Design of Efficient Multi Path Wireless Sensor Network

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Abstract- In this paper we propose a traffic adaptability, fast data collection, less energy consumption in wireless sensor networks (WSNs). In order to reduce the energy consumption of wireless sensor nodes while having fast data collection under different traffic generating rates, this paper proposes a fast, adaptive, and energy-efficient Here we are implementing 8 nodes and transmitting the information without data collision . Here 8 nodes acts as multi-path-multi-channel data collection. During data transmission, time is divided into duty cycles, and each consists of two phases. This phases are trunk and twig phases. The former is to match parents and children of the entire WSN in a distributed manner in order to determine whether a node should be a parent acting as source, or download acting as data sink, or sleep mode in a particular slot;. Simulation results show that our protocol is able to achieve lower energy consumption, data reliability and low latency even during a high traffic load.

Index Terms- transmission, Sensor node, cycles

I. INTRODUCTION

A wireless sensor network is a collection of nodes organized into a cooperative network. Each node consists of processing capability (one or more microcontrollers, CPUs or DSP chips), may contain multiple types of memory (program, data and flash memories), have a RF transceiver (usually with a single omni-directional antenna), have a power source (e.g., batteries and solar cells), and accommodate various sensors and actuators. The nodes communicate wirelessly and often self-organize after being deployed in an ad hoc fashion. Systems of 1000s or even 10,000 nodes are anticipated. Such systems can revolutionize the way we live and work.

Currently, wireless sensor networks are beginning to be deployed at an accelerated pace. It is not unreasonable to expect that in 10-15 years that the world will be covered with wireless sensor networks with access to them via the Internet. This can be considered as the Internet becoming a physical network. This new technology is exciting with unlimited potential for numerous application areas including environmental, medical, military, transportation, entertainment, crisis management, homeland defense, and smart spaces.

Since a wireless sensor network is a distributed real-time system a natural question is how many solutions from distributed and real-time systems can be used in these new systems? Unfortunately, very little prior

WIRELESS SENSOR NODE

A node is aware of its location, and a message that it is "routing" contains the destination address. This node can then computes which neighbor node makes the most progress towards the destination by using the distance formula from geometry. It then forwards the message to this next hop. In variants of GF, a node could also take into account delays, reliability of the link and remaining energy.

Another important routing paradigm for WSN is directed diff usion [11]. This solution integrates routing, queries and data aggregation. Here a query is disseminated indicating an interest in data from remote nodes. A node with the appropriate requested data responds with an attribute-value pair. This attribute-value pair is drawn towards the requestor based on gradients, which are set up and updated during query dissemination and response. Along the path from the source to the destination, data can be aggregated to reduce communication costs. Data may also travel over multiple paths increasing the robustness of routing.Beyond the basics of WSN routing just presented, there are many additional key issues including:

Reliability: Since messages travel multiple hops it is important to have a high reliability on each link,otherwise the probability of a message transiting the entire network would be unacceptably low. Significant work is being done to identify reliable links using metrics such as received signal strength, link quality index which is based on "errors," and packet delivery ratio. Significant empirical evidence indicates that packet delivery ratio is the best metric, but it can be expensive to collect then use the reverse path for acknowledgements.

Integration with wake/sleep schedules: To save power many WSN place nodes into sleep states. Obviously,an awake node should not choose an asleep node as the next hop (unless it first awakens that node).

Unicast, multicast and anycast semantics: As mentioned above, in most cases a WSN routes messages toa geographic destination. What happens when it arrives at this destination? There are several possibilities. First, the message may also include an ID with a specific unicast node in this area as the target, or thesemantics may be that a single node closest to the geographic destination is to be the unicast node. Many routing schemes exist for supporting efficient flooding.

Real-Time: For some applications, messages must arrive at a destination by a deadline. Due to the highdegree of uncertainty in WSN it is difficult to develop routing algorithms with any guarantees. Protocols such as SPEED [5] and RAP [6] use a notion of velocity to prioritize packet transmissions. Velocity is a nice metric that combines the deadline and distance that a message must travel.

Mobility: Routing is complicated if either the message source or destination or both are moving. Solutionsinclude continuously updating local neighbor tables or identifying proxy nodes which are responsible for keeping track of where nodes are. Proxy nodes for a given node may also change as a node moves further and further away from its original location.

Voids: Since WSN nodes have a limited transmission range, it is possible that for some node in therouting path there are no forwarding nodes in the direction a message is supposed to travel. Protocols like GPSR [3] solve this problem by choosing some other node "not" in the correct direction in an eff ort to find a path around the void.

Security: If adversaries exist, they can perpetrate a wide variety of attacks on the routing algorithmincluding selective forwarding, black hole, Sybil, replays, wormhole and denial of service attacks. Unfortunately, almost all WSN routing algorithms have ignored security and are vulnerable to these attacks. Protocols such as SPINS [23] have begun to address secure routing issues.

Congestion: Today, many WSN have periodic or infrequent traffic. Congestion does not seem to be abig problem for such networks. However, congestion is a problem for more demanding WSN and is expected to be a more prominent issue with larger systems that might process audio, video and have multiple base stations (creating more cross traffic).

Node Localization

Node localization is the problem of determining the geographical location of each node in the system. Localization is one of the most fundamental and difficult problems that must be solved for WSN. Localization is a function of many parameters and requirements potentially making it very complex.

II. PROPOSED ARCHITECHTURE

Each duty cycle of our protocol contains two phases, namely Slot Assignment and Data Transmission. Firstly, Slot Assignment is performed in order to schedule the activity of each node in each time slot in the Data Transmission phase. Note that there are three possible activities to be scheduled in each slot for a node, which are download, upload, and sleep. Coordination between nodes at two neighboring levels is required as when a child node is uploading, the corresponding parent node has to be in the download mode. In the Data Transmission phase, on the other hand, time is divided into a fixed number of, say *m* frames, and each frame contains a fixed number of, say *n*, slots. The duration of a slot is just enough for the transmission of a packet from one node to the next. In order to prevent interference, a multi-channel approach is used in which each node has a receiving frequency channel that is different from all neighboring nodes. All nodes will then followthe schedule determined in the Slot Assignment phase to perform activities in each slot in a frame, and the frame pattern will repeats *m* times until this duty cycle ends and the next begins. The details of the Slot Assignment and Data Transmission phases are discussed in the following subsections.

They are Trunk phase and twig phase. In trunk phase the data is transmitted in the way of folded tree architecture. Twig phase is used to receive the data. The saved elements of trunk phase and twig phase are same.

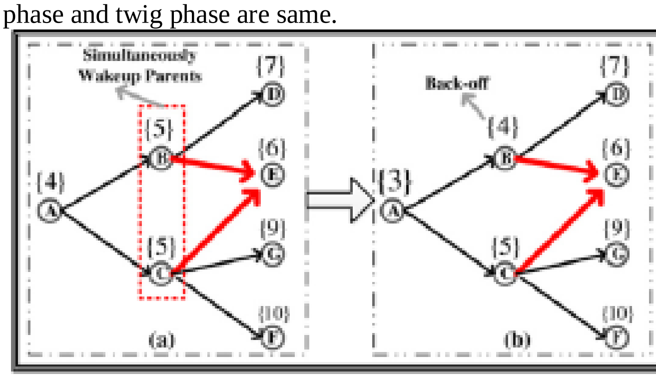

Fig.1 : Structure Topology block

In the trunk phase the left value L is saved locally as Lsave and it is added to the right value R, which is passed on toward the root. This continues until the parallel prefix element 15 is found at the root. Note that each time, a store and calculate operation is executed.

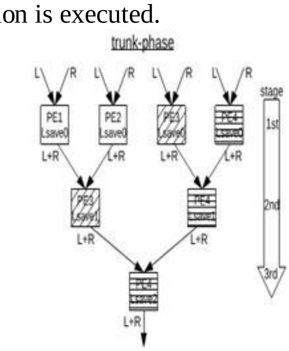

Fig.2: Trunk Phase implementation

The twig phase starts, during which data moves in the opposite direction, from the root to the leaves. Now the incoming value, beginning with the sum identity element 0 at the root, is passed to the left child, while it is also added to the previously saved Lsave and passed to the right child. In the end, the reduced prefix set is found at the leaves.

III. RESULTS

The wireless sensor networks details have been designed in Xilinx project navigator and used in simulation and the required results are obtained which are shown below in Figure2 & Figure3.

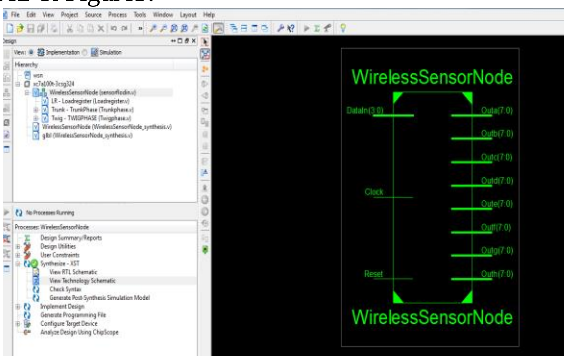

Fig.3: Top module of Wireless sensor module.

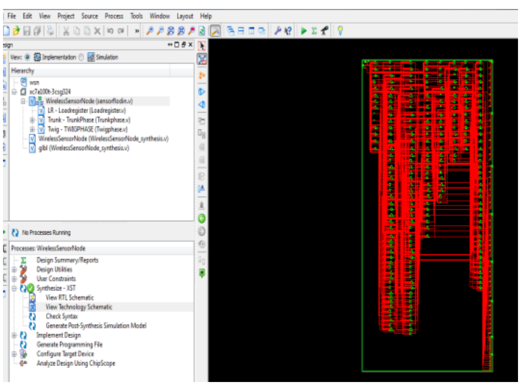

Fig.4: Internal Block Diagram of Wireless sensor module.

IV. SUMMARY AND CONCLUSION

In this paper we are able to achieve the lower energy consumption. Thus, it can prolong the network lifetime. Besides that, our protocol does not use a fixed scheduling. An adaptive scheduling based on the traffic load allows our protocol to achieve the low latency during the high traffic load. In additional, the combination of slot allocation and multi-channel division provides a collision free data transmission result that each of the node can directly send out packet without waiting a back off period and sensing channel. Thus, the outgoing traffic load of each node is increased result that our protocol is able to achieve data reliability in high traffic load. Performance and results are validated through simulation results.

V. REFERENCES

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