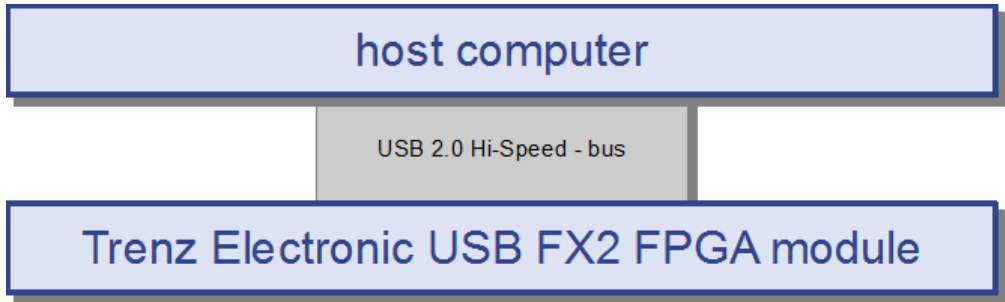# Technology Stack Outline

Trenz Electronic USB FX2 FPGA modules are devices that support USB 1.1 and USB 2.0 Hi-Speed communication with a host computer. Low-power downstream ports (capable of sourcing 100 mA or less) are *not* supported. High-power downstream ports (capable of sourcing at least 500 mA) *are* supported.

TE USB FX2 system overview.

This document gives an overview of the USB FX2 technology stack supported by Trenz Electronic FPGA modules equipped with Cypress EZ-USB FX2 microcontroller (currently: TE0300, TE0320 and TE0630).

Generations

There are two generations of Trenz Electronic USB FX2 FPGA modules. The following table summarizes the main differences.

generation	2	3
hardware	same	same
reference architecture	same	same
firmware	same	same
VID	*0x0547*	*0x0BD0*
PID	*0x1002*	*0x0300*
device driver family	*DEWESoft*	*Cypress EZ-USB*
API(s) family	*DEWESoft (C++)*	*Cypress (C++, .NET)*
reference application	*DEWESoft (C++)*	*Trenz Electronic (C++, .NET)*
recovery USB firmware tools	Cypress USB Console, Cypress USB Control Center	Cypress USB Console, Cypress USB Control Center
regular USB firmware tools	DEWESoft FUT Open_FUT (generation 2)	Cypress USB Console, Cypress USB Control Center Open_FUT (generation 3) OpenFutNet (generation 3)
recovery FPGA bitstream tool	Xilinx iMPACT	Xilinx iMPACT
regular FPGA bitstream tool	Xilinx iMPACT, DEWESoft FUT, Open_FUT (generation 2)	Xilinx iMPACT, Open_FUT (generation 3) OpenFutNet (generation 3)

Technology stack generation comparison table.

Trenz Electronic modules can be used with both couples of driver/API:

- DEWESoft device driver + DEWESoft API,
- Cypress device drivers + Trenz Electronic API(s),

but **not** a mix of the two:

- DEWESoft device driver + Trenz Electronic API(s),
- Cypress device driver + DEWESoft API.

Modules of both generations are factory programmed and tested with an open source **reference architecture**.

Capabilities

The reference architecture allows users to

- read and write the module SDRAM,
- read and write the Flash EEPROM,
- read and write the USB microcontroller EEPROM,
- read firmware version,
- reconfigure the FPGA

from a host application.
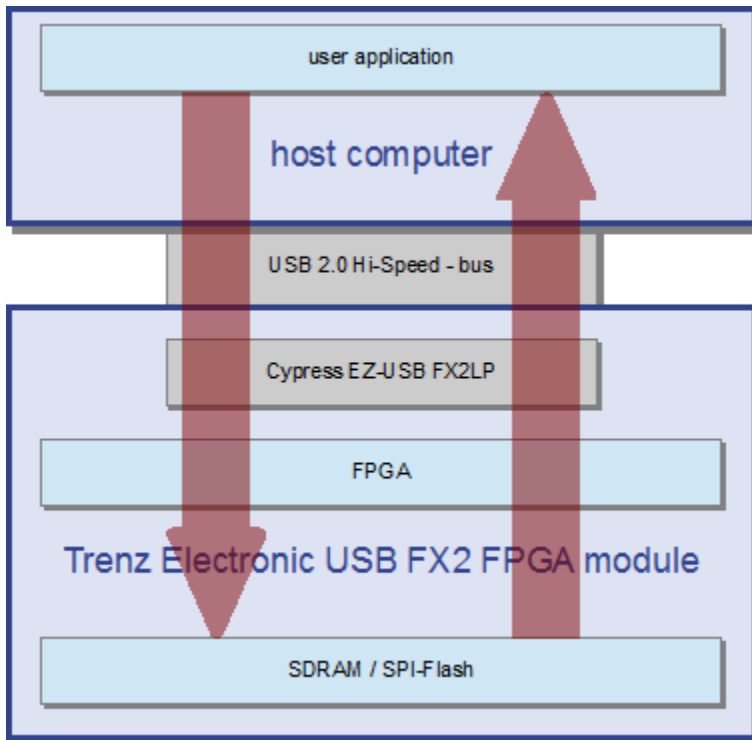
Sample application block diagram.

Technology Stack Overview (Recovery Mode)

host computer

Cypress Console	Cypress Control Center

Cypress C++ DLL CyAPI.lib (Win 32)	Cypress C++ DLL CyAPI.lib (Win 64)	Cypress .NET DLL CyUSB.dll

MS Win 32	MS Win 64	MS Win 32	MS Win 64
Cypress USB driver (Win 32) †	Cypress USB driver (Win 64) ‡	Cypress USB driver (Win 32) †	Cypress USB driver (Win 64) ‡

USB 2.0 Hi-Speed - host port

recovery mode

USB 2.0 Hi-Speed - bus

† = Same Win32 device driver.
‡ = Same Win64 device driver.

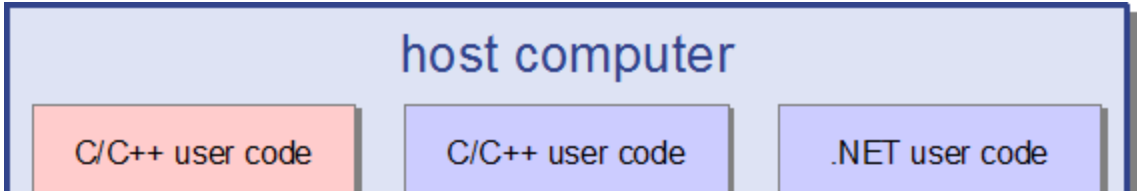USB 2.0 Hi-Speed - device port

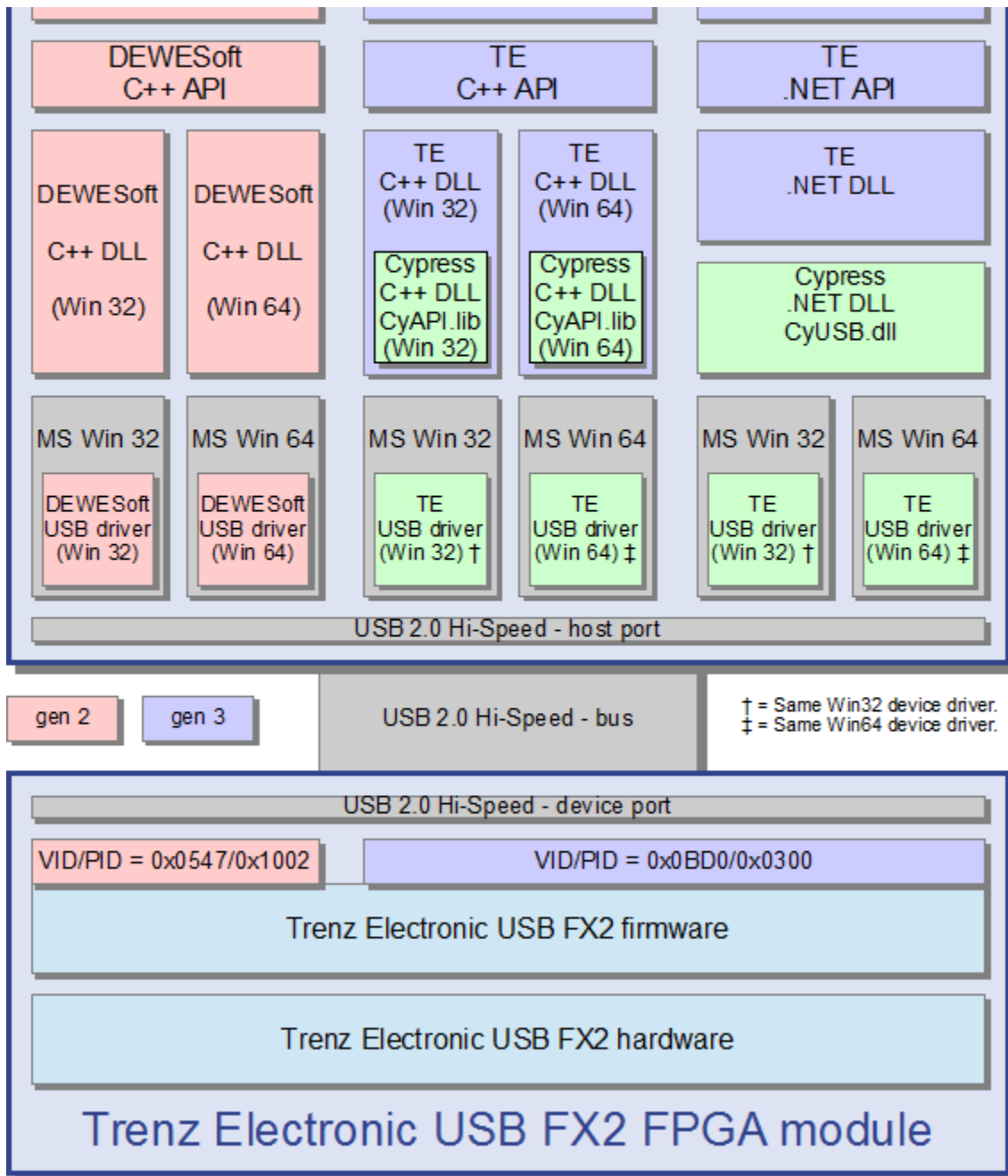VID/PID = 0x04B4/0x8613

Trenz Electronic USB FX2 firmware

Trenz Electronic USB FX2 hardware

Trenz Electronic USB FX2 FPGA module

Technology Stack Overview (Regular Mode)

host computer

| C/C++ user code | C/C++ user code | .NET user code |

Technology stack block diagram - regular mode.

Licence

The source code of the Trenz Electronic USB FX2 Technology Stack is released on GitHub under the MIT license.