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A Bandwidth Degradation Technique to Reduce Call Dropping Probability in Mobile Network Systems

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Abstract: *In Wireless/Mobile networks various kinds of encoding schemes were used for transmission of data over a bandwidth. The desired quality and generated traffic varies with the requirement with this bandwidth. A generic video telephony may require more than 40 kbps whereas a low motion video telephony may require about 25 kbps for data transmission. From the designing point of view these requirements demands for an alternative resource planning, especially for bandwidth allocation in wireless networks. In wireless network where bandwidth is a scare resource, the system may need to block incoming user if all of the bandwidth has been used to provide highest quality of service to existing users. However this bandwidth resource planning may be unacceptable for larger application. A degradable approach to multiple users can be made on bandwidth allocation to reduce the blocking probability without degrading the quality of service to existing users to an unacceptable level. This work aims towards a realization of a mobile network using W-CDMA multi access technique supporting multilevel quality of services. The bandwidth allocation to multiple users is adjusted dynamically according to the required network condition so as to increase bandwidth utilization. The work analyze the performance deriving the degradation period ratio,degradation bandwidth and propagation delay and throughput for the implemented wireless network.The proposed work is aim to implement on Matlab tool. For its functional verification considering various mobility patterns.*

I. Introduction

Cellular wireless technology today has become the prevalent technology for wireless networking. Not only mobile phones but also other types of devices such as laptops and Personal Digital Assistant (PDA) can connect to Internet via cellular infrastructure. These mobile devices are often capable of running multimedia applications (e.g., video, images). Therefore, cellular networks need to provide quality of service (QoS) guarantee to different types of data traffic in a mobile environment. A call admission control (CAC) scheme aims at maintaining the delivered QoS to the different calls (or users) at the target level by limiting the number of ongoing calls in the system. One major challenge in designing a CAC arises due to the fact that the cellular network has to service two major types of calls: new calls and handoff calls. The QoS performances related to these two types of calls are generally measured by new call blocking probability and handoff call dropping probability. In general, users are more sensitive to dropping of an ongoing and handed over call than blocking a new call. Therefore, a CAC scheme needs to prioritize handoff calls over new calls by minimizing handoff-dropping probability. Again, bandwidth adaptation and scheduling are necessary mechanisms for achieving high utilization of the wireless resources (e.g., channel bandwidth) while satisfying the QoS requirements for the users. These two techniques are closely related to call admission control, and in fact these three mechanisms jointly determine the call-level and the packet-level QoS for the different types of traffic in the cellular wireless air interface. For example, upon arrival of a new call or handoff call, bandwidth adaptation can be performed to degrade the channel allocations for some calls (still maintaining the QoS requirements) so that the new call can be admitted. Scheduling mechanisms impact the packet-level system dynamics (e.g., queuing behavior), and therefore, packet-level QoS. The packet-level dynamics can be exploited for designing efficient call admission control methods. The call admission control (CAC) and the adaptive channel adaptation (ACA) mechanisms are generally treated as the network layer (above layer-2) functionalities in the wireless transmission protocol stack. The scheduling and the adaptive modulation and coding (AMC) are layer-2 and layer-1 (i.e., physical functionalities, respectively.

II. QOS in wireless communication

Many real-time applications can use different encoding schemes according to their desired quality and generate traffic with different bandwidth requirements. For example, generic video telephony may require more than 40 KBPS, but low-motion video telephony requiring about 25 KBPS may be acceptable . From the standpoint of a system administrator, this property provides an alternative for resource planning, especially for bandwidth allocation in wireless networks. In wireless networks where the bandwidth is a scarce resource, the system may need to block incoming users if all of the bandwidth has been used up to provide the highest QoS to existing users. However, if these users can be degraded to a lower QoS level, it is possible to reduce the blocking probability without degrading the QoS of existing users to an "unacceptable" level. Various approaches and algorithms adopting this idea have been proposed. A graceful degradation mechanism is proposed in to increase bandwidth utilization by adaptively adjusting bandwidth allocation according to user-specified loss profiles. Thus, a system could free some bandwidth for new users by lowering the QoS levels of existing users.

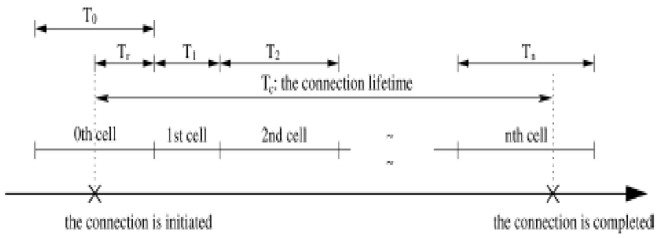
III. Problem Statement

The desired quality and generated traffic varies with the requirement with this bandwidth. A generic video telephony may require more than 40 kbps whereas a low motion video telephony may require about 25 kbps for data transmission these requirements demands for an especially Alternative resource planning for bandwidth allocation in wireless network there bandwidth is scare resource, the system may need to block incoming user if all of the bandwidth has been used to provide highest quality of service to existing users. However this bandwidth resource planning may be unacceptable for larger application. If these users can be degraded to a lower QoS level, it is possible to reduce the blocking probability without degrading the QoS of existing users to an "Unacceptable." Various approaches and algorithms adopting this idea have been proposed a graceful degradation mechanism is proposed to increase bandwidth allocation by adjusting bandwidth utilization by adaptively adjusting bandwidth allocation according user specified profiles. Thus, a system could free some bandwidth for new users. Senetal proposed an optimal degradation strategy by maximizing a revenue function and Sherifetal [3] an adaptive resource algorithm to maximize band width utilization and attempted to achieve fairness with a generic algorithm. In terms of bandwidth utilization or service provider's revenue can be improved significantly by allowing QoS degradation.

IV. Approach

In this work an optimal degradation strategy by adaptive resource allocation algorithm to maximize bandwidth utilization and attempted to achieve fairness in multi user communication. the system performance, in terms of bandwidth utilization or service provider's, can be improved significantly by allowing QoS degradation. Moreover, the potential dropping due to such cell crossings (i.e., handoffs) has to be taken into account. The forced-termination (or dropping) probability is a widely used metric to represent the compromise of QoS due to user mobility. This probability should be made as small as possible because admitting a user and then terminating his session before its completion would make the user even unhappier. In order to reduce this probability, many admission control algorithms give handoff users priority over new users.

A wireless network in which the base station takes charge of both admission control and bandwidth allocation for mobile users in its cell. While residing in the cell of a base station, a mobile user communicates with others via that base station. A "wireless network" can be a conventional cellular phone network or an office building with interconnected IEEE 802.11 wireless LANs. In such a network, a mobile user could either be successfully handed off to a new base station or simply dropped when it is about to leave the present cell. As mentioned in the introduction, we give handoff users priority over new users since dropping a handoff is usually less desirable and less tolerable than blocking new users. This is achieved by restricting a new user into the cell once the total number of users or the total occupied bandwidth exceeds a pre specified threshold, Nthresh. Handed-off and newly initiated users are treated equally once they are admitted into a cell. We are primarily interested in quality-degradable connections as long as the resultant quality is within the user specified QoS profile. The only QoS requirement we discuss here is the bandwidth. For example, it can be a video streaming application with multiple transmission rates depending on the encoding schemes and resolution. We assume that there are K different quality levels. The bandwidth requirement of the quality level is denoted as Wi and Wax=W1 >Wi >WK= Wmin. With such a degree of freedom, a base station may try to degrade the quality levels of some existing users in order to admit more users so as to improve the overall system performance. For example, we may be able to achieve high bandwidth utilization and maintain a small blocking and/or forced termination probability. We assume that the arrivals of new users into a cell is a Poisson process with a rate λ_0.The Poisson process works well in modeling call arrivals in a public telephone network. Even though recent studies found that the "packet" arrival process in the Internet switches/routers is not Poisson, the network traces also show that the user-generated connection requests, such as Telnet or FTP connection requests can still be modeled as a Poisson process. Since we mainly focus on the admission control and bandwidth allocation, which are the "connection-level" (as opposed to "packet-level") resource management, the Poisson process is still a good approximation for our purpose. For mathematical tractability, we also assume the lifetime of each connection to be exponentially distributed with means $1/\mu_0$. Note that the exponential distribution has been used to accurately model the intervals of talk spurt and silence in a phone call. Thus, this assumption captures the reality of some real-time applications. To evaluate the effects of user mobility on system performance, we use the cell-sojourn time,the time a user stays in a cell to account for his mobility. As far as connection-level resource management is concerned, the cell-sojourn time and connection lifetime together determine the duration for which a user will occupy the bandwidth in a cell.



A connection with n handoffs

we assume that these two random variables are independent. Thus, the probability that a mobile user will experience handoffs H times can calculated as where Tr is the remaining cell-sojourn time in the cellwhere

$P(H=n) = P(T_r+T_1+T_2+\ldots\ldots.T_{n-1})<Tc<P(T_r+T_1+T_2+\ldots\ldots.T_{n-1})$

a user's connection is initiated, Ti is the cell-sojourn time the ith cell, and Tc is the connection lifetime. Furthermore, if we consider the potential forced termination during a handoff (i.e., a handoff drop), the handoff rate can be derived as

$$\lambda_h = \frac{\eta\,(1-p_b)\,\lambda_o}{\mu_o+\eta p_f}$$

Where pf is the probability of terminating handoff users and p_b the probability of blocking new users. The handoff rate is a function of pf which itself is also a function of λ_h but it can still be solved recursively. The channel-holding time of an admitted user in a cell,the time he occupies some bandwidth in that cell can be computed by taking the minimum of the remaining connection lifetime and cell-sojourn time. Since we assume that both connection lifetime and cell-sojourn time are exponentially distributed, the distribution of channel-holding time can derived as $f_{co}= (\mu o+\eta)\, e^{-(\mu o+\eta)\, t}$ under the proposed degradation scheme, both blocking and forced-termination probabilities can be improved. However, some users may receive severely degraded QoS. In the following section, we investigate the tradeoffs among the QoS metrics, especially between the blocking probability and the other three QoS metrics.

If at a time more number of users wants to transmit their information allocating their bandwidth suitably to equal to channel bandwidth. At this instant some amount of quality degrades to each user but at a time all users can access the network without time delays. With this allocation bandwidth must be adjusted so that call of user is not blocked.

In this work, the adaptive bandwidth allocation for QoS provisioning in wireless/mobile networks is presented. For a code division multiple access (CDMA) system, the wideband CDMA can be used for service degrade/upgrade; for a time division multiple access (TDMA) system (e.g., Bluetooth), service degrade/ upgrade can be achieved by an adequate assignment of time slots (i.e., polling policy) .

BANDWIDTH ADAPTION ALGORITH

We consider a fairness-based bandwidth adaptation algorithm, which works in such a way that the allocated bandwidth to the ongoing calls will not differ from each other by more than one step. The bandwidth of an ongoing call is also allowed to be degraded below bandwidth requirement b_{req} to minimize new call blocking and handoff call dropping probabilities.

Let $\mathbf{w_{allc}}$ **and** $\mathbf{b_{allc}}$ denote the expected band-width for an incoming call and the bandwidth vector of ongoing calls, respectively. When a call arrives, the cell performs admission control by checking whether the total number of ongoing calls is less than the threshold t. If this condition is satisfied or if the incoming call is a handoff call, the cell tries to allocate maximum bandwidth to the incoming call; otherwise, the incoming new call is blocked. However, if the available bandwidth is not enough to allocate maximum bandwidth to an incoming call, the adaptation algorithm is invoked. The adaptation algorithm will randomly select an ongoing call with the current maximum bandwidth (i.e., max ($\mathbf{b_{allc}}$)) and de-grade allocated bandwidth of that call one step. At this point, expected bandwidth for incoming call increases one step. This operation is iteratively performed until the expected bandwidth for an incoming call is equal to the current minimum bandwidth of all ongoing calls (i.e., min (**b_{allc}**)). In contrast, if every call has the minimum band-width b1, none of the ongoing call can be degraded. Therefore, an incoming call is dropped. For call thinning scheme, line 1 of this algorithm would be changed to admit the user

If ((incoming is a new call) and (number of ongoing calls <K)
{
If (available bandwidth > or = b_{max})
Then assign b_{max} to incoming call
Else
{
$b_{allocated} = 0$
for (t=1,t<N, t++)
While ($b_{allocated} < b_{min}$ and $n_t > 0$)
{
randomly degrade one of n_t connections
by amount of $b_{degrade}$
$b_{degrade}$= min (b_{min}, $b_t - b_{min}$)
$b_{allocated} = b_{allocated} + b_{degrade}$
}
}
}
Else
reject incoming call

The Concept Of Spread Spectrum System

The capacity of any communications channel is defined by Shannon's channel capacity formula …….

$$C = Bw \log_2 \left[1 + \frac{S}{N} \right]$$

QOS MEASURES

Degradation ratio (DR):The fraction of time a user receives degraded qos. Since we are considering multi level Qos system,DR is defined as

$$DR = \frac{\sum_i \frac{(W_{max} - W_i)}{W_{max}} \cdot T_i}{\sum_i T_i},$$

if a user receives level-i QoS for Ti seconds.

Throughput:It gives the account of number of packets arrived at received. It measures the efficiency of system.

Throughput= (number of bits received / number of bits send)*100

Degraded bandwidth (DB): It is measure of amount of bandwidth degraded from existing users. If number of users enters in the channel are increased then bandwidth degraded is increase. The degradation is stops for a user if he reaches the minimum bandwidth (b1).

Multi Path Combining:

- Multipath: reflection, diffraction, and dispersion of the signal energy caused by natural obstacles such as buildings or hills, or multiple copies of signals sent intentionally (soft handover)
- Rake receiver used to combine different path components: each path is despread separately by "fingers" of the Rake receiver and then combined .
- Possible due to "low autocorrelation" of spreading code

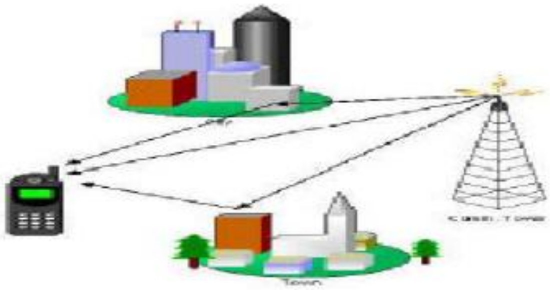


Fig: Multipath combining

WCDMA Transmission Module:

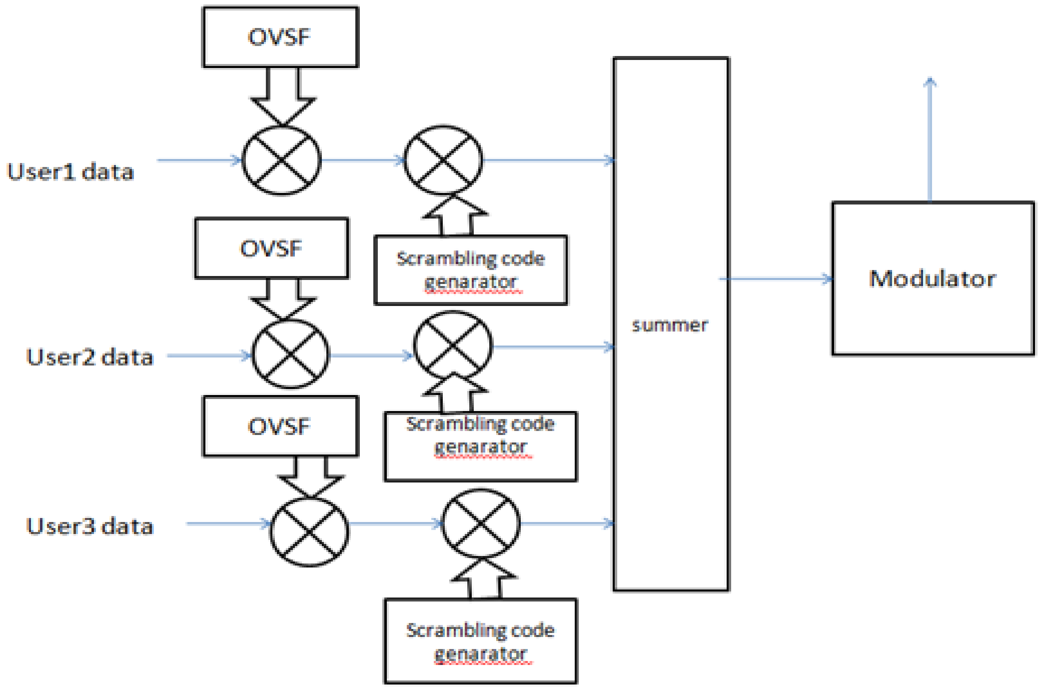


Fig: WCDMA Transmission Module

Ovsf Generator:
Transmissions from a single source are separated by channelization codes

$$C_{2n} = \begin{bmatrix} C_{2n,1} \\ C_{2n,2} \\ C_{2n,2n} \end{bmatrix} = \begin{bmatrix} \begin{bmatrix} C_{n,1} & C_{n,1} \\ C_{n,1} & -C_{n,1} \end{bmatrix} \\ \begin{bmatrix} C_{n,n} & C_{n,n} \\ C_{n,n} & -C_{n,n} \end{bmatrix} \end{bmatrix}$$

Scrambling Codes:
Scrambling codes make the direct sequence CDMA (DS-CDMA)technique more effective in a multipath environment

Lfsr (Linear Feed Back Shift Register):
LFSR sequence through (2^n -1) states, where n is the number of registers in the LFSR. The contents of the registers are shifted right by one position at each clock cycle.

Summer: Adaptive power control schemes are employed in CDMA technology for efficient transmission of messages.

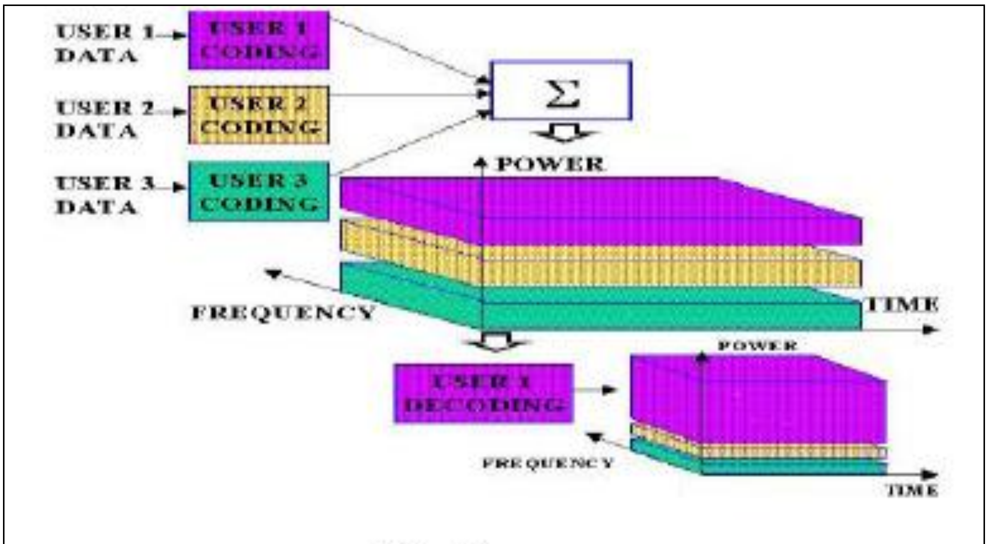
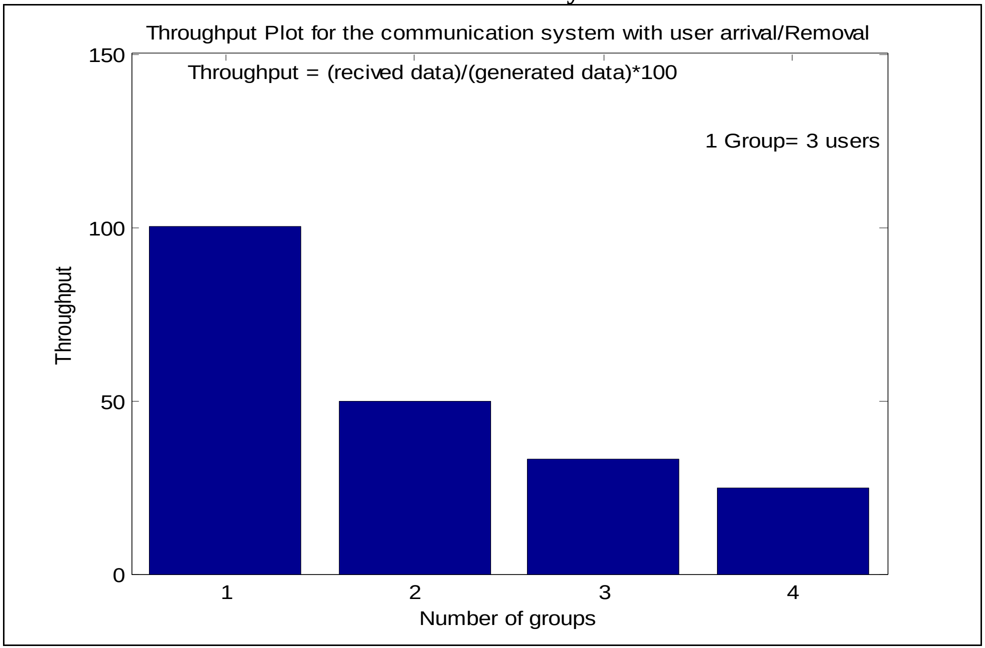


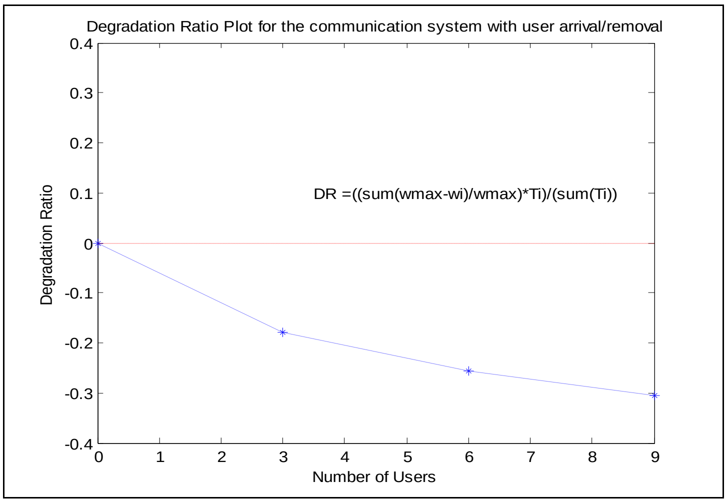
Fig: Summer

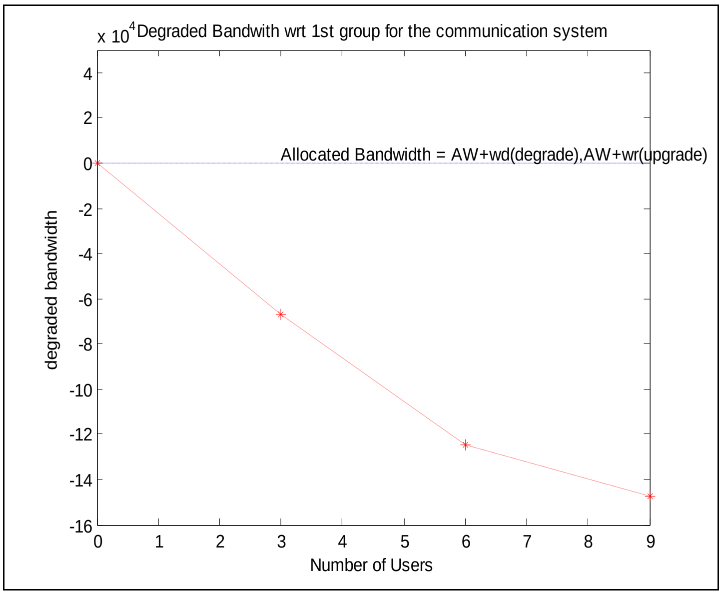
Modulation:

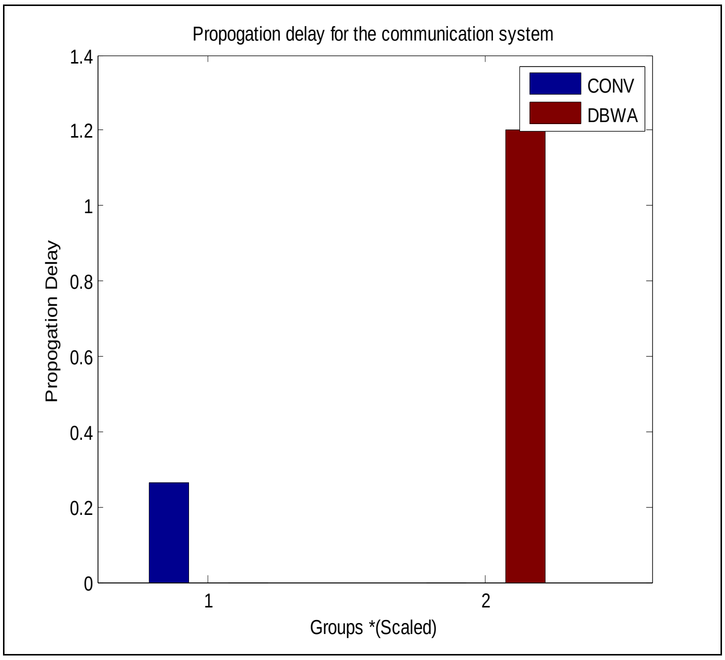
The differentially coherent PSK (DPSK) signaling scheme makes use of a clever technique designed to get around the need for a coherent reference signal at the receiver.

V. Result Analysis




Degradation Ratio Plot for the communication system with user arrival/removal
DR =((sum(wmax-wi)/wmax)*Ti)/(sum(Ti))
Degradation Ratio
Number of Users


x 10^4 Degraded Bandwith wrt 1st group for the communication system
Allocated Bandwidth = AW+wd(degrade),AW+wr(upgrade)
degraded bandwidth
Number of Users


Propogation delay for the communication system
CONV
DBWA
Propogation Delay
Groups *(Scaled)

VI. Conclusion

In this paper, we derived an analytical model for a wireless network which uses adaptive bandwidth allocation to provide users multilevel QoS. Four performance metrics—Throughput, propagation delay, degraded bandwidth, degradation ratio are observed.. The performance plots obtained gives that with increase in load with respect to time the through put levels maintains constant because of increase in compression level which could be controlled by adaptive band width allocation method.

The performance is evaluated over WCDMA architecture by adding or removing different group of users to evaluate the algorithm efficiency. The metrics used to evaluate the performance are throughput, propagation delay, degradation ratio allocated bandwidth degradation is observed to outperform the existing fixed bandwidth allocation technique.

References

[1]. S. Sen, J. Jawanda, K. Basu, and S. Das, "Quality-of Service Degradation Strategies in Multimedia Wireless Network," Proc.IEEE Vehicular Technology Conf., vol. 3, pp. 1884-1888, May 1998.

[2]. S. Singh, "Quality of Service Guarantees in Mobile Computing," Computer Comm., no. 19, pp. 359-371, 1996.

[3]. M.R. Sherif, I.W. Habib, M.N. Nagshineh, and P.K. Kermani,"Adaptive Allocation of Resources and Call Admission Control for Wireless ATM Using Generic Algorithm," IEEE J. Selected Areas in Comm., vol. 18, no. 2, pp. 268 -282, Feb. 2000.

[4]. T. Kwon, Y. Choi, C. Bisdikian, and M. Naghshineh, "Call Admission Control for Adaptive Multimedia in Wireless/Mobile Network," Proc. First ACM Int'l Workshop Wireless Mobile Multimedia, pp. 111-116, Oct. 1998.

[5]. S. Choi and K.G. Shin, "Location/Mobility-Dependent Bandwidth Adaptation in QoS-Sensitive Cellular Networks," Proc. IEEE Vehicular Technology Conf., vol. 3, pp. 1593-1597, 2001.

[6]. Y.B Lin, S. Mohan, and A. Noerpel, "Queuing Priority Channel assignment Strategy for PCS Handoff and Initial Access," IEEE Trans. Vehicular Technology, vol. 43, no. 3, pp. 704-712, Aug. 1994.

[7]. R. Ramjee, R. Nagarajan, and D. Towsley, "On Optimal Call Admission Control in Cellular Networks," Proc. IEEE INFOCOM '96, vol. 1, pp. 43-50, 1996.

[8]. K. Mitchell and K. Sohraby, "An Analysis of the Effects of mobility on Bandwidth Allocation Strategies in Multi-Class Cellular Wireless Networks," Proc. IEEE INFOCOM '01, vol. 2,pp. 1075-1084, 2001.

[9]. A. Sutoving and J.M. Peha, "Novel Heuristic for Call Admission Control in Cellular Systems," Proc. IEEE Int'l Conf. Universal Personal Comm., vol. 1, pp. 129-133, 1997.