

The Humble Beginnings

The term was coined by Kevin Ashton back in 1999 when he was on Procter & Gamble's payroll. The very first reference to the 'Internet of Things' was in relation to the RFID-enabled device connectivity, making it possible for smart management of supply chain logistics.

The Internet of Things (IoT hereafter) has humble beginnings dating back to the beginnings of the twenty-first century. It started with PC's and other immobile hardware and allowed for a very rudimentary system of data exchanges between machines. Many types of everyday "things" (vehicles, wearables, appliances, and more) are becoming Internet-connected. Today, the IoT includes an innumerable array of machines connected together, the total number of which is estimated to cross the 50 Billion barriers by 2020.

The Internet of Everything (IoE hereafter) is even more recent, though is quickly gaining wide applications across industrial streams. To offer a perspective that would help with a simplistic understanding of the two - IoE builds upon IoT, as it goes onto includes people, data and processes apart from machines. The IoE clubs all four together in an interactive ecosystem.

The end result is however still debatable, though the philosophy behind conceiving something like the IoE is the continued progression towards a utopian society with improved governance and equitable distribution of goods and services.

The Evolution: IoT ——>> IoE

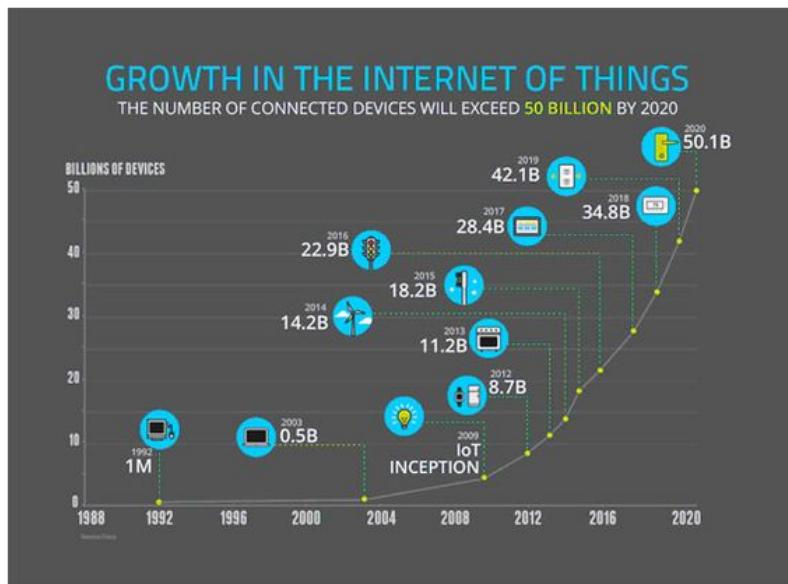
How the Internet of Things is slowly evolving into the Internet of Everything...

What basically started with just PCs and some PDA's rapidly progressed into increasingly complex networks with millions of smartphones. After this, there was no turning back for IoT and associative connectivity tech, as the increasingly powerful forces of commercialization and globalization provided the necessary impetus for these technologies to explore and find ready applications.

IoT refers to a myriad of internet-connected devices, capable of sensing and sharing data with one another - an automated system without any human intervention.

Embedded with sensors, processors and control systems for facilitating horizontal communication throughout an open, multi-node network, these IoT devices symbiotically both assisted by intelligent data and help grow AI with the plethora of data that users are creating. The consequences, likelihood for systems having massive near-future significance, often invaluable and of critical importance. For

instance, biochip transponders on farm animals, heart monitoring implants, field operation devices assisting with search and rescue operations, and including devices for DNA analysis of environmental/food/pathogen monitoring.



The Internet of Everything is a huge-common system that has active connections between people, things, data, and processes.

The theoretical objective behind the concept of IoT is to improve experiences and make smarter decisions. The aim of which is to convert collected information into actions, facilitate data-based decision-making and provide new capabilities and richer experiences.

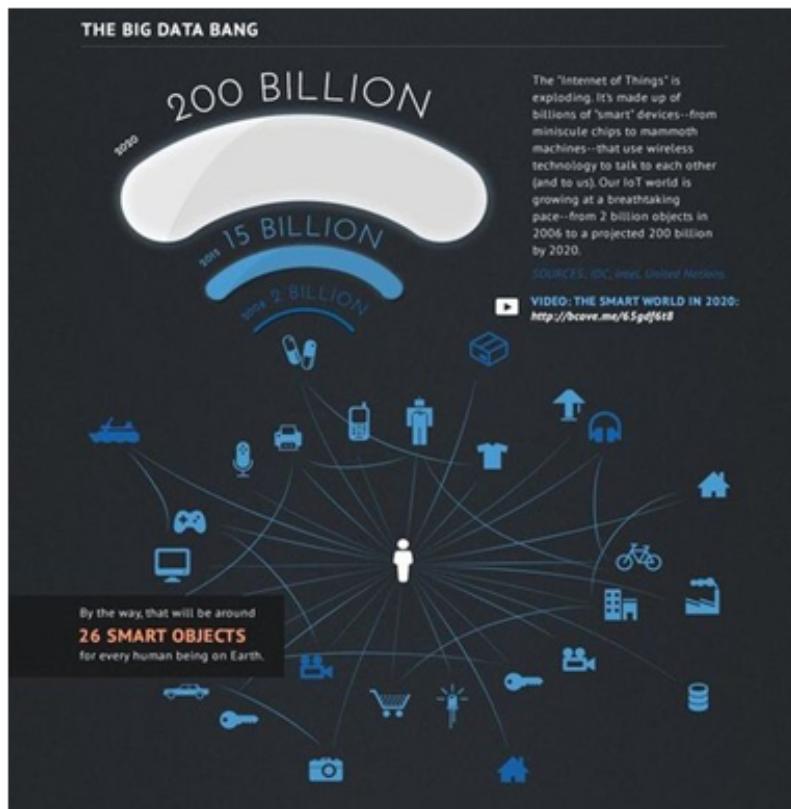
IOT = Network + Things
IOE = Network + Things + People + Data + Process

Internet of Things

- Connected together all things. Only the things without any innate capabilities of life form activities. Machine-to-Machine Communication (M2M).

Internet of Everything

- Machine-to-Machine Communication which also includes people-to-machine (P2M) and people-to-people (P2P) communication through technology.



The essence of IoT is the interconnectivity of physical objects that send and receive data, while the IoE is a wider term that includes, apart from IoT, numerous technologies and people as the end-nodes.

The IoT and IoE altogether build numerous interrelated networks and enlarge the space for digital transformation in healthcare, telecom, retail, manufacturing, transportation and logistics, and other spheres.

As the two concepts are not different, they share numerous similarities in-between them. The major ones are -

- **Decentralization - Distributed systems without a single center. Each node operates as a small management center, capable of performing certain tasks independently.**
- **Security - High vulnerability to penetration and cyber-attacks are some of the peculiar characteristics of decentralized systems. The more devices connected within the network, the higher the susceptibility to breaches of the ecosystem.**

Understanding the IoE?

The Philosophy behind IoE - A world comprising of billions of sensors that are implanted into billions of ordinary objects, devices, machines, giving them expanded networking opportunities.

A concept is based on the idea of all-round connectivity, intelligence and cognition, IoE can be theoretically comprehended in the manner in which it extends the IoT concept and includes many other things instead of purely device connectivity. A major upgrade on the theoretical capabilities of modern-tech systems from the previous decades, the IoE is for arriving at intelligent internet connections inclusive of computers, tablets, and smartphones.

With the mainstream adoption of IoE, outfitting any object with digital features and connecting it to the common network of other objects, people and processes for generating and exchanging valuable information and facilitating relevant decision-making becomes a possibility.

Tenets Central to the IoE Ecosystem: There are four central pillars (Things, People, Data and Process) as elaborated in the following table -

Things: The Nodes

The building blocks of both IoT and IoE, 'things' refer to all of the connected objects/devices within the network. Things gather the relative status information through sensors, and they share this info with one another over the internet.

The connected things in IoT are various devices, from consumer gadgets to institutional servers and even water pipes. Whereas In IoE, almost every physical object can become a connected 'thing' (in theory). For instance, sensors implanted in cattle for monitoring their health would assist in managing the milk supply chain.

Data: The Building Blocks

It is estimated that connected devices would be producing 500 ZB of data by the end of this year. This number is expected to increase exponentially each year. Even in our sleep we generate data, and by 2020, every person would be generating a whooping 1.7 MB per second. Fascinating! And as the number of sources and the volume of each multiply, data management and analysis would become vital, rather existential.

The bricks for building a future that is better than our today, Data alone is useless but when combined with analysis makes for smarter and faster decision-making.

People: The Variables

Intelligent connections are only possible via human actions. We use connected devices every day, often analyze data, and every day we harness the potential of data insights, though we rarely realize these things... As a result, people are integral to IoE ecosystems.

They don't just play an essential role in communication (P2M & P2P), chances are they may also become connected in-themselves.

Take for instance, in healthcare, sensors under human skin or on the body can share critical information on a patient's vital signs, allowing for timely clinical intervention, quality care, and treatment service. People can potentially act as nodes in the M2M communication process as well.

Process: The Relational

Processes determine how and in what respect each of the other three elements interact within the network and create value in the ecosystem. The process in IoE is said to execute successfully when a connected thing gathers the right data and transfers it to the right person at the right time.

The linchpin of IoE connectivity allowing that allowing for new opportunities across industries, via the means of improved processes as well as optimum settlements.

Another important element of the Internet of Things is a network. Serving the role of the crucial infrastructure for billions of devices to communicate over distances, the data-highways within the network can be wired (the internet) or wireless (LoRaWAN).



According to the American multinational tech conglomerate Cisco, the Internet of Everything is poised to make networked connections more relevant and valuable than ever before. IoE can convert information into actions for creating new capabilities and richer experiences, along with unprecedented levels of economic opportunities. Cisco is also attributed to use of the term ‘IoE’ for the very first time.

Among the industries that benefit the most from IoE are Manufacturing (automation), Retail (supply chain and dynamic demand), Information (humongous data networks), Finance & Insurance, and Healthcare. Industry estimates peg the value within IoE to cross the \$14.4 trillion mark by 2022, solely for the private sector worldwide. Estimates for the growth in IoE for public sectors is yet to be calculated, though one can expect massive investments as this tech is increasingly becoming mainstream.

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