**GMII VVC** –Quick Reference

**VVC**

For general information see UVVM Essential Mechanisms located in uvvm\_vvc\_framework/doc.

|  |
| --- |
| gmii\_write (VVCT, vvc\_instance\_idx, channel, data, msg, [scope, [use\_provided\_msg\_id\_panel, [msg\_id\_panel]]]) |
| Example: gmii\_write(GMII\_VVCT, 1, TX, v\_write\_bytes, “Write data to DUT”); |

*gmii\_vvc.vhd*

|  |
| --- |
| gmii\_read (VVCT, vvc\_instance\_idx, channel, num\_bytes, msg, [scope, [use\_provided\_msg\_id\_panel, [msg\_id\_panel]]]) |
| Example: gmii\_read(GMII\_VVCT, 1, RX, 10, “Receive 10 bytes”); |

GMII VVC Configuration record **´vvc\_config´ --** accessible via **shared\_gmii\_vvc\_config**

**Common VVC procedures applicable for this VVC**  
- See UVVM Methods QuickRef for details.

**await\_completion**() **enable\_log\_msg**() **disable\_log\_msg**()

**fetch\_result**()

**flush\_command\_queue**()  
**terminate\_current\_command**() **terminate\_all\_commands**() **insert\_delay**()

**get\_last\_received\_cmd\_idx()**

|  |  |  |
| --- | --- | --- |
| **Record element** | **Type** | **C\_GMII\_VVC\_CONFIG\_DEFAULT** |
| inter\_bfm\_delay | t\_inter\_bfm\_delay | C\_GMII\_INTER\_BFM\_DELAY\_DEFAULT |
| cmd\_queue\_count\_max | natural | C\_CMD\_QUEUE\_COUNT\_MAX |
| cmd\_queue\_count\_threshold | natural | C\_CMD\_QUEUE\_COUNT\_THRESHOLD |
| cmd\_queue\_count\_threshold\_severity | t\_alert\_level | C\_CMD\_QUEUE\_COUNT\_THRESHOLD\_SEVERITY |
| result\_queue\_count\_max | natural | C\_RESULT\_QUEUE\_COUNT\_MAX |
| result\_queue\_count\_threshold | natural | C\_RESULT\_QUEUE\_COUNT\_THRESHOLD |
| result\_queue\_count\_threshold\_severity | t\_alert\_level | C\_RESULT\_QUEUE\_COUNT\_THERSHOLD\_SEVERITY |
| bfm\_config | t\_gmii\_bfm\_config | C\_GMII\_BFM\_CONFIG\_DEFAULT |
| msg\_id\_panel | t\_msg\_id\_panel | C\_VVC\_MSG\_ID\_PANEL\_DEFAULT |
|  |  |  |

GMII VVC Status record signal **´vvc\_status´ --** accessible via **shared\_gmii\_vvc\_status**

|  |  |  |
| --- | --- | --- |
| **Record element** | **Type** |  |
| current\_cmd\_idx | natural |  | |
| previous\_cmd\_idx | natural |  |
| pending\_cmd\_cnt | natural |  |

VVC target parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Example(s)** | **Description** |
| VVCT | t\_vvc\_target\_record | GMII\_VVCT | VVC target type compiled into each VVC in order to differentiate between VVCs. |
| vvc\_instance\_idx | integer | 1 | Instance number of the VVC. |
| channel | t\_channel | TX, RX | The VVC channel of the VVC instance. |

VVC functional parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Example(s)** | **Description** |
| data | t\_byte\_array | (x”D3”, x”DA”, x”01”) | The data to be written. |
| num\_bytes | positive | 10 | The number of bytes that shall be received. |
| msg | string | “Read from DUT” | A custom message to be appended in the log/alert |
| scope | string | “GMII VVC” | A string describing the scope from which the log/alert originates. Default “GMII VVC”. |
| use\_provided\_msg\_id\_panel | t\_use\_provided\_msg\_id\_panel | “USE\_PROVIDED\_MSG\_ID\_PANEL” | Enables or disables the provided msg\_id\_panel. Default “DO\_NOT\_USE\_PROVIDED\_MSG\_ID\_PANEL”. |
| msg\_id\_panel | t\_msg\_id\_panel | shared\_msg\_id\_panel | Optional msg\_id\_panel, controlling verbosity within a specified scope. Default shared\_msg\_id\_panel. |

VVC entity signals

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Direction** | **Description** |
| gmii\_to\_dut\_if | t\_gmii\_to\_dut\_if | Inout | RX signals from DUT and clock. |
| gmii\_from\_dut\_if | t\_gmii\_from\_dut\_if | In | TX signals from DUT and clock. |

VVC entity generic constants

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Type** | **Default** | **Description** |
| GC\_ADDR\_WIDTH | integer | 8 | Width of the GMII address bus |
| GC\_DATA\_WIDTH | integer | 32 | Width of the GMII data bus |
| GC\_INSTANCE\_IDX | natural | 1 | Instance number to assign the VVC |
| GC\_GMII\_CONFIG | t\_gmii\_bfm\_config | C\_GMII\_BFM\_CONFIG\_DEFAULT | Configuration for the GMII BFM, see GMII BFM documentation. |
| GC\_CMD\_QUEUE\_COUNT\_MAX | natural | 1000 | Absolute maximum number of commands in the VVC command queue |
| GC\_CMD\_QUEUE\_COUNT\_THRESHOLD | natural | 950 | An alert will be generated when reaching this threshold to indicate that the command queue is almost full. The queue will still accept new commands until it reaches C\_CMD\_QUEUE\_COUNT\_MAX. |
| GC\_CMD\_QUEUE\_COUNT\_THRESHOLD\_SEVERITY | t\_alert\_level | WARNING | Alert severity which will be used when command queue reaches GC\_CMD\_QUEUE\_COUNT\_THRESHOLD. |
| GC\_RESULT\_QUEUE\_COUNT\_MAX | natural | 1000 | Maximum number of unfetched results before result\_queue is full. |
| GC\_RESULT\_QUEUE\_COUNT\_THRESHOLD | natural | 950 | An alert with severity 'result\_queue\_count\_threshold\_severity' will be issued if result queue exceeds this count. Used for early warning if result queue is almost full. Will be ignored if set to 0. |
| GC\_RESULT\_QUEUE\_COUNT\_THRESHOLD\_SEVERITY | t\_alert\_level | WARNING | Severity of alert to be initiated if exceeding result\_queue\_count\_threshold |

VVC details

All VVC procedures are defined in vvc\_methods\_pkg (dedicated this VVC), and uvvm\_vvc\_framework.uvvm\_methods\_pkg and uvvm\_vvc\_framework.uvvm\_support\_pkg (common VVC procedures)

It is also possible to send a multicast to all instances of a VVC with ALL\_INSTANCES as parameter for vvc\_instance\_idx.

# VVC procedure details and examples

|  |  |
| --- | --- |
| **Procedure** | **Description** |
| **gmii\_write()** | **gmii\_write(VVCT, vvc\_instance\_idx, channel, data, msg, [scope, [use\_provided\_msg\_id\_panel, [msg\_id\_panel]]])**  The gmii\_write() VVC procedure adds a write command to the GMII VVC executor queue, which will run as soon as all preceding commands have completed. When the write command is scheduled to run, the executor calls the GMII BFM gmii\_write() procedure, described in the GMII BFM QuickRef.  Example:  gmii\_write(GMII\_VVCT, 1, TX, v\_write\_bytes, “Write 10 bytes”); |
| **gmii\_read()** | **gmii\_read (VVCT, vvc\_instance\_idx, channel, num\_bytes, msg, [scope, [use\_provided\_msg\_id\_panel, [msg\_id\_panel]]])**  The gmii\_read() VVC procedure adds a read command to the GMII VVC executor queue, which will run as soon as all preceding commands have completed. When the read command is scheduled to run, the executor calls the GMII BFM gmii\_read() procedure, described in the GMII BFM QuickRef.  The value read from DUT will not be returned in this procedure call since it is non-blocking for the sequencer/caller, but the read data will be stored in the VVC for a potential future fetch (see example with *fetch\_result* below).  Example:  gmii\_read(GMII\_VVCT, 1, RX, 10, “Read 10 bytes”);  **Example with fetch\_result() call**: Result is placed in **v\_data**  variable v\_cmd\_idx : natural; -- Command index for the last read  variable v\_data : work.vvc\_cmd\_pkg.t\_vvc\_result; -- Result from read.  (…)  gmii\_read(GMII\_VVCT, 1, RX, “Read 10 bytes”);  v\_cmd\_idx := get\_last\_received\_cmd\_idx(GMII\_VVCT, 1, RX);  await\_completion(GMII\_VVCT,1, v\_cmd\_idx, 1 us, "Wait for read to finish");  fetch\_result(GMII\_VVCT,1, v\_cmd\_idx, **v\_data**, "Fetching result from read operation"); |

# VVC Configuration

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Record element** | **Type** | **C\_GMII\_BFM\_CONFIG\_DEFAULT** | | **Description** | |
| inter\_bfm\_delay | t\_inter\_bfm\_delay | C\_GMII\_INTER\_BFM\_DELAY\_DEFAULT | Delay between any requested BFM accesses towards the DUT. - TIME\_START2START: Time from a BFM start to the next BFM start   (A TB\_WARNING will be issued if access takes   longer than TIME\_START2START).  - TIME\_FINISH2START: Time from a BFM end to the next BFM start. Any insert\_delay() command will add to the above minimum delays, giving for instance the ability to skew the BFM starting time. | |
| cmd\_queue\_count\_max | natural | C\_CMD\_QUEUE\_COUNT\_MAX | Maximum pending number in command queue before queue is full. Adding additional commands will result in an ERROR. | |
| cmd\_queue\_count\_threshold | natural | C\_CMD\_QUEUE\_COUNT\_THRESHOLD | An alert with severity “cmd\_queue\_count\_threshold\_severity” will be issued if command queue exceeds this count. Used for early warning if command queue is almost full. Will be ignored if set to 0. | |
| cmd\_queue\_count\_threshold\_severity | t\_alert\_level | C\_CMD\_QUEUE\_COUNT\_THRESHOLD\_SEVERITY | Severity of alert to be initiated if exceeding cmd\_queue\_count\_threshold | |
| result\_queue\_count\_max | natural | C\_RESULT\_QUEUE\_COUNT\_MAX | Maximum number of unfetched results before result\_queue is full. | | | |
| result\_queue\_count\_threshold | natural | C\_RESULT\_QUEUE\_COUNT\_THRESHOLD | An alert with severity 'result\_queue\_count\_threshold\_severity' will be issued if result queue exceeds this count. Used for early warning if result queue is almost full. Will be ignored if set to 0. | | | |
| result\_queue\_count\_threshold\_severity | t\_alert\_level | C\_ RESULT\_QUEUE\_COUNT\_THRESHOLD\_SEVERITY | Severity of alert to be initiated if exceeding result\_queue\_count\_threshold | | | |
| bfm\_config | t\_gmii\_bfm\_config | C\_GMII\_BFM\_CONFIG\_DEFAULT | Configuration for GMII BFM. See quick reference for GMII BFM | |
| msg\_id\_panel | t\_msg\_id\_panel | C\_VVC\_MSG\_ID\_PANEL\_DEFAULT | VVC dedicated message ID panel | |

# The configuration record can be accessed from the Central Testbench Sequencer through the shared variable array, e.g.:

shared\_gmii\_vvc\_config(1).inter\_bfm\_delay.delay\_in\_time := 50 ns;

shared\_gmii\_vvc\_config(1).bfm\_config.id\_for\_bfm := ID\_BFM;

The index in shared\_gmii\_vvc\_config corresponds with the instance number of the VVC.

# VVC Status

The current status of the VVC can be retrieved during simulation. This is achieved by reading from the shared variable shared\_gmii\_vvc\_status record from the test sequencer. The record contents can be seen below:

|  |  |  |
| --- | --- | --- |
| **Record element** | **Type** | **Description** |
| current\_cmd\_idx | natural | Command index currently running |
| previous\_cmd\_idx | natural | Previous command index to run |
| pending\_cmd\_cnt | natural | Pending number of commands in the command queue |

# Activity watchdog

The VVCs support an activity watchdog which monitors VVC activity and will alert if no VVC activity is registered within a selected timeout value. The VVCs will register their presence to the activity watchdog at start-up, and report when busy and not, using dedicated activity watchdog methods and triggering the global\_trigger\_testcase\_inactivity\_watchdog signal, during simulations.

Include activity\_watchdog(timeout, num\_exp\_vvc, alert\_level, msg) in the testbench to start using the activity watchdog.   
More information can be found in UVVM Essential Mechanisms PDF in the UVVM VVC Framework doc folder.

# VVC Interface

In this VVC, the interface has been encapsulated in two signal records of type *t\_gmii\_to\_dut\_if* for the rx-signals that goes to the DUT, and *t\_gmii\_from\_dut* for the tx-signals that comes from the DUT in order to improve readability of the code.

# Additional Documentation

Additional documentation about UVVM and its features can be found under “/uvvm\_vvc\_framework/doc/”.

For additional documentation on the GMII protocol, please see the GMII BFM QuickRef.

# Compilation

The GMII VVC must be compiled with VHDL 2008.   
It is dependent on the following libraries

* ***UVVM Utility Library (UVVM-Util), version 2.2.0 and up***
* ***UVVM VVC Framework, version 2.1.0 and up***
* ***GMII BFM***

Before compiling the GMII VVC, assure that uvvm\_vvc\_framework and uvvm\_util have been compiled.

See UVVM Essential Mechanisms located in uvvm\_vvc\_framework/doc for information about compile scripts.

**Compile order for the GMII VVC:**

|  |  |  |
| --- | --- | --- |
| **Compile to library** | **File** | **Comment** |
| bitvis\_vip\_gmii | gmii\_bfm\_pkg.vhd | GMII BFM |
| bitvis\_vip\_gmii | vvc\_cmd\_pkg.vhd | GMII VVC command types and operations |
| bitvis\_vip\_gmii | ../uvvm\_vvc\_framework/src\_target\_dependent/td\_target\_support\_pkg.vhd | UVVM VVC target support package, compiled into the GMII VVC library. |
| bitvis\_vip\_gmii | ../uvvm\_vvc\_framework/src\_target\_dependent/td\_vvc\_framework\_common\_methods\_pkg.vhd | Common UVVM framework methods compiled into the GMII VVC library |
| bitvis\_vip\_gmii | vvc\_methods\_pkg.vhd | GMII VVC methods |
| bitvis\_vip\_gmii | ../uvvm\_vvc\_framework/src\_target\_dependent/td\_queue\_pkg.vhd | UVVM queue package for the VVC |
| bitvis\_vip\_gmii | ../uvvm\_vvc\_framework/src\_target\_dependent/td\_vvc\_entity\_support\_pkg.vhd | UVVM VVC entity support compiled into the GMII VVC library |
| bitvis\_vip\_gmii | gmii\_receive\_vvc.vhd | GMII Receive VVC |
| bitvis\_vip\_gmii | gmii\_transmit\_vvc.vhd | GMII Transmit VVC |
| bitvis\_vip\_gmii | gmii\_vvc.vhd | GMII VVC |

# Simulator compatibility and setup

This VVC has been compiled and tested with Modelsim version 10.3d and Riviera-PRO version 2015.10.85.

For required simulator setup see ***UVVM-Util*** Quick reference.

IMPORTANT

This is a simplified Verification IP (VIP) for GMII.

The given VIP complies with the basic GMII protocol and thus allows a normal access towards a GMII interface. This VIP is not a GMII protocol checker.

For a more advanced VIP please contact Bitvis AS at [support@bitvis.no](mailto:support@bitvis.no)

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