Multiple Access Techniques for Wireless Communication

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Abstract – Packet radio techniques support mobile transmitters sending bursty traffic in the form of data packets using random access. Ideal channel throughput can be increased if terminals synchronize their packet transmissions into common time slots, such that the risk of partial packet overlap is avoided. With high traffic loads, both unslotted and slotted ALOHA protocols become inefficient, since the contention between all transmitted packets exposes most of the offered traffic to collisions, and thus results in multiple retransmissions and increased delays.

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INTRODUCTION

In wireless communication system, it is always desirable to allow the user to send the simultaneous information to the base station while receiving the information from the base station.

For example talking on cell phone, at same time user transmit information receive information, this concept is known as Duplexing. Generally it is 1ssified in two part frequency division duplexing and time division duplexing.

Analog cellular systems are the first generation of cellular systems. Several incompatible analog standards have been developed and implemented world de. These systems use Analog Frequency Modulation (FM) and have a frequency Division Multiple Access (FDMA) based Media Access Control (MAC) architecture. The available radio spectrum is shared by a relatively large number of FM modulated signal.

2G cellular systems primarily use digital modulation and processing techniques and have several incompatible air interface standards. The first goal, use digital techniques, has been achieved, whereas the second goal, to have single digital cellular wireless global standard, is unlikely to be achieved. Limerous incompatible digital mobile wireless and cellular standards have been developed. Some of these techniques use FDMA, TDMA etc. Third generation systems such as several spread spectrum (SS), Collision Sense Multiple Access (CSMA), Direct Sequence (DS), Frequency Hoped (FH) spread spectrum have also been standardized.

FREQUENCY DIVISION DUPLEXING (FDD)

Frequency division duplexing provides two distinct bonds of frequencies for every user. The forward bond provides traffic from the base station to mobile and reverse bond provides traffic from the mobile to the base station. In FDD, any duplex channel actually consists of two simplex channels a forward and reverse and a device called a duplexer is used inside each subscriber unit and base station to allow simultaneous bidirectional radio transmission and reception for both the subscriber unit and the base station the duplex channel pair. Their must be a frequency separation between both channel and it must constant throughout the process.

TIME DIVISION DIJPLEXING (TDD)

It uses time instead of frequency to provide both forward and reverse link. In TDD multiple users share a single radio channel by taking turns in I time domain Each users are allowed to access the channel in pre-specified time slots and each duplex channel has both a forward time slot and a reverse time slot.

If the time separation is small then both way communications occur simultaneously but it is not too small so that signal become interfere to ea other. TDD requires a single communication channel which make equipment simpler while FDD required two dedicated communication channel [Two simplex].

TDD enables each transceiver to operate as either a transmitter or receiver, due to that a time delay is created between individual users but it is very le cannot be

observed but as compared to FDD where no time delay but t separate channel are required which is working at two different frequencies that equipment become costly than TOO enabled equipment.

TDD generally is limited to cordless phone or short range portable access. It is more effective for fixed wireless access when all users are stationary that propagation delays do not vary in time among the users.

INTRODUCTION TO MULTIPLE ACCESSES

TOMA, FDMA COMA are three major access technique that is used wireless communication system These techniques can be grouped as narrow band and wideband system depending upon how the available bandwidth is allocated to the users.

NARROWBAND SYSTEMS ACCESS

The term narrow band is used to relate the bandwidth of a single channel I the expected coherence bandwidth of channel mean the transmission bandwidth is equal to the channel bandwidth or comparable to the channel bandwidth. The system using narrow-band multiple access systems the available radio spectrum is divided into a large number of narrow band channels And the channels are usually operated using FDD To minimize interference between forward and reverse links on each channel the frequency separation e made as great as possible within frequency spectrum

NARROWBAND FDMA/TDMA

In this A user is assigned a particular channel which is not shared by other user and for this type of access if FDD is used then the system called FDMA/FDD. While narrow-band TDMA allows users to share the same radio channel but allocates a unique time slot to each user in a cyclic fashion on the channel thus separating a small number of users in time on a single channel and the system said to be narrow-band TDMA/TOD.

WIDEBAND SYSTEMS

In this the transmission bandwidth is much larger than channel bandwidth. In wideband multiple access systems a large number of transmitters are allowed to transmit on the same channel.

TDMA allocates time slots to the many transmitter on the same channel and allows only one transmitter to access the channel at any instant of time, whereas CDMA allows all of the transmitters to access the channel at the same time.

In addition to FDMA, TOMA, and COMA, two other multiple access schemes will soon be used for wireless communications. These are packet radio (PR) and space division multiple access (SDMA).

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