

Real-Time Orchestration with VOCI: A User Manual

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- Contact: voci [at] drakeandersen.com

What's New in this Version

- Beta release.

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1. Introduction

1.1 What is Voci?

Voci is a virtual score software platform for real-time orchestration. A virtual score is musical notation designed to be presented digitally, rather than on paper. Unlike notation on paper, digital notation can change in real time. For example, some virtual score compositions develop traditional notation algorithmically, while others use animated graphics.

Voci allows musicians to hear many different arrangements, orchestrations, and transformations of a musical idea or composition in real time. Voci is primarily designed for use as part of the creative process and as a teaching tool, rather than a platform for live performance (though this is certainly possible). Voci is a platform, not a composition in and of itself, meaning that users can load, explore, and transform many different compositions, as well as many different iterations of the same composition.

Possible uses vary widely: one conductor might be interesting in exploring subtle re-orchestrations of an orchestral composition; another might wish to re-score a chamber work for a large ensemble; another might be interested in evaluating the results of computer-assisted algorithmic orchestration.

Using Voci is simple. First, load a digital music notation file into the Voci software. The individual parts—or voices—within the notation file can be isolated and assigned to any musicians who are connected to the network. These musicians will read the notation on their own devices. Voices can be assigned manually or automatically, filtered by range, and transposed as desired.

1.2 System Requirements

Voci is distributed as a Max patch and requires Max 8, along with the packages bach, cage, dada, odot, and zero. All of these packages can be installed using the Package Manager in Max.

Voci is compatible with Mac and Windows. System requirements for Max 8 are available on the Cycling '74 site: <https://cycling74.com/downloads/sys-reqs>

2. Installation

You can run Voci on any device that runs Max. The installation procedure is the same for Windows and Mac:

1. Download the latest version of Max from the Cycling '74 website (cycling74.com). Voci is distributed as a Max patch, but you do not need to purchase a license to run Voci.
2. Download the latest version of Voci and unzip the file.
3. Open Max and add the folder or directory where you saved Voci to the File Preferences. You can do this through the main menu by clicking Options → File Preferences. Use the + button to add the folder or directory, making sure the Subfolders box on the right is checked.
4. Download the bach, cage, dada, odot, and zero packages from the Package Manager. (File → Show Package Manager.) All other dependencies are included in the download.
5. Open performerPatch.maxpat in the unzipped folder. This is the performer's patch, which displays notation to be interpreted. The conductor uses a different patch to change the orchestration in real time.

If you have trouble opening the file or if an error appears, consult the troubleshooting guide (section 5).

3. The Conductor Patch

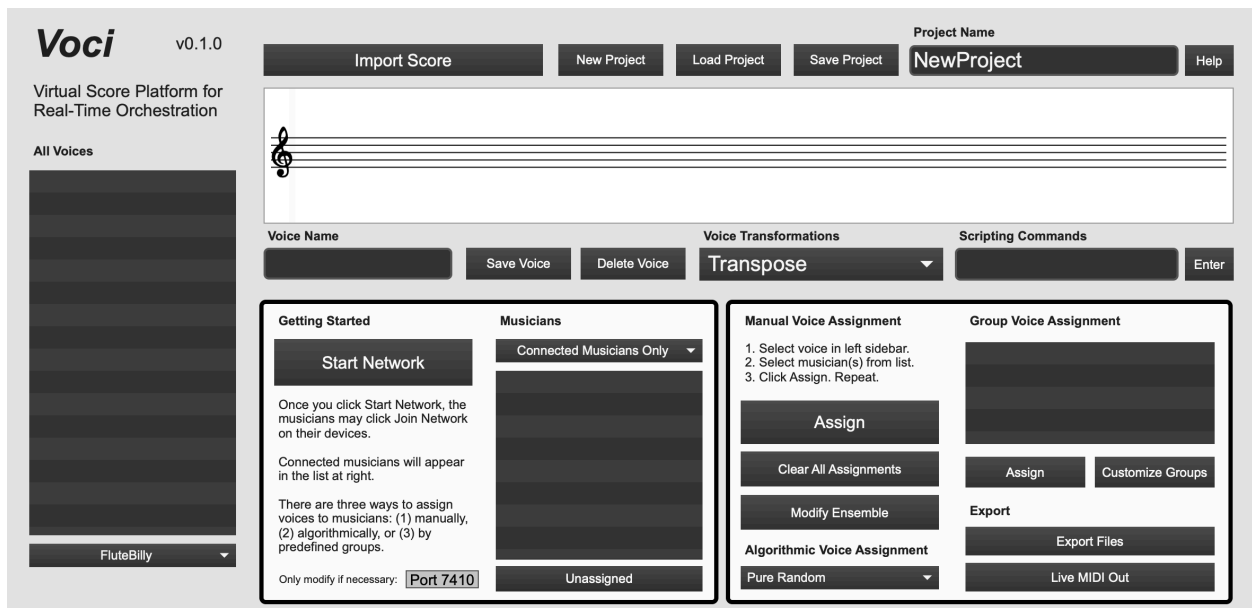
3.1 The Conductor's Role

Voci users can take on one of two roles—either the conductor, or a performer—which determines the patch that you open (conductorPatch or performerPatch). The conductor assigns parts—or voices—to individual performers. The performers play the parts assigned to them. The conductor can also transform the voices in a variety of ways before sending them to performers. This is important if the voices are being adapted between dissimilar ensembles.

Once voices have been assigned to the musicians, the conductor leads the rehearsal and performance as they normally would, while the musicians read the notation from the screen. The conductor (or an assistant) should be prepared to assist with any technical issues that may arise.

3.2 Interface Overview

There are four main areas in the conductorPatch. Across the top is (1) the notation display, along with controls for importing scores, working with projects (collections of voices associated with a single composition) and individual voices. On the left is (2) the list of voices in the current project. In the lower center are (3) the network controls and list of musicians. And finally, in the lower right are (4) the voice assignments.



3.3 Working with Projects

The basic unit working in Voci is called a project. Projects consist of any number of related voices, as well as (optionally) saved information on each performer, saved group assignments, and the conductor's preferred settings. Projects can be saved at any time, as well as loaded or renamed using the buttons above the notation display. Use the New Project button to clear everything and start from scratch.

3.4 Importing a Score

To begin, click Import Score and load a MusicXML file (*.xml) when prompted. (Most notation editor software programs will allow you to export any score in this format.) When you click Import, the individual staves in the score will automatically be converted into Voci-compatible voices. These voices are labeled "roots" by default, because they are derived directly from the score. As voices are transformed further using the software, they are referred to as "branches."

If possible, you are advised to import a C (non-transposing) score.

3.5 Working with Voices

All of the voices in a project are listed in the left sidebar of the conductorPatch. Voices derived directly from the imported score are labeled as "roots" by default, though any voice can be renamed by using the Voice Name text box and Save Voice button below the notation display. Voices can also be deleted if necessary, but it is considered best practice to keep voices in the project in most cases for possible later use (any voices you don't wish to use immediately can simply be left "unassigned").

Voices can be transformed in a number of different ways. First, you can use the any of the click- or shortcut-based commands on the bach.score that displays the notation. When you're finished, give it a new name and click Save Voice. (If you modify a voice and do not change the name, when you click Save Voice the previous version will be replaced.)

Voci has a number of built-in transformations that can be used on any voice. These transformations are listed in the middle of the screen under the notation display. More transformations will be added over time. At present, the following options are available:

1. Transpose: Enter the number of semitones up or down to transpose the currently displayed voice.
2. Compress to Range: Set a minimum and maximum pitch and compress all pitches outside of that range to fit. This is especially useful when converting a voice from one instrumental range to another.

Voices that have been transformed will have a suffix automatically appended to the file name that reflects the transformation. You must click Save Voice to save your transformation under this new name. (Or you may choose your own name and click Save Voice.)

Finally, you can also modify the currently displayed voice by using bach scripting commands. The scripting interface is on the right side of the screen. See the bach Help file (Extras -> bach.overview) for more details.

3.6 Setting Up the Network

When you are ready to use Voci with an ensemble, the conductor and performers must all be connected to the same wireless network. The network does not need to be connected to the internet; the individuals involved simply need to be connected to one another.

First, make sure everyone loads the patch successfully, following the installation instructions in section 2 (or in the Quick Start Guide). Once everyone has loaded the patch, the conductor should click the Start Network button. Once the conductor clicks this button, they should tell the ensemble that they have done so, and each performer should enter their information and click the Join Network button on their own computer. It may take a few seconds to connect.

If the process is successful, the conductor will see the musicians' names appear in the musicians list. Make sure the display reads "Connected Musicians Only." If the display reads "All Musicians," you will see a list of all musicians regardless of whether they are connected to the network or not.

If you have trouble connecting over the network, see the troubleshooting guide (section 5).

3.7 Assigning Voices

Once you have created all of the voices you need and the musicians in your ensemble have joined the network, you can begin to assign each musician a voice. Assigning a voice means deciding which notation each musician will see. There are three ways to assign a voice:

- **Manual Assignment:** Assign each musician manually. Click the desired voice from the left sidebar, click the desired musician from the list of musicians, and then click the Assign button. (Use the large Assign button under Manual Voice Assignment, not the one under Group Voice Assignment)
- **Algorithmic Assignment:** Assign all musicians automatically, by custom algorithm. Choose an option from the Algorithmic Voice Assignment drop-down menu. The musicians to which the algorithm will be applied depends on the display mode of the list of musicians. If “Connected Musicians Only” is selected, only connected musicians will be included; if “All Musicians” is selected, all musicians will be included. Currently, the following algorithms are available:
 - **Pure Random:** Assigns a random voice to each performer (but does not necessarily use all voices)
 - **Random (No Repeat):** Assigns each voice randomly to only one musician (does not necessarily use all musicians)
- **Group Assignment:** Assign a group of musicians according to a predetermined assignment scheme. Click the name of the desired group from the Group Voice Assignment display and then click Assign. (Use the smaller Assign button under Group Voice Assignment, not the larger one under Manual Voice Assignment.) To view or edit groups, click Customize Groups.

You can continue to create new voices or transform existing voices and assign them at any time. All assignments can be cleared by clicking Clear All Assignments.

Voci projects are designed for working with notation in concert pitch. By default, Voci automatically transposes voices that are assigned to transposing instruments. Transpositions are defined based on the instrument each performer selects when

joining the network. The names of automatically transposed voices will be appended with the transposition level and the word “auto” to indicate the transposition has taken place. This feature can be turned off in the Modify Ensemble window (see section 3.8 below).

Voci’s assignment system also has a built-in range detector. By default, this detector alerts the conductor when a voice that has been assigned to an instrument contains any notes outside of that instrument’s range. Instrumental ranges are defined by the instrument each performer selects when joining the network.

The detector can be set to prompt the conductor each time a voice is out of range, or to silently perform a predetermined action each time. There are three possible actions: (1) ignore the range discrepancy and assign the voice unchanged; (2) block the voice assignment; or (3) compress the voice to the assigned instrument’s range (see section 3.5 above). The conductor may choose any of these options each time they are prompted, or may choose any of these to be performed silently each time (i.e. without prompting). The detector’s behavior can be modified in the Modify Ensemble window (see section 3.8 below).

3.8 Modify Ensemble

The Modify Ensemble button allows the conductor to manually add, edit, or remove musicians from the ensemble. These features are primarily for testing and advanced users.

This is also where the conductor may change project settings, including turning the auto-transpose function on or off, and specifying the range detector’s behavior. (For more on these settings, see section 3.7 above.)

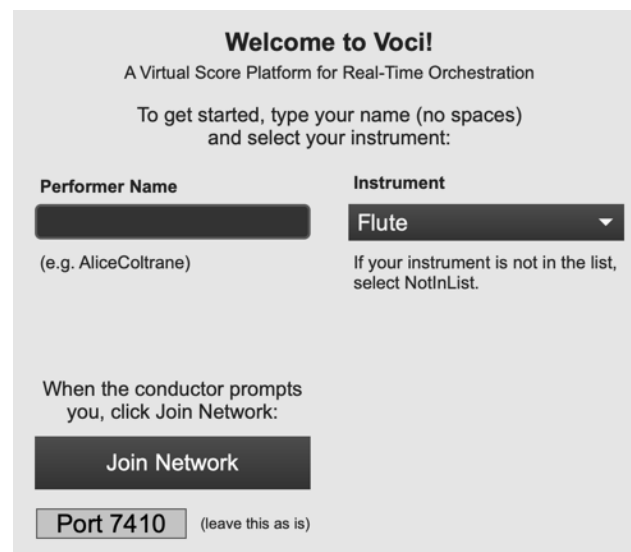
3.9 Alternate Output Options

While the network-based approach is at the heart of the Voci software, two additional output options are provided via the buttons in the lower right. If you click Export Files you can export any individual voices as XML, MIDI, or image (PNG) files. If you click Live MIDI Out, you can export all voices in real time via MIDI to be played back using a virtual instrument, or passed into a DAW.

4. The Performer Patch

4.1 The Performer's Role

Musicians using Voci will find the workflow to be very similar to other large ensemble rehearsal and performance scenarios. The main difference is that each performer must log on to the network in order to be connected with the conductor's computer. This allows the conductor to send updated notation to the performer in real time.



The screenshot shows a web interface titled "Welcome to Voci!" with the subtitle "A Virtual Score Platform for Real-Time Orchestration". Below the title, it says "To get started, type your name (no spaces) and select your instrument:". There are two input fields: "Performer Name" with a text box containing "AliceColtrane" and a note "(e.g. AliceColtrane)", and "Instrument" with a dropdown menu showing "Flute" and a note "If your instrument is not in the list, select NotInList.". Below these fields, it says "When the conductor prompts you, click Join Network:" followed by a "Join Network" button. At the bottom, there is a "Port 7410" field with the note "(leave this as is)".

When a musician opens the performerPatch, they are first greeted by a welcome screen that asks them to enter their name and instrument. These two pieces of information will help the conductor identify each individual musician on the network. The performer should enter their name without spaces and include a last name or initial as necessary. Under Instrument, the musician should select their instrument. If the instrument is not included in the list, select NotInList at the bottom of the list. A text box will pop up and the musician will be prompted to type in a custom name (no spaces) and the transposition and range.

Before clicking Join Network, the musician should be sure that the conductor has already started the network (i.e. clicking Start Network in the conductorPatch). After the conductor has started up the network, they should prompt the performers to click Join Network. If a musician has joined successfully, they will receive a message indicating that they are connected.

In rare cases, musicians may need to modify the receiving port on their computer using the control box in the lower left. See the troubleshooting guide in section 5 for more details.

4.2 Interface Overview

Most of Voci's performer patch comprises the virtual score display. The notation should be played in the usual fashion, from left to right and top to bottom. Use the buttons at the top to change pages.

The screenshot displays the Voci interface for a voice part named 'root3'. At the top left, the logo 'Voci' is shown with version 'v0.1.0' and the text 'Virtual Score Platform for Real-Time Orchestration'. To the right, the 'Voice Name:' is 'root3'. Navigation buttons for page 1 are present. A control panel on the right allows selecting clefs: Treble (checked), Bass (checked), Alto (unchecked), and Tenor (unchecked). A 'Bars per staff: 5' setting and a 'Network Settings' button are also visible. The main area shows a musical score in 4/4 time with a tempo of 100. The score consists of five staves of music, with bar numbers 2 through 25 indicated. Dynamics include *mf*, *p*, *mp*, *f*, and *mf*.

Check boxes next to clef names indicate the clef(s) that may be used in each musicians' part. Musicians may check and uncheck clefs as they desire. Musicians may also click on the name of the clef to immediately apply that clef to the entire page. If the display is cut off or hard to read, try changing the number of bars per staff by clicking on the current number and typing in a new number.

The Network Settings button allows a musician to modify their name or instrument, change their network port, or rejoin the network. The name of the voice currently in view can be found under “Voice Name.” As part of the troubleshooting process, the conductor may ask performers their current voice name.

The dynamic nature of virtual scores means that certain irregularities may occasionally crop up. For example, the barlines at the right margin may not be aligned perfectly and time signatures may be repeated on multiple staves. Minor issues like these are artifacts of the digital creative process and can be safely ignored. Ask your conductor if you have specific questions.

For further help with the performerPatch, consult the troubleshooting guide below (section 5).

4.3 Page Turning

Some performers may prefer an alternative page turning interface to the on-screen buttons at the top of the patch. Performers can use Max’s built-in Mappings feature to control these buttons using a key on the keyboard (e.g. using the space bar to advance the page) or an external control surface (e.g. a MIDI controller or Bluetooth device).

To set up a custom mapping, unlock the patch (lock icon in lower left) and click on the button you wish to control. Then click the Assign MIDI Map or Assign Key Map button from the toolbar across the bottom of the patch and press the desired key or button to learn the mapping.

You can view and edit existing mappings by clicking on the Mappings icon in the right sidebar. Remember to lock the patch after mapping.

5. Troubleshooting

If you encounter an issue or bug, send it in: voci [at] drakeandersen.com

5.1 Common Issues

- **I get an error when I try to load the patch.** If a file cannot be opened because it is from an “unidentified developer,” try right-clicking on the file and clicking “Open” (instead of just double-clicking). After confirming that you want to open the file you can proceed normally. If macOS marks any files as “quarantined,” choose the option to allow Mac to try to solve the problem and select “Apply to all.”
- **The Instrument menu is empty or reads “NotInList.”** Reset the file preferences in Options → File Preferences. Use the – button to delete the file preference associated with Voci, then use the + button to add it again just as before (making sure the Subfolders box is checked). This same solution can be used if you receive any error indicating that Max can’t find a file.
- **The conductor and performers are having trouble connecting over the network.** A few things to try:
 - Make sure the conductor and all performers are on the same network.
 - Make sure the conductor clicks Start Network before the musicians click Join Network.
 - Try clicking Join Network again.
 - Be sure that you have the zero package installed from the Package Manager.
 - Try changing the port numbers being used (try the range 7400 to 7410).
- **The patch is taking a long time to load.** While conductorPatch and performerPatch usually open quite quickly, occasionally they may take 30 seconds or longer to load. This is normal. However, if you think the patch is not loading properly, you can Force Quit Max and try again. If it happens repeatedly, try restarting your computer.