



virtutech

Simics/Ebony Target Guide

Simics Version 3.0

Revision 1406
Date 2008-02-19

VIRTUTECH CONFIDENTIAL

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Drottningholmsv. 14, SE-112 42 STOCKHOLM, Sweden

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Chapter 1

About Simics Documentation

1.1 Conventions

Let us take a quick look at the conventions used throughout the Simics documentation. Scripts, screen dumps and code fragments are presented in a `monospace` font. In screen dumps, user input is always presented in bold font, as in:

```
Welcome to the Simics prompt
simics> this is something that you should type
```

Sometimes, artificial line breaks may be introduced to prevent the text from being too wide. When such a break occurs, it is indicated by a small arrow pointing down, showing that the interrupted text continues on the next line:

```
This is an artificial ␣
line break that shouldn't be there.
```

The directory where Simics is installed is referred to as `[simics]`, for example when mentioning the `[simics]/README` file. In the same way, the shortcut `[workspace]` is used to point at the user's workspace directory.

1.2 Simics Guides and Manuals

Simics comes with several guides and manuals, which will be briefly described here. All documentation can be found in `[simics]/doc` as Windows Help files (on Windows), HTML files (on Unix) and PDF files (on both platforms). The new Eclipse-based interface also includes Simics documentation in its own help system.

Simics Installation Guide for Unix and for Windows

These guides describe how to install Simics and provide a short description of an installed Simics package. They also cover the additional steps needed for certain features of Simics to work (connection to real network, building new Simics modules, ...).

Simics User Guide for Unix and for Windows

These guides focus on getting a new user up to speed with Simics, providing information on Simics features such as debugging, profiling, networks, machine configuration and scripting.

Simics Eclipse User Guide

This is an alternative User Guide describing Simics and its new Eclipse-based graphical user interface.

Simics Target Guides

These guides provide more specific information on the different architectures simulated by Simics and the example machines that are provided. They explain how the machine configurations are built and how they can be changed, as well as how to install new operating systems. They also list potential limitations of the models.

Simics Programming Guide

This guide explains how to extend Simics by creating new devices and new commands. It gives a broad overview of how to work with modules and how to develop new classes and objects that fit in the Simics environment. It is only available when the DML add-on package has been installed.

DML Tutorial

This tutorial will give you a gentle and practical introduction to the Device Modeling Language (DML), guiding you through the creation of a simple device. It is only available when the DML add-on package has been installed.

DML Reference Manual

This manual provides a complete reference of DML used for developing new devices with Simics. It is only available when the DML add-on package has been installed.

Simics Reference Manual

This manual provides complete information on all commands, modules, classes and haps implemented by Simics as well as the functions and data types defined in the Simics API.

Simics Micro-Architectural Interface

This guide describes the cycle-accurate extensions of Simics (Micro-Architecture Interface or MAI) and provides information on how to write your own processor timing models. It is only available when the DML add-on package has been installed.

RELEASENOTES and LIMITATIONS files

These files are located in Simics's main directory (i.e., `[simics]`). They list limitations, changes and improvements on a per-version basis. They are the best source of information on new functionalities and specific bug fixes.

Simics Technical FAQ

This document is available on the Virtutech website at <http://www.simics.net/support>. It answers many questions that come up regularly on the support forums.

Simics Support Forum

The Simics Support Forum is the main support tool for Simics. You can access it at <http://www.simics.net>.

Other Interesting Documents

Simics uses Python as its main script language. A Python tutorial is available at <http://www.python.org/doc/2.4/tut/tut.html>. The complete Python documentation is located at <http://www.python.org/doc/2.4/>.

Chapter 2

Simics/Ebony Overview

Simics/Ebony models the *IBM/AMCC PPC440GP Evaluation Board* often referred to as *Ebony reference board*. The Ebony board includes a PowerPC PPC440GP processor, memory, flash memory, four PCI slots, two ethernet interfaces, two serial ports, a real-time-clock and two i2c busses.

Linux, VxWorks and OSE are known to work on Simics/Ebony. Only files needed to boot Linux are available from Virtutech. Scripts used to boot VxWorks are also included as examples, but not the VxWorks binaries.

The flashes on the Ebony board are setup according to *Configuration 3* in the *PPC440GP Evaluation Board User's Manual*. Two large flashes are mapped at 0xFFC0_0000 - 0xFFFF_FFFF. Two small flashes are mapped at 0xFF80_0000 - 0xFF8F_FFFF.

Chapter 3

Simulated Machines

Simics scripts for starting Ebony machines are located in the `[workspace]/targets/ebony/` directory, while the actual configuration scripts can be found in `[simics]/targets/ebony/`.

3.1 Ebony

The default configuration can be modified as described in section [3.2](#).

3.1.1 Ebony Scripts

This chapter explains the files used to boot Linux on Ebony.

`ebony-linux-common.simics`

Starts the Ebony machine with the default configuration to boot linux.

`ebony-linux-multi.simics`

Similar to `ebony-common.simics`, but instantiate 3 Ebony cards and creates a ethernet network.

`ebony-linux-scsi.simics`

Adds a PCI based SCSI controller and disk to the configuration. Boots a linux configuration with the (larger) root disk on the SCSI disk.

3.2 Parameters for Machine Scripts

The following parameters can be set before running the `ebony-linux-common.simics` scripts. Other `*-linux-*.simics` scripts may set some of the parameters unconditionally, and do not allow the user to override them.

3.2.1 `ebony-linux-common`

`$boot_command`

This the u-boot command automatically issued if `$do_boot` parameter is set to `yes`. The command specifies how u-boot should start linux.

\$create_network

Set to `yes` if the script should create an Ethernet link and connect the primary Ethernet adapter to it.

\$do_boot

Set to `yes` if the script should automatically start linux from u-boot.

\$do_login

Set to `yes` if the script should automatically login as root on linux and configure the first ethernet device.

\$ebony_u_boot

U-boot binary which system bootstraps from. This file will automatically loaded into the flash memory. The file should be an elf format.

\$eth_link

The Ethernet link to connect the primary Ethernet adapter to. This parameter should be set when a link already exist and the *\$create_network* parameter is `no`.

\$freq_mhz

The clock frequency in MHz for the processor.

\$host_name

The host name used by the DHCP and DNS servers for this machine This variable will not change the host name set for the machine on the disk dumps.

\$initrd_image

The file containing the initrd ram disk for Linux. If set, this file is loaded directly into memory.

\$ip_address

The IP address used by the DHCP and DNS servers for this machine This variable will not change any IP address set for the machine on the disk dumps.

\$kernel_image

The Linux kernel image file (in u-boot format) that should be booted.

\$mac_address

MAC address of the primary Ethernet adapter.

\$mac_address1

MAC address of the secondary Ethernet adapter.

\$machine_count

Number of ebony cards to create.

\$memory_megs

Amount of RAM in megabytes installed on the card.

\$rtc_time

Date and time of the real-time clock at boot.

\$service_node

The *service node* to use for DHCP and DNS. This parameter should be set when a service node already exist and the *\$create_network* parameter is `no`.

Chapter 4

Supported Components

The following sections list components that are supported for the Ebony architecture. There also exist other components in Simics, such as various PCI devices, that may work for Ebony but that have not been tested.

The default machines are constructed from components in the `-system.include` files in `[simics]/targets/ebony/`. See the Configuration and Checkpointing chapter in the Simics User Guide for information on how to define your own machine, or make modifications to an existing machine.

4.1 Ebony Components

4.1.1 ebony-board

Description

The “ebony-board” component represents the ebony board including the CPU.

Attributes

cpu_frequency

Required attribute; **read/write** access; type: **Integer**.

Processor frequency in MHz.

mac_address0

Required attribute; **read/write** access; type: **String**.

The MAC address of the first Ethernet adapter.

mac_address1

Required attribute; **read/write** access; type: **String**.

The MAC address of the second Ethernet adapter.

rtc_time

Required attribute; **read/write** access; type: **String**.

The data and time of the Real-Time clock.

Commands

create-ebony-board [*name*] *rtc_time* *cpu_frequency* *mac_address0* *mac_address1*

Creates a non-instantiated component of the class “ebony-board”. If *name* is not specified, the component will get a class-specific default name. The other arguments correspond to class attributes.

new-ebony-board [*name*] *rtc_time* *cpu_frequency* *mac_address0* *mac_address1*

Creates an instantiated component of the class “ebony-board”. If *name* is not specified, the component will get a class-specific default name. The other arguments correspond to class attributes.

<ebony-board>.info

Print detailed information about the configuration of the device.

<ebony-board>.status

Print detailed information about the current status of the device.

Connectors

| Name | Type | Direction |
|---------------|---------------|-----------|
| ddr-slot[0-1] | mem-bus | down |
| emac[0-1] | ethernet-link | down |
| pci-slot[0-3] | pci-bus | down |
| uart[0-1] | serial | down |

4.2 PCI Device Components**4.2.1 pci-dec21143****Description**

The “pci-dec21143” component represents a DEC21143 PCI based fast Ethernet adapter.

Attributes*bios*

Optional attribute; **read/write** access; type: **String**.

The x86 BIOS file to use.

mac_address

Required attribute; **read/write** access; type: **String**.

The MAC address of the Ethernet adapter.

Commands

create-pci-dec21143 [*name*] [*mac_address*] [*bios*]

Creates a non-instantiated component of the class “pci-dec21143”. If *name* is not specified, the component will get a class-specific default name. The other arguments correspond to class attributes.

<pci-dec21143>.info

Print detailed information about the configuration of the device.

<pci-dec21143>.status

Print detailed information about the current status of the device.

Connectors

| Name | Type | Direction |
|----------|---------------|-----------|
| pci-bus | pci-bus | up |
| ethernet | ethernet-link | down |

4.2.2 pci-sym53c875**Description**

The “pci-sym53C875” component represents a SYM53C875PCI based SCSI controller.

Attributes

bios

Optional attribute; **read/write** access; type: **String**.

The x86 SCSI BIOS file to use.

Commands

create-pci-sym53c875 [*name*] [*bios*]

Creates a non-instantiated component of the class “pci-sym53c875”. If *name* is not specified, the component will get a class-specific default name. The other arguments correspond to class attributes.

<pci-sym53c875>.info

Print detailed information about the configuration of the device.

<pci-sym53c875>.status

Print detailed information about the current status of the device.

Connectors

| Name | Type | Direction |
|----------|----------|-----------|
| pci-bus | pci-bus | up |
| scsi-bus | scsi-bus | down |

4.3 Standard Components**4.3.1 ddr-memory-module****Description**

The “ddr-memory-module” component represents a DDR memory module.

Attributes*banks*

Optional attribute; **read/write** access; type: **Integer**.
Number of banks.

cas_latency

Optional attribute; **read/write** access; type: **Integer**.
CAS-latency; each set bit corresponds to a latency the memory can handle

columns

Optional attribute; **read/write** access; type: **Integer**.
Number of columns.

ecc_width

Optional attribute; **read/write** access; type: **Integer**.
The error correction width.

memory_megs

Pseudo attribute; **read-only** access; type: **Integer**.
Total amount of memory in MB.

module_data_width

Optional attribute; **read/write** access; type: **Integer**.
The module SDRAM width.

module_type

Optional attribute; **read/write** access; type: **String**.
Type of memory.

primary_width

Optional attribute; **read/write** access; type: **Integer**.
Primary SDRAM width.

rank_density

Optional attribute; **read/write** access; type: **Integer**.

The rank density.

ranks

Optional attribute; **read/write** access; type: **Integer**.

Number of ranks (logical banks).

rows

Optional attribute; **read/write** access; type: **Integer**.

Number of rows.

speed

Optional attribute; **read/write** access; type: **String**.

PC standard speed. Supported values are PC2700 and none.

Commands

create-ddr-memory-module [*“name”*] [*rows*] [*columns*] [*ranks*] [*module_data_width*] [*primary_wi*]

Creates a non-instantiated component of the class “ddr-memory-module”. If *name* is not specified, the component will get a class-specific default name. The other arguments correspond to class attributes.

new-ddr-memory-module [*“name”*] [*rows*] [*columns*] [*ranks*] [*module_data_width*] [*primary_wi*]

Creates an instantiated component of the class “ddr-memory-module”. If *name* is not specified, the component will get a class-specific default name. The other arguments correspond to class attributes.

<ddr-memory-module>.info

Print detailed information about the configuration of the device.

<ddr-memory-module>.status

Print detailed information about the current status of the device.

Connectors

| Name | Type | Direction |
|---------|---------|-----------|
| mem-bus | mem-bus | up |

4.3.2 std-ethernet-link

Description

The “std-ethernet-link” component represents a standard Ethernet link.

Attributes

frame_echo

Optional attribute; **read/write** access; type: **Integer**.

Set this attribute to echo frames back to the sender. Default is not to echo frames.

link_name

Optional attribute; **read/write** access; type: **String**.

The name to use for the **ethernet-link** object. An error will be raised at instantiation time if the link cannot be given this name.

Commands

create-std-ethernet-link [*“name”*] [*“link_name”*] [*frame_echo*]

Creates a non-instantiated component of the class “std-ethernet-link”. If *name* is not specified, the component will get a class-specific default name. The other arguments correspond to class attributes.

new-std-ethernet-link [*“name”*] [*“link_name”*] [*frame_echo*]

Creates an instantiated component of the class “std-ethernet-link”. If *name* is not specified, the component will get a class-specific default name. The other arguments correspond to class attributes.

<std-ethernet-link>.info

Print detailed information about the configuration of the device.

<std-ethernet-link>.status

Print detailed information about the current status of the device.

Connectors

| Name | Type | Direction |
|--------|---------------|-----------|
| device | ethernet-link | any |

4.3.3 std-serial-link

Description

The “std-serial-link” component represents a standard Serial link.

Commands

create-std-serial-link [*“name”*]

Creates a non-instantiated component of the class “std-serial-link”. If *name* is not specified, the component will get a class-specific default name. The other arguments correspond to class attributes.

new-std-serial-link [*“name”*]

Creates an instantiated component of the class “std-serial-link”. If *name* is not specified, the component will get a class-specific default name. The other arguments correspond to class attributes.

<std-serial-link>.info

Print detailed information about the configuration of the device.

<std-serial-link>.status

Print detailed information about the current status of the device.

Connectors

| Name | Type | Direction |
|-------------|--------|-----------|
| serial[0-1] | serial | any |

4.3.4 std-service-node

Description

The “std-service-node” component represents a network service node that can be connected to Ethernet links to provide services such as DNS, DHCP/BOOTP, RARP and TFTP. A service node component does not have any connectors by default. Instead, connectors have to be added using the **<std-service-node>.add-connector** command.

Attributes

dynamic_connectors

Optional attribute; **read/write** access; type: **[[iss]*]**.

List of user added connectors

next_connector_id

Optional attribute; **read/write** access; type: **Integer**.

Next service-node device ID.

Commands

create-std-service-node [*"name"*]

Creates a non-instantiated component of the class "std-service-node". If *name* is not specified, the component will get a class-specific default name. The other arguments correspond to class attributes.

new-std-service-node [*"name"*]

Creates an instantiated component of the class "std-service-node". If *name* is not specified, the component will get a class-specific default name. The other arguments correspond to class attributes.

<std-service-node>.add-connector *"ip"* [*"netmask"*]

Adds a connector to the service-node with specified IP address and netmask. A connector must be created for the service-node before an Ethernet link can be connected to it. The *ip* argument is the IP address that the service node will use on the link. The *netmask* argument is optional, and defaults to 255.255.255.0. The name of the new connector is returned.

<std-service-node>.info

Print detailed information about the configuration of the device.

<std-service-node>.status

Print detailed information about the current status of the device.

4.3.5 std-scsi-bus

Description

The "std-scsi-bus" component represents a 16 slot SCSI bus.

Commands

create-std-scsi-bus [*"name"*]

Creates a non-instantiated component of the class "std-scsi-bus". If *name* is not specified, the component will get a class-specific default name. The other arguments correspond to class attributes.

<std-scsi-bus>.info

Print detailed information about the configuration of the device.

<std-scsi-bus>.status

Print detailed information about the current status of the device.

Connectors

| Name | Type | Direction |
|----------|----------|-----------|
| scsi-bus | scsi-bus | any |

4.3.6 std-scsi-disk**Description**

The “std-scsi-disk” component represents a SCSI-2 disk.

Attributes*file*

Optional attribute; **read/write** access; type: **String**.

File with disk contents for the full disk Either a raw file or a CRAFF file.

scsi_id

Required attribute; **read/write** access; type: **Integer**.

The ID on the SCSI bus.

size

Required attribute; **read/write** access; type: **Integer**.

The size of the SCSI disk in bytes.

Commands**create-std-scsi-disk** [*“name”*] *scsi_id* *size* [*“file”*]

Creates a non-instantiated component of the class “std-scsi-disk”. If *name* is not specified, the component will get a class-specific default name. The other arguments correspond to class attributes.

<std-scsi-disk>.info

Print detailed information about the configuration of the device.

<std-scsi-disk>.status

Print detailed information about the current status of the device.

Connectors

| Name | Type | Direction |
|----------|----------|-----------|
| scsi-bus | scsi-bus | up |

4.3.7 std-scsi-cdrom

Description

The “std-scsi-cdrom” component represents a SCSI-2 CD-ROM.

Attributes

scsi_id

Required attribute; **read/write** access; type: **Integer**.

The ID on the SCSI bus.

Commands

create-std-scsi-cdrom [*“name”*] *scsi_id*

Creates a non-instantiated component of the class “std-scsi-cdrom”. If *name* is not specified, the component will get a class-specific default name. The other arguments correspond to class attributes.

<std-scsi-cdrom>.info

Print detailed information about the configuration of the device.

<std-scsi-cdrom>.status

Print detailed information about the current status of the device.

Connectors

| Name | Type | Direction |
|----------|----------|-----------|
| scsi-bus | scsi-bus | up |

4.3.8 std-text-console

Description

The “std-text-console” component represents a serial text console.

Attributes

bg_color

Optional attribute; **read/write** access; type: **String**.

The background color.

fg_color

Optional attribute; **read/write** access; type: **String**.

The foreground color.

height

Optional attribute; **read/write** access; type: **Integer**.
The height of the console window.

title

Optional attribute; **read/write** access; type: **String**.
The Window title.

width

Optional attribute; **read/write** access; type: **Integer**.
The width of the console window.

win32_font

Optional attribute; **read/write** access; type: **String**.
Font to use in the console on Windows host.

x11_font

Optional attribute; **read/write** access; type: **String**.
Font to use in the console when using X11 (Linux/Solaris host).

Commands

create-std-text-console ["*name*"] ["*title*"] ["*bg_color*"] ["*fg_color*"] ["*x11_font*"] ["*win32_font*"] [*w*]

Creates a non-instantiated component of the class "std-text-console". If *name* is not specified, the component will get a class-specific default name. The other arguments correspond to class attributes.

new-std-text-console ["*name*"] ["*title*"] ["*bg_color*"] ["*fg_color*"] ["*x11_font*"] ["*win32_font*"] [*w*]

Creates an instantiated component of the class "std-text-console". If *name* is not specified, the component will get a class-specific default name. The other arguments correspond to class attributes.

<std-text-console>.info

Print detailed information about the configuration of the device.

<std-text-console>.status

Print detailed information about the current status of the device.

Connectors

| Name | Type | Direction |
|--------|--------|-----------|
| serial | serial | up |

4.3.9 std-server-console

Description

The “std-server-console” component represents a serial console accessible from the host using telnet.

Attributes

telnet_port

Required attribute; **read/write** access; type: **Integer**.

TCP/IP port to connect the telnet service of the console to.

Commands

create-std-server-console [*“name”*] *telnet_port*

Creates a non-instantiated component of the class “std-server-console”. If *name* is not specified, the component will get a class-specific default name. The other arguments correspond to class attributes.

new-std-server-console [*“name”*] *telnet_port*

Creates an instantiated component of the class “std-server-console”. If *name* is not specified, the component will get a class-specific default name. The other arguments correspond to class attributes.

<std-server-console>.info

Print detailed information about the configuration of the device.

<std-server-console>.status

Print detailed information about the current status of the device.

Connectors

| Name | Type | Direction |
|--------|--------|-----------|
| serial | serial | up |

4.4 Base Components

The base components are abstract classes that contain generic component attributes and commands available for all components.

4.4.1 component

Description

Base component class, should not be instantiated.

Attributes

connections

Optional attribute; **read/write** access; type: `[[sos]*]`.

List of connections for the component. The format is a list of lists, each containing the name of the connector, the connected component, and the name of the connector on the other component.

connectors

Pseudo class attribute; **read-only** access; type: **D**.

Dictionary of dictionaries with connectors defined by this component class, indexed by name. Each connector contains the name of the connector "type", a "direction" ("up", "down" or "any"), a flag indicating if the connector can be "empty", another flag that is set if the connector is "hotplug" capable, and finally a flag that is TRUE if multiple connections to this connector is allowed.

instantiated

Optional attribute; **read/write** access; type: **b**.

Set to TRUE if the component has been instantiated.

object_list

Optional attribute; **read/write** access; type: **D**.

Dictionary with objects that the component consists of.

object_prefix

Optional attribute; **read/write** access; type: **String**.

Object prefix string used by the component. The prefix is typically set by the **set-component-prefix** command before the component is created.

top_component

Optional attribute; **read/write** access; type: **Object**.

The top level component. Attribute is not valid until the component has been instantiated.

top_level

Optional attribute; **read/write** access; type: **b**.

Set to TRUE for top-level components, i.e. the root of a hierarchy.

4.4.2 top-component

Description

Base top-level component class, should not be instantiated.

Attributes*components*

Optional attribute; **read/write** access; type: [o*].

List of components below the the top-level component. This attribute is not valid until the object has been instantiated.

cpu_list

Optional attribute; **read/write** access; type: [o*].

List of all processors below the the top-level component. This attribute is not valid until the object has been instantiated.

Chapter 5

Miscellaneous Notes

5.1 Changing the Processor Clock Frequency

The clock frequency of a simulated processor can be set arbitrarily in Simics. This will not affect the actual speed of simulation, but it will affect the number of instructions that need to be executed for a certain amount of simulated time to pass. If your execution only depends on executing a certain number of instructions, increasing the clock frequency will take the same amount of host time (but a shorter amount of target time). However, if there are time based delays of some kind in the simulation, these will take longer to execute.

At a simulated 1 MHz, one million target instructions will correspond to a simulated second (assuming the simple default timing of one cycle per instruction). At 100 MHz, on the other hand, it will take 100 million target instructions to complete a simulated second. So with a higher clock frequency, less simulated target time is going to pass for a certain period of host execution time.

If Simics is used to emulate an interactive system (especially one with a graphical user interface) it is a good idea to set the clock frequency quite low. Keyboard and mouse inputs events are handled by periodic interrupts in most operating systems, using a higher clock frequency will result in longer delays between invocations of periodic interrupts. Thus, the simulated system will feel slower in its user response, and update the mouse cursor position etc. less frequently. If this is a problem, the best technique for running experiments at a high clock frequency is to first complete the configuration of the machine using a low clock frequency. Save all configuration changes to a disk diff (like when installing operating systems). Then change the configuration to use a higher a clock frequency and reboot the target machine.

Note that for a lightly-loaded machine (for example, working at an interactive prompt on a serial console to an embedded Linux system), Simics will often execute quickly enough at the real target clock frequency that there is no need to artificially lower it.

5.2 Manually Testing Interrupts

Interrupts from the interrupt controller comes in to the Simics PowerPC via the `simple_interrupt` interface. To manually trigger an interrupt it is possible issue:

```
simics> @conf.cpu0.iface.simple_interrupt.interrupt(conf.cpu0, 0)
```

The command line triggers the interrupt towards the CPU. The seconds parameter (zero) indicates that this is a normal interrupt. Critical interrupts should use the value 1. The external interrupt will only be serviced (when continuing execution) if the MSR[EE] bit is set, enabling external interrupts. To manually set this bit issue:

```
simics> %msr = %msr | 1<<15
```

To lower the external interrupt manually issue:

```
simics> @conf.cpu0.iface.simple_interrupt.interrupt_clear(conf.cpu0, 0)
```

5.3 Cache Simulation

For generic information on how cache simulation is done in Simics please refer to Simics User Guide.

PowerPC instructions which manipulates the cache directly, such as `dcbf` can effect the cache model provided that the processor's `icache` and `dcache` are properly set.

The `icache` and `dcache` attributes should point to g-cache objects simulating instruction and data cache. For SMP configurations, the `cpu_group` attribute should point to a `ppc-broadcast-bus` object which will be informed about the caches the cpus uses. If the WIMG M-bit is set for a cache transaction, then memory coherency is required and the cache operation is sent down to the broadcast bus which distributes it to all known caches. For non-SMP configurations or if the M-bit is not set, the local cache is called directly.

The following operations are supported:

PowerPC operation

`dcbf` (data cache block flush)
`dcbst` (data cache block store)
`dcbt` (data cache block touch)
`dcbtst` (data cache block touch for store)
`HID0[DCFI]`
`HID0[ICFI]`

Cache Operation

`Cache_Control_Invalidate_Line`
`Cache_Control_Copyback_Line`
`Cache_Control_Fetch_Line`
`Cache_Control_Fetch_Line`
`Cache_Control_Invalidate_Cache`
`Cache_Control_Invalidate_Cache`

Other operations, such as locking cache lines, are not currently supported. The cache module receives the the cache operation via the `cache_control` interface.

Chapter 6

Limitations

This chapter contains the limitations that exist on the PowerPC 440gp processor core. The SPRs listed do currently have no associated side-effect when either the register is read or written. In many cases this is not a problem even when code do use these registers.

The unimplemented instructions will cause Simics to break execution if the are ever executed.

The instructions implemented as no-operation (NOPs) will just execute without any side-effects at all.

6.1 PowerPC 440gp limitations

6.1.1 Unsupported SPRs

| SPR name | Number | Description |
|----------|--------|---|
| CCR0 | 947 | Core Configuration register 0 |
| DCDBTRH | 925 | Data Cache Debug Tag Register High |
| DCDBTRL | 924 | Data Cache Debug Tag Register Low |
| DNV0 | 912 | Data cache normal victim 0 |
| DNV1 | 913 | Data cache normal victim 1 |
| DNV2 | 914 | Data cache normal victim 2 |
| DNV3 | 915 | Data cache normal victim 3 |
| DTV0 | 916 | Data cache transient victim 0 |
| DTV1 | 917 | Data cache transient victim 1 |
| DTV2 | 918 | Data cache transient victim 2 |
| DTV3 | 919 | Data cache transient victim 3 |
| DVC1 | 318 | Data Value Compare 1 |
| DVC2 | 319 | Data Value Compare 2 |
| DVLIM | 920 | Data cache victim limit |
| IAC3 | 314 | Instruction Address Compare 3 |
| IAC4 | 315 | Instruction Address Compare 4 |
| ICDBDR | 979 | Instruction Cache Debug Data reg |
| ICDBTRH | 927 | Instruction Cache Debug Tag Register High |
| ICDBTRL | 926 | Instruction Cache Debug Tag Register Low |

| | | |
|--------|------|--------------------------------------|
| INV0 | 880 | Instruction cache normal victim 0 |
| INV1 | 881 | Instruction cache normal victim 1 |
| INV2 | 882 | Instruction cache normal victim 2 |
| INV3 | 883 | Instruction cache normal victim 3 |
| ITV0 | 884 | Instruction cache transient victim 0 |
| ITV1 | 885 | Instruction cache transient victim 1 |
| ITV2 | 886 | Instruction cache transient victim 2 |
| ITV3 | 887 | Instruction cache transient victim 3 |
| IVLIM | 921 | Instruction cache victim limit |
| PIR | 286 | Processor ID |
| RSTCFG | 923 | Reset configuration |
| DBCR1 | 309 | Debug Control register 1 |
| DBCR2 | 310 | Debug Control register 2 |
| DBDR | 1011 | Debug Data Register |

6.1.2 Miscellaneous Processor Core Limitations

PMC: Performance Monitor Counters (PMC) are not supported.

6.1.3 Unimplemented Instructions

dcread
 icread
 macchw
 macchws
 macchwsu
 macchwu
 machhw
 machhws
 machhwsu
 machhwu
 macldw
 macldws
 macldwsu
 macldwu
 mulchw
 mulchwu
 mulhbw
 mulhbwu
 nmacchbw
 nmacchws
 nmacchw
 nmacchws
 nmacldw
 nmacldws

6.1.4 Instructions Implemented as NOPs

dccc
 icbt
 iccci

Chapter 7

References

<http://www.busybox.net>

BusyBox combines tiny versions of many common UNIX utilities into a single small executable.

<http://kegel.com/crosstool/>

Useful information and tools for building cross-compilation toolchain.

<http://sourceforge.net/projects/u-boot>

Universal boot loader.

<http://www.amcc.com/Embedded/>

PowerPC 4xx information.

<http://www.kernel.org/>

Linux kernel.

<http://www.penguinppc.org>

Linux kernel information regarding PowerPC targets.

http://bugme.osdl.org/show_bug.cgi?id=4470

Unresolved bug in linux kernel on Ebony related to initrd and u-boot (with patch).

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Virtutech, Inc.

1740 Technology Dr., suite 460
San Jose, CA 95110
USA

Phone +1 408-392-9150
Fax +1 408-608-0430

<http://www.virtutech.com>