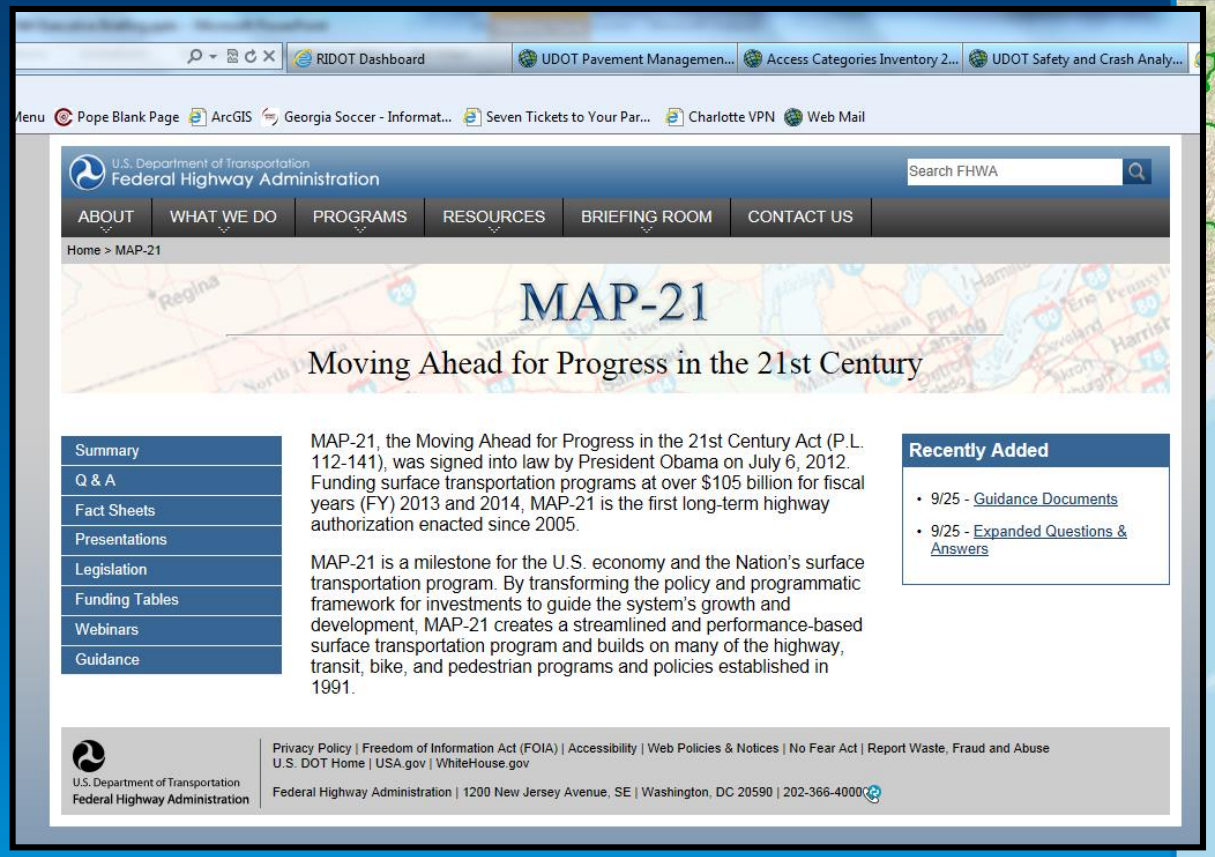
Tools and data to meet MAP 21

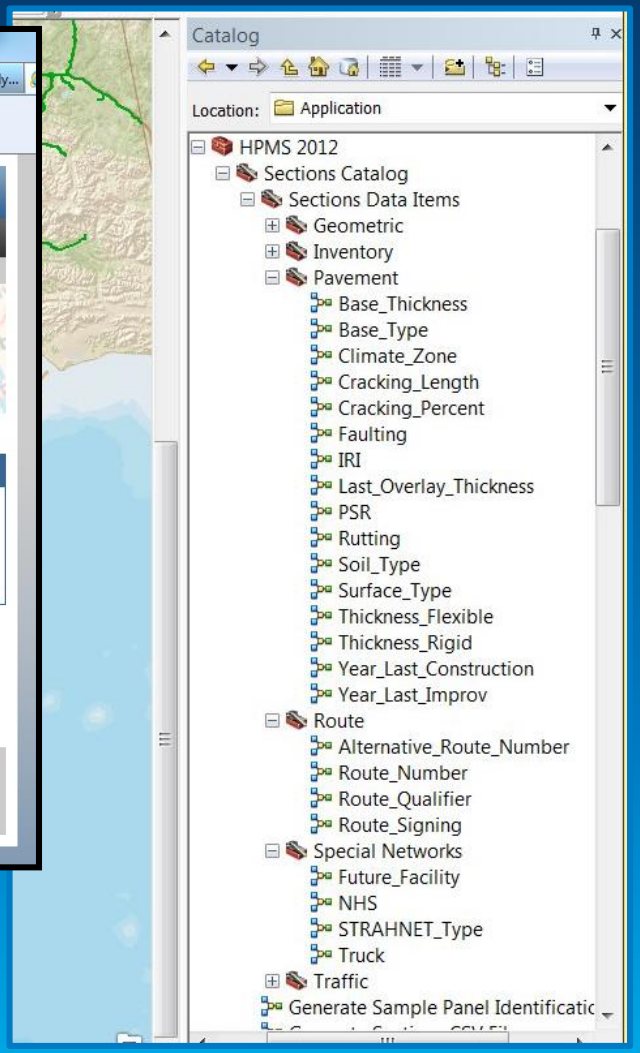
Meeting new Federal reporting requirements by enhancing data management & systems

Transportation Practice

Why the new initiatives?

MAP 21 changed HPMS and general reporting requirements at a fundamental level



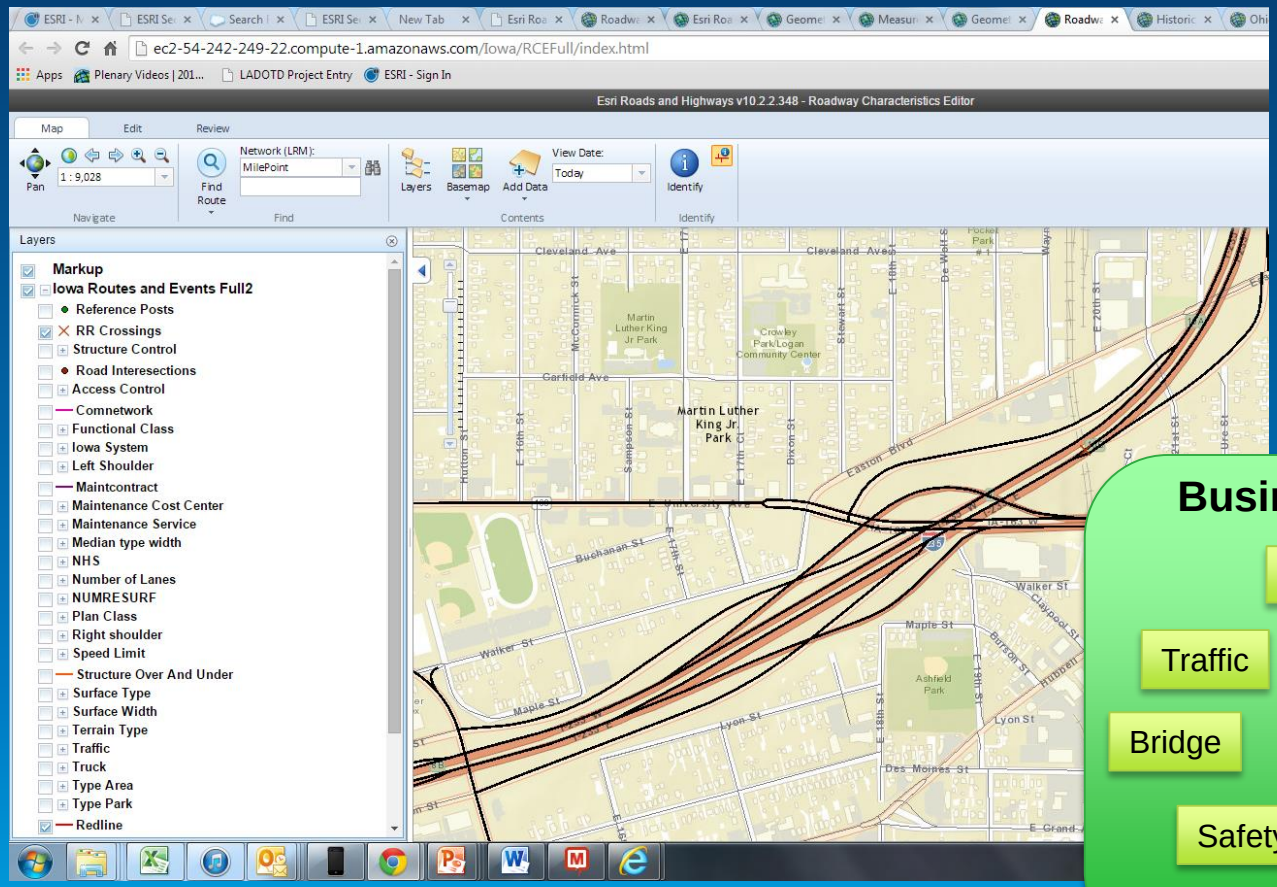


All public roads network (ARNOLD)
Dual carriageway representation
Linear Referencing System (LRS) on all roads
Performance measures

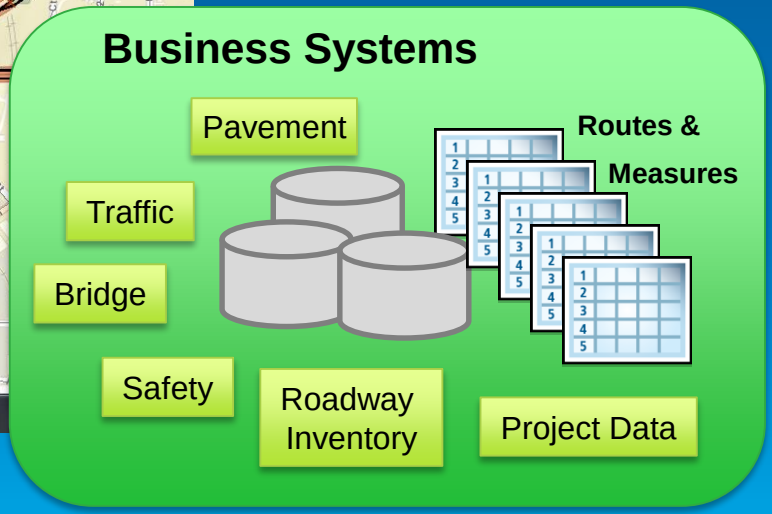
More changes will come as performance metrics are finalized and released…

What did we focus on to meet the challenges?

MAP 21 changed HPMS and general reporting requirements at a fundamental level



Better Integration



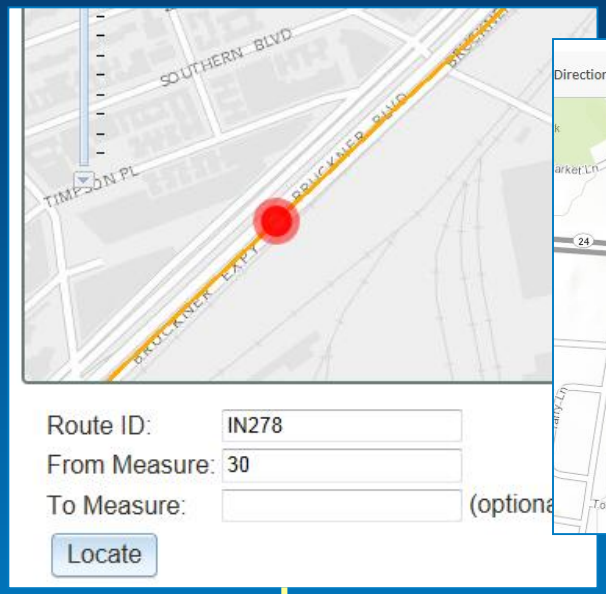
More Data

Meeting the challenges by going to the source of the issue…

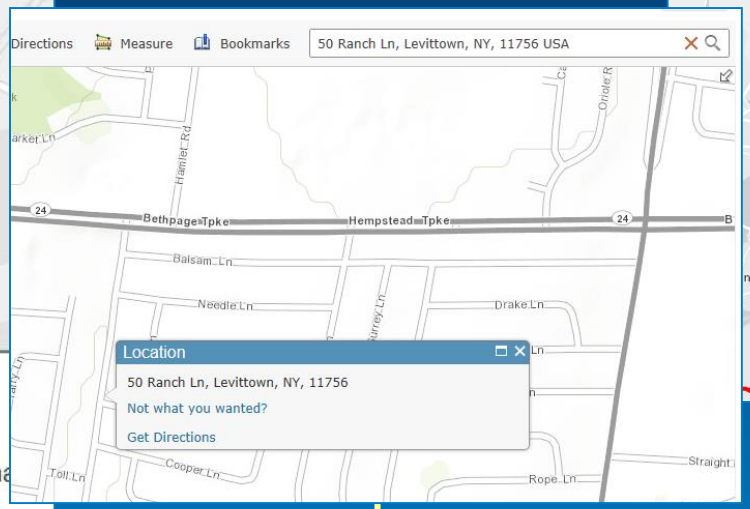
Maximizing the All Roads (ARNOLD) effort

Adding more data to an LRSable, geocodable, routable, sustainable, collaborative environment

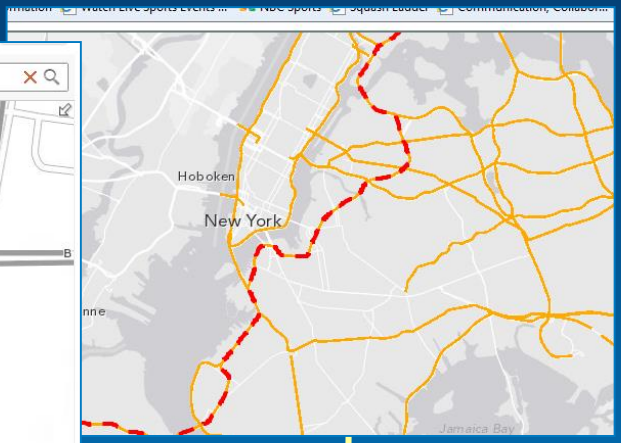
LRSable



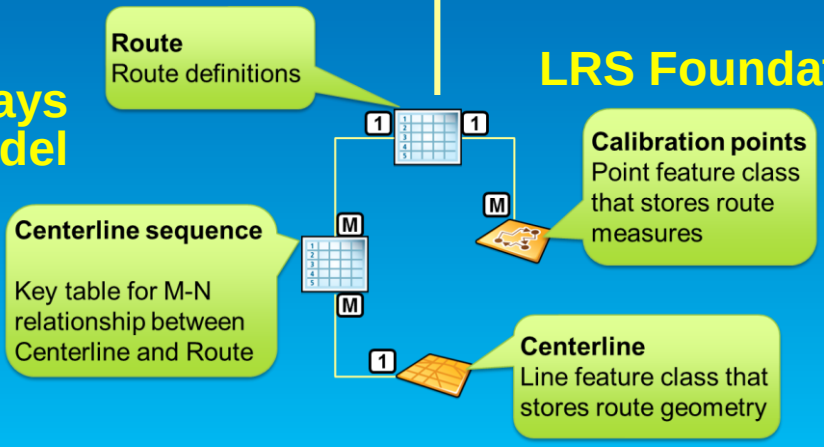
Geocodeable



Routable



Roads & Highways Data Model



LRS Foundation

How do we get there?

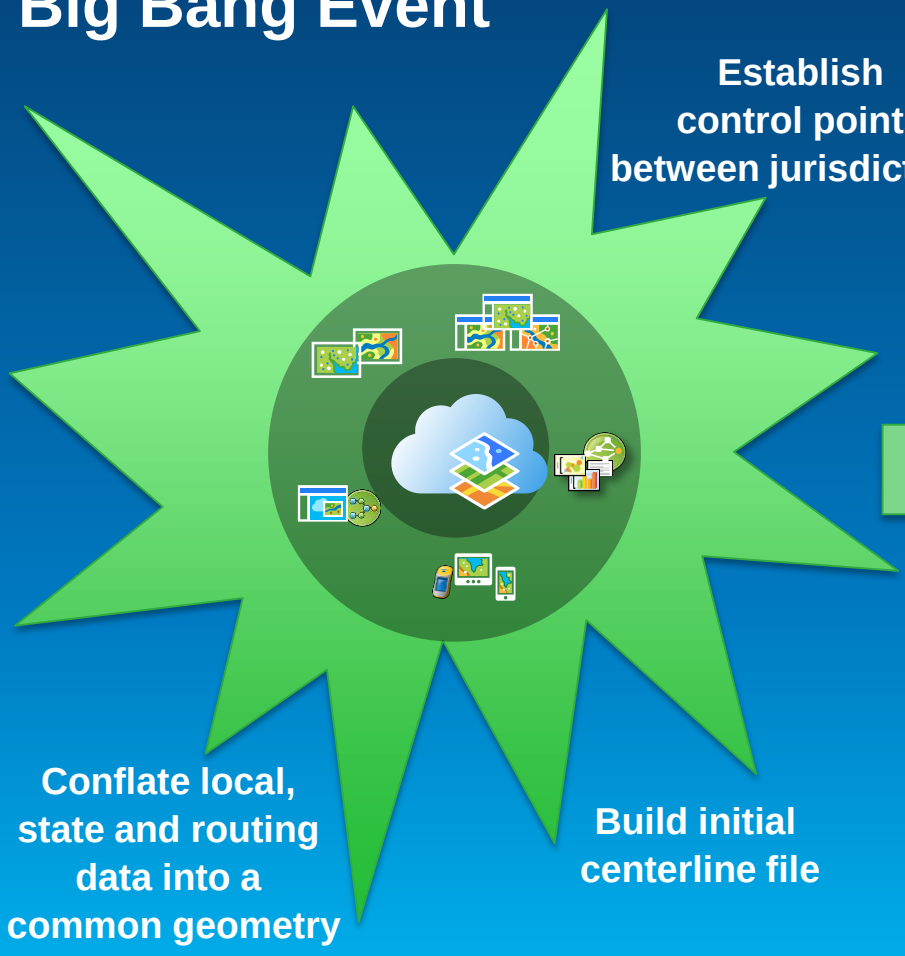
Simplicity is key

- Find data model, tools and processes that support the LRSable, geocodeable, routable, sustainable State-wide centerline file
- Agree on road network geometry across local and State jurisdictions
  - Create edge matching points
  - Conflate LRS, address and routing data
- Recognize the varying levels of technology at collaborating agencies
- Establish collaborative, sustainment processes
- Provide benefits to local, State and regional agencies

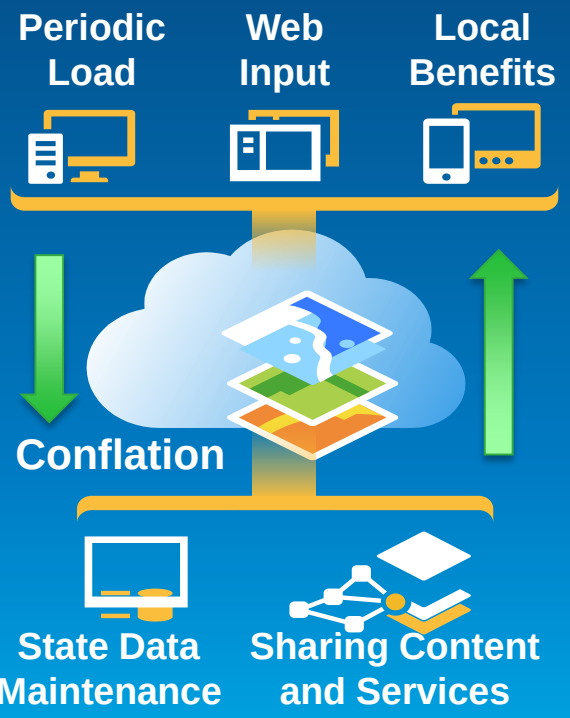
What does the solution look like?

Create, sustain, collaborate and share

Big Bang Event



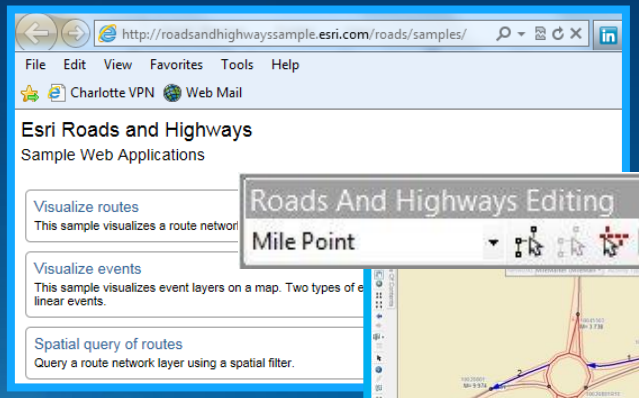
Sustainable Environment



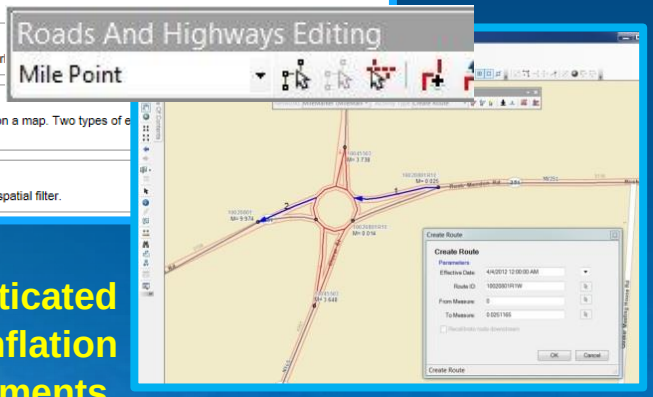
Providing a State-wide, collaborative system that has benefits for all…

What new tools have changed the technology environment?

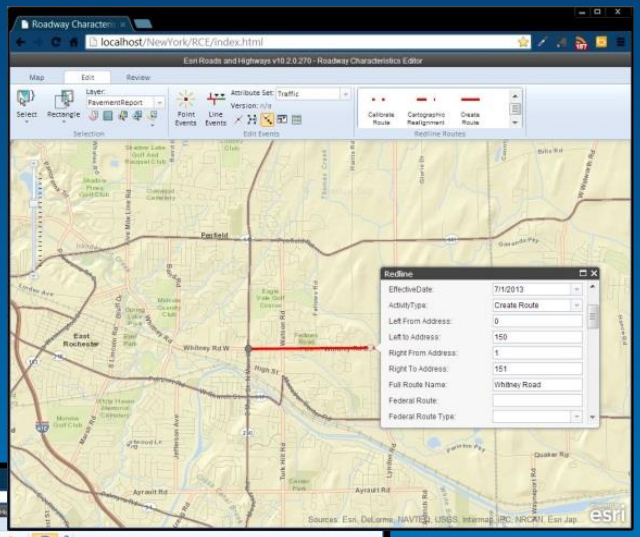
New and enhanced Commercial Off-The-Shelf (COTS) products



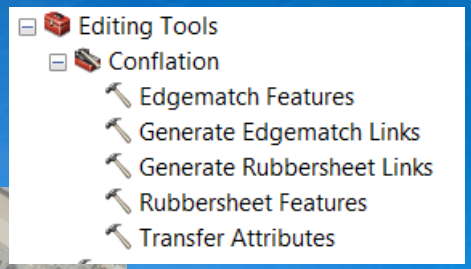
COTS LRS product release

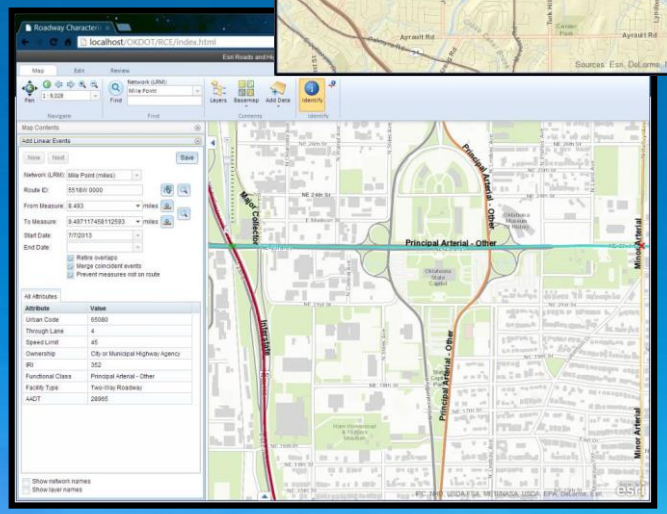


COTS Web-based Redlining to Support local collaboration



Sophisticated COTS conflation enhancements to build initial database & incorporate local changes



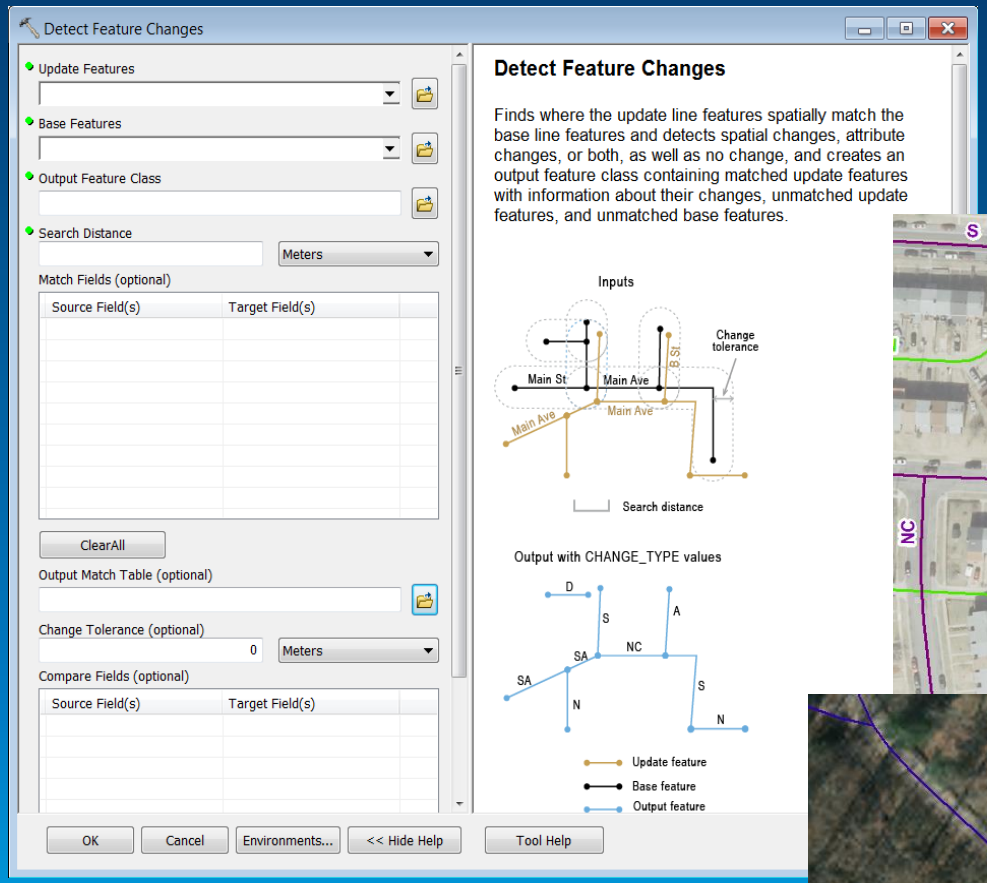


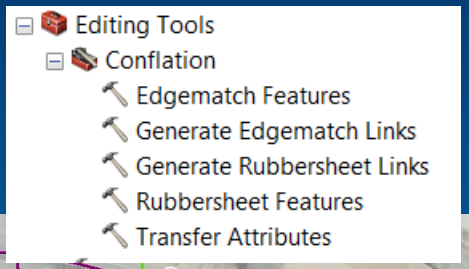
COTS Web-based Roadway Inventory data management

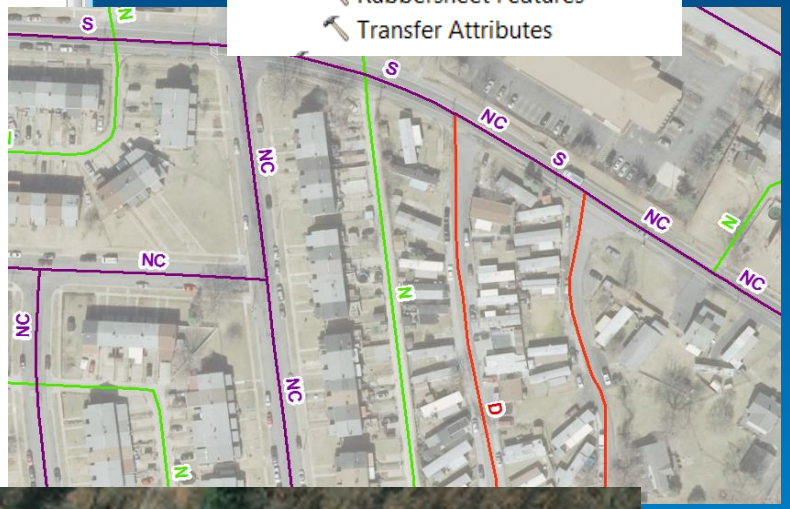
Providing a robust data, functionality and collaboration environment

Conflation tools in ArcGIS

Building and sustaining centerline data while minimizing impact on locals



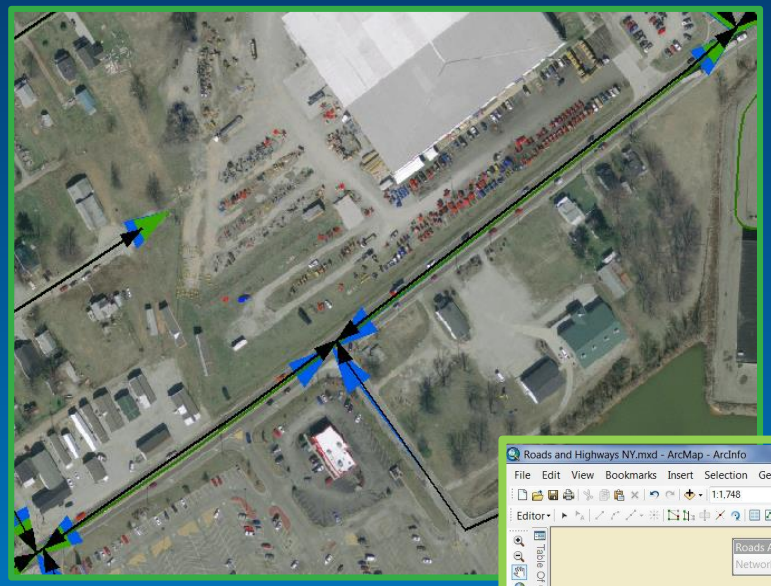




Sustaining the State-wide centerline file

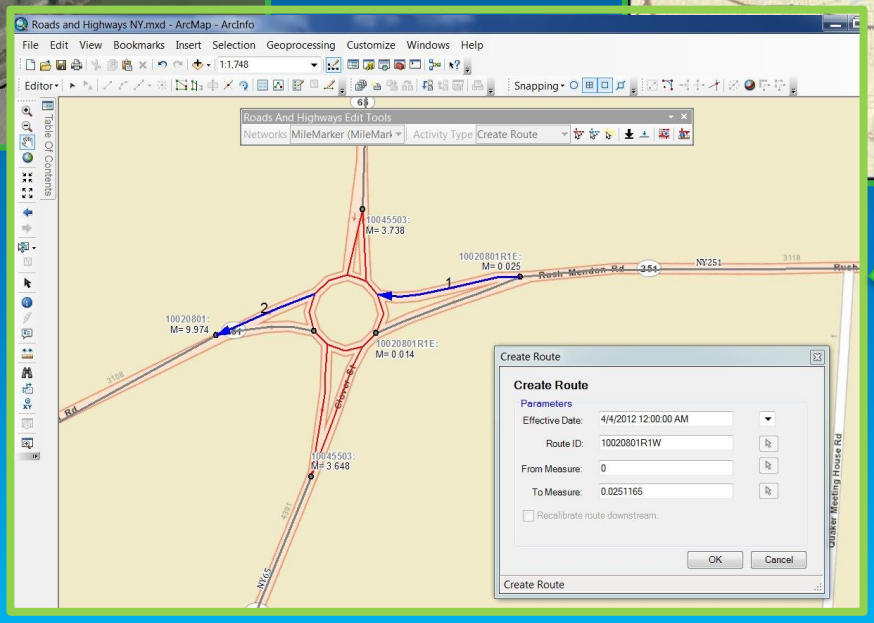
The key is minimizing change to local processes while providing benefit

Periodic upload from local source

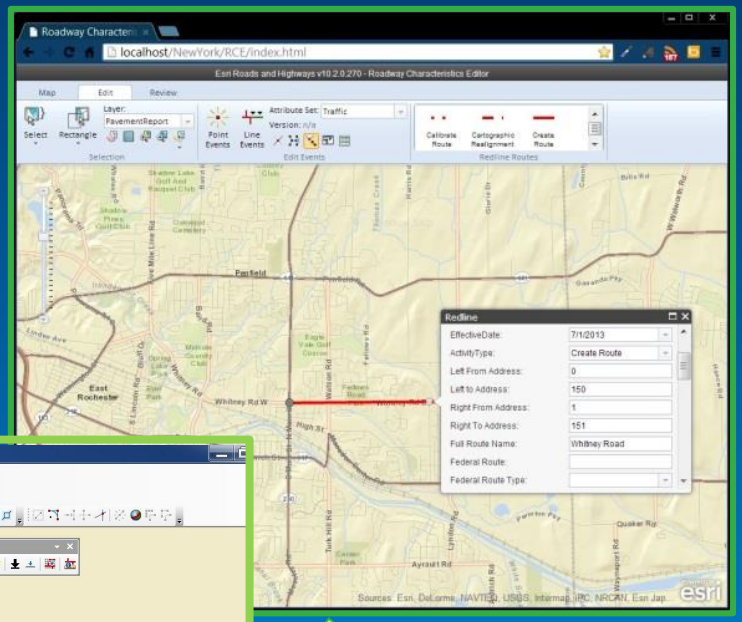


Conflation tools used as necessary

Direct use of Roads & Highways



Redlining using web tools

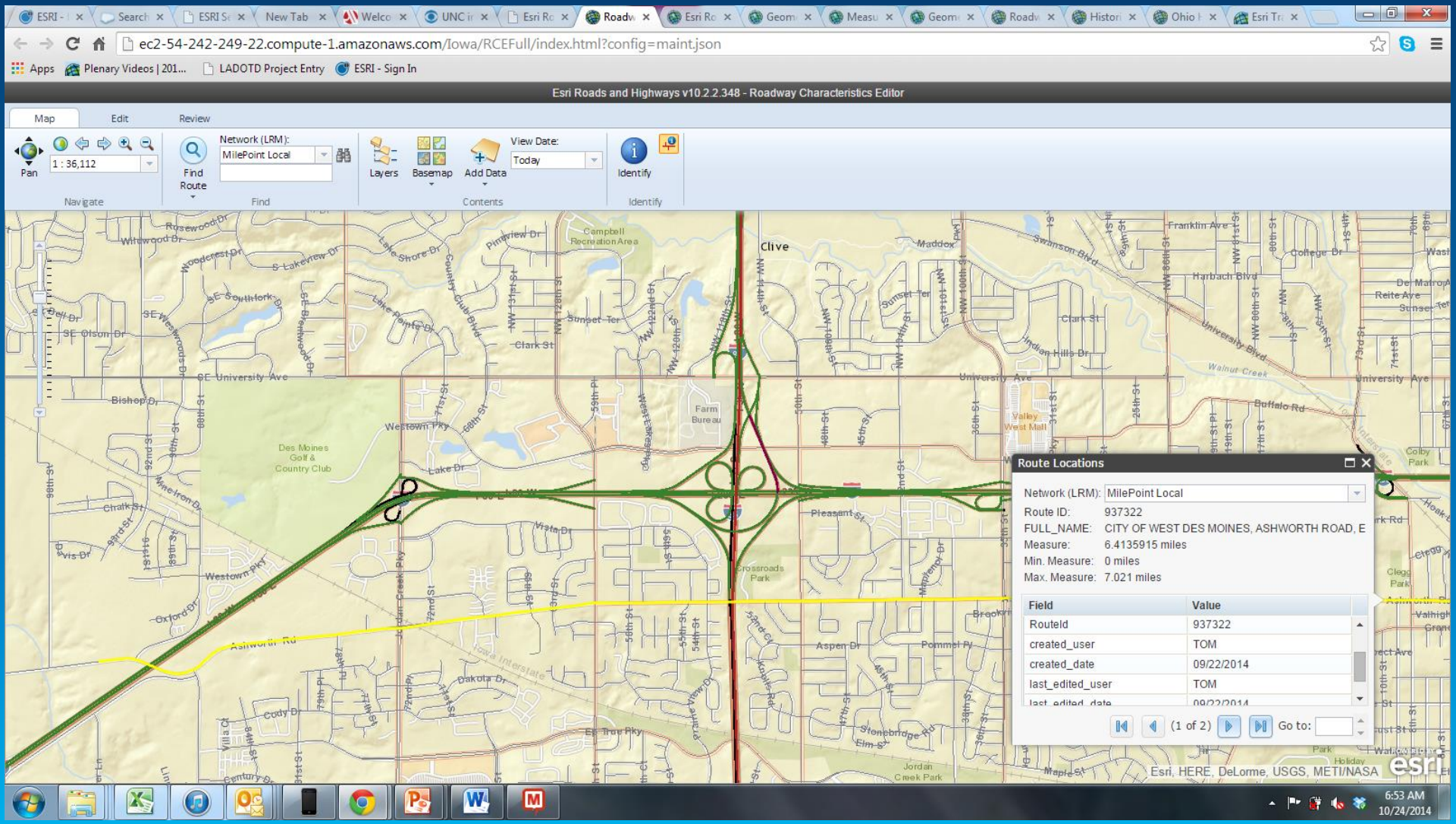


Consolidated data provided back to the locals

Supporting workflows to recognize the GIS capabilities of all involved…

Seeing the results

Ramps, dual carriageways and local roads

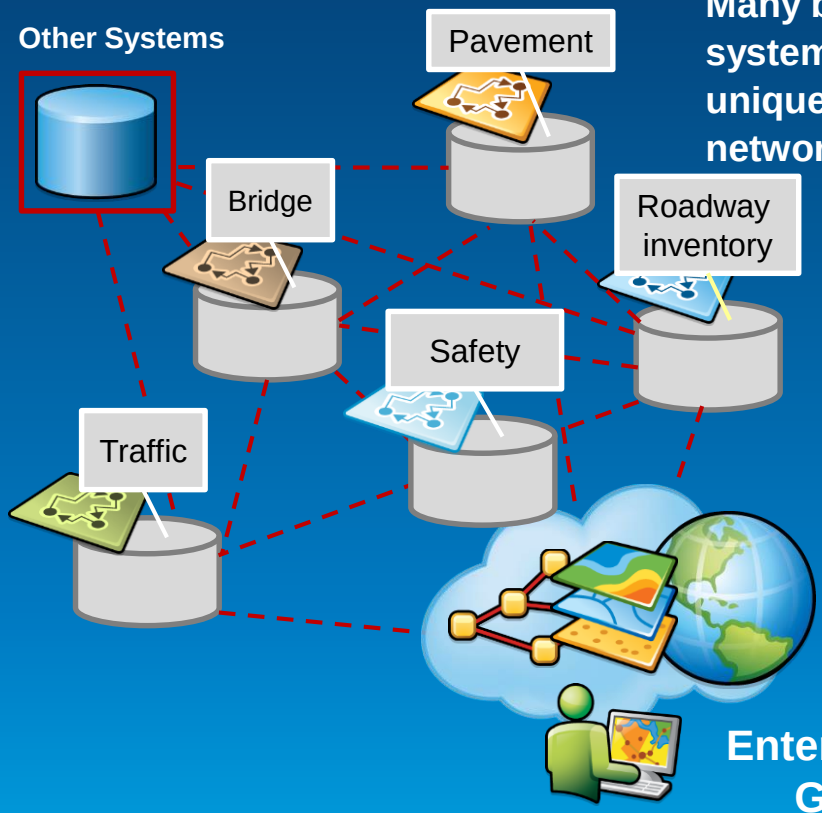


Integrating Business Systems: Current State

Trying to achieve better integration

Challenges

- Business information remains in silo
- Data not easily accessed by other systems
- Latency in propagation of updates
- Challenging or expensive integration
- GIS not well integrated leading to limited spatial capabilities across enterprise

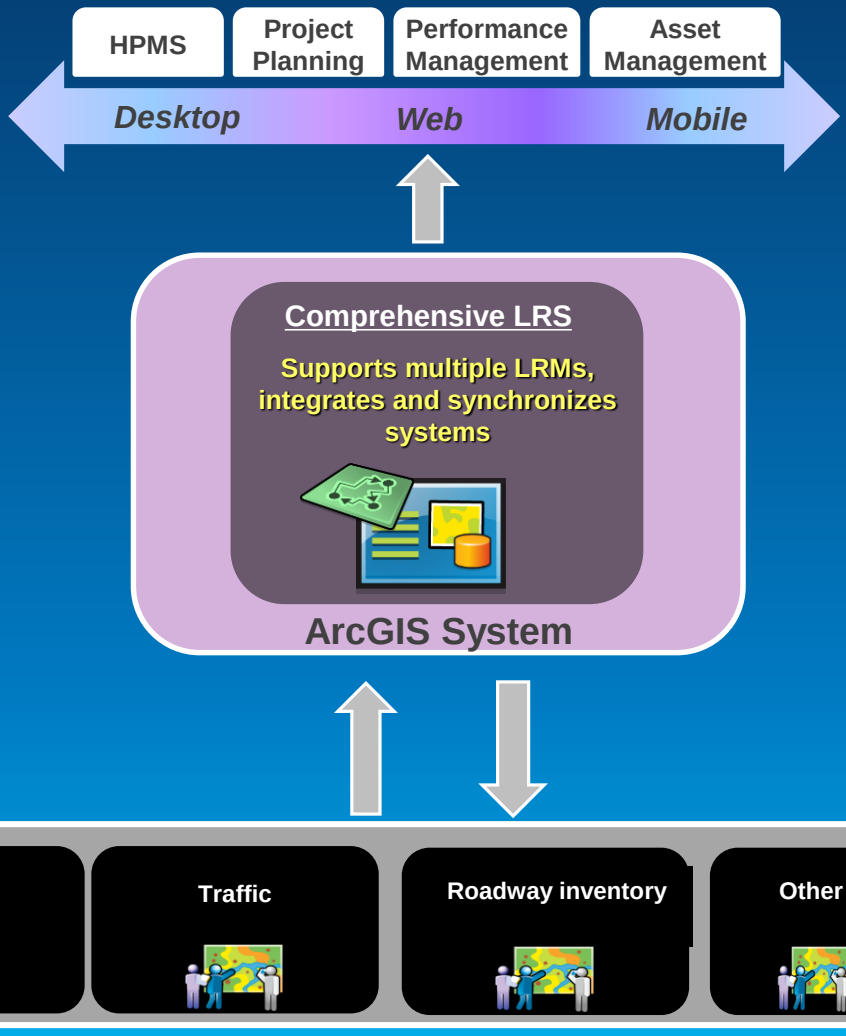


Integrating Business Systems: Target State

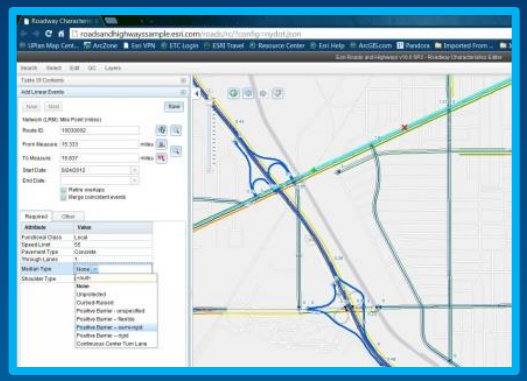
Unified, foundational, linear referencing 'Platform'

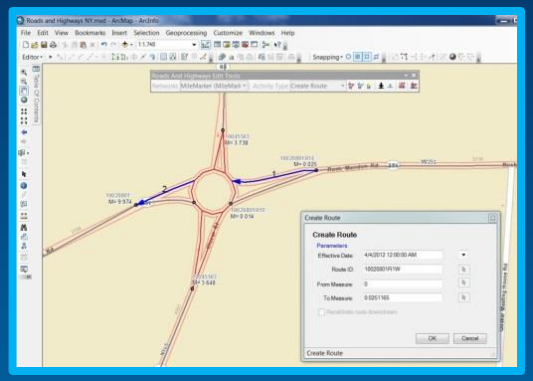
Benefits

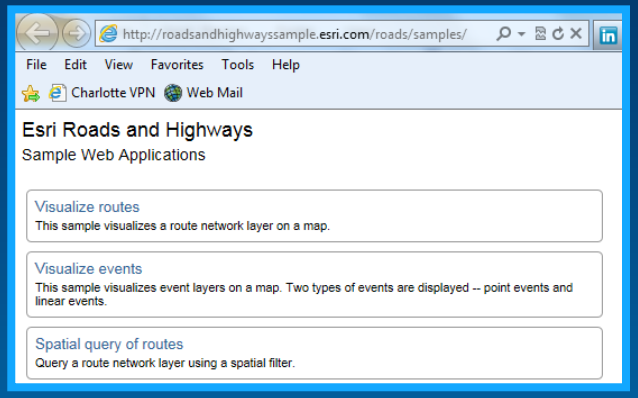
- Common, consistent location reference across all business systems
- Bi-directional data flow
- Data can be consumed by different systems
- Integration simplified
- Consolidation of redundant data
- Standards for system design & procurement
- GIS can serve many systems and functions
- Expanded spatial capabilities across enterprise



A new LRS Environment: Roads and Highways



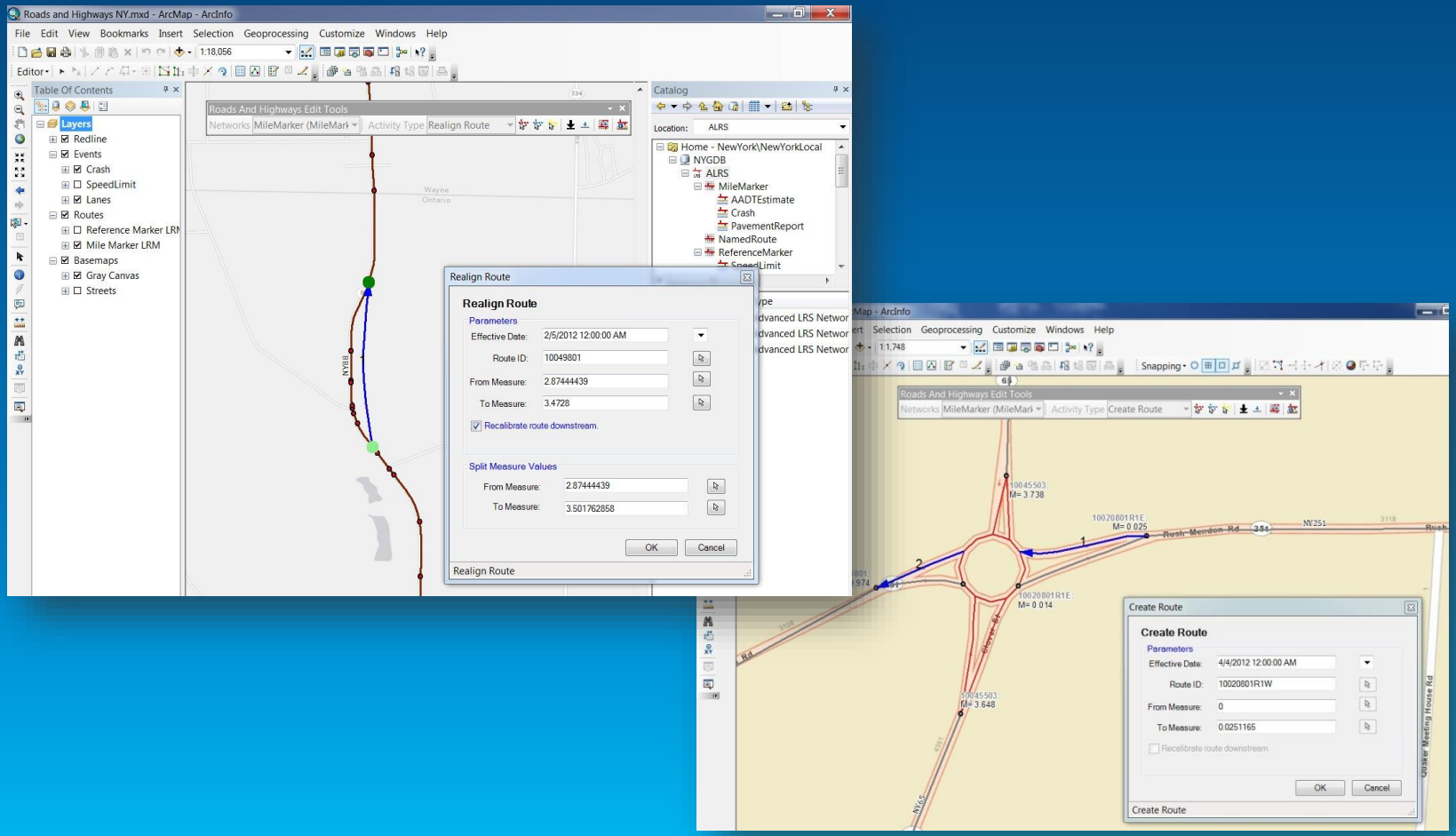




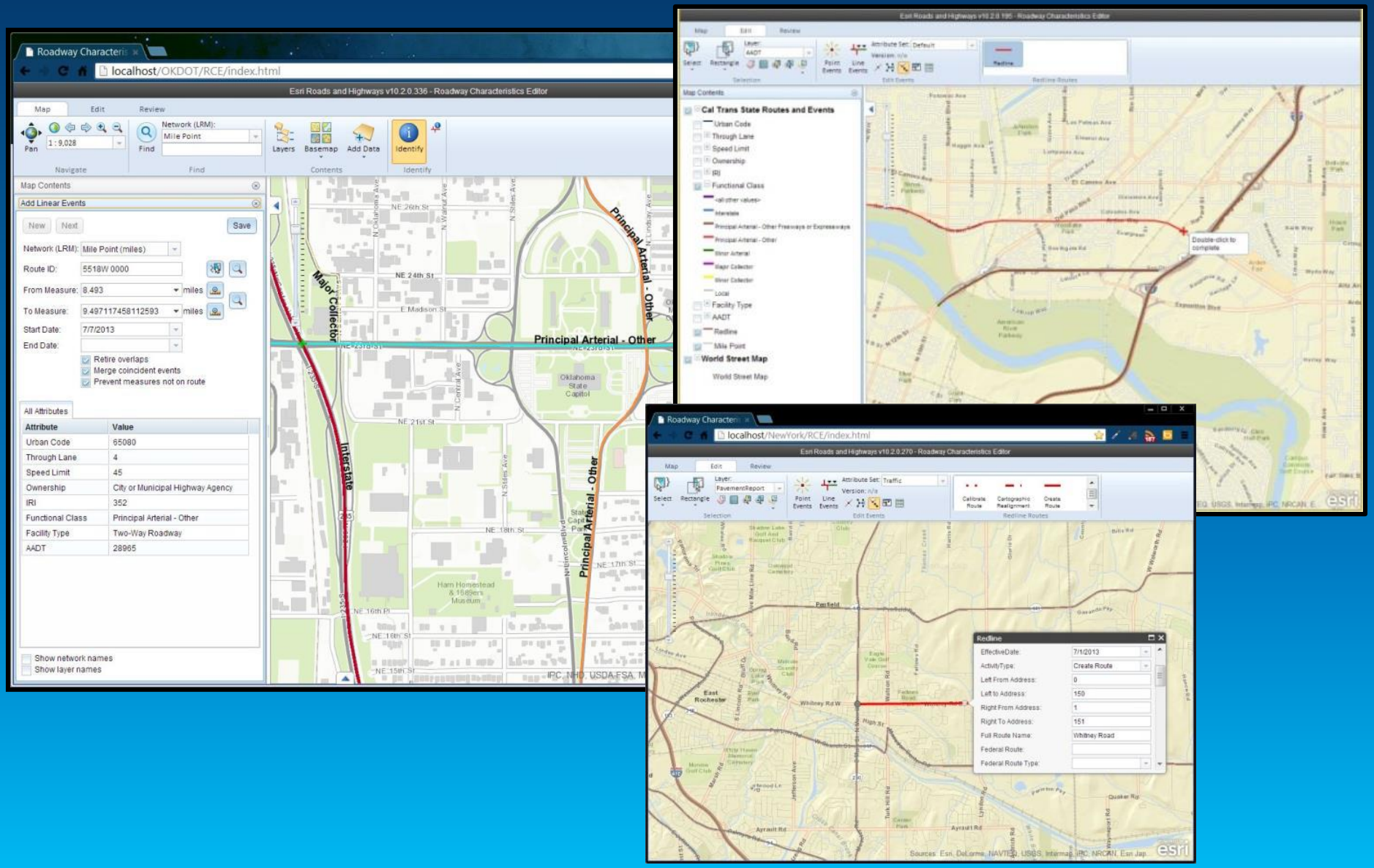
- Focused editing tools for LRS maintenance in the GIS
- Dynamic integration of enterprise business systems
- Automated synchronization of business systems with LRS
- LRS Web Services functionality for collaboration & data quality
- Roadway Characteristics Editing solution
- HPMS Reporting

A Commercial Off-The-Shelf (COTS) Linear Referencing System (LRS) solution from Esri…

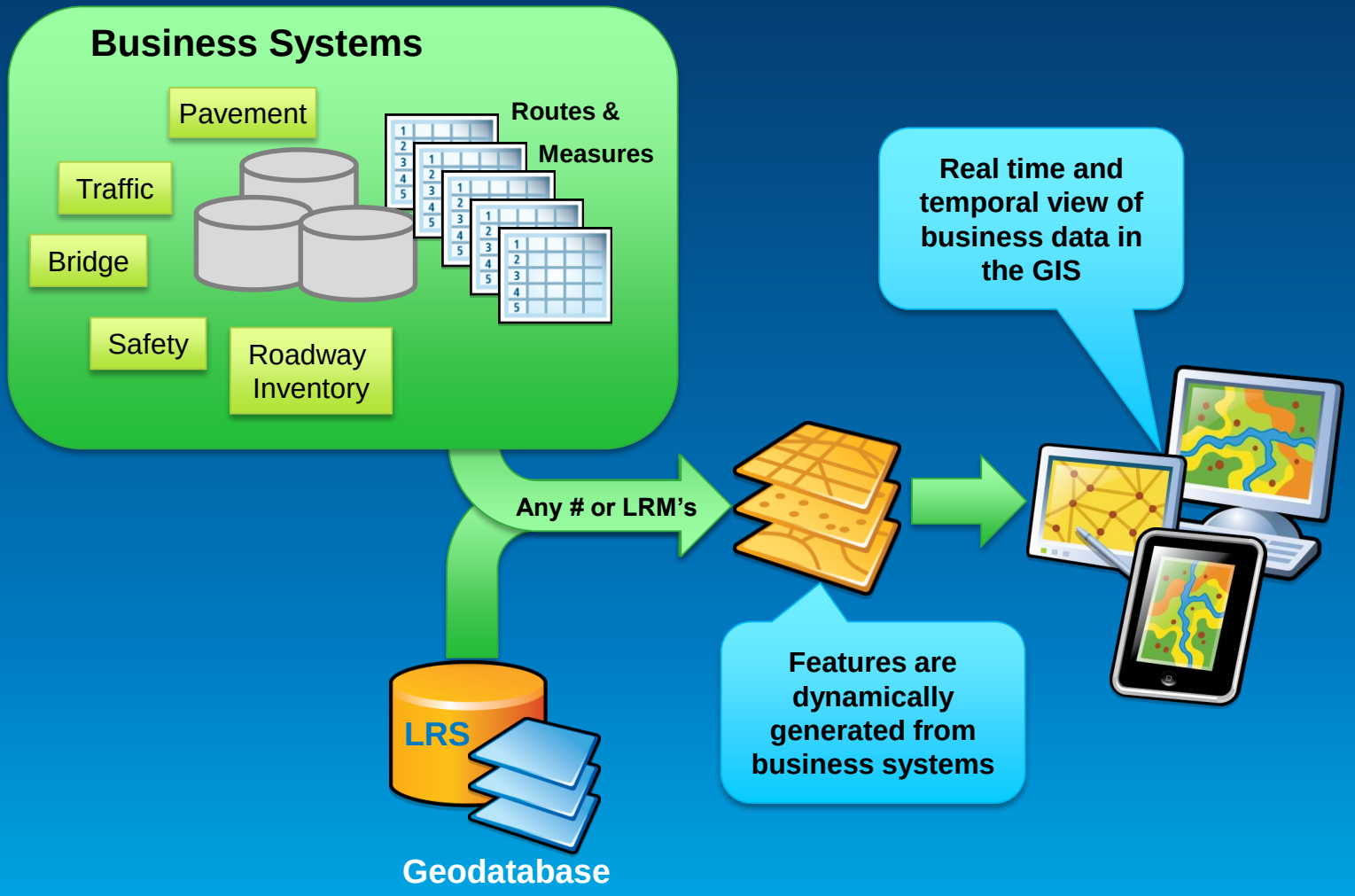
Focused LRS editing tools



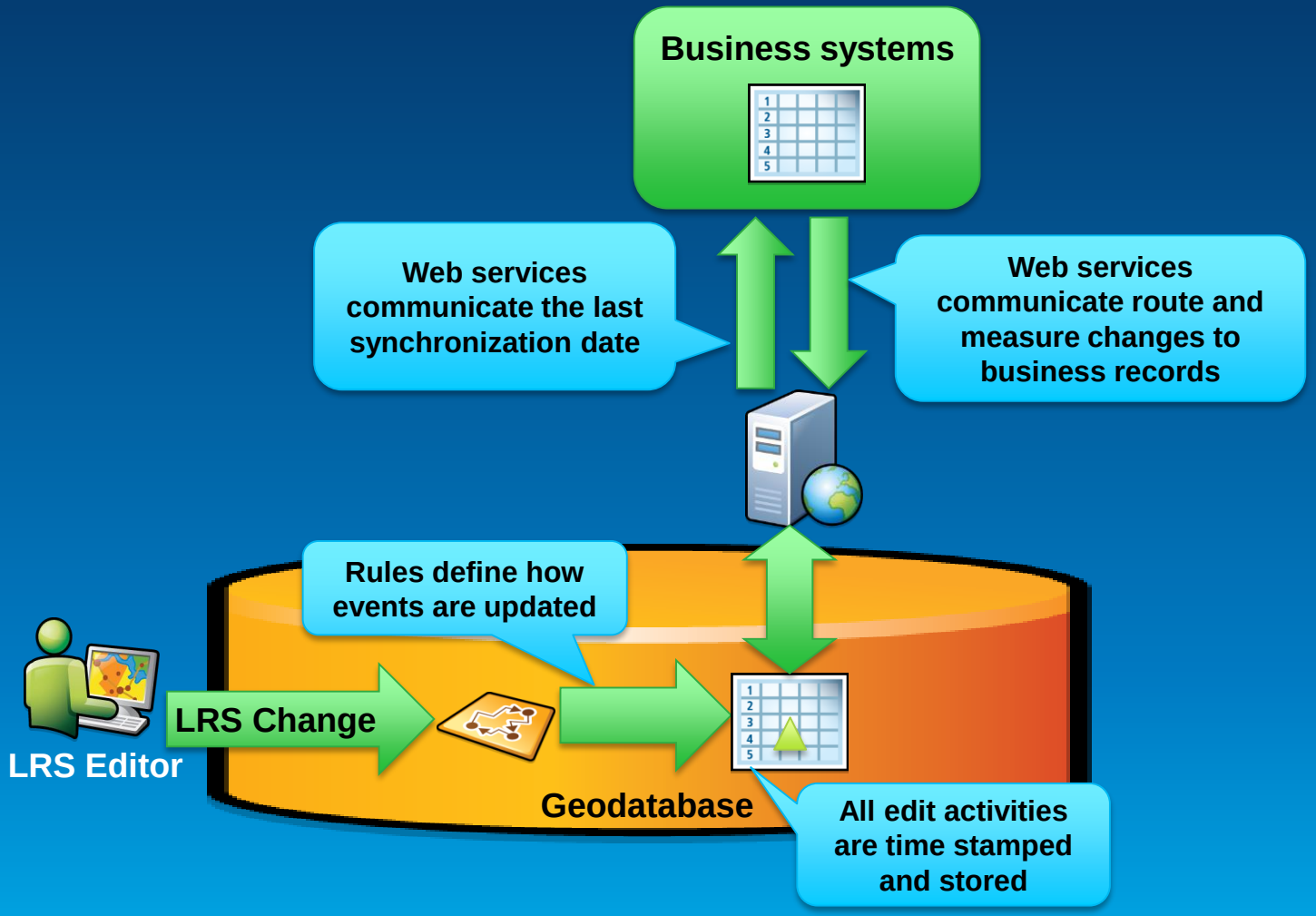
Roadway Characteristics Editor (RCE)



Dynamic integration of enterprise business systems



Automated sync'ing of business systems with LRS



Business Case for a Modernized LRS

MULTI-LEVEL LINEAR REFERENCING SYSTEM (MLLRS) COST/BENEFIT VALUE ANALYSIS STUDY

Requested by:

American Association of State Highway and Transportation Officials (AASHTO)

Standing Committee on Highways

Prepared by:

Renee L. Hoekstra, C
RH & Associates, In
Glendale, Arizona

May 2011

The information contained in this report was prepared as part o
National Cooperative Highway Research Program, Tra

SPECIAL NOTE: This report IS NOT an official publica
Highway Research Program, Transportation Research Board,
National Academies.

NCHRP Value Analysis Study

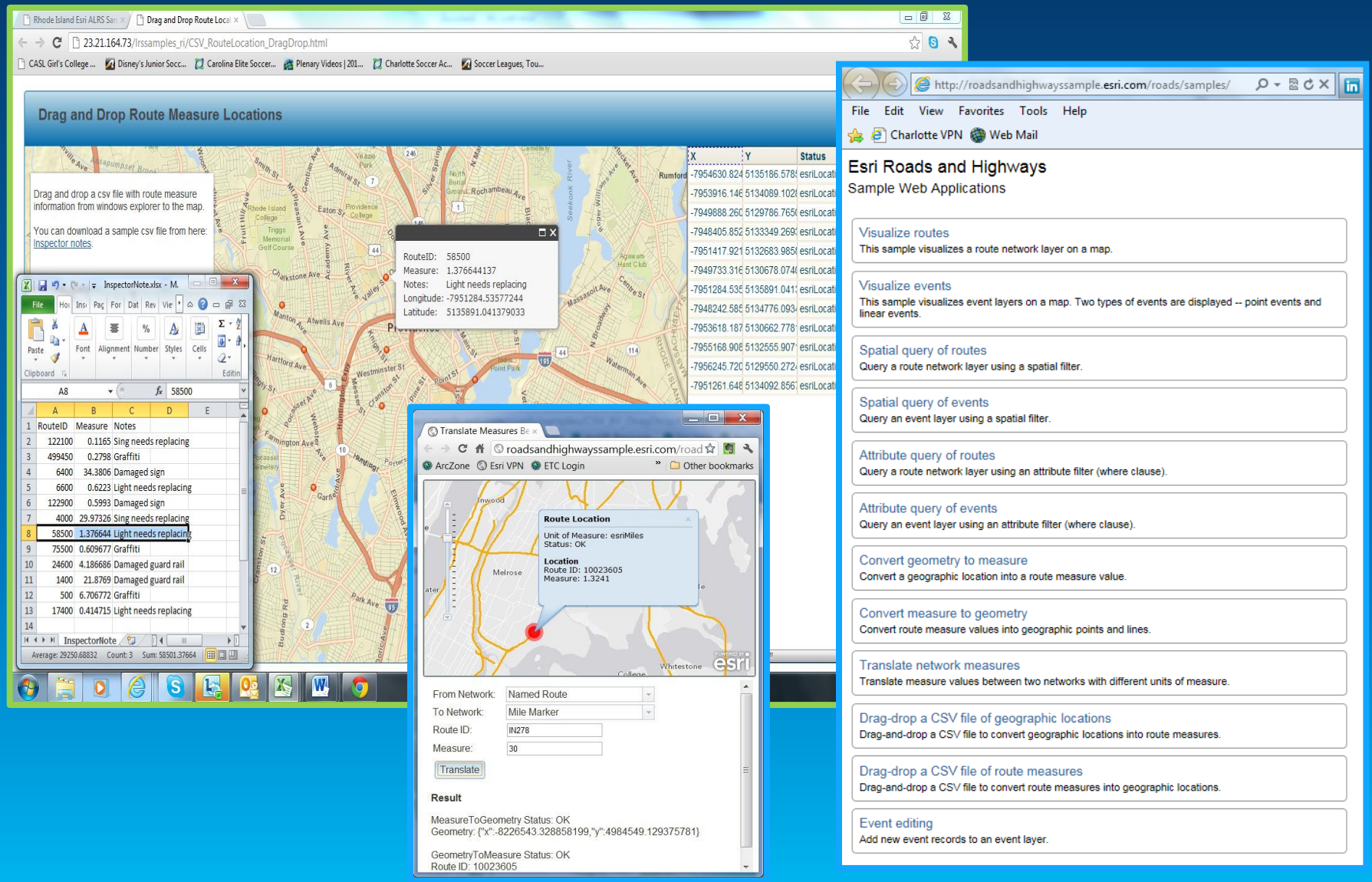
*onlinepubs.trb.org/onlinepubs/**nchrp**/docs/**NCHRP**20-07(302)_FR.pdf*

Multi-Level Linear Referencing System Cost/Benefit Value Analysis Study - NCHRP Project 20-07, Task 302, National Cooperative Highway Research Program, Transportation Research Board

When expressed as a C/B ratio, the baseline effort yields a C/B ratio of 1.8:1 while the optional functional elements yield an aggregate 21.4:1 ratio of benefits to cost. These figures were generated from empirical values generated by several of the participating states as workshop participants. These aggregate C/B ratios are bound to be different when each particular state is analyzed separately for their own costs versus benefits using their individual operating conditions.

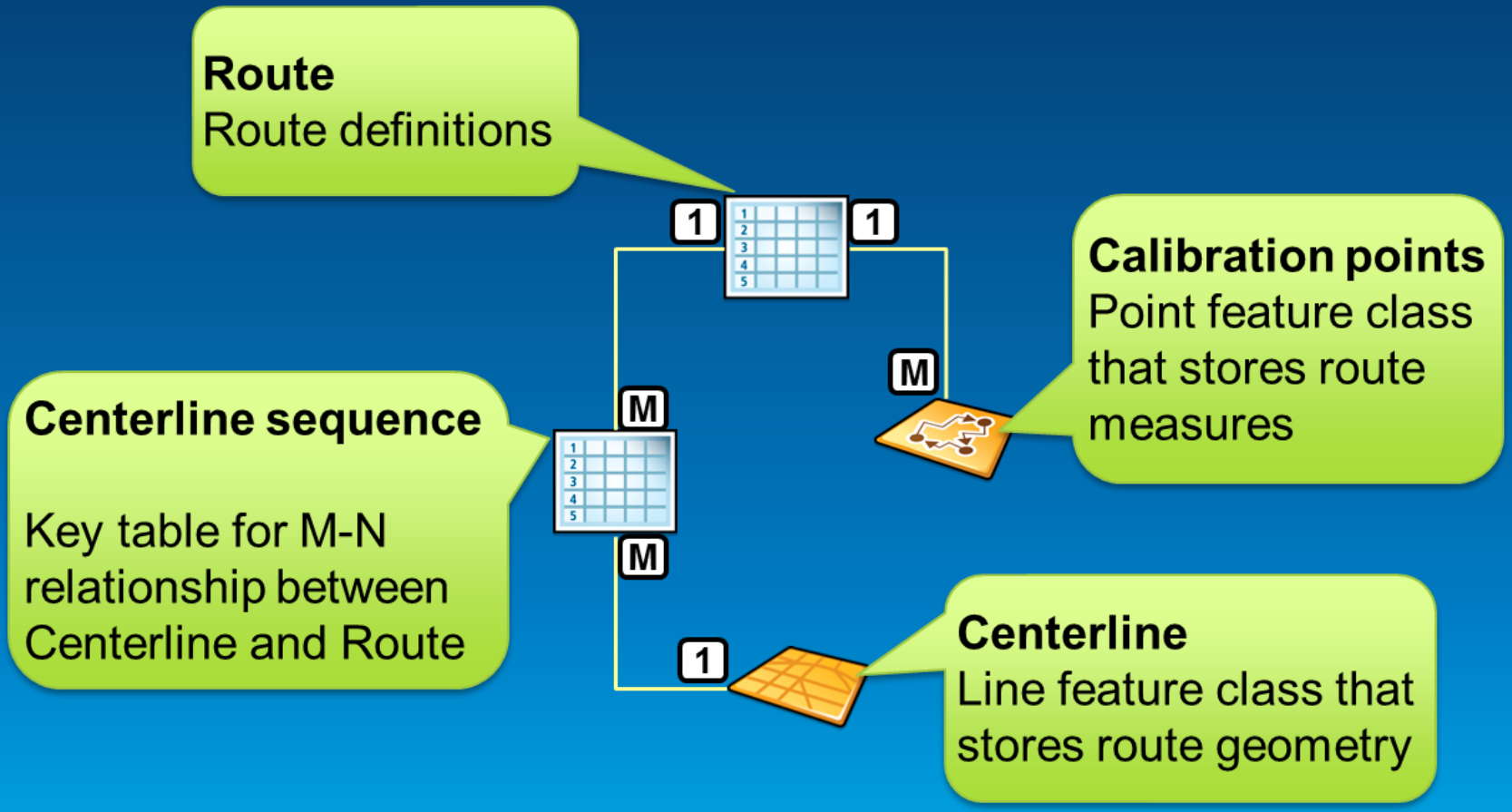
Robust set of web services for a variety of LRS functions

Improve data integrity & usability



Roads and Highways data model

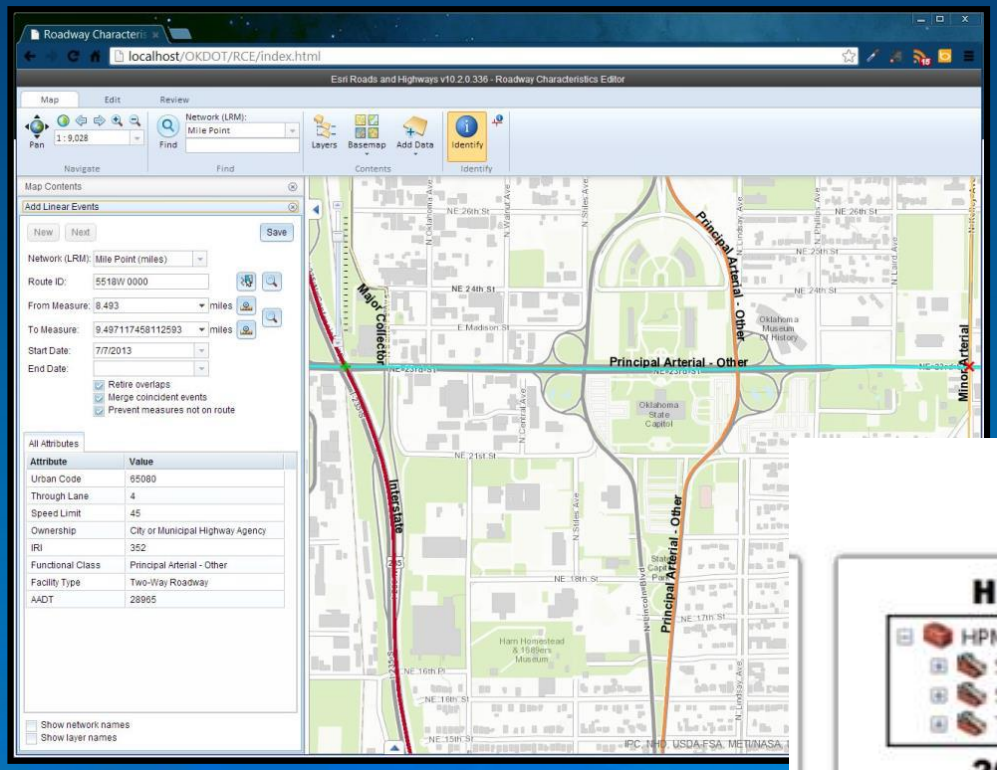
Simple, open, easily understood

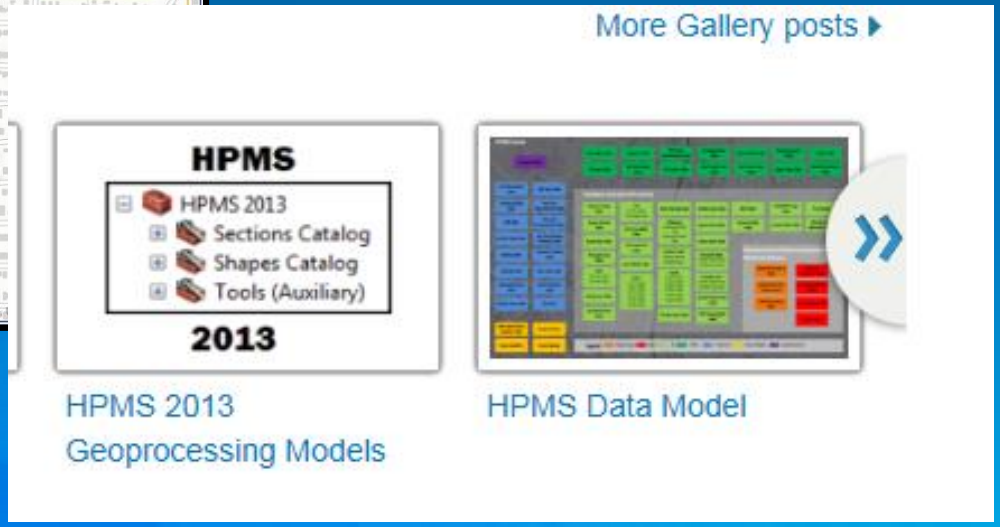


2 feature classes and 2 tables…

HPMS capabilities in Roads and Highways

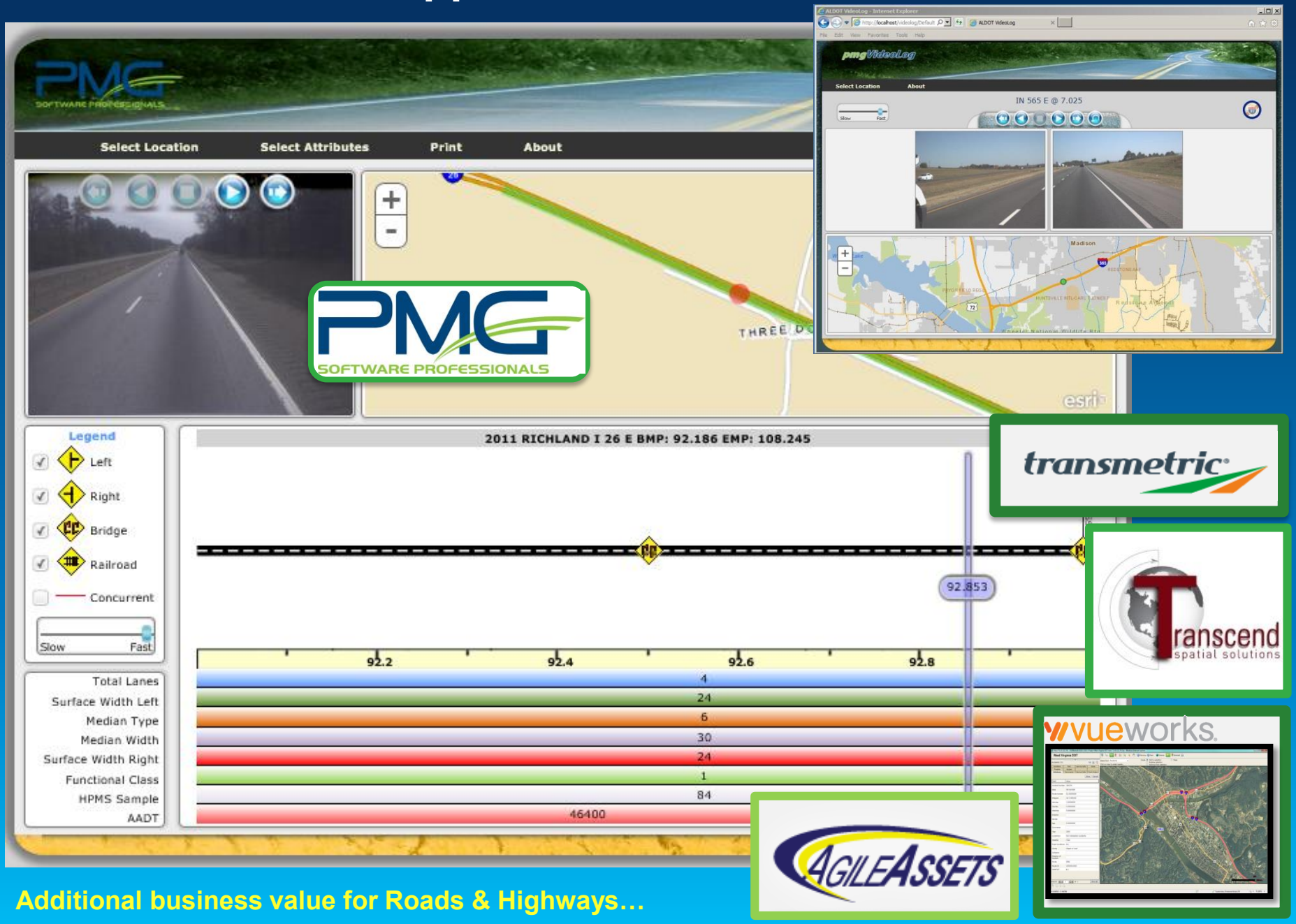
Output file formats, HPMS data model, RCE to edit sample sections and inventory





http://resources.arcgis.com/en/communities/roads-and-highways/

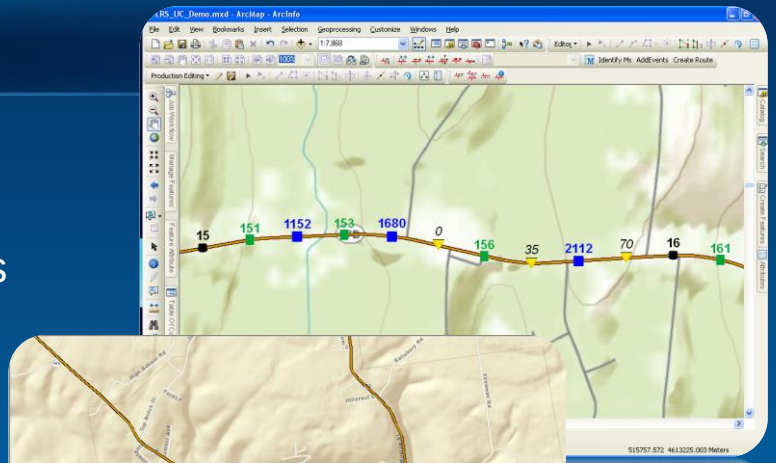
COTS Business Applications

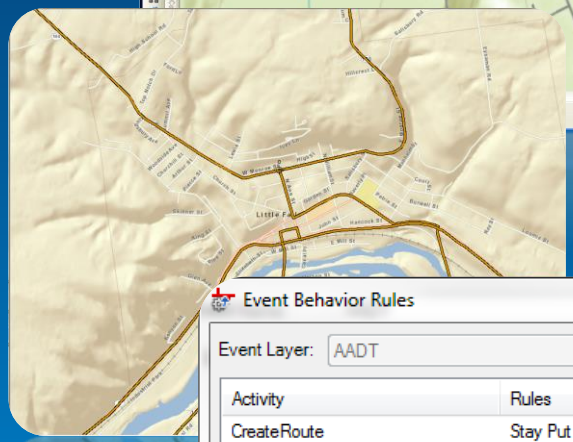


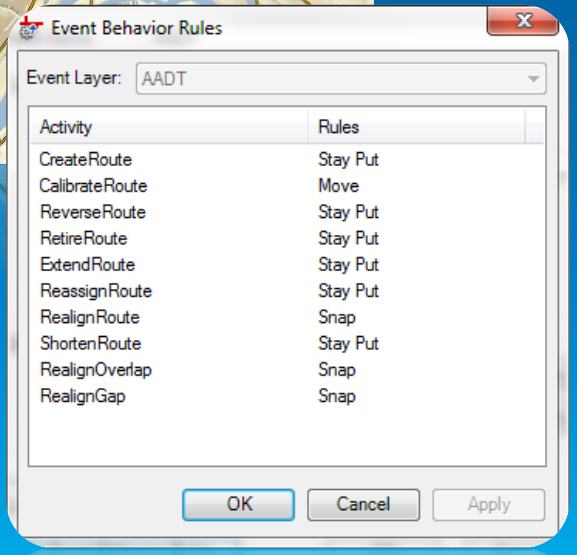
Additional business value for Roads & Highways…

Advanced Linear Referencing

- LRS Data Model
- Built on ArcGIS platform; no other/external tools
- Point feature class that stores calibration measures
- Redline feature class for input of proposed routes
- Any number of LRMs
- Includes Data Reviewer
- Includes Workflow Manager
- Rule-based location management
- Time aware LRS
- Highly configurable
- Robust set of web services for a variety of LRS functions



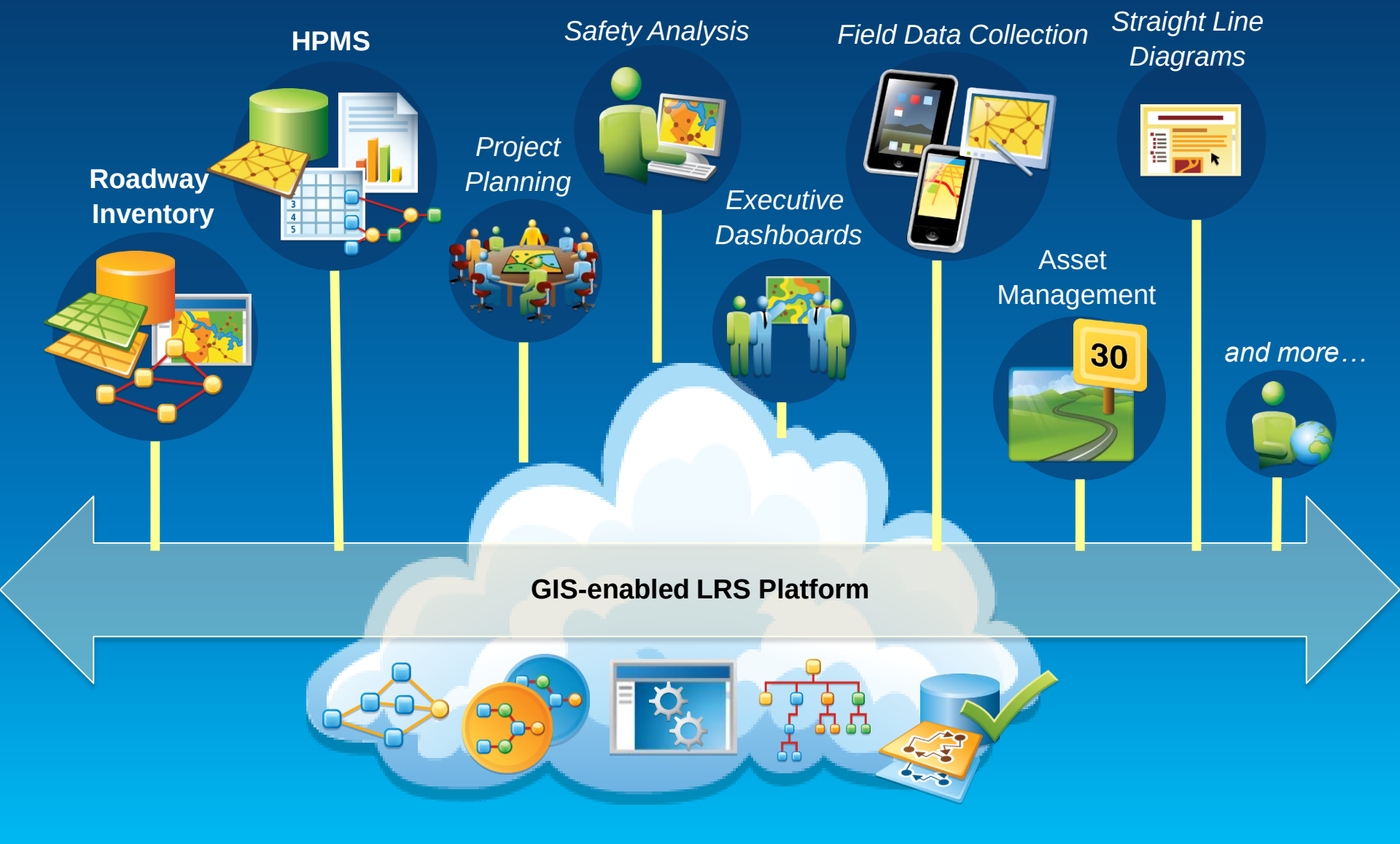




Supporting a full LRS environment…

ArcGIS supporting the DOT

ArcGIS simply includes Linear Referencing System (LRS) capabilities



Roads and Highways Interest Level in the U.S.

- **Implementing**
  - North Carolina
  - New York
  - Minnesota
  - Georgia
  - Colorado
  - Alabama
  - Indiana
  - Arizona
  - West Virginia
  - Alaska
  - LBJ Tollway
  - City/County of Denver
  - County of Boulder
- **Implementing**
  - Nevada
  - Kansas
  - Vermont
  - Virginia
  - Washington
  - Massachusetts
  - Rhode Island
  - Ohio
  - Wyoming
  - Louisiana
  - Maryland
  - DC DOT
- **Involved discussions**
  - Delaware
  - North Dakota
  - Oregon
  - South Dakota
  - Idaho
  - Utah
  - Iowa
  - Oklahoma
  - New Mexico
  - NJ Turnpike
- **Radar screen**
  - Maine
  - California
  - Michigan
  - Kentucky
  - Wisconsin
  - Texas
  - WMATA
  - FHWA

Questions

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