

The Digital Cinema Server

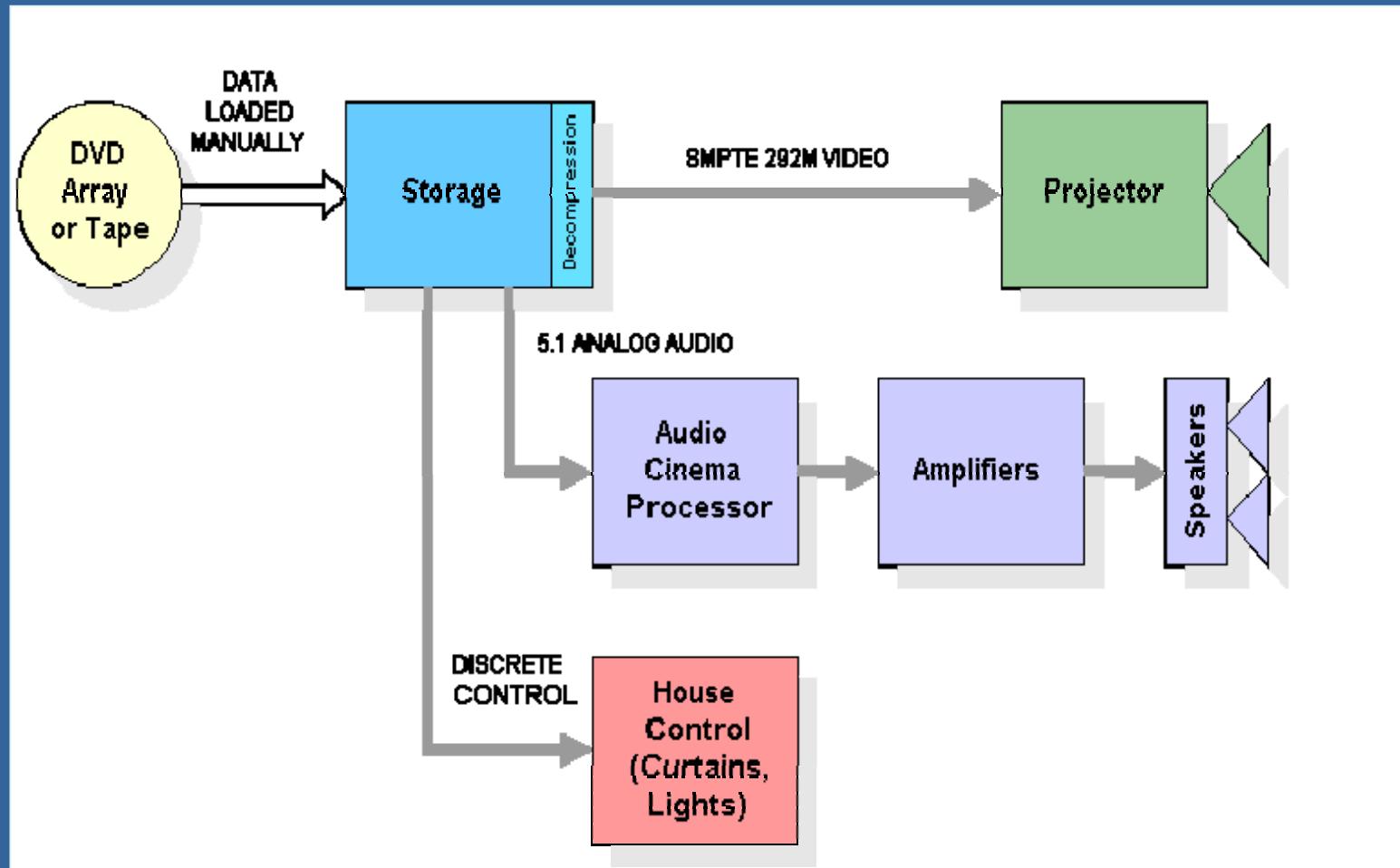
At the Heart of Digital Operations



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



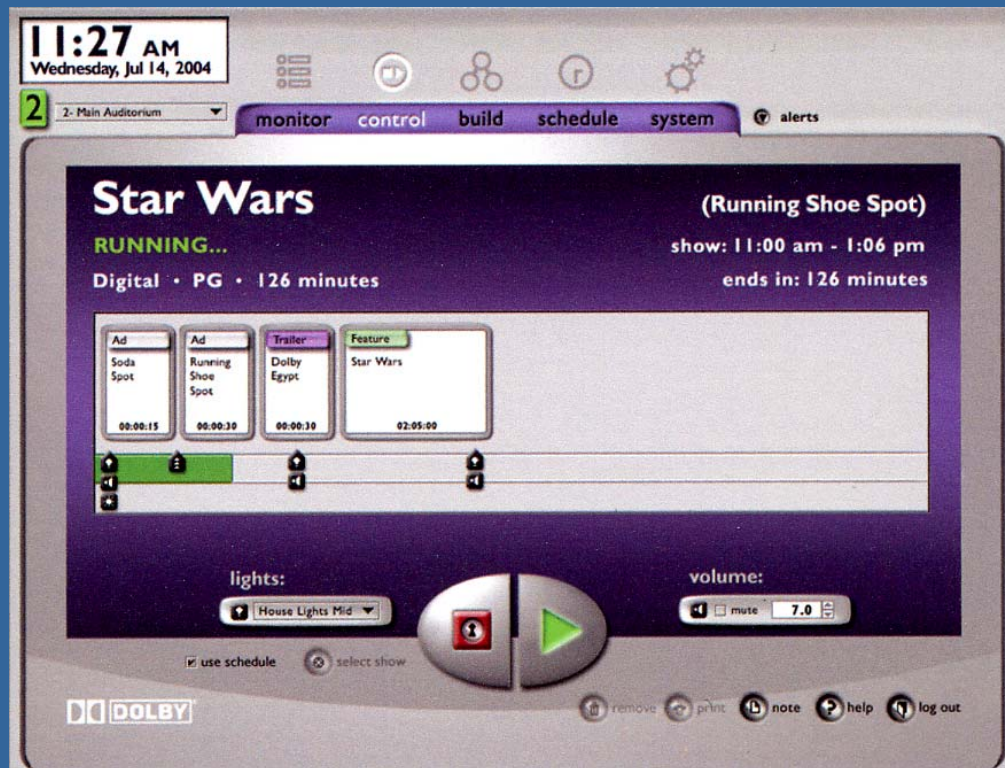
Functions of a server



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

The screenshot displays the Dolby Show Manager interface. At the top left, it shows the time **8:57 AM** and the date **Wednesday, Feb 25, 2004**. Below this is a navigation bar with tabs for **monitor**, **control**, **build**, **schedule**, and **system**, along with an **alerts** button. The main area is divided into several sections:

- Top Left:** A list of shows with their durations: **Mystic River** (R = 140 min) and **Return of the King** (PG-13 = 204 min).
- Top Center:** A calendar for **Feb 25, 2004** with a grid of days from 1 to 29.
- Top Right:** A detailed view for **Return of the King**, showing **Actual Duration: 204 min** and **Rating: PG-13**.
- Center:** A horizontal timeline from **9am** to **12am** with a vertical marker at **8:57 AM**.
- Auditorium 1:** Shows a schedule for **Auditorium 1** with shows **Mystic River**, **Mystic River**, **Return of the King**, and **Return of the King** scheduled between **4:00** and **7:24**.
- Auditorium 2:** Shows a schedule for **Auditorium 2** with shows **Master and Commal** and **Seabiscuit**.
- Auditorium 3:** Shows a schedule for **Auditorium 3** with shows **Lost in Transla**.
- Auditorium 4:** Shows a schedule for **Auditorium 4** which is currently empty.

At the bottom of the interface, there is a **DOLBY** logo, version information (**Client Version 1.0.9.0**, **Server Version 1.0.10.0**), and a row of icons for **remove**, **print**, **note**, **help**, and **log out**.

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

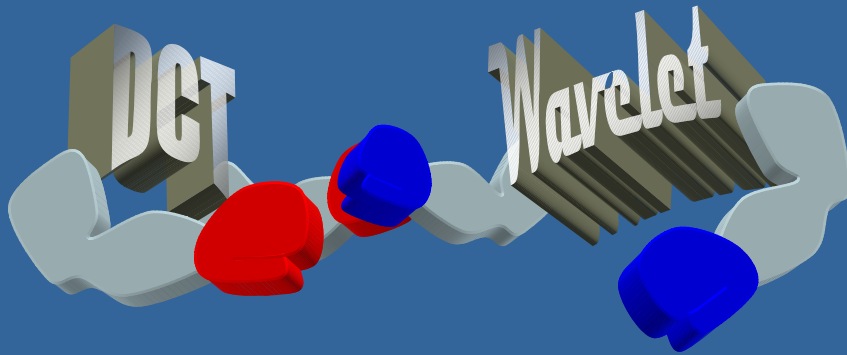
2 Hour Movie, JPEG2000 @ 200Mb/s

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200 GigaBytes

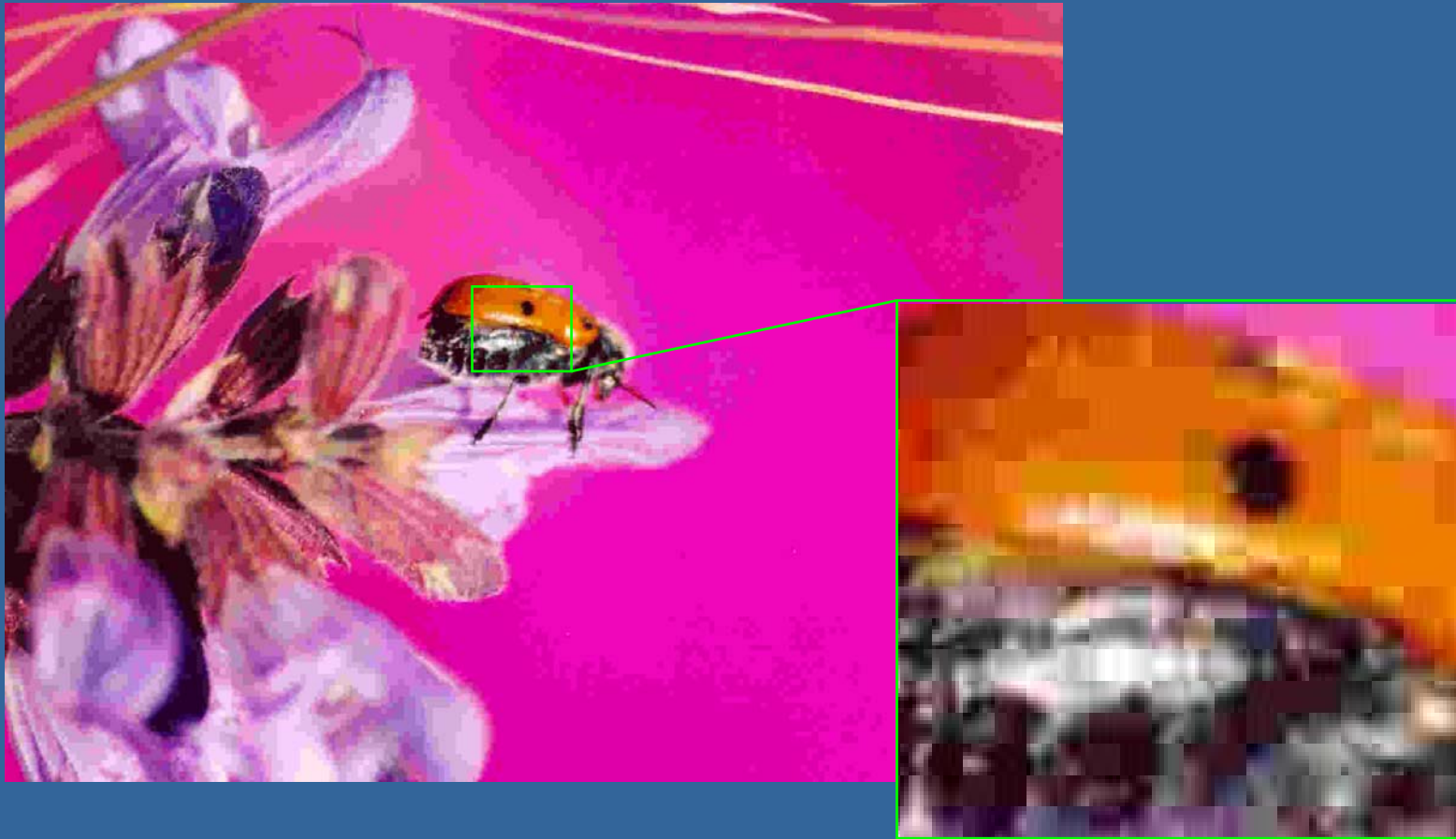
Image encoding

- MPEG2 (DCT-based) vs JPEG2000 (Wavelet-based)



Compression artefacts

- Image Compression – MPEG Artefacts:



Compression artefacts

- Image Compression – MPEG Artefacts:

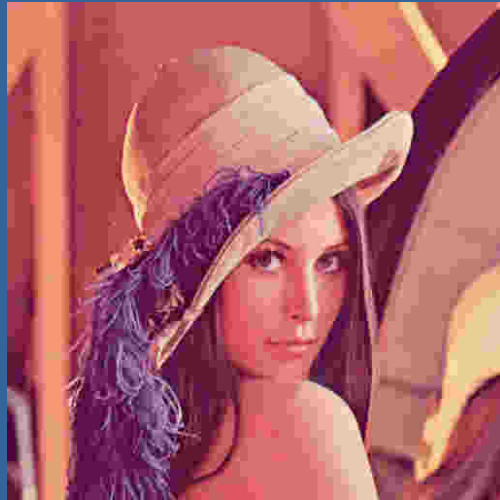


Blocking

Banding or Contouring

Compression artefacts

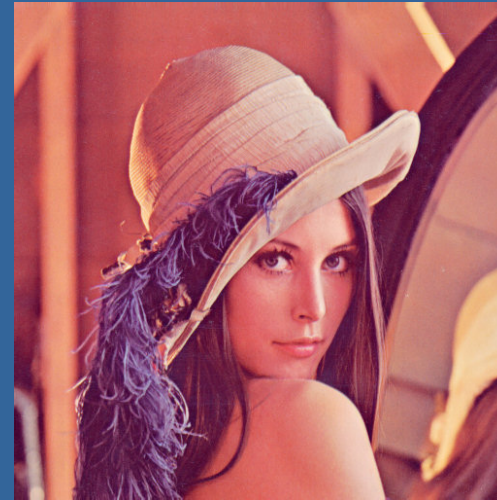
- Image Compression – MPEG:



100:1



50:1



10:1

Compression artefacts

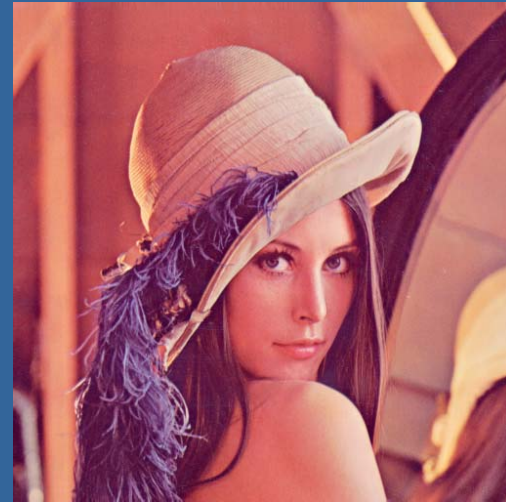
- Image Compression – JPEG2000:



100:1



50:1

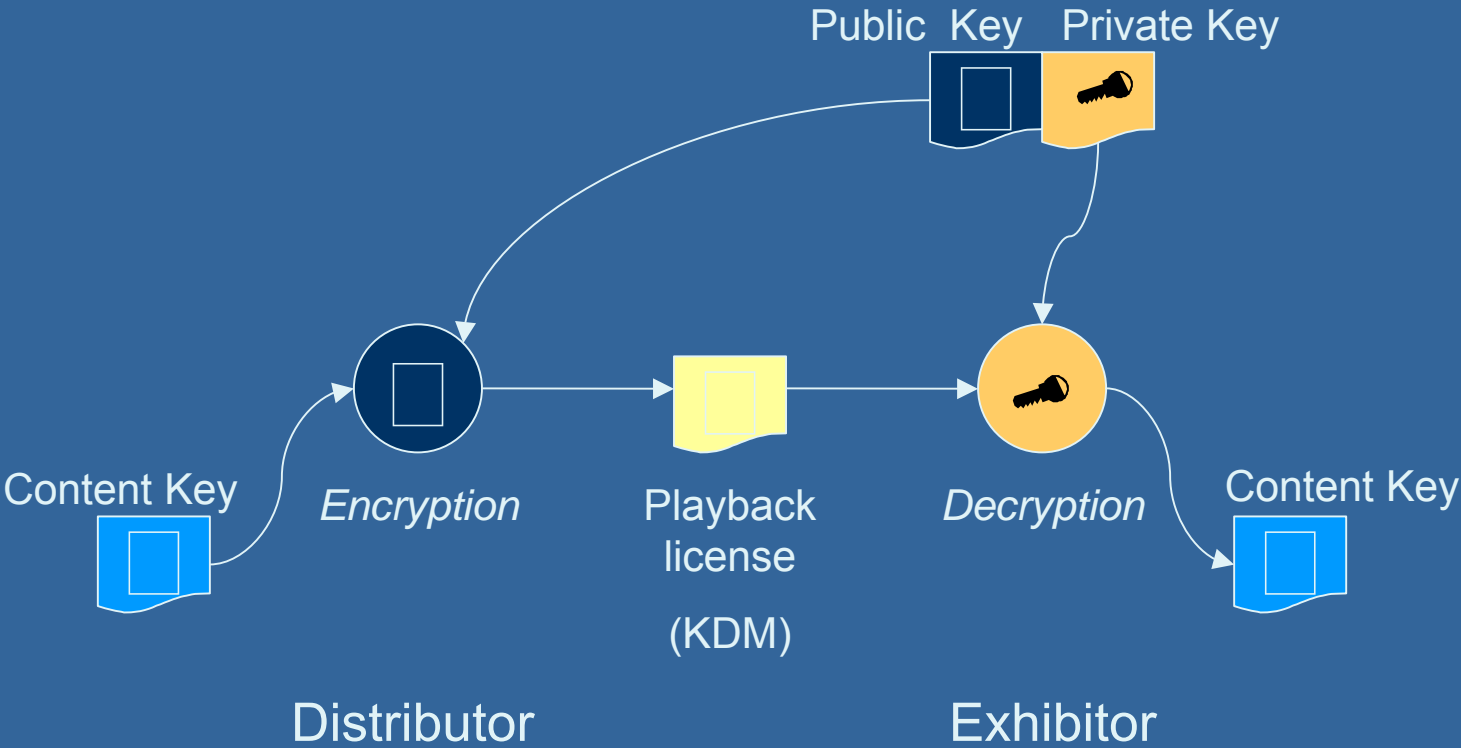


10:1

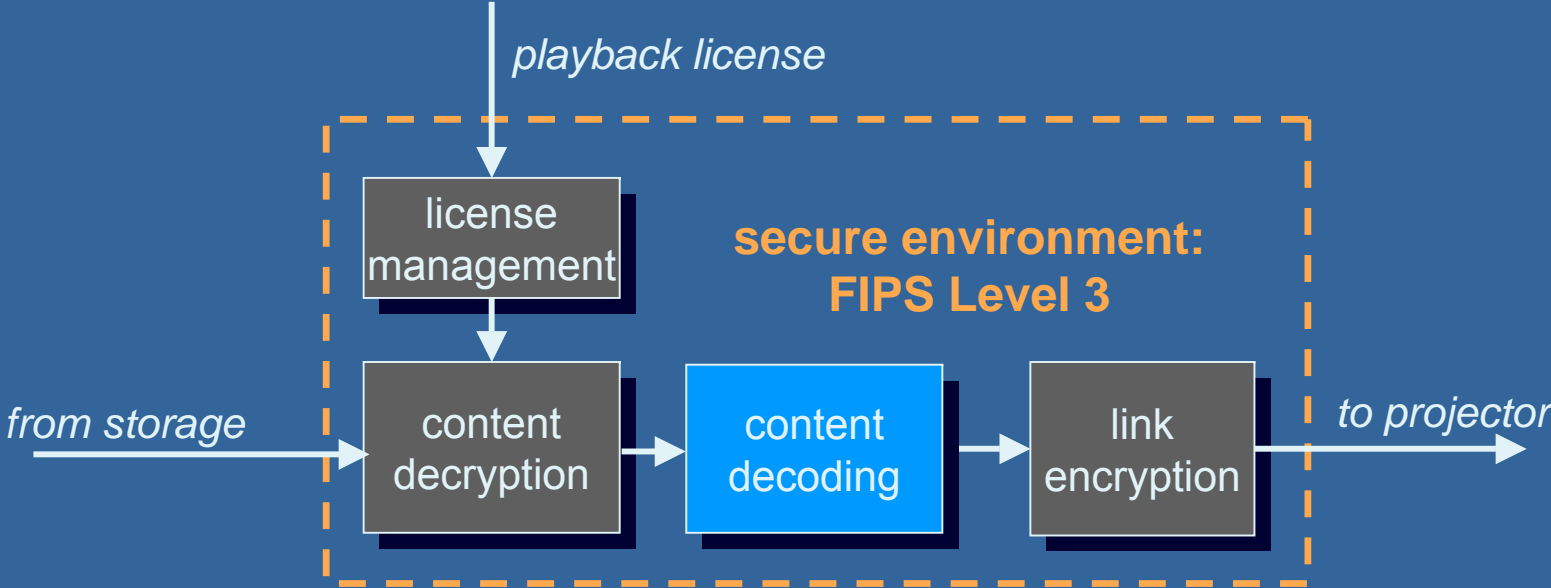
Other JPEG benefits

- 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



Security in the cinema



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

At the Heart of Digital Operations

