A Survey of the Architectures and Protocols for Wireless Sensor Networks and Wireless Multimedia Sensor Networks

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ABSTRACT: In this research, wireless sensor networks and wireless multimedia sensor networks are mentioned. Wireless sensor networks are a new technology that can be applied in many areas that have been quite on the agenda recently. By using wireless sensor networks, information can be collected interactively with the environment, this information can be evaluated collectively and changes can be made on the environment based on information if necessary. A sensor network allows you to easily access information at anytime, anywhere. This function fulfills the data by collecting, processing, analyzing and spreading. Thus, the network plays an effective role in the formation of a clever environment.
Keywords: Wireless Sensor Networks, Wireless Multimedia Sensor Network, Networks, Network architectures, Network Protocols.

1. INTRODUCTION

Developments in hardware and wireless systems have enabled the production of low -cost, low power consumption, multi -functional miniature detection devices. Hundreds and thousands of these devices can be created with the help of thousands. For example, these devices are distributed to a wide geography and a net-hoc network is formed. This distributed and the sensors that make up the network cooperate a detection network system. Wireless sensor networks; a wide range of revolutionary perception feature for different application areas offers capabilities. The reason for this is the sensor networks:

- Reliability
- Truth
- Flexibility
- Cost Efficiency
- It is the ease of installation.

Tilak etc. He stated that clever sensors could offer cautious surveillance and collect information about machine collapse, earthquakes, floods and even terrorist attacks.

- Sensor Networks
- Collection of information
- Information processing
- It makes it possible to monitor and observe various environments for civil and military applications.

With the developing technology, wireless networks have become widespread after wired networks. Wireless network technology has both ergonomic comforts and maximized the rate of use of systems. As a natural consequence of the widespread of this technology, wireless networks are

mostly preferred in the field. Perceptions; Temperature, movement, heat, humidity, location, pressure, such as the perception of changes in many factors are equipment. These functions of the sensors are combined with wireless networks and communication and interaction between further distances were established. Wireless multimedia sensor systems in many civil and military areas are widely used systems. Successful results are obtained in physical events or in combination with media, and microphones. WMSN (wireless multimedia sensor networks) applications can be used alone, as well as in areas such as computer vision, signal processing, communication, and network technologies, robotic areas can be used in areas where online operations can be performed. Wireless sensor networks are wireless personal field networks consisting of many sensor nodes to collect data from the environment. IEEE 802.15.4 and Zigbee standards are used in the communication between the wireless sensor network nodes. With these standards, low power consuming, low cost, reliable and expandable networks can be created. In the thesis, it is aimed to reach the sensor network nodes from every point that can be communicated between wireless sensor network nodes and IP-based networks and access to the internet. In line with this goal, literature research was conducted on the standards used in wireless sensor network and IP -based networks. As a result of the literature research, it was concluded that data packaging, addressing, service discovery and security problems should be overcome in order to communicate between the two networks. After the detection of the problems, the methods used to overcome them were examined. With the examination of inter -network communication techniques, it was concluded that the most efficient method that protects the existing standards is a server -based method. Based on the results of the literature research, a server -based method was preferred for inter -network communication [5-10]. The server -based communication system created in the study consists of server, network gateway and wireless sensor network. The server used in the system is the unit that offers users on the internet side of the wireless sensor network. In the study, XMPP technology, a messaging protocol as a server system, was preferred. The reason why XMPP technology is preferred is to exemplify the usability of different technologies as a server instead of a classic web server as a server. It is unit agility in the system in which the interchangeable translation process is performed. The network gate is the only device that can communicate with both the internet and wireless sensor network. Network passages undertake data storage, service providing, packaging, addressing, service discovery and security procedures in the system. The wireless sensor network consists of sensor nodes and interacts with the environment in various ways. As a result, the integration of IP -based networks with a wireless sensor network was designed by designing a server -based system. With the designed system, the advantages of Zigbee standard in communication between networks were maintained by using the server -based method. In addition, in server -based systems, the usability of the XMPP server instead of the classic web server is tested with the application made within the scope of thesis.

2. EXTENT OF PAST WORK
2.1 Wireless sensor networks
Wireless sensor networks consist of spatially distributed autonomous devices, which use sensors aimed at monitoring the physical and environmental conditions of a particular position, including measures such as temperature, sound, vibration, pressure, movement, pollutants, and different locations. These devices communicate with each other through a wireless connection. These sensors may have limits in their resources related to memory, calculation power, energy, and bandwidth. They are presented in small physical dimensions and can be easily placed in physical areas. They are also considered to be very seeking temporary networks that organize self-

organizing. Considering the architectures, there are special address requirements due to local unique addresses and data-based technologies. A special benefit of these networks is that they are efficient in energy to solve impulse and overlap problems. A quick comparison can be made between WSNs and mobile temporary networks (MANET). MANETs are not as strict resources as they are working on a multi-by network and provide security through common key encryption. WSN uses a wireless connection and provides security through symmetrical key encryption [7,8]. While WSN supports private traffic models, it provides tighter resources with power processor speed and bandwidth. Some advantages and disadvantages of WSN are:

Advantages:
- Prevents excess wiring.
- It can accommodate new devices when requested.
- It is flexible enough to pass through physical sections.
- It can be used through a central monitor.

Disadvantages:
- It may have a lower speed compared to the wired network.
- When purchased in a high amount, the installation costs can be costly.
- Configuration can be very complex compared to cable networks.

2.2 Advantages and disadvantages of the wireless sensor network

Despite some disadvantages, WSN technologies are expected to be an important part of our daily operations and working systems shortly. A way to reduce obvious challenges related to technology is to partner with organizations such as Wipe lot and buy the optimized versions of technology directly. Wipelot wireless sensor technologies aim to increase telecommunication resolution, speed, and coverage and reduce energy consumption. Functionality IEEE 802.15.4 based "wireless sensor network" and 2.4 technology, as well as GHz radio frequency; these components are determined as the benefits of technology. This system and application, which works without the need for an interface, offers portable, flexible, and useful design items. Therefore, technology allows users to concentrate on tracking results by focusing on real-time situations. [8, 9]

2.3 How does it work?

The system produces the required power from the battery or natural energy source when transferring data communication to the desired location via the wireless connection. It has integrated small devices into the transformation process. These wireless receiver nets; It has proven benefits such as internal processing, independent organization, flexible contact with the environment, interconnected work, small physical dimensions, and comfort. It allows remote monitoring through controlled web applications that offer a wide range of wireless networks to create lower costs and power consumption. In the past, these procedures were performed through battery-powered telecommunications. In contrast, the receiver nets easily collect data for local control efficiency, event diagnostic, and monitoring. Therefore, these systems help to eliminate the inadequacy of worn systems and cable-based solutions and provide communication supported by low energy consumption.

2.4 Wireless multimedia sensor networks

Wireless multimedia sensor Networks (WMSN), sound and video, such as multimedia content of devices with the ability to detect the wireless connection with each other systems. These systems have a layer similar to the cable network layer structure. These systems are used effectively in

many areas such as health, traffic, safety, and the industrial sector.

2.5 Scope of application
Application areas are expanded day by day but can be divided into major categories. WMSN can be used for surveillance purposes. This purpose is mostly used in the field of security. The determination of crime and terrorist attacks in advance, follow-up and control of public activities and the presence of missing persons are used effectively. In this application, moving/standing video images and audio recordings are examined. Criminal detection, loss search, identity detection, etc. Support to images obtained during the operations, vector machines (SVM), GAUSS (GPC), integer-numbered wave case transformation (ILWT) by applying classifications and images are classified. It was determined that the performance of the classifications together was increased in the investigations. WMSN can be used for traffic supervision. Theft, usurps, traffic accident, and traffic by relieving flow and identifying empty parking spaces are used in areas such as directing users. Studies are continuing for effective use in the field of traffic supervision. With the inclusion of the internet in these applications, the structure has expanded. While developing the design; the Technology to be used for the maximum package that can be passed through physical and Mac layers (IEEE 802.15.4) should be determined, the security algorithm to be used in the link layer should be selected, and scenarios such as transmission time, waiting time and time for communication should be carefully determined for the sensor nodes coming from different IP addresses. WMSN can also be used effectively in health services. With the spread of new generation 3G/4G technologies, it can be presented with the determination of emergency health status, as well as controlling the condition of patients from home and being able to perform image-centered procedures such as ECG without going to the hospital. In addition, health services such as remote control of body temperature, blood pressure, heart rate, and respiratory frequency can be provided instantly.

2.6 Factors affecting the design
Wireless sensors generally consist of several basic structures. It is generally possible to divide the structure into two layers. In the first part, there is an analog-digital converter in the second part, while the processor, sensor system, memory, power unit, and control/control unit are in the second part. The general working logic of the system is as follows: Data is taken with the sensor with the user interface, network device, and transmission software. The data received is processed from the analog-digital converters and the CPU is also processed and certain results are obtained. These results are subjected to various synchronization in the coordination unit.

2.7 The main problems that should be resolved and considered when designing are:
- The needs of each sensor device such as processor, memory, and power supply can be limited.
- The quality requirements of each application (QOS) are different. For example, while it is important to provide safe transmission of data in a short period in multimedia applications sent to instant messages, in the data received in the form of flow, it has become important to ensure the continuity of this flow. This should be determined in advance according to each problem type.

- Since the data you send is multimedia data, it is necessary to provide a healthy transmission of high bandwidth.
- Depending on the location of the data and the delay in the transmission, the capacity required is not the same. Therefore, a variable channel capacity need occurs.
- Channel sharing in wireless communication is a necessary concept. Therefore, there may be interaction in the transmission layers between the data. To prevent this interaction from damaging the data, it should be taken into consideration.
- Since the multimedia data sent are large, several algorithms and transactions can be applied to minimize the resources and costs in their transmission, and can be subjected to sorting, compression, and encryption operations.

3. Wireless Sensor Network Architectures and Wireless Multimedia Sensor Network Protocols

3.1 Network Architecture
The transmission of wireless sensor networks is also among some layers. Before moving on to these layers, brief information about network architecture should be given [10-11]. According to Ian F. Akyildiz, Tommaso Melodia, and Kaushik R. Chowdurry;

- Perceptions used may be audio/video and/or numerical sensors.
- Audio/video sensations (Video/Audio sensor) are perceivers who can capture sound and move/fixed/fixed images at low resolution.
  Numerical sensor (SCAR SENSOR), Pressure, Moisture, Temperature, such as perceivers. Storage capacity is low.
- Multimedia processor hubs are the relatively larger capacity hubs that provide data transmission between sensations with as little loss as possible.
- Storage Hub is the hub that allows this hub to keep real -time data long for a long time and even process with certain algorithms without being presented to the user.
- SINK is the area where users are directed to the user and transmit the multimedia currents from them to the user.
- Gateway is the part where Sink and the Internet and IP -based WMSN communicate with each other. There is a geographical area coverage area.
- Users are located in the last step of architecture. They are interested in the results of the WMSN within the geographical area they determine by using IP addresses and interfaces.

3.2 Network Layers
As in the standard network structure, there is a layered structure in WMSN. Transmission is made between layers [12-20]. These layers; Application layer, transmission layer, Network layer, Mac layer and physical layer.

3.2.1 Physical Layer
The physical layer is the layer where the network structures are materially. In this venture, which is resistant to initiative, multiple networks can be found together. As the number of networks in this layer on the bottom of the architecture increases and/or transmitters in the Mac layer, the possibility of parasites on the network increases. Equal methods are used to prevent these parasites on the network. One of them is UWB technology that offers high data rate transmission with low energy consumption. In this technology, information is transmitted as short-term blows such as radio frequency. However, this transmission may cause delays and efficiency in the transmission of multimedia data, which are continuous. For the solution of this issue, cross -layered transmission is seen as a light. Another technology is SDR-based MS technology. This technology makes different different wireless networks available in the same frequency band.

3.2.2 Mac Layer
The Mac layer is a layer in which the control and recovery functions of errors are fulfilled. The Mac layer used for WMSN differs from the presence of power savings, motion management and error recovery strategy and Mac used for wireless networks. Mac protocols used in cellular

communication are time-compartment multiple access (TDMA), frequency compartment multiple access (FDMA), and code divided multiple access (CDMA) protocols. Although the method applied is different, the purpose is to reduce the initiative between the data. Mac protocols can be divided into 3 groups as planned, unplanned and hybrid Mac protocols. In the planned Mac protocols, communication between the sensories is made sequential. TDMA can be given as an example of this method. Synchronization is increased by reducing the collisions between the sensories. In unplanned Mac protocols, independent communication is allowed between the sensories. The complexity is low and energy saving is high. Hybrid Mac protocols are a protocol targeting energy saving. It has the ability to separate long and short packages. In this way, when planned Mac protocol methods were used for long packages, energy savings were obtained by using unplanned MAC protocol methods for short packages. While this structure adapts to rapid changes, its complexity is high. In addition to these three approaches, another Mac protocol that begins to attract attention is the cross-based Mac protocol. The main purpose of wireless communication is to minimize energy expenditure while performing communication at the maximum level. In order to ensure this, it was found that transmission with layer architecture was found to reduce the yield while saving energy. The cross -based Mac protocol is based on this structure. In the studies on this method, it has been observed that productivity increases, reliability, management and planning increases the controllability. From this point of view, the reduction of costs and increasing the yield will increase the effectiveness of the WMSN.

3.2.3 Network Layer
This layer is a layer of routing. The main applications performed in this layer can be shown as multiple errors tolerance, providing connection quality and energy optimization. The data coming from the sensors to this layer may be in different ways. For example, in a video sensor, multiple cameras can therefore come to multiple image data. In this case, the reduction of the data is performed in this layer and sent to SINK. The situation is slightly different in directing real -time data. In these data, the accuracy of time, speed and data is important. In this case, it can be checked by the guidance protocols whether the data pass between the Mac and the Network layer is healthy. One of these protocols is the Multi-Way and Multi-SPEED routing protocol (MMSpeed) approach. In this approach, while trying to balance between the two layers, delay measurements and feedback mechanisms are taken into consideration. In the same way, the incoming data may be subjected to a number of deterioration due to external factors, such as rain, snow and/or elements such as camera lens. In this case, some algorithms should be applied to correct the deterioration. Various methods can be applied to maximize the transmission in the network layer. For example, plan and friends increase this transmission
They worked on nodes. As it is known, the data move through the sensor nodes. When various optimsasions are applied on these nodes, the connection time, the power of spent and the quality of the transmitted data were affected.

3.2.4 Transmission layer
It is the layer where the relationship between the network layer and the application layer is established. Although the TCP protocol is preferred in the transmission layer, the UDP still maintains its place as a preferred protocol. The UDP protocol continues to be preferred instead of TCP in some applications. The real -time transmission protocol (RTP), which works with UDP, is sent in formats such as real -time transmission control protocol (RTCP), which is adapted to dynamic timely conduction, and multimedia packages for KMAA in JPEG2000 and MPEG.

Because the content of the UDP and the multimedia package is not easy to distinguish. Instead of UDP, TCP is more successful in finding and relieving a tremor in data transmission and the obstruction in the network. However, UDP is more effective in safe transmission of data. However, TCP cannot distinguish the band on which this blockage is on. Factors such as excessive traffic density, congestion, high package recording rate, delays, excess energy consumption in the transmission layer are factors that adversely affect the performance of the transmission layer. In order to increase the performance layer performance, measures can be applied to increase the bandwidth, minimizing real -time delay and efficient use of energy.

3.2.5 Application Layer
Application layer is the layer where the user interfaces are located in the KMAA coding section. It is aimed to reach the best bandwidth in the coding phase by spending the least energy. Multimedia sensories also have Encoding processes should be preferred with the least complexity of these operations. As complexity increases, cost and energy will increase. But there is also a dilemma that needs attention here. As the computing complexity increases, the cost, time and energy consumption increases, and it may be difficult to solve in simple coding.

4. RESULTS AND DISCUSSION
4.1 Service Quality Concept
Service Quality (QOS) can be expressed as the service quality provided by the application for network applications or the quality of the application for the user. In terms of the user, QOS is the usability that the application provides itself, not the function and capacity quality of the application. In terms of application, it is based on the reliability, functionality and interaction between layers. QOS by the network perspective is to ensure the situation where network resource use is at the highest level. The main purpose of QOS is to increase the bandwidth to the highest level by using different algorithms or mechanisms in each layer for each data in the network structures where different multimedia data are available. Since the structures and QOS supports of different types of networks are different, limitation criteria and applicability can also be changed. For example, for mobile AD HOC, bandwidth restriction is a more challenging application than dynamic networks. In terms of the application layer, QOS can be expressed in general as the number of active senses and the low error rate of the data from the sensoria's. As a network layer, the QOS deals with the application of the data between layers, not the applicability of the application.

4.2 Procedures that can be applied in transmission of multimedia data
In the transmission of data such as sound and image, cost and time savings may need to be subjected to different procedures to protect the integrity of the data and to ensure safe transmission. These operations are compressed, encryption and so on. It could be. There are different algors that can be used for this purpose. F.Akyildiz and his friends, who work on the methods to be used for compression process, examined Entopy-based deviation measurement (EDM) and multiple cluster coding protocol (DMCP) methods. From these methods, EDM is a method based on coding the data received from different cameras and compressing and calculating the yield to be obtained. It is aimed to create a DMCP -based coding hierarchy by using EDM results. The compression efficiency obtained by coding using EDM according to the result obtained is higher than the classic coding. The transmission of sound data with a multimedia data is a more sensitive issue. The sound is a data that can be exposed to external effects and deterioration due to its structure. Encryption

of this data is a method that can be preferred to prevent the deterioration of data that may occur in the data and to protect the integrity of the data safely. Honggang Wang and his friends have worked on cross -layer architecture and resource efficiency and data safety for the transmission of sound by using WMSN. When the results of this study were evaluated, it was seen that the MDBT -based sound flow method was preferred. In this method, the data can be divided into packets according to the privacy of the sound information, and instead of encryption of all data, it is provided to encrypt the data package that only occurs privacy. Thus, while the safety of the data is provided, the energy is increased and the energy spent is reduced by equal resource allocation.

4.3 What to pay attention to security

WMSN applications are not only used to measure numerical values such as pressure, humidity and temperature, but also in analog data such as image and sound. Of course, this situation has brought about how to ensure the integrity and safety of these data and what should be considered.

- Effective management of experience quality (QOE) and service quality (QOS) is one of the biggest problems. Features such as limited welding capacities, computability and compression processes are complex, privacy/security management and dispersion of data should be considered for QOS.
- In these applications, indirect or direct data are obtained. Questions should be taken into consideration how much of this data is personalized, how much can be used and how to protect it.
- WMSN applications are also subjected to attacks as in every communication application. These attacks, called taxonomy, can be categorized as communication attacks, confidentiality violations, sensing knot attacks, crypto logical attacks. In order to prevent these attacks, many safety steps such as preventing the begging of the network, checking the integrity and accuracy of the data between the nodes, and authentication should be taken into consideration and applied.
- The platform used should be selected by taking into account security, privacy and technological restrictions. In different layers, different algorithms (compression, authentication, collection, etc.) should be a hierarch platform that allows applicable.
- In addition to these problems, there are certain controls that should be considered in the design stage since it is known that wireless networks are much more open to attacks.
- Since transmission is made between the sensor nodes, the positioning of the nodes is very important. The placement and association should be created in a way that allows an attack that may come to the other nodes to cause the least damage to other nodes.
- It should be taken into consideration that the collected data are special data of the individuals and it should be known that confidentiality tenders can be made through operations such as listening and playing the data. For this reason, it should be emphasized how to develop a model for the protection of privacy during the design phase.
- When transmitting the data between the nodes, it must be controlled and confirmed that the integrity and accuracy of the data is preserved.
- There are various studies in order to ensure that the designs are realized by taking these controls into consideration.

5. CONCLUSION

Wireless multimedia sensor networks are one of the recent working areas. With the effect of

technological developments, remote access and generally allowing system controllability has enabled it to attract more attention. It is thought that this technology, which is increasing in many areas from health sector to security sector, from industry to entertainment sector, will be used more effectively in the coming years. In particular, it is considered that the developments in the field of security and health are more interesting. Thanks to the new applications to be formed, it is vital to ensure that health services are provided more effectively and faster. New studies will be followed in this field. In addition, another interesting issue is the usage areas in security applications. It is thought that there may be practices such as determining the tendencies of the person by sound and video analysis among the following workspaces and the creation of the profile.

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