

Exploring Possibilities of MANET Protocols for IoT Enabled Smart Environment

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Abstract - Expiry of routing information is the main problem in the mobile network. The objective of the routing protocol is to establish a correct and efficient route to deliver data among mobile nodes in the network. The current routing protocols have many limitations so we need to improve the performance of existing routing protocols. In a dynamic environment, the protocol chosen for routing purpose should be the best in term of Overhead, Loop-Free, Complexity, Congestion Control, Reliability, Load Balancing, Throughput, and Route Maintenance etc. To solve the protocol problem and to improve network capacity we can combine the concept of IoT with MANET. Combing new standards, modern devices and advanced Technologies lead to the capability to develop more powerful MANET- IoT smart devices. In this paper, we have also summarized various Current limitations and future trends in mobility models. Finally, we come with a newly proposed design for inhancing routing protocol performance in MANET-IoT smart environment.

Keywords: Quality of Service, Mobile Ad-hoc Network, IoT, VANET, *Routing Protocol*

I. INTRODUCTION

MANET is a collection of mobile nodes, which form an autonomous and dynamic network. These nodes communicate in a self-administered, self-configured and self-organized manner. MANET is defined as " anytime anywhere" network and due to decentralized nature, infrastructure less and dynamically changing topology routing protocol faces many challenges and issues, such as non-optimal route, security, energy conservation, hidden and exposed terminal problem, asymmetrical link, location management, addressing extra [1]. Some protocol does not work under all kinds of circumstances/ network, particularly in those that are under the constraint of high losses and delays. Since mobile nodes move randomly, they cause frequent link failure and effect data traffic delivery and network performance and hence there is a need for good routing protocols to manage a route in the network. Internet of things concept have also various issues: Predict and preempt security issues, detect vulnerabilities & incidents, manage vulnerabilities, availability, unsecure mobile, web and cloud applications, device updating problem, authenticity and authorization problem etc. To solve the protocol problem and to improve network capacity we can combine the concept of IoT with MANET. Combing new standards, modern devices and advanced Technologies lead to the capability to develop more powerful MANET-IoT smart devices. MANETs secure algorithms are tailored for the resource-constrained environment and include RFID (Radio Frequency Identification Devices) tags, sensor

nodes, contactless smart cards, smart health devices and many more [2]. The smart environment is providing a large number of opportunities to various technologies and in near future, its impact on the society will increase beyond the human capability. The smart environment has various Applications like:

Personal and Home: For better and enhanced management of the home, the internet of things is facilitating different home equipment like refrigerators, lights, air-conditioners, washing machines, televisions, etc. Individuals who are owners of the network are allowed to use the information collected by sensors. Wi-Fi is normally used as the backbone to enable data transfer (audio/ video/ sound) of high bandwidth and higher sampling rates. For communication, smartphones along with some interfaces such as Bluetooth can be used for interfacing sensors capturing physiological parameters. An intelligent door system is also present now [3]. This system notifies the intrusion to the owner by sending notification through emails. This task is accomplished by accumulating intrusion data logs into a Google spreadsheet of the owner's Google drive account. In a smart micro-grid system, the battery monitoring system can be used for performance monitoring of batteries. The smart system comprises a communication channel, cloud system, and HMI "Human Machine Interface".

Traffic Congestion: Sensors embedded vehicles and GPS serves the main role in this area. By adopting acoustic

sensors along with air quality is also useful. The information collected from sensors is of great importance, especially to the citizens and authorities.

Smart Health Monitoring: From the last two decades, global healthcare is marking its presence through smart health. IoT is providing a platform for smart health vision by using body area sensors. Healthcare domain is benefited by various IoT applications including patients monitoring and tracking, staff tracking, identifying medical equipment and collecting data [4]. RFID Locator, a web-based application uses RFID technology to provide services to smart health enabled hospitals. RFID tags are embedded in medical equipment for monitoring of the patients; wore by staff members to store their employee ID number; wore by patients to stores their ID and monitor their activities and conditions. All other objects have self-adhesive RFID label having a unique identifier [5]. In the near future, heart rate monitoring in smart health has definite prospective to develop in the near future [6]. In m-Health, the human error rate is reduced with the introduction of sensors and it uses alarms for providing facility to prescribe medicines in time [7]. The intention behind building a smart environment is to improve the efficiency of services and improve the quality of life by using urban Technologies to meet the needs of the citizen. The data are collected processed and analyzed by integrating Sensors with real-time monitoring. Due to low-cost communication, Actuators and sensors are used for the smart cities. Communication technology is used to enhance the quality, performance, and interactivity between services, and is also used to reduce cost and resource consumption. For example in medical center communication technologies are used to link the whereabouts to the health, meditation and patient statistics. Identity management essentially approaches in IoT, which is used in [8] medical application. In this approach, everything, any device, any user, is provided a Unique Identification and all data of the device is maintained through its individuality. The interaction between IoT, MANET, and WSN is shown in figure 1:

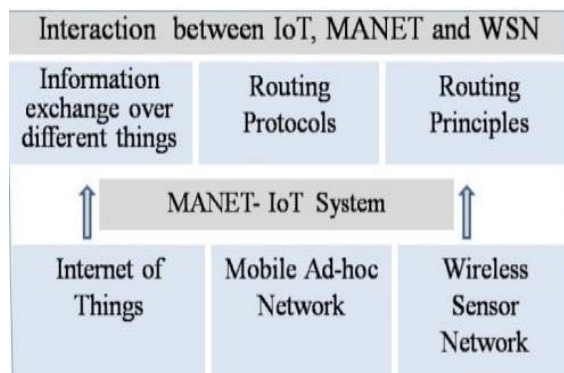


Figure 1: Interaction between IoT, MANET, and WSN

WSN and MANET combination organizes a way to develop new internet of things communication platform with the possibility of applications in different domains. MANETs are used in smart cities to support mobility. We can say that by using MANET and low-cost wireless sensors in smart cities have a lot of new opportunities and it does not contain any Central controller here routes are often arranged by the dynamic nodes. Nodes support mobile devices and these are fault tolerant in the network. All these features are used to build a mobile Ad Hoc Network based smart environment. It is a difficult task to provide real-time data transmission in the network. IDE (integrated development environment) with various services require quality of service to offer various resources available based on their relative importance. Smart cities should have a context-aware quality of service support. Several types of architecture were proposed to enhance the quality of smart cities. In this paper, the literature review provides the variously proposed architecture for the smart environment, quality of service requirement for different applications, and discuss the requirement of various routing protocols and issues in wireless networks. All objects in the interrelated world are seen as virtual objects by IoT technology [9]. Such objects can be instruments, maneuvers, processes or services that are efficient to present ways to stay connected to the internet. Internet of thing is a technology that can be interpreted as a model that comprehends various technical solutions. Therefore a standard communication protocol is required which can maintain this particular feature for IoT. Interdomain message passing in a smart environment is focused by Jacob [10]. The protocols used were DSR, DSDV, and AODV. The effectiveness of protocols in the smart environment depends on metrics like time taken to establish a connection, delay in message passing etc. Marion Soul et al. [11] explained that smart cities comprehensive health care application have been enabled by adding wireless sensor networks to wireless body sensors. Emerging alerts, continuous medical monitoring, location tracing are the features of remote medical monitoring applications. “Wireless Awareness” and “Quality of Service Support” are two important concepts of the paper. Data interpretation is needed in a wireless sensor network for Healthcare and context awareness for the quality of service management. There is some list of user needs towards network i.e. context awareness, network lifetime, interoperability, timelessness, reliability, quality, data accuracy. There are various open issues and challenges. The strong infrastructure for the health structure requires the Global structure to be done. To keep the implementation viable, the limited resources should be kept simple to the model. Encryption is required to secure the confidentiality of the data and authentication is required for patients to monitor. Smart environment basic structure is shown in the below figure 2, various communication techniques have been used for connecting various domains.

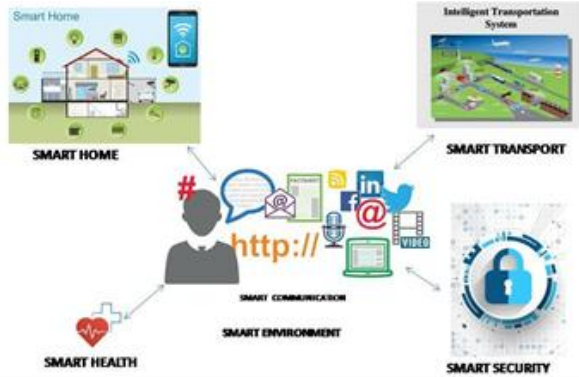


Figure 2: Basic structure of Smart environment

Rest of the paper is organized as follows; Section 2 contains the Confluence of MANET and IoT. Real time scenario in the internet of things is shown in next section. The proposed design and conclusion is presented in last Section.

II. THE CONFLUENCE OF MANET AND IoT

Two approaches can be included in the context of meeting the commanding features of WSN and mobile Ad Hoc network protocols, one of them is to enlightening the WSN about MANET access point and next MANET can be used to act as backbone of wireless network by permitting the MANET nodes [12] to access the network topology. Due to more energy consumption during data sending, receiving and processing, there is a requirement of dropping the packet processing time for the above-mentioned approach. An enhanced solution is given in [12] to put together the collaborative network construction of WSN and the MANET on-demand network development skills for smart area information excavating in a smart environment. By integrating the recent and latest technical standard for data collection, highly cohesive models are used to isolate and advance the high ordered data on the network. Now, a large city area has been protected by many wireless devices, including comprehensive and ubiquitous platforms, which are primarily planned to monitor, new and trigger events in a smart environment. Pervasive systems require less powerful devices with resource guarded components similarly in a ubiquitous system very potent apparatus are used with high presentation processors. It is important to maintain a symbiotic relationship between both kinds of devices and Systems. Cognitive radio (CR) enabled MANET to have an issue of optimal utilization of spectrum resource. In paper [13] a new routing protocol is invented that works in the cognitive radio based MANET. CR recognized data is used by this protocol for selecting the optimal path in the CR mobile ad-hoc network.

III. REAL TIME SCENARIO IN THE INTERNET OF THINGS

System monitoring is done in real time scenario for any type of activity in device setting so that necessary action may be taken immediately after the declaration of the incident. To prevent major accidents and Dam failures, IoT technologies are launching Smart Pre-Alarm System (TDMPAS) for monitoring and controlling networks, this system will be effective in curbing accidents, and after the use of this smart alarm system, there will be a decrease in the incidents of dam failures. MANET in IoT scenario is nominated as a set of smart devices able to communicate even in infrastructure less network. To maintain the quality of service is a difficult task for IoT applications. Research is being conducted by the MANET working group to organize efficient routing conferences for such type of IoT empowered MANET mobile devices have to work together with intermediate nodes to forward routing, data sources, and endpoints, so designing advanced routing protocol is very important, since the current MANET based protocol has its own margins. The Application issues at IoT and MANET intersection shown in below Figure. Current limitation and future trends of mobility models in MANETs are shown in table 1.

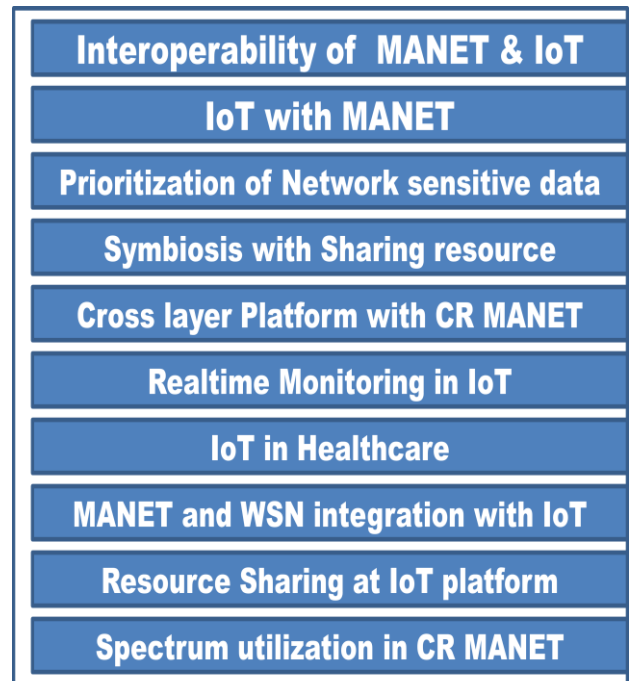


Figure 3: Application issues at IoT and MANET intersection

Table 1: Current limitation and future trends of mobility models in MANETs

Author	Model	Benefits	Future scope/limitation
Masoumeh karimi et.al.	“Dynamic nature of MANET issues in QoS”	Provide solutions to Quality of Service in MANET	Implement quality of service inherited from MANET in a smart environment.
Lei Chan et.al.	“QoS architecture to support real-time transmission in MANET”	Low Delay, Video Quality Improved	Multiple streams performance not shown
Marion souil et.al	“QoS requirements for health applications, open issues”	Provided a good network for the healthcare system	Adaptive and cross-layer QoS Framework
Katarzyna wac et. al.	“QoS support for context-aware health care”	Reacts quickly in a critical situation in medical	NA
Jiong jin et.al	“Four network architecture participatory sensing”	Solutions are given for various applications	Human active participation
Roozbeh jalali et.al.	“Architecture for community-level services”	Real-time monitoring in medical center	Extend with Arthemis cloud and remote monitoring
F.J. villaneuva et.al.	“Framework to provide context-aware quality of service for traffic”	Real-time monitoring	Extend based on SENDA and MANET
Jacob et.al	“Hybrid routing protocol for message passing”	Less end to end delay, better packet delivery ratio.	Features of various rules may conflict
Jitender pandey et.al	“Self-healing routing protocol”	Link breakage recovery	More delay and overhead
Adithya gaur et.al	“Multilevel Smart City architecture”	Describes uncertainty of data	Real-time Metro genius information can be discovered

IV. PROPOSED DESIGN

Description of new proposed algorithm is given in the shown diagram. In the proposed algorithm, route table are updated in adaptive manner. The algorithm notify all neighbors' nodes about link broken information. After identification of failure node, failure node is blocked for the transmission purpose. Route information is upgraded in route table. The algorithm enables MANET protocol to adapt quickly to topology changes.

The proposed algorithm is so designed that it not only leads to identification of failure node, the delivery ratio and performance factor are also better than the existing ones. Updating of routing tables also prevents state routers from being propagated to other nodes. The proposed structure rapidly removes corrupt nodes and stale routes no matter how nodes moves.

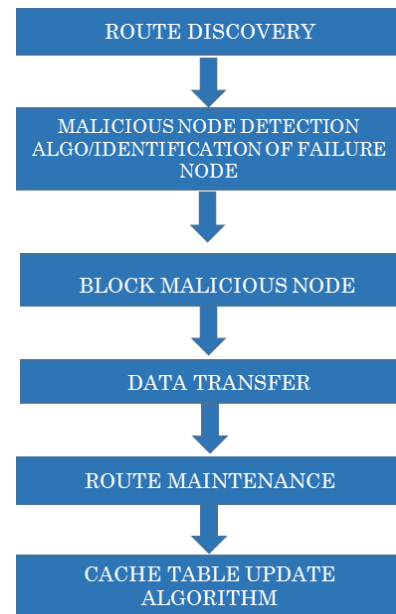


Figure 4: Improved MANET-IoT protocol framework for good connectivity

V. CONCLUSIONS

In this paper we have discussed mechanism of MANET in order to exploit an appropriate protocol scheme for IoT.

MANET consist of multiple mobile nodes, these nodes communicate through the wireless network. It does not have a pre-established infrastructure. Some protocol does not work under all kinds of network, particularly in those that are under the constraint of high losses and delays. Hence there is a need for good routing protocols to manage a route in the network. We have briefly discussed the need for the confluence of MANET and IoT & also summarized various Current limitations and future trends in mobility models. Proposed design, identify malicious node and improves delivery ratio in MANET-IoT enabled smart network.

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Authors Profile

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