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Internet of Things and Security Challenges in Wireless Sensor Network

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***Abstract* - Wireless sensor networks (WSNs) are gradually more acquisition impact in our daily lives. They are deciding a huge series of applications in different domain, include health-care, assist and improved-living scenarios, engineering and manufacture analysing, manage networks, and different fields. In future, WSNs are normal to be incorporated into the "Internet of Things", where sensor nodes incorporate the Internet with dynamism, and use it to cooperate with each other and achieve their tasks. However, when WSNs become a part of the Internet, we must cautiously explore and analyze the issues concerned with this integration. In this paper, we evaluate different approaches to integrate WSNs into the Internet of things.**
***Keywords:* Wireless Sensor network, Complementary Semiconductor Metal Oxide (CMOS), Quality of service (QoS)**

I. INTRODUCTION

Wireless Multimedia Sensor Networks are presently developed new concept of Wireless sensor network. Where in the Sensor nodes of Wireless sensor Network are equipped with Cameras and microphone and different sensor device to capture the data in multimedia format and are sent through the Internet. These Sensor nodes are made of complementary Semiconductor Metal Oxide(CMOS), where in this technology made the progress of development no of features on a single chip camera modes which could be integrated easily into sensor nodes to capture data. Such devices which are integrated for multimedia devices and because of their less communication cost have made the researches to move in this field. It also has a number of applications like Multimedia Surveillance, traffic management, automated assistance, environmental monitoring and industrial Process Control[1]. For the data transmission still the images are used for short distance hence the research has proven the multimedia data can be used for long distance through the use of Internet.

The Characteristics related to Wireless Sensor Multimedia Network are Bandwidth, delay, jitter, Buffer size and number of resource. The requirement or challenge required for Wireless Sensor Multimedia Network is the Quality of Service and mainly concerned with the security of the network. To develop this constrain different Routing protocols have been designed to provide Quality of Service (QoS) requirement.

The Wireless Sensor Network has limited energy capacity, limited hardware resources and also it also has dynamic and unreliable environment. The Security of the WSN is application dependent. The Wireless Multimedia Sensor Network is multimedia source coding, high bandwidth , application specific QoS requirement, resource coverage constraint, interconnection with other networks. The Security is application dependent. The Quality of Requirement is very important as the different type of data has to be mixed to obtain a single data. As in network different types of attacks are possible hence it needs to be provided with different security to provide good quality of service.

Here are some of the features which are must for Next Generation WMSN:

1. The routing Protocols that have been designed such that it has to provide the audio and video streams to provide good quality of services.
2. The sensor nodes should have high energy so that the nodes should have a long life time.
3. The security that needs to be provided should be high efficient so that easily the multimedia data need not be captured by an treat.
4. The link of WMSN should have high throughput so that the video streams of high-definition needs to be transferred.
5. It should be provided with mobility support so that it should cover a long area of interest.
6. It should also provide a feature of interconnection to networks as to support and cover huge area.

The security on wireless network is of major concern. The lessons learned from protocol design for Mobile Adhoc networks and the Wireless Scalar sensor network leads us to the concern that the security is critical and should be taken into account at the basic start point itself[2]. Hence the future of WMSN is mainly concerned with the security issues .This paper mainly deals with the security concerned for WMSN for future generation networks.

The Structure of multimedia network has been organised into different tiers as Single tier and multi-tier architectures. These two different architectures can be organized into different environments like homogenous and heterogeneous. If you consider with the homogenous concept all the elements of the network will have the same physical capability and perform the same sensing function and

transfer the data to the base station, but if the environment is heterogeneous ie if the sensor needs to capture different data like audio, video, text, image etc all of which needs to be supported by the architecture. Since in the WMSN the sensor that are used all of which are not of same quality instead each sensor is designed to perform its own specific task, like microphone is used to capture audio , image sensor hence the architecture required is heterogeneous architecture. Similarly the data processing and communication energy involved may be different for different nodes.

The two different architecture of WMSN nodes has been shown in the fig1 and fig 2. It divides the complete whole network into small group called a clusters the nodes that belongs to that clusters are called as cluster members and each cluster is associated with its own cluster head. The cluster members transfer the data to the Cluster head where s the cluster head transfers the data to the base station. One of the advantage of such architecture is that a concept of aggregation is used over her where as its not compulsory to send the data to the base station instead the cluster head will combined all the data that has come and then extract the data which is required as only that data is sent.

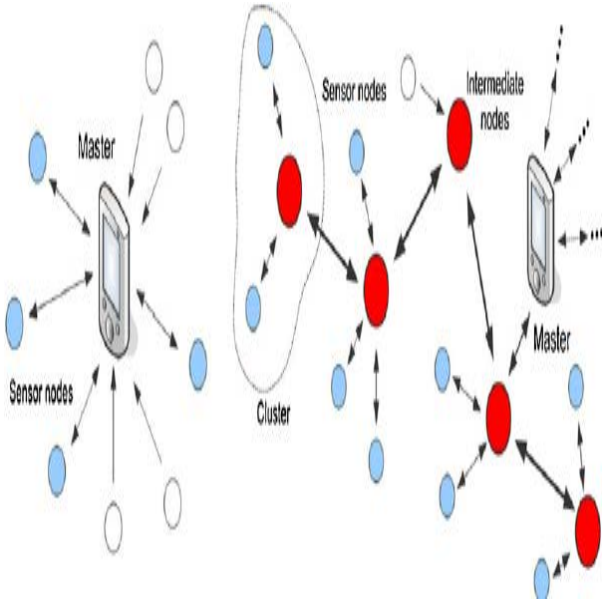

Fig.1 Single tier multi hop network architecture

One more advantage is that the task of communicating can be divided for different nodes the low energy nodes can be assigned will short area of communication and vice varsa and later all these concepts are added to transmit the data to base station. This type of arrangement reduces the communication overhead and also balances the load of traffic which in turn improves the scalability of the network. But the problem is how to develop cluster and select cluster head.

Let us discuss some of the sensor nodes present in WMSN. The Structure of WMSN with an aim as low cost small and one which consumes less power. Examples of electromagnetic wave detectors such as visible spectrum, infrared and ultraviolet detectors. The data that has been captured is analog in nature and it needs to amplified before converting into digital form using analog to digital converter. The earlier low-level analog signals are kept within the sensor packages minimizing possible external interferences and loss, and the amplifier, filter and ADC can be better matched to the capabilities and characteristics of each sensor [3].

A. Scalar Sensor

The scalar sensors0 are mainly used to mainly sense the condition of environment like temperature and humidity. It consists of two different types of sensors on an single IC chip. The sensor one counts the temperature and the humidity of the environment and the integrated digital sensor combines the result of both the sensors. The design of the combination is made of semiconductor metal oxide material.

B.Image Sensor

The technology used in image sensor is of CMOS sensors. This CMOS sensor is produced in the same as of the integrated circuit of computers. Because of high volume production and product yield to be high which is just because of continuous improvement in CMOS technology ensures that these sensors remain of low cost, small in size and remain ideal for the use in WMSNs.

C.Audio Sensors

Audio Sensors where are to be used in WMSN depends the quality of audio to be captured most probably they are of low cost and are of small size. When capturing any audio in the network the different environmental criteria's needs to be considered like humidity, vibration, temperature etc which directly or indirectly effect the audio. The main two audio sensor that are used are electre condenser microphone (ECM) or the micro electrical-mechanical system (MEMS)[3].

II. DESIGN CHALLENGES AND RECOURSE CONSTRAINTS

The WMSN deals with much number of challenges when designing an secure routing protocol. This Paper covers some of the challenges that are major to be considered to provide good quality communication in WMSN.

A. Energy Inspired in Multimedia Network

In Multimedia network which occupies huge traffic hence due to which the need to control the traffic is also huge in the traditional WMSN. Hence instead of DC batteries the

one which huge consumption of energy is used that is photovoltaic batteries. Hence this being as one of the challenge the network should be aware of sensing the network failure.

B. QoS Requirement

The criteria which deal with QoS criteria are bandwidth, jitter, delay, reliability, security, integrity and many more which should be taken into account. But all this criteria's differ with different type of application the WMSN is dealing with. For example with respect to time the multimedia traffic cannot tolerate with delay.

C. Coding Technique In Multimedia Network

There are many more techniques involved in multimedia like event detection, Event compression, Event fusion etc. These all techniques are used for information reduction in multimedia networks. Since the data sent at the source end will be huge quantity, this data will be applied with this techniques to reduce the information to some extent in such a way that this reduced information contains all the data that sources wanted to send.

D. Bandwidth Required

The requirement of bandwidth is huge in case of Multimedia network as different type of information is combined into one data. This high bandwidth requires new transmission techniques to provide the required bandwidth with an accepted energy consumption level to optimize the resource constrain [3] nature of WMSN. The use of Multimedia channel may be the solution to this problem.

E. Security in WMSN

The data in the WMSN is so critical hence it needs to be protected from access of unauthorised users. It is one of the major concern which needs to take care. WMSN are vulnerable to security risk because they use a medium which is highly prone to errors and also deployed in the area without the central control.

Some of the primary attacks are:

a. Active Attack
b. Passive Attack
c. Denial of Service

III. RELATED WORK ON SECURITY FOR WIRELESS MULTIMEDIA SENSOR NETWORK

Rosati *et al* proposed that the ant routing displays certain features which are kindly suitable for Wireless sensor network. It is mainly based on ant Colony optimization algorithm where according to this concept the ant go in for the search of path following the best optimal path. This concept has also used to solve many discrete mathematical problems like travelling salesman problem, shortest path problem, vehicle routing problem, routing in Adhoc network etc. the features of ACO algorithms are they are very simple and self-organized, they are fully distributed and fault tolerant and also they are ready for all time adaption of network condition due to traffic demand. ASAR is the QoS routing protocol which has been used for ACO-based algorithm on tradition ant-algorithm.

The ASAR routing protocol uses the concept of clusters and address only between the cluster head and sink node. There are different services provide the main are noted here:

a. D: query driven: Suppose a path has accommodated with high SNR ration or the path is congested this service can be used.
b. S: Stream driven : This service is used at the path where there is low SNR ration and less traffic
c. R: Event driven: High SNR ratio and less traffic

Here in this routing protocol each cluster head will be associated with this three type of services to find different service aware path from source to destination. This path must meet the QoS and also familiar to all traffic type. Here an some pheromone value is calculated which is based on different consideration like delay, rate of packet loss, energy consumption, required bandwidth. There are also some drawback related to this concept for optimal path setup due to congestion which requires extra consideration which directly effects network performance.

Deneubourge, Aron, Goss and pastels proposed double bridge experiment which is based on Ant colony Optimization only, this experiment deals with how the ants deal with the path foundation for search of food. It has been explained with two experiments, In the first experiment say the bridges has two branches of equal size, At the start the ants were left free to move over branches to reach the food, the percentage of ants that choose which path was observed over time although it was an random based choice, the same branch, which can be explained as follows. At the start the ants choose any one branch at the random base, and then further the remaining some ant also follow the same rule, as ants while travelling drop the pheromone while travelling , the next ants looks at maximum contain of pheromone which makes ants to believe that the max the path is nearest as many ants have travelled from the same path.

This autocatalytic or positive feedback is an example of self organizing behaviour of ants. In the second experiment was set in such a way that the second branch was double the first branch. In such a case all the ants try to choose the one which is short path. As in case of first experiment the ants choose both the paths but now the scenario is different if the ants travel from short path then they will reach the food soon and have a chance to have maximum food where as the one which travels through large path reaches the destination later hence due to environmental behaviour the path which

is best the ants will choose as due to the drop of pheromone contain at that path.

To explain this concept Denebourge[2] and colleagues proposed a simple stochastic model that adequately describes the ant colony in double branch experiment. In this model let, ʊ ants/sec cross the bridge at constant speed say v cm/sec, depositing one amount of pheromone on the branch. Let the lengths be ls and ln be for the short and long paths, an ant choosing the short branch will traverse it in ts=ls/v seconds. While an ant choosing the long distance will chose tn=ln/v seconds or r.ts seconds where r=ln/ls.
The probability p(t) that an ant arriving at decision point what the chance of route either (1,2) selects branch a€{1,2} respectively. The probability p(t) for chosing the short branch is given by

$$P(t)= (ts+ʊis(t))^x/(ts+ʊis(t))^x+(ts+ʊis(t))^x$$

ALCOLBR is a routing protocol based on ant colony optimization for load balancing and addressing the QoS requirement for WMSN. Here the concept of intercluster method is used which is used to find the optimal path and sub optimal path to reach destination. The generation of hierarchical tree to a cluster head along with it members is done using minimum spanning tree algorithm. Intercluster routing is mainly used to find the optimal and sub optimal path along with ACO algorithm. Suboptimal path are only employed as the amount flow exceeds the path flow threshold. In such case backward and forward ants are used. The forward ant have been programmed in such a way that when it reaches the expiry it gets automatically discarded. As the forward ant keeps on going the forward nodes keeps on updating the pheromone value using some local update rule. Till no alternate sub-nodes are obtained the same path is continued if suppose sub-paths come into account highest probability nodes are chosen. To finalise the optimal path the backward ant releases the high pheromone value according to global pheromone rule. Then the transmission will start from source to sink. Suppose any intermediate node fails then the neighbour node sets its pheromone value to zero and send an error message to source node. After that the source node stops sending the information in this path and enable an alternate path for transmission. The simulation results the performance of the algorithm is better than the other proposed routing protocols it's also most reliable and scalable.

Cobo et al propose a hierarchical structure routing based on ACO to satisfy QoS requirements and supports power-efficient , multipath video packet scheduling. In this routing protocol first the sensor nodes are clustered into colonies. After that the path between the clusters are found. Finally the data will be transmitted between the nodes where the new route has been be discovered. The packet loss rate, available memory, queue delay and remaining energy are the main QoS metrics considered . In this concept cluster algorithm are used which consists of cluster setup phase and cluster steady phase. During the cluster setup phase the cluster head will be chosen from the clusters and are placed for further process, during steady-up phase the transmission between sensors and destination take place. The determination of cluster head is decided by some special ant called cluster ant. The node which has this value is called as cluster head, and the other members chose the best cluster head and join that group. The ability to become cluster head is based on the pheromone value and this value is calculated based onn the maximum energy and memory. The sink node determines the no of ants reached which will specify the Time to live (TTL). The ants randomly chose one of the neighbours based on the probability function defined by clustering pheromone value. By this routing protocol the finding of cluster head is guaranteed. Different packet scheduling policies have been proposed to assign priorities to different classes.

IV. CONCLUSION

The advent of Wireless sensor network evolves new application to be created which leads to the research of new Innovative solution. In this paper new technologies of WMSN has been introduced and the current and next generation multimedia data re discussed. Here different multimedia issues have been discussed and different types of routing protocol considering security issue. In addition, we have discussed the security issues and challenges. In line with this, the most recent works in security solutions for WMSNs are surveyed. With the improved necessitate for huge multimedia data at ease, the issue of secure multimedia routing in WMSNs is an region that needs critical awareness

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