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Data Sharing Enabled Through Internet of Things (IoT) in Wireless Communication Networks

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***Abstract*— A variety of difficulties while attempting to transmit a file including multimedia data through the many peers of a wireless IoT network. The system's centralization, which increases the risk of a security breach and makes it harder for users to access their information, is one of the biggest issues. It would be possible to address the issues with security and user accessibility, but doing so would forfeit scalability, low latency, and lengthy response times. The project in issue uses the Interplanetary File System and an original block chain approach as a direct result of this. Additionally, we discussed the system's workings and the ideas that led to its development. This research looks at a broad range of uses for economic and pricing models, which are often known as methods for intelligent, logical decision-making. Building adaptive protocols and algorithms that are designed expressly for use with WSNs is the ultimate objective of this study. Our objective is to create an atmosphere that inspires smartphone users to engage. The findings show that SATS has the potential to lower communication and computation costs, enabling it to provide affordable data transfer. The SATS system's calculation costs are as follows: AN: 14%, 23%, and 59%; Fog-Node: 6.5%, 21.5%, and 51%; and Sensor Node and AN: 6%, 3%, and 4%, respectively. This is a reasonable price when compared to the costs of PPDAS, IDAP, and ASAS, which are 14%, 23%, and 59%, respectively. According to the findings, the suggested SATS has a greater storage capacity, lower computation costs, lower communication costs, and more effective energy utilization when compared to other systems that belong to the same category. When compared to other existing systems.**

Keywords*— Wireless Sensor Networks, Crowdsensing Network, Internet of Things, Communication Technologies, Smart Devices.

I. INTRODUCTION

Using different kinds of multimedia as a medium allows for the straightforward transmission of information from one location to another. It is a media that can be utilized in an interactive manner, and it provides the user with a number of efficient ways to show a range of different types of information. Users are able to engage in conversation with digital content by using several pieces of technology. It is possible to utilize this as a mode of communication.

A few examples of areas of business that extensively depend on multimedia are education and training, reference materials, corporate presentations, advertising, and the production of documentaries. The term "multimedia" is formed from the terms "multi" and "media," and it refers to the use of a number of different types of media for the purposes of information dissemination. Text, pictures, music, and video are displayed in a multimedia format that, via the use of links and other tools, lets users to navigate, engage, create, and communicate with one another using a computer. These characteristics may also be found in multimedia. Any media that allows digital information of any kind to be displayed, stored, communicated, and processed is what this term refers to. Text, drawings, still and moving images (videos), graphics, music, animation, and any other sort of material that fits into this category are all covered. This applies to any and all forms of media [1].

In order to organize everything you see, hear, and interact with, the first thing you'll need is a computer. Creating connections between all of the different pieces of information is also very important. Third, navigational tools are required in order to navigate the interconnected data sets in an appropriate manner. The use of multimedia may be found in a variety of settings, such as the corporate world, academic institutions, and vocational training programmes, among others [2].

A multimedia presentation is one that adheres to the fundamental meaning of the term "multimedia" and may consist of a variety of components such as text, audio, video, static pictures, and moving images, amongst others. Multimedia is the term given to the process of displaying information on a computer by making use of a number of different types of media, such as textual data, audio, photos, videos, graphics, and animations. A few examples of these kinds of services include electronic mail, Yahoo! Messenger, video conferencing, and a wide range of other kinds of multimedia messaging services. The protection of multimedia data is a good illustration of a content-based security system in action. It is the activity of guarding against unauthorized access, alteration, corruption, or theft of a user's digital information for the whole of the information's existence. A security against unwanted access to databases, websites, and computers, this method uses this technology. As a direct result of this, it provides a method for protecting multimedia data against the risk of having the data get corrupted or disappearing entirely. Figure 1 demonstrates how the Internet of Things may be used to a broad variety of different fields and businesses, including the medical and healthcare sectors, as well as commerce, industry, agriculture, transportation, and smart homes [3].

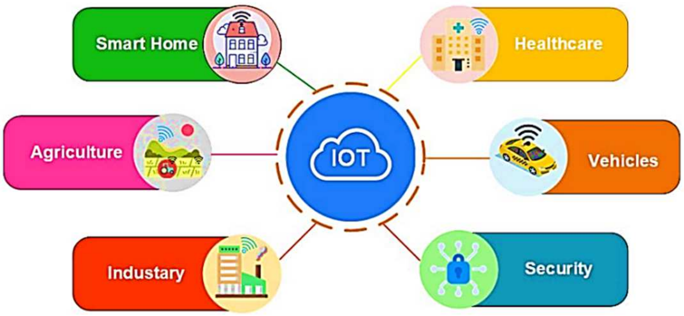

Figure 1. Application of Internet of Things

The Internet of Things has emerged as a critical component for the development of intelligent products, items, and commodities[29]. This is because it enables these types of things to communicate with one another. Utilise a combination of wired and wireless networks, as well as close and far-range communication, to reach your goal of interoperability [48]. It provides a real-time internet look-up service that is controlled and programmable, in addition to providing an acceptable information security mechanism [30]. It incorporates a large number of different home sensing devices and a substantial amount of data in order to enable logical inferences to be drawn on the operations of the house. It is common practise in settings associated with medical care, such as hospitals and nursing homes, to make use of biomedical technology in order to manage the documentation of patients' medical histories. It is now feasible, with the assistance of Wireless Sensor Networks (WSN), to place sensors in a number of different areas and yet offer coverage for a large territory [31]. There is a good chance that this would result in the accumulation of repeating data patterns, which would lead to an increase in the costs associated with processing and transmission [32]. A vital step in the process of data aggregation is the removal of repeated patterns from the data in question before the data in question is sent across a communication channel [33]. This phase is essential for reducing the costs associated with communication as well as the needs for storage. The story of the WSNs is often derailed by significant obstacles[34]. This is directly attributable to the unusual appearance of the WSNs [4].

The efficiency with which a network uses the energy it has access to is the most important factor that determines how long it can continue to function inside an IoT-enabled WSN [35]. Wireless sensor networks that are enabled by the Internet of Things are used in a wide variety of critical applications that are designed to sustain human life. Some of these applications include intelligent housing and transportation systems, as well as remote health monitoring and diagnostics. The survivability of a wireless sensor network (WSN) [49] refers to the capability of such network to keep providing a sufficient level of service even in the event that it suffers a loss, hence increasing the network's longevity. As a consequence of this, a technique that is dependable and efficient is required to evaluate patient survival [36]. The resilience of the network is also significantly influenced by security in a substantial way. In order to improve the network's capacity to withstand many attacks, it is common practice for security to include demonstrating a system's resistance to a variety of security risks. In this hypothetical situation, security and survivability are combined in order to provide essential services in an efficient manner [51]. When working in an environment that makes use of IoT-enabled WSNs, one of the most important challenges that must be overcome is ensuring the security of the data's integrity, confidentiality, freshness, network availability, and accuracy in the event of an assault coming from either the inside or the outside. Before encrypting the data with its very own private key, the Aggregator Node first uses a private key [37] and a simplified version of the XOR operation to validate the data. After the data has been encrypted, it may be securely sent to the FOG-Server [38]. It is now possible, because to advancements in fog technology, to cut down on gearbox delay and storage requirements. It is important to point out that the bulk of research on Internet of Things–enabled wireless sensor networks (IoT–enabled WSNs) [39] focuses on energy consumption, communication complexity, and network longevity. On the other hand, delivering a substantial amount of data requires a greater amount of memory, which boosts the cost of both processing and transmission [52].

A number of solutions that are based on safe aggregation have proven that there is a need for an efficient technique that not only regulates heterogeneity between sensor nodes but also offers secure data aggregation at the network's edge. This necessity has been shown by the solutions. We are of the opinion that fog-based healthcare systems will not be successful without an adequate amount of communication technology that is both lightweight and secure [53]. Greater study into healthcare-related practises has led to the development of a number of solutions for the transmission of data that are both lightweight and safe. This is the case even though there is still a great deal of work to be done in this sector.

II. REVIEW OF LITERATURE

When attempting to transmit a file that contains multimedia data with the numerous peers of wireless Internet of Things (IoT) networks [40], there are a number of challenges that need to be overcome. These challenges must be overcome before the transfer can be successful. One of the most significant problems is that the system is centralized, which both raises the possibility of a security breach and decreases the degree to which users may use the system [41]. It's possible that the system might be rapidly converted into a decentralized network if these files are uploaded to the block chain network. It's possible that this is the solution you're looking for. The problems with security and user reachability might be handled, but this would come at the sacrifice of having low latency, having long response times, being scalable, and having privacy concerns. As a direct consequence of this fact, the work in question makes use of the Interplanetary File System and an innovative block chain strategy. In addition to this, we spoke about the structure and operation of the system [42]. Finally, after doing a research on the system's security that we recommended, we found that it had a high probability of fixing the bulk of the security concerns that are present in traditional systems. This was the conclusion that we came to after conducting the study. This is the conclusion that we arrived at. The solution that we have provided may also be used to any wireless IoT network that engages in file trading and involves the interchange of multimedia data [43]. The networks for wearable technologies, healthcare, and smart cities are all included in this category [5].

This article's current literature review focuses mostly on discussing such subjects as economic analysis and pricing models for data collection and wireless transmission in relation to the Internet of Things (IoT). The Internet of Things is highly reliant on wireless sensor networks (WSNs), which collect data from their environments and transmit it to sink nodes for processing. In order to provide long service durations and incur minimal maintenance costs, WSNs need designs that are both adaptable and strong to manage a variety of challenges. The collection of data, the development of topologies, the forwarding of packets, the optimization of resources and power, the optimization of coverage, the proper distribution of tasks, and security are some of these challenges [44]. In order to find a solution to these issues, the Sensors need to evaluate their existing skills and alternatives and choose which course of action will offer them the best chance of being successful. This study investigates a wide variety of applications for economic and pricing models, which are also known as intelligent rational decision-making approaches from time to time. The ultimate purpose of this research is to build adaptive algorithms and protocols that are tailored specifically for use with WSNs [45]. In order to encourage smartphone users to contribute their sensory data to crowdsourcing applications by using a variety of apps, we are also researching various pricing schemes. Our goal is to provide smartphone users with an incentive to do so. In addition, we study the usage of a variety of price models for Machine-to-Machine (M2M) communication using a number of different pricing models [46]. In conclusion, we will discuss a number of key research problems that have not yet been answered, in addition to possible research topics that may be investigated in the future pertaining to the pricing and economics of the internet of things [6].

The capability of the Internet of Things to monitor and control the environment is one of the primary reasons for the significant amount of interest being shown in this emerging field of technology. Through the Internet of Things (IoT), a wide range of normal, day-to-day things have been endowed with intelligence, which enables them to provide aid with decision-making. This intelligence comes in the form of sensing, processing, and communication capabilities. Every Internet of Things device has to have the capability to interact with other Internet of Things devices so that it may transmit and receive data. This is one of the most essential and basic elements of an Internet of Things device. The vast majority of Internet of Things devices use wireless technology in order to connect with one another and other devices. Both the commercial sector and the academic community have developed a variety of unique communication tactics for Internet of Things (IoT) platforms. These strategies have been put forward. The authors of this book provide the conclusions of an in-depth investigation of the benefits and drawbacks associated with a variety of communication technologies [7].

The term "Internet of Things" (IoT) refers to a network of real physical objects or entities that are able to interact with one another and share information. Because of the Internet of Things (IoT), the wireless medical sensor network (WMSN) may be able to integrate data from distant patient monitoring with centralized repositories in the near future. These intelligent sensing components of the WMSN are what make it feasible to have this communication. Throughout the whole of the process of collecting and transmitting medical data, security is an absolute need in order to dissuade hackers. The production of batch keys in current base systems requires the employment of complex multiplication processes, which is the primary challenge associated with these systems. These approaches place a large computational burden on the aggregator node (AN), which necessitates that a sizeable quantity of RAM be made available on that node [8]. This article presents the lightweight Secure Aggregation and Transmission Scheme, sometimes known as "SATS," with the intention of securely calculating and providing data as rapidly as is practically possible. Its abbreviation comes from the acronym. SATS provides a simple XOR method as an alternative to the costly multiplication procedure that is often used to get batch keys. XOR is an abbreviation for exclusive or. The AN also provides an algorithm known as the AN Receiving Message Algorithm, or ARMA for short. This algorithm is used in the process of combining the data generated by sensor nodes [9]. On the fog server, batch verification and message decryption may be enabled with the use of a technology that is often referred to as RME, which stands for receiving message extractor. SATS provides protection against a wide range of security threats, including as attacks using a man-in-the-middle, attacks involving a denial-of-service, and attacks involving a reply.

A model of the intended SATS may be created with the help of simulation software called NS 2.35. According to the results, SATS has the potential to deliver cost-effective data transmission by reducing the expenses associated with calculation and communication. The expenses of doing calculations for the SATS system are as follows: 14%, 23%, and 59% at the AN; 6.5%, 21.5%, and 51% at the Fog-Node; and 6%, 3%, and 4% at the Sensor Node and AN, respectively. When compared to the expenses of PPDAS, IDAP, and ASAS, which are 14%, 23%, and 59% respectively, this is an acceptable price. According to the results, when compared to other systems that fall into the same category, the recommended SATS has a higher storage capacity, decreased computing costs, lower communication costs, and more efficient energy utilization. This is in contrast to other systems that are currently in use [10].

III. System Model and Problem Statement

While the data is being sent from the sender to the sink, a hacker who is positioned at an intermediary node has the opportunity to change the data in any manner that they see appropriate.[11] As a consequence of this, it is very necessary to provide a high level of security whenever one is sending sensitive healthcare data. With this in mind, we provide a model for the secure data aggregation and transmission that is required for Internet of Things-compatible wireless sensor networks. As can be seen in Figure 2, the body of the patient is completely covered with a wide array of cutting-edge sensor gadgets. In order to set up peer-to-peer connectivity, the sensor nodes will send data in a protected manner to an aggregator node that the user will choose. In contrast to the smart sensor nodes, the aggregator nodes only share data in response to requests made by the FoG-Server. Smart sensor nodes often communicate data with one another. In order to do remote data analysis and forecasting, it is usual practice for medical professionals to inquire with the fog server about the availability of patient health indicators.[12]

In the conceptualization of our system, the body of the patient is linked to a sizeable network of sophisticated medical sensor nodes. Wearable sensor nodes collect data pertaining to the patient's health and then transmit that data to a server. The obtained data are sent to the aggregator node, which is also referred to as the AN. Doing so makes it possible to aggregate data in a secure manner. In Figure 2, we break down the core concept of how sensory devices interact with ANs in order to better understand how this interaction occurs. Additionally, it is the responsibility of the AN node to collect medical data from the sensor nodes and to safely aggregate data from the other nodes. In this particular scenario, ANs are the ones that provide the fog server with aggregated data, either directly or indirectly. It's feasible that the AN3 and AN4 will communicate with the fog server directly by sending an aggregated message.[13] Between the AN1 and the AN2, there is not going to be any possibility of establishing a direct connection to the fog server. As a direct consequence of this, the aggregated data are sent from the middle node, AN4, to the end node, AN2. After combining the information that it obtained from the AN2 with the information that it obtained from the sensor nodes, the AN4 transmits the combined message to the Fog node. In order for the AN1 to interact with the fog server, it first creates a connection with the ANs 2 and 3, using a manner that is quite similar to the one that was explained before. [16]The AN-to-AN connection allows us to provide the service of WCN data aggregation, which is a direct result of the connection. In addition, the fog node provides safe data extraction and processing just before the data is sent to the cloud server for storage and access.

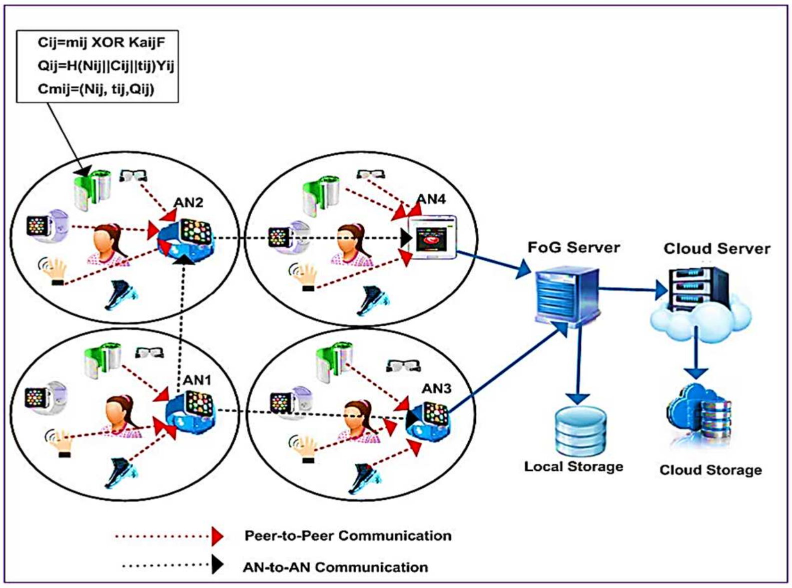

Figure 2. Peer-to-Peer system paradigm for exchanging aggregated data with fog-server.

The high cost of computing that results from carrying out challenging multiplication operations on extensive computations is the primary difficulty that arises with the approaches that are currently in use. When extremely high integers are multiplied, the outcome is a number that is more than the maximum amount of WCN data storage that a certain variable is capable of holding. Because the computations take so much time, there is an additional amount of overhead for the vast amount of data that is sent to the base station. When dealing with really large values, the costs of storage and transmission balloon to substantially higher levels. In this particular scenario, a workable solution presents itself in the form of a cyclic transfer of a predetermined amount of data. In order to avoid a sensing bottleneck, technology must be developed that is not only efficient but also sensitive to the needs of the natural world. [14-15]. Because of this, the method of data aggregation that will be discussed in the next section is both secure and space-efficient. During these processes, the keys were checked for validity before the data was delivered in batches to a server located in the public cloud. Before being sent for further transmission, all of the sensing device keys are multiplied by one another using this procedure. The verification of the key is carried out in batches using this manner. After this step is finished, the keys are not sent on to be used in any other processes until after this procedure has been finished. During the batch verification process, extensive multiplication uses a greater fraction of the storage capacity available at AN and fog nodes, which contributes to an increase in the overall cost of transmission and processing.

IV. RESEARCH METHODOLOGY

It has been shown that the proposed security paradigm is suitable for carrying out safe and portable remote monitoring of data health. An official security assessment of the technique is carried out in order to provide evidence that the proposed strategy is effective against a wide variety of attacks directed against the confidentiality of the WCN data. The cost of computing at the aggregator node is broken down into its component parts and compared in Table 1. The recommended SATS is evaluated against existing systems in the research literature with regard to the amount of time and resources required to calculate different node counts. [17]The findings provided in the table demonstrate that the suggested method outperforms its competitors, both when it comes to groups of up to 10 nodes and when it comes to single nodes. In addition, the almost linear increase in processing costs offers the prospect that increasing the number of nodes might keep the same rate of cost growth.

TABLE 1. A COMPARISON OF THE PROPOSED SATS AND THE CURRENT SYSTEM'S CALCULATION COSTS AT AN (MS)

Nodes	SATS	PPDAS	ASAS	IDAP
1	13.445	29.6699	57.8865	45.6157
2	25.169	43.9684	85.4816	63.5735
3	35.1654	59.4864	116.0854	75.5430
4	42.785	72.5859	142.6923	94.5359
5	51.376	84.8939	173.2962	109.4668
6	56.436	100.1964	202.9016	125.4697
7	68.686	114.4989	228.5083	152.3956
8	82.286	138.8064	267.1124	152.3555
9	95.853	145.129	295.7178	172.6584
10	125.246	159.4154	314.3322	198.2823

According to the data in the table, the technique that was advised often results in reduced costs associated with computing. It should be stressed that this trend is not significant despite the fact that it is very insignificant and virtually behaves in the same way as the computing costs at the ANs that are shown in Table 1.[18] Regardless of the total number of nodes, the performance of the SATS (WCN) system that was proposed is, without a shadow of a doubt, superior to that of its competitors. This fact cannot be refuted.

A. *Replay Attack*

In a replay attack, the attacker will wait some amount of time before delivering the intercepted communications of the victim again. As a protection mechanism against this kind of attack, a timestamp has been appended to each and every transmission. The proposed approach involves deleting outdated messages in order to avoid communications being sent twice or being delayed in any way. The communications that are received beyond the allotted amount of time will be discarded by the system that is being proposed in this scenario. This makes the window of opportunity for repeat attacks narrower, which is a contributing factor. [19]

B. *Man*-In-The-Middle Attack

An adversary node may act as an eavesdropping device for an attacker by allowing the latter to listen in on a conversation that is taking place between two other nodes. An encryption method that uses batch keys and provides protection against man-in-the-middle attacks is the strategy that has been suggested here. Sensitive information contained inside nodes may be protected from access by unauthorized parties if, in addition to other forms of security credentials, a hash of the data that was obtained is used. The ways that have been described offer secure data encryption and decryption, which enables the user to protect themselves against attacks that include a man in the middle. [20]

V. ANALYSIS AND INTERPRETATION

WCN data pertaining to multimedia may include information that is confidential, sensitive, or concealed. Therefore, it is essential to have a conversation about the risks associated with the scenario, and to evaluate how risky the strategy that we have proposed really is. As a consequence of this, the next section will discuss the many flaws and risks that are associated with the multimedia file system. In addition, we are going to investigate the extent to which the architecture of our system can withstand attacks of this kind. Table 2 presents the results of a comparison between the performance of the proposed SATS (WCN) and that of its competitors regarding the occurrence of ANs. When comparing the energy consumption of the proposed system with that of at least the two other systems, ASAS and IDAP, at the beginning, at a time of 0.1s, it is clear from the table that there is no obvious difference between the two sets of numbers. On the other hand, in comparison to the other possibilities, the energy consumption disparity between the suggested design and the alternatives rises with time.[21] In addition, it is possible to see that the anticipated increase in the scheme's level of energy consumption does appear to be levelling down over the course of time. When compared to its competitors, the solution that was offered performs very well in terms of the amount of energy it consumes at SNs.

TABLE II. COMPARISON OF THE PROJECTED SATS'S ENERGY USE AT AN (JOULE) WITH THAT OF THE CURRENT PLANS.

Time	SATS	PPDAS	ASAS	IDAP
0.1	0.0005	0.0011	0.0009	0.0008
0.2	0.0002	0.0022	0.0016	0.0019
0.3	0.0019	0.0035	0.0031	0.0029
0.4	0.0025	0.0051	0.0035	0.0041
0.5	0.0034	0.0059	0.0038	0.0051
0.6	0.0043	0.0068	0.0043	0.0059
0.7	0.0051	0.0076	0.0055	0.0069
0.8	0.0052	0.0085	0.0061	0.0073
0.9	0.0061	0.0088	0.0063	0.0085

Table 3, which is quite similar to Table 2, presents a comparison between the energy consumption of the proposed SATS system and that of the existing SD approaches. When contrasted with Table 2, the modification at the top of this table is more apparent. Nevertheless, the overall implementation of the strategy is not progressing at a pace that can be described as shockingly quick. As a direct result of this, one may get the understanding that the rate of energy depletion at SDs is often much slower, and that this is especially the case with the proposed system. In its present iteration, the [22] SATS continues to demonstrate individual performance that is superior than that of its competitors on a continuous basis. As a consequence of this, it is plausible to assert that the proposed technology enhances the survivability of networks in addition to being more energy-efficient than its rivals in this space.

TABLE III. ANALYSIS OF THE PROJECTED SATS'S ENERGY USE AT SD (JOULE) IN COMPARISON TO THE CURRENT PLANS

Time	SATS	PPDAS	ASAS	IDAP
0.1	0.0003	0.00011	0.0005	0.0008
0.2	0.00007	0.00015	0.00009	0.00008
0.3	0.0003	0.00019	0.00013	0.00019
0.4	0.00016	0.00028	0.00019	0.00027
0.5	0.00022	0.00036	0.00026	0.00031
0.6	0.00029	0.00038	0.00030	0.00035
0.7	0.00035	0.00046	0.00034	0.00043
0.8	0.00036	0.00052	0.00038	0.00047
0.9	0.00041	0.00059	0.00043	0.00054

VI. RESULT AND DISCUSSION

In order to validate the method that was proposed, a number of simulations were carried out. These simulations took into account the fact that the devices would be installed in an area of 1500 centimeters by 1500 centimeters. In addition, there is participation from the Public Cloud Centre as well as the Edge-Server. When compared to the methods that are currently being used, the recommended system's compute costs, edge server storage capacity, and communication costs are analyzed and contrasted [23]. The TCL file that was used to simulate message initiation and trace annotation using NS-2.35 on Fedora Core 16 contains all of the data that was required for the simulation. This data includes the location of the nodes, the organization of the nodes, as well as message initiation and trace annotation. The functionalities of sending and receiving may be implemented for edge servers and sensing devices, respectively, by developing a new class in the C programming language. After that, an AWK script for files is used to get the values that are included inside the trace files. The proposed tactic is then evaluated in comparison to a number of other base schemes that already exist, such as ASAS, IDAP, and PPDAS. ASAS, IDAP, and PPDAS. The computational costs of the SATS system are compared with those of IDAP, PPDAS, and ASAS at the aggregator nodes and fog nodes (AN) respectively. The following is a breakdown of the computational expenses associated with PPDAS, IDAP, and ASAS, as well as the proposed SATS: 157.4184 milliseconds, 314.3232 milliseconds, 188.2813 milliseconds, and 105.214 milliseconds, respectively, are the amounts of time that pass at the AN node in Figure 3 when there are 10 aggregator nodes. According to the results of this study [24-25], it is plainly clear that the SATS technique that was provided beats its rivals and is suitable for patients who are mobile. The expansion of the associated computer costs of the suggested method is also shown in the image. These costs are shown to increase WCN in a progressive and linear fashion in the illustration. It suggests that if the number of nodes increases, the suggested solution has the potential to outperform the other methods that have been considered.

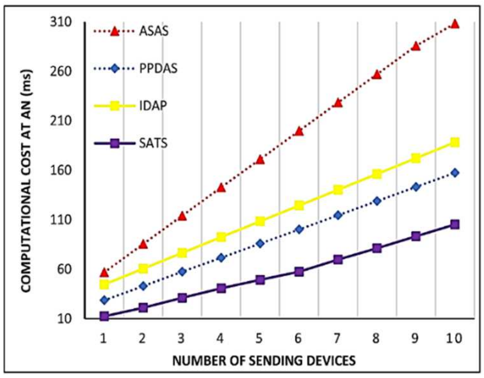

Figure 3. Computational Cost for SDS

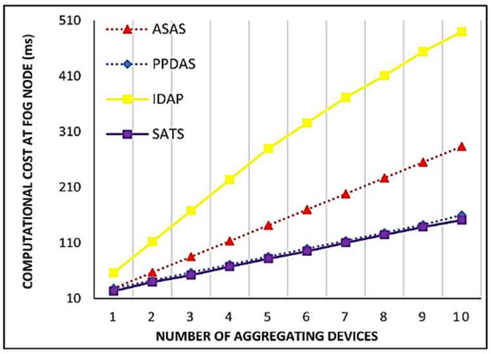

Figure 4. Computational cost for ANS

The performance of the recommended SATS system beats the performance of PPDAS, IDAP, and ASAS by margins of 15%, 22%, and 58%, respectively, when the computation cost is assessed in percentage terms. The result of this is that the solution that was proposed performs better at the fog node since it uses less processing resources than the alternative. Figure 4 demonstrates this point well. According to the figure, the computational expenses for PPDAS are 157.0747, ASAS are 283.437, IDAP are 482.782, and the suggested SATS are 151.0747 when the number of ANs is equal to 10. As a direct result of this, it follows that the strategy that was presented is the most cost-effective option when compared to its rivals in terms of the computational expenses that they incur [26].

Through the use of modelling, it is possible to predict how much energy the proposed system would need at the SN nodes while it is aggregating data. A pattern that is constructed from trace data serves as a representation of the residual elasticity of each node. Information on the total amount of energy that was used may be gathered from the AWK files using this method. Figure 5 takes into consideration the amount of energy that the sensor nodes use while the data is being sent. The starting energy level value is set to 1000 joules for each individual sensor node in the network. At 0.7 seconds, it is anticipated that the sensor nodes for ASAS, PPDAS, and IDAP [28] will use 0.00033 Joules, 0.00045 Joules, and 0.00042 Joules of energy, respectively. The SATS sensor nodes are expected to consume 0.00042 Joules of energy. SATS will make use of 0.00031 Joules worth of energy during its operation.

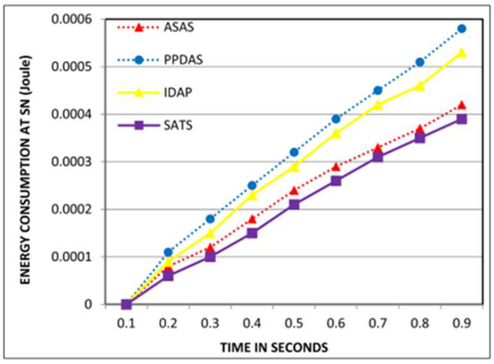

Figure 5. Energy usage for Various Node SN Counts

The amount of energy that was used at the aggregator node is shown in Figure 6. In this particular case, it has been determined that the amount of initial energy required for each node is 10,000 joules. The research indicates that throughout the period of 0.8 seconds, the aggregator nodes use 0.0058 Joules for ASAS, 0.0082 Joules for PPDAS, 0.0075 Joules for IDAP, and 0.0054 Joules for the suggested SATS architecture, respectively. According to the findings, SATS has a much greater energy efficiency compared to other systems.

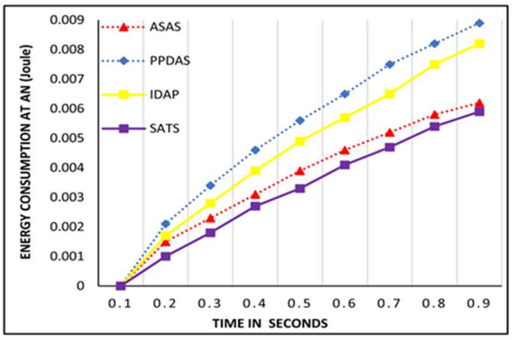

Fig. 6. Energy usage based on Node and AN Count.

VII. CONCLUSIONS

When one node in the network does not fully trust the other nodes in the network, sharing a multimedia file over the wireless IoT network such as an audio-video or large text file can be difficult. A centralized file-sharing system is more difficult to maintain than a decentralized one. Consider the possibility that a rogue server or mediator may shut down the whole network utilized for WCN data transmission. As a solution to this issue, we put forward a decentralized system architecture for distributing and sharing multimedia file systems via a wireless Internet of Things network. This architecture was created in order for us to manage it. In order to give exceptional security without sacrificing latency, we have done this by fusing IPFS with blockchain technology. We have developed a very quick multimedia data file sharing solution. This is a result of the system's strong security and significant latency. Independent classes needed for setting up sensor devices, AN, and the FoG-Server are included in the C files.

The results of the studies demonstrate that the suggested technique is more cost-effective than its rivals in terms of calculation and transmission costs, and it also requires less storage space. The SATS approach outperforms PPDAS, IDAP, and ASAS in terms of the amount of computational resources used by margins of 18%, 22%, and 61% at AN and 6.2%, 25.5%, and 51% at Fog Node, respectively. The SATS scheme's communication costs at the Sensor Node are, respectively, 7%, 4%, and 5% lower than those of PPDAS, IDAP, and ASAS. These expenses are 5%, 10%, and 13% less at the AN.

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