

# PERSONAL CABLE TELECOMPUTING enabled by COMMUNITY MULTIMEDIA NETWORKING

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## Abstract

*The cable television industry is capable of being a full telecommunications provider as it evolves its infrastructure into an all digital highway. Both the telephone and computer industries are suggesting their networking models of traditional point-to-point and extended distributed local area network technology become part of the cable industry solution.*

- CATV is positioned to create the multimedia networking model for the '90s as a...
- Full Telecommunications provider...

*This paper looks at a computer network model interconnecting integrated personal cable modems with personal computers and television systems in a community setting within the Digital Community Multimedia Networking Architecture (CMNA).*

## THE DIGITAL INFORMATION HIGHWAY

The next generation cable television broadband networks are taking over where traditional data communications solutions leave off. They are operating with the widely available installed base of broadband cable television coaxial and fiber optic cable plants.

Subscriber systems are using any available standard cable television channel pair for 2-way communications networking, with intelligent modems interfacing to standard computers and networks.

In most cable franchises the number of

## INFORMATION HIGHWAY



(⊗ MAN BY CATV — WAN BY TELCO = CABLCO INDUSTRY) UP TO 1000 TIMES BETTER

capable return channels is limited within entertainment networks, thus 2-way capacity must be managed effectively until fiber is justified and deployed deeper into the plant. This paper looks at providing a complete mix of interactive digital data, voice and video information referred to as multimedia services into the same 6 MHz channel, thus enabling the maximum utilization of the installed base of

## Principle



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## Societal Trends

Globalization  
Aging Workforce  
Family & Career  
Environment  
Relocation  
Re-sizing  
Education  
Healthcare  
Economy

Flexibility

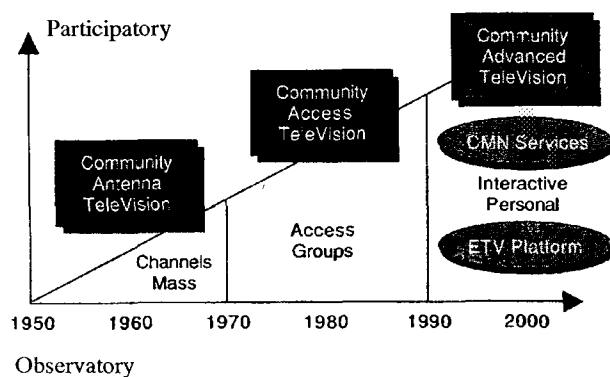
Workplace  
Worktime  
Workstyle

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return bandwidth with a wide range of new and diverse revenue streams.

The Community Multimedia Networking Architecture enables Personal Telecomputers to be added to the distributed 2-way cable network, with the ease of traditional televisions and videotape machines, while being registered and configured like personal computers as members of the networked community with digital capabilities.

## CATV Migration



ETV - Ethernet via Cable Television

## FULL TELECOMMUNICATIONS PROVIDER

The cable television industry is capable of being a full telecommunications provider as it evolves its infrastructure into an all digital

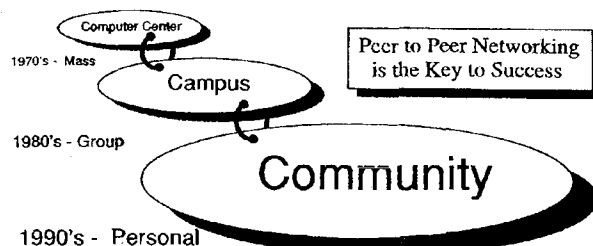
networking platform. This new advanced infrastructure has become the platform for all previous cable, telephone and computer network information applications and services which currently exist.

## Flexibility

This network platform is exhibiting the needed flexibility to support many unknown future service possibilities while meeting these important, responsible and necessary goals today.

## Vision Migration

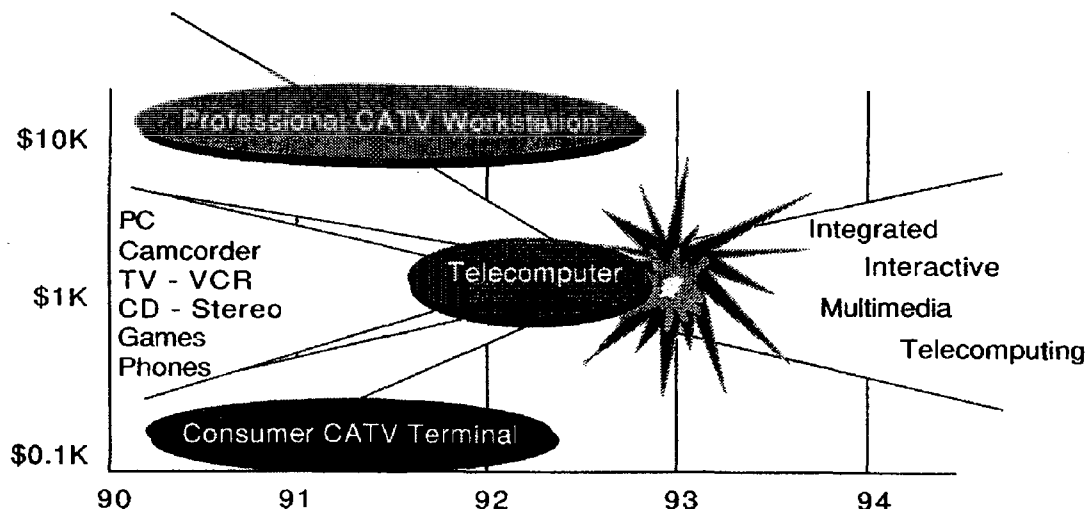
*We have arrived at a convergence of technologies which has created an opportunity to extend the computing infrastructure all the way to the ultimate beneficiary.*



## Integrated Model

Both the telephone and computer industries are suggesting their networking models of traditional point-to-point and extended distributed local area network technology can be enhanced as part of the cable industry broadband transport solution to a full multimedia networking information highway. An integrated network model that enables current and future solutions with standard interfaces for seamless connectivity will be needed to network technology of the past with technology of the future.

# Community Multimedia Convergence



## Digital Cable Television

### COMMUNITY SETTING

This paper looks specifically at a computer network model interconnecting integrated personal cable modems with personal computers and television systems in a community setting.

#### Information Islands

Today, there are islands of information in the form of corporate, educational, and healthcare campuses which have extensive information processing, storage and networking capabilities. The opportunity exists to extend, expand and connect these islands into a more contiguous and ubiquitous infrastructure providing services to more people "off-campus" by utilizing CATV system as an information highway. The integration of computer, telecommunications and cable television technology models enables new personalized community based networking.

### OPTIMIZING RESOURCES

The utilization of any cable plant bandwidth must be managed with optimization of techni-

cal resources with program streams and revenue flow in a timely fashion.

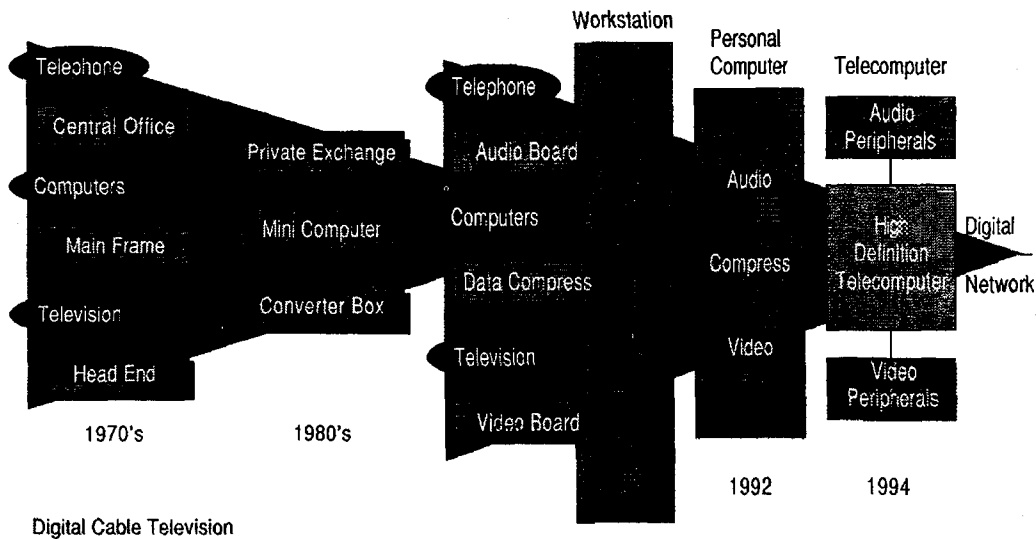
#### Telecomputing

Both network and systems hardware and software are optimized to enable highly integrated intelligent interactive personal telecomputers to operate throughout the community across the coaxial and fiber optic cable, under full management of the cable operator. Management systems monitor and maintain the digital traffic flow among the systems across the network, while having fully secured visibility of tiered and transactional services selected by the subscriber.

#### Diverse Revenue Streams

Increasingly more highly intelligent system and network hardware and software components at consistently decreasing costs through the use of very large scale integrated circuits is enabling broader configuration flexibilities with concurrent decreasing operational complexities, while at the same time generating more revenue.

# Community Multimedia Migration

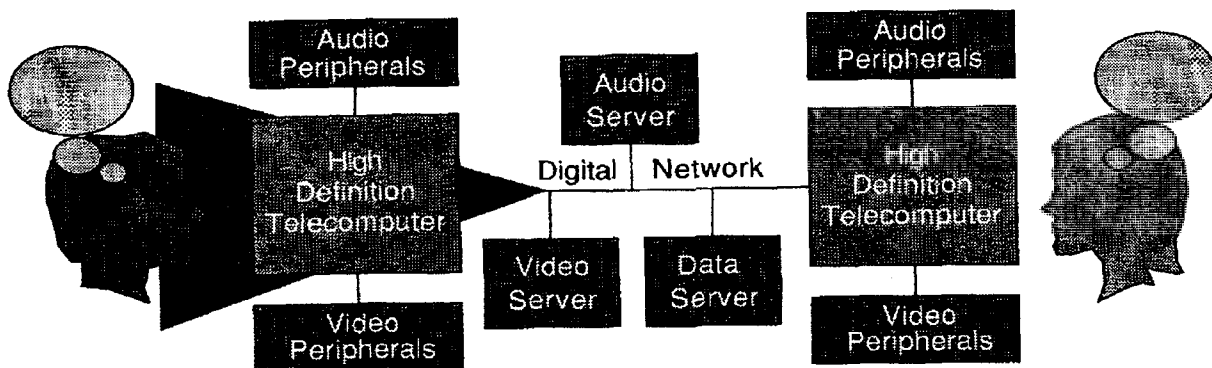


## Individually Driven

Both network and systems hardware and software are optimized to enable highly integrated intelligent interactive personal telecomputers to operate throughout the community across the coaxial and fiber optic cable, under macroscopic management of the cable

operator. While the cable operator has full management oversight of all of the necessary network entities, the individual subscriber has personal management oversight of his/her choice of network services on a continual rolling basis.

## Community Multimedia Migration: Peripherals & Applications



## Total Visibility

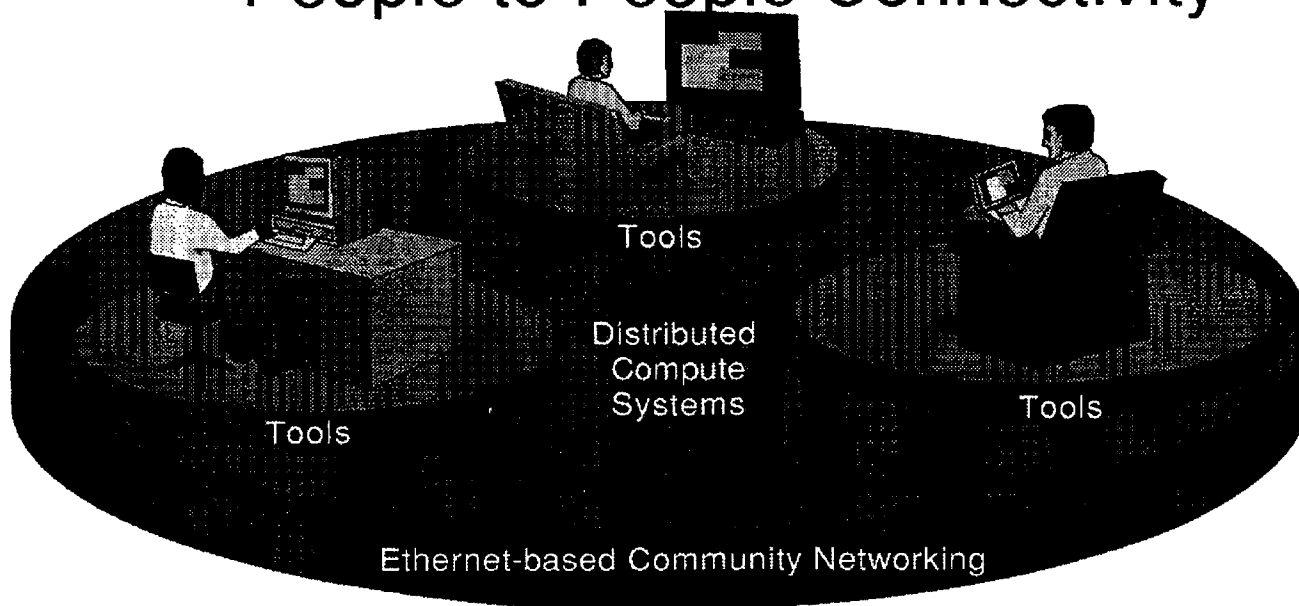
Management systems monitor and maintain the digital network traffic flow among the systems across the network, while having fully secured visibility of tiered and transactional

migration of full revenue services. This is different from the traditional use of channels, where different analog/digital applications are programmed in different 6 MHz channels.

Through more and more computing power, a finer and finer granularity of channel usage

# Platforms

## People to People Connectivity



## Digital Cable Television

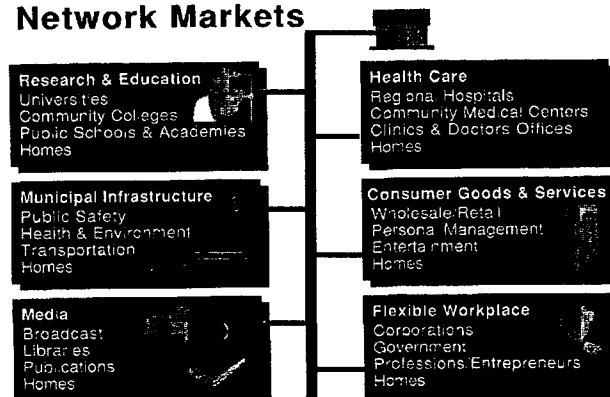
services selected by the subscriber. The networked services and applications selected by the subscriber are driven by the individual subscriber, who needs to know the type and how much of network resources are being utilized at all times and over a period of time. Network resource choices could be changed at anytime by the subscriber and with notification by the overall network manager.

## Finer Granularity

As channels become fully utilized, then additional channels with the same mix of voice, video and data are activated with a continual

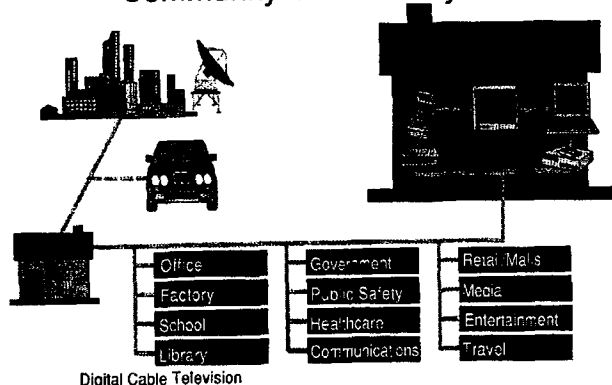
can be managed, such that traffic flow can be optimized over various time-lines.

## The Community Multimedia Network Markets



## The Infrastructure

### Community Connectivity



connectivity and not on the physical aspects of the connectivity components, where aspects are portrayed by software on Personal Computer (PC) screens.

Applications are based around networked pictures and sound with traditional data treated as secondary information, indicating multimedia networking.

The function of personalized system/networking itself is displayed on the configuration of the PC and emphasized through ease of operation and friendly windows.

### CABLE-READY TELECOMPUTING

The Digital Community Multimedia Networking Architecture enables Personal Cable Telecomputers to be added to the distributed 2-way digital network with ease and operational friendliness.

#### Personal Networking

The focus on personal systems architecture is about simple user interface regardless of

### WHAT IS MY STATUS?

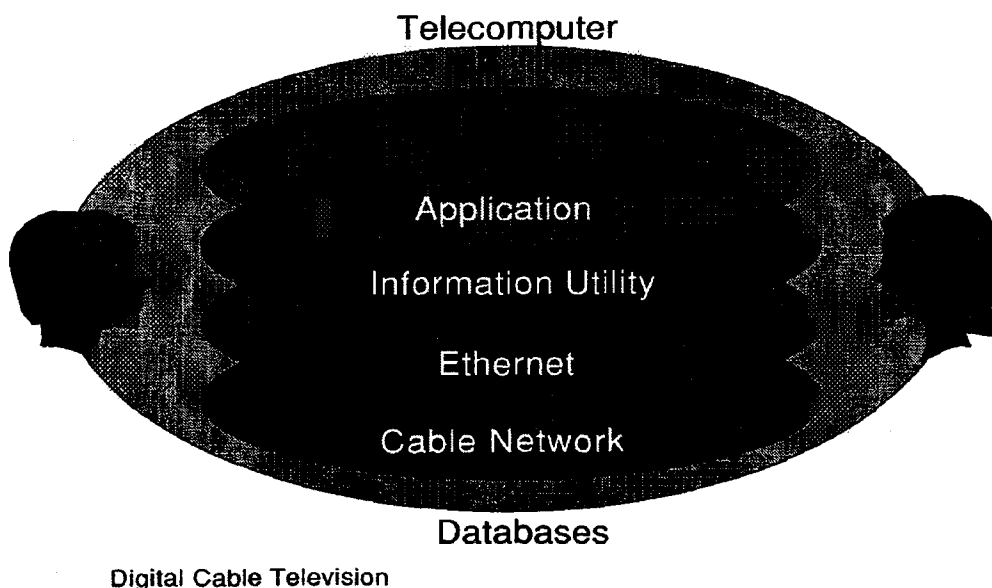
Future capabilities can include all aspects of management capabilities; specific functions would include what is going on across the network, from the network managers perspective and, what is going on with the individual's session from the node/subnetwork perspective.

#### How Am I Operating?

Examples include:

- What is my mode of network operation?

## Naturally Distributed Layered Environment



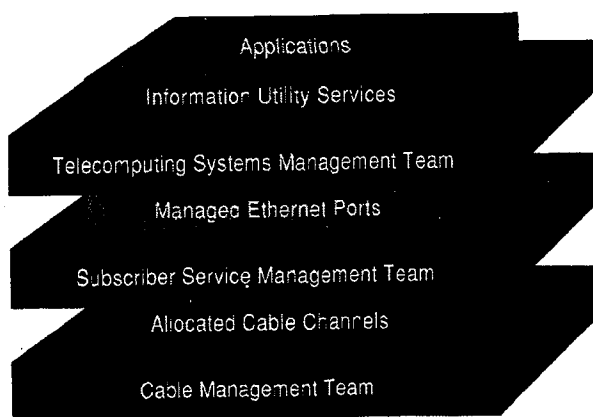
- What kind of session do I have between me and my peer(s)?
- What is my bandwidth availability currently between me and my peer(s)?
- Am I operating on a dedicated link, or switched link, and will my link be torn down after my current session?
- How much data am I currently transferring, and how much data have I transferred during this session, this day, and this month?
- Can I afford to continue operating in this mode, or should I change to something different?

### What Are My Costs?

Based on a set of arbitrary price tables:

- How much is this current session costing?
- How much is my bill so far for this month?
- How much will my bill be at the end of the month if I continue in this mode?
- What are my more cost effective alternatives?
- How much does contention, reserved and isochronous service cost, based on the bandwidth I need for my upcoming session that I have scheduled?
- What is the distance between me and my peers for this (planned) session?

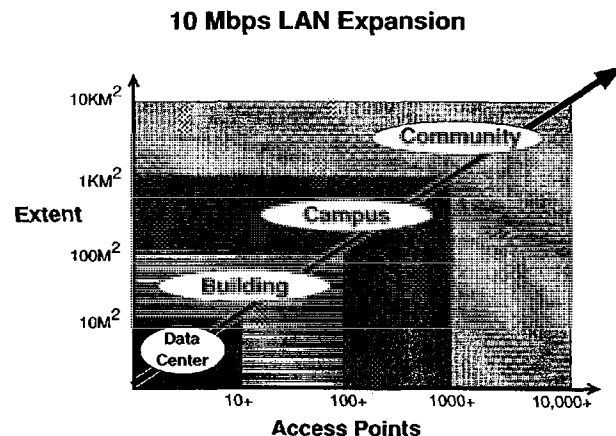
## Layered Management Teams



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- What is the best time for me to use the network based on my needs based on traffic and costs?

The above information could be gathered from each system and kept in the network management station(s), with read rights from the network manager and the individual subscriber.



### INFORMATION ON DEMAND

Reading your applications needs, the cable network provides you with the economical bandwidth for your needs. Each node doesn't use more bandwidth/network resources than it needs from the network for a session. The primary icons from the system could be transferred to the applications of the PC(s) attached on the initial screens.

### RETURN ON INVESTMENT

The cable industry needs to know which network services makes money. We not only want to optimize the cable plant in terms of 6 MHz bandwidth investment, but need to know which are the best configurations of traffic and times of usage.

Using the existing information highway created by CATV, it can deliver the entire data networking services of the '80s, plus video and audio networking services of the '90s as the key to multimedia networking.

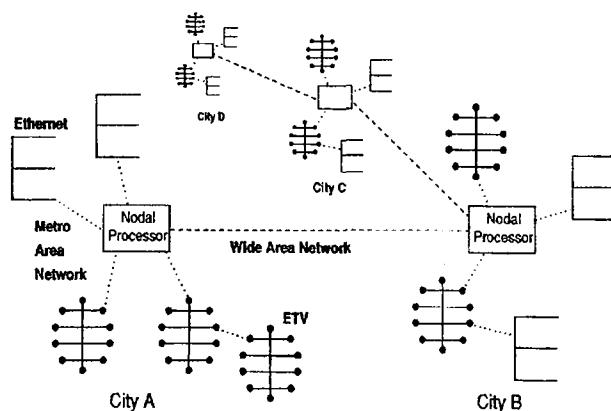
## Parameters

Some of the primary parameters for cable optimization are: bandwidth use, time, distance, costs, traffic patterns, node addresses, etc., with statistics and probabilities, all things that computers are good at, while business people keep track of how to spend and make money.

## Intelligent CATV Modems

New cable modem technology enable to take on the size and shape of traditional telecommu-

## **Community to Community Networking**



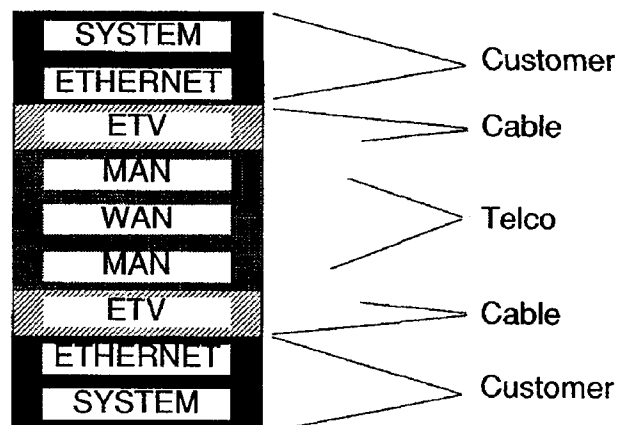
nications modems. They can now: Fit in a briefcase, sit on top of a desk, hang from a wall, mount in standard racks, carry under your arm, and even become part of specialized outside environmental systems, as well as be part of PCs.

## FULL SERVICE NETWORK

The Cable Television industry is capable of deploying interactive digital technology and is well positioned to be a "The Full Service Network".

- System built to enable full telecommunications cable services.
- System designed to provide a full range of multimedia services.

## **CMN Interfaces**



- System designed for full concurrent integrated, a) digital data services, b) digital audio services, c) digital video services, around the current cable program streams.

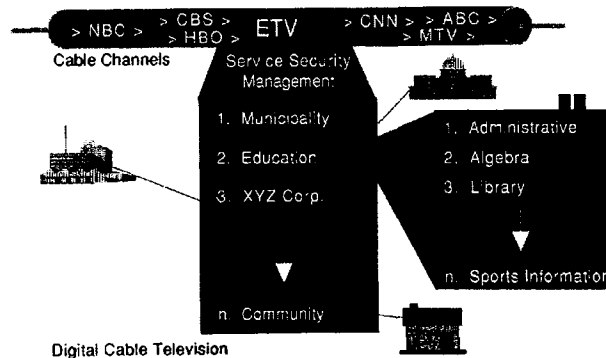
## TRADITIONAL TELECOMMUNICATIONS SERVICES FOR CABLE

Cable television alternative solutions for telco data network solutions of 10 Mbps service up to 70 cable miles are available for public and virtual private circuit use provides;

- Point-to-multipoint dedicated polled circuits.
- Multipoint-to-multipoint dedicated/switched circuits.

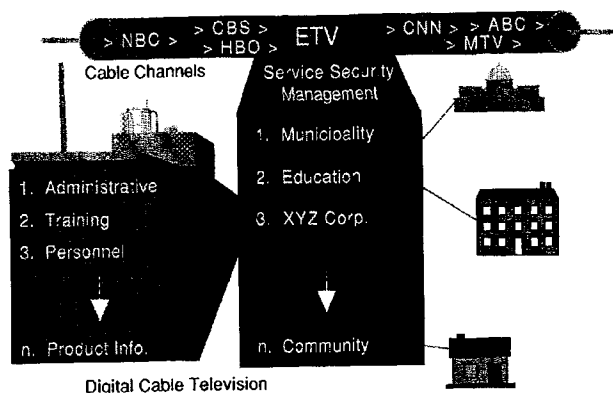
## **Community Network Partitioning**

### **Educational Management Service**





## Community Network Partitioning Business Service



### TRADITIONAL COMPUTER NETWORK SERVICES FOR CABLE

Cable television alternative solutions for computer Local Area Network (LAN) solutions up to 10 Mbps service to 70 miles are available. Extended and seamlessly integrated existing institutional LANs across communities connect and extend institutional and community LANs to a Metropolitan Area Networks (MAN). These can:

- Create public and virtual private community networks.
- Create public and virtual private Metropolitan Area Networks (MAN).

### BENEFITS TO THE CABLE TELEVISION INDUSTRY

Optimize the use of existing investment in coax and fiber cable bandwidth with a single 6 MHz channel in each direction enables full duplex 10 Mbps digital data highway.

10 Mbps 2-way highway provides integrated broadband transportation for:

- Traditional digital data..
- Digital sound, music, audio, voice.
- Digital pictures, images, video.

System designed for full multimedia networking for the cable industry for all community information needs, are available today, with the ability to form strategic partnerships

between Telco and CATV industries. A Cableco relationship and these combined industries provides society with an affordable and full service worldwide solution.

### Full functionality for cable

Concurrently on the same 10 Mbps 2-way digital highway a full range of traffic patterns are managed for optimized operations of switched/dedicated and public/private networking consisting of:

- Asynchronous traffic, for local large data loads, bursty, unpredictable access, guaranteed untimely delivery.
- Synchronous traffic, for long haul data loads with predictable, reserved access, regularly timed delivery.
- Isochronous traffic, for quality pictures and sound with guaranteed real-time precision delivery, with reserved access.

### Bandwidth Scaling to Many Subscribers

Multiple 10 Mbps channels activated and interconnected via Ethernet subnetworks with full Spanning-Tree-Bridge (STB) capability enables parallel redundant data paths for self-healing configurations for traffic scaling/management.

Full frequency channel agility under software control for receivers and transmitters in 250 kHz increments enables services for all channel allocation schemes.

### Distance Scaling to Many Subscribers

Channel segment links extend to 70 cable miles, with additional 70 cable mile links concatenated through Ethernet 10 Mbps subnetworks. Links can be connected by modem at multiple points with cable topologies that will yield maximum reliability using the built-in STB technology.

## NETWORK/SYSTEMS MANAGEMENT

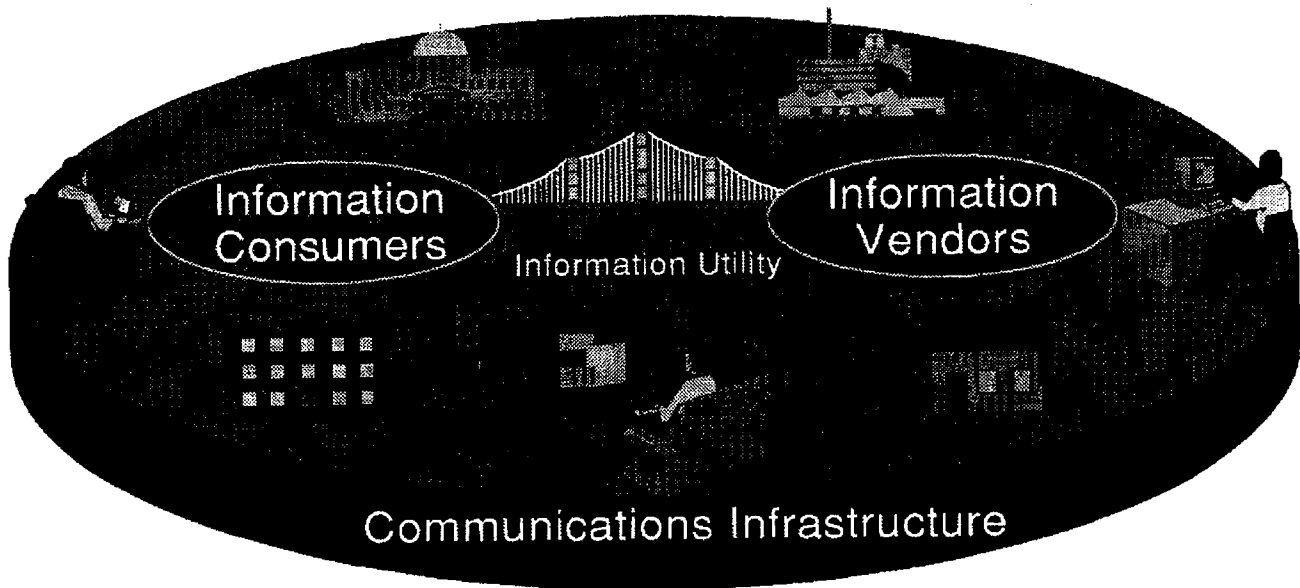
The cable network modem system is totally intelligent 10 Mips 20 MHz RISC computer processor based which:

- Knows all about itself.

eters easy to configure.

Operations help information is provided in hardcopy and softcopy discs with friendly help menus for ease of use. System is fully field replaceable with no component changes or adjustments.

# Community Multimedia Networking A New Frontier



## Digital Cable Television

- Knows all about its network peers.
  - Network manager knows all about all network members.
  - Doesn't know about its network peers that it doesn't need to know about.
- As all determined by the network manager.

## System Configuration

Specific modem system personality provided is by personal computer serial port locally or via telecom modem from anywhere. System is activated via standard PC windows program utilizing check-list format with friendliness and simplicity. Channel frequencies, network addressing, security attributes and other param-

## Network Configuration

Specific network personality is provided by a personal computer, either locally or via

## Ethernet Everywhere

The Quest Continues



Digital Cable Television

telecom modems from anywhere in a centralized or distributed operation. System incorporates standard SNMP (Simple Network Management Protocol). Network management is applied to the network via system modem-bridge through its serial port or Ethernet port. All modem systems on the cable network are managed across the cable backbone in a nonintrusive virtual private circuit within the 10 Mbps stream.

The STB feature allows continuous management from multiple network directions. Global network operations center of choice can provide network management services as needed.

### SUMMARY

The need for the Cable Television industry to become a full information network provider today, is a reality when utilizing the technology described in this paper. For over 10 years network technologists in the computer and cable industry have been working toward this end. The time has arrived with the convergence

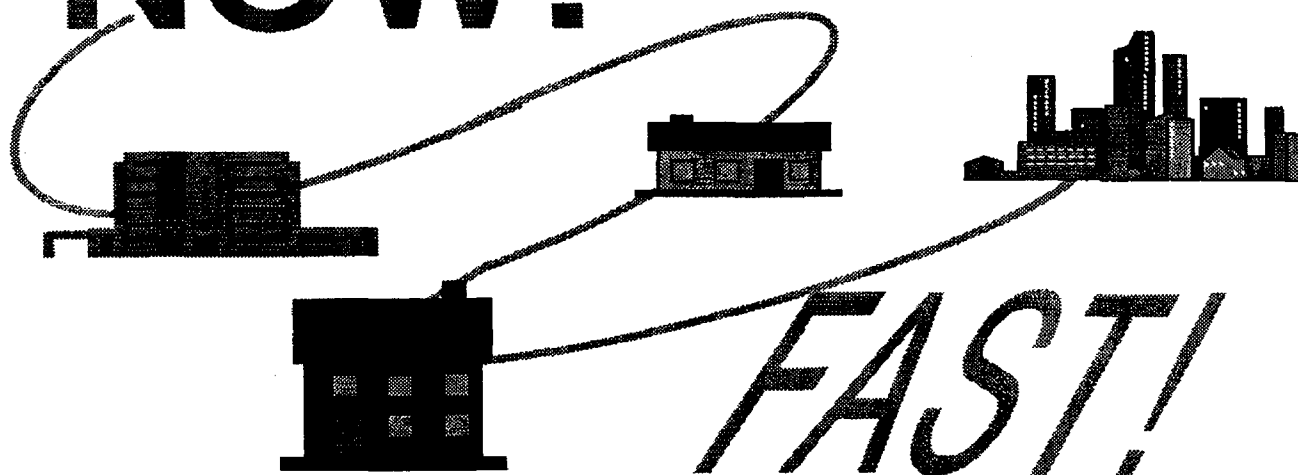
of technology development and societal trends to deploy broadband digital interactive cable television applications and services throughout communities everywhere. All elements are in place, and deployment is underway.

### REFERENCES:

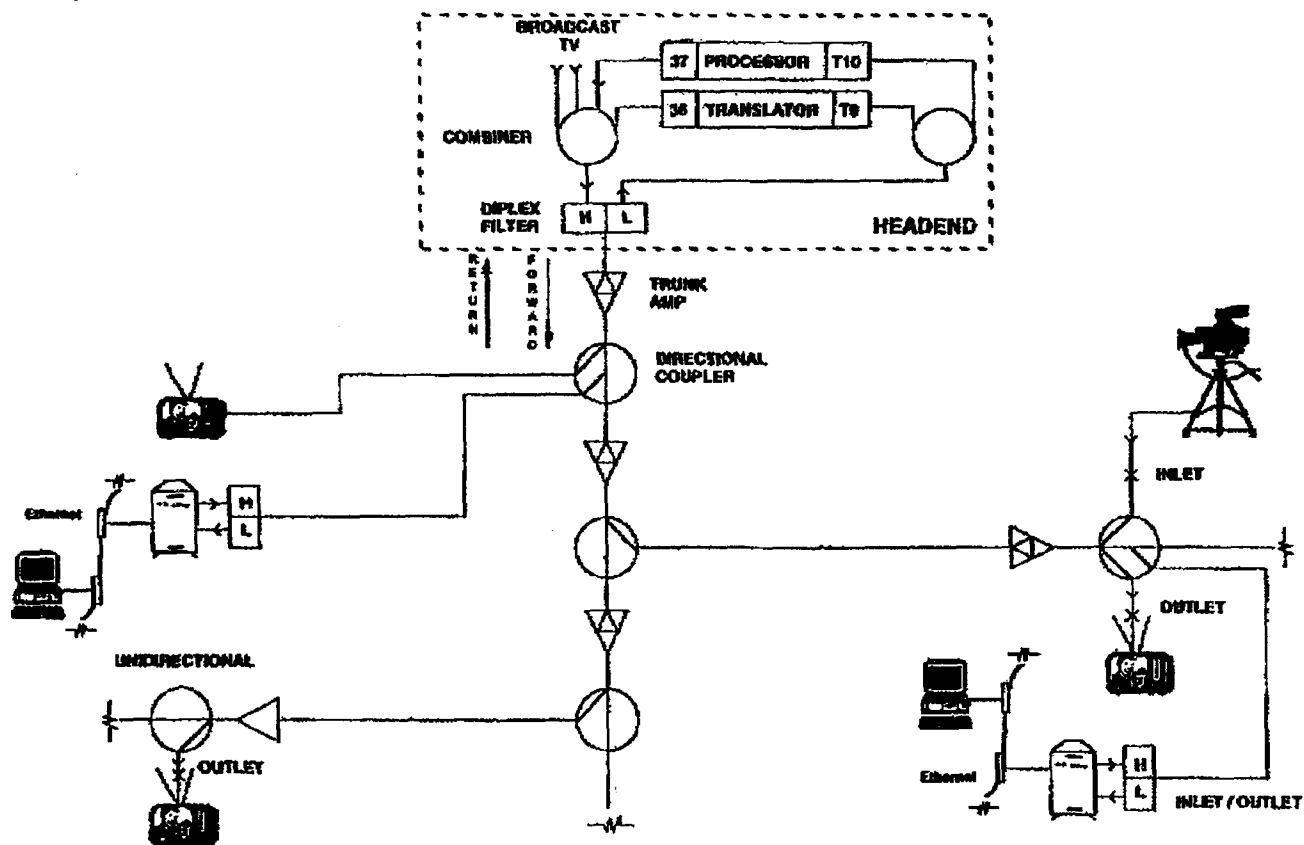
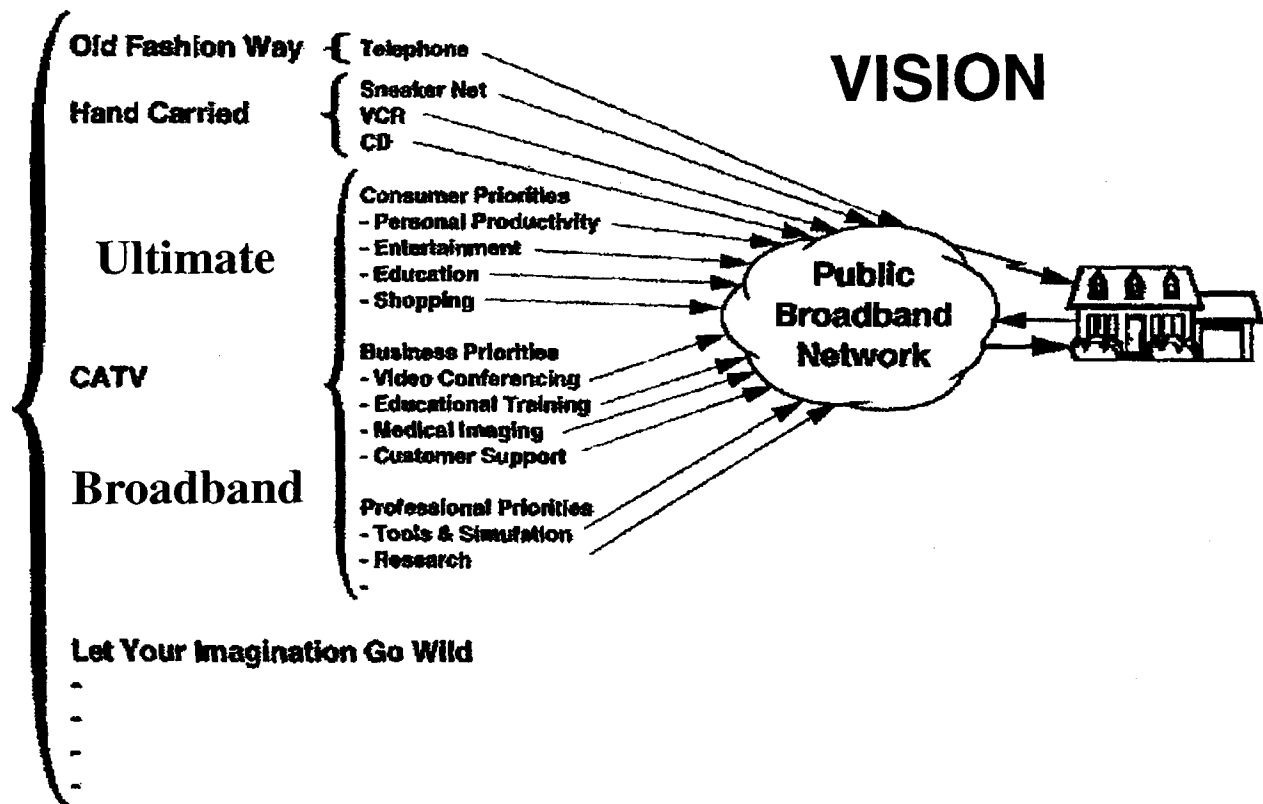
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## **Ethernet Everywhere: Strategy**

# NOW!



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**BIDIRECTIONAL CATV SINGLE CABLE PLANT**