USB CDC libusb device lab

USB CDC libusb device

- Libusb offers API for communication with CDC (and other classes) devices without default Windows driver, which is supporting obsolete COM port emulation

  + Spare one endpoint on STM32 device

  + No need to handle interrupt channel, and additional VCP layer (control signals, line coding..)

  + Native Plug and Play

  - Need driver on Windows side, which needs to be signed

  - Not so bright offer of terminal applications

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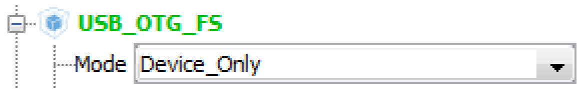
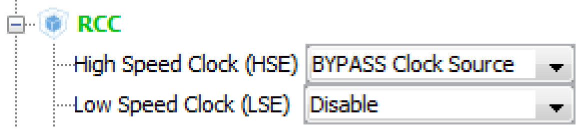
USB CDC libusb device

- Create project in CubeMX, same as for CDC VCP device
  - Menu > File > New Project
  - Select STM32F4 > STM32F446 > LQFP144 > STM32F446ZETx
- Select USB FS OTG in device mode

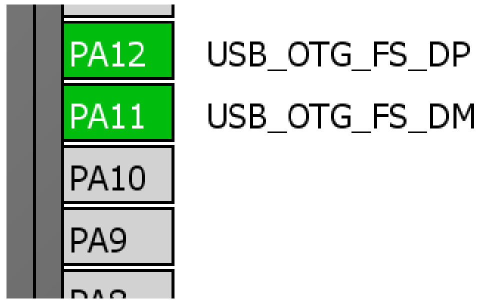


USB_OTG_FS
Mode Device_Only

- Select HSE clock
  - (Bypass HSE from STlink)

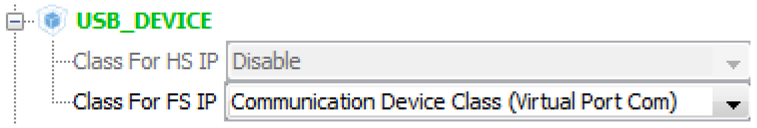


RCC
High Speed Clock (HSE) BYPASS Clock Source
Low Speed Clock (LSE) Disable



PA12 USB_OTG_FS_DP
PA11 USB_OTG_FS_DM
PA10
PA9

- Select CDC class in MiddleWares

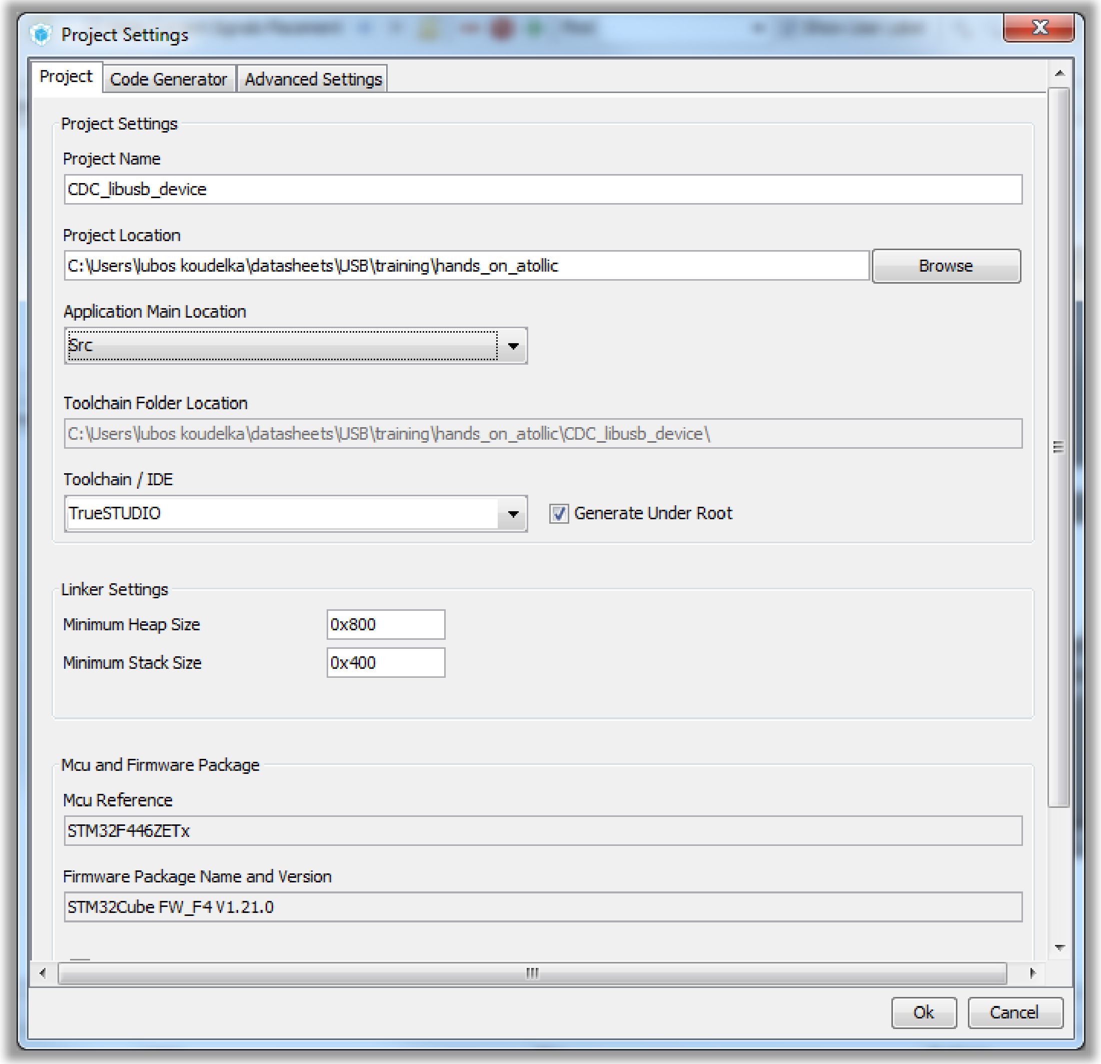


USB_DEVICE
Class For HS IP Disable
Class For FS IP Communication Device Class (Virtual Port Com)

- Configure RCC clocks
  - Set 8 MHz HSE as PLL input, set HCLK frequency 168 MHz

USB CDC libusb device

- Now we set the project details for generation
  - Menu > Project > Project Settings
  - Set the project name
  - Project location
  - Type of toolchain
- Linker Settings
  - Increase heap size to 0x800
  - Default value 0x200 is not enough for VCP example
- Now we can Generate Code
  - Menu > Project > Generate Code



Project Settings

Project Name: CDC_libusb_device

Project Location: C:\Users\lubos koudelka\datasheets\USB\training\hands_on_atollic

Application Main Location: Src

Toolchain Folder Location: C:\Users\lubos koudelka\datasheets\USB\training\hands_on_atollic\CDC_libusb_device\

Toolchain / IDE: TrueSTUDIO [✓ Generate Under Root]

Linker Settings

Minimum Heap Size: 0x800

Minimum Stack Size: 0x400

Mcu and Firmware Package

Mcu Reference: STM32F446ZETx

Firmware Package Name and Version: STM32Cube FW_F4 V1.21.0

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USB CDC libusb device

- Change device descriptor to differ this project from previous VCP project
  - PID 0xC1B0 is currently not used, but also it’s not assigned for this functionality
  - Temporary testing solution, for usage in real application request for own PID is mandatory
  - Find and change in usbd_desc.c

```
#define USBD_PID_FS     0xC1B0
```

USB CDC libusb device

- Change device descriptor in usbd_desc.c
- Default value of bDeviceClass and subclass (0x2) is recognized as VCP

```
__ALIGN_BEGIN uint8_t USBD_FS_DeviceDesc[USB_LEN_DEV_DESC]
__ALIGN_END =
  {
    0x12,                       /*bLength */
    USB_DESC_TYPE_DEVICE,       /*bDescriptorType*/
#if (USBD_LPM_ENABLED == 1)
    0x01,                       /*bcdUSB */
#else
    0x00,                       /* bcdUSB */
#endif
    0x02,
    0x00,                        /*bDeviceClass*/
    0x00,                       /*bDeviceSubClass*/
    0x00,                       /*bDeviceProtocol*/
    USB_MAX_EP0_SIZE,          /*bMaxPacketSize*/
    LOBYTE(USBD_VID),           /*idVendor*/
    HIBYTE(USBD_VID),           /*idVendor*/
    LOBYTE(USBD_PID_FS),           /*idVendor*/
    HIBYTE(USBD_PID_FS),           /*idVendor*/
    0x00,                       /*bcdDevice rel. 2.00*/
    0x02,
    USBD_IDX_MFC_STR,           /*Index of manufacturer  string*/
    USBD_IDX_PRODUCT_STR,       /*Index of product string*/
    USBD_IDX_SERIAL_STR,        /*Index of serial number string*/
    USBD_MAX_NUM_CONFIGURATION  /*bNumConfigurations*/
  } ;
```

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USB CDC libusb device

- Modify the project to avoid usage of interrupt endpoint
- There is a lot of changes in usbd_cdc.c in order to exclude command endpoint
  - Copy complete content of following file
  - Compare this file with previous one to observe modifications

usbd_cdc.c

- Modify configuration descriptor size in usbd_cdc.h
  - CMD endpoint address define may be deleted

```
#define USB_CDC_CONFIG_DESC_SIZ                          32
```

USB CDC libusb device

- In file usbd_cdc_if.c add loopback for echoing of incoming communication

```
static int8_t CDC_Receive_FS (uint8_t* Buf, uint32_t *Len)
{
  /* USER CODE BEGIN 6 */
uint8_t length = MIN(Len[0],APP_TX_DATA_SIZE);
  USBD_CDC_SetRxBuffer(&hUsbDeviceFS, &Buf[0]);
  USBD_CDC_ReceivePacket(&hUsbDeviceFS);
  CDC_Transmit_FS(Buf,length);
  return (USBD_OK);
  /* USER CODE END 6 */
}
```

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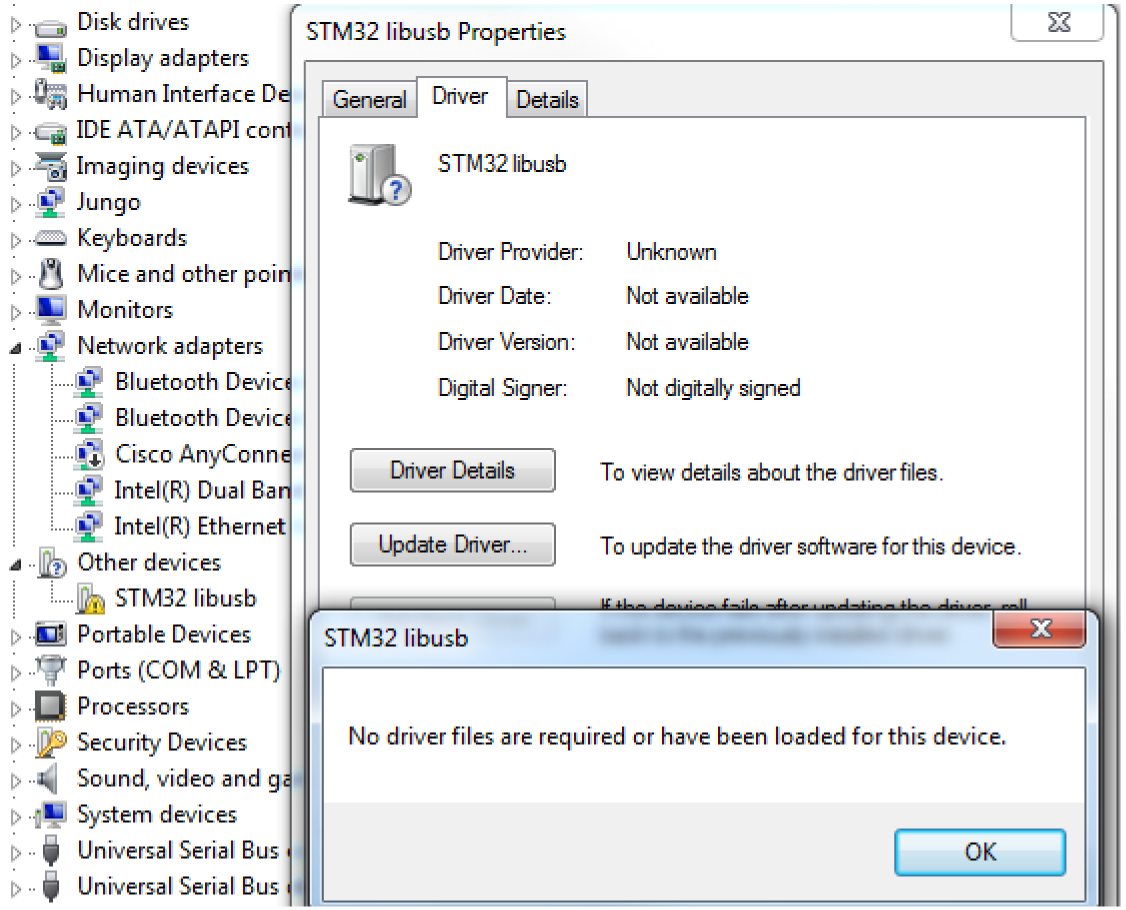
USB CDC libusb device

- Now when project is loaded to the MCU, no driver is loaded to the device after connection



STM32 libusb

Driver Provider: Unknown
Driver Date: Not available
Driver Version: Not available
Digital Signer: Not digitally signed

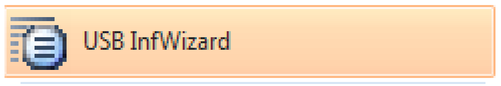
To view details about the driver files.
To update the driver software for this device.

No driver files are required or have been loaded for this device.

USB CDC libusb device

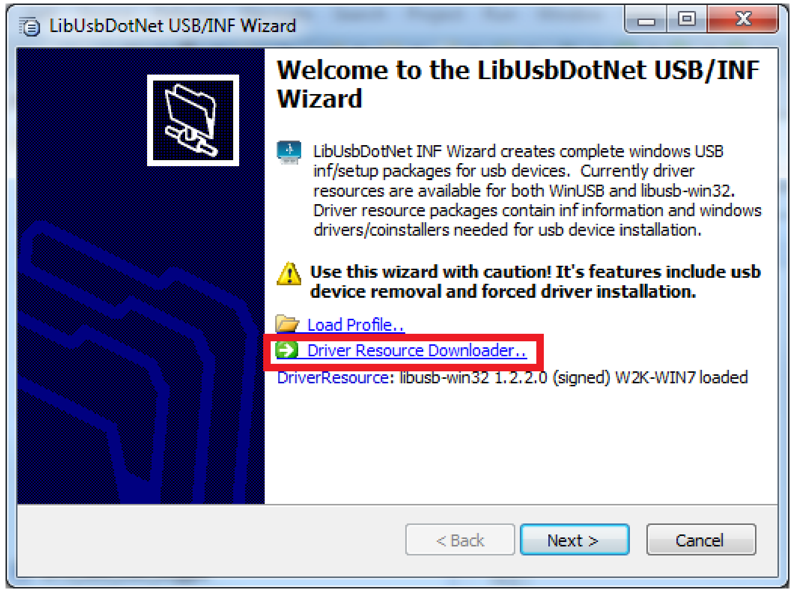
- For easier driver assignment, libusbdotnet application is used
- You can either install from included file, or search in project web sites for up to date version

- Then run USBInfWizard, which is part of the installed package



USB CDC libusb device

- Chose Driver Resource Downloader to get additional drivers
- Check Use InfWizard Downloader and download WinUSB 1.9.
- Once download is complete, choose next

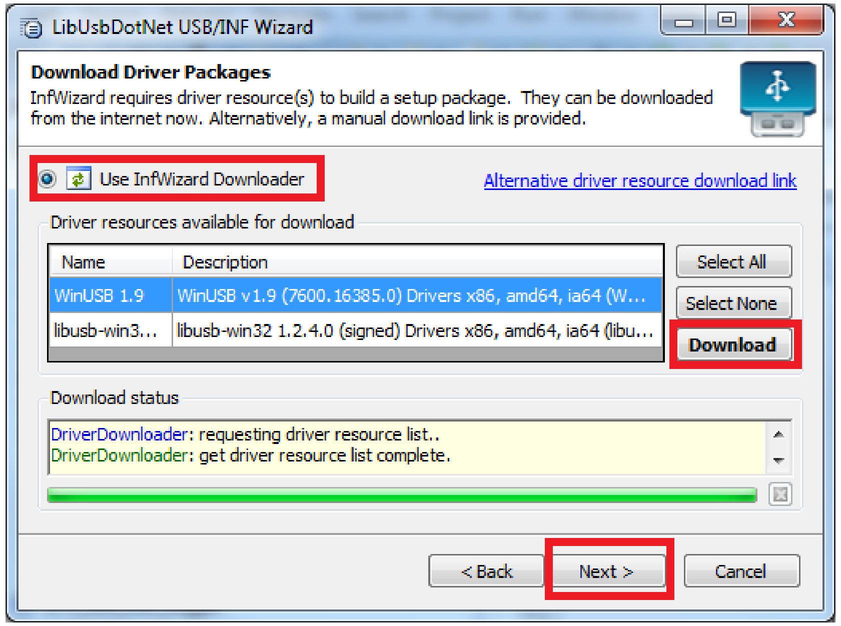


Welcome to the LibUsbDotNet USB/INF Wizard

LibUsbDotNet INF Wizard creates complete windows USB inf/setup packages for usb devices. Currently driver resources are available for both WinUSB and libusb-win32. Driver resource packages contain inf information and windows drivers/coinstallers needed for usb device installation.

Use this wizard with caution! It's features include usb device removal and forced driver installation.

DriverResource: libusb-win32 1.2.2.0 (signed) W2K-WIN7 loaded



Download Driver Packages

InfWizard requires driver resource(s) to build a setup package. They can be downloaded from the internet now. Alternatively, a manual download link is provided.

Driver resources available for download

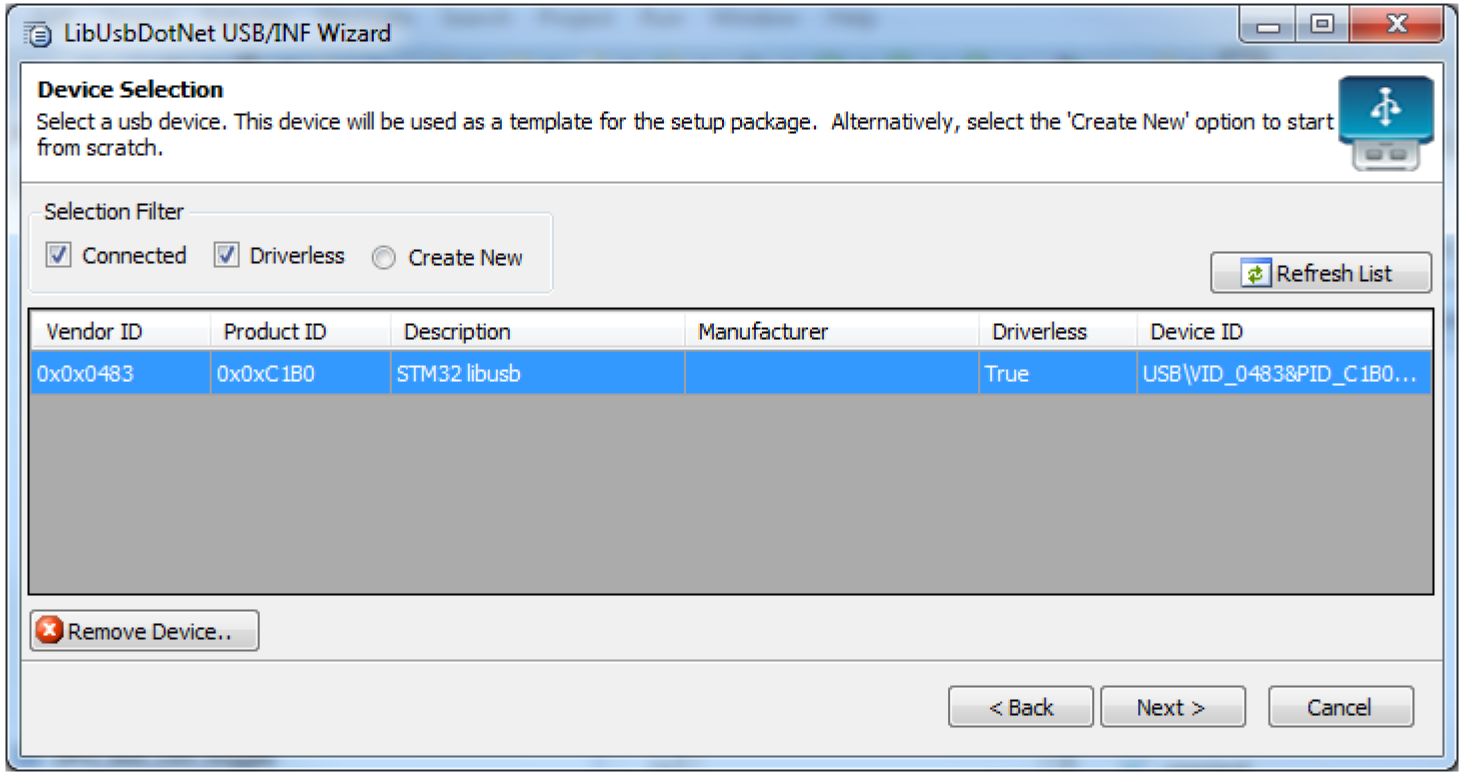
Name	Description
WinUSB 1.9	WinUSB v1.9 (7600.16385.0) Drivers x86, amd64, ia64 (W...
libusb-win3...	libusb-win32 1.2.4.0 (signed) Drivers x86, amd64, ia64 (libu...

Download status

```
DriverDownloader: requesting driver resource list..
DriverDownloader: get driver resource list complete.
```

USB CDC libusb device

- Chose tested device (checking VID & PID) and choose next



Device Selection

Select a usb device. This device will be used as a template for the setup package. Alternatively, select the 'Create New' option to start from scratch.

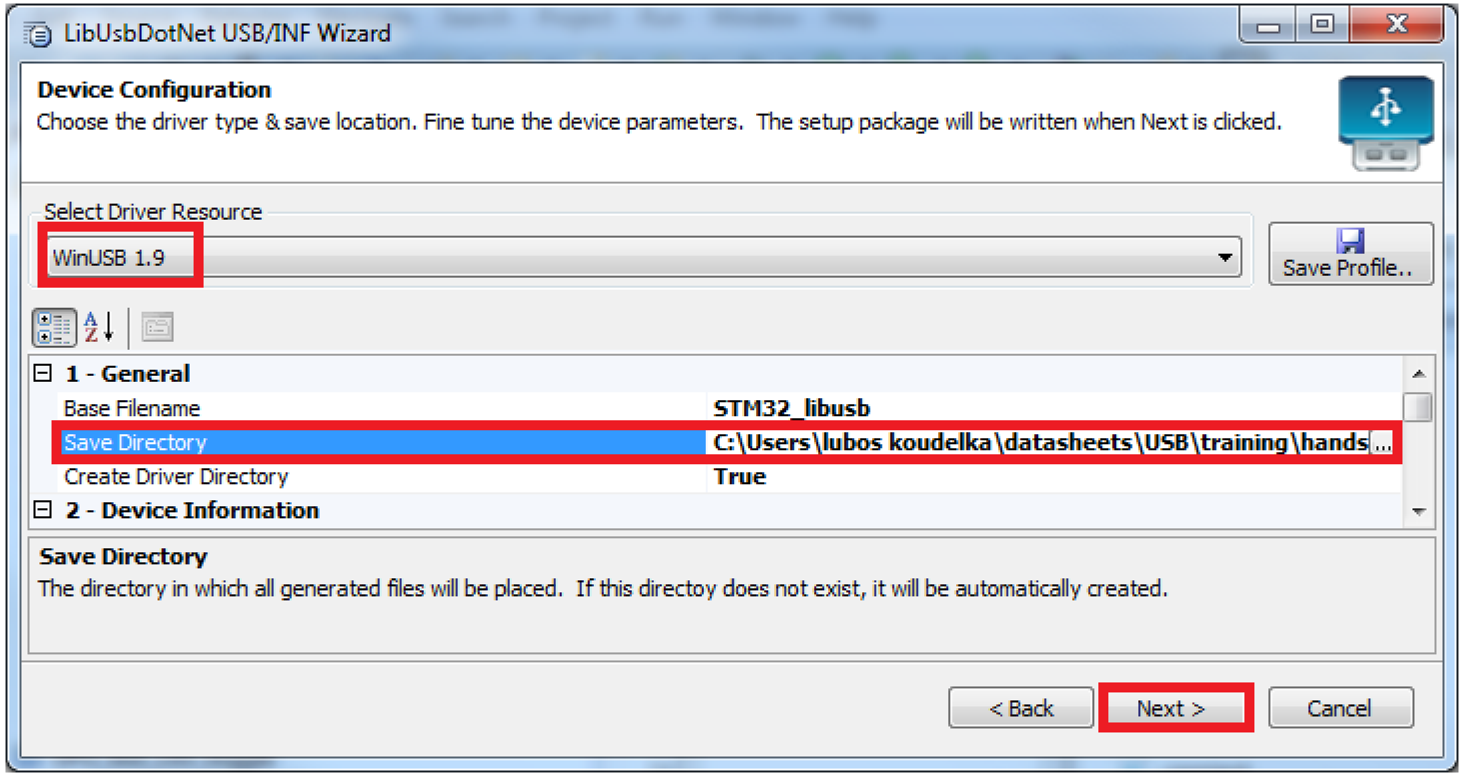
Selection Filter

[✓] Connected [✓] Driverless ( ) Create New

Vendor ID	Product ID	Description	Manufacturer	Driverless	Device ID
0x0x0483	0x0xC1B0	STM32 libusb		True	USB\VID_0483&PID_C1B0...

USB CDC libusb device

- Fill directory path where driver files will be saved (.inf, .cat and .dll files) and choose next
  - Inf file may be used for assigning the driver to this device on different machine without INFWizard usage



LibUsbDotNet USB/INF Wizard

Device Configuration

Choose the driver type & save location. Fine tune the device parameters. The setup package will be written when Next is clicked.

Select Driver Resource: WinUSB 1.9

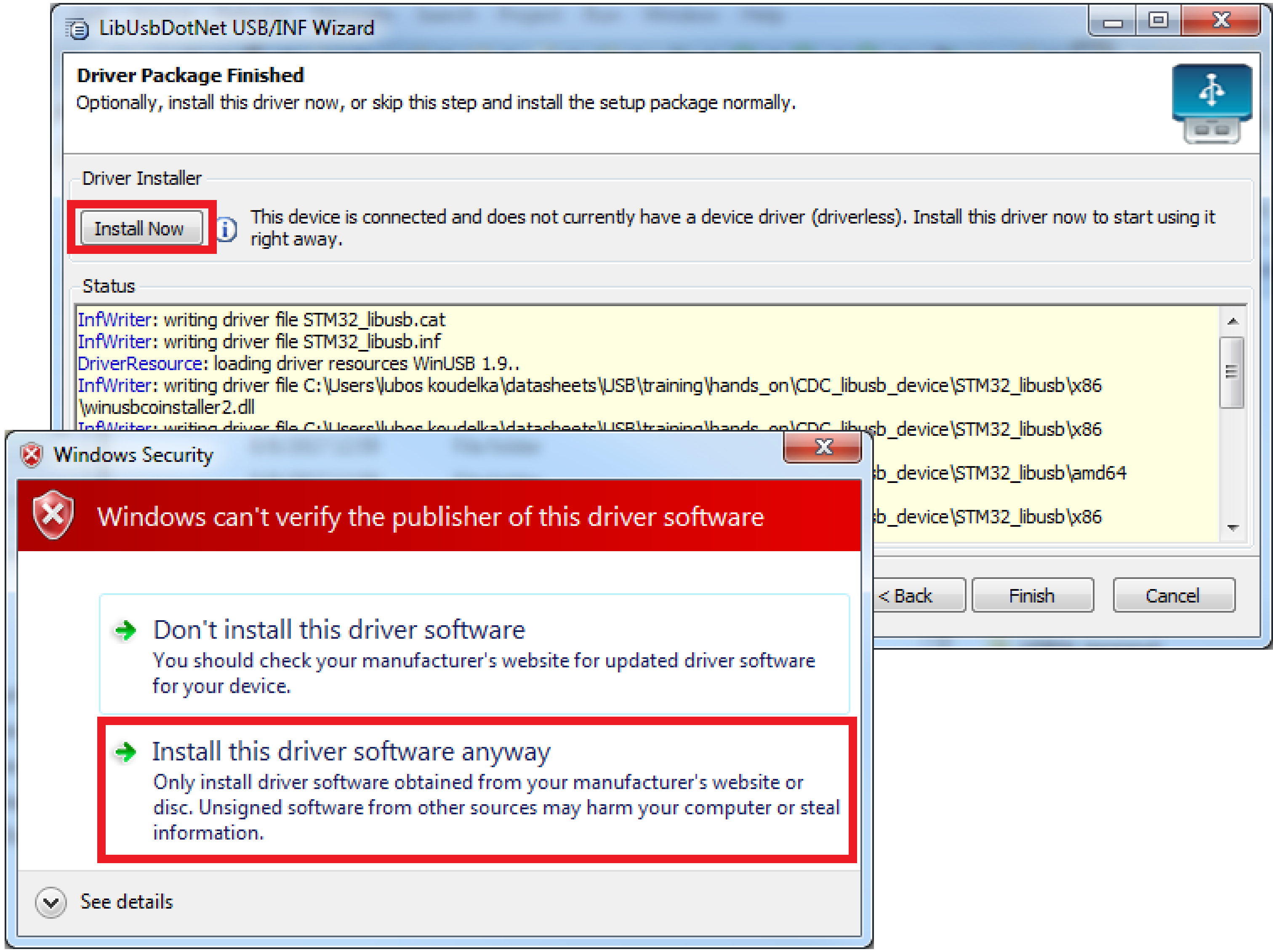
1 - General	
Base Filename	STM32_libusb
Save Directory	C:\Users\lubos koudelka\datasheets\USB\training\hands
Create Driver Directory	True
2 - Device Information	

Save Directory

The directory in which all generated files will be placed. If this directoy does not exist, it will be automatically created.

USB CDC libusb device

- Click Install Now to assign the driver to the device
  - Since this driver is not signed, you need to confirm to the system, that unsigned driver shall be used
- Now is driver installation complete and device can be used



LibUsbDotNet USB/INF Wizard

Driver Package Finished
Optionally, install this driver now, or skip this step and install the setup package normally.

Driver Installer

This device is connected and does not currently have a device driver (driverless). Install this driver now to start using it right away.

Status

```
InfWriter: writing driver file STM32_libusb.cat
InfWriter: writing driver file STM32_libusb.inf
DriverResource: loading driver resources WinUSB 1.9..
InfWriter: writing driver file C:\Users\lubos koudelka\datasheets\USB\training\hands_on\CDC_libusb_device\STM32_libusb\x86
\winusbcoinstaller2.dll
InfWriter: writing driver file C:\Users\lubos koudelka\datasheets\USB\training\hands_on\CDC_libusb_device\STM32_libusb\x86
b_device\STM32_libusb\amd64
b_device\STM32_libusb\x86
```

Windows Security

Windows can't verify the publisher of this driver software

Don't install this driver software
You should check your manufacturer's website for updated driver software for your device.

Install this driver software anyway
Only install driver software obtained from your manufacturer's website or disc. Unsigned software from other sources may harm your computer or steal information.

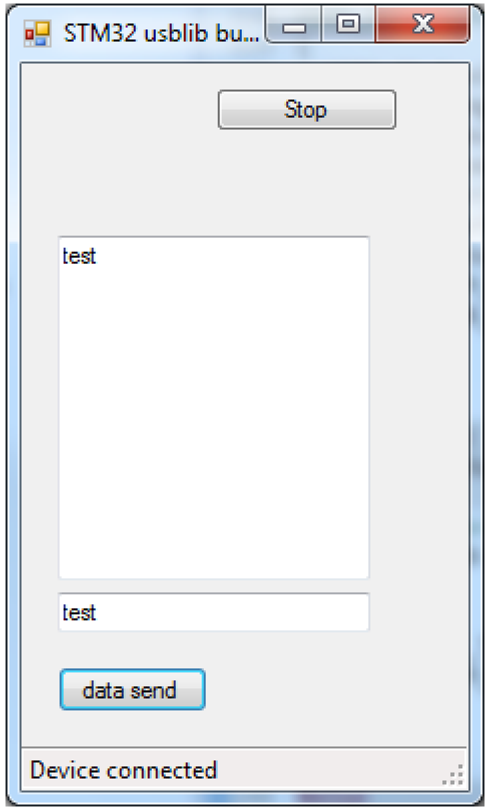
USB CDC libusb device

- Communication with the device can be tested using attached USBlib_terminal (C#)

USBlib_terminal.7z

- Incoming communication is echoed by the application

- Plug and play is supported natively



test

test

Device connected