

Applicationguide, Creating a new FPGA design and driver

The easiest way to create a new FPGA design and driver using the PCI Express functionality of the Spartan3 PCI Express Starter kit, is to use the *Empty* FPGA design and driver templates. These include the necessary functionality for transferring single DWORDs to and from BAR modules in the FPGA. This applicationguide will describe how to use this functionality.

Files used

The files used for this application can be found on CD1 in:

- FPGA Design: “*Source\FPGA_Design\Empty*”
- Windows device driver and applications:
“*Source\Windows_Device_Drivers_and_Applications\Empty*”
- Linux device driver and applications:
“*Source\Linux_Device_Drivers_and_Applications\Empty*”

The FPGA design

The *Empty* project contains the structure described in journal 2, but no BAR modules. To use the design the following needs to be done:

1. Create one or more BAR modules, and connect these to the BAR hardware interface exposed in the *Application* module.
2. Add any necessary I/O pins to the declaration of the *Application* and *Top* modules, and connect these together.
3. Add pin constraints for any new I/O pins.
4. Create a new PIPE IP source with suitable BARs.

The device drivers

The device drivers include functionality for reading and writing single registers, and for mapping and unmapping a BAR to user-space memory. If additional functionality is needed, the following should be done:

1. Add the necessary control codes in *s3pcie.h* (Linux) or *ioctl.h* (Windows).
2. Add the necessary functionality in the control code switch-case statement in *s3pcie.c* (Linux) or *s3_1000.c* (Windows).
3. (Windows only) Create a new GUID for the driver using GUIDgen¹, and insert it in *ioctl.h*.
4. Recompile the driver and application.

The application

To create an application that uses the driver, the provided empty application can be used. This includes code to open and obtain a handle to the device. The new code can either be added to the empty application, or the provided code can be incorporated into an existing application.

Usage

This application does not do anything besides opening and obtaining a handle to the driver. It is provided as a convenient starting point for new designs.

¹ GUIDgen can be found in the *Tools* folder on CD1.