

# String *Divisi* with The Garritan Personal Orchestra

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This essay outlines my reasons for adding the Garritan Personal Orchestra to the performance resources of my virtual orchestra, The Lam Lukka Foni Sinfonia, and demonstrates create divided orchestral string sections. At the end I provide web links to Ensemble files I created, which you may freely download.

## Background

In 2004, when I resumed composing for more traditional instrumental ensembles, but still wanting to remain free of reliance on those organizations to hear my work, I began searching for a suitable orchestral performance platform. At that time, I was using mostly software-based “virtual synthesizers. The only hardware synth left in my studio was an inexpensive Roland General MIDI rack-mount unit that did a barely passable job of imitating most orchestral instruments.

The challenge at that time was my *Second Symphony*. I needed to hear it rehearsed with reasonable fidelity as I was composing so I could make revisions, and to make a recording that would be an acceptable substitute for a real performance by a symphony orchestra, not a “synthy” version that merely resembled one. I needed a much greater variety of sounds available simultaneously, and much greater accuracy in the nuances of orchestral performance.

I was pretty naive about what direction to take. I first considered available hardware samplers, especially the Roland JV-1080 and JV-2080. Available with a keyboard or in a rack-mount version, it had slots into which various cartridges could be added, including an orchestral sound module. However, aside from the considerable cost of getting enough voices, the sounds weren’t accurate enough for serious orchestral scoring.

I owned a Digidesign SampleCell card with a basic sound library, but it was being discontinued. The software version, appropriately named Soft SampleCell, didn’t have enough sounds, and there was no system for organizing the enormous variety of sounds needed to make it practical.

AKAI had released a series of excellent hardware samplers with better sound libraries, but with the same issues of space and organization. And I wanted to avoid repeating my experience prior to 1993, collecting a roomful of boxes sucking up electricity and requiring maintenance while growing obsolete.

So I began checking out software samplers, and settled on Gigastudio, an application I’d heard of but never investigated. Originally called Gigasampler when it was released in 1998 by Nemesys Music , it

had some groundbreaking technology that made it the first choice for orchestrators. In particular, samples were read directly from a hard disk and streamed to the hardware outputs, with only the first few milliseconds loaded into RAM.

More importantly, the sample libraries were outstanding. In particular, Garritan's GigaHarp, GigaPiano and the Garritan Orchestral Strings were among the best I had heard. I was lucky to acquire version 2.5 second-hand, with these libraries plus a basic Vienna Symphonic Library, from a bored itinerant musician with too much money and too little talent.

I installed it on a second computer (my first was busy with Pro Tools), added an RME audio card to get 8 ADAT outputs, got it all working, wrote the symphony and made a recording I'm pretty happy with. You can hear excerpts on my web site (<http://www.johnmelcher.net/library.html>).

It wasn't perfect. Gigastudio was notoriously unstable. If too many samples were loaded, the computer might spontaneously reboot, wiping out unsaved work and sometimes corrupting the instrument files. I upgraded to version 3 because it added ReWire support, and I wanted to run it on the Pro Tools PC to get more simultaneous outputs. But it didn't work well; notes would hang if Gigastudio was in the background. And the new version kept crashing, at least once a day. Their manual was terrible and technical support wasn't much better.

By the time version 4 was released, most library developers were avoiding it, because it used unprotected sample files that were easily pirated, in favor of protected systems like Kontakt. I didn't switch because I had customized libraries that would be difficult to translate. So I've stayed with Gigastudio version 3, on a five-year-old PC running Windows XP. It still does what it does but can't be upgraded to a 64-bit OS to use more RAM. There are no new libraries, and old ones are disappearing.

### **The problem of divided strings**

Beginning a large project like a symphony tends to clarify technical issues for me. It's when I usually "sharpen my saw", or to use a more apt metaphor, "tune my piano".

In my *Second Symphony*, the string parts were mostly written as a normal five-part choir (first and second violins, violas, cellos and double-basses). The first movement had sections with 12 solo violins, 6 violas and 6 cellos playing long *glissandi*. This was handled easily enough with Kirk Hunter's Virtuoso Solo Strings (a relatively small library that was nonetheless good enough to render a string quartet) and the Garritan Orchestral Strings. Although they're different libraries recorded under different conditions was not a significant obstacle. Getting realistic glissandi over a range of an octave was much more difficult, and a problem not yet solved by any sample library (but I digress).

A typical symphony orchestra has approximately 16 first Violins, 14 second Violins, 12 violas, 10 cellos and 8 double basses (written 16-14-12-10-8). There's some variation:

New York (Phil.)	18-15-12-10-6
San Francisco	18-16-12-11-9
Saint Louis	16-14-12-10-8
Indianapolis	15-14-9-10-8
Cincinnati	15-16-10-10-7
Phoenix	12-9-6-7-4

These differences reflect the concert hall in which they perform, the players' seating pattern, and the Music Director's idea of proper orchestral balance. The smaller number of violas in some second-tier orchestras may also reflect the relative shortage of professional violists. I once wrote a piece for a college orchestra with three violas!

In a symphony orchestra, two string players usually share a music stand, or "desk". If the first violins are divided into two parts, each desk is divided, with the player sitting closest to the audience normally playing the first (usually higher) part, and the other player the second part. When dividing into three or more parts, the situation is more complicated. For example, in Stravinsky's *Rite of Spring*, at rehearsal marks 87-89 the first violins, violas and cellos are divided in two parts; the second violins are divided in three parts, specified in the score as desks 1-3, 4-5 and 6-7; the basses are also divided in 3 parts, but the division scheme is left to the conductor.

In my *Third Symphony*, the string section at times needs to divide into smaller sections. In one place, the first and second violins are each divided into three parts, and the violas, cellos and basses in two parts. At other times there are 3 viola parts.

The problem is that most libraries provide only full section or solo string samples. One notable (and expensive) exception is the Vienna Symphonic Library Chamber Strings collection. For a mere \$2,170, one gets ensemble samples of 6 violins, 4 violas, 3 cellos and 2 basses. This wouldn't have helped Stravinsky, who in the above example would require 4, 6 or 8 violins, perhaps 5 cellos and 3 basses. It's close, but not ideal. Modern composers are even more specific.

Aside from the ensemble size mismatch, another problem is "phasing". Most libraries provide one or two versions of each instrument, including the violin section. Unlike the VSL package, the original GOS provided separate first and second violin libraries. To its credit, GOS provided unique samples for First and Second Violins. But if, for example, the first violins are divided but happen to play notes in unison, likely using the same sample. and if the notes occur at precisely the same time, they will simply add together, giving the same sound but ~3dB louder. If they're slightly out of sync, the phase difference will create a comb filter with resonant peaks dependent on the pitch of the note played. If one note is slightly detuned, a flanging effect will be heard. A cumbersome workaround is to substitute a different sample in one voice at unisons.

Another problem is that when the string section is *not* divided, the same family of samples should be used, or the timbre will be off. That means purchasing the full VSL Orchestral String Library to complement the Chamber Strings. That's another \$2,830, a significant financial strain for most composers. Being in Thailand, I would have to add another 30% for shipping, taxes and Customs duties, pushing the price to nearly \$6,000, a big expense just to render a few bars of divided strings. I was leaning toward this option. The alternative, eliminating divided strings, would break my rule not to revise a composition to fit a sample library. So I decided to explore other options.

### **Garritan Personal Composer to the rescue?**

I had heard about the Garritan Personal Orchestra, a whole orchestra of instruments in one package for \$150. I assumed it would be too basic, more like a multimedia sound card and not suitable for "serious" performance. However, Garritan always pushed the envelope with its libraries, which had much to do with Gigastudio's success. When I read that an ensemble could be built up from individual parts, and that it was available as a download (no shipping, taxes or waiting), I bought version 4 immediately.

I've now had it for just a few days. I'm generally pleased with the sound and amazed at its versatility. It's not perfect, but I believe it's addressed many of the inherent problems with sample-based instruments. One is the abovementioned problem on making ensembles of different sizes, (which I'll get to in a moment). Another frustration is the problem with multiple velocity layers.

Instruments have a different timbre when played soft or loud; it's not just volume. If a violin is sampled only when playing *fortissimo*, it won't sound right when played softly. It will sound like a loud violin with the volume turned down. The usual solution is to sample at more than one playing dynamic. This creates a new problem, because the boundaries are not smooth. The worst case is two samples per note, one soft and one loud. If the sample switches between MIDI velocity 64 and 65, a musical passage with notes that increase from 48 to 72 will sound bad across the break. It's theoretically possible, but extremely difficult to fade between the two samples. At *mezzo forte* it usually sounds like two instruments playing together (which in fact is exactly what's happening).

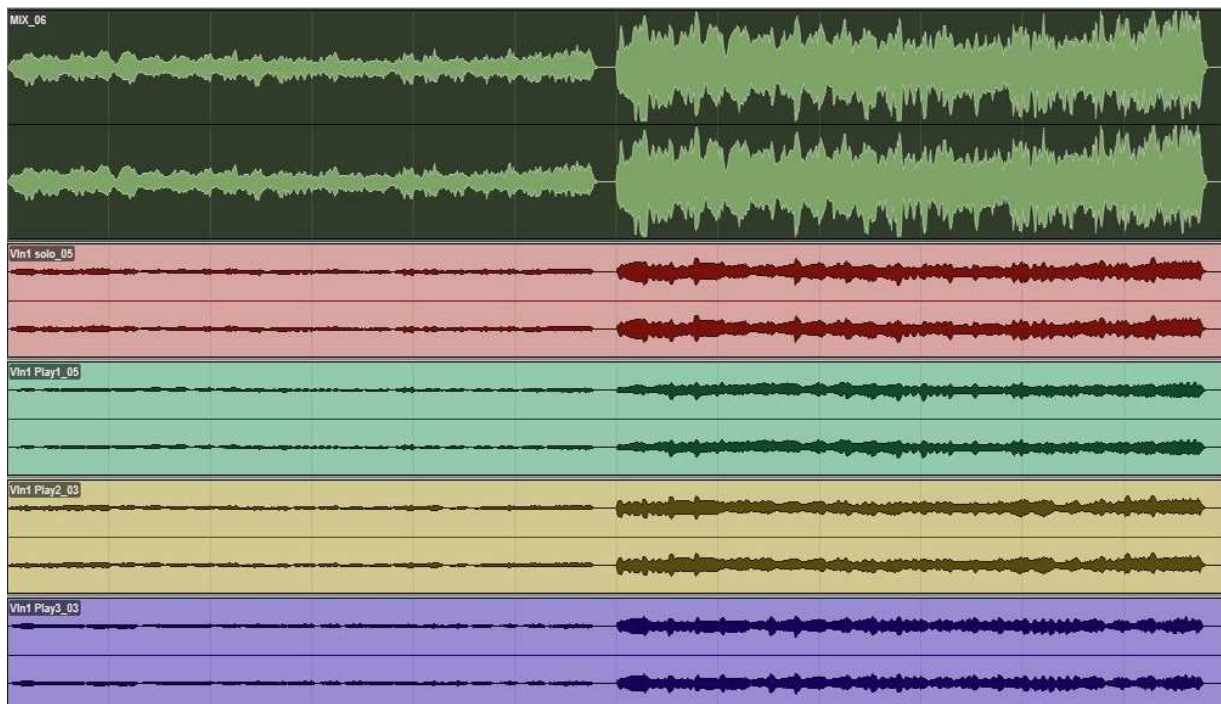
One can add more velocity layers. Usually 6-8 layers are needed to make the breakpoints unnoticeable in an orchestral texture, though extra work is still required to hide them in solo passages. This works if every single sample is exactly right. That means getting a violinist to play middle C at 8 "equally spaced" dynamic levels, then to do exactly the same with C#, D, etc. In every library I've purchased, there are "clinkers", notes where one or more velocity layers is too loud, too soft, too bright, out of tune, has a different attack, etc. And these libraries are proportionately bigger, requiring more RAM and hard drive usage, and usually at a much higher cost. To economize, designers often create sample sets that are not orthogonal; not every sound is available for every instrument. In string libraries, often the viola and bass have fewer articulations (*detache*, *staccato*, *non vibrato*, etc), than the violin and cello.

The Garritan Personal Orchestra appears to have found a good, though not ideal solution. There appears to be only one velocity layer per note (the manual doesn't say). Attack transient volume is controlled by MIDI Note On velocity, and sustain volume by the Modulation controller (CC #1). According to the manual it "simultaneously controls both the Volume and the Timbre (brightness)." This eliminates all of the rough edges between layers, though I hear very little timbre differences at lower dynamic levels.

GPO has two simple and intuitive method of producing legato notes. For most instruments, when the sustain pedal is depressed (technically, if MIDI Controller #64 is >64) the attack of notes is clipped off so they flow together. The same effect is possible by setting an instrument to Omni mode.

But what most interested me was the number of unique solo instruments available, and a process referred to as "ensemble building" to create instrumental sections by layering solo instruments. Individual layers can be detuned and also placed anywhere in a stereo field, and pitch and timbre (brightness) can be randomized by a specified amount to enrich the sound.

For example, GPO contains three separate sustained violin instruments, each with three derived variations, called "players", for a total of twelve unique players of sustained notes. To verify this, I used Pro Tools to record a 3-octave G Major scale using all four versions of Violin 1, 2, And 3, then mixed them together into three quartets. Here's what the Violin tracks look like:



*Tracks top to bottom: 4-part mix, Violin 1 solo, Violin 1 Player 1, violin1 Player2, violin 1 Player 3*

I'm not sure what algorithms were used to do this. It's not just filtering. In any case, I didn't hear any phasing.

To create an ensemble of up to 12 violins, the individual instruments are loaded into the ARIA player and assigned to the same MIDI channel.

Since one GPO Ensemble has a maximum of 16 parts, I decided to limit the total, undivided violin section size to 16 in order to keep it simple. I also created a 12-player section by removing some instruments.

Creating violins divided 8-8, 4-4-4-4 or any other combination is simple; just change the MIDI channel assignments and panning.



*First Violins divided 6-5-5*

This is an ensemble First Violins divided 6-5-5. Each of the three sections has a different combination of the 12 available instruments. In this case, it's assumed that the violins divide by desk, so they are

panned in pairs from near center to far left. The equivalent Second Violin ensembles have slightly different combinations of instruments and are panned slightly more toward the center.

Cello sections are created in the same way. In fact there are more available cello instruments available (12) than are usually needed. I created ensembles of 10 and 12, and divided them in various ways.

Violas are a problem; with only one solo viola and three variations, the largest section is four. Assuming a minimum division of two (for undivided strings, use the regular ensemble instruments), that would give only 8 violas, and each section would have the exact same instruments. A second viola instrument is sorely needed.

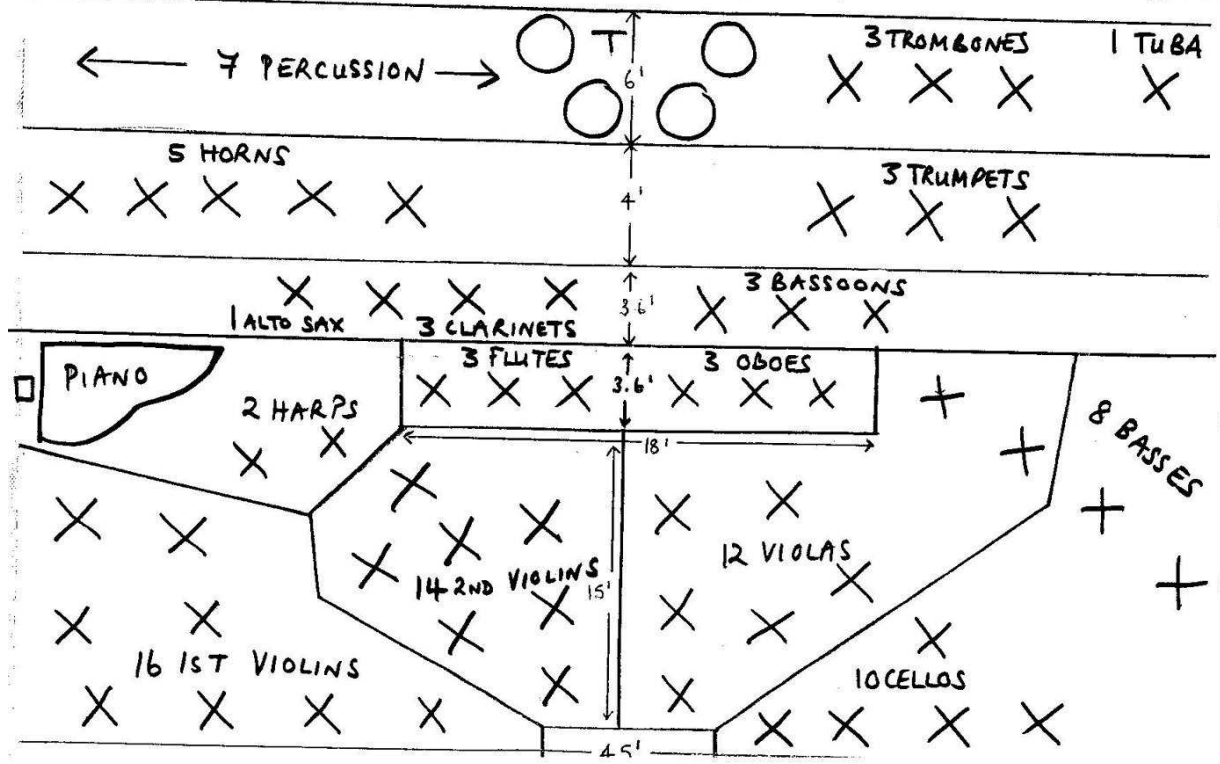
Double basses are also tricky; GPO contains three unique double-bass players derived from the original solo instrument, but the solo instrument exists only in the key-switched version. This means that to make sections of 4 basses (the standard symphony orchestra complement of 8 basses divided in two), the key switched instrument has to be included. This will work as long as they're switched to the default sustained voice. It's possible some other track could switch it to something else, with odd results when the divided sections are used later.

Instruments are panned to imitate a typical orchestra seating plan. For sections divided in two, each desk divides, so both parts is spread across the field; division into 3 or 4 parts is done by desk, so part 1 in near the center, and part 3 or 4 toward the outside, except for basses, which is the reverse.

PHILHARMONIA ORCHESTRA: 13 SEPTEMBER 2001 / ASHKENAZY

Risers  $\approx$  8" minimum high intervals.

[NB] Solo piano also required for Rachmaninov Piano Concerto No.3



A typical orchestra seating chart

Not all orchestra follow the above seating plan, and in performance, concert hall acoustics are designed to blend these instruments so the sound is balanced for all members of the audience.

For all ensembles, no pitch variation (Var. 1) is applied. I think they sound thick enough without it. If increased to 15 or more, the effect is of an amateur orchestra with bad intonation.

Timbre variation (Var. 2) is set to 20 on each voice. Setting it much higher creates an occasional low-frequency "thup" when changing from one note to another. It can mostly be filtered out during recording with a high-pass filter set with a very sharp cutoff (24dB/octave or more) at approximately 180 Hz for violins, 120 Hz for violas.

Auto Legato is ON. For double-stops, turn it off and use the Sustain controller (#64) instead.

Equalization, Stereo Stage and Effects are turned OFF to reduce CPU load. In any case I prefer to record a stereo mix in Pro Tools and add processing there.



*Control settings applied to all instruments*

The Ensembles I created are listed below. A WinZIP file containing all of them may be downloaded from my web site: [www.JohnMelcher.Net/Library/GPO\\_strings](http://www.JohnMelcher.Net/Library/GPO_strings). I suggest creating a subdirectory called "Strings divisi" inside your Ensembles directory. By default (on Windows) is "C:\Program Files\Garritan\Personal Orchestra\Ensembles".

Violins 1 (16) 8-8	Violins 1 (16) 6-5-5	Violins 1 (16) 4-4-4-4	
Violins 1 (12)	Violins 1 (12) 6-6	Violins 1 (12) 4-4-4	Violins 1 (12) 3-3-3-3
Violins 2 (16) 8-8	Violins 2 (16) 6-5-5	Violins 2 (16) 4-4-4-4	
Violins 2 (120)	Violins 2 (12) 6-6	Violins 2 (12) 4-4-4	Violins 2 (12) 3-3-3-3
Violas (12) 4-4-4	Violas (9) 3-3-3		
Cellos (12)	Cellos (12) 6-6	Cellos (12) 4-4-4	Cellos (12) 3-3-3-3
Cellos (12) 2-2-2-2-2-2			

Cellos (10)                      Cellos (10) 5-5                      Cellos (10) 4-3-3

Basses (8) 4-4                      Basses (8) 3-3-2                      Basses (8) 2-2-2-2

I tested them with a short excerpt from a new orchestral project. The 1<sup>st</sup> and 2<sup>nd</sup> violins and violas are all divided in three parts, cellos and basses in two parts (but only half the basses play). A TIFF file of the score and an MPEG audio file may be downloaded from my web site at the same location as given above.

### Issues

An obvious omission is Player instruments derived from the full key-switched solo instruments, so that string ensembles of other playing styles (*pizzicato*, *tremolo*, etc) can be built. The only workaround I can see is building an ensemble of two or three key-switched violins or cellos (you're out of luck with violas and basses).

The sounds themselves are, in my opinion, fair to good. I hear some background "grit" in high violin and viola notes which sound like compression artifacts. Also, there is an artificial vibrato added to the Player sounds; it's obvious when you listen to the low viola C or violin G, which can only be played on the lowest open string. Generally, ensembles built this way sound audibly inferior to the section samples. And the high strings sound a little "organ-like" for some reason.

I'd like more solo string players, preferably one more violin and bass and two more violas, with three Player variations of each (all key-switched). That would provide 12 unique violins, 9 violas and cellos and 6 basses for all playing styles.

I wish the Modulation wheel had more effect on string timbre, especially at the softer end of the dynamic spectrum. It really sounds to me to be optimized for louder playing.

The ARIA player has a well-designed interface, but needs some refinements. There should be some indicator when a channel is playing MIDI data. There's no way to know what Ensemble file has been loaded, and there's no alert if you overwrite an existing file when saving. The MIDI channel numbers and output assignments are black on gray, hard to read from a distance.

Having said all that, I'm impressed this product sounds as good as it does, especially at just \$149. I'm not yet sure where the GPO will fit into the Lam Lukka Foni Sinfonia. I'm keeping Gigastudio for recording and will probably use the GPO as a rehearsal instrument while composing until I decide if the sound is realistic and clean enough to record. The ARIA Player is easy to use, and I hope to see more advanced libraries developed for it.