Video Scaling for Professional Multi-Resolution Applications

Multi-platform content delivery demands efficient provision of video content across a range of video formats. Fuelled by the consumer preference for “content anywhere, anytime”, video-on-demand and mobile platforms continue to gain popularity.

Multi-Output Scaling Application Example: Broadcast Transcoding

The explosive growth of mobile video consumption implies a rapidly growing need to format video content for a variety of screens, such as smartphones and tablets. A common multi-platform distribution approach is to transcode finished content to the necessary formats, as illustrated below.

File-Based Transcoder System Block Diagram

The various stages can be accomplished with many ASSPs/ASICs or integrated into fewer FPGAs with the same architecture. Either way, there are inefficiencies with this simple approach:

- For downscaling, the scaler is under-utilized and could be inactive for the majority of the time
- Each video path buffers the same video, adding unnecessary redundancy to the design

An Enhanced Architecture that Maximizes Efficiency

Instead of scaling one frame at a time, the scaling could be done on a per-line basis. In this case, the scaler generates a new, resized output video line after it receives sufficient input video lines. The smaller the output resolution, the more time the scaler waits idly. For downscale-heavy applications, this presents an opportunity to time-division-multiplex (TDM) the scaler across multiple outputs, instead of dedicating one scaler per output. Furthermore, the line buffer can be shared across multiple scalers by adding scheduling and control logic.

TDM Architecture for Transcoding Application Example
The number of outputs scaled with TDM depends on the ratio of input and output resolutions. The smaller the output resolutions, the more channels one TDM scaler can handle. If the encoder supports TDM as well, then the system can shrink further in size by removing the corresponding encoder instances.

**Altera’s Multi-Output Scaling Design Example**

Using this efficient approach, Altera implemented a free example design for scaling a single input to multiple output resolutions. Features include:

- One 3G SDI input scaled to five different output resolutions
- Default outputs support up/down scaling and pass-through
- Flexible initialization and configuration via Nios® II embedded software
- Extensible to support more in/out channels, larger resolutions, and higher frame rates
- Targets the Stratix® IV audio/video development kit

**Multi-Output Scaler Design’s System Block Diagram**

This example design can be applied in any application that deals with multi-resolution video scaling, such as video conferencing, multiviewers, network operation centers, educational/enterprise A/V systems, etc.

**Want to dig deeper?**

To learn more about Altera’s video solutions, such as the Video and Image Processing IP Suite, the Avalon® Streaming video verification IP suite, and the various video reference designs, please visit [www.altera.com/end-markets/broadcast/bro-index.html](http://www.altera.com/end-markets/broadcast/bro-index.html)