EPICS IOC Integration with Rexroth Controller for a T-Zero Chopper

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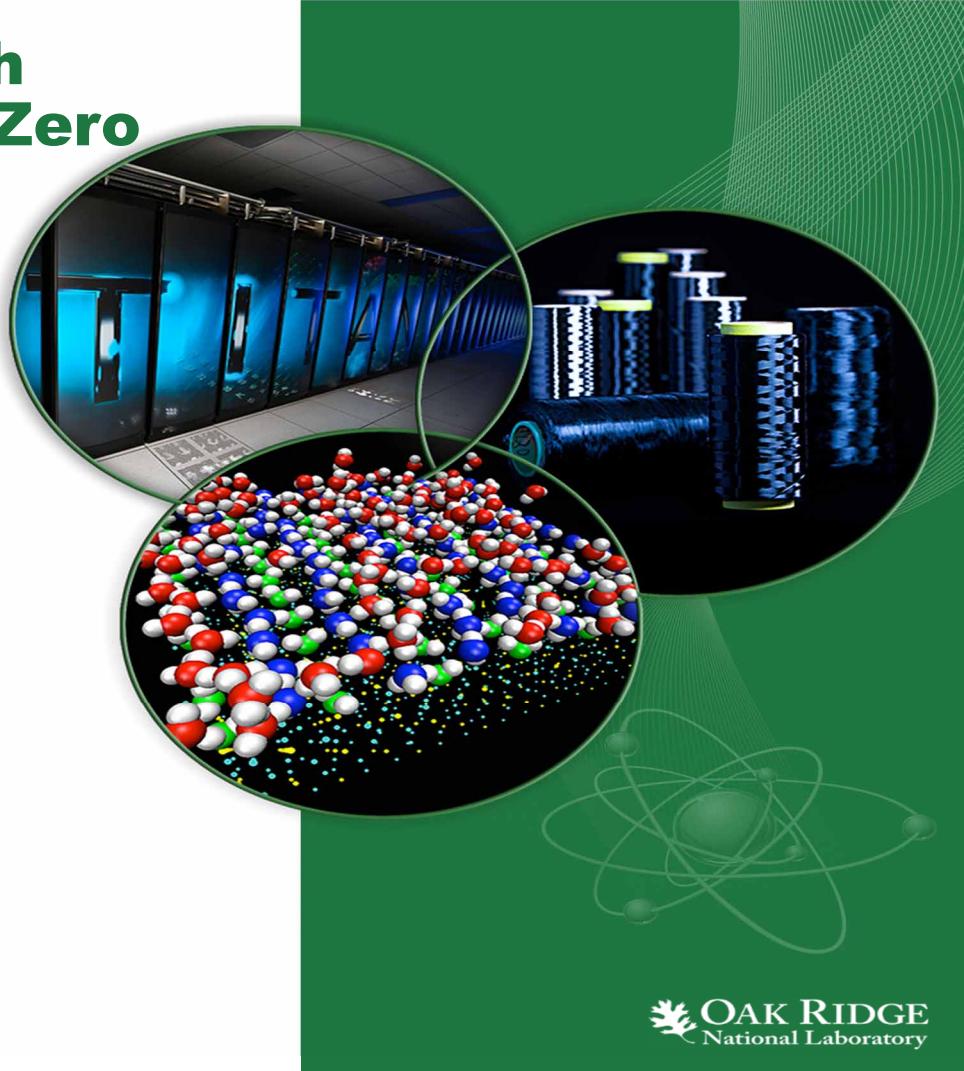
Introduction

- T-zero choppers - Rotate a large mass to place a beam stop in the path to eliminate high-energy neutrons occurring early.

- The current legacy architecture at SNS utilized Windows XP and an OPC server, leading to compatibility issues and separate maintenance efforts.

- To address these challenges, the Rexroth XM22 controller with its drivers was adopted, providing a versatile solution for integration with the existing Linux EPICS eco system.

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T0 EPICS System Architecture
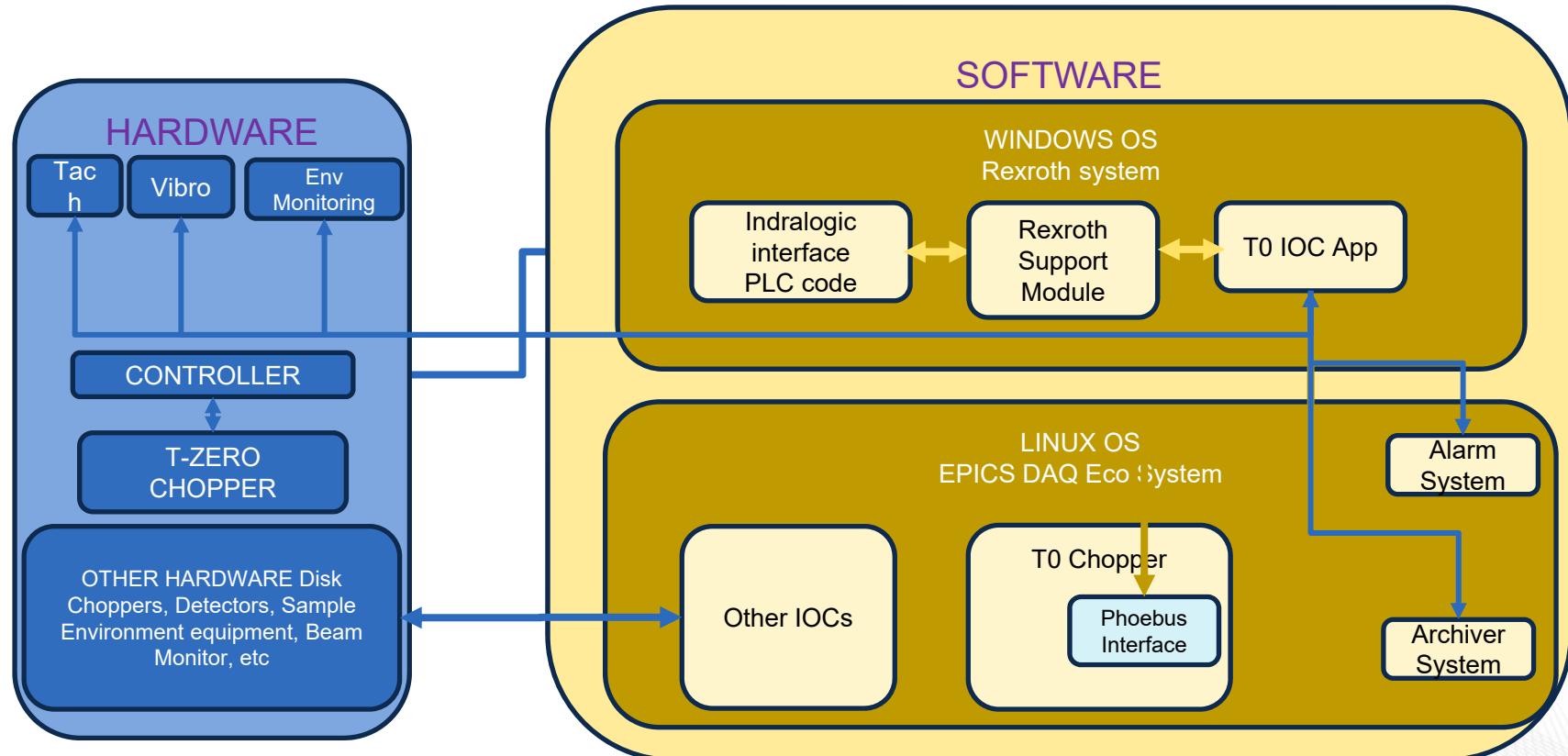
T0 EPICS System Architecture
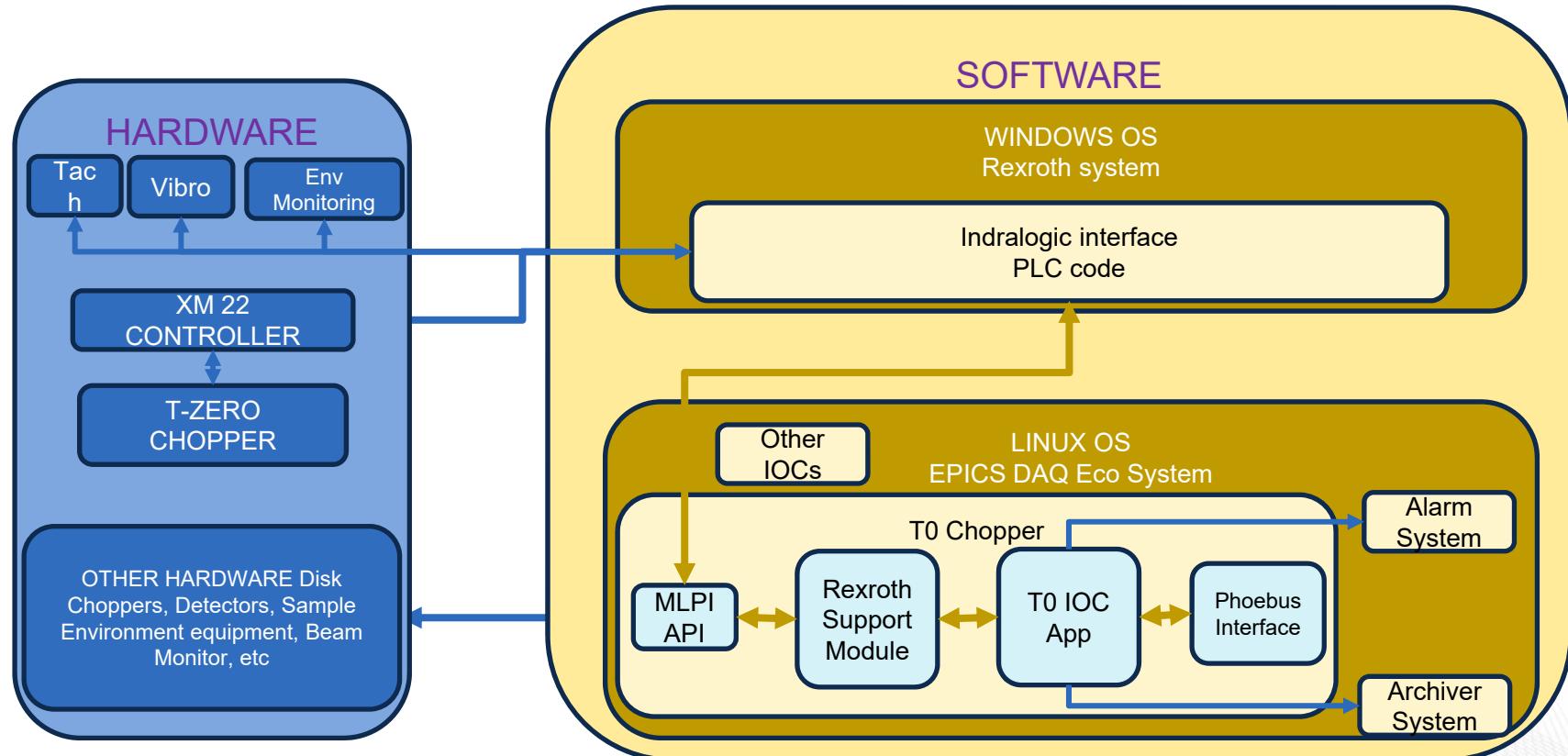
Development & Deployment Flow Diagram

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┌─────────────────────────────────────────────────────────┐
│        Get T0 and XM 22 controller to communicate        │
└─────────────────────────────────────────────────────────┘
                            ↓
┌─────────────────────────────────────────────────────────┐
│       Setup Indralogic Rexroth interface in Windows machine       │
└─────────────────────────────────────────────────────────┘
                            ↓
┌─────────────────────────────────────────────────────────┐
│   Develop PLC code to control the chopper (functions include   │
│        setting and getting speed, phase locking)         │
└─────────────────────────────────────────────────────────┘
                            ↓
┌─────────────────────────────────────────────────────────┐
│    Develop EPICS Support module using Rexroth MPLI API libraries    │
└─────────────────────────────────────────────────────────┘
                            ↓
┌─────────────────────────────────────────────────────────┐
│  Develop T0 IOC to create process variables to interact with the  │
│             controller using Streams             │
└─────────────────────────────────────────────────────────┘
                            ↓
┌─────────────────────────────────────────────────────────┐
│  Develop Phoebus interface to display the PVs for reading and  │
│                 writing to PVs                 │
└─────────────────────────────────────────────────────────┘
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Performance and testing

A 350lbs mass as shown, is successfully spun at a frequency of 60Hz at an upcoming VENUS beamline at SNS, perfectly synchronized with the accelerator pulse, achieving an impressive error margin of only 20us.
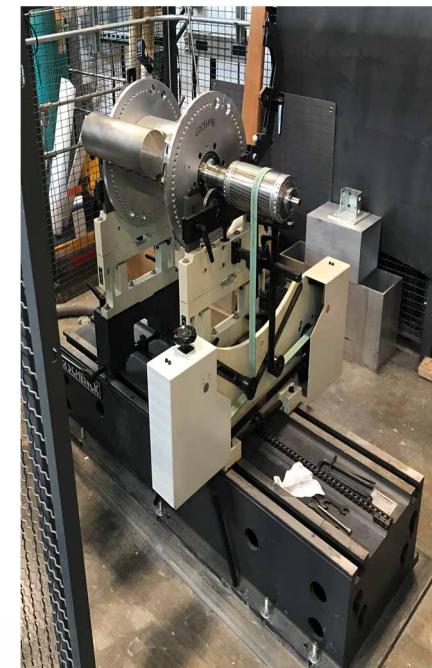
Rotor on a balancing machine

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