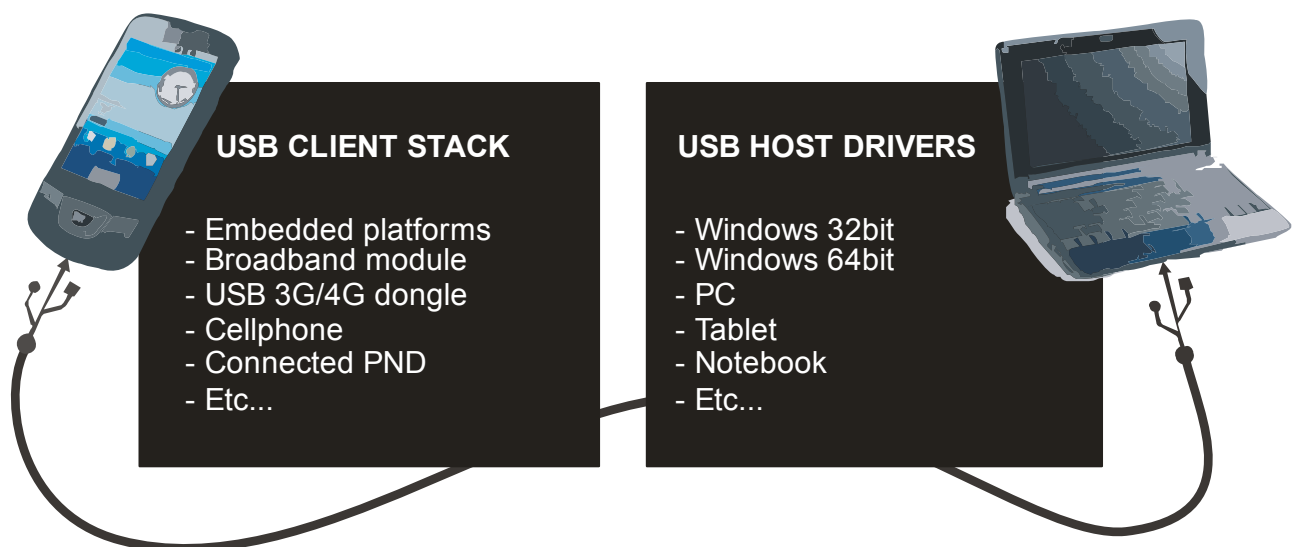


USB MODEM STACK

Complete Client and Host Driver solution for USB Modems



USB Client Stack

For Embedded platforms like Mobile Phones, Wireless Broadband Modules/dongles

USB Host Drivers

For Windows 7, Windows Vista, Windows XP

A Complete Solution for

Mobile phone manufactures, Wireless & mobile baseband chipset manufactures, Wireless application processor vendors, Middleware and operating systems vendors, Industry OEMs and ODMs

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USB MODEM STACK

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Complete USB Modem Communication solution that includes both the Client and Host software stacks. The Client stack for the embedded platform (wireless device with modem) provides

the modem sharing capability over USB. The Host drivers on the Microsoft Windows device lets Windows utilize the modem connection using a USB cable.

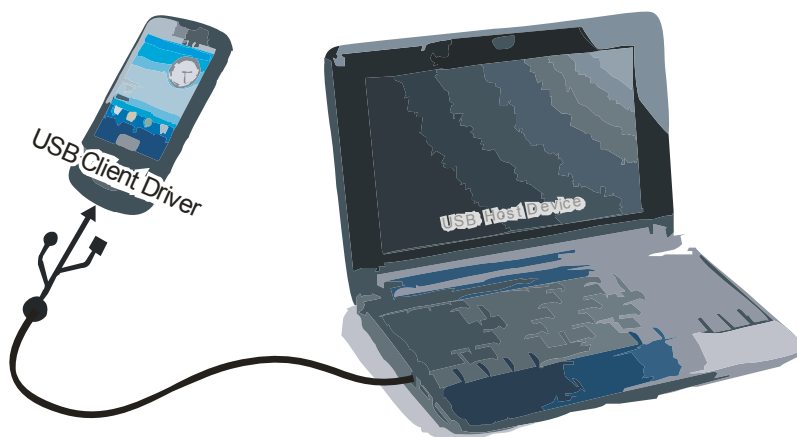


USB MODEM STACK

USB CLIENT STACK

The **USB Client Stack** is a USB software stack that provides USB functionality on Embedded platforms.

It provides serial communication so the embedded wireless device can share a wireless connection over USB to a Host device.



The USB Client Stack includes:

- ◇ **USB Embedded Firmware Library**
- ◇ **RS232 Replacement Library**

These software stacks / Libraries for embedded platforms are highly portable and robust products. Additional stacks are available that utilize the base USB Stack . These include MTP

(Media Transfer Protocol), Pictbridge (Printing from device), IEEE1394 Library (Mass Storage) and OBEX (Object Exchange Protocol) software products. [Contact Winwap](#) for details.

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USB CLIENT STACK

USB Embedded Firmware Library

Overview

The USB Embedded Firmware Library is a portable software stack for USB purpose which addresses USB Function, USB Host as well as USB On-The-Go (OTG) solutions in embedded applications. Its modular architecture together with an optimized memory footprint makes the USB Embedded Firmware Library a perfect choice for handsets and other mobile devices. The library is completely implemented in ANSI C/

C++ and can be easily ported to any combination of micro-processor, USB hardware and operating system. The USB Client Stack is fully compliant with the USB 2.0 specification and the On-The-Go supplement 1.0. Deliverables are in binary object code, and on demand the source code can be provided together with an easy to apply build environment.

Product Features

The USB Embedded Firmware Library provides all features necessary to establish basic USB Transfers, which includes the following key attributes:

- Function, Host, Dual Role and OTG support
 - Hardware, OS and processor independent
 - Simple to use API's on different abstraction layers for easy customization and application programming
 - Optimized footprint sizes by role specific customization (no unused code segments)
 - Abstraction layer for USB-
- hardware (Device and FIFO), specific port access (e.g. MemoryMapped, PCI-Port, ..) and general operating services (Thread, MessageQueue, Semaphore) for high portability
 - Support of all transfer modes (control, interrupt, bulk, isochronous) and speed (low-, full-and high-speed)
 - Extendable to other protocols
 - Association Descriptors supported
 - Microsoft OS Descriptor available

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USB MODEM STACK

USB CLIENT STACK

USB Embedded Firmware Library Technical Specification

The USB Client Stack is ported to many platforms, including the following DSPs and MCs:

- **8-bit Controller** (e.g. ST 9x, Motorola HC05, Intel i8051 and derivatives)
- **16-bit and 32-bit Controller** (e.g. Infineon C16x, ARC, Motorola MPC 8XX, MGT 5XXX, ARM 7, ARM 9 and customer derivatives)
- **DSP** (e.g. Analog Devices SHARC 21065, Texas Instruments TI C54xx)

The USB Client Stack supports among others the following USB-interface components:

- **Bridges** (with parallel or serial interface): (Philips PD12, ISP1161, ISP1362, National 9602, 9603, 9604)
- **Controller** (with integrated USB): (OHCI, MPC, MGT, Cypress EZ, C161U and C165UTAH, ST9, customer specific solutions like ams AS3525)
- **IP-cores**: (emsys FHG USBx, sciworx, synopsys)

OS abstraction is available for:

- **Desktop OS** (Linux, MAC-OS, Windows)
- **RTOS** (ucLinux, Nucleus, OSE, VRTX, embOS)
- **Libraries** (PThreads, ZThreads)
- **OS-less**

Powerful build environment available with setups for all established tool chains such as KEIL, TASKING, ARM, RealView, Metrowerks etc.

Prototyping development under Linux if target hardware is available or based on transport layer emulation by sockets in case hardware is unavailable.

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USB MODEM STACK

USB CLIENT STACK

USB Embedded Firmware Library Deliverables

Complete ANSI C/C++ implementation can be supplied as object code and/or source code. Beside higher protocol stacks like PTP and PictBridge, MTP, OBEX and RNDIS the following USB software stacks are deliverable:

Role	Host	Device	Foot Print / Byte
USB (<i>incl. dual role and OTG</i>)	+	+	24-36k
USB Device Classes			
MassStorage	+	+	1,5k
Communication Device Class	+	+	8k
Human Interface Device Class	+	+	2-8k
Content Security	+	+	1,5k
Device Firmware Update	+	+	4k
HUB	+		8k
StillImage	+	+	1,5k
Video	+	+	36k
Audio	+	+	20k
Printer	+	+	2k

For the purpose of achieving the USB Modem sharing connectivity, the USB Embedded Firmware Library needs the RS232 Replacement Library, as described on the next pages.

USB MODEM STACK

USB CLIENT STACK

RS232 Replacement Library

Overview

PC's (particularly Laptops/Tablets) with legacy free interfaces require the change from RS232 to USB. USB provides significant more functionality and supports a great variety of use cases, but the classical character based communication is used in many well established communication solutions like 3G/4G modems or mobile phones as well as UART-like communication in the industrial environment.

The solution for these wireless devices is to use Winwap's RS232 Replacement Library.

The USB Communication Device Class defines different use cases in Subclasses. The Subclass "Abstract Control Model" allows an emulation of the classical RS232 DCE (Data Communication Equipment) - DTE (Data Terminal Equipment) behavior. The "Wireless Mobile Communication" Subclass specification defines additional use cases, e.g. for OBEX specific data channels.

The direct USB connection via USB Communication Device Class has significant advantages:

- It offers much more flexibility:
 - ◆ *Multiple logical interface via one physical cable.*
 - ◆ *Additional protocols in parallel (e.g. Mass Storage, Content Security, ...).*
 - ◆ *Easy to use (Plug and Play, Standard Driver, ...)*
- It is significantly faster than high speed UART's.
- No additional bridging hardware is required. USB device hardware interfaces are integrated into the most common used CPU platforms.

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USB CLIENT STACK

RS232 Replacement Library Features

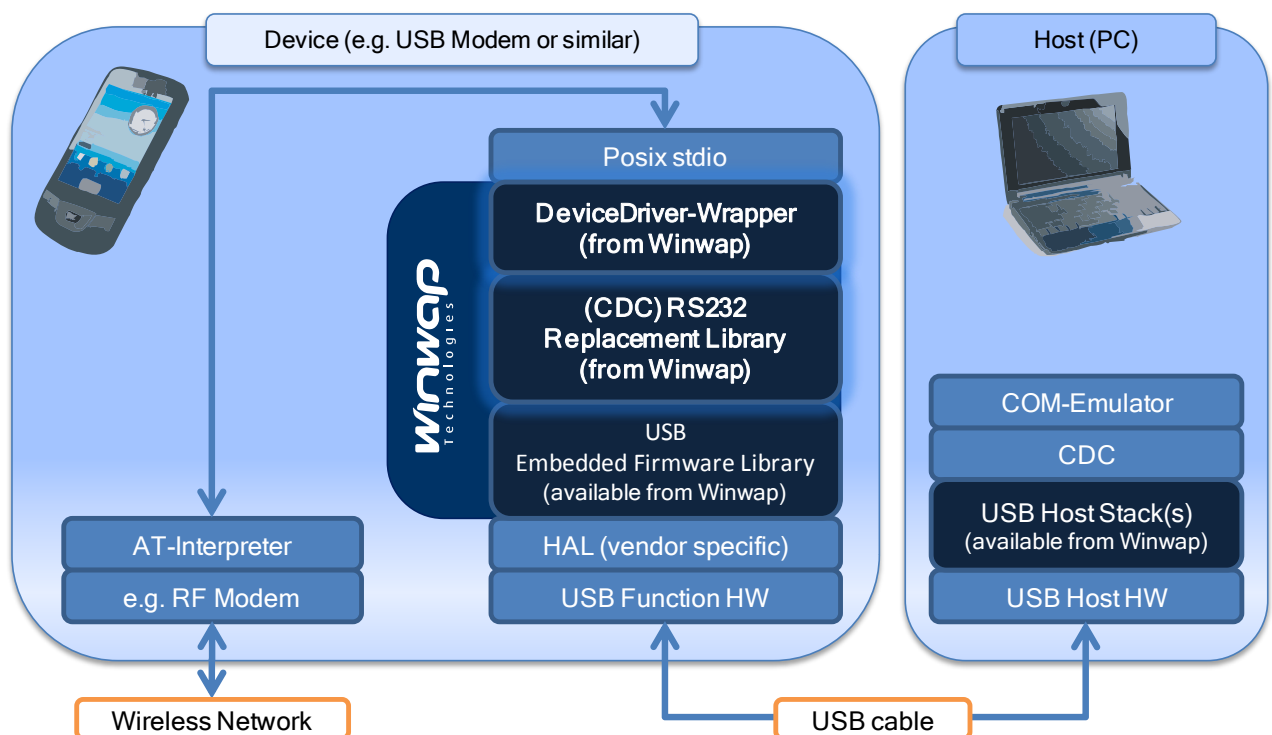
The library provides all necessary components to implement a USB solution as RS232 replacement.

- The CDC/ACM device class for direct serial or modem communication.
- Support of all DCE/DTE features including Line Coding (e.g. baud rate) and Control Line States (e.g. RTS/CTS). This allows a complete RS232 emulation including IOCTL.
- Optional support for encapsulated commands.
- A wrapper API to adapt the CDC Device class to different character based driver API's. The default is a POSIX based interface.

RS232 Replacement Library Architecture

The library is an extension to the USB Client Stack. It implements the complete USB device class CDC. The module provides two specific USB Interface implementations:

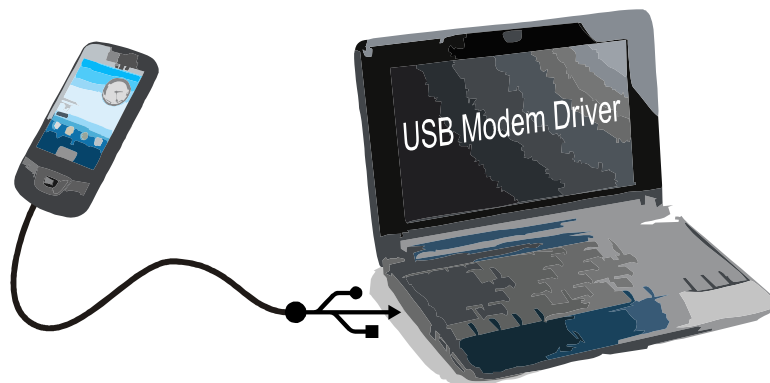
- Communication Interface (which uses the default control endpoint (EP0) as well as an Interrupt IN-Endpoint for notification; and
- Data Interface, which uses typically two Bulk Endpoints for bidirectional data transfer without any framing.



USB MODEM STACK

USB HOST DRIVERS

The **USB Host Drivers** consists of several drivers for the Windows platform that together provide a complete USB Modem Host solution.



The USB Host Drivers include:

- ◇ USB Modem Driver
- ◇ NDIS Miniport (WWAN) Driver
- ◇ USB Serial Port Driver
- ◇ USB Device Management Driver
- ◇ Enhanced Bus Drivers
- ◇ USB Composite Filter Driver

- Windows Drivers for Handsets, Data Cards, Broadband Modems.
- Excellent Throughput to maximize bandwidth availability on PC.
- Flexible & Quick integration and customization support.
- Reduces total cost for USB license.

The USB Host Drivers are a USB device driver solution for Microsoft Windows XP, Vista and 7. The drivers are designed to be used by mobile handset manufacturers (2G, 3G, 4G), USB Modems and broadband data modules. They are optimized specifically for the newest Windows versions as they are built with the latest KMDF framework recommended by Microsoft.

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USB HOST DRIVERS

USB Modem Driver

The USB Modem driver can be used for dialup networking. The driver has been tested with latest mobile platforms. The bandwidth of 20.3 Mbps is observed with HSPA mobile platform.

Features

Compliant with USB 1.1 /2.0 and USBCDC 1.2 Built with Microsoft KMDf framework Compatible with Windows XP/Vista/Win-7 32bit & x64 Editions

Usage Example

Windows DUN Third party connection managers

NDIS Miniport (WWAN) Driver

NDIS/Ethernet based Internet connectivity for High throughput needs. This driver has been tested with latest mobile platforms.

Features

Supports ECM and NCM protocols Compliant with USB 1.1 /2.0 and USBCDC 1.2 Built with Microsoft KMDf framework Compatible with Windows XP/Vista/Win-7 32bit & x64 Editions

Usage Example

NDIS based internet connectivity

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USB MODEM STACK

USB HOST DRIVERS

USB Serial Port Driver

This driver emulated the RS232 UART port over USB. This driver can be used with USB to Serial adapters or with devices which emulate serial port.

Features

Compliant with USB 1.1 /2.0 Emulates RS232 Signaling Built with Microsoft KMDf framework Compatible with Windows XP/Vista/Win-7 32bit & x64 Editions Tested with Nokia mobile phone and Ericsson Mobile Broadband module

Usage Example

Obex

SMS/Contacts synchronization etc

USB Device Management Driver

Device management driver is compliant with WMC 1.0. This driver can be used for sending AT commands for controlling the device.

Features

Compliant with USB 1.1 /2.0 and USBWMC1.0 Built with Microsoft KMDf framework Compatible with Windows XP/Vista/Win-7 32bit & x64 Editions Tested with Nokia mobile phone and Ericsson Mobile Broadband module

Usage Example

Call Management, SMS/ Control channel for Connection Managers.

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USB MODEM STACK

USB HOST DRIVERS

Enhanced Bus Drivers

USB devices in current market are more complex and flexible. Most of the devices are multifunction. This necessitates the need for a composite driver that caters to the need of the device without abandoning the Microsoft compatibility requirements for WHQL.

Features

Compliant with USB 1.1 /2.0 Built with Microsoft KMDF framework
Compatible with Windows XP/Vista/Win7 32/64 bit Editions

Usage Example

Child device enumeration

USB Composite Filter Driver

Microsoft has done lot of improvements to the inbox USB composite driver in Windows 7. It has overcome a major hurdle which was there in older version of composite driver with respect to the way of enumerating the child functions. The mechanism of filter driver or callback driver was introduced. This driver controls the way inbox composite driver enumerates the child functions.

Features

Compliant with USB 1.1 /2.0 Built with Microsoft KMDF framework
Compatible with Win-7 32bit & x64 Editions Tested with Nokia mobile phone and Ericsson Mobile Broadband module

Usage Example

Child device enumeration

Selective suspend supporting drivers

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USB MODEM STACK

USB HOST DRIVERS

Battery saving

All the Host drivers support selective suspend feature very transparently. Winwap offers customized driver solution to support Selective Suspend in cases where the driver framework around a device does not support, for example NDIS driver. The selective suspend feature suspends the portion of the bus when the device is found idle. This helps in saving the battery life of mobile computing devices.

Installation Support Applications

Winwap can provide the driver installation in various package formats like msm, msi etc. The install support appli-

cations are independent and they can be integrated with any kind of package formats which offers basic support. These packages can also support **Auto-Install** and Auto switch of configurations.

WHQL Certification

All Host Drivers are WHQL pre-certified. Winwap also has extensive experience in Microsoft WHQL certification of drivers for customers. Winwap can help vendors to get a Windows LOGO for their product. Winwap can run the WHQL certification tests on behalf of device manufacturer at onsite or at our labs. The USB drivers are WHQL certified.

Reasons for selecting Winwap's USB Solution

- Excellent Throughput.
- Exclusive and dedicated support team
- We provide integrated and validated solution for our clients.
- Fast response time (Incident turn-around time < 1 working day, quickest bug fixing time).
- Quick customizations and customer development support.
- All drivers are thoroughly tested with Microsoft Static Driver Verifier and Dynamic driver verifiers.
- Cost savings.

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Other Products for OEM

Winwap has a broad selection of technologies for both conventional computers and embedded platforms. Below is a list of the most popular products.

- ◆ **WEB Browser Application/SDK**
- ◆ **WAP Browser Application/SDK**
- ◆ **WAP Protocol Stack SDK**
- ◆ **MMS Messaging Application/SDK**
- ◆ **UPnP AV Application/SDK**
- ◆ **Email Client Application/SDK**
- ◆ **OMA DL Client**
- ◆ **Android App for Emergency situations (“Emergency”)**
- ◆ **Various combinations of the above technologies, customized for specific embedded devices and platforms**

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Platforms and Operating Systems

Products offered by Winwap are ported to many different platforms, and below is a list of the most common ones that products we offer have been ported to.

- ◆ Windows XP, Vista, 7
- ◆ Windows Server (NT and newer)
- ◆ Windows CE 5, 6
- ◆ Qualcomm Brew, BrewMP
- ◆ Linux (various distributives)
- ◆ HP UX
- ◆ Solaris
- ◆ Android
- ◆ Arena/Larena (for TDSCDMA)
- ◆ Various OEM specific versions of the above platforms for specific embedded devices

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Mobile Internet Browsing and
Multimedia Messaging



business partner



Winwap Technologies provides software technologies and applications for networked mobile devices. The product portfolio includes a powerful Internet Browser, Multimedia Messaging (MMS, SMS), Email client-side software, USB Host and Client Stacks, UPnP solution for A/V, Android Apps, and toolkits based on these technologies that allow others to integrate the functionality into their own products.

Winwap is a privately owned company that was founded by the current CEO, Mikael Krogius, in 1995. Winwap has always worked with telecommunications software, and entered the mobile Internet market in 1999 with the WinWAP browser. Today the core business is to provide customized software with integration support and maintenance services for companies involved in the different manufacturing steps of networked mobile devices.

At Winwap Technologies we constantly strive to make our software better and to keep our customers satisfied with our products and support while remaining innovative when creating new technologies for mobile devices.

Head office

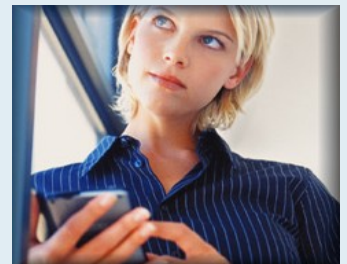
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All Winwap products are available for hardware or software manufacturers that want to include the products as part of their own solutions and products.

The products can be tailored and built for specific platforms, including desktop computers, notebooks, kiosks, handheld devices and smart phones.