MECHANISM INVOLVED IN ESTABLISHING A CALL BETWEEN TWO MOBILE USERS IN A CELLULAR SYSTEM

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ABSTRACT: In our daily life a mobile phone has become an extremely important part. It has instigate the wireless communication revolution. Mobile communication was invented in the year 1930 by introduction of two way police radio. Following that boundless development within mobile communication system took place during II world war. After II world war a large amount of mobile communication equipment and systems were found available and expanded mobile communication services for commercial usage. In the year 1946, the first public mobile communication services was introduced in United states known as first public mobile communication system(PMTS). PMTS marked the beginning of an era of public mobile communication system. Cellular concept came into existence in the year 1970. Since the mobile cellular communication has undergone phenomenal growth. Without interruption it is providing better services, CC systems are unexpected new challenges, such as unbalanced crowd communication behaviors of users and congestion from huge requests of high-quality video transmission.

KEYWORDS: Cellular mobile communication, frequency, signal, equipment, transceiver, network.

INTRODUCTION: In today's cellular mobile communication system, conventional mobile communication system was operationally different. It deployed base stations with high transmitter power on tall towers, in order to provide coverage over large geographical areas (PMTS has coverage over 50 kms of radius). The cellular mobile communication given offered service with limited capabilities and limited system capacity. The frequency bank utilization was based on trunking principle, meaning, the available frequency spectrum was divided into suitable number of frequency channels. The number of channels was limited and the blocking probability was very high. The user who starts a call in one service area has to reinitiate the call when moving in to another service area. Although the service performance was undesirable, yet the demands was high. Since users were willing to trade off the convenience of mobility against the poor quality of service.

A typical conventional mobile communication systems, the spectral congestion was the major problem and the service providers could not meet the increasing demand for mobile communication services. It fueled the need for a high capacity mobile communication system. Basically it was used to achieve large coverage. It was realized that having this objective is not enough so the new design objective became to achieve high capacity and high coverage over the give frequency spectrum. This needed to restructure the whole system. Thus the cellular concept in mobile communication evolved.

Mobile cellular Communication

The advent of cellular concept is a crucial event, which has played an extremely significant role in the evolution of mobile communication systems around the world. The cellular concept is a major breakthrough in resolving the issues of spectral congestion and system capacity. It helps to realize very high capacity and high coverage over the give frequency spectrum, without major technological changes. The main concept of cellular communication is on frequency reuse. It was developed at bell laboratories to find a spectrally efficient system. Besides frequency reuse, the advancement in technologies for digital signal processing, integrated circuits, access mechanisms and increased battery life has contributed to the exponential growth in mobile communication services. Throughput performance within mobile cellular communication has also gradually and significantly increased in order to meet the users’ expectations. So far, mobile cellular communication has come across vast developments, which resulted into several generations. The future of mobile cellular communication has ambitious targets.

Cellular Concept and Frequency Reuse

The cellular concept is a system level concept in order to resolve spectral congestion and to enhance system capacity. In cellular concept, a base station with high transmitter power is replaced with several base stations with low power transmitters, in the given service area. This helps to lower the coverage region of a base station and therefor the frequency used in a cell can be reused in another cell, distant apart, without any interference. This makes frequency reuse possible and supports large number of users in the given service area.

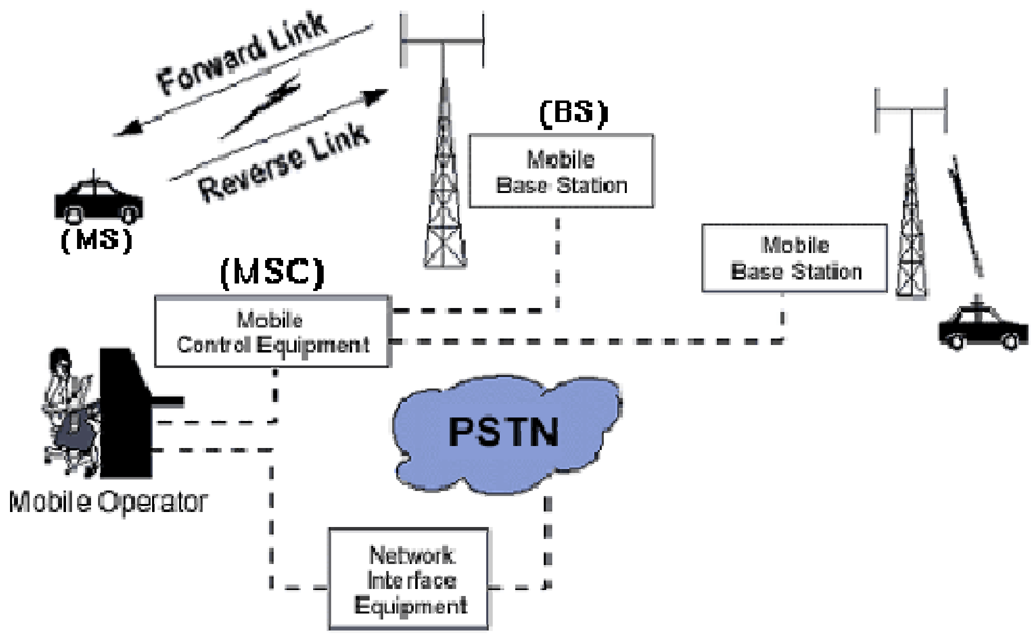
A cluster is repeated in order to realize frequency reuse in the service area to boost the capacity. This is how the same set of frequency channels can be reused in different locations within the service area. The repetition of a cluster must follow a systematic arrangement so that the cells with the same set of frequency channels are kept sufficiently apart to minimize interference, owing to handling on the same group of frequency channels. Two cells with the same set of frequency channels are called co channel interference.

The frequency channels can be reused in this manner as many times as desired, as long as the co channel interference between the co channel cell s is ensured to below acceptable limit. The frequency reuse depends on intelligent allocation of frequency channels. It enables high system capacity and wider coverage, without additional frequency band and without major technological changes.

Universal and Fractional Frequency Reuse: The frequency reuse in a cellular system could be categorized as universal frequency reuse and fractional frequency reuse. In universal frequency reuse, the complete system frequency band is reused in every cell in the cellular system, over the entire service area. On the other hand, in fractional frequency reuse, the total system frequency bank is divided in sub sets of frequency channels to be assigned to different cells. While assigning the sub-sets, care must be taken to minimize interference to the system. In fractional frequency reuse, a cluster is defined, which consists of the cells among which all the subsets are completely distributed. Let us assume that the whole system frequency bank is divided in N sub sets of frequency channels. Hence each cell will be assigned with 1/N of the total frequency channels. The first and second generation cellular systems (e. g AMPS and GSM) use fractional frequency reuse. On the other hand, systems based on CDMA and OFDM technology, use universal frequency reuse.

Cellular System Design Unit

A mobile cellular communication system, which is divided into a number of cells to establish services over a given area. Every cell has a base station, it determines the coverage region of the cell. The cellular system design requires installation of these base stations on the ground. Practically, before installation of the base stations on ground, a blue print is created on paper.



a. **User Equipment (UE):** UE consists of two parts, mobile equipment and a smart card. The mobile equipment is a physical device used by a subscriber and comprises of a transceiver and a microprocessor based control unit. It uses a single antenna for full duplex operation and provides hardware and software to support communication. The transceiver can precisely generate and adjust the frequency of the radio signal it transmits or receives. The control unit helps to control all the required function. The smart card which contains all the information related to the specific user.

b. **Base Transceiver Station (BTS):** Each cell is served by its own transceiver, called BTS. The geographical area covered by a BTS, known as a cell, may overlap with the coverage areas of other BTSs. As a result, a UE, such as a mobile phone, can be within the coverage range of multiple BTSs simultaneously. This is common in densely populated or high-traffic areas where cells are designed to overlap to ensure continuous and reliable service.. An UE communicates directly with its own BTS.BTS presents the fixed end to support wireless communication. In fact, the wireless link is only between a BTS and the UEs.

c. **Base Station Controller (BSC):** several BTSs are connected to a BSC by wired links. A BSC can be physically located alongside one or more Base Transceiver Stations (BTSs). In this setup, it manages the BTSs it is connected to, though it can also manage BTSs that are not physically collocated. A BSC participates in signaling exchange with MSC for setting up a call or in case of hand off requirement. Several BSCs are connected with one MSC over dedicated communication links.

d. **Mobile Switching Centre (MSC):** MSC us also known as mobile telephone switching office (MTSO). It is considered as the heart of a cellular network, since it is the central coordinating unit for all the BSCs connected to it. It comprises of switches and processors. MSC controls the functions related to call setup, call processing and call termination. It supervises assignments of frequency channels, monitors UE mobility and permits hand offs if required. It handles billing activities and contains various databases related local users and roaming users. When a UE moves from one cell to another, hand-off takes place, which is supervised by MSC. Roaming implies that a UE operates from a service area other than its own service area. In that case, an UE has to register as a roamer with MSC of the new service area. Once registered, a valid roamer is allowed to receive service in that area and the billing information is routed to the subscriber's home service provider. MSC connects with public switched telephone network (PSTN) to establish communication between landline telephone and mobile phone.

CONCLUSION

A cellular system operates with an allocation of limited frequency bank. It is important to use the allocated frequency band in most efficient manner to support as many users as possible. Tis demand efficient frequency management and appropriate channel assignment strategies to achieve optimal system capacity. In the design of cellular systems, strategies play a crucial role in ensuring the network operates efficiently, meets user needs, and adapts to changing conditions. The aim is to efficient utilization of the allocated frequency band in a manner such that the desirable signal quality is maintained. It involves dividing the system frequency band into a number of sub sets of frequency channels to be assigned to different base stations. The base station utilizes the set of frequency channels assigned to it for establishing two way communications with the UEs in its coverage region. In the aggregate, commercial wireless capabilities are considerable, yet many technical challenges remain. The cost of wireless voice systems needs to be reduced and their quality improved.

It is simple and straightforward strategy to implement, and it proves to be optimal, when the traffic densities in different cells within the cellular system are almost uniform.

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