A Comprehensive Study Of Architecture, Protocols And Enabling Applications In Internet Of Things-IoT

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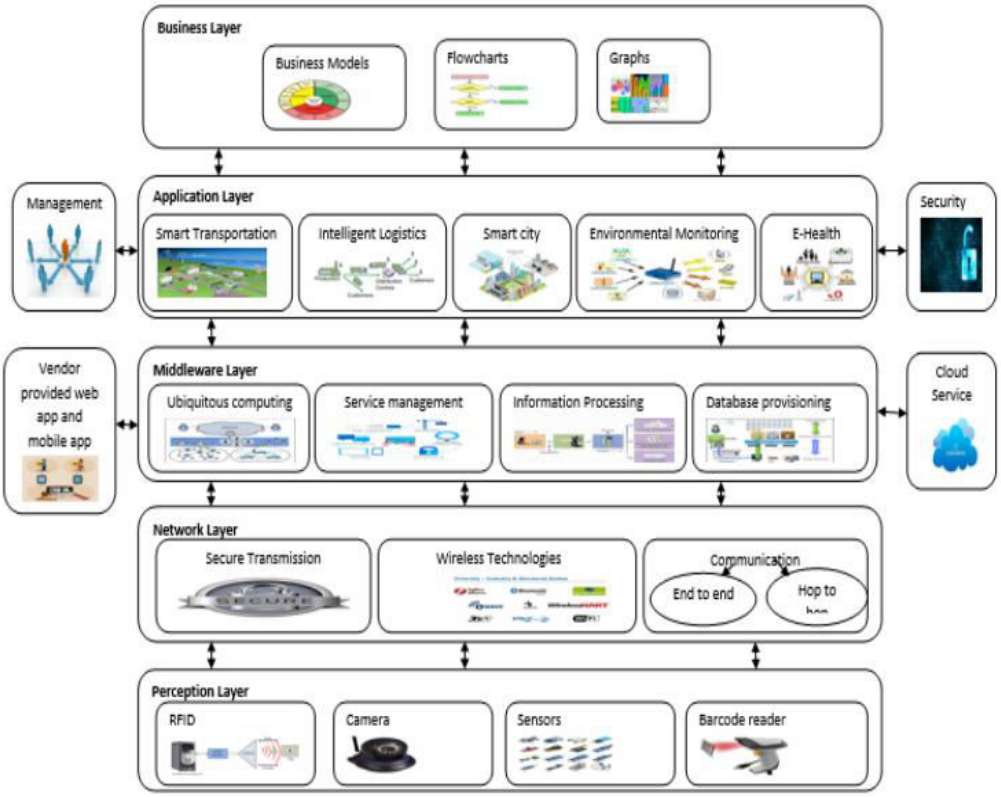
1.Introduction:

The IoT is the interconnection of things or objects for sharing information. Here Things refer to any system, device, or any other physical objects which can communicate with each other. IoT is considered a compound system with various functions such as processing, perception, transmission, service providing, and deciding. It also integrates differing technologies from device perception, and the communication network to intelligent data processing. It has attributes such as perceiving, ubiquitous interconnection, and intelligent processing.[3-4] Applications of IoT are not limited so it can be used in many applications such as smart transportation, smart city, and e-health.

2.Architecture:

Context architecture is defined as a framework for the physical components' specification, functional organization, configuration, operational principles, and procedure. The architecture can be in the form of layers and the layers are named a business layer, application layer, middle layer, network layer, and

perception layer. The following figure explains all the layers clearly.



3. Sensors and their Application:

IoT is used in the implementation of multiple sensors and these sensors are used In various day today activities. These sensors include:

- Temperature Sensor:
  Ex: Thermocouples, Resistor temperature detectors, thermistors, infrared sensors This device generally used to measure heat energy by detecting temperature change in the environment in some particular form and converting it for user or device. A/C control, refrigerators, manufacturing processes, agriculture and health industry.
- Proximity sensor:
  Ex: Capacitive sensor, photoelectric sensors, ultrasonic sensors This type of sensor is used to detect the presence or absence of a nearby object and its properties. It can also be used to convert properties of an object into user readable form or machine-understandable form. The retail industry, parking availability in malls, stadiums or airports.
- Pressure sensor:
  Ex: Pirani gauge A sensor which detects pressure and converts it into an electric signal. The amount of pressure depends on the level of pressure applied. Manufacturing, maintenance of water systems and heating systems
- Water Quality Sensor:

Ex: Organic carbon sensors, Turbidity sensor, pH sensor, Oxygenreduction potential sensor, This type of sensors used to measure water quality and iron monitoring in distribution systems of water. River and stream gaging, wastewater, and effluent measurement.

- Chemical sensor:
  Ex: chemiresistor, electrochemical gas sensor, hydrogen sulfide sensor, pH gas electrode, potentiometric sensor, zinc oxide Nano rod sensor To detect chemical changes in air or liquid, chemical sensors are used. This type of sensor is considered in various industries. Industrial environmental monitoring, process control, harmful chemical detection, explosive and radioactive detection
- Gas sensor:
  Ex: carbon monoxide sensor, hydrogen sensor, oxygen sensor, ozone monitor, gas detector, hygrometer, nitrogen oxide sensor, and air pollution sensor These sensors are used to detect changes in air quality and the presence of various gases similar to chemical sensors. Manufacturing, agriculture, and health, air quality monitoring, Detection of toxic or combustible gas, Hazardous gas monitoring in coal mines, Oil & Gas industries, chemical Laboratory research, Manufacturing – paints, plastics, rubber, pharmaceutical & petrochemical.
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- Level sensor:
  Ex: Point level sensor, continuous level sensor This sensor detecting amount of liquids, fluids or other substances which flow in an open or closed system. Fuel gauging & liquid levels in open or closed containers, Sea level monitoring & Tsunami warning, water reservoirs, Medical equipment, compressors, hydraulic reservoirs, machine tools, Beverage and pharmaceutical processing, High or low-level detection
- Image sensor:
  Ex: CCD (charge coupled device), CMOS (Complementary Metal oxide semiconductor) This type of sensor generally used to detect and conveys the information that constitutes an image. Digital camera & modules, medical imaging and night vision equipment, thermal imaging devices, radar, sonar, media house, Biometric and IRIS devices.
- Motion detection sensor:
  Ex: Passive Infrared(PIR), Ultrasonic, microwave The motion detector is used to detect physical movement in a given area and transform it into an electric signal. Intrusion

detection systems, Automatics door control, Boom Barrier, Smart Camera Toll plaza, Automatic parking systems, Automated sinks/toilet flusher, Hand dryers, Automated lighting, AC, Fan, Appliances

- Accelerometer:
  Ex: capacitive accelerometer, piezoelectric accelerometer Accelerometer generally used to convert mechanical motion into an electrical output. It also measures the acceleration of an cellular and media devices, vibration measurement, Automotive control object due to inertial forces. and detection, free fall detection, aircraft and aviation industries, movement detection, sports academy or athletes behavior monitoring, consumer electronics,/ industrial and construction sites
- Gyroscope sensor:
  Ex: rotary gyroscopes, vibrating structure gyroscope, optical gyroscopes, MEMs(Micro Electro-Mechanical Systems) gyroscopes This sensor used to measure angular velocity or angular rate. Angular velocity is defined as a measurement of the speed of rotation around the axis. Car navigation systems, Game controllers, Cellular and camera devices, consumer electronics, Robotics control, Drone and RC control helicopter or UAV control, Vehicle control or ADAS
- Humidity sensor:
  To detect water vapor content in an air atmosphere or from other gases the humidity sensor has to be used. The common humidity is Relative Humidity(RH) Industrial and residential domain for heating, ventilatin9-74g, and air conditioning systems control, Automotive, museums, industrial spaces and greenhouses, meteorology stations, Paint and coatings industries, hospitals and pharma industries to protect medicines
- Optical sensor:
  Ex: photodetectors, fiber optics, pyrometer, proximity & infrared This sensor detects the physical quantity of light rays and converts these rays into an electrical signal which can be easily read by the devices or user. Healthcare, environment monitoring, energy, aerospace and many more industries.

4. Summary:

In this paper, we have presented comprehensive key research efforts on architecture, protocols and applications in an Internet of Things ubiquitous environment. There is an industry trend towards the adoption of wireless sensors and actuators in their products and services to improve efficiency and productivity. IoT is already showing signs of occupying a prominent place in our daily life. We need to design protocols in order to control things in a resource-constrained and heterogeneous system. But the development of IoT applications is technically complex due to the presence of different IoT protocols, lack of industry standards, and interoperability issues. In such a complex and diversified scenario, this study helps in throwing light on a multifaceted discipline and contributes to the development of the IoT paradigm.