TEC NEWSLETTER

TELECOMMUNICATION ENGINEERING CENTRE

टी ई सी संचारिका

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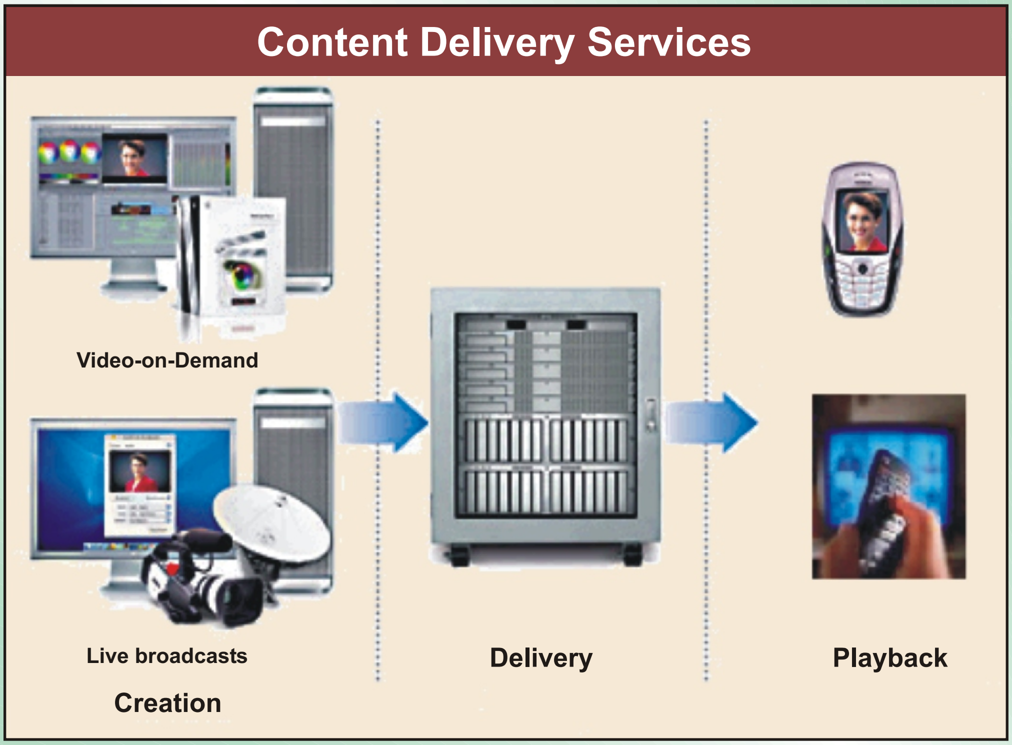


Courtesy: www.apple.com

IN THIS ISSUE

Content Delivery Services

Have you made telephone calls and surfed the Internet simultaneously over the telephone line using a DSL broadband connection. Then, how about watching simultaneously a movie of your choice, using same the telephone line ? Content based services like Broadcast TV, Video-on-Demand, Gaming etc. can be provided to xDSL/wireless customers having a Set-Top-Box (STB) connected to TV/PC or a PC with software implemented STB. In general, streaming media content delivery requires a Head-end (source of content), Multicast distribution and access networks (wireline/wireless) which can provide guaranteed bandwidth. The Content is transmitted in the form of IP data through the IP network infrastructure.

Market for Content-based services

Broadband policy announced by DoT in 2004 envisages a user target of 20 million by the year 2010. At present, there are only 12 million PCs (out of which 30% are potential customers for broadband Internet services) vis-à-vis 70 million TV sets out of which only 40 million are customers of cable TV network. Internet alone can not drive the broadband market due to its pricing (influenced by the cost of international bandwidth) and lack of local content. There is plenty of entertainment content (generated by TV, film and music industries) and educational content available today and the content market is substantial. The existing cable TV Network uses analog media and requires huge investment for its up gradation to support bidirectional digital content and transport. Digital content can be delivered to user over existing IP based broadband network. However, the demand for IP based content services would depend on the content, pricing and Quality of Service compared to the existing Cable TV services.

Content Delivery Services

Examples of Content services are given below :
Broadcast type

- IP Broadcast TV through Electronic Program Guide (EPG)
- Pay TV through EPG
- Scheduled Play-out of video (Network Video on Demand, NVoD)
- Other scheduled Play-outs (music, gaming content)
- Hi-Fi Radio (broadcast) through EPG

  Distance learning

On-demand type

- Video-on-Demand (VoD)
- Interactive TV
- Time shifted TV
- Music on demand with play lists
- Karaoke on Demand
- Games on demand
- Interactive Gaming

Content Delivery Network

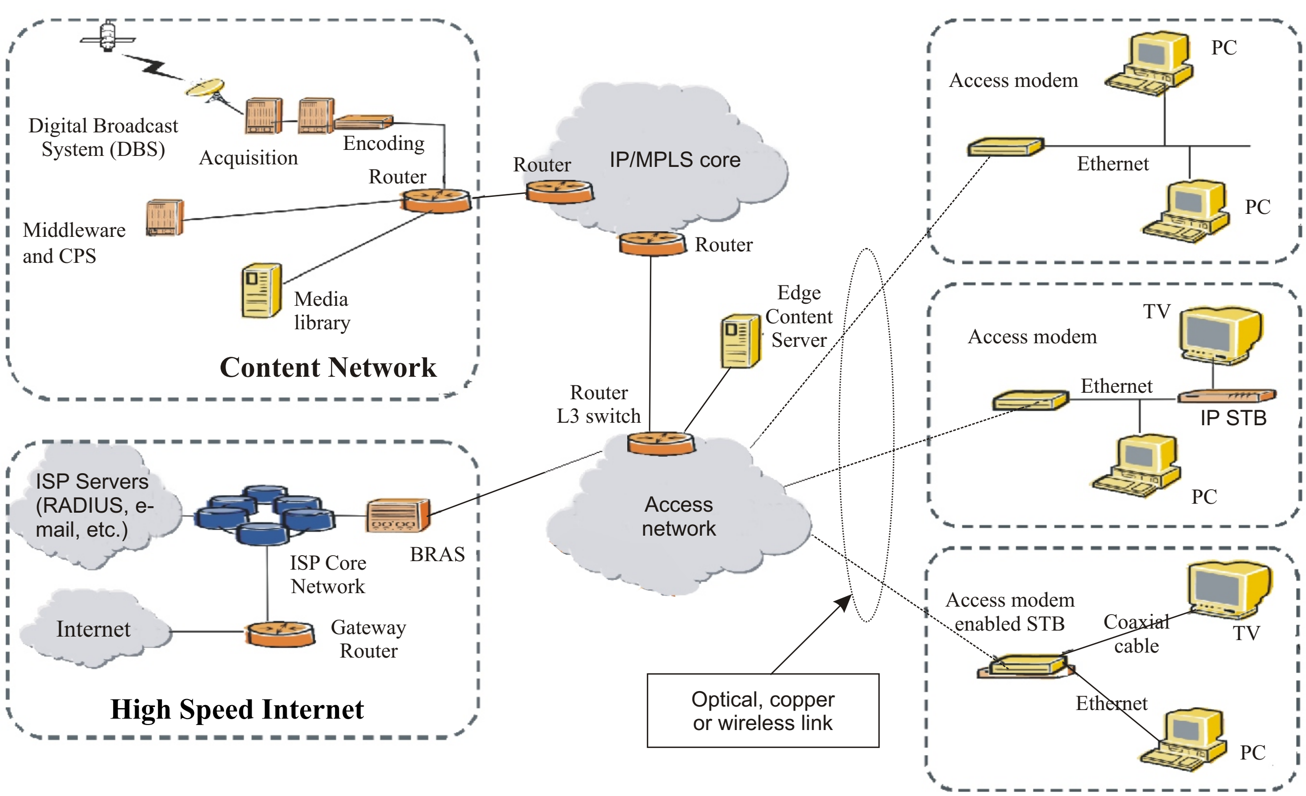
Content Delivery Network (CDN) consists of multiple geographically dispersed Content Servers linked by middleware servers and manages the content distribution over the Core Transport Network to the customers connected to different types of access networks. The content can be provided dynamically through the TV Head-end or statically stored in the Content Library or it can be dynamically provided using live web-cast. The architecture of the CDN is given in the figure on page 3 and is described below :

1. Middleware (MW)

It is a server that interfaces with the user. It keeps the profile of all services and provides AAA functionality to the user for use of content services. It displays a list of possible services with price tag and guides the user to select a service. After selection of the service, it redirects the user to the most suitable content server/router for delivery of the on-demand/ broadcast content. It is possible to apply parental control through this entity. Further, it helps user in modifying the setting of his/her account e.g. parental guidance, password, etc. by communicating with the directory server. MW communicates with billing server for displaying the balance of user account and displays the services which can be offered with the available balance (in case of pre-paid account) and sends CDRs to the billing server for the billing.

2. Content Protection System (CPS)

It ensures the content security by means of encryption. Standard encryption is essential for scalability and openness of CDN. AES/RC4 or any other 128 bit symmetric algorithm suited to IP network should be used for encryption of on-demand and broadcast content. It distributes the keys for decryption of content to STB in a secure way only after authentication of STB. It may be noted that use of proprietary mechanism will tie the STB to one CPS.



Infrastructure for Content Delivery Services

3. Content server and media library

It holds the actual content and delivers it to the user upon getting authorization from middleware. It follows hierarchical architecture (central, regional and edge), with central media library at one/ few places. Edge content servers should be placed as near to user as possible. It keeps the record of service delivered, fully or partly for usage record or further delivery for the last point and provides this information to the middleware for billing purpose. The central media library provides content injection, editing, encoding, management, etc. and presents raw content list to MW.

IP network infrastructure needs to be implemented keeping in view the type of service/demand. Broadcasting video needs multicasting nodes for replication of video content at access, aggregation or edge nodes, for transmission to downstream nodes. It improves the efficiency of the network, by reducing the bandwidth requirements to carry video channels.

4. Head-end (for broadcasting services)

It encodes and encapsulates analog/ digital broadcast content into IP packets for delivery over IP based broadband network. It also converts Variable Bit Rate (VBR) channels into Constant Bit Rate (CBR) for delivery on IP based network. It shall ideally be placed at one point in the network and collocated with main media library. It provides raw data of EPG (electronic programming guide) to MW.

5. Other network infrastructure

It includes the usual IP network components like Directory Server, DHCP Server, DNS, Routers, and a payment solution to meet the subscriber requirements etc. A Network Management System (NMS) shall be used for the management of all components and provisioning of services.

6. Set top box (STB) at Customer Premises

It delivers the content to the TV set of user. It broadly performs decryption & decoding; acts as user interface to CDN. It interacts with MW and CPS for content delivery. STB supports

Streaming Standards

Content delivery using IP network requires coding of information such as video, audio etc. into streaming data that is to be delivered in real time. Video formats based on MPEG standards as well as different proprietary formats such as those developed by Microsoft, Real Networks, Apple-Quick Time etc. are available today. An industry consortium called Internet Steaming Media Alliance (ISMA) was formed in December 2000, with the objective to accelerate the adoption and deployment of open standards for streaming rich media content such as video, audio and associated data, over Internet Protocols. ISMA announced a certification process based on specification ISMA 2.0. It includes codec technologies like MPEG-4 (Part 10), ISO/IEC 14496-10:2003 i.e. Advanced Video Coding (also known as AVC and H.264) for video and Advanced Audi Coding High Efficiency AAC Profile (HE-AAC) for audio. Media Control is as per IETF Real Time Streaming Protocol (RTSP). In case of MPEG-4 encoding stream rate can be adjusted according to connection bandwidth. However, digital TV content is widely available in MPEG-2 format. STB should be compatible with the used format.

Ethernet (10/100 Base T) input interface and provides video and audio outputs. It can be broadly classified into two categories as below :

- Low end – for VoD and IPTV, with a Infra Red remote control device, soft key board and a minimum browser.
- High end – for Internet access also. This category STB shall also have Infra-Red keyboard, mouse, PPPoE client and full web browser.

The Coding format used by the Head end Equipment and that of Set-Top-Box at customer premises shall be compatible.

Service Delivery Mechanism

The service delivery involves many stages like authentication, provisioning of program guide and then redirection. Once the customer has been redirected to the content, the content is provided in a secure manner using the encryption. The various stages involved in the service delivery to a customer accessing through Set Top Box (STB) are as below:

i. After power-on, STB gets a private IP address by DHCP server. IP v6 addresses can also be used. DHCP options can be used, e.g. option 82 or 60.

ii. STB then sends request to MW for home page.

iii. MW checks for the MAC address of STB in its database/from directory server and prompts for PIN in case of valid MAC address.

iv. MW searches for the authorisation (bill status, content viewing authorisations) from user id and MAC address relation.

v. Based on the authorisation and valid PIN, STB is provided with the portal home page (containing EPG & content list).

vi. When user selects on-demand content from program list, the request is redirected to suitable edge content server by MW.

vii. When users select a broadcast channel form EPG, address of nearest multicast router is sent back with the multicast address of channel by MW.

viii. All types of contents should be encrypted.

ix. For prepaid users demanding content, MW asks for card/voucher detail and sends this information to billing system for getting the balance of card voucher.

x. MW redirects the request to CPS for authentication of STB for any content request. CPS authenticates and sends the result to MW.

xi. Content server verifies the “purchase” of content before delivering it to the STB. Also MW, CPS and content server shall provide the trick modes (Forward, Rewind, Fast Forward etc.).

xii. CPS obtains the keys for the content from key database and distribute it to STB in a secure way. CPS also supports the key distribution for trick modes (forward, rewind etc.) of content delivery.

xiii. The service charging could be per view (e.g. movie), duration (e.g. game) or volume based.

xiv. AES/RC4 (see Box on the next page) or any other 128 bit symmetric algorithm suited to IP networks shall be used for encryption of on-demand and broadcast content.

xv. MW generates the CDR with ‘user id’. Before pre-paid content delivery, it shall send the balance reduction message to billing server for actual amount of content. In case content delivery is incomplete, it shall send a message to return the amount as per business rule defined by service provider.

xvi. User shall be able to view their current usage and bill including the served content, start and stop day & time of service availed, amount generated, volume/duration (for volume/duration based billed contents). MW acts in an integrated manner with billing system to achieve this functionality.

What is AES & RC4 ?

In cryptography, the **Advanced Encryption Standard (AES)**, also known as **Rijndael**, is a block cipher adopted as an encryption standard by the US government, and is expected to be used worldwide and analysed extensively, as was the case with its predecessor, the Data Encryption Standard (DES). It was adopted by National Institute of Standards and Technology (NIST) as US FIPS PUB 197 in November 2001 after a 5-year standardisation process. The cipher was developed by two Belgian cryptographers, Joan Daemen and Vincent Rijmen, and submitted to the AES selection process under the name "Rijndael", a portmanteau comprised of the names of the inventors.

In cryptography, RC2 (or ARCFOUR) is another widely-used software stream cipher and is used in popular protocols such as Secure Sockets Layer (SSL) (to protect Internet traffic) and Wired Equivalent Privacy (WEP) (to secure wireless networks). RC4 was designed by Ron Rivest of RSA Security in 1987; while it is officially termed "Rivest Cipher 4", the RC acronym is alternatively understood to stand for "Ron's Code". RC4 was initially a trade secret, but in September 1994 a description of it was anonymously posted to the Cypherpunks mailing list. It was soon posted on the sci.crypt newsgroup, and from there to many sites on the Internet. RC4 is often referred to as "ARCFOUR", to avoid possible trademark problems.

(Source: Internet)

Other Issues

Broadcast streaming of video/audio is relatively easy and cheaper compared to on-demand streaming. Digitised content for video needs to be stored for providing content on-demand and storage requirements would be huge.

Addressing

The CDN can use any version of IP Addressing. The scarcity of IPv4 addresses (Private or Public) address could influence the Service Providers to go in for the IPv6 addressing, depending on the growth of the subscriber base. During migration, IPv6 can be used at edges, initially and core can continue to be IPv4 till large blocks of IPv6 address space is available for converting the entire network into IPv6 network. IPv6 to IPv4 tunnelling at the edges of the network can be used till complete network is converted to IPv6.

Some of the issues in the use of IPv6 addresses in the CDN are :

- DHCP servers, DSLAMs, BRAS and access network need modification.
- All servers (MW, CPS, database, content servers, Billing etc) need to support 128 bit IPv6 address format.
- STB requires IPv6 enabled OS/ browser.

Abbreviations

AAA	Authentication, Authorisation, Accounting
AES	Advance Encryption Standard
BRAS	Broadband Remote Access Server
CDN	Content Delivery Network
CDR	Call Detail Records
DHCP	Dynamic Host Configuration Protocol
DNS	Domain Name Service
DSLAM	Digital Subscriber Line Access Multiplexer
ISMA	Internet Steaming Media Alliance
MAC	Media Access Control
MPLS	Multi Protocol Lab Switching
PIN	Personal Identification Code
PPPoE	Point to Point Protocol over Ethernet
QoS	Quality of Service
RC4	Rivest Cipher4
RTSP	Real Time Streaming Protocol
STB	Set-Top-Box

IMPORTANT ACTIVITIES OF TEC DURING JANUARY TO MARCH 2005

Preparation of GRs/IRs

Following GRs/IRs and Technical documents were issued

- OTA (Over the air) System for CDMA 2000 Network
- Wireless Intelligent Network (WIN) for CDMA 2000 Network
- L4-L7 IP switch
- NMS standard

Revised GRs/IRs

- 18 GHz Sub STM-1 Microwave Equipment
- SMPS Power Plants
- 2048 kbps Line Driver
- Internet Exchange Point
- Portable E1 Analyser
- Optical Power Meter(Type A & Type B)
- Optical Time Domain Reflectometer (Mini)
- Stablised Light Source (Type A , B & C)
- ATM Core Switch
- 20 W Solid State Power Amplifier(SSPA) 1+1 System Operating in Ku band
- 2.4m Earth Station Antenna Operating in Ku band
- Interface Requirement for ATM Access Equipment
- IR on IPPABX for Pvt. Use
- IR on Remote Access Server
- IR on IP based Integrated Media Gateway for NLD/ILD applications

Tests and Field trials

- Validation of MSC based CDMA2000 1x System (ZTE Make and Huawei Make)
- Proj. 2.1 of NIB-II
- CDMA2000 1x IFWTs
- CDOT MAX XL (version 2_2_1_6)
- LMDS Equipment of M/s Siemens in 10.5GHz bands
- IMPCS testing at Pune and Jaipur

Approvals issued by TEC during the period January 2005 to March 2005

Interface Approvals..............................	43
Interface Approvals..............................	03
Total	46

WORLD TELECOMMUNICATION DAY 2005

"Creating an equitable Information Society: Time for Action"

World Telecommunication Day 2005 marks two important anniversaries for ITU. It will be 140 years since ITU began helping the world communicate. From the birth of the telegraph, through radio and television broadcasting to satellite communications and the Internet, the work of ITU has helped harness the power of science and technology to fulfill a basic human need for communication. However, 20 years ago, we realized that not all people were sharing in the social and economic benefits that telecommunications creates. In 1985, ITU released the landmark Maitland Report, known as the 'Missing Link', which was the first to clearly identify the digital divide. Since its publication, ITU has been working in earnest to bring the benefits of ICT to all of humanity.

In 2003, ITU held the first ever World Summit on the Information Society (WSIS) in Geneva. The first phase of the Summit resulted in 175 countries endorsing a Declaration of Principles and Plan of Action that embrace the idea of universal and affordable access to ICTs. The second phase of the Summit, to be held this November in Tunis, will measure the progress we have made in fulfilling the specific objectives of the Geneva phase and will call on all stakeholders to transform the political will expressed at the first phase into long-term commitments. To help focus the world's attention on the importance of this mission, ITU members have selected the theme ***Creating an Equitable Information Society: Time for Action.***

Looking ahead to Tunis, the true test of an engaged, empowered and equitable Information Society will be the extent to which today's powerful knowledge-based communications tools are able to connect different peoples across geographic, knowledge and information divides, especially in the most impoverished countries. The time for action is now.

(Source: ITU web site)

Approvals issued by TEC upto 31.03.2005

Interface Approvals..............................	4108
Service Test Certificates.......................	1687
Grand Total	**5795**

WORLD TELECOMMUNICATION DAY 2005

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

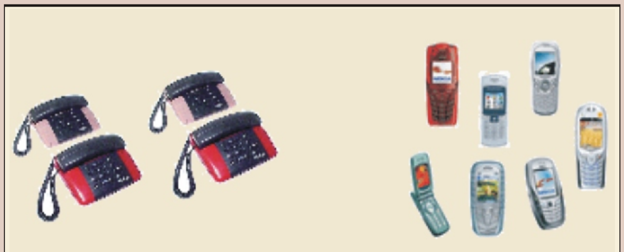
We live in an age in which communication between people is essential to achieving our shared goals of development and peaceful coexistence. New innovations in information and communication technologies have increased exponentially our capacity to connect with each other. It is up to us to use to harness the potential of these technologies in our work to extend the benefits of education, health care, trade and environmental protection to all.

The theme of this year's World Telecommunication Day, "***Creating an Equitable Information Society: Time for Action***", calls on us to give shape to the vision adopted at the first phase of the World Summit on the Information Society in 2003. I urge Member States and all other stakeholders to reaffirm their commitment to that process, and to participate at the highest levels when the Summit reconvenes in Tunis in November of this year.

Efforts to build an equitable and accessible information society depend on the strength of partnerships between Governments, civil society and businesses, underpinned by the support of international organizations such as the United Nations. On this World Telecommunication Day, which marks the 140th anniversary of the founding of the International Telecommunication Union, let us pledge to bridge technological differences and promote interconnectivity for all. Together, we can create a truly global information society that will benefit all the world's people.

TELECOM IN INDIA

A milestone of
100 million
Telephone subscribers
Reached in
April 2005

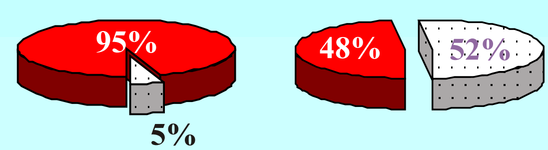


47.11 millions **55.38 millions**

Teledensity (Phones per 100 persons) 9.46

As on 31st May 2005 Source : TRAI

March 1999 **March 2005**



Fixed Line **Mobile Phone**

टी ई सी संचारिका
मई 2005
भाग 9
अंक 2

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