BUILDING INNOVATION
Emerging Technologies Series

Connecting the Dots

Army Installation Modernization thru Digital Engineering

Brandon Meinert, CM-BIM, BPA, CD

Acting Chief, Installations Readiness Branch

Construction Engineering Research Laboratory (CERL)

Engineering Research & Development Center (ERDC)

U.S. Army Corps of Engineers (USACE)

Problem

- The Army Modernization Strategy (AMS) describes how the Total Army (Regular Army, Army Reserve, National Guard, and Army Civilians) will transform into a multi-domain force by 2035 to retain its position as the globally dominant land power.
- **To achieve this goal, one of the primary objectives will require installations management practices to transform to accommodate new information-era technologies as defined in LOE3: Modernize and Innovate.** However, despite advances in technology and available COTS solutions, current Army practices are still mostly supporting a traditional, siloed, single transaction approach typical of the industrial age when it comes to installations. Enabling a common operating picture that allows the organization to make informed, data-driven decisions at every level is a core driver of the Army Modernization and Installation Strategies.

Framing the Environment

Current State:

- Projects are becoming more complex
  - Generating massive amounts of Data
    - 95.5 %Data is going unused due to disconnected systems
- Difficulty maintaining single source of truth
  - 13% construction teams time is spent searching for documents
- Siloed working environments → communication & coordination challenges
- Inefficient means to visualize project data holistically
  - 30% AEC firms use applications that don't integrate

Desired End State:

- Common Data Environment → Effectively integrate systems
- Visualize & Assess the project holistically to:
  - Monitor & measure progress
  - Understand risks & costs
  - Communicate seamlessly with stakeholders
- Have insight into space & asset data at project & portfolio levels
- Effective Data Management & Data Governance strategies
- Share data securely

Frame The Problem:

- Digital twins remain a new and untapped resource
- Owners & PMs not aware of pros & cons of implementing DTs
- AEC sector one of the least digitized
- Outdated contracts & procurement strategies
- AEC sector is fragmented →One-off projects
- Lack of common standards for sharing data
- PDTs fail to optimize their process & underutilize their data.

Operational Approach:

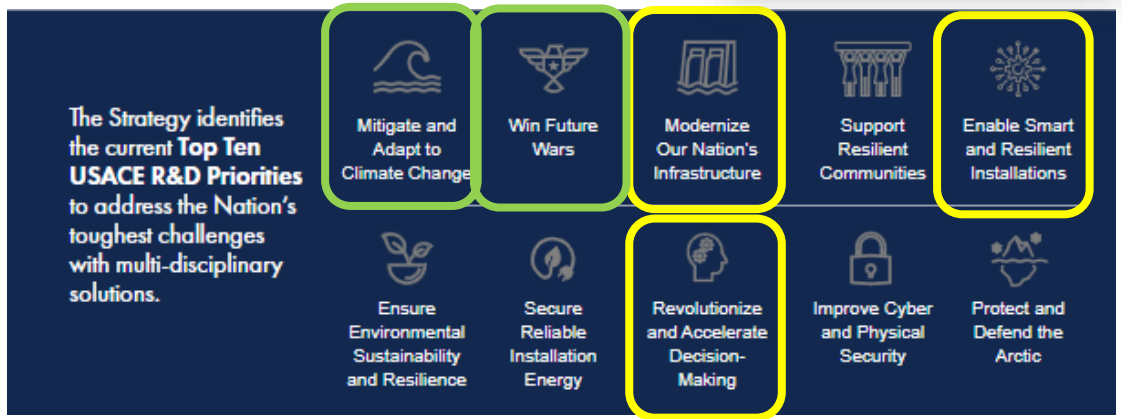
- Leverage uCOP/JECOP as CDE → increased visibility
- Define operational assets & data requirements
- Stakeholders need to adopt long-term mindset
- Update contract language →incentivize innovation
- Ensure models are machine readable & usable for data workflows
- Interaction & information sharing must be encouraged
- Transfer knowledge → apply lessons learned

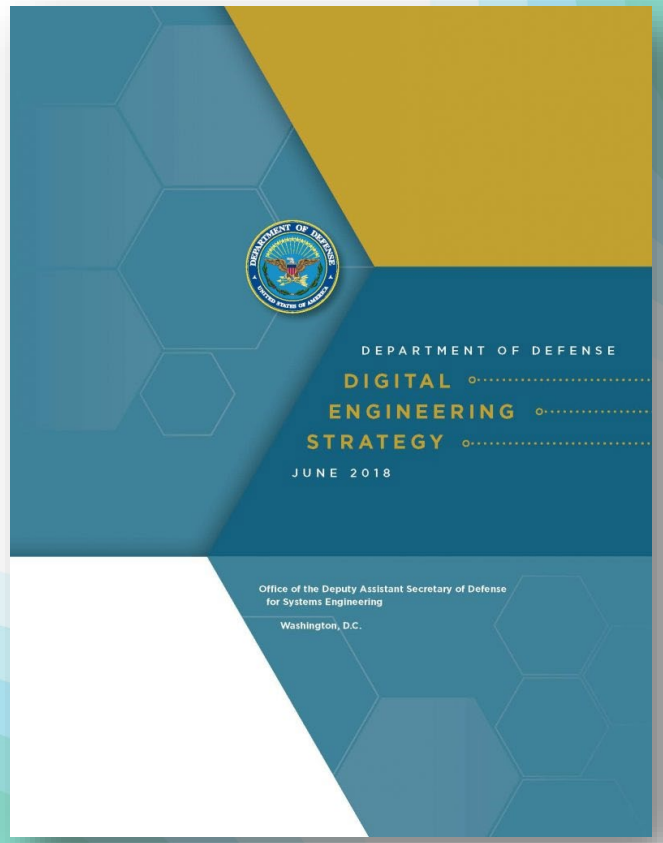
Modernization Call to Action

DoD

Army

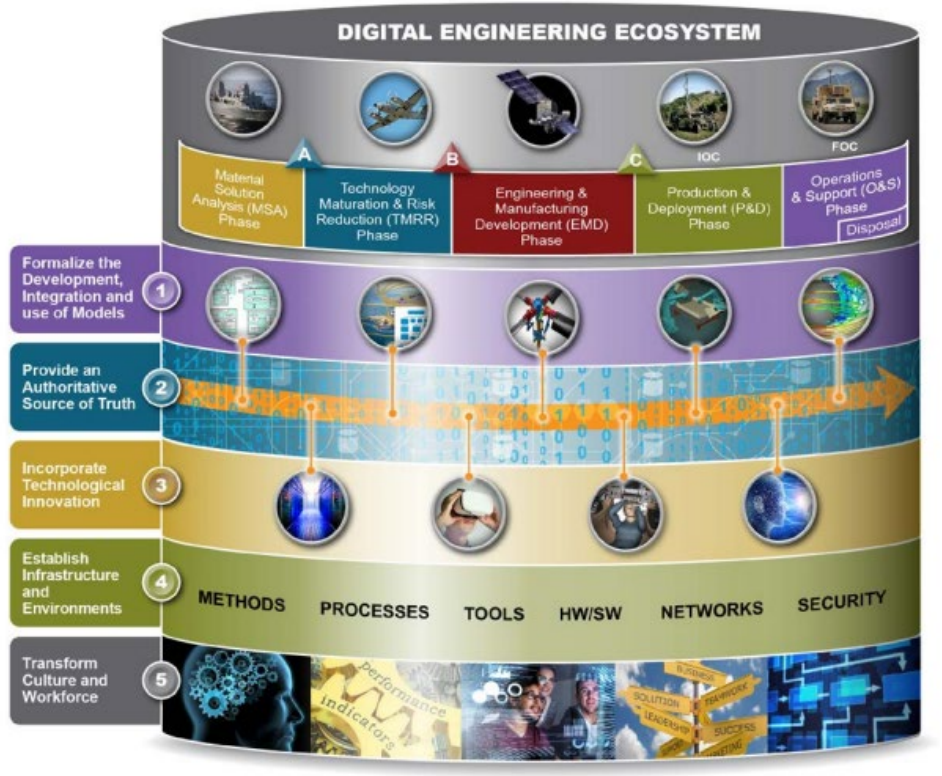
USACE/ERDC





Digital Engineering Overview

- **What is Digital Engineering?**
  - Combines model-based techniques, digital practices, and computing infrastructure
  - Enables delivery of high pay off solutions to the warfighter at the speed of relevance
- **Reforms Business Practices**
  - Digital enterprise connects people, processes, data, and capabilities
  - Improves technical, contract, and business practices through an authoritative source of truth and digital artifacts



Modernizes how we design, operate, and sustain capabilities to outpace our adversaries

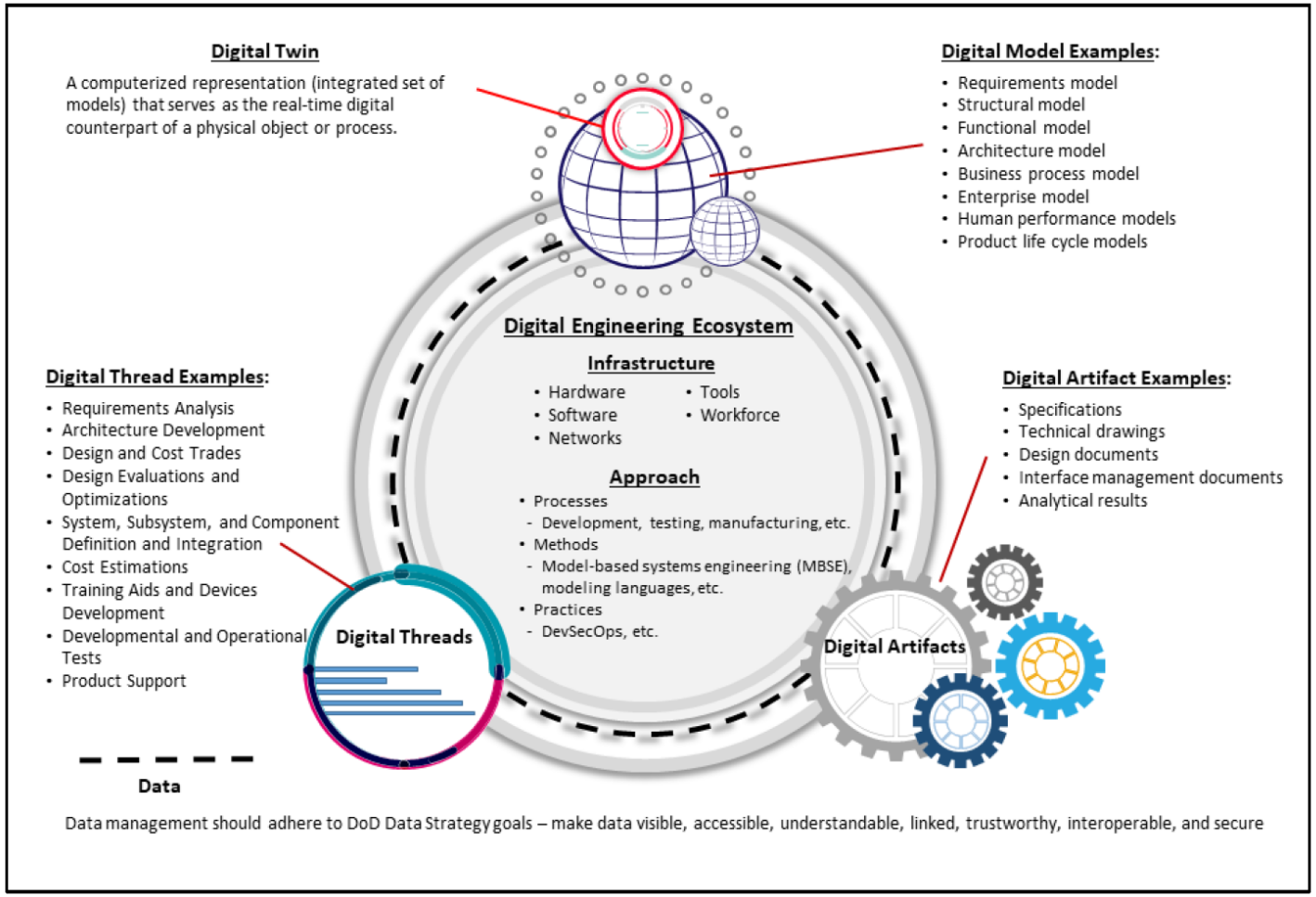
DoD INSTRUCTION 5000.97

DIGITAL ENGINEERING

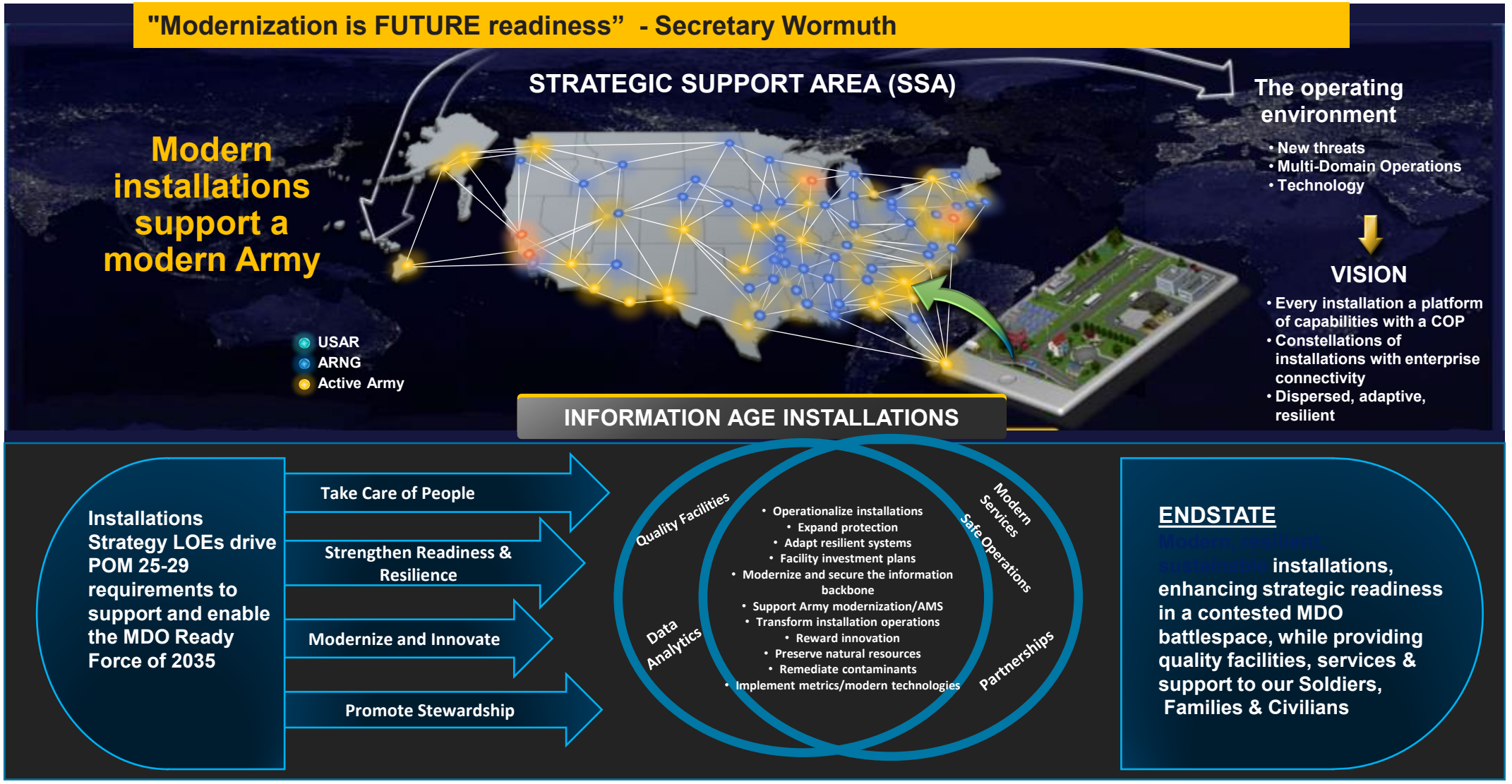
Originating Component:	Office of the Under Secretary of Defense for Research and Engineering
Effective:	December 21, 2023
Releasability:	Cleared for public release. Available on the Directives Division Website at https://www.esd.whs.mil/DD/.
Incorporates and Cancels:	Department of Defense Directive 5000.59, "DoD Modeling and Simulation (M&S) Management," August 8, 2007, as amended
Approved by:	Heidi Shyu, Under Secretary of Defense for Research and Engineering

Purpose: In accordance with the authority in DoD Directive 5137.02, this issuance establishes policy, assigns responsibilities, and provides procedures for implementing and using digital engineering in the development and sustainment of defense systems.

Figure 1. Digital Engineering Framework



Installations of the Future

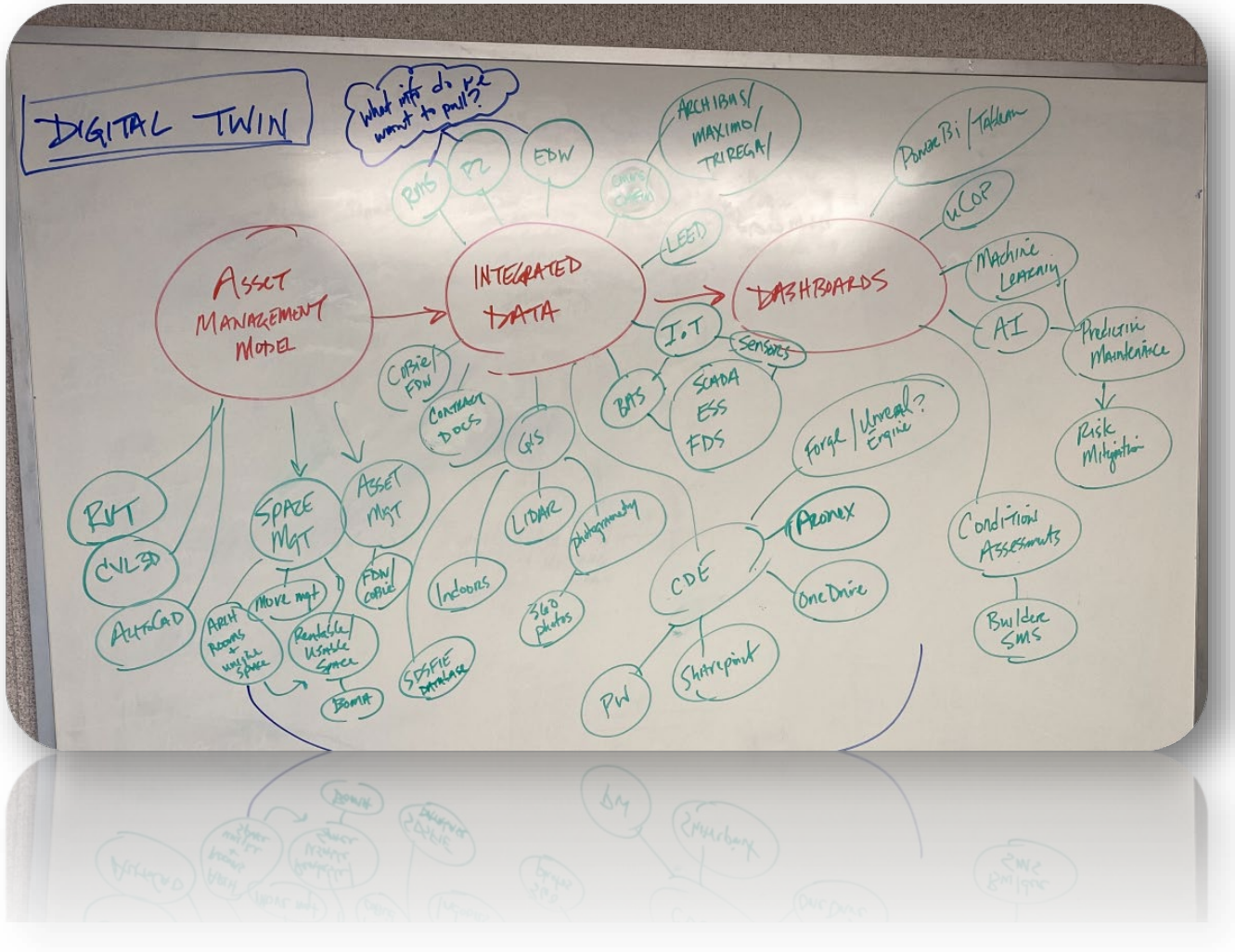


Building a Digital Twin

Visartech Inc. | Software Engineering
visartech.com

Factors to Consider During Development

- Data Integrity
- Data Accuracy
- Interoperability
- Scalability



Levels of a Digital Twin

Digital Twin

Visualization

Optimization

Five dimensions

Static twin

Dynamic twin

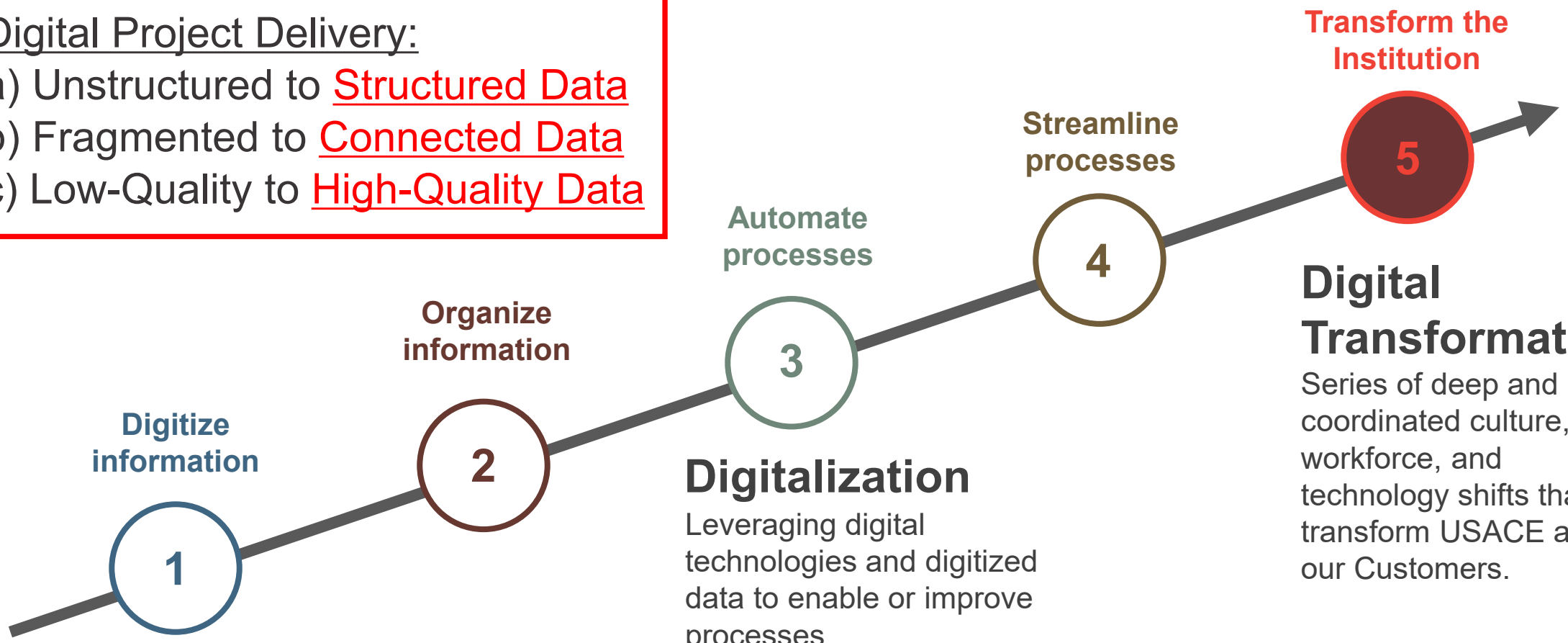
Operational twin

Simulation Twin

Predictive twin

Digital Transformation Maturity

Digital Project Delivery:
a) Unstructured to Structured Data
b) Fragmented to Connected Data
c) Low-Quality to High-Quality Data



Digitization
Changing from analog or physical to digital form.

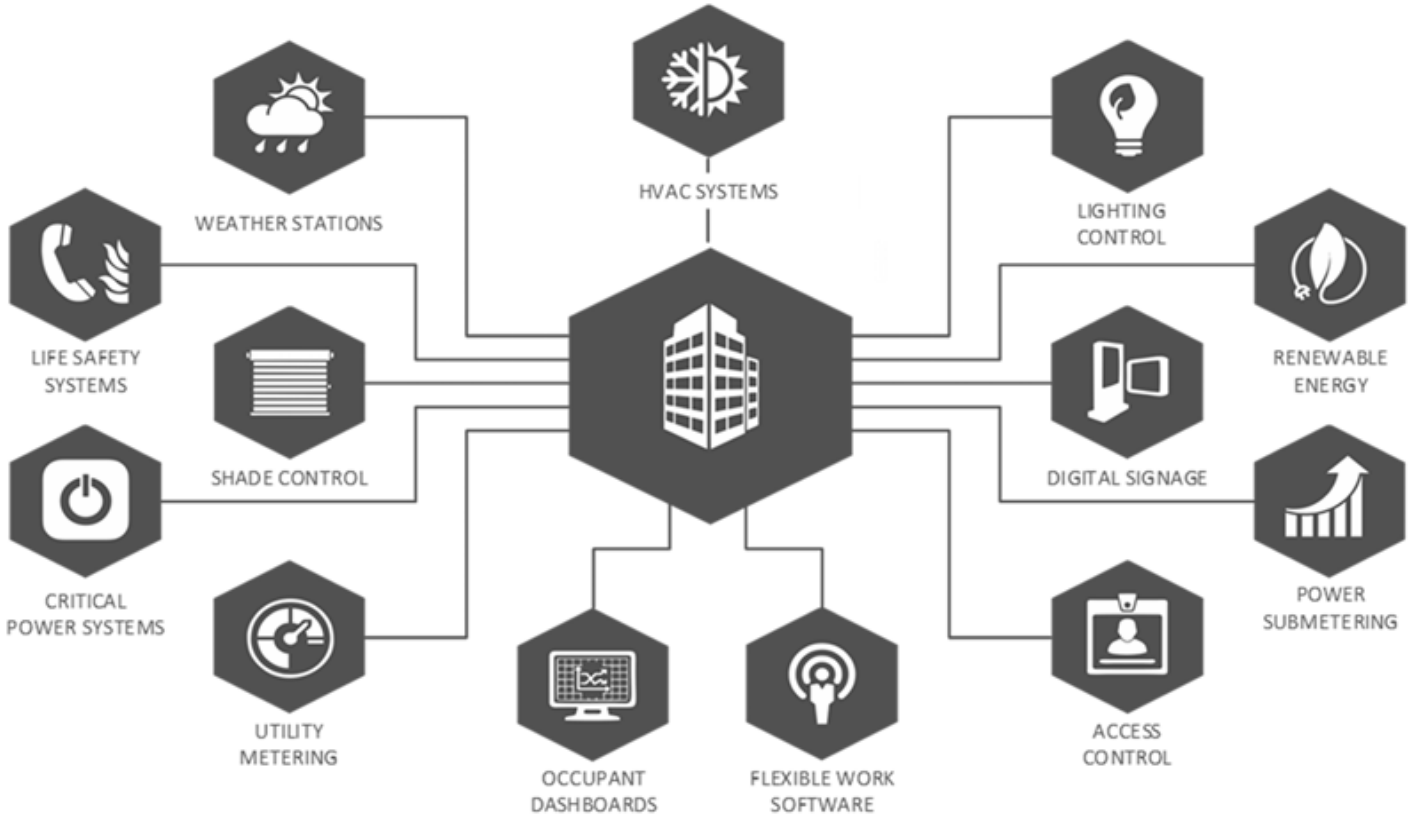
Digitalization
Leveraging digital technologies and digitized data to enable or improve processes.

Digital Transformation
Series of deep and coordinated culture, workforce, and technology shifts that will transform USACE and our Customers.

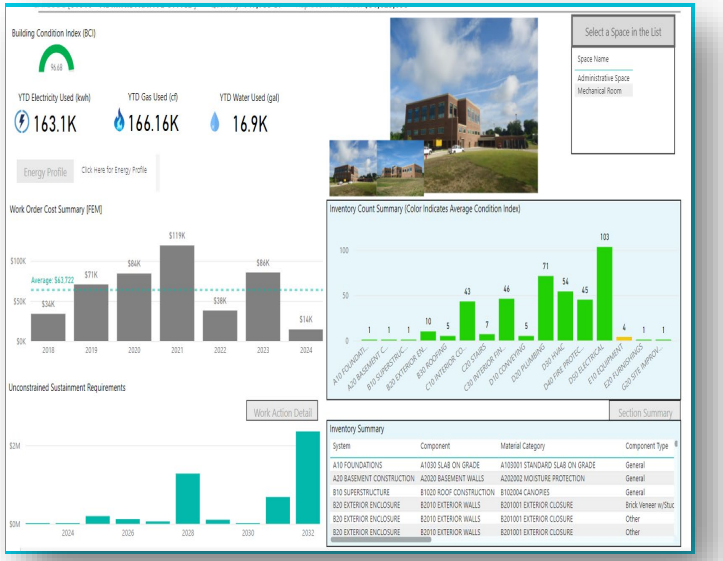
USACE is only in the early stages of digitization

Use Case Analysis

- Emergency Response
- General Population Notification
- Workflow Management
- Building System Analytics
- Wayfinding
- Autonomous Task Equipment
- Camera Analytics
- Emergency Utility Management
- Waste Management
- Dam Management
- Schedule & Occupancy-Based HVAC Control
- Gun Shot Tracking
- Scheduling Building Resources
- Scheduling Range Resources
- Utility Management
- Safety Management
- Master Planning
- Space Utilization & Allocation
- Asset Management
- Tracking Construction Progress
- Remote Inspection
- Geospatial Planning
- Energy Monitoring
- Anti-Terrorism and Force Protection

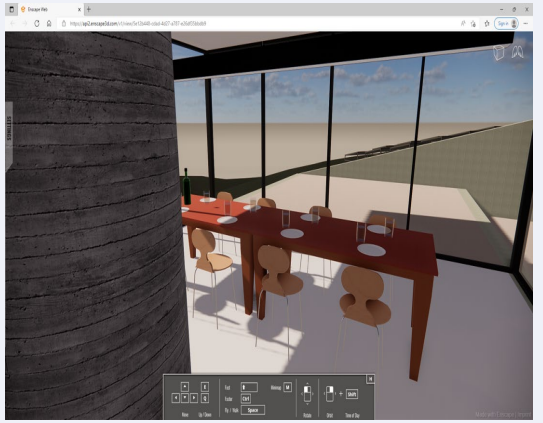
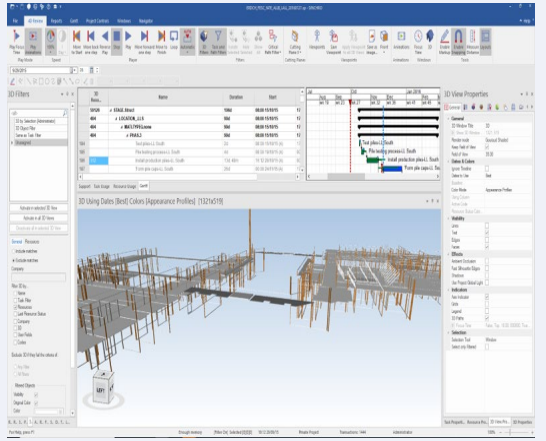



2408
2459
2460
2462
2411
2435
2412


Building Condition Index (BCI)
YTD Electricity Used (kwh)
163.1K
YTD Gas Used (cf)
166.16K
YTD Water Used (gal)
16.9K
Select a Space in the List
Work Order Cost Summary [FEM]
Inventory Count Summary (Color indicates Average Condition Index)
Unconstrained Sustainment Requirements
Inventory Summary

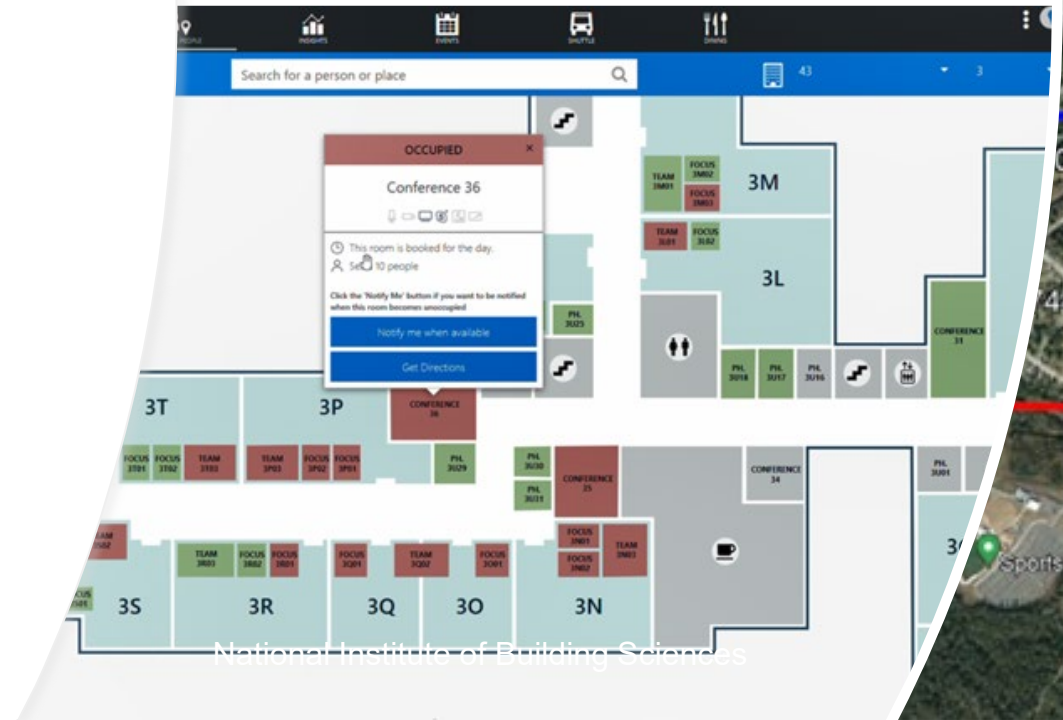

Building 310
Zoom to
Building 310_Forms
Building 310 As Builts
Building 310 Warranty Management Plan
ePRISMS 310 Facility Dashboard
ePRISMS Floorplan
ePRISMS ISR
Facility Number 310
Feature Description Flight Control Tower
Feature Name Flight Control Tower
Layers
Legend
Electric Utilities
Transportation
Water Utilities
Military Range
Building Condition Index 20241009
Building Information

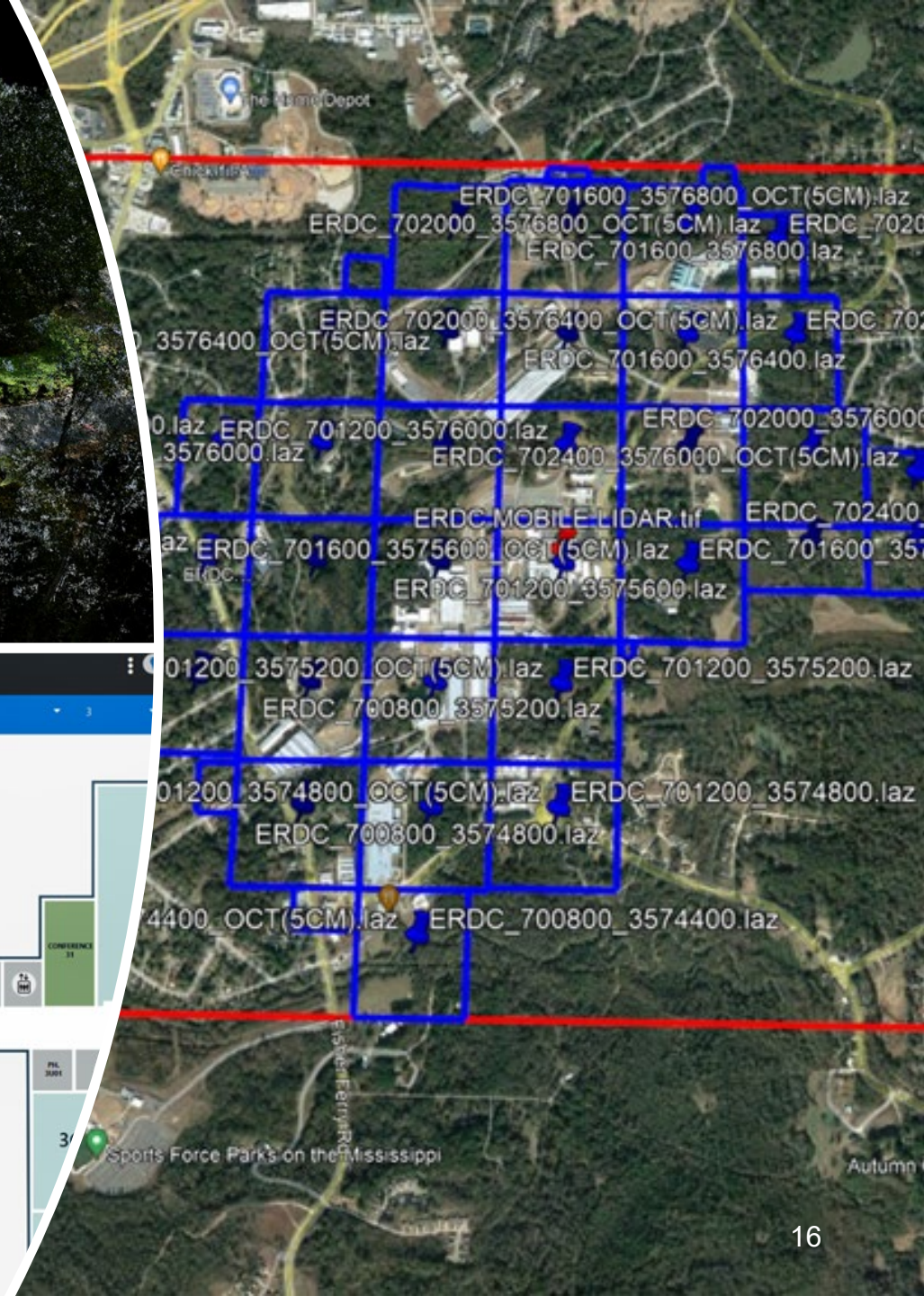
Models & Visualization

3D Web Scenes	Reality Capture	Virtual Reality	4D Schedules
			

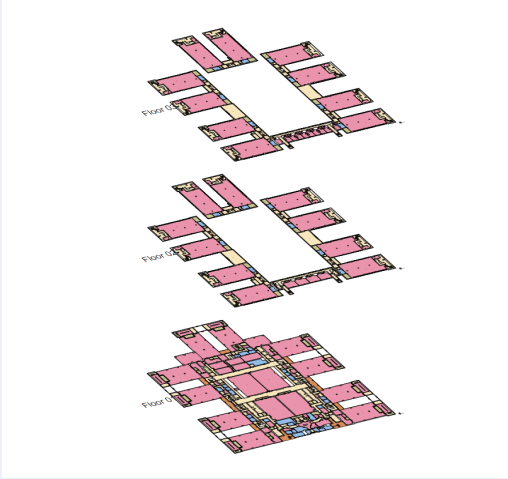
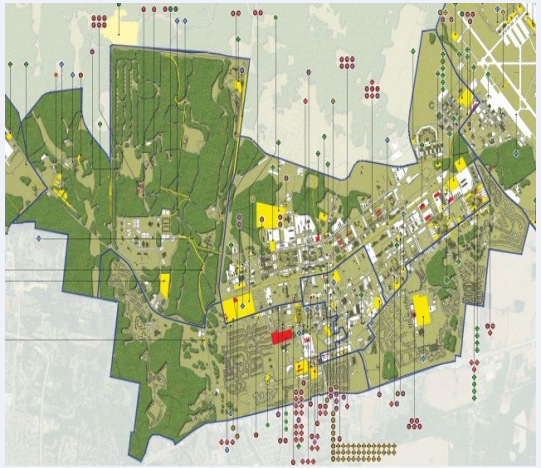
Mapping

- Exterior Photogrammetry
- Aerial LiDAR
- Indoor Mapping & Wayfinding

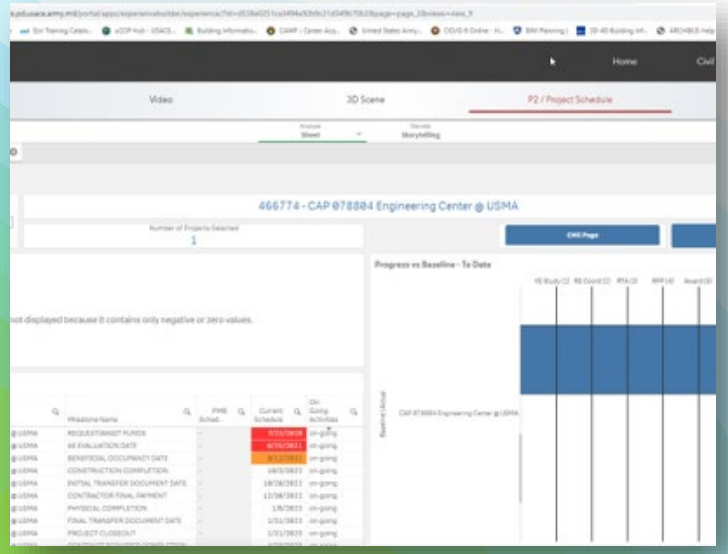




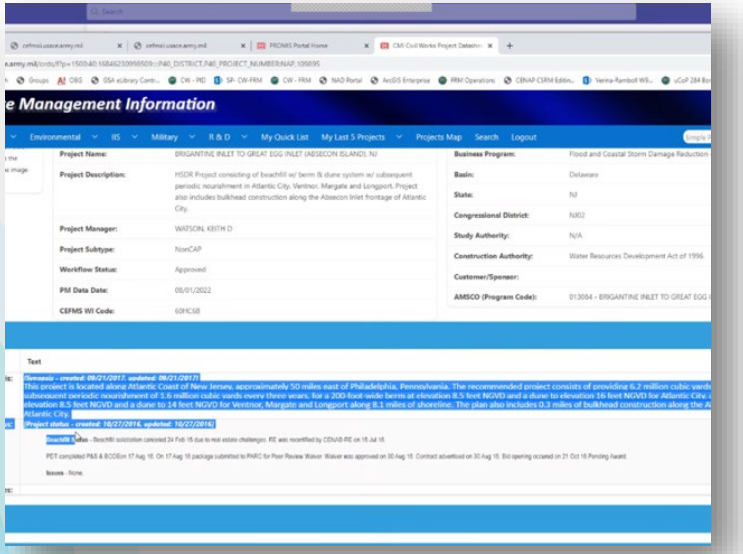
Database Integration

Space Management	Asset Management	Master Planning	Computer-Aided Dispatch
			

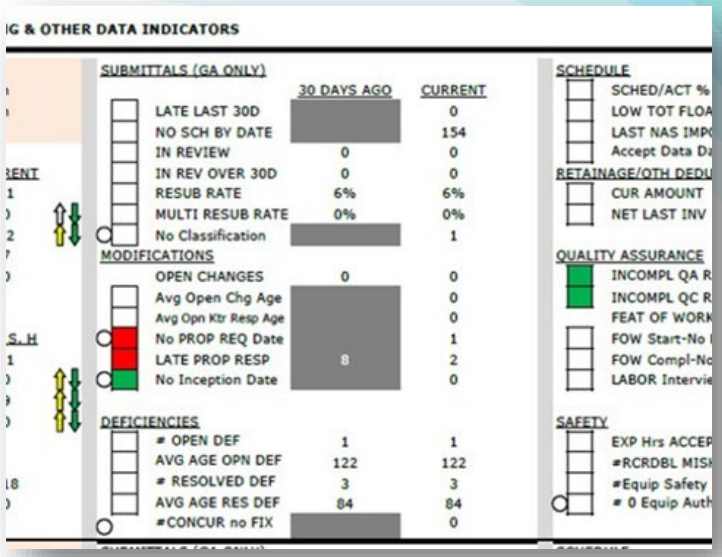
Project Delivery Reporting



Project Management

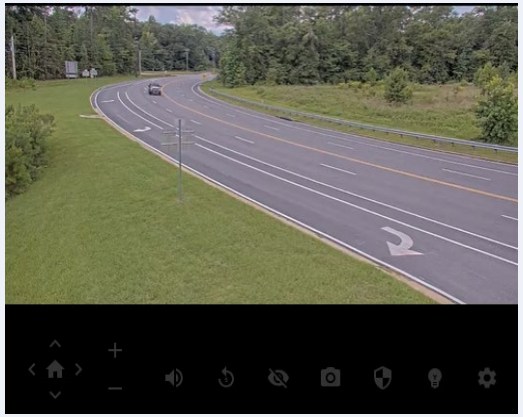
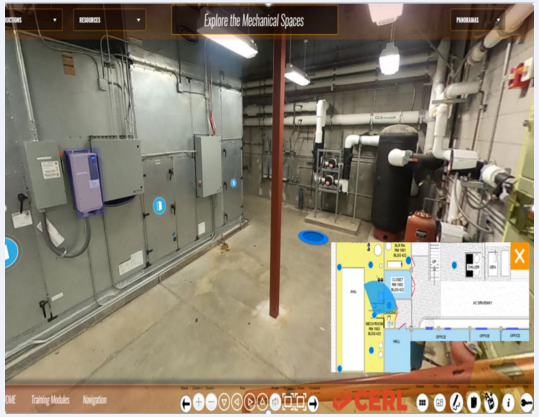
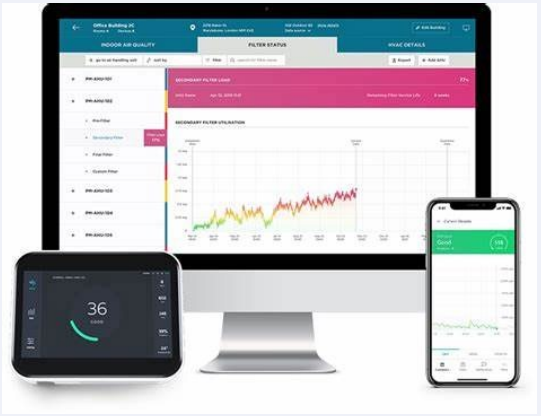
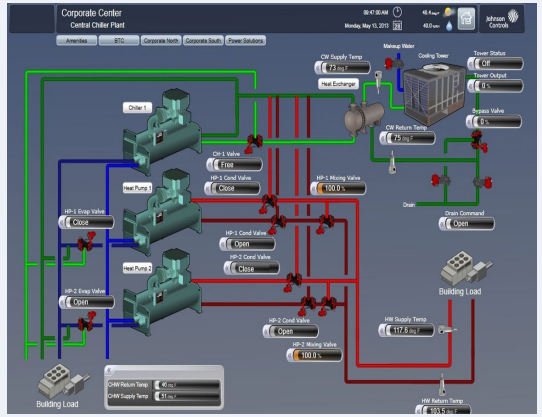


Corporate Management Information



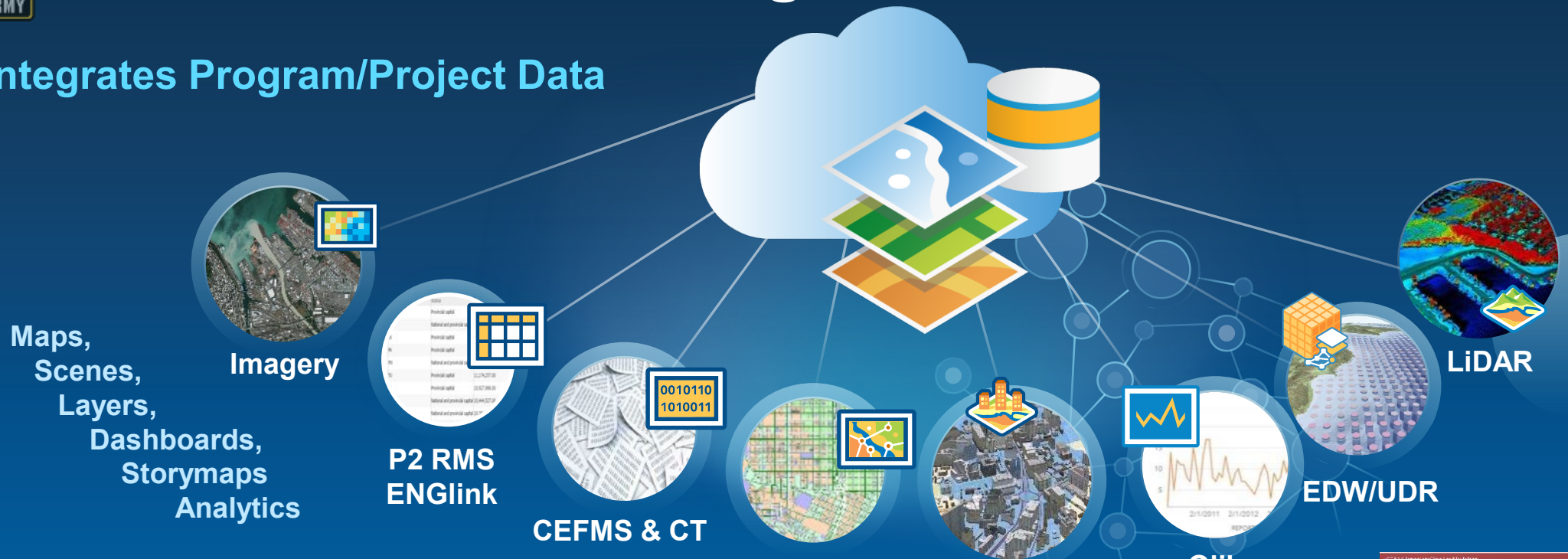
Construction Indicators

Future Database Integration

Security	Training	Air Quality	Utility Monitoring
			

uCOP Data Integration and Visualization

Integrates Program/Project Data



Maps,
Scenes,
Layers,
Dashboards,
Storymaps
Analytics

Imagery

P2 RMS
ENGlink

CEFMS & CT

Survey123
Mobile
Collection

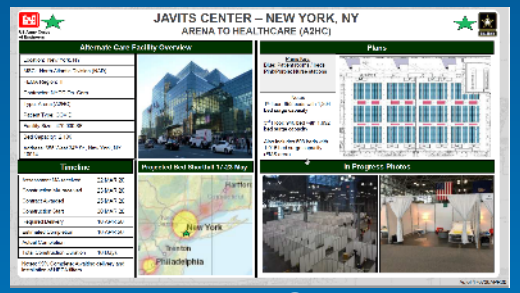
Mapping &
Modeling

Qlik

EDW/UDR

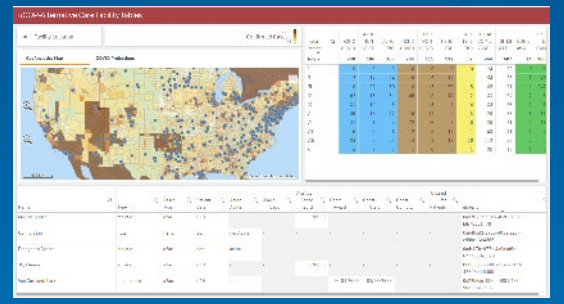
LiDAR

- Virtual Reality
- Laser Scans
- Contract Docs
- Closeout Docs
- COBie Data
- Indoor Mapping
- LEED
- 4D Schedules
- MS Office Apps



Project Quad

Time Lapse Model



Qlik Interactive Dashboard

uCOP Connects the ENTERPRISE

Storymapping

Thank You

Brandon Meinert, CM-BIM, CD, BPA

Acting Chief, Installations Readiness Branch
Construction Engineering Research Laboratory
U.S. Army Engineer Research and Development Center
U.S. Army Corps of Engineers
Brandon.M.Meinert@usace.army.mil
816-560-2607