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Ip Signaling Transmission For Umts

S. Babafakruddeen*1, V. Harini*2

M.Tech (DECS) Student Department of ECE, VCE, Shamshabad, R.R (Dist), AP, India.

Assistant Professor, Department of ECE, VCE, shamshabad, R.R (Dist), AP, India

Abstract

Universal Mobile Telecommunication System networks should be deployed according to cost-effective strategies that optimize a cost objective and satisfy target Quality-of-Service requirements. UMTS transmission networks are mostly IP based systems. IP traffic addition to current high capacity SONET / SDH network, ATM network and IP network will be implemented to carry the main load. In this project, the IP network is used as a transmission medium between Access Network and Core Network. QoS is one of the essential parameter in Core Network. IP connectivity has helped to achieve routing techniques within different networks. The connectivity of the transmission medium is observed in order to calculate the RMON performance along with the network and different multiplexing Existing techniques which are being used in 3G such as ATM/SDH. But in this project proposed IP adders are encapsulated using Point-to-Point Protocol. The PPP encapsulated IP datagram's are then framed using High-Level Data Link Control. The Paessler network monitoring products, PRTG and IP Check Server Monitor use the IP address in order to connect to the respective machines they are intended to monitor/graph achieving uploading or downloading data rate speed up to 2Mbps is high compared to EDGE data rate transmission in UMTS network.

Keywords: ZXR10/1800/2800/3800 router sires, Remote Monitoring (RMON), Paessler Route Traffic Grapher (PRTG).

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1. Introduction

The recent research efforts in the field of mobile communication combine Internet Protocol (IP) infrastructure and Universal Mobile Telecommunication Systems (UMTS). This resulted in giving added potential to the mobile operators to offer high speed internet access through mobile handsets and portable modems over the mobile network. Nowadays, mobile Internet services are becoming popular because of their ease of use and mobility advantages. With the new technological advancements, they are able to deliver data at speeds and capable of handling multimedia applications as well. The recent statistics show that there is an increase in the usage of mobile broadband. With the introduction of new technologies like 3G/3.5G, the total number of people subscribed to mobile broadband services would be nearly 37 million by the end of 2013 in Asian market alone. Nowadays mobile broad band services are able to deliver speed up to 21 Mbps and this can be reached 50 - 100 Mbps in near future. By adapting these high demand data services, mobile operators and service providers are making good profits. At the same time they are facing challenges to give better Quality of Service (QOS) to keep up their customer satisfaction. QOS is acknowledged in terms of application behavior, guaranteed network parameters, service level agreements and with traffic class differentiation. QOS can be taken in to account in two ways which are Subjective QOS and objective QOS. Subjective QOS relates to user's own perception of the network applications. While the objective QOS relates to technical parameters like delay and packet loss which are measurable.

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Network traffic measurements can give useful information to know the performance and characteristics of some specific network while accessing IP data services in third-generation (3G) mobile networks. This design of 3G network transmission acts as communicating device between the sender and receiver. This Transmission medium is used in the communication services provided by different mobile operators. The network traffic is varied by payload size and data rate changes.

The UMTS data services standard is specified as a migration from the 2G GSM standard via the general packet radio service (GPRS) for global evolution. There were over 780 million GSM subscribers around the world. The goal of 3G is to prove a network infrastructure that can support a much broader range of services than existing systems. First product released is R99 specification for UMTS network that is focused on change in Radio Access Network rather than the core Network. This allows core network to continue in functionality although changes will be made in areas of performance due to the higher data rate required by subscribers in the coming future networks. This functionality allows the mobile network operators to continue using their existing infrastructure and progress to 3G step by step. The handover between UMTS and GSM offering worldwide coverage's on the developments in cellular field day by day, and combines them with complementary developments in both the fixed line telecom networks and the world of the internet. This flexibility allows us to provide and support access to services regardless of location. These services can be voice or data or combinations of both.

IP over SONET technology is being deployed now a day in backbone networks to provide efficient, cost-effective, high speed transport between fast routers. IP over SONET technology has been examined currently for the future of high speed internet transport over technologies such as ATM over SONET etc. In the days of low traffic volume between IP routers, bandwidth partitions over a common interface made it attractive to carry IP over a frame relay and/or an ATM backbone. As the traffic grows, it is becoming more desirable to carry IP traffic directly over the synchronous optical network (SONET), at least in the core backbone with very high pair wise demand. Currently, the focus of IP transport continues to be data-oriented.

Now a day, there is demand for high speed data service. The initial phase of this project was focused to implement measurement infrastructure to data transmission and increasing speed in transmission network from a real network at sending and receiving end systems. An experiment was created on which UMTS Mobile networks were evaluated. A PRTG tool was used to observe data transmission in design networks. ROMAN tool was used to monitor different LAN's in different topology networks and SDH performance in transmission medium. Finally, the content was observed, discussed with the results evaluated along with the conclusion.

2. Related Work

All the technological advances and the simultaneous existence of the second generation, 2.5G, 2.7G and 3G network, importance of service features on network efficiency have become more critical from the generation to the other. There are more designing scenarios have developed with not only respect to 2G network but also with the evolution of data rates 2.5G to 2.7G or even to 3G network. Along with this infrastructure changes of the network have to be considered.

2.1. Improvement of Transmission Medium

First transmission technique plesiochronous digital Hierarchy (PDH) was used. This PDH is based on PCM. In PCM, a multiple shift usage of a transmission link is enabled by TDM. PDH technology enables with its hierarchical structure to implementation of the networks with a transmission capacities of up to 140 Mbps. In this application with cross connecting on bit level or with a demand of special interfaces, PDH system technology is using now a days. Application of modern solution of broadband wireless access gives an opportunity to make process of expansion of an infrastructure of last mile fast, simple and expensive. The transmitting multiplexer also adds additional bits in order to allow the far end receiving multiplexer combines the four data streams assuming that they are running at their maximum allowed rate. This rate is increased by some compensation that has to be introduced. The transmitting multiplexer combines the four data streams assuming that they are running at their maximum allowed rate. This means that occasionally the multiplexer will look for the various multiplexers and so on. Ultimately it gives total data transmission. This allows the receiving multiplexer to correctly reconstruction the original data for each of the 2Mbps data streams at the correct different plesiochronous rates.

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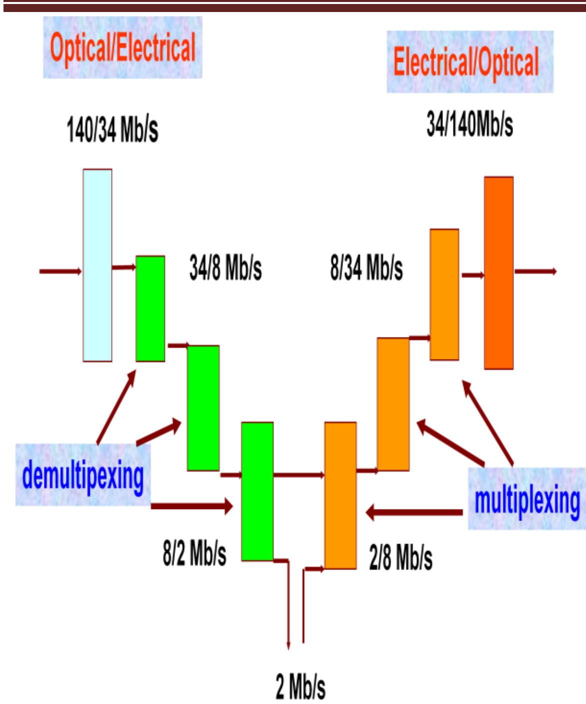

Fig.2.1.1 Optical to electrical multiplexing in UMTS network.

Existing of this PDH some addition techniques added to SDH/SONET transmission. This transmission implemented multiplexer in order to add/ drop transmission rate 2Mbps or more than high data rate.

2.2 Physical Structure Of Umts

The physical layer deals with interaction with the physical medium. However ATM is designed to be independent of transmission medium and flexible in its use of the underlying infrastructure. ATM cells can travel by themselves in the medium which is utilized for lower data rate on local connections, but more commonly the cells are packaged inside other carrier system for example Asynchronous Transmission Mode (ATM) over PDH. The physical layer implemented as ATM over SDH/SONET to outside of the local area networks in UMTS networks, all through ATM is implemented of underlying medium. Payload is most commonly implemented to run ATM over SDH, this is the first standard of a physical layer. The second standard, Synchronous Optical Network (SONET) was developed by Bell Labs, USA, just prior to SDH. For purpose of discussion, their differences are so minor that the two are normally discussed together. SDH specifies the communications mechanism at the physical layer, i.e. on the fiber. Today most long distance telephone traffic runs over SDH, and because of the availability of SDH equipment, it is straightforward for companies to plug into the network. The SDH standard is expected to provide sufficient transport infrastructure for worldwide telecommunication for at least the next two or three decades.

For increasing the data rate transmission lower data rate to higher data rate, for this reason of reuse existing infrastructure the I_{ub} interface will commonly using PDH perhaps in conjunction with inverse multiplexing for ATM, the I_u and I_{ur} interface can utilize any of the above, but generally will require at least 155 Mbps to support the volume of traffic resulting from connection to multiple base stations.

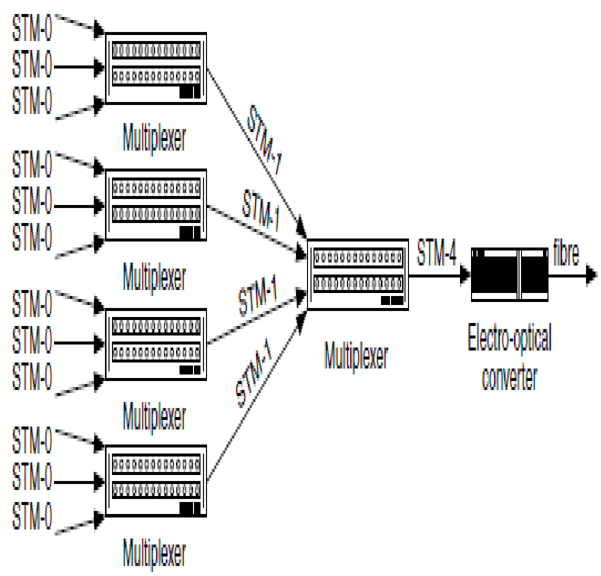

Fig 2.2.1 SDH multiplexing transmission.

2.3 ATM over SONET

ATM is fixed cell length 53 bytes, in that 5 bytes is head and remaining 48 bytes payload. ATM is complete of synchronous transfer mode (STM). STM is a circuit switched networking mechanism, connection is established between two termination points before data transfer commences and torn down when it is completed. The terminal points are allocates and receive the connections bandwidth for the entire duration, when not actually transmitting data. ATM is transmission technology that

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uses the fixed size packets called cell. The telecommunication companies are deploying fiber optics in across country and cross oceanic links with gigabytes per second speed. That likely to carry in an integrated way both real time traffic such as voice and high resolution data. Which can be tolerate some loss but not delay and non real time traffic such as computer data and file transfer, which may tolerate some delay, but not a loss. This ATM cells are encapsulated in STM frames which flows SDH/SONET transmission, then to optical fiber. This ATM cells are fixed length packets so to overcome this problem by using IP over SDH/SONET.

2.4 IP overcome ATM

In GSM standards are using ATM network and 3G on-words IP networks is implemented. Release 5 R_5 builds on the partial implementation of internet protocol packet switching within the core network as discussed thus far, to move to all IP architecture. In this release such as R_4 and $R_{5,}$ packets can be moved end to end using IP transport with an enhanced general packet radio services network connected to an IP multimedia sub system. This GPRS backbone for R_4 and R_5 must be able to provide similar levels and classifications of QoS usually associated with ATM network. This is to allow for the delivery of time sensitive traffics such as voice and multimedia. As well as enhancement to core network, the radio access network also migrate from ATM to IP. ATM completely connection oriented, IP network supporting packet switching domain, can be carried over the GPRS and IMS networks using IP QoS mechanism.

3. Methodology

3.1 Ip over Sonet/Sdh Interface Specification

IP over SONET are more correctly, IP/PPP/HDLC over SONET described by IETF. IP datagrams are encapsulated into point to point protocol packets. It provides multi protocol encapsulation, error control and link initialization control features. The PPP encapsulated IP datagram's are then framed using high level data link control (HDLC) and mapped by synchronous into the SONET synchronous payload envelope. The main function of the HDLC is to provide for delineation of the PPP encapsulated IP datagram's across the synchronous transport link. Delineation is accomplished using a technique called byte stuffing. Each HDLC frame begins and ends with the byte flag 0x7e. in this frames have addresses control, flag sequence, protocols and frame check sequence fields.

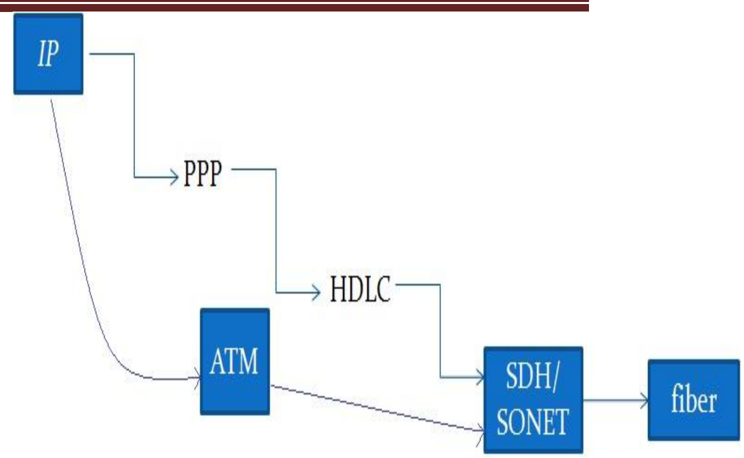

Fig .2.4.1 IP to SONET/SDH interfacing.

The HDLC based delineation mechanism does not scale easily beyond STS-48_c. Fundamentally every outgoing byte needs to be monitored and stuffing performed to prevent flag emulation by data octets. The receiver needs to monitor every incoming byte to do the destuffing. In addition to the stuffing and destuffing operations, the stuffed bytes interfere with bandwidth management and, as explained earlier malicious users could deliberately insert streams of flag octets to double the effective datagram length and create problems with band-width management mechanisms.

While it may be possible to scale HDLC to OC-48 and beyond, a key consideration is to design simple protocols that are scalable well beyond simple protocol that are scalable well beyond OC-48 and can be implanted at low cost. Lucent has begun circulating ideas for delineation techniques for scaling IP over SONET above 2.5 Gb/S. The Simplified Data Link (SDL) seeks to provide high-speed delineation of variable-length datagram's whose arrivals are asynchronous. At the most basic level the SDL frame consists of a payload length indicator, cyclic redundancy check, and a separate CRC over the payload. The CRC of each SDL header is verified with each successful delineation. If the CRC is invalid, it is assumed that the payload length filed is invalid and a hunt is done until the requisite numbers of consecutive valid CRC checks are encountered.

The asynchronousness of datagram arrives is take care of inserting idle headers with the payload length filed set to a default value with the appropriate CRC. All SDL frames with payload length field equal to default value would be discarded at the receiver.

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3.2 The Future of High-Speed IP Transport

In this section we examine the motivation for the migration of IP backbone networks to transport based on optical WDM technology. The combination of an unreconstructed demand for new capacity and the utilization of existing cable system has led network planners to look for the most expedient and cost-effective means of increasing capacity. The traditional techniques for increasing capacity has been to deploy more fiber and replace SONET time division multiplexing system with new higher-rate TDM systems with an optical fiber terminal multiplexer. Deploying higher-rate TDM system requires an inflexible replacement of an operational system, many networks planners are turning to WDM transport system as their mechanism for cost-effective flexible capacity expansion.

An interesting way to look at TDM and WDM fiber transport system is to consider the fiber a high way with many lanes. With just TDM the fiber highway is a multiple-lane highway with only one lane (wavelength) open and one speed limit. With WDM allows service providers to tap into the embedded capacity of the fiber. In addition, each lane can accommodate a different speed limit depending on the TDM technology used for that lane. WDM allows service providers to tap into the embedded capacity of their fibers thus maximizing the returns on existing facilities. In addition, the service provider has the flexibility of opening new lanes at the appropriate speed on the existing fiber to flexibly accommodate new capacity demands.

4. Analysis of Thesis

One has observed the typical behavior of TCP/IP transmission medium in mobile networks, and data transmission between two end users in mobile network which is designed with help network topologies in access network of mobile network. In access network have Node B's and Radio Network Controller. Now a day's, demand for data and video calls drastically increasing. Thus, a good QoS such as uploading and downloading data rate speed up to 2Mbps must be provided in 3G/UMTS. This can be achieved by increasing users of Node B's and IP over SONET in core network based on UMTS architecture. Previous technologies such as GSM standards are GSM, GPRS, and EDGE data rates are 9.6-14Kbps, 14-114Kbps and 384Kbps, compared to this previous techniques using of present technique IP over SONET in 3G must be providing 2Mbps to each 3G subscriber. In access network a group of Node B's is connected to a sub network with the help of network topologies. All Node B's are connected through different IP addresses in sub network with various topologies such as ring, mesh, star and extendable tree. All these sub networks are connected to core network (CN) through RNC.

Node B's are connected in ring topology as a sub network which is connected to CN via RNC. In sub network all Node B's are connected to a single LMDS Node B and then this Node B to RNC and data transmission multiplexing occurs from tower to tower has clearly shown in pictorially represented under below.

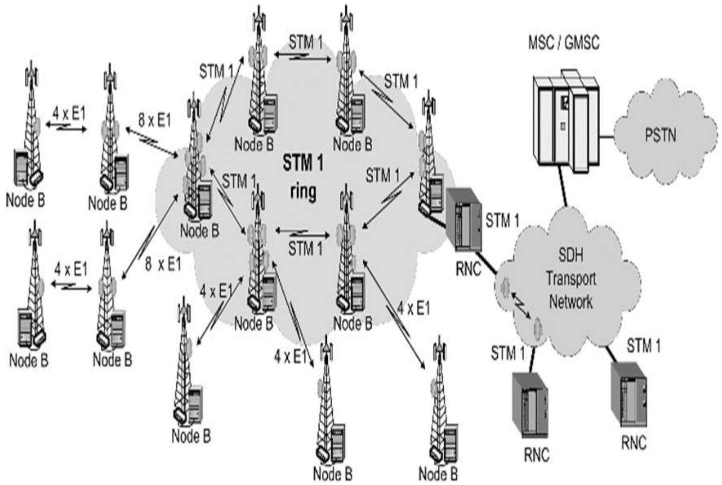

Fig.4.1 Ring topology network design

Data transmission is occurs from tower to tower multiplexing shown above figure. For example one Node B have 4xE1 (4x2Mbps) then it is multiplexing with another Node B data transmission 4xE1multiplexing gives 8xE1, like this multiplexing going on to make STM frames. This STM frames flows in sub network then connected to SDH transport network. In this sub network transmitted and receive different length of the packets collected by RMON monitoring.

When there is demand for 3G by the subscribers, then only the data transmission rate goes to 2Mbps for each subscriber. This data transmission rate is up to 2Mbps graphically measured by PRTG.

A) Remote network monitoring (RMON)

The RMON was developed by IETF to support monitoring and protocol analyses of LANs. An RMON implementation typically operates in a device model. Monitoring device contain RMON software agent that collect information and analyze packets. These probe acts as severs and the network management with them acts as a clients.

The RMON consists of groups:

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I. Statistics: real –time LAN statistics e.g. utilization, collisions.
II. Filter: defines packet data patterns of interest.
III. Capture: collects and forward packets in sub network matching filter.

In total, 9 Node B's of a sub network are examined for data transmission for different level of packet lengths obtained are specified in pictorially shown below fig and respective data was collected from RMON.

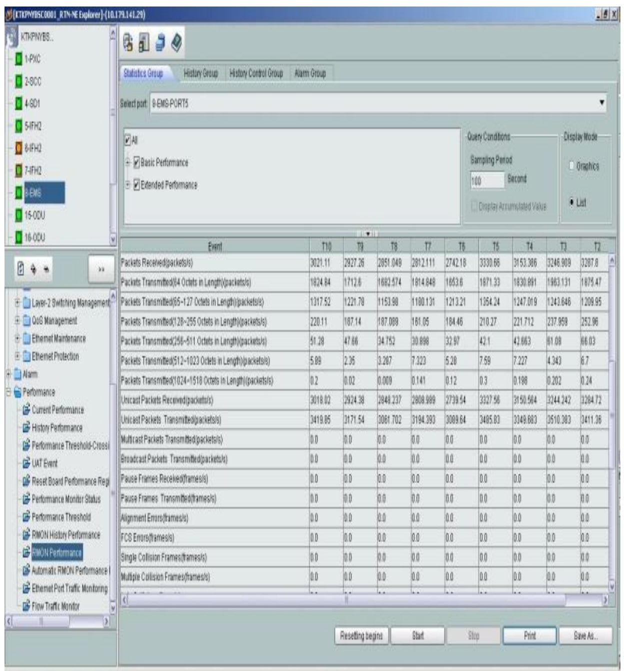


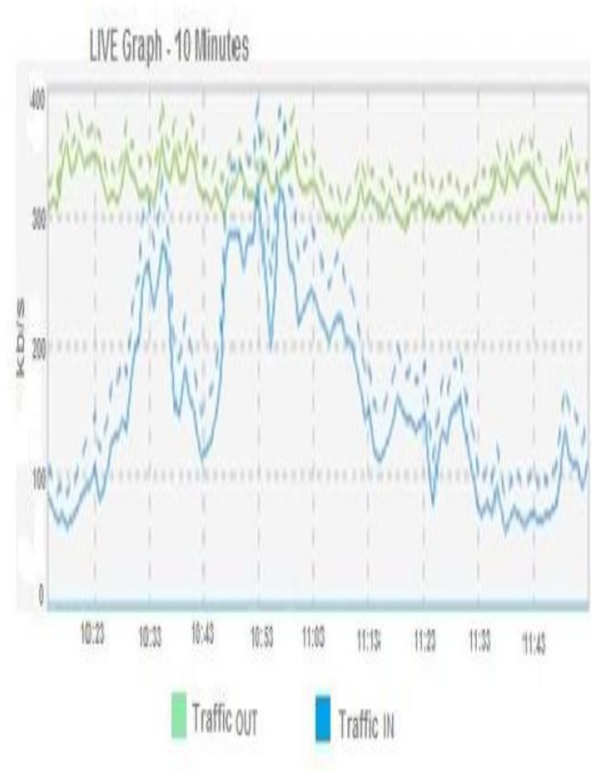
Fig.4.2 Node B's are transceiver different packet length.

B) PRTG

Paessler Route Traffic Grapher (PRTG) monitor network and providing system administrators with live readings and periodical usage trends to optimize the efficiency, layout, and setup of leased lines, routers, firewalls, servers, and other network components.

It monitoring network traffic for a single Node B connected to the network

The result obtained from the thesis Uploading/Downloading of data transmission rate up to 2Mbps of UMTS network shown in figure 6.8. This result collected from Node B with help of PRTG. If one need to know the long term accounting data, current status of data transmission and recent traffic, then IP protocol suit is installed and obtain from PRTG. According to the results obtained, when there is a demand for 3G by the subscribers then only the data rate transmission goes upto 2Mbps. Otherwise, normal transmission takes place i.e. below 2Mbps speed level compared to EDGE data rate speed 384 Kbps is high shown in pictorically in below.



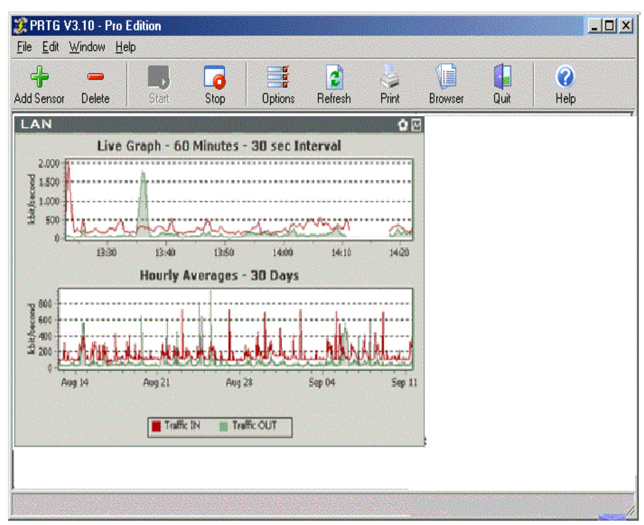


Fig.4.3 . Data transmission in Kbits per second in single Node B.

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5. Conclusion

The project UMTS network provides Quality of Services as well as high bit rate transmission download link from network to mobile users such as 2Mbps. The IP suite of protocols is providing security reliability, and connecting different network in wireless. A guarantee of service quality dedicated site through IP evaluates it's payload on transport layer-2. The IP overcomes ATM frame UTRAN network element via PDH and SDH/SONET. It establishes connection to a number of IP routers. Mobile operators enter direct and stiff competition with internet service providers. Capacity roadmaps and price erosion of IP vendors occur significantly faster than the telecom vendors, putting IP carriers in an economical advantage. Using of IP over SONET technique get more than 2Mbps data rate transmission compares to previous technique ATM over SONET.

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Vemula Harini received the B.Tech degree in Electronics and Communication Engineering from JNTUH, Hyderabad, Andhra Pradesh in 2008 and M.Tech degree in Communication Engineering from Vellore Institute of Technology, Vellore, Tamil Nadu in 2010. Presently she is working as Assistant Professor in the Department of Electronics and Communication Engineering, Vardhaman college of engineering, Hyderabad. Her areas of interest are digital communications, control systems and wireless communications.

Shaik Babafakruddeen received the B.Tech degree in Electronic and Communication Engineering from VVIT, JNTUH, Hyderabad, AP in 2010. He is pursing M.Tech in Digital Electronics and Communication System in Vardhaman College of Engineering, Hyderabad. His area of interest is Communication Systems and Digital Signal Processing.