FOUR PILLARS OF IOT – M 2M, RFID, SCADA & WSN

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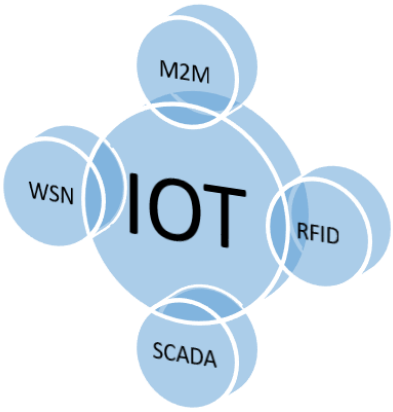
The four pillars of IoT are M2M, RFID, WSNs and SCADA (Supervisory Control and Data Acquisition).

- **M2M** uses devices to capture events, via a network connection to a central server, that translates the captured events into meaningful information.
- **RFID** uses radio waves to transfer data from an electronic tag attached to an object to a central system through a reader for the purpose of identifying and tracking the object.
- A **WSN** consists of spatially distributed autonomous sensors to monitor physical or environmental conditions.
- **SCADA** is an autonomous system based on closed-loop control theory or a smart system or a CPS data connects, monitors, and controls equipment via network in a facility such as a plant or a building.



One of the common characteristics of the Internet of Things is that objects in a IoT world have to be **instrumented**, **interconnected**, before **anything** can be **intelligently** processed and used **anywhere, anytime, anyway**, and **anyhow**, which are the 5A and 3I characteristics.

Four Pillars and Their Relevance to the Network:

Four Pillars and Networks	Short-Range Wireless	Long-Range Wireless	Short-Range Wired	Lon-Range Wired
RFID	Yes	Some	No	Some
WSN	Yes	Some	No	Some
M2M	Some	Yes	No	Some
SCADA	Some	Some	Yes	Yes

1. Machine-to-Machine (M2M) communication:

Machine-to-Machine (M2M) communication is a form of data communication that involves one or more entities that do not necessarily require human interaction or intervention in the process of communication. M2M is also named as Machine Type Communication (MTC) in 3GPP. It is different from the current communication models in the ways that it involves:

– new or different market scenarios
– lower costs and effort
– a potentially very large number of communicating terminals
– little traffic per terminal, in general

M2M communication could be carried over mobile networks (e.g. GSM-GPRS, CDMA EVDO networks). In the M2M communication, the role of mobile network is largely confined to serve as a transport network.

Some of the key features of M2M communication system are given below:

a. Low Mobility : M2M Devices do not move, move infrequently, or move only within a certain region
b. Time Controlled : Send or receive data only at certain pre-defined periods

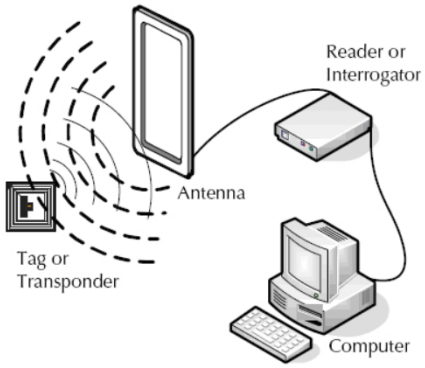
c. Time Tolerant : Data transfer can be delayed
d. Packet Switched : Network operator to provide packet switched service with or without an MSISDN
e. Online small Data Transmissions: MTC Devices frequently send or receive small amounts of data.
f. Monitoring: Not intend to prevent theft or vandalism but provide functionality to detect the events
g. Low Power Consumption : To improve the ability of the system to efficiently service M2M applications
h. Location Specific Trigger : Intending to trigger M2M device in a particular area e.g. wake up the device

RFID :

is the 2nd pillar of IOT.

RFID stands for **Radio Frequency IDentification** and it's a non-contact technology that's broadly used in many industries for tasks such as personnel tracking, access control, supply chain management, books tracking in libraries, tollgate systems and so on.

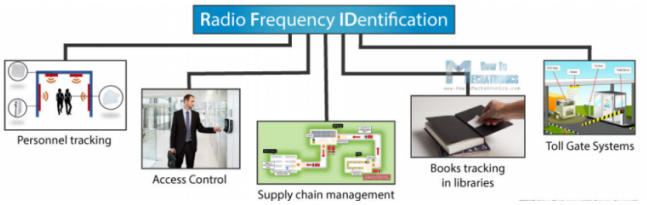
RFID uses radio waves produced by a **reader** to detect the presence of (then read the data stored on) an RFID **tag**. Tags are embedded in small items like cards, buttons, or tiny capsules.



The RFID reader consist of a radio frequency module, a control unit and an antenna coil which generates high frequency electromagnetic field. On the other hand, the tag is usually a passive component, which consist of just an antenna and an electronic microchip, so when it gets near the electromagnetic field of the transceiver, due to induction, a voltage is generated in its antenna coil and this voltage serves as power for the microchip.RFID Frequencies

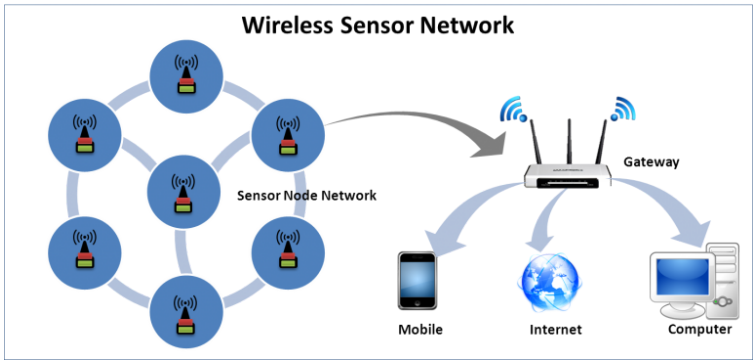
As well as active and passive systems, RFID systems can also be broken out into different frequencies.

Some frequencies and systems are designed to only read one tag at a time, while others can read multiple. Cost of readers can also vary wildly based the frequency rating of the modules. In prior years a reader capable of reading multiple tags was in the thousands of dollars, sometimes tens of thousands. These systems were unattainable for most hobbyists and prototypers. However, this is finally beginning to change, and multi-read capable readers are becoming much more affordable.



3. WIRELESS SENSOR NETWORK (WSN):

WSN is the third pillar of IOT.



It's a collection of devices " sensor nodes" . They are small, inexpensive, with constrained power . They are organized in a cooperative network .They communicate wirelessly in multi hop routing . Heavily deployment .Changing network topology

WSN Definition

□A sensor network is composed of a large number of sensor nodes that are densely deployed inside or very close to the phenomenon

□random deployment

□self-organizing capabilities

□Each node of the sensor networks consist of three subsystem:

□Sensor subsystem: senses the environment

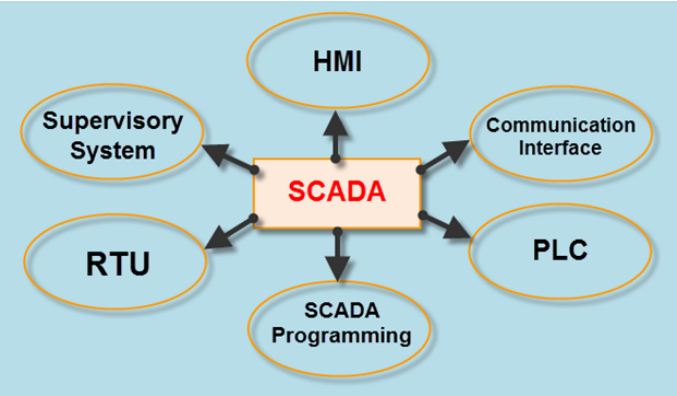
□Processing subsystem: performs local computations on the sensed data

- Communication subsystem: responsible for message exchange with neighboring sensor nodes

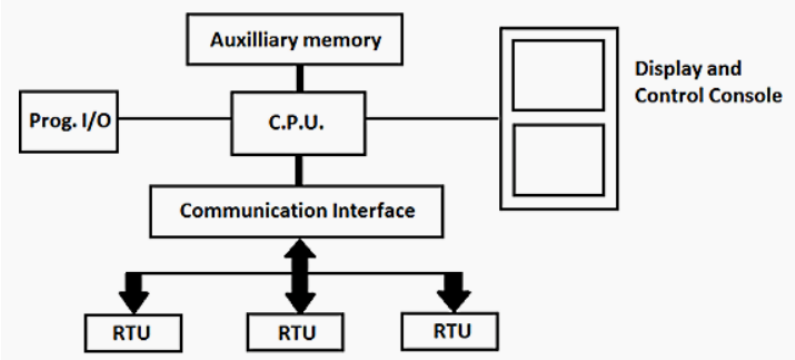
- The features of sensor nodes

  - Limited sensing region, processing power, energy

4. SCADA (SUPERVISORY CONTROL AND DATA ACQUISITION):



It is impossible to keep control and supervision on all industrial activities manually. Some automated tool is required which can control, supervise, collect data, analyses data and generate reports. A unique solution is introduced to meet all this demand is SCADA system.



1. Human Machine Interface (HMI)

It is an interface which presents ***process data to a human operator***, and through this, the human operator monitors and controls the process.

2. Supervisory (computer) system

It gathers data on the process and sending commands (*or control*) to the process.

3. Remote Terminal Units (RTUs)

It connect to sensors in the process, converting sensor signals to digital data and sending digital data to the supervisory system.

4. Programmable Logic Controller (PLCs)

It is used as field devices because they are more economical, versatile, flexible, and configurable than special-purpose RTUs.

5. Communication infrastructure

It provides connectivity to the supervisory system to the Remote Terminal Units.

PREVIOUS NEXT

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Hassan is Electronics Engineer with enriching experience in Robotics, Mechatronics and IOT training, project development and research. He is very passionate about latest developments in manufacturing and process industry.

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