Mobile phone

1. Mobile phone

A mobile phone or cellular phone, respectively cell phone, is a portable electronic device for personal telecommunication over long distances. Mobile phones connect the user to the telephone network of a provider. The phone number is associated with the Subscriber Information Module Card (SIM-Card). To use the telephone service of a provider, which interconnects the base stations of the wireless telephone network to the public switched telephone network (PSTN), you have to subscribe. There are two different possibilities. The first is to pay a monthly fee and every phone call and the second is to buy a pre-paid card and load an account with this sum.

The cornerstone for the modern telephone was set in 1873 by Graham Bell. The modern concept of hexagonal cells for mobile phone base stations was invented 1947 by Bell Labs. The first fully automatic cellular network for mobile phones was introduced in the early 1980s.

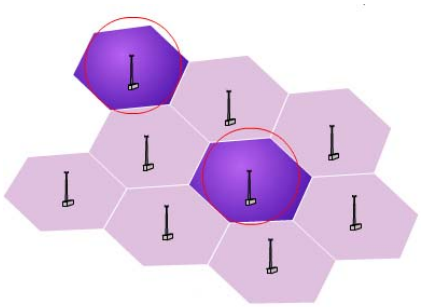
The first models of mobile phones where fixed mounted into cars and the target groups were business men and women. Later the technology involved and the devices got smaller until the modern form as we know it. Mobile phones still were expensive, but due to the low establishment costs for providers the networks have spread rapidly throughout the world, and the devices got cheaper. Nowadays almost everybody possesses at least one of these little ringing gadgets.

The total number of mobile phones subscribers in the world was estimated at 2.15 billion in 2005. Around 80% of world's population have mobile phone network coverage as of 2006. Africa has the largest growth rate of mobile subscribers in the world. The African markets are expanding nearly twice as fast as Asian markets.

2. Technology

Mobile phone networks are available around the world and everybody wants to make calls everywhere. So there have to be some standards. At the beginning of mobile communication the data was transmitted analog by radio signals but nowadays all communication is transmitted digital by electromagnetic waves.

2.1. Cellular Network



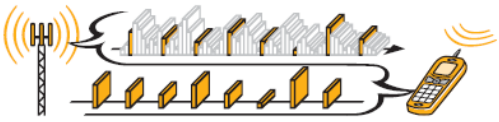
All new network technologies for mobile phones are based on so called cellular networks. That means that a base station covers a hexagonal area and many of these base stations covers the whole area of supply. The mobile phone always connects to the

nearest base station. If you travel through the different cells the mobile phone automatically connects to the nearest base station again. The reach of a mobile phone is up to 8 kilometres.

2.2. GSM

The most common standard is GSM. All European nations and most Asian and African nations have adopted GSM. Elsewhere GSM coexists with other standards.

GSM is the shortage for Global System for Mobile communications. In Europe GSM uses a frequency spectrum from 900-1800MHz, in USA 850-1900 MHz. The two systems are not compatible.



The voice is converted into digital data and divided into so called time slots, little pieces. This pieces are sent to the basis station on a frequency between the range of 900-1800 MHz or 850-1900 MHz. The division into pieces is necessary because more mobile phones communicate with the base station and so each mobile phone has only a fixed time slot, time range, where it can send.

2.3. GSM + GPRS + EDGE

GPRS (General Paket Radio Service) is an addition to GSM and adds the feature to send data up to 9.6kbit/s to and from the mobile phone. EDGE (Enhanced Data Rates for GSM evolution) is an improvement to GPRS and raises the data rate up to 200kbit/s. This makes it possible to surf the internet via the mobile phone.

2.4. UMTS + HSDPA

UMTS (Universal Mobile Telecommunication System) is the 3.Generation of mobile phone networks and transmits at 2000MHz. The advantage and difference to GSM is that one mobile phone can transmit and receive several data streams at the same time. The signals of one mobile phone get a code and by this code the base station could difference all connected mobile phones which can transmit at the same time. Different to GSM UMTS needs no additions like GPRS to send data. Voice and Data are sent by the same way. This makes also video calls possible. The data is transmitted with 384kbit/s.

HSDPA (High Speed Downlink Paket Access) raises the speed of the downlink, from the base station to the mobile phone, up to 3.600kbit/s.

3. Mobile phone radiation and health

Mobile phones send with a total power of about 2 Watts. But mobile phones regulate the power output about 1000 times per second and only use as much as they need for a good connection. In little difference to the basis station is less power needed than in great differences.

The maximal output of a mobile phone is given as a SAR value. SAR means (specific absorption rate) and is limited to 2.0W/kg in 10g of tissue by international laws. But what means 2.0W/kg in 10g of tissue? The cell phone emits the electromagnetic waves in all

directions and so waves are also directed towards our head or body. The effect of these waves in our tissue can be compared with the effect of microwaves to a piece of meat. The tissue is heated and this could have effects to our healthiness. So the maximal power which is allowed to be emitted is 2.0Watt/kg in 10g of tissue.

People living near a base station, which have a much higher output up to 100Watts, often have symptoms like headaches, dizziness, sleep disturbances, heart problems. But there is no serious scientific study which could explain that.

4. Future Trends

The trend is going to smallest devices with numberless functions that most of the users never use. Solid mobile phones that provide the only thing which is necessary namely making telephone calls get rare and by all the technique the lifetime of battery is reduced and the errors on handling and of the devices itself increase. Providers will push new functions like internet or music on your mobile phone to raise the revenue and win new customers. The question is, whether we need all these services or do we only want to make a telephone call without handling trough complex and overloaded menus?

5. References

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