Audio Multiplexer & Demultiplexer Reference Designs for Xilinx FPGAs

Industry challenges

- Support industry standard interfaces for high-end audio and video applications

- Differentiation of products through extra features or reduced cost

Xilinx solutions

- Free reference designs for audio embedding & de-embedding

- Easy to integrate into your own FPGA designs

- Reduce or remove cost of external audio ASSPs

The need for audio embedding and de-embedding

In many broadcast applications, audio is embedded in the video stream to facilitate the easier transport of combined audio and video rather than have a separate path for audio. For HD-SDI video (SMPTE292M), audio information can be multiplexed into the horizontal ancillary space (HANC) portion of the video stream. The free audio multiplexer and demultiplexer reference designs enable this embedded audio transport in HD-SDI video.
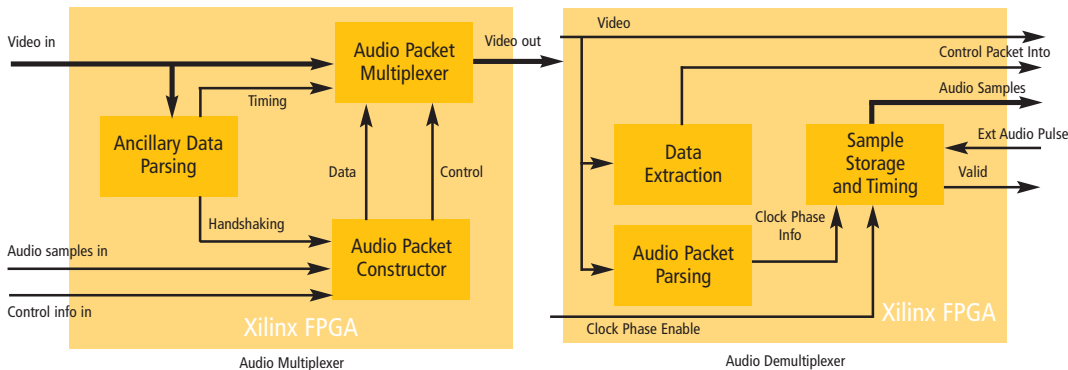
An example of use is where audio is de-embedded from the video stream and processed in a separate path, sometimes going through sample rate conversion (reference design also available from Xilinx), or where the video needs to be processed but the audio left alone. After processing is completed the audio and video are combined again using the audio multiplexer.

By using these reference designs, the broadcast hardware engineer saves time and money and can focus on the value add portion of the design.

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Audio Multiplexer and Demultiplexer Features

Multiplexer Features	Demultiplexer Features
Single audio group granularity: one instance embeds 4 channels (2 channel pairs) of a single audio group. Audio from multiple audio groups can be embedded by using multiple instances of the basic design in a daisy-chain fashion.	Single audio group granularity: one instance de-embeds 4 channels (2 channel pairs) of a single audio group. Audio from multiple audio groups can be de-embedded by using multiple instances of the basic design in a daisy-chain.
Support for audio control packets: control packets are generated & inserted on the appropriate lines.	Support for multiple HD standards: input field to designate which line standard is being used.
24-bit audio support at multiple sample rates: audio received as 24-bits plus Z, C, U and V flags with an audio valid strobe to indicate timing.	24-bit audio support at multiple sample rates: audio is output as 24-bits plus Z, C, U and V flags with an audio valid strobe to indicate timing.
Support for multiple HD standards: input field to designate which line standard is being used.	Support for synchronous and asynchronous audio.
Overwriting of incoming embedded audio: Existing embedded audio packets (data and control) in the designated group are overwritten with new packets to maximize utilization of ancillary space. Other ancillary data is passed. All embedding can be disabled.	De-embedding audio control packets: there are output ports containing control packet information.
Support for synchronous and asynchronous audio.	
Automatic clock phase and ECC code generation.	

Reference Design Specifications and FPGA Resources

Audio Multiplexer

Audio Demultiplexer

Reference Design	FFs	LUTs	BRAM	DSP Blocks
HD-SDI Audio Multiplexer	652	889	0	0
HD-SDI Audio Demultiplexer	687	550	0	0

Note: resources required for Virtex-5 design

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