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Tektronix

MTS4EAV7 HEVC/AVC Video and Compressed Audio Analyzer
Release Notes
077-0898-05

This document supports software version 7.1.5 Release.
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MAJOR CHANGES
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Version 7.1.5:
Added support for MTSA MPEG Analysis platform.

Version 7.1.3:
(1) Allows analysis of elementary streams of the supported codecs encapsulated
    in an MXF container file.

(2) The Stream Structure View provides an option to save a selected portion of

the elementary stream in a separate file.

(3) Provides an option to analyse closed caption content without analysing the
    elementary stream content.

Version 7.1.2:
(1) In Closed Caption Analysis, added support for Korean Language as per Korean
    Standard KSC-5601-1987.

(2) A new option added to start video analysis and decoding from a user defined
    time offset.

Version 7.1.0:
(1) Added Closed Caption and AFD Analysis for MPEG2 and AVC.
    a) Analysis of Closed Caption, XDS and Text Services content as per CEA 608 and
       CEA 708. Also analyses CEA 608 caption content carried in SCTE 20 and SCTE 21.
    b) Analysis of AFD.
    c) Rendering of selected decoded Closed Caption content over the video frame as
       per Active Mode.
    d) Allows viewing/comparing of all/selected decoded Closed Caption content in
       caption buffers.
    e) Stream Structure supports Closed Caption structure.
    f) Trace supports Closed Caption and AFD content.
    g) Provides option to extract and view closed caption content in Sub-Rip Text(.srt),
       Scenarist Closed Caption(.scc) and MacCaption Closed Caption(.mcc) file formats.
    h) Pre-scans for Closed Caption and AFD content in the first 50Mb.

(2) In High Efficiency Video Coding (HEVC)
    a) Analysis & verification of HEVC streams as per HM 14.0.
    b) Start analysis from any frame type using Video Start Position.
    c) Added tags in Stream Structure to easily identify content in Access Units.

(3) Added High Efficiency Advanced Audio Coding analysis (HE-AAC)
    a) Analysis of HE-AAC elementary streams
    b) Analysis of HE-AAC tracks in Transport Streams.

(4) Provides GOP structure parameters for MPEG2, AVC and HEVC.

Version 7.0.1:
(1) In High Efficiency Video Coding (HEVC):
    a) Allows viewing the Stream Structure
    b) Analysis & verification of HEVC streams as per HM 12.1
    c) Added a new mode of analysis called Decode Order Analysis in addition to the
       Display order Analysis
    d) Allows analysis of streams with repeating active SPS.

Version 7.0:
(1) Added High Efficiency Video Coding (HEVC) support
    a) Analysis & verification of HEVC streams as per HM 12.0.
    b) Analysis of all levels in Main and Main 10 profiles.
    c) Shows Decoded, Predicted and Residual pictures for every HEVC frame.

d) Tooltips provide comprehensive data about CUs, CTUs, Frames and Streams.
e) Additional HEVC specific overlays - Coding Tree Units, Coding Units, Prediction Units, Transform Units (Chroma & Luma separately), Slices and Tiles.
f) Updated Motion Vectors overlays for HEVC streams.
g) Trace support for HEVC streams
h) Existing graphs & statistical views now support HEVC – Bits per frame, Spatial bits, MV Histogram, CTU coded frequency, Average bits, quants, etc.
i) Additional HEVC specific graphs – CU Size distribution and QP Variation.
j) HEVC Picture Level and sub-Picture Level Buffer Analysis.
k) Video Navigator View support for HEVC.
l) Image Inspector shows the pixel values at the CU Level for HEVC streams (while in other standards it is shown at the MB Level).
m) When the mouse is moved over a CTU, the CTU, CU and PU boundaries are shown.
n) The window position of HEVC toolbar, HEVC tooltips and HEVC views such as CU Size distribution graph and QP Variation Graph are now stored in MTS4EA project files.

(2) Added support for HEVC tracks contained in Transport Streams.

(3) Allows generation and analysis of Trace files upto 2GB.

(4) Provides easy navigation using the Zoom feature for the Video View (Mouse scroll buttons & Keyboard shortcuts).

(5) Enhanced the video buffer size (upto 1GB), allowing longer rewind and play.

(6) Added the decode frame number to the status bar along with the display frame number.

(7) For H264 streams
    a) Better handling of AVC streams that have DPB errors.
    b) Updated level-specific tests as per Annex A of AVC.

Version 6.1.1:
(1) In H.264 AVC,
    a) Support for displaying Motion Vectors of MB types - P_SKIP, B_SKIP, B_DIRECT.
    b) Additional alerts in case the number of Motion Vectors in consecutive Macroblocks exceeds the limit specified by the standard.
    c) Additional checks for MMCO semantic errors incorporated.
    d) Alerts for non compliance of dpb_output_delay parameter.
    e) Fix for incorrect reference frame number in Trace file.
    f) Checks for "BinCountsInNALunits" compliance.
    g) Fix for the false alerts raised when analysing a TS stream with filler data NALUs in it.

(2) Fix for the crash issue encountered when opening a "grayscale-only YUV" with image inspector enabled.

Version 6.1.0:
(1) Support for analysis of scalable video codec (SVC)

(2) Compatibility with JSVM 9_19 decoder

(3) Support for following SVC profiles:
    a) Scalable Baseline
    b) Scalable High
    c) Scalable High Intra

(4) Support for decoding of stream at a chosen scalability level

(5) Support for inter-layer fidelity Analysis in a given SVC stream

(6) Addition of graph for viewing AVC versus SVC MB percentages

Version 6.0.5:
 1) Support for changing Sequence Parameter Set and
    Picture Parameter Set in H.264/AVC

Version 6.0.4:
(1) Support for AVC Intra.
   Includes support for all the AVC Intra profiles:
   High10 Intra, High422 Intra, High444 Intra, and CAVLC Intra.

(2) Enhanced support for H.264/AVC

(3) Compatibility with JM 15.0 decoder

(4) Support for additional profile and level checks in H.264/AVC

Version 6.0.3:
(1) Support for AVCDecoderConfigurationRecord in mp4 container

(2) Support for extensions to AVC Decoder Configuration Record
    including Sequence Parameter Set

(3) Updates to dongle library

Version 6.0.2:
(1) H.264 Intermediate Transform Checks
    This new mode adds checks to H.264/AVC streams to confirm
    that the intermediate values produced as part of the Scaling
    and Transformation Processes of sections 8.5.9 - 8.5.12 of
    the standard are within range.

Version 6.0:
(1) Improved tracing functionality and views
    The trace view has been reworked to provide more information, and
    to make that information easier to use. The different trace types
    are colour coded and can be filtered with a single click.
    New trace options are:
    a) Alert trace. The alert information now has its own trace, so
       can be easily collected or ignored.

b) Buffer trace. Buffer model figures for MPEG-2, MPEG-4 part 2
          and H.264/AVC.
       c) Stream summary trace. Initial stream identification and final
          stream statistics.

   (2) ARIB TR-B14 compliance mode
       This new mode adds a range of checks to H.264/AVC streams to confirm
       the stream's conformance to the ARIB TR-B14 standard.

   (3) In H.264/AVC:
       a) Updated to the JM 12.0 code base.
       b) Added SEI message parsing to the Stream Structure view.

   (4) In MPEG-4 part 2:
       Added support for Simple profile levels 4a and 5.

   (5) User interface enhancements:
       New MB Statistics toolbar allows easy selection of overlays.

   (6) New command line options for greater control and flexibility.

   Version 5.0:
   (1) Full stream analysis for audio streams of the following standards:
       a) MPEG-1 part 3
       b) MPEG-2 part 3
       c) MPEG-2 part 7 (AAC)
       d) MPEG-4 part 3 (AAC)

       Note that analysis of Dolby AC-3 streams is not yet supported.

       Analysis consists of a number of different trace options, bitstream editing,
       histograms and plots relevant to each standard, together with alerts for
       violations of the standards.

   (2) Support for playback and Audio Waveform View for Dolby AC-3 streams.

   (3) Bits Per Frame Analysis. A graphical view of bit usage and picture type.

   (4) User interface improvements:
       a) Can now close video view without closing the stream.
       b) More logical arrangement of buttons in Audio and Video toolbars.
       c) Some menu reorganisation due to new audio features.
       d) Improved icons for skip forward and skip backward.
       e) Lock macroblock highlight. The position of the highlighed macroblock
          may be locked and unlocked using a left mouse click.
       f) Better handling of multiple similar alerts.
       g) The alert log can be saved as XML.
       h) 'Goto view' functionality added to the H.264/AVC stream structure view.
       i) Buttons that generate a new view can be used to toggle that view.

   (5) A/V Delay measurement.
       This option allows the measurement of the delay between the Audio ES and
       Video ES, providing a complete solution for measuring AV delay in an encoding
       system. This option comes with a collection of predefined clapperboard test

streams in various formats, allowing users to select and encode an appropriate test stream with their encoding system. The encoded stream is then analyzed using MTS4EA. MTS4EA will measure the delay between audio and video in the encoded stream and report it to the user as a time value to an accuracy of ±1 mS. The variation between the Video ES and the Audio ES is also presented as a graph.

Version 4.2:
(1) Seeking: decode start position can be specified as a byte offset or frame number.

(2) Enhanced stream structure view: additional details shown in existing stream structure view (for all supported container formats).

(3) H.264/AVC:
     a) Support for MP4 file format (ISO/IEC 14496-15).
     b) Compatibility with JM 9.6 code base.
     c) Elementary stream structure tree view.

(4) VC-1: Support for FCD 1r2 version of the SMPTE standard.

(5) MPEG-2: Support for 4:2:2 profile ML and HL.

(6) Improved decode speed in all standards.

(7) User interface enhancements:
     a) Button to open Excel graphs.
     b) Automatically disable analysis options on stop.
     c) Show first frame after loading file.
     d) Remove 'left-click to advance frame'.
     e) 'Select all' button in trace view.

Version 4.0.0.5:
(1) Support for playback of audio streams: the following audio standards are supported:
     a) MPEG-1 part 3
     b) MPEG-2 part 3
     c) MPEG-2 part 7 (AAC)
     d) MPEG-4 part 3 (AAC)

(2) Audio waveform view: shows the time domain waveform of the decoded audio stream.

(3) Bitstream editing: bitwise editing of video elementary streams, including delete, insert and invert of individual bits; full change tracking and change highlighting; edited stream can be decoded or saved to disk; syntax element labels are shown in the editor.

(4) Image inspector: view the pixel values for each colour component of the current highlighted macroblock; shows magnified image as well as decimal values.

(5) A number of other enhancements:

a) When using an uncompressed reference input, the time based frame rate can be ignored.
b) H.264/AVC: frame time stamps are now derived from DPB SEI messages when present.
c) The fidelity graph has three alternative modes for x-axis labelling: time, frames, or fields.
d) In the alert log view, alerts can be copied to the Windows clipboard.
e) The decoded video output file can now be specified through the analysis options dialog as well as the command line.

Version 3.1.1.0:
(1) Support for H.264/AVC fidelity range extensions: High, High 10, High 4:2:2, and High 4:4:4 profiles (all levels).

(2) H.264/AVC: Compatibility with JM 9.3 code base.

(3) VC-1: Support for RCV file format (SMPTE CD2r3 release).

(4) Incorporated changes for Microsoft Windows Media v9 RC-1 release.

Version 3.1.0.0:
(1) Support for Microsoft Windows Media v9/VC-1 (WMV9/VC-1) Simple, Main and Advanced Profiles (all Levels).

(2) Support for Microsoft Advanced Systems Format (ASF) extraction for WMV9/VC-1.

(3) Support for MPEG-2 Transport Stream (ISO/IEC 13818-1) extraction for MPEG-2 and H.264/AVC Elementary Streams, and MPEG-2 PES and Program Streams.

(4) H.264/AVC: added reporting of Reference frames in Summary Tooltip, MacroBlock tooltip and Trace/Interpret.

(5) MPEG-4: updated to reflect 2004 ISO/IEC 14496-2:2004 edition.

(6) Colour maps for MacroBlock overlay statistics.

(7) Allow input type to be specified in file open dialog and in stream select dialog.

MINOR CHANGES
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Version 7.1.3:
(1) In High Efficiency Video Coding (HEVC)
    a) Addressed an issue with respect to negative quantization parameter values.

Version 7.1.2:
(1) In Closed Caption Analysis
    a) Added closed caption content information in Frame Summary Tooltip to help

in analysis
    b) Addressed an issue with Carriage Return.
    c) Addressed an issue with the extraction of Closed Caption content under
       certain conditions.

(2) In High Efficiency Video Coding (HEVC)
    a) Addressed an issue with respect to frame rate.
    b) Addressed an issue with Chroma mode.

Version 6.1.0:
(1) The window position of toolbars (including Macroblock and
    Summary tooltips) are now stored in MTS4EA project files.

(2) Continuous play option is available when audio analysis is
    selected

(3) In H.264/AVC:
    a) Resolved the issue where pic_timing SEI message was not shown in the
       stream structure view for some streams.
    b) Resolved the defect where some streams with invalid Ref picture list
       were getting aborted with a Fatal alert "MTS4EA Elementary Stream
       Analyzer encountered an unexpected system error".

Version 6.0.4:
(1) In H.264/AVC:
    a) Resolved the issue where analysis was stopped with
       incorrect alert "Aborting slice due to previous error".
    b) Resolved the issue where MTS4EA was incorrectly
       raising the alert "No space in Decoded Picture Buffer...".

(2) In the GUI:
    Resolved the issue where average bit rate was displayed as
    negative for some VC1 streams.

Version 6.0.2:
(1) In H.264/AVC:
    a) Fixed erroneous 'Unexpected end of NALU' alert for streams which
       are missing a data partition NALU for a given slice.
    b) Corrected YUV output of streams using 10-bit weighted prediction.

(2) In H.263:
    a) Added alert for unsupported 4CIF video resolution.

(3) In the GUI:
    Fixed pauses when using a floating licence dongle over a WAN.

(4) Other:
    Microsoft Vista is officially supported.

Version 6.0.1:
(1) In H.264/AVC:

a) Improved decode speed.
    b) Added alert for deprecated High 4:4:4 profile.
    c) Added support for new Amendment 2 SEI messages.
    d) Improved memory allocation for very large streams.
    e) Corrected default value for time_offset_length syntax element.
    f) Added support for non 8-bit I_PCM blocks.
    g) Removed some restrictions that were being inappropriately applied
       to FRExt streams.

(2) In MPEG-2:
    Fixed incorrect alert concerning repeated values of vbv_buffer_size.

(3) In the GUI:
    a) Minor improvements to the motion vector overlay.
    b) Fixed display of synchronisation markers for some ADTS streams.
    c) Fixed intra frame display in Bits per Frame view for interlaced streams.

(4) Other:
    a) Added support for display of 4:1:1 raw video.
    b) Resolved some installation and graphical issues when using the
       Microsoft Vista operating system. Note however that Vista is not an
       officially supported OS for this release and issues may remain.

Version 6.0:
(1) In H.264/AVC:
    a) New checks added for the VUI when an SPS is repeated.
    b) Improved decode speed.
    c) Fixed 'Aborting slice decode' problems with some streams.
    d) Updated the 'Too many macroblocks per second' alert to account for
       the change in the 2005 edition of the standard.
    e) Modified HRD calculations to avoid spurious alerts caused by rounding errors.
    f) Corrected misinterpretation of hypothetical field rate as a frame rate.
    g) Removed incorrect errors for out of range values of mb_qp_delta.
    h) Fixed incorrect parsing of pan-scan rectangle SEI message.

(2) In MPEG-2:
    a) Corrected problems dealing with videos that try to switch between CBR and
       VBR buffer models.
    b) Corrected timing issues for streams using repeated frames or fields.

(3) In MPEG-4:
    a) Corrections to VBV analysis.
    b) Fixed video packet overlay view.

(4) In AC-3:
    Allowed decoding of streams that do not start with a sync word.

(5) In VC-1:
    Allowed decoding of streams that do not start at the beginning.

(6) In the GUI:
    a) Resolved a number of issues with the image inspector.
    b) Fixed non-appearance of syntax elements in the bitstream editor for
       some streams.

(7) Other:
    a) Improved memory usage for large transport streams.
    b) New DESkey drivers provided that allow multiple instances to be run on a
       machine while only using one floating licence.
    c) Improved stream auto detection algorithms to reduce false matches.

Version 5.0.0.1:
(1) In H.264/AVC:
    a) Small correction to HRD conformance checking which could
       alter results for some streams with buffering messages that
       change the cpb_removal_delay_offsets.
    b) Removed skipping of AUD NAL units that occur at the start
       of the stream.
    c) Correction for decoding unpaired fields in successive IDR
       slices.
    d) Correction for incorrect error message for negative values of
       quantisation parameters.
    e) Correction for parsing time_offset syntax element in the pic_timing
       SEI message.
    f) Fix for parsing of full_frame_freeze SEI message.
    g) Fix for incorrect warning about filler payloads in SEI messages
       when the payload > 255 bytes.
    h) Fix for parsing of scene_info_present_flag in scene_info SEI messages.
    i) Fix where Intra8x8 blocks were being shown as Intra4x4 in the GUI
       if they appeared in non I-slices.
    j) Fix for checks dependent upon cpbBrNalFactor and cpbBrVclFactor in FRExt.
    k) Fix to the frame cropping calculation that is passed to the GUI.

(2) In VC-1:
    Correction for motion vectors in 4MV blocks, both in the GUI
    and in the trace.

(3) In MPEG-2:
    a) Added support for transport streams with 4-bytes of
       non-TS data between TS packets.
    b) Improved transport stream PSI parsing.
    c) Improved labelling of field- and frame-coded picture types in
       summary tooltip.
    d) Improved accuracy of VBV analysis for some CBR streams.

(4) Updated DESkey driver.

(5) In MPEG-4:
    Correction to value of interlaced top-field motion vector in
    macroblock tooltip.

(6) In the GUI:
    a) Fix for image inspector when viewing interlaced streams.
    b) Number of bits reported in trace now always matches the Summary Tooltip.

Version 4.2.0.0:
(1) In H.264/AVC:

a) Equation C-15 now only applied to access units with buffering period
   SEIs.
b) Intra_8x8 macroblock type now displayed with distinct colour in
   overlay.

(2) In MPEG-4:
Removed upper limit on decode resolution.

Version 4.0.0.5:
(1) In H.264/AVC:
    a) Increased maximum number of slices from 50 to 396.
    b) Correction to reference frame numbers in trace.
    c) Correction for fatal error when no_output_of_prior_pics_flag=1.
    d) Improved detail of HRD error messages.
    e) Correction to handling of multiple PPSs.
    f) Support for parsing buffering period SEI message before PPS.
    g) Trace cabac_zero_word syntax elements where present.

(2) MPEG-2:
Improvement to identification of ADTS/AAC audio under MPEG-2 TS
partial reception streams.

(3) In MPEG-4:
    a) Correction for handling large files.
    b) Relaxed error checking for incorrect marker bit.

(4) In MPEG-2 TS:
Improved stream description strings.

(5) In uncompressed video:
Correction for handling files larger than 4GB streams.

(6) In VC-1:
Correction for missing quant values.

(7) In the GUI:
Progress bar (with cancel) introduced for track select
identification process.

Version 3.1.1.0:
(1) In H.264/AVC:
    a) Fix problem in CABAC streams where certain bitstream errors could
       lead to incorrect decoding of when playback is repeated.
    b) Fixed incorrect interpretation of pan_scan_rect SEI message.

(2) In MPEG-4:
    a) Video packet number now available as overlay statistic.
    b) Correction to motion compensation in quarter-sample interlace streams.

(3) In VC-1:
    a) Correction to tracing of IMODE and MVMODE elements.
    b) Correction to MB trace when no quant is set.

(4) In the GUI:
    a) Correction to display of average fidelity metrics for interlace
       streams.

Version 3.1.0.2:
(1) In WMV9:
    a) Added warning about pre-RC1 interlaced streams.
    b) Corrected some block level elements being traced out at macroblock
       level (affects indentation and context, eg [PIC|MBK]).
    c) Improved startcode logging, plus tracing of SUBBLKPAT and HYBRIDPRED
       elements (these were not always being output in the log).
    d) Correct display of field pictures where the frame is an odd number of
       macroblocks high.
    e) Corrected overlay for 4MV MBs in field coded pictures
    f) Fix loss of stream sync in pictures using extended MVs where mvrange != 0.
    g) Many additional alerts
    h) Range Reduction now being performed in Advanced Profile.
    i) Trace flushing bits.
    j) Flush last frame on end of sequence.
    k) Fixed frame loss bugs for skip frames, and intensity-compensated
       field interlace pictures.

(2) In ASF:
    a) Support for the 'WVC1' four-CC as VC1 Advanced Profile.
    b) Correction to handling of compressed payloads.

(3) In MPEG-2:
    Improved PES demux to allow non-video extraction and updated stream
    types from 13818-1 Amd.2.

(4) In H.264/AVC:
    Correction to parsing of filler data and user data SEI messages.

Version 3.1.0.0:
(1) Command line:
    Added flags to enable fidelity analysis trace in batch mode.

(2) In MPEG-4:
    'Unexpected end of stream' error was being incorrectly reported with
    files using the visual_object_sequence_end_code, this has now been
    fixed.

(3) In H.264/AVC:
    a) Changed colour of Intra_4x4 MacroBlock type to Yellow in MacroBlock
       types overlay (to distinguish from Intra_16x16 types).
    b) Correction to motion vector range check: was comparing horizontal
       component to both horizontal and vertical limits.
    c) Correction to handling leading zero bytes in Annex B NALU format.

(4) GUI:
    a) Correction to motion vector overlay renderer: in rare cases, incorrect
       clipping was causing a crash.

Version 3.0.0.5:
(1) In H.264/AVC:
    Reduced level of "First access unit must be IDR" alert to error.

(2) In H.263:
    Improved handling of GSTUF bits.

KNOWN ISSUES
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(1) In H.264/AVC:
    a) The prev_intra8x8_pred_mode_flag and rem_intra8x8_pred_mode syntax elements
       are being wrongly traced as their 4x4 counterparts.
    b) Frame timings shown in the summary tooltip for streams with HRD information may
       be incorrect. This does not affect the HRD calculations.
    c) There is an artificial limit of 396 on the number of slices that may be present
       in a picture.

(2) In H.265 HEVC:
    a) This version of the MTS4EA does not support HEVC streams with POC errors.
    b) Overlays are best seen with the Zoom Level set at 100% or more. Use the toggle
       button for Video Scale to easily set the zoom level to 100%.
    c) During stream analysis the application may not be able to open trace files
       greater than 1GB. It is recommended to close the stream analysis when opening
       large trace files.
    d) The MTS4EA treats each field of a field coded (interlaced) HEVC stream as a
       separate frame.
    e) The performance of the 3D graph viewer (Microsoft Excel) for the MTS4EA graphs
       such as "Spatial bits/CTU", "Spatial bits/CTU coded", "MV Histogram", "Spatial
       average quant", "CTU coded frequency" and "Intra CTU coded frequency" is affected
       when the number of CTUs per frame is very large (>>10000). As an alternative,
       the .csv file created, may be used as a source for creating surface plots.
    f) Streams that have POC errors may have certain frames that are decoded but not
       displayed. To analyze such frames choose the decode-order analysis.

(3) In Closed Caption Analysis:
    a) Video Flickering observed during play or mouse movement when Closed Caption
       rendered over video.
    b) Closed Caption pre-scan of the file is done in decode order. The Closed Caption
       information derived from decoder analysis may be different from display order
       analysis. This e might result in CC Render over video list not being correct
       for some streams.

PLATFORMS
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The software has been verified with the Windows 7 (64 bit), Windows 8.1 (64 bit),
and Windows 10 (64 bit) platforms.