

# FACTFILE: GCE DIGITAL TECHNOLOGY

## A21 INFORMATION SYSTEMS



## Mobile Technologies

### Learning Outcomes

#### Students should be able to:

- describe how technology supports mobile phone communication: mobile phone masts, cells, handsoff, base station controller, mobile switching centre and public switched telephone network (PSTN) telephone system.

### Content in Mobile Technologies

- Switching on a mobile phone.
- How mobile phones communicate.
- Network Coverage.

### Switching on a mobile phone

A mobile phone uses low intensity microwave signals in order to transmit and receive voice and data information. Essentially they are small radios embedded with mini transmitters. The mobile phone transmits radio signals when switched on enabling it to broadcast its radio location so that calls can be diverted to it. Mobile phones communicate using a network of cells to transmit data.

When a phone is powered up it listens for an SID on the control panel. The SID is the System Identification Code. This is a unique code assigned to each carrier/network provider. If the phone cannot find any control channels to listen to it knows that it is out of range and displays a 'no service' message. When the phone receives an SID it compares it to the SID programmed into its hardware. If the two SIDs match, the phone knows that it has connected to its home network. The phone will send a registration request and the

Mobile Telephone Switching Office will register the phone and keep track of its geographical location in a database. The MTSO is the mobile equivalent of the PSTN. It routes calls between different regions of the network. Different telecoms companies and network providers – for example EE, Vodafone and Three in the UK – are interconnected to form a single virtual network that spans an entire country.

### Making a phone call on a mobile phone

When a mobile phone call is made, the microphone within the mobile phone picks up the voice signal and a microchip converts it into a radio wave signal so that it can be transmitted over the mobile network. The phone's antennae will broadcast this signal to the nearest mobile phone mast. The mast receives the signal and transmits it to its base station. The area over which the base station has control is known as a cell and the base station will coordinate the transmission of the signal across the cell. Calls made from one mobile to another on the same network will be routed through base stations

until they arrive at the destination phone. Phone calls made to a mobile phone on a different network may take a lengthier route. The radio transmitter and receiver contained within a mobile phone itself are not capable of transmitting signals over long distances. The numbers are sent to the nearest base station and passed on through neighbouring base stations to the handset of the destination number.

Mobile phones communicate with their nearest mast and base station and this enables calls to be routed from or to the mobile phone. Masts are large high powered antennae capable of send radio signals over larger distances.

### Network Coverage

The area where you live is divided up into smaller areas, each area is served by its own masts and base station. These areas are referred to as cells. The cells are in the shape of a hexagon. Cell masts and base stations are placed strategically to ensure maximum cell coverage. As a user moves across a city, during a call, they will move between

cells. The call must be transferred from one cell to another smoothly. The network automatically switches coverage responsibility from one base stations to another. This process is called **handoff**. The use of cells means that the system can handle many more calls at once, because each cell uses the same set of frequencies as the cells located close to it. The more cells, the greater the number of calls that can be made at once. So in large built up areas there are more cells than in less populated areas.

Mobile phones can also be used to make phone calls to landlines. A Mobile Switching Centre (MSC) carries out switching functions, such as call set-up, release, and routing. It also routes other services such as SMS messages and conference calls as well as interfacing with the public switched telephone network (PSTN). The MSC allows base stations to connect to it, while it connects to the PSTN. This enables all forms of communication, whether between two mobile phones or a mobile and a landline.

## Questions

1. Describe the process that occurs when a mobile phone is powered up. [4 marks]
2. Describe the technology used to allow users to make uninterrupted phone calls while traveling across a large city. [6 marks]
3. What technology is required to allow user to make phone calls between a land line and a mobile phone. [3 marks]
4. Describe the function of key components of a mobile telephone system. [6 marks]

