

Iowa DOT Traffic Operations Open Data Service

tech transfer summary

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RESEARCH PROJECT TITLE

Iowa DOT Traffic Operations Open Data Service

SPONSORS

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The mission of the Center for Transportation Research and Education (CTRE) at Iowa State University is to develop and implement innovative methods, materials, and technologies for improving transportation efficiency, safety, reliability, and sustainability while improving the learning environment of students, faculty, and staff in transportation-related fields.

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Tools and feeds using big data developed by the REACTOR Lab established an open data service for the Iowa DOT to provide near real-time alerts about traffic conditions and could allow for the creation of end-user applications by vendors.

Goal, Objective, and Scope

The goal of this project was to establish the Iowa Department of Transportation (DOT) open traffic data service, which will allow vendors and agencies to provide near real-time, proactive alerts to commercial drivers regarding traffic conditions along their routes. The objective was to make the data service available and allow third-party vendors the opportunity to develop their own end-user applications, rather than creating an application itself.

Background

The Iowa DOT is committed to providing open data by implementing a new program providing a high quality, near real-time, free open data service through the Institute for Transportation (InTrans). This open data service provides operations-related data to any commercial, public or private entity to develop their own applications or integrate these data into their existing hardware, software and logistics systems. The one-stop data service will provide considerable savings to DOT and local agency staff who currently have to seek out this information from multiple sources, formats, and accessibility.

Project Description

The open data service is maintained by the Real-time Analytics of Transportation Data (REACTOR) Lab at InTrans on behalf of the Iowa DOT. The open data service makes transportation-related data accessible to both internal DOT and external third-party users. A combination of high-performance computing (HPC) on premise and on the cloud is used to create data feeds that provide clean data streams, alerts for traffic congestion using machine learning, performance reporting and data analytics.

The open data service is functioning through a cloud-based service with Azure and currently has 12 feeds available. The open data service is composed of three main components:

- Data archival
- Data feeds
- Text alert module

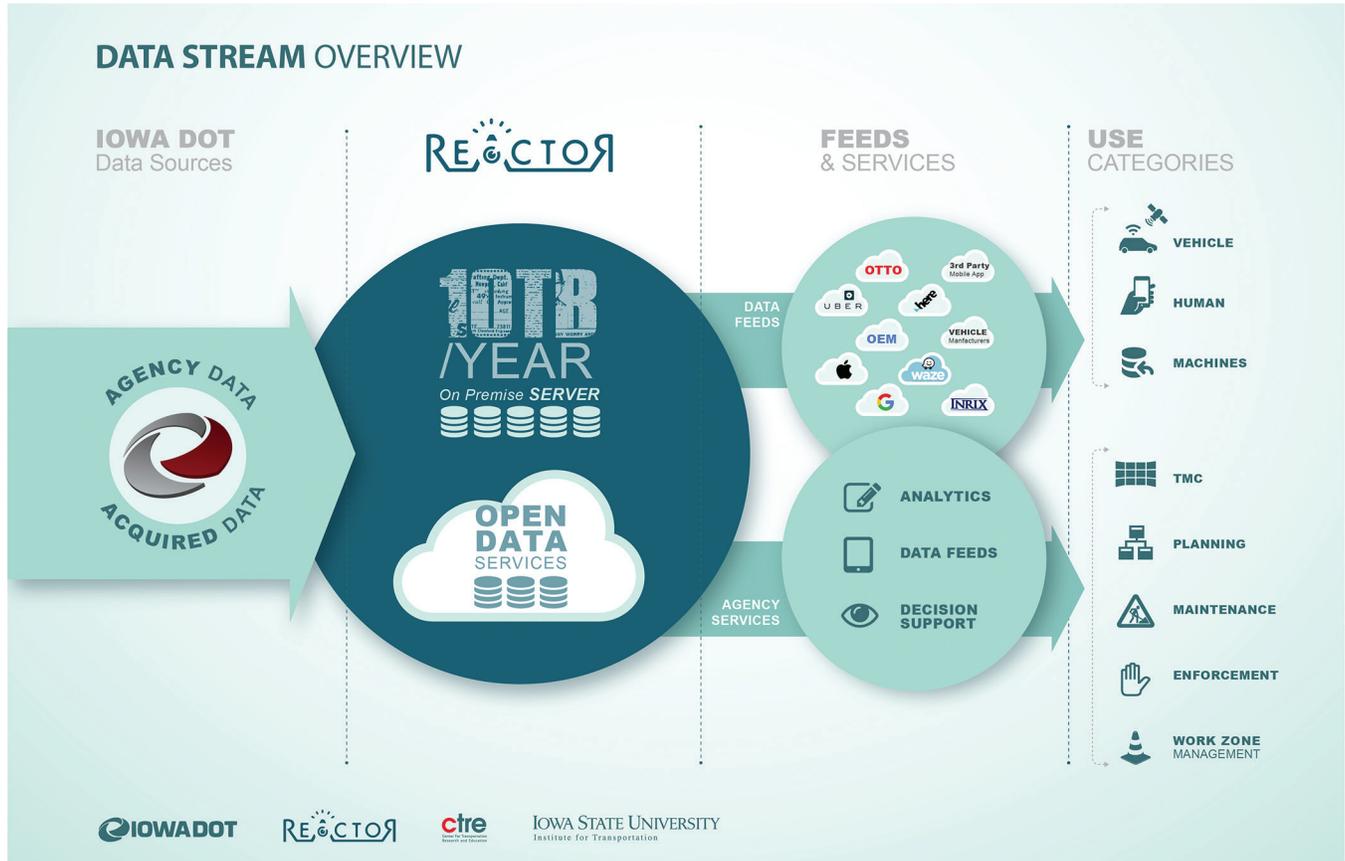
The data archival module supports the storing of transportation related data from various service providers and provides some quality assurance. The archived data is used for research and development of other projects/feeds. The data feeds module provides value added feeds

and is the primary use for most consumers. The text alert module provides a mechanism to notify the users with the text alerts when triggered (for example by work zone congestion).

The open data service is expected to provide a variety of data feeds for both DOT and non-DOT users. While this application acts as a producer that generates the data feeds, there is also a consumer part that gets the

data from other providers, and converts the data into a structured format, and then archives that data for further research and application.

Apart from the data feeds, there is a component that detects the congestion/bottlenecks in work zones and immediately notifies the appropriate DOT staff with text alerts. The scope of this project combines data generation, data archival and the work zone text alerting.



Overview of Open Data Service

Key Findings

The main features and functionalities of the open data service are split into three major categories: data archival, work zone congestion alerting, and the data feeds.

Data Archival

The project team initially identified all operations and weather data that could be used within the open data service and ranked the data based on the availability and the potential uses of the data. The data sources were then ranked and incorporated into the open data service. Currently, the open data service archives data from 16 sources.

The data archiving serves multiple purposes in the open data service and is typically the first process completed for any data feed. The first purpose of the data archiving is the ability to provide real-time data feeds that

have gone through a quality assurance process. Some data archived on the open data service are purely for historical purposes and the ability to query historical data. Data archiving also ensures that data are available for research, or the development of other applications/ data feeds, if needed. The following lists some of the data archived on the open data service:

- Traffic detector data
- INRIX data
- Waze data
- Dynamic message signs (DMS) inventory
- Work zone congestion events

- INRIX daily and monthly performance measures
- Advanced traffic management system (ATMS) event data
- Lane closure planning tool (LCPT) monthly performance data
- Snowplow automatic vehicle location (AVL)
- Road weather information system (RWIS) traffic data

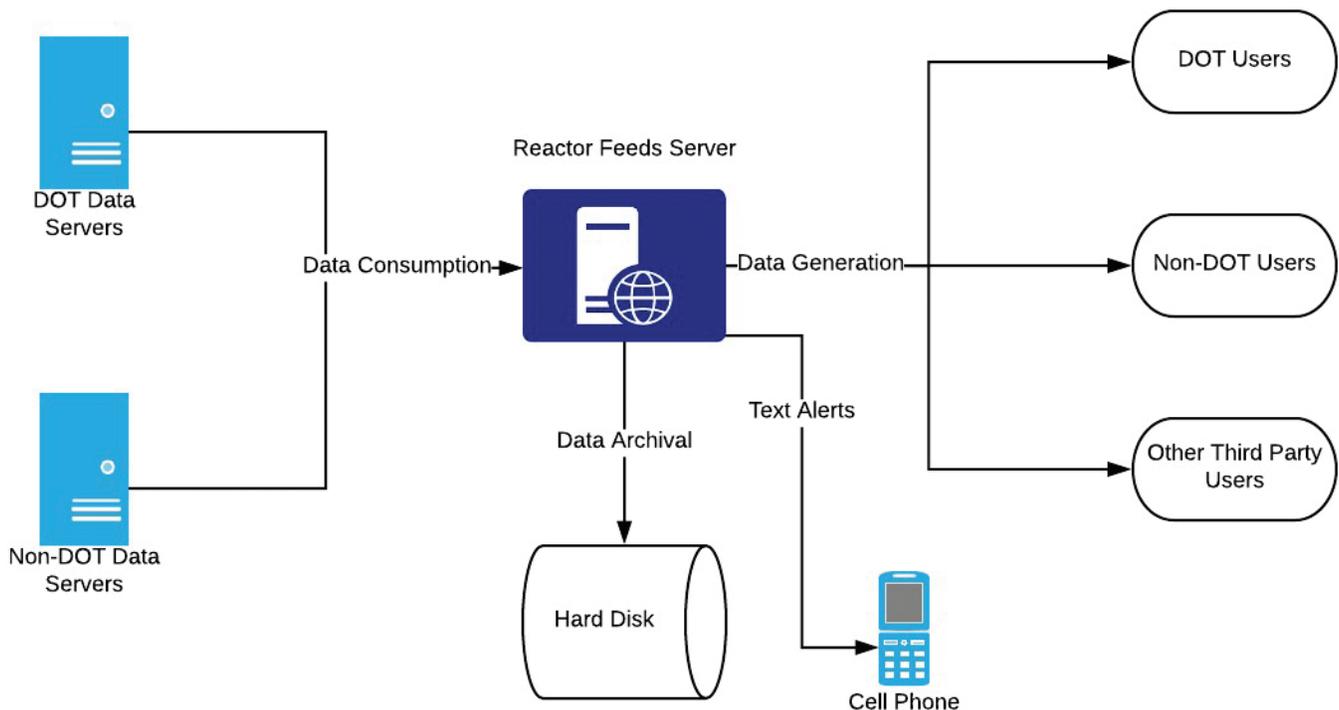
Work Zone Congestion Detection

A work zone congestion detection was developed for the office of traffic operations using the open data service framework. The framework implemented a quality

assurance and alerting process of work zone congestion events. This process ensures that only events meeting a defined criteria are being sent as a text alert.

Data Feeds

The data feeds that are being generated through the open data service provide clean data feeds, real-time incident detection using machine learning, performance reporting and data analytics. The data feeds use the data archived or generated from the previous categories. These feeds are the final product of the open data service, which can be used by DOT- or non-DOT users to access transportation related data from the Iowa DOT.



High-level architecture of Open Data Service

Implementation Readiness and Benefits

The open data service has proven to be a valuable asset for the Iowa DOT. The service enables access to important data as well as to value added data feeds. This service is advantageous to both internal and external DOT users.

A sample of how the feeds are being used within the DOT include the following:

- Project prioritization tool for the Office of Location and Environment (OLE)
- LCPT for the Office of Traffic and Safety

- Operations dashboard in the Traffic Management Center (TMC) for the Office of Traffic Operations
- Work zone alert feed, developed during the 2017 construction season, which identifies slow and stop conditions across the state, at each work zone for the TMC Operations Dashboard and for text alerting to DOT staff

The feeds also include a unified sensors feed (location and speed data), performance measures for INRIX and sensors, work zone congestion detection, DMS and ATMS historical archiving, and a Waze clean data feed.

Recommendations for Future Research

In addition to the data feeds, the open data service is archiving data from 16 different sources that include the DOT sensors (intelligent transportation systems and RWIS), INRIX, Waze, DOT ATMS events, DOT snowplow AVL. This will allow for easy development of additional feeds and data integration.

Integration with the Iowa DOT linear referencing system has been a priority when developing the open

data service and most features include fields that allow for integration within roadway asset management system (RAMS). A separate module is also being developed using the open data service that will allow for offline conflation to RAMS. The current RAMS has several limitations, including the numbers of records that can be sent and the response time. This module will significantly increase the speed of this process.