Libera

Zynq platform and related instruments

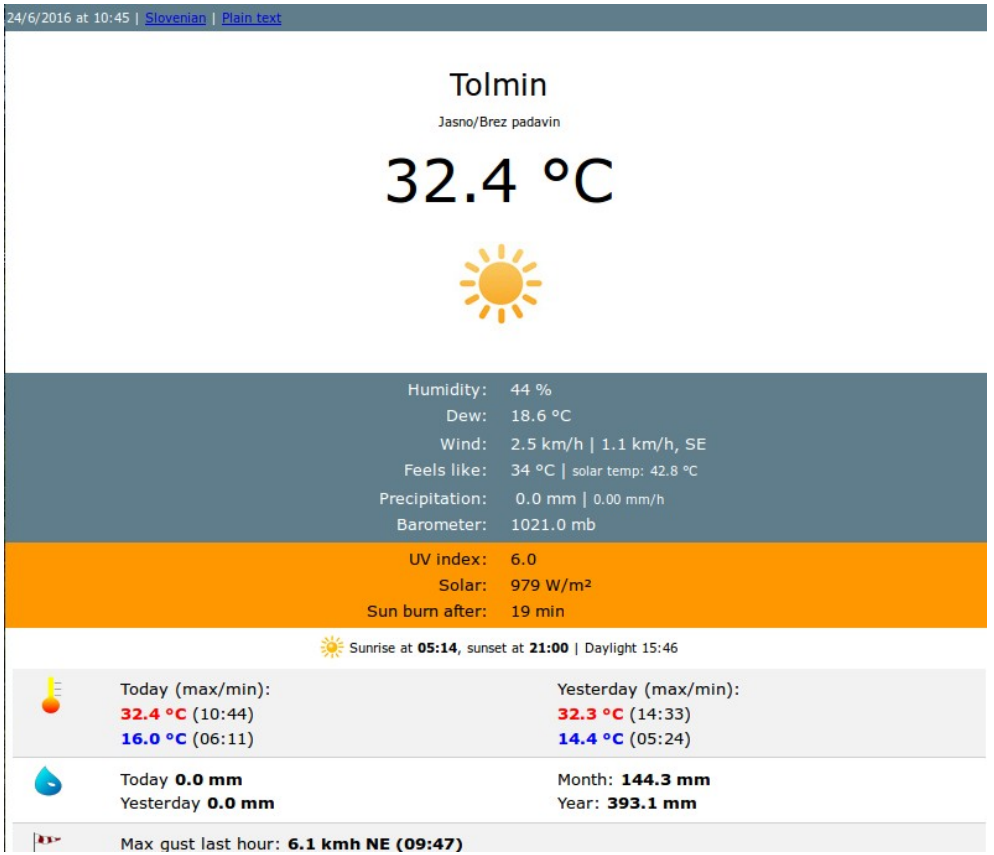
Peter Leban, DEELS, June 2017, Paris

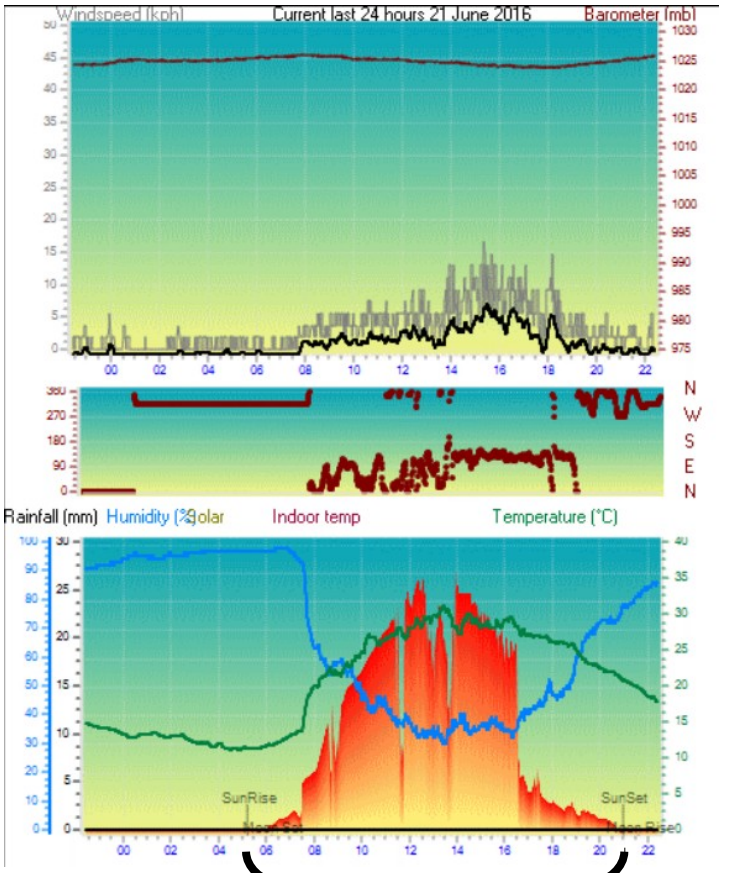
Content

Peter's project (continuation)

Company's projects (continuation)

Step 4. This was my project





Longest day at my lattitude.

http://freeweb.t-2.net/vreme_tmin

Step 5. Time for improvement

vremetolmin.si

Hardware upgrade:

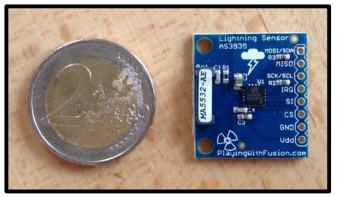
- 2.5-second wind sampling
- Standalone unit (no wood housing required)
- Standalone solar sensor

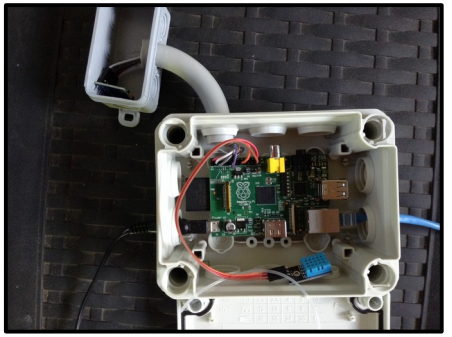
+

- Soil temperature sensors

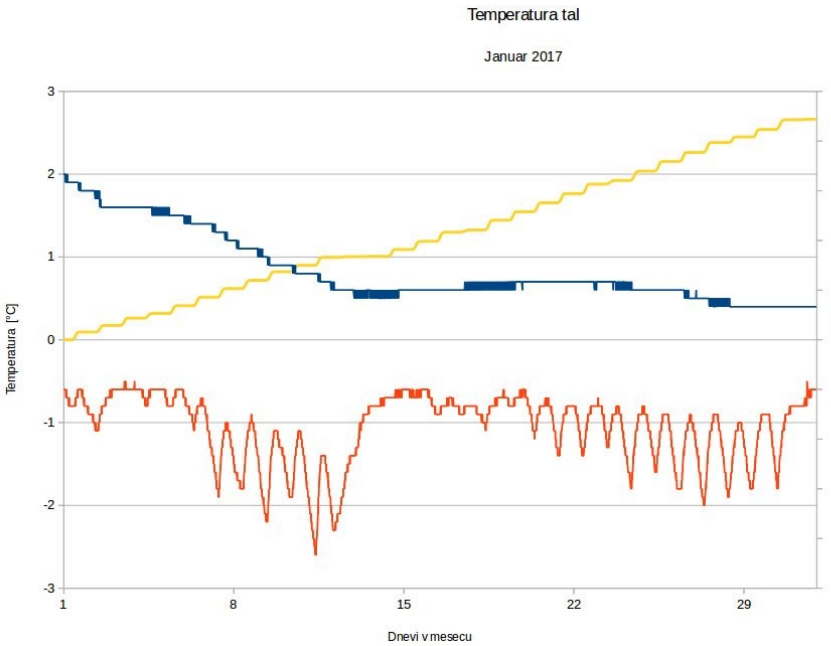
- Night cloud sensors

- Lightning strike detector



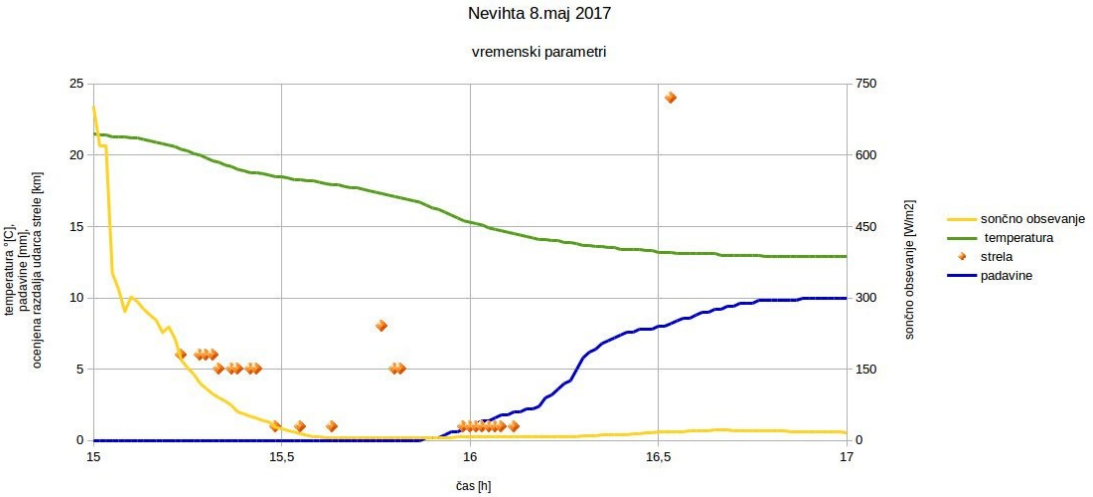


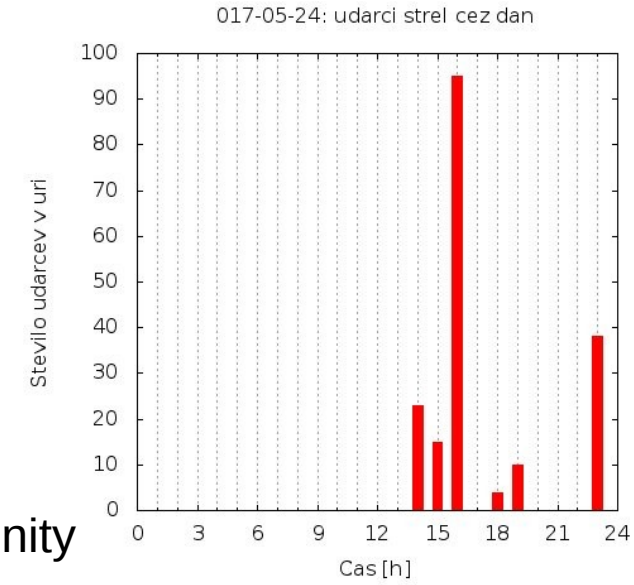
Latest performance



Above: January 2017 soil temp & sun
Below: Live data (2-second update)

Below: A short and weak storm





Right: A stormy afternoon & night in vicinity

Last year's presentation:

present and future platforms with Zynq SoC

- *Faster sampling rate: bunch-by-bunch BPM, cavity BPM, Beam loss monitor*
- *Optical links*
- *More input channels*
- *Analog output(s)*
- *More I/O interfaces (digital)*
- *Exchangeable front-end*
- *Better long-term stability performance*

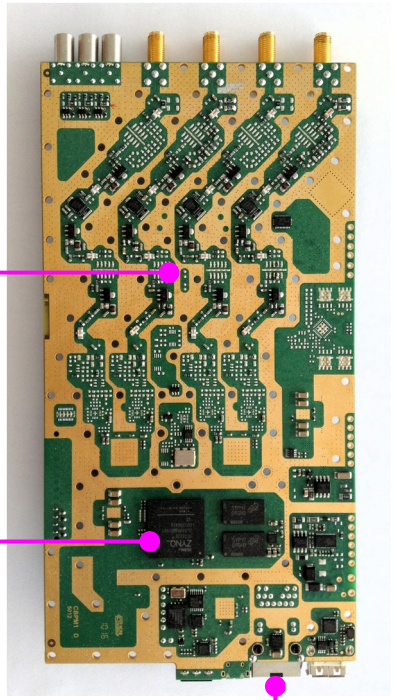
Which requirements did we fulfill and what did we develop since 1 year ago?

Platform C (or 'Zynq 7020' platform)

Zynq 7020

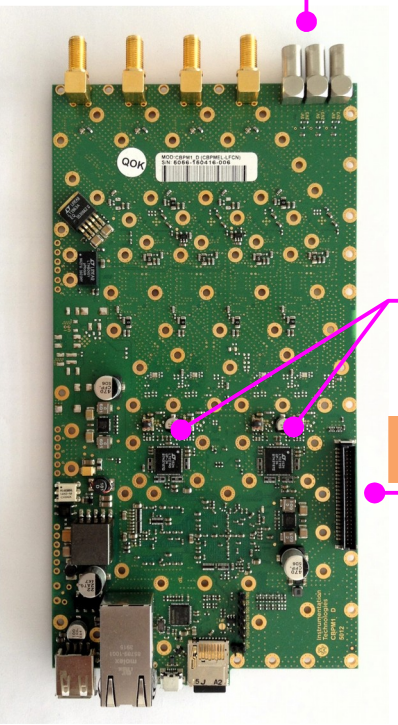
4 channels with
various assembly options:

*Easier than having
exchangeable version*



Zynq 7020

PoE



3x Input / output LEMO:

Max what this PCB supports

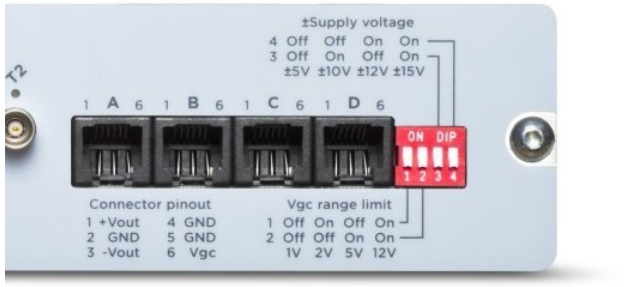
2x dual channel ADC:

Still 125 MHz

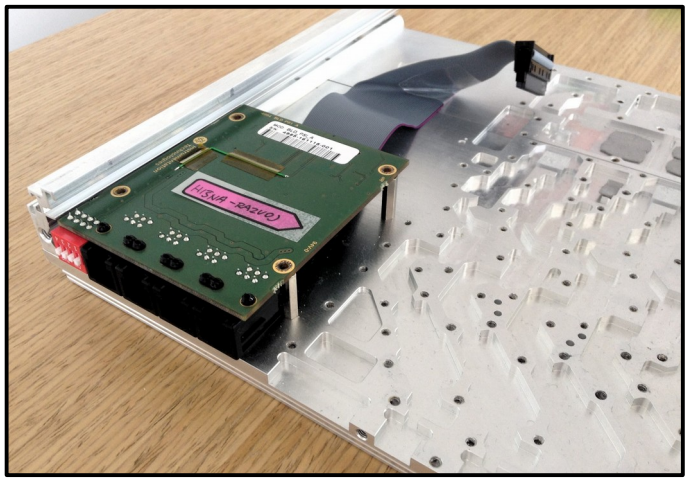
Extension slot

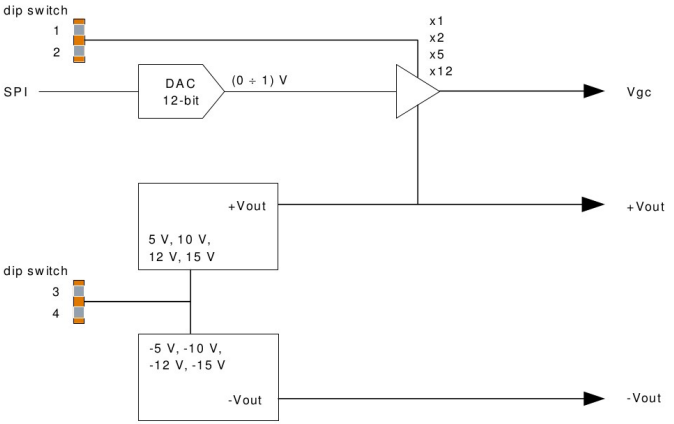
Platform C extension modules – BLD connections

Zynq 7020



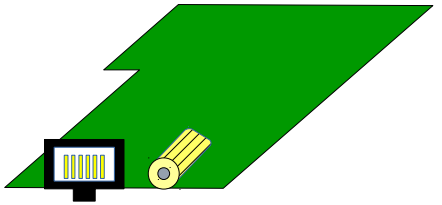
- 4x RJ25 interface
- DIP switch
- Power supply and gain control for the PMTs
- Direct control from Zynq (FPGA and OS)





Platform C extension modules – beamline feedback

Zynq 7020



Extension module still to be specified; possible options:

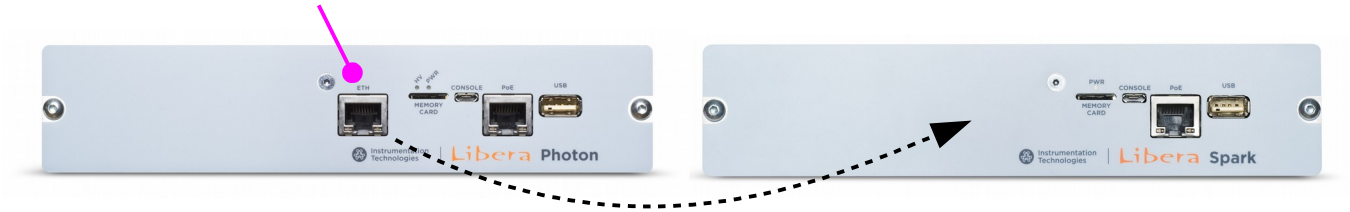
- Analog interface (e.g. SMA)
- Digital interface (e.g. RJ-11, RJ-25, RJ-45)
- DAC & protocol have to be specified

Platform C extension – GbE output

Zynq 7020

It is available in Libera Photon. The PCB is slightly different from the BLM, Spark and Digit

RJ-45 for fast data output (UDP)



PCB respin required

Available options:

- TBT streaming data (depends on the data rate)
- FA streaming data
- Other continuous data stream, processed by the FPGA

Availability foreseen Q4 2017

Platform C extension – ADC sensitivity

Zynq 7020

It is configured during assembly. For the future, it could be done runtime by user.

Available options:

- 0.5 V full scale
- 1.0 V full scale

PCB respin required

Availability foreseen Q4 2017

Platform C extension – Interlock

Zynq 7020

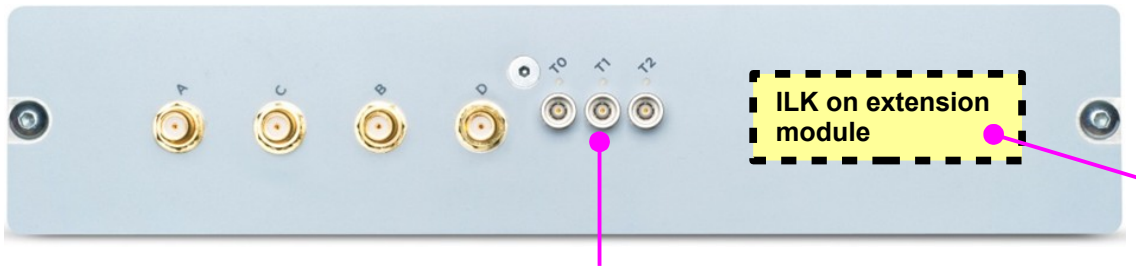
Typical use (all configured as inputs)

- T0 … reference clock (»tbt«)
- T1 … postmortem trigger
- T2 … (acquisition) trigger

Interlock output on the extension module

- Interlock functionality implementation (FPGA, software)
- Use same circuit as on the Libera Electron / Brilliance / +

PCB respin is NOT required



to be developed

3 I/O interfaces

Discussion with Cornell Laboratory

Faster sampling rate – Libera Cavity BPM

Zynq 7035

Last year a render only, this year a working instrument

- Delivered to INFN (Italy)
- Delivered to SACLA (Japan)

- Zynq 7035
- 500 MHz, 14-bit ADCs
- PoE++ (tested), uses 100-240 V
- 6.6 Gbps SFPs supported (with speed grade 1)

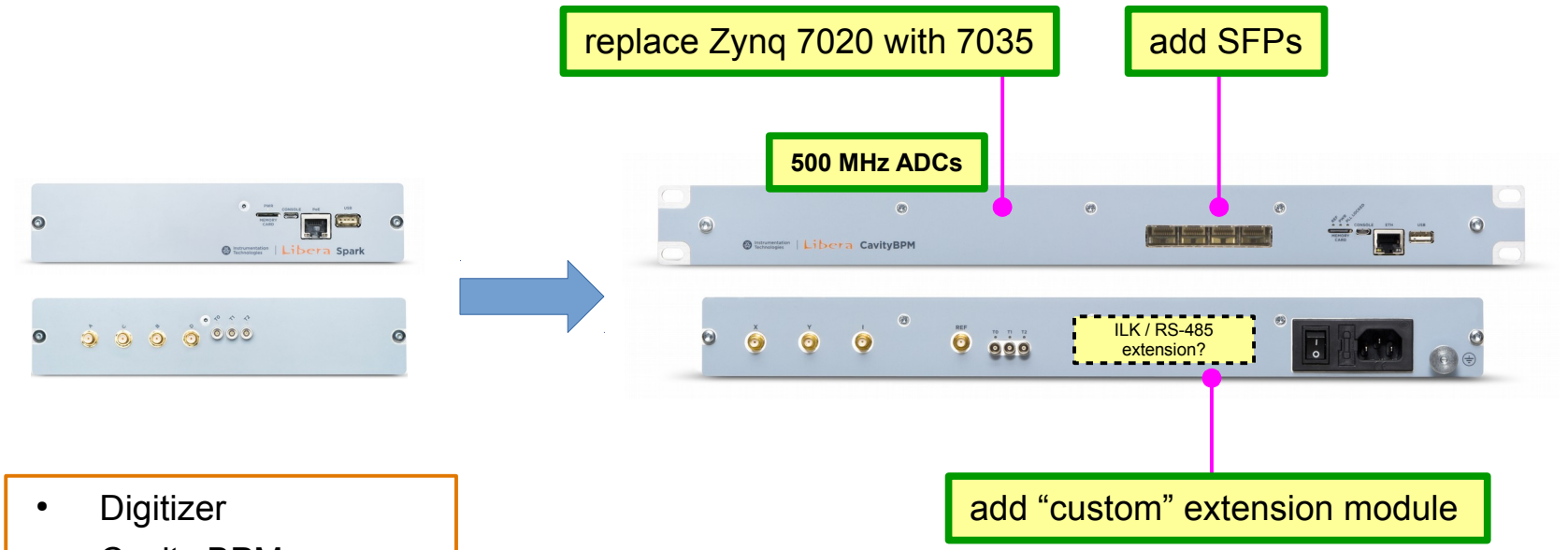
Available options:

- Add 4 SFP transceivers
- Higher speed grade for 10 Gbps SFPs
- 8 GB memory for raw ADC data storage
- Remove 'cavity BPM' specific front-end – digitizer only

Availability not known yet but can be soon

Zynq 7035 platform – what is next?

Zynq 7035

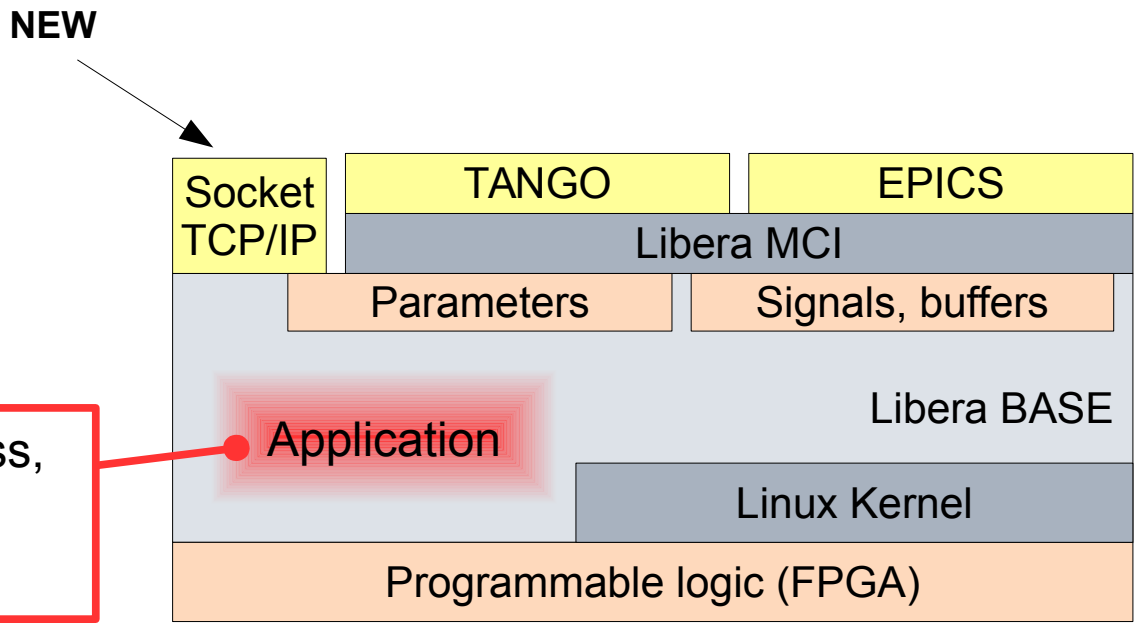


- Digitizer
- Cavity BPM
- Libera Spark ++
- ?

Software updates

- FPGA cores
- Libera BASE
- EPICS interface
- TANGO interface
- *Socket TCP/IP interface

Application (digit, beam loss, bpm) is **custom** but uses common blocks.



* Development version available only

What **has not** been done

- Evaluation of the thermally stabilized Libera Spark
- Instrument with more digital I/O and analog channels (no project behind this)
- Ultrascale FPGAs not evaluated yet
- Exchangeable front-end

What **has** been done

- Offer a digitizer with several (simple) processing options
- Developed a 500 MHz ADC instrument (Cavity BPM)
- New functionalities to Libera BLM, Libera Spark ERXR
- Updated Libera BASE with backward compatible clients
- Several fixes to TANGO interface (thanks to ESRF, SOLEIL)
- Major update to EPICS interface (requested by APS, NSRRC, NSRL)
- GUIs for all instruments; EDM & caQtDM
- VirtualBox image with MCI examples (C++)

Conclusion

- More instruments & applications have joined Libera
- Keep working with you:
  - faster development cycles than before
  - cooperate on code (especially the upper layer)
  - to understand use cases
- Build new instruments