

# IUB Libraries Video Streaming Service: A Technical Overview

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# Presentation Outline

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- Background and goals
- Demonstration
- Video ingestion and processing
- Video management and delivery
- Future directions



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## Project Background

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- 2004: Video e-reserves pilot involving 9 class sections
  - Supported by DLP and Media/Reserves
- 2005-2008: Further pilot testing and development
  - Supported by LIT and Media/Reserves
- Fall 2008: Production “soft launch” of Video Streaming Service
  - DLP and Media/Reserves



## Project Goals

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- Ability for Media/Reserves to easily deliver access to streaming video
- Support both locally-digitized content and digital video files acquired from vendors
  - Must be able to accept a wide variety of formats
- Support both licensed content and unlicensed e-reserves content
  - Requires access control



## Project Goals (continued)

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- Easy to use for both collection manager and faculty/student users
- Integrated with existing discovery platforms
  - IUCAT
  - E-Reserves
  - Oncourse



## Project Goals (continued)

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- Supportable and sustainable
- Leverage existing technology platforms
  - UITS streaming servers
  - DLP web application servers and repository system (Fedora)
  
- Aggressive timeline required deferring some goals:
  - Oncourse and Fedora integration



# Demonstration

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## Technical Overview: Video Processing

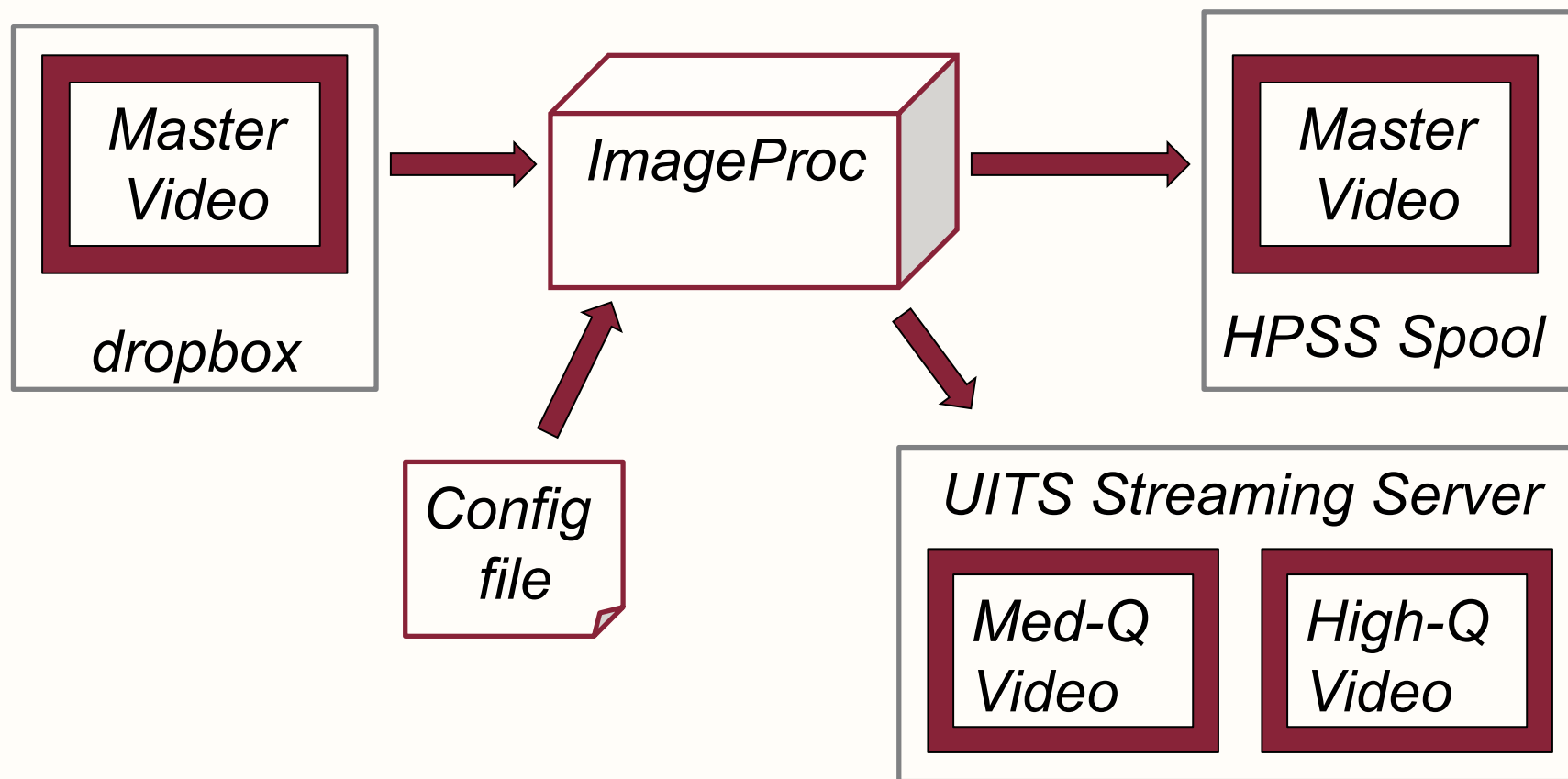
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- Master files not suitable for delivery
  - Large files, high quality and resolution
  - Bitrates too high for delivery (>5Mb/s)
  - File format not supported for streaming
- Deliverable files
  - Quality reduced and resolution fixed at 640x480
  - Bitrates set to 1Mb/s and 400Kb/s
  - MPEG-4 format using the h.264 codec





# Video Processing Workflow



## Processing Masters with ImageProc

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- ImageProc tool features:
    - Handles images and video
    - Dropbox-based processing
    - Performs quality control and processing
    - Transaction-based: only complete objects are committed
    - Multi-threaded: multiple objects processed simultaneously
    - C-like language for configuration and processing
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# ImageProc Configuration

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## o Video conversion configuration file:

```

collection {
    info {
        NAME := "VSS - KCR Collection";
        DROPBOX := "/digitize/dropbox/vss";
        PATTERN := "*.avi";
        SCAN := "find";
        DERIVATIVES := "/N/evs01/dig-lib/d1/media";
    }
    qc {
        id_format="avi";
        id_vcodec="mpeg4";
        id_acodec="pcm_s16le";
        id_samplerate=44100;
    }
    process {
        genvideo(filename:=BASENAME+"-med.mp4", format:="h264", quality:="medium");
        genvideo(filename:=BASENAME+"-high.mp4", format:="h264", quality:="high");
        movemaster("/digitize/hpss/vss");
    }
}

```



## Dropbox processing

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- Configuration file specifies
  - The name of the collection
  - The dropbox directory
  - The filename pattern to use to match files
  - How to find files: flat directory or recursively
  - Where derivatives are sent
  - Where to send status emails
  - A URL to use for status messages



# Quality Control

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- File attributes are tested:
  - Age
  - Permissions
  - Ownership
- Content attributes are tested:

```
qc {  
    id_format="avi";  
    id_vcodec="mpeg4";  
    id_colorspace="yuv420p";  
    id_acodec="pcm_s16le";  
    id_samplerate=44100;  
}
```



## Quality Control (continued)

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- Multiple values can be selected using any():
  - `any(id_samplerate, 44100, 48000);`
- Standard tools used for media identification:
  - Videos: `ffmpeg`
  - Images: `ImageMagick`, `tiffinfo`
- Unique filenames can be tested:
  - `unique("basename", BASENAME);`



## Derivative Creation

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- Configuration file defines derivative creation
- Functions for:
  - Image conversion
  - Video conversion
  - File copy and rename
- Sample video processing configuration:

```
process {  
    genvideo(filename:=BASENAME+"-med.mp4", format:="h264", quality:="medium");  
    genvideo(filename:=BASENAME+"-high.mp4", format:="h264", quality:="high");  
    movemaster("/digitize/hpss/vss");  
}
```



## Derivative Creation (continued)

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- Newly created files end with .new extension
  - `genvideo()` function builds ffmpeg command line:
    - `genvideo(filename:=BASENAME+"-med.mp4", format:="h264", quality:="medium");`
    - `ffmpeg -y -i 0057.avi -vcodec libx264 -f mp4 -acodec libfaac -ac 2 -ab 32000 -ar 44100 -b 368000 -flags +loop -cmp +chroma -b_strategy 1 -coder 1 -me_range 16 -g 250 -keyint_min 25 -sc_threshold 40 -i_qfactor 0.71 -bt 368000 -qcomp 0.6 -qmin 10 -qmax 51 -qdiff 4 -s 640x480 -r 29.997 -deinterlace -rc_eq blurCplx^(1-qcomp) -bf 16 -me umh -partitions +parti8x8+parti4x4+partp8x8+partp4x4+partb8x8 -subq 7 -trellis 1 -refs 6 -directpred 3 -bidir_refine 1 0057-med.mp4.new`
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## Transaction Processing

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- Object processing is all or nothing
  - Any failure will abort processing
    - New derivatives created will be erased
    - Existing files remain untouched
  - On successful processing of all parts
    - Derivatives copied to UITS server for streaming
    - Master files copied to HPSS spool for storage



## Final Processing

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- Processing results are sent to
  - The management application
  - Administrators via email
- Cleanup
  - Persistent data is written to disk
  - Temporary files are removed
- ImageProc goes back to sleep

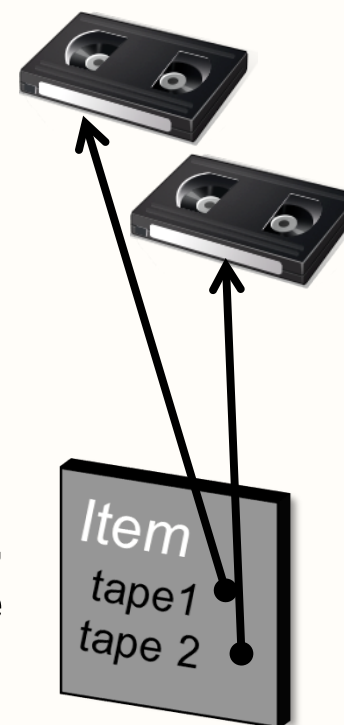


# Technical Overview: Management Application



## Technical Overview: Data Model

- Video
  - Represents a single captured video or video segment
  - Contains only enough metadata to identify and locate the streaming video files
- Item
  - Represents a logical item which may contain a sequence of one or more videos
  - Contains descriptive metadata to describe the videos, comparable to (and automatically populated from) the library catalog entry
  - Contains administrative metadata for those videos to determine access conditions.



## Technical Overview: Video Metadata Workflow

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- ID Generation and file naming
  - Done by the Drop Box application (automatic)
- Video to item assignment
  - Done using the management application
- Item descriptive metadata entry
  - Done using the management application
- Item administrative metadata entry
  - Done using the management application
- Catalog update (for Licensed content)



# Technical Overview: Playback application

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- Access Points
  - Persistent URL
    - In IUCAT records
    - In the E-Reserves Systems

<http://purl.dlib.indiana.edu/iudl/general/video/VAA8259>



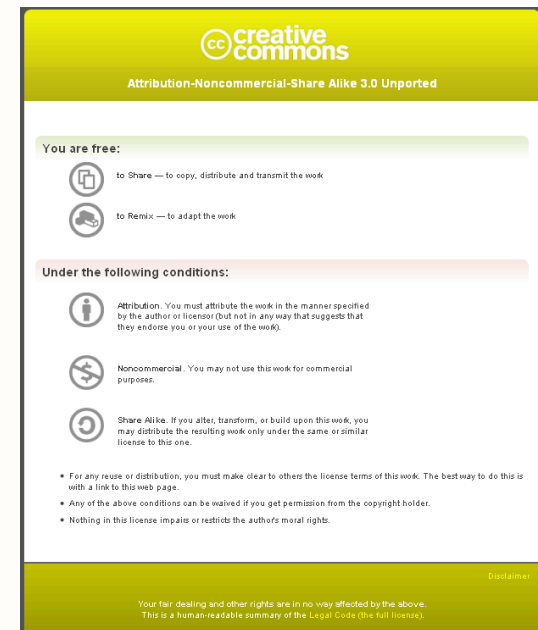
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# Technical Overview: Video Playback

- UITS Flash Streaming Server
- Playback Web application
  - Java Struts web page
  - JW FLV Media Player
    - CC non-commercial license
    - <http://www.longtailvideo.com/players/jw-flv-player/>
  - CAS authentication
  - Metadata-based authorization



## Next Steps

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- Extend to other libraries/departments
    - e.g. Cook Music Library
    - Multiple management views, branding
  - Support access control for e-reserves based on actual course enrollment data
    - Eliminate requirement to link from E-Reserves
  - Support access control for videos and management system using ADS groups
  - Support access via IUScholarWorks Repository
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## Possible Future Directions

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- Integrate Fedora repository as content management system
- Integrate with video preservation workflows
- Video in Variations



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# Questions?

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