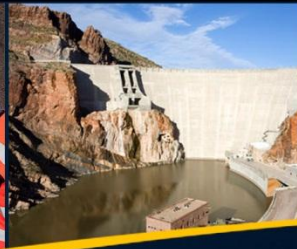




transforming the way the world works



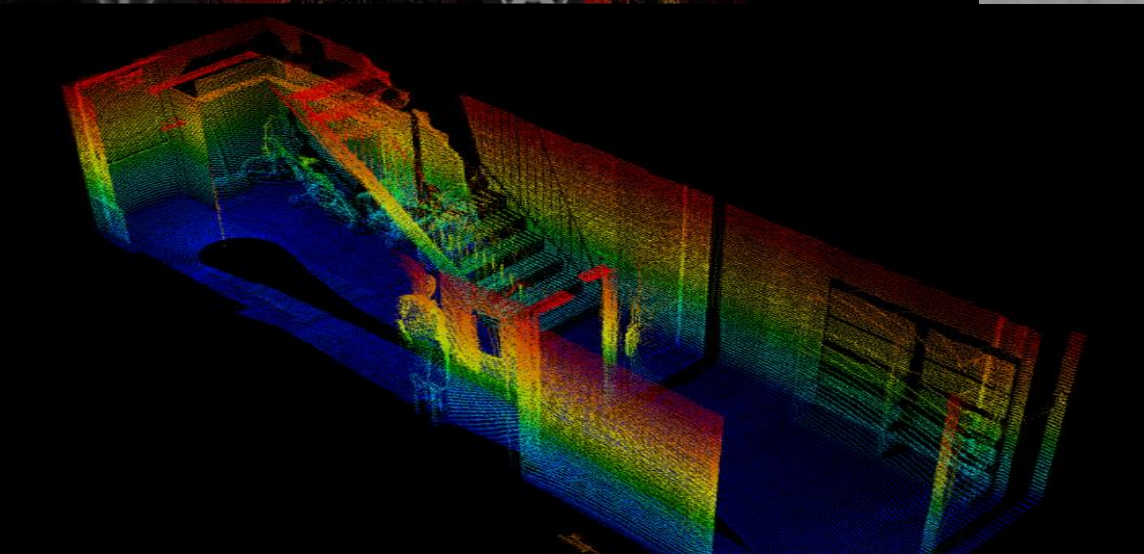
Geospatial Technologies – Enablers for Defence/National Security

Rajan Aiyer



Positioning Accuracy is also an aphrodisiac!

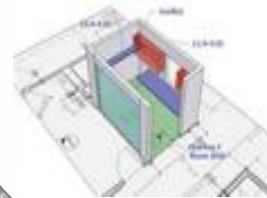
The technology now exists to map our world in 3D to sub-cm level accuracy, from space, air, land and inside buildings.



Integration of Technologies

Trimble's focus is on integrating its broad technological and application capabilities to create system-level solutions that transform how work is done within the industries we serve, enhancing productivity, accuracy, safety and regulatory compliance for our customers.

**MODELING,
ANALYTICS AND
DECISION SUPPORT**



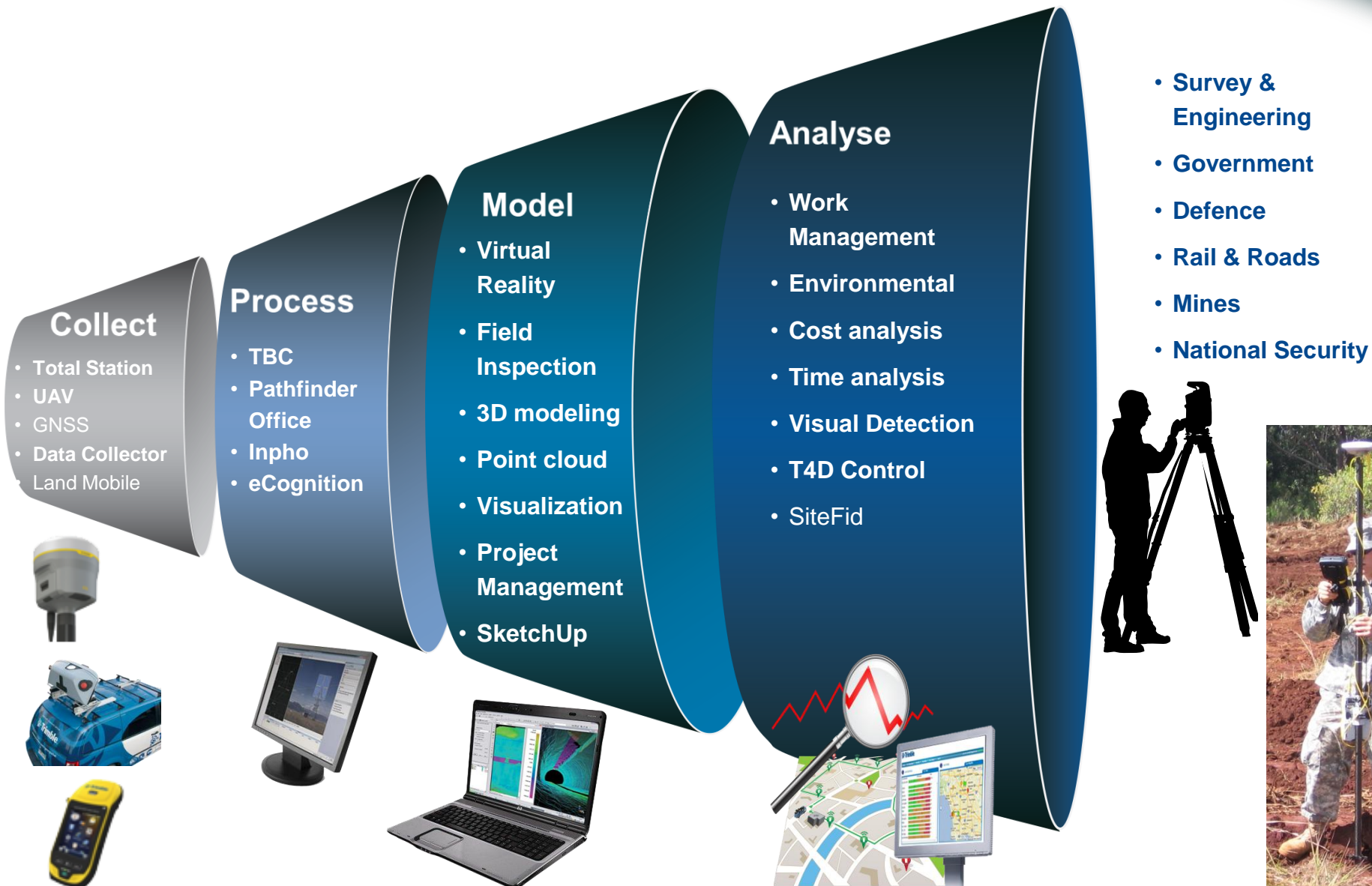
**CONNECTIVITY,
COLLABORATION,
MOBILITY**



**POSITIONING,
SENSING AND
GEOSPATIAL
CONTEXT**



Geospatial Workflows are Homogenous



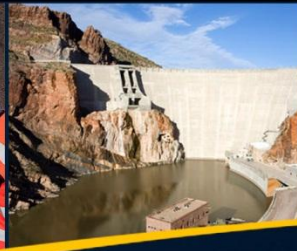


transforming the way the world works





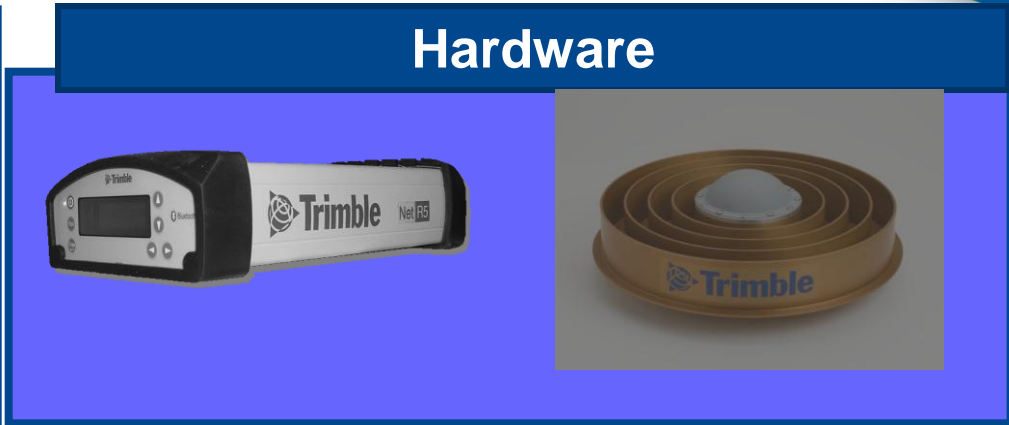
transforming the way the world works



CORS Network consist of



Software



Hardware

Communication & Power

Trimble® VRSNet Advanced

Home

- Sensor Map
- PWV Map
- Status Messages
- Network Information
 - IBS Ionosphere
 - IRIM/GRIM
- Reference Data Shop
- My Account
 - Personal Data
 - Change Password
 - Logins
 - Sessions
- Active Subscriptions
- Administration
 - Status Messages
 - Add Status Message
 - Edit Status Message
 - Regions
 - Add Region
 - Edit Region
 - User Management
 - Create User
 - Approve Users
 - Export e-mail addresses
 - Extended User Info
 - Extended User Info
 - Info Fields
 - Add Field
 - Extended Login Info
 - Info Fields
 - Add Field
 - Organization Management

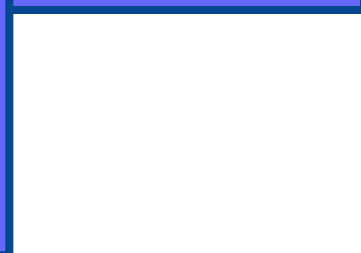
Precipitable Water Vapor Map

51 sensors

0620	[Europe]
0660	[Europe]
0664	[Europe]
0678	[Europe]
0683	[Europe]
0873	[Europe]
0885	[Europe]
AHTM	[Europe]
AHTM	[Europe]
ALUT	[Europe]
BENB	[Europe]
BORI	[Europe]
BRST	[Europe]
CANT	[Europe]
COBA	[Europe]
DUBL	[Europe]
DUBR	[Europe]
FRAE	[Europe]
GANP	[Europe]
GEO3	[Europe]
GRAZ	[Europe]
KIRO	[Europe]
KURE	[Europe]
LAMA	[Europe]
LERW	[Europe]
LISA	[Europe]
MUSE	[Europe]
MADR	[Europe]
MALL	[Europe]

Colour scale for PWV values from 0 m to 0.06 m

People





GNSS for Peacekeeping Missions



- **Navigate Rapidly to unknown positions in unfamiliar terrain and for Search & Rescue**
- **De-mining and cleansing of area of UXO**
- **Mapping of Defence Areas**
- **Situational Awareness**

Trimble Penmap Military Mapping System

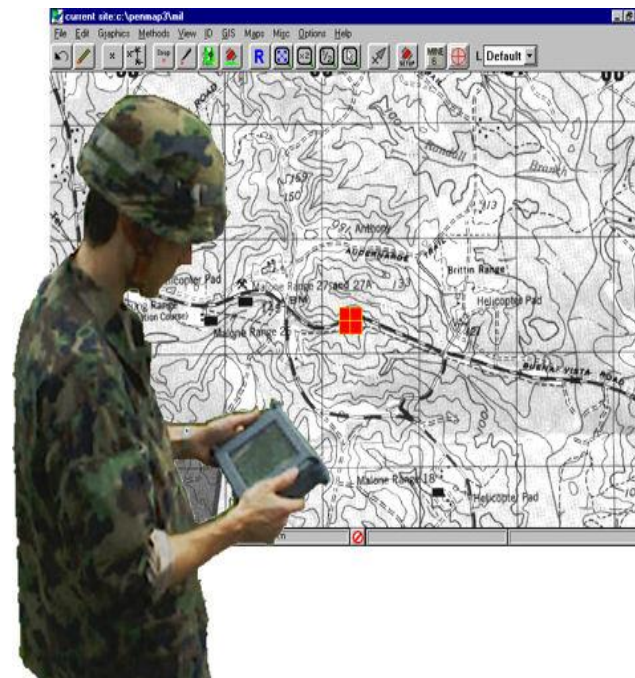
Penmap provides a variety of useful functions for Military Mapping and Digital Reconnaissance. Penmap features real-time display of positions from both GPS and measurement devices such as laser range finders.

Both map and database information is immediately available to burst over radio or to be downloaded to other mapping or command information systems using a variety of data formats.

Advantages

- Display data and graphics instantly when collected.
- Requires no computer or surveying skills
- Ruggedized system Works in Dark, Rainy or Foggy conditions
- Operates on TabletPCs and PDAs
- Combine GPS positioning with numerous other survey and mapping methods.
- User-configurable templates for mission-specific data collection •
- Raster or vector background images

- **Applications**
- Reconnaissance
- Minefield Mapping
- Navigation
- Command and Control



Trimble Solutions – H/W

GNSS



Imaging Rovers



Unmanned Aerial Systems



Aerial Imaging



Total Stations

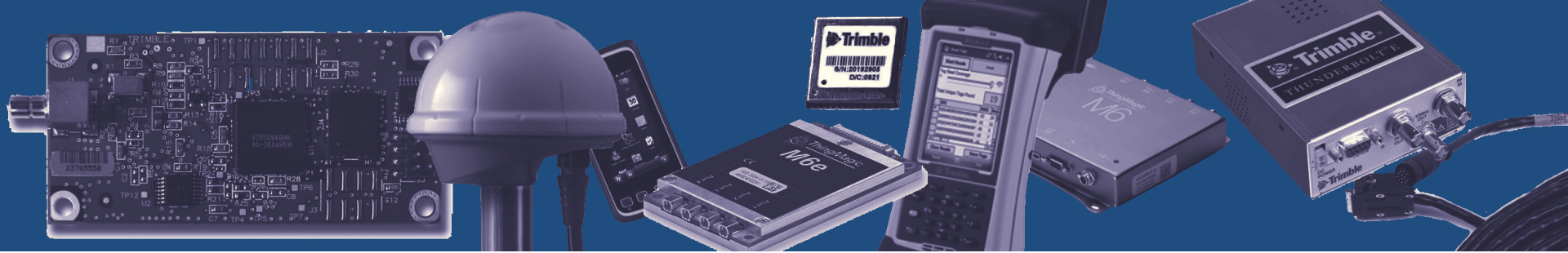


Land Mobile



3D Scanners & Spatial Stations





- **RFID**
 - UHF Readers
 - Reader modules
- **Rugged Computing**
 - Handheld
 - Tablet
- **Timing**
 - To 15 ns (1 sigma)
- **Embedded, Automotive**
 - GPS, GNSS
 - GPS + DR (Dead Reckoning)
- **Precision GNSS & Heading**
 - RTK, DGNSS, Dual-freq.
 - GNSS - Inertial

Geospatial –Imaging Products at a Glance

DATA COLLECTION → DATA PROCESSING → INFORMATION EXTRACTION

LAND

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



Trimble Trident Imaging Hub
 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)



eCognition Software:
 Geospatial Data Fusion
 Object Based Analysis



SATELLITE



transforming

THE WORK OF GEOSPATIAL PROFESSIONALS

Trimble offers A suite of advanced solutions across the entire data collection, processing, modeling and analysis workflow, leading to:

- Faster Project Completion
- Reduced Re-work, Labor
- Enhanced Quality
- Enhanced Service Capabilities
- Enhanced Worker Safety



Land Administration

GIS and Mapping

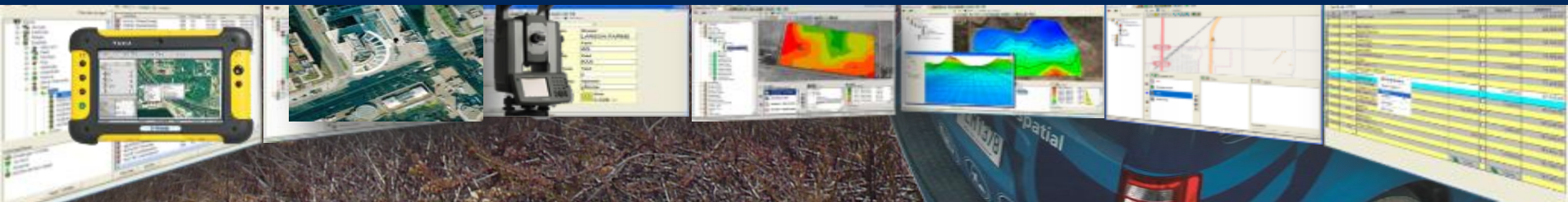
Surveying

3D Modeling & Imaging

Topographic

Data Analysis

Reporting



transforming

HEAVY CIVIL CONSTRUCTION – PLANNING, DESIGNING, BUILDING AND OPERATING

Enhanced information, decision making and control across the entire project lifecycle, generating benefits including:

- Faster Completion
- Reduced Fuel, Re-work, Labor
- Enhanced Worker Safety
- Reduced Environmental Impact



Feasibility and
Planning

Survey

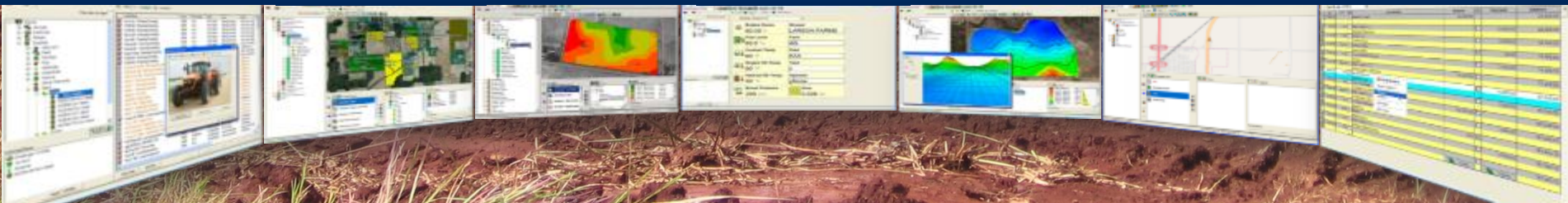
Design

Estimation

Earthworks

Construction

Maintenance and
Operation



Results of transformation

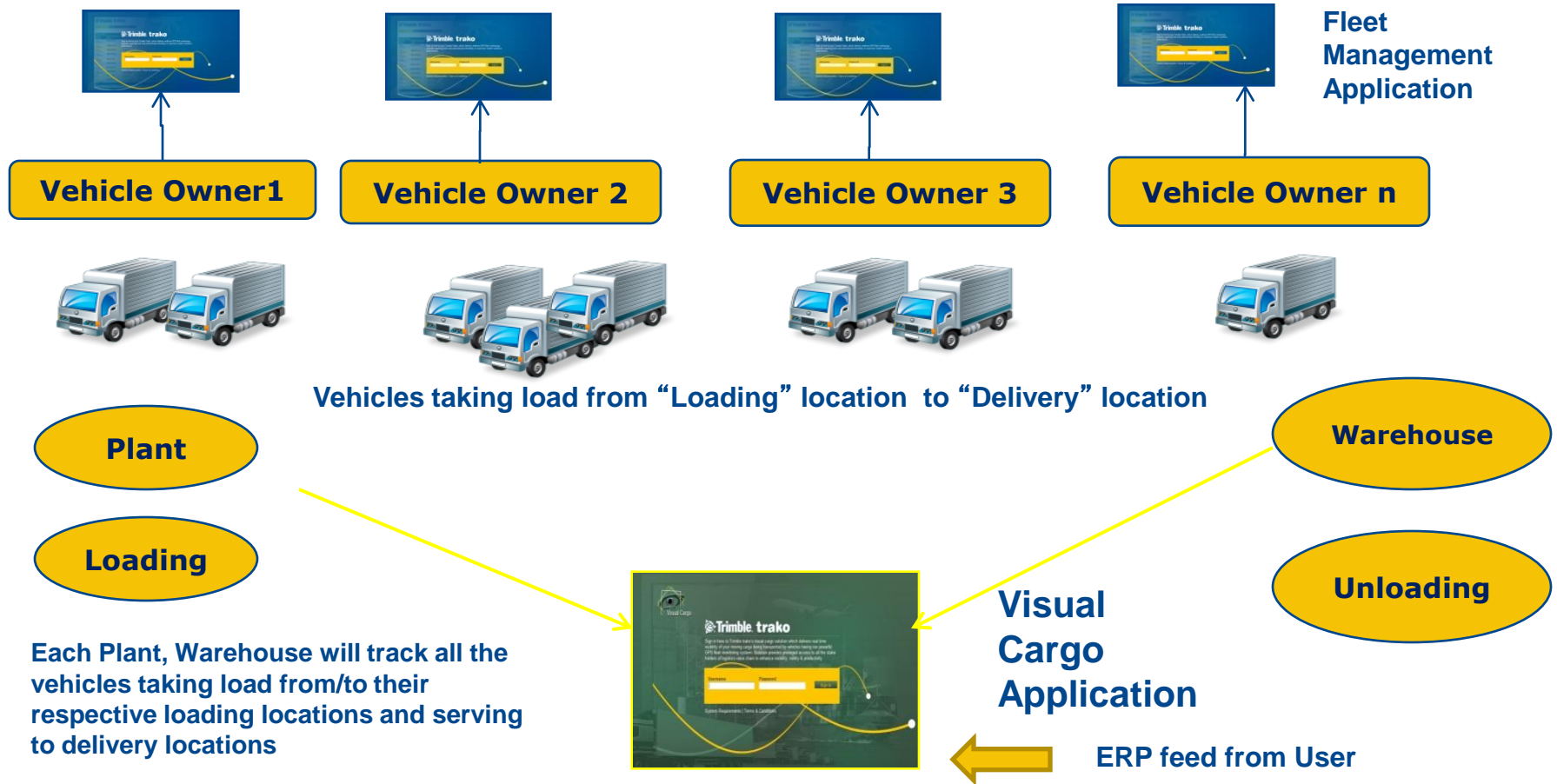
Civil Construction:

- Road built in half the time using technology
 - 24:32 hours using conventional methods
 - 11:50 hours using machine control technology
- 43% fuel savings over conventional method
 - 123 gallons for conventional method
 - 70 gallons for machine control method
- Machines using technology were twice as accurate as the conventional equipment
 - 86% vs 35% in tolerance of ± 3 cm for sub-grade
 - 98% vs 45% in tolerance of ± 3 cm for base course

Building Construction:

- Increase field productivity
 - 30% reduction in site prep
 - 70% reduction in erection time per truckload of steel
- Reduce field engineering cost
 - 50% reduction in structural information requests
 - 30% reduction in MEP information requests
 - 49% reduction for MEP field layout
 - 50% reduction for framing layout
- Reduce costs of rework
 - 100% accuracy for concrete embeds & anchors

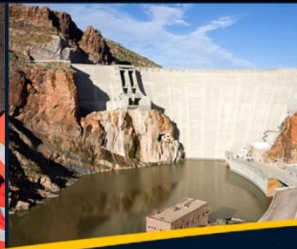
Transporter (vehicle owner) tracks his vehicles on our Fleet Management Application



Solution meets basic business needs with scope to Scale up



transforming the way the world works



Thank You