MOBILE
ISSUE: FEB.2004

MSC BASED CORE NETWORK FOR CDMA 2000 1x SYSTEM

GENERIC REQUIREMENTS
No. GR/MSC.01/01.FEB.2004

TELECOMMUNICATION ENGINEERING CENTER
KHURSHID LAL BHAWAN, JANPATH
NEW DELHI – 110 001
INDIA

Generic Requirements
for
MSC based Core Network for CDMA 2000 1x System

GENERIC REQUIREMENTS

GR NO. : GR/MSC.01/01.FEB.2004

History Sheet

Sl. No.	Title	GR No.	Remarks
1	**MSC based Core Network for CDMA 2000 1x System**	**GR/MSC.01/01.FEB.2004**	**Issue 01**

Table of contents

CHAPTER - 1

1. INTRODUCTION

1.1 General

This document contains the Generic Requirements (GR) of a Mobile Switching Center (MSC) based Core Network for cellular Mobile / Wireless in Local Loop (WLL) system based on CDMA 2000 1x standard to provide two way communication to customers of Bharat Sanchar Nigam Limited (BSNL)/ Mahanagar Telephone Nigam Limited(MTNL).

The Core Network is based on ANSI/TIA/EIA-41D (American National Standards Institute/ Telecom Industry Association/Electronic Industry Association, USA) or its later version and IOS 4.0 (Interoperability Standards) or its later version. The system supporting later version shall be backward compatible to system supporting earlier version). The CDMA 2000 1x standards are based on TIA/EIA standards, 3GPP2 (Third Generation Partnership Project 2) standards and ITU-R Recommendation M-1457.

This Core Network shall be required to work with the Radio Network (RN) as specified in TEC GR No. GR/WLL-04 and the Packet Core Network as specified in TEC GR/PCN.01.

Applications of such a system could be in urban and rural area with fixed and Mobile wireless terminals in zero mobility, limited mobility or full mobility environments. It shall be possible to limit mobility in the system in a limited mobility scenario as per the definition of limited mobility as specified by the DOT.

It may be noted that for the purpose of this document the word ‘mobile terminal /mobile subscriber’ refers to both the ‘mobile terminal/mobile subscriber’ as well as ‘FWT terminal/ FWT subscriber’, wherever applicable.

The tendering authority at the time of tendering may review the versions of all the documents mentioned in this GR and update them if necessary.

1.2 Functions

The functions and features of MSC based core network can be categorized into the following main functional areas: -

(a) Call processing
(b) Mobility Management
(c) Supplementary Services
(d) Radio Resource Management
(e) Terrestrial Facility Management

Call Processing: - This refers to the steps required in the MSC to set up and release wireless calls. Basic Call Processing functions include Remote Station Origination and Remote Station Termination call set up, as well as Call Clearing Scenarios initiated by the Remote Station, the BSC and the MSC. This functional area also includes the call failure scenarios such as timer expiration and unsuccessful resource allocation.

Mobility Management: - These procedures are needed to manage the registration and access status of individual Remote Station subscribers. These procedures include management of Mobile parameters such as Mobile location, Mobile identity, and authentication status in the Visitor Location Register (VLR) and Home Location Register (HLR). Through mobility management, wireless subscribers can roam freely within a network and across networks. Mobile Management Functions also include Authentication which is a technique used to ensure the security and privacy of wireless Mobile subscribers in a network.

Supplementary Services : - These are wireless subscriber features that provide capabilities other than basic voice and data services. Over-the-Air Service Provisioning (OTASP) and call features such as Call Forwarding and Call Waiting are all examples of Supplementary Services.

Radio Resource Management: - This refers to allocating radio channels for both voice and data traffic. This function includes the management of hand-offs within a BSC, between BSCs and across MSCs.

Terrestrial Facility Management: - This is the function in the MSC that manages the terrestrial signaling links, routes and voice circuit resources.

1.3 Network architecture

The following paragraphs describe the various components of the MSC based Core Network from the purview of this GR. The various subsystems & environment in which this MSC shall work is given in block schematic figure 1.

(a) **MSC/VLR**

MSC (Mobile Switching Center) is responsible for call establishment, route selection, call control, radio resource allocation, mobility management, location registration and channel handoff in switching areas. In addition, it generates bill information, coordinates services between it and the PSTN.

VLR (Visitor Location Register) acts as a dynamic database and stores the temporary information (all data necessary to set up call connections) about the users roaming to the local MSC area.

(b) **HLR/AUC**

HLR (Home Location Register) is responsible for storing subscription information (telecom service subscription information and user status), RS location information, MDN, IMSI (MIN), etc. The AUC (Authentication Center) is physically combined with the HLR. It is a functional unit of the HLR, specially dedicated to the security management of the CDMA system. It stores the authentication information and ciphering key and prevents unauthorized users from accessing the system and prevents the unauthorized radio interception.

HLR can be an integrated HLR or a stand alone HLR as per the requirements.

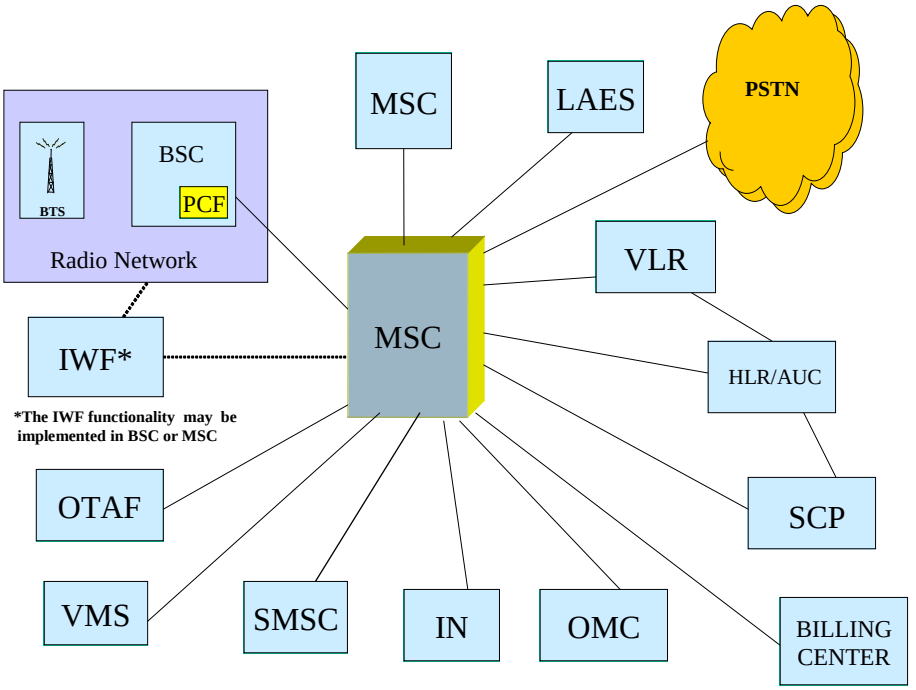

Figure-1 Various components of MSC based core network and its environment

(c) Operations and Maintenance Centre (OMC)

The Operations and Maintenance Centre (OMC) allows the centralized operation of the various units in the system and the functions needed to maintain the sub systems. The OMC provides the dynamic monitoring and controlling of the network management functions for operation and maintenance.

CHAPTER-2

2. GENERAL REQUIREMENTS

2.1 **Standards Compliant & Multi-Vendor Support** - System shall be based on ANSI/TIA/EIA-41D or its later version and IOS 4.0 standards or its later version and other standards mentioned therein and shall be supported by multiple vendors.

2.2 **Field Proveness and interoperability** - The equipment shall be fully solid state, field proven and shall adopt latest state-of-the-art technology. The equipment should have been field deployed commercially across multiple countries and networks and for a reasonable period of time. Tendering authority may indicate the deployment and a period of time for ensuring field proveness. Tendering authority may also specify the various technologies / vendors of Radio Networks (RN), Packet Core Network (PCN) and associated sub systems with which this system has to interoperate. The interoperability test shall be as per CDG IOS test Cases.

2.3 **Types of Remote Stations:** The MSC based Core Network for CDMA 2000 1x based system shall support Remote Stations (RS) specified in the GR of Radio Network (Base Station Controller & Base Transceiver Station) of WLL systems based on CDMA 2000 1x standards complying (TEC GR No. GR/WLL-04). It shall also be possible to support Removable User Interface Module (R-UIM) based handsets.

2.4 The MSC based Core Network shall support Radio Network (Base Station Controller & Base Transceiver Station) of WLL systems based on CDMA 2000 1x standards complying with TEC GR No. GR/WLL-04.

2.5 The environment including the different types of switches/ networks in which the system shall be required to operate and inter connect with is described in Section B of TEC specification G/LLT-01(latest version).

2.6 The MSC based system shall be capable of finally migrating to an all IP based Core Network.

2.7 The system shall form an integral part of the Telecommunication Network of BSNL/MTNL and the circuits derived therefrom shall be capable of extending over international circuits.

2.8 **Dimensioning** – The equipment supplier shall provide engineering rules/guidelines for dimensioning the capacity of the network components.

2.9 It shall be possible to upgrade the system to support CDMA 2000 1x Ev DO and EvDV. Tendering authority may specify at the time of tendering whether upgradability to 1x Ev DO and EvDV is required or not.

2.10 It shall be fully backward compatible with the existing cdmaOne networks, thereby implying that any CDMA 2000 1x Remote Station would be able to place and receive calls in IS-95A systems. Conversely, any CDMA 2000 1x system would be able to place and receive calls for IS-95A Remote Stations.

2.11 The system shall optionally allow voice (or circuit data service) and packet data service to operate concurrently (within the limits of the air interface system capacity).

2.12 The system shall support QoS parameters as defined in IS-707. The system shall optionally support a Quality of Service (Q.O.S) control mechanism to balance the varying Q.O.S. requirements of multiple concurrent services

2.13 The system shall be required to provide a wide range of voice and non-voice, circuit-switched and packet - switched services.

2.14 The system shall have the capability to support all the registration methods specified in the IS 2000 standards. The tendering authority, at the time of tendering, may specify the registration methods required to be supported in the equipment.

2.15 Pooling of resources such as vocoders, Echo cancellers etc. shall be there.

2.16 The system shall support the architecture of the CDMA 2000 1x system in terms of different layers for specific functions conforming to the following 3GPP2 standards: -

-	Physical layer	-	C.S0002
-	Link layer-MAC sub-layer	-	C.S0003
-	LAC sub-layer	-	C.S0004
-	Upper layers	-	C.S0005

2.17 Backhaul shall be packet based. However IP based back haul shall be highly desirable. In case of non IP based back haul such as ATM, possibility of migrating to IP in future shall be indicated.

2.18 Possibility to upgrade the system to support IPv6 protocol in future shall be indicated.

2.19 **Dimensions/Weight** - Dimension and weight of each of the equipment shall be indicated by the equipment supplier. The equipment shall be of self-supported cabinet or rack type. Maximum height of rack shall be restricted to 2200 mm. To have greater flexibility for operations, front-only serviceable racks are preferred.

2.20 **Ease of Expansion** - Expansion techniques of the system shall be easy, economical and shall not interrupt a working system. Expansion shall be required when the number of subscribers (capacity) in the area is increased or when the geographical coverage is increased. The equipment shall be modular in construction permitting expansion, without any major hardware changes by simply adding shelves and modules.

2.21 **Power Consumption** - The equipment shall have low power consumption.

2.22 **Power Supply** - The power supply unit shall form an integral part of the equipment and shall have protection against output over voltage, short circuit, input reverse polarity protection & shall have visual indication for output under voltage.

2.23 Hardware

2.23.1 General

(i) Compact and high-performance state-of-the-art hardware shall be used.

(ii) All components used shall be of rugged construction and shall be suitably designated by a label or sign-writing.

(iii) The system hardware shall be modular in design. The modules shall be standardised. The modular design shall permit growth in small steps.

(iv) The system shall use fully digital techniques for non blocking switching matrix. The switch architecture shall be such that there is a constant switching delay for any amount of traffic up to full load. The vendor shall specify the switching delay.

(v) The variety of hardware modules and components used in the system shall be a minimum.

(vi) Design precautions shall be taken to minimise the possibility of equipment damage arising from the insertion of an electronic package into the wrong connector or the removal of any package from any connector.

(vii) All components shall be rated for continuous operation of the system under the normal operating conditions. The circuits must also be designed so as to prevent damage to the other equipment under any condition of operating or any conditions of fault.

2.23.2 Processors

(i) The system shall have adequate redundancy so as to comply with the requirements of system reliability and stability as specified in TEC specification G/LLT-01.

(ii) The control unit memories shall be of the semiconductor type. The switch memory pool should support adequate redundancy.

(iii) Adequate backup memory shall be provided. Direct memory access, with suitable safeguards, is preferred for information flow between the backup memories on the one and the main memories and the input/output devices on the other.

(iv) Provision shall be made to prevent the loss/alteration of memory contents due to power failures, improper operating procedures and the procedures for restoring the system to its normal state, etc.

(v) Dimensioning standards shall be evolved for the various types of memories used. This shall also include standards for provisioning of the required spare memory capacity.

(vi) The system shall support hard-disk (in duplicate) of suitable capacity, to provide storage of charging information, detailed billing information, traffic statistics, command log, system software, office data etc. The hard disk shall be provisioned in mirrored configuration.

2.23.3 Input-Output devices

(i) The communication facilities provided for exchange of information between the s system and the maintenance and operating personnel shall include facilities for a system test and control and alarm indication.

(ii) Input/output terminals shall be capable of transmitting/receiving characters of a subset of the Alphabet No.5 as specified in ITU-T recommendation Z.314. The printing/display device shall print/display different graphic symbols for the digit zero and the capital letter O. The Input/Output terminal shall have the English Keyboard. Capabilities of visual display terminals shall be as per ITU-T Recommendation Z-322. Terminal emulation software and any standard operating system shall be available in the PC.

(iii) Adequate number of man-machine interfaces shall be available to facilitate various types of system administrations listed.

(iv) If provision is made for monitoring from a remote terminal, it shall be ensured that the data links conform to the ITU-T Recommendations Q.513 Care shall be taken that the reliability of the data links does not, in any way affect the reliability of the system. Special provision shall also be made for transmission of a failure signal even when the system is unable to transmit an output message.

(v) A suitable alarm and display system shall be provided for a continuous indication of the system status. The alarm system shall also provide an alarm to indicate the failure of power supply to the alarm circuits themselves. Provision shall be available to extend indications to a centralised place.

(vi) On a fault condition the system shall identity the faulty sub-system automatically and takes it out of service. This shall automatically bring in the diagnostic programmes for diagnosis. In such cases the details of the sub-systems taken out for executing diagnostic programmes shall be printed out. Availability of Intelligent terminal (PC) to display the location of bay, shelf, PCB on the screen would be desirable. The dimensioning of processing capacity shall be such that the normal call processing is not effected due to invocation of any diagnostic program.

2.23.4 Equipment practice

(i) All cards of the same type and design shall be interchangeable without necessitating special adjustments.

(ii) All metal parts of frames, supports, etc. shall be mechanically rugged and constructed of corrosion resistant material or treated with anti-corrosive finish. All equipment shall have a tropical finish.

(iii) Suitable test access points and displays shall be provided for facilitating maintenance. Test access points shall preferably be located on the front side of the bay. All visual display devices shall be located in a position attracting immediate attention of the operating and maintenance personnel. Suitable extension boards shall be provided to facilitate access to components on a printed card.

(iv) The material used for all printed boards shall be expoxy or equivalent (FR4). It shall not buckle due to a load of the assembled board or due to temperature changes occurring under normal circuit operations.

(v) The supplier shall indicate whether printed board connectors are of edge type or plug-and-socket type. They shall not be easily damaged during replacements and removals. The contact particulars as well as life test performance on contact resistance for each type of connector shall be supplied.

(vi) All components and material used in the equipment shall be non inflammable or in absence of it, self-extinguishable. They shall be fully tropicalised.

(vii) Contacts of all electromechanical relays shall be suitably protected against sparking. The supplier shall indicate the life test performance of these contracts, under normal load conditions. Where the expected life of an electromechanical relay is less than the life of the system, the relay shall preferably be of the plug-in-type.

(viii) The method used for connection of permanent wiring outside the printed cards shall be indicated.

(ix) The supplier shall indicate the various types of cables and wires used in his system. Detailed particulars of any special wires and cables like miniaturised coaxial, screened cable, etc. shall be furnished with their actual usage in the system.

(x) The buses, if any, shall be suitably protected against electrical and magnetic interference from neighbouring systems (like electromechanical systems, fluorescent tubes, motors, etc). The supplier shall indicate the care taken in the design and location of the bus system for minimising such interference.

(xi) The points for connecting the power supplies to the different plug-in cards shall be standardised and mechanically interchangeable. Otherwise suitable mechanical safeguards shall be provided to prevent damage due to accidental inter-change of cards.

(xii) The supplier shall indicate the requirement at the external interface against induced voltages and currents due to lightning, high power system, etc.

(xiii) The system shall provide for isolation and protection from accidental high voltage power contact.

2.23.5 Markings

(i) Equipment on the bay, whether of fixed or plug-in type, shall be suitably marked. Identification of a type of cards in its connector shall be possible without necessitating its removal. Any plug-in component shall be marked with sufficient information for its complete identification.

(ii) The marking on the equipment and the cables shall be the same as that used on the schematic drawings, cabling lines etc., in the documentation supplied with the equipment.

(iii) All instructions, labels, or any other marking on the equipment shall be perfectly legible and in the English language.

(iv) Colour code used for power feeding bus-bars/cables and earth shall be identical for a given voltage throughout the equipment.

(v) Fuses shall have a suitable marking for the different ratings to enable easy identification and replacement.

(vi) Marking shall ensure easy traceability.

(vii) The plug-in units - whose removal or insertion (while the equipment is in operation) might endanger the reliability or performance of the equipment -shall have suitable protection and caution marking.

(viii) Each sub-assembly shall be clearly marked to show its functions and circuit reference so that its complete description can be located in the handbook.

(ix) The components shall be marked with their schematic references so that they are identifiable from the component layout diagram in the handbook.

(x) All controls, switches, indicators etc. shall be clearly marked to show their circuit designations and functions.

(xi) Each terminal block and terminal shall be marked with an identifying code.

2.24 Software

2.24.1 General

(i) The design of the software shall be such that the system is easy to handle both during installation and day-to-day operations as well as during expansions.

(ii) The functional modularity of the software shall permit introduction of changes wherever necessary with least impact on other modules.

(iii) The architecture of the software shall be open ended so that the growth and addition of new features can be handled in practice without any need of redesign of the software.

(iv) Adequate flexibility shall be available to easily adopt changes in service features and facilities and technological evolution in hardware.

(v) The design shall be such that propagation of software faults is contained.

(vi) The software shall provide sufficient checks to monitor the correct functioning of the system.

(vii) Test programs shall include fault tracing for detection and localisation of system faults.

(viii) The normal operation of the system should not be adversely affected while undertaking
(a) Extension to system (Hardware expansion)
(b) Enhancement of system facilities.
(c) Correction to programs or functional blocks.

(ix) The software supporting documentation shall be in English. Any update in the software at a later stage to overcome deficiencies of the system due to bugs, compatibility etc., shall be provided free of cost by the equipment supplier.

(x) The equipment supplier shall undertake to supply on continuing basis all software updates as per the commercial agreements of the tender. These updates may include new features and services and other maintenance updates. The software up-gradation shall be possible with minimum interruption to the service. The tendering authority may indicate the services and features required by it in future along with commercial terms for the same.

(xi) The equipment supplier shall provide any software modification necessary due to modification of software in the inter-working with other networks such as PSTN/ISDN/PSPDN etc.

2.24.2 Diagnostic programs to localise hardware faults

(i) On a faulty condition, the software shall provide for isolating the faulty sub-system and then automatically bring in the diagnostic programs for diagnostic purposes.

(ii) It shall preferably be possible to diagnose to single PCB level in atleast 95% of the types of PCBs.

2.24.3 Software of charge records

(i) Arrangements shall exist for dumping the charging information to non-volatile backup memories automatically at periodic intervals.
(ii) Facility shall be available for changing this interval by a Man-Machine Command.

(iii) The charging information records shall be sufficiently protected against modifications by man-Machine Commands.

2.24.4 Right to use

There shall be no imposition of any sort of precondition on the 'Right to Use' of software.

2.25 Man-Machine Communication

2.25.1 Man-Machine Language (MML)

(i) Man-machine interface language shall be based on ITU-T Recommendations Z 301 to Z 341.

(ii) The man-machine language shall be in English. Commands shall be English based and responses shall be in English.

(iii) The MML shall be easy to learn and to use, easy to input commands and to interpret outputs.

(iv) The Man-Machine Language shall contain Man-Machine Commands (MMC), outputs, control actions and procedures sufficient to ensure that all relevant functions for the operation, maintenance, installation and testing of the SPC switching system can be performed.

(v) The MML shall have an open-ended structure such that any new function or requirement added will have no influence on the existing ones. The language structure shall be such that subsets can be created.

(vi) The character set used in the MML shall be a sub-set of the ITU-T alphabet No. 5 as recommended in ITU-T Z.314.

(vii) The command codes shall be function oriented. There shall be only one command per function. The codes shall be mnemonic. All the command codes in a particular application shall preferably consist of the same number of characters.

(viii) The output in response to input commands shall have the same format and use the same identifiers, codes, and labels, as the corresponding input command.

(ix) The MML shall provide facilities for cancelling and aborting the execution of commands.

(x) The MML shall provide facilities for inputting the parameters, for a command, in any sequence and the optional parameters need to be inputted only when they are required. Screen editing facilities for modifying the commands and parameters shall be available.

2.25.2 Input/Output

(i) The input and output information shall be presented in a compact form.

(ii) The automatic output, not made in response to an input command shall:
   a. Include the time and date.

   b. Use standard telephone terminology. It is preferred if the automatic output differentiated by colour or special characters from the output in response to an input command.

(iii) To facilitate filling and retrieval of recorded information in MML; the information shall be recorded on forms or pages with an identification header on top of each page with the date and time.

(iv) Special information shall be provided on priority printouts indicating emergent situations.

2.25.3 Man-machine dialogue

(i) The Man-Machine Command (MMC) shall offer the facility for a conversational mode of operation.

(ii) The MMC shall have facility for restricting the use of certain commands or procedures to certain staff/terminals.

(iii) Where several man-machine terminals are in use on a single system, a mechanism shall be available to avoid clashes.

(iv) The execution of any command shall not result in malfunctioning and/or over loading of the system, It shall also be ensured that the operator is not locked out by the system.

(v) The MMC shall be implemented in such a way that errors in commands or control actions shall not cause the system to stop or unduly alter the system configuration.

(vi) Command errors detected by the system shall be indicated by the output of error messages.

(vii) Possibility of priority messages to interrupt an input or output message of lower priority is desirable.

2.25.4 Checks and safeguards

Sufficient checks and safeguards shall be built into the implementation of the MMC so as to ensure reliable operation of the system.

2.26 It shall be possible to integrate the system with the National Internet Backbone (NIB) Phase I (as defined in TEC GR No. G/NIB.01) and NIB Phase II (as defined in TEC GR No. GR/VPN-01 and other related GRs/IRs of narrowband and broadband access). The tendering authority may indicate the type of interfaces required to be supported and associated hardware/ software required for integration may be specified by the supplier.

2.27 **Mobility Functions** – It shall be possible to restrict the services of the subscriber within the sector, within the BTS, within a Group of BTSs, within BSC area, within a group of BSCs within a MSC, within a group of MSCs, within a PDSN, within a group of PDSNs or any other area specified by BSNL/MTNL.

2.28 **Cooling Arrangement** - The equipment shall have necessary self cooling arrangement with or without in-built fan. The fan, if used, shall be a D.C. fan and shall be used in redundant configuration. The MTBF of the fan shall be at least 80,000 hours. It shall have a provision to report the fan failure event to the OMC.

2.29 **Diagnostics/Testing** – The equipment shall support diagnostic capabilities (which will run as background tasks) to verify the equipment's proper operation within the network. Built-in test capabilities shall be provided which will run at specific events or on demand. Health monitoring signals shall be continuously passed between the various modules to ensure the detection of any failure in a module.

2.30 The system hardware/software shall not pose any problem, due to changes in date in time caused by events such leap year etc., in the normal functioning of the system.

2.31 **Maintenance Aspects:**

(i) Maintenance philosophy is to replace faulty units after quick analysis of monitoring and alarm indications. Actual repair will be undertaken at a repair centre. The supplier shall ensure the repair of faulty equipment during and after warranty period.

(ii) It shall be possible to isolate Interface points for testing purposes.

(iii) The equipment shall have easy access for servicing and maintenance.

(iv) All important switches/controls on front panel shall be provided with suitable safeguards such as interlock system to avoid accidental operation by the maintenance personnel.

(v) Procedure for repair of equipment giving full details of testing instruments shall be provided by the equipment supplier. Test jigs, fixtures required for maintenance/repair shall also be provided.

(vi) Extensive facilities for testing, supervision and monitoring functions shall be provided for quick isolation and rectification of faults. These functions shall be performed by OMC. Any additional instruments required shall be provided by the equipment supplier with details.

(vii) The supplier shall provide information regarding the failure rate of the PCBs and accordingly supply number of spare cards depending on the size of the system, for a period of three years.

(viii) The maintenance spares supplied shall take into account the MTTR. At least one spare PCB of each type shall be supplied.

2.32 Electromagnetic Compatibility (EMC)

The equipment shall conform to the EMC requirements as per the following standards and limits indicated therein. A test certificate and test report shall be furnished.

a) Conducted and radiated emissions: - To comply with Class A of CISPR 22 {2003} "Limits and methods of measurement of radio disturbance characteristics of Information Technology Equipment".

b) Electrostatic discharge:- To comply with IEC 61000-4-2(2001) "Testing and measurement techniques of Electrostatic discharge immunity test" under following test levels:

Contact discharge level 2 {$\pm$ 4 kV}
Air discharge level 3 {$\pm$ 8 kV}

c) Fast transients common mode (burst):- To comply with IEC 61000-4-4 {1995 with Amendment 1 (2000) and Amendment 2 (2001)} "Testing and measurement techniques of electrical fast transients/burst immunity test" under Level 2 {1kV for DC power lines; l kV for signal control lines}.

d) Immunity: IEC 61000-4-3{2002} "Radiated RF Electromagnetic Field Immunity test under test level 2 (test field strength 3 v / m) for general purpose in frequency range 80 MHz to 1000 MHz and under test level 3 (10 v/ m) for protection against digital radio telephones in frequency ranges 800 MHz to 960 MHz and 1.4 GHz to 2.0 GHz".

e) Surges Common and differential mode :- To comply with IEC 61000-4-5 {2001} "Test & Measurement techniques for Surge immunity tests" under test levels of 0.5kV for differential mode and 1 kV for common mode.

f) Radio frequency common mode: To comply with IEC 61000-4-6 {2001} "Immunity to conducted disturbances induced by radio frequency fields" under the test level 2 {3 V r.m.s.}; clamp injection method for DC lines and Signal Control lines.

[**Note: -** For tests for checking compliance to above EMC requirements, the method of measurement shall be in accordance with TEC Standard No.SD/EMI-02 and the references mentioned therein.]

2.33 Safety Requirements

a. The operating personnel shall be protected against shock hazards as per IS 8473 (1993) – Guide on the effects of current passing through the human body (equivalent to IEC publications 479-1 (1984).

b. The equipment shall conform to IS 13252 (1992) – Safety of information technology equipment including electrical business equipment (equivalent to IEC publication 95 (1986) and IEC 215 (1987) Safety requirements of radio transmitting equipments (for Radio equipments only)

The manufacturer/supplier shall submit a certificate in respect of compliance to these requirements.

2.34 Documentation:

2.34.1 Hard & Soft copy of all documents shall be provided in English by the equipment supplier. The documents shall comprise of:

(i) System description documents
(ii) System operating documents including system repair document.
(iii) Training documents

(i) System Description Documents

The following system description documents shall be supplied along with the system:

(a) Overall system specification and description of hardware and software.
(b) Installation manuals and testing procedures. Installation manuals to be provided for shall contain step by step process of installation of system.
(c) Equipment layout drawings
(d) Cabling and wiring diagrams
(e) Detailed specification and description of all I/O devices.
(f) Adjustment procedures, if there are any field adjustable units.
(g) Spare parts catalog including information on individual component values, tolerances etc. enabling procurement from alternate sources.
(h) Detailed description of software describing the principles, functions, interactions with hardware, structure of the program and data.
(i) Programming language (s) manual.
(j) Planning and system engineering documents.

(ii) System Operation Documents

The following system operation documents shall be provided by the equipment supplier : -

a) Operating manual of the system
b) Maintenance manual.
c) Man-machine language manual.
d) Operation and maintenance manual for all I/O devices and auxiliary equipments.
e) Faulty location and trouble shooting instructions including fault dictionary.
f) Test procedures with auxiliary test equipments.
g) Emergency action procedures and alarm dictionary.

(iii) Training documents

Training manuals and documents necessary for organising training in installation, operation and maintenance and repair of the system shall be made available.

2.34.2 In addition to the printed documentation, all documents shall be provided in CD-ROM alongwith suitable means of retrieval i.e. IBM PC compatible machine with CD-ROM drive for each site.

2.34.3 Any provisional document, if supplied, shall be clearly indicated. The updates of all provisional documents shall be supplied immediately following the issue of such updates.

2.34.4 The structure and scope of each document should be clearly described.

2.34.5 The documents should be well structured with detailed cross-referencing and indexing enabling easy identification of necessary information.

2.34.6 All diagrams, illustrations and tables shall be consistent with the relevant text.

2.35 For all TEC and other Standards documents referred in this GR, only the latest version shall be applicable. The tendering authority, at the time of tendering should review the versions of all the documents mentioned in this GR and update them if necessary.

CHAPTER -3

3. QUALITY REQUIREMENTS

3.1 Components

(a) All the components used shall have to be approved and qualified as per procedure specified in QA document no. QM-324. The source of procurement of components shall also have to be submitted by the manufacturers. Alternatively, the bidders may indicate whether the components are approved by any international authority.

(b) List of all the components for which second source is not available, shall be provided.

3.2 Quality Standards

(a) The equipment shall be manufactured in accordance with the International Quality Standard ISO-9001:2000 for which the manufacturer shall be duly accredited. The quality plan describing the quality assurance system followed by the manufacturer shall be submitted.

(b) The equipment shall be manufactured as per the latest BDNL QA Guidelines indicated in Quality Manuals QM 118 {Quality and Reliability in Product Design}, QM 205 {Guidelines for Standard of Workmanship for Printed Boards}, QM 206 {Guidelines for Standard of Workmanship for Printed Board Assemblies}, QM 210 {Guidelines for Standard of Workmanship for Surface Mounted Devices} and QM 301 {Transmission Equipment General Equipment}.

(c) The product shall conform to the QA requirements stipulated in QM-351 {QA Requirement for switching equipment}.

3.3 Lightning Protection - The equipment including shall have adequate protection against lightning & power surges. All equipment shall have provision for grounding.

3.4 Redundancy - The Power Supply as well as the control equipment in the case of all components of the Core Network including the OMC shall be provided with 1+1 hot standby/ N +1 mode redundancy. Any other redundancy provided shall be indicated by the equipment supplier. The redundancy provided shall ensure reliability of 99.999.

3.5 Automated Service Provisioning –Along with manual service provisioning , automated provisioning capabilities shall also be provided to facilitate optimal utilisation of network resources and real time service provisioning (limiting human involvement to a minimum). Once a service is provided to a customer, the provisioning system shall constantly monitor its availability and quality. During an outage, it shall be possible to re-provision or provide an alternative support to the customer. Auto provisioning shall be available for both voice and data subscribers.

3.6 Design Objectives - The design objectives with regard to Quality of Service shall meet the below mentioned statistical values under normal operating conditions :

(i) Time to connect M-M call: The total time for a mobile to mobile call origination shall be less that 10 seconds for 90% of calls with the system running at rated capacity. This is the time from when the originating subscriber hits the SEND until the time that the terminating mobile receives the alert.

(ii) Time to connect M-L call: The call setup delay for a mobile to land call shall not exceed 5.0 seconds for 90% of calls with the system running at rated capacity. This is defined as the time period from processing the SEND button to outpulse complete.

(iii) Time to connect L-M call: The time to alert the mobile of land to mobile call shall be no greater than 6.5 seconds for 90% of mobile terminating calls which respond to the first page with the system running at rated capacity. For mobile terminated calls, it is defined as the period between the complete address information being received at the MSC from a PSTN interconnect link to the start of handset alerting.

(iv) Time to release call (RS originated – RS connection part) : The maximum time from initiating the DISCONNECT command to when this command is passed to the called network shall be less than 2 seconds.

(v) Time to invoke or change a supplementary service: The maximum time from initiating a Supplementary Service Request (INITIATE command) till this service has become available or changed (as requested by the user) shall be less than 10 seconds including authentication, if required.

CHAPTER-4

4. OPERATIONAL REQUIREMENTS

4.1 Services as specified in chapter 10 shall be supported.

4.2 Billing/Charging

4.2.1 MSC shall be capable of generating CDRs in AMA/ IS-124B/ DAS/ASN.1 format for end user billing as well as inter carrier accounting details. The tendering authority at the time of tendering may specify the type of billing format for CDRs, to be generated by MSC. The CDRs generated shall also broadly conform to TEC GR No.G/PCS-01 and shall be capable of being used by the mediation devices forming part of the existing billing systems of BSNL/MTNL as specified by TEC GR No. GR/BCS-01andTEC GR No. TD/CDR-01.

The MSC CDRs shall be input to the existing BSNL/MTNL billing system and hence it shall be ensured that the two are compatible. The tendering authority shall specify the CDR format & interfaces supported by the mediation device used for billing system. In case the MSC have a different CDR format from what the current billing system is configured to support, then the MSC vendor shall work with mediation & billing system vendor for integration and provide the extra hardware or software (if required) for the purpose of integration.

4.2.2 Some of the features to be provided by the CDRs are as follows:

i. Selected Subscriber's Dump – It shall be possible to immediately output the CDRs for a selected subscriber after each call is completed.

ii. Dialed Digits – The CDR shall provide the exact digits dialed by the subscriber including # and *.

iii. Record for feature code – The system shall generate the CDR even for the feature code dialed by the subscriber.

iv. CDR log shall be possible for an audit trail.

v. Intermediate CDR for long call with respect to time, charge etc.

vi. It shall be possible to view / access the data in the CDRs randomly as well as sequentially.

4.2.3 It shall be possible to transfer the billing information i.e. CDRs over X.25 or TCP/IP links to the billing centre of BSNL/MTNL using any standard file transfer protocol like FTP, FTAM etc.. Any additional hardware /software if required for such an on line transfer of billing information i.e. CDRs to the billing centre shall be provided by the supplier.

In addition, it shall also be possible to locally take the billing information in standard magnetic/optical media. Necessary hardware/software required to retrieve the information from the standard magnetic/optical media shall also be provided.

4.2.4 In order to ensure international roaming, the roamer billing standard CIBER as specified in ANSI-41D, shall be supported.

4.3 Lawfully Authorized Electronic Surveillance (LAES)

It shall be possible, through a man-machine command, to monitor/record voice of at least 1% subscribers of equipped capacity simultaneously, for all incoming and outgoing calls for complete duration of the call without intrusion on the line. The other requirements of monitoring are:

a) Number of monitoring agencies - 8

b) One subscriber is likely to be monitored by more than one agency.

c) Recording facility will be with the monitoring agency.

d) Interface between the system and monitoring agency shall be E1 as per G.703.

Similar facility shall be provided for SMS also.

The general requirements of lawful interception and monitoring shall be as per relevant clauses of TEC Document GR/LIS-01 (latest version). The tendering authority may specify the actual requirements of number of subscribers to be monitored, as per the requirements.

4.4 Hand-off – The action of switching a call in progress i.e. hand-off from one sector to another sector of same or adjacent BTS of same or different BSCs of same MSC or different MSCs of same PDSN or different PDSNs shall be automatic and smooth without the user noticing it. Continuous control of call quality shall be maintained automatically to get the optimum transmission quality.

4.5 Supervision – Supervision of complete network shall be both automatic and operator controlled and centralized at OMC.

4.6 Alarm Indications – In case of all major alarms (any event that leads to system switch-over or service disruption) both audio and visual alarm indications shall be provided. In case of minor alarms visual alarm indications shall be provided and provision of audio alarms is desirable. It shall be possible to define the major and minor alarm conditions and set the threshold values thereof. The OMC shall provide the flexibility to forward the alarm triggered by faulty operations to a pager, a short message service system, an electronic mail or additional alarm windows on the OMC interface. The operator shall be able to redefine and configure the alarm forwarding destination. Facility shall exist for audio/visual alarm indication in the event of 'Route Busy', poor network performance in terms of under utilisation of BTS or too many blocked calls etc., or when the processor load exceeds a certain preset value. Alarm indication shall exist in the event of fan failure.

4.7 Fraud Management - The system shall be capable of prohibiting the use of stolen units or use by unauthorized callers. For this, the OMC shall provide fraud management tools with all features as specified in TEC document GR/CDM-03 (Chapter 5).

4.8 **Security** - The system shall provide confidentiality, subscriber authentication features and high security. Latest digital encryption technology to support secure communications for message and voice privacy shall be provided. Authentication procedures and security arrangements specified in TEC document GR/CDM-03 (Chapter 5) shall be provided.

4.9 **Announcements/ Prompts** - Provision shall be available for announcements to give information regarding the following: -

(i) Barring service
(ii) Absent subscriber service
(iii) Changed number service
(iv) Closure of service
(v) Service not available etc.

4.10 Power Supply

4.10.1 **Input supply** : The system shall work satisfactorily for nominal input supply of -48 V DC over the voltage range of –44.4 V to –56.4 V.

4.10.2 **Power consumption:** The power consumption of system shall be specified by equipment supplier.

4.10.3 **Protection** : The protection for input over voltage, under voltage and short circuit shall be provided.

4.11 Environmental Specifications:

(i) The system shall satisfy the pre-installation conditions specified under category 'A' of QA Wing of BSNL document QM-333 for environmental testing of Electronic Equipment for Transmission and Switching use.

(ii) The system shall be capable of working in an environment specified for category 'A' equipment in the QA,BSNL document QM-333.

(ii) Extreme environmental conditions under which the system is capable of short-term emergency operation without permanent damage may be indicated.

4.12 **Transportation & Storage :** As per QM-333.

4.13 **MTBF/MTTR :** The MTBF and MTTR (predicted and observed values) figures shall be worked out by the equipment supplier as per QA document QM-115 and based on these figures, the maintenance spares for three years or for the period as specified by the tendering authority shall have to be specified by equipment supplier.

4.14 **Traffic Measurement and Recording :** For junction interface between PSTN and MSC(R2MF/CCS 7) the traffic measurement and recording shall be as per TEC GR G/LLT-01.

4.15 **System Operation and Management :** For junction interface between PSTN and MSC (R2MF/CCS 7) the traffic measurement and recording shall be as per TEC GR G/LLT-01.

4.16 **Line and Circuit Tests:** R2MF line testing if applicable shall be as per TEC GR G/LLT-01.

4.17 **Tandem working :** For junction interface between PSTN and MSC (R2MF/CCS 7), the system shall support tandem working

4.18 Synchronisation

4.18.1 The system shall be capable of merging into a single synchronised network as per TEC Generic Requirements No. G/SYN-01.

4.18.2 The synchronisation method shall be master/slave.

4.18.3 The system shall have integrated synchronisation equipment conforming to TEC Generic requirements No. G/SYN-01, with a layer 2 clock, i.e. with a minimum clock stability of $1x10^{-10}$ per day.

4.18.4 The acceptable slip rate shall be in accordance with ITU-T Recommendation G.822.

4.19 **Carrier Selection** - The subscriber shall have the flexibility to choose the carrier for long distance calls. The system shall support both carrier pre-selection (through System Administrator) and carrier selection on a per call basis (subscriber controlled) as per TEC Service requirements No. SR/ASF-01 titled "Service description for analog subscribers". To support National Long Distance (NLD) and International Long Distance (ILD) dialling for carrier selection, the equipment supplier shall support atleast 24 digit dialling. The maximum number of digit- dialling that can be supported may also be indicated.

4.20 The equipment supplier shall provide detailed information regarding extent of implementation in his equipment, to support international roaming w.r.t. all issues related to International Roaming, such as numbering issues, dialing issues, signaling issues, Fraud issues, Billing issues, Services issues and other miscellaneous issues, as specified in the latest release of IFAST document "International Roaming Guide".

CHAPTER - 5

5. MSC /VLR

5.1 The MSC shall be able to provide voice service using both 8 Kbps Enhanced Variable Rate Codec (EVRC) (EIA/TIA IS-127-2), (3GPP2 standard C.S0014-0-2) and 13 Kbps QCELP (IS 733) vocoder type. Selective Multirate Vocoders (SMV) shall be supported, in future through software upgrades.

5.2 It shall support dynamic allocation of vocoders in real time. The vocoder type shall also be selectable through a software command. The vocoder bypass capability (also referred to as TFO-Tandem Free Operation) shall be supported in future.

5.3 Connectivity

(i) It shall have capability to be connected to various elements as shown in figure '1'.

(ii) It shall be possible to connect the Mobile Switching Centre (MSC) to international exchanges, TAXs, local tandem exchanges and local exchanges, in accordance with the stipulations of the national switching & routing plan.

(iii) The MSC shall be capable of interfacing with all the existing BSNL/MTNL networks/other Basic and Long distance Service Providers/Mobile Operators voice switches and transmission Equipment based on standards currently existing.

5.4 The MSC/VLR shall support the following functions besides the conventional functions provided in the TEC GR G/LLT-01 (latest version) for switching equipment.

5.4.1 Call processing

(i) MSC shall support outgoing call, incoming call, and transit call. It shall process outgoing call and incoming call for all legal subscribers within its covering area, and provide corresponding services for each subscriber as per user profile in HLR.
(ii) It shall be able to provide functionality of Gateway MSC (GMSC).
(iii) It shall be able to provide functionality of Mobile tandem.
(iv) In case of TAX call connection, MSC shall be able to provide calling number and calling number attribute to TAX or other MSC.
(v) It shall be able to provide functionality of STP.
(vi) In addition to normal switching function, the MSC shall provide Integrated Service Switching Point (SSP) functionality for supporting the Intelligent Network (IN) services.
(vii) It shall support malicious call tracing.
(viii) It shall play voice announcements in case of user busy, user unreachable etc. It shall be able to provide up to 100 voice announcements.
(ix) It shall support access to various service station/desk, capable of choosing the nearest emergency call center to connect.
(x) It shall be able to perform DTMF signal conversion.
(xi) It shall support Either Party release.

(xii) It shall automatically perform number upgrading (increasing the number of digits of MDN).
(xiii) It shall support Call admission feature for overload control.

5.4.2 Number storing and translation

(i) Receiving and storing up to 24 digits.
(ii) Number inserting, deleting and translation.
(iii) Number delivering: supports group delivering or overlap delivering.
(iv) Capable of handling different lengths of numbers within one area.
(v) Supports various numbering systems
(vi) It may optionally support Global Title Translation (GTT).The tendering authority at the time of tender may specify if this feature is required.
(vii) Permitting different (SID) for different BTS in one MSC (Optional)
(viii) This requirement may not be necessary in certain network architectures and hence the tendering authority may specify if this feature needs to be supported by all MSCs.

5.4.3 Time Monitoring and Forced Call Release

The MSC switching equipment shall contain a time monitoring device, which monitors various connection status. When the monitoring time limit is reached, it shall immediately force to release the circuit and send the busy tone (or instructions) to the related subscriber, or establish corresponding connection in accordance with various connecting status.

5.4.4 Route selection functions

(i) It shall be possible that the number of trunk routes and the number of circuits of each route can be assigned according to the requirements and can be changed by man-machine commands.
(ii) MSC shall have capability of selecting direct routes or alternative routes and avoiding circuitous route.
(iii) It shall have capability to analyze up to 24digits of number and then decide the route selection.

5.4.5 Echo cancellation

It shall provide Echo cancellation for calls to/from PSTN. It shall control the access of echo canceller and indicate the subsequent exchanges to access the echo canceller or not.

5.4.6 Overload control functions

The system shall have capability to detect following overload conditions and apply overload mechanism:

(i) Access overload control
The MSC shall work within RN to prevent occurrence of access overload. The MSC shall be capable of gradually and automatically restricting the access of normal call with the restricted calls and distributed among all subscribers evenly. Overload control shall not break on-going call.

(ii) Internal overload control

The system shall provide overload control by means of man-machine commands with an adjustable controlling rate.

5.4.7 Mobility management functions

MSC shall be able to support the following types of handoff:

(i) Inter BSC soft handoff within a MSC.
(ii) Inter BSC hard handoff within a MSC.
(iii) Hard handoff between different MSC (including inter carrier handoff between MSCs supplied by different vendors)
(iv) Soft hand-off intra-BSC
(v) Intra-MSC and inter-MSC packet data call hand-off and hand-off from 1x BTS to IS-95 BTS.

5.4.8 Registration

(i) MSC/VLR shall be able to support registration and de-registration in all cases as specified in IS-2000 standards. However, the tendering authority, at the time of ordering may specify the specific registration methods to be supported in the equipment.
(ii) It shall support domestic and international automatic roaming for subscribers using equipment of various vendors. Roaming shall not affect the services provided to subscribers.
(iii) When a Mobile subscriber appears in a new location area, or when a registration, call setup or supplementary service operation message is received from the Mobile, the system shall send a registration notification to the HLR.
(iv) It shall be possible that if a subscriber does not appear in the MSC/VLR area within 24 hours or as required by HLR, the VLR can delete the data pertinent to this subscriber, and notify the HLR.
(v) It shall have provision for time based registration. When related timer expires, no registration and call processing shall be possible for this RS and VLR shall perform de-registration for this RS.
(vi) MSC shall give an alarm when ‘unknown subscriber’ or ‘illegal subscriber’ appears in the registration message. It shall also print out a report & maintain a log for errors such as “authorisation denied”.
(vii) MSC shall be able to support Mobile inactive function.

5.4.9 Security and authentication

The following features are applicable in case of integrated HLR only:

(i) Authentication and SSD updating during registration, call connection, supplementary service processing.

(ii) The possible occasions for authentication implementation in CDMA system are as follows:
- Registration
- RS origination
- SSD (shared secret data) update
- RS termination
- Data burst

(iii) The authentication algorithm is authentication part of Cellular Authentication and Voice Enciphering (CAVE), Enhanced Cellular Message Encryption Algorithm (ECMEA) / Encapsulating Security Payload (ESP) / Advanced Encryption Standard (AES)

(iv) If MSC receives some error such as 'deny access', MSC shall print out a report & maintain a log of such errors.

(v) Subscriber information encryption shall be provided.

5.4.10 Resource management

MSC shall have following features:

(i) Responsible for assigning selected circuit time slots between BSC and MSC.
(ii) Indicating the type of wireless channel suited for different processing phases to Radio Network(RN)
(iii) Receiving and processing RN blocking-circuit, RN resetting-circuit messages.
(iv) Sending resetting-circuit message to RN.
(v) Receiving and processing resetting message.
(vi) Sending resetting message to RN.

5.5 Numbering Requirements

(i) The system shall support the International Implementation of wireless telecommunication Systems Compliant standard TIA/EIA-41 (3GPP2 N.S0017) for administration and management of SIDs & MIN and format of IMSIs.

(ii) The system shall support the local numbering requirements.

(iii) Since one MSC may be shared among various SDCAs and the numbering requirements for each SDCA would be different, the MSC shall be able to support multiple SDCAs and treat each SDCA differently according to the numbering plan..

(iv) The numbering plan for each SDCA may also differ in terms of the digits (5 digit, 6 digit, 7 or 8 digits). The MSC shall be able to support different lengths of digits simultaneously.

(v) The system shall be capable of changing numbering scheme for WLL/ basic services to numbering scheme for Mobile and vice versa.

5.6 The Grade of Service shall be as follows :

(i) MSC-RN : 0.5%
(ii) MSC-PSTN : 1%

The system shall also comply with GOS requirements as per para 3.6 of TEC document GR/CDM-03.

5.7 Interface between MSC and PSTN

The Interface between MSC and PSTN shall be 2048 Kbps interface as a junction on CCS7 and R2MF signalling as per TEC GR No. G/LLT-01(latest version). For CCS7 signalling the MTP & ISUP shall conform to National CCS 7 standards S/CCS-02(latest version). The system shall have interworking compatibility with the exchange implementing national CCS 7 standards S/CCS-02 (latest version). STM – I interface shall also be supported with 1+1 APS (Automatic Protection Switching) redundancy.

5.8 The MSC/VLR shall support the interfaces as mentioned in Chapter 9.

5.9 IWF

The tendering authority may examine the requirement of IWF from the point of view of its utilization and cost. As IWF is normally deployed to provide fax services only and most of the data applications will run on CDMA 200 1x data network, hence it may have very limited utility, in case of full Mobile scenario. Based on the actual field requirements the tendering authority may specify whether IWF is required or not and may go for the IWF only if it is absolutely necessary.

5.9.1 IWF acts as a gateway between the wireless CDMA networks and the wireline Public Switched Telephone Network (PSTN/packet data networks). IWF provides the interworking and protocol conversion required for offering data services to cdma One Mobile subscribers. The IWF functionality may be implemented in BSC or MSC.

5.9.2 The IWF shall support all CDMA standards for MSC interoperability (EIA/TIA IS-658), Interworking Services (EIA/TIA IS-707), and 2G network support (EIA/TIA IS-95A/B)

5.9.3 The IWF shall support Remote Station originated and terminated Async Data and Group III Fax (IS-707.4) Services Options 12 and 13.

5.9.4 V. 42 bis compression shall be supported for more efficient use of the RF links.

5.9.5 The Equipment supplier shall describe the feature interactions when a Mobile is in circuit switched data mode e.g. availability of call waiting, voice mail notification etc.

5.10 Wireless Intelligent Network

5.10.1 It shall be possible to provide Wireless Intelligent Network (WIN) services as specified in the latest IFAST (International Forum on ANSI-41 standards Technology) documents by installing new network elements such as Service Control Points (SCPs),Service Nodes (SNs) or Intelligent Peripherals (IPs). The MSC shall support IN SSP capability for WIN network and shall be capable of using WIN call processing triggers to access a range of SCPs, IPs or SNs based intelligent network services. The HLR also shall support WIN triggers and service profiles. The equipment shall support WIN phase I as per TIA/EIA/IS-771 and WIN phase II (as per TIA/EIA/IS-826 for pre-paid and as per TIA/EIA/IS -848 for other charging services) and shall indicate roadmap for support of WIN phase III (as per TIA/EIA/IS-843).

5.10.2 The equipment supplier shall provide a list of all the standard and optional features that are required to support the following WIN services (both for voice and data):

(a) **Incoming (Terminating Call Services)**

i) Incoming Call Screening (ICS)
ii) Selective Call Rejection (SCR)
iii) Calling Name Presentation

(b) Outgoing (Originating) Call Services

i) End User Control (EUC)
ii) Virtual Private Network (VPN)
iii) Outgoing Call Allowance (OCA)
iv) Outgoing Call Restriction (OCR)
v) Voice Control Dialing (VCD)
vi) Voice Controlled Feature Control (VCFC)
vii) Voice-based User Authentication (VUA)
viii) Speech-to-Text Conversion (STC)

(c) **Transferring Call Services**

i) Service Call Forwarding (SCF)
ii) Flexible Call Forwarding (FCF)

(d) **Charging**

i) Freephone
ii) Pre-Paid Charging
iii) Premium Rate Charging
iv) Location Based Charging
v) Advice of Charging

(e) **Mobility and Location Services**

i) Location Based Information Services
ii) Fleet Management/Asset Management
iii) Fraud Detection
iv) Number Portability
v) Enhanced Call Routing

In case of non-support of any of the above services, the roadmap for their support in future may be indicated.

CHAPTER- 6

6. HLR/AUC

6.1 Home Location Register (HLR) serves as the primary database repository for subscriber information that is used to provide control and intelligence within ANSI-41 networks. Mobile subscriber profiles, locations and activities, and information about supplementary subscriber services are all seamlessly managed for the Mobile operator by the HLR. The HLR contains a record of each subscriber who has subscribed to a Mobile telephony service within the home area. One HLR can serve one or more MSC. HLR stores the related information of subscribers such as ESN, MDN, IMSI, MIN, selected services, current location, and authorized effective period etc.

Authentication Center (AUC) is the primary repository for managing and processing authentication information used to verify and validate a Mobile identity within ANSI-41 networks. This information consists of security and authentication features, as well as complex validation algorithms, which enable authentication procedures used to prevent fraudulent use of network resources. The AUC also incorporates database functions used to store the encryption and authentication. One AUC can serve one or more MSC via one or more HLR, which serves as gateways.

The functional entity of HLR/ AUC as described in para 1.3 may be physically integrated with logical separation or it can be stand alone HLR/AUC.

All requirements mentioned in this chapter/document for HLR/AUC are applicable to both stand alone HLR (S-HLR) and Integrated HLR (I-HLR) unless it is specifically mentioned otherwise.

6.2 HLR/AUC shall be developed based on ANSI41-D and subsequent standards, providing open interfaces.

6.3 HLR/AUC shall support the following features.

(i) Logical Group (Applicable to S-HLR only)

A logical group shall contain a collection of subscribers which the operator may create to maintain subscribers in different groups for administrative purposes.

(iii) Group Profile (Applicable to S-HLR only)

The group profile contains a set of default features automatically assigned to the subscriber. Operators shall be able to group a set of subscriber features together into group profiles and thus avoid having to assign each feature individually when creating the profiles for new subscribers.

(iii) Administration of Cooperating Exchanges (Applicable to S-HLR only)

A cooperating exchange is an MSC that accesses the HLR for subscriber information. Means shall be provided to specify, delete, modify, and print cooperating exchange data. The data shall specify the following:

a. Exchange identity (Global Exchange Name)

b. Roaming type (automatic or manual)

c. Routing Interrogation Code (how the interrogating exchange should route the call)

d. Signalling network information

e. Signalling protocol to be used for routing to a destination in the network.

(iv) Tables in the HLR

The provision shall be there for setting up and maintaining all data related to the HLR. The data stored in the table shall include:

a. Forward-to-number analysis table

b. PIC to CIC translation table

c. Procedure code analysis table

d. Announcement code analysis table

e. Restricted digits table

f. Cooperating exchange table

6.4 Alarms and Notifications

6.4.1 Alarms

The HLR shall generate an alarm when an error or fault occurs within the system. Provision shall be there for these alarms requiring human intervention in order for them to be acknowledged or cleared.

The HLR shall log all alarms and presents them to the user via the GUI (Live Alarm Display). The operator shall be automatically presented with the relevant procedure in order to resolve a given alarm.

6.4.2 Notifications

A notification shall report the occurrence of a specific event in the system. In general, a notification shall not require operator intervention.

6.5 The AUC shall have provision for security measure for fraud prevention by implementing a series of standard ANSI-41 authentication procedures to protect the Mobile network.

6.6 **Authentication Procedures :** AUC shall support authentication according to the ANSI-41 standard and according to the following ANSI extensions: IS-725A, IS-751, IS-737, IS-807 and IS-735. For the Unique Challenge procedure the AUC shall be compliant with TSB-51.

CHAPTER-7

7. OPERATIONS AND MAINTENANCE CENTRE (OMC)

7.1 The OMC allows the centralized operation of the various units in the system and the functions needed to maintain the sub systems. The OMC provides the dynamic monitoring and controlling of the network management functions for Operation and Maintenance. The OMC shall support Graphical User Interface (GUI) for operation and standard TMN interfaces as specified in ITU-T Rec. M-3010 & M-3020.

7.2 The overall objective of OMC is that neither equipment failure nor human error in the OMC implementation should render the OMC and /or the part of the network it supervises, out of service.

7.3 OMC shall be a carrier grade system with full redundancy and scalability. It shall be possible to have remote workstations with the OMC, with complete GUI tools for O & M of the system at the remote locations. It shall support north-bound interface like SNMP, Corba, TCP / IP, CMIP etc., to enable it to work with a remote NMS. The tendering authority, at the time of tendering may specify the type of NMS with which the OMC would be required to interface with and accordingly any additional hardware / software, (if required) shall be provided for interfacing with the NMS.

7.4 The Operation & Maintenance Centre (OMC) shall be capable of performing the following functions: -

- **(i)** Event/Alarm Management: Alarms shall be presented to the operator via software programs and tools for easy presentation and interpretation, for easy maintenance and to locate faults of all managed elements of the network. Events are logged for future use.
- **(ii)** Configuration Management : OMC shall provide real time configuration database access to manage the software loading and version tracking, support for addition, deletion and change of network element parameters.
- **(iii)** Performance Management: OMC shall provide tools for the collection of statistics and call information into a database and logging file. Data shall be viewed using tabular or graphical reports on the GUI terminal.
- **(iv)** Security Management : OMC shall provide password and login access to the system to prevent any unauthorized access to the system.
- **(v)** Fault Management : OMC shall provide capability to query and change device states and provide control for system diagnostics.
- **(vi)** Network statistics – OMC shall provide data related to channel occupancy, rejected calls etc. with visual display of faulty elements of the network.

CHAPTER -8

8. TECHNICAL REQUIREMENTS

The performance specifications of MSC based Core Network shall be as given below:

8.1	MSC Core Network Standard	ANSI/TIA/EIA-41D and IOS 4.0
8.2	Radio Network Standard	TIA/EIA/IS-2000 TEC GR No. GR/WLL-04
8.3	Voice Coding	8 Kbps Enhanced Variable Rate Vocoder (EVRC) as per IS127-2 standard, 13.4 Kbps QCELP vocoder as per IS-733. Selective Multirate Vocoders (SMV) as per C.S0030-0 v2.0. (Optional)
8.4	Backward compatibility	IS 95 A/B
8.5	Echo cancellation technique	As per ITU-T G.165 (2000) with delay permitted up to 128 msec.
8.6	Numbering system	As per ITU-T E.212, E.164
8.7	International Implementation of wireless telecommunication Systems Compliant standard for administration and management of SIDs & MIN and format of IMSIs.	As per TIA/EIA-41 (3GPP2 N.S0017-B)
8.8	Synchronisation	As per ITU-T Recommendation G.822 & TEC GR No. G/SYN-01,
8.9	Quality of Service (a) Speech Quality	 As per 3GPP2 standard C.S0012 (TIA/EIA/IS 125 A) (Recommended Minimum Performance Standard for Digital Cellular Wideband Spectrum Speech Service Option 1)
	(b) Speech Delay	As per ITU-T Rec G.173.
	(c) Freedom from Echo	As per ITU-T G.165.
	(d) Voice Band Data Requirements	
	• DTMF Signaling	As per ITU-T Rec. G.174
	• Data	As per TIA/EIA/IS-707-A (Data Service Options for Spread Spectrum System)
	• Connection Performance	As per ITU-T Rec. E.770
	• Reliability Performance	As per ITU-T Rec. E.800
8.10	**System capacity** * ***The tendering authority may review and specify the capacity and performance parameters as per the requirements depending on number of subscribers to start with, maximum expansion***	**I. MSC**: **i) Minimum capacity** of 50,000 lines ii) **Scalability** : Expandable in steps of 10,000 lines to a maximum capacity of at least 2,00,000 lines. iii) The terminating capacity of one MSC shall be able to support at least 10 BSCs.

	envisaged, type of call/ traffic model etc. ***The call profile may include the following parameters :*** ***i. BHCA / sub*** ***ii. Percentage of calls for M-L, L-M, . & M-M*** ***iii W-IN (Prepaid)*** ***iv. SMS - MO : msg/sub/BH, MT : msg/sub/BH*** ***v. VMS - msg/sub in BH*** ***vi. Mobility features --- Registration Authentication.***	iv) BHCA of atleast 800,000 and switched erlang traffic of atleast 20,000 erlang. It shall be possible to upgrade the BHCA to 1 million assuming for a call model having atleast 20% IN services. This will take care of 2,00,000 subs assuming BHCA of 4/sub. and **90**m Elrang/sub. v) Total terminating capacity for E1 links towards RBS, other MSC, PSTN switch & other subsystems shall be indicated by the vendor. Restriction, if any, in configuring the E1s to a specific direction (towards BSC/MSC/PSTN), may be indicated. **II. HLR** **(a) Integrated HLR** • System capacity : 2, 00, 000 subscriber • Number of SS7 links : 16 with 1 + 1 redundancy • Messages loss probability : $\leq 10^{-7}$ • Information retrieval delay : $\leq$ 1000ms (probability of 95%) • Registration delay : 2000 ms. (probability of 95%) **(b) Stand alone HLR** • System capacity : 2,000,000 subscriber • Number of SS7 links : 64 with 1 +1 redundancy • Messages loss probability P : $\leq 10^{-7}$ • Information retrieval delay : $\leq$ 1000ms (probability of 95%) • Registration delay : 2000 ms (probability of 95%) **III. AUC** • Security : CAVE Algorithm , ECMEA/ ESP/ AES • Message loss probability: $\leq 10^{-7}$ • Information retrieval delay: 2000ms

		(probability 95%)

CHAPTER - 9

9. INTERFACES

9.1 Full Technical details regarding implementation of interfaces (at each standard reference point) amongst different network elements as well as with other networks shall be provided and no interface shall be proprietary in nature. The block schematic showing the network elements and the interfaces is placed at annexure '1'. It shall be possible for the MSC to interface with external network elements such as Short Message Entity (SME), OTAF, IN etc. through standard interfaces.

9.2 Following interfaces shall be supported by the system as per the requirement:

	Physical connection	Physical feature	Standard Signalling interface	Signalling and protocols
i	MSC and BSC	E1 Upgradable to E3/STM-I links	A1/A2/ A5	IOS 4.0
ii	MSC and HLR (C interface)	E1	C	ANSI 41D
iii	VLR and HLR (D interface)	E1	D	ANSI 41D
iv	MSC/SSP and SCP.	E1	T1	ANSI 41D
v	HLR and SCP	E1	T2	ANSI 41D
vi	MSC and MSC	E1	E	ANSI 41D
vii	PSTN and the MSC or GMSC	E1/ STM1	Ai	MTUP, MISUP
viii	MSC and IWF	E1/T1 (optionally Ethernet Interface may also be provided	L interface	IS 638

The tendering authority, at the time of tendering may specify as per their requirement, the types of interfaces required as well as the number of such interfaces and ports.

CHAPTER - 10

10. SERVICES

The system shall provide following speech and data services:

10.1	**Speech**	Voice Calls (service option 3 TIA/EIA IS – 127, and service option 17 TIA/EIA IS-733) Emergency Calls
10.2	**Data Services** Circuit Switched	Asynchronous Data (14.4 Kbps) based on TIA/EIA/IS-707 service option 12 and Group 3 Fax Services to support Fax apparatus as per TEC GR No. IR/FAX-01 (Latest version) based on TIA/EIA/IS-707 service option 13 (3GPP2 standard C.S0017) Fax services shall be supported on the network with Fax machine to fax machine, Fax machine to PC, PC to fax machine and PC to PC.
	Packet Switched	High Speed Data Services Up to 144 Kbps – service option 33 Based on TIA/EIA/IS-707

The implementation technique for transmitting packet data at 144 Kbps shall be indicated by supplier.

10.3 Supplementary Services and other services

(i) The system shall support supplementary services, non supplementary services and miscellaneous services described in TEC Service requirements No. SR/ASF-01 titled “Service description for analog subscribers”. The procedure for invocation of these services shall be programmable. The tendering authority may specify the supplementary services, non supplementary services and miscellaneous services (as mentioned in the above document) which the system shall be required to support.

(ii) In addition to above, Voice Mail Service (VMS) [broadly conforming to latest edition of TEC document SR/VMS-01], Unified Messaging Service (UMS) [broadly conforming to latest edition of GR/UMS-01] and multimedia Messaging System [broadly conforming to latest edition of GR/MMS-01/01] and Multimedia Messaging System [broadly conforming to latest edition of GR/MMS-01/01] shall also be supported.

(iii) In general, all services available to wireline subscribers shall be possible. Exceptions, if any may be indicated along with road-map for their support in future. There shall be no de-rating of the system capacity and performance for implementation of facilities and services. Separate directory number shall not be required for implementing fax and data.

(iv) In addition to the services mentioned above, the following features/functions and supplementary services mentioned in IOS ver.4.0 shall also be supported: -

(a) Short Message Service (IS-637-A) [3GPP2 standard C.S0015]

Mobile Terminating SMS
Mobile Originating SMS

It shall be possible to deliver a short message to a subscriber terminal even if the terminal is engaged in a call.

In a Mobile-Originated SMS, it shall be possible for a subscriber to send a text message to the Message Center while the terminal is idle or during a voice conversation.

(b) Call Forwarding

Call Forwarding Unconditional (CFU),
Call Forwarding When Busy (CFB),
Call Forwarding When No Answer or Not Available (CFNA),
Call Forwarding of Call Waiting,
User and operator selective call forwarding
Call Forwarding Roll-over – This shall enable subscribers to redirect a already forwarded call to a default number like VMS if the "forward-to" destination in CFNA doesn't reply.

(c) Calling Number ID presentation (CNIP)

(d) Calling Number ID Restriction (CNIR)

(e) Call Transfer (CT)

(f) Call Waiting (CW)

(g) Call Hold (HOLD)

(h) Three Way Calling

(i) Closed User group (CUG) -Optional

(j) Over the Air Service Provisioning (OTASP)

(k) Over the Air Parameter Administration (OTAPA)

The equipment supplier shall provide a comprehensive list of parameters that can be programmed via OTASP/OTAPA as mentioned in (j) and (k) above. Optionally software download and Mobile diagnostics shall also be possible over the air.

The Equipment Supplier shall indicate the requirements on the part of the Mobile and the PDSN to realize the same.

The Equipment Supplier shall explain the functionality of the proposed infrastructure against the requirements laid down in RFC 2604 [Wireless Service Configuration (OTASP/OTAPA)via ACAP, a protocol specified in IS-707]

(l) Priority Access
It shall be possible to allow a user to have priority access to traffic channels on call origination. It shall be possible to have multi-level priority access.

(m) User Zone - Optional
This provides the mechanism/procedures for setting up a User Zone for the subscriber terminal.

(n) Voice and Packet Data Concurrent Service – Optional
This provides the capability to support one voice call and one packet data service option simultaneously.

(o) ISDN Interworking Service(As per 3GPP2 C.S0017) – **Optional**

(p) Advice of Charge – **Optional**

(q) Voice Mail System (VMS)
Voice Mail System allows a subscriber who is temporarily inaccessible in the CDMA system (busy, no reply) to redirect incoming calls to a personal voice mailbox integrated with the system.

(r) Support of Position Location service
This service provides for the transfer of position location data between the RS and the Network (TIA/EIA 801) [3GPP2 standard C.S0022].

(s) Pre - Paid Service (PP) for data and voice

(t) Markov Service Option

(v). All features and services specified in TIA/EIA/IS -41D shall be supported. The possibility of upgrading to TIA/EIA/IS-41 Rev. E in future and the roadmap for the same may be indicated.

(vi). In case of non support of any of the above mandatory/ optional features/ services, the road map to support them in future may be indicated.

The tendering authority, at the time of tendering may specify the services/features required to be supported by the equipment.

CHAPTER – 11

11. TENDERING INFORMATION

11.1 The versions of all the documents mentioned in this GR may be reviewed and updated, if necessary. Refer clause 1.1 & 2.35.

11.2 Field Proveness and Interoperability: The tendering authority may mention the requirement of equipment being deployed in multiple countries and networks and minimum period of deployment which may be atleast six months or any other period more than six months, as decided by the tendering authority. Tendering authority may also specify the various technologies / vendors of Radio Networks (RN), Packet Core Network (PCN), MSC based Core Network and associated sub systems with which this system has to interoperate. Refer clause 2.2.

11.3 The Tendering Authority may indicate whether upgradability to 1x EvDO and DV is required. Refer clause. 2.9.

11.4 The registration methods required to be supported in the equipment may be specified. Refer clause 2.14 & 5.4.8.

11.5 The tendering authority may indicate the maintenance updates and updates for new services and features required by it in future along with commercial terms for the same. Refer clause 2.24.1 (x).

11.6 The tendering authority may indicate the type of interfaces required to be supported and obtain information from the vendor regarding associated hardware/ software required for integration to NIB Phase I and Phase II. Refer Clause 2.26

11.7 As the MSC CDRs will be input to the existing BSNL/MTNL billing system and hence it shall be ensured that the two are compatible. To ensure this the tendering authority may specify the CDR format (like AMA/ IS-124B/ DAS/ASN.1) & interfaces supported by the mediation device used for existing billing system or billing system to be procured. In case the MSC generates a different CDR format from what the current billing system is configured to support, then the tendering authority must stress upon the MSC vendor to work with mediation & billing system vendor for integration and the MSC vendor shall have to provide the extra software or hardware (if necessary) for the purpose of integration. Refer Clause 4.2

11.8 The tendering authority may specify the actual requirements for lawful interception and monitoring like number of subscribers to be monitored, as per the requirements. Refer clause 4.3.

11.9 The tendering authority may specify the period for which the maintenance spare, based on MTBF and MTTR, have to be specified by equipment supplier. Refer clause 4.13

11.10 The tendering authority at the time of tender may specify if Global Title Translation (GTT) feature is required to be supported. Refer clause 5.4.2

11.11 As the feature of permitting different (SID) for different BTS in one MSC may not be necessary in certain network architectures, the tendering authority may specify if the requirement of this feature need to be supported by all MSCs. Refer clause 5.4.2

11.12 The tendering authority may examine the requirement of IWF from the point of view of its utilization and cost. As IWF is normally deployed to provide fax services only, hence it may have very limited utility, in case of full Mobile scenario. Based on the actual field requirements the tendering authority may specify whether IWF is required or not and may go for the IWF only if it is absolutely necessary. Refer clause 5.10.

11.13 The tendering authority may specify the type of NMS (if at all) which the OMC of MSC based Core Network would be required to interface with and accordingly any additional hardware/ software (if required), shall be provided by the vendor for interfacing with the NMS. Refer clause 7.3

11.14 System capacity: The tendering authority may review and specify the capacity and performance parameters as per the requirements depending on number of subscribers to start with, maximum expansion envisaged, type of call/ traffic model etc. It may give details of the call profile/ traffic modal for which this capacity & performance shall be supported. Refer clause 8.10.

11.15 The tendering authority may specify the types of interfaces as well as the number of such interfaces and ports for each subsystem. Refer chapter 9.

11.16 The tendering authority may specify the services/ features required to be supported by the equipment Refer chapter 10 and clause 5.10.

11.17 The requirement of the following test instrument may be indicated: -

- IOS protocol tester capable of testing all interfaces and at all layers.

11.18 The Tendering Authority may review all "Optional" features indicated in this GR and may consider making them "mandatory" if required.

Note: *TEC validation of the equipment is done under test/simulated conditions. Field Trial also is done with partially installed system and with limited number of test subscribers. It may not truly reflect the performance of the system in the filed. Hence, the network (of which the equipment covered under this GR is a part) should be retested for its performance after its complete commercial deployment under loaded condition, for a suitable time period. Accordingly, necessary provision may be made in the tender.*

CHAPTER - 12

References

TEC Documents

G/LLT-01	-	Large size digital local cum tandem exchanges
G/NIB.01	-	National Internet Backbone (NIB)
G/PCS-01	-	India Mobile Personal Communication System (IMPCS)
G/SYN-01	-	Digital Network Synchronisation Equipment (integrated in Switch)
GR/BCS-01	-	Billing & customer care system for cellular Mobile system
GR/CDM-03	-	CDMA based Cellular Mobile Telecom System
GR/LIS-01	-	Requirements of switching systems for lawful interception and Monitoring
GR/MMM-01	-	Multi Media Messaging System
GR/PCN-01	-	Packet Core Network for CDMA2000 system
GR/UMS-01	-	Unified Messaging System
GR/WLL-04	-	RN of WLL Systems based on CDMA-2000 1x Standards
IR/FAX-01	-	Group III Facsimile Apparatus
S/CCS-02	-	National CCS7 Standards for MTP and ISUP
SD/EMI-02	-	Electromagnetic compatibility standard for telecommunication equipment
SR/ASF-01	-	Service Description for Analogue Subscriber
SR/VMS-01	-	Voice Mail Service
TD/CDR-01	-	CDR based billing system for PSTN

QA Documents of BSNL

QM-115	-	Guidelines for Computing Reliability Figures.
QM 118	-	Quality and Reliability in Product Design
QM-205	-	Guidelines for Standard of Workmanship for Printed Boards.
QM-206	-	Guidelines for Standard of Workmanship for Printed Board Assemblies
QM-210	-	Guidelines for Standard of Workmanship for Surface Mounted Devices.
QM-301	-	Transmission Equipment General Equipment
QM-324	-	Guidelines for Computing Reliability Figures.
QM-333	-	Specification for Environmental testing of Sw. & Tx. Equipments.
QM-351	-	QA Requirement for switching equipment.

ITU –T Standards

E.164	-	The International public telecommunication numbering plan
E.212	-	Identification plan for land Mobile
E.770	-	Land Mobile and fixed network interconnection traffic grade of service concept
E.800	-	Terms and definition related to quality of service and network performance including dependability
G.165	-	Echo cancellers
G.173	-	Transmission planning aspects of the speech service in digital public land Mobile networks

G.174	-	Transmission performance objectives for terrestrial digital wireless systems using portable terminals to access the PSTN
G.822	-	Controlled slip rate objectives on an international digital connection
M-3020	-	TMN interface specification methodology.
M-3010	-	Principles for a telecommunications management network (TMN)
Q.513	-	Digital exchange interface for operations, administration and maintenance
V.42 bis	-	Data compression procedures for DCEs using asynchronous-to-synchronous conversion
Z.322	-	Capabilities of visual display terminals
Z.314	-	Character set and basic elements of MML
Z.301 to Z.341	-	Specifications pertaining Man-machine Language (MML)

ITU-R Standards

M-1457	-	Detailed specifications of the radio interfaces of IMT-2000.

International Quality Standard

ISO-9001:2000	-	Quality management systems – Requirements

ANSI/EIA/TIA Standards

IS-65B	-	Data Services Interworking Function Interface for Wideband Spread Spectrum Systems – Addendum 1
IS-95A	-	Replaced by TIA/EIA-95-B
IS 124B	-	Wireless Radio Telecommunication Intersystem Non-Signaling Data Communication DMH (Data Message Handler)
IS-125	-	Recommended Minimum Performance Standard for Digital Cellular Wideband Spread Spectrum Speech Service Option 1
IS-127	-	EVRC
IS-637	-	Short Message Service for Spread Spectrum Systems
IS-638	-	Surface Mount Solderability Test
IS-707	-	Data Service Options for Spread Spectrum Systems
IS-725	-	Cellular Radio telecommunications Intersystem Operations – Over-the-Air Service Provisioning (OTASP) & Parameter Administration (OTAPA)
IS-733	-	High Rate Speech Service Option 17 for Wideband Spread Spectrum Communication Systems
IS-735	-	Enhancements to TIA/EIA-41-D & TIA/EIA-664 for Advanced Features in Wideband Spread Spectrum Systems
IS-737	-	IS-41-C Enhancements for Circuit Mode Services
IS-751	-	Cellular Digital Packet Data System Specification – Part 751 Managed Object Conformance Statements (MOCS) (ANSI/TIA/EIA-732-751-2001) ; TIA/EIA-41-D Modifications to Support IMSI (R2002)
IS-771	-	Wireless Intelligent Network
IS-801	-	Position Determination Service Standard for Dual Mode Spread Spectrum Systems
IS-807	-	TIA/EIA-41-D Enhancements for Internationalization,

IS-826	-	WIN Pre-Paid Charging
IS-835	-	Wireless IP Network
IS-848	-	Enhanced Charging Services
IS-2000	-	CDMA 2000® Series (2000)
IS-8473 (1993)	-	Guide on the effects of current passing through the human body (equivalent to IEC publications 479-1 (1984).
IS-13252 (1992)	-	Safety of information technology equipment including electrical business equipment (equivalent to IEC Publication 95
TR-45.6	-	Adjunct Wireless Packet Data Technology – Mobile & Personal Communications Standards.
TSB-51	-	Cellular Application Level Testing for IS-41-B, TSB-51 and IS-53

3GPP2 Standards

A.S0001	-	Access Network Interfaces Inter-Operability Specifications (IOS)
C.S0002	-	CDMA 2000 System – Physical Layer
C.S0003	-	CDMA 2000 System – Layer 2 (Link Layer)[MAC sub-layer
C.S0004	-	CDMA 2000 System – Layer 2 (Link Layer)- LAC sub-layer
C.S0005	-	CDMA 2000 System – Upper Layers
C.S0012	-	Recommended Min. performance standard for Digital Cellular Wideband Spectrum Speech Service Operator
C,S0014	-	8 Kbps EVRC Vocoder
C.S0015	-	Short message services (SMS) for wide band spread spectrum systems
C.S0017	-	Data service option for spread spectrum systems
C.S0022	-	Position determination service standard for dual mode spread spectrum system
C.S0030	-	Selective Multirate Vocoders (SMV)
N.S0017	-	International Implementation of Wireless Telecom System compliant with TIA/EIA-41
S.R0005	-	Network reference model for CDMA 2000 spread spectrum systems

IETF RFC

RFC-2604	-	Wireless Service Configuration

Other standards

CISPR 22 (2003)	-	Limits and methods of measurement of radio disturbance characteristics of Information Technology Equipment"
IEC 215 (1987)	-	Safety requirements of radio transmitting equipments (for Radio equipments only)
IEC 61000-4-2 (2001)	-	Testing and measurement techniques of electrostatic discharge immunity test.
IEC 61000-4-3 (2002)	-	Radiated RF electromagnetic field immunity test.
IEC 61000-4-4 (1995)	-	Electrical fast transients/burst immunity test. (with amendments 1&2)
IEC 61000-4-5 (2001)	-	Test & Measurement techniques for Surge immunity tests.
IEC 61000-4-6 (2001)	-	Basic Immunity standard.

Note: All references are w.r.t. the latest versions/releases along with all amendments/addendums.

CHAPTER – 13

GLOSSARY

3GPP2	Third Generation Partnership Project 2
AES	Advanced Encryption Standard
AMA	Automatic Message Accounting
ANSI	American National Standard Institute
APS	Automatic Protection Switching
ASN	Abstract Syntax Notation
AUC	Authentication Centre
BHCA	Busy Hour Call Attempts
BSC	Base Station Controller
BSNL	Bharat Sanchar Nigam Lilmited
BTS	Base Transceiver Station
CAVE	Cellular Authentication and Voice Enciphering
CCS7	Common Channel Signalling No. 7
CDMA	Code Division Multiple Access
CDG	CDMA Development Group
CDR	Call Detail Record
CD-ROM	Compact Disc Read Only Memory
CFB	Call Forwarding when Busy
CFNA	Call Forwarding when No Answer or Not Available
CFU	Call Forwarding Unconditional
CIBER	Cellular Intercarrier Billing Exchange Roamer
CIC	Carrier Identification Code
CMIP	Common Management Information Protocol
CNIP	Calling Number ID Presentation
CNIR	Calling Number ID Restriction
CT	Call Transfer
CUG	Closed User Group
CW	Call Waiting
DAS	Data Acquisition System
DC	Direct Current
DOT	Department of Telecommunications
DTMF	Dual Tone Multi Frequency
ECMEA	Enhanced Cellular Message Encryption Algorithm
EIA	Electronic Industry Association
EMC	Electro-Magnetic Compatibility
ESN	Electronic Serial Number
ESP	Encapsulating Security Payload
EUC	End User Control
EvDO	Evolution Data Only
EvDV	Evolution Data & voice
EVRC	Enhanced Variable Rate Code
FCF	Flexible Call Forwarding
FWT	Fixed Wireless Terminal
GR	Generic Requirements

GTT	Global Title Translation
GUI	Graphical User Interface
HLR	Home Location Register
I/O	Input/Output
ICS	Incoming Call Screening
IFAST	International Forum on ANSI-41 Standards Technology
ILD	International Long Distance
IMSI	International Mobile Subscriber Industry
IN	Intelligent Network
IOS	Inter Operability Standards
IP	Internet Protocol
IS 95A	Interim Standards 95 release 'A'
ISDN	Integrated Service Digital Network
ISO	International Organization for Standardization
ITU	International Telecommunication Union
IWF	Interworking Function
LAES	Lawfully Authorized Electronic Surveillance
MDN	Mobile Directory Number
MIN	Mobile Identity Number
MMC	Man-Machine Command
MML	Man-Machine Language
MS	Mobile Station
MSC	Mobile Switching Centre
MTBF	Mean Time Between Failure
MTNL	Mahanagar Telephone Nigam Limited
MTTR	Mean Time To Restore
NLD	National Long Distance
NMS	Network Management System
OCA	Outgoing Call Allowance
OCR	Outgoing Call Restriction
OMC	Operation & Maintenance Centre
OTAF	Over-the-Air Functionality
OTAPA	Over-the-Air Parameter Administration
OTASP	Over-the-Air service provisioning
PC	Personal Computer
PCB	Printed Card Board
PCF	Packet Control Function
PDSN	Packet Data Service Node
PIC	Presubscribed Interexchange Carrier
PP	Pre Paid Service
PSPDN	Packet Switched Public Data Network
PSTN	Public Switched Telephone Network
Q.O.S.	Quality of Service
QA	Quality Assurance Circle of BSNL
QCELP	QualComm Code Excited Linear Predictive Coding
RN	Radio Network
RF	Radio Frequency

RS	Remote Station
R-UIM	Removable User Interface Module
SCF	Service Call Forwarding
SCP	Service Control Point
SCR	Selective Call Rejection
SID	System Identity
SME	Short Message Entity
SMS	Short Message Service
SMV	Selective Mutirate Vocoders
SN	Service Node
SNMP	Simple Network Management Protocol
SPC	Stored Program Control
SSD	Shared Secret Data
SSP	Service Switching Point
STC	Speech to Text Conversion
TAX	Trunk Automatic Exchange
T&D	Technical & Development Circle of BSNL
TCP/IP	Transmission Control Protocol/Internet Protocol
TEC	Telecom. Engineering Centre
TFO	Tandem Free Operation
TIA	Telecom Industry Association
TMN	Telecom Management Network
UMS	Unified Messaging Service
VCD	Voice Control Dialling
VCFC	Voice Controlled Feature Control
VLR	Visitor Location Register
VMS	Voice Mail Service
VPN	Virtual Private Network
VUA	Voice-based User Authentication
WIN	Wireless Intelligent Network
WLL	Wireless in Local Loop

ANNEX-1

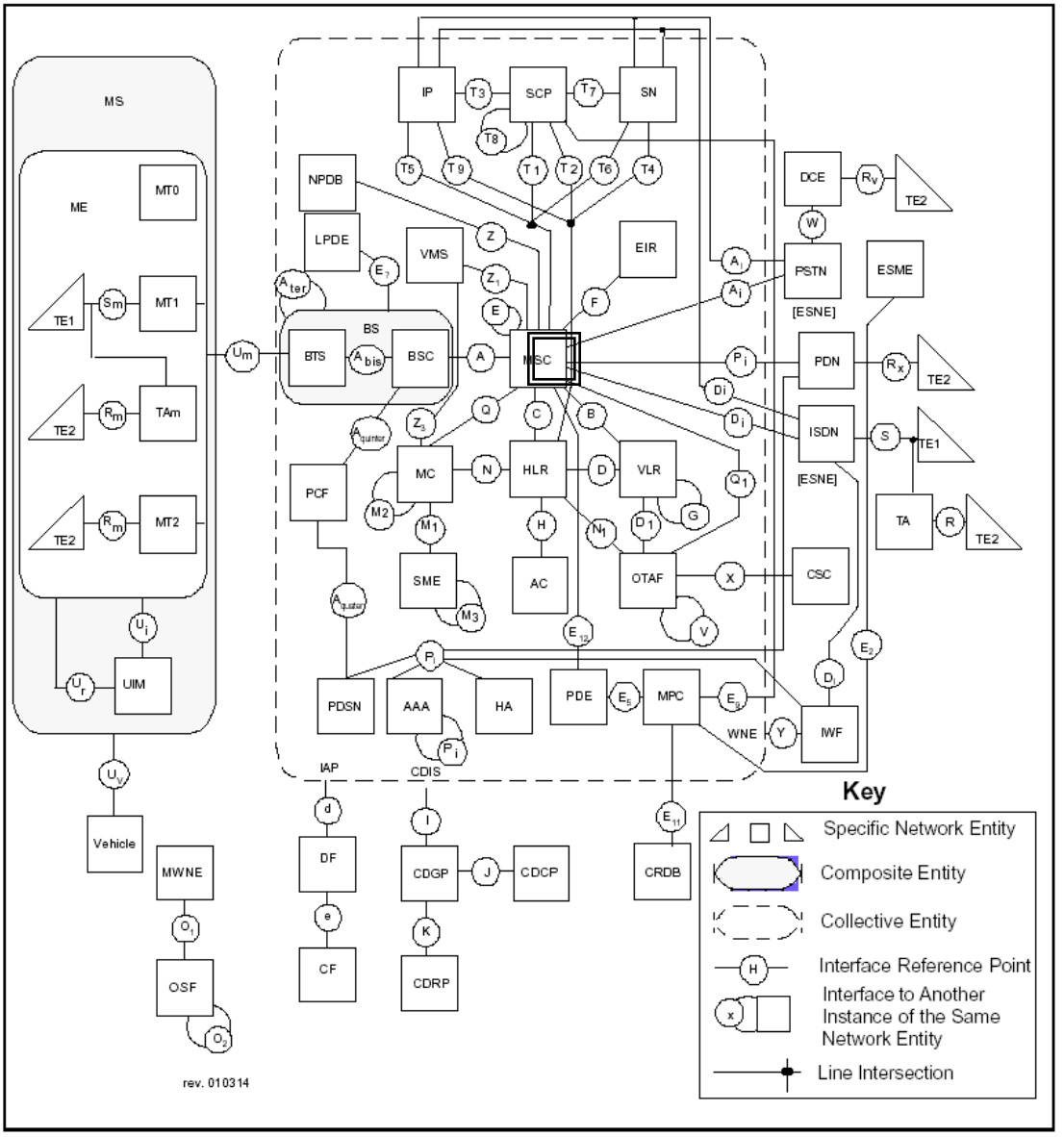

Figure 2.1 3GPP2 Wireless Network Reference Model

Figure 2 . Network Reference Model for MSC based Core Network (Ref. 3GPP2 S.R0005)

END OF THE DOCUMENT