

Reference Projects

TheSycon commands expertise in several areas around the development of device drivers and firmware. Below, we give a selection of the projects that have benefited from our expertise. Each item listed below refers to development work that TheSycon successfully completed either under contract to a client company or as product development. In many cases we worked together with partner companies responsible for hardware design.

USB Drivers

Universal USB Device Driver for Windows

- › Design and implementation of a generic WDM device driver for USB 1.1 and USB 2.0 devices
- › Programming interface for use by C/C++, Visual Basic, Delphi or Java applications

<http://www.thesycon.de/usbio>

USB CDC/ACM Class Driver for Windows

- › CDC/ACM (communication device class, subclass abstract control model) device driver
- › for Windows XP, Windows Vista, Windows 7
- › for Windows CE 5 and 6 and Windows Mobile
- › Virtual COM port emulation

<http://www.thesycon.de/cdcacmce>

USB CDC/ECM Class Driver for Windows

- › CDC/ECM (communication device class, subclass Ethernet control model) device driver
- › for Windows XP, Windows Vista, Windows 7
- › for Windows CE 5 and 6 and Windows Mobile
- › Ethernet adapter emulation

<http://www.thesycon.de/cdcecm>

<http://www.thesycon.de/cdcecmce>

USB Audio Class 2.0 Driver for Windows XP/Vista/7

- › Audio class 2.0 compliant high-speed isochronous audio streaming
 - › Windows WDM audio interface, DirectX
 - › ASIO 2.2 interface
- ⇒ See also the Professional Audio section below.

USB Driver Suite for 2G and 3G GSM Phones

- › CDC/ACM and WMC, OBEX drivers with virtual COM port interface on Windows 2000/XP/Vista
- › USB multi-interface (composite) driver
- › RNDIS driver for Ethernet emulation
- › Support for GSM, GPRS, EDGE, UMTS, HSDPA/HSUPA

Windows Driver for USB Smart Card Reader

- › WDM-compliant Windows device driver for smart card reader device with high-speed USB interface
- › Driver-integrated T0/T1 protocol implementation, compliant to ISO/IEC 7816-3, ISO/IEC 7816-4, ISO/IEC 14443-3, ISO/IEC 14443-4 (Contactless integrated circuit(s) cards, Proximity cards)
- › Interoperability Specification for ICCs and Personal Computer Systems
- › Specification of the SIM - ME interface (GSM 11.11)

Power Line Modem with USB Interface

- › Windows device driver for a USB-based power line modem

Ethernet Adapter with USB Interface

- › USB protocol design for a USB-Ethernet chip
- › Firmware design and implementation
- › Windows USB/Ethernet NDIS device driver

USB Driver Stack for Windows NT 4.0

- › Complete USB driver stack for Windows NT 4.0
- › OHCI host controller driver, USB bus management, HID class driver, USB audio driver

High-Speed USB Interface for Scanner

- › Firmware for Cypress FX-2 microcontroller
- › Windows device driver and API

High-Speed USB Data Capture

- › Device drivers and firmware for various USB-based high-speed data capture applications
- › e.g. for measuring devices and medical devices

Device Driver for USB Camera Devices

- › Device driver and API for a family of USB cameras

Device Driver for USB-based Touch Screen

- › WDM-compliant Windows kernel-mode device driver for touch screen with USB interface

Selective USB Device Filtering

- › WDM-compliant Windows filter driver that blocks non-authorized USB devices
- › Flexible and configurable filtering based on VID, PID, serial number etc.

USB Programming Interface for Java

- › Device drivers and JNI libraries for Windows and Linux to create a USB programming interface for Java applications

USB Device Drivers for Linux

- › Kernel-mode drivers for various USB devices
- › Compatible with Linux kernel 2.4 and 2.6 series

USB Drivers for Apple MacOS-X

- › Various USB device drivers for Mac OS 10.5 and 10.6
- › USB audio drivers with high-speed isochronous streaming

Embedded USB

Embedded USB Device Firmware Stack

- › Design and implementation of a modular and portable device firmware stack
- › Operating system independent
- › USB 2.0 full and high speed support
- › Various device classes:
CDC/ACM, Mass Storage, RNDIS, HID, DFU

<http://www.thesycon.de/embusbdevice>

Embedded USB Host Firmware Stack

- › Design and implementation of a modular and portable host firmware stack for OHCI/EHCI
- › Operating system independent
- › Support for external USB hubs
- › Class support: mass storage, HID, CDC

<http://www.thesycon.de/embusbhost>

USB Bootloader for Embedded Systems

- › USB-based bootloader, persistent in FLASH
- › DFU class compliant protocol
- › Windows device driver and API DLL
- › Convenient integration into applications and scripts

USB to Parallel Port Converter Device

- › Design and implementation of an IEEE 1284 parallel port to USB adapter with application-specific protocol implementation in the device
- › Firmware for 32-bit ARM-based MCU
- › Windows device driver, WHQL certification, driver installer, factory test support tools

IEEE 1394 (FireWire)

IEEE 1394 Bus Driver for Windows

- › Design and implementation of an alternative IEEE1394 bus driver for Windows 2000/XP/Vista
- › Compatible with Windows in-box bus driver
- › Full IEEE 1394a and IEEE 1394b support
- › OHCI 1.0, 1.1 and 1.1+ compliant
- › Robust design targeting industrial applications

<http://www.thesycon.de/t1394bus>

Universal IEEE 1394 Device Driver for Windows

- › Design and implementation of a generic WDM-compliant device driver for IEEE1394 devices
- › Programming interface for use by Win32 applications

<http://www.thesycon.de/vhpd1394>

IP over IEEE 1394 Device Driver for Windows

- › Design and implementation of a driver that implements the IOver1394 standard (RFC 2734).
- › IP packet transport over IEEE 1394a and IEEE 1394b
- › Ethernet adapter emulation

IEEE1394-based Frame Grabber Device

- › Design, Documentation and implementation of the 1394-based communication protocol, including isochronous streaming (similar to IEC 61883)
- › Firmware on Nexperia processor including PCI device driver for 1394 OHCI controller
- › Drivers for various busses: I2C, SPI, JTAG, GPIO
- › Windows device driver and application programming interface (API) library

IEEE 1394 Driver Stack for Windows NT 4

- › Design and implementation of a 1394 OHCI driver stack for Windows NT 4.0

Programming Interface for IEEE 1394 Cameras

- › Design, implementation and documentation of a C++ library that provides a flexible programming interface for various kinds of IEEE 1394-based camera devices

IEEE1394-based Isochronous A/V Streaming

- › IEC 61883-6 compliant audio stream transmission via an IEEE 1394 isochronous channel
- › Audio streaming server that provides IEC 61883-6 compliant streams to client applications
- › IEC 61883-4 compliant transmission of MPEG-2 transport streams via IEEE 1394 isochronous mode

ASIO/WDM Drivers for Professional Audio Devices with IEEE 1394 Interface

⇒ See Professional Audio section below.

Professional Audio

ASIO/WDM USB Driver for Windows

- › Device driver for a family of professional audio devices with USB 2.0 high-speed interface
- › Low-latency isochronous streaming and MIDI
- › Supports ASIO 2.0, DirectX/WDM audio, Kernel Streaming (KS) including MIDI and GSIF
- › Windows XP/Vista and XP/Vista x64 (64 bit)

USB 2.0 Interface for Pro-Audio Devices

- › Design and implementation of driver and firmware for a universal USB audio interface with up to 16x16 channels I2S, SPDIF and MIDI
- › Supports ASIO 2.2, WDM Kernel Streaming (KS)
- › Drivers for Windows XP/Vista, XP/Vista x64
- › Drivers for Mac OS X 10.4 and 10.5 Core Audio

ASIO/WDM IEEE1394 Driver for Windows

- › Device driver for a large set of professional audio devices with FireWire interface
- › Low-latency isochronous streaming according to the following standards: IEC 61883, IEC 61883-6, IEC 60958-1, IEC 60958-3, IEC 61937-5
- › Connection management and AV/C controller according to 1394 TA specifications
- › Supports ASIO 2.0, WDM/DirectX, GSIF
- › Supports multi-device setups and synch management
- › Windows XP, Vista and XP, Vista x64 (64 bit)

ASIO Driver for IEEE1394 Audio Controller

- › Windows ASIO 2.2 driver for 1394 audio device
- › IEC 61883-6 compliant audio streaming
- › Private MIDI and control protocol

FireWire-based PC-to-PC Audio Streaming

- › Windows driver with ASIO 2.0 interface
- › PC audio streaming network based on standard IEEE 1394 adapters
- › Up to 128 channels audio streaming from multiple slave PC systems to one master PC

WLAN-based Audio Streaming

- › Windows Kernel Streaming (KS) driver and service to transfer an audio playback stream over Wireless LAN to an external device
- › Device control via Universal Plug and Play (UPnP)

DVB-S and DVB-T

DVB Satellite Receiver PCI Card

- › Windows driver for PCI-based DVB-S receiver card with integrated MPEG-2 transport stream Demultiplexer (Demux) and PID-filters
- › Satellite tuner control
- › DVB SI table parsing and data management
- › DirectShow filter for MPEG2 audio and video stream rendering
- › DVB teletext parsing and rendering
- › Various accompanying Windows applications

Digital Satellite Radio Receiver PCI Card

- › Windows driver for PCI-based radio receiver card
- › Private API and demo application
- › Various tools for supporting mass production

DVB Satellite Receiver with USB Interface

- › Design and documentation of the USB-based streaming and control protocol
- › WDM compliant Windows device driver
- › Device firmware running on a 16 bit microcontroller

Windows Driver for USB DVB Receiver

- › Windows XP/Vista/7 driver for USB-based DVB receiver box
- › MPEG streaming on USB
- › Integration with Windows KS and BDA

Windows Driver for DVB Descrambling Device

- › Windows XP/Vista/7 driver for USB-based DVB CAM
- › Protocol implementation according to EN 50221 (Common Interface Specification for Conditional Access)
- › Kernel streaming and DirectShow integration

Device Driver Installation

Windows Device Driver Installation

Thesycon created driver setup wizards for numerous projects. We maintain an internal framework that enables us to create reliable installers very quickly.

<http://www.thesycon.de/pnpinstaller>

USB Device Driver Installer for Mobile Phones

- › Complex installer that handles all Windows versions including 64-bit systems and supports a large set of different mobile USB devices and drivers
- › Support for silent (non-interactive) mode
- › Auto-run support and various user interface options
- › External customization

Networking

Windows Driver for W-LAN Network Interface Card (PCI and CardBus)

- › NDIS 5.1 miniport driver for PCI/Cardbus W-LAN adapter with integrated software protocol module
- › Windows 98, ME, 2000 and XP

USB RNDIS Driver

- › USB Remote NDIS device driver for Windows as a replacement for the in-box driver

USB CDC/ECM Class Driver

- › USB CDC/ECM class driver for Windows XP/Vista/7

Virtual NDIS Network Adapter Driver

- › NDIS 5.0 miniport driver that provides a virtual network adapter with direct access to Ethernet packets via private API

Automatic W-LAN Configuration Wizard

- › Windows tool for automatic configuration of an external WLAN-based device
- › Automatic Windows firewall configuration

ATM Network Adapter Drivers

- › Various device drivers for ATM-155 and ATM-25 network interface controllers

Other

Audio/Video Processing and Streaming

- › Design and implementation of a library of DirectShow modules for real-time processing and transmission of audio and video data streams
- › The functionality includes audio/video capturing, encoding, real-time network transmission, decoding.

Various PCI Drivers

Thesycon implemented many PCI device drivers for Windows 2000/XP/Vista, Windows CE and Linux. Most devices use PCI bus mastering. Device types include:

- › PCI video capture board (frame grabber)
- › PCI multi-function card with serial and parallel ports
- › DMA-based high-speed measuring data capture
- › Network interface card
- › PCI-based USB device controller PLX NET2282

Serial Multiplexer Driver

- › WDM-compliant device driver for Windows that implements the serial multiplexing protocol defined by the ETSI TS 101 369 (GSM 7.10) standard

Persistent USB Disk Drive Letter Assignment

- › Windows kernel-mode driver that guarantees a fixed and persistent mapping of drive letters to USB disks

Serial Port Emulator (Virtual COM)

- › WDM-compliant bus driver that provides virtual COM port devices
- › Private API to create/destroy virtual ports and to transfer data
- › Can be used to create various virtual COM port solutions, for example: COM over TCP/IP tunneling, COM port emulation on top of arbitrary devices.

Virtual CD-ROM and Disk Driver

- › Windows kernel-mode driver that emulates a CD-ROM or hard disk drive and implements special data processing such as decryption

WHQL Certification of Windows Device Drivers

Thesycon has executed WHQL certification procedures and submissions on behalf of many customers. There is huge experience in running WHQL test benches on Windows XP, Windows Vista and Windows 7.

Thesycon offers WHQL driver certification as a service to customers.

Consulting

USB Problem Solution

For many customers Thesycon analyzed USB-related hardware, firmware or driver problems and provided methods of resolution, or implemented fixes.

USB Protocol Design

Thesycon designed and optimized the USB-based device communication protocol for numerous applications. There is a huge experience in designing reliable and efficient protocols as required by many industrial-scale solutions.

Programming Interface Design

Thesycon has many years experience in application programming interface (API) design and other software interface design tasks. Main design principles are: efficiency, robustness, simplicity and scalability.

EHCI USB Host Controller Verification

Thesycon has supported a major silicon manufacturer in verifying an EHCI host controller design. Thesycon provided various USB test benches and supported the designers in Windows kernel-mode debugging.

FireWire Problem Solution

Thesycon has supported a couple of customers to analyze and solve IEEE1394-related hardware, firmware or driver problems. We worked out solution strategies for various application scenarios, e.g. very large topology configurations.