

# Status of the GLIB firmware

Laurent Pétré

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## Goal

Use the GLIB seamlessly with the GE1/1 v3 electronics and GE2/1 electronics instead of the CTP7 or ATCA boards for test stands

Intended use:

- ▶ First GE2/1 tests at FIT
- ▶ QC7 at CERN B904
- ▶ ULB once the CPT7 will be at P5
- ▶ Potentially more

# The GLIB board

Versatile  $\mu$ TCA AMC board

- ▶ Crate operation
- ▶ Test bench operation

Equipped with a Virtex-6 (XC6VLX130T)

**8 6Gbps** transceivers

- ▶ 4 integrated SFP+ slots
- ▶ 4 more SFP+ slots on mezzanine card (required)
- ▶ Enough for 1 GE1/1 OH QC7-like test
- ▶ Enough for 2 GE2/1 OHs

**Two 72Mb** integrated SRAM (used for the PROMless)

**No CPU** like the CTP7 Zynq



## Firmware side

First proof of concept in **January 2019** based on *GEM\_AMC* firmware version 3.7.1.  
Currently rebased on the **latest version (3.9.6)**.

### All common features implemented

- ▶ GBT communication (lock, IC programming, ...)
- ▶ PROMless programming
- ▶ VFAT3 & OH slow controls
- ▶ DAQ event builder
- ▶ Trigger links
- ▶ Config blaster placeholder
- ▶ Backplane communication with the AMC13

Firmware is built for both GE1/1 and GE2/1, each with 2 OHs (2 missing GBT links for the 2<sup>nd</sup> GE1/1 OH)

Timing constraints difficult to meet (older FPGA, faster GBT clocks and ISE less effective than Vivado)

## Software side

Emulates the Zynq processor of the CTP7

Provide container images:

- ▶ GEM\_GLIB : emulates the Zynq CPU itself with the RPC modules (wrapper between memory-mapped registers access and IPBus)
- ▶ ControlHub : reliable and concurrent access to IPBus endpoint (optional)

Tests in January with the vanilla GEM software:

- ▶ Configuration of the chamber (*confChamber.py*)
- ▶ DAC scans (*run\_scans.py dacScanV3*)
- ▶ SCurves (*run\_scans.py scurve*)

Drawbacks / advantages :

- ▶ Transactions are much slower : each AXI ( $\sim 10 \mu\text{s}$ ) transaction becomes an IPBus transaction (few  $100 \mu\text{s}$ )
- ▶ Easy installation of debugging tools : gdb, Valgrind, ...

## To be done

### The main aim is to run *testConnectivity.py*

#### Firmware side:

- ▶ Thorough tests
- ▶ Long duration tests for stability verification (loopback and with OH)
- ▶ With GE2/1 (firmware ready)

#### Software side:

- ▶ Currently working with a IPBus-based *gem\_reg.py*-like tool
- ▶ Publish the container images to CERN GitLab Docker registry
- ▶ Add all scripts called by *testConnectivity.py*
- ▶ Quickly build the legacy xHAL and *ctp7\_modules*
- ▶ Properly build the new xHAL and *ctp7\_modules* packages

More generally, smooth the user experience

## Conclusion

- ▶ The GLIB does work with GE1/1 v3 electronics
  - ▶ Ready to be tested with GE2/1 electronics
- ▶ And with the vanilla software framework
- ▶ Firmware is built for both GE1/1 and GE2/1
- ▶ Software is work in progress
  - ▶ Expected to be published very soon
- ▶ Complete set of tests is required

Any questions ?