

# Internet of Things – The Sustainable Industrial Revolution

Topic of the month April 2016

In the 19th century, steam-powered printing and the telegraph, abundant coal, and locomotives on national rail systems gave rise to the first industrial revolution. In the 20th century, centralized electricity, the telephone, radio and television, cheap oil, and internal combustion vehicles on national road systems converged to create an infrastructure for the second industrial revolution. Today the third industrial revolution is taking shape in the form of the Internet of Things following the major shifts to mobility and cloud computing that have formed the last decade in technology.

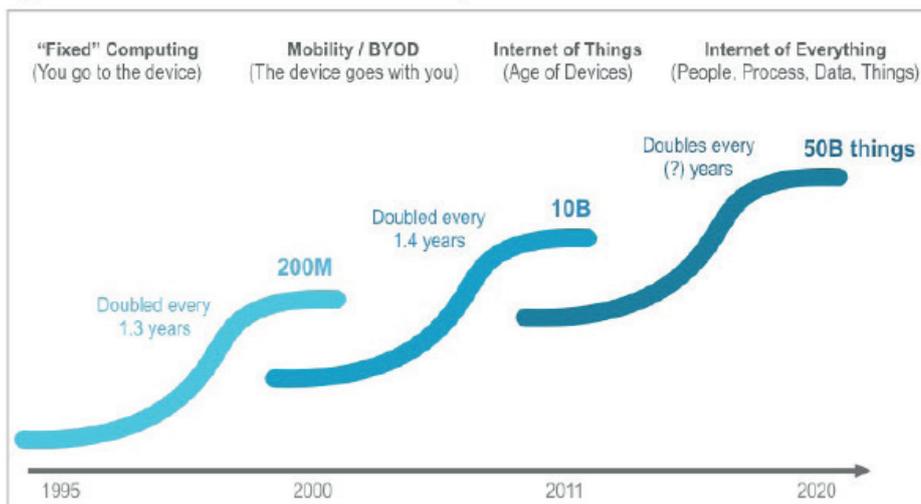


While the internet itself is not the Holy Grail, it is the one technology that has the potential to address many of the challenges we face. The internet, which has gone through several stages in its relatively short life span, already has benefited many individuals, businesses and countries by improving education through the democratization of information, allowing for economic growth through electronic commerce, and improving business innovation by enabling greater cooperation.

## What is the Internet of Things?

The Internet of Things is emerging as a third, and likely bigger, wave in the development of the internet, following the rise of the fixed internet in the 1990s and the mobile internet in the 2000s. In the year 2000 there were about 200 million devices connected to the internet, mainly PC's and servers. Driven by advances in mobile technology and the emergence of smartphones and tablets, this number has increased to well over 10 billion today. By 2020 it is expected that around 50 billion devices or 'things' will be connected to the internet (see Figure 2).

**Figure 2.** Internet Growth Is Occurring in Waves.



Source: Cisco IBSG, 2012



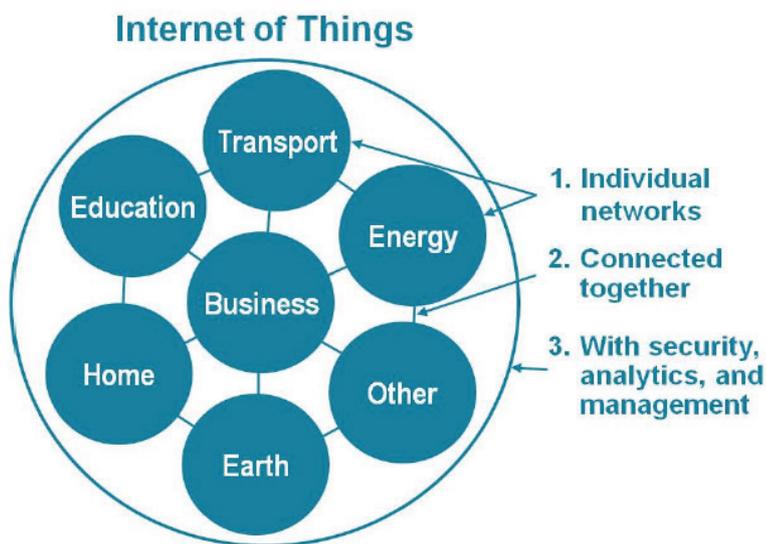
This leap to 50 billion connected devices will be driven by simply connecting more devices to the internet. In effect this means that the Internet of Things brings the Internet out of the computer and puts it into the real world. Although the idea that devices such as machines can be instrumented with sensors and connected to the internet to transmit data has been around for years, it is only now starting to be implemented widely. This was driven by the further miniaturization of electronics, more efficient batteries and the declining cost of sensors and connectivity.

In this context, the Internet of Things is the first real evolution of the internet as it makes the internet sensory. This will allow us to easily collect information about any object such as temperature, pressure, vibration, light, moisture and stress. Collecting and analyzing this information in real-time will enable us to monitor and manage the status of literally anything and do so in a proactive manner instead of reactive. Potentially this can reap big efficiency gains in managing vast quantities of objects such as an entire city's trash bins, city lighting or a nation-wide network of vending machines.

### Next steps in the development of The Internet of Things

As the Internet of Things evolves, these networks, and many others, will be connected with added security, analytics, and management capabilities (see Figure 2).

Figure 2. IoT Can Be Viewed as a Network of Networks



Source: Cisco IBSG, April 2011

As a network of networks, the Internet of Things will generate vast amounts of data, which is the raw material that is processed into information. High volumes of it and clever analytics can identify trends and patterns. From this perspective, the real value of the Internet of Things has very little to do with either the Internet or the Things. The real value lies in harvesting and analyzing the data that all these objects generate, and in turning those insights into meaningful action.



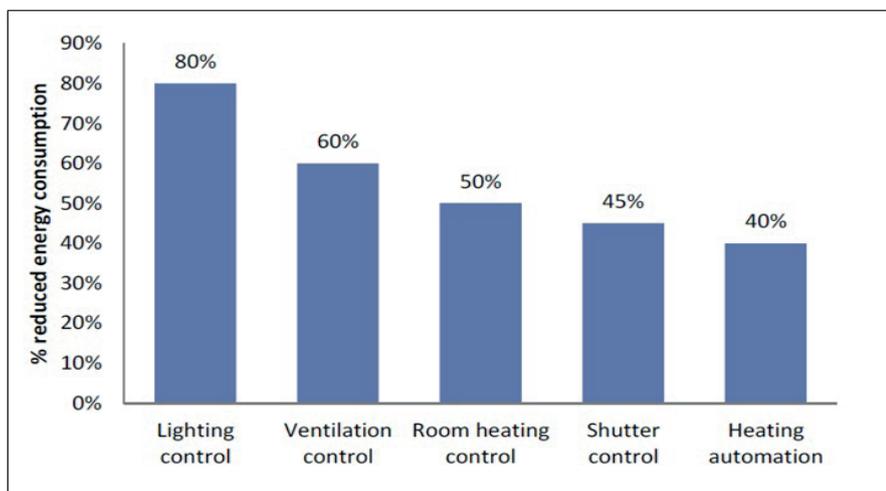
### How can the Internet of Things improve enterprises' sustainability?

The Internet of Things may well be the most sustainable business model ever as the ability to perform real-time analysis on any operation or process is a key game changer. With the resulting insights, we can improve efficiency in all aspects of a business. Improved efficiency cuts out wasted materials, reduces energy use and helps streamlining processes, promising to deliver greater value from a smaller amount of resources.

One practical application is inventory control. Attaching sensors to goods allows for instantaneous updating and real-time tracking of goods in the supply chain. The data derived will help businesses match supply and demand, cutting down the need for warehouse space, decreasing waste, and reducing the need for the transportation of personnel and goods.

Another example is energy management. Real-time monitoring and analysis of energy consumption patterns in buildings and factories can help the owners to reduce operational cost, greenhouse gas emissions and the environmental footprint. Lighting, in particular, can have a huge impact, especially in large workspaces. Connected light bulbs can turn on and off automatically at pre-set times, or be paired with environmental and motion sensors so they operate only when needed. This type of smart lighting and other building control systems have the potential to reduce electricity consumption by a staggering 40 percent (see Figure 3).

Figure 3: Building control systems usually offer over 40% electricity savings potential



Source: ABB

The Internet of Things therefore offers attractive prospects for well aware investors. A thorough research in companies' development combined with a focus on the sustainability of the latest findings can help uncovering tomorrow's winners which are the most attractive investment opportunities.



## Internet of Things Tomorrow

- **Conquering Climate Change**

While it may seem out of reach today (and possibly laughable to some), the Internet of Things will eventually allow us to become better stewards of our finite resources by improving how we sense, understand, and even manage our environment. As billions and even trillions of sensors are placed around the globe and in our atmosphere, we will gain the ability to literally hear our world's "heartbeat." Indeed, we will know when our planet is healthy or sick. With this intimate understanding, we can begin to eradicate some of our most pressing challenges, including hunger and ensuring the availability of drinkable water.

- **Hunger**

By understanding and predicting long-term weather patterns, farmers will be able to plant crops that have the greatest chance for success. And, once the fields are harvested, more efficient (and, therefore, less-expensive) transportation systems will allow for the distribution and delivery of food from places where there is abundance to places where there is scarcity.

- **Drinkable Water**

While the Internet of Things may not be able to create water where it is needed most, it will have the ability to fix many of the problems that reduce our clean water supply, such as industrial waste, unsustainable agriculture, and poor urban planning. For example, smart sensors located throughout a city's water system will detect when there is a leak and automatically divert water to avoid unnecessary waste. The same sensor will alert utility personnel so that the problem can be fixed as soon as resources are available.

*While these examples may seem a phantasy consider how people, businesses, and countries could contribute to and benefit from all of the various components and processes that need to come together for this scenario to become a reality. The opportunities are nearly limitless.*



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