

# TEMU

## TERMA EMULATOR

**THE TERMA EMULATOR (TEMU) IS A FULL SYSTEM SIMULATION FRAMEWORK. IT CONSISTS OF A SUITE OF INSTRUCTION-LEVEL EMULATORS OF THE SPARCV8 (ERC32, LEON2, LEON3, LEON4, LEON5), RISC-V (NOEL-V), POWERPC (E500) AND ARMV7-R PROCESSORS, INCLUDING ASSOCIATED PERIPHERALS. TEMU SUPPORTS THE EMULATION OF MULTI-CORE PROCESSORS. IT IS PROVIDED AS A STAND-ALONE APPLICATION AS WELL AS A SET OF LIBRARIES THAT CAN BE INTEGRATED IN AN EXISTING SIMULATOR.**

TEMU is constructed using modern compiler technology and offers very high performance thanks to domain specific LLVM-based optimisations and dynamic binary translation.

### Usage

TEMU runs unmodified operating systems (e.g. RTEMS and Linux) and application software. TEMU is suitable for software debugging and development, software validation facilities and operational simulators.

### Processor Models

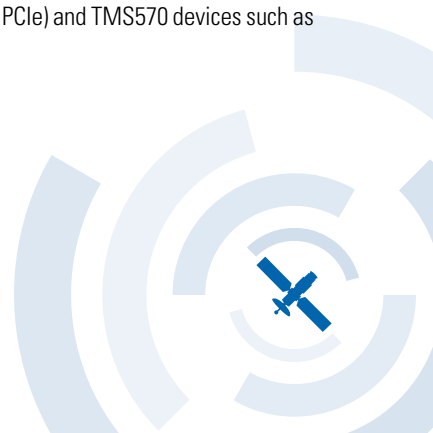
Several processor models are included, including:

- **SPARCV8** based ERC32, LEON2 (AT697), LEON3 (UT699, UT700 etc), LEON4 (GR740) and LEON5 (GR765).
- **ARMv7** support includes the TMS570.
- **PowerPC** support includes PPC750 and e500 (P2020, PPC8548E).
- **RISC-V** support includes the NOEL-V.

Additional architectures and variants can be supported on request.

### Peripheral Models

TEMU comes with several bundled peripheral models, including the ERC32 MEC, LEON2 on-chip devices and many GRLIB devices used in LEON3, LEON4, LEON5 and NOEL-V based processors (including timers, UARTs interrupt controllers, bus controllers), P2020 devices (such as the OpenPIC, UART, GPIO, Ethernet, PCIe) and TMS570 devices such as RTI, VIM and SCI.



## Multi-Core and Multi-System Emulation

A user can define systems with an arbitrary number of processors or use one of the default configurations.

## Bus Models

Multiple transactional bus models are built in. It includes serial ports, GPIO, MIL-STD-1553A/B, CAN, Ethernet, PCI and SpaceWire. Additional bus models can be added either by the user or by Terma. Controllers and remote terminal models can easily be implemented by the user using the bus model APIs.

## Performance

The emulator core is written using custom domain specific compiler optimizations. The emulator is further optimized using threaded code, idle loop detection, power down mode support, dynamic binary translation, and allow the users to attach their own application specific optimization layers (which could for example substitute expensive calls with simpler ones).

## Third Party Debugger Support

TEMU supports the GDB RSP (Remote Serial Protocol). This enables the use of existing GDB based debuggers, including graphical debuggers such as DDD and Eclipse. TEMU is fully deterministic, meaning that the user can be confident that behavior is repeatable.

## Integrated Debugging

TEMU provides both a command line interface for assembler level debugging, as well as a more advanced graphical debugger. The TEMU System Debugger is a graphical debugger that delivers full system awareness across multiple firmware images, kernels, and hardware states. Developers can inspect registers, memory, devices, and OS state simultaneously, correlating low-level hardware behavior with high-level program execution, while also managing breakpoints, navigating stacks and variables, and reviewing event and variable timelines for rapid root-cause analysis and efficient embedded debugging workflows.

## Plug-In Support and Emulator Embedding

There is a fully featured Application Programmer Interface (API) that supports devices, data buses, remote terminals and environmental models. The API supports the integration of TEMU in other simulators.

## Automation Languages

**TEMU script** provides a specific language driving the TEMU command line interface, this interface can be scripted.

**Python** provides access to much of the TEMU C-API.

## Operating Systems

Linux®	Works on all recent distributions, specific distributions can be supported if needed. RPM and DEB installers provided in addition to plain tarballs.
macOS®	TEMU can run on recent versions of macOS.
Windows®	TEMU can be made available for Windows if needed.

## Software Platform

C++11 based internals. Public API is exposed as C11. No GPL or other copy-left licensed code or libraries used.

## Support

The standard license price includes 1 year warranty & email support. Standard on-site training packages available on request. IPR owned by Terma, no export restrictions.

Product support is available at: <https://tgss.terma.com>

If you have any questions, please contact our team, [terma.space@terma.com](mailto:terma.space@terma.com)



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