GSM Architecture

The diagram shows the GSM Architecture with the following components and interfaces:

- **Base station subsystem**: MS (Mobile Station) connecting via Um interface to BTS (Base Transceiver Station) blocks, which connect via Abis interface to BSC (Base Station Controller)
- **Operation support subsystem / Network switching subsystem**: BSC connects via A interface to MSC; HLR, VLR, AUC blocks; OMC
- **Public network**: MSC connects via SS7 interface to PSTN, ISDN, Data N/W

Labels shown: A Interface, Abis Interface, Um Interface, A Interface, SS7 Interface, Base station subsystem, operation support subsystem, Network switching subsystem, public network, MS, BTS, BSC, MSC, HLR, VLR, AUC, OMC, PSTN, ISDN, Data N/W

GSM-900 ⇒ 890-915 MHz UpLink   M·S ⇔ BTS   (Reverse Link)

⇒ 935-960 MHz DownLink   BTS ⇔ MS (Forward Link)

GSM-1800 ⇒ 1710-1785 UpLink

1805-1880 DownLink

(Radio Air)
Um Interface

Abis
Interface

SS7
Interface

| BTS | | HLR | VLR | AUC |

BSC

A-Interface

MSC

PSTN

ISDN

Data
Network

OMC

operation support
subsystem (OSS)

Public
Network

Basestation Subsystem
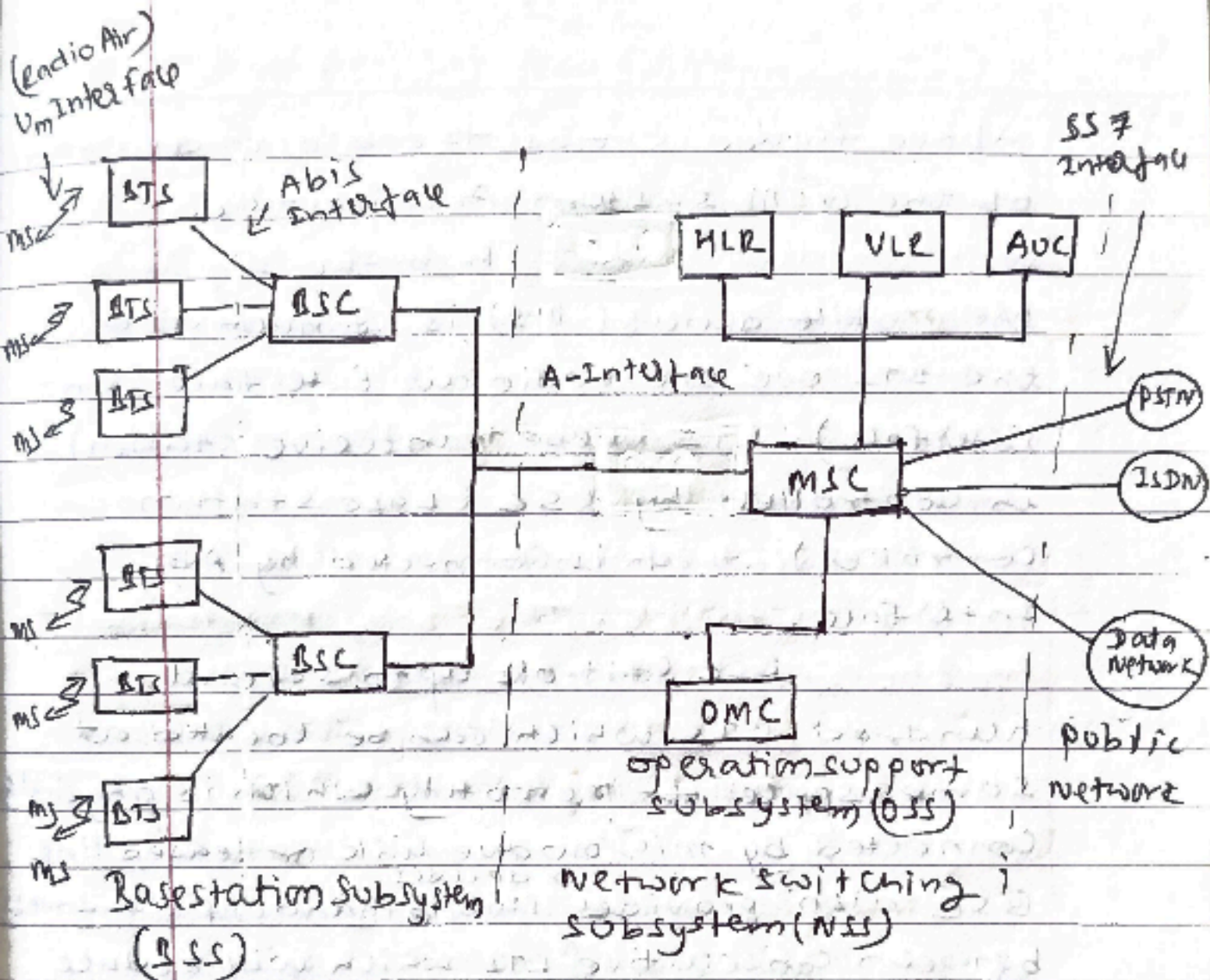(BSS)

Network Switching
Subsystem (NSS)

fig:→ GSM Architecture

Above figure shows the block diagram of the GSM System Architecture.

From the figure the mobile devices (MS) is connected to the BTS over the radio air interface (Um interface). BTS (Base transceiver station) is controlled by BSC (Base station controller) which is Connected by Abis Interface.

BSC controls upto several hundred BTS which can be located at same space or remotely which is physically Connected by microwave link or leased lines. BSC also provides or decides Mobile handoff (handovers) between consecutive BTS which will reduce. the burden of the MSC.

BSC's are physically Connected via dedicated (leased lines) or microwave link to the MSC. The interface between MSC and BSC is called A - interface. which uses SS7 protocol.

The GSM Architecutre Consists of three major interconnected subsystem. They are

1. **Base station subsystem (BSS) :→**

Base station subsystem is also known as radio subsystem. It is associated with the communication between the mobile in the network. It consist of two elements

a. **Base Transceiver Station (BTS) :→**

BTS comprises radio transmitter, receiver which transmits and receives for the communication between the mobiles. It handles the radio interface to the mobile station. BTS forms a radio cell and is connected to the mobile station (MS) via Um interface. BTS is the radio equipment (transceiver and antennas) needed to service each cell in the network.

b. **Base Station Controllers (BSC) :→**

BSC controls group of BTS. BSC provides control function and physical link between the MSC and BTS. It is high capacity switch that provides function such as

allocation of channel.

handover, and control of radiofrequency, power level in BTS.

2. **Network switching Subsystem :→**

Network Switching Subsystem is also called Core Network. It is responsible for the main control and interfacing of the mobile network. The major element for the Core network are

a. **Home location Register (HLR) :→**

HLR is database used for storage and management of subscriptions. HLR is the database that stores permanent data about subscribers including service profile, location information and activity status. For eg:→ when the customer buys SIM of any service provider, all the information about this subscription is registered in HLR of that operator.

b. **Visitor Location Register (VLR):→**

VLR is the database

that contains information about subssi
-bers that is needed by MSC in order
to service visiting subscribers.
VLR is
always integrated with the MSC. when
a mobile station roams into new
MSC area, VLR connected to MSC will
request data about the mobile station
from the HLR.

Now, the mobile station
makes call without interrogating HLR
each time as VLR will have all the inform
-ation for call setup.

c) Authentication center (AUC) :→

Authentication
center is a protected database
that stores a copy of secret key stored
in each subscribers SIM card, which is
used for authentication and ciphering of
radio channel. The Authentication protects
network operators from different type of
fraud occured in today's cellular
world.

d. Equipment Identity Register (EIR):→
                                    Equipment
Identity Register (EIR) is a database
that contains a list of valid mobile
equipment   on the network.
International Mobile Equipment Identity
(IMEI) identifies each mobile station (ms)

e. Mobile Service Switching Center (MSC):→
                                The Central
Component of the Network Switching
subsystem is the MSC. MSC performs
switching of calls between the mobile
and other fixed or mobile network
user. It also performs management
of mobile services such as registration,
authentication, location updating, handovers.
and call routing to a roaming subscriber.

3) operation and support subsystem (OSS):→
                            The operation and
support subsystem is an element
within the overall GSM Network architecture
connected to the component of the NSS
(Network switching subsystem) and the BSC.
It is used to control and monitor the

overall GSM Network and is used to control the traffic load of the Base station subsystem (BSS).

This is done by Operation Maintenance center (OMC) which also deals with management and billing of Mobile system.

* Subscriber Identity Module (SIM) :→

1. Identifier 2. Cardtype 3) serial Number
4. List of subscribed services 5) personal Identity Number (PIN) 6) Authentication key
7) PIN un blocking key (PUK)
8) International Mobile subscriber Identity (IMSI)