Effective Energy consumption chaining routing protocol with routing technique for MANET

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Abstract— *Networked micro-sensor technology is a fundamental technology for future. Sensors can be spread on the ground, in the air, under water, in vehicles and inside buildings. A sensor can discover and track threats. This paper introduces an energy efficient, multi-hop routing scheme. The technique applies clustering for routing. Ant Colony Optimization (ACO) is enforced over clustering algorithm for multi-hop routing. This cuts down amount of direct transmissions from Cluster Head to Base Station. The technique works in three phases clustering, inter-cluster communication and intra- cluster communication. Where LEACH is carried out for clustering, which gives arbitrarily distributed clusters, and then cluster members send data straight to their cluster head. Ant Colony Optimization algorithm (ACO) is used for communication between cluster-heads and base-station. Use of clustering reduces the transmission of extra data by data aggregation at the cluster-head level. ACO tends to explore shortest and energy efficient path. The results indicate lower power consumption and lower average cost (duration) and thus longer lifespan.*

Keywords: security, cluster, network, Manet, sensor, routing, protocol, base station, algorithm.

I. INTRODUCTION:

A mobile ad hoc network (MANET) is generally defined as a network that has many free or self-governing nodes, many time composed of mobile devices or other mobile places, which can arrange themselves in various ways and operate without strict top-down network administration. New advances in computer networking have introduced a new technology for future wireless communication, a mobile ad hoc network (MANET). This technology, which is the combination of peer-to-peer techniques, wireless communications ,and mobile computing, provides convenient infrastructure-less communications and could be very useful to provide communications for many applications especially when the infrastructure networks is not feasible. MANET could be used to overcome geographical constraints in a military operation. As it is easy to deploy, it may also very useful to assist in the disaster relief operations where temporary network infrastructure is immediately needed to replace the damaged infrastructure networks.

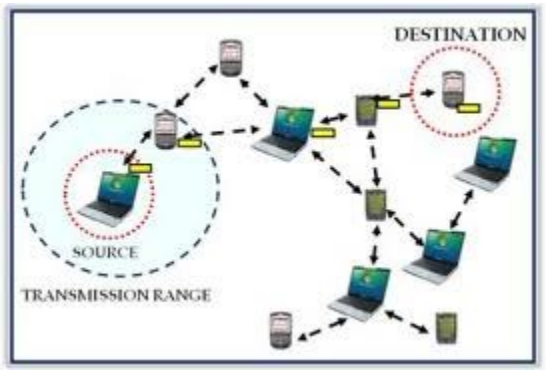

Figure 1: MANET architecture

II. MANET APPLICATIONS

As the platform independent devices increases and advancement in wireless network lead to the increasing number of application area. Unplanned networking can be used where there is no infrastructure or the surviving infrastructure is expensive to use. Ad-hoc networking allows the devices to maintained connections to the network as well as easily adding and removing devices to and from the network.

1) Military: Military equipment now contain some sort of computer architecture. Ad- hoc networking permits the military to take benefits of network technology to maintain an information network between the vehicles, soldiers and military information in central offices. The basic requirement of ad hoc network came from this field.

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2) Commercial Sector: MANET can be used in rescue operations for disaster ease attempts, example in flood, fire, earthquake etc. Emergency operations must take place where disgraced communications infrastructure and rapid preparation of a communication network is required. Information is send from one team member to another over a small hand held and quickly.

3) Personal Area Network (PAN): Short-range MANET can change the intercommunication between various mobile devices. Wired cables are exchanged with wireless connections. Such an ad hoc network can also increase the access to the Internet or other networks by mechanisms example WLAN etc. The PAN is potentially a promising application field of MANET in the future pervasive computing context.

III. MANET CHALLENGES:

Irrespective of the large range of the features, applications of MANET introduce several challenge can be expect. This included:

A) Routing: The topology of the network is continually altering the communication of packets between any pair of nodes becomes challenging. Most protocols should be based on reactive routing instead of proactive. Multi cast is routing also challenge because the multi cast tree is dynamic due to the random movement of nodes within the network. Route between nodes may contain multi hops routes, which is more cumbersome than the single hop communication.

B) Security and Reliability: In addition to the common exposures of wireless connections, an ad-hoc networks has some security related problems due to. Smutty neighbor relay packets. The features of distributed operation require different ways of authentication and key management for security purpose. Wireless links feature introduce reliability problem, because the limited range of wireless transmission of the broadcast nature of the wireless medium and data loss during transmission.

C) Quality of Service (QoS): Providing different level of quality of service is challenge in constantly changing environment. The feature of communication is quality in a MANET makes it difficult to offer guarantees on the services offered to a device. An adaptative QoS must be implemented over the traditional resource reservation to support the multimedia services for providing good Quality of services.

D) Inter-networking: with increase to the communication within network, inter-networking between MANET and conventional fixed networks (mainly IP based) is often expected in many cases lead to challenge in mobility management.

E) Power Consumption: As majority of the low-weight mobile ends, the communing functions make optimal for incline power consumption. Preservation of power and power-aware routing must be taken into consideration.

F) Location-aided Routing: Location-aided routing implements on laying data to define related regions so that the routing is limited to save power of nodes.

IV. ROUTING PROTOCOL IN MANET

With the advancement in technology, new protocols are designed for sensor network; here energy awareness is more important. Routing protocols are:

- Data centric protocols
- Hierarchical protocols
- Location based protocols

A) LEACH :(Low Energy Adtive Clustering Hierarchy In leach all nodes are organized into clusters on based on distance. Cluster heads are used for transmission of data from cluster to base station. The cluster head is selected by rotations one by one to balance the load of energy in the way that most of nodes get small distance to transmit and cluster only cluster head are responsible for long transmission to base station.

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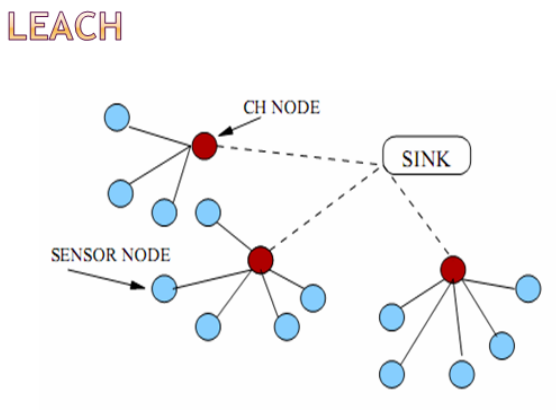

Figure 2: Clustering in LEACH

LEACH protocol is a cluster-head selection, and introduces an improve clustering algorithm. LEACH in balancing node energy consumption, improve the efficiency of data transmission and increasing the network life.

Problem in LEACH

The main problem is LEACH architecture provide the support to reduce the transmission cost for less number of nodes. But life time is longer than other protocols.

B) PEGASIS **(**Power Efficient Gathering in Sensor Information System):- PEGASIS is used for same as LEACH. But it creates a chain that is utilized to communicate to base station and restrict rotation of cluster-head as in LEACH. PEGASIS need changing

Topology is a sensor node needs to know about energy status of its neighbor in order to know where to send data; this topology modification can introduce overhead especially or highly utilized networks.

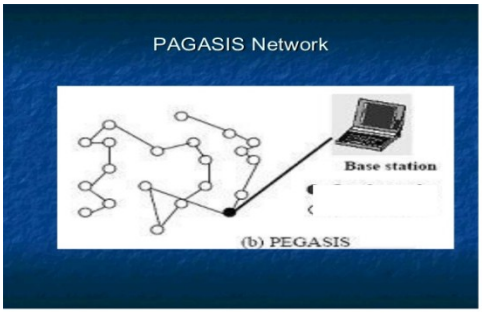

Figure3: Working of PEGASIS

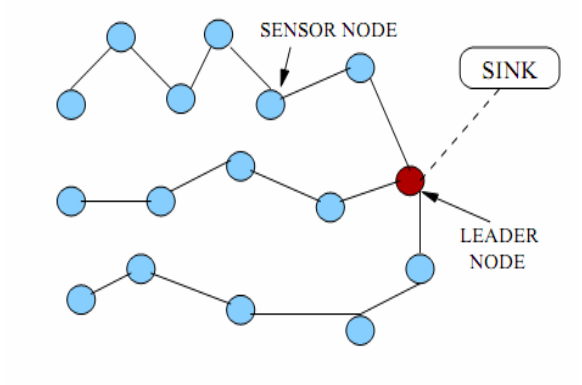

Figure 4: chaining using PEGASIS

It is chain based architecture in which transmission occur in such a way that send and receive data only form the neighbor. The Node which acts as a chain head is responsible for communication with base station. On receiving data, node passes data to next node.

V. ROUTING TECHNIQUE IN MANET:

ACO (Ant Colony Optimization): the original idea comes from observing the development of food source within ants. Which formulate the capacity of ants and find the shortest path between a food source and the nest. In ACO algorithm is search for the destination based on distance is needed in previous iteration. There is a chance of occurrences of lock as Ants travel in cycle.

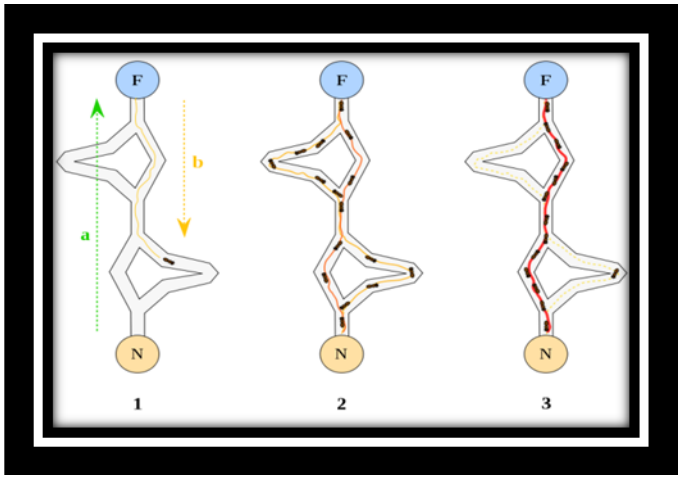

Figure 5: Working of ACO

VI. RESEARCH METHODOLOGY

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Proposed chain formation by improved PEGASIS with ACO

To combine PEGASIS with ACO is proved to be the best algorithm to minimize the power consumption in wireless sensor networks. ACO (Ant Colony Optimization) is energy optimization technique that finds the shortest path. PEGASIS is routing algorithm that is based on chaining. It forms a chain of nodes and transmits data towards base station. In this way they lead to travel minimum distance.

PEGASIS AND ACO ALGORITHM

- Initially no node in cluster.

```
xy = 100*rand(50,2);
```

- Make clustering and perform multihop routing for number of rounds.

```
i=1:1:n
S (i).xd=rand (1,1)*xm;
XR (i)=S(i).xd;
S(i).yd=rand(1,1)*ym;
YR(i)=S(i).yd;
S(i).G=0;
```

- Select the cluster-head with minimum transmission distance to base station.

```
if (temp_rnd0<m*n+1)
S(i).E=Eo*(1+a)
S(i).ENERGY=1;
plot(S(i).xd,S(i).yd,'+')
```

- Set TDMA schedule for clustering members for intra cluster communication.
- Each node compute distance and update the matrix.

```
for iter = 1:num_iter
          % Evaluate Each
Population Member (Calculate
Total Distance)
     for p = 1:pop_size
     d = 0; % Open Path
     for k = 2:n
    d = d +
dmat(pop(p,k1),pop(p,k));
          end
    total_dist(p) = d;
```

- Find the shortest path and transmit data.

```
if min_dist < global_min
global_min = min_dist;
opt_rte = pop(index,:);
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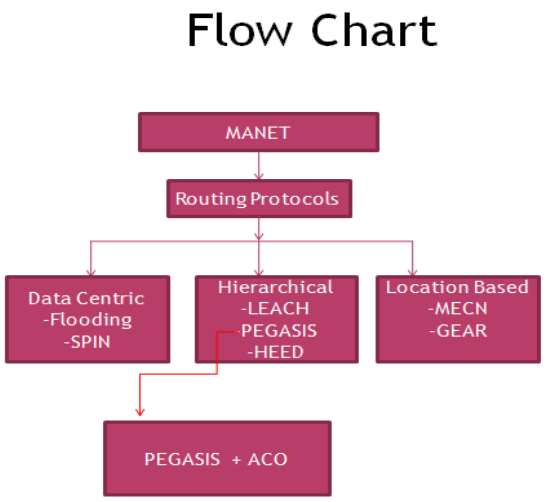

Figure 6: Flow chart for proposed protocols

VII. OBJECTIVE

A Mobile Ad hoc Networks (MANET) represents a system of wireless mobile nodes that can freely and dynamically self-organize in to arbitrary and form temporary network topological. Ad-hoc networks are power efficiency only a simple battery provides nodes independence. Thus, minimize power consumption is a major challenge in this networks. Power consumption is one of the valuable performance metrics for wireless ad hoc networks, it directly relates to the lifetime of the networks. Main objective to enhance routing using less power to fulfill this requirement we use PEGASIS and ACO. Networking routing algorithm can be originated to consider power consumption of the nodes in network as a primary objective.

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VII. CONCLUSION

Due to some problems in existing protocols like Unable to adapt according to network dynamic, system parameters are not be suitable for all network conditions .Performance degradation happens when routing protocols are used in environments for which they were not designed. Small changes to routing protocols to adapt to network characteristics can enable it to improve performance while maintaining interoperability with its not modified version. For further we can enhance performance of MANET routing protocols by dynamically adapt them according to other network characteristics: Traffic load Power and direct of links. Result and analysis are for developments of new adaptive routing protocol for MANET.

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