

UHD Overview

- UHD = Universal hardware driver
 - for all Ettus Research products
- C++ library
- Gnuradio component gr-uhd

<http://code.ettus.com/redmine/ettus/projects/uhd/wiki>

UHD hardware/feature support

- Supports all hardware
 - USRP1 classic
 - USRP2
 - Daughterboards
 - New products (exclusivly)
- Missing features
 - 16-bit complex samples over the wire
 - USRP2 "MIMO" cable support

UHD requirements

- Cross-platform w/ cmake

- Linux
- Windows
- Macintosh



- Runtime requirements

- Boost C++ library
- Libusb (optional)

- Build time requirements

- Python + Cheetah for code generation

UHD Images

- [git://code.ettus.com/ettus/uhd.git](https://code.ettus.com/ettus/uhd.git)
 - FPGA and firmware code included
- Pre-built images available
 - http://www.ettus.com/downloads/uhd_images/
 - No sdcc or Xilinx tools required
 - Debs/rpms/zip...



UHD USRP2 Card Burner

The screenshot displays a Windows 7 desktop environment. On the left, a command prompt window shows the execution of a Python script to burn an SD card. The script lists files in a directory and then burns them to a device. In the center, a file explorer window shows the contents of the 'Computer' folder, including hard disk drives and removable storage. On the right, the 'USR2 SD Card Burner' application is open, showing a 'Select Images' dialog with fields for 'Firmware Image' and 'FPGA Image'. Below this is a 'Select Device' section with a 'Rescan for Devices' button and a list of detected devices, including a hard disk volume. A warning message at the bottom of the application states: 'Warning! This tool can overwrite your hard drive. Use with caution.' The taskbar at the bottom shows the active windows: 'Administrator: C:\...', '76 USRP2 SD Card B...', and the system tray with the time '1:31 PM 7/13/2010'.

```
Administrator: C:\Windows\system32\cmd.exe - c:\Python26\python.exe usrp2_card_burner_gui.py

C:\Program Files (x86)\UHD\share\uhd\utils>ls
'ls' is not recognized as an internal or external command,
operable program or batch file.

C:\Program Files (x86)\UHD\share\uhd\utils>dir
Volume in drive C is Windows7_OS
Volume Serial Number is BC09-6F02

Directory of C:\Program Files (x86)\UHD\share\uhd\utils

07/13/2010  01:12 PM    <DIR>          .
07/13/2010  01:12 PM    <DIR>          ..
06/30/2010  12:29 PM      101,888      uhd_burn_db_eeprom.exe
07/13/2010  01:11 PM       88,576      usrp2_addr_burner.exe
05/28/2010  11:08 AM       8,902      usrp2_card_burner.py
05/28/2010  11:08 AM       6,022      usrp2_card_burner_gui.py
04/01/2010  06:22 PM       2,461      usrp2_recovery.py
07/13/2010  01:11 PM      101,888      usrp_burn_db_eeprom.exe
               6 File(s)      309,737 bytes
               2 Dir(s)  182,770,225,152 bytes free

C:\Program Files (x86)\UHD\share\uhd\utils>c:\Python26\python.exe usrp2_card_burner_gui.py
```

Computer

Hard Disk Drives (2)

- Windows7_OS (C:) 170 GB free of 221 GB
- Lenovo_Recovery (Q:) 2.19 GB free of 9.76 GB

Devices with Removable Storage (2)

- DVD RW Drive (D:)
- SD/MMC (F:)

76 USRP2 SD Card Burner

Select Images

Firmware Image:

FPGA Image:

Select Device

Rescan for Devices

\\?\Device\HarddiskVolume5

Raw Device: \\?\:

Warning! This tool can overwrite your hard drive. Use with caution.

Burn SD Card

UHD Architecture

- Device registry
 - Discovery (find device)
 - Factory (make device)
- Device address arguments
 - Key/value pairs
 - Serial, name, type, address...
- Device
 - Stream interface
 - Properties interface
 - Common set of properties

UHD Architecture cont...

- Wrappers on top of properties
 - Single USRP and Multi USRP
 - FAT API - set/get antenna, frequency, gains...
 - Cover 99% usage cases

UHD vs Gnuradio USRP* drivers

- Common API
- More control
 - Individually set gains
 - Finer control over tuning
- Set antenna selections
 - `set_rx_antenna("RX2")`
- Select subdevices by name
 - `set_rx_subdev_spec("A:AB")`

UHD Streaming Interface

- RX Streaming
 - Stream continuous
 - Stream n samples
 - Timestamps on each packet
 - Inline messages/error packets
- TX Streaming
 - Send now
 - Send at time
- TX Async Messages
 - TX errors (late/underflow/burst ack)

Gnuradio gr-uhd component

- Provides interfaces (multi-channel)
 - Single USRP source/sink
 - Multi USRP source/sink
- GRC wrappers
- TODO
 - Move gnuradio examples over to UHD
 - Graphical status monitor + controls
 - Non continuous streaming models with tags
 - Passing metadata with tags



UHD Conclusion

- Common API
- More features
- Cross platform
- Questions?