

[VxWorks](#) from [Wind River](#) is a real-time operating system.

Under UPDD version 3 we developed a serial driver for this operating system and under UPDD version 4 we have added USB support.

Within this environment, VxWorks is the embedded OS image created within the VxWorks Integrated Development Environment (IDE). The image can be build for a number of platforms. There is also WindML, otherwise known as UGL, which is the main graphics library on VxWorks and all other technologies seem to be built upon it. These include Zinc (a C++ wrapper for UGL) and the embedded Java runtime.

A good reference site for VxWorks and the IDE is <http://www.xs4all.nl/~borkhuis/vxworks/vxworks.html> or [http://www.windriver.com/products/development\\_suite/](http://www.windriver.com/products/development_suite/)

The prerequisites for running the driver are that WindML and C++ support are built into the VxWorks image.

***It is our experience that every VxWorks works system is unique and therefore does not lend itself to 'packaged' software and therefore in every request for a VxWorks touch driver we need to build a new driver with the required touch controller, embed it on the target VxWorks system and test/fix until all is working.***

***However, due to economic considerations (cost of development tools verses return on investment) we do not have a permanent VxWorks development license and this has been supplied to us each time we have needed to undertake development. A prerequisite of any new development is the temporarily supply of the appropriate VxWorks development licenses (for supported IDEs) or the VxWorks IDE software. We also require the target VxWorks system to test the driver.***

## Integration procedure

### UPDD version 4.0.x

#### General notes

##### 1) Global Variables

VXWorks implements a shared global namespace so functions and global variables must be unique. If unexpected crashes are observed it is possible that a name has been used in UPDD and another program in the image.

One such problem occurred with calibration where we were reading data from a msg queue to a global variable called "dummy" and the customer's image contained a 'dummy' variable. This resulted in a "page fault in msgQReceive" when spawning the tbcilibvx task until the customer changed the dummy variable name.

##### 2) File Descriptors

VxWorks keeps track of "file descriptors" used (files, sockets, pipes...) by means of a fixed size list that has a default size of 50 entries. Most systems will use a number of these 'file descriptors' and the number changes dynamically when operations are performed. It is important to have always some of these descriptors free because otherwise system errors will occur.

The UPDD driver requires approximately 25 file descriptors (mainly pipes) in order to work. One customer did not configure sufficient "file descriptors" and reported problems with USB devices dynamic attachment.

In this particular system the problem was solved by increasing the number of "file descriptors" (NUM\_FILES = 100).

#### Feb 2009 release

VxWorks 6.4  
WinML 5.0  
IDE 2.6 – Workbench

Under this environment we have only tested ELO USB controllers:

USB layer:

- Copy usrUsbUPDDInit.c to C:\WindRiver\vxworks-6.4\target\config\comps\src\
- Copy 10usb.cdf to C:\WindRiver\vxworks-6.4\target\config\comps\vxWorks\ overwriting the copy already there
- Copy usbUPDDLlib.h to C:\WindRiver\vxworks-6.4\target\h\drv\usb
- Copy Makefile to C:\WindRiver\vxworks-6.4\target\src\drv\usb overwriting the copy already there
- Copy usbUPDDLlib.c to C:\WindRiver\vxworks-6.4\target\src\drv\usb
- Copy device.c to C:\WindRiver\vxworks-6.4\target\src\usb2\usb overwriting the copy already there
- In Workbench in the "gui\_image" project, open the Kernel Configuration screen
- Navigate to hardware,peripherals,usb devices and right click "UPDD" and select "include"



## USB

### Installing the USB interface module

1. Close running Tornado sessions
2. Copy `usrUsbUPDDInit.c` to `<Tornado>\target\config\comps\src`
3. Copy `usbUPDDLlib.c` to `<Tornado>\target\src\drv\usb`
4. Copy `usbUPDDLlib.h` to `<Tornado>\target\h\drv\usb`
5. Edit `<Tornado>\target\src\drv\usb\Makefile` and add `"usbUPDDLlib.c"` to the `"DOC_FILES"` section
6. Edit `<Tornado>\target\src\drv\usb\Makefile` and add `"usbUPDDLlib.o"` to the `"OBJS"` section
7. Copy `10usb.cdf` `<Tornado>\target\config\comps\vxWorks`, overwriting the existing version
8. Rebuild the BSP

### Important DMC USB controller notes:

The DMC controller is a "VENDOR\_SPECIFIC" USB device and as such requires version 2.3 of the USB stack from Wind River as earlier versions are not compatible with "VENDOR\_SPECIFIC" devices.

This controller also requires 3 USB requests to send initialisation data:

To use USB requests with USB stack 2.3 then please replace your `$TORNADO\target\src\usb2\usb\device.c` with the one included with the driver package and then modify the `"usbSubmitRequest"` calls at line 2499 as below.

```
if(pNewDeviceInfo->uVendorID == 0xAFA && pNewDeviceInfo->uDeviceID == 0x3E8)
{
    UCHAR buf[4];
    UINT32 len;
    len = 2;
    usbSubmitRequest(pNewDeviceInfo, 0xC0, 0x55, 0, 0, &len, buf);
    usbSubmitRequest(pNewDeviceInfo, 0xC0, 0x5, 0x45, 0, &len, buf);
    usbSubmitRequest(pNewDeviceInfo, 0x40, 0x31, 0, 0, &len, buf);
}
```

### Project integration

1. Open your project in Tornado
2. In the "Workspace" windows, select the VxWorks tab and open "hardware\peripherals\USB Devices" in the tree
3. Right click "UPDD" in the tree and select "Include UPDD" from the menu
4. In the "Workspace" windows, select the VxWorks tab and open "hardware\peripherals\USB Devices\USB Devices Init" in the tree
5. Right click "UPDD Init" in the tree and select "Include UPDD Init" from the menu
6. Add all of the ".o" files to your project
7. Rebuild your vxWorks image file

### Enabling UPDD in WindML

1. Create the directory `<Tornado>\target\src\ugl\driver\pointer\updd`
2. Copy the files `"depend.PENTIUM3gnu"`, `"uglupdd.c"`, `"depend.PENTIUMgnu"`, `"Makefile"` to this directory
3. Copy the file `"uglupdd.h"` to the directory `<Tornado>\target\h\ugl\driver\pointer`
4. Edit the file `<Tornado>\host\resource\windML\config\database\windML_INPUT_DB.cfg` and add `"updd"` to the `"POINTER="` line
5. Add the following section to the bottom of `<Tornado>\host\resource\windML\config\database\windML_INPUT_DB.cfg`

```
# UPDD
```

```
updd.NAME=UPDD Touchscreen
updd.ARCH=pentium3
updd.SELECT=INCLUDE_UPDD
updd.DEVNAME=/ata0a/tbupddvx/comReadPipe
updd.HEADER=ugl/driver/pointer/uglupdd.h
updd.DIR=updd
```

6. Run the WindML configuration program from Tornado
7. Click the "Devices" tab
8. Click the drop down box for the "pointer" and select "UPDD Touchscreen"
9. Save the configuration and exit
10. Build WindML

### Invoking the driver and calibration procedure

1. Ensure that the following directories exist on the system: `"/ata0a/tbupddvx"`, `"/ata0a/tmp"`
2. Copy the file `"tbupdd.reg"` to the `"/ata0a/tbupddvx"` directory

The driver daemon must be running for UPDD to function correctly. To launch it, call the following function:-

```
taskSpawn "tbupddvx",100,0,48000,tbupddvx
```

You must calibrate the touchscreen before you use it. To do this call the following function:-

```
taskSpawn "tbcplibvx",100,0,48000,tbcplibvx
```

### Serial

This version has not been tested with serial controllers but still has the serial code from UPDD version 3 which, in theory should work. For future serial requirements we would suggest testing this release and addressing any issues that arise.

### Project integration

1. Open your project in Tornado
2. Add all of the ".o" files to your project
3. Rebuild your vxWorks image file

### Enabling UPDD in WindML

1. Create the directory <Tornado>\target\src\ugl\driver\pointer\updd
2. Copy the files "depend.PENTIUM3gnu", "uglupdd.c", "depend.PENTIUMgnu", "Makefile" to this directory
3. Copy the file "uglupdd.h" to the directory <Tornado>\target\h\ugl\driver\pointer
4. Edit the file <Tornado>\host\resource\windML\config\database\windML\_INPUT\_DB.cfg and add "updd" to the "POINTER=" line
5. Add the following section to the bottom of <Tornado>\host\resource\windML\config\database\windML\_INPUT\_DB.cfg

```
# UPDD
```

```
updd.NAME=UPDD Touchscreen
updd.ARCH=pentium3
updd.SELECT=INCLUDE_UPDD
updd.DEVNAME=/ata0a/tbupddvx/comReadPipe
updd.HEADER=ugl/driver/pointer/uglupdd.h
updd.DIR=updd
```

6. Run the WindML configuration program from Tornado
7. Click the "Devices" tab
8. Click the drop down box for the "pointer" and select "UPDD Touchscreen"
9. Save the configuration and exit
10. Build WindML

### Invoking the driver and calibration procedure

1. Ensure that the following directories exist on the system: "/ata0a/tbupddvx", "/ata0a/tmp"
2. Copy the file "tbupdd.reg" to the "/ata0a/tbupddvx" directory

The driver daemon must be running for UPDD to function correctly. To launch it, call the following function:-

```
taskSpawn "tbupddvx",100,0,48000,tbupddvx
```

You must calibrate the touchscreen before you use it. To do this call the following function:-

```
taskSpawn "tbcplibvx",100,0,48000,tbcplibvx
```

### UPDD version 3.x

This software was tested on

Tornado 2.0.2  
VxWorks 5.4.2  
WindML 2.0

The version only supports serial controllers. For future serial requirements we would suggest testing UPDD VxWorks version 4 and addressing any issues that arise.

### VxWorks integration instructions

- Copy uglupdd.c to <tornado>\target\src\ugl\driver\pointer
- Copy uglupdd.h to <tornado>\target\h\ugl\driver\pointer
- Open <tornado>\target\h\ugl\config\uglDepend.h
- At line 201 insert the following:-

```
/* UPDD Touchscreen */
#ifdef INCLUDE_UPDD
#include <ugl/driver/pointer/uglupdd.h>
#endif /* INCLUDE_UPDD */
```

- Open <tornado>\host\resource\ugl\uglDB.cfg
- At line 63 insert the following:-

```
# UPDD
```

```
DEVICE UPDD Touchscreen
ARCH PENTIUM
SELECT INCLUDE_UPDD
DEVNAME "/tbupddvx/comReadPipe"
HEADER uglupdd.h
BSPHDR
```

-Open <tornado>\target\src\ugl\config\uglInit.h  
-At line 249 insert the following:-

```
#undef INCLUDE_UPDD          /* Updd touchscreen */
```

-Open <tornado>\target\src\ugl\driver\pointer\uglupdd.c  
-At lines 18 and 19 modify the definitions of SCREEN\_WIDTH and SCREEN\_HEIGHT to match the video resolution you are using.  
-In Tornado, select Tools, WindML  
-Configure WindML for your hardware, selecting "UPDD Touchscreen" as your pointer device.  
-Clean, Build and download WindML to your target machine  
-Download "tbupddvx.out" to your target machine  
-Download "tbcplibvx.out" to your target machine

### **VxWorks Runtime Instructions**

-Create a directory "/tbupddvx"  
-Copy "tbupdd.reg" to "/tbupddvx"  
-Run "tbupddvx" with a stack size of at least 48000 bytes. e.g. to load it from the Tornado shell type:- "taskSpawn "tbupddvx",100,0,48000,tbupddvx" See below\*\*\*\*\*  
-Run "tbcplibvx" to calibrate the driver for the first time. e.g. to load it from the Tornado shell type:- "sp tbcplibvx"

### **VxWorks Instructions to load and run "tbupddvx.out"**

-Open Tornado  
-If you do not have a target server running then do the following:-  
-Click Tools, Target Server, Configure  
-Select the server you want to use (we assume you will only see one)  
-Click Launch  
-In the dropdown box on the LAUNCH toolbar, select the target server you are using (again we assume you will only see one)  
-Click Project, Download  
-Select "tbupddvx.out"  
-Click Tools, Shell  
-Select your target machine in the drop down box, and click  
OK to launch the Tornado shell  
-In the Tornado shell type: taskSpawn "tbupddvx",100,0,48000,tbupddvx

At this stage the driver is running, and you should load your GUI program.

## **Contact**

For further information or technical assistance please email the technical support team at [technical@touch-base.com](mailto:technical@touch-base.com)