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Break down Alternative Controller Performance Based on Bluetooth Service Discovery

Shobana jeyabalan[1], Marie Benadict Asha[2]

[1]*M.E, Department of Computer Science and Engineering, TCET.*
E-mail: shoba_jeyabalan@gmail.com

[2]*Assistant Professor, Department of Computer Science and Engineering, TCET.*
E-mail: ashabala@gmail.com

Abstract

Bluetooth is a short range radio innovation to frame a little remote framework. It is utilized as a part of low – cost, low power specially appointed systems and it experiences long administration disclosure postponement and high power utilization. Bluetooth utilizes the 2.4 GHz ISM band, having a similar data transfer capacity with the remote LAN executing the IEEE 802.11 models. In this manner it causes altogether bring down obstruction. For enhancing the effectiveness of SDP, we show an execution of Bluetooth 2.1 in the NS-2 test system, examine the IEEE 802.11b as a Bluetooth controller and propose another option Bluetooth Controller in light of Adaptive Frequency Hopping methods utilizing Amplifier Power. The subsequent approach essentially decreases the administration revelation time, in this manner bringing down power utilization and expanding the throughput. We introduce the advantages of our new approach and contrast it and existing methodology utilizing NS-2 Simulations and we have exhibited the correlation diagrams in help of our approach.

Keywords: *NS-2-BT2.1+EDR, 802.11b,Interference, Node Delay, Energy Efficiency*

1. INTRODUCTION

Bluetooth is a low-power, open standard for implementing PANs [1][2]. It is a popular protocol with 40 million Bluetooth-enabled phones shipped worldwide and over 1,000 new Bluetooth products being developed by more than 2,000 companies [3]. It uses a slow hop frequency hopping spread spectrum scheme with 79 1-MHz frequency slots (23 in some countries) in the 2.4 GHz band. Members of a Bluetooth piconet hop together among the 79 frequencies (numbered 0-78) with a sequence that is a function of the master's free-running counter (*CLK*) and the first 28 bits of the master's 48 bit address. Service Discovery Protocol (SDP) [4] is the basis for discovery of services on all bluetooth devices. This is essential for all bluetooth models. Using the SDP device information, services and the characteristics of the services can be queried and after that a connection between two or more bluetooth devices may be established. SDP uses a request/response model where each transaction consists of one request PDU and one response PDU. Only one SDP request per L2CAP connection to a given SDP server is allowed at a given instant until a response is received. Some requests may however require responses that are larger than what can fit in a single response PDU. To extend the response to more than a single response PDU, the SDP server generates a partial response along with a continuation state parameter. All SDP communications use only the BR/EDR controller.

The current SDP is characterized for task between two gadgets as it were. Also, the SDP does not keep up authentic data. Consequently, a new SDP ask for each administration summon. The current SDP does not give a proactive system to illuminate gadgets of accessibility of recently accessible administrations. A Bluetooth gadget needs to inquiry each other gadget regardless of whether the gadget has the coveted service(s) or not. As gadgets need to occasionally look for wanted administrations, it prompts higher overheads.

What's more, a Bluetooth gadget needs to build up a different SDP association with each other Bluetooth gadget. While this is fine for two gadget conditions, it forces a substantial overhead for bigger systems. To enhance execution in these condition, a system known as Adaptive Frequency Hopping has been acquainted by Bluetooth SIG with lessen the effect of impedance in WLAN and comparable situations. At the point when there are transmitters, there must be RF control enhancers. Individuals rate the execution of a RF control enhancer as far as the power pick up, the effectiveness and the linearity. Additionally, the essential hidden standards of activities of various power intensifier modes ought to be completely comprehended before an enhanced circuit topology can be composed. In this way, understanding the dialect utilized as a part of the universe of energy intensifiers and the fundamental working standard of various methods of energy speaker is required.

2. BLUETOOTH ADAPTIVE FREQUENCY HOPPING

We portray the Bluetooth recurrence bouncing succession characterized in the Bluetooth particulars [4], at that point we introduce an AFH calculation that adjusts it keeping in mind the end goal to alleviate obstruction. Versatile recurrence jumping is a technique for shirking of settled recurrence interferers. AFH for Bluetooth can be separated into four fundamental segments

- **Channel Classification** – A method of detecting an interfering source on a channel-by-channel basis (each channel equals 1 MHz)
- **Link Management** – Coordination and distribution of the AFH information to the rest of the members of the Bluetooth network (accomplished via LMP commands)
- **Hop Sequence Modification** – Avoiding the interferer by selectively reducing the number of hopping channels
- **Channel Maintenance** – A method for periodically re-evaluating the channels

Recurrence jumping in Bluetooth is accomplished as takes after. Frequencies are arranged into a rundown of even and odd frequencies in the 2.402-2.480 GHz go. A section comprising of the initial 32 frequencies in the arranged rundown is picked. After every one of the 32 frequencies in that window are gone to once in an irregular request, another window is set including 16 frequencies of the past window and 16 new frequencies in the arranged rundown. From the numerous AFH calculations conceivable, here is an execution that disposes of "terrible" frequencies in the grouping. Given a section of 32 "great" and "terrible" frequencies, the calculation visits every "great" recurrence precisely once. Every "awful" recurrence in the section is supplanted with a "decent" recurrence chose from outside the first fragment of 32.Thus, the distinction amongst AFH and the first Bluetooth jumping succession calculation is in the determination of just "great" frequencies keeping in mind the end goal to top off the portion measure. Some extra requirements can be forced on the greatest number of "terrible" frequencies to wipe out if a base number of various frequencies is to be kept in the arrangement. In their latest administering the FCC suggests utilizing no less than 15 distinct frequencies.

2.1 Benefits Of Afh

AFH for Bluetooth is focused toward facilitating the clog of the quickly swarming ISM band. AFH is particularly custom fitted to battle the obstruction of settled recurrence meddling gadgets, for example, 802.11b, some cordless phones, microwave broilers, and others. Keeping away from possessed range empowers the Bluetooth connect to work at a higher throughput and unwavering quality making an interpretation of straightforwardly into enhanced nature of administration (QOS). The advantages reach out past that of just Bluetooth frameworks. The dodged framework will encounter higher throughput (e.g., 802.11b) or more prominent voice quality (e.g., cordless phones). This is called Bluetooth's great neighbor approach and is because of the way that (from their point of view) the meddling Bluetooth gadget is never again bouncing in their coveted recurrence band.

AFH considers the concurrence between a Bluetooth framework and another framework (additionally involving the ISM band) by having the two frameworks maintain a strategic distance from each other in recurrence. Since the two advancements will have less impacts, they will both experience bring down inactivity because of a less number of retransmissions. The less retransmissions for the two advances likewise implies there will be less general meddling force produced inside the ISM band.

2.2 Amplifier Power

Concerning administration revelation, the fundamental downside of this is need of a for all time associated piconet framework with expanded power utilization for association support. To keep away from this when there are transmitters, there must be RF control enhancers. Individuals rate the execution of a RF control intensifier as far as the power pick up, the effectiveness and the linearity. At whatever point a RF control speaker is talked about, individuals are keen on its energy pick up, control included proficiency (PAE), the deplete effectiveness (DE) and the linearity. The RF control enhancer devours a large portion of the power inside a handset. To protect the battery lifetime, the power intensifier ought to be successful in changing over DC energy to RF control. PAE and DE are the parameters to describe the viability of energy transformation. where Pout is the yield control at the coveted recurrence, PDC is the DC supply power and Pin is the information control at the recurrence of intrigue. PAE incorporates data on the driving force for a power speaker, so PAE is regularly utilized rather than DE.

$$\text{Power Gain} = \frac{\text{Power delivered to the Load}}{\text{Power available at the input port}} = \frac{P_{out}}{P_{in}} \quad (1)$$

3. INTERFERENCE ANALYSIS

As Wi-Fi utilizes a settled recurrence band of 22 MHz while Bluetooth bounces between 79 groups every one of 1 MHz, there is a likelihood of 22/79 that a Bluetooth parcel jumps in the Wi-Fi settled recurrence band prompting an impact. Concurrence between Wi-Fi and Bluetooth was considered in [3, 5]. It was discovered in[3] that Wi-Fi bundles experience the ill effects of the 1-space Bluetooth parcels then 3 and 5 openings bundles, so 5-space parcels are prescribed when Bluetooth exist together with Wi-Fi as this would prompt a lessening in the Bluetooth jump rate, along these lines expanding the odds for a fruitful Wi-Fi bundle gathering. However, in the event that Bluetooth bounces to the Wi-Fi direct amid back-off period, there is no impact on Bluetooth bundles.

As to Wi-Fi information rates, it was found in [3] that with few Bluetooth hubs Wi-Fi high information rates can be utilized, yet when Bluetooth piconets increment, Wi-Fi high information rate modes must be surrendered. In [5], it was discovered that utilizing Bluetooth voice movement may be the most noticeably awful of all impedance cases causing a 65% bundle misfortune for the Wi-Fi with a serious effect on the Bluetooth voice prompting a parcel loss of 8%. Conjunction between limit band advancements and UWB was considered in [6]. The creators utilized high power IR-UWB transmitters that incredibly surpass the FCC radiation directions. It was discovered that both Wi-Fi and Bluetooth systems will somewhat experience the ill effects of the UWB signals (under 10 cm) [8]. Bundle choice and planning plan in light of channel state and line state by round robin parcel booking plan are considered in impedance condition [7].

4. PERFOMANCE EVALUATION

In this paper we are utilizing an elective controller in Bluetooth 2.1. To get understanding about the issues of exchanging between the controllers, to contrast controllers and contribute with the examination, we have built up the UWB [9] OPNET reenactment display in NS-2 Simulator in BT2.1+EDR.

4.1 Simulation Model

Interference based Service Discovery (ISDP) was developed to provide an accurate modeling of the AODV and DSDV protocol and communication channels over the different controllers and to provide an interface to easy the operation of adding other controllers for future research. For the alternative 802.11 MAC/PHY, NS-2 802.11b model was used. The L2CAP component was also modified to establish logical links over the 802.11 MAC using the 802.11 PAL and over the BT2.1+EDR MAC. Finally, the 802.11 and BT2.1+EDR models were integrated, creating a simulation model for high speed bluetooth over IEEE802.11b or BT2.1+EDR.

4.2 Simulation Environment

Various reenactment situations were worked to look at the execution of IEEE 802.11b and BT2.1+EDR as far as hub deferral, throughput and vitality effectiveness versus number of associations and parcel measure. In this investigation the BluetoothV2.1+EDR execution was utilized as a benchmark. Every situation was run ten times. The reproduction keeps running as indicated by the accompanying cases,

Case 1: By Increasing No. of Nodes

For this situation, expanding the no of gadgets and keeping as far as possible esteem and bundle estimate as steady, we are finding the hub deferral, vitality and Throughput

Table 1. Node Delay

No. of Nodes	**Existing (802.11b)**	**Proposed- (IBT2.1+EDR)**
10	0.0072776208389	0.0070195731999
20	0.0152245628045	0.0103235113328
30	0.0210823208483	0.0163846374112
40	0.0355142272220	0.0239032935361
50	0.0441974719310	0.0343920850603

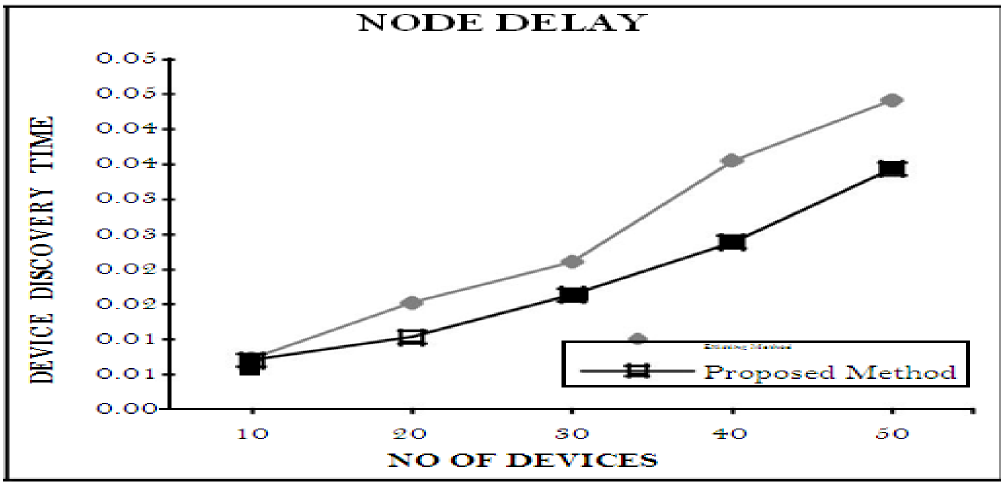

Figure 1. Node delay of 802.11b controller and BT2.1+EDR

Table 2. Node-Energy

No. of Nodes	Existing(802.11b)	Proposed(BT2.1+EDR)
10	0.0106742263941	0.0066367231713
20	0.0117599738032	0.0066095409355
30	0.0119683495049	0.0063823128359
40	0.0126923495337	0.0068138496717
50	0.0127075299329	0.0055588317798

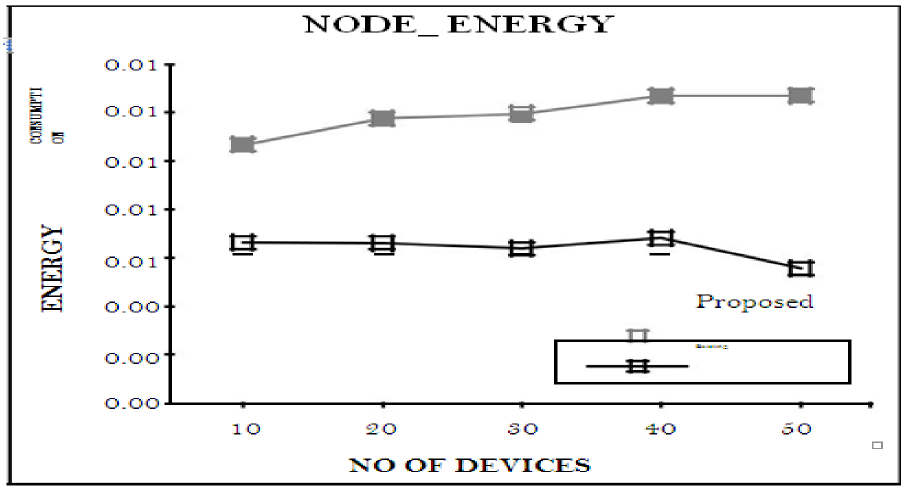

Figure 2. Node Energy of 802.11b controller and BT2.1+EDR

Table 3. Node-Energy

No. of Nodes	**Existing(802.11b)**	**Proposed(BT2.1+EDR)**
10	1.646315602	1.663469006282
20	1.211643169	1.357008330468
30	0.940703598	1.117988765506
40	0.747156256	0.892234606352
50	0.651767858	0.739023963660

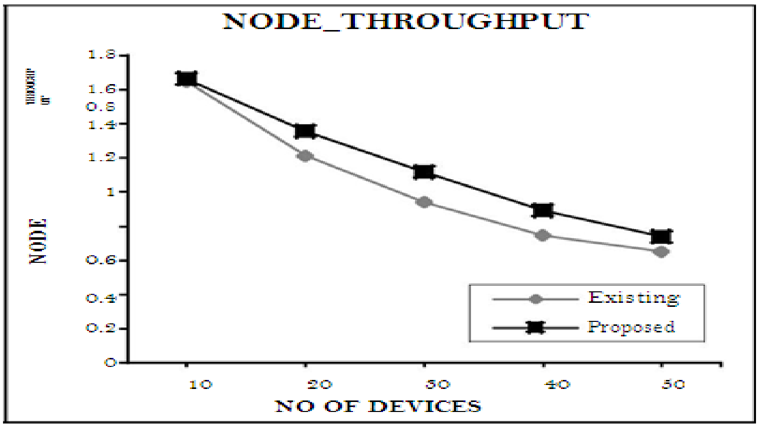

Figure 3. Node Throughput of 802.11b controller and BT2.1+EDR

Case 2: By Increasing Packet_Size

For this situation, expanding the bundle size and keeping as far as possible esteem 1000 and No. of Node-10 as steady, we are finding the hub deferral, vitality and Throughput

Table 4. Packet-Delay

Packet-Size	**Existing(802.11b)**	**Proposed(BT2.1+EDR)**
1000	0.0060444164079	0.0056226685413
3000	0.0072779671859	0.0070167653814
6000	0.0072779671859	0.0070184736838
9000	0.0073835619537	0.0070162993891
12000	0.0072779671859	0.0070180060157

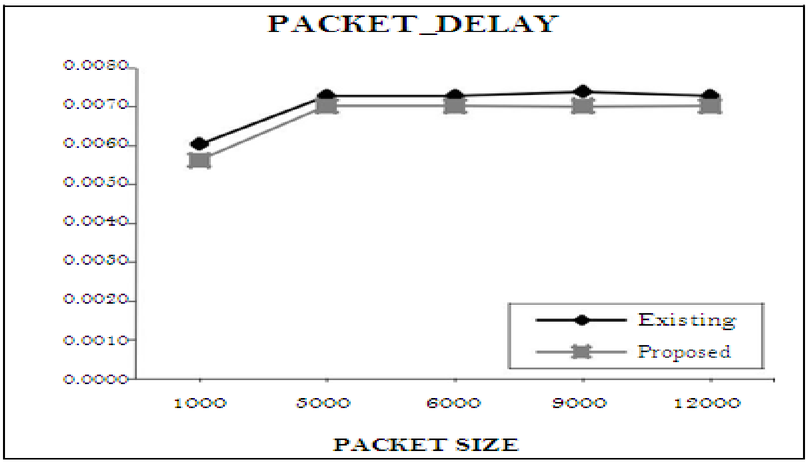

Figure 4. Packet Delay of 802.11b controller and BT2.1+EDR

Table 5. Packet-Energy

Packet-Size	Existing(802.11b)	Proposed(BT2.1+EDR)
1000	0.0114954423219	0.0071160048056
3000	0.0106748677274	0.0066343548935
6000	0.0106748677274	0.0066367690602
9000	0.0106615482830	0.0066324160046
12000	0.0106748677274	0.0066352135046

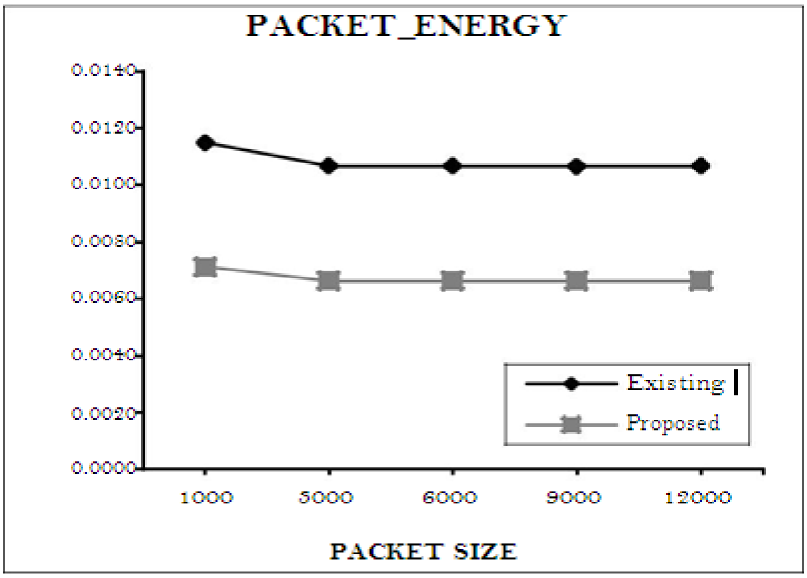

Figure 5. Packet energy of 802.11b controller and BT2.1+EDR

Table 6. Packet-Throughput

Packet-Size	Existing(802.11b)	Proposed(BT2.1+EDR)
1000	1.3709076748188	1.4094106353279
3000	1.6464091753605	1.6635906062824
6000	1.6464091753605	1.6628498103745
9000	1.6340562943288	1.6628180886353
12000	1.6464091753605	1.6628498103745

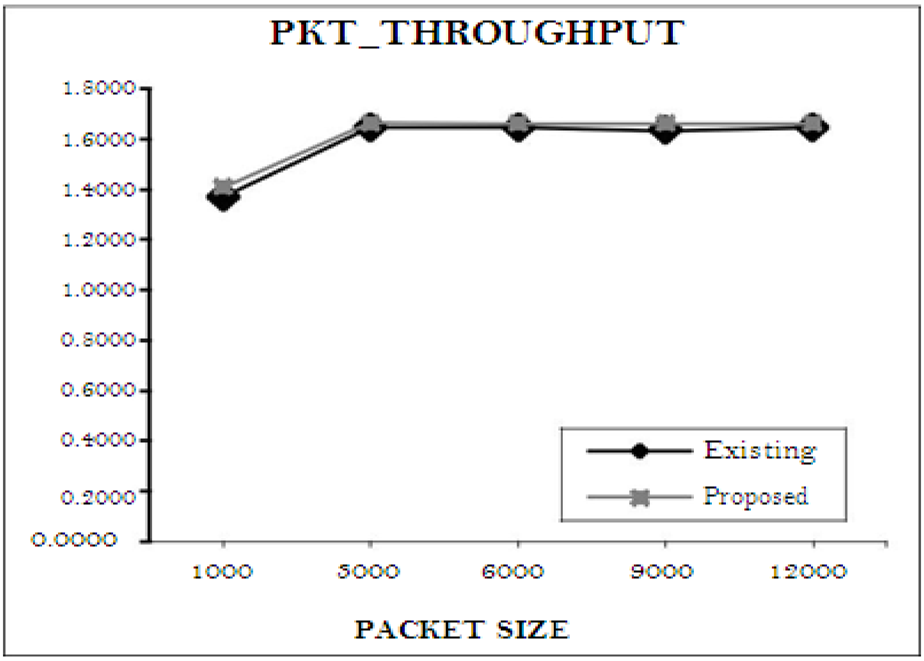

Fig.6. Packet Throughput of 802.11b controller and BT2.1+EDR

Table.7. Simulation Parameters

Parameter	Values
Propagation Model	Radio energy model
Initial energy (Wh)	3
Number of connections	1,2,4,6,8
Number of nodes	Twice the number of connections
Alternative controller	IEEE802.11b , BT2.1+EDR
Transport layer agent	UDP
Transport layer packet size (Bytes)	1500
Distance	1,3,6,10

5. RESULTS AND ANALYSIS

5.1 Node Delay

The normal end-to-end defer is yet another quantitative metric considered in the assessment procedure. Having a steady or close consistent metric esteem demonstrates that an innovation would suites applications that can't endure jitter. The normal postponement is gotten by figuring the whole of the aggregate deferral experienced by every one of the hubs in the system partitioned by their number as given in Eq.(2)

$$\textbf{Average delay} = \frac{\sum_{\forall \text{Nodes}} \frac{\sum_{\forall \text{Packets}} \textbf{Arrival Time} - \textbf{TransmissionTime}}{\textbf{Number\_of\_Packets}}}{\textbf{Number\_of\_Nodes}} \quad (2)$$

Table.8. Relationship between Node delay Existing and their Node delay Proposed

Node delay Existing	Correlation value	Statistical inference
Node delay Proposed	.987(**)	P <0.01 significant

** Correlation is significant at the 0.01 level
Statistical test: Karl Pearson coefficient correlation test

The above table demonstrates that there is a profoundly huge connection between Node postpone Existing and their Node defer Proposed. Thus, the figured esteem not as much as table esteem.

PKT delay Existing	Correlation value	Statistical inference
PKT delay proposed	.997(**)	P < 0.01 Significant

** Correlation is significant at the 0.01 level
Statistical test: Karl Pearson coefficient correlation test

The above table shows that there is an exceptionally critical connection between PKT vitality existing and their PKT vitality Proposed. Henceforth, the figured esteem not as much as table esteem.

5.2 Energy Consumption Per Bit

The other key quantitative measurements considered in the assessment procedure is the normal system vitality utilization per bit. Normal system vitality utilization per bit is ascertained by separating the aggregate sum of vitality expended to send and get the information by the measure of information got. Normal system vitality utilization per bit is gotten utilizing Eq.(3).

$$\text{Average Network Energy Consumption per bit} = \frac{\sum_{j=0}^{\text{Number\_of\_Nodes}} E_j}{\sum^{\text{Number\_of\_Connections}} R_i} \quad (3)$$

Table.10. Relationship between Node energy Existing and their Node energy Proposed

Node energy Existing	Correlation value	Statistical inference
Node energy Proposed	-.407	P > 0.05 Not significant

Statistical test: Karl Pearson coefficient correlation test

The above table demonstrates that there is no noteworthy connection between Node vitality Existing and their Node vitality Proposed. Subsequently, the ascertained esteem more prominent than table esteem.

Table.11. Relationship between PKT energy existing and their PKT energy Proposed

PKT energy existing	Correlation value	Statistical inference
PKT energy proposed	1.000(**)	P < 0.01 Significant

** Correlation is significant at the 0.01 level

Statistical test: Karl Pearson coefficient correlation test

The above table shows that there is an exceptionally noteworthy connection between PKT vitality existing and their PKT vitality Proposed. Thus, the figured esteem not as much as table esteem

5.3 Throughput

Normal system throughput is one of the key quantitative measurements considered in the assessment procedure. This metric gives a sign of the capacity of an innovation in dealing with high rate applications and moderating meddling sources impacts. Higher metric esteem demonstrates that an innovation is more skilled in taking care of more movement. Having a steady or close consistent incentive for this metric with various number of meddling sources speaks to a decent sign that an innovation can work in a swarmed domain. Normal system throughput is figured by averaging the associations throughput utilizing Eq.(4).

$$\text{Average Network Throughput} = \frac{\sum_{i=0}^{\text{Number\_of\_Connections}} R_i \,/\, \left(T(\text{Last})_i - T(\text{First})_i \right)}{\text{Number\_of\_Connections}} \quad (4)$$

where: R*i* is the total number of bits received at connection *i* destination node.

T(Last)i is the arrival time of the last data bit for connection *i*.

T(First)i is the arrival time of the first data bit for connection *i*.

Table.12. Relationship between node throughput existing and their node throughput Proposed

Node throughput existing	Correlation value	Statistical inference

Node throughput proposed	.990(**)	P < 0.01 Significant

** Correlation is significant at the 0.01 level

Statistical test: Karl Pearson coefficient correlation test

The above table shows that there is an exceedingly huge connection between hub throughput existing and their hub throughput Proposed. Thus, the figured esteem not as much as table esteem.

Table.13. Relationship between PKT throughput existing and their PKT throughput Proposed

PKT throughput existing	**Correlation value**	**Statistical inference**
PKT throughput proposed	.999(**)	P < 0.01 Significant

** Correlation is significant at the 0.01 level

Statistical test: Karl Pearson coefficient correlation test

The above table shows that there is a profoundly huge connection between PKT throughput existing and their PKT throughput Proposed. Subsequently, the computed esteem not as much as table esteem.

6. CONCLUSION

In this examination we proposed the utilization of BT2.1+EDR as an elective controller for proposed plan and IEEE 802.11b for existing plan. The two elective controllers are then assessed by methods for [NS-2] recreations as far as hub delay, vitality proficiency and throughput for 25 gadgets [say 50 nodes]. The reproduction comes about uncover that BT2.1+EDR have preferable productivity over the present or existing methodologies. Breaking down the information from the charts and tables we can see that the proposed approach is having a much lower normal end to end hub delay and decreases the normal system vitality utilization per bit. It is likewise demonstrated that the proposed approach gives better system throughput contrasted with the current one. These highlights make it reasonable for systems requiring high exchange rates and in the meantime lessening vitality utilization and hub delay. Then again, the current plan isn't appropriate for every single remote innovation, though the proposed display is reasonable for every remote innovation and in future, we intend to stretch out this model to help single-jump bunching and multi-bounce grouping in bluetooth organize utilizing Max-Min D-Cluster arrangement [10].

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