Design of Multipath, Multisource, Multimedia Transmission protocol for IOMT Framework

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Abstract- **The futuristic trend is towards the combination of cyber world with physical world leading to the development of Internet of Things (IoT) framework. This paper is focused on analysis of five different techniques such as an adaptive duty cycling based multi-hop PSMP protocol, A reliable cross layer protocol, IoT-RTP and IoT-RTCP protocols, An enhanced access reservation protocol with a partial preamble transmission mechanism, Multipath transmission, etc. But some problems exist in design of internet of multipath transmission. So to overcome these problems, paper proposes a design of internet based multipath transmission with the help of Link-Layer Bonding, Network-Layer, Transport-Layer Multipath Transmission, Application-Layer Multipath capability and Summary.**

Keywords- **Multimedia communication, Multimedia, Multipath Transmission, Internet of Things, Internet of multimedia Thing, Network Layer, Transport Layer Multipath Transmission.**

I. INTRODUCTION

The 'Internet of Multimedia Things' (IoMT) is a novel paradigm whose prime objective is to enable multimedia streaming as part of the realization of IoT recent escalation in the utilization of multimedia services and applications such as video conferencing, telemedicine, online-gaming, etc. IEEE 802.11n standard specifies Power Save Multiple Poll (PSMP) protocol [1]. Multimedia IoT (IoMT) applications have new a cross-layer protocol to cope up with heterogeneity among the various communicating objects [2]. Adaptive versions of the real-time transport protocol (RTP) and real-time Control protocol (RTCP), i.e., IoT-RTP and IoT RTCP is divided the large multimedia sessions into simple sessions with awareness of network status [3]. The ARP can enhance the ARP performance by mitigating the occurrence of preamble collisions, while being compatible with the conventional NB-IoT ARP [4].Application level approaches enable multipath transmission capability by establishing the multiple transport connections and the distributing data over them [5].

This paper, discusses five different schemes such as an adaptive duty cycling based multi-hop PSMP protocol, A reliable cross layer protocol, IoT-RTP and IoT-RTCP protocols, An enhanced access reservation protocol with a partial preamble transmission mechanism, and Multipath transmission. These provide the better capacity throughput delay trade-offs, overhead and packet delivery ratio.

But these methods also have some problem so to overcome such problems proposed a design of multipath transmission with the help of Link-Layer Bonding, Network-Layer, Transport Layer Multipath Transmission, Application Layer Multipath capability and Summary.

II. BACKGROUND

Many studies on IoMT have been done to develop the scheme in recent past years. Such schemes are:

An adaptive duty cycling based multi-hop PSMP protocol for internet of multimedia things is proposed for reduction in end-to-end delay and duty cycling along with significant improvement in energy efficiency of IoMT devices [1]. IoMT: reliable cross layer protocol for internet of multimedia things is proposed to cross layer communication protocol for energy conserved IoT where different layers collaborate with each other [2]. IoT-RTP and IoT RTCP these adaptive protocols used for multimedia transmission over internet of things environments [3]. An enhanced access reservation protocol with a partial preamble transmission mechanism in NB-IoT system provides an analytical model that captures the performance of the proposed ARP in terms of false alarm, misdetection, and collision probabilities and optimizes the proposed ARP according to the system loads [4].The survey on multipath transmission in which application level approaches enable multipath transmission capability by establishing multiple transport connections and distributing data over them [5].

This paper introduces five scheme an adaptive duty cycling based multi-hop PSMP protocol, A reliable cross layer protocol, IoT-RTP and IoT-RTCP protocols, An enhanced access reservation protocol with a partial preamble transmission mechanism, Multipath transmission.

These are organized as: Section I Introduction of paper. Section II includes paper background. In section III previous work are presented. Section IV includes existing methodologies. Section V discusses attributes. Section VI proposed method. Section VII represents outcome and possible results. Section VIII concludes the review paper. And section IX future scope.

III. PREVIOUS WORK DONE

In research literature, many multimedia transmission protocols have been studied to provide various schemes and improve the performance in terms of capacity-throughput-delay trade-offs, overhead and packet delivery ratio.

Bilal Afzal et al. (2016) [1] has proposed an adaptive duty cycling based multi-hop PSMP protocol which enables energy efficient multi-hop communication in infrastructure based WLANs and mPSMP protocol extends the single-hop PSMP protocol specified by IEEE 802.11n standard.

Shalli Rani et al. (2017) [2] has worked on a layered architecture covering first three layers namely physical layer, data link layer, and last one network layer which supports strong heterogeneity as well as choose optimal routing path to exchange multimedia data.

Omar Said et al. (2017) [3] has presented the IoT-RTP and IoT-RTCP, adaptive protocols for multimedia transmission over internet of things environments. An adaptive version of RTP and RTCP transmits multimedia streams through IoT while preserving the accepted QoS and taking into consideration the special IoT features.

Taehoon Kim et al. (2017) [4] have proposed an enhanced access reservation protocol with a partial preamble transmission mechanism in NB-IoT systems. The ARP can mitigate the collision probability while slightly sacrificing the detection performance.

Ming Li et al. (2016) [5] has shown the survey on multipath transmission. First, a complete taxonomy pertaining to multipath transmission, including link, network, transport, application, and cross layers. Second, the state-of-the-art for each layer, investigate the problems that each layer aims to address, and make comprehensive assessment of the solutions and third is based on the comparison.

III. EXISTING METHODOLOGY

Many multimedia transmission protocol IoMT schemes have been implemented over the last several decades. There are different methodologies that are implemented for different multimedia transmission protocol IoMT i.e. adaptive duty cycling based multi-hop PSMP, A reliable cross layer protocol, IoT-RTP and IoT-RTCP, An enhanced access reservation protocol with a partial preamble transmission mechanism, Multipath transmission.

3.1 An adaptive duty cycling based multi-hop PSMP protocol:

The proposed multi-hop PSMP protocol enables multi-hop operations in PSMP based WLANs while minimizing the utility function of duty cycling. The protocol adaptively selects appropriate frame aggregation threshold and the TXOP duration for each node based on its uplink schedule time, data. paper transmission rate, the QoS specified minimum frame per seconds and application specific delay bound to the arrival time of the oldest pending packet in a queue. When a data packet is received at the MAC layer, it is appended in the pending packets queue maintained at each node. The aggregated packets are then transmitted, the amount of data in the queue exceeds the frame aggregation threshold and the delay for the oldest packet equals to the maximum delay bound limit [1].

3.1 A reliable cross layerprotocol:

A reliable cross layer protocol for IoMT has two new approaches they are cross layer model and multi objective optimization. In cross layer model, the design approach to merge the different functions into one model and provide the optimization solution for IoT. In multi objective optimization, multi objective function is considered as the solution of optimization problem. The cross layer architecture proposed is based on the data link and physical layer and network layer of ME-CBCCP. The different layers and their tunable parameters for the cross layer model [2].

3.2 IoT-RTP and IoT-RTCP protocols:

The adaptive version of RTP and RTCP are IoT-RTP and IoT-RTCP. The adaptive versions of RTP and RTCP are considered as application layer protocols with some transport layer functions. Therefore, the header of these protocols should be added to the multimedia payload after the transport and network layer headers. The adaptive version of RTP should accommodate many changes in the traditional RTP version in order to function irrespective of the IoT environment challenges. These changes are related to multimedia session, energy consumption ratio for each routing path nodes, thing type (passive or active), thing state, and multimedia stream prioritization. In IoT-RTCP, SR and RR should be upgraded by adding many fields to gather specific information about the IoT system [3].

3.4 An enhanced access reservation protocol with a partial preamble transmission mechanism:

The proposed ARP with the PPT mechanism mainly differs from the baseline NB-IoT ARP has the two steps they are, first step is each device randomly selects an index of preamble sequence among NP preambles, and randomly selects a partial unit among the available partial units. Second step, the eNodeB determines which PPSs are received. The eNodeB accumulates the received power spread over the partial units, and compare to the predefined detection threshold, at every partial unit. If a certain PPS are detected, then eNodeB transmits RAR, which consists of an index of preamble, an index of partial unit, TA offset, and an uplink grant. [4].

3.5 Multipath transmission:

The various forms of multipath transmission have been proposed. The first 3G network to go commercially live was launched in South Korea, which promoted the proliferation of mobile devices equipped with multiple wireless interfaces. Key used fluid-flow modelling to demonstrate that multipath transport can provide not only robustness but also balanced congestion in a stable manner. RP principle is a significant step towards a practical multipath-aware end system. The state of the art multipath transmission schemes are classified according to which layer of the protocol stack the proposed approach performs at: link layer, network layer, transport layer and application layer [5].

IV. ANALYSIS AND DISCUSSION

An adaptive duty cycling based multi-hop PSMP protocol shows the simulation model is used for evaluating the performance of mPSMP protocol. The end to end delay increases with an increase in the packet size. It is incremented proportionally with the increase in number of hops [1].A reliable cross layer protocol shows the improvement in energy and delay parameters. The multi objective solution has improved the energy, delay, reliability, and scalability [2]. IoT-RTP and IoT-RTCP protocols shows the performance metrics measured in the simulation experiments are end-to-end delay, delay jitter, number of RRs, packet loss, throughput, and energy consumption ratio [3].An enhanced access reservation protocol with a partial preamble transmission mechanism shows the ARP success probability is affected mostly by the collision probability. When the system load is light, it mitigates the mis-detection probability and if load is heavy then it mitigates the collision probability even though the detection performance degrades. The ARP success probability can be improved [4]. Multipath transmission shows the how multipath has become increasingly popular at the transport layer with features such as load balancing, fairness control, congestion control and Pareto-optimality [5].

Scheme	Advantages	Disadvantages
An adaptive duty cycling based multi-hop PSMP protocol	This Proposed method improves the energy efficiency of multi-hop nodes.	This protocol is not more adaptive.
A reliable cross layer protocol	Improved the energy and delay parameters. It is suitable for IoT framework.	End to end delay at each level is also increased with mote number of RNs and CCOs which is not suitable for multimedia communication
IoT-RTP and IoT-RTCP Protocols	The proposed IoT-RTP/RTCP outperforms the traditional versions of RTP and RTCP. It decreases the	This is no long-term solution for the problems of multimedia transmission over IoT environments

TABLE 1: Comparisons between different multimedia transmissions protocol IoMT schemes.

V. PROPOSED METHODOLOGY

The proposed method present a detailed investigation of two important design issues, i.e the control plane problem about how to compute, select the routes and data plane problem of how to split the flow on the computed paths. The main purpose of this paper is a systematic articulation of the main design issues in network-layer multipath routing (IoMT).
The proposed method further described below:

5.1 Link-Layer Bonding:

It has the primary goal to coordinate multiple independent links between a fixed pair of systems, providing a virtual link with a larger bandwidth.

5.1.1 Load sharing:

Load sharing allows congestion control techniques for diffusing congestion over resources.

5.1.2 Packet reordering:

Packet reordering is difficult to schedule data packets over heterogeneous paths without causing reordering and performance penalties.

5.2 Network-Layer:

In the network layer there is a Multipath routing presented. In the Multipath routing there are another factor are included.

5.2.1 Multipath routing:

Multipath routing allows the computation of disjoint paths even for single-homed devices. The various multipath routing techniques can be classified into four categories of: (i) source routing, (ii) hop-by-hop routing, (iii) overlay routing, and (iv) SDN based routing.

5.2.1.1 Route Computation:

Route computation task is considered a network-layer function.

- Source Routing:

The source is best suited to deal with any failures that may arise along a route. This motivates source routing in which the source host or edge router defines the end-to-end path to be used for forwarding packets.

- Hop-by-hop:

Hop-by-hop routing is especially popular for multi hop and infrastructure-less environment. Hop-by-hop is the most famous and widely adopted technique in IP networks.

5.2.1.2 Routing Metric:

Different metrics have been used to quantify the performance and quality of multipath routes.

- Delay/Latency:

In many time-sensitive applications, the delay metric is of vital importance. Delay refers to the average, end-to-end latency experienced by a communicating source-destination pair.

- Bandwidth/Throughput:

Throughput, or more informally bandwidth, refers the amount of data that can be transferred within a period of time.

- Control overhead:

Control overhead refers to the number of control messages that is need to be exchanged to compute and maintain multiple paths.

- Energy Efficiency:

Energy efficiency refers to the extent the multipath technique conserves energy resource.

5.2.1.3 Number of Paths to use:

In this, there are two factors are included they are subset of all parts and all paths.

5.3Transport Layer Multipath Transmission:

At this layer, the end-systems can easily obtain information about each path: capability, latency, and loss rate and congestion state.

- Fairness:

The common form of fairness has been max-min fairness in which all the connections get the same share of the bottleneck.

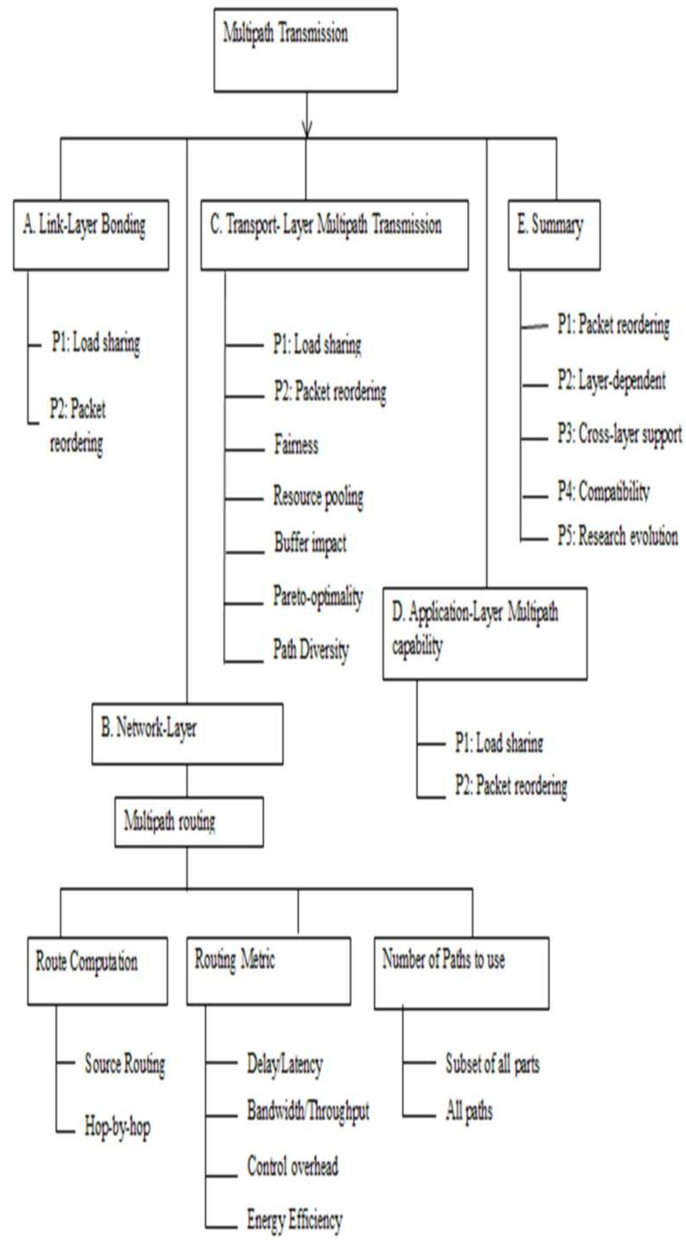

Fig: Multipath Transmission (MPTCP)

- Resource pooling:

RP is a concept that changed the notions of fairness in a way that made multipath communications widely acceptable in practice.

- Pareto-optimality:

It is a state of resource allocation in which there is no alternative. MPTCP is the first multipath transmission proposal which requires Pareto optimality.

- Path Diversity:

This path management may not only lead to a large number of sub flows being established but also ignore the benefits the path diversity could offer.

5.4 Application-Layer Multipath capability:
In this there are two factors are presents they are load sharing and packet reordering.

5.5Summary:
In the summary there various factors are included. They are given in th below:

- Layer-dependent:

The layer dependent features include the common research problems shared by the approaches on the same layer.

- Cross-layer support:

The cross-layer interaction for purposes of estimating path status to avoid packet delays and losses, scheduling traffic over multiple paths according to their capacity, exploring path diversity to obtain high throughput.

- Compatibility:

Application compatibility means that the lower layer changes do not require the legacy applications to be upgraded.
The above described parameters and issues are considered in network-layer multipath routing.

VII OUTCOMES AND POSSIBLE RESULT

In this way, with the help of proposed method solve the design issue of multipath transmission with the help of different layers. These layers are nothing but a link layer, network layer, transport layer and application layer. Multipath transmission is that multipathing with braided paths works better in terms of reliability and load balancing in WSNs. Multiple paths are considered in another study for improving reliability and energy efficiency.

VIII. CONCLUSION

This paper focused on the study of various scheme an adaptive duty cycling based multi-hop PSMP protocol, A reliable cross layer protocol, IoT-RTP and IoT-RTCP protocols, An enhanced access reservation protocol with a partial preamble transmission mechanism and Multipath transmission. But there are some problems in design of multipath transmission so solve the design issue of multipath transmission with the help of different layers. These layers are nothing but a link layer, network layer, transport layer and application layer, is proposed here. Multipath transmission has a natural solution with several salient features, such as reliability, fairness, RP and Pareto optimality.

IX. FUTURE SCOPE

From observations of the proposed method in the future multipath transmission can be implemented with the multicast, information centric networking

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