The Easiest Way for C++ Audio Programming on Windows with ASIO Driver

> **NOTE:** ASIO is only for Windows. Other platforms, e.g, Linux and MacOS, have their own audio API. We only provide the C++ tutorial for audio programming on Windows with ASIO. But the Juce library and Projucer mentioned in this document are also helpful for C++ programming on other platforms.

In this document, our goal is

> To setup the C++ development environment for audio programming on Windows;
> To build a demo of audio latency testing;
> To compile and run the demo, and test the latency of your sound card.

Setup Development Environment

There are three requirements.

- Microsoft Visual Studio
- ASIO Driver and SDK
- JUCE Library and Projucer

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1. Install Microsoft Visual Studio

> Reference: Install Visual Studio

Please follow the reference. In Step 4, choose **Desktop development with C++**.

2. Install ASIO Driver

- Download and install ASIO4ALL. (Dwonload ASIO4ALL)
- ASIO4ALL is an ASIO driver, but ASIO SDK is also required to develop program using this driver. You can download it here. Decompress the .zip file and remember the location of the folder. It will be used to configure the VS project.

> **If you want to know more about ASIO and audio programming on other platforms, following material may be helpful.**
>
> 1. A Brief History of Windows Audio APIs
> 2. How Linux Audio Works vs. Windows Audio in 2017
> 3. What is ASIO4ALL? Can You Get ASIO4ALL on a Mac? (This title is confusing. The conclusion is that ASIO is not necessary for Mac. The built-in audio driver, e.g., Core Audio, is good enough.)

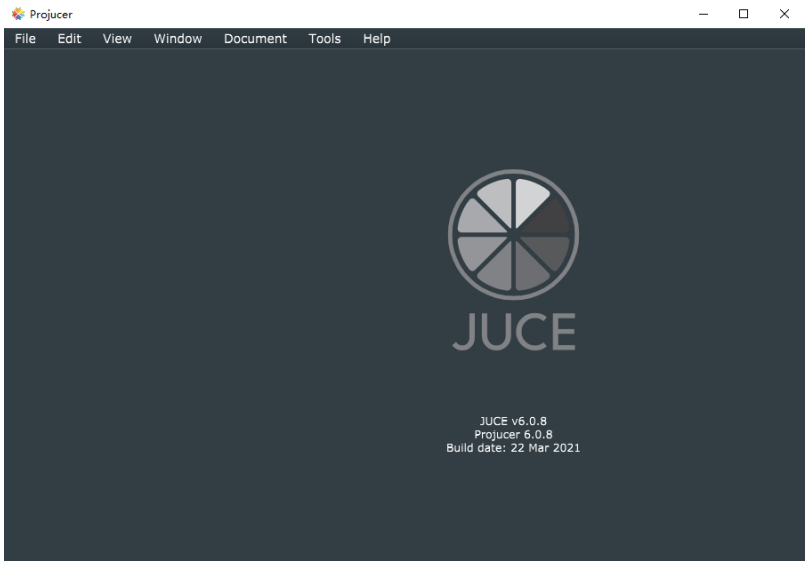
3. Download Juce and Projucer

> Reference: https://juce.com/

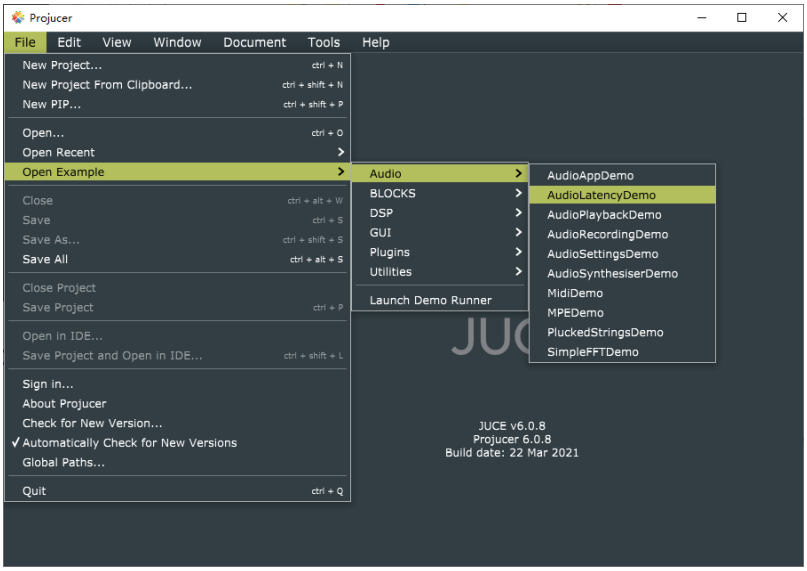
- You can download them here. Decompress the .zip file.

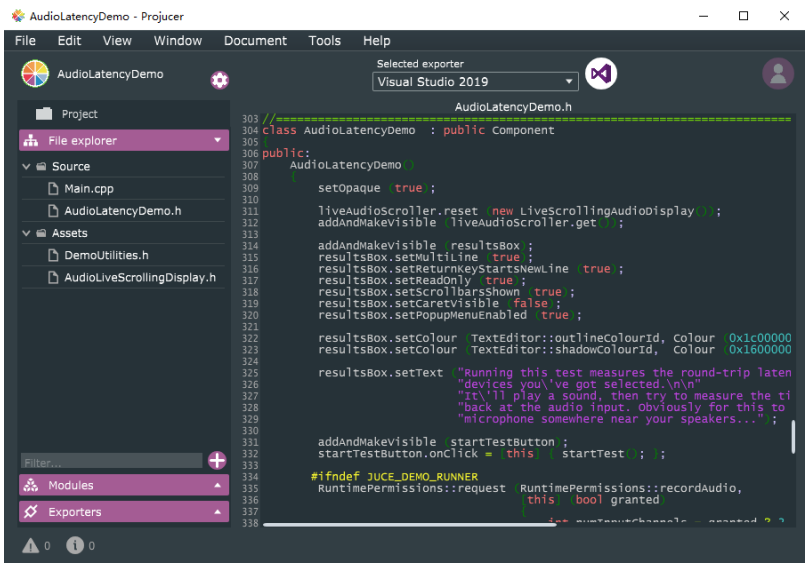
4. Run the AudioLatencyDemo

- In the JUCE folder, execute Projucer.exe. You will see the GUI of it.

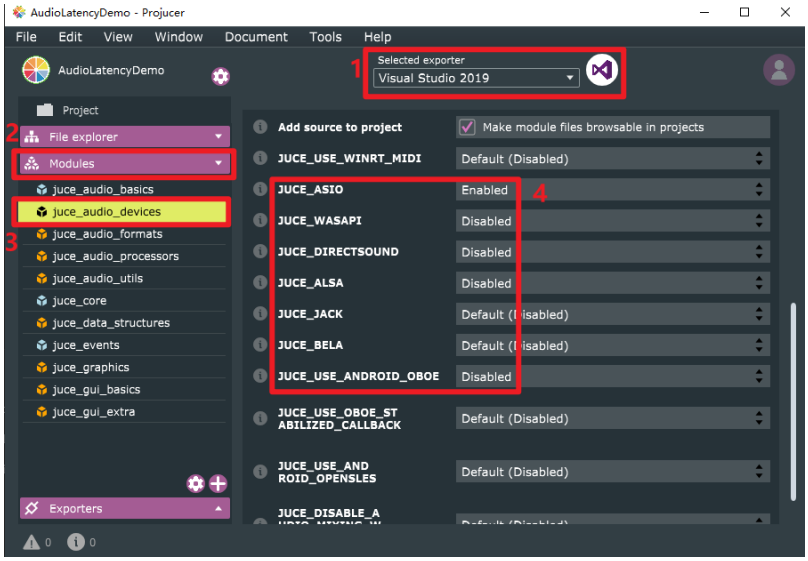


- Open AudioLatencyDemo. Click File -> Open Example -> Audio -> AudioLatencyDemo

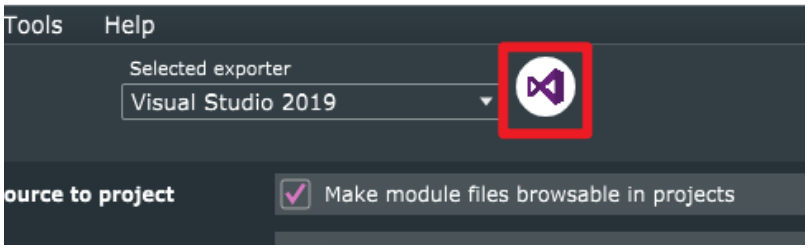




- Select your exporter. (1)
- Select ASIO audio API. (2-4)



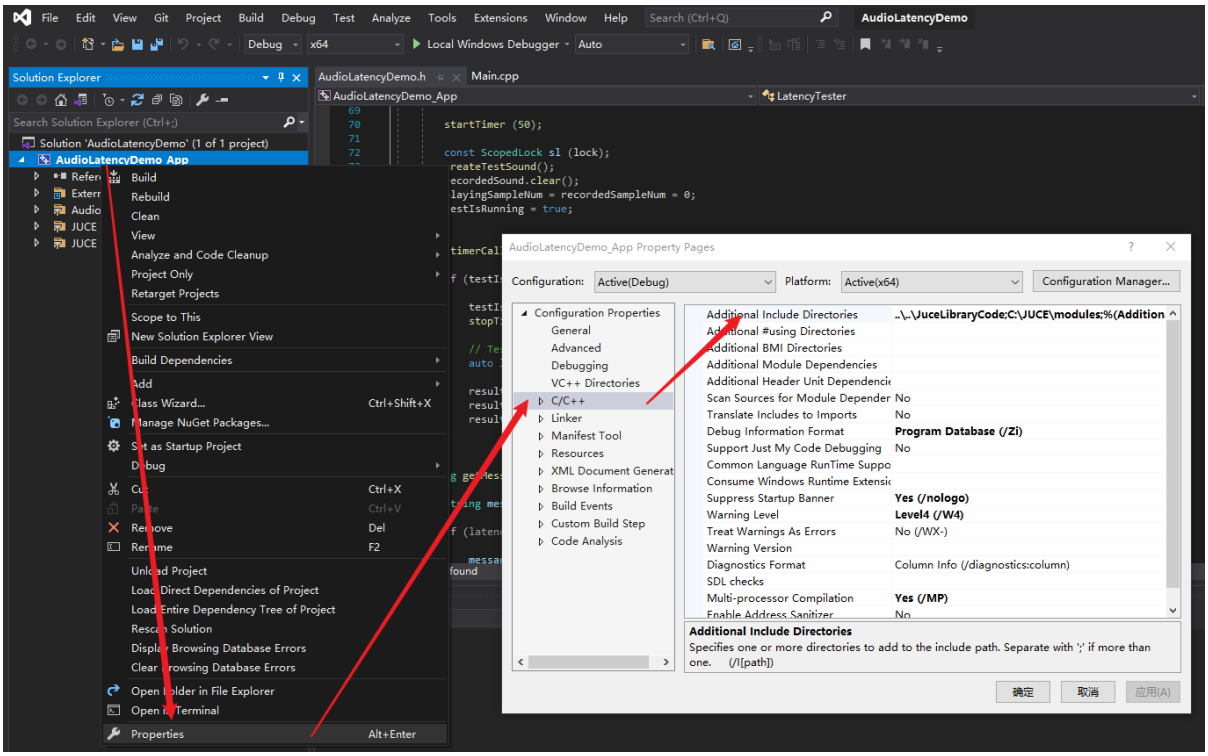
- Open this project in your IDE.

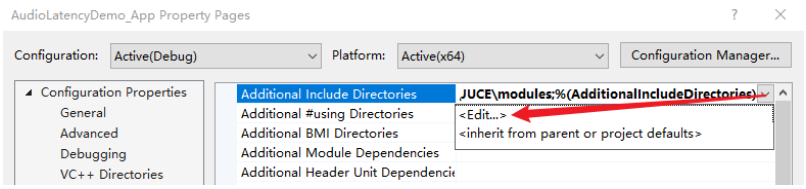


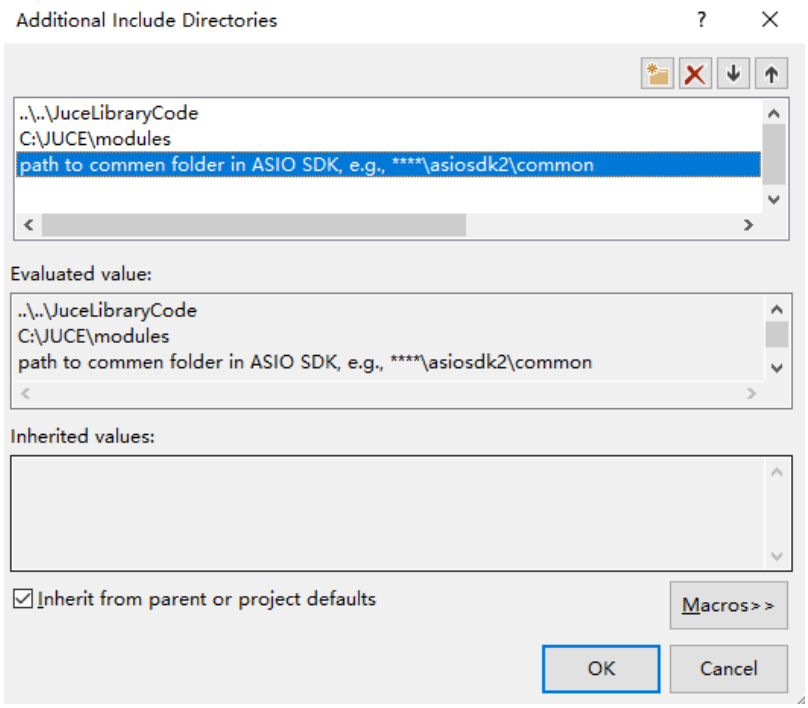
- Now, the AudioLatencyDemo project is opened in VS. The dependencies of this project are all configured, except the directory to ASIO SDK. If you compile it, an error will be reported,

> fatal error C1083: Cannot open include file: 'iasiodrv.h': No such file or directory (compiling source file ....\JuceLibraryCode\include_juce_audio_devices.cpp)

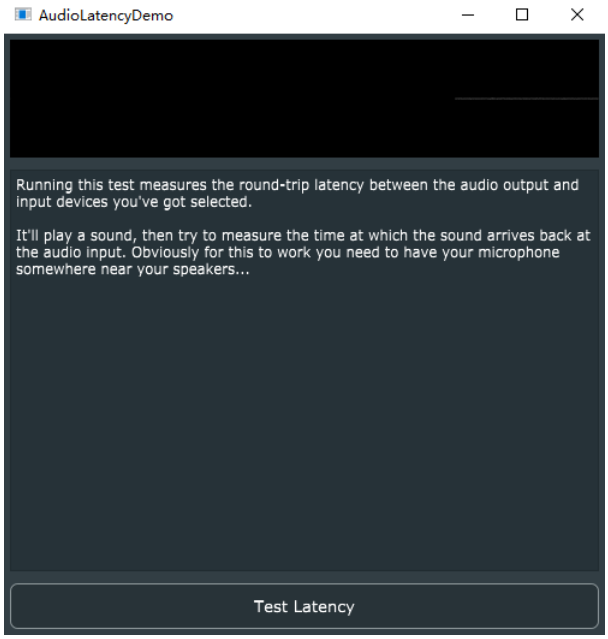
You need to configure it as shown in following figures. The path to "**common**" folder of ASIO SDK could be obtained in **Step 2. Install ASIO Driver**.



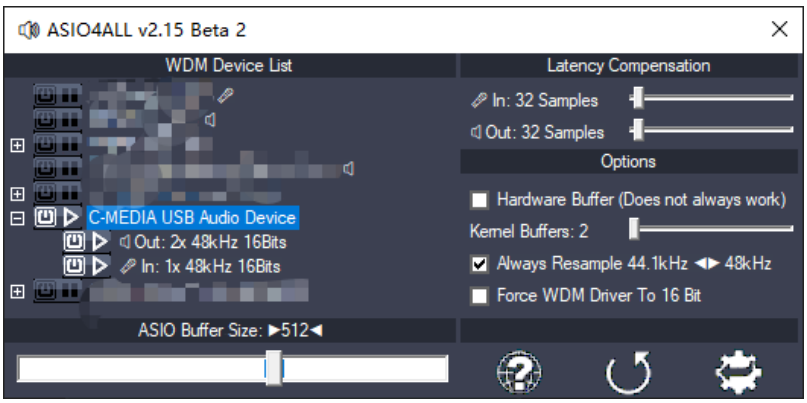




- It is ready to compile the project. If the project is built successfully, following application will run and an icon of ASIO driver () will appear in the task bar.

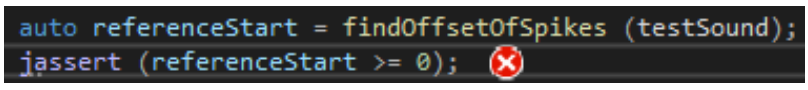


- Click  and enter the configuration UI. Select your preferred sound card. I select **C-MEDIA USB Audio Device** according to the UGREEN sound card adapter. This is the device you will use for the Project 2-4.



Some Bugs

1. Cannot find the Spikes of the testSound (Output Sound).



This is caused by a wrong initialized sample rate (8000 Hz) while the correct sample rate is 44.1 kHz or 48 kHz. Temporarily, if you meet this problem, just modify the code of **Line 129** in **AudioLatencyDemo.h**

```
sampleRate = device->getCurrentSampleRate();
```

to

```
sampleRate = 48000; // or 44100
```