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Recent Advances of Energy and Delay Techniques in MAC Protocols that Enhances WSN Life Span: A Comprehensive Investigation

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Abstract: The Wireless Sensor Network (WSN) can essentially be applied to numerous applications, including PC observing and information checking. In any case, applications for remote sensor networks have various attributes and necessities than standard wireless local area network (WLAN) applications. Wireless or Remote Sensor Networks (WSNs) have become a main arrangement in numerous significant applications, for example, interruption discovery, tracing the target, mechanical mechanization, brilliant structure, etc. The sensor hubs are commonly unattended after their arrangement in dangerous, antagonistic or far-off regions. A few MAC conventions for the WSNs are portrayed accentuating their quality and shortcoming. Efficient or smart energy utilization is the most significant idea of WSN. The low message rates and streamlined idleness necessities regularly utilized in sensor network applications can diminish the remote force utilization of sensor terminals. In this paper, we carried out a study of several energy-efficient Medium Access Control (MAC) protocols premeditated for wireless sensor networks namely Sensor-MAC (S-MAC) in addition to Time-out MAC (T-MAC). Finally, we will discuss the forthcoming research guidelines in the MAC protocol strategy.

Keywords: *WSN, MAC, protocol, S-MAC, communication.*

1. Introduction

Because WSN terminals have the ability to switch back to normal, its MAC layer protocol is designed to decrease the incompatibility of energy-saving shortcuts to rotation and long-distance communication interruptions. The compromise agreement includes systems that allow users to save energy, improve performance, and reduce test delays. Nodes can become inactive or cause unknown causes of death, and they can use limited force at any time. WSN is often used in high-demand areas; Timely discovery, processing, and communication are required.

Passive listening, incompatibility, transmission, and control are the main causes of energy consumption. Some measures to energy consumption are applied to minimize energy consumption as the primary means of passive testing. It has significant drawbacks. First, sleep increases transmission delays. The sender will have to wait until the recipient wakes up to send the package, and you will collect the delivery on each hop. Second, it increases the chances of signal interference over a period of time. If the neighbours are careful at the same time, it can compete with the channel, which can lead to conflict. In the K-Enclosed Wireless Sensor Network (WSN), each position in the surveillance area is within the sensitivity range of the K-sensor nodules. In general, sensor nodes have a larger communication range (CR) than their sensitivity threshold. So, when an event occurs, it detects an M ($\geq$ k) sensor node in each CR.

Interesting research includes wireless sensor networks (WSN), wireless ad hoc networks (WANET), Internet of vehicles (IOV), flying ad hoc networks (FANET), Internet of things (IoT), and body parts networks. Yet, it is significant to further improve the efficiency of energy of the WSN mission without adversely affecting other networks, e.g. In Network Activities. Improving energy efficiency and phase efficiency is good.

The MAC (Medium Access Control) protocol aims to address this issue as WSN plays a key role in node power management. Several controversial MAC protocols have been suggested to improve WSN performance, most of which rely on the CSMA / CA (Carrier Sense Multiple Access / Conflict Avoidance) program. These protocols are designed for small networks with up to 100 sensor nodes. If a large network has more than 100 sensor nodes, a number of malfunctions can occur due to MAC protocol incompatibilities. At the same time, it recommends multiple access time management software (DTMA) and other distribution-based techniques that can resolve irregularities on large networks. Still, on smaller networks, these protocols use slot resources and reduce load. As a replacement for using the controversial distribution protocol, multiple columns or hybrids have been designed to advanced collagen performance. Regrettably, these protocols are primarily focused on

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getting better the performance of standard WSNs on mobile WSNs.

In this study, 3D Hybrid Mac Layer Protocol (CTH-MAC) 3D based on CSMA / CA and TDMA [1] was developed to improve mobile performance. The functions of CTH-MAC are summarized as follows.

- **a** First, all the nodes are assigned to several subgroups in a new way depending on the transmission distance from the sensor node to the synchronization node. It also uses status predictions if the subcommittee allows.
- **b** Second, all subgroups send data through synchronized nodes using a fixed time point in the DTMA program. All sensor nodes in each subgroup compete according to the CSMA / CA scheme.
- **c** Finally, in the DTMA and CSMA / CA diagram, we provide the reservation facts of the protocol.

Simulation outcomes show that the specific etiquette provides the required enactment in terms of dynamism efficiency and network performance [1].

Currently, wireless sensor networks (WSNs) are extensively utilised on the Internet and for the transportation of objects such as rail and air. There have been several attempts to improve WSN broadcasting. However, WSN broadcasts are delayed due to inconsistencies, unstable channel distribution, and difficult broadcast conditions. In some cases, the terminals operate in a different transmission environment (DTE) and a single transmission environment (STE). Communication issues can lead to conflict, congestion and injustice in the WSN rankings.

Several protocols are recommended to solve the above problem. Z Mac (Media Access Control) is a hybrid MAC layer protocol that integrates multi-industry access with Carrier Sense Multiple Access (CSMA) to reduce channel usage and incompatibility [2]. Changing the access plan due to the size of the screen improves the performance of the Z-MAC, which adversely affects the speed extension. Recommended to reduce X-MAC / BEB incompatibility and increase performance [3]. It is distributed using the X-MAC [4] binary Exponential back-off (BEB) method. But X-MAC / BEB performance on multi-hop wireless networks is a matter of debate. Reliable Associated MAC (COO-MAC) Cryptographic Protocol (RCO) -MAC [5], which improves the reliability of associated nodes, resulting in reduced performance and latency. However, RCO-MAC finds itself in a situation where it is difficult to select or configure help nodes. The finest way to mend the enactment of large-scale wireless linkages is the step-by-step process recommended in [6], but the design of the channel distribution significantly affects the broadcast performance of multi-channel wireless networks. This article recommends the COO-MAC layer protocol for multi-channel WSN to improve broadcasting via DTE and STE. Additionally, the channel allocation algorithm provides a multi-channel network to maximize channel usage and solve logic problems [7].

The Wireless body area networks (WBAN) has attracted a lot of consideration from investigators due to the momentous enlargement of the Internet of Things (IoT) inaccessible development programs [8]. A WBAN scheme usually has multiple minuscule sensor nodules [9 10]. These sensor nodules are used to monitor body expanse, send health data directly, and receive base station (BS) orders. As of the length and breadth of the body sensor nodes (BSN) terminals, the power, capacity, gain, and length of these terminals are the result of the development of Medium Access Control (MAC) procedures for WBANs. In general, PS Charging is easy, so in this review we will discuss how BSN works.

Many researchers today are working to improve the energy efficiency of MAC protocols for WBANs. [11, 12] GDSIC [13] recommends improving power consumption by modifying the number of nodes in sensor networks. However, this adversely affects the length of the nodes, which eventually leads to delays and lengthening. Additionally, the MAC Division Protocol QS-PS [14], based on Time Division Multiple Access (TDMA), has been proposed for higher energy efficiency through new department applications and space design. But the QS-PS gaming app needs to be improved. Otherwise, the time limit will be lost, which reduces the length and efficiency. Carrier-Sense integrates the IEEE 802.15.6 standard with the Convention (CSMA / CA) [15] system. CPMAC [16] is premeditated to redeemable energy. Nevertheless, it has a comparatively long delay, which results in a reduction in life and energy consumption. This paper introduces the new Hybrid Mac Protocol (HyMAC), which aims to except energy on WBNs and encompass the life of sensor nodes.

Wireless Sensor Networks (WSN) is used in a variety of applications such as temperature and humidity. Consider places where humanoid access is almost intolerable. Military organizations are interested in surveillance, strategic military operations, and the widespread use of wireless networks. The main limitations of this type of WSN are energy efficiency, scalability, phase autonomy, latency, performance and control. Several intermediate access control systems have been introduced to solve this problem. These MAC protocols are mostly divided into two main categories:

(a) Contention based.

(b) Scheduling based.

Among controversial MAC protocols, the nodule competes with WSN Media for data transmission. Concerns arise if you need access to a single media company that sends information through multiple nodes. This increases the risk of inconsistencies, interruptions, and power loss, which can worsen the life of the wireless terminal. Significantly increases the number of inconsistencies that prevent access to a standard WSN channel. IEEE 802.11 is one of the standards for disputed MAC protocols. In this case, the passive listening method is similar to the energy consumption method. This passive listening power consumption is very high on widely used network screens, i.e. WSN. So this criterion is not optional for WSN. Sensor medium access control (SMAC), Berkley medium access control (BMAC), Chronological Average Access Control Timeout medium access control (TMAC), Utilization based duty cycle tuning medium access control (UMAC), Program-Based Duty Cycle Average Access Control. It controls the effective energy of the working cycle

WSN is often used, so controversial MAC protocols are not appropriate for such situations. On the further hand, there is no dispute about the planned MAC protocols, because all nodes define guaranteed time slots (GTS) for communication, i.e. multiple access time fraction (TDMA). TDMA avoids blocking access to radio channels by scheduling nodes in a timely manner. The TDMA variant, also known as Energy Efficient TDMA (e-TDMA), is recommended for categorised networks, where the all-inclusive network is alienated into assemblagesor else clusters. All nodes in this cluster follow the e-DTMA and send the information to the selected cluster header (CH). To save energy when members have no data to send, CH Radio turns off e-DTMA. These protocols protect terminal operations and extend their lifespan, but sometimes they do not measure at unpredictable WSN levels.

Due to dissimilar broadcast characteristics and differences in transportation load, the same data cannot be sent to the nodes. Nodes with similar functionality have time to collect and update data. To deal with traffic that receives this data, the TDMA-based MAC protocols such as BT-Map-Assisted (BMA) [17] besides BMA are recommended With Round Robin (BMARR) [18]. We use diverse scheduling arrangements to allow fixed time locations for the required member nodes. As a result, we redistribute unused time space across multiple data nodes.

All of the technologies discussed above work better than traditional TDMA, however the level of control in these applications will increase. The second problem with this approach is that the number of time apertures is equal to the number of member nodes. Since each tour has a fixed time, this method does not exactly solve the problem of adaptive traffic congestion. As a result, it increases latency and decreases efficiency.

In this study, we also provide a MAC protocol based on the embedded TDMA Bitmap-Assisted Short work First-Paste Mac (BSMAC):

(1) Provides short time intervals not equivalent to the number of member nodules. This resolve allows all members to effectively implement adaptive traffic.

(2) The Shortest job first (SJF) method is used to diminish node accomplishment time besides intermediate interruption of nodes.

(3) Using a control nodule address (1 byte as an alternative of 8 bytes) condenses the size of the controller packet, which effectively reduces the control overlap and effectively exceeds the capabilities of our specific program [18].

2. Related Works

Alvi et al. [19] have studied the Bitmap-assisted short-term wireless access control (MAC) protocol for Wireless sensor Networks (WSN), also known as Adaptive Time-Based MAC (BS- MAC). Major contributions of PS-Max: a) It uses less space. (B) The number of locations is now higher than the number of member nodes. (C) Short-term task priority (SJF) method for time location planning. (D) Short node address (1 byte) for member node identification. The first two contributions of BS-Max are excellent transfers to all members. The SJF algorithm shortens the end of the terminal and the middle pocket of the terminal. Short-term address control reduces unnecessary costs and prevents the performance of certain projects. Currently, the PS-Mac converts more data compared to the current Mac protocol, and simulation results are shown with lower latency and lower power consumption.

Zheng et al. [20] The Wireless Touch Network (WSN) is primarily designed for conditional monitoring and energy saving applications but is not appropriate for time-sensitive applications that directly control industrial automation and avionics. This study involves the utilize of the Medium Access Control Protocol (MAC), also known as Wireless Arbitrage (WirArb), to let each user to access channels based on different options. Many users support specific MAC protocols and predefined referee frequencies to determine the access queue for each user channel. This feature provides live channels and users' most important features. It uses a unique time-limited marking chain model (DTMC) that mathematically sets the WirArb protocol to calculate a specific MAC. The results show that some protocols are more suitable for ensuring protocol and bandwidth.

André Gomes et al. [21] have studied that Existing MAC protocols do not consider the dynamics and complexity of the environment and existing wireless network applications. Running programs and environments are constantly changing, and as a result wireless transmission requirement are changing. For example, if a user sends a video within a minute, more performance is required; this will control the robot arm that requires a border barrier. This example discusses the flexible transportation requirements of the disputed MAC protocol; however, it does not meet the delay barriers. However, the booking protocols work, but at the optimal level. Therefore, wireless networks require adaptive hardware that will change the way the network works over time. To this end, we offer SOMAC (Autonomous MAC), which uses state-of-the-art learning technology to replace the MAC protocol on wireless networks to meet the current needs of the configured network. SOMAC Discovery uses innovative research in the literature to address the following gaps in the literature: (i) lack of environmental change monitoring models or lack of representative data during training; (ii) Ability to develop multiple ethical policies. We evaluated the model by evaluating two different improvements in the bed (performance and delay).

Shah et al. [22] for the past 20 years, researchers have thoroughly examined the goal of extending the lifespan of wireless sensor networks (WSNs) based on the Internet of Things (IoT). Newer formats based on WSN and IoT are widely used in some network applications and require a lifetime warranty to meet your application requirements. Some previous studies aim to ensure the longevity of IoT-based networks. Most of these efforts do not pay much attention to other dimensions of network performance, such as coverage analysis and network connectivity. To overcome this problem, this article introduces a new centralized approach to step-by-step analysis of user consumption and consumption energy consumption to improve the node duty cycle. According to the proposed scheme, a network of synchronized nodes defines the active / inactive role of each node, which cycles from time to time after the total active time and the remaining active life. In a broader simulation, previous studies have shown that some assurance protocols outperform the best competing protocols developed in CERACC, A-Mac, and coverage security protocols.

Rahman et al. [23] have studied that the popularity of Internet of Things-enabled Intra-Vehicular Wireless Sensor Networks (IoT-IVWSN) based on the IEEE 802.15.4 standard has led to many wireless data exchanges and busy network features. In this course, the Middle Access Control (MAC) protocol seeks to create unprecedented data for media surveillance sensors, which can lead to pocket inconsistencies, severe network congestion, and time-sensitive data due to the protocol's flexible features. To address these issues, this work offers an innovative MAC program that can assess the quality of various emotional transmissions. A hybrid program that allows you to continuously transfer relevant network resources from multiple sensors, target two history modes, and synchronize MACs. Database-based MAC historical inconsistencies are used to improve data inconsistencies designed to minimize inconsistencies outside the data packet and to accelerate the average distribution of data. MAC prioritizes real-time review of critical data that allows network resource planning. Numerical results show single or selected strategies based on the best performance of the IoT-IVWSN hybrid program, pocket delivery speed, and transmission delay compared to current MACs.

Waqas Rehan et al. [24] have studied that Unlike measured data (temperature, pressure, humidity), vector data (image, audio, video) requires strict service quality (QoS) in terms of performance, latency, reliability, and information security. These QoS requirements are not sufficient for a wireless communication channel. In addition, the multicentre system can meet these QoS requirements by disrupting parallel communications, improving work / delivery speeds, reducing transmission delays, and reducing congestion. Additionally, QoS can improve data storage capacity at multiple points (e.g. multilingual approach) by resolving congestion, avoiding problems, and creating workload balance between relevant locations. This work introduces the WSN QS-Cross-layered Multichannel Multilink Routing protocol (QCM2R) for secure communication over streaming-based multi-channel wireless sensor networks (WSN). NS-2 performs simulations to demonstrate the effectiveness of the QCM2R protocol and to prove that the QCM2R protocol surpasses competitors in network life, reliability, latency, and performance.

Naghibi et al. [25] have studied that the wireless sensor network has multiple nodes that send data directly to the base station or intermediate nodes. Multi-hop communication increases the amount of traffic and reduces the number of output terminals connected to a fixed radiator. One way to overcome this challenge is to use mobile tape. Mobile synchronization balances the workload and strengthens the network. This article provides information on the use of multiple geographic sections of the tip network in these cells and the two underwater movements of water. Based on the interaction between cells and mobile drive cells, cells are divided into two categories: single-hop communication cells (SCC) and multi-hop communication cells (MCC). The mobile sink moves in a concentrated diamond-shaped orbit, with each half ring flowing simultaneously into the sink. Initially, the two sinks move in the same direction and rest at specific intervals to gather data from the sensor nodes at the corners of an orbit. Although sync is standard, SCC sends data for sync, but MCC uses a specific root algorithm (EGRPM) to send data for mobile sync. Follow a specific approach using NS2 software. Comparisons between EGRPM performance and traditional methods show that the use of EGRPM significantly reduces the average power consumption and data interference and significantly increases the pocket distribution speed and network length.

Haseeb et al. [26] have studied that The Wireless sensor Network (WSN) is gaining the reliability of many studies associated to traditional linkages. Resource Communication Next-generation radars are integrated with billions of products on the Internet (IoT). Owing to the huge layout of IoT devices in addition to their energetic circumstances, prevailing security systems do not encounter the necessities of fortification from malevolent enemies. In addition, due to untrustworthy besides uncluttered internet media, outmoded root protocols are subject to various malevolent intimidations besides compromises related to statistics corruption. Therefore, the objective of this study is to introduce light-weight structure-based Data Aggregation Routing (LSDAR) procedure for IoT integrated sensor linkages to protect node level data from malicious data and to improve energy efficiency. First, the network nodules are converted into self-determining clusters grounded on different radii besides block the power holes round the base station (BS) circuit. Second, the A-Star heuristic procedure sets the path efficiently and smoothly. Additionally, communications are protected from malicious nodes using the Mathematical Breakable System one-time pad (OTP) encryption program that ensure data safety. Consumption simulation outcomes designate the progress of the fine art in terms of energy ingesting, phase duration, delay suspension and pocket drop rate.

Alves et al. [27] Low-power wireless networks are an integral part of the Internet, including resource management tools that collect environmental information. It is the result of one-way connectivity due to physical effects, device diversity, and product malfunctions. There are many one-way connections, but for the most part routing and wireless duty cycling protocols for these networks do not handle these connections. Provides a one-way connection performance protocol and explores the use of these connections in network performance metrics such as data rate, latency, and power consumption. Our flexible protocols and flood protection software enhance your centralized knowledge of limited network models. Tests have shown that I need to find a one-way connection, but a one-way connection is too long to improve network performance for routing.

Stephan et al. [28] have studied that Cognitive Radio Sensor Network (CRSN) is a sensor network distribution network that detects event signals and communicates with employees in a dynamically accessible range. All nodes participating in CRSN should be aware of the network environment and have autonomy to make decisions regarding performance improvement, slowdown, and power reduction. Clustering has been shown to work in CRSN to overcome such problems and increase network length. However, clustering algorithms designed for WSN do not take into account CR functions and challenges, and CR-based networks operate with unlimited power. This article presents CRSN energy and spectrum aware unequal cluster-based routing (ESUCR) protocol solutions for cluster and energy sharing spectrum information. Clustering in ESUCR is mainly based on waste energy (SU) waste and its associated spectrum, i.e. the selection of public data cassettes is based on the performance of the PU event. ESUCR determines the position of the channel based on energy efficiency statistics and maintains the channel's sensitivity compared to the previous channel. CH cluster channel selection based on stability, energy, distance, and proximity will reduce premature death (CH) of cluster heads. When recording events, ESUCR creates an ES energy-efficient data path from the hop to the radiator node and sends it to the hop CS and primary / secondary gates. The performance of the proposed ESUCR protocol is compared with advanced simulations and advanced simulations of dynamic spectrum interactions.

Li et al. [29] Traditional and colonial methods for improving loop networks were explored at slow collection rates. We recommend another Root Protocol Advanced Agents Protocol based on the Advanced Agents Colony Algorithm. The protocol first introduces a sorting algorithm based on an anti-colonial algorithm, and then introduces the concept of an elite agent that accelerates root optimization. Second, this article describes the multifaceted transfer of self-organized networks. Simulation results show that the algorithm can detect multiple receptions and better quality through ADOV, DSR, AOC tracking algorithms and better tax credit.

Liu et al. [30] have studied that a dependable and quick communication network are important for the unmanned aerial vehicles. Flying Ad Hoc Networks (FANET) is a new model of unmanned communication with aircraft. However, the strong terrain of the fans and the limited capabilities of the unmanned aerial vehicles pose great challenges to the fans. High fan dynamics are difficult to match with the current routing protocols of Mobile Ad

Hoc Networks (MANET) and Vehicular Ad Hoc Networks (VANET). Additionally, some existing routing protocols respond to simultaneous interruptions of FANETs and power interruptions. This article offers a multifunction optimization routing protocol based on phone Q-training to ensure low latency and low power service guarantees. Most Q-training protocols use the core value of Q-training parameters. Due to the high mobility of the fan, the Q-training settings can be changed according to a specific protocol. In addition, a new method of research and exploitation is recommended to study the optimal path that is not observed when applying the acquired knowledge. Root neighbours will be evaluated in the decision-making process to select the most reliable next hop to replace the previous neighbours. The simulation results show higher pocket attendance, feedback and consumption than the current Q-Training based routing system.

Rusyadi Ramli et al. [31] have studied that the wireless sensor network (WSN) that deploys unmanned aerial vehicles (UAVs) in the data collection process is different from a typical WSN system. In UAV-WSN, the sensor nodes have time to communicate with the UAV at a specific time. Therefore, the sensor nodes must compete with each other and send their data to the drone in the shortest possible time. packet delivery ratio (PDR) affects the integrity of competing nodes and network performance. An effective protocol is needed to solve this problem, which can ultimately maintain or improve rationality. This paper introduces the new HP-Mac protocol, the Hybrid medium Access Control (MAC) protocol for UAV-WSN data collection. The proposed scheme works by sending a beacon to the frame sensor nodes from time to time to warn of the presence of unmanned aerial vehicles, and then each sensor node that adopts the beacon law competes with the unmanned aerial vehicle record. The UAV sends a second beacon to the recorded nodes according to their transfer schedule. HP-Mac is used to record CSMA / CA sensor nodes and to detect recorded sensor nodes during data collection. The time diagram is used to determine the transmission schedule during recording according to the parameters of each sensor. The results show that a specific Mac protocol is reasonable when it comes to improving network performance in terms of PDR and performance.

Rodriguez et al. [32] have studied that The Spectrum Transmission or industrial wireless sensors and activation networks (IWSAN) for industrial wireless sensors and activation networks can detect interference at a specific time and switch to another channel (in the same or another range). This is possible because spectrum handoff strategy interferes with communication with the MAC layer, making IWSAN more direct and reliable. MAC is used as the basis of cognitive radio. Evaluated with or without a specific method of spectrum transmission. We offer a theoretical analysis to determine the latency limit by calculating the network and performing simulations on the Internet to confirm the theoretical results. To understand the operation of the algorithm in the most common condition of industrial channels, several conditions are considered (shadow, rice, pipe disappearance, delay). The results indicate the advantages of specific transmission of a strong and environmentally friendly spectrum.

Gomes et al. [33] have studied thatthe new Industrial Wireless Sensor Network Protocol (IWSN), also known as the Adaptive and Beacon Based Multichannel Protocol (ABMP), integrates multichannel communication, direct connection quality assessment, and dynamic channel distribution. Issues affecting the quality of connection in the industrial environment. It uses a hybrid channel diversification system in which beacon frames are transmitted using a channel jumper, while similar data packets are transmitted using a channel adaptation. Channels provide dynamics to resolve temporary and spatial differences in channel quality. As ABMP points out, do not obtain all beacons to maintain communication for end points. As this study shows, a particular approach based on lighthouse construction issues significantly strengthens the network. Using the IWSN Realistic Channel Model, theoretical and simulation studies are compared with ABMP for TSCH, CSMA / CA Stellar, and Tree Topographic Networks. The results indicate that the protocol is better than the MAC protocols defined by the new IWSN standards such as speed, latency, and pocket delivery resolution.

Barnawi et al. [34] have investigated how numerous smaller nodes in wireless sensor networks can measure synchronous nodes and record physical occurrences via a multiplex protocol. One of the most crucial things to consider when trying to prolong the life of a sensor network is the routing protocol. The routing protocol's primary goal is to determine which path is best and whether to convey the gathered data to the sync node. Data on high energy consumption is redistributed as a result of inefficient root protocol. For this reason, any wireless sensor network must carefully and completely implement its routing protocols. This study's primary goal was to examine how well the RPL protocol performed in relation to three distinct MAC protocols and find out how RPL behaves best. Based on ContikiMac, CXMAC, NullRDC findings, pocket delivery speed, and battery consumption, the root protocol uses Mac protocol. The findings indicate that the ContikiMac outperforms the other RPLs in terms of power consumption and that the four RPLs perform best in terms of latency.

Shishupal Kumar et al. [35] have studied that The Wireless Sensor Network (WSN) is gaining significant attention in the scientific and industrial fields. WSN integrates various protocols, health and habitat monitoring, smart cities, various military programs, and disaster management. It offers a wide variety of programs and services, including the Internet of Things (IoT). However, as this feature cooperates with the Industrial Revolution, it becomes the subject of the Industrial Internet (IIoT). In this way, with the help of more and more internet users, it offers more IPv6 instead of IPv6. Work modules and protocol energy are required to achieve performance. This is because the lifespan of the sensor used is directly related to the short-term performance of its filter battery. By following these points, different protocols use the IIoT-based WSN test. However, all of this does not allow IoT to operate at satisfactory data speeds to ensure the rapid release of various programs and services. Therefore, in this study, we chose the G9959 protocol instead of IEEE 802.15.4 and compared the IPV6 package delivery speed with energy and latency. In addition, it carries energy to determine the impact of energy on the environment. In addition, we performed extensive simulations and the results worked better than any other program in our simulation industry.

Mahmud et al. [36] have studied that The Internet of Things (IoT) has become a key feature of the Smart World System (SWS). Improving wireless devices / equipment in the SWS environment provides an efficient, effective and fun way to communicate and communicate with each other over the Internet. However, during remote wireless operation, effective communication between different wireless devices on an IoT network is critical. The IoT-enabled Cooperative Media Access Control (MAC) wireless networking protocol is widely used to address this issue. It takes into account a number of factors, including signal rate (SNR), latency, and residual power. MAC -relay choice for telemetry collaboration adds a new dimension to today's matrix list. In addition, the protocol used to select the reliability of telemetry relay terminals was improved. Therefore, it provides remote sensitivity for adaptive cooperative MAC data bandwidth reliability for wireless IoT networks, and improves relay selection of cooperative MAC protocols. The text size is used to increase the size of the cooperative reliability component and to select the appropriate relay terminal for data transmission. Distance and residual energy are used to determine the optimal conditions for a high factor relay. Detailed simulation results show that optimal relay selection and MAC performance based on specific reliability can greatly improve the performance of existing attributes.

Sun et al. [37] have studied that This article offers a secure routing protocol based on Secure Routing Protocol based on Multi-objective Ant-colony-optimization (SRPMA), which complicates the ultimate goalmouth of wireless sensor network security. The anti-colonial algorithm is designed as another way of considering the remaining energy as multiple pheromone information and multiple data as two optimal targets that generate two objective functions in the same path. To assess the level of node reliability, a node reliability evaluation model was developed using the D-S source theory, which was updated with the previous node reliability introduction. Multifunctional path results can be obtained by measuring the load distance using the external archive method using the Pareto Optimal Solution mechanism. Simulation results of NS2 show that a special mechanism against black hole attack on the WSN path achieves the desired result.

Cheng et al. [38] Enterprises recognize the widespread acceptance of wireless communications in the industry. Compared to traditional barbed wire and surveillance systems, radio control and surveillance systems are more expensive and easier to deploy. Wireless technology based on IEEE 802.11 is widely used for reputation, flexibility, and processing, and is an excellent candidate for a variety of industrial radio control and software tracking applications. However, wireless control and monitoring software generally have different time requirements, and may not be able to meet these requirements due to inherent shortcomings of the Core IEE 802.11 Mac systems. Therefore, this review provides a comprehensive overview of the latest developments in IEEE 802.11 networks that can be used for a variety of purposes, including wireless control and monitoring systems. It briefly describes all the functions (especially time intervals) of each computer MAC algorithm. Finally, we conclude this article by identifying common research issues that need to be addressed.

Toor et al. [39] research has shown that routing plays a critical and challenging role in wireless efficiency, network performance, calibration, connection, and wireless sensor network (WSN) performance. Their communication skills are amazing. Routing protocols can be used to gather data from any physical environment. WSNs have put forth several significant protocol solutions in recent years to deal with these problems. Because the node level adjusts to the energy level, extending network life, the energy-efficient path algorithm based on the diverse cluster algorithm is more effective than the flat and location-based path algorithm. Using mobile sensor nodes is the newest trend in enhancing WSN performance and efficiency. The MEACBM (Mobile Energy Awareness Cluster) routing protocol, which is based on the mobile energy knowledge cluster for mobile sensor nodes, was proposed by the authors of this paper as a novel idea based on Multi-Hop. Think about the emotional node clustering's three stages. On the MEACBM network, cluster contact and sensitivity nodes are still visible. The sensor nodes that transmit data to the base station (BS) use a lot less electricity because to this technology. Findings derived from the MEACBM routing algorithm's simulation performance: Compare the network lifetime, stability, performance, number of CH, and number of dead nodes with other cluster path algorithms.

Sakya et al. [40] Energy energy-efficient wireless sensor networks play an significant role in complex work projects, making it difficult to constantly use nodes and change components in these applications. The comprehensive action plan for health, environmental monitoring and control program and monitoring plan (e.g. tsunami alert, earthquake alert, volcanic eruption site). These projects require rapid response time to achieve energy efficiency without significant energy management interruptions. Although researchers have suggested several MAC protocols to improve energy efficiency, this article does not justify the need for more complex projects. In-depth investigation analysis has helped to study several important MAC algorithms. This study presents a new perspective on energy efficiency based on the ADMC-MAC protocol. This protocol has been improved by improving data submission performance, traffic conditions, terminal layout size, and efficiency energy efficiency for critical protocol applications. This protocol ignores the distance between standard MAC protocols. This protocol recommends two methods.First, create a pocket-sized continuous simulation cluster and select the nearest node cluster based on your preference. The second method uses a regression technique to determine the rotation of the selected node duty based on the transmission level and the energy of the remaining nodes. Only selected nodes will participate in pocket transfer. Therefore, high load packages are reduced due to medium loads. Compared to the S-Mac protocol, it increases energy efficiency by 71,452% under harsh working conditions, which improves the overall performance of the system. It increases the pocket feed rate by 15,198% and greatly improves performance in harsh working conditions. The S-MAC is currently considered the most compatible Mac protocol and can be upgraded in difficult situations. The specific protocol for the S-MAC protocol introduced in NS-2.35 has been updated, and the results are similar to the standard S-MAC protocol and the most important MAC protocol for working with MC-MAC. ADMC-MAC Power provides a data function that breaks the latest MC-MAC protocol to make certain protocols work.

Chehri et al. [41] 15 years ago, attempts to install version IEE 802.15.3 of Ultra Wide Band (UWB) as a wireless alternative to USB, HDMI and Bluetooth were delayed several times. As IoT (Internet of Things) UWP (Internet of Things UWP) technology emerges as a solution, we hope this technology will be available for e-health applications. The DC-Mac (Dynamic Channel Encoding) protocol is designed for low emission UWP ad hoc networks. The main idea is to integrate physics and McLaren with this protocol and improve speed to avoid sources of interference in excluded areas. This White Paper modifies the DCC-Mac protocol using terminal power when power levels change between terminals. Longevity phase Consumption Reduces energy consumption using a combination of body and multiple access layers.

Abbache et al. [42] the Mobile Wireless Sensor Network (MWSN) is a collection of interconnected mobile sensor devices that create dynamic networks without existing management. MWSNs are used to detect disasters in a variety of areas, including medical systems, military applications, vehicle communications, and other critical applications. Compared to traditional touch networks, MWSNs operate more often due to the capabilities of touch devices. This affects the high consumption power consumption and phase reliability. In this study, we take responsibility for this important issue and support the proposed efficient and energy-efficient road protocol. Certain protocols apply to MWSN applications that run on requests and events. Traffic management provides a record of how touch devices work to create consistent layouts and integrate with new technologies without sending billing messages. We evaluated the performance of the proposed protocol through an effective simulation of energy consumption and load balance.

Kia et al. [43] have found that in order to prolong the lifespan of a wireless sensor network, the Advanced Route Protocol depends on a novel, energy-efficient Low Energy Adaptive Clustering Hierarchy (LEACH). Multi-routing protocols use clustering techniques to extend the life of their networks. Despite the existence of Leach-based protocols recently, this protocol employs several gateway values according to the state of the network. The distance, energy, and distance between the station and the nodes are calculated using this method. An appropriate selection of clusters and network operation hours is made possible by multi-core technology. According to simulation results, compared to the most recent cluster protocols, the consumption of the entire phase is decreased by at least 70%. Even when the number of sensor nodes varies, the Multi-Threshold Long Lifetime Protocol (MDLLP) consistently yields reliable findings**.**

Feng et al. [44] have studied that with the rapid development of wireless programming, the Knowledge Radio Network has attracted a lot of research in recent years as a successful solution. Solving the dating problem with radio is a big problem. In particular, unmanned aerial vehicles, embedded devices, or smart devices can install radios for a variety of reasons, including energy saving, storage, and noise control. This article presents the CogMOR-MAC-based multi-channel cognitive MAC protocol or multi-channel capacity booking system. The MOR system focuses on problem-solving and improves the efficiency of radio discussions. This MOR system is used to reduce frequency impact and prevent critical user activity. Frequent performance activities such as pocket success rate, connection delay, connection performance, and channel usage. Compared to other scientific MAC protocols running on CogMOR-MAC. As a result, the CogMOR-MAC Primary User (PU) operating system is highly compatible and can provide reliable communication. Of course, not only is it incompatible with many airlines, but it can also be used on mobile transient networks and wireless sensor networks, especially in severely interrupted environments.

Shamna et al. [**45]** have studied that the advantages of working on wireless networks include better performance and reliability, lower consumption power consumption, data interruptions, network security, and longevity. The goal of the collaboration is to use MAC Layer to improve network performance based on the current implementation, delay, and spectral performance of the communication program; Or to improve grid life and nominal energy efficiency. In this study, we discuss network performance enhancements and performance enhancements using MAC layer integrated communications. To this end, we create optimization problems for single-hop and multi-hop networks. Solutions show that sending packets using integrated communications via MAC Layer can significantly improve network performance and efficiency. We offer a network of diverse collaborative MAC protocols that provide a network multi-hop environment that can improve network performance and energy efficiency while reducing malfunction. The results of the analysis and simulation showed that a particular protocol could improve network operating time, performance, network idle time, and energy efficiency.

3. Analysis

3.1 EEWNSN-MAC Protocol

This section introduces the Mobile WNS MAC Protocol (EEWNSN-MAC), which includes several nano-routers, nano-nodes, besides nano-micro interfaces. The nano terminals travel at almost constant speeds and are equipped with a nano router besides a nano micro boundary. The EEWNSN-MAC protocol supports the TDMA network sequence configuration, clustering algorithm, and controversial free communication style to handle training issues. Therefore, nanorode sends packets to nanoroders grounded on DTMA programming. The nano router formerly collects the incoming material besides sends it to the nano micro boundary. In conclusion, the Nano Micro interface directs dimension material to a inaccessible server by means of an IEEE 802.11 wireless linking. This tabloid ignores the method of gathering nanosensors. Nevertheless, the two main problems of this WNSN are energy efficiency and reliability of communication, i.e. low consumption and low pocket speed for sending information to the monitoring centre.

The EEWNSN-MAC procedure is alienated into three phases: cluster selection, scheduling, besides data transfer.

a. Selection of cluster head

The recommended MAC protocol at this time usages the hands-on process to identify neighboring nodes. In fact, all nanotechnology is transformed into a training package $T_{\text{probe}}$to identify neighbours. Each nano machine that receives a broadcast packet responds to the ACK packet with material approximately its beard category besides power level. If there are nano routers in the source transmission range, it computes the distance to each nano router grounded on the multiplication postponement besides selecting the adjoining router to the interactive group reader.

b. Scheduling phase

Subsequently specifying the nano nodule required for the nano nodule, these nano nodes are assigned to specific locations according to a symmetry distribution system. Assume that the slot time is equal to the time required to change the packet (e.g. 1).

$$\text{slotTime} = \text{WLT}_P + (L-1)T_i \tag{1}$$

W is the index weight of the index, L is the pocket length in bits, i.e. the logical "1" percent of the pocket must pass through the pulse. On average, the number "1" in the pocket is equal to "0"($W = O.5$)[46]. The timeT_p and $T_i$codes view for pulse length besides pulse transmission intermission, respectively. It is vibrant that every nodule can solitary broadcast at its own intervals. Depending on the time of the given space, the nodule can calculate its time besides sleep at another time [47]. As a result, idle time and data transfer to the nearest nano-router will significantly reduce nano-node consumption and increase network efficiency.

c. The data transmission phase

At this point, when the nano technology MAC layer pocket is removed from the top layer, it is not proximately transferred to the physical boundary, but is warehoused in a separate line. Formerly moving on to the next tab, define the MAC layer as described in steps A and B. When the nano router is designated as the succeeding stage, the nano nodule sends the packet in the period allotted to the user. Also, if you log in directly to the nano router and select the target nano node, the pocket will close until the next hop ends. In other cases, the wireless source terminal may be turned off. Also, the package revolves around the nano nodes you select. Finally, a pocket cap with sender ID, subsequent hop ID, in addition to pocket ID besides DDL is inserted into the MAC layer and sent to the body layer. Due to the tiered structure of the target WNSN, the nano terminal permanently tries to direct packets in the path of the nano boundary. The EEWNSN-MAC procedure is illustrated in Figure 2. Figure 1 demonstrates the learned WNSN multi-hop communiqué map.

It is important to estimateT_{probe}A new practical procedure (new circuit) must be initiated to select as many nano routers as conceivable. In this tabloid, we undertake that when using nano nodules, the mobile nano nodes move in a straight line, at a constant speed, in an irregular direction. In the communication disc model, the R-distance transmission focuses on mobile nanotechnology[48]. The connection creates or terminates a mobile node during connection. Q Where is the thickness of nano routers in the linkage. As a consequence,T_{probe} it takes an average time to establish an innovative connection amongst a mobile node in addition to another nano-router, or to disconnect the ancient connection besides its cluster header. Therefore, if time $T_{\text{probe}}$is given between successive rounds, e.g. 2

$$T_{\text{probe}} = \frac{1}{2\lambda R\vec{V}} \quad \textbf{(2)}$$

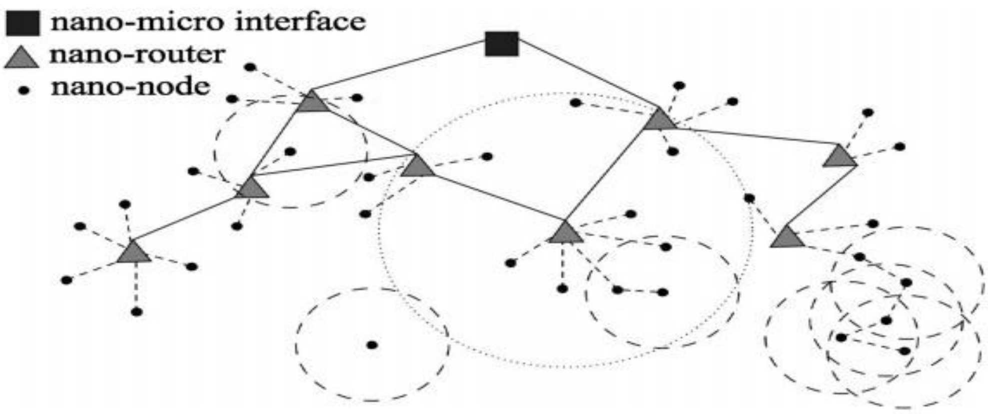

Fig. 1: Multi-hop communication in premeditated WNSN

In the succeeding segment, we will appraise EEWNSN-MAC protocols such as Smart-MAC. The only purpose we contemplate smart-Mac ratings is that the Srikanth system does not meet the requirements of the Terahertz channel or does not offer a Layer B communication program equipped with MAC Layer. On the other hand, the PHLAME algorithm is not used since it does not use a tiered structure grounded on another call-grounded communication method (RD TS-OOK). Additionally, the purchase method is founded on single-hop communiqué, which does not include nano text features.

In wide-ranging, we think the EEWNSN-MAC procedure is enhanced than the Smart Mac for the subsequent details.

- Chiefly, a specific MAC protocol uses fewer power than a smart MAC as it selects the bordering nano router for data broad cast besides practises TDMA programming to transfer nodule alert data to a specific location.
- Second, the TDMA program uses the EEWNSN-MAC protocol as an incompatible tool. So you can send the same group of clusters without conflict. As a consequence, the EEWNSN-MAC procedure is further stable than Smart-MAC.

Third, we believe that some MAC protocols can control network traffic more than using Smart-Mac, DTMA, and periodic resets [49].

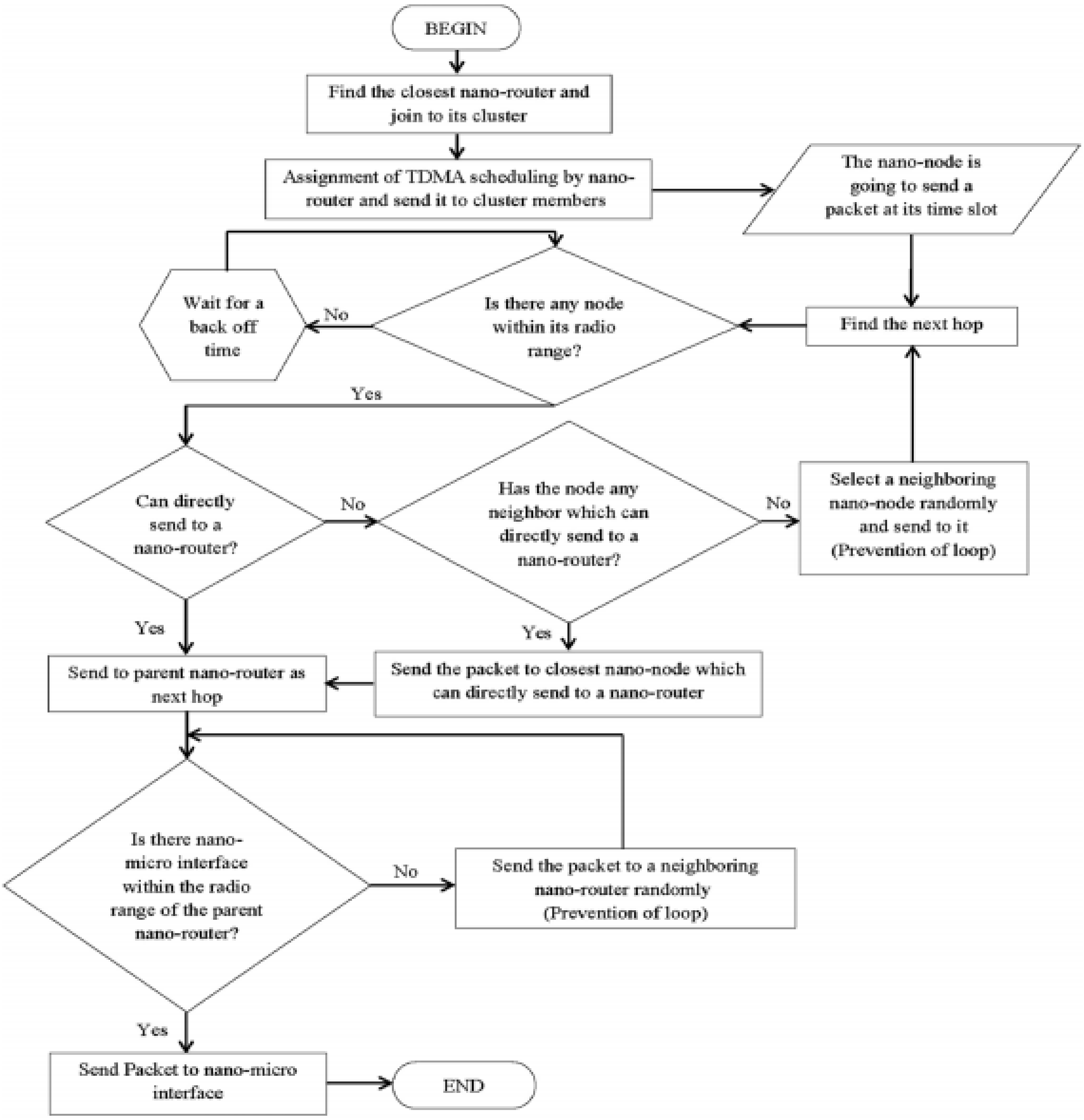

Fig. 2: The EEWNSN-MAC protocol procedure

3.2 Recommended PRIB-MAC protocol

This study suggests a broadcast protocol recommended by the Baptized Broadcast MAC (PRIB-MAC). PRIB-MAC is installed on top of RI-MAC. This protocol is very different from RI-MAC in data transmission. The remaining features have been developed in parallel with RI-MAC. The goal of the PRI-MAC protocol is to manage broadcast traffic more efficiently than the various aspects of RI-MAC. PRIB-MAC is different from prevailing MAC protocols because it combines a pre-initiated approach and a recipient-initiated tactic.

The strategy objectives of the PRIB-MAC procedure are as trails:

- Reduces the quantity of operations,
- Condense broadcast delays,
- Diminish sender power ingestion;
- Diminish the number of inconsistencies by effectively fixing concealed terminals and
- Effectually address your Unicast streaming invoice, address broadcast and Unicast.

3.2.1 Protocol strategy

PRIB-MAC is a receiver-induced multi-hop broadcast protocol that hides the terminal using short-term data transmission. The manoeuvre of the PRIB-MAC protocol is shown in Figure 3[50].

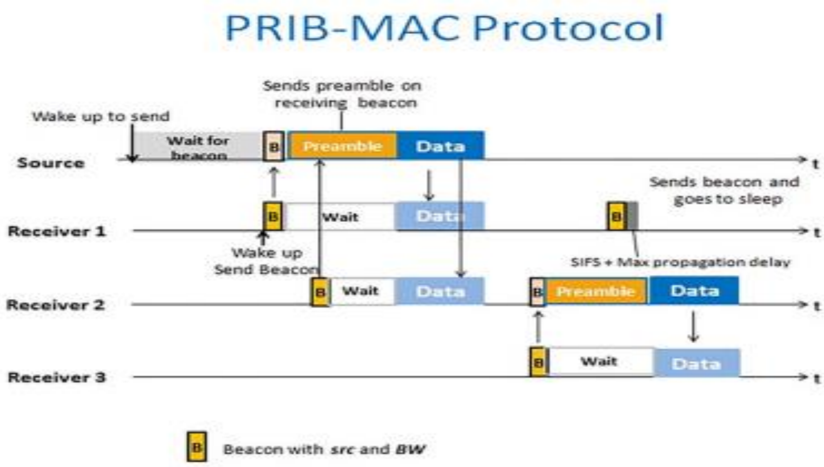

Fig. 3: Operation of PRIB-MAC protocol

Create a broadcast data source and expect a beacon from neighbouring countries. After getting the beacon, the sender adjournments the transfer of data by distributing a petite introduction. Throughout this introduction, a separate unit for creating nodes is created. The sender transfers the data to the addresses mentioned in the introduction. When the sender delays the transfer of data, the receiver nodes must be specified for monitoring. The receiver nodes transfer data to other nodes near them. PRIB-MAC NACK (Negative Authorization) is used to verify beacon authentication and prevent authentication explosions. If the recipient does not accept the statistics after the introduction, it directs a NACK beacon to the dispatcher. The usage of petite prefixes decreases the quantity of transfers associated with RI-MAC, increasing the number of nodes received during this introductory interval, which reduces the need for repeated unicasts. Compared to B-MAC, the sender has a higher output because the beacon is delayed until the beacon is received. Meeting time is shorter than slot time, which reduces network incompatibility. It handles inconsistencies by programming off-timers with the assistance of the beacon, thus effectively lecturing the concealed terminal. Subsequently, PRIB-MAC is constructed on RI-MAC, it performs the same function as RI-MAC[51].

3.3 Proposed EnRI-MAC protocol

In this broadsheet, we suggest an advanced RI-MAC (EnRIMAC) procedure grounded on RI-MAC. EnRIMAC solves the basic problem of controlling the compatibility of WSNs on the asynchronous duty cycle when dealing with broadcast in addition to multicast traffic on the MAC layer. Instead of trusting on numerous Unicast programs to control programme traffic, the specific protocol uses a wireless media broadcast character. Additionally, EnRIMAC offers a collision avoidance program for integrated traffic management.

It provides EnRI-MAC multicast traffic. For multicast transmission, the sender node stores multinational group data. The sender's node receives the beacon, the node checks if the beacon is in the multicast collection. When the primary address is added to the international group, the sender completes the node message appeal. Otherwise, the sender disregards the conventional pecan. The sender directs the request as statistics or message depending on the node shipping mode, so EnRIMC Unicast Traffic can perform similar functions to RI-Mac management [52].

3.4 Duty Cycle MAC Protocols

In this segment, we discuss MAC protocols based on the work cycle. Such protocols save energy by using sleep / wake cycles to put the nodes to sleep during passive listening. Turning off the terminal by radio while the terminals are running will reduce the additional power consumption by 50%. Delays duty cycle energy MAC protocols for efficient operation. The authors show that sending nodes to sleep and inactive attention causes a significant increase in energy. Figure 4 displays the power ingestion of MICA2 radio which comes in dissimilar radio means.

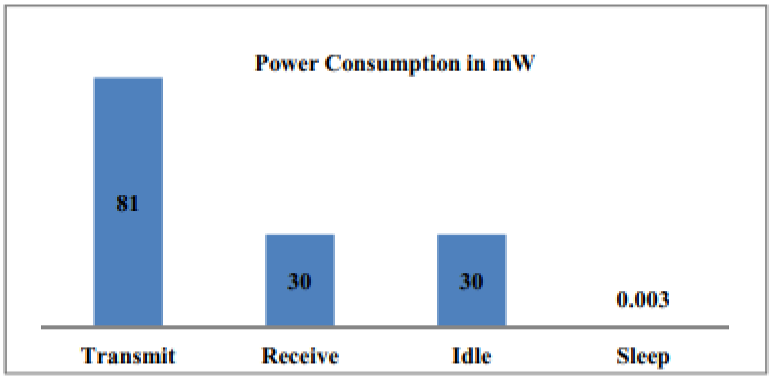

Fig.4: Radio supremacy ingestion of the MICA2 mote radar

This study implements the unified and asynchronous WSN duty cycle MAC protocol. The synchronization algorithm creates a list of nodes to restore sleep and wake time. Asynchronous or unplanned projects are classified as transmitter start and receiver start. When using the transmitter organization method, a node often sends a transmit request packet, short input, or data packet before making a request to the target nodule. During the approach initiated by the recipient, the nodes often confirm that pocket requests, a short introduction or terminals are ready to obtain pockets. In the subsequent two subsections, we converse the furthermost important besides current procedures in 2 groups.

3.4.1. Synchronous Low Duty Cycle MAC etiquettes

Every nodule has 2 means: wake mode in addition to sleep mode. During continuous alerting, the nodes generate sync requests and data packets. In sleep mode, the terminal turns off and the reserved radio wakes up.

In 2001, Chien in addition with Pei familiarized The Power Aware Cluster Time Division for Passive Cluster Multiple Access (PACT), where nodules characterise the communication mainstay. Nodules are categorized as Cluster Head, Common Node, in addition to Cluster Gate. Cluster nodules and cluster gates interchange their obligation to prevent electrical interference. Consumption increases due to synchronous overhead and network size increases. This is because the control pockets have to be taken from the other end in the middle. Additionally, a sync path is created before changing any terminal to which data is sent, which increases data interaction.

The most important and motivating function of energy efficiency is the MAC protocol radar - MAC or S-MAC. WSNS S- MAC Consumption is a multifacetedprocedure used by IEEE 802.11 that sometimes self-regulates consumption by reducing sleep and wake cycles. The design of the S-Mac indicates that the program has been idle for some time and may cause some delays. This S-MAC is not compatible with the class of applications that need instant messaging. He believes that nodes do not need to be constantly awake or waiting. Instead, its panel controls all nodes and manages adjacent nodes by synchronizing sleep / wake tables. Nodes maintain a sleep / listening cycle programme by generating a table for everynodule to apprise nearby tables. As a consequence, adjacent nodules can be changed at the same time. A sleeping node goes into a sleeping state when it moves to another node. Request period includes SYNC besides DATA communications. SYNC is a pocket used to synchronize nodule neighbours. Sending statistics using Request-To Send (RTS) / Clear-To-Send (CTS) approaches.

The S- MAC uses integrated conflict planning and conflict prevention planning. In addition, the intermediate nozzles fall asleep when the control message arrives to prevent overheating. On the S- MAC, long messages are split into smaller pieces and sent in explosive form. This method of sending requires more access to your media as it generates more messages. The S-Mac is primarily designed to lessen power ingestion, but disregards other key features namely integrity, performance, speed and latency. Some small nodes of the date need to be matched, so the MAC will have to wait, the integrity will decrease (MAC level view) and the messages during the cycle will move to two tasks. As a result, delays increase when you expect to receive more emails.

The T-Mac remainedfamiliarized to advance the presentation of the S-Mac by means of a vibrantliabilitysequenceas an alternative of the standard. To save sleep energy, all messages should be sent at different lengths from end to end. Determine the dimension of the adjustable load while preserving the optimum time. T-Mac uses RTS besidesCTS. If CDS does not respond to RDS, it will retry before leaving. Like the S-MAC, the T-MAC can merelydirect one memorandum to the trust per duty sequence, which causes additional delays. In accumulation, the D- MAC has an early sleep problem because the tip changes during sleep, even while waiting for a neighbour to send certain messages. As a result, the efficiency at the ends of the transmission sinks decreases.The sensor nodes in each loop have three modes (SYNC, DATA, and SLEEP) similar to RMAC S-MAC. Channel ordering on the SLEEP cycle is different from sending a PION on multiple nodes of the duty cycle and sending S-MAC data. PION performs RTCbesidesCTS, correspondingly, in addition to stays on the network in anticipation of the statistics cycle is complete or else the PION reaches its destination.

It is recommended to create an RMAC and send multiple messages for the P-MAC work cycle. It has the advantage of better traffic management than RMAC. The network adjacent to the synchronization terminal is separated by P-Mac Grade Division and Scheduling Assignment (GDSA). Everynodulecliques its own list bestowing to the criteria associated with it. Nodules placed at the same level will be maintained during planning. This list is minimal and meets the criteria. The P-Mac Network uses the pipeline to reduce packet delays from sending packets. The P-Mac has RTS quality information, as only low-quality terminals can respond to CTS. Additionally, the Conditional Window (CW) is used to respond to multiple nodes when responding to CTS. This protocol requires critical analysis.

3.4.2. Asynchronous Low Duty Cycle MAC procedures

Berkeley MAC (B-MAC) is a MAC protocol with incomparable responsibility. In B-Mac, each node has its own integration cycle diagram. The nodule can be sent by conveyance an intro to the data pocket, which should exceed the receiver sleep and make sure the receiver, is in signal mode. If the node is in a loop, it will only create secondary paths if it finds an introduction. Improved power consumption, performance, and B-Mac malfunctions; However, the main drawbacks are excessive focus and long-term introduction.

X- MAC promised to overwhelm the shortcomings of the B- MAC. It usages a brief introduction to circumvent unnecessary complications. In the introduction, the target node has the right to sleep on the non-target node, while the target node has the right to handle the actual ACK. This will not only prevent overheating but also reduce the delay. The main shortcoming of this etiquette is that it is unreliable and very difficult to recover after unloading. Another problematic with this tactic is that the introduction does not take into account the traffic generated by the exchanges. Due to the busy schedule of wireless media introductory broadcasts, energy efficiency is compromised when configuring traffic.

The RI-MAC receiver start-up system is used to achieve low power consumption, high quality and pocket delivery speed. Like the B-Mac, each nodule has its own self-determining duty rotation scheme. The main modification equated to B-Mac besides X-Mac is that the contributor is active until the target recipient is ready and ready to send the message. The receiver drive notifies the dispatcher by conveyance a beacon rule. Table 1 summarizes the features of different MAC protocols for WSN (both Synchronous and Asynchronous). This table clearly propels the need for a MAC protocol suitable for both real-time and energy-efficient WSN applications, and at the same time, it could also deal with other critical parameters.

S. no	Protocols	classification	Collision	overhearing	Idle listening	Latency	Scalability	Node life-time	Network throughput
1	CSMA	Traditional Mac protocol	High	High	High	High	Not scalable for WSN	Less	Very Low
2	PAMAS	Contention Based	High	Low	Low	High	Very low	>CSMA	Low >CSMA
3	S- MAC (Sensor Mac or Sleep MAC)	Contention Based	High	Low<PAMAS	Low	Low	Very low	>PAMAS	Low
4	Optimized MAC	Contention Based	High	Very Low<<S. MAC	Very Less<<s-MAC	Low	For latency is not a concern	>S-MAC	LOW
5	B-MAC (Berkley	Contention based	High	Very Low	Low	Yes (Low)	Scalable for WSN with	good	good

	MAC)						Low traffic		
6	CC MAC (correlation based collaborative MAC)	Contention Based	High	LOW	Low	Very low	Less for dense WSN	Good	good
7	STEM(Sparse topology and energy management)	Contention Based	High	Yes(Low)	Low	Low	High	Low	Good
8	Wise MAC	Contention Based	Very Low	Very Low	Yes(Less)	Yes (Low)	High	High	good
9	CSMA-MPS	Contention Based	Very Low	Overhearing of preamble is reduced	Yes (Less)	Low	High	High	Good
10	TRAMA	Schedule Based	Yes (Very Low)	Very Less	Very Less	High	High for low traffic WSN	High	High
11	PAMAC(Pattern Based MAC)	Schedule Based	Ultra Low	Very Less	Very Less	High	Worse for heavily loaded WSN	High	High
12	Energy aware TDMA based MAC protocol	TDMA based	Ultra Low	Very Less	Less	High	Low		Less
13	BMA MAC	TDMA based	Collision free inside cluster	Low	Less	High	Low	High	Low

4. Research Gap

Wireless ad hoc networks do not have existing infrastructure, and intermediate nodes transmit data over multiple lines. The MAC protocol naturally presents a number of complex issues, such as errors and personal issues. DTMA-based Macs provide features such as random security and logical partitioning. This document provides a time planning optimization model. This optimization will help you understand the nature of the problem, but it will take time to resolve. Therefore, the ambiguous TOPSIS approach to the time interval type is recommended as two main criteria: consumption, consumption, consumption, consumption energy consumption, and delay. The performance of the proposed algorithm is calculated based on the energy consumption and the final delay. Simulation results show that the proposed multi-dimensional algorithm is more efficient than the obtainable approaches. The simulation results show that the proposed approach is slightly different in terms of energy consumption.

5. Conclusion

Scientists have recently put forward a tradition of restricting media access to remote sensor networks. However, no meetings are accepted as standard. This is based on the fact that MAC conferencing and large-scale applications are transparent. Therefore, WSN does not have a standard MAC conference. Many existing MAC traditions are effectively guided by presentation inquiries from standard sensor centres, but at the same time there is a lack of writing that contradicts these traditions and multi-purpose systems. However, improving MAC conferencing basically improves the consistent quality and key functionality of the letter. The MAC Legacy area of remote sensor networks has attracted a lot of attention from research networks, resulting in a lot of WSN MAC legacy. This White Paper provides a summary of research on remote sensing systems. The MAC for WSN comes with features that enhance the dynamics between the legacy array layers. Common research questions Finally recommended. Recently, geneticists planned and deployed a separate MAC for WSNs. An important issue in identifying MAC traditions is energy efficiency. As you can see below, all things considered, there are several tests available at different locations for MAC conferences. Many of the MAC traditions proposed for sensor networks in this White Paper demonstrate their quality and disadvantages well. Prepared arrangements for security issues and MAC consultations.

Declarations:

Conflict of interest: The writers affirm that there is no conflict of interest between them.

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Consent of publication: Not applicable.

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