Finanziato dall'Unione europea NextGenerationEU
Ministero dell'Università e della Ricerca
Italiadomani PIANO NAZIONALE DI RIPRESA E RESILIENZA
FAIR Future Artificial Intelligence Research

Streaming Data Acquisition System Meeting

MSU-JLab

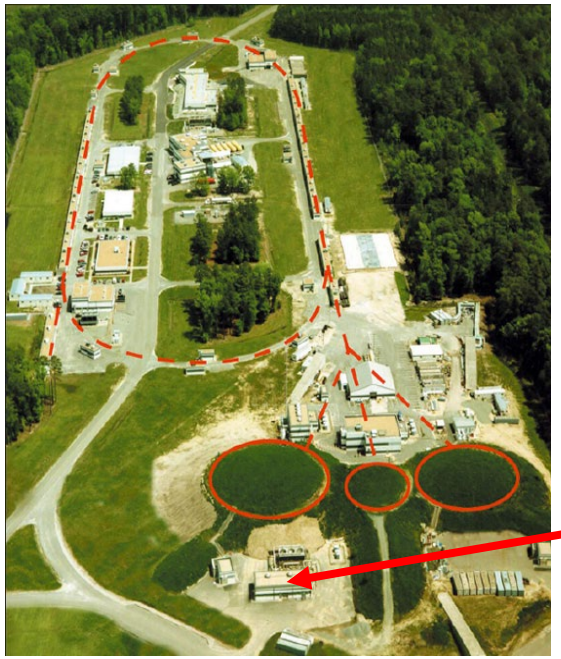
February 12, 2025
Jefferson Lab, Newport News (VA)

INFN SRO framework prototype

Fabio Rossi (presenter), **Marco Battaglieri**
Istituto Nazionale di Fisica Nucleare
Genova (Italy)

INFN Goal: Beam Dump eXperiment (BDX)

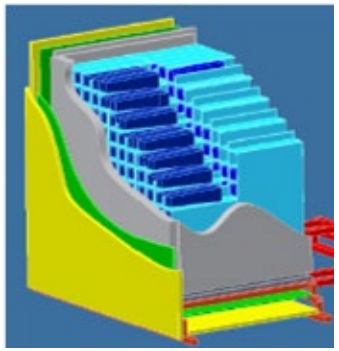
Jefferson Lab

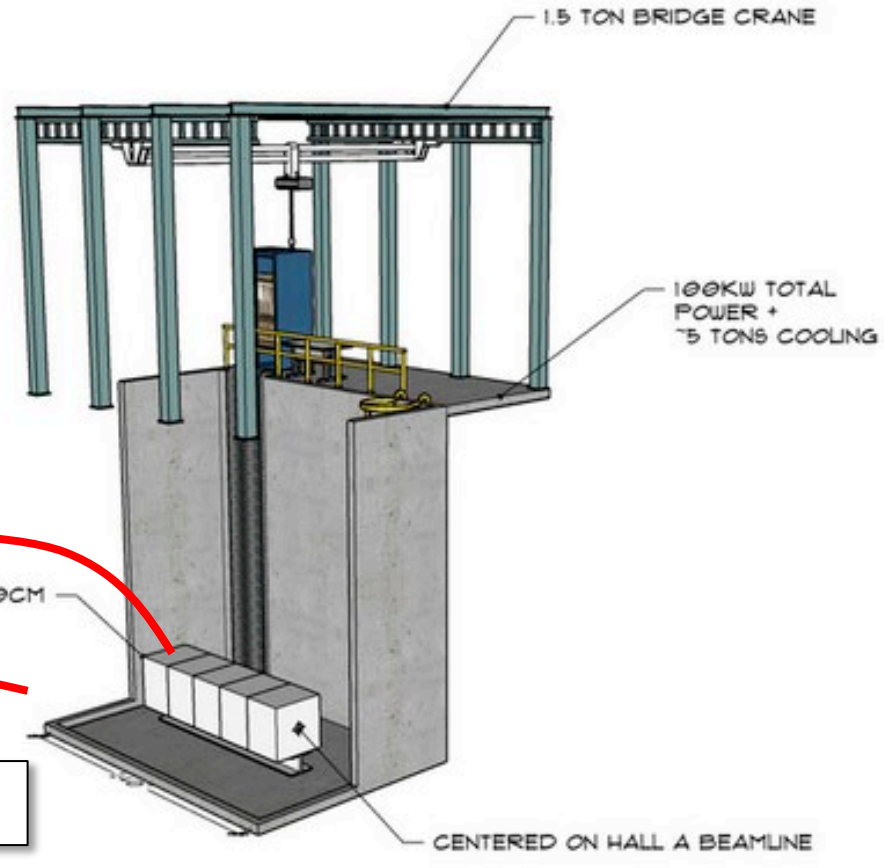


≈1000
Calorimeter channels
(30MB/s)

≈ 300
Veto channels
(500MB/s)

Single module





Very rare occurrence of Dark Matter events

Retrieved from: Battaglieri, M., et al. "Dark matter search in a Beam-Dump eXperiment (BDX) at Jefferson Lab." arXiv preprint arXiv:1607.01390 (2016).

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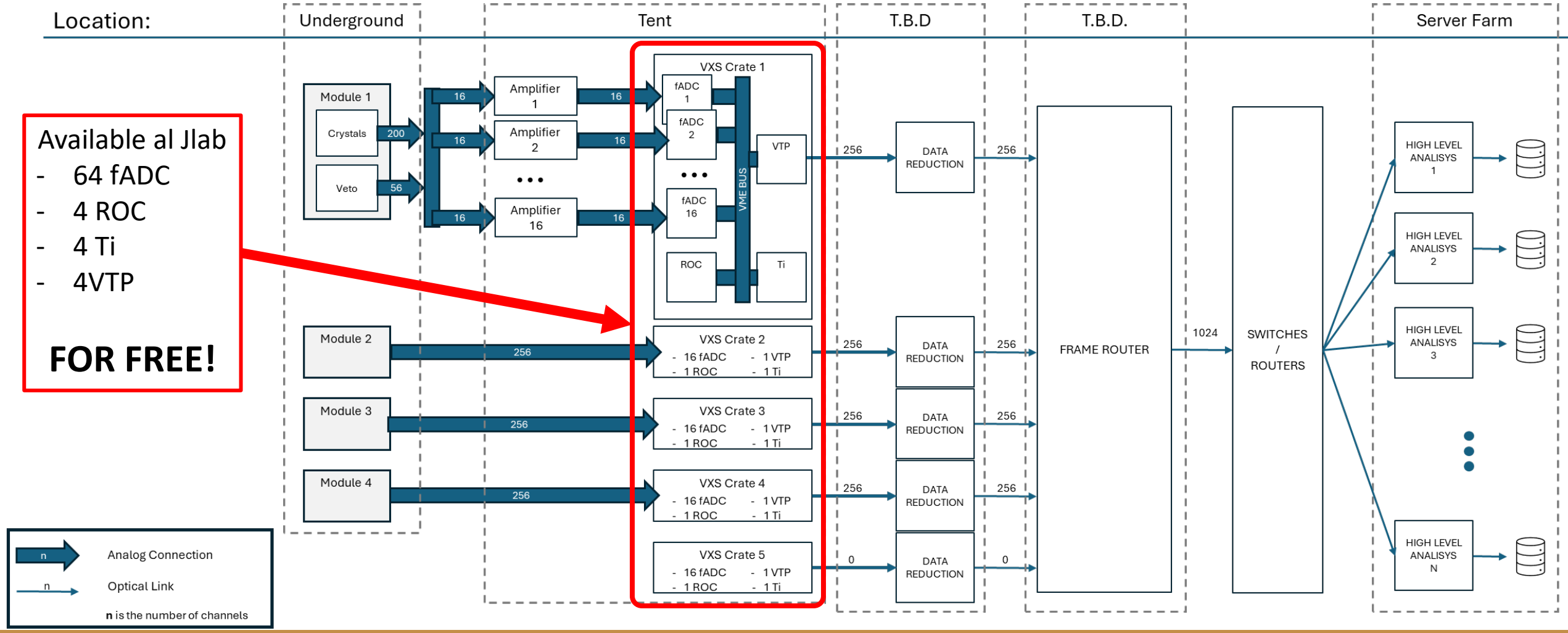
BDX data flow scheme

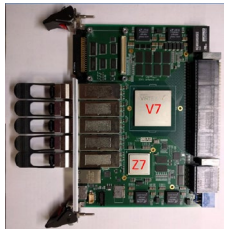


VTP Emulation for testing: Old Approach

Not Available Now

fADC

+



VTP

EVIO

The entire Acquisition system is based on specific Hardware

Acquisition System

Under development

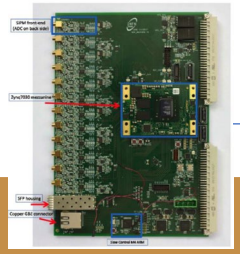
CAEN DIGITIZER

CAEN

CAEN / EVIO

EVIO

WAVE Board



WAVE

WAVE / EVIO

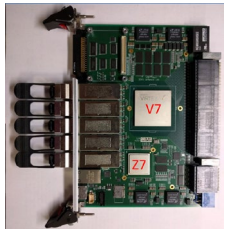
EVIO

VTP Emulation for testing: New Approach

Not Available Now

fADC

+



VTP

EVIO

Additional Hardware

EVIO / SRO_STD

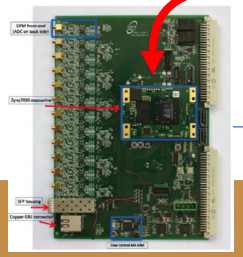
CAEN DIGITIZER

CAEN

Additional Hardware

CAEN / SRO_STD

WAVE Board



Protocol Interface

Additional Firmware

The entire Acquisition system is Hardware independent

Acquisition System

Under development

SRO_STD: Streaming Read-Out Standard protocol

```
struct sro_t
{
    uint16_t  id;              //!< Identification of protocol
    uint32_t  byte_len;        //!< Total length of packet in byte
    uint8_t   board_id;        //!< Unique board identifier number
    uint16_t  signal_number;   //!< Number of signals in the packet
    uint8_t   sample_number;   //!< Number of samples of the waveform
    sgn_t     *signals;        //!< Signals
};
```

```
struct sgn_t
{
    uint64_t  timestamp;       //!< Global timestamp
    uint8_t   channel_id;      //!< Unique channel identification number
    uint32_t  charge;          //!< Sum of all waveform samples
    uint16_t  *waveform;       //!< Waveform
};
```

Thank you for your attention

FUTURE AI RESEARCH

https://fondazione-fair.it

Jefferson Lab

https://www.jlab.org

INFN GENOVA

https://www.ge.infn.it

ACKNOWLEDGMENT

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