

Cypress CyAPI Programmer's Reference

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1 Overview

Library Overview

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CyAPI.lib provides a simple, powerful C++ programming interface to USB devices. More specifically, it is a C++ class library that provides a high-level programming interface to the **CyUsb3.sys** device driver. The library is only able to communicate with USB devices that are served by (i.e. matched to) this driver.

Rather than communicate with the driver via Windows API calls such as *SetupDiXxxx* and *DeviceIoControl*, applications call simpler CyAPI methods such as [Open](#), [Close](#), and [XferData](#) to communicate with USB devices.

To use the library, you need to include the header file, **CyAPI.h**, in files that access the **CCyUSBDevice** class. In addition, the statically linked **CyAPI.lib** file must be linked to your project. Versions of the .lib files are available for use with Microsoft Visual Studio 2008.

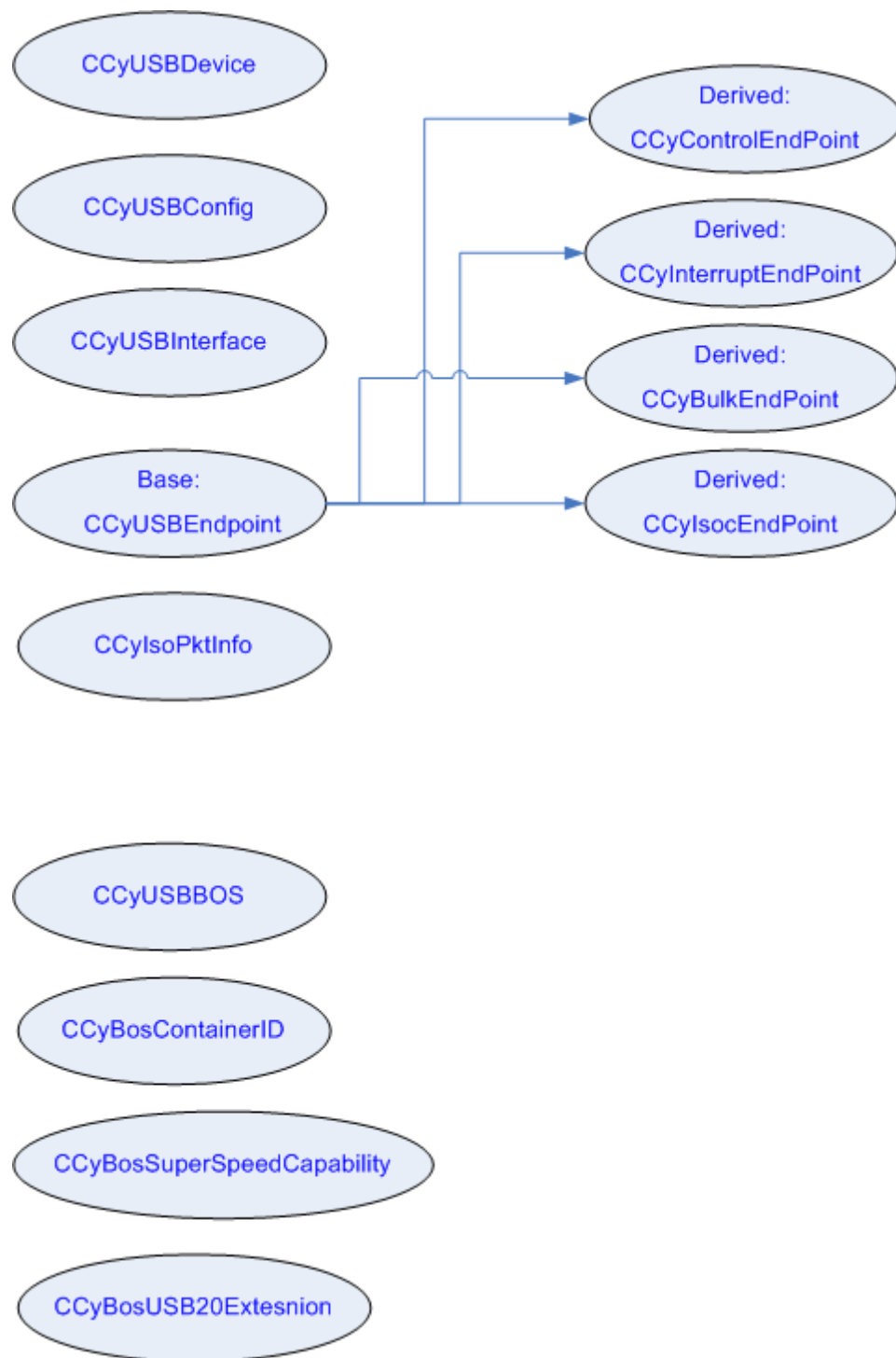
The library employs a **Device and EndPoints** use model. To use the library you must [create an instance](#) of the **CCyUSBDevice** class using the **new** keyword. A **CCyUSBDevice** object knows [how many USB devices](#) are attached to the **CyUsb3.sys** driver and can be made to abstract any one of those devices at a time by using the [Open](#) method. An instance of **CCyUSBDevice** exposes several methods and data members that are device-specific, such as [DeviceName](#), [DevClass](#), [VendorID](#), [ProductID](#), and [SetAltIntfc](#).

When a **CCyUSBDevice** object is open to an attached USB device, its [endpoint](#) members provide an interface for performing data transfers to and from the device's endpoints. Endpoint-specific data members and methods such as [MaxPktSize](#), [TimeOut](#), [bIn](#), [Reset](#) and [XferData](#) are only accessible through endpoint members of a **CCyUSBDevice** object.

In addition to its simplicity, the class library facilitates creation of sophisticated applications as well. The **CCyUSBDevice** [constructor](#) automatically registers the application for Windows USB Plug and Play event notification. This allows your application to support "hot plugging" of devices. Also, the asynchronous [BeginDataXfer/WaitForXfer/FinishDataXfer](#) methods allow queuing of multiple data transfer requests on a single endpoint, thus enabling data streaming from the application level.

2 Library Class Hierarchy

The class hierarchy diagram shown below illustrates the C++ CyAPI library interface classes.



3 New Features

Description

This section contains additional features for USB3.0.

The current list of new features is as follows:

[USB3.0 Basic Feature](#)

[FX3 Firmware Download Feature](#)

3.1 USB3.0 Support Overview

USB3.0 Support Overview

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Description

The Binary Device Object Store(BOS) descriptor defines a root descriptor that is similar to the configuration descriptor and a base descriptor for accessing a family of related descriptors. A host can read a BOS descriptor and learn from wTotalLength field the entire size of device-level descriptor set..

API

All BOS support API is incorporated in the [CyUSBDevice](#) class.

[GetBosDescriptor\(\)](#)

[GetBosContainerIDDescriptor\(\)](#)

[GetBosSSCapabilityDescriptor\(\)](#)

[GetBosUSB20DeviceExtensionDesc\(\)](#)

Data Structure

All BOS data structure definition is defined in the USB30_def.h header file.

[USB_BOS_DESCRIPTOR](#)

[USB_BOS_CONTAINER_ID](#)

[USB_BOS_SS_DEVICE_CAPABILITY](#)

[USB_BOS_USB20_DEVICE_EXTENSION](#)

Classes

All BOS class definition is defined in the CyAPI.h header file.

[CCyUSBBOS](#)

[CCyBOSContainerID](#)

[CCyBOSSuperSpeedCapability](#)

[CCyBOSUSB20Extension](#)

Device Speed

Super speed variable is defined in the [CyUSBDevice](#) class.

[bSuperSpeed](#)

SuperSpeed Endpoint Companion descriptor

All Superspeed endpoint companion descriptor data variable definition is incorporated in the [CCyusbendpoint](#). Below variable will be initialized with zero if device is USB2.0 and set the superspeed endpoint companion descriptor values for USB3.0 device.

[SSDscLen](#)

[SSDscType](#)

[SSBytePerInterval](#)

[SSBmAttribute](#)

[SSMaxBurst](#)

NOTE : Please note that this library does not support USB3.0 bulk streams and power management.

4 CCyBulkEndPoint

CCyBulkEndPoint Class

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Header

CyUSB.h

Description

CCyBulkEndPoint is a subclass of the CCyUSBEndPoint abstract class. CCyBulkEndPoint exists to implement a bulk-specific [BeginDataXfer\(\)](#) function.

Normally, you should not need to construct any of your own instances of this class. Rather, when an instance of CyUSBDevice is created, instances of this class are automatically created for all bulk endpoints as members of that class. Two such members of CyUSBDevice are [BulkInEndPt](#) and [BulkOutEndPt](#).

Example

```
// Find bulk endpoints in the EndPoints[]
array
CCyBulkEndPoint *BulkInEpt = NULL;
CCyBulkEndPoint *BulkOutEpt = NULL;

CCyUSBDevice *USBDevice = new
    CCyUSBDevice( NULL );
int eptCount = USBDevice->EndPointCount();

for (int i=1; i<eptCount; i++) {
    bool bIn = (( USBDevice->EndPoints[i]-
>Address & 0x80) == 0x80);
    bool bBulk = ( USBDevice->EndPoints[i]-
>Attributes == 2);
    if ( bBulk && bIn) BulkInEpt =
        ( CCyBulkEndPoint *) USBDevice->EndPoints
        [ i ];
    if ( bBulk && !bIn) BulkOutEpt =
        ( CCyBulkEndPoint *) USBDevice->EndPoints
        [ i ];
}
```

4.1 BeginDataXfer()

PUCHAR CCyBulkEndPoint::BeginDataXfer(
PCHAR buf, LONG len, OVERLAPPED *ov)

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Description

BeginDataXfer is an advanced method for performing asynchronous IO. This method sets-up all the

parameters for a data transfer, initiates the transfer, and immediately returns, not waiting for the transfer to complete.

BeginDataXfer allocates a complex data structure and returns a pointer to that structure. [FinishDataXfer](#) de-allocates the structure. Therefore, it is imperative that each BeginDataXfer call have exactly one matching FinishDataXfer call.

You will usually want to use the synchronous [XferData](#) method rather than the asynchronous BeginDataXfer/WaitForXfer/FinishDataXfer approach.

Example

```
// This example assumes that the device automatically sends back,
// over its bulk-IN endpoint, any bytes that were received over its
// bulk-OUT endpoint (commonly referred to as a loopback function)

CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );

OVERLAPPED outOvLap, inOvLap;
outOvLap.hEvent = CreateEvent( NULL, false, false, L"CYUSB_OUT" );
inOvLap.hEvent = CreateEvent( NULL, false, false, L"CYUSB_IN" );

unsigned char inBuf[ 128 ];
ZeroMemory( inBuf, 128 );

unsigned char buffer[ 128 ];
LONG length = 128;

// Just to be cute, request the return data before initiating the loopback
UCHAR *inContext = USBDevice->BulkInEndPt->BeginDataXfer( inBuf, length, &inOvLap );
UCHAR *outContext = USBDevice->BulkOutEndPt->BeginDataXfer( buffer, length,
&outOvLap );

USBDevice->BulkOutEndPt->WaitForXfer( &outOvLap, 100 );
USBDevice->BulkInEndPt->WaitForXfer( &inOvLap, 100 );

USBDevice->BulkOutEndPt->FinishDataXfer( buffer, length, &outOvLap, outContext );
USBDevice->BulkInEndPt->FinishDataXfer( inBuf, length, &inOvLap, inContext );

CloseHandle( outOvLap.hEvent );
CloseHandle( inOvLap.hEvent );
```

4.2 CCyBulkEndPoint()

CCyBulkEndPoint::CCyBulkEndPoint (void)

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Description

This is the default constructor for the CCyBulkEndPoint class.

The resulting instance has most of its member variables initialized to zero. The two exceptions are [hDevice](#), which gets set to INVALID_HANDLE_VALUE and [TimeOut](#) which is set to 10,000 (10 seconds).

4.3 CCyBulkEndPoint()

CCyBulkEndPoint::CCyBulkEndPoint (HANDLE
h, USB_ENDPOINT_DESCRIPTOR
pEndPointDescriptor)

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Description

This constructor creates a legitimate CCyBulkEndPoint object through which bulk transactions can be performed on the endpoint.

The constructor is called by the library, itself, in the process of performing the [Open\(\)](#) method of the CCyUSBDevice.

You should never need to invoke this constructor. Instead, you should use the CCyBulkEndPoint objects created for you by the CCyUSBDevice class and accessed via its [Endpoints, BulkInEndPoint](#) and [BulkOutEndPoint](#) members.

5 CCyControlEndPoint

CCyControlEndPoint Class

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Header

CyUSB.h

Description

CCyControlEndPoint is a subclass of the CCyUSBEndPoint abstract class.

Instances of this class can be used to perform control transfers to the device.

Control transfers require 6 parameters that are not needed for bulk, isoc, or interrupt transfers. These are:

[Target](#)
[ReqType](#)
[Direction](#)
[ReqCode](#)
[Value](#)
[Index](#)

All USB devices have at least one Control endpoint, endpoint zero. Whenever an instance of

CCyUSBDevice successfully performs its [Open\(\)](#) function, an instance of CCyControlEndPoint called [ControlEndPt](#) is created. Normally, you will use this [ControlEndPt](#) member of CCyUSBDevice to perform all your Control endpoint data transfers.

Example

```
CCyUSBDevice *USBDevice = new
    CCyUSBDevice( NULL);

// Just for typing efficiency

CCyControlEndPoint *ept = USBDevice-
    >ControlEndPt;

ept->Target      = TGT_DEVICE;
ept->ReqType     = REQ_VENDOR;
ept->Direction   = DIR_TO_DEVICE;
ept->ReqCode     = 0x05;
ept->Value       = 1;
ept->Index       = 0;

unsigned char buf[ 512];
ZeroMemory( buf, 512);
LONG buflen = 512;

ept->XferData( buf,  buflen);
```

5.1 BeginDataXfer()

PUCHAR CCyControlEndPoint::BeginDataXfer (
PCHAR buf, LONG len, OVERLAPPED *ov)

[Previous](#) [Top](#) [Next](#)

Description

BeginDataXfer is an advanced method for performing asynchronous IO.

This method sets-up all the parameters for a data transfer, initiates the transfer, and immediately returns, not waiting for the transfer to complete.

BeginDataXfer allocates a complex data structure and returns a pointer to that structure. [FinishDataXfer](#) de-allocates the structure. Therefore, it is imperative that each BeginDataXfer call have exactly one matching FinishDataXfer call.

You will usually want to use the synchronous [XferData](#) method rather than the asynchronous BeginDataXfer/WaitForXfer/FinishDataXfer approach.

Control transfers require 6 parameters that are not needed for bulk, isoc, or interrupt transfers. These are:

[Target](#)
[ReqType](#)
[Direction](#)
[ReqCode](#)
[Value](#)
[Index](#)

Be sure to set the value of these CCyControlEndPoint members before invoking the BeginDataXfer or [XferData](#) methods.

Example

```

CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL);

// Just for typing efficiency
CCyControlEndPoint *ept = USBDevice->ControlEndPt;

OVERLAPPED OvLap;
OvLap.hEvent = CreateEvent( NULL, false, false, L"CYUSB_CTL");

unsigned char buffer[128];
LONG length = 128;
ept->Target = TGT_DEVICE;
ept->ReqType = REQ_VENDOR;
ept->Direction = DIR_TO_DEVICE;
ept->ReqCode = 0x05;
ept->Value = 1;
ept->Index = 0;

PUCHAR Context = ept->BeginDataXfer( buffer, length, &OvLap);
ept->WaitForXfer( &OvLap, 100);
ept->FinishDataXfer( buffer, length, &OvLap, Context);

CloseHandle( OvLap.hEvent);

```

5.2 CCyControlEndPoint()

CCyControlEndPoint::CCyControlEndPoint(void)

[Previous](#) [Top](#) [Next](#)

Description

This is the default constructor for the CCyControlEndPoint class.

It sets the class' data members to:

```
Target = TGT_DEVICE
```

```

ReqType    = REQ_VENDOR
Direction  = DIR_TO_DEVICE
ReqCoe     = 0
Value      = 0
Index      = 0

```

5.3 CCyControlEndPoint()

CCyControlEndPoint::CCyControlEndPoint(
HANDLE h, USB_ENDPOINT_DESCRIPTOR
pEndPtDescriptor)

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Description

This is the primary constructor for the CCyControlEndPoint class.

It sets the class' data members to:

```

Target     = TGT_DEVICE
ReqType    = REQ_VENDOR
Direction  = DIR_TO_DEVICE
ReqCoe     = 0
Value      = 0
Index      = 0

```

5.4 Direction

CTL_XFER_DIR_TYPE CCyControlEndPoint::
Direction

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Description

Direction is one of the essential parameters for a Control transfer and a data member of the CCyControlEndPoint class.

Legitimate values for the Direction member are DIR_TO_DEVICE and DIR_FROM_DEVICE.

Unlike Bulk, Interrupt and ISOC endpoints, which are uni-directional (either IN or OUT), the Control endpoint is bi-directional. It can be used to send data to the device or read data from the device. So, the direction of the transaction is one of the fundamental parameters required for each Control transfer.

Direction is automatically set to DIR_TO_DEVICE by the [Write\(\)](#) method. It is automatically set to DIR_FROM_DEVICE by the [Read\(\)](#) method.

Example

```

CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );

// Just for typing efficiency
CCyControlEndPoint *ept = USBDevice->ControlEndPt;

```



```
ept->Target      = TGT_DEVICE;
ept->ReqType      = REQ_VENDOR;
ept->Direction    = DIR_TO_DEVICE;
ept->ReqCode      = 0x05;
ept->Value        = 1;
ept->Index        = 0;

unsigned char    buf[ 512];
ZeroMemory( buf, 512);
LONG buflen = 512;

ept->XferData( buf, buflen);
```

5.5 Index

WORD CCyControlEndPoint::Index

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Description

Index is one of the essential parameters for a Control transfer and a data member of the CCyControlEndPoint class.

Index values typically depend on the specific ReqCode that is being sent in the Control transfer.

Example

```
CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL);

// Just for typing efficiency
CCyControlEndPoint *ept = USBDevice->ControlEndPt;

ept->Target      = TGT_DEVICE;
ept->ReqType      = REQ_VENDOR;
ept->Direction    = DIR_TO_DEVICE;
ept->ReqCode      = 0x05;
ept->Value        = 1;
ept->Index        = 0;

unsigned char    buf[ 512];
ZeroMemory( buf, 512);
LONG buflen = 512;

ept->XferData( buf, buflen);
```

5.6 Read()

bool CCyControlEndPoint::Read(PCHAR buf, LONG &len)

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Description

Read() sets the CyControlEndPoint [Direction](#) member to DIR_FROM_DEVICE and then calls [CCyUSBEndPoint::XferData](#)().

The **buf** parameter points to a memory buffer where the read bytes will be placed.

The **len** parameter tells how many bytes are to be read.

Returns **true** if the read operation was successful.

Passes-back the actual number of bytes transferred in the **len** parameter.

Example

```
CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );

// Just for typing efficiency
CCyControlEndPoint *ept = USBDevice->ControlEndPt;

ept->Target    = TGT_DEVICE;
ept->ReqType   = REQ_VENDOR;
ept->ReqCode   = 0x07;
ept->Value     = 1;
ept->Index     = 0;

unsigned char buf[ 512 ];
LONG bytesToRead = 64;

ept->Read( buf, bytesToRead );
```

5.7 ReqCode

UCHAR CCyControlEndPoint::ReqCode

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Description

ReqCode is one of the essential parameters for a Control transfer and a data member of the CCyControlEndPoint class.

ReqCode values indicate, to the USB chip, a particular function or command that the chip should perform. They are usually documented by the USB chip manufacturer.

Example

```
CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );

// Just for typing efficiency
CCyControlEndPoint *ept = USBDevice->ControlEndPt;

ept->Target    = TGT_DEVICE;
```

```
ept->ReqType    = REQ_VENDOR;
ept->Direction  = DIR_TO_DEVICE;
ept->ReqCode    = 0x05;
ept->Value      = 1;
ept->Index      = 0;

unsigned char   buf[ 512];
ZeroMemory( buf,  512);
LONG buflen = 512;

ept->XferData( buf,  buflen);
```

5.8 ReqType

CTL_XFER_REQ_TYPE CCyControlEndPoint::
ReqType

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Description

ReqType is one of the essential parameters for a Control transfer and a data member of the CCyControlEndPoint class.

Legitimate values for the ReqType member are **REQ_STD**, **REQ_CLASS** and **REQ_VENDOR**.

Example

```
CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL);

// Just for typing efficiency
CCyControlEndPoint *ept = USBDevice->ControlEndPt;

ept->Target      = TGT_DEVICE;
ept->ReqType     = REQ_VENDOR;
ept->Direction  = DIR_TO_DEVICE;
ept->ReqCode    = 0x05;
ept->Value      = 1;
ept->Index      = 0;

unsigned char   buf[ 512];
ZeroMemory( buf,  512);
LONG buflen = 512;

ept->XferData( buf,  buflen);
```

5.9 Target

CTL_XFER_TGT_TYPE CCyControlEndPoint::
Target

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Description

Target is one of the essential parameters for a Control transfer and a data member of the CCyControlEndPoint class.

Legitimate values for the Target member are **TGT_DEVICE**, **TGT_INTFC**, **TGT_ENDPT** and **TGT_OTHER**.

Example

```
CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );

// Just for typing efficiency
CCyControlEndPoint *ept = USBDevice->ControlEndPt;

ept->Target      = TGT_DEVICE;
ept->ReqType     = REQ_VENDOR;
ept->Direction   = DIR_TO_DEVICE;
ept->ReqCode     = 0x05;
ept->Value       = 1;
ept->Index       = 0;

unsigned char  buf[ 512];
ZeroMemory( buf, 512);
LONG buflen = 512;

ept->XferData( buf,  buflen);
```

5.10 Value

WORD CCyControlEndPoint::Value

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Description

Value is one of the essential parameters for a Control transfer and a data member of the CCyControlEndPoint class.

Values typically depend on the specific ReqCode that is being sent in the Control transfer.

Example

```
CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );

// Just for typing efficiency
CCyControlEndPoint *ept = USBDevice->ControlEndPt;

ept->Target      = TGT_DEVICE;
ept->ReqType     = REQ_VENDOR;
ept->Direction   = DIR_TO_DEVICE;
ept->ReqCode     = 0x05;
```

```
ept->Value      = 1;
ept->Index       = 0;

unsigned char  buf[ 512];
ZeroMemory( buf, 512);
LONG buflen = 512;

ept->XferData( buf,  buflen);
```

5.11 Write()

```
bool CCyControlEndPoint::Write(PCHAR buf,
LONG &len)
```

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Description

Write() sets the CyControlEndPoint [Direction](#) member to DIR_TO_DEVICE and then calls [CCyUSBEndPoint::XferData\(\)](#).

The **buf** parameter points to a memory buffer where the read bytes will be placed.

The **len** parameter tells how many bytes are to be read.

Returns **true** if the write operation was successful.

Passes-back the actual number of bytes transferred in the **len** parameter.

Example

```
CCyUSBDevice  *USBDevice = new CCyUSBDevice( NULL);

// Just for typing efficiency
CCyControlEndPoint  *ept = USBDevice->ControlEndPt;

ept->Target      = TGT_DEVICE;
ept->ReqType     = REQ_VENDOR;
ept->ReqCode     = 0x07;
ept->Value       = 1;
ept->Index       = 0;

unsigned char  buf[ 512];
ZeroMemory( buf, 512);
LONG bytesToSend = 128;

ept->Write( buf,  bytesToSend);
```

6 CCyInterruptEndPoint

CCyInterruptEndPoint Class

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Header

CyUSB.h

Description

CCyInterruptEndPoint is a subclass of the [CCyUSBEndPoint](#) abstract class.

CCyInterruptEndPoint exists to implement a interrupt-specific [BeginDataXfer\(\)](#) function.

Normally, you should not need to construct any of your own instances of this class. Rather, when an instance of [CyUSBDevice](#) is created, instances of this class are automatically created as members of that class. Two such members of CyUSBDevice are [InterruptInEndPt](#) and [InterruptOutEndPt](#).

Example

```
// Find interrupt endpoints in the EndPoints[] array
CCyInterruptEndPoint *IntInEpt = NULL;
CCyInterruptEndPoint *IntOutEpt = NULL;
CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );

int eptCount = USBDevice->EndPointCount();
for (int i=1; i<eptCount; i++) {
    bool bIn = ( ( USBDevice->EndPoints[ i ]->Address & 0x80 ) == 0x80 );
    bool bInt = ( USBDevice->EndPoints[ i ]->Attributes == 3 );

    if ( bInt && bIn ) IntInEpt = ( CCyInterruptEndPoint *) USBDevice->EndPoints[ i ];
    if ( bInt && !bIn ) IntOutEpt = ( CCyInterruptEndPoint *) USBDevice->EndPoints[ i ];
}
```

6.1 BeginDataXfer()

PUCHAR CCyInterruptEndPoint::BeginDataXfer
(PCHAR buf, LONG len, OVERLAPPED *ov)

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Description

BeginDataXfer is an advanced method for performing asynchronous IO. This method sets-up all the parameters for a data transfer, initiates the transfer, and immediately returns, not waiting for the transfer to complete.

BeginDataXfer allocates a complex data structure and returns a pointer to that structure. [FinishDataXfer](#) de-allocates the structure. Therefore, it is imperative that each BeginDataXfer call have exactly one matching FinishDataXfer call.

You will usually want to use the synchronous [XferData](#) method rather than the asynchronous BeginDataXfer/WaitForXfer/FinishDataXfer approach.

Example

```

// This example assumes that the device automatically sends back,
// over its bulk-IN endpoint, any bytes that were received over its
// bulk-OUT endpoint (commonly referred to as a loopback function)

CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );

OVERLAPPED outOvLap, inOvLap;
outOvLap.hEvent = CreateEvent( NULL, false, false, L"CYUSB_OUT" );
inOvLap.hEvent = CreateEvent( NULL, false, false, L"CYUSB_IN" );

unsigned char inBuf[128];
ZeroMemory( inBuf, 128 );

unsigned char buffer[128];
LONG length = 128;

// Just to be cute, request the return data before initiating the loopback
UCHAR *inContext = USBDevice->BulkInEndPt->BeginDataXfer( inBuf, length, &inOvLap );
UCHAR *outContext = USBDevice->BulkOutEndPt->BeginDataXfer( buffer, length,
&outOvLap );

USBDevice->BulkOutEndPt->WaitForXfer( &outOvLap, 100 );
USBDevice->BulkInEndPt->WaitForXfer( &inOvLap, 100 );

USBDevice->BulkOutEndPt->FinishDataXfer( buffer, length, &outOvLap, outContext );
USBDevice->BulkInEndPt->FinishDataXfer( inBuf, length, &inOvLap, inContext );

CloseHandle( outOvLap.hEvent );
CloseHandle( inOvLap.hEvent );

```

6.2 CCyInterruptEndPoint()

CCyInterruptEndPoint::CCyInterruptEndPoint (
void)

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Description

This is the default constructor for the CCyInterruptEndPoint class.

The resulting instance has most of its member variables initialized to zero. The two exceptions are [hDevice](#), which gets set to INVALID_HANDLE_VALUE and [TimeOut](#) which is set to 10,000 (10 seconds).

6.3 CCyInterruptEndPoint()

CCyInterruptEndPoint::CCyInterruptEndPoint(
HANDLE h, PUSB_ENDPOINT_DESCRIPTOR

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pEndPtDescriptor)

Description

This constructor creates a legitimate CCyInterruptEndPoint object through which interrupt transactions can be performed on the endpoint.

The constructor may be called by the library, itself, in the process of performing the [Open\(\)](#) method of the CCyUSBDevice.

You should never need to invoke this constructor. Instead, you should use the CCyInterruptEndPoint objects created for you by the CCyUSBDevice class and accessed via its [EndPoints](#), [InterruptInEndPt](#) and [InterruptOutEndPt](#) members.

7 CCyIsocEndPoint

CCyIsocEndPoint Class

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Header

CyUSB.h

Description

CCyIsocEndPoint is a subclass of the [CCyUSBEndPoint](#) abstract class.

CCyIsocEndPoint exists to implement a isoc-specific [BeginDataXfer\(\)](#) function.

Normally, you should not need to construct any of your own instances of this class. Rather, when an instance of [CyUSBDevice](#) is created, instances of this class are automatically created as members of that class. Two such members of CyUSBDevice are [IsocInEndPt](#) and [IsocOutEndPt](#).

NOTE: For ISOC transfers, the buffer length and the endpoint's transfers size (see SetXferSize) must be a multiple of 8 times the endpoint's MaxPktSize.

Example

```
// Find isoc endpoints in the EndPoints[] array
CCyIsocEndPoint *IsocInEpt = NULL;
CCyIsocEndPoint *IsocOutEpt = NULL;

CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );
int eptCount = USBDevice->EndPointCount();

for (int i=1; i<eptCount; i++) {
    bool bIn = ((USBDevice->EndPoints[i]->Address & 0x80)==0x80);
    bool bInt = (USBDevice->EndPoints[i]->Attributes == 1);
    if (bInt && bIn) IsocInEpt = (CCyIsocEndPoint *) USBDevice->EndPoints[i];
    if (bInt && !bIn) IsocOutEpt = (CCyIsocEndPoint *) USBDevice->EndPoints[i];
}
```


7.1 BeginDataXfer()

PUCHAR CCyIsocEndPoint::BeginDataXfer (
PCHAR buf, LONG len, OVERLAPPED *ov)

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Description

BeginDataXfer is an advanced method for performing asynchronous IO. This method sets-up all the parameters for a data transfer, initiates the transfer, and immediately returns, not waiting for the transfer to complete.

BeginDataXfer allocates a complex data structure and returns a pointer to that structure. [FinishDataXfer](#) de-allocates the structure. Therefore, it is imperative that each BeginDataXfer call have exactly one matching FinishDataXfer call.

You will usually want to use the synchronous [XferData](#) method rather than the asynchronous BeginDataXfer/WaitForXfer/FinishDataXfer approach.

NOTE: For ISOC transfers, the buffer length and the endpoint's transfers size (see SetXferSize) must be a multiple of 8 times the endpoint's MaxPktSize.

Example

```
CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );
CCyIsocEndPoint *IsoIn = USBDevice->IsocInEndPt;

if ( IsoIn ) {

    int  pkts = 16;
    LONG bufSize = IsoIn->MaxPktSize * pkts;

    PCHAR      context;
    OVERLAPPED inOvLap;
    PCHAR      buffer      = new UCHAR[ bufSize ];
    CCyIsoPktInfo *isoPktInfos = new CCyIsoPktInfo[ pkts ];

    IsoIn->SetXferSize( bufSize );

    inOvLap.hEvent = CreateEvent( NULL, false, false, NULL );

    // Begin the data transfer
    context = IsoIn->BeginDataXfer( buffer, bufSize, &inOvLap );

    // Wait for the xfer to complete.
    if ( !IsoIn->WaitForXfer( &inOvLap, 1500 ) ) {
        IsoIn->Abort();
        // Wait for the stalled command to complete
        WaitForSingleObject( inOvLap.hEvent, INFINITE );
    }

    int complete = 0;
```

```

int partial = 0;

// Must always call FinishDataXfer to release memory of contexts[i]
if (IsoIn->FinishDataXfer(buffer, bufSize, &inOvLap, context, isoPktInfos)) {

    for (int i=0; i< pkts; i++)
        if (isoPktInfos[i].Status)
            partial++;
        else
            complete++;

} else
    partial++;

delete buffer;
delete [] isoPktInfos;
}

```

7.2 CCylsocEndPoint()

CCylsocEndPoint::CCylsocEndPoint (void)

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Description

This is the default constructor for the CCylsocEndPoint class.

The resulting instance has most of its member variables initialized to zero. The two exceptions are [hDevice](#), which gets set to INVALID_HANDLE_VALUE and [TimeOut](#) which is set to 10,000 (10 seconds).

7.3 CCylsocEndPoint()

**CCylsocEndPoint::CCylsocEndPoint(HANDLE h,
PUSB_ENDPOINT_DESCRIPTOR
pEndPointDescriptor)**

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Description

This constructor creates a legitimate CCylsocEndPoint object through which isochronous transactions can be performed on the endpoint.

The constructor is called by the library, itself, in the process of performing the [Open\(\)](#) method of the CCyUSBDevice.

You should never need to invoke this constructor. Instead, you should use the CCylsocEndPoint objects created for you by the CCyUSBDevice class and accessed via its [Endpoints.IsocInEndPt](#) and [IsocOutEndPt](#) members.

7.4 CreatePktInfos()

**CCyIsoPktInfo* CCyIsocEndPoint::
CreatePktInfos**(LONG bufLen, int &packets)

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Description

The **CreatePktInfos** method is provided for convenience.

It creates an array of [CCyIsoPktInfo](#) objects to be used in calls to [XferData](#) and [FinishDataXfer](#) for Isoc endpoints.

CreatePktInfos calculates the number of isoc packets that the driver will use to transfer a data buffer of **bufLen** bytes. This number is returned in the **packets** parameter.

CreatePktInfos also dynamically constructs an array of [CCyIsoPktInfo](#) objects and returns a pointer to the first element of that array. There are **packets** elements in the array.

After using the array of CCyPktInfo objects you must delete the array of objects yourself by calling **delete []**.

Example

```
CCyUSBDevice *USBDevice = new CCyUSBDevice();
CCyIsocEndPoint *IsoIn = USBDevice->IsocInEndPt;

if (IsoIn) {

    LONG    bufSize = 4096;
    UCHAR buffer = new UCHAR[ bufSize];

    CCyIsoPktInfo *isoPktInfos;
    int          pkts;

    // Allocate the IsoPktInfo objects, and find-out how many were allocated
    isoPktInfos = IsoIn->CreatePktInfos(bufSize, pkts);

    if (IsoIn->XferData(buffer, bufSize, isoPktInfos)) {

        LONG recvdBytes = 0;

        for (int i=0; i<pkts; i++)
            if (isoPktInfos[i].Status == 0)
                recvdBytes += isoPktInfos[i].Length;

    }

    delete [] buffer;
    delete [] isoPktInfos;
}
```

}

8 CCyIsoPktInfo

CCyIsoPktInfo

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The **CCyIsoPktInfo** class is defined as:

```
class CCyIsoPktInfo {
public:
    LONG Status;
    LONG Length;
};
```

When an Isoc transfer is performed, the data buffer passed to [XferData](#) or [BeginDataXfer](#) is logically partitioned, by the driver, into multiple packets of data. The driver returns status and length information for each of those packets.

The [XferData](#) and [FinishDataXfer](#) methods of [CCyUSBEndPoint](#) accept an optional parameter that is a pointer to an array of **CCyIsoPktInfo** objects. If this parameter is not NULL, the array will be filled with the packet status and length information returned by the driver.

If the value returned in the **Status** field is zero (USBD_STATUS_SUCCESS) all the data in the packet is valid. Other non-zero values for the Status field can be found in the DDK include file, USBDI.H.

The value returned in the **Length** field indicates the number of bytes transferred in the packet. In ideal conditions, this number will be `bufferLength / numPackets` (which is the maximum capacity of each packet). However, fewer bytes could be transferred.

An array of **CCyIsoPktInfo** objects can be easily created by invoking the [CCyUSBIsocEndPoint::CreatePktInfos](#) method.

Example

```
CCyUSBDevice *USBDevice = new CCyUSBDevice();
CCyIsocEndPoint *IsoIn = USBDevice->IsocInEndPt;

if (IsoIn) {

    LONG    bufSize = 4096;
    PCHAR   buffer = new UCHAR[ bufSize];

    CCyIsoPktInfo *isoPktInfos;
    int       pkts;

    // Allocate the IsoPktInfo objects, and find-out how many were allocated
    isoPktInfos = IsoIn->CreatePktInfos( bufSize, pkts);

    if (IsoIn->XferData( buffer, bufSize, isoPktInfos)) {
```

```
LONG recvdBytes = 0;

for (int i=0; i<pkts; i++)
if (isoPktInfos[i].Status == 0)
    recvdBytes += isoPktInfos[i].Length;

}

delete [] buffer;
delete [] isoPktInfos;

}
```

9 CCyFX3Device

CCyFX3Device

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Description

Please note that this class provided APIs will work with the FX3 boot devices only, the behaviour of each API is undefined for non-boot FX3 devices.

CCyFX3Device extends the functionality of [CyUSBDevice](#) by adding method specific to download firmware to the Cypress FX3 boot devices.

Note that any CyUSBDevice object is also capable of being cast into a CyFX3Device. However, only those that represent actual FX3 boot devices will function properly when the [DownloadFw](#) methods of CyFX3Device is invoked.

If your device does not support FX3 boot loader then please use CyUSBDevice class instead of CyFX3Device class.

Example

Get instance for FX3-boot device.

```
CCyFX3Device *m_usbDevice = new CCyFX3Device();
FX3\_FIRMWARE\_LOAD\_ERROR\_CODE dwld_status = FAILED;

if(m_usbDevice->Open(0))
{
    //Check if boot loader is running.
    status = m_usbDevice->IsBootLoaderRunning();
    if(status)
    {
        dwld_status = m_usbDevice->DownloadFw("C:\Bulkloop.img", RAM) //
Download the file Bulkloop.img to RAM
    }
}
```

Get instance for FX3 non-boot device.

Refer the example code on page [CCyUSBDevice](#)

9.1 DownloadFw

[FX3_FWDWNLOAD_ERROR_CODE](#) DownloadFw(char * fileName, [Top](#) [Previous](#) [Next](#)
[FX3_FWDWNLOAD_MEDIA_TYPE](#) enMediaType)

Description

The DownlaodFw method of CCyFX3Device allow user to download firmware to various media(Ram,I2C E2PROM and SPI FLASH).

Input Parameter1 : string filename firmware file (This must be *.img file otherwise operation will fail)

Input Parameter2 : [FX3_FWDWNLOAD_MEDIA_TYPE](#) enMediaType (RAM, I2CE2PROM, SPIFLASH).

Return Value : [FX3_FWDWNLOAD_ERROR_CODE](#)

Example#1 Sample code for RAM

NOTE : This is not a ready to compile code, you can use this sample code as a guideline.

```
CCyFX3Device *m_usbDevice = new CCyFX3Device();
FX3\_FWDWNLOAD\_ERROR\_CODE dwld_status = FAILED;

if(m_usbDevice->Open(0))
{
    //Check if boot loader is running.
    status = m_usbDevice->IsBootLoaderRunning();
    if(status)
    {
        dwld_status = m_usbDevice->DownloadFw("C:\Bulkloop.img", RAM) //
Download the file Bulkloop.img to RAM
    }
}
```

Example#2 sample code for I2C E2PROM

Step 1 First Download the Boot Programmer IMG file.

The Boot Programmer.IMG file is available in the Cypress SS USBSuite installation directory \Cypress SuperSpeed USBSuite\bin\CyBootProgrammer.IMG

```
CCyFX3Device *m_usbDevice = new CCyFX3Device();
FX3\_FWDWNLOAD\_ERROR\_CODE dwld_status = FAILED;

if(m_usbDevice->Open(0))
```

```

{
    //Check if boot loader is running.
    status = m_usbDevice->IsBootLoaderRunning();
    if(status)
    {
        // Download the boot programmer IMG file to RAM first
        dwld_status = m_usbDevice->DownloadFw( "\\Cypress SuperSpeed
USBSuite\\bin\\CyBootProgrammer.IMG", RAM)
    }
}

```

Step 2 Download Main IMG file to I2C E2PROM

After downloading the boot programmer firmware, the device will be re-enumerated with different VID/PID. First time user needs to install the driver from the Cypress SuperSpeed USBSuite\\driver\\bin\\ directory for the boot programmer.

```

CCyFX3Device *m_usbDevice = new CCyFX3Device();
FX3_FIRMWARE_LOAD_ERROR_CODE dwld_status = FAILED;

if(m_usbDevice->Open(0))
{
    // Download the Bulkloop IMG file to I2C E2PROM first
    dwld_status = m_usbDevice->DownloadFw( "C: \\Bulkloop.IMG", I2CE2PROM)
}

```

Example#3 sample code for SPI FLASH

Step 1 First Download the Boot Programmer IMG file.

The Boot Programmer.IMG file is available in the Cypress SS USBSuite installation directory \\Cypress SuperSpeed USBSuite\\bin\\CyBootProgrammer.IMG

```

CCyFX3Device *m_usbDevice = new CCyFX3Device();
FX3_FIRMWARE_LOAD_ERROR_CODE dwld_status = FAILED;

if(m_usbDevice->Open(0))
{
    //Check if boot loader is running.
    status = m_usbDevice->IsBootLoaderRunning();
    if(status)
    {
        // Download the boot programmer IMG file to RAM first
        dwld_status = m_usbDevice->DownloadFw( "\\Cypress SuperSpeed
USBSuite\\bin\\CyBootProgrammer.IMG", RAM)
    }
}

```

Step 2 Download Main IMG file to SPIFLASH

After downloading the boot programmer firmware, the device will be re-enumerated with different VID/PID. First time user needs to install the driver from the Cypress SuperSpeed USBSuite\\driver\\bin\\ directory for the boot programmer.

```
CCyFX3Device *m_usbDevice = new CCyFX3Device();
FX3_FWDNLOAD_ERROR_CODE dwld_status = FAILED;

if(m_usbDevice->Open(0))
{
    // Download the Bulkloop IMG file to SPI FLASH first
    dwld_status = m_usbDevice->DownloadFw("C:\Bulkloop.IMG", SPIFLASH)
}
```

9.2 IsBootLoaderRunning

[bool IsBootLoaderRunning\(\)](#)

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Description

The IsBootLoaderRunning function sends a vendor command to check boot loader status. If boot loader is running then it will return true otherwise false.

Example

NOTE : This is not a ready to compile code, you can use this sample code as a guideline.

```
CCyFX3Device *m_usbDevice = new CCyFX3Device();
FX3_FWDNLOAD_ERROR_CODE dwld_status = FAILED;

if(m_usbDevice->Open(0))
{
    //Check if boot loader is running.
    status = m_usbDevice->IsBootLoaderRunning();
    if(status)
    {
        dwld_status = m_usbDevice->DownloadFw("C:\Bulkloop.img", RAM) //
        Download the file Bulkloop.img to RAM
    }
}
```

10 CCyUSBDevice

CCyUSBDevice Class

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Header

CyUSB.h

Description

The CCyUSBDevice class is the primary entry point into the library. All the functionality of the library should be accessed via an instance of CCyUSBDevice.

Create an instance of CCyUSBDevice using the **new** keyword.

An instance of CCyUSBDevice is aware of all the USB devices that are attached to the USB driver and

can selectively communicate with any ONE of them by using the [Open\(\)](#) method.

Example

```
// Look for a device having VID = 0547, PID = 1002

CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL); // Create an instance of
CCyUSBDevice

int devices = USBDevice->DeviceCount();

int vID, pID;
int d = 0;

do {
    USBDevice->Open( d); // Open automatically calls Close() if necessary
    vID = USBDevice->VendorID;
    pID = USBDevice->ProductID;
    d++;
} while ((d < devices) && (vID != 0x0547) && (pID != 0x1002));
```

10.1 AltIntfc()

UCHAR CCyUSBDevice::AltIntfc(void)

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Description

This function returns the current alternate interface setting for the device.

A return value of 255 (0xFF) indicates that the driver failed to return the current alternate interface setting.

Call [SetAltIntfc\(\)](#) to select a different alternate interface (changing the AltSetting).

Call [AltIntfcCount\(\)](#) to find-out how many alternate interfaces are exposed by the device.

10.2 AltIntfcCount()

UCHAR CCyUSBDevice::AltIntfcCount(void)

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Description

This function returns the number of alternate interfaces exposed by the device.

The primary interface (AltSetting == 0) is not counted as an alternate interface.

Example

A return value of 2 means that there are 2 alternate interfaces, in addition to the primary interface. Legitimate parameter values for calls to [SetAltIntfc\(\)](#) would then be 0, 1 and 2.

10.3 bHighSpeed

bool CCyUSBDevice::bHighSpeed

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Description

bHighSpeed indicates whether or not the device is a high speed USB device.

If the USB device represented is a high speed device, **bHighSpeed** will be **true**. Otherwise, **bHighSpeed** will be **false**.

This property is only valid on systems running Windows 2K SP4 (and later) or WindowsXP. On earlier versions of Windows, a high speed device will not be detected as such and **bHighSpeed** will incorrectly have a value of **false**.

Example

```
CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );

if ( USBDevice->bHighSpeed) {
    // Do something
}
```

10.4 bSuperSpeed

bool CCyUSBDevice::bSuperSpeed

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Description

bSuperSpeed indicates whether or not the device is a Super speed USB device.

If the USB device represented is a super speed device, **bSuperSpeed** will be **true**. Otherwise, **bSuperSpeed** will be **false**.

Example

```
CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );

if ( USBDevice->bSuperSpeed) {

    // Do something
}
```

10.5 BcdDevice

USHORT CCyUSBDevice::BcdDevice

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Description

This data member contains the value of the **bcdDevice** member from the device's USB descriptor

structure.

10.6 BcdUSB

USHORT CCyUSBDevice::BcdUSB

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Description

This data member contains the value of the **bcdUSB** member from the device's USB descriptor structure.

10.7 BulkInEndPoint

CCyBulkEndPoint* CCyUSBDevice::
BulkInEndPoint

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Description

BulkInEndPoint is a pointer to an object representing the first BULK IN endpoint enumerated for the selected interface.

The selected interface might expose additional BULK IN endpoints. To discern this, one would need to traverse the [EndPoints](#) array, checking the [Attributes](#) and [Address](#) members of each [CCyUSBEndPoint](#) object referenced in the array.

If no BULK IN endpoints were enumerated by the device, BulkInEndPoint will be set to NULL.

Example

```
// Find a second bulk IN endpoint in the EndPoints[] array

CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );

CCyBulkEndPoint *BulkIn2 = NULL;

int eptCount = USBDevice->EndPointCount();

for (int i=1; i<eptCount; i++) {
    bool bIn = USBDevice->EndPoints[i]->bIn;
    bool bBulk = ( USBDevice->EndPoints[i]->Attributes == 2 );

    if ( bBulk && bIn ) BulkIn2 = ( CCyBulkEndPoint *) USBDevice->EndPoints[ i ];
    if ( BulkIn2 == USBDevice->BulkInEndPoint ) BulkIn2 = NULL;
}
```

10.8 BulkOutEndPoint

CCyBulkEndPoint* CCyUSBDevice::
BulkOutEndPoint

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Description

BulkOutEndPt is a pointer to an object representing the first BULK OUT endpoint enumerated for the selected interface.

The selected interface might expose additional BULK OUT endpoints. To discern this, one would need to traverse the [EndPoints](#) array, checking the [Attributes](#) and [Address](#) members of each [CCyUSBEndPoint](#) object referenced in the array.

If no BULK OUT endpoints were enumerated by the device, BulkOutEndPt will be set to NULL.

Example

```
// Find a second bulk OUT endpoint in the EndPoints[] array
CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );

CCyBulkEndPoint *BulkOut2 = NULL;

int eptCount = USBDevice->EndPointCount();

for (int i=1; i<eptCount; i++) {
    bool bIn = (( USBDevice->EndPoints[ i ]->Address & 0x80)==0x80);
    bool bBulk = ( USBDevice->EndPoints[ i ]->Attributes == 2);

    if ( bBulk && !bIn) BulkOut2 = ( CCyBulkEndPoint *) USBDevice->EndPoints[ i ];
    if ( BulkOut2 == USBDevice->BulkOutEndPt) BulkOut2 = NULL;
}
```

10.9 CCyUSBDevice()

CCyUSBDevice::CCyUSBDevice(HANDLE hnd =
NULL, GUID guid = CYUSBDRV_GUID)

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Description

This is the constructor for the CCyUSBDevice class.

It registers the window of *hnd* to receive USB Plug and Play messages when devices are connected or disconnected to/from the driver.

The object created serves as the programming interface to the driver whose GUID is passed in the *guid* parameter.

The constructor initializes the class members and then calls the [Open](#)(0) method to open the first device that is attached to the driver.

Parameters

hnd

hnd is a handle to the application's main window (the window whose WndProc function will process USB PnP events).

If you are building a console application or do not want your window to receive PnP events, you may omit the *hnd* parameter.

guid

guid is the GUID defined in the [Strings] section of the CyUsb.inf file (or your own named copy). If this parameter is omitted, *guid* defaults to CYUSBDRV_GUID.

If you do not want to register for PnP events, but you do want to pass your own driver GUID to the constructor, you will need to pass NULL as the *hnd* parameter.

Example 1

NOTE: This is not a ready to compile sample code, you can use it as a guideline.

```
void MainForm::FormCreate( Object *Sender)
{
    USBDevice = new CCyUSBDevice( Handle);
    CurrentEndPt = USBDevice->ControlEndPt;
}

// Overload MainForm's WndProc method to watch for PnP messages
// Requires #include <dbt.h>
void MainForm::WndProc( Message &Message)
{

    if ( Message.Msg == WM_DEVICECHANGE) {

        // Tracks DBT_DEVICEARRIVAL followed by DBT_DEVNODES_CHANGED
        if ( Message.WParam == DBT_DEVICEARRIVAL) {
            bPnP_Arrival = true;
            bPnP_DevNodeChange = false;
        }

        // Tracks DBT_DEVNODES_CHANGED followed by DBT_DEVICEREMOVECOMPLETE
        if ( Message.WParam == DBT_DEVNODES_CHANGED) {
            bPnP_DevNodeChange = true;
            bPnP_Removal = false;
        }

        if ( Message.WParam == DBT_DEVICEREMOVECOMPLETE) {
            bPnP_Removal = true;

            PDEV_BROADCAST_HDR bcastHdr = ( PDEV_BROADCAST_HDR) Message.LParam;
            if ( bcastHdr->dbch_devicetype == DBT_DEVTYP_HANDLE) {

                PDEV_BROADCAST_HANDLE pDev = ( PDEV_BROADCAST_HANDLE) Message.LParam;
                if ( pDev->dbch_handle == USBDevice->DeviceHandle())
```

```

        USBDevice->Close();

    }
}

// If DBT_DEVNODES_CHANGED followed by DBT_DEVICEREMOVECOMPLETE
if ( bPnP_Removal && bPnP_DevNodeChange) {
    Sleep(10);
    DisplayDevices();
    bPnP_Removal = false;
    bPnP_DevNodeChange = false;
}

// If DBT_DEVICEARRIVAL followed by DBT_DEVNODES_CHANGED
if ( bPnP_DevNodeChange && bPnP_Arrival) {
    DisplayDevices();
    bPnP_Arrival = false;
    bPnP_DevNodeChange = false;
}

}

Form::WndProc( Message) ;

}

```

Example 2

In the *CyUSB.inf* file :

```

[Strings]
CyUSB.GUID="{BE18AA60-7F6A-11d4-97DD-00010229B959}"

```

In some application source (.cpp) file:

```

GUID guid = {0xBE18AA60, 0x7F6A, 0x11D4, 0x97, 0xDD, 0x00, 0x01, 0x02,
0x29, 0xB9, 0x59};
CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL, guid); // Does not register for PnP
events

```

10.10 ~CCyUSBDevice()

CCyUSBDevice::~CCyUSBDevice(void)

[Previous](#) [Top](#) [Next](#)

Description

This is the destructor for the CCyUSBDevice class. It calls the [Close\(\)](#) method in order to properly close any open handle to the driver and to deallocate dynamically allocated members of the class.

10.11 Close()

void CCyUSBDevice:: Close(void)

[Previous](#) [Top](#) [Next](#)

Description

The Close method closes the handle to the CyUSB driver, if one is open.

Dynamically allocated members of the CCyUSBDevice class are de-allocated. And, all "shortcut" pointers to elements of the [EndPoints](#) array (ControlEndPt, IsoIn/OutEndPt, BulkIn/OutEndPt, InterruptIn/OutEndPt) are reset to NULL.

Close() is called automatically by the [~CCyUSBDevice\(\)](#) destructor. It is also called automatically by the [Open\(\)](#) method, if a handle to the driver is already open.

Therefore, it is rare that you would ever need to call Close() explicitly (though doing so would not cause any problems).

10.12 Config()

UCHAR CCyUSBDevice::Config(void)

[Previous](#) [Top](#) [Next](#)

Description

This method returns the current configuration index for the device.

Most devices only expose a single configuration at one time. So, this method should almost always return zero.

10.13 ConfigAttrib

UCHAR CCyUSBDevice::ConfigAttrib

[Previous](#) [Top](#) [Next](#)

Description

This data member contains the value of the **bmAttributes** field from the device's current configuration descriptor.

10.14 ConfigCount()

UCHAR CCyUSBDevice::ConfigCount(void)

[Previous](#) [Top](#) [Next](#)

Description

This function returns the number of configurations reported by the device in the **bNumConfigurations** field of its device descriptor.

10.15 ConfigValue

UCHAR CCyUSBDevice::ConfigValue

[Previous](#) [Top](#) [Next](#)

Description

This data member contains the value of the **bConfigurationValue** field from the device's current configuration descriptor.

10.16 ControlEndPoint

**CCyControlEndPoint* CCyUSBDevice::
ControlEndPoint**

[Previous](#) [Top](#) [Next](#)

Description

ControlEndPoint points to an object representing the primary Control endpoint, endpoint 0.

ControlEndPoint should always be the same value as [EndPoints](#)[0].

Before calling the [XferData](#)() method for ControlEndPoint, you should set the object's control properties.

Example

```
CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );

// Just for typing efficiency
CCyControlEndPoint *ept = USBDevice->ControlEndPoint;

ept->Target      = TGT_DEVICE;
ept->ReqType     = REQ_VENDOR;
ept->Direction   = DIR_TO_DEVICE;
ept->ReqCode     = 0x05;
ept->Value       = 1;
ept->Index       = 0;

unsigned char  buf[ 512 ];
ZeroMemory( buf, 512 );
LONG buflen = 512;

ept->XferData( buf,  buflen );
```

10.17 DevClass

UCHAR CCyUSBDevice::DevClass

[Previous](#) [Top](#) [Next](#)

Description

This data member contains the value of the **bDeviceClass** field from the open device's Device Descriptor.

10.18 DeviceCount()

UCHAR CCyUSBDevice::DeviceCount(void)

[Previous](#) [Top](#) [Next](#)

Description

Returns the number of devices attached to the USB driver.

The value returned can be used to discern legitimate parameters for the [Open\(\)](#) method.

Example

```
// Look for a device having VID = 0547, PID = 1002

CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );
int devices = USBDevice->DeviceCount( );

int vID, pID;

int d = 0;
do {
    USBDevice->Open( d );    // Open automatically calls Close( ) if necessary
    vID = USBDevice->VendorID;
    pID = USBDevice->ProductID;
    d++;
} while ( (d < devices ) && ( vID != 0x0547) && ( pID != 0x1002) );
```

10.19 DeviceHandle()

HANDLE CCyUSBDevice::DeviceHandle(void)

[Previous](#) [Top](#) [Next](#)

Description

Returns the handle to the driver if the CCyUSBDevice is opened to a connected USB device. If no device is currently open, DeviceHandle() returns INVALID_HANDLE_VALUE.

10.20 DeviceName

**char CCyUSBDevice::DeviceName
[USB_STRING_MAXLEN]**

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Description

DeviceName is an array of characters containing the product string indicated by the device descriptor's iProduct field.

10.21 DevProtocol

UCHAR CCyUSBDevice::DevProtocol

[Previous](#) [Top](#) [Next](#)

Description

This data member contains the value of the **bDeviceProtocol** field from the open device's Device Descriptor.

10.22 DevSubClass

UCHAR CCyUSBDevice::DevSubClass

[Previous](#) [Top](#) [Next](#)

Description

This data member contains the value of the **bDeviceSubClass** field from the open device's Device Descriptor.

10.23 DriverGUID()

GUID CCyUSBDevice::DriverGUID(void)

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Description

Returns the Global Unique Identifier of the USB driver attached to the CCyUSBDevice.

See also: [CCyUSBDevice\(\)](#)

10.24 DriverVersion

ULONG CCyUSBDevice::DriverVersion

[Previous](#) [Top](#) [Next](#)

Description

DriverVersion contains 4 bytes representing the version of the driver that is attached to the CCyUSBDevice.

10.25 EndPointCount()

UCHAR CCyUSBDevice::EndPointCount(void)

[Previous](#) [Top](#) [Next](#)

Description

Returns the number of endpoints exposed by the currently selected interface (or Alternate Interface) plus 1.

The default Control endpoint (endpoint 0) is included in the count.

Example

```
// Find bulk endpoints in the EndPoints[] array
CCyBulkEndPoint *BulkInEpt = NULL;
CCyBulkEndPoint *BulkOutEpt = NULL;

CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );
int eptCount = USBDevice->EndPointCount();

// Skip EndPoints[0], which we know is the control endpoint
for (int i=1; i<eptCount; i++) {
    bool bIn = ((USBDevice->EndPoints[i]->Address & 0x80)==0x80);
    bool bBulk = (USBDevice->EndPoints[i]->Attributes == 2);
```

```

if ( bBulk && bIn) BulkInEpt  = ( CCyBulkEndPoint *)  USBDevice->EndPoints[i];
if ( bBulk && !bIn) BulkOutEpt = ( CCyBulkEndPoint *)  USBDevice->EndPoints[i];
}

```

10.26 EndPointOf()

CCyUSBEndPoint* CCyUSBDevice::EndPointOf(
UCHAR addr)

[Previous](#) [Top](#) [Next](#)

Description

Returns a pointer to the endpoint object in the EndPoints array whose [Address](#) property is equal to **addr**.

Returns NULL If no endpoint with Address = **addr** is found.

Example

```

UCHAR eptAddr = 0x82;
CCyUSBDevice *USBDevice = new    CCyUSBDevice( NULL);
CCyUSBEndPoint *EndPt =  USBDevice->EndPointOf( eptAddr);
if ( EndPt)  EndPt->Reset(  );

```

10.27 EndPoints

CCyUSBEndPoint CCyUSBDevice::EndPoints**

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Description

EndPoints is a list of up to MAX_ENDPTS (16) pointers to endpoint objects.

The objects pointed to represent all the USB endpoints reported for the current USB interface/Alt interface of the device.

EndPoints[0] always contains a pointer to a [CCyControlEndPoint](#) representing the primary Control Endpoint (endpoint 0) of the device.

Unused entries in EndPoints are set to NULL.

Use [EndPointCount\(\)](#) to find-out how many entries in EndPoints are valid.

EndPoints is re-initialized each time [Open\(\)](#) or [SetAltIntfc\(\)](#) is called.

NOTE:

[CCyUSBEndPoint](#) is an abstract class, having a pure virtual function [BeginDataXfer\(\)](#).

The objects pointed to by EndPoints** are, therefore, actually instances of [CCyControlEndPoint](#), [CCyBulkEndPoint](#),

[CCyIsocEndPoint](#) or [CCyInterruptEndPoint](#).

Calling `EndPoints[n]->XferData()` automatically results in the correct `XferData()` function being invoked.

Example

```
// Count the bulk-in endpoints

CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );

int epCnt = USBDevice->EndPointCount();

bool bBulk, bIn;
int blkInCnt = 0;

for (int e=0; e<epCnt; e++) {
    bBulk = ( USBDevice->EndPoints[ e]->Attributes == 2 );
    bIn    = ( ( USBDevice->EndPoints[ e]->Address & 0x80 ) == 0x80 );

    if ( bBulk && bIn ) blkInCnt++;
}
```

10.28 FriendlyName

```
char CCyUSBDevice::FriendlyName
[USB_STRING_MAXLEN]
```

[Previous](#) [Top](#) [Next](#)

Description

FriendlyName is an array of characters containing the device description string for the open device which was provided by the driver's .inf file.

10.29 GetDeviceDescriptor()

```
void CCyUSBDevice::GetDeviceDescriptor(
PUSB_DEVICE_DESCRIPTOR descr)
```

[Previous](#) [Top](#) [Next](#)

Description

This function copies the current device's device descriptor into the memory pointed to by **descr** .

10.30 GetBosDescriptor()

```
bool CCyUSBDevice::GetBosDescriptor(
PUSB_BOS_DESCRIPTOR descr)
```

[Top](#) [Previous](#) [Next](#)

Description

This function copies the device's Binary device object store descriptor into memory pointed to by **descr** . This function will return BOS descriptor only for usb3.0 device.

Return Value

True Operation successful.

False Operation failed (Device is not a usb3.0)

10.31 GetBosUSB20DeviceExtensionDescriptor()

```
bool CCyUSBDevice::
GetBosUSB20DeviceExtensionDescriptor(
PUSB_BOS_USB20_DEVICE_EXTENSION descr)
```

[Previous](#) [Top](#) [Next](#)

Description

This function copies the device's USB2.0 device extension descriptor into **descr**. This function will return USB2.0 Device extension descriptor only for usb3.0 device.

Return Value

True Operation successful.

False Operation failed (Device is not a usb3.0)

10.32 GetBosContainerIDDescriptor()

```
bool CCyUSBDevice::
GetBosContainerIDDescriptor(
PUSB_BOS_CONTAINER_ID descr)
```

[Previous](#) [Top](#) [Next](#)

Description

This function copies the device's Container ID descriptor into **descr**. This function will return Container ID only for USB3.0 device otherwise it will return false as a return value.

Return Value

True Operation successful.

False Operation failed (Device is not a usb3.0)

10.33 GetBosSSCapabilityDescriptor()

```
bool CCyUSBDevice::
GetBosSSCapabilityDescriptor(
PUSB_BOS_SS_DEVICE_CAPABILITY descr)
```

[Previous](#) [Top](#) [Next](#)

Description

This function copies the device's super speed capability descriptor into **descr**. This function will return super speed capability descriptor only for USB3.0 device.

Return Value

True Operation successful.

False Operation failed (Device is not a USB3.0)

10.34 GetConfigDescriptor()

```
void CCyUSBDevice::GetConfigDescriptor(
PUSB_CONFIGURATION_DESCRIPTOR descr)
```

[Previous](#) [Top](#) [Next](#)

Description

This function copies the current device's configuration descriptor into the memory pointed to by **descr**.

10.35 GetIntfcDescriptor()

```
void CCyUSBDevice::GetIntfcDescriptor(
PUSB_INTERFACE_DESCRIPTOR descr)
```

[Previous](#) [Top](#) [Next](#)

Description

This function copies the currently selected interface descriptor into the memory pointed to by **descr**.

10.36 GetUSBConfig()

```
CCyUSBConfig CCyUSBDevice::GetUSBConfig(
int index)
```

[Previous](#) [Top](#) [Next](#)

Description

This function returns a copy of the [CCyUSBConfig](#) object indicated by **index**.

The **index** parameter must be less than [CCyUSBDevice::ConfigCount\(\)](#).

Example

```
// This code lists all the endpoints reported
// for all the interfaces reported
// for all the configurations reported
// by the device.
```

```
CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );
```

```
char buf[ 512 ];
string s;
```

```
for (int c=0; c<USBDevice->ConfigCount(); c++)
{
    CCyUSBConfig cfg = USBDevice->GetUSBConfig( c );
```

```
    sprintf_s( buf, "bLength: 0x%x\n", cfg.bLength ); s.append( buf );
    sprintf_s( buf, "bDescriptorType: %d\n", cfg.bDescriptorType ); s.append( buf );
    sprintf_s( buf, "wTotalLength: %d ( 0x%x )\n", cfg.wTotalLength, cfg.wTotalLength );
    s.append( buf );
    sprintf_s( buf, "bNumInterfaces: %d\n", cfg.bNumInterfaces ); s.append( buf );
    sprintf_s( buf, "bConfigurationValue: %d\n", cfg.bConfigurationValue ); s.append( buf );
```

```

sprintf_s(buf, "iConfiguration: %d\n", cfg.iConfiguration); s.append(buf);
sprintf_s(buf, "bmAttributes: 0x%x\n", cfg.bmAttributes); s.append(buf);
sprintf_s(buf, "MaxPower: %d\n", cfg.MaxPower); s.append(buf);
s.append("*****\n");
cout<<s;
s.clear();

for (int i=0; i<cfg.AltInterfaces; i++)
{
    CCyUSBInterface *ifc = cfg.Interfaces[i];
    sprintf_s(buf, "Interface Descriptor: %d\n", (i+1)); s.append(buf);
    sprintf_s(buf, "-----\n"); s.append(buf);
    sprintf_s(buf, "bLength: 0x%x\n", ifc->bLength); s.append(buf);
    sprintf_s(buf, "bDescriptorType: %d\n", ifc->bDescriptorType); s.append(buf);
    sprintf_s(buf, "bInterfaceNumber: %d\n", ifc->bInterfaceNumber); s.append(buf);
    sprintf_s(buf, "bAlternateSetting: %d\n", ifc->bAlternateSetting); s.append(buf);
    sprintf_s(buf, "bNumEndpoints: %d\n", ifc->bNumEndpoints); s.append(buf);
    sprintf_s(buf, "bInterfaceClass: %d\n", ifc->bInterfaceClass); s.append(buf);
    sprintf_s(buf, "*****\n"); s.append(buf);
    cout<<s;
    s.clear();

    for (int e=0; e<ifc->bNumEndpoints; e++)
    {
        CCyUSBEndPoint *ept = ifc->EndPoints[e];
        sprintf_s(buf, "EndPoint Descriptor: %d\n", (e+1)); s.append(buf);
        sprintf_s(buf, "-----\n"); s.append(buf);
        sprintf_s(buf, "bLength: 0x%x\n", ept->DscLen); s.append(buf);
        sprintf_s(buf, "bDescriptorType: %d\n", ept->DscType); s.append(buf);
        sprintf_s(buf, "bEndpointAddress: 0x%x\n", ept->Address); s.append(buf);
        sprintf_s(buf, "bmAttributes: 0x%x\n", ept->Attributes); s.append(buf);
        sprintf_s(buf, "wMaxPacketSize: %d\n", ept->MaxPktSize); s.append(buf);
        sprintf_s(buf, "bInterval: %d\n", ept->Interval); s.append(buf);
        s.append("*****\n");
        cout<<s;
        s.clear();
    }
}
}

```

10.37 Interface()

UCHAR CCyUSBDevice::Interface(void)

[Previous](#) [Top](#) [Next](#)

Description

Interface returns the index of the currently selected device interface.

Because Windows always represents different reported interfaces as separate devices, the CyUSB driver is only shown devices that have a single interface. This causes the Interface() method to always return zero.

10.38 InterruptInEndPoint

CCyInterruptEndPoint* CCyUSBDevice::

[Previous](#) [Top](#) [Next](#)

InterruptInEndPt

Description

InterruptInEndPt is a pointer to an object representing the first INTERRUPT IN endpoint enumerated for the selected interface.

The selected interface might expose additional INTERRUPT IN endpoints. To discern this, one would need to traverse the [EndPoints](#) array, checking the [Attributes](#) and [Address](#) members of each [CCyUSBEndPoint](#) object referenced in the array.

If no INTERRUPT IN endpoints were enumerated by the device, InterruptInEndPt will be set to NULL.

Example

```
// Find a second Interrupt IN endpoint in the EndPoints[] array

CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );

CCyInterruptEndPoint *IntIn2 = NULL;
int eptCount = USBDevice->EndPointCount();

for (int i=1; i<eptCount; i++) {
    bool bIn = ((USBDevice->EndPoints[ i ]->Address & 0x80) == 0x80);
    bool bInt = (USBDevice->EndPoints[ i ]->Attributes == 3);

    if (bInt && bIn) IntIn2 = (CCyInterruptEndPoint *) USBDevice->EndPoints[ i ];
    if (IntIn2 == USBDevice->InterruptInEndPt) IntIn2 = NULL;
}
```

10.39 InterruptOutEndPt

CCyInterruptEndPoint* CCyUSBDevice:: InterruptOutEndPt

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Description

InterruptOutEndPt is a pointer to an object representing the first INTERRUPT OUT endpoint enumerated for the selected interface.

The selected interface might expose additional INTERRUPT OUT endpoints. To discern this, one would need to traverse the [EndPoints](#) array, checking the [Attributes](#) and [Address](#) members of each [CCyUSBEndPoint](#) object referenced in the array.

If no INTERRUPT OUT endpoints were enumerated by the device, InterruptOutEndPt will be set to NULL.

Example

```
// Find a second Interrupt OUT endpoint in the EndPoints[] array

CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );
```



```
CCyInterruptEndPoint *IntOut2 = NULL;
int eptCount = USBDevice->EndPointCount();

for (int i=1; i<eptCount; i++) {
    bool bIn = ((USBDevice->EndPoints[i]->Address & 0x80)==0x80);
    bool bInt = (USBDevice->EndPoints[i]->Attributes == 3);

    if (bInt && !bIn) IntOut2 = (CCyInterruptEndPoint *) USBDevice->EndPoints[i];
    if (IntOut2 == USBDevice->InterruptInEndPt) IntOut2 = NULL;
}
```

10.40 IntfcClass

UCHAR CCyUSBDevice::IntfcClass

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Description

This data member contains the **bInterfaceClass** field from the currently selected interface's interface descriptor.

10.41 IntfcCount()

UCHAR CCyUSBDevice::IntfcCount(void)

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Description

Returns the **bNumInterfaces** field of the current device's configuration descriptor.

This number does not include alternate interfaces that might be part of the current configuration.

Because Windows always represents different reported interfaces as separate devices, the CyUSB driver is only shown devices that have a single interface. This causes the **IntfcCount()** method to always return 1.

10.42 IntfcProtocol

UCHAR CCyUSBDevice::IntfcProtocol

[Previous](#) [Top](#) [Next](#)

Description

This data member contains the **bInterfaceProtocol** field from the currently selected interface's interface descriptor.

10.43 IntfcSubClass

UCHAR CCyUSBDevice::IntfcSubClass

[Previous](#) [Top](#) [Next](#)

Description

This data member contains the **bInterfaceSubClass** field from the currently selected interface's interface descriptor.

10.44 IsocInEndPt

CCyIsocEndPoint* CCyUSBDevice::IsocInEndPt

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Description

IsocInEndPt is a pointer to an object representing the first ISOCHRONOUS IN endpoint enumerated for the selected interface.

The selected interface might expose additional ISOCHRONOUS IN endpoints. To discern this, one would need to traverse the [EndPoints](#) array, checking the [Attributes](#) and [Address](#) members of each [CCyUSBEndPoint](#) object referenced in the array.

If no ISOCHRONOUS IN endpoints were enumerated by the device, IsocInEndPt will be set to NULL.

Example

```
// Find a second Isoc IN endpoint in the EndPoints[] array

CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );

CCyIsocEndPoint *IsocIn2 = NULL;

int eptCount = USBDevice->EndPointCount();

for (int i=1; i<eptCount; i++) {
    bool bIn = ((USBDevice->EndPoints[i]->Address & 0x80)==0x80);
    bool bIsoc = (USBDevice->EndPoints[i]->Attributes == 1);

    if (bIsoc && bIn) IsocIn2 = (CCyIsocEndPoint *) USBDevice->EndPoints[i];
    if (IsocIn2 == USBDevice->IsocInEndPt) IsocIn2 = NULL;
}
```

10.45 IsocOutEndPt

**CCyIsocEndPoint* CCyUSBDevice::
IsocOutEndPt**

[Previous](#) [Top](#) [Next](#)

Description

IsocOutEndPt is a pointer to an object representing the first ISOCHRONOUS OUT endpoint enumerated for the selected interface.

The selected interface might expose additional ISOCHRONOUS OUT endpoints. To discern this, one would need to traverse the [EndPoints](#) array, checking the [Attributes](#) and [Address](#) members of each [CCyUSBEndPoint](#) object referenced in the array.

If no ISOCHRONOUS OUT endpoints were enumerated by the device, IsocOutEndPt will be set to NULL.

Example

```

// Find a second Isoc OUT endpoint in the EndPoints[] array
CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL);

CCyIsocEndPoint *IsocOut2 = NULL;
int eptCount = USBDevice->EndPointCount();

for (int i=1; i<eptCount; i++) {
bool bIn = (( USBDevice->EndPoints[i]->Address & 0x80)==0x80);
bool bIsoc = ( USBDevice->EndPoints[i]->Attributes == 1);

if ( bIsoc && !bIn) IsocOut2 = ( CCyIsocEndPoint *) USBDevice->EndPoints[i];
if ( IsocOut2 == USBDevice->IsocOutEndPt) IsocOut2 = NULL;
}

```

10.46 IsOpen()

bool CCyUSBDevice::IsOpen(void)

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Description

IsOpen() returns **true** if CCyUSBDevice object has a valid handle to a device attached to the CyUSB driver.

When IsOpen() is **true** , the CCyUSBDevice object is ready to perform IO operations via its [EndPoints](#) members.

10.47 Manufacturer

**wchar_t CCyUSBDevice::Manufacturer
[USB_STRING_MAXLEN]**

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Description

Manufacturer is an array of wide characters containing the manufacturer string indicated by the device descriptor's **iManufacturer** field.

10.48 MaxPacketSize

UCHAR CCyUSBDevice::MaxPacketSize

[Previous](#) [Top](#) [Next](#)

Description

This data member contains the value of the **bMaxPacketSize0** field from the open device's Device Descriptor structure.

10.49 MaxPower

UCHAR CCyUSBDevice::MaxPower

[Previous](#) [Top](#) [Next](#)

Description

This data member contains the value of the **MaxPower** field of the open device's selected configuration descriptor.

10.50 NtStatus

ULONG CCyUSBDevice::NtStatus

[Previous](#) [Top](#) [Next](#)

Description

The NtStatus member contains the NTSTATUS returned by the driver for the most recent call to a non-endpoint IO method (SetAltIntfc, Open, Reset, etc.)

More often, you will want to access the [NtStatus](#) member of the CCyUSBEndPoint objects.

10.51 Open()

bool CCyUSBDevice::Open(UCHAR dev)

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Description

The Open() method is one of the main workhorses of the library.

When Open() is called, it first checks to see if the CCyUSBDevice object is already opened to one of the attached devices. If so, it calls [Close\(\)](#), then proceeds.

Open() calls [DeviceCount\(\)](#) to determine how many devices are attached to the USB driver.

Open() creates a valid handle to the device driver, through which all future access is accomplished by the library methods.

Open() calls the driver to gather the device, interface, endpoint and string descriptors.

Open() results in the [EndPoints](#) array getting properly initialized to pointers of the default interface's endpoints.

Open() initializes the [ControlEndPt](#) member to point to an instance of [CCyControlEndPoint](#) that represents the device's endpoint zero.

Open() initializes the [BulkInEndPt](#) member to point to an instance of CCyBulkEndPoint representing the first Bulk-IN endpoint that was found. Similarly, the [BulkOutEndPt](#), [InterruptInEndPt](#), [InterruptOutEndPt](#), [IsocInEndPt](#) and [IsocOutEndPt](#) members are initialized to point to instances of their respective endpoint classes if such endpoints were found.

After Open() returns **true**, all the properties and methods of CCyUSBDevice are legitimate.

Open() returns **false** if it is unsuccessful in accomplishing the above activities. However, if Open() was able to obtain a valid handle to the driver, the handle will remain valid even after Open() returns **false**. (When open fails, it does not automatically call Close().) This allows the programmer to call the [Reset\(\)](#) or [ReConnect\(\)](#) methods and then call Open() again. Sometimes this will allow a device to open properly.

Example

```
CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );
```

```
// Attempt to open device #0
if ( USBDevice->DeviceCount()  && ! USBDevice->Open( 0) ) {
    USBDevice->Reset();
    USBDevice->Open( 0);
}

if ( ! USBDevice->IsOpen() ) return false;
```

10.52 PowerState()

UCHAR CCyUSBDevice::PowerState(void)

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This function is no longer supported. It is available to keep backward compatibility with legacy library and application.

10.53 Product

**wchar_t CCyUSBDevice::Product
[USB_STRING_MAXLEN]**

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Description

Product is an array of wide characters containing the product string indicated by the device descriptor's **iProduct** field.

10.54 ProductID

USHORT CCyUSBDevice::ProductID

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Description

This data member contains the value of idProduct from the open device's Device Descriptor structure.

Example

```
// Look for a device having VID = 0547, PID = 1002

CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL); // Create an instance of
CCyUSBDevice
int  devices = USBDevice->DeviceCount();
int  vID, pID;
int  d = 0;

do {
    USBDevice->Open( d);      // Open automatically calls Close() if necessary
    vID = USBDevice->VendorID;
    pID = USBDevice->ProductID;
    d++;
} while ((d < devices) && (vID != 0x0547) && (pID != 0x1002));
```

10.55 ReConnect()

```
bool CCyUSBDevice::ReConnect(void)
```

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Description

ReConnect() calls the USB device driver to cause the currently open USB device to be logically disconnected from the USB bus and re-enumerated.

10.56 Reset()

```
bool CCyUSBDevice::Reset( void)
```

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Description

Reset() calls the USB device driver to cause the currently open USB device to be reset.

This call causes the device to return to its initial power-on configuration.

10.57 Resume()

```
bool CCyUSBDevice::Resume(void)
```

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The Resume() method sets the device power state to D0 (Full on).

The method returns true if successful and false if the command failed.

10.58 SerialNumber

```
wchar_t CCyUSBDevice::SerialNumber  
[USB_STRING_MAXLEN]
```

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Description

SerialNumber is an array of wide characters containing the serial number string indicated by the device descriptor's **iSerialNumber** field.

10.59 SetConfig()

```
void CCyUSBDevice::SetConfig( UCHAR cfg)
```

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Description

This method will set the current device configuration to **cfg**, if **cfg** represents an existing configuration.

In practice, devices only expose a single configuration. So, while this method exists for completeness, it should probably never be invoked with a **cfg** value other than 0.

10.60 SetAltIntfc()

```
bool CCyUSBDevice::SetAltIntfc(UCHAR alt)
```

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Description

SetAltIntfc() calls the driver to set the active interface of the device to **alt** .

If **alt** is not a valid alt interface setting, the method does nothing.

Legitimate values for **alt** are 0 to [AltIntfcCount\(\)](#).

Calling SetAltIntfc() causes all the [EndPoints](#) members of CCyUSBDevice to be re-assigned to objects reflecting the endpoints of the new alternate interface.

Returns **true** if the alternate interface was successfully set to **alt** .

Example

```
CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );

int lastIntfc = USBDevice->AltIntfcCount( );

// Select the last Alternate Interface
USBDevice->SetAltIntfc( lastIntfc );
```

10.61 StrLangID

USHORT CCyUSBDevice::StrLangID

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Description

This data member contains the value of **bString** field from the open device's first String Descriptor.

This value indicates the language of the other string descriptors.

If multiple languages are supported in the string descriptors and English is one of the supported languages, StrLangID is set to the value for English (0x0409).

10.62 Suspend()

bool CCyUSBDevice::Suspend(void)

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The Suspend() method sets the device power state to D3 (Full asleep).

The method returns true if successful and false if the command failed.

10.63 USBAddress

UCHAR CCyUSBDevice::USBAddress

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Description

USBAddress contains the bus address of the currently open USB device.

This is the address value used by the Windows USBDI stack. It is not particularly useful at the

application level.

10.64 USBDIVersion

ULONG CCyUSBDevice::USBDIVersion

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Description

This data member contains the version of the USB Host Controller Driver in BCD format.

10.65 UsbdStatus

ULONG CCyUSBDevice::UsbdStatus

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Description

The UsbdStatus member contains the USB_STATUS returned by the driver for the most recent call to a non-endpoint IO method (SetAltIntfc, Open, Reset, etc.)

More often, you will want to access the [UsbdStatus](#) member of the CCyUSBEndPoint objects.

10.66 UsbdStatusString()

**void CCyUSBDevice::UsbdStatusString(ULONG
stat, PCHAR s)**

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Description

The UsbdStatusString method returns a string of characters in **s** that represents the UsbdStatus error code contained in **stat**.

The **stat** parameter should be the [UsbdStatus](#) member or a CCyUSBEndPoint::UsbdStatus member.

The format of the returned string, **s**, is:

"[state=SSSSSS status=TTTTTTTT]"

where SSSSSS can be "SUCCESS", "PENDING", "STALLED", or "ERROR".

Note:

There is no endpoint equivalent for this method. To interpret the UsbdStatus member of an endpoint object, call this method (CCyUSBDevice::UsbdStatusString) passing the UsbdStatus member of the endpoint.

10.67 VendorID

USHORT CCyUSBDevice::VendorID

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Description

This data member contains the value of idVendor from the open device's Device Descriptor structure.

Example

```
// Look for a device having VID = 0547, PID = 1002

CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL); // Create an instance of
CCyUSBDevice

int devices = USBDevice->DeviceCount();
int vID, pID;

int d = 0;
do {
    USBDevice->Open( d); // Open automatically calls Close() if necessary
    vID = USBDevice->VendorID;
    pID = USBDevice->ProductID;
    d++;
} while ((d < devices) && (vID != 0x0547) && (pID != 0x1002));
```

11 CCyUSBConfig

CCyUSBConfig Class

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Header

CyUSB.h

Description

CCyUSBConfig represents a USB device configuration. Such configurations have one or more interfaces each of which exposes one or more endpoints.

When [CCyUSBDevice::Open\(\)](#) is called, an instance of CCyUSBConfig is constructed for each configuration reported by the open device's device descriptor. (Normally, there is just one.)

In the process of construction, CCyUSBConfig creates instances of [CCyUSBInterface](#) for each interface exposed in the device's configuration descriptor. In turn, the CCyUSBInterface class creates instances of [CyUSBEndPoint](#) for each endpoint descriptor contained in the interface descriptor. In this iterative fashion, the entire structure of Configs->Interfaces->EndPoints gets populated from a single construction of the CCyUSBConfig class.

The following example code shows the use of the CCyUSBConfig class in an application.

Example

```
// This code lists all the endpoints reported
// for all the interfaces reported
// for all the configurations reported
// by the device.
```

```

CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL);

char buf[ 512];
string s;

for (int c=0; c<USBDevice->ConfigCount(); c++)
{
    CCyUSBConfig cfg = USBDevice->GetUSBConfig( c);

    sprintf_s( buf, "bLength: 0x%x\n", cfg.bLength); s.append( buf);
    sprintf_s( buf, "bDescriptorType: %d\n", cfg.bDescriptorType); s.append( buf);
    sprintf_s( buf, "wTotalLength: %d (0x%x)\n", cfg.wTotalLength, cfg.wTotalLength);
    s.append( buf);
    sprintf_s( buf, "bNumInterfaces: %d\n", cfg.bNumInterfaces); s.append( buf);
    sprintf_s( buf, "bConfigurationValue: %d\n", cfg.bConfigurationValue); s.append( buf);
    sprintf_s( buf, "iConfiguration: %d\n", cfg.iConfiguration); s.append( buf);
    sprintf_s( buf, "bmAttributes: 0x%x\n", cfg.bmAttributes); s.append( buf);
    sprintf_s( buf, "MaxPower: %d\n", cfg.MaxPower); s.append( buf);
    s.append( "*****\n");
    cout<<s;
    s.clear();

    for (int i=0; i<cfg.AltInterfaces; i++)
    {
        CCyUSBInterface *ifc = cfg.Interfaces[ i];
        sprintf_s( buf, "Interface Descriptor: %d\n", ( i+1)); s.append( buf);
        sprintf_s( buf, "-----\n"); s.append( buf);
        sprintf_s( buf, "bLength: 0x%x\n", ifc->bLength); s.append( buf);
        sprintf_s( buf, "bDescriptorType: %d\n", ifc->bDescriptorType); s.append( buf);
        sprintf_s( buf, "bInterfaceNumber: %d\n", ifc->bInterfaceNumber); s.append( buf);
        sprintf_s( buf, "bAlternateSetting: %d\n", ifc->bAlternateSetting); s.append( buf);
        sprintf_s( buf, "bNumEndpoints: %d\n", ifc->bNumEndpoints); s.append( buf);
        sprintf_s( buf, "bInterfaceClass: %d\n", ifc->bInterfaceClass); s.append( buf);
        sprintf_s( buf, "*****\n"); s.append( buf);
        cout<<s;
        s.clear();

        for (int e=0; e<ifc->bNumEndpoints; e++)
        {
            CCyUSBEndPoint *ept = ifc->EndPoints[ e+1];
            sprintf_s( buf, "EndPoint Descriptor: %d\n", ( e+1)); s.append( buf);
            sprintf_s( buf, "-----\n"); s.append( buf);
            sprintf_s( buf, "bLength: 0x%x\n", ept->DscLen); s.append( buf);
            sprintf_s( buf, "bDescriptorType: %d\n", ept->DscType); s.append( buf);
            sprintf_s( buf, "bEndpointAddress: 0x%x\n", ept->Address); s.append( buf);
            sprintf_s( buf, "bmAttributes: 0x%x\n", ept->Attributes); s.append( buf);
            sprintf_s( buf, "wMaxPacketSize: %d\n", ept->MaxPktSize); s.append( buf);
            sprintf_s( buf, "bInterval: %d\n", ept->Interval); s.append( buf);
            s.append( "*****\n");
            cout<<s;
            s.clear();
        }
    }
}

```

11.1 AltInterfaces

CCyUSBConfig::AltInterfaces

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Description

AltInterfaces contains the total number of interfaces exposed by the configuration (including the default interface). This value is the number of interface descriptors contained in the current configuration descriptor.

Because the [CCyUSBDevice::AltIntfcCount\(\)](#) method does not count the primary interface, it returns CCyUSBConfig::AltInterfaces - 1.

11.2 bConfigurationValue

UCHAR CCyUSBConfig::bConfigurationValue

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Description

bConfigurationValue contains value of the **bConfigurationValue** field from the selected configuration descriptor.

11.3 bDescriptorType

UCHAR CCyUSBConfig::bDescriptorType

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Description

bDescriptorType contains value of the **bDescriptorType** field from the selected configuration descriptor.

11.4 bLength

UCHAR CCyUSBConfig::bLength

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Description

bLength contains value of the **bLength** field from the selected configuration descriptor.

11.5 bmAttributes

UCHAR CCyUSBConfig::bmAttributes

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Description

bmAttributes contains value of the **bmAttributes** field from the selected configuration descriptor.

11.6 bNumInterfaces

UCHAR CCyUSBConfig::bNumInterfaces

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Description

bNumInterfaces contains value of the **bNumInterfaces** field from the selected configuration descriptor.

11.7 CCyUSBConfig()

CCyUSBConfig::CCyUSBConfig(void)

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Description

This is the default constructor for the CCyUSBConfig class.

This constructor simply sets all its data members to zero.

11.8 CCyUSBConfig()

**CCyUSBConfig::CCyUSBConfig(HANDLE handle,
PUSB_CONFIGURATION_DESCRIPTOR
pConfigDescr)**

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Description

This constructor creates a functional CCyUSBConfig object, complete with a populated Interfaces[] array.

During construction, the pConfigDescr structure is traversed and all interface descriptors are read, creating CCyUSBInterface objects.

This constructor is called automatically as part of the [CCyUSBDevice::Open\(\)](#) method. You should never need to call this constructor yourself.

11.9 CCyUSBConfig()

**CCyUSBConfig::CCyUSBConfig(CCyUSBConfig&
cfg)**

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Description

This is the *copy* constructor for the CCyUSBConfig class.

This constructor copies all of the simple data members of **cfg**. Then, it walks through **cfg**'s list of [CCyUSBInterface](#) objects and makes copies of them, storing pointers to the new interface objects in a private, internal data array. (This is accomplished by calling the [copy constructor](#) for CCyUSBInterface.)

You should usually not call the copy constructor explicitly. Instead, use the [GetUSBConfig\(\)](#) method of the CCyUSBDevice class.

Example

```
CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );  
CCyUSBConfig cfg = USBDevice->GetUSBConfig( 0 );
```

11.10 ~CCyUSBConfig

CCyUSBConfig::~~CCyUSBConfig(void)

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Description

This is the destructor for the CCyUSBConfig class.

The destructor deletes all the dynamically constructed [CCyUSBInterface](#) objects that were created during construction of the object.

11.11 iConfiguration

UCHAR CCyUSBConfig::iConfiguration

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Description

iConfiguration contains value of the **iConfiguration** field from the selected configuration descriptor.

11.12 Interfaces

**CCyUSBInterface* CCyUSBConfig::Interfaces
[MAX_INTERFACES]**

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Description

Interfaces are an array of pointers to [CCyUSBInterface](#) objects. One valid pointer exists in Interfaces[] for each alternate interface exposed by the configuration (including alt setting 0).

The [AltInterfaces](#) member tells how many valid entries are held in Interfaces.

Use [CCyUSBDevice::AltIntfcCount\(\)](#) and [CCyUSBDevice::SetAltIntfc\(\)](#) to access a configuration's alternate interfaces.

Example

```
// This code lists all the endpoints reported
// for all the interfaces reported
// for all the configurations reported
// by the device.

CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );

char buf[ 512 ];
string s;

for ( int c=0; c<USBDevice->ConfigCount(); c++)
{
    CCyUSBConfig cfg = USBDevice->GetUSBConfig( c );

    sprintf_s( buf, "bLength: 0x%x\n", cfg.bLength ); s.append( buf );
```

```

    sprintf_s(buf, "bDescriptorType: %d\n", cfg.bDescriptorType); s.append(buf);

    sprintf_s(buf, "wTotalLength: %d (0x%x)\n", cfg.wTotalLength, cfg.
wTotalLength); s.append(buf);
    sprintf_s(buf, "bNumInterfaces: %d\n", cfg.bNumInterfaces); s.append(buf);
    sprintf_s(buf, "bConfigurationValue: %d\n", cfg.bConfigurationValue); s.
append(buf);
    sprintf_s(buf, "iConfiguration: %d\n", cfg.iConfiguration); s.append(buf);
    sprintf_s(buf, "bmAttributes: 0x%x\n", cfg.bmAttributes); s.append(buf);
    sprintf_s(buf, "MaxPower: %d\n", cfg.MaxPower); s.append(buf);
    s.append("*****\n");
    cout<<s;
    s.clear();

    for (int i=0; i<cfg.AltInterfaces; i++)
    {
        CCyUSBInterface *ifc = cfg.Interfaces[i];
        sprintf_s(buf, "Interface Descriptor: %d\n", (i+1)); s.append(buf);
        sprintf_s(buf, "-----\n"); s.append(buf);
        sprintf_s(buf, "bLength: 0x%x\n", ifc->bLength); s.append(buf);
        sprintf_s(buf, "bDescriptorType: %d\n", ifc->bDescriptorType); s.
append(buf);
        sprintf_s(buf, "bInterfaceNumber: %d\n", ifc->bInterfaceNumber); s.
append(buf);
        sprintf_s(buf, "bAlternateSetting: %d\n", ifc->bAlternateSetting); s.
append(buf);
        sprintf_s(buf, "bNumEndpoints: %d\n", ifc->bNumEndpoints); s.append
(buf);
        sprintf_s(buf, "bInterfaceClass: %d\n", ifc->bInterfaceClass); s.
append(buf);
        sprintf_s(buf, "*****\n"); s.append
(buf);
        cout<<s;
        s.clear();

        for (int e=0; e<ifc->bNumEndpoints; e++)
        {
            CCyUSBEndPoint *ept = ifc->EndPoints[e+1];
            sprintf_s(buf, "EndPoint Descriptor: %d\n", (e+1)); s.append
(buf);
            sprintf_s(buf, "-----\n"); s.append
(buf);
            sprintf_s(buf, "bLength: 0x%x\n", ept->DscLen); s.append(buf);
            sprintf_s(buf, "bDescriptorType: %d\n", ept->DscType); s.append
(buf);
            sprintf_s(buf, "bEndpointAddress: 0x%x\n", ept->Address); s.
append(buf);
            sprintf_s(buf, "bmAttributes: 0x%x\n", ept->Attributes); s.
append(buf);
            sprintf_s(buf, "wMaxPacketSize: %d\n", ept->MaxPktSize); s.
append(buf);

```

```

        sprintf_s(buf, "bInterval: %d\n", ept->Interval); s.append(buf);
        s.append( "*****\n");
        cout<<s;
        s.clear();
    }
}
}

```

11.13 wTotalLength

USHORT CCyUSBConfig::wTotalLength

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Description

wTotalLength contains value of the **wTotalLength** field from the selected configuration descriptor.

12 CCyUSBEndPoint

CCyUSBEndPoint Class

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Header

CyUSB.h

Description

CCyUSBEndPoint is an abstract class, having a pure virtual method, [BeginDataXfer\(\)](#). Therefore, instances of CCyUSBEndPoint cannot be constructed. [CCyControlEndPoint](#), [CCyBulkEndPoint](#), [CCyIsocEndPoint](#), and [CCyInterruptEndPoint](#) are all classes derived from CCyUSBEndPoint.

All USB data traffic is accomplished by using instances of the endpoint classes.

When a CCyUSBDevice is opened, a list of all the [Endpoints](#) for the current alt interface is generated. This list is populated with viable CCyUSBEndPoint objects, instantiated for the appropriate type of endpoint. Data access is then accomplished via one of these CCyUSBEndPoint objects.

12.1 Abort()

void CCyUSBEndPoint::Abort(void)

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Description

Abort sends an IOCTL_ADAPT_ABORT_PIPE command the USB device, with the endpoint address as a parameter. This causes an abort of pending IO transactions on the endpoint.

Example

```

CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL);

USBDevice->ControlEndPt->Abort();

```

12.2 Address

UCHAR CCyUSBEndPoint::Address

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Description

Address contains the value of the **bEndpointAddress** field of the endpoint descriptor returned by the device.

Addresses with the high-order bit set (0x8_) are IN endpoints.

Addresses with the high-order bit cleared (0x0_) are OUT endpoints.

The default control endpoint ([ControlEndPt](#)) has Address = 0.

Example

```
// Find a second bulk IN endpoint in the EndPoints[] array

CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );

CCyBulkEndPoint *BulkIn2 = NULL;

int eptCount = USBDevice->EndPointCount();

for (int i=1; i<eptCount; i++) {
    bool bIn = ( (USBDevice->EndPoints[ i ]->Address & 0x80) == 0x80 );
    bool bBulk = ( USBDevice->EndPoints[ i ]->Attributes == 2 );

    if ( bBulk && bIn ) BulkIn2 = ( CCyBulkEndPoint *) USBDevice->EndPoints[ i ];
    if ( BulkIn2 == USBDevice->BulkInEndPt ) BulkIn2 = NULL;
}
```

12.3 Attributes

UCHAR CCyUSBEndPoint::Attributes

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Description

Attributes contains the value of the **bmAttributes** field of the endpoint's descriptor.

The Attributes member indicates the type of endpoint per the following list.

- 0: Control
- 1: Isochronous
- 2: Bulk
- 3: Interrupt

Example

```
// Find a second bulk IN endpoint in the EndPoints[] array

CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );

CCyBulkEndPoint *BulkIn2 = NULL;

int eptCount = USBDevice->EndPointCount();

for (int i=1; i<eptCount; i++) {
    bool bIn = USBDevice->EndPoints[ i ]->bIn;
    bool bBulk = ( USBDevice->EndPoints[ i ]->Attributes == 2 );

    if ( bBulk && bIn ) BulkIn2 = ( CCyBulkEndPoint *) USBDevice->EndPoints[ i ];
    if ( BulkIn2 == USBDevice->BulkInEndPt ) BulkIn2 = NULL;
}
```

12.4 BeginDataXfer()

```
virtual PCHAR CCyUSBEndPoint::
BeginDataXfer(PCHAR buf, LONG len,
OVERLAPPED *o) = 0
```

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Description

Note that the CCyUSBEndPoint version of this method is a pure virtual function. There is no implementation body for this function in the CCyUSBEndPoint class. Rather, all the classes derived from CCyUSBEndPoint provide their own special implementation of this method.

BeginDataXfer is an advanced method for performing asynchronous IO. This method sets-up all the parameters for a data transfer, initiates the transfer, and immediately returns, not waiting for the transfer to complete.

BeginDataXfer allocates a complex data structure and returns a pointer to that structure. [FinishDataXfer](#) de-allocates the structure. Therefore, it is imperative that each BeginDataXfer call have exactly one matching FinishDataXfer call.

You will usually want to use the synchronous [XferData](#) method rather than the asynchronous BeginDataXfer/WaitForXfer/FinishDataXfer approach.

Example

```
// This example assumes that the device automatically sends back,
// over its bulk-IN endpoint, any bytes that were received over its
// bulk-OUT endpoint (commonly referred to as a loopback function)

CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );

OVERLAPPED outOvLap, inOvLap;
```

```

outOvLap.hEvent = CreateEvent( NULL, false, false, L"CYUSB_OUT");
inOvLap.hEvent  = CreateEvent( NULL, false, false, L"CYUSB_IN");

unsigned char  inBuf[128];
ZeroMemory( inBuf, 128);

unsigned char  buffer[128];
LONG  length = 128;

// Just to be cute, request the return data before initiating the loopback
UCHAR  *inContext = USBDevice->BulkInEndPt->BeginDataXfer( inBuf, length, &inOvLap);
UCHAR  *outContext = USBDevice->BulkOutEndPt->BeginDataXfer( buffer, length,
&outOvLap);

USBDevice->BulkOutEndPt->WaitForXfer( &outOvLap,100);
USBDevice->BulkInEndPt->WaitForXfer( &inOvLap,100);

USBDevice->BulkOutEndPt->FinishDataXfer( buffer, length, &outOvLap,outContext);
USBDevice->BulkInEndPt->FinishDataXfer( inBuf, length, &inOvLap,inContext);

CloseHandle( outOvLap.hEvent);
CloseHandle( inOvLap.hEvent);

```

12.5 bIn

bool CCyUSBEndPoint::bIn

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Description

bIn indicates whether or not the endpoint is an IN endpoint.

IN endpoints transfer data from the USB device to the Host (PC).

Endpoint addresses with the high-order bit set (0x8_) are IN endpoints. Endpoint addresses with the high-order bit cleared (0x0_) are OUT endpoints.

bIn is not valid for [CCyControlEndPoint](#) objects (such as CCyUSBDevice->ControlEndPt).

Example

```

// Find a second bulk IN endpoint in the EndPoints[] array

CCyUSBDevice  *USBDevice = new  CCyUSBDevice( NULL);

CCyBulkEndPoint *BulkIn2 = NULL;

int  eptCount = USBDevice->EndPointCount();

for (int  i=1; i<eptCount;  i++) {

```

```
bool In = USBDevice->EndPoints[i]->bIn;
bool bBulk = (USBDevice->EndPoints[i]->Attributes == 2);

if (bBulk && In) BulkIn2 = (CCyBulkEndPoint *) USBDevice->EndPoints[i];
if (BulkIn2 == USBDevice->BulkInEndPt) BulkIn2 = NULL;
}
```

12.6 CCyUSBEndPoint()

CCyUSBEndPoint::CCyUSBEndPoint(void)

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Description

This is the default constructor for the CCyUSBEndPoint class.

Because CCyUSBEndPoint is an abstract class, you cannot instantiate an object of CCyUSBEndPoint. That is, the statement

```
new CCyUSBEndPoint( );
```

would result in a compiler error.

The default constructor initializes most of its data members to zero. It sets the default endpoint Timeout to 10 seconds. It sets bln to false, and sets hDevice to INVALID_HANDLE_VALUE.

12.7 CCyUSBEndPoint()

**CCyUSBEndPoint::CCyUSBEndPoint(HANDLE h,
PUSB_ENDPOINT_DESCRIPTOR
pEndPtDescriptor)**

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Description

This is the primary constructor for the CCyUSBEndPoint class.

Because CCyUSBEndPoint is an abstract class, you cannot instantiate an object of CCyUSBEndPoint. That is, the statement

```
new CCyUSBEndPoint(h, pEndPtDesc);
```

would result in a compiler error.

However, the constructor does get called (automatically) in the process of constructing derived endpoint classes.

This constructor sets most of its data members to their corresponding fields in the **pEndPtDescriptor** structure. It sets the default endpoint Timeout to 10 seconds. It sets its hDevice member to **h**.

12.8 CCyUSBEndPoint()

**CCyUSBEndPoint::CCyUSBEndPoint(
CCyUSBEndPoint& ept)**

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Description

This is the *copy* constructor for the CCyUSBEndPoint class.

This constructor copies all of the simple data members of ept.

Because CCyUSBEndPoint is an abstract class, you cannot invoke this constructor explicitly. Instead, it gets called as a side effect of invoking the copy constructors for [CCyControlEndPoint](#), [CCyBulkEndPoint](#), [CCyIsocEndPoint](#), and [CCyInterruptEndPoint](#).

Example

```
CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );  
  
CCyControlEndPoint *ctlEpt = new CCyControlEndPoint( *USBDevice->ControlEndPt );
```

12.9 DscLen

UCHAR CCyUSBEndPoint::DscLen

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Description

DscLen contains the length of the endpoint descriptor as reported in the **bLength** field of the USB_ENDPOINT_DESCRIPTOR structure that was passed to the endpoint object's constructor. (Because the passed descriptor was an endpoint descriptor, this value should always be 0x07.)

This data member exists for completeness and debugging purposes. You should normally never need to access this data member.

12.10 DscType

UCHAR CCyUSBEndPoint::DscType

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Description

DscType contains the type of the endpoint descriptor as reported in the **bDescriptorType** field of the USB_ENDPOINT_DESCRIPTOR structure that was passed to the endpoint object's constructor. (Because the passed descriptor was an endpoint descriptor, this value should always be 0x05.)

This data member exists for completeness and debugging purposes. You should normally never need to access this data member.

12.11 GetXferSize()

ULONG CCyUSBEndPoint::GetXferSize(void)

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Description

This function is no longer supported. It is available to keep backward compatibility with legacy library and application.

For more information on USB transfer size please refer link from Microsoft : <http://msdn.microsoft.com/en-us/library/ff538112.aspx>

Following is the maximum transfer size limit set into the CyUSB3.sys driver for various transfers.

1. Bulk and Interrupt Transfer
4MBytes
2. Full Speed Isochronous Transfer
256 Frames
3. High Speed and Super Speed Isochronous Transfer
1024 Frames

12.12 FinishDataXfer()

**bool CCyUSBEndPoint::FinishDataXfer(PCHAR
buf, LONG &len, OVERLAPPED *ov, PCHAR
pXmitBuf, CCyIsoPktInfo* pktInfos = NULL)**

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Description

FinishDataXfer is an advanced method for performing asynchronous IO.

FinishDataXfer transfers any received bytes into **buf** . It sets the **len** parameter to the actual number of bytes transferred. Finally, FinishDataXfer frees the memory associated with the **pXmitBuf** pointer. This pointer was returned by a previous corresponding call to [BeginDataXfer](#).

The pointer to an OVERLAPPED structure, passed in the **ov** parameter, should be the same one that was passed to the corresponding BeginDataXfer method.

The **pktInfos** parameter is optional and points to an array of [CCyIsoPktInfo](#) objects. It should only be used for Isochronous endpoint transfers.

You will usually want to use the synchronous [XferData](#) method rather than the asynchronous BeginDataXfer/WaitForXfer/FinishDataXfer approach.

Example

```
// This example assumes that the device automatically sends back,  
// over its bulk-IN endpoint, any bytes that were received over its  
// bulk-OUT endpoint (commonly referred to as a loopback function)
```

```
CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );
```

```

OVERLAPPED outOvLap, inOvLap;
outOvLap.hEvent = CreateEvent( NULL, false, false, L"CYUSB_OUT" );
inOvLap.hEvent = CreateEvent( NULL, false, false, L"CYUSB_IN" );

unsigned char inBuf[128];
ZeroMemory( inBuf, 128 );

unsigned char buffer[128];
LONG length = 128;

// Just to be cute, request the return data before initiating the loopback
UCHAR *inContext = USBDevice->BulkInEndPoint->BeginDataXfer( inBuf, length, &inOvLap );
UCHAR *outContext = USBDevice->BulkOutEndPoint->BeginDataXfer( buffer, length,
&outOvLap );

USBDevice->BulkOutEndPoint->WaitForXfer( &outOvLap, 100 );
USBDevice->BulkInEndPoint->WaitForXfer( &inOvLap, 100 );

USBDevice->BulkOutEndPoint->FinishDataXfer( buffer, length, &outOvLap, outContext );
USBDevice->BulkInEndPoint->FinishDataXfer( inBuf, length, &inOvLap, inContext );

CloseHandle( outOvLap.hEvent );
CloseHandle( inOvLap.hEvent );

```

12.13 hDevice

HANDLE CCyUSBEndPoint::hDevice

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Description

hDevice contains a handle to the USB device driver, through which all the IO is carried-out. The handle is created by the [Open\(\)](#) method of a [CCyUSBDevice](#) object.

The only reason to access this data member would be to call the device driver explicitly, bypassing the API library methods. *This is not recommended.*

You should never call `CloseHandle(hDevice)` directly. Instead, call the [Close\(\)](#) method of a `CCyUSBDevice` object.

Note that an instance of `CCyUSBDevice` will contain several [CCyUSBEndPoint](#) objects. Each of those will have the same value for their `hDevice` member. Also, the endpoint's `hDevice` member will be identical to its container `CCyUSBDevice` object's private `hDevice` member (accessed via the [DeviceHandle\(\)](#) method).

12.14 Interval

UCHAR CCyUSBEndPoint::Interval

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Description

Interval contains the value reported in the **bInterval** field of the USB_ENDPOINT_DESCRIPTOR structure that was passed to the endpoint object's constructor.

This data member exists for completeness and debugging purposes. You should normally never need to access this data member.

12.15 MaxPktSize

UCHAR CCyUSBEndPoint::MaxPktSize

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Description

MaxPktSize contains the value indicated by the **wMaxPacketSize** field of the USB_ENDPOINT_DESCRIPTOR structure that was passed to the endpoint object's constructor.

MaxPktSize is calculated by multiplying the low-order 11 bits of **wMaxPacketSize** by the value represented by 1 + the next 2 bits (bits 11 and 12) .

For USB3.0 device the **MaxPktSize** contains the value indicated by *wMaxPacketSize* field of the USB_ENDPOINT_DESCRIPTOR structure and multiply it with the SSMaxBurst field of Super speed companion descriptor.

NOTE: For ISOC transfers, the buffer length and the endpoint's transfers size (see [SetXferSize](#)) must be a multiple of 8 times the endpoint's [MaxPktSize](#).

Example

If wMaxPacketSize is 0x1400 (binary = 0001 0100 0000 0000)

$\text{MaxPktSize} = [100\ 0000\ 0000\ \text{binary}] * [10\ \text{binary} + 1] = 1024 * 3 = 3072$

For USB3.0 Device.

$\text{SSMaxBurst} = 3$
 $w\text{MaxPacketSize} = 1024$

$\text{MaxPktSize} = (w\text{MaxPacketSize} * (\text{SSMaxBurst} + 1))$

12.16 NtStatus

ULONG CCyUSBEndPoint::NtStatus

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Description

NtStatus member contains the error code returned from the last call to the XferData or BeginDataXfer methods.

12.17 Reset()

```
bool CCyUSBEndPoint::Reset(void)
```

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Description

The Reset method resets the endpoint, clearing any error or stall conditions on that endpoint.

Pending data transfers are not cancelled by the Reset method.

Call [Abort\(\)](#) for the endpoint in order force completion of any transfers in-process.

12.18 SetXferSize()

```
void CCyUSBEndPoint::SetXferSize(ULONG xfer  
)
```

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Description

This function is no longer supported. It is available to keep backward compatibility with legacy library and application.

For more information on USB transfer size please refer link from Microsoft : <http://msdn.microsoft.com/en-us/library/ff538112.aspx>

Following is the maximum transfer size limit set into the CyUSB3.sys driver for various transfers.

1. Bulk and Interrupt Transfer
4MBytes
2. Full Speed Isochronous Transfer
256 Frames
3. High Speed and Super Speed Isochronous Transfer
1024 Frames

12.19 TimeOut

```
ULONG CCyUSBEndPoint::TimeOut
```

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Description

TimeOut limits the length of time that a [XferData\(\)](#) call will wait for the transfer to complete.

The units of **TimeOut** is milliseconds.

NOTE : For [CCyControlEndPoint](#), the **TimeOut** is rounded down to the nearest 1000 ms, except for values between 0 and 1000 which are rounded up to 1000.

Set the TimeOut values to 0xFFFFFFFF(INFINITE), to wait for infinite time on the any transfers(bulk, Isochronous, Interrupt, and Control).

The TimeOut value 0 for bulk, interrupt, and isochronous transfers does not wait for read/write operation to complete, it will return immediately.

The TimeOut value 0 for control transfer is rounded up to 1000ms.

The default TimeOut for Bulk, Interrupt, Control, and Isochronous transfer is 10 seconds. User can override this value depending upon their application needs.

Example

```
unsigned char buf[128];
LONG length = 128;

CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );

USBDevice->BulkOutEndPt->TimeOut = 1000; // 1 sec timeout
USBDevice->BulkOutEndPt->XferData( buf, length );
```

12.20 UsbdStatus

ULONG CCyUSBEndPoint::UsbdStatus

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Description

UsbdStatus member contains an error code returned from the last call to the [XferData](#) or [BeginDataXfer](#) methods.

UsbdStatus can be decoded by passing the value to the [CCyUSBDevice::UsbdStatusString](#)() method.

12.21 WaitForXfer()

bool CCyUSBEndPoint::WaitForXfer(OVERLAPPED *ov, ULONG tOut)

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Description

This method is used in conjunction with [BeginDataXfer](#) and [FinishDataXfer](#) to perform asynchronous IO.

The **ov** parameter points to the OVERLAPPED object that was passed in the preceding [BeginDataXfer](#) call.

tOut limits the time, in milliseconds, that the library will wait for the transaction to complete.

You will usually want to use the synchronous [XferData](#) method rather than the asynchronous [BeginDataXfer](#)/[WaitForXfer](#)/[FinishDataXfer](#) approach.

Example

```
// This example assumes that the device automatically sends back,
// over its bulk-IN endpoint, any bytes that were received over its
// bulk-OUT endpoint (commonly referred to as a loopback function)
```

```

CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL);

OVERLAPPED outOvLap, inOvLap;
outOvLap.hEvent = CreateEvent( NULL, false, false, L"CYUSB_OUT");
inOvLap.hEvent = CreateEvent( NULL, false, false, L"CYUSB_IN");

unsigned char inBuf[128];
ZeroMemory( inBuf, 128);

unsigned char buffer[128];
LONG length = 128;

// Just to be cute, request the return data before initiating the loopback
UCHAR *inContext = USBDevice->BulkInEndPt->BeginDataXfer( inBuf, length, &inOvLap);
UCHAR *outContext = USBDevice->BulkOutEndPt->BeginDataXfer( buffer, length,
&outOvLap);

USBDevice->BulkOutEndPt->WaitForXfer( &outOvLap,100);
USBDevice->BulkInEndPt->WaitForXfer( &inOvLap,100);

USBDevice->BulkOutEndPt->FinishDataXfer( buffer, length, &outOvLap,outContext);
USBDevice->BulkInEndPt->FinishDataXfer( inBuf, length, &inOvLap,inContext);

CloseHandle( outOvLap.hEvent);
CloseHandle( inOvLap.hEvent);

```

12.22 XferData()

```

bool CCyUSBEndPoint::XferData(PUCHAR buf,
LONG &bufLen, CCyIsoPktInfo* pktInfos)

```

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Description

XferData sends or receives **len** bytes of data from / into **buf**.

This is the primary IO method of the library for transferring data. Most data transfers should occur by invoking the **XferData** method of an instantiated endpoint object.

XferData calls the appropriate [BeginDataXfer](#) method for the instantiated class (one of [CCyBulkEndPoint](#), [CCyControlEndPoint](#), [CCyInterruptEndPoint](#), or [CCyIsocEndPoint](#)). It then waits for the transaction to complete (or until the endpoint's [TimeOut](#) expires), and finally calls the [FinishDataXfer](#) method to complete the transaction. It call [Abort\(\)](#) method internally if operation fail.

For all non-control endpoints, the direction of the transfer is implied by the endpoint itself. (Each such endpoint will either be an IN or an OUT endpoint.)

For control endpoints, the [Direction](#) must be specified, along with the other control-specific parameters.

XferData performs synchronous (i.e. blocking) IO operations. It does not return until the transaction

completes or the endpoint's TimeOut has elapsed.

Returns **true** if the transaction successfully completes before TimeOut has elapsed.

Note that the **len** parameter is a reference, meaning that the method can modify its value. The number of bytes actually transferred is passed back in **len**.

The **pktInfos** parameter is optional and points to an array of [CCyIsoPktInfo](#) objects. It should only be used for Isochronous endpoint transfers.

NOTE: For ISOC transfers, the buffer length and the endpoint's transfers size (see [SetXferSize](#)) must be a multiple of 8 times the endpoint's [MaxPktSize](#).

Please refer [XferData for Isochronous transfer](#) for the usage of the XferData for isochronous transfers.

The code sample below demonstrates the usage of XferData() api for bulk and interrupt transfers.

Example

```
CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL);

unsigned char buf[] = "hello world";
LONG length = 11;

if ( USBDevice->BulkOutEndPt)
    USBDevice->BulkOutEndPt->XferData( buf, length);
```

12.23 ssdscLen

UCHAR CCyUSBEndPoint::ssdscLen

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Description

ssdscLen contains the length of the superspeed endpoint companion descriptor as reported in the *bLength* field of the USB_SUPERPEED_ENDPOINT_COMPANION_DESCRIPTOR structure that was passed to the endpoint object's constructor. (Because the passed descriptor was an endpoint descriptor, this value should always be 0x06.)

This data member exists for completeness and debugging purposes. You should normally never need to access this data member.

12.24 ssdscType

UCHAR CCyUSBEndPoint::ssdsType

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Description

ssdscType contains the type of the superspeed endpoint companion descriptor as reported in the *bDescriptorType* field of the USB_SUPERPEED_ENDPOINT_COMPANION_DESCRIPTOR structure that was passed to the endpoint object's constructor. (Because the passed descriptor was an endpoint descriptor, this value should always be 0x30.)

This data member exists for completeness and debugging purposes. You should normally never need to access this data member.

12.25 ssmaxburst

UCHAR CCyUSBEndPoint::ssmaxburst

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Description

ssmaxburst contains the value indicated by the bMaxBurst field of the USB_SUPER SPEED_ENDPOINT_COMPANION_DESCRIPTOR structure that was passed to the endpoint object's constructor.

The ssmaxburst represent the maximum number of packets the endpoint can send or receive as part of a burst. Valid values are from 0 to 15. A value of 0 indicates that the endpoint can only burst one packet at a time and a value of 16 indicates that the endpoint can burst up to 16 packets at a time.

For endpoint of type control this shall be set to 0.

12.26 ssbmAttribute

UCHAR CCyUSBEndPoint::ssbmAttribute

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Description

ssbmAttribute contains the value indicated by the bmAttributes field of the USB_SUPER SPEED_ENDPOINT_COMPANION_DESCRIPTOR structure that was passed to the endpoint object's constructor.

ssbmAttribute represent different information based on the type of endpoint.

If this is a bulk endpoint:

Bits(4:0) - MaxStreams , The maximum number of stream this endpoint supports. Valid values are from 0 to 16, where a values of 0 indicates that the endpoint does not define streams. For the values 1 to 16 the number of streams supported equals $\text{power}(2, \text{MaxStream})$.

Bit (7:5) - Reserved. These bits are reserved and shall be set to zero.

If this a control or interrupt endpoint type:

(7:0) - Reserved. These bits are reserved and shall be set to zero.

if this is an isochronous endpoint:

Bits(1:0) Mult. A zero based value that determines the maximum number of packet within a service interval that this endpoint supports.

Maximum number of packets = $\text{bMaxBurst} * (\text{Mult} + 1)$

The maximum value that can be set in this field is 2.

Bits(7:2) Reserved. These bits are reserved and shall be set to zero.

12.27 ssbytesperinterval

USHORT CCyUSBEndPoint::ssbyteperinterval

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Description

ssbyteperinterval contains the value indicated by the bBytePerInterval field of the USB_SUPER SPEED_ENDPOINT_COMPANION_DESCRIPTOR structure that was passed to the endpoint object's constructor.

The total number of bytes this endpoint will transfer every service interval. This field is only valid for periodic endpoint.

For Isochronous endpoint, this values is used to reserve the bus time in the schedule, required for the frame data payloads per 125us. The pip may, on an ongoing basis actually use less bandwidth that that reserved. The deice reports, if necessary, the actual bandwidth used via its normal, non-USB define mechanism.

13 CCyUSBInterface

CCyUSBInterface Class

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Header

CyUSB.h

Description

CCyUSBInterface represents a USB device interface. Such interfaces have one or more endpoints.

When [CCyUSBDevice::Open](#) () is called, an instance of [CCyUSBConfig](#) is constructed for each configuration reported by the open device's device descriptor. (Normally, there is just one.)

In the process of construction, CCyUSBConfig creates instances of CCyUSBInterface for each interface exposed in the device's configuration descriptor. In turn, the CCyUSBInterface class creates instances of [CyUSBEndPoint](#) for each endpoint descriptor contained in the interface descriptor. In this iterative fashion, the entire structure of Configs->Interfaces->EndPoints gets populated from a single construction of the CCyUSBConfig class.

The below example code shows the usage of the CCyUSBInterface class in an application.

Example

```
// This code lists all the endpoints reported
// for all the interfaces reported
// for all the configurations reported
// by the device.

CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );

char buf[ 512 ];
string s;

for (int c=0; c<USBDevice->ConfigCount(); c++)
{
    CCyUSBConfig cfg = USBDevice->GetUSBConfig( c );

    sprintf_s( buf, "bLength: 0x%x\n", cfg.bLength ); s.append( buf );
    sprintf_s( buf, "bDescriptorType: %d\n", cfg.bDescriptorType ); s.append( buf );
    sprintf_s( buf, "wTotalLength: %d (0x%x)\n", cfg.wTotalLength, cfg.wTotalLength );
    s.append( buf );
    sprintf_s( buf, "bNumInterfaces: %d\n", cfg.bNumInterfaces ); s.append( buf );
    sprintf_s( buf, "bConfigurationValue: %d\n", cfg.bConfigurationValue ); s.append( buf );
    sprintf_s( buf, "iConfiguration: %d\n", cfg.iConfiguration ); s.append( buf );
    sprintf_s( buf, "bmAttributes: 0x%x\n", cfg.bmAttributes ); s.append( buf );
    sprintf_s( buf, "MaxPower: %d\n", cfg.MaxPower ); s.append( buf );
}
```

```

s.append("*****\n");
cout<<s;
s.clear();

for (int i=0; i<cfg.AltInterfaces; i++)
{
CCyUSBInterface *ifc = cfg.Interfaces[i];
sprintf_s(buf,"Interface Descriptor:%d\n",(i+1));s.append(buf);
sprintf_s(buf,"-----\n");s.append(buf);
sprintf_s(buf,"bLength: 0x%x\n",ifc->bLength); s.append(buf);
sprintf_s(buf,"bDescriptorType: %d\n",ifc->bDescriptorType); s.append(buf);
sprintf_s(buf,"bInterfaceNumber: %d\n",ifc->bInterfaceNumber); s.append(buf);
sprintf_s(buf,"bAlternateSetting: %d\n",ifc->bAlternateSetting); s.append(buf);
sprintf_s(buf,"bNumEndpoints: %d\n",ifc->bNumEndpoints); s.append(buf);
sprintf_s(buf,"bInterfaceClass: %d\n",ifc->bInterfaceClass); s.append(buf);
sprintf_s(buf,"*****\n");s.append(buf);
cout<<s;
s.clear();

for (int e=0; e<ifc->bNumEndpoints; e++)
{
CCyUSBEndPoint *ept = ifc->EndPoints[e+1];
sprintf_s(buf,"EndPoint Descriptor:%d\n",(e+1));s.append(buf);
sprintf_s(buf,"-----\n");s.append(buf);
sprintf_s(buf,"bLength: 0x%x\n",ept->DscLen); s.append(buf);
sprintf_s(buf,"bDescriptorType: %d\n",ept->DscType); s.append(buf);
sprintf_s(buf,"bEndpointAddress: 0x%x\n",ept->Address); s.append(buf);
sprintf_s(buf,"bmAttributes: 0x%x\n",ept->Attributes); s.append(buf);
sprintf_s(buf,"wMaxPacketSize: %d\n",ept->MaxPktSize); s.append(buf);
sprintf_s(buf,"bInterval: %d\n",ept->Interval); s.append(buf);
s.append("*****\n");
cout<<s;
s.clear();
}
}
}

```

13.1 bAlternateSetting

UCHAR CCyUSBInterface::bAlternateSetting

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Description

This data member contains the **bAlternateSetting** field from the currently selected interface's interface descriptor.

This data member exists for completeness and debugging purposes. You should normally never need to access this data member.

13.2 bAltSettings

UCHAR CCyUSBInterface::bAltSettings

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Description

This data member contains the number of valid alternate interface settings exposed by this interface.

For an interface that exposes a primary interface and two alternate interfaces, this value would be 3.

This data member exists for completeness and debugging purposes. You should normally never need to access this data member.

See [CCyUSBDevice::AltIntfcCount\(\)](#).

13.3 bDescriptorType

UCHAR CCyUSBInterface::bDescriptorType

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Description

This data member contains the **bDescriptorType** field of the USB_INTERFACE_DESCRIPTOR structure that was passed to the interface object's constructor. (Because the passed descriptor was an interface descriptor, this value should always be 0x04.)

This data member exists for completeness and debugging purposes. You should normally never need to access this data member.

13.4 CCyUSBInterface()

**CCyUSBInterface::CCyUSBInterface:(HANDLE
h, PUSB_INTERFACE_DESCRIPTOR
pIntfcDescriptor)**

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Description

This is the constructor for the [CCyUSBInterface](#) class.

It reads [bNumEndpoint](#) endpoint descriptors and creates the appropriate type of endpoint object for each one, saving a pointer to each new endpoint in the class's [EndPoints](#) array.

13.5 CCyUSBInterface()

**CCyUSBInterface::CCyUSBInterface:(
CCyUSBInterface& intfc)**

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Description

This is the *copy* constructor for the [CCyUSBInterface](#) class.

This constructor copies all of the simple data members of **intfc**. It then walks through **intfc**'s [EndPoints](#) array, making copies of every endpoint referenced there and storing pointers to the new copies in its own [EndPoints](#) array.

You should usually not call the copy constructor explicitly. It is called by the copy constructor for [CCyUSBConfig](#) when [CCyUSBDevice::GetUSBConfig\(\)](#) is called.

The below example shows how you could create a copy of the first interface exposed by a device.

Example

```
CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );

CCyUSBConfig cfg = USBDevice->GetUSBConfig( 0 );

CCyUSBInterface *iface = new CCyUSBInterface( *cfg.Interfaces[ 0 ] );
```

13.6 bInterfaceClass

UCHAR CCyUSBInterface::bInterfaceClass[Previous](#) [Top](#) [Next](#)**Description**

This data member contains the **bInterfaceClass** field from the currently selected interface's interface descriptor.

This data member exists for completeness and debugging purposes. You should normally never need to access this data member.

13.7 bInterfaceNumber

UCHAR CCyUSBInterface::bInterfaceNumber[Previous](#) [Top](#) [Next](#)**Description**

This data member contains the **bInterfaceNumber** field from the currently selected interface's interface descriptor.

This data member exists for completeness and debugging purposes. You should normally never need to access this data member.

13.8 bInterfaceProtocol

UCHAR CCyUSBInterface::bInterfaceProtocol[Previous](#) [Top](#) [Next](#)**Description**

This data member contains the **bInterfaceProtocol** field from the currently selected interface's interface descriptor.

This data member exists for completeness and debugging purposes. You should normally never need to access this data member.

13.9 bInterfaceSubClass

UCHAR CCyUSBInterface::bInterfaceSubClass[Previous](#) [Top](#) [Next](#)**Description**

This data member contains the **bInterfaceSubClass** field from the currently selected interface's

interface descriptor.

This data member exists for completeness and debugging purposes. You should normally never need to access this data member.

13.10 bLength

UCHAR CCyUSBInterface::bLength

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Description

This data member contains the **bLength** field from the currently selected interface's interface descriptor. It indicates the length of the interface descriptor. (Because the descriptor is an interface descriptor, this value should always be 0x09.)

13.11 bNumEndpoints

UCHAR CCyUSBInterface::bNumEndpoints

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Description

This data member contains the **bNumEndpoints** field from the currently selected interface's interface descriptor. It indicates how many endpoint descriptors are returned for the selected interface.

This data member exists for completeness and debugging purposes. You should normally never need to access this data member.

13.12 EndPoints

**CCyUSBEndPoint* CCyUSBInterface::EndPoints[
MAX_ENDPTS]**

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Description

This is the key data member of the CCyUSBInterface class. It is an array of pointers to CCyUSBEndPoint objects that represent the endpoint descriptors returned, by the device, for the interface.

The [CCyUSBDevice::EndPoints](#) member is actually a pointer to the currently selected interface's EndPoints array.

Example

```
// This code lists all the endpoints reported
// for all the interfaces reported
// for all the configurations reported
// by the device.

CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL );

char buf[ 512 ];
string s;
```

```

for (int c=0; c<USBDevice->ConfigCount(); c++)
{
    CCyUSBConfig cfg = USBDevice->GetUSBConfig(c);

    sprintf_s(buf, "bLength: 0x%x\n", cfg.bLength); s.append(buf);
    sprintf_s(buf, "bDescriptorType: %d\n", cfg.bDescriptorType); s.append(buf);
    sprintf_s(buf, "wTotalLength: %d (0x%x)\n", cfg.wTotalLength, cfg.wTotalLength);
    s.append(buf);
    sprintf_s(buf, "bNumInterfaces: %d\n", cfg.bNumInterfaces); s.append(buf);
    sprintf_s(buf, "bConfigurationValue: %d\n", cfg.bConfigurationValue); s.append(buf);
    sprintf_s(buf, "iConfiguration: %d\n", cfg.iConfiguration); s.append(buf);
    sprintf_s(buf, "bmAttributes: 0x%x\n", cfg.bmAttributes); s.append(buf);
    sprintf_s(buf, "MaxPower: %d\n", cfg.MaxPower); s.append(buf);
    s.append("*****\n");
    cout<<s;
    s.clear();

    for (int i=0; i<cfg.AltInterfaces; i++)
    {
        CCyUSBInterface *ifc = cfg.Interfaces[i];
        sprintf_s(buf, "Interface Descriptor: %d\n", (i+1)); s.append(buf);
        sprintf_s(buf, "-----\n"); s.append(buf);
        sprintf_s(buf, "bLength: 0x%x\n", ifc->bLength); s.append(buf);
        sprintf_s(buf, "bDescriptorType: %d\n", ifc->bDescriptorType); s.append(buf);
        sprintf_s(buf, "bInterfaceNumber: %d\n", ifc->bInterfaceNumber); s.append(buf);
        sprintf_s(buf, "bAlternateSetting: %d\n", ifc->bAlternateSetting); s.append(buf);
        sprintf_s(buf, "bNumEndpoints: %d\n", ifc->bNumEndpoints); s.append(buf);
        sprintf_s(buf, "bInterfaceClass: %d\n", ifc->bInterfaceClass); s.append(buf);
        sprintf_s(buf, "*****\n"); s.append(buf);
        cout<<s;
        s.clear();

        for (int e=0; e<ifc->bNumEndpoints; e++)
        {
            CCyUSBEndPoint *ept = ifc->EndPoints[e+1];
            sprintf_s(buf, "EndPoint Descriptor: %d\n", (e+1)); s.append(buf);
            sprintf_s(buf, "-----\n"); s.append(buf);
            sprintf_s(buf, "bLength: 0x%x\n", ept->DscLen); s.append(buf);
            sprintf_s(buf, "bDescriptorType: %d\n", ept->DscType); s.append(buf);
            sprintf_s(buf, "bEndpointAddress: 0x%x\n", ept->Address); s.append(buf);
            sprintf_s(buf, "bmAttributes: 0x%x\n", ept->Attributes); s.append(buf);
            sprintf_s(buf, "wMaxPacketSize: %d\n", ept->MaxPktSize); s.append(buf);
            sprintf_s(buf, "bInterval: %d\n", ept->Interval); s.append(buf);
            s.append("*****\n");
            cout<<s;
            s.clear();
        }
    }
}

```

13.13 iInterface

UCHAR CCyUSBInterface::iInterface

[Previous](#) [Top](#)

Description

This data member contains the **iInterface** field from the currently selected interface's interface descriptor.

This data member exists for completeness and debugging purposes. You should normally never need to access this data member.

14 CCyUSBBOS

CCyUSBBOS class

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Header

CyAPI.h

Description

CCyUSBBOS represents a USB3.0 device BOS descriptor. .

When [CCyUSBDevice::Open\(\)](#) is called, an instance of CCyUSBBOS is constructed if device is USB3.0 device.

In the process of construction, CCyUSBBOS creates instances for each capability. if device does not define specific capability then the valued of the instance will be NULL. following are the capability types [CCyBOS_USB20_DEVICE_EXT](#), [CCyBOS_SS_DEVICE_CAPABILITY](#) and [CCyBOS_CONTAINER_ID](#)

The following example code shows how you might use the CCyUSBBOS class in an application.

Example

```
// This code lists the BOS device capability descriptor
//
char buf[ 512];
string s;
CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL);

CCyUSBBOS *bos = USBDevice->UsbBos;

sprintf_s(buf, "BOS Descriptor");
sprintf_s( buf, "-----");
sprintf_s( buf, "bLength: 0x%x", bos->bLength); s.append( buf);
sprintf_s( buf, "bDescriptorType: %d", bos->bDescriptorType); s.append( buf);
sprintf_s( buf, "wTotalLength: %d", bos->wToatalLength); s.append( buf);
sprintf_s( buf, "bNumDeviceCaps: %d", bos->bNumDeviceCaps); s.append( buf);
sprintf_s( buf, "*****");
cout<<s;
s.clear();

if( bos->pUSB20_DeviceExt)
{
    CCyBosUSB20Extesnion *Usb20Ext = bos->pUSB20_DeviceExt;
    sprintf_s( buf, "USB20 Device Extension Descriptor");
```

```

    sprintf_s(buf, "-----");
    sprintf_s(buf, "bLength: 0x%x", Usb20Ext->bLength); s.append(buf);
    sprintf_s(buf, "bDescriptorType: %d", Usb20Ext->bDescriptorType); s.append(buf);
    sprintf_s(buf, "bDevCapabilityType: %d", Usb20Ext->bDevCapabilityType); s.append(buf);
    sprintf_s(buf, "bmAttribute: %d", Usb20Ext->bmAttribute); s.append(buf);
    sprintf_s(buf, "*****");
    cout<<s;
    s.clear();
}

if( bos->pSS_DeviceCap)
{
    CCyBosSuperSpeedCapability *ssCap = bos->pSS_DeviceCap;
    sprintf_s(buf, "Super Speed Device capability Descriptor");
    sprintf_s(buf, "-----");
    sprintf_s(buf, "bLength: 0x%x", ssCap->bLength); s.append(buf);
    sprintf_s(buf, "bDescriptorType: %d", ssCap->bDescriptorType); s.append(buf);
    sprintf_s(buf, "bDevCapabilityType: %d", ssCap->bDevCapabilityType); s.append(buf);
    sprintf_s(buf, "bmAttribute: %d", ssCap->bmAttribute); s.append(buf);
    sprintf_s(buf, "SpeedsSupported: %d", ssCap->SpeedsSupported); s.append(buf);
    sprintf_s(buf, "bFunctionalitySupported: %d", ssCap->bFunctionalitySupported); s.append
(buf);
    sprintf_s(buf, "bU1DevExitLat: %d", ssCap->bU1DevExitLat); s.append(buf);
    sprintf_s(buf, "bU2DevExitLat: %d", ssCap->bU2DevExitLat); s.append(buf);
    sprintf_s(buf, "*****");
    cout<<s;
    s.clear();
}

if( bos->pContainer_ID)
{
    CCyBosContainerID *ContID = bos->pContainer_ID;
    sprintf_s(buf, "Container ID Descriptor");
    sprintf_s(buf, "-----");
    sprintf_s(buf, "bLength: 0x%x", ContID->bLength); s.append(buf);
    sprintf_s(buf, "bDescriptorType: %d", ContID->bDescriptorType); s.append(buf);
    sprintf_s(buf, "bDevCapabilityType: %d", ContID->bDevCapabilityType); s.append(buf);
    sprintf_s(buf, "bResereved: %d", ContID->bResereved); s.append(buf);
    sprintf_s(buf, "ContainerID: %s", ContID->ContainerID); s.append(buf);
    sprintf_s(buf, "*****");
    cout<<s;
    s.clear();
}

```

14.1 pSS_DeviceCap

CCyBosSuperSpeedCapability
*pSS_DeviceCap

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Description

pSS_DeviceCap is a [CyBOS_SS_DEVICE_CAPABILITY](#) object represent the USB3.0 device super speed capability of BOS. It can be null if it device does not define this capability or if device is USB2.0.

This data member exists for completeness and debugging purposes. You should normally never need to access this data member.

14.2 pContainer_ID

CCyBosContainerID *pContainer_ID

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Description

pContainer ID is a [CyBOS_CONTAINER_ID](#) object represent the USB3.0 device container ID of BOS. It can be null if it device does not define this capability or if device is USB2.0.

This data member exists for completeness and debugging purposes. You should normally never need to access this data member.

14.3 bLength

UCHAR bLength

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Description

This property returns length of BOS descriptor.

14.4 bDescriptorType

UCHAR bDescriptorType

[Top](#) [Previous](#) [Next](#)

Description

bDescriptorType contains value of the **bDescriptorType** field from the selected BOS descriptor.

14.5 wTotalLength

USHORT wTotalLength

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Description

wTotalLength contains value of the wTotalLength field from the selected BOS descriptor.

14.6 bNumDeviceCaps

UCHAR bNumDeviceCaps

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Description

bNumDeviceCaps contains value of the **bNumberOfDeviceCapability** field from the selected BOS descriptor.

15 pUSB20_DeviceExt

CCyBosUSB20Extesnion *pUSB20_DeviceExt

[Top](#) [Previous](#) [Next](#)

Description

pUSB20_DeviceExt is a [CyBOS_USB20_DEVICE_EXT](#) object represents the USB2.0 device extension capability of BOS. It can be null if it device does not define this capability or if device is USB2.0.

This data member exists for completeness and debugging purposes. You should normally never need to access this data member.

16 CCyBOSUSB20Extension

CCyBOSUSB20Extension class

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Header
CyAPI.h

Description

CCyBOSUSB20Extension represents a USB3.0 device USB2.0 device extension capability descriptor.

When [CCyUSBDevice::Open\(\)](#) is called, an instance of CCyUSBBOS is constructed if device is USB3.0 device. If device defines the USB2.0 device extension capability then it will be instantiated by the CCyUSBBOS class.

The following example code shows how you might use the CCyUSBBOS class in an application.

Example

```
// This code lists the BOS USB20 device extension descriptor
//
char buf[512];
string s;
CCyUSBDevice *USBDevice = new CCyUSBDevice(NULL);
CCyUSBBOS *bos = USBDevice->UsbBos;

if(bos->pUSB20_DeviceExt)
{
    CCyBosUSB20Extension *Usb20Ext = bos->pUSB20_DeviceExt;
    sprintf_s(buf, "USB20 Device Extension Descriptor");
    sprintf_s(buf, "-----");
    sprintf_s(buf, "bLength: 0x%x", Usb20Ext->bLength); s.append(buf);
    sprintf_s(buf, "bDescriptorType: %d", Usb20Ext->bDescriptorType); s.append(buf);
    sprintf_s(buf, "bDevCapabilityType: %d", Usb20Ext->bDevCapabilityType); s.append(buf);
    sprintf_s(buf, "bmAttribute: %d", Usb20Ext->bmAttribute); s.append(buf);
    sprintf_s(buf, "*****");
    cout<<s;
    s.clear();
}
```

16.1 bLength

UCHAR bLength

[Top](#) [Previous](#) [Next](#)

Description

bLength contains the value of bLength field of USB20 Device extension descriptor.

16.2 bDescriptorType

UCHAR bDescriptorType

[Top](#) [Previous](#) [Next](#)

Description

bDescriptorType contains the value of bDescriptorType filed of USB20 Device extension descriptor.

16.3 bDevCapabilityType

UCHAR bDevCapabilityType

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Description

bDevCapabilityType contains the value of bDevCapabilityType filed of USB20 Device extension descriptor.

16.4 bmAttribute

UINT bmAttribute

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Description

bmAttribute contains the value of bmAttribute filed of USB20 Device extension descriptor.

17 CCyBOSSuperSpeedCapability

CCyBOSSuperSpeedCapability class

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Header

CyAPI.h

Description

CCyBOSSuperSpeedCapability represents a USB3.0 device super speed device capability descriptor. .

When [CCyUSBDevice::Open\(\)](#) is called, an instance of CCyUSBBOS is constructed if device is USB3.0 device. If the device defines the SS device capability, then it will be instantiated by the CCyUSBBOS class.

The following example code shows the usage of the CCyBOSSuperSpeedCapability class in an application.

Examples

```
// This code lists the BOS Super Speed device capability descriptor
//
char buf[512];
string s;
CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL);
CCyUSBBOS *bos = USBDevice->UsbBos;

if( bos->pSS_DeviceCap)
{
    CCyBosSuperSpeedCapability *ssCap = bos->pSS_DeviceCap;
    sprintf_s(buf, "Super Speed Device capability Descriptor");
    sprintf_s(buf, "-----");
}
```

```

printf_s(buf, "bLength: 0x%x", ssCap->bLength); s.append(buf);
printf_s(buf, "bDescriptorType: %d", ssCap->bDescriptorType); s.append(buf);
printf_s(buf, "bDevCapabilityType: %d", ssCap->bDevCapabilityType); s.append(buf);
printf_s(buf, "bmAttribute: %d", ssCap->bmAttribute); s.append(buf);
printf_s(buf, "SpeedsSupported: %d", ssCap->SpeedsSupported); s.append(buf);
printf_s(buf, "bFunctionalitySupported: %d", ssCap->bFunctionalitySupported); s.append
(buf);
printf_s(buf, "bU1DevExitLat: %d", ssCap->bU1DevExitLat); s.append(buf);
printf_s(buf, "bU2DevExitLat: %d", ssCap->bU2DevExitLat); s.append(buf);
s.append("*****\n");
cout<<s;
s.clear();
}

```

17.1 bLength

UCHAR bLength

[Top](#) [Previous](#) [Next](#)

Description

bLength contains the value of bLength field of SS Device capability descriptor.

17.2 bDescriptorType

UCHAR bDescriptorType

[Top](#) [Previous](#) [Next](#)

Description

bDescriptorType contains the value of bDescriptorType field of SS Device capability descriptor.

17.3 bDevCapabilityType

UCHAR bDevCapabilityType

[Top](#) [Previous](#) [Next](#)

Description

bDevCapabilityType contains the value of bDevCapabilityType field of SS Device capability descriptor.

17.4 bmAttribute

UCHAR bmAttribute

[Top](#) [Previous](#) [Next](#)

Description

bmAttribute contains the value of bmAttribute field of SS Device capability descriptor.

17.5 SpeedsSupported

USHORT SpeedsSupported

[Top](#) [Previous](#) [Next](#)

Description

SpeedsSupported contains the value of wSpeedsSupported field of SS Device capability descriptor.

17.6 bFunctionalitySupport

UCHAR bFunctionalitySupport

[Top](#) [Previous](#) [Next](#)

Description

bFunctionalitySupport contains the value of bFunctionalitySupport field of SS Device capability descriptor.

17.7 bU1DevExitLat

UCHAR bU1DevExitLat

[Top](#) [Previous](#) [Next](#)

Description

U1DevExitLat contains the value of U1DevExitLat filed of SS Device capability descriptor.

17.8 bU2DevExitLat

USHORT bU2DevExitLat

[Top](#) [Previous](#) [Next](#)

Description

bU2DevExit contains the value of bU2DevExit filed of SS Device capability descriptor.

18 CCyBOSContainerID

CCyBOSContainerID class

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Header

CyAPI.h

Description

CCyBOSContainerID represents a USB3.0 device container id descriptor. .

When [CCyUSBDevice::Open\(\)](#) is called, an instance of CCyUSBOS is constructed, if device is USB3.0 device. if device define the SS device capability then it will be instantiated by the CCyUSBOS class.

The following example code shows how you might use the CCyBOSContainerID class in an application.

Examples

```
// This code lists the BOS container ID device capability descriptor
//
char buf[ 512];
string s;
CCyUSBDevice *USBDevice = new CCyUSBDevice( NULL);
CCyUSBOS *bos = USBDevice->UsbBos;

if( bos->pContainer_ID)
{
    CCyBosContainerID *ContID = bos->pContainer_ID;
    sprintf_s( buf, "Container ID Descriptor");
    sprintf_s( buf, "-----");
    sprintf_s( buf, "bLength: 0x%x", ContID->bLength); s.append( buf);
    sprintf_s( buf, "bDescriptorType: %d", ContID->bDescriptorType); s.append( buf);
    sprintf_s( buf, "bDevCapabilityType: %d", ContID->bDevCapabilityType); s.append( buf);
    sprintf_s( buf, "bResereved: %d", ContID->bResereved); s.append( buf);
    sprintf_s( buf, "ContainerID: %s", ContID->ContainerID); s.append( buf);
    s.append( "*****\n");
    cout<<s;
    s.clear();
}
```

18.1 bLength

UCHAR bLength

[Top](#) [Previous](#) [Next](#)

Description

bLength contains the value of bLength field of Container ID descriptor.

18.2 bDescriptorType

UCHAR bDescriptorType

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Description

bDescriptorType contains the value of bDescriptorType field of Container ID descriptor.

18.3 bDevCapabilityType

UCHAR bDevCapabilityType

[Top](#) [Previous](#) [Next](#)

Description

bDevCapabilityType contains the value of bDevCapabilityType field of Container ID descriptor.

18.4 Reserved

UCHAR Reserved

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Description

Reserved field of Container ID descriptor.

18.5 ContainerID

UCHAR ContainerID

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Description

ContainerID contains the value of ContainerID field of Container ID descriptor.

19 USB_BOS_USB20_DEVICE_EXTENSION

struct USB_BOS_USB20_DEVICE_EXTENSION defined in CyUSB30_def.h

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Description

The USB_BOS_USB20_DEVICE_EXTENSION structure is filled-in by the [GetBosUSB20DeviceExtensionDesc](#) method of [CyUSBDevice](#). The structure is defined as:

```
typedef struct USB_BOS_USB20_DEVICE_EXTENSION
{
    UCHAR bLength;
    UCHAR bDescriptorType;
    UCHAR bDevCapabilityType;
    UINT bmAttribute;
} USB_BOS_USB20_DEVICE_EXTENSION, *PUSB_BOS_USB20_DEVICE_EXTENSION;
```

Please refer USB3.0 specification section 9.6.2.1 for detail description of each parameter.

20 USB_BOS_SS_DEVICE_CAPABILITY

struct _USB_BOS_SS_DEVICE_CAPABILITY
defined in CyUSB30_def.h

[Top](#) [Previous](#) [Next](#)

Description

The USB_BOS_SS_DEVICE_CAPABILITY structure is filled-in by the [GetBosSSCapabilityDescriptor](#) method of [CyUSBDevice](#).

The structure is defined as:

```
typedef struct _USB_BOS_SS_DEVICE_CAPABILITY
{
    UCHAR bLength;
    UCHAR bDescriptorType;
    UCHAR bDevCapabilityType;
    UCHAR bmAttribute;
    USHORT wSpeedsSupported;
    UCHAR bFunctionalitySupported;
    UCHAR bU1DevExitLat;
    USHORT bU2DevExitLat;
}USB_BOS_SS_DEVICE_CAPABILITY,*PUSB_BOS_SS_DEVICE_CAPABILITY;
```

Please refer USB3.0 specification section 9.6.2.2 for detail description of each parameter.

21 USB_BOS_CONTAINER_ID

struct _USB_BOS_CONTAINER_ID
defined in CyUSB30_def.h

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Description

The USB_BOS_CONTAINER_ID structure is filled-in by the [GetBosContainedIDDescriptor](#) method of [CyUSBDevice](#).

The structure is defined as:

```
typedef struct _USB_BOS_CONTAINER_ID
{
    UCHAR bLength;
    UCHAR bDescriptorType;
    UCHAR bDevCapabilityType;
    UCHAR bReserved;
    UCHAR ContainerID[USB_BOS_CAPABILITY_TYPE_CONTAINER_ID_SIZE];
}USB_BOS_CONTAINER_ID,*PUSB_BOS_CONTAINER_ID;
```

Please refer USB3.0 specification section 9.6.2.3 for detail description of each parameter.

22 USB_BOS_DESCRIPTOR

struct _USB_BOS_DESCRIPTOR

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defined in `CyUSB30_def.h`

Description

The `USB_BOS_DESCRIPTOR` structure is filled-in by the [GetBosDescriptor](#) method of [CyUSBDevice](#). The structure is defined as:

```
typedef struct _USB_BOS_DESCRIPTOR
{
    UCHAR bLength;
    UCHAR bDescriptorType;
    USHORT wToatallLength;
    UCHAR bNumDeviceCaps;
}USB_BOS_DESCRIPTOR,*PUSB_BOS_DESCRIPTOR;
```

Please refer USB3.0 specification section 9.6.2 for detail description of each parameter.

23 FX3_FWDWNLOAD_MEDIA_TYPE

enum `FX3_FWDWNLOAD_MEDIA_TYPE`

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Description

This is enumerator for the types of Firmware media.

It defined following media types

RAM - Download firmware to Ram.
 I2CE2PROM - Download firmware to I2C E2PROM.
 SPIFLASH - Download firmware to SPI FLASH.

24 FX3_FWDWNLOAD_ERROR_CODE

enum `FX3_FWDWNLOAD_ERROR_CODE`

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Description

This enumerator defines following firmware download error codes.

SUCCESS(Firmware download successful)
 FAILED(Firmware download failed)
 INVALID_MEDIA_TYPE (Given Input Media type is not supported)
 INVALID_FWSIGNATURE (Invalid Firmware Signature)
 DEVICE_CREATE_FAILED (Device Open failed)
 INCORRECT_IMAGE_LENGTH(Firmware image length is incorrect)
 INVALID_FILE (Invalide file)
 SPILASH_ERASE_FAILED(SPI erase operation failed)
 CORRUPT_FIRMWARE_IMAGE_FILE (Corrupt Firmware image file)
 I2CE2PROM_UNKNOWN_I2C_SIZE (Unknown I2CE2PROM size, Unknown value parsed from 2nd Bytes of IMG file)

25 How to Link CyAPI.lib

Please follow the below steps to add CyAPI.lib to your project.

1. Add the CyAPI.h header files to your project from the CySuiteUSB installation directory CyAPI\inc. Note that the other related header files are available in the same directory.

2. Linking CyAPI.lib

Select Project property.

Select 'Linker' node under the 'Configuration Properties'.

Select the 'Input' node under the 'Linker'.

Add lib path(including the lib name, example-..\lib\x86\cyapi.lib) in the 'Additional Dependencies' edit box. Libraries for 32/64 bit available in the CySuiteUSB installation directory CyAPI\lib. The directory 'x64' is for 64-bit library and the 'x86' directory is for 32-bit library.

3. Linking setupapi.lib in your project

Select Project property.

Select 'Linker' node under the 'Configuration Properties'.

Select the 'Input' node under the 'Linker'.

Add lib 'setupapi.lib' in the 'Additional Dependencies' edit box. The setupapi.lib is a standard library and it is available in the Microsoft SDK.

26 Features Not Supported

The Following features are not supported by CyAPI.lib

1. SET ADDRESS Feature

The SET ADDRESS Request cannot be implemented through control endpoint.

2. SYNC FRAME

The SYNC FRAME Request cannot be implemented through Control Endpoint.

3. USB3.0 Bulk Streaming

4. Set/Get Transfer size

The [XferSize](#) variable to get/set the transfer size of endpoint is no longer supported. Please refer [XferSize](#) the for more information.

5. Device Configuration for USB3.0 composite device.

The CyUSB3 driver return device configuration inclusive of both interface for USB3.0 composite device. This is the limitation due to the USB DI bus interface. The USB DI does not support USB3.0 specific

device configuration.

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