SpaceWire
Development and Test Equipment

International SpaceWire Seminar
2003

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SpaceWire IP

- **SpaceWire CODEC**
  - Configurable VHDL core
  - Suitable for ASIC and FPGA implementation
  - IP licence available from ESA

- **SpaceWire Router**
  - Configurable VHDL Router
  - Generics for
    - Number of SpaceWire Ports
    - Number of External Ports
  - IP licence from University of Dundee
Feature Tracking

“Landmark” Tracking

Target Landing Site
Feature Extraction IC

Camera Control

SpaceWire Mini-Router

Feature Detection

Local Maximum

Selection

Feature Tracking

Feature List Manage

Image Memory

FEIC
SpaceWire Router-USB

- Eight port SpaceWire router
- FPGA prototype for SpaceWire Router ASIC
- Operates at 200 Mbps
- External port connected to USB 2.0 interface
- Unit operates from single +5V power supply
SpaceWire Router-USB

- ROUTER
- USB INTERFACE
- POWER SUPPLIES

SpaceWire Interfaces

USB 2.0

POWER
SpaceWire Monitor

- Monitors traffic on a SpaceWire link
- Two banks of LEDs show
  - connection state
  - Data flow
  - EOPs/EEP
  - NULLs
  - FCTs
  - Errors
SpaceWire Monitor

- Logic analyser connections
  - Break-out decoded SpaceWire signals
  - For analysis of what is happening on the link
- Both directions monitored simultaneously
SpaceWire Monitor

Disconnected
Parity Error
Character Sequence Error
ESC Error
Character Monitor State
Synchronised
Failed Sync
Connecting
NULL
FCT
Data Character
EOP
EOP
EEP
Time-Code

A
B
UNBUFFERED
A to B
B to A
# SpaceWire Monitor LEDs

<table>
<thead>
<tr>
<th>Disconnected</th>
<th>Monitor State</th>
<th>Failed Sync</th>
</tr>
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<tbody>
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<td>Null</td>
<td>Synchronised</td>
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<td>Time-Code</td>
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SpaceWire Monitor Summary

- **SpaceWire Monitor provides:**
  - Convenient means of monitor SpaceWire
  - Two methods of monitoring
    - LEDs
    - Logic Analyser
  - Simple and powerful debugging aid
SpaceWire DSP

- Developed under BNSC funding
- Sub-contractor to SciSys
- 8-port router
- Powerful DSP
- For research use
- Micro ORB running over SpaceWire
SpaceWire-DSP

- SpaceWire Router
- ADSP-21160 DSP Processor
- JTAG Port
- External RAM 512k x 64-bits
- External RAM 512k x 64-bits
- Boot EPROM
- POWER SUPPLY
- SHARC LINKS

SpaceWire Links
SpaceWire-PCI

- SpaceWire Interfaces
- SMCS 332
- DUAL-PORT MEMORY
- PCI INTERFACE

LVDS connections between components.
SpaceWire-PCI-2

SpaceWire Interfaces

SMCS FPGA

DUAL-PORT MEMORY

PCI INTERFACE
SpaceWire PCI-2

- Fully SpaceWire compliant
- SMCS FPGA being developed by Astrium GmbH
- Board currently being designed
- Funded by ESA
- Sub-contractor to Astrium GmbH
SpaceWire Drivers

- SpaceWire PCI (and PCI-2)
  - Windows (98, 2000, XP)
  - Linux
  - VxWorks
  - TCP/IP network driver for Linux

- SpaceWire Router-USB
  - Linux
  - TCP/IP network driver for Linux
  - Windows driver under development
Other SpaceWire Developments

- **SpaceWire Conformance Tester**
  - Unit to test conformance of other equipment to SpaceWire standard
  - Level that can be tested will depend upon accessibility to equipment under test
  - Funded by ESA
  - Sub-contractor to Austrian Aerospace
SpaceWire-USB Stick

- SpaceWire to USB 2.0 interface
- 160 Mbits/s real data rate to/from PC main memory
- 124 Mbits/s bi-directional
- Powered from USB
SpaceWire-USB Brick

- SpaceWire to USB 2.0 interface
- Two SpaceWire ports
- Configurable as three port router
- Or two port interface
- 160 Mbits/s real data rate to/from PC main memory
- 124 Mbits/s bi-directional
- Powered from USB
SpaceWire Link Analyser

- Displays link state on host PC
- Captures link packet transfers
- Funded by SMART award from Scottish Executive
- Can also act as two port SpaceWire interface
SpaceWire Research

- IP is available from University of Dundee
  - Router encrypted VHDL
  - Router VHDL source code
  - Software source code
Support for users of SpaceWire

- IP support
- ASIC support
- Development support
- Software drivers
- Test equipment
STAR-Dundee

- **Products available now**
  - Router-USB driver
    - Full CE/FCC certification
  - SpaceWire PCI drivers

- **Products available soon**
  - SpaceWire Monitor
  - SpaceWire Link Analyser
  - SpaceWire USB Stick
  - SpaceWire USB Brick
  - SpaceWire Conformance Tester