What is the internet of things (IoT)?

060233213 Internet of Things Application and Design


5G
REMOTE
CONTROL
VEHICLE


IOT
SECURITY

The Internet of Your Things

"50 billion devices will be connected to the internet just by the end of this decade" *Phil Regnault, Hitachi Consulting*

Home Automation is predicted to top $2.5 billion by 2016

Your mobile devices connecting, controlling and informing all other devices in your life.

Wifi enabled **washing machines** allow remote timing control and programming

Control your home comforts from anywhere

Sonos system plays an alert when physical mail is delivered to your house

On body devices monitor your movements. Intel showcased smart earbuds matching songs to your heart rate.

Sources: ReadWrite / Expert Reviews / The Wall Street Journal

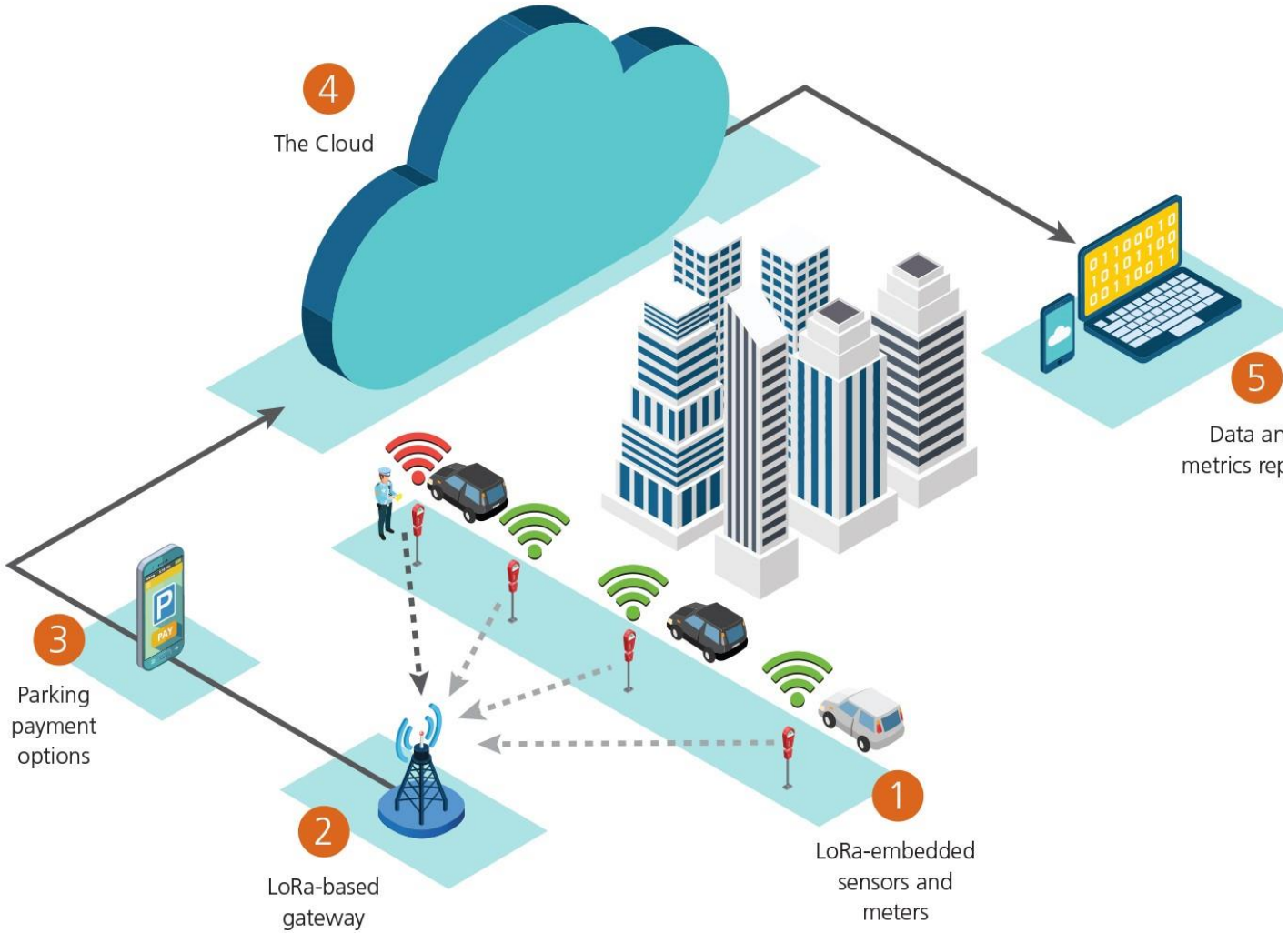
ORACLE

intel

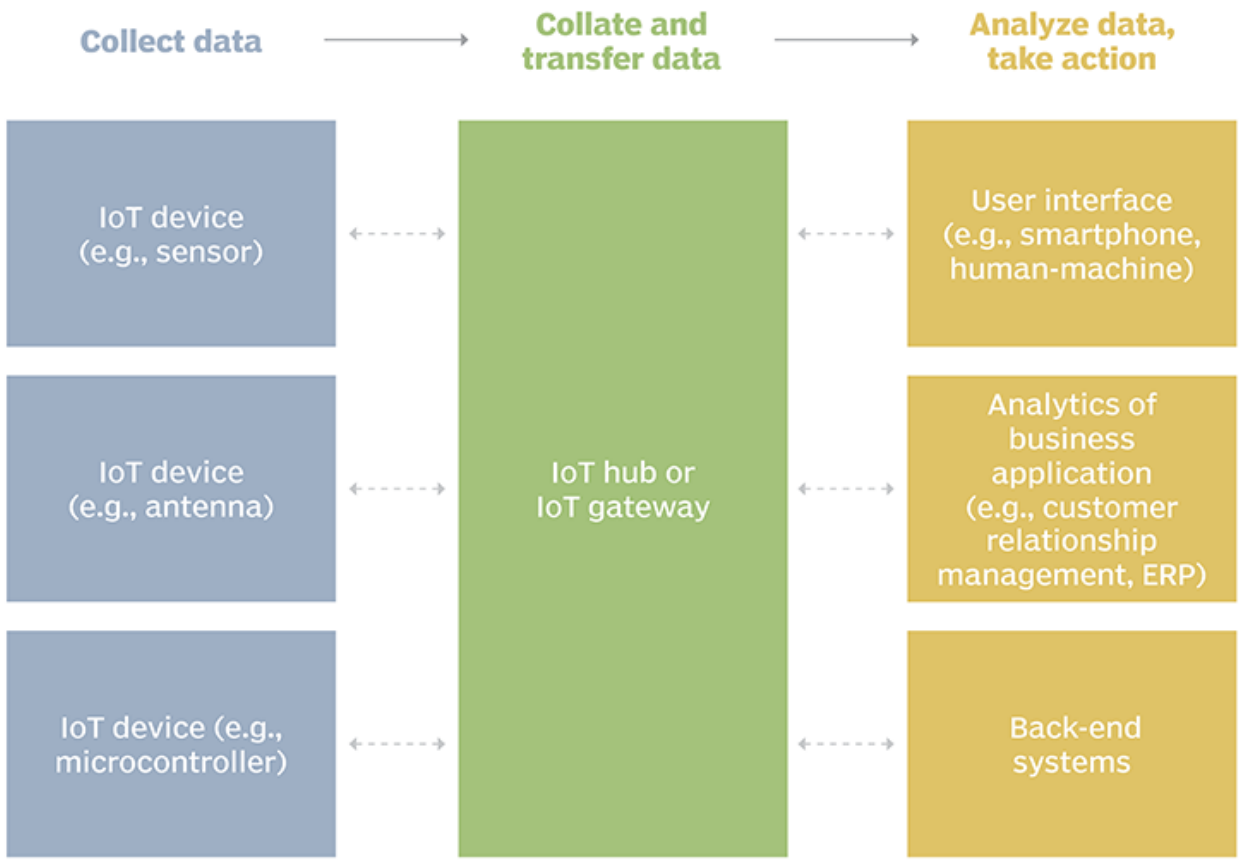

t is 150°F
shake it!
turn off till 6:30 pm
toast is ready!
make more!
milk is absent. buy!
everything is washed
start record at 3:15 pm


PROCEESSING SPEED
LIGHT-WEIGHT OS
THE RISE OF
IOT
SMALL-FOOTPRINT PROTOCOLS
RESEARCH
CLOUD COMPUTING
WIRELESS COMMUNICATION

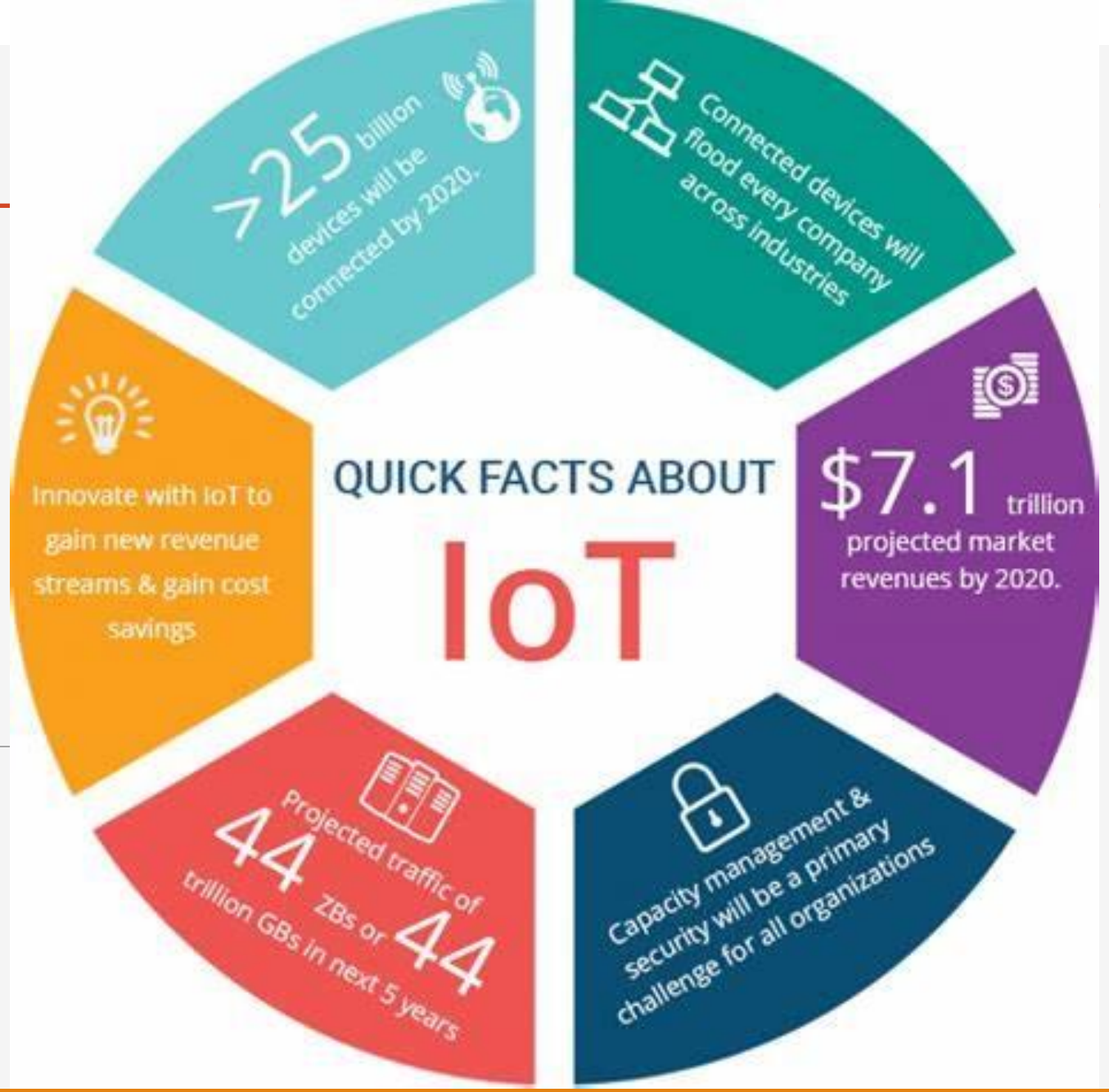
How does IoT work?



Example of an IoT system



Why is IoT important?



What are the benefits of IoT to organizations?

The internet of things offers several benefits to organizations. Some benefits are industry-specific, and some are applicable across multiple industries.

Some of the common benefits of IoT enable businesses to:

- monitor their overall business processes;
- improve the customer experience (CX);
- save time and money;
- enhance employee productivity;
- integrate and adapt business models;
- make better business decisions; and
- generate more revenue.

What are the pros and cons of IoT?

Some of the advantages of IoT include the following:

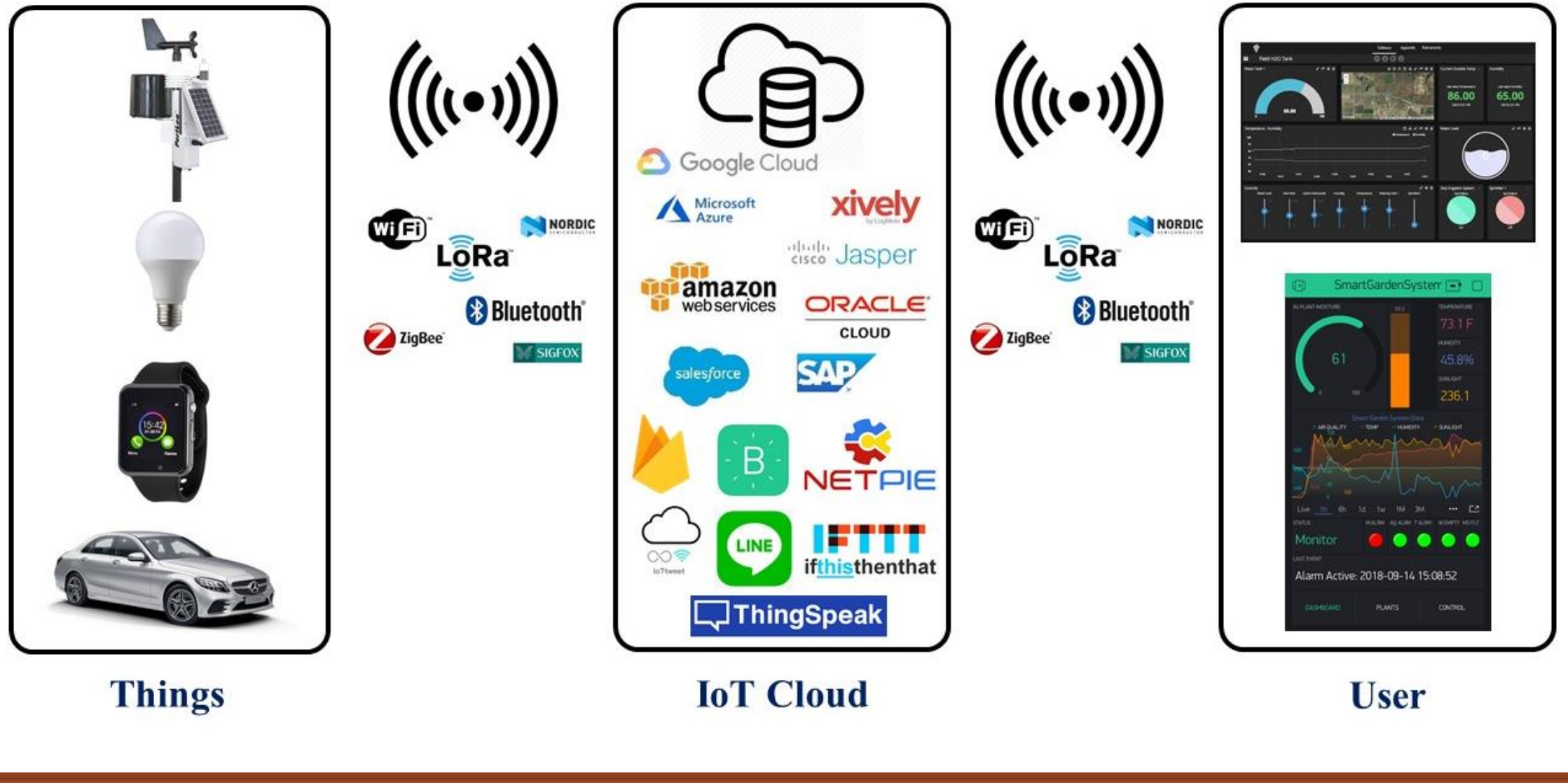
- ability to access information from anywhere at any time on any device.
- improved communication between connected electronic devices.
- transferring data packets over a connected network saving time and money.
- automating tasks helping to improve the quality of a business's services and reducing the need for human intervention.

Some disadvantages of IoT include the following:

- As the number of connected devices increases and more information is shared between devices, the potential that a hacker could steal confidential information also increases.
- Enterprises may eventually have to deal with massive numbers -- maybe even millions -- of IoT devices, and collecting and managing the data from all those devices will be challenging.
- If there's a bug in the system, it's likely that every connected device will become corrupted.
- Since there's no international standard of compatibility for IoT, it's difficult for devices from different manufacturers to communicate with each other.

What is the history of IoT?

Concept of the Internet of Things architecture



IoT Ecosystem

Introduction to IoT Ecosystem

Components of an IoT Ecosystem

In a typical IoT ecosystem, end-user components like smart devices, sensors, third party components are connected to the compute engines or cloud instances through the internet or intranet. Let us look at the various modules of it.

1. Sensing and embedding components
2. Connectivity Layer
3. Analytics Layer
4. Data Management Layer
5. Edge IT
6. End Components

Sensing and embedding components

We incorporate temperature, gyroscope, pressure, light sensors, GPS, Electrochemical, Gyroscope, RFID, etc. to acquire data based on a particular use case. For example for automotive use cases, we use Light detection sensors along with pressure, velocity and imagery sensors. Choosing the right sensing components is a key step for a successful use case.

Connectivity Layer

An important aspect of the IoT environment is connectivity. Without seamless connectivity between IoT sensors, end devices, and analytics or computing components, we cannot execute a use case. Let us list down the various modules of connectivity layers

- **Protocols**: IoT applications can be based on both the internet and intranets. For internet applications TCP/IP, based architecture is generally followed. For Intranet IoT use cases, devices are connected using LAN, RF, Wi-Fi, and Li-Fi, etc.
- **Gateway**: Gateways are an important component to manage the internet traffic between IoT devices and connected networks. For any end to end IoT use case it is very important to maintain the security. Level Five Gateways are useful to maintain and monitor the traffic. It can block the particular IP addresses, protocols, even application layers components.

Analytics Layer

In almost every IoT use case, the data is used to derive important business insights and drive business decisions. We use predictive learning/ deep learning-based models on this huge data to obtain insights. The raw analog signals are preprocessed and converted to a format on which machine-learning models are developed. We choose a big data infrastructure based on the use case.

Data Management Layer

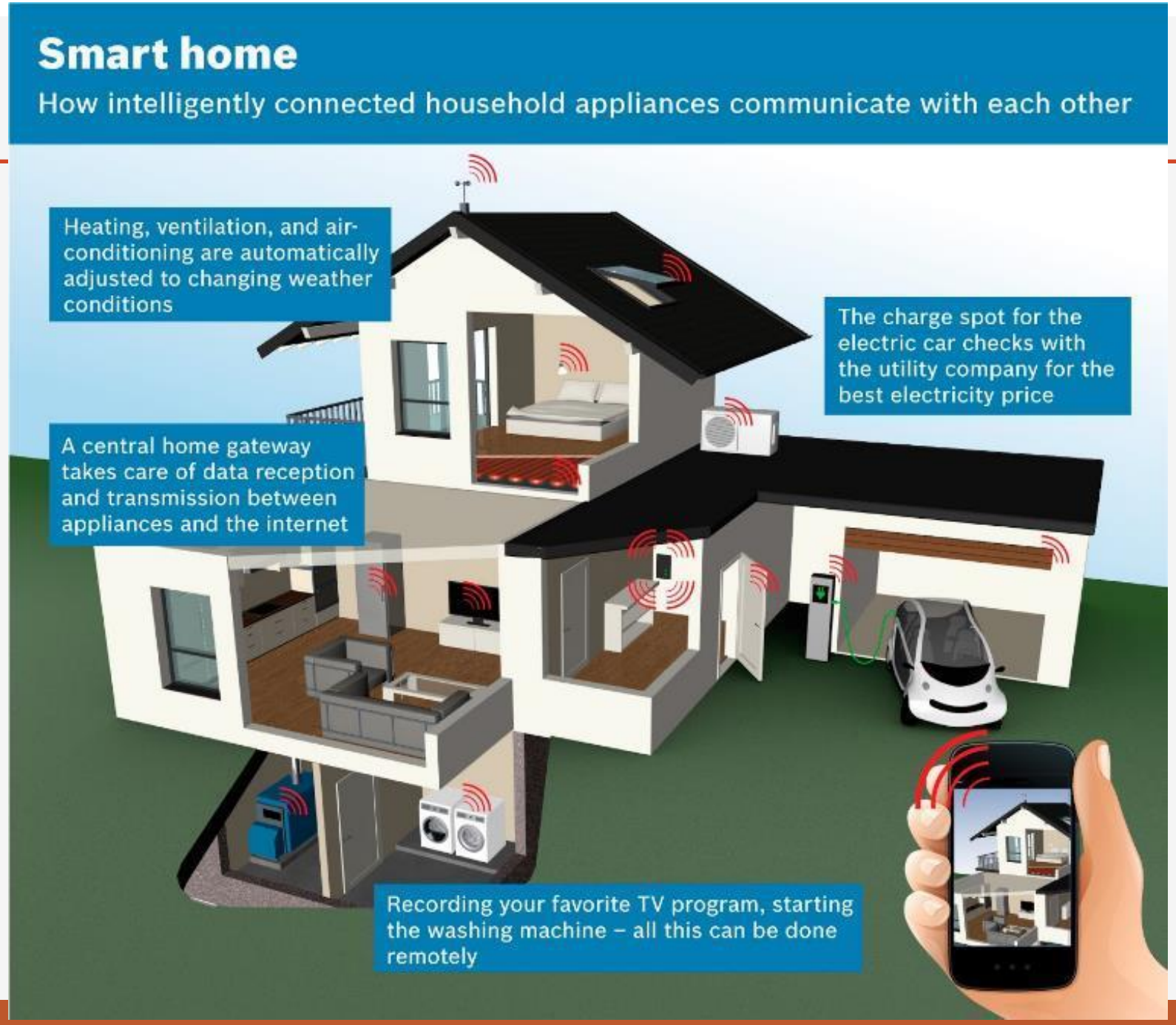
Industry grade IIoT solutions require acquiring, managing and manipulating large scale raw and processed data. Generally, cloud-based architectures are used to serve the purpose based on business needs. Very large scale organizations, capable of handling large scale data (as huge as petabytes per second) often set up their own data centers to manage this.

Edge IT

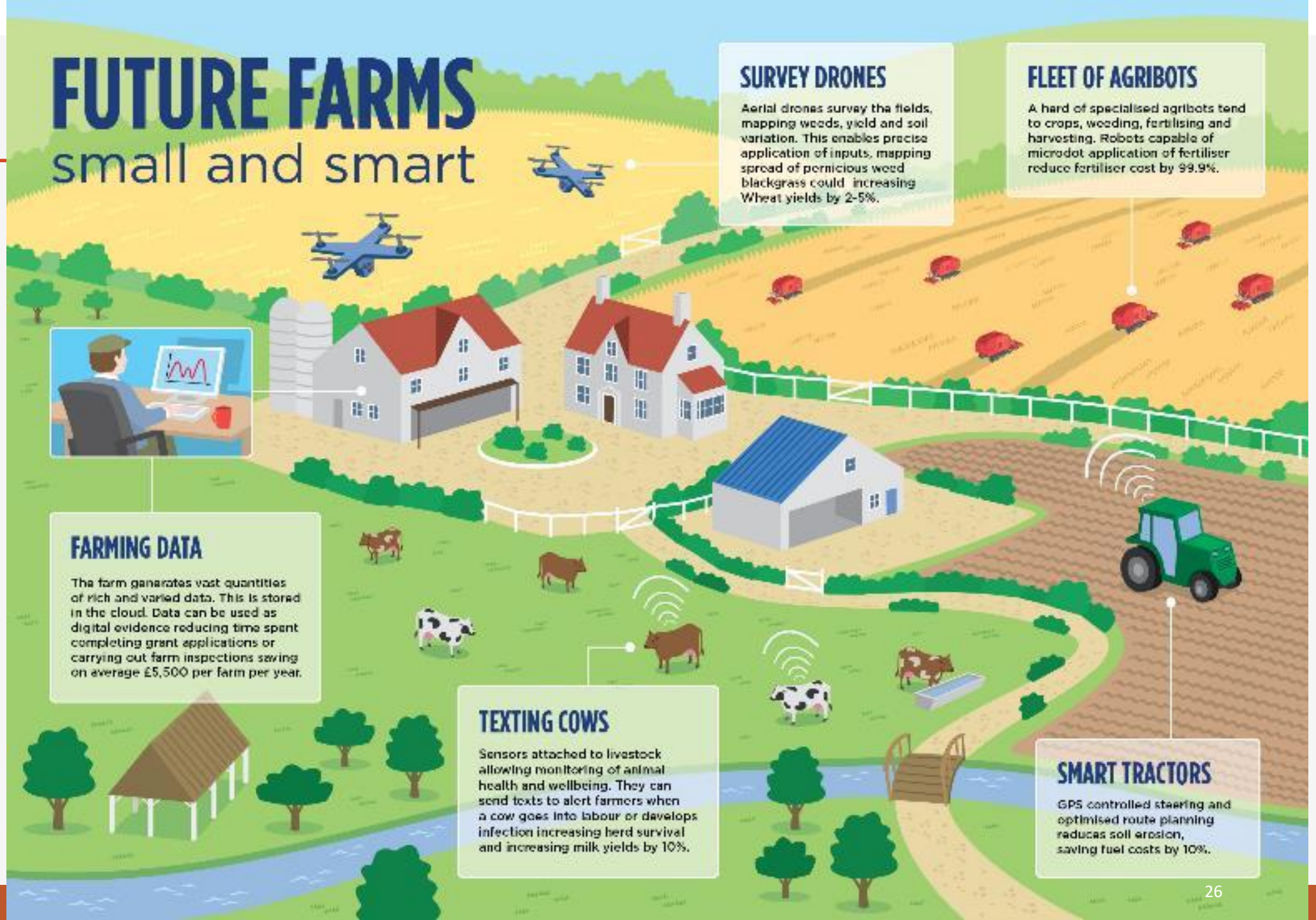
Edge IT is the consolidated architecture of software and hardware gateways to preprocess raw data. Edge IT solutions are used to collect the raw data from sensors, RFID, electromechanical components and do the necessary transformation before sending it to the cloud servers. They also come with local storages, which is used as a buffer for the data pipeline before the transformation.

End Components

Smart devices like smartphones, tablets, PDA, etc. serve as the end components of an IoT ecosystem. These devices are connected to the IoT computational engine through cloud applications and remote connectivity is established on demand. In some cases, the computational engine is integrated into third-party UI components, services or served as a component of the parent ecosystem.

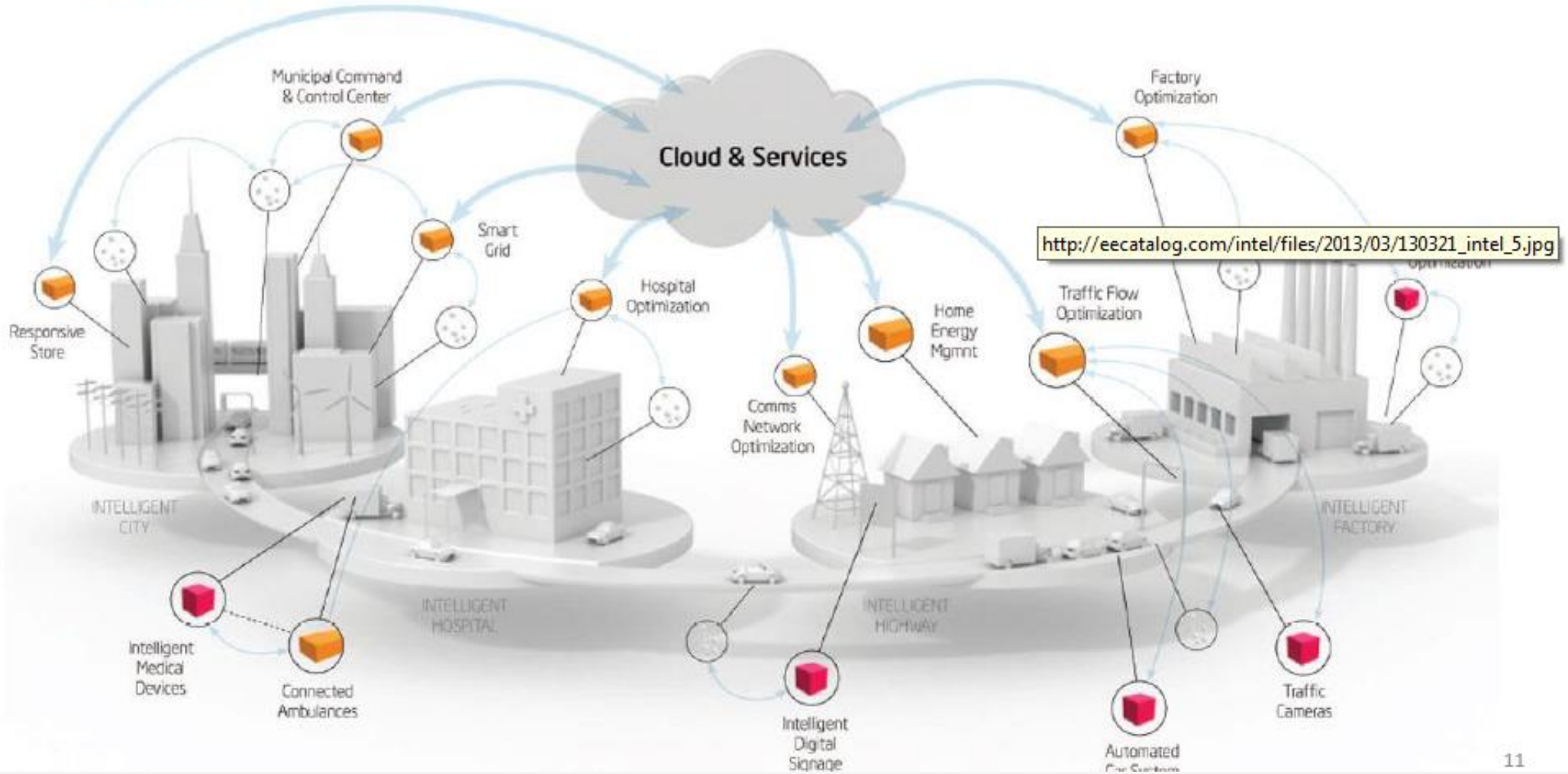


By 2022, a typical family home could contain more than 500 smart devices. [Gartner]


FUTURE FARMS
small and smart
SURVEY DRONES
Aerial drones survay tha fields, mapping weeds, yield and soil variation. This enables precise application of inputs, mapping spread of pernicious weed blackgrass could increasing Wheat yields by 2-5%.
FLEET OF AGRIBOTS
A hard of specialised agribots tend to crops, weeding, fertilising and harvesting. Robots capable of microdot application of fertiliser reduce fertiliser cost by 99.9%.
FARMING DATA
Tha farm ganarates vast quantities of rich and varied data. This is stored in the cloud. Data can be used as digital evidence reducing time spent completing grant applications or carrying out farm inspections saving on average £5,500 per farm per year.
TEXTING COWS
Sensors attached to livestock allowing monitoring of animal health and wellbeing. They can send texts to alert farmers when a cow goes into labour or develops infection increasing herd survival and increasing milk yields by 10%.
SMART TRACTORS
GPS controlled steering and optimised route planning reduces soil erosion, saving fuel costs by 10%.


Satellite communications
Terrestrial broadcast
Mobile
Intermodal communications
Navigation
Metropolitan-area network
Vehicle-to-vehicle
Safety systems
Passenger information
Travel assistance
Traffic signs
Wireless local-area network
Adaptive cruise control
Trip planning
Fleet management
Toll collection

Smart City


Municipal Command & Control Center
Cloud & Services
Factory Optimization
Smart Grid
Responsive Store
Hospital Optimization
Home Energy Mgmnt
Traffic Flow Optimization
Comms Network Optimization
http://eecatalog.com/intel/files/2013/03/130321_intel_5.jpg
INTELLIGENT CITY
INTELLIGENT HOSPITAL
INTELLIGENT HIGHWAY
INTELLIGENT FACTORY
Intelligent Medical Devices
Connected Ambulances
Intelligent Digital Signage
Automated
Traffic Cameras
11

Smart Egg Tray

Egg Minder syncs with your smartphone to tell you how many eggs you've got at home (up to 14 eggs) and when they're going bad.

http://www.quirky.com/shop/619

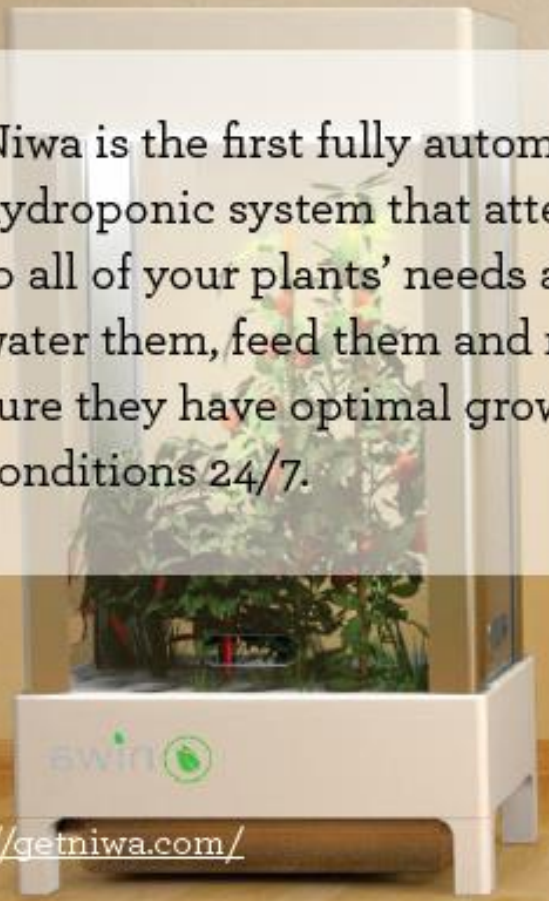
Smart Propane Tank

This super smart propane tank gauge connects to an app on your mobile device so no matter where you are, you'll always know when it's time to refuel.

http://www.quirky.com/shop/732-refuel-smart-propane-tank-gauge

Hydroponic System

Niwa is the first fully automated hydroponic system that attends to all of your plants' needs and water them, feed them and make sure they have optimal growing conditions 24/7.



http://getniwa.com/

Glucose Monitoring

A cellular-powered glucose meter transmits each test result to a secure server and provides instant feedback and coaching to patients. This equips doctors, nurses, diabetes educators with real-time clinical data.

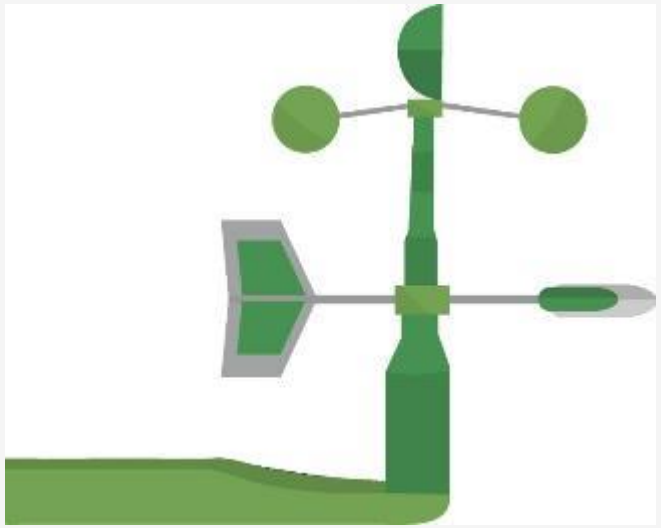
http://www.telcare.com/

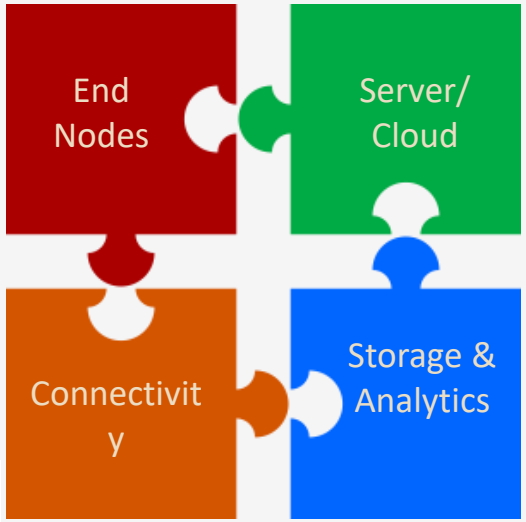
Smart Mirror

A reflective mirror with programmable applications and digital display for the home, office and public environments (hotels, hospitals, retail shops).

http://www.cybertecturemirror.com/

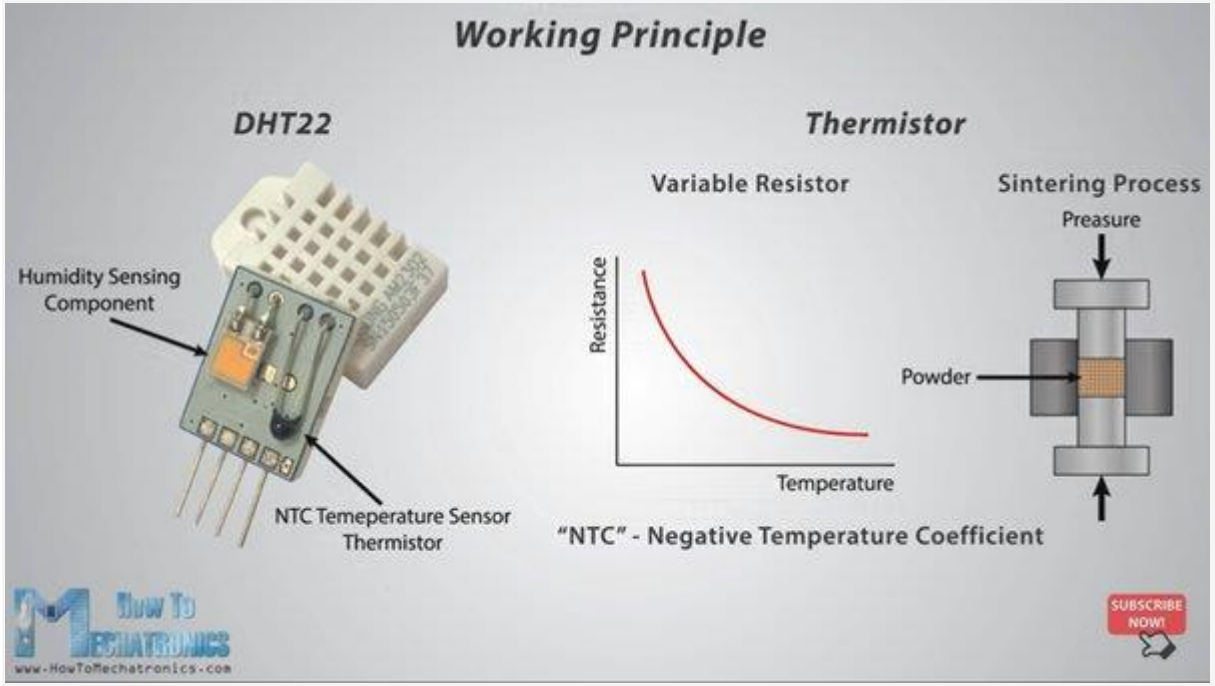
If I smell the rain, I will tell the umbrella

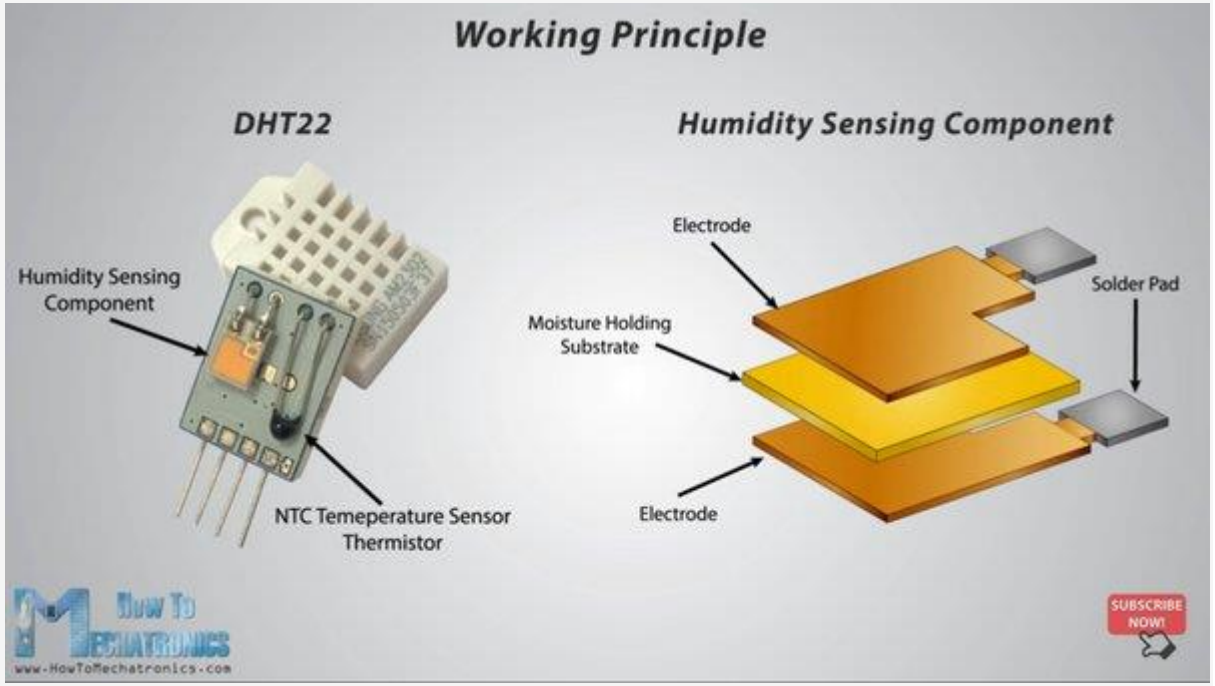




If I know it's going to rain, I will shake

DHT22 Temperature and Humidity





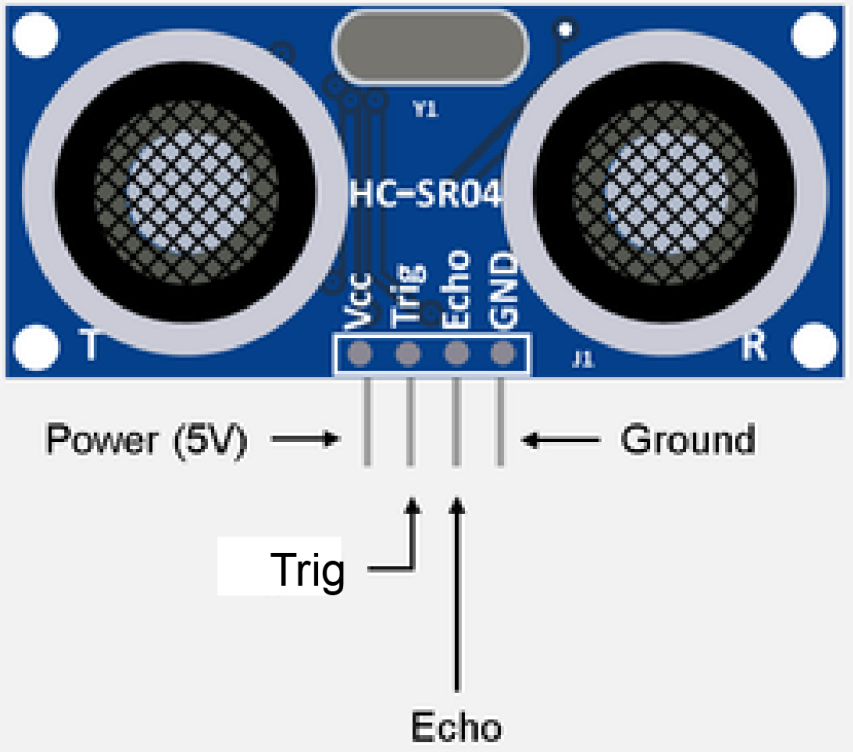
DHT22

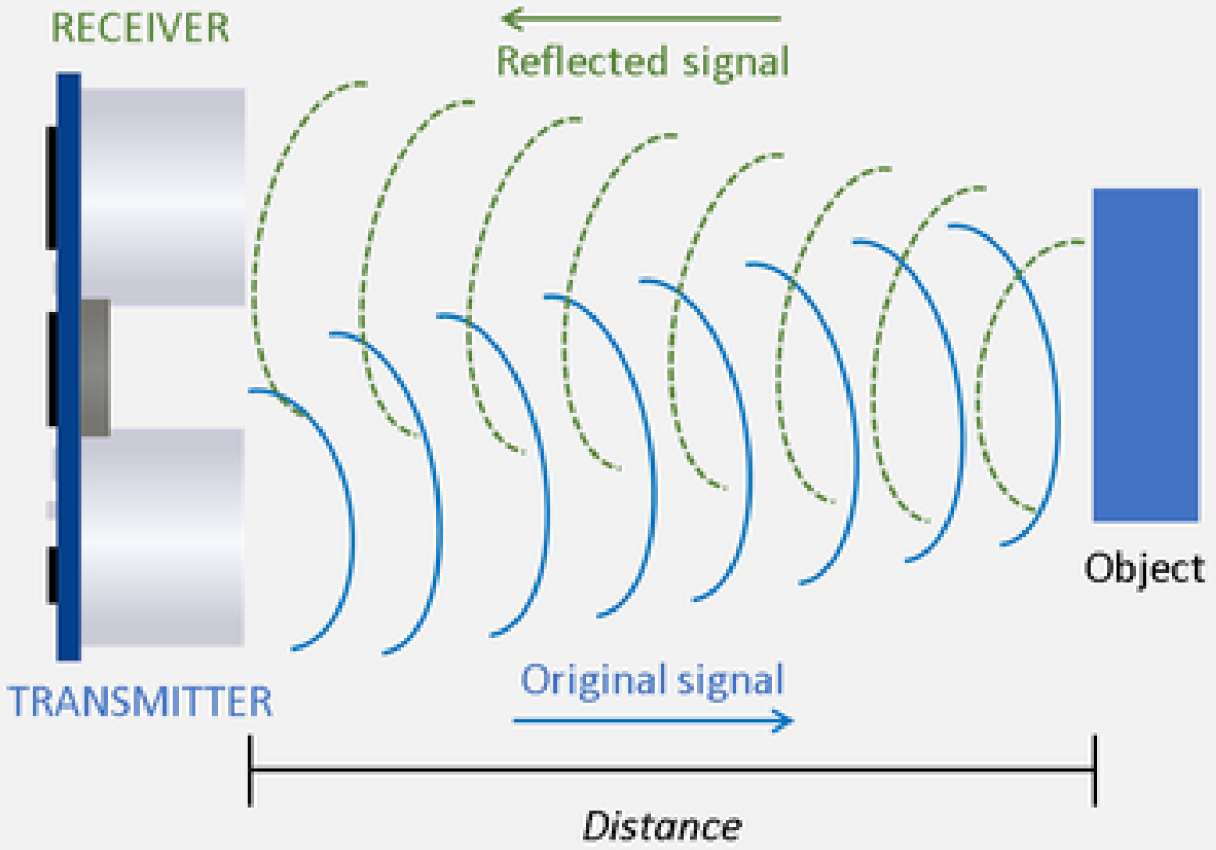
Measuring Temperature and Humidity: When activated by a device or system that needs to measure temperature and humidity in the environment, the DHT22 sensor performs measurements of temperature and humidity in its vicinity using its built-in sensors.

Sending Signal to Microcontroller: Once the DHT22 completes its measurement process, it sends an electrical signal with changing levels of light and frequency to a microcontroller or controlling device that is responsible for interacting with the DHT22.

Reading the Values: The microcontroller reads the signal sent back by the DHT22, which consists of varying light levels and frequencies. These values are then translated into temperature and humidity readings, which can be further utilized for various purposes.

HC-SR04 Ultrasonic





Ultrasonic

1.Sending Sound Waves: When the measurement begins, the ultrasonic sensor emits ultrasonic sound waves with a high frequency (beyond the range of human hearing) in the direction of the object to be measured.

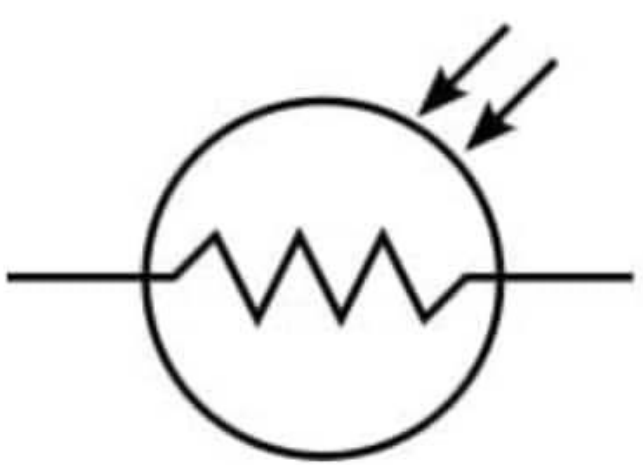
2.Echo Reflection: The emitted sound waves hit the object in front of the sensor and get reflected back towards the sensor.

3.Receiving Echo: The ultrasonic sensor receives the echoed sound waves, and it measures the time taken for the sound waves to travel to the object and back to the sensor.

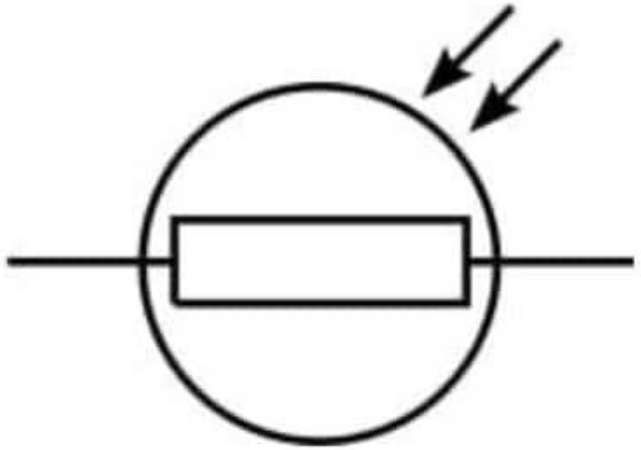
4.Calculating Distance: By knowing the speed of sound and the time taken for the sound waves to travel, the sensor can calculate the distance between itself and the object.

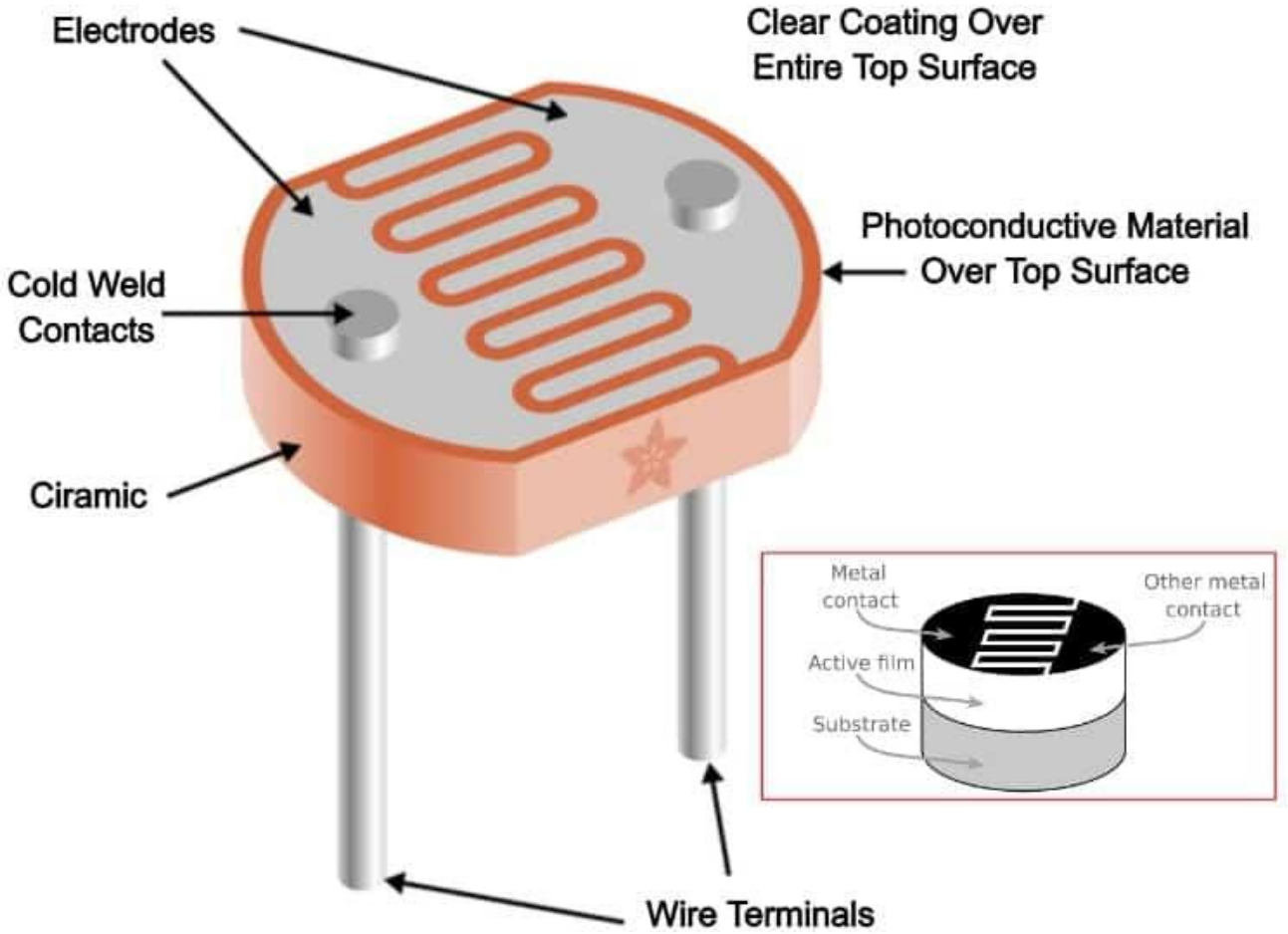
5.Measurement Result: The calculated distance is the measurement result obtained from the sensor. This distance value can be used for various purposes such as control or detection of objects in different applications.

LDR Light Dependent Resistor



LDR Symbol





What is Photoresistor (LDR)?

engineeringlearn.com

LDR

Resistance Value in Darkness: When there is no light shining onto the LDR or when it's in a dark environment, the resistance value of the LDR is at its maximum. This means that electric current cannot flow through the LDR due to its high resistance.

Resistance Value in Light: When light shines onto the LDR, its resistance value decreases. This is because the electrons within the LDR get stimulated to move, creating a path for electric current to flow more easily.

Change in Resistance Value: The resistance value of the LDR changes according to the level of light it receives. The resistance value decreases as the intensity of light increases and increases when the light intensity decreases.

Application: LDRs can be used as light sensors, and their changing resistance values can be utilized for controlling various devices. For instance, they can be employed in light control systems for rooms or in creating motion detection circuits using light.

Question ?

Thank you for your attention.