Dynamic Clustering-Genetic Secure Energy Awareness Routing To Improve the Performance of Energy Efficient In IoT Cloud

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Abstract: The Internet of Things (IoT) is one of the emerging technologies that has attracted the attention of researchers in the field of education and industry. The idea behind the Internet of Things is that things and devices are operated on the Internet to achieve some common goals with humans. It serves as a platform for monitoring the collection process, controlling the cyber-global fire world, and collecting data and analyzing data using IoT sensor nodes. Power saving is important for battery-powered devices. The amount of previous work is small, although it has a large tip capacity, especially in terms of battery life and energy efficiency. This regulates the development of IoT a simple and energy efficient routing scheme for war sensor networks. The nodes require an increased lifespan of intelligently transmitted data communications. To conserve the energy of IoT nodes, the Dynamic Clustering-Genetic Secure Energy Awareness Routing Protocol (DC-GSEARP) utilizes clustering, cluster head selection and energy and efficient path calculation for efficient and real-time routing. To accomplish the efficient cluster head selection, to have used Dynamic Clustering algorithm. The proposed DC-GSEARP protocol achieve an improved that can be used to construct an optimal path for energy efficient data transmission for IoT sensor nodes. DC-GSEARP, which uses the integration of clustering supported by short path resolution to provide energy efficient and advanced routing capabilities for IoT, ensures entering a path with lower power consumption and enhanced QoS measurements. The results of the simulations show that the proposed approach can reduce the power consumption of sensor nodes, data packet losses and extend network life.

Keywords: Dynamic Clustering -Genetic Secured Energy Aware Routing Protocol (DC-GSEARP), Internet of Things (IoT), Cluster Head Selection and Energy-Efficient Path.

1. Introduction

IoT-based data security in the digital world has always been a major global concern for the risks and stakes associated with the region. It is becoming very sensitive to new technologies such as end-to-end communication with disparate frameworks such as IoT and sensors. Its purpose is to make human life more convenient, but at the same time started to take on new challenges of security in information. Impressive works can be found in the literature and are performed on protected data and information with various cryptographic techniques.
Therefore, we need a simple solution that can effectively save the energy of the equipment. Equal routing distributes processing load across all devices in a network. Energy-efficient networks, especially one including coordinated devices, are very important. This guarantees that the more devices you have, the longer you will be working. Conversely, if the processing load is due to routing, only a subset of the IoT nodes in the network will have a higher battery drain, but in Figure 1, this subset of equipment will have its energy at a faster rate is passed to consume an early break network. For the purposes of this article, the proposed routing protocols, in turn, guarantee, solve this problem by increasing the time of network traffic and distributing routing efforts. The work of this protocol is described in detail in the following chapters. It should also be noted that the term refers to the IoT network of both node and device sensor nodes and is used interchangeably in text.

With this huge number, devices can collect personal information and also monitor lifestyles, activities, and behaviors. The Internet of Things has created new types of applications and services that are beneficial to human life, but they can cause huge prices for privacy and security. Wireless sensor networks (WSNs) play an important role in the Internet of Things. It is easy to use and easy to deploy in harsh areas. These sensors monitor and recognize the surrounding environment. When a sensor monitors and reports an object, such as the appearance of a sensor node, a rare animal is sent a series of messages via multi-hop radio communication to the sink.

2. Related Work

Energy consumption is given priority over energy demand due to rising and rising energy prices, global warming, and energy waste. [1] This is achieved by raising awareness about the Internet and energy consumption from the home model. This data is compatible with real-time cloud-based data analysis [2] using IoT (Internet of Things) for laboratory or auditorium tables and occupation levels. Energy consumption generates a warning if further inquiries and action schedules or occupation levels are not met [3].

Specifically, DBSCAN (Density-Based Spatial Clustering of Applications with Noise) per cluster is used to obtain the radius of each cluster region [4] at a distance between users within the outer boundaries of each cluster. However, there is an inherent contradiction between power consumption reliability and time: additional reliability usually leads to higher power consumption than reliance on traditional restoration [5].

Some customer satisfaction / feedback is analyzed as Quality of Experience (QoE) and Quality of Service (QoS) are not a good candidate for multimedia exchange as described in Emotions and User

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**Figure 1.** Cluster Based Energy Efficient Routing Schemes.
Expectations [6]. An important factor. In Noma, however, the multiple transfer energy consumption that leads to simultaneous transmission (non-orthogonal multiple access) is also good, in fact, the power consumption of the circuits is an important device because it controls IoT [7] energy. Efficient use of energy resources requires Low Power Wide Area (LPWA) technology because it characterizes the ability to distribute low power connected devices on a large scale, at low cost and over a wide area [8].

Energy Harvesting (EH) considered IoT a tool for large-scale use of vast trees and completely independent spawning trees (CISTs). High performance EH technology [9], which provides a permanent network operating environment around, eliminating the need to change the power source frequently. Clustering algorithms play an important role in energy saving and energy controlled networks. [10] This allows you to distribute loads to the appropriate network for cluster heads, which reduces energy consumption and increases lifespan.

Predicts energy consumption in the short term, [11] providing the best way for communication between energy operators and consumers. Based on the margin device of the energy forecasting mechanism based on real-time energy management, the complexity of time saving is minimal and the main contribution is to monitor the servers of the best standardized technology choices via cloud-based public data. There is a new learning sequence [12] with an error rate.

In addition, the proposed method uses feedback from signs of full pre-heavy activity to predict each data packet [13]. Studies of heavy quality significantly reduce overall energy consumption once the simulated results are proposed. Furthermore, the method proposed for false alarms, such as irregular messages, is more sensitive than work [14].

As a single statistical device, we redone the numerical solution by obtaining the best closed solution with some useful properties based on the Karush-Kune Tucker (KKD) position which is unnecessary. In many demographic devices, EE (Energy Efficient) can propose an efficient and somewhat favorable method for solving the maximum problem [15]. Internet of Things task processing requests are provided by colleagues. Host Virtual Machine (VM) IoT and relays of the object representing those in the proposed P2B network. We are considering three cases to investigate the capabilities of power saving and work processing systems. The first display was the "relay only" mode, [16] which was used for task requests only and was processed by the relay.

At the same time, circuit power [17] is taken into account to reduce the overall power consumption of the network through integrated capacity control and time allocation. If multiple sources simultaneously send information to their respective locations via a [18] large array relay, multiple pairs of relay decoding and sharing are considered a network-dependent population energy saving design.

In particular, access is detected via random access distributed based on the probability of allocation detection caused by power consumption, data collision speed, and its recovery accuracy [19] by transmitting sensor data for each sensor node. Determine the contribution of. At the beginning of each super frame, the base station raises the schedule broadcast and contains the network panel information used to turn the IoT device type into a sleeping group [20]. In the Random Access (RA) function of LTE-based systems, the Timing Advance (TA) value is added to the device that integrates its development time synchronization. This letter uses the [21] TA value, which proposes a simple preferred Energy-Efficient Random Access (EERA) program for standard IoT networks.

3. Materials and Methods

Dynamic Clustering - Genetic Secured Energy Aware Routing Protocol based network clusters are made up of nodes with higher energies that are more complex in sending packets than nodes with lower energy levels. Nodes with high energy are called root nodes. The root node broadcasts a data packet containing information that the destination arrives through the root node. A node whose first high threshold energy level requires traditional energy to respond to packets on a node passing a cache entry and broadcasts an active receive packet. This guarantees that the identified root node knows the root of the node known as the leaf node. As a cluster composition, the head determines that it is important for the cluster to have a complete routing trench. The figure 2 represent a proposed method block diagram and route selection process.
The choice of spacing between the cluster head station and its adjacent nodes for its strength and fluidity is based on the extended innovation node search energy level. Node clusters with maximum power, minimum mileage with its adjacent nodes, and medium velocity deflection characteristic will be the selected head, if the next step and the cluster structure is advanced, the cluster member may be selected. It is based on masonry head properties.

3.1 Cluster formation

First, the basis of network topology is the development of a set of IoT sensor nodes. These nodes are collected with the help of dynamic clustering algorithms. A cluster is often defined as a group of very similar nodes that are located or co-occur. Clustering aids reduce energy consumption and improve data transmission. A detailed description of the dynamic clustering analysis algorithm is given below.

\[\text{For each } C_i \quad \text{//un-clustered node} \]
\[\text{Empty cluster to create } (C_q)\]
\[\text{Clustered multimedia node } C_i \]
\[\text{C}_i - \text{the first member of cluster } C_q \]
\[\text{For each } C_i \quad \text{// un-clustered multimedia node} \]
\[\text{While } (C_i < \text{max generation}) \]
\[\text{For every } i \]
\[\text{For every } k \]
\[\text{Update the function and light intensity} \]
\[\text{End for} \]
\[\text{End for} \]

3.2 Cluster Head Selection

After the cluster is formed, the cluster heads are selected based on a cluster. The cluster head cluster is responsible for collecting messages from all population sensor nodes and sending them to the base station. Therefore, the cluster head cluster consumes more processing and energy, and is then involved in generating the described routing path. However, it drains the cluster head energy very
quickly. The IoT node with the maximum remaining power in a given cluster will be the cluster head for subsequent rounds. This rotating routing effort of cluster head channels is distributed evenly between devices to increase the operating life of the network. Each device in the first round will have the same amount of power, so the cluster heads in this round will be randomly selected. In this dynamic cluster distance are calculate using an equation 1.

Run Dynamic Clustering algorithm to create cluster set $C_s$

For $C_i \in C_s$ do
  For $i \in C_k, \text{nodes do}$
    If $d_{\text{current\_energy}} < i, \text{current\_energy}$ then
      $d = i$;
      Set $C_i, \text{Cluster\_head} = d$;
    To Connecting all cluster heads
  Return routing path;
While $C_i - 1 > 1$ do
  Select
  $C_{k0}, C_{k+1} \in d_{i+1}$;
End while
For $i = 1 \text{ to } P$ //denotes number of nodes per cluster
  If number of nodes $C_k$ equals to P
  End for
End if

3.3. Route discovery

When a node in IoT tries to send a data packet to a synchronous node with another uncertain path, it violently uses a path finding process to determine such a path. Route Requirement Network path detection is performed by flooding the network with RREQ (also known as query) packets. Each node receives the request and rebroadcasts them until they are in sync path or it must be in cache memory. Path RREP pocket responses and node responses returned to the actual source of the request. Route request and response packets are redirected to the source. A request to create a path to travel at present. A routing error packet is sent to the supported IoT node to clear the cache for each object in the path, including the broken connection path. If the path is still needed, the new path finding process must start from the source and there is no alternative to temporary storage.

3.3.1 Route maintenance

Route maintenance is a message packet along an outgoing or forward source route executed by each IoT node. Each node such as has the legal responsibility to ensure that the data packet was sent to the next one-hop neighbor along the starting node specified in the packet. The data packet retransmits until a confirmation is received (maximum number of attempts).

3.3.2 Energy Efficient Route Establishment

The network is formed by a “divide and rule” policy for sending node data packets to the destination. Tree structures and virtual skeletons are used for fusion within the network to ensure that data packets are sent to receivers with good cache hit rates and energy. Nodes that enter the network are associated with one of the specific roots. If its energy level is otherwise a root, higher than the identified root node, and it is a node of the IoT leaf node to be the root. The node with the highest energy in the virtual backbone domain is connected at one end to the other end to establish a path from the node within the IoT. The following sections detail the route / path discovery and routing / route maintenance algorithms.
Figure 3. Analysis of Energy Efficient Route Establishment.

It is used only by normal IoT sensor nodes to sense responsibility for environmental data and data transmission, it flow diagram is shown in following figure 3. The advanced IoT node is responsible for receiving the data detected from the node in the component IoT, and the node's advanced energy will \((1 + h) \times E_n\)

The energy of the normal node is \(n \times E_n\) and the energy of the altitude node is \(A (1 + h) \times E_n\) as follows. Therefore, the total energy of the nodes in the network is expressed

\[
Total\ Energy = n \times E_n + A \times (1 + h) \times E_n
\]

(2)

The Dynamic Clustering -Genetic Secured Energy Aware Routing Protocol ((DC-GSEARP)) broadcast path detection data packets and answers respond to the sink node entry in its cache or path response message. The developed protocol is that if the packet has the response of the path to the cache entry of the pocket, or if the packet is sent that way, the path will be sent that way.

4. Result and Discussion

Network simulation (version 2), commonly referred to as NS2, and is simply a simulation device driven by the phenomenon that the dynamic properties of resource communication networks have proven to give a valuable result. Network functions (UDP, TCP, routing algorithms, etc.) and protocol emulation should be possible using wired and wireless NS2. Table 1 shows the simulated network model. The simulation parameters are evaluated through the proposed Dynamic Clustering - Genetic Secured Energy Aware Routing Protocol (DC-GSEARP). The network area consists of a maximum number of randomly deployed IoT nodes, and it is assumed that the maximum transmission distance of each IoT sensor is 100 meters.

Table 1. Simulation Parameters.
| Parameters           | Value       |
|---------------------|-------------|
| Data rate           | 2 Mbps      |
| Application Type    | Constant bit rate (CBR) |
| CBR interval        | 1.0 (second) |
| Simulation Time     | 350 s       |
| Simulator           | NS-2        |
| Data Speed          | 20 m/s      |
| Total energy        | 500 joule   |

Table 1 describes the resources needed in this proposed system protocol. This section describes the comparison of existing Density-Based Spatial Clustering of Applications with Noise (DBSCAN), Karush-Kuhn-Tucker (KKT), Completely Independent Spanning Trees (CISTs) and the proposed Dynamic Clustering - Genetic Secured Energy Aware Routing Protocol (DC-GSEARP). This experimental result describes the analysis of parameters are analysis of throughput, energy efficient, route availability analysis, life-span of the network and packet delivery ratio.

![Analysis of Throughput Level](image)

**Figure 4.** Analysis of Throughput Level.

IoT can determine the good performance of the sensor node by measuring the transfer success on a regular basis. A successful distribution plan in which the deep-rooted path was suddenly broken and without loss. DC-GSEARP ensures that the rehearsal team maintains the right path through a rule-based system with improved performance.

\[
\text{Throughput} = \frac{\text{Packets Received (n) \times Packet size}}{200}
\]  

(3)

The throughput evaluation in the figure 4 shows the performance of the DC-GSEARP under variations in the availability of nodes at regular period of intervals shows the supreme performance of the DC-GSEARP with 3.59 Mbps and its heightened throughput compared to the previous methods (DBSCAN with 1.9 Mbps, KKT with 2.6 Mbps, and CISTs with 3.1 Mbps).

![Energy efficient Level Analysis](image)

**Figure 5.** Energy efficient Level Analysis.

The first IoT sensor node or IoT node in the set of power means of the network cycle times runs out. The network life is determined by the remaining power supply network, which can simply be
defined. The DC-GSEARP protocol and existing method DBSCAN, KKT, CISTs comparison of energy consumption shown in figure 5.

\[
Energy\ Efficiency = \frac{Energy\ Density_{Discharge}}{Energy\ Density_{Charge}} \times 100
\]  

(4)

In the path analysis calculate total number of IoT node, number of available path it’s divided by total number of connection.

![Route availability analysis](image)

An important advantage of using path transmission is inherent path diversity (ie, the loss process is expected to operate independently on different paths). To achieve this goal, energy efficient routing is an effective method as shown by network data that can be shared via multiple paths to reduce network congestion. Comparison of the proposal shown in figure 6 with existing methods. The existing methods DBSCAN in 67%, KKT in 71%, CISTs in 86%, and the proposed method DC-GSEARP with 95%.

![Route Availability Analysis](image)

**Figure 6. Route Availability Analysis.**

Network life is determined using the direct IoT nodes available on the network. The batteries of the electric IoT sensor nodes are clustered and fully designed to avoid unnecessary use of the power of these sensor nodes and to extend the life of the system in a well-organized manner through proper head selection. In this comparison of proposed method and existing method is show in figure 7.

![Life-Span of the IoT Sensor Node](image)

**Figure 7. Life-Span of the IoT Sensor Node.**
Packet Delivery Rate (PDR) to assess the quality of the network. It defines the ratio between the packets received by the destination and the data packets generated by the source. It can be obtained by using the awk script, which produces a trace file and the result.

\[
PDR = \frac{\text{Received packets}}{\text{Generated packets}} \times 100
\]

The proposed method DC-GSEARP and existing method DBSCAN, KKT, CISTs comparison of packet delivery ratio shown in figure 8. The analysis result proposed method 9.4 sec of lower time-based packet delivery provide compare to existing method DBSCAN has 14.5 sec, KKT with 12.76 sec, and CISTs has provided a 16.45 sec.

5. Conclusion

Today’s IoT networks work effectively in many applications. For this reason, the IoT of the various sensors must be selected at the nodes required to create cluster heads for data transfer. Energy is the basic source of wireless sensor networks. The gateway used to establish the connection is a simple IoT based on DC-GSEARP, which avoids the waste generated by head and cluster mode selection and can adopt a properly designed DC-GSEARP. It is a cluster in which the use of DC-GSEARP can greatly improve the energy efficiency of the network. Energy is an important factor in improving online life. The formal configuration of the Internet in the network of things provides a long life for cluster routing. Consumption, as compared to the cluster-based routing technology (ESCHS, Fuzzy Logic, ARSH-FATI), significantly reduces the energy of the sensor node, another type of routing. The proposed DC-GSEARP based analysis of throughput level is 3.59 mbps, energy efficient level analysis is 500 joules, route availability analysis level is with 95%, life-span of the IoT sensor node level is 80 alive of sensor nodes, packet delivery ratio is 9.4 sec.

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