Design and Development of JUNO DAQ Data Flow Software

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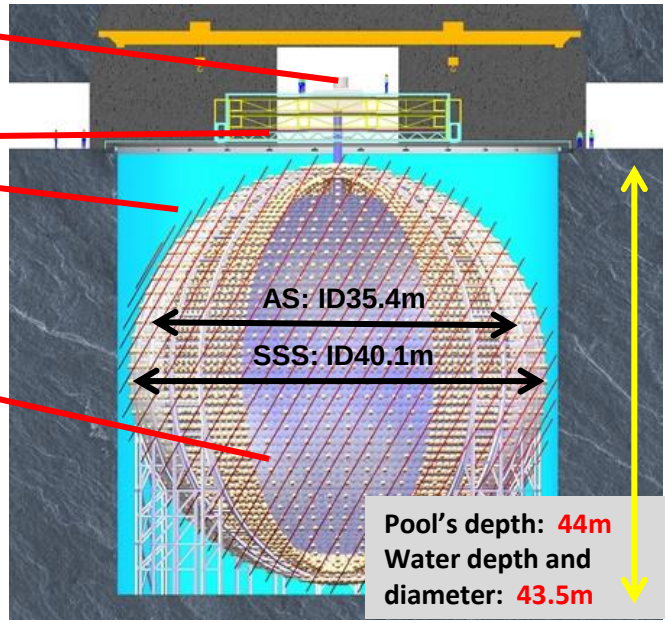
JUNO Detectors

Calibration

VETO system
Top Tracker
Water Cherenkov with 2400 20'' PMT
Earth Magnetic Field shielding coils

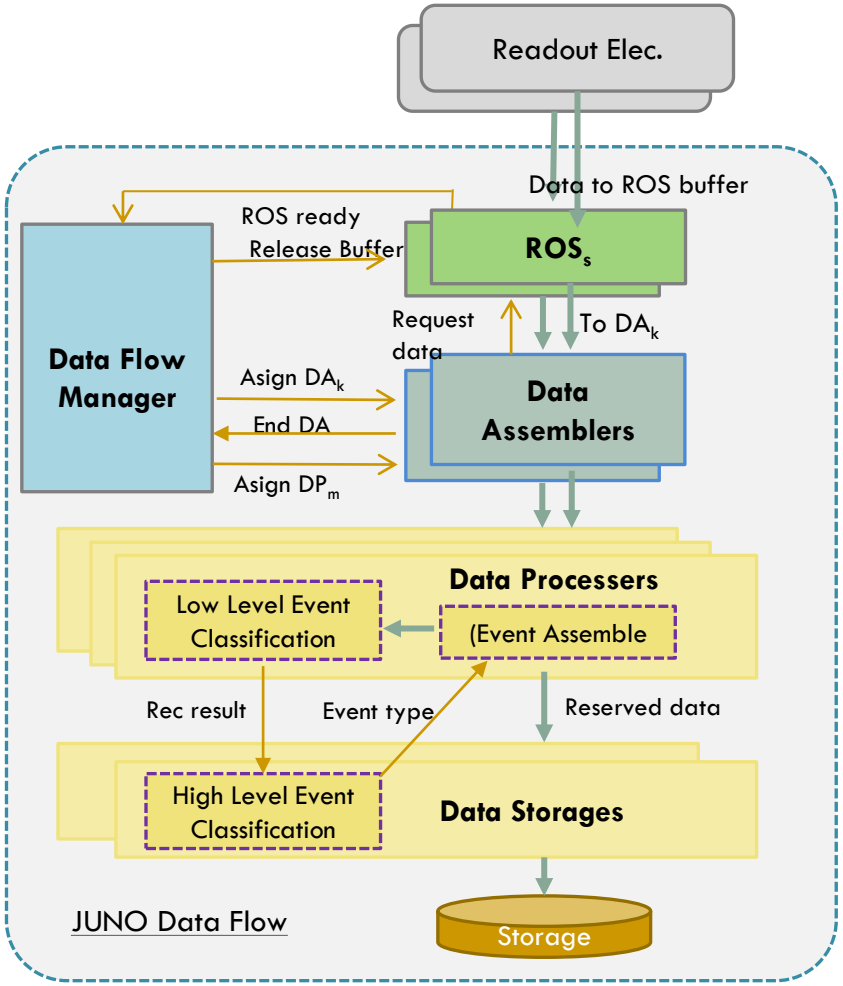
Central detector
- Steel structure (SSS)
- Acrylic sphere(AS) + 20kt Liquid scintillator
- 17612 20" PMT (LPMT)
- 25600 3'' PMT (SPMT)



JUNO Data Flow Software:

- Data Readout (ROS)
- Data Assembler (DA)
- Data Processer (DP)
- Data Storage (DS)
- Data Flow Manager (DFM)

Plugin-based module design
- Different readout electronics use different readout modules
- Different online processing uses different algorithm modules



■ 20'' LPMT data
- 3 channels/UWB for LPMTs of CD and WP : ~6800 UWBs
- CD waveform data rate with hardware trigger:
  18000 * 1GHz sample * 2 Bytes *1us window *1kHz trigger rate = 36GB/s
- CD trigger-less TQ data rate: 18000 * 30kHz dark rate * 16 Bytes = 8.5GB/s

■ 3'' SPMT data
- 128 channels/UWB for SPMTs: 200 UWBs
- Trigger-less TQ data rate:
  500Hz dark rate * 25000 * 30 Bytes = 375MB/s

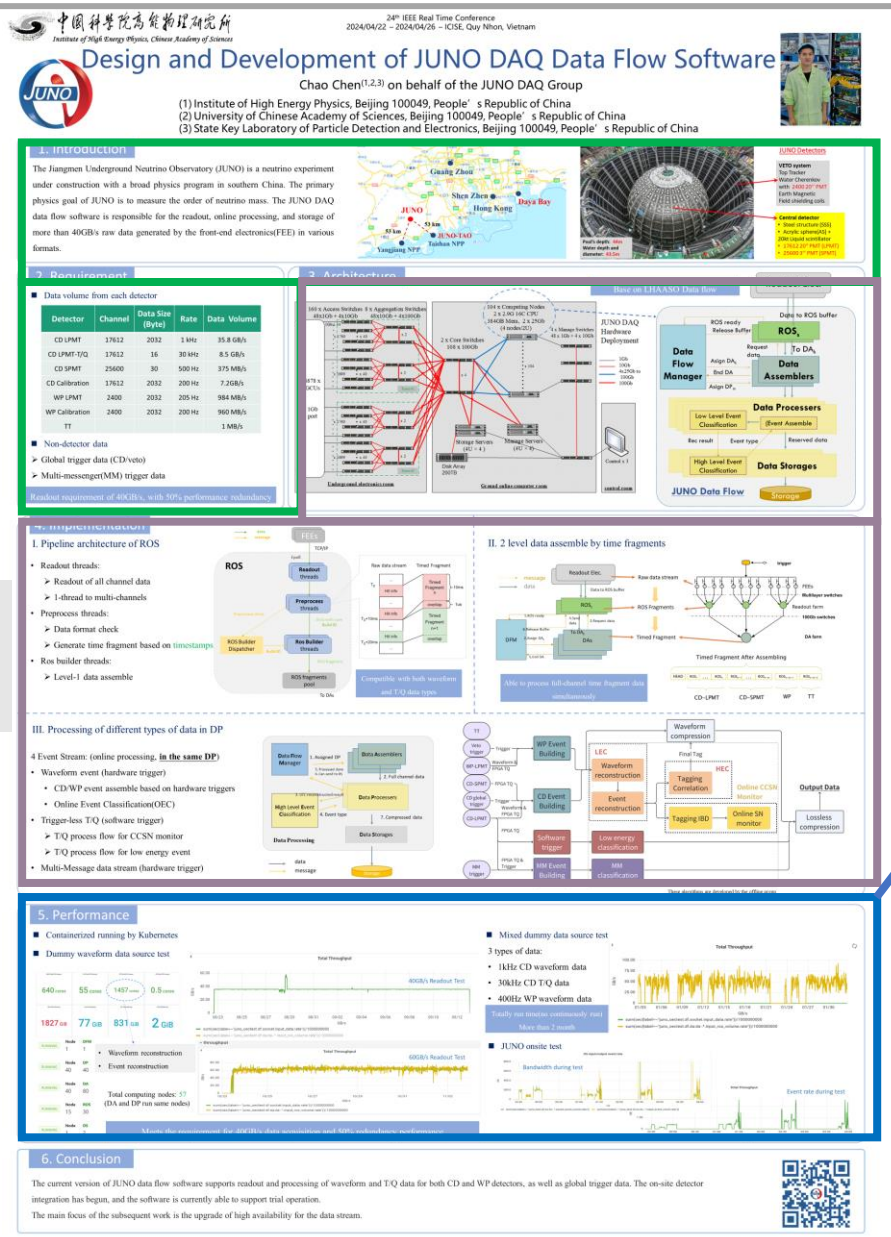
~7000 links, readout interface: 1Gbps Ethernet + TCP protocol , ~40GB/s data rate

Poster

Introduction and Motivation

Data flow Software Architecture Design and Implementation

Achieved Results



The current version of JUNO data flow software supports readout and processing of waveform and T/Q data for both CD and WP detectors, as well as global trigger data. The on-site detector integration has begun, and the software is currently able to support trial operation.

The main focus of the subsequent work is the upgrade of high availability for the data stream.