Computer Systems, Inc.
MERCURY

Audio Capture and Playback Components

FM3TR Waveform Reference Implementation

SDR Forum Contract

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1 Component Name

AudioCapture, AudioPlayback

2 Component Processing Summary

The Audio Capture component takes audio input from a microphone and streams the data out for processing. The Audio Playback component takes audio input data and plays the audio on the PC sound output. The audio components are typically implemented as an audio device as the functionality is hardware and OS specific and not covered by the SCA Application Environment Profile (AEP). For the FM3TR waveform reference implementation project, they are implemented as Resources to be able to provide the source code.

The Audio Capture and Audio Playback component implementations use Win32 SDK calls which are not part of the SCA AEP.

3 Where used

The Audio Capture and Audio Playback components are used in the audio waveform.

4 Data Input and Output Ports

The Audio Capture component has one output port and no input ports. The Audio Playback component has one input port and no output ports.

5 Control Interfaces

The Audio Capture and Audio Playback components inherit the control interfaces from CF::Resource.

6 Component SCA Properties

Aside from the DLL execparams, the audio capture and audio playback components have no additional properties.

7 Component Attributes/Key Variables

Below is a list of several key variables to the bit packetizer components with a brief description of their purpose.

`m_audiohdr`	A set of WAVEHDR data structures, one for each audio sample buffer. Holds information about each buffer and provides synchronization between the recording/playback component and the audio device.
`m_lphwi`	Audio Capture uses this; a handle to the Windows

	default audio recording device.
`m_lphwo`	Audio Playback uses this; a handle to the Windows default audio playback device.
`m_audio`	A set of buffers that are used to pass PCM samples between the audio playback/recording component and the audio device; used on a round-robin schedule.

8 Processing Details

The Audio Capture and Audio Playback components handle the audio I/O via the sound card using the Win32 SDK. Both classes inherit the Audio Component class which implements common functionality that is used by both components.

8.1 Audio Capture

The Audio Capture component, in its main processing loop (Run() method), uses the Win32 Waveform Audio API (waveInOpen() etc.) to read 16 bit PCM audio samples at 16kHz from the computer's default audio recording device.

The Waveform Audio API supports multi-buffering. A number of empty buffers are supplied to the recording device, to be filled asynchronously. When a recording buffer is filled, a flag indicates its readiness. The Audio Capture component waits for this flag to be set, and then sends the acquired PCM samples to its output port. The buffer is then re-initialized, and again provided to the audio device, resulting in round-robin use of the available buffer set.

8.2 Audio Playback

The Audio Playback component uses the Win32 Waveform Audio API (waveOutOpen() etc.) to play 16 bit PCM audio samples at 16kHz using the computer's default audio playback device.

The Waveform Audio API supports multi-buffering. A number of full buffers are supplied to the playback device and are played asynchronously. When playback of one buffer's samples is complete, a flag indicates the buffer's readiness to be filled again.

The Audio Playback component, in its main processing loop (Run() method), reads audio samples from its input port. In the ConvertToAudio() method, the samples are then copied into the next available buffer; if all buffers are in use, the method waits until the next one empties. The buffer is then passed to the audio playback device. This again results in round-robin use of the buffer set.