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Analysis of QoS in Different Application by using Opnet Workbench

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Abstract

Quality of service gauges the overall performance of different services within the network in many applications like voice telephony, video conferencing, audio conferencing etc. This paper involves the analysis of quality of service among different application by using Opnet workbench. With the help of Opnet which includes many built-in parameters thus by using some parameters of QoS within an Opnet, the effect of QoS has been detected. The central idea is to mainly determine the role of QoS on some applications. This paper includes a simple network which does not include quality of service and a complete network with some applications in which authentic parameters regarding the quality of service, are applied. Thus, it has been concluded there is a great impact of QoS in a network. A network without quality is considered to be a poor network so this paper majorly emphasizes the importance of QoS.

Keywords Quality of service Opnet; Network topology; Voice over IP

Introduction

With the new innovation in technology, great advancement in technology has been witnessed through different network services. The major need that every user wants is Bandwidth. All the networked applications which have the services like more bandwidth, less jitter, and even fewer delays are considered to be best fitted because every user who is the internet user wants speed even more than considering in GUI and other benefits. Network services like DNS, Email, instant messaging, gaming, printing, VOIP, wireless sensor network etc. these are the services which are provided by any means of a network. Every user have an inclination for the quality either it is in our daily life or it is in the internet of things. Services which are provided by the network as discussed above should be rich in quality. Quality of service which provides better service includes priority difference and gives the degree of satisfaction to the user's mind [1-8].

Technically QoS refers you to divide your data traffic with different parameters in the header of packets that are coming on receiving end. For example, you can differentiate the traffic on the base of class or priority or the source/destination address of the received packet. Network devices like routers and switches fulfill this task in a way that it determines the parameters of the packet received at destination site and place the packets into a different class of service on the basis of the value of those parameters. Every CoS (class of service) have different quality of service attributes and behaviors which are combined with it. QoS teaches how to behave the different class of traffic coming from the destination. It totally depends on the QoS abilities and the configuration of the network device to check which QoS behavior a network device petitions to the data traffic in every class of service. End to End quality of service requires Per Hop configuration. To deploy full QoS (end to end) it is necessary that all the data traffic allotted to the single class of service get uniform behavior from every network device. That absolutely does not mean each network device in data traffic path must be configured in the same way. QoS behaves uni-directionally and the operator who is operating the whole network must define them in both incoming and outgoing directions on each device in the data traffic transmission. To decrease the latency, packet loss and jitter in today's going on the network; a standard of IETF, internet engineering task force developed two models relative to QoS in IP based network [8-13]. They are Intserv and Diffserv thus pronounced as integrated services and differentiated services.

The Internet also supports best effort services but this service includes deficiency of QoS, it also bestows the quality of service by provides no guarantee. In case of packet loss during the transmission Best effort services fails to acknowledge that the specific data packet is failed. Thus no guarantee was provided by best-effort and by now this service is failed.

Integrated services provide quality services. It is a flow-based QoS model thus uses internet protocols [13-16]. The Intserv, where hosts side declares their QoS need to the server but failed to fulfill users request because of its very difficult and complex implementation. The network performs the operation of admission control and call setup with the help of information required within applications and the resources available in the network. It also fulfills all the need of QoS within the applications as the transmission of packets stay consistent within the profile specifications and it maintains the per-flow state after that classifies the packets accordingly and applies to police and intelligent queuing based techniques which are based on that state.

RSVP Resource reservation protocol is that protocol which provides a signaling mechanism that signaling mechanism assures you either your application are working within a right way or not. It provides the controlled load service that is also a type of integrated services.

The mechanism of intelligent queuing can also be used with RSVP to give the guaranteed rate services; these services allow your application to reserve the speed to fulfill all requirements accordingly. VOIP is a big example that stores required an amount of bandwidth with an end to end QoS [16,17]. This type of service is used in real time communication where no delays can be tolerated. Another service includes in Intserv is Controlled load service that provides a facility that allows your application to low the level of delays and provide high throughput even if there is a lot of load or congestion within the

transmission. This type of service has used that application where little bit delays and jitters can be tolerated like emailing and files transfer. The second model which was presented by IETF was Differentiated services; it is a model that is used for many different missions and provides multiple services that meet all the requirement of QoS. Unlike integrated services applications which use DiffServ, do not provide the signals to the router before transmitting the data towards its destination end. The network delivers an amenity-based on QoS which is specified by each packet. It is a class-based model and handles all the short comes of integrated services. It includes service and forwarding treatment and Per-Hop Behaviors (PHBs). The network used the QoS specialization that includes classification of packets, marking, shaping, and traffic policing and performing intelligent queuing. Cisco supports the CAR and intelligent queuing schemes provided by differentiated services. CAR performs the packet classification through IP precedence and QoS settings. It also performs metering and measuring. Moreover policing of transmission of packets, it relatively provides bandwidth management. Intelligent Queuing scheme like WRED and WFQ algorithms can be used with CAR to provide differentiated services. This paper includes the analysis of QoS on different applications within the Opnet modeler 17.5 version. OPNET is best among all networking simulators. Within the Opnet a very basic scenario is created firstly which is without applying the QoS and it is shown that how simple network can be created. The second scenario is created which includes routers, switches, application configure, profile configure, and different application servers. There are three different application servers and end nodes are deployed in the scene which shows that the different applications like HTTP, FTP, and voice are going on with better quality of services. There are four Workstations, six Routers, two switches and three servers like FTP server, SIP server, HTTP server. Moreover: application configuration, profile configuration is present in the scenario. There are different wires are used because of a large network and more devices [16-25] (Figures 1 and 2).

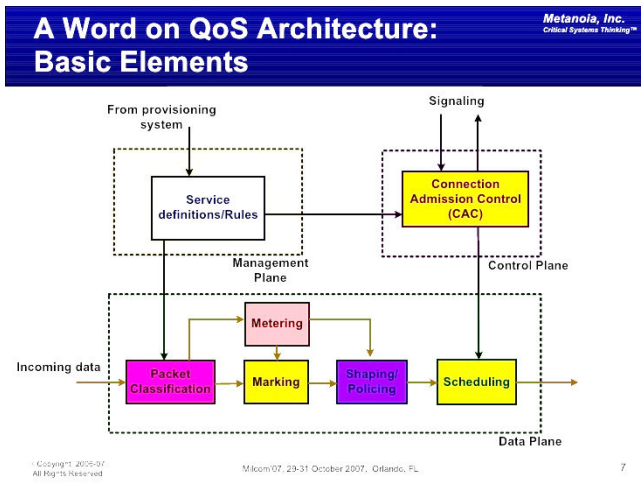

Figure 1: QoS architecture.

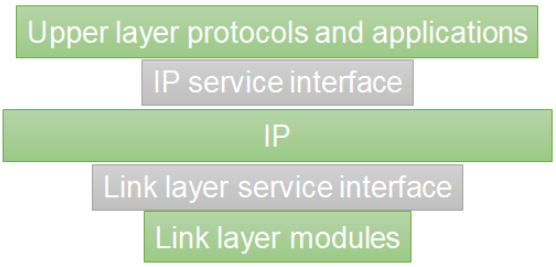

Figure 2: Mechanism of intelligent queuing.

Literature review

The very basic goal of QoS is to provide best services for different applications. The early work for QOS over the internet was IntServ read as integrated services, it is the philosophy that reserve resources for the different application. In a broadband network, it comprises of a large service provider, the core router would be used to accept, maintain and tear down the possibilities of hundreds of thousands of reservations and would fail to grow network rapidly.

The DiffServ pronounced as differentiated services, use the mechanism in which data packets would be marked according to its priority or the TOS that the application needs in result of these the different devices which are used in network like switches, hubs and routers etc. use different routing techniques and strategies of queuing to examine the performance according to the given requirement.

Routers which use differentiated services use multiple queues for packets who waiting for the transmission form bandwidth constrained interfaces. Vendors of routers provide different abilities for configuring this behavior like including the number of queues for supporting, relative marking of queues and bandwidth for each queue.

Practically when packets arrive from source to destination their priority level thus changes like the packets that are queues are given less priority as compared to the packets having low jitter rate.

It is very difficult to deploy QoS in a solid network based on IP; there is no any specific definition for QOS thus QoS have different requirement for different application like for audio and video there must be different requirements for QoS same like other applications QoS behaves differently.

In the case of packet switched network, QoS is an issue because of the built-in services which are given the same priority level to every application and priority level is the service which is to be given to different applications.

By doing complete survey analysis it has been witnessed that many authors have a workout on the QoS by using a different network and different class QoS majorly used in voice and video conferencing, for a good voice and video applications, QoS is an important factor. By applying the different parameters of QoS in a different application of VOIP, the network can be enhanced. Very important parameters for VOIP are following: Latency, packet loss, delay, and jitter.

QoS has been sustaining a lot of heed in many different research areas like multimedia systems, real-time systems including networks.

The author declared that they have presented a well-organized model for QoS management in which it must satisfy applications which need multiple dimensions like data quality, cryptography, reliably delivering of packets etc.

They have referred this model as QRAM because it can deal with the much parallel application.

Several authors have described the use of overlay-based techniques and approaches for the deployment of multicasting techniques and for the improvement of routing strategies. These systems are specially used in difficulty of modifying the internet protocol for creating robustness in the systems and also in terms of deployment.

Within the QoS and boundary of controlling load, proposed a way to brace a very limited range of speed (bandwidth) services by using the technique of overlay framework. It may also require for the enhancements in all the edge routers within a domain to reach its functionality level. There is one more technique named as a service overlay network, which is proposed recently that provides bandwidth with QoS parameters by using SLAs and combine the parameters to provide the QoS guaranteed

Moreover according to the many author's loss recoveries involves FEC and ARQ based approaches that have been investigated in the packets of audio, video and internet telephony. According to the author Since the FEC which is forward error correction technique which makes the transmission of packets errorless, are limited in different applications anyone cannot be able to apply these results directly to the settings however the mechanism of Classical Coding (CC) is a method which is used in wireless networks and can be greatly applied in the problem for getting good solution.

Quality of services have an important role in many fields as it is discussed above, like in wireless sensor networks according to the author there are two different approaches which are based on traffic engineering to achieve the quality of services, one is RSVP resource reservation protocol and reservation-less protocol. In the reservation-based protocol, all the resources are required but according to the application's requirement of QoS and bandwidth rules and regulations. This approach is used in ATM and integrated services model on the internet. But in reservation less protocol there is no resource allocation or reservation is required. Quality of services can be achieved by using some strategies like admission control, call setup and queuing mechanism.

Wireless networks which are based on infra-structure like WLANs and BWANs both of them are enhancements of wired networks so the connectivity could be easily enlarged to the users of mobile and mobile users can reach to the base station at one hop count so QoS in this context mainly due to the less bandwidth and the complex structure of mobility so it's very instinctive to use QoS architecture to establish with wireless MAC protocols in wired networks. Wireless MAC protocols work in a way, it proves that network traffic of classes of differentiated service with the ingress of priorities over any wireless devices which are shared so that QoS can be provided overall.

Materials and Methods

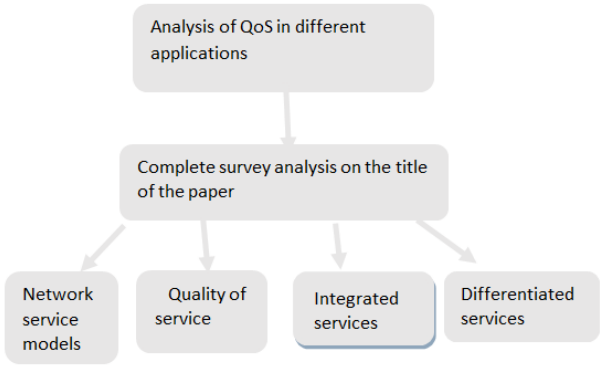

Figure 3: Analysis of QoS.

Experimental setup

Basic scenario in OPnet: We have created a very basic scenario on one in which it has been witnessed that how much traffic is sent and received to the destination. Moreover, it is checked that how many delays are present during the transmission of packers as well by slightly changing the parameters.

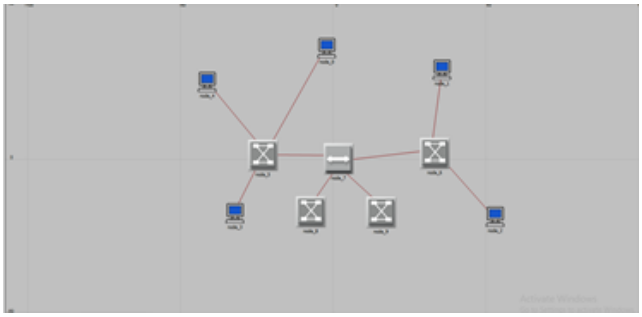

Figure 4: Topology 1.

This is the main topology in which three switches and one hub has selected. And five workstations by creating the connectivity through 10 baseT wires thus created the very small and basic network which will show how much traffic is going to be sent and received and much many delays we have to face during the transmission.

This is the second topology in which three servers are deployed, mainly named as a voice server, HTTP server, and Ftp server. Next six routers are brought on the scene which is connected by two switches and further one switch is connected to the workstation and other is connected to the servers with different bandwidth of wires because of large network and different devices it was essential to use different connectivity cables (Figures 3-5).

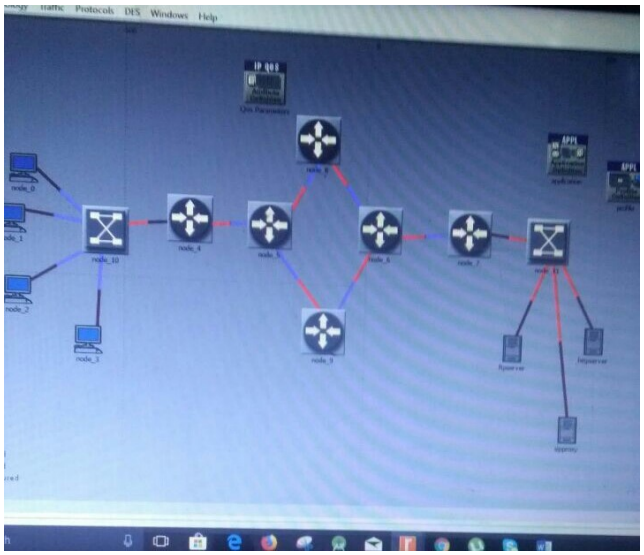

Figure 5: Topology 2.

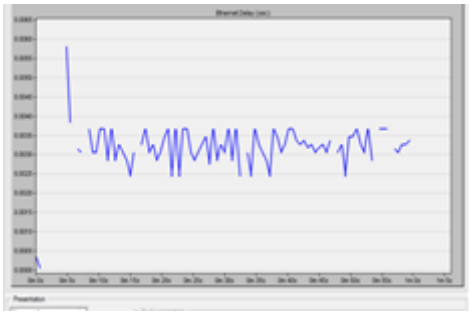

Figure 6: Result of topology 1.

Figure 6 shows the delays which are being witnessed during the transmission of data packets in the basic and simple topology. It can be seen very clearly that the graph is firstly gone very up and then gradually it becomes slightly down but remains in up and down position means somewhere it slightly up and somewhere it is slightly down but besides all this, it seems to be in a constant position.

Figure 7 shows the traffic received within the transmission. The graph is showing excellent results of data packets that are to be received. It shows that transmission of packets is going very well to the destination end.

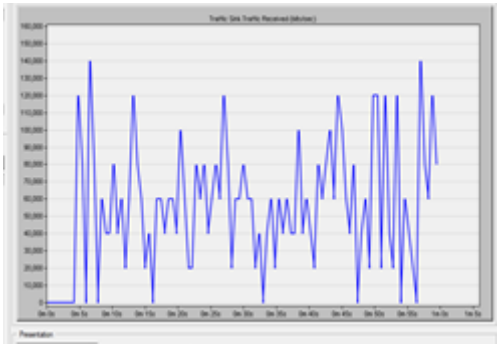

Figure 7: Traffic received within the transmission.

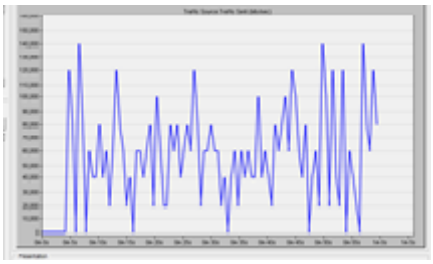

Figure 8: Packets which are sent from source to destination.

This Figure 8 represents the packets which are sent from source to destination. The parameters which are checked through global statistics are packets sent, received and delays. The packets are sent and received in the form of bits per second. These are the results that show how many packets are to be sent at the destination end in the form of bits.

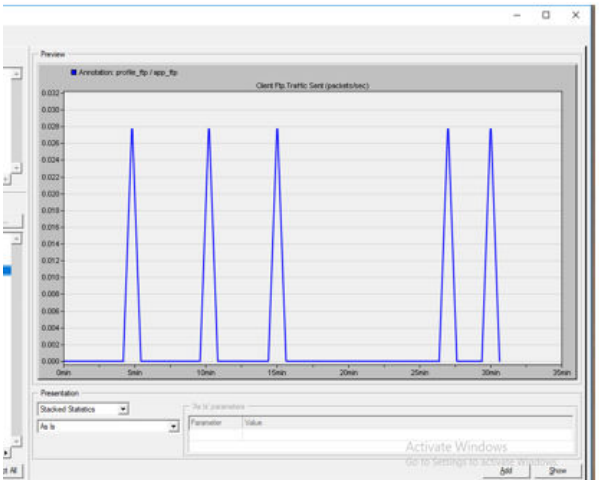

Figure 9: Results of topology 2.

These are the results of packets that are sent from source to destination through file transfer protocol. This is the result of file transferring from one place to another (Figures 9-17).

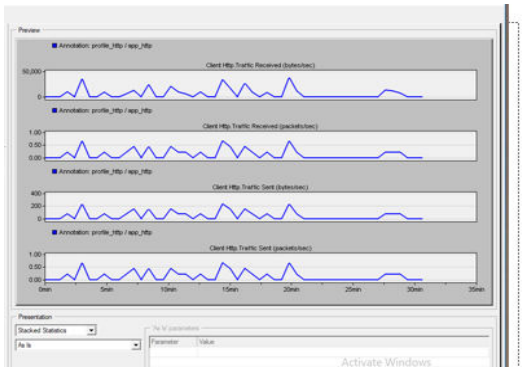

Figure 10: These are the results of HTTP packets that are sent and received from source to destination within the parameter of QoS.

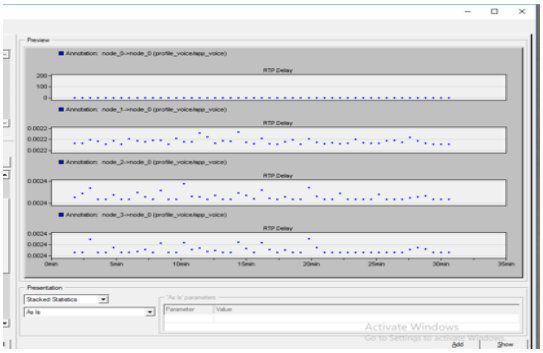

Figure 11: These are the delays at different nodes of voice applications. Which are tending to be much less than the simple network?

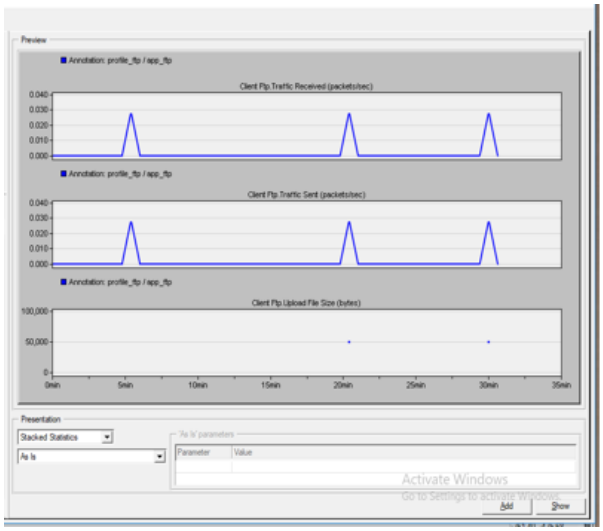

Figure 12: Here this figure represents FTP traffic sent and received at node 1.

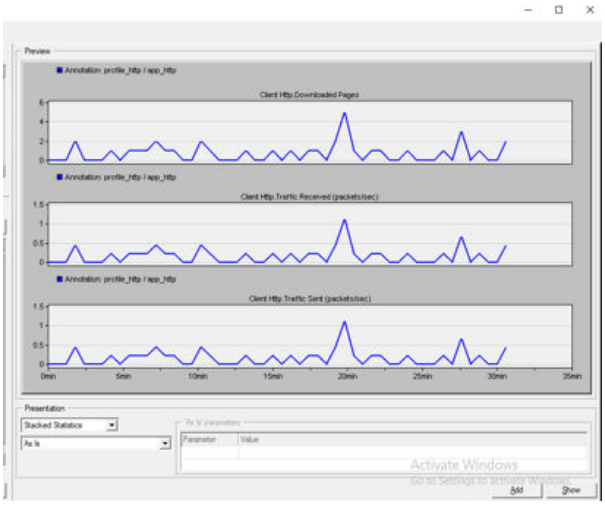

Figure 13: These are the results at the client side of node 1 of traffic sent and received by HTTP.

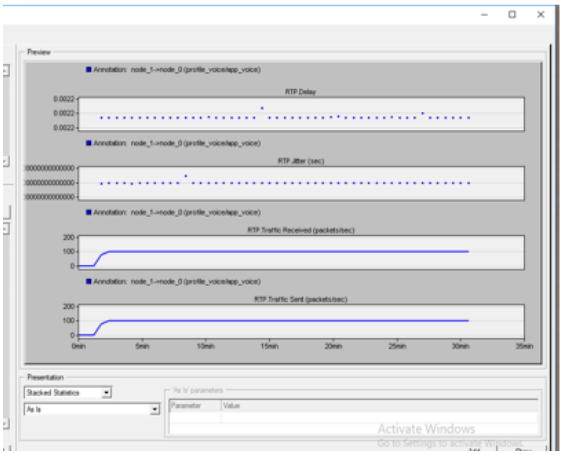

Figure 14: These are the delays of voice packets sent. And packets sent and received from source to destination.

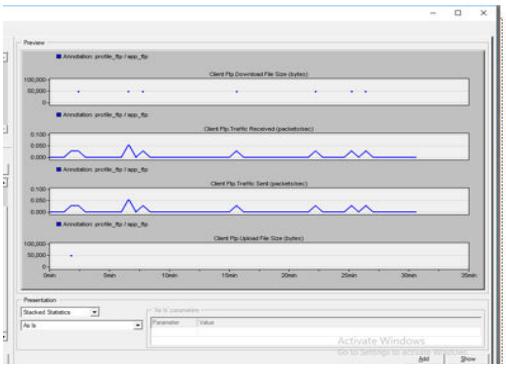

Figure 15: These results show the traffic sent and received from source to destination by using FTP. Traffic bytes as well as in the form of packets.

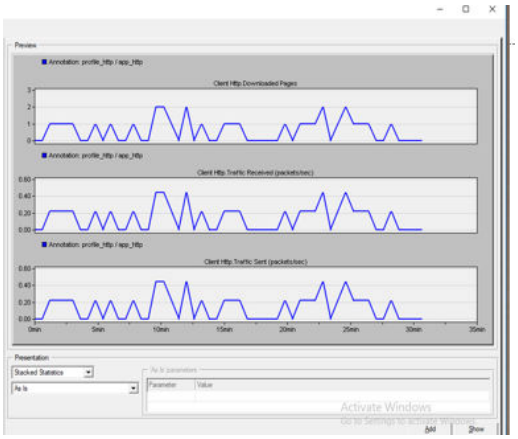

Figure 16: These are the results of traffic of HTTP by the client (node 3). Traffic sent and traffic received. Moreover, the graph also shows the downloaded pages from the client side.

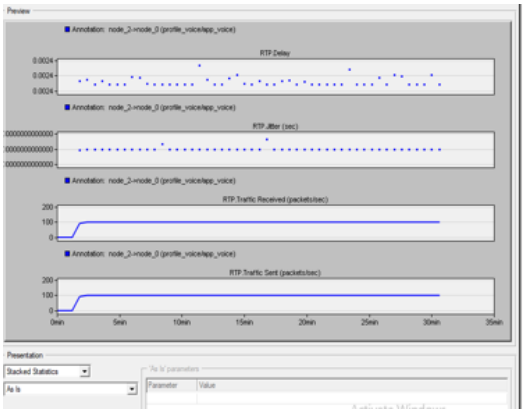

Figure 17: These are the data packets of node 3 for voice application traffic received, traffic sent and delays in bit per second.

Conclusion

In this paper quality of service is discussed mainly and different models/standards are discussed too. In today's network application, every application needs good quality in terms of bandwidth or speed, low jitters, low delays etc. these papers involves all the depth of quality of services, the backend algorithms and protocols. We firstly created a simple network in which it is clearly shown that how much traffic is sent and received at the destination end in bytes per second or in packets form. Other scenarios include the topology within the QoS, by applying application configuration and profile configuration and last but not least and major parameters of QoS. QoS works on the basis of many parameters if we go through all the parameters in every node there are many parameters available to enable QoS but in this scenario, we have only used WFQ algorithm which is working at the backend. Thus by slightly changing the parameters, we sort out some results. There are three different applications which are brought on to the scene like HTTP, Ftp, and voice. It has been just analyzed in this paper that how QoS works on the file transferring and web browsing moreover invoice. Because a quality named thing cannot be compromised in voice transmission.

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