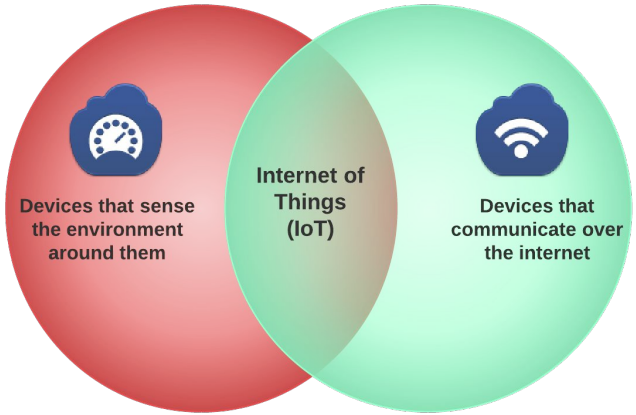
IOT New Trends and Future Directions of ICT

Internet of Things (IoT)

"The network of physical objects—“things”—that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet."



Source : https://senseandsend.wordpress.com/2014/05/09/internet-of-things-a-simple-definition/

Features of IoT

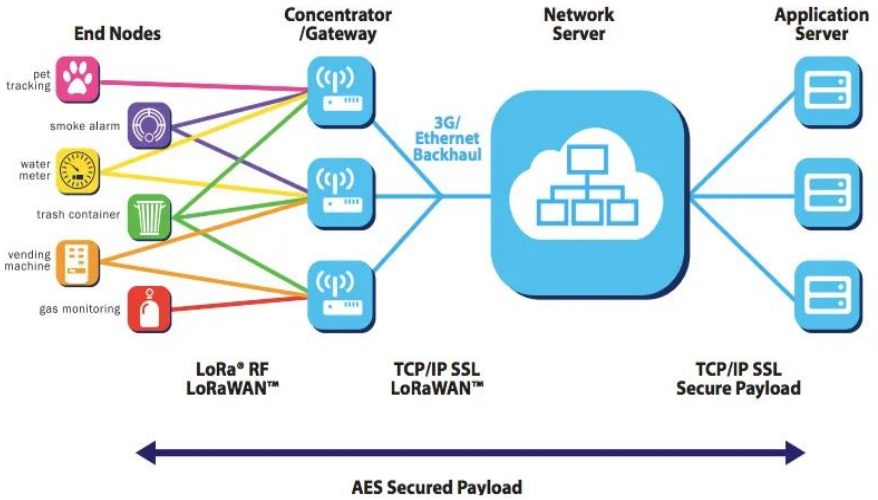
- Interconnection of Things
- Connection of the Things to the Internet
- Uniquely Identifiable Things
- Ubiquity - be available where it is needed, when it is needed
- Sensing / Actuation Capabilities
- Embedded Intelligence
- Self - configurability
- Programmability

Connecting the Internet of Things

- Trade Off Between Power Consumption, Range and Bandwidth
  - High Power Consumption, High Range, High Bandwidth
    - Cellular, Satellite
  - Low Power Consumption, Low Range, High Bandwidth
    - Wifi, Bluetooth, Ethernet
  - Low Power Consumption, High Range, Low Bandwidth
    - Low Power Wide Area Network (LPWAN)

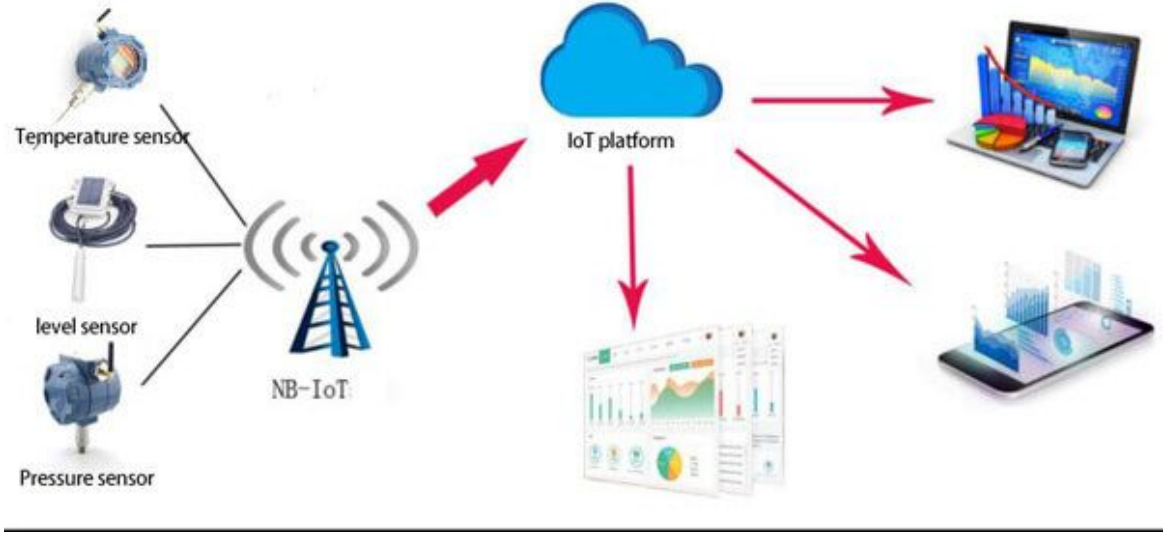
Low Power Wide Area Network (LPWAN)

- An LPWAN is a wireless communication network that can deliver low-bandwidth and low-power data transmissions over a wide area.
- Types of LPWAN
  - Cellular network based LPWAN
    - NB-IoT
    - LTE M
  - Non Cellular network based LPWAN
    - LoRa
    - Sigfox
    - Weightless



Sensing Capabilities

- IoT Sensor - Any sort of mechanism or tool that gathers data related to the environment in which they deployed and transmit it to the cloud.

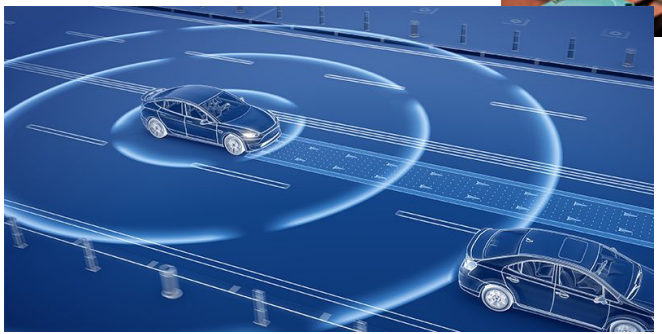


Types of Sensors

- Accelerometers
- Air Quality Sensors
- Biomedical Sensors
- Cameras
- Chemical Sensors
- Electric Current Sensors
- Flow Sensors
- Gyroscope
- Humidity Sensors
- Level Sensors
- Motion Sensors
- Pressure Sensors
- Proximity Sensors
- Temperature Sensors

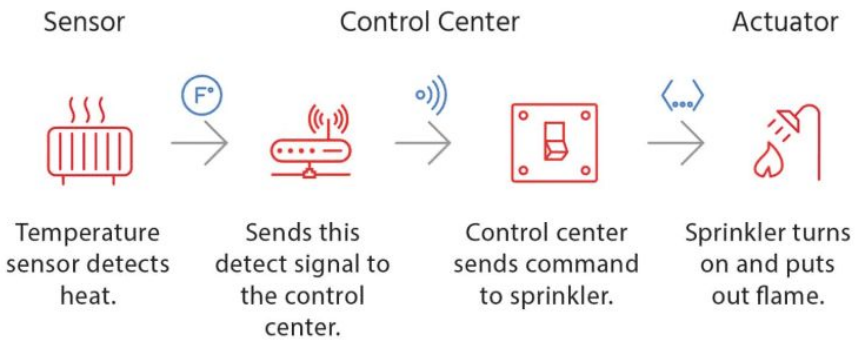






Actuation Capabilities

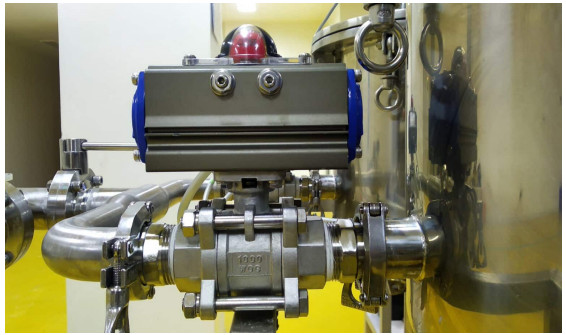
- An actuator is a device that converts energy into motion. It does this by taking an electrical signal and combining it with an energy source.
- The actuator can act on data collected by sensors to create an outcome as determined by the user.



Source : https://www.rcrwireless.com/20191107/fundamentals/the-difference-between-an-iot-sensor-and-an-iot-actuator

Types of Actuators

- Hydraulic Actuators
- Pneumatic Actuators
- Electric Actuators
  - Servo Motors, Stepper Motors
- Thermal Actuator
- Magnetic Actuator
- Relay Actuator



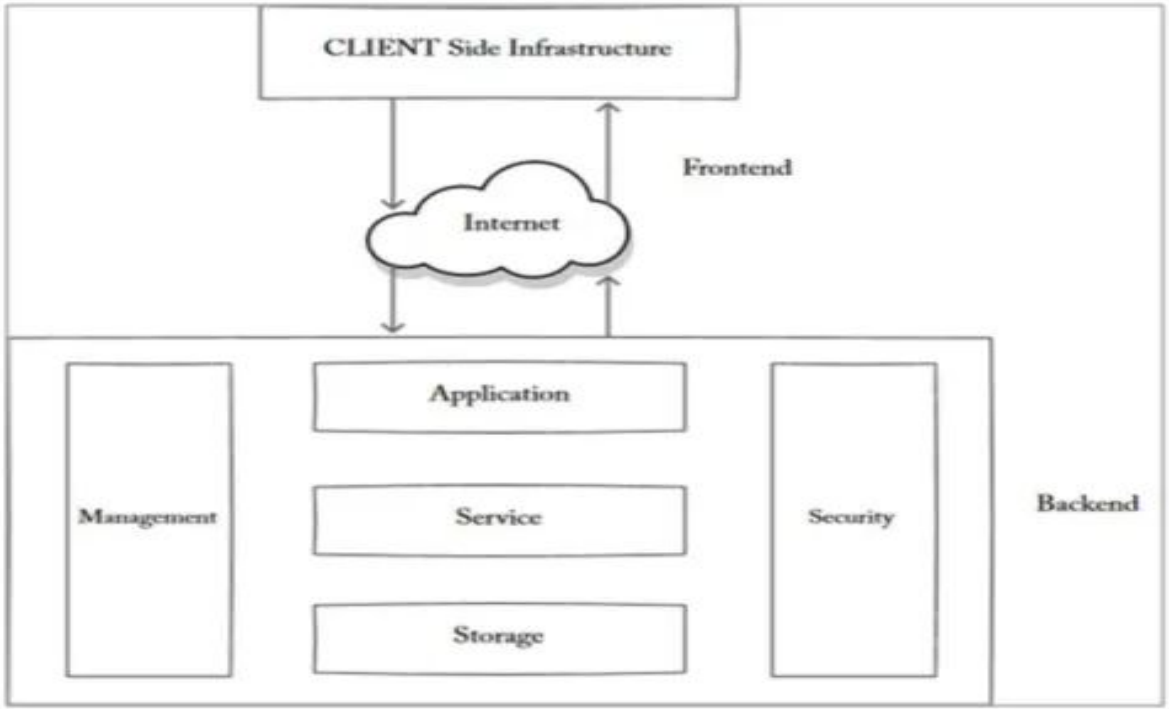


Embedded Intelligence

Embedded intelligence in the things themselves can further enhance the power of the network by devolving information processing capabilities to the **edges** of the network.

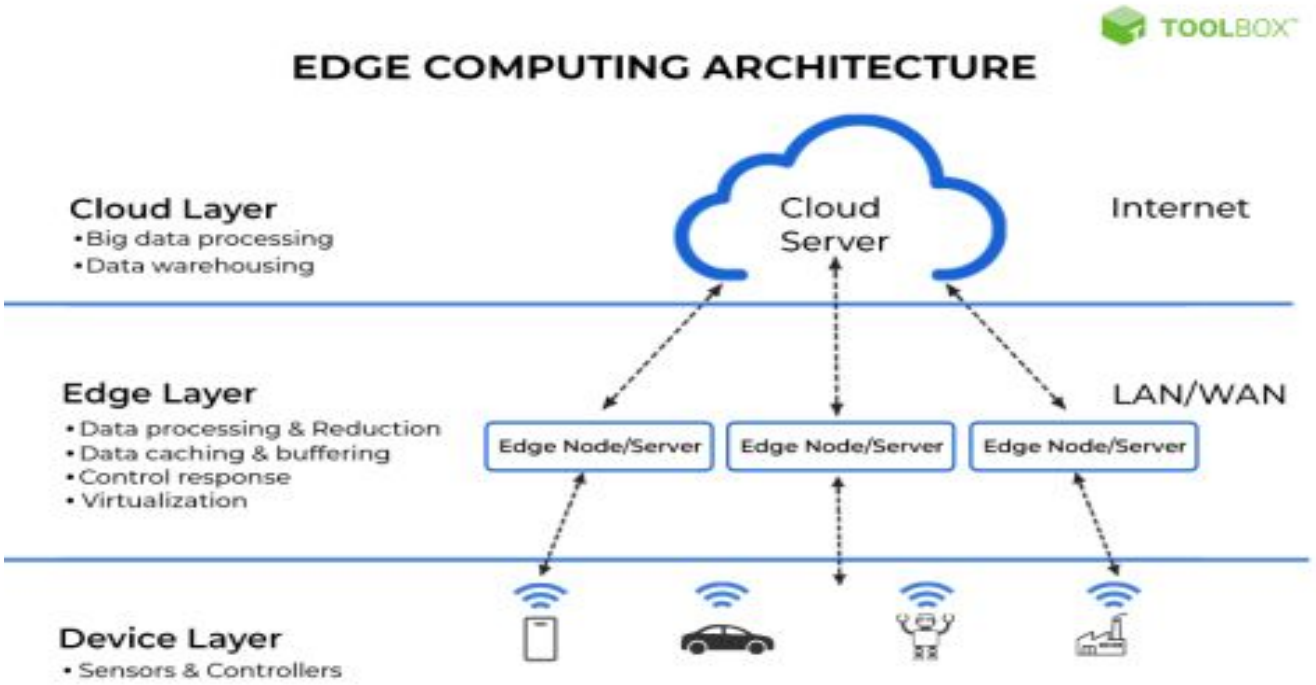
Before looking at the Embedded Intelligence let's take a look at existing technologies…

Cloud Computing



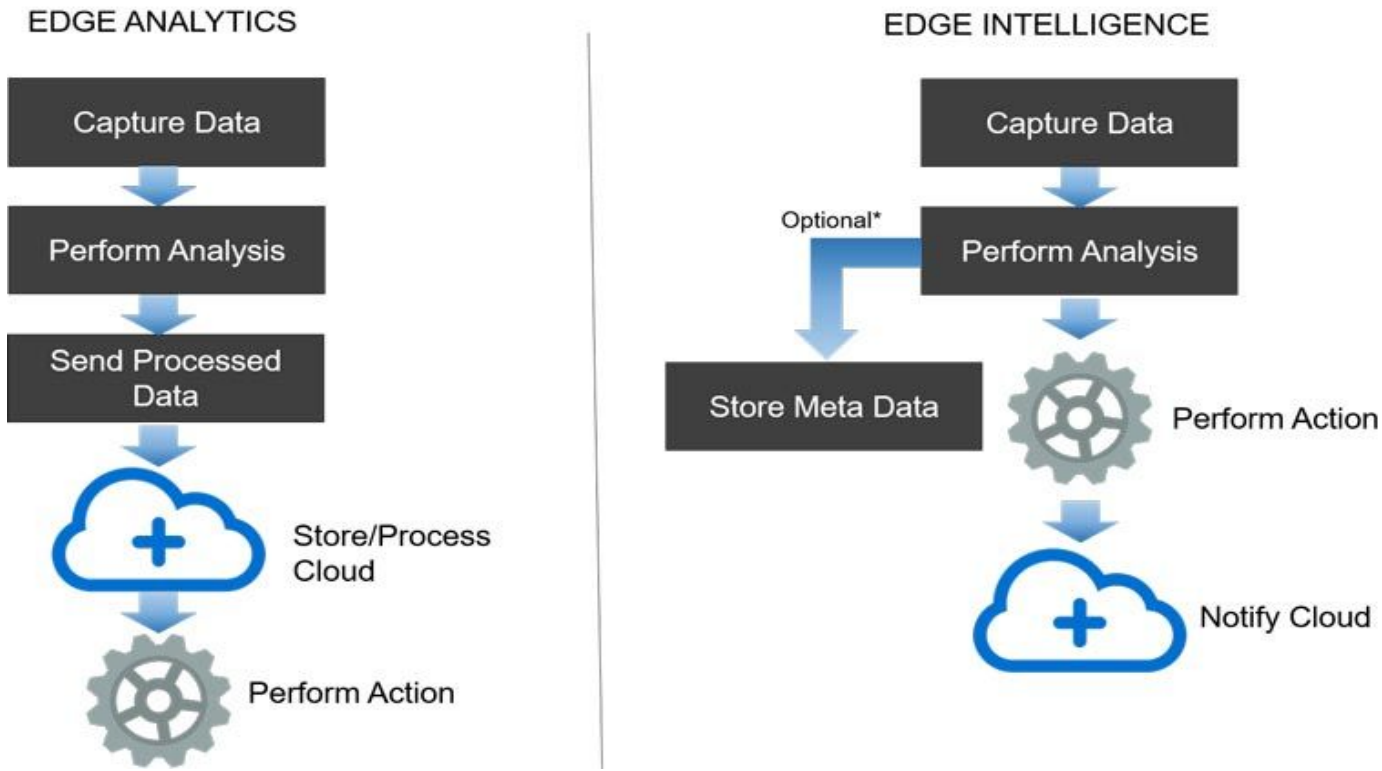
Source : Spiceworks

Edge Computing



Source : Spiceworks

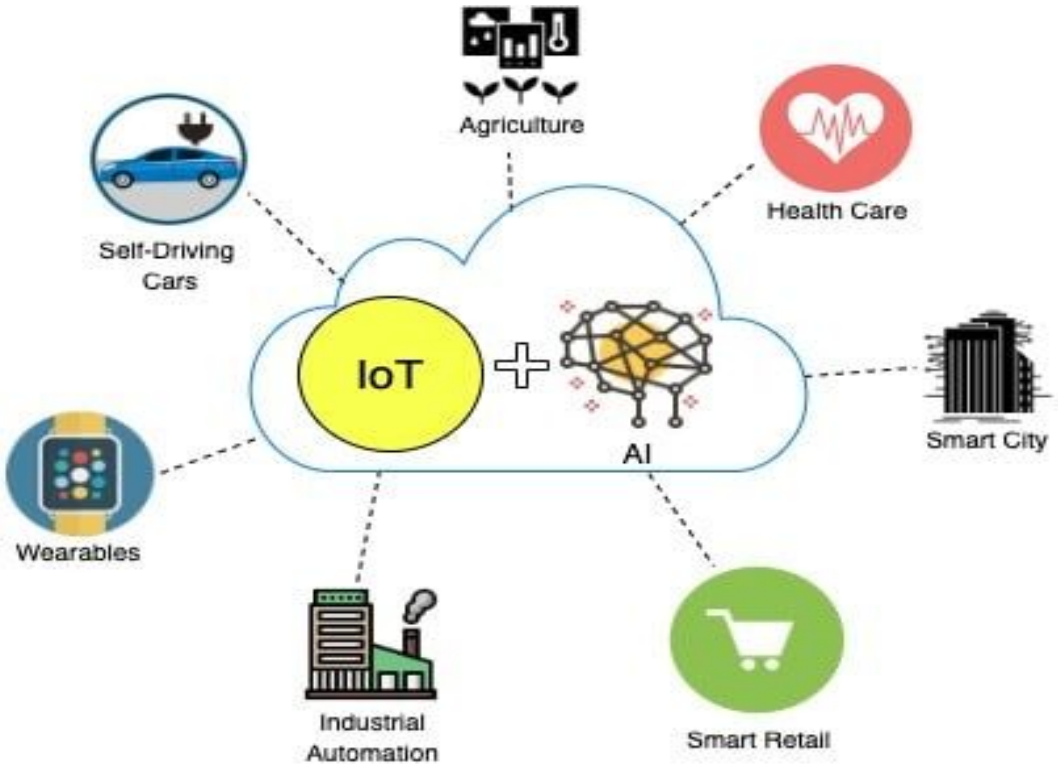
Edge / Embedded Intelligence



Benefits of Edge Intelligence

- Intelligence at low latency
- Data storage at low bandwidth
- Linear Scalability
- Reduce Operational Cost

Examples of AI and IoT in Action



Future Trends of IoT

- Blockchain
- Digital Twin
- Metaverse
- IoT Security
- IoT Powered with 5G Technology