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Emergency Packet Transmission Using Optimal Backpressure Scheduling

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Abstract: - **The backpressure scheduling scheme has been applied in Internet of Things, which can control the network congestion effectively and increase the network throughput. However, in large-scale Emergency Internet of Things (EIoT), emergency packets may exist because of the urgent events or situations. The traditional backpressure scheduling scheme will explore all the possible routes between the source and destination nodes that cause a superfluous long path for packets. Therefore, the end-to-end delay increases and the real-time performance of emergency packets cannot be guaranteed. To address this shortcoming, this paper proposes EABS, an event-aware backpressure scheduling scheme for EIoT. A backpressure queue model with emergency packets is first devised based on the analysis of the arrival process of different packets. Meanwhile, EABS combines the shortest path with backpressure scheme in the process of next-hop node selecting. The emergency packets are forwarded in the shortest path and avoid the network congestion according to the queue backlog difference. The extensive experiment results verify that EABS can reduce the average end-to-end delay and increase the average forwarding percentage. For the emergency packets, the real-time performance is guaranteed.**

***Keywords*: Backpressure scheduling, network throughput, packet transfer.**

I. INTRODUCTION

The Internet of things (IOT) is the network of physical devices, vehicles, home appliances and other items embedded with electronics, software, sensors, actuators, and network connectivity which enables these objects to connect and exchange data. "Things", in the IoT sense, refers to devices which collect useful data with the help of various existing technologies and then autonomously flow the data between other devices. As the network scale increases number of packets which are in transmission is also very huge and may cause network congestion and this may leads to a problem during emergency situations where the packets cannot be delivered to the destination node in an appropriate time. Hence, here comes the challenge to deliver the emergency packets without any delay in transmission. This is achieved by implementing backpressure based scheduling scheme which can effectively control the network congestion and guarantee the throughput of networks. The emergency packets will be prior forwarded, which reduces the waiting delay in queue for emergency event. Furthermore, the shortest path is combined with backpressure scheme for emergency packets. Most of the packets generated are regular packets and if any emergency packet gets generated as a result of any urgent event, which needs to delivered to its destination node at its faster rate. Backpressure scheduling scheme effectively controls the congestion of networks and also can guarantee network throughput. In case of high data load transmission back pressure scheduling scheme does not consider the real time performance of emergency packets.

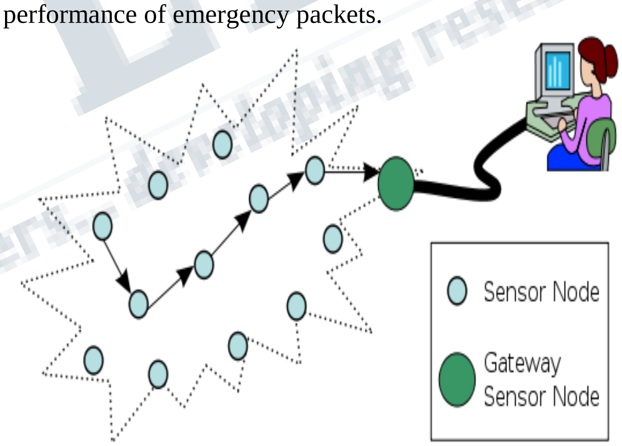

Fig 1.1: wireless sensor network

To overcome this drawback we focus on the emergency internet of things with high data rate and proposed an optimal back pressure scheduling scheme for emergency internet of things

II. RELATED WORKS AND PROBLEMS:

In existing system, more number of packets are transmitted that can cause network congestion. This situation makes a problem in case of any urgent events. The packets cannot reach the destination within its need. Emergency packets takes long paths to reach the destination and gets delayed, to reduce this delay scheduling scheme is used. Many

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scheduling schemes available for the sensor networks, such as Collection Tree, ZigBee etc. But this traditional scheme cannot guarantee the network throughput.

Problem Definition:

- Packets are transmitted in various long paths without considering the importance and selecting the next hop node.
- So the Emergency packets take a more time to reach the destination.

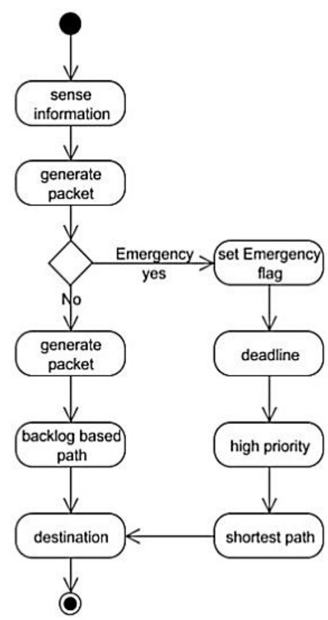
2.1. DEMERITS

- When the network load is low, it attempts to explore all the possible paths before the packets are delivered because there are not enough queue backlog difference gradients
- The backpressure scheduling scheme does not take the real-time performance of emergency packets into consideration.
- Poor real-time performance affects the deployment of backpressure scheduling scheme in the sensor networks of EIoT.

III. PROPOSED WORK AND METHODS USED:

According to the changes applied with the technology to overcome the drawbacks of the traditional scheme the advanced Event Aware Backpressure Scheduling (EABS) scheme is applied. In this method, during transmission Sensor senses the data from the environment and generates packets that transmit over the internet. During transmission itself it senses and identifies the packets as regular or emergency based on the occurring event which is normal or urgent respectively. If the emergency event has occurred, the emergency data will be sensed by sensor and generate packets. Each packet header contains emergency flag and deadline. Emergency Flag indicates emergency occurred or not and deadline indicate how long data will be available .Each sensor maintains a queue for data transmission. Source transmits a packets to the neighbor based on the backlog size.

Fig3.1: Activity Diagram

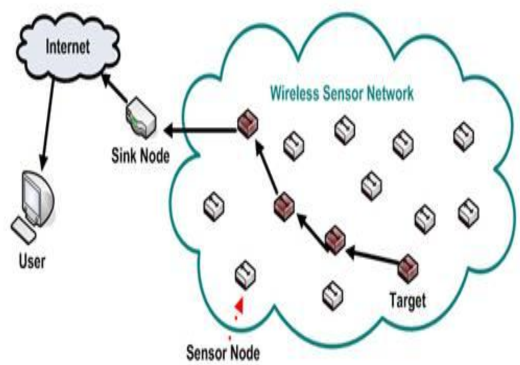


The packet inserts in source queue, Source give first priority to transmit the data. So it reduces the waiting delay. The source transmits emergency packet to the neighbor, that neighbor nearest to the destination. So it select the shortest path to reach the destination and reduce the transmit time. In case of occurrence of normal event the packets generated are regular packets and will be choosing the regular path to reach the destination has no priority has been set to the regular packets. And finally it is proved that based on priority or importance provided the emergency packets will be reached to its destiny without any deviation and this may resolve many emergency problems and provide many benefits.

3.1: Network Formation:

In this module, it consists of multi-hop network which contains number of nodes. Each node has some range for its transmission. The node can communicate only within its range. Any one node range which could intersect with another node range would define that both are neighbor nodes. One node can have more number of neighbors. The destination is not a neighbor of source and so it cannot send information directly to the destination. Start node sends information to its neighbor and the neighbor send information to another neighbor and then finally it reaches to the destination node. Source finds a path to reach its destination and to transfer all the packets in a shortest route. In our illustration we will create nodes using java fx concepts and the nodes are kept as static and its position where it is located and the range up to which it can intersect has been given during creation. The destination is assumed as RSU which is Road side unit which monitors the vehicles in the road system. Each vehicle is considered as single node and will send information to its end point at a periodic basis.

Fig 3.1.1: Network formation



3.2: Backpressure Scheduling:
Each node maintains a queue for data transmission. The node sends a packet to another node based on backlog. Backlog means how many packets are received by the node or available space of the node. The source needs to transmit a data to another node by following the below mentioned steps, first source check the neighbor node regarding how many spaces are available and according to that packets gets transmitted. This technique reduces the congestion and increase the throughput. This scheme is combined with shortest path for avoiding transmission delay.
This can be achieved by following EABS algorithm by two ways. First, selection of path whether shortest or regular one based on event occurred. Second, selection of Next-hop node for transmission with its maximum backlog difference.
3.3: Priority of Emergency packet:
Sensor senses the data from the environment and generates packets that transmit over the internet. When the emergency occurred, the emergency packets will be sensed by sensor and generated the packets. Each packets header contains emergency flag and deadline (time to left). Emergency flag indicates emergency occurred or not and deadline indicates how long data will be available. If the emergency flag is true, that packet is emergency packet. The packet inserts in source queue and the source gives the first priority to transmit the data. The source queue contains more than one emergency packets the emergency packets priority based on the deadline.
3.4: Emergency packet transmission:
Most of the packets are regular packets and that are inserts into the normal queue. Source sense the emergency packets and it inserts into the shortest queue. The source transmits emergency packet to the neighbor, that neighbor nearest to the destination. So it select the shortest path to reach the destination and reduce the transmit time.
User data split into small amount of information. This small amount of information is called packet. The Source provides unique number for each packet. These packets are encoded using base64 algorithm. Source creates a block used to transmit a packet. The packets are shuffle and then placed in the blocks so that every block will contain shuffled packets. Source finds all possible paths to reach the destination. Source sends a block to Destination. Source does not send all blocks to the same path. Each block sends in different path. Source generates a codeword for all blocks. Original order of packet's unique number is called codeword. Codeword sends in another channel and the channel send only code word not a block. All blocks contains out-of-order packets. The destination arrange the packet using these codeword. The destination receives all blocks from the source and these blocks are travel in different channel. Some channel contains more noises so packets are easily loosed. Some channel contains very less noise so no loss of packets. The destination will find an error if any packet is lost during travel. The destination indicates to the source. The source resends a message in low noise path.

IV. CONCLUSION AND FUTURE ENHANCEMENTS

In this paper, we propose a novel event backpressure scheduling scheme to enhance the real-time performance of emergency packets for EIoT. In this phase we propose an idea to provide priority to emergency packets and reduce the end to end delay during transmission. In particular, we first design backpressure-based queue model according to the arrival process of different packets that reduces the waiting time of emergency packets in queues. For the sake of simplicity, in the EABS scheme, we only consider the existence of emergency packets and regular packets. Illustration will be shown in two ways, one with no emergency event occurred where the packets will be reached in its given time. Second, the emergency packets are created in case of emergency events this can be shown by using dashing kit and will prove that the packets are reached in a faster rate than others in a shortest path which is having maximum backlog difference.

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