

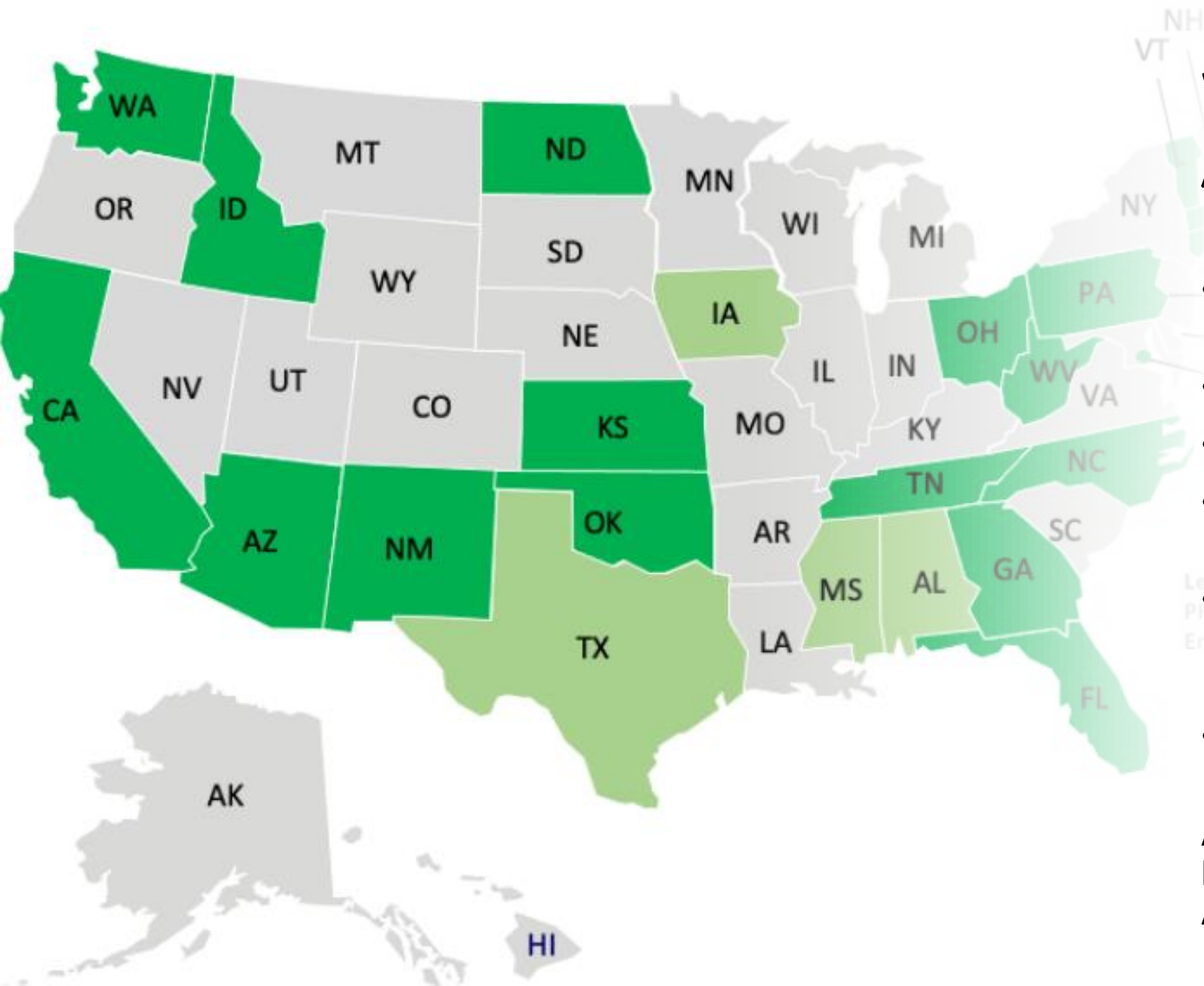
Applications of Enterprise GIS in Transportation (AEGIST)

Why AEGIST ?

What is Applications of Enterprise GIS in Transportation (AEGIST)

A Federal Highway Administration and States–led Pooled Fund Study for enhancing spatial data modeling, governance, integration, engineering and analytics platforms at transportation agencies

Who is a part of AEGIST?



- FHWA Offices of Planning & Safety
- 18 States; 5 more engaged
- Local Agencies
- Federal Lands Management Agency
- National and International Standard Development Organizations
- Software vendors, Data vendors and agency consultants

All of the above engaged to deploy best practices and standards using AEGIST pilots at each agency

Why AEGIST?

Enabling Data Offices/Councils & Geospatial Information System Units at State DOTs to meet Agency Performance Goals and Objectives of Business Units at their Agencies

Project Planning & Programming

Project
Selection &
Evaluation

Highway
Economic
Requirements
Analysis

Statewide
Transportation
Improvement
Program

Asset Management

(Operations and Maintenance)

Pavement Life
Cycle Plan

Bridge Life
Cycle Plan

Maintenance
Work Management

Emergency
Response

Asset Inventory & Routine
Inspection Operations

Data Office, Data Governance Council, Data Analytics Unit
Information Technology (IT) Unit,
Geospatial Information Systems (GIS) Unit

Design & Construction: Digital Delivery

Survey
(Ground Survey,
Mobile Lidar,
Aerial Imagery &
Lidar)

Environmental Planning,
Design and Fabrication

Construction
Management

Traffic and Safety

Travel Demand
Modeling

Highway Safety
Analysis

Freight / Truck
Routing

Congestion
Management

Traffic Systems Operations and
Management

Why AEGIST?

A Day in the life of Business Units at Transportation Agencies

Business Unit: Project Planning and Programming

Goals

- Plan, locate and integrate projects in various asset management systems (bridge, pavement, safety)
- Develop project location maps along with information about socio-demographics at proposed project sites
- Evaluate equity performance measures for transportation planning, project evaluation and decision-making
- Create Transportation Asset Management plans (TAMPs) by evaluating and prioritizing projects across disciplines

Challenges & Opportunities

- Creating map that shows location and information about all assets in highway right-of-way, including work history
- Developing data pipelines to integrate all asset and equity evaluation data for planning projects
- Building a geodatabase of all completed, planned and envisioned infrastructure projects across business units
- Conducting asset life cycle analysis using organization and social goals, objectives, constraints to plan work
- Schedule and program projects across all infrastructure assets and programs (structures, pavement, traffic & safety)

How Can AEGIST help?

- Develop a **standard for modeling asset, project and equity evaluation data** required by planners
- Establish data pipelines between the data systems used across business units to **prepare data required for planning**
- Deploy **data governance system for planning data** using National & International Governance Frameworks
- Develop applications that **help visualize equity performance measures along side project data** for developing plans

Why AEGIST?

A Day in the life of Business Units at Transportation Agencies

Business Unit: Asset Management

Goals

- Maintain infrastructure assets in a “state of good repair” by carrying out asset Life Cycle Planning (LCP) using data
- Manage inventory of all assets in the highway right-of-way and conduct routine asset condition inspections
- Manage maintenance work operations, for example: winter maintenance operations, weather information systems
- Meet Federal, State and agency-specific reporting requirements and regulations

Challenges & Opportunities

- Gather all data required for efficient asset operations and maintenance work operations
- Map that shows location and information about all assets in the highway right-of-way
- Integrating all asset condition data with maintenance work operations data for use in maintenance work planning
- Prepare asset work recommendations by incorporating equity in the decision-making process
- Integrating asset operations and maintenance data into the infrastructure “digital twin”

How Can AEGIST help?

- Develop **standards for creating and integrating asset data** across various asset management systems
- Establish **data pipeline between the data systems** used across business units to help prepare data required
- Deploy **asset information management governance system** using National & International Frameworks
- Develop guidelines, **standards for development of digital twins** including demonstration of process via pilots

Why AEGIST?

A Day in the life of Business Units at Transportation Agencies

Business Unit: Traffic and Safety

Goals

- Achieve the Vision-Zero goals and objectives
- Meet safety data modeling, quality and management requirements laid out by Federal Highway Administration
- Conduct systemic highway safety analysis
- Integrate data from traffic systems into the safety and mobility management systems for decision support

Challenges & Opportunities

- Availability of local agencies roadway characteristics and road centerline data
- Limited data for Model Inventory of Roadway Elements (MIRE)
- Roadway characteristics data (for example: speed limit) managed in documents and design plans
- Safety analysis does not take into consideration the spatial relationships across locations
- Intersection data model does for locating and mapping crashes has limitations

How Can AEGIST help?

- Deploy **data governance system** for coordinating State DOT & Local agencies. For example: integrate NG911 & DOT Systems
- **Acquire Model Inventory of Roadway Elements (MIRE) data** from open and proprietary data sources
- Develop **tools to extract roadway characteristics data** from documents and roadway design data models
- Accelerate **implementation of Roadway Data Improvement Program (RDIP) & deploy applications** for safety analysis
- **Develop road network and intersection data model as per open standards** from Open Geospatial Consortium (OGC)

Why AEGIST?

A Day in the life of Business Units at Transportation Agencies

Business Unit: Digital Delivery – Project Environmental Planning, Survey, Design and Construction

Goals

- Digital Project Delivery by creating Digital Twins and Data Models (as opposed to drawings and paper plans)
- Hand-off Asset Data from As-Builts to Asset Managers, as per Asset Information Requirement Standards
- Deliver projects on time, under budget using efficient data modeling and management processes
- Integrate data from traffic systems into the safety and mobility management systems for decision support

Challenges & Opportunities

- Emerging processes, standards, tools and techniques for managing data created during project delivery
- Design systems do not manage data in a structured data model, thus making asset data hand-offs to GIS difficult
- Limited/no coordination between project delivery (design-construction) and asset management units at State DOTs
- Metadata setup differently in design systems and highway asset management systems
- Different Common data environment (CDE) used by design, construction and asset management business units

How Can AEGIST help?

- Inform agencies about **National and International processes, standards and best practices** in data management
- Introduce standards for **managing data in structured form** by **collaborating with standard development organizations**
- Integrate **geospatial design and construction systems/data** with **geospatial asset management systems/data**
- **Accelerate data governance deployment** for data management across multiple common data environments

Why AEGIST?

A Day in the life of Business Units at Transportation Agencies

Business Unit: Data Offices, Geospatial Information System Units, Information Technology Unit

Goals

- Data life cycle management by deploying data integration tools and data pipelines across business systems
- Enterprise data dictionary development, data standards deployment
- Data governance. Applications governance. Data management policies and processes deployment
- Investment decisions associated with data collection, data management tools and technology

Challenges & Opportunities

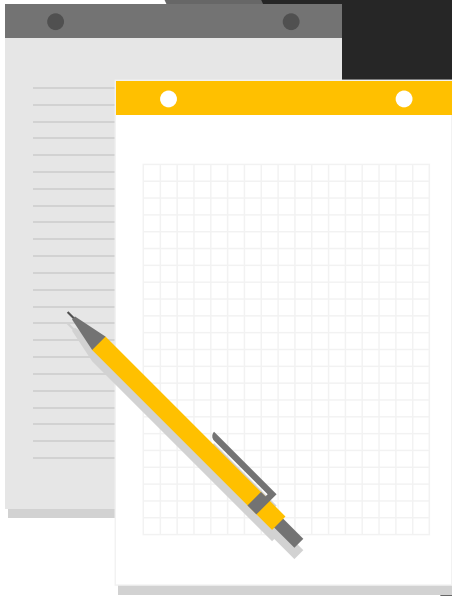
- Each business unit at the agency manages data differently, thereby making data integration difficult.
- GIS units and data offices focusing on few business use cases (e.g. federal reporting) as opposed to enterprise needs
- Data quality and data creation governance policies and standards not implemented at the enterprise level
- Limited staff for meeting the needs of multiple business units at the agency. Limited automation in tools.
- Limited/no coordination with local and other State agencies in governing and managing geospatial data

How Can AEGIST help?

- Develop **data management standards** for enterprise data systems, applications and porcesses
- Demonstrate how **data governance system can be deployed at enterprise/agency level**, as well as at the State level
- Introduce **consistency and alignment in data quality rules** and data quality assessment procedures across units
- **Automate data collection, integration processes**. For example, data acquisition from open & proprietary sources
- **Deploy data pipelines** for integrating data across business units and data systems, for example, Design and GIS

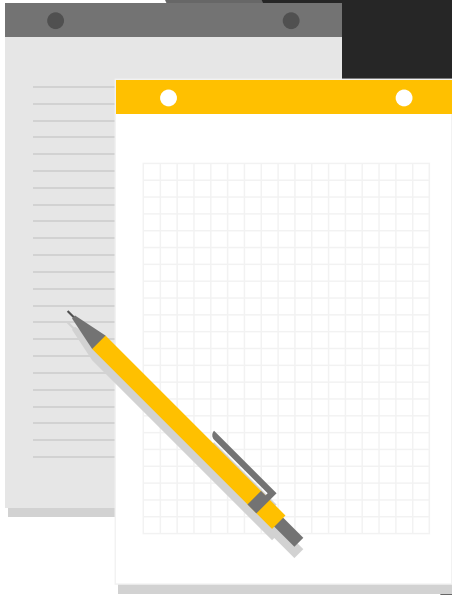
AEGIST Beneficiaries

- **Planners** (AEGIST modeled data + traditional census data)
 - Land use and transport modeling, impact assessments (resilience, environmental justice), complete streets design, investment analysis
 - Travel demand modeling and vehicle routing
- **Roadway Inventory & Geospatial Information Systems Unit**
 - Federal reporting: HPMS, ARNOLD, MIRE
 - Data quality automation, GIS products teams
- **Safety engineers**
 - Roadway Improvement Data Program Deployment
 - Roadway safety analysis, Intersection safety analysis,
 - Pedestrian, Bike network for safety analysis
- **Asset Managers**
 - Asset Information Management, Data governance (roads/bridges/safety), digital twins, better lifecycle data integration
- **Digital Delivery: Design, Construction Management**
 - Hand-off As-Built Asset and Roadway Characteristics data to Asset Managers, thereby improving quality of data reported to FHWA



AEGIST Beneficiaries

- **Federal agencies**
 - Better data reporting from States for HPMS 9, MIRE, ARNOLD, Federal-Aid projects data submission
 - Decentralized national road network data creation
 - Development of National standards for road data modeling
- **Local agencies**
 - Roadway Mileage Reporting
 - Pavement condition information tracking
 - Safety analysis using comprehensive roadway inventory data
 - Transportation improvement programs data standards
- **Emergency management agencies**
 - NG911 and ARNOLD Road Centerline data integration methodology, approach and proof-of-concept pilots
- **Federal Lands Management Agency:** Roads data integration
- **Private Sector: Governance of Emerging Data Technologies**
 - Integrate Connected Vehicle Environment (CVE), Unmanned Aerial Systems and Mobile Survey data in enterprise asset systems





Why AEGIST?

- Disparate business rules among the States as well as across business units and agencies within the State, for spatial data compilation, maintenance and delivery
- Situation made it difficult to procure GIS products to support analysis/reporting (including Federal reporting)
- Impasse could not be solved using existing forums; national guidance need identified by States
- AEGIST intended to find a common consensus set of business rules and implementation mechanisms
- AEGIST provides funding for conducting pilots and proof of concept studies for deploying data standards, data governance, and data integration pipelines
- AEGIST has brought multiple State, Local, Federal and Private Sector entities together for solving complex data issues



AEGIST Core Activities

- Develop and refine enterprise data management standards, tools and processes
- Road Centerline Modeling & Governance
- HPMS 9 and National Road Network
- FHWA MIRE datasets
- Proprietary and open data sources integration with State & Federal Systems
- Open standards compliant, topological road network model
- Connections to Digital Twins, Building Information Modeling
- Deploy spatial data engineering & analytics tools for enterprise use
- Support enterprise data governance

Ohio GIS Strategic Roadmap

Draft, Work in Progress

A7. Geospatial Roadway Inventory Data Models for Supporting Equity in Transportation Planning

Building Road Asset Information Models for safety, mobility and infrastructure health to support USDOTs' Transportation Equity Action Plan



A6. Bike and Pedestrian Routes Modeling for Complete Streets

Models for Bike Routes, Trail Network. Classification System for Bike Lanes Adopt Standards like Generalized Modelling Network Specification (GMNS)



A3. Road Network Data Governance & Provisioning for Enterprise Business Users

Data Catalog, Applications Communication Diagram, Data Models, Metadata. Roadway Characteristics & Road Sections Data Engineering and Provisioning to Enterprise



A1. Road Network Linear Referencing System

LRS Centerline Modeling for All Roads using data from Local Agencies (including street names, concurrencies), Referent-offset linear referencing method (?), Events Administration



A8. Asset Data Extraction from Design for Pulling Data into Roadway Inventory System

Building Information Modeling (BIM) for Infrastructure using Geospatial Data and Information Systems. Creating Asset Information Models from Digital As-Builts (DABs). Data Exchange using Industry Foundation Classes (IFC)



A5. Road Segments, Junctions and Intersections Model

Topological Road Network Model with Road Segments, Intersections, Junctions for MIRE, Safety Analysis and Travel Demand Modeling, Freight Analysis



A4. Data Quality Framework: Rules & Dashboards

Additional Rules for FME-Based Data Quality Workspaces Data Quality Assessment Dashboards



A2. HPMS 9.0 Data Modeling

National Highway Freight Network (NHFN) Roadway Segments, Restricted Public Roads, Widening Potential, AADT, Route Identifications (Primary/Secondary Routes)

