td>
</tr>
</tbody>
</table>

III. APPLICATIONS

There will be nearly 26 billion devices on the Internet of Things by 2020, according to Gartner, Inc. (a technology research and advisory corporation). ABI research estimates that more than 30 billion devices will be
wirelessly connected to the Internet of Things by 2020. As a technological innovation, the UK government allocated £40,000,00 towards research into Internet of Things, in their 2015 budget.

IP address will be used as a unique identifier in integration with the internet. As the address space of IPv4 is limited, the objects in the IoT uses IPv6 to accommodate the extremely large address spaces. To a greater extent the future of the IoT will not be possible without using the IPv

A.MEDIA

The media and big data are interconnected, so it is must to provide some context in the media processing mechanism. The ultimate aim is to serve, or convey, a message or a content that is in line with the consumer’s mindset.

The media industries process the Big Data in a dual and interconnected manner:

- Tragetting of consumers
- Data-capture

The IoT serves an opportunity to measure, collect and analyse an ever-increasing variety of behavioural statistics. Cross-correlation of this data could revolutionise the targeted marketing of products and services.

Big Data and the IoT works in a conjuctional manner, device interconnectivity. The Internet of Things transforms the media industry, companies and governments, there by opening up a new era of economic growth and competitiveness.

B.ENVIRONMENTAL MONITORING

The applications of IoT in the field of Environmental monitoring uses sensors to assist in environmental protection by monitoring the air or water quality, atmospheric or soil conditions, and also the movements of wildlife and their habitats. Devices connected to the internet can be used to earthquake and tsunami-early warning systems.

C.INFRASTRUCTURE MANAGEMENT

Monitoring and controlling the urban and rural infrastructure like bridges, railway tracks on and off-shore wind farms is a key application of IoT. The IoT devices can be used to control critical infrastructure like bridges to provide access to ships. Even the areas such as waste management can benefit from automation and optimization that could be brought by the IoT.

D.MANUFACTURING

Digital control systems to automate the process and also operator tools and services information systems to optimize plant safety and security are within the purview of the IoT.

E.ENERGY MANAGEMENT

It is expected that IoT devices will be integrated into all forms of energy consuming devices (switches, power outlets, bulbs, television etc.). Such devices would also offer the opportunity for users to remotely control their devices, or centrally manage them via cloud based infrastructure.

Using Advanced Metering Infrastructure (AMI) Devices connected to the internet backbone, electric utilities can not only collect data from end-user connections but also manage other distribution automation devices like transformers and reclosers.

F.MEDICAL AND HEALTHCARE SYSTEMS

IoT devices can be used to enable remote health monitoring and emergency notification systems. These health monitoring systems can range from blood pressure and heart rate monitors to advanced devices capable of monitoring specialized implants, such as pace makers or advanced aids.

G. LARGE SCALE DEPLOYMENTS

There are several ongoing or planned large-scale deployments of the IoT. For Example Songdo, South Korea, the first of its kind fully equipped and wired city. This is implemented only with the help of IoT.

Another example of large deployment is the completed New York Water Ways(NYWW) in the New York city to connect all their vessels and being able to monitor them lively 24/7. The network is designed and engineered by Fluidsmesh Networks. New applications can include security, energy and fleet management, digital signage, public wi-fi, paperless ticketing and others.

H. TRANSPORTATION

Fig.1: digital speed limit sign
The IoT can assist in integration of communications, control, and information processing across various Transportation systems i.e. the vehicle, infrastructure, and the driver and user etc.,

IV. UNIQUE ADDRESSABILITY OF THINGS

The original idea of the Auto-ID Center is based on RFID-tags and unique identification through the Electronic Product Code, however, this has evolved to objects having an IP address or URI.

From the world of Semantic Web, as an alternative view, it focuses on making all things (not just the electronics, smart or RFID-enabled) addressable by the existing naming protocols, such as URI. The objects themselves do not converse, but they may now be referred by the other agents, such as powerful centralized servers acting for their human owners.

The next generation of Internet applications using communicate with devices attached to virtually all human-made objects because of the large addressing space of IPv6.

The combination of these ideas can be found in the current GS1/EPCglobal information services (EPCIS) specifications.

V. TRENDS AND CHARACTERISTICS

The latest trends and characteristics can be explained by means of the following figure.

![Technology roadmap: Internet of Things](image)

- **Teleoperation and telepresence**
- **Locating people and everyday objects**
- **Security, healthcare, transport, document management**
- **RFID tags for routing and loss prevention**
- **Vertical market apps**
- **Supply chain helpers**
- **Ubiquitous positioning**
- **Physical world**
- **Time**

VII. NETWORK ARCHITECTURE

The Internet of Things requires huge scalability in the network space to handle the surge of devices. IETF 6LoWPAN would be used to connect devices to IP networks with billions of devices. IPv6 will play an major role in handling the network scalability.

VIII. COMPLEX SYSTEMS

In semi-open or closed loop, it will be considered as a Complex system, because of the huge number of different links and interactions between Autonomous actors, and its capacity to integrate new actors. At the overall stage it will be seen as Achaotic environment.

IX. A BASKET OF REMOTES

According to CEO if Cisco, the remote control market is expected to be a USD 19 trillion market. Many IoT devices have a potential to take a piece of this market. Then, there exists “Basket of remotes” problem, where we will have hundreds of applications to interface with hundreds of devices that don’t share protocols for speaking with one another.

There are several ways to find solution for this problem. One of them is “Predictive Interaction” where
cloud or fog based decision makers will predict the user’s next action and reaction. This problem is also a competitive advantage for some very technical startup companies with fast capabilities.

XI. FRAMEWORKS

Internet of Things frameworks helps supporting the interaction between "things" and allow for more-complex structures like Distributed system and the development of Distributed applications. Nowadays, some Internet of Things frameworks seems to be focused on real time data logging solutions offering some basis to work with many "things" and have them interact. Future developments might lead to specific Software development environments to create the software to work with the hardware used in the Internet of Things. Companies such as Tibbo Systems - AggreGate Platform, are developing technology platforms to provide this type of functionality for the Internet of Things.

The XMPP standards foundation XSF is creating such a framework in a fully open standard that isn't tied to any company and not connected to any cloud services. It provides a set of needed building blocks and a proven distributed solution that can scale with high security levels. The extensions are published at XMPP/extensions.

The independently developed MASH IoT Platform was presented at the 2013 IEEE IoT conference in Mountain View, CA. MASH’s focus is asset management (assets=people/property/information, management=monitoring/control/configuration). Support is provided for design through deployment with an included IDE, Android client and runtime. Based on a component modelling approach MASH includes support for user defined things and is completely data-driven.

REST is a scalable architecture which allows for things to communicate over Hypertext Transfer Protocol and is easily adopted for IoT applications to provide communication from a thing to a central web server. MQTT is a publish-subscribe architecture on top of TCP/IP which allows for bi-directional communication between a thing and a MQTT broker.

XI. ENABLING TECHNOLOGIES FOR IoT

There are many technologies that enable IOT.

1. RFID and near-field communication - In the early 2010s, with uses such as reading NFC tags or for access to public transportation.
2. Optical tags and quick response codes - This is used for low cost tagging. Phone cameras decodes QR code using image-processing techniques. In reality QR advertisement campaigns gives less turnout as users need to have another application to read QR codes.
3. Bluetooth low energy - This is one of the latest tech. All newly releasing smart phones have BLE hardware in them. Tags based on BLE can signal their presence at a power budget that enables them to operate for up to one year on a lithium coin cell battery.

XII. CRITICISM AND CONTROVERSIES

While many technologists take the Internet of Things as a step towards a better world, scholars and social observers have doubts about the promises of the ubiquitous computing revolution.

XIII. SECURITY

Concerns have been raised that the Internet of Things is being developed rapidly without appropriate consideration of the profound security challenges involved and the regulatory changes that might be necessary. According to the BI (Business Insider) Intelligence Survey conducted in the last quarter of 2014, 39% of the respondents said that security is the biggest concern in adopting Internet of Things technology.[38] In particular, as the Internet of Things spreads widely, cyber attacks are likely to become an increasingly physical (rather than simply virtual) threat. Computer-controlled devices in automobiles such as brakes, engine, locks, hood and truck releases, horn, heat, and dashboard have been shown to be vulnerable to attackers who have access to the onboard network. In some cases, vehicle computer systems are internet-connected, allowing them to be exploited remotely. The U.S. National Intelligence Council in an unclassified report maintains that it would be hard to deny "access to networks of sensors and remotely-controlled objects by enemies of the United States, criminals, and mischief makers. An open market for aggregated sensor data could serve the interests of commerce and security no less than it helps criminals and spies identify vulnerable targets. As a response to increasing concerns over security, the Internet of Things Security Foundation (IoTSF) was launched on 23 September 2015. It has a mission to secure the Internet of Things by promoting knowledge and best practice. Its founding board is made from technology providers and
telecommunications companies including BT, Vodafone, Imagination Technologies and Pen Test Partners.

XIV. DESIGN

Given widespread recognition of the evolving nature of the design and management of the Internet of Things, sustainable and secure deployment of Internet of Things solutions must design for "anarchic scalability.

XV. ENVIRONMENTAL IMPACT

A concern regarding IoT technologies persists to the environmental impacts of the manufacture, use, and eventual disposal of all these semiconductor-rich devices. Modern electronics are repleted with a wide variety of heavy metals and rare-earth metals, as well as highly toxic synthetic chemicals. This makes them extremely difficult to properly recycle. Electronic components are often simply dumped in regular landfills, thereby polluting soil, groundwater.

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REFERENCE:


