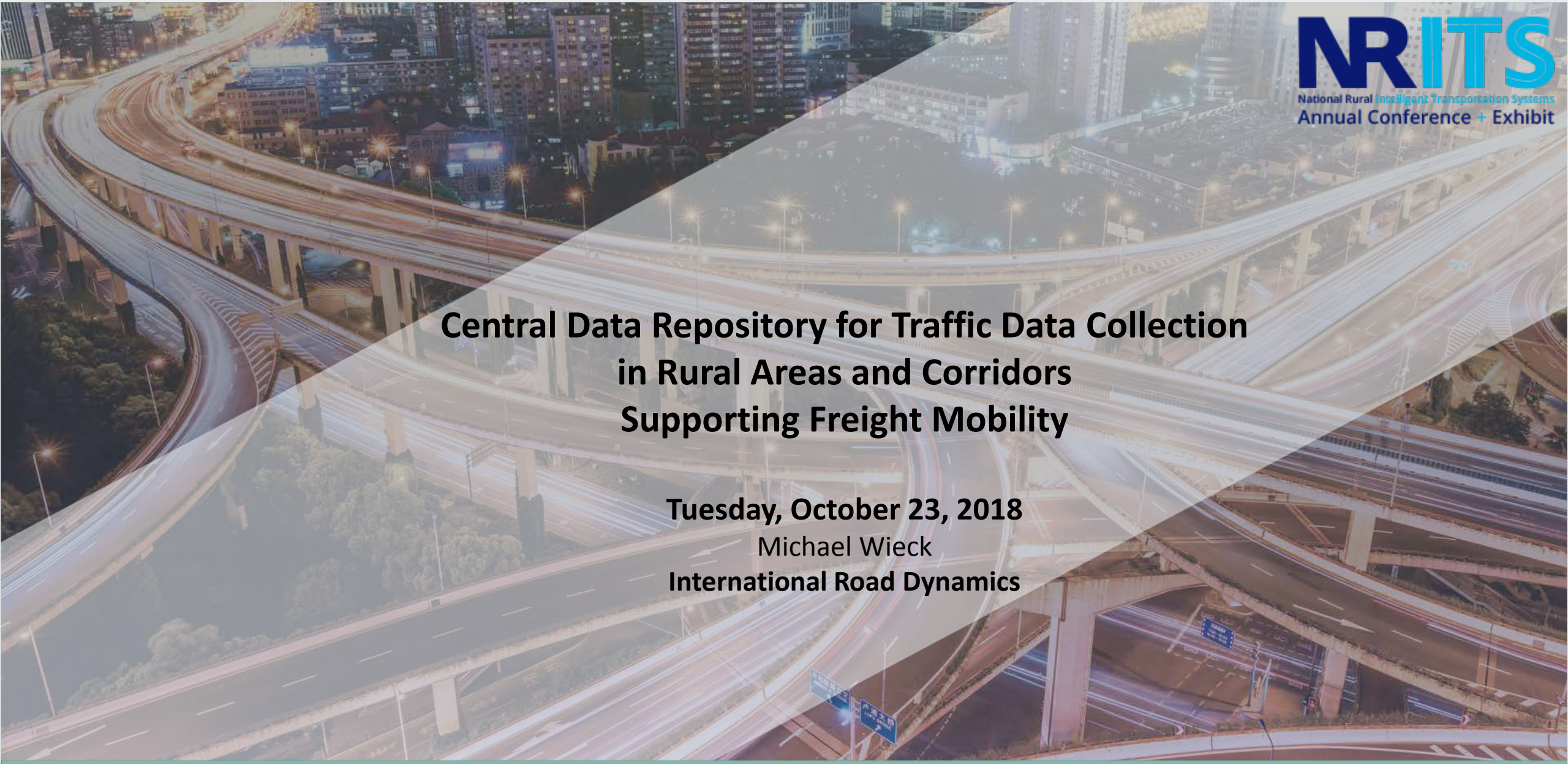


NRITS
National Rural Intelligent Transportation Systems
Annual Conference + Exhibit

Central Data Repository for Traffic Data Collection in Rural Areas and Corridors Supporting Freight Mobility

Tuesday, October 23, 2018

Michael Wieck
International Road Dynamics

INTERNATIONAL ROAD DYNAMICS INC.

QUARTERHILL

Starting Point

Technology to improve freight safety, operations and information in rural areas

Get freight safely from A to B

Enhance overall transportation system safety

Get freight reliably from A to B
In a timely manner

Enhance economic competitiveness

Provide technology framework to support freight mobility

Improve freight system efficiency and performance

Something for everybody…..

Improvements in

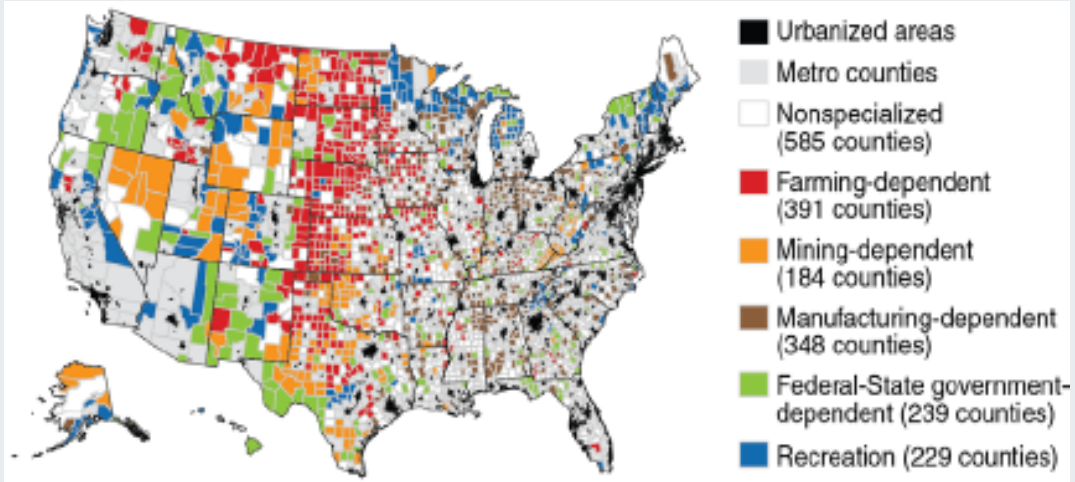
- Freight safety
- Freight reliability
- Freight performance

are critical for freight industry, general traveling public, consumers, and public agencies - from an operational as well as long term planning perspective

Economic growth in rural areas depends on a safe and reliable transportation system that improves freight mobility and efficiency

Rural Challenges

- Rural economy far more reliant on goods production than urban economy
- Deteriorating infrastructure
- Agriculture and energy extraction activity strain infrastructure (increasing loads)
- Safety Challenges
  - Roadway features that reduce safety
  - Rural non-interstate routes have traffic fatality rate two-and-a-half times higher than all other roads based on VMT (TRIP report 2017)
  - Higher speed limits in States with large rural road networks
- Lack of alternate routes
- Size and weight harmonization across neighboring States (129K routes)



Note: The 2015 county typologies use data from 2010-2012. See footnote 1.
Source: USDA, Economic Research Service using data from the Bureau of Economic Analysis.

FAST Act and Rural Freight

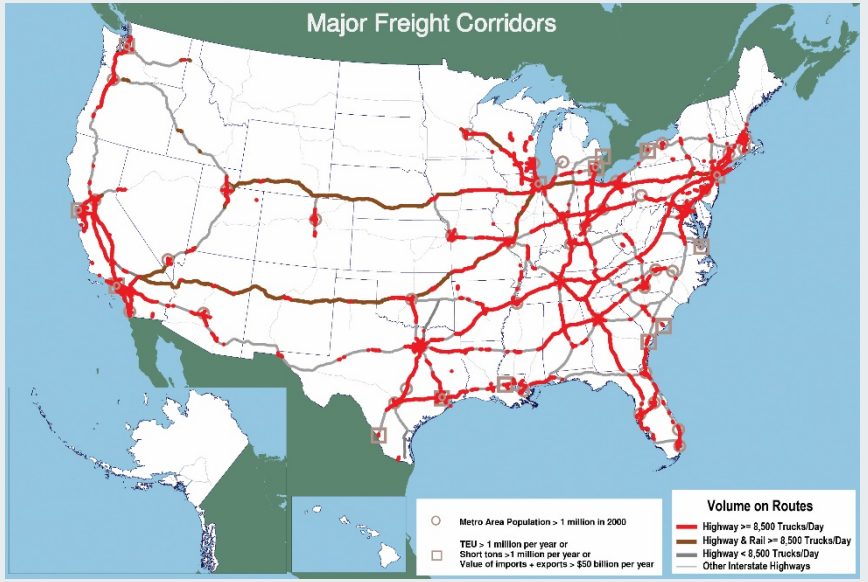
Critical Rural Freight Corridors

- Designation as part of State Freight Plan
- One of several criteria
  - Rural principal arterial roadway with trucks equaling 25% or more of AADT
  - Provide access to energy exploration, development, installation or production areas
  - Connect the Primary Highway Freight System or Interstate system to facilities handling as certain amount of bulk commodity or TEU per year
  - Connect to international POE
  - Provide access to significant air, rail, water or other freight facility
  - Is determined vital to improving efficient moving of freight of importance to state's economy
- Designation and certification required before National Highway Freight Program funds can be used

Why to measure….

Objectives drive measurement needs

- Freight performance measures to determine funding priorities and to indicate ROI on investments
- Freight performance measures contribute to overall efforts to improve travel times (incl. reliability)
- FAST Act calls for freight analysis and data collection to justify eligibility for Federal funding
- Safety related measures
  - Proactive - OS/OW trucks, speed, tire anomalies
  - Reactive – number of truck incidents



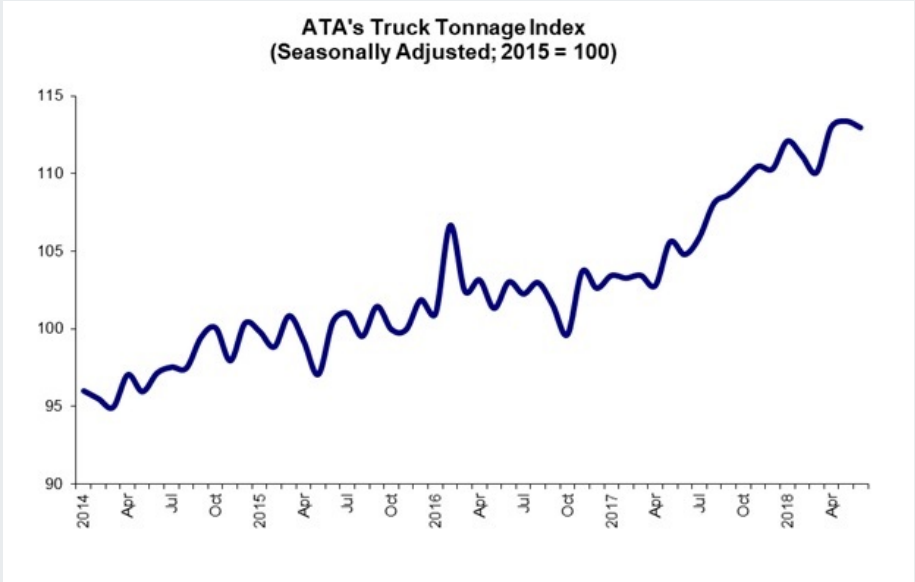
Source: FHWA

What to measure….

It's all about the data!

- Origin-Destination (O-D) of goods by commodity classification, tonnage
- Vehicle lengths to determine turning radii
- Number of OS/OW permits and average weight of OS/OW trucks
- Truck traffic volumes and classification on road segments
- Types of load (e.g. hazmat)
- Number of violations

Ideal world – use of public and private data sources



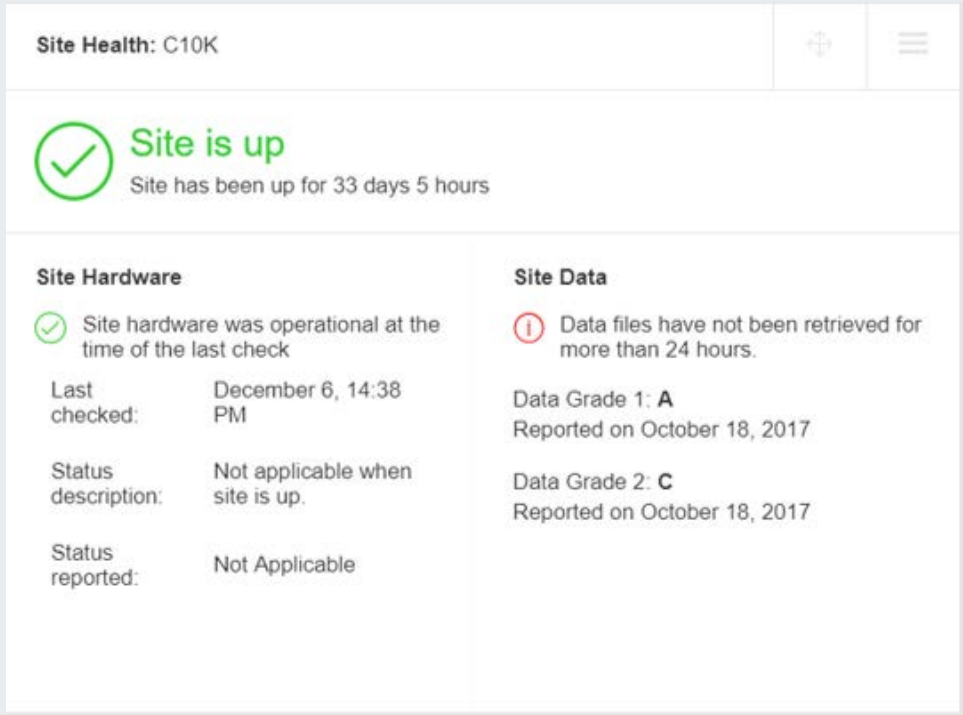
Source: ATA

Data Challenges

- Multiple disparate data sources
- Multiple interpretations of data
- Statistical relevance (sample size, spot measurements)

- Data holes – reliability of data access
  - Tools can automate monitoring of data source availability

- Data quality
  - Initial checks for data integrity
  - Data quality checks following agency rules

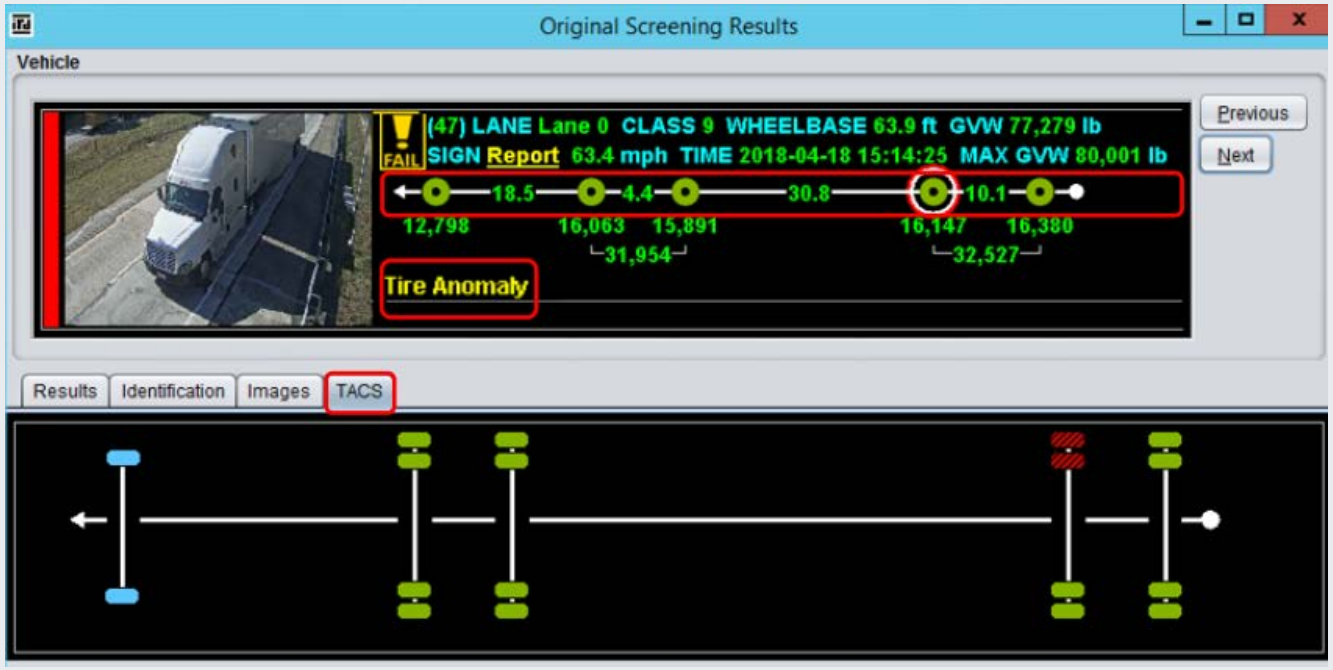


Data Collection on Rural Roads

- Spot measurements - Count / Class / WIM require local sensors
- Re-identification requires capturing of unique attribute – e.g. via ALPR, Bluetooth reader, inductive loop signature
  - Sample size
  - Accuracy
- Dedicated Hazmat sensors
- Safety measurements with innovative tire anomaly sensors
  - In Oregon, 13 out of 42 (or 31%) large truck mechanical crashes were due to tire failures in 2017

Safety

- Tire Anomaly Detection significantly improves safety by identifying trucks with missing or underinflated tires



- Illinois Deployment of Tire Anomaly Detection (TACS)

Date [2018]	Vehicle Count	TACS Count	%
6 May – 12 May	9129	105	1.15
13 May – 19 May	8546	93	1.09
20 May – 26 May	9551	117	1.23
27 May – 2 Jun	6676	67	1.00
3 Jun – 9 Jun	3423	36	1.05
10 Jun – 16 Jun	8857	109	1.23
17 Jun – 23 Jun	8745	110	1.26
24 Jun – 30 Jun	9110	119	1.31
1 Jul – 7 Jul	4771	83	1.74
8 Jul – 14 Jul	8989	118	1.31
15 Jul – 21 Jul	9122	106	1.16
22 Jul – 28 Jul	9336	104	1.11
29 Jul – 4 Aug	7815	78	1.00
5 Aug – 11 Aug	5724	70	1.22

Data Quality

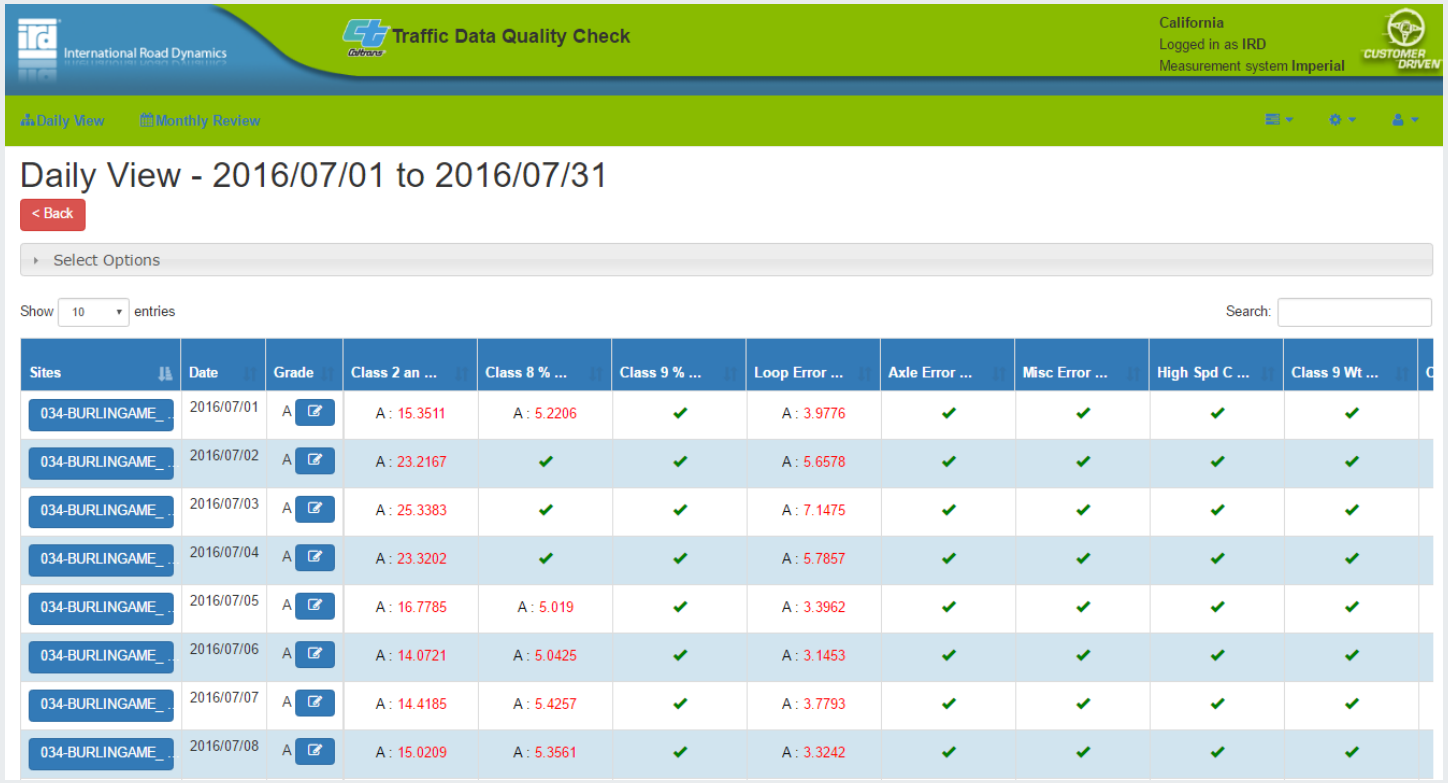
- Importance of data quality is underappreciated
  - Verify proper equipment operation in a timely manner to ensure good data is being collected
  - Verify the data collected is of a quality that is acceptable for its intended use
- Key: define intended use to measure and assess data quality

- Example: grades of daily data collected at WIM sites

Grade	Description
A	Usable for volume, classification, speed and weight reporting
B	Usable for volume, classification and speed reporting. Manual evaluation required before using for weight reporting.
C	Manual evaluation required before using for volume, classification, speed or weight reporting
D	Data is not usable for any purpose.
E	Data is unavailable or corrupt.

Data Quality

- Data Quality tools can automate quality checks
  - Create rules to satisfy agency needs



Sites	Date	Grade	Class 2 an ...	Class 8 % ...	Class 9 % ...	Loop Error ...	Axle Error ...	Misc Error ...	High Spd C ...	Class 9 Wt ...
034-BURLINGAME_...	2016/07/01	A	A : 15.3511	A : 5.2206	✔	A : 3.9776	✔	✔	✔	✔
034-BURLINGAME_...	2016/07/02	A	A : 23.2167	✔	✔	A : 5.6578	✔	✔	✔	✔
034-BURLINGAME_...	2016/07/03	A	A : 25.3383	✔	✔	A : 7.1475	✔	✔	✔	✔
034-BURLINGAME_...	2016/07/04	A	A : 23.3202	✔	✔	A : 5.7857	✔	✔	✔	✔
034-BURLINGAME_...	2016/07/05	A	A : 16.7785	A : 5.019	✔	A : 3.3962	✔	✔	✔	✔
034-BURLINGAME_...	2016/07/06	A	A : 14.0721	A : 5.0425	✔	A : 3.1453	✔	✔	✔	✔
034-BURLINGAME_...	2016/07/07	A	A : 14.4185	A : 5.4257	✔	A : 3.7793	✔	✔	✔	✔
034-BURLINGAME_...	2016/07/08	A	A : 15.0209	A : 5.3561	✔	A : 3.3242	✔	✔	✔	✔

Central Repository

Local Equipment (e.g. sensors, scales)

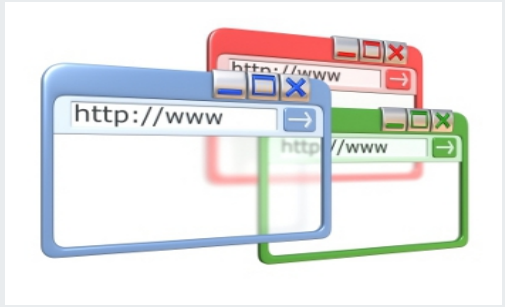
Integrated Data Quality Control

Central Data Repository Remote Monitoring and Reporting

Local Operations

External Data

Central Repository



Central Data Repository

Equipment Check Software

Equipment check report

Field Device / Counter

Data File Upload Software

Upload Report

Data File

Real-Time Data

Data Quality Check Software

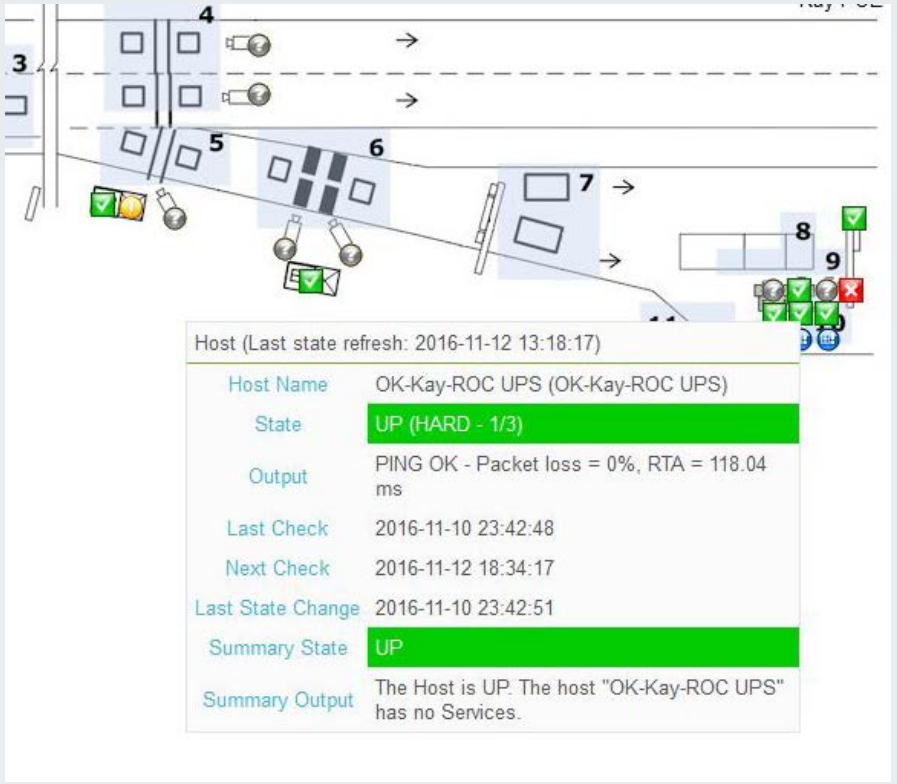
QC'd Data File

QC report

External Data

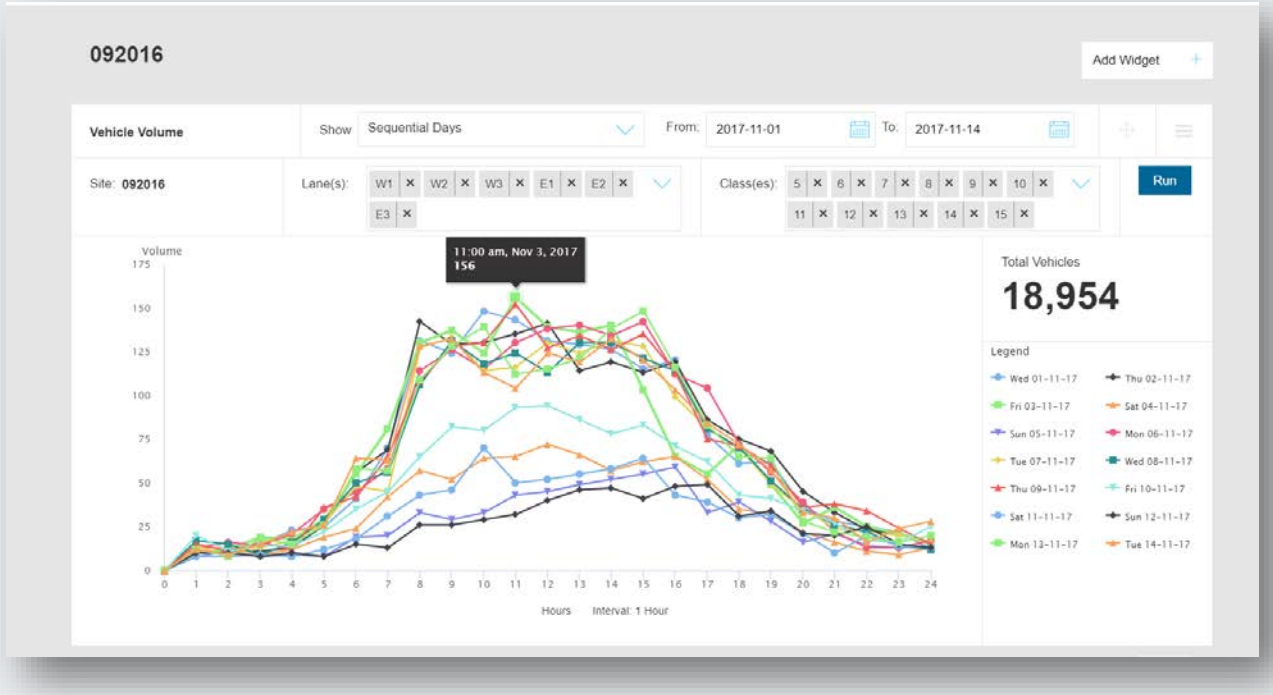
Remote Monitoring of Equipment

- Operational Status of local data collection equipment and communication



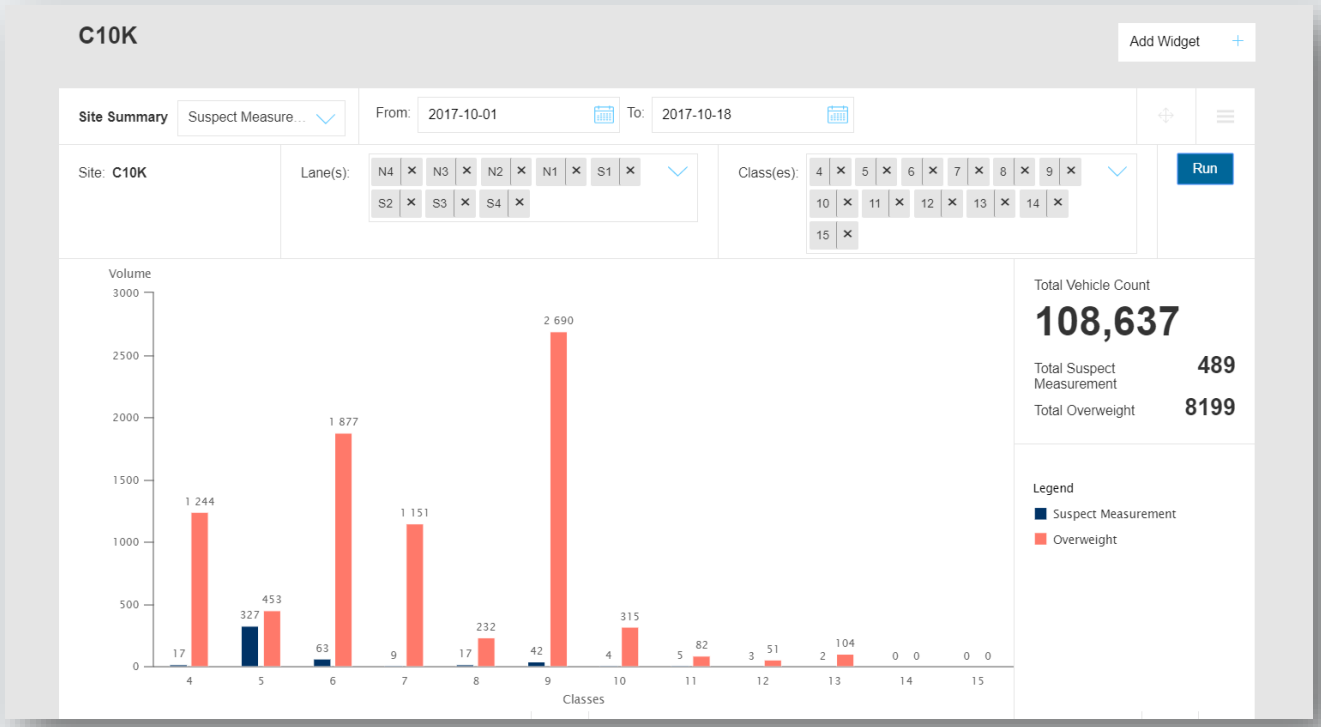
Central Data Repository

- Central Repository collects data from multitude of local data sources
  - WIM, Class, Count
  - Tire anomalies
  - Hazmat
  - O-D matches
- Provision of statistical reports and data visualizations
- Standard API to third party systems
  - DOT Enterprise data system
  - Analytics Engines



Special Reports

- Provision of reports targeted to specific needs of agency



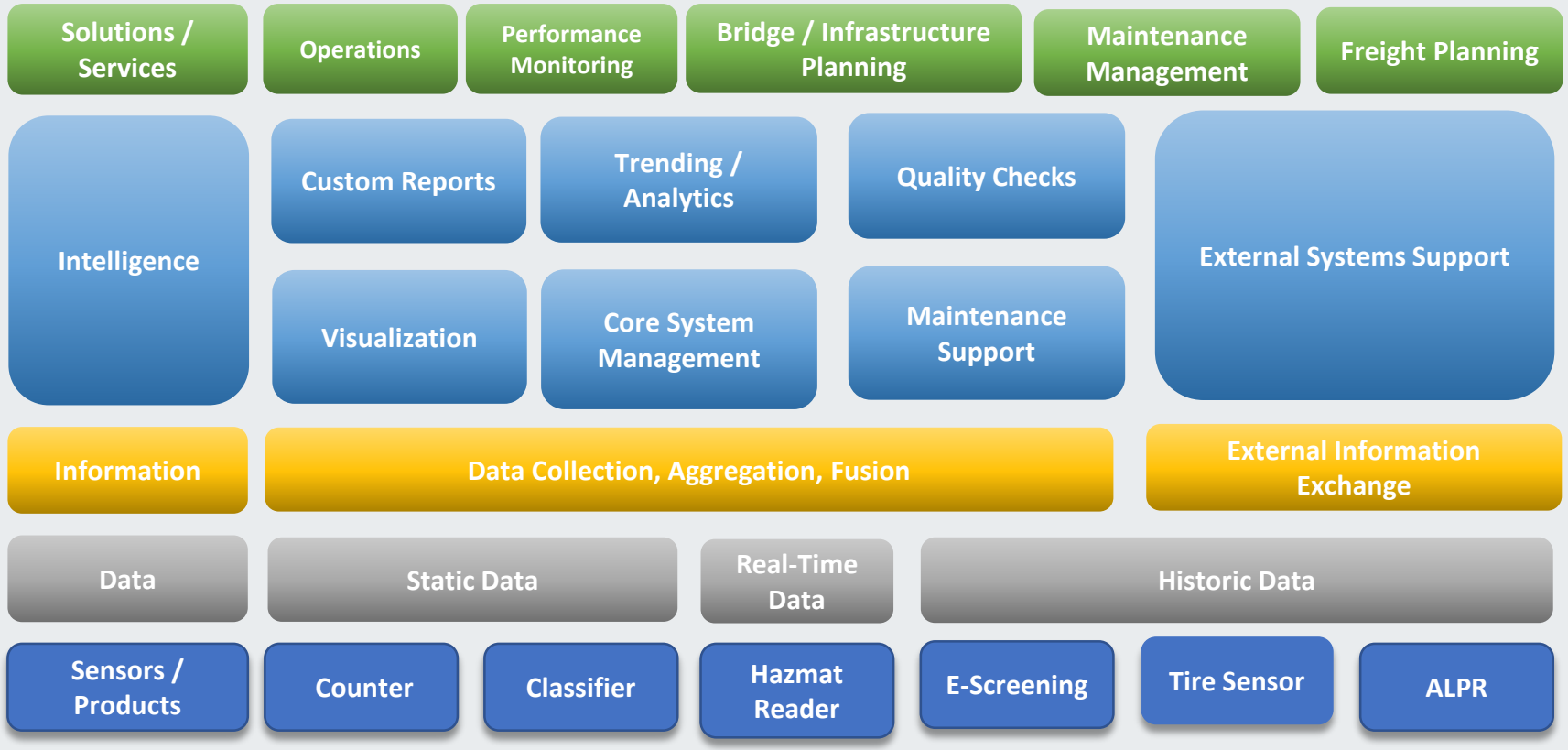
WeekNum	Date Range	CMV Count	Tire Anomalies	%
17	23 Apr - 29 Apr 2018	9196	101	1.1
18	30 Apr - 06 May 2018	8113	102	1.26
19	07 May - 13 May 2018	8965	105	1.17
20	14 May - 20 May 2018	8416	92	1.09
21	21 May - 27 May 2018	9385	117	1.25
22	28 May - 03 Jun 2018	6545	67	1.02
23	04 Jun - 10 Jun 2018	3358	36	1.07
24	11 Jun - 17 Jun 2018	8696	109	1.25
25	18 Jun - 24 Jun 2018	8765	112	1.28
26	25 Jun - 01 Jul 2018	8492	113	1.33
27	02 Jul - 08 Jul 2018	4523	79	1.75
28	09 Jul - 15 Jul 2018	8582	102	1.19
29	16 Jul - 22 Jul 2018	8508	101	1.19
30	23 Jul - 29 Jul 2018	8679	99	1.14
31	30 Jul - 05 Aug 2018	7168	74	1.03
32	06 Aug - 12 Aug 2018	5311	67	1.26
33	13 Aug - 19 Aug 2018	4824	47	0.97
34	20 Aug - 26 Aug 2018	8072	82	1.02
35	27 Aug - 02 Sep 2018	8911	109	1.22
36	03 Sep - 09 Sep 2018	7205	71	0.99
37	10 Sep - 16 Sep 2018	8594	94	1.09
38	17 Sep - 23 Sep 2018	7713	99	1.28
39	24 Sep - 30 Sep 2018	7941	88	1.11

Value for Agencies

- Centralized web based data repository:
  - reliable delivery of complete data with integrated and consistent quality control checks
- Intermediary between devices and enterprise systems
- Platform to allow additional data analysis and device centric monitoring
- Modular system allow easy upgrade and enhancements
- Automates time expensive processes to obtain reliable and accurate data and relevant information so that agency can focus on Knowledge Acquisition

Vision

- Transportation Intelligence Ecosystem with Central Data Repository as Foundation



Thank You!

Michael Wieck
Michael.Wieck@irdinc.com
+1 303 905 7008