A simplified version of the TriDAS for the WB

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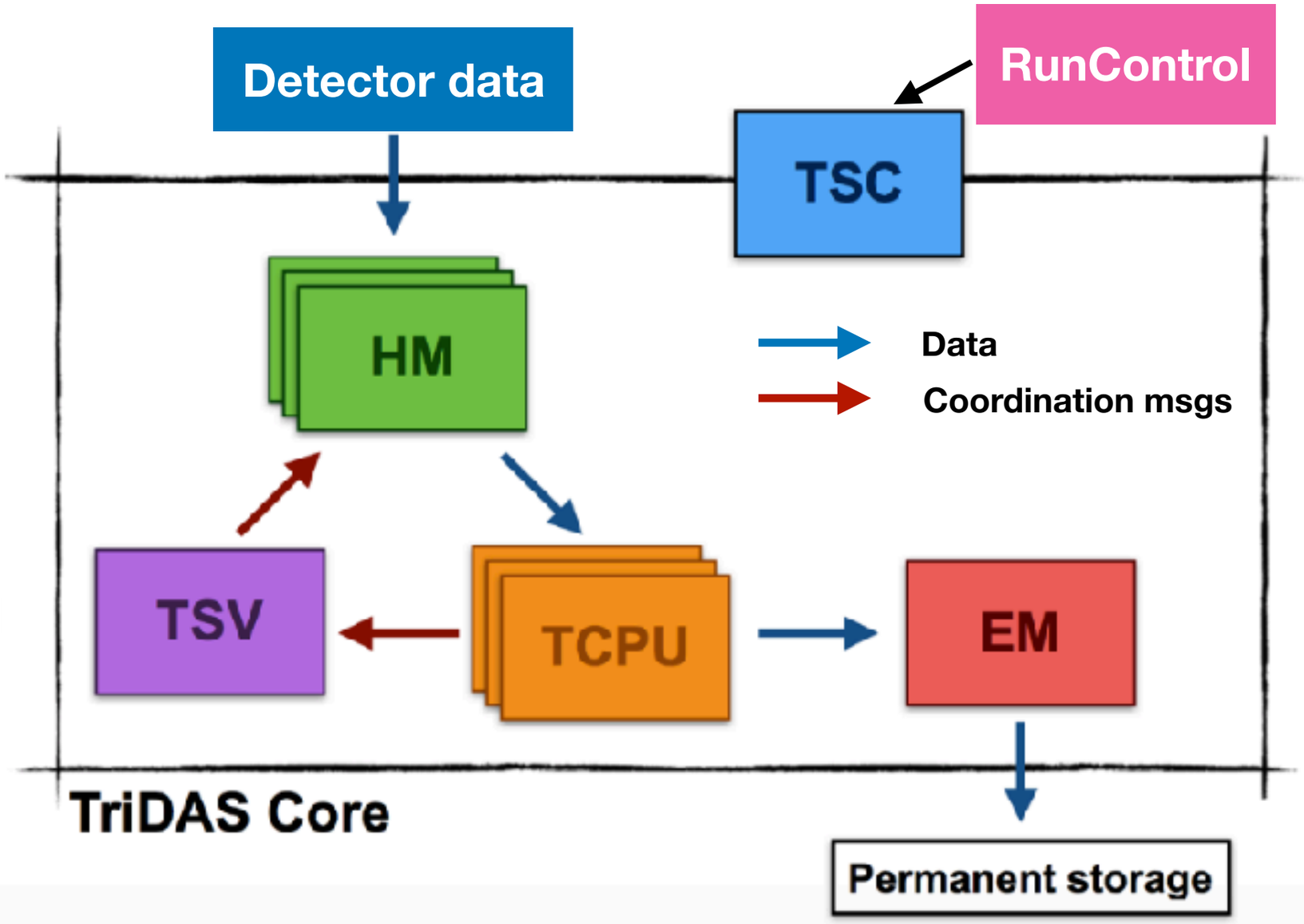
Streaming ReadOut VI Workshop

What is TriDAS

Triggerless **D**ata **A**cquisition **S**ystem, was initially designed for **astrophysical neutrino underwater** experiments.

Key features:

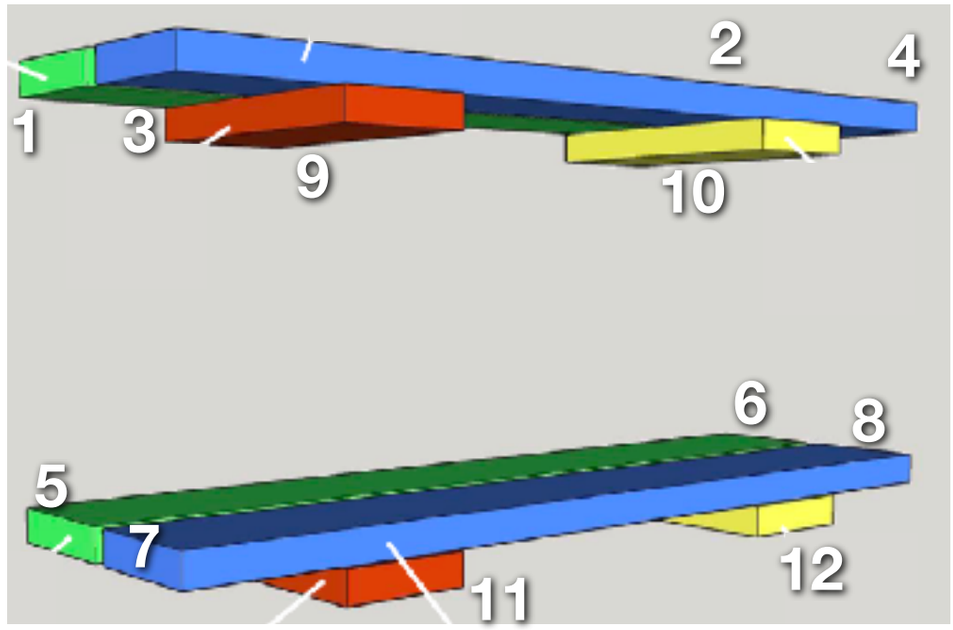
- Event Builder
- Distributed computing allowing high scalability wrt data input (tested up to 700 channels@70kHz SPE)
- Online trigger system
- Support for customisable high-level trigger algorithms (via independently developed plugins)
- Supports the WaveBoard read-out from the earliest version of it



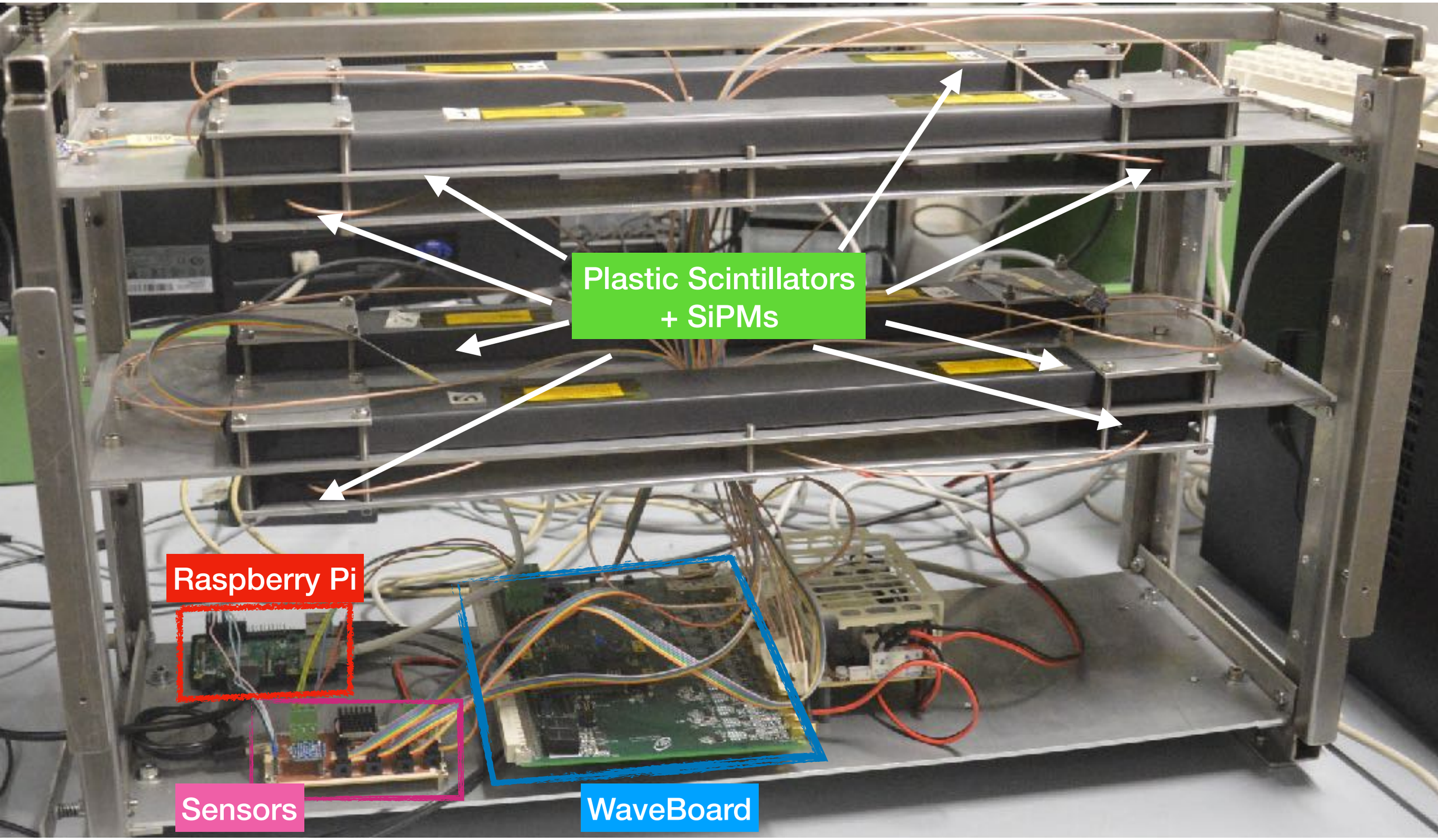
- See talk from T. Chiarusi tomorrow

AstroPlano

- A project for dissemination in high schools
- 8 Scintillators
- 12 SiPM
- 1 WaveBoard
- “Portable”, self-contained all-in-one detector
- Read-out and trigger performed on a **Raspberry Pi 3**



AstroPlano


Plastic Scintillators
+ SiPMs
Raspberry Pi
Sensors
WaveBoard

TriDAS+AstroPlano

Pros:

- WaveBoard data stream is first class citizen within TriDAS
- TriDAS can run on RPi3 (some troubles for compiling, but runs)
- TriDAS has a well established code base
- TriDAS has a wide set of tools to support debug, simulation and offline analysis

Cons:

- Non-trivial architecture and system setup
- No need for such high scalability (only 12 channels at hit low rate)
- Resource hungry (multiple multithreaded processes, data flow duplication required)

plano-b

plano-b is a lightweight alternative to TriDAS to perform data acquisition and trigger using computing minimal resources

- C++17-based software leveraging some TriDAS core libraries

- Self-contained: single process, single thread

- Extremely efficient (see next slides)

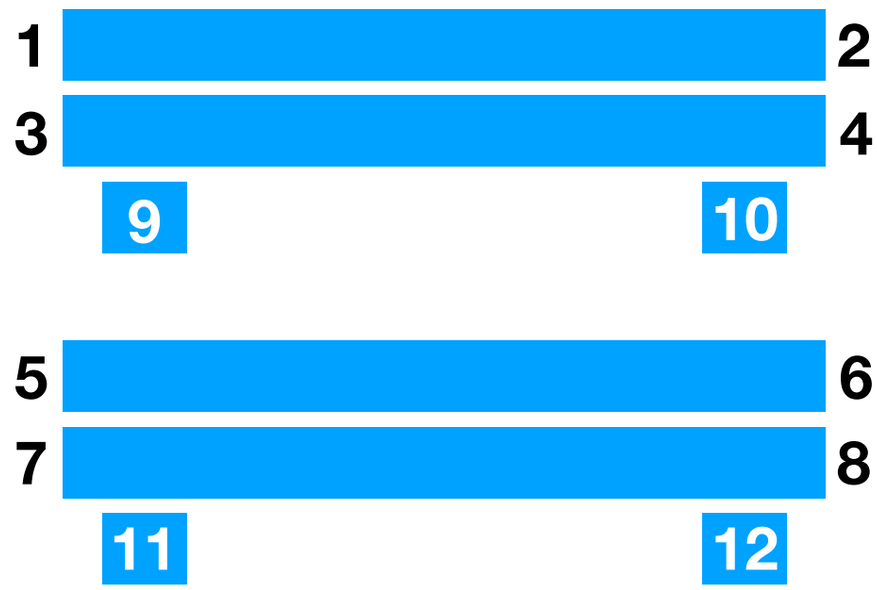
- Compatible with TriDAS output data format -> no need for new software tools for offline analysis, debug, and simulation

- Not tight to the AstroPlano project -> the only dependency is the WaveBoard

- Can run (at least!) on RPi 3 and Linux-based x86 computer

Trigger algorithms

- Coincidence trigger between pairs of channels looking in the same scintillator bar:
  - 1-2
  - 3-4
  - 5-6
  - 7-8



- Charge trigger on each of the 12 channels

Performance test

- Test bed:
  - Continuous read-out from one WaveBoard over Ethernet
  - 12 channels at low:
    - ch 1-8 (long bars) ~10-28Hz
    - ch 9-12 (short bars) ~4-8Hz
  - Raspberry Pi 3 Model B
- Results:

✓CPU usage ~1.4% of 1 RPi core

✓RAM usage ~40MB

Leaves most of the computing resources for other activities!

Conclusions

- The TriDAS is suitable to run on a wide range of computing platforms, although with some overhead for small detectors

- plano-b is a lightweight replacement for TriDAS that allows to perform readout and trigger on embedded systems or poor computing resources

Thank you for your attention