

Source: Apple Computer, Ericsson, France Telecom, Fraunhofer, Nokia, ORANGE, Panasonic, Philips, RealNetworks, Sharp, Toshiba, Vodafone

Title: Support for the adoption of Advanced Video Coding (AVC/H.264) into Release 6

Document for: Discussion

Agenda Item: 7.4.2

In the recent SA4 meeting in Prague, consensus was not reached over two issues, which meant that the CRs to adopt AVC (H.264) were not presented to SA plenary by SA4. They are instead brought to SA#25 for approval by a number of supporting companies and have the document numbers listed below.

- SP-040655 Proposed CR008R1 to 26.140: Update of MMS codecs and formats with H.264
- SP-040656 Proposed CR075R1 to 26.234: Introduction of the H.264 (AVC) video codec into the PSS service
- SP-040657 Proposed CR004R1 to 26.244: Storage of H.264 (AVC) video in 3GP files
- SP-040658 Proposed CR008R1 to 26.235: Introduction of the H.264 video codec into packet-switched conversational services
- SP-040659 Proposed CR010R3 to 26.111: 3G-324M Improvements
- SP-040660 Proposed CR014R3 to 26.911: 3G-324M Improvements

This contribution first summarizes the two issues over which a consensus was not reached and then includes our discussion of these two issues.

1) "The encoder complexity and quality are not defined or constrained."

TD S4-040590 (Revised Technical Report on Video Codec Selection in Rel-6) summarizes the issue as follows: Concerns have been raised about the fact that the encoder is not fully specified in H.264/AVC since only the decoding process, bit-stream syntax, bit-stream semantics and constraints on bit-streams are specified. Related to this issue is the concern that the computational complexity for an encoder is not specified either. Hence, it is not clear how much complexity is required to achieve the reported performance gain. Furthermore, the quality of the encoding process is not guaranteed (like for any video codec). Ensuring the quality of the encoding process is felt an important aspect in 3GPP compliant implementations.

We would like to remark that the concern is true for all standard video codecs, to date, because of a number of factors. It has so far proved difficult to establish an objective quality metric for video codecs ñ though, for example, PSNR is a reasonable measure of quality, it does not perfectly correlate to subjective quality. Then there are questions over whether each frame is measured and must meet the quality, or there is some time-averaging, and so on. Finally, video encoders have traditionally had a long period of improvement ñ the quality achieved today by MPEG-2 encoders comfortably exceeds what was expected when the standard was published, and some of those improvements are quite recent. For this reason bit-exact coding is not desirable and has not been specified for video.

For some services, in addition, notably PSS and network-inserted MMS, the encoder is off-handset and the complexity is not very relevant. In addition, 3G-324M and packet-switched conversational can be used in a non-symmetric way, i.e. a terminal can run H.263 encoder and receive and decode H.264 bitstreams.

Some encoding complexity measurements and the PSNR comparison of speed-optimized encoder versus the publicly available MPEG/ITU-T VCEG/JVT reference encoder (JM) have been given in S4-040048 (Annex A).

From a procedural point of view, SA4 has already agreed that H.264/AVC meets the complexity requirements by approving that it meets the qualification criteria (S4-030712) and that all the requested submission material (S4-030855) is provided. This is stated in the video codec ad-hoc group meeting report (S4-030859), approved by SA4 in SA4#29.

Recent work in a number of bodies ñ notably the Video Quality Experts Group (VQEG) working under the auspices of ITU-T SG 9 and ITU-T SG 12 ñ suggest that a video quality metric may be achievable. However, currently, such advances are only available for high-resolution, high quality video typically for TV applications. Indeed, VQEG is in the initial stages of investigating objective quality assessment of multimedia services accessed from mobile devices. The recommendation by

VQEG and standardization process within the relevant bodies, ITU-T SG 12/SG9, could potentially last until 2006. However, the introduction of new codecs in 3GPP should not be delayed for such a time frame.

We have no objection to opening e.g. a work item to establish a quality metric for video coding, and quality thresholds for the various codecs we have in the services in which they are used. But the introduction of new codecs should not be delayed while we do this work.

2) 'The decision that the codec was optional should be interpreted as "may" be used, not "should".'

At SA4 #30 (Malaga, Feb. 2004) the status of the codec was discussed. Some in the room felt that AVC yielded compelling video quality at the screen sizes and bit-rates of 3G networks, and that this was not true for existing mandated codecs (H.263 baseline), and that therefore AVC should be mandated. Against this, three concerns were raised:

- 1) 3GPP already has a mandatory codec.
- 2) Complexity is still a problem for low/mid-range terminals.
- 3) Concerns about non-technical aspects related to licensing that were also raised.

For these reasons, it was decided that the codec not be mandatory, i.e. that it be optional.

However, it is the undisputed consensus of SA4 that AVC yields the best quality of all the codecs in the 3GPP specifications; and many feel, as stated above, that it achieves commercially compelling quality. We feel that the 3GPP specifications should give guidance on choices, and that we should be encouraging interoperability of content and devices. The recommendation "should" recognizes this, and sets direction, while allowing the choice of lower-complexity codecs ñ down to H.263 baseline ñ if conditions warrant, including consideration of both technical issues such as complexity and also business issues such as the licensing.

If the licensing concerns remain, they should be addressed directly in a suitable forum where they can be openly discussed and resolved, not in the context of a technical working group. It may be that a suitable direction is for the SA plenary to approve the CRs contingent upon the completion of a licensing review (as was done in the DVD Forum, for example).

A statement that a codec "may" be used is almost an empty statement; codecs other than those described in 3G also "may" be used. Indeed, "may" should probably be used only when interoperability is not affected, which is not the case here. No technical reasons for preferring "may" were advanced at the recent SA4 meeting, whereas there are good arguments to prefer "should" detailed here and elsewhere.

For these reasons, we believe "should" is the correct choice between the two words that indicate that something is not mandatory.