

STAR-Dundee

SpaceWire and SpaceFibre Expertise

STAR-System

STAR-System is the software suite provided with STAR-Dundee's SpaceWire and SpaceFibre interface and router devices. It presents a common interface across operating systems and allows different types of devices to be accessed in a consistent manner.

Graphical User Interface Applications

GUI applications are provided to perform many common tasks when developing or testing SpaceWire and SpaceFibre systems.

Device Configuration: Provides an interface (shown below) in which the properties of a device can be viewed and configured. For example, the device can be reset, its version can be viewed, links can be started and stopped, and routing tables can be configured.



Transmit: Allows a packet to be typed in, its EOP specified, and for the packet to then to be transmitted over the selected device and channel. This makes it very easy to insert packets into a network.

Receive: Allows packets to be received on the selected device and channel, and the contents of the received packets to be displayed as a sequence of bytes. This is a very useful application for looking at the contents of small packets received on a network.

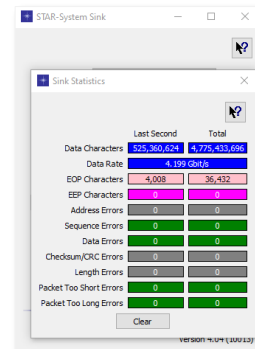
Error Injection: Allows various forms of errors to be injected on a link, including parity errors and inserting or suppressing FCTs.

RMAP Target Configuration: STAR-Dundee products which include a hardware RMAP Target can be configured with this application.

Device Update: STAR-Dundee regularly adds new features to products after they have been released, and this application provides an easy method to upgrade the firmware of a device to the latest version.

Source: Provides the ability to insert packets into a network at very high data rates, specifying the format of packets, and the schedule to which the packets should be transmitted. The statistics can also be viewed, to monitor the rate at which packets are transmitted.

Sink: Can be used to receive packets at very high data rates, with the option to view the receive statistics (shown below). The content of the received packets can be checked for correctness and the packets, or fields in those packets, can also be written to file.



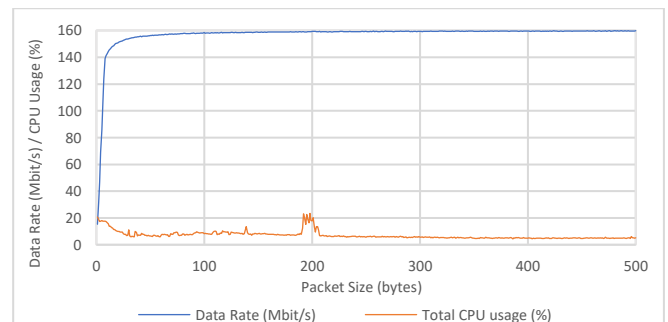
Application Programming Interface

APIs are provided to allow all functions of supported devices to be controlled from application software. Both C and C++ versions of the APIs are provided, which also allows the APIs to be imported into other languages. LabVIEW support is available separately to allow easy access to devices from LabVIEW.

The APIs are common across many of STAR-Dundee's products, and are consistent across each programming language and platform supported. This simplifies software development and allows migration of test software from one device to another and from one platform to another, enhancing software reuse.

A key feature of the APIs is that they not only provide functionality to transmit and receive packets, but also include functions required to test equipment. For example, the APIs make it simple to transmit packets terminated with an EEP and to determine the end of packet marker type of received packets. They also make it possible to transmit and receive streams of traffic including time-codes in the middle of packets, for example, and maintain the position of these time-codes. This allows traffic streams to be recorded accurately and replayed, so multiple test runs will be consistent.

STAR-System is not only packed with features, it also provides these features with very high performance and low CPU usage. The graph below shows data rates and CPU usage when transmitting and receiving packets of various sizes on a 200 Mbit/s link with a SpaceWire Brick Mk4. With packets as small as 10 bytes in length, the data rate achieved is close to the theoretical maximum, which is slightly less than 160 Mbit/s for larger packets.



The APIs are provided with extensive searchable documentation and example code for each function. Example test programs with source code are included for each language supported.

Supporting Modules

STAR-System is a modular system. This can reduce the footprint of the software, which can be important where memory or storage is at a premium. If validation of the APIs is required, this can also reduce the number of functions which must be validated.

In addition to the core components of the system, modules are provided to implement commonly required features. For users working with the Remote Memory Access Protocol, the RMAP Packet Library simplifies building and interpreting RMAP packets, while the RMAP Target API provides functions for configuring the hardware RMAP Target in devices which provide this functionality.

Several STAR-Dundee devices include triggering capabilities which can be used to cause actions to be performed when an event occurs. These features are configured using a Triggering API.

A Generic Configuration API is provided to configure each of the devices supported by STAR-System in a consistent manner. As well as allowing devices connected to the local PC to be configured, the API also allows devices to be configured over a SpaceWire or SpaceFibre network. Features that can be configured include starting and stopping links, getting and setting link speeds, configuring routing tables, reading the status of devices, enabling and disabling interface mode and enabling a time-code master.

Key Features

Extensive APIs: Developed after many years spent supporting users of SpaceWire interface and router products, the STAR-System APIs provide a common interface to all of STAR-Dundee's latest range of products, enhancing reusability of application software. The extensive functionality of the APIs makes it easy to develop SpaceWire and SpaceFibre related application software. Example application programs further relieve the pressure on development schedule. The APIs provide access to all the functionality of supported devices, providing the high performance data transfer capabilities often needed for SpaceWire and SpaceFibre system simulation and testing purposes.

High performance: STAR-System has been designed to provide the highest possible performance with the lowest possible CPU usage. STAR-Dundee has a wealth of experience developing high performance APIs and drivers, and this knowledge has been used to ensure STAR-System is capable of transmitting and receiving traffic at rates of multiple Gbit/s on a single link, while also providing low latency. This is achieved while keeping CPU usage to a minimum, and so performance can be scaled to multiple links. Although physical SpaceWire links aren't capable of matching this performance, these rates mean that STAR-System can also be used with SpaceFibre devices, with no changes required to user software to support both SpaceWire and SpaceFibre.

Ease of use: STAR-System is designed to be easy to use. By taking advantage of features of each programming language, the APIs should be intuitive to use for anyone familiar with that language. Comprehensive documentation is also provided, including example source code demonstrating the use of each function.

Comprehensive examples: Example applications are provided with source code, demonstrating the features provided by the APIs and referenced in the documentation. These examples can be used as is or can provide a reference point when writing your own application. An example application is also provided which can be used to test the performance of a device and/or the system. The

source code for this application demonstrates potential methods to achieve the highest possible performance using the system.

GUI applications: Graphical applications are provided to configure devices, transmit packets and receive packets. These make it easy to start using SpaceWire and SpaceFibre, while their flexibility means that they may be all you require to perform more advanced testing, simulation or any other SpaceWire or SpaceFibre task.

First class support: As with all of our products, STAR-System includes a year's support and maintenance. This support is provided by the team that developed the software so we can respond quickly with answers to your questions, give assistance with application development, and quickly resolve any problems.

Specifications

Languages/ Environments	<ul style="list-style-type: none">• C• C++• LabVIEW (available separately)• Other languages to be included in the future
Platforms	<ul style="list-style-type: none">• Windows (10, 8 and 7)• Linux (5.x, 4.x and 3.x kernels, i386 and x86-64 targets – other targets on request)• QNX (available separately)• VxWorks (available separately)• RTEMS (available separately)
Devices	<ul style="list-style-type: none">• SpaceWire Brick Mk2, Brick Mk3, Brick Mk4• SpaceWire PCI Mk2, cPCI Mk2• SpaceWire PCIe• SpaceWire PXI Interface, PXI Interface with RMAP Target, PXI Router• SpaceWire PXI Interface Mk2, PXI Interface Mk2 with RMAP Target, PXI Router Mk2• SpaceWire Router Mk2S• SpaceWire Physical Layer Tester• STAR Fire, STAR Fire Mk3• STAR-Ultra PCIe
APIs/ Modules	<ul style="list-style-type: none">• STAR-API• RMAP Packet Library• Modules for Configuring Devices:<ul style="list-style-type: none">○ Remote Device Configuration API○ Generic Configuration API○ Configuration APIs for individual devices○ RMAP Target API○ Triggering API• Drivers for individual device types:<ul style="list-style-type: none">○ SpaceWire cPCI/PCI/PCIe/PXI Driver○ SpaceWire USB Driver○ STAR-Ultra PCIe Driver
GUI Applications	<ul style="list-style-type: none">• Device Configuration• Transmit• Receive• Source• Sink• Error Injection• RMAP Target Configuration• Device Update

If you have a requirement for another language, operating system or device, please contact us and we will do our best to assist.

All information provided is believed to be accurate at time of publication. Please contact STAR-Dundee for the most recent details. © 2020 STAR-Dundee Ltd.



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