

An Analysis of Iot Based Smart Cities

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ABSTRACT

It is known that IoT can help in building smart cities and smart homes that is the reason, throughout the world and even in countries like India, there is a lot of focus on building smart cities. Of course, the scope of smart cities in every country is different and the scope again depends on the priority areas of each of them and their government. Now for example in India, since the last few years, there have been a couple of cities that have been identified and phase-wise these cities have been given funds to build or to transform them as smart cities. So, when it is being talked about smart cities; in addition to the regular infrastructure that is there in any city, for example, the urban infrastructure consisting of office buildings residential areas, hospitals, schools, transportation, police and so on. Something advanced also needed in addition to make the cities smart. In this paper that advancement i.e., IoT had been described.

Keyword: Internet of Things (IoT), Smart Cities, Information and Communication Technologies (ICT)

I. INTRODUCTION

IoT is the platform in which devices are made connected through the internet for ease in the working of the system [1]. The security of the IoT devices is also needed because in today word max of the data are communicated through the internet [2-5]. So the internet and internet based devices are going to be part of daily life. Smart means that it is in terms of the services that are given to the respective stakeholders of these cities. So, citizens can do things in a better manner in an improved manner than usual and that is made possible with the help of nothing, but the ICT technologies which also includes electronics embedded and different other advanced topologies in electrical sciences and so on [6]. So, computers and electronics put together can make these cities smart.



Fig 1: Smart City System

II. HUMAN-SMART CITY ANALOGY

In a smart city, there is an urban system which uses different ICT tools as shown in fig 3, which makes the infrastructure very interactive, efficient and accessible in an easier manner than before you know it; it should be easily accessible infrastructure and the need for smart cities arose due to different things. There is an ever-growing urban population throughout the world it is not limited to any country, but throughout the world and at the same time the natural resources like coal are depleting at a fast rate. And also at the same time there is a change in climate change in environment throughout.

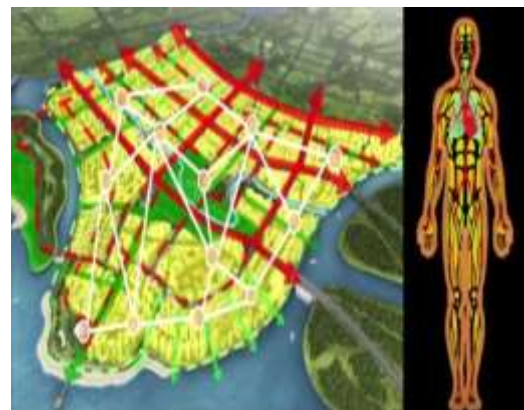


Fig 2 : Human- Smart City Analogy



Fig 3 : Connectivity by ICT Tools.

So, all these necessitate the building of smart cities using advanced ICT tools. There is an analogy when we talk about a human-human have the skeleton the skin, different types of organs, brains, nerves, sensory organs cognition and so on, in the smart city as well in the same way has buildings, industries, people transportation, hospital, police, banks schools [7]. So, these are there, but on top of that if there is a human with skeleton skin and organs, but no brains no nerves no sensory organs no cognition, then there will no life in that human. So, the same analogy can be drawn you know analogously that in a smart city if you do not have embedded intelligent communication network sensors and software embedded in these different components and infrastructure of the city, the existing cities also do not have any life. So, to bring in life to the existing cities having buildings, industries, transportation, police, banks etcetera. You need to embed ICT which includes ubiquity in embedded intelligence, digital communication networks, sensors, actuators and different software smartly doing different things making these different devices to act and so on.

These are some of the application focus areas for having a smart economy because of the ever increasing competitiveness; it needs to improve the infrastructure and the economy to make it smart. So, it is also need to improve citizen participation in any good governance with the help of the ICT tools [8-9]. It is also necessarily need to make the social and human capital smarter by giving them different technologies and tools. ICT tools can be used for smart mobility to improve transportation. So, smart environment you know. To make your environment smart, there should be less harmful or toxic gas emissions or other sorts of waste disposals. These should be done in a smart without basically effecting the environment any and in a way conserving the natural resources which would improve the overall quality of life of the citizens. So, these are some of the application focus areas of a smart city.

III. COMPONENTS OF SMART CITY

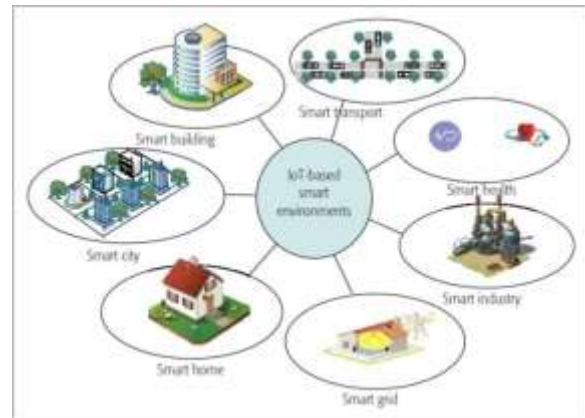


Fig 4 : Components of Smart City

A. SMART ECONOMY

For a smart city, one of the most important things is the smart economy. So, the economy must be improved over what already exists. So, let us say that in any economy what do it is needed in addition to the existing economic infrastructure like industry of different types and different other economic domains including even like schools, hospitals, etc. also, by involving the growth of startups. The different technologies all of these have to be there and they have to be interconnected with different other components. So, they all have to be interconnected inter-networked together not just at the connectivity level, but. So, this connectivity must be there. So, you know different types of information with different types of services are made available to each of these different components in a smart manner. So, they should be able to get these services from the different components they would be participating to improve the quality of fulfillment of the use case.

Under governance, there are the core of the government bodies, the government departments, and the citizens. So, these government agencies citizens and officials government officials now besides you have all these peripheral ones like banking, fin, let us say that the officials are not only going to get connected to these government agencies and citizens, but also to the public services to the emergency services to the banking to finances you know surveillance citizens you know. So, all these different types of interconnectivity are going to be there [10]. So, you have to make it possible to build a smart government system. There are citizens that at the transportation, resident, educational and official level that has to be identified intelligently with the help of cognition

and with the help of the different software the intelligence that is embedded into the system to get the best services.

B. SMART MOBILITY

Smart mobility likewise in addition to the population citizens has localities and so on interconnectivity with other peripheral components like vehicular transportation such as transportation, railways, airways, electric vehicles and so on. there is a concern about this can be understood by an example let's say a person wants to go to a city from point a to point b not just in the city we can even go from one city to another city as well one city to another city [11]. Now, there should be the information available in such a way he will just get I want to book a train from city x to city y or point x in a city to point y in a city and let us say that the road that he is going to take is going to be very much congested or it is going to be very expensive that particular route is going to be very expensive or maybe having some difficulties, but here are some ways by which he can go very easily instead of taking a train, so, if the information of all transportation links, only he can get to about all stuff. Further let's say he had taken a bus or electric vehicle, if there any trouble happening the route which have to be connected with the police and the emergency vehicles so that any accident can be avoided and response team should be able to get information on the fly, they should be able to get information and then the action also has to initiate with the help of these tools in a smart manner.

there should be a smart environment where in addition to the government agencies' localities population, there are components like waste collection and disposal, agriculture, forest monitoring, pollution monitoring, disaster management, green constructions, smart energy, etc all these are internetworked together.

C. SMART HOME

Smart home where there is a water tap will be turned off automatically it will be turned off maybe with the help of ICT tools whenever it is not being used may be accidentally if I have turned on it will be turned off similarly with the fuel consumption or conservation as well. Security and safety are very much paramount in a smart home for the prevention of burglars from entering into the house and so on. So, like that actually, there are different other types of benefits of having a smart home.

D. SMART PARKING

Smart parking lots are very interesting because in the city and particularly when we are going into the downtown areas or the central areas of a city typically parking is a huge problem. So, sometimes it might so happen that in some places do not have any parking spot at all and maybe there are few other parking spots parking lots in the city which are vacant or relatively vacant and to get this information until physically going there and get this information, but you know that is infeasible. However, if we have a smart parking solution in a city then one can from the mobile device inside the car one can get access to this information about which parking slots are available which ones are not and dynamically that information can be updated and made available to the users and other things like autorotation of vehicles to empty slots empty parking lots. Auto charging services which are provided detection of vacant lots in the parking lot and so on.

E. SMART VEHICLES

Smart vehicles with respect to assistance even to drivers during bad weather, there will be low visibility condition and the vehicles would be assisted about how to drive ahead then there are different ways the routes that can be taken from a particular point to the destination and so also on detection of bad driving by patterns or driving under the influence of substances the vehicle should be alerting the user of the vehicle and not only the driver may be the other corresponding stakeholders like police or the respective dignitary bodies, auto alert generation, if there is accident auto alerts will be generated and will be sent to the police. there should be a self diagnostics system in the vehicle so that if there is something wrong with any component of the vehicle, automatically it will diagnose and that information would be made available to the user of the vehicle.

F. SMART HEALTH

Smart health with low-cost portable diagnostic by medical diagnostic kits made available, also remote checkups and diagnosis would be made possible on-body sensors for effortless and accurate health monitoring for use by the patients who need this kind of care [12]. Auto alert generation in case of emergency medical episodes like heart attacks, etc, etc automatically the emergency persons in the hospital

will be made available and that again is on the basis of subscription there might be several different hospitals with which the patient might get connected, but only to the hospitals with which the patient has a subscription. So, they will be getting notified and the emergency vehicles are going to the ambulances going to come to the home of the patient automatically without even having them to be informed.

Pollution and calamity monitoring for whether or manmade based calamities alert generation in case of threshold pollutants in air or water. So, nowadays actually we have all these air monitoring systems, water monitoring systems these are in different situations. The air quality index or similar information being monitored in different cities of our country. So, a similar kind of thing is going in different countries as well. So, this sort of information from any point is essential for various purposes [13]. Let say from Kanpur, a person want to go to another place let say Delhi. So, before he travels he can check the air quality of that particular city; that means, Delhi and then he can make a decision about whether he should go there or not maybe even better would be if he can get an advisory about whether it is safe to travel to Delhi because of this air contamination and so on. So, this is just an example like this can be a similar kind of thing can be done concerning pollution and environment monitoring in any city.

G. SMART ENERGY

Smart energy like smart metering systems, programmable meters through which different things at your homes having differential usage being monitored and build accordingly in a smart kind of environment. Smart energy is allocation and distribution system incorporation of traditional and renewable sources of energy in the same grid.

H. SMART AGRICULTURE

Smart agriculture likewise automatic detection of plant water, stress monitoring of crops, health status auto-detection of crop infection, auto detection and application of fertilizers and pesticides, scheduling harvesting and arranging proper transfer of harvests to warehouses or markets [14]. So, these actually can be implemented for smart agriculture in which the agricultural field are monitored with the help of sensors and different other ICT tools and that information about the field cognition is made available to farmers so that

the farmers can decide accordingly about what to do next. So, like this, air-born and auto application of fertilizers is also possible with the help of offspring or pesticides autonomously in a smart environment of smart city.

So, different technological focus areas include data collection with the help of mobile devices, sensors, and architecture. the need for the transmission of the data after collection of data through the above means with the help of radios, networking topologies and so on, then the data that is collected and transmitted have to be stored locally and then remotely and as well in the form of data warehouses you know cloud storage and so on and they also again have to be analyzed to first of all cleaned analyzed and predicted.

IV. IOT CHALLENGES IN SMART CITIES

So, there are different IoT challenges in smart cities' i.e. security and privacies because all these different infrastructures are made available to all different types of citizens. So, this can expose citizens to different types of attacks [15]. Also, for the government, there are the most crucial documents which vulnerable to different types of attacks, privacy leaks and so on. So, that also has to be taken up concurrently while building smart cities and the same thing exposure to vulnerabilities multi-tenancy. The same devices are accessed by different tenants, by different users and that multi-tenancy induces the risk of data leakage, data privacy leakage, threat to data security and so on. Heterogeneity integration of varying hardware platforms and specifications is a very important challenge and IoT interoperability we spoke about some of these issues integration of different radio specifications integration of various software platforms and accommodation of varying user requirements are some of the different other heterogeneity and interoperability issues in IoT. reliable and unreliable communication due to vehicle mobility is not good similarly device failures can happen and that has to be taken care of large scale deployment also has different challenges. So, there would be delay due to large scale deployment itself and also due to mobility of deployed nodes and the distribution of devices can affect the monitoring tasks.



Fig 5: Challenges of IOT based smart cities

There are legal and social issues as well, for example, services that are based on user provided information may be subject to local or other national and international laws and that also has to be taken care of in a very smart way. Individuals and informed consent is required for using humans as data sources. big data issues are there as from various types of data media, text data and so on the data in huge volumes coming at high speeds. So, these have to be clean in a purified and that is a time-consuming process and then data is also has to be analyzed in real time to make sense out of it and the corresponding actuation has to happen. So, big data issues are there big data in a real-time environment is a very important and difficult challenge in sensor networks. The deployment of sensor networks in a smart city comes with different-different challenges. The choice of different sensors for sensing is also very crucial energy planning is very much required different.

V. CONCLUSION

IoT is ultimately a great idea for making smart cities which make it efficient and favorable. It ease the working system of smart cities. They are much more considered as the nervous system of coming future technology. This platform of internet connectivity will immediately create a smart ecosystem and having great potential in saving energy resources. With the proper established of IoT based smart cities, there will be large transformation occur in this world.

IoT can be implemented in smart cities but with full provisions of data security and problem like devices consuming different energy levels are going to schedule and has to do the duty cycling. These are all different issues in sensor networks. So, smart cities and smart homes focusing on smart cities specifically different

good use cases by which it is understand that smart cities is very much required and nothing else other than IoT and IoT constituent technologies can help in the building of smart cities and that is why there is so much of up search on not only research, but also deployment and investment on building smart cities throughout the world and there is lot of opportunity that is ahead in the building of smart cities.

REFERENCES

- [1] Ravi Khandelwal, Manish Kumar Mukhija, Satish Kumar Alaria, "Numerical Simulation and Performance Assessment of Improved Particle Swarm Optimization Based Request Scheduling in Edge Computing for IOT Applications", ", New Arch-International Journal Of Contemporary Architecture, vol-8, issue-2, pp. 155-169, 2021.
- [2] Swati Bhargava and Manish Mukhija, "Hide Image And Text Using Lsb, Dwt And Rsa Based On Image Steganography", ICTACT Journal On Image And Video Processing, Volume: 09, Issue: 03, pp. 1940-1946, Feb 2019.
- [3] Gaurav Kumar Soni, Himanshu Arora and Bhavesh Jain, "A Novel Image Encryption Technique Using Arnold Transform and Asymmetric RSA Algorithm", In. Springer International Conference on Artificial Intelligence: Advances and Applications 2019, Algorithm for Intelligence System, pp. 89-90, 2020.
- [4] Manish Kumar, Dr. Sunil Kumar, Dr. Harish Nagar. (2021). Enhanced Text and Image Security Using Combination of DCT Steganography, XOR Embedding and Arnold Transform . Design Engineering, 2021(3), 732 - 739.
- [5] H. Arora, G. K. Soni, R. K. Kushwaha and P. Prasoon, "Digital Image Security Based on the Hybrid Model of Image Hiding and Encryption," 2021 6th International Conference on Communication and Electronics Systems (ICES), pp. 1153-1157, 2021.
- [6] Sourabh Banga, Akash Rawat, Riya Ahuja, Mohd. Zaid, Yamini Goyal, "A Brief Survey on Personal Cloud Storage using Raspberry-Pi", Design Engineering, pp. 6767- 6774, 2021.
- [7] Monika Mehra, Manish Kumar, Anjali Mourya, Charu Sharma, "MERN stack Web Development", Journal Annals of R.S.C.B., ISSN: 1583-6258, pp. 11756-11761, Vol. 25, Issue 6, 2021.

- [8] Manish Mukhija, "A Resourceful Technique for virtual Machine Migration in Fog Computing", International Journal of Innovative Science and Research Technology, vol-6, issue-6, pp. 167-170, 2016.
- [9] Shachi Sharma, Krishna Kumar Sharma, Himanshu Arora, "A Natural Human-Machine Interaction via an Efficient Speech Recognition System", International Journal of Applied Information System (IJ AIS), vol-4, issue-9, pp- 2249-0868, 2012.
- [10] M. Pradhan, "Interoperability for Disaster Relief Operations in Smart City Environments," 2019 IEEE 5th World Forum on Internet of Things (WF-IoT), pp. 711-714, 2019.
- [11] P. Yadav and S. Vishwakarma, "Application of Internet of Things and Big Data towards a Smart City," 2018 3rd International Conference On Internet of Things: Smart Innovation and Usages (IoT-SIU), pp. 1-5, 2018.
- [12] C. Raj, C. Jain and W. Arif, "HEMAN: Health monitoring and nous: An IoT based e-health care system for remote telemedicine," 2017 International Conference on Wireless Communications, Signal Processing and Networking (WiSPNET), pp. 2115-2119, 2017.
- [13] V. Tripathi and F. Shakeel, "Monitoring Health Care System Using Internet of Things - An Immaculate Pairing," 2017 International Conference on Next Generation Computing and Information Systems (ICNGCIS), pp. 153-158, 2017.
- [14] Gaurav Kumar Soni, Sonam Gour, Mr. Kshitiz Agarwal, Aakash Sharma, Chandraveer Singh Shekhawat, Braj kishore sharma, " IOT Based Smart Agriculture Monitoring System", Design Engineering, Issue-6, pp. 2243- 2253, 2021.
- [15] S. Rhee, "Catalyzing the Internet of Things and smart cities: Global City Teams Challenge," 2016 1st International Workshop on Science of Smart City Operations and Platforms Engineering (SCOPE) in partnership with Global City Teams Challenge (GCTC) (SCOPE - GCTC), pp. 1-4, 2016.