# The National Road Network Pilot Project and the US Road Specification

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GIS-T North Charleston, SC April 2022

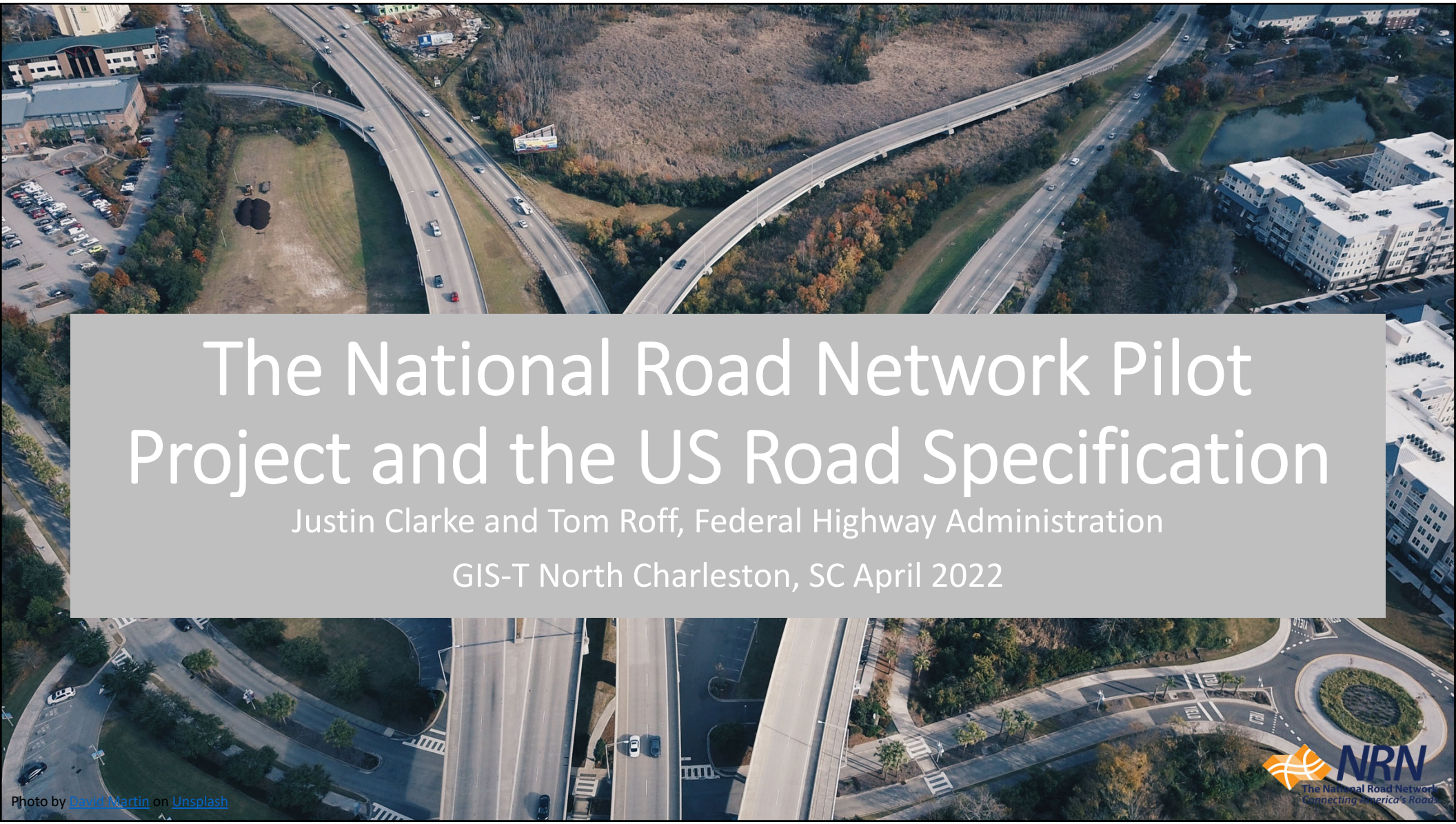

Photo by David Martin on Unsplash

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# Project Team

**Justin Clarke**
Project Manager

**Tom Roff**
Technical Lead

**Project Support**
Applied Geographics, Inc.

**Network Development Support**
1Spatial
U.S. DOT Volpe Center

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# Outline

- National Road Network Pilot Project
  - Background
  - What we've done
  - State projects
  - Next Steps
- US Road Specification
  - Scope
  - Process
  - Key Elements
  - Status

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# NRN: The National Road Network (Pilot)

- Congress appropriated FY 20 and 22 funds for FHWA to create a National Road Network using data reported to HPMS by State DOTs.
- Three network focus areas:
  - Connectivity
  - Representation
  - Spatial Accuracy
- The resulting network should also:
  - Support Interagency use
  - Enhance timeliness of data

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# Elements of NRN Development

| | | | | |
|---|---|---|---|---|
| **Outreach** | Symposium | Expert Panel | USRS WG | |
| **Research Coordination** | GMNS | AEGIST | Work Zones | |
| **Funding** | Grants | NOFO | | |
| **Network Development** | Match Points | Pilot | National Project | |
| **Products** | USRS | Pilot Findings | HPMS ARNOLD | NRN |

Complete

Ongoing

Future

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# Pilot Workflow

- ✓State project statement
- ✓Grant Request
- **Grant Approval/Allocation**
- Projects Begin
- Monitoring
- Final Report

Image: FHWA

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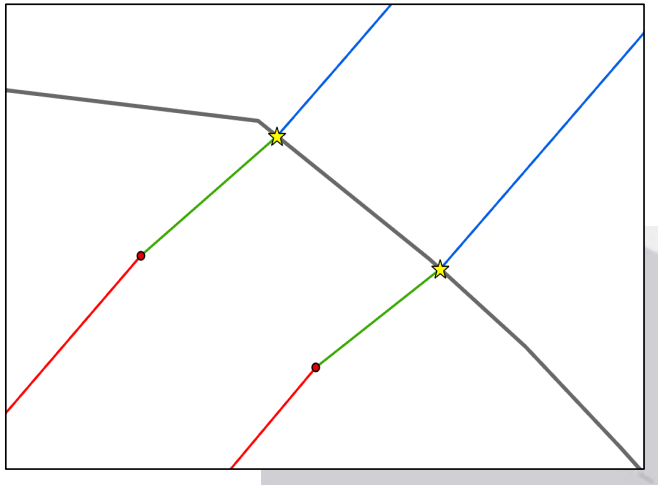
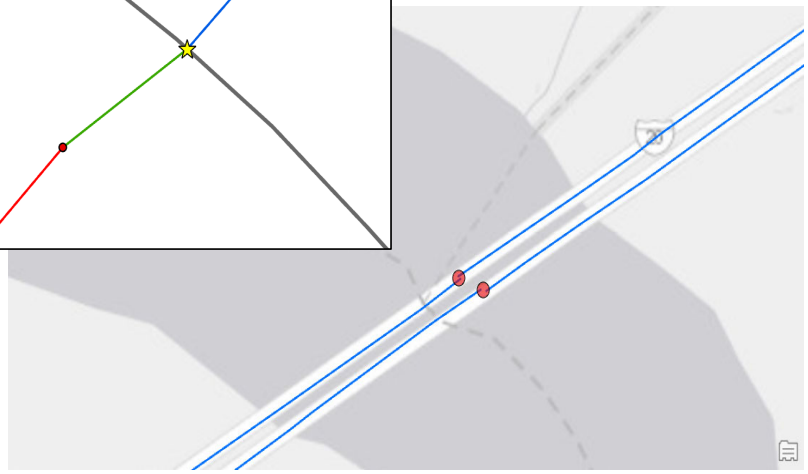
# Match Points: V1

- Interstates
- How do roads connect?
  - Overshoots
  - undershoots
  - Rivers/waterways at borders
- Connection Options
  - Trim ends
  - Center
  - Extend





Images: 1Spatial, US DOT Volpe Center, FHWA

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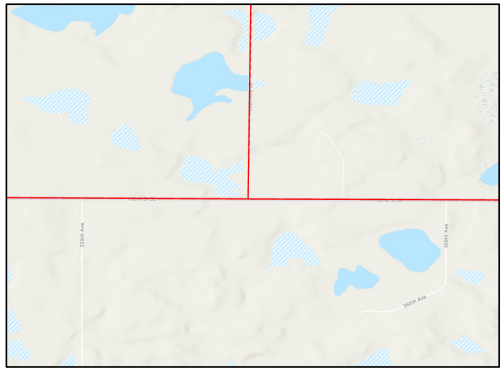
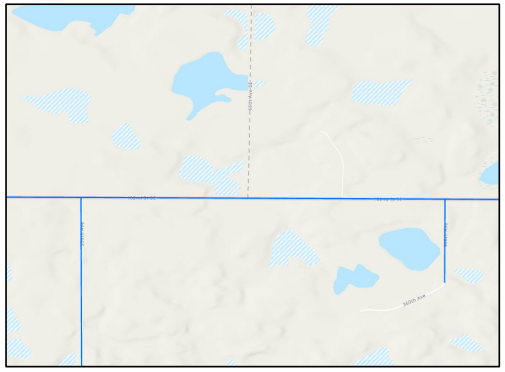
# Match Points: V2

## Full Network System Connections

- Ensure connections match Functional System
  - (1-1, 2-2,….7-7)
- Border Roads
- Urban areas
- Dog leg
- Discontinuous streets





Images: US DOT Volpe Center

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# Match Points: V2 Product

1. Connection points (points)
2. Multi border intersects (lines)
3. Coincident features (lines)
4. Connectors (lines)
5. Roads near border lines
6. State border dangles point feature class
7. State borders line feature class

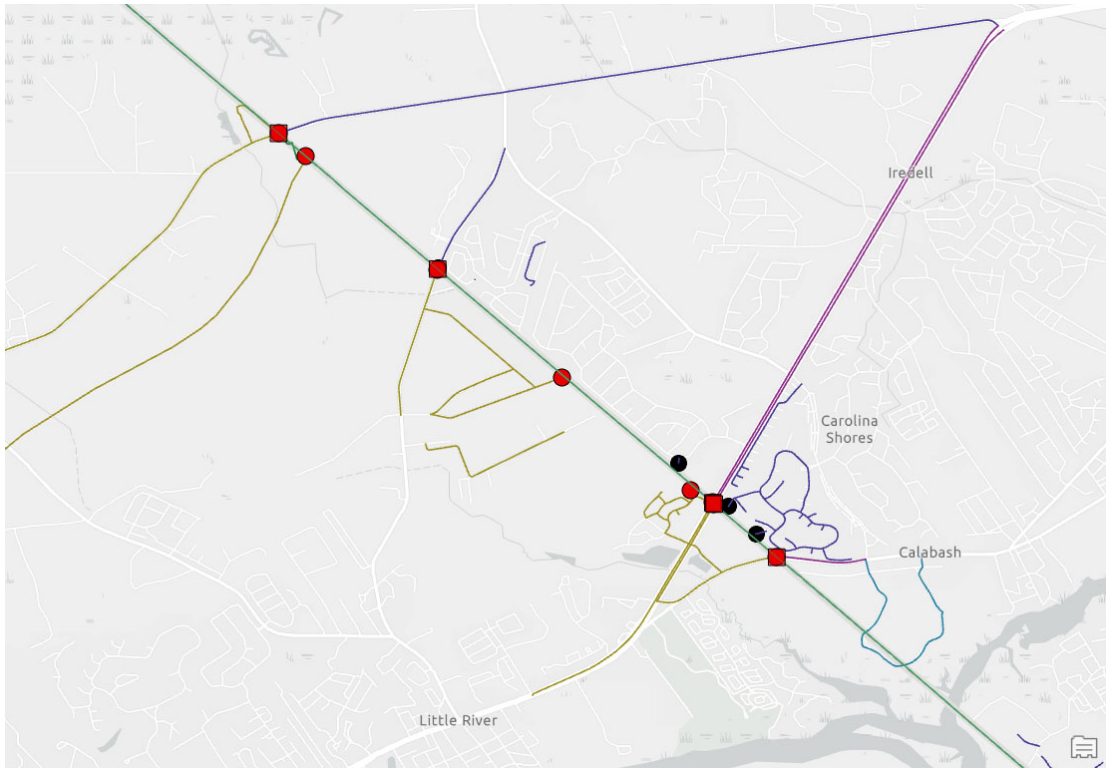


Image: US DOT Volpe Center, FHWA

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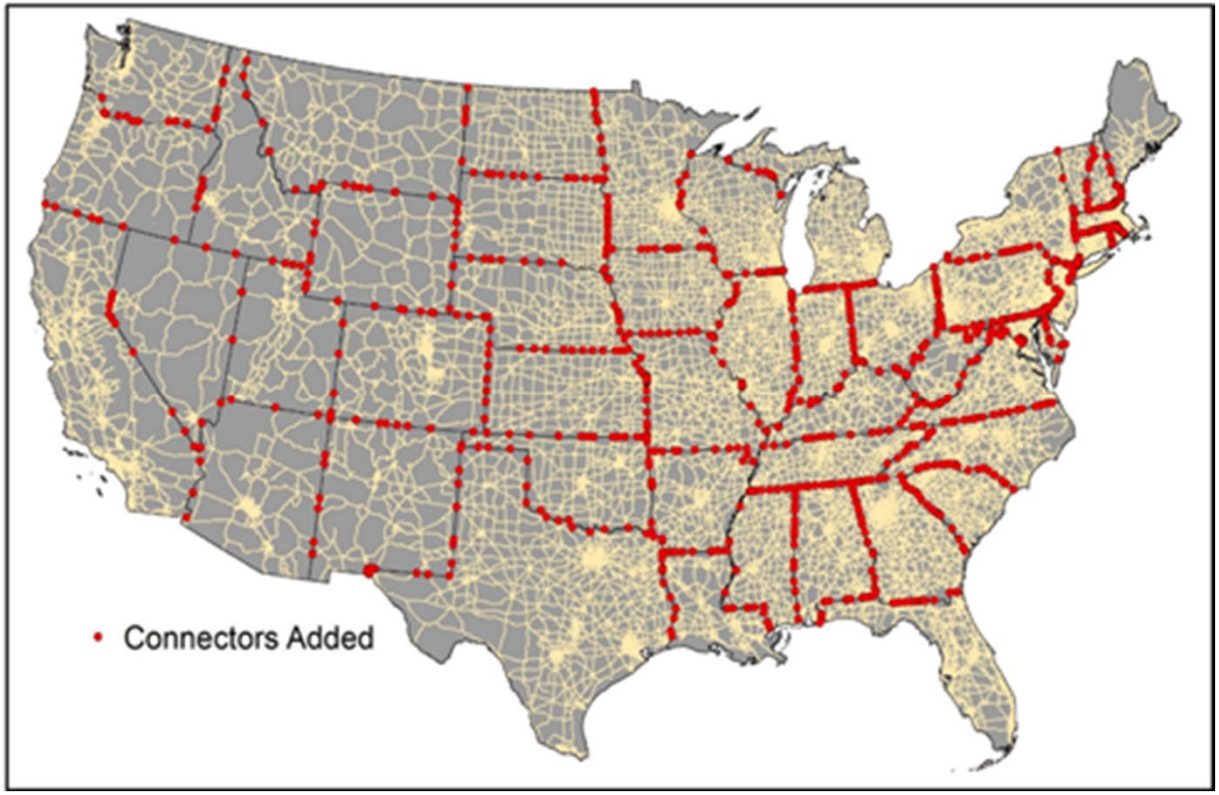
# Match Points Vn




Source: Volpe National Transportation System Center

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# Expected Outcomes for State DOTs

- Internal boundary cleanup
- Build state border connectivity
- Implement best practices for data modelling and spatial representation
- Improve data quality and completeness (esp. topology)
  - Local Roads
- Improved workflow to maintain or improve spatial accuracy (e.g. data collection)
  - Connectivity (state border)
  - Accuracy
  - Network completeness
  - Intrastate connectivity

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# Next Steps

FHWA Coordination

- State Pilot Project Tasks
- National Application through Grants

GIS- T value

- NRN Product

Timing

- When can other states participate?

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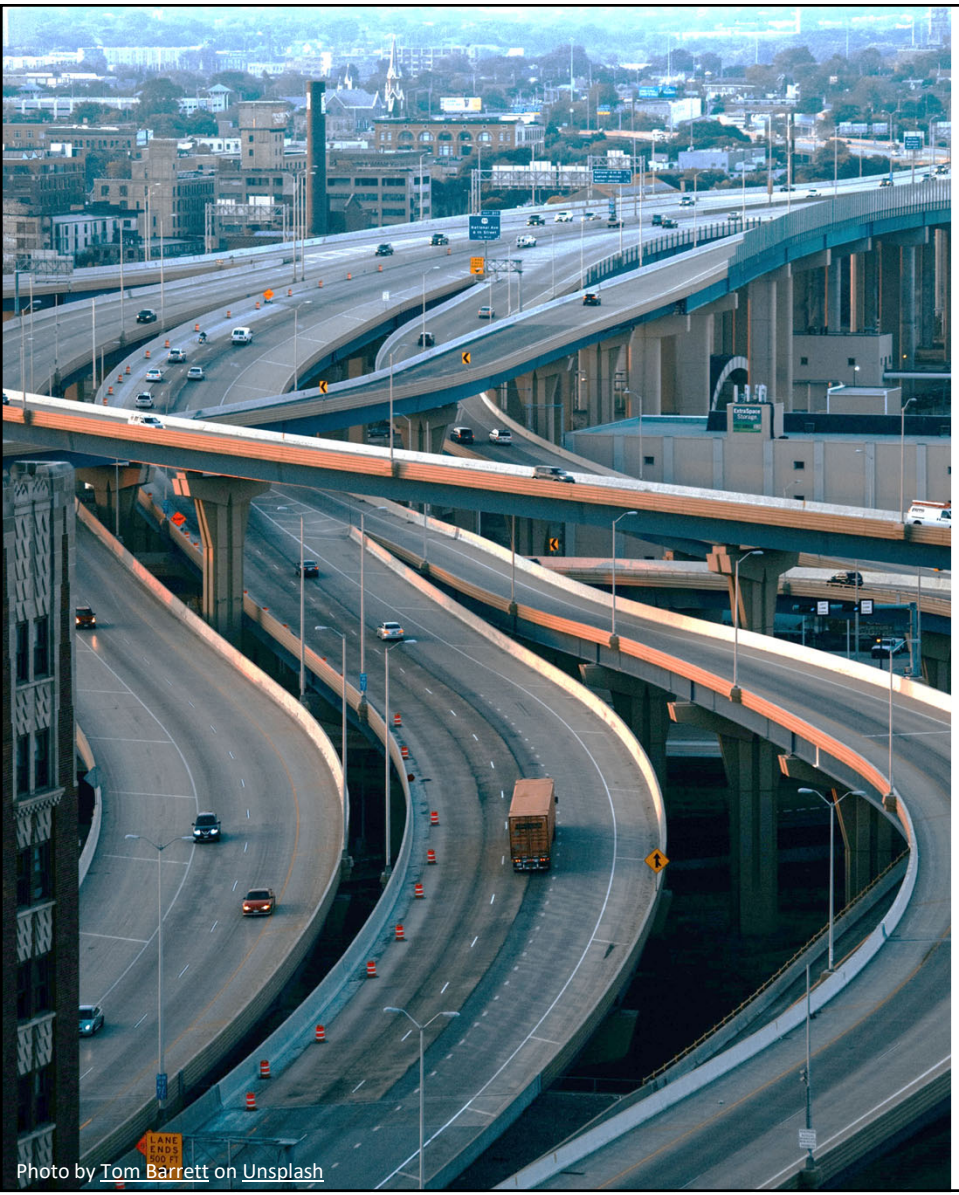

Photo by Tom Barrett on Unsplash

# The USRS

(US Road Specification)

# USRS – US Road Specification

- Two projects align
- NRN
  - House and Senate Committees emphasized standardization of geospatial data to support interoperability of the NRN data sets
- USRS Working Group (FGDC)
  - Over the past six months a working group assembled to sketching out what a Specification would look like
- Applied Geographics was hired to guide us through the process

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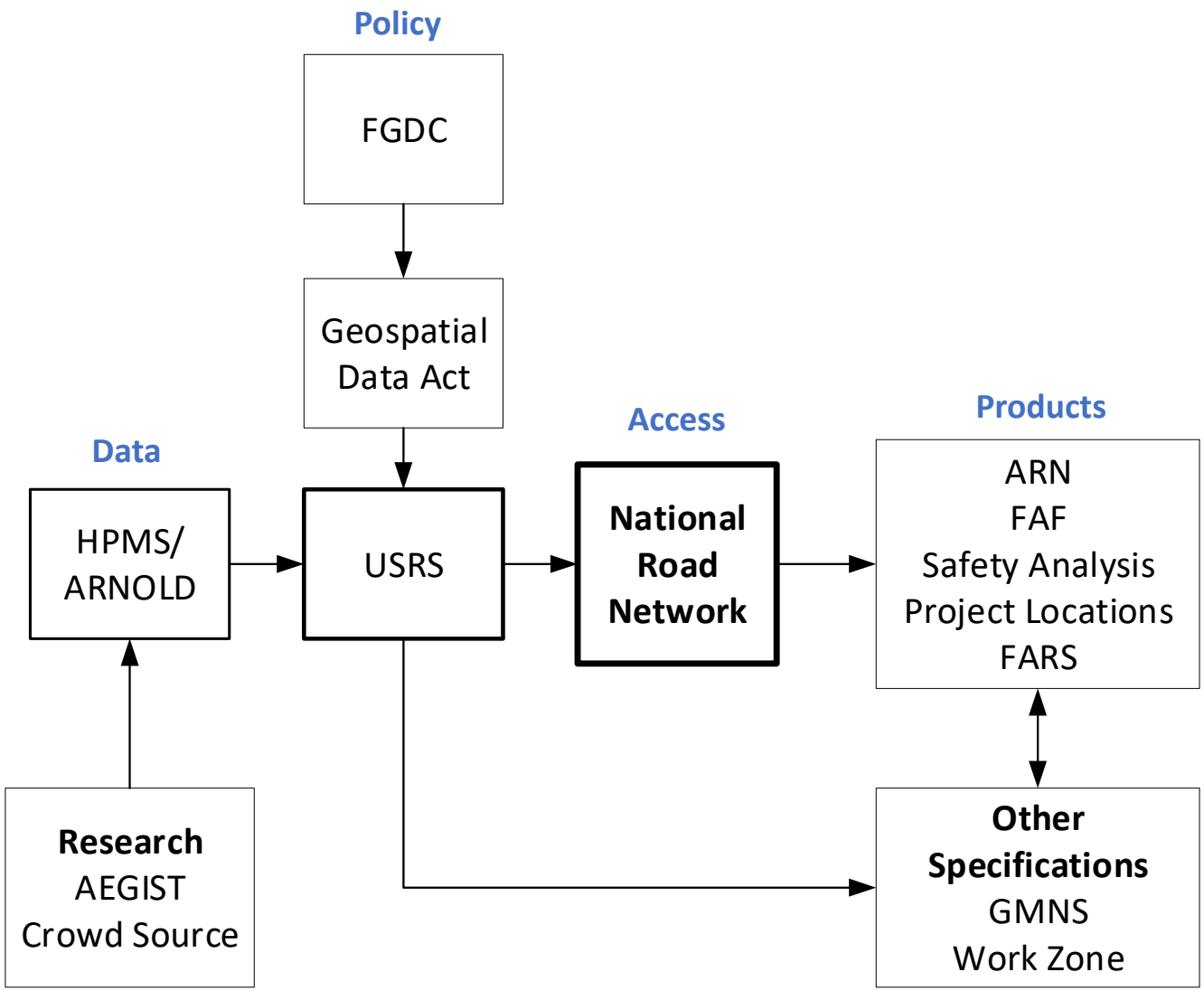


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# Scope

## The USRS Is (or will):

- Establish common base for federal datasets
- Preserve source information
- Roll out incrementally

## The USRS Is Not:

- A Requirement for States
- Adopted by the FGDC
- A product
- Does not supersede existing standards
  - E.g. GMNS
  - Census

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# Scope

- Data Standard
  - Describes how data is stored and exchanged (transferred)
  - Within Federal Geographic Data Committee (FGDC) development methodology
  - Applies to federal agencies
- Extension of Existing FGDC Standards
  - Road
  - Transportation Base
- Includes Public and Private roads
  - May include roads outside of the US

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# Scope

USRS will support:

- An inventory of Roads in the US.
- An ability to calculate an official length of the centerline geometry.
- The geolocation of other data including Highway Assets, Crashes, Housing units, Highway projects, etc.
- Topological connectivity as a baseline for routing applications.

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# Process – USRS Working Group

- Monthly Meetings over the past year
- Participants
  - US Census Bureau
  - US DOT - GIO, FHWA,  Bureau of Transportation Statistics
  - Federal Land Management Agencies
    - USGS
    - US Fish and Wildlife Service
    - US Forest Service
    - National Park Service
  - DoD/Army
  - USDA
- Was it open to others?
- How binding are the results of the Work Group?
  - They aren't. Working Group forwards recommendations to FGDC for consideration.

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# Process – USRS Working Group

Discussion Topics

- Precision and Accuracy
- Scope and Extent
- Geometry and Topological Connectivity
- Representation (Intersections, Interchanges, Multi-Carriageway)
- Attributes
- Metadata (Dataset, Record Level)

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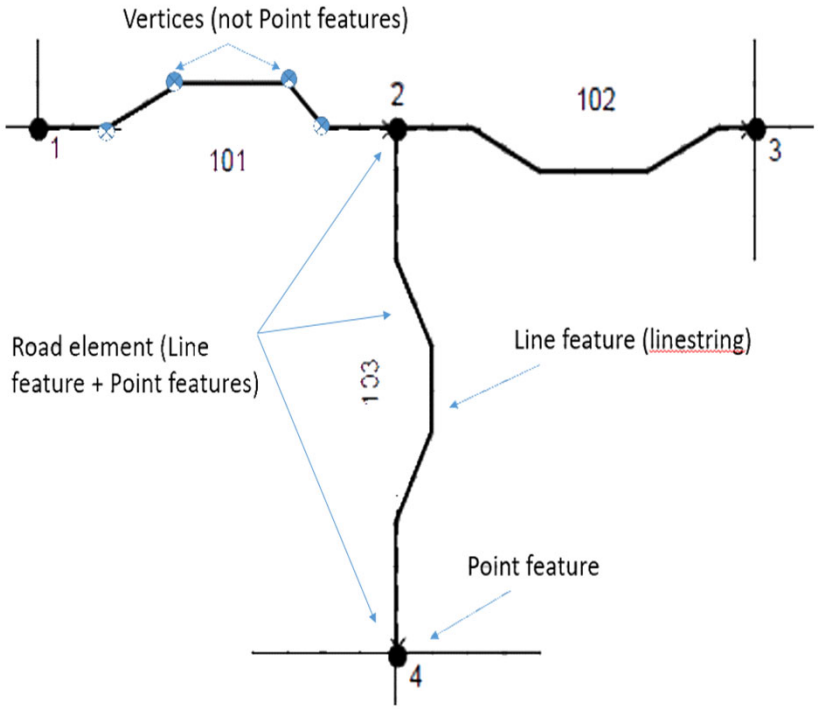
# Key Elements of the Spec

*Road Elements* are the basic spatial unit in the USRS

- Point Feature (x,y,z,m)
  - Represents highway phenomena including road junction, toll booth, at-grade or grade-separated crossing, points of interest, control points
  - In v1 z and m are optional

- Line Feature (1-D feature )
  - A sequence of one or more edges along which travel can take place
  - Interior coordinates are vertices, not point features

- Road Element = Line Feature terminated at each end by a Point Feature

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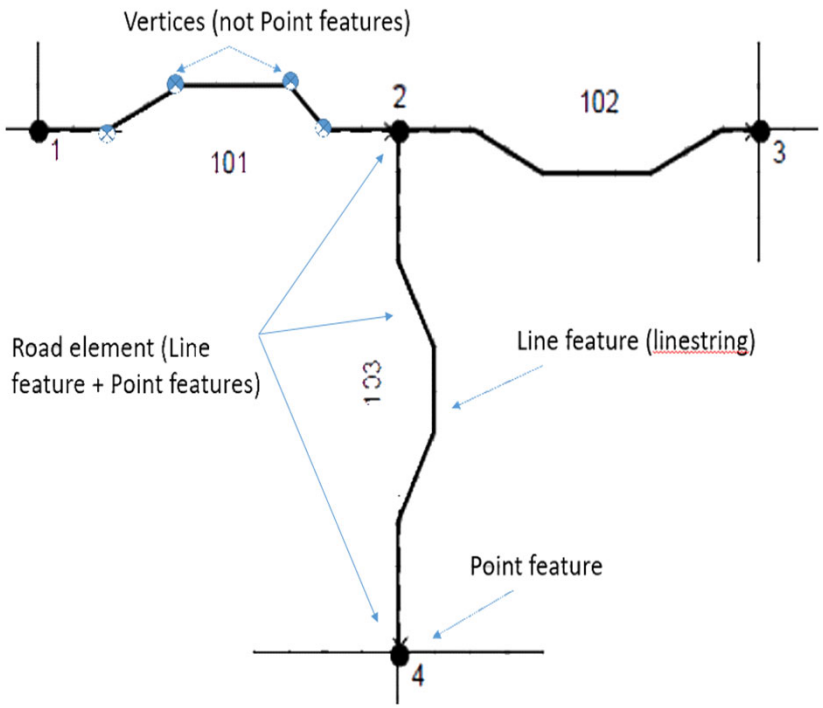
# Key Elements of the Spec

A single *Road Element* can represent many kinds of actual roads

- Centerline of a multi-lane, divided, interstate highway
- Centerline of a local street
- Centerline of one direction of a multi-lane, divided, interstate highway
- Each lane of a multi-lane road

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# Key Elements of the Spec

- Required:
  - Unique feature level Identifier
    - Roadway Element and Point features
  - Feature Level Metadata – Source

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# Key Elements of the Spec (Linear Features)

- Optional
  - Source Feature-Level Identifier
  - Length of Roadway Element
  - Surface Type
  - Multi-Carriageway
  - One-Way Restriction
  - Controlled Access
  - Number of Lanes
- Conditional – Mandatory
  - Road Route Number
  - Road Name
  - Road Element Type
    - E.g. mainline, bridge, ramp, etc.

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# Status

FGDC Process - Five Stages (and 12 Steps)

1. Proposal
2. Project (set up)
3. Draft
4. Review (evaluate, public comment)
5. Final (endorsement)

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# Status

- Where is the Draft?
  - We can mail it to you, working on public location.
- How can I become part of the process?
  - Send us your email, give us a card.

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# Take Home Points

- USRS Draft v1 is about to got to FGDC for review
- V1 will be basic: line strings and feature identifiers
- Implication for States? It is really a federal thing
- What are the benefits of compliance
  - Products that follow the standard are:
    - Documented
    - Consistent
- Risks of non-compliance
- If you are interested, contact us for more information

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# Contact Information

- Justin Clarke – justin.clarke@dot.gov
- Tom Roff – thomas.roff@dot.gov

- National Road Network Pilot Project Website:

https://data.transportation.gov/nationalroadpilot

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