Comment on the Proposal to Permit Reducing Orbital Spacing Between U.S. Direct Broadcast Satellites

Submitted by Sand Video, Inc.
January 23, 2004

Sand Video's mission is to provide superior broadcast quality digital video and audio compression semiconductor solutions for consumer digital video products. Sand Video's digital video codec solutions incorporate the significant enhancements in image quality and compression efficiency provided by the H.264/AVC coding standard while also supporting the existing MPEG-2 digital video compression standard.

Sand Video was founded in January 2001 by veterans of the digital imaging and semiconductor industries and is headquartered in Andover, Massachusetts. At the recent 2004 CES show Sand Video became the first company ever to demonstrate a silicon based high definition main profile H.264/AVC decoder. At CES Sand Video also announced that it will in the support Microsoft WM9 Series audio and video codec technology in its products.

Sand Video's understanding of the proposal to permit reducing orbital spacing between U.S. direct broadcast satellites suggests that the reduced spacing implies lower power utilization and thus a reduction in net bit rate (by approximately a factor of 2x) available through the satellite transponder. In order to compensate for the reduction in bit rate Sand Video wishes to propose that H.264/AVC advanced video compression technology be utilized as the video compression format for video streams to be delivered via satellites deployed with reduced orbital spacing. H.264/AVC technology provides significant bit rate reductions (on average 2.5x reduction in bit rate over MPEG-2) while preserving full video image quality. By utilizing H.264/AVC technology satellite service providers using reduced orbital spacing satellites can provide as much or more video content per unit bandwidth as compared with systems using MPEG-2. This means that not only will there not be a loss of transmission capacity as compared to existing systems, there will likely be an increase in capacity over satellite based systems deployed today.

The H.264 specification leverages similar coding methods used with MPEG-2 to achieve video compression including dividing video frames/fields into blocks of pixels for processing at block boundaries, and removing the spatial and temporal redundancies through prediction, transform, quantization and entropy coding. However, H.264 provides unique differences between previous standards to achieve greater compression with better video quality. The major enhancements include features such as:

- Grouping of macroblocks into slices (I, P, B, SI, and SP) with flexible macroblock ordering.
- Transform – Fixed 4x4 Integer transform with no mismatch as opposed to a DCT transform for MPEG-2.
- Quantization – Increased quanitization step size over MPEG-2.

- Entropy Coding – Three entropy coding operations supported including Variable Length Coding (VLC), Context Adaptive Variable Length Coding (CAVLC), and Adaptive Binary Arithmetic Coding (CABAC).
- Motion Estimation – Seven block sizes and shapes with ¼ pel motion estimation accuracy.
- Loop Filter – Deblocking filter to remove horizontal and vertical block edges within the prediction loop.
- Intra Prediction/Compensation – Nine modes of prediction for 4x4 luminance blocks.
- Variable block size motion prediction.
- Multiple reference picture selection.
- SP and SI pictures (or slices).

In summary, H.264/AVC advanced video coding technology provides substantial improvements in compression performance over the MPEG-2 standard. By utilizing advanced video compression satellite service providers can more than compensate for the anticipated bit rate reductions associated with reduced orbital spacing and maintain or even increase the net video transmission throughput of the system.

For more information please contact:
Don Shulsinger
Executive Vice President
Sand Video Inc.
200 Brickstone Square
Andover, MA 01810
www.sandvideo.com