Analyzing and Improving Quality of Service in Wireless Networks

PAPER WRITTING REPORT

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MASTERS OF COMPUTER APPLICATION

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DECLARATION

We hereby declare that the Research work entitled “Analyzing and Improving Quality of Service in Wireless Networks” is an authentic record of our own work and all ideas and references have been duly acknowledged & any work carried out as requirement of Dissertation (II) for the award of degree of MCA (Hons.) (Lateral Entry) Lovely Professional University, Phagwara, under the guidance of Mr. Guravtar Singh Sir during January to May, 2015.

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It is certified that the above statement made by the students is correct to the best of my knowledge and belief.

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I.) INTRODUCTION

DEFINITION OF QUALITY OF SERVICE

There have been vast advancements in Computer and Communication Technologies. Wireless network has been a keen issue at sustaining versatile applications. A Wireless Local Area Network implements a flexible data communication system frequently augmenting rather than replacing a wired LAN within a building or campus. WLANs utilize radio rate to broadcast and obtain data over the air, minimizing the demand for wired connections. With the monumental emergence of wireless technology, computer networks would have gain connectivity with a passable amount of bandwidth free from networked via a wall socket.[4]

Providing Quality of service is more important in an effort of providing authentic network execution while using total network resources in an efficient and effective mode. Offering Quality of service assures to various applications is an keen target in scheming the next-generation wireless network. Different applications can have variety Quality of service necessities in terms of delay bounds , data rates, & Delay bound violation probabilities.

ISSUES OF QOS

Why QoS is a exigent problem, can be described with reason as follows.

First, bounded network bandwidth. Second, timely deliverance of real time multimedia data is tricky due to mobility, low power and service distraction because of link malfunction and/or security problems. Third, the wireless channel fading and elevated BER directly affect the throughput performance of the network. Architectures of most network deal with all packets in the same way, a single level of service. However, applications have assorted necessities and may be approachable to packet losses and latency.

For example, interactive and real-time applications such as VoIP and streaming services such as videos, audios and interactive services such as web and transaction have a diverse intensity of obligation to the superiority such as packet losses and latency. When the latency or packet loss rate exceeds definite levels, some applications and services happen to unusable . The traffic flow requirements for each kind can be characterized by four factors, i.e. reliability, delay, jitter and bandwidth.[7]

There have been numerous challenges associated with guarantying quality of services, but the biggest challenge for conventional networks has been congestion. However, many more challenges subsist for wireless and mobile networks above those in conventional networks. For this reason, an entire different set of Quality of service techniques are mandatory for wireless networks than for wired networks. and we have tried our best.[3]

Our Paper describes about different guarantee that can be made , what application require Quality of service guarantee , what challenges are , and some well known Quality of service Approaches.

II.) LITERATURE REVIEW

PAPER 1 :- RESEARCH ISSUES IN WIRELESS NETWORKS :

Study : The explosive development in wireless networks over the last few years resembles the rapid development of the internet within the last decade. Wireless communication continues to enjoy exponential growth in the cellular telephony, wireless internet and wireless home networking arenas. In addition the popularity of wireless networks growing at a exponential rate, the data rate enhancements, minimizing size, cost, low power. They use networking, user security and the best requirement to obtain the required Quality of Service problems becomes more challenging.[1]

PAPER 2 :- BRINGING QUALITY OF SERVICE OVER WIRELESS LAN INTO FOCUS :

Study : The introduction of corporate Wi-Fi networks and wireless clients introduces a disruptive new variable in the transportation of latency-sensitive streams, one that must be properly managed and controlled to provide a satisfactory user experience. The underlying protocols for Quality-of-Service (Quality of Service) over Wi-Fi were standardized several years ago, and enterprise wireless LANs now incorporate the relevant standards. However, adhering to the standards alone is not sufficient to build a superior multimedia-enabled wireless LAN. Rather, the network vendor demands to understand the fundamentals of how these protocols work, and then implement network configuration adjustments that dynamically and automatically tune the network to deliver end-to-end Quality of Service.[6]

In this paper, They will briefly examine Wi-Fi Quality of Service standards, and see the role these play in delivering end-to-end Quality of Service. The paper will conclude with a detailed explanation of Aruba’s self-tuning Quality of Service mechanisms and how they ensure the reliable delivery of latency-sensitive voice and video streams.

PAPER 3 :- EFFICIENT DEADLINE-BASED QOS ALGORITHMS FOR HIGH-PERFORMANCE NETWORKS:

Study : [5] This paper discusses about the environments for high performance networks and parallel networks which consists of various traffic types. With this matter deadline based algorithm can furnish the great provision. They also explored how to efficiently adapt the Earliest Deadline First family of algorithms to high-speed network environments. The results show excellent performance using just two virtual channels, FIFO queues, and a cost feasible with today's technology.

PAPER 4 :- QUALITY OF SERVICE (QOS) PROVISIONS IN WIRELESS SENSOR NETWORKS AND RELATED CHALLENGES :

Study : [7] In this paper we have studied the QoS requirement in Wireless Sensor Networks and highlighted some of the challenges posed by the unique characteristics of wireless sensor network. They presented a survey of some of the QoS aware routing techniques in Wireless Networks and reviewed some of the QoS aware routing protocols for Wireless Networks. A comparative study of some of the QoS aware routing protocols, taking few important factors in context of Wireless Networks is done. They have also discussed about the middleware based QoS support in Wireless Networks. Finally, They have concluded by mentioning some of the open research problems in Wireless Networks to initiate further research in the subject.

PAPER 5 :-QUALITY OF SERVICE SCHEDULING ALGORITHMS:

Study : This paper discuss about the various scheduling algorithms available , what's their properties, and their classification and goals. It includes FIFO, processor sharing, Round Robin, Deficit Round Robin, Strict priority, Generalized processor sharing, Weighted Round Robin, Virtual Clocks and Weighted Average Queuing. It has competed it's comparison.

PAPER 6 :- QUALITY OF SERVICE IN WIRELESS NETWORKS :

Study : [8] In this paper They revise some of the most relevant aspects concerning the Quality of Service in wireless networks, providing, along the research issues we are currently pursuing, both the state-of-the-art and our recent achievements & topics concerned with Quality of Service in wireless networks, focusing our attention on aspects like survivability, data approach and layout design.. More specifically, first of all we focus on network survivability, that is the ability of the network of maintaining functionality as a consequence of a component failure.

PAPER 7 :- QUALITY OF SERVICE IN THE FUTURE INTERNET:

Study : [9] This paper addresses Quality of Service in a Future Internet scenario and is focused on three emerging concepts: Network Virtualization, enabling the coexistence of multiple network architectures over a common infrastructure; In-Network Management, improving scalability of management operations by distributing management logic across all nodes; the Generic Path based on the semantic resource management concept, enabling the design of new data transport mechanisms and supporting different types of communications in highly mobile and dynamic network scenarios.

Considerable research effort will be necessary to address the challenges raised by the design of the Networks of the Future.

PRESENT WORK

QoS has been defined as a layout of service demands to be satisfied when transmitting a stream of packets from origin to terminus. Modern supercomputers and parallel machines put very much pressure on the interconnection network. there is little doubt that QoS will establish a primal demand. However, QoS issues and their respective results will not stay unaltered. New challenges will be aroused , new ways of handling with QoS will be enabled by novel networking conceptions and techniques. Thus, a fresh approach at the QoS problem will be required every time.[5]

III.) PROBLEM STATEMENT

The upholding emergence of wireless devices and multimedia services create challenges for providing Quality of Service (QoS) support to users. The devices and internet connection (fixed & mobile) is ideal by users who hinges on the circumstances when availing from a particular service. There are various factors that determine users' conclusion :

1) **Time to approach the content.** For Example, Smartphone is preferred when it comes to take a picture and upload it to Facebook;

2) **Mobility.** Smartphone may be measured superior than the laptop in terms of the mobility;

3) **Security.** When approaching the individual internet bank or shopping with a credit/debit card or net banking, a laptop with a fixed line is favored to a mobile device over a wireless network, as the latter suffers in terms of security;

4) **Quality of Experience.** For example, a movie played on a large screen tool provides superior viewing skill and experience than on a Smartphone;

5) **Context.** The user‛s decisions are also impacted by geographical factors, i.e., at home, at work, or waiting for a train; social factors, e.g. alone, with friends; service factors, e.g.

car routing and navigation, (VOD) video on demand, video conferencing like Skype or Google Talk.

There are several vital issues associated to QoS in wireless networks that do not get addressed in the wire line environment. These issues occurs because wireless networks are essentially special and different from wire line networks. Numerous significant wireless network rareness include actuating transport QoS , dynamic and divergent connections, and handoff to QoS .

The traffic QoS factors (throughput, delay and loss rate) are not adequate in a wireless environment. In a wire line environment, the application layer can generally be certain that once a connection is established it will continue to exist until it is closed. In a wireless environment, connections may temporarily shatter throughout a procedure termed handoff . It is unlikely that handoff can take consign without at least a short connection interruption. Applications running in a wireless environment must be able to recover from temporary interruptions, and should specify the maximum connection interruption time that they can tolerate. The application could specify such a time via a large loss rate;

however, this would burden the meaning of loss rate. Loss rate should only reveal losses due to buffer overflow or transmission errors. A utmost rate of connection interruption is an added performance factor that would be worthy in a wireless network. Some applications may appeal a low interruption rate so that the QoS professed by the user remains adequate.

For example, an application may hope to guarantee that a voice connection will not be busted more than once per minute. A low interruption rate implies that handoffs do not happen too often. Applications may allow a larger maximum connection interruption time in exchange for a low interruption rate. For example, It may possibly be more desirable to have occasional long breaks in a video connection, rather than regular minor breaks.

Currently these days, contention-free and low-latency interconnection networks are demanded for the execution of parallel applications. Moreover, high bandwidth is also obligatory to approach storage devices. In addition to these, there is also a demand for management and administration traffic bound to configure and to deal with the machine. Finally, some low-priority traffic-like backup copies are demanded. Therefore, there is a vast variety of application requirements in such environments.

In conventional data network, QoS defines certain factors such as packet jitter, bandwidth ,loss, delay, etc . Though, the QoS requirements in Wireless Networks such as aggregation delay, coverage, fault tolerance, data accuracy , and network lifetime etc. are application particular and they are different from the conventional end-to-end QoS requirements due to the difference in application domains and network properties. Although, some QoS solutions (like IntServ, DiffServ etc) are developed for conventional networks, these cannot be simply ported in Wireless Networks due to

1) Strict resource constraints in sensors nodes,

2) Major and arbitrary deployment of sensors nodes and

3) application specific and data-centric communication protocols in Wireless Networks.

Researchers have been working continuously towards QoS support in Wireless Networks and have proposed some methodologies for that purpose. To name a few, Network Layer based QoS may sustain in terms of routing protocols, Cross Layer based QoS support and Middleware layer based QoS support are the most important types of approaches for QoS support in Wireless Networks.

IV.) REVIEW SOLUTION

SITUATION 1

[5] In this paper, The usual solution is given to cope with this variety of communication necessities is to overprovision the network. The designers provide more resources than demanded to ensure meeting traffic requirements. Besides, to provide the different classes of traffic with their requirements, it is common to settle on a network for each traffic class (TC).

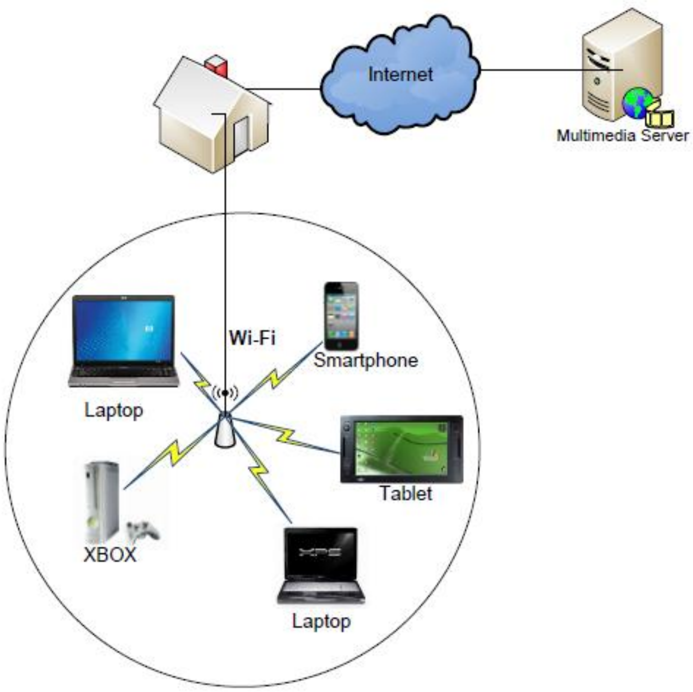
A subtler approach could be taken in the design of the interconnection for such machines. A single network with some quality-of-service (QoS) support could be used to provide each kind of traffic with its specific requirements. In fact, some of the latest high-performance interconnection proposals incorporate some support for QoS. they have introduce the InfiniBand and PCI AS interconnection standards, which include some QoS mechanisms.

The two main types of QoS support are per-traffic-class and per-flow support. The first approach requires the cataloging of the traffic in TCs and the task of one virtual feed (VC) per TC. The network switches present a traffic differentiation based on these TCs by applying diverse scheduling algorithms at the VC level. On the other hand, per-flow QoS support requires a stream of identifier to be allied with each packet and per-flow data and information to be set aside at each switch of the network. This second approach is much more powerful, but it is also so complex that it has never been implemented in a high-performance situations and environment, with possibly the omission of ATM.

From above scenarios, we have approached how to obtain most of the benefits of the per-flow QoS approach within the restrictions of high-performance switches. More specifically, they have recommended a novel strategy to emulate the Earliest Deadline First (EDF) family unit of algorithms using just a couple of First - In, First - Out (FIFO) queues.

SITUATION 2

[4] In this paper , Authors have considered three scenarios in which there are multiple devices (eg. Laptops, Smartphones, XBOX, and tablet PCs) connected to IEEE 802.11 wireless router providing services.



[4]

1) All family members are watching videos carried over the wireless network. The kids are watching cartoons using the tablet PC, mom is watching a dance show from Youtube using the laptop, and dad is watching live soccer game using his Smartphone;

2) The family members obtain different multimedia services via the wireless network. The kids are playing an on-line video game via XBOX, mom is watching a video from Youtube using the laptop, dad is updating his Facebook profile with his Smartphone;

3) Mom is having a Skype video chat with her friends and dad is having an important meeting with his colleagues using VoIP via Skype.

In the case of the first and second scenarios, the downlink traffic dominates the WLAN, while in the third scenario, the downlink and uplink traffic competes for the wireless channel. Current IEEE 802.11 networks can grant high speed approach, i.e., up to 54Mpbs and 600Mbps for IEEE 802.11g and IEEE 802.11n, separately. However, the restrictions of the original IEEE 802.11 protocols might influence the QoS in three scenarios.

In the first scenario, video content is delivered to the laptop, tablet PC, and Smartphone via the same wireless approach router. The laptop might require higher bandwidth allocation than the tablet PC and the Smartphone, due to more powerful data processing potential and larger screen resolution.

In the second scenario, interactive video service (on-line game), video on demand service (Youtube), and best-effort service (Facebook) are delivered. There is a order to give the interactive video application users higher bandwidth than that for the best-effort service users, since video applications are more sensitive and responsive to delay and loss. Though, according to original IEEE 802.11 protocols, the wireless bandwidth is uniformly mutually shared by all downlink traffic.

In the third scenario, interactive services (video chat and voice over IP) are delivered in the IEEE 802.11 WLAN. It is necessary to allow average wireless channel approach between downlink and uplink traffic in order to satisfy the end users. Nevertheless, according to original IEEE 802.11 protocols, the downlink flows acquire fewer channel approach prospect than the uplink flows due to the inbuilt and inherent contention mechanism of CSMA/CA. Consequently, the downlink traffic has lower priority in approaching the channel, regardless of much of the traffic being downlink and not uplink.

In this context, there is a demand to develop an intellectual QoS differentiation solution when delivering multimedia content to different devices over the IEEE 802.11 networks. Such a QoS differentiation solution is expected to involve the following aspects:

1) Multimedia services awareness. For example, bandwidth share allocated to the real-time traffic flows (i.e. video on demand, on-line gaming, streaming audio, etc) are expected to be higher than the best-effort or background traffic flows (i.e. e-mail service, web-browsing, etc);

2) Device characteristics awareness. For example, when delivering video sequences to a laptop and Smartphone which are connected to the same IEEE 802.11 approach point, the laptop should be allocated higher bandwidth share than that of the Smartphone;

3) Average traffic distribution between downlink and uplink. For example, when delivering VoIP services in the IEEE 802.11 networks, the downlink and uplink traffic flows are expected to achieve average network approach in terms of throughput, delay, and loss.

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