Reverse Engineering the Amplifier Slab Tool at the National Ignition Facility

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Objective

- Review and Lessons-Learned from the migration of a legacy Microsoft Access-based application's reimplementation in Oracle APEX, in the *absence of original requirements*.

Reimplementing a Legacy MS Access Application in Oracle APEX

The Legacy Application

- The Amplifier Slab Selection Tool (ASL) provides a means to manage and track the Amplifier Slabs on National Ignition Facility (NIF) beamlines.
- Developed in MS Access when NIF was under construction, over a decade ago.
  - —Front-End comprised of Forms and Reports for use by Optics Designers/Component Engineers.
  - —Back-End saves Beamline Configuration of Amplifier Slabs in an MS Access database.

NF PORT ASL — Slab Selection Update Form

Status	Beam	Position*	SN**	Tab	Material	Bin	Pt Count	Thickness	Ref. Index	Walk Off	NCR Check***	I Code
SAVED	112	MA1	162750	4	HOY	ROW 5	3	40.93	1.5219		YES	00
SAVED	112	MA2	162972	4	HOY		4	40.81	1.5227			00
SAVED	112	MA3	163067	4	HOY		3	41.17	1.5222			00
SAVED	112	MA4	163063	4	HOY		13	40.71	1.5225			00
SAVED	112	MA5	163555	4	HOY		5	41.12	1.522			00
SAVED	112	MA6	163463	4	HOY		10	41.02	1.522			00
SAVED	112	MA7	163468	4	HOY		2	40.99	1.5219			00
SAVED	112	MA8	164090	3	HOY		7	41.1	1.5222			00
SAVED	112	MA9	164000	3	HOY		2	41.19	1.5224			00
SAVED	112	MA10	163388	3	HOY		1	41.09	1.5221			00
SAVED	112	MA11	163172	1	HOY		1	40.75	1.5224			00
SAVED	112	PA1										00
SAVED	112	PA2										00
SAVED	112	PA3	102724	1	SCH		0	40.84	1.49716875			00
SAVED	112	PA4	102751	1	SCH		1	40.88	1.4972275		YES	00
SAVED	112	PA5	102222	1	SCH		1	40.34	1.49731375		YES	00
SAVED	112	PA6	101455	1	SCH		0	41.11	1.49731125			00
SAVED	112	PA7	102658	1	SCH		0	41.06	1.497224444			00

*To swap positions edit position field. Switch SNs with same tab and different material to reduce walkoff.

**Double Click SN to view similar available slabs. Enter a new SN from the available list to switch out an existing SN.

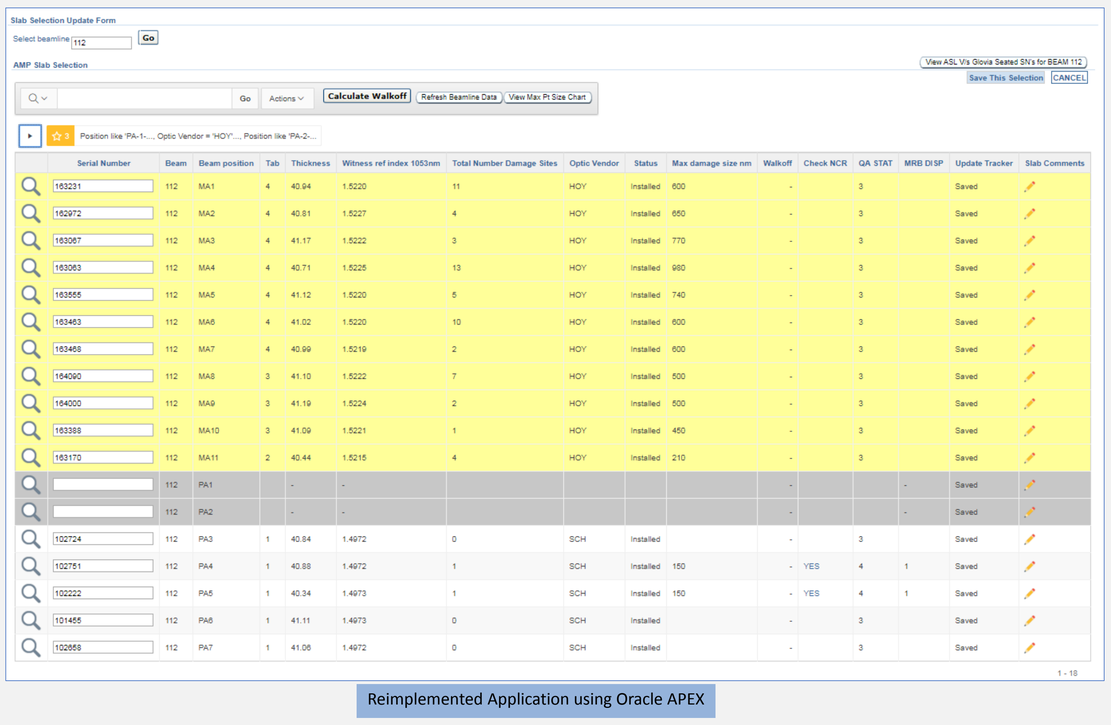
New Auto Select | Recalc Walkoff | Save This Selection OR CANCEL

***Double Click to see NCR Check — View Max Pt Size Chart

Legacy Amplifier Slab Tool implemented in MS Access as a *Standalone* Simulation Tool

The Target Application

- **Reverse-Engineered**, **Redesigned** and **Reimplemented** in Oracle APEX.
- Added to Production Optics Reporting and Tracking (PORT) - a tool suite used by NIF Engineers/Scientists for activities including
  - —reporting and analysis
  - —task-scheduling and optics installation
  - —optics and targets tracking.



Reimplemented Application using Oracle APEX

METHODOLOGY

Reverse-Engineer, Redesign and Reimplement.

GOAL: Implement a new application that was functionally equivalent to the legacy application, in the absence of original requirements.

1. Identify all functionality in Legacy tool
2. Identify Obsolete Functionalites
3. Reverse Engineer Requirements
4. Identify New Requirements
5. Design New Backend
6. Design New Frontend
7. Convert Data

Methodology Followed

Identifying All Legacy Functionality

GOAL: Gain broad understanding of features provided by tool.

- Identify Legacy Application Features
- Understand Usage Patterns
- Identify the Data Flow

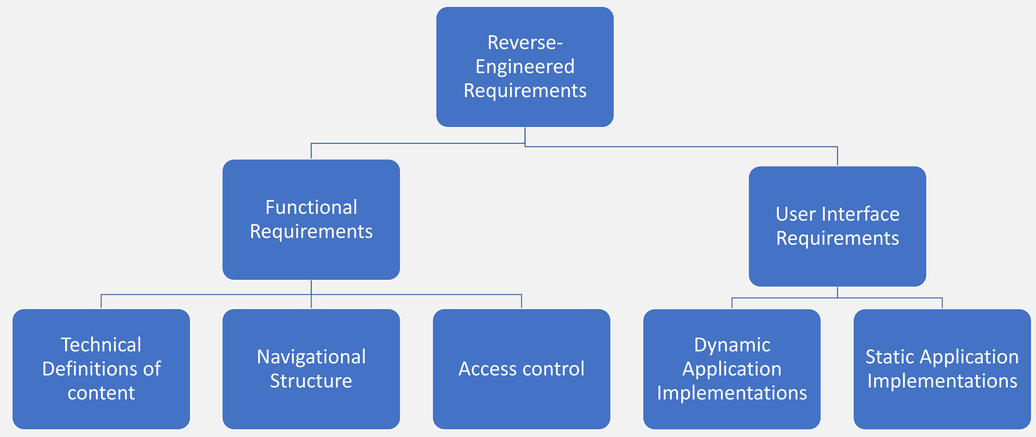
Identifying Obsolete Functionalities

GOAL: Identify Legacy Application Functionalities that are now obsolete.

- Identify Redundant Features given the new environment
- Identify Features made Obsolete by Business Process Changes
- Identify Features made Obsolete due to changes in project scope and needs.

Reverse Engineering Requirements

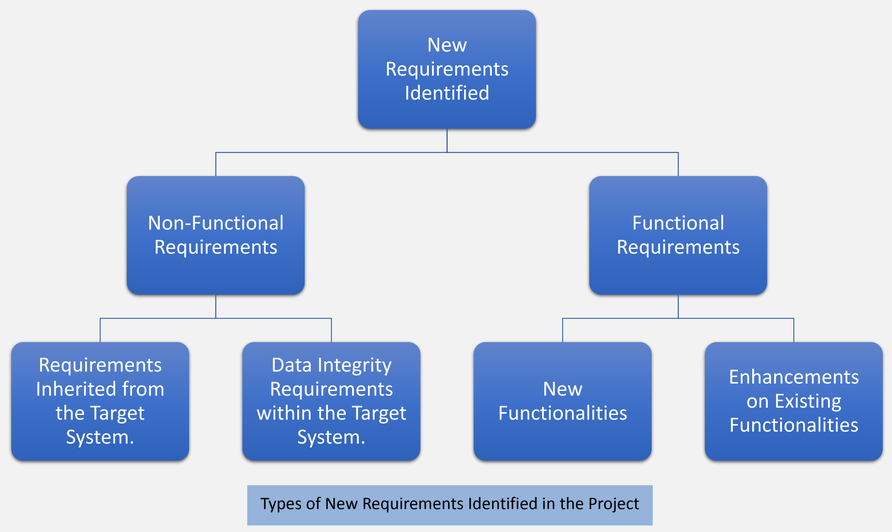
GOAL: Perform a deep-dive analysis to uncover the design of the legacy tool.



Types of Reverse-Engineered Requirements in the Project

Identifying New Requirements

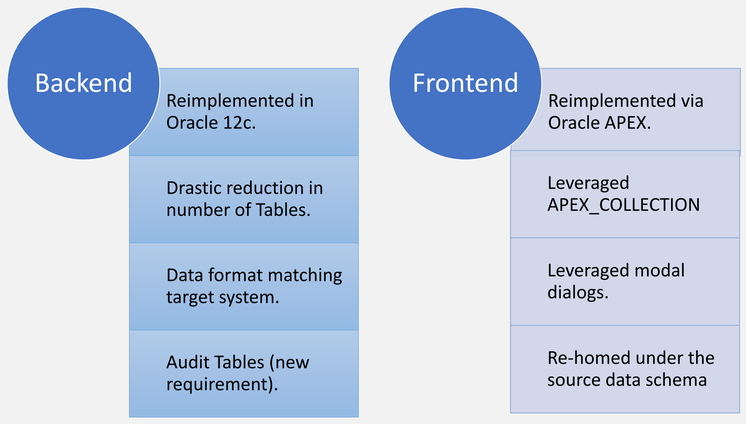
GOAL: Add new requirements into the system. These could be new or enhanced functionalities, as well as requirements pertaining to the target environment.



Types of New Requirements Identified in the Project

Designing the New Application

GOAL: Based on all reverse-engineered and newly identified requirements, re-design application to be implemented in the target environment.



Data Conversion

FullConvert v7 was used to convert database constructs in the MS Access database 2010 to Oracle 12c. This allowed for automatic, direct conversion from the MS Access database constructs (standard datatypes, tables etc.) to Oracle database constructs with minimal user inputs.

CURRENT STATUS AND FUTURE WORK

The conversion project of the Amplifier Slab tool from MS Access to Oracle APEX was one of a series of such conversions, which have all been successfully completed. The converted application is being actively being maintained by the PORT team and is being prepared to undergo an upgrade from Oracle APEX 5.0 to Oracle APEX 19 at this time.

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