BOOZ ALLEN DIGITAL SYSTEMS ENGINEERING TRANSFORMATION

NDIA Systems Engineering Division

JANUARY 25, 2022

TOPICS

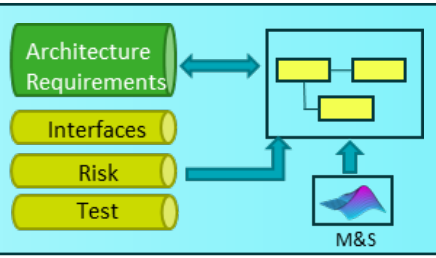
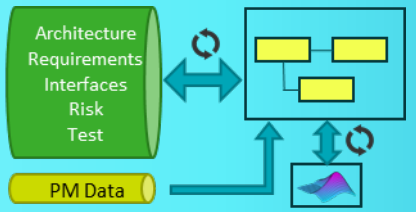
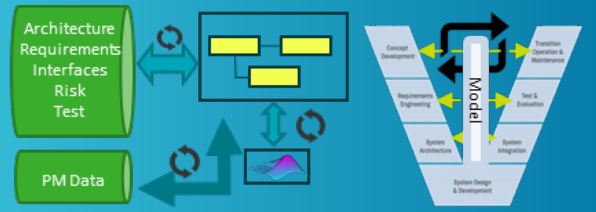
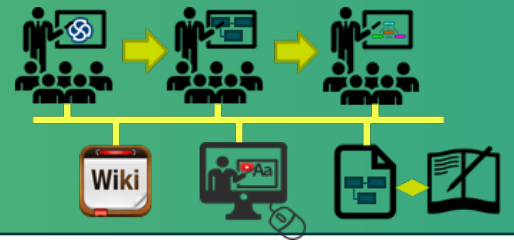
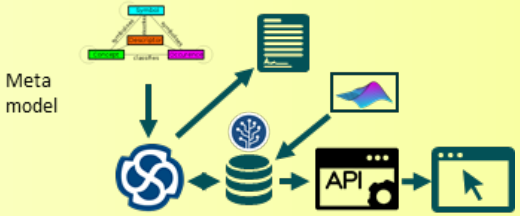
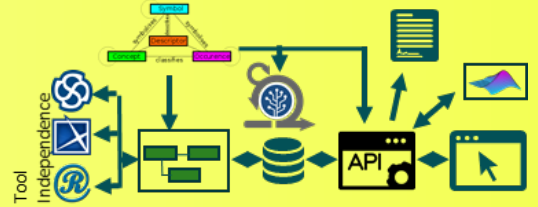
- Digital Engineering is transforming Systems Engineering
- Booz Allen's Digital Ecosystem
- Owning the technical baseline – Space C2 program
- Digital Twins and advanced applications
- NDIA Collaboration Opportunities

BOOZ ALLEN SYSTEMS ENGINEERING ECOSYSTEM STARTS WITH OUR PEOPLE

- 13,000 Engineers and Scientists work for Booz Allen
  Approximately 70% work in Systems Engineering fields for DoD, Federal Agencies, Civil and Commercial clients
- Our Systems Engineers work integration and management functions across many DoD programs and are heavily involved in Open Architectures and Open Systems
- Our Systems Engineers work at the senior levels in DoD helping develop/implement policy, guidance, and practice of systems engineering
- A key advantage our Systems Engineers have is a well-developed and accessible digital engineering ecosystem and expertise in our community of practice.

Our ecosystem provides a common set of COTS and open standards-based infrastructure, tools and processes that enable staff to rapidly establish customized digital engineering solutions that interoperate in any client environment

VISION FOR SCALING DIGITAL ENGINEERING AT BOOZ ALLEN

	Today	1 Year	3 Years
Process			
People			
Technology			

- **Centrally managed infrastructure, and integrated toolset**
- **Multi-tier organized training and onboarding program**
- **MBSE starter kit models and standardized processes**

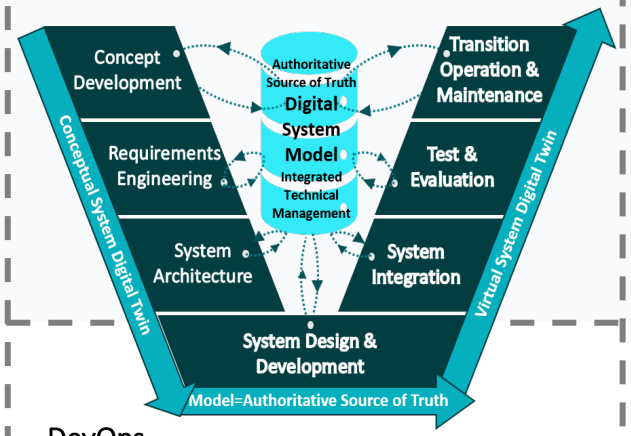
- **Synchronized model data; external access enabled**
- **Differentiated set of courses, methods, & videos**
- **Metamodel, APIs, MBSE Scaled Agile Methods Mechanized**

- **Comprehensive processes and technical standard**
- **Integrated curricula, reference guides, and wiki for employees and users**
- **Metamodel and API fully incorporated into CM and auditing process**

Enhancing the scale of Digital Engineering ecosystem to support more complex systems

EXTENDING SYSTEM ENGINEERING TO CREATE DIGITAL THREADS AND TWINS

System Engineering
interdisciplinary field of engineering that focuses on how to design, integrate, and manage complex systems over their entire lifecycle



DevOps
Methodology that combines development with operations, and encompasses agile practices and rapid feedback

Digital Engineering
Weaves system models, integrated data environments and Model Based Systems Engineering (MBSE) to manage complexity, support informed decision making, enhance communication and increase efficiency

- Tier 1: Digital Threads Centric Capability
- Tier 2: Digital Threads Plus Advanced Integration of M&S for Digital Twins
- Tier 3: Digital Twins Plus Integrated ML/AI and Virtual Simulation Capabilities

Wargaming

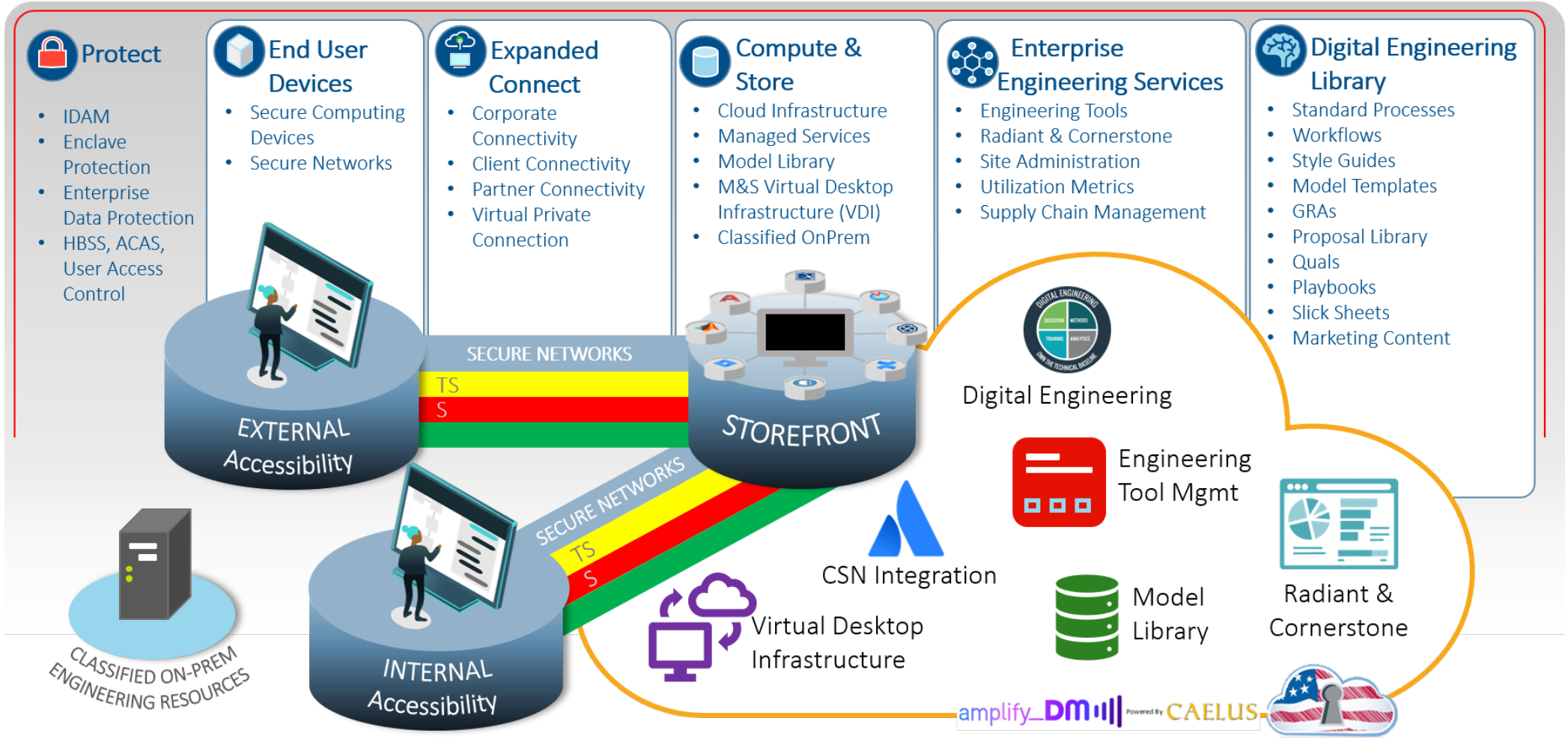
Digital Twin

Investment in Digital Engineering establishes a foundational ecosystem that enables growth

People | Infrastructure | Tools | Processes

System Engineering is being transformed through the use of Digital Model-Based Engineering

BOOZ ALLEN DIGITAL ENGINEERING ECOSYSTEM END STATE



Solid Infrastructure enables robust Community of Practice collaboration and continuous improvement

Systems Engineering

An interdisciplinary engineering management process that evolves and verifies an integrated, life-cycle balanced set of system solutions that satisfy customer needs

Project Management

Product Development

Documents
(Requirements, governance, resource, etc.)

Digital Engineering

The art of creating, capturing, and integrating data using a digital skillset

Model-Based SysML Systems Engineering

CAD

PLM

BIM

Req Mgmt.

Modeling & Simulation

Software Development

Web Applications

Common Data Environment

DE Data relations without aggregation

Ontology

UAF

XMI

{json}

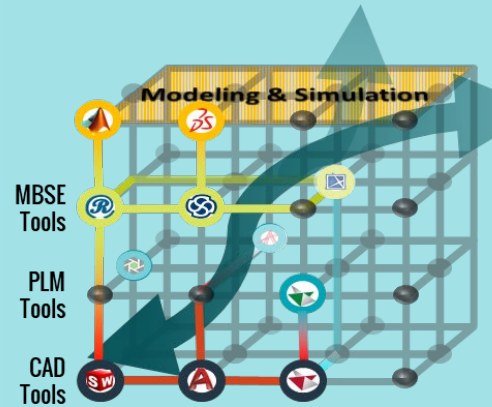
APIs

YAML

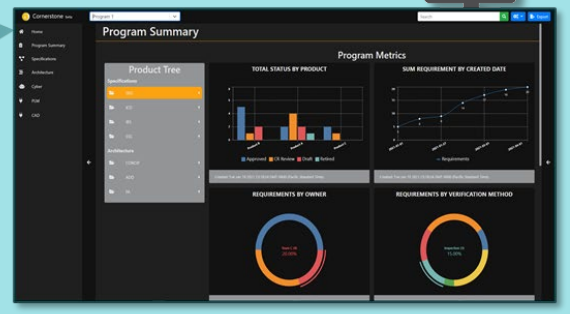
Cornerstone

Integrating DE Tools to work in concert and providing insight to the Digital Thread

DIGITAL TWIN

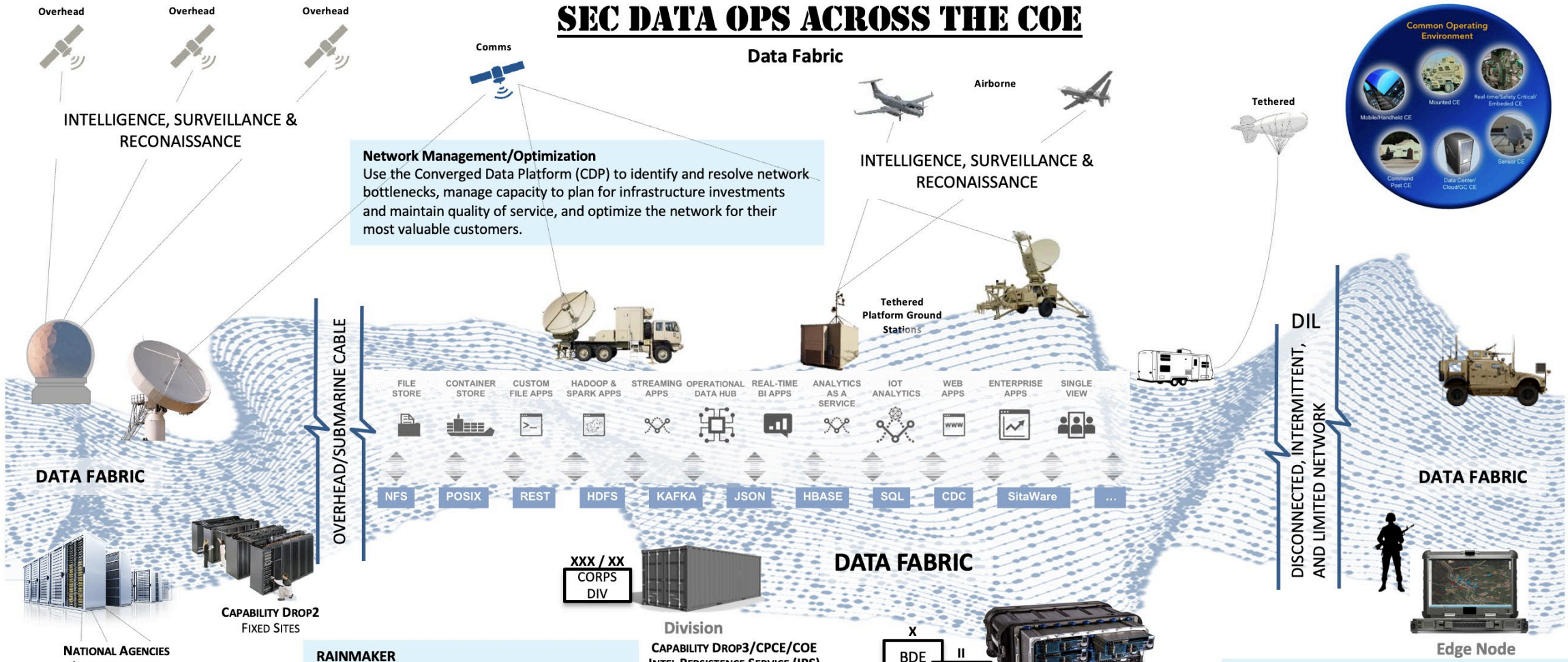


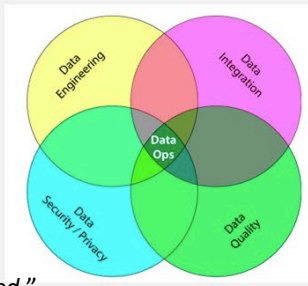
Orchestrated Data Continuity



Business Intelligence Dashboard

SEC DATA OPS ACROSS THE COE





"DataOps (data operations) is an approach to designing, implementing and maintaining a distributed data architecture that will support a wide range of open source tools and frameworks in production.

A DataOps strategy, which is inspired by the DevOps movement, strives to speed the production of applications running on big data processing frameworks. Like DevOps, DataOps seeks to break down silos across IT operations and software development teams, encouraging line-of-business stakeholders to also work with data engineers, data scientists and analysts so that the organization's data can be used in the most flexible, effective manner possible to achieve positive business outcomes."

Edge Node – for DIL Environment
A fully-functional cluster that can be run on small form-factor commodity hardware. Edge clusters are supported in three- to five-node configurations.

Realize the full potential of an organizations IoT investment by addressing DIL challenges and more. Allows customers to deploy an architecture in which they "act locally, learn globally."

Address the need to capture, process, and analyze data generated by IoT devices close to the source, Edge Node provides secure local processing, quick aggregation of insights on a global basis, and the ability to push intelligence back to the edge for a faster and more significant mission impact.

IMPLEMENTING THE DISCIPLINE

RAPID STARTUP AND CONSISTENT IMPLEMENTATION

AFLCMC/EBD MBSE FRAMEWORK DEVELOPMENT

AFLCMC/EBD is driving a Digital Transformation to more efficiently integrate Program Management, Technical Directors, Systems Engineers, and Original Equipment Manufacturer (OEM) contractors using digital tools and processes.

Developing the Model Framework

Booz Allen MBSE, strategy, and program management experts are working together to develop and deliver: Framework Models, Template Libraries of Packages and Components, Model Management Plans, RFP Model Language, Integration of Modeling and Simulation Tools and Processes, auto-generated risk and performance documentation, as well as training materials and sessions. These products leverage industry best practices in the context of the AFLCMC/EBD mission.

Booz Allen has delivered regular bi-weekly Digital Engineering training sessions and ten foundational model frameworks during the first year of this effort and will continue the effort in the fourth contract option year

RAPID STARTUP

Created a Model Framework and model initiation process that enables teams to quickly tailor the proven foundation for their needs. Reusable template strategy accelerates design and implementation.

CONSISTENT IMPLEMENTATION

The framework promotes consistency across model implementations reducing human errors/inconsistencies and promoting reusability of scripts and other supplemental tools

CULTURAL TRANSFORMATION

Providing strategic and training support alongside technical deliverables has empowered diverse members of the client organization to understand how the Digital Transformation applies to them.

RECOGNIZING OPPORTUNITIES
SCALABLE EXPERIENCE

VARIABLE APERTURE DIGITAL RADAR (VADR) SYSTEM

Document-based engineering is not efficient enough to support the Sustainment and Modernization of the Advanced Radar Threat System (ARTS), thus Booz Allen is leveraging MBSE to construct a system architecture model, trace requirements, and develop system technical documents.

Developing & Leveraging the Technical Baseline

The ARTS-V/VADR program is challenged to execute system engineering processes on a ruggedized mobile closed-loop radar and EO/IR system designed to emulate missile threats. Booz Allen is developing a system architecture model that establishes the functional, performance, functional interface, and verification requirements for the radar. It is intended to be used by the program office and contractors as a system level requirements and guidance for sustainment and modernization projects affecting the system.

OPEN ARCHITECTURE

Development and defining of a Modular Open System Architecture (MOSA) Radar in support of optimizing designs linked to threat models while supporting broader DoD enterprise efforts.

REQUIREMENTS ANALYSIS & VALIDATION

Traceability from customer requirements to Interoperability Key Performance Parameters (KPPs) and system architecture. Generation of documentation.

DIGITAL THREAD

Implementation of a digital surrogate of a material system to allow dynamic, real-time assessment of the radar's current and future capabilities.

DIGITAL TWIN

Design of a conceptual high-fidelity model of the system used to validate requirements, simulate design decisions, and assess radar end-states.

Digital Twins empower data-driven decisions. As the digital footprints of everything we interact with becomes larger and more complex, it becomes essential to integrate, analyze, and visualize the hundreds to potentially millions of disparate data streams that make up the world around us. Digital Twins enable the integration and analysis of all the data in our connected world.

Digital Twins are fast becoming a cornerstone in the design, manufacture, and operations of the products we use to the buildings and cities we work and live in.

DIGITAL TWIN - VARIOUS USES

HELPING CLIENTS ACROSS MARKETS THROUGH ALL STAGES OF THE LIFECYCLE

SYSTEMS/DESIGN

Design and test new prototypes or systems before implementation

Digital Warrior Digital Twin:

Digital Twin to support defining the digital architecture blueprint/design for an on-body suite of threat/hazard sensors and power infrastructure that will demonstrate "plug and play" mission tailoring capabilities within ensemble uniform.

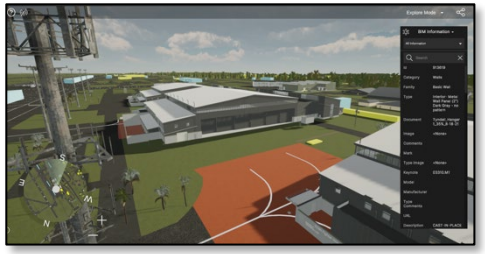
PLANNING

Simulate "what if" scenarios and the impact on missions

USAF Infrastructure Planning:

Digital Twin for Kunsan Air Force Base aided planning, logistics, and phasing for construction projects by consolidating asset and project information into an easily digestible form to foster collaboration, assist engineering master planning, and develop cost-effective solutions for utility and infrastructure challenges.

OPERATIONS



Use real-world data to improve efficiency, savings, and security

Tyndall Air Force Base:

Digital Twin built at significant scale to improve operational performance and resiliency through BIM and GIS data visualization, simulations, real-time monitoring, and interactive 2D and 3D viewports in on platform to support design, planning, operations, and sustainment of the base's multi-year reconstruction efforts.

MODERNIZATION

Enable continuous improvement of systems/applications

VA Office of Healthcare Innovation and Learning:

Digital Twin to create a virtual future hospital operating room environment needing to simulate integration of technology across numerous vendors. A second **Digital Twin to model potential infrastructure and hospital activations** to improve capital investments.

BAH advanced Digital Twins are deployed across the DoD and US Civil agencies to optimize capabilities

NDIA SYSTEMS ENGINEERING COLLABORATION OPPORTUNITIES DISCUSSION

1) Work with the NDIA SE Division in developing a digital systems engineering practice concept integrating digital systems engineering tools, ecosystems, and the systems engineering processes – a NDIA study/report product freely available to Government and Industry.

2) Create more/enhanced opportunities for our member companies' workforce individually to collaborate with their peers in other companies and government through NDIA. Increase our workforce participation from member companies and government in the NDIA SE Division to foster an enhanced professional affiliation as systems engineers.

3) Look for ways to integrate Intellectual Property, contracting and other PM critical acquisition workstreams into digital systems engineering tools and practice.

4) Encourage Industry to adopt COTS , open standards, tools, and processes to accelerate systems engineering's digital evolution and widespread adoption.

Our Info

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- https://www.boozallen.com
- https://www.boozallen.com/digitaltwin
- Digital Twin Primer
- Digital Engineering for Agile Weapon Systems article
- How Digital Engineering Strengthens Space Systems article