MAQ: 
A Mobile Agent Based Quality of Service Platform for MANETs

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ABSTRACT

Protected data transmission in cluster based Mobile Adhoc Networks (MANETs) is a challenging mission due to the high level of node mobility of nodes and resource constrained autonomous stations during packet routing. To target this mission, a Mobile Agent based QoS (MAQ) platform has been planned in this paper that uses an improved clustering algorithm during data communication. A Mobile agent architecture has been anticipated in a way that it is coupled with the cluster head of every cluster in MANET and when priority based real time application gets notified in these clusters then the proposed system gets activated to support prioritized service to these applications including checking and monitoring the flow characteristics for real time applications. JADE (Java Agent Development Environment) based prioritized scheme at the mobile agent has been implemented in the proposed system. As this is a function oriented approach, so the overall network performance significantly improves resulting better throughput and packet delivery ratio.

KEYWORDS
AODV, MANETs, PDR, QoS Mobile Agent, Throughput

1. INTRODUCTION

In MANETs, there are some features which makes the network special. They include easy setup, infrastructure less organization, and with self-configurable nodes. These networks are basically applied in some specific applications such as battle field, medical applications etc. (Pati et al., 2016). Basic challenging factors in MANETS (Rout et al., 2015) are to handle the sustainability of network connection (Oh, 2009) with increasing scalability and ability to handle during maximum mobility of nodes (Rath et al., 2016). Similarly, there are many clustering algorithms (Umamaheswari and Radhamani, 2015) that supports cluster based routing (Rath and Pattanayak, 2014) in MANETs. Some of them use mobile agents for routing functions that are described in literature review section. The clustering algorithms basically structures the main network into some groups of nodes called clusters in a hierarchical manner (Derr and Manic, 2013). In this structure there is a cluster head which is selected among a group of stations with high level of resources such as high configuration with sufficient memory (Bridges and Vladimirova, 2013), high speed processor and located with approximately equal distant from other nodes of the group. Because of the changeability and unpredictable nature of the mobile ad-hoc networks (Sharma et al., 2015) due to wireless medium and dynamic mobility of nodes (Rath et al., 2016) there are certain issues which are to be handled carefully (Rath and Pattanayak, 2014). Resource utilization, Constant bandwidth provision, channel sharing, link failure and repair (Pattanayak et al., 2016) etc. some of the challenging issues which are taken care in the proposed protocol design.
2. RELATED WORK

Keeping in view about the future QoS systems as management of distributed control plane with various controllers and every controller executes some QoS task for efficient routing within its own domain and interacting with their counterpart controllers, an innovative quality of service technique has been implemented in Egilmez and Tekalp (2014) for multimedia data transmission over large heavy network condition and larger scale Software Defined Networks. A new MAC scheme supporting multimedia service is proposed in Kim et al. (2003) in which a novel procedure classifies the channel in a way similar to diff-serve and applies QoS mechanism on it. There is improvement in this scheme during multimedia traffic and specifically in heavy traffic load. There are a lot of research advancements in the area of 5G mobile networks from all over the world because this magnificent technology supports QoS guarantee providing variety of services to various users with differentiated applications fulfilling diversified user requirements. A heterogeneous QoS architecture is proposed in this paper (Zhang et al., 2014) for 5G mobile networks for wireless medium considering device to device communication in full duplex mode and in cognitive radio networks. In Castellanos et al. (2016) a better QoS approach for reducing end to end delay in time sensitive data transmission has been presented known as AQA-AODV in which route formation takes place as per requirement of the application. An improved link and path based bandwidth calculation has been done here that provides information to the sender node regarding the state of the network, so that the required transmission rate may be changed by the source. Yakine and Idrissi (2015) presents ILP (Integer Linear Programming) based QoS architecture for optimization of MANETs routing in term of QoS satisfaction in delay and bandwidth. Using such architecture they are not only able to reduce total energy consumption in the network but also there is prolonged network life time and better computational performance. Analysis of related routing protocols in real time scenario (Rath et al., 2016) has been conducted with special focus on comparison between them with various network parameters.

3. PROJECTED MAQ PLATFORM

The proposed Mobile Agent Based QoS Platform in this paper is based on our previous work in 2015 and 2016 where an optimized Adhoc On-Demand Distance Vector (AODV) routing protocol has been designed for MANETs with load balanced path selection. For performing the QoS computation at every forwarding node mobile agents have been utilized in this deigned platform specifically for real time applications. The mobile agent visits all the neighboring stations of a particular station to compute the QoS constraints such as processing delay to estimate the end to end delay and availability of sufficient bandwidth to transmit packets with bandwidth criteria. In the network layer of TCP/IP model, an efficient PDO AODV Protocol (Rath et al., 2016) has been proposed which has been further improvised for power and delay (Pati et al., 2016) and it acts as the basic protocol in our research work. This protocol is an improvement over conventional AODV protocol (Sharma et al., 2015) that calculates a cost function as an integration of power, delay and packet processing rate during packet processing and forwarding. In the current research work, the considered protocol performs the energy consumption at the routing nodes during data transmission in the following process.

3.1. Energy Consumption in Proposed Approach

Since the residual battery power in nodes of Mobile Adhoc Networks is limited, and non-renewable, energy proficient protocol design is very challenging. In our proposal we have considered four states of a node in which energy can be consumed transmit, receive, idle and sleep. The sleep state is a minor power state in which node does not receive any packet nor sends any packet. The wireless channel is categorized by attenuating the strength of the signal according to distance from the transmitter. The formula for power degradation is as follows.
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