

"The contribution proposes values for maximum bit-rate and HRD/VBV buffer size for some levels defined in the JVT committee draft. A different definition of the peak bit-rate is proposed for low-latency and high-latency applications. In low-latency applications, the peak bit-rate is equal to the peak transmission bit-rate, whereas in high-latency applications, the peak bit-rate is equal to the peak video bit-rate."

JVT-D134 P2.0/3.1 [MacInnis+] Complexity Limitations for High Definition

"Per the CD, worst case compliant streams stress decoders much more than very difficult real world streams, particularly for high definition decoders. This document proposes a simple solution in terms of the maximum number of motion vectors per 2 macroblocks and limits on bi-directional blocks."

JVT-D064 P2.0/3.1 [Wenger+] Reasonable Limits

"This document proposes some upper bounds for the bit stream complexity. In particular, it a) limits the maximum number of motion vectors for any four consecutive macroblocks in a slice for levels 3 and above, b) sets an upper bound to the maximum number of bits per coded picture, c) limits the maximum length of a vertical motion vector. Furthermore, it proposes additional Parameter Set entries that allow an encoder to signal even lower bit stream requirements, in order to facilitate the resource management in decoders that allow for dynamic resource allocation."

JVT-D116 P2.0/3.1 [Zhou+] Restriction on Vector Spread in 8x8 Partitioning Mode

"The document proposes to constrain the 4x4, 8x4, 4x4 vector spread-out for the Baseline Profile&Level 2 and below. In the case of multiple vectors in an 8x8 block, the rectangular block of memory that encompasses all reference pixels required to perform luma motion compensation on all vectors within the block must contain no more than 484 bytes. By imposing such a restriction, the maximum number of reference block loading per macroblock could be reduced from 48 to 12 with no quality loss, while keeping the maximum memory bandwidth requirement unchanged."

JVT-D067 P2.0/3.1 [Wenger+] Levels in JVT

"The Level system agreed upon in previous meetings is adequate for most traditional mainstream video applications, but does not well serve several important and fast-growing types of non-traditional applications:

- Large picture sizes at very low frame rates, as in
 - Video conferencing systems
 - Telemedicine systems
 - Security camera applications
- Low-cost (often portable) video devices with very small displays

Each current Level specifies a fixed processing rate (MB/sec) and decoder memory requirement (ultimately bytes), but there is no way to choose a different ratio of processing rate to memory, in order to fit an application. In this contribution, we propose a solution to this problem."

Discussion: interesting idea, needed for various new products, support for both parts of the proposal / creates a big number of conformance points

Conclusion: revisit at the next meeting

JVT-D144 P2.0/3.1 [McMahon] Support for Level 5

Contribution supports definition of a Level 5 for very high spatio-temporal resolution support.

Level 5 request includes potential need for 10 or 12 bits, possibly 4:4:4.

Discussion: Why define a level 5 with 8-bit samples and 4:2:0 when contribution seems to advocate greater bit depth and greater chroma resolution?

4.18. Supplemental Enhancement Information

Agreed principles regarding SEI:

- Not required to normatively reconstruct the sample/pixel values
- Non normative for decoder's compliance to JVT spec
- Assists decoder in processes related to decoding, e.g. Pan Scan, Display, and/or processes of other anticipated elements, e.g. help in muxing
- Should be useful for wide range of applications

Does SEI go in the HRD buffer (if yes then which one)? Resolve in HRD output document and future study.

JVT-D097 P2.2.1/3.1 [Wang+] On Random Access

"Two issues on random access are proposed. First, we propose the adoption of gradual decoder refresh based on isolated regions, flexible macroblock order, and turning off loop filter in slice boundaries. Second, we propose the signaling of open decoder refresh and leading pictures. The term "leading picture" is used for any frame or picture that is not correctly decodable after accessing the previous I frame randomly and whose presentation time is before the I frame's presentation time. An open decoder refresh picture refers to a randomly accessible frame with leading pictures."

Proposes three things

1. Random access to conventional gops: special picture type called ODR (an I or SI picture that indicates that all temporally subsequent pictures can be decoded and displayed), leading frame flag in slice headers -- this could be an SEI indication rather than a special picture type (IDR is different because IDR has mandatory decoder effect)
2. Detection of editing cuts, sub-sequence identifier in slice headers (broken link support)
3. GDR – a) turn off loop filter at slice boundaries, b) evolving slice groups for FMO, c) start of GDR period with special NAL unit type, d) GDR signaling as in JVT-B109.

Proposal:

1. Random Access to Conventional GOPs
 - o Bug fix
 - o Random Access to Conventional GOPs
 - o Identified by ODR picture (similar to IDR) mandated to be an I or SI picture
 - o Leading frame flag in slice headers

Discussion: functionality can be achieved using SEI messages, since an ODR picture is an I or SI picture with the attached information that the encoder made temporally preceding dependent pictures ...

Proposal: ODR NUT

Discussion: can be done differently

Proposal: ODR SEI message

Adopt.

2. Detection of Random Access and Editing Cuts

- Bug fix
- Sub-sequence identifier in slice headers additional gains compared to broken sequence identifier as of MPEG-2

Consider only the SEI variant of this concept.

3. Gradual Decoder Refresh

- Enhancement
- Turn off loop filter at slice boundaries

Consider this as a separate issue for further study.

- Evolving slice groups for FMO

Adopt.

- Start of GDR period identified with the GDR NAL unit type (similar to IDR)

Covered using SEI message.

- GDR SEI signaling as of JVT-B109

Adopt.

Notes: Non-normative (for decoding process relative to JVT spec).

Recommendation: Adopt it (SEI and evolving slice group aspects only). JVT experts are encourage to think about using it for other applications, like trick-mode, and see in the October meeting if this needs to be further extended for those applications.

JVT-D126 P2.2.1/3.1 [Sullivan] SEI for Gradual Decoder Refresh / Open GOP

" The functionality known as "gradual decoder refresh" (GDR) or (rather more narrowly) "open GOP" is a commonly-used feature of MPEG-2 video that remains unsupported in the JVT design. GDR differs from the "instantaneous decoder refresh" (IDR) feature supported in JVT video by allowing the use of predictions across the location of the random access point in the bitstream while providing information on how to deal with these pictures and initialize the decoding process. This proposal advocates the adoption of GDR functionality using SEI messages, now that the SEI syntax structure is in place."

Expression of duration of end of GDR using frame numbers. (note that frame numbers are incremented by one against frame numbers of previously stored reference frames)

Switching off deblocking filter to be considered separately.

Placing HRD parameters at random access points.

Adopted.

Broken link support.

Advice SEI message.

Adopted.

Recommendation: Adopt.

JVT-D098 P2.2.1/3.1 [Hannuksela+] Signaling of Enhanced GOPs

"The key unit of the enhanced GOP concept is a sub-sequence that represents a number of inter-dependent pictures that can be disposed as a group. It is shown that conveying the sub-sequence identifier in the slice header is essential for many purposes. Syntax and semantics for the enhanced GOP concept is proposed."

Sub-sequence identifiers adopted as SEI only. See notes above re JVT-D097.

4.18.1. Further Study Topic: SEI Spare Pictures

JVT-D100 P2.2.1/3.1 [Tian+] Spare Pictures

"We propose signaling of entire and partial spare pictures with the Supplemental Enhancement Information mechanism. With the help of the proposed signaling, receivers may avoid unnecessary picture freezing, feedback, and error concealment. Furthermore, spare pictures also help in error concealment."

Much of the picture sometimes stay the same. Proposes SEI to indicate that pictures or parts of pictures are practically the same.

Two ways to indicate "spare picture": 1) whole picture (as in H.263), or 2) macroblock map.

SEI message says for example that picture number X is similar to picture number Y.

Targeted for static-camera sequences – may be useful for others, but this is the motivation of the proponent.

Non-normative.

Reaction generally favorable – some members indicated that this is useful and used in real products, some reservation expressed regarding stage of the project (response that this is non-normative and following up on an intent expressed for further study of this proposal from Fairfax, following up on prior intent to investigate H.263 SEI features). Remark that perhaps we should consider spare pictures as more mature than the macroblock map part of the proposal.

Recommendation: Adopt it.

JVT-D099 P2.2.1/3.1 [Wang+] Signaling of Shot Changes

"This contribution proposes signaling of shot changes in the JVT bitstream for two purposes: First, simulations show that the proposed signaling, together with proper error concealment methods, can significantly improve visual quality in packet-lossy environments. Second, shot boundaries can be easily and robustly detected from coded bitstreams for video indexing/retrieval."

Primary case for adoption is the usefulness of this for error concealment purposes.

Non-normative, Good Idea

Recommendation: Adopt it

4.18.2. New Proposal: SEI relating to FMO

JVT-D096 P2.2.1/3.1 [Hannuksela+] Optional MC Limitations for FMO

"This contribution proposes an optional motion compensation limitation on flexible macroblock order regarding the pan scan rectangle SEI information, to achieve computation and bitrate scalability, for a couple of applications, such as picture-in-picture of TV and multimedia messaging service."

Good idea. Consider loop filter interaction. Need to show that it is useful for wider range of applications. Consider to decouple with pan and scan.

Recommendation: Revisit in the next meeting.

4.18.3. Clean-Up: Filler Data and User Data

JVT-D127 P2.2.1/3.1 [Sullivan] Filler Data & SEI for User Data

"This contribution proposes adding the capability to handle "filler data" and both registered and unregistered user data to the JVT syntax design."

4.18.3.1. Notes:

- (1) There should be an SEI message for the user data. **Adopted.**
- (2) Provision to have a registration authority for the user data. **Agreed**
- (3) One of the many forms of the user data shall be ITU-T Rec T.35 compliant. JVT will specify an ID number for that form of data. **Adopted**
- (4) Filler data not related to HRD compliance is sent through SEI. **Adopted**
- (5) Filler data required for HRD compliance is sent as NUT (normative). **Adopted.**

4.18.4. New Proposal: SEI for Chroma Upsampling

JVT-D071 P2.2.1/3.1 [Rodriguez] Transmission of Auxiliary Chroma_420 Information in SEI

"This contribution proposes transmission of ancillary chroma information for chroma upsampling to perform the closest reverse filtering that matches the chroma subsampling performed by the encoder. We propose transmission of a minimal amount of ancillary information."

Notes: Non-normative. Standard will specify the normative location of Chroma sample. An optional SEI message is proposed be sent to indicate that the encoder is not following the normative locations. Decoder will have an option to either ignore this message and do chroma upsampling based on normatively specified locations or take this message into consideration to change

upsampling filters. Accepted in principle. Arturo needs to provide the table before the final adoption.

Comments: Important consideration of a poorly-understood issue.

Recommendations: Adopted.

5. NB Ballot Comments

JVT-D082 Ballot [JNB to MPEG] Comments on JVT CD

JVT-D140/M8479 (MPEG document M8479) FINB Comments on AVC

JVT-D141 [ILNB] ILNB Comments

JVT-D142 [GNB] GNB Comments

JVT-D150 [ISO] Ballot Comments

JVT-D151/M8510 [KNB] Ballot Comments

(SENB Comments in JVT-D150)

(UKNB Comments in JVT-D150)

(USNB Comments in JVT-D150 (additional comments appended late))

Disposition recorded in JVT-D149.

6. Performance Analysis & Demonstration

JVT-D022 Info. [Wiegand+] H.26L streaming demonstration

JVT-D023 Info [Winger+] Videolocus Real-Time JVT SD Encoder/Decoder Demos

Hardware-assisted encoder

Software decoder

JVT-D068 Info. [Reader] A History of Video Compression (draft)

"This contribution is a draft history of the development of the H.26x and MPEG standards. It is hoped that it will assist understanding of the origins and relative contribution of the various coding tools."

6.1. Test Model, Reference Encoding, Error Handling

6.1.1. Tuesday test model, perf analysis, demo

Rate control: two proposals: Without rate control, we can't even exercise some coding tools. Find a rate control that meets HRD requirements.

R-D Optimization: Choose a different Lambda for B pictures. Adopt.

High-complexity mode decision for error prone: Adopt – add as new mode.

Error detection watermark trick: Would like more information & verification.

Motion estimation: Two proposals: JVT-D117 adopted.

Get final notes from Chul-Woo Kim.

6.1.2. Rate Control

JVT-D030 P2.2.1/3.1 [Ma+] Rate Control on JVT Standard

"Unlike the existing video coding standards, rate control in JVT standard becomes quite difficult especially at macroblock level because both rate control and rate-distortion optimization (RDO) will involve the quantization parameters. In this proposal, we develop an efficient rate control algorithm at macroblock level for the coming JVT standard by considering both rate control and RDO."

JVT-D070 P2.0/3.1 [Wang+] An MAD-based rate control strategy

6.1.3. R-D. Optimization

JVT-D041 P2.0/3.1 [Tourapis+] Perf. Analysis of Lagrangian Parameter Selection in JVT

"In this contribution we evaluate the performance of the Lagrangian Parameters used within the Rate Distortion Optimization of the current JVT codec (unofficial version 3.3) with regards to B frames. In particular, we find that the current Lagrangian parameters are excessively large and could have adverse effect on the overall performance of the encoding. We believe that any further experiments on the decision of the lagrangian parameters should also consider B frames, especially considering that the current software does not support any other Multi-Hypothesis pictures."

JVT-D118 P2.2/3.1 [Kim+] High-Complexity Mode Decision for Error Prone Channel

" This contribution proposes efficient mode decision algorithm by modeling the drift

noise which is inherited from the referenced block. Average performance improvement over error resilient mode decision of JM is about 14% with peak improvement of 47%."

JVT-D120 Info. [Kim+] Verif. result of JVT-C084 (Lagrange Mult. & RDO)

"Verification result of JVT-C084 which is about the optimality of Lagrangian multiplier of current JM."

6.1.4. Error Detection

JVT-D048 P2.2.1/3.1 [Zhou+] Fragile Watermark based Error detection scheme

"An error detection scheme using fragile watermark for hybrid codec based video communication is proposed, it functions like parity checking but don't need to insert the parity checking bits for every MB. It improves the error detection rate and error correct detection rate dramatically, penalized maximally of 0.2dB at QP=1, a penalty less than 0.05dB at the frequently used QP range (Qp from 10 to 30). To take the advantages of the watermark, a standardization of the scheme should be taken into account."

6.1.5. Fast Motion Search

JVT-D069 P2.2.1/3.1 [Chen+] Algorithm for fast fractional pixel motion search

JVT-D117 P2.2/3.1 [Hong+] Further Improvement on Motion Search Range Decision

"This contribution proposes the intelligent search range decision depending on the motion vectors around the neighboring blocks. Over 70% of encoding time reduction was achieved with negligible performance degradation. Performance can be improved by combination with other fast search algorithm."

JVT-D060 Info. [Jeon] Verif. Result for Search Range Decision (JVT-C065)

"In this document we verified the results for "Modified Search Range Decision" proposed in document JVT-C065. We have followed the same test conditions used in JVT-C065, and obtained similar (but slightly better) result compared to the contribution JVT-C065. Detailed performance comparison is in JVT-D060.xls. The results show that encoding time is reduced by at least 51 % (foreman) and up to 75 ~ 77 % (Paris, Mobile, and Tempete) without significant loss in visual quality."

7. Contributions on project planning

JVT-D152/M8591 from JNB on confirmation of coding efficiency / verification testing.

JNB requests confirmation of coding efficiency. Would like to have software reflecting document so can do testing of visual quality e.g., relative to MPEG-4. Asking for AHG activity to begin and to get software that reflects the design. JNB desires some kind of test before FDIS. Not necessarily formal subjective testing.?

8. IPR-Related Contributions

Several contributions were provided in regard to intellectual property aspects of the technology used in the draft for the project as outlined below. These issues are being considered primarily at the parent-body level.

All parties are urged to report their IPR in the draft design as required by parent-body policies. IPR letters should be submitted to the WG11 convenor Leonardo Chiariglione and to the ITU-T Secretariat. Such letters must be submitted prior to approval of the standard, and therefore should be submitted now as approval is imminent. Anyone seeking help to determine how to file these letters can contact the JVT management team.

JVT-D129 Report [Sullivan] JVT IPR Status Report

Review of policy and status.

JVT-D035 Comment [van der Meer] IPR matters for JVT

This contribution contains a letter sent by Philips to ITTF on IPR matters. See also the ITTF report JVT-D130.

JVT-D077 Comment [Lindbergh+] Support for JVT Royalty Free Baseline

Resubmission of JVT-C150 – now with 23 co-contributors: Apple, BT, Broadcom, Cisco, Conexant, DT, FastVDO, Glance, Nokia, Polycom, RADIVISION, SANDVIDEO, Siemens, Sun, Tandberg, Telenor, Teles AG, TI, UBVideo, VCON, VideoLocus, ViXS, and VWeb.

JVT-D130 Info. [ITTF] ITTF Report on Responses to RFTI re JVT Baseline

Report of the outcome of responses to the "request for technical information" issued after the Fairfax meetings of JVT.

JVT-D072 Comment [Kogure] IPR WG establishment proposal

Comments on the need to work toward licensing availability for the new video standard.

9. Wrap-up of meeting

Disposition of NB Comments D149

High-level syntax JVT-D145

Frame/Field JVT-D018r1

JVT-D152/M8591 – request to MPEG re verification testing

Complexity analysis JVT-D138/M8547, JVT-D153/M8696

Conformance testing – Part 4 AMD.

Ref software – Part 5 AMD.

Starting work on conformance

Starting work on verification testing – target 2003

9.1. Changes Adopted from CD to FCD

As listed in JVT-D156.

9.2. Changes to Test Model Reference Encoding

- Rate control per JVT-D030
- Alteration of Lambda for B pictures per JVT-D041
- High-complexity mode decision for error/loss-prone environments JVT-D118
- Fast motion estimation added (not in common conditions) JVT-D117

Get additional notes from Chul-Woo Kim – check email.

9.3. Further Study Areas After Meeting

1. Consideration of intra prediction entropy coding for CABAC and ABT
2. Complexity reduction of CAVLC per JVT-D083 (modified to avoid >16 bit)
3. Consideration of memory access in intra prediction
4. Final decision on "special position" for motion compensation
5. Consideration of division operations (e.g., in SP/SI picture specification)
6. Consideration of time/decoding syntactical interaction considering Haskell & Hannuksela time substitutes
7. Direct mode finalization
8. Aspects of ABP as noted above
9. Chroma loop filtering selection between JVT-D037 and JVT-D049 complexity reductions
10. Loop filter boundary strength simplification in JVT-D037
11. Verification of MB-level AFF
12. Consideration of non-ABT alternate scan

13. Consideration of SEI for motion vector restrictions per JVT-D096 and gradual random access extending JVT-D097
14. Finalization of HRD regarding post-decoder buffering
15. Consideration of reduced-memory-access motion compensation.
16. Interlaced sampling structure and temporal alignment issues in frame-structured MC JVT-D079
17. max bits per mb ... JVT-D154
18. number of mv's in two or more consecutive... [notes elsewhere]
19. Initialization selection on slice basis for CABAC JVT-D020
- 20.

9.4. Future planning

Conformance testing – Part 4 AMD. (AHG)

Ref software – Part 5 AMD.

Starting work on confirmation of coding efficiency / verification testing JVT-D150

Software availability – not expected until Dec/March

Selection of test sequences: interlaced and progressive, various resolutions

References: MPEG2 and MPEG4 quality? Codec or product? Pre-filtering, mode decision, post-filtering, ...

Plan to test core codec under well-defined conditions (e.g., using reflecting similar degree of optimizations and enhancements for all codecs)

Confer with Vittorio

9.5. Output document review

High-level syntax JVT-D145

Frame/Field JVT-D018r1

FCD draft (editing period to August 9)

JM Reference encoding method JVT-D147 (editing period)

HRD JVT-D146

List of changes to CD design (items noted in DispOfC, with specific remarks added) JVT-D156

Disposition of WG11 NB Comments JVT-D149

Modified direct mode & ABP JVT-D155

JVT-D154 Profiles & Levels

10. Primary Meeting Results

10.1. Communication Practices, Ad Hoc Groups Established, and AHG Charters

The general JVT reflector can be subscribed to by clicking on “join jvt-experts” at

<http://mail.imtc.org/cgi-bin/lyris.pl?enter=jvt-experts>

Email for the reflector should be sent to jvt-experts@mail.imtc.org.

The subject line of each email message will automatically be prefixed with "[jvt-experts]". Project identification and unsubscribe information will be attached to the bottom of each reflected message.

Our new ftp site recently established for JVT use is <ftp://ftp.imtc-files.org/jvt-experts/>. Our prior site containing the files of the first and second JVT meetings was the VCEG site at <http://standard.pictel.com/ftp/video-site>.

We heartily thank the International Multimedia Telecommunications Consortium for their great generosity in hosting both our email reflector and our ftp site.

Many good technical discussions have been taking place on the JVT reflector and the reflectors of the various JVT ad hoc groups.

Below is the current list of interim JVT ad hoc groups established at the Fairfax meeting that report to the Klagenfurt meeting, their chair contact information, and ad hoc reflector lists.

To AHG Chairs:

- 1) Please check this to make sure it contains correct and complete information for your ad hoc group. (Particularly if the Discussion entry says "contact the chairs/general...")
- 2) Please always include the three rapporteurs on any ad hoc group discussions.
- 3) When possible, put an identifying tag in the subject line for discussions of a particular ad hoc group. E.g., "[jvt-car]"

We need to make sure that our process is open for participation by all interested parties. We also hope that anyone working in an area covered by a designated ad hoc group will try to coordinate their work with the activities taking place in that group to the maximal possible extent. Care should especially be taken in areas that affect multiple ad hoc groups.

10.1.1. JVT Project Management

Chairmen: Gary Sullivan (garysull@microsoft.com), Ajay Luthra (aluthra@motorola.com), and Thomas Wiegand (wiegand@hhi.de)

Charter: To further the work on the JVT project as a whole, including project planning, work coordination, and status review.

Discussions: General JVT Reflector

10.1.2. Text Editing and Reference Software Development

Chairmen: Thomas Wiegand (wiegand@hhi.de), Karsten Suehring (suehring@hhi.de), and Aharon Gill (aharon@zoran.co.il).

Charter: To further the work on the draft text and software implementation of the joint design, including incorporation of modifications as approved by the group, production of the joint final committee draft text, collection of comments on the text and software, preparations to facilitate necessary future text modification work, and provision of improved software for group use in future experiments and for eventual approval as standardized reference software.

Discussions: Contact the chairs / General JVT Reflector

10.1.3. Coding Efficiency Analysis and Testing of JVT/AVC codec

Chairmen: Vittorio Baroncini (vbaroncini@tiscalinet.it), Xuemin "Sherman" Chen (schen@broadcom.com), and T.K. Tan (tktan@spg.yrp.nttdocomo.co.jp).

Charter: To evaluate the coding efficiency of the H.264/MPEG-4-AVC codec in comparison with MPEG-4 part 2 and MPEG-2 part 2; To formulate the testing conditions and schedule; To identify and secure latest available software for performing the test.

Discussions: avc_ce@ient.rwth-aachen.de

Subscription: Contact the chairs.

10.1.4. High-Level Syntax and Relationship to Systems Finalizations

Chairmen: Miska Hannuksela (miska.hannuksela@nokia.com), Young-Kwon Lim (young@netntv.co.kr), Thomas Stockhammer (stockhammer@ei.tum.de)

Charter: To study the high-level syntax of JVT content (particularly syntax at the slice header level, picture parameter set level, and sequence parameter set level) to determine whether that this syntax is fully and properly specified and supports the carriage of JVT bitstreams for all appropriate transport environments and to consider the syntax and interaction issues surrounding the connection between time and the decoding process.

Discussions: jvt-car@advent.ee.columbia.edu

Subscription: email majordomo@advent.ee.columbia.edu
saying "subscribe jvt-car"

10.1.5. CABAC Finalization

Chairman: Detlev Marpe (marpe@hhi.de)

Charter: To study the CABAC design with regards to completeness and correctness of specification, focusing particularly on the consideration of CABAC for intra prediction entropy coding; and to evaluate and cross-verify the potential need for CABAC state-initialization selection on a slice basis as proposed in JVT-D020.

Discussions: jvt-CABAC@hhi.de

Subscription: Contact the chair

10.1.6. Structured VLC for CAVLC Evaluation

Chairmen: Greg Conklin (gregc@real.com) and TK Tan (tktan@spg.yrp.nttdocomo.co.jp).

Charter: To study the use of a structured VLC for CAVLC as per JVT-D083 (potentially with modifications to avoid greater than 16-bit codes).

Discussions: jvt_vlc_adhoc@yahoogroups.com
Subscription: jvt_vlc_adhoc-subscribe@yahoogroups.com

10.1.7. Reference Example Encoding Methods

Chairman: Chul-Woo Kim (charlie@mcubeworks.com)

Charter: To further the work on description of example reference encoding methods for the JVT codec design as described in the joint reference model toward eventual adoption as non-normative standard text, including the drafting work toward production of a new draft joint model reflecting the outcome of the Klagenfurt meeting.

Discussions: Contact the chair / General JVT reflector

10.1.8. Level Constraints

Chairmen: Yoichi Yagasaki (yagasaki@AV.CRL.SONY.CO.JP) and Lowell Winger (lwinger@videolocus.com).

Charter: To investigate the constraints established in the levels defined in Annex A of H.264/AVC in order to close outstanding TBD's in the text and evaluate the need for a limit on the maximum number of bits per macroblock and the potential value of such a limit.

Discussions: General JVT reflector.

10.1.9. Division Operator Analysis

Chairmen: Barry Haskell (bhaskell@apple.com) and Gary Sullivan (garysull@microsoft.com)

Charter: To determine whether any division operators are specified in the current draft text that should be avoided and to study possible ways to avoid any such division operators that are found.

Discussions: General JVT reflector.

10.1.10. Bitstream Exchange

Chairmen: Xuemin "Sherman" Chen (schen@broadcom.com) and Karsten Suehring (suehring@hhi.de)

Charter: To establish methods and begin the exchange of H.264/AVC NAL unit streams for interoperability testing and development of conformance tests.

Discussions: Contact the Chair / General JVT Reflector

10.1.11. Motion Compensation Memory Analysis and "Special Position"

Chairman: Ajay Luthra (aluthra@motorola.com) and Xuemin "Sherman" Chen (schen@broadcom.com)

Charter: To investigate the usefulness of the "special position" for motion compensation toward the potential removal of the use of a different filtering method applied in this case; and to evaluate the potential need for methods of reducing the memory access requirements for motion compensation prediction, focusing in particular on consideration of the number of distinct motion vector values applied in local regions (such as for two consecutive macroblocks as in JVT-D134), the "spread-out" in values between distinct motion vectors in local regions (such as for 8x8 regions as in JVT-D116), the use of a shortened interpolation filters under some conditions as in JVT-D029, JVT-D080, and JVT-D110, and the use of memory region limitation for interpolation as in JVT-D106.

Discussions: Contact the chair / General JVT Reflector

10.1.12. Interlaced Chroma, Alternate Scan, and Verification Issues

Chairmen: Eric Viscito (eric.viscito@conexant.com), Limin Wang (limin.wang@motorola.com), and Byeungwoo Jeon (bjeon@yurim.skku.ac.kr)

Charter: To investigate the interlace-related issues of sample alignment for chroma and possibly for luma as raised by JVT-D079, the use of alternate scan patterns without ABT as raised by JVT-D073, and to complete verification of MB-level adaptive-frame/field coding.

Discussions: jvt-asic@media.skku.ac.kr.

Subscription: <http://media.skku.ac.kr/mailman/listinfo/jvt-asic>

10.1.13. Intra Prediction Memory Analysis

Chairwoman: Marta Karczewicz (marta.karczewicz@nokia.com)

Charter: To consider memory access issues for intra prediction as raised by JVT-D026.

Discussions: Contact the chair / General JVT Reflector

10.1.14. B picture and ABP Finalization

Chairmen: Byeong-Moon Jeon (jeonbm@lge.com), Yoshihiro Kikuchi (yoshihiro.kikuchi@toshiba.co.jp), and Alexis Tourapis (alexis@msrchina.research.microsoft.com)

Charter: To study the need for changes to the draft text to finalize the design and description for B slices and prediction weighting focusing on direct mode prediction finalization, the syntax and interaction for issues surrounding the connection between time and the decoding process, and consideration of any open issues surrounding weighted prediction such as whether to apply customization of weights at the macroblock level or below.

Discussions: Contact the chair / General JVT Reflector

10.1.15. Hypothetical Reference Decoder

Chairman: Eric Viscito (eric.viscito@conexant.com)

Charter: To study the design of hypothetical reference decoder buffering compliance verifier, focusing on the finalization of specification of the delay and memory constraints imposed by retention of decoded pictures in the multi-picture buffer until the arrival of the output time for each picture in addition to the need for retention of decoded pictures in the multi-picture buffer until the pictures are marked as unused for future referencing purposes.

Discussions: Contact the chair / General JVT Reflector

10.1.16. Chroma and Interlaced Loop Filtering and Boundary Strength Finalization

Chairman: Eric Viscito (eric.viscito@conexant.com) and Peter List (peter.list@t-systems.com)

Charter: To work toward determining the appropriate selection of chroma loop filtering complexity reductions between the alternative proposals of JVT-D037 and JVT-D049; to study the need for the loop filtering boundary strength simplification in JVT-D037; and to determine any need for clarification or modification regarding the relationship between the coding of interlaced video and loop filtering.

Discussions: loopfilter@berkom.de

Subscription: Contact Peter List (peter.list@t-systems.com)

10.1.17. Supplemental Enhancement Information

Chairman: Miska Hannuksela (miska.hannuksela@nokia.com)

Charter: To consider the need for clarification or modification of the supplemental enhancement information defined in the draft text, focusing on the consideration of SEI for motion vector restrictions as per JVT-D096 and gradual random access extending JVT-D097.

Discussions: Contact the chair / General JVT Reflector

10.2. Summary Information Report and Action Requests from the JVT

The Joint Video Team (JVT) organization reports the following action requests and information to its ISO/IEC MPEG and ITU-T VCEG parent bodies and to its participants:

10.2.1. The JVT forwards the following documents to its parent bodies for information and approval

Title	No.	TBP	Available
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Text of Final Committee Draft of Joint Video Specification (ITU-T Rec. H.264 ISO/IEC 14496-10 AVC)	JVT-D157 (WG11 N4920)	Y	02/08/08
Disposition of NB Comments for Committee Draft of Joint Video Specification (ITU-T Rec. H.264 ISO/IEC 14496-10 AVC)	JVT-D149 (WG11 N4916)	Y	02/08/08
Description of Profiles and Levels of Draft Joint Video Specification	JVT-D154	Y	
Description of Specific Actions Taken on the Drafting of Joint Video Specification	JVT-D156	Y	
High-Level Syntax Design Description	JVT-D145	Y	
HRD/VBV Buffer Model Design Description	JVT-D146	Y	
Motion Prediction, B-Picture Direct Mode, and ABP Design Description	JVT-D155	Y	
Preliminary Plan for Verification Testing of Joint Video Specification	JVT-D158	Y	
Reference Encoding Method Description JM 4	JVT-D147	Y	02/08/09

10.2.2. The JVT reports the establishment of the following Ad Hoc groups:

Title	Chair	Mtg
JVT Project Management	Gary Sullivan, Ajay Luthra, and Thomas Wiegand	Y
Text Editing and Reference Software Development	Thomas Wiegand, Karsten Suehring, and Aaron Gill	02/07/27-02/07/29
AHG on coding efficiency analysis and testing of AVC/JVT Codec	Vittorio Baroncini (FUB), Xuemin Chen (Broadcom), TK Tan (NTT DoCoMo)	
AHG on High-Level Syntax and Relationship to Systems Finalization	Miska Hannuksela, Young-Kwon Lim, and Thomas Stockhammer	
AHG on CABAC Finalization	Detlev Marpe	
AHG on Structured VLC for CAVLC Evaluation	Greg Conklin and T.K. Tan	
AHG on Reference Example Encoding Methods	Chul-Woo Kim	
AHG on Level Constraints	Yoichi Yagasaki and Lowell Winger	
AHG on Division Operator Analysis	Barry Haskell and Gary Sullivan	
AHG on Bitstream Exchange	Sherman Chen and Karsten Suehring	
AHG on Motion Compensation Memory Analysis and "Special Position"	Ajay Luthra and Xuemin Chen	
AHG on Interlaced Chroma, Alternate Scan and Verification Issues	Eric Viscito, Limin Wang, Byeungwoo Jeon	
AHG on Intra Prediction Memory Analysis	Marta Karczewicz	

AHG on B picture and ABP Finalization	Byeong-Moon Jeon, Yoshihiro Kikuchi, and Alexis Tourapis	
AHG on HRD	Eric Viscito	
AHG on Chroma & Interlaced Loop Filtering and Boundary Strength Finalization	Eric Viscito and Peter List	
AHG on Supplemental Enhancement Information Finalization	Miska Hannuksela	

10.2.3. The JVT future meeting plans proposed by the JVT Chair|Rapporteur are as follows:

Approx Date	Auspices	Location	Project Milestone
Oct. 9-17, 2002	ITU-T	Geneva, CH	JM5, AAP Consent
Dec. 9-13, 2002	JTC1	Awaji, Isl., JP	JM6, FDIS & Rec.
Feb./March, 2003	<Ballot Result>	N/A	IS
March, 2003	ITU-T	TBD	
July, 2003	JTC1	Trondheim, NO	Verification Test Completion
Sept, 2003	ITU-T	TBD	
Dec., 2003	JTC1	Hawaii	Reference Software & Conformance Standardization Completion

It is noted that final meeting dates for the next meeting and for any preparatory ad-hoc meetings if necessary within a few days of that next meeting in Geneva are to be announced with 30 days notice and approved by SG16 and WG11 management.

10.2.4. The JVT adopted a text of its joint draft for technically-aligned standardization approval by the parent bodies, including in particular a recommendation for approval in ISO/IEC as a Final Committee Draft [JVT-D157 / N4920]. This includes the changes recorded in the Disposition of WG11 NB ballot comments as recorded in JVT-D149 / N4916 and the specific actions detailed in other JVT output documents.

10.2.5. The JVT authorizes to the editor an editing period for production of the Joint FCD text and final text of disposition of WG11 NB comments, to be provided by Aug 8, 2002.

10.2.6. Regarding the WG11 Committee Draft ballot comments on the technical content of the draft joint video specification (ITU-T Rec. H.264 | ISO/IEC 14496-10 AVC), the JVT thanks the following National Bodies to WG11 for their comments and reports its response to those National Bodies as recorded in JVT-D149 / N4916:

Finland, Germany, Israel, Japan, Republic of Korea, Sweden, United Kingdom, and the United States of America.

10.2.7. The JVT appoints Aaron Gill as a special assistant editor focusing on completeness, consistency, and terminology in the joint video specification.

10.2.8. The JVT instructs its software coordinator Karsten Suehring to produce a schedule by Aug 9, 2002 for integration of the changes to the draft design in consultation with the experts regarding prioritization of integration order.

10.2.9. The JVT reports the following summary information regarding the three profiles defined in the joint video draft standard specification from JVT-D154:

The Baseline Profile consists of the following features:

- **I and P picture types**
- **In-loop deblocking filter [with dithering removed]**
- **Progressive-scan pictures**
- **Interlaced-scan pictures (only for decoders supporting Level 2.1 and above) - frame/field adaptive at picture level only.**
- **1/4-sample motion compensation**
- **Tree-structured motion segmentation down to 4x4 block size**
- **VLC-based entropy coding**
- **Arbitrary Slice Order (ASO) and flexible macroblock ordering (maximum 8 slice groups)**
- **Chrominance format 4:2:0**
- **Redundant slices**

The Main Profile consists of the following features:

- **B pictures**
- **CABAC**
- **Adaptive block-size transforms (ABT)**
- **Adaptive Bi-Prediction (ABP)**
- **Interlaced pictures (only for decoders supporting Level 2.1 and above) - frame/field adaptive at picture level and macroblock level.**
- **All features included in the Baseline Profile, except,**
 - **Arbitrary slice order (ASO) and flexible macroblock ordering (FMO)**
 - **Redundant Slices**

Profile X (final name is TBD) consists of the following features:

- **B pictures**
- **SP and SI pictures**
- **Data partitioning**
- **Adaptive Bi-Prediction (ABP)**
- **All features included in the Baseline Profile**

10.2.10. The JVT thanks Siemens, AG for the use of its D-1 VTR in our work during the meeting.

10.2.11. The JVT thanks the University of Klagenfurt and Hermann Hellwagner in particular, for the provision of excellent facilities during the 4th meeting of the

JVT.

The 4th (Klagenfurt) JVT meeting was closed at 1:25pm Friday, July 26, 2002