



STATISTICAL ANALYSIS ON IoT FOR SMART INDIA

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Abstract

“The game changer for overall business transformation is Internet of Things (IoT)”. The technology that creates the fastest data streams and have become the vital part of our daily lives. IoT plays a major role in the applications such as intelligent tracking system in transportation, industrial wireless automation, public safety, personal health monitoring, and health care for the aged community. This technology has influenced the lifestyle of many in the current scenario. The Internet of Things industry is big and it is estimated that 24 billion IoT devices are installed by 2020, which clearly shows the enormous growth in the ecosystem of IoT. As predicted by ITC, the IoT revenue will reach beyond 300 and sixty billion after 2020 resulting plenty of job opportunities within the IT industry.

Keywords: *Industrial Internet of Things (IIOT), Human-IoT, Cloud gateway, Data Lake*

INTRODUCTION

IoT is mostly termed as an enormous network with many connected devices. IoT devices gather and share data about how they're used and also the environment during which they're operated[1]. It provides a standard platform for of these devices to dump their data and customary language for all the devices to speak with one another. The technology is used in n number of applications in which IoThas redefined the lifestyle and transformed the way of interaction with technologies. This paper focuses on the Statistical Analysis on IoT for Smart India, which incorporates the brief explanation of how IoT is in Indian Economy, IoT in Indian Market, IoT devices which might rule India in 2020, IoT in 21stCentury, and Challenges of IoT in 2020, and also the development in IoT architecture.

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IOT IN INDIAN ECONOMY

There are plenty of IoT devices which can affect the economy[2]. The foremost disruption was caused by the connected mobile devices which allowed the little business and individuals to simply take payments without expensive registers or MasterCard processing. Instead, nowadays all we'd like is an app on a tablet or smartphone, a straightforward card reader and a web connection. The IoT is additionally aimed to disrupt other industries, like insurance, where the flexibility to own sensors on early detection of risks and dangers, could allow them to reward customers for adopting these devices.

IOT IN INDIAN MARKET

The Industrial Internet of Things (IIOT)[3], which was valued approximately \$145.81 billion in 2017, is anticipated to the touch \$233.15 billion by 2023, in line with a report by Zion research. This is able to translate to a compound annual growth (CAGR) of around 8.06% between 2018 and 2023.The report showed the Asia-Pacific region is anticipated to work out the very best CAGR within the global Industrial Internet of Things (IIOT)market during the forecast period. This can be mainly thanks to the largescale industrialization in Asian countries which incorporates India too. With the foremost favourable geographic zones and high client base, the Asia Pacific region is anticipated to exhibit a powerful growth within the Industrial Internet of Things (IIOT) market.

IOT DEVICES WHICH MIGHT RULE INDIA IN 2020

The Internet of Things is an intelligent network, which concatenates all things to the Internet for the purpose of interchange information and communicating via the information sensing devices in conformity with agreed protocols.The IoT devices[4]that is considered to rule India in 2020 are:

1. Voice Assistants: IoT allows voice assistants to become an element of all connected devices, allowing them to travel from place to place.
2. Wearables are finally Diversifying: Your next wearable might be equipped to offer your doctor instant access to life-saving status about your health and fitness.
3. Smart Mirror and wall: a sensible mirror can show your calendar, weather and news like something out of a sci-fi movie.
4. Smart Home market gets more pragmatic: With the assistance of IoT smart home devices, it becomes easy to energy and costs, all the while saving time.
5. Don't chuck Self-Driving car: Self-Driving cars are a shared ambition among top automotive, tech and ridesharing companies.
6. Behold the Flying tax: traveling is ready to be transformed before you think that.
7. Processing with Edge Computing: Edge computing will bring computation and data storage closer to the situation proves response times and save band width.
8. Flexible displays: Flexible displays are one amongst the foremost significant technological breakthroughs of the last decade.
9. 5G Obscuring Reality: 5G is that the first generation of cellular network technology designed with IoT application in mind and can make an enormous difference.
10. Sensor Innovation: Billions of interconnected IoT Devices with sensors would allow remote data gathering and interaction at a scale.

IOT IN 21st CENTURY

Today's world may be a world dominated by digital technology[5], during which IoT plays a prominent role. So as to offer smart performances in every task it's developed an ecosystem that links many systems. The expansion of IoT has created new evolution of cell phones, home and other embedded applications that are all connected to the web. They need excellently integrated human communication in ways we never expected before.

CHALLENGES OF IOT IN 2020

Many IoT Systems are poorly designed and implemented, using diverse protocols and technologies that create complex configurations. Some of the challenges[6] faced in adopting and implementing IoT in 2020 are:

1. More Human-IoT Interaction: The core component of IoT Technology is Sensor data, but most of the sensors which are in use today monitors the machinery or tech infrastructure. Throughout 2019, employees are expected to interact more with IoT. Performance management software plays a serious role within the workplace. Moreover, IoT can enable more

comprehensive data gathering and better analysis of employee performance. The year have seen discussion about what varieties of employee monitoring were optimal and ethical; is that the added stress that came with increased monitoring well worth the analytics provided? Do employees perform better when not addressing the anxiety of automated monitoring? And what factors can IoT technology even measure? Automated employee monitoring certainly has appeal for management, but the benefits and drawbacks of the technology isn't clear.

2. Artificial Intelligence Plays a Central Role: the best impact of IoT is it changed our view of computing. The thinking in terms of centralized servers is now changed to terms that describe the distributive nature of contemporary technology. Making the foremost out of information, and also the understanding on a basic level of how computer science is required through computer assistance for contemporary infrastructure functions. the foremost cloud vendors are looking forward to compete supported their computer science capabilities. Through AI Algorithms in machine learning and deep learning great incumbent players and startups hope to extend their market share, allowing businesses to extract more value out of their huge volumes of information.

3. New Terminology: one amongst the foremost complaints about IoT is its confusing nature. How specific implementations are being employed was the most terminology which was utilized by the businesses and also the tech press in 2019. It's important for people who use IoT technology to be told new terminology when making decisions. It's said that if the precision is provided better, clear landscape are going to be obtained.

4. More Voice Technology: it's an ascendant technology for years now, and enhancements in accuracy are astounding. Even more importantly, people are getting more aware of interacting with digital assistance and other voice recognition technologies, and corporations are feeling better-off asking their customers to talk with digital assistants. Only through online connections we can process the voice data and microphone, more IoT devices offers voice assistance in 2019. Employees may be at the foremost a part of this change; companies might need invested in voice recognition to stay the worker hands free for other tasks, rather than allowing employees to interact through a computer. Again, problems with privacy might come to the leading position.

5. IoT publicly Spaces: Companies stands first in adopting the IoT technology. The IoT technology is compelling in cities so as to extend its potential benefits. Cities of all sizes are exploring how IoT technology can cause better efficiency and safety, and this infrastructure has increasingly extended 2019. In bringing IoT Technology to traffic lights, transportation department would lead this transformation. Public transportation through IoT could be a significant factor expected to play a job in smart city development under 5G technologies. Fast 5G rollouts will spur prompt development, while delays might slow the pace of change.

6. More Movement to the Edge: Edge computing is on the increase in recent years, but the growing scope of IoT technology will make this move even higher. The most important two factors that will cause this change: affordable price of the powerful edge devices and also the stress of the centralized infrastructure. Moreover, data management is formed simple through

Edge computing. It's more expected that the tech will shift between centralized approaches and more distributed, edge- powered approaches. Over the approaching years and even decades, it's likely that tech will shift between centralized approaches and more distributed edge-powered approaches. Because it happened in 2019 and now in 2020s, it's clearly seen that edge computing is leading the way now likewise as within the years to come back. 2019 and early the 2020s, however, the edge computing will definitely plays the vital role.

DEVELOPMENT IN IOT ARCHITECTURE

A “thing” is an object connected with sensors that gather data which is able to be transferred over a network and actuators that allow things to act (for example, to modify on or off the sunshine, to open or close a door, to extend or decrease engine rotation speed and more). Fig.1 shows the various components of IoT architecture [7][8][9].

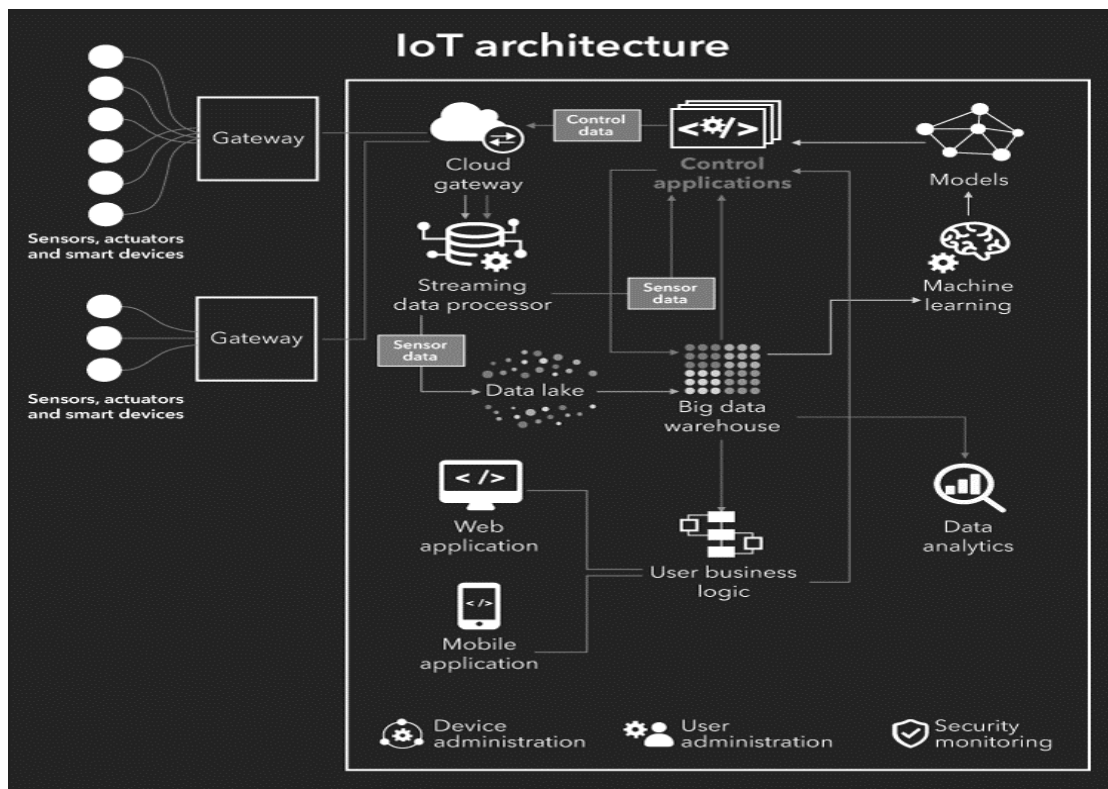


Fig 1 IoT Architecture

Gateways: Data goes from things to the cloud and the other way around through the gateways. A gateway provides connectivity between things and also the cloud a part of the IoT solution, enables data pre-processing and filtering before moving it to the cloud (to reduce the quantity of information for detailed processing and storing) and transmits control commands going from the cloud to things. Things then execute commands using their actuators.

Cloud gateway: It facilitates data compression and secure data transmission between field gateways and cloud IoT servers. It also ensures compatibility with various protocols and

communicates with field gateways using different protocols counting on what protocol is supported by gateways.

Streaming data processor: It ensures effective transition of computer file to an information lake and control applications. No data is occasionally lost or corrupted.

Data Lake: an information lake is employed for storing the info generated by connected devices in its natural format. Big data comes in "batches" or in "streams". When the info is required for meaningful insights it's extracted from an information lake and loaded to a giant data warehouse.

Big data warehouse: Filtered and pre-processed data needed for meaningful insights is extracted from an information lake to a giant data warehouse. A giant data warehouse contains only cleaned, structured and matched data (compared to an information lake which contains all forms of data generated by sensors). Also, data warehouse stores context information about things and sensors (for example, where sensors are installed) and also the commands control applications send to things.

Data analytics: Data analysts can use data from the large data warehouse to seek out trends and gain actionable insights. When analysed (and in many cases – visualized in schemes, diagrams, infographics) big data show, as an example, the performance of devices, help identify inefficiencies and figure out the ways to enhance an IoT system (make it more reliable, more customer-oriented). Also, the correlations and patterns found manually can further contribute to making algorithms for control applications.

Machine learning and also the models ML generates: With machine learning, there's a chance to make more precise and more efficient models for control applications. Models are regularly updated (for example, once in a very week or once in a very month) supported the historical data accumulated in a very big data warehouse. When the applicability and efficiency of recent models are tested and approved by data analysts, new models are employed by control applications.

Control Applications send automatic commands and alerts to actuators, for example:

- Windows of a wise home can receive an automatic command to open or close counting on the forecasts taken from the weather service.
- When sensors show that the soil is dry, watering systems get an automatic command to water plants.
- Sensors help monitor the state of business equipment, and just in case of a pre-failure situation, an IoT system generates and sends automatic notifications to field engineers.

The commands sent by control apps to actuators are also additionally stored in a very big data warehouse. this could help investigate problematic cases (for example, an effect app sends commands, but they're not performed by actuators – then connectivity, gateways and actuators

have to be checked). On the opposite side, storing commands from control apps may contribute to security, as an IoT system can identify that some commands are too strange or are available in too big amounts which can evidence security breaches (as well as other problems which require investigation and corrective measures). Control applications is either rule-based or machine-learning based. Within the first case, control apps work in keeping with the foundations stated by specialists. Within the second case, control apps are using models which are regularly updated (once in a very week, once in a very month counting on the specifics of an IoT system) with the historical data stored in a very big data warehouse. Although control apps ensure better automation of an IoT system, there should be always an option for users to influence the behaviour of such applications (for example, in cases of emergency or when it seems that an IoT system is badly tuned to perform certain actions).

User applications: are software components of an IoT system which enables the connection of users to an IoT system and offers the choices to watch and control their smart things (while they're connected to a network of comparable things, as an example, homes or cars and controlled by a central system). With a mobile or web app, users can monitor the state of their things, send commands to regulate applications, set the choices of automatic behaviour (automatic notifications and actions when certain data comes from sensors).

Device management: to make sure sufficient functioning of IoT devices, it's far not enough to put in them and let things go their way. There are some procedures required to manage the performance of connected devices (facilitate the interaction between devices; ensure secure data transmission and more):

- Device identification to ascertain the identity of the device to make sure that it's a real device with trusted software transmitting reliable data.
- Configuration and control to tune devices in keeping with the needs of an IoT system. Some parameters have to be written once a tool is installed (for example, unique device ID). Other settings might need updates (for example, the time between sending messages with data)
- Monitoring and diagnostics to make sure smooth and secure performance of each device in a very network and reduce the danger of breakdowns.
- Software updates and maintenance to feature functionality, fix bugs, address security vulnerabilities. User management alongside with device management, it's important to produce control over the users having access to an IoT system. User management involves identifying users, their roles, access levels and ownership in a very system. It includes such options as adding and removing users, managing user settings, controlling access of assorted users to certain information, additionally because the permission to perform certain operations within a system, controlling and recording user activities and more. Security monitoring Security is one in all the highest concerns within the internet of things. Connected things produce huge volumes of information, which require be securely transmitting and guarding from cyber-criminals. Another side is that the items connected to the web are entry points for villains. What's more, cyber-criminals can get the access to the "brain" of the full IoT system and take

hold of it. To prevent such problems, it is sensible to log and analyse the commands sent by control applications to things, monitor the actions of users and store of these data within the cloud. With such an approach, it's possible to deal with security breaches at the earliest stages and take measures to scale back their influence on an IoT system (for example, block certain commands coming from control applications). Also, it's possible to spot the patterns of suspicious behaviour, store these samples and compare them with the logs generated by IoT systems to stop potential penetrations and minimize their impact on an IoT system.

RESULTS AND DISCUSSIONS

The statistical analysis on IoT for Smart India [10][11][12][13][14] reveals that IoT will be ruling the whole world, provided technical enhancements are done to prevent technical breach by the cyber criminals at the earliest stages to scale up the utilization of IoT systems for building a Smart India. Spotting of of suspicious behaviour to stop potential penetrations by the intruders to minimize their impact on an IoT system and improve their utilization in the Smart World.

CONCLUSION

Internet of things has been designed as a network of interconnected things/devices, in which devices have independent processing and communication capabilities as well as different storage capacity. IoT has conquered most of the industry and hence known as Industrial Revolution 4.0. IoT statistics reveals the critical role of tech-innovations in the organization of economy, healthcare, marketing, banking & finance, as well as government. It is analyzed that the increased penetration of affordable devices, combined with cloud computing, analytics and rising consumer expectations is driving the rapid growth of the IOT market making it the utmost power of India. India stands in the top in the census taken for the count of IoT experts in the country around the world. Therefore, it is clearly highlighted that IoT is playing a major role in transforming India as Smart India.

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