IoT: Challenges & Avenues in India

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Abstract

IoT refers to the networked interconnection of everyday objects, which are often equipped with ubiquitous intelligence. IoT will increase the ubiquity of the Internet by integrating every object for interaction via embedded systems, which leads to a highly distributed network of devices communicating with human beings as well as other devices. The IoT (Internet of Things) has capability to connect the objects of the physical world with the virtual world, thus enabling anytime, anyplace connectivity for anything and not only for anyone. This research paper focuses on the challenges and avenues of IoT with respect to India.

Introduction:

Science and technology has nature of continuous evolution and this keeps changing human life. In 1990's with invent of world wide web (WWW) it changed the way of information exchange, in late 2000's the mobile Internet provided anywhere anytime access to global information and now the next wave is IoT. IoT refers to the networked interconnection of everyday objects, which are often equipped with ubiquitous intelligence. IoT will increase the ubiquity of the Internet by integrating every object for interaction via embedded systems, which leads to a highly distributed network of devices communicating with human beings as well as other devices. The IoT (Internet of Things) has capability to connect the objects of the physical world with the virtual world, thus enabling anytime, anyplace connectivity for anything and not only for anyone.

IoT System Design:

IoT system architecture has 4 major activities- measuring the value from the environment with accuracy, communicating the values to cloud in real time, retrieving the value from cloud and presenting it in desired format at last taking action on the basis of the values retrieved and pre

decided instructions. On the basis of these activities four different components are required to develop IoT system:

1. Sensor
2. Wireless Communication Technology
3. Mobile/ Web based application
4. Actuators / Control Panels

Sensor is electronic devices having capability to measure certain parameter from the environment. Many electronic industries are developing various sensors such as temperature sensor, Infra-Red sensors, object detectors, motion detectors.

The wireless communication will help to transmit the data from remote station to the cloud in real time. The data collected from sensors will be transmitted to some cloud server where it will be stored and analysed by the application. The wireless communication could be wi-fi based or any

The next component required is an application that will process and analyse the data collected from sensors. This application must be designed either for mobile platform or web platform, so that it can be accessed beyond geographical boundaries. This application design should be capable to generate the information in desired forms. Along with the reports it should also provide graphical presentation of data.

In some applications of IoT, it may be required to take some actions based on the data collected by the sensor and analysed by the application. In this stage we need to have devices that can take command and execute it such as switching on/off a device, changing the value of parameters (voltage, current, temperature etc.)

Designing an IoT system need a deeper understanding of the behaviour of the environment and various devices interacting. The limiting behaviour of the devices, network and application should be identified and considered during the application development and deciding controlling actions

State of IoT in India

The internet of things is now growing exponentially and is reaching different verticals and industries. India is one of the countries where a lot of innovation is happening around IoT across different verticals and technologies. The IoT ecosystem in India is mainly driven by 3 players: Government, Industry and Startups.

Government:

There is a lot of scope for IoT in India and Government has rightly recognized it and working towards it. The government has taken initiative and framed a draft policy to fulfill a vision of developing a connected, secure and a smart system based on our country's needs.

The Indian Government's plan of developing 100 smart cities in the country, for which Rs. 7,060 crores has been allocated in the current budget could lead to a massive and quick expansion of IoT in the country. Also, the launch of the Digital India Program of the Government, which aims at 'transforming India into digital empowered society and knowledge economy' will provide the required impetus for development of the IoT industry in the country. The various initiatives proposed to be taken under the Smart City concept and the Digital India Program to setup Digital Infrastructure in the country would help boost the IoT industry.

One of the key initiatives of the Government is to build smart cities across the country. Major aspects of a smart city being focused by the Government are:

- Smart parking
- Intelligent transport system
- Tele-care
- Woman Safety
- Smart grids
- Smart urban lighting
- Waste management
- Smart city maintenance
- Digital-signage
- Water Management

Other domain specific applications include smart water, smart environment and smart health. There is a plan to incorporate an incubator for to IoT to promote innovation.

Industries:

Next key player in this ecosystem is the Industry. Innovations based on IoT will definitely change the way companies do their day to day operations. Many of the market leaders have already started the journey. Technology leader Intel is in the production of low-power chips to connect IoT devices, Automobile companies have developed an SAP system to keep track of parts during the entire manufacturing line to help them track where items are located at all times. Also using IoT devices for process quality control, pollution control and monitoring, measurement of water flow and power consumption.

Some tech-leaders have launched development platform which helps design and prototype IoT devices and wearables. They have been working greatly in nurturing and mentoring a lot of start-ups as well. Another example is Hindustan Petroleum, which is using IoT, it automates processes and creates real-time insights into the business. It has installed sensors in field units to capture information such as temperature, pressure etc. IoT will transform Health care and large amount of working is in progress for exploring IoT in disease management. SUGAR is their diabetes management initiative which enables constant monitoring of the specific blood sugar levels using IoT enabled technology and transform them to personal health record system. It is also looking at IoT in effective inpatient care, post-discharge care and overall preventive health and wellness.

IoT is also useful in management and live monitoring of companies passive infrastructure like machine, buildings, tower, fuel management, energy distribution, monitoring and surveillance on the site etc. Big tech giants like IBM are investing heavily in enterprise application infrastructure and databases for connected devices.

Start-ups:

Apart from the industry leaders and giants another player in the ecosystem is Startups. Cities like Bangalore, Mumbai, Pune and Hyderabad are places where we would discover quite a few startups that are making a breakthrough. These are silently disrupting and innovating thereby breaking and creating newer realms each day within the IoT space.

Available Consumer Applications of IoT in India:

Apart from industrial application, IoT applications are also reaching the consumer goods segment. Smart home is one of the major category of it. Application based on IoT providing comfort convenience and entertainment to the consumers are highly appreciated by them. In Indian markethome IoT based applications became popular first. Afterwards they named with "Smart Home Devices".

Smart Homes are homes which are powered by computing devices and information technology that connect various gadgets and instruments in the house to provide enhanced comfort, convenience, security, and entertainment to residents in a sustainable way. The Smart Homes market is fast evolving in the Indian context. Initially Smart Homes were marketed primarily as homes with advanced security features. The market is now evolving into newer areas like lighting systems, gas leakage detectors, fire detection systems, entertainment systems and energy efficiency systems. Therefore, Smart Homes, apart from providing better security, conveniences and comfort to the resident, also provide significant energy savings.

Features that customers are aware of in these specific categories are:

- Security features – Video (IP) door, Gas leakage, Motion sensors, Dome speaker / Mike. Few mentions of Curtain sensors, Intrusion sensors and Fire control features
- Lighting controls – Switching lights from remote control
- Entertainment – AV controls. Few mentions of content sharing & information feed
- Electrical controls – AC controls. Few mentions of Smart gadgets
- Communication tools- Communication with front door and main gate

Following are other most popular IoT products developed for consumers by different startups in India.

Cariq:

Having compatibility with all the cars made after the year 2008, this IoT product provides its user with the real-time data about his car's performance. It does so by connecting itself to the car's OBD port. Furthermore, the product also connects one to the car service station most suitable to one's car. The product starts selling at a cool price quotient of Rs. 4000.

Website – MyCariq.com (http://mycariq.com/)

Lechal:

Started as a boon for all the visually impaired people out there, this product by the duo Krispian Lawrence and Anirudh Sharma was in its initial days a hepatic feedback based footwear that would assist the visually challenged people with navigation. But, almost a year ago, they decided to shift their focus to human fitness.

Website – Lechal.com (http://lechal.com/)

Carnot Technologies:

Carnot Technologies is another budding startup from Qualcomm's Design in India initiative. Carnot is an IoT device that connects a user's car or bike to their smartphone. The device then send alerts to users if their car/bike is being towed or stolen. It also recognises if the car/bike suffers an accident and informs emergency contacts in such a scenario. The device also measures mileage and shares analytics and insights to improve it. Using the device, bike enthusiasts can also share their road trips on social media platforms.

Website – www.carnot.co.in (http://www.carnot.co.in/)

Touchkin:

Designed especially for the elderly people, this 21st century invention is actually a sensor in disguise of a beautiful pendant that is capable of detecting falls. It also doubles up as a panic button. The product also comes with a mobile application. Further, the healthcare services provided are charged separate from the product and is available on demand.

Website – www.touchkin.com (http://www.touchkin.com/)

Leaf Wearables:

Leaf Wearables is a smart Jewellery startup that designs special pendants, bracelets and key chains that have a small circular device at their heart called SAFER. When a user double clicks the SAFER device attached to the jewellery, the corresponding app is triggered about a potential threat.

Website – www.leafwearables.in (https://www.leafwearables.in/)

Retisense:

A perfect gift for all your runner friends, Stridalyzer is a smart insole. It is just like we have has smartphones, smart TVs and smart cars, this one is a smart insole that is capable of measuring the runner's run. Not only this, it also provides tips and feedback on how to improve the form and helps prevent injuries.

Website – www.retisense.com (http://www.retisense.com/)

WearablesActofit claims to redefines what fitness trackers can do. Yes, all your digital devices will now be able to function on the command of one super ring. The yet to be launched wrist-band fitness tracker auto recognizes over 60 gymexercises. ActoFit minimalizes manual entry by logging entire sessions, allowing you to see what's working vs what's not working for you. ActoFit'sproprietary ActoBeat™ heart rate tracking provides the user with continuous heart rate even during motion.

Belgaum based IoT startup, which is known for its flagship product 'Find, a smart, connected tracking device that can be attached to valuables as well as pets. SenseGiz also manufactures SAFR, a wearable product which can be clipped to clothing or worn as a band. It can trigger automatic alarms on a loved one's phone, if the user has a crash/fall/emergency, has a panic button, can track fitness and sleep quality, can use simple gestures to control phone functions and can display phone related notifications on its screen. SenseGiz also builds IoT solutions for smart city applications, smart sensor networks, smart metering, smart light control, smart neighbourhood applications, and more.

Website – SenseGiz.com (https://www.sensegiz.com/)

GetActive :

Having been active in the IoT scene from the year 2012, the product focuses on one of the most important aspect of one's life in this 21st century stress driven life- Health. Adding a dash of wearable fun to the fitness process, this product is a huge hit among health conscious today's youth.

Website – www.getactive.in (http://www.getactive.in/home.html)

CooeyCooey:

It is an end to end patient engagement IoT platform for chronic patients. It helps in collecting (life-logging) & managing health vitals & provide hyper local targeted services after analysing the health data. The Bangalore-based startup has three products to offer – Bluetooth Blood Pressure Monitor, Glucometer and Body Analyser.

Other notable product-based startups in IoT are – Namma Energy (http://www.nammaenergy.com/), a maker of small smart sensor, clips right on to your home's electricity meter and gives you a detailed report about the electricity consumption of one's home, and which is a smart hub that upgrades a user's TV to a home automation and social media control centre.

Challenges in Indian Scenario:

Deep security concerns

An IoT device is an appliance or similar device that connects to the internet. This ranges from automobiles and smart TVs to heating thermostats, security systems, baby monitors, surveillance cameras, dishwashers and garage doors. Additionally, connected smart coffee makers, batteries, light bulbs and even toothbrushes are also available.

A previous survey(BullGuard) shown that 58% of consumers are 'very concerned' or 'highly concerned' about potential hacking and data theft carried out against their connected devices, with a worryingly large 37% having already experienced a security incident or privacy problem in the past. A large 68% of consumers express concern about security risks such as viruses, malware and hackers, while 65% of consumers express concern over data collected by device manufacturers being inappropriately used or stolen. 51% of consumers are also anxious about privacy breaches.

Education is essential:

Clearly there are still issues to address when it comes to reassuring and educating consumers, even those who consider themselves technically literate.

When asked how they would rate their computer skills, the majority of respondents – 70% described themselves as 'intermediate or advanced'. 83% said they are capable of setting up their own router, yet when asked if they have changed their router's password, 45% said 'no.' 36% also admitted that they don't know how, and a substantial 61% do not know how to configure a router to keep a home network secure.

Router security is essential in the realm of IoT. An IoT device provides a gateway to a home network via a router, allowing cyber criminals the ability to essentially 'scope out' home networks and remain undetected.

"Consumers are clearly not equipped to handle the myriad of security risks presented by connected devices," said Paul Lipman, CEO of BullGuard. "With devices such as security cameras, alarm systems and door locks now being connected to the internet, physical security is becoming as much of a consideration for consumers as data security. Keeping these devices secure is absolutely imperative." Consumers are clearly looking to antivirus vendors to help them solve this problem; 54% of consumers believe antivirus vendors are responsible for securingtheir connected devices. The antivirus vendor was selected as the primary choice, even ahead of the device manufacturer and the ISP.

- The biggest implementation challenge will be the complete integration of technology and language. We have to keep in mind India's diversity.
- Cyber security is another obstacle. We are all well aware that internet and cybercrime are inseparable.
- Issue of last mile connectivity.

Conclusion:

This paper attempted to draw an overview of IoT systems and its state in India. IoT has made a good start here in India, many IT giants as well as start ups are working to develop IoT solutions. In India there is a huge potential for IoT developments. The major challenges for the IoT development and user acceptance are:

Availability of Internet Infrastructure

In India the availability of internet infrastructure is good in tier I and tier II cities but it is poor tier III cities. Although the many suburban areas of metro has disrupted connectivity of internet, which is a big challenge for IoT systems. Poor internet will limit the functionality of IoT systems.

Security Concerns –Multiple interconnected devices in the world may poise a security threat. In such condition security policy cannot be an afterthought.

If the IOT devices are poorly secured, cyber attackers will use them as entry points to cause harm to other devices in the network. This will lead to loss of personal data out into the public and the entire trust factor between internet connected devices and people using them will deteriorate.

Privacy issues –The IoT devices collect user data without any permission. This may lead to the invasion of privacy in future. The possibility of tracking and surveillance of people by government and private agencies increases as the devices are constantly connected to the internet.

Legal Regulatory and Rights issues –Government law department needs to prepare it self for the upcoming challenges of legal issues generating from IoT. New laws to be developed and new definitions to be set up for these new devices.

Developing Economy and Development issues –IoT will be accessible to the developing economies when low cost microprocessor will be developed. In developing economy the cost of device needs to be low so that majority of people can reach to the solutions.

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