

## Detection and Prevention of Wormhole Attack in Wireless Sensor Network

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### **Abstract**

*Exceptional features a like imperfect bandwidth, imperfect battery-operated control and active topology type wireless sensor network (WSN) defenseless to various varieties of outbreaks. Then, curiosity in exploration of safety in WSN has been cumulative since earlier quite a lot of ages. Organization less and self-sufficient countryside of WSN is stimulating topic in rappers of safety. Wormhole outbreak is one of the severe outbreaks in wireless sensor network. In this paper, the method production with wormhole outbreak in WSN are plotted and a method is projected for detection and prevention of wormhole outbreak. AOMDV (Ad hoc On demand Multipath Distance Vector) routing protocol is combined into these ways which is based on RTT (Round Trip Time) instrument and other features of wormhole outbreak. As associated to other resolution shown in nonfiction, projected method looks very hopeful. NS2 simulant is used to complete all replication. And the several results can be explaining.*

**Keywords:** *Outbreaks, AOMDV (Ad hoc On demand Multipath Distance Vector) Wireless Sensor Network (WSN), RTT (Round Trip Time), NS2.*

### **1. Introduction**

In MANET comprises have been a sensor spaces of a quantity a huge no of little sensor ecologic circumstances. Device centers perform different important responsibilities as sign management, calculating, and buildings self-design to increase organize insertion and strengthen its changeability. The instruments all collected give international public of the circumstances that proposal extra statistics than those gave by effortlessly at work sensors. They are equally responsible for perceiving condition and broadcast data. Frequently the transmission task is basic as there is incredible quantity of material and instruments devices are controlled. As sensor appliances are constrained the arrangement is existing to assortment of stabbings. Conservative safety gears are not pertinent for WSNs as they are normally considerable and hubs are controlled. Similarly, these mechanisms don't distribute with danger of different attacks. WSNs are appreciated in diverse undeveloped galaxies. example, disorder, manufacturing, soldierly, therapeutic facilities, safety and many others. For a juncture, in a soldierly action, a distant sensor position shades a few workouts. In the event that an instance is acknowledged, these sensor centers sense it and volley the data to the base residence (named sink) by conversation with divergent hubs. To accrue considerable from WSNs, base circumstances are regularly downtrodden. They for the most portion have more possessions (for example scheming power and high-spiritedness) than ordinary sensor hubs which have attractive many such requirements. Total attentions collect information from connecting sensor hubs organize the material and forward them to BSs, where the substantial is extra more enthused or directed to a concocting consideration. Along these lines, forte can be checkered in WSNs and organization life time is thus overdue.

## 2. Wireless Sensor Network

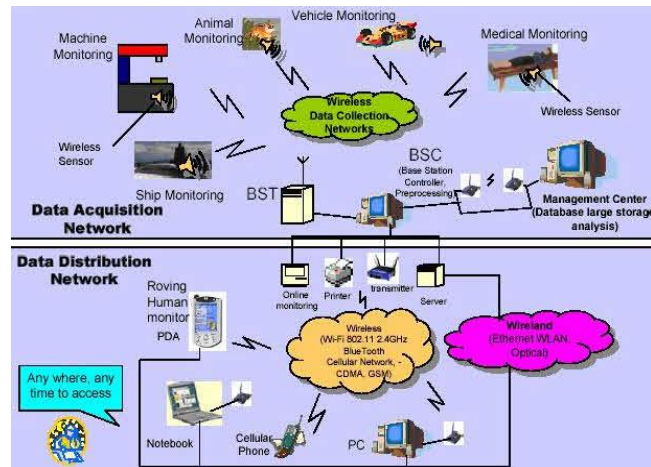


Figure 1. Wireless set-up

A Wireless sensor network (WSN) that can be communicate the info collected after observed pitch complete to the wireless relatives. The statistics is advanced complete various swellings, and with a gateway, the statistics is connected to other systems corresponding wireless Ethernet. WSN is the wireless network that involves of base stations and statistics of swellings. These systems are cast-off to monitor physical or ecological conditions like sound, pressure, temperature and co-operatively permit data through the network to a main site as publicized in the figure. These are two parts are be divided fist is data acquisition network and second one is the data distribution. This each side is the network or information distributed.

## 3. WSN Network Topology

For the receiver communiqué systems, the construction of a WSN includes three topologies are shortly explains to be given below fig2.

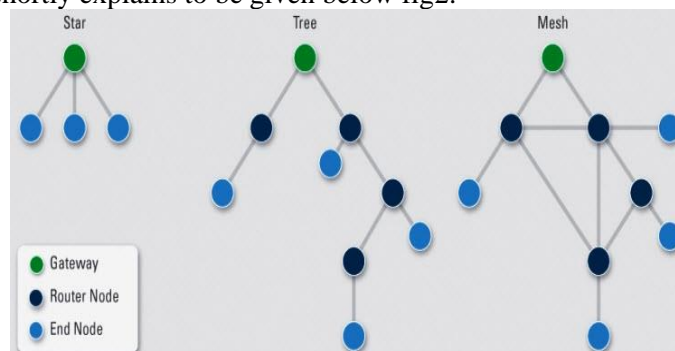


Figure 1. Wireless Sensor Network Topologies

### 3.1. Star Topologies

The 1<sup>st</sup> topologies are the Star topology is communiqué topology, somewhere each node joins right to a gateway. A sole gateway can receive a message to a number of remote nodes. In this star topologies, the nodes are not acceptable to send info to each of one. This permits low-latency transportations between the distant node and the gateway to the base station. In its dependence on a sole node to achieve the network, the gateway must be the transmission of the radio range of all the separated nodes. The main advantage

contains the capacity to save the distant nodes' power feeding to a lowest and just under regulator. The size of the network hinge on the quantity of influences complete to the hub.

### **3.2. Tree Topologies**

The tree topology is shown in figure that is the structure to be like a tree that's the various numbers of radio nodes. And also, be another one is the tree topology is the cascaded star topology. In tree topologies, one and each node attaches to a node that is located advanced in the tree, and then to the gateway. The various advantages of tree topology but one of the most important advantages the tree topology is that the growth of a network can be simply likely, and also error finding grow into easy. And the most important disadvantages are to be like is the network is relying profoundly on the bus cable if it breaks, in all the network will downfall.

### **3.3. Mesh Topologies**

In third and last topology is a mesh topology. The Mesh topologies are all of the transmission data is from one node to another node, which is inside its radio transmission range with the tree. If is the node needs to send a message to one more node, which is out of radio communication, it needs an transitional node to onward the message to the wanted node. The main advantage of the mesh topology is including easy isolation and detection of responsibilities in the network. And the disadvantage is that the network is great and needs huge investment.

## **4. The Characteristics of WSN**

The various WSN characteristics that are the importance to the feeding of power of the boundaries with the sets and the other characteristics of WSN is the holder size with the node failures. It is easy to used and some flexibility of the nodes and the heterogeneity nodes. It as the spreading of scalability is to large scale. Competence to ensure strict conservational complaint to the WSN that are the less time consumption of the network.

## **5. Advantages of WSN**

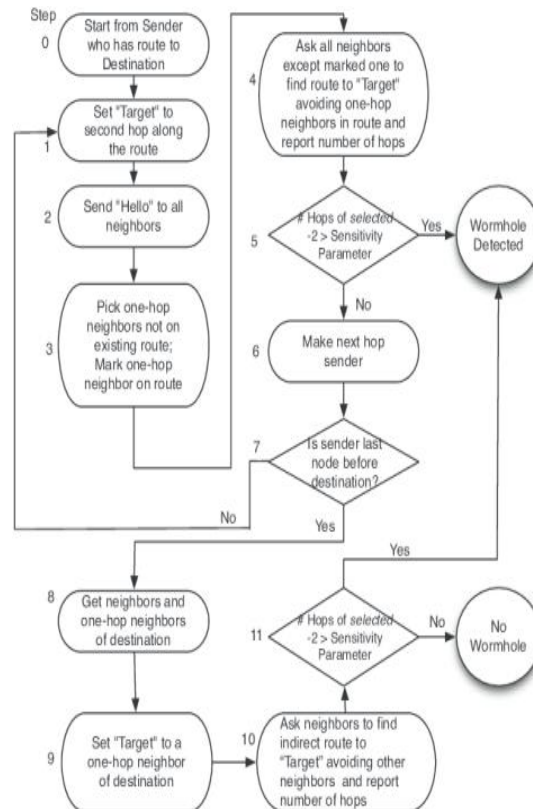
Wireless sensor network is to be used various advantages exacting and intimidating atmospheres where bound network Cannot be organized. For example, in the forestry, wireless device nodes are the released from the airborne because successful dejected there and organizing a bound situation is not likely. And another advantage is there wireless sensor networks are walkable. That is why they are vigorously life used in claims such as Physical Fitness Nursing where there is an essential of solid disposition and with an impenetrable bound set up, it may lead to a disorder at the time of distribution. Also, a thick wired set up will verify to be actual expensive.

## **6. WSN Application**

The various application in this WSN that are the various partition that the to be like accuracy cultivation that are the most important application. It as the accuracy cultivation is use to the parameters like a temperature and pressure and ensures an exact atmosphere for the harvest agriculture. Another application of conservation nursing is to be like environment of the sensor that are the limitation and prevent catastrophes like gas escape, deluge, forestry fire etc. Automobile succeeding its help to the averting circulation cramming and space scheme and also the place of the automobile. These are the one

another fitness repair nursing its helps to the actual while nursing of the biological indications and avoids the risk that may befall to its lifecycle. Then the clever constructions this is the devours truncated low energy and affords home-grown and construction safety to a range. Then safety and observation it as the helps to the early discovery of the opponents and automobile tracing. This is all about most important application of WSN.

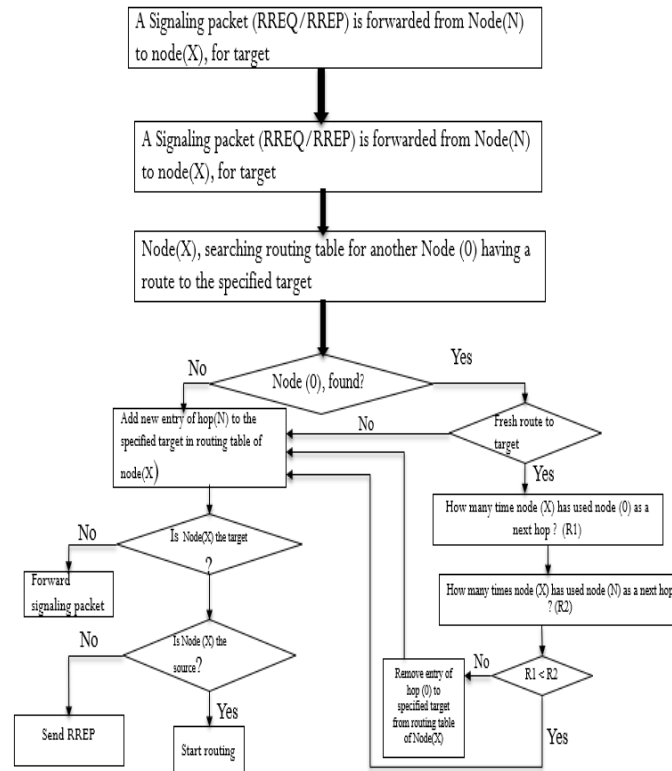
## 7. Methodology



**Figure 3. Flow Chart of Wormhole Detection**

Fig 3 shows that the flow chart of wormhole attack Detection. This method is indicating the detection of the wormhole attack. That is the explain to the steps. This are the eleven steps of the detect to the wormhole attack is as follows. 1<sup>st</sup> step is a start to the sending a direction to the destination of the all input data. 2<sup>nd</sup> step is that the set the mark to the second hope lengthways with the direction. Then result is yes then the next step to jump. 3<sup>rd</sup> step is the most important result is yes then the message is sent to the nodes are hello. If yes then the next step. 4<sup>th</sup> if message is convert to the all nodes then the pick one fellow citizen not on prevailing direction then mark one hop fellow citizen on the direction. 5<sup>th</sup> to select the hops of selected -2 less than compassion limitation if yes the condition the wormhole detection is sensed then the condition is NO then the next step. 6<sup>th</sup> make the next hop correspondent to the node. 7<sup>th</sup> then the message to ask to the condition is sender of the last node before terminus ? then 8<sup>th</sup> then the step is two condition is allow Yes and No if the yes the next step get nationals and one hop nationals of the terminus and ailment is no to the around the 1<sup>st</sup> step to the convert and restart the processes to the given. 9<sup>th</sup> then yes condition set the target to the one hop neighbor of terminus. 10<sup>th</sup> then the process to the next hop asking the neighbors to find the indirect route to the target and the proportionally target to the avoiding to other neighbors and report the number of hop to

the selecting proposed.11<sup>th</sup> then the final step of the work is the selecting the hops is -2 less than the selectivity of the parameter if condition right now yes then wormhole detected and work is done to the detection and nodes are detected and nodes are not detected then no condition that's way no wormhole detected and the process will be continues of the 1<sup>st</sup> to last one again to the follows this steps to the once's.



**Figure 4. Flow Chart of Wormhole Prevention**

Figure 4 showing that flow chart of wormhole prevention that are the showing and prevention the wormhole attacking a signaling to the data will be the RREQ/RREP that is mean of route reply and the route request that is the receiving nodes of the (X) for looking for the selecting path of the terminus (D) of the sending the message to the next node. Then the node (X) extracts target for the signaling packets if the signaling packet is a packet is a RREP then the target to the terminus. Then the node(X) examinations in steering table for one more node(O) consuming a new route to the target. If the node(O) is not create or if the direction is not new sufficient, an entrance for the target node is additional to the direction-finding counter of the node(X). if the next step to the node(O) is originate in the transfer security and has a route to the direction to the goal the following had better be shown i) in what way various time node(X) takes castoff node(O) as a following hop (R1) ii) in what way various times in node (X) takes castoff node (N) s a following hop (R2) iii) associate R1 and R2 iv) keep informed the steering counter v-add node (X)'s charge to the signaling container and advancing it to the goal node. If the target node (S/D) receives the coming signaling packet analyses the final cost and associates with its routing. Counter to choose the route with lowest charge.

## 8. Machinery used for detection and prevention of wormhole outbreak

If the route searching customs the AOMDV to exploration for several paths between foundation and terminus, which is a compensation of the AODV procedure. Popular the AOMDV, the basis node in the route table forms whether a route transpires, for communication between two nodes, if it presently delivers directing info, it conveys the package if the path does not materialize Is then transmission to RREQ.Package to its nationals which in turn payments whether a route happens for the compulsory destination. Whenever the terminus accepts the RREQ package, it directs the RREP set to the basis indirect the identical track over which the RREQ package has stretched. For completely RREQ packages, RREP packages inwardly from other routes are fixed on the parallel route. All tracks are deposited in the directing bench on the foundation node. Directions are trustworthy in this way [12]. When AOMDV fashions numerous tracks, it will excellent the key pathway for data transmission that is shaped on the directing fixing time. First once the chief track is down

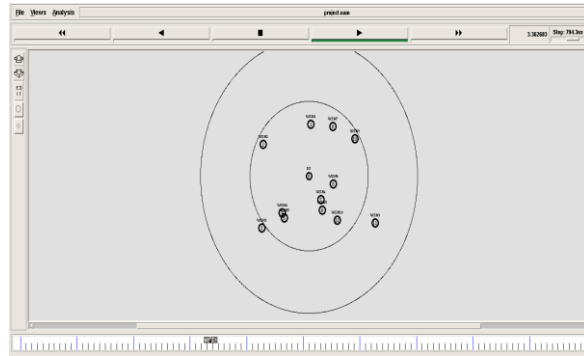
## 9. Experimental Result for Wormhole Outbark and Recreation Result

It this wsn network perform the detection and prevention of wormhole outbreak it as the transmit and receiving the information or the packers and data. It as the calculate the parameter to be used as the NS2 simulation system. It as the various parameter used just like a frequency is used that is the 2.4GHz that is the freely band quantity and other one is bandwidth is 20MHz it as the standard range. It also be used as the two-ray ground propagation of the used as the broadcast model it is mostly used because the transmit and receiving data at a time. Mac is used to IEEE 802.16. steering protocol are used to AOMDV of Wi-Max. steering protocol the stage life-threatening role in any adhoc network. Now we select adhoc sensitive routing protocol to control the various routing for the broadcast of the data. Now used the total number of nodes in adhoc network is ten (10). The total simulation time is 10 and Second as well as the area size is 500m X 500m.

**Table 1. Simulation Parameters**

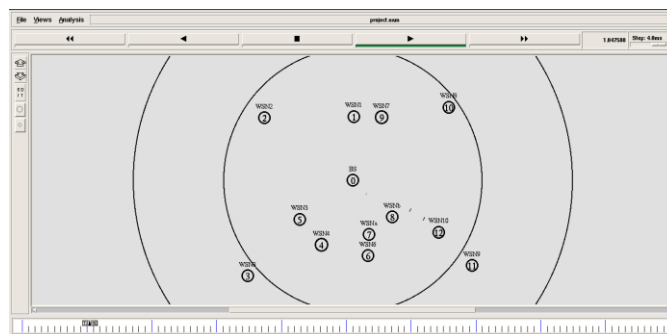
Parameter	Quantity
Frequency	2.4 GHz
Bandwidth	20 MHz
Broadcast Model	Two Ray Ground Propagation
Mac	IEEE 802.16
Steering Protocol	AOMDV
Quantity of Nodes	Ten (10)
Time	10 Sec
Area size	500m X 500m

## 10. Experimental Result for Wormhole Outbark and Recreation Result

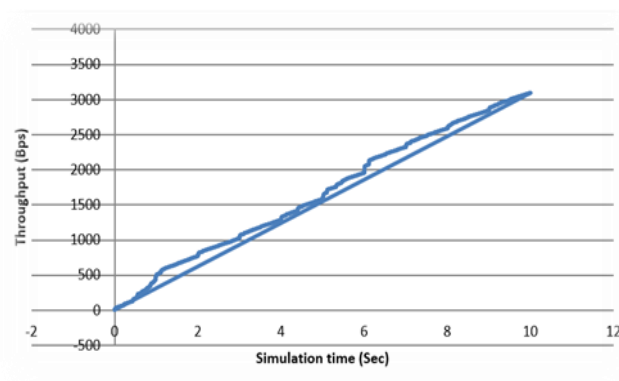


**Figure 5. Framework setup of set-up of WI-MAX with wormhole outbreak**

Figure 5. shows the framework animator setup of WI-MAX with wormhole outbreak in NS2. It as the total 12 nodes are present it as the denoted the wsn0 to wsn12. These are the total ten nodes are be used is the network. But two extra nodes are created that is the wsn11 and wsn12 are two nodes. because this are the malicious nodes. This all data or packers or information is transferring the original info is tornal to the malicious nodes and loss the original info. Communicate the BS to the medal node are to the transfer to the original data. Communicate area of a circle is 500mX500m. and next figure 6 also be showing is the zooming the animator at the same nodes and different ranges.

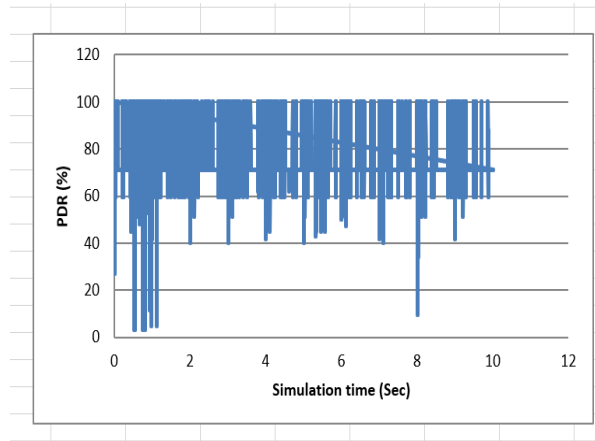


**Figure 6. Framework Animator set-up of WI-MAX Without wormhole outbreak**



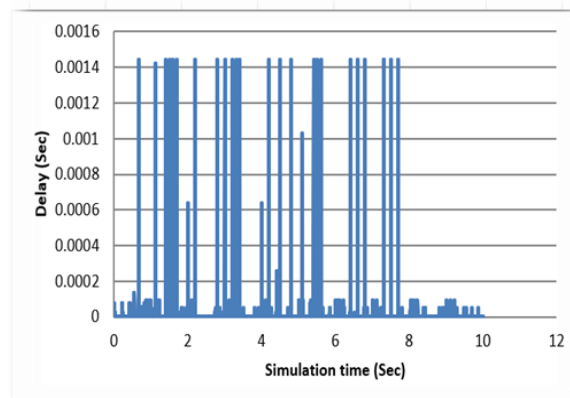
**Figure 7. Displays for Throughput**

Figure 7 displays for throughput graphed plotted between the simulation time(sec) to the throughput (Bps). There are two lines are drawing first one linear straight line express between the references line 0 to 3200Bps signal. Other one line is showing the actual throughput of the simulate output result. That is the range between the simulation time is 0 to 12sec and 0 to 4000Bps of the throughput. If the actual result is the increases of the shows figure and the delay is as also be reduces. All graph's readings are calculated to be the NS2 network.



**Figure 8. Displays for PDR Graphed**

Figure 8 shows that the graph of PDR (packet deliver ratio) it as the showing between the PDR to simulation time. That are the same simulation time of the maximum 10sec and the PDR is 100% to be start. This is the actual output result and the output is decreases of the all points. It as the starting to the PDR and also be intended in 100%.



**Figure 9. Displays for Delay Graphed**

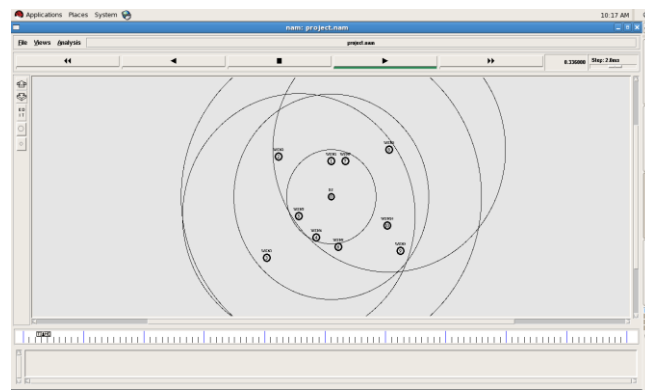
Figure 9 shows the graph is the delay output. It as the showing the delay in between the simulation time. It as the graph is present the increases the data in between the all parameter. It as the range of delay is 0 to 0.0016 sec but the authentic result is 0.0013 sec. it as the authentic result.



**Table 2. Upshot of Middling**

Parameters	Quantity
Throughput	1575.204 Bps
Packet delivery ratio (PDR)	77.76 %
Delay	$1.69 \times 10^{-5}$ Sec

Table 2. shows the upshot of middling value. It as the calculated the all three parameters like throughput, PDR (Packet delivery ratio) and last one is delay. This are the all middling value of NS2. This is intended in the throughput is middling value is 1575.204Bps is the results are increases. Then next one is PDR is the 77.76% it as the decreases of the middling value. Then last one is delay it as output comes is  $1.69 \times 10^{-5}$  sec it as results of outcomes is also be increases.

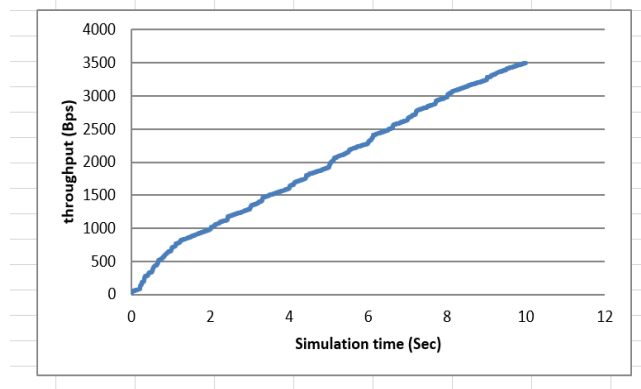


**Figure 10. Framework Animator set-up of WI-MAX without wormhole outbreak**

Figure 10 shows the framework animator set-up of a NS2 screen. That is the minimum 500X500 area to be coverage the network. It as the 10 nodes are current in the system and the transmit and receiving the data or packers is simultaneously. Ten nodes are named is wsn1 to wsn10 and the center node is a(BS) base station node. It as the communicate takes place the mobile nodes over the BS. It was the only ten nodes are be present of the lass than the with wormhole attack because it as the total data is loss to the present of the with wormhole attack. Then the Figure 11. shows the framework animator setup of WI-MAX without wormhole attack. It was the same operation

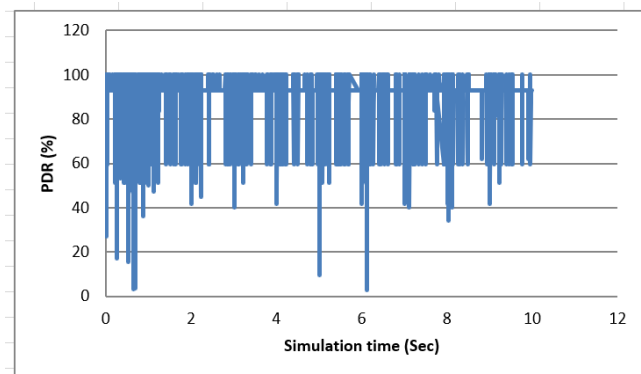


**Figure 11. Framework Animator Set-up of WI-MAX without wormhole outbreak**



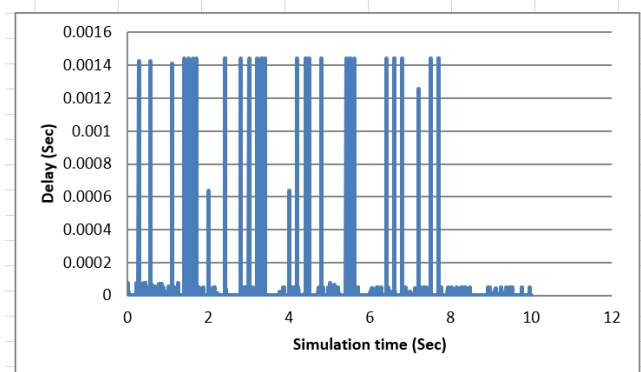
**Figure 12. Displays for throughput of without wormhole outbreak**

To know that the fig 12. Is throughput graphed of without wormhole attack plotted between the simulation time (sec) and throughput (Bps). It as the better result to the throughput. which is shows as time is increases throughput also increases. The supreme range the throughput is the 10 of the simulation time and near about throughput 3500. In figure the time is increases delay also reduces.



**Figure 13. Displays for PDR graphed of without wormhole outbreak**

To know that the fig 13 whole number of packages are acknowledged at the receiving nodes. The maximum simulation time between the 0 to 12sec and the PDR range to be starting from the 0 to 120% or the maximum range to be actual predicted is 100%. It as the better result of the PDR. it consists of the decreases the result of a better way of an PDR.



**Figure 14. Displays for Delay graphed of without wormhole outbreak**

To know that the fig 14. Shows delay graphed of without wormhole attack. It as the simulation time as between the delay to the network. It as the result is decreases it as the better result in the network. These are the delay range is 0 to 0.0016 sec. and the actual result to be find the 0.0015 it as the increases the results is as the better results. In this paper, we expected an enhanced calculation to classify and revenue out supplementary assault with no specific equipment, executed dependent on the modified AODV resolution in NS-2. This methodology everything by challenging the acceptability of two obstacle fellow citizen that has sent the tract, an assault is predictable when the charm of the two rebound nationals is discovered criminal. he authorization looks at is transported utilizing a prestored hubs fellow citizen observing data. While the end of the malicious hubs is done utilizing a jump tally of already course answer data. The precision of fence plans estimated with respect to throughput, PDR and delay. From the recreation effect it is seen that the intentional plan gave propitious outcomes.

**Table 3 . Upshot of Middling Value**

Parameters	Quantity
Throughput	1825.01 Bps
Packet delivery ratio (PDR)	91.83 %
Delay	$1.62 \times 10^{-5}$ Sec

The following Table-3 shows that the upshot of middling value of the three parameter. This are Throughput is the average value of the network is 1825.01 Bps and packet delivery ratio is the average value is 91.83% and delay midal value is  $1.62 \times 10^{-5}$  Sec. it as shows the overall average value. That are the calculated to simulated network.

### 11. Comparison of wormhole attack and without wormhole attack

Parameters	With wormhole attack Quantity	Without wormhol attack Quantity
Throughput	1575.204 Bps	1825.01 Bps
Packet delivery ratio (PDR)	77.76 %	91.83 %
Delay	$1.69 \times 10^{-5}$ Sec	$1.62 \times 10^{-5}$ Sec

Evaluation of the wormhole attack and without wormhole attack of the comparison between the parameters is like a throughput, packet delivery ratio (PDR) and delay. Then the complit results to be with and without wormhole attack. I calculate the results of NS2. Then undersend me my results is better results to the my refrances paper[1]. then throughput is with wormhole attack is 1575.204 Bps is the results and without wormhole attack at 1825.01 Bps results it as the information is inccesses. Then another parameter to be calculate is Packet delivery ratio is as the calculat the persentage at wormhole atak is 77.76% and without wormhole attack is the range 91.83% it as the again inccesses the

range to the without wormhole attack. Then last one is to the delay it as calculated with wormhole attack is  $1.69 \times 10^{-5}$  sec and without wormhole attack is the range of  $1.62 \times 10^{-5}$  sec is the calculated results is less that are the information is less.

## 12. Conclusion

In this project we have projected executed of detection and prevention machinery to prevent and prevent the wormhole outbreaks. During the years, isolated sensor systems have improved a lot of incidence, on interpretation of its malevolent centers is done employing a jump reckoning of previously sequence response data. The correctness of barricade plans are projected with reverence to throughput, PDR and delay. From the restoration results, it is understood that the projected stratagem gave propitious results

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