Embedded Controller for Industry CT trigger module

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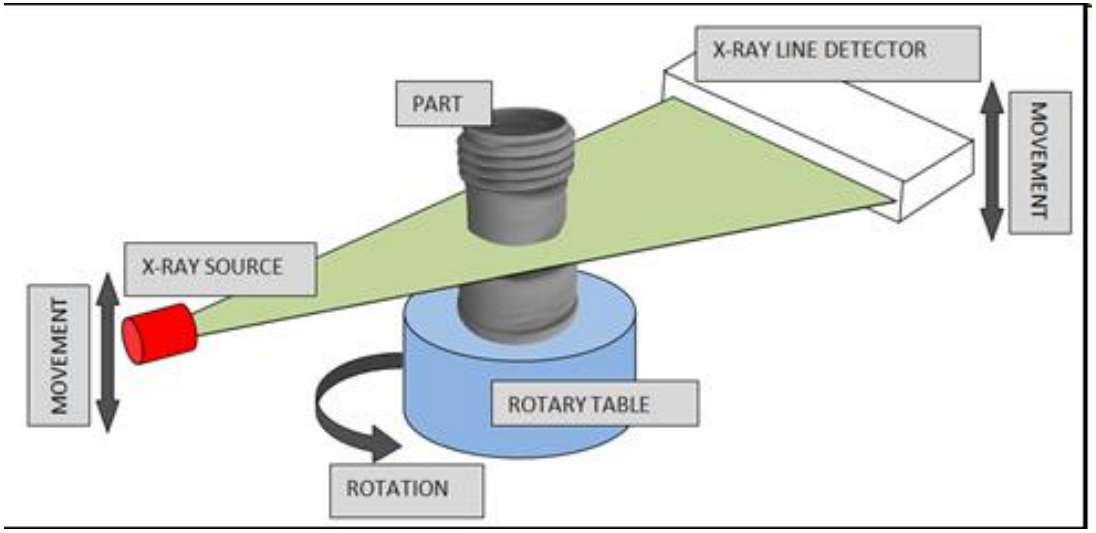
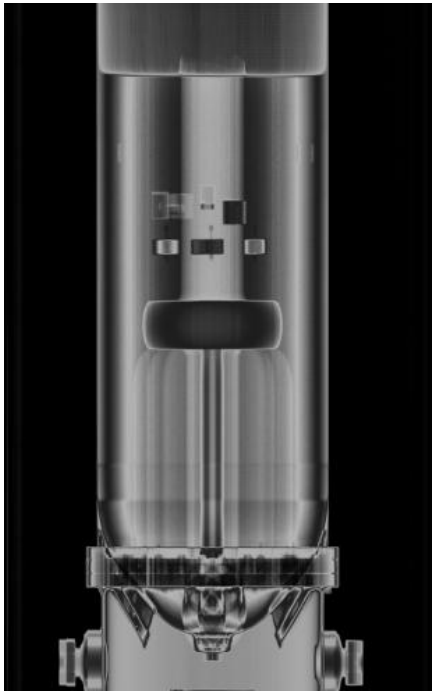
Canadian Light Source | Centre canadien de rayonnement synchrotron

Industrial CT - Introduction





- Non destructive inspection
- Accurate diagnostic information about the distribution of structures inside the object
- Flaw detection, failure analysis, metrology, etc..

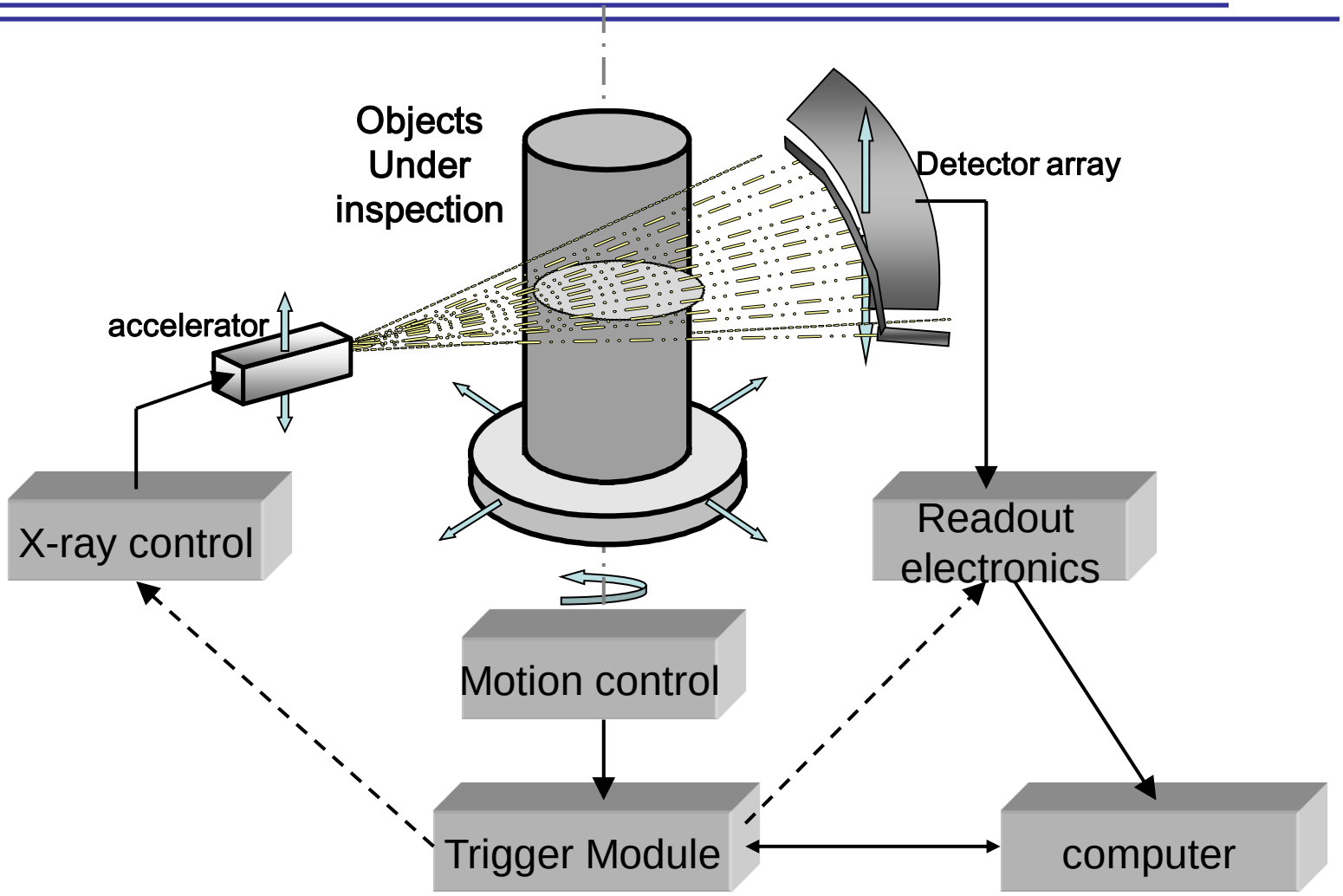
Industrial CT - Products



固鸿科技 GRANPECT – a company originating from Tsinghua university

- Over 20 products delivered in past few years
  - Mainly used industry and military
  - Accelerator based x-ray source (2Mev – 15Mev)
  - Inspect objects up to Ø1x5 meters, Fast speed and high resolution

Industrial CT – Structure



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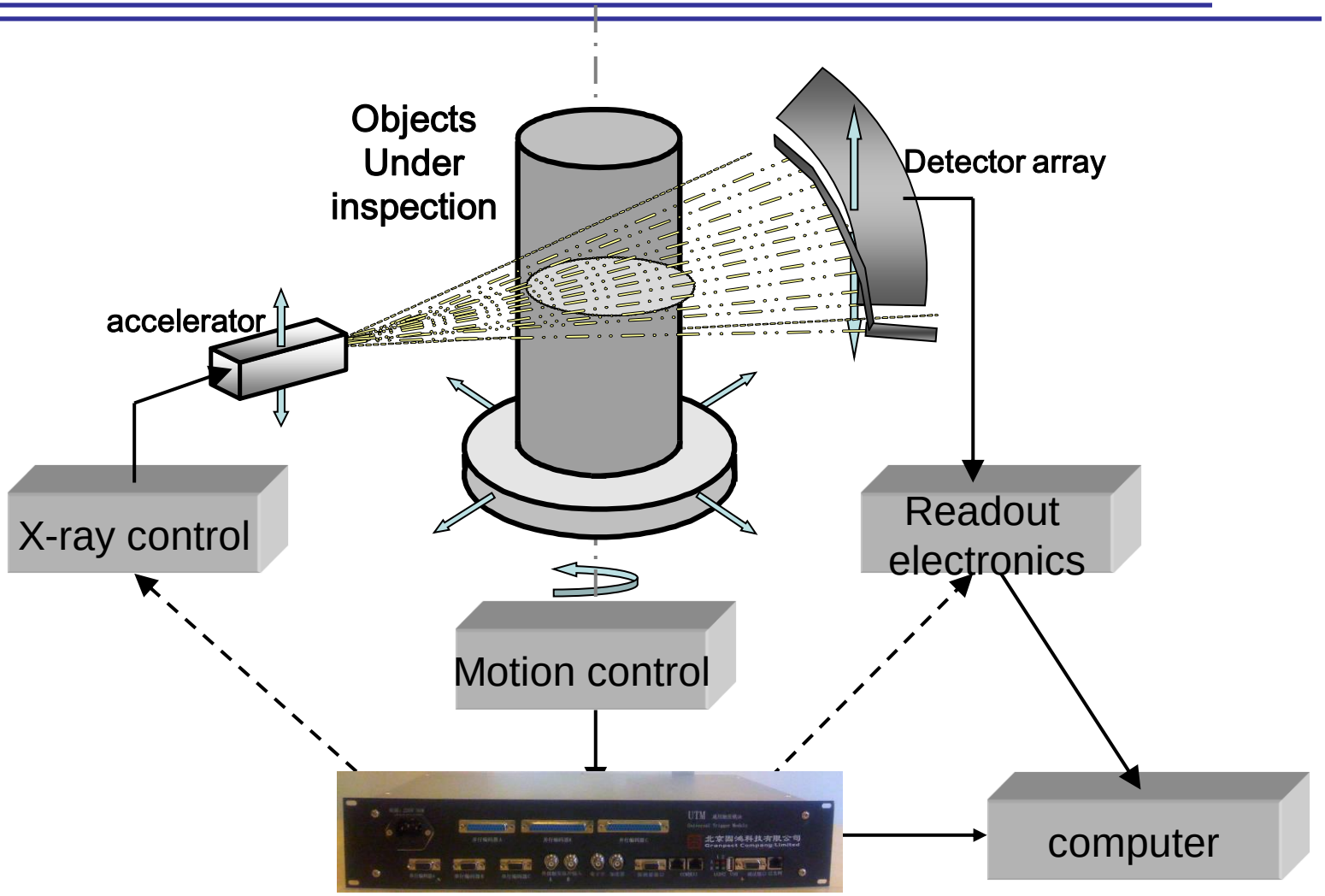

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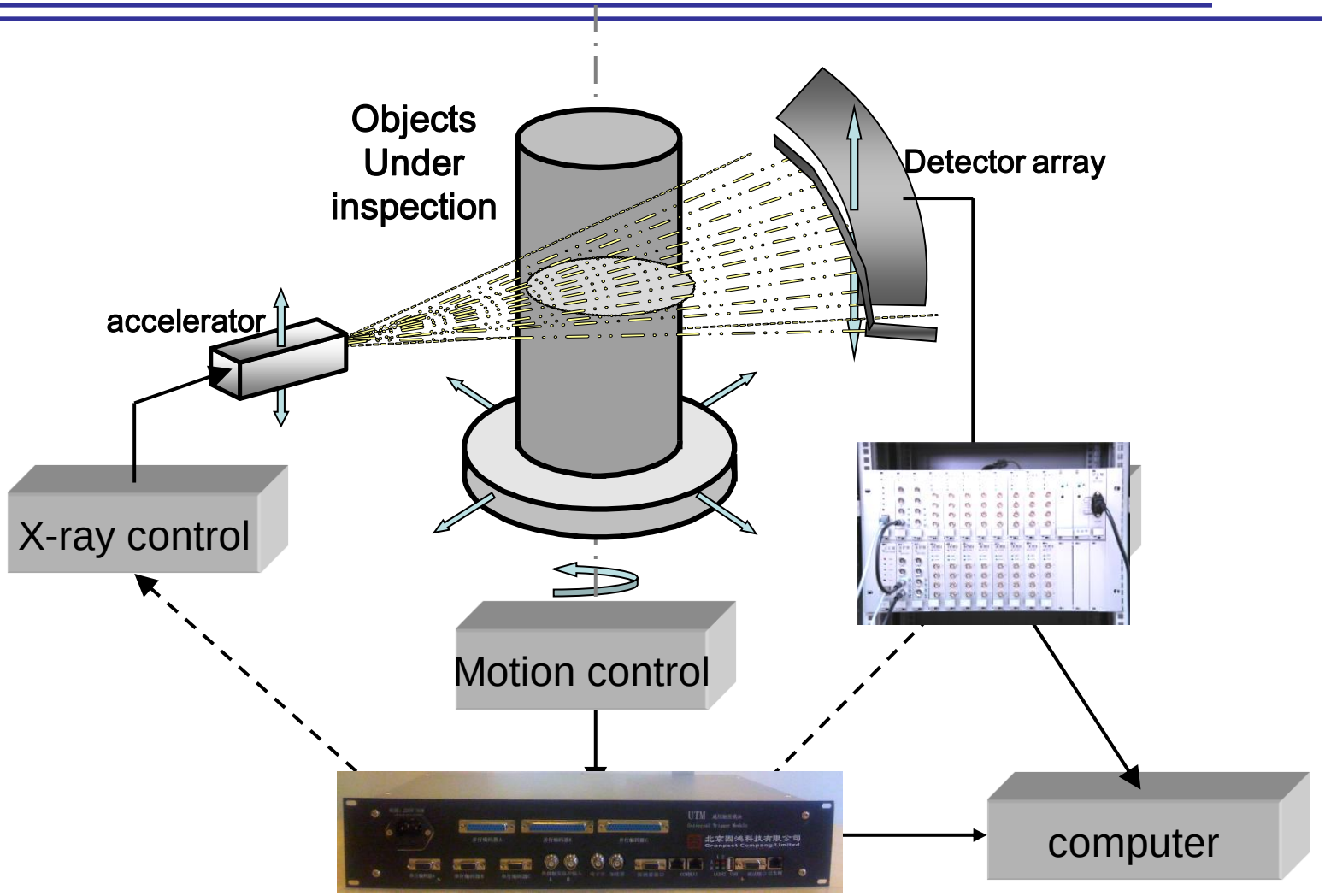

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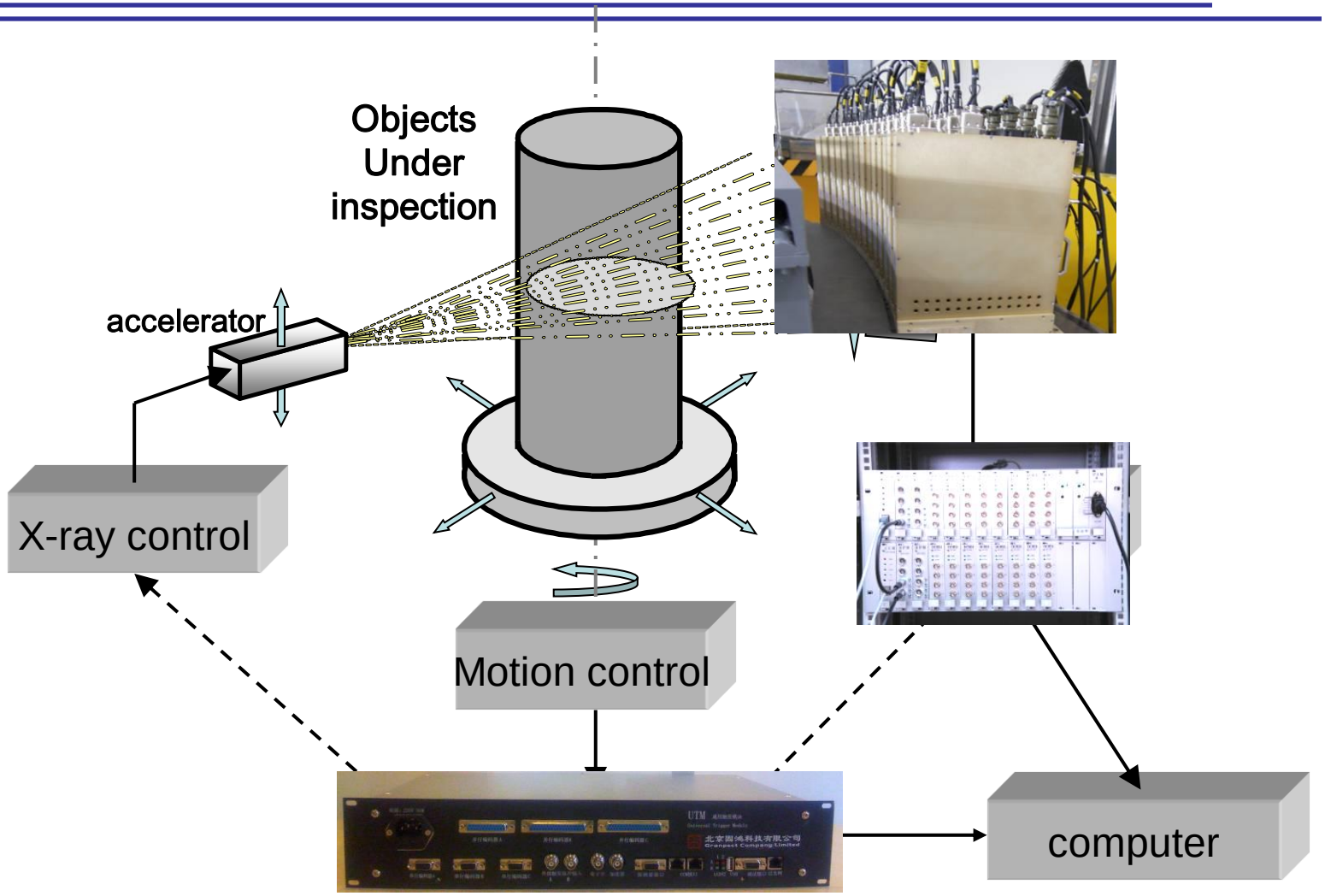
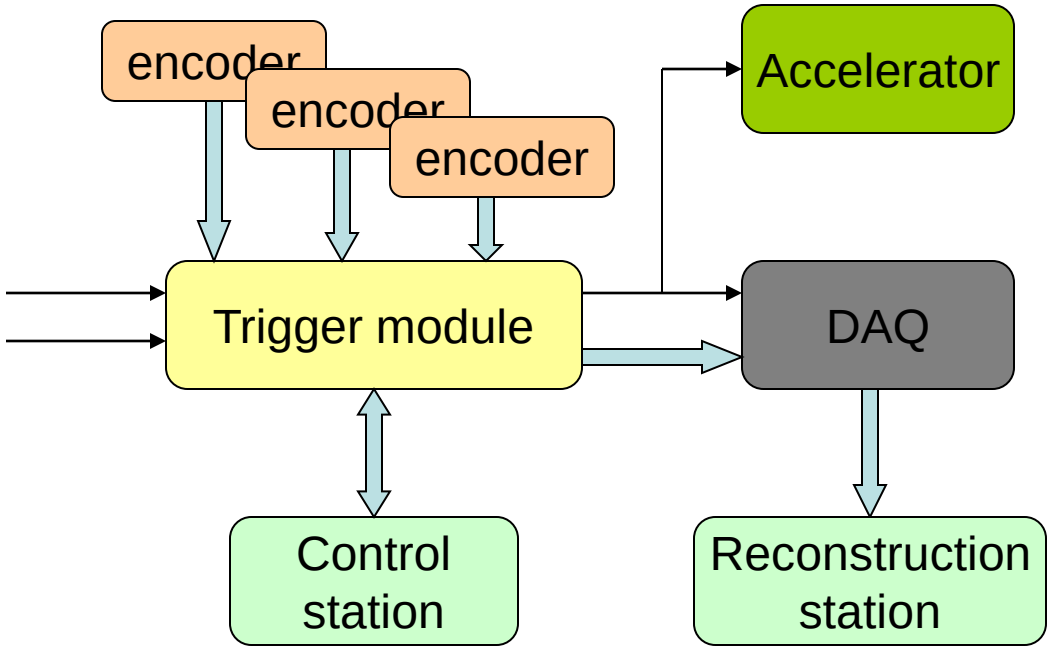


Trigger module for Industrial CT



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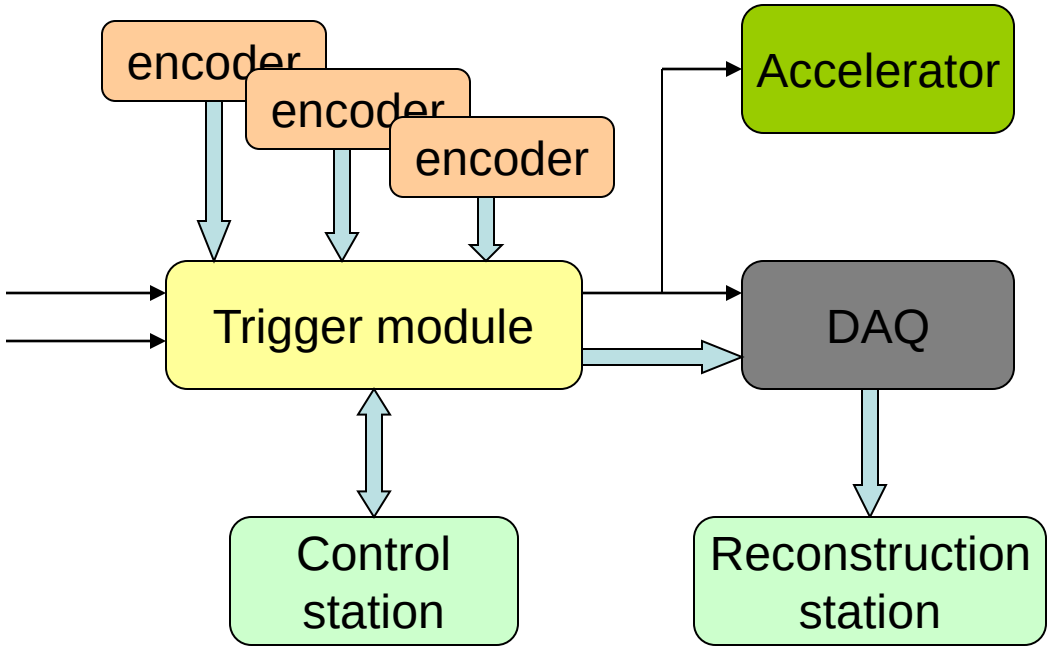
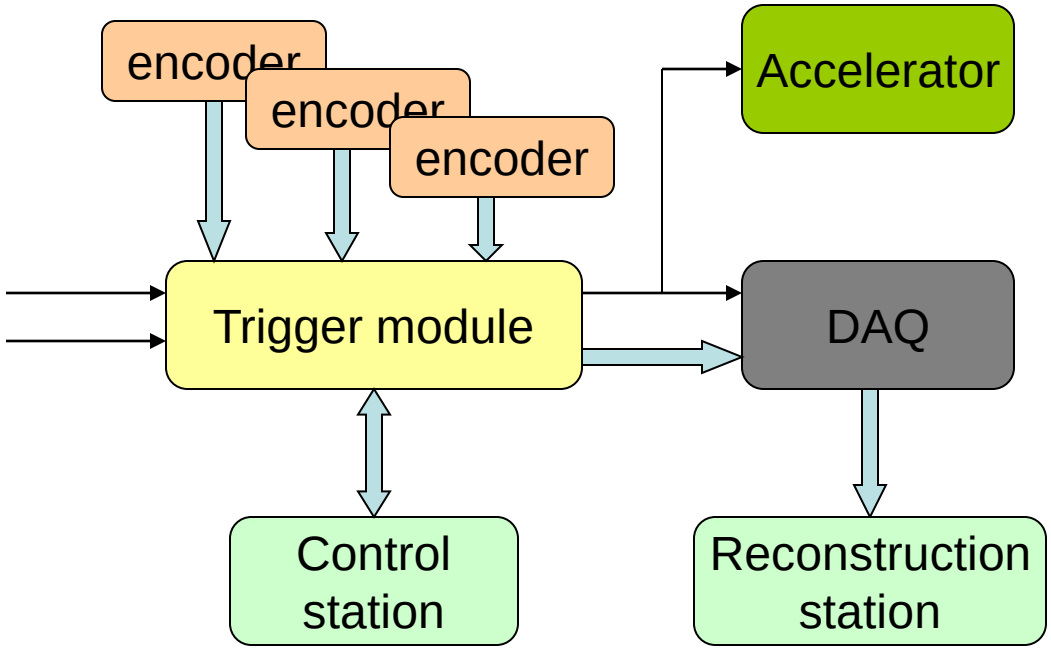


The task is quite clear and simple, flexibility is required!

Trigger module for Industrial CT

- Position collection
  - Serial / parallel
- Trigger generation
  - Modulation/delay/periodic
- DAQ interface
  - VME / serial link
- External inputs
  - Interlock signal
  - Synchronization
- Control interface
  - Ethernet / Field bus



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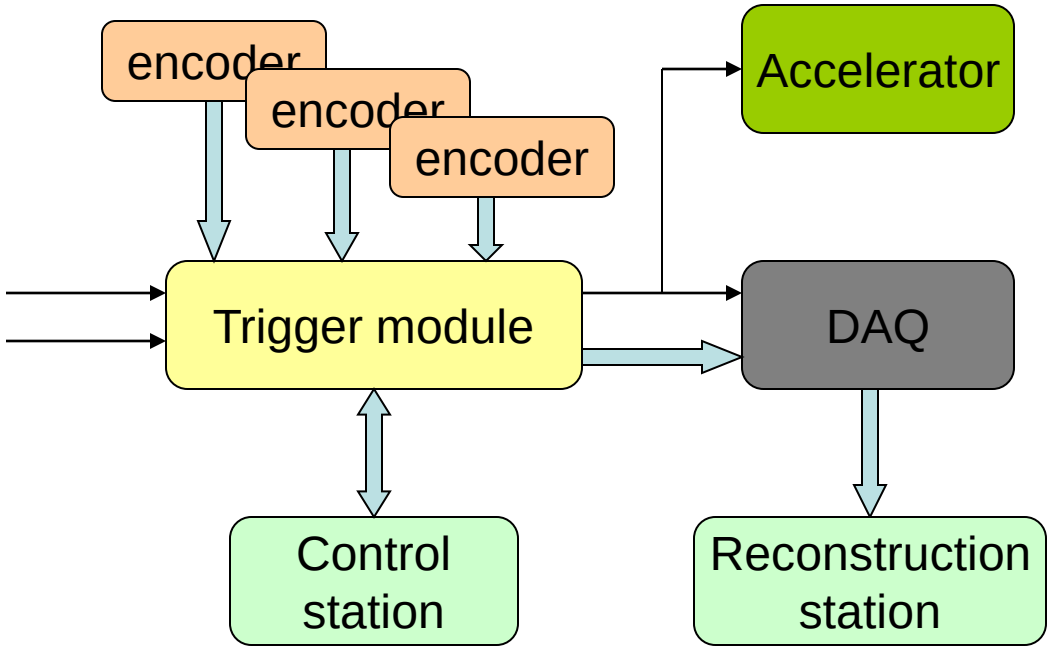

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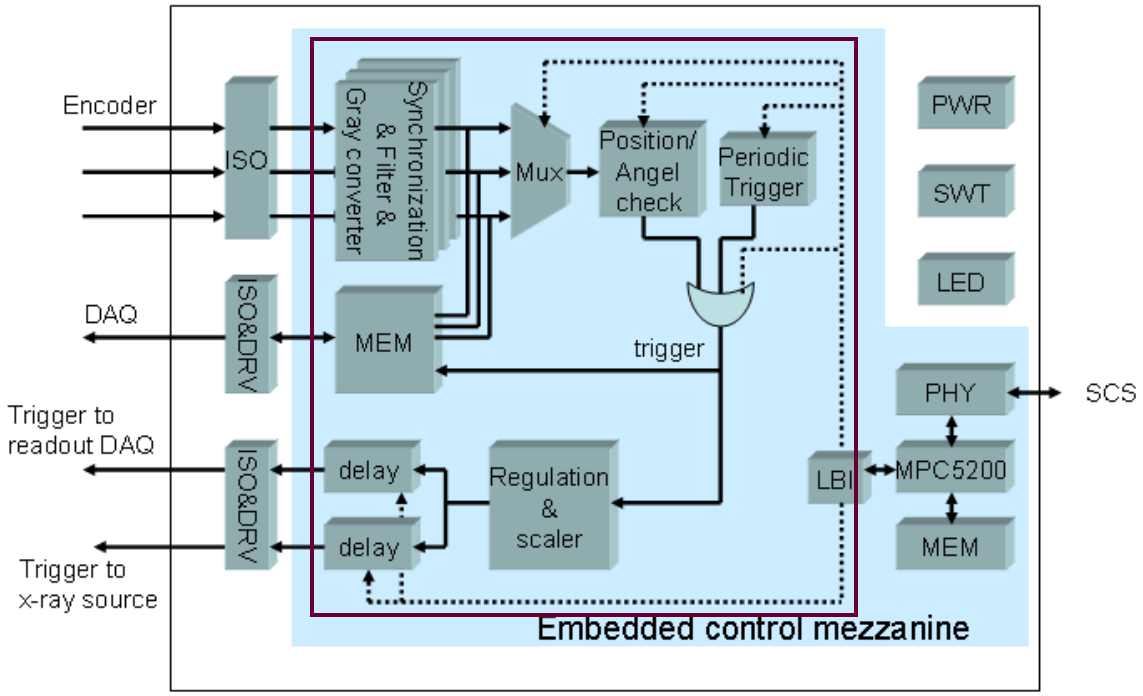
The trigger module logic is mainly implied in a embedded control Mezzanine: **A single board computer with FPGA extension**

Embedded Controller Mezzanine

- A single board computer with FPGA extension



Embedded Controller Mezzanine

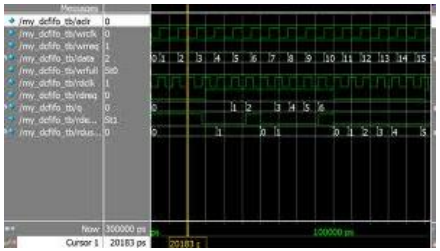
- The MPC5200 processor
  - 400MHz, 760MIPs
  - FPU & MMU
  - PCI interface
  - Wide temperature range
- Memory
  - 256MB DDR SDRAM
  - 32MB NOR FLASH
  - 512MB NAND FLASH
  - CF interface for mass storage
  - USB flash disk
- Communication
  - Fast Ethernet
  - RS232/RS485
  - CAN/I2C
  - USB
- RTC
  - NTP support

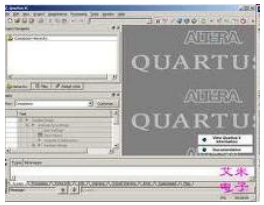
- FPGA
  - Cyclone-II 2C35
  - Upto 230 user IO
  - ***Dynamic configuration by CPU***
  - Variable interfaces to CPU
    - Parallel local bus
    - I2C / SPI
- Compact / Small footprint
- Low power consumption
- OS
  - ***Linux 2.6.24 + RT***
  - ***RTEMS***
  - Tmpfs/YAFFS2/EXT2/FAT32

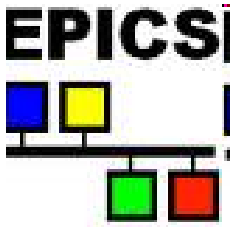
An ideal platform for Industrial control and EPICS IOC

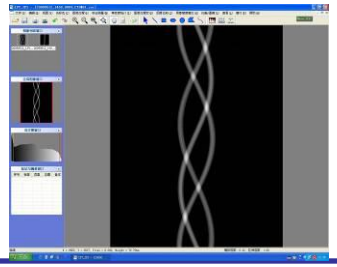
Development

- Software
  - GNU tool chain
  - Cross compile
  - NFS environment
- Firmware
  - FPGAdvantage
  - Modelsim+Quartus
- GUI
  - Visual studio .NET
  - EPICS
  - Labview



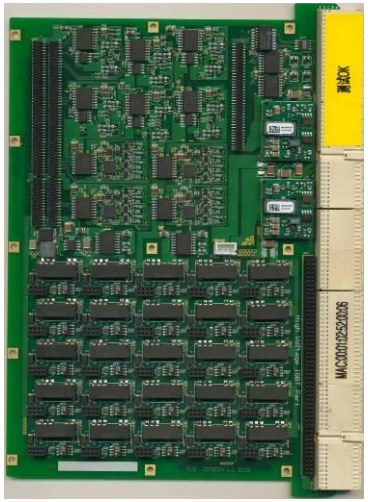






Other Applications

- Remote control modules
  - Clock distribution system for DYB reactor neutrino experiment
  - Environment monitor system for ultra-deep underground laboratory
- Industrial application
  - 16 channels RS232 hub
  - Control module for automatic train marshalling system
  - Interface module for hardware-in-loop simulation bench for the high-speed railway



Thank you!