

# The advantages of high accuracy GIS field data collection in the Transportation Industry.

MGIS Overview Sergio Hernández



### The big question:

Where are our assets?

Where do we need improvements?



Where are our vehicles & equipment?

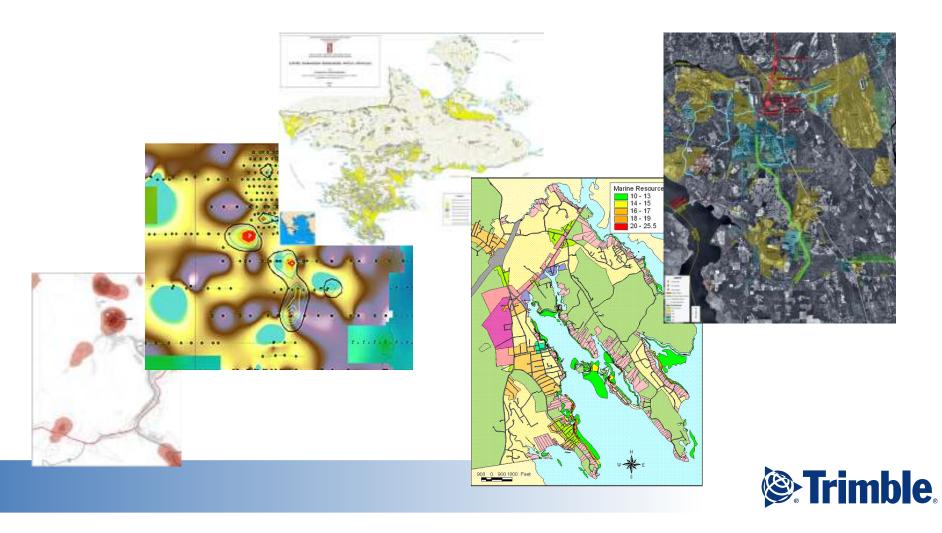
Where did we get this information?

Where are our field workers?



# Adding value to GIS

- Organizations utilize GIS to make critical decisions
  - But where is the data coming from?



# If GIS data collection is worth doing, it's worth doing right.





#### **Designed for GIS Data Collection**

- Systems designed specifically for GIS:
  - Data collection
  - Asset management
  - Inspection
- Professional-grade, integrated systems
  - Communications (data and voice)
  - High-res imaging & geotagging
  - Bright, sunlight-readable touch screens
  - Software and unique technologies for better productivity
  - Accurate offset measurements via laser rangefinder
  - GNSS accuracy up to 1cm in the hand





# **GIS Data Collection portfolio**

#### Integrated GNSS handhelds

- Trimble GeoExplorer 6 series
- Trimble Nomad® 900G series
- Trimble Juno 3 series

#### Modular GNSS receivers

- Trimble Pro 6 series
- Field computers
  - Trimble Yuma® rugged tablet





#### Software

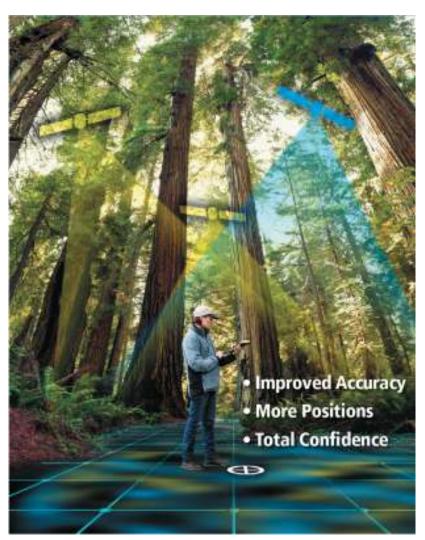
- Trimble TerraSync™ software
- Trimble GPS Pathfinder® Office software
- Trimble GPScorrect™ extension for Esri ArcPad
- Trimble GPS Analyst™ extension for Esri ArcGIS for Desktop
- Trimble Developer Community
  - Trimble Positions™ Toolkit
  - GPS Pathfinder Field Toolkit





### **Promoting productivity**

- Trimble Floodlight™ technology
  - Combats "GNSS shadows" so field workers can get the job done in the most challenging situations
- Simplifying field-to-officeto-field in Esri environment
  - Trimble Positions for Esri ArcGIS Mobile

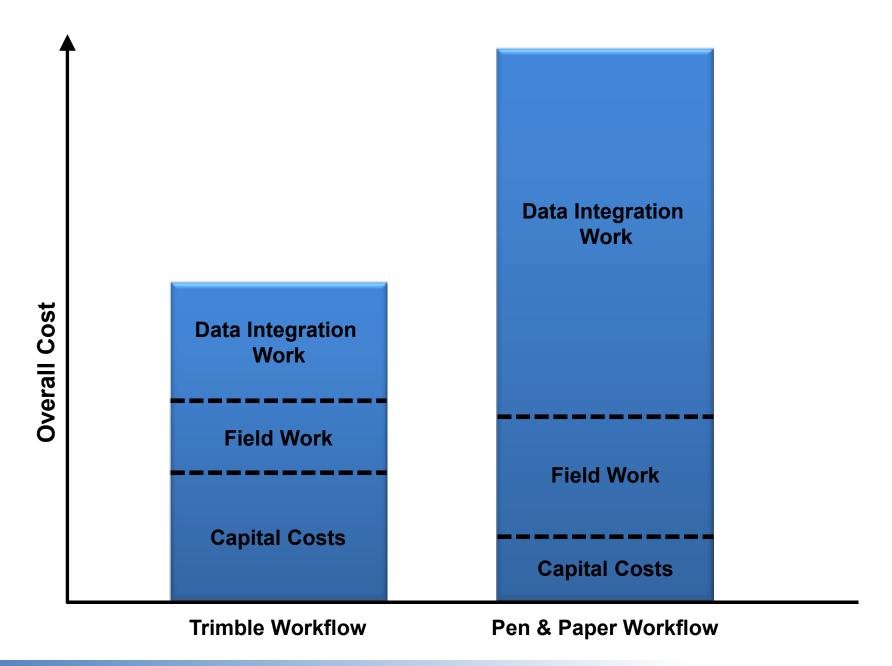




# Data Collection Method - Comparison

Characteristic/Item	Trimble workflow	Pen & Paper	Consumer Device
Field UI designed for GIS data collection	✓	?	X
Digital, fixed field/mandatory data entry	✓	X	X
Office software offering GIS integration	✓	X	X
Data immediacy	✓	X	X
Retain knowledge (eliminate brain drain)	✓	X	X
Field crews stay on task at hand - Secure data store omits loss (reduces trips)	✓	x	X
Field-to-Office workflow is streamlined	✓	X	X
Detailed attribution core to solution	✓	X	X
Reliable and consistent spatial link - Accuracy metadata	✓	X	X







# If GIS data collection is worth doing, it's worth doing right.





#### **Customer Success Stories**



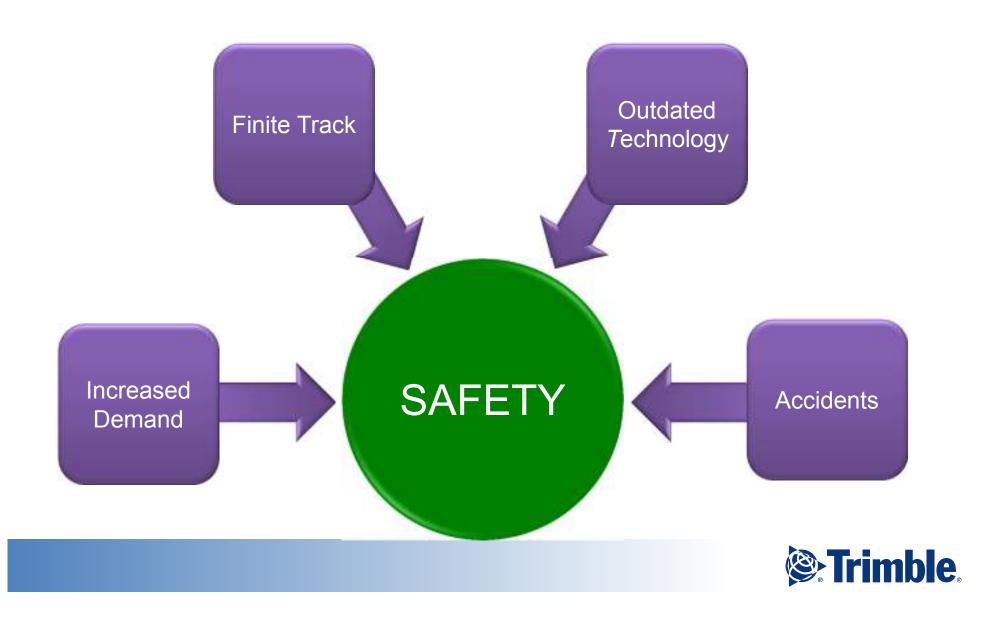
#### Norfolk Southern "NS Mobile" solution

- Developed for Norfolk Southern railroad company in conjunction with Trimble Market Solutions Team (MST)
- Driven by the mandate for Positive Train Control





# A description of the problem



## **Positive Train Control (PTC)**

- Overrides locomotive control when necessary
  - Prevent over-speed
  - Avoid signal and authority violations
  - Protect track crews
  - Prevent movement through a track switch in the wrong position



# **Positive Train Control (PTC)**

- Improve railroad efficiency
- Interoperable systems
- Estimated 20,000 locomotives and 100,000mi of track to be equipped



#### **The PTC Mandate**

- US & Canadian Railroads
- Rail Safety Act of 2008 (RSIA) mandated PTC
  - Systems will be up and running January 1, 2016
- Class 1 railroads leading the way
  - CSX



Norfolk Southern



BNSF



Union Pacific





# Norfolk Southern – Positive Train Control

#### Goals

Map all critical assets for Positive Train
 Control

#### Challenges

- ~500 Roadmasters each responsible for anywhere for 20-150 miles of track
- Data collection is not their primary job
- Time critical GIS updates











### **Domain Knowledge**

- Trimble gained this knowledge by engaging with them as a consultant
  - Developed the Trimble Positions Toolkit and software suite as a result of this engagement

Barlett & West integrated with ArcGIS for Mobile SDK.

- Key requirements
  - Mandate to map critical assets
  - Capacity of backend throughput
  - Timeliness of data
  - Complex in-field data validation
  - Simplicity for fieldworker





### The Asset Management Challenge

- The GIS Contribution & High Level Requirements
  - Develop a change management system that accepts, validates, processes, stores, and distributes changes of critical assets
  - System must be:
    - Reliable
    - Accurate
    - Timely



#### **GPS/GIS** contribution to PTC

- Create a track database that describes the network and wayside assets
- Keep the track database updated as changes occur in the field
- Accuracy requirements:
  - 1.3m horizontal (XY)
  - 0.8m vertical (Z elevation)
  - Must be verifiable to FRA



#### Tools for the job

- Disconnected users
- Distributed geographically
- Business rules to enforce
- Timely and efficient data upload and integration



#### **ArcGIS**

A Pervasive System for Geographic Information

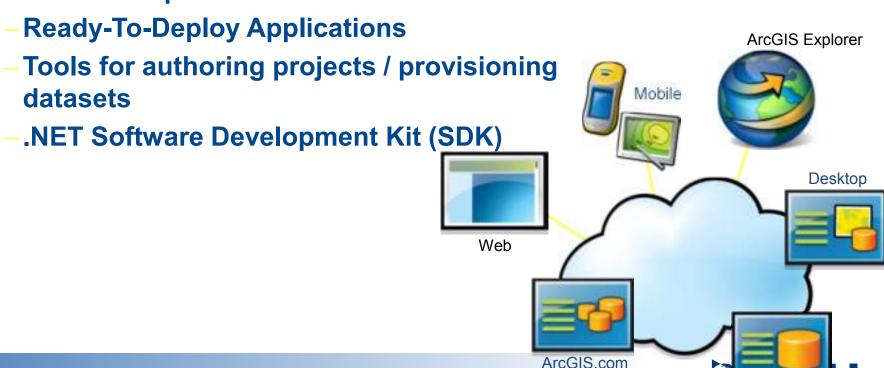




#### What Is ArcGIS Mobile?

**Enterprise Ready GIS...** 

- ArcGIS Mobile is the technology framework that extends the reach of GIS to the field
- ArcGIS Mobile provides:



#### What are the benefits of ArcGIS Mobile?

Increases value of your enterprise GIS

#### 3 key benefits of a Mobile GIS Solution:

- Improve Efficiency and Accuracy of Field Operations
- Rapid Data Collection and Seamless Data Integration
- Helps to Make Informed and Timely Decisions



Damage Assessment



Location awareness and collaboration



Locating and Inspecting Assets



### **ArcGIS Mobile Field Applications**

Simple, Scalable Map Viewing, Data Collection, and Field Collaboration ...

- Quick and Easy Deployment of Maps, Apps & Projects
- Task-based, Workflow Driven User Experience
- Synchronization of Data between Field & Office
- Local Caching of Data
- Platforms:
  - Windows XP, Vista,Windows 7
  - Windows Mobile



#### **ArcGIS Mobile SDK**

Rapid Application Development...

- Coarse-grained .NET SDK
  - Extend field applications
  - Create focused Mobile GIS applications
  - Embed ArcGIS into existing line of business applications
- Download from Customer Care Portal
- Help and Samples location at ArcGIS Mobile Resource Center





## Capabilities (Applications and APIs)

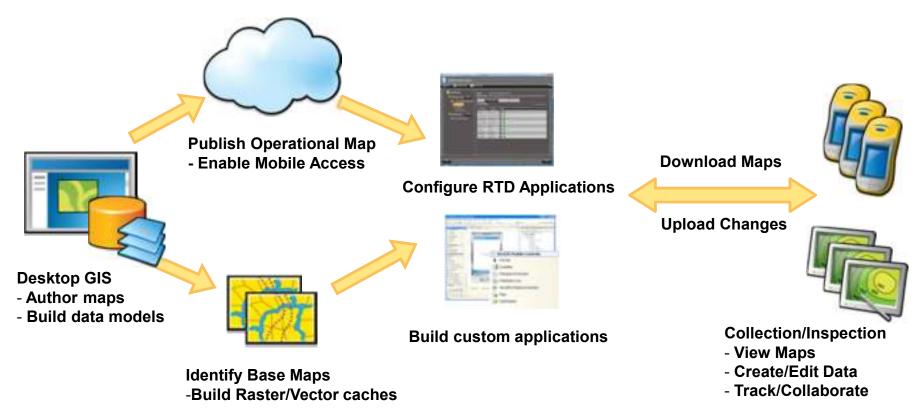
- Map Viewing
  - Connected/Disconnected use
  - Operational/Base maps
  - Identify/Measure Locations
- Simple, Task-driven data collection tools
  - Map sketching and coordinate entry
  - Datum transformation supported
- Forms collection
  - Data validation
  - Media capture
  - Table joins via ADO.Net data tables
- Synchronize Changes
  - Store and forward using web services
  - Check-in/Check-out transactions
- Query/Search Data & Collections
  - Spatial and non-spatial queries
- GPS Tracking and Collaboration
  - User identity/sign in
  - Log field use by time/distance
  - Collaborate w/ field co-workers in the field





# **Deployment & Field Workflow**

Scalable Server-centric deployment





## Rounding out the solution

- Requirement for high accuracy GPS data
- Work within ArcGIS Mobile workflow



#### Success

- 3-400 GeoExplorer receivers and Trimble Positions toolkit licenses
- Higher (50cm) accuracy having added benefits
  - Better braking algorithms
  - Optimising service on utilities for shacks and power houses

Looking at the next application around inventory rail defects

e.g. welding



### What is the opportunity?

- Post processing in ArcGIS Mobile environment
- Trimble GNSS receiver control and configuration
- Enterprise solution
- Extendible to any ArcGIS Mobile SDK-based application



# **Get Trimble Positions, Get Data Confidence**



Data quality you can trust





### **Supported Platforms & Technologies**

#### Esri

- ArcGIS for Desktop 10.1 Standard or Advanced editio
- ArcGIS for Windows Mobile 3.x
- ArcGIS Mobile Project Center 3.x
- File or enterprise geodatabase

#### Trimble

- Juno® 3B/3D & SB/SC/SD handhelds
- GeoExplorer <sup>®</sup> 6000 & 3000 series handhelds\*
- Pro 6T/6H and GPS Pathfinder ® Pro XT™/XH™ re
- Nomad <sup>®</sup> 900G series handhelds





# Questions

