

UNISIM

ppcemu Simulator Manual

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1 Simulator technical reference (generated)

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1.1 Introduction

UNISIM ppcemu, user level PowerPC simulator with support of ELF32 binaries and Linux system call translation.

Section 1.2 gives licensing informations about the simulator. Section 1.3 shows the set of modules and services that compose the simulator. Section 1.4 shows how to invoke the simulator at the command line prompt. Section 1.5 gives the simulator parameters. Section 1.6 gives the simulator statistic counters. Section 1.7 gives the simulator statistic formulas.

1.2 Licensing

UNISIM ppcemu 1.0beta3

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1.3 Simulated configuration

The UNISIM ppcemu simulator is composed of the following modules and services:

- **cpu**
- **debugger**
- **gdb-server**: this service implements the GDB server remote serial protocol over TCP/IP. Standards GDB clients (e.g. gdb, eclipse, ddd) can connect to the simulator to debug the target application that runs within the simulator.
- **host-time**: this service is an abstraction layer for the host machine time
- **inline-debugger**: this service implements a built-in debugger in the terminal console
- **linux-os**
- **memory**: this module implements a memory
- **profiler**
- **tee-memory-access-reporting**
- **tee-memory-access-reporting.tee-memory-access-reporting.control_selector[0]**
- **tee-memory-access-reporting.tee-memory-access-reporting.control_selector[10]**
- **tee-memory-access-reporting.tee-memory-access-reporting.control_selector[11]**

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- tee-memory-access-reporting.tee-memory-access-reporting.control_selector[13]
- tee-memory-access-reporting.tee-memory-access-reporting.control_selector[14]
- tee-memory-access-reporting.tee-memory-access-reporting.control_selector[15]
- tee-memory-access-reporting.tee-memory-access-reporting.control_selector[1]
- tee-memory-access-reporting.tee-memory-access-reporting.control_selector[2]
- tee-memory-access-reporting.tee-memory-access-reporting.control_selector[3]
- tee-memory-access-reporting.tee-memory-access-reporting.control_selector[4]
- tee-memory-access-reporting.tee-memory-access-reporting.control_selector[5]
- tee-memory-access-reporting.tee-memory-access-reporting.control_selector[6]
- tee-memory-access-reporting.tee-memory-access-reporting.control_selector[7]
- tee-memory-access-reporting.tee-memory-access-reporting.control_selector[8]
- tee-memory-access-reporting.tee-memory-access-reporting.control_selector[9]
- **time**: this service is an abstraction layer for the SystemC kernel time

1.4 Using the UNISIM ppcemu simulator

The UNISIM ppcemu simulator has the following command line options:

Usage: unisim-ppcemu-1.0beta3 [<options>] [...]

Options:

- **--set** <param=value> or **-s** <param=value>: set value of parameter 'param' to 'value'
- **--config** <XML file> or **-c** <XML file>: configures the simulator with the given XML configuration file
- **--get-config** <XML file> or **-g** <XML file>: get the simulator configuration XML file (you can use it to create your own configuration. This option can be combined with **-c** to get a new configuration file with existing variables from another file)
- **--list** or **-l**: lists all available parameters, their type, and their current value
- **--warn** or **-w**: enable printing of kernel warnings
- **--doc** <Latex file> or **-d** <Latex file>: enable printing a latex documentation
- **--version** or **-v**: displays the program version information
- **--share-path** <path> or **-p** <path>: the path that should be used for the share directory (absolute path)
- **--help** or **-h**: displays this help

1.5 Configuration

Simulator configuration (see below) can be modified using command line Options **--set** <param=value> or **--config** <config file>.

Global	
Name: enable-gdb-server	Type: parameter
Default: true	Data type: boolean
Valid: true, false	

Description: Enable/Disable GDB server instantiation.	
Name: enable-inline-debugger Default: true Valid: true, false	Type: parameter Data type: boolean
Description: Enable/Disable inline debugger instantiation.	
Name: enable-press-enter-at-exit Default: false Valid: true, false	Type: parameter Data type: boolean
Description: Enable/Disable pressing key enter at exit.	
Name: estimate-power Default: false Valid: true, false	Type: parameter Data type: boolean
Description: Enable/Disable power estimators instantiation.	
Name: kernel.logger.file Default: false Valid: true, false	Type: parameter Data type: boolean
Description: Keep logger output in a file.	
Name: kernel.logger.filename Default: logger_output.txt	Type: parameter Data type: string
Description: Filename to keep logger output _(the option file must be activated).	
Name: kernel.logger.std_err Default: true Valid: true, false	Type: parameter Data type: boolean
Description: Show logger output through the standard error output.	
Name: kernel.logger.std_err.color Default: false Valid: true, false	Type: parameter Data type: boolean
Description: Colorize logger output through the standard error output _(only works if std_err is active).	
Name: kernel.logger.std_out Default: false	Type: parameter Data type: boolean

Valid: true, false	
Description: Show logger output through the standard output.	
Name: kernel_logger.std_out_color	Type: parameter
Default: false	Data type: boolean
Valid: true, false	
Description: Colorize logger output through the standard output _(only works if std_out is active).	
Name: kernel_logger.xml_file	Type: parameter
Default: false	Data type: boolean
Valid: true, false	
Description: Keep logger output in a file xml formatted.	
Name: kernel_logger.xml_file_gzipped	Type: parameter
Default: false	Data type: boolean
Valid: true, false	
Description: If the xml_file option is active, the output file will be compressed (a .gz extension will be automatically added to the xml_filename option).	
Name: kernel_logger.xml_filename	Type: parameter
Default: logger_output.xml	Data type: string
Description: Filename to keep logger xml output _(the option xml_file must be activated).	
cpu	
Name: cpu.cpu-cycle-time	Type: parameter
Default: 3333	Data type: unsigned 64-bit integer
Description: CPU cycle time in picoseconds.	
Name: cpu.voltage	Type: parameter
Default: 1300	Data type: unsigned 64-bit integer
Description: CPU voltage in mV.	
Name: cpu.max-inst	Type: parameter
Default: 18446744073709551615	Data type: unsigned 64-bit integer
Description: maximum number of instructions to simulate.	

Name: cpu.verbose-all Default: false Valid: true, false	Type: parameter Data type: boolean
Description: globally enable/disable verbosity.	
Name: cpu.verbose-setup Default: false Valid: true, false	Type: parameter Data type: boolean
Description: enable/disable verbosity while setup.	
Name: cpu.verbose-step Default: false Valid: true, false	Type: parameter Data type: boolean
Description: enable/disable verbosity when simulating an instruction.	
Name: cpu.verbose-dtlb Default: false Valid: true, false	Type: parameter Data type: boolean
Description: enable/disable verbosity when accessing data translation lookahead buffer.	
Name: cpu.verbose-itlb Default: false Valid: true, false	Type: parameter Data type: boolean
Description: enable/disable verbosity when accessing instruction translation lookahead buffer.	
Name: cpu.verbose-dl1 Default: false Valid: true, false	Type: parameter Data type: boolean
Description: enable/disable verbosity when accessing L1 data cache.	
Name: cpu.verbose-il1 Default: false Valid: true, false	Type: parameter Data type: boolean
Description: enable/disable verbosity when accessing L1 instruction cache.	
Name: cpu.verbose-l2 Default: false Valid: true, false	Type: parameter Data type: boolean
Description: enable/disable verbosity when accessing L2 unified cache.	

Name: cpu.verbose-load Default: false Valid: true, false	Type: parameter Data type: boolean
Description: enable/disable verbosity when simulating a load.	
Name: cpu.verbose-store Default: false Valid: true, false	Type: parameter Data type: boolean
Description: enable/disable verbosity when simulating a store.	
Name: cpu.verbose-read-memory Default: false Valid: true, false	Type: parameter Data type: boolean
Description: enable/disable verbosity when reading memory for a debug purpose.	
Name: cpu.verbose-write-memory Default: false Valid: true, false	Type: parameter Data type: boolean
Description: enable/disable verbosity when writing memory for a debug purpose.	
Name: cpu.verbose-exception Default: false Valid: true, false	Type: parameter Data type: boolean
Description: enable/disable verbosity when handling exceptions.	
Name: cpu.verbose-set-msr Default: false Valid: true, false	Type: parameter Data type: boolean
Description: enable/disable verbosity when setting MSR.	
Name: cpu.verbose-set-hid0 Default: false Valid: true, false	Type: parameter Data type: boolean
Description: enable/disable verbosity when setting HID0.	
Name: cpu.verbose-set-hid1 Default: false Valid: true, false	Type: parameter Data type: boolean
Description: enable/disable verbosity when setting HID1.	

Name: cpu.verbose-set-hid2 Default: false Valid: true, false	Type: parameter Data type: boolean
Description: enable/disable verbosity when setting HID2.	
Name: cpu.verbose-set-l2cr Default: false Valid: true, false	Type: parameter Data type: boolean
Description: enable/disable verbosity when setting L2CR.	
Name: cpu.enable-linux-printk-snooping Default: false Valid: true, false	Type: parameter Data type: boolean
Description: enable/disable linux printk buffer snooping.	
Name: cpu.enable-linux-syscall-snooping Default: false Valid: true, false	Type: parameter Data type: boolean
Description: enable/disable linux syscall snooping.	
Name: cpu.trap-on-instruction-counter Default: 18446744073709551615	Type: parameter Data type: unsigned 64-bit integer
Description: number of simulated instruction before trapping.	
Name: cpu.halt-on Default:	Type: parameter Data type: string
Description: Symbol or address where to stop simulation.	
Name: cpu.bus-cycle-time Default: 13333 ps	Type: parameter Data type: sc_time
Description: bus cycle time.	
Name: cpu.nice-time Default: 1 ms	Type: parameter Data type: sc_time
Description: maximum time between synchronizations.	

Name: <code>cpu.ipc</code> Default: 1	Type: parameter Data type: double precision floating-point
Description: targeted average instructions per second.	
debugger	
Name: <code>debugger.verbose</code> Default: false Valid: true, false	Type: parameter Data type: boolean
Description: Enable/Disable verbosity.	
Name: <code>debugger.dwarf-to-html-output- ↔directory</code> Default:	Type: parameter Data type: string
Description: DWARF v2/v3 to HTML output directory.	
Name: <code>debugger.dwarf-register-number- ↔mapping-filename</code> Default: <code>powerpc_eabi_gcc_dwarf_register_</code> ↔ <code>number_mapping.xml</code>	Type: parameter Data type: string
Description: DWARF register number mapping filename.	
Name: <code>debugger.parse-dwarf</code> Default: true Valid: true, false	Type: parameter Data type: boolean
Description: Enable/Disable parsing of DWARF debugging informations.	
gdb-server	
Name: <code>gdb-server.memory-atom-size</code> Default: 0x00000001	Type: parameter Data type: unsigned 32-bit integer
Description: size of the smallest addressable element in memory.	
Name: <code>gdb-server.tcp-port</code> Default: 0	Type: parameter Data type: signed 32-bit integer
Description: TCP/IP port to listen waiting for a GDB client connection.	

<p>Name: <code>gdb-server.architecture-description-filename</code> Type: parameter ↳filename</p> <p>Default: <code>gdb-powerpc.xml</code> Data type: string</p> <p>Description: filename of a XML description of the connected processor.</p>
<p>Name: <code>gdb-server.verbose</code> Type: parameter Default: <code>false</code> Data type: boolean Valid: <code>true, false</code></p> <p>Description: Enable/Disable verbosity.</p>
<p>inline-debugger</p>
<p>Name: <code>inline-debugger.memory-atom-size</code> Type: parameter ↳size</p> <p>Default: <code>0x00000001</code> Data type: unsigned 32-bit integer</p> <p>Description: size of the smallest addressable element in memory.</p>
<p>Name: <code>inline-debugger.search-path</code> Type: parameter Default: Data type: string</p> <p>Description: Search path for source (separated by ';').</p>
<p>Name: <code>inline-debugger.init-macro</code> Type: parameter Default: Data type: string</p> <p>Description: path to initial macro to run when debugger starts.</p>
<p>Name: <code>inline-debugger.output</code> Type: parameter Default: Data type: string</p> <p>Description: path to output file where to redirect the debugger outputs.</p>
<p>Name: <code>inline-debugger.architecture-description-filename</code> Type: parameter ↳description-filename</p> <p>Default: Data type: string</p> <p>Description: filename of a XML description of the connected processor.</p>
<p>linux-os</p>

Name: linux-os.verbose Default: false Valid: true, false	Type: parameter Data type: boolean
Name: linux-os.system Default: ppc	Type: parameter Data type: string
Description: Emulated system architecture available values are "arm", "arm-eabi" and "powerpc".	
Name: linux-os.endianness Default: big-endian Valid: little-endian, big-endian	Type: parameter Data type: endianness
Description: The endianness of the binary loaded. Available values are: little-endian and big-endian..	
Name: linux-os.memory-page-size Default: 0x00001000	Type: parameter Data type: unsigned 32-bit integer
Name: linux-os.stack-base Default: 0xc0000000	Type: parameter Data type: unsigned 32-bit integer
Description: The stack base address used for the load and execution of the linux application.	
Name: linux-os.binary Default:	Type: parameter Data type: string
Description: The binary to execute on the target simulator. Usually it is the same value than the argv[1] parameter..	
Name: linux-os.argc Default: 0	Type: parameter Data type: unsigned 32-bit integer
Description: Number of commands in the program execution line (usually at least one which is the name of the program executed). The different tokens can be set up with the parameters argv[<n>] where <n> can go up to argc - 1..	
Name: linux-os.apply-host-environment Default: false Valid: true, false	Type: parameter Data type: boolean
Description: Wether to apply the host environment on the target simulator or use the provided envc and envp..	

Name: linux-os.envc	Type: parameter
Default: 0x00000000	Data type: unsigned 32-bit integer
Description: Number of environment variables defined for the program execution. The different variables can be set up with the parameters envp[<n>] where <n> can go up to envc - 1..	
Name: linux-os.utsname-sysname	Type: parameter
Default: Linux	Data type: string
Description: The value that the uname system call should return. As this service is providing linux emulation support its value should be 'Linux', so you should not modify it..	
Name: linux-os.utsname-nodename	Type: parameter
Default: (none)	Data type: string
Description: The network node hostname that the uname system call should return. Default value is localhost, but you could write whatever name you want..	
Name: linux-os.utsname-release	Type: parameter
Default: 3.0.4	Data type: string
Description: The kernel release information that the uname system call should return. This should usually match the linux-kernel parameter..	
Name: linux-os.utsname-version	Type: parameter
Default: #1 PREEMPT Thu Jan 1 00:00:00 ↔CEST 1970	Data type: string
Description: The kernel version information that the uname system call should return..	
Name: linux-os.utsname-machine	Type: parameter
Default: ppc	Data type: string
Description: The machine information that the uname system call should return. This should be one of the supported architectures (the system parameter, that is, arm or powerpc) or a specific model derived from it (i.e., arm926ejs)..	

Name: linux-os.utsname-domainname Default: (none)	Type: parameter Data type: string
Description: The domain name information that the uname system call should return..	
memory	
Name: memory.org Default: 0x00000000	Type: parameter Data type: unsigned 32-bit integer
Description: memory origin/base address.	
Name: memory.bytesize Default: 4294967295	Type: parameter Data type: unsigned 32-bit integer
Description: memory size in bytes.	
Name: memory.initial-byte-value Default: 0x00	Type: parameter Data type: unsigned 8-bit integer
Name: memory.cycle-time Default: 13333 ps	Type: parameter Data type: sc_time
Description: memory cycle time.	
Name: memory.read-latency Default: 13333 ps	Type: parameter Data type: sc_time
Description: memory read latency.	
Name: memory.write-latency Default: 0 s	Type: parameter Data type: sc_time
Description: memory write latency.	
Name: memory.verbose Default: false Valid: true, false	Type: parameter Data type: boolean
Description: enable/disable verbosity.	

profiler	
Name: profiler.min-data-read-prof- ↔addr Default: 0x00000000	Type: parameter Data type: unsigned 32-bit integer
Description: Minimum address for data read profiling.	
Name: profiler.max-data-read-prof- ↔addr Default: 0xffffffff	Type: parameter Data type: unsigned 32-bit integer
Description: Maximum address for data read profiling.	
Name: profiler.min-data-write-prof- ↔addr Default: 0x00000000	Type: parameter Data type: unsigned 32-bit integer
Description: Minimum address for data write profiling.	
Name: profiler.max-data-write-prof- ↔addr Default: 0xffffffff	Type: parameter Data type: unsigned 32-bit integer
Description: Maximum address for data write profiling.	
Name: profiler.min-insn-fetch-prof- ↔addr Default: 0x00000000	Type: parameter Data type: unsigned 32-bit integer
Description: Minimum address for instruction fetch profiling.	
Name: profiler.max-insn-fetch-prof- ↔addr Default: 0xffffffff	Type: parameter Data type: unsigned 32-bit integer
Description: Maximum address for instruction fetch profiling.	
Name: profiler.min-insn-exec-prof- ↔addr Default: 0x00000000	Type: parameter Data type: unsigned 32-bit integer

Description: Minimum address for instruction execution profiling.	
Name: profiler.max-insn-exec-prof- ↔addr	Type: parameter
Default: 0xffffffff	Data type: unsigned 32-bit integer
Description: Maximum address for instruction execution profiling.	
Name: profiler.enable-data-read- ↔prof	Type: parameter
Default: false	Data type: boolean
Valid: true, false	
Description: Enable/Disable data read profiling.	
Name: profiler.enable-data-write- ↔prof	Type: parameter
Default: false	Data type: boolean
Valid: true, false	
Description: Enable/Disable data write profiling.	
Name: profiler.enable-insn-fetch- ↔prof	Type: parameter
Default: false	Data type: boolean
Valid: true, false	
Description: Enable/Disable instruction fetch profiling.	
Name: profiler.enable-insn-exec- ↔prof	Type: parameter
Default: false	Data type: boolean
Valid: true, false	
Description: Enable/Disable instruction execution profiling.	
Name: profiler.verbose	Type: parameter
Default: false	Data type: boolean
Valid: true, false	
Description: Enable/Disable verbosity.	

1.6 Statistics

Simulation statistic counters are listed below:

cpu	
Name: cpu.instruction-counter	Type: statistic
	Data type: unsigned 64-bit integer

Description: number of simulated instructions.	
Name: cpu.bus-cycle	Type: statistic Data type: unsigned 64-bit integer
Description: number of simulated bus cycles.	
Name: cpu.num-il1-accesses	Type: statistic Data type: unsigned 64-bit integer
Description: number of accesses to L1 instruction cache.	
Name: cpu.num-il1-misses	Type: statistic Data type: unsigned 64-bit integer
Description: number of misses to L1 instruction cache.	
Name: cpu.num-dl1-accesses	Type: statistic Data type: unsigned 64-bit integer
Description: number of accesses to L1 data cache.	
Name: cpu.num-dl1-misses	Type: statistic Data type: unsigned 64-bit integer
Description: number of misses to L1 data cache.	
Name: cpu.num-l2-accesses	Type: statistic Data type: unsigned 64-bit integer
Description: number of accesses to unified L2 cache.	
Name: cpu.num-l2-misses	Type: statistic Data type: unsigned 64-bit integer
Description: number of misses to unified L2 cache.	

Name: <code>cpu.num-ibat-accesses</code>	Type: statistic Data type: unsigned 64-bit integer
Description: number of accesses to IBATs.	
Name: <code>cpu.num-ibat-misses</code>	Type: statistic Data type: unsigned 64-bit integer
Description: number of misses to IBATs.	
Name: <code>cpu.num-dbat-accesses</code>	Type: statistic Data type: unsigned 64-bit integer
Description: number of accesses to DBATs.	
Name: <code>cpu.num-dbat-misses</code>	Type: statistic Data type: unsigned 64-bit integer
Description: number of misses to DBATs.	
Name: <code>cpu.num-itlb-accesses</code>	Type: statistic Data type: unsigned 64-bit integer
Description: number of accesses to ITLB.	
Name: <code>cpu.num-itlb-misses</code>	Type: statistic Data type: unsigned 64-bit integer
Description: number of misses to ITLB.	
Name: <code>cpu.num-dtlb-accesses</code>	Type: statistic Data type: unsigned 64-bit integer
Description: number of accesses to DTLB.	
Name: <code>cpu.num-dtlb-misses</code>	Type: statistic Data type: unsigned 64-bit integer
Description: number of misses to DTLB.	

memory	
Name: memory.read-counter	Type: statistic Data type: unsigned 64-bit integer
Description: read counter.	
Name: memory.write-counter	Type: statistic Data type: unsigned 64-bit integer
Description: write counter.	

1.7 Formulas

Simulation statistic formulas are listed below:

cpu		
Name: cpu.il1-miss-rate Formula: $\text{cpu.num-il1-misses} / \text{cpu.} \hookrightarrow \text{num-il1-accesses}$	Type: formula Data type: floating-point	double precision
Name: cpu.dl1-miss-rate Formula: $\text{cpu.num-dl1-misses} / \text{cpu.} \hookrightarrow \text{num-dl1-accesses}$	Type: formula Data type: floating-point	double precision
Name: cpu.l2-miss-rate Formula: $\text{cpu.num-l2-misses} / \text{cpu.} \hookrightarrow \text{num-l2-accesses}$	Type: formula Data type: floating-point	double precision
Name: cpu.ibat-miss-rate Formula: $\text{cpu.num-ibat-misses} / \text{cpu.} \hookrightarrow \text{num-ibat-accesses}$	Type: formula Data type: floating-point	double precision
Name: cpu.dbat-miss-rate Formula: $\text{cpu.num-dbat-misses} / \text{cpu.} \hookrightarrow \text{num-dbat-accesses}$	Type: formula Data type: floating-point	double precision
Name: cpu.itlb-miss-rate Formula: $\text{cpu.num-itlb-misses} / \text{cpu.} \hookrightarrow \text{num-itlb-accesses}$	Type: formula Data type: floating-point	double precision
Name: cpu.dtlb-miss-rate Formula: $\text{cpu.num-dtlb-misses} / \text{cpu.} \hookrightarrow \text{num-dtlb-accesses}$	Type: formula Data type: floating-point	double precision