INTRODUCTION TO GSM

GSM- CHANNELS

1. **PHYSICAL CHANNELS**
2. **LOGICAL CHANNELS**
3. **PHYSICAL CHANNELS**:

The physical channel is the medium over which the information is carried, in the case of a terrestrial interface this would be a cable.

1. **LOGICAL CHANNELS**

The logical channels consist of the information carried over the physical channel.

GSM PHYSICAL CHANNELS

• GSM PHYSICAL CHANNELS

* A single GSM RF carrier can support up to eight MS subscribers simultaneously
* Each channel occupies the carrier for one eighth of the time
* This is a technique called Time Division Multiple
* Time is divided into discrete periods called “timeslots”.

The timeslots are arranged in sequence and are conventionally numbered 0 to 7. Each repetition of this sequence is called a “**TDMA frame**”.

• BURST

* The information carried in one timeslot is called a “burst”.

GSM LOGICAL CHANNELS

• There are two main groups of logical channels:

* Traffic channels
* Control channels.

TRAFFIC CHANNELS

• The traffic channel carries speech or data information.

• The different types of traffic channel are listed below:

**GSM Control Channel**

• Broadcast Control Channel (BCCH)

• Common Control Channel (CCCH)

• Dedicated Control Channel (DCCH).

1. BCCH (Broadcast Control Channel**)**

Frequency Correction Channel (FCCH)

Synchronization Channel (SCH)

1. **Common Control Channels (CCCH)**

• It consists of the following:

* Random Access Channel (RACH)
* Paging Channel (PCH)
* Access Grant Control Channel (AGCH)
* Cell Broadcast Channel (CBCH)

1. **Dedicated Control Channels (DCCH)**

* Stand-alone Dedicated Control Channels (SDCCH).
* Associated Control Channels (ACCH)
* Slow Associated Control Channel (SACCH)
* Fast Associated Control Channel (FACCH)

BASIC GSM CALL SETUp

• The BTS receives a data message from the MS which it passes it to the BSC

• The BSC relays the message to the MSC

• the MSC then sets up the call to the land subscriber via the PSTN.

• The MSC connects the PSTN to the GSM network, and allocates a terrestrial circuit to the BSS serving

• the MS’s location.

• The BSC of that BSS sets up the air interface channel to the MS and then connects that channel to the allocated terrestrial circuit, completing the

• connection between the two subscribers.

**Error Protection and Detection**

• To protect the logical channels from transmission errors introduced by the radio path, many different coding schemes are used.

• Three coding protection schemes:

1-Speech Channel Encoding

2-Common Control Channel Encoding

3-Data Channel Encoding

**Battery Life**

• One of the main factors which restrict reducing the size of a MS is the battery.

• A battery must be large enough to maintain a telephone call for an acceptable amount of

• time without needing to be recharged. Since there is demand for MSs to become smaller

• and lighter the battery must also become smaller and lighter.

• Features which enable the life of a GSM MS battery to be extended.

• Power Control

• Discontinuous Transmission (DTX)

• Discontinuous Reception (DRX)

Power Control

• The BSS controls the transmit power of both the MS and the BTS. The received MS power is monitored by the BSS and the receive BTS power is monitored

by the MS and then reported to the BSS.

• Using these measurements the power of both MS and BTS can be adjusted accordingly

• The closer the MS is to the BTS, the less the power it and the BTS will be required to transmit.

• This feature saves radio battery power at the MS.

DTX (**Discontinuous Transmission)**

• If the MS does not transmit during ‘silences’ there is a reduction in the overall power output requirement.

• It ensures that the MS does not transmit unnecessary message data

**Discontinuous Reception (DRX)**

• DRX allows the MS to effectively “switch off” during times when reception is deemed unnecessary.

• It can therefore, after initially locking on to a BCCH, determine when the next relevant information is to be transmitted. This allows the MS to ‘go to sleep’ and listen-in only when necessary, with the effective saving in power

usage.

**Multipath Fading**

• Multipath Fading results from a signal travelling from a transmitter to a receiver by a umber of routes.

• This is caused by the signal being reflected from objects, or being influenced by atmospheric effects as it passes, for example, through layers of air of

varying temperatures and humidity.

• Received signals will therefore arrive at differenttimes and not be in phase with each ther, they will have experienced time dispersion. On arrival at the receiver, the signalscombine either constructively or destructively, the overall effect being to add together orto cancel each other out.

• GSM offers five techniques which combat multipath fading effects:

▫ Equalization.

▫ Diversity

▫ Frequency hopping.

▫ Interleaving

▫ Channel coding.

**Diversity**

• Signals arrive at the receive antenna from multiple paths. The signals are therefore received by the antenna at different phases, some at a peak and some at a trough.

• This means that some signals will add together to form a strong signal, while others will subtract causing a weak signal.

• When diversity is implemented, two antennas are situated at the receiver. These antennas are placed several wavelengths apart to ensure minimum correlation between the two receive paths.

• The two signals are then combined and the signal strengthimproved.

Frequency Hopping

• Frequency hopping allows the RF channel used for carrying signaling channel timeslots or traffic channel (TCH) timeslots to change frequency every frame (or 4.615 msec).

• This capability provides a high degree of immunity to interference, due to the effect of interference averaging, as well as providing protection against signal fading.