



Welcome!

WHY WE'RE HERE

Mission

To promote the growth and the development of the technologies and skills required to process, analyze, and apply data; and to help Boston create the talent and technologies that will shape our future in a big data-driven economy.

Supporting key areas:

- Big Data Technologies and Analytics Development
- Collaboration between Industry & Academia
- Workforce Development and Training

hack/reduce collaborative projects & workshops:

- Focus on addressing issues and solving problems through development of big data analytics
- Serve as a forum for engagement between industry and academia
- Provide programs/events that support training for both students and professionals in big data-related skills

THANKS TO OUR PARTNERS

 ATLAS VENTURE

 BESSMER
VENTURE PARTNERS



 BROWN RUDNICK

 CHARLES RIVER
VENTURES

 DELL
The power to do more

The Dell logo consists of the word "DELL" in a bold, sans-serif font inside a blue circle. Below it, the tagline "The power to do more" is written in a smaller, lighter blue font.

dunhumby

 FOLEY
FOLEY & LARDNER LLP

GOODWIN
PROCTER

Google™

 GREENPLUM®
A DIVISION OF EMC

The Greenplum logo features a green circle with a white 'G' inside, followed by the word "GREENPLUM" in a serif font with a registered trademark symbol, and "A DIVISION OF EMC" in a smaller sans-serif font below it.

 IBM®

 MASSACHUSETTS
TECHNOLOGY
COLLABORATIVE

matrix
PARTNERS

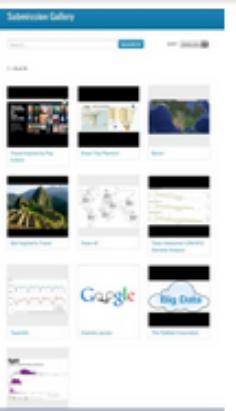
Microsoft®

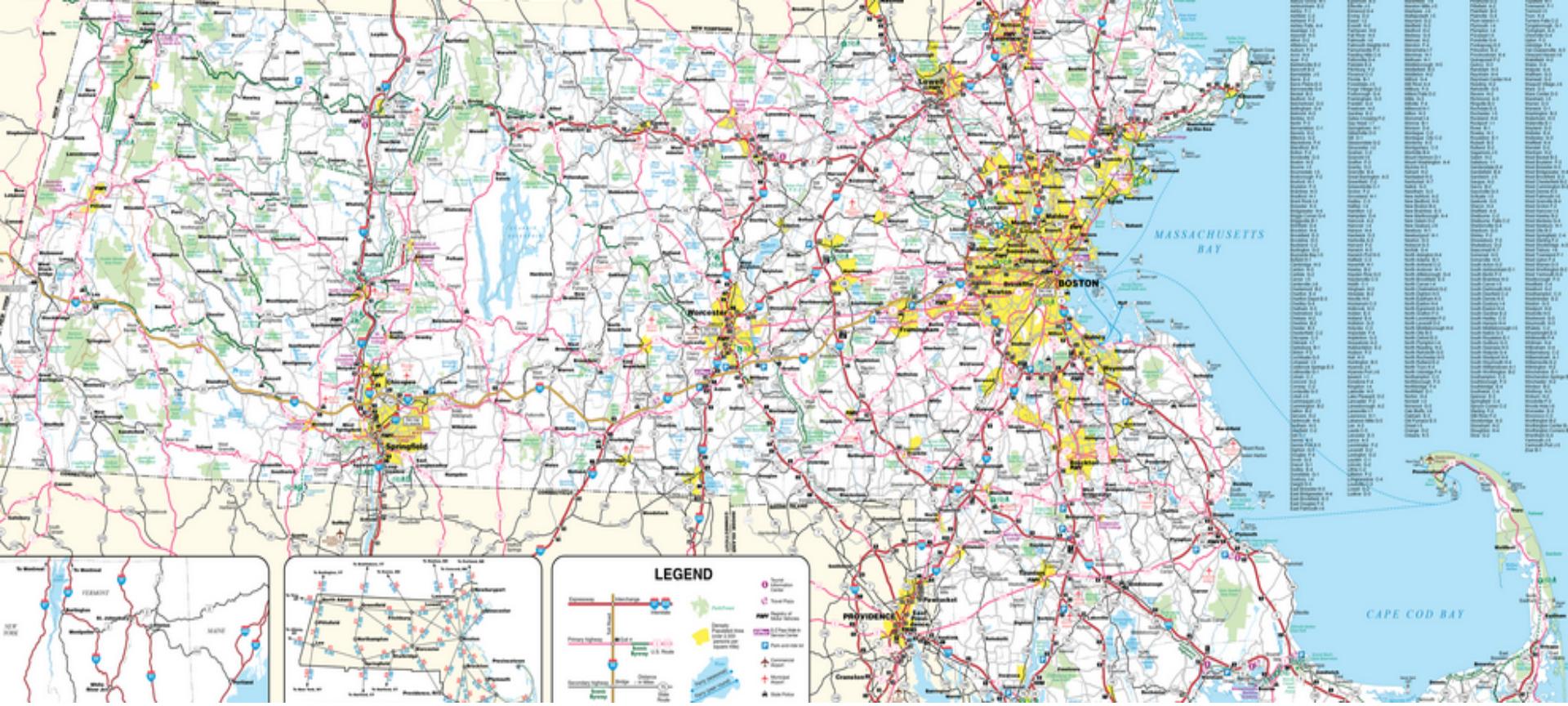
 VOLTDDB

The VoltDB logo features a stylized 'V' shape composed of blue and green segments, with a small infinity symbol '∞' at the top right, and the word "VOLTDDB" in a green sans-serif font below it.

hack✓reduce

CODE BIG OR GO HOME





MassDOT Visualizing Transportation Hackathon



HOSTED BY:



Tweet about it!
#MassBigData @MassDOT
@mass_tech @hackreduce

AGENDA - Friday

6:00pm -- Check-in and grab a slice of pizza.

6:45pm -- Welcome!

- Adrienne Cochrane, hack/reduce
- Christopher Scranton, MassTech Collaborative
- Rachel Bain, MassDOT
- Celia Blue, MassDOT
- Andrew Lamb, Nutonian

7:30pm -- Find a team and get started!

10:45pm -- Goodnight!

Tweet about it!

#MassBigData @MassDOT
@mass_tech @hackreduce

AGENDA - Saturday

9:00am -- Check-in, coffee and bagels.

9:45am -- Welcome back

- Adrienne Cochrane, hack/reduce
- Christopher Scranton, MassTech Collaborative
- Andrew Lamb, Nutonian

10:00am -- hacking!

12:30pm -- Lunch

1:00pm -- hacking!

6:00pm -- Dinner and Presentations begin

8:00pm -- Special Guest Speaker...

8:30pm -- Winners and Prizes!

9:00pm -- Goodnight!

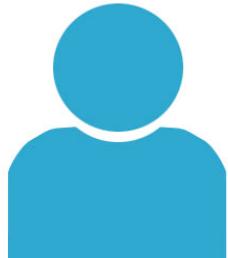
Tweet about it!

#MassBigData @MassDOT
@mass_tech @hackreduce

Mentors



Andrew Lamb
Software Engineer, Nutonian



Russell Bond
Planner, MassDOT



David Barker
Manager of Operations Technology, MBTA

Judges



Clinton Bench

Deputy Executive for Operations, MassDOT



Jeff Mullen

Partner, Foley Hoag, LLP

Former Secretary of Transportation



Christopher Scranton

Senior Manager for Big Data & Tech
Initiatives, Mass Tech Collaborative

Speakers



Deval Patrick

Governor, Commonwealth of Massachusetts



Richard Davey

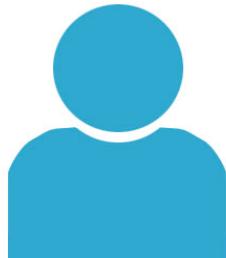
Secretary, Transportation



David Mohler

Deputy Sec. for Policy, MassDOT

Speakers (con't)



Celia Blue

Assistant Secretary, Performance, MassDOT



Rachel Bain

Deputy Registrar for Operations,
MassDOT



Christopher Scranton

Sr. Mgr, Big Data & Technology Initiatives,
Mass Tech Collaborative

Prizes



Best Use of Data
\$2,000



Most Visually Compelling
\$2,000



Crowd Favorite
\$2,000

Rules, Submissions, Voting, etc.

<http://masstransporthack.challengepost.com/>

ChallengePost Find Challenges Post Challenges adriennecoch2613 ▾

MassDOT Visualizing Transportation Hackathon

Dec 14, 2013 (view all dates) \$6,000 in prizes

HOME RULES DISCUSSIONS

Informing the Future of Massachusetts Transportation through Data Analysis and Visualization.

REGISTERED



Mass Big Data Initiative

Launched in 2012 by Governor Deval Patrick, driven by the Mass Tech Collaborative's Innovation Institute



Mass Big Data Initiative



- Strengthening & Expanding Cluster by:
- 1- Raising Awareness:
Web Portal – Dec Launch
Major Industry Study – Jan release
- 2 - Workforce: Student Engagement/ Mass Intern Partnership
- 3 - Accl. Regional Innovation:
Sponsorship & Launch of hack/reduce
Massachusetts Green High Performance Computing Center
- Enhancing Access to Public Data Sets

*mass***DOT**
Massachusetts Department of Transportation

Technical Details

1. Access to Datasets
2. Dataset Overview

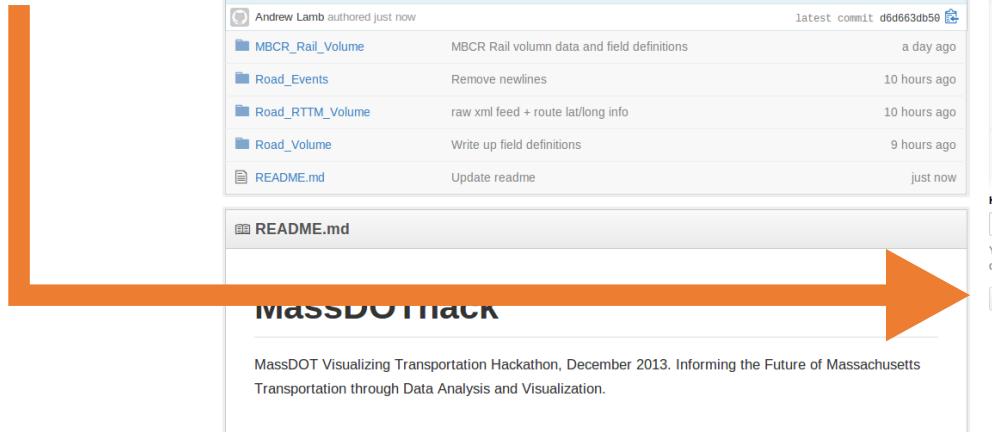
Andrew Lamb
Nutonian, Inc.
andrew@nutonian.com

Dataset Access -- on Github

<https://github.com/hackreduce/MassDOThack>

Access Options:

1. Download via browser
2. clone git repository



```
$ git clone https://github.com/hackreduce/MassDOThack.git
```

Dataset Format

- Data are in CSV (comma separated value) format
 - Easy to use in
 - Excel, LibreOffice, etc
 - Most programming languages
 - All datasets have a ..._fields.csv file which describes each column
- * Please come and find me if you want/need help transforming the data into a different format

Available Datasets

MBCR Rail Volume: MBTA Commuter Rail trip volume

MBCR Rail Locations: Position of each commuter rail train

Road Events: Planned (roadwork) and unplanned (accident) information for major roadways

Road Real Time Traffic Management (RTTM): Fine grained (5 minute) average speeds for major road segments

Road Volume: Average volume (cars/day) on various roadway segments

NOAA Weather: Weather information for stations in Eastern MA

MBCR Rail Volume

- 111 MB of data for 2011, 2012 and 2013
- Individual MBTA Commuter rail trips details
 - Date, route
 - Scheduled vs Actual departure and arrival times
 - Passenger, bike, crew counts



MBCR Rail Locations

- 578 MB of data for November 2013
- Individual MBTA Commuter train locations
 - Timestamp
 - Scheduled route
 - Latitude and Longitude
 - Heading
 - Speed



Note: I also have raw data for anyone who wants it

Road Events

- 18MB of data from 2012 to 2013
- Major planned and unplanned events
 - Start and end time
 - Road and weather conditions
 - Textual descriptions of what happened

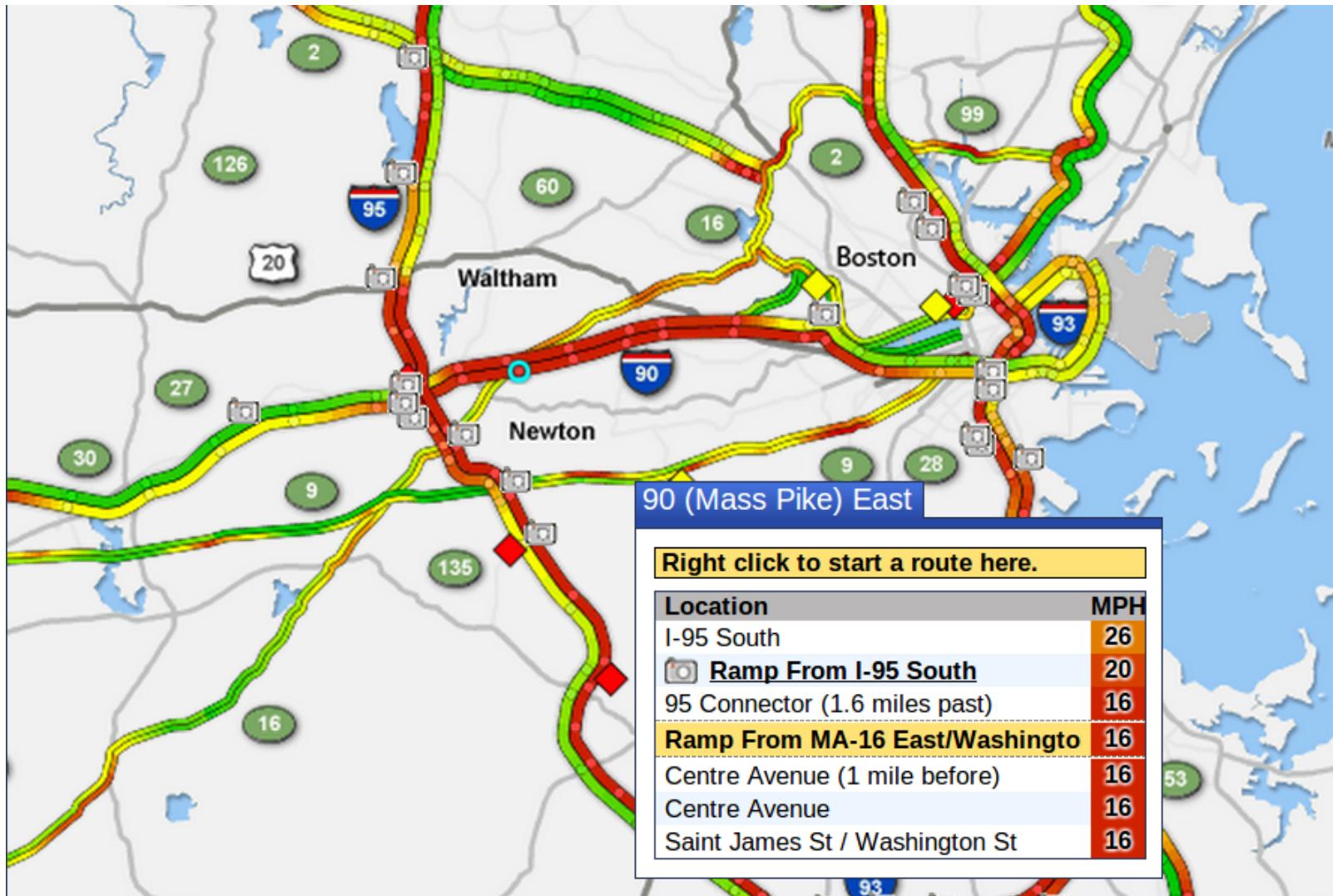
"MSP Charlton reporting Several Thousand Bee's have been abandoned at Rest Area 5E"

"HOC observed MVA FRNB at Mass Ave Connector. Small flames beneath engine."

"Sumner Tunnel - bicyclist heading to Boston in the right lane per Boston Police."



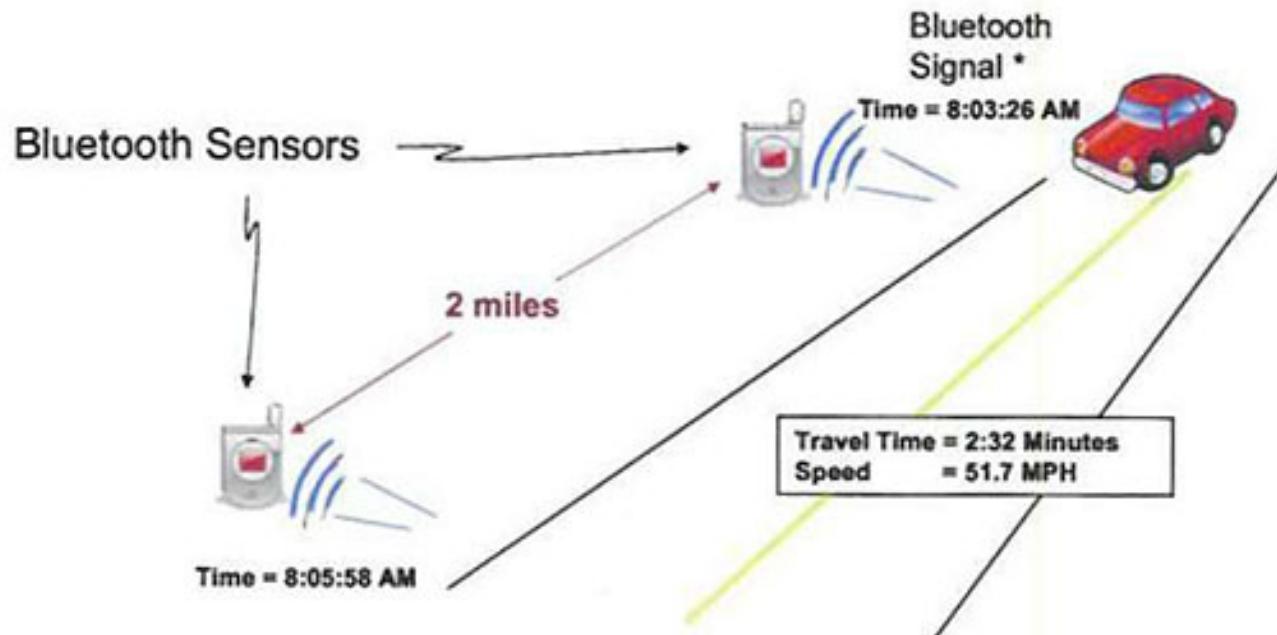
Road RTTM



Road RTTM



Bluetooth Traffic Monitoring



Road RTTM

- 325 MB of average speed estimates at 5 minute increments for 167 road segments between June 2012 to October 2013
- Detectors pick up discoverable Bluetooth MAC addresses* from passing vehicles
- An algorithm processes raw data and produces an estimated travel time on road segments.

**RTTM collected MAC address data that is stored by MassDOT after calculating the travel time will be automatically translated to a non-repeating series of random numbers in order to eliminate any connection between the MAC address and the owner of the device. The MAC address information is not stored. This will enable MassDOT to continuously look for ways to improve the algorithm using historical (paired data) between Bluetooth readers and at the same time ensure privacy standards.*

Road RTTM (cont)

- pair_id is a specific pair of detectors in the field and represents a specific roadway segment.
- Three files:
 - massdot_bluetoad_data.zip: raw data
 - pair_definitions.csv: descriptions of road segments
 - pair_routes.xml (snapshot of http://www.massdot.state.ma.us/feeds/traveltimes/RTTM_feed.aspx)
- Contains geographic points which comprise each roadway segment

Road Volume

- 1.8 MB of data from 1988 to 2013
- Number of cars / day for certain road segments
 - Roadway name
 - Geographic location



More details...

NOAA Weather

- 72 MB of data from 1800s to 2013
- Weather observations for Eastern Massachusetts
 - Precipitation
 - Snowfall, Snow Accumulation
 - Min and Max Daily Temperatures



MBCR Rail Train Location (Raw)

We also have a 117MB (zipped!) containing one month of position data for all commuter rail trains. Basically it's ten million lines like:

11-08-2013 9:54:19 AM GPRS Comm Interface - Send Vehicle - Vehicle ID:1647 - Location[Operator:910, Workpiece:
212, Pattern:311, GPS:>RPV53656+4263222-0713124200732912<]

Here is how to interpret the data:

11-08-2013 9:54:19 AM Date/timestamp of receipt of message.

Send Vehicle Ignore any lines in which this text is different.

1647 Unique identifier for train as in physical trainset, or more specifically its control cab.

Location Ignore any lines in which this text is different.

311 Unique identifier for train as in scheduled trip from point A to point B. Corresponds to the number that is publicly published on our schedules. But not exactly. See below.

>RPV53656+4263222-0713124200732912< Position in Trimble ASCII Interface Protocol (TAIP) format. (Next Slide)

MBCR Rail Train Location (Raw)

Regarding the unique identifier for train-as-in-scheduled trip, there are exceptions. Note that our publicly scheduled train numbers are only unique systemwide if you account for which ones have leading zero's and which ones don't.

For the following train numbers in the data you must add 1-2 leading zero's to match with the published train number.

2,3,4,5,6,7,8,9,10,12,14,15,16,17,18,19,20,21,22,23,25,27,28,29,32,33,34,36,38,40,41,43,45,47,48,51,52,55,56,57,60,61,62,63,64,65
,66,67,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93

For the following train numbers in the data drop the last two zero's to match with the published train number.

6100,6200,6300,6400,6500,6600,6700,6800,6900,7200,9400,9500,9700,9800

For the following train numbers in the data add a prefix of the letter P to match with the published train number.

500,501,502,503,504,505,506,507,508,509,510,511,512,513,514,515,516,517,518,519,520,521,522,523,524,525,526,527,528,529,5
30,531,532,533,534,535,536,537,538,539,540,550,551,552,553,554,555,556,557,558,559,560,561,562,563,564,565,566,567,582,58
3

MBCR Rail Train Location (Raw)

Trimble ASCII Interface Protocol

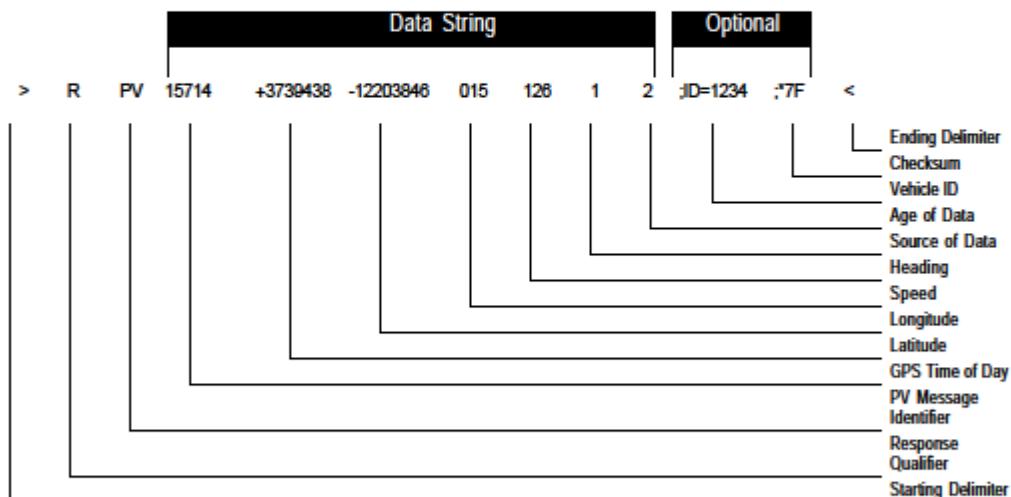
TAIP

Sample PV Message

The Position/Velocity Solution (PV) message is one of the more commonly used TAIP messages and most sensors using TAIP are set by default to output the PV message once every 5 seconds.

The following analysis of a typical PV message is provided to further explain the TAIP message protocol.

>RPV15714+3739438-1220384601512612;ID=1234;*7F<



Data String Information

GPS Time of Day : 15714 seconds, 04:21:54 GPS (time of last fix)
Latitude: +37.39438 degrees
Longitude: -122.03846 degrees
Speed: 15 MPH
Heading: 126 degrees
Source of Data: 3D GPS
Age of Data: Fresh (<10 seconds)

- ◆ NOTE: Refer to the discussion of the PV message data string for more detail on how this message is interpreted.

Good luck!

Let me know how I can help.

I'll be around all night and all tomorrow morning