



**Interview: Cakewalk Chief Technical Officer, Noel Borthwick
by Rick Paul - 7th February 2007 -**



CakewalkNet: Hello, Noel. Thank you for taking time out of your busy schedule to speak to CakewalkNet's readers. We'll get to the nitty-gritty technological questions shortly. First, though, I'd like to congratulate you on your promotion to Chief Technical Officer of Cakewalk.

I know some of our readers will recognize you from the Cakewalk forums. For those who may not, how about a few words on your background, both with Cakewalk and anything else you think our readers might like to know? Just what does a CTO at Cakewalk do?

Noel Borthwick: Thanks Rick. My first contact with Cakewalk was as a beta tester back in 1994. I was a Cakewalk user much before I joined the company, and the first Cakewalk product I bought was Cakewalk Professional For Windows 1.0. My theory is that they got so tired of my feature requests and voluminous bug reports at the time, that they decided to hire me!

Prior to Cakewalk I had a background in 3D computer graphics animation and imaging, a domain that has many technological parallels to the music software world. I worked for a couple of graphics companies including Corel for several years, had my own company briefly, and was involved with Java and Linux for awhile. Somehow writing graphics software never really excited me as much as real time audio software. So when the opportunity came up to work for Cakewalk, it was a welcome change. My first gig at Cakewalk was to help rewrite the audio engine for Pro Audio 7 and then implement video playback support in PA 8 -- pretty daunting tasks for a newcomer! Since then I've survived several application and engine rewrites. Fortunately I still have a little hair left!

I'm currently still actively involved with getting my hands dirty with the development of SONAR -- no escaping that! Like many small to medium sized companies our size, at Cakewalk we don't really have a lot of the classic subdivision of roles you might see in a bigger organization, so people wear many hats and multitask a lot. Some of my new official responsibilities include defining Cakewalk's overall technical vision as a company, being a spokesperson for our technical offerings and being a point of contact for our various development partners.

Finally, my first love has been jazz guitar. I've played jazz since I was a teenager and it's still an active pursuit of mine. I've been fortunate to have been able to combine my passion for this alongside working on software for musicians.

CakewalkNet: There have been a few big announcements recently that could have a big impact, be it now or in the future, on SONAR users. Of course, the latest news in the world of Windows PCs in general is the availability of Microsoft Windows Vista, the first major release of Windows in half a decade. Cakewalk had its own recent announcement with the availability of the SONAR 6.2 upgrade, including the industry's first native support for Vista.

Meanwhile, there's been a lot of buzz, both positive and negative, about Vista in general. We'll talk a little more about specific technologies later, but first I'm going to ask the question that seems to be on everyone's mind: Why should I, as a SONAR user who is happily using SONAR with Windows XP, consider moving to Vista? Am I better off adhering to the principle of, "if it isn't broke, don't fix it?" or are there some concrete things Vista brings to the table that could make my SONAR experience better? For example, assuming the same computer system I'm using already under Windows XP, should I expect SONAR performance under Vista to stay the same, improve, or worsen, and in what ways and by how much?

Noel: That's a good question. Having been through more than five Windows incarnations as a software developer, I would say, the question you should first ask is whether you have a hardware upgrade planned. While Vista is compatible with previous generation hardware for the most part, it has several enhancements that may require current generation hardware for optimal performance. If your hardware doesn't satisfy the minimum requirements of Vista you may get degraded performance in SONAR due to the operating system overhead. There are many variables obviously, but based on tests we have done in-house, using hardware with a higher Vista Performance rating, you should see equivalent or better performance with SONAR. Regarding Vista itself, there are definitely more audio centric enhancements in the OS than there were in XP. SONAR 6.2 takes advantage of some of the relevant new audio features in Vista and Vista's redesigned audio stack can also buy you greater stability and more CPU efficiency. But the bottom line is, if you are running a stable setup that gives you the features you want today, then there is no pressing reason to upgrade your OS.

CakewalkNet: Let's talk about some specific Vista technologies that were highlighted in Cakewalk's announcement. The first is WaveRT drivers. What are they, and what do you see happening with respect to audio interface manufacturers making these available in the SONAR 6.x time frame? How do these fit alongside the general SONAR driver support models such as WDM and ASIO? One of the questions I've heard quite a bit is, if I'm running a screamer of a Core 2 Duo system where I can even run my most complex mixes at 2 milliseconds of latency without a hiccup, what does "enhanced CPU performance at low latency audio playback settings" really mean?

Noel: WaveRT is Microsoft's new model for low latency audio drivers. It's the first time we've seen a focus from MS on a model that was truly designed with low latency audio in mind so this is an achievement in itself. While it is not impossible to have very efficient drivers under XP, you see a lot of variation in driver quality due to lack of a standardized driver mechanism for efficient low latency audio streaming. The WaveRT specification fills this gap by providing a well-defined solution for low latency audio streaming. The model has many technical merits over the previous generation XP WaveCyclic drivers. Most notably WaveRT drivers expose a shared user mode data buffer and clock register that can be directly accessed by the host software. Shared user mode direct access means no expensive user/kernel transitions while streaming audio, as is particularly evident with WDM KS audio drivers on XP today. These transitions translate into extra CPU consumption particularly while streaming low latency audio.

As an example of the performance gains, in some initial tests I did, just using the stock Microsoft HDAudio.sys driver that ships with Vista, I was able to achieve around 3 MS latency in SONAR 6.2, with a built in consumer RealTek chipset on the motherboard. Based on our experience with similar devices in XP this is quite an achievement.

From the host application's point of view, the WaveRT architecture is fairly symmetric to WDM KS and in fact WaveRT drivers are really just a new class of WDM drivers. What differs is the mechanism by which we stream

audio to the driver. This is "event driven" and uses the shared data buffer exposed by the driver instead of IOCTL's as used with WDM KS. Regarding how these fit into SONAR, to access a WaveRT device, you pick WDM as the driver model and WaveRT drivers if available, show up in the enumeration with a [WaveRT] suffix to the driver name.

CakewalkNet: Another of the technologies mentioned is MMCSS (Multimedia Class Scheduler Service) support. Cakewalk's announcement indicates this gives important SONAR processes, such as the audio engine, prioritized access to CPU resources. Is this important in practice? Can you shed some light on practical cases where this might make a difference? For example, will it help with a finely tuned DAW? What about the multi-purpose system where someone is always moving back and forth between checking e-mail in Outlook, reading the Cakewalk forums or CakewalkNet on the web, and composing their latest masterpiece in SONAR 6.2?

Noel: You can think of MMCSS as giving you an extra layer of protection against other applications/processes competing for your CPU resources. While streaming audio in a real-time application such as ours, there are a myriad other threads and processes running in the background, even on a finely tuned system, all competing for your CPU. The scheduler in Windows manages these threads, allocating CPU time-slices to them based on their thread priorities. Under XP threads of equal priority have the same chance of running or being interrupted by another thread, so performing an operation elsewhere in Windows can potentially compete with the audio engine streaming threads.

When you register your critical threads with MMCSS you are essentially buying extra insurance against these threads being interrupted. This translates into fewer potential glitches. One of the tests I did while implementing this was to start playback in SONAR 6.2 with a fairly CPU bound project. During playback I did all I could to sabotage playback - I launched a bunch of office applications and about 20 instances of IE7 each opening the home page. While all this was happening SONAR just kept going with barely a glitch! Under XP you would most likely drop out or glitch a lot more under such stress.

So yes if you are a user who likes to multitask with other applications, this will benefit you. Even if you have a fine tuned system, you are getting "glitch insurance" against the OS itself -- i.e. launching Windows Explorer itself can cause interruptions.

CakewalkNet: Are there other areas of Vista's technology or features that provide benefits for SONAR or SONAR users?

Noel: In a word, stability. Vista's audio stack has been re-architected so that many components that previously lived in kernel mode now live in user mode. This means there is a much smaller likelihood of a driver bringing down the entire operating system. This translates into fewer blue screens or spontaneous reboots due to driver failures.

CakewalkNet: There has been a lot of chatter lately about various reports of Vista imposing itself in ways that inconvenience users. A few specific areas I've heard mentioned include high memory requirements, dealing with unsigned drivers (which most pro and semi-pro audio devices have, at least in the Windows XP world), DRM (Digital Rights Management) restrictions, and pop-up dialog boxes related to needs for administrative privileges. Can you shed any light in this area? Are any of these issues, or other new Vista "protections", likely to have practical impact on SONAR users' workflow or configuration needs?

Noel: Several independent questions here...

You pretty much need to have signed drivers in Vista especially X64, which refuses to load such drivers unless you press F8 at boot up time and choose "Disable Driver Signature Enforcement" from the menu. X86 is somewhat less strict about enforcing signed drivers.

Regarding admin privilege popups, you will not see any of these popups while running SONAR 6.2 under Vista. 6.2 is fully Vista UAC compliant, so no operations in the application (other than registration itself) require

administrative privileges anymore. This was one of the changes we made to 6.2 in order to properly support UAC and ensure a smooth user experience while running SONAR in Vista.

CakewalkNet: I hate to put you on the spot, but, to sum up this Vista segment, do you have any general advice for SONAR users on Vista? Is it a must-have upgrade? Something to wait and see on? Somewhere in between? Also, the question I hear asked second most frequently regarding Vista is, "if I decide to move to Vista, which of the versions available do I need to support SONAR's needs?"

Noel: Vista is certainly going to be Microsoft's OS going forward. Upgrading to a new OS is always a decision that needs to be carefully weighed, especially if you already have a stable configuration. If you are building a new computer setup or buying one, I would think there are compelling reasons to consider Vista over XP. As long as you have drivers for all your hardware, SONAR 6.2 is Vista-ready today.

A good resource to figure out Vista versions is Microsoft's official [Windows Vista Product Guide](#).

While choosing a Vista version some considerations to ask are how much RAM would you ever want to run on this OS and how many CPU's would you ever need. Note that only Vista business and higher support dual physical CPU's. The other versions support multi core CPU's but only one physical CPU.

The per OS RAM capabilities are as follows:

Vista 64 bit:

Windows Vista Business: 128GB+

Windows Vista Home Premium: 16GB

Windows Vista Home Basic: 8GB

Vista 32 bit:

Windows Vista Home Premium: 4GB

Windows Vista Home Basic: 4GB

CakewalkNet: Let's talk about some of the other highlights of SONAR 6.2. Perhaps one of the most intriguing, and my personal favorite thus far, is X-Ray Windows.

For our readers who haven't checked this feature out yet, X-Ray Windows can save a lot of time formerly spent moving plug-in windows around the screen, or minimizing and restoring them, when you need to access other parts of the SONAR screen obscured by one or more plug-ins. Instead, you simply hover your mouse over the plug-in window, hit a shortcut key (Shift-X by default), and the plug-in becomes mostly transparent. You can then tweak whatever is behind that plug-in, then, when you're done, you hover over the plug-in again, hit the same shortcut key, and you're back to being able to tweak the plug-in's settings.

This seemed to come out of left field, but represents a major workflow improvement. Can you shed some light on the history of this feature?

Noel: Indeed it came out of left field! X-Ray is one of those "rogue programmer" features, the idea for which came from one of our new developers. Most of us at Cakewalk eat our own dog food, so he is an avid SONAR user in his personal studio. He was frustrated by the fact that he had to keep resizing and moving plug-in windows each time he wanted to tweak his mix or edit in the track view or console. So he hacked his private SONAR build to do this dynamic transparent windows thing using a keyboard shortcut. When he showed it to some of us on his machine we all thought it was cool, and the feature was officially approved and christened X-Ray. As they say necessity is the mother of invention! Of course he had to do a lot more work than he bargained for in order to get the feature working across the rest of the application so he might think twice the next time.

CakewalkNet: ACT (Active Controller Technology), which was first introduced in SONAR 6.0, has also seen significant enhancements in SONAR 6.2. Would I be correct to guess these enhancements represent a combination of features that may have been on the drawing board prior to SONAR 6, but just couldn't be completed in time, and features that arose out of initial feedback from SONAR 6 users? What is Cakewalk's general vision for where ACT fits into the modern studio and/or live environment, and its relative state of evolution at this point in time versus what might be coming in the future?

Noel: Yes. There were some changes to 6.2 that were originally slated for the 6.0 release but never made it into the schedule. Additionally we added several enhancements in response to user feedback to ACT. This is common after a new feature is "road tested".

ACT is definitely one of the coolest new features available in SONAR 6. (For the uninitiated, ACT is a technology that lets your MIDI controller/surface follow your context as you navigate around the application. Click a synth, you've got a synth controller. Click a reverb, you've got 'verb knobs. Click on the track strips and switch back to old-school control surface parameters.) Musicians and engineers have always needed the ability to control the myriad of parameters on instruments and other hardware devices. In the past this could be a daunting task to set up remote control via MIDI CC's to automate these controls. ACT addresses this by making this task adaptive -- it's one of those features that can intelligently learn from your workflow and adapt to it, simplifying access to your gear.

In terms of the future, the most promising thing is that several 3rd parties are ACT-enabling existing surface plug-ins or creating new plug-ins that will support ACT.

For your reference, these are the improvements to ACT as of SONAR 6.2:

Framework Changes:

1. Support for opening/closing surface property page from the surface
2. Support for opening/closing/changing focus to any plug-in property page from the surface
3. Support for navigating to next/previous plug-in property page from the surface

ACT controller plug-in:

1. Support for infinite encoders
2. Support for sysex (MMC) buttons
3. Ability to broadcast hardware initialization messages
4. "Match" and "Jump" capture modes (previously only had Jump)
5. Support for framework changes above

Other plug-ins:

1. Dedicated Edirol PCR 300 controller
2. Existing Edirol PCR30 plug-in now supports Framework changes mentioned above.

Host Changes:

1. ACT lean buttons on all property pages.
2. Ability to import ACT Learn XML files

CakewalkNet: Without going down a detailed feature list, are there any other SONAR 6.2 features, perhaps some of your personal favorite additions or changes, that you'd care to highlight for our readers?

Noel: You can see a detailed list of 6.2 features here:

<http://www.cakewalk.com/sonar/62.asp>

Besides the big bullets, the following less obvious updates are also interesting to me:

1. 6.2 has numerous optimizations. One such interesting optimization is that we doubled the performance for wave picture computation. This is especially noticeable if you have a multiprocessor/multi-core machine, since we now parallelize the computation of wave pictures in the background and draw them as they are being computed. With these improvements, after recording or importing audio you no longer need to wait until the entire picture is computed until you can see the audio. Its cool to watch the parallelized waves draw if you have a dual or quad core machine!

2. Another useful feature that sort of came out of the UAC changes we made for Vista, is the fact that you can now run SONAR with multiple user profiles on the same computer. I.e., you can now create completely independently tweaked configurations of SONAR on the same computer and switch to them by simply logging in to the corresponding user profile in XP or Vista. In a networked environment you can even set up per user folders that are stored on a network share instead of your local hard drive. This is very useful for our academic users who have been asking for this sort of functionality for a long time. This scheme can also be helpful for normal studio users who want to create a per client configuration of SONAR, or create a profile that is tweaked and set up for different hardware configurations.

3. S6.2 supports selecting mono outputs from virtual instruments. An interesting "featurette" that evolved from the development of this feature, is that you can now route an output from any synth to multiple tracks simultaneously. This opens up some interesting routing and effects processing scenarios. For example you could route the same output of a synth to two synth tracks and process them completely independently, and mix the results with independent gain and pan control in real time. You couldn't do this earlier without bouncing down the output first.

CakewalkNet: With the advanced state of DAW technology these days, I hear a lot of people saying they don't need yearly upgrades to SONAR, because SONAR "X" (where "X" may go as far back as 2.2, but is typically 4 or 5) already does everything they need. Can you talk a bit about the general challenge of finding new, compelling features to warrant users' upgrading? Any hints you can give us on where SONAR might be going beyond version 6.2?

Noel: It's always a challenge. SONAR is a very mature application and does a lot of things. Any new functionality we add requires careful thought and design, since it needs to integrate with the rest of the application features. These days our focus is all about simplifying workflow and making it easier for users to do complex tasks easily. You can see some of this initiative in SONAR 6 with ACT and integrated plug-in management, for example.

In future versions of SONAR we will continue to make it easier for users to be creative without getting bogged down in the details of using their DAW.

CakewalkNet: There is one area in SONAR that has been a personal pet peeve of mine, and which I've heard many other users mention over time, in terms of not already having everything we need. I'm sure you've heard the same sorts of things, so you may be reading my mind already to know I'm speaking of the area of musical notation and SONAR's Staff View. This is particularly important to users who score for film or television using traditional techniques, as well as those of us who deal with complex arrangements. It is also one of the few areas where SONAR currently lags behind other prominent DAWs such as Cubase, Logic Pro, and Digital Performer. With Digidesign's recent purchase of Sibelius, one may also wonder if ProTools might soon have developments coming in this area. Does Cakewalk have any plans in this area for the foreseeable future? Is there anything you can share with our readers now?

Noel: SONAR has primarily evolved into a mega-DAW application over the years. We do get occasional requests to update our notation capabilities but it's always been a difficult choice to make for us, when weighing the maximum benefit to our customers versus available development resources. Notation is an area that only a relatively small percent of our users actively use and there are admittedly better tools for professional notation available. We do try to make incremental updates in each version -- there were a few minor notation updates in SONAR 6.

CakewalkNet: Of course, Cakewalk isn't only about SONAR. I understand there is a new Project5 upgrade coming this Spring, and Cakewalk has recently diversified into creating world class software instruments, not only for

Windows, but also for the Mac. Can you tell us anything about what might be coming down the pike in any of these other areas? What about SONAR or Project5 for Mac users?

Noel: We have a lot of exciting projects in the pipeline for 2007:

Project 5 Version 2.5 is a major new update to the program that has lots of P5 users have been waiting for.

There is a brand new SONAR Home Studio version also due soon that will introduce our new "Cakewalk Publisher", that helps users present and share their music online. Using Publisher, you can create a customized streaming music player with a playlist of your music, upload it to your personal or band's website, and embed it in any other website. You can also update your playlist with album art, links (URLs), and artist, track, and album information.

Cakewalk and Roland Systems REAC digital snake recording solution (announced at NAMM) will soon be shipping.

We will soon be announcing a new free Rapture 1.1 update with lots of new features and expanded platform support. New Dimension Pro expansion packs will soon ship as well as a new Session Drummer 2 Hip Hop Pack.

And, of course there are products in the pipeline that I can't talk about just yet!

CakewalkNet: Thank you for taking your time to speak with CakewalkNet. Are there any closing thoughts you'd like to address to our readers?

Noel: Thank you, Rick, for profiling Cakewalk on CakewalkNet. I'd also like to thank all the CakewalkNet readers who use our products. One of our greatest strengths as a company is the open and interactive relationship we have with our user base - you don't see this kind of public rapport very often.

**Rick Paul is a singer-songwriter living in Southern California. You can contact him at <http://www.RickPaul.info>.*