International Journal of Research in Engineering, Science and Management
Volume-1, Issue-12, December-2018
www.ijresm.com | ISSN (Online): 2581-5792

A Survey on Internet of Things

Shwetav Sharad[1], Amit Singh[2], Divyanshu[3], Abhishek Rai[4]
[1]*Assistant Professor, Department of Computer Science & Engineering, BBDIT College, Ghaziabad, India*
[2,3,4]*Student, Department of Computer Science & Engineering, BBDIT College, Ghaziabad, India*

***Abstract*: Internet of Things is a well-known and used technology in the world. IOT (Internet of Things) is a network of devices, vehicle and home appliance that contain electronic, software, actuators, and connectivity which allows these things to connect, interact and exchange data. Nowadays Internet of Things gained a great attention from researchers, since it becomes an important technology that promises a smart human being, by allowing a communications between objects, machines and every things together with peoples. IoT represents a system which consists a thing in the real world, and sensors attached to or combined to these things, connected to the Internet via wired and wireless network structure. IoT-enabled things will share information about the condition of things and the surrounding environment with people, software systems and other machines. The IOT technology made the world to become smart in every aspects, since the IoT will provides a means of smart homes, smart cities, self-driven cars and framing and healthcare, in addition to many important applications such as smart energy, IOT retail shop, transportation, waste management and monitoring. In this paper we review a concept of IoT and elaborate its architecture, protocols, and top uses of IOT and future possibilities of the IoT.**

***Keywords*: Internet of Things, architecture, protocols, top uses**

1. Introduction

In today's era the Internet has become ubiquitous, has touched almost every corner of the globe, and is affecting human life in unimaginable ways. However, the journey is very far from over. We are now moving into an era of even more pervasive connectivity where a very wide variety of appliances will be connected to the web. We are entering an era of the "Internet of Things" (IoT). This term has been defined by different authors in many different ways. The term "Internet of things" was likely coined by Kevin Ashton of Procter & Gamble, later MIT's Auto-ID Center, in 1999, though he prefers the phrase "Internet for things". At that point, he viewed Radio-frequency identification (RFID) as essential to the Internet of things, which would allow computers to manage all individual things. Pena-Lopez-at-al defines the Internet of things as a paradigm in which computing and networking capabilities are embedded in any kind of conceivable object. We use these capabilities to query the state of the object and to change its state if possible. In common parlance, the Internet of things refers to a new kind of world where almost all the devices and appliances that we use are connected to a network. IoT is not a single technology; rather it is an agglomeration of various technologies that work together in tandem. We can use them collaboratively to achieve complex tasks that require a high degree of intelligence.

Fig. 1. Internet of things

2. Architecture

The internet of things (IOT) has four stage architecture as follows,

- Sensors/Actuators: The primary function of sensors is that it collects the data from the environment or object under measurement and turn it into useful data. Think of the specialized structures in your cell phone that detect the directional pull of gravity—and the phone's relative position to the "thing" we call the earth—and convert it into data that your phone can use to orient the device. Actuators also intervene to change the physical conditions that generate the data. An actuator might, for example, shut off a power supply, adjust an air flow valve, or move a robotic gripper in an assembly process. The sensing/actuating stage covers everything from legacy industrial devices to robotic camera systems, water-level detectors, air quality sensors, accelerometers, and heart rate monitors. Data is at the heart of an IoT architecture, and you need to choose between immediacy and depth of insight when processing that data.
- The Internet Gateway: The data from the sensors starts in analog form. That data needs to be aggregated and converted into digital streams for further processing downstream. Data acquisition systems (DAS) perform these data aggregation and conversion functions. The DAS connects to the sensor network, aggregates outputs, and performs the analog-to-digital conversion. The Internet gateway receives the aggregated and digitized data and routes it over Wi-Fi, wired LANs, or the Internet, to Stage 3 systems for

further processing. Stage 2 systems often sit in close proximity to the sensors and actuators. For example, a pump might contain a half dozen sensors and actuators that feed data into a data aggregation device that also digitizes the data. This device might be physically attached to the pump. An adjacent gateway device or server would then process the data and forward it to the Stage 3 or Stage 4 systems.

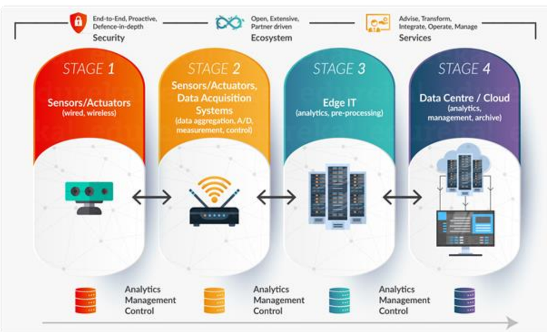

Fig. 2. Edge IT

- Edge IT- Once IoT data has been digitized and aggregated, it's ready to cross into the realm of IT. However, the data may require further processing before it enters the data center. This is where edge IT systems, which perform more analysis, come into play. Edge IT processing systems may be located in remote offices or other edge locations, but generally these sit in the facility or location where the sensors reside closer to the sensors, such as in a wiring closet. Because IoT data can easily eat up network bandwidth and swamp your data center resources, it's best to have systems at the edge capable of performing analytics as a way to lessen the burden on core IT infrastructure. If you just had one large data pipe going to the data center, you'd need enormous capacity. You'd also face security concerns, storage issues, and delays processing the data. With a staged approach, you can preprocess the data, generate meaningful results, and pass only those on. For example, rather than passing on raw vibration data for the pumps, you could aggregate and convert the data, analyze it, and send only projections as to when each device will fail or need service.
- Cloud/ Data center- Data that needs more in-depth processing, and where feedback doesn't have to be immediate, gets forwarded to physical data center or cloud-based systems, where more powerful IT systems can analyze, manage, and securely store the data. It takes longer to get results when you wait until data reaches Stage 4, but you can execute a more in depth analysis, as well as combine your sensor data with data from other sources for deeper insights. Processing may take place on-premises, in the cloud, or in a hybrid cloud system, but the type of processing executed in this stage remains the same, regardless of the platform.

The 4-stage approach to IoT infrastructure and processing will require new levels of collaboration, particularly as the separations between these stages start to blur.

3. IOT network protocol stack

- *Physical layer*: IEEE 802.15.4 protocol is designed for enabling communication between compact and inexpensive low power embedded devices that need a long battery life.
- *Data link layer:* IPv6 is considered the best protocol for communication in the IoT domain because of its scalability and stability. Such bulky IP protocols were initially not thought to be suitable for communication in scenarios with low power wireless links such as IEEE 802.15.4.6LoWPAN, an acronym for IPv6 over low power wireless personal area networks, is a very popular standard for wireless communication. Header compression 6loWPAN defines header compression of IPv6 packets for decreasing the overhead of IPv6. Some of the fields are deleted because they can be derived from link level information or can be shared across packets.
- *Fragmentation:* The minimum MTU size (maximum transmission unit) of IPv6 is 1280 bytes. On the other hand, the maximum size of a frame in IEEE 802.15.4 is 127 bytes. Therefore, we need to fragment the IPv6 packet. This is done by the data link layer. Link layer forwarding- 6LoWPAN also supports mesh under routing, which is done at the link layer using link level short addresses instead of in the network layer. This feature can be used to communicate within a 6LoWPAN network.
- *Network Layer*: The network layer is responsible for routing the packets received from the transport layer. The IETF Routing over Low Power and Lossy Networks (ROLL) working group has developed a routing protocol (RPL) for Low Power and Lossy Networks (LLNs)
- *Transport Layer:* TCP is not a good option for communication in low power environments as it has a large overhead owing to the fact that it is a connection oriented protocol. Therefore, UDP is preferred because it is a connectionless protocol and has low overhead.
- *Application Layer:* The application layer is responsible for data formatting and presentation. The application layer in the Internet is typically based on HTTP. However, HTTP is not suitable in resource constrained environments because it is fairly verbose in nature and thus incurs a large parsing overhead. Many alternate protocols have been developed for IoT

environments such as CoAP (Constrained Application Protocol) and MQTT (Message Queue Telemetry Transport).

4. Top uses IOT

- *Smart Homes:* Now-a-days IoT devices are becoming a part of the larger concept of home automation, which can include lighting, heating and air conditioning, media and security systems. If we see the long term benefits of IoT it could include energy savings by automatically ensuring lights and electronics are turned off.
- *Smart City*: IoT is widely used in the smart cities in the way that it manages traffic management, waste management, electricity management and many more. Not just internet access to people in a city but to the devices in it as well – that's what smart cities are supposed to be made of. And we can proudly say that we're going towards realizing this dream.
- *Self-driven Cars:* Self-driven cars are always been in news. Google and Tesla tested it and even Uber came up with a version of self-driven cars that it later shelved. Since we are dealing with the human lives on the roads, we need to ensure the technology has all that it takes to ensure better safety for the passenger and those on the roads. The cars make use of several sensors and embedded systems connected to the cloud and internet, which keep generating data and send them to cloud for informed decision making through Machine Learning.
- *Medical and healthcare:* IoT devices can be used to enable remote health monitoring and emergency notification systems. IOT is an application of the IoT for medical and health related purposes, data collection and analysis for research, and monitoring. This 'Smart Healthcare', as it can also be called, led to the creation of a digitized healthcare system, connecting available medical resources and healthcare services.
- *Farming:* Farming is one of the most sector that will benefit from the Internet of Things. With the vast developments happening on tools farmers can use on their farms and in agriculture, the future is sure promising. Tools are being developed for drip irrigation, understanding crop patterns, water distribution, drones for farm surveillance and more. These will allow farmers to come up with better produce and also take care of the concerns better.
- *IoT Retail Shops*: IoT retail shops are used in Amazon Go – it is the store from the eCommerce giant. Perhaps this is the best use of the technology in bridging the gap between an online store and a retail store. The retail store allows you to go cashless by deducting money from your Amazon wallet. It also adds items to your cart in real-time when you pick products from the shelves. If you change your mind and pick up another product, the previous item gets deleted and replaces your cart with the new one. The best part of the concept store is that there's no cashier to bill your products. You don't have to stand in line but just step out after you pick up your products from shelves.

5. Conclusion

In conclusion, the Internet of Things is closer to being implemented than the average person would think. Most of the necessary technological advances needed for it have already been made, and some manufacturers and agencies have already begun implementing a small-scale version of it. The main reasons why it has not truly been implemented is the impact it will have on the legal, ethical, security and social fields. Workers could potentially abuse it, hackers could potentially access it, corporations may not want to share their data, and individual people may not like the complete absence of privacy. For these reasons, the Internet of Things may very well be pushed back longer than it truly needs to be.

References

[1] Zeinab Kamal Aldein Mohammed, and Elmustafa Sayed Ali Ahmed, "Internet of Things Applications, Challenges and Related Future Technologies," in World Scientific News, vol. 67, no. 2, pp. 126-148, 2017.
[2] Pallavi Sethi and Smruti R. Sarangi, "Internet of Things: Architectures, Protocols, and Applications," Journal of Electrical and Computer Engineering, vol. 2017, 25 pages, 2017.
[3] https://www.linkedin.com/pulse/iot-deployment-models-bhargava-c-s
[4] https://sites.google.com/site/v3viceiot/summary-and-conclusion
[5] https://en.wikipedia.org/wiki/Internet_of_things
[6] https://analyticstraining.com/top-uses-of-iot/
[7] https://sites.google.com/site/netothings/home/honor-code-statement/introductio-1/potential-benefits/legal-and-ethical-issues/security-concerns/social-problems/further-research/conclusion