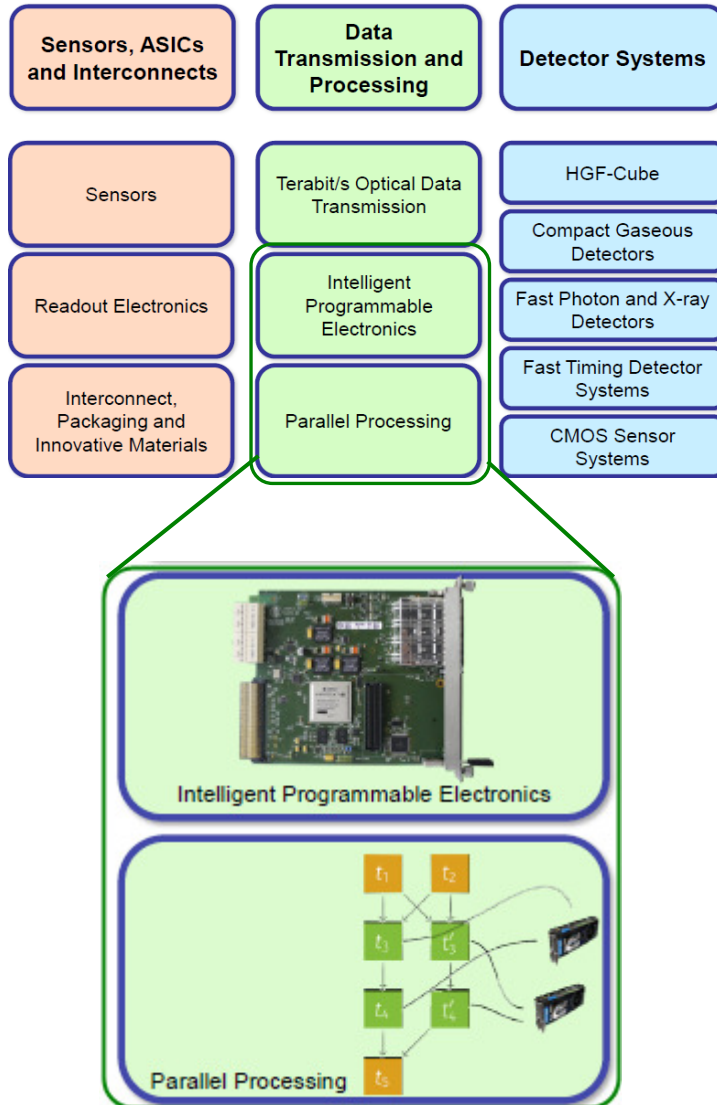


**DTS Topics**



**DTS requirements:**

- ⇒ High data rates: (Beispiele)
- ⇒ Requirement for preprocessing (Beispiele)
  
- ⇒ Large variety of application and sensors
  - ▶ USCT
  - ▶ High power X-ray tomography (HZDR)
  - ▶ Dark matter (KIT)
  - ▶ X-ray camera (KIT,HZG)
  - ▶ Medical imaging
  - ▶ ...

**Situation:**

- ▶ Specific detectors & frontend
- ▶ generic electronics & processing

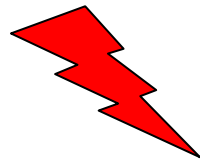
## Generic technology in electronics & processing:

- ▶ FPGA as DAQ-Interface (ADC / Asics) + preprocessing unit
- ▶ Ethernet, PCIe
- ▶ Crate system: Nim, VME, Micro TCA, ...
- ▶ GPU, CPU
- ▶ Linux
- ▶ Software Development in VHDL; C/C++; Open GL; Python

⇒ Commodity equipment and common tools

⇒ Subsystems with high performance (and complexity) on different levels

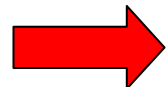
**Easy start**



**Large gap**

Experiment instrumentation requires the full set (in many cases):

- Control and data streaming
- Parameter Handling
- Component management
- History and Logging
- Start & configuration scripts
- HMI
- Version handling
- configuration handling
- Security & Safety
- vertical communication to supervisory control

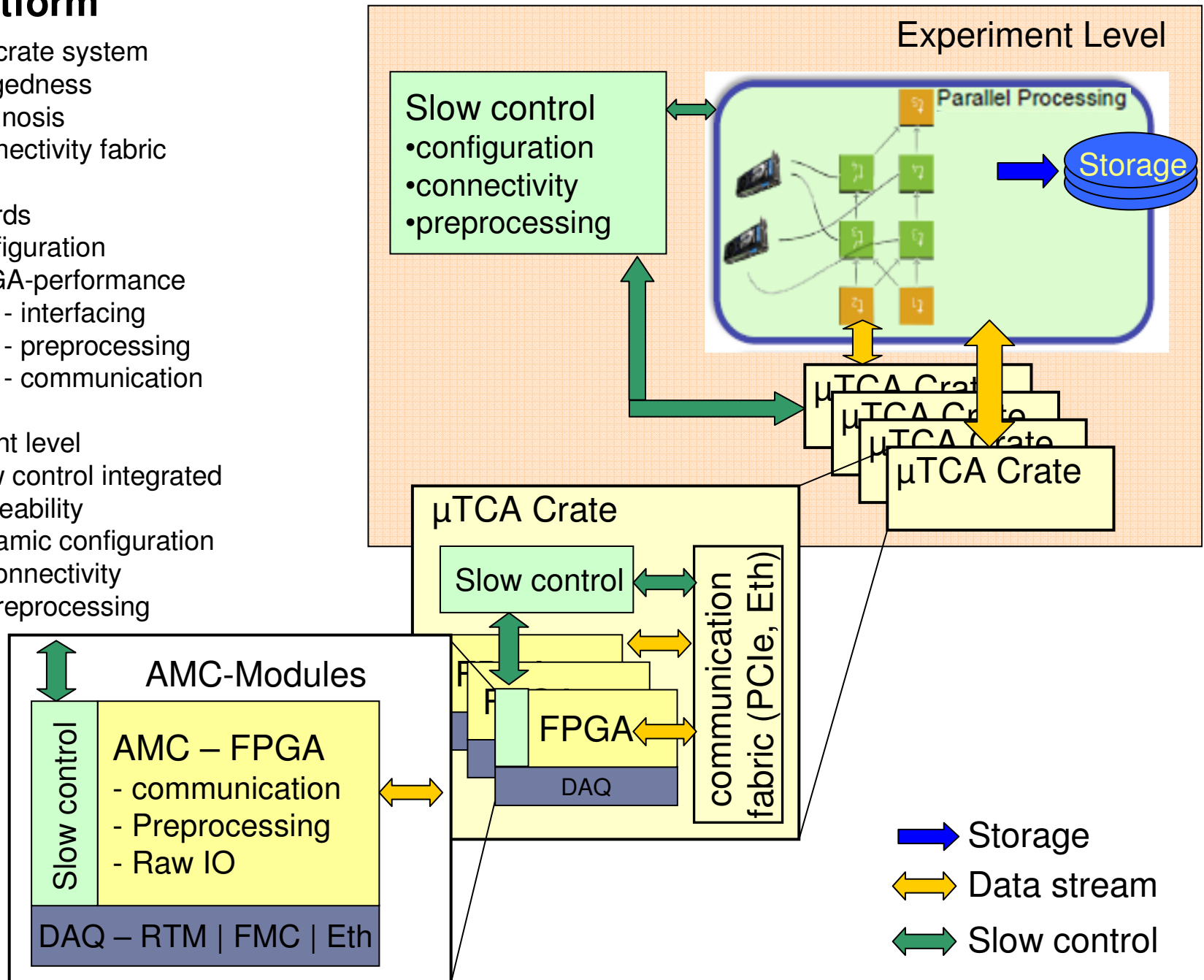


Platform: generic, modular design & cooperation



# DTS Platform

- $\mu$ TCA as crate system
  - ruggedness
  - diagnosis
  - connectivity fabric
- AMC boards
  - configuration
  - FPGA-performance
    - interfacing
    - preprocessing
    - communication
- Experiment level
  - slow control integrated
  - scalability
  - dynamic configuration
    - > connectivity
    - > preprocessing





## DTS Platform approach:

- ⇒ Join efforts in HGF-centers
- ⇒ Merge and optimize existing technology
- ⇒ Design a flexible and scaleable target platform
- ⇒ Build an ecosystem (platform & contributors & users)
- ⇒ Continuous development, early deployment (starter kits available)

### ⇒ We concentrate on

- ⇒ modules to improve performance
- ⇒ Proper interfaces to ease integration
- ⇒ organization (roadmap, verification, ...)

### We target

- robust, well tested modules
- seamless integration
- efficient development

### ⇒ Contributors:

- ⇒ KIT ( xx FTE)                      DESY (xx FTE)
- ⇒ HZDR (xx FTE)

### ⇒ Experience / previous work

- ⇒ HGF-AMC design for FLASH, XFEL
- ⇒ UFO Framework (KIT)
- ⇒ Ethernet UDP Transfer (KIT, HZDR, DESY,...)
- ⇒ Test data generation based on 1..10 Gb/s Ethernet (HZDR)
- ⇒ PCIe Transfer (KIT, FZJ?)

## DTS Platform : components & features

### ⇒ FPGA Features

- ⇒ Fast parallel preprocessing
- ⇒ x Gb/s transceivers
- ⇒ High flexibility

### ⇒ Micro TCA / AMC Features

- ⇒ High performance digital systems
- ⇒ Scaleable
- ⇒ Communication fabric
- ⇒ Hot swap, inbuilt diagnosis

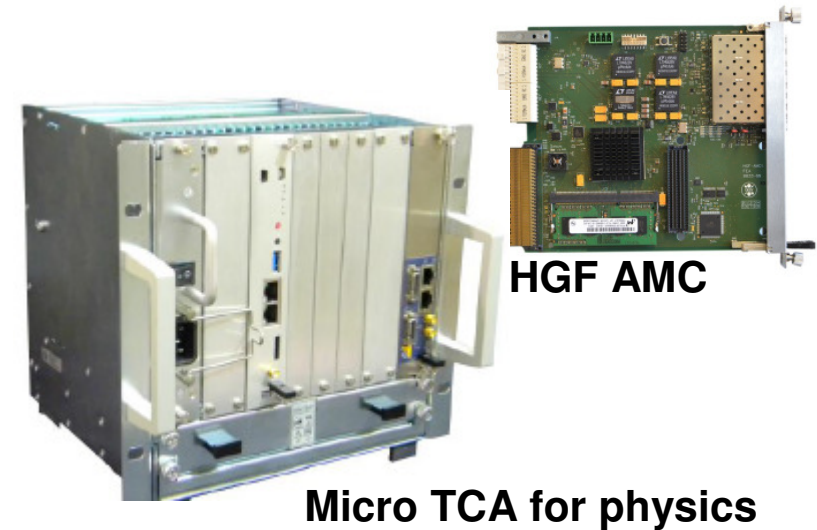
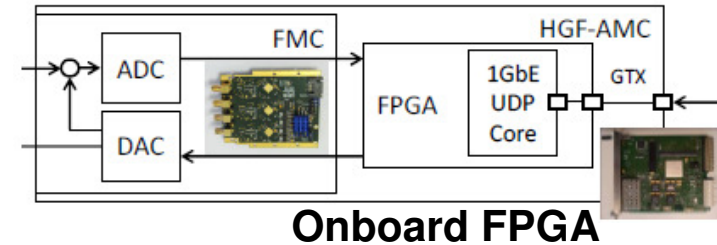
### ⇒ Communication Features

- ⇒ PCIe, Ethernet

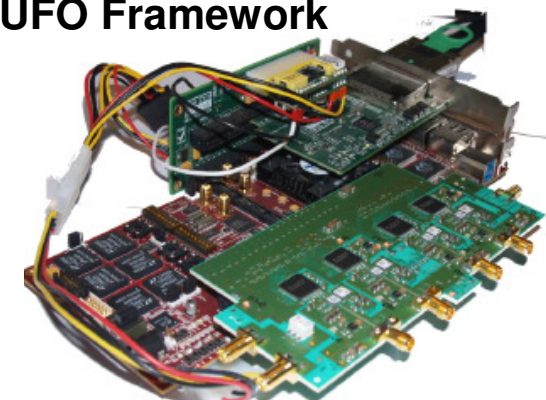
### ⇒ UFO Features

### ⇒ Configuration layer

- ⇒ Scale communication
- ⇒ Scale computation



### UFO Framework





# Conclusion

- High-speed DAQ systems are a key component for future experiments
- These systems are highly complex and challenging
- A DTS-Ecosystem (platform, contributors, users) is necessary, but critical
- The initial nucleus exists, but has to be fostered (DESY, KIT, HZDR)
- There is a unique chance to unite efforts
- Join in !