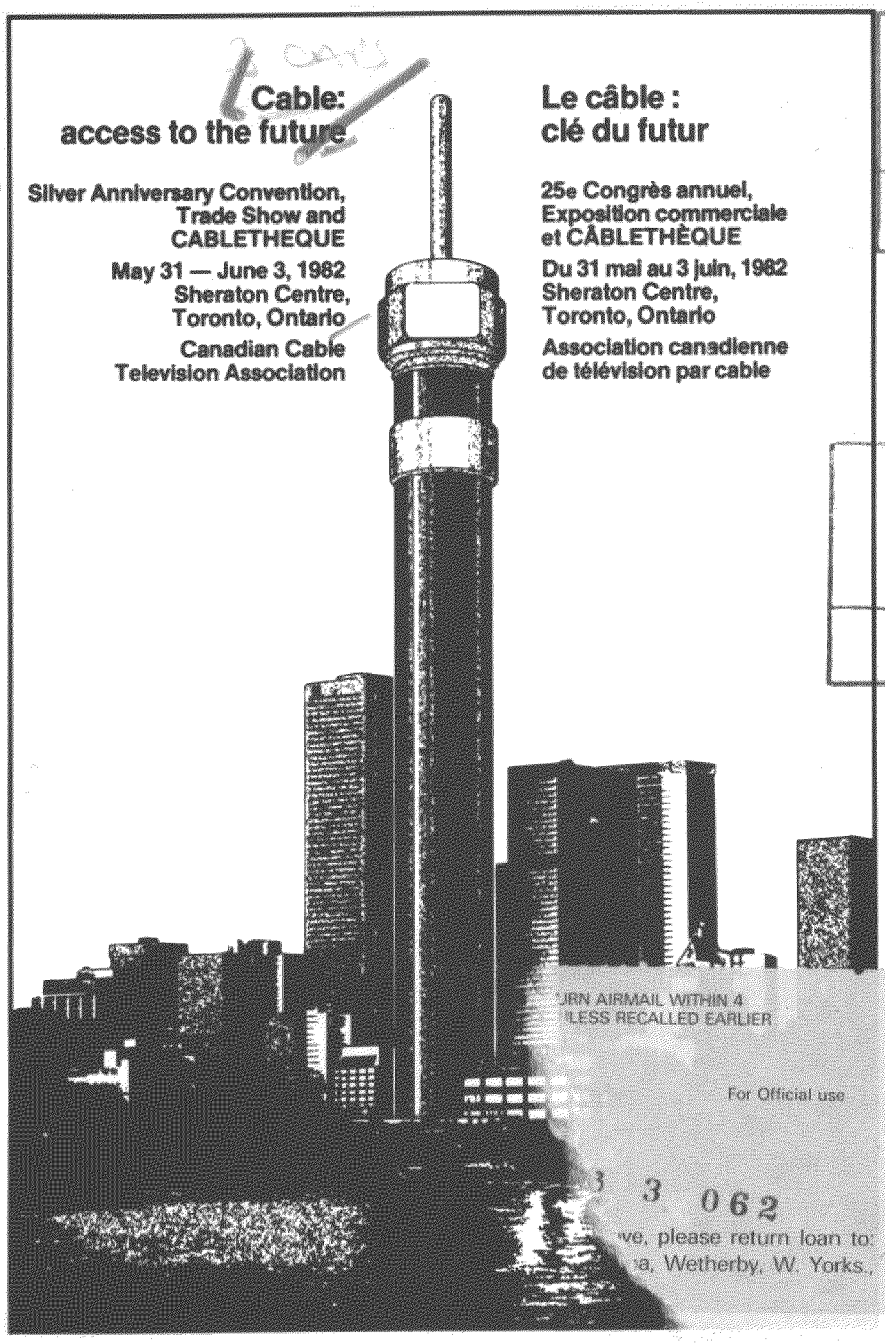
OFFICIAL TECHNICAL RECORD 1982

Cable:
access to the future

Silver Anniversary Convention,
Trade Show and
CABLETHEQUE
May 31 — June 3, 1982
Sheraton Centre,
Toronto, Ontario
Canadian Cable
Television Association

Le câble :
clé du futur

25e Congrès annuel,
Exposition commerciale
et CÂBLETHÈQUE
Du 31 mai au 3 juin, 1982
Sheraton Centre,
Toronto, Ontario
Association canadienne
de télévision par cable



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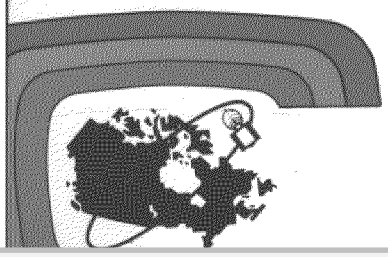

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INTRODUCTORY COMMENTS

DOSSIER TECHNIQUE OFFICIEL 1982 DE L'ACTC
COMMENTAIRES D'INTRODUCTION

Isn't it a wonderful sight to see sunlight streaming through a window. The infusion of warmth and light is akin to the feeling that exists today in the Canadian cable television industry. The Canadian Radio-television and Telecommunications Commission and the Department of Communications have moved the industry ahead appreciably in the last year. The licensing of Pay TV distributors and the steps taken towards deregulation are appreciated by all Canadians.

This year's Official Technical Record reflects this feeling of optimism in the industry. Twenty-six outstanding papers will cover the full spectrum of our technical concerns. Substantial input has been provided by the Cable Telecommunications Research Institute (CTRI), the manufacturing and supply industry, cable companies and by government. It is also encouraging to note that we have papers being presented by United States company representatives, also by Telesat and, a landmark first time, by a Canadian Broadcasting Corporation representative.

We are indebted to the many members of the CCTA Technical Committee and Subcommittees who have done so much over the last year to assist CCTA in it's continuing efforts to "open the curtains wider". CCTA extends it's appreciation to both the authors and to those people who have contributed freely of their time to assist in the bringing together of the Technical Program, particularly to those who are members of the CCTA Convention Program and Technical Digest Technical Subcommittee: N. Hamilton-Piercy, R. McIntyre, G. Brothers, R.J. Ménard and J. Halina.

N'est-il pas merveilleux de voir enfin le soleil s'infiltrer par la fenêtre? Le mélange de chaleur et de lumière qui s'en dégage est semblable au sentiment qui existe aujourd'hui au sein de l'industrie canadienne de la télédistribution. Le Conseil de la radiodiffusion et des télécommunications canadiennes et le ministère des Communications ont grandement contribué à l'avancement de l'industrie au cours de l'année écoulée. L'attribution de licences de télé payante et les mesures visant la déréglementation sont appréciées de tous les Canadiens.

Cette année, le Dossier technique officiel arbore cette couleur d'optimisme. Vingt-six exposés hors pair couvriront tous les aspects de nos préoccupations techniques. L'Institut de recherche en télécommunications par câble (IRTC), les fabricants et fournisseurs, les télédistributeurs et le gouvernement y ont fourni un apport considérable. Fait encourageant: des exposés nous viennent de représentants de compagnies américaines, de Télésat et, grande première, d'un représentant de la Société Radio-Canada.

Nous sommes reconnaissants aux nombreux membres du Comité technique et des sous-comités de l'ACTC d'avoir tant appuyé l'Association dans la poursuite de ses efforts vers "une fenêtre plus dégagée". L'ACTC remercie les auteurs et tous ceux qui ont offert de leur temps pour la réalisation du programme technique, et tout particulièrement les membres du Comité d'établissement du programme du congrès et du Sous-comité de rédaction des résumés techniques: N. Hamilton-Piercy, R. McIntyre, G. Brothers, R.J. Ménard et J. Halina.

George Cormack
Vice-President Engineering/CCTA
Le vice-président, Ingénierie, ACTC

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THE NABU CONCEPT - DISTRIBUTED DATA PROCESSING VIA CABLE NETWORKS

by
John Lee Hughes,
NABU Manufacturing Corporation,
Ottawa, Ontario

ABSTRACT

Microcomputers are becoming cheaper and more capable. However, software creation and distribution costs are rising, and cable operators are looking for new revenues. This paper describes NABU's entrepreneurial concept which provides the CATV operator with several profitable opportunities and the customer with an obsolescence-resistant microcomputer. Some technical details of the equipment are described.

INTRODUCTION

NABU Manufacturing Corporation was formed with the intention of being Canada's first major manufacturer of microcomputers. NABU's management felt that the strongest impediment to the sale of microcomputers on a large scale was the existing method of distributing software. Physical distribution of software through cassette or floppy disk was inappropriate to mass marketing because the buyer does not have adequate information to make a buying decision. The current methodology of buying "off the rack" software is analogous to a consumer buying a record without ever having heard it played!

The solution was to build microcomputers with adequate communications capability to enable the distribution of software by electronic means. The benefits would be as follows:-

1. Software would be previewed before purchase.
2. User documentation would be integrated into the software and accessed through a "Help" command.
3. Maintenance of software would be centrally controlled.
4. The consumer would always have the latest version.

A study of the communication parameters of telephone, data, and cable networks indicates many factors which would militate against using the telephone network as a distribution medium. Among the more obvious are low data transmission rate, low peak load handling capability, inability to receive telephone calls when using the home computer, and the cost penalty of a measured, distance oriented billing system.

Each channel of the cable system, on the other hand, can deliver data at rates exceeding one thousand times that of a telephone circuit. Moreover, CATV provides a full time, non-switched system with no penalty for timed billing or distance from the data source. In addition, when used for data distribution, the coaxial cable can still be used to receive normal television programming.

Having made the decision to use cable networks, other benefits soon became obvious. Cable operators would have new revenue potential through the sale of microcomputers and a whole range of data related services to their customers.

THE NABU CONCEPT

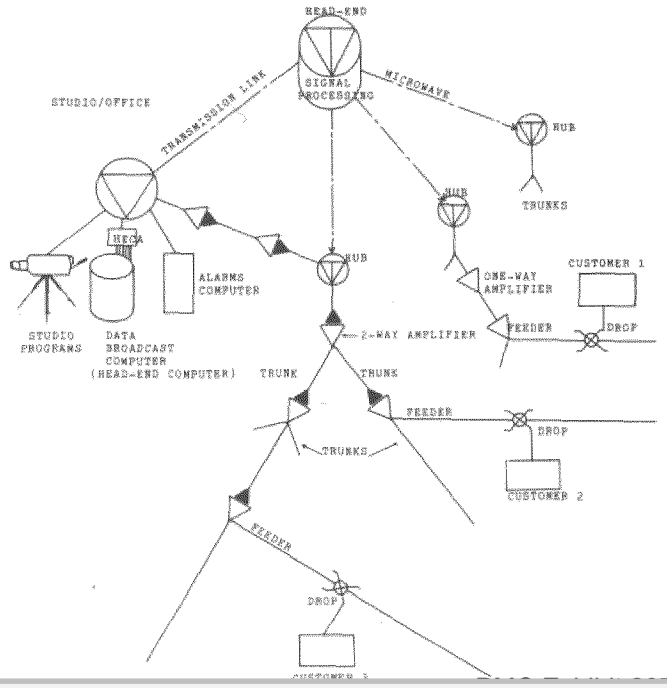
NABU was founded on the concept of marrying microcomputers with the cable industry. As a result, microcomputers will facilitate the delivery of many exciting new services to the home and business. The cable plant is the cornerstone of a broadband communications network including not only cable, but microwave and satellites as well. It is the first really viable alternative to the telephone company. By placing computers with large data bases at the head end software can be downline loaded, enabling subscribers in their homes and businesses to have access to enormous up-to-date program libraries for a monthly fee.

ONE-WAY CABLE COMMUNICATIONS

The NABU concept covers various communications patterns and topologies, from one-way cable broadcasting, through two-way cable communications, and on to an intergrated system involving many local and regional CATV networks interconnected by gateways. This paper describes the one-way system as it appears to have the most immediate appeal and lowest introduction cost.

The one-way service provided is Digital Broadcast Data which involves encoding data (e.g. pages of information, software programs, etc.) into some form suitable for transmission on the CATV network. The head-end cyclically broadcasts the entire data base on the CATV network. The end user selects the information of interest from a specific channel or sub-channel. A generic network topology is illustrated in Figure 1.

Figure 1 Topology of a Generic Cable System



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The following components reside at the studio or the head-end of the cable operator:-

— Head-End Computer which stores and manages the applications software.

— Head-End Cable Adapter (HECA) which formats the data into several parallel bit streams for transmission on the CATV network. The HECA contains modulators, which modulate each serial bit stream into appropriate analog signals, placing it into the TV frequency channel designated by the CATV operator. The Combiner at the CATV head-end mixes these data channels with regular television programs and transmits the signals to the hubs of the cable network and thence into the homes of subscribers via the coaxial cable plant.

At the terminal or customer end is the following equipment:

— The Home Computer Cable Adapter (HCCA) which demodulates the data channels and re-formats the data for the Home Cable Computer. The HCCA is an addressable, tuneable intelligent modem with local and remote diagnostic capabilities.

— The Home Cable Computer (HCC) which receives the data from the HCCA and executes the software (e.g. display audio-visual information, perform calculations).

Full Channel Data (FCD) encoding technique is employed for data transmission on the CATV network. Compared with Vertical Blanking Interval (VBI) or Full Frame Data (FFD) transmission, FCD has the following advantages:-

— higher aggregate data throughput per channel

— higher reliability

— lower cost

— lower impact on cable loading and hence less impact on regular television programmes

The bit error rate (BER) performance of the communications channel (i.e. modulator, CATV network and demodulator) is expected to be better than 1 error in 10**8 for most CATV systems. However, NABU is not dependent on this BER for successful operation. Error control techniques are employed to ensure satisfactory performance over marginal CATV systems.

HEAD-END CONFIGURATION

The head end equipment consists of a Head-end Computer and a Head End Cable Adapter (HECA) as shown in Figure 1. The functions of these items are elaborated below.

— The Head End Computer stores and manages applications software from several sources. The software for each application is divided into segments, while each segment is sub-divided into data packets.

— The digital portion of the HECA attaches special formatting information (addresses, headers, flag characters) to each data packet according to a NABU proprietary protocol.

— Each data packet can be addressed to all customers or to a specific customer, so giving the system a messaging capability in addition to that of software distribution. The CATV operator can thereby address a customer or update an HCCA on a global or selective basis.

— Each data channel occupies a regular 6 MHz TV slot and carries data at 4.8 Mb/s. The modulation technique was carefully chosen for high speed, low error rate, low costs for the HCCA and the HECA, and low impact on the CATV amplifiers.

— Data can be transmitted on up to 4 TV channels. More channels may be used if required.

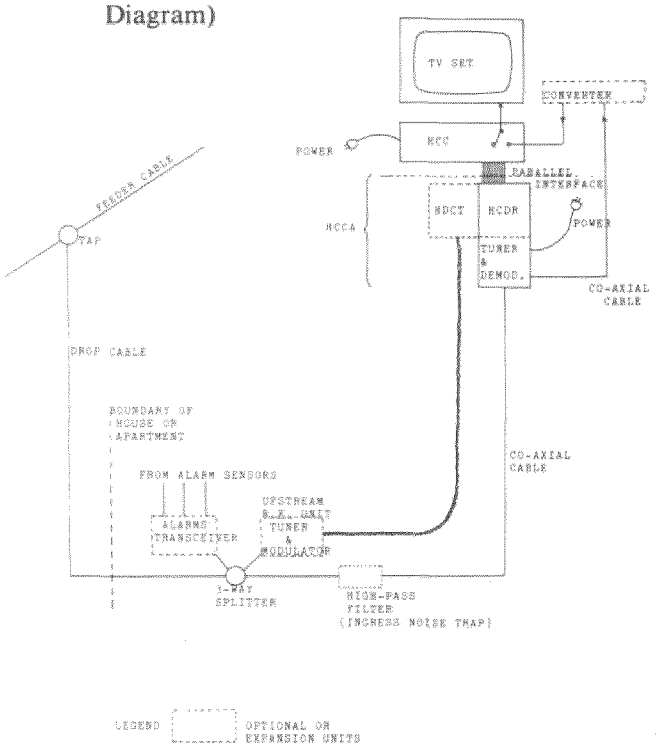
— The centre frequency and the frequency offset of each data channel can be adjusted to meet the individual requirements of each CATV operator.

— The signal levels of each modulated channel are individually adjustable by the CATV operator.

CUSTOMER-END CONFIGURATION

The customer-end equipment contains the Home Computer Cable Adapter (HCCA) and the Home Cable Computer (HCC) as shown in Figure 2. The functions of each are described below:-

Figure 2 Customer-End Equipment (Functional Block Diagram)



— The HCCA can be tuned by the HCC to any one of the 4 data channels being transmitted by the HECA. Alternatively, a video switch within the HCCA allows the cable signal to be fed to a regular TV set or a channel converter for watching TV programs.

— The HCCA demodulates the data broadcast cycle from the data channel to which it is tuned

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— Depending on the information within the header of each packet, the HCCA either rejects a packet, or accepts and processes it. If the data is intended for (or was requested by) the HCC, it transfers the packet to the HCC.
— Each data packet may belong to a tier level dictated by the CATV operator. The customer may subscribe to any number of tiers. The HCCA checks the tier level of each requested packet and does not send unauthorized packets to the HCC.
— The HCCA contains a number of indicator lamps so that the customer can help the CATV operator to diagnose the location of any problem. This feature reduces service calls as well as repair time in the field.
— The Home Cable Computer receives the data from the HCCA and carries out the necessary application (e.g. display audio-visual information, play a game).
— Since the operating system as well as the character sets of the HCC can be defined and changed from the head-end, the HCC can be made to perform a much wider variety of tasks than if it were an inflexible device.

CONCLUSIONS

The first versions of all these units went through successful technical trials in Ottawa in March 1982. Production quantities are expected in the latter part of 1982. NABU would be pleased to entertain enquiries and make technical results available to the cable industry.

JOHN L. HUGHES

John Lee Hughes is Vice President, Strategic Planning for NABU Manufacturing Corporation. In this capacity, Mr. Hughes has overall responsibility for market research, advanced technology, and short and long range strategic planning.

Mr. Hughes is a 1962 graduate of American University with a business administration degree and has done advanced studies in digital systems at Massachusetts Institute of Technology. He has held the position of Vice President, Data Systems at Citibank, N.A. and Vice President, Interactive Products for Automated Data Processing, Inc., one of the largest computing service organizations in the world.

A frequent lecturer on the subject, Mr. Hughes has been appropriately termed "The Father of Distributed Processing".

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