Collecting and Monitoring Arterial Travel Times from Wireless Solar Powered RFID Readers

North American Travel Monitoring Exposition & Conference – Seattle, WA

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Rensselaer

Project Purpose

- Demonstrate that a wireless, solar powered, non-intrusive tag reader is a viable solution for field deployment.

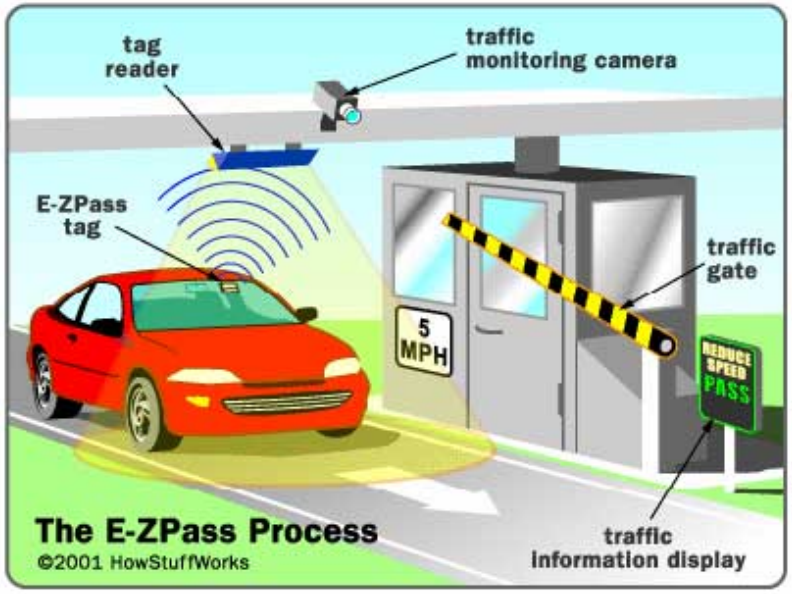
- Demonstrate this technology could be used for traffic management for:
  - Local arterials
  - Special events
  - Work zones

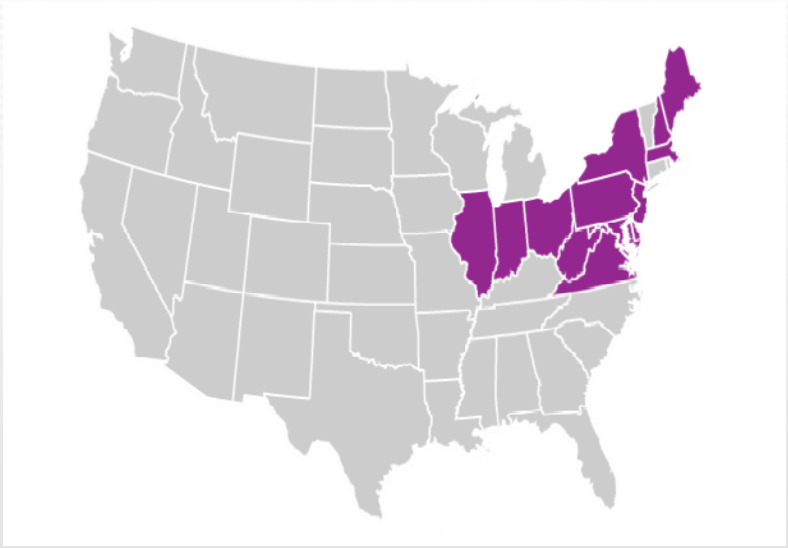
- Reduce dependence on power and wired telecommunication access

RFID Technology

- RFID technology for tolling and traffic management in the USA

- E-ZPass^{sm} tag technology
  - Used for toll collection in 14 northeast states
  - Typically windshield mounted
  - Over 21 million tags on the road

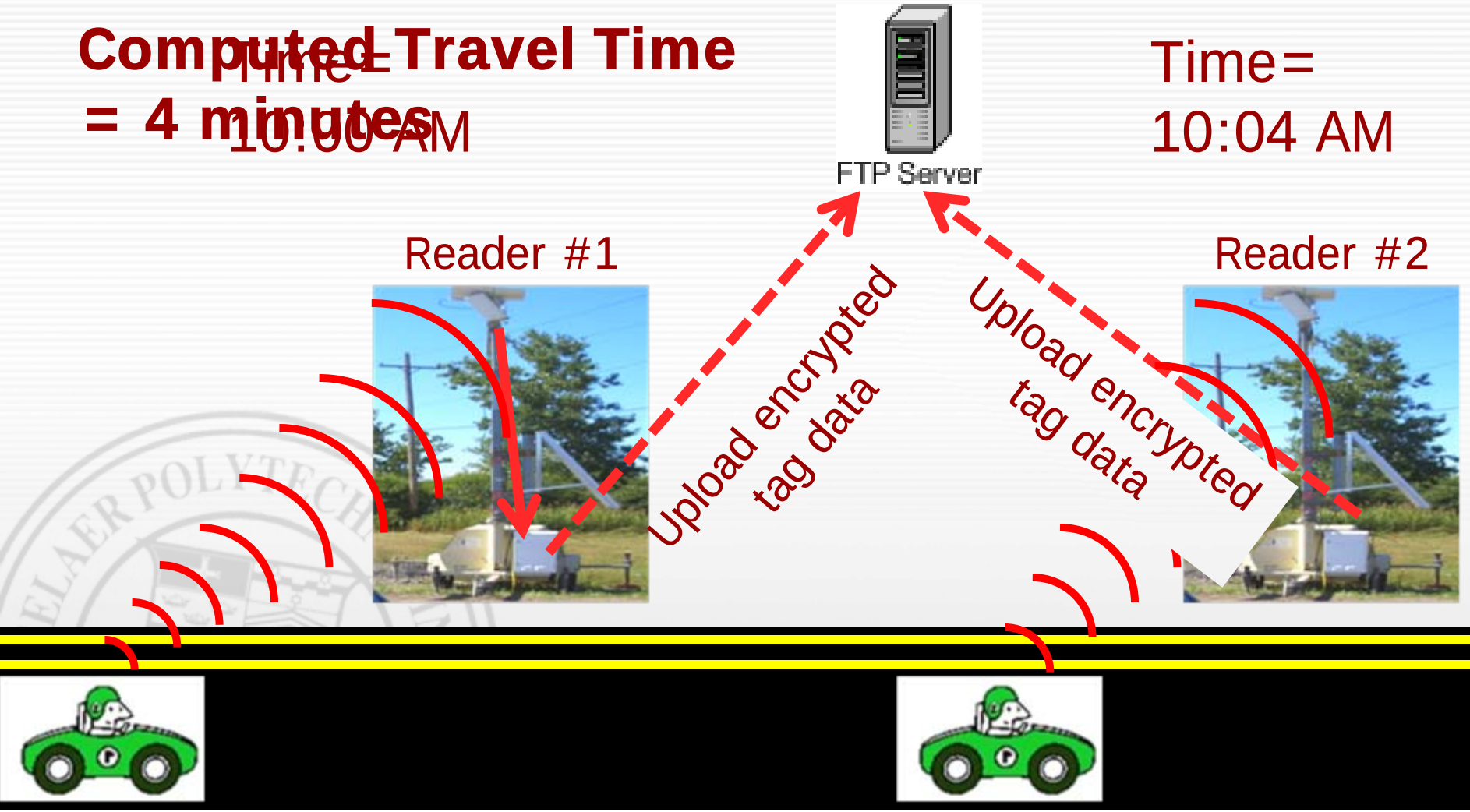




General Concept

Computed Travel Time = 4 minutes

Time= 10:00 AM



System Schematic

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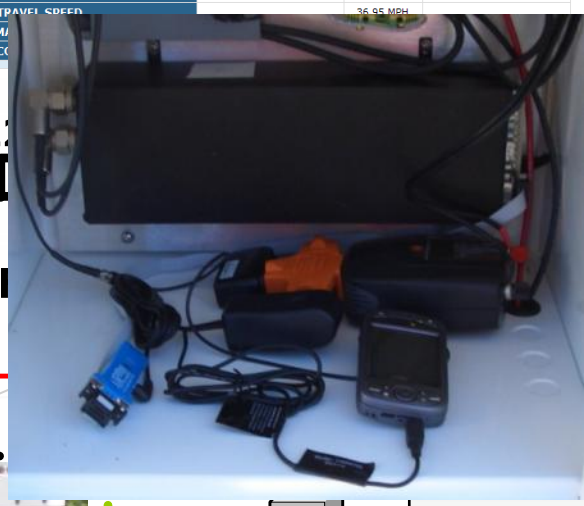
	STATION ETTM_6		STATION ETTM_1
LAST READ	1/21/2008 7:13 AM		1/13/2008 11:46 AM
BATTERY %	100		80
TOTAL READS	17084		7699
AVG TRAVEL TIME		116.85 seconds	
TRAVEL DISTANCE		1.1 mi.	
AVG TRAVEL SPEED		33.89 MPH	
NORMAL TRAVEL SPEED		35 MPH	
# RECORDS INCLUDED IN ANALYSIS		466	

	STATION ETTM_6		STATION ETTM_3
LAST READ	1/21/2008 7:13 AM		1/22/2008 11:30 AM
BATTERY %	100		100
TOTAL READS	17084		34171
AVG TRAVEL TIME		204.6 seconds	
TRAVEL DISTANCE		2.1 mi.	
AVG TRAVEL SPEED		36.95 MPH	



BATTERY ARRAY

CHARGER

SW

SW

SW

Internet

FTP Server

Real – Time Tag Data

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NORMAL TRAVEL SPEED		35 MPH	
# RECORDS INCLUDED IN ANALYSIS		7594	

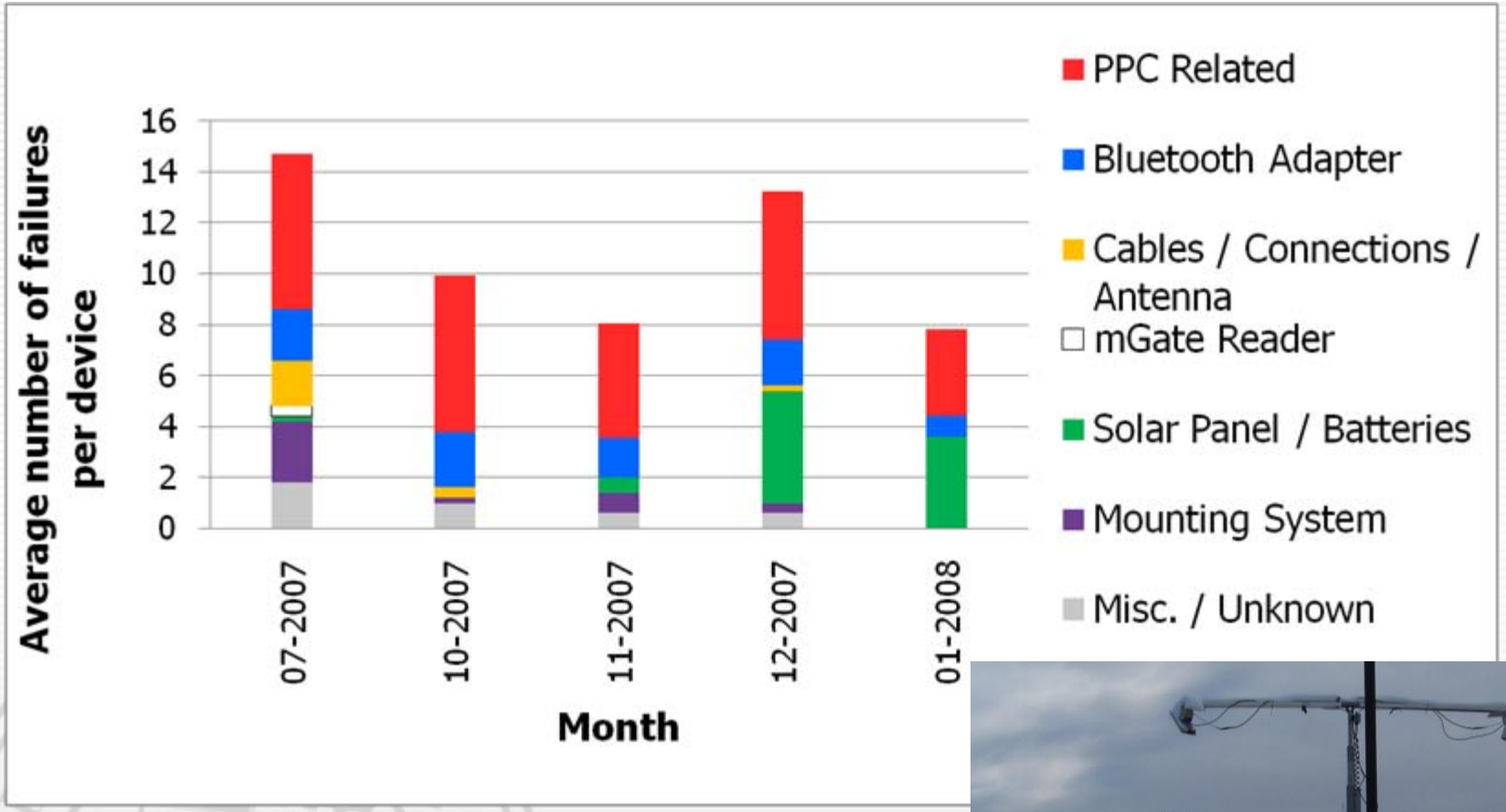
	STATION ETTM_2		STATION ETTM_5
LAST READ	1/22/2008 11:30 AM		1/18/2008 2:56 AM
BATTERY %	100		100
TOTAL READS	29517		6808
AVG TRAVEL TIME		229.46 seconds	
TRAVEL DISTANCE		2.2 mi.	
AVG TRAVEL SPEED		34.52 MPH	
NORMAL TRAVEL SPEED		35 MPH	
# RECORDS INCLUDED IN ANALYSIS		1938	

Deployment Locations

- NY Route 4 – Troy, NY
  - Deployment conditions
    - Local arterials
  - Dates:
    - July 2007 – August 2007
    - Sept 2007 – Feb 2008

- New York State Fair – Syracuse, NY
  - Deployment conditions
    - Local arterials
    - Planned special event
    - Interstate work zone
  - Dates:
    - August 2007
    - August 2008

Device Performance

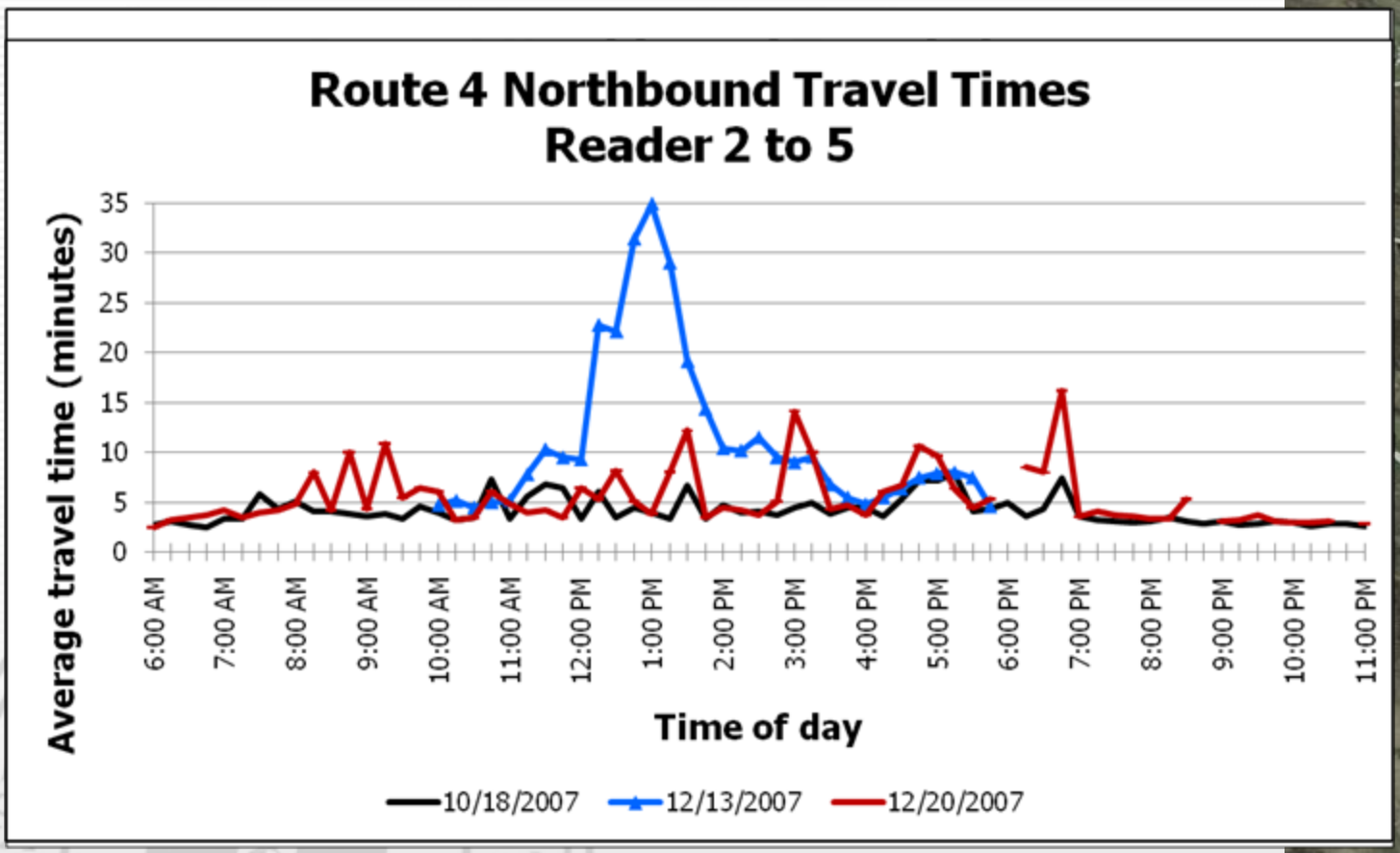


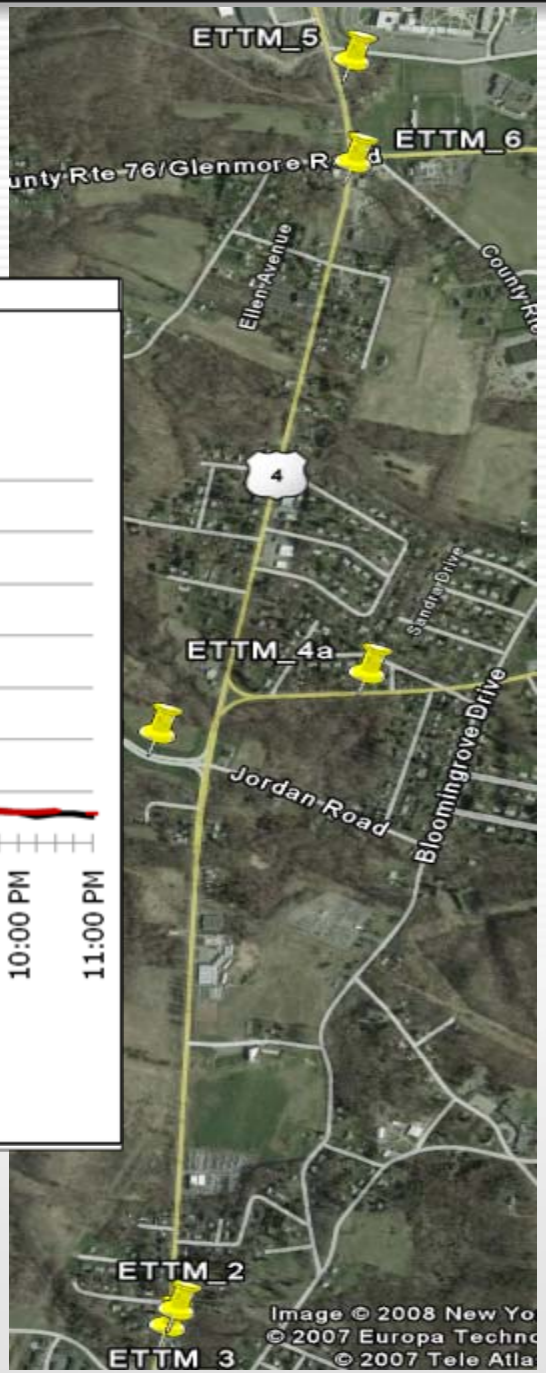
Device Performance Summary

- 90 – 95% tag read reliability (single lane).
- Vehicle travel time was published to website less than 1 minute after a vehicle passed a pair of readers.
- On average a device operated for 38 consecutive hours before experiencing a shut down.
  - Pocket PC was the most problematic component.
- The solar components were able to power all the devices for much of the study even during cloudy, rainy, icy, snowy days.

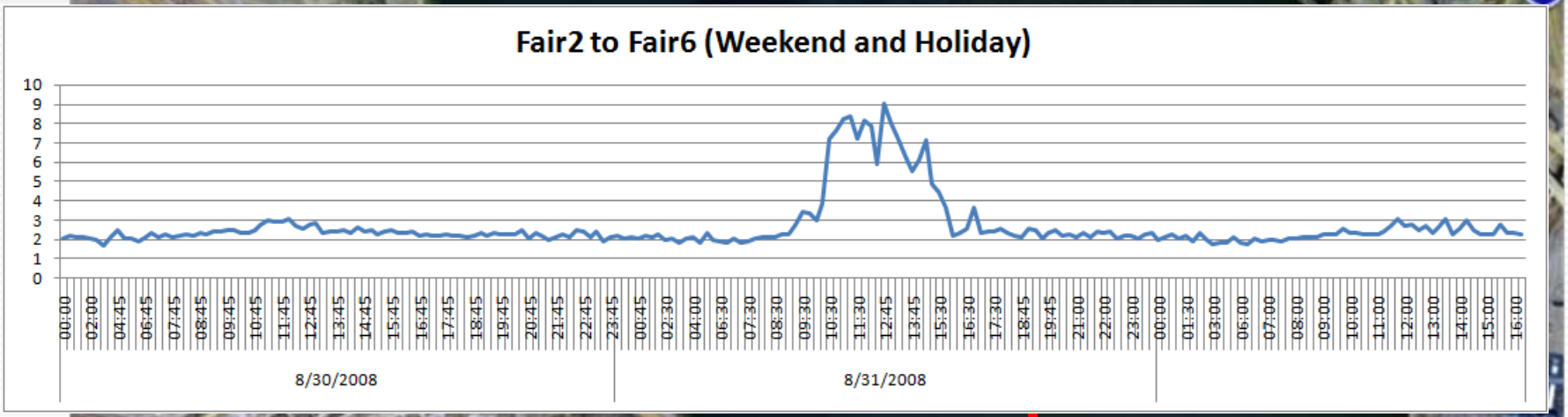
TRAVEL TIME MONITORING

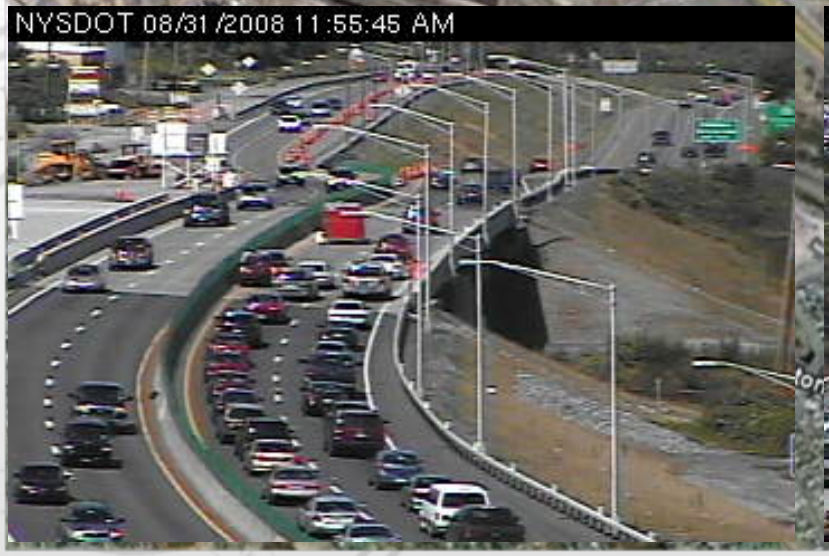
Travel Time Monitoring

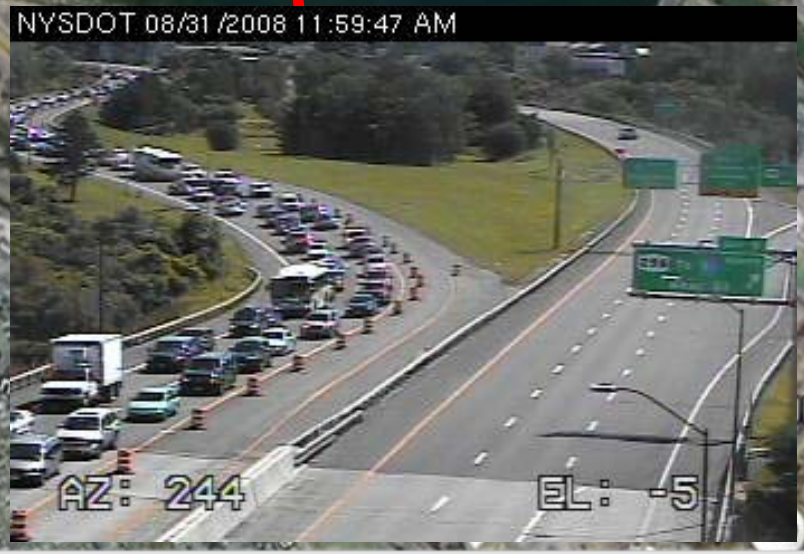




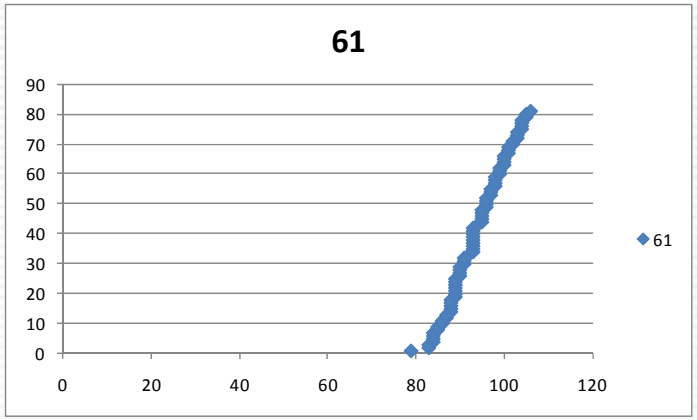
Travel Times at the NYS Fair

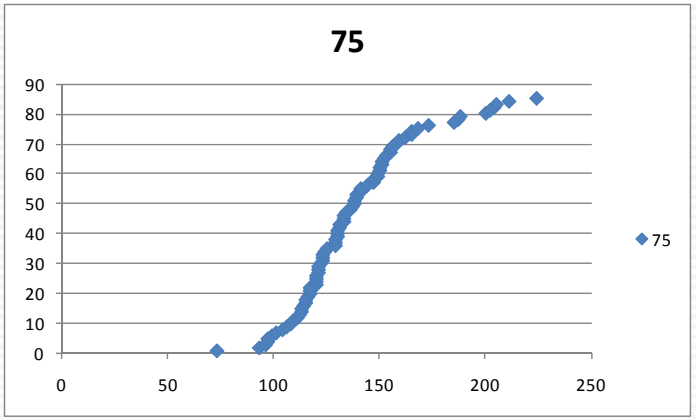


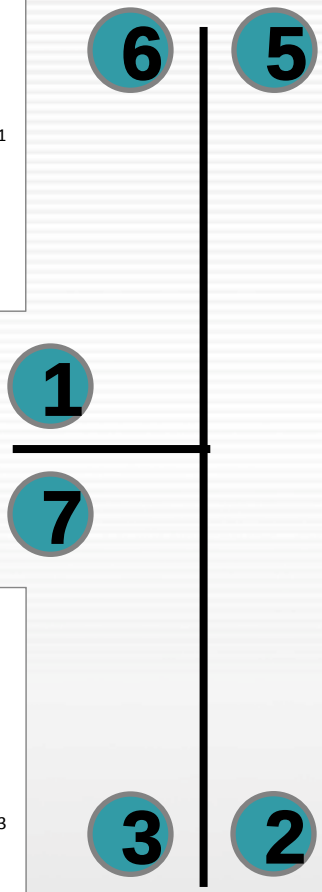


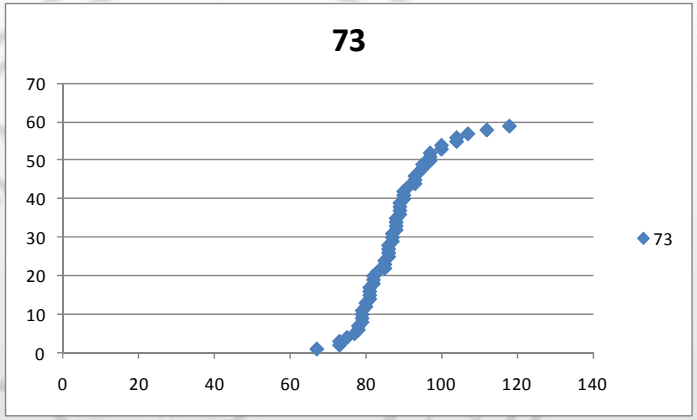


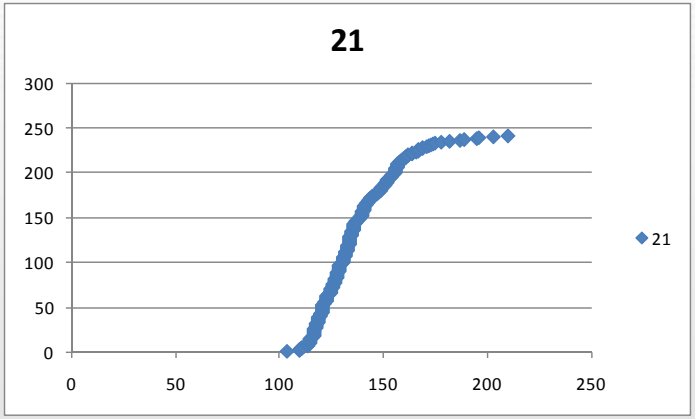
Sensor to Sensor Travel Times











Conclusions

- Prototype device was successful
- Green technology
  - Wireless & solar powered to aid in network observation
- Device reliability
  - 90%+ tag read reliability
- Traffic management:
  - Travel time information provides great insight into network conditions
  - Portable for planned special events and work zones
  - Complement existing traffic data collection or deploy at locations where traffic data is not being observed

Acknowledgments

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