

SuperH Interfaces Guide

Paul Mundt

`lethal@linux-sh.org`

SuperH Interfaces Guide

by Paul Mundt

Copyright © 2008 Paul Mundt

Copyright © 2008 Renesas Technology Corp.

This documentation is free software; you can redistribute it and/or modify it under the terms of the GNU General Public License version 2 as published by the Free Software Foundation.

This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU General Public License for more details.

You should have received a copy of the GNU General Public License along with this program; if not, write to the Free Software Foundation, Inc., 59 Temple Place, Suite 330, Boston, MA 02111-1307 USA

For more details see the file COPYING in the source distribution of Linux.

Table of Contents

1. Memory Management	1
1.1. SH-4	1
1.1.1. Store Queue API	1
sq_flush_range	1
sq_remap	2
sq_unmap	3
1.2. SH-5	3
1.2.1. TLB Interfaces	4
sh64_tlb_init	4
sh64_next_free_dtlb_entry	4
sh64_get_wired_dtlb_entry	5
sh64_put_wired_dtlb_entry	6
sh64_setup_tlb_slot	6
sh64_tearardown_tlb_slot	7
for_each_dtlb_entry	8
for_each_itlb_entry	9
__flush_tlb_slot	10
2. Clock Framework Extensions	11
clk_set_rate_ex	11
3. Machine Specific Interfaces	13
3.1. mach-dreamcast	13
aica_rtc_gettimeofday	13
aica_rtc_settimeofday	13
3.2. mach-x3proto	14
ilsel_enable	14
ilsel_enable_fixed	15
ilsel_disable	16
4. Busses	19
4.1. SuperHyway	19
superhyway_add_device	19
superhyway_register_driver	20
superhyway_unregister_driver	21
4.2. Maple	21
maple_driver_register	22
maple_driver_unregister	22
maple_getcond_callback	23
maple_add_packet	24

Chapter 1. Memory Management

1.1. SH-4

1.1.1. Store Queue API

sq_flush_range

LINUX

Kernel Hackers Manual November 2011

Name

`sq_flush_range` — Flush (prefetch) a specific SQ range

Synopsis

```
void sq_flush_range (unsigned long start, unsigned int len);
```

Arguments

start

the store queue address to start flushing from

len

the length to flush

Description

Flushes the store queue cache from *start* to *start + len* in a linear fashion.

sq_remap

LINUX

Kernel Hackers Manual November 2011

Name

`sq_remap` — Map a physical address through the Store Queues

Synopsis

```
unsigned long sq_remap (unsigned long phys, unsigned int size,  
const char * name, unsigned long flags);
```

Arguments

phys

Physical address of mapping.

size

Length of mapping.

name

User invoking mapping.

flags

Protection flags.

Description

Remaps the physical address *phys* through the next available store queue address of *size* length. *name* is logged at boot time as well as through the sysfs interface.

sq_unmap

LINUX

Kernel Hackers ManualNovember 2011

Name

sq_unmap — Unmap a Store Queue allocation

Synopsis

```
void sq_unmap (unsigned long vaddr);
```

Arguments

vaddr

Pre-allocated Store Queue mapping.

Description

Unmaps the store queue allocation *map* that was previously created by `sq_remap`. Also frees up the pte that was previously inserted into the kernel page table and discards the UTLB translation.

1.2. SH-5

1.2.1. TLB Interfaces

sh64_tlb_init

LINUX

Kernel Hackers Manual November 2011

Name

`sh64_tlb_init` — Perform initial setup for the DTLB and ITLB.

Synopsis

```
int sh64_tlb_init ( void );
```

Arguments

void

no arguments

sh64_next_free_dtlb_entry

LINUX

Name

`sh64_next_free_dtlb_entry` — Find the next available DTLB entry

Synopsis

```
unsigned long long sh64_next_free_dtlb_entry ( void );
```

Arguments

void

no arguments

sh64_get_wired_dtlb_entry

LINUX

Name

`sh64_get_wired_dtlb_entry` — Allocate a wired (locked-in) entry in the DTLB

Synopsis

```
unsigned long long sh64_get_wired_dtlb_entry ( void );
```

Arguments

void

no arguments

sh64_put_wired_dtlb_entry

LINUX

Kernel Hackers Manual November 2011

Name

`sh64_put_wired_dtlb_entry` — Free a wired (locked-in) entry in the DTLB.

Synopsis

```
int sh64_put_wired_dtlb_entry (unsigned long long entry);
```

Arguments

entry

Address of TLB slot.

Description

Works like a stack, last one to allocate must be first one to free.

sh64_setup_tlb_slot

LINUX

Kernel Hackers Manual November 2011

Name

`sh64_setup_tlb_slot` — Load up a translation in a wired slot.

Synopsis

```
void sh64_setup_tlb_slot (unsigned long long config_addr,  
unsigned long eaddr, unsigned long asid, unsigned long paddr);
```

Arguments

config_addr

Address of TLB slot.

eaddr

Virtual address.

asid

Address Space Identifier.

paddr

Physical address.

Description

Load up a virtual<->physical translation for *eaddr*<->*paddr* in the pre-allocated TLB slot *config_addr* (see `sh64_get_wired_dtlb_entry`).

sh64_teardown_tlb_slot

LINUX

Kernel Hackers Manual November 2011

Name

`sh64_teardown_tlb_slot` — Teardown a translation.

Synopsis

```
void sh64_teardown_tlb_slot (unsigned long long config_addr);
```

Arguments

config_addr

Address of TLB slot.

Description

Teardown any existing mapping in the TLB slot *config_addr*.

for_each_dtlb_entry

LINUX

Kernel Hackers Manual November 2011

Name

`for_each_dtlb_entry` — Iterate over free (non-wired) DTLB entries

Synopsis

```
for_each_dtlb_entry ( tlb );
```

Arguments

tlb

TLB entry

for_each_itlb_entry

LINUX

Kernel Hackers Manual November 2011

Name

`for_each_itlb_entry` — Iterate over free (non-wired) ITLB entries

Synopsis

```
for_each_itlb_entry ( tlb );
```

Arguments

tlb

TLB entry

__flush_tlb_slot

LINUX

Kernel Hackers Manual November 2011

Name

`__flush_tlb_slot` — Flushes TLB slot *slot*.

Synopsis

```
void __flush_tlb_slot (unsigned long long slot);
```

Arguments

slot

Address of TLB slot.

Chapter 2. Clock Framework Extensions

clk_set_rate_ex

LINUX

Kernel Hackers Manual November 2011

Name

`clk_set_rate_ex` — set the clock rate for a clock source, with additional parameter

Synopsis

```
int clk_set_rate_ex (struct clk * clk, unsigned long rate, int algo_id);
```

Arguments

clk

clock source

rate

desired clock rate in Hz

algo_id

algorithm id to be passed down to `ops->set_rate`

Description

Returns success (0) or negative errno.

Chapter 3. Machine Specific Interfaces

3.1. mach-dreamcast

aica_rtc_gettimeofday

LINUX

Kernel Hackers Manual November 2011

Name

`aica_rtc_gettimeofday` — Get the time from the AICA RTC

Synopsis

```
void aica_rtc_gettimeofday (struct timespec * ts);
```

Arguments

ts

pointer to resulting timespec

Description

Grabs the current RTC seconds counter and adjusts it to the Unix Epoch.

aica_rtc_settimeofday

LINUX

Kernel Hackers Manual November 2011

Name

`aica_rtc_settimeofday` — Set the AICA RTC to the current time

Synopsis

```
int aica_rtc_settimeofday (const time_t secs);
```

Arguments

secs

contains the `time_t` to set

Description

Adjusts the given *tv* to the AICA Epoch and sets the RTC seconds counter.

3.2. mach-x3proto

ilse_enable

LINUX

Name

`ilssel_enable` — Enable an ILSEL set.

Synopsis

```
int ilssel_enable (ilssel_source_t set);
```

Arguments

set

ILSEL source (see `ilssel_source_t` enum in `include/asm-sh/ilssel.h`).

Description

Enables a given non-aliased ILSEL source (\leq ILSEL_KEY) at the highest available interrupt level. Callers should take care to order callsites noting descending interrupt levels. Aliasing FPGA and external board IRQs need to use `ilssel_enable_fixed`.

The return value is an IRQ number that can later be taken down with `ilssel_disable`.

`ilssel_enable_fixed`

LINUX

Name

`ilssel_enable_fixed` — Enable an ILSEL set at a fixed interrupt level

Synopsis

```
int ilssel_enable_fixed (ilssel_source_t set, unsigned int
level);
```

Arguments

set

ILSEL source (see `ilssel_source_t` enum in `include/asm-sh/ilssel.h`).

level

Interrupt level (1 - 15)

Description

Enables a given ILSEL source at a fixed interrupt level. Necessary both for level reservation as well as for aliased sources that only exist on special ILSEL#s.

Returns an IRQ number (as `ilssel_enable`).

`ilssel_disable`

LINUX

Name

`ilssel_disable` — Disable an ILSEL set

Synopsis

```
void ilssel_disable (unsigned int irq);
```

Arguments

irq

Bit position for ILSEL set value (retval from enable routines)

Description

Disable a previously enabled ILSEL set.

Chapter 4. Busses

4.1. SuperHyway

superhyway_add_device

LINUX

Kernel Hackers Manual November 2011

Name

superhyway_add_device — Add a SuperHyway module

Synopsis

```
int superhyway_add_device (unsigned long base, struct  
superhyway_device * sdev, struct superhyway_bus * bus);
```

Arguments

base

Physical address where module is mapped.

sdev

SuperHyway device to add, or NULL to allocate a new one.

bus

Bus where SuperHyway module resides.

Description

This is responsible for adding a new SuperHyway module. This sets up a new struct `superhyway_device` for the module being added if `sdev == NULL`.

Devices are initially added in the order that they are scanned (from the top-down of the memory map), and are assigned an ID based on the order that they are added. Any manual addition of a module will thus get the ID after the devices already discovered regardless of where it resides in memory.

Further work can and should be done in `superhyway_scan_bus`, to be sure that any new modules are properly discovered and subsequently registered.

superhyway_register_driver

LINUX

Kernel Hackers Manual November 2011

Name

`superhyway_register_driver` — Register a new SuperHyway driver

Synopsis

```
int superhyway_register_driver (struct superhyway_driver *  
drv);
```

Arguments

drv

SuperHyway driver to register.

Description

This registers the passed in *drv*. Any devices matching the id table will automatically be populated and handed off to the driver's specified probe routine.

superhyway_unregister_driver

LINUX

Kernel Hackers Manual November 2011

Name

`superhyway_unregister_driver` — Unregister a SuperHyway driver

Synopsis

```
void superhyway_unregister_driver (struct superhyway_driver *  
drv);
```

Arguments

drv

SuperHyway driver to unregister.

Description

This cleans up after `superhyway_register_driver`, and should be invoked in the exit path of any module drivers.

4.2. Maple

maple_driver_register

LINUX

Kernel Hackers Manual November 2011

Name

`maple_driver_register` — register a maple driver

Synopsis

```
int maple_driver_register (struct maple_driver * drv);
```

Arguments

drv

maple driver to be registered.

Description

Registers the passed in *drv*, while updating the bus type. Devices with matching function IDs will be automatically probed.

maple_driver_unregister

LINUX

Name

`maple_driver_unregister` — unregister a maple driver.

Synopsis

```
void maple_driver_unregister (struct maple_driver * drv);
```

Arguments

drv

maple driver to unregister.

Description

Cleans up after `maple_driver_register`. To be invoked in the exit path of any module drivers.

maple_getcond_callback

LINUX

Name

`maple_getcond_callback` — setup handling
`MAPLE_COMMAND_GETCOND`

Synopsis

```
void maple_getcond_callback (struct maple_device * dev, void  
(*callback) (struct mapleq *mq), unsigned long interval,  
unsigned long function);
```

Arguments

dev

device responding

callback

handler callback

interval

interval in jiffies between callbacks

function

the function code for the device

maple_add_packet

LINUX

Kernel Hackers Manual November 2011

Name

`maple_add_packet` — add a single instruction to the maple bus queue

Synopsis

```
int maple_add_packet (struct maple_device * mdev, u32  
function, u32 command, size_t length, void * data);
```

Arguments

mdev

maple device

function

function on device being queried

command

maple command to add

length

length of command string (in 32 bit words)

data

remainder of command string

