

Vcilcu

1) Functional Description

This VCI target is a memory mapped peripheral implementing a vectorized interrupt controller. It can concentrate up to 32 independent interrupt lines **p_irq_in[i]** to a single **p_irq** interrupt line.

The active state is high, and the output interrupt is the logical OR of all input interrupts. Each input interrupt can be individually masked through a programmable register.

This component can be addressed to return the index of the highest priority active interrupt **p_irq[i]**. The priority scheme is fixed : The lower indexes have the highest priority.

This hardware component checks for segmentation violation, and can be used as a default target.

This component contains 5 memory mapped registers:

- **ICU_INT** Each bit in this register reflects the state of the corresponding interrupt line. This is read-only.
- **ICU_MASK** Each bit in this register reflects the state of the enable for the corresponding interrupt line. This is read-only.
- **ICU_MASK_SET** Each bit set in the written word will be set in the ICU MASK. (**ICU_MASK = ICU_MASK | written_data**). This is write-only.
- **ICU_MASK_CLEAR** Each bit set in the written word will be reset in the ICU MASK. (**ICU_MASK = ICU_MASK & ~written_data**). This is write-only.
- **ICU_IT_VECTOR** This register gives the number of the highest-priority active interrupt. If no interrupt is active, (-1) is returned. This is read-only.

For extensibility issues, you should access your ICU using globally-defined offsets.

You should include file `soclib/icu.h` from your software, it defines **ICU_INT**, **ICU_MASK**, **ICU_MASK_SET**, **ICU_MASK_CLEAR**, **ICU_IT_VECTOR**.

Sample code:

```
#include "soclib/icu.h"

static const volatile void* icu_address = 0xc0000000;

static icu_test()
{
    // Getting / setting interrupt mask
    uint32_t current_interrupt_mask = soclib_io_get( icu_address, ICU_MASK );

    // Enabling IRQ #5
    soclib_io_set( icu_address, ICU_MASK_SET, 1<<5 );
    // Disabling IRQ #0
    soclib_io_set( icu_address, ICU_MASK_CLEAR, 1<<0 );

    // When interrupt is raised, you may do:
```

```

int irq_to_serve = soclib_io_get( icu_address, ICU_IT_VECTOR );
// This should be equivalent to (see man 3 ffs)
int irq_to_serve = ffs( soclib_io_get( icu_address, ICU_IT_VECTOR )
                        & soclib_io_get( icu_address, ICU_MASK ) );
}

```

(add -I/path/to/soclib/include to your compilation command-line)

2) Component definition & usage

source:trunk/soclib/module/infrastructure_component/interrupt_infrastructure/vci_icu/caba/metadata/vci_icu.sd

```
Uses( 'vci_icu')
```

3) CABA Implementation

CABA sources

- interface :
[source:trunk/soclib/soclib/module/infrastructure_component/interrupt_infrastructure/vci_icu/caba/source/include/vci_icu.h](#)
- implementation :
[source:trunk/soclib/soclib/module/infrastructure_component/interrupt_infrastructure/vci_icu/caba/source/src/vci_icu.c](#)

CABA Constructor parameters

```

VciIcu(
    sc_module_name name, // Component Name
    const soclib::common::InTab &index, // Target index
    const soclib::common::MappingTable &mt, // Mapping Table
    size_t nirq); // Number of input interrupts

```

CABA Ports

- sc_in<bool> **p_resetn** : Global system reset
- sc_in<bool> **p_clk** : Global system clock
- soclib::caba::VciTarget<vci_param> **p_vci** : VCI port
- sc_out<bool> **p_irq** : Output interrupt port
- sc_in<bool> **p_irq_in[]** : Input interrupts ports array

4) TLM-DT Implementation

TLM-DT sources

- interface :
[source:trunk/soclib/soclib/module/infrastructure_component/interrupt_infrastructure/vci_icu/tlmdt/source/include/vci_icu_tlmdt.h](#)
- implementation :
[source:trunk/soclib/soclib/module/infrastructure_component/interrupt_infrastructure/vci_icu/tlmdt/source/src/vci_icu_tlmdt.c](#)

TLM-DT Constructor parameters

```

VciIcu(
    sc_module_name name, // Component Name
    const soclib::common::InTab &index, // Target index

```

```
const soclib::common::MappingTable &mt, // Mapping Table
size_t nirq); // Number of input interrupts
```

TLM-DT Ports

- `tlm::tlm_target_socket<32, tlm::tlm_base_protocol_types>` **p_vci_target** *VCI target port*
- `tlm::tlm_initiator_socket<32, tlm::tlm_base_protocol_types>` **p_irq_initiator** *IRQ output port to the processor*
- `std::vector<tlm_utils::simple_target_socket_tagged<!VciIcu,32,tlm::tlm_base_protocol_types>*>` **p_irq_target** *Up to 32 IRQ input ports*