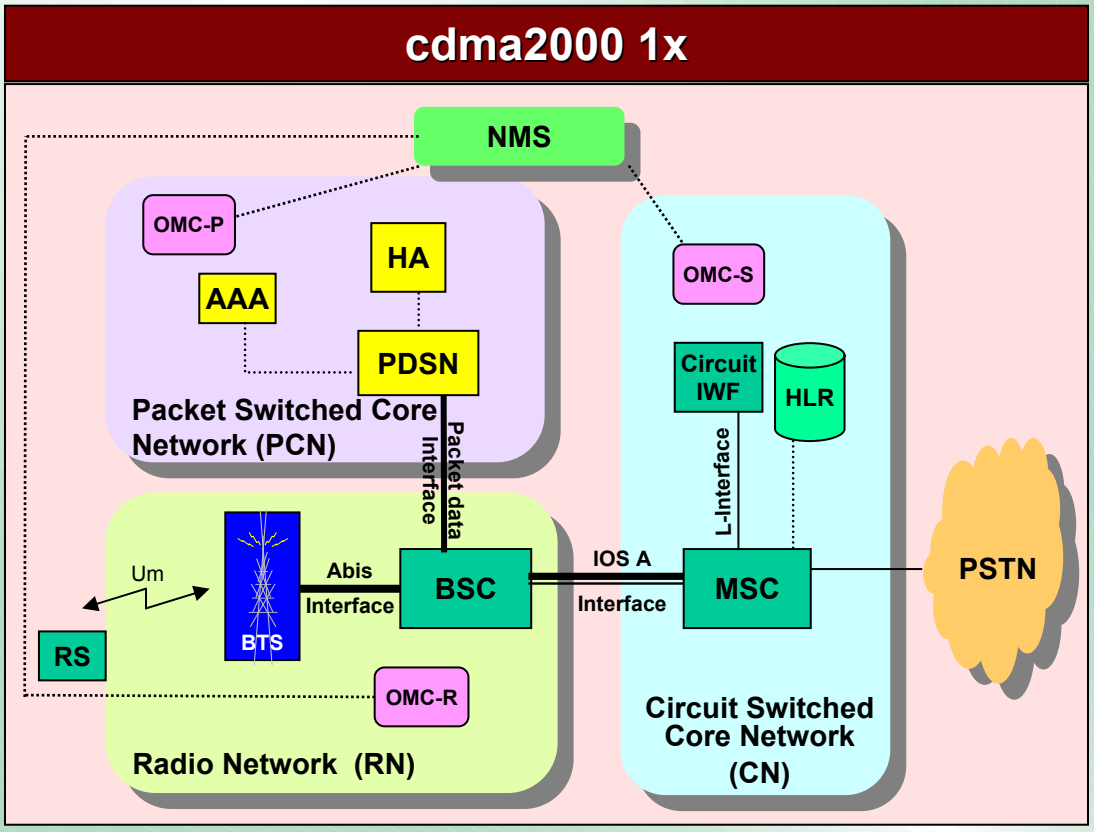
TELECOMMUNICATION ENGINEERING CENTRE

TEC NEWSLETTER

VOL 7 JUNE 2003 ISSUE 2



IN THIS ISSUE

Foreword

Telecom technologies are evolving at an unbelievable pace. In a privatised and competitive telecom scenario, technology plays a vital role. Deployment of right technology at right time gives a tremendous lead to an operator in providing new services and may initiate a market churn. Mobile communications and Internet are today's extremely high-growth sectors. The second generation (2G) mobile systems currently deployed worldwide are migrating towards third generation (3G) mobile systems and are expected to provide broadband interactive multi-media services to subscribers on the move.

I am happy to note that Telecom Engineering Centre has been providing information on telecom technology updates through TEC Newsletter.

K.H. Khan
Member (Technology),
Telecom Commission

cdma2000 1x

cdma2000 is a 3rd Generation Mobile Technology backward compatible with 2nd generation IS 95A Technology currently deployed for WLL applications by Fixed (Basic) Service providers. It is based on TIA/EIA (Telecom Industry Association/ Electronic Industry Association, USA) and 3G PP2 (Third Generation Partnership Project 2) standards.

Its various Derivatives are:

- cdma2000 1x
- cdma2000 1x EV DO – Data Optimised
  No voice traffic
- cdma2000 1x EV DV– Data and Voice
- cdma2000 3x

The standard is divided into two phases: 1x and 3x. 1x is used to signify that the standard carrier on the air interface is 1.25 MHz, the same as for IS95A/B. 3x is a multi-carrier approach, and is used to signify 3 times standard carrier of 1.25 MHz or 3.75 MHz. Thus, 3x implementation requires minimum 5 MHz spectrum band width if guard band of 0.625 MHz is included on both sides.

cdma2000 1x delivers approximately twice the voice capacity compared to IS 95 A because it uses a new modulation scheme. It provides average data rates of 144 Kbps. Upgradation of IS95 A to cdma2000 1x requires software upgrades in base station, base station controller (and some times in mobile switch centre) for incorporating enhanced features. Due to change in modulation scheme, this upgradation requires replacement of channel cards in BTS. Further, a new packet data router is also required to be deployed.

cdma evolution path also includes provision of higher data rates in the existing 1.25 MHz bandwidth through upgradation to 1x EV. This has two phases. 1st phase is known as 1x EV-DO (Data only) supporting data rates upto 2.4 Mbps and does not support voice. This can be used as an overlay over the existing 1x or IS 95 A systems to provide high speed data services. 2nd phase is known as 1x EV-DV (Data and Voice) supporting both data and voice services. The final stage of cdma evolution is multi-carrier cdma2000 3x, requiring a minimum band width of 5 MHz. This stage of upgradation is expected to require at least software upgrades in base station and base station controller and replacement of channel modem cards in base station controller.

The key characteristics of cdma2000 are:

(i) Backward Compatibility with IS 95A deployments and provides easy and cost effective migration from 2G to 3G services.
(ii) Voice Capacity is 2 times the voice capacity of IS 95A.
(iii) High Speed Packet Data (144 Kbps to 2.4 Mbps) support.
(iv) Extended Battery Life/talk time of mobile unit as compared to IS 95 A mobile unit.

Generic Model of cdma2000 Network:
(Refer to Schematic on the Cover Page)

(i) Radio Network (RN) consists of:
- Base Transceivers Stations (BTS) and
- Base Station Controllers (BSC)

(ii) Circuit Switched Core Network consists of:
- Mobile Switching Centre (MSC)
- Home Location Register (HLR)
- Visitor Location Register (VLR)
- Equipment Identity Register (EIR)
- Authentication Centre (AUC)
- Inter Working Unit (IWU)

(iii) Packet Switched Core Network consists of:
- **Packet Control Function (PCF)** - It is a hardware/software that activates the packet forming and switching capability. It also provides packet data transfer and routing from a wireless network to a wired network, or vice versa.

- **Packet Data Service Node (PDSN)** is basically a packet router that establishes, maintains and terminates the Point-to-Point Protocol (PPP) sessions to the Mobile Terminal (MT) and to the Home Agent (HA). It assigns IP addresses for mobile networks; supports Foreign Agent (FA) functionality & acts as a client AAA server.
- **Authentication, Authorization and Accounting (AAA) Centre** - It passes authentication requests from the PDSN to the home IP network and the authorisation responses from the home IP network to the PDSN. It stores accounting information for the Remote Station (RS) received from the PDSN. It provides a user profile and Q.O.S. information to the PDSN as received from the home IP network.

(iv) Remote Station consisting of:

- User Interface Module (UIM)
- Mobile Terminal (MT)

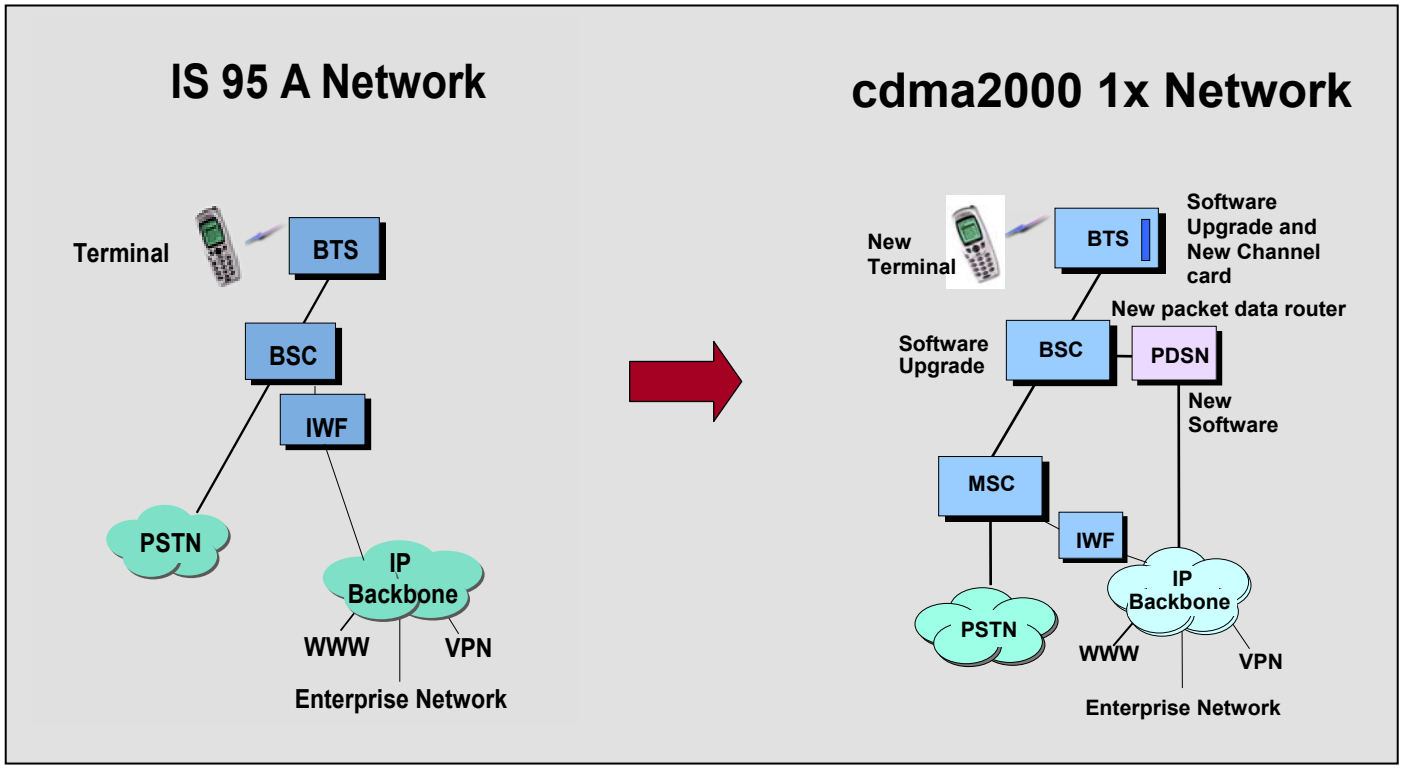
(v) Operations and Maintenance Centre (OMC)

Interfaces

- BSC - MSC (A-interface*) – supports signalling and traffic for both voice and data. A-Interface protocols have been defined in Inter-Operability- Specifications (IOS) based on TIA IS-634.
- BTS-BSC (Abis Interface)
- MSC-PSTN (Ai interface)
- MSC-IWF (L-Interface)
- BTS-RS (Um-Interface - the air interface
- MSC-MSC (E-Interface) - the traffic and signalling interface between wireless networks, defined in the TIA IS-41 protocol specification.

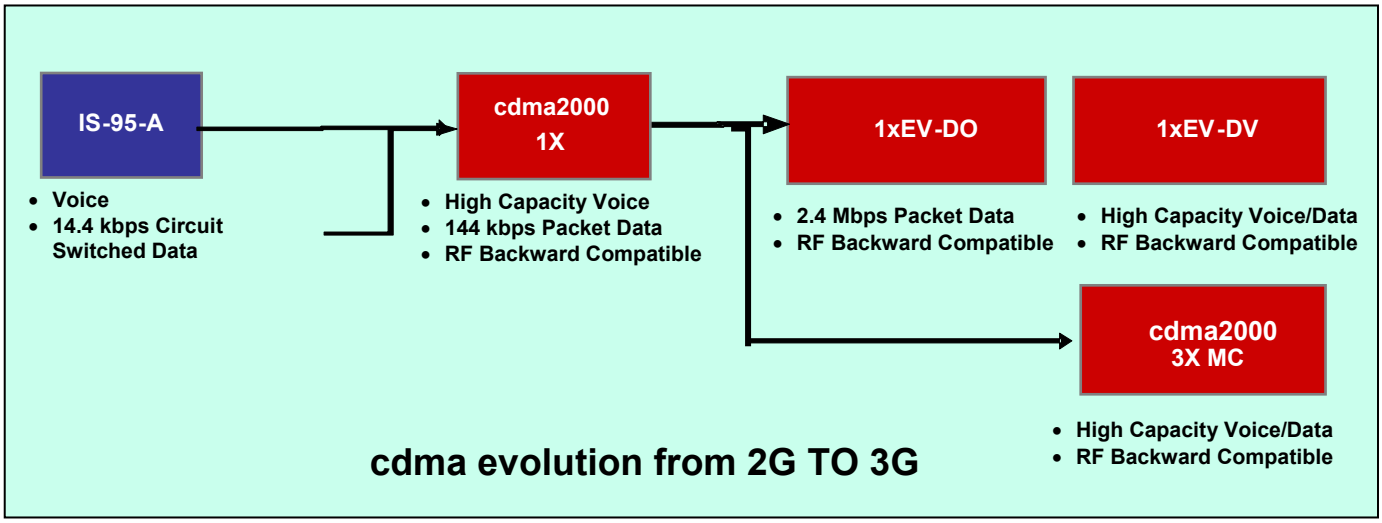
** A-Interface defines a set of open inter-working protocols between the BSC and all of its adjacent nodes.*

- *A1/A2 defines MSC to BSC interface for PSTN connectivity.*
  - *A1: MSC to BSC signalling link is based on the SS7 protocol stack.*
  - *A2: MSC to BSC traffic link is an E1 interface.*
- *A3/A7 defines BSC to BSC interface for soft handoff support.*
  - *A3: BSC to BSC traffic link is an ATM interface using nailed up ATM AAL2 SVCs.*
  - *A7: BSC to BSC signalling link is based on the TCP/IP protocol stack carried over ATM AAL5.*
- *A10/A11 defines BSC (or in particular, the PCF) to the PDSN interface for packet data calls.*
  - *A10: BSC to PDSN traffic link, based on IP protocol stack.*
  - *A11: BSC to PDSN signalling link, based on IP protocol stack.*
- *A8/A9 defines BSC to PCF interface for packet data calls.*



Functional Comparison between IS95A and cdma2000

S. No.		IS 95 A	CDMA 2000 1x
1.	Voice	Supported	Supported
2.	Circuit Switched Data	14.4 Kbps max.	144 Kbps max
3.	Packet Switched Data	-	144 Kbps (max.) achieved due to * Improved handoff management * Improved forward error correction * Turbo codes * Stronger Convolutional codes * Fundamental traffic channel + Supplemental traffic channels
4.	Voice Capacity	n	1.6 n to 2 n due to * Faster Power Control on Forward Link * Transmit Diversity * Improved modulation technique * Better error correction through stronger convolutional codes * Continuous pilot on the reverse link * Walsh codes
5.	RF Carrier	1.25 MHz	1.25 MHz
6.	Modulation	BPSK	QPSK
7.	Backward Compatibility	-	Backward compatible with IS 95 A
8.	Battery Life	-	Significantly improved battery standby times through * Quick Paging Channel * Faster Power Control
9.	IP Support	Simple IP	Simple IP as well as Mobile IP.
10.	High Speed Data Services	-	Supported.
11.	Different Q.O.S. for various applications	-	Supported.



TELECOMMUNICATION MANAGEMENT DURING DISASTER

Natural disasters like high intensity cyclone, hurricane, earthquake etc., cause large-scale disruption to telecommunications by destroying the telecom infrastructure like towers, buildings, exchanges, cables etc. The other disasters like land slide, heavy rain, cloud burst, affect telecom services in a local area. There are man-made disasters also like airplane/train accidents etc.

Management of telecommunications during disaster can be depicted by an eight fold path shown below. The preparedness to meet the situation of disaster in an effective manner requires advance planning. Local response is the first element of relief and is a crucial factor in all cases. No national or international assistance can replace the response by local emergency services. The quicker the response, the faster is recovery in any disaster situation. The response in terms of information, help in protection of life and property requires immediate telecommunications. Disaster communications need to concentrate on the response phase, but their effectiveness depends on preparedness. A well defined National 'Disaster Management' structure should be in place based on the evaluation of problems, constraints, equipment and personnel involved.

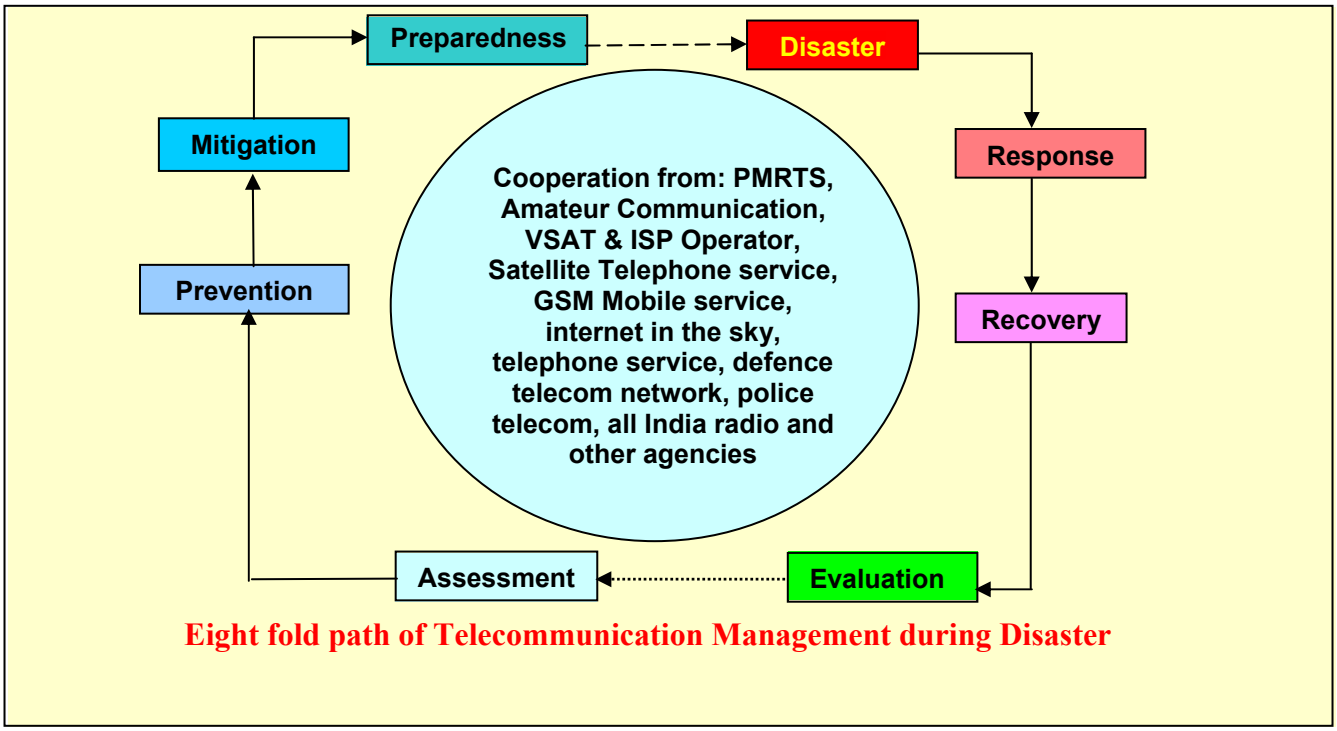
Maintenance of Data Base

During a disaster the following information becomes handy, if it is readily available/accessible:

- Geographic Information System (GIS) information of the area
- Administrative authority in the area and telephone numbers
- Telecommunication infrastructure installations in affected area including details of amateur service, Very Small Aperture Terminal (VSAT) operator, Radio Taxi service, Global Service Mobile (GSM) Service, Internet Service Provider (ISP) service, medical service including remote tele-medicine service
- Details of possible emergency communication,
- Persons responsible and their contact information
- History of earlier disasters and mitigation action taken
- News information and forecasting of cyclone, rainfall, land slide etc. and alert information.

Emergency Telecommunication Systems :

Satellite telephone becomes handy when all other types of communication fail. Help of Amateur Radio Service and Amateur Satellite (AMSAT) Service could be taken.



Eight fold path of Telecommunication Management during Disaster

Special Communication equipment based on satellite, GSM, Land Mobile Data Service (LMDS), VSAT could be installed with collapsible tower fitted in it in a van and could be taken to disaster area. Connectivity to near by PLMN should be possible via radio or satellite or optical fibre cable. The van should be equipped with SMPS power supply with sufficient battery backup. This will make immediate voice, video and Internet communication possible. The data base could be accessed to get required information.

The building fell like playing cards!

Besides these local narrowband communications, there can be broadband wireless Internet in the sky via satellite or High Altitude Platform System (HAPS) to provide tele-medicine service, GIS information, access to relevant database and other basic information at the time of disaster.

The Trunk Automatic Exchanges (TAXs) will get congested due to heavy traffic in view of heavy information exchanges and anxiety calls. In order to manage the telephone traffic, major city exchanges can be directly parented to other TAXs bypassing the local TAX.

International Activity:

Working Group on Emergency Telecommunication (WGET) /Inter-Agency Standing Committee, Reference Group on Telecommunication (IASC-RGT) of United Nation have given emphasis on:

- Inter-operability of telecommunications networks in the field through common standard and gateway
- Use of telecommunication for the safety and security of humanitarian personnel
- Optimal use of available telecommunications resources and expertise through Inter-Agency cooperation and provision of surge-capacity for IT and telecommunication
- Cooperation with the Private Sector.

MESA Project:

MESA (Mobility for Emergency Safety Applications), the partnership project of European Telecommunications Standards Institute (ETSI) and Telecommunications Industry Association (TIA) of USA, has been working on 2 Mbps and above advanced digital mobile broadband communication for Public Protection and Disaster Relief (PPDR) to access remote area of disasters. The applications include:

- **Enabling remote command and control** – for rescue efforts
- **Remote Patient Monitoring** – for providing effective medical assistance to injured citizens
- **Mobile Robotics** – for rescue of people from hazardous area, automated inspection of non accessible area, anti terrorist actions, and clearing of land mine from the effected areas
- **MESA fire-fighter** – to secure their own and save other people's lives by using real time vital parameter monitoring
- **Elevated Back- Haul Gateways**
- **Ad-hoc networking capability** – the ability of a terminal to work automatically as a small 'base node' in the absence of fixed infrastructure
- A variety of other applications e.g. technological need for wireless transport and distribution of rate intensive data, digital video and digital voice.

ITU Activity:

The relevant ITU documents are:

- The agenda item 1.3 of WRC 03 for recognition of frequency bands for PPDR applications.
- ITU-R Recommendations: F.1105, M.1036
- Report ITU-R M.[PPDR] 'Objectives and requirements for PPDR radio communication'
- Recommendation ITU-D 13, 'Effective utilization of the amateur services in disaster mitigation and relief operations'
- The ITU 'Disaster communications handbook for developing countries'.

IMPORTANT ACTIVITIES OF TEC DURING JANUARY TO JUNE 2003

A. Preparation of GRs/IRs & Technical documents

Following GRs/IRs and Technical documents issued:

GRs

- CorDECT Router.
- SMS Phone for PSTN.
- 15 GHz & 18 GHz STM-1 SDH Microwave equipment.
- Digital Circuit Multiplication Equipment (DCME) with 20:1 gain.
- Digital Network Synchronisation Equipment (Stand Alone).
- Feeder Cable for 900 MHz & 1800 MHz frequency band (890-960 MHz & 1710-1880).
- GSM Base station Panel Antenna & Omni Antenna in frequency band 890-960 MHz & 1710-1880 MHz.
- Intrusion Detection System.
- MCPC VSAT with enhanced capacity network operating in C band.
- Electronic Mail Service.
- MPLS Protocol & Performance Analyser.
- National TCAP standard.
- Scratch Card.

IR

- SMS Phone for PSTN.

Revised GRs

- 7 GHz SUB STM-1 SDH Microwave equipment.
- 13 GHz 34/ 16x3 mbps Microwave equipment.
- 2 GHz Grid Paraboloid Antenna.
- 3 m Earth Station Antenna Operating in C band.
- 6 GHz Waveguide.
- 6 GHz, 7 GHz, 11 GHz & 13 GHz High Performance Antenna.
- 64/128 Kbps Line Driver.
- Digital Network Synchronisation Equipment.
- Digital Cross Talk and Attenuation Tester.
- 55K Low Noise Amplifier Subsystem operating in extended C band on INSAT II series.
- Voice Mail System.
- Voice Mail Service specification.
- Interactive Voice System.
- Service description for Analog subscriber.
- Digital switch with Operator Sub-system.

Revised IRs

- Privately owned PABXs with 2 wire interface & DID interface.
- Electronic Telephone Instruments.
- Technical Paper on QoS for VoIP based ILD service.

B. Tests and Field trials

Tests/field trials have been carried out for:

- CDOT CNMS.
- CorDect WLL System in (1880-1900 MHz), Type I (5+0.5) mm braided cable.
- New software for WLL R2 CDMA expansion equipment of M/s LG.
- STM-1 System of M/s SPENL.
- Very Long Haul System of M/s ITI.
- 32 Channels DWDM of M/s HFCL.
- 4/1 Digital Cross Connect of M/s HFCL.

C. Other Activities

- **Manufacturer Forum conducted for**
  - Accessories for Feeder Cable, Antennas and Wave guides.
  - Various Optical Fibre Cables and SDH M/W in 4 GHz, 6 GHz and 11 GHz frequency bands.
  - Scratch Cards for prepaid services in GSM.
  - Customer Premises equipment at STM-1.
  - 4/1 Digital Access Cross-Connect.
  - Coarse & Dense Wavelength Division Multiplexer 40/80 Channels.
  - DLC over SDH-IP platform.
  - Implementation of Pre-Paid service roaming based on CAMEL Phase-II.
  - 1.2 m Earth Station Antenna in C band.
  - Long Distance Satellite Telephone.
  - Digital Satellite Phone System in Ku band.
  - 3W/ 6W SSPA in Ku band.
  - Up/Down Converter in Ku band.
  - VSAT Networks.

Approvals issued by TEC upto 31.06.2003

Type Approvals.....	6262
Interface Approvals.....	3632
Service Test Certificates.....	1546
Grand Total	**11440**

Approvals issued by TEC during the period January 2003 to June 2003

Type Approvals.....	351
Interface Approvals.....	178
Service Test Certificates.....	31
Total	**560**

WORLD TELECOMMUNICATION DAY 2003

ITU-T has selected "Helping all of the world's people to communicate" to celebrate the World Telecom day on 17th May 2003.

Today's telecommunication world would not be what it is without the untiring efforts of the ITU to help countries harmonize their national policies, bridge technological differences, foster interconnectivity and interoperability of systems on a global scale. Anytime, anyone makes a phone call, checks their email, watches television or surfs the Web, they benefit from the work of the world's first universal organization: ITU. For over 135 years, ITU has been helping people to communicate. But its mission is also to bring the benefits of information and communication technologies to all of the world's inhabitants.

The need for ITU to focus on a global policy perspective does not mean we intend to turn our back on the specific needs of Member States or on the telecommunication industry. However , we must acknowledge that the broader goals of humanity, such as those expressed in the UN Millennium Declaration, will be much easier to achieve once developing countries benefit from the same ubiquity of advanced information and communication technologies as developed countries.

World Telecommunication Day 2003 is therefore an excellent opportunity to launch public campaigns and advocacy activities in favour of greater access to ICT and how the work of ITU helps all of the world's people to communicate.

(Source: ITU web site)

Message by Mr. Kofi A. ANNAN, Secretary- General, United Nations

The theme of World Telecommunication Day – "Helping all of the world's people to communicate"- reminds us once again of the crucial role of communication in all areas of human endeavour. It also reminds us that millions of people in the poorest countries are still excluded from the "right to communicate", increasingly seen as a fundamental human right.

"Helping all of the world's people to communicate" is an integral part of the Millennium Development Goals, agreed upon by Heads of State and Government at the United Nations Millennium Summit in 2000. In particular, the eighth Millennium Development Goal aims "to develop a global partnership for development" and, "in cooperation with the private sector, make available the benefits of new technologies, especially information and communications technologies". Information and communication technologies must be used to bridge the digital divide and accelerate progress in the poorest corners of the world.

Free and informative media are also a cornerstone of the information society and essential to helping all of the world's people to communicate. At the same time, the "content divide" between developed and developing countries must be addressed, encouraging media organizations and individuals in developing countries to promise local content, in line with the local culture and in the local language. Press freedom and pluralism of content can and must go together in our information society.

The terms "information society", "digital era", or the "information age " have all been used to describe this age. Whatever term we use, the society we build must be open and pluralistic – one in which all people, in all countries, have access to information and knowledge. This is the primary goal of the world Summit on the information Society, the first phase of which will take place this December in Geneva.

The Summit will serve as a unique platform to galvanize the international community – working in concert with governments, private business and civil society – to narrow the "digital divide" and lay the foundations of a truly inclusive global information society.

TEC NEWSLETTER
June 2003
Volume 7
Issue 2

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