

# Data Management for Tracking Optic Lifetimes at the National Ignition Facility (NIF)

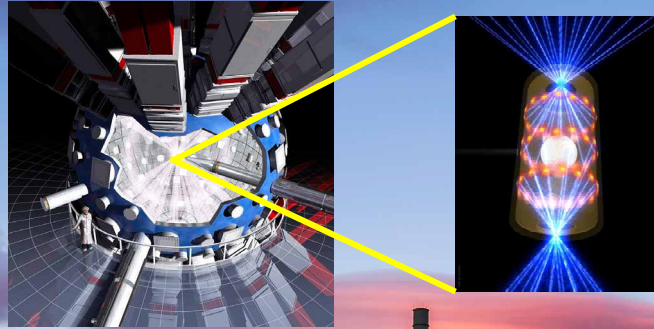
ICALEPCS 2023

October 11, 2023

Raelyn Clark



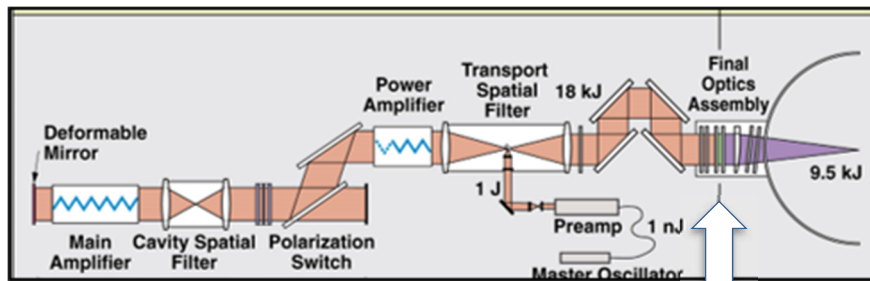
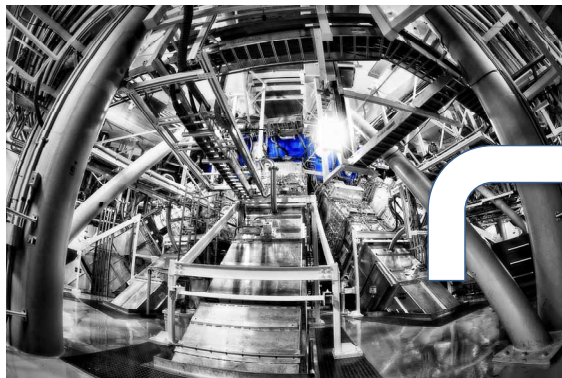
# The National Ignition Facility (NIF) high energy laser recreates the conditions inside of stars, giant planets and nuclear weapons in a 2 mm target



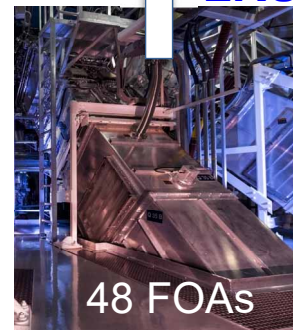
# The Optic Path



Target Chamber



LRU



Deformable Mirrors

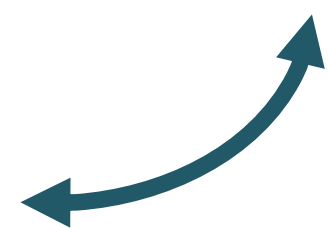
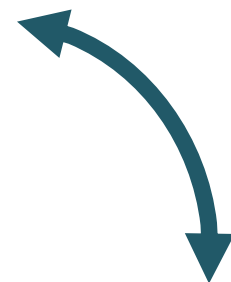
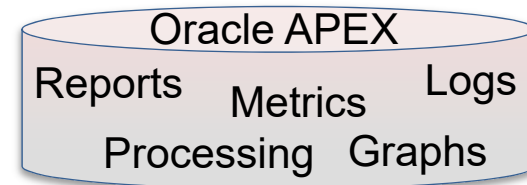
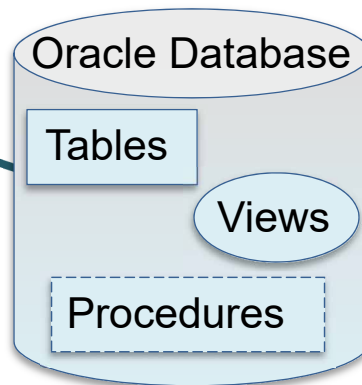
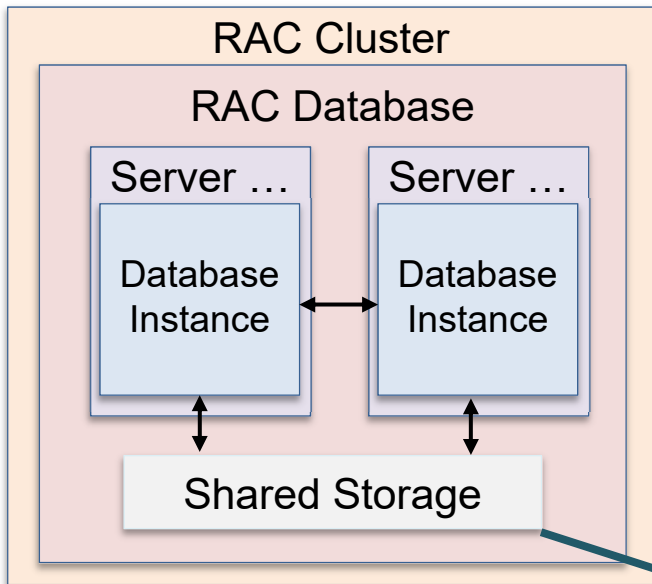


Mirrors & Polarizers

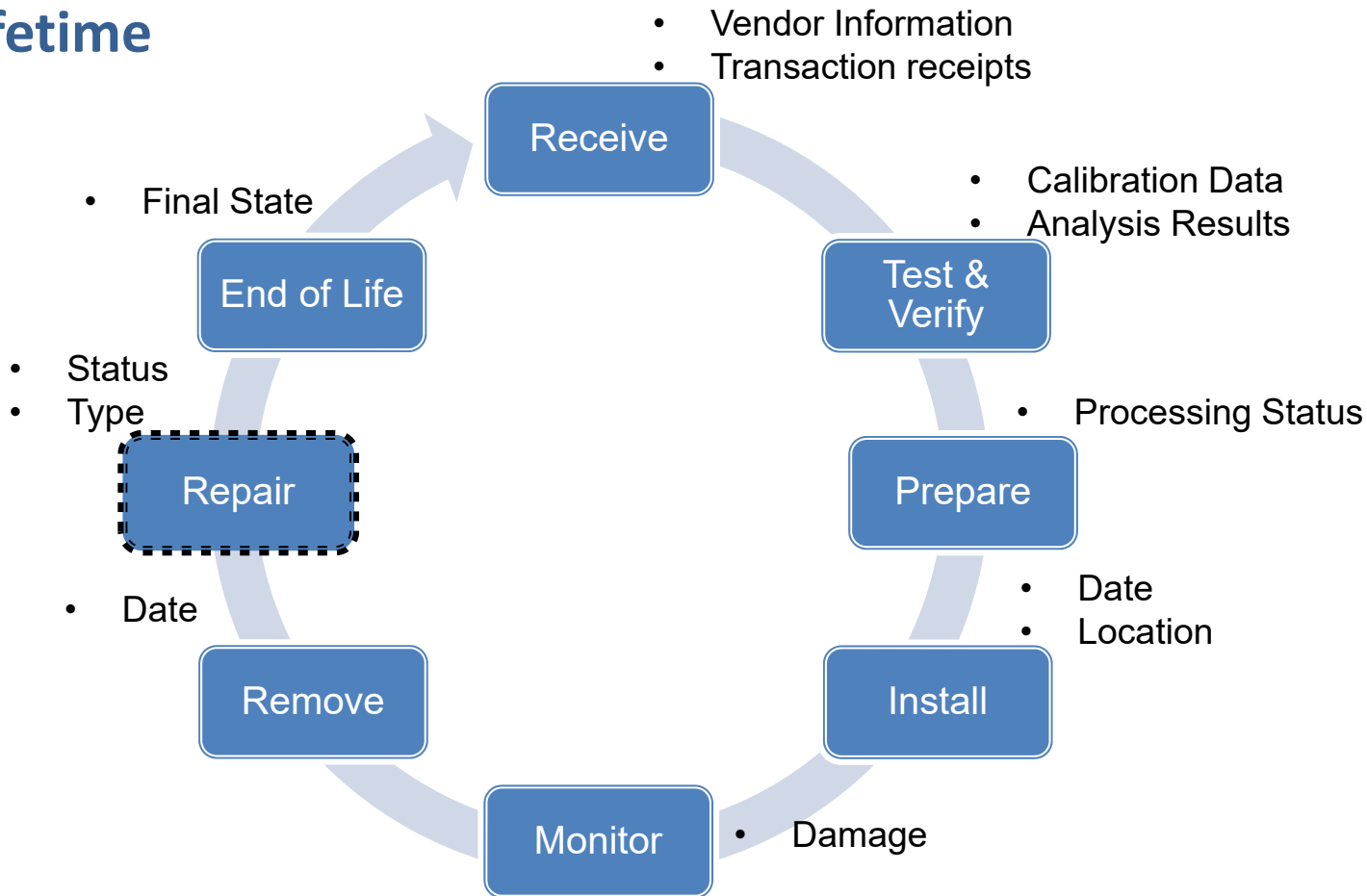


Amplifiers

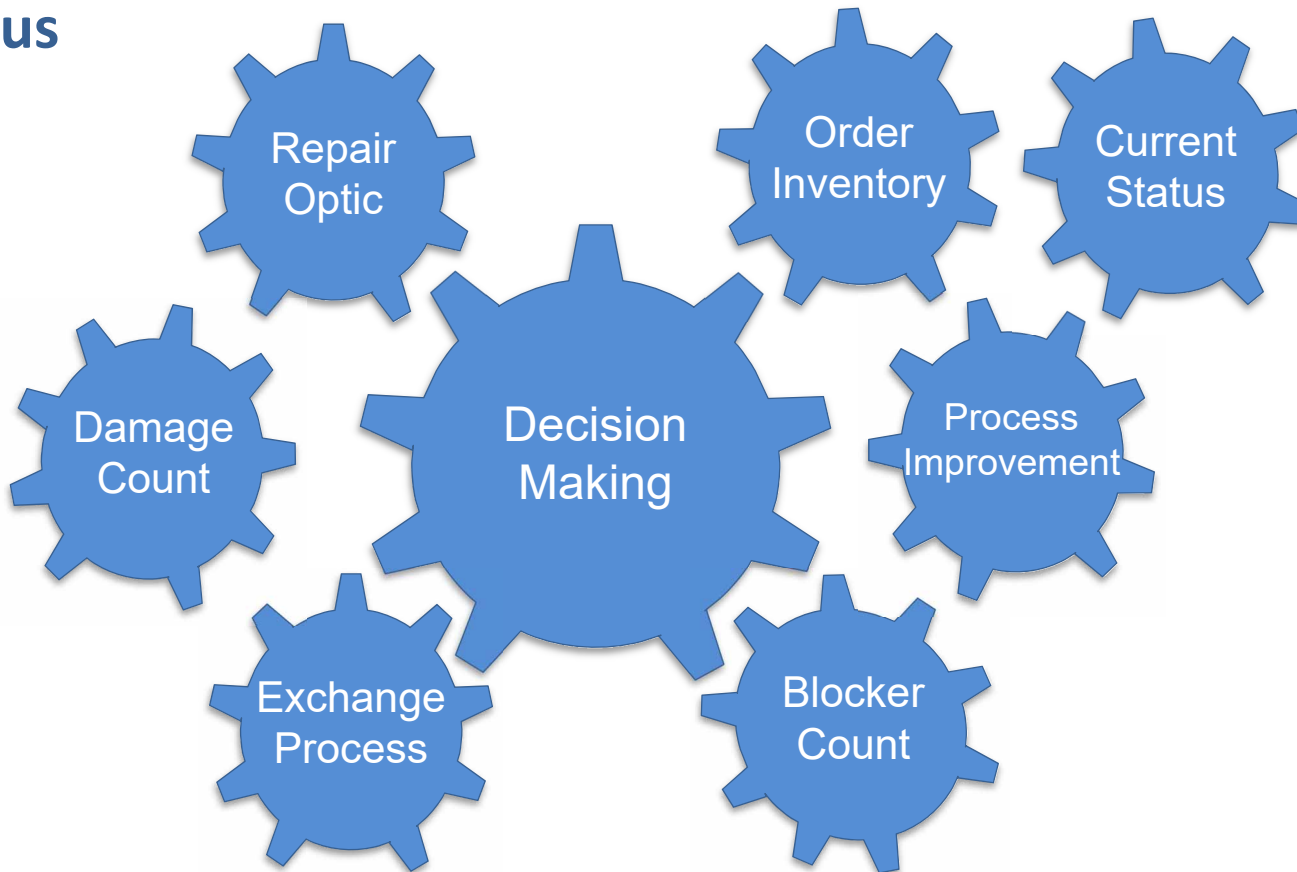
# The Database



# Optic Lifetime



# Optic Status

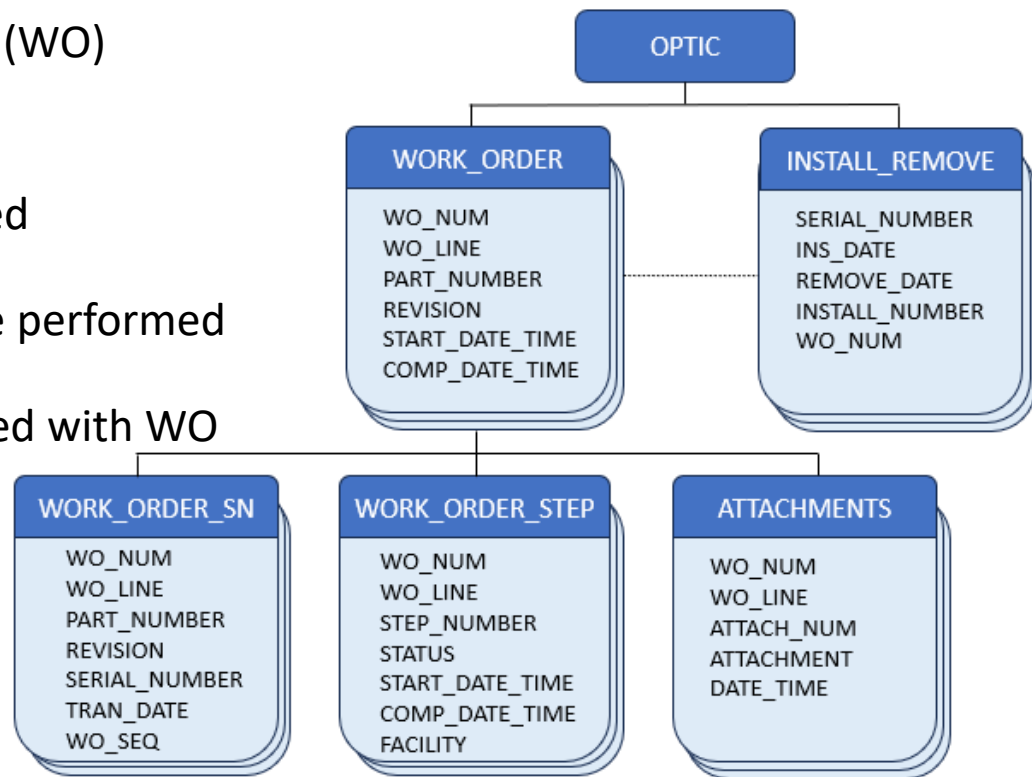


Allows key decisions to be made



# Optic Processing

- Optics transition states via Work Order (WO)
  - Type of work
  - Facility processing optic
  - Timeframe for work to be completed
- WO steps identify individual tasks to be performed
- Additional information can be associated with WO



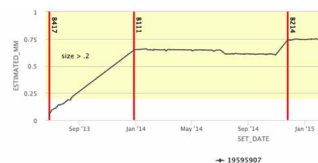
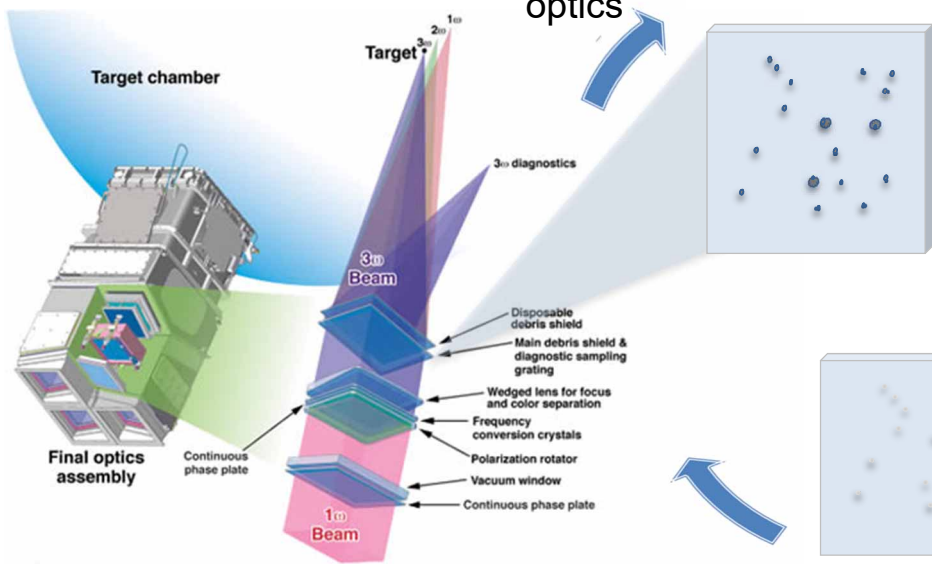
Work Order defines all work done to an optic

# Optic Processing

## Recycle Loop

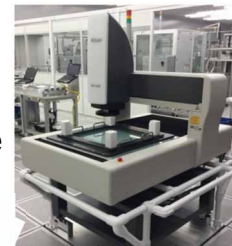
High fluence  
laser shots  
damage  
optics

Monitor damage *in situ*;  
block sites as needed

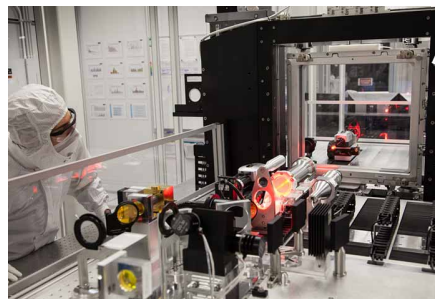


Remove optic  
from NIF

Scan with  
microscope



Repair optic in  
Mitigation Facility



Install near-perfect  
optic on NIF

Damage is tracked from on-beamline to off-beamline inspections  
and then used for many applications





# Optic Exchange Process

Exchange Plan identifies exchanges

csv file upload

Loc	Beam	Plan Date	Task Type	Comments
WFL	364	6/02/2023	INS	Recycle for shot estimated 10/5/2023
GDS	262	6/02/2023	EXCH	Recycle for shot estimated 10/5/2023

Dbase Procedure

Rows: [Delete Selections](#) [Manual Selections](#) [Auto Select SNs](#) [REJ Selections](#) [APP Selections](#) NOTE: You cannot approve your own selections

Go 1. Primary Report Rows All Actions

Needs Selection, Special / Not Ready, Dup Resvs, Non-Seat Part Number, Blockers > Max Al..., Sched Too Early

<input type="checkbox"/>	Sched ID	Sched ↑	Plan	Priority	Install Location	Activity Comments
<input type="checkbox"/>	36TL-209008	06/02/23	06/02/23	3254	BSG/MDS-364-Q3	Recycle for shot estimated 10/5/2023
<input type="checkbox"/>	26TL-209007	06/02/23	06/02/23	3254	WFL-262-Q2	Recycle for shot estimated 10/5/2023

1-2

Tasks created for exchanges

Installation Work Order generated

Dbase Procedure

[Steps](#) [Issue](#) [Serial BOM](#) [Datasets](#)

Order Description: INSTALL FROM INVENTORY  
Part Description: ASSEMBLY, MDS LRU, Q1/Q3, MDS LRU ASSY, Q1/Q3

Automated processing results in Work Order generation

# Checks and Balances

## Database Constraints

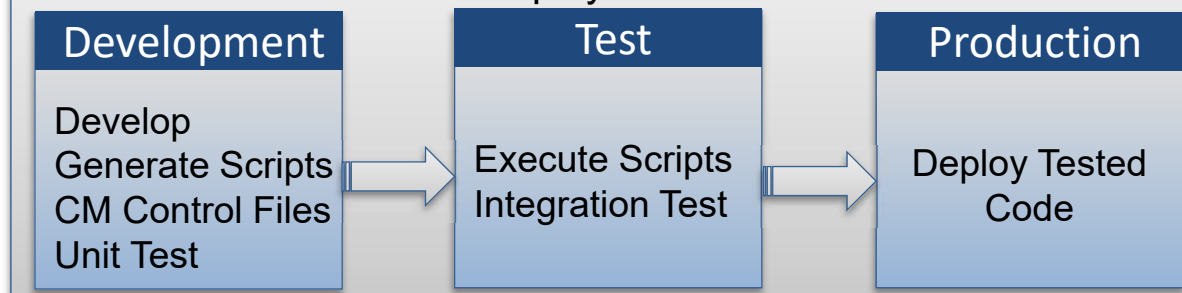
SN	LRU	Part Number	WO	Status	Location	Completed	Completed Date	Completed Time
97121		AAA96-111-02			WH_ITT	Trans to Vend	8-Nov-12	94632
97121		AAA96-111-02	VW11102	C			19-Jul-12	100032
97121	12112231	AAA06-222	DW10999	C			6-Jul-12	163130
97121	12112231	AAA06-222	AW108755	C	OMF	MITLSM	2-Jul-12	202600
97121		AAA96-111-02	PW108665	C	OPF	IMSL5	29-Jun-12	64800
97121		AAA96-111-02	PW108665	C	OPF	COAT	26-Jun-12	62900
97121		AAA96-111-02	PW108665	C	OPF	STRIP5	25-Jun-12	143200
97121	12221123	AAA06-313	IW107113	C	NIF	REMOVE	14-Jun-12	162900
97121	12221123	AAA06-313	IW107113	C	NIF	INSTALL	3-Apr-12	64909

↑  
Referential Integrity

↑  
Check Constraint

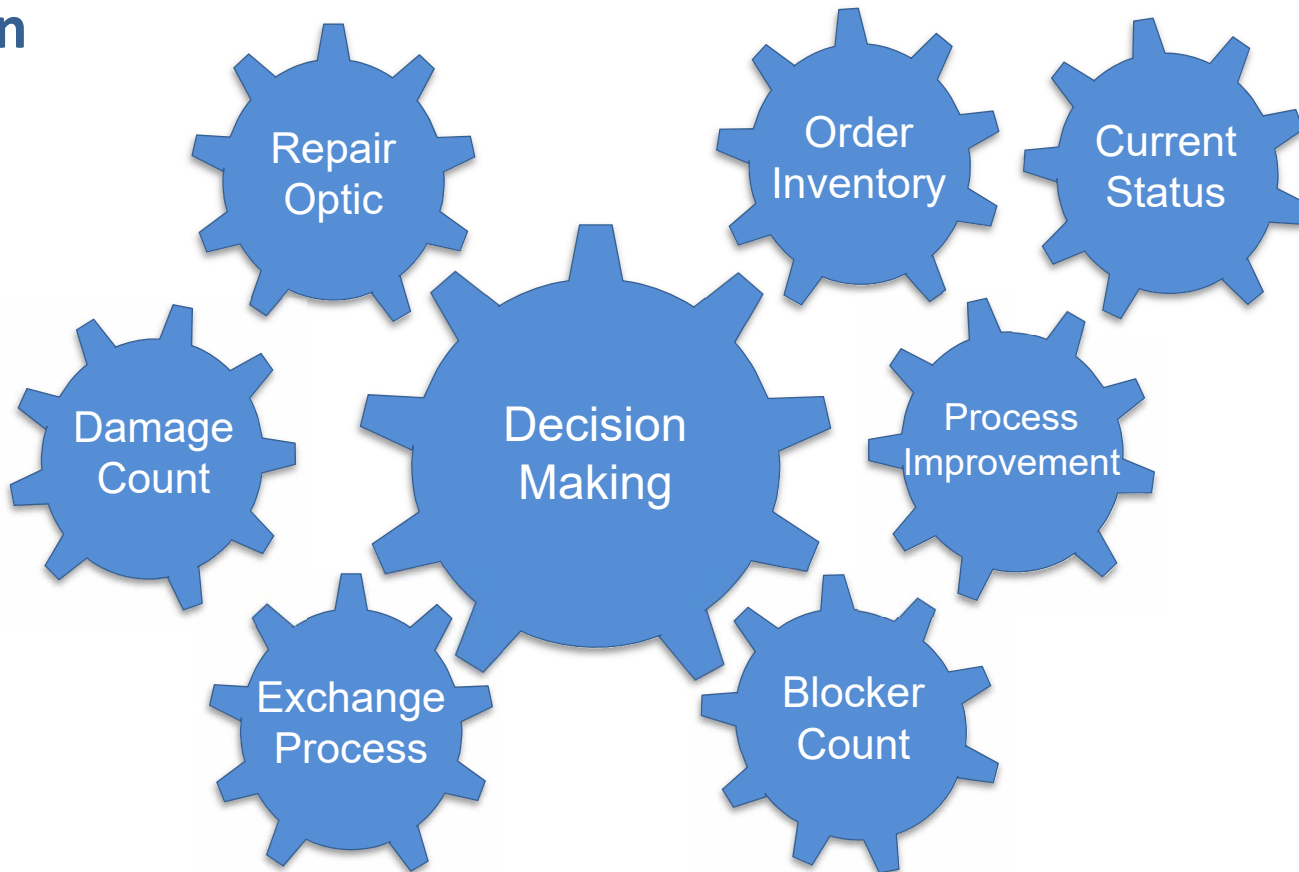
↑  
Auto Populate

## Multi-Level Deployment Environment



**Data Integrity is a MUST!**

# Conclusion



Quality data and a stable environment are key to critical decision making





**Lawrence Livermore  
National Laboratory**