# Power Management Strategies in MANETs

**Lubna Naaz Fatima, Syeda Hajra Mahin, FahminaTaranum, Khaleel Ur Rahman Khan**

***Abstract:**Nodes in MANETs transit from one mode to another in order to communicateamong themselves. Different types of modes are transmit, receive, sleep and idle. Maintaining dynamic topology and states lead to consequences such as consumption of more battery power thereby diminishes the network lifetime. Therefore, it is essential to optimize the power consumption for improving the performance of the network. Many routing protocols have been proposed for efficient routing of the data. Different routing protocols can be collaborated with multiple energy models such as GENERIC, MICAZ, MICA-MOTES, and USER-DEFINED types in QualNet order to analyse the power consumption mechanism. These protocols are implemented and evaluated to foregather the most reliable and efficient protocol. Analyses are done with the main emphasis to achieve energy efficiency. Performance evaluation is done based on metrics such as energy consumption, network lifetime, time to live, the amount of current utilized, cost of the battery, drain count, etc.*

***Keywords:**Energy Models; Energy Efficiency; MANET's; Network lifespan; QualNet.*

## I. INTRODUCTION

Nodes in Manet's are deployed dynamically, quickly and inexpensively using radio equipments and antennas at the physical layer. The flexibility of deploying a node is to ensure the easy and straight-forward way of expanding a network to larger scale. An ad hoc network consists of independent devices that interact with each other and send data either directly or via other nodes to the destination node. A MANET consists of mobile devices that move effortlessly in any direction while communicating with one another. Each node must act as a router and should forward the data packets besides its own use. Hence, it is a peer-to-peer and self-forming decentralized network. Unlike centralized network which consists of a single base station, there is a chance of single point of failure due to which the whole network collapses. Whereas in the decentralized network the idea of the centralized system is dropped i.e. data routing takes place using multi-hop fashion that takes multiple paths. Therefore, even if one node stops functioning the other nodes continue to work resulting in a reliable network. This gives the lead to the decentralized network. Apart from advantages, there are also some issues that need to be addressed viz. Topology, mobility, battery, speed of the wireless link, dis-connectivity, caching, handovers, hidden and exposed nodes identification.

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Wireless scenarios are designed effortlessly using IEEE standards with basic knowledge of the technology.

Typically wireless network consists of,

- Access Point :-It acts as central hub offering abundance services to users, connected to other access point to cover a wider geographical area.
- Wireless radios :- Radio waves or electromagnetic waves are used intransmission to enable signal transmission from uplink to downlink and vice versa, a radio transmitter supplies an electric current oscillating at radio to the antenna's terminals, and the antenna radiates the energy.

Different simulation tools can be considered to scrutinize MANET's such as NS2, NS3, OPNET, OMNeT++, NetSim, REAL, Glomosim, Manasim and QualNet. QualNet reveals other certain factors such as the location of nodes, the behavior of nodes and connectivity to reflect realistic conditions for large heterogeneous networks.

Power management plays an essential role to prolong the life of the network. There are numerous methods used to minimize the power usage by the nodes in the network that deals with different layers. Many approaches are used to reduce the battery consumption, the widely used one is to shift the state of the device to power saving mode. Most of the mobile devices are driven by batteries and sotheyposses restricted energy. Power consumption becomes prime focus when considering wireless network especially when the cellular networks are evolving. High Power utilization in mobile network can be due to numerous reasons such as CPU, memory, device display, dynamic nature and so on, making it the most exigent issue that needs to be addressed.The lifetime of the node is also depended on the duty cycle (d) and the transmission energy (Etx).The duty cycle is inversely proportional to the lifetime of the battery.Lifetime in seconds may be calculated using available battery at an instant of time divided by transmit energy multiplied by distance.

Modeling of the physical Layer is required in simulation to incorporate characteristics of the transmitter and the receiver in an active and passive modes by catering aspects of a wireless system such as modulation, coding, noise, interference and antenna gains. In QualNet, a Physical Layer model consists of two parts: a PHY component and an antenna component. The PHY component models signal transmission, reception and reflection using the effects of the MAC scheme, node status, physical parameters, distortions from the channel, and interference from neighbor nodes caused during transmission. The antenna component models the functions and properties of the antenna to capture more signals during transmit mode.

Energy consumed in transmission mode

$P_{Transmission}$= Currentrequired to transmit signals * Voltage *Time (1)

Energy consumed in receiving mode

$P_{receiving}$= Current required to receive signals *Voltage *Time (2)

Energy consumed in idle mode

$P_{idle}$ = Current required in Idle mode * Voltage * Time (3)

Energy consumed in Sleep mode

$P_{sleep}$ = Current required in Sleep mode *Voltage * Time (4)

The units of power is mW, voltage is volts, time, current, battery life is mAh, charge is mAs.The total energy utilized is equal to aggregation of energies in all modes.

### *1.1 Protocols*

In MANET's routing protocols can be categorized [2] [14] as shown in Figure 1 and Figure 2.

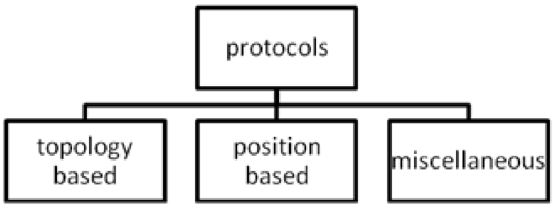


**Fig. 1: Classification of routing protocols**

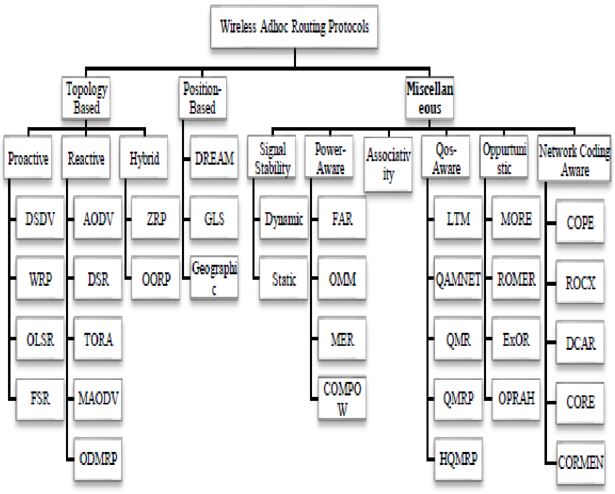


**Fig. 2: Detailed classification of routing protocols**

#### *1.1.1 Topology-based routing protocol:*

The topology-based routing protocol can be further classified as

a) *Table-driven protocols*: Each node exclusively in the network possesses oneor more table providing information about other participating nodes, which routes to the destination

b) *Reactive/On Demand/Lazy protocols*: Depending on the need for the databy the destination, the path or route is created by the initiator node that route towards the destined node.

c) *Hybrid protocols*: Hybrid routing protocol adoptsthe properties of bothtable driven and on-demand protocols.

#### *1.1.2 Position based routing protocol:*

It mainly focuses on data collected on physical location. The location of the node is detected either by employing GPS or by using various positioning strategies. Location services are used by the sender to locate the destination node. Three main packet forwarding schemes mainly used are [14],

- Greedy forwarding
- Restricted directional flooding
- Hierarchical approaches

*Geographic based routing protocol:* It is aroutingprotocol that dependsoninformation of geographic position. It is also known as Geo Routing [14], where all the nodes determine their location using the geographic location and forward the messages to the destination node [18].

#### *1.1.3 Miscellaneous routing protocols:*

Some of them are,

a) *Signal Stability Routing Protocol:* Its main emphasis is on selecting theroutes based on signal strength between nodes also considering the node's location stability [14].

b) *Power-Aware Routing Protocol*: These protocols concentrates on makingsmart, power-aware routing decisions that direct the actual transmission of data.

c) *Associatively Based Routing Protocol:* In this protocol, the path is selecteddepending on the degree of associative stability [14].

d) *Opportunistic routing*: In Opportunistic routing when a node enters thetransmission phase, the neighbours around it are capable of hearing it.When a neighbour receives a packet from the sender node, it further forwards the packet to its neighbour nodes in the direction of the destination node, so that, some specified conditions are satisfied [17].

e) *QOS based routing protocol:* Route is discovered by consideringcircumstances such as constrained bandwidth, limited minimal search, distance and traffic conditions [14].

f) *NC-aware routing*: The nodes that consider the NC-aware routing is knownas coding points in the network, that aid in path selection for transmission of the packets in the network[1].

## II. POWER MANAGEMENT TECHNIQUES

There are numerous ways to conserve power and increase the efficiency as well as the lifespan of the network

### *2.1 Energy model*

Using the energy models provided by the QualNet simulator, analysis can be done on various routing protocols under radio/physical layer resulting in efficient power management mechanisms. With the help of energy model parameters i.e. electrical current load consumed/power supply voltage [14] and depending on modes/states such as transmit, receive, idle and sleep, energy consumption can be calculated. Different types of energy models provided by QualNet are,


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1. GENERIC: Power usage of radio is computed by this radio generic energy model in different power modes and for variable transmission power.
2. MICAZ: Power usage of MicaZ motes is given by the radio specific energy model and this model is preconfigured.
3. MICA-MOTES: Power consumption of Mica motes is given by the radio specific energy model and this model is also preconfigured.
4. USER-DEFINED: User can specify the amount of energy that is availablefor consumption in the network.

These energy models need to be configured using certain parameters prior to their implementation [14], which helps to get to know the amount of power consumed and the need to control the power consumption. Hence, providing an efficient way to consume power.

*2.2 MAC Layer*

Using the Mac layer, energy consumption at station node is reduced with the help of power saving mode which is mainly supported by three procedures [14][14].

- Wake-up Procedure
- Sleep Procedure
- Power-save Poll (PS-Poll) Procedure

On combining them power management can be achieved for various purposes.

*Wake-up Procedure*: An STA basically wakes up due to two chief reasons 1) toforward pending data or 2) to get buffered data from an access point (AP). When an STA transition its status from sleep mode to an active mode, it reports an AP by sending an uplink frame to it with the power-save (PS) bit set to active.

*Sleep Procedure*: Alike to wake-up procedure, the transition to the sleep mode isdone by setting PS bit active

*PS-Poll Procedure*: An AP can perform two actions, either forwarding of buffereddownlink frame with a result taking the form of an immediate data response or forwarding an acknowledgment message with a response consisting of the buffered data frame. With an emphasis on immediate data response case, sending a buffered downlink frame can be only a response to the PS-poll from the STA, while the STA can remain in the sleep state.

A Mac protocol frequently makes use of omni-directional antenna model which aids in dispatching and accepting radio signals via any direction. When considering directional antennas, MAC protocols needs all other nodes in the surrounding area to continue being silent. This makes it likely to attain maximum gain values and confines the transmission to an exact direction.

The below listed are few of the guidelines for minimizing the power utilization.

- The foremost reason of frequent retransmissions that needs to be averted is Collision.
- Since there is more power utilization by transceivers in active mode, the transition to the stand-by mode becomes a necessity whenever possible.
- The transmitter also has the facility to shift to power saving mode that provides enough battery capacity for the destination to accept the packets

*2.3 Battery model*

Battery is mainly a depository of electrical charge which gets loaded on recharging and discharges itself when in use. Therefore, performance of the peripherals such as CPU, DC-DC converter, sensors, memory blocks, etc attached to battery is often limited.DC-DC converter acts as a voltage regulator for various components [14]

With the help of battery models provided by Qualnet, the network efficiency can be achieved, perhaps increasing the lifetime and predicting the behavior of the nodes under various circumstances.

Battery models capture the characteristics of real-life batteries and can be used to predict their behavior under different design such as system architecture, power management policy, Life time of the battery, transmission power control and components based on time.Three Battery models supported by Qualnet 7.4 includes Service life time, Linear and Residue which are useful tools for a battery-driven systems.

The total energy utilized by the system per cycle is equivalent to the sum of energies absorbed by the peripherals i.e. nodes/transceivers

(ETransceivers), processors (EProcessors), the DC-DC converter (EDC-DC) and the discharged amount of current in the battery (EBatttery).

The equation used to calculate E(consumed ) for battery model and interfaces is depicted in (5).The architecture to show the energy dispersed in peripheral devices is shown in fig 3.

$$E(consumed) = E(DCtoDCconverter) + \text{EProcessors} + \text{ETransceivers} + \text{EBatttery} \qquad (5)$$

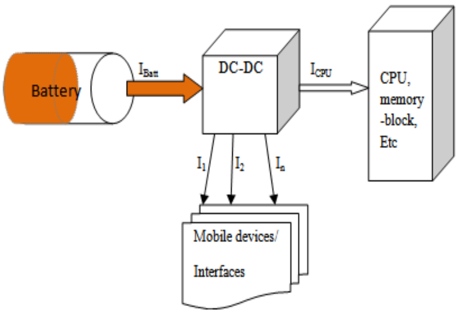


**Fig. 3: Block diagram of power consumption in a system**

There are various battery models. Some of them are Electro-chemical models, Electrical-circuit models, Analytical models, Kinetic Battery Model, Stochastic models. Each of them possess certain advantages and disadvantages.

In Analytical models, battery lifetime is predicted using Peukert's law. Extension to Peukert's law, to improve the accuracy of calculation of battery lifetime, made use of fick's law and faraday's law that focused on one dimensional diffusion The use of these models can be diverse.

Therefore, main emphasis is laid on the energy consumption of wireless communication devices, hence, they can be combined with the models provided by the Qualnet simulator such as


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- Precise Service Life Estimator
- Precise Residual Life Estimator
- Linear Model

Precise Service Life Estimator model:

With help of Rakhmatov's analytical model yield precise estimation of the service life of a wireless device that makes use of battery under predefined time-varying load. Battery specification of batteries such as DURACELL AA, DURACELL AAA and ITSY is considered for this model.

Precise Residual Life Estimation:

While circuit consumes power from the battery, this model estimates battery efficiency. One of the main features of the battery is to distribute the energy to the peripherals, a bit of energy is misspent. Batteries such as DURACELL AA, DURACELL AAA and PANASONIC are considered or this model.

When battery output voltage is predefined and if the current consumed by the circuit is I, then actual current dissipated by the battery is given by (2)

$$I_{battery}=I_{actual} * \mu \qquad (6)$$

Where Iactual ≥ I battery.

μ gives the utilization factor or battery efficiency

*Linear Model:*

It makesuse *of* coulomb counting technique which assembles the consumed coulombs and gives the residual service life of the battery by comparing the accumulated dissipated coulombs with a pre-recorded capacity of battery at the beginning of the cycle.

*2.4 Models for 802.11 MAC layer coordination functions*

Basically, the issue evolved in WLAN's is sharing of the communication medium and the protocols that help inallotment of the medium i.e. concluding when a station can forward the data are recognized as co-ordination functions. Two main coordination functions are that play a prominent role

- DCF(Distributed Coordination Function)
- PCF(Point Coordination Function)

The communication model of BSS is shown in fig 3, which consists of groups of station that Interact with one another internally and communicates with those outside the group with the help of an AP and performs functions in infrastructure mode.

IBSS assembles the stations into groups that interact with each other directly without considering an AP and works in an ad-hoc mode.

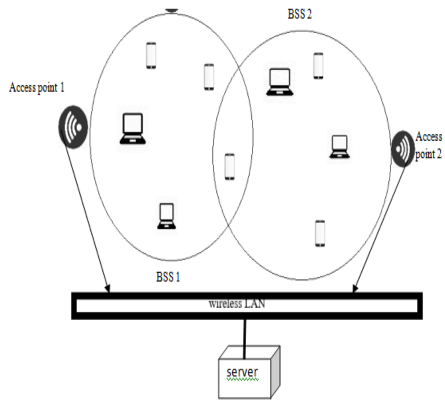


**Fig. 4: Overview of communication in Basic service set**

*2.5 Other strategies*

Other strategies available at the lower level protocols are listed below

*Power-Aware Medium Access Control with Signaling (PAMAS):* A node halts itspower usage when left with no transmission, while it is aware of transmissions in its vicinity.

*Dynamic Power-Saving Mechanism (DPSM):* DPSM uses the scheme whichinvolves 2 states i.e., sleep and wake to lessen the power usage. Being an alternative of the IEEE 802.11, it employs variable sized ATIM windows to attain prolonged snooze time for nodes.

*Power Control Medium Access Control (PCM):* In PCM, data and ACK packets areforwarded with the least amount of power, while the RTS and CTS packets are dispatched with utmost power, in order to facilitate the ongoing communication between two end points.

## III. RESULTS & DISCUSSIONS

Several strategies have been proposed to solve the issue of energy consumption

[3] The authors of this paper came up with a Probabilistic Energy Efficient Routing protocol (PEER). During route handling mechanism the node checks its own residual capacity, based on which it forwards the packets with some probability attached to it. This probability is based on the percentage of the remaining battery capacity of the node. Thus, a route is discovered by nodes with high energy and tries to save the power and protects the network from early exhaustion.

[4] This paper concentrates on the application of star topology in the mobility model. Mobility models describe the activity of the mobile user and also give the location, speed, and acceleration that change over time, of the mobile user, such that when a new communication is established they can be used for simulation purpose. Mobility model can be of many types, some of them are *File based mobility model, Group based mobility model, Pedestrian mobility model, Random Waypoint mobility model.* The analysis is done and the changes in the metrics like jitter, throughput isobserved. Reflecting that, among the above-mentioned mobility models, the Group based mobility is observed to be suitable for transmission.

[5] Provides exhaustive survey on Effective Energy-Efficient Node Placement Algorithm, which focuses on the placement of sensor nodes in the simulated area at a uniform distance with different patterns i.e. in random, circular and grid pattern and also examining the energy utilized by the nodes that are randomly placed with that of nodes arranged in an optimized way.

[6] This paper estimated the energy consumption of AODV, DSR and DYMO routing protocol employing MICAZ Energy Model. Ultimately, the



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results were compared and the comparison report showed that the energy absorbed in idle mode is highest followed by Receive and then in Transmit mode subsequently. Also, it has been noted that DYMO provides maximum throughput accompanied by DSR and AODV.

[7] This paper focused on localization. This localization scheme can be applied with help of beacon node i.e. node that knows its position using a GPS receiver. The chief offering of this paper is to design the optimized path for the beacon node and localize all sensor nodes, such that their localization error is minimum.

[8] This paper details on the energy model i.e. MICA, MICA Z and modulation schemes. It is resolved that mica mote with ASK modulation is highly effective than BPSK and O-QPSK modulation. Whereas, on the comparison, it is concluded that MICAZ uses limited energy in idle mode when working with BPSK modulation than MICA energy model that uses ASK modulation scheme.

[9] There is an application of the modified version of AODV that practices the idea of drain count. It gets the amount of energy available at the nodes and compares it with a certain threshold value. Hence, it sends packets along the path with least drained nodes that co-operate in securing a prolonged network lifetime. If the residual energy of a node is below the set threshold level, then the drain count value of the route is increased by a factor of one. The path with minimum hop count is picked if more than one path posses similar drain count value else path with minimum transmission power is preferred.

[10] This paper introduces a new Energy-efficient Survivable Routing Protocol that utilizes hop penalty strategy and flooding delaying approach so as to enhance the conventional method. On observing it was found that the utilization of energy in ESRP is valuable than regular routing protocol. Thus, it can be concluded that ESRP makes recognizable improvement in the network survivability.

[11] An energy efficient routing protocol viz. EERP is stated. During the route reply process, the distance separating two sequential nodes is computed based on RSS (received signal strength). It follows the rule "if the nodes are adjacent to each other, RSS is high". Hence, a low transmission power is utilized to send the data which in turn diminishes battery consumption.

[12] This paper focuses on Multi-hop relay communications. Under mobile environments, the battery utilizations are compared with existing network topology using QualNet 5.1. Apart from that, the heterogeneous network topology is presented with its advantages over existing networks. The battery models such as AA and AAA that are modeled in service life estimator mode have been considered which provides information on residual battery in a node after a specific simulation time. Energy models for the BS (base station), RS (relay station) and MS (mobile station) are considered for which the QualNet Simulator gives the residual life of the battery using energy model parameters that gives the consumption pattern of the nodes.

## IV. CONCLUSION

The prime focus is on energy efficiency in MANET's. Since nodes in MANET's transitions from one mode to another mode such as transmitting, receiving, and idle and sleep mode, this in turn leads to more consumption of battery power leading to reduced network lifetime. Therefore, more priority is given to reduce the power consumption in the system, thereby increasing the lifetime of the battery. This performance analysis of efficiency can be experimented using different energy models such as GENERIC, MICAZ, MICA-MOTES, and USER-DEFINED using QualNet simulator.

## V. ACKNOWLEDGEMENT

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## REFERENCES


1. Muhammad AzharIqbal, BinDai, Ben xiong Huang, A. Hassan, Shui Yu, "Survey of network coding-aware routing protocols in wireless networks", *journal of network and computer applications*, Vol. 34, (2011), available online: https://www.sciencedirect.com/science/article/pii/S1084804511001500, last visit:28.10.2018
2. Behra Rajesh Umashankar, RakhiKumariPurnima,"A Comparative Study of Topology and Position-Based Routing Protocols in Mobile Ad Hoc Networks", *International Journal of Advanced Research in Computer Science & Technology*, Vol.2, No.1, (2014), available online: http://www.ijarcst.com/doc/vol2-issue2/rajesh.pdf, last visit:28.10.2018
3. MansiRajgor, PrasannaShete, R. N. Awale,"Probabilistic Energy Efficient Routing Protocol for Wireless Sensor Network", *International conference on communication information & computing technology(ICCIC)*,(2018), https://ieeexplore.ieee.org/document/8325889
4. Parma Nand, Rani Astya, Abdul Wahid Ali,"Performance Analysis and Impact of Different Mobility model on the specific configured network with IEEE 802.15.4 for WSNs", *International Conference on Computing Communication and Automation (ICCCA)*, (2016), https://ieeexplore.ieee.org/document/7813772
5. Kirankumar, Y. Bendigeri I, Jayashree D. Mallapur2," Node Placement in Wireless Sensor Network: An Energy Approach", *National Conference on Recent Advances in Electronics & Computer Engineering*, RAECE lITRoorkee, India, (2015), https://ieeexplore.ieee.org/document/7510223
6. SonikaKandari, M.K.Pandey," Evaluation of Energy Consumption by nodes of MANET", *National Conference on Recent Advances in Electronics & Computer Engineering*, (2015), https://ieeexplore.ieee.org/document/7510221
7. M.S. Aruna1, R. Ganesan2, and A. PravinRenold," Optimized Path Planning Mechanism for Localization in Wireless Sensor Networks", *International Conference on Smart Technologies and Management for Computing, Communication, Controls, Energy, and Materials (ICSTM)*, (2015),

https://ieeexplore.ieee.org/document/7225409
8. Sarvesh Kumar Singh, Rajeev Paulus, Shiv Veer," Analysis of energy model and QoS in wireless sensor network under different modulation schemes", *International Conference for Convergence of Technology,* (2014), https://ieeexplore.ieee.org/document/7092114
9. Dr. Annapurna P Patil, VarshaChandan, B., Aparna, S., Greeshma, R., Akshatha," An Improved Energy Efficient AODV Routing Protocol for MANET 's", *international Conference on wireless and optical communication networks*, (2014), https://ieeexplore.ieee.org/document/6923063
10. Uma Rathore Bhatt, Priyanka Jain, RakshaUpadhyay," An Enhanced AODV- An Energy Efficient Routing Protocol for MANET", *Nirma University International Conference on Engineering (NUiCONE),* (2013), https://ieeexplore.ieee.org/document/6780114
11. Akshay Jain," Reduction of Power Consumption at Mobile Station in Multi-hop Networks In Mobile Environments*", International Conference on Emerging Technology Trends in Electronics, Communication and Networking*, (2012), https://ieeexplore.ieee.org/document/6470043
12. Moustafa A. Youssef , ArunchandarVasan , Raymond E. Miller "Specification and Analysis of the DCF and PCF Protocols in the 802.11 Standard Using Systems of Communicating Machines", *IEEE international conference on network protocols*,(2002),https://sci-hub.tw/10.1109/icnp.2002.1181394
13. Dharma PrakashAgrawal, carlos de moraiscordeiro, *a Book on Adhoc and Sensor Networks Theory and Applications*,World Scientific Publishing Company ,(2006)
14. M.R. Jongerden and B.R. Haverkort "Battery Modeling" *,CTIT Technical Report Series (2008),* https://research.utwente.nl/en/publications/battery-modeling
15. V.Ramesh, Dr.P.Subbaiah, "Load Balancing: Energy Management Scheme for Preemptive DSR to increase Packet Delivery Ratio & to decrease Delay" , Journal of Theoretical and Applied Information Technology , Vol 47, Issue 3, pp 1112-1119, January 2013.
16. V.Ramesh, Dr.P.Subbaiah, "Mobility scenario-based Performance Evaluation of Preemptive DSR Protocol for MANET", WSEAS Transactions of Communications, Vol 12, Issue 5, May 2013, published by WSEAS-World Scientific and Engineering Academy and Society.
17. M.JanardhanaRaju, Dr.P.Subbaiah, V.Ramesh, "A Novel Elliptic Curve Cryptography Based AODV for Mobile Ad-Hoc Networks for Enhanced Security", Journal of Theoretical and Applied Information Technology, Vol. 58, Issue 3, Dec'2013.
18. QualNet- 4.5.1-Wireless Model Library. Book
19. Wikipedia: https://en.wikipedia.org/wiki/Mobile_ad_hoc_network
20. ResearchGate:https://www.researchgate.net/publication/310790633_Opportunistic_Routing_in_Wireless_Networks
21. Wikipedia: https://en.wikipedia.org/wiki/Geographic_routing

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