Installing and Running Jacktrip Command Line (CL) 1.3 on Windows 10 // 28 March 2021
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Jacktrip Command Line (CL) is a software application that runs in the command window to send and receive uncompressed, low latency audio over wired ethernet connections. JACK and Jacktrip are two separate programs. JACK engages with your sound system to process the audio and hands it off to JacktripCL, which sends and receives the audio to and from the World Wide Web. Jacktrip connects in either p2p or hub mode, as a client or as a server, for use with an external audio interface (USB), or built-in sound (BIS).

System Requirements for Jacktrip 1.3 include:

- ➔ 64-bit computer (check in control panel-system-system type)
- ➔ Updated Microsoft Windows 10 Pro or Home Edition
- ➔ Wired Ethernet connection from computer to modem (turn off wifi – too much latency & jitter)
- ➔ Internet Speed of at least 10mbps upload and download
- ➔ Microphone, Instruments, etc.
- ➔ Time and Attention to Detail (seriously!)

The computers used for testing include a 64-bit lenovo laptop with an Intel Core i5 CPU @ 2.60GHz, with 4 GB of RAM, and VM's (using gnome-boxes under Fedora 32).

USB audio interfaces which have been tested include Behringer UMC204HD and UMC22, Focusrite Scarlett 2i2, Presonus AudioBox 96, and several others.

Important: Install ASIO driver, then JACK2, then Jacktrip.

Regarding ASIO drivers: check your device website to see if they offer an ASIO driver for your device and use it instead of ASIO4ALL.

I. SOFTWARE INSTALLATIONS – ASIO 2.14, JACK2 1.9.18, JACKTRIP 1.3.0

1. **ASIO:** Required on Windows: First check the web to see if there is a dedicated ASIO driver for your specific device, and if so, download and install it **instead of ASIO4ALL.**

   If your device does not have a dedicated ASIO driver, download and install ASIO4ALL below:
   http://www.asio4all.org/downloads_11/ASIO4ALL_2_14_English.exe
2. **JACK2**: Download JACK2 1.9.18 from the URL below. Drag QjackCtl to Program Files folder, then double-click the installer
   https://github.com/jackaudio/jack2-releases/releases/download/v1.9.18/jack2-win64-v1.9.18.exe
3. **Jacktrip**: Download Jacktrip 1.3.0 directly to a folder on your computer -
   NOTE: static build – no installer needed – run from the folder where it is located
   https://ccrma.stanford.edu/software/Jacktrip/windows/Jacktrip.exe
4. Steps to confirm Jacktrip version in the cmd window
   - **a)** Navigate in Windows File Explorer to the folder where the Jacktrip file was downloaded
   - **b)** Copy the path of that downloads folder
   - **c)** In the lower left corner Start Menu Search box type: "cmd" <enter>
   - **d)** In the cmd window – change directories (cd) to the folder where Jacktrip.exe is located or paste in the folder path location just copied above (do not include Jacktrip.exe)
   - **e)** type "Jacktrip.exe -v" <enter> (from the folder where it is located)
     or type the first bit and then hit tab to run through the files in that directory
   - **f)** Should return the version: **JackTrip VERSION: 1.3.0**

II. TEST FOR SUCCESS

1. Steps to Test USB audio (without any other apps running)
   - **a)** Plug in USB audio device
   - **b)** Right-click on the speaker icon (lower right corner)
   - **c)** Choose Open Sound settings
     1. Confirm that Output has picked up your USB audio device as output
        a) if not, click the down arrow and select it
     2. Scroll down and confirm that Input has picked up your USB audio device
        a) if not, click the down arrow and select it
     3. Scroll down to “Test your microphone” and make a sound
        a) the level meter should show activity, if not, check sound settings again
2. Steps for Testing the JACK Audio loopback
   - **a)** In the Start Field (lower left corner) type: "Jack Control" – aka "qjackctl"
   - **b)** Right-click on Jack Control and select "Pin to Taskbar" – this is the JACK interface
   - **c)** Launch Jack Control-qjackctl from the white page icon that was pinned to the taskbar
   - **d)** Click Setup on the Jack Control-qjackctl interface
     1. Edit Jack Control-qjackctl Settings
        a) realtime : check the box
        b) interface : click the down arrow
        c) select ASIO4ALL (if your USB audio device has it's own ASIO driver select it)
        d) sample rate : 48000 (all other connections must match)
        e) frames/period (aka “buffer size”): 512 (all other connections must match)
        f) click ok
   - **e)** Press the green arrow Start button on the JackControl interface (qjackctl)
     1. The JACK audio engine should start now.
        a) If JACK throws an error, just cancel and click Start again, or retrace setup steps
   - **f)** Reduce the volume on your USB audio interface
   - **g)** Click on the “Connect” button (on Jack Control-qjackctl interface)
     1. In the connect screen, on the left - Click on “system” – it is now highlighted
     2. In the connect screen, on the right - Click on “system” – it is also highlighted
   - **h)** Put on Headphones or listen carefully to speakers
   - **i)** Click “connect” (lower left side of the JACK Connect window)
     1. Make a sound (speak, snap fingers) near the USB device microphone
     2. JACK should now be connected to your USB device and should sound “enhanced”
   - **j)** Click “disconnect”
     1. Make a sound to confirm that the USB has been disconnected and no longer audible
3. Steps to Test Jacktrip loopback server
   - **a)** Open a cmd window (type “cmd” in the Start Menu search box)
   - **b)** Navigate to the directory where the exe is located (cd <”filepath”>)
     type: "Jacktrip -C jackloop512.stanford.edu" <enter>
   - **c)** In the cmd window you should see “Connection Received”
   - **d)** Make a sound into the microphone
     1. mic signal should be heard echoing back from the Stanford server
   - **e)** To end the Jacktrip connection, in the cmd window, press: control c
   - **f)** Click Stop on the Jack Control (qjackctl) interface

Note: If Jacktrip connection failed: 1) ensure that the command was called from the directory where the Jacktrip.exe is located, 2) a buffer size of 512 might be too high, check below for info on using a lower buffer size, 3) ensure that everyone matches sample rate and buffer size.

III. ADVANCED – BUFFER SIZES, P2P

1. Try Different Buffer Sizes on JACK
   - **a)** Stop JACK
   - **b)** Click on Setup
     1. Change the frames/period to 256 or 128
   - **c)** Click ok
   - **d)** Start JACK
   - **e)** Switch to the cmd window and arrow up to get the last Jacktrip command
     1. Replace the name of the server with the name of the server with the new buffer size
        a) "jackloop256.stanford.edu"
        b) "jackloop128.stanford.edu"
   - **f)** Individuals can change their own buffer size by adding the following command to the end of the line : "-q 6" (or 8, 10, 12, etc.). This could help straighten out jitter, which happens with lower buffer sizes.
2. Steps for p2p connection (one server -s and one client -c)
   - **a)** In order to connect as a server -s, port 4464 must be opened or "forwarded"
     1. Steps to enable port forwarding
        a) Log into modem/router
        b) Find Advanced Settings (port forwarding, gaming, etc.)
        c) Specify port 4464 for Jacktrip traffic to be "forwarded" through
        d) In other fields, enter local/internal IPV4 address of the computer being used (found in computer network settings)
        e) And the external/public IP address found by searching the web for : "what is my ipv4 address?". This will return a number of sources.
        f) Server gives IP address to client(s)
     2. Server initiates connection from the cmd window with the following command line:
        a) "jacktrip -s" <enter>
        b) server should see "Waiting for Peer" (or Client)
   - **b)** In order to connect to a server as a client, port forwarding is not required
     1. **Client waits for server to give the go-ahead to connect**
     2. Client launches Jacktrip in the cmd window with the following command line:
        a) "jacktrip -c <serverIP address>" <enter>
     3. Client should see "Received Connection" in the cmd window
     4. Wait up to 90 seconds for the connection to be made
     5. Audio should be heard and received by both sides
     6. To end the connection, press: control c

IV. Important Information

1. In order to use the same audio interface in Zoom and JACK at the same time, you must uncheck the setting "Allow applications to take exclusive control": Search box, "Change System Sounds", click on Recording tab, click the device you want to use, click Properties, click the Advanced tab, uncheck "Allow applications to take exclusive control". On the Playback tab, repeat the process: click on the device, click Properties, Advanced, uncheck.
2. Wait ten seconds after every disconnection before reconnecting to allow for resets.
3. After launching JACK, or changing its settings, multiple start attempts might be needed.
4. Please lower volume before connecting audio, and closely monitor volume levels.

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