Unity Connect
Configuration Manual

OVERVIEW

Unity Connect is a multi-site audio codec that can deliver up to 64 channels of source audio to multiple remote destinations simultaneously, while also receiving audio from multiple destinations and playing back on up to 64 local playback channels. Unity Connect also provides incoming audio stream mix capability which allows you to sub-mix audio before playback. Finally, Unity Connect can also resample incoming audio from/to 44.1kHz or 48kHz in real time.

INTRODUCTION TO UNITY CONNECT

Unity Connect is a Mac OSX-based application that runs on OSX versions 10.8 and above. Unity Connect communicates with other Unity Connect locations, usually over the internet using UDP communication which provides low-latency operation. Unity Connect can operate down to 5ms latency (plus link latency), providing near real-time audio communication.

Due to the UDP based nature of the Unity Connect system, it is strongly recommended (but not required) that the computer running Unity Connect be hard-wired into the network using standard network wiring. This will minimize packet loss and guarantee the best possible audio quality.

BASIC CONNECT CONFIGURATION

To begin using Unity Connect, you must first configure a few basic settings. You must first connect your Mac to either a hard-wired network (recommended) or a Wi-Fi network.

GENERAL TAB

You install Unity Connect by dragging the application to your Applications folder. When you launch Unity, you'll see its icon appear in the menu bar of your computer. Selecting Settings from the Unity menu will show you the following window:
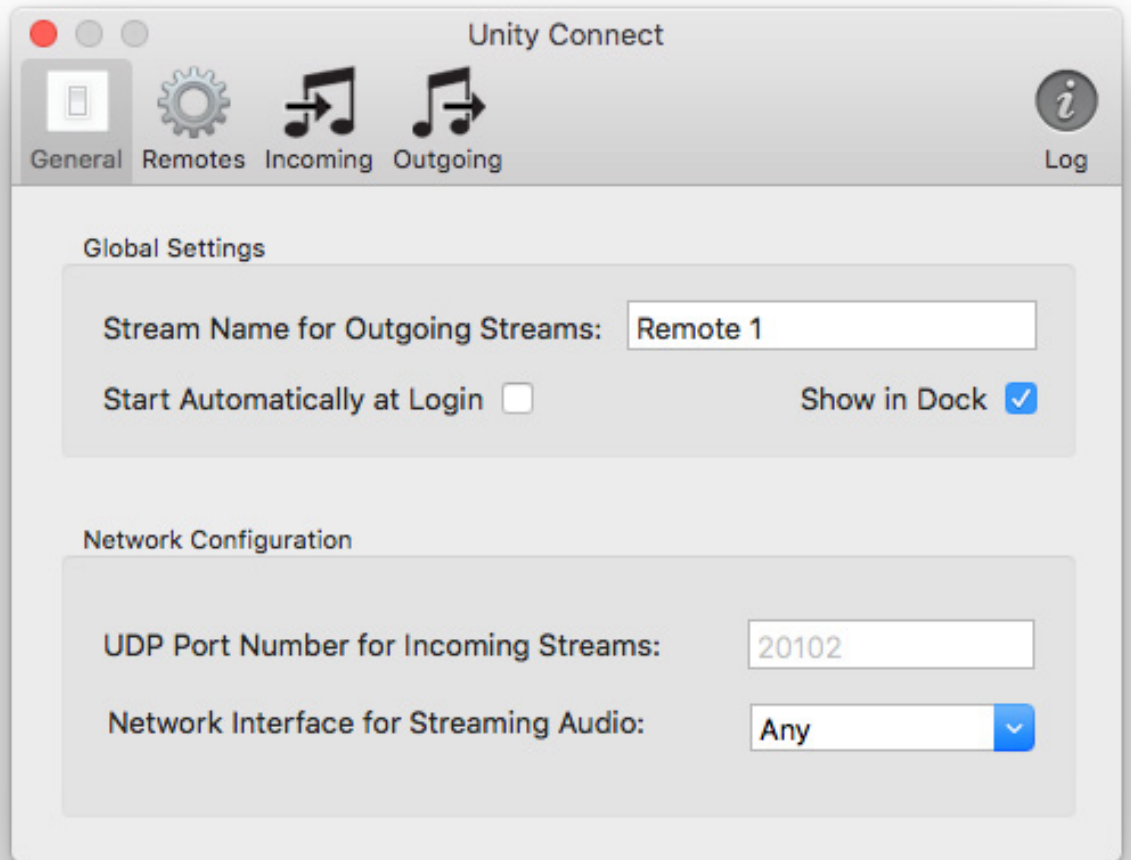
Each section of the Unity Connect General Settings window is explained below.

Stream Name for Outgoing Streams – Each Unity Connect application running in an interconnected environment needs to have a unique name to identify itself to other Unity Connect applications. Examples would be 'Main Studio', 'Remote 1', 'Remote 2', etc. Unity Connect will not operate until this stream name is defined.

Start Unity Automatically at Login – If this box is checked, Unity Connect will start automatically each time a user logs into the Mac. If not checked, Unity Connect will have to be manually started. A user must be logged in for Unity Connect to operate, since it runs in general application space and not as a system service.
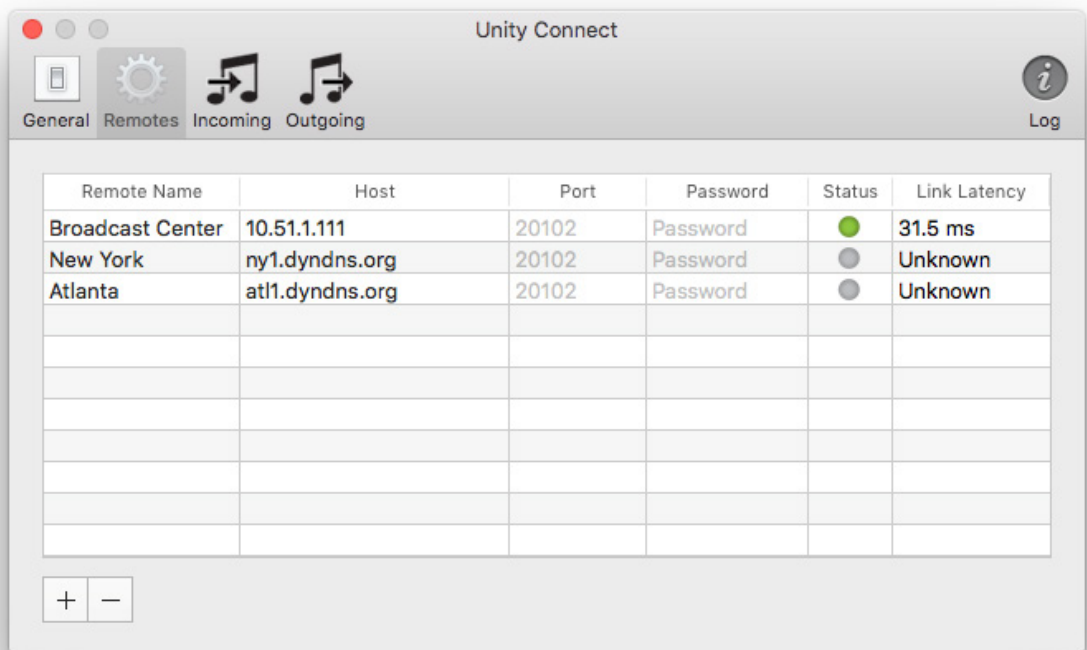
Show in Dock – By default, Unity Connect runs as a system accessory, which means that Unity Connect will create an icon in the upper-right accessory tray on the Mac, and will NOT create a system menu or be available in the dock-bar at the bottom of the screen. By selecting this option, Unity Connect will create a dock-icon at the bottom of the screen as well as a regular application menu.

UDP Port Number for Incoming Streams – Unity Connect communicates using UDP sockets, and this setting specifies which UDP port number that Connect will use for incoming connections. The default port number is 20102 and should work fine for most installations.

Network Interface – This pull-down allows you to specify what network interface Unity Connect uses if your computer has more than one interface. This can normally be left at "Any". However in certain applications such as using the Dante Virtual Sound Card as an audio device, it might be desired to separate the Dante traffic from the Unity Connect traffic by restricting Connect to a particular network interface.

REMOTES TAB

Selecting the "Remotes" button on the Unity Connect toolbar will display the Unity Connect remote stream configuration screen. Before you can send or receive audio streams between remote locations, their names and addresses must be defined using the "Remotes" setup. An example configured with three remote locations is shown below:

Remote Name	Host	Port	Password	Status	Link Latency
Broadcast Center	10.51.1.111	20102	Password	🟢	31.5 ms
New York	ny1.dyndns.org	20102	Password	⚪	Unknown
Atlanta	atl1.dyndns.org	20102	Password	⚪	Unknown

Remotes must be set up at both ends of a Unity Connect system in order for the two sites to communicate properly. In the example above, the remote named "Broadcast Center' has to be configured with our stream name (Remote 1 in our case) before communications will proceed.

Remote Name — This is the unique stream name of the remote Unity Connect installation that we want to communicate with. This must match the Stream Name for Outgoing Streams specified on the remote machine.

Host — This specifies the IP address or DNS name where the specified remote can be found on the local network or internet. If left blank, communications will not begin with the remote until the remote Unity Connect system establishes communications. Note that only one side of the connection needs to specify the address of the other remote. If the Host field is configured, then this particular Unity Connect will be the initiator of all communications sessions.

Port – Specifies the UDP port that the remote Unity Connect machine is listening on, and must match the number specified by the remote location on it's General Settings page. If this is left blank it will default to port 20102.

Password – You can configure an optional password of additional connection security between two Unity Connect stations. Leaving this field blank will result in a non-secured connection. Note that this password field is not case sensitive.

Status – This is a non-configurable field that simply indicates the connection status of a remote user. A gray color indicates that a connection has not been made with the configured remote machine. A green color indicates that the two Unity Connect stations are actively communicating (although actual audio streams may or may not be active). An orange color indicates that the two systems are communicating, but that the remote system is not at the configured Host/Port location. The system will work fine in this situation, but may be an indication of a misconfigured or unknown Unity Connect participant.

Link Latency – Once a connection with a remote Unity Connect system has been made, this field will be continually updated with the current one-way latency between the two systems. This number, when added to the incoming audio buffer is a good estimate of overall end-to-end audio latency.

INCOMING TAB

Once all of the desired Unity Connect remotes have been configured, you can then enable any incoming audio streams that you would like to receive, and map what output audio device you would like to use to playback the incoming audio as well as what audio device channels to use. In addition, you should select the playback sample rate, which should be selected as the optimal playback rate for your system.
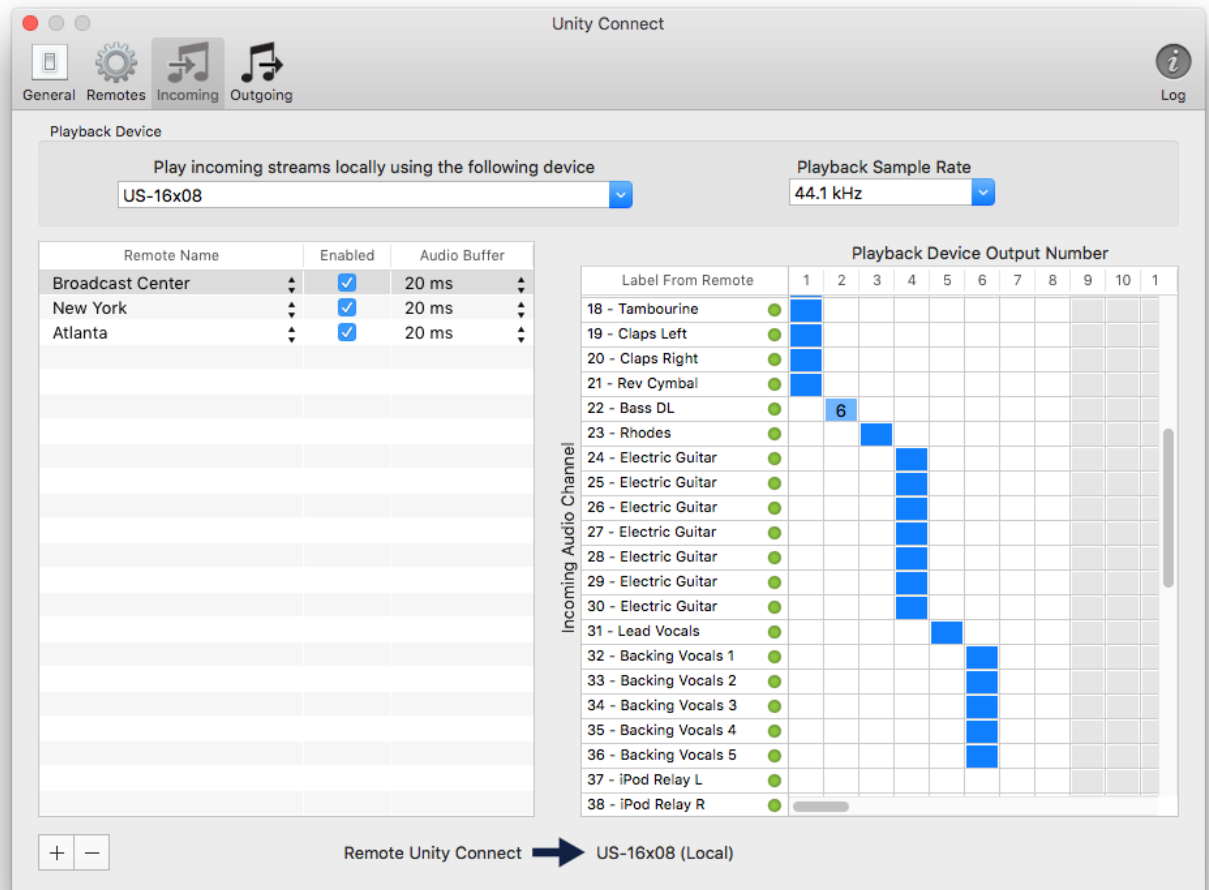
The example below shows a configuration for three incoming audio streams from the remotes that we set up earlier. The stream from 'Broadcast Center' is a 42 channel audio stream, which is mapped to an 8 channel output device.

Play incoming streams locally using the following device – Specifies the local playback audio device available on your Mac to handle the incoming streams. In our example we are using a Tascam US-16x08 device for playback, which has 8 total output channels. In addition to regular audio devices, you can also take advantage of OS X aggregate audio devices for additional flexibility.

Playback Sample Rate – This sets the sample rate that the playback device will use when playing incoming audio streams. Usually you will want to configure this to match the sample rate of the incoming stream, but in some cases the installation is limited by the audio playback device itself. As an example, many Dante Virtual Sound Card installations are set to 48kHz and can not be changed. In this situation, if the incoming stream is running at 44.1kHz, the stream will be resampled in real time as it is played back.

The Incoming page is divided into two sections. The left side of the screen specifies all remotes which have been configured to receive incoming streams from, and the right side always displays the layout channel mapping' for the incoming stream currently selected on the left.

To add a previously configured remote as a source for our incoming audio streams, click the + button at the bottom of the screen. This will create a new row in the left side remote list. Then configure this new list as follows:

Remote Name – This combo box allows you to select one of the previously configured remote locations (configured on the Remotes tab).

Enabled – Clicking on this check box will enable the incoming audio stream for playback. Note that if you do not enable the incoming stream, the remote audio will still be received but not processed. Stopping flow of an audio stream must be configured at the remote location.

Audio Buffer – This specifies the amount of incoming audio to buffer before playing to the local playback device. Using a hard-wired network connection, this would normally be set as low as possible. If you are using a WiFi connection, this number should be increased to around 140ms to accommodate periodic interruptions and lost packets that commonly occur in WiFi environments. Note that this number will always be at least twice the incoming audio packet size regardless of what value the audio buffer has been set. For example, if incoming packets are 20ms in size, the actual incoming audio buffer will be at least 40ms. Settings less than 40ms will have no effect.

When an incoming stream is selected in the left side of the Incoming configuration, the corresponding stream content information will be updated on the right side. The applicable fields are as follows:

Label from Remote – This displays the channel number and name of the audio channel as configured by the remote incoming Unity Connect source. This cannot be edited locally. In addition, an indicator light is shown that displays the status of the incoming

channels. If the indicator is gray, then there is no audio present. A green indicator indicates that a channel is present, and matches our current playback sample rate. Finally, an orange color indicates that an incoming stream is present, but will require resampling during playback, possibly resulting in a slight loss in signal quality.

Playback Device Output Number – For each of the incoming audio channels, this matrix-style display enables playback on that particular channel. In the example you can see that streams 17-21 (in fact, all channels 1 through 21) have been combined to output 1 as a 'percussion mix'. Likewise, the Bass is output to playback channel 2, the Rhodes is output to channel 3, all seven guitar tracks are combined on playback channel 4, lead vocals are output to channel 5 and the backing vocals are combined on channel 6.

A very useful feature of Unity Connect is it's ability to apply a pad to an incoming signal. By right-clicking on a particular cell, a pop-up slider will appear that allows you to adjust the incoming channel volume between a level of 0 (completely off) to 10 (matches incoming volume). Each integer value below 10 represents a -3db signal reduction in the output audio.

OUTGOING TAB

Unity Connect can also send local audio to remote Unity Connect sites by configuring Outgoing streams. The Outgoing stream page appears as follows:

Send Audio from the following local device to outgoing streams – Specifies the local playback audio device available on your Mac that will be used as a source for all outgoing streams. In our example we are once again using a Tascam US-16x08 device for local audio capture. This device has 16 analog inputs.

Capture Sample Rate – This sets the sample rate that the capture device will use when capturing local audio for transmission. All outgoing streams will be sent at the sampling rate specified in this drop-down box.

Like the Incoming stream configuration, the Outgoing stream configuration page is also divided into two sections. The left side of the screen specifies all the remotes that we want to send our local audio to, and the right side shows which specific channels should be sent for each configured remote.

To add one of the previously configured remotes as a destination for our local audio, click the + button at the bottom-left side of the page and configure it as follows:

Remote Name – This combo box allows you to select one of the previously configured remote locations (configured on the Remotes tab). The selected channels (explained below) will be sent to this remote.

Enabled – Clicking on this check box will enable the outgoing audio stream to be sent to the remote. If you do not enable the outgoing stream, no audio will be transmitted to the remote Unity Connect system.

Channels to Send – This is a read-only display of the individual channels that are currently selected for transmission to the selected remote. Selection of the actual channels are done on the right-hand side of the Outgoing configuration screen.

Mode – Audio streams can be sent using either Audio or Voice mode. Audio mode delivers a slightly higher quality stream and also allows for lower latency audio packet sizes (all the way down to 2.5ms). Voice mode can only be used with 20ms packets, and adds a small amount of speech pre-emphasis as well as forward-error-correction for audio packet loss.

Latency – This specifies the size of each outgoing audio packet. Packet sizes less than 20ms are possible only while using Audio mode and results in decreased audio latency at the expense of increased bandwidth and a slight loss of audio quality. For most applications a 20ms latency setting works fine.

The right side of the Outgoing stream configuration displays the channels that are being transmitted for the selected outgoing stream (selected on the left side of the screen). The only values that will be different for each stream are the center Send values. The columns on the right side of the Outgoing screen are as follows:

Chan – These correspond to the physical inputs on your selected capture device. The total number of channels will change based on which capture device is used, up to a maximum of 64 capture channels.

Send – Clicking on this column for each channel will enable or disable sending the actual channel to the selected Unity Connect remote. A blue color indicates that the channel is being sent, and a white color indicates silence. Note that if the selected remote stream is not enabled, then no channels are sent at all.

Label – This is used to assign a name to each local capture channel, and is common to all outgoing remote streams. The remote Unity Connect system will display these labels on it's Incoming stream configuration to help organize the incoming signal flow.

LOG TAB

The far upper right tab shows the system log, and will be highlighted in red if there are any errors that may require attention, such as audio streams coming from unknown sources, or remote Unity Connect systems that are trying to connect with incorrect passwords. If the Log icon is gray, there is no new information to see.