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DESIGNING A FRAMEWORK USING IOT FOR SECURITY AND DATA PROTECTION IN SMART CITY

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ABSTRACT:

The exponential growth in the number of Internet-connected devices, from the most basic sensors to the most complex cloud servers, has formed the Internet of Things. Electronic and non-electronic "things" that are part of the Internet of Things include smart lamps, smart locks, IP cameras, thermostats, electronic appliances, alarm clocks, vending machines, and more. One feature that unites all IoT objects is their ability to connect to the internet and exchange data. A greater level of integration with the real world and a reduced requirement for human involvement are made possible by the network connection feature, which enables items to be remotely controlled through the already-existing network infrastructure. This paper is reflects designing a framework using IoT for security and Data protection in smart city.

KEYWORDS: electronic, Internet of Things (IoT), smart city, cloud servers, technologies

1.0 INTRODUCTION:

The Internet of Things (IoT) is shaped by the exponential increase in the number of Internet-connected devices, from the simplest of sensors to the most sophisticated of cloud servers. IoT "things" can be either electronic or non-electronic (e.g. smart bulbs, smart locks, IP cameras, thermostats, electronic appliances, alarm clocks, vending machines, and more). All things in the IoT share a common characteristic: they can all connect to the web and share information with one another. Thanks to the network connectivity function, objects may be remotely controlled via the already established network infrastructure, leading to a higher degree of integration with the actual world and less need for human interaction.

By leveraging its underlying technologies like pervasive computing, communication capacities, Internet protocols, and apps, the IoT converts inanimate items into sentient ones. We can live better, safer, and more secure lives with the help of smarter, more accessible objects that have been combined with sensors, electronics, and connectivity.

Cities are currently changing from computerized urban communities to shrewd urban communities, advanced or savvy urban areas that are more innovation arranged counterparts

of brilliant city ideas. A city progresses toward becoming "keen" when it is instrumented, interconnected, versatile, self-ruling, learning, self-repairing, and powerful. Parts of its foundation and offices are carefully associated and upgraded by utilizing ICT to convey administrations to their natives and different partners. The hypothesis of brilliant urban communities comprehended from the impression of innovations and segments has some correct properties inside the more extensive digital, advanced, keen, smart urban areas writings. Smart urban areas, or clever spaces all the more for the most part, allude to an extensive variety of electronic and computerized applications identified with advanced spaces of groups and urban communities, for instance savvy lattices, brilliant meters, and other framework for power, water supply, and waste administration. Advanced urban areas, got from computerized portrayal of urban areas, mean a computerized illustration of urban areas, and insightful urban areas, got from the new knowledge of urban communities that speak to aggregate and appropriated insight. As development has progressed, new classes of articles have been made in the electronic age, they have included telephones, radios, TVs, PCs, and PDAs. Correspondingly as with most new advancement, these contraptions tended to start incredibly expensive and well-ordered plummet in cost. Demand drives down expenses, and research prompts improvement and downsizing. In the end, it winds up observably possible and in addition achievable to fuse value that would as of now have required its own specific committed contraption inside another. So regardless of the way that a TV screen would at first have physically charged a receiving area, not solely are the present level screen sheets more traditionalist, however the development is pervasive to the point that a high assurance screen fit for demonstrating TV substance can be introduced into a door frame or a kitchen unit, and clearly, impressively tinier screens can find their way into music players and mobile phones. Likewise with PCs, it has ended up being so decrepit to make a comprehensively valuable microchip in contraptions that you're garments washer may contain a PC running Linux, the cash enroll at the general store may continue running on Windows, and your video player may run an interpretation of Apple's OS X. Nevertheless, as we've quite recently demonstrated, basic figuring power isn't a sufficient precondition for the Internet of Things. Or on the other hand perhaps, we are looking force associated from one point of view to electronic sensors and actuators which coordinate with this present reality and on the other to the Internet. Shockingly the quick sharing and getting ready of information with organizations or diverse purchasers is a colossal differentiator. A radical development of the present Internet into a Network of interconnected items that not just reaps data from the earth (detecting) and collaborates with the physical world (incitation/order/control), yet in addition utilizes existing Internet norms to give administrations to data exchange, investigation, applications and correspondences.

The smart city should have followings infrastructure in this city. This infrastructure will make the life easier in terms of services, security and safety. In this way the service provider as well as residents of the city will get more and more benefits. The following are the proposed infrastructure for the smart city model. This model is based on the Internet of Things (IoT) applications.

1. Smart Home.

2. Smart Apartments.
3. Smart Traffic Control.
4. Smart Environment and Pollution Control.
5. Smart Power Grids
6. Smart Health Care.
7. Smart Transportations
8. Smart Highway Systems.
9. Smart Weather Monitoring System.
10. Smart Garbage Disposal System.
11. Smart Logistic System
12. Smart Water Purification and Distributions.
13. Smart Banking.
14. Smart Education System.
15. Smart Tube Railway Ticketing System.
16. Smart Plate form Ticketing System
17. Smart manufacturing and Industries

Figure 1 : Smart City Model

2. REVIEW OF LITERATURE

Abbas Shah Syed (2021) Internet of Things (IoT) is a system that integrates different devices and technologies, removing the necessity of human intervention. This enables the capacity of having smart (or smarter) cities around the world. By hosting different technologies and allowing interactions between them, the internet of things has spearheaded the development of smart city systems for sustainable living, increased comfort and productivity for citizens. The IoT for Smart Cities has many different domains and draws upon various underlying systems for its operation. In this paper, we provide a holistic coverage of the Internet of Things in Smart Cities. We start by discussing the fundamental components that make up the IoT based Smart City landscape followed by the technologies that enable these domains to exist in terms of architectures utilized, networking technologies used as well as the Artificial Algorithms deployed in IoT based Smart City systems. This is then followed up by a review of the most prevalent practices and applications in various Smart City domains. Lastly, the challenges that deployment of IoT systems for smart cities encounter along with mitigation measures.

Szum, Katarzyna. (2021) Modern cities face many challenges related to globalisation, metropolisation and digitalisation. The smart city concept, which has been gaining popularity in recent years, is considered an answer to their needs. One of the paradigms of modern smart cities is the Internet of Things. This article aims to identify the main research directions and trends in the scientific literature in the field of Internet-of-Things-based smart cities. The author of the paper conducted a bibliometric analysis of publications from 2012–2021, collected from the Web of Science, Scopus and IEEE Xplore databases. The methodology includes: (i) the selection of databases and key words, (ii) defining search criteria, (iii) data export, creation of an aggregate database and record selection, and (iv) the analysis of the results and identification of the major research trends. The study involved 1019 publications. The last stage of the research process identified the leading countries, institutions, journals, and authors in terms of publication activity, as well as the most frequently occurring terms. The key word analysis allowed identifying five main research directions: IoT application domains in smart cities, IoT architecture for smart cities, energy, security and privacy and data. Within each area, the main research themes have been identified, and selected publications have been reviewed.

3. PROPOSED METHODOLOGY

3.1 APPROACH OF THE STUDY

In general, a city needs to confront various issues such as scarcity of the resources, inadequate and random infrastructure, shortage of electricity, water supply, volatility of pricing and human health, managing the existing resources and services, delivering on time medical facilities, preserving resources etc. Smart cities have the features to deliver the associated information on urban services to each resident, Khansari et al. (2014) and the citizen may also track the influence of resource use on the growth of the city. With an installation of this booming technology produced on the basis of the module would not only sort out the requirement to combat resource crisis but would also help to survive up as well as supply diverse ways of

comfort to the greatest care and availability. ICT gives the vital instruments in the growth of a city.

Figure 2 represents the rise of use of ICT for urban services in previous five years.

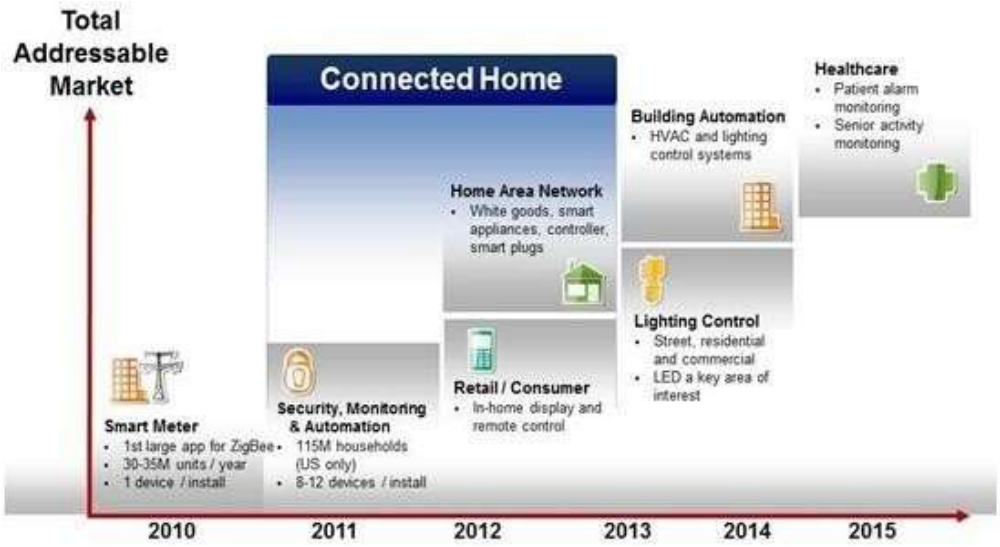

Figure 2: Application of ICT in urban services

Since the power supply is essential to the proper operation of these applications, IoT plays a crucial role in managing it by facilitating the connecting of devices and semi-peripherals in the module and so assisting in effective resource management.

One of the most pressing difficulties facing the smart city is the waste of energy caused by the unneeded operation of loads and the insufficient power supply mechanism. Kumar (2015). The current energy management methods use a "sense- analyze-respond" framework. Several sensors keep tabs on the state of the building and relay the information they've gathered to a central server in near real time. Information collected from the building's infrastructure and connected devices is processed and analysed by the server. Once the data has been analysed, the servers will provide commands to the automated load control devices. The job of neighborhood-wide sensing is complex and labor-intensive. On the other hand, gathering data, sending it to the server, and having the server process it is all complex and time-consuming endeavours. Extracting the required information from large volumes of heterogeneous data in real time is likewise a challenging challenge. Therefore, the following problems, some of which have only partial answers, must be resolved if smart energy management is to be implemented.

The following methodology will be used to implement the proposed solution:

Table 1: Discussion of three approaches has been taken to propose up the solution

APPROACH – I	How can we design a smart home that has the feature to collect, transmit and process entire neighbourhood data without increasing the overhead?

APPROACH – II	How to define the function that includes the energy usage of the individual devices of a home as whole?
APPROACH– III	What will be the way of implementation of the above-mentioned function to monitor and control the dynamic requirement of devices in a smart home?

Similar to the issue of electricity, the issue of water supply is a major obstacle to the growth of smart cities. The right kind of monitoring, which involves a lot of data on citizens' everyday activities, can help solve these issues. Traditional methods of surveillance are inadequate for the daily monitoring of such a big population; thus, we must instead rely on technology solutions. Home appliances and other comparable things can be monitored and controlled by an automated energy and water monitoring system. Moreover, the smart city's precious resource may be conserved thanks to these solutions.

And at last, a big worry was considered, as the wasteful method of irrigation constituted a major drain on the precious supply of water. According to the third module, which is described in chapter five, the primary focus is on the efficient use of water in the context of irrigation. Overuse of energy as a resource that, if conserved, might be highly useful, is contrasted with the issue of highway and high mast lighting operating outside their intended areas in chapter five.

3.2 PURPOSE OF THE STUDY

The ultimate objective of this research is to provide a technique that can lessen energy usage while storing the surplus for later use. Home energy efficiency is addressed, as is the decrease of energy use in big public networks like those used for street lighting, as part of the thesis's overarching goal. The research in this thesis also focuses on the issues of water irrigation with the goal of lowering water waste. The following three modules have been proposed to accomplish the goal. The modules were created with the whole picture in mind, and each separate level of the problem was addressed. i.e.

i. The domestic and commercial level that includes residential places such as hotels, homes, work area (offices) etc.

ii. Major is covering up a city, a town etc.

iii. The rural and bucolic area where irrigation practices are followed and traffic density are very less or occasional

Proposed a Framework to Monitor and Control the Energy Consumption by Home Appliances and Outdoors

i. Managing the operation of remotely located loads such as door lamps or garden lamps through time-based autonomous or over through android device

ii. Maintaining the temperature and humidity level as per the need and comfort and

cancelling the Air conditioner to reduce wastage of energy

iii. Turning off the load autonomously and activating them autonomously when presence of human detected over sensor

iv. Cooling sprinkler through moisture detector to prevent the water and energy wastage

Proposed a Method to Solve the Irrigation Problem in a Smart City

i. Maintaining security standard at public place

ii. Investigate and manage traffic rush through diversions

iii. Monitoring power theft

Proposed a Study to Prevent Water Wastage in Irrigation Practices

i. Management of water irrigation through advanced sensor-based operation

ii. Conserving energy by avoiding beyond point operation of Highway and High mast lamps

3.3 RESEARCH METHODOLOGY

Household appliances may be recognised and managed using LabVIEW. It keeps tabs on your home's electronics and turns off energy-hogging gadgets like fans, lights, and air conditioners while you're not there to save money. Figure below depicts a block schematic of the LabVIEW-enabled energy saving system. Given the scarcity of available electricity, ensuring a constant supply is a significant task. As a result, reducing waste is another strategy for keeping up with the rising power supply demand. According to research by Khansari et al. (2014), appropriate monitoring and feedback policies can cut energy use by 10-15% across a wide range of urban services.

LabVIEW is crucial in managing the control and acquiring the response signal from the sensor by acting as a GUI Graphical User Interface over the desktop. Home appliances may be recognised and managed by it. This article cites the following works: Dhivyya et al (2011). It keeps tabs on the electronics at home and, when nobody is there to use them, turns off the lights, fans, and other energy hogs to save money. Figure depicts a block schematic of the energy-saving system that may be controlled with LabVIEW. However, with fewer power sources available, maintaining a constant supply might be difficult. So, lowering power consumption is another technique for keeping up with the rising demand for electricity. According to research by Khansari et al., (2014), appropriate monitoring and feedback policies can cut energy use by 10-15% across a wide range of urban services.

Ultra-low power MSP43Dt7FDRR is controlled and programmed using the TI DSP development tool, which allows for efficient operation and management of sensor readings. The TI kit is used because it can operate over a single channel bus and tell the difference

between different frequencies measured by the discrete sensors.

A custom Arduino code has been used to handle and regulate the analogue and digital signal sampling of the sensors.

System architectures based on Trio Lab-View, TI development, and Arduino sketches have been utilised to conduct the research. Figure 3 provides an overall visual picture of the planned research. While the other two serve to connect devices to one another, LabVIEW is the key player in managing the connection between the user and the digital system through the creation of a graphical user interface. The system includes a traffic control module, an irrigation system module, and a highway lighting control module, among others. Additional research has made use of LabVIEW-enabled platforms.

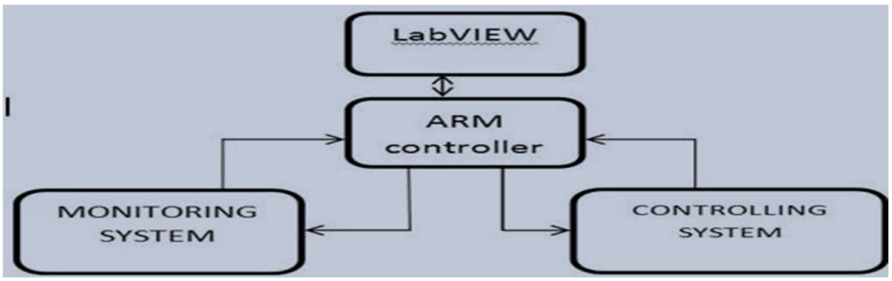

Figure 3 : Block diagram for the energy conservation system with LabView

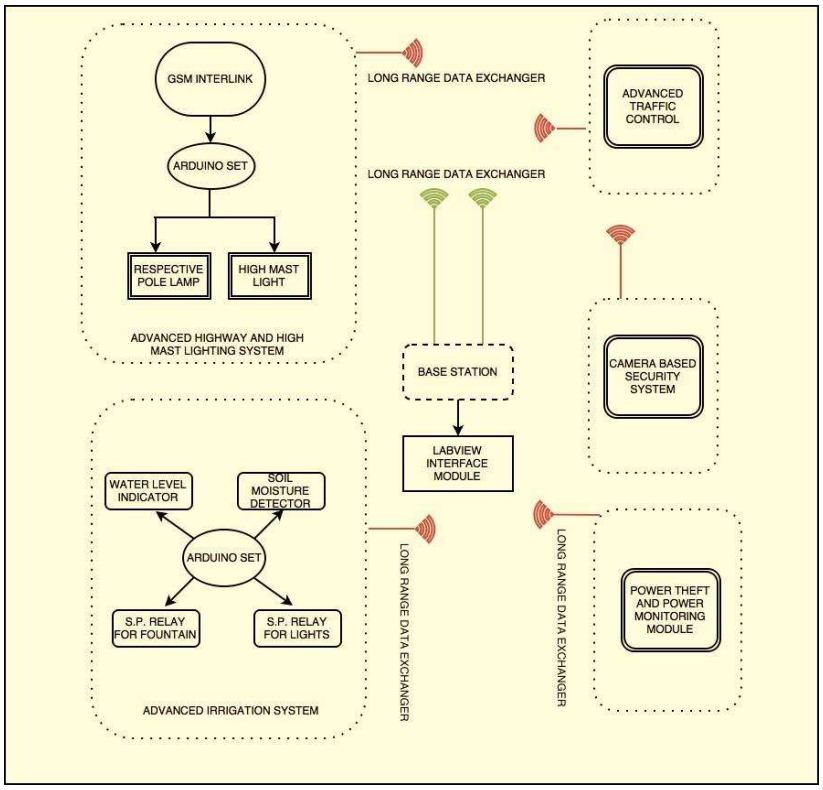

Figure 4 : A block diagram representing the aggregate module in the proposed study

3.4 OBJECTIVES OF THE STUDY

i. To study the impact Internet of Things (IoT) application in smart cities

ii. To study the Internet of Things (IoT) application architecture and framework

iii. To propose a model of smart city with integration of new services

iv. To suggest a mechanism which reduce the energy consumption and save the extra energy for further use.

v. To Solve the Irrigation Problem in a Smart City

4. CONCLUSION

The study lays out the different layers of the insightful propelled system required to maintain a functional sagacious urban environment, including (1) Smart Apartments, (2) Smart Mobility and Transport, (3) Smart Grid, (4) Smart Water Administration, (5) Smart Waste Administration, and (6) Smart Healthcare. The need of obtaining a unified strategy for managing a high-quality organisational chart is highlighted. This section concludes by analysing the five main obstacles encountered by smart city setup explorers: (1) Adapting Smart City Perceptions to Resident Conditions Disparity in Capabilities (3) Financial Limitations Incorporating Suitable Models of Governance (4) and Inclusive Smart City Program Development (5). The study considers all of these issues and uses appropriate case studies to foresee some prudent STI-driven solutions. The most salient takeaway from this article is that the STI community as a whole should plan to play a significant role in the planning, implementation, and management of high-quality urban strolls. Therefore, governments should effectively collaborate with the whole range of nearby STI partners and their global partners in the Smart City activities to report the growth issues and make the most of opportunities presented by development. Principles of a Sharp Strategy Arrangement

It is possible to distil several key decisions that might coordinate the keen establishment travels from the deals on Smart City travels worldwide and moreover the ideas displayed in the previous parts of this article. The undersides of these are checked right away. Inclusive and Person-Centered Physical Spaces: While innovation as a smart city framework is essential, it shouldn't be seen as anything more than a catalyst for change in order to solve the problems faced by the city's residents. Effective framework development, then, should avoid a "innovation driven" approach in favour of one that is "people-driven," responding to the attainable development requirements of individuals. The intelligent framework should be selected and designed with a thorough understanding of people's way of life, culture, behaviour, and requirements. It's possible that they will vary among different regions and socioeconomic classes, highlighting the need for local adaptation of technological improvements. Furthermore, all parts of society should be considered during the planning of a solid basis in order to guarantee total development.

Given the enormous commercial potential of IoT technology, it's clear that there will be a

tremendous surge in research, development, and adoption of this revolution. Therefore, there is a pressing need for long-term research attention in that area, and breakthroughs in that area may have far-reaching effects. Business owners must constantly weigh the benefits of using an open framework biological system vs developing their own proprietary foundation stack. It is therefore crucial that open rules based on robust and secure foundation emerge swiftly to make it easier for enterprises to receive open innovation. It is crucial that the group makes deep interests in collectively fathoming these multiple obstacles, in addition to responding to the important research tasks put forth above.

The Internet of Things, like previous waves of innovation, has the potential to usher in a plethora of new opportunities for business and greatly improve the quality of our daily lives. These novel frameworks will continue to test our abilities to design and build the strongest and safest possible systems. We have provided broad outlines of critical research difficulties that we see playing a significant role in this new IoT wave, and we have highlighted some potential responses to these challenges. Assuring these challenges are solved in a workable manner and that the Internet of Things has the greatest effect possible requires an active dialogue between major elements of the organisation, including the government, industry, and the academic community.

The Internet of Things is a paradigm shift that treats everything as if it were smart. Objects that can identify themselves, gather and interpret data, and connect with other devices and online services are considered intelligent. The Internet of Things (IoT) relies on the infrastructure of intelligent things, which contributes to raising city dwellers' standard of living. Internet of Things (IoT) based apps are active in various parts of a smart city. This thesis uses the Internet of Things to analyse municipal electricity usage, irrigation system efficiency, traffic flow, and security system vulnerabilities in order to provide solutions for improving these areas. The goal of our suggested IoT-based automation is to be carried out on three different levels, each with its own set of sub-modules.

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