VST Connect SE
VST Connect SE Performer

Operation Manual

Steinberg Media Technologies GmbH

December 2012

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1 Introduction

Welcome!

Steinberg VST Connect SE allows musicians to connect directly to each other, giving you the freedom to collaborate and produce together, even when you're not in the same studio, town or country. Talkback and chat functions as well as video and audio stream in real time give you limitless possibilities. Collaborate with other musicians even if they don't use Cubase, thanks to the included standalone version, which is available as a free download.

In a nutshell VST Connect SE allows you to:

- Collaborate with your partners around the globe
- Peer-to-peer solution with sample accurate sync
- Video feed, talkback and chat functions

VST Connect SE consists of three modules:

VST Connect SE Performer application

The "VST Connect Performer' application runs on the Performer's end and handles audio data to record and all chat communication on the performer's side. It is a free download from the download section at steinberg.net and doesn't require any license.

VST Connect SE plug-in

This plug-in is inserted in an Input Channel, preferably where the Engineer has his talkback microphone connected. This

plugin provides the user interface with the Performer's video display and controls.

VST Connect SE Cue Mix plug-in

This plug-in sends an audio stream to the Performer. It has virtually no user interface, once inserted in the appropriate group channel (called either "To Performer", or "Cue Mix"), it can be closed and forgotten about.

2 Quick start

Before you begin

Please note that VST Connect requires a solid internet connection on both ends; a minimum of 256 kBit/s upstream is required as well as a reasonable local connection. For instance, tethering via a smartphone across 2 WiFi (WLAN) hotspots in between is not likely to work, a solid Ethernet cable connected directly to your router or modem is highly recommended on both sides.

In case you face any connection issues, please see the Troubleshooting chapter for more in-depth information about setting up your Router.

⚠️ *The following text assumes two people, one called the "Performer" (artist, talent), the other named Engineer (in the control room, running Cubase or Nuendo).*

Setting up VST Connect SE Performer

VST Connect SE Performer is used on the side of the musician/vocalist who will be recorded.

1) Install and start the VST Connect SE Performer application. Do not start Cubase or other audio applications.

2) Type an arbitrary name in the Your Name field, and the Key number you get from the Engineer (via phone, mail etc) in the Key field.

3)
Click the Connect button. That's it!

Setting up the VST Connect SE plug-ins

VST Connect SE plug-ins are used on the side of the recording engineer who running Cubase or Nuendo.

Setup the studio recording situation

First we need to set up a standard studio recording situation in Cubase or Nuendo as follows:

⚠️ *Please note that the built-in Control Room Mixer does not work for this (yet).*

Setup the VST Connect SE plug-in for recording

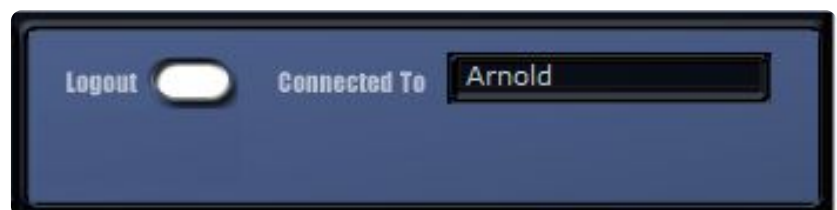1) Create an Input bus (creates an input channel) with your talkback microphone as source, label it "TB/Performer".

2) Create an audio track labeled "Performer Rec", input bus (source) is "TB/Performer". Make sure that monitoring is set to "manual" mode. Record enable this track, but do not enable monitoring for it.

3) Create another audio track, also with source "TB/Performer", and label it " Performer Mon". This time, enable monitoring for this channel but don't record enable it.

Setup the VST Connect SE Cue Mix plug-in

1) Create a Group channel labeled "To Performer". This is your cue mix (what the Performer hears on his/her headphones). You would normally route this to an audio output to the studio headphones, but for now you can leave it on the main output.

2) Load the music the performer is to play/sing/do whatever to to your project. Route the sends on these tracks to the "To Performer" channel. Also route the sends from the "Performer Rec" channel (not the "Performer Mon" channel) to the cue mix ("To Performer") so that the Performer can review his receordings.

3) If a Performer (and our talkback mic) was next door, you could now start a recording session. You would always hear the Performer (via the "Performer Mon" channel), punch in and out, modify the cue mix etc in the usual way.

Remote record the Performer

Now let's modify this with just a few steps to record our remote Performer:

1) Insert the VST Connect SE Cue Mix plugin in the "To Performer" channel, and lower the volume of that cue mix channel to zero (but don't mute it). The VST Connect SE Cue Mix plugin sends the cue mix stream to the Performer. It has virtually no user Interface, so just close and forget about it.

2) The "TB/Performer" input channel serves 2 tasks: it sends your talkback mic (along with the cue mix) to the Performer, and receives the Performer's signal for recording in return.

3) Insert the VST Connect SE plugin in the "TB/ Performer" input channel. Type an arbitrary name in the User Name field to the top right, and click Login.
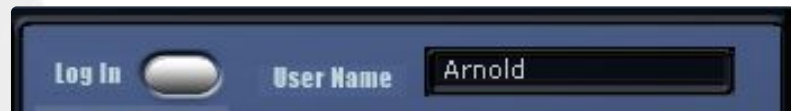
4) Provide the Key shown now (generated by the VST Connect server) to the Performer and have them enter it and click their connect button as described above.
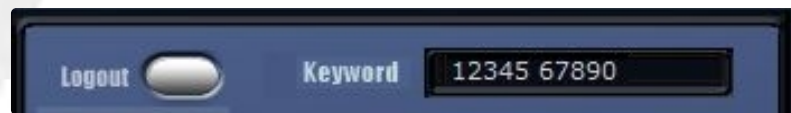
You're done. You can now see, hear, and record the Performer, and create a decent cue mix just like when recording someone next door. Note that the controls to the right are for the Performer's audio and settings, not your own (for yours, click the Setup button).

3 First steps

VST Connect SE Performer application

If you are a Performer, all you need to do is to install and start the VST Connect SE Performer application.

Do not start Cubase or other audio or video applications at the same time to avoid problems. Type any name into the 'Your Name' field, then ask the Engineer for a key number (mail, phone etc.), type the key number in the Key text field and click the Connect button.

You should then immediately be connected to the Engineer, that is, see his webcam picture and hear his voice. If connecting fails, see the Troubleshooting section.
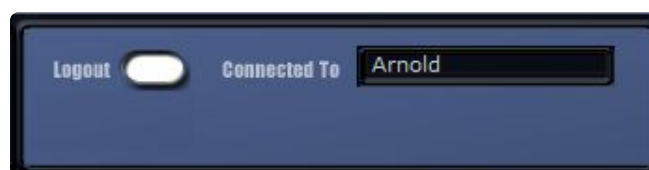
If this is the first time that you're using the VST Connect Performer application, you may not be able to hear the Engineer and/or your microphone yet. In this case, the Engineer can set up your audio device and ports by remote controlling your settings.

If you are familiar with audio applications, you may also want to configure your setup by yourself, by clicking the 'Conf' button to the right. The same applies to the mixer controls; it is recommended you leave these to the Engineer unless you are familiar with how to set them up, in which case the controls (described below) should already be clear for you. Both the mixer and configuration pages of the VST Connect Performer application are described in more detail below.

VST Connect SE and VST Connect SE Cue Mix plugins

The Engineer uses Cubase / Nuendo and two VST3 plugins:

VST Connect SE Cue Mix plugin

This sends an audio stream to the Performer. It has virtually no user interface, once inserted in the appropriate group channel ("To Performer", or "Cue Mix"), it can be closed and forgotten about.

VST Connect SE plugin

This is inserted in an Input Channel, preferably where the Engineer has his talkback microphone connected. This plugin provides the user interface with the Performer's video display and controls. Note that all of the controls on the right side control the *Performer's* audio and settings, not yours. Click the Setup button on the top right to configure your own (local) settings.

When setting this up for the first time, you should leave the up/downstream settings as they are until a stable connection is established. Type any name in the User Name field and click Login.
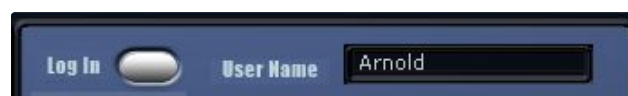
A so called Key number will appear in the Key field; this is generated by the VST Connect connection server. You will provide this key to the Performer you want to work with.In turn,

the Performer will type this key in their VST Connect Performer application and then establish a connection by clicking their Connect button.
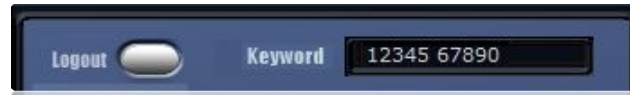
You should now at least see a video picture, provided the Performer has a webcam or other video source. Click the 'Conf' button to the right (if you are still in your setup view, click Setup on the top right again to return to the Performer controls). You can now adjust the Performer's video, audio, and network settings. Once configured, those settings will be stored on the Performer's computer, so this has to be done only once. You should now be able to communicate with the Performer, otherwise refer to the Troubleshooting section.

VST Connect utilizes a technology named VRLC ("VST Connect Remote Latency Compensation"). When the Cubase or Nuendo transport is started, the Engineer will have to wait for a second or so (configured in the Engineers' setup page) until playback actually happens. During that time, internal playback has already started, and the cue mix (the channel where the VST Connect SE Cue Mix plugin is inserted) is transferred to the Performer. The Performer provides his/her performance in sync to what they hear and the result is sent back to Cubase or Nuendo so that when playback actually starts there, the Performer's audio signal has arrived for listening and recording in sync to the transport (timeline).

The more time VRLC is given to manage the data, the more reliably the system works. This greatly depends on the quality of the internet connection. There are many factors outside Cubase or Nuendo and VST Connect which determine this quality. You can improve it by making sure that your internal network is not used by other people, close all network intensive applications such as browsers, and have a direct connection (avoid WiFi) etc. This applies to both Partners.

There are two bargraphs which show how well the 2 points are synchronised during playback and recording, one for the Control Room (Engineer), and one for the Performer. These display how much audio is already available on either end per second. As long as these bars are not too short and reddish, all should be well. Furthermore, there are two rows of 3 LED-type displays which indicate connection quality issues, namely receive, send, and sync for either side. In general, these should

always be green; occasional red activity of the sync indicator may happen during transport actions such as start, stop, and locate. This is quite normal, though.

The delay between hitting start and actual playback caused by VRLC can be setup freely, but if you have a good internet connection, you may try to go below one second; normally, approx 0.75 seconds should work. Again, if either sync LED lights up too often during playback, you should consider raising the VRLC time (Setup button, 'Remote Delay Compensation', described in more detail below).

Routing

First, create an Input channel, the source of which is your Talkback microphone. Let's label this "TB/Performer", as it serves two tasks:

- It sends your talkback signal (along with the cue mix) to the Performer

- In return, it routes the Performer's signal to its destination (audio track).

Insert the VST Connect SE plugin here.

VST Connect solves several problems you might encounter with other systems. For example, the Performer can review their recordings without any problems, and punch in/out works without restrictions. In order to acheive the first, we create 2 audio tracks for the Performer, one for recording the Performer's performance, and another one solely for monitoring (hearing) the Performer. Both of these audio tracks' input (source) should be set to the TB/Performer channel. Label the first audio track "Performer Rec" or the like, and set with recording enabled. You should set monitoring to manual and make sure that this track is *not* set with monitoring enabled. Label the second track "Performer Mon" and enable monitoring (but not record) for only this track. So now we can hear the Performer at any time through the "Performer Mon" channel, while recording takes place on the "Performer Rec" track.

Now, create a group channel and label it "To Performer" (or "Cue Mix", if you prefer). Insert the VST Connect SE Cue Mix plugin here, and lower the volume to zero (but don't mute it). Whatever is sent to this channel is what the Performer hears (mixed with the talkback signal). Note that the stream to the Performer provided by the VST Connect SE Cue Mix plugin can only be sent when the VST Connect SE plugin is activated. Currently, the VST Connect SE Cue Mix plugin does not work in the Cubase or Nuendo Control Room Mixer Studio (cue mix) channel, as this is excluded from latency compensation.

You can now send from the "Performer Rec" channel to the "To Performer" channel, so that the Performer can review their recordings (don't send from the "Performer Mon" channel, as this would certainly confuse the Performer). Now you can create a cue mix by sending the appropriate playback channels to the "To Performer" channel and start recording, adjusting the cue mix to the Performer's needs.

Of course, reverb and other realtime audio processing applied to the "Performer Mon" channel can not be sent to the cue mix, because of the delay. To overcome this, VST Connect includes local processing within the Performer's application VST Connect SE Performer for EQ, compression, and reverb. All of these can be remote controlled by the Engineer to provide a comfortable mix to the Performer. Use the faders to adjust the overall mix. There is even a metronome click, though you may prefer to send a click signal via the "To Performer" channel; because it's all in perfect sync, this is no problem VST Connect.

Another feature allows you to monitor exactly what the Performer hears. Click the "Mon" button in the Performer's mixer page (beware of possible feedback). You should use the listen feature in Cubase or Nuendo (click the "L" button of the "Performer Mon" channel) to listen only to the return signal. This can also be used to check for sample accurate sync when you send a 0 dB signal, all faders to default (0 dB) and phase invert the "Performer Mon" channel. Residual noise in this case is due to compression artifacts.

4 Getting into the details

The Performer Mixer

Please note: all of these controls can be remote controlled by the Engineer when the Partners are connected. It is a good idea for the Performer to leave this to the Engineer so the Performer can concentrate on his performance, and this feature is especially useful for Performers who are not experienced with audio applications.

Mic fader:

Adjusts the level at which the Performer hears (monitors) his microphone input. This (as well as all other faders and knobs in this window) has no effect on the signal sent to the Engineer.

Studio fader

This controls how much of the signal sent from the control room (Engineer) is fed to the Performer's headphone. This includes the cue mix, and the Engineers' talkback signal.

Master

Overall listening level for the Performer.

Metro

Optional metronome click fed to the Performer's monitor mix (headphones). The Engineer may prefer to send some other click signal to the cue mix.

EQ Controls

Controls the EQ (Equalizer, Filter) settings for the Performer's. Depending on the Instrument setting, all of the effects at the bottom are applied to either the microphone input (when Instr. is off), or only to the Instrument input (Instr. is on), in which case the mic input is used only for talkback and remains dry. Again, none of the effects are applied to the feed sent to the Engineer (except when monitoring is active), only the Performer's monitor mix is affected.

Threshold, Attack, Release, Ratio, Makeup

Controls the built-in compressor for the Performer's monitor mix (headphones) only. The display to the right above the compressor section shows the resulting gain reduction. If you are not familiar with compressors you should leave all these knobs as they are (middle position, ctrl/click to reset them).

Reverb, Size, Damp, and Width

Sets the built-in reverb. You can experiment with these controls to get a reverb effect to improve your listening experience. If in doubt, for all these effects, the Performer to be recorded may prefer to have the Engineer control these settings, just tell him 'can you add some reverb' or 'my voice sounds very thin' and he will take care of this.

Inst switch

When activated, an additional channel (and also input in the Conf page, see there) is created where the Performer can connect their instrument (another microphone for an acoustic instrument, an electric guitar, a keyboard or the like). When Instr. is activated, the microphone input acts as a talkback source: effects are only applied to the instrument channel, and the microphone stream to the engineer is muted during playback. Note this means the Performer can't talk to the engineer during playback or recording. This is to avoid that anything else but the instrument signal is sent to and recorded in the control room. The Instrument fader in the mixer controls the amount of the instrument signal applied to the Performer's monitor (headphone) mix.

Mon button

This is not accessible for the Performer but only for the Engineer. It provides a means to send the Performer's monitor signal (what they hear on their headphones) to the Engineer. The Engineer should use the listen feature in Cubase or Nuendo (click the "L" button of the "Performer Mon" channel) to listen only to the return signal. This can also be used to check for sample accurate sync by sending a 0 dB signal, all faders to default (0 dB) and phase invert activated to the "Performer Mon" signal. Note that there may be residual noise due to compression artifacts.

'Conf' button

It will replace the effects page with the Configuration page to configure the Performer's settings described below.

The Performer Configuration Page

The Performer Configuration page adjusts settings relevant only to the Performer, but can be set up by both the Performer and the Engineer. As stated elsewhere, it is recommended to leave this to the Engineer unless you are familiar with setting up audio applications. This page will appear when you click the 'Conf' button in the Performer's mixer page (if you are an Engineer and don't see this, you may need to click the 'Setup' button on the top right to return from your own setup to the Performer mixing and effects or configuration page).

Audio Device

The Performer's audio device can be chosen from a list of installed compatible devices. If nothing appears here, the Performer should search the web for an appropriate driver supporting his audio hardware. If none can be found, for Microsoft Windows ™ systems, the freely available ASIO4ALL driver has proven to work well with most standard audio hardware.

Audio Output

This is the audio output port for the Performer's headphones.

Instrument Input

If the Instr. Option (Performer mixer page) is activated, the port (audio input) for the Performer's instrument can be selected here.

Mic Input

Choose the input (port) where the Performer's microphone is connected here.

Audio Upstream

The higher this value, the better is the audio quality for the signal sent to the control room (the Performer's performance). Note that there will be dropouts if this setting, together with the Video Upstream value, exceeds approx 80% of what your IP (Internet Provider) delivers as upstream rate. For instance, if your provider guarantees only 384 kilobits per second upstream, you should set both of audio and video upstream to 128 kBit/s so that there is sufficient headroom for reliable network operation without dropouts.

Video Upstream

The same as Audio Upstream, this time for the video signal. The same rules apply. Usually, the quality of the video signal (normally, a webcam stream of the Performer) is of lesser importance, but if your connection and IP allow it, you can improve picture quality with higher values.

Video Device

Choose the video signal to be sent to the Engineer here from a list of devices available on the computer. You can send any video signal that is offered by the operating system.

The Talkback and Dignostics View

There are two bargraphs which show how well the 2 points are synchronised during playback and recording, one for the Studio (control room, Engineer), and one for the Performer. These show how much audio data is available on either end per second. As long as these bars are not too short and reddish, all should be well. Furthermore, there are 2 rows of 3 LED-type displays which indicate connection quality issues, namely receive, send, and sync for either side. In general, these should always be green, if the the sync indicator occasionally lights up red, that's normal for transport actions such as start, stop and locate.

Talkback from the Engineer to the Performer (how loud the Engineer appears in the Performer's headphone mix) can be adjusted with the knob next to the Talkback switch. Note that Talkback is switched automatically: when transport has started (playback, record), the Engineer Talkback is disabled automatically. You can override this by engaging the talkback switch while transport is in play mode. When you switch off talkback during stop, it is disabled altogether, for instance, if you send another talkback signal to the cue mix ("To Performer" channel).

The Setup Page

The Engineer's Setup page adjusts settings relevant to the Engineer only and is only available in the VST Connect SE plugin. It appears when the Engineer clicks the **Setup** button on the top right.

Audio Upstream

The higher this value, the better the audio quality for the signal sent to the Performer (cue mix and talkback). Note that there will be dropouts if this setting, together with the Video Upstream value exceeds approx 80% of what your provider offers upstream. For instance, if your provider guarantees only 384 kilobits per second upstream rate, you should set both of audio and video to 128 kBit/s so that there is sufficient headroom for reliable network operation without dropouts. A higher upstream rate can also be important when you use VST Connect for instance to review mixes etc.

Video Upstream

The same as Audio Upstream, this time for the video signal. The same rules apply. Usually, the quality of the video signal (normally, a webcam stream of the Engineer) is of lesser importance, but if your connection provider allow, you can improve picture quality with higher values.

Video Device

Choose the video signal to be sent to the Performer here from a list of devices available on the computer. You can send any video signal that is offered by the operating system.

Input channels

If the input channel where the VST Connect SE plugin is inserted is a stereo channel (useful if the Performer plays a stereo instrument, or for precise loopback operation), the Performer may hear your (mono) talkback signal on one side only. In this case, set the talkback in a way that the signal appears in the middle (usually, choose 'Left').

Remote Latency Compensation

VST Connect utilizes a technology named VRLC ("VST Connect Remote Latency Compensation"). When the Cubase or Nuendo transport is started, the Engineer will have to wait for a second or so (configured in the Engineers' setup page) until playback actually happens. During that time, internal playback has already started, and the cue mix (the channel where the VST Connect SE Cue Mix plugin is inserted) is transferred to the Performer. The Performer provides his/her performance in sync to what they hear and the result is sent back to Cubase or Nuendo so that when playback actually starts there, the Performer's audio signal has arrived for listening and recording in sync to the transport (timeline).

The more time VRLC is given to manage the data, the more reliably the system works. This greatly depends on the quality of the internet connection. There are many factors outside Cubase or Nuendo and VST Connect which determine this quality. You can improve it by making sure that your internal network is not used by other people, close all network intensive applications such as browsers, and have a direct connection (avoid WiFi) etc. This applies to both Partners.

The delay between hitting start and actual playback caused by VRLC can be up to about 1.5 seconds or so. If you have a good internet connection, you may try to go below one second; normally, approx 0.75 seconds should work. Again, if either sync LED lights up too often during playback, you should consider raising the VRLC time.

5 Troubleshooting

Internet connection

It can't be stressed enough that a solid internet connection is essential. A cable is much more likely to provide good results than any form of wireless connection. A wireless connection may work, but it can also cause for dropouts, long delays and the like. Try to get a hardware cable connection directly to your router or modem.

Firewall

If "Server not responding" is reported, you either have no connection to the internet at all (check this by trying to access the internet in a browser), or your firewall settings are too restrictive (this might be the case of you're accessing the internet from inside a company or school network). You may either try to configure your router/firewall to allow incoming information for UDP ports 51111 through 51113, or ask the administrator to do so.

Normally, a firewall works like this: if something unknown comes in, it is simply dropped, because nobody has asked for it and it might cause security issues. But when you asked for information (for instance, clicked a link in your browser), the reply from the server that was asked is accepted. While this makes perfect sense (how else could we communicate?), restrictive firewalls don't even accept replies even when we asked for it. They block any incoming UDP (and possibly, some other) traffic unless they are beeing configured to not to. This should not happen with a regular home setup, as normally routers are pre-configured to allow for incoming UDP traffic when such information has been requested by your computer.

Setup your router

Router manufacturers often use different user interfaces (and sometimes even different terminology) to set up the "port forwarding" function. If you already know how to configure your router to forward UDP Port 51111 through 51113, do that now.

As many gamers have similar problems, the web is full of good advice and instructions for pretty much every router model on the market.

Here are some details:

UDP port 51111 is used to communicate with the VST Connect connection server. This is required to register users, generate

the key numbers, and provide information to both Partners (Performer and Engineer) how to establish a direct connection. As the server is always open to receive requests, and provide replies, this connection should work without the need to change any firewall configuration. If you get a "Server not responding" message and you are sure the internet connection is working, you are most probably behind a firewall of some company or institution run by a system administrator. Show them this document and ask him to open UDP ports 51111 through 51113.

UDP port 51113 is used for direct communication between the two Partners. This is a more tricky issue, as one firewall has to accept incoming UDP messages. The same applies as with port 51111, but some firewalls don't accept if the two ports try to connect to each other. In this case, at least one Partner has to open ("port forward") port 51113, otherwise both will get a message "Sorry, connection failed" and no connection can be established even though both Partners have tried their best to connect to the other side.

UDP port 51112 is reserved for later use. For best results, it should be opened as well.

Avoid feedback and loopback stream

A possible cause of confusion is that for the Engineer using the VST Connect SE plugin, the sliders, knobs, and menus are not doing anything on his computer; they are remote controlling the Performer's machine (except when the Setup page is entered). This can lead to feedback etc; be careful with the Mic slider, in particular, as this controls how much the Performer hears of his/her own mic signal. This is why this fader is all the way down initially; if the Performer uses speakers, this may cause nasty feedback loops. Ask the Performer to use headphones, this will also eliminate possible echos.

As an Engineer, be careful to solo ("Listen") the "Performer Mon" channel before you engage the "Mon" button in the Performer Mixer. As described earlier, this provides a loopback stream which can lead to severe feedback if you're not careful.