International Journal of Application or Innovation in Engineering & Management (IJAIEM)
Web Site: www.ijaiem.org Email: editor@ijaiem.org
Volume 4, Issue 5, May 2015 **ISSN 2319 - 4847**

TO DESIGN ENERGY EFFICIENT PROTOCOL BY FINDING BEST NEIGHBOUR FOR ZIGBEE PROTOCOL

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ABSTRACT

ZigBee is a worldwide standard of wireless personal area network targeted to low-power, cost-effective, reliable, and scalable products and applications. Different from the other personal area network standards such as Bluetooth, UWB, and Wireless USB, ZigBee provides the low power wireless mesh networking and supports up to thousands of devices in a network. Based on these characteristics, ZigBee Alliance has extended the applications to the diverse areas such as smart home, building automation, health care, smart energy, telecommunication, and retail services. In the given new strategy it finds or chooses the best node or data transmission and then after energy model helps in conservation of energy as well as routing cost balance. It reduces the network cost also. Simulations have been run using NS2. This simulation concludes the trace file which shows the visual transmission of data and energy traces for that network transmission.

Keywords— “ZigBee”,”shortcut Tree Routing”,”Energy”, “Neighbour table”,”Tree routing”

1. INTRODUCTION

As we all know that, Wireless Sensor Network has been a hot research topic now days. A Wireless Sensor Network may be designed with different objectives. It may be designed to gather and process data from environment in order to have best network and monitoring of that network. Flexibility, Self-organization, high sensing, low cost, low power consumption of Wireless Sensor Network is the characteristics for these standards. Zigbee has been made various developments in wireless pan network for remote monitoring, home control, and industrial automation as examples of the Zigbee Alliance. Zigbee Technology itself as well as the combination with other technologies will be playing a leading role in various fields. In Zigbee there is Tree Routing that is simplified routing where the node communication is restricted to parent-child links only. When an intermediate node receives a packet and the destination itself, it will forward the packet either downwards to its descendent nodes or upwards to its parent node along the tree. There is no routing discovery and any routing overhead in the tree routing. In the tree routing protocol, when packets transmitted from Source S to Destination D it follow tree topology for forwarding the packets to Destination D. It is simple to understand as well as easy to implement and use limited resources. In this routing, when node sense data from environment and want to send it to Destination D, it first checks if the Destination address is in address space of its descendants. If this is the case when Source simply transmit the data packet downwards to its descendants. Otherwise it transmits the packet upwards to its root node or parent node. When both parent and descendants are receive this packet they will select the hop node according to the destination address following the same manner. In this routing strategy we consider only parent child relationship not neighbor node.

The Main Drawback of tree routing is that it uses only the parent and relationship for routing, ignoring neighbor nodes. As a result, Data packet may be routed through several hops towards the destination even Destination node is nearby Sender node. So it would lead to end to end delay increase during data packet transmission, especially in the large networks, which results transmission imbalance and energy consumption. After that Taehong Kim and Youn-Soo Kim proposed Shortcut Tree algorithm and Extended Tree algorithm by using neighbor table which can reduce the routing hop. But how to select the neighbor nodes is not introduced. If there are unapt (not suitable) neighbor nodes, memory and complexity will be added. Nodes exhaustion is fast due to energy usage by the nodes.

2. PREVIOUS STRATEGY

The Improved Tree Strategy basically follows ZigBee tree routing algorithm, but chooses neighbor nodes as next hope nodes if the routing cost to the destination can be reduced. The neighbor table that we use in improved algorithm is defined in the ZigBee Specification, so we don’t need to make an effort to search neighbor list. In order to choose the next hope node that can reduce the routing cost, the remaining hope count from next hop node to the destination is computed for all the neighbor nodes including parent and children nodes. In the above the remaining hops to the destination for each neighbor can be computed assuming that the route from the neighbor to the destination goes along the tree. In this the route cost can be minimized if the sender transmits the data directly to the destination.

3. NEW STRATEGY

A.
New Strategy

Case 1: Destination is parent of source: The source node checks if its parent node is the destination node. If yes, then it will transmit the packets to the parent and stop.

Case 2: Destination is source's descendent: The source node checks if the destination address is one of its descendants. If yes then it will transmit the packets to its descendant. Then checks if the descendent is the destination. If yes, it means destination is found therefore stop. Otherwise, the descendent will search for the destination in its own descendents until the destination found.

Case 3: Destination is its neighbor: The source nodes checks if the destination address is one of its neighbors. If yes, then it will transmit the packets to the neighbors and stop.

Case4: Destination is its neighbor's descendent or parent: The source node checks if the destination address is one of its neighbor's descendents. If yes, it will transmit the packets to the neighbor. Then the neighbor will find the destination among its descendents.

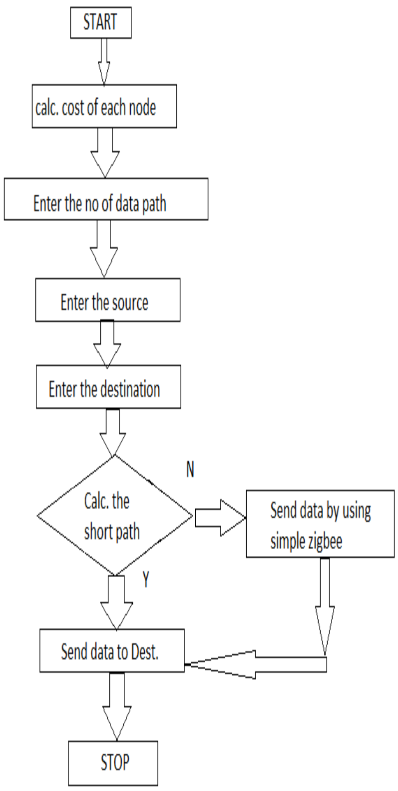


Figure 1: flow diagram of proposed system

4. EXPERIMENTAL RESULT AND ANALYSIS

The results for the energy efficient network and best path routing is simulated on NS2 i:e Network simulator -2 is the result of an on-going effort of research and development that is administrated by research at Berkeley. It is a discrete event simulator targeted at networking research. It provides substantial support for simulation of TCP, routing, and multicast protocols consider a network consisting of N=n sensor nodes distributed on d * d meter sq. area, all sensor nodes are configured in nonbeacon-enabled mode. Parameters of node are set. When the simulation is started, the first task of the scheduler is to schedule the events that are already predefined by the user in the scenario file. Thus ns TCL commands from the scenario file are scheduled first. Events like creating a new simulator object, starting nodes/traffic, node configuring, etc can be predefined, hence are scheduled first.

1) Throughput

In general terms, throughput is the rate of production or the rate at which something can be processed. When used in the context of communication network, such as Ethernet or packet radio, throughput or network throughput is the rate of successful message delivery over a communication channel. The data these messages belong to may be delivered over a physical or logical link or it can pass through a certain network node. Throughput is usually measured in bits per second (bit/s or bps), and sometimes in data packets per second (p/s or pps) or data packets per time slot.

Throughput defined from the number of useful bits per unit of time forwarded by the network from a certain source address to a certain destination, excluding protocol overhead, and excluding retransmitted data packets. Figure describes the comparison of ZTR and STR

$$\text{Throughput} = \frac{\text{No of packet received}}{\text{Simulation time}}$$

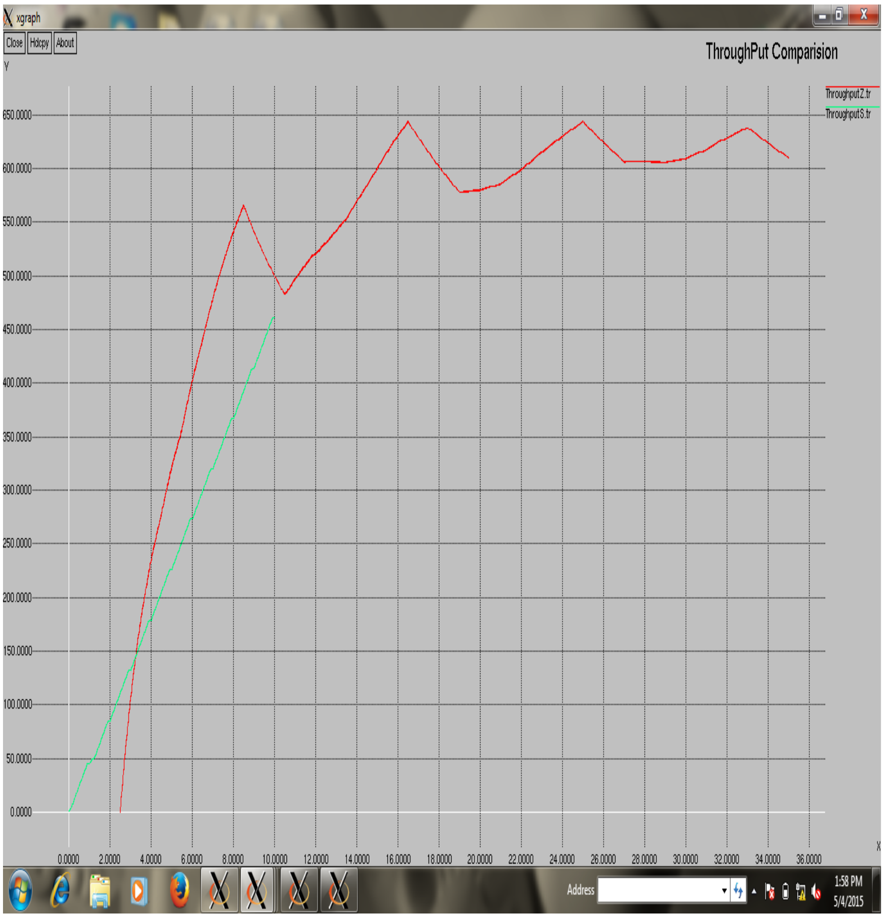


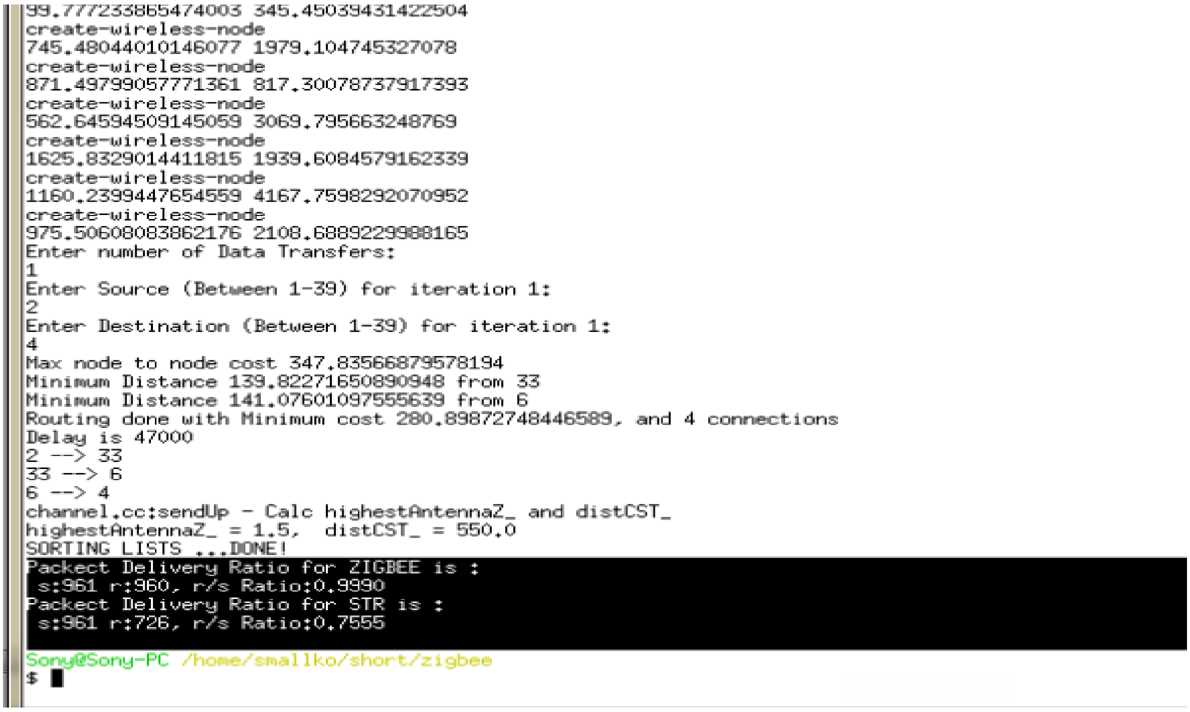
Figure 2: Throughput comparison between ZTR and STR.

2) Packet Delivery Ratio

Packet Delivery Ratio is defined as the average of the ratio of the number of data packets received by each receiver over the number of data packets sent by the source from Figure describes the comparison of ZTR and STR

$$\text{Packet delivery ratio} = \frac{\text{No of packet received}}{\text{No of packet send}}$$

Rather than plotting the graph for result calculation of the packet delivery ratio here it simply calculated on terminal by using the AWK file which can execute the trace file to calculate the packet delivery ratio of both STR and ZTR.



```
99.777233865474003 345.45039431422504
create-wireless-node
745.48044010146077 1979.104745327078
create-wireless-node
871.49799057771361 817.30078737917393
create-wireless-node
562.64594509145059 3069.795663248769
create-wireless-node
1625.8329014411815 1939.6084579162339
create-wireless-node
1160.2399447654559 4167.7598292070952
create-wireless-node
975.50608083862176 2108.6889229988165
Enter number of Data Transfers:
1
Enter Source (Between 1-39) for iteration 1:
2
Enter Destination (Between 1-39) for iteration 1:
4
Max node to node cost 347.83566879578194
Minimum Distance 139.82271650890948 from 33
Minimum Distance 141.07601097555639 from 6
Routing done with Minimum cost 280.89872748446589, and 4 connections
Delay is 47000
2 --> 33
33 --> 6
6 --> 4
channel.cc:sendUp - Calc highestAntennaZ_ and distCST_
highestAntennaZ_ = 1.5,  distCST_ = 550.0
SORTING LISTS ...DONE!
Packect Delivery Ratio for ZIGBEE is :
 s:961 r:960, r/s Ratio:0.9990
Packect Delivery Ratio for STR is :
 s:961 r:726, r/s Ratio:0.7555

Sony@Sony-PC /home/smallko/short/zigbee
$
```

Figure 3: Packet Delivery Ratio comparison between ZTR and STR.

3) Packet Drop

Packet loss occurs when one or more packets of data travelling across a network fail to reach their destination. Packet loss is typically caused by network congestion. When content arrives for a sustained period at a given router or network segment at a rate greater than it is possible to send through, then there is no other option than to drop packets. If a single router or link is constraining the capacity of the complete travel path or of network travel in general, it is known as a bottleneck.

Packet loss may be measured as frame loss rate defined as the percentage of frames that should have been forwarded by a network load were not forwarded due to lack of resources.

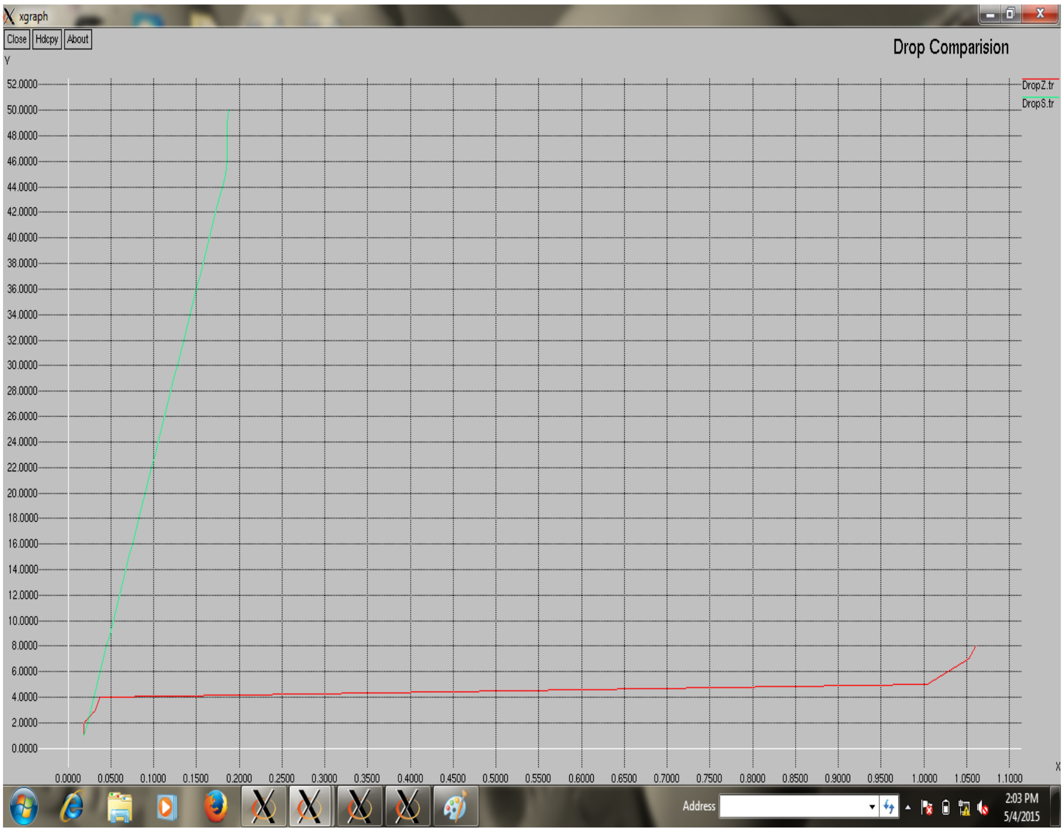


Figure 4: Drop comparison between ZTR and STR.

4) Energy

The main focus of the praposed system is on the energy. As shown in the below figure the comparision between the STR and ZTR energy is calculated and plot in the form of the graph. The graph completely shows that the praposed ZTR is definitely save some amount of energy in the network. The energy is calculated in the form of joules.

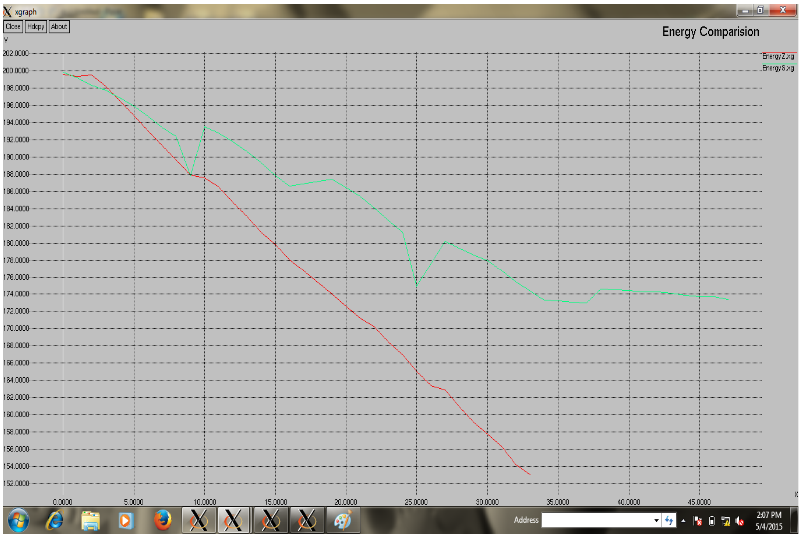


Figure 5: Energy comparison between ZTR and STR.

5. CONCLUSION

We have identified the detour path problem and traffic concentration problem of the ZTR. These are the fundamental problems of the general tree routing protocols, which cause the overall network performance degradation. To overcome these problems, we propose STR that uses the neighbour table, originally defined in the ZigBee standard. As we all know, there are a multitude of standards that address mid to high data rates for voice, PC LANs, video, etc. However, up till now there hasn't been a wireless network standard that meets the unique needs of sensors and control devices. Sensors and controls don't need high bandwidth but they do need low latency and very low energy consumption for long battery lives and for large device arrays. Here we have new strategy it finds or choose the best node or data transmission and then after energy model helps in conservation of energy as well as routing cost balance. It reduces the network cost also.

Finally, extensive quantitative and comparative experiments demonstrated the effectiveness of the proposed method compared to existing ones.

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