





## 1.1 Introduction:

The growing of the internet has exceeded expectations in terms of the massive number of users, and the revenue gained from all Internet related activities. This massive rising in the internet users leads to adopt heterogeneous traffic to satisfy customer requirements [1]. Therefore, to allow today's computer networks to handle such traffic, policies are needed to regulate and prioritize traffic based on services sensitive to delay (real time services) and services based on service level agreements (both sensitive to delay and BW guarantee). Soon after that SLA has becomes an important issue to regulate the internet Service Provider (ISP) relationships with their customers to assure services they provide. Service Level Agreement (SLA) is merely service specification guarantee which it has to state clearly the main duties of the ISP and the customer. For the ISPs provider to fulfill SLA commitments there is a need to reconfigure all systems to be compatible and adaptive with SLAs requirements[4]. Differentiated Services or Diffserv (DS) is a computer networking architecture that specifies a simple, scalable and coarse grained mechanism for classifying, managing network traffic and providing Quality of Service (QoS) guarantees on modern IP networks. Diffserv can, for example, be used to provide low latency, guaranteed service (GS) to critical network traffic such as voice or video while providing simple best-effort traffic guarantee to non-critical services such as web traffic and file transfer [7].

The objective of this work is the simulation of a highly congested network that has traffic priorities for assurance of guaranteed services using Diffserv. Simulation can be used to evaluate the performance of the network to traffics having different priorities and different quality of service requirements.

Due to the shape of the today's network traffic, different traffic types require different treatments and different QoS requirements which mean that each service such as VoIP, VoD should be treated differently. Thus the need for studying Diffserv becomes very important to.

## 1.2 Literature Review

In IEEE 802.16 [10] based (WiMAX) major homogeneous scheduling algorithms are evaluated for QoS metrics (average throughput, average delay, and average jitter) and fairness to discover their suitability and their shortcomings for particular triple play service application. Recently In[11],analyze the model on the basis of two different scheduling mechanisms and find different QoS parameters such as packet delays and packet loss rate for corresponding traffic classes. Also build a comprehensive discrete event simulator, which implements the traffictmodel and evaluate the QoS behavior of self-similar traffic under new proposed scheduling schemes.

On the other hand [12] implementation and performance evaluation of a distributed Machine Learning (ML) -based traffic classification and control system for FreeBSD's IP Firewall (IPFW) .On an Intel Core i7 2.8 GHz PC our system can classify up to 400 000 packets per second using only one core and system scales well to up to 100 000 simultaneous flows. Also implementation allows one classifier PC to control subsequent traffic shaping or blocking at multiple (potentially lower performance) routers or gateways distributed around the network.

In [13] one of the major issues for Heterogeneous Wireless Access Networks (HWAN) or Next Generation Wireless Network (NGWN) is integrating the different wireless access technologies (e.g. GSM, GPRS, EDGE, UMTS, WiMAX, WLAN, etc...) into a common platform. This integration should transparently provide mobile users unified and continuous services, including seamless handoff and real-time support of QoS. However, a real-time support of End-to-End QoS, in HWAN, is a challenging task that requires mapping of related messages as well as their associated attributes and parameters across all networks.Present here a novel method for mapping these messages and their attributes across UMTS, WiMAX and IP-Diffserv/MPLS networks.

### **1.3 Problem statement:**

Due to the shape of the today's network traffic, different traffic types require different treatments and different QoS requirements which mean that each service such as VoIP, VoD should be treated differently. Thus the need for studying Diffserv becomes very important to.

This dissertation is highlights QoS analysis in a wired IP network. Four different multimediaapplications are used i.e. FTP, Database, Voice over IP (VoIP) and Video Conferencing (VC).

Simulation can be used to evaluate the performance of the network to traffics having different priorities and different quality of service requirements.

### **1.4 Methodology:**

There are pressing demands regarding differentiation of the massive traffic in today's internet. Based on these demands a network with heterogeneous traffic is simulated using OPNET modeler, the traffic streams in this network is prioritized. Then differentiated Service (Diffserv) is used to protect high priority traffic to guarantee specific quality of service. The results obtained show that Diffserv performs well in protecting high priority traffic with some reservations. Performance of Diffserv is evaluated taking into account different simulation scenario, through all of which throughput, latency (delay) and packets dropped are examined.

OPNET modelers used to trace the effect of the congestion and non-congestion states and the consequences of that in the performance of the network.

Results have shown that Diffserv performs well in core networks and guarantees traffic priorities, delay and throughput.

### **1.5 Aims and objectives:**

The main aim of this thesis is to provide QoS levels in any network in efficient way need to classify traffic into various priorities and place the highest priority traffic in queues that gets better service and the rest of the traffic priorities should be handled based on the SLA agreed on between the customer and the service provider.

The objective of this work is the simulation of a highly congested network

that has traffic priorities for assurance of guaranteed services using Diffserv.

### **1.6 Thesis layout:**

Chapter two in this dissertation presents background information about QoS, some QoS examples and standardizations. Chapter three contains Diffserv architecture theory and traffic conditioners that measure and mark packets arriving at the Diffserv boundary according to certain configuration parameters. Chapter four depicts introduction about OPNET modeler in addition to Diffserv simulation in OPNET, also simulations of the main elements of Diffserv and results of the simulations are shown beside some simulation parameters stated for performance evaluation. Chapter five contains conclusions and references.