Mechanical Association of Railcar Technical Services

Remote Monitoring
Defining Value

September 23, 2008

Mechanical Association of Railcar Technical Services

CARX 54 – Where Are You?

Mechanical Association of Railcar Technical Services

- Objectives of Presentation
  - Update on current rules and proposed rules for application of Remote Monitoring Devices
  - Update on current technologies
  - Update on current software interfaces
  - How (and Who) does this bring value
- Agenda
  - Bob Fronczak, Assistant Vice President Environmental & Hazardous Materials, AAR
  - John Felty, National Sales Manager, RFTRAX, Inc.
  - Ken Sherman, Vice President, IntelliTrans
  - Don Loftis, Principle Software Engineer, Olin Corp.
  - Q & A

Mechanical Association of Railcar Technical Services

Bob Fronczak

Asst. VP Environmental and Hazardous Materials

- Joined AAR in 1994
- Worked 6 years on the Milwaukee Road
- Sr. Program Manager at Radian Corp
- B.S. in Civil Engineering, Valparaiso Univ.
- MBA, DePaul University
- Registered Professional Engineer, Illinois
- AAR Asset Condition Visibility Task Force

Remote Monitoring Equipment

Railway Supply Institute Annual Meeting

September 23, 2008

Chicago, IL

Robert Fronczak, Assistant Vice President Environment & Hazmat

ASSOCIATION OF AMERICAN RAILROADS

TOMORROW. ARRIVING BY TRAIN.

Remote Monitoring Equipment

Remote Monitoring Equipment (cont.)

- C- 10286 Issued March 27, 2006 (effective April 1, 2006) AAR Standard S-2045
  - Cabling should be enough to reach the device without excess
  - Cabling inside jacket or inside conduit
  - Approval required by Tank Car Committee
  - Requires registration inn UMLER (fitting code RD)
  - Stencil of decal with contact information must be provided (2” x 3”)
  - Installed in a manner not to create a safety hazard

Remote Monitoring Equipment (RME)

- Dow is equipping all their TIH cars with RME
- Examples of the sensors being installed include the following:
  - Dome (open/closed)
  - Temperature excursion
  - Chlorine vapor detection in dome above 10 ppm
  - Accelerometer / impact detection
  - Loaded / empty status
  - Location with geofencing capabilities for HTUA's, and shipper consignee locations
  - Lack of movement

Remote Monitoring Equipment (Cont.)

- Issues the railroads need to decide:
  - Do we want to receive the signals?
  - If so, which ones, to whom and how?
  - Do we want to establish a standard?
  - Do we want to require encryption of the signal?
  - Do we want to require all signals be sent to railroads?

Asset Condition Visibility Task Force (ACV-TF)

- The ACV-TF has been formed to create a standard for the format for reporting exceptions from RME on hazmat cars to the railroads
- Work rules and response protocols have been drafted into a white paper for all known sensors
- Three initial alert types:
  1. Maintenance required
  2. Shipper to investigate
  3. Custodian to investigate
- Three initial levels of urgency for the above alert types:
  1. Before change in custody
  2. Next reasonable opportunity
  3. Immediate attention required

Draft Railroad Actions

Alert	*Actions*
Generic alert	If active, dispatcher needs to communicate to crew to move train to specific safe location. Once in a safe location, RR emergency response center identifies someone to do sensor specific inspection.
Dome Sensor	Do a visual inspection of the seal. If seal is present, continue normal operations and report to shipper. If seal is broken, call appropriate authorities.
Temperature	Take external car temp reading (need to determine best place to take the temp consider ambient temp) to determine if car is temperature is higher than expected. If temp is normal, report normal temp to shipper. If temp is higher than expected take appropriate action.
Impact	Inspect coupler and sill for cracks/defects (need more data to determine this procedure) If no defect found continue operations and notify shipper If defect found, follow defect procedures and notify shipper
Chemical Detector/Sniffer	Move car to the closest safe location Mobilize railroad/contract hazmat person to investigate Follow emergency notification procedures Feedback to Shipper
Hand Brake	If handbrake is set, release hand brake and report to shipper If handbrake is not set, continue operations and report to shipper

Challenges

1. Who is going to climb on the car when RRs have to investigate an alert? How long will it take to bring someone into location if external person is needed?

2. What happens if an alert happens in a HTUA? Does the train get moved out of HTUA before investigation or investigate while in HTUA?

3. Still need to involve Shortlines and better understand their concerns and capabilities to react to alerts.

4. Need a feedback system in place to evaluate reliability and accuracy of system.

Pilot Project

- BNSF, CSX, BASF, Dow, Shell Chemical, GE Technology, and Savi Technologies are embarking on a pilot project to test the draft protocols
- Project is scheduled to start in August 2008
- Based upon the results the white paper will be revised
- Once the system has been tested, we will consider a standard to incorporate the standard message protocols outlined in the white paper

Circular Letter C-10698

- C-10698 “Early Solicitation of Stakeholder Inputs – Remote Monitoring Equipment Data Sharing
- Comments received from 8 parties including:
  - AAR’s ACV-TF
  - Amstead Rail
  - GE Railcar
  - Olin
  - American Railcar
  - BASF
  - Greenbrier
  - Progressive Rail
- Most agree that safety & security critical information should be shared with those parties needing it (carriers & those in control)
- Some disagreement about who should pay

Mechanical Association of Railcar Technical Services

CARX 54 – Are We There Yet?

Mechanical Association of Railcar Technical Services

John Felty – RFTRAX

National Sales Manager

- Joined RFTRAX in 2005
- Worked 5 years for Lat-Lon
- VP International Business Development and Western Sales Manager for PED
- Sales and marketing for American Express
- AAR Asset Condition Visibility Task Force

Finding Value with Remote Monitoring of Rail Cars

John Felty
RFTrax
National Sales Manager

RFTrax

Benefits for Rail Shippers

Today

- **Car Health**
  - » Detect track problems, overspeed impact events, and truck hunting
  - » Detect hand brake application when moving
  - » Detect gate open while moving
- **Automated Management**
  - » Gate open at destination prompts billing event
  - » Monitoring on-time delivery
  - » Automated request for pick-up
- **Fleet and Load Visibility**
  - » Car location in yards
  - » Detect inbound delays
  - » Light up dark territory
  - » Track cars in shop
  - » Eliminate lost cars
  - » Load under-temperature drives diversion to thaw shed
  - » Gate open alerts for possible product loss in transit

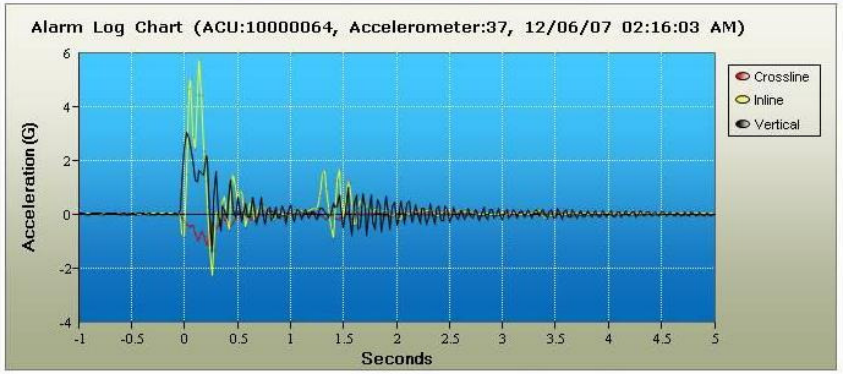
Car Health

- **Detect track problems, overspeed impact events, truck hunting, and pitch & bounce that can damage cars**

Data Type	Alarm Time	Peak Alarm Time	Minimum Acceleration (G)	Maximum Acceleration (G)
Crossline	-	12/06/07 02:15:57 AM	-1.116	0.132
Inline	-	12/06/07 02:15:57 AM	-2.314	5.729
Vertical	-	12/06/07 02:15:57 AM	-1.404	3.027

Truck Hunting Report Time: -
Truck Hunting Maximum RMS Amplitude: 6

Alarm Log Data - Partial Preview | Download Alarm Log Data | Request Complete Alarm Log Data



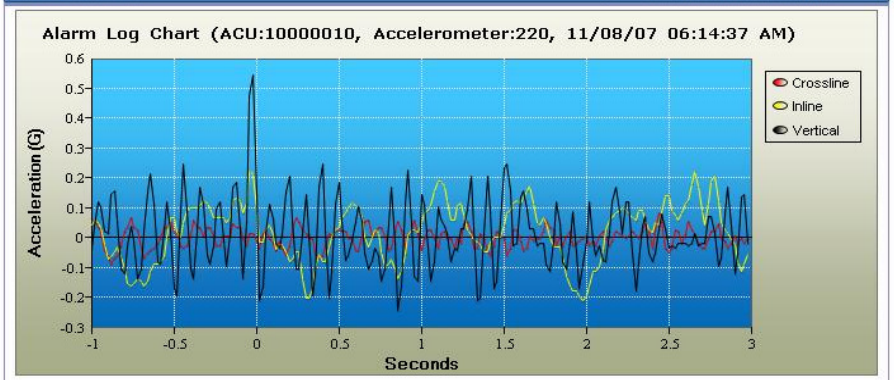
Scale: auto scale | Crossline | Inline | Vertical | Refresh Chart

Report Data

Data Type	Alarm Time	Peak Alarm Time	Minimum Acceleration (G)	Maximum Acceleration (G)
Crossline	-	-	-0.091	0.082
Inline	-	-	-0.212	0.221
Vertical	11/08/07 06:14:34 AM	-	-0.244	0.546

Truck Hunting Report Time: -
Truck Hunting Maximum RMS Amplitude: 0

Alarm Log Data | Download Alarm Log Data



Scale: auto scale | Crossline | Inline | Vertical | Refresh Chart

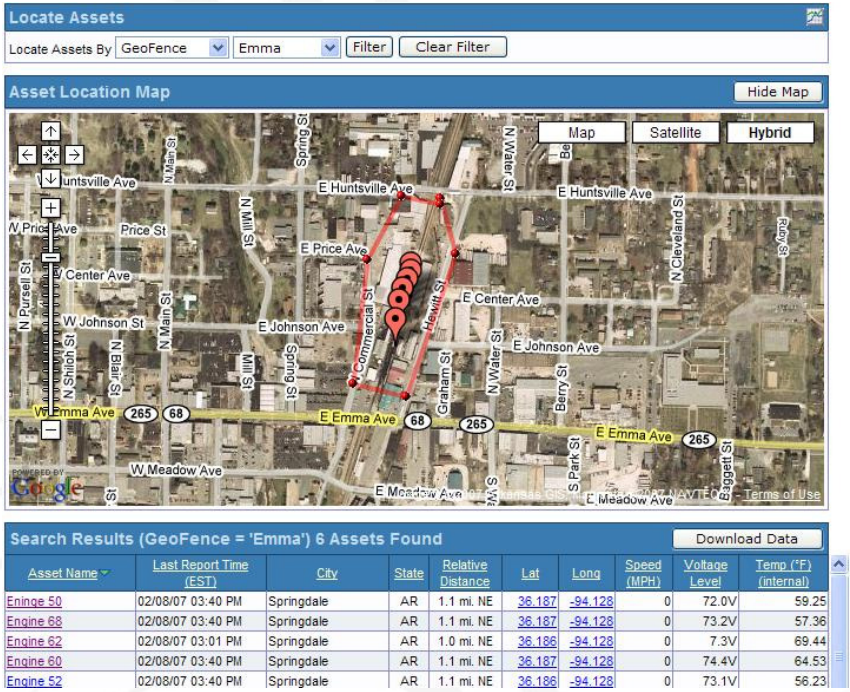
RF Trax

Car Health

- **Detect hand brake application when moving**
  - » Wheel damage associated with inappropriate hand-brake application is $300 million/ year problem on rail (AAR)
- **Detect gate open while moving**
  - » Avoid cleanup, environmental costs, lost product

Fleet and Load Visibility

- **Car location in yards**
  - Eliminate yard inspections
- **Detect inbound delays, confirm on-time arrivals**
  - Allow plants to make other arrangements
  - Reduce overtime waiting for delivery
- **Light up dark territory**
  - Track cars in repair shop-
- **Eliminate lost cars**
  - Value of cars, plus time spent searching

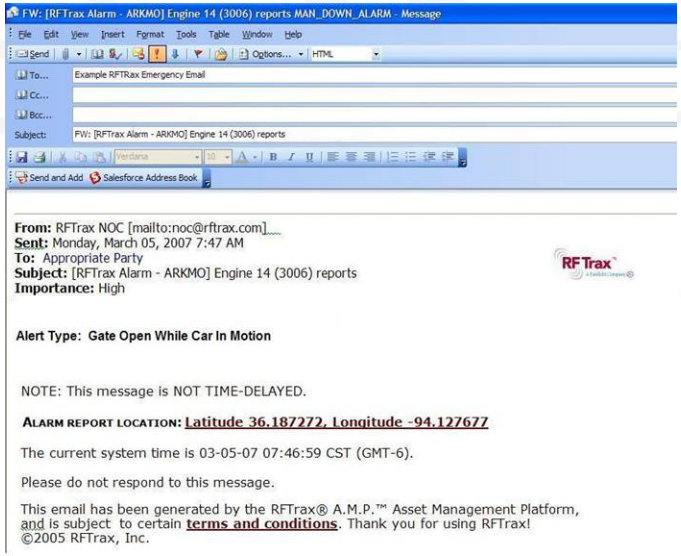


Asset Name	Last Report Time (EST)	City	State	Relative Distance	Lat	Long	Speed (MPH)	Voltage Level	Temp (°F) (internal)
Engine 50	02/08/07 03:40 PM	Springdale	AR	1.1 mi. NE	36.187	-94.128	0	72.0V	59.25
Engine 68	02/08/07 03:40 PM	Springdale	AR	1.1 mi. NE	36.187	-94.128	0	73.2V	57.36
Engine 62	02/08/07 03:01 PM	Springdale	AR	1.0 mi. NE	36.186	-94.128	0	7.3V	69.44
Engine 60	02/08/07 03:40 PM	Springdale	AR	1.1 mi. NE	36.187	-94.128	0	74.4V	64.53
Engine 52	02/08/07 03:40 PM	Springdale	AR	1.1 mi. NE	36.186	-94.128	0	73.1V	56.23

RF Trax

Fleet and Load Visibility - Alerting

- **Open hatch outside approved yard alerts security personnel**
- **Load under-temperature drives diversion to thaw shed**
- **Gate open alerts detect possible product loss in transit**



FW: [RFTrax Alarm - ARKMO] Engine 14 (3006) reports MAN_DOWN_ALARM - Message

File Edit View Insert Format Tools Table Window Help

Send | Options... | HTML

To... Example RFTrax Emergency Email

Cc...

Bcc...

Subject: FW: [RFTrax Alarm - ARKMO] Engine 14 (3006) reports

Send and Add | Salesforce Address Book

From: RFTrax NOC [mailto:noc@rftrax.com]
Sent: Monday, March 05, 2007 7:47 AM
To: Appropriate Party
Subject: [RFTrax Alarm - ARKMO] Engine 14 (3006) reports
Importance: High

Alert Type: Gate Open While Car In Motion

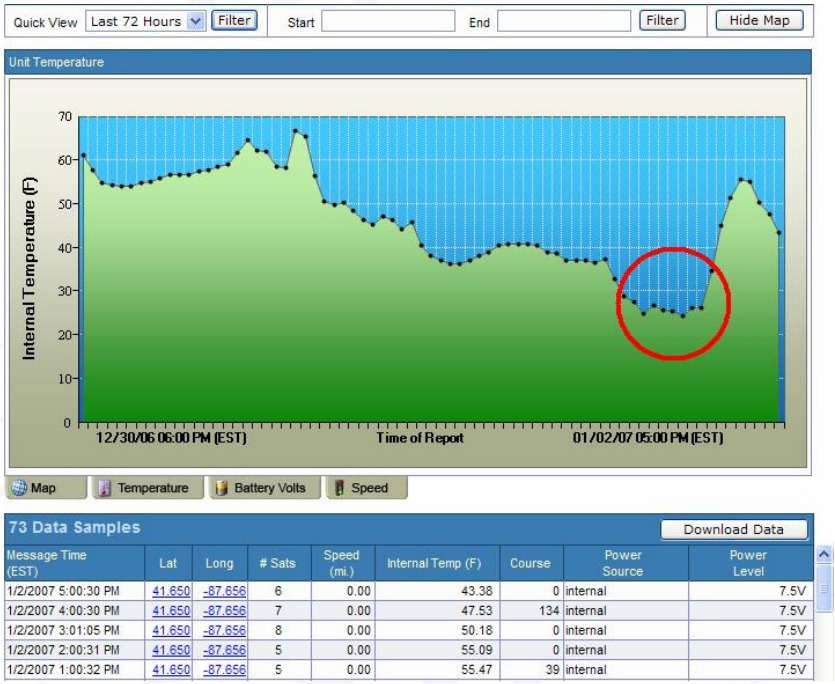
NOTE: This message is NOT TIME-DELAYED.

ALARM REPORT LOCATION: Latitude 36.187272, Longitude -94.127677

The current system time is 03-05-07 07:46:59 CST (GMT-6).

Please do not respond to this message.

This email has been generated by the RFTrax® A.M.P.™ Asset Management Platform, and is subject to certain terms and conditions. Thank you for using RFTrax!
©2005 RFTrax, Inc.



Quick View: Last 72 Hours | Filter | Start | End | Filter | Hide Map

Unit Temperature

Internal Temperature (F)

70
60
50
40
30
20
10
0

12/30/06 06:00 PM (EST) — Time of Report — 01/02/07 05:00 PM (EST)

Map | Temperature | Battery Volts | Speed

73 Data Samples — Download Data

Message Time (EST)	Lat	Long	# Sats	Speed (mi.)	Internal Temp (F)	Course	Power Source	Power Level
1/2/2007 5:00:30 PM	41.650	-87.656	6	0.00	43.38	0	internal	7.5V
1/2/2007 4:00:30 PM	41.650	-87.656	7	0.00	47.53	134	internal	7.5V
1/2/2007 3:01:05 PM	41.650	-87.656	8	0.00	50.18	0	internal	7.5V
1/2/2007 2:00:31 PM	41.650	-87.656	5	0.00	55.09	0	internal	7.5V
1/2/2007 1:00:32 PM	41.650	-87.656	5	0.00	55.47	39	internal	7.5V

Automated Management

- Hatch or Gate open at destination prompts invoicing
- Automated pickup request when hatch or gates close

RF Trax

What is deployed on rail cars today?

Proven sensor technologies include

- Loaded / empty
- Hand brake application
- Open / closed gate
- Temperature of car body & mechanical systems
- Accelerometer
  - » Truck hunting, pitch & bounce
  - » Vertical & longitudinal events

RF Trax

Where are we heading?

Future developments could provide…

- Bearing condition and temperature
- Enhanced algorithms for accelerometer to help predictive maintenance
- Where ever the market leads development efforts

RF Trax

Mechanical Association of Railcar Technical Services

CARX 54 – Are We There Yet?

Mechanical Association of Railcar Technical Services

Ken Sherman – Intellitrans

Vice President

- Joined Intellitrans in 2003
- Worked 13 years at GE in R&D, Plastics and Equipment Services
- Ran Global VMI for GE Plastics
- Master Black Belt and Supply Chain Leader at GE Plastics
- B.S and M.S. in Mechanical Engineering

Utilization of Telematics in Rail Tracking

NCTA O&M Meeting
June 16-18, 2008
Ken Sherman

Agenda

- Introduction
- Integration Points with Telemetry Providers
- Solution Components
- Value-Added Services
- Conclusion

TRANSCORE

Who are TransCore and IntelliTrans?

- **TransCore is a $500MM wholly-owned subsidiary of Roper Industries, headquartered in Harrisburg, PA.**
- **IntelliTrans is a wholly-owned subsidiary of TransCore, headquartered in Atlanta, GA.**
- **Largest provider of toll collection and intelligent transportation systems.**
- **3sixty suite of products and services:**
  - 3sixty Rail-Intermodal and Visibility Services, powered by IntelliTrans.
  - 3sixty Fleet Management Services powered by GlobalWave.
  - 3sixty Operations Management Services.
  - 3sixty Freight Matching Services powered by DAT.
  - 3sixty Fleet Compliance Services.
  - 3sixty Financial Management Services.

http://3sixty.transcore.com/home

TRANSCORE

Introduction

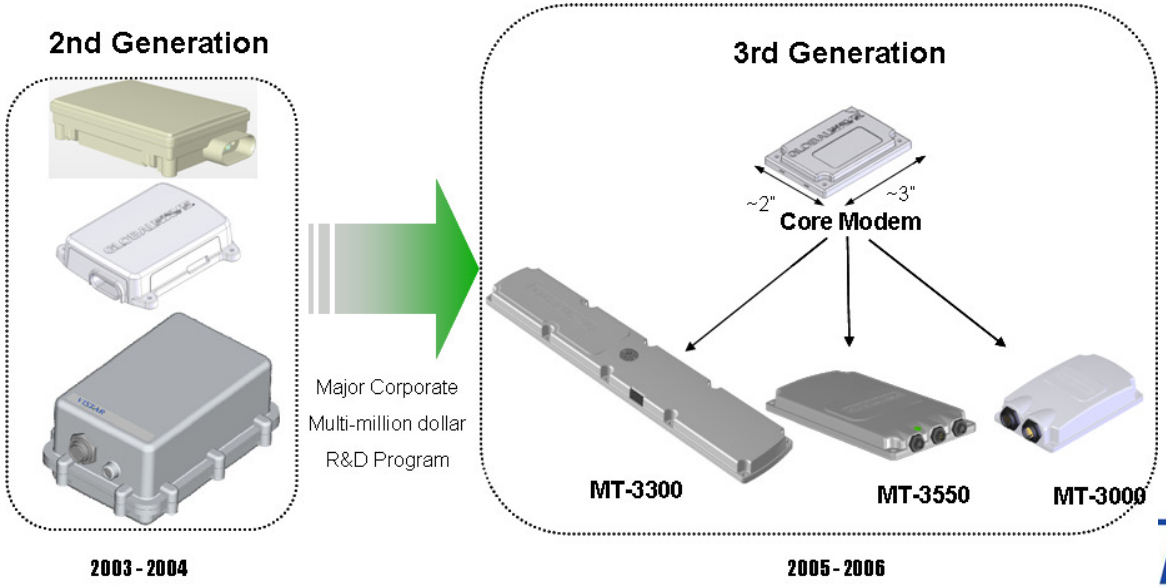
- **Shippers have an ever-increasing focus on cost reductions:**
  - Fleet utilization.
  - Maintenance management.
  - Tampering & damage to contents.
- **Consignees are demanding better information on inbound equipment.**
- **Many organizations that divert a significant number of shipments need more real-time information in order to properly manage diversions.**
- **In addition, shippers and the government are driving initiatives to increase monitoring of hazardous material fleets.**
  - Particular early interest in ethylene oxide.

TRANSCORE

Equipment Provision

- **Hardware technology, both GPS and sensors, continues to improve, evolve, and expand.**
  - Position.
  - Temperature.
  - Pressure.
  - Impact.
  - Open / closed.
  - Tension.

- **Power management has significantly improved.**
- **Intrinsically safe devices are available.**



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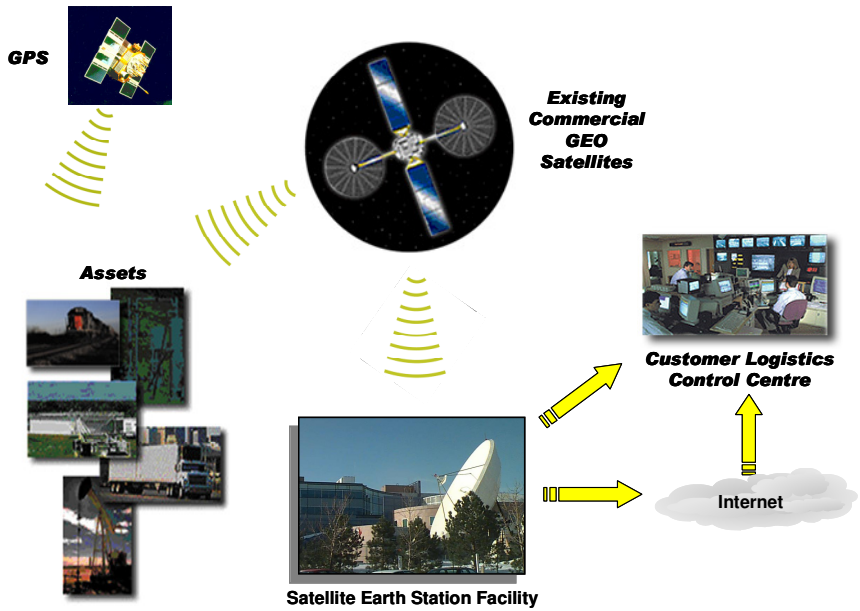
Integration with Hardware Suppliers

- **Transmission of GPS and sensor data to visibility system.**
  - Real-time tranmission required for most applications.
- **Ability to change parameters via the web interface (either through host or over the air configuration).**
  - Reporting intervals.
  - Geofence settings.
  - Alarm levels for various sensors.
- **Ability to "ping me now."**



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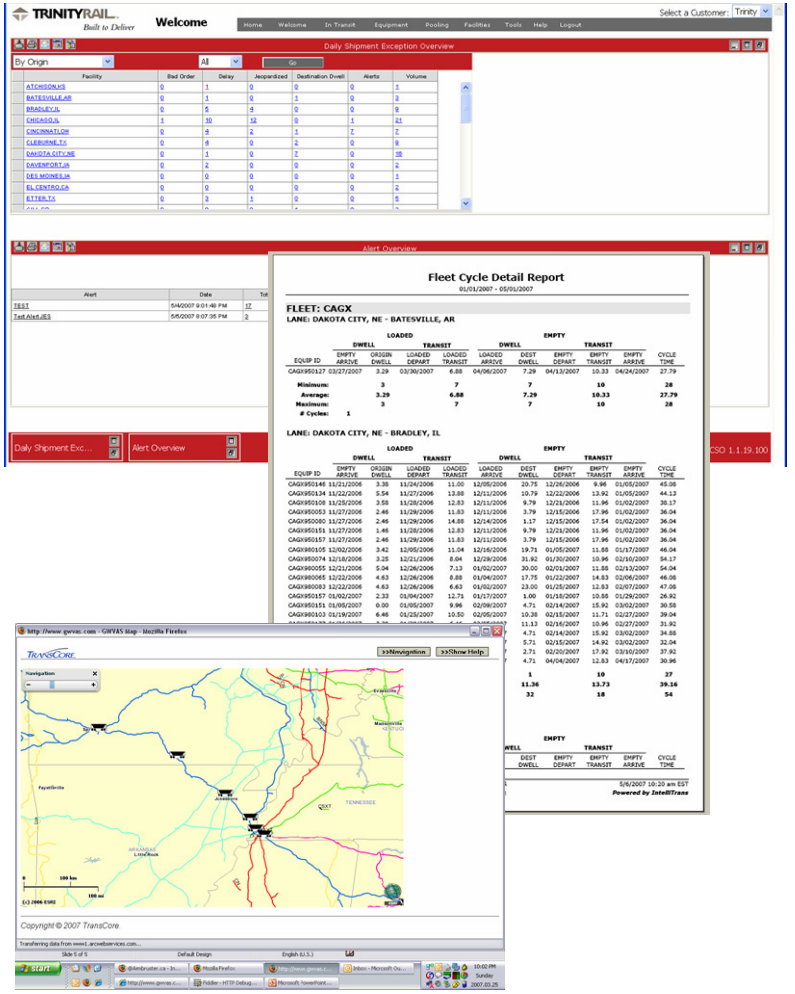
Integration of Old & New

- **Data obtained through telemetry is extremely powerful…next step is to link it with traditional data.**
- **Car location messages (CLMs) have additional information readily available:**
  - Equipment ID from AEI tag.
  - Status railroad.
  - Origin / destination.
  - Waybill.
  - ETA.
  - Status L/E.
- **Bills of lading / waybills have even more information:**
  - Shipper.
  - Consignee.
  - Weight.
  - Route.
- **By combining all of this data, additional value and offerings can be created.**

TRANSCORE

Solution Components

- View both rail & telemetry data within a single platform.
- Create alerts based on entire data set.
- Searching & querying.
- Historical reporting.
  - Minimum 13 months.
- Integrated mapping solution.
- Dynamic ETAs.
- Hardware management interface.



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Potential Business Problem Resolution Examples

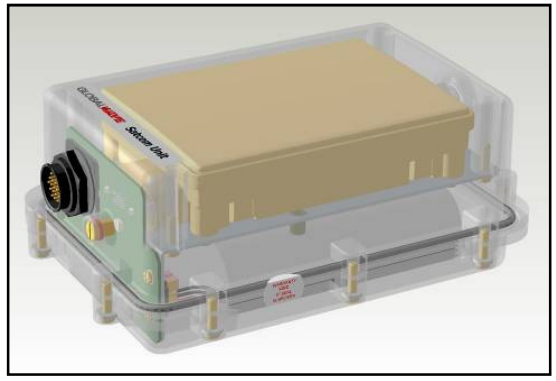
- **Refrigerated cargo:**
  - Combine temperature, GPS, status railroad, and two-way control.
  - Create alert upon temperature excursion.
  - Modify control parameters, divert equipment/contents.
- **Flat wheels:**
  - Combine hand break tension sensor, motion detection, and GPS.
  - Create alert upon motion = yes and hand break tension > X.
  - Notify causal location of event (using GPS and CLM info).
  - Record event in history and associate comment.
  - Manage maintenance costs with wheel repair / replacement.
- **Equipment damage.**
  - Combine CLM information, impact detection and GPS.
  - Create alert upon impact > X.
  - Notify & record.
  - Manage damaged equipment costs.

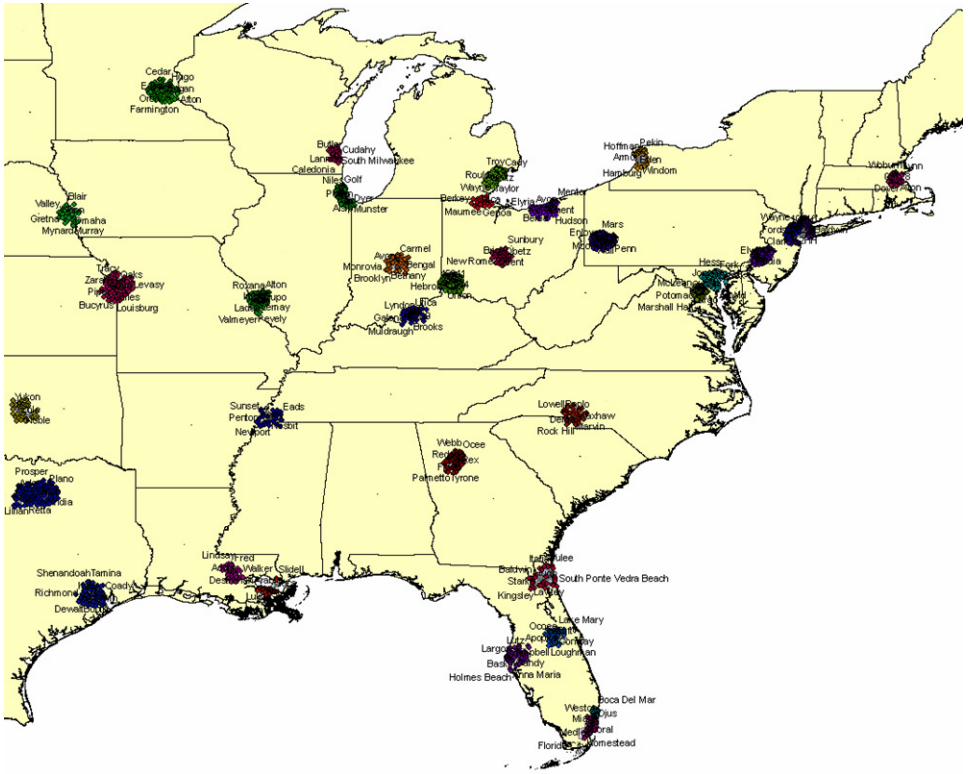
Potential Business Problem Resolution Examples - continued

- **Fleet utilization.**
  - Create geofences within facilities.
  - Identify when equipment has been moved into a loading area and then back out again.
    - Can link to constructive and actual placement events.
    - Now probably unloaded.
    - Can potentially use load/empty sensor to verify.
  - Follow-up with locations to get empty equipment released more quickly to reduce origin/destination dwell.
- **Out-of-route / reporting accuracy management.**
  - Compare GPS with CLM reported information.
  - Create alerts or queries to look for anomalies.
  - Follow-up on exceptions and resolve.
- **Staff utilization.**
  - GPS and dynamic ETAs provide site with most accurate information on likely arrival day/time.
  - Ensure staff present when required and NOT present when not required – reduce labor costs.

Potential Business Problem Resolution Examples - continued

- **HazMat security.**
  - Combine CLM, GPS, open/closed, and appropriate sensor data.
  - Create alerts by combining sensors and geofences appropriately.
    - Dome opened and not at origin or destination.
  - Notify first responders if required.
    - GIS system may have ability to identify first responders near equipment.
  - Poll entire fleet in case of national security events.
  - Management of hazardous shipments with high-threat urban areas (HTUA).





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Value-Added Services

- **Data completion.**
  - Leverage GPS data to properly assign CP/AP/W data.
  - Ensure proper detention / demurrage / private car storage fees.
- **Intervention.**
  - Leverage GPS data for better dialogue with railroads on shipments in exception status (where is the car really?):
    - Delayed
    - Bad ordered
    - Out-of-route
    - Storage & hold
- **Diversion management.**
  - Precise knowledge of car location enables proper diversion submission.
    - Correct status railroad.
    - Know if it is “too late” to divert the railcar.

Conclusion

- **Hardware providers have made significant progress:**
  - Power management.
  - Sensor technology.
  - Intrinsic safety.
- **Integration of traditional and telematics data provides significant value over just one or the other.**
- **Return on investment getting stronger with reduced equipment cost, increased life, and better ability to integrate data, software, & services.**
  - Device and service costs decreasing.
  - Power management increasing – lower total cost of ownership.
  - Increased value delivery through services – fleet utilization, maintenance costs, etc.
- **Pilot programs are very common across all industries at this point.**
  - Low risk & investment.
  - High probable return over time:
    - Improved fleet utilization.
    - Reduced maintenance costs.
    - Reduced personnel costs.

Mechanical Association of Railcar Technical Services

CARX 54 – Are We There Yet?

Mechanical Association of Railcar Technical Services

Don Loftis, Olin Corporation

Principle Software Engineer

- 28 years with Olin
- Primary designer and author of Olin's Distribution Control System
- Authored Olin's hazmat railcar/barge tracking software
- Member of Transportation Research Board HM-04 hazmat tracking project
- Involved with DHS, US Coast Guard, Battelle and Oak Ridge National laboratories on hazmat tracking projects
- B.S in Chemistry

Railcar Monitoring and Tracking

Olin Hazmat Tracking programs

Security

Logistics

Legislative and Industry Initiatives

Future Perspective

Don Loftis

Olin Corporation

C/A Division 423-336-4340

dbloftis@olin.com

Tracking Technologies

2 Basic Techniques

GPS Technology

- Current Location (Poll Units)
- Timed Reports Even if No-Movement
- Sensors are supported
- No Shipment Framing

Car Location Message
CLM - RFID

- Past Locations (No Polling)
- Event Reports No-Move=No Report
- Sensors are Not supported
- Shipments Are Framed

Functional System Diagram

Satellite

Cellular

Raw Data Collection Server

Olin DataBase

SAP

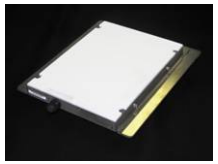
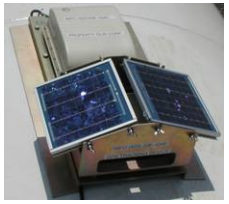
Rail CLMs

RFID AEI Reader

Olin Asset Locator Software

GPS Devices Tested

- Since 2004 – 200+ devices combining 8 vendors and 8 sensor types


- Devices selected to test differing technologies
  - Location determination (GPS, GLS)
  - Communication (Satellite, GSM-GPRS, Analog Cell)
  - Sensor Support (Analog, Digital)
  - Life Cycle Issues (Solar recharge, Battery Types)
- Reporting and alarming capabilities

Sensors Tested

- Cl2 Sensor (Alarms at 5 ppm)
  - In route Security
  - Environmental impact reduction (Return or Fix Car)
  - Customer offloading assessment (Customer Service)
- Hatch Open/Close Detection
  - In route Security (Off-site)
  - Infer Empty/full car messages for logistics data
- Seal/Break-wire Detection
  - In route Security (Off-site)
  - Incident Detection (Wire is Cut)
- Impact sensing
  - Railroad Behavior (specific switch yard feedback)
  - Incident Detection (Derailment, Explosion)
- Direct Empty/Full Sensing
  - Customer Behavior (Retention information)
- Photo Image returned with event alarm

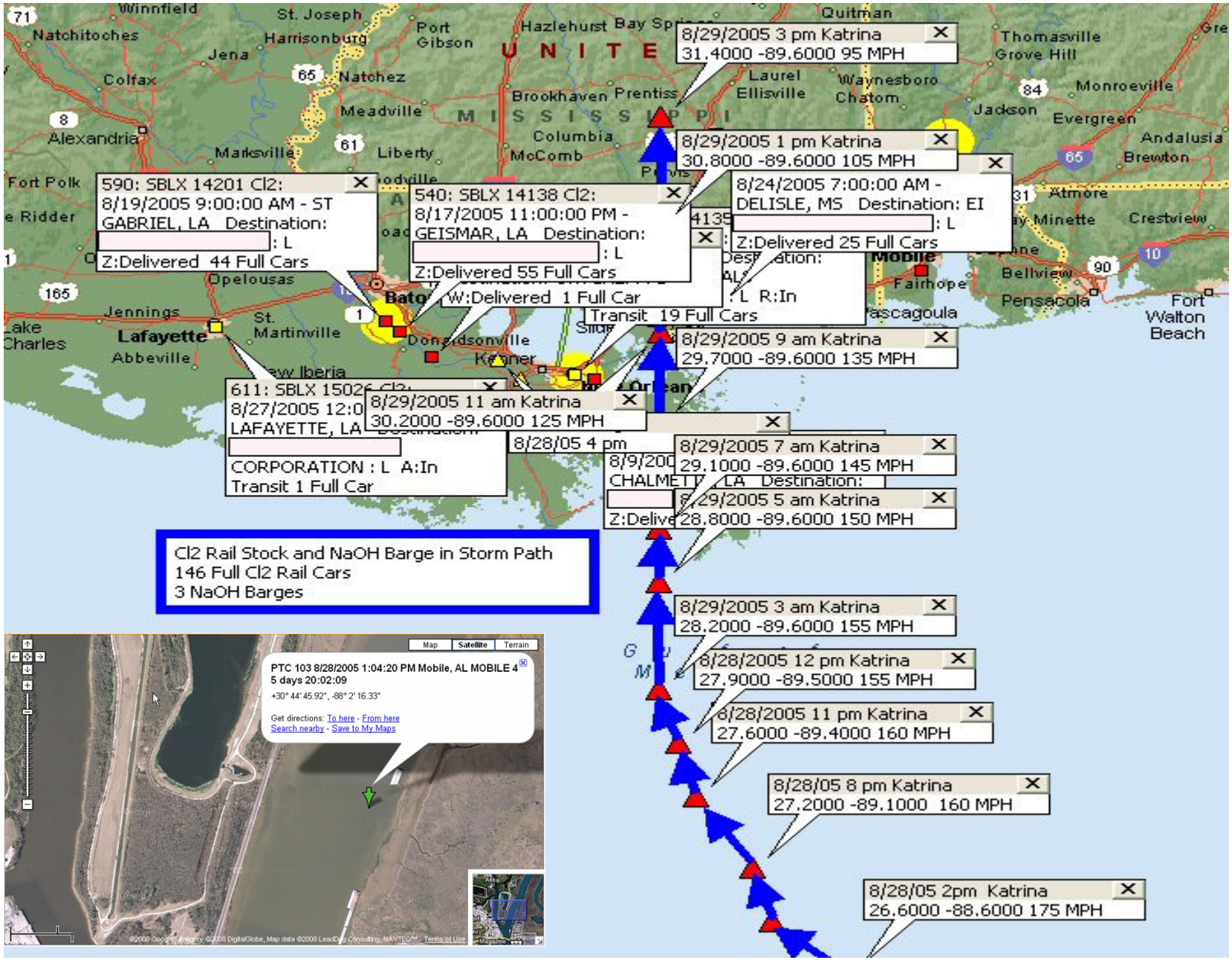
From: dataservice@Olin.com [mailto:dataservice@Olin.com]
Sent: Friday, August 01, 2008 10:15 PM
To: Loftis, Don CHAS
Subject: OLNX 114016, Alarm: OPEN, 0 ppm, 08/01/2008 9:48AM(EST), Charleston, TN

This is an automatic Olin.com Transportation alarm message.

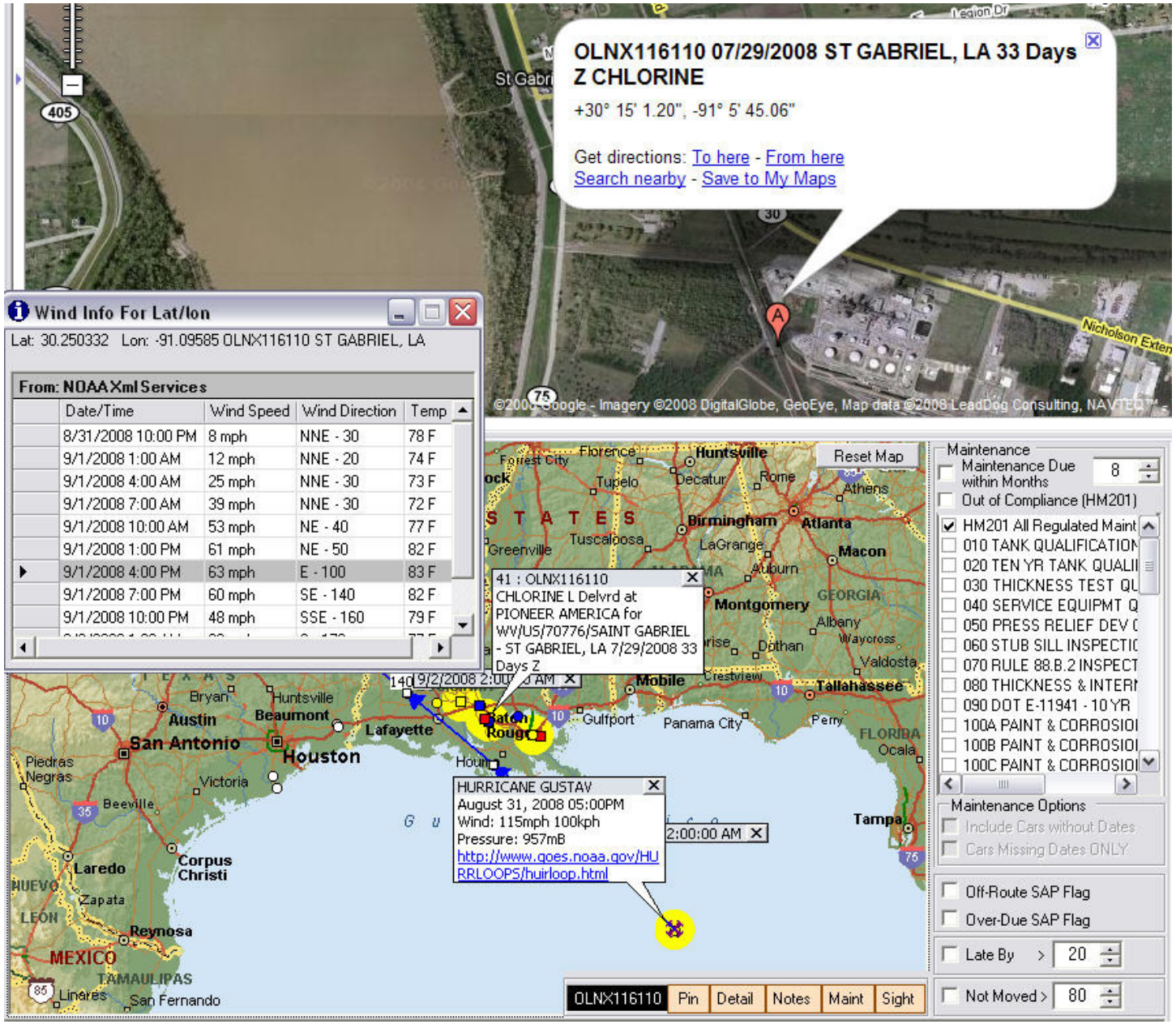
Customer:	Olin
Car Number:	OLNX 117063
Message Received:	Aug 1 2008 10:15AM(EST)
Message Created:	Aug 1 2008 9:48AM(EST)
Message:	Alarm: OPEN, 0 ppm
Location:	
	town: Charleston
	state: TN
	distance: 1.4091 mi
	bearing: 60.137 deg
Latitiude:	35.3042
Longitude:	-84.7736
Railroad:	NS
Extra Data:	

For additional information contact Olin 423-336-4340

Katrina Event Context



Gustav Event



Hazmat / Security

Maximize Response and Minimize Response Time

- Embedded Hazmat Response
- Integrated NWS wind speed, direction
- Hurricane and severe weather tracking
- Quick Proximity location and assessment
- RR Filters and HTUA Geo-fence
- Population Density Map (people/square Mi)
- Alarm differentiation and filtering
- Text messages and Email notifications

Logistics Filters

- Specific Cars, Specific Products
- Railcar locations based CLMs, GPS or Route
- Off Route Alarms
- Customer, Railroad, and City groupings
- Maintenance Overdue, History
- Late cars, No Movement cars, Detention cars
- Impacts, Alarms, Off-site events

Perspectives

- Logistics – Lifecycle Cost justified?
  - Vendors Business Model (on-going data service)
  - GPS Data more expensive than CLM Data
  - GPS needs to add value via sensors
  - Primary benefit is retention data
  - Minimize Environmental/Safety incidents
  - Difficult to justify GPS technology on logistics alone….

Industry Initiatives

- Chemtrec® – Response to Tracking Alarms
  - Define alarm filtering and response policies
  - Define auto-reporting protocol

- AAR -> RAILINC ®
  - Technical XML spec for sharing GPS tracking data between Shipper and Carrier
  - Enhanced CLM?

Pending Rules

- DHS/TSA (12/2007)
  - Positive documented chain of custody
  - Report location within designated Time
  - Codifies TSA inspection authority
  - Establishes security event reporting procedure
- DOT/PHMSA (12/2007)
  - Annual routing analysis for most secure route
  - Security Inspection before car is transported
  - Minimizes time TIH is waiting for pick-up
- Specifications on new Super Car design (4/2008)

Mechanical Association of Railcar Technical Services

CARX 54 – Are We There Yet?

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- Remote Monitoring Suppliers –
  - IONX, an Amsted Company, Booth 1201
  - VeriWise Rail, GE Equipment Services, Booth 3201
  - Eversee, Salco Technologies
  - RailRider, Lat-Lon, Booth 1322
  - RF Trax, A Fairfield Company, Booth 3321
  - Intellitrans, Transcore
  - ReeferTrak, Startrak

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Questions?

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