The Digital Cinema Server

At the Heart of Digital Operations
What is the server for?

- Secure storage of the movie in the cinema
- Decodes and decrypts
- Playing the movie data out into the projector and sound system
- Provides ‘showtime’ projectionist controls – start, stop, etc
- Provides tools to assemble different content into shows
- Runs automatic show schedule or links to existing automation
- Heart of key management system: stores, decrypts and processes keys
- DEFINES WHETHER YOU CAN OR CAN’T PLAY CONTENT
A simple D-Cinema system
Functions of a server

**Decoding**
- Secure cinema image and sound decoder/decrypter
- Showtime controls for the projectionist

**Storage**
- High-reliability movie storage
- Movies loaded by portable drive or network
Functions of a server

Show setup

- Enables assembly of shows
- Built-in or add-on “TMS” for multiplex-wide operation
- Links to automation and external devices
Functions of a server
Reliability

- The booth isn’t like an office or broadcast facility

- Hardware goals:
  - resiliency, serviceability, security
Standards and interoperability

• DCI requirements published July 2005
• SMPTE developing detailed standards – over 50% done
• DCI-compliance test plan under discussion
• No products officially “DCI-compliant” yet
• Good progress with JPEG interoperability but care required
The Digital Cinema Package

DCP

Image - JPEG2000 – MXF
Audio – PCM – MXF
Subtitles – TI Cine-Canvas – XML
Auxiliary Data – XML
Play-List(s) - XML

2 Hour Movie, JPEG2000 @ 200Mb/s
≈
200 GigaBytes
Image encoding

• MPEG2 (DCT-based) vs JPEG2000 (Wavelet-based)
Compression artefacts

• Image Compression – MPEG Artefacts:
Compression artefacts

- Image Compression – MPEG Artefacts:

- Blocking
- Banding or Contouring
Compression artefacts

• Image Compression – MPEG:

100:1

50:1

10:1
Compression artefacts

- Image Compression – JPEG2000:

100:1  
50:1  
10:1
Other JPEG benefits

• Each frame coded separately – easier to make foreign versions
• Easy to scale 4K to 2K in player – single file for 2K and 4K sites
• Simplifies projector setup
Security overview

Distributor Exhibitor

Content Key

Private Key

Public Key

Playback license (KDM)

Decryption

Content Key

Encryption
Security in the cinema

Secure environment: FIPS Level 3

From storage:
- Content decryption
- Content decoding
- Link encryption

To projector:
- Playback license

License management
Security practicalities

- Physical protection as important as encryption
- Each server has a unique identity
- Need a separate key for each server
- Take care with time windows
Getting on-screen

• Load content on to local drives
• Load keys on to system
• Content can be checked at this point
• Assemble clips into a show and add automation cues
• Set automated schedule or start shows manually
• Remember to check when licenses expire
At the heart of digital operations

• The server has the main set of controls for the projectionist
• Needs to be extremely interoperable and reliable
• Manages keys and content decryption
The Digital Cinema Server

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