

Road Weather Management Program Stakeholder Meeting

Weather Data Environment Update

August 12-14, 2014

Gabriel Guevara



Purpose of the WxDE

The purpose of the Weather Data Environment (WxDE) is to provide a data and interoperability platform to meet the weather-related research needs of the community, especially for Intelligent Transportation Systems.



The WxDE Builds on the *Clarus* System

- The *Clarus* System:
 - Assimilated and provided access to road weather data from a network of fixed stations from across the nation, i.e., a weather mesonet
 - Performed quality checks on the road weather data and made the resulting information available
 - Grew to serve state and local transportation agencies, academic researchers, and meteorological information service providers (Wx forecasters)
- The *Clarus* System is being incorporated into the Final MADIS Operating Environment at NOAA



The WxDE Integrates with the Research Data Exchange (RDE)

- The Research Data Exchange:
 - USDOT C-V Data Clearinghouse
 - Collects and archives transportation data from a variety of sources
 - Compiles metadata describing all RDE data
 - Provides access to data and metadata to registered users
- Primary Contact: Dr. Gene McHale
 - Gene.McHale@dot.gov



The WxDE Incorporates the Vehicle Data Translator (VDT)

- The Vehicle Data Translator:
 - Reads data from input files that contain
 - Weather data from mobile sources
 - Weather data from RWIS sources
 - Road segment definitions
 - Contextual data such as radar, RTMA and METAR
 - Performs quality checks on mobile data and makes quality checked data available
 - Computes value-added forms of the collected data (road segment-specific pavement and atmospheric condition characterization) and makes the value-added data available



Improvements over *Clarus*...

- Enhanced Data Management
- Re-engineered Core Processing and Infrastructure
- Improved Metadata Discovery
- Enhanced Data Quality Checking
- **Data Archiving Ability**
- Services to Manage all Access to WxDE Data
- **Federates with the RDE**
- User Interface (maps, queries, subscriptions, metadata, data display, feedback, bug fixes...)
- **Additional data-set providers (WxTelematics)**
- **Historical Data Query Interface**
- Administrative & User Management Capability
- **Usage Analytics**
- Data Source Monitoring
- **Integrates VDT Functionality**



What you see after you log in...

The screenshot shows the homepage of the Weather Data Environment (WxDE) website. At the top, there is a header for the U.S. Department of Transportation Federal Highway Administration. Below this is the 'Weather Data Environment' logo. A navigation bar includes links for Home, Data, About, and Feedback, along with an Admin dropdown menu and a user profile for 'zheng'. The main content area features a large banner with the text 'WEATHER DATA ENVIRONMENT' and a 'Latest News' section. The news item is titled 'VDT Segment Data Integration and UI Enhancement' and is dated January 10, 2014. The news text states: '- Completed integration of VDT segment statistics and assessment'. A 'READ MORE' button is visible below the news item. Below the news section is a 'Welcome to the Weather Data Environment' heading, followed by two paragraphs of introductory text. The first paragraph describes the WxDE as a research project that collects and shares transportation-related weather data, with a focus on connected vehicle applications. The second paragraph explains that the WxDE is a weather-specific adjunct to the Data Capture and Management (DCM) Research Data Exchange, providing weather data-related services to support the development, testing, and demonstration of multi-modal transportation mobility applications. The final paragraph notes that most information is available to all site visitors, while registered users have additional capabilities like creating data subscriptions and accessing restricted data.

U.S. Department of Transportation
Federal Highway Administration

Weather Data Environment

Home Data About Feedback Admin zheng

Latest News

VDT Segment Data Integration and UI Enhancement January 10, 2014

- Completed integration of VDT segment statistics and assessment

[READ MORE](#)

Welcome to the Weather Data Environment

The Weather Data Environment (WxDE) is research project that collects and shares transportation-related weather data, with a particular focus on weather data related to connected vehicle applications. The WxDE collects data in real-time from both fixed environmental sensor stations and mobile sources. The WxDE computes value-added enhancements to this data, such as by computing quality check values for observed data and computing inferred weather parameters from vehicle data (e.g., inferring precipitation based on windshield wiper activation). The WxDE archives both collected and computed data. The WxDE supports subscriptions for access to real-time data in near real generated by individual weather-related connected vehicle projects.

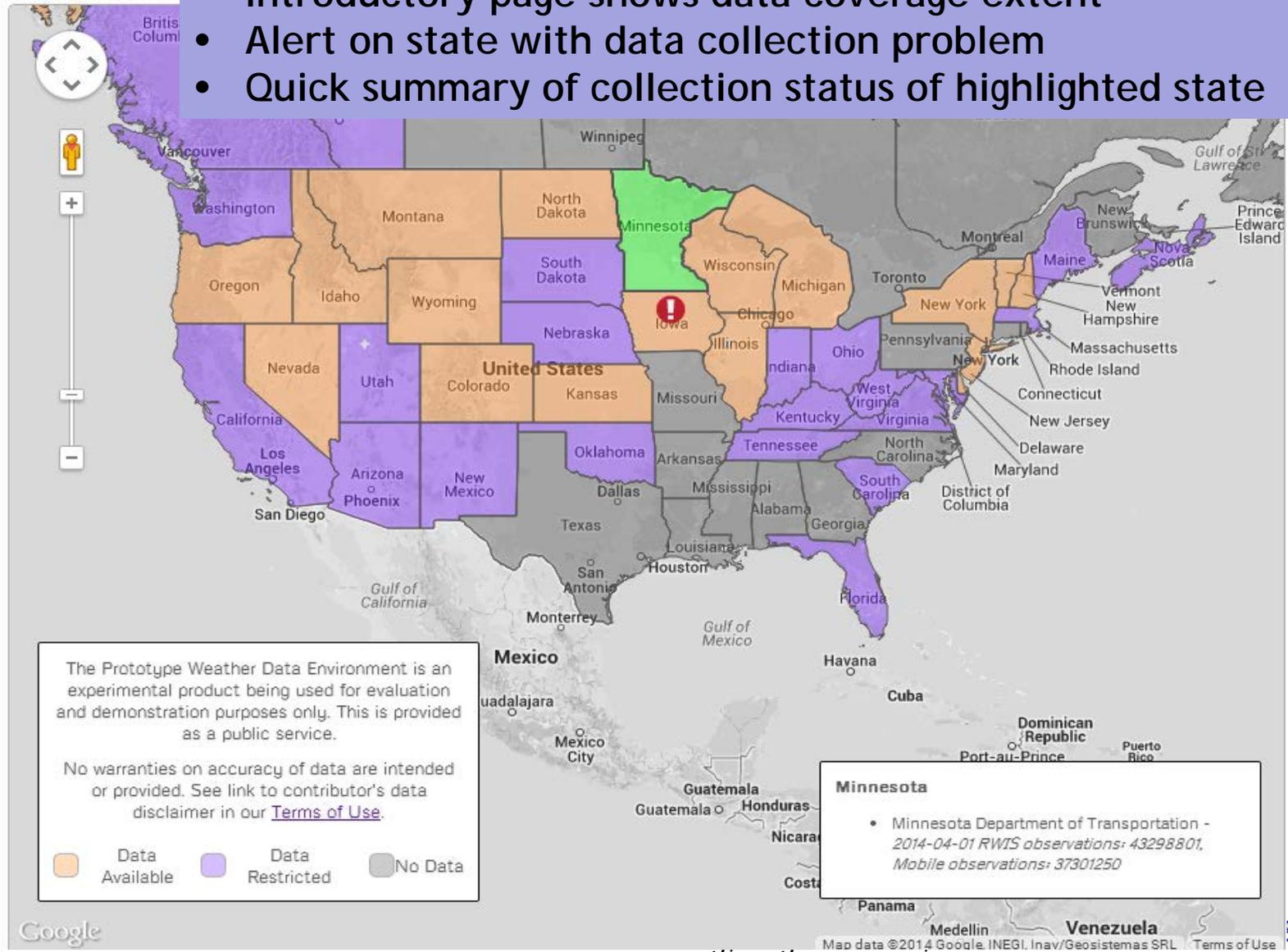
The WxDE is weather-specific adjunct to the Data Capture and Management (DCM) Research Data Exchange and, as such, is to provide weather data-related services that support the development, testing, and demonstration of multi-modal transportation mobility applications being pursued under the USDOT ITS Dynamic Mobility Applications (DMA) Program and other connected vehicle research activities. Data accessible through the WxDE will be well-documented and freely available to the public. (Registration and approval may be required to access some data, if the original provider of the data places restrictions on its distribution by the WxDE.) The vision of the DCM Program is to enhance current operational practices and transform future transportation systems management through the active acquisition and systematic provision of integrated data from infrastructure, vehicles, and travelers. This data is available to researchers, application developers, and others.

Most information is available to all site visitors. Registered users are provided with some additional capabilities, such as creating data subscriptions and accessing data for which the original provider placed restrictions on its distribution by the WxDE.



Data Map

- Introductory page shows data coverage extent
- Alert on state with data collection problem
- Quick summary of collection status of highlighted state



- Google Map display of WxTelematics vehicles
- Integrated display of WxTelematics data

(Re-center map on ...)

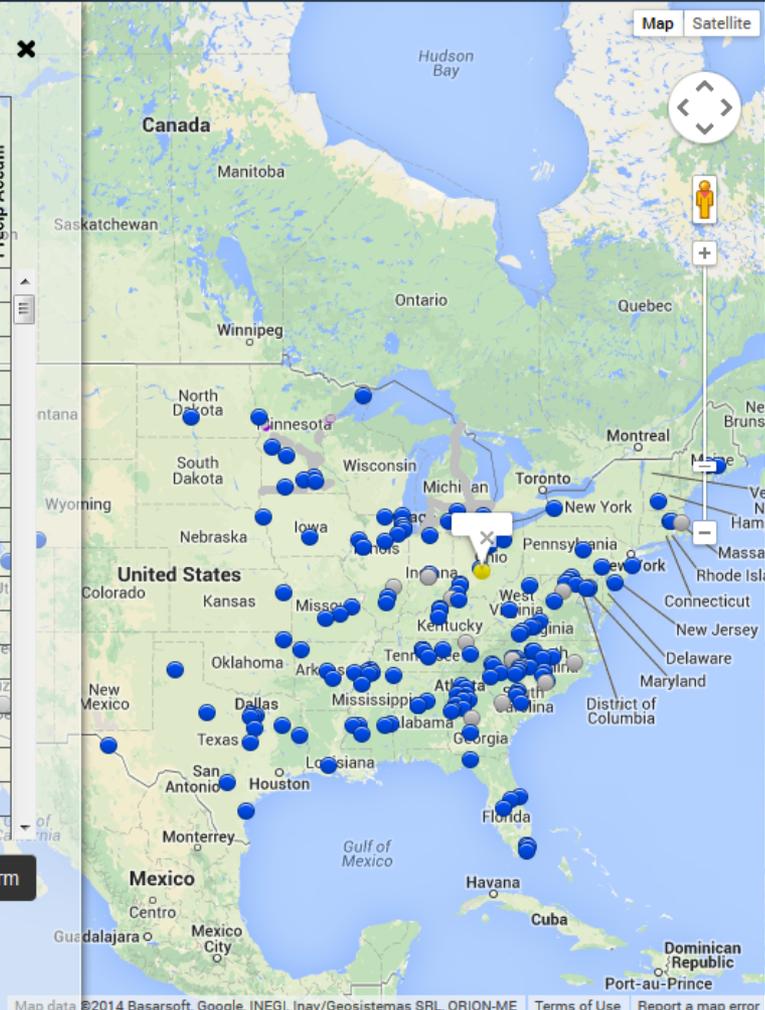
InfoWindow Shade

Platform Code:

Lat, Lon: 59.355596, -86.308594

Observations

1584 Weather Telematics Lat, Lon: 39.99351, -83.13854 Elevation: 284 m						Complete	Manual	Sensor Range	Climate Range	Step	Like Instrument	Persistence	IQR Spatial	Barnes Spatial	Dew Point	Sea Level Pressure	Precip Accum
Timestamp (UTC)	Observation Type	Ind	Value	Unit	Conf												
2014-07-29 15:18:10	essAirTemperature	0	68.67	F	100%	●	—	●	●	●	●	●	●	—	—	—	—
2014-07-29 15:18:10	essRelativeHumidity	0	62.76	%	100%	●	—	●	●	●	●	●	●	—	—	—	—
2014-07-29 15:18:10	essO3	0	3200.00	pphb	100%	●	—	●	—	—	—	—	—	—	—	—	—
2014-07-29 15:18:10	essVehicleSpeed	0	24.23	mph	100%	●	—	●	—	—	—	—	—	—	—	—	—
2014-07-29 15:18:10	precipIntensity	0	56.00		100%	●	—	●	—	—	—	—	—	—	—	—	—
2014-07-29 15:18:10	essAtmosphericPressure	0	29.01	inHg	89%	●	—	●	●	●	●	●	●	●	●	●	●
2014-07-29 15:18:10	essPavementTemperature	0	87.03	F	100%	●	—	●	●	●	●	●	●	—	—	—	—
2014-07-29 15:18:03	essO3	0	3100.00	pphb	100%	●	—	●	—	—	—	—	—	—	—	—	—
2014-07-29 15:18:03	precipIntensity	0	56.00		100%	●	—	●	—	—	—	—	—	—	—	—	—
2014-07-29 15:18:03	essRelativeHumidity	0	66.37	%	100%	●	—	●	●	●	●	●	●	—	—	—	—
2014-07-29 15:18:03	essAtmosphericPressure	0	29.02	inHg	89%	●	—	●	●	●	●	●	●	●	●	●	●
2014-07-29 15:18:03	essVehicleSpeed	0	18.02	mph	100%	●	—	●	—	—	—	—	—	—	—	—	—
2014-07-29 15:18:03	essAirTemperature	0	68.47	F	100%	●	—	●	●	●	●	●	●	—	—	—	—
2014-07-29 15:18:03	essPavementTemperature	0	85.91	F	100%	●	—	●	●	●	●	●	●	—	—	—	—
2014-07-29 15:17:56	essPavementTemperature	0	84.79	F	100%	●	—	●	●	●	●	●	●	—	—	—	—
2014-07-29 15:17:56	essAtmosphericPressure	0	29.02	inHg	89%	●	—	●	●	●	●	●	●	●	●	●	●
2014-07-29 15:17:56	essO3	0	3000.00	pphb	100%	●	—	●	—	—	—	—	—	—	—	—	—



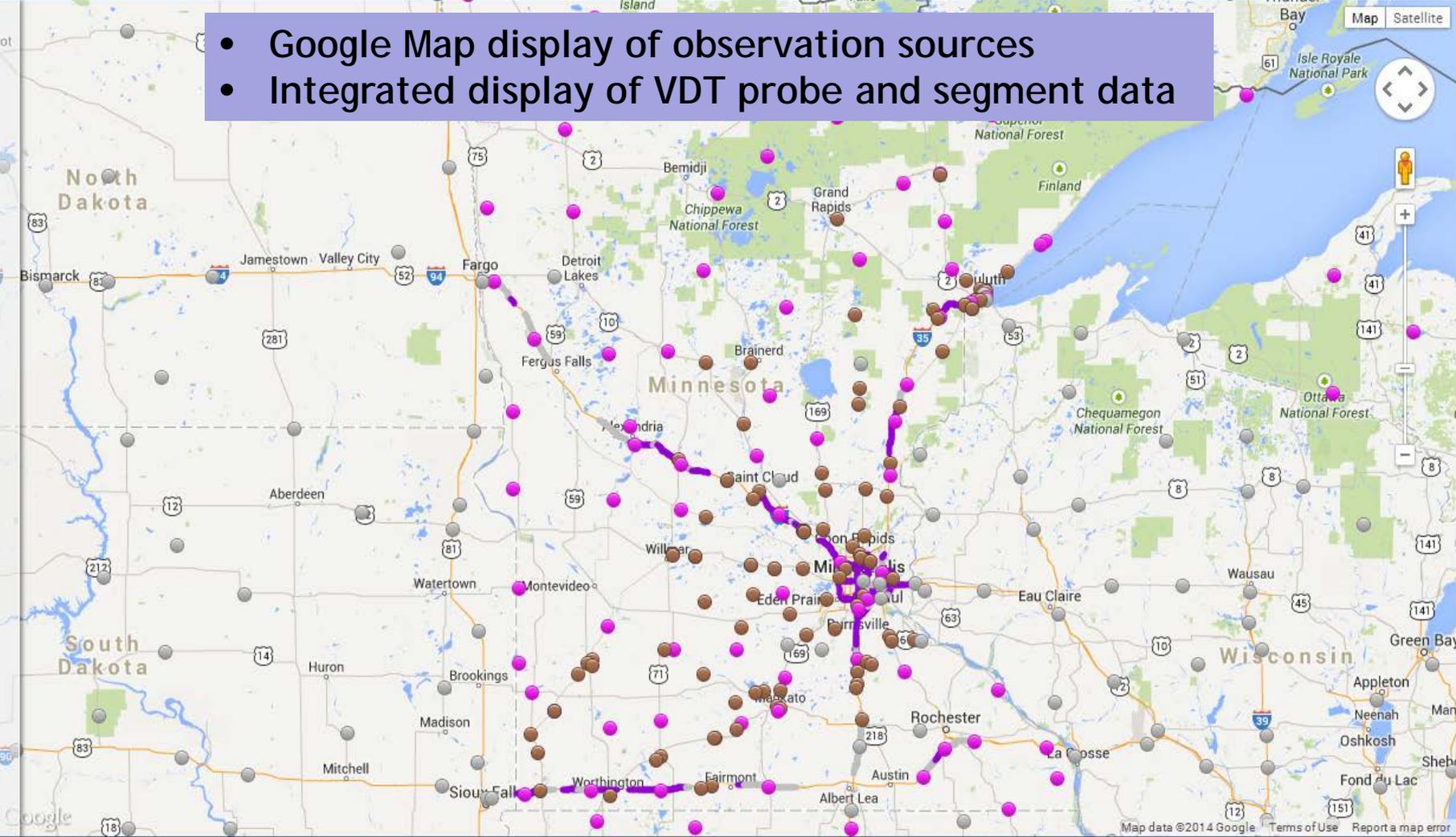
Center Platform

(Select Data to Show)

Metric
 English
 Road Segments
 VDT Mobile
 WxDE Mobile
 Non-Mobile

2014-07-29 15:32 UTC

- Google Map display of observation sources
- Integrated display of VDT probe and segment data



Observations

206507
MnDOT Sterling Vehicle
Lat, Lon: 46.90358, -91.896767
Elevation: 0 m

Timestamp (UTC)	Observation Type	Ind	Value	Unit	Combined Algorithm	Climate Range	Model Analysis	Nearest Surface Station	Neighboring Vehicle	Persistence	Sensor Range	Standard Deviation	Spatial Barnes	Spatial IOR	Time Step	Overall Dew Temperature	Filtering	
2014-04-04 00:32:28	mobileWipers	1	0.00															
2014-04-04 00:32:28	mobileHeadlights	1	1.00	argo														
2014-04-04 00:32:28	mobileHeading	0	229.02	deg														
2014-04-04 00:32:28	mobileSpeed	0	19.85	m/s														
2014-04-04 00:32:26	mobileWipers	1	0.00															
2014-04-04 00:32:26	mobileHeadlights	1	1.00															
2014-04-04 00:32:26	mobileHeading	0	229.02	deg														
2014-04-04 00:32:26	mobileSpeed	0	19.85	m/s														
2014-04-04 00:32:16	mobileWipers	1	0.00															
2014-04-04 00:32:16	mobileHeadlights	1	1.00															
2014-04-04 00:32:16	mobileHeading	0	229.02	deg														
2014-04-04 00:32:16	mobileSpeed	0	19.85	m/s														
2014-04-04 00:32:14	mobileSpeed	0	19.85	m/s														
2014-04-04 00:32:14	mobileHeading	0	229.02	deg														
2014-04-04 00:32:14	mobileHeadlights	1	1.00															
2014-04-04 00:32:14	mobileWipers	1	0.00															
2014-04-04 00:32:02	mobileWipers	1	0.00															

- More stylish display of observations than *Clarus*
- More user friendly display of long list of data
- Three different table displays for WxDE, VDT mobile and segment
- User has option to use improved *Clarus* Info Window



2014-07-29 13:26 UTC

Time and Format

Enhanced query interface for archived data

Instructions

Specify a start and end date and time for the request.

Start Date 07/01/2014 Start Time 0000
End Date End Time 0100

Format Jul 2014 August 2014 September 2014

Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa
		1	2	3	4	5						1	2		1	2	3	4	5	6
6	7	8	9	10	11	12	3	4	5	6	7	8	9	7	8	9	10	11	12	13
13	14	15	16	17	18	19	10	11	12	13	14	15	16	14	15	16	17	18	19	20
20	21	22	23	24	25	26	17	18	19	20	21	22	23	21	22	23	24	25	26	27
27	28	29	30	31			24	25	26	27	28	29	30	28	29	30				
							31													

Today Done

Run Query





Weather Data Environment

Frequently Asked Questions

Embedded Frequently Asked Questions

Questions

- News
- Change Logs
- Terms of Use
- FAQ

Weather Data Environment (WxDE)

- What is the Weather Data Environment (WxDE)?
- What is the USDOT Data Capture and Management Program?

Weather Data Environment Data

- Registration and Privacy
- Using the Weather Data Environment

Weather Data Environment Terminology

• *What is the Weather Data Environment (WxDE)?*

The Weather Data Environment is part of **USDOT's Data Capture and Management Program** and associated with the **Research Data Exchange**. The WxDE is intended to support research, analysis, application development, and testing related to weather responsive transportation management by collecting and distributing weather and weather-related transportation data. There is a particular focus on meeting the evolving weather data needs of connected vehicle applications.

The WxDE currently collects and distributes data from (a) environmental sensor stations (ESS) that collect weather data at fixed locations and (b) mobile sensor platforms that collect weather data from specially-equipped vehicles as the vehicles operate on roadways. ESS data is available for most U.S. States, and mobile platform data is available from three States participating in USDOT Integrated Mobile Observations (IMO) projects. Data is distributed via maps that provide access to recent observations, queries that allow a user to select and download large batches of data, and subscriptions that allow users to periodically download recently obtained data.



Super-user accessible reports such as collection statistics

Reports

* Click column headers containing vertically aligned carets (↕) to sort.

File Name ↕		Last Modified Date ↕					File Size ↕		Download File			
collectionReport		Fri Apr 04 04:00:46 UTC 2014					0.0 MB		Download			
	Contributor Name	2014-03-01 to 2014-03-07	2014-03-08 to 2014-03-14	2014-03-15 to 2014-03-21	2014-03-22 to 2014-03-28	3/29/2014	3/30/2014	3/31/2014	4/1/2014	4/2/2014	4/3/2014	
Wx	IA_State_DOT (P)	42729024	42711360	43312416	43875120	6196320	6259968	6268224	6268752	5980128	6166	
	IA_State_DOT (T)	399792	411984	410400	409488	58800	58608	57888	58656	57168	57	
Wx	MI_State_DOT (M)	137088	30528	53040	4313280	662688	109824	973824	2168688	1228224	1632	
	MI_State_DOT (P)	33475632	33763680	32563056	15926400	2460912	2601264	2501424	2575824	2582160	2640	
Wx	MN_State_DOT (M)	129927024	34933872	106042704	67909248	576624	303312	9136272	27398544	5424672	17846	
	MN_State_DOT (P)	80800848	74303136	82933248	83126496	12248112	12324048	12206784	11902752	11909760	11859	
Wx	MN_State_DOT (S)	108421296	32979024	74558160	48850320	531072	264720	2720112	13259376	4710432	11759	
	NV_State_DOT (M)	254400	324048	306288	305424	29952	51504	54384	135888	94752	60	
Wx	NV_State_DOT (P)	33950928	34383984	34011072	35280960	4978704	4990272	5067600	5389824	5215248	5208	
	VA_State_DOT (P)	31425168	31354224	30478656	30509232	4185648	4383744	4288416	4323696	4343232	4354	
Wx	VA_State_DOT (T)	4653984	5124672	4896672	4772016	751296	739104	760800	761136	767040	769	

- API for RDE to query WxDE data availability statistics
- RDE landing page in WxDE for coordinate-based queries

EXPLORE DATA

Data Environments

Minnesota DOT Mobile Obse

Data Sets

All

[Data Environments](#) >> Minnesota DOT Mobile Observation data

Minnesota DOT Mobile Observation data



Description: The data sent from the Integrated Mobile Observation (IMO) project provides information that can be used to develop applications that can download the RDE API client application and receive the real-time data.

Start Date: 2013-08-29 **End Date:** 2014-06-23

Sample Data: [Sample MN IMO Files](#)

Total data sets: 2

Search for Weather Data Environment (WxDE) related data: [View WxDE records](#)

Data Sets

2 items found, displaying all items.

Title	Start	End	Description
archive data	2013-08-29	2014-04-29	These data files are obtained from Minnesota Department of Transportation (MnDOT) under the Integrated Mobile Observation (IMO) contract with the...
live data	2013-05-14	2013-12-31	You can use the RDE API client software to receive data as they are sent to the RDE. These data...

2 items found, displaying all items.

Data Environment Meta Files

4 items found, displaying all items.

Title	Type
IMO DataDictionary	txt
IMO DataDictionary	doc
IMO Metadata documentation	doc
IMO Metadata documentation	txt

4 items found, displaying all items.

WxDE data

Summary of data available in the WxDE:

- canBrakeAppliedStatus 984
- canHeading 1289
- canHeadlights 175
- canLongAcceleration 983
- canSpeed 1289
- canSteeringWheelAngle 984
- canTractionControlState 984
- canWiperStatus 1289
- essAirTemperature 8621
- essAtmosphericPressure 4964
- essDewpointTemp 7264
- essMaxTemp 5009
- essMinTemp 5009
- essPrecipRate 5009
- essPrecipitation24Hours 4808
- essPrecipitationOneHour 5009
- essPrecipitationSixHours 5009
- essPrecipitationThreeHours 5009
- essPrecipitationTwelveHours 4921
- essRelativeHumidity 4605
- essSubSurfaceTemperature 3053
- essSurfaceConductivityV2 862
- essSurfaceFreezePoint 862
- essSurfaceIceOrWaterDepth 862
- essSurfaceSalinity 862
- essSurfaceStatus 6306
- essSurfaceTemperature 6938
- essTotalRadiation 1293
- essVisibility 4976
- essWetBulbTemp 4637
- precipIntensity 5006
- precipType 5006
- windSensorAvgDirection 6220
- windSensorAvgSpeed 6241

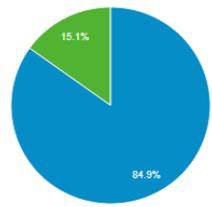
Go to
Cancel



Google Analytics enabled for site traffic analysis



Returning Visitor New Visitor



Next Steps...

- Continue to run the system as a research environment until MADIS is fully operational and provides the core functionality of the WxDE
- Incorporate functionality of VDT 4.x
- Various enhancements in user interface, process monitoring, and data hosting/query management





WEATHER DATA ENVIRONMENT



Release Schedule:

- Interim Instance opened for access - July 2013
- Demo Instance (<http://wxdedemo.leidoshost.com/>) opened for access - Sept 2013
- Production Instance (<http://74.254.188.153/>) - August 2014 (awaiting conclusion of IRB process). Will be accessible via <http://wxde.fhwa.dot.gov/>

