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Traffic Prediction and Routing Based On Ns2

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ABSTRACT: Performance and Security are two critical functions of Networks. The design of the link model of the sensors and the energy optimization of the routing protocol in wireless sensor networks based on the Gaussian network link model in this research. The research proposes a fresh wireless sensor network link model through the node-symmetric and four distinct directions to four neighbouring nodes of each node in the Gaussian network model, on which the network region will be split into some virtual square grids. Some simulations have been introduced in NS2. Thus proposing a routing technique, which is a mixture of the Gaussian network's shortest path routing protocol and clustering protocol to enhance the routing effectiveness of the wireless sensor network.

KEYWORDS: load balancing, energy efficiency, prediction, routing.

I. INRODUCTION

Ultra-reliable low-latency communications (URLLC) is one of the cornerstones of the upcoming fifth generation (5G) New Radio (NR) cellular system framework, together with enhanced mobile broadband (EMBB) and massive machine type communications (MMTC). The key requirements of URLLC as per the Third Generation Partnership Project (3GPP) are to minimize the over-the-air latency of user plane data (at most 0.5 ms on average), while simultaneously ensuring very high packet reception reliability (error rates of at most 10–5). These constraints are expected to be critical for cutting-edge network applications such as augmented/virtual reality, autonomous ground vehicles, industrial Internet of Things (IOT) applications such as factory automation, pilotless aircraft, and remote surgery. The 3GPP URLLC standardization and academic studies have therefore been focused on the NR physical layer design needed to achieve the latency and reliability criteria. The interplay of URLLC latency and energy efficiency (EE) has received less attention. For example, initial studies have been performed on delay-aware downlink scheduling algorithms. While EE aspects of 5G EMBB systems have been studied previously, the latency criterion of URLLC invites further analysis. From a system perspective, network infrastructure EE and device or user equipment (UE) EE are equally important. About 80 percent of a mobile network's energy is consumed by base station sites, and carbon emissions from network infrastructure account for over 2 percent of the global total. On the other hand, a typical approach for increasing EE is to reduce the transmission or reception durations of network nodes in order to conserve power, which tends to increase packet delays. The endeavour of this article is to explore the emerging URLLC system architecture and some of the associated trade-offs between delay and EE that have not yet been addressed in the standardization process. The proposed solutions may be employed individually or in combination, depending on the specific needs of the network deployment. The article concludes with avenues for further research in the final section.

II. EXISTING WORK

Recently, a modelling for the interconnection network is proposed, which is called as the Gaussian network. The Gaussian network is represented by the set of Gaussian integers. One of the advantages of the Gaussian network over the torus network is that for a given number of nodes, N, the diameter of the Gaussian network can be much less than that of the torus network. This is a good metric for forwarding a message from the source node to the destination node. The shortest routing route can be as long as the k diameter of the network. If its worst-case time complexity is asymptotically O(k), Furthermore, there are two edge disjoint Hamiltonian cycles in the Gaussian network based on the node symmetry and four neighbouring nodes, so that all nodes can be linked through these Hamiltonian cycles. The drawbacks of existing are: Cluster formation all nodes are mobile nodes so routing strategies may be regularly changed that will decreases the performance energy. [1]The paper presents a self-organizing, wireless mobile radio network for multimedia support. The proposed architecture is distributed and it has the capability of rapid deployment and dynamic reconfiguration. Without the need of base stations, this architecture can operate in areas without a wired backbone infrastructure. This architecture provides an instant infrastructure for real-time traffic transmission. Based on the instant infrastructure, a stable and loop-free routing protocol is implemented.[2] Mobile Ad-Hoc Network (MANET) is a collection of wireless mobile hosts forming a temporary network without the aid of any stand-alone infrastructure or centralized administration. Most of the proposed MANET protocols do not address security issues. In MANETs routing algorithm is necessary to find specific routes between source and destination. The primary goal of any ad-hoc network routing protocol is to meet the challenges of the dynamically changing topology and establish an efficient route between any two nodes with minimum routing overhead and bandwidth consumption. The existing routing security is not enough for routing protocols. An ad-hoc network environment introduces new challenges that are not present in fixed networks. A several protocols are introduced for improving the routing mechanism to find route between any source and destination host across the network. In this paper present a logical survey on routing protocols and compare the performance of AODV, DSR and DSDV.[3] In Ad-hoc wireless networks, mobility management faces many challenges. Mobility of the nodes causes the network topology to change. The routing protocols must dynamically re-adjust to these changes in order to keep the accurate routes. Therefore, the routing updates traffic overhead is very much high. Generally, different types of mobility patterns have different impact on the network protocols or applications. Thus, the network performance is strongly affected by the nature of mobility pattern. In this paper, we present a survey of various mobility models in ad-hoc networks. One of the main purpose of this paper is to investigate the impact of the mobility model on the performance of a specific network protocol or application. The results indicate that different mobility patterns affect the various protocols in different ways. Specifically, the ranking of routing algorithms is influenced by the choice of mobility pattern.[4] Continuous *k*-nearest neighbor (C*k*NN) search is a variation of *k*NN search that the system persistently reports *k* nearest moving objects to a user. For example, system continuously returns 3 nearest moving sensors to the user. Many query processing approaches for C*k*NN search have been proposed in traditional environments. However, the existing client-server approaches for C*k*NN search are sensitive to the number of moving objects. When the moving objects quickly move, the processing load on the server will be heavy due to the overwhelming data. In this thesis, we propose a distributed C*k*NN search algorithm (DC*k*NN) on wireless sensor networks (MANETs) based on the Voronoi diagram. There are four features about DC*k*NN: (1) each moving object constructs a local Voronoi cell and keeps the local information; (2) in order to keep the reliability of system, the query message will be propagated to related objects; (3) using the idea of safe time, the number of updates is reduced; (4) an equation to estimate a more accurate safe time is provided. Last, we present our findings through intensive experiments and the results validate our proposed approach, DC*k*NN.

III. PROPOSED WORK

Minimizing each node's energy consumption and prolonging the lifetime of the network are often considered the WSN's most important research goals. The writers in demonstrate that extending clustering's network lifetime is longer than the hierarchical architecture. The writers in demonstrate that maximizing the lifetime of a network is a significant goal in developing and deploying a WSN. To accomplish this objective, clustering sensor nodes is an efficient topology control method. The writers in demonstrate that clustering is one of the efficient ways to prolong a WSN's lifetime and increase its scalability.

1. System Construction Module
2. Self-Organization Phase
3. Current Cluster Setup Cycle Length
4. Performance Evaluation

1. System Construction Module:

In this Module, After the deployment of the sensor nodes, the BS creates groups of different sensor nodes in order to form clusters is shown in ***Fig 1.*** Each cluster contains a CH node and two DCH nodes. The BS selects a set of suitable sensor nodes from each cluster, which can act as CH or DCH at a later stage. This set of nodes is also called CH panel.

The cluster members i.e., the sensor nodes, forward data to the respective CH node. The CH nodes do the data aggregation to remove redundancy and then forward the aggregated data toward the BS. The DCH nodes do several cluster management tasks that include mobility monitoring also. Other cluster management tasks are, for example, collecting location information of cluster

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members regularly and communicating this location information to the BS.
They also remain ready to act as intermediate hop in presence of faults in some CH nodes. Therefore, the DCH nodes are also called cluster management nodes. The CH nodes do not transmit data directly to the BS, unless it is the nearest one to the BS. The communication pattern or the route for the CH nodes is determined by the BS and distributed to the respective CH nodes.

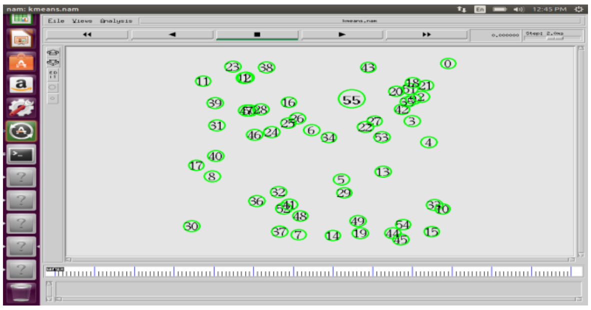

Fig 1. system construction modules

2. Self-Organization Phase

In this module, After random deployment of the sensor nodes in the sensor field, the self-organization phase starts is shown in ***Fig 2.*** It is the first phase of the protocol. During this phase, the clusters are formed. The CH set, the current CH, and the two DCH nodes are selected by the BS. Initially, the BS collects the current location information from each of the sensor nodes and then forms a sensor field map. The sensor nodes can discover their geographic location information through some GPS-free solutions. Based on the velocity of a sensor node, the BS can prepare a rough estimate of the zone in which the sensor node is going to be in the next time interval. The next time interval is a specific time period for which a particular setup of the network remains valid.

The value of the next time interval can be set manually depending on the type of the application, and this value is critical because most of the computations, e.g., cluster setup validity period and medium access slot, are dependent on the next time interval. Using this information, the BS can compute the topology of the sensor network. Once the BS creates the sensor field map, it forms the clusters. The cluster formation approach is simple. The basic objective is to maintain geographically uniformly distributed clusters so that the coverage is uniform. It is also desired that the CH nodes are uniformly distributed over the entire sensor field.

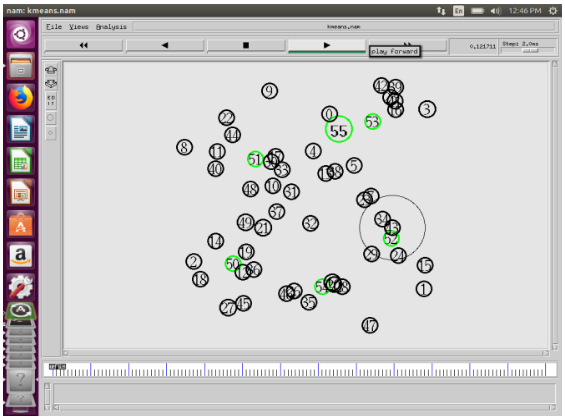

Fig 2. self organisation phase

3. Current Cluster Setup Cycle Length:

An important and critical issue is how long a particular cluster setup will remain valid. Depending on the initial energy level of the sensor nodes and the kind of application, the optimal time duration is fixed. This optimal time duration is called as cycle length, and the current cluster setup remains valid until the end of the cycle length is shown in ***Fig 3***. However, exception may always occur.

For example, due to mobility of the nodes, severe link failures may occur, and nodes may die out due to depletion of energy, which may together cause network partition. In such situations, current cluster validity time, i.e., cycle length, may become outdated, and re clustering may get initiated by the BS before expiry of the cycle length. Ideally, cycle length is the same as the next time interval aforementioned.

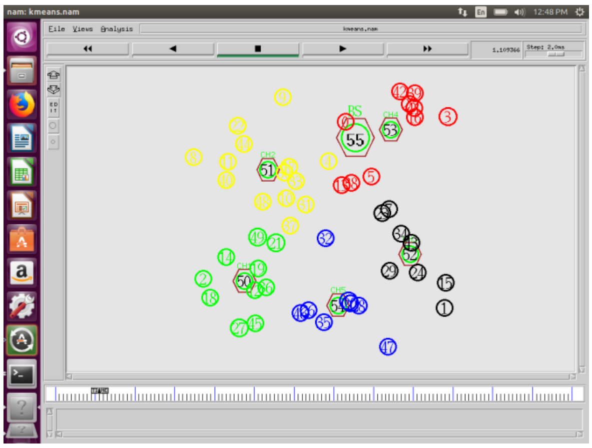

Fig 3. current cluster setup length

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4. Performance analysis.

For the simulation purpose, NS2 has been taken as simulation tools, and two attributes are taken for analysis purpose. No of generated packets, throughput, average and end-to-end delay are considered as the parameters for the purpose of comparisons and performance analysis is shown in ***Fig 4.***

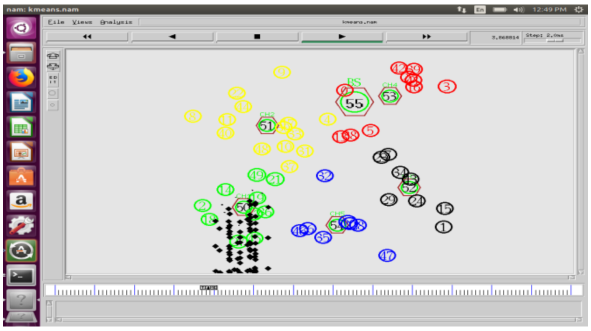


Fig 4 performance analysis and data transmission

IV. PERFORMANCE EVALUATION AND RESULTS ANALYSIS

The network performance, such as System delay, Packet loss rate, Throughput and other key indicators are shown in ***fig 5***. By running of TCP and UDP protocols, we make the analysis and evaluation to network performance from different aspects, and then, associated parameters were compared graphically. Simulation results and conclusions have a positive referenced value for the design of wireless network topology and the configuration of network elements. **The following metrics are used to understand the performance of our routing approach:**

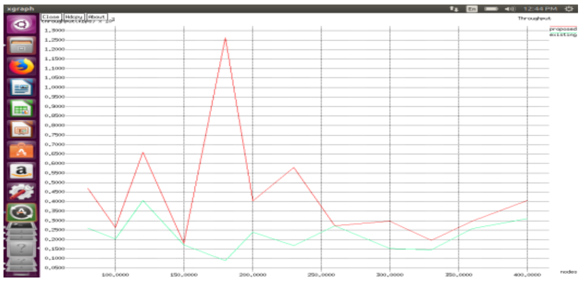
Throughput: It is the ratio between the actual numbers of packets transmitted by the nodes in the system to the numbers of successfully delivered packets at the BS. It reflects the percentage of packets lost during transmission. A protocol with higher throughput is desirable.***fig 5(a)***

Alive node: It is the number of **nodes** that sends data to the sink directly after aggregating the data. Increase the **Alive Nodes** based on the Cluster Head Selection Algorithm for Heterogeneous Wireless Sensor Networks.***fig 5(b)***

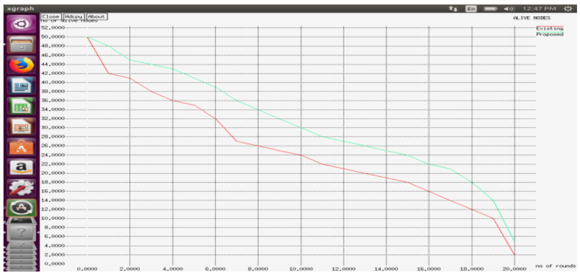
Average Communication Energy: It is the average of the total energy spent due to communication in the network over a particular time period and with respect to a specific data rate. If E is the total energy spent due to communication and N is the total number of nodes in the system, then E/N (i.e., energy per node) is the average communication energy. A protocol with lower average communication energy is desirable. ***fig 5(c)***

Delay: End-to-end delay or one-way **delay** (OWD) refers to the time taken for a packet to be transmitted across a network from source to destination. It is a common term in IP network monitoring, and differs from round-trip time (RTT) in that only path in the one direction from source to destination is measured.***fig 5(d)***

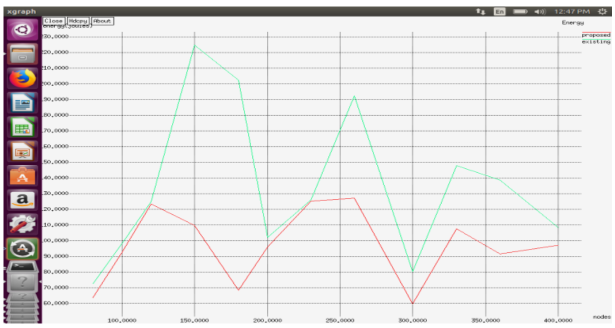
Packet ratio: The **packet delivery ratio** is the **ratio** of **packets** successfully received to the total sent. Throughput is the rate at which information is sent through the network.



(a) Throughput



(b) ***alive node***



(c) energy

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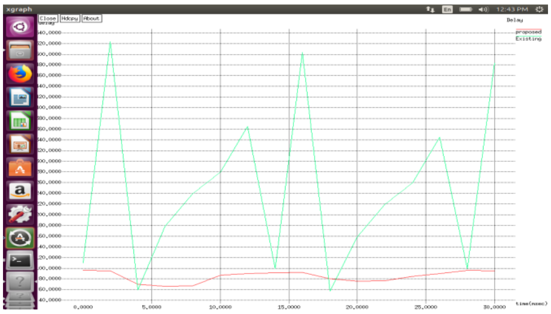
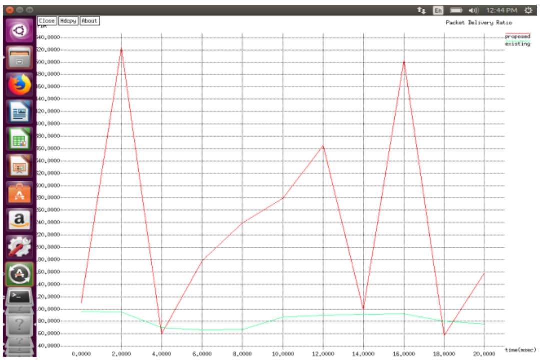


(d) ***delay***



(e) ***packet ratio***

Fig 5 performance evaluation and result analysis fig 5(a) shows the throughput fig. 5(b) shows the alive nodes fig .5(c) shows the energy efficiency fig .5(d) shows the average delay . fig 5(e) shows the packet delivery ratio.

V. CONCLUSION& FUTURE WORK

This protocol proposes an energy efficient and reliable routing protocol for dense and mobile wireless sensor networks. The proposed protocol (E2 R2) is a hierarchical and cluster based one in which each cluster contains one Cluster Head node and the Cluster Head is assisted by two Deputy Cluster Head nodes which are also called group management nodes.Author also compares the performance of the proposed protocol with MLEACH in terms of lifetime and throughput. Such a routing protocol is useful for a dense wireless sensor network when the sensor nodes as well as the Base Station are mobile. This work can be expand to improve the throughput even in the high data rate situation where the sensor nodes generate data at a very high constant rate.

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