SPACEWIRE-CPCI VXWORKS SUPPORT

iain Martin, Steve Parkes, Stuart Mills
STAR-Dundee
Overview

- Software components
- Initialisation issues
- Driver architecture overview
- Performance
- Example Jitter measurement test application
Driver Architecture

- Based on hardware design
  - SMCS332SpW
  - PLX9056
  - Dual port memory
Driver API

- Similar to SpaceWire PCI-2 Windows and Linux drivers
- Test code almost identical
  - RTOS modifications
- Control of interrupt thread priority
- Ports of RMAP and Router Configuration Libraries
Software Components

vxWorks Image (includes Board Support Package)
- SpW cPCI Driver Initialisation (source) code
- SpW test (source) code

Downloadable module
- SpW test (source) code

Pre-compiled libraries
- Config Library
- SpW driver library
- RMAP packet library
Initialisation issues

- Variation in Board Support Packages
- PCI Interrupt vector
- Board memory mapping
- DMA issues
Initialisation Approach

- Initialisation code provided as source
  - Easy to integrate with VxWorks build
  - Builds a table of detected SpaceWire cPCI devices
  - Calculate the interrupt vector
  - Memory map device space
  - Any non-standard I/O or DMA

- After VxWorks boot all cPCI devices detected with DMA
Performance

- Deferred procedure call model
- Task usage
- Data transfer rate
Interrupt Handling
Interrupt Handling
Jitter Measurement
Test Example

- SpaceWire Router-USB
- SpaceWire Link Analyser
- SpaceWire cPCI

PC running Validation software and Link Analyser software

USB Cable

PowerPC running custom vxWorks application

cPCI bus
Jitter Result

- Measuring the difference between the time code and the EOP detected on the SpaceWire Link.
- Jitter measured as the difference between the time to send each packet and the average.
- Maximum measured jitter measured as 1.5 microseconds
Future

- Support current VxWorks versions
  - Current version tested with Tornado 2.2 using VxWorks 5.5.
- Improvements to small packet transfer rate
- Possible port to RTEMS