TV TechCheck
The NAB Labs Newsletter for Television Broadcast Engineers
NAB LABS
July 28, 2014

SHVC Technology is Maturing

SHVC is the scalable extension of High Efficiency Video Coding (HEVC) standard, which is the latest video compression technology that promises about 50% improvement over the previous generation H.264/AVC standard. SHVC's bandwidth saving and scalability capabilities are valuable for adaptive video streaming applications; SHVC provides a means for graceful degradation of video quality in challenging channel conditions. SHVC enables transmission of partial bit streams with different robustness while retaining the capability to reconstruct the high quality video from the partial bit streams.

Scalability in SHVC means the ability to ignore some parts of the video stream in order to adapt to different types of receivers and channel conditions. SHVC supports scalability in spatial, temporal, quality (SNR), bit-depth, color gamut, hybrid codec, or any combinations thereof. In an SHVC scheme, video is encoded into one base layer and one or more enhancement layers. The base layer provides the lowest quality video, whereas the enhancement layer uses the information in the base layer and improves the quality. The benefits of SHVC can be best understood by some use-case examples.

First, assume that a broadcaster wants to transmit high-quality video at a 15 Mbps rate. Because of varying signal attenuation, some receivers within the coverage area will receive the signal at SNR below the detection threshold and will not display the video at all. Assume, however, that these receivers see a signal quality that could maintain a 5 Mbps video stream. One way to reach these receivers is to transmit, in addition to the high-quality signal, a lower quality video at 5 Mbps rate through a more robust channel. Of course, this second signal will require additional channel resources (20 Mbps payload in total), and therefore sending two independent copies of the same content is inherently inefficient. Instead, SHVC sends the lower quality 5 Mbps video as the robust base layer and then send only the *difference* between the base layer and the high quality signal as an enhancement layer. From an information-theory point of view, the enhancement layer will require less than the full 15 Mbps data rate to transmit. If we assume that the enhancement layer requires an 11 Mbps data stream, when added to the 5 Mbps base layer, the broadcaster transmits only 16 Mbps total payload, thereby saving valuable channel resources. In this SHVC example, the receivers operating at low SNR will display the low quality video and the receivers operating at high SNR will display the high quality video, but the total required resources will be less than that for transmitting two fully independent video streams.

The use of Internet as a back channel is presented as the second use-case example. Assume that sometime in the future a broadcaster is transmitting 4K video over the air, but a viewer has an 8K TV with a broadband Internet connection. Let us assume that the 4K signal is transmitted as a 1080p base

layer and one 4K enhancement layer, and let us also assume that the receiver can demodulate and decode both layers. The broadcaster, in this scenario, can provide an 8K enhancement layer over the Internet. It should be noted that the enhancement layers alone do not render any video, but the 8K enhancement layer would render 8K quality video if both the 1080p base layer and 4K enhancement layers are available in the device at the same time.

SHVC allows the broadcasters to reach all devices under a wide range of reception conditions with a single transmission. Heterogeneous devices, with different channel conditions and access technologies, will render the video according to their capabilities. The base layer forms the core service that is received by all receivers, allowing an enhancement layer to render higher quality video if it can be received and the device's display can utilize it. This implies that a highly capable handheld or mobile device receiving a strong signal may display the high-quality video using both base and enhancement layers, whereas a fixed, big-screen TV under difficult channel conditions may display only the low-quality video provided by the base layer. The examples explains a broadcasting service's core and enhanced modes of operation that are unrelated to a device's mobility or size. Thus an SHVC-based broadcast service essentially eliminates the distinction between mobile and fixed services, and works on a wide range of devices.

Scalable video coding has been an active research and standardization area for more than two decades. H-262/MPEG-2 Video, H.263/MPEG-4 Video, and H.264/AVC standards all supported some form of scalability, but the scalability profiles of these standards did not gain popularity because decoder complexity at that time outweighed the benefits. In recent years, advancement in semiconductor technology has made scalable coding a more viable option, however. The still developing SHVC extension to the HEVC/H.265 codec also improves upon previous scalable video coding in other ways. Technicolor presented a real-time software demo of SHVC at the 2014 NAB Show in Las Vegas. If real-time decoders can be implemented in software, it can be safely assumed that they can also be implemented in hardware.

Some broadcast industry stakeholders are actively supporting the SHVC approach to expand broadcast signal's reach to handheld and mobile devices—as well as to fixed TVs that suffer from reception problems—in future broadcasting systems. It appears that the full potential of scalable video coding may be applied to broadcast services soon.

NAB Partners with Technology Trade Associations for U.S. Vets

NAB is honored to partner with a group of national and regional technology trade associations in USTechVets.org, an initiative to connect veterans to employment opportunities in the U.S. technology sector. The initiative helps facilitate veterans' transition to civilian careers, reduce veteran unemployment and give our member companies access to our country's unique veteran workforce.

Participation in USTechVets.org is free to any NAB member company. To get started, a primary human resources or recruiting contact at your company should apply for an employer login to the site. Once logged in, you can post jobs manually, search the site's database of more than 800,000 veteran resumes, and add additional recruiters to your company's account.

Monster.com, one of the primary partners of USTechVets.org, provides helpful video tutorials on the site. You can also click here for tips on how to create an account or here for tips on posting jobs. In addition, Monster will host webinars to guide employers on how to get the most value out of the job board and resume database. Please email veterans@nvtc.org for dates and call-in information for future webinars.

If your company already has active postings on Monster.com, those jobs will automatically be reposted to the USTechVets.org job board at no additional cost. However, if you do not want your company's Monster.com jobs reposted to the USTechVets.org site, you must notify NAB by August 1, 2014 by emailing membership@nab.org.

Finally, NAB members who have a job board on their company website can elect to have specific jobs reposted to the USTechVets.org job board for a small fee. To learn more about this option, please contact Ted Wadsworth at ted.wadsworth@monster.com.

NAB is pleased to offer this valuable resource to our members. If you have any questions, please email Chris Vane cvane@nab.org or (202) 429-5400.

Important Dates and Upcoming Events

NAB/SBE Satellite Uplink Operators Training Workshop

September 29 - October 2, 2014

Washington, DC

137th International AES Convention

October 9 - October 12, 2014

Los Angeles, CA

2014 IEEE Broadcast Symposium

October 15 - October 17, 2014

San Antonio, TX

SMPTE Annual Technical Conference and Exhibition

October 20 - October 23, 2014

Hollywood, CA