

## **Resource Allocation in cellular Network : A cross layer approach**

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### **ABSTRACT**

As the cellular and PC'S world collide with Wireless LANs and Internet-based packet data, new networking approaches will support the integration of voice composite infrastructure of cellular base stations and Ethernet-based wireless access points. A cross layer design is a way of getting the better performance in the layering structure. In this paper we proposed introduced a new cross layer design framework for both downlink and uplink state in which the resources are fast allocated in the network.

**Keywords** - Cross layer, cellular n/w, OFDM, MS, VBR, CBR.

### **1. INTRODUCTION**

An internet is a set of interconnected networks. Each network share the resources from one node to another node. In a small communication network or a large network the data is to be shared. These data/resources are of text, image, voice, video, and combination of these resources in different types. These are bundled in all a single approach called multimedia data/resources. Resources can be used as input for other system. These resources are useful for users in a network. Resources are shared on a communication network. The communication may be take place with wired or wireless network but both are different approaches. In a wireless network data is sent in form of packet and these packets are independent in network. They can use any path in a network but wired network have a fixed path. when we talk about wireless network then there are some network structures present such as:- ad-hoc, mesh, cellular network. An ad-hoc network can be used in many applications by using sensor node like:- water storm, disaster, earth-quake, weather information, etc. There are many applications where ad-hoc networks are used to gather the information or resources from one to another end. In mesh network, nodes are connected to each other in wired or wireless communication network. If any node fails then there is no impact on another node. Likewise cellular network is used for communication between nodes. The only difference is that the structure is different for each network in networks. A cellular network look like as shown in

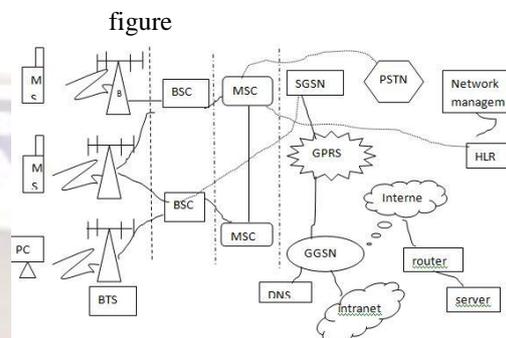


Fig.1.1 cellular network

In this communication the user uses their handset or mobile phone for resources (multimedia messages) sharing from the service provider. The MS (mobile station) connected to BTS (base transceiver) BTS are connected through MSC (mobile switching center) and so on etc. All are connected through a router link. In a network resources are fastly allocated to MS when there is no congestion. But in every communication system there is some congestion occur due to rain, storm or unwanted messages in the path. Most of the researchers provide the resource allocation algorithm and mechanism based on channel etc, like:-

radiowaves, optical device, OFDM, CDMA, WCDMA, Wimax etc but mainly the focus is on allocation of resources with minimum delay and max throughput. Due to need or demand of internet user for resources like fast internet access, video-voice calling etc in the communication, the resources are allocated mainly two basic rate (data transfer limit like: peak, average or max) firstly constant bit rate like video, voice etc, second is variable bit rate like: sms, email, file transfer etc. Even in the dynamic multiuser, resources allocation is the basic fundamental of OFDM and cross layer design approach. OFDM is a multicarrier transmission in wireless communication for supporting multimedia and broadband services [1]. In any MS, the signal or co-channel is necessary for connecting to the network. Due to the presence of multiple propagation paths as well as the motion of mobile users and surroundings, a wireless channel varies substantially in time, frequency, and space. Some parameters are used in wireless network (i.e. modulation, coding, and transmit power) to change the channel states. The water-filling principle gives a theoretical explanation of this idea. It states that

under a certain power constraint, the overall information rate of a random channel is maximized by transmitting more power where the attenuation and noise are smaller. In other words, a higher transmission rate should be used when the channel is under good condition. Cross-layer design become a popular designing method for the IP-based next generation wireless systems such as 3G/4G[2]. A number of cross-layer methods are emerging to enhance the performance of the applications and achieve better Quality of Service (QoS) support. In this paper, the proposed work specify the allocation of resources in cellular network with the help of cross layer concept. Here, we discuss how a cross layer is used in allocation of resources in multicarrer channel, resource allocation cycle and the resources are to be allocated to the user in communication area under air interface.

## 2. RELATED WORK

In the world of the communication technology, there are lots of changes because of the internet. and their fast services in less cost. Even in the telecommunication sector also, there is a huge demand of services at less cost and more user connectivity with each other. But all user in the network are based on the resources i.e the main part of the system, because the communication makes the maximum use of resources between the users. Without resources, there is no use of communication. The resources are depend on the service type in a network. Probst et.al [3] provide an algorithm of context-aware resource allocation in cellular network based on the signals that how much data is received by user in heterogeneous network. If the user know what data is needed, then according to that the resources are allocated to user which are depend on available channel on that area. An area defined the range of the BTS or the coverage under the communication channel. Chang et.al.[4] proposed a novel time-frequency resource allocation mechanism using FFR(fractional frequency reuse) for a macro-femto overlay cellular network. High data rate in OFDM systems can be achieved by employing spectrum reuse and utilizing high spectral efficiency. The femto-cell is used for reducing the interference in the frequency by using the sub-channels. The FFR(fast frequency reuse) used for resource allocation i.e., co-channel use in low CCI(co-channel interference) and orthogonal channel use in high CCI as a useful policy to handle the interference for a macro-femto overlay cellular network. Amram et. al.[5] specified an intelligent video aware mobile network architecture which addresses the expected growth in demand for video content delivery. Ritesh et.al.[6], specified that fast allocation of resources in download link is higher in OFDM and it provides the optimal solution of

channel fading in network. According to Mohamed et.al.[7], there are two categories of services in wireless cellular network. In first category variable bit rate(VBR) and constant bit rate(CBR) are specified and in the another category streaming call(video,voice,broadcast(T.V)) is given that is used in current generation based on QoS and demand of user. According to Khaled[1] OFDM has already been adopted in Hiper-LAN, 802.11a, 802.11g, and 802.16, and is now considered one of the main air interfaces under consideration for fourth-generation (4G) wireless systems. According to Sonia[2], A Cross Layer Coordination Based Architecture (CLCBA) is used to provide a solution that solves simultaneously multiple problems which directly affect the performance of a 3G/4G terminal. the proposed cross layer optimizer is based on the system utility optimization. The benefit of the cross layer interaction are QoS, Mobility, Security, Power Saving. The goal of the CLCBA is the coordination between many sub-optimizers. These sub-optimizer is controlled by a central coordinator(handler) that choose the final optimization strategies. Zhang[8] specified packet scheduling or fair queueing (FQ) schemes have been proposed to provide fair services to users in wired networks [8-10]. According to Parekh[9] Among them, the most well known ones include WFQ (weighed fair queueing, also known as PGPS), zhang[10] VC (virtual clock), S.J[11] SCFQ (self-clocked fair queueing), Ferrari[12] delay-EDD (delay earliest due date), etc. Most of them aim to serve the backlogged users in proportion to the share of bandwidth reserved by the users.

## 3. PROPOSED WORK

In the wireless network, resource allocation is the main goal of method and their services to the user. In our proposed work, we introduced a new cross layer design framework for both downlink and uplink state in which the resources are allocated fastly in the network. With the proposed approach, Cross layer is designed in such a manner that provide better performance. The proposed cross layer design architecture is as follows:-

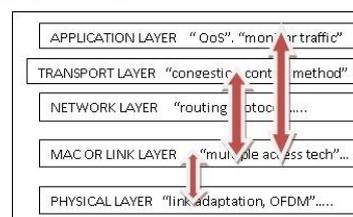


Fig.3.1 cross layer design architecture.

An application layer, in which the service provider resides in MSC(mobile switching center), provides the co-channel to the user and to monitor

the resources and quality oriented services with the help of link stage of user in the cellular network. When a co-channel is allocated to the user, the server monitors the congested route and non-congested route from end to end connectivity in network. The routing protocols check the flow of data or resources from one end to another end based on the demand of services and to overcome the traffic in the path. Different multiple access techniques are used like(TDMA,CDMA,OFDM) etc. to provide the better performance and optimization result at client side. A link adaptation, in which the connectivity between the MAC and physical layer or MAC and transport layer, provides both end services between user and within the network. We use physical channels like optical fiber, radio channel etc for this work. A cross link between the layer is used to monitor the services in the layer and in the network. Every system use layered approach to provide and get the maximum throughput and less delay services i.e the uplink and downlink in the QoS. According to fig.3.1 a cross layer design architecture shows the better linking between layers and with the help of cross link, performance has been improve with optimizer (to optimize the performance or monitor the services).

In cross layer approach, the data is to be tranfered from one place to another. For this purpose the simple structure of data transfer scheme using cross layer method in the networks is to be shown with help of fig 3.2 which is as follows.

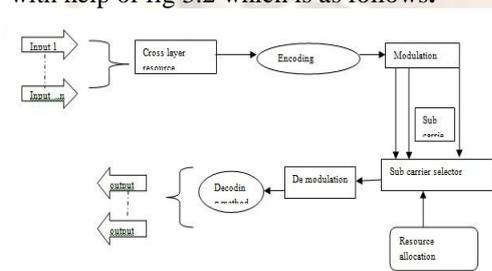


Fig.3.2 data transfer scheme

This diagram shows the flow of data for receiving and transformation. In this, there are n inputs from n different user in a particular area. These inputs the data to cros layer allocation area and after that it tranfer data/resources to the encoding method. Input data is to be encoded using different encoding schemes according to the priority. This encrypted data is modulated and send on communication channel like- TDMA, CDMA, OFDMA etc. After that the multi subcarrier (if we use OFDM techniques) selector receive the signal and the decision of correct signal is taken out. The signal is demodulated and decoded into main message and the correct information is received at receiver end. For the tranformation of data resource allocation is to be needed and the resources are allocated with

the help of resource allocation cycle. A resource allocation cycle in the communication network is described as shown in fig3.3:-

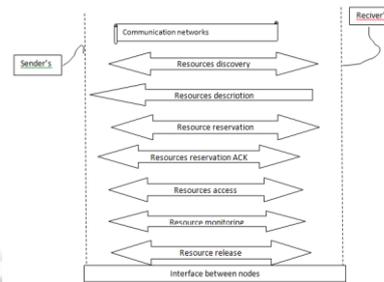


Fig.3.3 Resource allocation cycle

A resource allocation cycle describe the way of transferring the data from one end to the another end in the communication network. Whenever a sender send the request, then the related matching data is to be discover after finding the data or resources with its description. Resources are reserved on that channel in which the MS both end are connected. After the reservation of the resources, an acknowledgement is to be sent to the MS(user). The MS access the resources from the service provider. Resources are to be monitored in network. After the use of resources, the link is disconnected and resources are to be released. These activities are performed rapidly within the network. The sender and receiver have no knowledge above the process in the network . They just use the services which are provided by the service provider.

In communication, we have two state of transfer the data first is downlink(download at client side), second is uplink(transfer on server). The better system performance can be obtained from information exchanges a cross protocol layers and by minimizing the unwanted use of distribution. To minimize the overall power consumption three components are to be used i.e. Subcarrier allocation, power distribution, and packet scheduling. The function of the subcarrier allocation is to allocate subcarriers to the packets that are selected for transmission in a most power efficient way. To avoid CCI (co-channel interference), each subcarrier is allocated to at most one user in the networks. The objective of power distribution is to smooth the variance in the wireless channel capacity and maintain a sufficiently low PER (packet error rate) by allocating the transmission power according to the channel conditions. A power network in cellular network can sense the consuming devices like the cell network. They can only transmit the power when there is a device to use it or may be the power on demand at specific location. The transmitted power is more feasible inside a building, where the user shape the field using distributed antennas. But more power consumer device make the battery life short so there is a need

of low power transmitter or some power distribution control mechanism.

#### 4. CONCLUSION

The cross layer design is helpful for getting the better performance in the layered structure. In this paper a new architecture is to be developed for downlink and uplink state in which the resources are allocated fastly and for this a data transfer scheme and resource allocation cycle are to be developed. These architecture can be used in 3G,4G or next generation with OFDM techniques to get the better optimization and performance in resource allocation. This work also lead to further enhancement in which the researcher can allocate the resources based on priority.

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