



Cable TV Networks as a Means of Providing Low Cost Internet Access to Nigerian Homes: Recent Advances and Survey

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Abstract: The Internet carries a vast range of information resources and services among private, public, academic, business and government networks that are linked by a broad array of electronic, wireless and optical networking technologies. Its performance has become extremely important in view of their ever expanding usage, and the complexity of its functions. However, the fundamental challenges facing Nigerians while trying to access the internet is very obvious, generally to get internet access to Nigerian homes are quite expensive coupled with the problems of poor connection and frequent network breakdown. Cable TV network with the aid of broadband technology have opened up a new realm of information access, storage and delivering of information to the world, internet access inclusive. Our objective in this work is to present a system architecture of internet access via Cable TV network, and propose a mechanism that can proffer solutions to the challenges facing the home internet users in Nigeria with a feasible economic return.

Keywords: Splitters, Cable Modem, Dial-up connection, Router, Communication networks, Decoders

I. INTRODUCTION

Cable TV networks and telecommunications networks are the two predominant forms of communication networks in Nigeria homes. However, to get internet access to Nigerian homes are quite expensive coupled with problems of poor connection and frequent network breakdown [2]. In Nigeria, most home internet users depend on dial up connections characterized by poor speed and connection problems. Meanwhile, cable TV has a strong reach to the homes and can serve as an alternative medium for delivering the internet services to Nigerian homes.

Earlier cable TV systems provided only one-way broadcast type services such as standard and premium channel television. Upgrading these earlier systems to support the two-way communications can offer internet access, pay-per-view, voice and video-on-demand services [10]. Today, many cable TV carriers have merged with large telecommunications companies in order to take advantage of the enormous market potential that exists in the industry. In the mid 1990's, a major shift occurred in the broadcast industry, the conversion from analog systems to digital systems provided broadcasters with the tools they needed to bundle multiple types of services onto a television channel signals. This included cable modems, digital television, and even telephone services [4]. The ability to integrate several services into one transmission signal allows the cable television to offer many new services without significant investment in the new cable systems. Analog CATV systems typically provide 50-100 video channels while digital CATV systems provides hundreds of video channels, as well could provide high-speed internet access, and telephone services. As cable systems evolved to include fiber (optical) cable and two-way amplifiers, cable networks evolved to allow data transmission in both directions [5].

The two-way cable system requires cable modems at the user end and a coordinating modem at the head-end of the system. A modem at the head-end coordinates the

customer's modem and interfaces data to other networks such as the Internet [3].

In Telecommunication, cable access is a form of broadband internet access that uses the cable television infrastructure [4]. Like Digital Subscriber Line (DSL) and fiber to the premise services, cable internet access can provide network edge connectivity from the Internet Service Provider (ISP) to an end user. This could be integrated into the cable television infrastructure analogously to Digital Subscriber Line (DSL) which uses the existing telephone network.

II. OBJECTIVES

- To explore issues and challenges facing home internet users in Nigeria.
- To present a system architecture of internet access via Cable TV network, and
- Propose a mechanism that can provide solutions to the challenges facing the home internet users in Nigeria with feasible economic return.

III. LITERATURE REVIEW

A. Cable TV Network Systems:

Cable television systems provide video and data services through a system of high bandwidth coaxial cables and fibers. The cable network includes a head-end amplifier that combines the broadcast and data signals for transmission to the subscribers. High-speed internet access could be obtained by including a cable modem termination system (CMTS) function within the head end that connects to a 10/100Mbps Ethernet router [6]. In the network, the head-end is connected to fiber or coaxial trunks that carry the signals into the neighborhoods where they can be tapped to provide service to the residence. Figure 1 below shows a typical cable television network system.

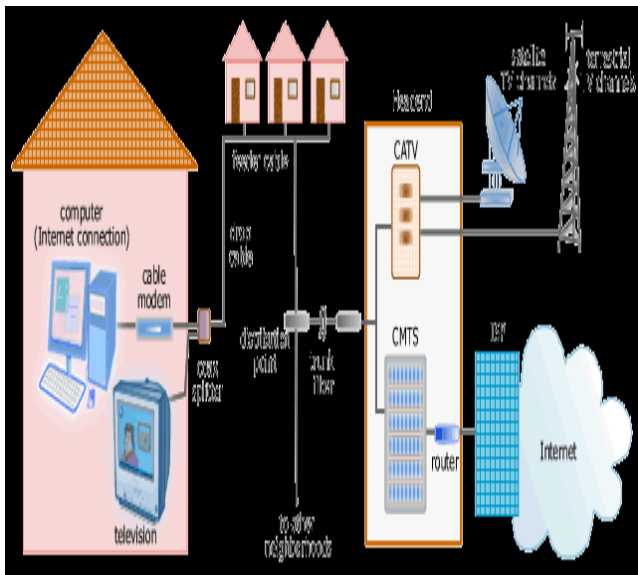


Figure 1- a Typical Cable Television Network System.

The head-end is the initial distribution center for a cable television (CATV) system. The head end is where incoming video and television signal sources (e.g., video tape, satellites, and local studios) are received, amplified, and modulated onto TV carrier channels for transmission on the CATV cabling system. The cable distribution system is a cable (fiber or coaxial connected to a small dish at the user's premises) that is used to transfer signals from the head end to the end-users [3]. This cable can be attached to the television through a set-top box/decoder as it is well known here in Nigeria. The set-top box is an electronic device that adapts a communications medium to a format that is accessible by the end-user.

B. Internet Access via Cable TV Network:

Internet Access through Cable TV Network defined a form of broadband internet access that uses the cable television infrastructure. Like digital subscriber lines and fiber to the premises. Cable internet access provides network edge connectivity from the internet service provider to an end user [2]. This could be integrated into the cable television infrastructure analogously to DSL which uses the existing telephone network. The cable TV signals are often removed by filtering at the line tap outside the customer's premises. In broadband cable internet access, the network requires a cable modem at the customer's premises and a cable modem termination system at a cable operator facility, typically a cable television head end [5]. The two are connected via coaxial cable or a Hybrid Fiber Coaxial (HFC) plant, although in Nigeria, a small satellite dish is require to connect to the Cable TV head end which can now be wired to the user's TV through the use of coaxial cables.

If the HFC network is large, the cable modem termination system can be grouped into hubs for efficient management. Downstream traffic bit rates directed toward the user can be as much as 400Mbits per second for business connections, and 100Mbit per seconds for residential service. Upstream traffic, originating at the user, ranges from 384Kbit per second to more than 20Mbit per second [6]. One downstream channel can handle hundreds of cable modems, and as the system grows, the Cable Modem Termination System (CMTS) can be upgraded with more downstream and upstream ports, and grouped into CMTS hubs for efficient management. Most Data over Cable

Service Interface Specification (DOCSIS) cable modems restrict upload and download rates, with customizable limits. These limits are set in configuration files which are downloaded to the modem using the Trivial File Transfer Protocol (TFTP), when the modem first establishes a connection to the provider's equipment [10].

IV. ANALYSIS AND DESIGN OF CABLE ELECTRONIC COMPONENTS

Putting both upstream and downstream data on the cable television system requires two types of equipment: (i) a cable modem on the customer end and (ii) a cable modem termination system (CMTS) at the cable provider's end. In addition, cable TV networks require an additional splitter for it to be able to provide internet access, (see figure 1 above). The splitter is also referred to as a bi-directional amplifier. It has one input port (for coaxial cable coming from the dish) and two output ports each of which is coaxial with one going into the cable modem and the other going into the TV's setup box/decoder. Basically, the cable TV network was designed for a one way communication (i.e. downstream; the direction towards the user), the job of the splitter/bi-directional amplifier is to enable the network with the capability for a two way communication (i.e. both downstream and upstream data communication) [11, 13]. It filters the signals into two appropriately selecting the set of signals for TV channels receiver and those for internet access while adequately routing each to its required destination during downstream and also route requests from the user to the internet through the head end during upstream [7]. For cable internet access on PC, a cable modem is required at user's end. A cable modem is a communication device that modulates and demodulates data signals to and from a cable television system. It is an external device that connects to the computer to provide high-speed data access via cable TV networks.

Beside these two types of equipment, all the computer networking, security and management of internet access over cable television should be put in place. The DSL and cable Internet can easily be shared with computers on your home LAN through software (Microsoft Internet Connection Sharing for example) or by using a connection sharing device, such as a router and firewall software [12]. Figure 2 below depicts a typical network framework of cable electronic components connection.

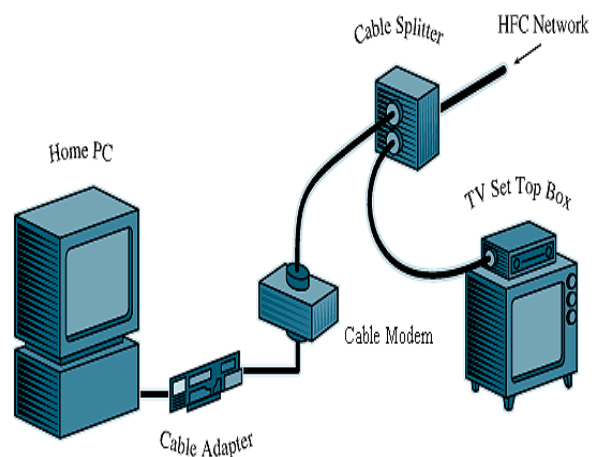


Figure 2 shows a typical network framework of cable electronic components connection

V. IMPLEMENTATION OF INTERNET ACCESS VIA CABLE TV NETWORK IN A MULTIPLE COMPUTER ENVIRONMENTS

In this framework, a cable modem can be used to provide internet access in a multiple computer or business environment. This could be achieved by using the normal configurations as in the single computer environment. However, instead of connecting the cable modem to the computer directly, we connect the cable modem to a LAN switch or an Ethernet router/wireless router as shown in figure 3 below. The switch can be connected to as many computers as possible depending on the number of Ethernet ports in it. The switch provides each computer with an individual IP address so as to enable it communicate with the internet in both upstream and downstream manner.

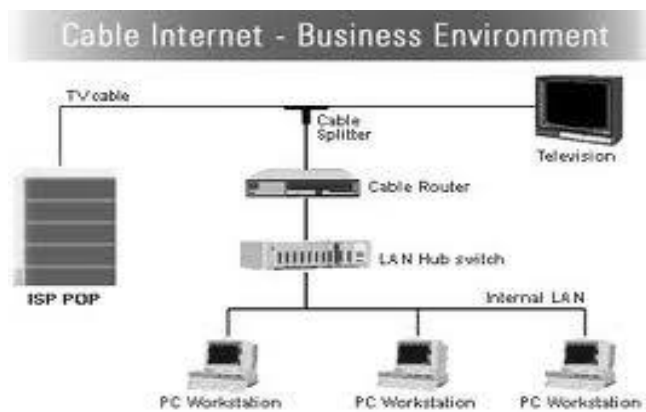


Figure.3- a typical Internet Access via Cable TV Network in a Multiple Computer Environments

VI. RECOMMENDATION

Cable TV networks as a means of accessing the internet is an effective method compared to other access methods currently in use in the country as it offers better and higher bandwidth, stronger reach to homes hence devoid of time cut down, drop outs, cheaper costs, and always on connectivity. Thus since this method holds comparative advantage over other methods, this method should be implemented to solve the current crisis facing the home internet users and also provide low cost internet connectivity to companies and corporations. It is our believe that proper implementation of this concept; will enable Nigerian homes to enjoy optimum internet access and in addition, the use of internet access via cable TV networks can help in enhancing the development of E-learning over the internet as it involves a very high speed downstream and upstream.

VII. CONCLUSION

Internet access via cable TV network with the aid broadband technology in no doubt have opened up a new realm of information access, storage and delivering of information to people. In Nigeria, internet access is majorly provided through the use of telephone lines as the transmission media. The main disadvantage of this method is the occupation of the telephone lines during usage, in addition to cost, accessing the internet could be very expensive. Internet access via cable TV network offers very high speed internet access without traffic jam with less cost.

There is no doubt, cable internet access definitely will be a principal competitor to DSL in Nigeria and could offer 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 network method presented is an alternative medium for delivering the internet services to millions and have the potential of solving the challenges facing the home internet users in Nigeria with feasible economic return.

VIII. REFERENCES

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