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AN EFFICIENT ALGORITHMIC APPROACH TO ENHANCE POWER OF MOBILE NODES

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ABSTRACT

To facilitate communication within a Mobile network, an efficient routing protocol is required to discover routes between mobile nodes. Energy efficiency is one of the main problems in a Mobile network, especially in designing a routing protocol. In this technique, we surveyed and classified a number of energy aware routing schemes. In many cases, it is difficult to compare them directly since each method has a different goal with different assumptions and employs different means to achieve. For example, when the transmission power is

controllable, the optimal adjustment of the power level is essential not only for energy conservation but also for the interference control. When node density or traffic density is far from uniform, a load distribution approach must be employed to alleviate the energy imbalance problem. The sleep/power-down mode approach is essentially independent of the other two approaches because it focuses on inactivity energy. The energy consumption of each node is compared and results were generated using graphs.

Introduction and Review of Literature

In mobile network, nodes involved in communication initially has 100% battery power once it started performing packet transfer, the battery power decreases tremendously, at one point the network disconnects because of empty battery backup of sender node or any other node in that network. The major objective of this project is to stabilize the battery backup of all the nodes in a network. So that no node is running below the average battery power, this can be achieved through the energy efficient routing technique for the mobile network.

[1] Over the last half a century, computers have exponentially increased in processing power and at the same time decreased in both size and price. These rapid advancements led to a very fast market in which computers would participate in more and more of our society's daily activities. In recent years, one such revolution has been taking place, where computers are becoming so small and so cheap, that single purpose computers with embedded sensors are almost practical from both economical and theoretical points of view. Wireless sensor networks are beginning to become a reality, and therefore some of the long overlooked limitations have become an important area of research. In this project, they attempt to find out and overcome limitations of the wireless sensor networks such as: limited energy resources, varying energy consumption based on location, high cost of transmission, and limited processing capabilities. All of these characteristics of wireless sensor networks are complete opposites of their wired network counterparts, in which energy consumption is not an issue, transmission cost is relatively cheap, and the network nodes have plenty of processing capabilities. Routing approaches that have worked so well in traditional networks

for over twenty years will not suffice for this new generation of networks. Besides maximizing the lifetime of the sensor nodes, it is preferable to distribute the energy dissipated throughout the wireless sensor network in order to minimize maintenance and maximize overall system performance. Any communication protocol that involves synchronization between peer nodes incurs some overhead of 7 setting up the communication. So here, they attempt determine whether the benefits of more complex routing algorithms overshadow the extra control messages each node needs to communicate. Each node could make the most informed decision regarding its communication options if they had complete knowledge of the entire network topology and power levels of all the nodes in the network. This indeed proves to yield the best performance if the synchronization messages are not taken into account. However, since all the nodes would always need to have global knowledge, the cost of the synchronization messages would ultimately be very expensive. For both the diffusion and clustering algorithms, they will analyze both realistic and optimum schemes in order to gain more insight in the properties of both approaches. The usual topology of wireless sensor networks involves having many network nodes dispersed throughout a specific physical area. There is usually no specific architecture or hierarchy in place and therefore, the wireless sensor networks are considered to be ad hoc networks. An ad hoc wireless sensor network may operate in a standalone fashion, or it may be connected to other networks, such as the larger Internet through a base station. Base stations are usually more complex than more network nodes and usually have an unlimited power supply. Regarding the limited power supply of wireless sensor nodes, spatial reuse of wireless bandwidth, and the nature of radio communication cost which is a function of the distance transmitted squared, it is ideal to send information in several smaller hops rather than one transmission over a long communication distance. In this simulation, they use a data collection problem in which the system is driven by rounds of communication, and a sensor node8 has a packet to send to the distant base station if it detects a target within its sensing radius. The algorithms are mainly based on location, power levels, and load on the node, and their goal is to achieve better target sensing with minimizing the power consumption and maintenance throughout the network. So that the majority of the nodes consume their power supply at relatively the same rate regardless of physical location. This leads to better maintainability of the system, such as replacing the batteries all at once rather than one by one, and maximizing the overall system performance by allowing the network to function at

100% capacity throughout most of its lifetime instead of having a steadily decreasing node population.

[2] Wireless Sensor Network (WSN) is a wireless network consisting of small nodes with sensing, computation, and wireless communications capabilities. Each sensor collects data from the monitored area (such as temperature, sound, vibration, pressure, motion or pollutants). Then it routs data back to the base station BS Data transmission is usually a multi-hop, from node to node toward the base station. As wireless sensor networks consist of hundreds to thousands of low-power multi functioning sensor nodes, operating in an unattended environment, with limited computational and sensing capabilities. Sensor nodes are equipped with small, often irreplaceable batteries with limited power capacity. WSN consist of hundreds or thousands of small, cheap, battery-driven, spread-out nodes bearing a wireless modem to accomplish a monitoring or control task jointly. An important concern is the network lifetime: as nodes run out of power, the connectivity decreases and the network can finally be partitioned and become dysfunctional Routing in WSNs is a very challenging problem due to the inherent characteristics which differentiate such networks from other wireless networks such as ad hoc networks and cellular networks (SU, 2002; Cao, 2007). In recent years, many algorithms have been proposed for the routing issue in WSNs. The minimum energy routing problem has been addressed in The minimum total energy routing approaches in these papers are to minimize the total consumed energy. However, if all traffic is routed through the minimum energy path to the destination, the nodes along that path will run out of batteries quickly rending other nodes useless due to the network partition even if they do have available energy. Instead of trying to minimize the total consumed energy on the path, the objective is to maintain the connected network as long as possible. If sensor nodes consume energy more equitably, they continue to provide connectivity for longer, and the network lifetime increases. Good surveys of the sensor networks have been given in (Rentala) and (Estrin, 1999). Crucial to the success of ubiquitous sensor networks is the availability of small, light weight, low cost network elements, called Pico nodes. These nodes must be smaller than one cubic centimetre, weigh less than 100 grams, and cost substantially less than 1 dollar (US). Even more important, the nodes must use ultra-low power to eliminate frequent battery replacement. A power dissipation level below 100 microwatts would enable self-powered nodes using energy extracted from the environment,

an approach called energy scavenging or harvesting. As sensor networks have specific requirements on energy saving, data-oriented communication, and inter-connection between non-IP and IP, therefore sensor network dedicated routing protocols may be required, for energy efficient routing scheme. In WSN there are the routing protocols that minimize the used energy, extending subsequently the life span of the WSN. Energy awareness is an essential in routing protocol design issue. Depending on the network structure, routing in WSNs can be divided into:

a) Flat-based routing

b) Hierarchical-based routing

c) Location-based routing

Depending on the protocol operation, routing in WSNs can be divided into:

a) Multipath-based routing

b) Query-based routing

c) Negotiation-based routing

d) QoS-based routing

e) Coherent based routing

[3] Wireless Sensor Networks consist of tiny sensor nodes that, in turn, consist of sensors (temperature, light, humidity, radiation, etc.), microprocessor, memory, transceivers, and power supply. In order to realize the existing and potential application for WSNs, advanced and extremely efficient communication protocols are required. WSNs are application-specific, where the design requirements of WSNs change according to the application. Hence, routing protocol requirements are changed from one application to another. For instance, the requirements of routing protocols designed for environmental applications are different in many aspects from those designed for military or health applications. However, routing protocols for all Wireless Sensor networks, regardless of the application, must try to maximize the network life time and minimize the overall energy consumption in the network. Network lifetime is a critical concern in the design of WSNs. In many applications, replacing

or recharging sensors is sometimes impossible. Therefore, many protocols have been proposed to increase network lifetime. It is difficult to analyze network lifetime because it depends on many factors, like network architecture and protocols, data collection initiation, lifetime definition, channel characteristics, and the energy consumption model. For all routing protocols, energy consumption during communication is a major energy depletion parameter; the number of transmissions must be reduced as much as possible to achieve extended battery life. For these reasons, the energy consumption parameter is a top priority. In this article, they propose a new routing protocol based on Gossiping called Fair Efficient Location-based Gossiping (FEL Gossiping) to improve the problems of Gossiping and its extensions. FEL Gossiping consists of three phases: Initialization, Information Gathering and Routing. In the first phase, each node generates the gradient to the sink. In the second phase, the FEL Gossiping sends a request message to the other nodes to receive the information of other members or neighbouring nodes. Once the hop count and the remainder energy of the member nodes are known, FEL Gossiping chooses two nodes in the third phase. The nodes are chosen near to the base station, according to the hop count of the selected nodes with the sink node, in order to deliver the packet to the sink. After selecting two nodes, the protocol only chooses one of the two nodes to send the packet. The node with more residual energy is selected, and the message is sent to the selected node to broadcast the packet to the base station. Finally, they present some optimal strategies and through simulation results show that the optimal routing strategies provide a significant benefit.

[4] Recent technological advances have enabled the inexpensive mass production of sensor nodes which despite their relatively small size, have particularly advanced sensing, processing and communication capabilities. A WSN consists of spatially distributed sensor nodes, which are interconnected without the use of any wires. In a WSN, sensor nodes sense the environment and use their communication components in order to transmit the sensed data over wireless channels to other nodes and to a designated sink point, referred to as the Base Station (BS). BS collects the data transmitted to it in order to act either as a supervisory control processor or as an access point for a human interface or even as a gateway to other networks. Through the collaborative use of a large number of sensor nodes, a WSN is able to perform concurrent data acquisition of existing conditions at various

points of interest located over wide areas. Nowadays, WSNs, due to the numerous benefits that their utilization offers, support an ever growing variety of applications, including agriculture, traffic control, environment and habitat monitoring, object tracking, fire detection, surveillance and reconnaissance, home automation, biomedical applications, inventory control, machine failure diagnosis and energy management. However, despite the advantages that the utilization of a WSN offers, their use is severely limited by the energy constraints posed by the sensors. The energy expenditure of the sensor nodes occurs during the wireless communication, the environment sensing and the data processing. Therefore, most of the routing protocols in WSNs aim mainly at the attainment of power conservation. Since most of the routing protocols developed for wired networks pursue the attainment of high Quality of Service (QoS), they are practically improper for application in WSNs. For these reasons, many protocols have been proposed for data routing in sensor networks. Most of the protocols use clusters in order to provide energy efficiency and to extend the network lifetime. Each cluster first elects a node as the cluster head (CH), and then, the nodes in every cluster send their data to their own cluster head. The cluster head sends its data to the base station. This data transfer can be performed in two alternative ways. Either directly, in the case in which the cluster head is located close to the base station, or via intermediate cluster heads. In this paper, a novel energy efficient protocol, named ECHERP, is proposed. ECHERP, contrary to other existing cluster based protocols that select a random node or the node with the higher energy at a particular time instance as the new cluster head, considers the current and the estimated future residual energy of the nodes, along with the number of rounds that can be cluster heads, in order to maximize the network lifetime. The network is modelled as a linear system, and the Gaussian elimination algorithm is used in order to calculate the combinations of nodes that can be chosen as cluster heads. The proposed protocol allows new nodes to be added to the system and automatically adjusts its behaviour based on the dying nodes and the signal-to-noise interference.

Existing technique

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In existing technique, they followed *sleep/power down mode* approach. This approach minimizes the battery power consumption of the mobile node to a particular limit. The steps followed in this approach are as follows.

Step 1

The nodes participating in a network has two modes, *sleep* mode and *awake* mode.

Step 2

Initially all the nodes are *sleep* mode, only the nodes that are need to transfer the packet to destination node are in *awake* mode.

Step 3

Once the sender node starts sending packet to its neighbouring node, then it goes to *sleep* mode. The neighbouring node or adjacent node comes to *awake* mode to transfer the packet till it reaches the destination node.

Step 4

The nodes holding the packets and node going to receive the packet are in *awake* mode. All other nodes are in *sleep* mode.

Existing architecture

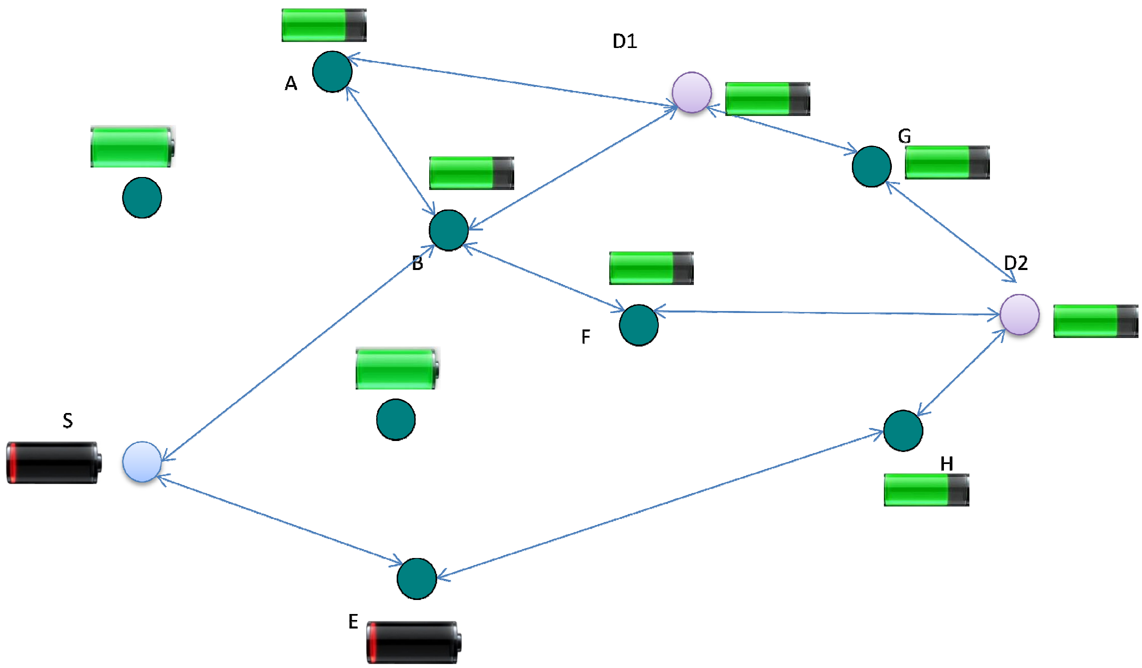

Fig 1: Existing technique

The major drawback with this system is, the nodes are spending lot of power to amplify the signal to reach the adjacent node, rather than selecting path from nearby nodes, so this leads to the more power loss to that particular node. In this technique the nodes S and E spends lots of power to amplify signal to reach the nodes S and B, so this leads to the in efficient routing.

Sequence diagram for existing system

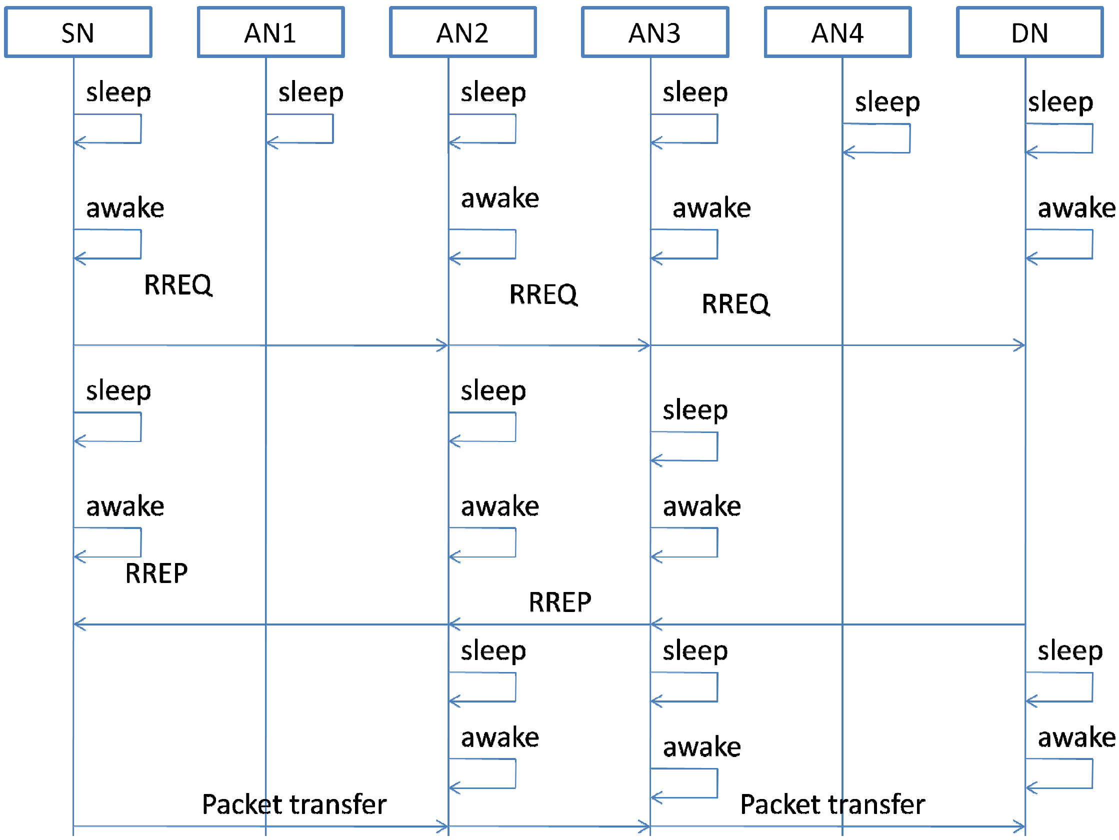

Fig 2: Existing technique

Modelling Technique

This project is developed based on the Waterfall model, as the Existing system is clearly analyzed, increase the packet transfer efficiency. Considering each requirement as a phase and each requirement is verified to its specification. Then the proposed system is developed with reference to the specification and also maintaining the system in future as per the requirements.

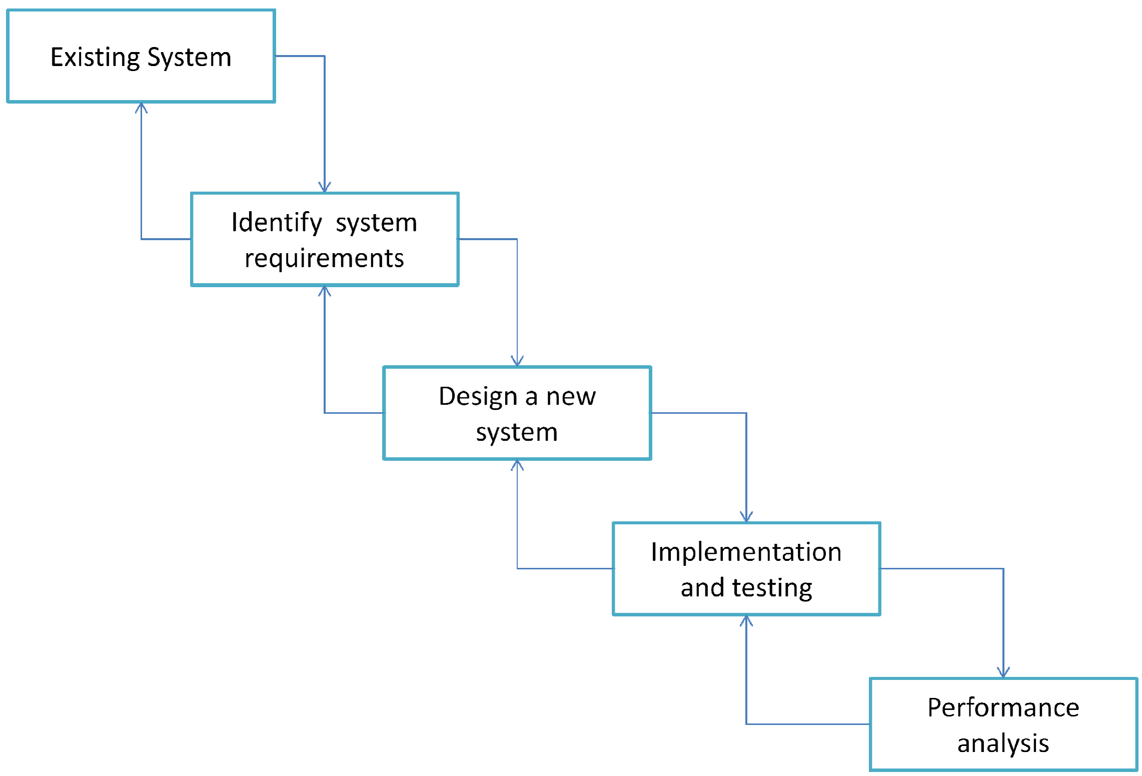

Fig 3: Modelling technique

General Constraints

- Operating system should be Linux to run NS2.
- User should know TCL & C++ languages.
- Since mobile node, router is wireless there is no acknowledgment for UDP packets.
- The protocol uses the UDP CBR packets to achieve real life scenario.

Non-Functional Requirements

Performance Requirements

The proposed system will increase efficiency of performance to the user who uses Mobile Ad-hoc network (MANET) by means of decreasing packet delay and packet loss and increasing throughput.

Security Requirements

The proposed system uses advanced security mechanisms to prevent various attacks on the network layer and ensure communication between the source and destination nodes , hence it provide secure service to the users.

Software Quality Attributes

The quality of the system is maintained in such a way to the user to maintain continuity of session without any interruptions and comfortable with it.

Proposed technique

In proposed technique, the battery power is optimized by following the energy efficient routing technique. The steps followed in this technique are as follows.

Step 1

All the nodes participating in the network are in *sleep* mode initially.

Step 2

The source node changes to the *awake* mode and starts sending route request randomly to the nearby nodes.

Step 3

The adjacent node that receives the route request is turned into *awake* mode and starts passing request to the neighbour till it reaches the destination node.

Step 4

The destination node initially in *sleep* mode, turns to *awake* mode once it receives the route request.

Step 5

The destination node replies to the route request in similar fashion followed during route request.

Step 6

Then the source node starts sending packets to destination in a shortest route as well as the nodes that are in range to the source node.

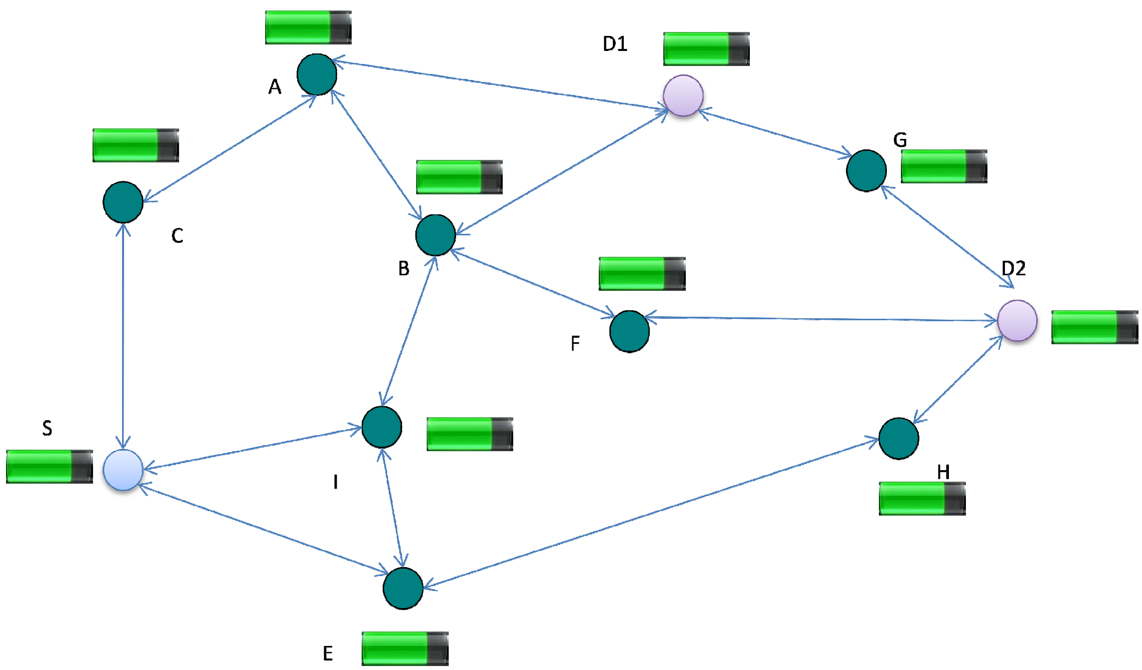

Fig 4: Proposed Technique

Proposed system sequence diagram

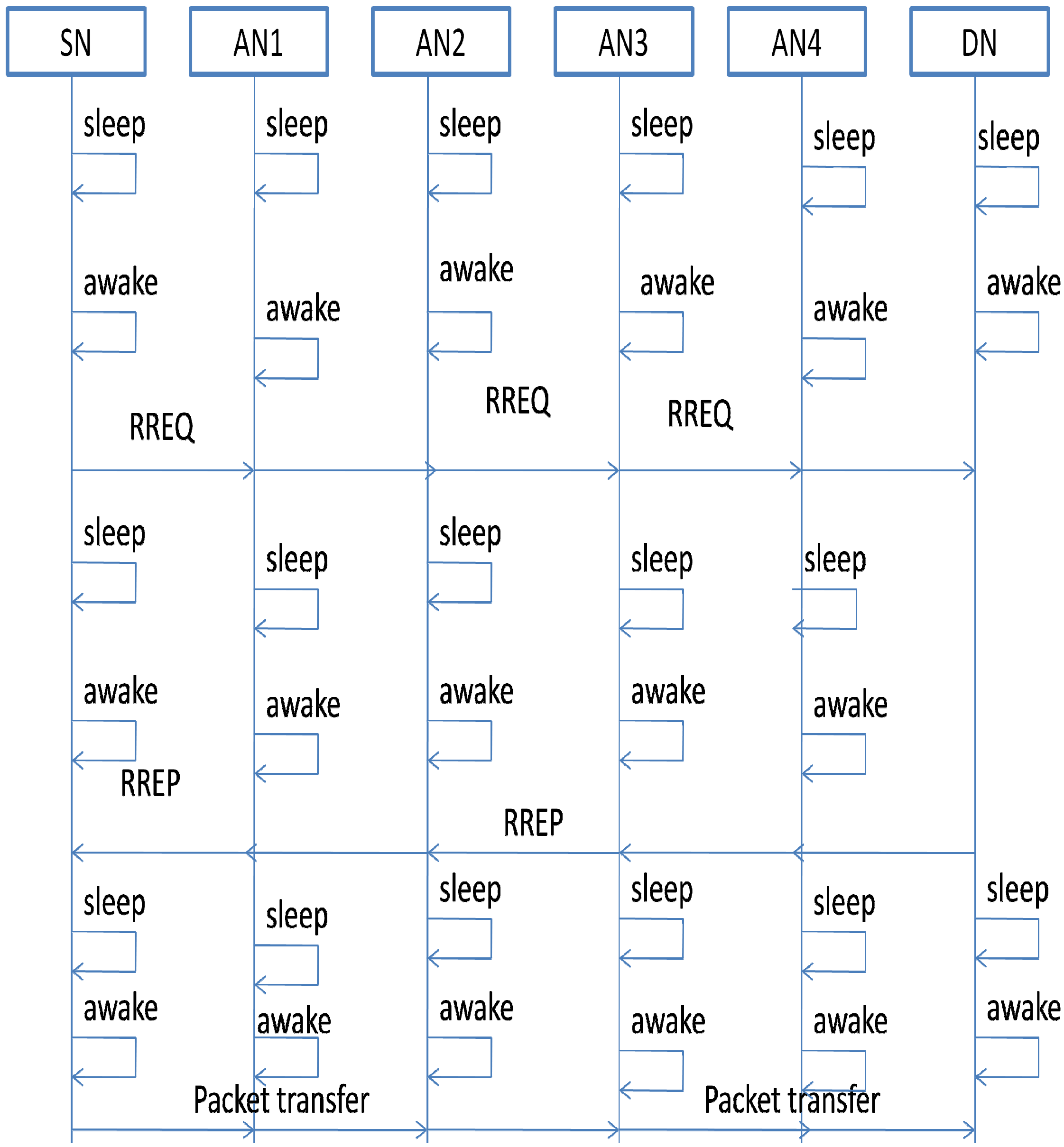

Fig 5: Proposed system sequence diagram

Conclusion

In this power efficient routing technique, before transferring packets the routes are analyzed and the routes with minimum distance to the source node are utilized for transferring packets, so that power required to amplify the signal to the nodes far from the source node is reduced. This technique manages the battery backup for all nodes participating in a network.

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