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## NTT Press Releases

August 8, 2013

Nippon Telegraph and Telephone  
NTT Advanced Technology Corporation

### NTT Develops World's Highest-level Compression Software Encoding Engine Fully Compliant with Next-gen "HEVC/H.265" Video Coding Standard, Rolls Out "HEVC-1000 SDK" Codec Development Kit

-- Supports development of high-quality video over LTE mobile links and 4K video streaming systems --

Nippon Telegraph and Telephone Corp. (NTT Head Office: Chiyoda-ku, Tokyo; President and CEO: Hiroo Unoura) has developed compression software (an encoder engine) with the world's highest level compression performance that is fully compliant with the Main/Main10 profile of the next-generation "H.265/HEVC" (High Efficiency Video Coding) <sup>1</sup> video coding standard.

The H.265/HEVC standard delivers a two-fold improvement in compression efficiency compared to the prevailing H.264/AVC <sup>2</sup> standard in handling compression of video data. Using a unique proprietary technology, NTT has demonstrated a 2.5 times bandwidth saving at its maximum performance, thus holding the record for the highest practical level compression ever achieved. This means we are able to slash the required bit rate by 60% compared to the legacy H.264 standard without any loss of picture quality.

The H.265 technology will ease mobile data congestion, hold down network operator investment costs, provide users with higher definition content even on bandwidth-constrained networks, and promises to deliver high-quality video streaming over LTE lines, and 4K video streaming over IPTV, and other next-gen video services.

Acquiring the H.265 encoding technology from NTT, NTT Advanced Technology Corporation (NTT-AT, headquartered in Shinjuku-ku, Tokyo, President and CEO: Takashi Hanazawa) rolled out the RealFeel series HEVC software codec development kit "HEVC-1000 SDK" on domestic and global markets on August 8 (Thursday), 2013.

With this development kit, engineers have access to the latest HEVC standard in developing applications that conform to the highest level compression performance that is available. Certainly, we hope to bolster our domestic and international market share for video conversion application engines needed to produce content, but by bringing the kit out at this early date, we also hope to further expand the market for video streaming which requires better picture quality accompanied by higher rates of compression.

This will open the way to video streaming to smart phones and other mobile devices over LTE and other fast links, and to 4K video streaming that is currently getting a lot of worldwide exposure.

#### NTT : HEVC Software Encoder Engine R&D

##### Development Background


Today's mobile environment supports greater capacity over high-speed 4G LTE links, rapid penetration of video services for smartphones, and deployment of conventional video streaming services for mobile devices.

Yet faced with this rapid upsurge in communications traffic, network operators are seeking higher compression rates for video content. Clearly, a next-generation encoder engine that harnesses the new H.265/HEVC video coding standard is required to preserve image quality while achieving greater compression for ultra high-definition 4K and 8K video streaming that is already beginning to excite people's interest.

Moreover, in order for audiences to enjoy IPTV and other video streaming services, efficient video delivery capability that equalizes the flow of data over the network is required, but HEVC does not support this functionality. Another challenge associated with HEVC's high compression capability is that it involves very high arithmetic processing load and substantial processing time, but so far no practical encoder engine has addressed this issue.

##### Development Outcome

Now NTT Media Intelligence Laboratories has developed a unique software encoder engine compatible with HEVC that achieves remarkably high compression while maintaining high image quality. Offering roughly 2.5 times better compression than H.264 standard encoders at its maximum performance, NTT's encoder engine delivers the highest compression ratio to date by slashing the volume of transmitted data by 60% (compared to H.264) while maintaining comparable image quality.

Combined with a unique control scheme for steady streaming of high-quality video for IPTV and other services, the encoder engine also features high-speed technology that enables encoding time of 5 times compared to playback time for HD video <sup>3</sup> content. This figure is an approximate guide to the practical processing time when typical content is produced, and reveals that the software encoder engine achieves both excellent compression as well as high speed (Figure 1: ).

Anticipating significant expansion of video streaming services in the near-term future, the engine also supports Main 10 profile for high-definition 4K and 8K video.

## Technical Features

### (1) Higher compression opens the way to HD video services

"H.265/HEVC" is said to double the data compression ratio of the conventional "H.264/AVC" standard. NTT was able to achieve a 2.5 times bandwidth savings compared to H.264/AVC software at its maximum performance by developing a unique compression scheme called *local QP adjustment*<sup>4</sup> that markedly improves the compression rate by slashing the amount of data from areas where it's difficult for the human eye to notice distortion (e.g., areas with complex patterns such as splashing water or forest foliage) while preserving high image quality (Figure 2).

### (2) Unique control technology (Figure 3) opens the way to high-image-quality IPTV services

Proper allocation of the amount of bits is essential to ensure steady streaming of high-quality video over fixed-bandwidth lines. By exploiting a technique developed for the H.264 encoder engine, we were able to achieve high image quality with a coding control scheme that estimates the amount of bits from statistical information, then allocates the proper amount of bits to each frame based on type of picture.

### (3) High-speed video compression opens the way to practical video compression processing time

In video compression, a frame is encoded by dividing it into a grid of squares known as *macroblocks*. In contrast to the H.264 standard, HEVC/H.265 permits several different macroblock sizes with varying compression modes applied to different sized macroblocks, a scheme that greatly increases the calculation time needed to select the compression mode for all macroblocks. To meet this challenge, NTT developed a novel selection technology (i.e., that selects both the macroblock size and the mode) that greatly accelerates the selection process while maintaining image quality by using intrapicture similarity and locational correlations within each frame (Figures 4 and 5).

## NTT-AT : Description of the HEVC Software Codec Development Kit, HEVC-1000 SDK

### Overview of the product

NTT-AT has been selling software codec with high video compression, called the *RealFeel* series, with considerable success. It has now begun selling a new product in this series. Called HEVC-1000 SDK, it uses an HEVC software encoder engine developed by NTT Media Intelligence Laboratories, and provides unparalleled compression performance.

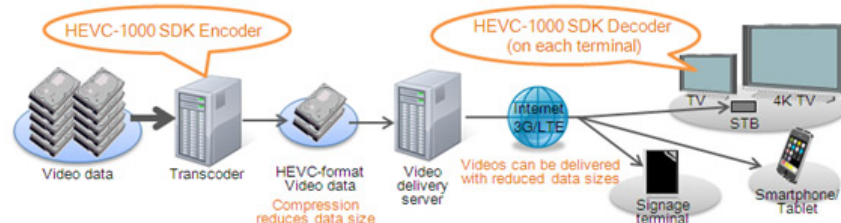
Backed by its extensive experience in codec development, NTT-AT has turned the coding technology of NTT Media Intelligence Laboratories into a commercial product. It has independently developed a decoder engine, which can decode streams generated by this encoder engine. Since both the encoder and the decoder are included in this software codec development kit, the user can easily build a codec system without the need for any dedicated hardware decoding terminals.

By getting our product to market quickly, and building on the solid sales history of the RealFeel series, NTT-AT seeks to gain a considerable share of the growing market for the development of high-quality, high-compression video distribution systems.

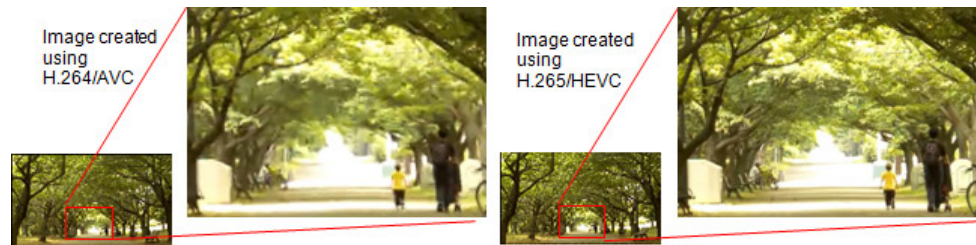
### Applications

- Video Conversion
- Authoring Software for Editing of Video Data
- 4K Video Distribution
- Video Delivery to Mobile Terminals
- Digital Signage Systems

### Storage area and network bandwidth can be saved by highly compressing the videos



### Image comparison



The two images are compared under the same conditions (bitrate: 2.5Mbps; frame rate: 29.97fps; and image size: 1080p). The image created by HEVC shows the tree leaves in finer detail.

### Specifications of HEVC-1000 SDK

Items provided		Library as a 64-bit or 32-bit Windows DLL (Dynamic Link Library), import library, C-language header file, and the interface specification document
Operational requirements	OS	Microsoft Windows Vista/7/8 (32-bit or 64-bit) Microsoft Windows Server 2008 R2/2012
	CPU	SSE2 or higher Intel-compatible CPU (support of AVX recommended)
	Runtime library	Redistributable Visual C++ package of Visual Studio 2012

### Input/output formats

	Encoding	Decoding
Input format	8-bit/pixel or 10-bit/pixel YUV420 format. Progressive or interlaced	HEVC elementary stream (Annex.B format)
Input data	Image size: 64×64 to 7680×4320 Frame rate: 10 to 120 fps	-
Output format	HEVC elementary stream (Annex. B format)	8-bit/pixel or 10-bit/pixel YUV420 format. Progressive or interlaced
Coding methods	HEVC (ITU-T H.265   ISO/IEC 23008-2), progressive coding/interlaced coding	

### Product release date, price and areas where the HEVC-1000 SDK will be available

Product release date. : August 8, 2013  
 Price : please contact NTT-AT  
 Sales area : Japan, USA, Europe and some other areas

### Exhibitions where the HEVC-1000 SDK will be displayed

The HEVC-1000 SDK will be displayed at IBC 2013, to be held from September 12 (Thursday) to 17 (Tuesday), 2013, in Amsterdam, and at Inter BEE 2013, to be held from November 13 (Wednesday) to 15 (Friday), 2013 in Makuhari Messe, Chiba, Japan.

### Glossary

- \*1 H.265/HEVC (High Efficiency Video Coding)  
The ITU-T standard was ratified at the end of April 2013.
- \*2 H.264/AVC (Advanced Video Coding)  
A video compression standard developed through ITU/ISO collaboration. Typical applications of the H.264 compression scheme include Blu-ray Disc and broadcasting for mobile phones (ONE-SEG).
- \*3 Full HD Video  
Video format with a resolution of 1920 pixels in width and 1080 pixels in height.
- \*4 QP  
QP (quantization parameter) is a type of parameter for determining the encoding compression rate.

### Attachment-Reference

- ▶ [Figure 1: Merit of using HEVC](#)
- ▶ [Figure 2: Technology for high compression rate](#)
- ▶ [Figure 3: Rate control technology](#)
- ▶ [Figure 4: Block sizes and compression modes comparison between H.264 and HEVC](#)
- ▶ [Figure 5: High-speed block size and mode selection technology](#)

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