A Brief Survey On Underwater Wireless Sensor Network Routing Protocol For Acoustic Communications Techniques

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Abstract: Internet of things a monster technology that blends the virtual with the material to offer a smarter to keeps attracting market players and increments with its limitless potential. It is a growing network of objects, devices and machines. In Internet of Things (IoT) devices the Dynamic Spectrum access plays an increasingly important role to improve the spectrum efficiency. The global IoT spectrum is confusing with countless licensed and unlicensed frequency bands and regional fragments. The cross-layer design where the boundary range among the protocol layers is violated by sharing the internal information and help layers to become aware of the changes in the others and hence provide higher quality of service to the user. This paper aims to clear the cross-layer design in IoT protocol layers and the spectrum allocation technique.

Keywords: IoT, WSN, Cross Layer, Spectrum Sensing.

1 INTRODUCTION

Nowadays, the Internet is used by more than number of customers roughly the world to surf content, send and accept mails, play online games, access multimedia resources and create social networking, between others. Furthermore, the Internet is also predictable to provide as a worldwide platform to connect physical objects or "things", therefore, allowing latest methods of interacting, working, living and entertaining [1, 2]. Within such viewpoint, the Internet of Things (IoT) is a new networking pattern which permits the communication between all kinds of physical objects over the Internet [3]. The IoT is permitted by embedding communication abilities and, in several cases, classification, sensing and actuation functionalities into each day things and communicating in extended Internet technologies. The IoT describes a truly world-wide cyber-physical structure in which each physical object can be linked and restricted remotely. The collection of applications and services leveraging such knowledges open a overabundance of novel business and market opportunities in the fields of domotics, e-health, real-time monitoring of industrial processes, and intelligent logistics, among others [4]. IoT helped to attach the special devices for special purpose. The devices are proficient to communicate with assist of wireless network to contact the internet. The most current analysis approximates assume that by 2020 there will be over 30 million connected devices. The traditional wireless communication system connects spectrum resource allocated by fixed allocation strategy. But Dynamic spectrum management techniques allow the devices to switch between different options, thereby increasing the overall network capacity by providing more degrees of freedom.

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The traditional IoT protocol architecture is a standardized network connection so it affects the quality of service and the response time. The model only offers a limited interaction in that, data communication only takes place between the two adjacent of neighboring layers. Because of the problems the cross-layer design proposed. Its core idea is to maintain the functionalities associated to the original layers but to allow coordination, interaction and joint optimization of protocols crossing different layers.

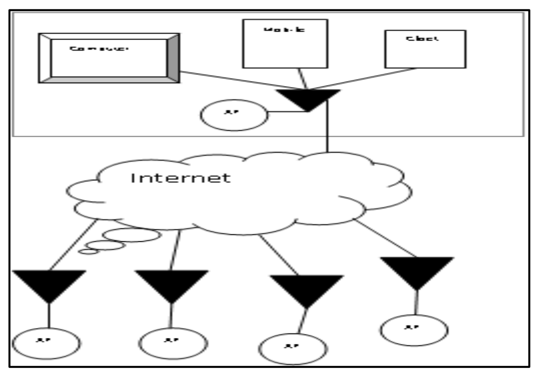

Fig. 1*: Abstract network architecture of the IoT*

Figure 1 demonstrates the network architecture of the IoT, in which several things are connected to the Internet via a common Access Points (AP). In common scenarios (e.g., at home, in the office), the AP domain is composed by a few tens of things. Access Points (APs): i.e., additional sophisticated devices which cooperates the role of local network coordinator as well as interface and gateway for the communication over the Internet. This paper presents a various cross layer design on Internet of things issues and possible solutions and dynamic spectrum management techniques for IoT devices. The cross layer approach follows a resource allocation approach to integrate different communication functionalities into one coherent mathematical optimization model and to provide an adaptive solution for cross-layer design and control.

2 RELATED WORK

Vaghela Lara (2016) [5] have presented the paper about traditional OSI or TCP/IP model, Cross layer design model, and the major issues on the IoT and the solutions will be cleared in cross layer design. The issues and problems are Communication and Routing between heterogeneous hardware's, Security, Problem in the Application of 6LoWPAN, Increase in the Data sharing among IOT devices, Privacy and Scalability, Service Integrity, and Energy Consumption in WSN's (IoT application). The solution for the above problems the author discussed some solutions for the security problem cross layer model is used to convey some encryption technique for additional security. Application of 6LoWPAN is support low power, communication between the layers involved emerges. The cross-layer mechanism is embraced, such that the edge routers gets power from the power grid, thereby detecting not only the data loss issue but also streamlining the communication in the network. Bongkyo Moon (2017) [6] have proposed ensure the unlicensed users never interfaces the access time of licensed user network, that is called as a minimize the spectrum capacity for the unlicensed users. The author presented both licensed bands and unlicensed bands dynamic spectrum access strategy in cognitive radio-enabled LPWAN operating system. The dynamic spectrum access strategy the diagram has two types of users like unlicensed band cognitive user (CU's) and the licensed primary users (PU's). For reducing the spectrum capacity, the author proposed matrix geometric approach. Using the approach in dynamic strategy the licensed user's probability blocked and the mean dwell time of the unlicensed users and the total carried traffic and combined service quality for the licensed and unlicensed users [3]. Subhajit Chatterjee (2017) [7] have presented the cross-layer architecture for IoT to find out the challenges in connectivity among different types of IoT devices and that devices connectivity issues and possible solutions. And the author discussed about different types of IoT underlying technology. The cross-layer design in IoT this section discussed inter-dependencies between the technologies. Universal Mobile Telecommunications System (UMTS) technology uses wideband code division multiple access radio access technology to offer greater spectral efficiency and bandwidth. The next one is Wide Local Area Network (WLAN) is the network type which is used in Wi-Fi. And some of the other technologies used in IoT is 6LoWPAN and Sigfox. With the help of Multiple Input Multiple Output (MIMO) system IoT systems are developed. The main concern area of issues are security and energy efficiency. Bassel Al Homssi, et.al., (2018) [8] have presented spectrum occupancy experiment result. In this result of free spectrum band used to quantify the feasibility of present and future IoT applications. And they classify the spectrum measurements according to the population densities and they formulate a relation between the current source's spectrum occupancy and the underlaying population density [4]. Using the pure ALOHA access model, and they draw the future paradigms on the available spectral room for additional IoT services. Lin Zhang et.al. (2018) [9] have presented Spectrum Sharing for Internet of Things: A Survey. In this survey paper based on how the IoT technology devices deployed within unlicensed cellular spectrum and licensed spectrum. The devices connection preferably will be based on the spectrum sharing solutions including the shared spectrum, interference model, and interference management. End of this survey they discussed about both advantages and disadvantages of different IoT technologies. And they presented the identify challenges for future IoT and they suggested the potential research directions. Sehrish Malik et.al., (2019) [10] have proposed the scheduling algorithm called a custom tailored adaptive and intelligent scheduling algorithm. It is used for the efficient execution and management for the IoT embedded systems. The soft real-time tasks in the overloaded cases its fully focused on the execution of high priority. That time hard real-time its primary objective. The measurement achieved with the help of urgency measure and failure measure. Finally, the results show that the custom tailored adaptive and intelligent scheduling algorithm is compare with other algorithms performance, it reducing the task starvation rate and it increasing the CPU utilization. Fuhui Zhou et.al,. (2019) [11] have presented dynamic spectrum management via machine learning made it with the help of state-of-the-art research efforts. It is used to understand the challenges and benefits in this application and designed the taxonomy to categorize and classify the existing investigations. The taxonomy of DSM via machine learning that is based on four sub-divisions is called as the operation modes, learning paradigms, enabling functions, and design objectives. Toufik Ahmed et.al., (2019) [12] have presented An Architecture Framework for Virtualization of IoT Network. In this paper they investigate the provision of NFV (Network Function Virtualization) in the Internet of Things. In this paper they proposed an architecture framework based on introducing SDR, SDN and VNF paradigm shifting. Next, they introduced the virtualization paradigm used to describe the use-cases and deployment model scenarios. And they presented a proof to display how the proposed architecture framework for virtualization of IoT network can be prototyped using Raspberry Pi acting as IoT devices and Docker containers as IoT functions. With a help of virtualization technique of full stack of the IoT functions, that can be deployed and dynamically on the IoT devices. Feng Li, Li Wang, et.al. (2019) [13] has presented the paper based on spectrum trading for distributed IoT devices. In spectrum trading the proposed novel dynamic spectrum access method. The idea of access benefit is introduced which is based on the purchased band number and modulation mode provided to the mobile user. In this method every single cognitive IoT device is considered to judge whether its actual benefits obtained from the spectrum dealing can exceed the cost it paid, then make a decision for accessing the spectrum in distributed mode. The cognitive IoT user's benefit is given in detail from the perspective of transmission capacity and BER in receiver. Based on the utility function of cognitive IoT user, it can make a proper option on this distributed dynamic spectrum access and the channel number for using. Martin BH Weiss, et.al. (2019) [14] have presented On the Application of Blockchains to Spectrum Management. In this paper explores the application of blockchain to radio spectrum management and it fully focused on dynamic spectrum sharing applications. The Blockchain is based on database technology. And they discussed about Blockchain characteristics benefits applied to spectrum sharing. The Blockchain characteristics are Decentralization, Transparency, Immutability, Availability and Security. And then they examine some potential application to four major categories of spectrum sharing. The four major categories are Primary non-cooperative, Primary cooperative, Secondary non-cooperative, cooperative.

3 IDENTIFICAION

Different types of architecture proposed for IoT protocols by many researchers. The most basic architecture has three-layer architecture it namely called as perception layer, network layer and application layer it defines the main idea of the Internet of Things, but it is not sufficient. So, we need to focus on the more layered architectures. From one of the proposed architectures is five-layered architecture.

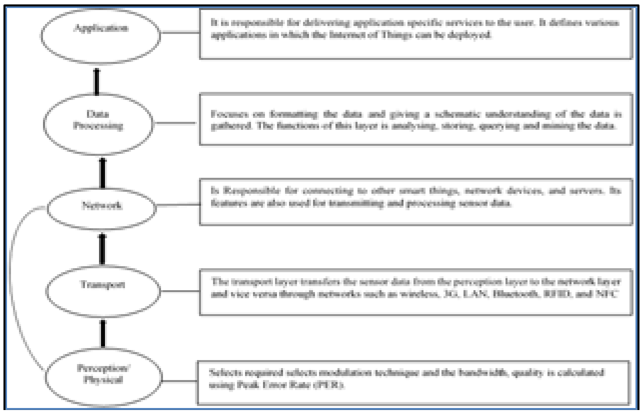

Fig. 2*: Five layered architecture*

In this model additionally two more layers are added namely data link layers and transport layers. The above five-layer architecture is improving the spectral efficiency of devices communication. IoT technologies need to tackled some issues like,

- Security
- Privacy
- Frequency spectrum management
- Certification

The proper spectrum management implies a good understanding of IoT connectivity technologies and the trends in IoT. IoT technologies differ based on how they connect to the Internet whether by fixed, satellite, low-power-wide-area ("LPWA") networks, cellular, or other solutions. The global network traffic will triple over the next generation. Most of the network traffic will happened because of the IoT devices. The wireless spectrum already in short supply and nearing the limit of the capacity. A broad range of spectrum management areas including basic principles of spectrum regulation, spectrum sharing and trading, spectrum pricing, monitoring and international coordination. The spectrum allocations making on either an exclusive, shared, primary or secondary basis. These decisions are reflected in the International and National Tables of Frequency Allocations. The current fixed spectrum allocation strategy faces the spectrum scarcity problem. In order to solve this problem, dynamic spectrum management are introduced to improve the spectral efficiency of the spectrum usage. It relies on geo-location database that contains details of assets and rules, which allows the spectrum to be allocated in real-time based on the location of the user and other considerations, such as radio parameters and the type of usage.

4 COMPARISON ANALYSIS

This survey paper aims to collect and consider papers that deal with Cross Layer Design for Dynamic Spectrum Access in Intelligence of IoT techniques. The aim is not to assume a constraint reviews, but quite to provide a broad state-of-the-art view on these related fields. Several existing methods have been projected to assist Cross Layer Design for Dynamic Spectrum Access n IoT techniques, which has mentioned in a body of literature that is spread over a wide variety of applications.

Table 1: *SUMMARY TABLE FOR COMPARISON OF CROSS LAYER DESIGN FOR DYNAMIC SPECTRUM ACCESS IN IoT TECHNIQUES*

TITLE	*ALGORITHM*	*KEY-IDEA*	*TECHNIQUES*	*PERFORMANCE*
Cross Layer Design in the Internet of Things (IoT): Issues and Possible Solutions (2016) [5]	*TCP/IP layer model*	*Internet of Things (IoT), Cyber Physical Systems (CPS), Cross layers, TCP/IP, OSI layers, Wireless Sensor Networks (WSN).*	*Power Control techniques, Encryption technique, Big Data and Cloud Computing techniques, WSN technique*	*The cross-layer design is normally used to resolve prominent problems in the Internet of Things (IoT), comprising of such as security, privacy, energy consumption and efficiency among other error.*
Dynamic Spectrum Access for Internet of Things Service in Cognitive Radio-Enabled LPWANs (2017) [6]	*Cellular networks and cognitive radio-enabled low power wide area networks (CR-LPWANs).*	*IoT, cognitive radio, dynamic spectrum access, matrix geometric solution, mean dwell time, carried traffic.*	*Dynamic spectrum access strategy for Internet of Things (IoT).*	*Cognitive users (CU) traffic load* ρ_2 *(=* λ_2/μ_2*) is kept constant at 0.01 with* $\lambda_2 = 0.2$ *and* $\mu_2 = 20$*.*
Free Spectrum for IoT: How Much Can It Take? (2018) [8]	*ALOHA algorithm*	*IoT, spectral occupancy, spectrum measurements.*	*Spectrum Occupancy.*	*The standard deviation on the other hand is quite high with a value of 10.4%.*
An Adaptive Emergency First Intelligent Scheduling Algorithm for Efficient Task Management and Scheduling in Hybrid of Hard Real-Time and Soft Real-Time Embedded IoT Systems (2019) [10]	*Emergency First Intelligent Scheduling Algorithm.*	*Real-time tasks, task scheduling, embedded IoT systems, periodic tasks and event-driven tasks.*	*Packet traffic scheduling techniques such as priority queuing (PQ), first-in-first-out (FIFO) and weighted fair queuing (WFQ).*	*Fair Emergency First (FEF) Scheduling Success Rate 78.75%.*

5 CONCLUSION

This paper presents a brief survey about Cross Layer Design for Dynamic Spectrum Access in Intelligence of IoT techniques is discussed. This survey discussed various cross layer design on Internet of things issues and possible solutions and dynamic spectrum management techniques for IoT devices. In future we put forward to work to improve the spectral efficiency in IoT devices dynamic spectrum management with help of some management techniques such as efficient fixed or dynamic channel allocation, power control, link adaptation and diversity schemes.

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