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IOT: The Future of Connectivity

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ABSTRACT: *Internet of things , in basic terms is Connectivity of different devices through wireless means.Today many tasks are based on IOT. Devices are becoming smarter these days , Cities for instance are becoming intelligent by implementing IOT. Smart cities incorporate obstacle tracking, Object sensing,Network sensing and control , tracking people around them , monitoring lights etc. The main objective of IOT in cities is to keep the cities clean using various methods such as Garbage management systems and the second objective is making people more responsible. Keeping this in ming "IOT based Intelligent Garbage Bin for Smart cities" has been developed . Garbage management is one major application of IOT. We use sensors ,that are connected to the bins at different locations. These sense the garbage levels when full, Notifies with a message via GSM to the concerned admin to clean the bins*.

DEFINITION OF INTERNET OF THINGS (IOT) :

"Today computers and the Internet are totally dependent on humans for information. Roughly 50 petabyte of data available on the Internet were first
captured and created by humans by typing, pressing a record button, taking a digital picture, or scanning a bar code etc. Conventional diagrams in the Internet
leaves out most numerous and important routers - people. The problem is that people have less time, attention and accuracy all of which means they are not very good at capturing data about things in the real world.Today's information technology is totally dependent on data originated by people that our computers know more about ideas . If computer could learn from the generated data and gathered information, would help us immensely ,we would be able to track and count everything, and greatly reduce waste and cost. We would know, when things
need to be replaced, repaired or recalling,. The Internet of Things has a huge potential to change the world.

ARCHITECTURE OF INTERNET OF THINGS

Architecture of internet Of Things contains basically 4 layers:

1. *Application Layer*
2. *Gateway and the network layer*
3. *Management Service layer*
4. *Sensor layer*

fig.1:Architecture of IOT

layer
Sensor layer
Management Service
Gateway and the network layer
Application Layer

1. APPLICATION LAYER:

• Lowest Abstraction Layer With sensors we are creating digital nervous system.
• Measure physical quantities.
• It Interconnects the physical with digital world.
• It Collects and process the information in real time.

2. GATEWAY AND THE NETWORK LAYER:

• Has a robust and high performance network infrastructure.
• Supports all the communication requirements for latency, bandwidth or security
etc.
• Allows several multiple organisations to share and use the same network independently whenever needed

3. MANAGEMENT LAYER:

• It captures periodic sensory data.
• Data Analytics (Extracting relevant information from massive amount of raw
data).
• Streaming Analytics (It Process the real time data)
• Maintains security and privacy of data.

4.SENSOR LAYER:

• Provides user interface for using IoT.
• Different applications for various sectors like Transportation, Healthcare, Supply
chains, Agriculture, Automotive sectors,Retail ,Government etc.

ENABLING TECHNOLOGIES:

Energy:

This concern about low-power chipset having new and efficient and compact battery cells like fuel cells, polymer batteries which can help in case of IoT.

Intelligence:

The devices should have capabilities of context awareness and inter-machine communication.

Communication:

The devices with smart multi-frequency band antennas, integrated on-chip made of new materials that will enable the devices to communicate effectively .

Integration:
Integration of smart devices into packaging, or better, into the products themselves will allow a significant cost saving and increase the eco-friendliness of the
products.

Interoperability:
It means communication of different protocols by using some protocol stack. Two devices might not be interoperable even if they belong to same standards.

Available Architectures:

Two major architectures available are: the IoT-A and IIRA. Proposals of both the architectures have been prepared attentively but the IoT-A has been escribed
completely and expanded. It has been going hand in hand with the Io'T community and incorporates multiple views since its launch in 2012. In contrast, the IIRA still aims for feedback and further detailing.
Comparison of these architectures are now done regarding their capabilities and layers according to three perspectives.

The first perspective is semantic orientation-data and information are interpreted to create knowledge for business cases. The IoT-A focuses on the generic aspects of informatics instead of specific application facets of semantics. In contrast, the IIRA focuses on the functionality of the industry domain, such as business, operations(prognostics, monitoring, optimisation, and so on), information (analytics and data), and application (UIs, APIs, logic, and rules).
RAMI 4.0 is domain specific and it extends the view of the IIRA toward the life cycle and value streams of manufacturing applications.In particular, it intensifies
the functional-layer structure by two dimensions-the life cycle and value stream
and also by hierarchy levels (for further details, see International Electrotechnical Commission [IEC] standards 62890, 62264, and 61512).

The second perspective is Internet orientation. It has two aspects. The first is middleware for service support and data management in the cloud and servers. In an abstract manner, the IoT-A extensively covers the modelling and structuring of IoT business process management, virtual entities, IoT services, and cross-service organisation from the functional, information, and domain viewpoints. The serverside
architecture and its management are defined by the implementation. The same applies to agents and code on domain-specific devices. The IIRA focuses
mainly on business and use cases apart from other aspects.

The second aspect is networking, transport, and data links. These things are considered by both the architectures but they refer mainly to M2M communication to cover the OSI stack's lower layers. For instance, the network layer could be implemented by IPv6, whereas network and transport could be based on UDP (User Datagram Protocol) and CoAP (Constrained Application Protocol). The lightweight protocol MQTT could be used on top of TCP/IP instead of HTTP if it is
alternatively realised.

The third perspective is things orientation, which focus on assets such as sensors, actuators, and tags that are vital in both the IoT-A and IIRA. This is the classic approach for the automation industry, which tries to define bottom-up a reference around tangible objects and their individual data sources and information needs.Both architectures have management and security mechanisms across all layers. The architecture proposals help define and explain

fig.2: Available Architectures

Perspective	Application
Semantic oriented	Service protocols such as OSA A,UPnP,DPWS and EXI
Internet oriented	Inter connectivity and protocol conversion based on UDP vs TCP with HTTP Support for IPV4 and IPV6
Things oriented	A physical layer and data link layer conversion with low communication protocols suitable for easy installation and maintenance

Perspective Application
Semantic oriented Service protocols such as OSA UA,UPnP,DPWS and EXI Internet oriented Inter connectivity and protocol conversion based on UDP vs TCP with HTTP Support for IPV4 and IPV6
Things oriented A physical layer and data link layer conversion with low communication protocols suitable for easy installation and maintenance

Proposed Methodology

Sensors like weight sensors, IR sensors can be used for garbage detection. The information about the weight of garbage is given by weight sensor, but it is not efficient because it fails to identify the level of waste in the bin. Hence Infrared sensor (IR sensor) is used to detect the level of garbage. IR sensor is a
multipurpose sensor which emits the light , invisible to naked eye but the electronic components can detect it. It consists of IR transmitter and IR receiver. IR sensor produces both analog and digital output.
This sensor produces the output as logic „1" at the digital output when an object is sensed and a logic „0" if no object is sensed. Sensor produces the analog output voltage

between 0 and 5V based on the distance between sensor and the object.

An LED present on the IR sensor board is used to indicate the presence of an object. IR sensors are highly sensitive to surrounding lights and therefore these are covered properly. Potentiometer is used to calibrate the sensor. The output of IR sensor is acquired by The National Instruments myRIO-1900. It is an input-output device which is portable and reconfigurable. This can be used in the design of robotics, controls and many other designs. The NI myRIO-1900 has a ZYNQ chip.This ZYNQ chip is a combination of processor (ARM Dual core) and FPGA (Xilinx).The NI myRIO-1900 consists of analog input, digital input, analog output, digital output, power output, non-volatile memory and audio input and output in an embedded device. USB acts as a connector between the NI myRIO-1900 and host computer. It has connectors A and B that act as an expansion port and a connector C that act as a mini-system port that carry signals and these signals are
differentiated by connector names. Here the mostly used connector is mini-system port connector C. This device can even create wireless network by connecting to the wireless network. It can be connected to Wi-Fi which is an inbuilt option available.

APPLICATIONS :
There are several application domains which will be impacted by the emerging IOT. The applications can be classified based on the network availability, coverage, scale, heterogeneity, repeatability, user involvement and impact.

We categorise the applications into four application domains:
(1) Personal and Home
(2) Enterprise
(3) Utilities
(4) Mobile.
There is a huge crossover between applications and the use of data between these domains. For instance, the Personal and Home IOT produces electricity usage data of the house and makes it available to the electricity company, which can in turn optimise the power supply and demand. The internet enables sharing of information between different service providers seamlessly also creating multiple
business opportunities.

Advantages :
1. Data: The more the information, the easier it is to make the right decision. Knowing what to get from the grocery while you are out, without having to check on your own, not only saves time but is convenient as well.

2. Tracking: The computers keep track of both quality and the viability of things at home. Knowing the expiration date of products/items before one consumes them , increases safety and quality of life. Also, Will never run out of anything when you need it at the last moment.

3. Time: The amount of time saved in monitoring and the number of trips done otherwise would be tremendous.

4. Money: The financial aspect is the best advantage. IOT technology could replace humans who are involved in monitoring and maintaining supplies.

Disadvantages :
1. Compatibility: As of now, there is no standard for tagging and monitoring with sensors. A uniform concept like the USB or Bluetooth is required which
should not be that difficult to do.

2. Complexity: There are several opportunities for failure with complex systems. For example, you or one of ur registered family members may receive messages that the milk is over and both of you may end up buying the same. which leaves you with double the quantity required Or a software bug causing the printer to order ink multiple times when it only requires a single cartridge.

3. Privacy/Security: Privacy is a big issue in IoT. All the data must be securely encrypted so that various data like financial status or how much milk you consume isn't common knowledge at the work place or known with your friends.

4. Safety: There is a chance that the software can be hacked and your personal information misused. The possibilities are endless. Your prescription being changed or your account details being hacked could put you at risk. Hence, all the safety risks become the consumer's responsibility.

CONCLUSION:
The rapid increase of devices with communicating–actuating capabilities is bringing closer the actual vision of IOT, where the actuation and sensing functions seamlessly blend into the background and new capabilities are also made possible through access of rich and new information sources. The evolution of the next generation of mobile system and devices will depend on the creativity of the users in designing these new applications and products .IoT is an emerging technology, influencing this domain by providing new changing data and the required computational resources for creating the revolutionary apps and software.

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Show Context

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