



# **SMS and Installation GIS Coordination and Governance**

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July 31, 2024

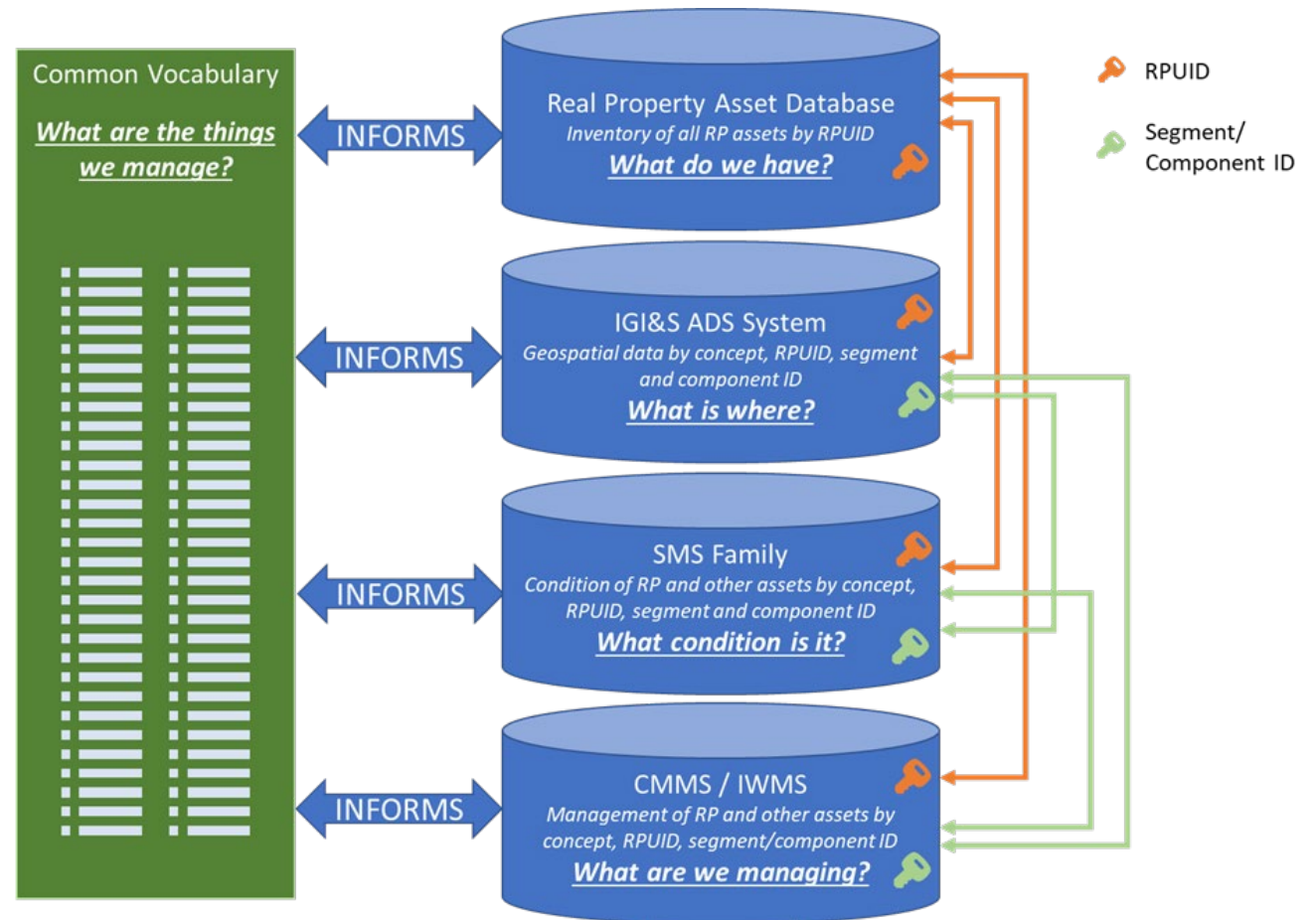


# Facility Management – Source Data Compatibility Conundrum

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DoD Installations rely on several systems for facility management:

1. Real Property Inventory (aka Accountable Real Property System (APSR))
2. Installation Geospatial Information & Services (IGI&S) systems
3. Computerized Maintenance Management Systems (CMMS) (e.g. Maximo)
4. Sustainment Management System (SMS)
5. Computer Aided Design (CAD)





# What Are We Supposed to Do?

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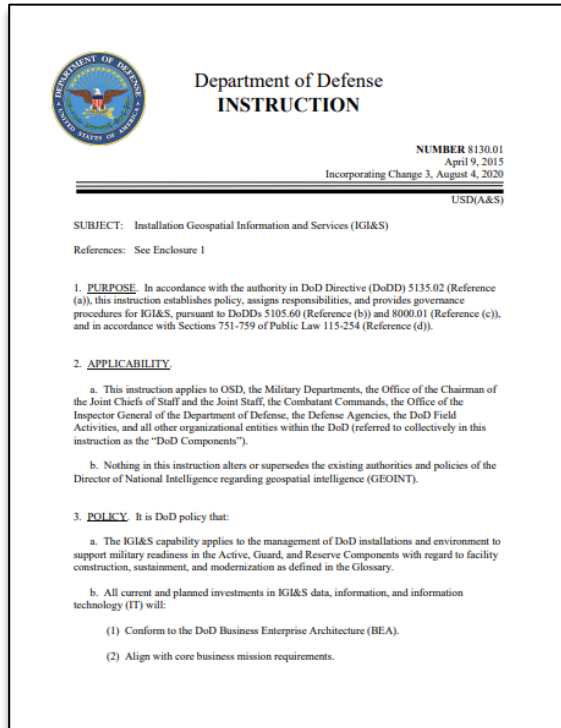
- DoD Policy and recent guidance issued by the Deputy Secretary of Defense focus on:
  - Joint All Domain Operations – using data for advantage on the battlefield
  - Senior Leader Decision Support – using data to improve DoD management
  - Business Analytics – using data to drive informed decisions at all echelons
- DoD Data Strategy – Guiding Principles:
  - Data is a Strategic Asset
  - Collective Data Stewardship
  - Data Ethics
  - Data Collection
  - Enterprise-Wide Data Access and Availability
  - Data for Artificial Intelligence Training
  - Data Fit for Purpose
  - Design for Compliance

*Visible – Accessible – Understandable – Linked – Trustworthy – Interoperable – Secure  
(VAULTIS)*



# The Spatial Data Standards for Facilities, Infrastructure, and Environment (SDSFIE)

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- A family of geospatial data standards
  - Models
  - Specifications
  - Procedures/Workflows
  - Online tools
- Purpose & Scope: To structure commonly used data and products for GIS mapping of DoD Installations and USACE Civil Works infrastructure - make geospatial data and services visible, accessible, understandable, trusted, and interoperable across the DoD

\* SDSFIE is mandated per DoD Instruction 8130.01, Installation Geospatial Information and Services, Change 3 issued 4 Aug 20

*The most comprehensive data standard of any kind in use across the EI&E and Civil Works mission areas today*






# SDSFIE Family of Standards

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## SDSFIE-Portrayal (P)

States how each layer should be displayed on the map

-  Installation
-  RoadCenterline
-  Building

## SDSFIE-Vector (V)

Uniquely defines and names sets of geospatial features, e.g.,

- Building Footprints
- Installation Boundary
- Road Centerlines

## SDSFIE-Metadata (M)

Metadata describes what is in the dataset; how it was produced; who did the work; when, & why

## SDSFIE-Quality (Q)

Specifies how the dataset should be produced, maintained, and assessed and checked for quality

## SDSFIE-Raster (R)

Provides guidance and best practices for acquiring and using raster data, e.g., satellite and *aerial imagery* and elevation



Fort Buchanan



# The SDSFIE Vector Standard: “Points, Lines, Polygons”

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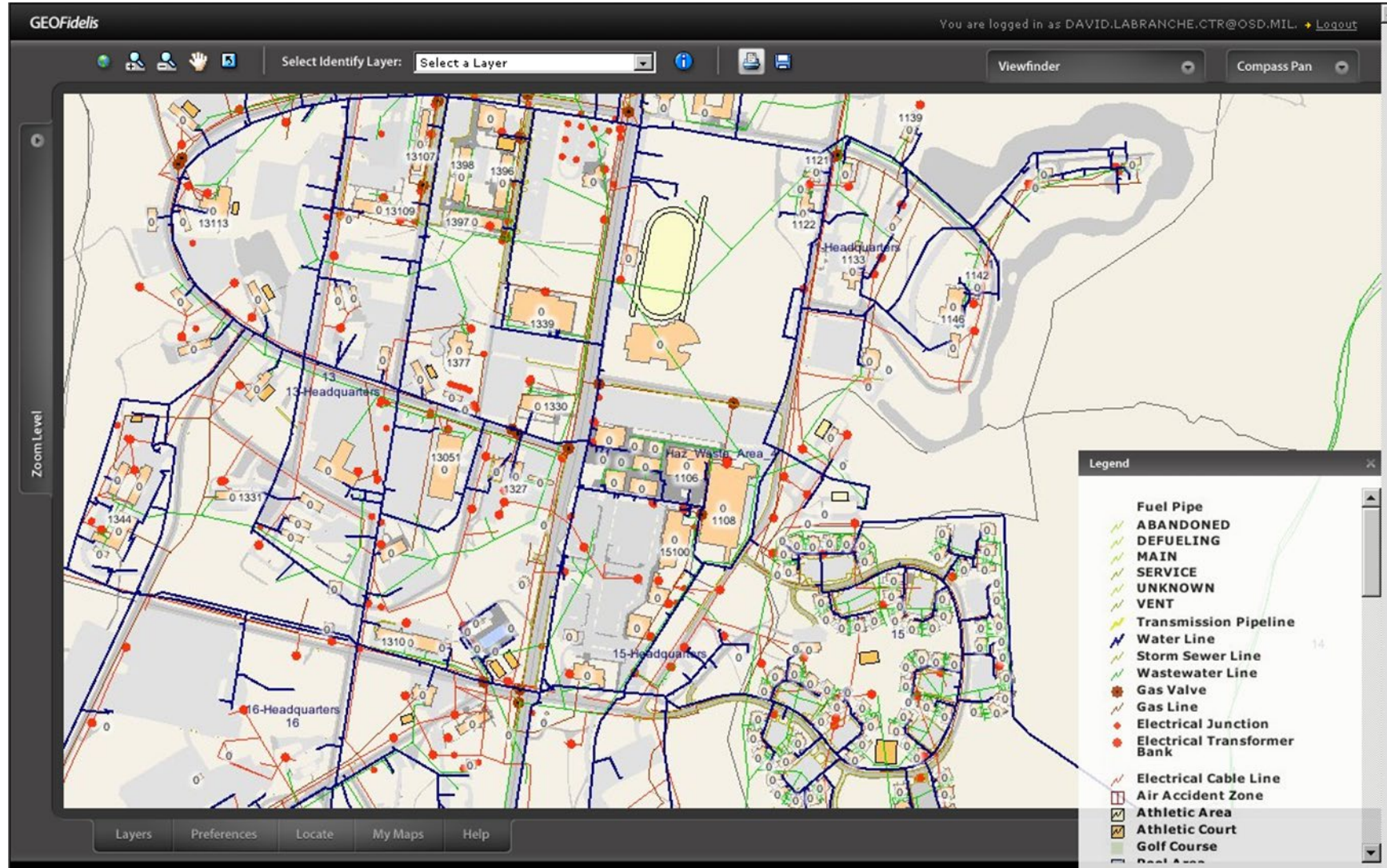
- SDSFIE Vector (SDSFIE-V)
  - A “dictionary” of 287 geospatial feature types (aka map layers) commonly used in DoD for performing installation management, energy management, environmental restoration, natural and cultural resource management, test and training range operations, and civil works construction/maintenance/operations
- Functional Themes of SDSFIE-V data:

Airfields	Common & Cross-Functional	ENV Common & Cross-Functional	Planning
Cemetery Operations	Environmental Compliance	Military Ranges and Training	Real Property (Buildings, Structures, Land)
Civil Works	Cultural Resources	Natural Resources	Recreation
Environmental Clean Up	Emergency Services	Public Works (Communications, Electrical, Gas, Other, POL, Stormwater, Wastewater, Water)	Transportation



# “What Does SDSFIE-V Data Look Like?” Utilities Management Feature Types (example)

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# Recent History of SMS-SDSFIE Coordination

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- 2009-2011: DoD Component users of PAVER, RAILER, etc. proposed adding various SMS concepts into SDSFIE Gold 3.0 (e.g., Pavement section/branch, Rail track/segment)
- 2014-2017: During development of SDSFIE-V Gold 4.0, the SDSFIE support team aligned with PAVER
  - Pavement section and branch types and other elements
  - Pavement linear structure area and pavement sample unit area
- 2020-2021: USAF and USMC proposed many Utilities changes based on working with Utilities SMS SMEs (incorporated into SDSFIE-V Gold 4.0.3 and SDSFIE-V Gold 4.0.5)
- 2021: Worked with PAVER SMEs to further harmonize Pavement Section feature type, and RAILER SMEs to harmonize Rail-related feature types
- 2022: POL-related elements harmonized in coordination with FUELER SMEs
- 2023-2024: In-depth data modeling of Utilities elements, aligning SDSFIE-V Gold with SMS according to the varied approaches of DoD Components



# SDSFIE-V: Utilities Data Overview

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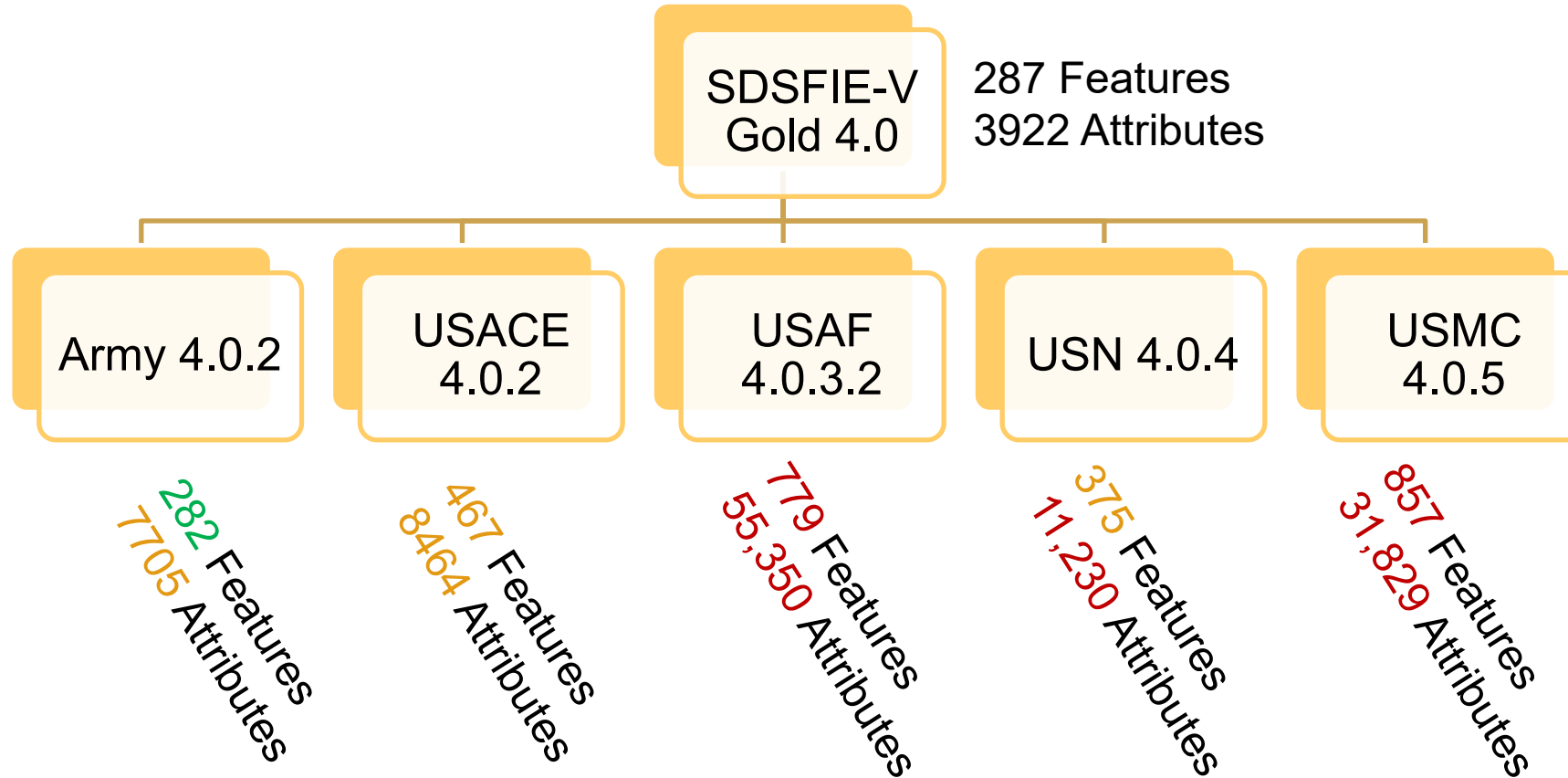
- Components are empowered to create “Adaptations” of the SDSFIE-V Gold model, including extending, modifying, and profiling (removing) model elements
- Most of the additional entities cited in the previous table are extensions (additions) that match concepts in the “type” domain lists of the Gold utility entities (see next slide)
- Some Gold utilities entities/services have been removed (or minimized) in Component Adaptations
  - E.g. the Compressed Gas utility network is not included in the Army Adaptation. The POL utility network is minimal in the Navy Adaptation (only a few concepts are maintained, external linked tables are used instead)

*Visible – Accessible – Understandable – Linked – Trustworthy – Interoperable – Secure  
(VAULTIS)*



# DoD Components' Implementation of SDSFIE-V 4.0

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**Facilitating interoperability is the key goal of SDSFIE-V**

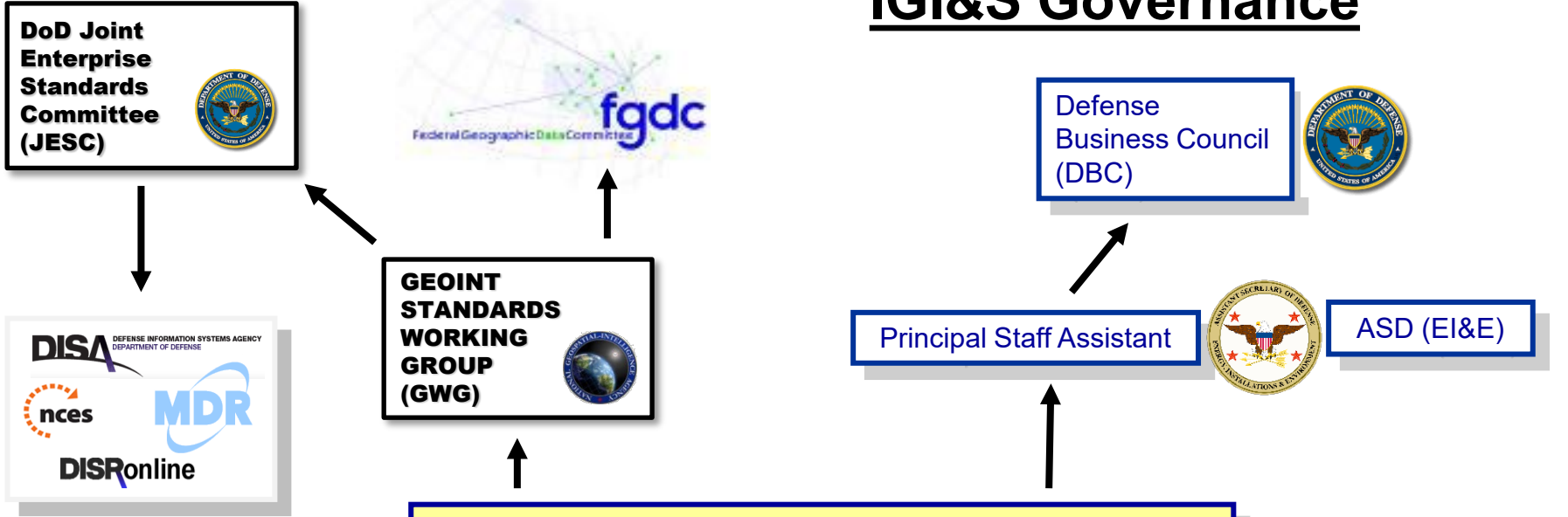


# Key Points About SDSFIE

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- Three most important parts of SDSFIE:
  - SDSFIE-V (vector)
  - SDSFIE-M (metadata)
  - SDSFIE-Q (quality)
- The IGI&S Governance Group (IGG) has a highly structured and repeatable change management process for SDSFIE
- SDSFIE-V defines data types for the full spectrum of EI&E functions/missions, and is closely aligned to the Real Property Information Model
- SDSFIE-V is primarily a 2-D model, but 3-D can be integrated using commercial off-the-shelf software
- SDSFIE continues to evolve, especially the vector standard

# IGI&S Governance



## The IGI&S Governance Group

OASD(EI&E) GIO (DISDI)		
DCS G-9, US Army (Army IGI&S)	CNIC N44, US Navy (GeoReadiness)	A4C / Air Force Civil Engineer (GeoBase)
Headquarters, US Army Corps of Engineers	MCICOM (GF-EI), US Marine Corps (GEOFidelis)	FSD / Federal Facilities Division, WHS

ADVISORY

- Army National Guard
- Air National Guard
- National Geospatial-Intelligence Agency



**US Army Corps of Engineers®**



## IGI&S Governance (cont.)

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- SDSFIE Governance Plan
  - Revision 4 issued 3 Jan 2024 under ASD(EI&E) signature
  - Defines all parts of SDSFIE
  - Sets conditions for how each SDSFIE part will be implemented
  - Defines a comprehensive Change Management Plan (models and documents)
- Implementation Guidance documents
  - SDSFIE-V
  - SDSFIE-M
  - SDSFIE-Q
- IGG Standard Operating Procedure (roles & responsibilities, working groups, voting)

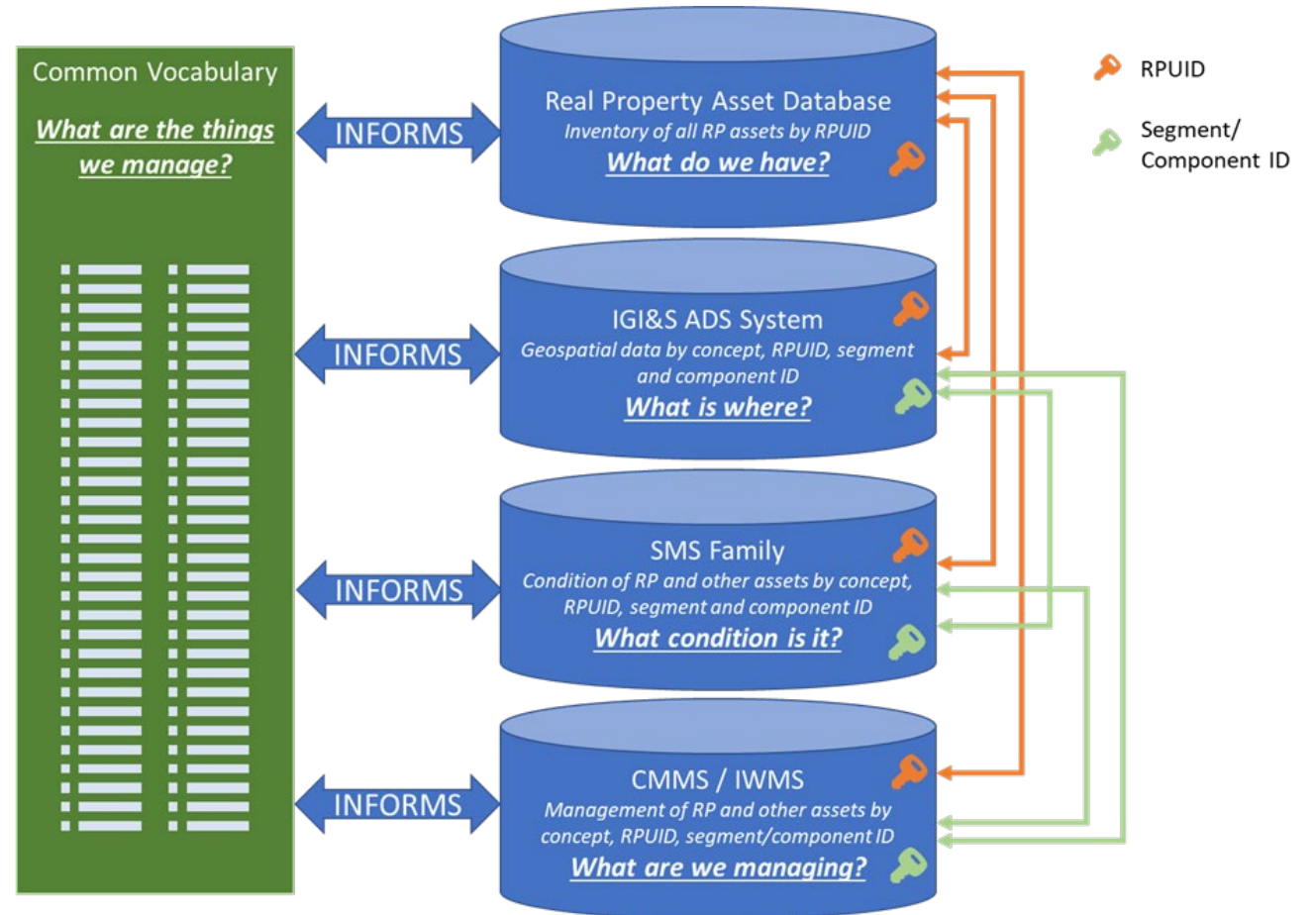
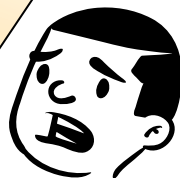


# Getting to Interoperability – “Apples to Apples”

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- For the last 2.5 years, the SDSFIE and eSMS teams have worked closely together to harmonize the standards
  - Used Components’ SME input
  - Data modeling is now integrated
  - Agreement on terminology (name, description, attributes, etc.)
  - Establishing rules that allow “sub-parts” (segments or nodes) to be mapped between systems

*“When I see features in the installation GIS it should match the locations and spatial configuration of SMS assets... and vice versa”*





# Summary

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- DoD Policy and the Data Strategy require us to act
  - Treat data as a Strategic Asset
  - Senior Leader Decision Support – use data to improve DoD management
  - Business Analytics – use data to drive informed decisions at all echelons
- The current coordination between eSMS and SDSFIE development teams is paying significant dividends
- A coordinated governance effort across the Department will assure:
  - Interoperability of data between installation systems – “apples to apples”
  - Reduced data collection costs
  - Reduced system operation costs
  - Increased decision advantage and trustworthy results
- Policy & Guidance gap remains for sustaining this interoperability ***over time***



# SDSFIE-eSMS Utilities Modeling and Harmonization

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July 31, 2024



# SDSFIE and eSMS Harmonization – Goals

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- Per DoD policy, installation data sources like SMS, CAD, CMMS, and geographic information systems (GIS) are strategic assets and must be made *linked*, trustworthy, *interoperable*, and secure.
  - GIS needs to be able to communicate with CAD, CMMS, and SMS... and vice versa
  - GIS and eSMS are at an ideal point in development to allow for this
    - o eSMS:
      - Is solidifying their data schemas
      - Has defined their requirements in required attributes and picklists from their engineering database
      - Needs to communicate their data requirements to Components
    - o SDSFIE-V:
      - Moving to new major version that includes Component derived detailed utility models
- SDSFIE and eSMS Harmonization
  - Syntactic harmonization – name/nomenclature synchronization and/or crosswalk must be established
  - Semantic harmonization – concept/definitions must be known and aligned
  - Must make logical connections between the “component”, “sub-component”, “section”, and “segment” in eSMS and their counterparts in the SDSFIE-V hierarchy of feature types and sub-classes
    - o RPSUID alone will be insufficient to link features between the systems; need lower-level identifier



# SDSFIE/eSMS Modeling Elements

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- Understanding element terminology in the modeling process ensures proper harmonization and data manageability. Even at the element level, SDSFIE and eSMS use varying vocabulary to differentiate between the element types.

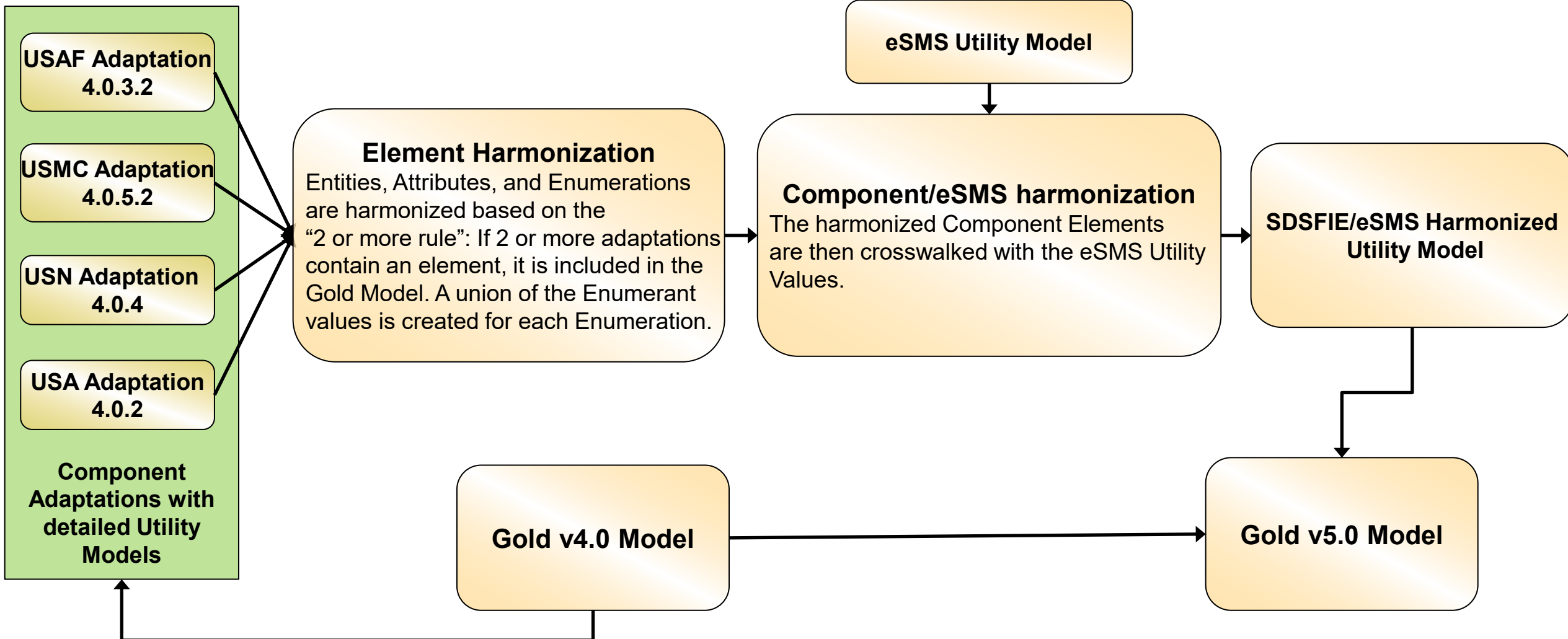
←Physical Data Model→ ←-----Logical Data Models-----→

Esri Geodatabase Element Name	SDSFIE Element Name	eSMS Element Name
<ul style="list-style-type: none"><li>Feature Class</li><li>Object Class</li></ul>	Entity <ul style="list-style-type: none"><li>Feature Type</li><li>Object Table</li></ul>	Component Type
Field	Attribute	Attribute
Domain	Enumeration	Attribute Values (name)
Domain Value	Enumerant	Attribute Values (values)



# SDSFIE/eSMS Utilities Modeling Process

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# SDSFIE/eSMS Utility Harmonization Example

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eSMS Model	Proposed, Harmonized Model	USAF Adaptation	USMC Adaptation	Navy Adaptation	Army Adaptation
<i>Component Name</i> Definition	<i>Entity Model Name</i> Entity Definition	<i>Entity Name</i> Definition	<i>Entity Name</i> Definition	<i>Entity Name</i> Definition	<i>Entity Name</i> Definition
<p><i>Thermal Tank</i></p> <p>A tank to hold and/or process water and/or a liquid as part of the thermal energy generation or distribution process.</p>	<p><i>TExpansionTank</i></p> <p>The location of a tank used in closed thermal systems to absorb excess water pressure, which can be caused by thermal expansion as water is heated.</p>	<p><i>TExpansionTank</i></p> <p>The location of a tank used in closed thermal systems to absorb excess water pressure, which can be caused by thermal expansion as water is heated.</p>	<p><i>TherUtilNode_TExpansionTank</i></p> <p>The location of a tank used in closed thermal systems to absorb excess water pressure, which can be caused by thermal expansion as water is heated.</p>		<p><i>ThermalUtilityNode</i></p> <p>The subdivision of a thermal distribution network, particularly an asset that participates in the transmission of a thermal control substance but is not a pipeline.</p>
<p><i>Thermal Pipe Fitting</i></p> <p>Fittings serve as a link connecting and providing restraint for pipe segments.</p>	<p><i>TFitting</i></p> <p>The location of a mechanical device that connects two or more pipes, or caps or plugs a single pipe, on the thermal system.</p>	<p><i>TFitting</i></p> <p>The location of a mechanical device that connects two or more pipes on the thermal system.</p>	<p><i>TherUtilNode_TFitting</i></p> <p>The location of a mechanical device that connects two or more pipes, or caps or plugs a single pipe, on the thermal system.</p>	<p><i>TFitting</i></p> <p>The location of a mechanical device that connects two or more pipes on the thermal system.</p>	<p><i>ThermalUtilityNode</i></p> <p>The subdivision of a thermal distribution network, particularly an asset that participates in the transmission of a thermal control substance but is not a pipeline.</p>
<p><i>Thermal Production Structure Component</i></p> <p>The location of a component of a thermal production structure which is often found outside of the plant building.</p>	<p><i>TProductionStructComponent</i></p> <p>The location of a component of a thermal production structure which is often found outside of the plant building.</p>				



# Utility Model Processing: Status and Next Steps

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Modeling Step and Description		<u>Step 1:</u> Component-based SDSFIE Model	<u>Step 2:</u> eSMS-SDSFIE harmonized model (Initial Draft)	<u>Step 3:</u> Component Review Complete	<u>Step 4:</u> Final Draft	<u>Step 5:</u> Import to Portal Model Registry	<u>Step 6:</u> SDSFIE-V WG Review Complete	<u>Step 7:</u> IGG Vote on v5.0 Gold
<b>Utility</b>								
<u>Target Completion Date:</u>		6/14/2024	6/28/2024	7/12/2024	7/26/2024	8/5/2024	11/12/2024	12/11/2024
Models with eSMS Input	<b>Water Utility</b>	✓	✓	✓	✓	In process		
	<b>Electrical Utility</b>	✓	✓	✓	✓			
	<b>Wastewater Utility</b>	✓	✓	✓	✓			
	<b>Stormwater Utility</b>	✓	✓	✓	✓			
	<b>Thermal Utility</b>	✓	✓	✓				
	<b>Natural Gas Utility</b>	✓	✓	✓				
	<b>Petroleum, Oil, and Lubricants (POL) Utility / FUELER</b>	In process	On hold					
No eSMS Input	<b>Telecommunications Utility</b>	✓	N/A	In Process				
	<b>Compressed Gas Utility</b>	In process	N/A					



# Component Point of Contact (POC)

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- Each Component has Component Lead that serves on the IGI&S Governance Group (IGG)
- Each Component has a representative to the SDSFIE Vector (SDSFIE-V) Working Group
- Each Component may have a utility modeling liaison responsible for communicating about their Adaptation and other requirements relative to the utility models developed for SDSFIE-V Gold 5.0
- These Component representatives and/or liaisons serve as intermediaries between the SDSFIE Support Contractor team and Component subject matter experts (SMEs)

Component	IGG Member	Vector WG Representative	Utility Model Liaison	Contact Information	SMEs
US Air Force	Scott Ensign	James Ray		james.ray.33@us.af.mil	Ed DeLeon Robert Johnson Tom Sofka
US Army	Vince Nicchitta	Martina Harmon		martina.s.harmon.ctr@army.mil	Luciano Gomes
US Marine Corps	Tim Dougherty	PG Katsourakis	Beven Harris	beven.harris@usmc.mil	
US Navy	Kristy Capobianco	Cherie Montague		cherie.montague@oneworldgeo.com	Kevin Magnone Evan Jones
US Army Corps of Engineers	Jake Watts	Andrea Parish		andrea.parish@usace.army.mil	
Wash. Headquarters Services	Mike Stebbing	Adam Ruf		adam.d.ruf.ctr@mail.mil	
DISDI Office	Dave Labranche	Karen Barnhouse		karen.m.barnhouse.ctr@mail.mil	



# Summary

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- SDSFIE and eSMS Harmonization Goals
  - Ensuring strategic asset interoperability
  - Syntactic and Semantic harmonization
- SDSFIE/eSMS Modeling Elements
  - SDSFIE and eSMS use different vocabulary for element types
  - Understanding element terminology ensures proper harmonization
- SDSFIE/eSMS Utilities Modeling Process
  - Component Adaptation driven
- SDSFIE/eSMS Utility Harmonization Example
- Utility Model Processing: Status and Next Steps
  - Current Status of Utility modeling
- Components Point of Contact
  - Component POC coordination is essential to continual model development



# SMS Utilities Update

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# SMS UTILITIES OVERVIEW



Provides SMS Coverage for

- Electrical
- Water
- Sewer
- Storm
- Thermal
- Natural Gas
- Possibly Others in the Future

Accounts for distinctives of Utilities RP Assets

- Mission Impact
- Linear Assets
- Various Data Sources
- Diverse Assessment Methods
- Unique Risk Management





# SMS UTILITIES OVERVIEW (CONT.)



- Runs on the Enterprise SMS Platform

Enterprise SMS

Apply Selected Domains

- Select All
- Facility - Buildings
- Transportation - Fuel
- Transportation - Pavement
- Transportation - Rail
- Utility - General
- Utility - Electrical
- Utility - Water
- Utility - Wastewater
- Utility - Gas
- Utility - Thermal
- Utility - Stormwater
- Waste Management
- Structure - Waterfront

Favorites + Frequents

Components

Recent Visted and Favorites

Recent Pages Visted	Favorites	Name
		Components
		Organizations
		Sites
		Components
		Components
		Components





# DATA MODELS



Enterprise SMS

Inventory Catalog Manager

Component Types

Group Types    Asset Types    Specifications    CATCODEs

General    Custom Attributes    References

Search...

Attributes

- Miscellaneous
- Primary Attributes
  - Control Type**
  - Outlet Diameter
  - Horsepower
  - Pump Type

Attribute Name: Control Type

Attribute Type: List

List Values: +

Current Organization: Air Force Example Organization

Domains Active: (1)

Home

Inventory

Assess

Work

Catalog

Inventory Catalog

Assessment Templates

Import/Export Configurations

Work Actions

Reference Books

Administration

Import/Export

Documents

Reports

Fire Hydrant

Fire Protection Water Distribution

Fire Protection Water Storage

Non-Potable Water Distribution

Other Water Supply

Packaged Water Treatment

Packaged Water Treatment Plant

Potable Water Storage

Pumping Station (Water Utilities)

Water Control

Water Distribution Main Line

Water Distribution Meter

Updated June 2024



# Utility Model Processing: Status and Next Steps



	Modeling Step and Description	Step 1: Component-based SDSFIE Model	Step 2: eSMS-SDSFIE harmonized model (Initial Draft)	Step 3: Component Review Complete	Step 4: Final Draft	Step 5: Import to Portal Model Registry	Step 6: SDSFIE-V WG Review Complete	Step 7: IGG Vote on v5.0 Gold
	<b>Target Completion Date:</b>	6/14/2024	6/28/2024	7/12/2024	7/26/2024	8/5/2024	11/12/2024	12/11/2024
	<b>Utility</b>							
Models with eSMS Input	<b>Water Utility</b>	✓	✓	✓	✓	In process		
	<b>Electrical Utility</b>	✓	✓	✓	✓			
	<b>Wastewater Utility</b>	✓	✓	✓	✓			
	<b>Stormwater Utility</b>	✓	✓	✓	✓			
	<b>Thermal Utility</b>	✓	✓	✓				
	<b>Natural Gas Utility</b>	✓	✓	✓				
	<b>Petroleum, Oil, and Lubricants (POL) Utility / FUELER</b>	In process	On hold					
No eSMS Input	<b>Telecommunications Utility</b>	✓	N/A	In Process				
	<b>Compressed Gas Utility</b>	In process	N/A					



# COMPONENT INVENTORY




Enterprise SMS

WP-01

Create New Component Edit Component Delete Component

General

Installation JBAS Joint Base Archer Sullivan Site [JBAS-AR JBAS Archer AFB 12](#) Asset [2918 Water Distribution Line 1000643745](#)



Component Name	WP-01	Date Installed	01/01/2010	CI	95
Number	WP-01	Repair Date	NONE	RSL	NONE
Alternate ID	NONE	Replacement Value (Entered)	\$85,000.00	RDL	NONE
Component Type	Water Distribution Pump	Quantity	1 EA	Design Life	35 (Component Type)
Specification	Water Distribution Pump, 10 inch (10.0 inches) inDiameter			Age	14
Uniformat Classification	G301007 - G301007 PUMPING STATIONS			Effective Age	NONE
Operational Status	Active			Last Inspection CI	NONE
				Last Inspection Date	NONE
				Component Importance	NONE
				Last Rollup	NONE

Details

Description Desc of Pump

Comments Comment for Pump

Custom Attributes

Component Details +

Water Distribution Pump Properties

Assessments +

Work Items +

Inspection Schedule



# INPUT: COMPONENT INVENTORY



The physical component assets that make up a Real Property Asset

- Components comprise the primary “management unit” in SMS
- Includes key attribute info (name, year installed, type, size, etc)
- Each component needs to be associated to an RPUID to be included in FCI

Primary source of component inventory is GIS (or CMMS if there is an asset inventory)

- SMS component == GIS feature
- SDSFIE provides standard schema and nomenclature for consuming this data into SMS
- Data import and crosswalk tools support flexibility across service adaptations

SDSFIE – ESMS working group synchronizes standards with SMS data requirements

System Interface and/or Data Sharing Agreements needed to incorporate this information?



# NEXT STEPS FOR UTILITIES SMS



- Finish Entry of Data Models in ESMS
- Develop Custom Data Import Process for Each User
- Import a Sample Set of Actual Data
- Test Basic Analysis and Reporting