Energy Efficient Routing Protocol for Improving Lifetime in 5G Networks

Santosh M Nejakar, Prabhu G Benakop,

Abstarct:: 5G Wireless technologies is one amongst the quick developing technologies within the fashionable state of affairs and it has ample scope of applications. It has tiny sensors with less communicative and computational power. Subject to the operating cost of the node, energy consumption varies. This leads to degrade the performance in the whole network. Therefore, a replacement economical energy management technique in reactive routing protocol has been designed that discover the shortest path in between any supply to destination wear demand and swapping of nodes will used for locating lowlevel energy node. within the restoration methodology, the node in its shut house will establish the lowlevel energy node house and it'l update to sink node, this in turn sends shut node that has smart energy to regain the node. it'll replace the node and eventually the info transmission goes to be happening with none loss of packets to bring out the credibleness within the network.

Keyiwords: Energy management, Wireless Network, Route Request (RREQ), Route Reply (RREP), Route Error (RERR), 5G- Fifth Generation.

I. INTRODUCTION

Mobile networks are also a collection of wireless nodes, dynamically forming a shortest network. the thought of this structura vogue is to supply communication services between sources to destination with nonelcentralized infrastructure[6]. Energymanagement in wireless networks offers vital role thanks to the restricted energy convenience among the wireless nodes. one among the biggest lies onthe complexity of provision involving selective replacement of nodes that have ran out of energy[5].Dueto random activity strategy, positive areas of the observation region may need low energy and significant coverage overlapping; this degrades the network performance.

It leads to the random loss of the nodes and in addition nodes may die thanks to exhaustion of battery power, this cause the network failure[10]. Hence, mechanisms need to be compelled to be developed to use the offered energy in an economical method[8].

II. ROUTING WIRELESS NETWORK

Several protocols exist to rout the packets in wireless network. Out of that, Ad_hoc_On Demand-Distance_Vector (AODV) is taken into account as ancient protocol, that can be a reactive routing protocol which can construct the route only if the knowledge transmission is required [7]. This protocol frames routes between nodes solely as most popular by transmitter nodes.

It discovers routes quickly for brand spanking new receiver, and doesn't want nodes to stay up routes to non-active receivers. This protocol builds routes employing a Route-Request-(RREQ)/Route-Reply (RREP) question sequence [8]. Once one node desires to find a route to a different one it sends a RREQ to the entire network till the destination node is reached. A RREP is replied to the supply and therefore the new found route is formed available [9]. Moreover, Ad-hoc-On-Demand Reactive Routing (AODV) uses series of numbers to create certain the originality of routes. Once a node detects the invalid route, it sends a Route-Error (RERR)-message to neighbors that area unit active and use the route. Finally as a result, AODV protocol builds routes between nodes relating to the shortest path parameter. Associate degree illustration of AODV is shown below in Fig1.

III. EXISTING SYSTEM

To expanding the existence time of wireless nodes are troublesome since nodes over the time rehearses differential power utilization. Precedent, nodes contiguous the sink in a directing way transmits higher number of packets and thus expends more power quickly than nodes far from the sink[2].

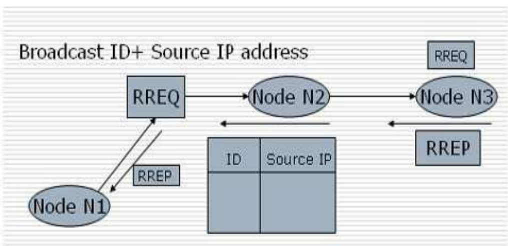

Fig 1: An Illustration of AODV Protocol

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Santosh M Nejakar Assistant Professor Dept of ECE, DBIT, Bengaluru.
Dr. Prabhu G Benakop Principal INDURiet,Siddipet, Telangan

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The mobile node swapping a brand new methodology for victimization ,low-priced mobile detector nodes has been projected to upset differential power consumption and extend amount of your time of wireless nodes[11]. The drawbacks of gift system is that it focuses on node rotation solely, throughout the presence of less energy node, in network failure cases and restoration of cut links while not considering the requirement for information transmission that ends up in spare energy depletion[4].

III. PROPOSED SYSTEM

In this area we will in general propose new changed Swap-Level algorithmic principle which needs less calculation from the controller and also less synchronization among nodes as nodes move severally of various nodes. Our principle goal is to swap the nodes which have low dimension vitality by abnormal state vitality node with the separation and area data [1], and furthermore considering the matter of system hinder on though swapping in order to possess the uniform dispersion of the vitality inside the entire system that accomplishes higher obligation.

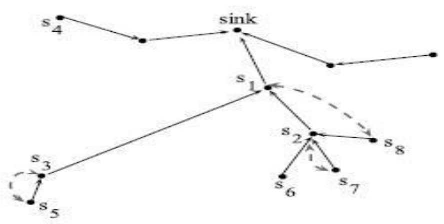

Fig.2: The Node swapping scheme

This overcomes the matter of network interruption where as swapping is finished. Fig.2 depicts the node swapping scheme of expected methodology[3]. We propose a substitution approach that we keep an eye on choice versatile hub swapping that is awed by the crouching and turn conduct of ruler penguins. In this portable hub swapping our point is to swap the physical places of versatile hubs to share the weight of any powerful utilization area. In Fig.2, the hubs at bottleneck areas s1, s2 and s3 can turn with hubs at areas s8, s7 and s5, separately after a timeframe to adjust the vitality utilization between high utilization areas and low utilization areas. We illustrate the most plans behind hub swapping exploitation the system appeared in Fig 2. The 3 hubs at first areas s1, s2, and s3 expend high vitality than the hubs at various areas, the hubs at s1 and s2 devour various vitality because of they need various relatives whose information ought to be transmitted towards the sink and thusly the hub at s3 expends various vitality because of it's off from its parent hub at s1. Utilizing hub swapping, different hubs swap through high vitality utilization areas. For instance, hub at s1 swap with hub at s8, hub at s2 swap with hub at s7, and hub at s3 swap with hub at s5. Therefore, the quantity of vitality required at a high utilization area is shared by 2 hubs instead of just 1 and furthermore the life expectancy of the system is extensively extended.

V.EXPERIMENTAL BLOCK DIAGRAM

As appeared in Fig 3, remote nodes are conveyed, framing a remote system that gather information from their neighborhood and transmit the information through one or numerous jumps to the sink shaping a coordinated directing tree. We separate time into intervals. In each interval,we accept each wireless hub gathers a fixed measure of information and that every node transmits the information it gathered as well as the information it got from its surroundings to the sink node. Versatile node pivot is performed for using low cost portable sensor nodes to address differential control utilization and broadening remote nodes lifetime.

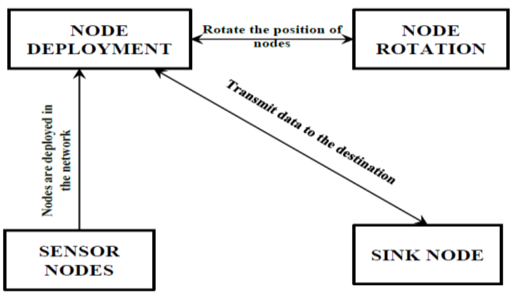

Fig 3. Data transmission using mobile node rotation

VI. IMPLEMENTATION

We have deployed a wireless network consisting of 20 nodes with 4 source nodes and 4 destination nodes. 1000 J of energy is applied to each of the nodes.We have considered the following 2 cases:

CASE 1: Nodes Having Energy but No Swapping Performed.

CASE 2: Nodes Having Energy and Swapping Performed.

The effect of each of the following parameters on both the cases has been considered:

- Packets transmitted: Bytes of data sent from source node.
- Packets received: Bytes of data received at the sink node.
- Packet Delivery Factor (PDF): The ratio of the data packets delivered to the destinations to those generated by the CBR sources.
- Throughput: It is the packet delivery percentage obtained from a ratio of the number of data packets sent and the number of data packets received.
- Network residual energy: The amount energy remaining in each of the nodes of the network at the end of simulation.

We have obtained better simulation results; it is shown and proven that the above mentioned factors have shown increase in value thereby enhancing the performance of the network.

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VII. OBSERVATION AND RESULTS

A wireless sensor network of 20 nodes has been created using NSG-2 software. Simulations are performed on the network for 2 different cases:

- Energy of 1000J is applied to each of the nodes of the network.
- Energy of 1000J is applied to each node and node swapping performed.

Number of packets sent, received, Packet Delivery factor and throughput is calculated for each of the cases and the results are analyzed and compared. As energy consumption by the nodes is reduced by using **node rotation** method, it results in increased throughput and packet delivery factor, thereby improving network lifetime.

A. Case 1

With Energy without Swapping:

Fig 4. shows the simulation obtained by NAM using AODV protocol at 0.028 seconds. Packets are transmitted from CBR Source nodes to destination nodes.N3, N18 are the source nodes. N0, N11 are the destination nodes. Green color of the nodes indicates that they have greater amount of energy.

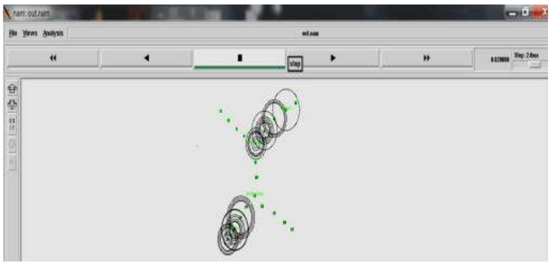

Fig 4: Simulation obtained by NAM using AODV Protocol (With energy without swapping)

Fig 5. shows the simulation obtained by NAM using AODV protocol at 0.82 seconds. Packets are transmitted from CBR Source nodes to destination nodes.N3,N18 are the source nodes. N0, N11 are the destination nodes. Green color of the nodes indicate that they have greater amount of energy, yellow color indicate the nodes whose energy is about to drain.

Fig 5: Simulation obtained by NAM using AODV Protocol (With energy without swapping)

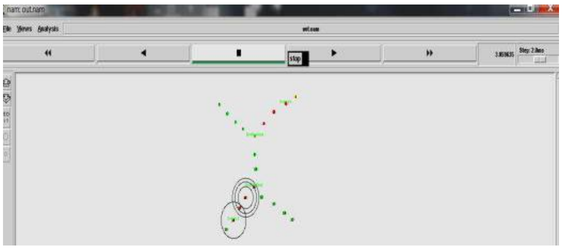

Fig 6: Simulation obtained by NAM using AODV Protocol (With energy without swapping)

Fig 6. shows the simulation obtained by NAM using AODV protocol at 3.05 seconds. Packets are transmitted from CBR Source nodes to destination nodes.N3,N18 are the source nodes. N0, N11 are the destination nodes. Green color of the nodes indicates that they have greater amount of energy, yellow color of the nodes indicates that their energy is about to drain, red color of the nodes indicate zero energy

Computed Results:

Table.I(a): Simulation Results – With energy without swapping

Simulation Time	Sent	Received	Loss	PDF	Throughput	Packet Size
0-50	33	22	11	0.666667	903.4667	1540
Source	**Destination**		**Route Path**			**Time**
N3	N0		N3-N2-N1-N0			37.5 Sec

Table.I(b): Simulation Results – With energy without swapping

Simulation Time	Sent	Received	Loss	PDF	Throughput	Packet Size
0-50	36	17	19	0.4722	698.13	1540
Source	Destination		Route Path			Time
N18	N17		N18-N17-N16-N11			37.5 Sec

Results obtained at the end of simulation for Case 1 has been tabulated in Table.I(a) and Table.I(b).

B. Case 2:

With Energy with Swapping:

Fig 7. shows the simulation obtained by NAM using AODV protocol at 0.22 seconds. Packets are transmitted from CBR Source nodes to destination nodes.N3, N18 are the source nodes. N0, N11 are the destination nodes. Green color of the nodes indicates that they have greater amount of energy.

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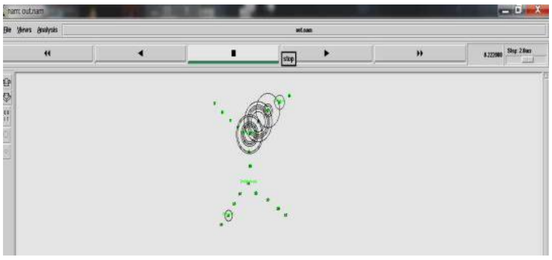

Fig 7: Simulation obtained by NAM using AODV Protocol (With energy with swapping

Fig 8. shows the simulation obtained by NAM using AODV protocol at 1.01 seconds. Packets are transmitted from CBR Source nodes to destination nodes.N3, N18 are the source nodes. N0, N11 are the destination nodes. Green color of the nodes indicate that they have greater amount of energy, yellow color of the nodes indicate that their energy is about to drain. Nodes with minimal and maximum energy are swapped. Swapping of node 12 and node 16 can be observed.

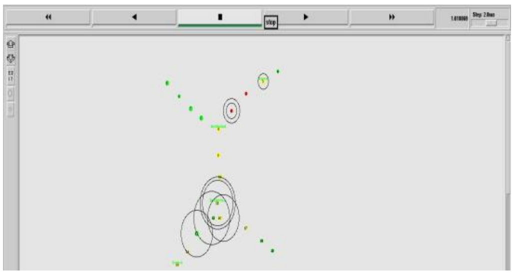

Fig 8: Simulation obtained by NAM using AODV Protocol (With energy with swapping)

Fig 9. shows the simulation obtained by NAM using AODV protocol at 1.82 seconds. Packets are transmitted from CBR Source nodes to destination nodes.N3, N18 are the source nodes. N0, N11 are the destination nodes. Green color of the nodes indicates that they have greater amount of energy, yellow color of the nodes indicates that their energy is about to drain, red color of the nodes indicate zero energy.

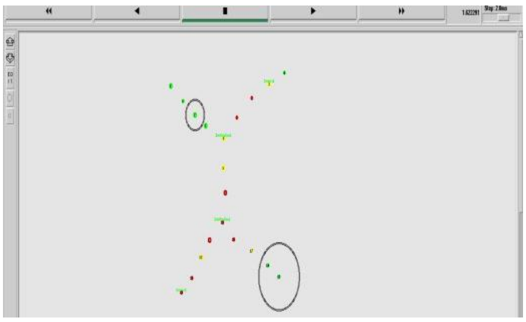

Fig 9: Simulation obtained by NAM using AODV Protocol (With energy with swapping)

Computed Results:

Table.II(a): Simulation Results -With energy with swapping.

Simulation Time	Sent	Received	Loss	PDF	Throughput	Packet Size
0-50	25	24	7	0.96	985.6	1540
Source	Destination		Route Path			Time
N3	N0		N3-N2-N1-N0			37.5 Sec

Table.II(b) Simulation Results – With energy with swapping

Simulation Time	Sent	Received	Loss	PDF	Throughput	Packet Size
0-50	27	20	7	0.740	821.33	1540
Source	Destination		Route Path			Time
N18	N17		N18-N17-N16-N11			37.5 Sec

PDF=(Number of packets received/Number of packets sent)*100 Throughput=(Number of packets received/Simulation time)*(Packet size) From the above tabulations, we observe that packet deliver factor (PDF), and throughput has been increased by the method of node swapping. The alteration of physical movement of nodes helps to share the burden of high-power energy consumption locations. As a result, rate of packet transmission increases due to which the lifetime of the network is enhanced.

C. Graphical Results:

Fig 10. shows the plot of Time versus packet delivery factor (PDF). N3 is the source node and N0 is the destination node. From the graph, we observe that PDF has reached 100% between 1.5s and 2s and has almost remained constant when the nodes are being swapped. Whereas, without swapping the results obtained is comparatively low.

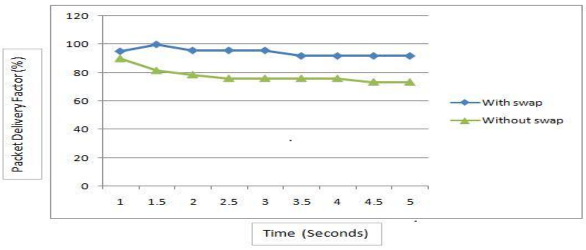

Fig 10: Plot of PDF v/s Time (Source -N3, Destination -N0)

Fig 11. shows the plot of Time versus Packet Deliver Factor (PDF). N18 is the source node and N11 is the destination node. From the graph, we observe that the value of PDF is high when swapping is performed and has almost remained constant. Whereas without swapping the value of PDF is low and drastically varying with time.

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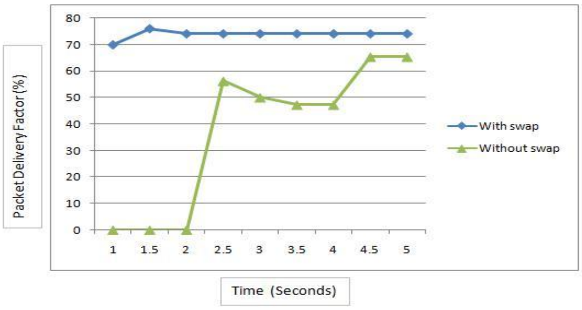

Fig 11: Plot of PDF v/s Time
(Source -N18, Destination -N11)

Fig 12. shows the plot of Time versus Throughput. N3 is the source node and N0 is the destination node. From the graph, we observe that the throughput obtained is high when node rotation is performed as compared to when no swapping is performed.

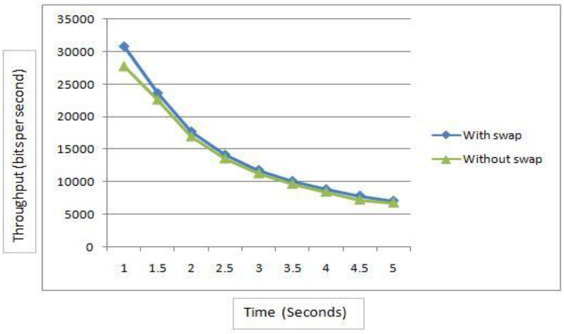

Fig 12: Plot of Throughput v/s Time
(Source -N3, Destination -N0)

Fig 13. shows the plot of Time versus Throughput. N18 is the source node and N11 is the destination node. From the graph, we observe that the throughput obtained is high when rotation is performed as compared to when no swapping is performed.

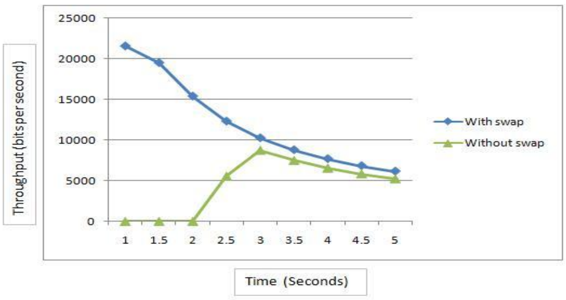

Fig 13: Plot of Throughput v/s Time
(Source -N18, Destination - N11)

VIII. CONCLUSION

In this paper we've an inclination to focused new node swapping mode for increasing the time period of mobile nodes. Our approach exploits the standard of nodes to mitigate differential power consumption by having nodes act in high power consumption positions whereas not modifying the prevailing topology. Here node swapping approach is incredibly totally different than different schemes like knowledge mules in this all nodes consumes comparatively very little energy on movement and move solely some times throughout the network time period. Our simulations show that our node swapping approach will improve network time period by reducing energy consumption by the nodes.

Cases with energy without swap and with energy with swap are analyzed. Number of packets sent, received, Packet Delivery Factor and throughput are calculated for each of the cases and the results are compared. As energy consumption by the nodes is reduced by using node swapping method, it results in increased Throughput and Packet Delivery Factor.

From the simulation results obtained, we observe that packet transmission ceases within a short duration when node swapping is not performed. Whereas, performing node swapping enhances the rate of packet transmission by allowing the nodes to share the burden of high-power utilization location, thereby improving network lifetime.

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AUTHORS PROFILE

Mr. Santosh M Nejakar received his B.E. Electronics & Communication Engineering from SIET, Tumkur on 2008 and M.Tech. Digital Electronics & Communication Systems in 2013 from JNNCE, Shivamogga. He is pursuing Doctoral degree in VTU, Belagavi . Presently he is working as Assistant Professor Dept of ECE, DBIT, Bengaluru. He has 9 years of diverse experience in teaching, Member of TIE. His Research interests in Wireless Mobile Networks, Artificial Intelligence, Embedded Systems, and 5G Networks.

Dr. Prabhu G Benakop received his B.E. Electrical and Electronics Engineering from K L E 'S Engg & Technology, Belgaum, Karnataka University, Dharwad on 1987 and M.E. in 1994 from ECE Dept, P.D.A College of Engg, Gulbarga, Gulbarga University, Gulbarga and Ph.D. in 2005 from Karnataka University, Dharwad. Karnataka. Presently he is working as Principal INDURiet,Siddipet, Telangan . He has 30 years of diverse experience in teaching, Life member of ISTE, and Senior IEEE Member. His Research interests in Artificial Intelligence, Wireless Communication, Control Systems and VLSI.

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