VidCheck

Video Test with Intelligent Automated Correction

Webinar 1

Getting Started in Auto QC of File-based Media

Note: all information represents the views of VidCheck personnel: participants should satisfy themselves of the applicability to their particular circumstances

Agenda

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➢ Logistics   [1 min]

➢ Quick company & speaker background   [1 min]

➢ The move to file-based media – auto QC   [40 mins]

  ❑ file-based workflows; sending & receiving files
  ❑ structure & formats of file-based media
  ❑ QC and types of errors
  ❑ differences from digital transmission and analog
  ❑ auto QC requirements and solutions, including automation
  ❑ other implementation considerations
  ❑ the *VidChecker* solutions (incl. demo)

➢ Q & A   [5 mins plus…]

> *Problems connecting, with audio etc. – call +44 7502 470 565*

Logistics

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- ➢ Prior to the Q & A section all participants' microphones are muted:
    - ❑ if you have a question prior to Q & A type a question

- ➢ Meeting is recorded
    - ❑ to ensure we record who participates
    - ❑ record questions & answers

- ➢ After the webinar
    - ❑ brief feedback questionnaire (to e-mail address used to register): please fill this in and return it
    - ❑ more information on VidChecker; or demo; or free trial version

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Company Overview & Speakers

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Video Test with Intelligent Automated Correction

➢ Founded mid-2009 following discussions and experience of broadcasters with 1st generation file-based QC systems

➢ Speakers

❑ Thomas Dove: 25 years experience in compressed video/video test

   • Founded Vqual late 2002: sold to Tektronix late 2005

     – 'industry standard' video codec development tools (used by Microsoft, Sony, Philips, Samsung, Motorola, Harmonic..)

     – inspiration behind and responsible for Cerify

❑ Simon Begent: 20 years experience in compressed video/video test

     – previously marketing manager for Vqual products and Tektronix Cerify

➢ Other personnel previously with Vqual/Tektronix in Bristol, UK – software engineers genuinely expert in file-based video test

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The Move to File-based Media - Auto QC

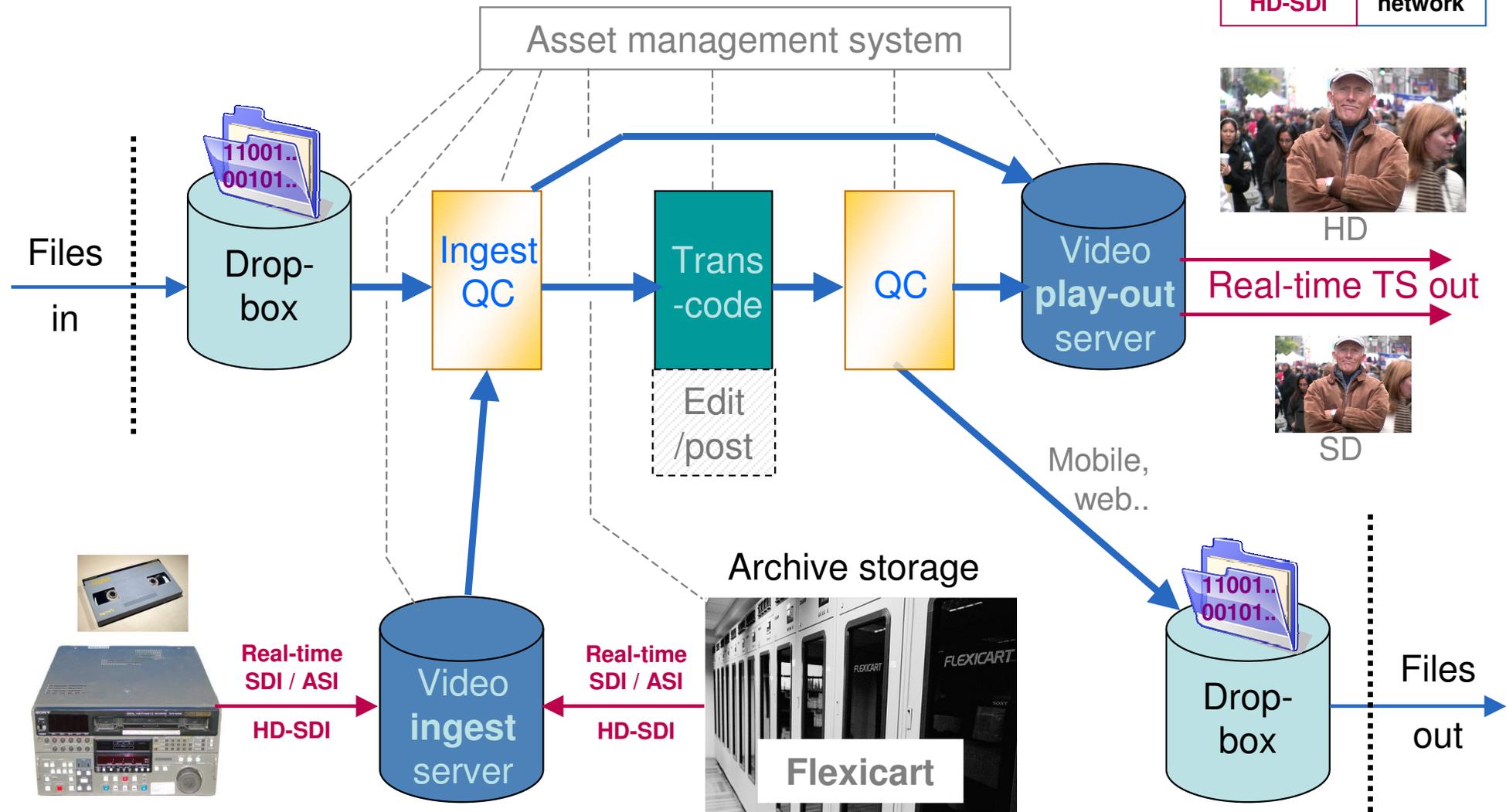# Context / applicability

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➢ Broadcasters and content distributors who
- ❑ receive (ingest) file-based media
- ❑ transmit ('outgest') file-based media

➢ Where requirement is to receive or send media
- ❑ in a specified format(s) e.g. codecs, resolutions, frame rates
- ❑ in a defined configuration e.g. bit-rates, audio channels
- ❑ meeting video 'legality' requirements e.g. video range, black levels, color gamut
- ❑ meet audio loudness requirements (ATSC A/85, EBU R128, Tech 3341)
- ❑ perhaps in a specific layout e.g. bars ⇨ black ⇨ program
- ❑ with a specific quality level e.g. no 'blockiness', with / without letterboxing
- ❑ correct field order flagged and in baseband
- ❑ with test reports
- ❑ correcting some errors
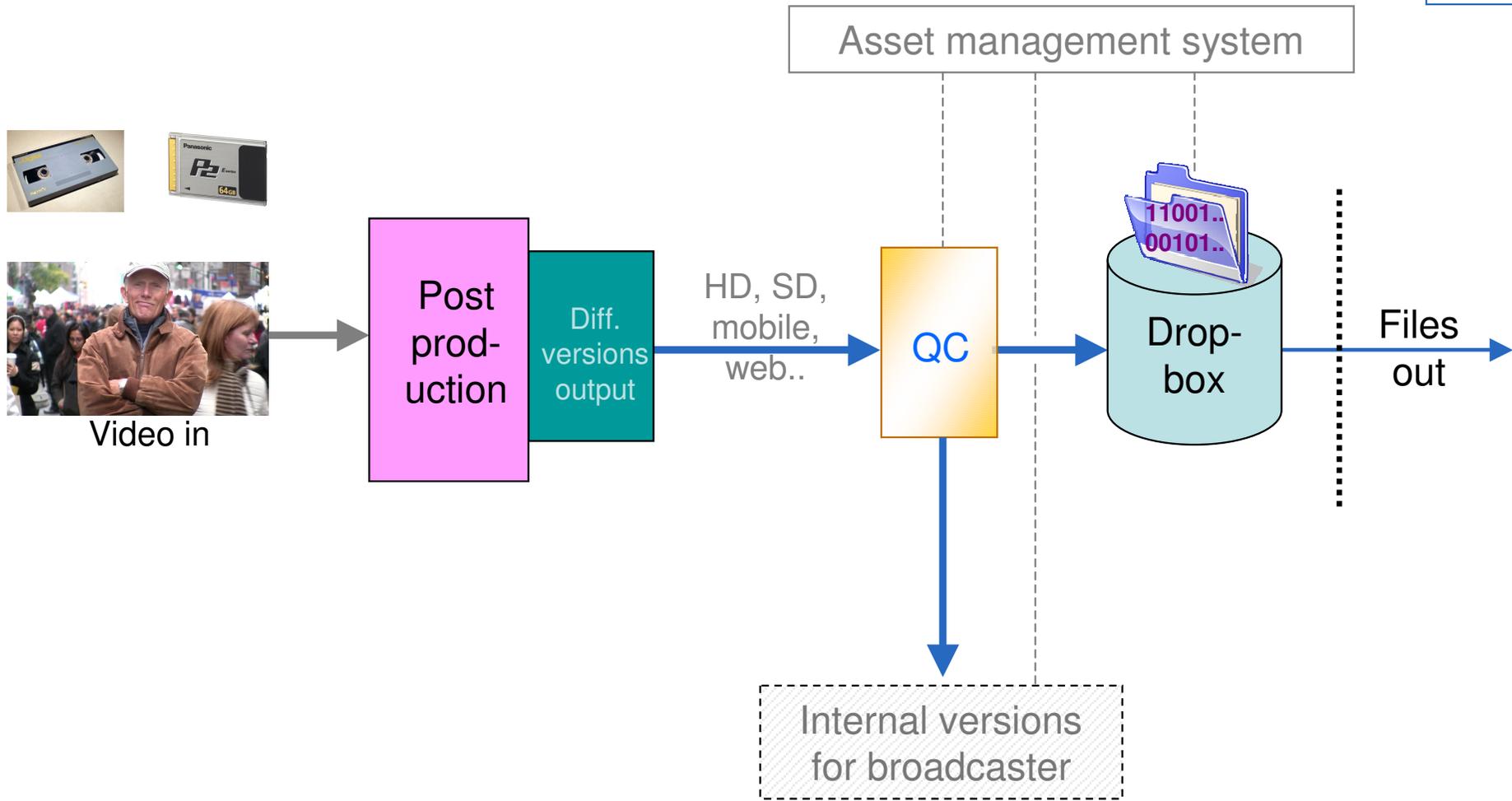- ❑ and to accept / reject / move the files depending if OK or not

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File-based broadcast

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SDI / ASI HD-SDI | Internal network

Asset management system

Files in

Drop-box

Ingest QC

Trans-code

Edit /post

QC

Video **play-out** server

HD

Real-time TS out

SD

Mobile, web..

Real-time SDI / ASI

HD-SDI

Video **ingest** server

Real-time SDI / ASI

HD-SDI

Archive storage

Flexicart

Drop-box

Files out

File-based content distribution

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Internal network

Asset management system

Video in

Post prod-uction

Diff. versions output

HD, SD, mobile, web..

QC

11001.. 00101..

Drop-box

Files out

Internal versions for broadcaster

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Sending / receiving files

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➢ Receipt and transmission not real time

  ❑ whereas Transport Streams transmitted in real-time

➢ Video files are big

  ❑ e.g. 50Mbit MPEG-2 video + audio 30 minute program = 11.5 GBytes

➢ File transmission errors

  ❑ with real-time TS a quick visual glitch

  ❑ but bit errors can make a video file completely unusable

  ⇨ *fortunately relatively easy solution: MD5 hash / checks on receipt (same as checking correct receipt of any large data file)*

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Receive (send) format

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➢ May send / receive in higher bit-rate 'mezzanine' format to transcode and generate internal versions for

- ❑ HD & SD live transmission
- ❑ proxy
- ❑ web
- ❑ mobile

➢ Or can send / receive in 'transmission ready' format

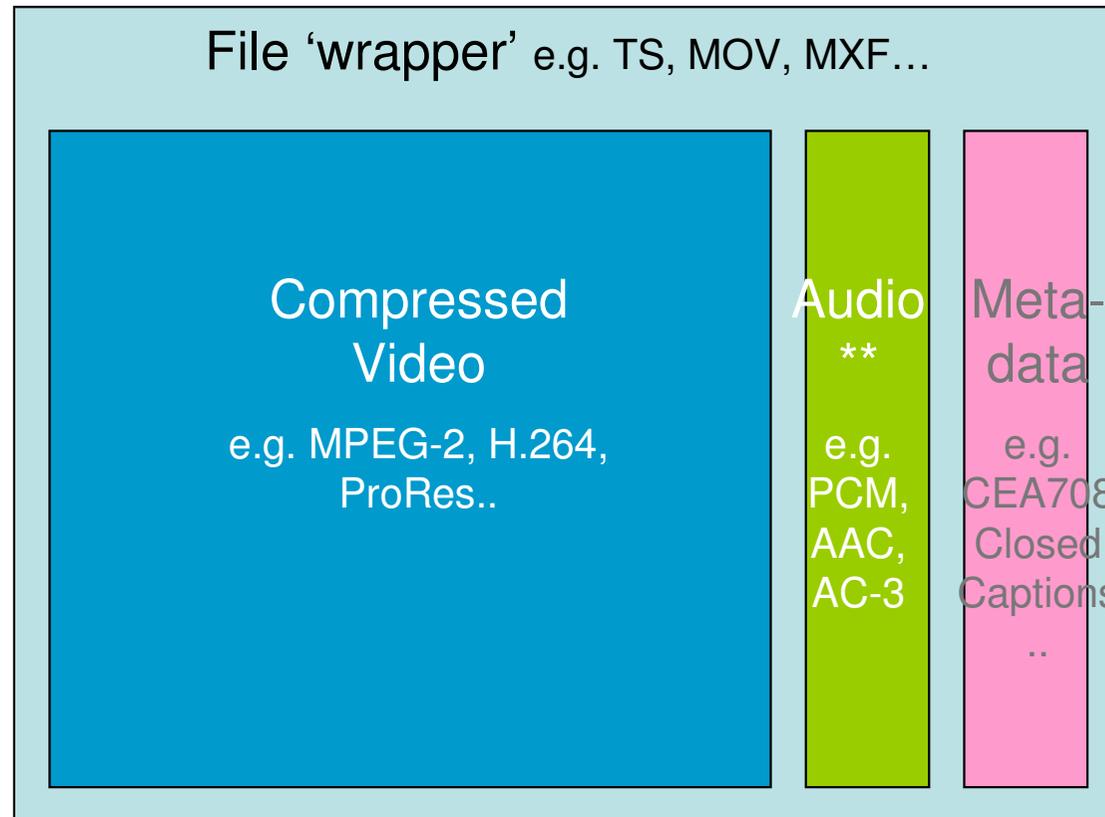- ❑ after QC, file can go directly to video server

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Structure & Formats of File-based Media

Structure of file-based media   (1)

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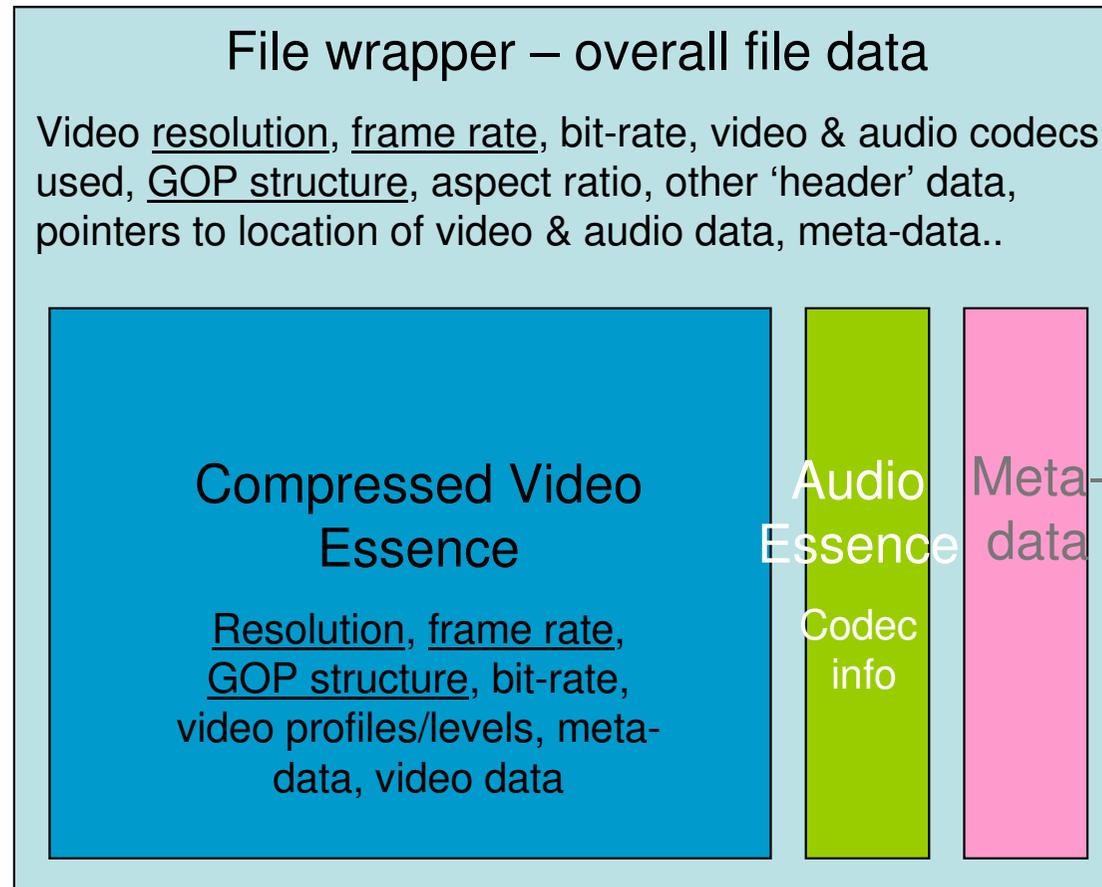
Filename: movie_hd.mxf

File 'wrapper' e.g. TS, MOV, MXF…

Compressed
Video

e.g. MPEG-2, H.264,
ProRes..

Audio
**

e.g.
PCM,
AAC,
AC-3

Meta-
data

e.g.
CEA708
Closed
Captions
..

** Audio data volume is much smaller:
may or may not be compressed

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Structure of file-based media   (2)

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Filename: movie_hd.mxf

File wrapper – overall file data

Video <u>resolution</u>, <u>frame rate</u>, bit-rate, video & audio codecs used, <u>GOP structure</u>, aspect ratio, other 'header' data, pointers to location of video & audio data, meta-data..

Compressed Video Essence

<u>Resolution</u>, <u>frame rate</u>,
<u>GOP structure</u>, bit-rate,
video profiles/levels, meta-data, video data

Audio Essence

Codec info

Meta-data

Structure of file-based media (3)

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Byte 0 in file

Wrapper — Overall file data

Meta data

Video — Frame 1 data

Audio

Video

Video essence header

Frame 1 header

Audio for video frame 1

Frame 2 header

Byte 0 in file

more wrapper

Fr 1 | Fr 4 | Fr 2 | Fr 3 | Fr 7 | Fr 10 | Fr 20

Video frame order in file may be different to display order

GOP

Examples of formats

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➢ Common file wrappers

❑ MPEG-2 Transport Stream, MPEG-2 Program Stream, MXF Op1A, MOV (QuickTime), AVI, MP4 ..

➢ Common video codecs (formats)

❑ MPEG-2 video, AVC/H.264/MPEG-4, IMX, DV25, XDCAM, ProRes, DNxHD/VC-3, VC-1, DVCPro, uncompressed YUV ..

➢ Common audio codecs

❑ MPEG-1 / MPEG-2 audio, PCM, AAC, AC-3 (Dolby Digital), Dolby Digital Plus, uncompressed WAV

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QC and Types of Errors

Differences with file-based (1)

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➢ Live video signal (transmission or from video tape deck)

- ❏ output on SDI / ASI on coaxial cable

- ❏ vertical blanking (VBI / VANC) e.g. captions, teletext

- ❏ horizontal and vertical timings

- ❏ signal levels e.g. video 1V p-p, 'black setup 7.5 IRE'

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Differences with file-based (1)
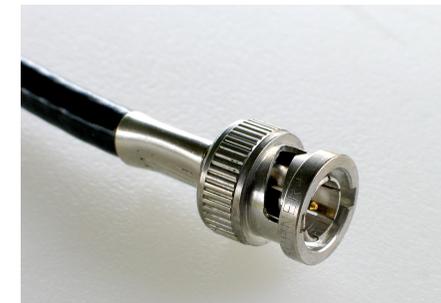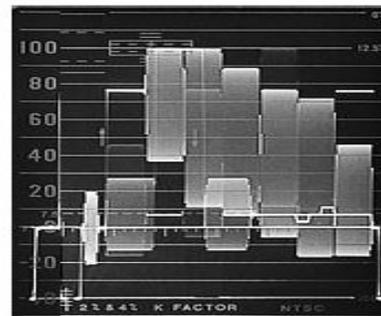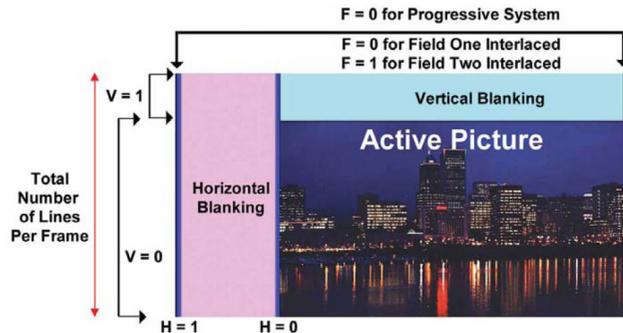
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➢ File-based is.. just a file!

- ❑ copy, move, delete just like any other file
- ❑ 'vertical blanking interval [VBI] data' – meaningless
- ❑ 'signal timing' – meaningless
- ❑ 'voltage 1V p-p, IREs' – meaningless
- ❑ ***only way to know what is inside is by the QC software reading & decoding the file*** – 'equivalent' to playing out and watching
  - • read the wrapper and headers to read overall data
  - • decode the video
  - • decode the audio
  - • read the meta data

Video <u>essence</u> only this part ..

Active Picture

.. stored as

11001..
00101..

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Tools no longer relevant

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➢ Waveform monitor

❑ there is no waveform: no voltage to see, no timings to see..

➢ Proc amps

❑ no analog levels to 'tweak'

➢ Analog / SDI legalizers

⇨ *unless the file is* **decoded***, played out in real-time*
(e.g. using a video server)
and then **re-encoded** *to a file*

So how to test a file?

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➢ Can check some info by right-click in Windows Explorer or load into VLC and get info

- ❑ frame size, frame rate

➢ Manual play-out using a media player to check

- ❑ video looks OK
- ❑ audio sounds OK – or even if any audio there at all (or any video)

➢ But play-out using a media player has problems

- ❑ only real-time
- ❑ needs a person to watch – very expensive
- ❑ subjective
- ❑ player can hide errors
- ❑ person can't see all issues & parameters

A specific QC software solution is needed

What are common errors? (1)

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➢ Simple errors in post / rendering / file production

- ❑ selecting the wrong frame rate
- ❑ incorrect resolution
- ❑ incorrect bit-rate
- ❑ interlaced top-field first when should be bottom field first or vice-versa
- ❑ incorrect codec profile/level
- ❑ incorrect audio coding
- ❑ incorrect aspect ratio (picture or pixel)
- ❑ incorrect layout e.g. incorrect timing of color bars / black
- ❑ Incorrect audio levels and loudness
- ❑ missing audio or incorrect number of tracks
- ❑ the audio track ends too soon or starts too late (audio is shorter than video)

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➢ **'Artistic' choices in post**

- ❑ audio too loud or peak level too high **

  • post-house: "let's make the audio really punchy!"

** *the most common error of all in commercials! (already subject to legislation in many countries in Europe, soon to be in US also)*
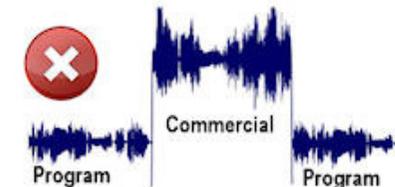
- ❑ black level too low or white level too high

  • post-house: errors when applying contrasts, gains, adjustments.. and/or incorrect selection of options at render time

- ❑ UV chroma out of range   [same post-house causes]

- ❑ color gamut errors (illegal RGB values converting from legal YUV values)   [same post-house causes]

Don't correct some errors

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➢ Some errors can't be corrected e.g.

- ❑ if no audio.. can't add it in
- ❑ if chroma missing.. can't add it in

➢ Many errors need to be flagged but better <u>not</u> to try to correct, e.g.

- ❑ if video is incorrect frame rate or resolution or incorrect codec (or incorrect profile/level) - could transcode but fundamental errors so almost invariably need to reject file
  - • perhaps re-edit or use post-production software to fix
- ❑ likewise similar errors on audio
- ❑ or if video not letterboxed when it should be, or color bars not present, or black frames present when they should not be ⇨ almost invariably need to reject file
  - • perhaps re-edit or use post-production software to fix

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Auto QC Requirements and Solutions

QC requirements summary

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➢ Need to check media to a defined format or template

➢ Check processing progress & get QC reports at end

➢ Move video to different places depending if good, bad, corrected or to be manually inspected

➢ Automate as much as possible

➢ QC software – needs to read data from file

  ❑ e.g. file on server A, QC software on server B – server B must have access to A and read the whole file check it

➢ Reading file – not real time, it is a **data processing** operation

  ❑ so making use of multiple cores and processing important – speeds and cores increasing all the time

➢ Integrate with asset management / automation systems – when ready

Automation steps

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➢ 'First step'

- ❑ drop box (watch folder) – files that arrive in folder are automatically tested
- ❑ perhaps correct some errors automatically
- ❑ file mover – depending if good, bad, corrected or to be re-checked
- ❑ control all easily from a GUI
- ❑ needs to be straightforward to use – new area for many staff

➢ 'Second step' – full automation

- ❑ asset management / automation system
  - • knows what is coming in
  - • controls QC – start when file present
  - • does scheduling and priority
- ❑ need API control of QC software
  - • to start, stop, pause processing
  - • get processing progress
  - • ..and get QC reports via the API

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Other Implementation Considerations

Video – but now an IT issue

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- ➢ Lots of video to check?
  - ❑ Time to process
  - ❑ Processing multiple files concurrently
  - ⇨ *Solution: throw processing power at the problem – relatively cheap to do*
  - ❑ Processing files with multiple audio – don't want to have to repeat for each audio stream
  - ❑ Time to move large files around internal network; space to store

- ➢ Video servers – may not do network I/O quickly
  - ❑ configured for real-time SDI etc. I/O – so network I/O is constrained
  - ⇨ *may need to upgrade video server network I/O capabilities*

- ➢ IT training / understanding for staff who are transitioning to file-based

Auto QC is not a person

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➢ ## Auto QC is great for technical issues

- ❑ e.g. checking frame rates, blockiness, video data legality, audio loudness
- ❑ accurately
- ❑ thoroughly consistently
- ❑ and more extensive as human QC is often beginning-middle-end only

➢ ## But auto QC software cannot e.g.

- ❑ decide that that skin tone is a bit red during part of the video
- ❑ decide that a night scene looks a bit dark
- ❑ decide that the audio dialog is a bit quiet some of the time
- ⇨ all these are post-production / editing decisions that must be taken by people

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ROI – be realistic

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➢ Auto QC can reduce need for human QC substantially

- ❑ reduce man-hours required
- ❑ leave humans to take decisions on more interesting issues where judgement is required

➢ Auto QC can sort the majority good from the minority bad

- ❑ but will then likely need a person to look at the small amount that is bad
  - • sign-off as OK
  - • or reject, or edit

➢ If auto QC can sort enough of your video so that fewer man-hours are needed

⇨ ***ROI can be very short for auto QC***

(even if auto QC is only on a minority of your media – depends upon cost of QC software of course)

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VidChecker QC Solutions

VidChecker overview

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- ➢ 2nd generation file-based video auto QC
  - ❑ builds on the experience of earlier products launched 3-5 years ago
  - ❑ flexible software-only solution (Win 7/Vista/XP/Server 2003/08 and virtualization)

- ➢ 'Automated Intelligent Correction' of video & audio as well as checking

- ➢ Focuses on the checks 'that people get wrong'
  - ❑ not on the things that are almost invariably correct, such as syntax elements (a problem some years ago, but not now)

- ➢ Straightforward user interface, designed from the beginning to be easier to understand with user-intelligible error messages

- ➢ Takes advantage of modern multiple core CPUs & multiple PCs
  - ❑ can run on a single PC on multiple cores
  - ❑ and on multiple PCs in a ***VidChecker Grid***

- ➢ ***Low cost*** - from $6K + $1K Gold maintenance for processing 4 files at once
  - ❑ e.g. i7 PC processes 3.5 hours of IMX30 SD per hour with almost all tests turned on

VidChecker correction

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➤ ## Video is checked and corrected

❑ Luma level incl. black levels; Chroma - color gamut errors; RGB - color problems   using patent-pending algorithms to *intelligently* correct
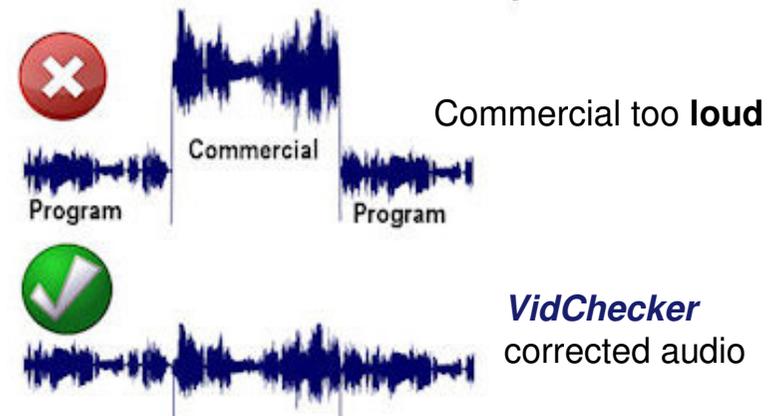

Original - over limit highlights
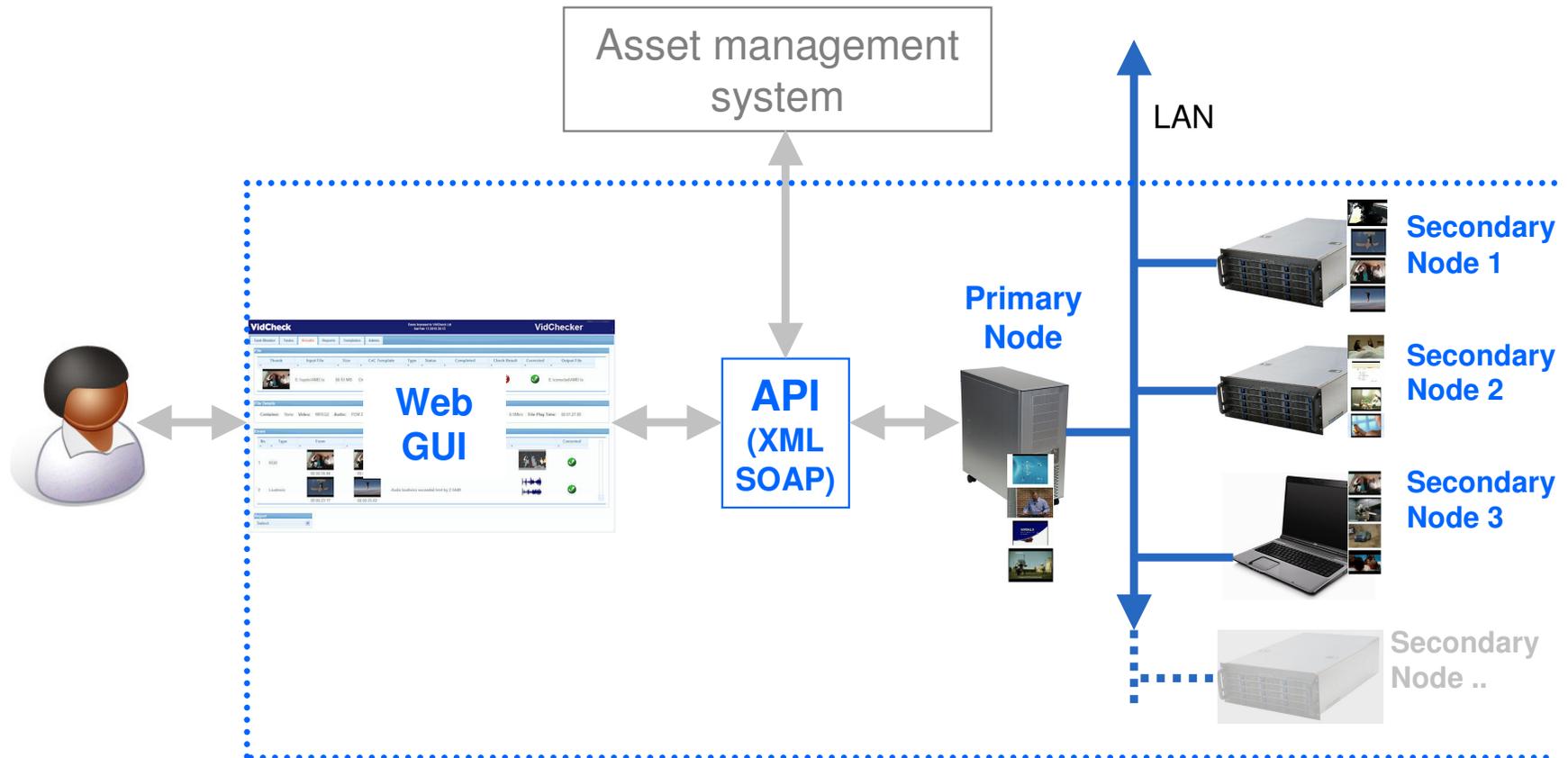

Typical "Legalizer" – color artefacts

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➤ ## Audio is checked and corrected

❑ peak, loudness to ATSC (ITU) and EBU recommendations

Commercial too **loud**

VidChecker corrected audio

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VidChecker Grid

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Asset management system

LAN

Web GUI

API (XML SOAP)

Primary Node

Secondary Node 1

Secondary Node 2

Secondary Node 3

Secondary Node ..

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VidChecker Demo

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Q & A

Next webinar

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Not Too Loud, Not Too Quiet ("getting the sound right")

Auto-correction of audio loudness & levels to meet CALM and other legislation
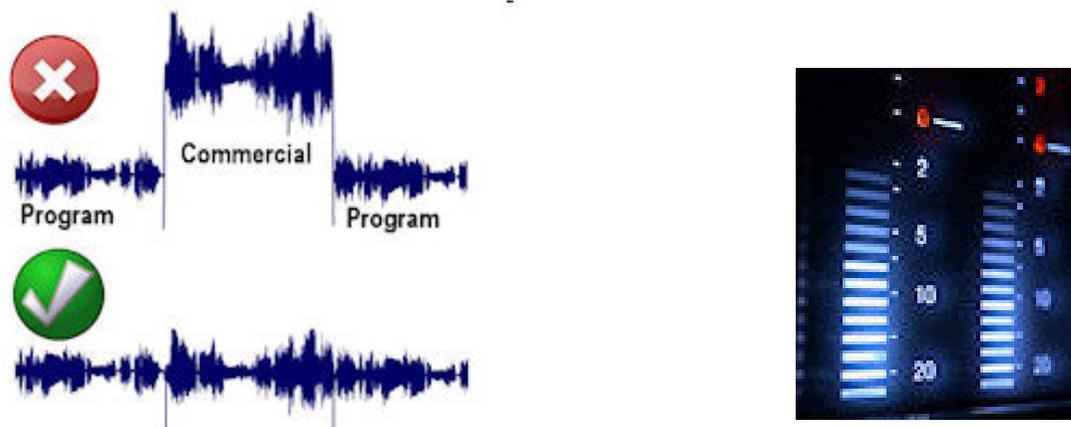
Wednesday 23 March 2.00pm EDT (6.00pm UK / GMT)

Register at www.vidcheck.com/webinar.asp

or email sbegent@vidcheck.com

Next steps

Video Test with Intelligent Automated Correction

➢ Individual online demos of VidChecker

➢ Download a 15-day fully-functional trial

➢ Contact Sales

- ❑ sbegent@vidcheck.com
- ❑ tel.: 011 44 7502 470 565

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Thanks for your time !