

AEGIST: Applications of Enterprise GIS in Transportation

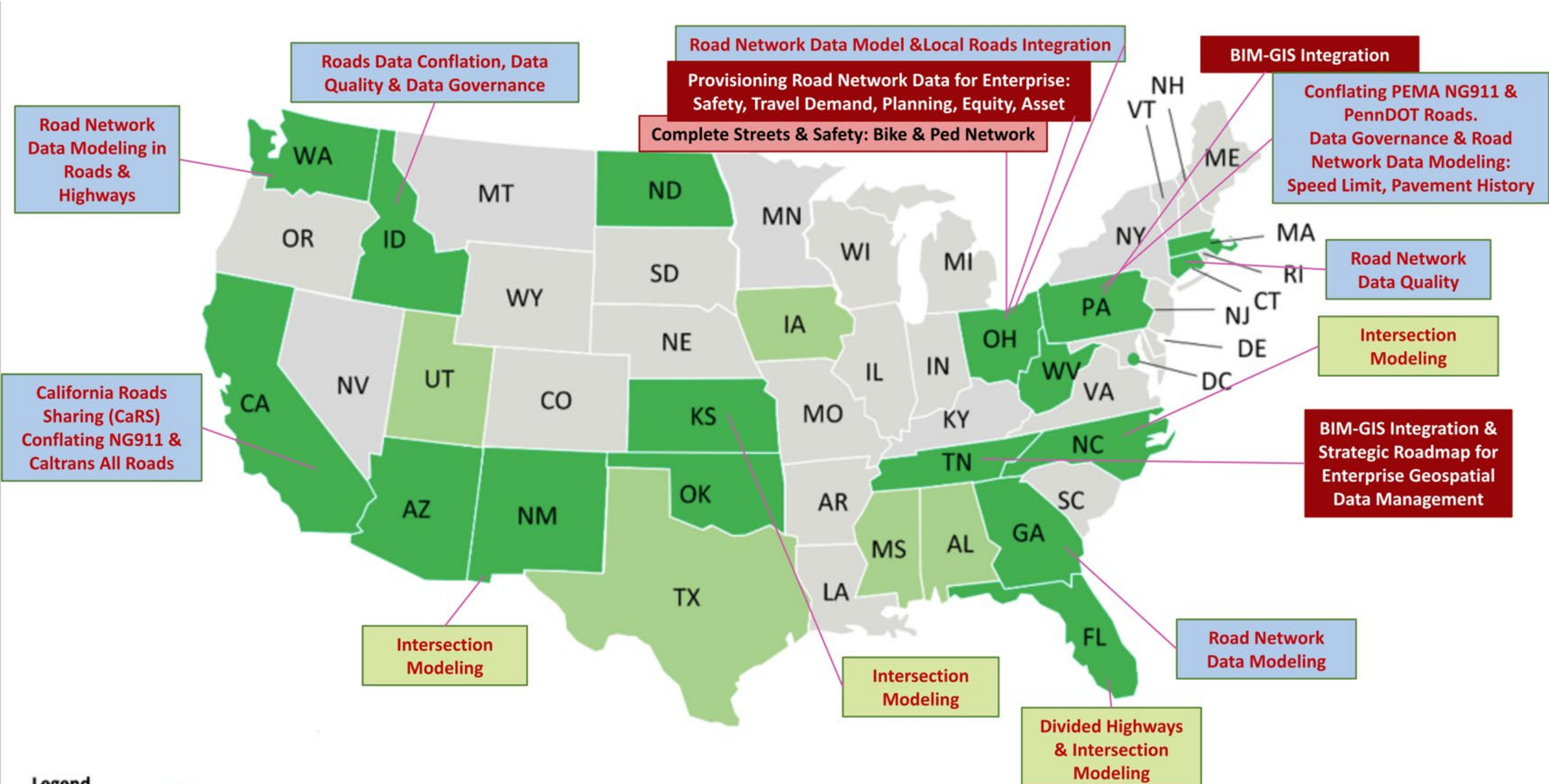
TRB-2024

Joe Hausman, FHWA Office of Planning

January 2024

For Questions Contact:
joseph.hausman@dot.gov

Disclaimer: Information in this deck is subject to change during the AEGIST Project (2019 – 2024)



AEGIST Activities

Enterprise GIS

Building up from ARNOLD, HPMS 9.0 & MIRE

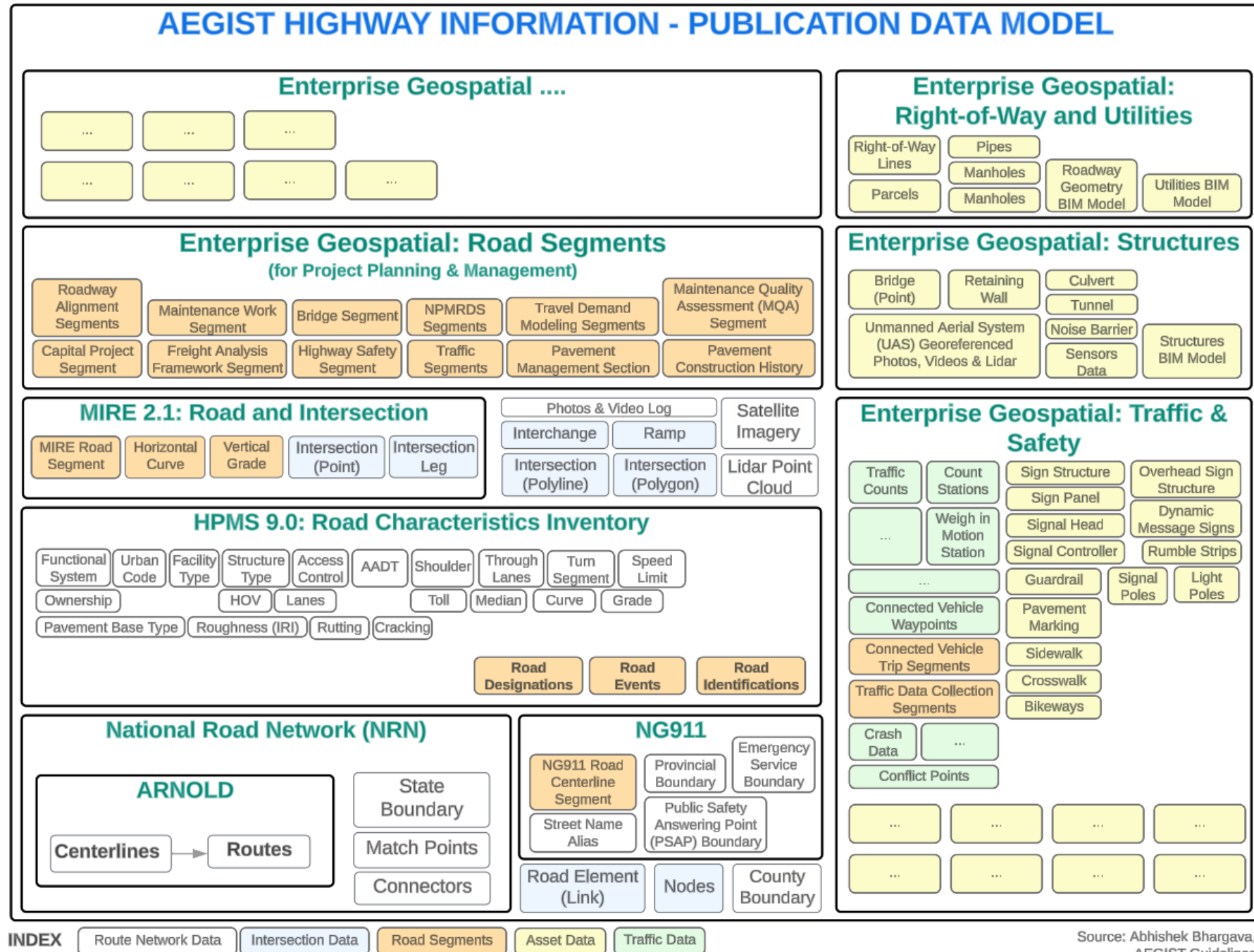
Adding NG911: Local Agency Roads

Creating Road Segments for Asset Management, Safety Analysis, Travel Demand Modeling, Freight Analysis Network, Traffic Systems

Adding Geospatial Assets: Linear & Coordinate Referencing, Bringing Assets from Digital As-Builts (BIM-GIS)

Adding Traffic & Safety Data, including data from Connected Vehicles, IoT Devices using Cloud-Based Data Platforms: AWS, Snowflake, Google Cloud

Managing Unstructured Data: Lidar, Georeferenced Photos, Videos for use in Geospatial AI/ML Apps



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

Preliminary Planning & Scoping

Asset Information Models for Preliminary Design, Traffic and Structural Analysis

Construction Management

Traffic and Safety

Travel Demand Modeling

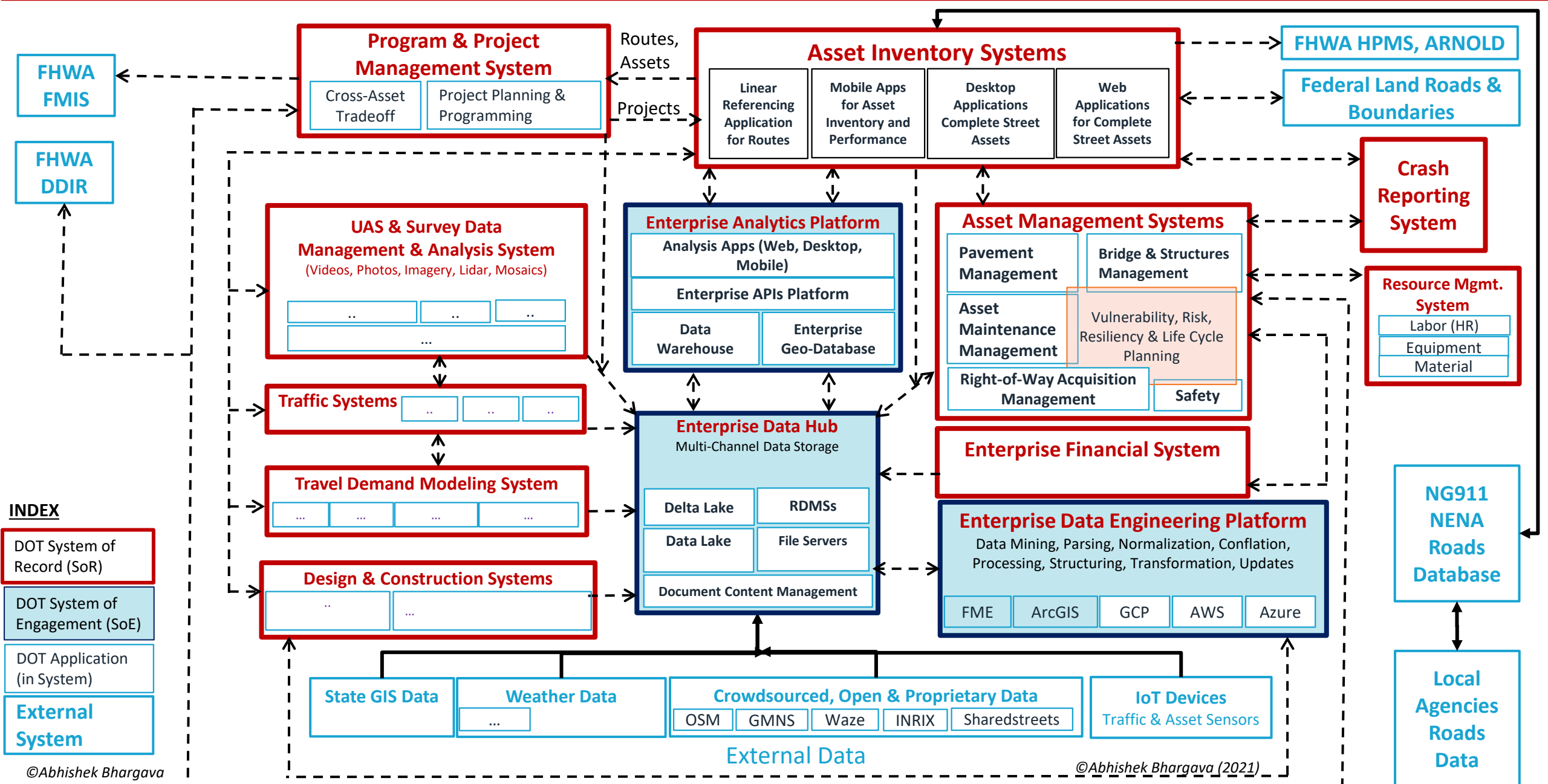
Highway Safety Analysis

Freight / Truck Routing

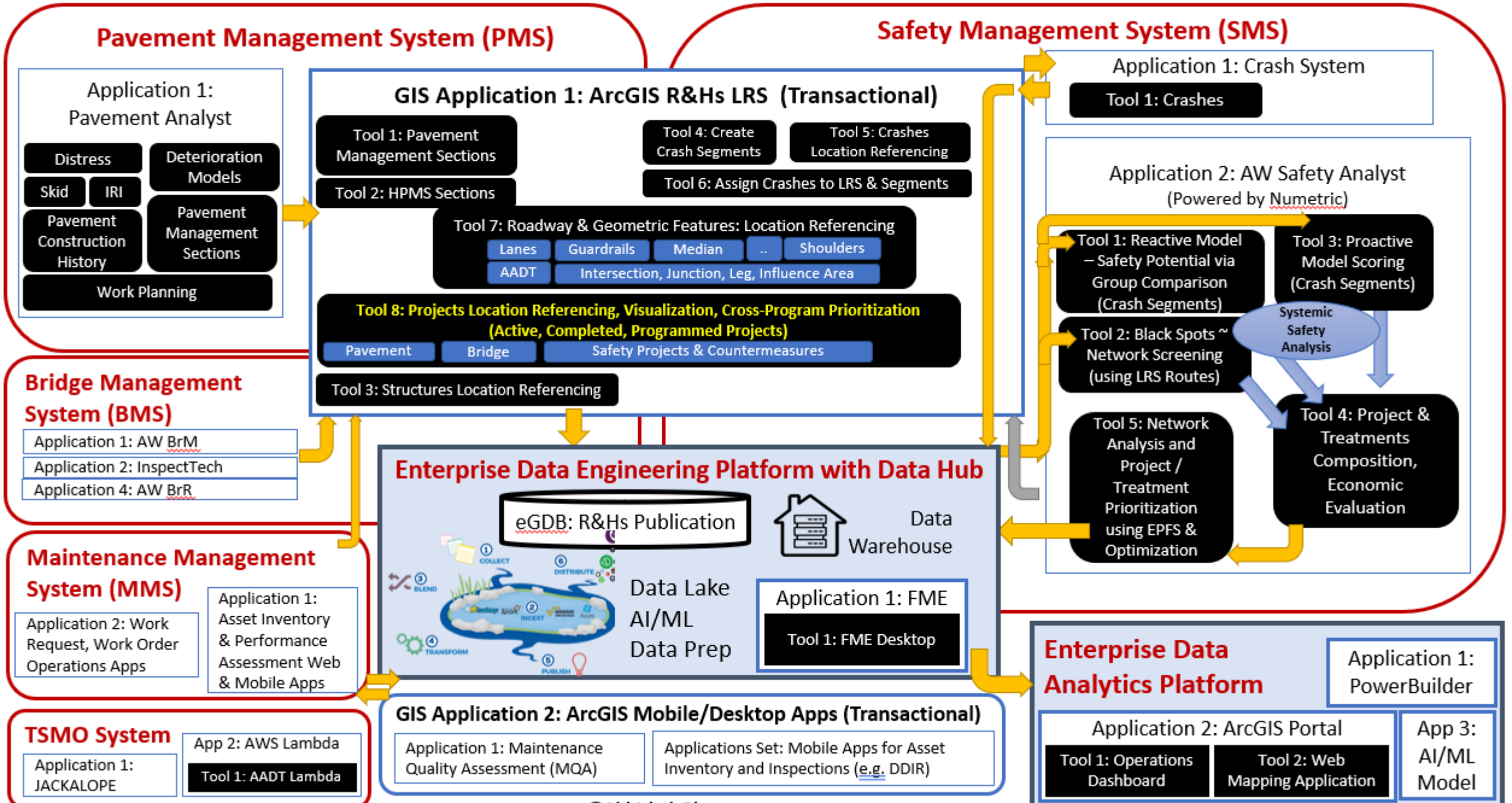
Congestion Management

Traffic Systems Operations and Management

AEGIST Geospatial Data Management Systems and Applications



Geospatial Highway Information Modeling, Integration, Engineering and Analytics using Enterprise GIS



AEGIST Technical Services Activities at PFS States

	CA	CT	FL	ID	TN	PA	OH	KS	NM	NC	WA	GA	MA
Spatial Data Governance, Management <i>Strategy, Roadmap, Metadata Repository, Data Catalogs</i>				✔	✔	✔	✔				✔	✔	
Spatial Data Modeling													
Roads Data Modeling & Business Rules <i>DOT, Federal, Local: HPMS, ARNOLD, NG911, MIRE, Intersection</i>	✔		✔		✔		✔	✔			✔	✔	✔
Intersections Data Model <i>HPMS 9.0, MIRE, GDF, IFC Roads Based</i>			✔				✔	✔	✔	✔	✔		✔
Data Quality Automation <i>HPMS, MIRE & Assets</i>	✔	✔		✔		✔	✔						
Spatial Data Integration and Engineering													
Roads Data Integration, Authoritative Data Mgmt. <i>DOT, Federal, Local Roads Data Sharing & Federation</i>	✔		✔				✔	✔					
Road Network and Events Data Publication/Sharing <i>Data Model for Data Warehouses. Data Models & Engineering Data Hubs</i>		✔		✔	✔	✔	✔						
Spatial Data Analytics													
Spatial Visualization, Statistics, Econometrics, AI/ML, <i>Visualization, Descriptive, Diagnostics, Predictive & Prescriptive Analytics;</i>				✔	✔	✔		✔					

State DOT Technical Services Activities Summary

Summary of Work Activities Coordination Efforts

Connecticut DOT	<ol style="list-style-type: none"> (1) Road Network Data Quality Report Generation using FME (including HPMS Data) (2) Asset Information Requirements and Design to GIS Data Handoff from Digital As-Builts 	
Idaho Transportation Department	<ol style="list-style-type: none"> (1) Spatial Data Governance Platform (Data Portfolio/Catalog; Data Engineering and Data Analytics) (2) DOT LRS Roads and Federal Land Roads Data Conflation Tool (Python-Based) (3) Strategic Roadmap for Geospatial Data Management 	FHWA BIM Projects: BIM National Strategic Roadmap; Data Governance
Tennessee DOT	<ol style="list-style-type: none"> (1) Strategic Roadmap for Spatial Data Management and Governance at Enterprise Level (2) BIM-GIS Integration – Roadway Characteristics Data from Design/CAD to Geospatial Information Systems using Digital Twins and Building Information Modeling Tools-Techniques 	FHWA BIM Projects: BIM National Strategic Roadmap; Data Governance
Caltrans	<ol style="list-style-type: none"> (1) California Roads Sharing (CaRS): Caltrans, CalOES, Local Agencies (NG-911, ARNOLD-HPMS Data) (2) CTDOT LRS-GIS Data Migration to AEGIST Data Model (formerly NRBM) for Publication & APIs 	e911/NG-911, HPMS 9.0 MIRE, National Roads Pilot
Pennsylvania	<ol style="list-style-type: none"> (1) Traffic Count Site Selection Using GIS (2) Geocoding Data Workflow Automation using Python-Based Geoprocessing Tool (3) Speed Limit Data Quality Review using Routes, Signs, Vertical-Horizontal Curves GIS Data (4) Local Agency and DOT Roads Integration: NG911 NENA Discussion and Data Exchange with DOT (5) Data Governance for PennDOT Assets: Traffic & Safety, Projects, (6) Building Information Modeling: Building Spatial Digital Twins with Data from Multiple Systems 	e911/NG-911, HPMS 9.0 MIRE, National Roads Pilot
Ohio DOT	<ol style="list-style-type: none"> (1) Strategic Roadmap for Roads Data Administration using LRS: 10 Areas Identified, such as: <ul style="list-style-type: none"> • Road Network Data Model for Travel Demand Modeling & Safety using DOT & Local Data • Complete Streets: Bike Routes and Pedestrian Network • HPMS 9.0-ARNOLD Rules Compliance, LRS-GIS Database Administration, Data Quality • Open Standards Compliant, Machine Readable, Topological Road Network Data Model 	e911/NG-911, HPMS 9.0 MIRE, National Roads Pilot

State DOT Technical Services Activities Summary

Summary of Work Activities	Coordination Efforts
Georgia DOT	(1) Road Network Data Supply Chain – Roadway Characteristics Data Collection with Local Agencies e911/NG-911, HPMS 9.0 MIRE, National Roads Pilot
Massachusetts DOT	(1) Interchange Data Modeling for Traffic, Safety and Mobility Applications (2) Road Network Data Quality Assessment ARNOLD, HPMS 9.0 MIRE, National Roads Pilot
New Mexico DOT	(1) ALRS Review and Comparison with AEGIST Data Model (National Road Network- NRN Data Model) (2) Intersection Features Data Engineering and Modeling with Topology and Connectivity using Lidar and Open Street Maps (OSM) data. Pilot Implementation: Limited Study Area. (Semi-Automated Data Engineering/Modeling). Statewide Implementation (Investigating Automation with Lidar Data) e911/NG-911, HPMS 9.0 MIRE, National Roads Pilot
Washington State DOT	(1) Road Network Data Modeling in Linear Referencing Systems for Enterprise Use (2) Geospatial Database Modernization and Cloud-based Geospatial Data Management HPMS 9.0, MIRE, National Roads Network
Florida DOT	(1) Intersection Features Data Engineering and Modeling with Topology and Connectivity: Open Standards Compliant, Machine Readable, Topological Road Network Data Model (2) Dual-Carriageways Data Modeling HPMS 9.0, MIRE, National Roads Network
North Carolina DOT	(1) Road Network Data Management and Governance (2) Intersection Features Data Engineering and Modeling with Topology and Connectivity: Integrating data from NCDOT LRS, Open Street Maps, Traffic Signals Data for Enterprise Users (e.g. Safety) HPMS 9.0 National Roads Network
Kansas DOT	(1) Intersection Features Data Engineering and Modeling with Topology and Connectivity (2) Lidar Data Integration into LRS-GIS System and Publication for use by Enterprise Systems. <i>Mobile</i> <i>Lidar Project Tasks: Routes with Z-values from Lidar Data, Creating HSM Road Segments & Calibrating Safety Performance Functions</i> e911/NG-911, HPMS 9.0 MIRE, National Roads Network

AEGIST Guidebook v2.0

AEGIST Phase 1: FHWA & States



Measure once.
Use many times.

**Applications of Enterprise
GIS for Transportation
(AEGIST) Guidebook**



2019

AEGIST Phase 1: FHWA & States
One-Year Effort

AEGIST Phase 2: FHWA & States



Measure once.
Use many times.

**Applications of Enterprise
GIS for Transportation
(AEGIST) Guidebook v2.0**



~2023

Developed and Reviewed in
Meetings of States in 2019, 2021, 2022, 2023



Measure once.
Use many times.

**Applications of Enterprise
GIS for Transportation
(AEGIST) Guidebook v2.0**



~2024

Released for All States & Industry
Stakeholders