



FGDC's Work Zone Data Exchange (WZDx) Specification:

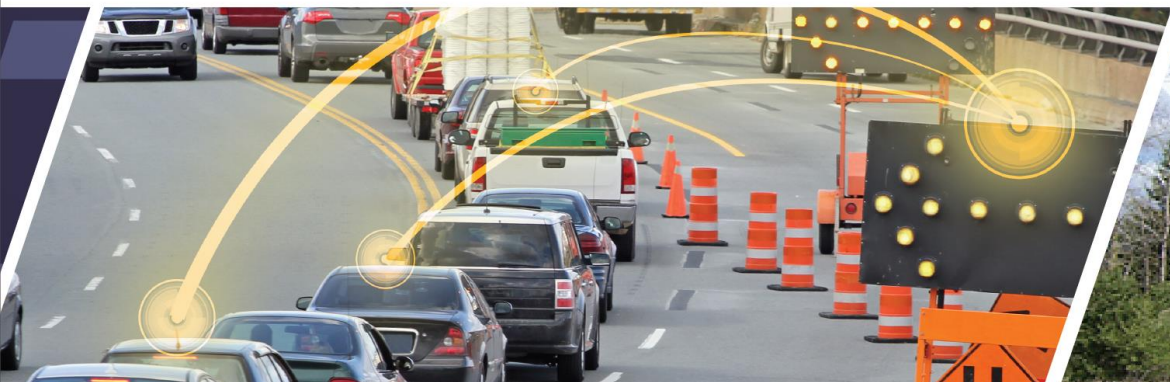
Version 3.0 Release Webinar

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Nate Deshmukh-Towery, Technology Policy Analyst, Volpe National Transportation Systems Center, U.S. DOT

David Craig, Chief of Maps, General Motors, Vehicle Engineering Center

Derald Dudley, NSDI Transportation Theme Lead, Bureau of Transportation Statistics, U.S. DOT



Purpose of Today's Webinar

- Provide an overview and update on the version 3.0 release of the Work Zone Data Exchange (WZDx) Specification, covering the latest changes
- View a live demo of the WZDx v3.0 Schema and respective examples
- Introduce the Work Zone Data Working Group (WZDWG) and its Subgroups' Co-Chairs for the next development cycle

Housekeeping Items



Your line will be, by default, muted during the presentation today.



Type any questions you have into the chat box.



This virtual meeting will be recorded.



Slides and recording will be available within 1-2 days at:

- <https://github.com/usdot-jpo-ode/jpo-wzdx/wiki> and
- <https://www.transportation.gov/av/data/wzdx>

Overview of the WZDx Specification



Work Zone Data Exchanges

The Work Zone Data Exchange project responds to priorities identified by public and private sector stakeholders. The goal is to develop a harmonized specification for work zone data that infrastructure owners and operators can make available as open feeds that automated vehicles and others can use.

Accurate and up-to-date information about dynamic conditions occurring on the roads—such as work zones—can help automated vehicles navigate safely and efficiently. Many infrastructure owners and operators maintain data on work zone activity, but a common specification for this type of data does not currently exist.

This makes it difficult and costly for third parties—including vehicle manufacturers and makers of navigation applications—to access and use work zone data across various jurisdictions.

Several State DOT agencies and private companies are voluntarily participating in the project, with U.S. DOT acting as a technical facilitator. U.S. DOT has been working with these partners to help define the core data elements that should be included in an initial work zone specification and to determine what types of technical assistance the data producers will need to implement it, expand it over time, and address broader work zone data management challenges.

Purpose

- Jumpstart voluntary adoption of a basic work zone data specification.
- Enable collaborative maintenance and expansion for future development.

Near-Term Outcomes

- **Data producers** make an active work zone data feed available using a common, non-proprietary specification.
- **Non-government developers** use that data in a meaningful way—thus, establishing a minimum viable product of a voluntary data exchange for work zone data.

Long-Term Aspirations

- Make travel on public roads safer and more efficient through ubiquitous access to data on work zone activity.
- Validate a repeatable approach to accelerate harmonization of local data sources.
- For a webinar with additional background: <http://itsa.adobeconnect.com/psbfh0id51iv/>

WZDWG Updates

- WZDWG Co-Chairs:
 - Nate Deshmukh-Towery and David Craig
- WZDx Specification v3.0 is now available on [GitHub](#).
 - Proposed changes to include in v3.0 were approved by a supermajority of WZDWG voting members.
- WZDx GitHub '[Discussion](#)' forum was launched this past development cycle.
- An updated WZDWG charter is now available on the GitHub [Wiki](#).
- Three Subgroups remain chartered under the WZDWG:
 - **Specification Update Subgroup**
 - Co-Chairs: Skylar Knickerbocker, Craig Moore, David Craig, Jacob Brady
 - **Technical Assistance Subgroup**
 - Co-Chairs: Chuck Felice, Curtis Hay, Shane Zumpf
 - **Worker Presence Subgroup**
 - Co-Chairs: Serge Beaudry, Ross Sheckler, Luke Urie, Kristin Virshbo

WZDx Version 3.0: Spec. Updates

Non-Spec. Changes to the WZDx Repository

The following changes were mainly focused on overall WZDx repository hygiene and editorial revisions:

- [Added JSON schema for the WZDx v2.0 feed](#)
 - [Renamed 'feed-content' directory to 'spec-content' and updated all hyperlinks](#)
 - [Added clarifying text to 'direction' field description as well as 'enumerated type'](#)
 - [Removed full-spec.md to avoid requiring updates to multiple repo locations \(ease of reference\)](#)
 - [Updated root README file based on ITS JPO's new source code guidelines](#)
 - [Changed 'release_notes.md' to 'RELEASES.md' for consistency with file naming conventions](#)
 - [Updated repo to correct other minor errors – e.g., typos, necessary clarifications](#)
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- *Forthcoming* – transferring the WZDx Specification to a new repository, improving visibility and searchability (new hyperlink will be shared ahead of the next specification release).
 - New Housing Organization: National Transportation Library

Require restriction_type for a lane_restriction

Use Case:

- *Bug Fix:* Require (i.e., make mandatory) the **restriction_type** field on the lane_restriction entity in order to prevent empty restrictions in the feed output.

Implemented Solution:

- Made the **restriction_type** field on lane_restriction entity a “required” element in the specification.

GitHub Link can be found [here](#) (pull request is now closed).

Issue in v2.0:

```
{
  "lanes": [
    {
      "lane_restrictions": [ {}, {} ]
    }
  ]
}
```

Lane Restrictions Table:

Field Name	Data Type	Description	Conformance
lane_restriction_id	ID	Identifies the lane restriction info record.	Required
lane_id	ID	Identifies the lane to which a restriction info record is related.	Required
restriction_type	Enumeration; Text	The type of restriction being enforced.	Required
restriction_value	Float	The measure of the restriction type.	Optional
restriction_units	Enumeration; Text	Units of measure for the restriction value.	Conditional: required if restriction_value is not null

Change Time and Spatial Verification Enumerated Type Values to be Lowercase

Use Case:

- *Increase Consistency:* Time/Spatial verification enumerated types are the only enumerated types in the WZDx Spec. that are not lowercase, dash-delineated. They also confusingly note (-est) and (-ver), which are leftovers from v1.1.

Implemented Solution:

- Changed the Time/Spatial Enumerated Type values to lowercase and remove (-est) and (-ver).

GitHub Link can be found [here](#) (pull request is now closed).

From:

Estimated (-est)
Verified (-ver)

To:

estimated
verified

Require major.minor Format for road_event_feed_info `version` Field

Use Case:

- *Greater Clarity:* Standardize the **version** property on **road_event_feed_info** to ``major.minor`` to prevent allowing different values to reference the same feed version (e.g., v2.0, v2, 2, 2.0, etc.).

Implemented Solution:

- Updated **version** field in `road_event_feed_info` table to clarify it should use `minor.major` format (e.g., 1.1, 2.0) with no preceding “v” and add a regular expression in the JSON schema to validate this format.

GitHub Link can be found [here](#) (pull request is now closed).

Clarify Usage of Lanes Table and Clean Up Lane Types

Use Case:

- *Greater Clarity:* The Lane Type Enumeration has unfitting and unclear values that didn't get addressed in v2.0 and allowed a WZDx "lane" to represent more than one actual lane on the roadway.

Implemented Solution:

1. Clarified that a "lane", represented by an entry in the [lanes](#) array on a road event, represents a *single* lane.
2. Removed all plural values from the [Lane Type Enumerated Type](#).
3. Renamed lane type values **outside** and **inside**—which were ambiguous but intended for shoulders—to be **left-shoulder** and **right-shoulder**.
4. Changed **middle-lane** description to note that it can be used for any lane that is not the right- or left-most lane, not just "the center lane when the total number of lanes is odd".
5. Added new lane type **center-lane** to capture the "center lane when the total number of lanes is odd" functionality.
6. Added new lane types **center-left-turn-lane**, **reversible-lane**, and **hov-lane** to cover missing functionality.

GitHub Link can be found [here](#) (pull request is now closed).

Remove:

all
left-2-lanes
left-3-lanes
right-2-lanes
right-3-lanes
middle-two-lanes
none
unknown
outside
inside
both

Add:

left-shoulder
right-shoulder
shoulder
lane
center-lane
center-left-turn-lane
reversible-lane
hov-lane

Add `order` property to the lane entity to indicate position and standardize lane counting to begin from the left side of the roadway

Use Case:

- *New Functionality/Clarity:* Allow identifying the position of a lane in sequence on the roadway without relying on the text-based **lane_type** or limiting the flexibility of the **lane_number** field.
- Additionally, having the edge reference consistent in all WZDx feeds limits parsing logic, as well as makes it easier to talk consistently about lanes and lane numbers.

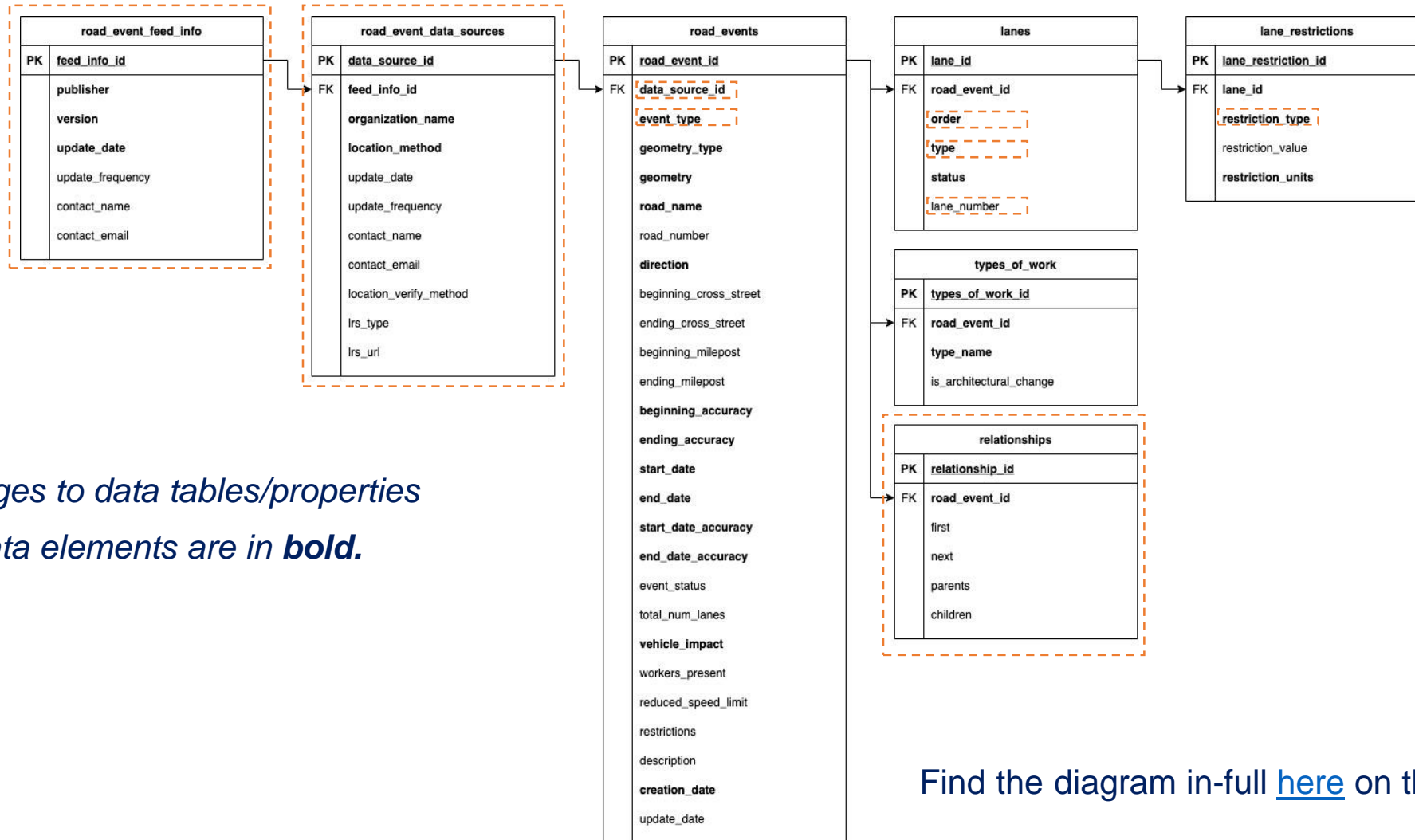
order: 1	order: 2	order: 3
type: left-lane	type: right-lane	type: shoulder
status: open	status: open	status: closed

Implemented Solution:

1. Added new, required **order** property to the lane entity, used as an index to identify the position of the lane in sequence on the roadway.
2. Renamed lane entity properties **lane_type** to **type** and **lane_status** to **status**.
3. Removed **lane_edge_reference** from the lane entity and stated in the business rules that **lane_number** and **order** counting must begin from the **left** side of the roadway.
4. Added new, more general **shoulder** lane type to be used when the shoulder isn't clearly left or right (e.g., between HOV lane and main roadway), or in place of **left-shoulder** and **right-shoulder**.
5. Added new, generic '**lane**' lane type, which is useful for when a more specific value is unsuitable (e.g., single-lane roadway) or in place of **left-lane**, **right-lane**.

GitHub Link can be found [here](#) (pull request is now closed).

WZDx v3.0 Entity Relationship Diagram



Key

Changes to data tables/properties

*Required data elements are in **bold**.*

Find the diagram in-full [here](#) on the WZDx GitHub.

Update Metadata to Allow Multiple Sources and Include Info Directly in the Feed, Rather than an External File

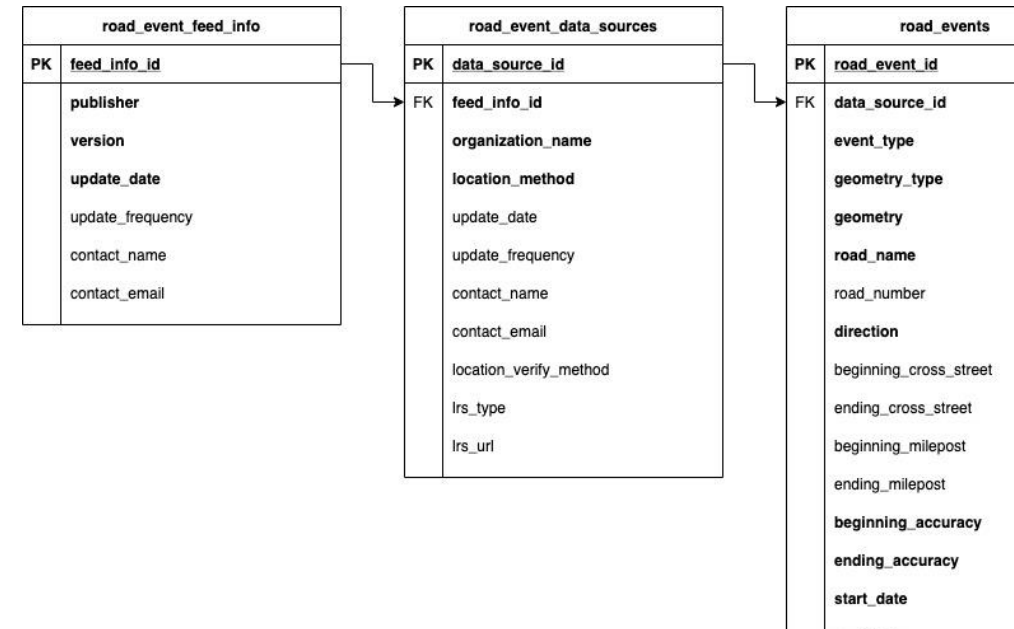
Use Case:

- *Increased Functionality:* Embed Metadata within the data feed header.
- Allows multiple sources within a feed.

Implemented Solutions:

- Model data to accommodate multiple sources per WZDx feed and one Version per feed. (Driven by Arizona DOT).
- Inserted metadata properties into road_event_feed_info table.
- Created a road_event_source_info object.
- Relate the road_events object to the road_event_source_info object.

GitHub Link can be found [here](#) (pull request is now closed).



Replace the Subidentifier Field with a Relationship Object

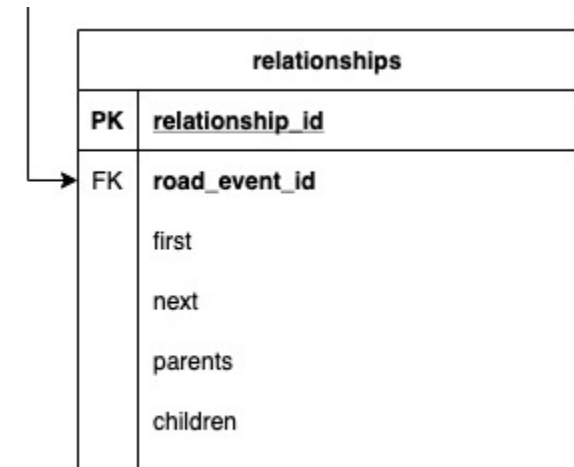
Use Case:

- *Greater Clarity:* The subidentifier field in the road_events table does not explicitly describe how linked features are related; replacing the subidentifier with Relation objects will link related road event features and explicitly describe those relationships.

Implemented Solutions:

- Replaced subidentifier with a relationship object.
- A relationship consists of key-value pairs.
 - Sequential Keys: First or Next
 - Hierarchical Keys: Parent or Child
 - Values are the IDs of the linked feature
- Relationship objects describe sequential or hierarchical relationships.
- Eases the implementation of Detours within the specification.

GitHub Link can be found [here](#) (pull request is now closed).



Update road_events.md with event type (Detours)

Use Case:

Increased Functionality: Add detour information to the WZDx Data Model.

Scalability: Consider more event types - closures, parades, accidents, emergency response.

Implemented Solutions:

Added a **required** field called **type** to the road_event object:

- The **type** field will indicate whether the road event is a work zone or detour.
- The **type** field will use a new enumeration with the values "work-zone" and "detour".
- Work zone and detour features will use the same fields.

Scalability:

- Differing event types could have different geometries and properties depending on use case.
- Consistent with Objective 2 of the WZDWG Charter.

GitHub Link can be found [here](#) (pull request is now closed).

road_events	
PK	road_event_id
FK	data_source_id
	event_type
	geometry_type
	geometry
	road_name
	road_number
	direction
	beginning_cross_street
	ending_cross_street
	beginning_milepost
	ending_milepost
	beginning_accuracy
	ending_accuracy
	start_date
	end_date
	start_date_accuracy
	end_date_accuracy
	event_status
	total_num_lanes
	vehicle_impact
	workers_present
	reduced_speed_limit
	restrictions
	description
	creation_date
	update_date

Demo: WZDx v3.0 Schema and Examples

WZDx Awareness Campaign

To support the awareness and future adoption of the WZDx Specification, we are launching a partnership and awareness campaign targeting future data consumers and producers including **infrastructure owner operators (IOOs), construction companies, mapping companies** and **original equipment manufacturers (OEMs)**.

Key messaging themes for early outreach include:

- What is WZDx? Why is it necessary? Who is currently involved? How can new partners get involved?

Campaign Timeline:

- Phase I (August 2020 – January 2021): Establish early named partners and “launch” the campaign.
- Phase II (January – April 2021): Outreach to potential new partners to raise awareness and increase involvement in the WZDx Specification.
- Phase III (April – June 2021) : Highlight current partners and pilot projects to promote WZDx in partnership with the National Work Zone Awareness Week campaign.

Action Items & Next Steps

Action Items:

- Express your interest in participating in any of the Subgroups (Specification Update, Technical Assistance, and/or Worker Presence) by emailing avdx@dot.gov.

Next Steps:

- Co-Chairs will review and update the charters for each Subgroup.
- Monthly Subgroup meetings will resume in October 2020 with those who expressed membership interest for the next development cycle.

Resources

To learn more and access available resources, please visit:

- [WZDx Version 3.0 Specification](#)
- [WZDx GitHub Wiki \(Day-to-Day Subgroup Activities\)](#)
- [WZDx Technical Assistance Discussions](#)
- [WZDx Technical Assistance Help Desk](#)
- [WZDx Data Feed Registry](#)
- [FHWA WZDI Data Dictionary and Framework](#)
- [V2X Mapping Tool](#)
- [CARMA](#)

For more information on the WZDx project or anything else related to the Work Zone Data Working Group, contact AVDX@dot.gov.