

# The Art House & Digital Cinema

- Making sense of D-Cinema
- Alternative Content Video
- Upgrades to existing systems
- Planning for the future use

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# The Evolution of Video

- NTSC – Standard Definition
  - 640 x 480 Pixels (visible)
  - 4 x 3 Aspect Ratio (1.33)
  - Typically Composite Video
  - aka: 480i (interlaced signal)
- Examples:
  - Analog Broadcast TV
  - CRT Displays
  - VHS / Betacam Tape

# The Evolution of Video

- NTSC – EDTV (Standard Definition)
  - 640 x 480 Pixels (visible)
  - 4 x 3 Aspect Ratio (1.33)
  - Typically Component Video
  - Progressive Scan (480p)
  - Non-interlaced Signal
- Examples:
  - DVD – Standard Definition
  - VGA Computer (typically RGBHV)
  - Early Plasma TV's

# The Evolution of Video

- ATSC – HDTV (1K High Definition)
  - 1280 x 720 Pixels (visible)
  - 16 x 9 Aspect Ratio (1.78)
  - Component Video, DVI, HDMI
  - Progressive Scan Signal - 720p
  - Interlaced Signal - 1080i
  - Dolby Digital 5.1 Audio
  - Analog Broadcast TV “Sunset” on 6-12-09
- Examples:
  - Broadcast HDTV (Cable, Satellite, Off-Air)
  - WXGA Computer (RGBHV, DVI)
  - 2<sup>nd</sup> Generation Plasma TV’s

# The Evolution of Video

- ATSC – Full HD (2K High Definition)
  - 1920 x 1080 Pixels (visible)
  - 16 x 9 Aspect Ratio (1.78)
  - HDMI or DVI (with HDCP Encryption)
  - Progressive Scan Signal - 1080p
  - 7.1 Digital Audio Support
- Examples:
  - Blu-Ray DVD / Sony PS3
  - WUXGA Computer (DVI, Display Port)
  - Current Generation Plasma TV's

# The Evolution of Video

- Digital Cinema (DCI Specification)
  - 2048 x 1080 Pixels @ 24 or 48 fps (2K)
  - 4096 x 2160 Pixels @ 24 fps (4K)
  - 1.85 Aspect Ratio - Native
  - JPEG2000 files via dual HD-SDI streams
  - 12-bit deep color space
  - 3D supported: 2K @ 48 fps (24 fps per eye)
  - Language Subtitle Support
  - 7.1 Digital Audio – Uncompressed PCM/WAV
  - Capacity for up to 16 channels @ 24-bit/96kHz
- Examples:
  - DCI-Compliant Servers (2K & 4K)
  - DLP Projectors (2K & 4K Upgradable)
  - SXRD Projectors (4K)

# The Evolution of Video

- Video Transport Platforms (Analog)

- Composite Video (1) Coax
- S-Video (2) Coax
- Component Video (3) Coax
- RGBS (4) Coax
- RGBHV (5) Coax
- UTP Cable (CAT5E) TX/RX modules for all of the above, usually used to overcome long cable distances

- Audio Transport Platforms (Analog)

- Balanced Line (1) Twisted Shielded Pair Cable / Channel
- Speaker Level (1) Twisted Unshielded Pair Cable per driver element. Wire gauge dependent on amplifier power & distance
- UTP Cable (CAT5E) TX/RX modules for the line level audio, usually used to overcome long cable distances

# The Evolution of Video

## ● Video Transport Platforms (Digital)

- SDI / HD-SDI (1) Coax
- DVI-D (1) Proprietary Cable (Digital Video Only)
- DVI-I (1) Proprietary Cable (Digital + Analog Video)
- HDMI / Display Port (1) Proprietary Cable (Digital Video & Audio)
- UTP & Fiber Optic Cable TX/RX modules for very long distance applications

## ● Audio Transport Platforms (Digital)

- S/PDIF (1) Coax
- Optical (Toslink) (1) Proprietary Cable (Fiber)
- AES / EBU (1) Twisted Shielded Pr. Cable / Channel Pair
- HD-SDI (8) Embedded channels within video data
- HDMI (8) Embedded channels within video data
- Cobra-Net Multi-channel audio over UTP Cable



# Does your head hurt yet?

Post-production digital working resolutions

Standard	Resolution	DAR	PAR	Pixels
Full Aperture 4K	4096 × 3112	4:3	1:1	12,746,752
Academy 4K	3656 × 2664	1.37:1	1:1	9,739,584
Full Aperture Native 2K	2048 × 1556	4:3	1:1	3,186,688
Academy 2K	1828 × 1332	1.37:1	1:1	2,434,896
Sony HDCAM SR (1080)	1920 × 1080	16:9	3:2	2,073,600
Sony HDCAM (1080)	1440 × 1080	16:9	3:2	1,555,200
HDV 1080i/p	1440 × 1080	16:9	4:3	1,555,200
Panasonic DVCPRO HD 1080, 50i	1440 × 1080	16:9	3:2	1,555,200
Panasonic DVCPRO HD 1080, 59.94i	1280 × 1080	16:9	3:2	1,382,400
Panasonic DVCPRO HD 720p	960 × 720	16:9	4:3	691,200
D1 PAL	720 × 576	4:3	32:30	414,720
D1 NTSC	720 × 486	4:3	9:10	349,920
DV PAL	720 × 576	4:3	32:30	414,720
DV NTSC	720 × 480	4:3	10:11	345,600
Web 720x	720 × 540	4:3	1:1	388,800
Web 720x HD	720 × 405	16:9	1:1	291,600
Web 640x	640 × 480	4:3	1:1	307,200
Web 640x HD	640 × 360	16:9	1:1	230,400
Web 480x	480 × 360	4:3	1:1	172,800
Web 480x HD	480 × 270	16:9	1:1	129,600
Web 360x	360 × 270	4:3	1:1	97,200
Web 360x HD	360 × 203	16:9	1:1	73,080



# Discussion Topic

- How do you use video now?
  - Features on DVD / DV / DigiBeta / BluRay
  - Computer-based presentations
  - Satellite delivered content (Met Live)
  - Hard-drive content (National Theatre)
  - Local content / membership / coming events
  - Other ??

# Discussion Topic

- How do you use film now?
  - 35mm platter system or changeover reels
  - Formats (1.33 / 1.37 / 1.66 / 1.85 / 2.39)
  - 70mm (2.21)
  - 16mm (1.33 / 1.66 / 2.66)
  - Audio playback (Analog / Dolby-D / DTS)
  - Screen & masking type / options

# Upgrade Planning

- Considerations (Video Sources):
  - Must-have resident video sources
  - Source options to budget for
  - Occasional use sources / Guest inputs
  - Audio playback (Stereo / Pro-Logic / 5.1)
  - Required aspect ratios
  - Backward compatibility

# Upgrade Planning

- Considerations (Video Projection):
  - Highest resolution requirement for all sources
  - Switching / scaling needs for all sources
  - Screen size requirements per format
  - Display's native aspect ratio
  - Throw distance (lens selection)
  - Space, power and ventilation needs
  - Screen & masking requirements

# Upgrade Planning

- Considerations (Audio Playback):
  - Output capability for all sources
  - Existing cinema processor capability
  - Switching & decoding requirements
  - Embedded audio (HD-SDI / HDMI)
  - Existing B-chain audio system
  - Hearing-assist option

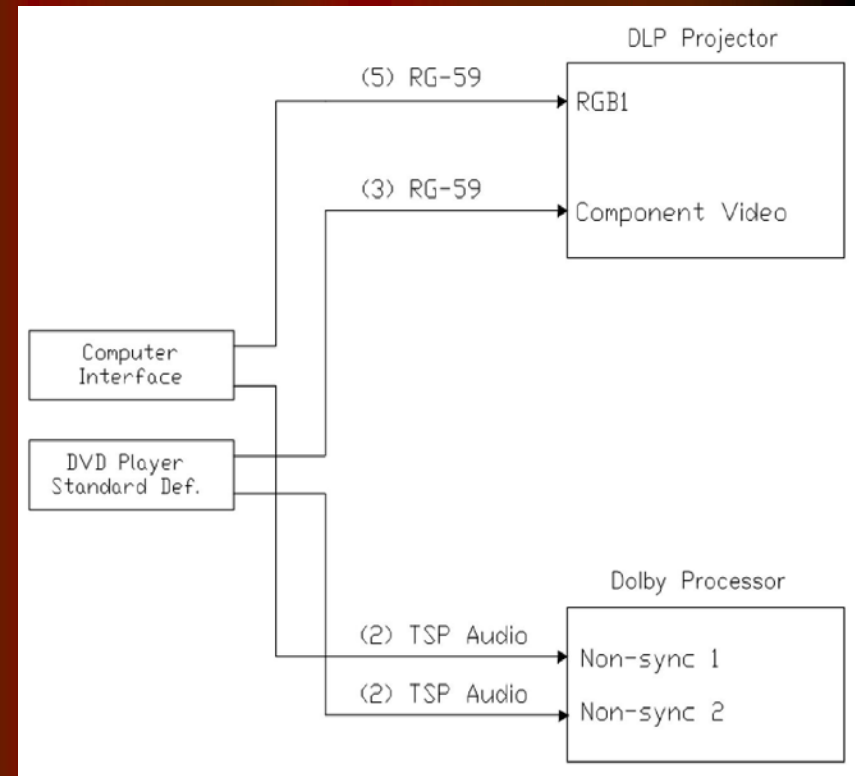
# Upgrade Planning

- Considerations (Automation & Control):
  - System operator (tech staff / client)
  - Show requirements (multi-source)
  - System complexity
  - Control locations (booth / presenter)
  - Existing automation

# Video System – Example #1

- Basic video projection

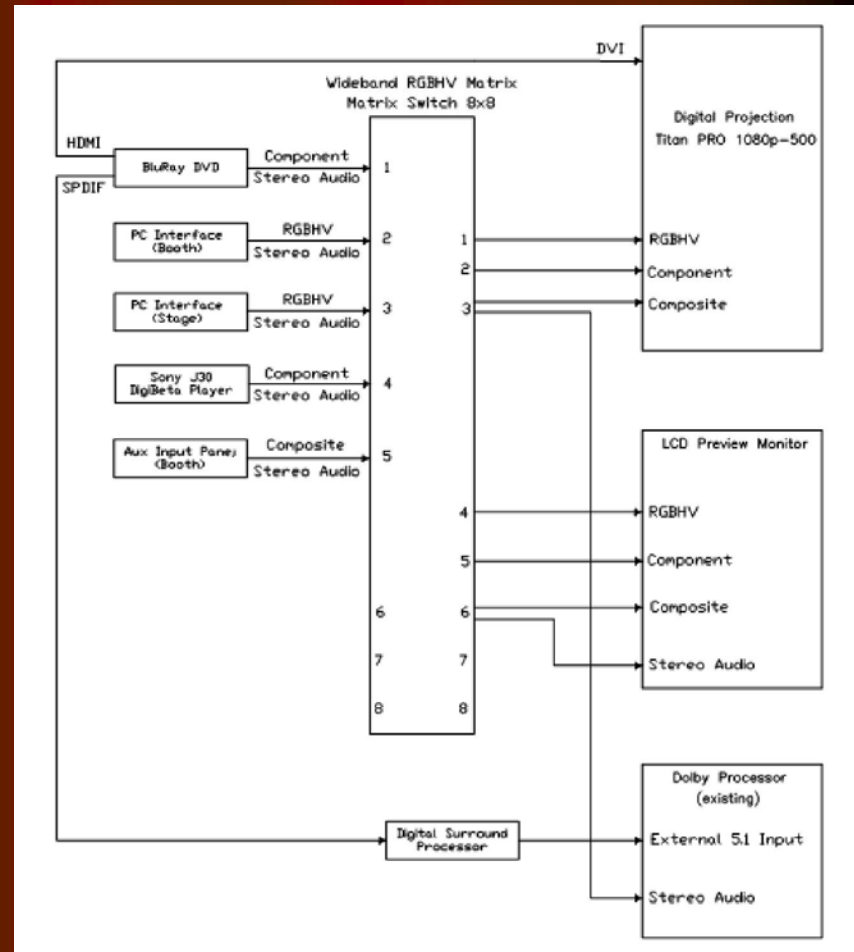
- WXGA Projector
- Single PC Input
- DVD Player
- Staff operation
- Masking for flat & scope formats
- Pro-Logic playback





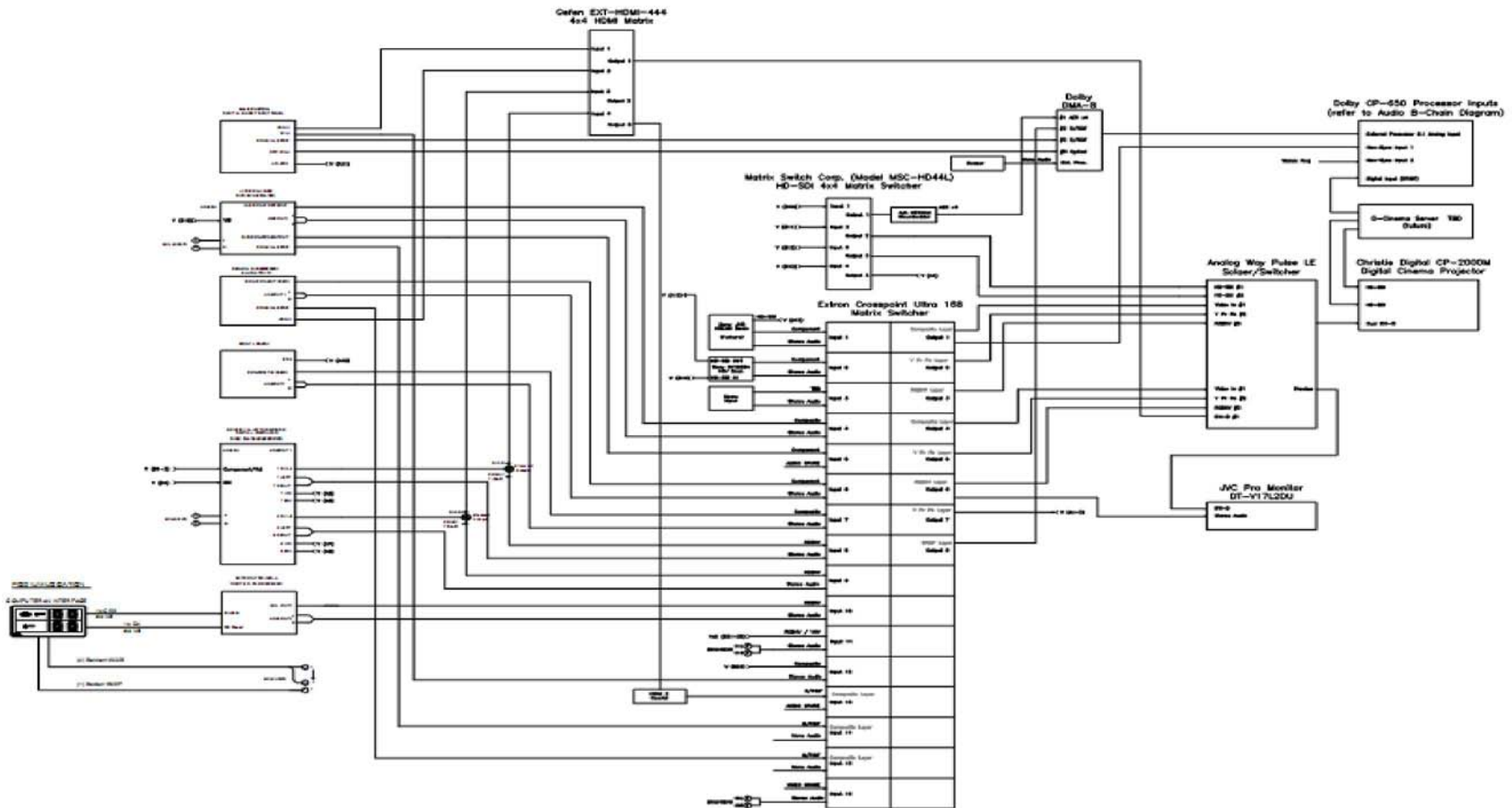
# Video System – Example #2

- Multi-source with matrix switching
  - 1080p Projector
  - (2) PC Inputs
  - BluRay DVD
  - DigiBeta Player
  - Aux Composite Input
  - Preview Monitor



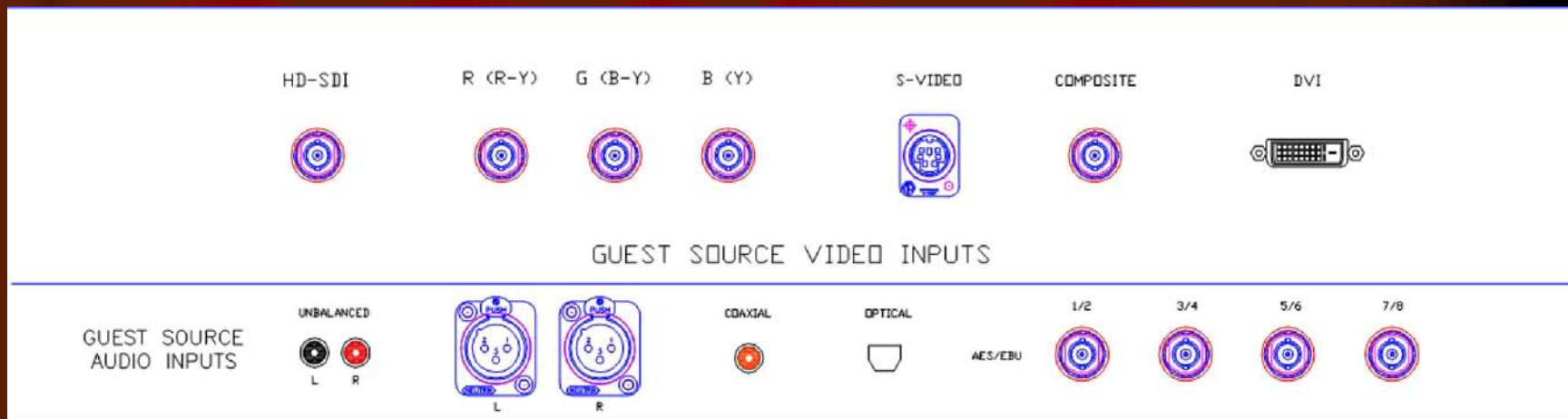
# Video System – Example #3

(Don't try this at home)



# The A/V Guest Input Panel

- Allows connection of external equipment sources from clients or decks rented for a specific event to be played back on your system.
  - Examples: HDCAM-SR / D5 / XDCAM / DigiBeta



# Audio Upgrades

- Existing Film Sound System Processor Upgrades (Dolby)
  - Current Dolby Model 650 Processors are upgradable to SR / Dolby Digital Film Sound / Digital Audio (AES x4) from an external source w/Dolby EX
  - DA-20 Processor has been discontinued
  - DMA-8 Processor adds external digital audio capability
- Amplifier / Loudspeaker Upgrades
  - 2-Way and 3-Way Screen Channels / LFE
  - Multi-channel Surrounds

# Digital Cinema / DCI Specification

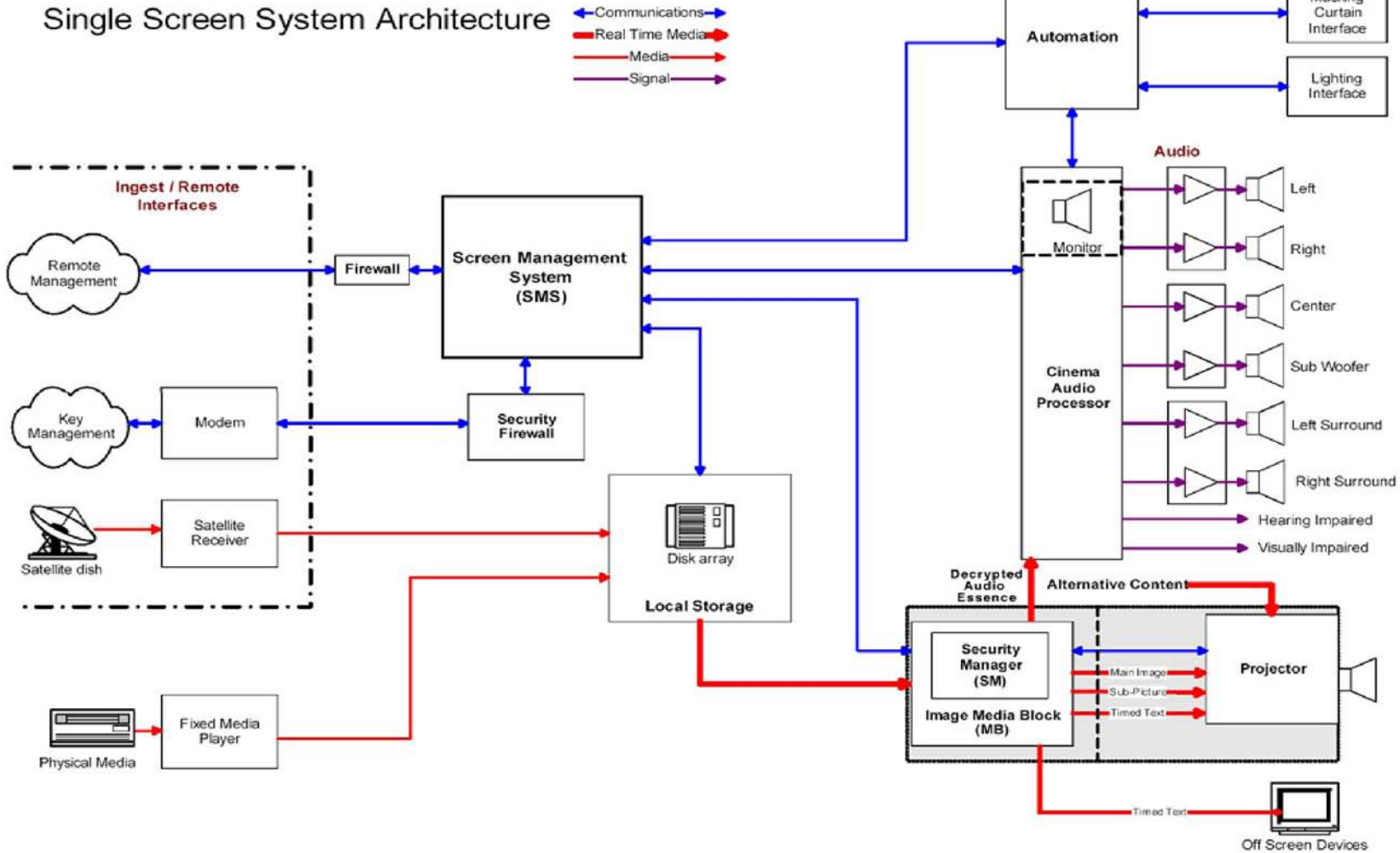
- Digital Cinema Initiative, LLC
  - DCI Joint Venture formed in March 2002 between:
    - Metro-Goldwyn-Mayer
    - Paramount Pictures
    - Sony Pictures Entertainment
    - 20th Century Fox
    - Universal Studios
    - Walt Disney Company
    - Warner Brothers
  - DCI Spec v1.0 – 7/2005
  - DCI Spec v1.1 – 2/2008
  - DCI Spec v1.2 – 3/2008
  - Amended through 4/2009

# Digital Cinema / DCI Specification

- Overall Objectives:
  - Motion picture presentation capability equal to or surpassing present 35mm film prints
  - Based on global standards, a presentation can be played anywhere in the world, similar to the current 35mm model
  - Assure inter-operability between systems of different manufacture, both 2K & 4K, again as with 35mm prints
  - Backward compatibility with the DCI Standard
  - Allows means of presenting Alternative Content video
  - Reliability and availability equal to or better than 35mm
  - Protection of intellectual property via encryption of content and forensic marking for traceable evidence of theft

# Digital Cinema / DCI Specification

Single Screen System Architecture



# D-Cinema Manufacturers

- Projectors

- Christie Digital
- Barco
- Sony
- NEC

- Servers

- Dolby
- Doremi
- GDC
- Qube
- QuVIS



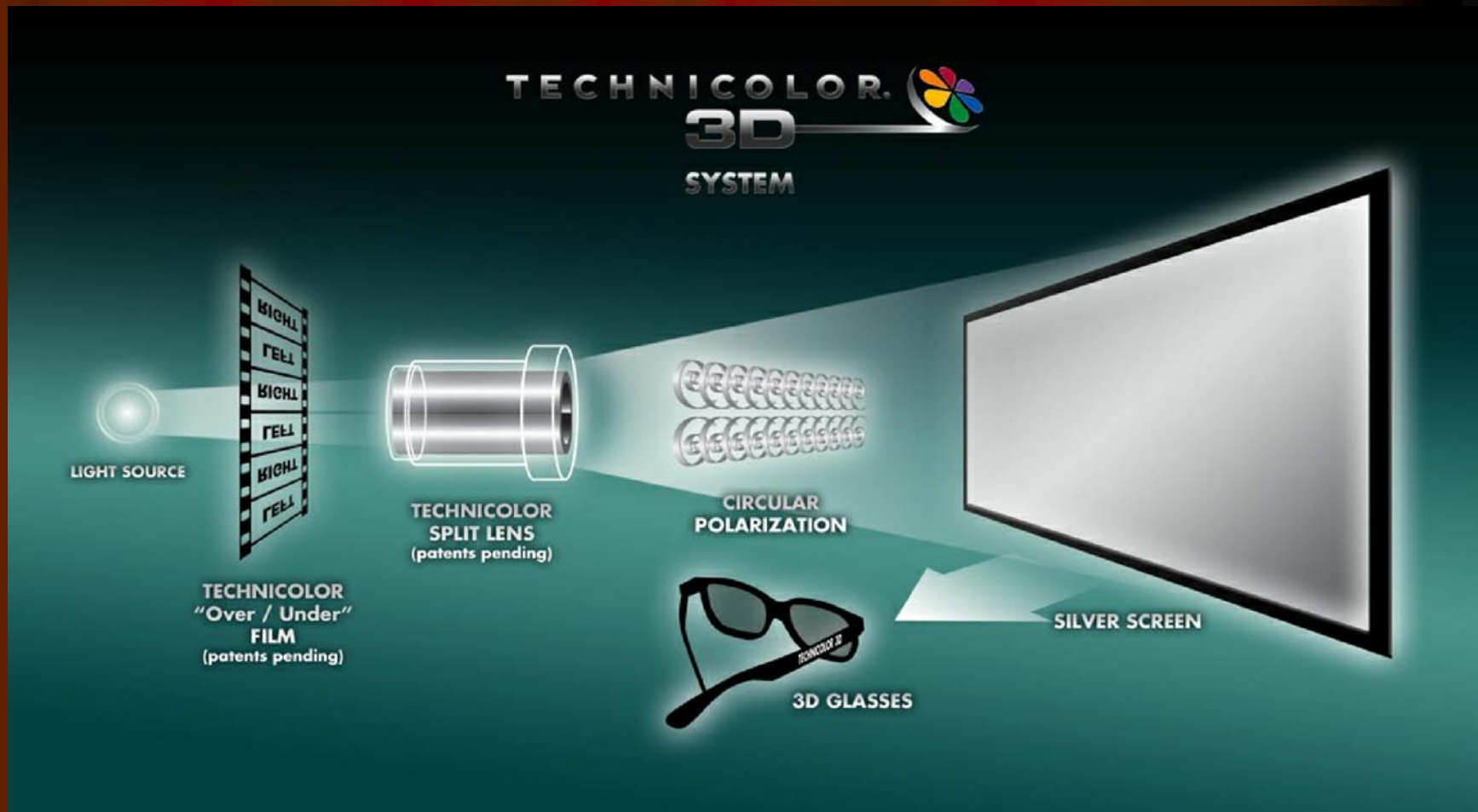
# The Miracle of 3D

- Manufacturers:

- Dolby
- RealD
- Sony
- Master Image
- XPand
  
- Technicolor  
(35mm Film)



# Technicolor's 3D on Film Concept



# 3D Considerations

- Equipment:

- Any 3D Projection solution will require a higher light-output projector than a comparable 2D presentation
- A silver screen is required by all solutions except Dolby and XPand (gain screen of approximately 1.8 is recommended)
- Technicolor's 3D system is currently not supported by Walt Disney and 20<sup>th</sup> Century Fox Studios
- Administration costs for recycling glasses

# Summary

- Interim upgrades can enhance your presentation now & ease the expense of your digital transition later
- Planning for the long term will help you avoid investing in equipment you may outgrow
- Anticipating & planning for special events can reduce ongoing rental costs

# Questions ??

