Role of Energy aware routing protocols in e-Governance

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Abstract: The design of energy efficient routing protocols is a major problem in a Mobile Ad-Hoc Network (MANET). There are different protocols, each one based on different characteristics and properties. And Some of these protocols have been studied and their performances have been evaluated focusing on aspects like routing overhead, communication latency and route distance. In this paper we discuss different approach to minimize energy consumption so long lived node can survive in MANET. And we will discuss the performance of the routing protocols with respect to energy consumption and evaluating how the different approaches and algorithms affect the energy usage in the mobile devices. We raised some issues which causes wastage of energy resources in mobile ad hoc network due to imbalance of load, routing of packet in multi hop, ideal timing of node.
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1. Introduction:

A Mobile Ad hoc Network (MANET) is a decentralized wireless network where wireless nodes can move arbitrarily. The nodes communicate directly to nodes in transmission range, and takes part in multi-hop communication with others nodes. However, wireless medium and dynamic changeable infrastructure, these networks face various problems like unpredictable topology, increased interference and congestion, and limitation of resources like bandwidth and energy. The primary objectives of MANET routing protocols are to maximize network throughput, to maximize energy efficiency, maximize network lifetime, and to minimize delay. The one of the most important objective of MANET routing protocol is to **maximize energy efficiency**, since nodes in MANET depend on limited energy resources.

Nodes within an ad hoc network generally depend on batteries for power source. Since these energy sources have a limited lifetime which is one day an average, power availability is one of the most important factor for the operation of the ad hoc network.

There are different sources of power consumption in a mobile node. To measure Energy consumption in wireless network several experiments have done which concludes that mobile nodes not only consumes energy while communicating but also while in idle mode. But communication is one of the main sources of energy consumption. Since the rate of battery performance improvement is rather slow currently, and in the absence of breakthroughs in this field, other measures have to be taken to achieve the goal of getting more performance out of the currently available battery resources. In this regard several routing protocols for MANET's have been suggested.

Comparison among routing protocols in wireless networks:

Basically MANET works on two kinds of protocols, **Proactive** - perform periodic updates with control packet and therefore generate an extra traffic that adds to the actual data traffic. The control traffic is broadcasted all over the network via optimized flooding. Optimized flooding is possible since nodes permanently monitor the topology of the network. Destination Sequenced Distance Vector Routing (DSDV) is example of a proactive protocol. **Reactive** - route discovery procedures are invoked on demand when a source node has a new connection pending toward a new destination. The route discovery procedure in general consists of the flooding of a query packet and the return of the route by the destination. The exhaustive flooding can be very expensive, thus creating delays in route establishment. Furthermore the route discovery via flooding does not guarantee to create optimal routes in terms of hops distance.

The **Destination–Sequenced Distance-Vector** routing protocol is a table-driven protocol requiring every node to periodically propagate routing information updates throughout the network.

The **Dynamic Source Routing** each data packet to be transmitted carries the complete sequence of nodes by which the packets must pass to reach the target. This property is known as source

routing, and requires the sender to know the complete route to the destination. The protocol is based on two basic processes: (a) the route discovery process and (b) the route maintenance process. The route discovery process is based on flooding and is used to dynamically discover new routes.

The **Ad Hoc on Demand Distance Vector** routing protocol is a combination of the DSR and the DSDV protocols. This protocol uses the on-demand mechanism of route discovery and route maintenance from DSR and the hop-by-hop routing and sequence number from DSDV. While DSR uses node cache to maintain routing information, AODV uses traditional routing tables (one per destination) as DSDV. AODV also uses sequence number to prevent routing loops and to avoid stale routes.

The **Temporally-Ordered Routing Algorithm** tries to minimize the overhead due to reaction to topological changes by confining routing messages to the "neighborhood" near to the change. TORA uses a "height" metric over a previously defined acyclic graph to assign, in every node, a forward direction for packets to a given destination. TORA implements three main process: (a) on-demand route create process, (b) route maintenance process, and (c) erase route process. The erase route process tries to erase the invalid routes, and is initiated by a node that detects network partition.

It has been observed by seeing ns2 simulator result that DSR and AODV perform better those other routing protocols. Since DSR and AODV routing protocols are reactive routing protocols in which routes are created only when desired. Wastage of energy by node to discover nodes can be avoided. Therefore Energy aware routing protocols are devised using reactive protocols like AODV and DSR. But potential problem in current protocols is that they find the lowest energy route and use that for every communication which leads to energy depletion of the nodes along the path and in worst case may lead to network partition.

2. Energy Preserved Routing Protocol in Wireless Networks

As we know that MANET is a self Organized Structured network where each individual device works as router to participate in network and hence spend more energy.

Therefore there is a need to minimize broadcast traffic so node which is heavy loaded spends less energy. Each of the nodes needs to transmit and communicate sensed data to an aggregation point for use by higher layer systems. Data and message transmission among nodes collectively consume the largest amount of the energy available in a WSN. The network routing protocols ensure that every message reaches the destination and has a direct impact on the amount of transmissions to deliver messages successfully. The transmission protocol in the MANET should be scalable, adaptable and optimized to consume the least possible amount of energy to suit different network architectures and application domains. Mobile node tolerance is evident in the protocol's ability to provide a constant successful message delivery ratio at the sink node with the introduction and increase in the number of mobile nodes.

3. Energy-aware Hierarchy Routing Mechanism

In order to reduce the power consumption of data transmission, we adjust communication range of each node. Thus, all sensing data of sensor nodes will be transmitted by multi-hop mechanism. Each node uses the hop count of received information in a neighbor table. Thus, each sensor node knows which nodes are closer to the cluster head, and these nodes could be its parent node. [2]

4. Mobile ad hoc routing network protocols problems

The aim of the routing protocols is to send a packet data from source to destination. This includes selection of a route and delivering packets data to correct destination using that route. For this purpose network protocols includes a plurality of routers, which receive and process packets. A router makes routing decisions and attempts to forward the packets data closer to destination.

Routers exchange routing information with each other. Routing information helps to keep a router aware of the available routes or of the topology of the routing network protocols. At start up each router has only "local knowledge" i.e. they merely know their own addresses and links to which they are attached. The exchange of routing messages enables each router to build up its knowledge of the network. Building up the knowledge goes through intermediate states until all routing information has been received and the network has reached equilibrium. We say that routing has converged. [3]

Unfortunately this is not permanent state of affairs. In reality links break and routers must make new routing decisions and find new and alternate routes for packets. In large networks this is a constant process, which not always goes as planned. Packets can start looping, they are congested or some packets are lost forever. The network should be able to recover from this kind of situations in no time. Routing is actually done by software running in a router. The software implements a routing protocol, which are based on some algorithm or routing mechanism. Routing protocols try to compute network routes that follow the shortest path to a destination [4].

5. Challenges of wireless networks

Wireless Networks has certain challenges of designing routing protocols [5]; the reasons of it are as stated below.

- Network nodes are randomly deployed.
- Networks are without any infrastructure.
- Being a battery operated device, available energy can be the bottleneck in the operation of network nodes.
- Networks usually rely on their battery for power, which in many cases cannot be recharged or replaced.
- Networks are highly dynamic therefore it should be capable to adapt topological changes, due to failure of nodes, or powering up of new node.

Conclusion

Here we discuss the order to reduce the power consumption of data transmission; and we can reduce the time waiting process. And we adjust communication transmission range of each node. Thus, all sensing data of sensor nodes will be transmitted by multi-hop mechanism. In this method we can implement the data transmission method by each node uses the hop count of received information in a neighbor table. In this we are evaluating how the different approaches and algorithms affected by the energy usage in the mobile devices and wireless devices. And we raised some issues which causes wastage of energy resources in mobile ad hoc network due to imbalance of load, routing of packet in multi hop, ideal timing of node.

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