

## CONGESTION CONTROL FRAMEWORK IN WIRELESS MULTIMEDIA SENSOR NETWORKS

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### ABSTRACT

*Congestion is a conundrum for sensor networks because it leads to lack of efficiency and waste of communication. While comparing with other wireless sensor networks, Multimedia WSN has more congestion occurrence event because of its high limit of information emerging from multimedia media spilling. In this research, a Traffic Rate control (TRC) routing protocol was proposed and designed for multimedia transmission over wireless multimedia sensor networks. Congestion controls are examined and controlled Traffic rates using bandwidth utilization technique, which provides an efficient congestion mitigation technique by converting the packet format of the source data. In this work no extra buffers are used. So TRC provides low cost and low computational level. In this way, TRC improves the continuity of the video streaming. Performance of TRC is compared with the existing routing protocol Sensor Fuzzy based Image Transmission (SUIT) and it provides better traffic send parameters.*

**Keywords:** WSN, Congestion, Traffic rate

### [1] INTRODUCTION:

A remote sensor system are dispersed self-ruling sensors to screen physical or natural conditions, for example, temperature sound, weight, and so on and to helpfully go their information through the system to a primary area. The more cutting edge systems are bi-directional, moreover empowering control of sensor action. The advancement of remote sensor systems was persuaded by military applications, for example, front line reconnaissance; today such systems are utilized as a part of numerous mechanical and buyer applications, for example, modern procedure checking and control, machine well being observing, et cetera. The WSN is fabricated of "hubs" - from a couple to a few hundreds or even thousands, where every hub is joined with one.

Every such sensor system hub has normally a few sections: a radio handset with an inward reception apparatus or association with an outside Antenna, a micro controller, an electronic circuit for interfacing with the sensors and a vitality source, more often than not a battery or an installed type of vitality reaping. Remote media sensor systems are systems of remote installed gadgets that permit recovering feature and sound streams, pictures, and sensor information from the atmospheric real time environment [1]. With quick changes and scaling down in equipment, a solitary installed gadget can be furnished with sound and visual data accumulation modules. Notwithstanding the capacity to recover media information, WMSNs will likewise have the capacity to store, prepare progressively, correspond, and wire media information started from heterogeneous sources. The idea of WMSNs can be seen as the joining between the ideas of remote sensor systems and conveyed brilliant cams. A WMSN is a disseminated remote framework that connects with the physical environment by watching it through numerous media. Besides, it can perform web handling of the recovered data and respond to it by joining advancements from assorted teaches, for example, remote correspondences and systems administration, sign transforming, PC vision control, and apply autonomy. The fundamental qualities of WMSN that call for new research in this field can be delineated as takes after. (i)Resource Constraints. (ii)Embedded sensing gadgets are obliged regarding battery, memory, transforming capacity, and achievable information rate. (iii)Application-Specific Qos Prerequisites [2]. Notwithstanding information conveyance modes normal of scalar sensor systems, interactive media information incorporate preview and spilling sight and sound substance Depiction sort media information contain occasion activated perceptions got in a brief while period (e.g., a still picture). Spilling media substance is produced over more time periods, requires managed data conveyance, and commonly needs to be conveyed progressively.

High Bandwidth Demand: Multimedia substance, particularly feature streams, obliges information rates that are requests of size higher than that upheld by business off-the-rack (COTS) sensors. Henceforth, transmission strategies for high information rate and low power utilization need to be utilized. Variable Channel Capacity, Capacity and postponement achievable on every connection are area ward, shift ceaselessly, and may be bursty in nature, accordingly, making nature of administration (QoS) provisioning a testing undertaking. Cross-Layer Coupling of functionalities [3]. In view of the imparted way of the remote correspondence channel, there is a strict association among capacities took care of at all layers of the correspondence convention stack. This must



be unequivocally considered when outlining correspondence conventions went for QoS provisioning on asset compelled gadgets.

**Media Source Coding Techniques:** State-of-the-workmanship feature encoders depend on Intra-outline pressure procedures to lessen excess inside one edge also, on between edge pressure (likewise prescient encoding or movement estimation) to adventure excess among consequent edges. Since prescient encoding obliges complex encoders, effective preparing calculations, and high vitality utilization, it may not be suited for congestion.

**Multimedia In-Network Processing:** Handling of multimedia substance has generally been drawn closer as an issue secluded from the system plan issue. Correspondingly, explore that tended to the substance conveyance angles has commonly not considered the attributes of the source content and has essentially contemplated cross-layer collaborations among lower layers of the convention stack [4]. Be that as it may, handling and conveyance of mixed media substance are not autonomous, and their cooperation has a noteworthy effect on the achievable QoS. The QoS needed by the application will be given by method for a mix of cross-layer streamlining of the correspondence process and in-system handling of crude information streams that depict the sensation of enthusiasm from various perspectives, with diverse media, and on numerous resolutions.

## 2. OUTLINE OF THE PROJECT

### 2.1 Congestion Control

All in all, sensor hubs are incorporated with stringent calculation ability, battery force and memory space. The event of clogging in the system devours an additional vitality of the system by parcel breakdown and retransmission of bundles. In thick system, the concurrent transmission of parcels causes obstruction and subsequently bundle drops because of blockage. A percentage of the issues of clogging in WSN are portrayed beneath, because of blockage, there happen cushion drops and expanded defers in the conventional wired systems and cell remote systems [5]. The movement from different parts of the system prompts blocking which thus corrupts the radio channel quality. For the hubs which cross a critical number of jumps the activity stream gets to be uncalled for and this influences the execution and the lifetime of the system. There are sure limits in remote sensor systems in light of the vitality, memory and transmission capacity.

The connection level error reasons increment in bundle administration time and diminishing in connection usage. Vitality proficiency and QoS is influenced by both these blockages which diminishes lifetime of the remote sensor systems. In spite of the numerous years of examination endeavours, the issue of system clogging control remains a discriminating issue and a high need, particularly given the developing size, request, and rate (data transfer capacity) of the systems. System blockage is turning into a genuine danger to the development of existing parcel exchanged systems, and without bounds organization of incorporated administrations correspondence systems. It is an issue that can't be overlooked. Blockage is brought about by immersion of system assets, (correspondence joins cradles, system switches, and so forth.). Case in point, if a correspondence connection conveys parcels to a line at a higher rate than the administration rate of the line, then the line size will develop, but instead an element asset allotment issue [6]. Systems need to serve all clients demands, which may be eccentric and bursty in their conduct (beginning time, bit rate, and term). However arrange assets are limited, and must be overseen for imparting among the contending clients. Blockage will happen, if the assets are not over saw adequately. The ideal control of systems of lines is a surely understood, quite contemplated, and famously troublesome issue, notwithstanding for the least complex of cases. Case in point, Papatheometriou and Tsitsiklis demonstrate that few renditions of the issue of ideally controlling a basic system of lines with straightforward landing and administration disseminations and numerous client classes is finished for exponential time (i.e. Provably obstinate).

The impact of system congestion is corruption in the system execution. The client encounters long defers in the conveyance of messages, maybe with overwhelming misfortunes brought on by cradle floods. Therefore there is corruption in the nature of the conveyed administration, with the requirement for retransmissions of bundles (for administrations prejudiced to misfortune. In the occasion of retransmissions, there is a drop in the throughput which prompts a breakdown of system throughput when a considerable piece of the conveyed activity is because of retransmissions (in that state very little helpful movement is conveyed misuse of framework assets). Blockage is a complex methodology to characterize [7]. It is felt by a corruption of execution. The decision of how to gauge jam and where, aside from the other pragmatic issues, for example, expense and intricacy, can impact to an extraordinary degree the achievable control methodology, control procedure, and control area. Here the framework just highlights this potential issue through a sample. In the TCP/IP blockage control plan, parcel misfortune is utilized to sense blockage. The watched blockage for this situation is at a propelled state (has officially happened and henceforth misfortunes are beginning to happen).

While sensing postponement at a hub (e.g. line length) does not so much demonstrate that clogging has happened. (Really, one may expect that with deferral sensing a prescient model can be assembled to demonstrate the level of the normal condition of clogging over a given future time skyline, therefore empowering remedial measures to be taken). Likewise different components may impact to a huge degree the



viability and velocity of reaction of a blockage calculation. Case in point, in TCP IP blockage sensing is paired (vicinity or nonattendance of clogging), and the round trek time (and criticism deferral) are fundamentally distinctive. (For a top to bottom dialog of these issues, the impact of area on nature of control, as seen through the control skyline, and also potential issues of control, and how these impact the configuration of the controls,). One may likewise distinguish other potential issues of control, for example, Large scale; Distributed nature; Large geographic spread (at its breaking point it covers the globe); Increasingly preparing deferral at hubs gets littler, in correlation to the engendering defer in the connections. Substantial data transfer capacity delay item makes the control of blockage through criticism conceivably troublesome; Diverse nature and conduct of conveyed activity (voice, feature, www, ftp.); Unpredictable and time differing client conduct ; Lack Suitable element models for control; and desire of the requirement for ensured levels of execution to every client, bundles in the system [8].

This happens on the grounds that the source retransmits the bundles, utilizing timeout system when parcels neglect to achieve the destination. Various parcel misfortunes, low join use, low throughput, the obstructing of new associations and high lining deferral will prompt the clogging breakdown. Blockage Collapse is a condition which systems reach, when almost no valuable. A system framework is a substantial appropriated complex framework, with troublesome regularly exceptionally non-straight, time changing and riotous conduct. There is an inalienable fluffiness in the meaning of the controls (proclaimed targets and watched conduct). Dynamic or static demonstrating of such a framework for open or shut circle) control is to a great degree complex. Estimations on the condition of the system are inadequate, regularly generally poor and time deferred. Its sheer numerical size and geographic spread are psyche boggling. For instance, clients (dynamic administrations) in the 10s of millions, system components in the 100s of million, and worldwide scope [9].

Thus, in planning the system control framework, an organized methodology is fundamental. The conventional procedures of activity designing, lining analysis, choice hypothesis, and so on ought to be supplemented with a mixture of novel control methods counting (nonlinear) dynamic frameworks, computational insight and insightful control (versatile control, learning models, neural systems, fuzzy. Computational Intelligence (CI) is a zone of central and connected exploration including numerical data handling (rather than the typical data preparing systems of Artificial Intelligence (AI)). These days, CI exploration is exceptionally dynamic and thusly its applications are showing up in some end client items. The meaning of CI can be given by implication by watching the showed properties of a framework that utilizes CI parts: "A framework is computationally savvy when it: bargains just with numerical (low-level) information, has an example acknowledgment segment, and does not utilize information in the AI sense; and also, when it (starts to) show, computational adaptively; computational adaptation to internal failure; speed approaching human-like turnaround; mistake rates that rough human execution. The real building pieces of CI are manufactured neural systems Fuzzy rationale, and transformative reckoning." Fuzzy Logic Controllers (FLCs) may be seen as option, non-customary method for outlining input controllers where it is helpful and powerful to construct a control calculation without depending on formal models of the controlled framework and control theoretic instruments [10]. The control calculation is exemplified as a situated of judicious tenets. FLCs have been connected effectively to the undertaking of controlling frameworks for which expository models are not effectively realistic or the model itself, if accessible, is excessively perplexing and exceedingly nonlinear. Fuzzy Blockage Controller (FCC) is a Fuzzy rationale controller (FLC). Outlining a FLC includes choice of suitable numerical representations for t-standard s-standard, defuzzification administrators, Fuzzy ramifications capacities, and states of participation capacities among a rich arrangement of hopefuls. Specific determination of these administrators and capacities modify the nonlinear data yield relationship, or as it were the conduct of a FLC. However, research has demonstrated that same impacts can be accomplished by legitimate adjustment of the principle base. Hence, in commonsense applications, generally computationally lighter and very much mulled over administrators and capacities are chosen, and sought conduct of a FLC is gotten by adjusting the semantic tenets [11]. Here the framework presents the Fuzzy rationale based blockage estimation way to deal with identifies clogging proficiently. The framework plans three diverse blockage pointers in blend to get more exact estimation. The convention in this framework uses the cross layer functionalities and makes utilization of cross-layer data trade among the application, transport, MAC and directing layers.

## 2.2 OPNET (Optimized Network Engineering Tool)

OPNET gives a complete improvement environment to the particular, simulation and execution examination of correspondence systems. OPNET gives four instruments called editors to build up a representation of a framework being demonstrated. These editors the Network, Node, Process and Parameter Editors, are sorted out in a various leveled design, which underpins the idea of model level reuse. Models created at one layer can be utilized by another model at a higher layer [12]. The graphical proofreader interface can be utilized to assemble system substances from the application layer to the physical layer. Object oriented programming strategy is utilized to make the mapping from the graphical configuration to the usage of the genuine frameworks. The



parameters can likewise be balanced and the tests can be reshaped effortlessly through simple operation through the GUI OPNET Simulator.

### 3. EXISTING SYSTEM

The framework assesses the execution of SUIT by contrasting it and two distinct contenders. By means of Fuzzy Logic-Based Congestion Estimation and support inhabitation based blockage control system which is usually utilized as a part of past studies.

SUIT is a picture transport convention which gives a Fuzzy rationale way to deal with assessing blockage proficiently and afterward responding to relieve the blockage The framework outlines three diverse clogging markers in blend to acquire more exact estimation[2]. The convention in this framework uses the cross layer functionalities and makes utilization of cross-layer data trade among the application, transport, MAC and steering layers The Congestion slope element is resolved utilizing Fuzzy rationale.

This paper addresses a Fuzzy based clogging control plan, which gives better execution regarding vitality utilization, outline conveyance, outline misfortune and casing inertness by diminishing the quality without yielding picture quality excessively. In this way, the nature of got picture execution of SUIT is lower than alternate conventions obviously. Nonetheless, the normal picture nature of the SUIT convention is still palatable.

#### 3.1 Algorithm

{Nomenclature=number of running applications, n=number of packets BW=maximum bandwidth of a cell, BS=maximum buffer size of a base station, D=delay of the packets, FR=flow rate of the packet, CG=congestion gradient}

#### 3.2 Experimental Images

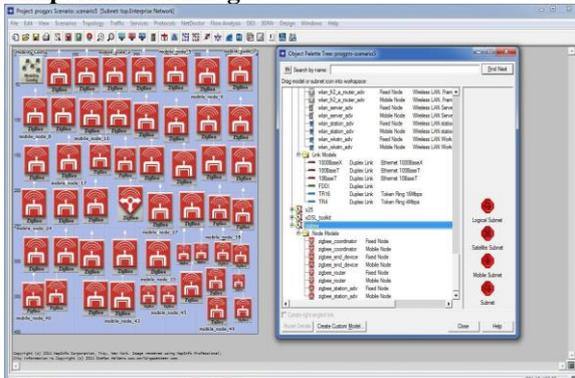


Fig 1 Suit Network Structure

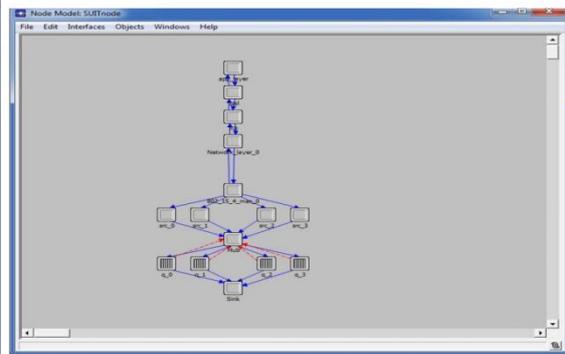


Fig 2 Suit Nodal Format

#### 3.3 Experimental Result

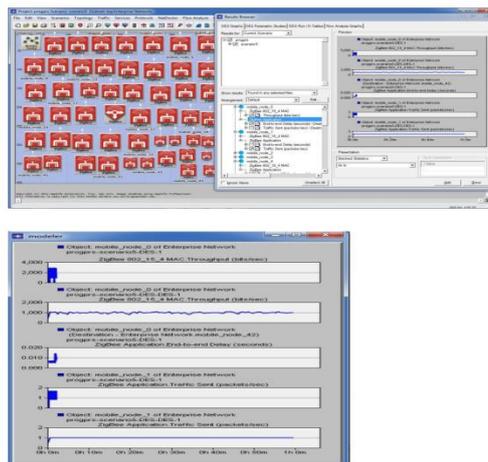


Fig 3 Suit- Simulated Result

#### Summary:

SUIT is a picture transport convention which gives a Fuzzy rationale way to deal with assessing blockage proficiently and after that responding to relieve the blockage. Here the framework presents the Fuzzy rationale based blockage estimation way to deal with identifies clogging proficiently. SUIT gives blockage estimation

way to deal with identifies clogging productively. It present another blend of three distinctive clogging markers to get a more exact estimation of the blockage which can perform quality adjustment on-the-fly and give an impressive edge conveyance and inertness execution pick up.

The motivation behind congestion detection is to provide high efficiency for high data rate transmission. Applications requiring high data –rate can easily cause congestion problem (i.e.) when traffic is high it leads to congestion. In this work, Buffer Occupancy (BO) is used to detect congestion When the Buffer Occupancy exceeds the threshold value it intimates, that, congestion has occurred Buffer Occupancy is calculated using backlogged packets in the queue. If the measured Buffer Occupancy is greater than threshold, it intimates that the congestion has been occurred; else there is no congestion in the network. There is a disadvantage of SUIT involving use of extra buffer structure in its operation; they in turn produce high cost and computational level.

#### 4. PROPOSED SYSTEM

The framework displayed a convention which uses the cross-layer functionalities. The framework assesses the execution of TRC by contrasting it and two distinct contenders. Fuzzy Based Congestion Estimation and support inhabitancy based traffic control system which is ordinarily utilized as a part of past studies. TRC is a picture transport convention which gives a Fuzzy rationale based traffic control component. The primary thought behind TRC is transmitting the greatest number of casings to the sink by diminishing the casing quality to a worthy level if there should be an occurrence of clogging. TRC gives two distinctive procedures. The primary strategy is adjusting feature casing movement rate at source sensor hubs. The second one is a novel clogging alleviation procedure which can adjust the nature of pictures on-the-fly by using the improved data transmission. The principle objective of the framework is to build the casing conveyance execution while keeping up an adequate limit. Without tainting the picture document TRC adjusts the encircling sending rate in blockage, Instead of dropping the entire edges ,it lessens the edge quality and additionally the measure of the outline by dropping sub-casings of continuously encoded JPEG. TRC has its craving edge design. Hence, TRC transmits pictures to the sink with lower, however adequate quality. Along these lines, TRC enhances the congruity of the feature gushing. TRC is the first transport convention proposed for WMSNs which has the capacity alleviates clogging by changing picture quality while picture information is being transmitted. Here rather than support structure, it includes the work on its casing organizations.

##### 4.1 MODULES DESCRIPTION

1. Zigbee Network Formation
2. Identifying congestion
3. New packet format creation for TRC
4. New node model creation for TRC
5. Performance evaluation of TRC protocol

###### 1. Zigbee Network Formation

Zigbee end gadgets and facilitators are utilized to shape the network. Since Zigbee contains the sensing limit likewise encourages cam to screen the objects. Layered system configurations are utilized, since operations are partitioned into various levelled layers. Every layer is in charge of performing interrelated capacities. Layered system configuration has a considerable measure of preferences. It diminishes the unpredictability of the outline, advancement and testing stages in light of the fact that every layer spotlights all alone assignment and it doesn't need to consider different layer.

###### 2. Identifying congestion

More than 40 sensor nodes are formed and it sends the high data rate application traffic to sink location such as it sends the traffic to the coordinator. Zigbee coordinator receives the data then congestions are occurred, it is found during simulation via traffic received and throughput.

###### 3. New packet format creation for TRC

New packet format was created for implementing TRC protocol in this system. It contains the Phy/Mac layer, TCP control packet for transmission, application, header, payload details.

###### 4. New nodal model creation for TRC

New TRC nodal model is created and it is supported by the zigbee network for better performance. It contains application layer, network and transport layer and it contains no extra queue for buffer occupancy for preventing congestion.

###### 5. Performance evaluation of TRC protocol

Performances are to be evaluated by comparing the simulation parameters such as throughput, Traffic sent at source, End-to-end delay of TRC. Here I compared traffic send of both models.

#### SYSTEM ARCHITECTURE



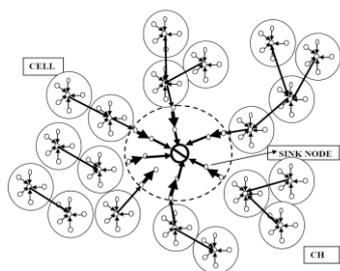


Fig 4 System Architecture

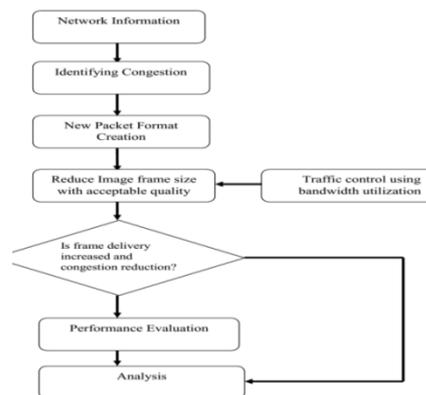
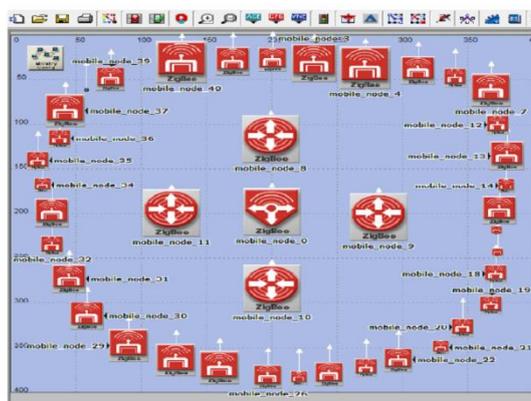


Fig 5 Flow Diagram

Algorithm 1:



Experimental Images

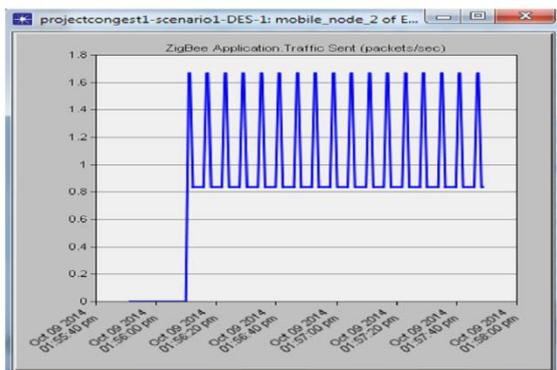


Fig 6 TRC Network Structure

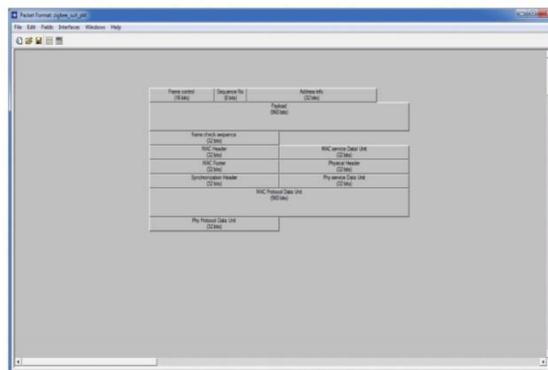


Fig 7 TRC packet format

Experimental Result

Summary

The framework assesses the execution of TRC by contrasting it and two unique contenders. The first is an illustration transport convention, specifically Fuzzy Logic-Based Congestion Estimation. The second one is upgraded transmission capacity use for transmission. TRC is a picture transport convention which gives a Traffic rate controlled and improved data transfer capacity use for evaluating clogging effectively and afterward responding to alleviate the blockage. Here the framework presents the TRC based clogging estimation way to deal with distinguish blockage proficiently. The framework outlines three diverse blockage pointers in mix to get more precise estimation. The convention in this framework uses the cross layer functionalities and makes utilization of cross-layer data trade among the application, transport, MAC and steering layers. TRC based blockage control plan, which gives better execution as far as vitality utilization, outline conveyance, outline misfortune and casing idleness by diminishing the quality without relinquishing picture quality excessively. In this way, the nature of got picture execution of TRC is lower than alternate conventions obviously. Be that as it



may, the normal picture nature of the TRC convention gives better attractive when contrasted and the current one.

Here TRC operation involves only in packet format, does not need any extra buffers for mitigating congestion and it also remain same in both the channel bandwidth (high and low channel capacity) in traffic send scenario.

## RESULTS AND DISCUSSIONS

### Evaluation of TRC compared with existing SUI

The evaluation of traffic rate control is compared with existing SUI using low and high bandwidth

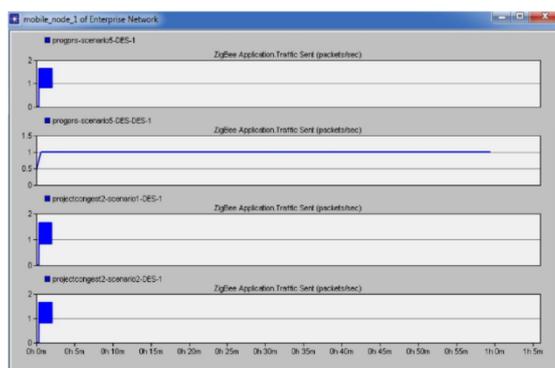


Fig 8 Comparison of TRC And SUI On Traffic Send Parameter

### SUIT- HIGH BANDWIDTH OUTPUT:



Fig 9 SUI- High Bandwidth Output

### SUIT-LOW BANDWIDTH OUTPUT:

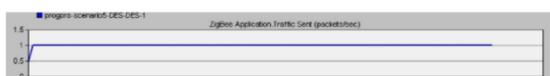


Fig 10 SUI- Low Bandwidth Output

### TRC-HIGH BANDWIDTH OUTPUT:



Fig 11 TRC- High Bandwidth Output

### TRC-LOW BANDWIDTH OUTPUT:

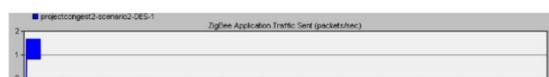


Fig 12 TRC- Low Bandwidth Output

Here compare traffic that send by both SUI and TRC, TRC remain its traffic rate same in both high and low bandwidth channels. Whereas SUI provides high traffic send for high channel and low traffic send for low channel capacity.

## 5. CONCLUSIONS AND FUTRUE SCOPE

The main goal of the system is to increase the packet send performance even in low bandwidth channels, without corrupting the image file. TRC adapts the frame and also measure the sending rate in transmitting packets from end devices to sink. Thus, TRC transmits images to the sink even in lower bandwidth with high data rates. In this way, TRC improves the continuity of the video streaming. Simulation results shown that TRC remains the same data rate in all channel bandwidth (both high and low channel capacities) when compared with the existing ones. In future investigate the heavy data traffic such as video data traffic and its congestion status in order to implement congestion mitigation technique in the proposed system added with some security parameters and also to produce better parameters such as frame loss, colliding data, throughput etc.

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