INTERNET ACCESS VIA CABLE TV NETWORK

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ABSTRACT

Internet access has become a feeding frenzy and the commercialization of the Internet has opened the door for access to the largest information network in the world. The growth of the Internet continues to be exponential. The recent technology of Dial-up access to the World Wide Web just wasn't fast enough. Your subscribers know that cable TV can give them access to hypertext. The cable TV industry has the capability to provide subscribers with Internet access at speeds unmatched   in price/performance by any other medium. For Cable Internet access on PC, a Cable Modem is required at user's end.

Cable Internet access is the principal competitor to DSL and is offered at a range of prices and speeds overlapping that of DSL. Cable TV has a strong reach to the homes and therefore offering the Internet through cable is a scope for furthering the growth of internet usage in the homes. The cable is an alternative medium for delivering the Internet Services in the US; there are millions of homes with cable modems, enabling the high-speed internet access over cable. In India, we are in the initial stages.

Keywords- Cable Modem, Cable TV network, Digital Subscriber line, Dial-up Connection, Internet Access,

I. INTRODUCTION

The Internet is a global system of interconnected computer networks that use the standard Internet Protocol Suite (TCP/IP) to serve billions of users worldwide. It is a network of networks that consists of millions of private, public, academic, business, and government networks, of local to global scope, that are linked by a broad array of electronic and optical networking technologies. The internet carries a vast range of information resources and services, such as the inter-linked hypertext documents of the World Wide Web (WWW) and the infrastructure to support electronic mail. There are mainly three ways to connect to internet; namely: dial up, broadband and wireless where broadband service is available in three main platforms viz Cable modem, Digital Subscriber Line (DSL) and Satellite .Here specifically we will lay stress on Cable modem which uses the same connection that delivers cable TV .This platform is fast and reliable but not available in all areas.

A Cable Modem is a device that allows high-speed access to the Internet via a cable TV (CATV) network the cable modem attaches to computer through an Ethernet Network interface card. It takes a signal from the computer and converts it for transmission over the cable network. Through the use of cable modem you can have a broadband Internet connection that is designed to operate over cable TV lines. Cable internet works by using TV channel space for data transmission, with certain channels used for downstream transmission, and other channels for upstream transmission. Because the coaxial cable used by cable TV provides much greater bandwidth than telephone lines, cable modem can be used to achieve extremely fast access. Cable providers

typically implement a cap to limit capacity and accommodate more customers. Cable speed range from 512 Kbps to 20 Mbps.

Internet access via cable TV network is interesting in many points of view: it is fast, cheap, easy to install and use and you have the advantage of a permanent Internet connection. For teleworkers this is a very attractive alternative to get Internet connectivity. The advantage to the user of accessing the Internet via cable TV is that he does not need his own leased line in order to get high-speed 10 Mbps access to the Internet. In the past, these speeds, since they required a dedicated leased line, were out of reach for all but large corporations. By connecting businesses, institution

There is a higher demand from residential and business customers, especially in the last few years, for access to the Internet, corporate intranets and various online information services. The Internet revolution is sweeping the country with a burgeoning number of the Internet users. As more and more people are being attracted towards the Internet, traffic congestion on the Net is continuously increasing due to limited bandwidths resulting in slower and expensive Internet access. The number of household getting on the Internet has increased exponentially in the recent past. First time internet users are amazed at the internet's richness of content and personalization, never before offered by any other medium. But this initial awe last only till they experienced the slow speed of internet content deliver. Hence the popular reference "World Wide Wait"(not World Wide Web).

II. HOW TO ACCESS THE INTERNET VIA CABLE NETWORK

- Use the dial-up telephone services provided by your Cable Company in conjunction with a modem.
- To Use a cable Modem

III. COMPARISON OF INTERNET SPEEDS

The revolution of digital technology and evolution of cable TV network (broadband technology) helps to access Internet, the cable modem's speed varying widely. In the downstream direction from network to the computer, speeds can be any where up to 36Mbps.Few computers will be capable of connecting at such high speeds; a more realistic number for computers is 3 to l0Mbps<.In the upstream direction from computer to network, speed can be up to l0Mbps. However, most modem producers will probably select a more optimum speed between 200kbps and 2Mbps. for instance; a file that takes eight minutes to download over a28.8kbps modem connection would take two minutes to download on ISDN, compared to eight seconds via cable modem. In the upstream direction (from computer to network), speeds can be up to 10 Mbps. However, most modem producers have selected a more optimum speed between 500 Kbps and 2.5 Mbps, and many cable operators limit the upstream bandwidth to128 or 384kbs. An asymmetric cable modem scheme is most common.

The downstream channel has a much higher bandwidth allocation (faster data rate) than the upstream. Once broadband technology becomes available to large sections of the society, a whole range of applications will become possible to consumers. There will be high-speed Internet access, real time video conferencing, video streaming, music downloads, interactive television, online education and remote classroom distance learning, online shopping, video-on-demand, online games and working. Broadband technologies can deliver information

faster and because of the efficient and use of the communication pipes, more number of users can be connected to the Internet without affecting the speed of downloading or uploading data. Typically, in an academic business environ merit, this helps to boost employee efficiency, increase their productivity and reduce cost. In the cable modem development an asymmetric setup will probably be more common than a symmetric setup. In an asymmetric scheme, the downstream channel has a much higher bandwidth allocation, faster data rate than the upstream. One reason is that the current Internet applications tend to be asymmetric in nature. Activities such as web navigation and news group reading send much more data down to the computer than to the network. Mouse clicks (URL requests) and e-mail messages are not bandwidth-intensive in the upstream direction. Image files and streaming media i.e. audio-video are very bandwidth intensive in the downstream direction. Hence, using cable modem is much beneficial than the telephone dial-up-modem. A cable modem can be part modem, part tuner, part encryption or decryption device, Part Bridge, part router, part network interface card, part simple network management protocol agent and part Ethernet hub. Typically a cable modem sends and receives data in two slightly different fashions. In the downstream direction, the digital data is modulated and then placed on a typical television carrier. The signal can be placed in 6MHz channels adjacent to TV signals on either side, without disturbing the cable television video signals. Primarily because Internet applications

IV. HOW DOES IT CONNECT

There are several methods for computer connection, but Ethernet 10 Base T is emerging as the most predominant method. Although it probably would be cheaper to produce the cable modem as an internal card for the computer, this would require different printed-circuit cards for different kinds of computers, and additionally would' make the demarcation between cable network and the customer's computer too fuzzy.

This type of network is classified as HFC (Hybrid Fiber-Coaxial), as it uses both fiber optic and coaxial cables. The connection between the cable TV companies to the distribution points (also called optical nodes) is made using fiber optics, with distances up to 25 miles (40 km), while the connection between optical nodes and the users' home is made using coaxial cables

The most common system used by cable TV companies to offer Internet access is called DOCSIS (Data over Cable Service Interface Specification). Currently, there are four DOCSIS versions available: 1.0, 1.1., 2.0, and 3.0. Versions 1.0 and 1.1 are identical, except that version 1.1 accepts quality of service (Quos) parameters, allowing the use of the cable TV network for telephony (voice over IP, a.k.a. VoIP). Therefore, we call versions 1.0 and 1.1 simply 1.x. Version 3.0 allows channel bonding (i.e. allows the use of more than one channel at the same time)

V. WHAT IS CABLE MODEM AND HOW IT WORKS

5.1 Cable Modem

A "Cable Modem" is a device that allows high-speed access to the Internet via a cable TV (CATV) network. The cable modem attaches to computer through an Ethernet Network Interface Card. It takes a signal from the computer and converts it for transmission over the cable network. For Cable Internet access on

PC, a Cable Modem is required at user's end. It has two connections; one to the TV cable wire and the other to a computer.

A Cable Modem sends and receives data to and from the Internet by using the existing coaxial cable network. The modem translates cable signals the same way a telephone modem translates signals from a telephone line. Cable modems translate radio frequency (RF) signals to and from the cable plant into Internet Protocol (IP), the communications protocol spoken by all computers connected to the Internet.

At the customer premise, a high quality two way splitter is installed on the Cable TV line, with one output connected to the Cable Modem and the second output connected to the TV.

Regardless of their outward appearance, all cable modems contain certain key components:

- A tuner
- A demodulator
- A modulator
- A media access control (MAC) device
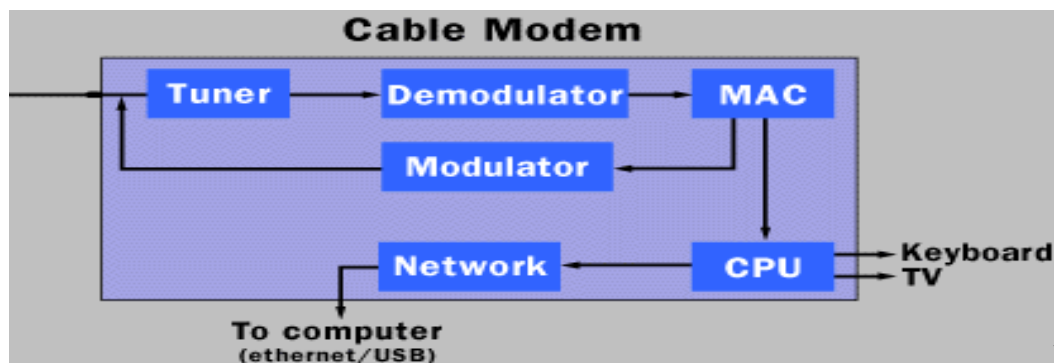- A microprocessor

Fig.1

: Inside view of cable modem

5.2 Working

Your cable Company supplies you with a connection to your home which in turn connected to a splitter box. One spur from the splitter box is connected to your TV through a TV adapter, the other being connected to your Cable Modem, Which in turn is connected to your computer through an Ethernet Connection. Cable Modems can be part modem, Part tuner, part encryption/decryption device, Part Bridge, part router, part NIC card and Ethernet hub.
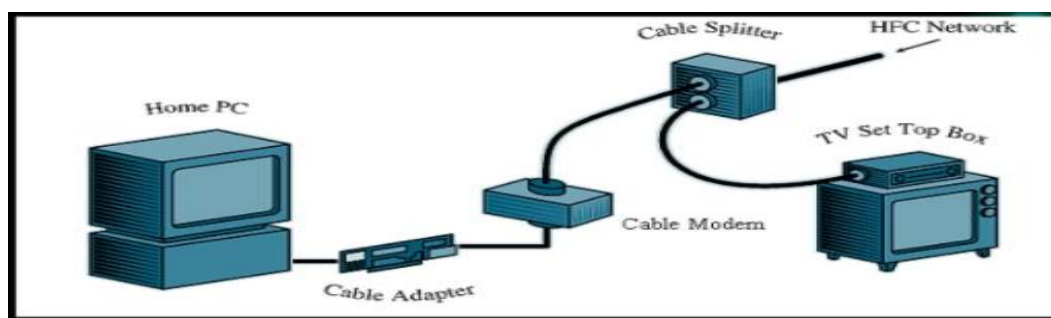

Fig. 2: Working of Cable Network

VI. CHANGES IN CABLE NETWORK

The cable network was designed to deliver TV signals in one direction from the Head- End to the subscriber's homes. To provide TV services Cable Operators had to recreate a portion of the over-the-air radio frequency (RF) spectrum within a sealed coaxial cable line. Operators had to upgrade the cable

Network so that signals could flow in both directions. Cable Operators assign a spectrum of signal frequencies to the cable network. One spectrum is used for the signals that move from the Head-End towards the cable subscriber. Another spectrum of signal frequencies are used for the signals that move from the cable Subscriber towards the Head-End. By replacing existing one way amplifiers with two way amplifiers Cable Operators are able to separate the upstream and downstream signals and amplify each direction separately in the right frequency range.

VII. HOW DATA IS SENT IN BOTH STREAMS

When a cable company offers Internet access over the cable, Internet information can use the same cables because the cable modem system puts downstream data -- data sent from the Internet to an individual computer -- into a 6-MHz channel. On the cable, the data looks just like a TV channel. So Internet downstream data takes up the same amount of cable space as any single channel of programming. Upstream data -- information sent from an individual back to the Internet -- requires even less of the cable's bandwidth, just 2 MHz, since the assumption is that most people download far more information than they upload.

Putting both upstream and downstream data on the cable television system requires two types of equipment: a cable modem on the customer end and a cable modem termination system (CMTS) at the cable provider's end. Between these two types of equipment, all the computer networking, security and management of Internet access over cable television is put into place.

VIII. DSL VERSUS CABLE:

8.1 Speed (advantage - Cable):

Cable boasts faster speed than DSL Internet in theory. However, cable does not always deliver on the promise in everyday practical use.

8.2 Popularity (advantage - Both):

In the US, cable Internet enjoys significantly greater popularity than DSL, although DSL has been closing the gap recently. Outside the US, DSL continues to hold the edge.

8.3 Customer Satisfaction (advantage - DSL):

US cable services generally rate lower than DSL in customer surveys.

8.4 Security (advantage - Both):

Cable and DSL implement different network security models. Historically, more concerns have existed with cable security, although cable providers have definitely taken steps to improve security over the past few years. It's likely both DSL and cable are "secure enough" for most people's needs

IX. THEORETICAL AND REAL-WORLD PERFORMANCE OF A CABLE MODEM

9.1. Theoretical

A cable modem is theoretically capable of receiving data at 30MBPS to 40MBPS which, if it were achieved in the real World, Would be 892 times the throughput of a standard 56k modem. The theoretical performance of a Cable Modem is based upon all other devices being able to work at the same speed and performance as the Cable Modem.

9.2. Real-World

Although performance to services on the cable network itself can be amazingly fast, access to 'the outside world will be slowed down by the performance of other connections on the way. As usage on your segment grows (as more customers are added) the bandwidth must be shared by more people. The Cable network itself will suffer the same problems of Internet performance as any other Internet Service Provider (ISP). However, in a similar way that the actual usable bandwidth on a 10MBPS Ethernet connection reduces to a 4MBPS, so too will the performance of a Cable Modem connection be reduced.

9.3 Some company names of Cable Modem

3Com

Cisco Systems

Com21

General Instrument

Motorola

Nortel Networks

Phasecom

Samsung

Terayon

Toshiba

Zenith

9.4 Advantages of Cable Internet:

- High connection speed.
- Convenient, as you are always connected to the internet.
- High Availability.
- High bandwidth to low cost.
- No new software is required.
- Always on connectivity.
- Does not affect your phone line. You don't need to switch your local phone service provider.
- Unlike ADSL, its performance doesn't depend on distance from the central cable office.
- No reconstruction of cable system is required.
- In the coaxial network, amplifiers can be used in order to regenerate the signal and expand the maximum length of the coaxial network. Because of this configuration, cable TV networks do not offer problems with

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the quality of the cable, the length of the cable, or electromagnetic interferences (EMI) that plague typical DSL systems, in particular ADLS systems, as they use conventional telephone cables.

9.5 Disadvantages of Cable Internet:

- Bandwidth is shared over the same cable line. Connection speed is affected by the number of people using the internet at the same time in your neighborhood.
- Traffic congestion on net.
- Higher security risk than dialup (personal firewall is needed).
- Not available to all cable TV networks.
- Usually tied with cable TV subscription

X. CONCLUSION

The capacity of the Internet will continue to grow, as will the user systems connecting to it. Multimedia and client-server based applications, such as digital libraries, telecollaboration, concurrent engineering, and visualization will proliferate. Multicasting, taking video or audio material, digitizing it, and sending it over the Internet, will benefit greatly from cable. Videoconferencing over the Internet to the home PC or to the desktop will become possible.

Cable TV has a strong reach to the homes and therefore offering the Internet through cable be a scope or furthering the growth of internet usage in the homes. Cable TV can make high speed access to the multimedia Internet of tomorrow a reality today.

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