

# FileFlow4

## Simple and Scriptable Media Processing and Orchestration

### Introduction

FileFlow4 is a media processing and orchestration platform that makes media workflows to and from LiveTouch fast and effortless. The FileFlow Manager provides an easy-to-use web interface to configure and monitor file transfers, while FileFlow Engines process media transfers faster than real time. Deliver the same content to multiple destinations with powerful processing and easy configuration. FileFlow4 scales to satisfy any size of live production by adding more processing engines.

FileFlow automatically exports to a wide variety of file formats/codecs directly from LiveTouch using either transwrapping or transcoding. Providing ultra-fast turnaround workflows. LiveTouch FileFlow can access growing files to begin transcoding after just a few frames of ingest for fastest delivery times. FileFlow4 works seamlessly with HD, 1080p, UHD and HDR content, meeting the demands of any live production use case.

To simplify content sharing. FileFlow's HTML5 management UI provides unified control of the media workflow through a standard web browser. Automation with rules creation, job monitoring, and configuration are all accessed in one place. Operators can quickly create rules for automated file delivery in multiple formats that enable fast delivery to social media, archive and other network storage, and third-party editors.

### Key Features

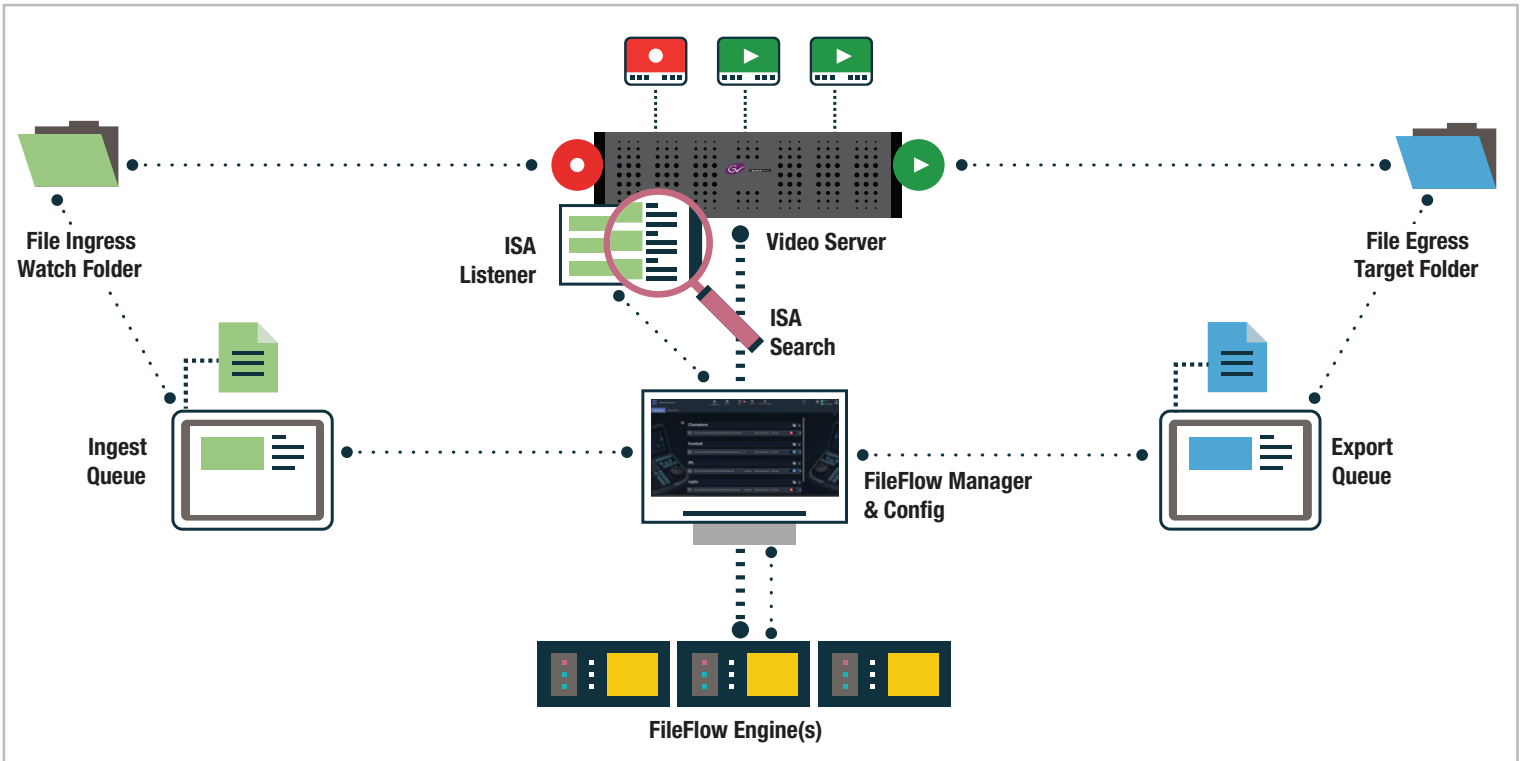
- Simple, intuitive, browser-based configuration and monitoring
- Intelligent job management
- Expanded automation capabilities including metadata triggers, user configured rules and time based transfers
- Quick and easy watch folder creation and configuration
- Quickly create and manage automation templates according to specific productions or events
- Simultaneously deliver multiple media formats to meet the requirements of complex workflows
- Seamlessly handles Super Motion content in live sports workflows for ultra-smooth slow motion highlight delivery
- Flexible HDR and UHD support for today and tomorrow's broadcast requirements
- Architecture scales to meet live sports workflows of any size
- 'RESTful' API for seamless integration with third-party MAM tools

### HDR

- ▶ No sacrifice is required when working with multiple SDR/HDR deliverables. HDR files can be managed with a simple passthrough or real-time up/down/cross-mapping.
- ▶ Normalize content in mixed format productions — even with SDR and HDR mixed in the same clip
- ▶ Supports S-Log3, PQ, HLG

## System Overview

FileFlow scales to meet the demands of any size of live production. The FileFlow Manager can be built on a single server or deployed on a resilient cluster. Independent processing engines can be added to increase processing capability and bandwidth.



### FileFlow Manager

The FileFlow Manager runs various software modules that provide services used by other parts of the system, including the job queue, a database of jobs which is accessed by web clients and FileFlow Engines through a RESTful API. The FileFlow Manager also hosts the rules engine and configuration interface.

### Search

Search Service is usually installed when an Integrated Server Architecture (ISA) system database is present. FileFlow Manager can use the Search Service to provide an integrated solution enabling users to search the ISA database, locate and select clips for export via FileFlow.

### LiveTouch & ISA Listeners

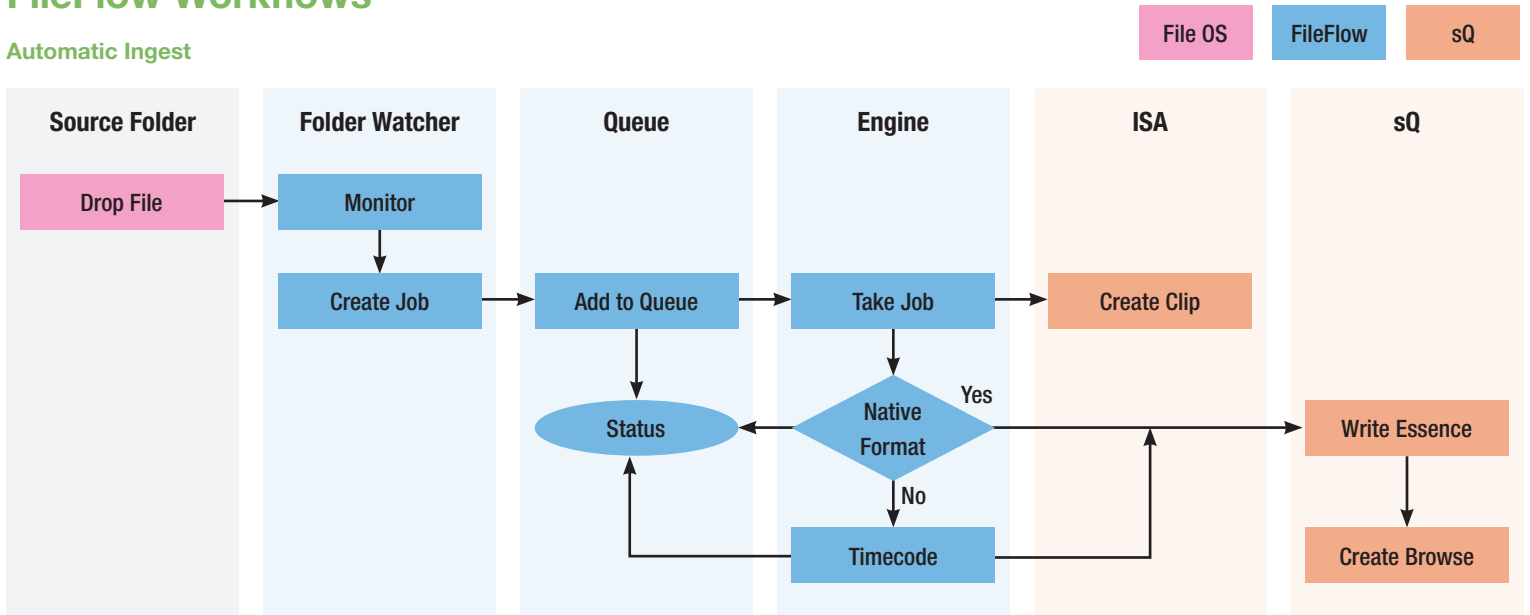
Monitor events coming from the LiveTouch system to trigger export if configurable criteria are met.

### FileFlow Engine(s)

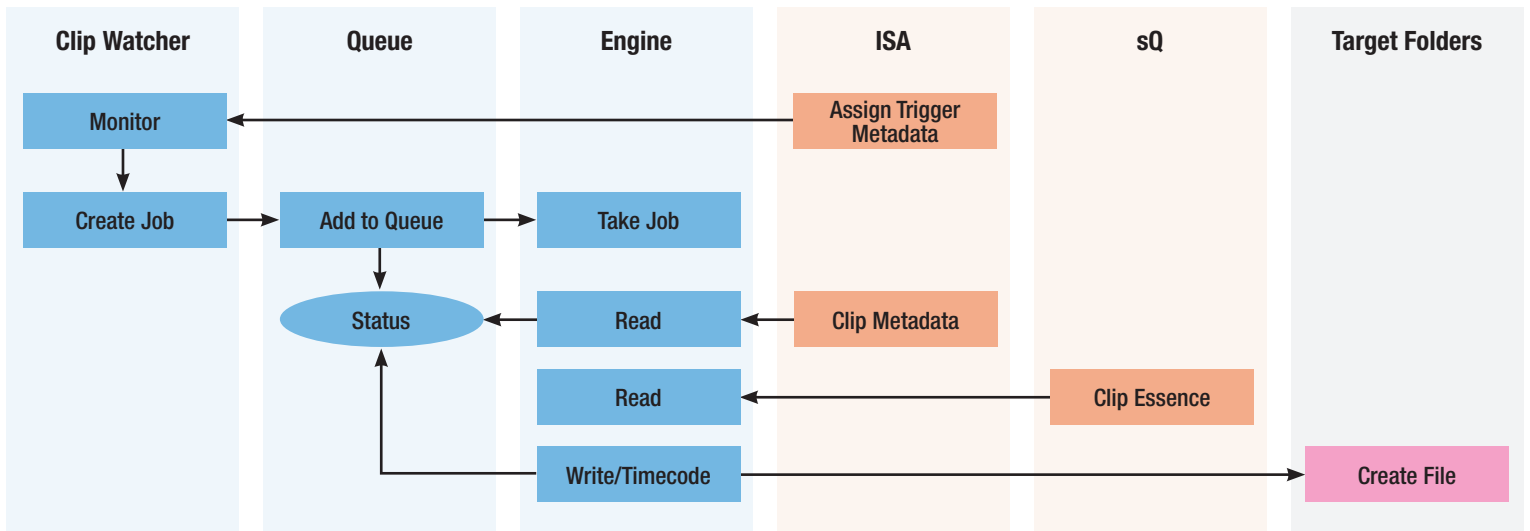
The FileFlow Engine is the main essence processing application. Media is processed by one or many FileFlow engines. A single instance runs on a customer supplied high-performance multicore PC. Additional FileFlow Engine machines can be added to enable multiple jobs to be processed at the same time and provides N+1 scalability and redundancy.

## FileFlow Workflows

### Automatic Ingest



### Automatic Export



## Formats — Ingest

### MXF

The broadcast-standard container file format, SMPTE MXF (Material Exchange Format) using the OP-1a operational pattern, can be used with the following codecs:

Ingest Format	Codec	Bitrates	Resolution/Standard	Import Type
<b>Panasonic</b>				
<b>DVCPR025</b>	DVCPRO	25	1080i 50, 59.94i	Native, Transcode
<b>DVCPR050</b>	DVCPRO	50	1080i 50/59.94, 720p 50/59.94	Native, Transcode
<b>DVCPR0 HD</b>	DVCPR0 HD	100	1080 @ 50i, 59.94i 720 @ 50p, 59.94p	Native, Transcode
<b>AVC-Intra 50</b>	AVC-Intra Class 50	50	1080p 50/59.94 1080i 50/59.94 720p 50/59.94	Native, Transcode
<b>AVC-Intra 100</b>	AVC-Intra Class 100 10-bit	100	1080p 50/59.94 1080i 50/59.94 720p 50/59.94	Native, Transcode
<b>AVC-Intra 100</b>	AVC-Intra Class 100 10-bit	200	1080 @ 50p, 59.94p	Native, Transcode
<b>Sony</b>				
<b>DVCAM</b>	DV	25	50i, 59.94i	Native, Transcode
<b>XDCAM</b>	MPEG-2 IMX	30, 40, 50	50i, 59.94i	Native, Transcode
<b>XDCAM HD</b>	MPEG-2	18, 25, 35, 50	1080 @ 50i, 59.94i 720 @ 50p, 59.94p	Transcode only
<b>XDCAM HD 422</b>	MPEG-2	50	1080 @ 50i, 59.94i 720 @ 50p, 59.94p	Transcode only
<b>XAVC HD Intra Class 50</b>	H.264	50	1080p 25/29.97/50/59.94 1080i 50/59.94 720p 50/59.94	Native, Transcode
<b>XAVC HD Intra Class 100</b>	H.264 10-bit	100	1080p 25/29.97/50/59.94 1080i 50/59.94 720p 50/59.94	Native, Transcode
<b>XAVC HD Intra Class 100</b>	H.264 10-bit	200	1080 @ 50p, 59.94p	Native, Transcode
<b>XAVC 2K Intra Class 100 CBG &amp; VBR</b>	H.264 10-bit	200	2K @ 50p, 59.94p	Transcode only
<b>XAVC UHD Intra Class 300 VBR</b>	H.264 10-bit	500/600	QFHD 2160p (3840 x 2160) 25/29.97/50/59.94	Native, Transcode only
<b>XAVC UHD Intra Class 300 CBG</b>	H.264 10-bit	500/600	QFHD 2160 (3840 x 2160) @ 50p, 59.94p	Transcode only
<b>XAVC 4K Intra Class 300 &amp; Class 480, CBG &amp; VBR</b>	H.264 10-bit	300 480	4K (4096 x 2160) @ 50p, 59.94p	Transcode only
<b>XAVC HD Long GOP</b>	H.264	50	1080 @ 50i, 59.94i 1080 @ 50p, 59.94p	Transcode only
<b>XAVC HD Long GOP</b>	H.264 10-bit	25, 35	1080 @ 50p, 59.94p	Transcode only
<b>XAVC UHD Long GOP</b>	H.264 10-bit	150	QFHD 2160 (3840 x 2160) @ 50p, 59.94p	Transcode only
<b>Sony F55 DNxHD</b>	DNxHD 8-bit/10-bit (OP1a MXF)	145/220X	1080 @ 59.94p, 59.94i	Transcode only
<b>Sony F55 DNxHD</b>	DNxHD (OP1a MXF)	120/185X	1080 @ 50p, 50i	Transcode only

Ingest Format	Codec	Bitrates	Resolution/Standard	Import Type
<b>Avid (SMPTE VC3)</b>				
DNxHD HD (VC3)	VC-3 10-bit	365(x)	1080p 50/59.94	Transcode only
DNxHD HD (VC3)	VC-3 10-bit	185(x)	1080i 50i/59.94	Native, Transcode
DNxHD HD (VC3)	VC-3 10-bit	175(x)	720p 50/59.94	Native, Transcode
DNxHD HD (VC3)	VC-3 8-bit	240	1080 @ 50p	Native, Transcode
DNxHD HD (VC3)	VC-3 8-bit	185	1080 @ 50i	Native, Transcode
DNxHD HD (VC3)	VC-3 8-bit	125	1080 @ 50i	Native, Transcode
DNxHD HD (VC3)	VC-3 8-bit	175	720 @ 50p	Native, Transcode
DNxHD HD (VC3)	VC-3 8-bit	115	720 @ 50p	Native, Transcode
DNxHD HD (VC3)	VC-3 8-bit	75	1080 @ 50p	Native, Transcode
DNxHD HD (VC3)	VC-3 10-bit	440(x)	1080 @ 60p	Transcode only
DNxHD HD (VC3)	VC-3 10-bit	220(x)	1080 @ 60i	Native, Transcode
DNxHD HD (VC3)	VC-3 10-bit	220(x)	720 @ 60p	Native, Transcode
DNxHD HD (VC3)	VC-3 8-bit	290	1080 @ 60p	Native, Transcode
DNxHD HD (VC3)	VC-3 8-bit	220	1080 @ 60i	Native, Transcode
DNxHD HD (VC3)	VC-3 8-bit	145	1080 @ 60i	Native, Transcode
DNxHD HD (VC3)	VC-3 8-bit	220	720 @ 60p	Native, Transcode
DNxHD HD (VC3)	VC-3 8-bit	145	720 @ 60p	Native, Transcode
DNxHD HD (VC3)	VC-3 8-bit	90	1080 @ 60p	Native, Transcode
<b>ARD_ZDF_HDF</b>				
ARD_ZDF_HDF01a XDCAM 422	10-bit	50	1080 @ 50i, 8 Audio Tracks - v1.2	Transcode
ARD_ZDF_HDF01b XDCAM 422	10-bit	50	1080 @ 50i, 16 Audio Tracks - v1.2	Transcode
ARD_ZDF_HDF01a AVC-Intra 100	10-bit	100	1080 @ 50i, 8 Audio Tracks - v1.2	Native, Transcode
ARD_ZDF_HDF02b AVC-Intra 100	10-bit	100	1080 @ 50i, 16 Audio Tracks - v1.2	Native, Transcode
ARD_ZDF_HDF03a AVC-Intra 100	10-bit	100	720 @ 50p, 8 Audio Tracks - v1.2	Native, Transcode
ARD_ZDF_HDF03b AVC-Intra 100	10-bit	100	720 @ 50p, 16 Audio Tracks - v1.2	Native, Transcode

**MP4**

MP4 files with H.264 essence are supported for ingest. Various sizes and bitrates are supported including those shown below:

Ingest Format	Codec	Bitrates	Resolution/Standard	Import Type
<b>Sony</b>				
XDCAM EX	MPEG-2	25,35	1080 @ 50i, 59.94i	Transcode only
XDCAM EX	MPEG-2	35	720 @ 50p, 59.94p	Transcode only
XAVC-S HD Long GOP	H.264 8-bit	50	1080 @ 50p, 59.94p	Transcode only
XAVC-S UHD Long GOP	H.264 8-bit	150	QFHD 2160 (3840 x 2160) @ 50p, 59.94p	Transcode only

## Formats — Export

## MXF

Export Format	Codec	Bitrates	Resolution/Standard	Import Type
<b>Panasonic</b>				
<b>DVCPR025</b>	DVCPRO	25	50i, 59.94i	Native, Transcode
<b>DVCPR050</b>	DVCPRO	50	50i, 59.94i	Native, Transcode
<b>DVCPRO HD</b>	DVCPRO HD	100	1080 @ 50i, 59.94i 720 @ 50p, 59.94p	Native, Transcode
<b>AVC-Intra 50</b>	AVC-Intra Class 50	50	1080 @ 50p, 59.94p 1080 @ 50i, 59.94i 720 @ 50p, 59.94p	Native, Transcode
<b>AVC-Intra 100</b>	AVC-Intra Class 100 10-bit	100	1080 @ 50i, 59.94i 720 @ 50p, 59.94p	Native, Transcode
<b>AVC-Intra 100</b>	AVC-Intra Class 100 10-bit	200	1080 @ 50p, 59.94p	Native, Transcode
<b>Sony</b>				
<b>DVCAM</b>	DV	25	50i, 59.94i	Native, Transcode
<b>XDCAM</b>	MPEG-2 IMX	30, 40, 50	50i, 59.94i	Native, Transcode
<b>XDCAM HD</b>	MPEG-2	25, 35, 50	1080 @ 50i, 59.94i 720 @ 50p, 59.94p	Transcode only
<b>XAVC HD Intra Class 50</b>	H.264	50	1080 @ 50i, 59.94i 720 @ 50p, 59.94p	Native, Transcode
<b>XAVC HD Intra Class 100</b>	H.264 10-bit	100	1080 @ 50i, 59.94i 720 @ 50p, 59.94p	Native, Transcode
<b>XAVC HD Intra Class 100</b>	H.264 10-bit	200	1080 @ 50p, 59.94p	Native, Transcode
<b>XAVC UHD Intra Class 300 VBR</b>	H.264 10-bit	500/600	QFHD 2160 (3840 x 2160) @ 50p, 59.94p	Native, Transcode
<b>XAVC UHD Intra Class 300 CBG</b>	H.264 10-bit	500/600	QFHD 2160 (3840 x 2160) @ 50p, 59.94p	Transcode only
<b>Avid (SMPTE VC3)</b>				
<b>DNxHD HD (VC3)</b>	VC-3 10-bit	365(x)	1080 @ 50p	Transcode only,
<b>DNxHD HD (VC3)</b>	VC-3 10-bit	185(x)	1080 @ 50i	Native, Transcode
<b>DNxHD HD (VC3)</b>	VC-3 10-bit	175(x)	720 @ 50p	Native, Transcode
<b>DNxHD HD (VC3)</b>	VC-3 8-bit	240	1080 @ 50p	Native, Transcode
<b>DNxHD HD (VC3)</b>	VC-3 8-bit	185	1080 @ 50i	Native, Transcode
<b>DNxHD HD (VC3)</b>	VC-3 8-bit	125	1080 @ 50i	Native, Transcode
<b>DNxHD HD (VC3)</b>	VC-3 8-bit	175	720 @ 50p	Native, Transcode
<b>DNxHD HD (VC3)</b>	VC-3 8-bit	115	720 @ 50p	Native, Transcode
<b>DNxHD HD (VC3)</b>	VC-3 8-bit	75	1080 @ 50p	Native, Transcode
<b>DNxHD HD (VC3)</b>	VC-3 10-bit	440(x)	1080 @ 60p	Transcode only
<b>DNxHD HD (VC3)</b>	VC-3 10-bit	220(x)	1080 @ 60i	Native, Transcode
<b>DNxHD HD (VC3)</b>	VC-3 10-bit	220(x)	720 @ 60p	Native, Transcode
<b>DNxHD HD (VC3)</b>	VC-3 8-bit	290	1080 @ 60p	Native, Transcode
<b>DNxHD HD (VC3)</b>	VC-3 8-bit	220	1080 @ 60i	Native, Transcode
<b>DNxHD HD (VC3)</b>	VC-3 8-bit	145	1080 @ 60i	Native, Transcode
<b>DNxHD HD (VC3)</b>	VC-3 8-bit	220	720 @ 60p	Native, Transcode
<b>DNxHD HD (VC3)</b>	VC-3 8-bit	145	720 @ 60p	Native, Transcode
<b>DNxHD HD (VC3)</b>	VC-3 8-bit	90	1080 @ 60p	Native, Transcode

Export Format	Codec	Bitrates	Resolution/Standard	Import Type
<b>ARD_ZDF_HDF</b>				
ARD_ZDF_HDF01a XDCAM 422	10-bit	50	1080 @ 50i, 8 Audio Tracks - v1.2	Transcode
ARD_ZDF_HDF01b XDCAM 422	10-bit	50	1080 @ 50i, 16 Audio Tracks - v1.2	Transcode
ARD_ZDF_HDF01a AVC-Intra 100	10-bit	100	1080 @ 50i, 8 Audio Tracks - v1.2	Native, Transcode
ARD_ZDF_HDF02b AVC-Intra 100	10-bit	100	1080 @ 50i, 16 Audio Tracks - v1.2	Native, Transcode
ARD_ZDF_HDF03a AVC-Intra 100	10-bit	100	720 @ 50p, 8 Audio Tracks - v1.2	Native, Transcode
ARD_ZDF_HDF03b AVC-Intra 100	10-bit	100	720 @ 50p, 16 Audio Tracks - v1.2	Native, Transcode
<b>Generic</b>				
MPEG-2	MPEG-2	25, 35, 50	1080 @ 50i, 59.94i 720 @ 50p, 59.94p	Transcode only

**MP4**

Export Format	Codec	Bitrates	Resolution/Standard	Export Type
H.264, MP4 or MOV	240p	0.57	424 x 240 @ 50p, 59.94p	Transcode
H.264, MP4 or MOV	360p	0.9	640 x 360 @ 50p, 59.94p	Transcode
H.264, MP4 or MOV	480i	1.2	720 x 480 @ 59.94i	Transcode
H.264, MP4 or MOV	480i HQ	1.5	720 x 480 @ 59.94i	Transcode
H.264, MP4 or MOV	576i	1.8	720 x 576 @ 50i	Transcode
H.264, MP4 or MOV	576i HQ	2.1	720 x 576 @ 50i	Transcode
H.264, MP4 or MOV	720p	2.5	1280 x 720 @ 50p, 59.94p	Transcode
H.264, MP4 or MOV	720p HQ	3	1280 x 720 @ 50p, 59.94p	Transcode
H.264, MP4 or MOV	1080p	5	1920 x 1080 @ 50p, 59.94p	Transcode
H.264, MP4 or MOV	1080p HQ	7.5	1920 x 1080 @ 50p, 59.94p	Transcode
H.264, MP4 or MOV	1080p Superbit	20	1920 x 1080 @ 50p, 59.94p	Transcode

Frame rate conversion during transcode is supported only within the currently configured region of the video server.

For example, the following would not be supported: 60p to 50p or 30i to 25i, whereas 60p to 30i, 25i to 50p is supported.

## Formats — HDR (High Dynamic Range)

FileFlow supports the transfer of HDR encoded media to and from the sQ Server using the MXF file format.

- HLG (Hybrid Log-Gamma)
- PQ (Perceptual Quantizer)
- Sony S-Log3

The ingested video will be conformed to the configured server encoding standard on ingest. Exported timelines with mixed SDR and HDR video encoding are converted to a single encoding standard for storage to MXF file. HDR requires that the video ingest or export format codec is 10-bit.

### HDR Formats

Dynamic Range Mode	Color Space	Transfer Curve
SDR & Rec.709	Rec. 709	2.2 Gamma (Rec. 709)
SDR & Rec.2020	Rec. 2020	2.2 Gamma (Rec. 709)
HDR-HLG & Rec.2020	Rec. 2020	Hybrid Log-Gamma (Rec. 2100)
HDR-PQ & Rec.2020*	Rec. 2020	SMPTE ST 2084 (10,000 cd/m <sup>2</sup> )
HDR-S-Log3 & Rec.2020	Rec. 2020	Sony S-Log3
HDR-S-Log3 & S-Gamut3	Sony S-Gamut3	Sony S-Log3

\*HDR10 media profile is not supported.

## Super Slow Motion Support

Ingest and export SSM video to the sQ Server using MXF file format. Perform conversion between SSM (high frame rate) and standard frame rate. Perform video format transcoding while preserving SSM content.

### Supported Capture Rates:

- 2, 3, 4, 6X rates

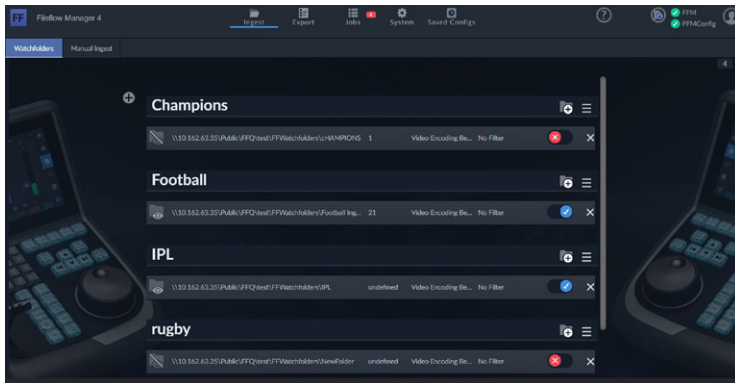
### Supported SSM Video Formats:

- AVC-Intra 100 1080i
- AVC-Intra 100 720p
- AVC-Intra CL100 200M 1080p
- XAVC-Intra 100 1080i
- XAVC-Intra CL100 200M 1080p

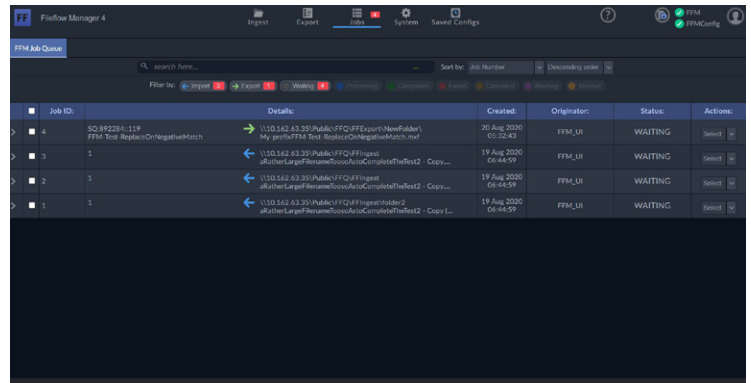


# Technical Specification

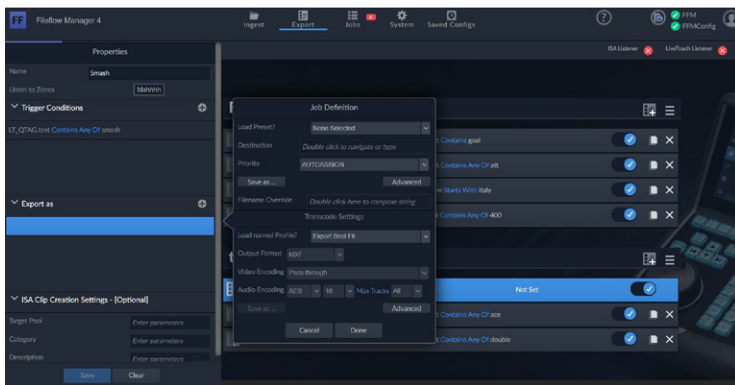
Requirement	FileFlow Engine	FFM (Windows standalone)	FFM (Cluster Node1 & Node2)	FFM (Cluster Node3)	FileFlow Cluster Monitor
Base System	X10 #1 High Performance	—	Supplied virtual machine	Supplied virtual machine	Windows system with Java 8 installed
CPU	Dual Intel Xeon E5-2690v3, 2.6 GHz, 12-Core	Minimum spec: 4 cores	Minimum spec: 4 cores	Minimum spec: 4 cores	Single Intel Xeon E5-2609v3, 1.9 GHz, 6-Core
Memory	8x 8 GB RAM, 2133 MHz, REC ECC DDR4 (dual-channel memory)	Minimum spec: 8 GB RAM	Minimum spec: 8 GB RAM	Minimum spec: 8 GB RAM	4x 8 GB RAM, 2133 MHz, REC ECC DDR4 (dual-channel memory)
Networking	Dual-port 10G Jumbo Frame 9014 packet support – enabled	—	—	—	Dual-port 1G Jumbo Frame 9014 packet support – enabled
OS	Ubuntu 16.04	Tested on Win 7,10 and Windows Server 8, 16	VM Supplied with Ubuntu LTS (current is 18.04.2)	VM Supplied with Ubuntu LTS (current is 18.04.2)	Ubuntu 16.04



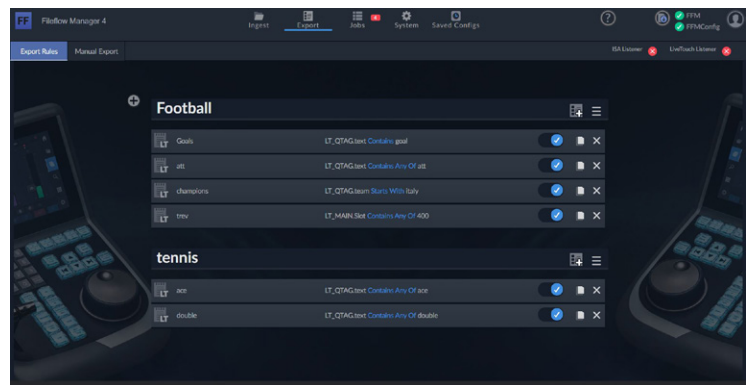
Ingest folders



Job queue



Export rules



Export folders

TB-PUB-2-0934A-EN



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