TASCAM
MAKE IT HAPPEN

White Paper: Plug-In Sampler Performance

Performance tests comparing TASCAM GVI with other plug-in samplers
July 20, 2007

TASCAM has completed a number of performance tests in order to gauge the ability of three Windows user mode samplers: TASCAM **GVI**, Native Instruments **Kontakt 2** and Steinberg **HALion 3**. All the programs had the latest updates installed. The DAW software (Cubase 4) and the drivers for the soundcard were also updated to the latest.

GigaStudio 3.x was left out of the comparison because it is a kernel-based system sampler which creates an unfair advantage over the user-mode, plugin software.

The hardware with which the samplers were tested:

CPU:	Pentium D 2.80 GHz
Motherboard:	ASUS P5LP-LE
OS:	Microsoft Windows XP SP Build 2600
OS Drive:	Seagate SATA I ST340833AS
Sample Drive:	Seagate SATA I ST330620AS
DAW:	Cubase 4, v4.0.2
RAM:	2 Gbyte 533 MHz
Soundcard:	TASCAM US-144 (USB 2.0 audio interface)

The tested versions of the samplers:

GVI:	v3.62.7.78200
Kontakt:	v2.2.1.010
Halion:	v3.3.0.450

Important Note: All three tests were performed with very 'unmusical' instruments for the sole purpose of minimizing the variables within the tests. To create a fair comparison, it was necessary to simplify the parameters of the tests as much as possible. Consequently, none of the tests compare the advanced features of a sampler engine such as filters, interpolators, cross fading, etc. A cautionary note to the reader would be that the data presented here is a single data point, and it should not be taken out of context. Ultimately, the true measure of a performance is how the sampler software handles in a real-world environment in a desired musical context.

Test 1: Disk Streaming Test (Disk Usage):

Goal
The purpose of this test was to test the samplers' hard disk streaming capabilities. The sampler would pass the test by being able to play a certain number of voices for the full duration of the MIDI file (1:30 minutes). The testers increased the number of voices with each pass of the MIDI file until the sampler could not complete the test and noted the results. The CPU and RAM readings were taken off the Task Manager to see the efficiency of the sampler.

Preparation
Sine waves were created using an audio editor, and mapped into the 127 keys. Each audio file was given a unique name so that the audio engine would be forced to read them all from the disk. The instrument file was stored as "Sine wave test-00.gvi". Eight copies of this instrument was made, and again each was given unique names. The files were converted into HALion format and Kontakt's .nki format to load into these respective samplers. All the instrument files were present on the same hard drive.

Testing Procedure
All of the tests were performed following a fresh reboot of the computer. Eight channels were created in Cubase 4, and all of the channels accessed a single instance of GVI VST, a single instance of Kontakt 2 VST or single/multiple instances of HALion VST(s) (due to the polyphony limitation of 255 voices). MIDI files were created with a length of approximately 1:30 minutes, with notes sustaining from the first measure through to the end.

Variations of these MIDI files were created using the piano roll editing tool. The resulting MIDI files had 8 notes, 12 notes, 16 notes, 20 notes, 32 notes, 64 notes or 128 notes sustaining from the beginning to the end. Depending on the polyphony total being tested, one of these was played by one or more channels. For example, if 1,024 mono voices was being tested, the testers used the 128-note MIDI file loaded into 8 channels for a total of 128 x 8 = 1,024 mono voices.

Disk Streaming Test Results

Sampler	*Maximum Voices Playable*	*Resources Used*	*Comments*
GVI	128 mono voices	CPU: 9% (avg) RAM: 299MB	Polyphony meter shows fluctuations
Kontakt2 (default DFD settings)	96 mono voices	CPU: 2% (avg) RAM: 320MB	CPU meter in task manager is inconsistent.
Kontakt2 (DFD settings matched with GVI)	96 mono voices	CPU: 4% (avg) RAM: 295MB	
HALion3	96 mono voices	CPU: 11% RAM: 303MB	

Conclusions

GVI was able to continuously stream more voices than the other samplers, even though the CPU usage was slightly higher than Kontakt 2's. HALion 3 performed similar to Kontakt 2 albeit consuming more CPU.

Test 2: Maximum Polyphony Test

Purpose
The purpose of this test was to see how many voices of polyphony each sampler could play at one time. To pass the test, the sampler must be able to play at least one measure of the MIDI file for a certain number of voices. The maximum number of voices playable by each sampler for this minimum duration without drop outs, crashes, stutters, etc. was recorded. Note that it is not required for the samplers to play all of those voices for the entire length of the file. This requirement was already tested by the streaming test. This test simply sees how many voices a sampler can handle for a certain time without any hitches, and notes the resources being consumed by each sampler.

Preparation
The preparation was the same as the disk streaming test. The same instrument files were used for this test.

Testing Procedure
The same procedure used for the streaming test was used in this test also.

Maximum Polyphony Test Results

Sampler	*Maximum Voices Playable*	*Resources Used*	*Comments*
GVI	512 mono voices	CPU: 34% (avg) RAM:299 MB	Voice meter fluctuates
Kontakt2 (GVI-matched DFD settings)	256 mono voices	CPU: 10% (avg) RAM: 296 MB	Unstable CPU meter reading
Kontakt2 (Default DFD settings)	256 mono voices	CPU: 25-28% RAM:182 MB	
HALion 3	448 mono voices	CPU: 55% (avg) RAM: 346 MB	Had to use 2 instances of HALion 3

Conclusions
GVI seemed to perform better than the others even though the CPU used is higher than Kontakt 2's.

Test 3: 32-voice CPU/RAM usage test

Purpose
The purpose of this test was to measure the CPU resources consumed by the samplers in stand-alone mode. The samplers were measured with the test files loaded and while playing 32 mono voices (i.e. 16 stereo voices triggered by the 16 notes from an external MIDI controller).

Preparation
After a fresh boot, each sampler was started in stand-alone mode, and loaded with the sine wave-test files.

Testing Procedure
16 notes were played using an external controller. The CPU and RAM usage was noted from the Task Manager readings.

CPU/RAM usage Test Results

Sampler	*CPU/RAM Usage**	*Comments*
GVI	CPU (ave): 4% RAM: 178 MB	Maximum Polyphony was set to 1024 voices
Kontakt 2	CPU (ave) : 4% RAM: 181 MB	Maximum Polyphony was set to 1024 voices
HALion 3	CPU (ave.): 4% RAM: 133 MB	Default DFD/Polyphony settings

Conclusion
At lower polyphony, there doesn't seem to be much difference in CPU usage between the various samplers.

** It is important to note that all CPU measurements were taken using the Windows Task Manager. Unfortunately, this measurement mechanism is only a rough estimate based on a statistical sampling technique. To more accurately measure an application's CPU usage would require more sophisticated measuring tools, or access to the application's source code.*