



**Newport News
Shipbuilding**

A Division of Huntington Ingalls Industries

Digital Problem Resolution (DPR)

Using 3D Scans to Support a Revised Growth IR Resolution Process



ManTech Project Number S2762
Process Change - Under Cognizance of Industry

NSAM

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- Digital Problem Resolution (DPR) Overview
- History of Technology at NNS
- Overview of Technology and Applications
- DPR Project Details



Project Purpose:

“Develop a process for capturing and retaining growth work items *using digital information capture technologies*”

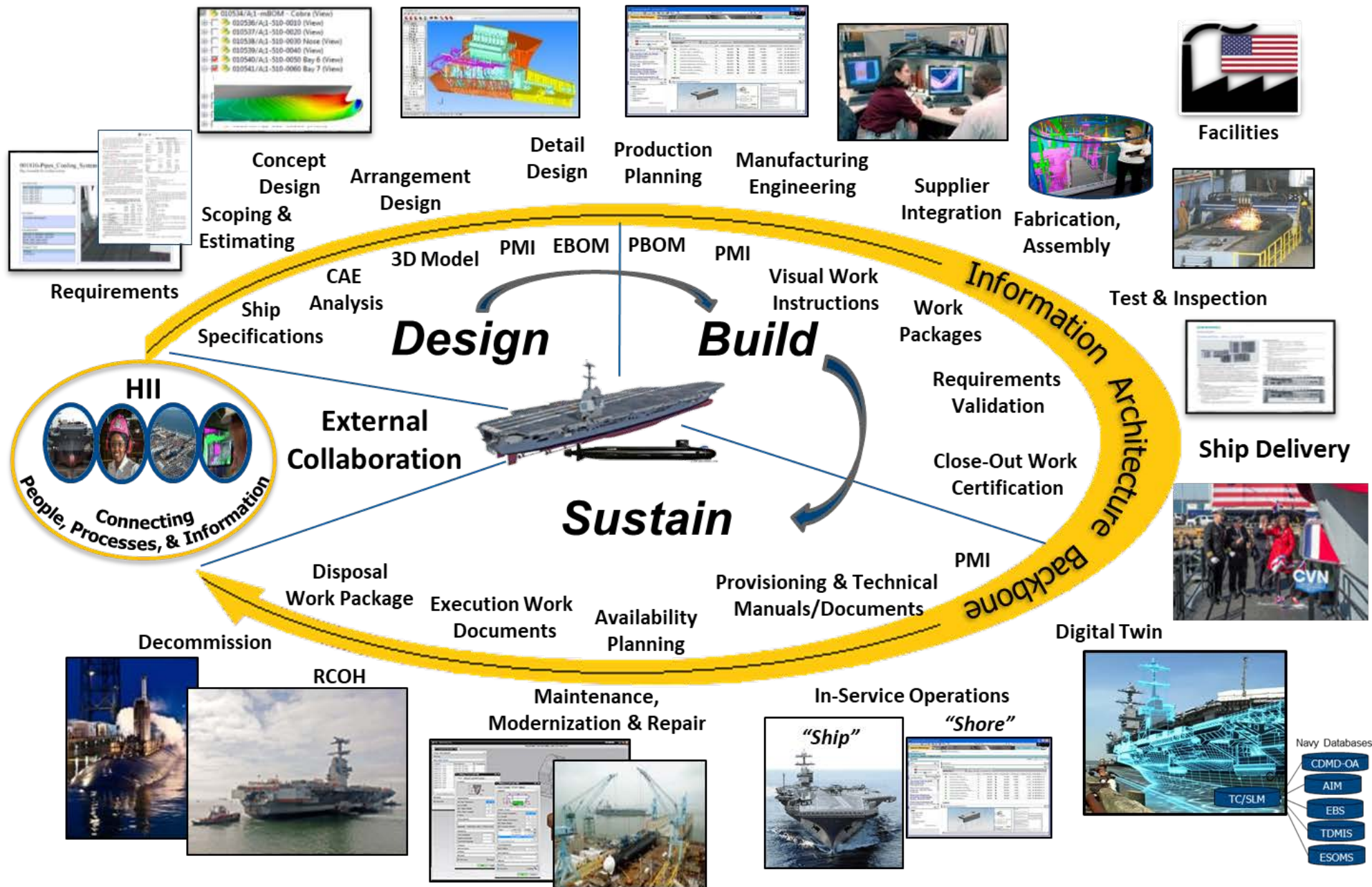
Project Goals

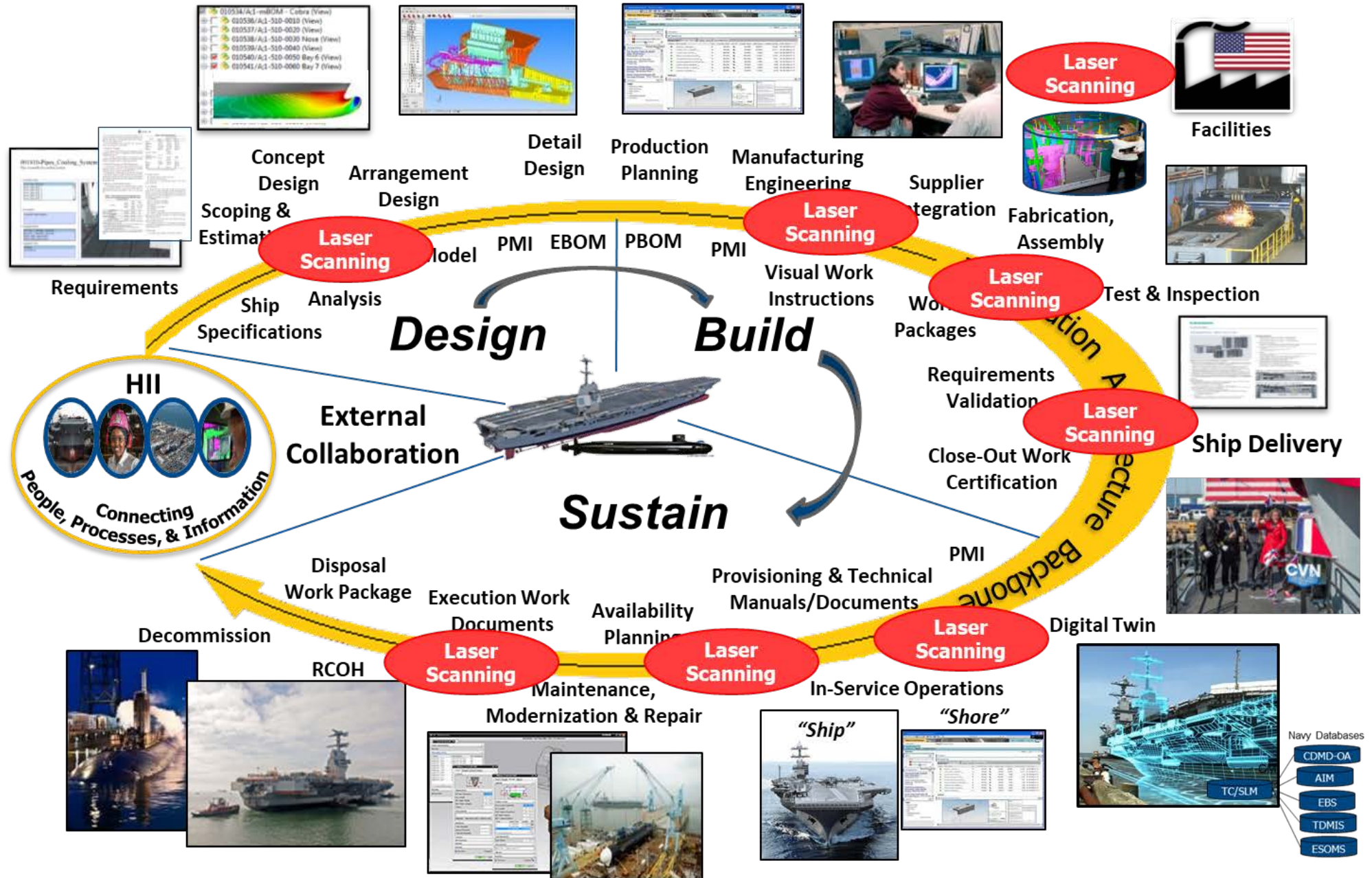
1. Phase I: Establish a Knowledge Base to store identified resolutions for each growth work item (Complete 12/2018)
2. Phase II: Define a new problem resolution process and evaluate both the process and Knowledge Base in active contracts. (On Track for 8/2019)



- In the midst of a digital transformation
- Our business is being disrupted
- There are a multitude of opportunities
- In recent years – Laser Scanning
 - MANTECH: Reality Capture (April 2015)
 - NSRP: 3 Views to 3D (September 2017)
 - NSRP: Foundational Technology for Scanning & Laser Peening in Shipyards (March 2018)
 - NSRP: Capturing In-Service Ship Configuration (2019-2020)







LASER Scanning is the controlled steering of LASER beams followed by a distance measurement at every pointing direction. This method is used to rapidly and accurately capture shapes of objects, buildings, and landscapes. A variety of sensors exist with accuracy's of .002"–0.125".

A **Point Cloud** is digital display of all the point information captured by the laser scanner including each point's location (x, y, and z relative to a given origin) and other relevant information (ex. color, temperature, etc.).

A **3D model** can be developed by linking points together via lines and then creating surfaces where 3 or more lines intersect. Surfaces can also be constructed by using the points as a guide to define new 3D solid shapes.



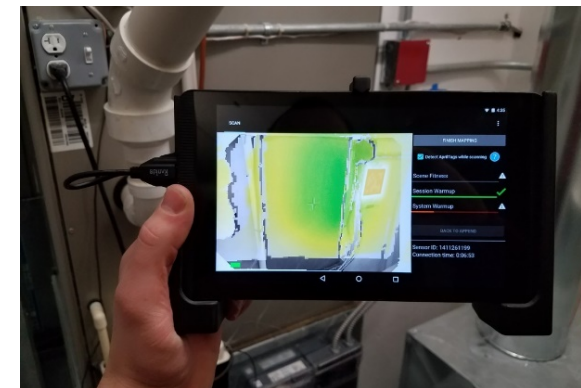
About the Technology - Hardware

Hardware	Accuracy	Used For
GeoSLAM ZEB-REVO RT	1 – 3 cm	3D mobile mapping
FARO Scan Arm	≤ 1 mm	Dimensional analysis, inspection, reverse engineering
Basis Surphaser 100HSX	≤ 1 mm	Reverse engineering, dimensional control, BIM, historical preservation, architecture, forensics
FARO Freestyle X	≤ 1 mm	Complex measurements, reverse engineering, facility management, forensics, accident reconstruction
FARO Focus3D X 330	1 mm	Ship repair, as-built documentation, facility management, surveying, forensics, quality control, historical/archeological 3D documentation, BIM
Leica P-20	3 mm	Industrial as-built documentation, BIM, construction, forensics
DotProduct DPI-8X	≤ 1.7 mm	As-built MEP, BIM, renovation design, progress tracking, forensics, heritage documentation, shipboard conditions

GeoSLAM
ZEB-REVO RT



FARO Focus3D X 330



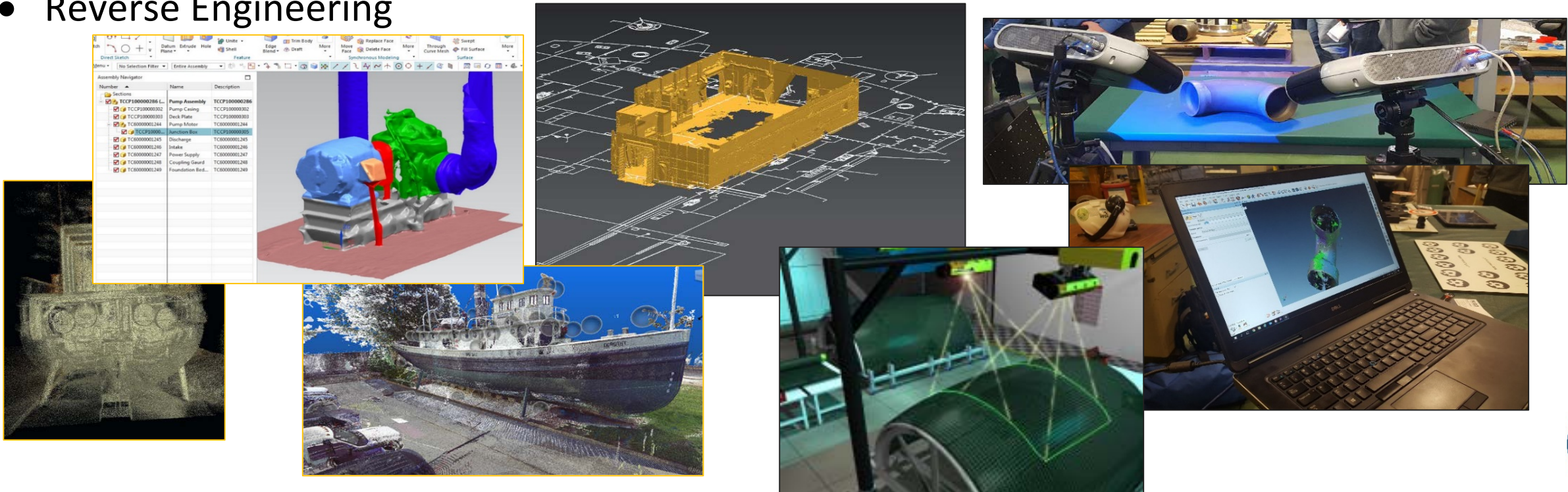
DotProduct
DPI-8X

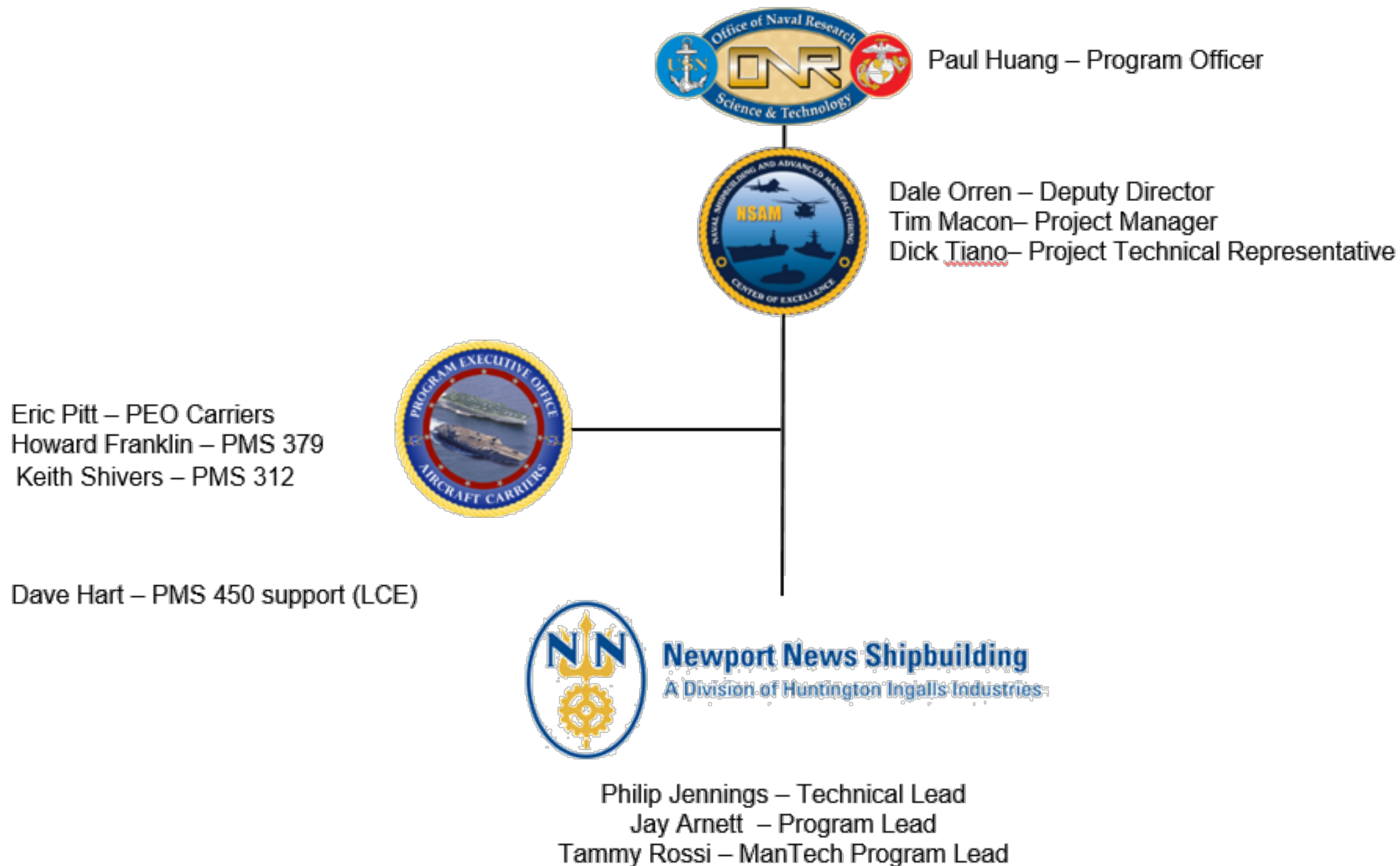


Software	Used For
Leica Cyclone	Process, model, and manage 3D point clouds
FARO Scene	Processing and managing FARO scan data
Autodesk ReCap	Create point clouds or meshes ready for CAD and BIM authoring tools
Geomagic Design X	Reverse engineering, combine history-based CAD with 3D scan data processing
Geomagic Wrap	Transform 3D scan data and imported files into 3D models for use downstream
Basis Software SurphExpress	Surphaser scanner control, data analysis, and exportation
Elysium InfiniPoints	Point cloud data processing, modeling, and analysis for engineering applications
Thinkbox Software Sequoia	Stand alone point cloud processing and meshing
Capturing Reality RealityCapture	Automatically extract 3D models from a set of ordinary images and/or laser scans
Bentley Systems ContextCapture	Hybrid process reality meshes using point clouds supplemented with high-res photography



- As-built condition assessment and ship check
- Clash detection and analysis
- Virtual product measurement
- Execution of damage investigation
- Critical alignment
- Reverse Engineering
- Improved quality review
- Collection of data in normally inaccessible areas
- Asset documentation
- Job briefings and animations
- Digital problem resolution (DPR)





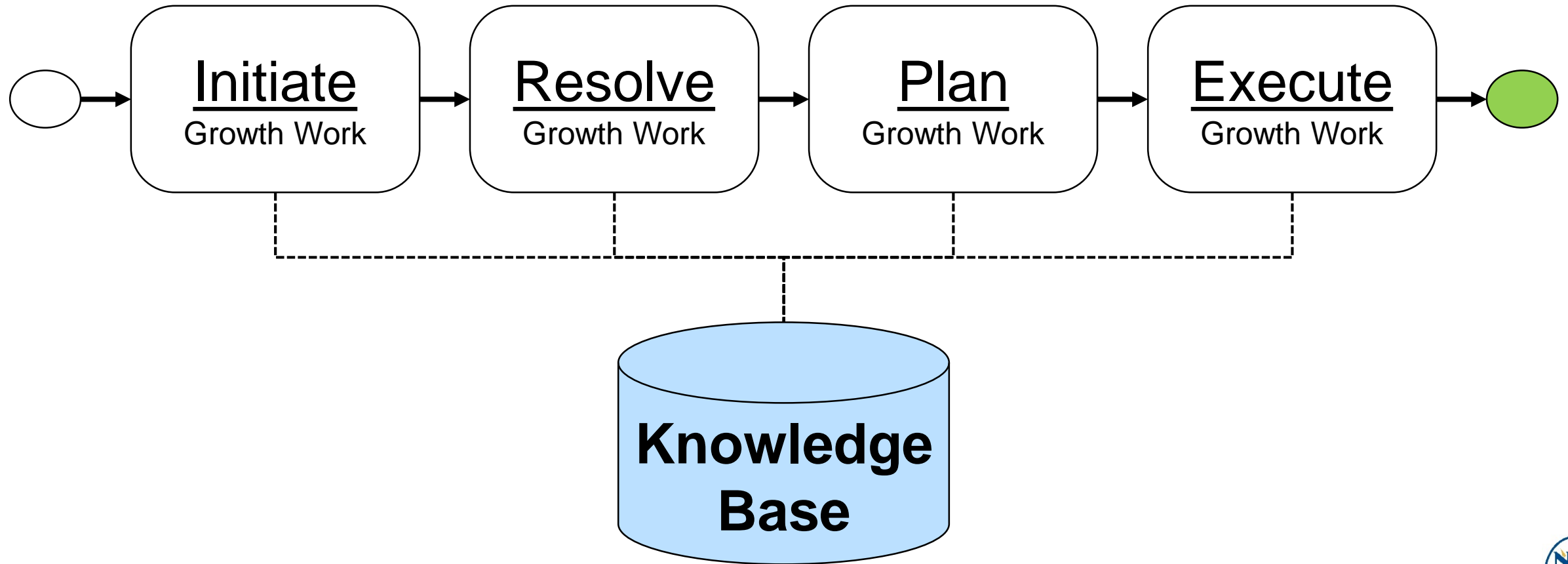
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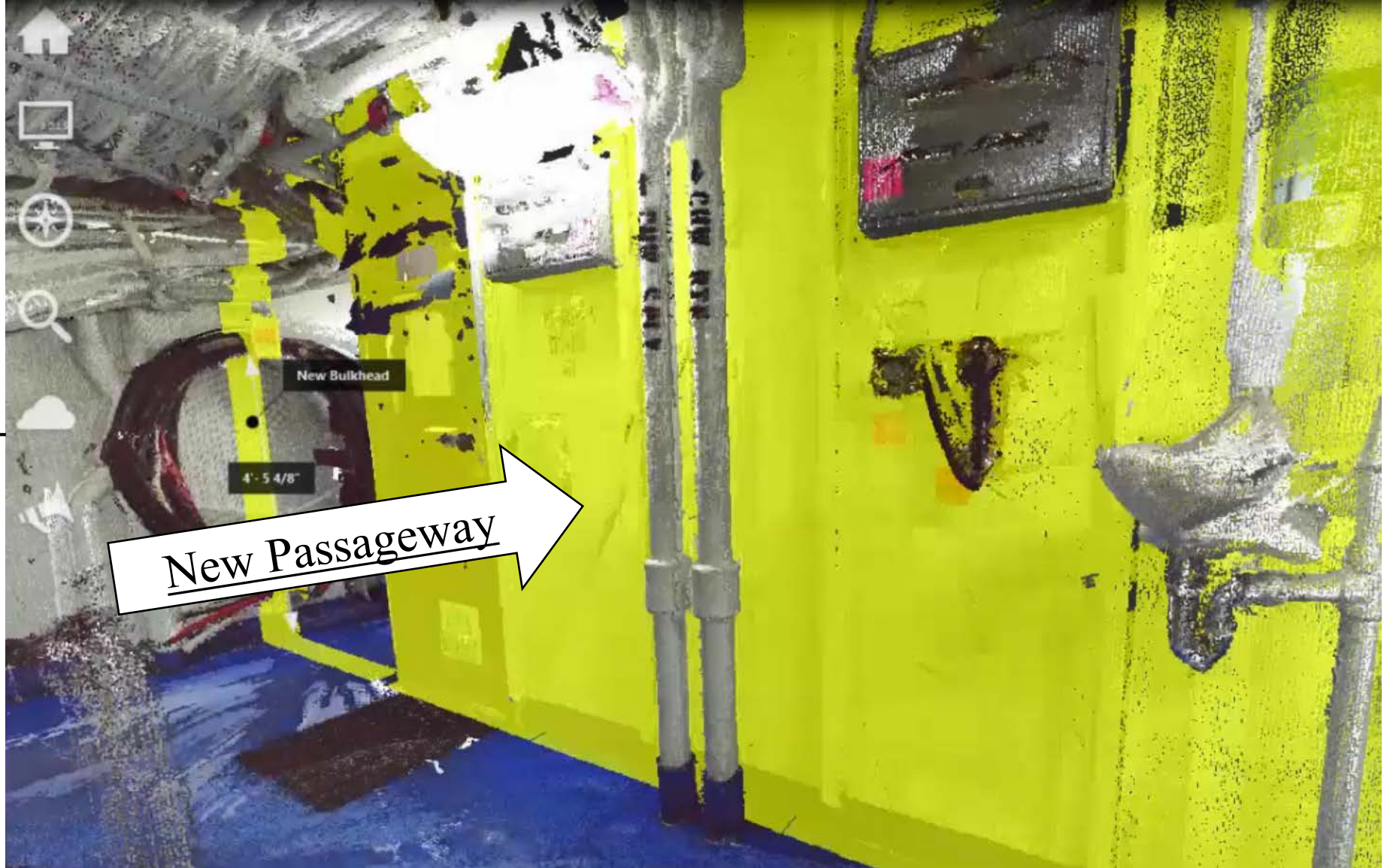
Initiate
Growth Work



Knowledge
Base



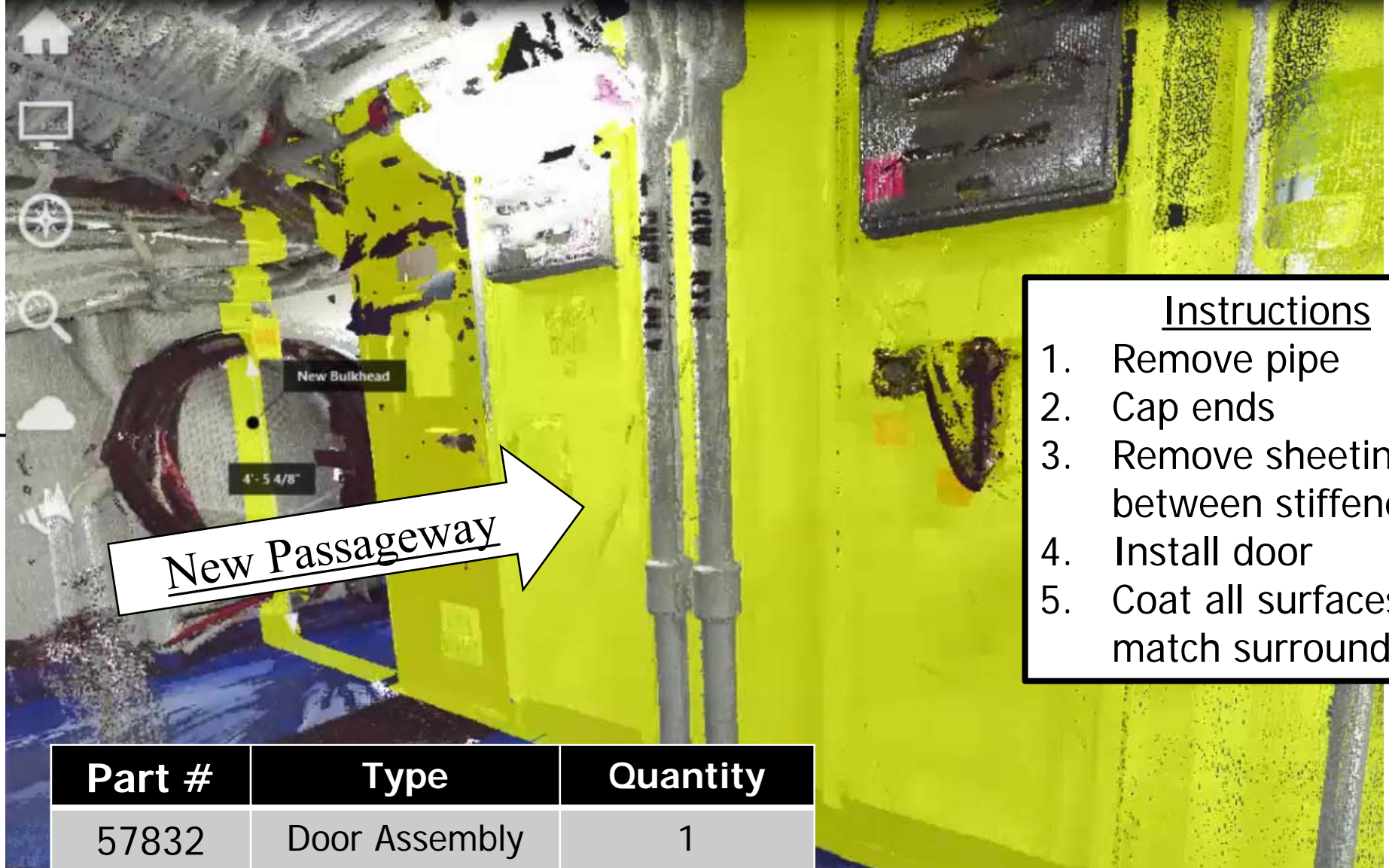
Resolve
Growth Work



Knowledge
Base



Plan
Growth Work



Instructions

1. Remove pipe
2. Cap ends
3. Remove sheeting between stiffeners
4. Install door
5. Coat all surfaces to match surrounding

Knowledge
Base

Part #	Type	Quantity
57832	Door Assembly	1
T8735	Paint	3 gal



Execute
Growth Work



Knowledge
Base





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