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Entrepreneurship and Modernization Mechanism in Internet of Things

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ABSTRACT: The Internet of Things (IoT) continues to evolve and expand in terms of the number of companies, products, and applications that illustrate just how beneficial it is becoming to connect our devices, appliances, homes, and vehicles together. Some companies like Nest have led the way and are becoming instantly recognizable.The advent of Internet of Things (IoT) is changing the day to day functionality of our life dramatically. IoT and Make in India project are creating waves by spreading its range to different sectors from homes to smart homes, from health to smart healthcare and much more. The Internet of Things (IoT) is modifying the existing IT ecosystems. By enabling access and use of devices data, possibly at wide scale when used in conjunction with cloud and big data technologies, it offers new playgrounds with reduced entry (capex) costs. It is thus expected to provide additional innovative business development opportunities for SMEs and web entrepreneurs. In this also recognising that business models have changed, as in general businesses tend to have more contact with the users, and as the network effect affects the value, exponentially, with the number of users. On the other hand, economies of scale have become less important as production capacity has become much more distributed With an objective to transform India as the global manufacturing hub, the Government of India has launched the significant dream project by the name ‘Make in India’. Make in India initiative has the ability to take the Indian economy to the new pinnacles and create enormous employment opportunities. Because of its favorable approach, it has started getting attention from all over the world. The business-centric policies and the conducive environment for the investment are expected to play a major role in the realization of this project.

KEYWORDS: Internet of Things, protocol, challenges, application.

I. INTRODUCTION

Connecting everyday things embedded with electronics, software, and sensors to internet enabling to collect and exchange data without human interaction called as the Internet of Things (IoT). The term "Things" in the Internet of Things refers to anything and everything in day to day life which is accessed or connected through the internet IoT is an advanced automation and analytics system which deals with artificial intelligence, sensor, networking, electronic, cloud messaging etc. to deliver complete systems for the product or services. The system created by IoT has greater transparency, control, and performance.

As we have a platform such as a cloud that contains all the data through which we connect all the things around us. For example, a house, where we can connect our home appliances such as air conditioner, light, etc. through each other and all these things are managed at the same platform. Since we have a platform, we can connect our car, track its fuel meter, speed level, and also track the location of the car.

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II. IoT ARCHITECTURE

There is not such a unique or standard consensus on the Internet of Things (IoT) architecture which is universally defined. The IoT architecture differs from their functional area and their solutions. However, the IoT architecture technology mainly consists of four major components:

Components of IoT Architecture

- Sensors/Devices
- Gateways and Networks
- Cloud/Management Service Layer
- Application Layer

Stages of IoT Solutions Architecture

There are several layers of IoT built upon the capability and performance of IoT elements that provides the optimal solution to the business enterprises and end-users. The IoT architecture is a fundamental way to design the various elements of IoT, so that it can deliver services over the networks and serve the needs for the future.

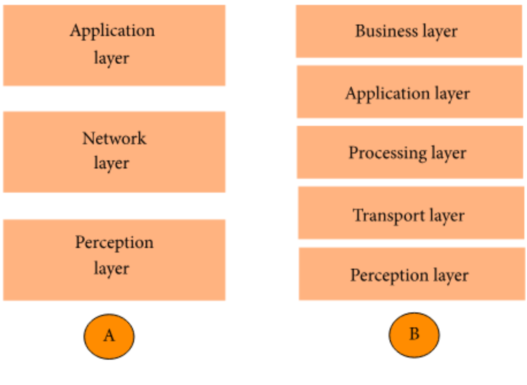

Figure 1: Architecture of IoT (A: three layers) (B: five layers).

Following are the primary stages (layers) of IoT that provides the solution for IoT architecture.

1. **Sensors/Actuators:** Sensors or Actuators are the devices that are able to emit, accept and process data over the network. These sensors or actuators may be connected either through wired or wireless. This contains GPS, Electrochemical, Gyroscope, RFID, etc. Most of the sensors need connectivity through sensors gateways. The connection of sensors or actuators can be through a Local Area Network (LAN) or Personal Area Network.
2. **Gateways and Data Acquisition:** As the large numbers of data are produced by this sensors and actuators need the high-speed Gateways and Networks to transfer the data. This network can be of type Local Area Network (LAN such as WiFi, Ethernet, etc.), Wide Area Network (WAN such as GSM, 5G, etc.).
3. **Edge IT:** Edge in the IoT Architecture is the hardware and software gateways that analyze and pre-process the data before transferring it to the cloud. If the data read from the sensors and gateways are not changed from its previous reading value then it does not transfer over the cloud, this saves the data used.
4. **Data center/ Cloud:** The Data Center or Cloud comes under the Management Services which process the information through analytics, management of device and security controls. Beside this security controls and device management the cloud transfer the data to the end users application such as Retail, Healthcare, Emergency, Environment, and Energy, etc.

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III. LITERATURE REVIEW

Prof. Rahul Wantmure and Dr. Murlidhar Dhanawade (2016) Indian cities and cities around the world is gradually evolving. It is not a sudden decision with planned infrastructure in advance. The concept of Smart City has suggested in a planned city, with such impact that each activity carried out in the city is supervised and controlled by technology. Internet of things is an emerging technology in the IT world that can be explored to its zenith to achieve the goal of building a smart city. Building alone is not enough, but to maintain and sustain their identity. The integrity and authenticity is another task to be processed and implemented. There are several challenges in making an smart city in India, as there are several implicit and explicit obstacles that must be confronted. A smart city model is not a solution because each city is unique in its existence. However, a prototype development is needed by having a logical design using for Smart City using IoT. 2. Mr. Kyusoo Chong and Hongki Sung (2015) Authors aim is to study investigate the prediction technology based road safety on the roads large volumes of data. This study examines actual cases of road management systems and technologies of road safety analysis in Korea and other countries. Types and ease of use of the information collected through the road of a road management system are analyzed. Based on the result, the limitations of existing technologies and management systems are analyzed. A series of related technologies and road management systems were examined using basic physics based on information such as distance, speed, etc., and past event information, and they do not reflect a number of specific factors and data in real time. Consequently, the development of technology for the service road / traffic using multiple data sets in real time information such as traffic information, weather information, and status information of the road is necessary, and the analysis of multiple data sets. It will be possible to develop more reliable systems and technologies for management of road safety road using data derived from various types of road management systems. 3. Kaoutar Ben Ahmed, et al (2014) This article provides an overview of the topic that points to its current status and forecast of the crucial functions that will play in the future & defines analysis of big data into smart cities and discusses their potential contributions in change to our way of life and, finally, it discusses the possible disadvantage of this upcoming technologies that can deceive, violate our privacy.

IV. IOT NETWORK PROTOCOL STACK

The Internet Engineering Task Force (IETF) has developed alternative protocols for communication between IoT devices using IP because IP is a flexible and reliable standard [50, 51]. The Internet Protocol for Smart Objects (IPSO) Alliance has published various white papers describing alternative protocols and standards for the layers of the IP stack and an additional adaptation layer, which is used for communication [51–54] between smart objects.

(1) Physical and MAC Layer (IEEE 802.15.4). The IEEE 802.15.4 protocol is designed for enabling communication between compact and inexpensive low power embedded devices that need a long battery life. It defines standards and protocols for the physical and link (MAC) layer of the IP stack. It supports low power communication along with low cost and short range communication. In the case of such resource constrained environments, we need a small frame size, low bandwidth, and low transmit power.

Transmission requires very little power (maximum one milliwatt), which is only one percent of that used in WiFi or cellular networks. This limits the range of communication. Because of the limited range, the devices have to operate cooperatively in order to enable multihop routing over longer distances. As a result, the packet size is limited to 127 bytes only, and the rate of communication is limited to 250 kbps. The coding scheme in IEEE 802.15.4 has built in redundancy, which makes the communication robust, allows us to detect losses, and enables the retransmission of lost packets. The protocol also supports short 16-bit link addresses to decrease the size of the header, communication overheads, and memory requirements [55].

Readers can refer to the survey by Vasseur et al. [54] for more information on different physical and link layer technologies for communication between smart objects.

(2) Adaptation Layer. IPv6 is considered the best protocol for communication in the IoT domain because of its scalability and stability. Such bulky IP protocols were initially not thought to be suitable for communication in scenarios with low power wireless links such as IEEE 802.15.4.

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(3) Network Layer. The network layer is responsible for routing the packets received from the transport layer. The IETF Routing over Low Power and Lossy Networks (ROLL) working group has developed a routing protocol (RPL) for Low Power and Lossy Networks (LLNs) [53].

(4) Transport Layer. TCP is not a good option for communication in low power environments as it has a large overhead owing to the fact that it is a connection oriented protocol. Therefore, UDP is preferred because it is a connectionless protocol and has low overhead.

(5) Application Layer. The application layer is responsible for data formatting and presentation. The application layer in the Internet is typically based on HTTP. However, HTTP is not suitable in resource constrained environments because it is fairly verbose in nature and thus incurs a large parsing overhead. Many alternate protocols have been developed for IoT environments such as CoAP (Constrained Application Protocol) and MQTT (Message Queue Telemetry Transport).

V. CHALLENGES TO IOT ENTREPRENEURSHIPS

In terms of challenges to be addressed, emphasis was put on the fact that “people with ideas” need a lot more to be able to put those ideas into the markets. Whereas there are clearly technology challenges, these do not seem to dominate the current scene: there is a clear need for support in connecting into an ecosystem that enables the entrepreneur to foster. Existing ecosystems to link in to (often set-up in public and private collaboration) provide opportunities for networking and interaction, supporting open innovation. Such ecosystems should ideally also include opportunities to test and pilot. Having an idea is one thing – getting it to work is often a different skill that goes beyond that idea. Even more so when working with products that are tightly liaised to new business concepts such as “X as a service” and “on demand”. The technical challenge is in that fact that the IoT development is moving fast, yet it is not “one” mature technology – there is a wealth of options. For an entrepreneur to find her or his way in choosing the best options a wide understanding of those options is needed – knowledge needs to be accessible. Standards are important, also for creating trust. Furthermore, in getting from idea to concept to proof of concept to market, there are major steps, as we are looking towards a mass market of things in which thousands and millions of objects will need to continue functioning – even beyond a proof of concept test environment. A very clear example in this is batteries – easy to include them in a test environment and it may prove to be a not economically sustainable solution in the long run, in a global environment.

VI. SECURITY AND PRIVACY

6.1 Security

While security considerations are not new in the context of information technology, the attributes of many IoT implementations present new and unique security challenges. Addressing these challenges and ensuring security in IoT products and services must be a fundamental priority.Users need to trust that IoT devices and related data services are secure from vulnerabilities, especially as this technology become more pervasive and integrated into our daily lives. Poorly secured IoT devices and services can serve as potential entry points for cyber attack and expose user data to theft by leaving data streams inadequately protected.

The interconnected nature of IoT devices means that every poorly secured device that is connected online potentially affects the security and resilience of the Internet globally.

As a matter of principle, developers and users of IoT devices and systems have a collective obligation to ensure they do not expose users and the Internet itself to potential harm. Accordingly, a collaborative approach to security will be needed to develop effective and appropriate solutions to IoT security challenges that are well suited to the scale and complexity of the issues.

6.2 Privacy

The full potential of the Internet of Things depends on strategies that respect individual privacy choices across a broad spectrum of expectations. The data streams and user specificity afforded by IoT devices can unlock incredible

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and unique value to IoT users, but concerns about privacy and potential harms might hold back full adoption of the Internet of Things. This means that privacy rights and respect for user privacy expectations are integral to ensuring user trust and confidence in the Internet, connected devices, and related services.

Indeed, the Internet of Things is redefining the debate about privacy issues, as many implementations can dramatically change the ways personal data is collected, analyzed, used, and protected. For example, IoT amplifies concerns about the potential for increased surveillance and tracking, difficulty in being able to opt out of certain data collection, and the strength of aggregating IoT data streams to paint detailed digital portraits of users. While these are important challenges, they are not insurmountable. In order to realize the opportunities, strategies will need to be developed to respect individual privacy choices across a broad spectrum of expectations, while still fostering innovation in new technology and services

VII. CONCLUSION

The IoT continues to reshape commercial, industrial, scientific, and engineering endeavors in profound and unpredictable ways. In the scientific revolution of the 17th century, newly invented instruments extended the reach of human senses far into the microscopic and astronomic realms. The IoT is the instrument that will enable your organization to connect intelligent technologies to the data-emitting universe of objects. The implications for IT infrastructure will be just as far-reaching.

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