SpaceWire VxWorks Driver

The SpaceWire VxWorks driver provides a library of functions to program SpaceWire cPCI Mk2, SpaceWire PCI Mk2 or SpaceWire PCIe devices in the VxWorks real-time operating system from WindRiver. The driver interface is provided as a custom interface VxWorks driver in the form of a compiled C library. Board initialisation support which must be built into the VxWorks image is provided as customisable source code with full working examples for Kontron cp620 and Maxwell SCS750 targets. The fully interrupt-driven driver provides support for transmitting and receiving data simultaneously out of all three SpaceWire links. Data transfer to and from user buffers is performed by the onboard DMA controller and so is light on target processor load. Full double buffering is used to achieve efficient data transfer.

VxWorks Version

The VxWorks driver installation includes support for releases:

- VxWorks 5.4, 5.5.
- VxWorks 6.5, 6.7, 6.9.

(For a full list of supported releases please visit our website.)

The principal features of the SpaceWire VxWorks driver are:

- **High level API:** A rich, high-level API is provided to enable high-speed data transfer.
- **Low level API:** Support is provided for access to onboard registers and memory.
- **Transmitting data:** One or more packets from a user buffer can be transmitted out of a specified SpaceWire link.
- **Receiving data:** One or more packets, or a specified amount of data, can be received on a specific SpaceWire link.
- **Multiple devices:** Multiple SpaceWire CompactPCI or PCI-2 boards can be supported on the same target.
- **Link error recovery:** Link errors are detected giving the user the option to clear errors if appropriate.
- **Documentation:** A detailed user manual is supplied which includes a full reference of all driver interface functions and data structures. The procedure for board initialisation is described in detail.
- **Example code:** A rich set of example code applications is provided to demonstrate how to use the driver library and also to provide a good starting point to develop more complex applications.
- **Ease of use:** The high-level API and detailed example code should enable a VxWorks programmer to quickly create applications using the driver.

Driver Performance

Figure 1 shows data transfer rates at varying packet sizes where the SpaceWire CompactPCI board is set to 200 MHz running on a Kontron cp620 PowerPC target. At 200 MHz the maximum theoretical data transfer rate is just below 160 Mbits/s. The single loopback test transmits data out of one link and receives it from another. The double loopback transfers and receives data out of one link while also transmitting and receiving data out of another link. The triple loopback test transmits and receives data out of all three links simultaneously. The PCI bus on the Kontron cp620 saturates at around 310 Mbits/s. This is target specific and other targets may have better saturation rates at greater than 400 Mbits/s.

The SpaceWire VxWorks driver is an essential software driver to provide VxWorks support for the SpaceWire cPCI Mk2, PCI Mk2 and PCIe devices.
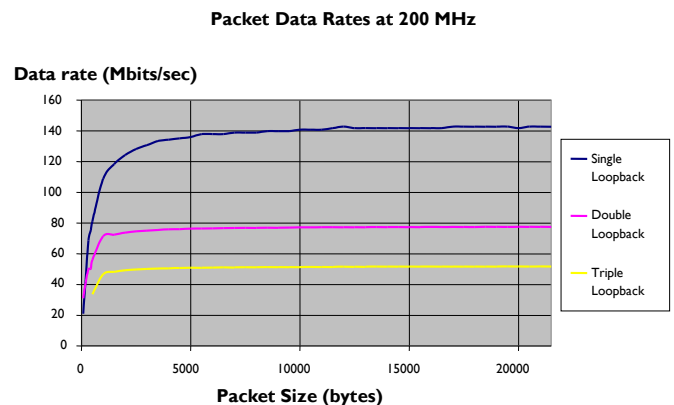

Figure 1: Data transfer rates

VxWorks Experience

Due to differences between various targets' Board Support Packages (BSPs), if this driver is to be used on a target other than Kontron cp620 or Maxwell SCS750 it is recommended that someone with experience of working with VxWorks BSPs be available to modify the board initialization code. STAR-Dundee will provide prompt and extensive support should it be required.

STAR-Dundee

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