Building a Universal, Ultra HD Broadcast Solution

Software

intel

SoftLab-NSK combines the functionality of a 4K HEVC video encoder and a playout server in one box using technologies from Intel

Building the Future of Broadcasting

Ultra HD video is the future of broadcasting. And finding the best way to switch to 4K broadcasting is a key topic on the pages of magazines and at exhibitions and conferences worldwide. As TV operators begin broadcasting new Ultra HD channels, hardware manufacturers search for the best way to integrate support for the 4K format into their solutions. Typically, video signal encoding is performed on a standalone video encoder that's separate from the broadcasting playout server.

The most effective technology for compressing 4K video is the H.265/HEVC codec. Compared to the previous H.264 codec, HEVC has a higher compression ratio with a relatively equal image quality. However, it requires exponentially more computing resources.

This presents a challenge for SoftLab-NSK, which develops complete TV broadcast automation solutions that work with the 4K format and HEVC compression and include functionality for video encoding. Its TV-channel-in-a-box solutions are installed on one computer to handle all the main tasks of broadcasting.

When the company wanted to expand its flagship Forward T* line of playout servers, it needed the most efficient solution for video transcoding. After a through study, it chose technologies from Intel that support decoding, processing, encoding, and broadcasting 4K HEVC video from the output of the playout server:

- **Intel® Quick Sync Video**, which uses the dedicated media processing capabilities of Intel® Graphics Technology for fast decoding and encoding, enabling the processor to complete other tasks and improving system responsiveness.

- **Intel® Media SDK**, part of Intel® Media Server Studio. This cross-platform API is for developing media applications, on Windows* and embedded Linux*, for encoding Ultra HD video.
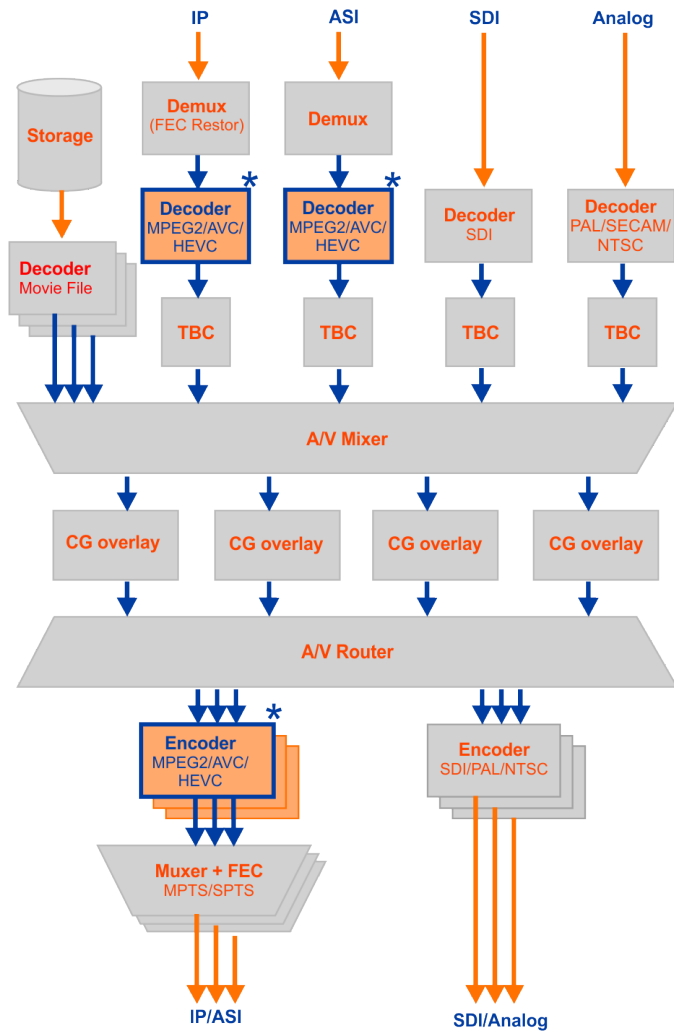
Using Intel® Quick Sync Video and Intel® Media SDK

Starting from high definition, video in AVC format makes it possible to execute only a few software transcoding channels on a typical modern CPU. When moving to HEVC compression and Ultra HD 4K resolution, software-only encoding requires expensive multi-processor systems that typically consume both power and space.

The situation changes dramatically with the possibility of integrated Intel GPUs and Intel Quick Sync Video, available in Intel Media SDK. It enables software solutions that can perform simultaneous decoding and encoding of several video streams in MPEG2/AVC/HEVC formats on a single-CPU platform.

SoftLab-NSK developers discovered that it's possible to transcode, in real time, two or more HD AVC channels on one CPU with Intel® HD Graphics 4600 and five or more HD AVC channels on one CPU with Intel® Iris™ Pro Graphics 5200.

> "Processing 4K HEVC video requires extremely high computing power. Using Intel® Quick Sync Video technology, we can afford decoding, processing, and encoding video on-the-fly at the same time in one CPU playout video server. As a result, Intel helps us to provide cost-effective, high-performance, and low-power-consuming universal broadcast solution to our customers and promote the progress of Ultra HD television."
>
> —**Michael Shadrin**
> **Director of Multimedia Department**
> **SoftLab-NSK**

Figure 1. Typical Forward T video playout server structure. MPEG2/AVC/HEVC decoding, and especially encoding software modules (marked with *), are the most performance-requiring parts of the video server. Even when working with SD/HD video resolutions, high efficiency is the most important task for broadcast automation systems.

SoftLab-NSK: 25 Years in Television

Founded in 1991 in Novosibirsk, Russia, SoftLab-NSK develops hardware and software systems for TV broadcast automation.

The company's flexible and cost-effective solutions are in demand beyond the borders of Russia, with more than 27,000 licenses sold in more than 30 countries.

SoftLab-NSK's products are primarily aimed at central and regional TV companies, regional cable operators, and small-budget TV studios.

The company's flagship product is a broadcast system, the Forward T* video playout server. One system combines everything necessary for both retransmission and broadcasting of its own channel:

- **Playback** of media files of all popular formats and compression types.
- **Switching** between several non-synchronous video inputs of different formats.
- **Audio input switching** in sync with video input switching.
- **Delay** of the pass-through video and audio (signal time-shift).
- **Overlaying** multilayered animated graphics with alpha channel.
- **Interaction** with external equipment via GPI signals or serial ports.
- **Automatic recognition** of special start/end cues for automated advertisement insertion.
- **And more**.

With Intel Iris Pro Graphics P530, it's possible to encode one 4K HEVC channel with 30 frames per second. Intel Iris Pro Graphics P580 makes it possible to encode one 4K HEVC channel of up to 60 frames per second.

Using Intel Media SDK allowed SoftLab-NSK to quickly integrate these possibilities into its broadcasting solutions, significantly improving their efficiency. For example, an Intel® Xeon® processor E3-1585 v5-based server with SoftLab-NSK software, in real time, was able to input a 4K HEVC stream at 50 frames per second, overlaying character generation (CG) with alpha channel and/or inserting video content from local file storage, and finally encoding the output back to 4K HEVC and streaming it to IP output.

Building a professional video broadcasting server requires not only video, but also audio encoding. SoftLab-NSK selected Intel Media Server Studio Professional Edition, which includes Intel Media SDK as well as a limitless license for encoding audio in AAC format. When starting the development, SoftLab-NSK widely used the documentation and code samples, including:

- sample_decode
- sample_encode
- sample_vpp

The sample_vpp example allowed SoftLab-NSK to speed up not only video transcoding, but also color conversions and other data transforms.

Working with specialists from Intel also helped SoftLab-NSK build its decoding and encoding software modules quickly and efficiently.

Intel Quick Sync Video includes a Microsoft Media Foundation*-based AVC video encoder from Intel. In SoftLab-NSK solutions this module captures video from various sources, compresses it to AVC format, and saves it into MP4 files. This module, present on any PC with an Intel processor with an integrated GPU, makes it possible to quickly compress video materials to AVC format using hardware acceleration—freeing the main CPU for execution of other important tasks.
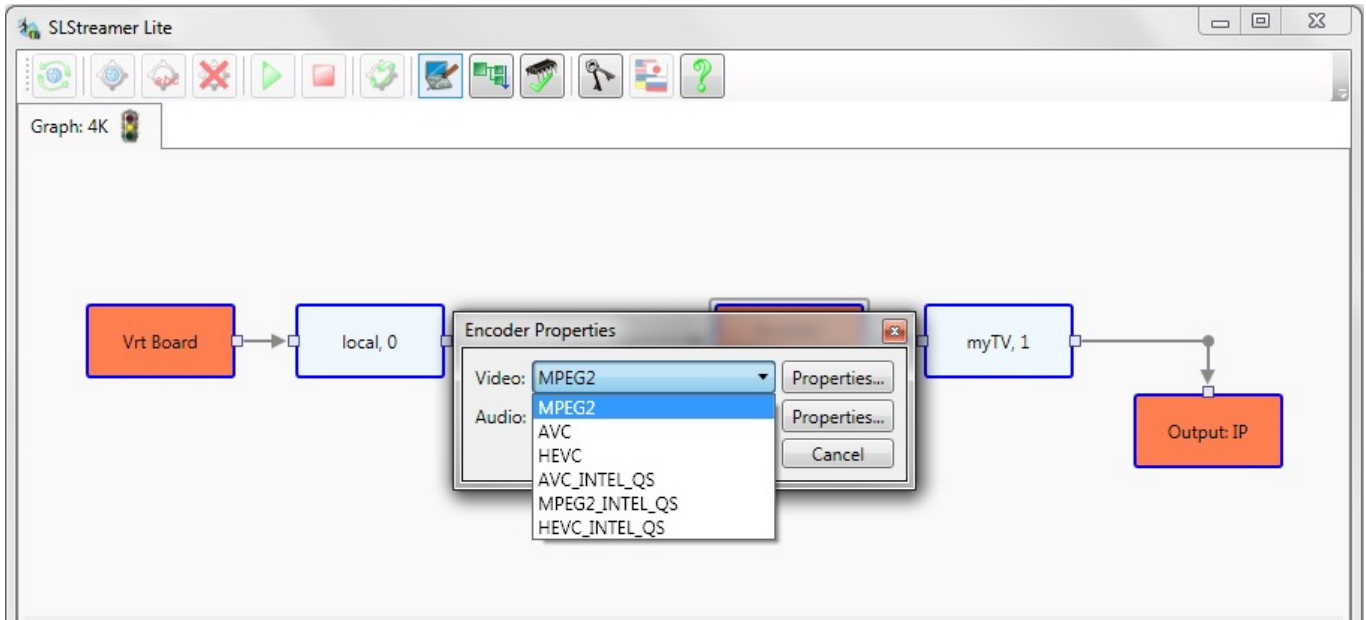
Figure 2. Window of the SLStreamer Pro* application working inside a Forward T playout server. This makes it possible to construct video/audio transcoding schemes using SoftLab-NSK decoder/encoder software modules implementing Intel Quick Sync Video technology.

SoftLab-NSK software modules implementing Intel Quick Sync Video technology provide encoding of one or several TV programs—including video, audio, and subtitles—into a transport stream. It is possible to compress video to MPEG2, AVC/H.264, or HEVC/H.265 format. For audio compression, AAC or MPEG audio formats can be used.

Flexible, Expandable Solutions

For SoftLab-NSK's customers, the combination of technologies means solutions that are both flexible and expandable. For example, if a TV studio broadcasts channels in SD resolution and needs to add an HD or Ultra HD channel,

it only needs to purchase an additional license and update the software. With the same software used for broadcasting in different formats, there is no need to learn new software when switching to another broadcasting signal type or video resolution.

Being able to use an all-in-one solution also saves on power consumption and means the equipment takes up less space, because one PC can handle broadcasting one or several TV channels.

Finally, the solution is cost-effective. SoftLab-NSK also provides free software updates and technical support.

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