Performance Evaluation with End to end delay and Jitter for Multi-rate Multi-channel Networks

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Abstract: These days WiFi based networks are mostly using 802.11 based architectures. Due to evolution of multimedia network based applications multiple receivers for the same content strategies were developed. These applications were in need of the multicast based data delivery mechanisms. This paper provides the implementation of the multi-channel multi rate architecture for delivering multimedia packets seamlessly using parallel respective of multiple channels. The performance evaluation is done using NS2 based simulation for end to end delay and jitter parameters.

Keywords: IEEE802.11b/g protocols, end to end delay, jitter.

I. Introduction

In a group of multimedia receivers of wireless mesh networks (WMN) have shown efficient resource utilization in multicast connections scenario. The current technique constitutes sharing of the same spectrum for streaming the packets. There is always competition amongst devices to occupy the channel due to sharing platform. There is always at least one hop distance for parallel data delivery. In such cases there is performance degradation for multimedia traffics.

The interference is suppressed with the help of orthogonal channel for different radio interfaces. Due to limited availability for optimum performance of orthogonal channels their limitations while allocating channels to streaming services with sufficient bandwidth. Hence there is a need to extend the performance with efficient utilization of orthogonal channels with a specific strategy.

There is much complexity in multimedia multicast applications and hence large levels of interference. The main cause of this problem is because of an adaptive change in different transmission coverage ranges which may include interference.

II. Literature Survey

Er. Navneet Kaur, Er. Gurjot Singh in “Runtime Optimization of 802.11 based Wireless Mesh Network by Multi-Radio Multi-Channel" introduced that. The existing method works on single-radio single-channel (SR-SC) design thereby sharing one basic channel. In this engineering, the system continues from low limit and throughput because of successive back offs and collision impacts. Consequently Single-Radio Multi-Channels (SR-MC) had been intended to upgrade the WMNs execution. In SR-MC, there is switching between channels in a progressive manner concerning load in the system along with at least one chance-based data trade of in typical time frame. In such a system, allocation of time frame for communication is achieved by tight time synchronization amongst devices. However in a multi-hop WMNs it is hard to accomplish such synchronization among hubs. A satisfactory answer for decrease the high inactivity and at the same time upgrade throughput and diminish end-to-end delay of WMNs is to utilize Multi-Radio Multi-Channel (MR-MC) engineering. In MR-MC WMNs design, various interchanges can happen in the meantime, and diverse channels doled out to connecting connections can convey information packets without impedance. In the wake of authorizing SR-MC WMNs and MR-MC WMNs in Qualnet test system, results are assessed in view of parameters such as throughput and end-to-end delay. Results demonstrate the critical distinction between these two situations. MR-MC WMN gives the better result as contrast with the SR-MC WMN. MR-MC WMN is considerably more suitable for the calamity administration in the broadband web application. But in present eon scalability is also a major factor for the optimization of the network so in this paper effect of scalability on SR-MC and MR-MC wireless mesh networks is optimized.[1]

Peng-Jun Wan et al [2], have shown study of maximum multiflow (MMF) and maximum concurrent multiflow (MCMF) which is applicable for multi-channel multi-radio multi hop wireless networks under the 802.11 interference model or the protocol interference model. Also authors have given algorithm with the practical polynomial approximation for maximum multi flow and also constant approximation bounds for MCMF irrespective of number of channels. As per protocol interference model in 802.11 standard, the approximation bounds are set to 20 maximum in general and 8 maximum when there is uniform interference radius. The radius considered in this strategy is c times the communication radius. Also if total number of channels are bound by a constant in both multiflow and multichannel cases polynomial approximation scheme is used [2].

Wanqing Tu in Multi-rate Multi-channel Multicast Algorithm in WirelessMesh Networks have shown multiple channels scenarios in wireless mesh networks which show automatic channel based transmission rate adoption. The technique based on channel occupying strategy, multiple rates and multiple channel allocation for performance improvement in terms of transmission coverage in multicast network scenarios. High throughput is achieved by using multichannel multi rate multicast algorithm which controls the link. NS2 based simulation results show the improved multicast quality of LC-MRMC in much larger wireless areas as compared to current studies.[3]

Shreeshankar Bodas, Sanjay Shakkottai, Lei Ying, and R. Srikant in "Scheduling in Multi-Channel Wireless Networks: Rate Function Optimality in the Small-Buffer Regime" discussed the problem of designing scheduling algorithms for a multichannel (e.g., orthogonal frequency division multiplexing based) wireless downlink network. The classic Max Weight algorithm degrades the users delay based performance in such systems. As a solution to this challenge authors have shown alternate method which uses iterated longest queues first (iLQF). The iLQF based algorithms are evaluated using different system configurations. For wide deviation settings capability the pull up iLQF algorithm is used. The results obtained in these type of settings show optimal results for the problem and is shown to result in mostly positive value of the rate function for variety of combinations of the basic system model.[4]

Salah A. Alabady et all [5], have given in their paper a new paradigm of wireless broadband Internet access. This is achieved by providing a service with high data rate, which shows scalability and self-healing abilities at lowest cost. Due to interference and channel quality variations it is challenging to achieve performance in terms of better throughput in multicast applications of WMN. A cross layer methodology is shown to overcome on this challenge. The maximum multi cast throughput is achieved in effective manner by using network coding. Bandwidth utilization along with optimum usages improved multicast throughput are the benefits of using this strategy. Authors have addressed variety of techniques by reviewing them with the fundamental concept types of medium access control (MAC) layer, routing protocols, cross-layer and network coding for wireless mesh networks.[5]

III. Methodology of analysis and existing results:

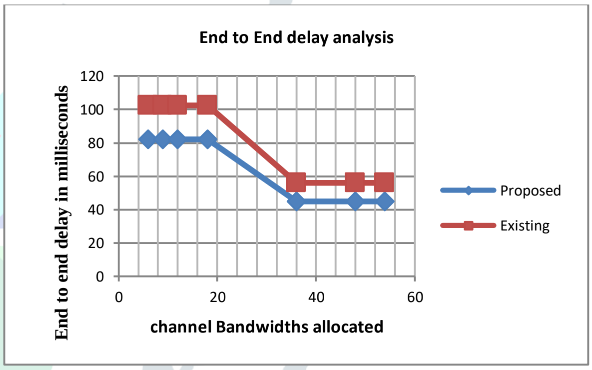
End-to-end Delay:

End-to-end delay is the time it takes for a packet to be transmitted from the source node to the destination. In order to calculate this, we take the time for the last packet (lpkttime), subtract the current packet time (time sent) then divide the total by the difference between the current numbers of packets received by the last number of packets received.

Results of End to End delay:

Figure 1: End to end delay analysis

Channel Bandwidth	Proposed	Existing
6	82.0474936	102.559367
9	82.0474936	102.559367
12	82.0474936	102.559367
18	82.0474936	102.559367
36	44.8105544	56.013193
48	44.8105544	56.013193
54	44.8105544	56.013193



Analysis of End to End delay:

1. In end to end delay it can be observed that as bandwidth allocation increases delay decreases.
2. In proposed protocol end to end delay is much less compared to 802.11

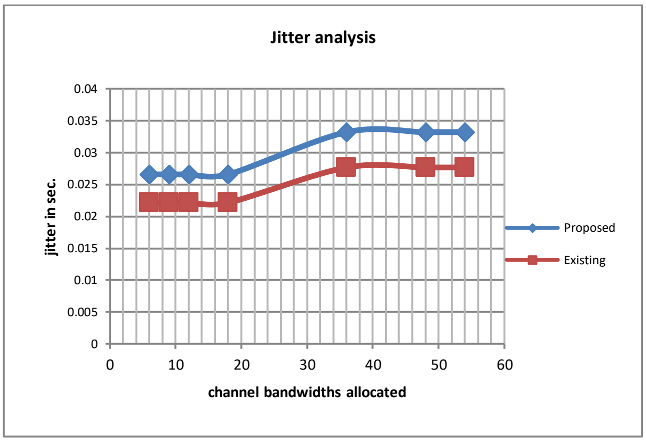
Jitter:

Jitter is the variation in the delay of the received packets. Although packets are usually sent at a consistent rate, yet delay between packets may be forced to vary due to congestions and limitations of queuing mechanisms.

Results of Jitter:

Figure 2: Jitter analysis

channel bandwidth	Proposed	Existing
6	0.0265584	0.022132
9	0.0265584	0.022132
12	0.0265584	0.022132
18	0.0265584	0.022132
36	0.033198	0.027665
48	0.033198	0.027665
54	0.033198	0.027665



Analysis of Jitter:

Jitter analysis indicates that as bandwidth increases jitter decreases and hence less time is required to rearrange sequence of packets thereby faster data reception.

IV. Conclusion:

In this paper we have presented multichannel allocation scheme. The results obtained for end to end delay and jitter show that, proposed scheme outperforms thereby decreasing the jitter and end to end delay. The results are satisfactory and shows the application of systems where streaming and fast delivery of large sized data are required.

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