Framework on Internetwork, Elements and Operations of Internet of Things

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Abstract—Since from recent decades, people see the importance of internet for controlling the external devices related to day-to-day life. Internet of Things (IoT) mainly concentrates on automation and increases tension free life. It has enormous effect on public such that every individual depend on IoT to meet their requirements like daily purchase, ticket booking, and online transfers. Internet plays very important role here in establishing intercommunication between the elements present in the network of the devices. Some of the devices on the network interfaces with the internet to predict the next parameter at the device and to control the passive devices. Interfacing smart devices with user mind and electronic gadgets require high speed internet. This can be implemented with most sophisticated peripherals categorised like sensors, transducers, microcontrollers, and communication devices. In the present work the device management, control, applications, limitations is discussed along with internetwork. The present paper mainly concentrates on essential design considerations and limitations to improve the IoT in an organization or a city to provide superior experience to the customer.

Keywords— IoT, Internet, Microcontroller, Smart devices, intelligent network, Cloud, Sensors, Communications

I. INTRODUCTION

The Internet of Things (IoT) will have a profound impact in the future. IOT is an advanced technology interconnects sensors, actuators, data bases, and high end artificial algorithms. Machines from tiny size to gigantic size and humanoids with super-fast internet to produce final product or service. The methods are used to enable and provide smartness to these connected things will bring reflective value across IoT sectors. But the IoT for short is not always that easily explained. Sensors and actuators embedded in physical objects are linked through wired and wireless networks, often using the same Internet Protocol (IP) that connects the Internet [5]. Wide numbers of devices are connected on the internet and available to the public. Here all the devices such as satellites, routers, switches, and microcontrollers are called elements. Each device connected on the Internet can have its own IP address. Without person intervention Machine-to-machine (M2M) communication enables devices to exchange information with particular IP address. The challenge for the embedded industry is to unlock the value of this growing interconnected web of devices, often referred to as the Internet of Things (IoT) [6].

According to Metcalfe’s Law, the value of a network is equal to the square of the number of devices [8][10]. The value of a network is equal to the square of number of device connected to it as shown in the plot figure 1. A single device has no value for the client. The value of device increases with the total number of devices in the network. This is because the total number of devices interfaced with total number of microcontrollers increases and hence the value. The point at which the value crosses the cost is called “Critical Mass Crossover” [6].

It is the right time to where IoT explores its wings like anything because of present developments in software technologies, reduces in hardware prices and the new trends to habituates the technologies. The IoT has active components pertaining the data and process the data to decide an action.

Figure 1: The Value of a Network is Equal to the Square of the Number of Devices Connected to It.
II. DESIGN ELEMENTS

An **Active sensor interconnection**: The passive sensors are made active by interconnecting small intelligent devices in network. Along with the active devices all passive devices can also be made intelligent with IoT network.

**Inter-Network**: IoT network follows fundamental topologies to make interconnection between devices and sensors. RFID, Bluetooth, IR, ZigBee, Wi-Fi, and many other sophisticated topologies are used in the network establishment between nodes and devices. As physical connection is not used in IoT it reduces cost in assembling the circuit and triggers fast data transmission. There is no hard wire torn in the circuit. There will be no electro-magnetic interference in data communication. The modules are interconnected with wireless modules. So the modules can easily be upgraded, interconnected and replaced with new modules.

**Data Storage**: The IoT tremendously creates database and very difficult to maintain and analyse it. The current database algorithms are not at all sufficient to meet the future requirements of faster IoT technologies. There is a wide scope of developing newer algorithms and Heuristic algorithms for wide analysis. Frankly speaking the microcontrollers, sensors, actuators, and wireless networks provide brain, hands, nerve system to IoT system [6]. Many smart places where IoT is connected the user never see the number of sensors and never have knowledge on either control over the sensor nor the operation. But all the sensors internally communicated each other and activate required actuator to perform the predefined task with Internetwork. For example, smart cities, smart homes, smart hospitals, smart transport, smart society, cc camera and smart class rooms.

III. DESIGN

In the fundamental model of IoT, initially the operations are initiated by client by the help of external devices available at user which are far from the sight and are connected to internet. The operations are initiated by triggering devices like cell phone, smart cards, or Tabs. The triggered signals are send to control panel/device which is located at the active sight. The triggered signals are sorted with an interrupt controller. After triggered signal, the sensors which read the real time physical parameters are sent to transducers and then attenuators. The attenuators modify the strength of the electrical signal produced at transducers. These attenuated signals will be sorted and send to microcontrollers for selecting an appropriate routine. The routine will pick a procedure from internal storage data base and operates on the data fetched from internal data storage. The internal data storage locations are evaluated from the routines selected by microcontrollers. The routines will execute the data with the help of procedures available in the internal storage. The output will be again stored in internal storage.

The requested input to the control device is stored at external cloud through internet network connection. In many applications the procedures required for microcontroller are not stored in local storage device. But they are available in External cloud. Once the triggered signal is received at external cloud it uploads appropriate or requested program to real-time application. The program will be stored in internal storage and same thing will be execute by microcontroller. The output data again sent to external cloud to store the data permanently. The communication between devices at the actual sight is controlled by wireless communication like RFID, ZigBee, WiFi, or some time Blue-Tooth as shown in figure 2.

The programs in the external cloud can access multiple requests from various sources like human, machines, and Bio-Devices. The communications can be between Machine to Machine or human to Machine or vice versa. The external cloud can upload multiple programs to the devices connected to it. At the same time several devices work at the actual sight to perform multiple tasks. For instance a manger in the office wants to activate his devices in the remotely located office in the city before he reaches there in the morning. The manager can control his desktop and applications in the
desktop, he can answer the persons who came earlier than him, he can send assignments to his subordinates, he can check current day schedule given to him to control by the superiors, he can switch on Air Conditioner to maintain the room temperature before manager arrives into the office, he can read/check all the messages received to the office phone, and many more. So, to perform multiple tasks like this only one device type may not be sufficient. Multiple sensors, actuators are used to read the parameters in the office and actuators to control the devices. Multiple or power full microcontroller is required to handle multiple number of sensors and actuator. More than 50 sensors are located in a smart home to monitor regularly. But a typical microcontroller can support only 64 I/O ports. With the 64 I/O ports it is very difficult to monitor all sensors in the rooms and control the actuators. So, multiple microcontrollers are required to interface all the devices as shown in figure 2. Microcontrollers are connected in parallel to process all the device requests simultaneously and control all actuators too at the same time.

IV. APPLICATIONS OF IOT

The There are many advantages with smart devices connected with IoT technology. Few of the advantages are discussed here.

**Home Appliances:** The home appliances can be automatically controlled by IoT devices. Many components at home are interdependent. Like the temperature in refrigerator related with food items, AC is related with number of persons in a room, and kitchen controlling items are related with many components [2].

**Corporate Appliances:** The login and logout of an employee is a simple example of current trend. But knowing the person who entered in the room in our absence by biometric is an example of IoT. When the boss enter into the room the messages left by third person will automatically delivered to desktop or a phone speaker. The messages can be voice message of a third person entered in the room came for the boss in his absence. The salary, increments automatically credited based upon the working hours of an employee. The cabin temporarily will answer the client automatically by responding the telephone in the absence of an employee.

**Smart Weather Analysis:** Knowing the climate conditions of the other areas in large cities is very important. For instance, it is very important for a marketing person to know the climate condition of other sectors in the city. So that he can plan his business schedule smoothly. This can be done with smart devices connected with satellite. These devices are located at different parts of the city and send the weather report to prerequisite persons [3].

**Medical Analysis:** When a person is seriously injured on the road and brought to hospital and in many like situations it takes long time to take correct treatment and more chances or wrong treatment due to lack of patient prior health history. If the injured person has some bio-tag or some chip card which includes all health details of the person. Reading the embedded data in it allows the doctors to react quickly in emergency situations [4]. Smart database plays very important role in such situations.

**Dead Lock Traffic:** Traffic control and transport is a major issue creating a seviour problem in many countries like India, China, and other developing countries. If traffic police or vehicle chauffeurs known what is the traffic density in the coming junction they can take a wise decision to select their travelling path. If this can be managed with smart displays the transporters can reduce their travelling time period.

The IoT has also many advantages in other areas like agriculture which helps to farmer to apply accurate percentage of chemicals. IoT also supports to mine large data bases in an organization. It is also spreading too many other areas like civil engineering, chemical engineering, nano technology, food Technology, Internet, telemedicine, security management, event management, mobile phones and many other things.

**Virtual Database:** It is not necessary for a system to have its own memory management system. It just sends its real time parameters to service provider. The parameters executes with the help of program stored on third party server. Finally the result will be returned to client system. For instance Google maps, investigating a crime rate in an area or city, Virtual cards [4], home appliances, defence, business oriented application, project design.

V. ISSUES AND LIMITATIONS

The IoT is very much concerned with privacy issues. The personal data is available on centric internet based database. Storing all the personal data at third person is not suggestible. Higher data encryption mechanisms and faster, secure protocols are required in data communication. Transparency of service provider must be present to the user. It is the responsibility of the service provider to provide reliable network between smart devices [7][11].

VI. CONCLUSION

It is very important to provide scalable and reliable complex internet network. The IoT provides solutions which improve energy efficiency, security, health, education and many other aspects of daily life. It is very tedious work to select, design, implement and operate smart operation. But it provides accurate results and provides accurate information in time. Without human intervention many I/O devices are automatically controlled through Internet. Smart and Intelligent systems are implemented to read human commands and controls human made structures.

REFERENCES


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[8] Bob Briscoe (July 2006). "Metcalfes Law is wrong".

