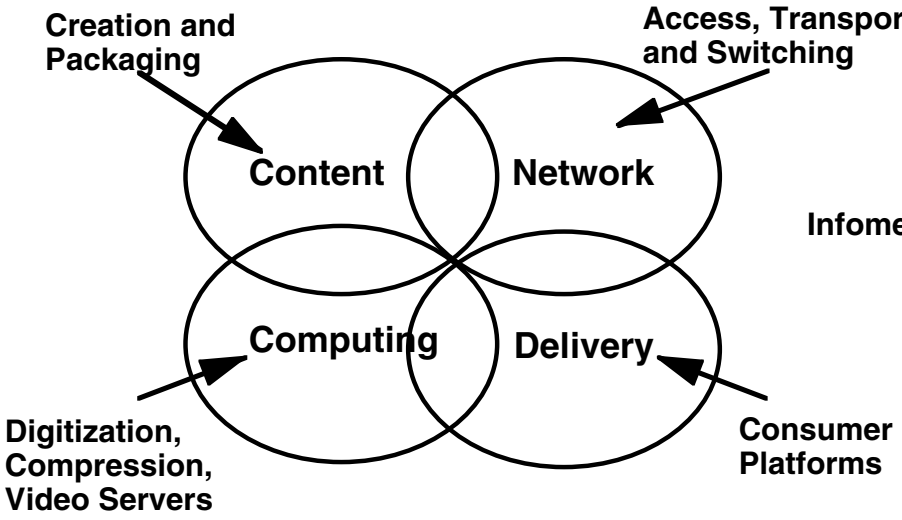
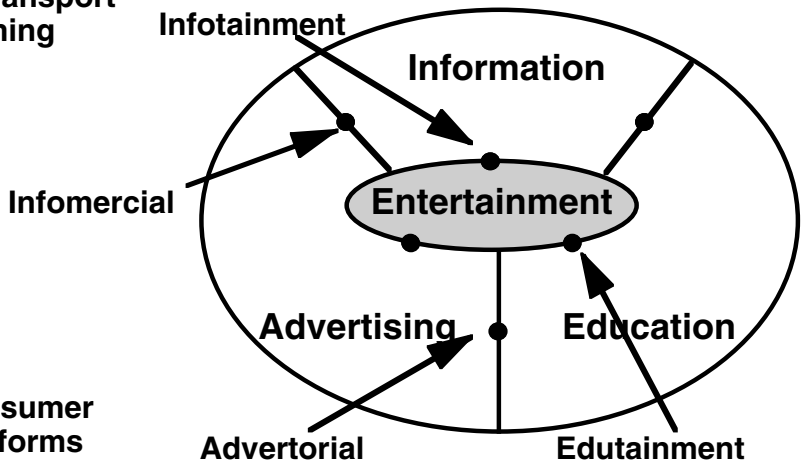
Industry Convergence

Interactive Multimedia Creation and Delivery



Market Convergence

The "Experience Industry"



Cable Industry Perspectives

Technology Trends: The Convergence of Broadband and Entertainment

Massachusetts Software & Internet Council

May 29, 2003

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Outline

In this new world of *convergence* and *hypercompetition* there is no safe haven-- the cable industry has recognized the challenges and is proceeding to remake itself

- **Introduction**
- **Drivers**
- **Summary and Conclusions**

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Introduction- The Food Chain

Business opportunities occur when the chain is fully populated.

Un-served and Under-served Marketplace Needs

What is the fundamental market need, consumer demographics, cultural or other trend driving consumer electronics & Home Networking ?

Applications that Address Market Needs

Given the need, what product functionality, features, interface, etc., will be should be provided?

Infrastructure that Supports the Applications

Do new products & Home Networks rely on an infrastructure (physical, telecom, standards, etc.) and if so, when will it deploy?

Systems

How will the system interact with the user, supply channels, infrastructure and other relevant devices?

Components and Underlying Technologies

Are there critical components, or unusual technical requirements ?

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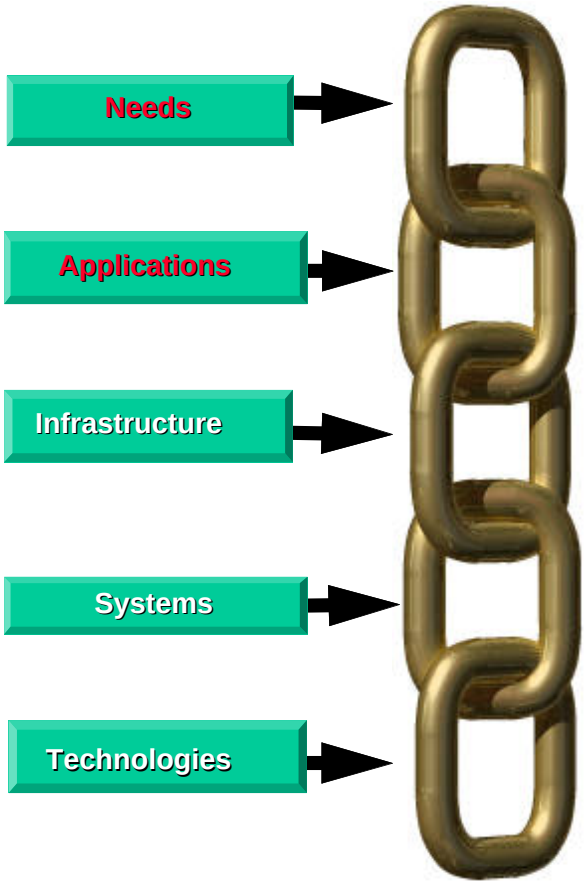
Introduction- Needs

Consumers are diverse and multifaceted and so are their needs.



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Introduction- Applications

The historical cable industry application was simple broadcast TV.

Entertainment Group	
Broadcast TV	Pay per Month

Introduction- Applications

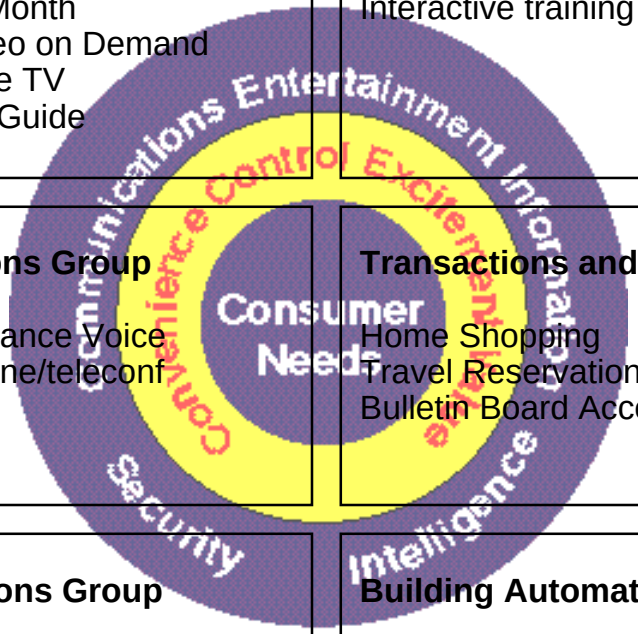
However consumer needs are driving new applications

Entertainment Group

Broadcast TV
Pay per Event
Video on Demand
Video Games
Pay per Month
Near Video on Demand
Interactive TV
Program Guide

Education

Interactive training
Distance Learning



Public Network Communications Group

Local Telephone
Internet WWW
Long Distance Voice
Videophone/teleconf

Transactions and Information

Home Shopping
Travel Reservations
Bulletin Board Access
Banking
Yellow Pages
Advertising

Private Network Communications Group

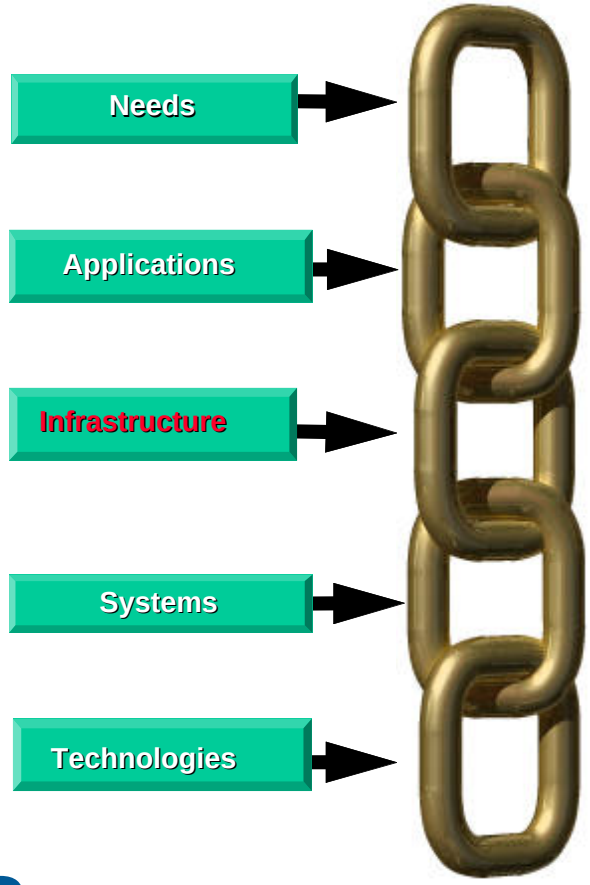
VPNAccess
to office LAN
FX to PABX
Group Work
Telemedicine

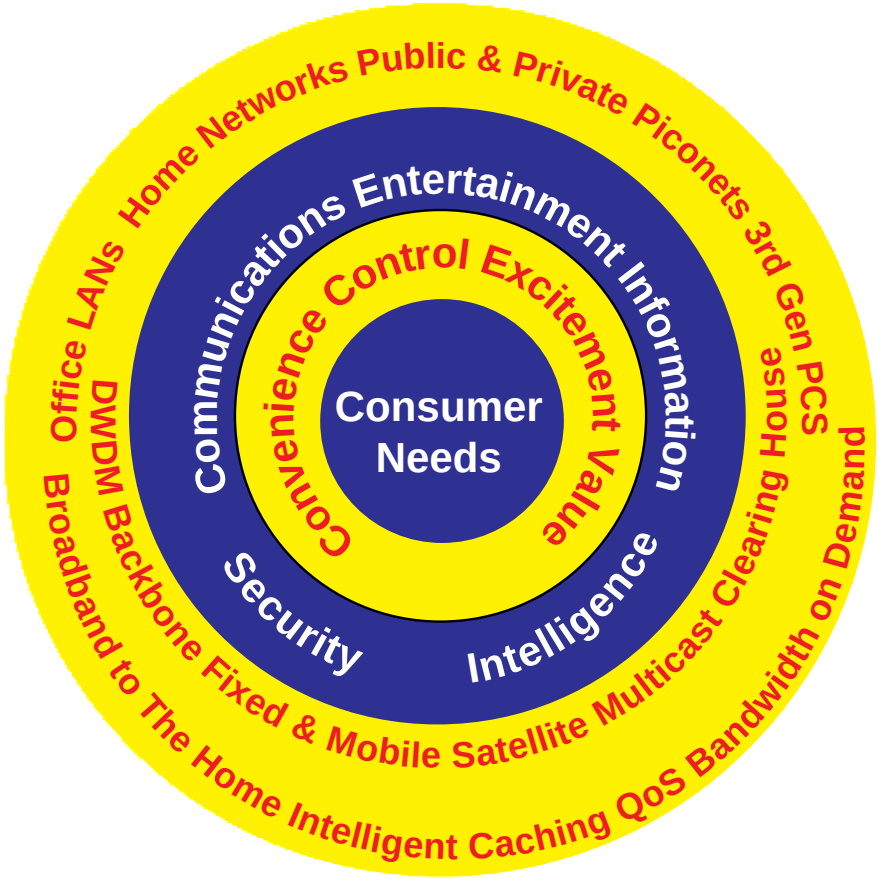
Building Automation

Security Monitoring
Automatic Meter Reading
Energy Management

Introduction- Infrastructure

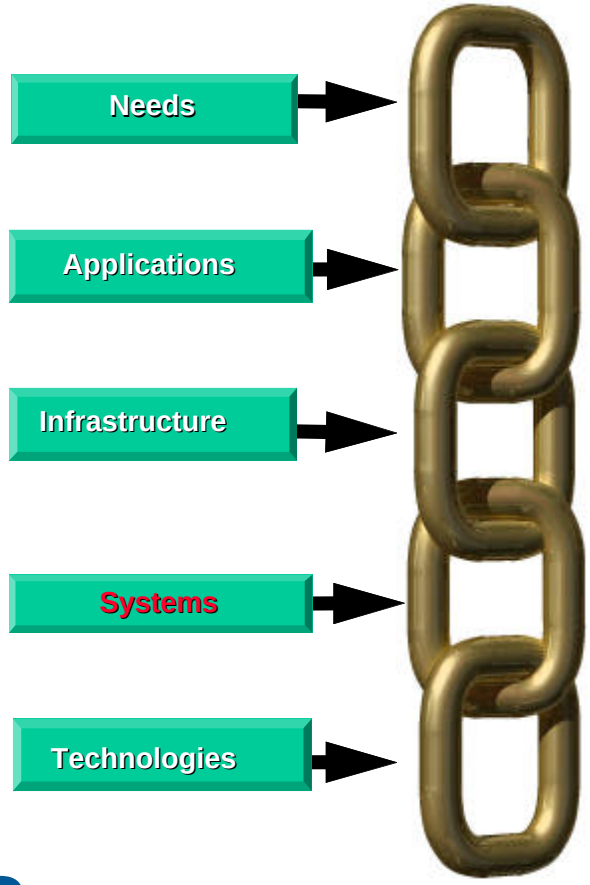
Supporting these new applications requires flexible, broadband, rights managed infrastructure.

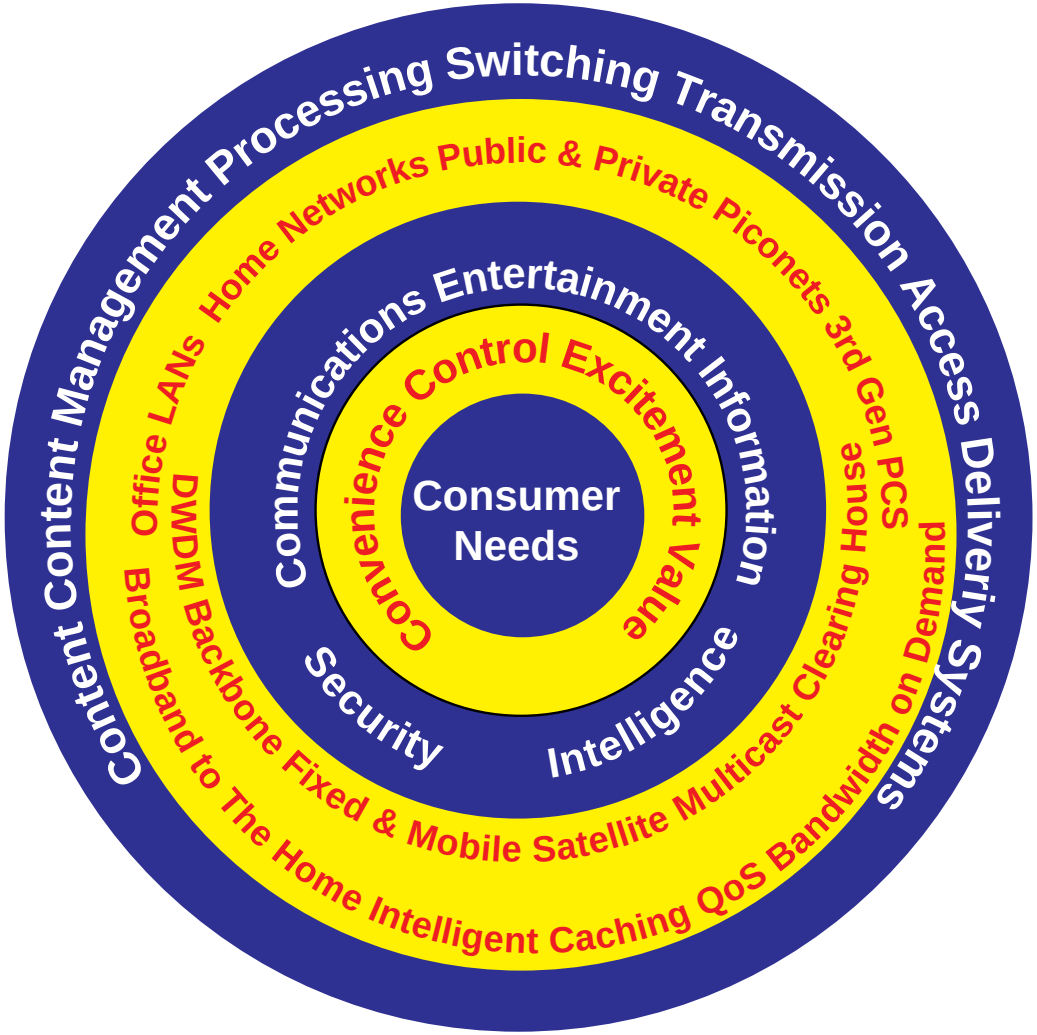




Introduction- Systems

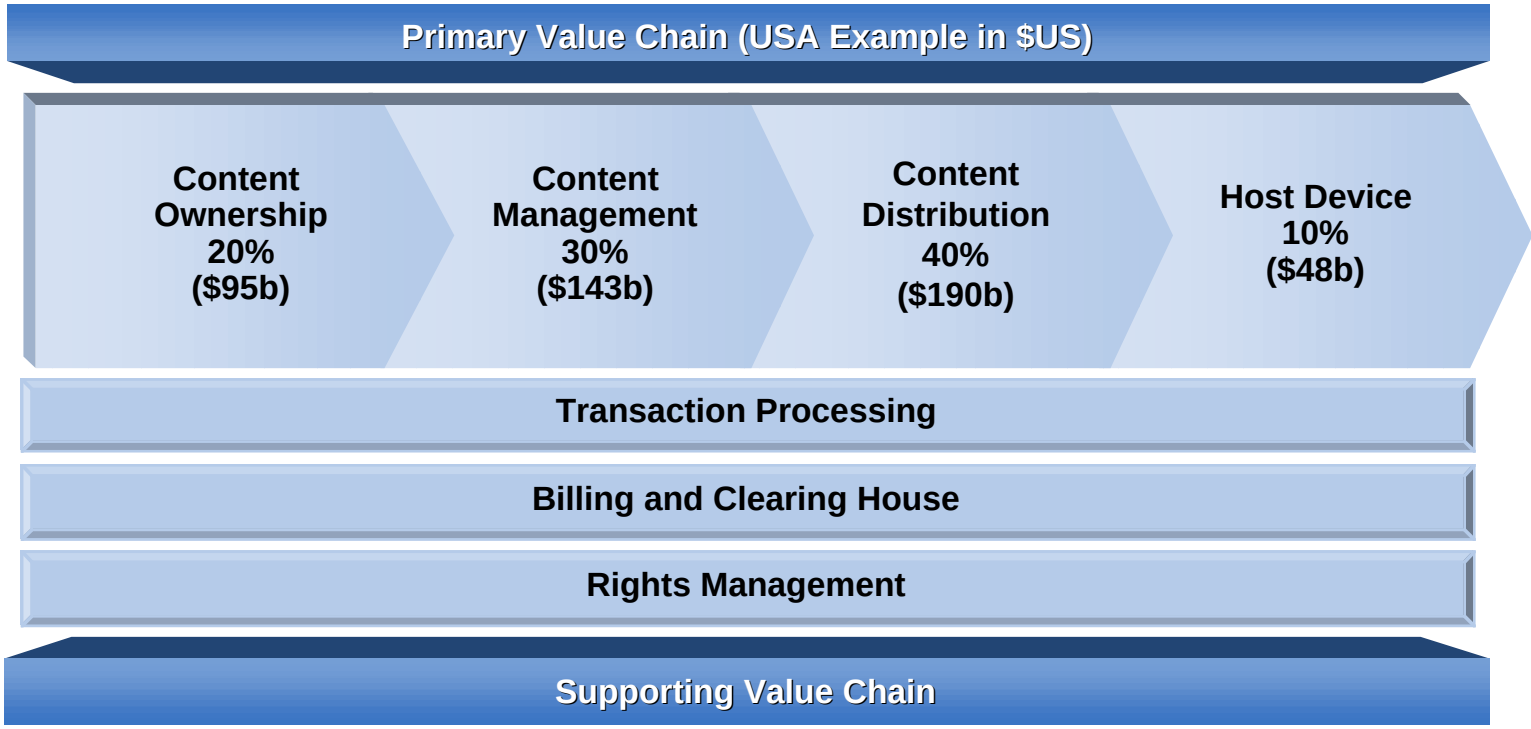
The systems required by the food chain must cover the full value chain





Introduction- Systems

There is also substantial business opportunity if one plays across the entire value chain.



Source: EC Study (1996 reporting 1994 numbers) and ADL calculations

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Introduction- Systems

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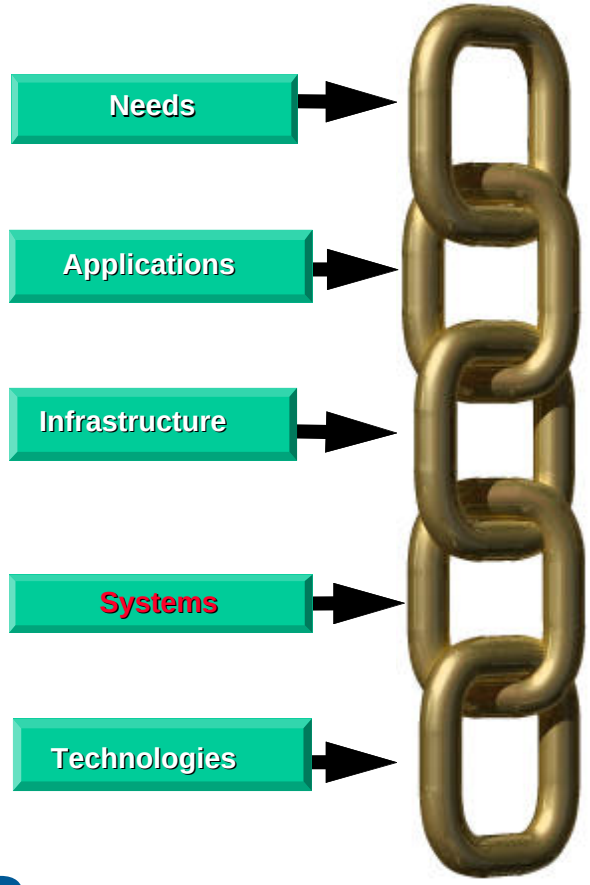
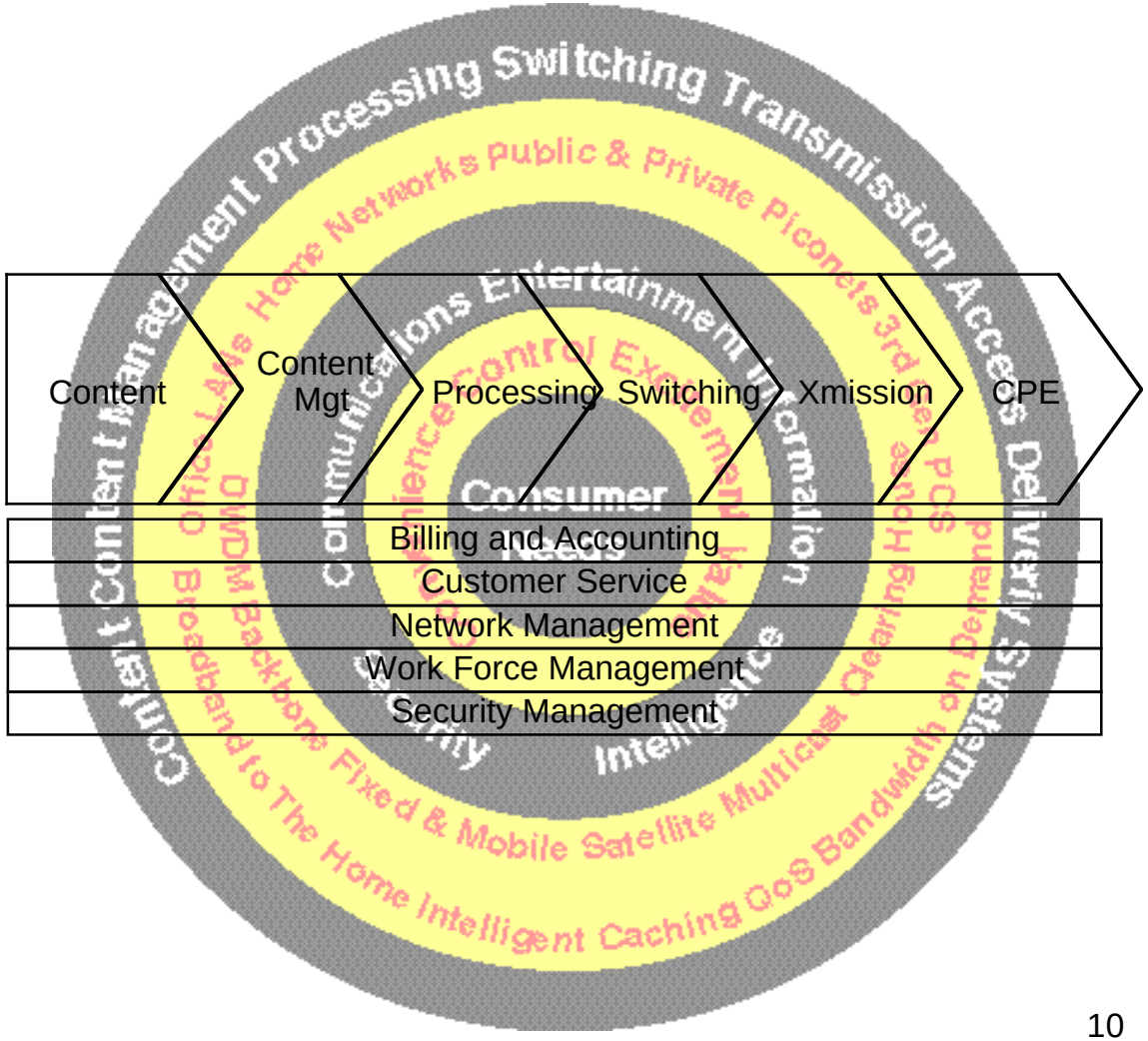
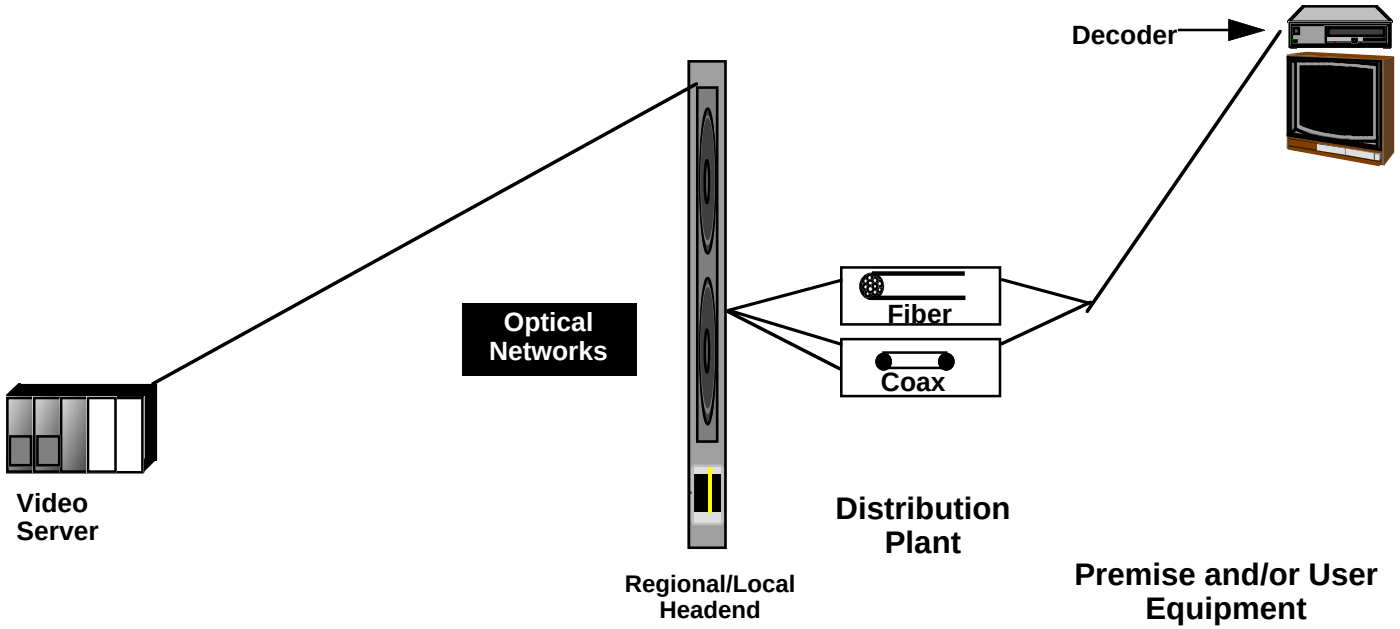




Introduction- Systems

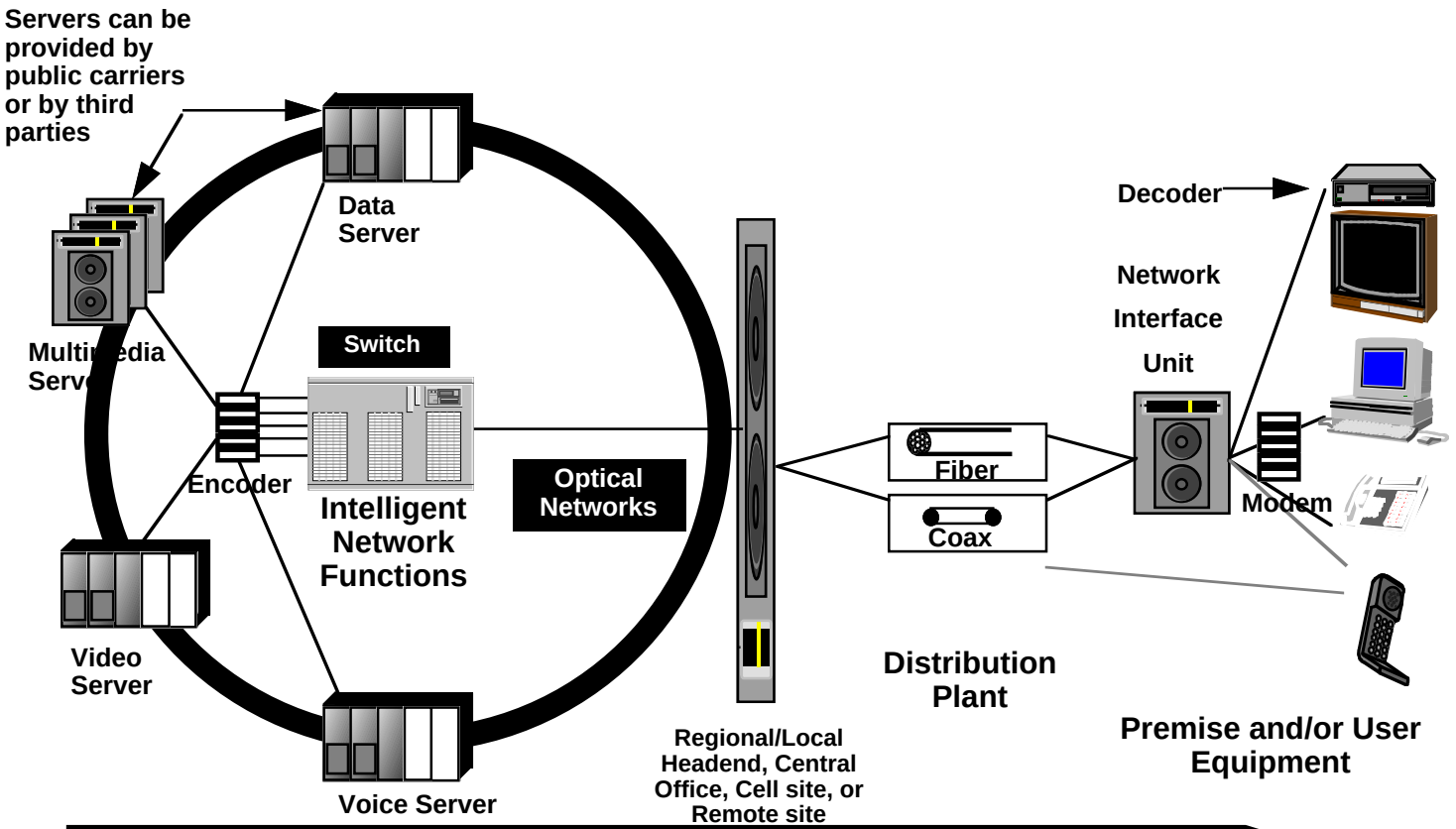
Historical cable systems were designed to deliver broadcast analog video.



Operational Support Systems & Services (e.g. Network Management, Billing, Customer Validation, Clearing-house services)

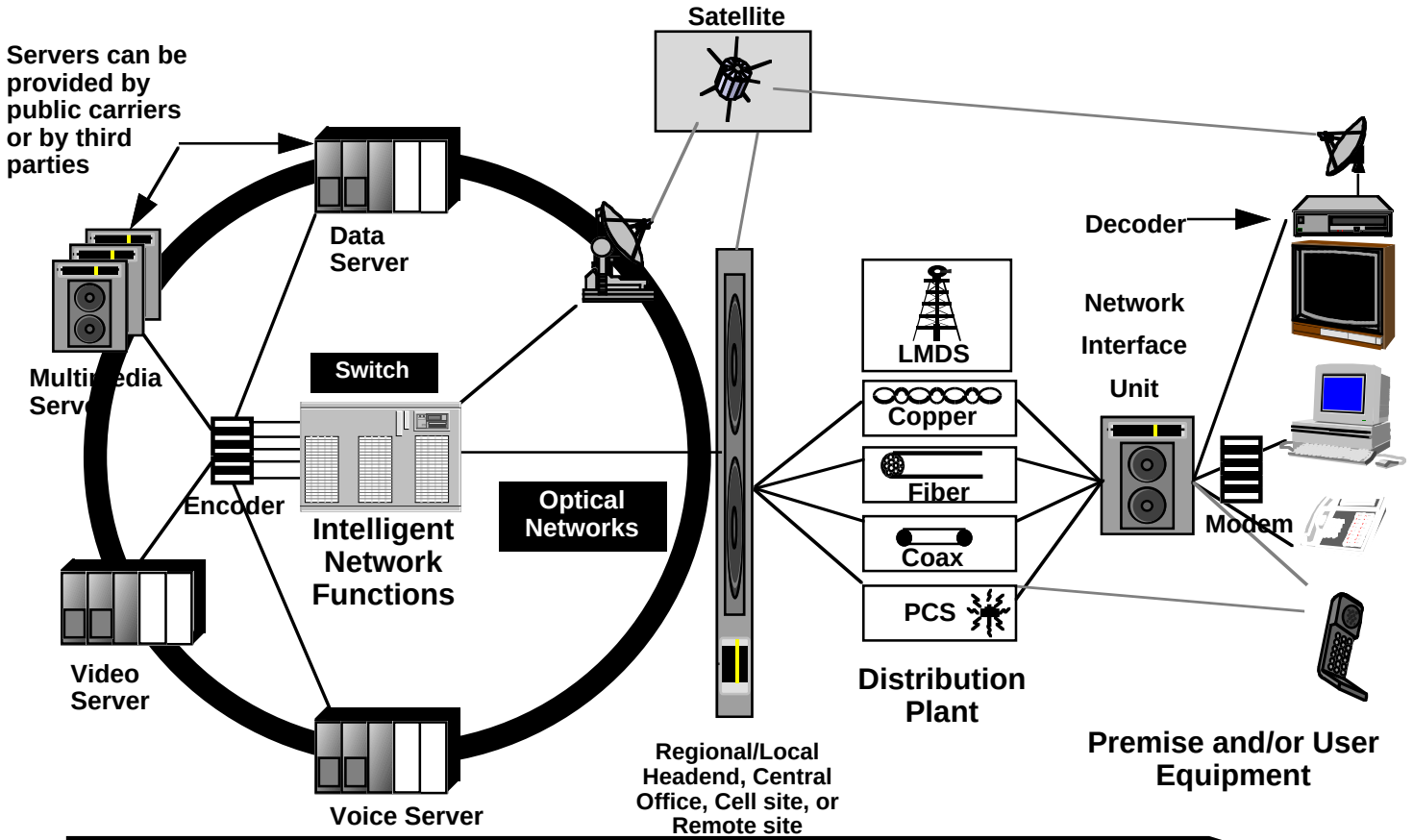
Introduction- Systems

Building upon past HFC investments, new systems are being added.



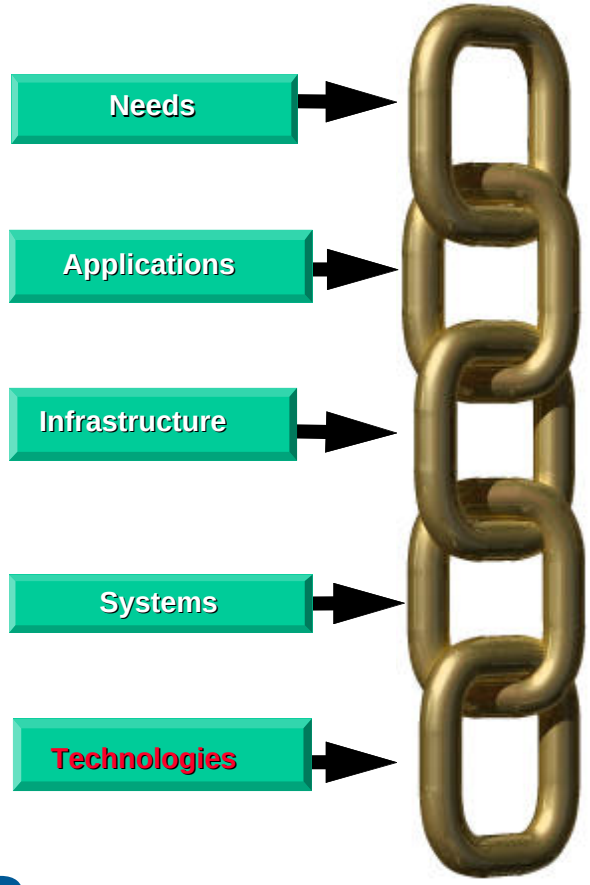
Introduction- Systems

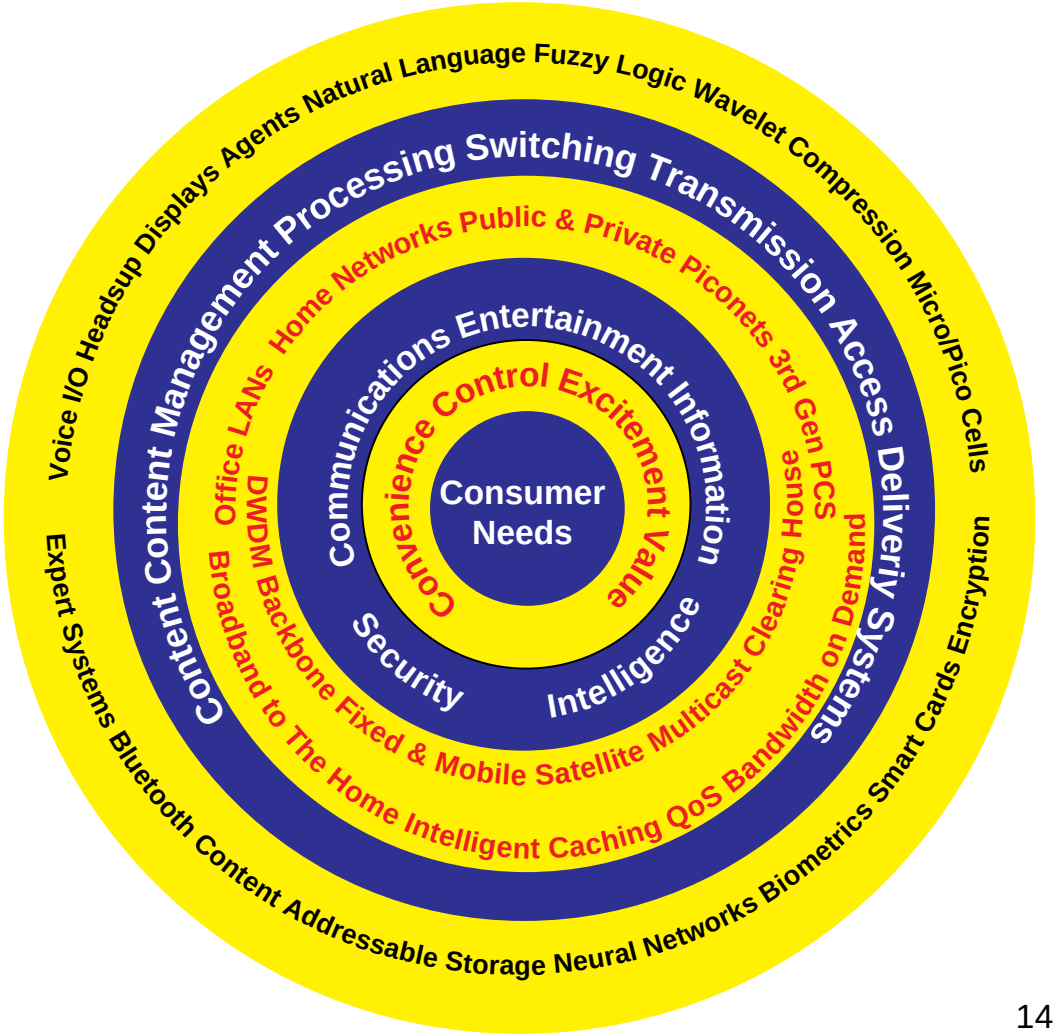
At the same time new competitors are emerging.



Introduction- Technology

Just in time, critical technologies are emerging to support complexity and rights management.





Drivers of Change and Opportunities

There are a variety of developments that are driving change and enabling new opportunities.

- Migration from NTSC analog to ATSC digital video
- DTV plug and play agreements and FCC DTV tuner regulations
- Secure QoS managed IP transparent digital packet infrastructure with unicast, multicast, and broadcast capabilities
- Intelligent set-top boxes with integrated DRMs
- Home networking
- Bundling mobility services with traditional fixed services
- Offering of voice telephony services
- Video on demand servers
- Advanced network, operations, and business support systems

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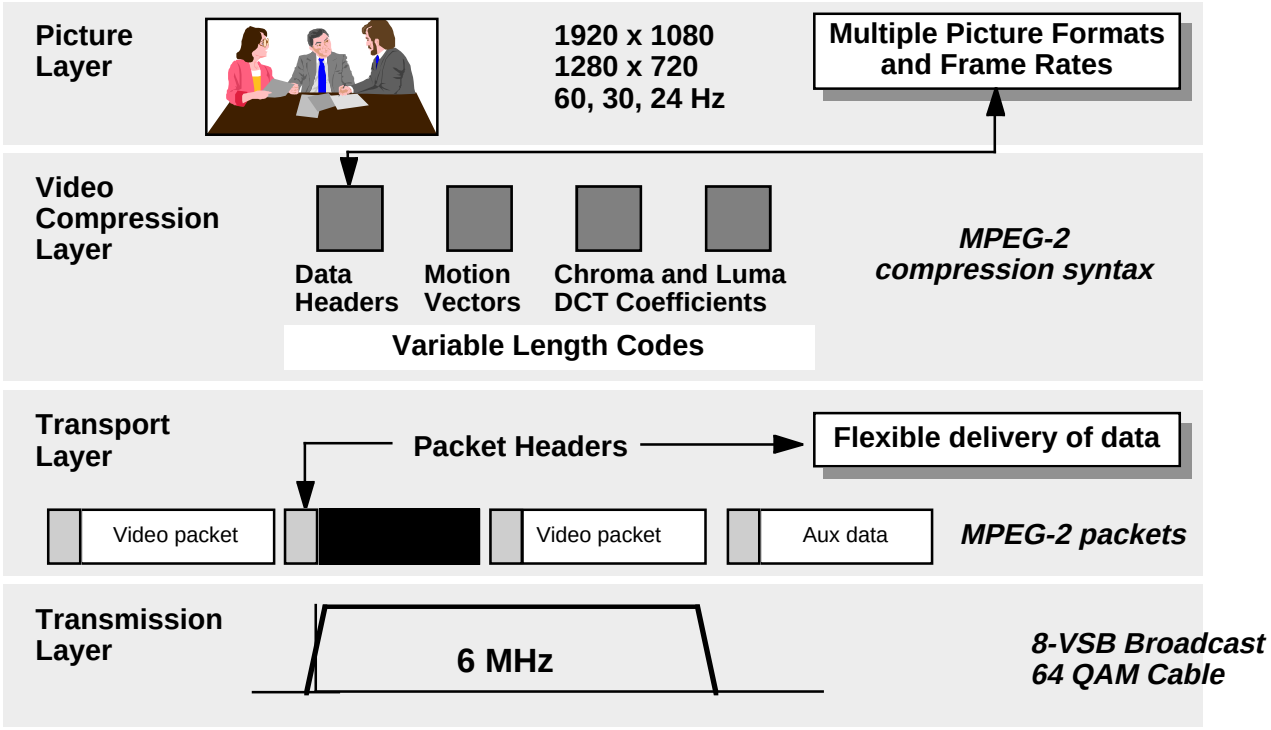
ATSC video migration allows flexibility in trading off quantity for quality.

- **Typical 6MHz analog channel can carry up to 10X SDTV programs or 1 HDTV channel**
- **Potential to expand capacity from 85 to 850 programs**
- **Provides support for NVOD as well as free up spectrum**

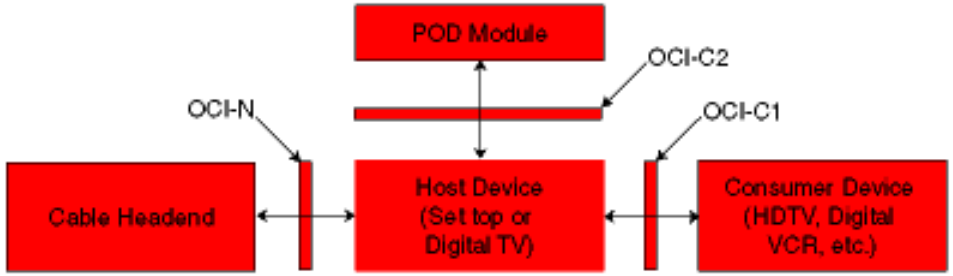


Source: Sarnoff Research Center

Drivers of Change and Opportunities DTV Plug & Play

Following the FCC regulations the stakeholders went one step beyond.

- **—FCC mandate for manufacturer DTV tuners frees up capex**
- **—Industry Plug & Play agreements program DRM & secure infrastructure for high value video content delivery**



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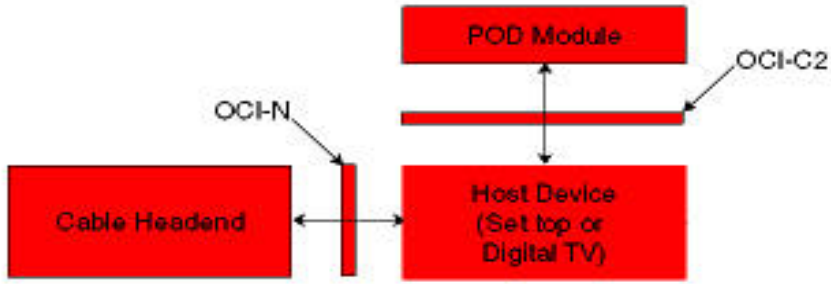
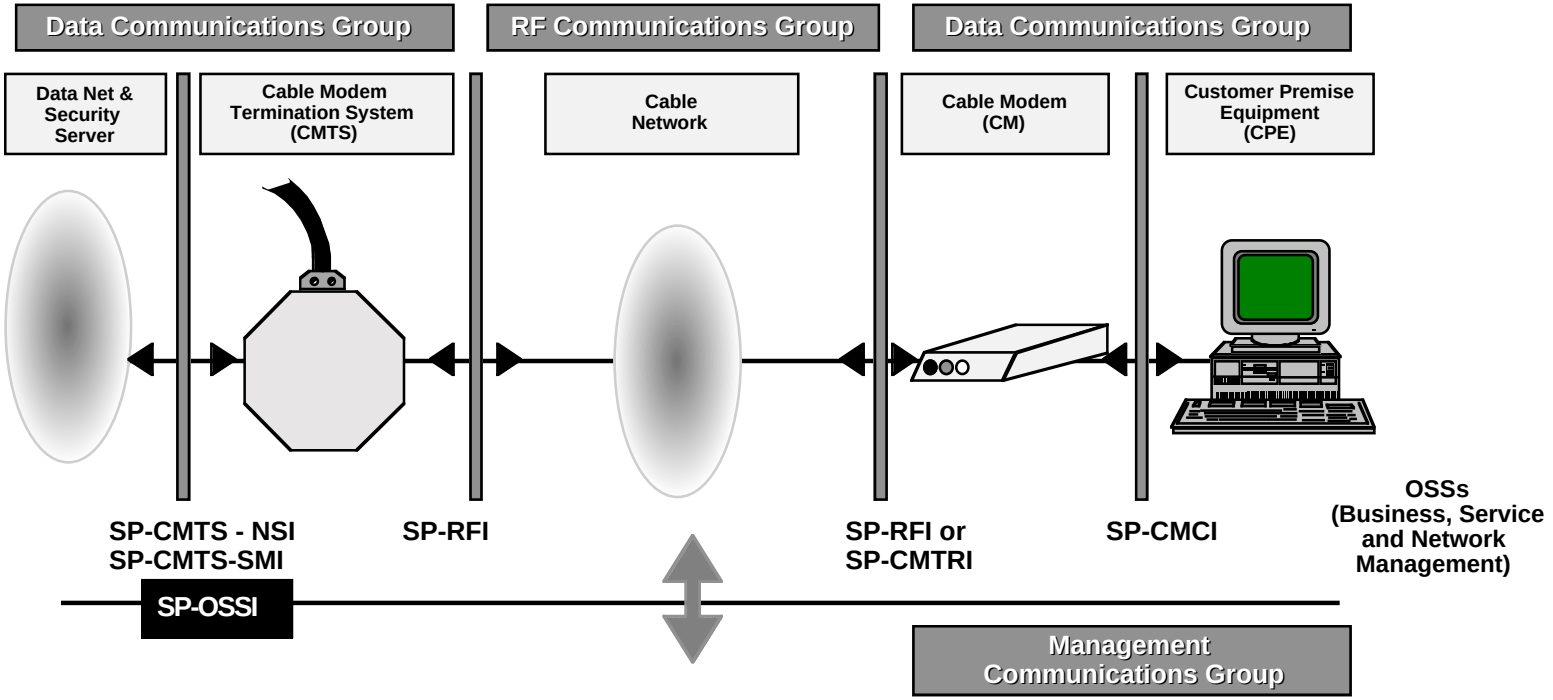


Drivers of Change and Opportunities Secure QoS IP Infrastructure

Cablemodems provide secure QoS managed IP transparent digital packet infrastructure with unicast, multicast, and broadcast capabilities.

- **DOCSIS 1.0 was designed for flexible expansion supporting both contention and reservation packet grants to cablemodem**
- **DOCSIS 1.1 added enhancements to support streaming content and packet fragmentation**



Drivers of Change and Opportunties Intelligent Set-Top Boxes

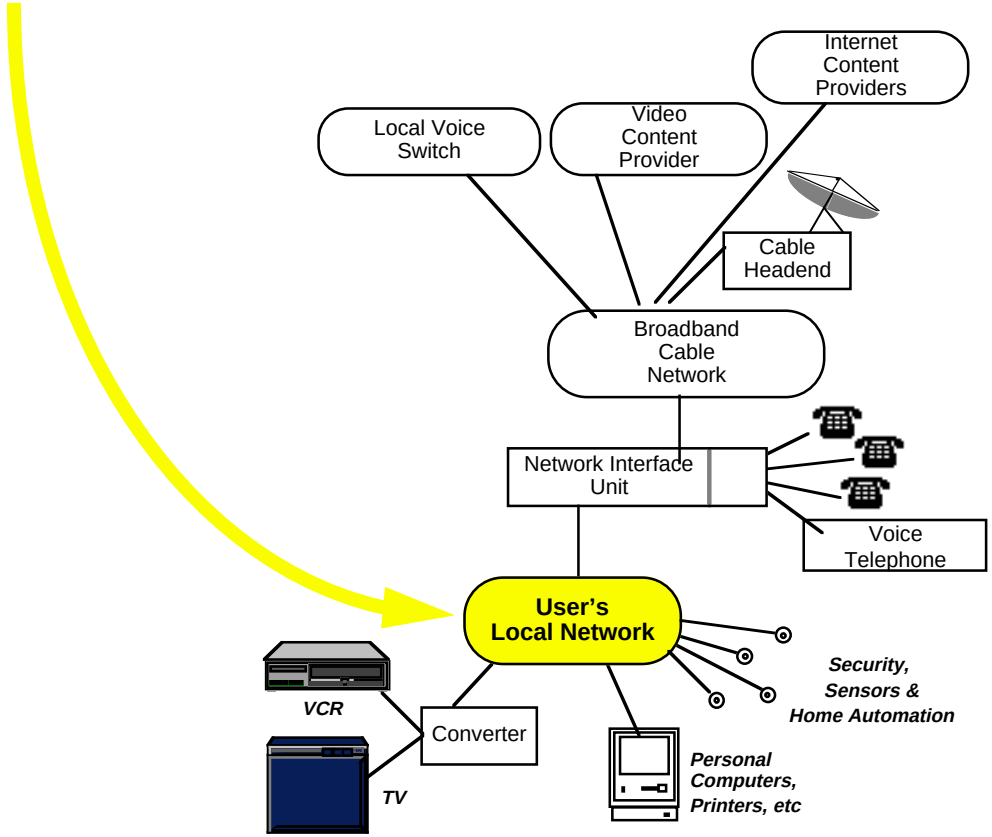
Open cable efforts have yielded a set-top box spec with downloadable intelligence.

- **Includes OCAP (OpenCable Applications Platform) a middleware software layer specification based on DVB-Multimedia Home Platform (MHP)**
  - **—Supports JAVA application engine (AE) and ECMA Script**
  - **—Includes presentation engine (PE) in OCAP2.0**
- **Open cable includes security features**
  - **—Conditional access APIs**
  - **—Copy control technology**
- **Some operators deploying set-top boxes with USB ports to support future music downloads.**

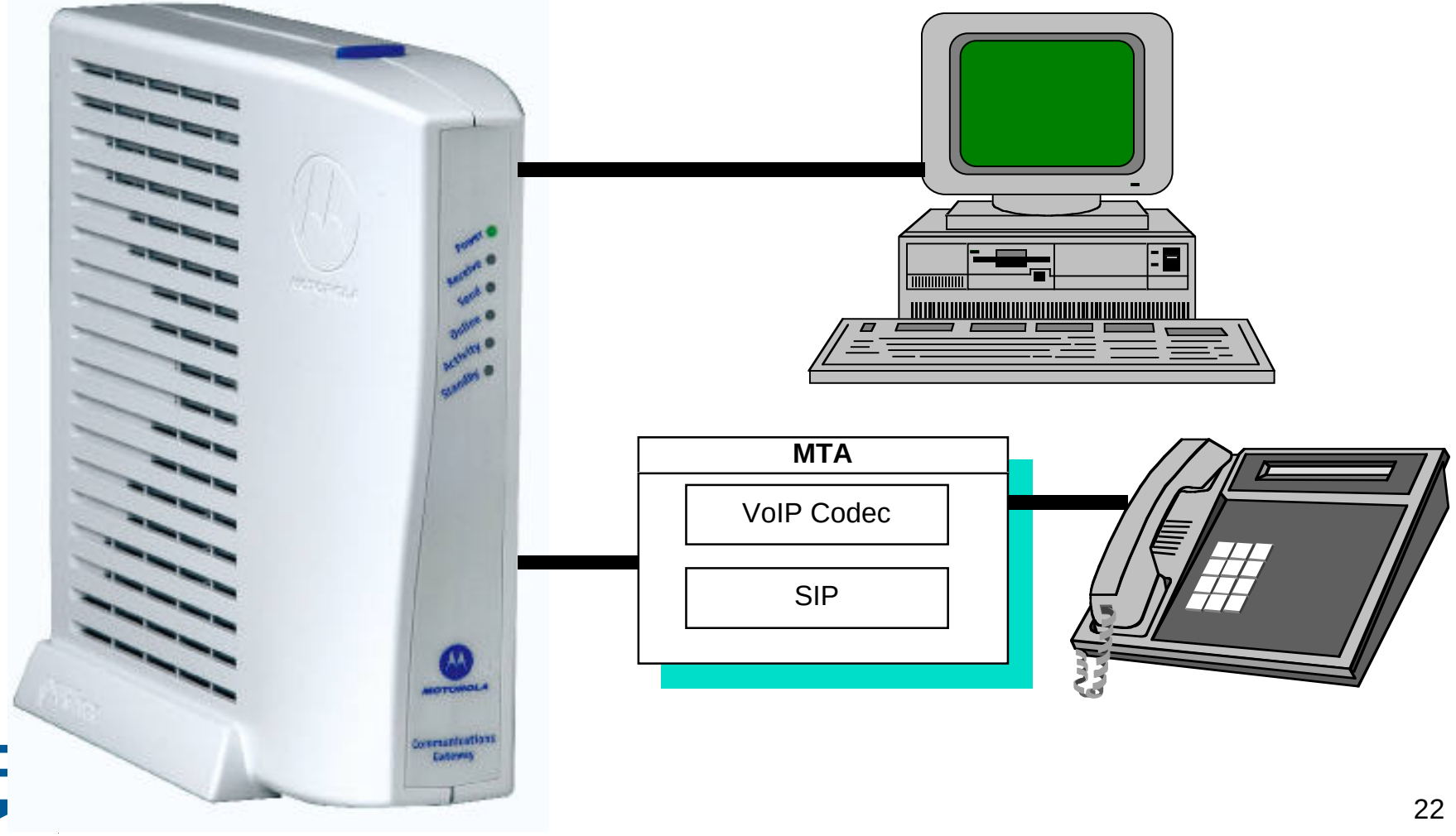
Drivers of Change and Opportunities Home Networks

With multiple TV outlets, computers, and telephones; home networks now make sense.

- **Candidates include HomePNA, 802.11, and PLC.**



Once a QoS managed IP infrastructure is in place, to provision telephony requires little more than a VoIP multimedia terminal adapter (MTA).



Summary and Conclusions

With little additional incremental investment the cable industry is now positioned to offer a variety of new services that will generate high margin incremental revenues at the same time defending against encroachment by DBS and LEC competition.

- **Expanded program offerings**
- **Video on demand**
- **Interactive TV and video commerce**
- **Electronic content delivery**
- **Voice telephony**
- **Value added internet services**
- **Home networking**
- **WiFi hotspots**

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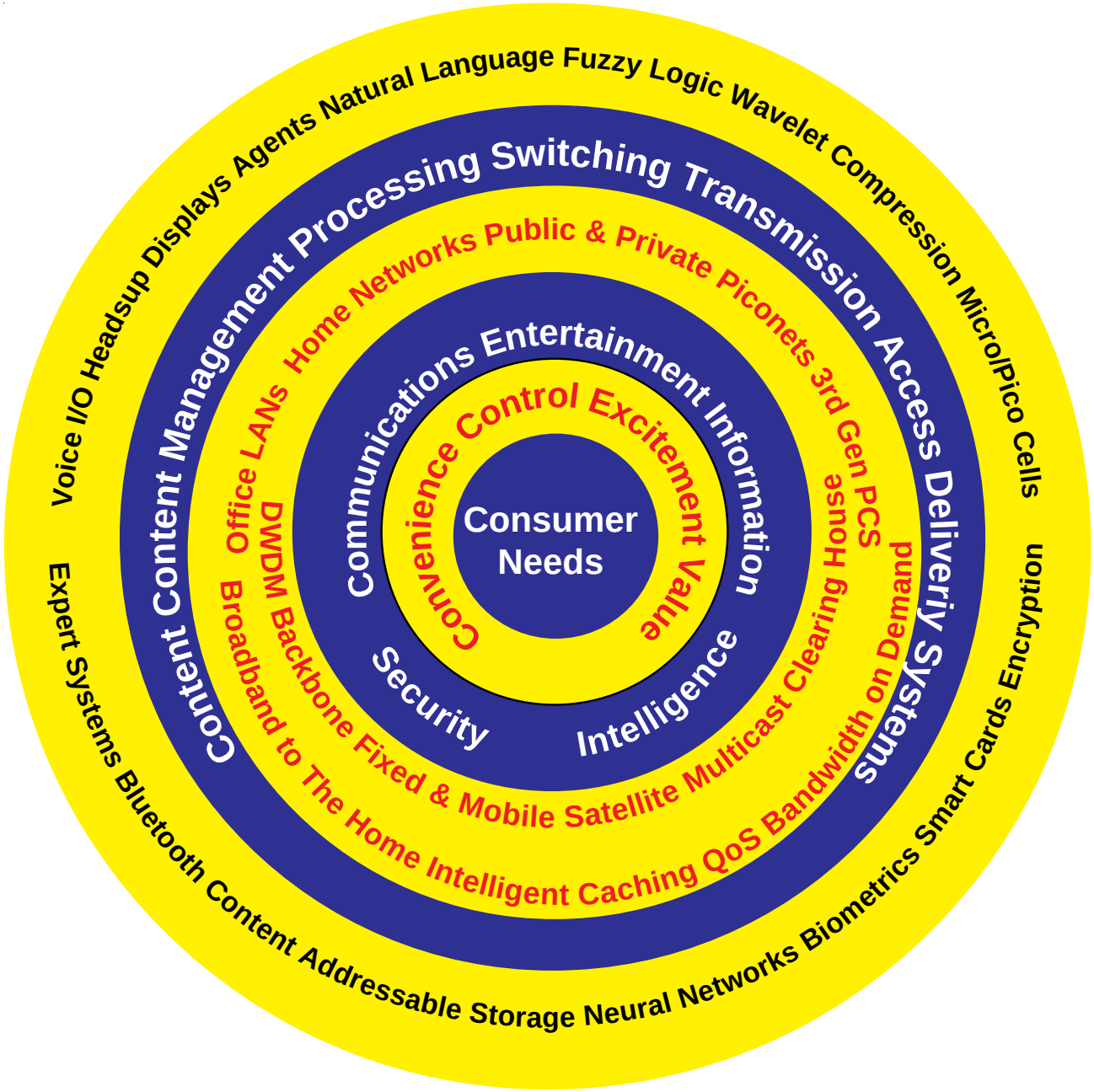
Voice I/O Headsup Displays Agents Natural Language Fuzzy Logic Wavelet Compression Micro/Pico Cells
Expert Systems Bluetooth Content Addressable Storage Neural Networks Biometrics Smart Cards Encryption
Content Content Management Processing Switching Transmission Access Deliveriy Systems
Office LANs Home Networks Public & Private Piconets 3rd Gen PCS
DWDM Backbone Fixed & Mobile Satellite Multicast Clearing House
Broadband to The Home Intelligent Caching QoS Bandwidth on Demand
Communications Entertainment Information
Convenience Control Excitement Value
Consumer Needs
Security
Intelligence

Stuart Lipoff, Partner, IP Action Partners

Stuart Lipoff is a co-founder of IP Action Partners providing management and technology consulting services to clients who are seeking to change their competitive position by exploiting disruptive technologies. His consulting career included 25 years as VP of Technology & Innovation at Arthur D Little, Inc. During his career he has led the project for the cable industry which developed the DOCSIS CableModem Specifications including the industry's strategic applications vision. Currently he is working on projects exploring mobile commerce, video commerce, and secure electronic delivery of content to internet appliances.

An IEEE Fellow, as past president of The IEEE Consumer Electronics Society, he brings particular expertise to projects in which high volume, low cost, advanced technology is an important success element.

Stuart can be reached at stu@ipaction.com or www.ipaction.com, Phone: (617) 244-3877.

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