

SECURITY CHALLENGES AND FUTURE APPLICATIONS OF SMART DEVICES BASED ON INTERNET OF THINGS

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Abstract : With the Internet of Things (IoT) step by step developing as the ensuing period of the advancement of the Internet, it gets critical to perceive the different expected areas for the use of IoT and the research challenges that are related with these applications—going from brilliant smart cities, to health care services, smart agriculture, coordinations and retail. IoT is required to invade into for all intents and purposes for all parts of the day by day life. Even though the current IoT empowering technologies have enormously improved in the ongoing years, there are as yet various issues that require consideration. Since the IoT idea results from heterogeneous technologies, many research challenges will undoubtedly emerge. The way that IoT is so sweeping and influences all parts of our lives makes it a considerable research theme for concentrates in different related fields, for example, data technology and computer science. Accordingly, IoT is preparing for new elements of research to be completed. This paper presents the ongoing advancement of IoT technologies and examines future applications and research challenges.

Keywords: Internet of Things (IoT), Smart devices, security,

I. INTRODUCTION

The Internet of Things (IoT), now and again alluded to as the Internet of Objects will make a massive difference, including ourselves. The Internet affects education, communication, business, science, government, and humanity [1]. The Internet is one of the most significant and incredible manifestations in all of humanity's set of experiences, and now with the idea of the Internet of things, the Internet turns out to be more significant to have intelligent life in each viewpoint. Smart devices, smartphones, smart cars, smart homes, smart cities, smart world. These ideas have been embraced for a long time. Accomplishing these objectives has been examined, until now, by numerous assorted and often disjoint research networks. Five such conspicuous research networks are Internet of Things (IoT), Mobile Computing (MC), Pervasive Computing (PC), Wireless Sensor Networks (WSN), and most as of late, Cyber-Physical Systems (CPS). Be that as it may, as technology and arrangements progress in every one of these fields, there are an expanding cover and consolidation of standards and research questions. In this manner, the fundamental objective of the Internet of Things is to cause it feasible for objects to be

associated with different objects, people, whenever or anyplace utilizing any network, way or service. The Internet of Things (IoT) is bit by bit being viewed as the resulting stage in Internet development.

IoT will cause it feasible for standard devices to be connected to the Internet to accomplish endless dissimilar objectives. Right now, an expected number of just 0.6% of devices that can be essential for IoT has been associated so far. Notwithstanding, continuously 2020, all things considered, more than 50 billion devices will have an internet association. The Internet of Things (IoT) is relied upon to keep extending its range as relates to the number of devices and capacities, which it can run. This is apparent from the vagueness in the statement of "Things" which makes it hard to diagram the ever-developing restrictions of the IoT[2]. While business achievement keeps on appearing, the IoT continually offers a virtually boundless flexibility of chances, in businesses as well as in research. As needs are, the understudy tends to the different likely zones for the use of IoT areas and the research challenges that are related to these applications. As the Internet keeps on advancing, it has gotten more than a primary network of PCs, but instead a network of

different devices, while IoT fills in as a network of different "associated" devices a network of networks [3], as appeared in Fig. 1. These days, devices like smartphones, vehicles, modern systems, cameras, toys, structures, home appliances, industrial systems, and innumerable others would all be able to share data over the Internet.

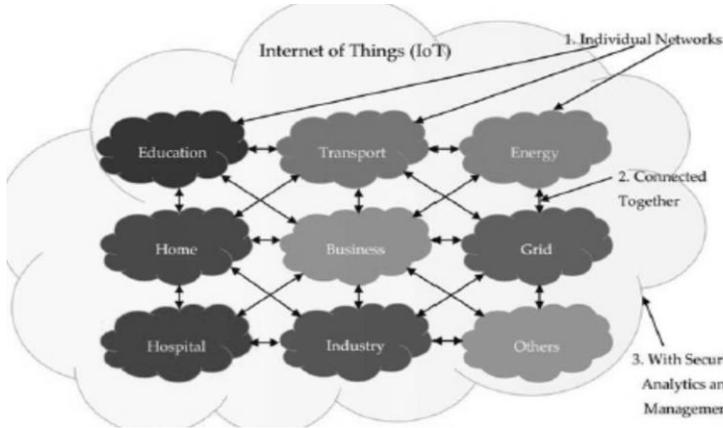


Figure1: IoT can be viewed as a Network of Networks

II. RESEARCH CHALLENGES

For all the above applications of IoT, there must be a reasonable possibility into the various spaces to learn the achievement of specific applications and their usefulness. Likewise, with some other type of technology or advancement, IoT has its difficulties and suggestions that must be figured out to empower mass selection[3]. Even though the ebb and flow IoT empowering technologies have significantly improved in the ongoing years, there are as yet various issues that require consideration, henceforth preparing for new components of research to be done.

1. Security and Privacy

Security attacks are dangerous for the IoT on account of the insignificant limit of devices is being utilized, the physical availability to sensors, hardware's and objects, and simplicity in a network of the systems, including the way that most devices will impart wirelessly. The security issue is additionally aggravated because transient and perpetual random disappointments are typical, and disappointments are weaknesses that can be misused by assailants. Notwithstanding, the significant excess that is accessible makes the potential for planning applications to keep on offering their predefined types

of assistance even despite disappointments. To meet good framework prerequisites that get from enduring and unattended activity, IoT applications must have the option to keep on working sufficiently within sight of and to recuperate successfully from security attacks. Arrangements may require downloading new code and this itself is available to security attacks[4]. The framework should likewise have the option to adjust to new attacks unpredicted when the framework was first introduced, when the framework works with a base degree of help, including substantial assault recognition capacities. When an assault is identified, then the response to it happens, without help from anyone else recuperating.

Notwithstanding the security and assurance parts of the Internet such as communications privacy, the and dependability of communication partners, and message trustworthiness, different prerequisites would likewise be significant in an Internet of Things. The pervasiveness and cooperations associated with IoT will give numerous comforts and helpful services for people, yet besides, make numerous occasions to abuse protection. The Internet of Things presents some extraordinary difficulties with regards to security, and a ton of that goes a long ways past the information protection gives that exist as of now. A lot of this is a result of the difficulty coordinating devices into the conditions without individuals utilizing them intentionally[5]. This is turning out to be considerably more predominant with regards to shopper devices, for example, GPS beacons for cars and telephones and additionally smart TVs. Indeed, your TV will before long be smarter than you. Lowering, correct? Vision highlights and voice acknowledgement are presently being coordinated into smart TVs. These highlights can listen ceaselessly to discussions or search for action and communicate information specifically to cloud services for processing.

2. Processing, Analysis and Management of Data

The procedure for preparing, analysis and data the board is colossally challenging a result of the heterogeneous idea of IoT, and the enormous size of data gathered, especially in this period of Big Data. At present, most systems use robust systems in offloading data and doing computationally escalated assignments on a worldwide cloud stage. In any case, there is a steady worry about customary cloud structures not being

compelling as far as moving the gigantic volumes of data that are delivered and devoured by IoT empowered devices and to be capable further help the going with the computational burden and at the same time meet planning imperative[6]. Data analysis and its setting not just assumes a critical part in the achievement of IoT, it likewise presents significant difficulties. Whenever data has been gathered, it must be utilized brilliantly to accomplish smart IoT capacities. Likewise, the advancement of machine learning strategies and artificial intelligence algorithms, resultant from neural works, genetic algorithms, developmental algorithms, and numerous other artificial intelligence systems are fundamental in accomplishing mechanized dynamic.

3. Better Connectivity

Machine-to-machine communication has a few novel qualities: the data rate is often lower, the data from various sensors or at various time steps may have stable connections, and a few messages do not need ongoing conveyance. Like this, one way to deal with these issues is to shape the bunches of machines. Rather than speaks with the base station straightforwardly, machines converse with close-by group head, which like this give to the base station. This will lessen the machine transmission power demand and increment spatial reuse of the range[7]. Another chance is to meld data or eliminate the excess of the data, e.g., through appropriated coding, to decrease bandwidth use additionally. Second, many associated devices are mobile; for example, sensors introduce vehicles. These sensors not just need to speak with different sensors through intra-vehicle networks, yet additionally between vehicle networks. Existing radios no doubt fail to meet expectations in on-street wireless channels. To give reliable vehicle-to-vehicle communication, we should initially examine the vehicle portability display and then build up the ideal communication protocols dependent on the channel model.

4. Monitoring and Sensing

Regardless of whether technologies worried about monitoring and sensing have gained colossal ground, they are continually developing especially zeroing in on the energy effectiveness and structure viewpoint. Sensors and labels are ordinarily expected to be dynamic continually to acquire quick data; this angle makes it essential for energy effectiveness, particularly in lifetime expansion[8]. At the same time, new advances in

nanotechnology/biotechnology and scaling down have permitted the improvement of actuators and sensors at the Nano-scale.

III. POTENTIAL APPLICATION DOMAINS OF IOT

Potential applications of the Internet of Things are various as well as very different as they pervade into for all intents and purposes for all parts of everyday life of people, foundations, and society. As per, the applications of IoT cover vast regions including fabricating or the industrial sector, health sector, agriculture, smart cities, security, etc.

1. Smart Cities

As per the IoT assumes a vital function in improving the smartness of cities and upgrading general foundation. Some of IoT application territories in making smart cities incorporate insightful transportation systems, smart buildings, traffic congestion, waste management, smart lighting, smart parking, and urban maps. This may incorporate various functionalities, for example, monitoring accessible parking spots inside the city, monitoring vibrations just as secular states of scaffolds and structures, setting up sound monitoring devices in touchy pieces of cities, just as monitoring the degrees of walkers and vehicles. Artificial Intelligence (AI) empowered IoT can be used to monitor, control and diminish gridlocks in Smart Cities. Additionally, IoT permits the establishment of savvy and climate versatile road lighting and identification waste and waste compartments by keeping tabs of refuse assortment plans. Utilization of IoT to accomplish smart cities would require utilizing radio frequency identification and sensors. A portion of the generally evolved applications around there is the Aware Home and the Smart Santander functionalities[9]. In the United States, some significant cities like Boston have plans on the best way to actualize the Internet of Things in the more significant part of their systems going from their parking meters, streetlights, sprinkler systems, and sewage grates are thoroughly planned to be interlinked and associated with the Internet.

2. Healthcare

Most healthcare systems in numerous nations are wasteful, slow and inclined to blunder. This can undoubtedly be changed since the healthcare sector depends on various exercises and devices that can be automated and improved through technology. Different technology that can encourage different tasks like report sharing to numerous people and areas, record keeping and apportioning meds would go far in changing the healthcare sector. A great deal of advantages that IoT application offers in the healthcare sector is generally classified into the following of patients, staff, and objects, distinguishing, just as confirming people, and the automatic social occasion of data and sense. Medical clinic work process can be altogether improved once patients stream is followed. Application domains in this sector incorporate; having the option to monitor a patient's consistency with remedies, telemedicine arrangements, and alarms for patients' prosperity. In this manner, sensors can be applied to outpatient and inpatient patients, dental Bluetooth devices and toothbrushes that can give data after they are utilized and patient's surveillance[10]. Different components of IoT in this limit incorporate RFID, Bluetooth, and WiFi, among others.

3. Smart Agriculture and Water Management

IoT can reinforce and improve the agriculture sector through analyzing soil dampness and on account of vineyards, monitoring the storage compartment width. IoT would permit to control and save the number of nutrients found in horticultural items and manage microclimate conditions to take advantage of the creation of vegetables and products of the soil quality. Besides, contemplating climate conditions permits gauging of ice data, dry season, wind changes, downpour or day off, controlling temperature and humidity levels to forestall parasite just as other microbial pollutants. Water the management, the part of IoT includes contemplating water appropriateness in oceans and streams for both drinking and agriculture use, identifying pressure varieties in lines, and fluid presence outside tanks just as monitoring levels of water variety in dams, waterways and stores[11]. These IoT applications use Wireless sensor networks. Instances of existing IoT applications in these domains include; SiSviA, GBROOS, and SEMAT.

4. Smart Living

In this domain, IoT can be applied in controller devices whereby one can distantly turn apparatuses on and off consequently forestalling mishaps just as sparing energy. Other smart home apparatuses incorporate refrigerators fitted with LCD (Liquid Crystal Display) screens.

Empowering one to realize what is accessible inside, what has overstayed and is nearly lapsing just as what should be restocked. This data can likewise be connected to a smartphone application empowering one to get to it when outside the house and this way, purchase what is required. Besides, clothes washers can permit one to monitor clothing distantly[12]. Moreover, a broad scope of kitchen devices can be interfaced through a smartphone, consequently making it conceivable to change temperature, like in the case of an oven.

5. Smart Environment

The environment includes a fundamental function inside all parts of life, from individuals to humans, birds, animals and additionally plants, are influenced by an unhealthy environment somehow. There have been various endeavours to establish a healthy environment as far as taking out contamination and diminishing wastage of assets, however, the presence of businesses, just as transportations squanders combined with foolish and destructive human activities are regular spot components which reliably harm the environment. Subsequently, the environment requires smart and imaginative approaches to help in monitoring and overseeing waste, which gives many data that powers governments to set up systems that will ensure the environment. Smart environment procedures coordination with IoT technology ought to be made for sensing, following an appraisal of objects of the environment that offer potential advantages in accomplishing a useful life and a green world. The IoT technology permits noticing and overseeing of air quality through data assortment from far off sensors across cities and giving nonstop geographic inclusion to achieve better methods of overseeing gridlocks in significant cities.

Moreover, IoT technology can be applied in estimating contamination levels in water and subsequently illuminate choices on water utilization. In squander the board, which comprises of different sorts of waste, similar to synthetic compounds and poisons being inconvenient to the environment

and people, animals, and plants too, IoT can likewise be applied. This can be accomplished by environmental insurance by methods for controlling industrial contamination through close monitoring, and the executive's systems joined with oversight notwithstanding dynamic networks.

IV. CONCLUSION

The IoT can best be portrayed as a CAS (Complex Adaptive System) that will keep on advancing henceforth requiring new and imaginative types of software designing, systems designing, venture the board, just as various controls to create it further and oversee it the coming years. A coordinated exertion is needed to move the business past the beginning phases of market improvement towards development, driven by a common understanding of the particular idea of the chance. This market has specific attributes in the territories of service circulation, business and charging models, abilities needed to convey IoT services, and the varying demands these services will put on mobile networks. Associating those smart devices to the web has likewise begun occurring, even though at a more slow rate. As increasingly more research studies are directed, new measurements to the IoT measures, technologies included and the objects that can be associated, keep on arising, further clearing a route for substantially more application functionalities of IoT. The way that IoT is so extensive and influences all aspects of our lives makes it a considerable research topic for studies in different related fields, for example, information technology and software engineering.

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