

ISSUE: JAN' 2005

OTA SYSTEM FOR CDMA 2000 NETWORK

**GENERIC REQUIREMENTS
GR No. GR/OTA-01/01. JAN' 2005**

© TEC

**TELECOMMUNICATIONS ENGINEERING CENTRE
KHURSHID LAL BHAVAN, JANPATH,
NEW DELHI - 110001
INDIA**

All Rights Reserved and no part of this publication may be produced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, scanning or otherwise without written permission from the Telecommunication Engineering Centre, New Delhi.

**Generic Requirements
for
OTA System for CDMA 2000 Network**

**GENERIC REQUIREMENTS
GR No. GR/OTA-01/01. JAN 2005**

History Sheet

Sl. No.	Title	IR No.	Remarks
1	OTA System for CDMA 2000 Network	GR/OTA-01/01. JAN 2005	Issue 01

CONTENTS

	Page No.
<u>REFERENCES</u>	5
<u>PART 1</u>	
Chapter 1 INTRODUCTION	6
1.1 General	6
1.2 Scope	6
1.3 Generic Model	7
1.4 Various components of CDMA 2000 1x OTA System	7
Chapter 2 TECHNICAL REQUIREMENTS	
2.1 General	9
2.2 Standards Compliant & Multi-Vendor support	9
2.3 Support of Different Layers	9
2.4 Support of registration and registration notification	9
2.5 Security	9
2.6 Subscriber Privacy requirement	10
2.7 Support of RS/AT for 1x and 1x EV-DO Network	10
2.8 Support of RS/AT for both Postpaid and Prepaid Services	10
2.9 Upgradation to IP based OTA System	10
2.10 Interactive Voice Response (IVR)	10
2.11 Upgradation to support IPv6	10
2.12 Mobility Restrictions	11
2.13 Voucher System support/Billing Interface	11
2.14 SMS Confirmation	11
2.15 Interface with the Billing system	12
2.16 Scalability	12
2.17 Interface to existing CDMA 2000 Networks	12
2.18 Standalone operation without integration with Billing system	12
2.19 Download of NAM (Number Assignment Module)	12
2.20 RS/AT Lock Support	12
2.21 A-Key Support	13
2.22 Customization	13
2.23 Design Objectives	13
2.24 Performance Parameters	14
2.25 Other Technical Requirements	14

Chapter 3	OTAF	
	3.1 General	15
	3.2 OTASP	15
	3.3 OTAPA	16
Chapter 4	CUSTOMER SERVICE CENTER (CSC)	18
Chapter 5	OPERATIONS AND MAINTENANCE CENTRE (OMC)	
	5.1 General	20
	5.2 Objective of OMC	20
	5.3 Redundancy, Scalability and Interface to NMS	20
	5.4 Functions of OMC	20
	5.5 Support for Multiple OTAFs and CSCs	21
Chapter 6	INTERFACES	
	6.1 General	22
	6.2 Interface between OTAF & RS/AT (Mobile Station)	22
	6.3 Interface between OTAF & CSC	22
	6.4 Interface between OTAF & MSC	22
	6.5 Interface between CSC & MSC	22
	6.6 Interface between OTAF & HLR	22
	6.7 Interface between OTAF & VLR	23
	6.8 Interface between OTAF & SMSC	23
	6.9 Interface between OTAF & OTAF	23
	6.10 Interface between OTAF & Billing System	23
	6.11 Interface between OTA & OMC	23
	6.12 Interface between OTAF & PCN	23
 <u>PART 2</u>		
Chapter 7	GENERAL REQUIREMENTS	25
	7.1 Engineering Requirements	25
	7.1.1 Hardware	25
	7.1.1.1 General	25
	7.1.1.2 Processors	25
	7.1.1.3 Input-Output devices	26
	7.1.1.4 Equipment Practice	27
	7.1.2 Ease of Expansion	28
	7.1.3 Software	28
	7.1.3.1 General	28
	7.1.3.2 Diagnostic programs to localize hardware faults	29
	7.1.3.3 Software of charge records	29

7.1.3.4	Right to use	29
7.1.4	Man-Machine Communication	29
7.1.4.1	Man-Machine Language (MML)	29
7.1.4.2	Input/Output	30
7.1.4.3	Man-Machine dialogue	31
7.1.4.4	Checks and safeguards	31
7.1.5	Markings	31
7.1.6	Hot-Swappable Modules	32
7.1.7	Dimensions & Weight	32
7.1.8	Cooling Arrangement	32
7.1.9	MTBF/MTTR	32
7.1.10	Diagnostics/Testing	32
7.1.11	Dimensioning	33
7.1.12	Field Proveness	33
7.2	Operational Requirement	33
7.2.1	Supervision	33
7.2.2	Alarm Indications	33
7.2.3	Transport & storage	33
7.2.4	No problem due to change in date/time/year etc.	33
7.3	Quality Requirements	34
7.3.1	Components	34
7.3.2	Quality Standards	34
7.3.3	Redundancy	34
7.3.4	Environmental Specification	34
7.4	Maintenance Requirement	34
7.5	Power Supply	35
7.5.1	Power Supply Unit	35
7.5.2	Input Supply	35
7.5.3	Protection	35
7.5.4	Power Consumption	36
7.6	Documentation	36
7.7	Protection	37
7.8	Safety Requirements	37
7.9	Electromagnetic Compatibility (EMC)	38
7.10	Reference to latest version of all documents/standards	39
<u>ANNEX-I</u>	NETWORK REFERENCE MODEL FOR OTA SYSTEM	40
<u>ANNEX-II</u>	INFORMATION FOR THE TENDERING AUTHORITY	41
<u>ABBREVIATIONS</u>		42

REFERENCES

TEC Documents

- GR/EDO-01/01.JUN 2004 - CDMA 2000 1x EV-DO System.
- GR/MS-C-01/01.FEB 2004 - MSC based Core Network for CDMA 2000 1x system
- GR/PCN-01/01.FEB 2004 - Packet Core Network for CDMA 2000 1x system
- GR/RST-01/01. JUN 2004 - CDMA 2000 1x Remote Stations
- GR/RST-03/01. JUN 2004 - CDMA 2000 1x EVDO Card
- SD/EMI-02/02.SEP 2001 - Electromagnetic compatibility standard for Telecommunication equipment

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 - Acceptability of Printed Board Assemblies Containing Surface Mounted Devices.
- QM-301 - Transmission Equipment General Equipment
- QM-324 - Guidelines for Computing Reliability Figures.
- QM-333 - Specification for Environmental testing of Switching and Transmission Equipments
- QM-351 - QA Requirement for switching equipment.

ITU –T Standards

- E.770 (03/93) - Land mobile and fixed network interconnection traffic grade of service concept
- E.800 (08/94) - Terms and definitions related to quality of service and network performance including dependability
- M.3010 (02/00) with Amendment 1(2/03) - Principles for a telecommunications management network (TMN)
- M-3020 (02/00) - TMN interface specification methodology.
- Q.513 (03/93) - Digital exchange interface for operations, administration and maintenance
- Z.301 to Z.341 (11/88) - Specifications pertaining Man-machine Language (MML)
- Z.314 (11/88) - Character set and basic elements of MML
- Z.322 (11/88) - Capabilities of visual display terminals

BIS Standards

- IS 8437 (1993) - Guide on the effects of current passing through the human body (equivalent to IEC 60479-1 (1984).
- IS 13252 (2003) - Safety of information technology equipment including electrical business equipment (equivalent to IEC publication 60950 (2001)

Other standards

- CISPR 22 (2003) - Limits and methods of measurement of radio disturbance characteristics of Information Technology Equipment”
- EN55022 - Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment, 1987
- EN61000-4-2 - Electrostatic Discharge Immunity Test
- EN61000-4-3 - Radiated RF Electromagnetic Field Immunity Test
- EN61000-4-4 - Electrical Fast Transients/Burst Immunity Test
- EN61000-4-5 - Surge Immunity Test
- EN61000-4-6 - Immunity to Conducted Disturbance Induced by RF Fields

- IEC 60479-1 (1984) - Effects of current on human beings Part 1
- IEC 60215 (1987) - Safety requirements of radio transmitting equipments (for Radio equipments only)
- IEC-60950 (2001) - Information technology equipment - Safety
- 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.

International Quality Standard

- ISO-9001:2000 - Quality Management System – Requirement

EIA/TIA/IS Standards

- IS-683-C - Over-The-Air Service Provisioning of Mobile Stations in Spread Spectrum Standards
- IS-725 A - Enhancements for Over-The-Air Service Provisioning (OTASP) & Parameter Administration (OTAPA)
- IS-637 - Short Message Services for Wideband Spread Spectrum Systems
- IS-2000 - CDMA 2000 1x Spread Spectrum Standards
- IS-41D & E - Cellular Radio telecommunications Intersystem Operations

3GPP2 Standards

- | | | |
|------------|---|---|
| C.S-0016-B | - | Over-the-Air Service Provisioning of Mobile Stations in Spread Spectrum Standards |
| C.S0040-0 | - | IP Based Over-the-Air Handset Configuration Management (IOTA-HCM) |
| N.S0011-0 | - | OTASP and OTAPA |
| S.R0101-0 | - | IOTA Device Management for CDMA 2000 Systems |

Note: The version of the references mentioned above are the latest versions as available at the time of publication of this GR. All the references are subject to revision hence all the users (including tendering authority) are encouraged to investigate the possibility of applying the most recent edition of these references.

PART-1

CHAPTER 1

1 Introduction

1.1 General

This document contains the Generic Requirements (GR) of OTA (Over-the-Air) System for ANSI-41D (or later version) based CDMA 2000 Networks which permits Service Provisioning (OTASP) and Parameter Administration (OTAPA) in OTA capable CDMA 2000 1x Remote Station (RS) and Hybrid Access Terminal (AT) (i.e. terminals supporting both CDMA 2000 1x and EVDO) in CDMA 2000 1x and 1x EV-DO Networks respectively.

OTA System allows a potential wireless service subscriber to activate (i.e. become authorized for) new wireless services, and allows an existing wireless subscriber to make changes in existing services without the intervention of a third party.

It basically consists of two functional entities viz. Over- the- Air Service Provisioning Function (OTAF) and Customer Service Centre (CSC).

OTAF has applications for OTASP (Over-the-Air Service Provisioning) and OTAPA (Over-the-Air Parameter Administration) which supports Service Provisioning / Parameter Administration as per the IS-683 (3GPP2 C.S-0016) & IS-725 (3GPP2 N.S0011) standards. CSC is an IVR (Interactive Voice Response) based entity, which receives requests for new subscription or changes in existing services.

In case of ANSI-41D based OTA System the roadmap to support system based on ANSI-41E may be indicated by the supplier.

1.2 Scope

The requirements spelt out in this GR relate to the CDMA 2000 OTA System which allows provisioning and parameter administration of Remote Station (RS) of CDMA 2000 1x Network and Hybrid Access Terminals (AT) of CDMA 2000 1x EV-DO Networks. The Remote Station can be Fixed Wireless Terminals (FWT), Handheld terminal (Mobile), RUIM based RS/AT etc. as per TEC GR No. GR/RST-01 and GR No. GR/RST-03. It also includes the requirements of IVR based CSC.

1.3 Generic Model

CDMA 2000 OTA System typically consists of:

- i) **OTAF server:** It has following functionalities:
 - a) **OTASP** (Over-the-Air Service Provisioning) applications
 - b) **OTAPA** (Over-the-Air Parameter Administration) applications including Database for scheduling the OTAPA sessions
- ii) **CSC:** It is a fully automated IVR based customer interface to the OTA system

Block schematic of the network is given at Annexure -I.

1.4 Various components of CDMA 2000 OTA System

The following paragraphs describe the various components (under purview of this GR) of the CDMA 2000 OTA System.

(i) **OTAF Server**

The OTAF is the entity that interfaces proprietarily with CSCs to support service provisioning activities. The OTAF interfaces with the MSC to send orders, to RS/AT, necessary to complete service provisioning requests. The OTAF may or may not be co-located with the CSC. The OTAF server has two main applications, OTASP (Over-the-Air Service Provisioning) and OTAPA (Over-the-Air Parameter Administration).

(a) **OTASP (Over-the-Air Service Provisioning)**

The Over-the-Air Service Provisioning (OTASP) feature allows a potential wireless service subscriber to activate (i.e., become authorized for) new wireless service, and allows an existing wireless subscriber to make changes in existing services without the intervention of a third party.

The OTASP feature shall have the objectives to support OTASP on CDMA 1x/EV-DO networks and simplify the service provisioning process for both the user and the operator. It shall aim to increase efficiency of RS/AT Number Assignment Module (NAM) programming and reduce the possibility of errors during initial service provisioning programming. In this process the OTASP shall ensure to minimize the ability to fraudulently use wireless

service, keep the distribution of the Authentication Key (A-key) secure and to safeguard user information. OTASP shall provide a secure authentication key to a RS/AT to facilitate authentication. The OTASP feature shall incorporate a cryptographic Authentication Key Generation procedure. This procedure shall allow the network to exchange Authentication Key parameters with a RS/AT. These parameters are used to generate the A-key that is used to generate the Shared Secret Data (SSD).

(b) OTAPA (Over-the-Air Parameter Administration)

Over-The-Air Parameter Administration feature shall allow an operator to update the NAM, MDN, PRL, Authentication Key, SSD Service Programming Lock Code etc in a subscriber's already activated OTAPA capable RS/AT over-the-air. OTAPA sessions shall be initiated autonomously by the network, and proceed without any subscriber involvement or knowledge and with no limitation on the subscriber's ability to receive telecommunications services. Apart from OTAPA applications it shall have OTAPA database for scheduling of the OTAPA sessions.

(ii) CSC (Customer Service Center)

The CSC is an entity which receive telephones calls from customers wishing to subscribe to initial wireless service or request changes in their existing services. Through CSC the operator provides an interface to the customers wishing to use the OTA facility. The CSC interfaces with the OTAF to perform network and RS/AT related changes to complete the service provisioning request. CSC shall have an IVR system which enables automated voice response, secure and efficient interface to the OTAF system.

(iii) Operations and Maintenance (O&M)

The Operations and Maintenance (O & M) allows the operation of the various units in the system and the functions needed to maintain the sub systems. It shall enable the configuration of system parameters, notifications of alarms and events and performance logs and retrieval of Call Detail Records (CDRs) and software installation and upgrades. There shall be provision to restrict access to the OTA system through multilevel password.

CHAPTER 2

2 Technical Requirements

2.1 General

The OTA system shall perform the provisioning of the RS/AT for both pre-paid and post-paid services. The provisioning shall be supported through the CSC interface for the subscribers. It shall support voucher system for verification of the subscription before provisioning of the RS/AT. After the successful provisioning of the RS/AT, the system shall be able to send an operator defined SMS with the MDN information to the subscriber.

OTA shall allow the operator to update the NAM, MDN, PRL, Authentication Key, SSD Service Programming Lock Code etc in a subscriber's already activated OTAPA capable RS/AT over-the-air. OTAPA sessions shall be initiated autonomously by the network, and proceed without any subscriber involvement or knowledge and with no limitation on the subscriber's ability to receive telecommunications services.

2.2 Standards Compliant & Multi-Vendor support

System shall be based on standards mentioned in the 'References' and other standards mentioned therein and shall be able to work in multi-vendor environment.

2.3 Support of Different Layers

The architecture of the CDMA 2000 OTA system in terms of different layers for specific functions shall conform to the IS-683 (3GPP2 C.S-0016) & IS-725 (3GPP2 N.S0011) standard.

2.4 Support of registration and registration notification

The system shall support registration and registration notification procedures as per IS-725 (3GPP2 N.S0011) standard.

2.5 Security

Authentication and encryption shall be supported as per IS-683 (3GPP2 C.S-0016). Optionally authentication and encryption may be supported as per IS-725 (3GPP2 N.S0011).

2.6 Subscriber Privacy requirement

Subscriber Privacy and message encryption shall be supported as per IS-683 (3GPP2 C.S-0016). However, the system may optionally comply with Re-Authentication for Voice Privacy, and Message Encryption procedure as per IS-725 (3GPP2 N.S0011).

2.7 Support of RS/AT for 1x and 1x Ev-DO Network

- (i) The OTA system shall be able to support both CDMA 2000 1x and 1x EV-DO systems (as defined in TEC GRs GR/WLL-04, GR/MS-01, GR/PCN-01 & GR/EDO-01). It shall be able to support RS of CDMA 2000 1x as specified in TEC GR No. GR/RST-01 and AT of EV-DO Network as specified in TEC GR No. GR/RST-03.
- (ii) It shall support procedure for download of Third Generation Packet Data (3GPD) Parameter Blocks for provisioning data capabilities in the RS/AT as per the IS-683 Standard. It shall support EV-DO HRPD (3GPD) parameters/profiles download for EVDO networks as per IS-683 Standard.

2.8 Support of RS/AT for both Postpaid and Prepaid Services

It shall be possible to perform basic Service provisioning and Parameter administration of RS/AT for both post-paid and pre-paid services.

2.9 Upgradation to IP based OTA system

Possibility may be indicated to upgrade this OTA System (based on IS-683/3GPP2 C.S-0016) to IP based OTA as per 3GPP2 standard for IP-based Over-the-Air Handset Configuration Management (IOTA-HCM) (3GPP2 C.S0040) and IOTA Device Management for CDMA 2000 System as per 3GPP2 S.R0101. The capability of supporting IP based Over-the-Air Mobile Diagnostics (IOTA-OTAMD) in the future may be indicated by the supplier. In case of support of these features, supplied hardware shall be upgradable to meet the requirement with software upgrade.

2.10 Interactive Voice Response (IVR)

The system shall have IVR based CSC (Customer Service Center) to interface with the OTASP and OTAPA applications.

2.11 Upgradation to support IPv6

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

2.12 Mobility Restrictions

- (i) 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 environment. It shall be possible to define parameters, during service provisioning/ Parameters Administration, to limit mobility in the system in a limited mobility scenario as per the definition of limited mobility as specified by the DOT from time to time.
- (ii) It shall be possible to configure the subscription profile so as to restrict the services of the subscriber within an SDCA or any other area specified by operator. The OTA system shall allow the operator to provide coverage in a pre-defined geographic area identified by home-zone-id / Short Distance Charging Area (SDCA), through the following process / guidelines:
 - The desired area identified by home-zone-id/SDCA is also inputted by the user along with voucher information.
 - OTA checks user input data with the billing system.
 - The billing system may then provision the subscriber in the relevant VLR/HLR that corresponds to the home-zone-id/SDCA.
- (iii) It shall be possible to implement mobility restriction both through OTASP as well as OTAPA applications.

2.13 Voucher system support / Billing Interface

The OTA system shall support a voucher based mechanism for service provisioning by accepting user inputs such as account number, PIN, validation code, etc. during the RS/AT provisioning for the post-paid and pre-paid subscribers. However, in case the OTA system is required (by tendering authority) to interface with an external billing system, then it shall be able to interface with this billing system to validate user inputs and to obtain parameters to be downloaded into the RS/AT.

2.14 SMS Confirmation

The OTA system shall be capable of sending a confirmation SMS after successful provisioning of the RS/AT including the welcome message (as defined by the operator) with the MDN number to the RS/AT.

The OTA system may optionally support the capability of sending a voice confirmation message.

2.15 Interface with the Billing system

The OTA system shall have capability of interfacing with the billing system through TCP/IP over LAN or WAN network, if so desired by the operator. The interface would be based on the API on the billing system agreed upon / provided by the billing system.

2.16 Scalability

The OTA system shall be scalable to support atleast 5400 provisioning call attempts per busy hour. It shall be possible to deploy single OTA system for the nationwide CDMA 1x and 1x EV-DO network. The OTA shall have the capability of being modularly scalable with suitable configurations for different types of OTA traffic.

2.17 Interface to existing CDMA 2000 Networks

The OTA system shall be able to work in existing CDMA 2000 Network complying to TEC GRs No. GR/WLL-04 (for Radio Network), GR/MSC-01 (for MSC), GR/PCN-01 (for Packet Core Network) and GR/EDO-01 (for 1x EV-DO Network).

The OTA system shall have provision to interface with the existing above mentioned network including its adjunct elements as per the interfaces defined in the Chapter 6 of this document.

2.18 Standalone operation without integration with Billing System

The OTA system shall have provision for its own database server / database for operation without integration of the system with the billing system.

2.19 Download of NAM (Number Assignment Module)

The OTA system shall support the download of NAM module including the MIN and other parameters. It shall also be able to support the download of MDN (Mobile Directory number) and PRL block (Preferred Roaming List). It shall be able to download a maximum of 64Kbytes of PRL to the RS/AT, with option of reprogramming the same as the roaming agreement changes for the operator.

2.20 RS/AT Lock Support

OTA system shall support Lock & unlock of RS/AT based on SPL & SPC as per IS-683 (3GPP2 C.S-0016) & IS-725 (3GPP2 N.S0011) standard This feature shall allow the operators to distribute RS/AT (that are factory locked) into their network and prevent subsequent unauthorised updates of the RS/AT.

The OTA system shall be able to find the status of the lock during the OTA call, retrieve the unlock code, unlock the RS/AT and program it. The RS/AT shall be automatically locked when the call is completed. If the SPC needs to be modified subsequently then this shall also be done during an OTA call through the OTA system.

2.21 A-Key Support

The A-Key facilitates encryption on the Air interface of the CDMA network so that user identity (MIN, MDN) and user data are protected. A-key provides subscribers the important assurance that their conversations and data exchanges are secure. The A-key is only known to the AuC, HLR and the RS/AT.

The OTA system shall support interface with the HLR to create the A-key and download into the RS/AT memory, during the activation of the RS/AT in the CDMA network. For all subsequent calls the Base Station and RS/AT will use this A-key for encrypting the user data. The provision for modifying the A-key & SSD Over-the-Air subsequently through another call shall be there.

2.22 Customization

The OTA system along with the IVR shall be fully customizable as per the operators' business process.

2.23 Design Objectives

The design objectives with regard to Quality of Service shall be as follows:

- (i) Connection/session performance : Grade of Service (GOS) as per ITU-T Recommendation E.770
- (ii) Service retainability performance :As per ITU-T Recommendation E.800
- (iii) Reliability performance : As per ITU-T Recommendation E.800
- (iv) Initial connection time to the OTA system : 5-6 sec

2.24 Performance Parameters

The system shall meet the following Performance Parameters requirements, in the design process as well as the equipment performance.

- (a) Time to complete call: An OTASP call shall be finished within 4 minutes after the call set up for a PRL download of size of 1.5 Kbytes and 12 minutes after the call setup for a maximum PRL size of 64 Kbytes. This shall include A-key download and SSD update subject to obtaining user inputs as soon as the prompt is played out.
- (b) Cold Start: Cold start of the OTA system shall not exceed 9 minutes before the system is ready for call processing.
- (c) The CPU and Memory (RAM) utilization shall not exceed 70% while working at the maximum BHCA
- (d) The SS7 signalling link utilization shall not exceed 40% while working at the maximum BHCA.

2.25 Other Technical Requirements

a.	OTAF & CSC	IS-683 (3GPP2 C.S-0016), IS- 725 (3GPP2 N.S001) & TIA/EIA IS – 637
b.	Air Interface	TIA/EIA IS – 637, IS-683 (3GPP2 C.S-0016)
c.	Backward compatibility	IS-95
d.	IOTA based Capabilities (Optional)	(i) All of above OTAF and CSC capabilities (ii) Application provisioning (iii) Over-the-Air Software Download
e.	System capacity	(i) No. of simultaneous OTA calls : 360 (ii) BHCA (both OTASP & OTAPA) presuming a maximum of 4 minutes per OTA call. : 5400 (iii) PRL length : 64 K-bytes (iv) Minimum number of voice channel interface :120 (v) Minimum No. of E1 links : as per the requirement

CHAPTER 3

3 OTAF

3.1 General

It shall provide OTASP & OTAPA functionalities as per IS-683 (3GPP2 C.S-0016) & IS- 725 (3GPP2 N.S001) including communication with CSC, MSC/HLR, SMSC, etc. as per the interfaces given in Chapter 6.

3.2 OTASP

3.2.1 The Over-the-Air Service Provisioning (OTASP) feature shall allow a potential wireless service subscriber to activate (i.e., become authorized for) new wireless service, and allows an existing wireless subscriber to make changes in existing services without the intervention of a third party.

3.2.2 OTASP shall include the following:

- (i) A call to the service provider's customer service center.
- (ii) "Over-The-Air" programming of Number Assignment Modules (NAMs), and optionally, service provider or manufacturer specific parameters (e.g., lock code, call timer).
- (iii) An Authentication Key Generation procedure.

3.2.3 The OTASP feature shall have atleast the following objectives:

- i. To support OTASP on CDMA 2000 1x & 1x EV-DO Networks.
- ii. To simplify the service provisioning process for both the user and the wireless service provider.
- iii. To increase efficiency of RS/AT NAM programming and reduce the possibility of errors during initial service provisioning programming.
- iv. To enable a potential wireless user to easily choose a desired wireless service provider.
- v. To minimize the ability to fraudulently use wireless service.
- vi. To keep the distribution of the Authentication Key (A-key) secure.
- vii. To safeguard user information.

- 3.2.4** The OTASP application shall have atleast the following capabilities as per IS-725 and IS-683:
- i. Remote provisioning of new terminals under user request
 - ii. RS/AT (MS) protocol capabilities request
 - iii. A-key generation
 - iv. SSD generation
 - v. SSD updating
 - vi. RS/AT configuration request (NAM, etc)
 - vii. PRL download - support maximum 64KBytes size PRL
 - viii. MS unlock & change MS lock , SPL & SPC support
 - ix. Automatic generation of COMMIT messages
 - x. Independent NAM Parameter Block download
 - xi. Independent Mobile Directory Number download
 - xii. 3GPD parameters download
 - xiii. Re-Authentication (Mandatory for IS-683 & Optional for IS-725)
 - xiv. Independent IMSI_T Parameter Block download (Optional)

3.3 OTAPA

- 3.3.1** The OTA system shall support the NAM (inclusive of the MIN), MDN, PRL, A-Key, SPC download and reprogramming onto the RS/AT, upon initiation by the operator. This can be used for subsequent parameter updates on RS/AT once the RS/AT have been provisioned.
- 3.3.2** OTAPA sessions shall be initiated autonomously by the network, and proceed without any subscriber involvement or knowledge.
- 3.3.3** It shall be capable of upload/download of all the mobile parameters as listed below:
- SPASM authentication
 - CDMA Number Assignment Module (NAM)
 - Mobile Directory Number (MDN)
 - IMSI_T
 - Preferred Roaming List (PRL)
 - PRL dimensions
 - A-Key and Shared Secret Data (SSD) (can only be created newly. Mobile will not upload existing A-key & SSD).
 - Changing the Service Programming Lock Code (SPC)
 - Protocol Capability
 - 3G Packet Data profile parameters

- 3.3.4** The OTA System shall have a comprehensive OTAPA database through which the system operator can schedule and execute OTAPA on RS/AT of subscribers
- 3.3.5** It shall support re-attempt of OTAPA session at later time in case of non-availability of the RS/AT during the scheduled time. In these cases, where the OTAPA session is postponed, the OTA system shall re-initiate the OTAPA session for execution when the HLR sends a notification to OTA later, when mobile registers into the network and on the receipt of this message.
- 3.3.6** OTAPA database shall also support re-trying an OTAPA session which failed earlier. The retry period and maximum retry attempts shall be operator configurable.
- 3.3.7** The OTAPA database shall be capable of storing all details that need to be uploaded or downloaded. It shall also create detailed Call Detail Records (CDRs). The OTA solution shall have a mechanism for scheduling/viewing OTAPA sessions and Call Detail Records.

CHAPTER 4

4 Customer Service Center (CSC)

- 4.1 General:** The CSC is an entity where the calls originating from subscribers (to get their new RS/AT provisioned or to modify their services parameters) lands. Through CSC, the operator provides an interface to the customers wishing to use the OTA facility.
- 4.2** The CSC shall interface (proprietary) with the OTAF to perform network and RS/AT related changes necessary to complete the service provisioning request
- 4.3** CSC shall have an IVR system which enables automated voice response, and provides for secure and efficient interface to the OTAF system.
- 4.4** The CSC (IVR) shall be able to support at least Hindi, English and eight other regional languages. The list of regional languages to be supported may be specified by the tendering authority.
- 4.5** The CSC (IVR) shall be capable of taking various inputs from the subscribers like language preference, account number, and validation code, for verifying and retrieving the profile that needs to be downloaded to the RS/AT. The IVR shall be customizable based on the operator's business process requirements in the field.
- 4.6** CSC shall provide Triggers to execute OTASP Procedures for OTASP Data Message Exchange, A-key Generation, , SSD Update and Reauthentication as per IS-683 (3GPP2 C.S-0016) & IS- 725 (3GPP2 N.S001).
- 4.7** The CSC shall have the following IVR capabilities:
- (i) Recording and playback of messages/ announcements, personalized greeting messages, etc. It shall support atleast 50 numbers of different prompts /IVR messages. It shall include messages such as successful or unsuccessful provisioning, invalid data entry, invalid PIN, etc. and prompts such as numerical digits, music, asking the subscriber to wait etc. It shall support these messages /prompt for all business models such as Pre-paid, Post-paid, Reprogramming of already provisioned subscribers etc.

- (ii) Collection and storage of information from subscribers including subscriber number, if applicable.
 - (iii) Automatic initiation of call to the subscriber (**OPTIONAL**)
 - (iv) In case of failure of OTAF or under other predefined conditions, it shall be possible to route calls of subscriber(s) to a designated number/operator.
- 4.8** The CSC shall be dimensioned/designed such that it shall not become bottleneck for the performance as specified in clause 2.23, 2.24 and 2.25.

CHAPTER 5

5 OPERATIONS AND MAINTENANCE (O&M)

5.1 General

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

5.2 Objective of OMC

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

5.3 Redundancy, Scalability and interface to NMS

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 NMS.

5.4 Functions of OMC

The Operation & Maintenance function 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 OTA system. Events shall be 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. The OMC function shall support software installation and upgradation. It shall also provide real time configuration database access to manage and schedule OTAPA sessions for loading different set of parameters in different RS/AT, audit transactions, maintain reports and databases for these transactions.

- iii Performance Management:** The OMC function shall provide tools for the collection of statistics and call & session information into a database and logging file both for OTASP and OTAPA functionalities. It shall have capability of presenting the session completion report with RS/AT that could not be programmed successfully, based on a schedule. The 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. It shall have capability of providing atleast 10 multi-level access profiles with provision of defining profile for each type.
- v Fault Management:** OMC shall provide capability to query and change device states and provide control for system diagnostics. It shall be possible to monitor different protocols in real-time.
- vi Network statistics:** OMC shall provide data related to channel occupancy, rejected calls etc. with visual display of faulty elements of the network.

5.5 OMC shall have capacity to support Multiple OTAFs and CSCs and scalable to support at least up to 5 OTAFs & CSCs.

CHAPTER 6

6 INTERFACES

6.1 General

The system shall support interfaces as per IS-683 (3GPP2 C.S-0016) & IS-725 (3GPP2 N.S0011) standard with support for multiple E1 links (ports). 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 by the supplier and no interface (except for the interface between the OTAF & CSC) shall be proprietary in nature. The various interfaces are shown at Annex-1.

6.2 Interface between OTAF & RS/AT(Mobile Station)

This interface shall be as per IS-683 (3GPP2 C.S-0016) & IS-725 (3GPP2 N.S0011).

6.3 Interface between OTAF & CSC

It shall be as per X interface as mentioned in IS-725 (3GPP2 N.S0011) which may be proprietary implementation. It shall be implemented using E1 links. Optionally support for Ethernet/WAN interface may also be provided. In case of Ethernet/WAN interface, the necessary hardware and software (wherever required) to connect OTAF to CSC through E1 links, shall be provided by the vendor.

6.4 Interface between OTAF & MSC

It shall be as per Q1 interface as defined in IS-725 (3GPP2 N.S0011) and IS-41D/E standards and it shall be implemented using E1 links.

6.5 Interface between CSC & MSC

It shall support ISUP signaling and voice channels from the MSC to the CSC and shall be implemented using E1 links.

6.6 Interface between OTAF & HLR

It shall be as per N1 interface as defined in IS-725 (3GPP2 N.S0011) and IS-41D/E standards and it shall be implemented using E1 links.

6.7 Interface between OTAF & VLR (Optional)

It shall be as per D1 interface as defined in IS-725 (3GPP2 N.S0011) and IS-41D/E standards and it shall be implemented using E1 links.

6.8 Interface Between CSC & SMSC

Interface between CSC and SMSC is optional in case the SMSC feature is inbuilt in the OTA system.

For OTA system where interface between CSC and MSC is required, then it shall be as per SMPP v3.4 standards on TCP/IP over Ethernet interface (10/100 Base T).

6.9 Interface between OTAF & OTAF (Optional)

It shall be as per V interface as defined in IS-725 (3GPP2 N.S0011) and IS-41D/E standards and it shall be implemented using E1 links.

6.10 Interface between CSC & Billing System

It shall be over Ethernet interface on 10/100 Base T link. This interface shall be customizable as per the format & interfaces supported by the mediation device used for billing system. The supplier shall work with mediation & billing system vendor for integration and provide the extra hardware or software (if required) for the purpose of integration.

6.11 Interface between OTA & OMC

Proper interface and interconnection shall be provided by equipment supplier and details furnished. It shall be possible to control multiple OTAFs and CSCs through a single OMC. Thus while the physical connection from the OMC to one OTA system may be through LAN connectivity, connection to other remote OTAs shall be possible through WAN connectivity.

6.12 Interface between OTAF & PCN

It shall be over Ethernet interface on 10/100 Base T link. HTTP interface shall be used for IOTA provisioning.

PART-2

CHAPTER 7

7 General Requirements

7.1 Engineering Requirements

7.1.1 Hardware

7.1.1.1 General

- ii. Compact and high-performance state-of-the-art hardware shall be used.
- iii. All components used shall be of rugged construction and shall be suitably designated by a label or sign-writing.
- iv. All necessary hardware and software required for redundancy shall be provided.
- v. The system hardware shall be modular in design to permit growth in small steps.
- vi. The system shall use fully digital techniques for switching.
- vii. The variety of hardware modules and components used in the system shall be minimum.
- viii. 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.
- ix. 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.
- x. All the components used are to be approved and qualified as per the procedures of the QA wing of BSNL. The source of procurement of components is also required to be submitted by the manufacturers.

7.1.1.2 Processors

- (i) 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.
- (ii) 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.
- (iii) 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.

7.1.1.3 Input-Output devices

- (i) The communication facilities provided for exchange of information between the 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 Recommendation 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 Network Management Server.
- (vi) On a fault condition the system shall identify 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.

7.1.1.4 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 epoxy 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) The supplier shall indicate the various types of cables and wires used in the system. Detailed particulars of any special wires and cables like standardized coaxial, screened cable, etc. shall be furnished with their actual usage in the system.
- (viii) 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 such interference.
- (ix) The points for connecting the power supplies to the different plug-in cards shall be standardized and mechanically interchangeable. Otherwise suitable mechanical safeguards shall be provided to prevent damage due to accidental inter-change of cards.
- (x) The supplier shall indicate the requirement at the external interface against induced voltages and currents due to lightning, high power system, etc.
- (xi) The system shall provide for isolation and protection from accidental high voltage power contact.

7.1.2 Ease of Expansion

Expansion techniques of the equipment shall be easy, economical and shall not interrupt a working system. Expansion shall be possible when the number of OPASP & OTAPA sessions increases due to increase in subscribers in the area 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.

7.1.3 Software

7.1.3.1 General

- (i) The software shall be modular and structured.
- (ii) 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.
- (iii) The functional modularity of the software shall permit introduction of changes wherever necessary with least impact on other modules.
- (iv) 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.
- (v) Adequate flexibility shall be available to easily adopt changes in service features and facilities and technological evolution in hardware.
- (vi) The design shall be such that propagation of software faults is contained.
- (vii) The software shall provide sufficient checks to monitor the correct functioning of the system.
- (viii) Test programs shall include fault tracing for detection and localization of system faults.
- (ix) The normal operation of the system shall not be adversely affected while undertaking :
 - (a) Extension to system (Hardware expansion)
 - (b) Enhancement of system facilities.
 - (c) Correction to programs or functional blocks.
- (x) 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.
- (xi) The equipment supplier shall undertake to supply on continuing basis all software updates. 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.

- (xii) The equipment supplier shall provide any software modification necessary due to modification of software in the inter-working with other network elements.
- (xiii) Provision shall be there to check checksum, software version, service version, operating version etc., through MML command.

7.1.3.2 Diagnostic programs to localize 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 at least 95% of the types of PCBs.

7.1.3.3 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.

7.1.3.4 Right to use

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

7.1.4 Man-Machine Communication

7.1.4.1 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 (MML) 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 MML 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 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 canceling 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.

7.1.4.2 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 is 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.

7.1.4.3 Man-machine dialogue

- (i) The 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.

7.1.4.4 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.

7.1.5 Markings

- (i) Equipment on the bay, whether of fixed or plug-in type, shall be suitably marked. Identification of 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.

7.1.6 Hot-Swappable: All main control and processing modules cards shall be hot- swappable.

7.1.7 Dimensions, Weight & Mounting

The equipment shall each be of self supported cabinet or rack type. Maximum height of rack shall be restricted to 2100mm. To have greater flexibility for operations, front-only serviceable racks are preferred. Actual dimension and weight of each of the equipment shall be indicated by the equipment supplier.

7.1.8 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.

7.1.9 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, shall have to be specified by equipment supplier. The availability figures shall be 99.999% for OTA system.

7.1.10 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. Individual channel element functionality shall be also be monitored to prevent call blocking due to a lack of channel element resources.

7.1.11 Dimensioning

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

7.1.12 Field Proveness

The equipment shall be fully solid state, field proven and shall adopt latest state-of-the-art technology. The details of inter-operability with different vendors' network elements shall be provided. The tendering authority may specify this in terms of the equipment been field deployed commercially across multiple networks for a reasonable period of time and reasonable numbers of subscribers / RS provisioned through the system. .

7.2 Operational Requirements

7.2.1 Supervision

The OTA system shall automatically supervise the status of different interfaces and functional modules and shall take corrective actions and raise alarms. It shall also have provision to quarry the status of interfaces and functional modules.

7.2.2 Alarm Indications

In case of all major alarms (any event that leads to system switch-over or service disruption) in the OTA system, both audio and visual alarm indications shall be provided. In case of minor alarms in OTA system, visual alarm indications shall be provided and provision of audio alarms is desirable. The provision to communicate the alarm through SMS/VMS, to a predefined number, shall be there.

7.2.3 Transportation & Storage

The system shall comply with transportation and storage requirement as specified in QM-333.

7.2.4 No problem due to change in date/time/year etc.

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

7.3 Quality Requirements

7.3.1 Components

- (a) All the components used shall have to be approved and qualified as per procedure specified in QA BSNL 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.

7.3.2 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 BSNL 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}.

7.3.3 Redundancy

The control equipment as well as Power Supply shall be provided with 1+1 hot standby / N+1 mode redundancy. The server shall have minimum of CPUs with redundant data storage capabilities using standard RAID or Disk mirroring mechanisms. The redundancy shall be 99.999.

7.3.4 Environmental Specifications

As per Category A of QM-333.

7.4 Maintenance Requirement

- (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.

7.5 Power Supply

7.5.1 Power Supply unit

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

7.5.2 Input Supply

The OTA system shall operate on Nominal input supply of -48 V DC over the voltage range of -44.4 V to -56.4 V.

The system operating on Nominal input supply of 230 VAC over voltage ranges of 160-270 V and frequency range of 50 Hz \pm 2Hz, is also acceptable. In this case, the power system for conversion of DC to AC shall be provided by the supplier

7.5.3 Protection

The protection for input over voltage, under voltage, input reverse polarity and short circuit protection shall be provided.

7.5.4 Power consumption

The equipment shall have low power consumption. The actual power consumption shall be specified by the supplier.

7.6 Documentation

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

(i) System Description Documents

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 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) System Configuration 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 organizing training in installation, operation and maintenance and repair of the system shall be made available.

7.6.2 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.

7.6.3 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.

7.6.4 The structure and scope of each document shall be clearly described.

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

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

7.7 Protection

The equipment shall have adequate protection against lightning & power surges. All equipment shall have provision for grounding.

7.8 Safety Requirements

- a. The operating personnel shall be protected against shock hazards as per IS 8437 (1993) – Guide on the effects of current passing through the human body (equivalent to IEC publications 60479-1 (1984).
- b. The equipment shall conform to IS 13252 (2003) – Safety of information technology equipment including electrical business equipment (equivalent to IEC publication 60950 (2001) and IEC 60215 (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.

7.9 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 from test agency. The test agency for EMI/EMC compliance shall be an accredited one and details of accreditation shall be submitted.

- a) Conducted and radiated emissions: - OTA System shall comply with CISPR 22 {2003} "Limits and methods of measurement of radio disturbance characteristics of Information Technology Equipment" as per Class A.
- 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 { ± 4 kV};
 - Air discharge level 3 { ± 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; 1 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 line to earth coupling and line to line coupling :- To comply with IEC 61000-4-5 {2001} "Test & Measurement techniques for Surge immunity tests" under test levels of 0.5kV for line to line coupling and 1kV for line to earth coupling;
- 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.

Note1: For tests for checking compliance to above EMC requirements, the methods of measurement shall be in accordance with TEC standard No. SD/EMI-02 and references mentioned therein. Alternatively, corresponding relevant Euro Norms of the above IEC/CISPR

standards are also acceptable subject to the condition that frequency range and test level are met as per above mentioned sub clauses (a) to (f) and TEC standard No. SD/EMI-02. The details of IEC/CISPR and corresponding EURO Norms are as follows

IEC/CISPR	EURO Norm
CISPR 22	EN55022
IEC 61000-4-2	EN61000-4-2
IEC 61000-4-3	EN61000-4-3
IEC 61000-4-4	EN61000-4-4
IEC 61000-4-5	EN61000-4-5
IEC 61000-4-6	EN61000-4-6

7.10 Reference to latest version of all documents/standards

The latest version of the references mentioned in this document, at the time of publication, is given in the 'References'. All the references are subject to revision hence all the users (including tendering authority) are encouraged to investigate the possibility of applying the most recent edition of these references.

ANNEX –I

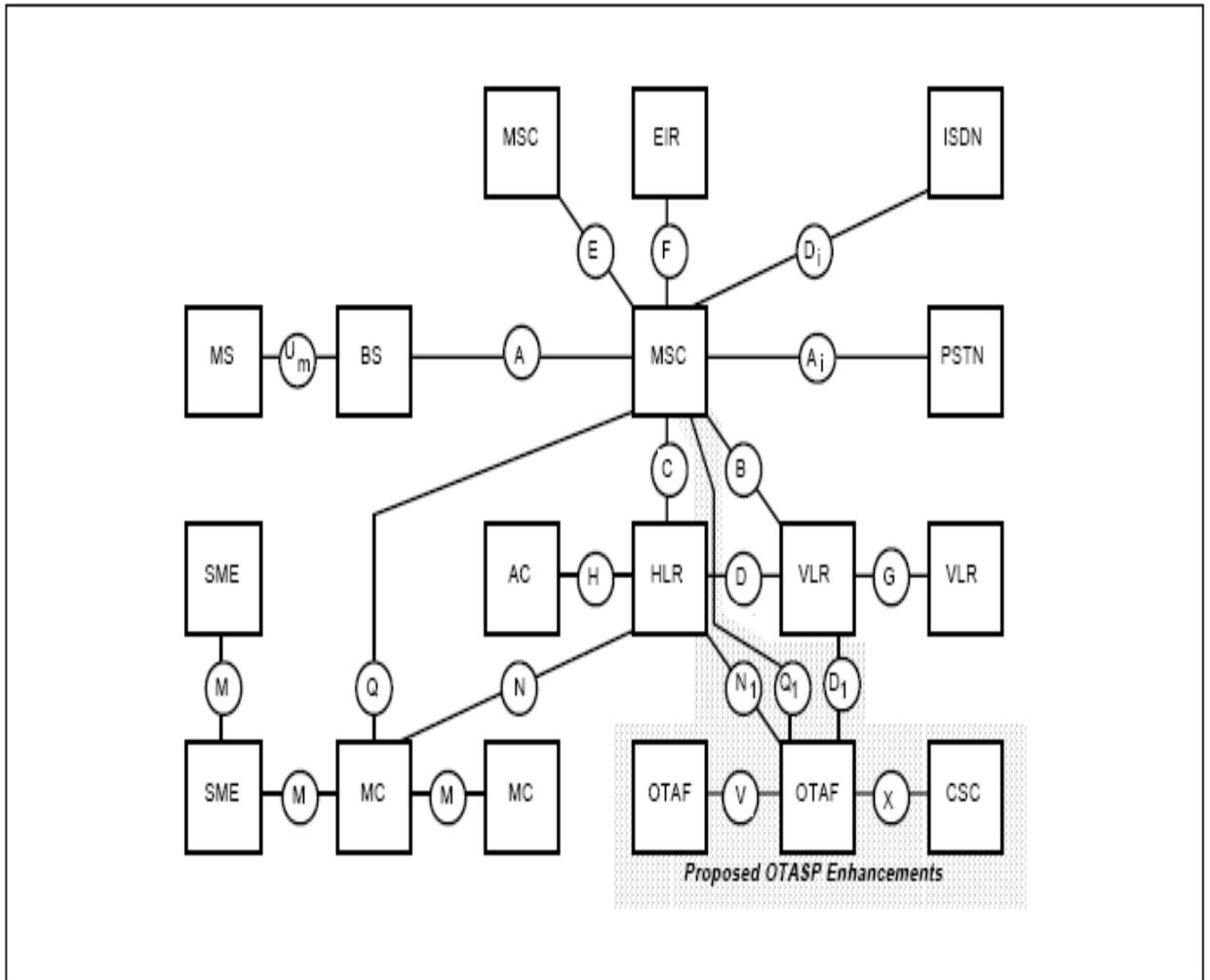


Figure-1 Network Reference Model for OTA System

Source: 3GPP2 N.S0011 / TIA/EIA-41.1-D, Section 5)

Note : 'MS' has been referred as RS/AT in this document.

ANNEX –II

Information for the Tendering Authority

1. **Clause 2.5 & 2.6**
The Tendering Authority may review these “Optional” features w.r.t. availability of OTA system supporting these features.
2. **Clause 2.15**
The tendering authority may specify the requirements for Billing Interface.
3. **Clause 2.25 and Clause 2.25 :**
The tendering authority may review the Performance parameters and System dimensions & Capacities as per the actual deployment plan and accordingly these values may be specified.
4. **Clause 4.7 :**
The tendering authority may specify in detail the customization of messages & prompts in CSC (IVR) as per the requirements.
5. **Clause 5.3 :**
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) to be provided for interfacing with the NMS.
6. **Chapter 6 :**
The tendering authority may specify the types of interfaces as well as the number of such interfaces and ports for each subsystem.
7. **Clause 7.1.12 :**
The tendering authority may mention, as part of the eligibility criteria, the requirement of equipment having been deployed in multiple countries and networks for a minimum period of six months or any other period, as deemed fit by the tendering authority. Tendering authority may also specify the various technologies / vendors of CDMA 2000 1x & EV-DO and associated sub systems with which this system has to interoperate.
8. **Clause 7.10 :**
The latest version of the references mentioned in the document, at the time of publication, is given in the ‘References’. All the references are subject to revision, hence Tendering authority may consult TEC with respect to latest version/revision of references, features etc. at the time of tender.
9. The Tendering Authority may review all “Optional” features indicated in this GR and may consider making them “mandatory” if required.

ABBREVIATIONS

3GPD	Third Generation Packet Data
AC	Alternating Current
A-Key	Authentication Key
API	Application Program Interface
AT	Access Terminal
AUC	Authentication Centre
BHCA	Busy Hour Call Attempt
BSNL	Bharat Sanchar Nigam Limited
CSC	Customer Service Centre
CDMA	Code Division Multiple Access
CDR	Call Detail Record
CD-ROM	Compact Disc Read Only Memory
CMIP	Common Management Information Protocol
CPU	Central Processing Unit
DC	Direct Current
DOT	Department of Telecommunications
EMC	Electromagnetic Compatibility
EV-DO	Evolution-Data Only
FR4	Flame Retardant Type 4 (woven glass reinforced epoxy resin)
FWT	Fixed Wireless Terminal
GOS	Grade of Service
GR	Generic Requirements
GUI	Graphical User Interface
HCM	Handset Configuration Management
HLR	Home Location Register
HRPD	High Rate Packet Data
HTTP	Hyper Text Transfer Protocol
HZ	Hertz
I/O	Input /Output
IMSI_T	International Mobile Station Identity
IOTA	IP Based Over-the-Air
IS	Interim Standards of TIA/EIA, BIS Standards
ISUP	ISDN User Part
IVR	Interactive Voice Responder
kV	Kilo Volt
LAN	Local Area Network
MDN	Mobile Directory Number
MIN	Mobile Identification Number
MMC	Man-Machine Commands
MML	Man-Machine Language
MSC	Mobile Switching Center
MTBF	Mean Time Between Failure

MTTR	Mean Time Restore
NAM	Number Assignment Module
NMS	Network Management System
O & M	Operation & Maintenance
OTA	Over-the-Air
OTAF	Over-the-Air Service Provisioning Function
OTAMD	Over-the-Air Mobile Diagnostics
OTAPA	Over-the-Air Parameter Administration
OTASP	Over-the-Air Service Provisioning
PC	Personal Computer
PCB	Printed Card Board
PCN	Packet Core Network
PIN	Postal Index Number
PRL	Preferred Roaming List
QA	Quality Assurance Circle of BSNL
QoS	Quality of Service
RAM	Random Access Memory
RS	Remote Stations
R-UIM	Removable User Identity Module
SDCA	Short Distance Charging Area
SMPP	Short Message Peer to Peer
SNMP	Simple Network Management Protocol
SMS	Short Message Service
SPASM	Subscriber Parameter Administration Security Mechanism
SPC	Service Programming Code
SPL	Service Programming Lock
SS7	Signalling System 7
SSD	Shared Secret Data
STM	Synchronous Transport Module
TCP/IP	Transmission Control Protocol/Internet Protocol
TEC	Telecom Engineering Centre
TIA	Telecom Industry Association
TMN	Telecom Management Network
VLR	Visitor Location Register
WAN	Wide Area Network

END OF THE DOCUMENT