

VINES

(Vandenberg Integrated Network Enterprise Synchronizer)

A three phased data project effort to building a comprehensive view of key launch range assets

Phase 1 Progress Demo - Aug 2024

Project Overview

OVERVIEW:

- › The current network mapping system at VSFB suffers from:
 - **Fragmented data**
 - **Limited visibility**
- › Hinders a comprehensive view of VSFB operations, mission threat analysis and situational awareness.



Development Plan



PHASE 1: ALIGN GIS DATA

STATUS: IN
PROGRESS

GOAL:

Aggregate GIS data sources. Lays the foundation for Phase 2 and 3+ development needs.

DELIVERABLES:

- 1 GDB store = CE data
- 1 GDB store = CIPS data
- 1 GDB store = SMT aggregation includes multiple layers
- ArcGIS Map-Viewer Module



PHASE 2: ALIGN NETWORK DATA

STATUS: TBD

GOAL:

Aggregate network monitoring information (LogRhythm, SolarWinds, What's Up Gold, ELICSAR, etc...) across Range and Base COMMs. This lays the foundation for Phase 3+ visualization of data needs.

DELIVERABLES:

- NIFI configuration
- PostgreSQL database



PHASE 3+: VISUALIZE THE DATA

STATUS: TBD

GOAL:

Combine phase 1 and 2 data with real time data actions for visualization and data driven decisions. Integrate ML/AI, Data Analytics and customized views.

DELIVERABLES:

- Full-Stack Web Application (VINES)
- RESTful api

Project Key Benefits

› **CONSOLIDATED DATA &**

TRANSPARENCY: Aggregates data from disparate sources into a single, accessible repository.

› **IMPROVED DECISION-MAKING:**

Provides periodic insights for informed decisions regarding network operations and maintenance.

› **ENHANCED TROUBLESHOOTING:**

Facilitates quicker identification and resolution of network issues.

› **STREAMLINED MANAGEMENT:**

Centralizes data and offers a unified platform for network monitoring, configuration, and asset tracking.

› **SUPPORTS MISSION OBJECTIVES:**

- Aligns with the [MRT Congressional Mandate](#) (Sec. 1505) for mapping mission-critical terrain.
- Supports SLD30 "Defend the Mission".

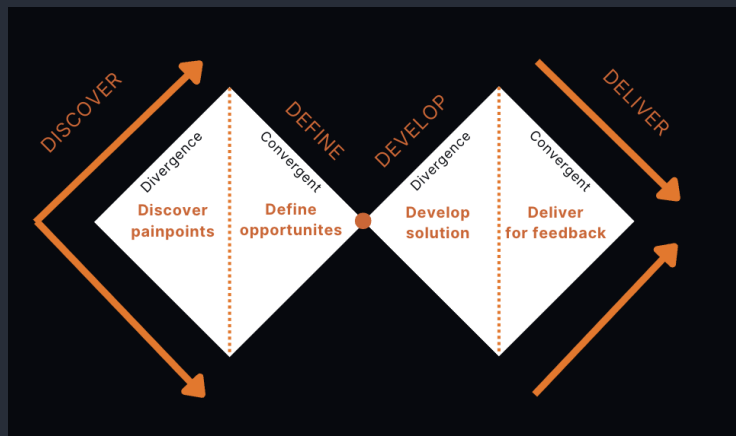
Collaboration & Discovery

Discovery:

- › **January 22-26:** GAP analysis onsite discovery
Goal: Understand SLD30 network terrain. ([IL4 outbrief](#))
- › **April 2-5:** Second onsite discovery
Goal: Understand accessibility of GIS data repositories and security protocols in place. ([IL4 outbrief](#))

Collaboration & user feedback:

- › 10 Progress Demos
- › 19+ feature requests for prioritization ([link](#))



ArcGIS Map Viewer Prototype features

FEATURES:

- ★ Digitized VSFB GIS map viewer (interactive - ability to zoom, pan, search, print, etc.)
- ★ Quick point measure tool
- ★ Bookmark view tool
- ★ Coordinates tool
- ★ Facility manager information (in progress)
- ★ Road Route Simulation
- ★ Quick swipe map split tool
- ★ Multiple base map views

LAYER VIEWS:

- > “Highly Connected” layer view
- > Unexploded ordnances
- > 60+ processed layers (power, water, utilities, roads, structures, etc..)



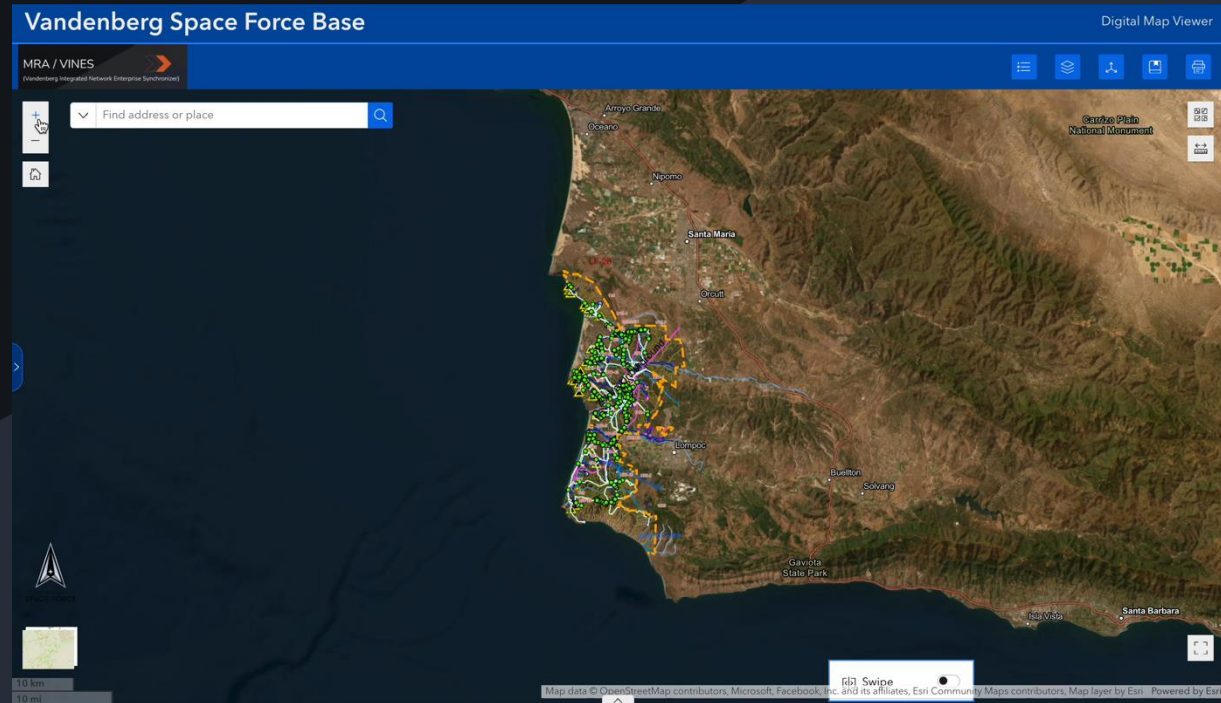
Progress Demo: ArcGIS Map Viewer Module



ArcGIS Map Viewer Prototype

FEATURES:

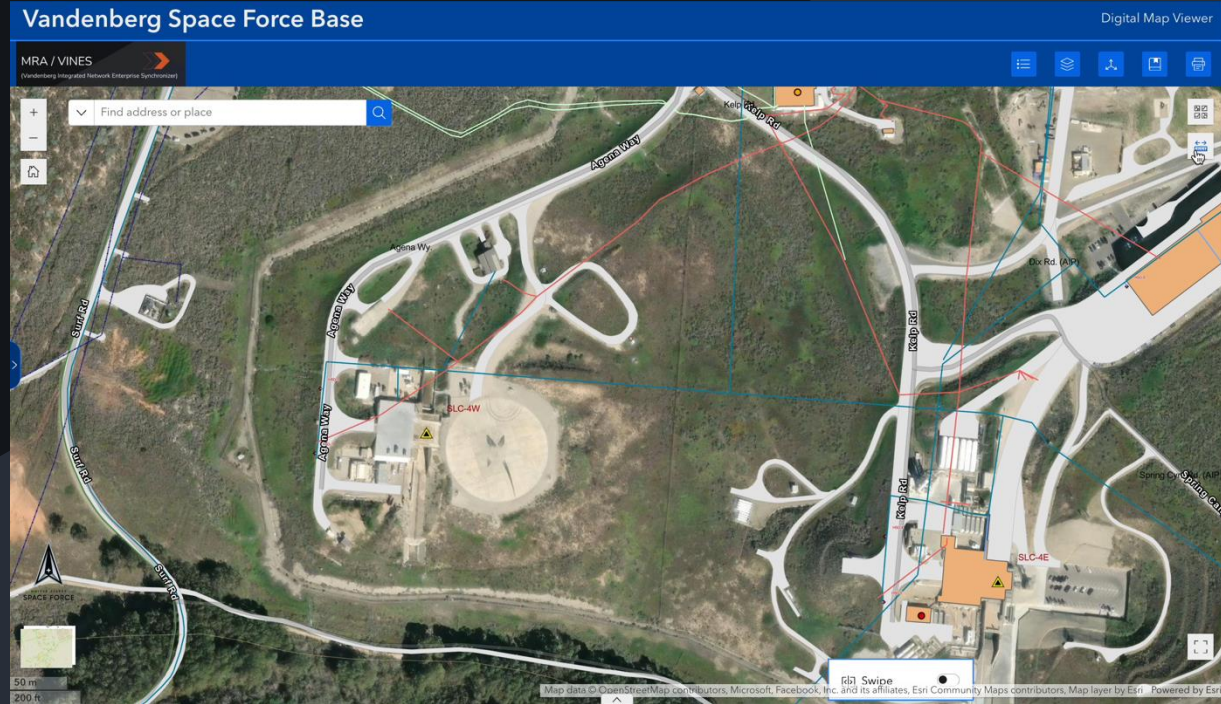
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ArcGIS Map Viewer Prototype

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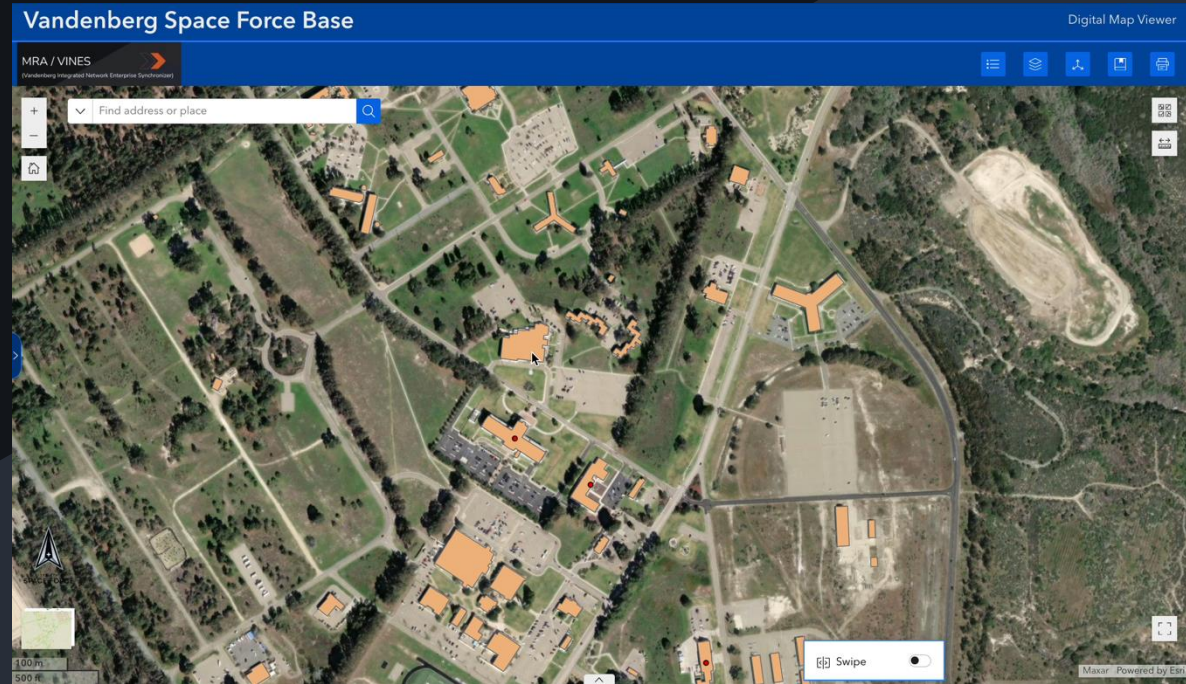
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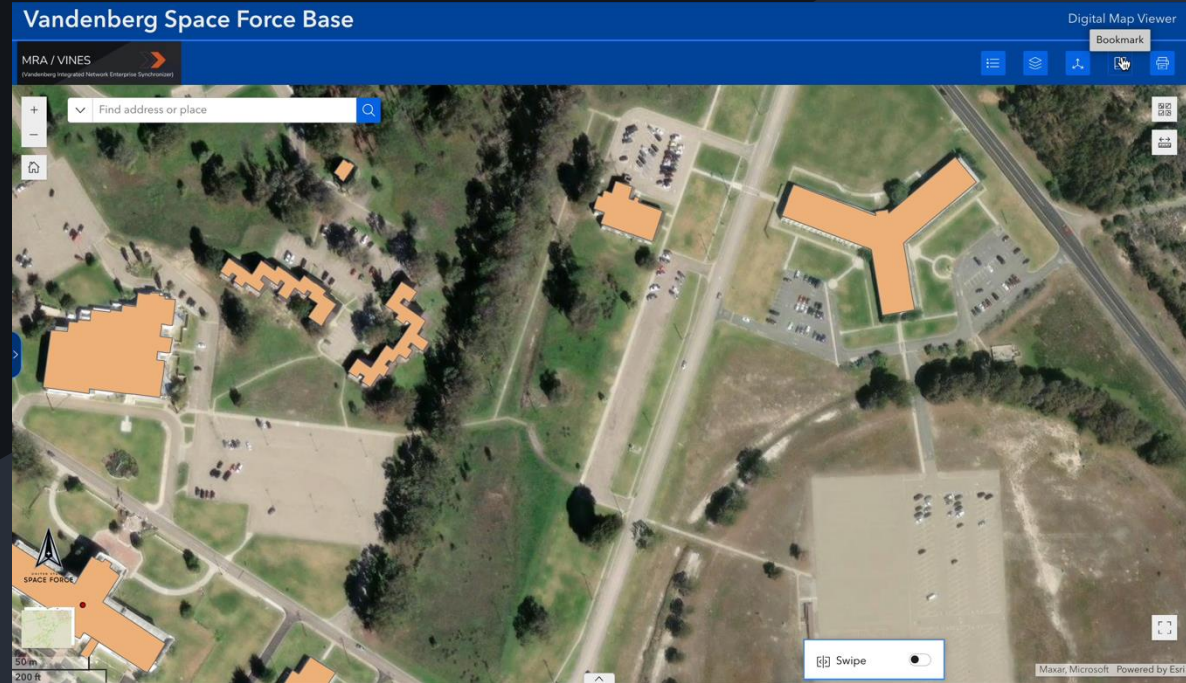
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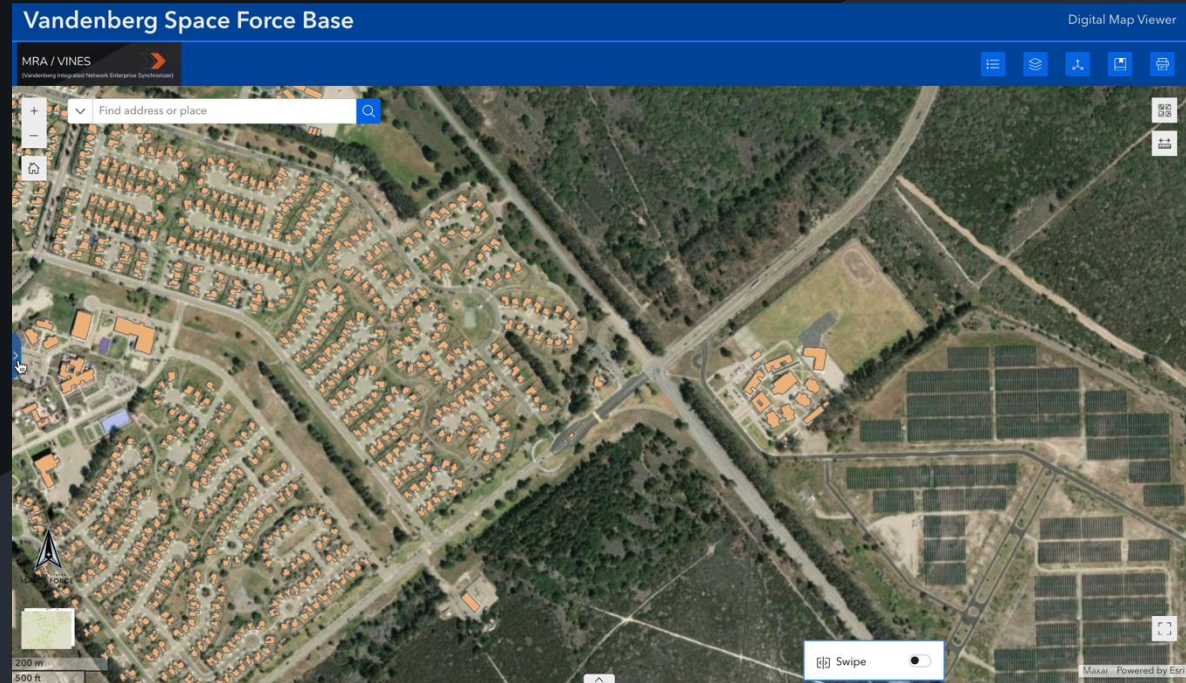
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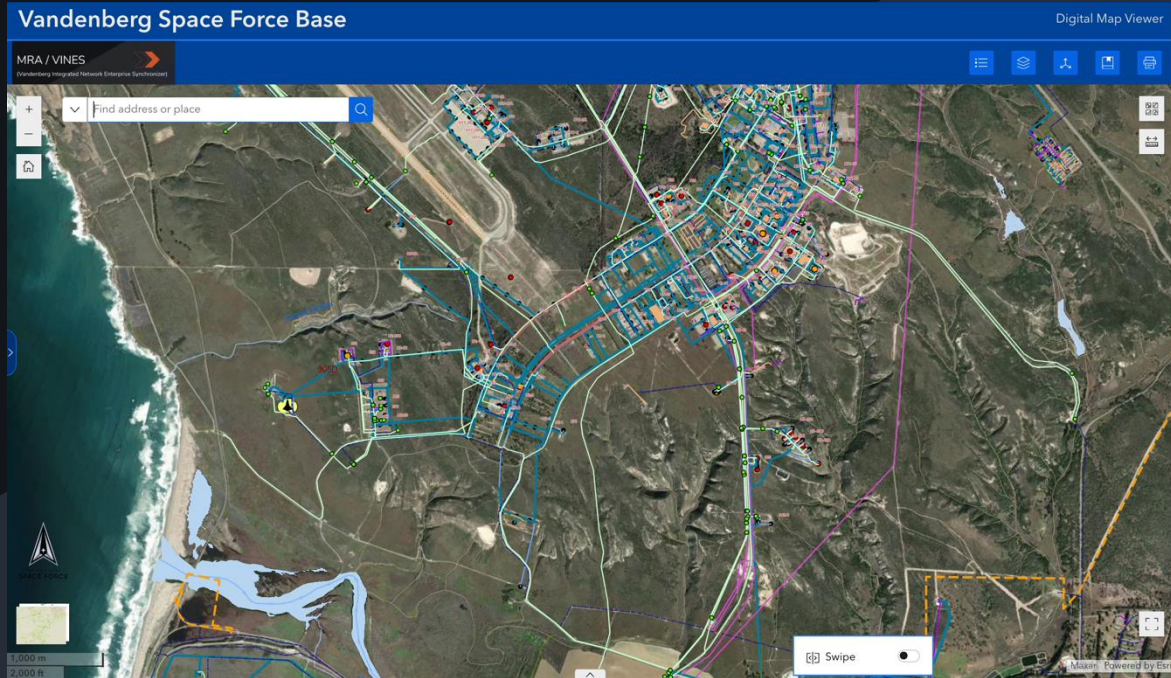
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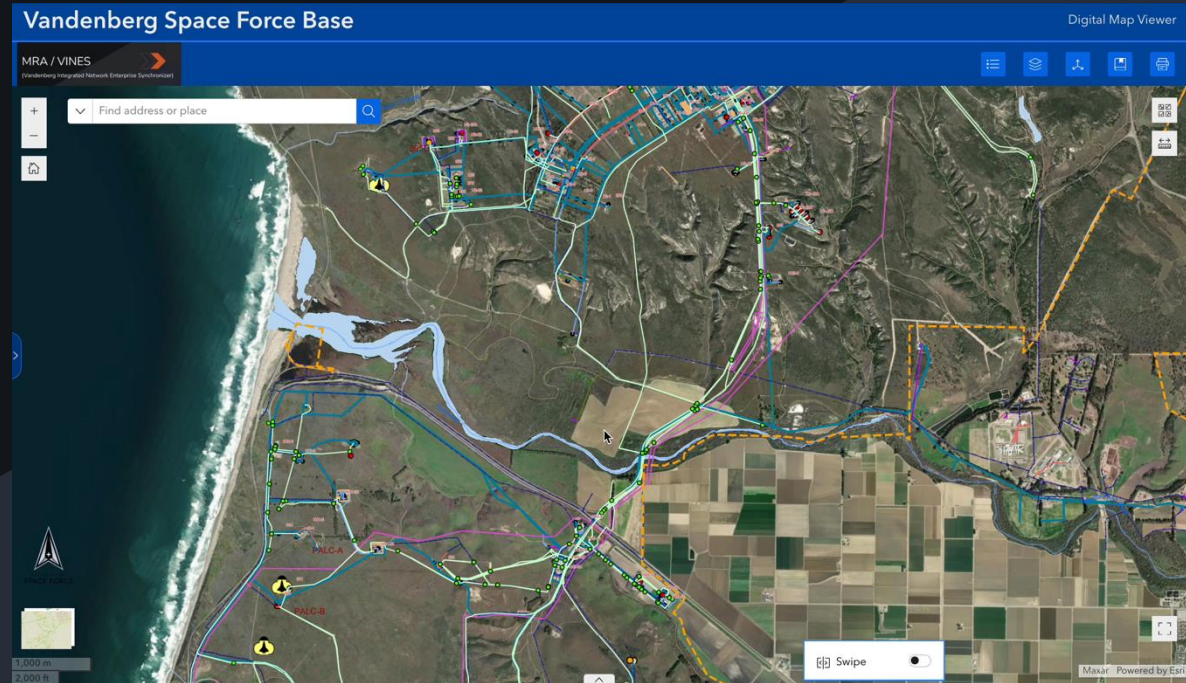
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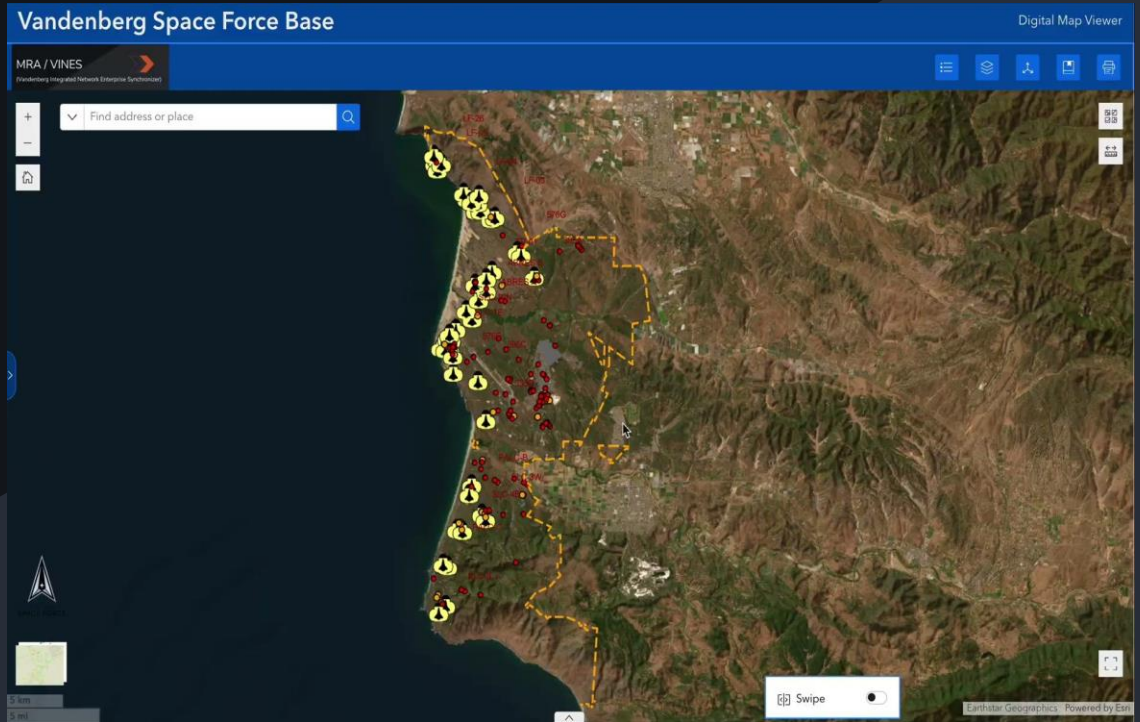
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ArcGIS Map Viewer Prototype

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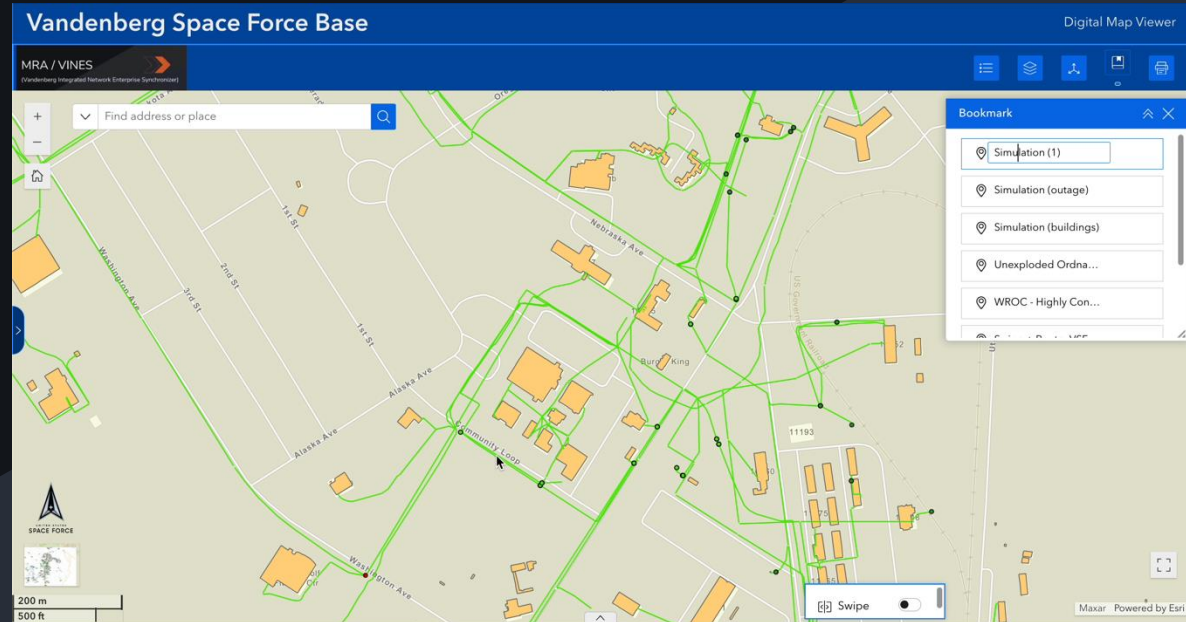
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- › Unexploded ordnances
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ArcGIS Map Viewer Prototype

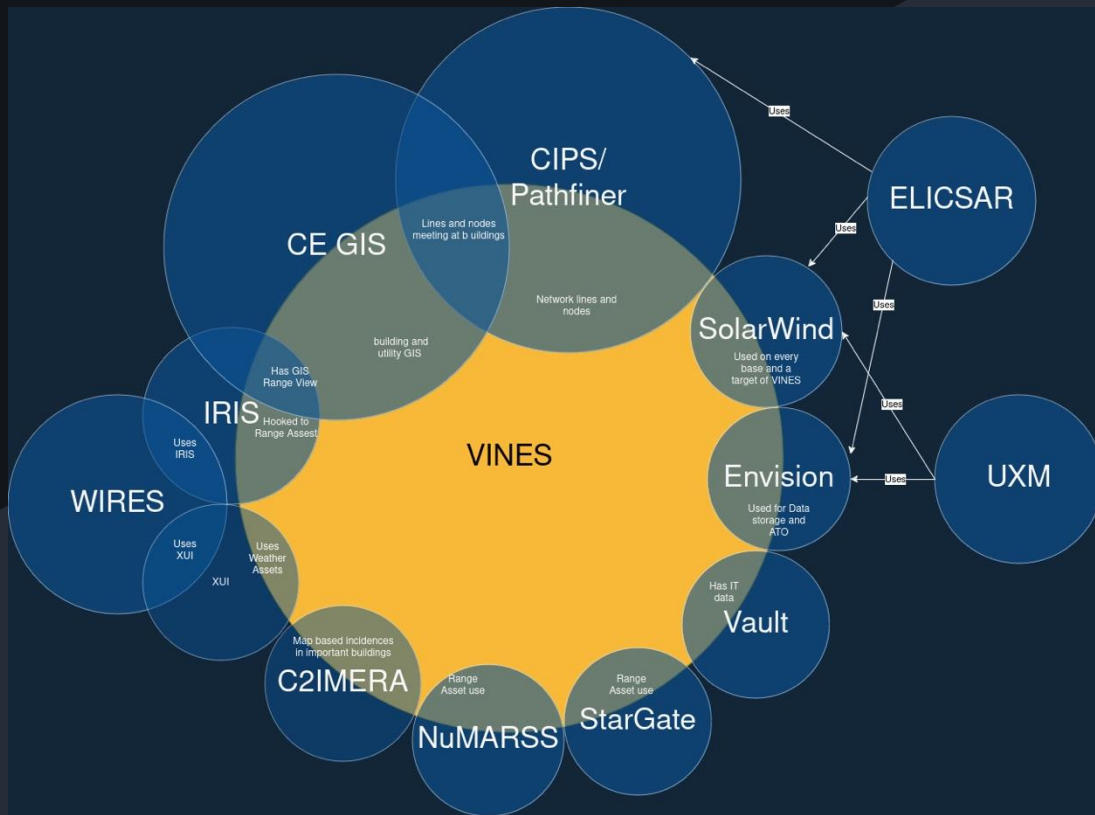
Simulation (future capability):

- Outage Simulation



VINES: Future State Design

- › The diagram provides a visual of the future design state of VINES integrating into a larger VSFB enterprisal system.





What other data or information do you think would
be valuable to integrate?



Appendix



Progress to Date:

Phase 1 **IN PROGRESS** (to be completed by FY25)

OBJECTIVE: Aggregate GIS data

- Aggregating **disparate GIS data sources** into a **single repository**.

**MEDIUM
EFFORT
MEDIUM
EFFORT**

- User Discovery
- Implemented data processing of GIS data from CES and CIPS.

HIGH EFFORT

- Gathering GIS Data

**MEDIUM
EFFORT**

- Early UI development of Web App

LOW EFFORT

- User Experience preparation

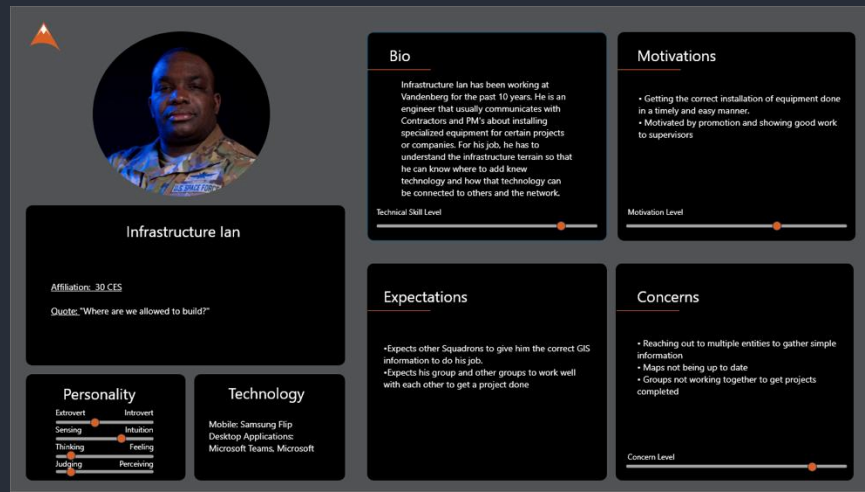
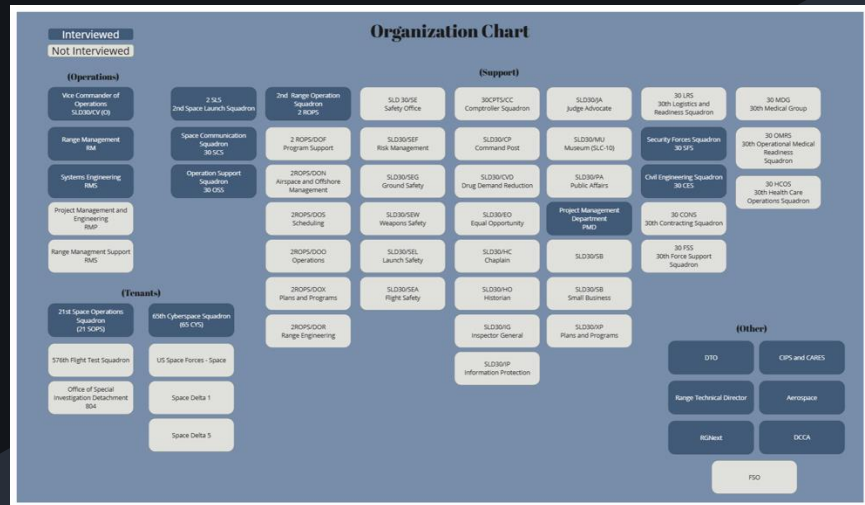
**MEDIUM
EFFORT**

- Map Viewer Prototype

DELIVERABLES:

> Multiple GDB stores

- Basic Map Viewer Web Module for restricted access

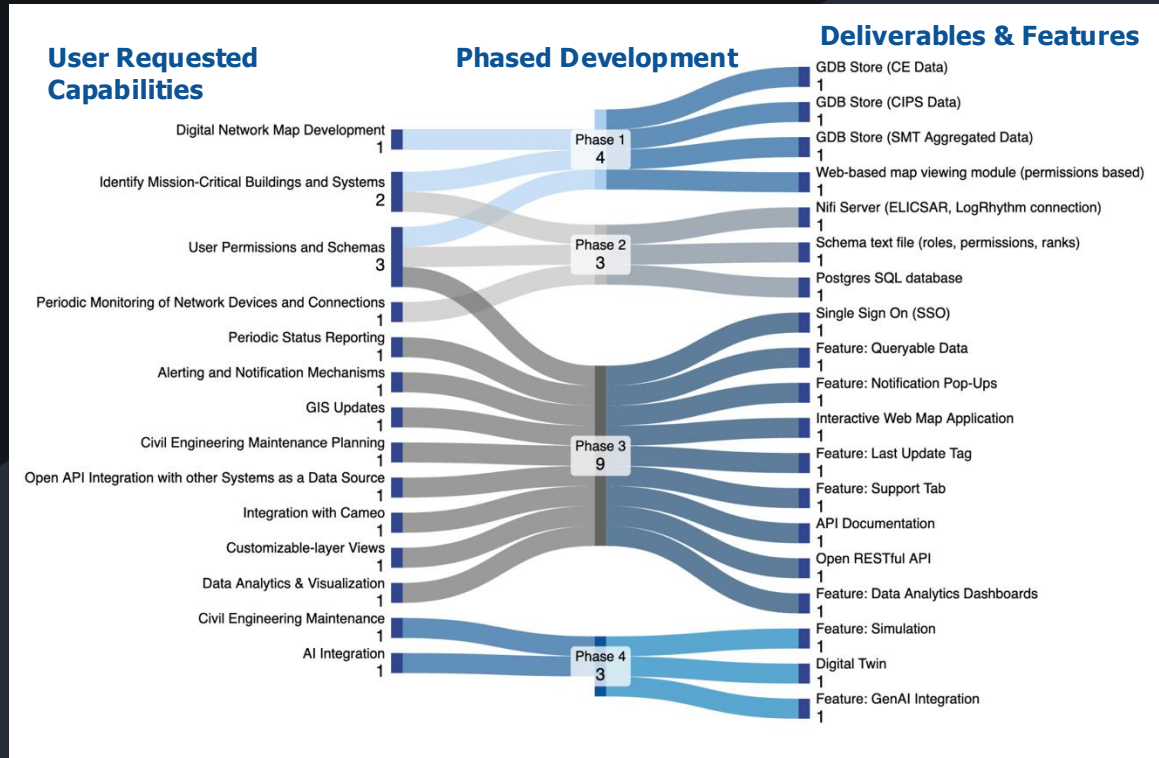


User Capabilities: (Mapped to Development Features)

User requested requirements and capabilities mapped to phased project development and deliverables.

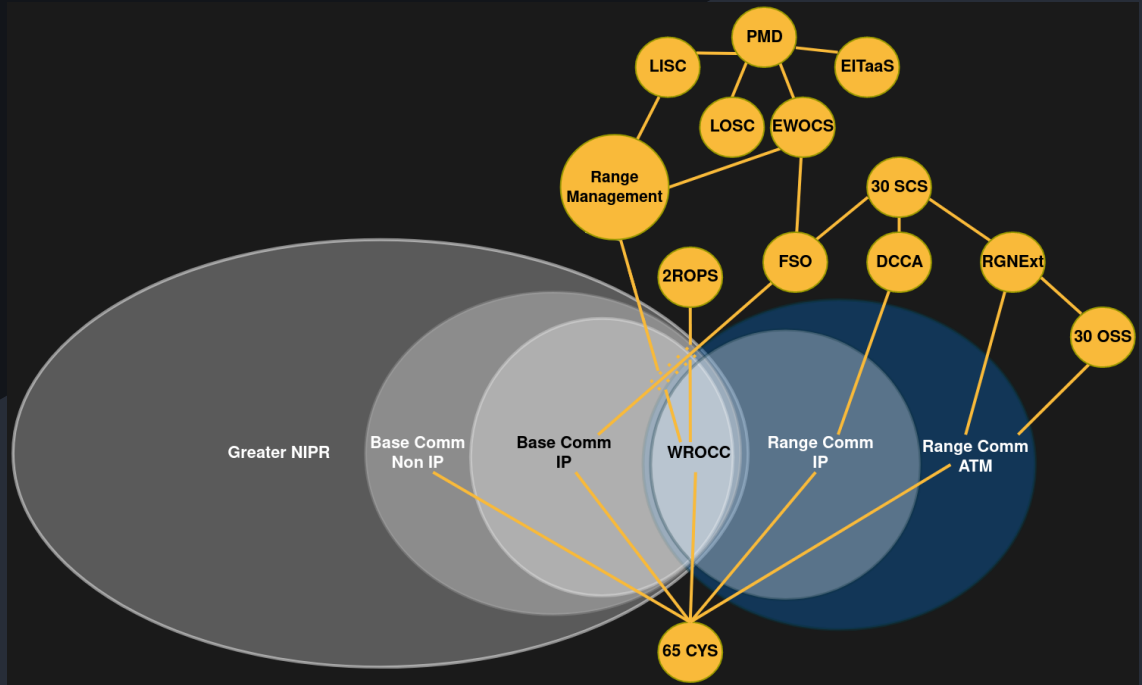
› **FY25 Phase 2-3**
Development: Four COA options proposed for FY25 development efforts.

All options guarantee the achievement of Phase 2 deliverables and goal of “Align the Network Data”



Network/Relationship Diagram

- › The diagram provides a visual for the complex nature of the networks on base
- › Displays relationship between Range and Base Networks and how they interact with different squadrons and contractors
- › Allows opportunity to identify stakeholders and end users



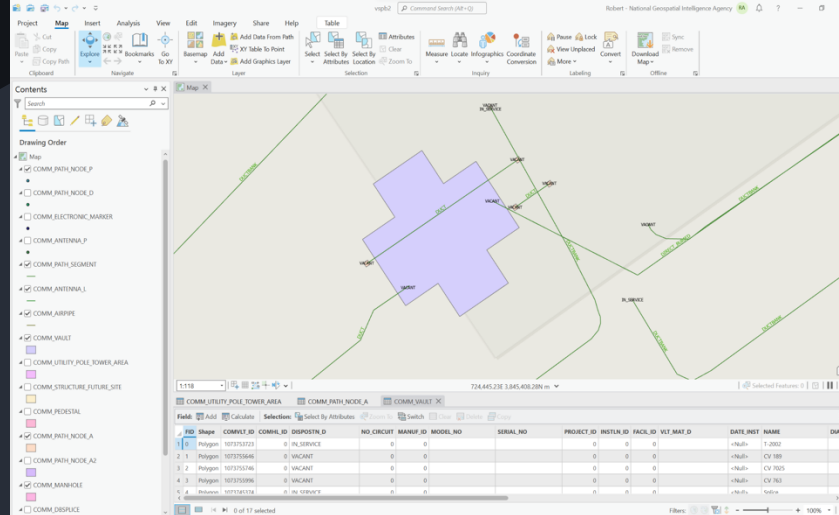
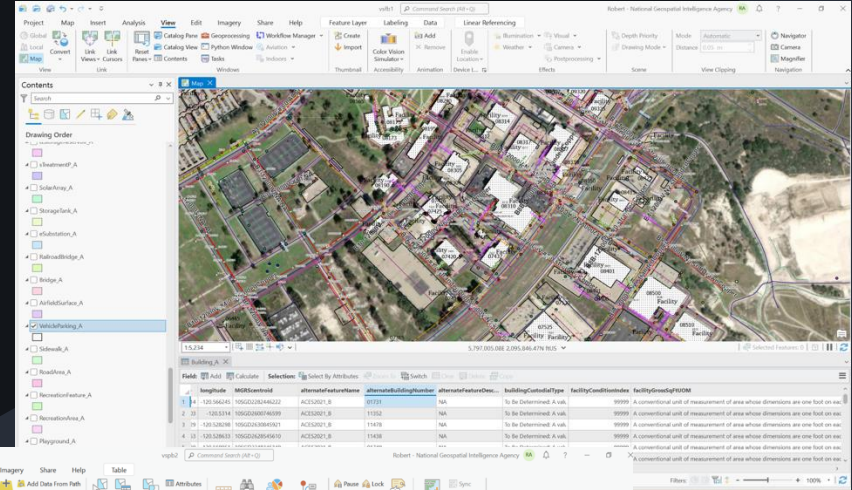
Data Sources

Current: Aggregation of GIS data

- > CE
- > CIPS
- > AFGIMS (pending)

Future: Phase 2 and 3

- > ELICSAR
- > LogRhythm
- > Weather
- > Windchill
- > LIMES



SILICON MOUNTAIN

Progress to Date:

Phase 1 **IN PROGRESS** (to be completed by FY25)

OBJECTIVE: Aggregate GIS data

- › Aggregating **disparate GIS data sources** into a **single repository**.

MEDIUM
EFFORT

- Implemented data processing of GIS data from CES and CIPS.

HIGH EFFORT

- Gathering GIS Data

MEDIUM
EFFORT

- Early UI development of Web App

LOW EFFORT

- User Experience preparation

MEDIUM
EFFORT

- Map Viewer Prototype

DELIVERABLES:

- › Multiple GDB stores
- › Basic Map Viewer Web Module for restricted access

Phase 1: ALIGN GIS DATA

GOA: ALIGN GIS DATA

Aggregating GIS data sources into a centralized location (server) for future accessibility, system visibility and efficiency. *This will lay the foundation for the long-term project goal. If low effort, turn on web-based module for permissions based access.*

RISKS:

- **LOW RISK** Permission to install Server on Base COMs
- **LOW RISK** Access, create work environment for Bob
- **LOW RISK** Obtain API for CIPS GIS data

HARDWARE	SOFTWARE	DATA NEEDS (PULL)	KEY STAKEHOLDERS
Server (housed on Base COM) (SMT server recommendation below to best accommodate future Phase 2 & 3+ needs) 	ArcGIS license for Bob	• CES GIS Data • CIPs GIS Data - Network Layers • Solar Winds Data (stretch goal) • Open Source GIS layers	• CES • DTO • CIPs Admin

ACTIVITIES

- Determine and implement update process of data, cadence and implementation
- Management and sustainment plan for the server and ArcGIS software

DELIVERABLES (3 GDB stores)

- 1 GDB store = CE data (manual xlsx)
- 1 GDB store = CIPS data (network layer manual or via API)
- 1 GDB store = SMT aggregation includes
 - nodes from base comm via Solar Winds (stretch goal)
 - additional open-sourced data layers

VALUE

- Aggregates multiple sources of GIS data into a single repository
- Web accessible for consolidated GIS view
- Lays the foundation for the digital twin
- As foundation for digital twin, this is the first step in achieving a program of greater value.
- Compounding effect

Development Plan:

Phase 2 TBD

OBJECTIVE: Align the Network Data

- › Collect and standardize network monitoring information from Range COMMs (WMN) and Base COMMs and establishing a unified repository enabling future development.
 - Model data structures, configure data transformation tools (NIFI), and establish secure communication between network segments.
 - (Option) **Lite GenAI development of change detection algorithms**
 - (Option) **Data Analytics and dashboard prototype**

DELIVERABLES:

- › Aggregated data stores of network monitoring information
- › Standardized Data schemas and objects

Phase 2: ALIGN NETWORK DATA

GOAL: ALIGN NETWORK DATA (Would involve Alonso)

Aggregate network monitoring information across Range COM (WMN) and Base COM. *This lays the foundation to visualize the data.*

- Range COM - Monitoring capabilities for the RIUs & tap into [LogRhythm](#) software
- Base COM - Tap into ELICSAR software
- Utilize NIFI to perform ETL services
- Install NIFI onto Phase 1 server

RISKS:

- **HIGH RISK** Figuring out a tunnel between Range COM and Base COM
- **LOW RISK** Getting access to LogRhythm and ELICSAR data
- **MEDIUM RISK** Project Funding

HARDWARE	SOFTWARE	COMBINATION	DATA NEEDS	KEY STAKEHOLDERS
Existing Phase 1 Server	• NIFI • PostgreSQL Database	Tunnel	• LogRhythm - DCCA • ELICSAR (via api)	▪ 65CYS ▪ FSO ▪ ELICSAR ▪ DCCA ▪ RM

ACTIVITIES

- Model Data Structures
- Configure NIFI to transform data into databases

DELIVERABLES

- Aggregate Data stores of network monitoring information.

VALUE

- Aggregates Range and Base COM monitoring information into single repository.
- Consolidates base transactional information (Log)
- Partner w/ 65CYS to utilize and meet MRT mandates
- Data for Digital Twin (ready to create app for twin)

Development Plan:

Phase 3 TBD

OBJECTIVE: Visualize the Data

- › Leverage data from Phases 1 & 2 to create a visual interactive digital twin. The twin can be used for monitoring and simulations and informed decision-making.
- › Building an interactive map and establishing data depth lays the foundation for future analysis.

DELIVERABLES:

- › Web Application
- › Feature: Lite GenAI development of change detection algorithms
- › Feature: Data Analytics and dashboard prototype

Phase 3+: VISUALIZE THE DATA

GOAL: VISUALIZE THE DATA (Utilize Supra Coders if possible)

Combine Phase 1 and Phase 2 data with real time data actions of the base.

- Start to build data models and depth of data that's necessary for simulations and analysis.
- Additional creation of metadata to test and verify simulations
- Include Supra Coders as a mentor and training opportunity

RISKS:

- **MEDIUM RISK** Project Funding
- **MEDIUM RISK** Assistance in creating interaction maps

HARDWARE	SOFTWARE	DATA NEEDS	KEY STAKEHOLDERS
Existing Phase 1 Server (<i>pending space</i>)	• Application Server • UI Web Application		

ACTIVITIES

- Build an interaction map between objects
 - Manually build the map
 - Realtime updates based on data from Phase 2

DELIVERABLES

- Visualization of the Digital Twin to a digitized format

VALUE

- Achievement of Digital Twin of VSFB
 - Lay foundation for simulations
 - Provides roadmap for Eastern Range+
 - Provide leadership view of Spaceport operations
 - Consolidated view to see status of base from operational perspective
 - ★★★★★ Supports **MRT congress mandate**
 - ★★★★★ Supports SLD30 Base Mission → "Defend the Mission"
- [› MRT Congressional Mandate Tasker...](#)

Direct Quotes (from leaders across the base)

Regarding network infrastructure issues



It should not take months to identify DISA Circuit overlays.



We do not know which TACLANEs are inop to connect to SIPR.



We would like to know which range assets are connected and running vs disconnected.



It takes too much time to determine which

network nodes impact the others – this degrades our ability to know mission impacts.



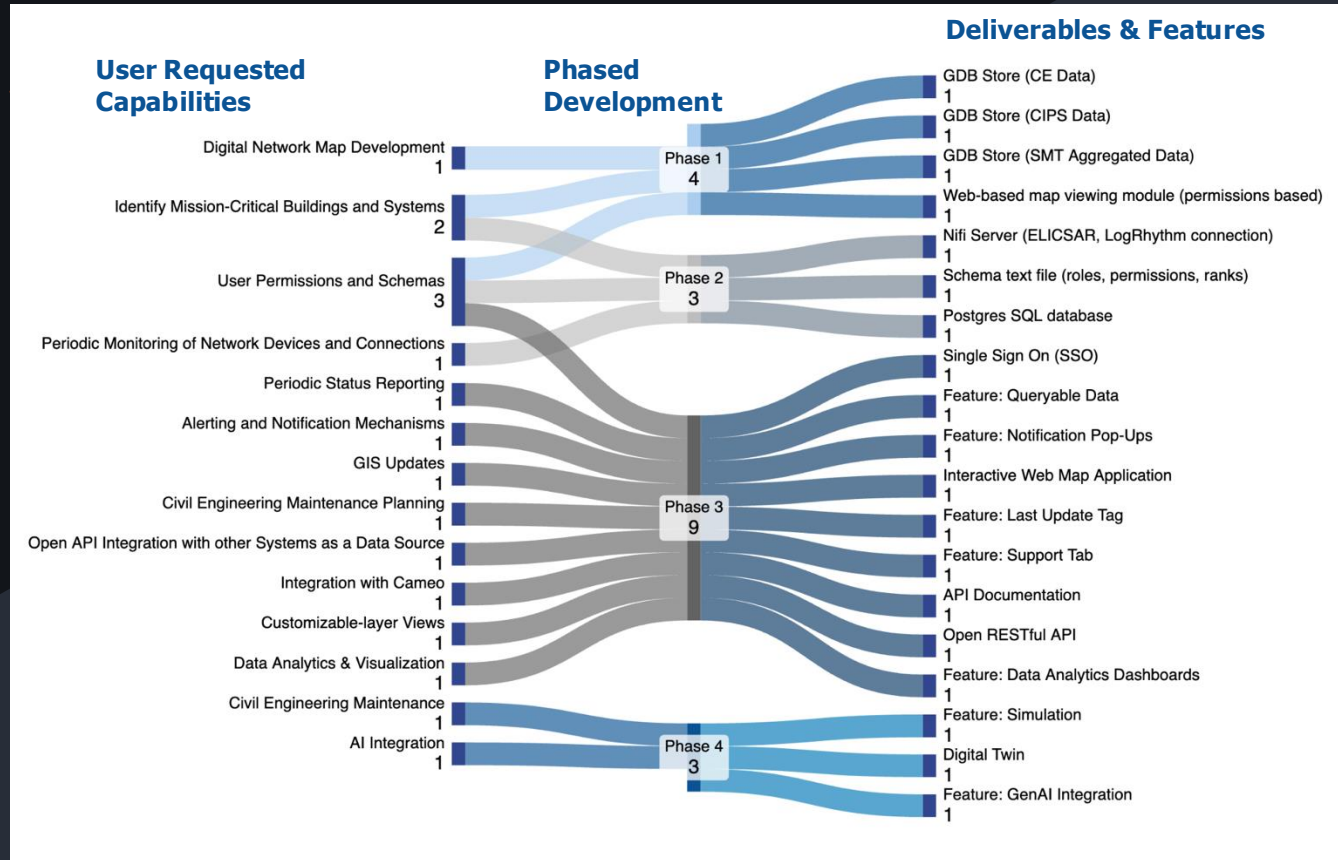
We are not sure which end user devices could be quarantined until it's too late.

User Capabilities: (Mapped to Development Features)

User requested requirements and capabilities mapped to phased project development and deliverables.

› **FY25 Phase 2-3 Development:** Four COA options proposed for FY25 development efforts.

All options guarantee the achievement of Phase 2 deliverables and goal of “Align the Network Data”



Data Sources

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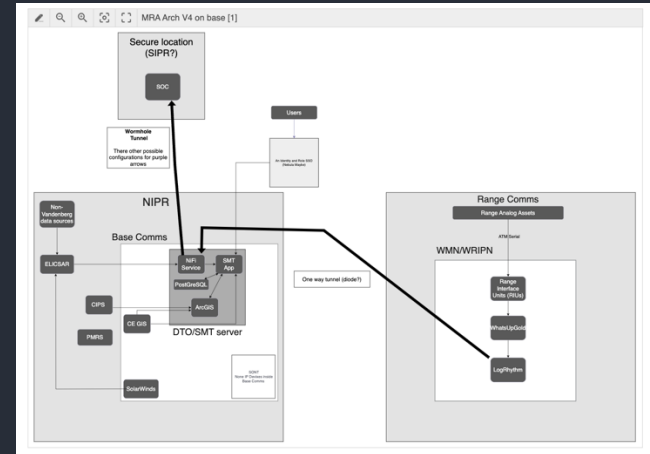
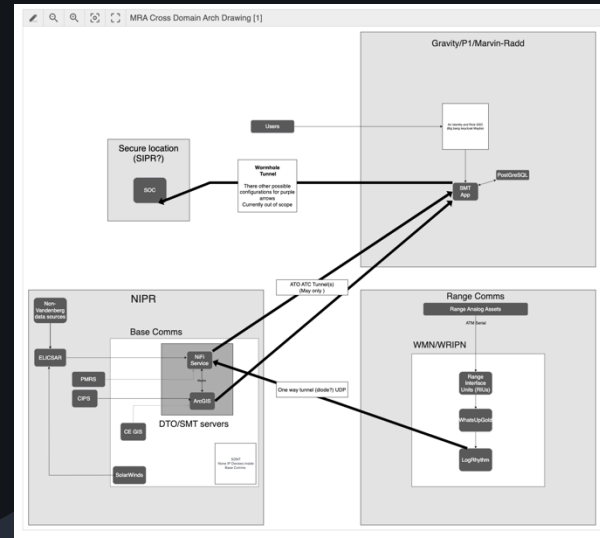
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- > CIPS
- > AFGIMS (pending)

Future: Phase 2 and 3

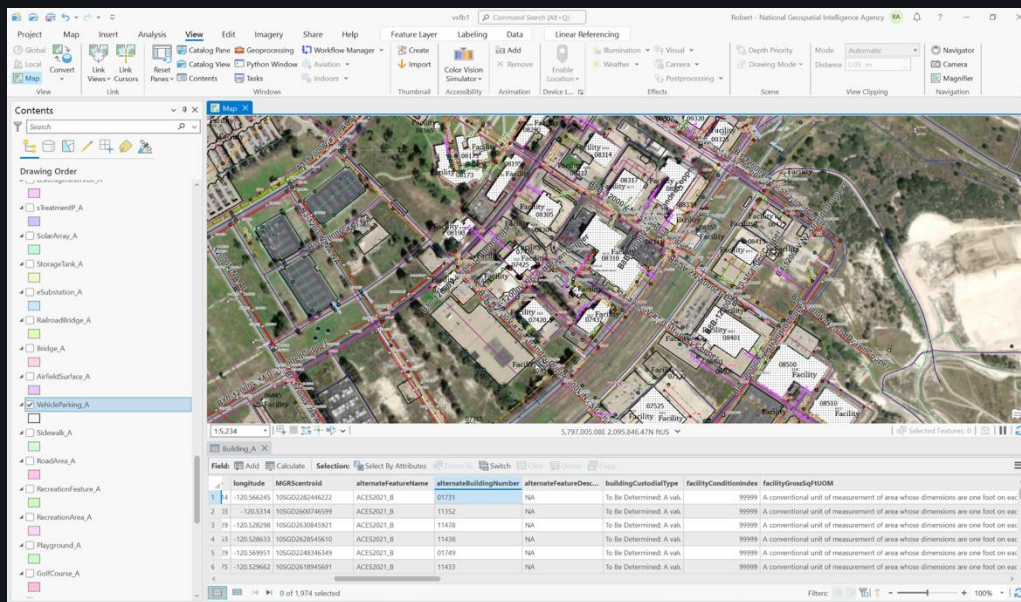
- > ELICSAR
- > LogRhythm
- > Weather
- > Windchill
- > LINES

Architecture drawings consider both Cross-Domain Pathway and On-Premise Pathway options.

(Phase 2 discovery will provide a clearer picture of the available hardware and software options.)



GIS Data Review (CE)



Data Processing IN PROGRESS

Currently 73 layers of base infrastructure data available including buildings, utilities, and transportation layers.

(Note: not all layers will be in the final product.)

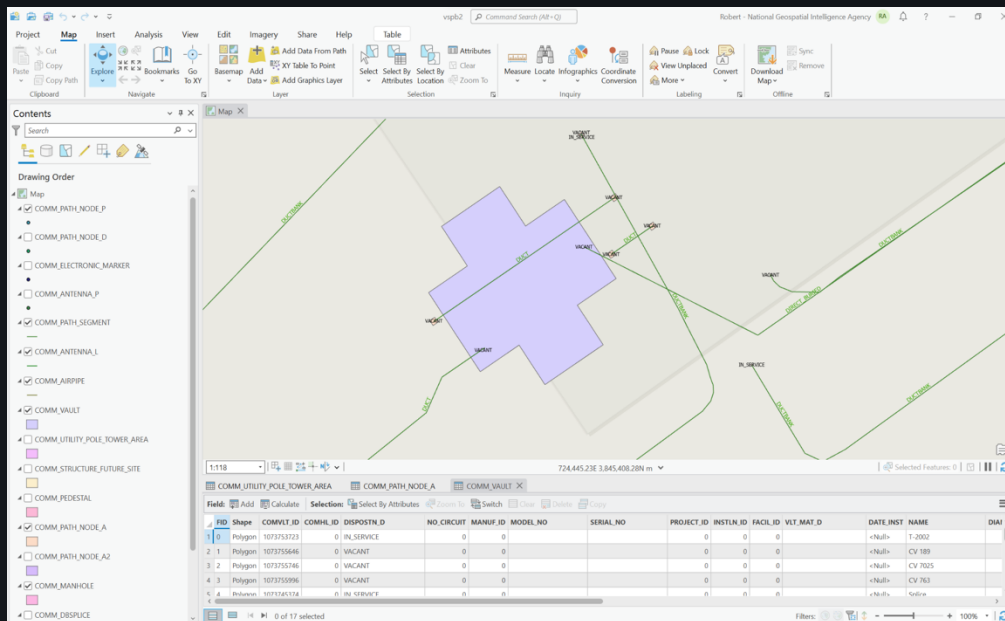
Key Layers (for inclusion):

- Roads
- Utilities: (Power, Water, Gas)
- Buildings
- Launch Sites

Unexpected Data:

- Unexploded Ordnance

GIS Data Review (CIPS)



Data Processing **IN PROGRESS**

Merging COMM Data: 15 data layers will be integrated with CE data into a unified viewer application using location data (lat/long). Ground truthing may be required to ensure data accuracy.

Key Layers (for inclusion):

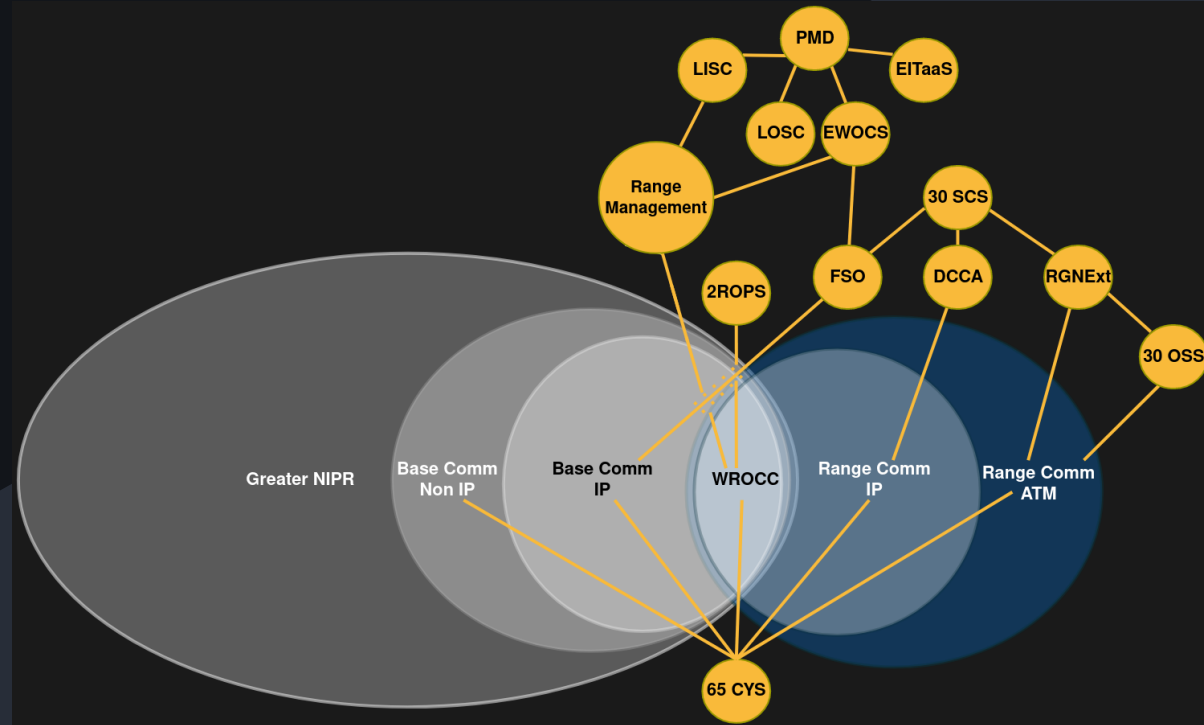
- Comm Nodes
- Comm Paths
- Vaults
- Comm Utility Poles

Unexpected Data:

- Comm Airpipe

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- › Allows opportunity to identify stakeholders and end users



Progress to Date: (Metrics)

45

People interviewed

18

Organizations represented
(Includes gov't & civilian)

2

GIS data sources assessed

80

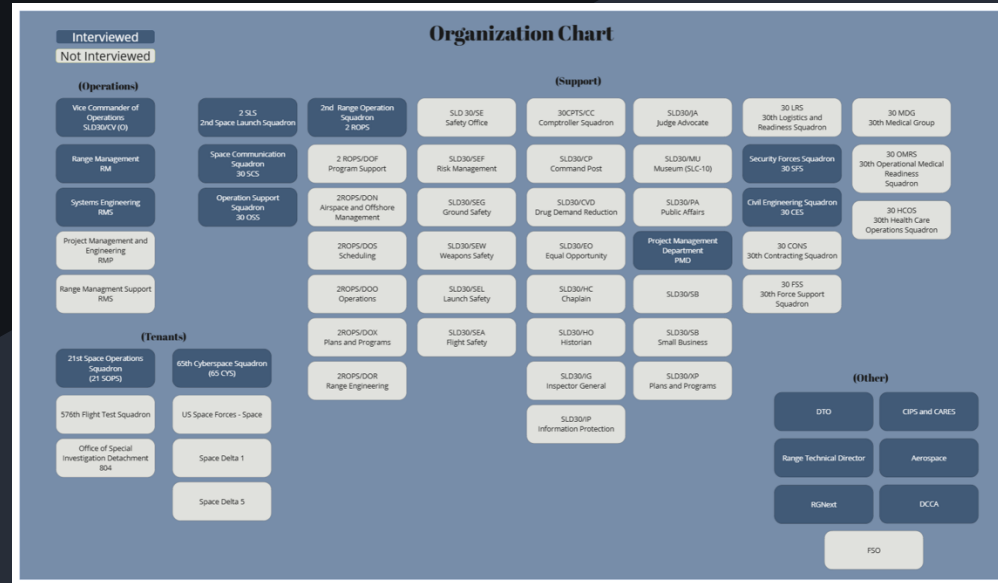
Processing GIS layers

1

Lo-Fi Mock up

5

Technical Documents

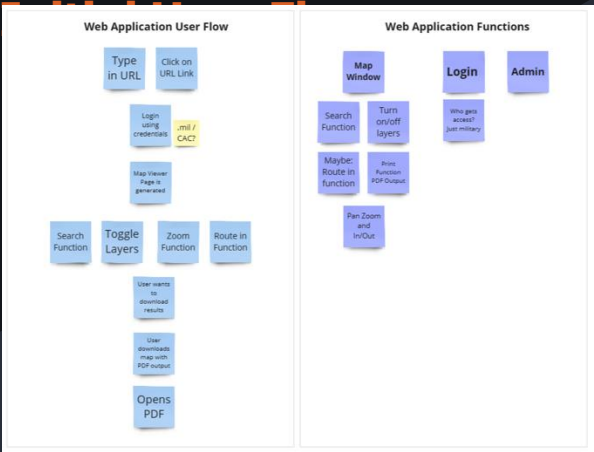


User Personas (from Phase 1 Discovery)

Supplied set of User Personas: (5 total)

› Ranging from end-user to high-level leadership needs

Designed



Infrastructure Ian

Affiliation: 30 CES

Quote: "Where are we allowed to build?"

Bio

Infrastructure Ian has been working at Vandenberg for the past 10 years. He is an engineer that usually communicates with Contractors and PM's about installing specialized equipment for certain projects or companies. For his job he has to understand the infrastructure terrain so that he can know where to add new technology and how that technology can be connected to others and the network.

Technical Skill Level

Motivations

- Getting the correct installation of equipment done in a timely and easy manner.
- Motivated by promotion and showing good work to supervisors

Motivation Level

Expectations

- Expects other Squadrons to give him the correct GIS information to do his job.
- Expects his group and other groups to work well with each other to get a project done

Concerns

- Reaching out to multiple entities to gather simple information.
- Maps not being up to date
- Groups not working together to get projects completed

Concern Level

Personality

Extrovert ———— Introvert

Sensing ———— Intuition

Thinking ———— Feeling

Judging ———— Perceiving

Technology

Mobile: Samsung Flip

Desktop Applications: Microsoft Teams, Microsoft

Strategic Sally

Affiliation: Space Force Leadership

Quote: "What's the bigger picture?"

Bio

Strategic Sally is a high level officer within the Space Force rankings. She deals with bigger picture operations that affect the SF on a bigger scale. She interacts with other high level officers and needs a quick but informative way to be updated about Space Force operations for multiple bases. She has been in the military for 20+ years and has had many leadership accomplishments.

Technical Skill Level

Motivations

- Big Picture Items
- National Security
- Improvement within Space Force Operations
- Overseeing Multiple Bases
- Space Port
- Being ready and vigilant for emergencies

Motivation Level

Expectations

- Expects to be filled in on problems within the Space Force
- Expects to be filled in on new initiatives that would greatly impact Space Force Operations
- Expects others to be aligned on Space Force Goals and initiatives

Concerns

- Overseas Adversaries
- Lack of unity within Space Force
- Lack of preparation for Space Launches
- Scoping of information relayed to her

Concern Level

Personality

Extrovert ———— Introvert

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Technology

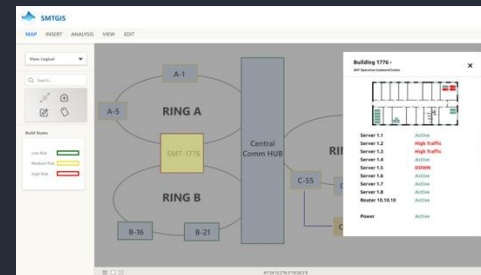
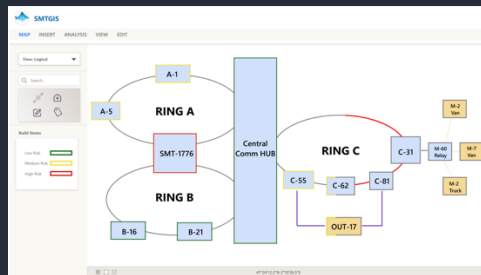
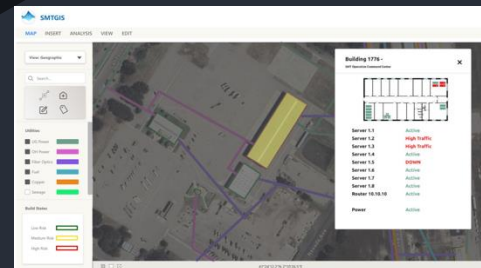
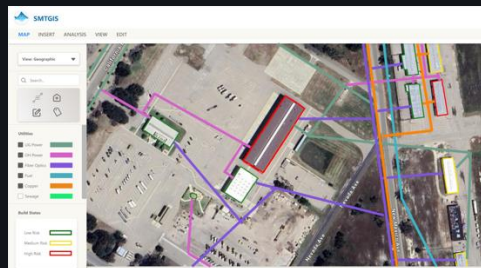
Mobile: iPhone 12

Desktop Applications: Microsoft Teams

Generated Early Mockups of Web Application

Generated an interactive mockup of the Web application.

- Included views
 - Geographic map view
 - Geographic map with model
 - Logical map view
 - Logical map with modal

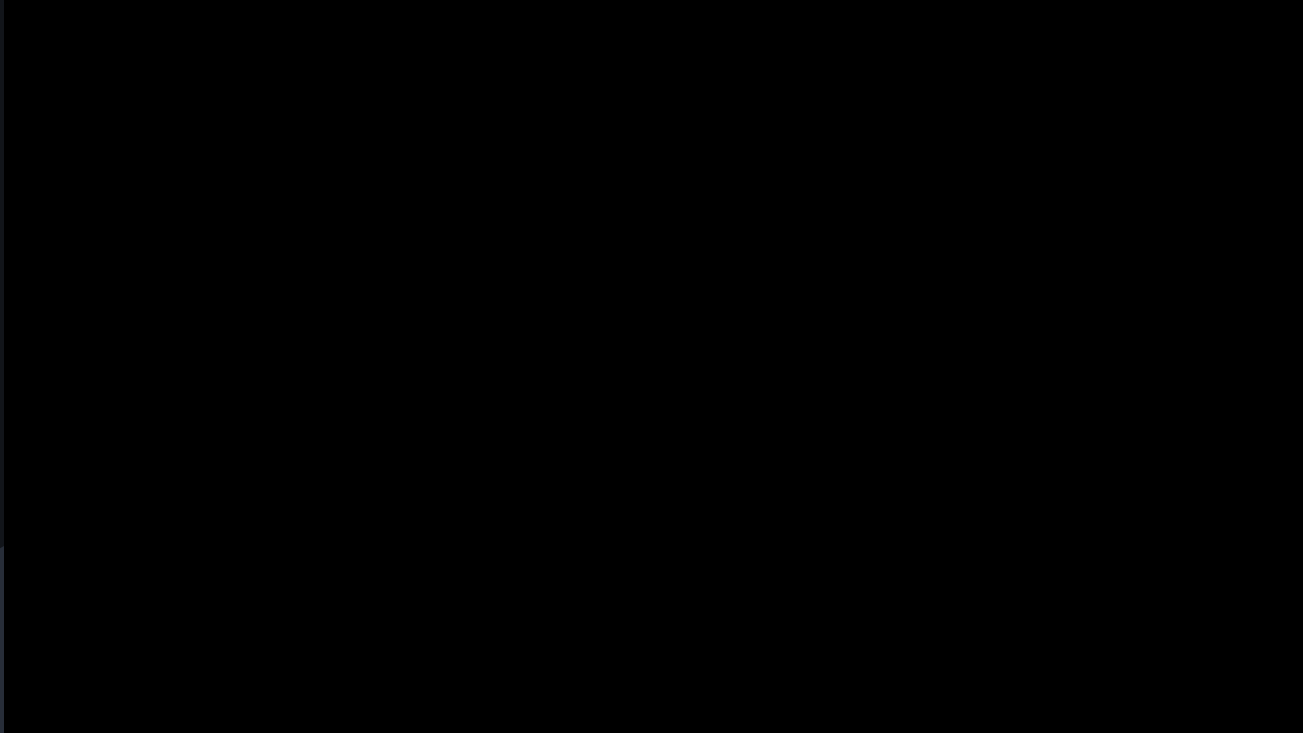


Progress to Date: (Video)

Title: SMT_MRA_Progress_to_date_2852024

Length: 2:17

[Video Link \(IL4\)](#)



Budget & Resources (FY25)

Technical Resources:

- › **Hardware*:** Existing Phase 1 Server (pending space)
- › **Software Instance and Licensing*:** ArcGIS, NIFI, PostgreSQL, React, Java Spring Boot, etc.
- › **Hosting Fees*:** for UI Web Application or other agent application(s).

* Technical Resources are not included in pricing estimates.

Personnel Resources:

- › **Travel (FY25):** 5+ onsite trips for critical MRA project activities enabling effective collaboration, knowledge transfer, and training.
- › **Personnel:** Four COA options for personnel funding to support FY25 development efforts.
 - All options guarantee the achievement of Phase 2 deliverables. Increased funding allows development of additional functionality.
- › **Supra Coder Integration:** SMT welcomes 2+ part-time USSF Supra Coders for development training creating a sustainable, non-vendor-locked solution for future projects.

Tech Stack and Supra Coder Inclusion

An augmented SMT development team including Supra Coders and collaboration with 65CYS is a win-win for the USSF.

PROS:

- › Provides relevant development training and experience for Supra Coders
- › Reduces overall labor cost of project
- › Provides a sustainment and maintenance option without becoming vendor-locked

TECH STACK:

- › React - front end
- › Spring Boot (Java) - backend
- › PostgreSQL - database
- › Open API