TLM 2.0 Approximately Time (AT) System Example – Mixed AT System

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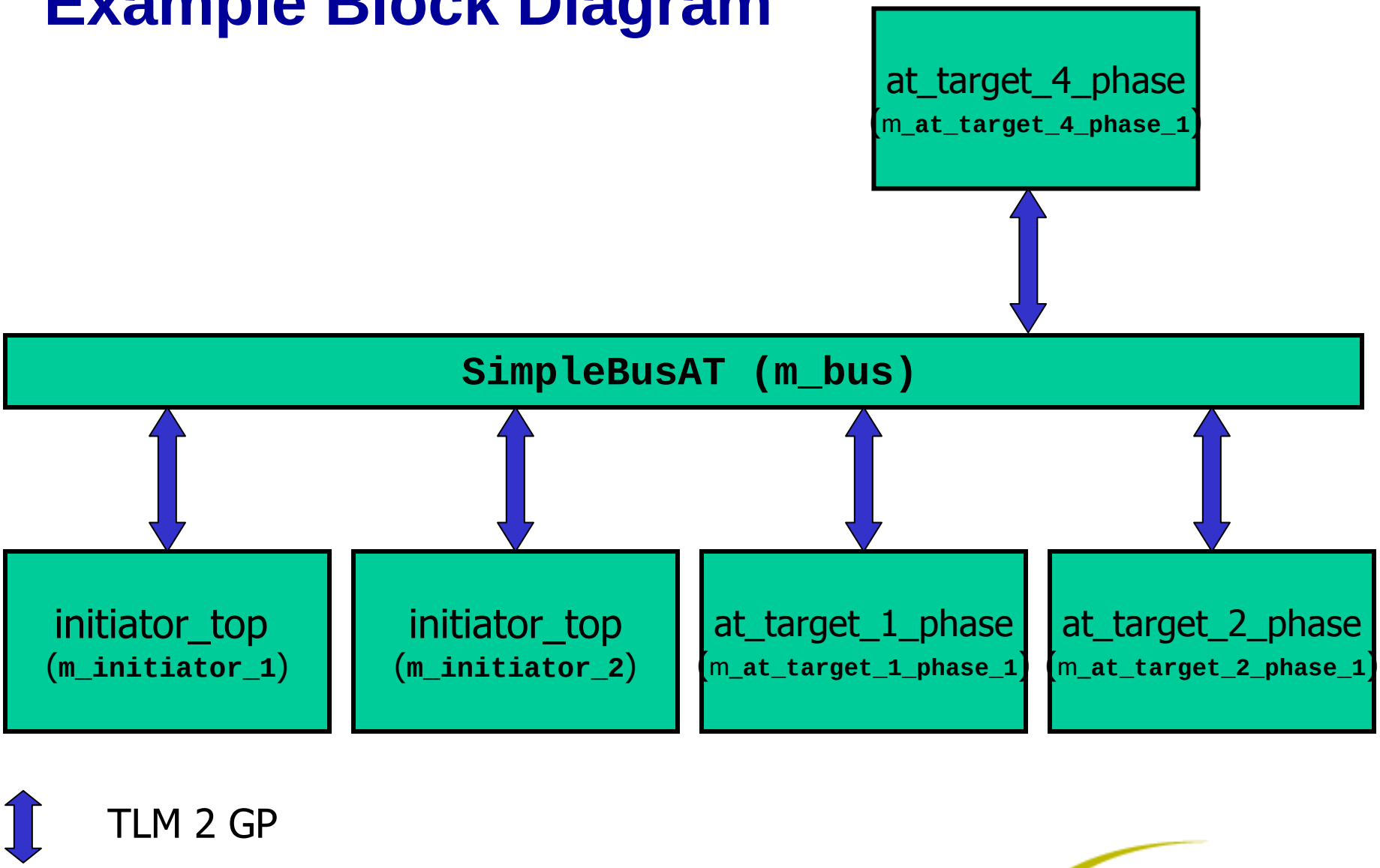
June 2008

AT System Example - Annotated Timing

- **The Goal is to Illustrate:**
  - **Application of TLM 2.0 in a real system**
  - **Illustrate interoperability of different AT styles**
- **Possible Applications:**
  - **Architectural exploration**
  - **Early software development**
  - **Continued modeling with available models**

Example Block Diagram



How to run this example (Linux)

- Set **`SYSTEMC_HOME`**
- **`cd examples/tlm/at_1_phase/build-unix`**
- **`make clean`**
- **`make`**
- **`make run`**

How to run this example (MSVC)

- Open a explorer window on **`examples/tlm/at_1_phase/build-windows`**
- Launch **`at_1_phase.sln`**
- Select **‘Property Manager’** from the **‘View’** menu
- Under **‘at_1_phase > Debug | Win32’** select **‘systemc’**
- Select **‘Properties’** from the **‘View’** menu
- Select **‘User Macros’** under **‘Common Properties’**
- Update the **‘SYSTEMC’** entry and apply
- Build and run

Expected Output – Target ID: 201

```
Info: traffic_generator.cpp: 0 s - traffic_generator_thread
      Initiator: 101 Starting Traffic
…
Info: select_initiator.cpp: 0 s - initiator_thread
      Initiator: 101 starting new transaction for Addr:0x00000100
      Initiator: 101 nb_transport_fw (GP, BEGIN_REQ, 0 s)
Info: select_initiator.cpp: 0 s - initiator_thread
      Initiator: 101 ACCEPTED (GP, BEGIN_REQ, 0 s)
      Initiator: 101 transaction waiting end-request on backward-path
…
Info: at_target_1_phase.cpp: 0 s - nb_transport_fw
      Target: 201 nb_transport_fw (GP, BEGIN_REQ, 0 s)
Info: memory.cpp: 0 s - print
      ID: 201 COMMAND: WRITE Length: 04
      Addr: 0x0000000000000100 Data: 0x00000100
Info: at_target_1_phase.cpp: 0 s - nb_transport_fw
      Target: 201 COMPLETED (GP, BEGIN_REQ, 40 ns)
Info: select_initiator.cpp: 40 ns - nb_transport_bw
      Initiator: 101 nb_transport_bw (GP, BEGIN_RESP, 0 s)from Addr:0x00000100
      Initiator: 101 target omitted end-request timing-point returning ACCEPTED
```

Expected Output – Target ID: 202

```
Info: select_initiator.cpp: 0 s - initiator_thread
      Initiator: 102 starting new transaction for Addr:0x10000200
      Initiator: 102 nb_transport_fw (GP, BEGIN_REQ, 0 s)
Info: select_initiator.cpp: 0 s - initiator_thread
      Initiator: 102 ACCEPTED (GP, BEGIN_REQ, 0 s)
      Initiator: 102 transaction waiting end-request on backward-path
…
Info: select_initiator.cpp: 50 ns - nb_transport_bw
      Initiator: 102 nb_transport_bw (GP, END_REQ, 0 s)from Addr:0x00000200
      Initiator: 102 transaction waiting begin-response on backward path
      Initiator: 102 ACCEPTED (GP, END_REQ, 0 s)
…
Info: at_target_2_phase.cpp: 80 ns - begin_response_method
      Target: 202 starting response method
Info: memory.cpp: 80 ns - print
      ID: 202 COMMAND: WRITE Length: 04
      Addr: 0x0000000000000200 Data: 0x10000200
Info: at_target_2_phase.cpp: 80 ns - begin_response_method
      Target: 202 nb_transport_bw (GP, BEGIN_RESP, SC_ZERO_TIME)
Info: at_target_2_phase.cpp: 80 ns - begin_response_method
      Target: 202 ACCEPTED (GP, BEGIN_RESP, 0 s)
Info: select_initiator.cpp: 80 ns - nb_transport_bw
      Initiator: 102 nb_transport_bw (GP, BEGIN_RESP, 0 s)from Addr:0x00000200
      Initiator: 102 transaction moved to send-end-response PEQ
      Initiator: 102 ACCEPTED (GP, BEGIN_RESP, 0 s)
Info: select_initiator.cpp: 87 ns - send_end_rsp_method
      Initiator: 102 starting send-end-response method
      Initiator: 102 nb_transport_fw (GP, END_RESP, 0 s)
Info: select_initiator.cpp: 87 ns - send_end_rsp_method
      Initiator: 102 COMPLETED (GP, END_RESP, 0 s)
```

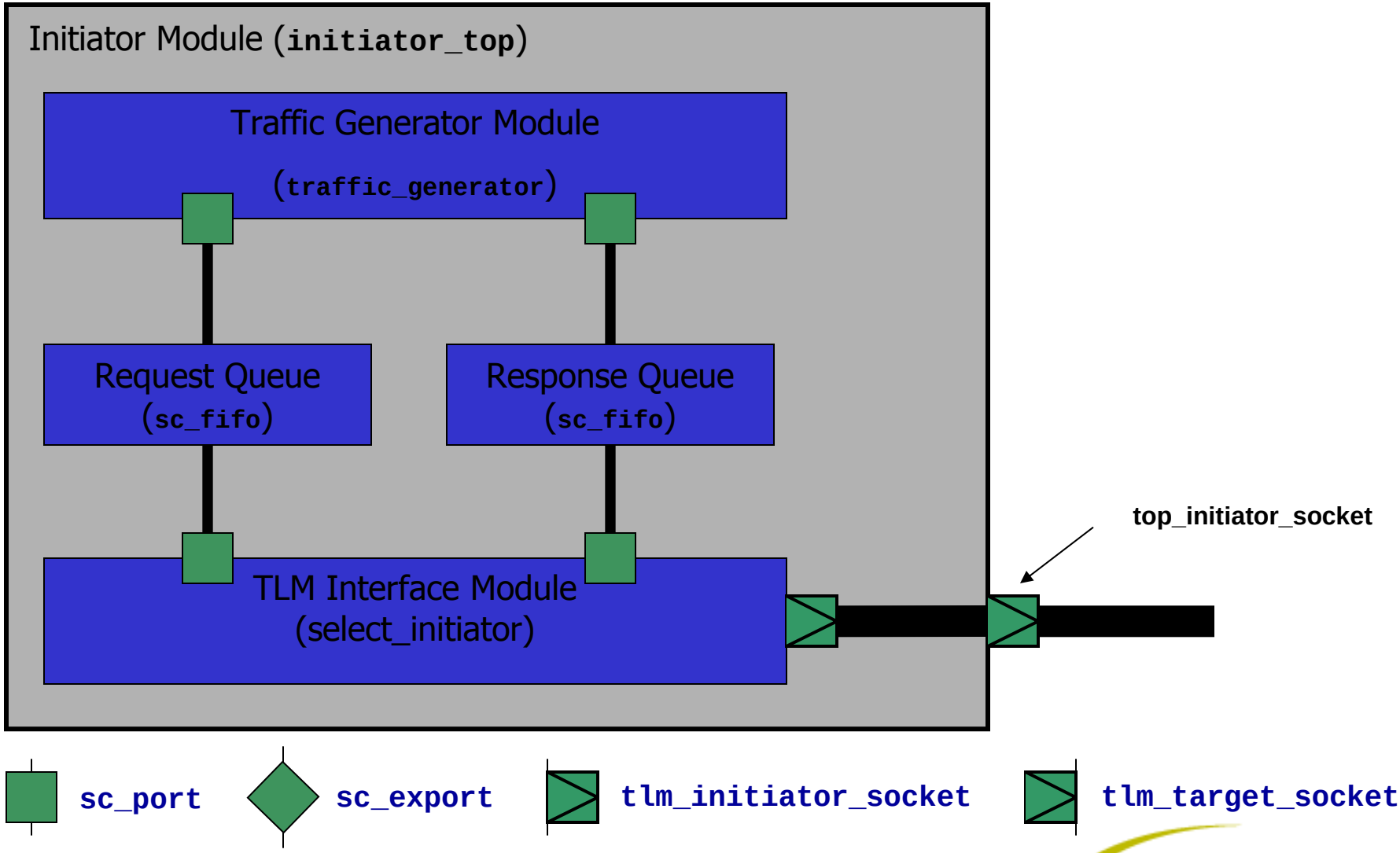
Expected Output – Target ID: 203 (1 of 2)

```
Info: select_initiator.cpp: 1974 ns - initiator_thread
      Initiator: 102 starting new transaction for Addr:0x20000200
      Initiator: 102 nb_transport_fw (GP, BEGIN_REQ, 0 s)
Info: select_initiator.cpp: 1974 ns - initiator_thread
      Initiator: 102 ACCEPTED (GP, BEGIN_REQ, 0 s)
      Initiator: 102 transaction waiting end-request on backward-path
Info: at_target_4_phase.cpp: 1974 ns - nb_transport_fw
      Target: 203 nb_transport_fw (GP, BEGIN_REQ, 0 s)
      Target: 203 ACCEPTED (GP, BEGIN_REQ, 0 s)
Info: at_target_4_phase.cpp: 1984 ns - end_request_method
      Target: 203 starting end-request method
      Target: 203 transaction moved to send-response PEQ
      Target: 203 nb_transport_bw (GP, END_REQ, 0 s)
Info: at_target_4_phase.cpp: 1984 ns - end_request_method
      Target: 203 ACCEPTED (GP, END_REQ, 0 s)
Info: select_initiator.cpp: 1984 ns - nb_transport_bw
      Initiator: 102 nb_transport_bw (GP, END_REQ, 0 s)from Addr:0x00000200
      Initiator: 102 transaction waiting begin-response on backward path
      Initiator: 102 ACCEPTED (GP, END_REQ, 0 s)
…
```

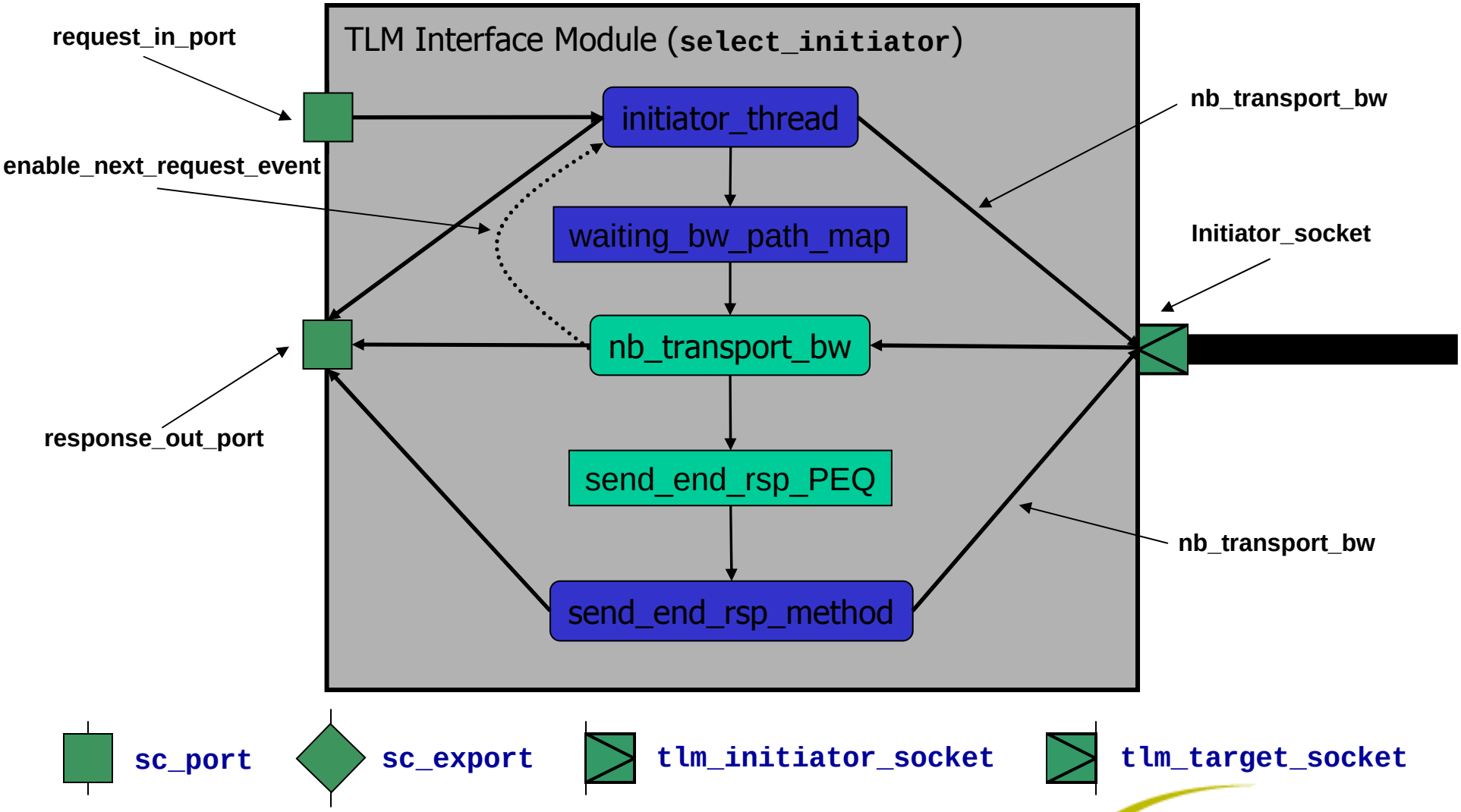
Expected Output – Target ID: 203 (2 of 2)

```
…
Info: at_target_4_phase.cpp: 2014 ns - begin_response_method
      Target: 203 starting response method
Info: memory.cpp: 2014 ns - print
      ID: 203 COMMAND: WRITE Length: 04
      Addr: 0x0000000000000200 Data: 0xDFFFFDFF
Info: at_target_4_phase.cpp: 2014 ns - begin_response_method
      Target: 203 nb_transport_bw (GP, BEGIN_RESP, SC_ZERO_TIME)
Info: at_target_4_phase.cpp: 2014 ns - begin_response_method
      Target: 203 ACCEPTED (GP, BEGIN_RESP, 0 s)
Info: select_initiator.cpp: 2014 ns - nb_transport_bw
      Initiator: 102 nb_transport_bw (GP, BEGIN_RESP, 0 s)from Addr:0x00000200
      Initiator: 102 transaction moved to send-end-response PEQ
      Initiator: 102 ACCEPTED (GP, BEGIN_RESP, 0 s)
Info: select_initiator.cpp: 2021 ns - send_end_rsp_method
      Initiator: 102 starting send-end-response method
      Initiator: 102 nb_transport_fw (GP, END_RESP, 0 s)
Info: select_initiator.cpp: 2021 ns - send_end_rsp_method
      Initiator: 102 COMPLETED (GP, END_RESP, 0 s
```

Initiator Module

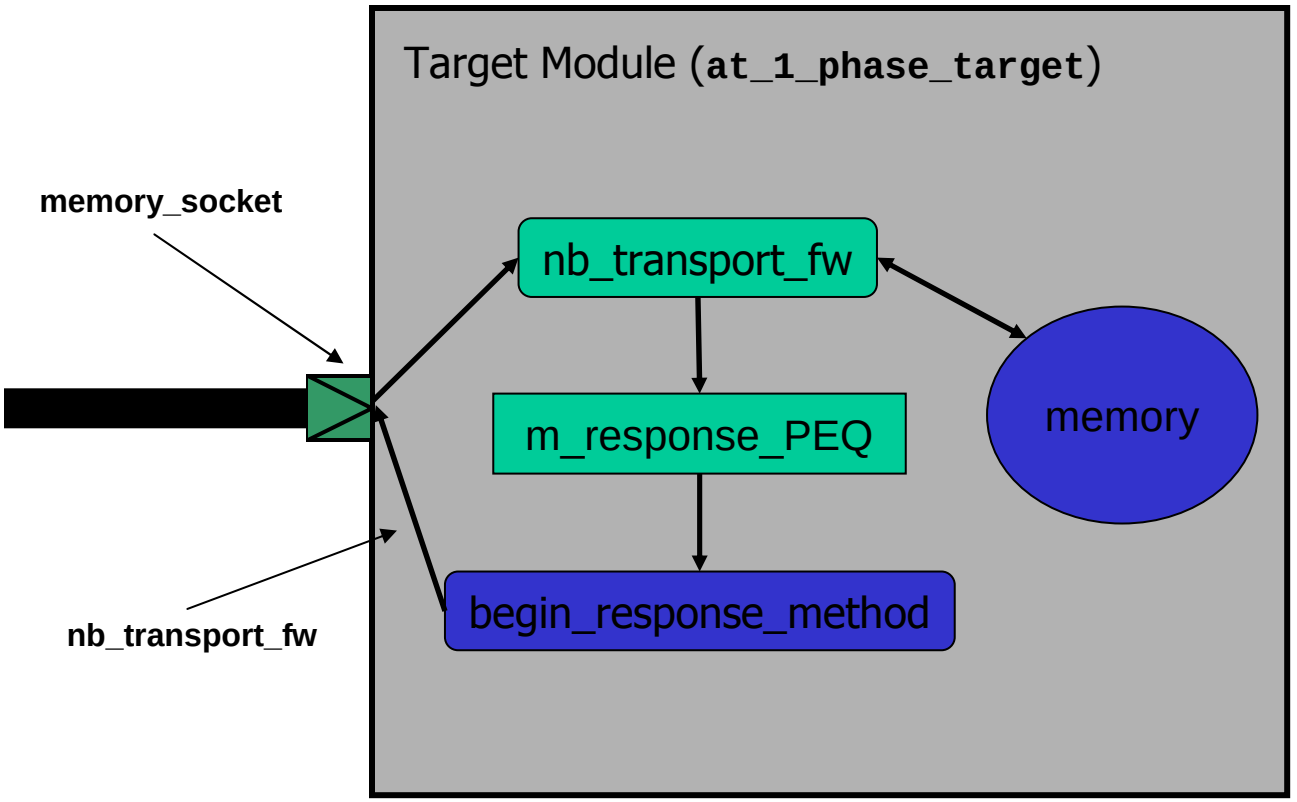


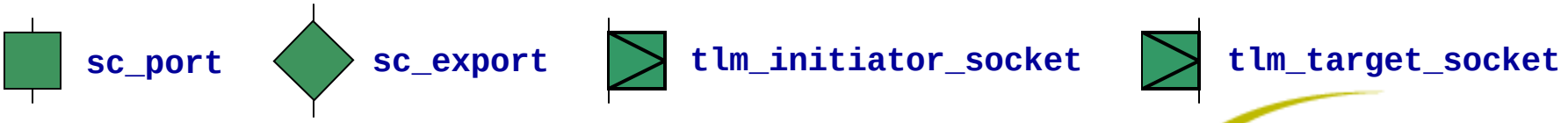
TLM Interface Module



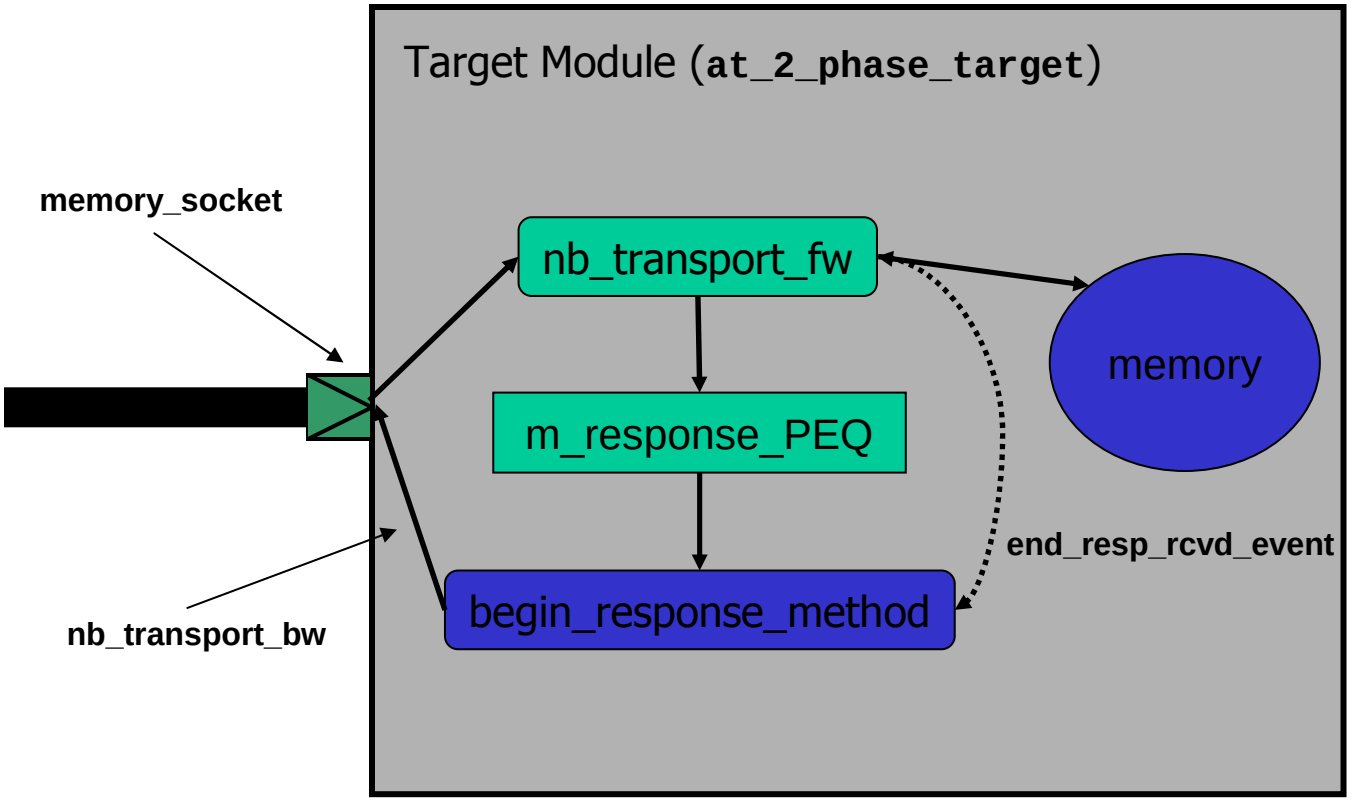
SYSTEMC™

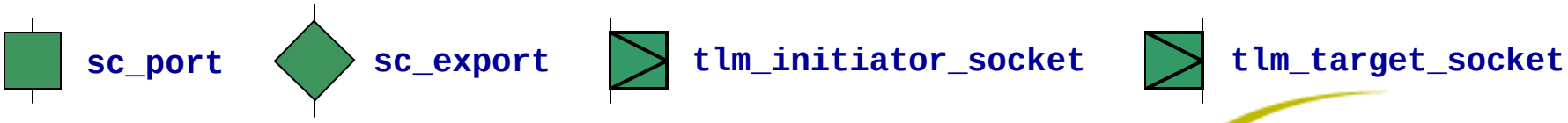
Target Module





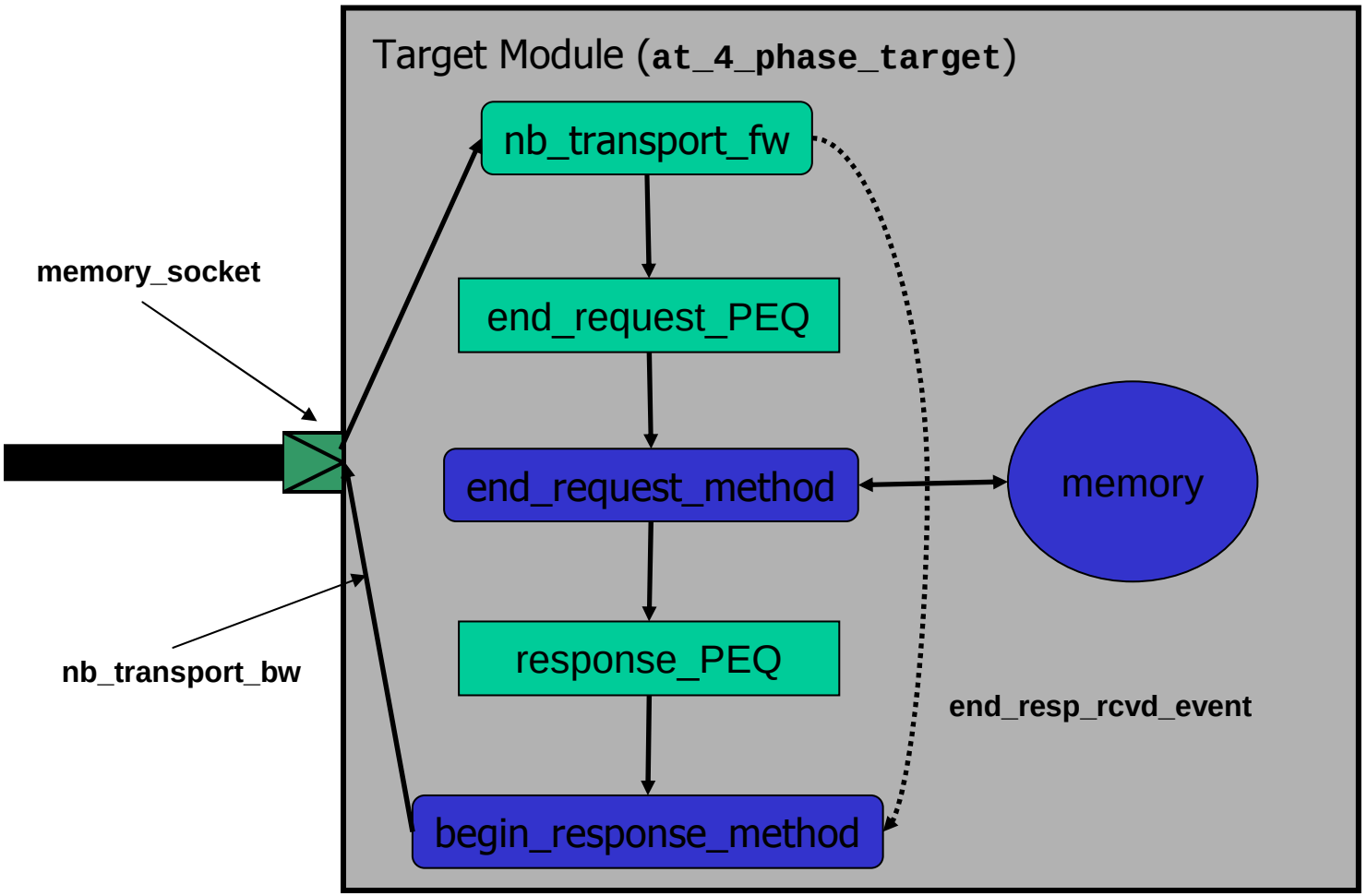
Target Module

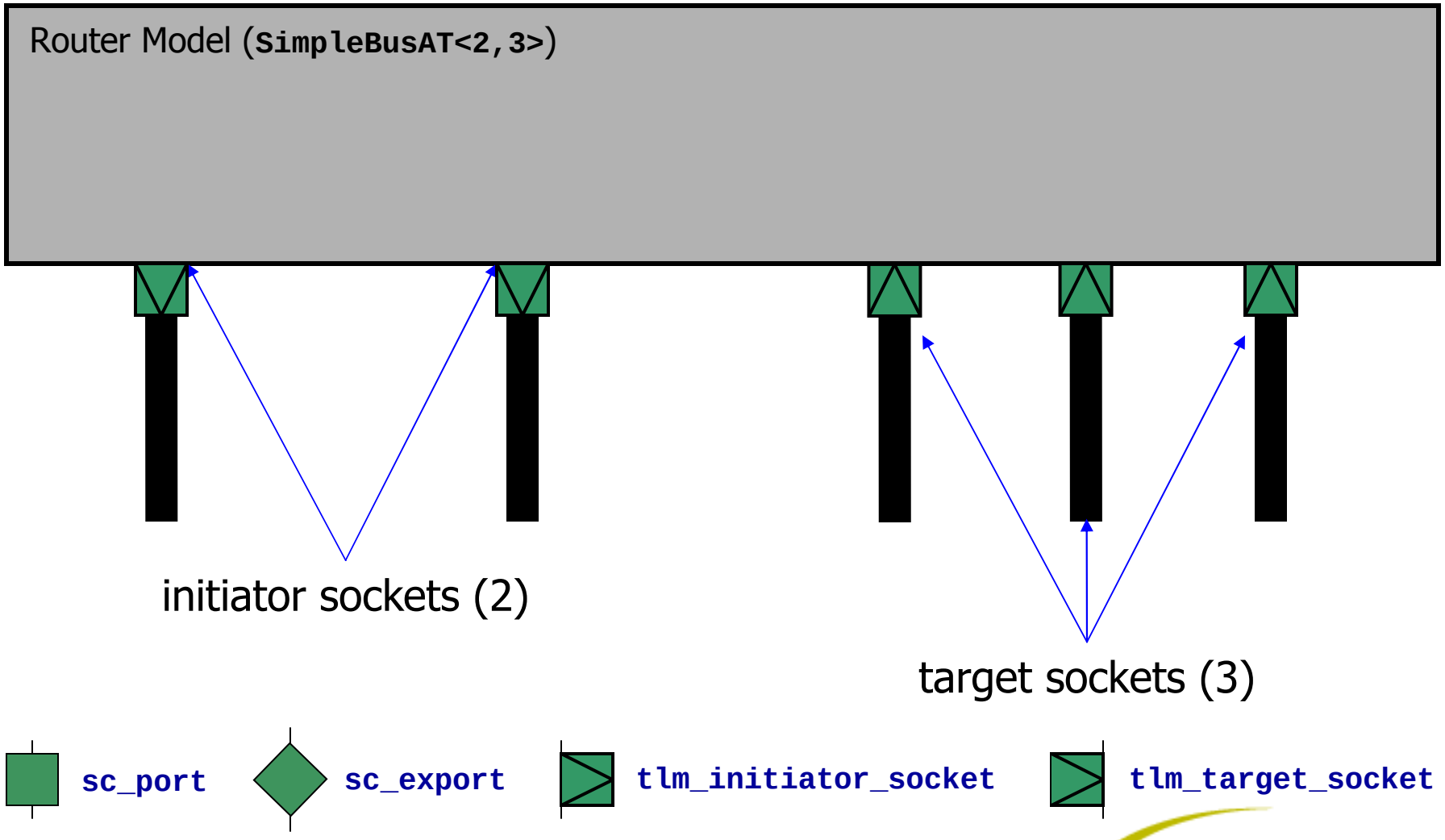




SYSTEMC™

Target Module



sc_port sc_export tlm_initiator_socket tlm_target_socket

Router Component