

STAR-Dundee

SpaceWire Engineering Excellence

SPARCV8 SOFTWARE DEVELOPMENT ENVIRONMENT

The SPARCV8 Software Development Environment (SPARCV8-SDE) from STAR-Dundee is designed to support the development of software for the SPARC V8 series of processors, SoC devices and FPGA cores targeted for on-board spacecraft. SPARCV8-SDE consists of an all-in-one software development environment that provides great flexibility allowing generic application software development and, through a library of plugins, processor specific software.

Helping both hardware and software engineers at all stages of system development: evaluation, hardware prototyping, software development and debugging, SPARCV8-SDE provides the essential tools to help reduce development time and cost.

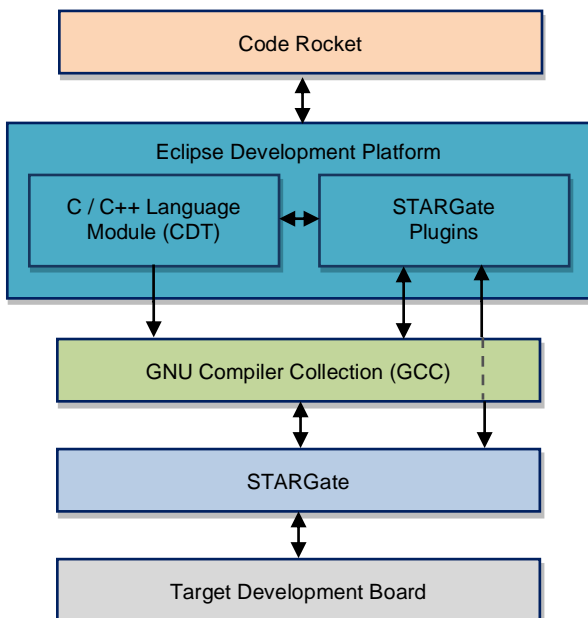
SPARCV8-SDE currently supports three major SPARC V8 based devices:

- **Microchip AT697E/F:** Radiation-Hardened SPARC® V8 architecture with throughput approaching 1MIPS per MHz. The AT697F is the latest release developed with ESA support to serve the increasing demand for on-board processing.
- **Microchip AT7913E SpW-RTC:** Single chip embedded system includes a general purpose LEON2-FT SPARC® V8 core that provides the mixed capability to effectively perform data handling at the platform level and powerful data processing at the payload level.
- **Microchip ATF697FF:** Radiation-Hardened SPARC® V8 architecture with Combined AT697F LEON2-FT 100Mhz Rad Hard Processor + ATF280F SRAM based FPGA (280K) in a single package.

In addition to the software packages, STAR-Dundee provides development boards containing target processors, and a complete range of SpaceWire interface, analysis, emulation, and test and development equipment.

Software Development Environment

SPARCV8-SDE is a suite of tools combining a powerful debugger, editor, code browser, configuration manager, and other tools into one integrated package.

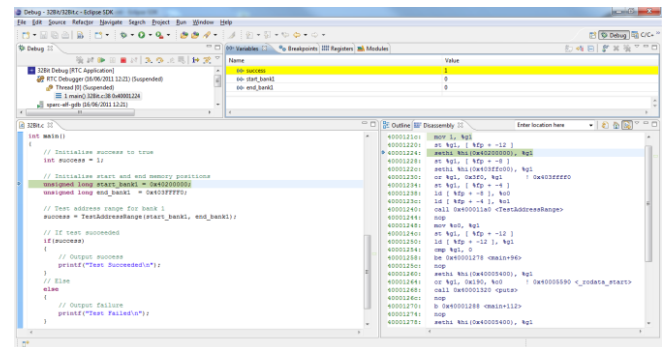


Fully Featured IDE

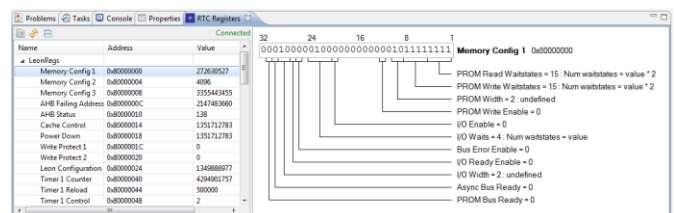
The Eclipse IDE is used for the SPARCV8-SDE front end. Its wide adoption for software development of embedded systems due to a reputation for software quality and a vast support network, and its extensible nature make it an ideal choice.

Connection between the host computer and the target processor board over any of the range of supported debugging interfaces provides a smooth, responsive debugging experience. Supported interfaces include Debug UART over both USB and serial.

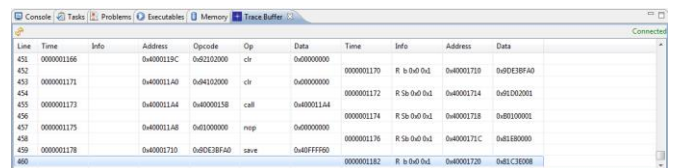
While debugging, Eclipse provides familiar views to the developer: Workspace for project navigation, Editor to allow inspection of code, variables and register values and Console Debug for code stepping.



SPARCV8-SDE provides target specific custom plugins for the Eclipse environment for each supported processor to add views that allow access to all aspects of the target hardware, such as the device internal register view. Register values can quickly be visualised, and individual bits clearly identified and edited graphically.

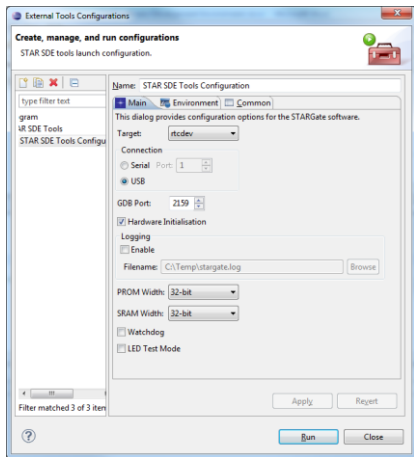


The trace buffer shows operations that have taken place on the hardware. It can be used in conjunction with break points to step through a program when debugging a problem or as a source of post-mortem information when a program has crashed unexpectedly.



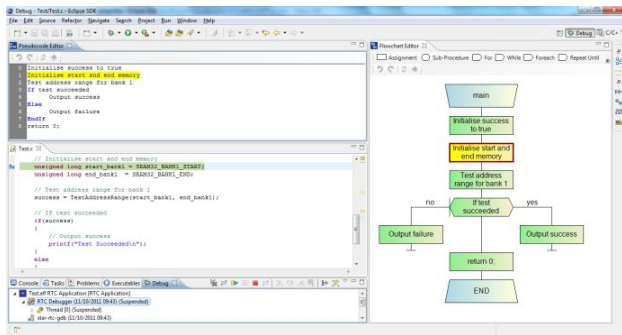
Source code views of the trace buffer and Code Rocket views are available as well as the assembly language view, simplifying understanding of the program execution flow and speeding up debugging.

Various configuration options are integrated inside Eclipse that provide direct control over hardware settings and compilation options.



Code Rocket

Code Rocket, from Rapid Quality Systems Ltd., is a software design tool that provides abstract pseudocode and flowchart visualisations of algorithms. A plugin for the Eclipse IDE allows the developer to design and visualise methods on demand.



The Code Rocket toolset seamlessly integrates with existing development processes to improve developer productivity and code understanding. When designing new algorithms, boiler plate code is automatically generated from abstract pseudocode and flowcharts. This allows the developer to focus on designing high quality algorithms without being distracted by implementation details which can be filled in later. The abstract design visualisations can be useful when discussing processes with non-technical stakeholders or when developers are working with unfamiliar code. Similarly, the Code Rocket views can help during debugging as they are automatically populated and highlighted when stepping through the code. Automated detailed design documentation can be produced at the touch of a button in both HTML and Word formats, ensuring that documentation is always up-to-date.

GNU Compiler Collection

SPARCv8-SDE uses a version of the industry standard GNU Compiler Collection (GCC) which is tailored for use with LEON2 and LEON2-FT processors, and which supports all peripheral features.

This includes the compilers, linkers and debuggers, and a number of other tools.

A Board Support Package (BSP) is provided to support development of C and C++ programs.

STARGate

STARGate is the platform abstraction layer that provides a suite of tightly coupled plugins to expose interfaces and functionality essential for developers to make efficient use of target device capabilities when implementing complex instrument control applications.

STARGate provides connections over all supported communication interfaces available on the target platform, for example RS232 serial link, USB and SpaceWire.

Applications

SPARCv8-SDE can be used to develop a wide range of applications such as instrument data processing and control software.

It allows development and integration of software and hardware for spacecraft instruments or payloads:

- In early stages, in conjunction with STAR-Dundee development units, when there is little or no access to final hardware.
- When actual hardware (flight or test) becomes available.

SPARCv8-SDE is designed to resolve problems much earlier in the development process and provides for extensive system testing prior to flight platform integration.

Specifications

Software:

- Operates under Windows (Windows 10, 8, 7, Vista, XP).

Plugins:

- Microchip AT697E/F/FF:
 - Views: Register bit level view, Trace buffer, Cache mapping; instruction and data.
- Microchip AT7913E:
 - Views: Register bit level, Trace buffer, Cache mapping: instruction and data.
 - Peripherals: CAN, RS232, PCI, USB, GPIO, 64KByte EDAC protected memory, SpaceWire, FIFO interface, ADC/DAC.

PROM programming support:

Allows programming on-board, non-volatile memory over various board and processor supported interfaces. Supports the following standards: Common Flash Interface (CFI) and Scalable Command Set.

Further Information

For more information about STAR-Dundee development boards see: <https://www.star-dundee.com/products/spacewire-rtc>

For more information on Microchip radiation hardened processors see:

- <https://www.microchip.com/wwwproducts/en/AT697F>
- <https://www.microchip.com/wwwproducts/en/AT7913E>
- <https://www.microchip.com/wwwproducts/en/ATF697FF>