TV Distribution

Healthcare

TV Distribution

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Expected Deliverables: Patient Room

1. Entertainment TV
2. Video-on-Demand (VOD)
3. Patient Education & Training
4. Electronic Medical Records (HIPPA)
5. Internet Access
6. Games (Nintendo, etc.)
7. Meal Ordering
8. Housekeeping Requests
9. Daily Charges
TV Distribution

The Patient Room

1. Television
2. Keyboard
3. Swing Arm TV
4. Interactive System/Computer/IP Device
5. Telephone

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Expected Deliverables: Common Areas

1. Entertainment TV
2. Digital Signage
3. Way-Finding
4. Mass Notification
Delivery of Services

This Presentation Will Address the METHODS for Delivering the Content to the Patient Room and Common Areas

BUT...

NOT the Sources of Content or the Content Itself. It Will Not Advocate the Way the Patient Records Are Kept Nor the Brands of VOD Service, or Internet Access, etc.
TV Distribution

Signal Types

- **Broadband RF**
  - CATV
  - Satellite
  - Internally Generated
  - Off-Air

- **IP**
  - Cloud
  - Satellite
  - CATV
Broadband RF Sources: CATV

- Frequency 5-860MHz - Each Channel Is 6MHz Wide
- If Analog - Amplitude & Freq. Modulated - One Channel
- If Digital - Amplitude & Phase Modulated
  - QAM Modulation
  - SD: 6-10 Channels per 6MHz
  - HD: 1-2 Channels per 6MHz
  - MPEG2
- If Unencrypted, Can Use Standard TV and Can Be Distributed as is or Headended
  - Commercial Feeds May Be Available with Unencrypted Digital
Broadband RF Sources: Off-Air

- Frequency 5-860MHz - Each Channel Is 6MHz Wide
- If Analog - Amplitude & Freq. Modulated - One Channel
- If Digital - Amplitude & Phase Modulated
  - 8-VSB Modulation
  - SD: 6-10 Channels per 6MHz
  - HD: 1-2 Channels per 6MHz
- MPEG2
- Signals Are Unencrypted, Can Use Standard TV
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Broadband RF: Satellite

• Commonly Used in Healthcare and Other Institutional Facilities
• Frequency 2+GHz – Has Distribution Limitations Over CAT Cable
• Each Channel is 6MHz Wide
  – QPSK Modulation (Quadrature Phase Shift Keying)
  – MPEG4
  – DIRECTV Comm1000 Headend – Consistent Signal Levels
• Headend Typical – No Set-Top Box at TV
Headends Allow You To Combine Various Inputs: (CATV, CATV Encrypted, Satellite, Off Air, IP, Cameras, Analog, Digital, etc.) And Create Custom Channel Plans For Your Facility.
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Broadband RF: Headends

The headend provides “clear” TV to the facility. It can be either analog or digital.

DM: Demodulator
STB: Set Top Box
Modulator: Digital or Analog
SAT RCVR: Satellite Receiver
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Broadband Headend Solutions

HDCP

• Digital Copyright Protection: Program Encryption Not the Cable or Satellite Channel Encryption
• Decryption Occurs at Viewing Device, i.e. TV
• Content Providers Are “Strict”
• Different Carriers Have Different Takes
  — May Be Different Not Just Carrier to Carrier But Region to Region Within the Same Carrier
• A Pro Idiom Encryption Works in All Cases
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Headend Solutions: IPTV

• MPEG2 Requires 15-20 Mbps/sec, MPEG4 ~9 Mbps/sec
• Can Be Encoded from CATV, Satellite, Off-Air RF Source(s) and Can Be Expensive
• Requires an IP Device at All Viewing Locations
  – IPTV, Computer, or Decoder
• Typically Has it’s Own Network Due to High Bandwidth
• IP Addresses Are Controlled by User Software
• Still Requires Some Form of Encryption
• QOS
  – Latency
  – Lock-Ups Requiring Rebooting of Device
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Headend Solutions: IPTV
TV Distribution

TV Can Be Distributed Via:

- UTP/STP
- COAX
- FIBER
RF Over COAX

- RF TV Distributed Using RG-6/RG-11 COAX
  - Unstructured – Undocumented System
  - Requires RF Engineering
  - Requires Manual Adjustments
  - Low Cost Up-Front
  - High Cost MAC’s/Maintenance
  - Generally Works Well for Backbone
  - Can Do an Adequate Job in the Horizontal, But Only Until MAC’s Are Required
**TV Distribution**

**RF Over COAX**

- Multiple Split/Tap Topology
- Stand-Alone Amps Required
- Signal Levels Need to Be Established
- Still Needs a CAT Cable to TV for Interactive Systems
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RF Over Category Cable (UTP & STP)

• Category Cable Can Distribute Multiple Formats Over a Single Cable:
  — IP
  — RF
  — Control Functions (Serial Commands)
  — VGA/HDMI (With Extenders)

• Moderate Cost Up-Front
• Low Cost MAC’s/Maintenance
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RF Over Category Cable

- 4 Twisted Pairs Per Cable
- 10/100 Ethernet Uses 2 Pairs (Giabit Uses all 4 Pairs)
  - That Leaves 2 Unused Pairs for Other Functions Such As:
    - RF TV Distribution (Pins 7 & 8)
    - Control Functions (Pins 4 & 5)
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RF TV Over Category Cable

- 75 Ohm Unbalanced RF Split and Converted to 100 Ohm Balanced Signal
- Sent 180 Degrees Out of Phase to Eliminate Common Mode Noise
- The Better the Balance the Lower the Loss
- Due to Balance, Able to Meet FCC Specifications
RF Over Category Cable

• In Order to Be of Maximum Value the RF Over CAT 5e/6 Must be Compatible With the TIA 568 Standard. That Is:
  – Be Able to Go 100m (90m + 10m patch)
  – Use Standard Interconnects

• In Order to Be of Maximum TV Value the System Should be Able to Support the Full Video Spectrum – 5MHz to 860MHz

• IT Department Are More Comfortable with TV Over CAT Cable – Compatible with RF Today, Ready for IP Tomorrow

• The Use Of Structured Cabling Allows Better System Mapping Over The Life Of Application
TV Distribution

RF Over Category Cable

- However, UTP Has Significantly More Loss Than Coax!
TV Distribution

RF Over Category Cable

• Types of RF TV Distribution Systems:
  – **Passive Component Method**
    • All the Problems of a COAX System, BUT WITH GREATER LOSS
    • Inability to Go 100m at 860 MHz
    • Significant RF Design with Some Manual Adjustments
  – **Active Distribution System**
    • Simple to Design and Install
    • Full RF Spectrum Over CAT 6, at Full 100m
    • Uses Automatic Gain Control (AGC) for Self-Adjustment Set-Up, and Normal Operations
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RF Via Category Cable - Passive Components

- The Passive Approach Has Some Dedicated UTP Components, i.e. Splitter/Balun Hub and a TV Balun, Plus Typical Coax Components of Splitters, Taps, and Multiple Amps.
- Requires Runs to be Segmented Into Long/Medium/Shorts
- Amps Need to be Adjusted
- Adds/Moves/Changes, While Easier Than Coax, May Need Additional Amps, Splitters, etc.
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RF Over Category Cable - Active System

- Active System Provides Automatic Signal Level Control to Provide Consistent RF Levels to All Floors of the Facility and to All TV Drops
- Full 860 MHz of RF Can Be Launched 100m and Provides Optimum Signal Levels to the TV’s By Using an “Active/Intelligent” Balun at The TV. Baluns Are Powered and Have Built-In Amps
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RF Over Category Cable

Active System

- Patch Panel
- Category 5e/6/7
- <90 Meters
- Wall Outlet
- HD TV
- Active/Intelligent Balun
- RF Video
- Video Source/s (CATV/Satellite/Etc.)
  - Analog 23dBmV/83dBuV
  - Digital 17-20dBmV/77-80dBuV
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**RF Over Category Cable - Active System CASCADE**

- Coax Cascades Using AGC Up to 600’
- Cascades to Multiple Units: Up to 585 HUBs
- No Intermediate Amps, Taps, or Splitters
- NO MANUAL ADJUSTMENTS REQUIRED
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RF Over Category Cable - Active System

- Cascades Using SM Fiber Up to 15Km’s. Can Support Entire Campus from Single Headend.
- Very High Signal Quality
- Low Maintenance
- Becoming More Cost Effective with Large Installations as Cost Is Distributed over a Large Number of IDF’s and Fiber RX’s Are Built Into Active Hubs
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RF Over Category Cable - Active System Fiber Backbone
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RF Over Category Cable - Sharing the Sheath

- A Single Sheath of CAT Cable Can Support Multiple Functions
- Pins 1, 2, 3 & 6 Can be Used for Data or Control Functions
- Pins 4, 5, 7 and 8 Are Used for RF Video
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IPTV Over Category Cable
**TV Distribution**

RF Over Category Cable Sharing The Sheath-IP Patient Infotainment

- **Digital Headend**
- **SWITCH**
- **LAN**
- **VIDEO SERVER**
- **Interactive System and IP Appliance**
- **Video Hub**
- **Patch Panel**
- **Provides Both IP Patient Information and RF TV Over a Single CAT Cable**
- **Active Balun**

*Image courtesy of Bicsi*
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DOCSIS/FSK RF Video-On-Demand

Digital Headend -> RF PROCESSOR/ROUTER

VIDEO SERVER

Provides Both Patent Information and RF TV Over a Single CAT Cable

Video Hub

Patch Panel

FSK/DOCSIS SET TOP BOX

Active Balun

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RF Over CAT Cable Sharing Sheath - Signage/TV Control

Using IP And RS232 Control Functions
You Can:

- Tune All TV’s For Mass Notification
- Tune a Group of TV’s to a Select Channel
- Tune TV To Certain Channel At A Given Time

- Provide Central Or Local Control In Common Areas
- Remove Need For Remotes In Common Areas
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RF Over Category Cable Sharing The Sheath - Signage/TV Control

Able to Control Large Number of TV’s From Central Area
Hospital TV Environment: Summary
The TV Distribution To The Patient Can Be Provided Via RF And/Or IP

- IPTV Is Still in It’s Infancy With Some Challenges:
  - High Cost
  - High Bandwidth
  - Latency Issues
  - Lock-Up
  - Possible Additional IT Staff

But Getting Better…
Hospital TV Environment: Summary

- RF TV Over CAT 5+
  - Extremely Reliable
  - Hundreds of HDTV Channels in a 5MHz to 860 MHz Bandwidth; Without Affecting Facility Network Capacity
  - Active System Is Low Maintenance & Provides Consistent RF Levels
  - UTP System Utilizes TIA568 Structured Cabling: Easy to Design and Document
  - UTP System Allows Distribution of Both IP TV/Control Functions and RF Video Over a Single UTP Cable
- RF Over UTP Provides a Reliable, High Quality Video Transport System for All Information and Entertainment Required in Today’s Patient Room
Hospital TV Environment: Summary

For The Patient:
- The Interactive Systems Provide The Interface For Surfing The Web, Viewing Educational Content, Entrainment TV And Video-On-Demand.
- That’s Why The Entertainment TV Needs To Be The Most Reliable, Cost Effective Type Possible.
TV Distribution

Hospital TV Environment: Summary

For The Hospital:
- Interactive Systems Allow Hospitals to Send & Receive Information to & from the Patient Room, and Delivers Entertainment & Education Content. Less Time Is Spent on Non-Mission Critical Staff Requests Like Temperature Control, Housekeeping, Volume Control, etc.
- The Hospital That Chooses CAT Cable Can Select The Most Cost Effective IP and RF Solution for Each Video Application
- The Benefits of CAT Cable, and the Structured Cabling Environment it Provides is Very Beneficial to Healthcare.
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RF or IP…. Coax or Category Cable

YOUR CHOICE! YOUR CHOICE!

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Q & A