



Sistem Tertanam + IoT

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Outlines

2.1 What is IoT?

2.2 Where is IoT?

2.3 Why is IoT?

2.4 How does it work?

2.5 The Digital Mine

2.6 Anything can be part of the IoT

2.1

- *The concept of connecting devices together is not new. In 1982, a Coke machine at Carnegie Mellon University became the first appliance connected to the Internet. It could keep track of inventory and whether drinks were cold. Since then, connectedness has greatly expanded, in the areas of ubiquitous computing, machine-to-machine (M2M) communications, and device-to-device (D2D) communications.*
- *But the term IoT was invented by British entrepreneur Kevin Ashton in 1999, in a presentation he made to Procter & Gamble. As that time, he was the cofounder and executive director of the Auto-ID Center at MIT, and the vision of IoT was based on radio-frequency identification, or RFID (radio-frequency identification).*
- *IoT has evolved since, and became increasingly popular in recent years, due to the convergence of several enabling technologies, such as microcontrollers, sensors, wireless communications, embedded systems, and micro-electromechanical systems (MEMS)*

What is IoT?

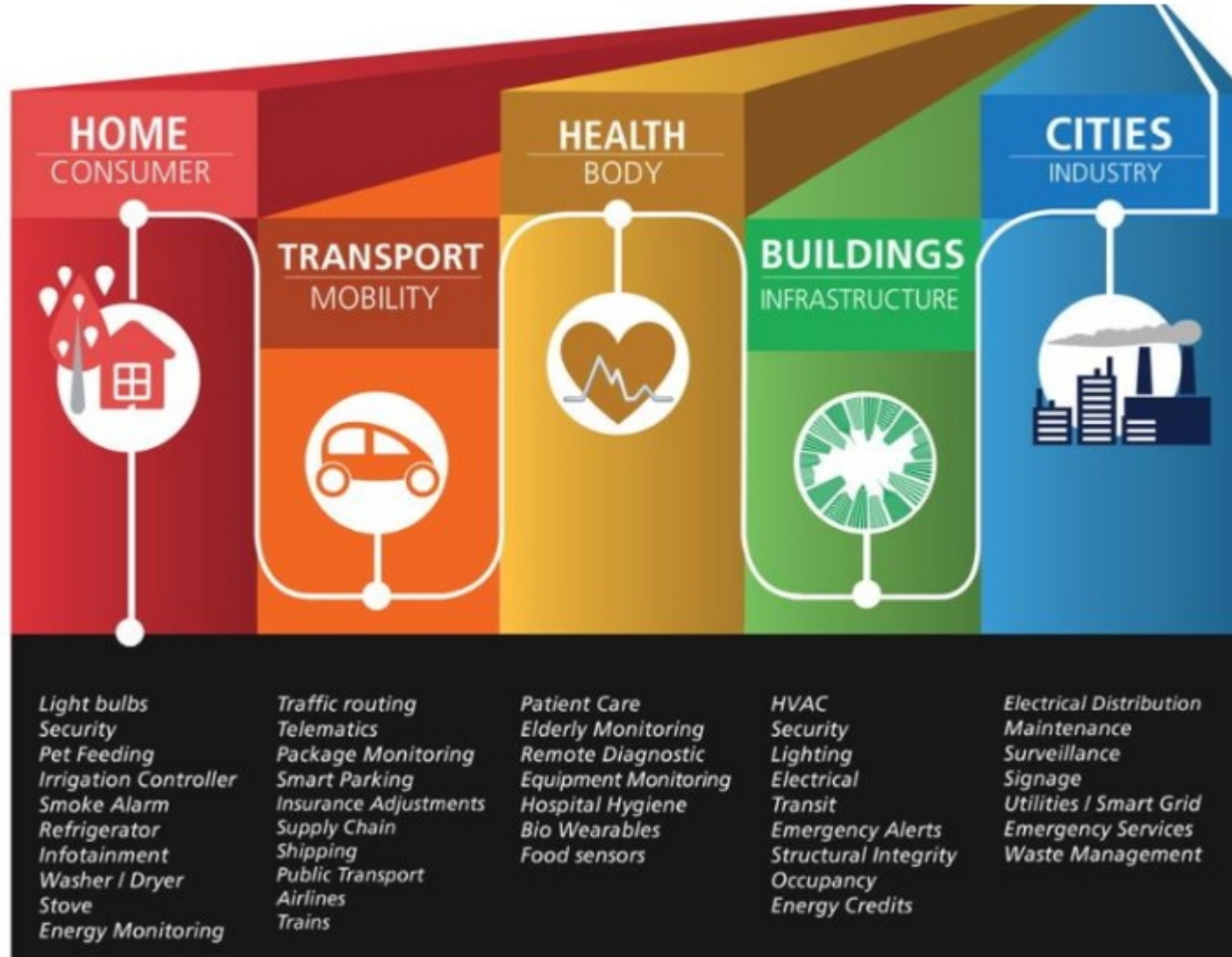
- *IoT is a new revolution (Fourth Industrial Revolution) in the capabilities of the our world that are connected to the internet.*
- *The Internet of Things (IoT) is the network of physical objects or "things" embedded with electronics, software, sensors, and network connectivity, which enables these objects to collect and exchange data.*
- *IoT allows objects to be sensed and controlled remotely across existing network infrastructure.*

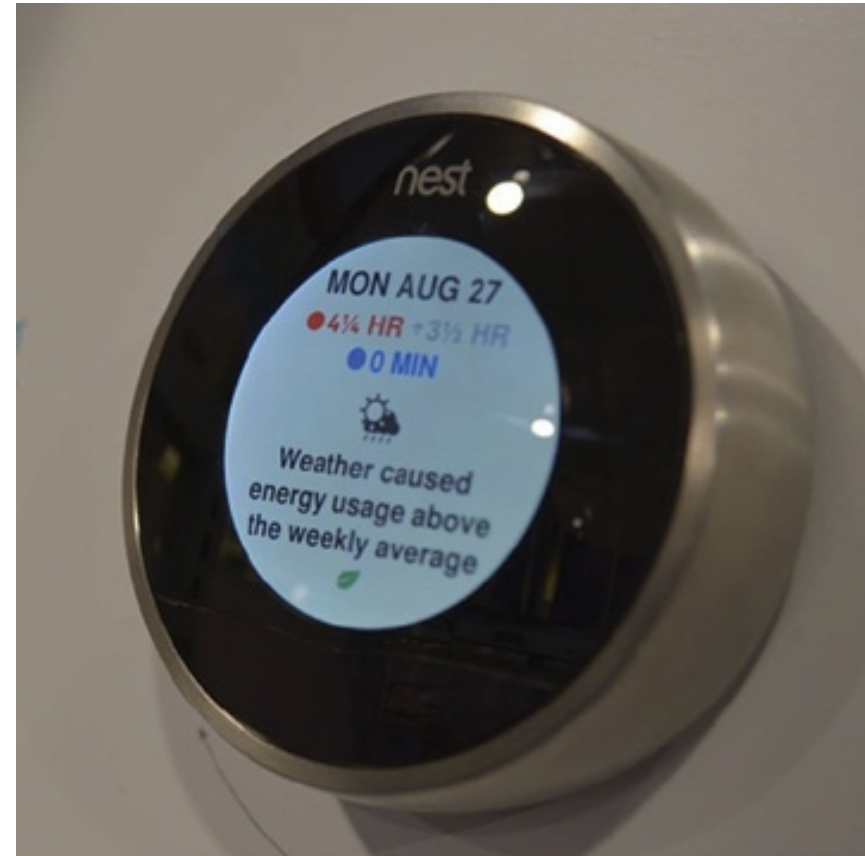
What is the Internet of Things

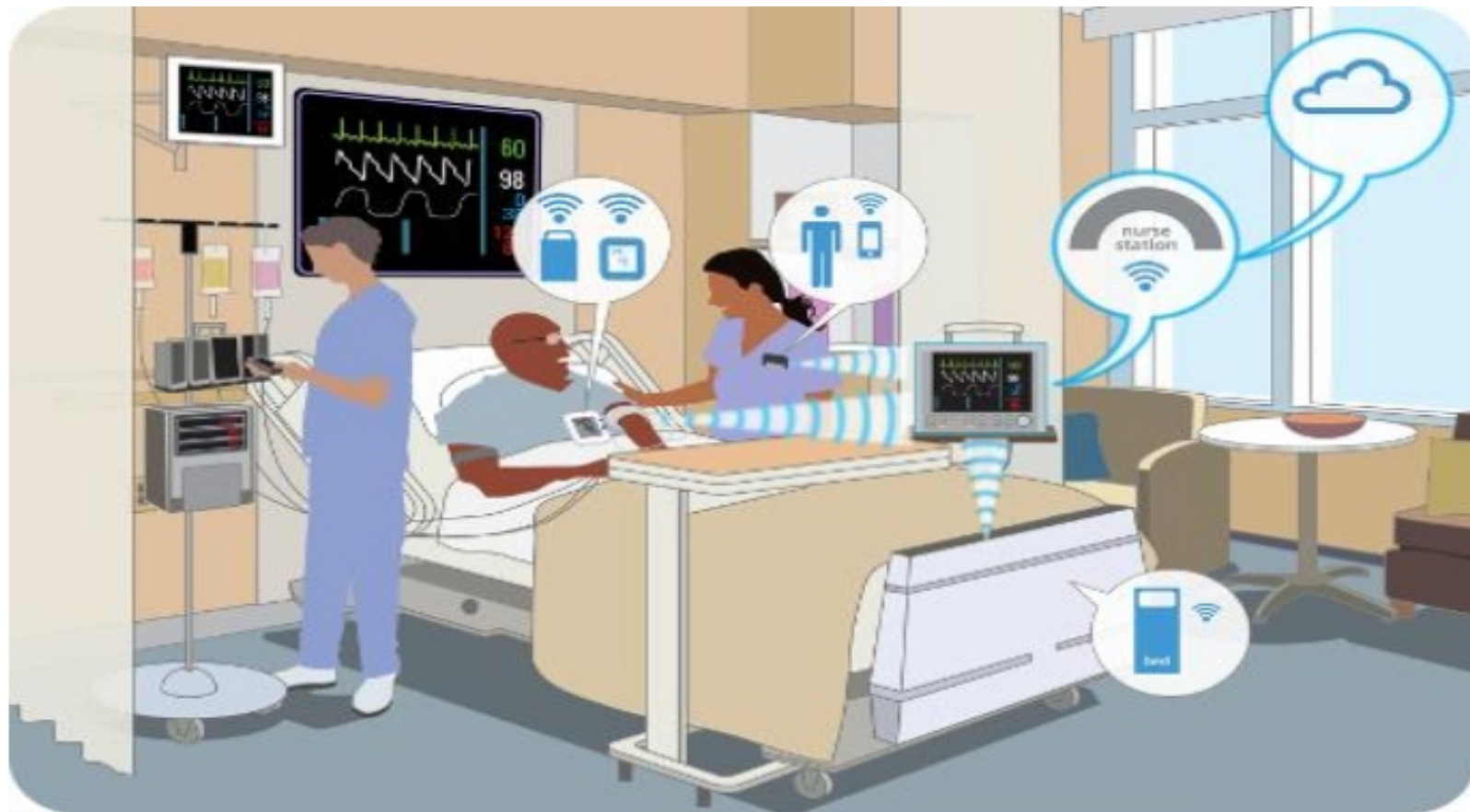


Image from <http://www.cchc.cl/informacion-a-la-comunidad/industria-de-la-construccion/personaje/>

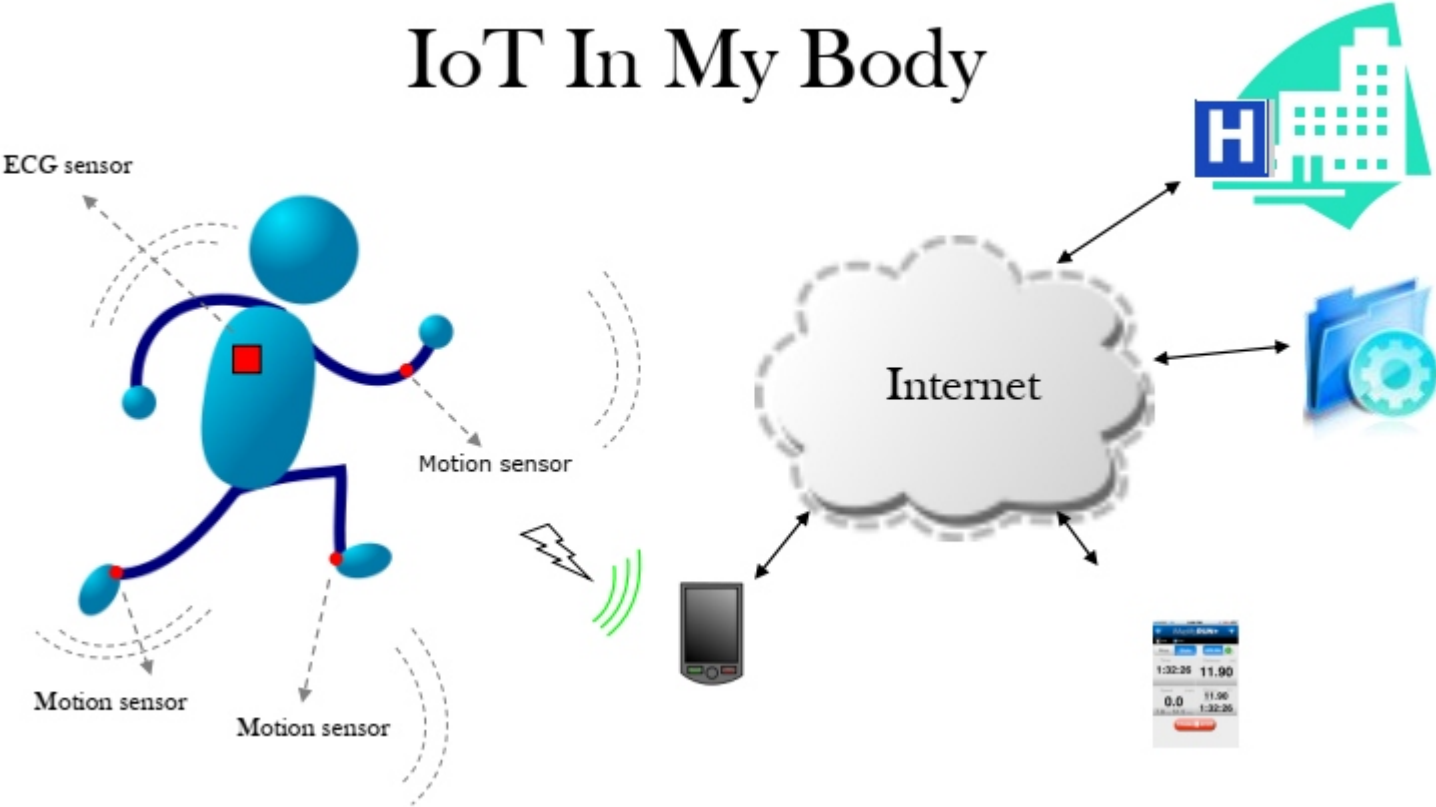
Where is IoT?







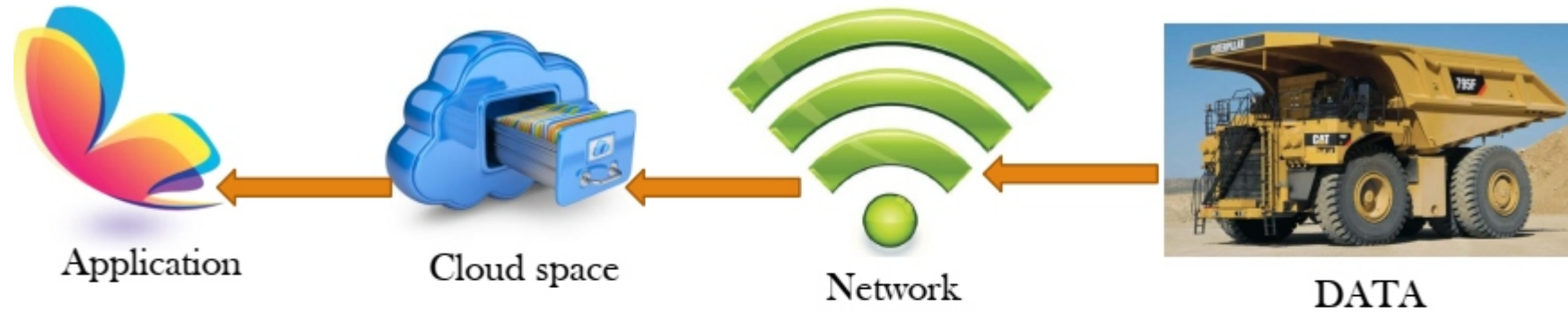
IoT In My Body



Why IoT?

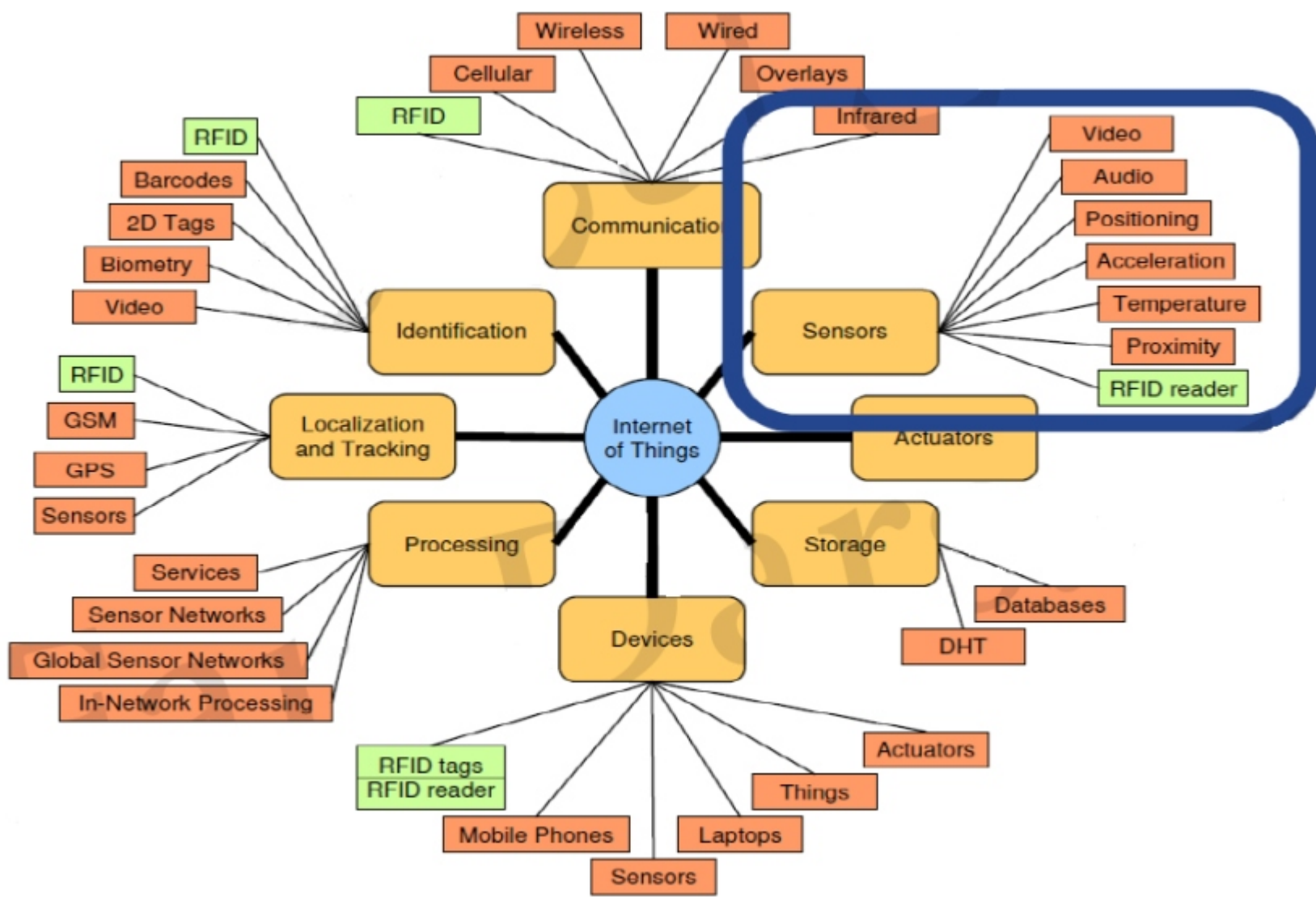
- Humans tend to get too much information in a short time;
- Humans tend to control objects remotely;
- Humans tend to make objects automated;
- Humans tend to do their work earlier;
- Decrease hardware prices over time;
- Decrease hardware dimensions over time;
- Decrease hardware weights over time;
- Improve internet access;
- Development of wireless technology
- Increase data bandwidth, the computing power and speed, cheap access to information.

How Does it Work?



2.4

- **First**, each “thing” on the Internet of Things must have a unique identity. Thanks to internet Protocol Version 6 (IPv6) address, the 128-bit next-generation Internet Protocol (IP) address can provide 2^{128} different addresses—that is about 6.7×10^{23} addresses per square meter. We should be able to assign a unique ID to every physical object on the planet.
- **Second**, each “thing” must be able to communicate. There are number of modern wireless technologies which make communications possible, such as WiFi, Bluetooth Low Energy, Near-field communication (NFC), RFID, as well as ZigBee, Z-Wave, and 6LoWPAN (IPv6 over Low power Wireless Personal Area Networks), etc.
- **Third**, each “thing” needs to have sensors so that we can get information about it. Sensors can be temperature, humidity, light, motion, pressure, infrared, ultrasound sensors, etc. The new sensors are increasingly getting smaller, cheaper, and more durable.
- **Fourth**, each “thing” needs to have a microcontroller (or microprocessor) to manage the sensors and communications, and to perform the tasks. There are many microcontrollers exist that could be used for IoT.
- **Finally**, we will need cloud services to store, analyze, and display data so that we can see what’s going on and take action via phone apps. There are already a lot of big companies working on this, such as IBM’s IBM Watson, Google’s Google Cloud Platform, Microsoft’s Azure, and Oracle’s Oracle Cloud etc..



Good for sensors



Arduino
\$25
ATmega328

ChipKIT
\$30
PIC



LaunchPad
\$4
MSP430

Good for some sensors and processing



STM32

\$30
ARM Cortex M0,
M3, M4

Particle

\$35
ARM
WiFi Internet



Espruino

\$30
ARM
Javascript



Good for processing and network



Raspberry Pi

\$35

900 MHz ARM, GPU

1 GB RAM

Compute Module

Intel® Galileo

\$50

400 MHz Quark x86

256 MB RAM



Intel® Edison

\$70

1 GHz Dual Core Atom x86

1 GB RAM

WiFi

BLE

4 GB Flash



Good for processing and network



UDOO Neo

\$50

i.MX 6 Solo ARM, GPU

ARM M4

512 MB or 1 GB RAM



Beaglebone Black

\$45

1 GHz ARM, GPU

512 MB RAM

4 GB Flash



Parallella

\$99

1 GHz Dual Core Zynq ARM

16 or 64 Epiphany CPUs

The Digital Mine

- *Digital mining helps to supervise factors affecting mine safety and production which include mine geology, mine pressure, hydrology, gas, fire, dust, transportation, etc., through local fiber network, GPRS/CDMA, microwave communication network, RFID devices and any other data transmission method.*
- *Using IoT technologies and the digital mine, one can realize transparent operation on the surface and in underground mines at all times and in all the mining areas and all the climatic conditions.*

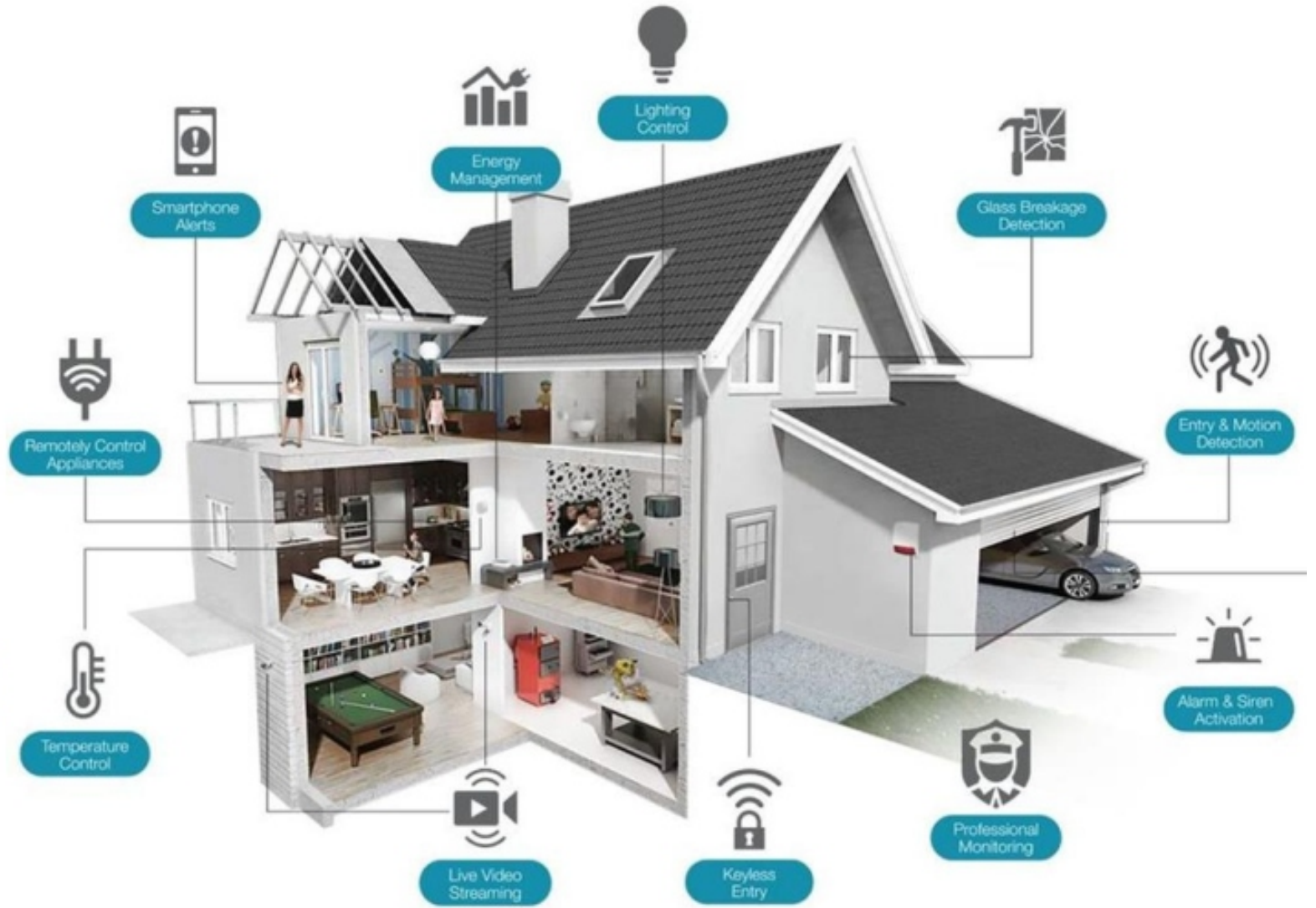
Applications

- Monitoring and Tracking of Underground Miners
- Monitoring of Gases
- Water Inrush and Waterlogged Area Monitoring
- Condition Monitoring of Mine Machinery
- Strata Monitoring of Underground Mines
- Mine Fire Detection and Early-Warning System
- Monitoring of Conveyor Belt and Coal Production
- Monitoring of Mine Ventilation
- Monitoring of Stowing Practices in Underground Mines

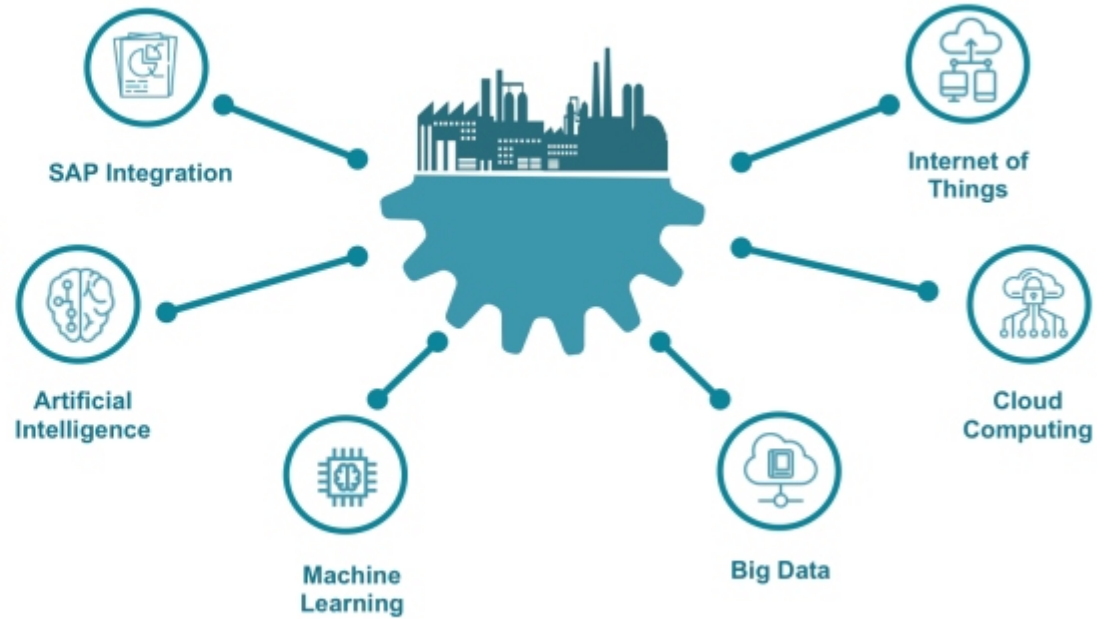
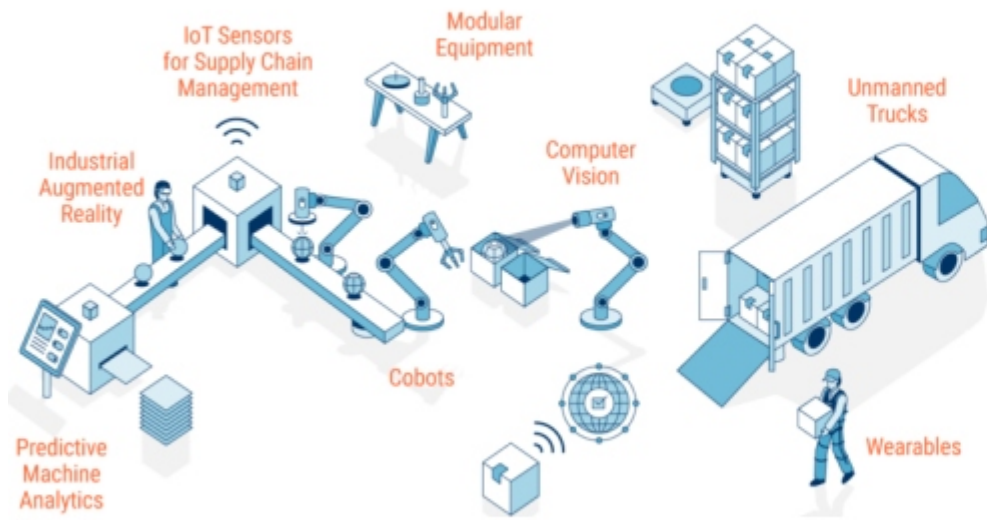
Anything can be part of the IoT

- Smart Home
- Smart Factory
- Smart City
- Smart Economy

Smart Home



Smart Factory



SMART CITY

BUILDING TOMORROW'S CITIES



Smart Economy

Industrial revolution
technologies in building smart cities
leads to having smart economy

