AN220: USB Driver Customization

Many of Silicon Labs' USB devices require device drivers to operate within Windows. Default driver installers are provided for these devices. However, if the devices are customized with a non-default VID and/or PID, the drivers must also be customized. This application note provides a tool that creates custom driver installers for Windows to match a device's configuration. This tool also provides additional driver and installation options, such as silent install.

The following drivers are available in this tool:

- A Virtual COM Port Driver is available for the CP210x device family.
- A WinUSB driver is available for the CP2130 device.
- Direct Access Drivers (formerly called USBXpress) are available for the CP210x, C8051F32x, C8051F34x, C8051F38x, C8051T32x, C8051T62x, and EFM8UBx device families.

This document describes the steps necessary to customize the Windows device driver installation using the Custom USB Driver Installation Wizard.

KEY POINT

- Use the Custom USB Driver Installation Wizard to create a custom Windows driver installer with your unique VID/PID and installation options.

APPLICABLE DEVICES

- CP210x
- CP2130
- C8051F32x
- C8051F34x
- C8051F38x
- C8051T32x
- C8051T62x
- EFM8UBx

1. Customizing Driver Installations

The driver installation is customizable by modifying certain sections of the hardware installation files (.inf). The strings contained in the .inf files affect what is displayed in the "Found New Hardware Wizard" dialogs, Device Manager, and the Registry. The changes to the VID and PID in the driver installation should match the VID and PID contained in the EPROM/FLASH of your product. See "AN144: CP21xx Device Customization Guide" for more information on changing the VID and PID for your product.

Note: Any changes to the Windows installation .inf files will require new Windows Hardware Quality Labs (WHQL) tests.

2. Using the Custom USB Driver Installation Wizard

The Custom USB Driver Installation Wizard generates a custom driver installation for distribution to end-users. This customized installation consists of modified .inf files, optional installation support files, and driver files for Windows 7/8/8.1/10.

The optional installation executable provided can be used to copy driver files and register a device on a PC before or after the device has been connected. It will also add an entry in the add/remove programs listing. When the device is connected to the PC for the first time, the drivers will be installed with little interaction from the user.

Note: A customized installation does not contain certified drivers for Windows 7/8/8.1/10. Certification must be performed by Microsoft for the new driver installation. Uncertified drivers cannot be installed in Windows 7/8/8.1/10 except under certain testing conditions.

To run the Custom USB Driver Installation Wizard, open CustomUSBDriverWizard.exe, which is included in the AN220SW.zip download. The figure below shows the first screen of the Custom USB Driver Installation Wizard. Choose the type of driver installation desired. For detailed instructions on creating a custom driver installation, see 3. Creating a Custom Driver. This description goes through the process of customizing a CP210x driver. The process for creating a Direct Access (USBXpress) driver or CP2130 driver is the same as this description, only select "USBXpress WinUSB Driver Installation" or "CP2130 WinUSB Driver Installation" on the starting screen of the wizard, respectively.
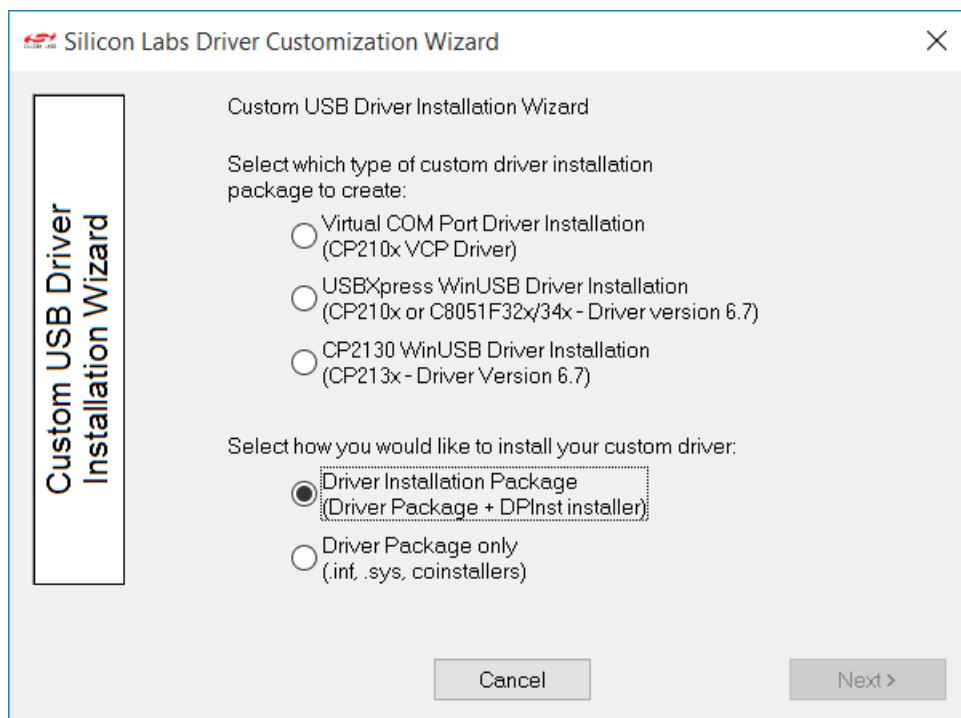

Figure 2.1. Driver Installation Selection

3. Creating a Custom Driver

This section describes how to create a custom driver. To begin, choose the type of installation to customize: "Virtual COM Port Driver Installation", "USBXpress WinUSB Installation", or "CP2130 WinUSB Driver Installation". Differences between the three installations are noted, but a sample CP210x customization is shown in the figures. Next, determine if an installation executable should be generated (see 3.5 Installation String Options and 3.8 Generation Directory for more information on the generated installer), and click Next.

3.1 Driver Certification Warning

The first screen is the warning explaining that the generated driver installation will not be certified. (See figure below.) Click Next to begin customizing your driver installation.
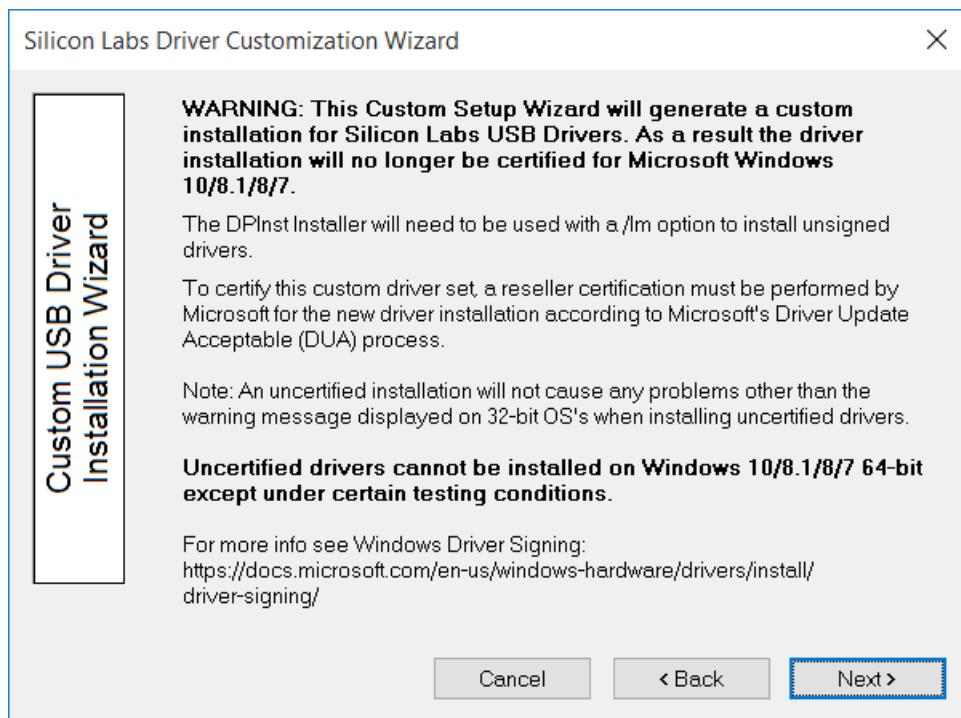
Figure 3.1. Driver Certification Warning

3.2 Operating System Selection

The first step in the customization utility (shown in the figure below) is to specify the operating system for which the custom driver is being generated.
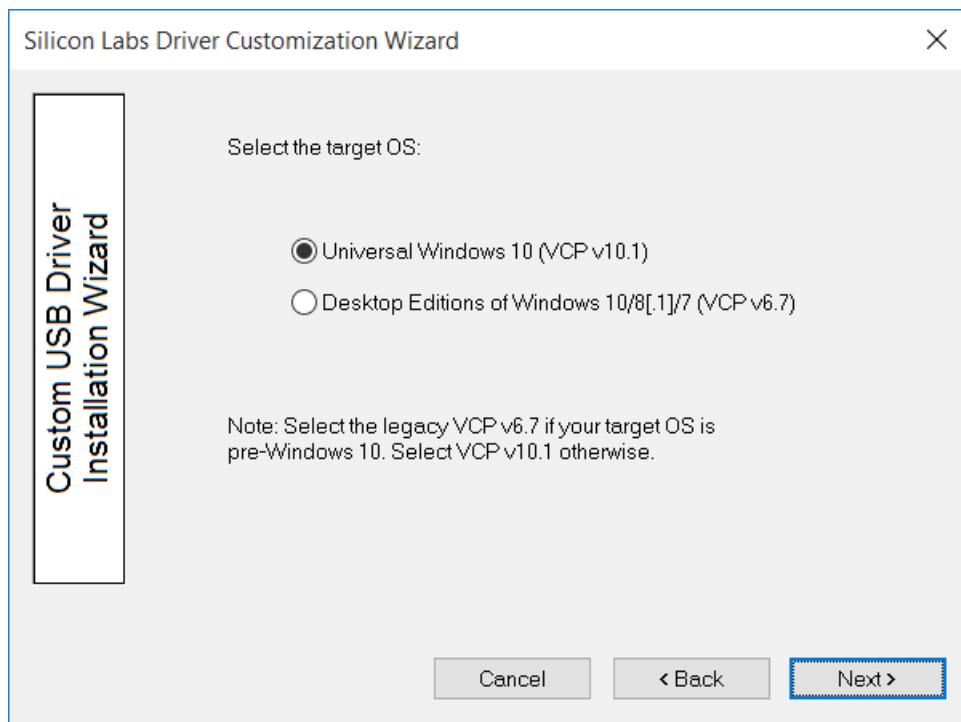
Figure 3.2. Operating System Selection

3.3 String and File Name Customization

The next step in the customization utility (shown in Figure 3.3 String and File Customization on page 6) is to specify your preferred strings and filenames. Each field is described in further detail below.

3.3.1 Company Name (Long Name for .inf File Entries)

The company name appears in the .inf file entries and has a maximum length of 255 characters.

3.3.2 Company Abbreviation (Short Name for .inf File Entries)

The abbreviation appears in the .inf file entries and has a maximum length of 31 characters.

3.3.3 File Name for .inf

This field allows for specification of a unique name for the .inf file. The maximum length of this string is eight characters. The generated file will be named xxxxxxxx.inf.
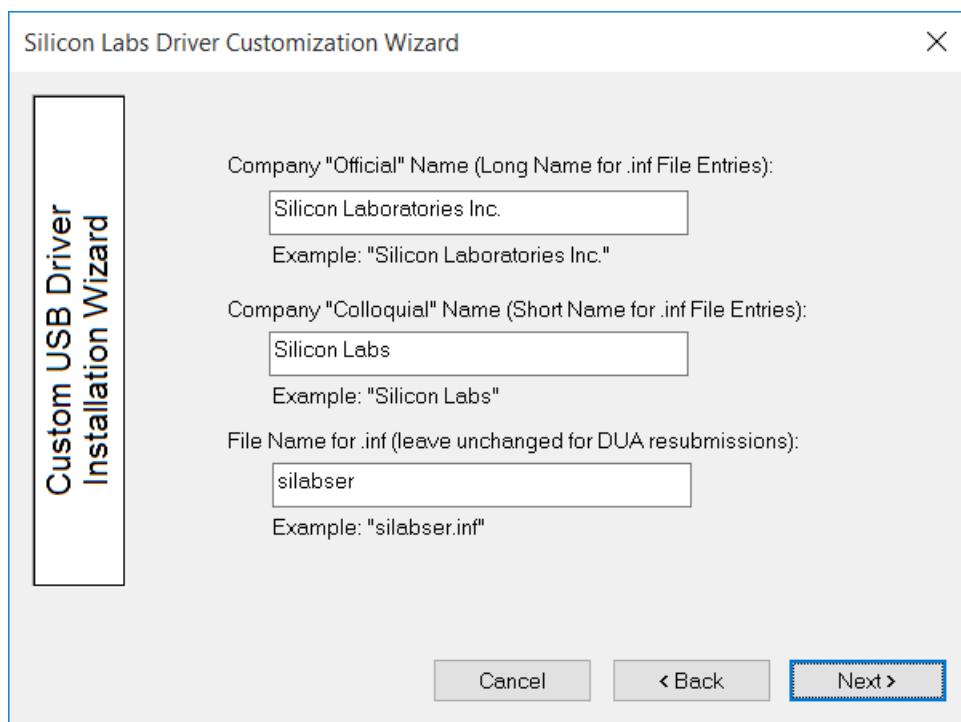
Figure 3.3. String and File Customization

3.4 VID, PID, and Device Name Customization

The next step in the customization utility (shown in Figure 3.4 VID and PID Customization on page 7) allows multiple VID/PID combinations in one driver. This entry is also where the Device Name, which appears in Windows Device Manager, is specified. An example for Windows 7 is shown in Figure 3.6 Windows 7 Device Manager Example on page 9.

3.4.1 General Device Installation Name

This field is the general description of device installation. This will not appear in Device Manager, but will show up during installation if the user is prompted for a disk.

3.4.2 Device List

The Device List allows multiple VID and PID combinations to be added to one driver. Current devices can be edited by double-clicking an entry.
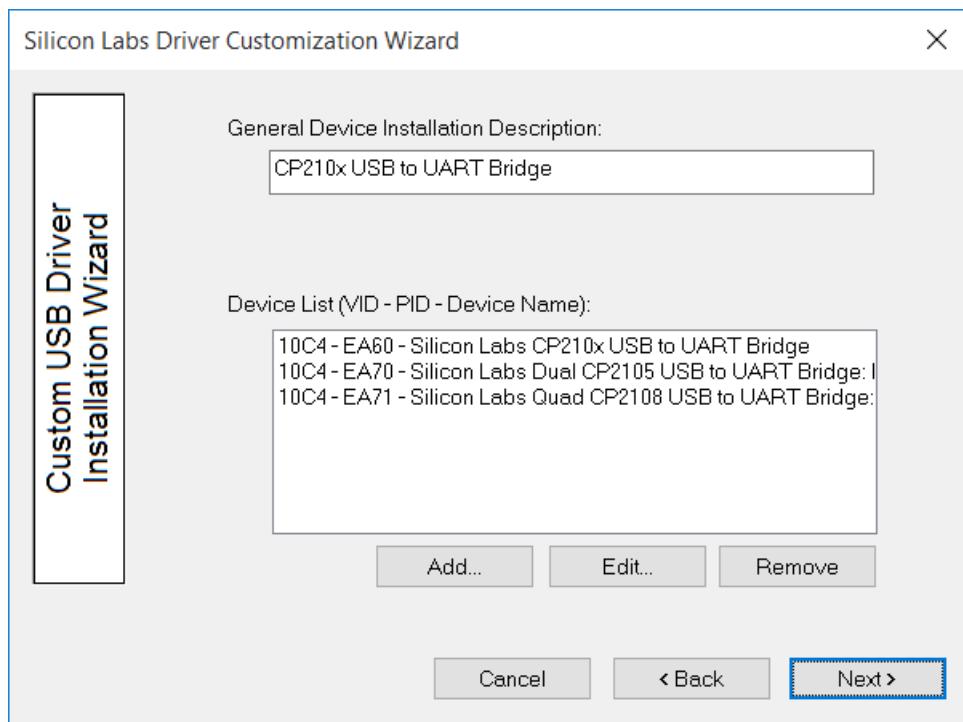
Figure 3.4. VID and PID Customization

To add a new entry, click the Add button. A new dialog box (shown in) will appear with the following options.

3.4.3 Device Type

This specifies which device is being customized. If the VCP driver for the CP2105 Dual UART Bridge is being customized, two interface names will appear. Likewise, if the VCP driver for the CP2108 Quad UART Bridge is being customized, four interface names will appear. Otherwise, only one interface name will appear.

3.4.4 VID

Allows specification of a new vendor ID (VID).

3.4.5 PID

Allows specification of a new product ID (PID).

3.4.6 Device Name

This string will be displayed in Device Manager under the Ports or USB tab. If the VCP driver is being customized for a multiple-interface bridge device, one string will be displayed per interface.
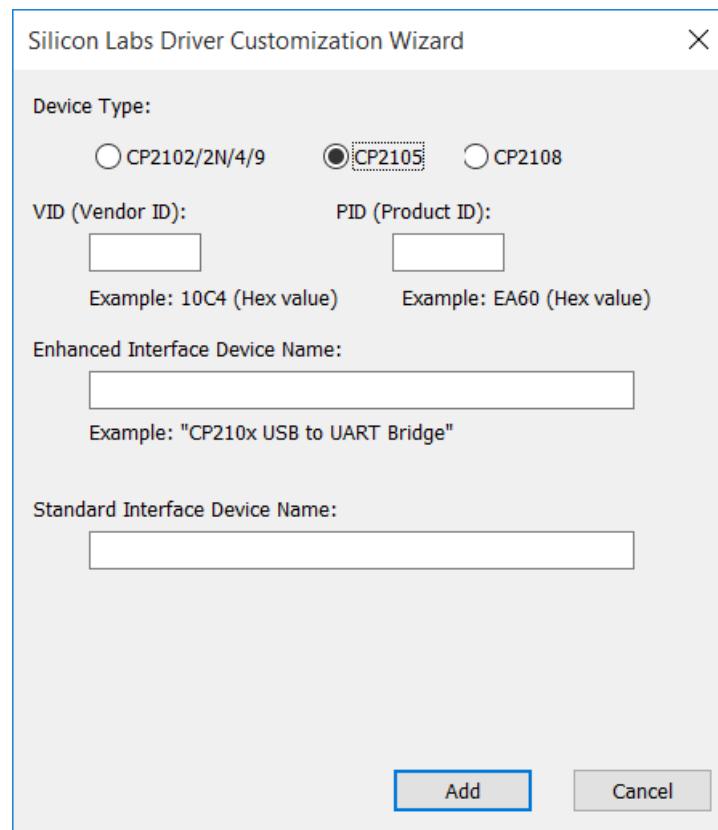

Figure 3.5. Add VID/PID/Device Name to Installation
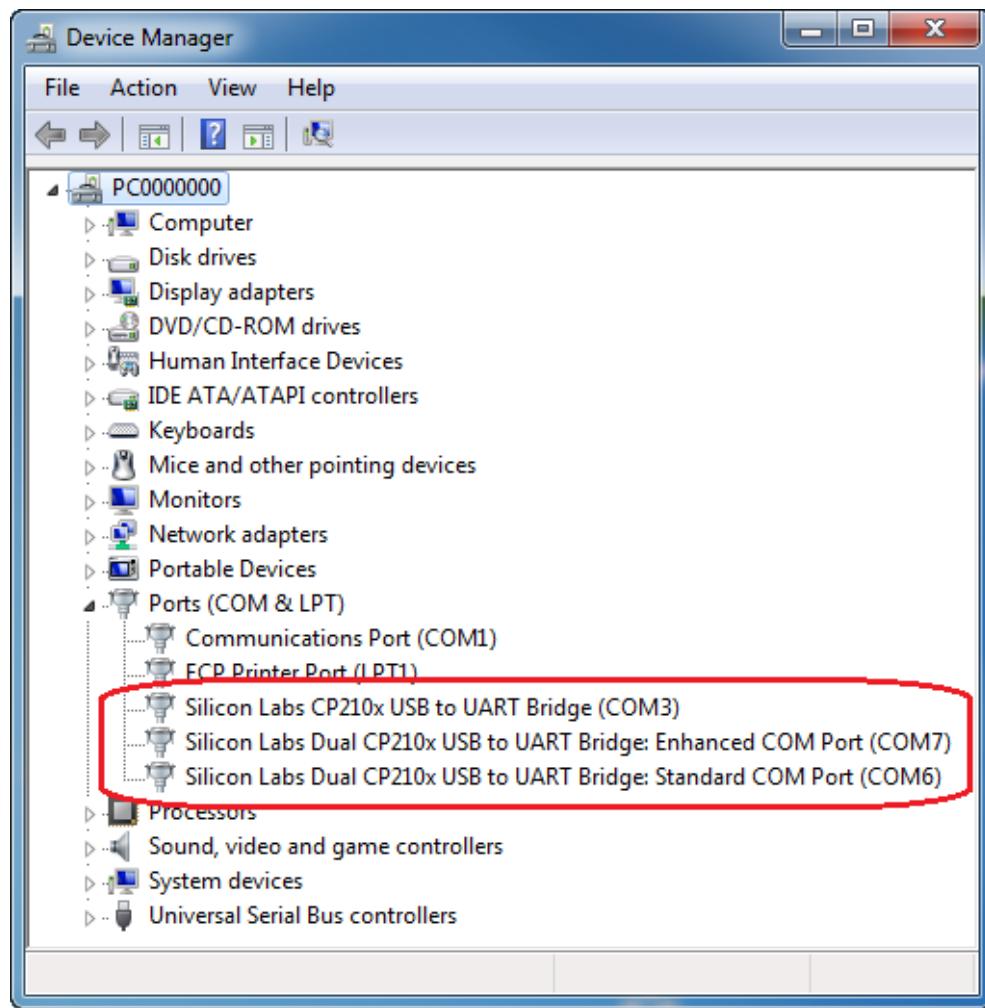
Figure 3.6. Windows 7 Device Manager Example

If an installer is not being generated, then skip to 3.9 Option Verification.

## 3.5 Installation String Options

The next step in the customization process is to specify options for the driver installer. The driver installer will allow for a device to be installed before or after a device has been connected to the PC. If this is run before a device is plugged in, drivers will already be registered for devices that belong to that installation. If a device is already plugged in, the installer will rescan the bus for any devices for that installation. This section covers adding the installer's strings and is shown in Figure 3.7 Installation Strings on page 10. The driver installer and its corresponding setup.ini file are explained in further detail in "AN335: USB Driver Installation Utility".

3.5.1 Product Name

This is the string that identifies the product installation in the Add/Remove Programs listing. The string shows up as "<Product Name String> (Driver Removal)" for easy identification.

3.5.2 Name for Installation File

This is will be the name of the installation executable and shows up as "<InstallName>.exe".
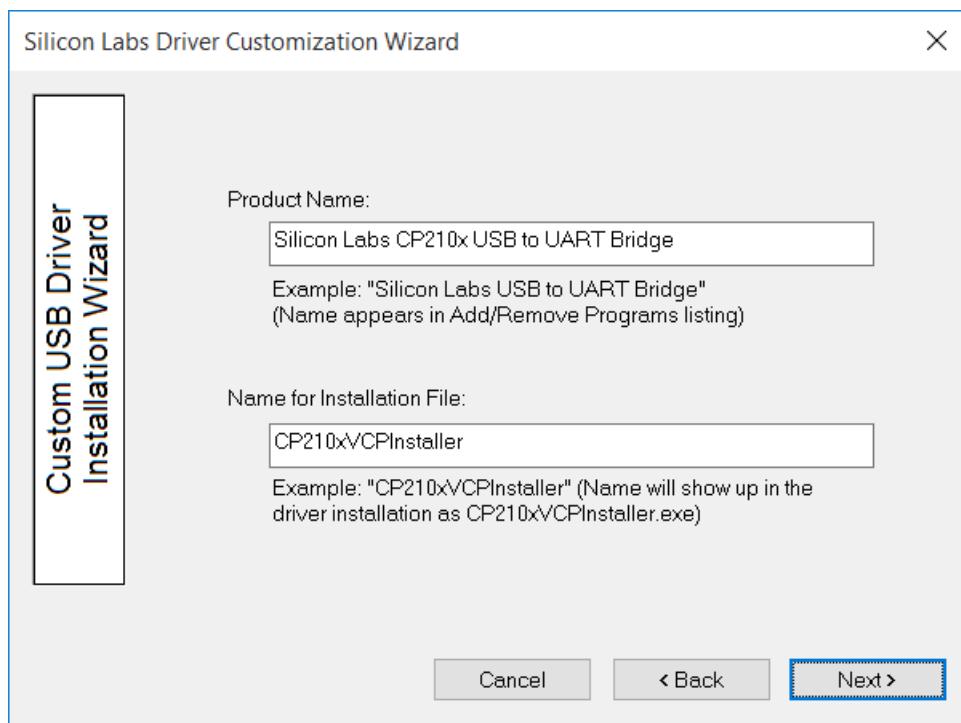
Figure 3.7. Installation Strings

3.6 Device Options

The next step in the customization utility (shown in 3.6.2 Selective Suspend Support) is to configure the serial enumeration and selective suspend options.

3.6.1 Serial Enumeration Support

This allows Windows to "enumerate" a device(s), such as serial mice or an external modem, connected to the CP210x . If your device always presents data to the PC (such as a GPS device), then disable this to prevent false serial enumerations.

3.6.2 Selective Suspend Support

Enabling this feature will put the device to sleep if it has not been opened for a time longer than the specified Timeout Value. This is used to save power on the PC and is recommended unless your CP210x needs to be powered if a handle to the device is not opened.
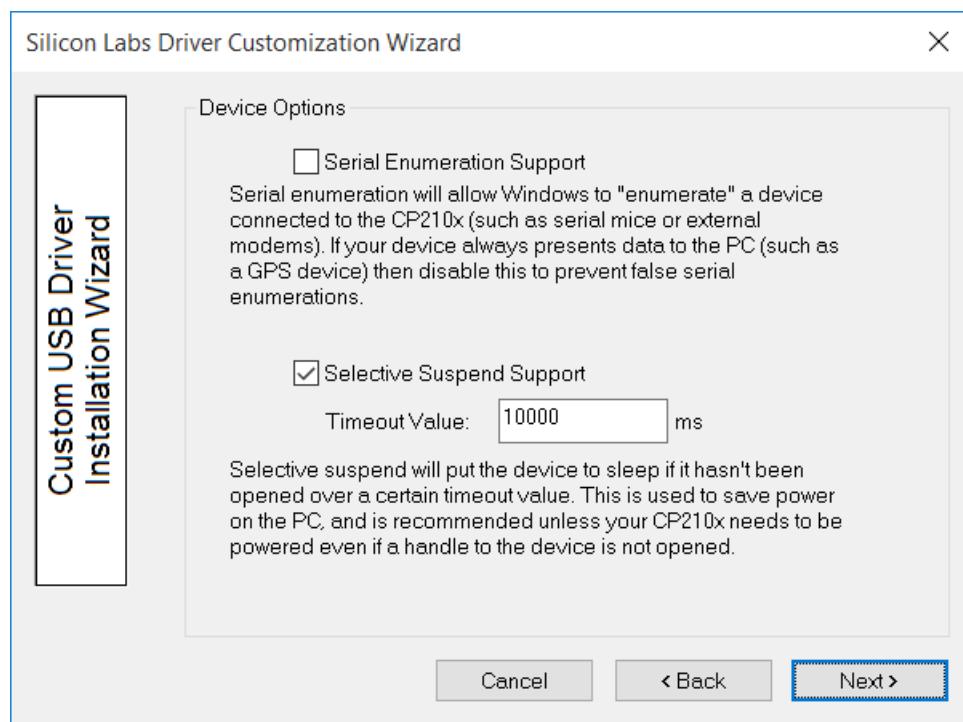

Figure 3.8. Device Options

3.7 Installation Options

Specific options for the GUI should now be specified.

3.7.1 Display GUI Window during Install

Check this option when using the generated Installer as a stand-alone application. The Installer will display several GUI windows during the installation process. Uncheck this option to run the Installer in Quiet Mode. When running in Quiet Mode, no GUI will be displayed. This is useful when using another application to launch this Installer.

3.7.2 Copy Files to Target Directory during Install:

Check this option if a copy of the drivers will be needed on the hard drive. This is useful when installing the drivers from a CD. Uncheck this option if copies of the driver files are not needed on the hard drive.

3.7.3 Target Directory

Selects the hard drive location that will contain a copy of the driver files. The default location is C:\Program Files\Silabs\MCU\CP210x for the VCP Driver and C:\ProgramFiles\Silabs\MCU\USBXpress for the USBXpress driver. If the "Display GUI window during Installation" option is selected, this path can be changed during installation by clicking the Browse button. However, if the "Display GUI window during Installation" option is not selected, then the default directory is always used unless a directory is specified through the command line. This option is ignored if the "Copy Files to Directory during Setup" option is not selected.

Note: The Target Directory must be different for each product released.

3.7.4 Display GUI Window during Uninstall

Check this option when using the generated Uninstaller as a stand-alone application. The Uninstaller will display several GUI windows during the uninstall process. Uncheck this option if the Uninstaller will be launched by another application. The Uninstaller then runs in Quiet Mode. When running in Quiet Mode, no GUI will be displayed.

3.7.5 Remove Files from Target Directory during Uninstall

Check this option if the files copied to the Target directory should be removed upon uninstallation. This option is ignored if the "Copy Files to Directory during Setup" option is not selected.
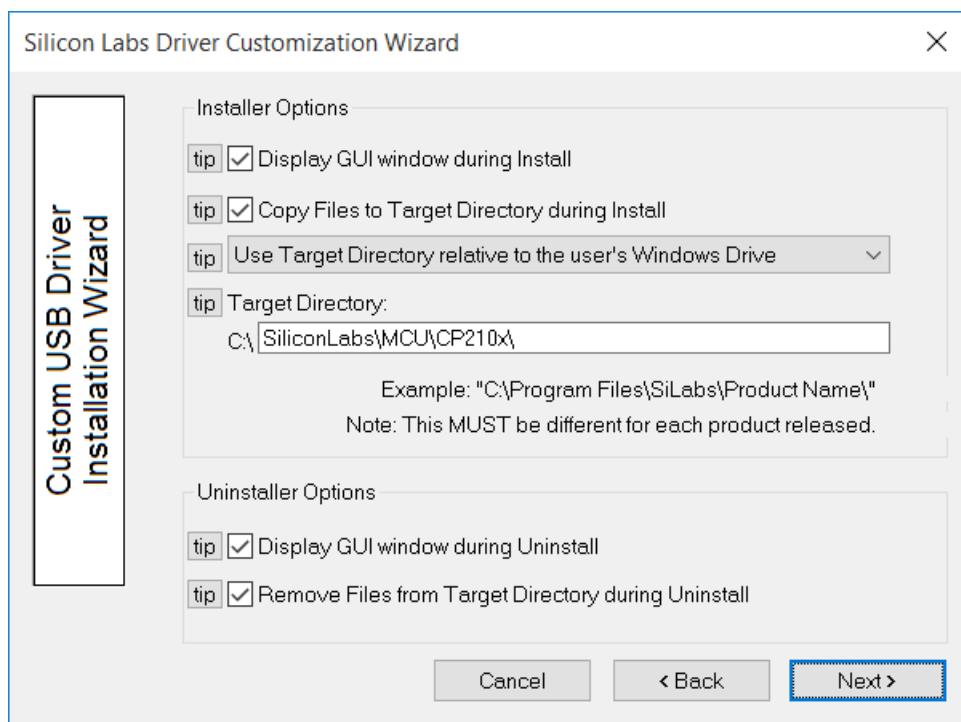
Figure 3.9. Installation Options

3.8 Generation Directory

The next step in the customization utility is to specify where this custom driver's installation files will be generated. The default directory for a VCP driver is C:\Silabs\MCU\CustomCP210xDriverInstall, and the default for a USBXpress Driver is C:\Silabs\MCU\CustomUSBX-pressDriverInstall. However, a different directory can be selected or created. This step is shown in the figure below.

Note: This is not an actual installation of the drivers. This is simply a directory to output all installation files needed for the installation. These files can be added to a CD or OEM installation for distribution to the end-user.
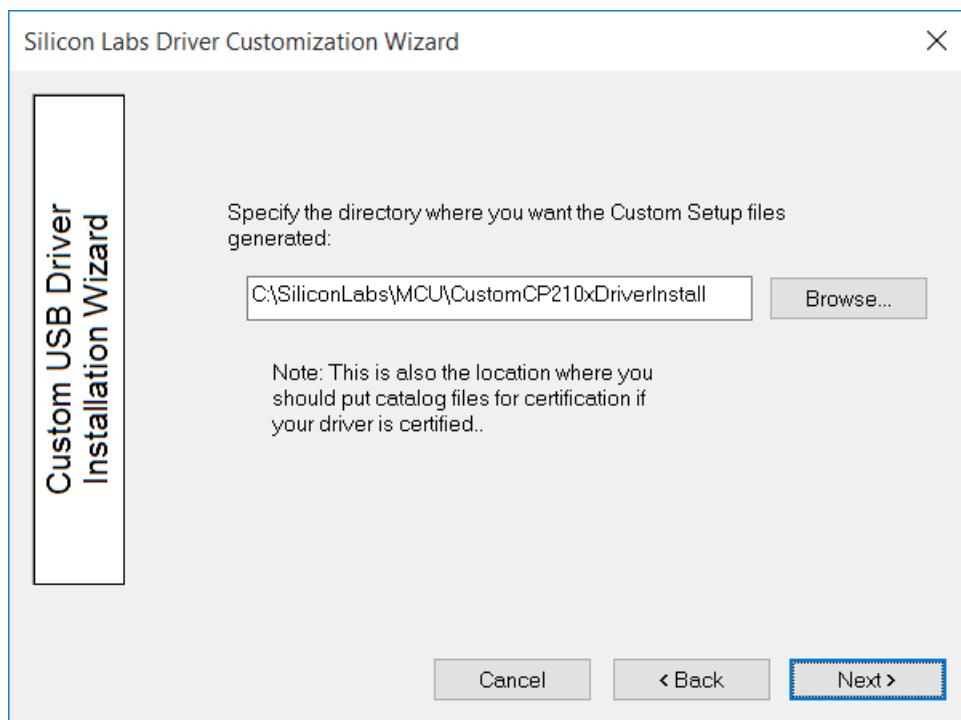
Figure 3.10. Generation Directory

3.9 Option Verification

The final step in the customization utility is to review all of the selected options. If anything needs to be changed, the Back button can be used to go back to previous pages to change items. Once all options have been verified, press Finish to create the customized driver files. This step is shown in the figure below.
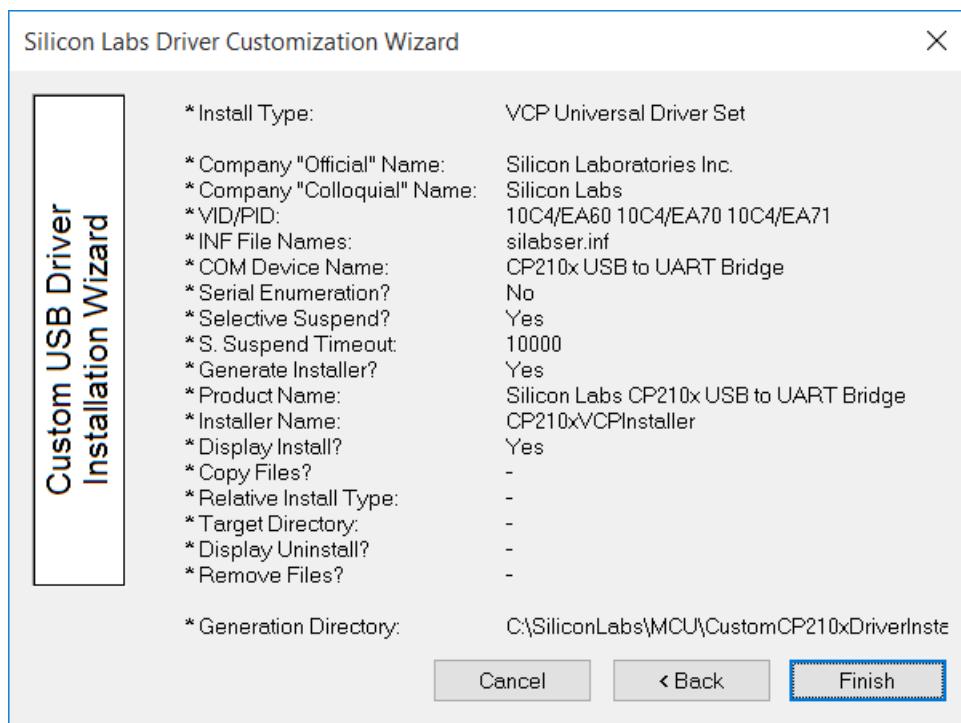
Figure 3.11. Option Verification

4. Customizing Driver Installations, macOS (Mac OS X)

If the VID or PID is changed from the default factory settings, contact Silicon Laboratories Support (https://www.silabs.com/support) to obtain drivers that incorporate the new values. Mac OS X requires that the drivers be compiled with the values that will be used by the production CP210x device.

5. Revision History

Revision 1.0

August, 2018

- Converted to new Appnote format.
- Updated screenshots to match the current release of the customization tool.
- Added references to CP2130 driver.
- Updated Windows versions to currently supported versions 7/8/8.1/10.
- Updated references to USBXpress drivers to mention the current name "Direct Access Drivers."
- Added EFM8UBx devices to supported device list.

Revision 0.7

- Added CP2108 to Relevant Devices list.

Revision 0.6

- Added support for C8051F38x, C8051T32x, and C8051T62x devices.
- Updated Figures 1 through 12.

Revision 0.5

- Added support for CP2104 and CP2105.
- Added support for Windows 7.
- Updated all screen shots of the AN220 software.
- Updated explanations of AN220 software.

Revision 0.4

- Updated diagrams and wording to reflect 4.1 and later versions of the Custom Driver Wizard.
- Updated to include documented support of C8051F34x devices.
- Updated to reflect Vista support.

Revision 0.3

- Updated figures and customization description to reflect version 3.4 and later of the Custom Driver Wizard.
- Removed USBXpress specific customization description. Version 3.4 and later contains the same process for customizing both VCP and USBXpress driver installations.
- Removed preinstaller explanations and added descriptions on how the new Driver Installer is used.

Revision 0.2

- Added CP2103 to Relevant Devices on page 1.

Revision 0.1

- Initial revision.
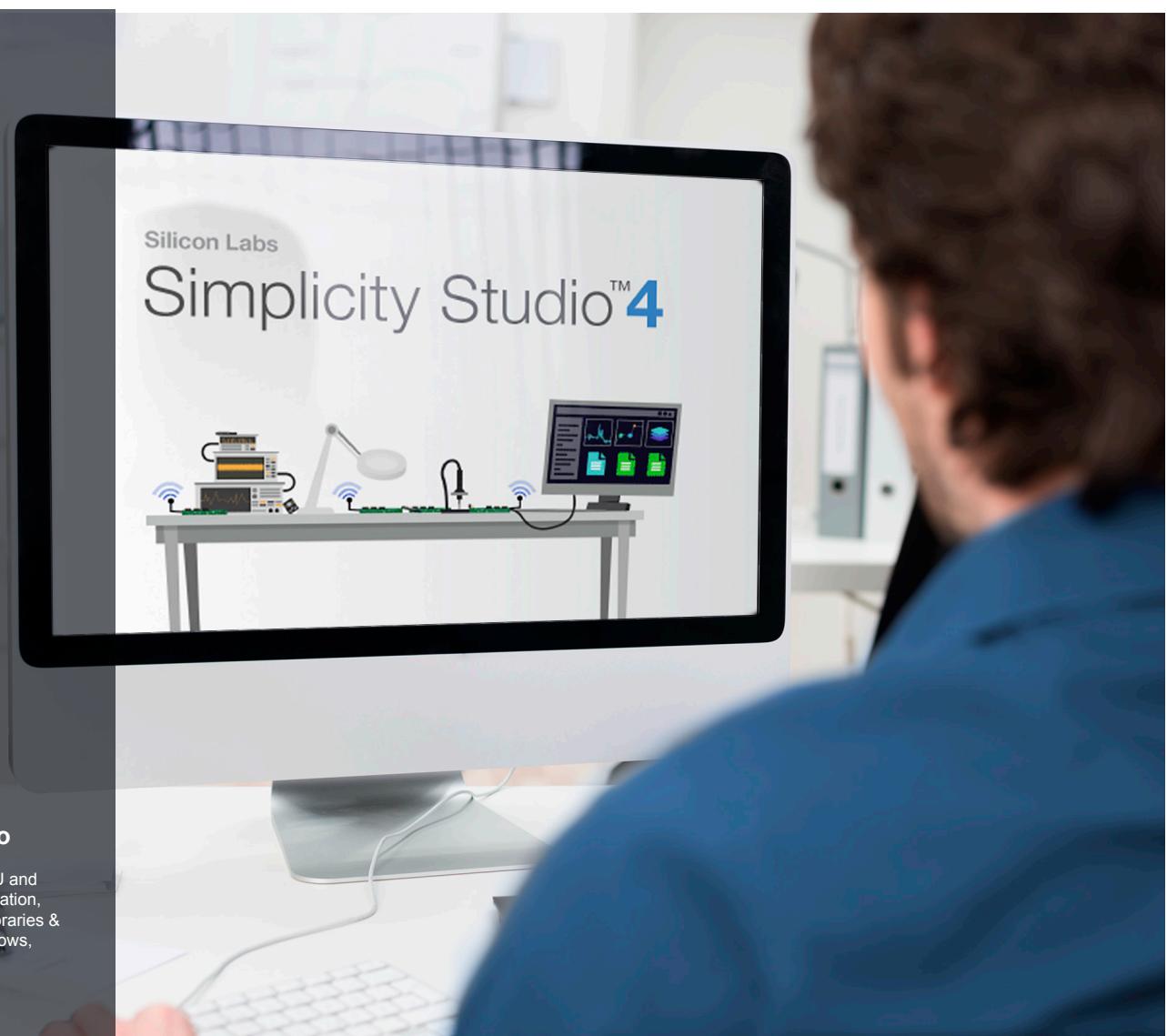
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