

Introduction to Cable Technology and Architecture



1066_03F8_c2 NW98_US_203 This session offers a high level view of the Cable Industry as it evolves from the role of simple video distribution, to sophisticated service provider now capable of supporting advanced digital and two way services consistent with prevailing quality and reliability expectations. The session details the plant components and architecture, and will relate to how such advanced services as Internet Data, Digital Video, IP Telephony etc., ill be transported and interface to existing infrastructure





- The concept of television is born!
- Competing and divergent views on implementation methods promoted by several sources



Cable Network Post World War II

- Television becomes a reality!
- Television transmitters established:

Limited content

Few broadcast sources

Limited urban coverage, or near rural transmitters





Quality Reception

- Limited reach
- Signal blockage





- Makes video available to many
- Improves signal quality
- Extended coverage through amplification
- Amplification has range limitations because of excessive noise



• CATV as we know it is born:

One way broadcast signal distribution Signal amplification over coaxial cable Amplifiers powered through coaxial cable plant Range limitation because of noise build up

• But!

Limited content:

Current affairs and panel discussions

Little entertainment

Reduced broadcast hours

Few broadcast/content sources

Frequent outages

Cable networking advances





Microwave + The Community Antenna

Microwave Broadens the Distribution Range of Quality Video Reception to a Larger Subscriber Population



Cable Network Cable Networking Standards Evolve:

• Based on available vendor product and cost:

Diameter and quality of Coaxial Cable

Bandwidth specification on amplifiers

Power distribution products

Set Top devices

• Standards primarily defined channel capacity:

Initially 16 channels, followed by:

32 channel systems

64 channel systems

• Limited quality control, faults often identified by customer call





Limited Content and Signal Sources Available:

Content sourced from:

Local **ØF** AIR?pickup

Remote GF AIR?pickup with microwave back haul

Film and tape

Emerging local content as mandated by FRANCHISE terms:

Local affairs, educational etc.

• Consequently:

16 or 32 channel systems are considered adequate

Systems were DCAL? limited to regional FRANCHISE

Wined and Operated?by local entrepreneur



Cable Network Color Television Standards Introduced:

 NTSC (National Television System Committee) permits color broadcast over existing monochromatic infrastructure

North America, Japan, Portions of South America, US sphere of influence

• PAL (Phase Alternation by Line)

Europe, portions of South America, Parts of Asia and Africa

• SECAM (SEquential Couleur a Memoire)

France, Russia, Eastern Europe, Middle East



Cable Network CCIR Broadcast Standards Introduced

 Individual nations select color and broadcast standards based on:

Primary power line frequency

Lines per frame

Horizontal frequency

Video bandwidth

Sound carrier

Color sub carrier



• Satellite transmission emerges:

New content becomes available

National coverage by a single source is now possible

A national market develops for content producers

- A **ORNUCOPIA**?of content offered to the market
- Resulting in:

New customer demand for content (HBO, CNN, ESPN, International) New marketing concepts e.g., By Per View?, Pemium channels Market DEMAND compels CATV operators to:

Increase system capacity

Improve service quality

Invest heavily in their networks, or @sh In?and sell out to stronger players

The MSO Emerges







• Results in:

TCI

Industry consolidation

Expansion of MSO holdings

14 M basic subscribers

TIME WARNER CABLE 7 M basic subscribers

MEDIA ONE

5 M basic subscribers

System clustering (property exchanges)



Cable Network Upgrading the Cable Network:

- To meet customer service expectations
- To increase capacity
- Defend against loss of market share
- To support new services and revenue growth



Cable Network Upgrading the Cable Network:

 Introduce Fiber Optics technology to the network

Improve signal quality

Reduce maintenance effort and cost

Remove bandwidth constraints

Reduce operating cost

Reduce the number of failure elements



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- Bypass and eliminate coaxial cable and amplifiers from a portion of the downstream path and replace the link with fiber
- Make ready for two way operation!





Typically Fewer than Five Amplifiers in Cascade

- The video signal is transmitted over fiber to the node, where it is converted to an electrical signal and forwarded to the subscriber over existing coaxial cable
- Provision is made to support return traffic for future services



Cable Plants Are Upgraded for:

- Improved reliability
- Smaller serving area
- Increased bandwidth
- Increased availability
- Improved end-to-end?signal quality
- Advanced network management
- Two way operation
- Platform for advanced services





- Analog fiber RING for broadcast video
- Headend/hub to improve reliability
- SONET/SDH RING overlay for reliability of advanced services



Cable Network Reliability, Increased Access Bandwidth

• Smaller, robust / / / serving areas: < 80 Channels HFC to the node CNN HBO Alternate feed ESPN to the node Node Hub Node **Target nodes** COAX Тар Node of 500 homes **Fewer amplifiers** Drop **Alternate Feed Settop TV CISCO SYSTEMS**





Increased bandwidth:

Downstream ebuilds?to 750 MHz Wide band amplifiers etc

• Two way operation:

Upstream (5?2 MHz) Povisioned? and perational







The Cable Plant Has Been Transformed. The Stage Is Now Set for an Advanced Services Platform



An Advanced Services Platform Based on DCSIS? (Data Over Cable Services Interface Specifications) enables High Speed Data over Cable











Cisco Universal Broadband Router uBR 7246

CISCO SYSTEMS



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- High bandwidth
- QoS (Quality of Service)
- MPEG packet format
- Network management
- Multicast
- Privacy
- Security
- Future capabilities:
 - VoIP (Voice) IP Video





• Possible service applications:

- **Internet access**
- Enterprise
- Telecommute
- Virtual private network
- Voice
- SOHO





CISCO SYSTEMS