Vista Makes Digital Audio Workstation Sing

Customer: Cakewalk
Web Site: www.cakewalk.com
Customer Size: 1-99
Country or Region: United States
Industry: Software
Partner:

Customer Profile

Founded in 1987 and based in Boston, MA, Cakewalk is the industry-leading developer of powerful and easy to use products for music creation and recording, used daily by millions of musicians.

Software and Services

- Products
  - Microsoft Visual Studio 2005
  - Microsoft Windows Vista
- Technologies
  - 64 Bit Processing
  - C++
  - WaveRT Drivers
  - Multimedia Class Scheduler Service
  - User Account Control

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Noel Borthwick, CTO, Cakewalk

Cakewalk, a leader in music creation software for Windows, saw opportunities from supporting new features in Windows Vista. By supporting WaveRT drivers, Cakewalk was able to provide much lower audio latencies when running processor intensive projects with numerous tracks, effects, and virtual instruments. By supporting 64-bit Windows, Cakewalk was able to address more memory, allowing for very large sample banks in virtual instruments.

Business Needs

For Cakewalk, releasing the first digital audio workstation on any given Windows® platform isn't an accident. Founded in 1987 as Twelve Tone Systems, the company broke new ground by bringing MIDI music authoring software to Microsoft® Windows with its Cakewalk for Windows product in 1991. In 1995, Cakewalk broke new ground again by combining waveform and MIDI music editing into a single package, Cakewalk Pro Audio, the first 32-bit digital audio workstation for Windows 95. This

product evolved over the years into a full-fledged digital audio workstation product, SONAR.

"Being first to market on Windows platforms is a priority for us," said Carl Jacobson, Director of Marketing. "We were first on 64-bit Windows, first to fully support multi-core systems, and we wanted to be first on Windows Vista. We always intend to deliver cutting-edge audio tools with the highest possible bandwidth and the lowest possible latency."

Vista includes several technologies of interest to digital audio workstation users. "Windows Vista has a focus on low-latency audio which is improved over Windows XP," said Noel Borthwick, CTO. "Our customers need low audio latency, and they need their audio to be glitch-free."

In addition, some Cakewalk customers wanted to be able to run SONAR as standard users, rather than administrators. "We have university customers that operate electronic music labs with many workstations," said Jacobson. "SONAR used to require administrative privilege to run; the lab administrators would prefer the students to log in as standard users."

Solution

Cakewalk participated in design reviews for the new audio driver specifications for Windows Vista, and started preparing for Vista compatibility in 2003. "Our old audio engine was based on DirectShow," said Borthwick. "That wasn't going to work well with the new audio stack, so we went back and rewrote our audio engine in a more compatible and flexible way for SONAR 3. The new architecture is similar to the DMO model rather than DirectShow, which required a connected graph topology."

Several years passed and several versions were released before Windows Vista was finalized. SONAR 6.2, which shipped in January 2007, is fully compatible with Vista, and was built for the Microsoft Application Platform in Visual C++® using Visual Studio® 2005. It takes advantage of four major Windows Vista technologies: WaveRT Driver Support, Multimedia Class Scheduler Service (MMCSS), Windows Vista User Account Control (UAC), and both 32-bit (x86) and 64-bit (x64) modes.

WaveRT is a new wave real-time port driver architecture, introduced with Windows Vista. WaveRT drivers offer application programmers the simplicity of writing to or reading from a cyclic memory buffer, and also incur very little CPU and latency overheads. WaveRT drivers do not require either data copying, which caused high CPU overhead in WaveCyclic drivers, or kernel-streaming, which caused high mode-switching overhead in WavePci drivers. Instead, WaveRT drivers allow the audio data in the cyclic buffer to flow directly between the client and the hardware without driver intervention. SONAR 6.2 supports WaveRT drivers as well as older WDM and ASIO drivers.

MMCSS is a new scheduling service that gives priority to real-time media threads. SONAR 6.2 marks its audio threads as real-time to avoid glitches caused by other processes and services.

UAC, if enabled, causes all users, even ones entitled to administrative privilege, to run with standard privilege unless they specifically allow privilege elevation. SONAR 6.2 has been carefully rewritten to avoid all operations that would require privilege elevation.

Benefits

By supporting MMCSS, SONAR 6.2 has made its audio capture and playback more reliable, even when a user is running multiple applications. This reduces the need to strip down a Windows installation in order to create digital music.

By supporting WaveRT drivers, SONAR 6.2 has lowered its audio latency and lowered its CPU overhead. The principal benefit SONAR accrues from WaveRT drivers is that the processor load at low latencies is diminished, allowing you to run more

complex and intensive projects at the lowest latency settings. In addition, SONAR can now run with low latency on computers without expensive professional audio cards.

Low latency and CPU overhead are two of the keys to being able to create rich digital music content. If the latency and CPU overhead are low, the musician can use more tracks, apply more audio effects, and use more virtual instruments in real time.

"What you get at lower latencies is a more engaging real-time experience," said Jacobson. "There is no perceptible delay between hitting a key on the keyboard and hearing the sound, or moving a fader or knob and hearing the sound change. That means a more inspiring and real-time music creation experience."

The other key to being able to create large complex digital music projects is memory. In 32-bit Windows Vista, 4 GB is the maximum amount of addressable RAM. In Windows Vista for x64, applications can access up to 128 GB of RAM; the limits are typically determined by the hardware design and the cost of the memory. With more memory, digital musicians can use bigger sample banks, which produce more realistic instrumental sounds; they can use more sample banks, for richer orchestration; and, they can keep more frequently referenced audio data in RAM without having to stream it to and from disk.

There's one more benefit to Windows Vista for musicians. "It looks awesome," said Jacobson. "It ends the aesthetic argument for our customers with their 'Mac' friends."

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