HPMS version 9.0
The Vision

FHWA Highway Information Seminar

Arlington, VA

October 30, 2018

First Things First

DON'T PANIC!

-Douglas Adams

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Reassessment Approach

Position Papers
- **WHY** HPMS data items are needed (key uses, legislation)
- **WHAT** is needed
- **HOW** it will be collected and accomplished

DOT Regional Meetings

Identify and Discuss
- Challenges
- Risks
- Opportunities

Recommendations
- HPMS changes to meet requirements
- Based on Requirements and DOT Feedback

HPMS Data Model & Final Report
- Supports FHWA and DOT Missions
- Supports the flexible design of HPMS to reduce burden to states

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HPMS Principles

- The Primary focus of HPMS is for **analytical purposes.** It can support operational applications but it is not it's primary purpose.
- HPMS does not collect data on its own. **HPMS relies on State DOTs and other sources**. State DOTs **may not be the authoritative data source** for a given application.
- FHWA should not ask States for information that is already known.
- Legislative and FHWA mission **requirements should drive the data model**.
- HPMS should be **flexible as data needs change**.
- The HPMS data model should adhere to **object oriented principles**.
- The data Items in HPMS are **independent from each other.**
- The HPMS database **should not store features that don't exist**.
- HPMS should **only store and process the same data once**.

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Designations

- Module for Designations
  - The FHWA relies on State DOTs to provide information that they do not have the final authority, mainly concerning highway designations. These include:
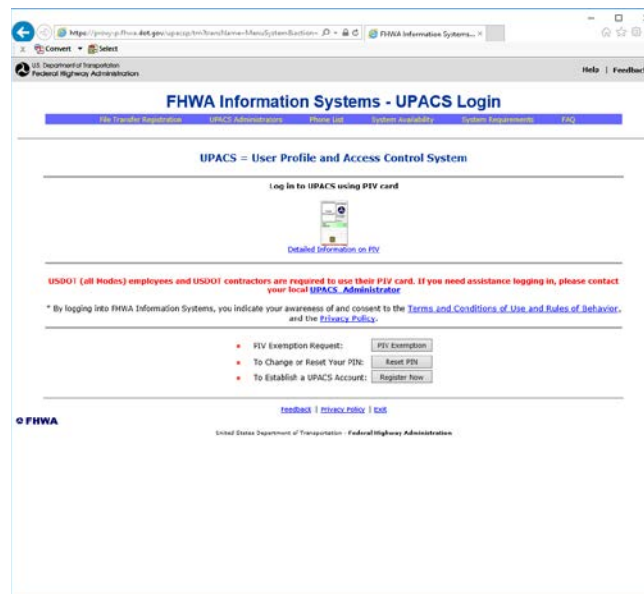   - National Highway System- NHS (FHWA Planning Office)
    - Strategic Highway Network- STRAHNET (FHWA Planning Office)
    - Functional Classification (FHWA Division Field Office)
    - National Highway Freight Network – NHFN (FHWA Office of Freight Operations)
    - Assignment of the U.S. Route Numbers – USRN (AASHTO)
    - U.S. Bike Network – USBN (AASHTO)
  - Using the National Highway System Module as a starting point, FHWA intends to extend this process to the designations for the systems above.

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NHS Module Demo

- https://proxy-p.fhwa.dot.gov/upacsp/tm?transName=MenuSystem&action=buildHTML

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Transactions/Incremental

- The FHWA intends to provide flexibility to State DOTs in how they provide data to the Highway Performance Monitoring System.
- Providing opportunities for incremental updates will benefit the data program by:
  - Reducing the amount of data in the system
  - Align data reporting with data collection cycles
  - Provide a process that encourages constant data quality improvement

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Transactions/Incremental

- The **Submit** area of the HPMS software application is largely seen as a staging area for State DOTs to prepare the annual data submittal. This area will transition to a series of transactions.
  - The Structure of the Sections Table in the Submit area will include new fields to manage the temporal nature of the Incremental approach.
    - Begin Date – the date that the data becomes Valid.
    - End Date – The Date the data becomes invalid. This could be the data that a new observation replaces and old one. A technical correction. Or the date that a road does not exist.
    - Reporting date – the date that the data was provided to HPMS
    - Status of the data – Active, retired, corrected.

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Transactions/Incremental

- The **Review** area of the HPMS software application will accept an extract of the data from the submit area at appropriate times. (April 15th, June 15th, Aug 15th).
  - The review area will include only data that shows an active status.
- The **National** area will be transitioned out of HPMS and into the Integrated Transportation Information Platform (ITIP).

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Third Party Sources

A third-party source is defined as any data that FHWA acquires directly from an entity other than a State DOT. Examples of third-party would include commercial, crowd source, research, and other agency (Census, National Park Service) data.

- There are several Data Items that are reported from State DOTs that have little or no impact on the State DOT program.
  - Example- The State funding from FHWA is not impacted if a State reports a lane width of 10 feet or 12 feet. The Lane Width Data Item is required to support the Highway Economic Requirement System which is a national needs model.
- The addition of non-state DOT data will necessitate the inclusion of a source field in the section table along with a structure that supports metadata about the source.

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Third Party Sources

Potential Candidates for Third Party Opportunities

Data Item	
Access Control	Median Type/Width
HOV Type/Lanes	Should Type/Widths
Speed Limit	Curve and Grade Classification
Percent Green Time	Terrain Type
Signalized Intersections	Passing Sight Distance
Stop Signs	Parking
Peak/Counter Peak Lanes	Non TPM Distress Items

These Data Item will require some research to find an appropriate Source

There is currently a Speed Limit Research Project to look at some alternatives

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Data Item Modification

- NAAQS Summary Table
  - The Clean Air Act describes models within the Environmental Protection Agency.
    - The data reported to HPMS could be used to calibrate the models at the MPO level.
    - The data in the NAAQS table is an estimate of traffic volume within the Non-Attainment area which is reported by the same entity that requires the data to calibrate.
  - Removal of the reporting requirement will have no impact since those who need the data are the same as those who provide it.
- Structure ID
  - The National Bridge Inventory(NBI) is the authoritative source for all the bridge features in the United States.
- Toll ID-
  - HPMS currently requests some information regarding Toll Facilities.
  - The information does not tell a complete story for the Toll Report.
  - FHWA proposes to gather the Location of a Toll Facility that can link to other data through a Toll ID
- Percent Green Time- will accept Defaults

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Data Item Modification

- Percent Green Time- will accept Defaults
- Widening Potential-
- Travel Time Code-
- Common Street Name-
- Cracking Length-
- Climate Zone-
- Soil Type-
- Maintenance and Operations-
- Capacity-

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Inclusion of MIRE Data Items

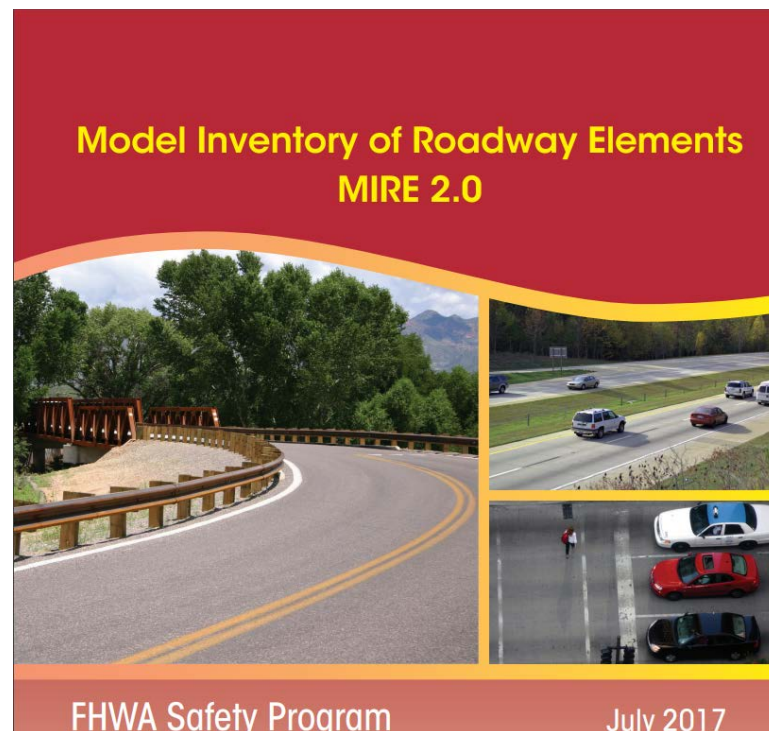- According to the Office of Highway Safety
  - MIRE data items are not required to be reported to FHWA.
  - State DOTs are required to have **access** to the Fundamental Date Elements(FDE).

205 Elements
Some of which
are already reported.

Model Inventory of Roadway Elements
MIRE 2.0

FHWA Safety Program   July 2017

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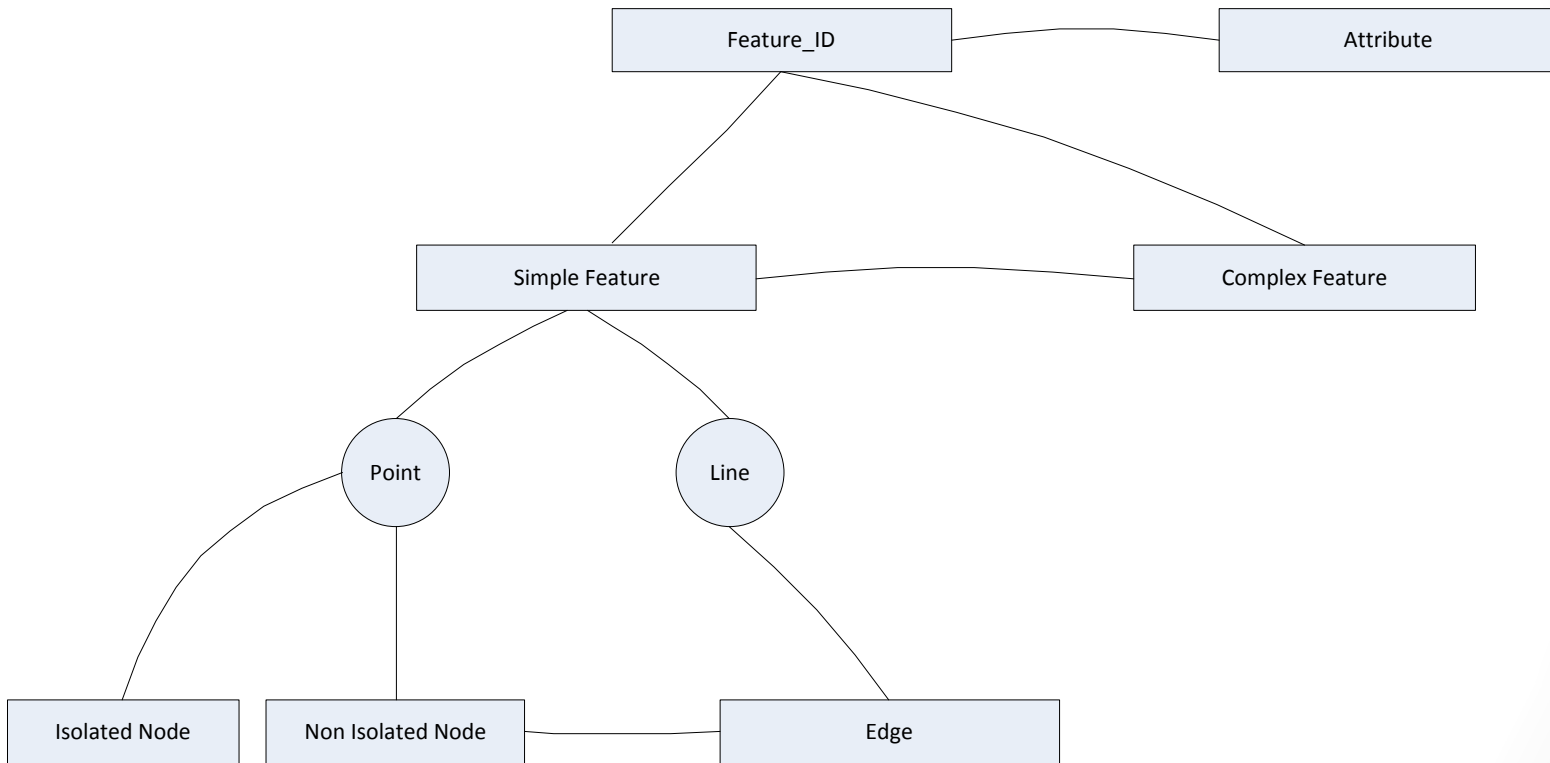**Federal Highway Administration**

Data Economy- Hierarchal Structure

- Intersection Modelling
  - The Office of Highway Safety has been conducting Peer Exchange meetings throughout the country. These meetings have included several DOTs to establish best practices for intersection modelling in support of the MIRE recommendations.
- Dual Carriageway reporting
  - The Transportation Performance Measure Pavement and Bridge Condition Metrics(PM2) have allowed States who choose to report Pavement distress items by direction on the Interstate System. This is at the request from several State DOTs since it reflects a closer semblance of how they collect data.
  - This can be transitioned to other Data Items particularly traffic.
  - Dual Carriageway reporting is closer to the real world

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Data Economy- Hierarchal Structure

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Data Economy- Hierarchal Structure
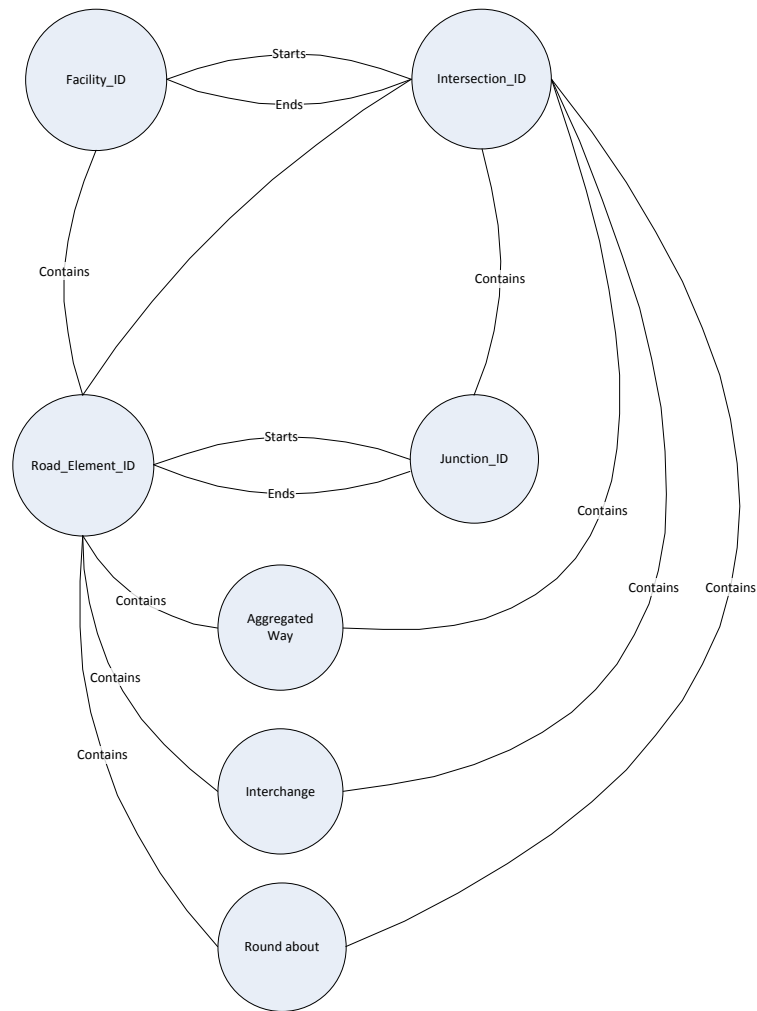
Data Economy- ARNOLD Maturity

ARNOLD is designed to support interoperability between attributes in HPMS with other datasets including the National Bridge Inventory, Rail Crossings, Freight Analysis, Crash locations and Highway Project Locations.

Hierarchal Structure of Simple and Complex Features-

Intersections	Interchanges
Dual Carriageway	Roundabouts

Freight Routing-
    Internal Connectivity to support.
    Edge Matching – Demarcation Points

    Topology, Topology, Topology

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National Sample

The Sample Data is solely intended to support the Highway Economic Requirements System (HERS). A National Level Needs Assessment Model.

The results of HERS are presented in the Conditions and Performance Report to Congress.

- Initial studies show National Sample consisting of 55% of the current Sample Panel. Reducution 120k to 65k
- This will require a more in depth study.
- Could take advantage of Third Party Sources.

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Web Services

- The USDOT is moving to centralizing the IT Infrastructure.
  - Shared Services for GIS and Business Intelligence Tools

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HPMS Software Goals

- There should be an input **mechanism to receive data from providers**. In most cases, State DOTs are the primary providers, but other data providers may be identified.

- **Metadata should be documented** including source, valid date ranges, and release restrictions.

- The data received should be **validated for timeliness, completeness, and quality**.

- **HPMS should provide feedback to data providers upon submittal** concerning timeliness, completeness, and quality.

- HPMS should **provide adjudication for data that does not conform**.

- The data within HPMS should be exported to **customers who will add context and create program specific information** from the data.

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Software

- Move User Interface from Silver Light to HTML 5
- Redesign Database
  - Transactions
  - Source
  - Hierarchal Structure
- Validation Engine to 1Spatial
- Business Intelligence tools for Data Review
- Web Services

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Section Table Structure

Road_Element

PK	State_Code
PK	Route_ID
PK	Begin_Point
PK	End_Point
PK	Data_Item
PK	Begin_Date
PK	End_Date
	Value_Numeric
	Value_Text
	Value_Date
	Record_Date
	Record_Status
	Source_ID
	Cardinality

Road Element Sections

Road_Elements

PK	Road_Element_ID
	Facility_ID
	Record_Date
	Geometry

Facilities

PK	Facility_ID
	Geometry

ARNOLD

Facility

PK	Facility_ID
PK	Data_Item
PK	Begin_Date
PK	End_Date
	Value_Numeric
	Value_Text
	Value_Date
	Record_Date
	Record_Status
	Source_ID

Facility Sections

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Timeline

9/26/2018

Data Item Changes

Scheduled Start Now	Scheduled Finish 15APR2020
Actual Start	Actual Finish

DESIGNATIONS

Scheduled Start 1JAN2019	Scheduled Finish 15APR2020
Actual Start	Actual Finish

Transactional

Scheduled Start 1JAN2019	Scheduled Finish 15APR2020
Actual Start	Actual Finish

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Scheduled Start 1JAN2019	Scheduled Finish 15APR2020
Actual Start	Actual Finish

Third Party Sources

Scheduled Start 01JAN2019	Scheduled Finish
Actual Start	Actual Finish

Web Services

Scheduled Start	Scheduled Finish 2021
Actual Start	Actual Finish

National Sample

Scheduled Start 2020	Scheduled Finish 2022
Actual Start	Actual Finish

Hierarchal Structure

Scheduled Start 01MAY2019	Scheduled Finish 2024
Actual Start	Actual Finish

ARNOLD Maturity

Scheduled Start 01MAY2019	Scheduled Finish 2024
Actual Start	Actual Finish

3/27/2026

MIRE

Scheduled Start	Scheduled Finish 2026
Actual Start	Actual Finish

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Questions / Comments?

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