BittWare
FPGA PLATFORMS

BittWorks II Toolkit

Application Development Software for BittWare FPGA Boards

The BittWorks II Toolkit is a suite of development tools for BittWare's FPGA-based hardware that serves as the main interface between the BittWare board and the host system. The Toolkit includes drivers, libraries, utilities, and example projects for accessing, integrating, and developing applications for the BittWare board. Utilities and drivers connect the board to the host – whether via PCIe, USB, Ethernet, or serial port – and provide easy access to the board's system monitoring features and Flash programming. Extensive libraries provide a consistent, intuitive API for integrating the board into the system, and example projects illustrate data movement and provide a starting point for development. The Toolkit supports 64-bit Windows and Linux platforms.

BittWorks II Toolkit Contents

Libraries

- **BwHIL**: Control a local or remote BittWare board
- **BmcLib**: Control the BMC on a BittWare board

Utilities

- **BwConfig**: Control BittWare hardware in a PC
- **BwServer**: Access the BittWare hardware remotely
- **BwShell**: Quickly debug live FPGA
- **BwMonitor**: View board health

Drivers

- **BwPCI**: Customizable PCI Express driver for Linux
- **Jungo**: Generic driver for Windows

Examples and reference designs

### Installers

BittWorks II Capabilities

During Development

- Device setup, device information
- FPGA developer controls and debugs live FPGA images

During Development & Application Run-Time

- Driver and APIs for system integration
- Flash loading and FPGA booting
- Virtual PCIe hot-swap reduces time spent waiting for system reboots
- Monitor board health via Board Management Controller (BMC)
- Remote board upgrades: FPGA loads, BMC firmware, programmable clocks

BittWorks II tools provide drivers, libraries, utilities, and example projects to make your software and FPGA development easier and more efficient.
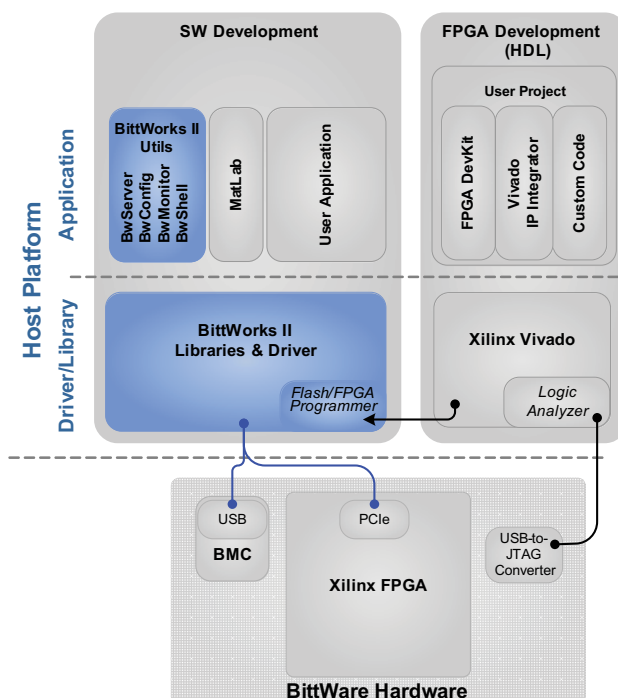
Libraries

The BittWorks II Toolkit libraries provide a stable API that scales with new boards. The functions are C-callable and are cross-platform, allowing them to be run anywhere that Linux or Windows runs.

BwHIL
The BittWorks Host Interface Library (BwHIL) is a library of C-callable functions for controlling BittWare boards.

- Supports PCIe and USB devices
- Includes functions for FPGA configuration, reset, memory access
- Includes functions for Flash loading, erasing, memory access
- Supports virtual PCIe hot-swap

BmcLib
BmcLib is a function library to control the BMC on a BittWare board.

- Manage board sensors
- Program clocks and voltages
- Perform firmware field-upgrades

Utilities

The Toolkit features several utilities that allow you to configure your device in the system, interact with FPGA projects and debug the FPGA, control the BMC on your board, and access the board from a remote system.

BwConfig
BwConfig is an interface for configuring BittWare devices in a system.

- Control BittWare hardware in PC
- Scan and map new devices via PCIe or USB
- View device resources and information
- Control FPGA booting and Flash loading
- Backup Flash to restore a factory default image over PCIe
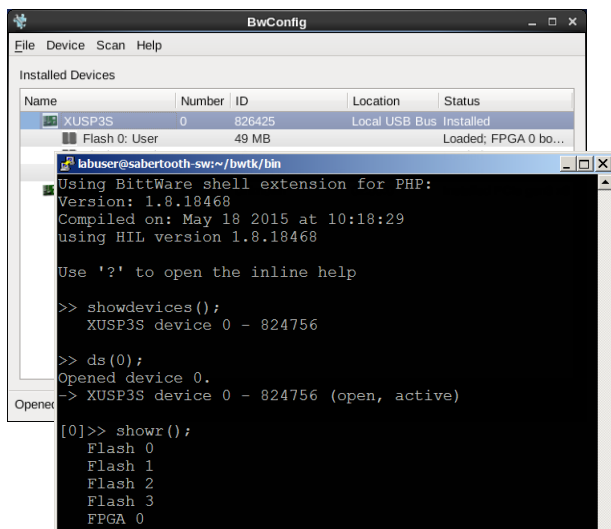
BwConfig and BwShell are Toolkit utilities that provide access to your BittWare hardware
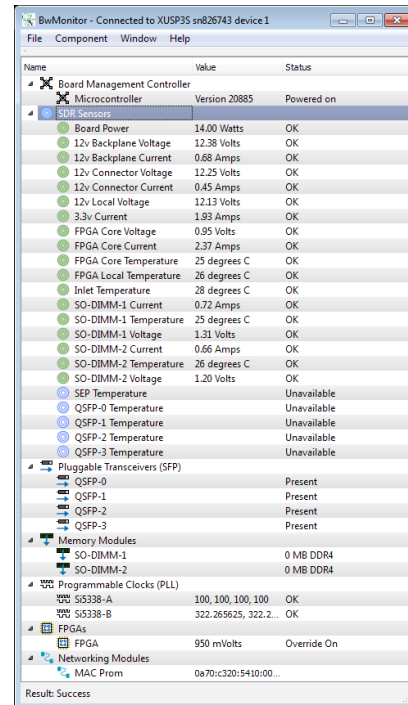
BwMonitor provides a view into the baseboard management capabilities of your BittWare hardware.

BwShell
BwShell is an interactive command-line shell for PHP scripting that provides access to the BwHIL API and the BittWare hardware.

- Quick debug of live FPGA
- Large PHP standard library and extensions
- Refer to FPGA Development Kit components by name without hard-coding addresses
- Access nearly all library functions
- Inline help

BwMonitor
BwMonitor is an interface for controlling the Board Management Controller (BMC) on a BittWare board

- View board health
- Read and log sensors
- Control sensor thresholds that determine when the board will shut down
- Load programmable clocks
- Voltage overrides
- Access devices via I²C
- Upgrade the BMC firmware
- Monitor the board over PCIe or USB

BwServer
BwServer provides remote access to the BittWare board over a TCP/IP network via the BwHIL.

- TCP/IP server for accessing Toolkit programs from a remote machine
- Can be used with or without a user interface
- Allows daisy-chaining of multiple BwServers
- Supports unique names and access restrictions

Drivers

The BittWorks II Toolkit includes drivers for Linux and Windows. The Linux driver is BittWare's fully customizable PCI Express driver, and Windows systems use a standard Jungo driver.

BwPCI
BwPCI is a customizable PCI Express driver for Linux.

• Full source code included
• Fully customizable interrupt service routines
• Customer control for lowest latency, highest throughput
• MSI support
• User / Kernel interaction and custom command support
• Use with any PCI vendor / device ID

Jungo Windows Driver
Windows systems use a standard driver from Jungo.

• Customizable interrupt service routines
• MSI support
• Use with BittWare vendor / device IDs

Examples

Several reference designs are available to provide a starting point for your application development. These examples are available to download on BittWare's developer site.
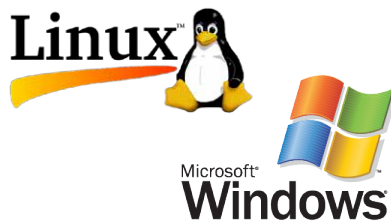
Installers

Download installers for the Toolkit from BittWare's developer site: developer.bittware.com. The Toolkit installs quickly and allows you to begin using your BittWare hardware immediately.

Linux Packages
• 64-bit Linux
• .RPM for Centos
• .DEB for Ubuntu

Windows Installer
• 64-bit Windows

Support Resources

Developer.bittware.com
BittWare's developer site at https://developer.bittware.com provides many resources to help you get started with the BittWorks II Toolkit. Once you create an account, you can log in and download the latest release of the Toolkit, view complete online documentation for all of your BittWare products, and find reference designs and examples.

BittWare Technical Support
BittWare's support team of technical experts are available to answer any installation and usage questions for BittWare products, while also providing assistance with more advanced technical problems that may arise. With your developer site account, you can create and access your technical support issues in our issue tracking system.

FPGA Development Kit Integration

The BittWorks II Toolkit is tightly integrated with BittWare's FPGA Development Kit (FDK), which provides FPGA board support IP and integration for BittWare's FPGA-based boards.

• FDK is used to build IP, and the Toolkit is used to load the IP into Flash or the FPGA.
• FDK contains a 'Discovery ROM' component which provides the Toolkit tools with IP-awareness. IP-awareness is the ability to refer to live FPGA components and their memory regions and registers by their names and instances in software.
• **Coming Soon:** FDK will contain a software library, using functions in the BittWorks II Toolkit HIL for low-level access, that gives user applications IP-awareness.

BittWorks II Toolkit User Experience

The BittWorks II Toolkit significantly eases the effort required to develop applications for BittWare's FPGA board platforms. The following is an example user experience that steps through installing the Toolkit to deploying the final application.

Install the Toolkit and BittWare Hardware
Download and install the BittWorks II Toolkit quickly and with minimal interaction. After installing the Toolkit, install the BittWare hardware in the system.

Build the FPGA Project
Use BittWare's FPGA Development Kit (FDK) to build your FPGA project. Use BittWare's developer website to find a reference design to start your application.

Map the BittWare Devices and Configure Resources
The BwConfig utility contains an easy-to-use PCI and network scanner to find local or remote BittWare devices and map them to the local PC. BwConfig displays device and resource properties of the BittWare hardware. When a device is opened, some of its resources appear in the list, allowing them to be reset or loaded with an FPGA image.
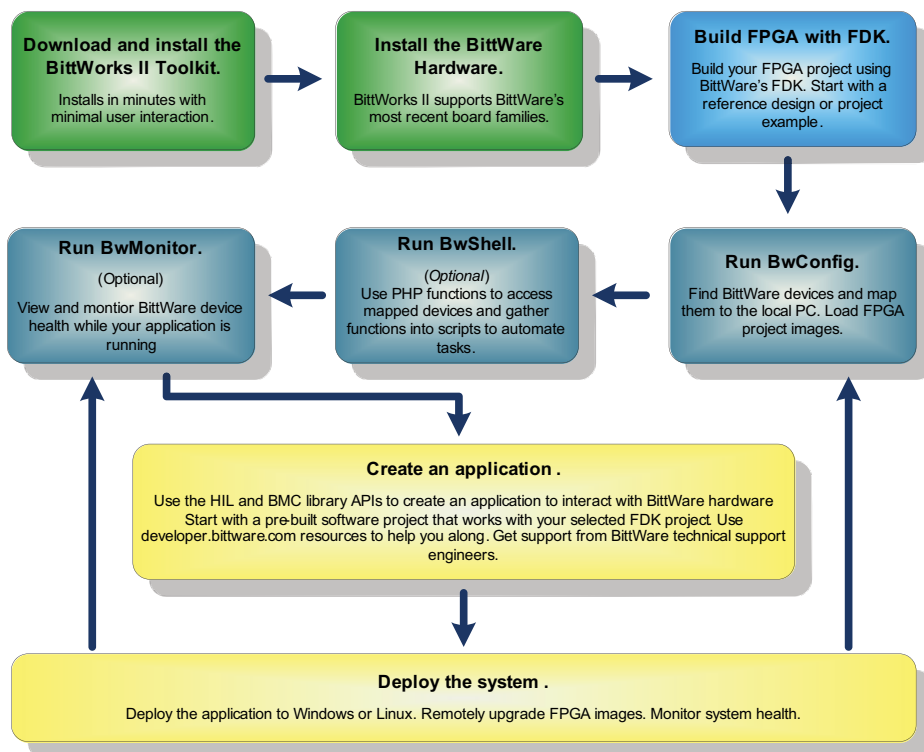
Access Mapped Devices
BwShell provides access to all of the mapped devices. Enter PHP functions and commands into the shell to read and write to device resources. Later, gather functions into scripts to automate tasks.

Create an Application
With the BwHIL and BmcLib APIs, create an application to interact with BittWare hardware. BwHIL allows you to open the device, load the FPGA, read and write memory locations, and create and install an interrupt service routine. Use BwMonitor to view and monitor your board while the application is running.

Deploy the System
Deploy your application for Windows or Linux. You can use the BwHIL and your board's BMC to remotely upgrade FPGA images and monitor system health.

Download and install the BittWorks II Toolkit.
Installs in minutes with minimal user interaction.

Install the BittWare Hardware.
BittWorks II supports BittWare's most recent board families.

Build FPGA with FDK.
Build your FPGA project using BittWare's FDK. Start with a reference design or project example.

Run BwConfig.
Find BittWare devices and map them to the local PC. Load FPGA project images.

Run BwShell.
(*Optional*)
Use PHP functions to access mapped devices and gather functions into scripts to automate tasks.

Run BwMonitor.
(Optional)
View and monitor BittWare device health while your application is running

Create an application.
Use the HIL and BMC library APIs to create an application to interact with BittWare hardware Start with a pre-built software project that works with your selected FDK project. Use developer.bittware.com resources to help you along. Get support from BittWare technical support engineers.

Deploy the system.
Deploy the application to Windows or Linux. Remotely upgrade FPGA images. Monitor system health.

Example BittWorks II User Experience Steps

Ordering Options

Ordering Options
BW2TK-WIN-01 - BittWorks II Toolkit for Windows
BW2TK-LNX-01 - BittWorks II Toolkit for Linux

DS-BWII | Rev 2016.06.30 | June 2016

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Your Solution... Built on BittWare