LBNF/DUNE – Systems Engineering – Engineering Data Management

Matthew A. Sawtell – LBNF/DUNE Engineering Data Manager
Jeff Dolph – DUNE Systems and Project Mechanical Engineer
Nandhini Dhanaraj – LBNF Systems Engineer

LBNF Discussion at CERN
13APR16

Reason for this Discussion

- The Systems Engineering group is in the process of establishing an Engineering Data Management Process amongst the various LBNF/DUNE Project Partners

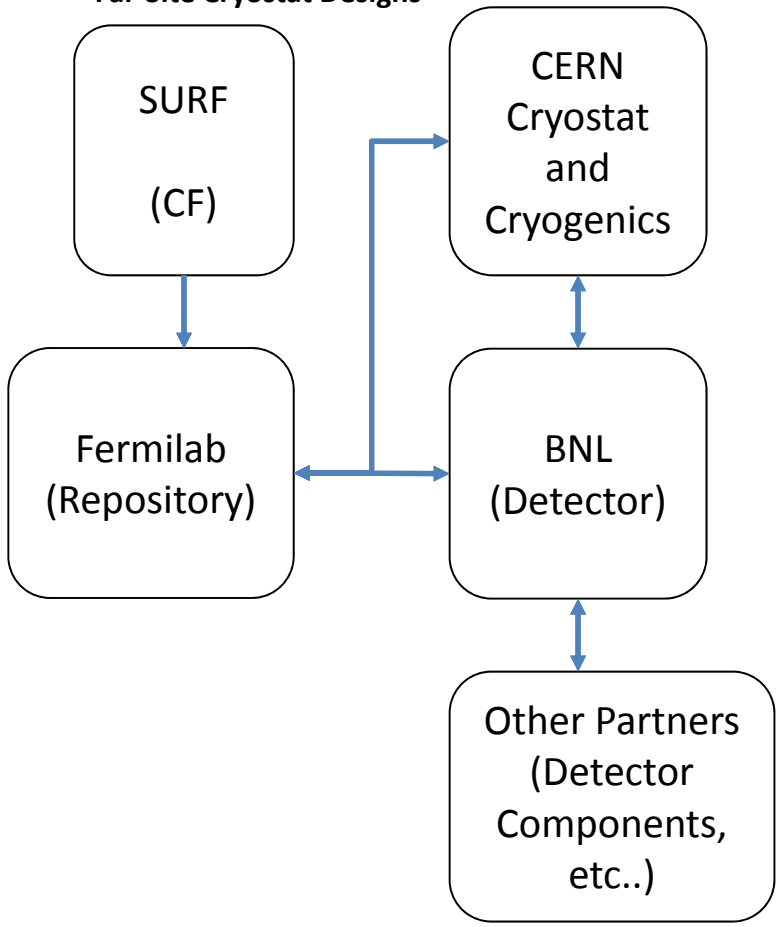
- The ultimate objective is to have an integrated, consistent and traceable approach to design and document management

- For the purpose of brevity, this presentation refers to the 3D CAD and associated data only.

Recommended Approach for LBNF/DUNE Partnership (starting at 30% Final Design for Far-Site)

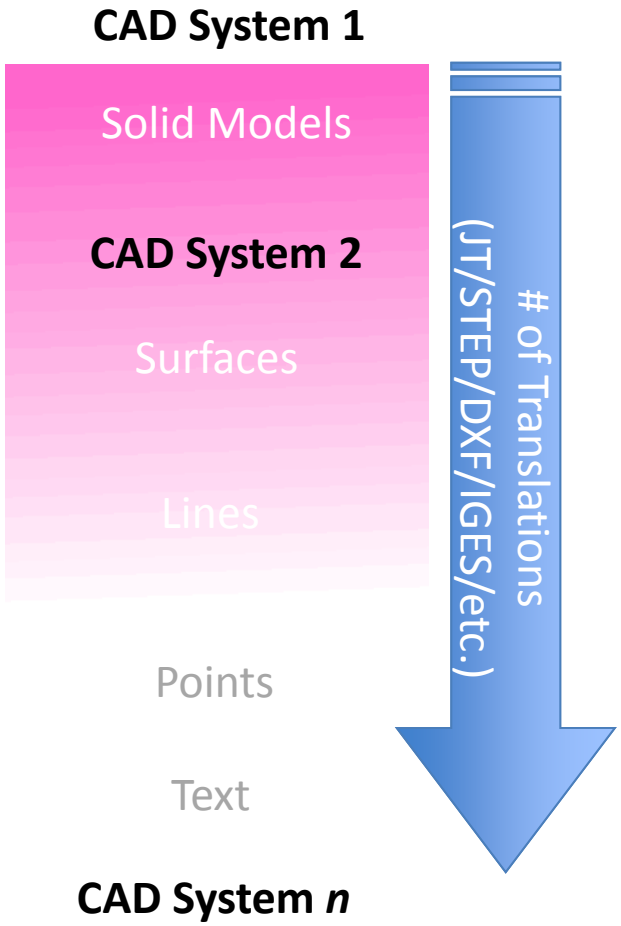
- Approach to storing, integrating, and analyzing the Design/Engineering Work
  - Emulating CERN's Past Practices with previous Joint European projects
  - Dependent on specific systems for Site (i.e. Cryostat #1 for Far-Site)
  - Fermilab will provide and manage the Engineering document repository
  - Fermilab responsible to conduct integration reviews to assure coordinated designs

Example Communication Network for Far-Site Cryostat Designs



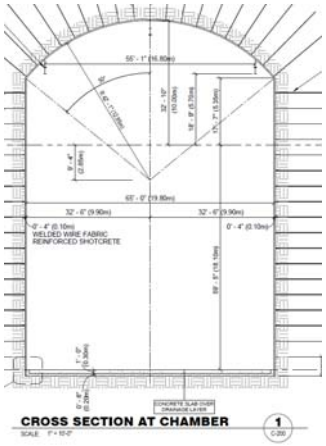
Important Goal – to avoid Miscommunication of Designs (Models and Drawings) within the LBNF/DUNE Partnership

- Traditional translation mediums for CAD Data (Models, Drawings, and so on) relied on a multitude of steps in the transmittal process
  - Easy: CAD System 1 to Neutral Format to CAD System 2
  - Hard: CAD System 1 to Neutral Format 1 to {…} to Neutral Format n to CAD System 2
- Once Translated – no guarantee that a person using the other CAD system would not alter the final result, whether "fixing a translation issue" (lost lines, surfaces, etc.) or reading accompanying Drawings or Documentation Incorrectly and altering the model



When Miscommunication Occurs – Design Issues Could Occur if Design Drawings are 'Misread'

- Use of Multiple 'Self-Modeled' 3D Designs, from various revisions of Drawings have lead to misinterpretations of dimensioning of key features – as pointed out with the Hoist Rail Location Discussion



Hoist Rail Locations

ARUP UG-PDR-C-201 (100% Prelim)

versus

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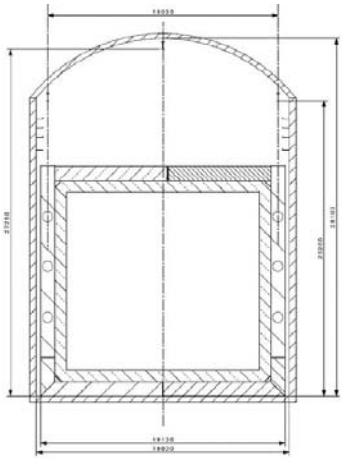
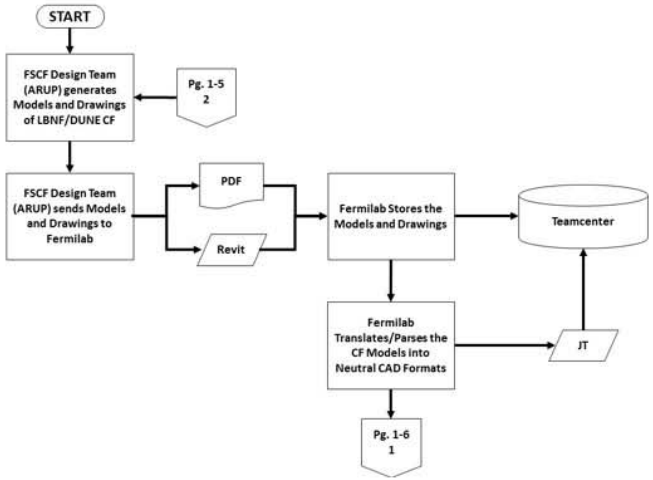


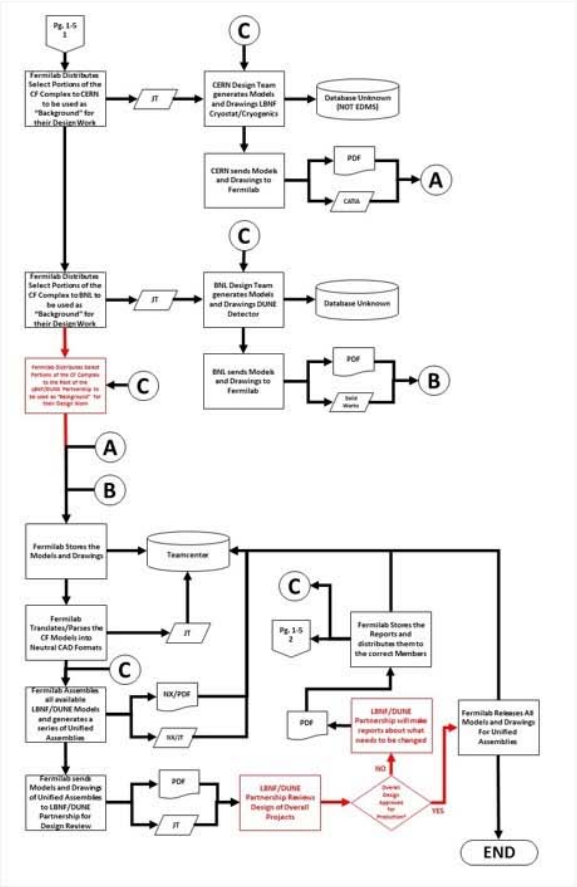
- There is a need for Partners to verify what Designs they are sharing can be read and understood by the rest of the Partnership

Design Flow Process document in development and ready for review

1 Data Flow Process – Entire 4850 Level Campus

The following diagram is to track the flow of Engineering Data (Drawings, 3D CAD Models, etc.) used to construction and maintain the LBNF/DUNE Far-Site Detector Site located at the SURF Complex in North Dakota, United States. This device, and the complex that houses is in the process of being developed by a multinational team of Laboratories and Universities – all of whom are using various levels of Design/Engineering tools to create their contributions to the effort. Fermi National Accelerator Laboratory has been tasked with tracking and maintaining all of the Drawings and 3D CAD Models created by this LBNF/DUNE Partnership, and provide design review capabilities for the entire LBNF/DUNE Partnership as well. Any part of the process that is in the color Red represent areas are processes that have not codified by the LBNF/DUNE Partnership. Parts colored Blue are processes that are between select LBNF/DUNE Partners, but have impact on the overall process.





Current Work Plan

- Do not plan on implementing any of what has been discussed before 30% Final Design for Far-Site, which is still scheduled to start in October 2016