

IoT: The Building Blocks of Smart Cities

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ABSTRACT

The Internet of Things (IoT) carries the potential to transform communities around the world into “smart cities,” creating a new era of urban living. The benefits include increased safety, reduced traffic, lower levels of pollution, more efficient use of energy, and a better overall quality of life for future city dwellers. The phrase Internet of Things (IoT) heralds a vision of the future Internet where connecting physical things, from banknotes to bicycles, through a network will let them take an active part in the Internet, exchanging information about themselves and their surroundings. This will give immediate access to information about the physical world and the objects in it leading to innovative services and increase in efficiency and productivity. Smart cities start with a smart public infrastructure to deliver clean water, dependable power, safe gas, and efficient public lighting. And as they free up resources by intelligently delivering essential services, they are able to invest in other services to improve quality of life. This paper studies the state-of-the-art of IoT and presents the key technological drivers, potential applications, challenges and future research areas in the domain of IoT.

Keywords:IoT, Smart Cities, Smart Communication.

INTRODUCTION

In early days of computing the network is connect computer machines only. This networks made by computer system, routers, servers, switches etc. After that it becomes global networks called internet and provide services of web pages, emails, pictures and video etc. nowadays the network evolved to IoT and it connects all the real world objects with computer and people. The people do not have that’s much time to measure physical things and meet in-person. The IoT is networks of smart things capable of sensing the physical world, and communicating, without human intervention.



Fig1.Overview of IoT

Every day the modern people expect new device and new technology to simplify their day to day life. The innovators and researchers are always trying to find new things to satisfy the people but the process is still infinite. In the 1990s, Internet connectivity began to proliferate in enterprise and consumer markets, but was still limited in its use because of the low performance of the network interconnects. In the 2000s Internet connectivity became the norm for many applications and today is expected as part of many enterprise, industrial and consumer products to provide access to information. However, these devices are still primarily things on the Internet that require more human interaction and monitoring through apps and interfaces. One research reveals, the Internet of Things (IoT), which excludes PCs, tablets and smart phones, will grow to 26 billion units installed in 2020 representing an almost 30-fold increase from 0.9 billion in 2009[1].

The Internet of Things is a new era of intelligence computing and it's providing a privilege to communicate around the world. The objective of IoT is Anything, Anyone, Anytime, Anyplace, Anyservice and Anynetwork [2].



Fig 1 objectives of IoT

Fig 1 describes the coupling of C's and A's. That reveals, people and things can be connected Anytime, Anyplace, with Anything and Anyone, ideally by using in Anypath/network and Any service. This implies addressing elements such as Convergence, Content, Collections (Repositories), Computing, Communication, and Connectivity in the context where there is seamless interconnection between people and things and/or between things and things so the A and C elements are present and tightly coupled.

This paper propose a novel architecture of IoT enabled smart home which is control and monitor smart devices through GSM and Internet Technologies. Normally the smart homes will be conscious about what happens inside a building, mainly impacting three aspects:

- resource usage (water conservation and energy consumption etc),
- security and
- Comfort.

The architecture designs are imposed on these three functionalities. The user can control or check the status of any resources or enable/disable security options of the smart home. This paper introduces aIoT agent which is brain of this architecture and it controls web server and remote embedded system module. At very short period of time the IoT agent reads the user data from the webserver, creates a SMS command and it will be sent to remote embedded system module through GSM-SMS. This command will be received by GSM receiving module which is connected with embedded system placed in a remote home. The home appliances and other devices are directly connected and controlled by this embedded system module. The GSM module is inbuilt with IoT agent and embedded system module. After executing the commands the acknowledgement will be sent to user.

The objective of a Smart City would be to use technology to offer services that are intelligent, advanced, affordable and accessible.

II.ADDRESSING THE CHALLENGES OF SMART CITIES

Smart city projects require expertise that spans many different fields including finance, planning , transport, energy safety telecommunications and more. They also require public–private partnerships (PPPs) that embrace all of these different dimensions. The IoT smart city concept is a holistic and layered framework that addresses the needs of mulitple aspects of smart city projects and allows cities to use urban data to boost economic competitiveness, and build more effective, workable solutions to many city challenges. Working with an ecosystem of partners, we offer products, tools and services for public service providers, city network operators, application providers, and enterprises. We use our technologies and expertise to create an effective common network infrastructure, a secure IoT architecture, and layers of control and management that serve the needs of CIOs, city agencies and city councils.

Our market trials and use cases span smart metering, parking, energy, public spaces (like bus shelters), smart city private networks, crowd monitoring, and more...

III.THE BUILDING BLOCKS OF THE SMART CITY

The Smart City infrastructure includes a wide range of Mobile network technologies that support standard cellular protocols, Wi-Fi ® (coverage for indoor and outdoor locations), LoRa, MuLTEfire, and mission-critical LTE for public safety and first responders.

Our mission-critical Wide Area Network (WAN) which leverages our IP/MPLS, optics, and microwave products and unified, service-aware network manager.

Cloud networking solutions help cities reap the benefits of an open cloud architecture composed of Nokia Nuage Networks SDN and Data Center Interconnect solution which supports low latency and highly secure connections between data centers.

The IMPACT (Intelligent Management Platform for All Connected Things) IoTPlatform, provides the necessary layers for connectivity management, application enablement and device management which is secure across all endpoints and enables you to use data and analytics to create value for your city.

The NetGuard security portfolio uses security analytics and threat intelligence to protect the smart city and prevent infections.

Nokia enterprise IP communications and collaboration solution provides an open, agile, and incremental framework that lets city administrators take control of their communications services.

IV.IOT FOR WASTE MANAGEMENT FOR SMART CITIES

Every morning the one sight that a walker does not miss is that of overflowing garbage bins. Today, most cities have bins strategically placed so they are accessible by homes. However this has led to the next issue of piling up of garbage leading to stench, pests and filth. How can IoT solutions resolve this problem? Imagine smart bins placed at street corners. These bins are developed to act as trash compactors with in-built sensors. So as you dump trash into them they will compact them to take in probably 4 times more waste and additionally give out signals to the waste management system when the bins are nearing full to schedule for pickups. Wow I would love to see that on my street. Look at the multiple benefits this can have – increased waste load, eliminate overflows, efficient logistics planning and increased cleanliness. Companies like Big Belly are offering similar products. This is just the beginning; with IoT the possibilities here are limitless.

V.IOT FOR TRAFFIC MANAGEMENT FOR SMART CITIES

Thankfully I don't have to travel on road and so saved from all the road rage that everyone else at work talks about! This definitely will be another critical agenda for a smart city to resolve. Traffic management is one of the biggest challenges that IoT can help manage. What if you could plan your travel based on the "best time to travel" recommendations thrown at you by an IoT device? What if the traffic signals were dynamic and operated depending on the density of vehicles rather than just time bands? What if your device could let you know the crowded streets to avoid if you are looking for parking? This and a lot more is possible by deploying IoT managed services and systems in a city. With IoT Solutions, traffic management can go to a completely different level, being more predictive, dynamic, intelligent and secure. Especially for a country like India, where every city operates as a country by itself, an IoT driven traffic management can be customized to the advantage of the lifestyle of that city.

VI.IOT FOR SMARTER ENERGY UTILIZATION FOR SMART CITIES

Considering that cities worldwide contribute to 80% of CO₂ emissions, better environment systems needs to be at the core of any Smart City development. Taking a cue from Paris that has taken the initiative to reduce greenhouse emissions and energy consumption by 30% before 2020, India needs to build in smart solutions to make its' cities more energy efficient and sustainable. IoT technology embeds at its' core the ability to work with a city to improve its air quality, reduce its water wastage and increase power generation. Now we all know that these three elements are important to function on a day-to-day basis. With smart city the day will not be far when you can actually wake up get updates on key energy metrics from inside your house and office. Technology will aid in informing you about the small steps to be taken as an individual that would have a larger impact on the community and hence on the city. Overall IoT tracking solutions can help cities maintain more efficient water supply, receive service alerts and track the consumption trends. Adding to that, with better solutions for sewage management I think the overall quality of life will be at an improved level.

VII.IOT FOR PUBLIC SAFETY FOR SMART CITIES

With lifestyles becoming more mobile and busy, won't it be a dream if your city had the best in class security and surveillance system that could take away the jitters when you are alone? An IoT enabled city will be like the constant pair of eyes that can help individuals, communities and government keep a friendly safety watch on people. Smart video surveillance for public monitoring, hovering drones acting as alarm sensors, rapid action team dispatch technology and a dynamic security system can all work together to make cities safer and traceable. IoT enabled security system could be the eyes and ears that authorities needs in order to be more efficient and agile. With IoT huge clouds of data can be accessed dynamically and tracked with single clicks. By deploying smart solutions if your city crime rate could drop by 30%, like it did for Shanghai, wouldn't that be the boon that we are looking for?

VIII.SMARTER COMMUNICATION FOR SMART CITIES

2G, 3G, 4G, 5G and the saga continues! It is all about staying connected. India is still a long way off in becoming 100% connected. However this cannot be the case with smart cities. With everyone on a constant move, working across multiple platforms and interacting through the globe, connectivity is the lifeline that a Smart City will need to address. In India Internet has finally penetrated the rural areas and with the recent demonetization it became essential for the daily man to connect to a network. Beyond cloud backups and internet-connected devices, it is internet-connected services that will run smart cities. With connectivity arises the need for security and efficiency. People are not satisfied with just being connected. The Internet is now teaching them what architecture will keep them secure and give higher performance, leading to service providers educating their consumers on networks and their capabilities (aka Airtel open network promotions). The competition landscape for connectivity solutions is broadening, with innumerable players entering to win

market share. It is now critical for the Government to step in to standardize and stabilize the services across the country.

IX.CONCLUSION

The vision of the “Smart City”, making use of the Internet-of-things to provide services for the good of the citizens and public authorities, promises solutions to some of today’s societal challenges such as air quality, transportation and energy efficiency. We argue that these IoT systems need to be based on open standards including protocols and interfaces, so that the systems enable third-party innovation in new services, and so that vendor lock-in is avoided. Standardised protocols might not be enough to achieve these goals - systems need to be designed with openness in mind at all levels.

REFERENCES

- [1] P. Magrassi, T. Berg, A World of Smart Objects, Gartner research report R-17-2243, 12 August 2002.
- [2] White Paper: “Internet of Things Strategic Research Roadmap”, Antoine de Saint-Exupery, 15 sep 2009.
- [3] Souza, Alberto M.C. Amazonas, Jose R.A. “A Novel Smart Home Application Using an Internet of Things Middleware”, Proceedings of 2013 European Conference on Smart Objects, Systems and Technologies (SmartSysTech), pp. 1 – 7, June 2013.
- [4] Perumal, T, Ramli, A.R, Chui Yew Leong, “Design and implementation of SOAP-based residential management for smart home systems”, IEEE Transactions on Consumer Electronics, Vol: 54, pp. 453 – 459, May 2008.
- [5] Ming Wang, Guiqing Zhang, Chenghui Zhang, Jianbin Zhang, Chengdong Li. “An IoT-based appliance control system for smart homes”, Fourth International Conference on Intelligent Control and Information Processing (ICICIP), pp. 744 – 747, June 2013.
- [6] Yepeng Ni, Fang Miao, Jianbo Liu, Jianping Chai. “Implementation of Wireless Gateway for Smart Home”, Communications and Network, pp. 16-20, 2013.
- [7] Kelly, S.D.T., Suryadevara, N.K. ;Mukhopadhyay, S.C. “Towards the Implementation of IoT for Environmental Condition Monitoring in Homes”, Sensors Journal, IEEE, Volume:13, pp- 3846 – 3853, May 2013.