

Internet of Things for Business

Nagaraju Kilari

Senior Assistant Professor & HOD,
Department of Computer Science - BCA,
New Horizon College,
Bangalore, Karnataka, India.
Mail ID: nagarajuk@newhorizonindia.edu

Abstract

The past decade saw machine-to-people connections via Internet and people-to- people connections via social networks capturing the world, catapulting it into an era of accessibility and connectivity. Today, the concept has been cranked up into the Internet of ‘Everything’ that leverages this accessibility and connectivity to efficient and productive use like the smart cities, smart governments and policing, smart grids, smart Transportation and so on. So, the availability of hyper-connectivity sets the stage for building utility and enterprise services around it, which otherwise stay unharnessed. These people-to-machine, people-to-people, machine-to-people and machine-to-machine connections that engage people, processes, data and machines in a bidirectional flow of information results in enormous amount of data which needs to be stored, processed and accessed. Such use cases require convergence of machine-to-machine connectivity, event stream processing, Big Data, analytics, Cloud, and mobile technologies. This paper highlights the introduction, standards, bodies and challenges of IoT.

Keywords

IOT, Big data, Data analytics, cloud computing and mobile technologies.

1. INTERNET OF THINGS: Introduction, Brief History & Related

One day, our coffee machines are going to be smart enough to recognize us and suggest us with the flavor of coffee we like (say 50% coffee +40% milk+10% chocolate+1 sugar cubicle) combined with an offer, this entire process of identifying the person to running thru the algorithms and pushing the offer happens within a span of 1 or 2 seconds before we press the button on the coffee vending machine. That day is going to be soon and will be bought to you by Internet of Things

Internet of Things (IoT) - is the network that connects people, data, processes, and physical objects including machines, devices, and appliances. This hyper connectivity is already delivering new capabilities, richer experiences, and unprecedented economic opportunity for businesses, individuals, and cities.

Brief History - The idea around connected devices had been around since 1970s. This was called as “embedded internet” or “pervasive computing”, in fact ATM’s were some of the first Internet of Things Objects as far back as 1974. However Kevin Ashton coined the actual term “Internet of Things” in 1999 while working in supply chain optimization project using RFID technology.

Related Terminologies - For the last 5-6 years, IoT started to gain momentum and popularity .In 2011, Gartner, the market research company in their famous “hype-cycle for emerging technologies” included “The Internet of Things” as a new emerging phenomenon on their list. So “Internet of Things” is the most popular term in describing this new interconnected world however there are related terminologies popped up such as

M2M, Industry 4.0, and Internet of Everything, and so on.

2. INTERNET OF THINGS: Why the Buzz now?

Digital Quotient among the companies is changing the way of enterprise data capture and data consumption, resulting in enormous amount of devices and data.

Following IoT Enablers are the fundamental reason for the rise in digital quotient and current buzz.

#1 Cheap and Powerful Sensors:

Moore’s law: An observation made by Intel co-founder Gordon Moore in 1965. He noticed that the number of transistors per square inch on integrated circuits had doubled every year since their invention. Moore’s law predicts that this trend will continue into the foreseeable future. As a result

- Processing power increased
- Sensor size decreased – making it easier to install and embed
- Sensor cost decreased: Average cost of sensors reduced from \$1.30 to \$0.60 in the past 10 years.

#2 Cheap Connectivity:

Over the past 10 years the cost of bandwidth reduced 40 times as a result Wi-Fi is available almost everywhere and at a very affordable cost.

#3 IPv6 - Unique Addresses

IP address is the unique identification for every device on an IP network. The fourth version of the Internet protocol allows 4.3 billion addresses. With the increasing number of devices getting connected to IP networks, IPv6 serves much beyond than what is needed as it allows 340 trillion-trillion-trillion potential new addresses ($3.4 * 10^{38}$).

#4 Ubiquitous Mobile

Today there are 2.6 billion smartphone subscriptions globally; analysts predicted that this count would reach 6.1 billion by 2020; Given that smart phones are becoming the personal gateway to IoT.

#5 Big Data Analytics

IoT by definition will generate voluminous amount of structured and unstructured data. Availability of big data analytics is a key enabler to handle such volume, variety, velocity and veracity nature data.

Sl.No	ERA	No. of Devices
1	Mainframes - Back office automation (1960 - 1970s)	Thousands
2	Client Server- Front office automation (1980 - 1990s)	Millions
3	Internet - e-Commerce (2000s)	Hundreds of millions
4	Mobile + Cloud - CAPEX to OPEX (SaaS, PaaS, IaaS), Social (2005+)	Billions
5	IOT (2015+)	Tens of Billions

Table 1: Devices evolution over a period

3. INTERNET OF THINGS: Standards Bodies

There is an ongoing explosion in the number of consortia, industry groups, company alliances, and standards bodies to define standards for different IoT related topics like interoperability, security, data privacy, reference models and so on helping to bring the IoT from a hopeful potential to a profitable reality.

Some of them to name are IETF, IEEE, IPSO, the Open Interconnect Consortium, the Thread Group, the Industrial Internet Consortium and the AllSeen Alliance.

Last week, the OCF (Open Connectivity Foundation) unifies the entirety of the former Open Interconnect Consortium with leading companies at all levels – silicon, software, platform, and finished-goods – dedicated to providing this key interoperability element of an IoT solution.

The OCF's vision for IoT is that billions of connected devices (appliances, phones, computers, industrial equipment) will communicate with one another regardless of manufacturer, operating system, chipset or transport. With the OCF fulfilling this promise, anyone – from a large technology company to a maker in their garage - can adopt the open standards of OCF to innovate and compete, helping ensure secure interoperability for consumers, business, and industry.

Industrial Internet Consortia (IIC) - Industrial Internet Consortium Working Groups coordinate and establish the priorities and enabling technologies of the Industrial Internet in order to accelerate market adoption and drive down the barriers to entry. There are currently 19 Working Groups and teams, broken into 7 broad areas some of them being Security, Testbeds, Technology and Legal.

4. INTERNET OF THINGS: Challenges

IoT being an ecosystem play from fragmented set of industries, it poses different challenges and critical among them are described below. Business can reap maximum benefits only by addressing these challenges

1. **Interoperability:** IOT is about creating connectivity among content, people, process and things/devices so one of the major challenges is to provide seamless interoperability between these connections. Consistency in IoT standards are well needed for better interoperability because some layers of the IoT technology stack have no standards, and others have numerous competing standards. This means IoT requires better standardization, which can enable both horizontal and vertical Interoperability, In other words Internet of Interoperable Things. McKinsey Global institute in their report on how IoT technology can create real economic value – indicated that Interoperability between IoT systems is critically important to capturing maximum value; IoT's interoperability could deliver over \$4 trillion out of an \$11.1 trillion economic impact.

2. **Security and Privacy:** With evolving opportunities, risks too evolve with greater pace. We cannot imagine the risky situation if the central smart energy grids, smart cities, smart factories, connected medical devices and mission critical aeronautical stuff getting hacked, it cannot be Internet of loosely connected things. There are well-documented cases of IoT freak-outs— the spamming fridge, the disabled car, the manipulated insulin pump, the list goes on.

According to a new market research report, published by Markets and Markets, Internet of Things (IoT) Security Market is expected to grow from USD 6.89 Billion in 2015 to USD 28.90 Billion by 2020, at a Compound Annual Growth Rate (CAGR) of 33.2% from 2015 to 2020.

Given that security and privacy has high stakes with serious consequences so they need to be tackled to reap the maximum benefits of tightly connected IoT world.

Conclusion

IT to IOT is a new phenomenon. Every business whether emerging or mature, IOT will enable efficiency and improved productivity. In other words the new generation applications that powers enterprises will be based on SMAC coupled with Big Data to form smart Applications. Though we are at Peak on IOT hype curve, we are realizing the tangible outcomes of what IOT can yield.

This talk will unlock the buzzwords and key concepts behind 'Internet of Things' and also gives a glimpse of how businesses are looking to scale on IOT and reap benefits from this connected world phenomenon.

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