AMPS (Advanced Mobile Phone System):

Advanced mobile phone system (AMPS) was a standard for analog cellular phone system developed by Bell Labs and officially introduced by AT&T in 1983. It was officially introduced in the Americas on October 13, 1983,Israel in 1986, Australia in 1987, Singapore in 1988, and Pakistan in 1990.

AMPS is a **first-generation cellular** technology that uses separate frequencies, or "channels", for each conversation. It therefore required considerable bandwidth for a large number of users. In general terms, AMPS was very similar to the older "0G" Improved Mobile Telephone Service, but used considerably more computing power to select frequencies, hand off conversations to PSTN lines, and handle billing and call setup.

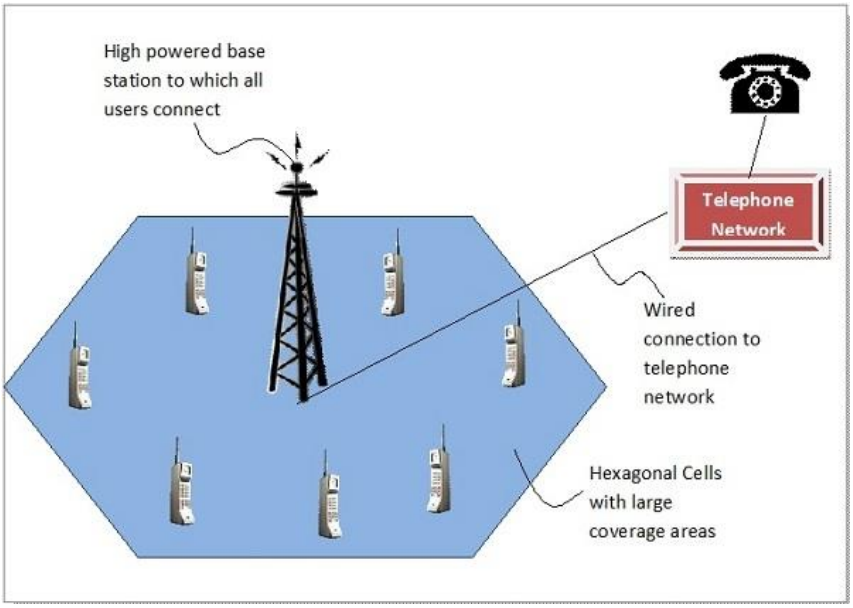
What really separated AMPS from older systems is the "back end" call setup functionality. In AMPS, the cell centres could flexibly assign channels to handsets based on signal strength, allowing the same frequency to be re-used in various locations without interference. This allowed a larger number of phones to be supported over a geographical area.

Features

- It is an Analog system based on the initial electromagnetic spectrum allocation for cellular service by the Federal Communications Commission.
- It uses frequency division multiple access (FDMA) for multiple simultaneous conversations.
- Frequency ranges within the **800 and 900 MHz** are allocated for cellular telephones in AMPS. Half of the signal is used for sending signals and half is used for receiving signals.
- It has a high bandwidth requirement particularly when the number of conversations is very high.
- **It was the first system to use hexagonal cells**. So, the pioneers of AMPS had coined the term coined cellular.
- **The cells in AMPS are 10km to 20 km across.**
- RF bandwidth 30khz. The band can accommodate 832 duplex Channels, among which 21 are reserved for call set up, and the rest for voice communication.

- Frequency allocated by FCC(**Federal Communications Commission**) on 824-849MHz for downlink and 869-894MHz for Uplink traffic.
- Since, it was an Analog technology, it suffered from noise and **Eavesdropping**

  (**Eavesdropping** is as an electronic attack where digital communications are intercepted by an individual whom they are not intended. This is done in two main ways: Directly listening to digital or analog voice communication or the interception or sniffing of data relating to any form of communication.)

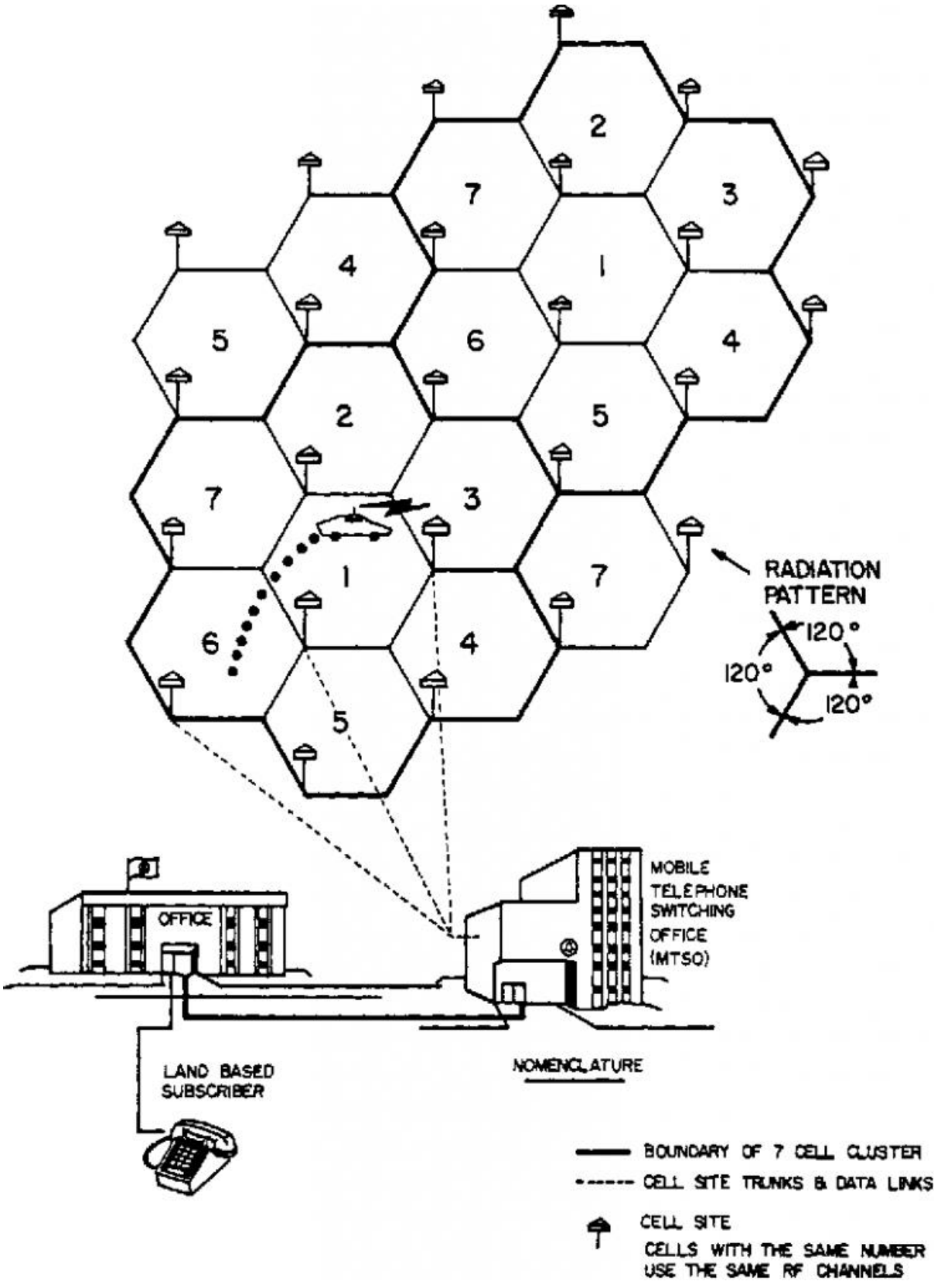


The analog service of AMPS has been updated with digital cellular service by adding to FDMA a further subdivision of each channel using time division multiple access (TDMA). This service is known as digital AMPS (D-AMPS)

AMPS and D-AMPS have now been phased out in favour of either CDMA2000 or GSM, which allow for higher capacity data transfers for services such as WAP, Multimedia Messaging System (MMS), and wireless Internet access. There are some phones capable of supporting AMPS, D-AMPS and GSM all in one phone (using the GAIT standard)

AMPS System Components :

1. Public Switch Telephone Network (PSTN)
2. Mobile Telephone Switching Office (MTSO)
3. Cell site with Antenna
4. Mobile Subscriber Unit


2
7
3
4
1
5
6
4
2
5
7
3
1
7
6
4
5
RADIATION PATTERN
120°
120°
120°
OFFICE
MOBILE TELEPHONE SWITCHING OFFICE (MTSO)
LAND BASED SUBSCRIBER
NOMENCLATURE
BOUNDARY OF 7 CELL CLUSTER
CELL SITE TRUNKS & DATA LINKS
CELL SITE
CELLS WITH THE SAME NUMBER USE THE SAME RF CHANNELS

How Advanced Mobile Phone Service works:

The First AMPS cellular system used large cells and omni directional base station antennas to minimize the Initial equipment needs. The AMPS system Uses a seven-cell reuse pattern with provisions for sectoring and cell splitting to increase capacity when needed.

AMPS was designed as a voice only System.

AMPS use frequencies in the 800-MHz to 900-MHz range of the radio spectrum. It modulates a 3-kHz voice channel onto 30-kHz FM carrier signals using Frequency Division Multiple Access (FDMA) to create a series of 30-kHz channels. Separate channels are used for base station to mobile transmission (forward channels) and mobile station to base transmission (backward channels). The resulting allocation of bandwidth for each channel results in a maximum of approximately 800 simultaneous phone conversations per operator.

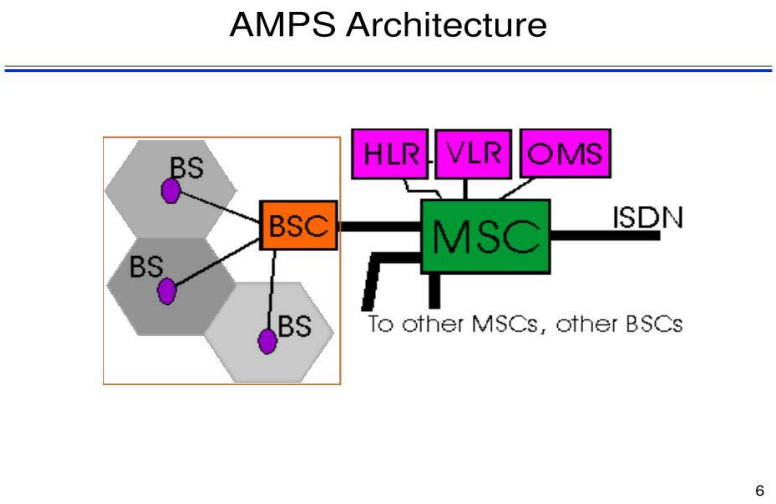
Because the population of most cities would suggest that 800 simultaneous phone conversations is far from enough, the idea was developed to partition the coverage of cities into several small areas called “cells.”

Each base station uses a limited-power transmitter with a **directional antenna** to provide coverage for a small geographical cell (from which the term “cellular communication” arose). **A typical cell ranges from .5 kilometre to 20 kilometres in size**, depending on whether the coverage is in a densely populated urban area or a sparsely populated rural one. Mobile users’ phones also have limited transmission power, meaning that communication is usually limited to the immediate cell the user is in. As a user moves from one cell to another, the signal is smoothly picked up from the new cell. Adjacent cells use different frequencies, which prevents interference.

In communication with the network the mobile provides two identifiers for registration, call control and validation. The first of these identifiers is the MOBILE IDENTIFICATION NUMBER (MIN), which is programmed handset phone number used to call the subscriber.

The second identifier is the ELECTRONIC SERIAL NUMBER(ESN), which is a manufactured characteristic of the mobile unit. This identifier is permanent and associated with the physical equipment. It is 32bits is length, with the first 8 bits identifying the manufacturer.

AMPS mobile call origination and Termination:



the mobile simply transmits its request (which include MIN and ESN) and listens on the forward channel for its subsequent channel assignment. The base station forwards the request to MSC (Mobile Switching system)

After validating the mobile via HLR and VLR, the MSC select a traffic channel pair for the mobile, if no channel is available, MSC rejects the request.

If MSC grant channel for the subscriber, it must connect call through to the destination. This is done via standard telephony- MSC simply appears to be a Private Branch Exchange (PBX) to the PSTN. Call and power control from this point forward are handled in band on the AMPS traffic channel Assigned to the Mobile.