Intrusion Detection and Prediction by Using Lte-5lowpan in IoT Techniques

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ABSTRACT:

Nowadays, the Internet of Things (IoT) research zone pulls in experts, as a result of its wide grouping of uses and straightforwardness in passing on in a couple of spaces of the real world, particularly for conditions that are seen as essential, for instance, E-prosperity, insightful homes, and wise metropolitan zones. Things in splendid metropolitan networks are hard-headed through the Internet. These things are ordinarily sent in a proper atmosphere distantly. They become unprotected against the diverse security attacks that can affect their genuine functionalities at whatever point. As the Routing Protocol for Low Power and Lossy Networks (RPL) transformed into the standard for controlling the Internet of Things (IoT) associations, various experts analyzed the security parts of this show. In any case, no work (clearly) has investigated the usage of the security segments associated with the show's standard, because there was no execution for these features in any IoT working structure yet. A fragmented utilization of RPL's security instruments was presented starting late for LTE 5G identified with IPV6 which gave us the event to examine RPL's security parts. Thusly, it will explore the effects and challenges of using RPL's security instruments under fundamental guiding attacks. Introductory, an assessment of RPL's (Routing Protocol with Low power) execution, with and without its security frameworks, under three coordinating attacks (Blackhole, Selective-Forward, and Neighbor attacks) is driven using a couple of estimations Based on the discernments from this relationship. It reviewed to decrease the effects of such attacks, without having added security segments for RPL. The huge part identified with the LTE-5G (Long-term Evolution in 5G) used to treat the introduction of MUX/DEMUX taking care of is the speedier difference with existing. The IPV6 is used to portray the ID and the territory structure for PCs on associations by passing on the shows that course traffic across the association.

KEYWORDS*:* IoT – Internet Of Things, RPL – Routing Protocol with Low Power, LTE-5G – Long Term Evolution in 5G, IPV6 – Internet Protocol Version 6, ECC (Elliptic Curve Cryptography in 5G).

I. INTRODUCTION*:*

Something genuine can be made by this creative knowledge to infer itself in the high-level world. Regarding real things that are related to the web, it is significant that contemplating different speculations and looming figures, they, by and large, require guaranteed structures, additionally, they are at risk for a couple of attacks. IoTs are advanced with explicit directing rebellion called sinkhole attack inferable from their scattered features.

In these attacks, a malicious center discusses illusive information as for the routings to constrain itself as a course towards unequivocal centers for the neighboring center points and subsequently, pull in data traffic. RPL (IP-V6 coordinating show for beneficial and low-energy associations) is a standard directing show that is mostly used in sensor associations and IoT. This show is called SoS-RPL containing two key sections of the sinkhole acknowledgment. In the principle territory rating and situating the center points in the RPL is finished subject to removal assessments.

The communicated issue earnestness even becomes higher when they are passed on in sharp metropolitan regions. Likewise, it is presumably going to deal with data while moving to begin with one source and then onto the following until showing up at the goal during data coordinating. Existing Routing Protocols for Low Power and Lossy Networks (RPL) are seen as lightweight and secure coordinating shows for IoT contraptions, which offer slight protection against inestimable kinds of RPL guiding attacks. Considering the possibility of the IoT association, being resource prerequisites, the standard coordinating procedures oncein a while miss the mark for them using any means. The IoT coordinating security is, thusly,a troublesome task. This overview hopes to explain the stream research composing, openings,and investigation openings of secure RPL coordinating shows.

Our responsibilities can be summarized by going with centers:

(1) It has been given an introduction connection with RPL between the insecure mode and the Preinstalled secure mode; the last case is investigated with and without the optional replay confirmation. We found that running RPL in the Pre-presented secure mode (without replay confirmation) doesn't use a bigger number of resources than the insecure mode, much-persevering through an invasion.

(2) It has been affirmed that the Pre-presented secure mode can forestall outside adversaries from joining the IoT network for the inspected attacks. Further, it demonstrated that the

optional replay protection also gives bewildering easing against the Neighbor attack; regardless, it needs further smoothing out to lessen its effect on energy usage.

(3) It has been seen and separated the effect of the analyzed attacks on the coordinating geology and proposed a few fundamental techniques that could help decline the effects of the investigated attacks, without using outside wellbeing endeavors, for instance, IDSs or added security segments.

II. RELATED WORKS:

Md Anam Mahmud et.al has been proposed the Internet of things has numerous approaches to improving the likely things and thoughts to associate the worldwide and all-inclusive organization. It is addressable to associate and speak with brilliant things. Shrewd items are chips, handsets, sensors, and force sources to manage the low force framework and Lossy organizations. Hubs have restricted capacity. Nature of administration is obligatory to give the difficult sensors and it very well may be dissipated to the impromptu way of steering conventions. Web Engineering Task Force and normalized directing conventions are underlying IPv6 and it has tree-like geography dependent on organization metric improvement [1].

Abdelhak Zier et.al, has proposed the time of systems administration and correspondences to explore the IoT difficulties and QoS directing convention both have been a rising point for quite a long time. Looking RPL and E-RPL are utilized to diminish the number of messages in Low force and Lossy organizations. Target capacities are multi- obliged to adaptable new conventions and they have energy, data transmission, start-to-finish hubs, and start-to-finish delay [2].

Pratibha Sharma et.al, has recommended that Low force and Lossy Networks compelled its versatility and gadget-to-gadget correspondence with less force utilization. IoT produces the base P2P with help portability. It diminishes the less energy to broadening the P2P directing convention just as hubs. Upgraded Mobility Aware Energy Efficient Routing Protocol execution with some benchmark conventions are RPL, P2P, and ER-RPL. It burns- through 9.61% and the less energy 12.31% is the bundle conveyance proportion [3].

Harith Kharrufa et.al has been suggested that IoT makes them interested and a promising worldview contributes to the cutting-edge applications utilizing actual things on the web. IoT has some unique medical services and climate applications with a low-fueled sensor. RPL normalizing RFC6550 in 2012 with low force and lossy organizations. RPL has two benefits and bad marks. RPL depends on security and adaptability [4].

Zibuyisile Magubane et.al has been proposed a specialized worldview to convey the sensor and activation gadgets to show the IoT wonder. It limits memory, data transmission, and processor to expand the significance of time and save power in an organization. Steering convention encourages the transmission of bundles from the source to the objective hubs utilizing parcels. A few conventions have the near energy of RPL to execute the Contiki working framework and Cooja Network test system [5].

Maja Lazarevska et.al has been suggested that remote sensor networks have brilliant medical services and IoT methods for detecting information to give the appropriate information move. WSN has energy utilization and a lifetime sensor for supplanting or energizing the battery. Hubs have low and high energy to support the portability of the structure utilizing RPL. WSN has both static and portable organization hubs and directing models of target capacities to analyze the energy, and obligation cycle, and control the debasement of parcel proportion [6].

John Abied Hatem et.al has been suggested that low force and lossy organizations picked up a ton of intensity in the adaptable geographies. It has some different choices like Looping, recognition, Healing, and arrangement through IoT. Steering convention and Objective Function have specific organization hubs to improve their switches. It proposes the various alterations of MRHOF in two measurements are more dependable [7].

Shruti Pathak et.al has been recommended that IoT has processing wording to associate the web and correspondence with different gadgets. Interfacing objects are interconnected with Wi-Fi sensors and other home machine gadgets. IoT is a systems administration stage with mechanization dependent on associated gadgets. Correspondence sensors drop the data and effectively dissect the end to play out the errand with the adequacy of security and shared organization. RPL has a security break to reuse the directing convention in various methods of utilizing IoT switch enhancement and data transfer capacity [8].

Ghada Glissa et.al, has suggested that information transportation and steering are huge information assortments to unsurprising the low force and lossy organization in RPL. RPL has a few weaknesses to trade the control messages identity with the 5LoWPAN organizations. RPL and SRPL alluded to keeping the undesirable hubs from changing the control organization to upset the phony geography. It limits the hash affix confirmation methods to manage the inner assaults, and so on SRPL controls powerful and pernicious assaults in RPL measurements [9].

Sheeraz A. Alvi et.al has been recommended that IoT has a scalar sensor to explore the uses of mixed media things or the Internet of sight and sound things. Data and Communication innovation is utilized to diminish energy utilization and CO2 discharges in order green correspondence. Steering Protocol has a low force and Lossy organizations in IPv6 and it fabricates a tree structure geography in the goal work. RPL usage has carbon impressions outflows and energy utilization to consider the Cooja and Contiki-OS regarding effectiveness framework [10].

Aashima Bisen et.al, has recommended that Wireless sensor networks need to detect theindigenous habitat to impart the hubs over the remote connections. WSN innovation exists in the distant district and has very different testing and investigating issues. Remote organizations increment the sensor's lifetime. Force advancement, less utilization of energy framework, Memory, and directing conventions are getting the centers in the most recent adaptation of the convention in correspondence models. Lifetime sensors are progressively power hubs in RPL low force and lossy organizations are utilized. Portable hubs and fixed hubs are indicated their portability to affecting boundaries and convention utilizing Cooja and Contiki OS [11].

Mauro Conti et.al, has recommended that steering convention and information correspondence are proficient in low force and Lossy organizations utilizing IoT to gather the information and cycle the normalized network. IoT has an absence of adaptability and weakness towards the security dangers and appropriation of RPL directing in IoT organizations. SPLIT uses the lightweight distant methods programming to hubs by validating messages of piggybacks to control the messages. SPLIT has low force utilization to enormous scope organizations of adaptability. It shows the viability of IoT situations in various methods of energy utilization [12].

Aiman Nait Abbou et.al, has recommended that WSN and IoT innovations are created by directing conventions utilizing low force and Lossy organizations. RPL is a proactive unique convention dependent on IPv6 that gives the exhibition of a steering framework. It has 3typesof capacities they are target work, target work zero, and Hysteresis target work. It has various boundaries for power utilization to play out the dormancy level, hubs, centering, and fewer boundaries [13].

Meet K. Shah et.al, have been suggested that 6LoWPAN is a mix of IPv6 and LoWPAN that permits the restricted gadget handling and capacity to communicate the data of conventions. The directing header inspects the steering bundles to embody the header pressure, and fracture of IP parcels. The Macintosh layer and transformation layer has an alternate form of a convention stack. Impromptu vector and request distance-vector are Dynamic MANET of 6LoWPAN rearranged convention forms. Differentiation directing conventions have diverse memory, hubs, networks, and foundation of a RERR message to nearby fix. 6LoWPAN grouped the steering calculations and the arrangement of directing boundaries possesses its advantages and disadvantages of the application [14].

Antimo Barbato et.al has been suggested that the IPv6 convention gives web availability to an item and implants specialized gadgets. IoT and IPv6 of remote sensor organizations to assume a critical job in a few climate capacities become eyes and nose. WSNs convention hasdistinctive energy-productive of steering convention for low force and Lossy organizations. RPL building blocks are additionally called IoT. RPL has terms of energy-effective to play out the bargaining the organization throughput [15].

G. Gautham Krishna et.al, has been suggested that WSN has swayed a few zones in wide-scale detecting current ages. To quantify and notice the comprehension of actual components it offered the activating correspondence organizations of IoT. Sensors and actuators are shared across the stage with mixing climate with ease WSN gadgets. RPL sensor plays out this present reality applications, hubs, and capacities to center the measurements in everyday applications situations are broken down [16].

Anna Triantafyllou et.al has been recommended that IoT huge the following stage to bring the progressions of medical services, ecological and metropolitan improvement of innovations. Interoperability difficulties of framing vision to make sure about the information secrecy last however not the least energy-proficient administration frameworks. Organization correspondence innovation to typify the directing conventions between IoT network conventions is inspected. A layer-based convention works the new tending to IoT necessities and applications to review the systems of IPv6. IPv6 open systems administration challenges are security, stockpiling, versatility, and adaptability of energy the board in the IoT space [17].

III. METHODOLOGY:

The RPL has assessed the layer convenience in the security instrument looked like under the three methods for the confirmation. It has been defaulted to recognize the PSM (pre- presented secure mode) which sees the symmetric for changing over the messages by secure. The centers of joins have been choosing to get the new key for checking the consistency of the segment without lacking and need to control the messages by the ASMrp (Authenticated Mode).

It helps with exchanging and is used to ensure the message as a no-answer had occurred. The attacker model has been proposed by using the IPV6 mix of LTE-5G. The geology has included the one root, dangerous center point, and interpretation number attacks and made plans for that. Expecting the root center point which can't be revealed by the ID can't be manhandled. It is ensured to choose inside the attacker similarlyto the outer aggressor by using the ECC (Elliptic Curve Cryptography in 5G).

It has been passed on the DIO messages and recognizes the version number for a marker for the people who are inciting or planning by the geology in the most secure Tx in the RPL across the association. It is an overall fix movement for finding the root center point as a DODAGwhich is a change or not by organizing the ways. RPL centers and topography have taught the exchanging the controls message and the root taking care of with change the structurenumber. Under the situating framework sort the packs as per the malicious DIO while sending and tolerating the association. To choose the apex and vapor with the impact of the association execution in RPL to broadcasting the fake situating distinguished by using the ECC in the two circumstances. The structure number should be varied by the RPL stream time in each MUX.DEMUX across the layer in ECC change.

To control the continuous occurrence in the interpretation number and situating while simultaneously having the chance of the center points, it throws the impetus for the assailant and the threatening record as indicated by the stream time. It moreover passes on the DODAG. Once getting the DIO packs and the harmful which shows the structure situating reports to balance and lossy with the msg made the screw-up message as followed by theECC in every typical taking care of. It can show up in the top-notch report similarly to thelow usage record with the situating data. It helps with preventing the security of peer correspondence across the association while using the RPL and having a predominant execution of the transmission.

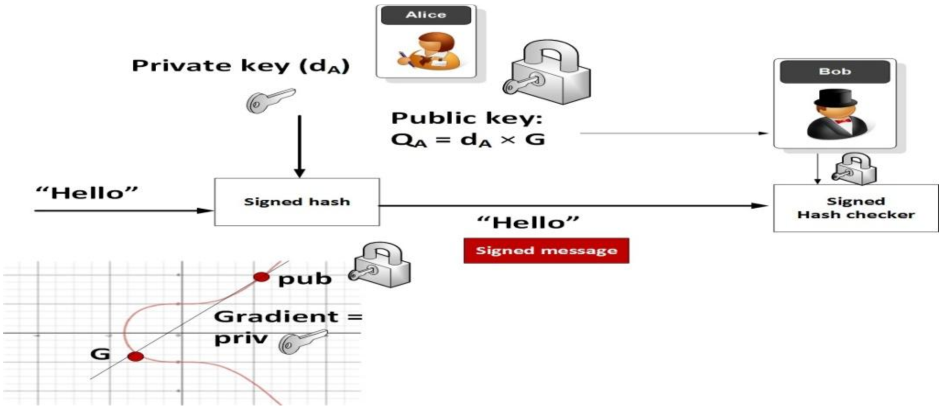

Fig 1: ECC conversion while sending a DIO Packets- Samples

The private key and public key are set to get to the vital boundary of the DIO bundles while Secured sending by the layer insurance through the organization. For the most part, it hasbeen 256 characters and it conveyed the heft of documents supporting the quickest transmission of the LTE-5G. When it scrambled by utilizing the ECC techniques at that point relegated the estimation of the positioning request for the symmetric keys just as the objectiveside as well. Particularly the IoT expressions to be utilized the low force utilization and the hash checker used to allocate the vital boundary for the safe transmission in the conventioncorrespondence. The slope is used to identify the method of capacity while sending and accepting the advantages dependent on admittance to the DODAG parcels. It assists with finding the advancement of security advertisement gives consistency of the messages just as the checker approval.

$y2 \equiv x3 + ax + b \ (\mathrm{mod}\ p)$ .... **(1)**

$y2 \equiv x3 + 7 \ (\mathrm{mod}\ p)$ .... **(2)**

thus the equ (1) and (2) has been uncovered the advancement of the Galois field of reach while acting like RSA in the purpose of the whole number reach as [P = 0,1,2.]. It has been comprising all focuses are equivalent to 0 according to the ECC axioms. Here,

$$Ax^3+Bx^2y+Cxy^2+Dy^3+Ex^2+Fxy+Gy^2+Hx+Iy+J = 0 \ldots\ldots\ldots\ldots \ (3)$$

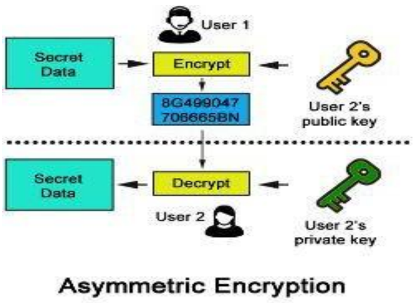

Fig 2: Asymmetric Encryption in ECC – Samples

Accordingly, it has been shown by a symmetric key used to choose the shortcomings and thereafter insufficient concerning the information between the normal DIO packages and subsequently noxious groups., it arranged by the pattern of the cross-endorsement ended up supporting the customer or not in the confirmation mode. It helps with orchestrating the situating as per the characteristics, numbers, and the DIO group sizes. The customer needs to reveal the secret and customary message by conveying reason. Once articulated apply the keys as per the different sides to control the Galois limit of the structures and ECC changing over to the given core interests. So finally perceives the poisonous once they cross-endorsement twice times as indicated by the streaming period of the cycle across the association. The huge part is it serves to pre-chosen once the message getting for the harmful while consideration or the lacking shortcomings in outside.

Elliptic curve subgroups for the most part have various generator centers, yet cryptographers circumspectly select one ofthem, which makes the entire social affair (or subgroup) and is sensible for execution upgrades in the computations. This is the generator known as "G". It is understood that for specific curves assorted generator centers make subgroups of different solicitations. Even more accurately, if the social occasion demand is n, for each prime "d" apportioning n, there is a point Q with the ultimate objective that d * Q =boundlessness. This infers that a couple of centers used as generators for a comparable twist will make more unobtrusive subgroups than others. if the social occasion is close to nothing, the security is weak. These are known as "little subgroup" attacks. This is the inspiration drivingwhy cryptographers by and large pick the subgroup demand r to be a prime number.

$P = K * G$ .... (4)

$K = P / G$ …………………………………………………..(5)

Subsequently, the ECC change has been uncovering the capacity focuses are p signifies thepublic key, G inspects the generator point and k depicts the incentive as a number. By giving elliptic bend over limited field p and generator point G on the bend and point P on the bend, discover the number k (if it exists), with the end goal that P = k * G. For deliberately picked (by cryptographers) limited fields and elliptic bends, the ECDLP issue has no proficient arrangement.

For elliptic curves with cofactor h > 1, unmistakable base centers can make different subgroups of EC centers around the twist. By picking a particular generator point, it has been chosen to work over a particular subgroup of spotlights on the curve, and most EC point assignments and ECC crypto computations will work splendidly. In any case, once in a while,exceptional thought should be given, so it is endorsed to use just exhibited ECC executions, figurings, and programming groups. The LTE-5G is used to Tx the DIO messages to the target once held in the generator centers then using the ECC change to the layer through the shows. Other than arranging the IPV6 with theIoT blend of the ensured transmission layer to give the DIO groups. To suggest the 6LoWPAN for the snappiest transportability to the partner system show correspondence through the geology. The message changes over the packages and subsequently finds the model regard and dangerous id of the character in the DIDAG by the orchestrating regards in the RPL. The RPL work is used to keep an essential separation from the concede acknowledgment and plausibility of the lacking DIO packs for the security concern. so in all probability, it finds the value deviation to arranging the dangerous records and gets to the DIO packages with low power usage similar to the speedier transmission for the progression of the association.

Effects on packet delivery rate (PDR):

The alleviation of the attacks which are utilized to decrease the lacking and attacking of the effect of DIO packs in the internal and external in the PDR has been reducing the low usage in the RPL. It has been continually picked the DODAG for the aggressors in the sink center to choose the response and no response from the show correspondence.

RPL had the alternative to respond to the began DIO groups in an elective manner while jitter happened. So it causes low power without losing the data and without traffic of the limit in the IPV6 supports. The examinations under the ECC change with the 5G of IPV6 show correspondenceto their DIO messages through the adversary.

E^2: $y^3 = x \quad + ax + b$ ………………………………..(6)

From this time forward the condition has been recommended by the packs and which is proper the confirmed mode as a section the DIO bundles and subsequently tolerating the sie and ID regard. What's more, a short time later, the probability has been chosen the extent ofdeformation structure in the frameworks organization security issues. By then, it finds the sorts of the attacking effects in the organizing side of the misstep rate in the group diffuse and thereafter inadequate concerning the attacker's helpfulness in the RPL. By using the IoT techniques collaborate with control the DODAG upholds.

$$= [([k]G),\ (P \quad P_{C} \quad {}_{m}+ [k]P \ \ {}_{B})] \ldots\ldots\ldots\ldots (7)$$

Effects on the E2E latency:

Certifying our revelations referred to above, Fig.2b shows that the RPL's Preinstalled secure mode soothed the three attacks when they are dispatched by an external adversary, keeping the E2E inertness in any event. As a result of a gigantic number of undelivered data packages for the affected center points, the SF had the greatest E2E dormancy among all within attacks. This effect is, again, because of the dynamic venture of the adversary in the DODAG uphold. For a comparative clarification, the Blackhole attack familiarized some inactivity with the association. In any case, since the affected centers had the alternative to find an elective way and were viable in passing on the rest of their data divides, dormancy was impressively not exactly under the SF attack circumstance. The condition is more bewildered for the Neighbor attack circumstance, as self-retouching parts were used a couple of times to recover the affected centers from the attack, which incited extensively higher E2E idleness than the Blackhole attack circumstance.

y1 = mod_sqrt(x3 + **a**x + **b**, **p**)..(8)

y2 = **p** - mod_sqrt(x3 + **a**x + **b**, **p**)..(9)

Effects on the exchanged number of RPL's control messages:

The uncommon instance of this end is the Neighbor attack circumstance with RPL in the Preinstalled secure mode and the replay affirmation framework is dynamic. In this phenomenal case, the replay affirmation instrument introduced a much higher number of control messages. Significantly, the amount of gained power messages is reliably higher than they sent one because countless of the sent control messages are multicast messages which will be gotten by all neighboring center points of the sender.

IV. RESULT AND DISCUSSION:

Significantly, the amount of gained power messages is reliably higher than they sent one considering the way that immense quantities of the sent control messages are multicast messages which will be gotten by all neighboring centers of the sender. Effects on power usage: It examines the ordinary association of power use per got the pack, as it gives a more careful examination of the effect of the attacks on the power use than essentially using the standard typical power use readings. Looking at the outcomes of the external foe investigation in the No Attack circumstance, it can see that power use is fairly higher diverged from comparable circumstances in various preliminaries. The clarification is that the data groups from the impacted center points are taking the other choice and longer way, i.e., more power is used by the center points in that way. Regardless, the power use configuration is unclear in all the circumstances of the external adversary attempt, which shows it isn't affected by the attacks; from now on, productive control of the attacks.

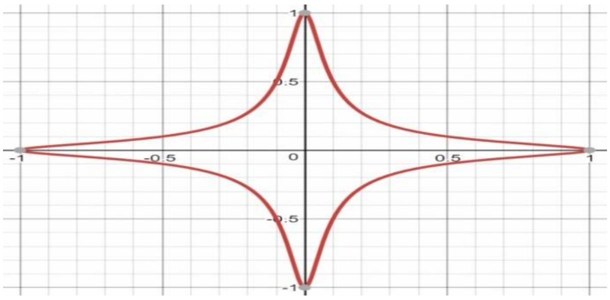

Fig 4: DIO Packet compression

For the wide scope of different examinations the power usage plans are in a general sense equivalent to between the unsteady mode and the Preinstalled secure mode in the No Attack, Blackhole, and Selective-Forward attacks circumstances, with the replay protection framework having to some degree more power use than the rest. This is a direct result of the way that various data groups were not passed on and the power consumed for their inadequate movements is wasted. As of now, it is evident from Fig.3 that using the replay protection in a general sense assembles the ordinary power use when the Neighbor attack is dispatched, whether or not essentially the aggregate of the sent data bundles was passed on viably. This time theclarification for this direction is the extended number of control messages exchanged to calm the attack, as seen in Fig 4.

Description	**Value**
No. of experiments Four	(See §IV-C)
No. of scenarios per experiment	4 scenarios
No. of the sim. rounds per scenario	time 10 rounds / 20 min
per round, Node Positioning Random Deployment	area 290m W x 310mL
Number of nodes	28
Wiimote mote	Propagation model Unit Disk Graph Model
DATA transmission rate	≃ 1 packet per minute

Table 1: DIO data compression and transmission rate

Considering the insights referred to above, it proposes going with a proposition to help decrease the effects of guiding attacks on RPL's presentation. These proposals needn't bother with extra security parts or systems. However, their suitability should be checked through more examinations:-

1) Designing the association geology in a course where there are more elective ways toward the root center and more neighbors percenter points. This would decrease the recovery time required for centers to crush a Blackhole attack and diminish the effects of the other investigated attacks on PDR and E2E idleness.

2) Optimizing the "dead parent" break of RPL to go with the association's changing conditions could reduce the E2E latency and augmentation of the PDR. Regardless, that may fabricate power use when there are no attacks. It could recommend using a dynamic strategy where the "Dead parent" break is randomized, or to use the IPv6 over Low-energized Wireless Personal Area Network-Neighbor Discovery (6LoWPAN-ND) show, which works close by RPL to distinguish the center's neighbors and check their status in a resource pleasing way.

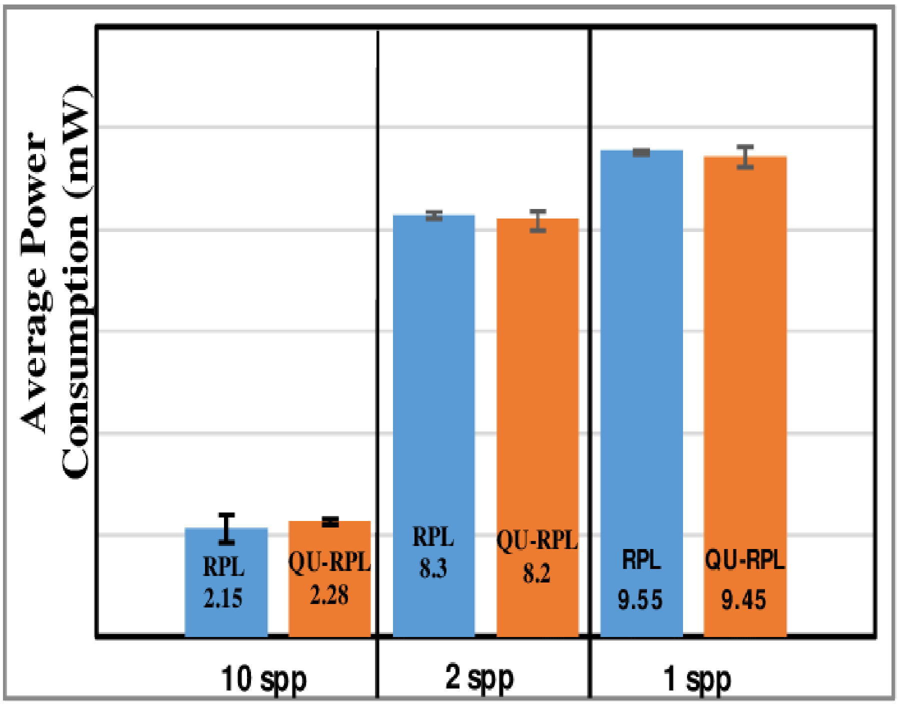

Fig 5: Average RPL Consumption

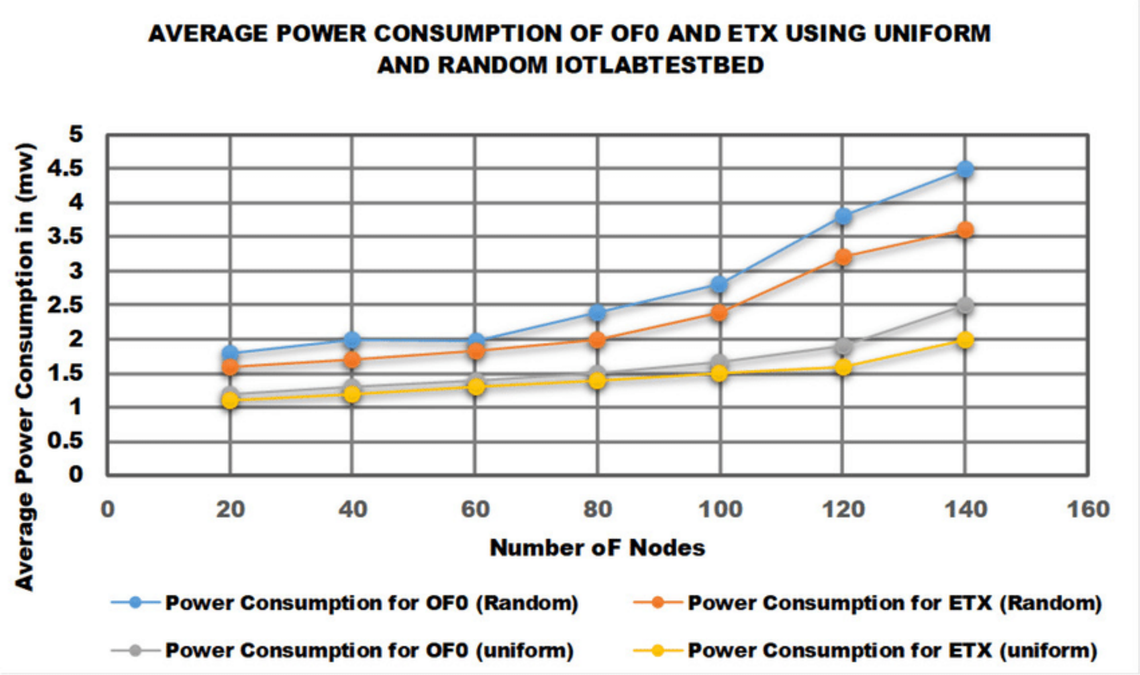

Fig 6: RPL by using IoT via the protocol communication

Figs 5 and 6 portray the edified RPL directing shows and its DODAG advancement with both upward and slipping heading. The introduction assessment of RPL coordinating shows similar to limit estimations, for instance, Average power use, ordinary radio commitment cycle, packs got percenter using LTE -5G associated with 6LoWPAN test framework. The result shows that the best amounts of packs are gotten percenter with high throughput and typical inertness. At the point when the widely appealing center addition than the power usein like manner increases and case the center has less power usage, by then the radio commitment cycle decreases.

V. CONCLUSION AND FUTURE ENHANCEMENT:

Internet of Things (IoT) advancement is bound with possible results to change standard metropolitan networks into splendid metropolitan zones. RPL-based IoT is hard to arrange capability and relentless quality. Multi DODAGs are an undertaking to address this trouble. Multi DODAGs improve data transport, diminishes control of traffic overhead, and abate power usage. Multi DODAGs similarly give constancy by extended center speculation. Right when faced with a center or association frustration, an elective way or sink is helpful for arrangement point sharp city associations. Likewise, Multi DODAGs give combination centers (sinks) that can be versatile covering a huge topographical region.

For further execution propose updating the entertainment gadgets and controlling the arrangement of estimations to promote libbed the show correspondence by using the standard geologies and the ensured transmission without obstacle.

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