SELECTIVE ELECTRONIC HOME SHOPPING

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ABSTRACT

Given the extraordinary financial success recently enjoyed by televised home shopping, the viability of the electronic medium as a vehicle for the display of merchandise intended for sale now seems assured.

To date, however, the philosophy of network shopping has been to rely on conventional television distribution methods rather than to use cable technology to advantage. This has resulted in two (2) significant shortcomings:

1) Viewer satisfaction is limited to that very narrow demographic group with both the time and inclination to endure a serial product display, the viewer remaining poised to interact on a "target of opportunity" basis, and

2) Cable's unique technology is nowhere apparent. The viewer therefore perceives no enhanced value to cable TV subscribership.

OVERVIEW

This paper will describe a cable-unique, interactive, electronic home shopping service offering the subscriber full random access, for view or purchase, to potentially over 50,000 products, each displayed in full NTSC video/audio over a 6 MHZ CATV channel.

No home terminal devices beyond basic CATV and a touchtone telephone are required.

EHS Concept

Electronic home shopping (EHS) as a subscriber controlled program service can best be visualized if viewed from **Telaction's** perspective. That is, the television receiver becomes the visual equivalent of a shopping mall. Replete with the full functionality of a shopping mall, i.e., random access to a cross section of stores. The ability to enter those stores and examine a cross section of products again, through random access. And finally, to optionally purchase products, store products for future purchase or simply examine products at leisure without the necessity of visiting a conventional brick and mortar store, free of the intervention of a sales person. When and if human intervention is desired the shopper has at his/her command a simple bridge to customer service representatives from any of the stores participating in the "electronic mall".

All of the capability described above is accessible through simple, usually single, touchtone strokes to cable subscribers at systems affiliated with **Telaction**. The system - a three year, forty million dollar development effort- exists in hardware and is poised for technical test followed by market introduction in the Chicago area during the next several months.

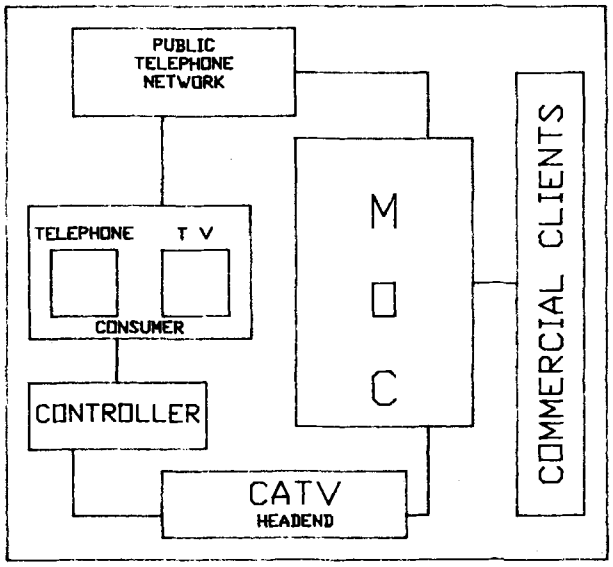
Technology nothwithstanding, the implications of so powerful a service are, of course, enormous.

Four "C's"

Operationally, the system is a hybrid composed of four (4) interactive entities; what **Telaction** refers to as the mandatory "four C's".

1. Consumer
2. Cablesystem
3. Communications
4. Clients

Amalgamation of these components in even a simplest form of life, single node net requires a hardware intensive, software driven co-operative interconnection between private residence, public utility, public switch, common carrier, cable system, and Telaction operating center.



(Figure 1)

Prior to describing system architecture however, its fundamental precepts must be understood. Only then, from a perspective of functionality, can the extensive hardware complement be rationalized.

Conceptually, the system will operate as follows:

The cable subscriber, tuning to the Telaction channel, will observe a "welcome screen". The screen, a still frame graphic, will advise him in lower one-third (1/3) script ... "to begin shopping dial the phone number".

Following these instructions the consumer removes the phone from its cradle, dials as instructed and within two (2) seconds of closure a menu will appear on screen with its associated prompt. This menu will consist of product categories. Following the prompt, now reduced to single touchtone keystrokes, the consumer may "navigate" the catalogue inventory of some thirty national and international stores. Each displayed in full NTSC video with aural accompaniment. This activity may now continue until such time as the consumer chooses to terminate the interaction by purchase, storage, customer service, feed forward, or simply hanging-up the telephone.

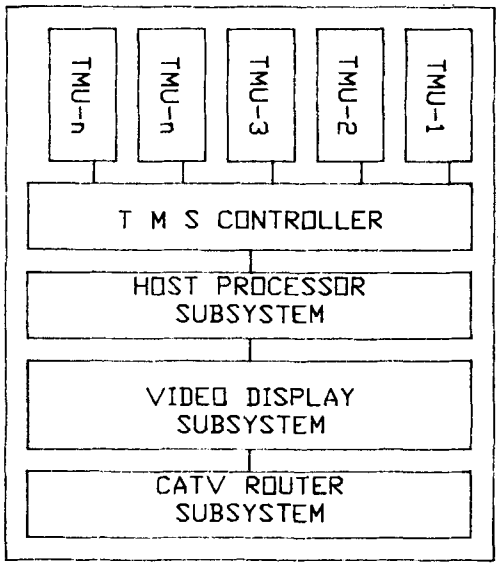
Simply stated, the viewer need not be subjected to the rigors of computer operation or any sort of intrusive hardware. Interaction is via telephone and television. Specifically cable television.

ARCHITECTURE

Metropolitan Operating Center

This level of interactivity, albeit with a far narrower range of products and services, has been achieved to date only through use of home personal computer or point of purchase (mall) kiosk devices. In order to deliver such functionality while limiting user hardware requirements to CATV and phone, transaction processing and control must be emulated externally. This is accomplished on a regional scale through a facility known as a Telaction Metropolitan Operating Center.

When an interactivity is initiated i.e., a subscriber dials into the Telaction Network via the 800 or local toll the call will be routed to the most local metropolitan operating center. Incoming traffic will process via ATT conversant telephone management system, (TMS). The conversant telephone management system is characterized by voice recognition. Voice grade circuits will direct incoming calls at the Chicago metropolitan operating center from the telephone management system, to a host computer system for data entry and control.



(Figure 2 (MOC)

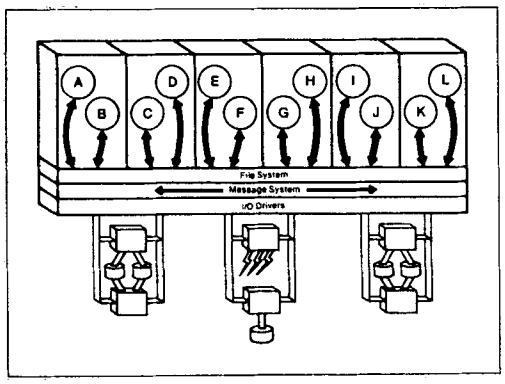
The host computer systems, in the interest of reliability, are Tandem Systems TXP and VLX multiple processor mainframes, characterized by full redundant hardware running the Tandem non-stop operating system.

While essentially transaction process computers the VLX and TXP systems are sufficiently fast to respond to the level of activity generated by electronic home shopping. Of greatest importance however, is the fundamental architecture of Tandem systems - complete hardware duplicity, each computer is a dual system, each running duplicate programs and interconnected in a failure deferral hierarchy.

Simply stated, should a host computer experience a catastrophic failure in hardware, the operating system ("non-stop") will sense the failure, shift output to the operable duplicate and continue running valid data, virtually undisturbed.

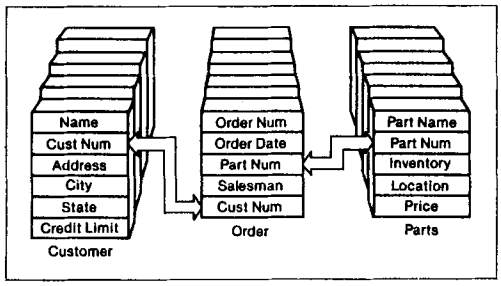
In addition to reliability, the Tandem system architecture is eminently expandable. Following market introduction the Tel**action** Network is expected to expand into sixty regions nationwide. This, according to a rather aggressive schedule will place extraordinary demands on MOC data processing facilities.

A system architecture characterized by its inherent ability to balance processor loading (Figure 3) is essential to orderly growth of the network. The Tandem system is capable of "bolt on" expansion to accommodate 4,000 processors.



(Figure 3)

Additionally, a relational rather than hierarchical data base foundation will allow those changes to existing programs inherent to developmental projects. As the network grows a rigid hierarchical construct would become increasingly resistant to change and too easily obsolete.



(Figure 4)

Following data base query as to the validity and identification of the incoming transaction, the host computer outputs a command to the video display subsystem.

The video display subsystem consists of a video display unit, (VDU), an audio distribution unit, (ADU), intelligent controllers; VBI, address inserter, and a nxl matrix switch, interconnected via high speed LAN.

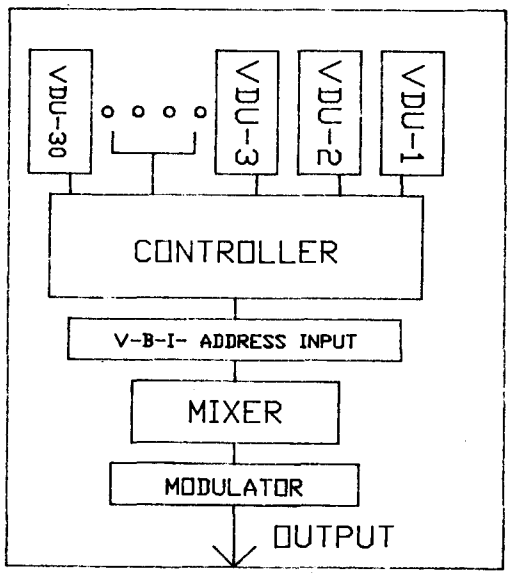
Video access is random read only as well as multiple write to accommodate dynamic data such as graphics or product change.

The entire EHS system is characterized by the output of the VDS.

The output, a series of television frames, are electronically conventional NTSC, 30 frames per second.

The frames, however, are concatenated i.e.: each is an individually fetched and addressed slide, bearing no continuity to the previous or subsequent frame.

This system of distribution allows for a very large transfer of information without stressing CATV system bandwidth or linearity.



(Figure 5)

Additional detail relating to the video display subsystem is confidential at the present time, however, it is apparent that in order to provide program audio a time compression technique is employed. The audio, once recovered, processed and addressed, is transmitted in synchronous parallel to its associated serial video frame. Audio accompaniment is limited to 40 seconds per frame. In practice considerably less time has been required.

CATV Router Subsystem

The cable television (CATV) router subsystem receives audio and video signals from the video display subsystem (VDS) and converts them into signals which can be transmitted to the cable television plant. Under control of a host software subsystem (router controller), video images from the VDS are concatenated at 30 frames per second, a frame grabber address and an audio RF reception frequency are inserted into the vertical blanking interval (VBI) associated with each frame, the video signal is modulated onto a given channel, the audio signals are converted to a given bandwidth, and the resultant audio and video signals are combined and sent to the cable television head end.

Components include a micro-computer controller (scheduler), a VBI switch, a VBI address inserter, a modulator (for the video signal), a block upconvertor (for audio), and a combiner.

The resulting combined video and audio signals are transmitted from the regional MOC system to a cable television head end facility via coaxial cable, microwave, or other wideband transmission facility.

NETWORK

A network comprised of six geographic regions is planned. The time period for completion covering 1987 through 1996, with the major activity in decline by late 1991. Network hierarchy will be as follows:

LOCAL M.O.C.
REGIONAL M.O.C.
HEADQUARTER M.O.C.

Local M.O.C.

Local M.O.C.'s would house a complete presentation system as well as CATV routing subsystems sufficient to serve their respective markets. These subsystems would comprise microwave and copper or fibre interconnects into local CATV systems.

Additional communication facilities would be necessary to provide:

a. Gateway or data base dynamics between local commercial clients and Telaction. These transactions could be relegated to voice grade Telco facilities between the Communicating entities.

b. Transaction data base dynamics between local and regional M.O.C.'s.

These transactions could be carried out on a dedicated basis via T-1 carrier.

c. Presentation data base dynamics from Headquarter M.O.C., all video presentation system modifications would be input at the local M.O.C., via T-1 carrier. These might include pricing, text or full video updates or future VDS subsystem.

d. Customer service bridge of all customer service inquiries. These would be bridged to the regional M.O.C., via dedicated voice grade (56KBPS) circuits.

e. System diagnostics, this data would be communicated to the regional M.O.C., via a dedicated T-1 "order wire" circuit. A complimentary command channel would return from the associated regional or Control Headquarter M.O.C.

Regional M.O.C.

These facilities would include all the facilities of a local M.O.C., as well as:

a. Communication facilities for transmission to Headquarters of data aggregated from local and regional transactions.

b. Diagnostic duplex channel to/from local M.O.C.'s.

c. Customer Service Telephone management system and voice communications to Headquarters.

Headquarter M.O.C.

This facility will include all of the subsystems of a local M.O.C., as well as:

a. Customer Service TMS.

b. Complete aggregation of data base inputs from local from local through regional transactions.

c. Communication links to/from commercial clients.

Communications network subsystems sufficient to support this level of information transfer would, of necessity require:

1. Interfacility communications ..e., between M.O.C.'s including data voice, and video carried out via a satellite multiplex single channel per carrier (SCPC) scheme.

Duplex R/T facilities at each communicating entity (Trans, Rec. Ant. Modems, etc.).

Protected (non-pre-emptible) satellite service across at least a single 36 HZ transponder.

2. CATV communications links-microwave, fibre and copper interconnects between M.O.C.'s and potentially 5,000 CATV systems.

3. Commercial client data communications in the form of switched telco service from local entities to dedicated T-1 SCPC over Tel**action's** transponder for national accounts.

CATV Distribution

CATV distribution closes the loop from consumer telephone to consumer display.

The incoming audio and video signals are received and demodulated at the CATV headend facility. Re-modulation for distribution is via Tel**action** supplied and modified CATV channel modulators.

Video modulation is conventional NTSC in signal characteristic, however, of concatenated frame content and devoid of aural subcarrier.

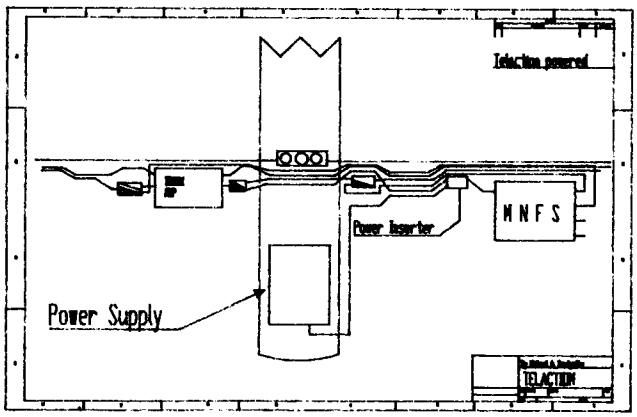
Audio distribution is via single channel per carrier, multiplexed into the CATV trunk, and may be carried on any trunk frequency irrespective of converter capability.

Since trunk distribution will route the signals through the CATV plant, selectivity ana conversion to subscriber usable format must take place externally.

These functions are accomplished in an original engineering device known as the multi-node frame store unit (FSU), designed and built by Cableshare, Canada.

Frame Store Units

Frame store units are designed for installation at off premise aerial or underground locations generally co-located with similar population to existing bridger amplifiers.



(Figure 6)

In its simplest form the frame store system consists of a combination of circuit components that 1) recognizes a video frame addressed to it, stores that frame for subsequent transmission as a video signal to the subscriber addresses it serves, and 2) receives and transmits the audio signal related to the video image being transmitted. The circuit components include a dual audio receiver, a video demodulator, an analog/digital converter, a digital frame store, a digital/analog converter, a channel modulator, and a controller which reads and interprets the addressing information in the incoming vertical blanking interval and activates the other components as required.

In its multi-node configuration the MNFS system (Figure 7), will accept an input signal, comprised of NTSC video and frequency divided multiple access (FDMA) audio.

By virtue of address the system will detect, A/D convert, discriminate, store, D/A convert, remodulate and amplify up to four specific video and associated audio "frames". Stored signals will appear simultaneously at up to four parallel feeder maker outputs of the MNFS.

Output video levels are continuously variable over a ±20 db range, up to a maximum of +59 dbmv continuous.

In its four node configuration, the functions described comprise a component allotment of thirteen single side printed circuit boards housed in thirteen plug in modules plus transformer less power supply, line filter and receive I/O modules. The entire assembly resides in a 26" x 10 1/2" x 12" cast housing. The external appearance being similar to that of a conventional feed forward CATV trunk amplifier and should exhibit similar environmental immunity and RF radiation properties.

When a subscriber initiates a transaction call to the M.O.C., the requested frames are routed to and through the CATV trunk system. All frames appear at the input ports of all FSU's, and are selected by address for display by the FSU associated with the initiating subscriber.

Audio is routed via frequency division multiple access technique throughout the trunk system as well. The appropriate carriers are selected for feeder distribution by address and modulated on subcarrier 4.5 MHZ above video by the targeted FSU.

Simply stated, in the CATV trunk line a channel of concatenated frames as well as narrow channel of FDMA audio are routed. At the feeder level, those frames (A&V) requested by homes served by each feeder are selected by the FSU and routed only to that feeder.

Each interaction taken by the subscriber results in an additional VDS subsystem output. Each will be discriminated by that subscribers FSU for display. Tel**action's** design target for response time is two (2) seconds, from key stroke to video display at the drop.

FSU's outputs are phase locked to the input carrier and will thus introduce no instability impact as regards harmonically or incrementally related carrier systems.

Each FSU is capable of providing up to four distinct output frequencies.

Contention

Contention is a major design concern in any technology where numerous homes passed vie for one channel.

Tel**action's** design target is 86% availability during peak use and virtually unrestricted availability during low use periods. This level of contention is rationalized as follows:

IF:

A x B x C x D = E

WHERE:

A = Feeder population in homes passed (national average)

B = CATV system penetration in percent basic subscribers

C = Tel**action** subscriber penetration in percent of basic subscribers

D = Probable concurrent user percent system wide

E = Contention ratio

THEN:

100 X 50% X 33% X 0.5% = .08:1

CATV Implications

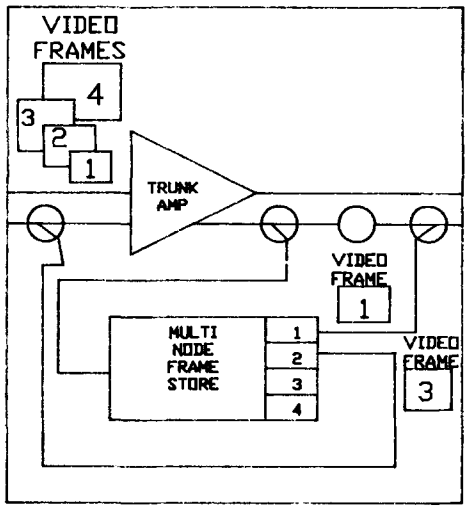
The EHS is the first service in which a series of devices need actually be installed in off premise physical plant. Consequently, the ramifications are extensive.

It is Telaction's stated intent to minimize the impact to the financial operational and signal quality performance of affiliated systems during EHS installation. To that end Telaction will assume all cost associated with installation of EHS hardware. At each affiliates option, installation will be carried out by contract organizations. Project management will be the largest CATV hardware producers to insure system integrity is maintained throughout this critical phase.

At each affiliates option all components of the EHS system residing on CATV plant are subjected to rigorous performance testing and verification on site.

Alignment and proof of performance will be carried out by Telaction prior to launch.

All subassemblies of CATV resident equipment are designed to be field maintainable. Telaction will provide on site spares to an adequate level based upon projected MTBF. Failed unit repair depots are to be located at each regional M.O.C. It is important to note that each component of the Telaction system is designed to limit failed effects to the Telaction channel through both active and passive isolation.



(Figure 7)

CONCLUSION

The Chicago market introduction of the electronic home shopping concept is intended to exercise this dramatic new application of the CATV medium.

The extensive software and hardware complement, the vast majority of which is original design, will not be without fault, therefore, Telaction intends to exhaust every resource in a pre-market series of technical tests to minimize those contingencies, while improving the fundamental system for future expansion. However, as with each pioneering endeavor; earth stations, 400 MHZ, addressability and so on, the quality of service has driven the CATV industry to endure.

Some 150 new program offerings have appeared in the CATV arena during the most recent 10 years. Of these only some 40 survive. Those few of enduring quality remain as valuable, cable apparent offerings, HBO, CNN, Discovery, etc.

And while the CATV industry has long since passed into the mainstream of establishment American industry that same innovative spirit that accepted such drastic departures from convention as HBO's, 1970's earth station concept is apparent today, and will reflect in the bottom line.

Telaction intends to be the next cable unique, program innovation.