Positioning Aware Solutions for Smart Grid

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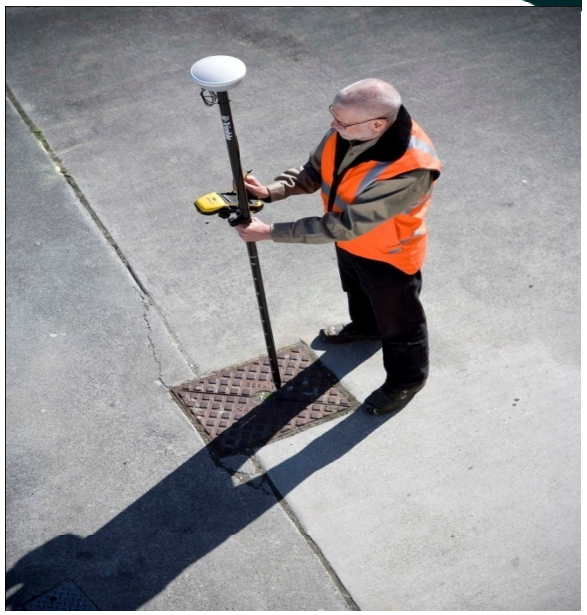
Enterprise Geospatial & Business Development Manager- GIS DC
(Trimble, MEIA Region)

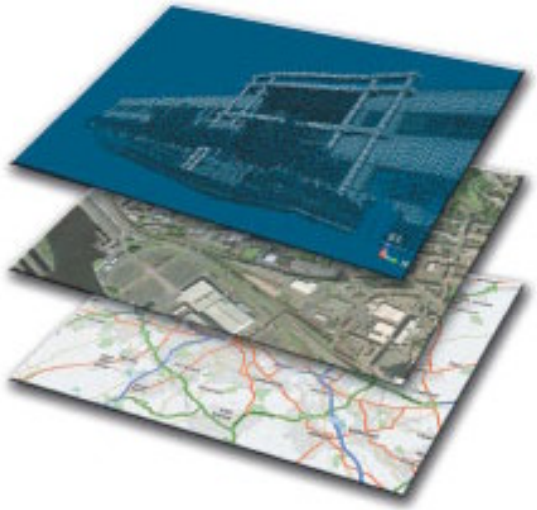
Agenda:

- Overview: Position-aware solutions for Smart Grid
- Handheld based solutions
- Field Inspection and Maintenance Solution
- Outage Management Solution
- Mass Data Collection Solutions- Aerial and Terrestrial Lidar Solution

Overview: Position-aware solutions for Smart Grid

- Gain geospatial context in the field and back office in real time
- Improve speed and efficiency of data collection
- Improve quality of service and quality of information
- Generate ROI and return on geospatial assets
- Eliminate paper maps and forms





Handheld based solutions

Trimble Juno Series

Juno SA

Juno 3B/3D

Juno 5B/5D

Juno 5D

WEHH	WEHH	WEHH	Android
• Ready to use any windows base GIS application & Trimble Mapping software in the field • Low cost per user • Windows 6.1 Mobile handheld with 3.5” Screen • 2-5 Meter Real Time Accuracy in the field • 1-3 Meter Accuracy with Post-Processing	• Ready to use any windows base GIS application & Trimble Mapping software in the field • Connectivity with office and field for real-time results • Windows 6.5 Mobile Handheld with 3.5” Screen • 5 MP Camera with Geo-tagging facility • 2-5 Meter Real Time Accuracy in the field • 1-3 Meter Accuracy with Post-Processing	• Built for GIS field workflow • Rugged Device (IP 65) for different field conditions • Smart phone form factor with 8 MP Camera & 4.3” Screen • Reading capability of 1D and 2D barcode • 2-4 Meter Real Time Accuracy • 2-4 Meter Accuracy with Post-Processing	• Available in Android • All features available, as in WEHH

Trimble Geo Series

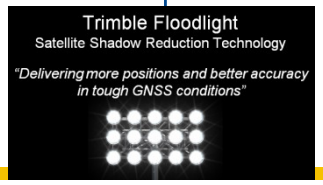
Geo 5

Geo XT 6000

Geo XH 6000

Geo 7

WEHH	WEHH	WEHH	WEHH
• Windows Mobile 6.5 based Handheld with 45 Channels (GPS, GLONASS, SBAS) • Sunlight Readable 3.5” Screen with 3 MP Camera • Compatible with Trimble MGIS Software and any windows based GIS Application • Work as Base Station also in the field • Sub-meter Accuracy in the field	• Handheld computer with integrated high accuracy GNSS • Exceptional GNSS performance in difficult environments • 4.2” Sunlight Readable Screen with 5 MP Camera • Work Rover as well as Base for Sub-meter Accuracy • Field Connectivity with 3.5G Modem • Field Swappable Battery with 11 hours operation	• Handheld computer with integrated high accuracy GNSS • Exceptional GNSS performance in difficult environments • 4.2” Sunlight Readable Screen with 5 MP Camera • Work Rover as well as Base for Decimetre and CM Accuracy • Field Connectivity with 3.5G Modem • Field Swappable Battery with 11 hours operation	• Handheld computer with integrated high accuracy GNSS • For Decimetre & CM Accuracy in the field • Free installed Rangefinder Utility • Trimble Flight-wave Technology • Powerful, economic and rugged unit



Trimble GPS Pathfinder Series

GPS Pathfinder ProXRT

Pro 6H/6T

GPS Pathfinder ProXRT	Pro 6H/6T
• Flexible GNSS Receiver with Real-Time Decimeter Accuracy • Omnistar Capability • Rugged Unit (IP67) with 13 Hours Battery Backup in the field • NMEA Option • Work with Trimble MGIS Handheld units	• High accuracy GNSS positioning system • Easy to use in the field, Bag pack is available • Work with Trimble MGIS Handheld units • For Decimeter & Sub-meter accuracy

Trimble Yuma 2 Rugged Tablet

Yuma 2

Yuma 2

- Capacitive display, Integration of Reflective and Transmissive Technologies
- Take the full GIS in the field
- Windows 7 operating system
- Hard Drive storage capacity, Dual-mode 3.75G Data Communication option, extended Life batteries, color choices
- Military Standard Rugged unit
- 2-4 meter accuracy in the field
- Duel Camera option available

Trimble Nomad

Nomad

Nomad

- Rugged Unit with IP68 rating
- Work in extreme temperature
- Windows 6.1 Mobile Handheld
- RS 232, USB, Bluetooth & Wi-Fi as connectivity option
- Barcode Scanner facility
- 3.5” Display
- Compatible with Trimble MGIS Software & and mobile base GIS application
- 5 MP Autofocus Camera
- 2-5 Meter Real Time Accuracy

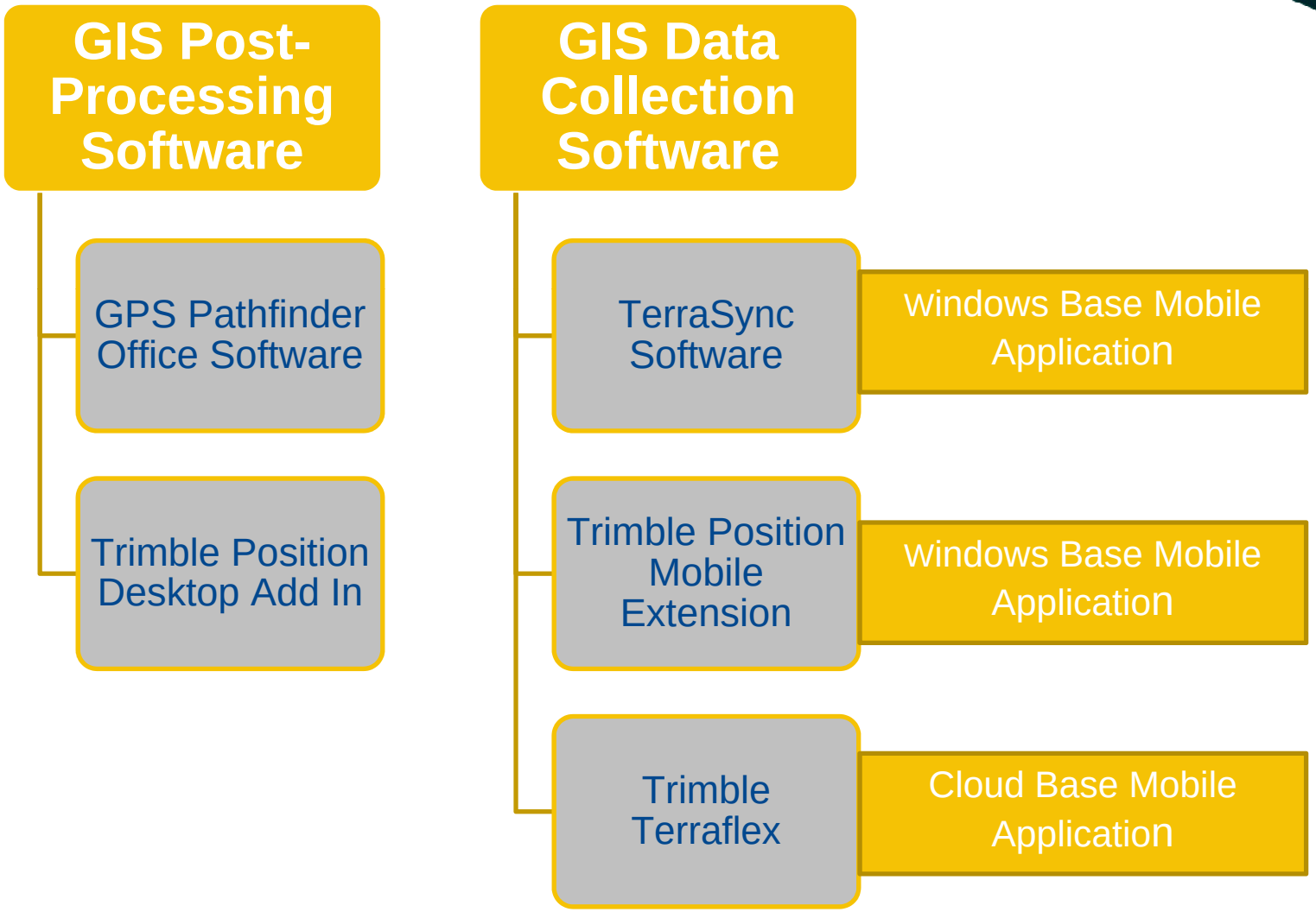
Trimble LaserAce 1000 Rangefinder

LaserAce 1000

LaserAce 1000

- Easy to use, Collect Remote Measurements
- Increase productivity with Safely Data collection
- Collect X,Y,Z with the help of Bearings, when collect Tree, Pole heights etc.
- Rugged Hardware with IP63
- Bluetooth can connect with Trimble MGIS Handhelds

Trimble MGIS Software



Utility Asset Mapping

Case Study-1

R-APDRP Project in India

Electricity – Asset Inventory

R-APDRP in India

Restructured Accelerated Power Development & Reforms Program for Electric Distribution Companies in India

APDRP Field Data Requirements

- DGPS Survey
- Field Data Collection
- Differential Correction of Raw GPS Data
- Exporting the Data into GIS
- Accuracy of Sub Meter Level (< 1 M)
- Asset Co-ordinates- Longitude & Latitude
- Regular Maintenance & Update of Field Data
- Establish Ground Control point Network
- UTM-WGS84

Utility Asset Mapping

Case Study-2

Kenya Power Pre-Paid Meter & Asset mapping

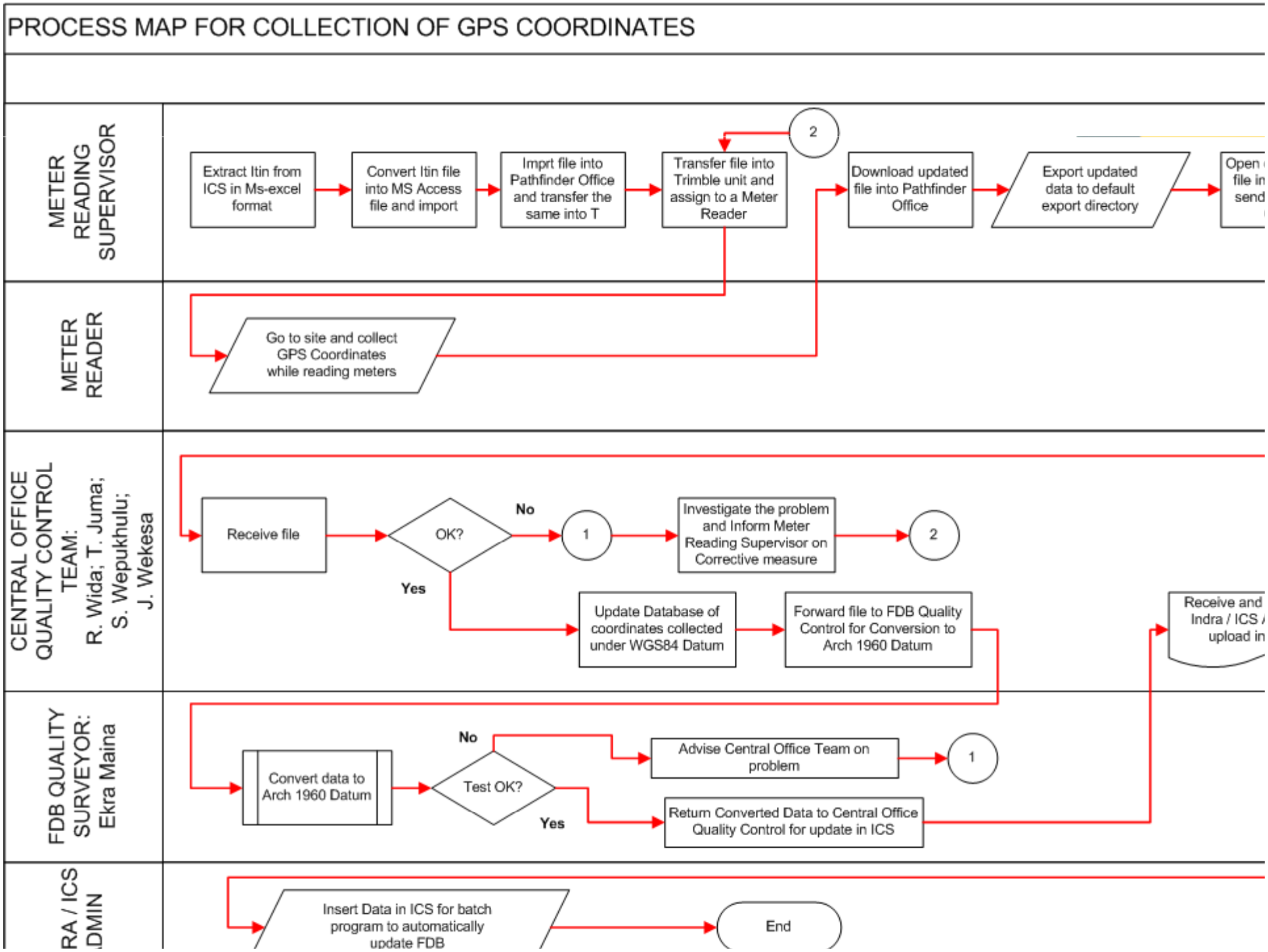
First Pilot Area

- Sportsview Estate in Kasarani, Nairobi North, which was the pilot area for the prepaid metering system

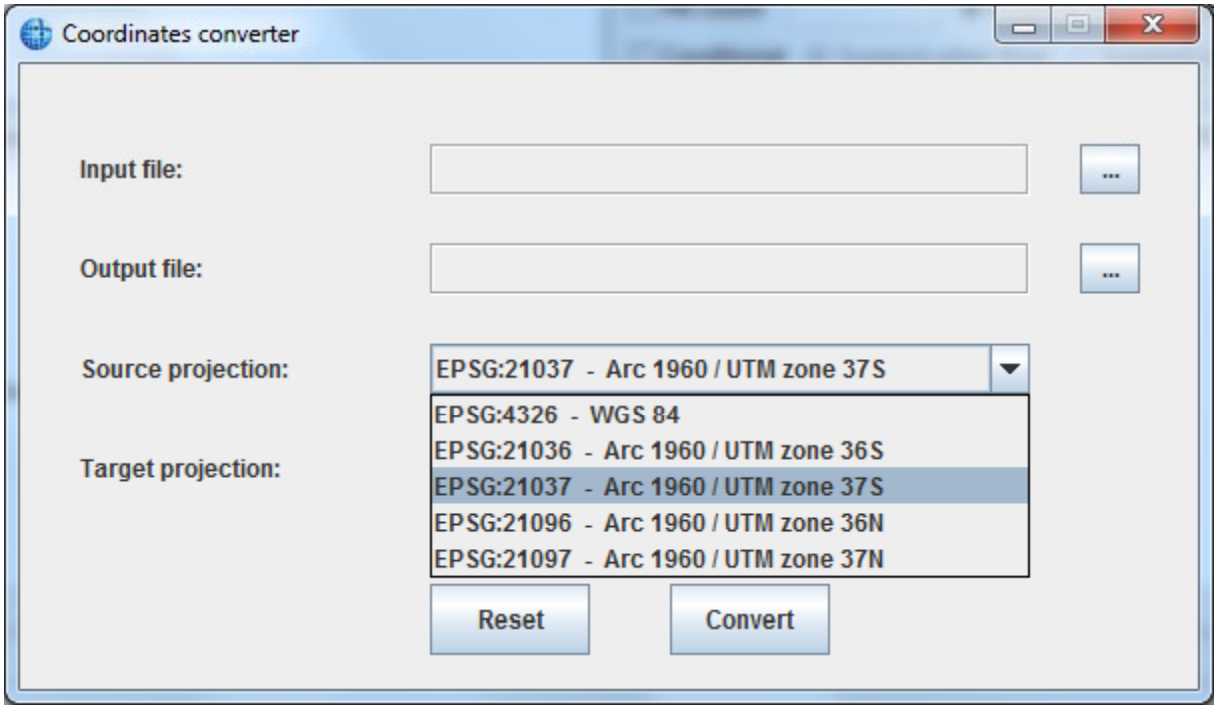
This map shows the area of study which is one of pilot areas the prepaid metering system was carried out

36°52'51.638"E 11°9'29.376"S

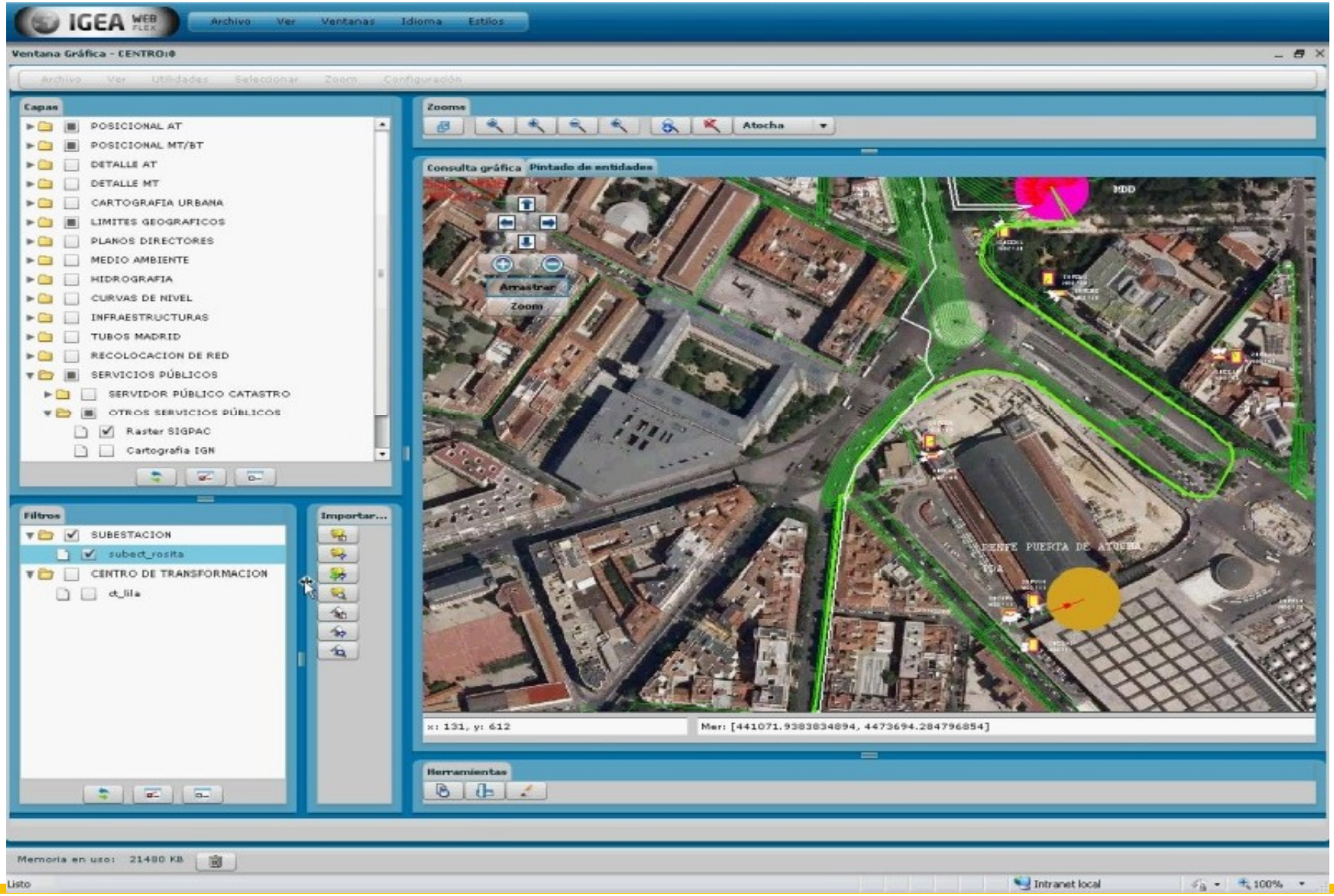
PROCESS MAP FOR COLLECTION OF GPS COORDINATES



CONVERSION TOOL FROM WGS-84 TO ARC 1960

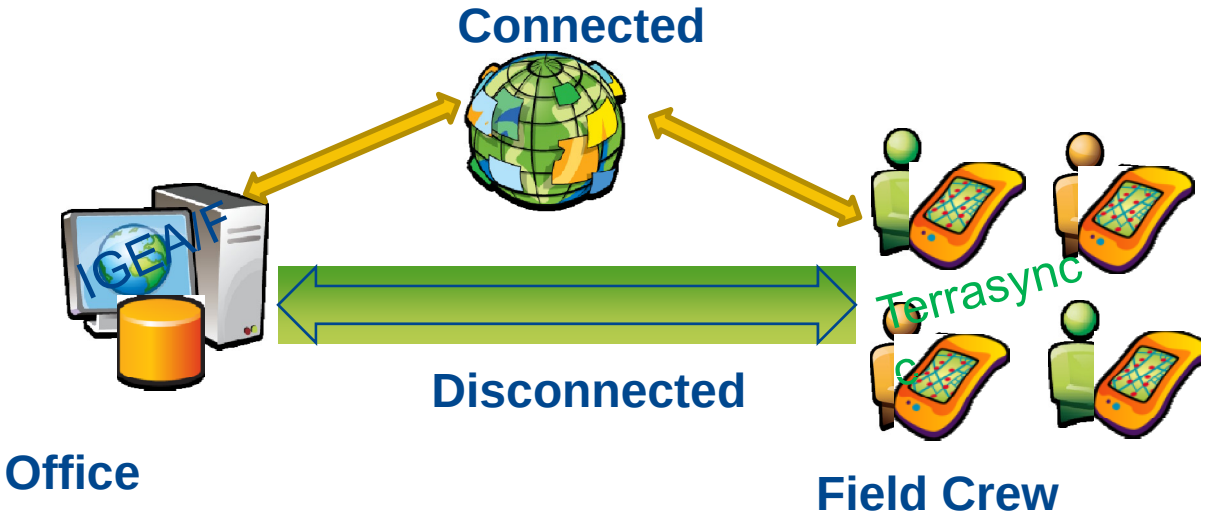


KENYA POWER GIS

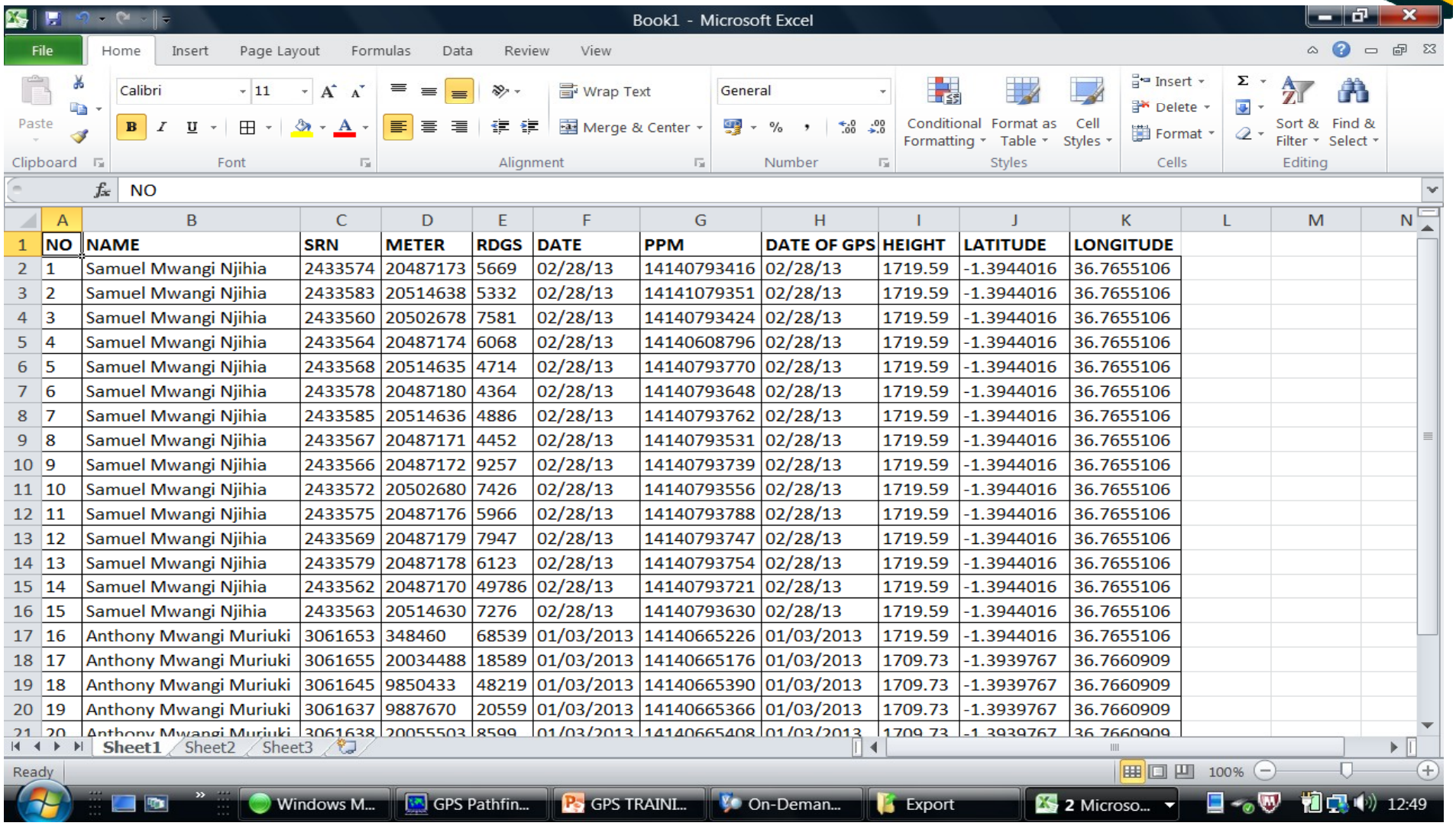


Kenya Power Workflow:

- Update the spatial records only
- Update server on a real-time basis at KPLC HQ
- Update the prepaid meter numbers using the barcode reader
- If no record of the meter exists it captures coordinates as new feature and prompts one to enter attribute details on the data collection form.



GPS COORDINATES FORMAT FROM FILE IN .CSV



NO	NAME	SRN	METER	RDGS	DATE	PPM	DATE OF GPS	HEIGHT	LATITUDE	LONGITUDE
1	Samuel Mwangi Njihia	2433574	20487173	5669	02/28/13	14140793416	02/28/13	1719.59	-1.3944016	36.7655106
2	Samuel Mwangi Njihia	2433583	20514638	5332	02/28/13	14141079351	02/28/13	1719.59	-1.3944016	36.7655106
3	Samuel Mwangi Njihia	2433560	20502678	7581	02/28/13	14140793424	02/28/13	1719.59	-1.3944016	36.7655106
4	Samuel Mwangi Njihia	2433564	20487174	6068	02/28/13	14140608796	02/28/13	1719.59	-1.3944016	36.7655106
5	Samuel Mwangi Njihia	2433568	20514635	4714	02/28/13	14140793770	02/28/13	1719.59	-1.3944016	36.7655106
6	Samuel Mwangi Njihia	2433578	20487180	4364	02/28/13	14140793648	02/28/13	1719.59	-1.3944016	36.7655106
7	Samuel Mwangi Njihia	2433585	20514636	4886	02/28/13	14140793762	02/28/13	1719.59	-1.3944016	36.7655106
8	Samuel Mwangi Njihia	2433567	20487171	4452	02/28/13	14140793531	02/28/13	1719.59	-1.3944016	36.7655106
9	Samuel Mwangi Njihia	2433566	20487172	9257	02/28/13	14140793739	02/28/13	1719.59	-1.3944016	36.7655106
10	Samuel Mwangi Njihia	2433572	20502680	7426	02/28/13	14140793556	02/28/13	1719.59	-1.3944016	36.7655106
11	Samuel Mwangi Njihia	2433575	20487176	5966	02/28/13	14140793788	02/28/13	1719.59	-1.3944016	36.7655106
12	Samuel Mwangi Njihia	2433569	20487179	7947	02/28/13	14140793747	02/28/13	1719.59	-1.3944016	36.7655106
13	Samuel Mwangi Njihia	2433579	20487178	6123	02/28/13	14140793754	02/28/13	1719.59	-1.3944016	36.7655106
14	Samuel Mwangi Njihia	2433562	20487170	49786	02/28/13	14140793721	02/28/13	1719.59	-1.3944016	36.7655106
15	Samuel Mwangi Njihia	2433563	20514630	7276	02/28/13	14140793630	02/28/13	1719.59	-1.3944016	36.7655106
16	Anthony Mwangi Muriuki	3061653	348460	68539	01/03/2013	14140665226	01/03/2013	1719.59	-1.3944016	36.7655106
17	Anthony Mwangi Muriuki	3061655	20034488	18589	01/03/2013	14140665176	01/03/2013	1709.73	-1.3939767	36.7660909
18	Anthony Mwangi Muriuki	3061645	9850433	48219	01/03/2013	14140665390	01/03/2013	1709.73	-1.3939767	36.7660909
19	Anthony Mwangi Muriuki	3061637	9887670	20559	01/03/2013	14140665366	01/03/2013	1709.73	-1.3939767	36.7660909
20	Anthony Mwangi Muriuki	3061638	20055503	8599	01/03/2013	14140665408	01/03/2013	1709.73	-1.3939767	36.7660909

GPS UNIT USED

Kenya Power GPS Units:

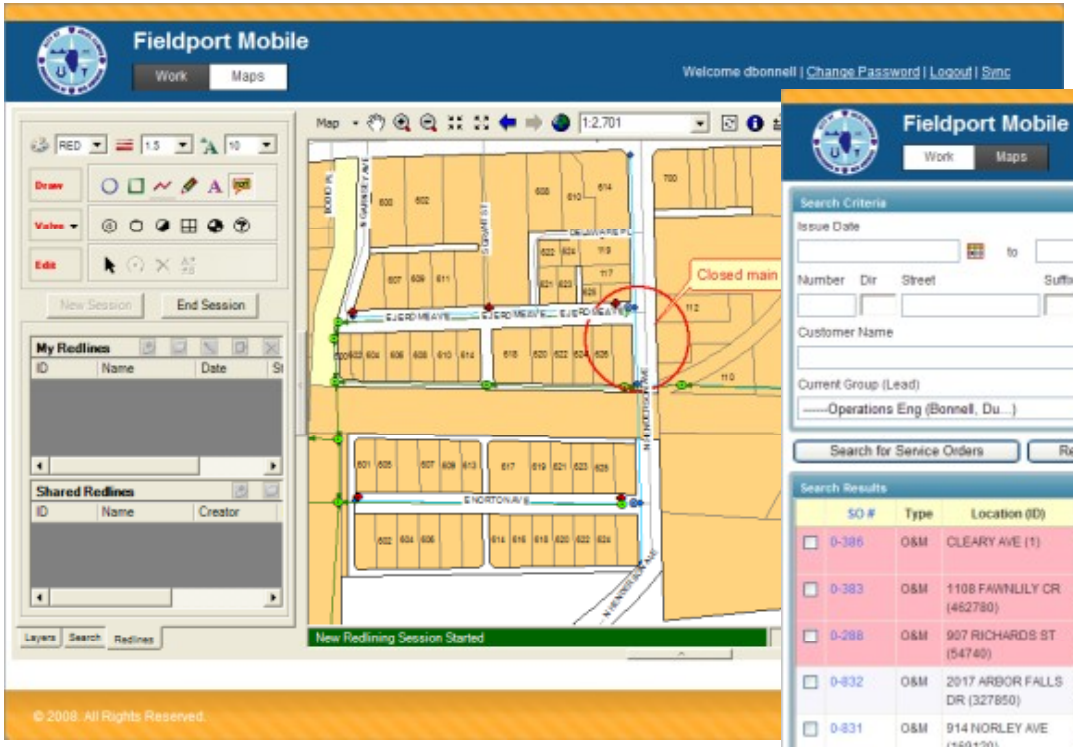
- Nomad- 1700+
- Geo 6000- 60
- Terrasync Professional
- Pathfinder Office- 75+

Trimble

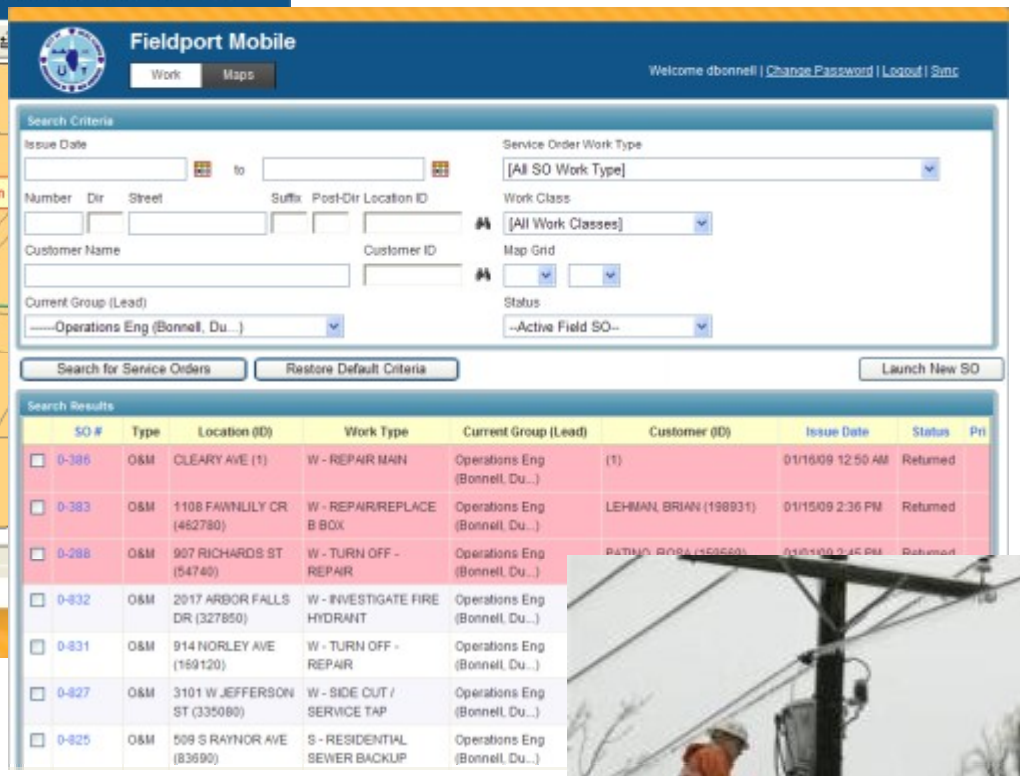
transforming the way the world works

Field Inspection and Maintenance Solution

GIS and GPS Based Utility Field Work Management – Field Inspector



Integrated Work Queue
Single List of CIS, O&M Work Orders



Mobile GIS and GPS
Maps and Redlines Shared with Field Crews

Field Inspection

Private water utility serving the City of Baton Rouge Louisiana

Accurate GIS maps in the field

Eliminate inspection paperwork

Improve asset management information

Increase worker productivity

"We've certainly optimized our processes for locating assets, updating maps and drawings, sharing information, and handling repairs using mobile GIS. Having access to the GIS has become an integral part of our field workers' jobs." Ryan Scardina, Technical Services Supervisor

Automate Meter Change Outs

Automate workflows, improve GPS precision and data quality, for improved accuracy, productivity and reduced costs

- **Centrally manage meter deployments and change-outs**
- **Use high accuracy GPS to identify meter locations**
- **Accurately record data using barcodes and digital photos**
- **Direct meter communications via internal or external manufacturer radio integration**

GIS Spatial View of Meters and Work

Location-Aware Work List and Route for Meter Change Out

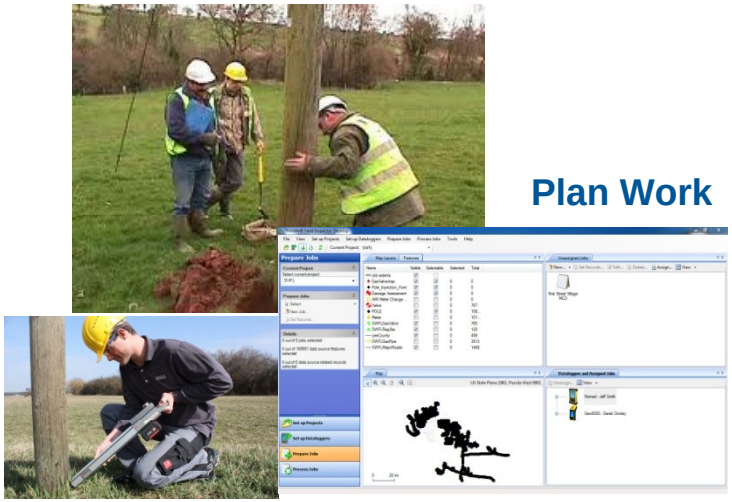
Scan Meter Barcodes and Capture Digital Photos

Complete Meter Work Order with Data Validation

Enhance Utility Pole Inspections

Proactively inspect aging and neglected poles for reduced outages, maximized joint use revenue, and improved system reliability

- **Eliminate the paper record keeping process**
- **Instantly record the location and condition of poles**
- **Verify joint-use attachments for accounting audits**
- **Capture photographs of pole as well as time and date of inspection**



Plan Work

Transmission Line Inspections

Safely and accurately perform construction and maintenance inspections on critical electric transmission lines

- **Accurately record the location of encroaching vegetation or report upon the status previous encroaching vegetation**
- **Report upon the condition of access roads and locked gates**
- **Eliminate the need for paper or a laptop while patrolling lines**
- **Instantly notify management of broken equipment**

Track and Assess Damage in the Field

Automatically notify operations managers of the condition of assets soon after major events such as storms, fires, and accidents

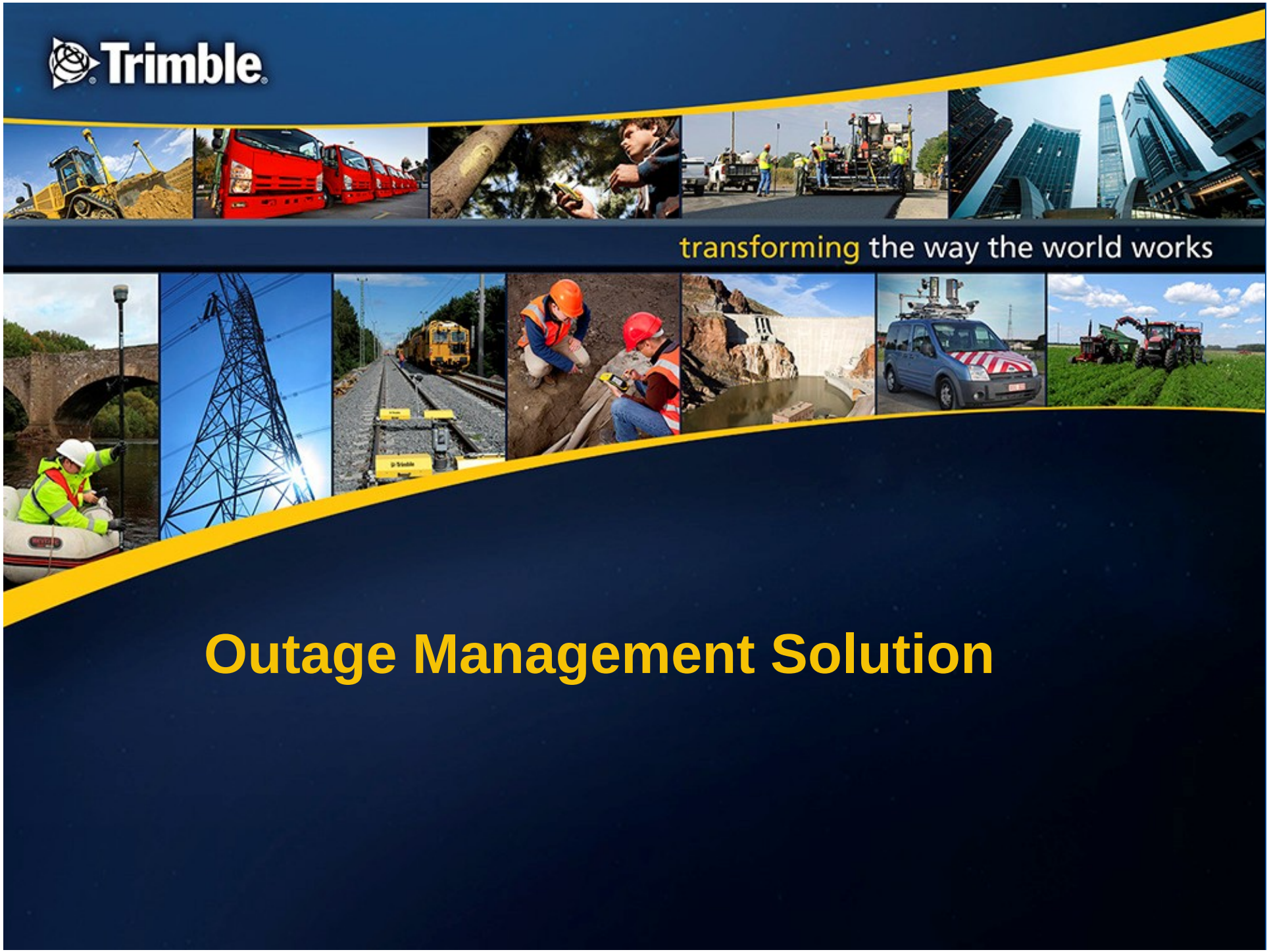
- **Efficient reporting for unplanned events**
- **Quickly assess damage to help set restoration priorities**
- **Capture GPS, photos and GIS redlines of affected areas**
- **Integrated directly with your GIS, Outage and facility management programs**

Damage Assessment Areas

Navigate to Pole

Record Damage Data

Make Redline Notes on Map



Outage Management Solution

Serving a Range of Utilities Segments

Electric ● **Gas** ● **Water** ● **Communications**

Initial Planning	Project Management	Site Preparation	Construction	Operations	Maintenance
•Feasibility planning •Route selection •Route Optimization	•Integrated Lifecycle Management •Budget and Schedule Management	•Heavy Construction •Fleet Management •Schedule and Dispatch •Construction Asset Management •GPS Survey •Optical Survey •Work Management	•Heavy Construction •Fleet Management •Schedule and Dispatch •Construction Asset Management •Spatial Imaging •GPS Survey •Optical Survey •Work Management •Building Information Management •Mobile Computing	•Fleet Management •Schedule and Dispatch •Work Management •Asset Management •Outage Management •GIS Data Collection •GIS Data Maintenance •GIS Data Use •Mobile Computing	•Fleet Management •Schedule and Dispatch •Work Management •Asset Management •Outage Management •Geospatial •GIS Data Collection •GIS Data Maintenance •GIS Data Use •Mobile Computing

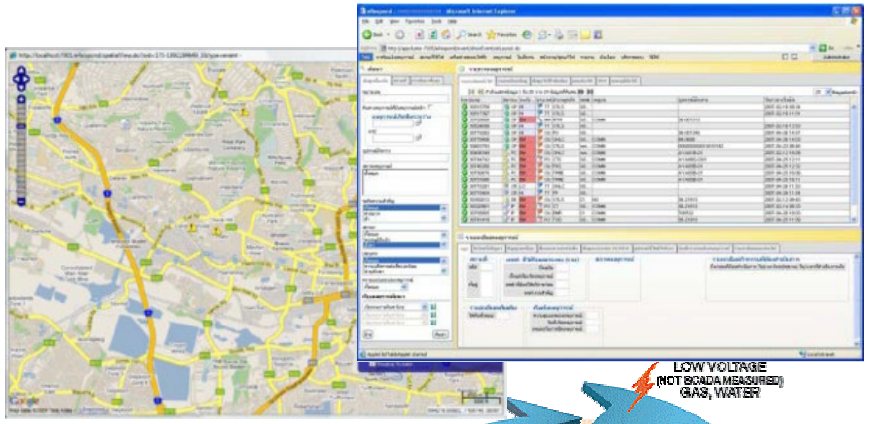
Trimble eRespond™ Software

Utility Incident and Outage Management System (OMS) Solution

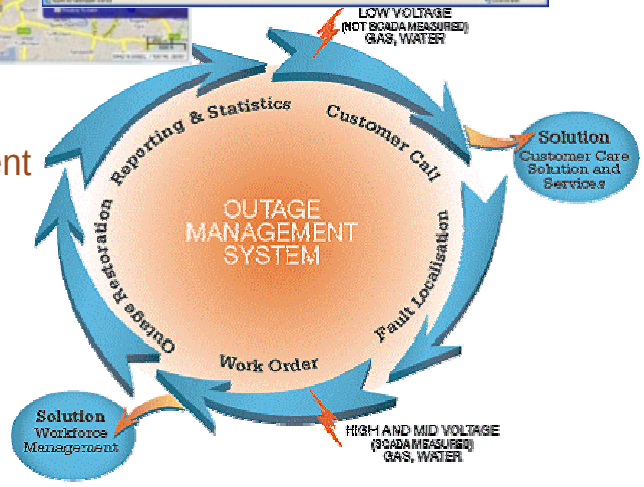
Application Features:

- Network Model Management
- Incident Identification and Management
- Customer Premise Data Management
- Contact Management
- Workforce and Dispatch Management
- Back-office System Interfaces

Incident and Outage Identification and Management



Customer Contact and Workforce Management



Electricity – Outage Management eRespond

PEA in Thailand

Provincial Electricity Authority

Project with SIEMENS ED and IBM

15,000,000 meters

200 concurrent users

3,000 user accounts

Many remote users

High volume testing

Localized in Thai

First region live August 2009

Mass Data Collection Solutions- Aerial and Terrestrial Lidar Solution

DATA COLLECTION → DATA PROCESSING → INFORMATION EXTRACTION

LAND

Mobile Data Capture for Imaging
Mobile Data Capture for GIS
Mobile Spatial Imaging

Trimble Trident 3D Analyst:
Spatial Imaging, GIS, & Road sign Extraction

AERIAL

Aerial Cameras & Imaging
Aerial Laser Scanning & Imaging
Direct Georeferencing & Flight Mgt

Inpho Software:
Photogrammetry & Laser Scanning
Processing (DTM)

Trimble inpho™

eCognition Software:
Geospatial Data Fusion
Object Based Analysis

eCognition®

SATELLITE

Complete Geospatial Workflows

Aerial Mapping

Geospatial Aerial Workflow & Products

Flight Management

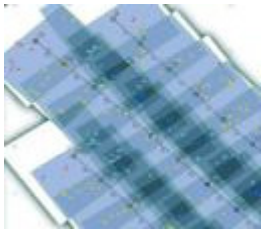
- Flight management system
- Direct Georeferencing System

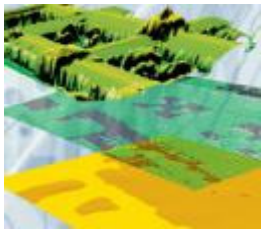
Data Acquisition

- Optical Sensors
- LiDAR Sensors

Data Preparation

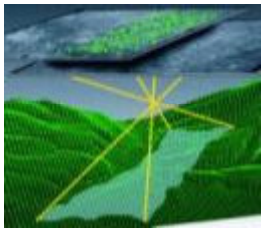
- Image Mosaicing
- Point Cloud Matching





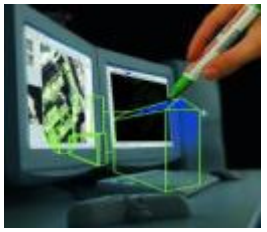
Data Processing

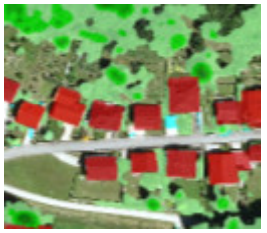
- Orthophoto production
- Point cloud processing
- DSM / DTM generation



Feature Extraction

- Manual feature extraction
- Automatic feature extraction





Land Mobile Data Capture and Analysis

Geospatial Land Workflow & Products

Data Acquisition

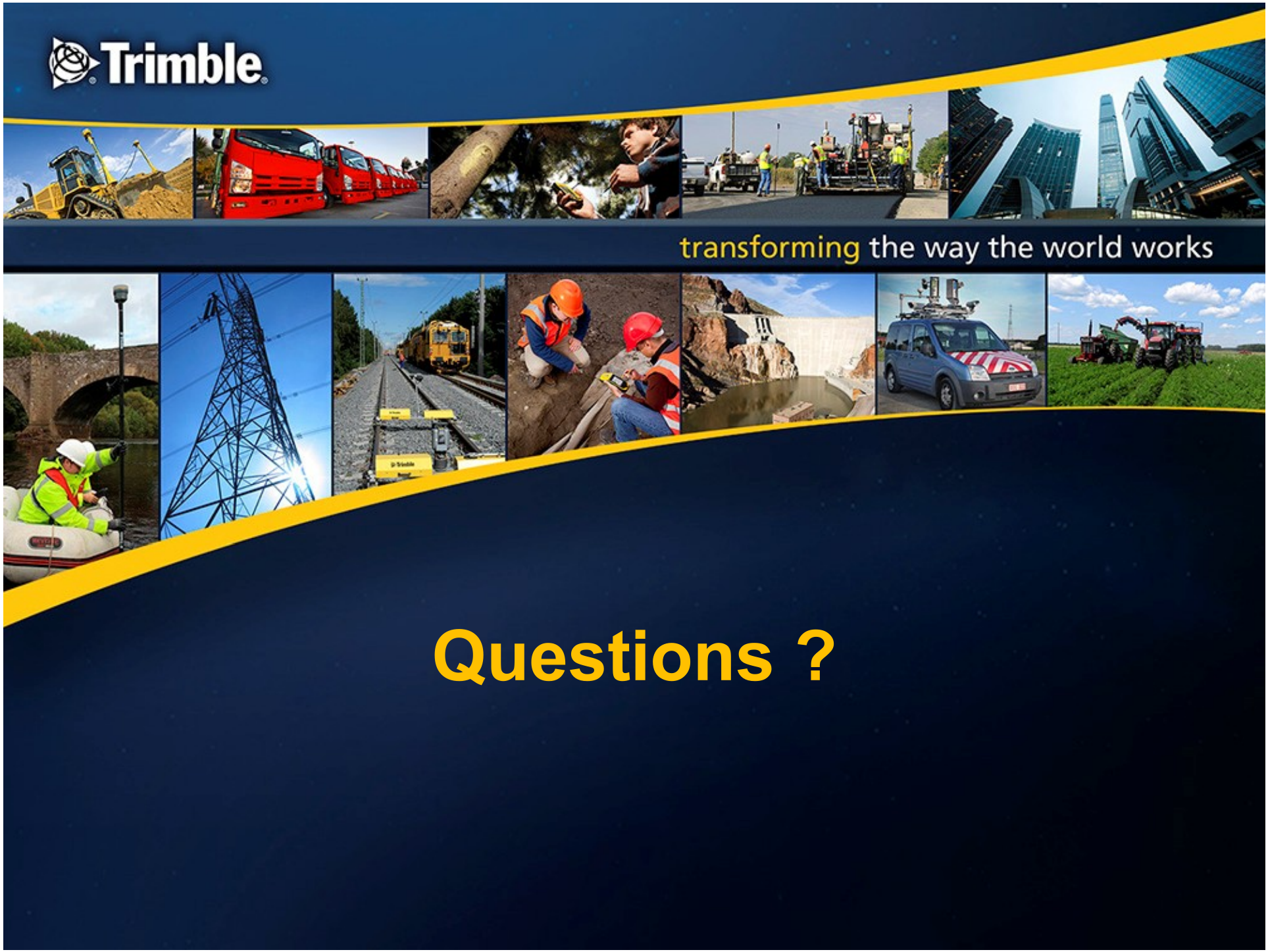
- Optical systems
- Optical & LiDAR systems

Data Processing

- Georeferencing

Feature Extraction

- Manual feature extraction
- Automatic feature extraction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transforming the way the world works
Questions ?