Jacktrip Manual

Operation

The overall steps for JackTrip operation are to verify Internet connection, start JackPilot, start JackTrip, and route the audio in JackPilot if utilizing multichannel audio. Here are the detailed steps.

I. Verify Internet Connection
1. Before each session with JackTrip, check to make sure the machine is online, on the expected network and static IP address. To do this, open System Preferences on the machine and choose Network. Make sure the machine is connected via Ethernet to the expected network on the static IP address. A further verification is to open the Terminal application on the machine. Type "ifconfig" and press <return>. This will give more detailed network statistics for verification.

II. Start JackPilot
1. Open the JackPilot application.
2. Before starting JackPilot, choose settings for the session. Click on the JackPilot menu and choose Preferences. Notes on these settings:
    a. "Driver" should be coreaudio.

    b. "Input Device" and "Output Device" should be the interface for the session.
Note if an audio application you wish to use does not appear in this window, go into the application's preferences and make sure JackRouter is selected as the audio interface. For example, if it is a system application such as iTunes, Logic, Ableton, or MaxMSP, select JackRouter as the default for System Audio in Sound Preferences of System Preferences. Alternately if sending and receiving audio through an interface, mixer, and microphones, then select the interface.

    c. "Sample Rate" and "Buffer Size" has to match between the machines at each site. JackTrip will not run if they do not match. Choose Sample Rate and Buffer Size based on quality level for the session and the internet connection conditions. All modems should be able to handle packet size of 128 and above, some have trouble with 64. Generally internet connections with lower bandwidth or lower quality of service run better with lower Sample Rate and higher Buffer Size. Keep in mind higher buffers add latency. Experiment with these settings to optimize the JackTrip audio signal.

    d. "Hog mode" [add information]

    e. "Clock drift compensation" [add information]

    f. "Interface Input Channels" and "Interface Output Channels" should match the amount of channels available on the interface utilized for the session. (If this does not match, the interface is not routed correctly into JackPilot.)

    g. "Virtual Input Channels" and "Virtual Output Channels" are the amount of audio channels that will be sent via JackTrip. This number has to match between the machines at each site, otherwise JackTrip will not run. This number can be different from the interface channels. For example, the local mixer could receive 16 channels of local audio, then this could be routed virtually through JackPilot into 8 virtual channels sent to the remote site. The virtual routing takes place after connecting JackTrip and is covered later in this document. Each virtual channel requires 1-2Mbps internet.

    h. "Auto-Connect with physical ports" is a setting for routing. If this box is checked, JackPilot will automatically route channels according to its default settings. This routing can be undone manually if desired. It is recommended to check this box only if the JackTrip session will be stereo or if the session routing is exactly the same as the default settings. Otherwise do not check this box, then route the audio later after JackTrip is connected.

    i. "Verbose logging for debug purposes" gives connection statistics. Check this box only if the JackTrip session is for debugging.

    j. Click Save at the bottom to save all settings.

3. Check Audio MIDI Setup to make sure the interface is routed correctly and the sample rates match the sample rates saved in JackPilot. To do this, click the JackPilot menu, choose Open Audio MIDI Setup. Check the Input and the Output.
4. Check Sound Preferences to make sure the interface is routed correctly into the machine and any appropriate input levels are coming through. To do this, click the JackPilot menu, choose Open Sound Preferences. Check the Input and the Output.
5. Once all of the settings are ready, start JackPilot by clicking the "Start" button.
6. Then below the "Start" button, click "Routing". Click on the triangle icons to reveal the local audio channels available. The amount of audio channels should match the interface utilized for the JackTrip session. If not, stop JackPilot and go back to Preferences to fix this. If the local channels match, move on to starting JackTrip. The remote channels will appear once the JackTrip connection is made to the remote site(s). The routing instructions are given later in the manual.
7. Note that once JackPilot is started, preferences cannot be changed. To make any preference changes, stop JackPilot, make the change, and restart JackPilot.

III. Start JackTrip
1. Open a new window in the Terminal application on the computer.
2. Connections in JackTrip take place between "server" and "client". In a two-way JackTrip connection, one location should be the server and the other location should be the client. In multiple connections, one location can be the server and the other locations can be clients, or multiple point-to-point connections can be made with each location being a server to one location and a client to another. Decide amongst the locations which will be server(s) and client(s).
3. In a basic two-way connection, in the Terminal window the server types:

jacktrip -s

The client types:
jacktrip -c [insert server's IP address]

4. In a basic multiple connection, in the Terminal window for the first connection the server types:
jacktrip -s

The client types:
jacktrip -c [insert server's IP address]

      a. To connect with a second location simultaneously, the server opens a new Terminal window, and types the server command plus a port offset (since multiple connections cannot take place on the same port). This changes the port from the default UDP 4464 in use by the first connection to UDP 4474 for use with the second location:
jacktrip -s -o10

The client opens only one Terminal window and types:
jacktrip -c [insert server's IP address] -o10

      b. To connect with more locations simultaneously, the server opens a new Terminal window for each location. The command line remains the same except each connection has to be on a different port so the port offset changes. Increase the port offset by 10 each time. For example, the basic server command line for a third connection would be:
jacktrip -s -o20

The client opens only one Terminal window and types:
jacktrip -c [insert server's IP address] -o20

The basic server command line a fourth connection would be:
jacktrip -s -030

The client basic command line would be:
jacktrip -c [insert server's IP address] -o30

      c. The amount of connections available in the software is limitless. Other factors such as the hardware and bandwidth will be what limits the amount of quality connections that are possible.

5. Further options can be added to the command lines. Each option should be added at the end of the basic command lines in each location. Here is a list of the options.
      a. -n, --numchannels #   Number of Input and Output Channels (default 2)
Indicates the number of virtual channels in and out. The default number of channels is 2, so if the connection has 2 virtual channels it is not necessary to write this option in the command line. If the number of channels is any other number, add this to the end of the command line in each location. For example, if there are 8 virtual channels, add:
-n8

This would make the full server command line read:
jacktrip -s -n8

The client command line would read:
jacktrip -c [insert server's IP address] -n8

      b. -q, --queue   # (1 or more)   Queue Buffer Length, in Packet Size (default 4)
Changes the buffer length to increase or decrease the default buffer 4. Indicate the change to the buffer by listing the number after this command. For example, to increase the default buffer by 2, add to the end of the command lines:
-q2

Adding this to the command lines above, the server line would read:
jacktrip -s -n8 -q2

The client line would read:
jacktrip -c [insert server's IP address] -n8 -q2

      c. -r, --redundancy # (1 or more) Packet Redundancy to avoid glitches with packet losses (default 1)

Adds one or more redundant audio packets to the connection. Good for connections that contain dropouts since the redundant audio would be substituted. Doubles the bandwidth use. Indicate the number of redundant packets and add this to the end of the command lines. For example, to add another redundancy, type:

-r2

      d. -o, --portoffset #   Receiving port offset from base port 4464
Changes the port for the connection from the default UDP port 4464 to a different port. The option "-o10" would change the port to UDP 4474, "-o20" would change the port to UDP 4484, "-o-10" would change the port to UDP 4454. Add this to the end of the command lines.

      e. -b, --bitres   # (8, 16, 24, 32) Audio Bit Rate Resolutions (default 16)
Changes the audio bit rate resolution from the default 16 to either 8, 24, or 32. List this number in the option and add this

to the end of the command lines. For example, to change to 24, type:
-b24

      f. -z, --zerounderrun   Set buffer to zeros when underrun occurs (defaults to wavetable)
Creates momentary silence each time the software senses noise. Good for improving the quality of connections that have sporadic noise. There is no number to add to this option, simply add "-z" to the end of the command lines.

      g. -l, --loopback   Run in Loop-Back Mode
[add information]

      h. -j, --jamlink   Run in JamLink Mode (Connect to a JamLink Box)
Jamlink is an additional hardware box connected to the computer that provides connection for one channel of audio. Jamlink boxes do not require a static IP address and can be utilized on internet with lower bandwidth. Visit <http://www.musicianlink.com/> for more details.

      i. --clientname   Change default client name (default is JackTrip)
[add information]

      j. -v, --version   Prints Version Number
Type this option in a Terminal window to print the version number of JackTrip. Command line:
jacktrip -v

      k. -h, --help   Prints this help
Type this option in a Terminal window to print the jacktrip options. Command line:
jacktrip -h

6. Once the command lines for each location have been determined, enter these into the Terminal window(s) and press return. This can be done simultaneously, at different times, or in any order. If the server is up but the client is not connected yet, the software will indicate in text "Waiting for Client". If the client is up but the server is not connected yet, the software will indicate in text "Waiting for Peer". When the connection is complete, the software will indicate in text that the connection has been received.
      a. If the connection is between two locations on stereo channels, both locations should be able to hear each other at this point. The JackTrip operation is complete. Keep JackPilot running and JackTrip connected in Terminal for the duration of the session.
      b. If the connection is between two locations on more than two channels, or if there are more than two locations involved that have be connected on audio, proceed to the next section on routing.

IV. Routing
1. When JackTrip is connected in the Terminal window, go back to the JackPilot application and click the Routing button. This brings up the Connections manager window. The Send Ports column and Receive Ports columns should both show System and JackTrip.
      a. In two location connections, System is for local channels and JackTrip is for virtual channels.

      b. In multiple location connections, the server routing will show System for local channels and numbered JackTrip listings of virtual channels for each location. For example, the first remote location may be listed as JackTrip1, the second remote location may be JackTrip2, etc. The clients routing in multiple location connections will only show System for local channels and JackTrip for virtual channels from the server.

2. Click on the triangle icons for System and any JackTrip listings. This shows a list of all available channels. The number of System channels should match the channels of the local interface. The number of JackTrip channels should match the amount of virtual channels indicated in the connection.

3. To route one channel to another, click the channel in the Send Ports column once. Double-click the channel you are routing to in the Receive Ports. The connection made will appear in the Connections column. Continue this procedure until all of System channels and JackTrip virtual channels are routed to your specification.
      a. Note that in multiple location connections the server has to route the audio to each client and route each client's audio to each other.

      b. When all intended audio channels can be heard in each location the routing is finished and the JackTrip operation is complete. The routing can be saved in JackPilot by going to File in the menu and choosing Save Studio Setup. This will create an audio routing file that can be loaded in the future if the exact same setup is utilized, to avoid manually routing audio each time.

      c. Keep JackPilot running and JackTrip connected in Terminal for the duration of the session.