Pioneering User Adaptive Video Streaming Technology

- Revolutionary technology that delivers bandwidth savings and enhances user experience
- Gains achieved by sensing the viewer and his environment and optimizing the delivery of streaming video to the capacity of the visual channel
- The technology is available for evaluation as a streaming client SDK and streaming encoder SDK.

During the last two decades Internet streaming has experienced a dramatic growth and transformation from an early concept into a mainstream technology. Current streaming formats, such as MPEG-DASH or HTTP Live Streaming (HLS), benefit from recent advances, including the use of HTTP infrastructure, bandwidth adaptation mechanisms, and the latest audio and video codecs. However, some challenges in implementation and deployment of streaming systems still exist. In particular, they arise in the delivery of streaming video content to mobile devices, such as smartphones and tablets. On one hand, many mobile devices are already matching and surpassing HDTV sets in terms of graphics capabilities. They often feature high-density screens with 720p, 1080p, and even higher resolutions. They also come equipped with powerful processors, making it possible to receive, decode and play HD-resolution videos. On the other hand, network and battery/power resources for mobile devices remain limited even with the introduction of 4G/LTE. Very often users experience poor video quality due to rebuffering and inconsistent quality.

All these factors suggest that technologies for reducing bandwidth and power and improving quality in mobile video streaming are very much needed. InterDigital's user-adaptive video streaming technology offers a novel and highly efficient method for achieving these goals. This innovative technology senses the presence and proximity of viewers and their viewing conditions, and adapts the video streaming to deliver the best possible user experience while minimizing bandwidth consumption.

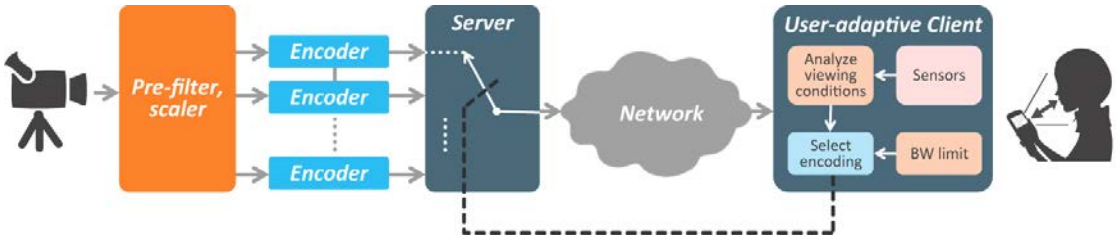
The technology is available for evaluation as a streaming client SDK and streaming encoder SDK.

User Adaptive Streaming

How it is different from conventional streaming?

Conventional video delivery (broadcast, progressive download, streaming) pushes content without leveraging knowledge about viewing conditions or the user's attention to the content.

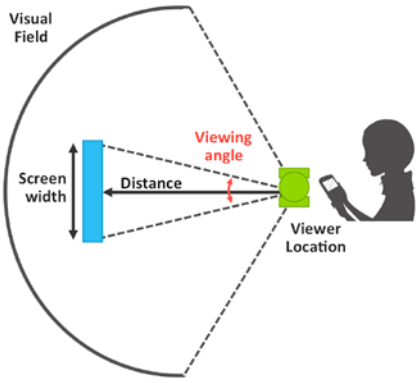
User-adaptive streaming customizes the video for different viewing attributes (such as ambient lighting conditions and the distance between the viewer and the display) and selects an encoding that delivers the same visual result using substantially less bandwidth. Alternatively this technology can be used to improve the quality of experience by using the same bandwidth to achieve a perceptually better representation of the content.

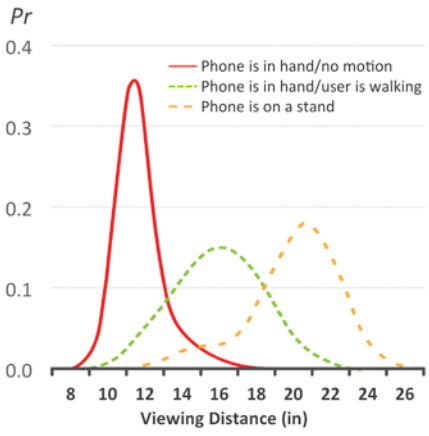


This technology is easy to deploy using bandwidth-adaptive HTTP streaming protocols such as DASH and HLS which provide a means for multi-rate encoding and client-driven switching between streams.

How does it work?

The ability of the user to perceive visual information depends on several factors, including the distance of the eyes from the screen, display pixel density, and ambient lighting. For example, the user may hold a phone close to his eyes, or at arm's length. This significantly affects the user's ability to perceive the information presented on the display as shown in the left part of the figure below. The right part of the figure shows how viewing distance can be inferred by the user activity.





Ambient illuminance may also change significantly. The user may be in the office, outside under direct sunlight, in a shadow, or in a completely dark area. As ambient light becomes reflected this also lowers the perceived contrast of video or images projected by the screen. Finally, the user may pay full attention to visual content on the screen, or he or she could be distracted.

Our technology exploits the limitations of human vision which requires spatial oscillations to belong to a certain range of the frequencies and contrasts in order to be perceived by the user. The range of perceivable spatial frequencies is influenced by the viewing distance, while the contrast range is influenced by the ambient lighting conditions. Combined with characteristics of the display, these factors affect the capacity of the ”visual channel”, serving as the last link in a communication system delivering information to the user. Our reference design demonstrates that the characteristics of this last link can be effectively measured and utilized in optimizing streaming video delivery.

Capabilities, Features and Benefits

Main Capabilities

- Streaming protocols: MPEG-DASH, HLS.
- Video codecs: H.264/AVC, HEVC
- Supported platforms: Android (v3.0+), iOS, Windows

Key Features

- User detection & adaptation to viewing conditions
- Network conditions / bandwidth adaptation
- Power adaptation

Benefits

Device OEMs: Bandwidth reduction provides differentiation via reduced data costs for the end user.

OTT content aggregators / publishers: Bandwidth reduction offers savings via reduced CDN costs.

Cable operators: Bandwidth reduction offers savings due to reduced capacity requirements. Most significant savings are expected with deployment of 4K UHDTVs.

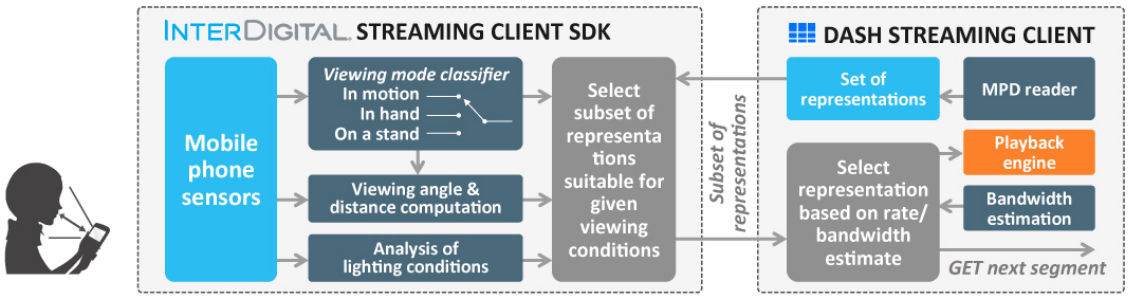
Mobile carriers: Bandwidth reduction offers savings due to reduced capacity requirements and better user experience due to less congested networks and longer battery life.

Technology Evaluation SDKs

The User Aware Streaming technology is available for evaluation as a streaming client SDK and streaming encoder SDK.

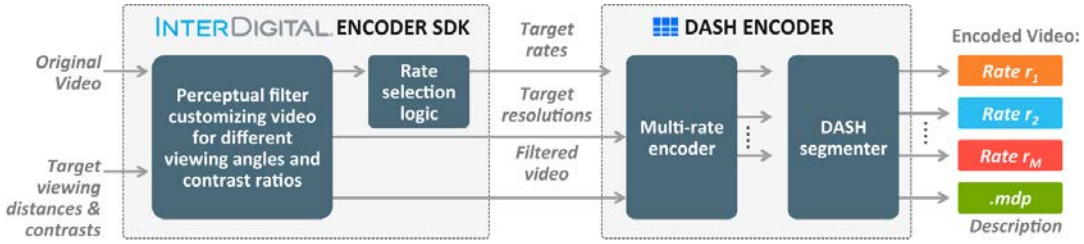
Streaming client SDK

Detects the user, estimates viewing distance and perceivable contrast ratio, and assists the streaming client in selecting the best encoded version of the content. The streaming client SDK is provided as Java and C++ libraries for application development on an Android platform. The SDK also includes a test Android application demonstrating the use of these libraries.



Streaming Encoder SDK

Enables customization of the encoded video to different target viewing distances and display contrasts. The encoder SDK is provided as a stand-alone command-line application.



About InterDigital®

InterDigital develops fundamental wireless technologies that are at the core of mobile devices, networks, and services worldwide. We solve many of the industry's most critical and complex technical challenges, inventing solutions for more efficient broadband networks and a richer multimedia experience years ahead of market deployment. InterDigital has licenses and strategic relationships with many of the world's leading wireless companies. Founded in 1972, InterDigital is listed on NASDAQ and is included in the S&P MidCap 400® index.

InterDigital, Inc.
200 Bellevue Parkway, Suite 300
Wilmington, DE 19809
www.interdigital.com