Multiple Access Method In The Various Stages Of The Evolution Of The Ways To Utilise The Air Interface

Multiple access is a technique that allows multiple users on the cellular network share their allocated spectrum in the most efficient manner so as to let as many users on the network as possible. Since spectrum space is often limited this kind of spectrum saving is required to improve the overall capacity of the cellular network in a given area. This saving is achieved by assigning the same section of spectrum to multiple users at the same time. These multiple assignments are achieved by utilising a multiple access method which will allow multiple devices to connect to the same multiple point transmission devices and to share the spectrum space.

A cellular network will split any allocated area in to cells in which a mobile unit in every cell will be able to communicate with the base station. The main purpose of this design is to allow for increased channel capacity. This is intended to allow the management of as many calls as possible in a particular area of the spectrum. Multiple access techniques will permit multiple users to access to a channel. A channel represents the part of the system dedicated to a single mobile user. This system resource will allow the mobile user to connect and communicate with other users in the network.

Initially on the 1G Network there was only one method of multiple access known as FDMA (Frequency-division multiple access). This multiple access system worked by dividing one channel or set of bandwidth into multiple individual bands which would each be used by a single user. A band would contain two sets of frequencies, one for uplink and one for downlink. This method of multiple access meant that the network only supported one user per channel and they had to be separated by a large gap of spectrum to avoid interference. This cross channel interference is known as cross talk. As FDMA was one of the earliest multiple access methods it had multiple issues and surprisingly few advantages over its follow up multiple access schemes. As already discussed crosstalk was a large issue with this scheme as it required large gaps in frequency between each user within the same cell. This meant that large concentrations of users would run out of correctly spaced channels and would begin to experience crosstalk.

A and B are within the same cell and due to the limitations of this multiple access method and the 1G network in general they have to be separated by a large frequency gap. Another downside to is related to this interference as due to the tight filtering required to ensure there is no crosstalk it requires high-performing filters to ensure there is no crosstalk which are often more expensive. (www.iitg.ac.in, Unknown). An unfortunate side effect of the way that frequencies are directly assigned means that currently in use spectrum cannot be swapped to another user even if at the moment another call is engaged the previous user is not speaking. They can share the same spectrum if the call is started and ended between each user’s attempt.

An advantage of FDMA is that it is not susceptible to the near far problem that can often affect CDMA transmissions due to frequency filtering being a valid way to circumvent this issue. The near-far problem is the situation where two transmitters are transmitting at equal power but due to the fact that one is closer this one will be the detected one. To get around these

transmissions will often increase their power so that they can be heard over other transmissions. This will lead other transmissions doing the same until the power output becomes untenable. Thanks to FDMA using separate frequency bands it is easy to filter out undesired frequencies to achieve the desired result.