What is the Internet of Things (IoT)?

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What is IoT?

The term "IoT" was coined in 1999 and refers to the world of devices connected to the Internet, which is the method by which much of big data is collected, concentrated and curated. Big data refers to the analysis of this information to produce useful results.

Why Implement the IoT and Big Data?

The commercial and governmental sectors are showing how the IoT and big data can be used to improve operations, but how can these concepts extend profitability into manufacturing and other related industrial sectors? It helps to first define where this data is coming from, below are some of the main vertical markets where big data is collected. These markets include but aren't limited to agriculture, electricity, forestry, water treatment and virtually every type of manufacturing facility.
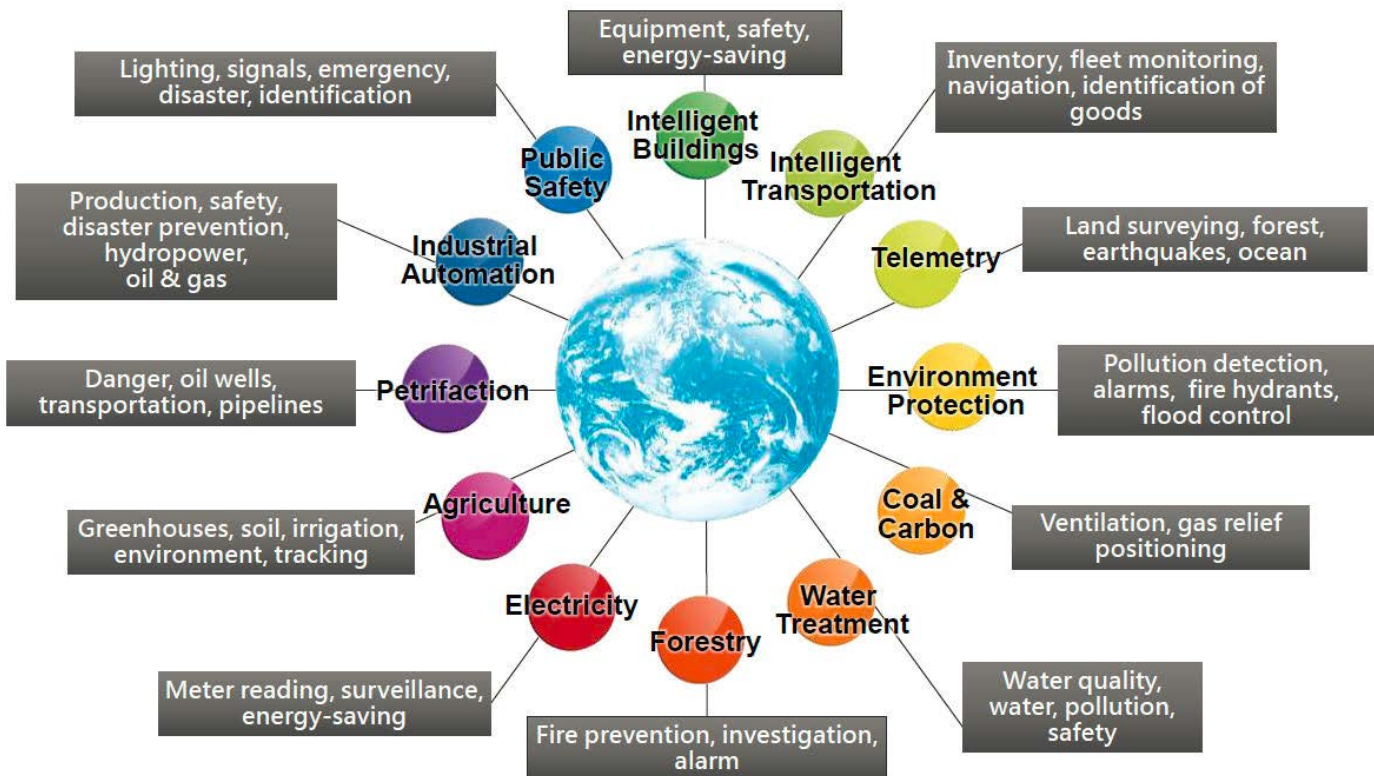
Ways Manufacturing can be Improved by IoT and Big Data
1. Predictive health monitoring
2. Less downtime
3. Lower reject rates
4. Improved quality
5. Higher throughput
6. Improved safety
7. More efficient use of labor
8. Enable mass customization

How can IoT be used in a Factory?
Individual sensors, analyzers, radio frequency identification (RFID) hardware, vision systems, and other devices are becoming "smarter" and are offering network connectivity. Thus, more data than ever is available from the factory floor and process plants.

This combination of information and capabilities can be harnessed by a top-level predictive health monitoring system. Motor run times and start counts, valve actuation counts and other tracking metrics can be configured to alert the user when equipment requires service. More detailed diagnostics such as temperature and vibration monitoring can trigger a useful warning of imminent trouble. In fact, many devices now include powerful diagnostic information on-board, just waiting to be tapped by end users.

Journey of Data in an IoT System

1. Collection of Data - Sensing
Smartphones react to user inputs by tracking the smallest of gestures, automobiles constantly monitor vehicle motions to achieve stability control, and buildings vary environmental controls to provide both comfort and energy savings. When looking from a system-wide perspective, the sensing function can be considered to exist at the lowest level or out on the "edge."

Types of Sensors:
1. Temperature
2. Pressure
3. Level
4. Flow
5. Density
6. Proximity
7. Position, angle, displacement, distance, speed, acceleration
8. Vision
9. Vibration
10. Current, voltage and other power parameters
11. pH and other analytical values
12. Moisture, humidity and other weather conditions

2. Concentration of Data - Storage

Data typically journeys from networked sensors to some form of data storage or concentration device. This device or devices, can exist in a number of locations. Classically, the data would be deposited in large PC server or mainframe systems in a control room or mission control center. Below are some other data concentration options.

Types of Data Concentrators:
1. Data loggers
2. Embedded controllers
3. Embedded PCs
4. PLCs
5. Multi-variable instruments and transducers
6. Smart sensors

Data concentration can be scaled to meet the need, ranging from many smaller field devices all the way up to large centralized or distributed PC-based systems. It's becoming more straightforward to reduce the amount of manual human intervention required to obtain useful data, which in turn drives up the quantity and quality of data available for curation, and eventually interpretation.

3. Curation of Data

Once data has been harvested from sensors, and concentrated onto some type of storage system, it becomes important to organize the information in a manner that helps users make sense of it. The activity of "curating" this data typically involves the use of database software. Curating is usually accomplished at the PC server level, since database management is an advanced software function that requires equally capable hardware.

Some of the most well-known commercially available business databases include Oracle Database, Microsoft SQL Server, Microsoft Access, SAP Sybase, and IBM DB2. These software packages are used throughout industry for maintaining all sorts of data, and they offer a platform for querying and analyzing information.

4. Visualization and Analysis of Data

To a great extent the data collection, concentration, and curation activities occur silently and unseen after initial configuration. These activities must be in place to act as a foundation for visualizing and analyzing information. However, simply presenting users with large tables of values from a historical database will not help most people to understand the data, since most people are more visually oriented towards graphical representations of data such as charts, graphs and other symbols.

Fortunately, more options than ever are available to display quantities of information and help users make sense of it. At the field level, many analyzers and data loggers offer local displays or come with associated operator interfaces. These devices often allow users to view trends of data, alarms and events.

Types of Visualization and Analysis Tools
1. Smart phones
2. Tablets
3. Operator Interface Terminals
4. PC-based HMIs
5. Data loggers
6. Transducer and analyzer displays

Conclusion
The IoT and big data are empowering extensive changes in the manufacturing and automation world. The industry is entering a fourth industrial revolution of higher technical integration. The internet of things is creating a bridge between the virtual and the real world.

Improving and automating data collection, concentration and curation enables end users to take full advantage of visualization and analysis software to make their operations more efficient. As key components of these activities, the IoT and big data are forces ready to be harnessed with today's products and systems to improve the efficiency, safety and profitability of manufacturers worldwide.

Video: What is IoT? https://www.youtube.com/watch?v=QSIPNhOiMoE

Want to learn more about IoT and how to implement solutions into your factory or location?
Contact Dustin at info@automationinc.com for more information.

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