QNX® Momentics® DDK

Universal Serial Bus (USB) Devices

For QNX® Neutrino® 6.3.0 or QNX® 4

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Technical support options

To obtain technical support for any QNX product, visit the **Technical Support** section in the **Services** area on our website (**www.qnx.com**). You'll find a wide range of support options, including our free web-based **Developer Support Center**.

Contents

About the USB DDK

☞ Our USB API is designed to work with either QNX Neutrino or QNX 4. Exceptions will be noted where appropriate.

This guide is organized into these main parts:

- a read-this-first page indicating your system requirements and other vital information you should know before you begin
- an overview describing how the OS supports USB
- command-line utilities
- a set of function pages describing the USB driver interface calls

☞ The USB SDK includes source code for several USB class drivers. Each class driver is contained in its own separate archive. Look under the */ddk_working_dir*`/usb/src/hardware/devu/class` directory on your system.

Assumptions

We assume you're familiar with the Universal Serial Bus (USB) Specification revision 2.0, especially the chapters on:

- Architectural Overview
- USB Data Flow Model
- USB Device Framework
- USB Host: Hardware and Software.

You'll need a good understanding of the concepts in those chapters in order to write USB client device drivers.

For up-to-date information on USB developments, visit **www.usb.org**.

Building DDKs

You can compile the DDK from the IDE or the command line.

- To compile the DDK from the IDE:

  Please refer to the Managing Source Code chapter, and "QNX Source Package" in the Common Wizards Reference chapter of the *IDE User's Guide*.

- To compile the DDK from the command line:

  Please refer to the release notes or the installation notes for information on the location of the DDK archives.

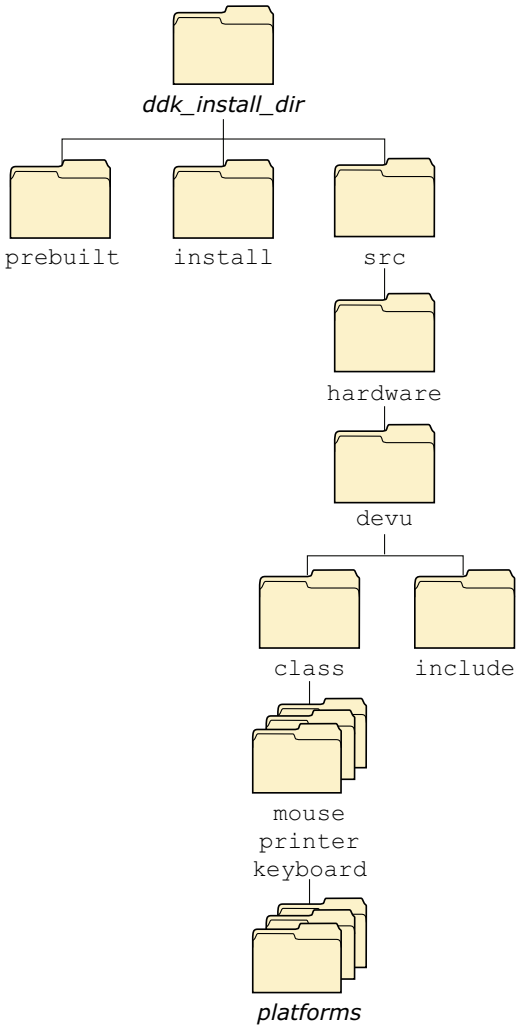
  DDKs are simple zipped archives, with no special requirements. You must manually expand their directory structure from the archive. You can install them into whichever directory you choose, assuming you have write permissions for the chosen directory.

  Historically, DDKs were placed in **/usr/src/ddk_VERSION** directory, e.g. **/usr/src/ddk-6.2.1.** This method is no longer required, as each DDK archive is completely self-contained.

  The following example indicates how you create a directory and unzip the archive file:

```
# cd ~
# mkdir my_DDK
# cd my_DDK
# unzip /path_to_ddks/ddk-device_type.zip
```

  The top-level directory structure for the DDK looks like this:



Directory structure for this DDK.

You must run:

```
. ./setenv.sh
```

before running **make**, or **make install**.

Additionally, on Windows hosts you'll need to run the **Bash** shell (**bash.exe**) before you run the **. ./setenv.sh** command.

If you fail to run the **. ./setenv.sh** shell script prior to building the DDK, you can overwrite existing binaries or libs that are installed in **$QNX_TARGET**.

Each time you start a new shell, run the **. ./setenv.sh** command. The shell needs to be initialized before you can compile the archive.

The script will be located in the same directory where you unzipped the archive file. It must be run in such a way that it modifies the current shell's environment, not a sub-shell environment.

In **ksh** and **bash** shells, All shell scripts are executed in a sub-shell by default. Therefore, it's important that you use the syntax

```
. <script>
```

which will prevent a sub-shell from being used.

Each DDK is rooted in whatever directory you copy it to. If you type **make** within this directory, you'll generate all of the buildable entities within that DDK no matter where you move the directory.

all binaries are placed in a scratch area within the DDK directory that mimics the layout of a target system.

When you build a DDK, everything it needs, aside from standard system headers, is pulled in from within its own directory. Nothing that's built is installed outside of the DDK's directory. The makefiles shipped with the DDKs copy the contents of the **prebuilt** directory into the **install** directory. The binaries are built from the source using include files and link libraries in the **install** directory.

Chapter 1

Before You Begin

In this chapter. . .

System requirements

This USB SDK is designed to work with both QNX Neutrino 6 and with QNX 4.

For QNX Neutrino 6.3

You'll need the following:

- QNX Neutrino 6.3
- GNU GCC 2.952
- USB EHCI, OHCI or UHCI controller, version 1.1 and 2.0 compliant

For QNX 4

You'll need the following:

- QNX 4.25, patch D or later
- Watcom 10.6, patch B or later
- USB EHCI, OHCI or UHCI controller, version 1.1 and 2.0 compliant

USB devices supported

Type of device	Manufacturer	Model
Keyboard	Belkin	MediaBoard F8E211-USB
″	Micro Innovations	–
Mouse	Logitech	USB Wheel Mouse M-BB48
″	″	WingMan Gaming Mouse M-BC38

continued…

Type of device	Manufacturer	Model
″	Microsoft	IntelliMouse
Hub	ADS Technologies	4-port
″	Belkin	4-port
Printer	Canon	BJC-85
″	Epson	Stylus Color 740
″	HP	DeskJet 895Cse

Known limitations

EHCI

Isochronous and split isochronous transfers are unsupported at this time.

Retrieving ’Other Speed Descriptor’ has not been implemented.

Photon and text mode

If you’re using Photon as well as text mode, you won’t be able to switch between them and use a USB keyboard once the USB stack has been started.

From a cold boot, you’ll be able to use a USB keyboard in text mode *before the USB stack has been started*. As soon as you start the USB stack, you can’t use a USB keyboard in text mode.

CAUTION: Make sure that the command line for **devi-hirun** (or **Input**) includes the option to *not* reset the keyboard controller. For example:

```
devi-hirun kbd -R fd -d/dev/usbkbd0 &
```

Or with QNX 4:

```
Input kbd -R fd -d/dev/usbkbd0 &
```

If you don't use the **-R** option, then the keyboard controller will be reset whenever you switch between Photon and text mode, and the machine may hang.

Chapter 2

Overview

In this chapter. . .

The USB stack and library

USB (Universal Serial Bus) is a hardware and protocol specification for interconnecting various devices to a host controller. We supply a USB stack that implements the USB protocol and allows user-written class drivers to communicate with USB devices.

We also supply a USB driver library (*usbd_*()*) for class drivers to use in order to communicate with the USB stack. Note that a class driver can be considered a "client" of the USB stack.

The stack is implemented as a standalone process that registers the pathname of **/dev/io-usb/io-usb** (by default). Currently, the stack contains the hub class driver within it.

Host Controller Interface (HCI) types

The stack supports the three industry-standard HCI types:

- Open Host Controller Interface (OHCI)
- Universal Host Controller Interface (UHCI)
- Enhanced Host Controller Interface (EHCI).

We provide separate servers for each type (**devu-ohci.so**, **devu-uhci.so**), and **devu-ehci.so**. Note that USB devices don't care whether a computer has an OHCI, UHCI, or an EHCI controller.

Data buffers

The client library provides functions to allocate data buffers in shared memory; the stack manages these data buffers and gives the client library access to them. This means that all data transfers must use the provided buffers.

As a result, a class driver *must* reside on the same physical node as the USB stack. The *clients* of the class driver, however, can be network-distributed. The advantage of this approach is that no additional memory copy occurs between the time that the data is received by the USB stack and the time that it's delivered to the class driver (and vice versa).

USB enumerator

With the QNX Neutrino OS, the USB enumerator attaches to the USB stack and waits for device insertions. When a device insertion is detected, the enumerator looks in the configuration manager's database to see which class driver it should start. It then starts the appropriate driver, which provides for that class of device. For example, a USB Ethernet class driver would register with **`io-net`** and bring the interface up.

For small, deeply embedded systems, the enumerator isn't required. The class drivers can be started individually — they'll wait around for their particular devices to be detected by the stack. At that point, they'll provide the appropriate services for that class of device, just as if they'd been started by the enumerator. When a device is removed, the enumerator will shut down the class driver.

How a class driver works

A class driver typically performs the following operations:

1 Connect to the USB stack (*usbd_connect()*) and provide two callbacks: one for insertion and one for removal.

2 In the insertion callback:

- **2a** Connect to the USB device (*usbd_attach()*).
- **2b** Get descriptors (*usbd_descriptor()*).
- **2c** Select the configuration (*usbd_select_config()*) and interface (*usbd_select_interface()*).
- **2d** Set up communications pipes to the appropriate endpoint (*usbd_open_pipe()*).

3 In the removal callback, detach from the USB device (*usbd_detach()*).

4 Set up all data communications (e.g. reading and writing data, sending and receiving control information, etc.) via the *usbd_setup_*()* functions (*usbd_setup_bulk()*, *usbd_setup_interrupt()*, etc.).

5 Initiate data transfer using the *usbd_io()* function (with completion callbacks if required).

In this context, the term “pipe” is a USB-specific term that has *nothing* to do with standard POSIX “pipes” (as used, for example, in the command line **`ls | more`**). In USB terminology, a “pipe” is simply a handle; something that identifies a connection to an endpoint.

Chapter 3

USB Utilities

The USB Software Development Kit contains the following command-line utilities:

The utilities used in this DDK are the same ones that exist in the QNX Neutrino Utilities Reference.

devu-ehci.so

USB manager for Enhanced Host Controller Interface standard controllers. (USB 2.0)

devu-ohci.so

USB manager for Open Host Controller Interface standard controllers. (USB 2.0)

devu-prn Class Driver for USB printers.

devu-uhci.so

USB manager for Universal Host Controller Interface standard controllers. (USB 2.0)

io-usb USB server.

usb Display USB device configuration.

Chapter 4

USB Library Reference

In this chapter. . .

Functions arranged by category

The USB functions may be grouped into these categories:

- Connection functions
- Memory-management functions
- I/O functions
- Pipe-management functions
- Configuration/interface functions
- Miscellaneous functions

Connection functions

usbd_connect() Connect a client driver to the USB stack.

usbd_disconnect()
Disconnect a client driver from the USB stack.

usbd_attach() Attach to a USB device.

usbd_detach() Detach from a USB device.

Memory-management functions

usbd_alloc() Allocate memory area to use for data transfers.

usbd_free() Free memory allocated by *usbd_alloc()*.

usbd_mphys() Get the physical address of memory allocated by *usbd_alloc()*.

usbd_alloc_urb()
Allocate a USB Request Block for subsequent URB-based operations.

usbd_free_urb() Free the URB allocated by *usbd_alloc_urb()*.

I/O functions

usbd_setup_bulk()

Set up a URB for a bulk data transfer.

usbd_setup_interrupt()

Set up a URB for an interrupt transfer.

usbd_setup_isochronous()

Set up a URB for an isochronous transfer.

usbd_setup_vendor()

Set up a URB for a vendor-specific transfer.

usbd_setup_control()

Set up a URB for a control transfer.

usbd_io() Submit a previously set up URB to the USB stack.

usbd_feature() Control a feature for a USB device.

usbd_descriptor()

Get USB descriptors.

usbd_status() Get specific device status.

Pipe-management functions

usbd_open_pipe()

Initialize the pipe described by the device or endpoint descriptor.

usbd_close_pipe()

Close a pipe previously opened by the *usbd_open_pipe()* function.

usbd_reset_pipe()

Clear a stall condition on an endpoint identified by the *pipe* handle.

usbd_abort_pipe()

Abort all requests on a pipe.

usbd_pipe_device()

Retrieve the device associated with the pipe.

usbd_pipe_endpoint()

Retrieve the endpoint number associated with the pipe.

Configuration/ interface functions

usbd_select_config()

Select the configuration for a USB device.

usbd_select_interface()

Select the interface for a USB device.

Miscellaneous/ convenience functions

usbd_args_lookup()

Look up a driver's command-line arguments.

usbd_configuration_descriptor()

Get the configuration descriptor for a specific configuration setting.

usbd_device_lookup()

Map the device instance identifier to an opaque device handle (from *usbd_attach()*).

usbd_device_extra()

Retrieve a pointer to the device-specific extra memory allocated by *usbd_attach()*.

usbd_device_descriptor()

Get the device descriptor for a specific device.

usbd_endpoint_descriptor()

Get the endpoint descriptor for a specific endpoint setting.

usbd_get_frame()

Get the current frame number and frame length for a device.

usbd_hcd_info() Get information on the USB host controller and SDK library.

usbd_hub_descriptor()

Get the hub descriptor for a specific (hub) device.

usbd_interface_descriptor()

Get the interface descriptor for a specific interface setting.

usbd_languages_descriptor()

Get the table of supported LANGIDs for the given device.

usbd_parse_descriptors()

Parse device descriptors looking for a specific entry.

usbd_reset_device()

Reset a USB device.

usbd_string() Get a string descriptor.

usbd_urb_status()

Return status information on a URB.

usbd_topology()

Get the USB bus physical topology.

usbd_abort_pipe()

Abort all requests on a pipe

Synopsis:

```
#include <sys/usbdi.h>

int usbd_abort_pipe( struct usbd_pipe *pipe );
```

Description:

The *usbd_abort_pipe()* function aborts all requests on a pipe. This function can be used during an error condition (e.g. to abort a pending operation) or during normal operation (e.g. to halt an isochronous transfer).

pipe An opaque handle returned by *usbd_open_pipe()*.

Returns:

EOK Success.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	Yes
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_open_pipe(), *usbd_close_pipe()*, *usbd_pipe_endpoint()*, *usbd_reset_pipe()*

usbd_alloc()

Allocate memory area to use for data transfers

Synopsis:

```
#include <sys/usbdi.h>

void *usbd_alloc( size_t size );
```

Description:

The *usbd_alloc()* function allocates a memory area that can then be used for data transfers. You should use the memory area allocated by this function, because it's allocated efficiently and because its physical address is quickly obtained via *usbd_mphys()*.

The *usbd_setup_*()* functions require *usbd_alloc()*'d data buffers.

size Size (in bytes) of the area to be allocated.

To free the memory, use *usbd_free()*.

Returns:

A pointer to the start of the allocated memory, or NULL if there's not enough memory.

Errors:

ENOMEM Insufficient memory available.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	No
Interrupt handler	No

continued...

Safety	
Signal handler	No
Thread	Yes

See also:

usbd_alloc_urb(), *usbd_free()*, *usbd_free_urb()*, *usbd_mphys()*

usbd_alloc_urb()

Allocate a USB Request Block for subsequent URB-based operations

Synopsis:

```
#include <sys/usbdi.h>

struct usbd_urb *usbd_alloc_urb( struct usbd_urb *link );
```

Description:

The *usbd_alloc_urb()* function allocates a USB Request Block (URB) to be used for subsequent URB-based I/O transfers.

link Specifies multiple URBs linked together. (*Not yet implemented*.)

To free the block, use *usbd_free_urb()*.

Returns:

A pointer to the start of the allocated block, or NULL if there's not enough memory.

Errors:

ENOMEM Insufficient memory available.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	No
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_alloc(), usbd_free(), usbd_free_urb(), usbd_mphys()

usbd_args_lookup()

Look up a driver's command-line arguments

Synopsis:

```
#include <sys/usbdi.h>

void usbd_args_lookup(struct usbd_connection *connection,
                      int *argc,
                      char ***argv );
```

Description:

The *usbd_args_lookup()* function lets you look up a device driver's command-line arguments at insertion/attach time.

The command-line arguments are held in *argc* and *argv* within the **usbd_connect_parm** data structure. See *usbd_connect()* for details.

connection Identifies the USB stack (from *usbd_connect()*).

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	No
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_configuration_descriptor(), *usbd_connect()*, *usbd_device_lookup()*, *usbd_device_extra()*, *usbd_device_descriptor()*, *usbd_endpoint_descriptor()*, *usbd_hcd_info()*, *usbd_hub_descriptor()*, *usbd_interface_descriptor()*, *usbd_languages_descriptor()*, *usbd_parse_descriptors()*, *usbd_string()*, *usbd_urb_status()*

usbd_attach()

Attach to a USB device

Synopsis:

```
#include <sys/usbdi.h>

int usbd_attach( struct usbd_connection *connection,
                 usbd_device_instance_t *instance,
                 size_t extra,
                 struct usbd_device **device );
```

Description:

You use the *usbd_attach()* function to attach to a USB device. Typically, you do this out of the insertion callback (made when the device matched your filter), which will give you the *connection* and *instance* parameters involved. The insertion callback is prototyped as follows:

```
void (*insertion)(struct usbd_connection *, usbd_device_instance_t *instance)
```

Here are the parameters:

connection — An opaque handle that identifies the USB stack (from *usbd_connect()*).

instance — Describes which device you wish to attach to.

extra — The size of additional memory you'd like allocated with the device. You can use *usbd_device_extra()* later to get a pointer to this additional memory. Typically, the class driver would store various status/config/device-specific details in here (if needed).

device — An opaque handle used to identify the device in later calls.

The **usbd_device_instance_t** structure looks like this:

```
typedef struct usbd_device_instance {
    _uint8                  path;
    _uint8                  devno;
    _uint16                 generation;
    usbd_device_ident_t     ident;
    _uint32                 config;
    _uint32                 iface;
    _uint32                 alternate;
} usbd_device_instance_t;
```

Looping

Another way to attach is to loop and attach to *all* devices (in which case you build the *instance* yourself). For example:

```
for (devno = 0; devno < 64; ++devno) {
        memset(&instance, USBD_CONNECT_WILDCARD, sizeof(usbd_device_instance_t));
        instance.path = 0, instance.devno = devno;
        if (usbd_attach(connection, &instance, 0, &device) == EOK) {
          ......
        }
}
```

The degree of "attachedness" depends on how you connected. If you specified insertion/removal callback functions, then you'll get exclusive access to the device and can make I/O to it.

If you didn't use callbacks and you attached as in the loop above, you get *shared access*, so you can only read device configuration.

Returns:

EOK	Success.
ENODEV	Specified device doesn't exist. If in a loop, then there's nothing at that *devno*. If from a callback, then the device has since been removed.
EBUSY	A shared/exclusive conflict.
ENOMEM	No memory for internal device structures.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	Yes
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_connect(), *usbd_detach()*, *usbd_device_extra()*, *usbd_disconnect()*

usbd_close_pipe()

Close a pipe previously opened by usbd_open_pipe()

Synopsis:

```
#include <sys/usbdi.h>

int usbd_close_pipe( struct usbd_pipe *pipe );
```

Description:

You use the *usbd_close_pipe()* function to close a pipe that was previously opened via *usbd_open_pipe()*.

pipe An opaque handle returned by *usbd_open_pipe()*.

Returns:

EOK Success.

EBUSY Active or pending I/O.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	No
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_abort_pipe(), *usbd_open_pipe()*, *usbd_pipe_endpoint()*, *usbd_reset_pipe()*

usbd_configuration_descriptor()

Get the configuration descriptor for a specific configuration setting

Synopsis:

```
#include <sys/usbdi.h>

usbd_configuration_descriptor_t
    *usbd_configuration_descriptor(
        struct usbd_device *device,
        _uint8 cfg,
        struct usbd_desc_node **node );
```

Description:

The *usbd_configuration_descriptor()* function lets you obtain the configuration descriptor for a specific configuration setting.

device An opaque handle used to identify the USB device.

cfg The device's configuration identifier (**bConfigurationValue**).

node Indicates the descriptor's location for rooting future requests (e.g. interfaces of this configuration).

The **usbd_configuration_descriptor_t** structure looks like this:

```
typedef struct usbd_configuration_descriptor {
    _uint8                  bLength;
    _uint8                  bDescriptorType;
    _uint16                 wTotalLength;
    _uint8                  bNumInterfaces;
    _uint8                  bConfigurationValue;
    _uint8                  iConfiguration;
    _uint8                  bmAttributes;
    _uint8                  MaxPower;
} usbd_configuration_descriptor_t;
```

Returns:

A pointer to **`usbd_configuration_descriptor_t`** on success, or NULL on error.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	No
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_args_lookup(), *usbd_device_lookup()*, *usbd_device_extra()*, *usbd_device_descriptor()*, *usbd_endpoint_descriptor()*, *usbd_hcd_info()*, *usbd_hub_descriptor()*, *usbd_interface_descriptor()*, *usbd_languages_descriptor()*, *usbd_parse_descriptors()*, *usbd_string()*, *usbd_urb_status()*

usbd_connect()

Connect a client driver to the USB stack

Synopsis:

```
#include <sys/usbdi.h>

int usbd_connect( usbd_connect_parm_t *parm,
                  struct usbd_connection **connection );
```

Description:

You use the *usbd_connect()* function to connect to a USB device and to provide insertion/removal callbacks (in the **usbd_connect_parm_t** data structure).

parm — Connection parameters describing how to connect to the USB stack and how you intend to operate with it.

connection — An opaque handle returned on a successful connection; it's used to pass into other routines to identify the connection.

Data structures

```
typedef struct usbd_connect_parm {
    const char                      *path;
    _uint16                          vusb;
    _uint16                          vusbd;
    _uint32                          flags;
    int                              argc;
    char                            **argv;
    _uint32                          evtbufsz;
    usbd_device_ident_t              *ident;
    usbd_funcs_t                     *funcs;
    _uint16                          connect_wait
} usbd_connect_parm_t;
```

path — Name of the stack (NULL means **/dev/io-usb/io-usb**, the default name).

vusb and *vusbd* — Versions of the USB stack (USB_VERSION) and SDK (USBD_VERSION).

flags	Currently none defined. Pass 0.
argc and *argv*	Command-line arguments to the device driver that can be made available via *usbd_args_lookup()* at insertion/attach time.
evtbufsz	Size of the event buffer used by the handler thread to buffer events from the USB stack. For the default size, pass 0.
ident	Identifies the devices you're interested in receiving insertion/removal callbacks for (a filter); fields can be set to USBD_CONNECT_WILDCARD or to an explicit value.
funcs	The insertion/removal callbacks.
connect_wait	A value (in seconds) or USBD_CONNECT_WAIT.

```
typedef struct usbd_device_ident {
    _uint32                     vendor;
    _uint32                     device;
    _uint32                     class;
    _uint32                     subclass;
    _uint32                     protocol;
} usbd_device_ident_t;
```

You would typically make the **`usbd_device_ident`** structure be a filter for devices you support from this specific class driver.

```
typedef struct usbd_funcs {
   _uint32   nentries;
   void      (*insertion)(struct usbd_connection *, usbd_device_instance_t *instance);
   void      (*removal)(struct usbd_connection *, usbd_device_instance_t *instance);
   void      (*event)(struct usbd_connection *, usbd_device_instance_t *instance,
                      _uint16 type);
} usbd_funcs_t;
```

The callback functions are contained here.

insertion	Called when a device that matches defined filter is detected.
removal	Called when a device is removed.

event A future extension for various other event notifications (e.g. bandwidth problems).

_USBDI_NFUNCS

A constant that goes into *nentries*.

By passing NULL as the *usbd_funcs*, you're saying that you're not interested in receiving dynamic insertion/removal notifications, which means that you won't be a fully operational class driver. No asynchronous I/O will be allowed, no event thread, etc. This approach is taken, for example, by the **usb** display utility.

Returns:

EOK Success.

EPROGRAMISMATCH

Versionitis.

ENOMEM No memory for internal connect structures.

ESRCH USB server not running.

EACCESS Permission denied to USB server.

EAGAIN Can't create async/callback thread.

Examples:

A class driver (in its *main()*, probably) for a 3COM Ethernet card might connect like this:

```
usbd_device_ident_t        interest = {
                            USB_VENDOR_3COM,
                            USB_PRODUCT_3COM_3C19250,
                            USBD_CONNECT_WILDCARD,
                            USBD_CONNECT_WILDCARD,
                            USBD_CONNECT_WILDCARD,
                           };
usbd_funcs_t               funcs = {
```

```
                            _USBDI_NFUNCS,
                            insertion,
                            removal,
                            NULL
                        };
usbd_connect_parm_t         cparms = {
                            NULL,
                            USB_VERSION,
                            USBD_VERSION,
                            0,
                            argc,
                            argv,
                            0,
                            &interest,
                            &funcs
                        };
struct usbd_connection    *connection;
int                         error;

    error = usbd_connect(&cparms, &connection);
```

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	Yes
Interrupt handler	No
Signal handler	No
Thread	Yes

Caveats:

The *usbd_connect()* function creates a thread on your behalf that's used by the library to monitor the USB stack for device insertion or removal. Since your insertion and removal callback functions are called by this new thread, you *must* ensure that any common

resources used between that thread and any other thread(s) in your class driver are properly protected (e.g. via a mutex).

See also:

usbd_args_lookup(), *usbd_attach()*, *usbd_detach()*, *usbd_disconnect()*

usbd_descriptor()

Get USB descriptors.

Synopsis:

```
#include <sys/usbdi.h>

int usbd_descriptor( struct usbd_device *device,
                     int set, _uint8 type, _uint16 rtype,
                     _uint8 index, _uint16 langid,
                     _uint8 *desc, size_t len );
```

Description:

The *usbd_descriptor()* function lets you obtain the USB descriptors.

device An opaque handle used to identify the USB device.

set A flag that says to either get or set a descriptor.

type Type of descriptor (e.g. USB_DESC_DEVICE, USB_DESC_CONFIGURATION, USB_DESC_STRING, USB_DESC_HUB).

rtype Type of request (e.g. USB_RECIPIENT_DEVICE, USB_RECIPIENT_INTERFACE, USB_RECIPIENT_ENDPOINT, USB_RECIPIENT_OTHER, USB_TYPE_STANDARD, USB_TYPE_CLASS, USB_TYPE_VENDOR).

index This varies, depending on the request. It's used for passing a parameter to the device.

langid Identifies the language supported in strings (according to the LANGID table).

desc Pointer at buffer to put descriptors.

len The length of the data transfer in bytes.

Returns:

EMSGSIZE	Buffer too small for descriptor.
ENOMEM	No memory for URB.
ENODEV	Device was removed.
EIO	I/O error on USB device.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	Yes
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_feature() usbd_io(), usbd_setup_bulk(), usbd_setup_control(), usbd_setup_interrupt(), usbd_setup_isochronous(), usbd_setup_vendor(), usbd_status()

usbd_detach()

Detach from the USB device

Synopsis:

```
#include <sys/usbdi.h>

int usbd_detach( struct usbd_device *device );
```

Description:

You use the *usbd_detach()* function to disconnect from a USB device that you previously had attached to via *usbd_attach()*.

The *usbd_detach()* function automatically closes any pipes previously opened via *usbd_open_pipe()*.

device An opaque handle from *usbd_attach()*.

Returns:

EOK Success.

EBUSY I/O pending on the device.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	Yes
Interrupt handler	No
Signal handler	No
Thread	Yes

Caveats:

Don't try to detach if there's I/O pending on the device. If there is, *usbd_detach()* will fail.

See also:

usbd_attach(), *usbd_close_pipe()*, *usbd_connect()*, *usbd_disconnect()*, *usbd_open_pipe()*

usbd_device_descriptor()

Get the device descriptor for a specific device

Synopsis:

```
#include <sys/usbdi.h>

usbd_device_descriptor_t
  *usbd_device_descriptor(
    struct usbd_device *device,
    struct usbd_desc_node **node );
```

Description:

The *usbd_device_descriptor()* function lets you obtain the device descriptor for a specific *device* (a handle from *usbd_attach()*).

The *node* parameter tells you where a descriptor was found to root future requests from (e.g. configurations of the device).

The **usbd_device_descriptor_t** structure looks like this:

```
typedef struct usbd_device_descriptor {
    _uint8                  bLength;
    _uint8                  bDescriptorType;
    _uint16                 bcdUSB;
    _uint8                  bDeviceClass;
    _uint8                  bDeviceSubClass;
    _uint8                  bDeviceProtocol;
    _uint8                  bMaxPacketSize0;
    _uint16                 idVendor;
    _uint16                 idProduct;
    _uint16                 bcdDevice;
    _uint8                  iManufacturer;
    _uint8                  iProduct;
    _uint8                  iSerialNumber;
    _uint8                  bNumConfigurations;
} usbd_device_descriptor_t;
```

Returns:

A pointer to **usbd_device_descriptor_t** on success, or NULL on error.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	No
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_args_lookup(), *usbd_configuration_descriptor()*, *usbd_device_lookup()*, *usbd_device_extra()*, *usbd_endpoint_descriptor()*, *usbd_hcd_info()*, *usbd_hub_descriptor()*, *usbd_interface_descriptor()*, *usbd_languages_descriptor()*, *usbd_parse_descriptors()*, *usbd_string()*, *usbd_urb_status()*

usbd_device_extra()

Get a pointer to the memory allocated by the extra parameter

Synopsis:

```
#include <sys/usbdi.h>

void *usbd_device_extra( struct usbd_device *device );
```

Description:

You use the *usbd_device_extra()* function to get a pointer to the additional memory allocated via the *extra* parameter in *usbd_attach()*.

Returns:

NULL if no device-specific memory was allocated by *usbd_attach()*.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	No
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_args_lookup(), *usbd_attach()* *usbd_configuration_descriptor()*, *usbd_device_lookup()*, *usbd_device_descriptor()*, *usbd_endpoint_descriptor()*, *usbd_hcd_info()*, *usbd_hub_descriptor()*, *usbd_interface_descriptor()*, *usbd_languages_descriptor()*, *usbd_parse_descriptors()*, *usbd_string()*, *usbd_urb_status()*

usbd_device_lookup()

Map the device instance identifier to an opaque device handle (from usbd_attach())

Synopsis:

```
#include <sys/usbdi.h>

struct usbd_device *usbd_device_lookup(
                        struct usbd_connection *connection,
                        usbd_device_instance_t *instance );
```

Description:

You use the *usbd_device_lookup()* function to map the device instance identifier to an opaque device handle from *usbd_attach()*. This would typically be required in the removal callback.

Returns:

An opaque device handle or NULL.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	No
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_args_lookup(), *usbd_attach()*, *usbd_configuration_descriptor()*, *usbd_device_extra()*, *usbd_device_descriptor()*, *usbd_endpoint_descriptor()*, *usbd_hcd_info()*, *usbd_hub_descriptor()*, *usbd_interface_descriptor()*, *usbd_languages_descriptor()*, *usbd_parse_descriptors()*, *usbd_string()*, *usbd_urb_status()*

usbd_disconnect()

Disconnect a client driver from the USB stack

Synopsis:

```
#include <sys/usbdi.h>

int usbd_disconnect( struct usbd_connection *connection );
```

Description:

You use the *usbd_disconnect()* to disconnect a client driver that had been previously connected to the USB stack via the *usbd_connect()* function.

The *usbd_disconnect()* function automatically closes any pipes previously opened via *usbd_attach()*.

connection Identifies the USB stack (from *usbd_connect()*).

Returns:

EOK Success.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	Yes
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_attach(), *usbd_connect()*, *usbd_detach()*

usbd_endpoint_descriptor()

Get the endpoint descriptor for a specific endpoint setting

Synopsis:

```
#include <sys/usbdi.h>

usbd_endpoint_descriptor_t
   *usbd_endpoint_descriptor(
        struct usbd_device *device,
        _uint8 config,
        _uint8 iface,
        _uint8 alt,
        _uint8 endpoint,
        struct usbd_desc_node **node );
```

Description:

The *usbd_endpoint_descriptor()* function lets you obtain the endpoint descriptor for a specific endpoint on a configuration/interface.

device	An opaque handle used to identify the USB device.
config	Configuration identifier (**bConfigurationValue**).
ifc	Interface identifier (**bInterfaceNumber**).
alt	Alternate identifier (**bAlternateSetting**).
endpoint	Endpoint identifier (**bEndpointAddress**).
node	Indicates the descriptor's location for rooting future requests.

The **endpoint_descriptor_t** structure looks like this:

```
typedef struct usbd_endpoint_descriptor {
    _uint8                  bLength;
    _uint8                  bDescriptorType;
    _uint8                  bEndpointAddress;
    _uint8                  bmAttributes;
    _uint16                 wMaxPacketSize;
    _uint8                  bInterval;
} usbd_endpoint_descriptor_t;
```

Returns:

A pointer to **`usbd_endpoint_descriptor_t`** on success, or NULL on error.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	No
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_args_lookup(), *usbd_configuration_descriptor()*, *usbd_device_lookup()*, *usbd_device_extra()*, *usbd_device_descriptor()*, *usbd_hcd_info()*, *usbd_hub_descriptor()*, *usbd_interface_descriptor()*, *usbd_languages_descriptor()*, *usbd_parse_descriptors()*, *usbd_string()*, *usbd_urb_status()*

usbd_feature()

Control a feature for a USB device.

Synopsis:

```
#include <sys/usbdi.h>

int usbd_feature( struct usbd_device *device,
                  int set, _uint16 feature,
                  _uint16 rtype, _uint16 index );
```

Description:

The *usbd_feature()* function lets you control a specific feature on a USB device.

device	An opaque handle used to identify the USB device.
set	Set or clear a feature on the USB device.
feature	A specific feature on the device.
rtype	Type of request (e.g. USB_RECIPIENT_DEVICE, USB_RECIPIENT_INTERFACE, USB_RECIPIENT_ENDPOINT, USB_RECIPIENT_OTHER, USB_TYPE_STANDARD, USB_TYPE_CLASS, USB_TYPE_VENDOR).
index	This varies, depending on the request. It's used for passing a parameter to the device.

Returns:

EOK	Success.
ENOMEM	No memory for URB.
ENODEV	Device was removed.
EIO	I/O error on USB device.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	Yes
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_descriptor(), *usbd_io()*, *usbd_setup_bulk()*, *usbd_setup_control()*, *usbd_setup_interrupt()*, *usbd_setup_isochronous()*, *usbd_setup_vendor()*, *usbd_status()*

usbd_free()

Free the memory area allocated by usbd_alloc()

Synopsis:

```
#include <sys/usbdi.h>

void usbd_free( void* ptr );
```

Description:

The *usbd_free()* function frees the memory allocated by *usbd_alloc()*. The function deallocates the memory area specified by *ptr*, which was previously returned by a call to *usbd_mphys()*.

It's safe to call *usbd_free()* with a NULL *ptr*.

Returns:

EOK Success.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	No
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_alloc(), *usbd_alloc_urb()*, *usbd_free_urb()*, *usbd_mphys()*

usbd_free_urb()

Free the USB Request Block allocated by usbd_alloc_urb()

Synopsis:

```
#include <sys/usbdi.h>

struct usbd_urb *usbd_free_urb( struct usbd_urb *urb );
```

Description:

The *usbd_free_urb()* function frees the memory allocated by *usbd_alloc_urb()*.

Returns:

EOK Success.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	No
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_alloc(), *usbd_alloc_urb()*, *usbd_free()*, *usbd_mphys()*

usbd_get_frame()

Get the current frame number and frame length for a device

Synopsis:

```
int usbd_get_frame( struct usbd_device *device,
                    _int32 *fnum,
                    _int32 *flen );
```

Description:

This function gets the current frame number and frame length for a specific *device* (a handle from *usbd_attach()*).

fnum If non-NULL, this is set to the frame number.

flen If non-NULL, this is set to the frame length.

Returns:

EOK Success.

ENODEV The device has been removed.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	Yes
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_attach()

usbd_hcd_info()

Get information on the USB host controller and SDK library

Synopsis:

```
#include <sys/usbdi.h>

int usbd_hcd_info( struct usbd_connection *connection,
                   _uint32 cindex, usbd_hcd_info_t *info );
```

Description:

You use the *usbd_hcd_info()* function to obtain information from the USB host controller and SDK library.

connection Identifies the USB stack (from *usbd_connect()*).

cindex Gets information about a specific host controller.

info A pointer to the **usbd_hcd_info_t** data structure, which is filled in by *usbd_hcd_info()*. The structure contains at least the following:

```
typedef struct usbd_hcd_info {
    _uint16                 vusb;
    _uint16                 vusbd;
    char                    controller[8];
    _uint32                 capabilities;
    _uint8                  ndev;
    _uint8                  reserved[1];
    _uint16                 vhcd;
    _uint8                  reserved[12];
  } usbd_hcd_info_t;
```

The **vusb**, **vusbd**, and **vhcd** fields hold the version numbers of the USB stack, the SDK, and the HCD; **controller** and **capabilities** hold the name and capabilities of the USB host controller; **ndev** contains the number of devices currently connected.

Returns:

EOK Success.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	Yes
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_args_lookup(), *usbd_configuration_descriptor()*, *usbd_device_lookup()*, *usbd_device_extra()*, *usbd_device_descriptor()*, *usbd_endpoint_descriptor()*, *usbd_hub_descriptor()*, *usbd_interface_descriptor()*, *usbd_languages_descriptor()*, *usbd_parse_descriptors()*, *usbd_string()*, *usbd_urb_status()*

usbd_hub_descriptor()

Get the hub descriptor for a specific (hub) device

Synopsis:

```
#include <sys/usbdi.h>

usbd_hub_descriptor_t *usbd_hub_descriptor(
                          struct usbd_device *device,
                          struct usbd_desc_node **node );
```

Description:

The *usbd_hub_descriptor()* function lets you obtain a hub descriptor.

device An opaque handle used to identify the USB device.

node Indicates the descriptor's location for rooting future requests.

The **usbd_hub_descriptor_t** data structure looks like this:

```
typedef struct usbd_hub_descriptor {
    _uint8                  bLength;
    _uint8                  bDescriptorType;
    _uint8                  bNbrPorts;
    _uint16                 wHubCharacteristics;
    _uint8                  bPwrOn2PwrGood;
    _uint8                  bHubContrCurrent;
    _uint8                  DeviceRemovable[1];
    _uint8                  PortPwrCtrlMask[1];
} usbd_hub_descriptor_t;
```

Returns:

A pointer to **usbd_hub_descriptor_t** on success, or NULL on error.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	No
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_args_lookup(), *usbd_configuration_descriptor()*, *usbd_device_lookup()*, *usbd_device_extra()*, *usbd_device_descriptor()*, *usbd_endpoint_descriptor()*, *usbd_hcd_info()*, *usbd_interface_descriptor()*, *usbd_languages_descriptor()*, *usbd_parse_descriptors()*, *usbd_string()*, *usbd_urb_status()*

usbd_interface_descriptor()

Get the interface descriptor for a specific interface setting

Synopsis:

```
#include <sys/usbdi.h>

usbd_interface_descriptor_t
   *usbd_interface_descriptor(
        struct usbd_device *device,
        _uint8 cfg,
        _uint8 ifc,
        _uint8 alt,
        struct usbd_desc_node **node );
```

Description:

The *usbd_interface_descriptor()* function lets you obtain the interface descriptor for a specific interface setting.

device An opaque handle used to identify the USB device.

cfg The device's configuration identifier (**bConfigurationValue**).

ifc Interface identifier (**bInterfaceNumber**).

alt Alternate identifier (**bAlternateSetting**).

node Indicates the descriptor's location for rooting future requests (e.g. endpoints of this interface).

The **usbd_interface_descriptor_t** structure looks like this:

```
typedef struct usbd_interface_descriptor {
    _uint8                  bLength;
    _uint8                  bDescriptorType;
    _uint8                  bInterfaceNumber;
    _uint8                  bAlternateSetting;
    _uint8                  bNumEndpoints;
    _uint8                  bInterfaceClass;
    _uint8                  bInterfaceSubClass;
    _uint8                  bInterfaceProtocol;
    _uint8                  iInterface;
} usbd_interface_descriptor_t;
```

Returns:

A pointer to **`usbd_interface_descriptor_t`** on success, or NULL on error.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	No
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_args_lookup(), *usbd_configuration_descriptor()*, *usbd_device_lookup()*, *usbd_device_extra()*, *usbd_device_descriptor()*, *usbd_endpoint_descriptor()*, *usbd_hcd_info()*, *usbd_hub_descriptor()*, *usbd_languages_descriptor()*, *usbd_parse_descriptors()*, *usbd_string()*, *usbd_urb_status()*

usbd_io()

Submit a previously set up URB to the USB stack

Synopsis:

```
#include <sys/usbdi.h>

int usbd_io( struct usbd_urb *urb,
             struct usbd_pipe *pipe,
             void (*func)(struct usbd_urb *,
                          struct usbd_pipe *, void *),
             void *handle, _uint32 timeout );
```

Description:

This routine submits a previously set up URB to the USB stack. The URB would have been set up from one of these functions:

- *usbd_setup_bulk()*
- *usbd_setup_control()*
- *usbd_setup_interrupt()*
- *usbd_setup_isochronous()*
- *usbd_setup_vendor()*

For this release of the USB SDK, vendor requests are *synchronous* only. Therefore, the *func* parameter in *usbd_io()* must be NULL.

The *usbd_io()* function is the one that actually makes the data transfer happen; the setup functions simply set up the URB for the data transfer.

pipe	An opaque handle returned by *usbd_open_pipe()*.
func	Callback at I/O completion, given URB, pipe, plus *handle*.
handle	User data.
timeout	A value (in milliseconds) or USBD_TIME_DEFAULT or USBD_TIME_INFINITY.

Returns:

EBADF	Improper *usbd_connect()* call.
EINVAL	Improper *usbd_connect()* call.
ENODEV	Device was removed.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	Yes
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_descriptor(), *usbd_feature()*, *usbd_setup_control()*, *usbd_setup_bulk()*, *usbd_setup_interrupt()*, *usbd_setup_isochronous()*, *usbd_setup_vendor()*, *usbd_status()*

usbd_languages_descriptor()

Get the table of supported LANGIDs for the given device

Synopsis:

```
#include <sys/usbdi.h>

usbd_string_descriptor_t
   *usbd_languages_descriptor(
     struct usbd_device *device,
     struct usbd_desc_node **node );
```

Description:

The *usbd_languages_descriptor()* function lets you obtain the table of supported language IDs for the device.

device An opaque handle used to identify the USB device.

node Indicates the descriptor's location for rooting future requests.

The **usbd_string_descriptor_t** structure looks like this:

```
typedef struct usbd_string_descriptor {
    _uint8                  bLength;
    _uint8                  bDescriptorType;
    _uint16                 bString[1];
} usbd_string_descriptor_t;
```

Returns:

A pointer **usbd_string_descriptor_t** on success, NULL on error.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	No
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_args_lookup(), *usbd_configuration_descriptor()*, *usbd_device_lookup()*, *usbd_device_extra()*, *usbd_device_descriptor()*, *usbd_endpoint_descriptor()*, *usbd_hcd_info()*, *usbd_hub_descriptor()*, *usbd_interface_descriptor()*, *usbd_parse_descriptors()*, *usbd_string()*, *usbd_urb_status()*

usbd_mphys()

Get the physical address of memory allocated by usbd_alloc()

Synopsis:

```
#include <sys/usbdi.h>

paddr_t usbd_mphys( const void *ptr );
```

Description:

The *usbd_mphys()* function obtains the physical address used by *usbd_alloc()* to allocate memory for a data transfer.

Returns:

Physical address.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	No
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_alloc(), usbd_alloc_urb(), usbd_free(), usbd_free_urb(), usbd_mphys()

usbd_open_pipe()

Initialize the pipe described by the device or endpoint descriptor

Synopsis:

```
#include <sys/usbdi.h>

int usbd_open_pipe( struct usbd_device *device,
                    usbd_descriptors_t *desc,
                    struct usbd_pipe **pipe );
```

Description:

You use the *usbd_open_pipe()* function to initialize the pipe described by the endpoint descriptor.

device An opaque handle used to identify the USB device.

desc A pointer to the device or endpoint descriptor that was returned from *usbd_parse_descriptors()*.

pipe An opaque handle returned by *usbd_open_pipe()*.

Returns:

EINVAL Descriptor isn't device or endpoint.

ENOMEM No memory for internal pipe structures.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	No
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_abort_pipe(), *usbd_close_pipe()*, *usbd_pipe_endpoint()*, *usbd_reset_pipe()*

usbd_parse_descriptors()

Parse device descriptors looking for a specific entry

Synopsis:

```
#include <sys/usbdi.h>

usbd_descriptors_t *usbd_parse_descriptors(
                        struct usbd_device *device,
                        struct usbd_desc_node *root,
                        _uint8 type, int index,
                        struct usbd_desc_node **node );
```

Description:

When called the first time, the *usbd_parse_descriptors()* function loads all the descriptors from the USB device:

- device
- configuration
- interface
- endpoint
- hub
- string

The function uses *usdb_descriptor()* to get each raw USB descriptor. The data is then endian-ized, made alignment-safe, and built into an in-memory tree structure to facilitate future parsing requests.

Each node in this tree is a struct usbd_desc_node. The *root* parameter lets you say where in the tree to begin parsing (NULL is base). The *node* parameter tells you where a descriptor was found to root future requests from.

The tree looks like this:

```
(ROOT)
  |
  (DEVICE)  -  (HUB)  -  (LANGUAGE TABLE)
    |
    (CONFIG)  -  .....   (CONFIG)
```

```
|
(INTERFACE)  -  .....    (INTERFACE)
  |
  (ENDPOINT)  -  .....    (ENDPOINT)
```

Any vendor-specific or class-specific descriptors that are embedded into the standard descriptor output are also inserted into this tree at the appropriate point.

Although a descriptor for endpoint 0 (control) isn't present on the wire, one is constructed and placed in the tree (to simplify enumeration within the class driver).

You use *type* for specifying the type of descriptor to find; *index* is the *n*th occurrence. Note that type 0 will match any descriptor type; you can use it to retrieve *any* embedded class or vendor-specific descriptors if you don't know their type.

Here's an example that will walk all endpoints for an interface:

```
for (eix = 0; (desc = usbd_parse_descriptors(device, ifc, USB_DESC_ENDPOINT,
               eix, &ept)) != NULL; ++eix)
;
```

where *ifc* is the appropriate (INTERFACE) node (found by a previous call to *usbd_parse_descriptors()* or *usbd_interface_descriptor()*.

Returns:

A pointer to the descriptor on success, NULL on error.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	No
Interrupt handler	No
Signal handler	No

continued...

Safety	
Thread	Yes

See also:

usbd_args_lookup(), *usbd_configuration_descriptor()*, *usbd_device_lookup()*, *usbd_device_extra()*, *usbd_device_descriptor()*, *usbd_endpoint_descriptor()*, *usbd_hcd_info()*, *usbd_hub_descriptor()*, *usbd_interface_descriptor()*, *usbd_languages_descriptor()*, *usbd_string()*, *usbd_urb_status()*

usbd_pipe_device()

Retrieve the device associated with the pipe

Synopsis:

```
#include <sys/usbdi.h>

struct usbd_device*
  usbd_pipe_device( struct usbd_pipe *pipe );
```

Description:

You use the *usbd_pipe_device()* to retrieve the device associated with *pipe* (an opaque handle returned by *usbd_open_pipe()*).

Returns:

A pointer to a **usbd_device** that describes the device.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	No
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_abort_pipe(), *usbd_open_pipe()*, *usbd_close_pipe()*, *usbd_reset_pipe()*

usbd_pipe_endpoint()

Retrieve the endpoint number associated with the pipe

Synopsis:

```
#include <sys/usbdi.h>

_uint32 usbd_pipe_endpoint( struct usbd_pipe *pipe );
```

Description:

You use the *usbd_pipe_endpoint()* to retrieve the endpoint number associated with *pipe* (an opaque handle returned by *usbd_open_pipe()*).

Returns:

A pipe/endpoint number.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	No
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_abort_pipe(), *usbd_open_pipe()*, *usbd_close_pipe()*, *usbd_reset_pipe()*

usbd_reset_device()

Reset a USB device

Synopsis:

```
#include <sys/usbdi.h>

int usbd_reset_device( struct usbd_device *device );
```

Description:

You use the *usbd_reset_device()* function to reset the specified *device*.

Returns:

EOK	Success.
ENODEV	Device was removed.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	Yes
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_attach(), usbd_connect()

usbd_reset_pipe()

Clear a stall condition on an endpoint identified by the pipe handle

Synopsis:

```
#include <sys/usbdi.h>

int usbd_reset_pipe( struct usbd_pipe *pipe );
```

Description:

You use the *usbd_reset_pipe()* function to clear a stall condition on an endpoint identified by the *pipe* handle.

Returns:

EOK	Success.
ENOMEM	No memory for URB.
ENODEV	Device was removed.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	Yes
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_abort_pipe() usbd_open_pipe(), usbd_close_pipe(), usbd_pipe_endpoint(),

usbd_select_config()

Select the configuration for a USB device

Synopsis:

```
#include <sys/usbdi.h>

int usbd_select_config( struct usbd_device *device,
                        _uint8 cfg );
```

Description:

You use the *usbd_select_config()* function to select the configuration for a USB device.

device An opaque handle used to identify the USB device.

cfg The device's configuration identifier (**bConfigurationValue**).

Returns:

EOK	Success.
ENOMEM	No memory for URB.
ENODEV	Device was removed.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	Yes
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_select_interface()

usbd_select_interface()

Select the interface for a USB device

Synopsis:

```
#include <sys/usbdi.h>

int usbd_select_interface( struct usbd_device *device,
                           _uint8 ifc, _uint8 alt );
```

Description:

You use the *usbd_select_interface()* function to select the interface for a USB device.

device	An opaque handle used to identify the USB device.
ifc	Interface identifier (**`bInterfaceNumber`**).
alt	Alternate identifier (**`bAlternateSetting`**).

Returns:

EOK	Success.
ENOMEM	No memory for URB.
ENODEV	Device was removed.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	Yes
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_select_config()

usbd_setup_bulk()

Set up a URB for a bulk data transfer

Synopsis:

```
#include <sys/usbdi.h>

int usbd_setup_bulk( struct usbd_urb *urb,
                     _uint32 flags, void *addr,
                     _uint32 len );
```

Description:

This routine sets up a URB for a bulk data transfer.

urb An opaque handle (from *usbd_alloc_urb()*).

flags One of the following:

- URB_DIR_IN — Specify incoming (device-to-PC) transfer.
- URB_DIR_OUT — Specify outgoing (PC-to-device) transfer.
- URB_DIR_NONE — Don't specify direction.
- URB_SHORT_XFER_OK — Allow short transfers.

addr Address for start of transfer — you *must* use the buffer allocated by *usbd_alloc()*.

len The length (in bytes) of the data transfer.

Returns:

EOK Success.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	No
Interrupt handler	No
Signal handler	No
Thread	Yes

Caveats:

To ensure that the correct physical address will be used, you *must* use the buffer allocated by *usbd_alloc()* for the *addr* parameter.

See also:

usbd_descriptor(), *usbd_feature()*, *usbd_io()*, *usbd_setup_control()*, *usbd_setup_interrupt()*, *usbd_setup_isochronous()*, *usbd_setup_vendor()*, *usbd_status()*

usbd_setup_control()

Set up a URB for a control transfer

Synopsis:

CAUTION: This function is still under development --- its synopsis and other details shown here may change significantly!

#include <sys/usbdi.h>

usbd_setup_control(struct usbd_urb *_urb_, _uint32 _flags_, _uint16 _request_, _uint16 _rtype_, _uint16 _value_, _uint16 _index_, void *_addr_, _uint32 _len_);

Description:

This routine sets up a URB for a control transfer.

urb — An opaque handle (from *usbd_alloc_urb()*).

flags — One of the following:

- URB_DIR_IN — Specify incoming (device-to-PC) transfer.
- URB_DIR_OUT — Specify outgoing (PC-to-device) transfer.
- URB_DIR_NONE — Don't specify direction.
- URB_SHORT_XFER_OK — Allow short transfers.

request — A device-specific request.

rtype — Type of request (e.g. USB_RECIPIENT_DEVICE, USB_RECIPIENT_INTERFACE, USB_RECIPIENT_ENDPOINT, USB_RECIPIENT_OTHER, USB_TYPE_STANDARD, USB_TYPE_CLASS, USB_TYPE_VENDOR).

value — This varies, depending on the request. It's used for passing a parameter to the device.

index — This varies, depending on the request. It's used for passing a parameter to the device.

addr Address for start of transfer — you *must* use the buffer allocated by *usbd_alloc()*.

len The length (in bytes) of the data transfer.

Returns:

EOK Success.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	No
Interrupt handler	No
Signal handler	No
Thread	Yes

Caveats:

To ensure that the correct physical address will be used, you *must* use the buffer allocated by *usbd_alloc()* for the *addr* parameter.

See also:

usbd_descriptor(), *usbd_feature()*, *usbd_io()*, *usbd_setup_bulk()*, *usbd_setup_interrupt()*, *usbd_setup_isochronous()*, *usbd_setup_vendor()*, *usbd_status()*

usbd_setup_interrupt()

Set up a URB for an interrupt transfer

Synopsis:

```
#include <sys/usbdi.h>

int usbd_setup_interrupt( struct usbd_urb *urb,
                          _uint32 flags,
                          void *addr,
                          _uint32 len );
```

Description:

This routine sets up a URB for an interrupt transfer.

urb An opaque handle (from *usbd_alloc_urb()*).

flags One of the following:

- URB_DIR_IN — Specify incoming (device-to-PC) transfer.
- URB_DIR_OUT — Specify outgoing (PC-to-device) transfer.
- URB_DIR_NONE — Don't specify direction.
- URB_SHORT_XFER_OK — Allow short transfers.

addr Address for start of transfer — you *must* use the buffer allocated by *usbd_alloc()*.

len The length (in bytes) of the data transfer.

Returns:

EOK Success.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	No
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_setup_bulk(), *usbd_setup_control()*, *usbd_setup_isochronous()*, *usbd_setup_vendor()*

usbd_setup_isochronous()

Set up a URB for an isochronous transfer

Synopsis:

CAUTION: This function is still under development - its synopsis and other details shown here may change significantly!

```
#include <sys/usbdi.h>

int usbd_setup_isochronous( struct usbd_urb *urb,
                            _uint32 flags,
                            _int32 frame,
                            void *addr,
                            _uint32 len );
```

Description:

This routine sets up a URB for an isochronous transfer.

urb An opaque handle (from *usbd_alloc_urb()*).

flags One of the following:

- URB_DIR_IN — Specify incoming (device-to-PC) transfer.
- URB_DIR_OUT — Specify outgoing (PC-to-device) transfer.
- URB_DIR_NONE — Don't specify direction.
- URB_ISOCH_ASAP — Allow transfer as soon as possible (overrides *frame*).
- URB_SHORT_XFER_OK — Allow short transfers.

frame The device frame number. This is ignored if URB_ISOCH_ASAP is set.

addr Address for start of transfer — you *must* use the buffer allocated by *usbd_alloc()*.

len The length (in bytes) of the data transfer.

Returns:

EOK Success.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	No
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_descriptor(), *usbd_feature()*, *usbd_io()*, *usbd_setup_bulk()*, *usbd_setup_control()*, *usbd_setup_interrupt()*, *usbd_setup_vendor()*, *usbd_status()*

usbd_setup_vendor()

Set up a URB for a vendor-specific transfer

Synopsis:

```
#include <sys/usbdi.h>

int usbd_setup_vendor( struct usbd_urb *urb,
                       _uint32 flags, _uint16 request,
                       _uint16 rtype, _uint16 value,
                       _uint16 index, void *addr,
                       _uint32 len );
```

Description:

This routine sets up a URB for a vendor-specific transfer.

For this release of the USB SDK, vendor requests are *synchronous* only. Therefore, the *func* parameter in *usbd_io()* must be NULL.

urb An opaque handle (from *usbd_alloc_urb()*).

flags One of the following:

- URB_DIR_IN — Specify incoming (device-to-PC) transfer.
- URB_DIR_OUT — Specify outgoing (PC-to-device) transfer.
- URB_DIR_NONE — Don't specify direction.
- URB_SHORT_XFER_OK — Allow short transfers.

request A device-specific request.

rtype Type of request (e.g. USB_RECIPIENT_DEVICE, USB_RECIPIENT_INTERFACE, USB_RECIPIENT_ENDPOINT, USB_RECIPIENT_OTHER, USB_TYPE_STANDARD, USB_TYPE_CLASS, USB_TYPE_VENDOR).

value This varies, depending on the request. It's used for passing a parameter to the device.

index This varies, depending on the request. It's used for passing a parameter to the device.

addr Address for start of transfer — you *must* use the buffer allocated by *usbd_alloc()*.

len The length (in bytes) of the data transfer.

Returns:

EOK Success.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	No
Interrupt handler	No
Signal handler	No
Thread	Yes

Caveats:

To ensure that the correct physical address will be used, you *must* use the buffer allocated by *usbd_alloc()* for the *addr* parameter.

See also:

usbd_descriptor(), *usbd_feature()*, *usbd_io()*, *usbd_setup_bulk()*, *usbd_setup_control()*, *usbd_setup_interrupt()*, *usbd_setup_isochronous()*, *usbd_status()*

usbd_status()

Get specific device status

Synopsis:

```
#include <sys/usbdi.h>

int usbd_status( struct usbd_device *device,
                 _uint16 rtype, _uint16 index,
                 void *addr, _uint32 len )
```

Description:

You use the *usbd_status()* function to get specific device status.

device An opaque handle used to identify the USB device.

rtype Type of request (e.g. USB_RECIPIENT_DEVICE, USB_RECIPIENT_INTERFACE, USB_RECIPIENT_ENDPOINT, USB_RECIPIENT_OTHER, USB_TYPE_STANDARD, USB_TYPE_CLASS, USB_TYPE_VENDOR).

index This varies, depending on the request. It's used for passing a parameter to the device.

addr Address for start of transfer — you *must* use the buffer allocated by *usbd_alloc()*.

len The length (in bytes) of the data transfer.

Returns:

EOK Success.

EMSGSIZE Buffer too small for descriptor.

ENOMEM No memory for URB.

ENODEV Device was removed.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	No
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_descriptor(), *usbd_feature()*, *usbd_io()*, *usbd_setup_bulk()*, *usbd_setup_control()*, *usbd_setup_interrupt()*, *usbd_setup_isochronous()*, *usbd_setup_vendor()*

usbd_string()

Get a string descriptor

Synopsis:

```
#include <sys/usbdi.h>

char *usbd_string( struct usbd_device *device,
                   _uint8 index,
                   int langid );
```

Description:

The *usbd_string()* function lets you obtain a string from the USB device's table of strings.

Typically, the string table may contain the names of the vendor, the product, etc. The string table is optional.

device An opaque handle used to identify the USB device.

index Index into the device's (optional) string table.

langid Language ID. The *usbd_languages_descriptor()* function provides the supported *langid*s for the device. If you specify 0, the *usbd_string()* function will select the first/only supported language.

Note that the strings are actually in Unicode/wide characters, so *usb_string()* also conveniently converts them to UTF-8 (byte stream) for you.

Note that *usbd_string()* places the result string in a static buffer that's reused every time the function is called.

Returns:

A pointer to the string in an internal static buffer, or NULL on error.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	No
Interrupt handler	No
Signal handler	No
Thread	No

See also:

usbd_args_lookup(), *usbd_configuration_descriptor()*, *usbd_device_lookup()*, *usbd_device_extra()*, *usbd_device_descriptor()*, *usbd_endpoint_descriptor()*, *usbd_hcd_info()*, *usbd_hub_descriptor()*, *usbd_interface_descriptor()*, *usbd_languages_descriptor()*, *usbd_parse_descriptors()*, *usbd_urb_status()*

usbd_topology()

Get the USB bus physical topology

Synopsis:

```
#include <sys/usbdi.h>

int usbd_topology( struct usbd_connection *connection,
                   usbd_bus_topology_t *tp )
```

Description:

You use the *usbd_topology()* function to get the USB bus physical topology.

For more information on USB bus topology, see sections 4.1.1 and 5.2.3 in the USB Specification v1.1.

Here are the parameters:

connection — An opaque handle that identifies the USB stack (from *usbd_connect()*).

tp — A pointer to the **usbd_bus_topology_t** data structure, which is filled in by *usbd_topology()*.

The **usbd_bus_topology_t** structure contains at least the following:

```
typedef struct usbd_port_attachment {
    _uint8                  upstream_devno;
    _uint8                  upstream_port;
    _uint8                  upstream_port_speed;
} usbd_port_attachment_t;

typedef struct usbd_bus_topology {
    usbd_port_attachment_t    ports[64];
} usbd_bus_topology_t;
```

The structure contains an array of **usb_port_attachment**s, one per device. Note that the *upstream_devno* field will contain a value other than **0xff** to indicate a valid attachment.

Returns:

EOK	Success.
ENODEV	Device was removed.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	Yes
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_connect()

usbd_urb_status()

Return status information on a URB

Synopsis:

```
#include <sys/usbdi.h>

int usbd_urb_status( struct usbd_urb *urb,
                     _uint32 *status,
                     _uint32 *len )
```

Description:

You use the *usbd_urb_status()* function to extract completion status and data-transfer length from a URB.

urb An opaque handle (from *usbd_alloc_urb()*).

status Completion status (see below).

len The *actual* length (in bytes) of the data transfer.

Completion status

The *status* field contains the completion status information, which includes the following flags:

USBD_STATUS_INPROG

The operation is in progress.

USBD_STATUS_CMP

The operation is complete.

USBD_STATUS_CMP_ERR

The operation is complete, but an error occurred.

USBD_STATUS_TIMEOUT

The operation timed out.

USBD_STATUS_ABORTED

The operation aborted.

USBD_STATUS_CRC_ERR

The last packet from the endpoint contained a CRC error.

USBD_STATUS_BITSTUFFING

The last packet from the endpoint contained a bit-stuffing violation.

USBD_STATUS_TOGGLE_MISMATCH

The last packet from the endpoint had the wrong data-toggle PID.

USBD_STATUS_STALL

The endpoint returned a STALL PID.

USBD_STATUS_DEV_NOANSWER

Device didn't respond to token (IN) or didn't provide a handshake (OUT).

USBD_STATUS_PID_FAILURE

Check bits on PID from endpoint failed on data PID (IN) or handshake (OUT).

USBD_STATUS_BAD_PID

Receive PID was invalid or undefined.

USBD_STATUS_DATA_OVERRUN

The endpoint returned more data than the allowable maximum.

USBD_STATUS_DATA_UNDERRUN

The endpoint didn't return enough data to fill the specified buffer.

USBD_STATUS_BUFFER_OVERRUN

During an IN, the host controller received data from the endpoint faster than it could be written to system memory.

USBD_STATUS_BUFFER_UNDERRUN

During an OUT, the host controller couldn't retrieve data fast enough.

USBD_STATUS_NOT_ACCESSED

Controller didn't execute request.

Returns:

EOK	Success.
EBUSY	URB I/O still active.
ETIMEDOUT	Timeout occurred.
EINTR	Operation aborted/interrupted.
ENODEV	Device removed.
EIO	I/O error.

Classification:

QNX Neutrino, QNX 4

Safety	
Cancellation point	No
Interrupt handler	No
Signal handler	No
Thread	Yes

See also:

usbd_args_lookup(), *usbd_configuration_descriptor()*, *usbd_device_lookup()*, *usbd_device_extra()*, *usbd_device_descriptor()*, *usbd_endpoint_descriptor()*, *usbd_hcd_info()*, *usbd_hub_descriptor()*, *usbd_interface_descriptor()*, *usbd_languages_descriptor()*, *usbd_parse_descriptors()*, *usbd_string()*

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