NCNR Reactor Operations and Engineering Digital Transformation

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SURF Colloquium, Reactor Operations NCNR

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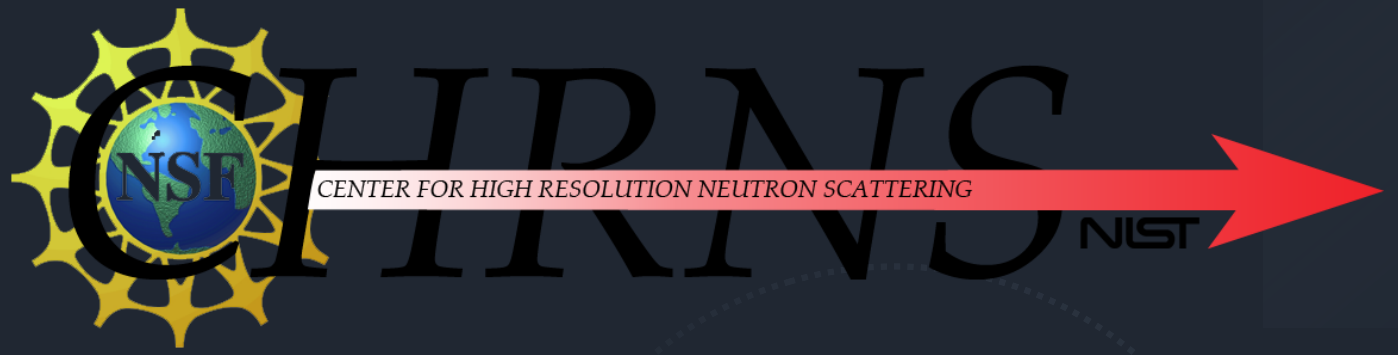
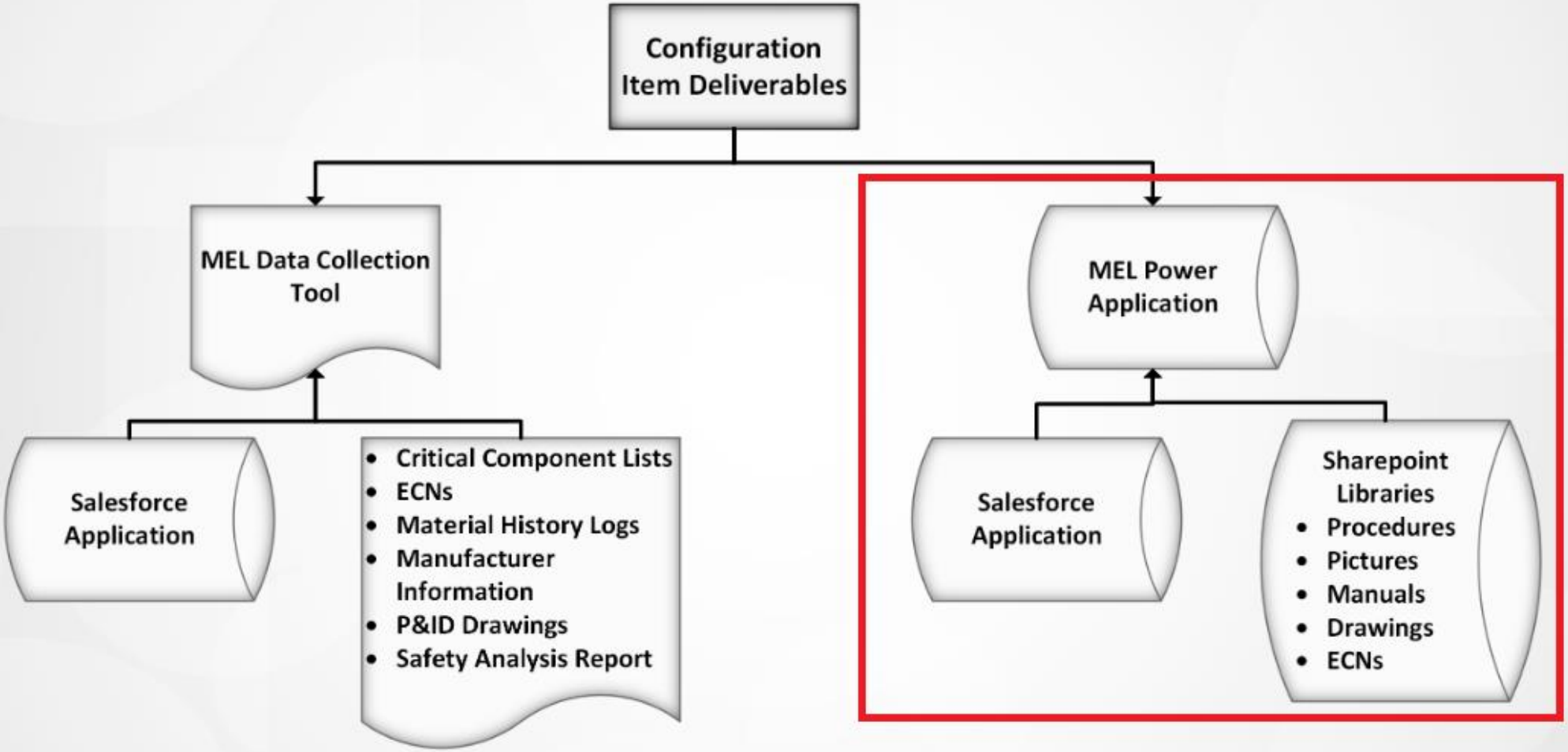


Project Terms

- **NCNR -** NIST Center for Neutron Research (NCNR) is a division of NIST specializing in neutron measurement, research, standards, and capabilities for the U.S. research community. As such, the NCNR is under the federal jurisdiction of the Nuclear Regulatory Commission and the U.S. Department of Energy.
- **NBSR** - National Bureau of Standards Reactor (NBSR) is a 20 MW nuclear reactor using enriched U02 fuel with D2O coolant; The NBSR is used for various applications but is primarily specialized for its use for neutron science research at the NCNR.
- **MEL -** The Master Equipment List (MEL) is a digitalized comprehensive inventory and equipment list showcasing all components, such as valves, regulators, switches, gauges, filters, compressors, pumps, dampeners, etc., at the NCNR.
- **CI -** Configuration Items (CIs) are any component within hardware, software, information data, or documentation within the IT environment that must be managed for the development process. A configuration management system (CMS) can be employed to track CIs.
- **EAMS –** A software that helps organizations or corporations manage and track their ongoing maintenance, repair, and refurbishment activities. For the NCNR, the EAMS will be implemented from the data and feedback based on the MEL to work towards a streamlined maintenance and logistics management system

Master Equipment List Application Project



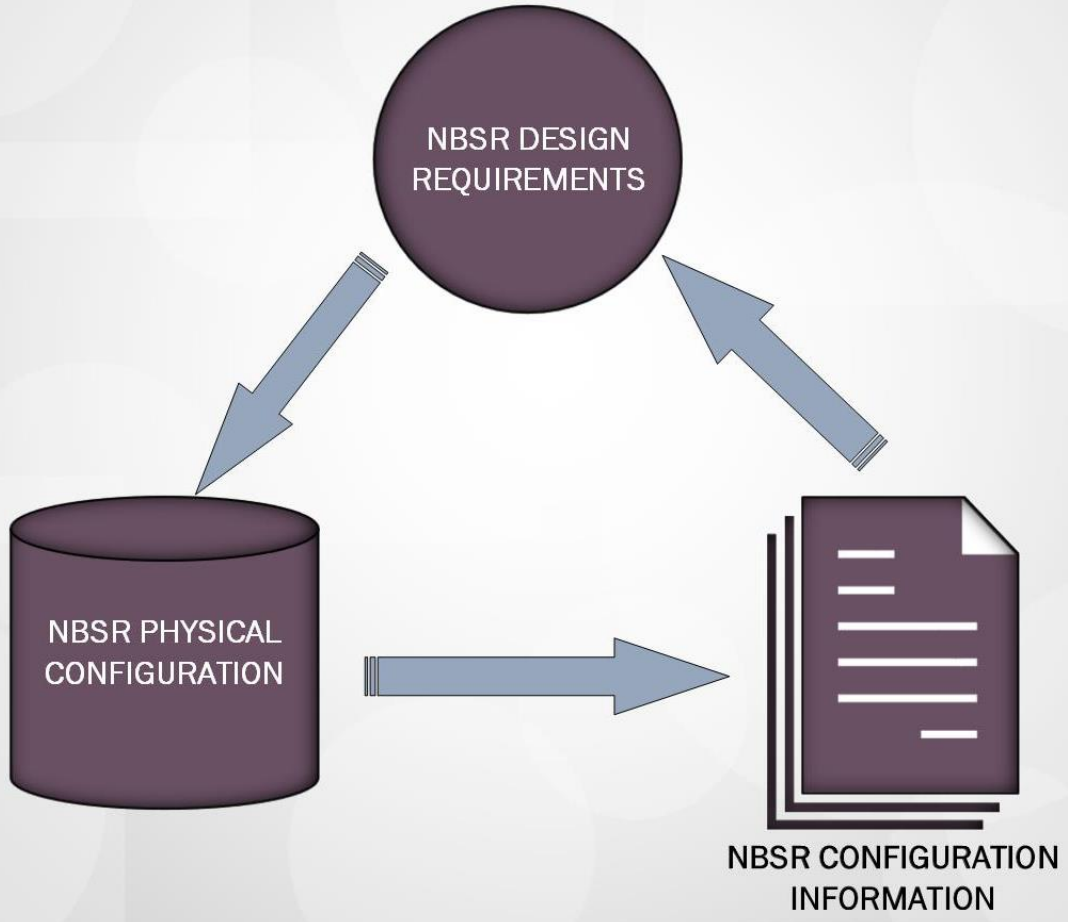
Project Introduction

- Create a centralized cohesive equipment database system with real time data integration services
- MEL Power Application deals with transfer of information and data from MEL Data Application
- Think of MEL Software Data Collection tool is front end, and MEL Power Application is back-end of NBSR MEL
- The completion will greatly support correlation checking at NCNR for maintenance of the NBSR and Reactor Operations for ease of access
- MEL is a sub-project of supporting a larger digital transformation strategy at the NCNR

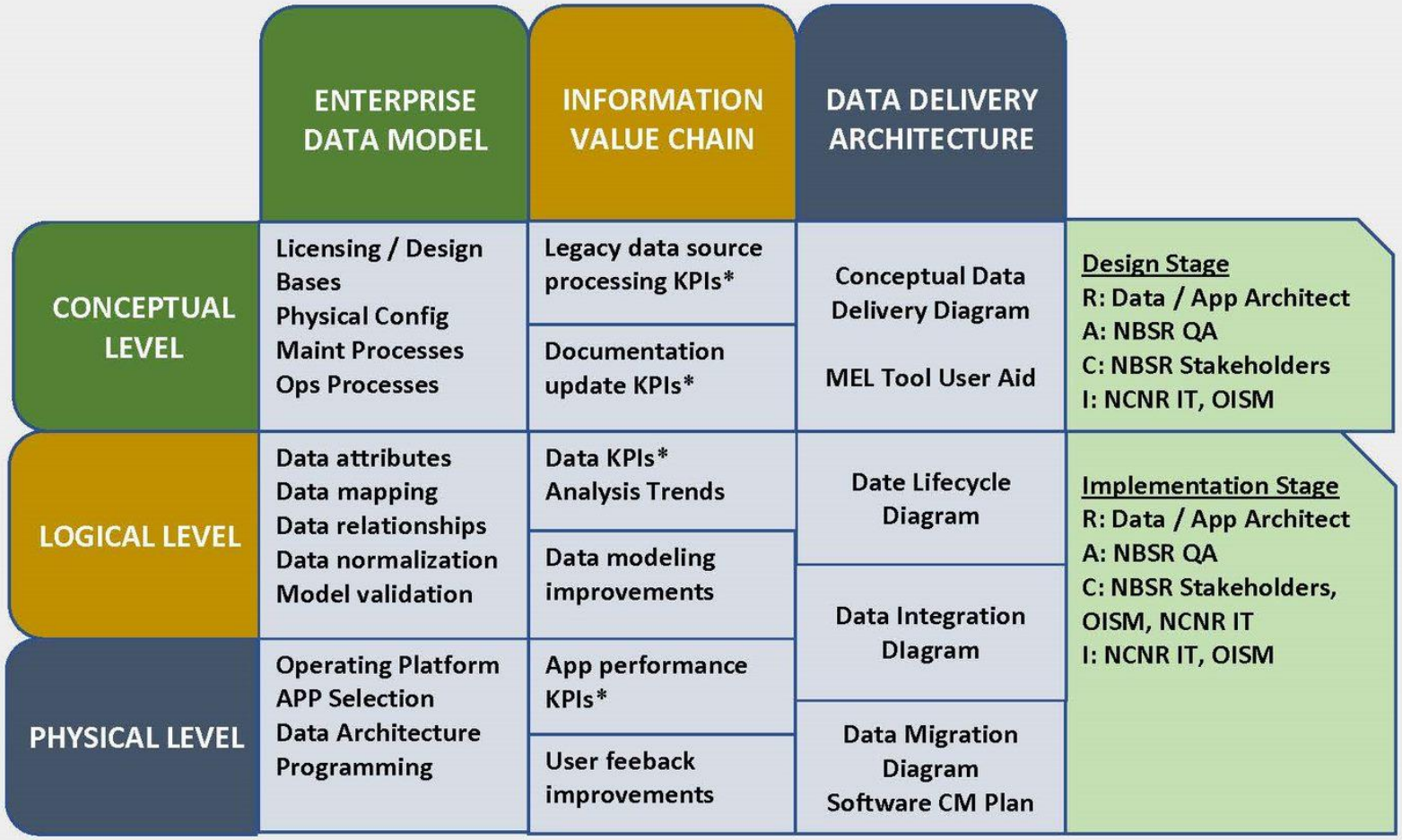
Software Application Implementations

- Establish the baseline requirements for the applications, along with the retrieval of equipment reference information, equipment communication, information status, update methods, and user interface
- Establish the data architecture, such as its principles, assets, models, and framework
- Establish data sources – such as its information regarding component information, engineering drawings, vendor records, purchase orders, and specifications
- Build the application and test the application up to an acceptable format for the application to where a software plan can be drafted based on the applications format
- Establish the Software Configuration Management (SCM) controls to maintain the integrity of the software application

National Bureau of Standard Reactor (NBSR) Configuration Management Model

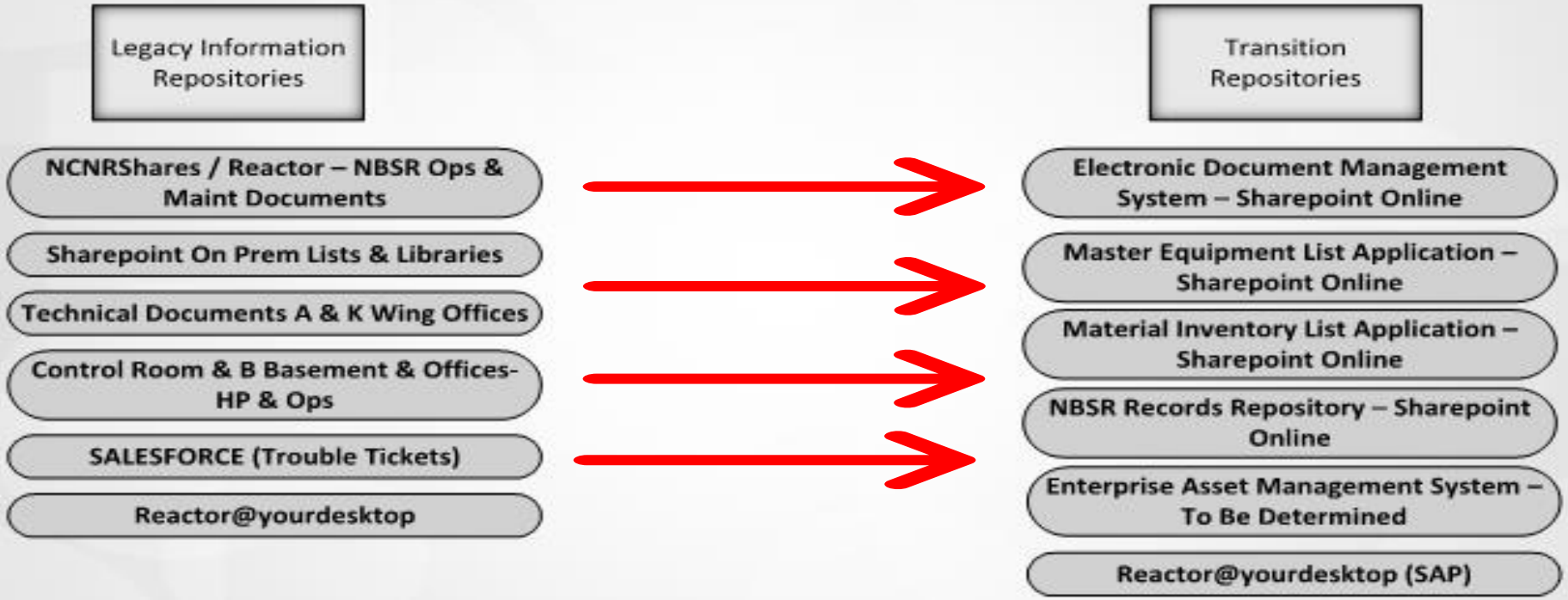


MEL Enterprise Data Architecture Outline

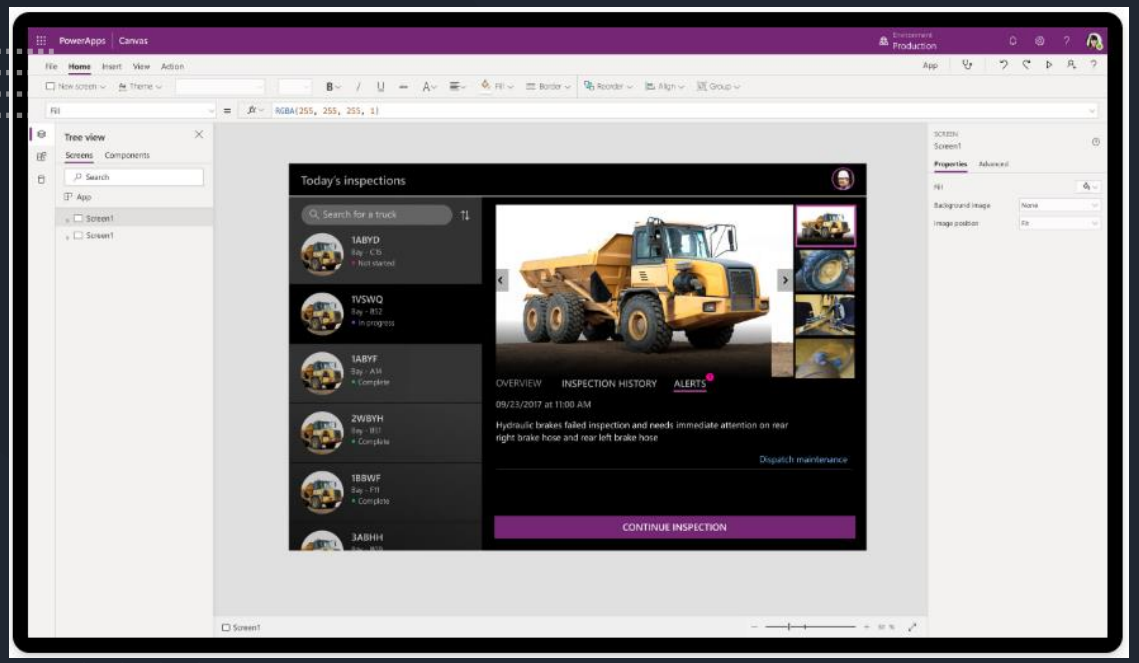


KPI: Key Performance Indicator

NCNR Reactor Operations and Engineering Digital Transformation



Application Programs



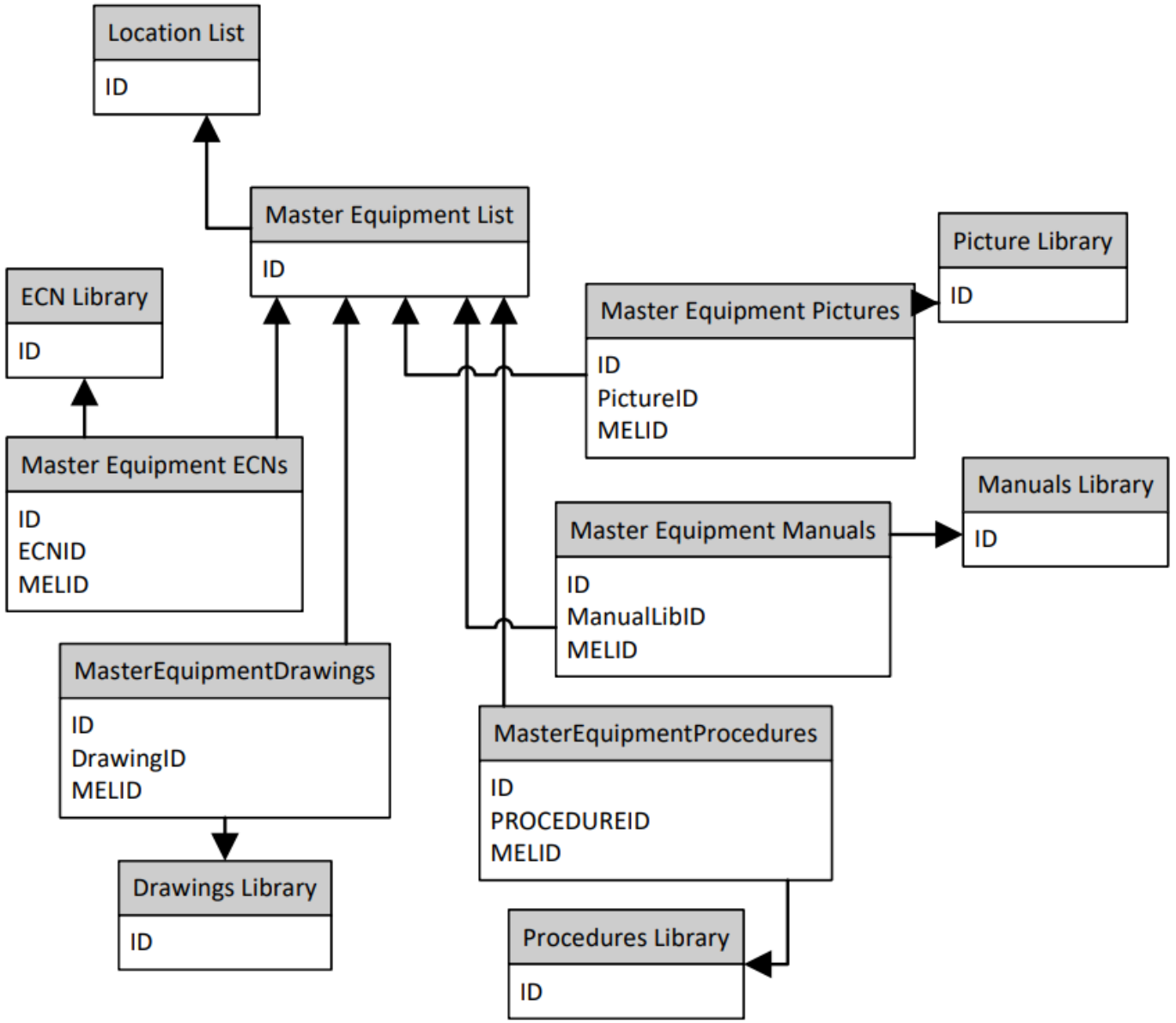
- Power Automate is used as a tool for loading tables and automating their process onto the Power Application.
- Power BI is used as a support tool to Power Applications in analyzing data patterns and refining data information.
- Power Applications is a tool within the Microsoft Suite that enables developers to build software applications with little-to-no programming languages or extensive programming knowledge.
- SharePoint is used as a digital cloud storage service, where Power Automate loads the lists and libraries, and the information is compiled into a single view in the Power Application.

Power BI

Power Apps

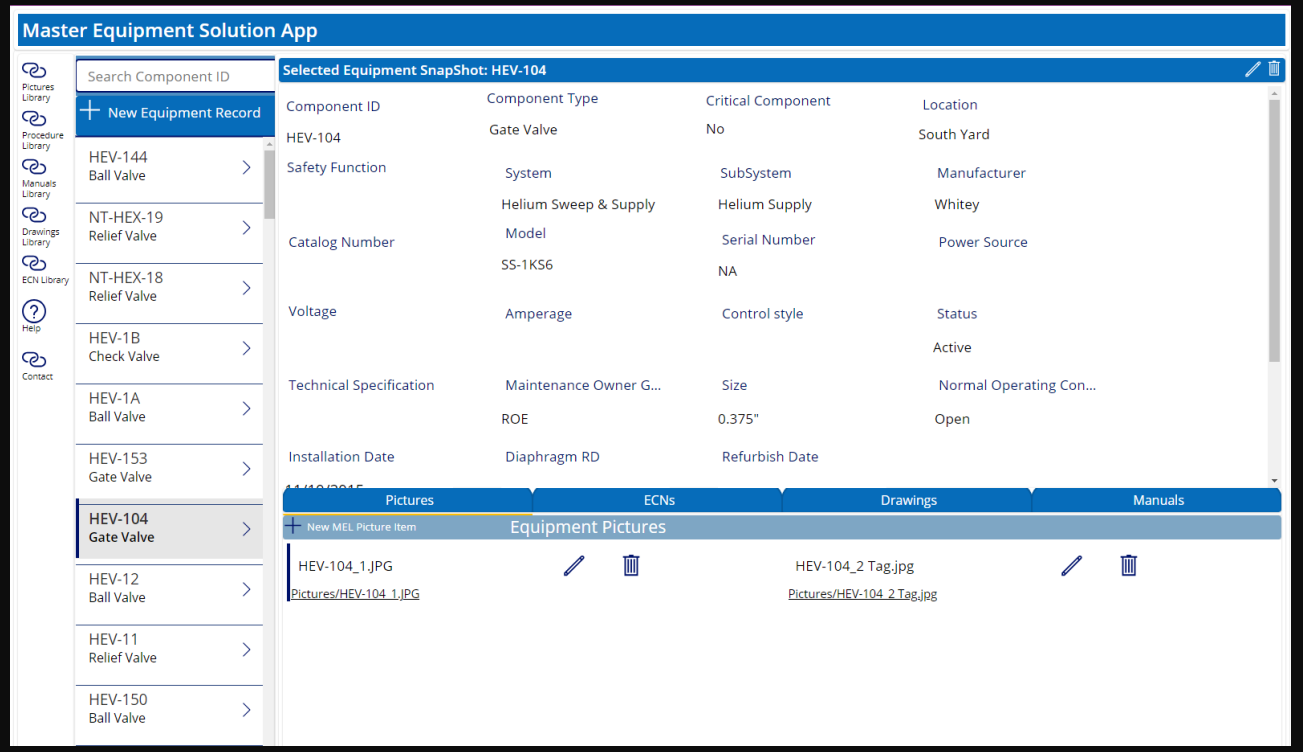
Power Automate

Master Equipment Solution Table

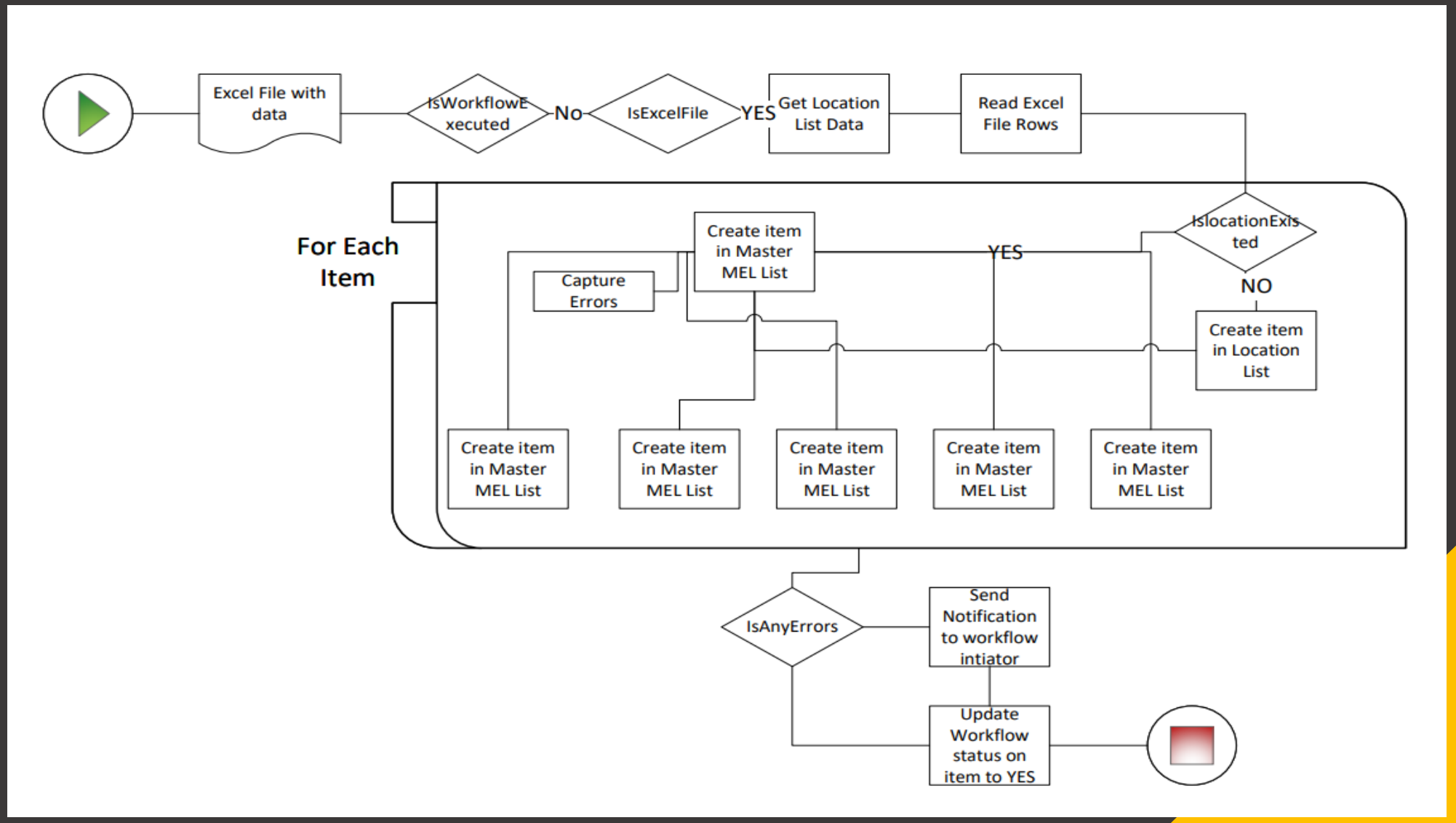


NBSR Equipment Application

- **With Power Applications, new component information can be added in, modified, edited or deleted based on the requirements with dropdown menus.**
- **The Power Application is still under development, and additional reference information is being implemented. As the application expands in scope further, software developers will also improve the User Interface for better accessibility.**
- **Researchers can quickly access the component reference materials, which are in the tabs - such as - reference engineering drawings, ECN information, and manuals.**



MEL Information Transfer



Future Goals of NBSR Equipment Application

- Baseline Physical Configuration Component Data
- Transform Physical Configuration Component Data into a Digital Modeling Tool (MEL APP)
- Baseline remaining supporting legacy data and develop Modeling Tools for Legacy Data
- Transform remaining supporting legacy data into Digital Modeling Tools
- Transition Digital Modeling Tools into an Enterprise Asset Management System

Internship CORE Reflection

Goals

Gain Information Technology (IT) experience at the National Institute for Standards and Technology (NIST)

Skills & Knowledge

Gained valuable experience in data management, data analysis, and understanding of tools and their usage, such as Excel, Power BI, and Power Applications, both from a technical and non-technical perspective.

Experience

- Worked on a team to develop and lay the foundations to develop a Master Equipment List to work our way towards a CMMS
- Currently extending the internship, and working on a software configuration management plan as the baseline for standards and changes for the NBSR EAMS project

Applications

IT applications can be applied in almost every domain or field - since corporations and organizations have issues with their data management for logistics, critical infrastructure, customer service, or customer management

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