

Cable Modem

Sheena Gupta¹, Sachin Chauhan²

¹Poornima Institute of Engineering & Technology, ISI-2, Sitapura, 302022, Jaipur
sheenapiet025@poornima.org

²Poornima Institute of Engineering & Technology, ISI-2, Sitapura, 302022, Jaipur
sachinchauhan@poornima.org

Abstract: Cable modem are an old technology. Present material science may make them a reality soon in specialized applications. Problems have plagued their introduction. The Cable modem appears to be the most promising technology for using a high speed internet in both tv's and computers. The Cable modem appears to be the most promising as a cable television replacement for portable applications such as laptop and computers. It is difficult to tell at this moment whether cable modem will be practical for transportation applications such as tv's and computers or whether internet will be more popular in the future. It is unclear whether cable modem will be widely used or whether a mostly electric economy will develop. Cable modem are analyzed theoretically using the carnot ratio which applies to both heat engines as well as cable modem as already been explained. A simple second law analysis shows where the loss of efficiency in different cable modem occurs.

Keywords: Cable modem, Set-top box

1. Introduction

A cable modem is a device that enables you to hook up your PC to a local cable TV line and receive data at about 1.5 Mbps. Up to 128 Kbps of Integrated Services Digital Network (ISDN) and is about the data rate available to subscribers of Digital Subscriber Line (DSL) telephone service. This data rate far exceeds that of the widespread 28.8 and 56 Kbps telephone modems.

A cable modem can be added to or integrated with a set-top box that provides your TV set with channels for Internet access. A cable modem has two connections: one to the cable wall outlet and the other to a PC or to a set-top box for a TV set. In most of the cases, cable modems are usually furnished as part of the cable access service and are not purchased directly and installed by the subscriber. Although a cable modem does modulation between different types of analog and digital signals, it actually is a much more complicated device than a telephone modem. Typically, the cable modem attaches to a standard 10BASE-T Ethernet card in the computer. It can be an external device or it can be integrated within a computer or set-top box. All cable modems can send signals and receive from only to the CMTS, but cannot do the same to other cable modems on the line. All of the cable modems attached to a cable TV company coaxial cable line communicate with a Cable Modem Termination System (CMTS) at the local cable TV company office. Some services have the upstream signals returned by telephone rather than the cable, in that case the cable modem is known as a telco-return cable modem. Leading companies using cable TV to bring the Internet to homes and businesses are @Home and Time-Warner. The actual bandwidth for Internet service over a cable TV line is up to 27 Mbps on the download path to the subscriber with around 2.5 Mbps of bandwidth for interactive responses in the other direction.

2. Types of cable modem

The three main types of Cable Modems are set-top box, external and internal and their ways of running differ

slightly-

2.1 Set-top box

Set-top box is a device that allows the user to connect to the Internet with any type of screen to watch the result, it can be a computer but also a television. It uses the POTS (Plain Old Telephone System). Through the same line, it is possible to take some data from the Internet or to send data to the Internet, so these operations do not themselves execute at the same frequencies (FDM).

2.2 External cable modem

External cable modem is when the computer is linked to the network via a wire in a wall socket. It uses a 10Base-T-Ethernet card.

2.3 Internal cable modem

Finally, the internal version is a card inside the computer unit, it is fundamentally designed to desktop PCs. Cable Modems are linked with a socket or a television to a Head-end, which is then connected to other Head-ends.

3. How fast is a cable modem?

Typical downloads are over 300Kbps, or nearly 600Kbps, but the actual speed of the cable modem depends on a few things. Cable modems are up to 10-20Mbps downloads. First it depends on how many users are on the system since the cable technology is a "shared" bandwidth.

The second factor to cable modem speed is a limit on the cable modem itself. Too many users using too much throughput can drain this "shared" technology. Some cable providers will limit the upload or download speed on the cable modem, and this could adversely affect your connection speed.

4. How secure is a cable modem?

Cable connections are not 100% secure in any instance like many other connections on the Internet. A general rule is to keep passwords long and turn off any service that you don't absolutely need running. Even though most cable providers block 137-139 ports, cable modems are likely to be generated in any case where a user has file and print sharing turned on, or possibly other services like (Simple mail transfer protocol)SMTP, Web Servers and Telnet services. A firewall type application should be used to keep a network as secure as possible.

5. Cable modem vs ADSL

- There is one major advantage that ADSL has over cable modems. Cable modems use a shared networking technology where all the cable modems share a single pipe to the Internet. Depending on the number of subscribers on the network, this pipe speed will fluctuate.
- When ADSL is used, the pipe to the Internet is solely "yours", and is not shared along the way to a central office. This allows for a more consistent speed and this speed does not typically fluctuate like cable modem networks.

6. What are the standards?

- Proprietary systems (1st generation)
- MCNS (USA mainly). Developed for Cable Modem only. Specifies external Cable Modem only, but may add internal.
- DAVIC.DVB (Europe mainly) Used for set-top box and now also Cable Modem.
- IEEE 802.14 lost 1st round, but tries to leapfrog and be the standard of the future (3rd generation systems).

7. Implementation of Cable Modem:

7.1 DOCSIS - 3. Architecture – Protocols

7.1.1 Access Methods

To log on the Internet when using a cable modem connection, we have to use the television network because it can receive some data (video) from a wide range area. There is in the network a Head-end linked to the television, so to the computer thanks to the cable between the computer and the television. Even if the name does not say so, there is no modem in this system. A cable modem can be seen as a Local Area Network, because the Head-end is most of the time situated in a local range, this Head end is a bridge to the Internet. Between the different subscribers, the wires are coaxial trunk cables, whereas fiber optic cables connect the Head-ends together. So there are numerous small networks and they are linked to create a Wide Area Network: a few houses share the same coaxial feeder line so neighbors can see the operations other people are doing, these groups of

houses belong to a bigger network linked with coaxial trunk cables, which are connected to a FCNN (Fiber Coaxial Neighborhood Node). There are several FCNN in the same Head-end. This scheme is called FTTN (Fiber to the Neighborhood) because they use a mix of wires, such as trunk cables, fiber optic cables. Cable modem architecture uses television lines, but those are only to download data, there was no need.

7.1.2.2 Routing

At the Cable Operator end, there is a device called a CMTS (Cable Modem Termination Service) this provides much the same functionality as a Dialup Router or DSLAM Router provides in other ISP alternatives? A Gateway to the Internet. The CMTS routes the traffic coming to and from a number of different users? This traffic may not just be Internet IP Data it may also be contain Video and Interactive TV Messages. The Internet Data is merged in one direction and split in the other from Video Data and routed to an ISP (Internet Service Provider) destined for the Internet. To transfer data quicker over longer distances? Cable Operators started using specially designed combined Coaxial and Fiber Optic cables, HFC (Hybrid Fiber Coaxial) made it possible to transfer data along fiber while still been compatible with the original coaxial system. In some cases the HFC may run all the way from the CMTS to the end of the subscribers road, where it would be converted to normal Coaxial signals running into the home. A more in depth look at the Cable Operators backend showing the CMTS and how it routes data can be seen in the following block diagram. As discussed there is usually one CMTS providing connection for a number of subscribers in a Neighborhood (FCNN). The CMTS reads MPEG-2 data streams and determines the destination source as video or data and routes accordingly.

8. Top 5 cable modems

- Motorola SB6121 SURF board
- Cisco-Linksys CM100
- Toshiba PCX2600
- Zoom External Cable modem
- D-link Broadband cable modem.

9. Applications

- A cable modem will provide you with rapid download transmission speeds.
- Downloading a file that would take one and a half hour using telephone modem connection will take only few minutes using a cable modem connection.
- A cable modem provides a continual connection to the Internet. Two way cable modems do not require the use of a telephone line.
- Your service will not be interrupted or receive external static since the outer layer of the cable will not allow any noise to enter the transmission line.
- As a high speed medium, you will be able to view many different multimedia presentations---"live " or streamed--

-such as concerts, movies,etc.

References

- [1] A Edward Amoroso. Cable modem: An Introduction to Internet Surveillance, Correlation, Trace Back, Traps and Responses. Intrusion NetBooks-1999.
- [2] Michele Adams and I Mokubey, "Cable modem: Concepts, Approaches, and Challenges," *Proceedings of the 45th annual southeast regional conference, 2007 - dl.acm.org.*)
- [3] R C Joshi, "Cable Modem: A New Paradigm to Information Security," *NewPrentice Hall, 2001*
- [4] "Cable Modem: An Introduction",www.CableModem.org
- [5] N Provos, "Cable modem,"*USENIX Security Symposium, 2004 - static.usenix.org*

Author Profile



Sheena Gupta is currently pursuing her engineering from Electronics and Communication branch from Poornima Institute of Engineering and Technology, Jaipur and is in her final year(8th semester) right now. She has already presented a paper entitled cognitive radio: reviewing spectrum sensing techniques in an a national conference named advancement in microelectronic and communication technologies in SKIT, Jaipur.