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IOT Enabled Energy Efficient Wireless Sensor Network & Services – A Pathway towards Green Engineering - Part 5 (Applications)

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Wireless Sensor Network Applications

Wireless sensor networks may comprise of numerous different types of sensors like low sampling rate, seismic, magnetic, thermal, visual, infrared, radar, and acoustic, which are clever to monitor a wide range of ambient situations. Sensor nodes are used for constant sensing, event ID, event detection & local control of actuators. The applications of wireless sensor network mainly include health, military, environmental, home, & other commercial areas.

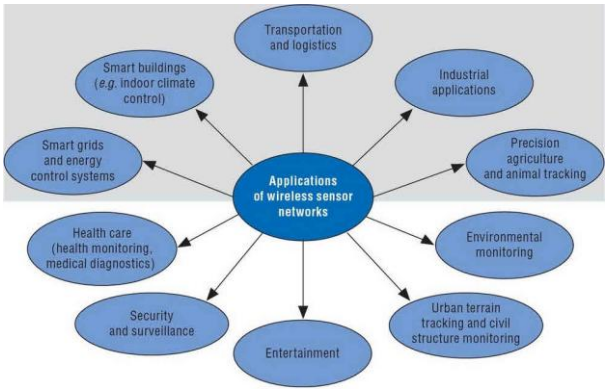


Fig : WSN Application

- Military Applications
- Health Applications
- Environmental Applications
- Home Applications
- Commercial Applications
- Area monitoring
- Health care monitoring
- Environmental/Earth sensings
- Air pollution monitoring
- Forest fire detection
- Landslide detection
- Water quality monitoring
- Industrial monitoring

How Big is IoT?

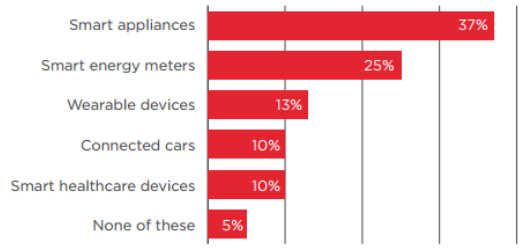
This new wave of connectivity is going beyond laptops and smartphones, it's going towards connected cars, smart homes, connected wearables, smart cities and connected healthcare. Basically a connected life. According to Gartner report[9], by 2020 connected devices across all technologies will reach to 20.6 billion. Woah! that's a huge number.

YEAR	NUMBER OF CONNECTED DEVICES
1990	0.3 million
1999	90.0 million
2010	5.0 billion
2013	9.0 billion
2025	1.0 trillion

Source: HP[9]

HP did a small survey in which they estimated the rise of connected devices over the years and the results are surprising. Are we moving towards a fully automated world? These devices will bridge the gap between physical and digital world to improve the quality and productivity of life, society and industries. With IoT catching up Smart homes is the most awaited feature, with brands already getting into the competition with smart applicances. Wearables are another feature trending second on the internet. With launch of Apple Watch and more devices to flow in, these connected devices are going to keep us hooked with the inter-connected world.

A survey conducted by KRC Reserach in UK, US, Japan and Germany the early adopters of IOT has revealed which devices are the customers more likely to use in the coming years. Smart Appliances like thermostat, smart refrigerator to name a few are most liked by the customers and are seem to change the way we operate.



Source: GSMA Report[9]

If you are wondering what impact will IoT have on the economy then for your information as per the Cisco report IoT will generate $14.4 trillion in value across all industries in the next decade. Yes, you are thinking correctly IoT will bring a wave, nobody can forsee.

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Ten Real World Applications of IoT

1. Smart Home

With IoT creating the buzz, 'Smart Home' is the most searched IoT associated feature on Google. But, what is a Smart Home? Wouldn't you love if you could switch on air conditioning before reaching home or switch off lights even after you have left home? Or unlock the doors to friends for temporary access even when you are not at home. Don't be surprised with IoT taking shape companies are building products to make your life simpler and convenient. Smart Home has become the revolutionary ladder of success in the residential spaces and it is predicted Smart homes will become as common as smartphones.

The cost of owning a house is the biggest expense in a homeowner's life. Smart Home products are promised to save time, energy and money. With Smart home companies like Nest, Ecobee, Ring and August, to name a few, will become household brands and are planning to deliver a never seen before experience.

2. Wearables

Wearables have experienced a explosive demand in markets all over the world. Companies like Google, Samsung have invested heavily in building such devices. But, how do they work? Wearable devices are installed with sensors and softwares which collect data and information about the users. This data is later pre-processed to extract essential insights about user. These devices broadly cover fitness, health and entertainment requirements. The pre-requisite from internet of things technology for wearable applications is to be highly energy efficient or ultra-low power and small sized.

3. Connected Cars

The automotive digital technology has focused on optimizing vehicles internal functions. But now, this attention is growing towards enhancing the in-car experience. A connected car is a vehicle which is able to optimize it's own operation, maintenance as well as comfort of passengers using onboard sensors and internet connectivity. Most large auto makers as well as some brave startups are working on connected car solutions. Major brands like Tesla, BMW, Apple, Google are working on bringing the next revolution in automobiles.

4. Industrial Internet

Industrial Internet is the new buzz in the industrial sector, also termed as Industrial Internet of Things (IIoT). It is empowering industrial engineering with sensors, software and big data analytics to create brilliant machines. According to Jeff Immelt[9], CEO, GE Electric, IIoT is a "beautiful, desirable and investable" asset. The driving philosophy behind IIoT is that, smart machines are more accurate and consistent than humans in communicating through data. And, this data can help companies pick inefficiencies and problems sooner. IoT holds great potential for quality control and sustainability. Applications for tracking goods, real time information exchange about inventory among suppliers and retailers and automated delivery will increase the supply chain efficiency. According to GE the improvement industry productivity will generate $10 trillion to $15 trillion in GDP worldwide over next 15 years.

5. Smart Cities

Smart city is another powerful application of IoT generating curiosity among world's population. Smart surveillance, automated transportation, smarter energy management systems, water distribution, urban security and environmental monitoring all are examples of internet of things applications for smart cities.

IoT will solve major problems faced by the people living in cities like pollution, traffic congestion and shortage of energy supplies etc. Products like cellular communication enabled Smart Belly trash will send alerts to municipal services when a bin needs to be emptied.

By installing sensors and using web applications, citizens can find free available parking slots across the city. Also, the sensors can detect meter tampering issues, general malfunctions and any installation issues in the electricity system.

6. IoT in agriculture

With the continous increase in world's population, demand for food supply is extremely raised. Governments are helping farmers to use advanced techniques and research to increase food production. Smart farming is one of the fastest growing field in IoT. Farmers are using meaningful insights from the data to yield better return on investment. Sensing for soil moisture and nutrients, controlling water usage for plant growth and determining custom fertilizer are some simple uses of IoT.

7.Smart Retail

The potential of IoT in the retail sector is enormous. IoT provides an opportunity to retailers to connect with the customers to enhance the in-store experience. Smartphones will be the way for retailers to remain connected with their consumers even out of store. Interacting through Smartphones and using Beacon technology can help retailers serve their consumers better. They can also track consumers path through a store and improve store layout and place premium products in high traffic areas.

8.Energy Engagement

Power grids of the future will not only be smart enough but also highly reliable. Smart grid concept is becoming very popular all over world. The basic idea behind the smart grids is to collect data in an automated fashion and analyze the behavior or electricity consumers and suppliers for improving efficiency as well as economics of electricity use. Smart Grids will also be able to detect sources of power outages more quickly and at individual household levels like

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nearby solar panel, making possible distributed energy system.

9. IOT in Healthcare

Connected healthcare yet remains the sleeping giant of the Internet of Things applications. The concept of connected healthcare system and smart medical devices bears enormous potential not just for companies, but also for the well-being of people in general. Research shows IoT in healthcare will be massive in coming years. IoT in healthcare is aimed at empowering people to live healthier life by wearing connected devices.

10.IoT in Poultry and Farming

Livestock monitoring is about animal husbandry and cost saving. Using IoT applications to gather data about the health and well being of the cattle, ranchers knowing early about the sick animal can pull out and help prevent large number of sick cattle.

End Notes

The future of IoT is more fascinating than this where billions of things will be talking to each other and human intervention will become least. IoT will bring macro shift in the way we live and work.

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