Computerized Maintenance Management System (CMMS) Integration to BUILDER

Presented to the **BUILDER™ Summit**

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Lawrence Livermore National Laboratory

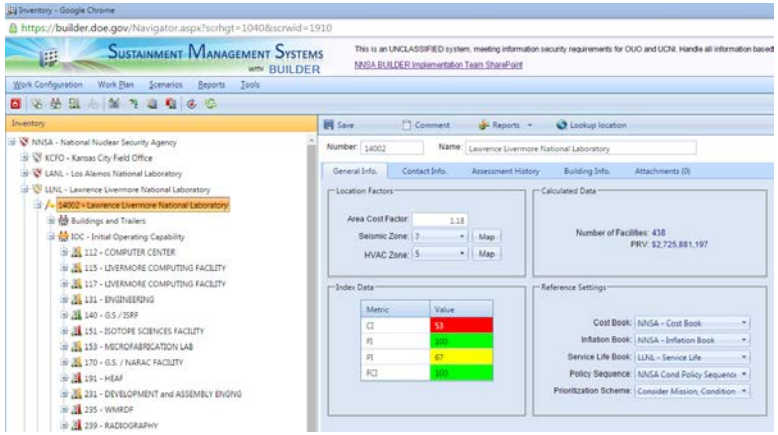
BLUF

- Livermore first achieved CMMS integration in 2018
- NNSA needed an efficient way to implement and maintain site data integration with BUILDER
- We recognized that data sources come and go in our ever-changing IT landscape
- The InSite application and database was built with this basic tenet in mind

As InSite's features continue to evolve, the implementation of data extrapolation continues to be critical as we leverage our soft data relationships and exploit a very powerful CMMS integration application program interface (API)

NNSA BUILDER provides critical data to support agency decision-making

- BUILDER provides:
  - Risk-informed portfolio management based on engineering and life cycle cost data and analysis
  - Funding level scenario analysis and risk projection
  - Correlation of condition to importance across all real property assets
  - Credibility with stakeholders



National Nuclear Security Administration

SMS

US Army Corps of Engineers®

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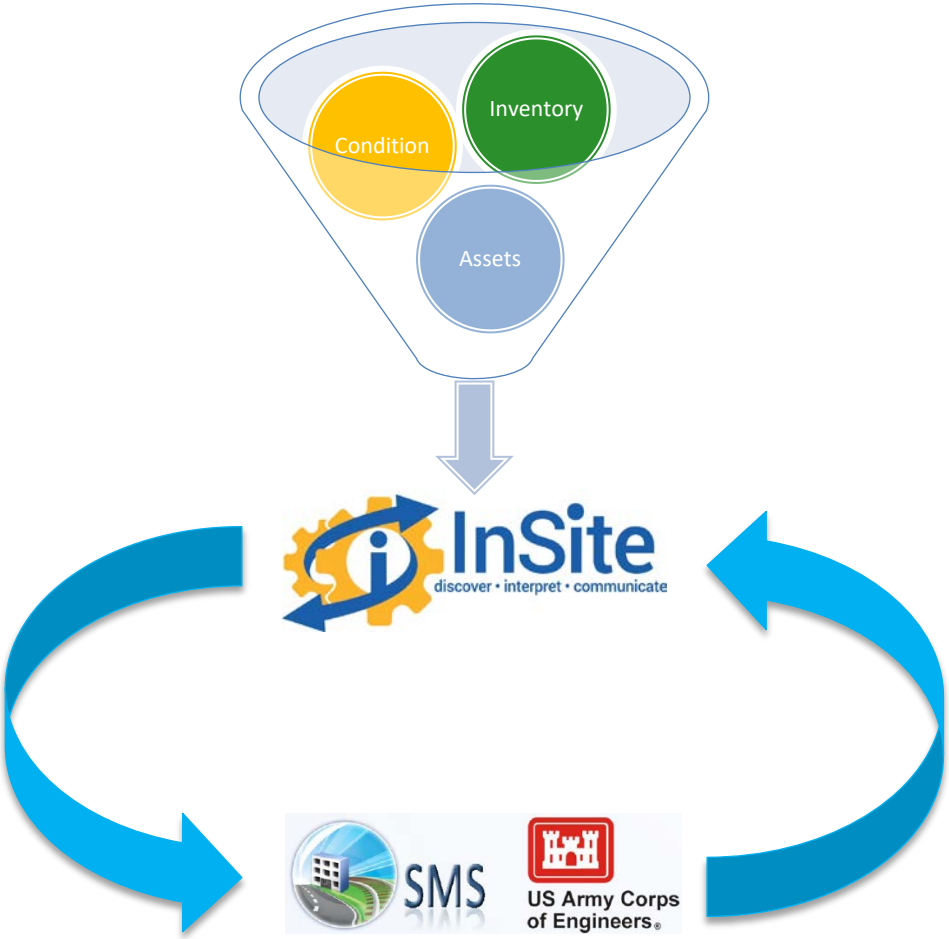
Livermore's CMMS integration scope

Our InSite application is used to maintain BUILDER inventory and condition from our EAM's MEL and MA-50's CAIS in NNSA's BUILDER instance hosted at ORNL

FIMS asset data is used to Validate BUILDER building data

Definition	Acronym
Enterprise Asset Management System	EAM
Master Equipment List	MEL
Condition Assessment Information System	CAIS
Oak Ridge National Laboratory	ORNL
Facility Management Information Systems	FIMS



Requirement and development constraints for CMMS integration

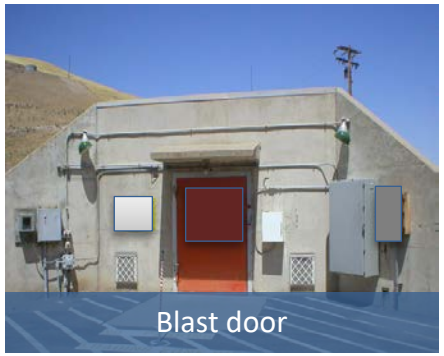
- 2017 to 2019 Livermore was in the process of migrating from a custom CMMS to the EAM Custom Off The Shelve (COTS) solution
  - NA-52's implementation plan called for CMMS integration in 2018 so a delay was not an option
- Support for a rapidly maturing catalog which requires a significant re-mapping ability
- The solution would have to be flexible enough to support an ever-changing environment
- Support for complex analytics (InSite Demo)

Code design challenge is to produce a flexible, scalable, and configurable solution

InSite provides powerful, specialized processing to represent unique NNSA infrastructure

- Detects retired inventory in EAM and removes them from BUILDER
- Detects new inventory in EAM and creates new inventory in BUILDER
- Detects replaced inventory in EAM and replaces the inventory in BUILDER
- InSite has a bulk re-mapping feature that can move entire systems or just one inventory item and their inspections records to a new catalog item

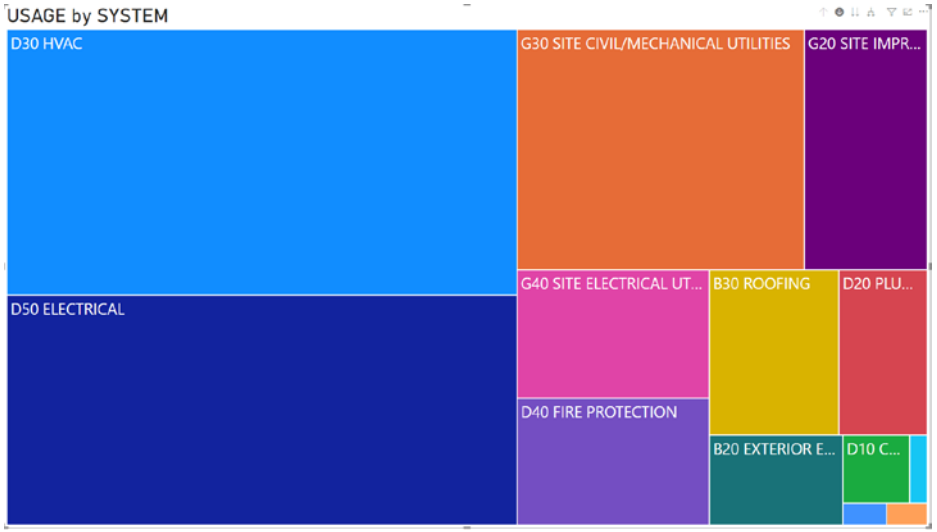
NNSA infrastructure includes facilities and systems not found in the commercial world


Blast door

800-ft deep water shaft

Covered magazine

Representation of NSE site by Commercial systems



Configuration Type	2018	Non Standard NNSA Building systems (Addtions)	Current Total	Per/Year
BUILDER RPV asset models	76	93	169	60
Building system catalog items	3,819	6,119	10,106	996
Multipliers *	0	179	179	

* Number of multipliers depend on site determinations

InSite Processing capabilities provide for robust data validation and verification

- Detects data discrepancies between EAM facilities, BUILDER buildings and FIMS assets
- Determines assets last inspection date and creates CAIS inspections in BUILDER. It is also able to create calculated model conditions records (synthetics) leveraging a configurable process basically replacing BUILDER's rapid inspection feature with a configurable condition engine
- Keeps processing history since inception (2018)
- Automated synchronization of buildings, inventory and condition between ORNL and LLNL's InSite database
- Keeps BUILDER asset, inventory and condition history(New Feature)

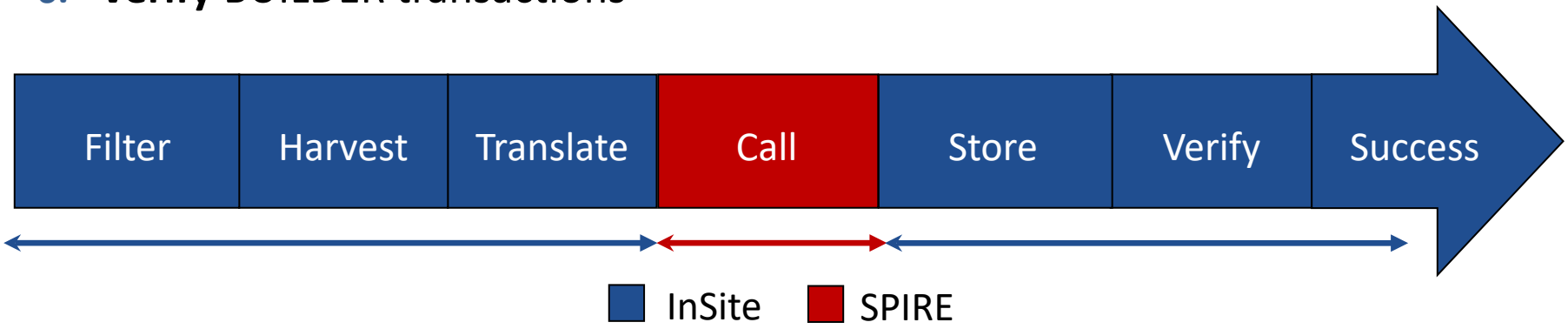
Sophisticated V&V processing capabilities provide confidence in supporting decision making

InSite processing rules enforce rigorous version control

- Transactions are verified post processing
- BUILDER inventory is flat
- Subject matter experts assign catalog entries
- Processing tables are archived weekly with archives going back to 2018
- R&D Modeling experiments are run prior to any major impact processing
- Delete API’ s are manual with strict access controls

InSite workflow process is highly integrated to the BUILDER workflow process

1. **Filter** and groups LLNL data for processing
2. **Harvest** and herds LLNL data for processing (Automation)
3. **Translate** LLNL data for SPIRE API
4. **Call** the SPIRE API
5. **Store** SPIRE API return message
6. **Verify** BUILDER transactions



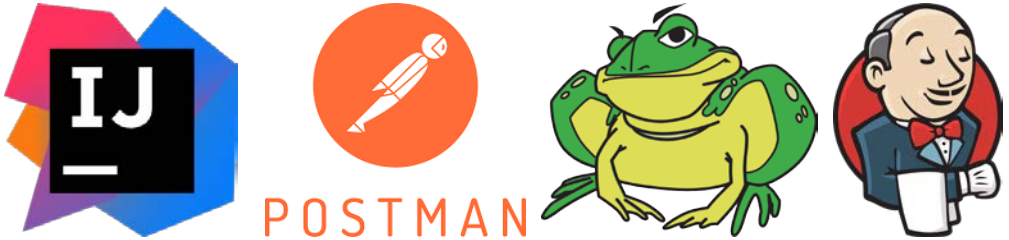
Demo

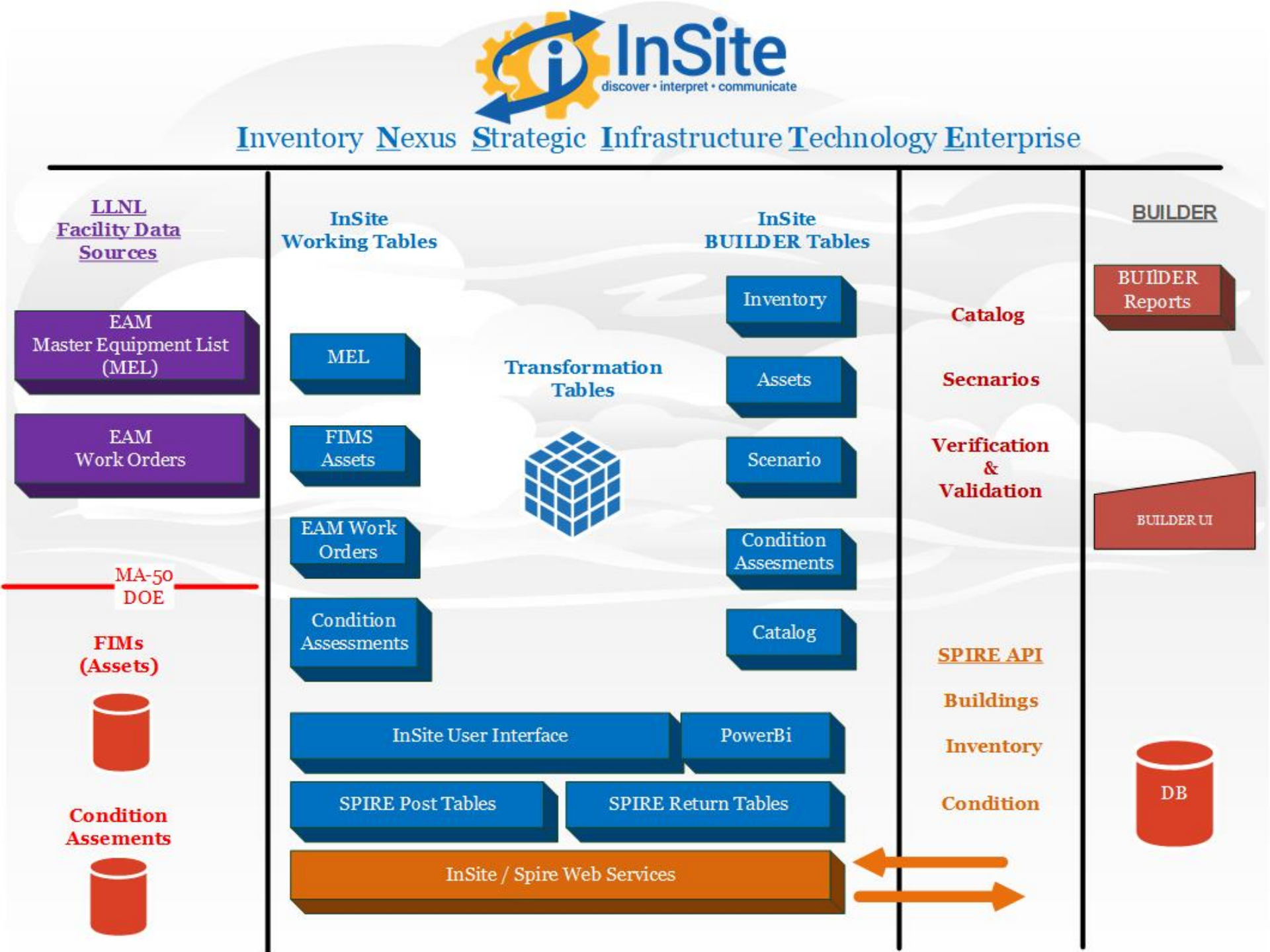
InSite technology stack is based on common industry standard frameworks

Front-End

Back-End

IDE/other




InSite
discover • interpret • communicate
Inventory Nexus Strategic Infrastructure Technology Enterprise
LLNL Facility Data Sources
EAM Master Equipment List (MEL)
EAM Work Orders
MA-50 DOE
FIMs (Assets)
Condition Assements
InSite Working Tables
MEL
FIMS Assets
EAM Work Orders
Condition Assessments
Transformation Tables
InSite BUILDER Tables
Inventory
Assets
Scenario
Condition Assesments
Catalog
InSite User Interface
PowerBi
SPIRE Post Tables
SPIRE Return Tables
InSite / Spire Web Services
Catalog
Secnarios
Verification & Validation
SPIRE API
Buildings
Inventory
Condition
BUILDER
BUILDER Reports
BUILDER UI
DB

The InSite data lounge promotes automated interaction with a wide set of infrastructure data

- **BUILDER**
  - Inventory *
  - Buildings (active NNSA Owned & Operating Buildings& Trailers and some OSF's)*
  - Condition (CAIS deficiencies & model) *
  - Catalog *
  - Scenario reports*
  - Functionality (future)
- **Facility Information Management System (FIMS) ***
- **Condition Assessment Information System (CAIS) ***
- **Personal Property Data (Sunflower) ***
  - Source system for EDADS application
- **CMMS (EAM) ***
  - Master Equipment List (MEL)
  - Work Order Data
  - Ranking data
  - Assessment data (heartbeat)

- **G2 Data ***
  - G2 Project Data
  - G2 MDI data
  - ERI data
  - NNSA capability data
- **InSite**
  - CMMS Transformation
  - Processing history
  - Synthetics
  - BUILDER history (since 2018)**
- **SAFER ***
  - Interface into EAM work order data to SAFER Palantir platform

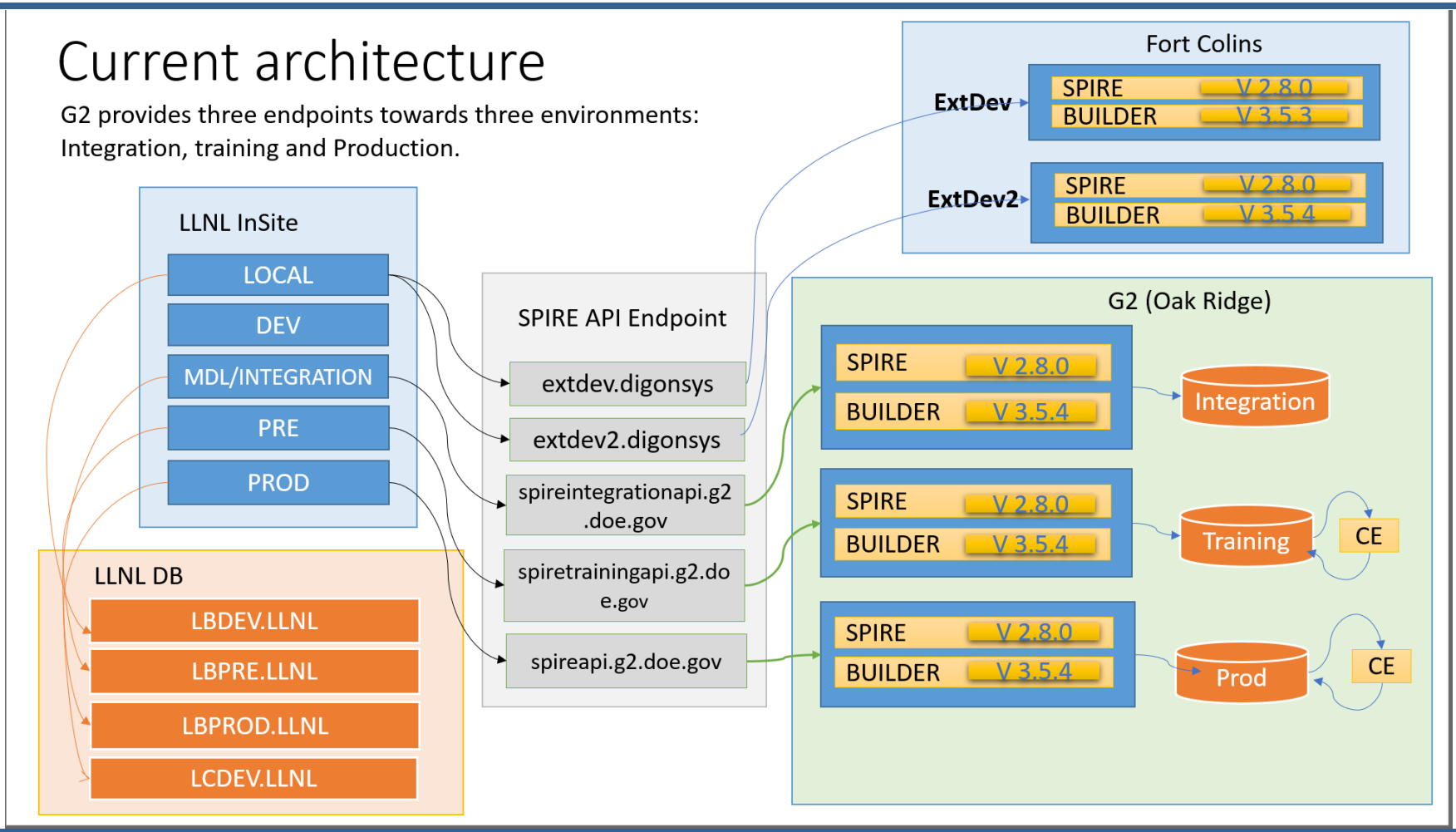
Refresh Process

* Requires manual refresh

* Daily refresh

Many sources, one repository

InSite supports integration, training, and production environments



InSite data fusion enables complex analysis and evaluation of real property life cycle data

Suite of modeling tools and data to project condition and life cycle resource requirement for infrastructure

Science Based Infrastructure Stewardship Framework

Site Data

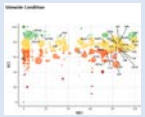
- Asset (FIMS)
- System Condition
- Master Equipment List
- Lifetime Cost Data

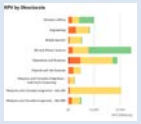
Modeling Tools

- M&R
- Life Cycle Model
- Cost Lab
- BUILDER
- LLNL Enterprise
- Equipment-EDADS

Analysis & Visualization

- LLNL InSite





- NNSA G2

Enterprise Data

- Mission Dependency Index
- (NIST) Classification Uniformat II Catalog
- Functionality Index
- RPV Cost Models

Modeling Tool Evolution Timeline

2000-2006	2006-2012	2012-2015	2015-Present
Maintenance and Repair (M&R) Modeling	Time Dependent Full Life Cycle Modeling based on Statistical Sampling	Risk Based Centered Real Property Resource Projection Cost Effective	Integrated Nuclear Weapons Capability Projection

Questions

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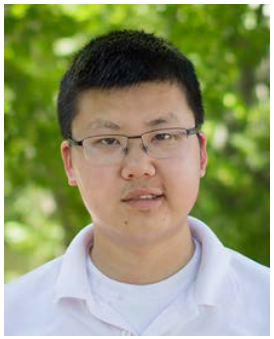
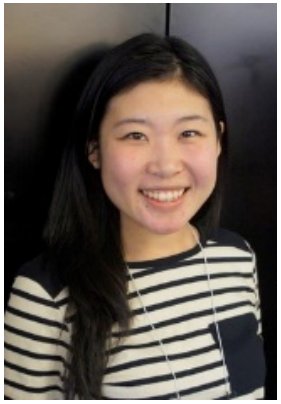
Renelda Lechner-Strand



Kevin Chen



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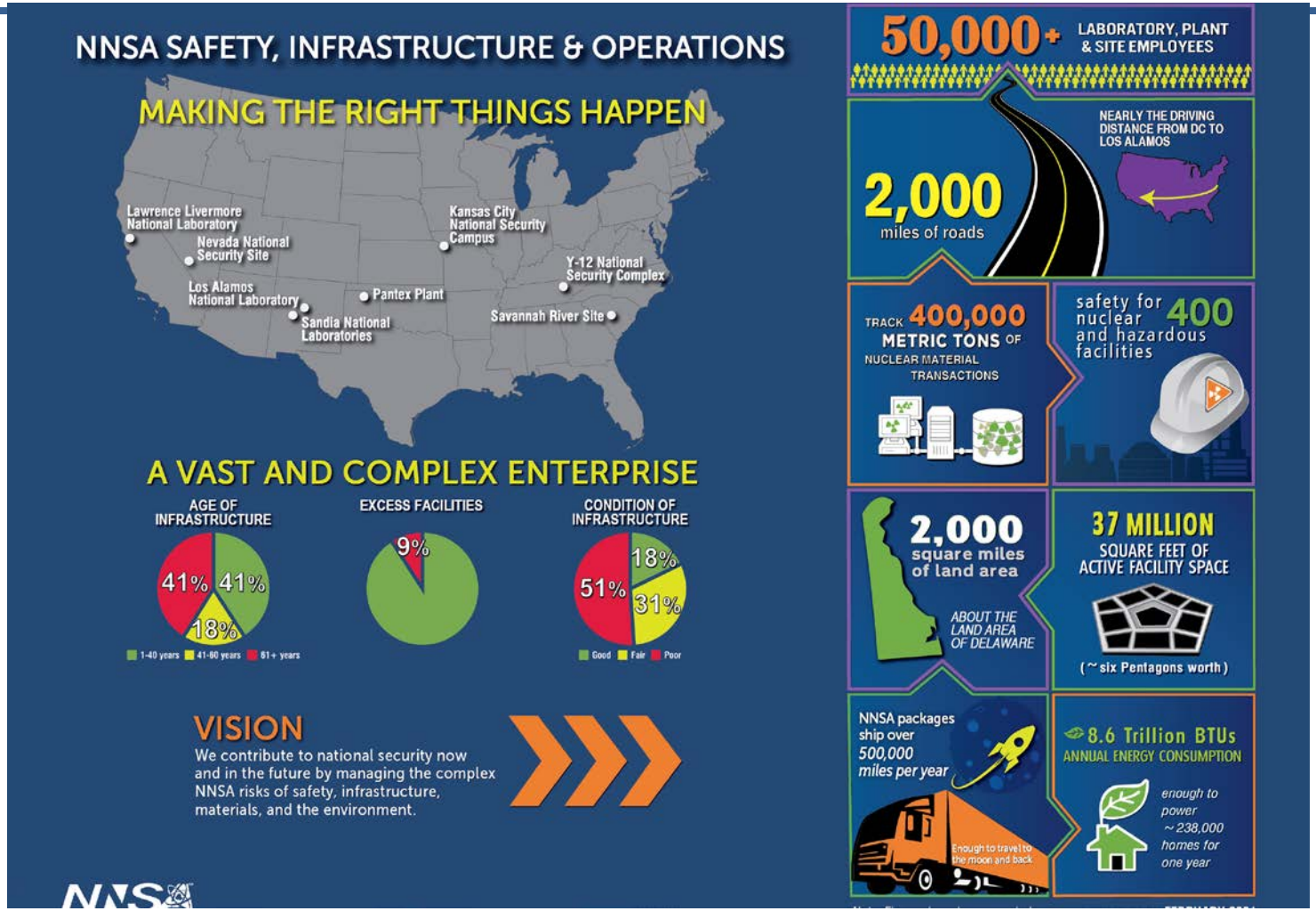
NNSA Enterprise