ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 8, August 2016

R3E: Reliable Reactive Routing for Remote Sensor Networks

Sayali P. Gaikwad, Dr. Achala Deshmukh

Department of Electronics & Telecommunication, Sinhgad College of Engineering, Pune, India

ABSTRACT: Giving dependable and effective correspondence under blurring channels is the real specialized difficulties in remote sensor systems (WSNs), particularly in mechanical WSNs (IWSNs) with dynamic and brutal situations. Here we present the Reliable Reactive Routing to increase the ability to quickly recover back from difficulties of link failure for WSNs/IWSNs. R3E is proposed to improve existing routing protocols to provide strong, capable and energy saving message transfer against the untrusted wireless paths by using the local path information. In route finding procedure, a biased back off scheme is introduced to find a strong and dependable guiding path that provide coordinated forwarding. Here, we measure the weight of the link, define forward energy density, traffic crowding experienced by the nodes and the intrusion effect is analyzed. So, based on this the path is to be selected for routing. Analysis results in high message transfer ratio and less delay, less energy consumption and less data transmission cost.

KEYWORDS: Industrial wireless sensor networks (IWSNs), coordinated forwarding, untrusted wireless links.

I. INTRODUCTION

Remote Sensor Networks (WSNs) have become an established technology for huge number of applications ranging from monitoring, to event detection and target tracking. In industries too, the traditional wired communication has been replaced by WSNs since the mechanical Wireless Sensor Networks (IWSNs) offer several benefits including simple and quick installation and lowcost maintenance. In IWSNs, loosing and delaying of process data and control data may cause due to transportation failure which is unbearable in industrial applications, as it may create issues in industrial automation process resulting in economic losses. Reliable Reactive Routing improvises the recovery from link failures for WSNs/IWSNs. R3E is thus proposed to improve existing routing protocols to provide strong, capable and energy saving message transfer against the untrusted wireless paths by using the local path information.So, here AODV protocol is extended with R3Ewhich effectively improves durability, end-to-end energy consumption and latency in IWSN. The idea of opportunistic routing is, in each hop, neighboring nodes that hold the copies of a data packet serve as stores, thus the node down the link can recover the packet from any of the nodes up the link. The rationale is that, the path with higher spatial diversity may possibly provide more dependable and efficient packet transmission against the untrusted links. With this observation, we aim to find such a efficient virtual path to guide the packets to be progressed toward the destination. The general direction towards the destination, and the routing decision is made a *posteriori*, i.e., the actual senders are chosen based on the packet reception results at each hop. Remote Sensor Networks may fail due to lack of energy of the sending nodes. Hence, it is imperative to find the nodes that will provide services for long time. For mechanical WSNs, due to rough and dynamic nature of the links it is necessary to ensure reliable data delivery from source to destination. The protocols are classified as flat based, hierarchical-based and location-based. We can specialize in the load equalization multi-path flat routing protocol in WSNs. Once all sensors have equal initial power and equal probabilities to become sources, network might maximize its life if all detector sensors dissipate energy at equal rate, since no loss of connectivity would result from node failure. In this paper, we have proposed a new methodology to balance energy consumption and keep approximate network wide energy equivalence by equalizing the network load. Our approach concentrates on a way to change the routing methods so as to equalize load. Many routing protocols are projected for WSNs; we will classify them into either proactive or reactive. Proactive routing protocols update routes for each try of nodes at equal intervals regardless of their demand. The on-demand routing protocols verify route if we have to transmit a knowledge packet, initiating a broadcasting query-reply (RREQ-RREP) procedure. Most of those protocols use min-hop because of the route choice metric. It is found that shortest path route has short life, particularly in extremely dense accidental

DOI: 10.15680/IJIRCCE.2016. 0408059

networks even with low quality, attributable to edge impact. In rest of this paper, we presents the connected work studies. In section III, discussed the proposed framework, algorithm steps and design. Section IV, presenting the system architecture. Section V, discussing about simulation results and parameters and finally the conclusion.

II. PROPOSED METHODOLOGY

The use of remote sensor networks (WSNs) has grown widelydirecting towards the urgent need for scalable and energy-saving routing and data collecting in corresponding large-scale environments. SLQDEARP is an on-demand unipath routing protocol. The SLQDEARP takes benefit of various features of AODV routing protocol and estimates link quality and selects the delay and energy aware path towards the destination node. In SLQDEARP the first node based on the received signal strength estimates link quality. Then the delay and power cost are also estimated. The node which is having more link quality is taken into account. If more number of nodes are having the same link quality, then the node which is having least delay and energy is chosen. An adaptive node stability mathematical modeling is proposed SLQDEARP finds the efficient node by estimating quality of link, delay and power and sends the data packets through that node. Also ad-hoc security algorithms are incorporated for the secure transmission. Thus comparison of AODV and ASA algorithm is been carried out to calculate energy consumption, end to end delay and packet lost.

A)Forward -aware factor based efficient selection routing method

Based on the detailed analysis of the data transmission mechanism of WSN, quantify the forward transmission area, measure the weight of the link, define forward energy density, traffic crowding experienced by the nodes and the intrusion effect is analyzed**.** So, based on this the path is to be selected for routing.To extend the network lifetime an innovative technique is proposed which is called Efficient Selection of Route based on awareness of **L**ink weight and **F**orward energy density, **T**raffic congestion, **I**nterference level (ESR-LFTI).

I. In this technique, the next-hop node is selected according to the awareness of link weight and forward energy density. Furthermore, a spontaneous reconstruction mechanism for local topology is designed additionally.

II. Traffic congestion is experienced by the nodes when incoming traffic is much higher than outgoing traffic. Smart metering nodes buffer the incoming packets in finite size queue and start dropping any new incoming packets when queue is full. Nodes which serve maximum number of nodes in multi hop transmission (like the ones close to sink) are likely to experience maximum traffic load leading to traffic congestion.

III. Many routing messages are propagated unnecessarily and may cause different interference characteristics during route discovery phase and in the actual application data transmission phase. As a result incorrect routes may be selected. The main intent is to design solutions which make more accurate routing decisions by reducing the interference level during the route discovery phase and making it more similar to that during the actual data transmission phase.

So, based on the four factors such as Link weight and Forward energy density, Traffic congestion, Interference level the path is selected for routing.

B)Reliable Guide Path Discovery

If a node has data packets to send to a destination, it initiates a route finding by sending an RREQ message. When a node receives a RREQ, it stores the upstream node id and RREQ's sequence number for reverse route learning. Instead of rebroadcasting the RREQ immediately in existing reactive routing protocols, we introduce a biased back-off scheme at the current RREQ forwarding node. The aim of this operation is to intentionally amplify the differences of RREQ's traversing delays along different paths.

When a node receives an RREP, it checks if it is the selected next-hop (the upstream guide node) of the RREP. If that is the case, the node realizes that it is on the guide path to the source, thus it marks itself as a guide node. Then, the node records its upstream guide node ID for this RREP and forwards it. In this way, the RREP is propagated by each guide node until it reaches the source via the reverse route of the corresponding RREQ.

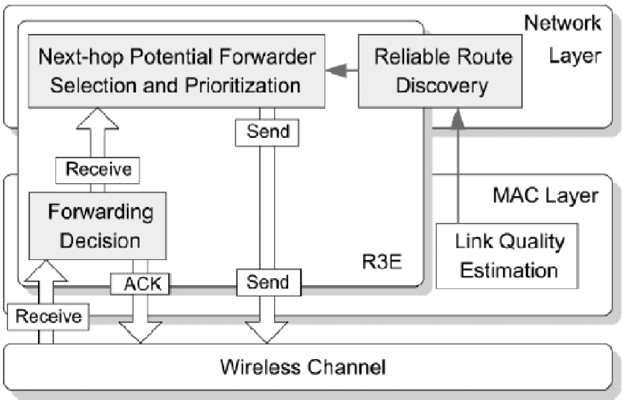
C) Route selection algorithm design

In this module, the optimal path is selected based on weight of the link, define forward energy density, traffic crowding experienced by the nodes and the intrusion effect., interference level.

In this method, the remaining energy level is computed based on the subtraction from the initial energy to the processing energy.

III. SYSTEM MODEL

Reliable Reactive Routing Enhancement (R3E) project defines idea of R3E which is used as an extension over the AODV protocol. This enhances the AODV routing protocol to provide reliable and energy saving packet conveyance against the condition of Link Failure which may occur in remote sensor network. Figure below shows the functional architecture of R3E. It is a middle-ware design across the MAC and the network layer. The R3E enhancement layer module consists of three main modules, Reliable Route discovery module, potential forwarder selection and prioritization module and forwarding selection module. The reliable route discovery module finds the route information for each node. The other two modules are responsible for the runtime forwarding phase. Forwarding decision module check if the node receiving the packet is one of the intended receivers if it is true then the node will store the incoming packet. The potential sender selection and prioritization module attaches the ordered sender list in the data packet header for the next hop. Lately the outgoing packet will be submitted to the MAC layer and forwarded towards the destination.



IV. SIMULATION RESULT

The simulation analyses for R3E while the data transmission and certificate revocation based security is implemented using Network Simulator NS2. The simulation is done by comparing the R3E protocol with the AODV protocol. The simulation is done for calculating Energy Consumption, Packet delivery ratio, End-to-End Delay and Packet Lost using R3E whose results are shown in Figure below.

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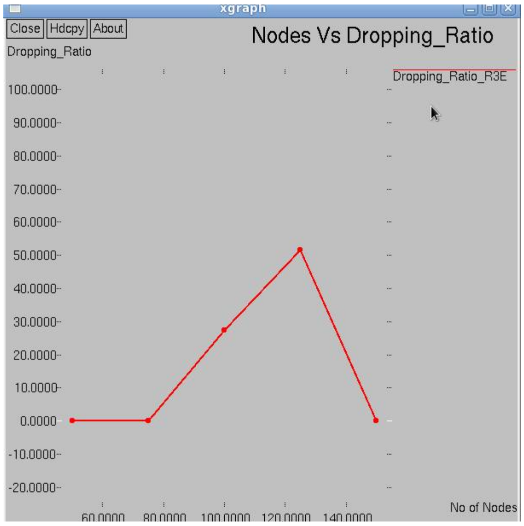


Figure 1: Graph of nodes versus packet dropping ratio

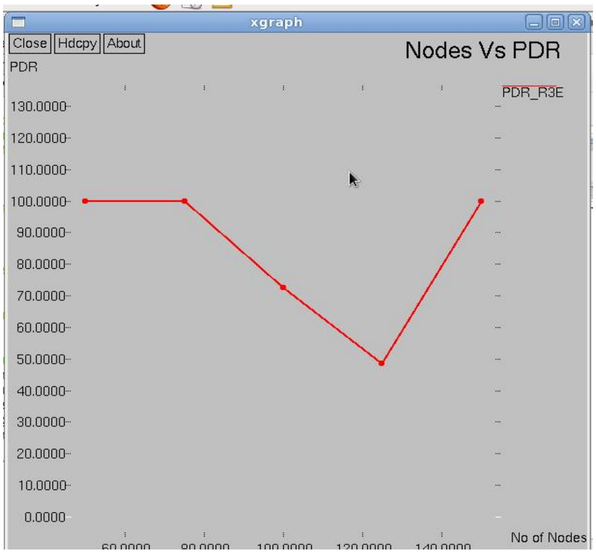


Figure 2: Graph of nodes versus packet delivery ratio.

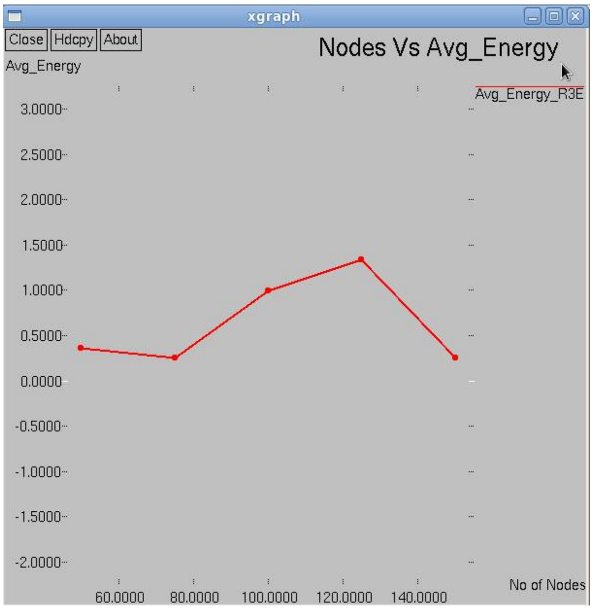


Figure 3: Graph of nodes versus energy consumption.

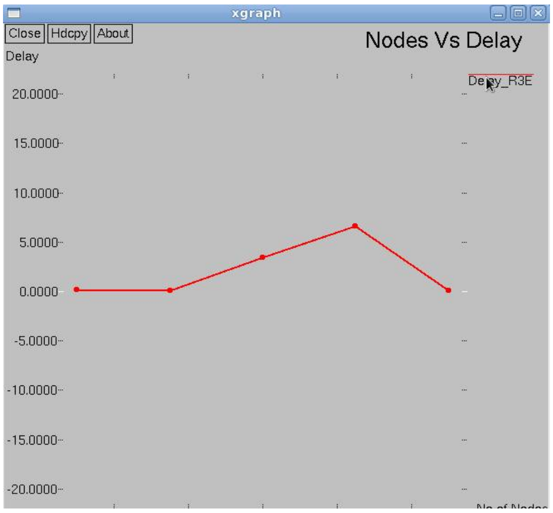
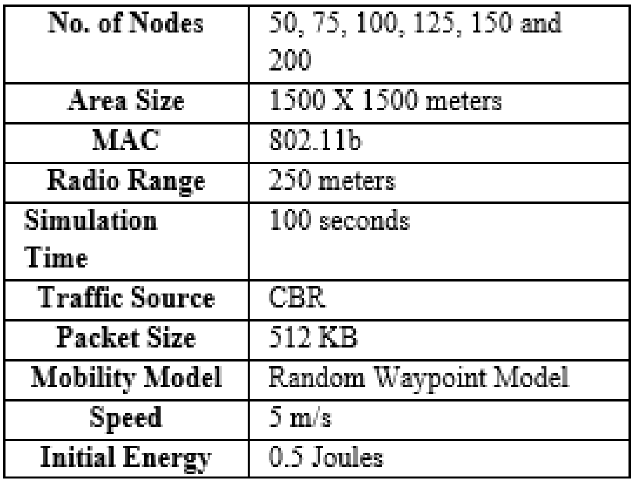


Figure 4: Graph of nodes versus packet delay.

Table 1: Simulation Settings and Parameters



No. of Nodes	50, 75, 100, 125, 150 and 200
Area Size	1500 X 1500 meters
MAC	802.11b
Radio Range	250 meters
Simulation Time	100 seconds
Traffic Source	CBR
Packet Size	512 KB
Mobility Model	Random Waypoint Model
Speed	5 m/s
Initial Energy	0.5 Joules

The output design includes the following parameters

a. Packet drop = Number of packets received – Number of packets sent
b. Packet delivery ratio = (Number of packets received/ Number of packets sent)*100
c. Energy consumption = Average energy consumption on idle, sleep, transmit & received.
d. Delay = (Interval of 1st packet delivery time & 2nd packet delivery time)/ Total data packet delivery time

V. CONCLUSION AND FUTURE WORK

In this work, we presented R3E, with a very good scalability; this approach is applicable to both small size WSNs and WSNs with larger number of nodes.Using R3E in WSNs it provides reliable and energy-efficient packet delivery against the unreliable wireless links. A biased back-off scheme is used in the route discovery phase to find a strong guiding path with low overhead. But the disadvantage is due to the limited energy and communication ability of sensor nodes, it seems especially important to design a routing protocol for WSNs so that sensing data can be transmitted to the receiver effectively. So, in the proposed system a new technique is introduced which is called Efficient Selection of Route (ESR-LFTI) based on awareness of **L**ink weight and Forward energy density so, based on this the path is to be selected for routing. The proposed SLQDEARP takes advantage of various features of AODV routing protocol and estimates link quality and also selects the delay and energy aware path towards the destination node.SLQDEARP finds the efficient node and sends the data packets through that node. Also ad-hoc security algorithms are incorporated for the secure transmission. Thus comparison of AODV and ASA algorithm is been carried out to calculate energy consumption, end to end delay and packet lost**.**

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