



## ADSL2 and ADSL2+

ADSL2 family of standards offers significant improvements in performance as well as new features intended to accelerate the growth of the worldwide DSL market.

### Chronology of ADSL standards

Family	Description	Ratified
ADSL	G.992.1 G.dmt	1999
ADSL	G.992.2 G.lite	1999
ADSL2	G.992.3 G.dmt.bis	2000
ADSL2	G.992.4 G.lite.bis	2000
ADSL2+	G.992.5 G.ADSL2 PLUS	2003
ADSL2	G.992.3 Reach Extended	2003

ADSL2 technology (ITU-T G.992.3 and G.992.4) adds new features and functionality targeted at improving performance and interoperability and offers support for wide range of new applications, services and deployment scenarios. The vast improvements in data rate and reach performance, rate adaptation, diagnostics and stand-by mode are some of the changes.

ADSL2+ technology (ITU-T G.992.5) doubles the copper spectrum used for downstream data transmission, effectively doubling the maximum downstream data rates and achieving rates of 20 Mbps on phone lines at 5,000 feet lengths. ADSL2+ will enable service providers to evolve their networks to support new improved services such as video in a flexible way, with a singular solution for both short-loop and long-loop applications. It will include all the feature and performance benefits of ADSL2 while maintaining the capability to interoperate with the legacy equipment. As such, carriers will be able to overlay these new advanced technologies, allowing for a smoother transition to futuristic bandwidth intensive services.

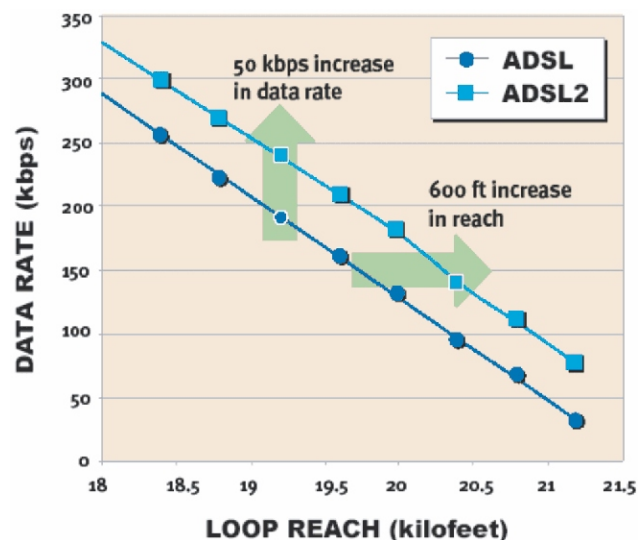
### Rate and Reach Improvements

ADSL2 has been specifically designed to improve the rate and reach of ADSL largely by achieving

performance on long loops. This is achieved by improved modulation efficiency, reduction in framing overhead, achieving higher coding gain and providing enhanced signal processing algorithms.

- Uses 16-state trellis-coded and 1-bit QAM constellation providing higher bit rates at low line-SNR.
- In ADSL2 standard, overhead bits per frame can be programmed for 4-32 kbps, unlike 1<sup>st</sup> generation ADSL where overhead bits per frames are fixed and consume 32 kbps of actual payload data. The advantage can be seen on low sync rates @128kbps where 32 kbps costs 25% of the total data rate.
- Over long copper lines where data rates are low, higher coding gains are achieved by Reed Solomon (RS) code.
- Better crosstalk performance due to Power Cut-back feature at both ends of the line.
- Determination of Pilot-Tone location by receiver avoids channel-nulls due to bridged-taps or narrowband interference due to AM radio.

The increase in data rate results in an increase in reach of about 600 feet, which translates to an increase in coverage area of about 6% or 2.5 square miles.



## Improved Diagnostics

Locating the problems in consumer ADSL service has at times been a major challenge in mass ADSL deployments. To solve the issue, ADSL2 transceivers have been designed with extensive diagnostic capabilities providing tools for troubleshooting during and after installation, performance monitoring while in service and upgrade qualification.

ADSL2 transceivers provide for measurements of loop-noise, line SNR, loop attenuation at both ends of a line. ADSL2 also provides real time monitoring performance capability at both ends of a line.

## Power Improvements

First generation ADSL transceivers generally operate in full-power mode even when out of use. ADSL2 provides sleep/standby modes providing huge advantage in remote office ADSL deployment through Broadband DLCs.

## Rate Adaptation

Varying crosstalk levels, AM radio interference etc., may force ADSL system to drop the connections. ADSL2 addresses this issue by providing Seamless Rate Adaptation (SRA). ADSL2 detects changes in channel conditions and adapts the channel rates transparently to the user.

## Bonding for Higher Data Rates

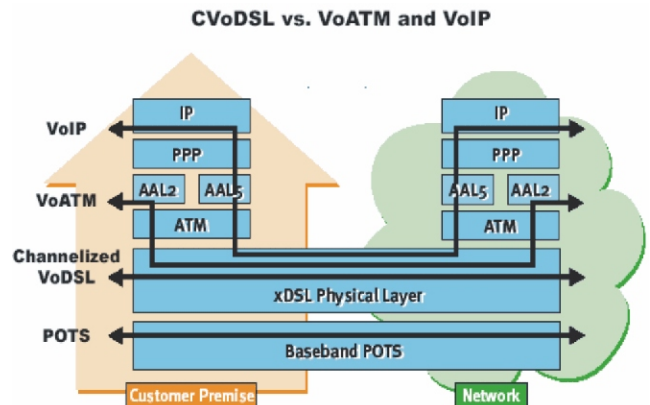
Data rates to homes and business customers can be significantly increased by bonding multiple phone lines together using ATM Forum's IMA [Inverse Multiplexing on ATM] standard.

## Channelisation and Voice over DSL

ADSL2 enables simultaneous voice connection which needs higher data error rates and low latency. On the contrary, data connection needs

low error rates but may sustain high latencies. ADSL2 supports both the requirements simultaneously.

ADSL2's channelisation capability also provides support for Channelised Voice over DSL (CVoDSL), a method to transport derived lines of TDM voice traffic transparently over DSL bandwidths.



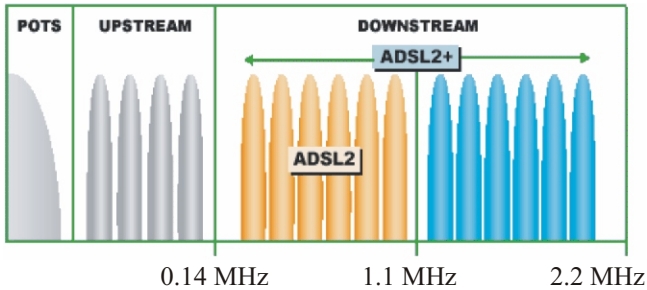
**CVoDSL does not packetise voice data,  
as VoIP and VoATM do.**

## Support for Packet-based Services

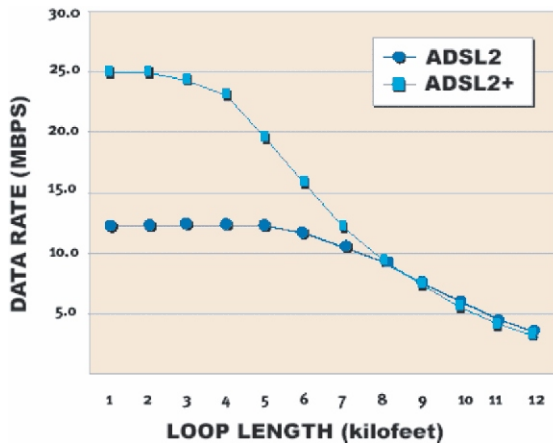
ADSL2 includes a packet mode transmission through a new trans-convergence layer (PTM-TC) that enables packet-based service (such as IP/Ethernet) to be transported over ADSL2. First generation ADSL supported only ATM-TC mode, curtailing advantages of next generation IP-based Broadband networks.

## ADSL2+ (G.992.5)

ADSL2+ was consented at the ITU-T in January 2003, joining the ADSL2 standards family as ITU-T Recommendation G.992.5. The ADSL2+ recommendation doubles the downstream bandwidth, thereby increasing the downstream data rate on telephone lines shorter than about 5,000 feet.



**ADSL2+ doubles the bandwidth used to carry data.**



ADSL2+ can also be used to reduce crosstalk. ADSL2+ provides the capability to use only tones between 1.1 MHz and 2.2 MHz by masking the downstream frequencies below 1.1 MHz. This can be particularly useful when ADSL services from both the central office (CO) and a remote terminal (RT) are present in the same binder as they approach customers' homes. The crosstalk from the ADSL services from the RT onto the lines from the CO can significantly impair data rates on the line from the CO.

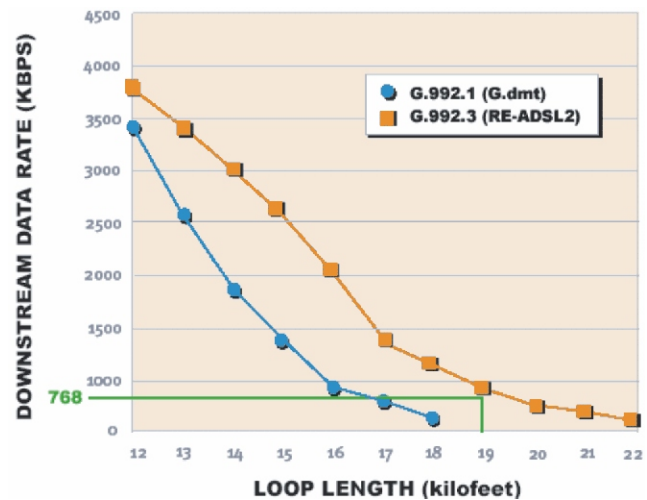
ADSL2+ corrects this problem by using frequencies well below 1.1 MHz from the Central Office to Remote Terminal and frequencies between 1.1 MHz and 2.2 MHz from Remote Terminal to Customer Premises. This solves most of the crosstalk problems.

**ADSL2 (G.992.3) Annex L: Reach Extended ADSL2 (RE-ADSL2)**

Reach-Extended ADSL2 systems provide increased performance on long lines under various

crosstalk conditions. The increase in transmit PSD levels result in increased data rates, which are achieved even though the overall transmit bandwidth is less than Annex.A ADSL systems. This is primarily because the higher frequency spectrum is not usable on long lines due to the large channel attenuation. As a result, RE-ADSL2 systems provide an increase in data rate on shorter lines (where the high frequency spectrum is good) as compared to Annex.A systems, even though they use less overall bandwidth.

The Reach-Extended ADSL2 system was evaluated under a large number of crosstalk conditions and loop topologies. Figure below compares the downstream data rate performance of conventional ADSL systems based on G.992.1 (G.dmt) and RE-ADSL2 systems based on G.992.3. The crosstalk environment for this test case is white noise injected at the RT. Under these test conditions RE-ADSL2 extends a 768 kbps downstream service approximately 3,000 feet to 19,000 feet. As a result, the coverage area for this service increases by about 37%.



**Reach Extended ADSL2 (RE-ADSL2) Reach Improvement.**

Carriers and subscribers have played a significant role in development of ADSL2 standards, having provided feedback that ITU-T in-turn incorporated in to the standards.

(courtesy: DSL Forum Web-site)

## Universal Service Obligation (USO)

*Note: The following extracts from DOT Web-site are reproduced for information purposes only. Neither TEC nor editor is responsible for any error, omissions, incompleteness or changes.*

The new Telecom Policy'99 envisaged provision of access to basic telecom services to all at affordable and reasonable prices. The resources for meeting the Universal Service Obligation (USO) shall be generated through a Universal Service Levy (USL), at a prescribed percentage of the revenue earned by the operators holding different type of licences. Further, NTP'99 envisaged implementation of Universal Service Obligation for rural and remote areas through all Basic service providers who will be reimbursed from the funds collected by way of USL. Other service providers shall also be allowed to participate in USO provisioning subject to technical feasibility and shall be similarly reimbursed out of the funds of USL.

### Amendment to India Telegraph Rules

Indian Telegraph Rules have been amended for USO by inserting new rules 523-527.

### Administration of the Universal Service Obligation Fund.

The USO Administrator shall have powers to -

- (i) formulate bidding procedures including its terms and conditions for the purposes of implementation of Universal Service Obligation;
- (ii) evaluate the bids called for the purposes of implementation of Universal Service Obligation;
- (iii) enter into Agreement with the Universal Service Provider for the purposes of implementation of Universal Service Obligation;

(iv) settle the claim of Universal Service Provider after due verification, and make disbursements accordingly from the Fund;

(v) specify relevant formats, procedures and records to be maintained and furnished by the Universal Service Provider;

(vi) monitor the performance of the Universal Service Provider as per the procedure specified by him from time to time.

### Guidelines for implementation of Universal Service Obligation (USO)

i) The funds created by the Universal Service Levy shall be spent in rural and remote areas on both the public access telephones or Community telephones meant for public use and individual household telephones in net high-cost rural/remote areas.

ii) The support from Universal Service Fund will be provided to meet Net Cost (i.e. Cost minus Revenue) of providing the universal service.

iii) In the event of an increase in the requirement of Universal Service Obligation (USO), the percentage of contribution towards USL can be raised to meet such additional requirement but the added levy will be drawn out of the prevalent percentage of licence fee keeping the ceiling intact and as such, will not cause any additional burden either on the service providers or the consumers.

iv) The implementation of USO will be divided into two clearly identifiable streams:

### Stream-I: Provision of Public Telecom and Information services

**a) Installation of VPTs in the remaining villages:** For installation of VPTs in the 6,07,491 villages, identified as per 1991 census which were required to be covered by 31.3.2002, no reimbursement towards Capital recovery shall be admissible and given. However, the Net Cost

towards operating expenses of these VPTs will be reimbursed. For the remaining villages, i.e. additional revenue villages identified as per 2001 Census, the Net cost towards both the annual capital recovery as well as annual operating expenses will be allowed as a support from the USF.

**b) Provision of additional rural community phones in areas after achieving the target of one VPT in every village:** The second public phone will also be installed in villages where population exceeds 2000. These may be provided in public places such as schools, primary health centers etc. and for the purpose of support from the USF, the Net cost towards both annual capital recovery as well as annual operating expenses will be allowed.

**c) Replacement of VPTs installed before 1.4.2002:** A large number of VPTs working on MARR Systems will in the first instance be required to be replaced to ensure their reliable operation. The BSOs will be required to draw up a yearly plan for replacement of such VPTs and support from USF will be allowed towards both the annual capital recovery as well as annual operating expenses.

**d) Up gradation of VPTs to Public Telecom and Info Centers (PTICs):** It shall be endeavored to provide, by the year 2004, for data transmission facilities within 5 Kms of every village and at least in all those villages where regular post offices are located. The reimbursement from the USF will be towards Net Cost that may arise if the PTICs are engineered by upgrading an existing VPT, with the minimum configuration of i) a PC, ii) a Modem and iii) an UPS. Both capital and operational cost will be taken into account to determine the quantum of support from USF. A phased programme will be drawn and implemented to upgrade about 35,000 VPTs to function as PTICs by end of year 2004.

**e) Installation of High Speed PTICs (HPTICs)** by upgrading the existing VPTs to provide wide band applications like tele-education and tele-medicine based on two basic channels i.e. 128 Kbps. In the first phase by 2004 about 2 HPTICs shall be set up in each SDCA. Both capital and operational costs will be taken into account to determine the quantum of support from USF.

### **Stream-II: Provision of household telephones in Net High cost areas (rural/remote)**

For Stream II, the cost of service in the SDCAs will comprise the capital recovery and operating expenses in respect of the access network, developed for DELs installed after the specified date. Per Line net cost will be worked out on the basis of SDCA average. At the beginning of each Financial Year, the service providers would indicate their SDCA-wise roll out plan including projected cost and revenue. The rural SDCA as per list issued by Department of Telecommunication shall be treated as rural SDCA for this purpose. The subsidy will be automatically withdrawn as soon as any SDCA's net cost becomes zero i.e.; it becomes a revenue surplus area.

v) While the implementation of stream-I and stream-II would be simultaneous, stream-I, i.e. stream relating to provision of common access (VPTs & PTICs) will receive priority. However, the support (towards OPEX only) to rural household DELs provided prior to 1.4.2002 in the rural SDCAs shall be given along with stream-I. (*Ammendment dated 3.2.2003*).

vi) The implementation of Universal Service Obligation shall be through a multi-layered bidding process on the Least Quoted Subsidy support basis. For this purpose, the first round of bidding will be amongst the existing Access providers (BSOs and CMSPs) of the concerned

Service area. Where no bids are received from any of the BSOs/ CMSPs in the concerned service area, or the lowest bid is higher than the benchmark, then a fresh round of bidding shall be called from all the BSOs and CMSPs in the country including the ones in the concerned service area as well as their franchisees. However, the award of contract as a result of bidding process will not be treated and taken as grant of fresh licence under Indian Telegraph Act 1885.

vii) The existing Service Areas as defined in the Basic Services Licences shall be the unit of bidding for US support. The bids shall be called for separately, for each Service Area or part thereof.

viii) The lowest bid, offering the least subsidy shall be accepted subject to a ceiling of the benchmark cost as determined by DOT.

ix) A separate fund for crediting the receipts towards USO is being set up and will be presently administered by the DOT.

x) The Universal Service Support shall be reimbursed on the basis of the actual physical performance. Liquidated Damages shall be imposed in accordance with devised scheme for any shortfall in the achievement of targets.

xi) The DOT reserves the right to modify these guidelines or incorporate new guidelines considered necessary in public interest, security and for proper conduct of telegraphs.

## IMPORTANT ACTIVITIES OF TEC DURING APRIL TO JUNE 2004

### A. Preparation of GRs/IRs & Technical documents

Following GRs/IRs and Technical documents were issued

- 80 Channel Dense Wavelength Division Multiplexing (DWDM) Equipment for Channel Bit-Rate upto STM-16
- Remote Fibre Test and Monitoring System
- 1m Earth Station Antenna in Ku band
- Optical Fibre Cable for Concrete Surfaces
- Optical Fibre Jumper (Patch Cord & Pig Tail) and Adopter (SC-PC & SC-APC) and Hybrid Jumpers

### Revised GRs

- STM-4 & STM-1 Synchronous Multiplexer
- 18 GHz High Performance Antenna
- ISDN Protocol Tester
- MLLN
- 40 Meter Narrow Base Heavy weight Tower
- Coin Box telephone
- 32 Chl Dense Wavelength Division Multiplexing (DWDM) equipment for channel Bit- Rates upto STM-16

### B. Tests and Field trials

- IN system of BSNL
- STM-1 & STM-16 of M/s Fibcom
- CDOT switch SBM-VE (version 2\_3\_1\_6)
- WAN of M/s Alcatel

### C. Other Activities

- Manufacturer Forum conducted on IR for switch with Integrated STM-1 Interface
- Manufacturer Forum conducted on IR for Remote Station for CDMA 2000 1xSystem
- Incorporated patch at Bhilai TAX to provide PiP-PiP tone for calls through MCPC equipment
- Amendment issued for Digital Satellite Phone System (DSPS) in Ku band

### Approvals issued by TEC during the period April 2004 to June 2004

Type Approvals.....	97
Interface Approvals.....	90
Service Test Certificates.....	23
<b>Total .....</b>	<b>210</b>

### Approvals issued by TEC upto 30.06.2004

Type Approvals.....	6746
Interface Approvals.....	3959
Service Test Certificates.....	1652
<b>Grand Total .....</b>	<b>12357</b>

**WORLD TELECOMMUNICATION DAY 2004**

ITU has been helping the world communicate ever since its inception in 1865. Having brought government and industry together for several decades coordinate global telecommunications networks and services, it is once again pioneering a new communication path by laying the foundations for a World Information Society.

Following two years of intense negotiations in a multi-stakeholder process that included governments, intergovernmental agencies, civil society, business entities and the media, a Declaration of Principles and an Action Plan was agreed at the World Summit on the Information Society (WSIS). The 11,000 delegates to the summit agreed on the importance of ICTs as an essential requirement for an inclusive Information Society and embraced the idea of universal, accessible, equitable and affordable ICT infrastructure and services as a key goal.

To help focus the world's attention on the strategic role which ICTs can play in reducing poverty and creating opportunities for long term development, ITU members have selected the theme "ICTs: leading the way to sustainable development" for this year's World Telecommunication Day, on 17<sup>th</sup> May 2004.

(Source: ITU web site)

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

It was 160 years ago that Samuel Morse used a simple series of dots and dashes to send the first message by telegraph-ushering in the dawn of the telecommunications age. Within a decade, telegraphy had become a routine public service.

Today, many people could not imagine daily life without the use of increasingly sophisticated information and communication technologies (ICTs), from television and radio to mobile telephone and the internet. Yet for millions of people in the world's poorest countries, there remains a "digital divide" excluding them from the benefits of ICTs.

The theme of this year's observance of World Telecommunication Day ICTs: Leading the way to sustainable development reminds us that ICTs serve as crucial tools for achieving economic progress. Affordable technologies, in the hands of local communities, can be effective engines of change, both social and material. Access to information and technological know-how is essential if the world is to defeat hunger, protect the environment and achieve the other Millennium Development Goals agreed by Heads of State and Government at the United Nations Millennium Summit in 2000. But to harness this potential, we need to forge global partnership for development between governments, the private sector, civil society and the United Nations system.

Last December, at the first phase of the World Summit on the information Society in Geneva, leaders set out a shared vision of how the world can eliminate the digital divide in content and physical infrastructure. This was the first global gathering of its kind, and I was very encouraged by the innovative initiatives that were put forward and by the strong commitment that was voiced towards overcoming the disadvantages faced by so many of the world's people. I urge Member States and all other stakeholders to sustain that commitment as we prepare for the Tunis phase of Summit next year.

टी ई सी संचारिका  
जुलाई 2004  
भाग 8  
अंक 2

दूरसंचार इंजीनरी केन्द्र  
खुशीदलाल भवन  
जनपथ  
नई दिल्ली-110001

Editor : I. S. Sastry, DDG (S) Phone : 23329540 Fax : 23723387 Email : ddgsw@bol.net.in