

# 塑造智慧变革



HEXAGON

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[2018.hexagonchina.com.cn](http://2018.hexagonchina.com.cn)

# Mobile Scanning Product and Technical Trends

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Stuart Woods, Vice President GCSD

September 2018

An aerial photograph of a city skyline, likely London, featuring a river and various buildings. Overlaid on the image is a teal silhouette of a city skyline at the bottom. The text is centered in the upper half of the image.

**3 million people**  
move to cities each week





Drivers in cars, trucks, minivans and SUVs drove 3.22 trillion miles on US roads last year, up 2.8 percent from 3.1 trillion miles in 2015

driving gets cheaper  
(1980 / 2014)

Train

+ 63%

- 14%

Car

Source: Independent

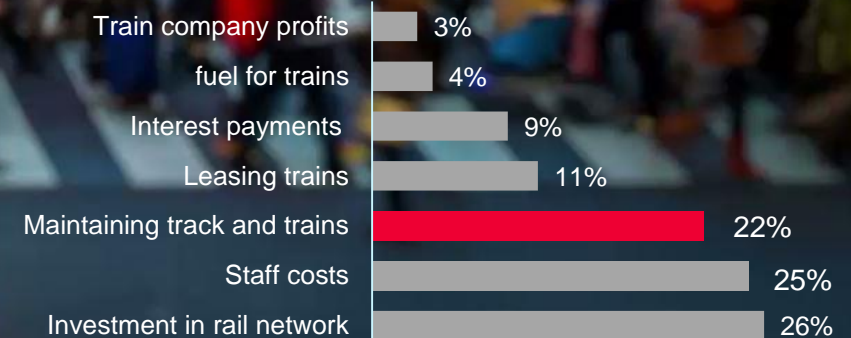
From 1990 to 2000, US travel increased 28.9%, yet the total miles of roads in the US increased by only 2.1%



# Approximately 13.6 billion

passengers boarded a tram or light rail vehicle in 2014 in 388 cities

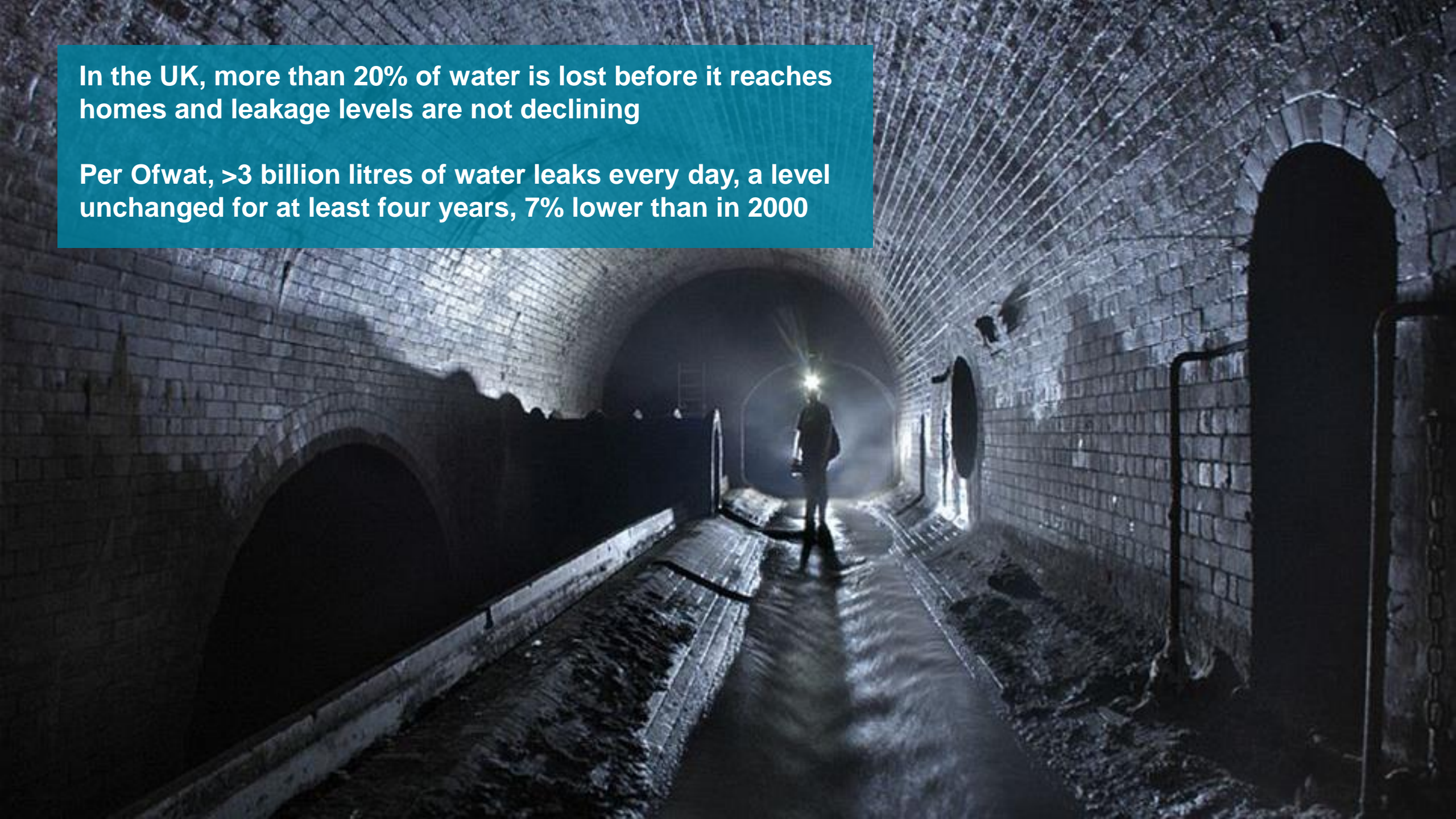
## rail ticket price brakedown





**In the UK, more than 20% of water is lost before it reaches homes and leakage levels are not declining**

**Per Ofwat, >3 billion litres of water leaks every day, a level unchanged for at least four years, 7% lower than in 2000**







# “ Problems with City Urbanisation

- Aging Infrastructure
- Traffic congestion
- Public safety / Emergency services
- Energy demand
- Expansion does not meet need





HD City Mapping



Heavy Transports



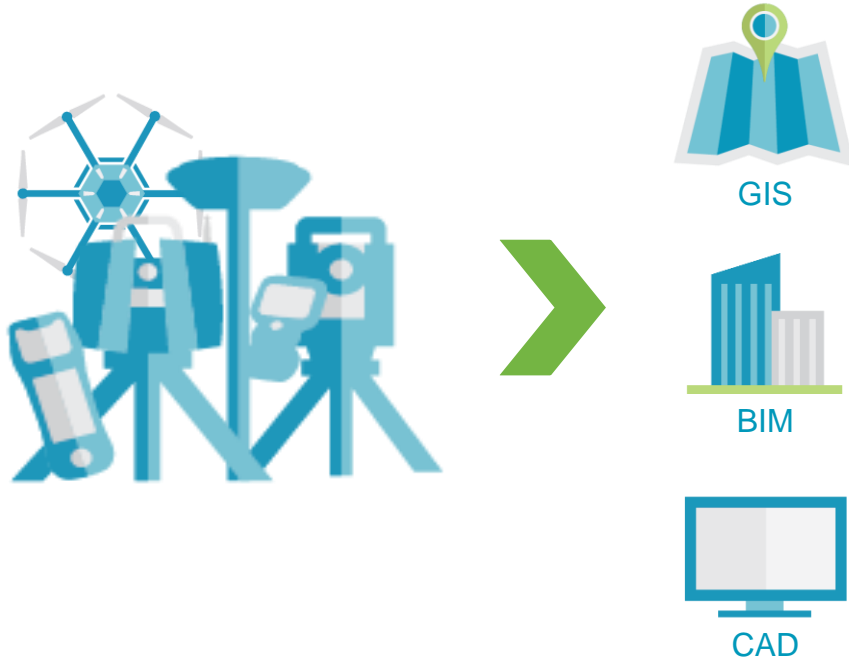
Autonomous Maps



5G Network Plans



# Infrastructure Mapping Today & Tomorrow



CAPTURE LARGE AMOUNTS OF DATA FOR  
USE IN TRADITIONAL APPLICATIONS



DIGITAL INFRASTRUCTURE FOR SMARTER  
AND FASTER DECISION MAKING





We're changing the  
world with technology.

Bill Gates



The illustration depicts a smart city ecosystem integrated with a smartphone. At the top, a large 'TECHNOLOGY' banner is connected by dotted lines to various icons representing different sectors: industry (factory), security (lock), commerce (shopping cart), healthcare (heart rate), home (house), and transportation (car, briefcase, airplane). These icons are linked to corresponding elements within the city scene below. The city itself is a colorful, stylized representation of a smart urban environment, featuring a mix of modern and industrial architecture. A prominent train station is labeled 'SELANGOR SMART CITY', with a train and a bus. Other elements include a hospital, a shopping mall, a factory, and various vehicles like cars, trucks, and a motorcycle. The entire scene is set against a light blue background, emphasizing the digital and technological nature of the smart city concept.





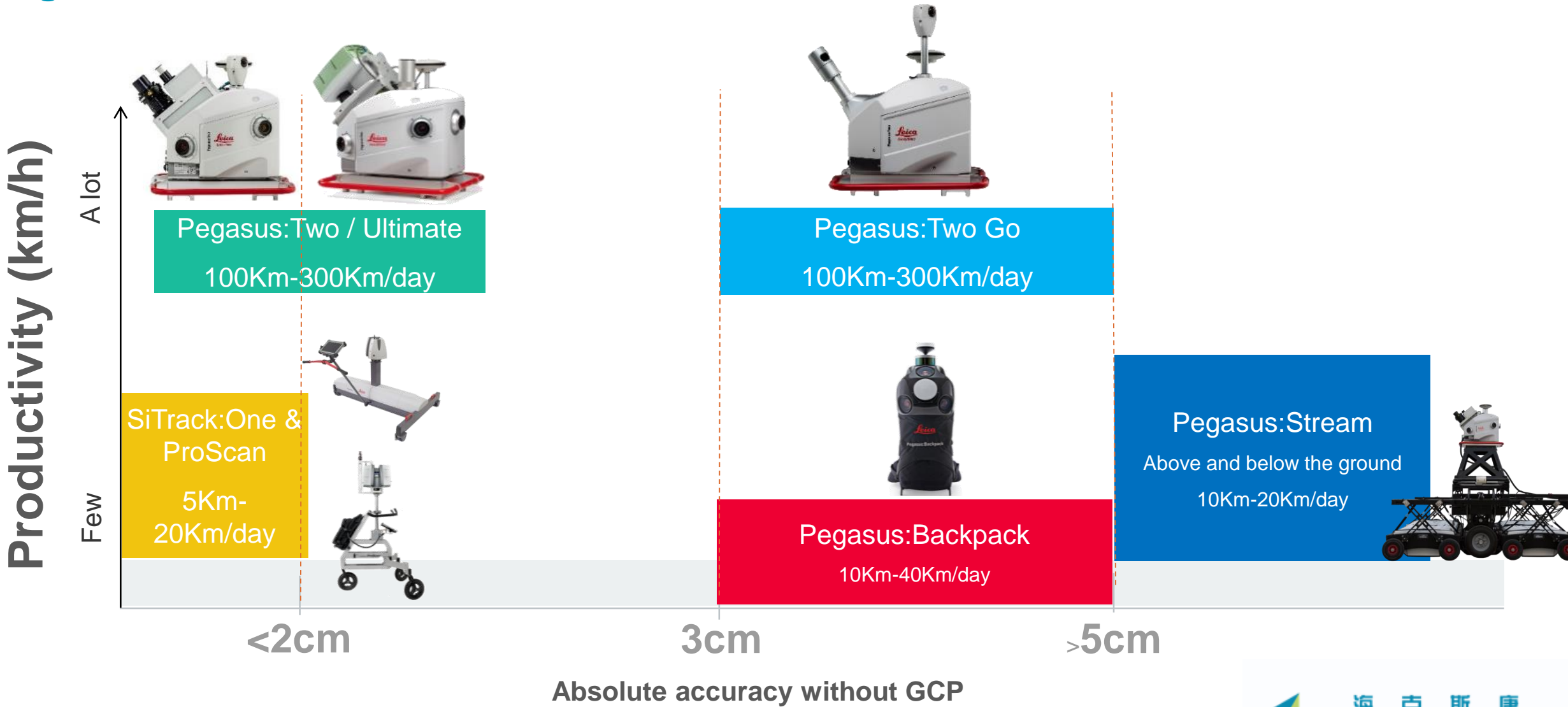
A 3D rendering of a highway interchange. A green overhead sign with white text and arrows is positioned above the road. The sign reads "Mapping Faster, High Volume" and has three arrows pointing left, down, and right. The road is black with yellow dashed lines and white solid lines. The road splits into two lanes on the left and two lanes on the right. The background is white. There are three small black sensors or cameras mounted on the signpost. The text "Mapping in Places Never-Before" is on the left and "Mapping Accurately" is on the right, both in blue. A large grey arrow points from the sign towards the right side of the road.

Mapping Faster,  
High Volume

Mapping in Places  
Never-Before

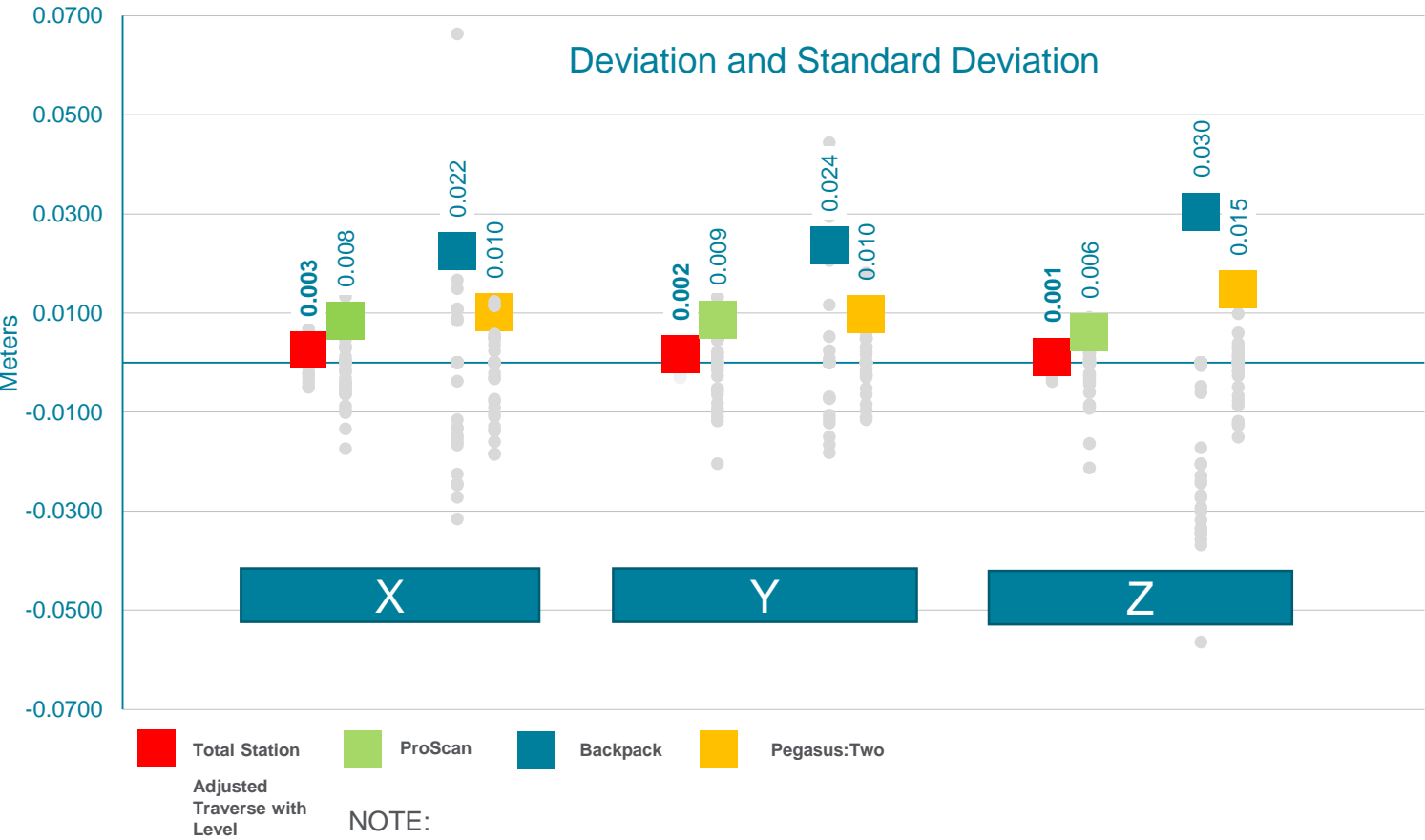
Mapping Accurately

# Digital Realities Product Portfolio at a Glance





# Deviation and Standard Deviation per System – vs TS



TS: Network of 9 traverse points adjusted, 48 scan targets measured twice

ProScan: 4 setups, tracked with MS50,GRZ122 Prism

Pegasus:Two: open sky GNSS, 4 GCP used, processed tightly coupled with IE, single pass

Pegasus:Backpack: open sky GNSS, 4 GCP used, processed tightly coupled with IE, single pass

## Accuracy factor against TotalStation

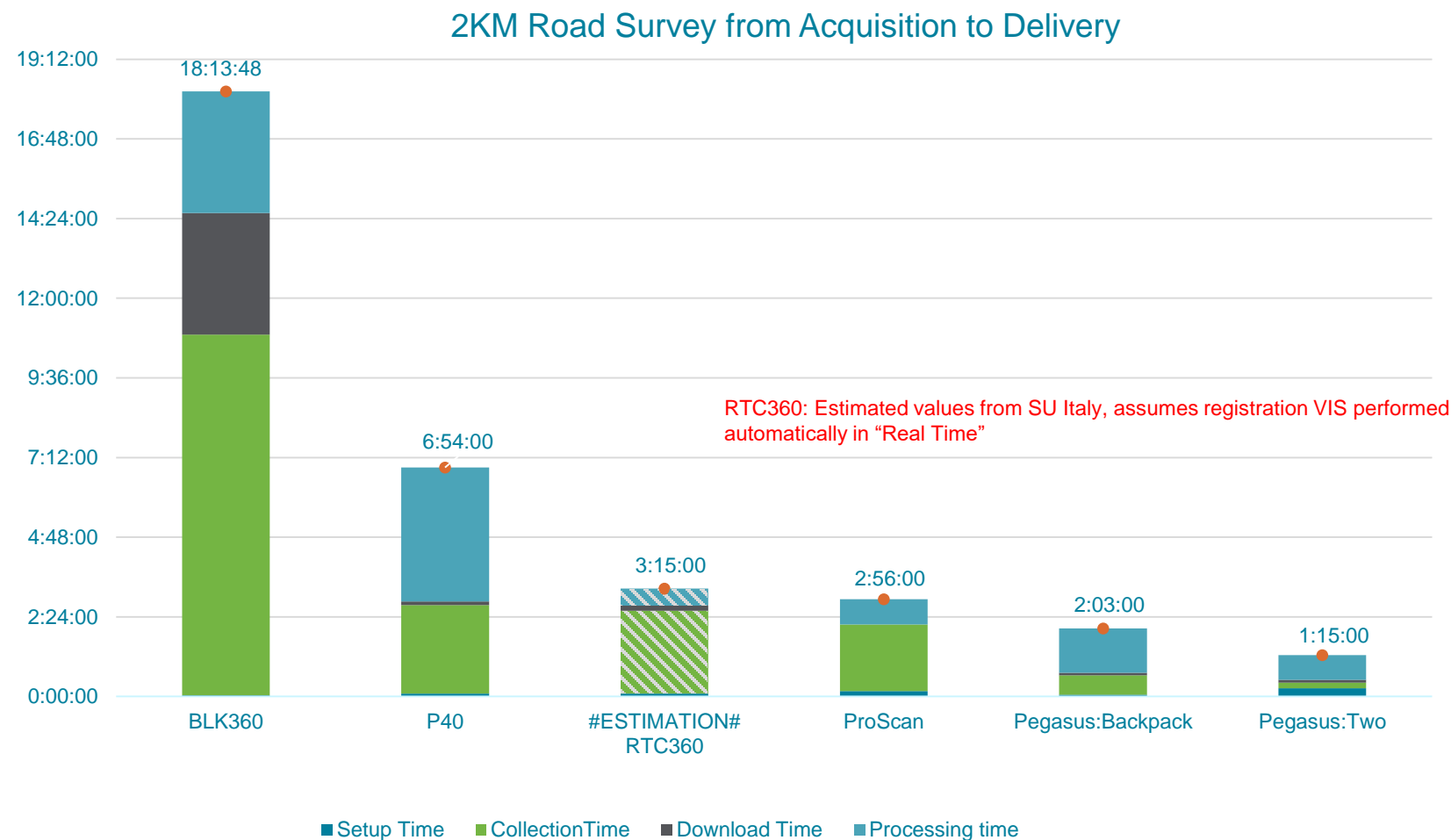
(Adjusted Traverse with Level)

ProScan	Pegasus:Backpack	Pegasus:Two
Factor 2.5 - 6	Factor 7 - 30	Factor 3 - 15

SiTrack  
(not shown)

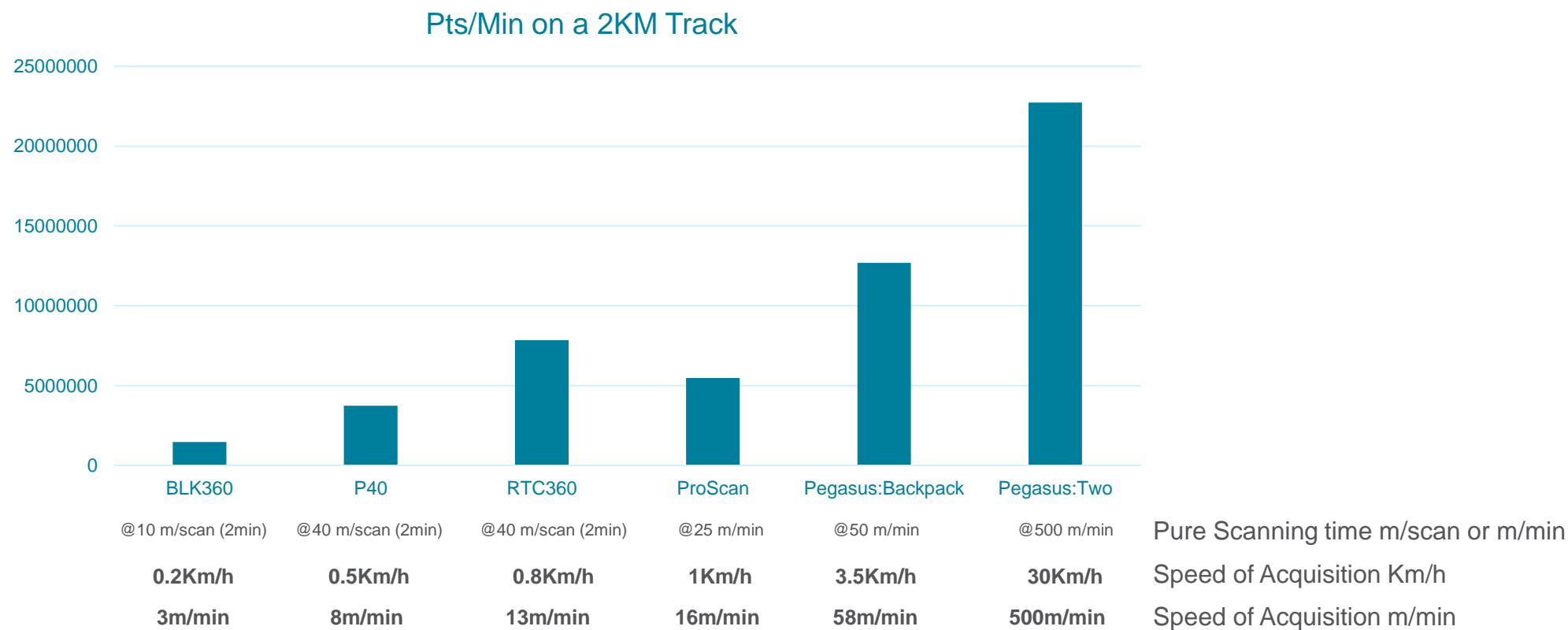
Factor 2 - 3

# 2Km Road Survey from Acquisition to Delivery

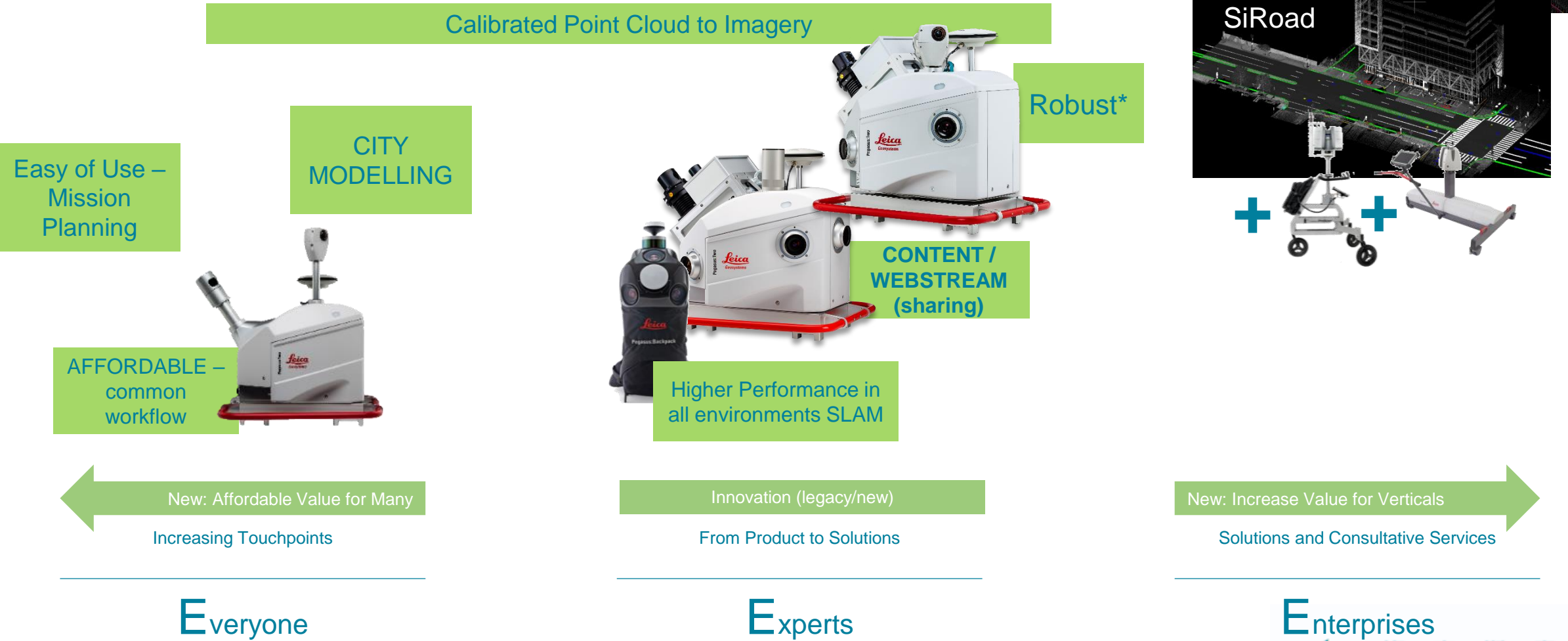




# Achievable and Usable Points by Speed of Capture



# Digital Realities Strategy



\*On camera JPEG compression, low PC load, industrial removal SSD



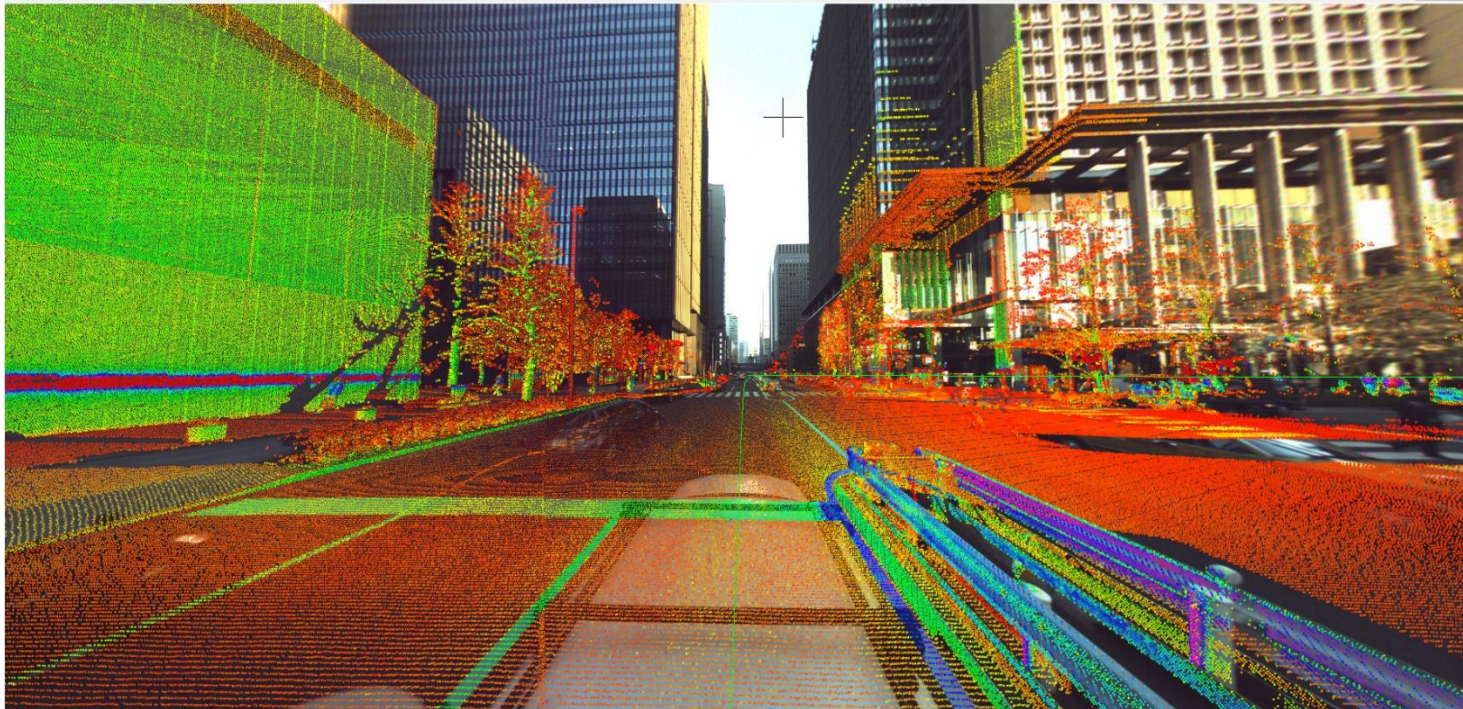
# Image IS everything - Pegasus:Two Go





# Imagery Driving Product - P2U+P2Go

- Market requiring high quality imagery with point cloud
  - If images have stitching error – then customers lose trust in total system
- Seamless 360° Images – w/ Flat Field Correction
- Point cloud fitting with calibrated 360° Images

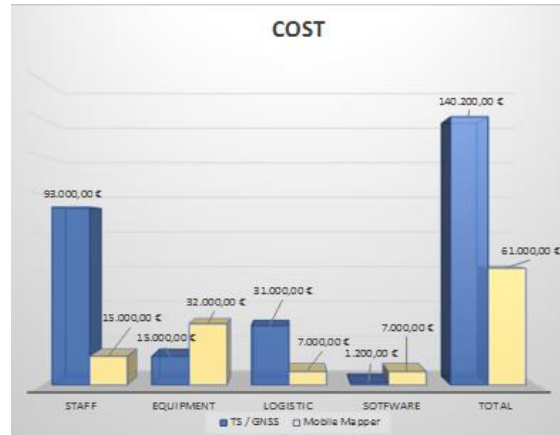




## Customer Feedback – Acre, Pegasus Survey Tool



- > **Government investment**  
Important government investment:  
400 Million \$USD
- > **200 KM**  
200 Km of simple road in northern Colombia
- > **Accuracy**  
Accuracy measurement of heights very important for design the new road surface



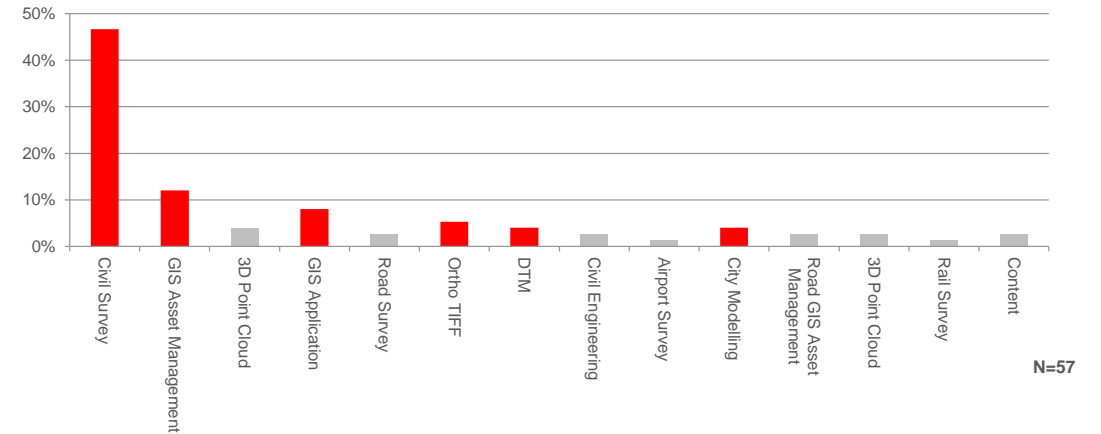
[www.grupoacre.com](http://www.grupoacre.com)



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# ROI

## How Do Our Customers Generate Value From P2



8

# Doing More with Less



## How Do You Efficiently Digitise Your Rail Network?

Surveying provides important elements for a reliable and efficient transport infrastructure:

- Comprehensive infrastructure asset management and as-built capture
- Reliable quality control in the construction process
- Knowledge of the condition and requirements of the rail network



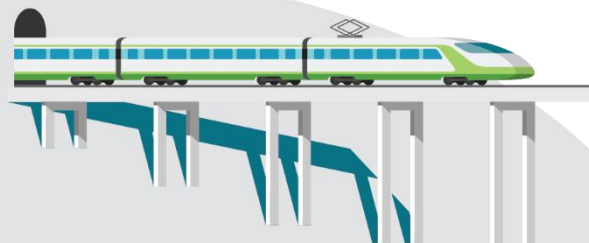
# Rail Market Overview

- Reality Capture
- GIS & Asset Mapping
- As-is documentation
- As-built Management
- Feature Extraction
- Best Fit Geometry
- Corridor Mapping

## As-built & GIS Documentation



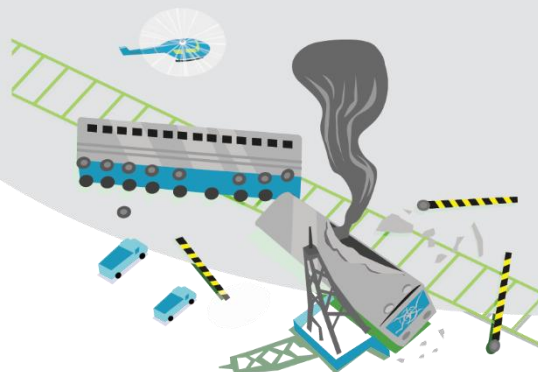
## Operations & Maintenance



- Load measurement
- Track Geometry
- Clearances
- Platform Gauging
- Tunnel Condition
- Bridge Inspection
- Track Profiles
- Ballast Condition

- Change Detection
- Damage Documentation
- Evacuation Route Planning
- Slope Monitoring
- Infrastructure Monitoring

## Monitoring & Incident Response

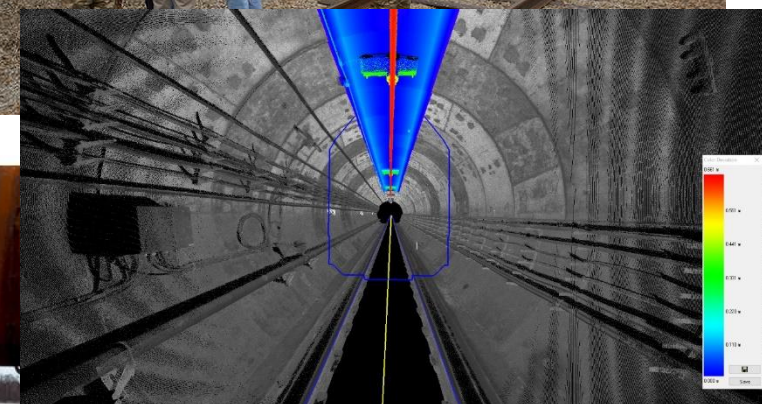


## Engineering & New Construction



- Machine Control
- Surveying & Stake Out
- Progress Reporting
- Reality Capture
- New Construction Documentation
- As-built Best Fit Geometry

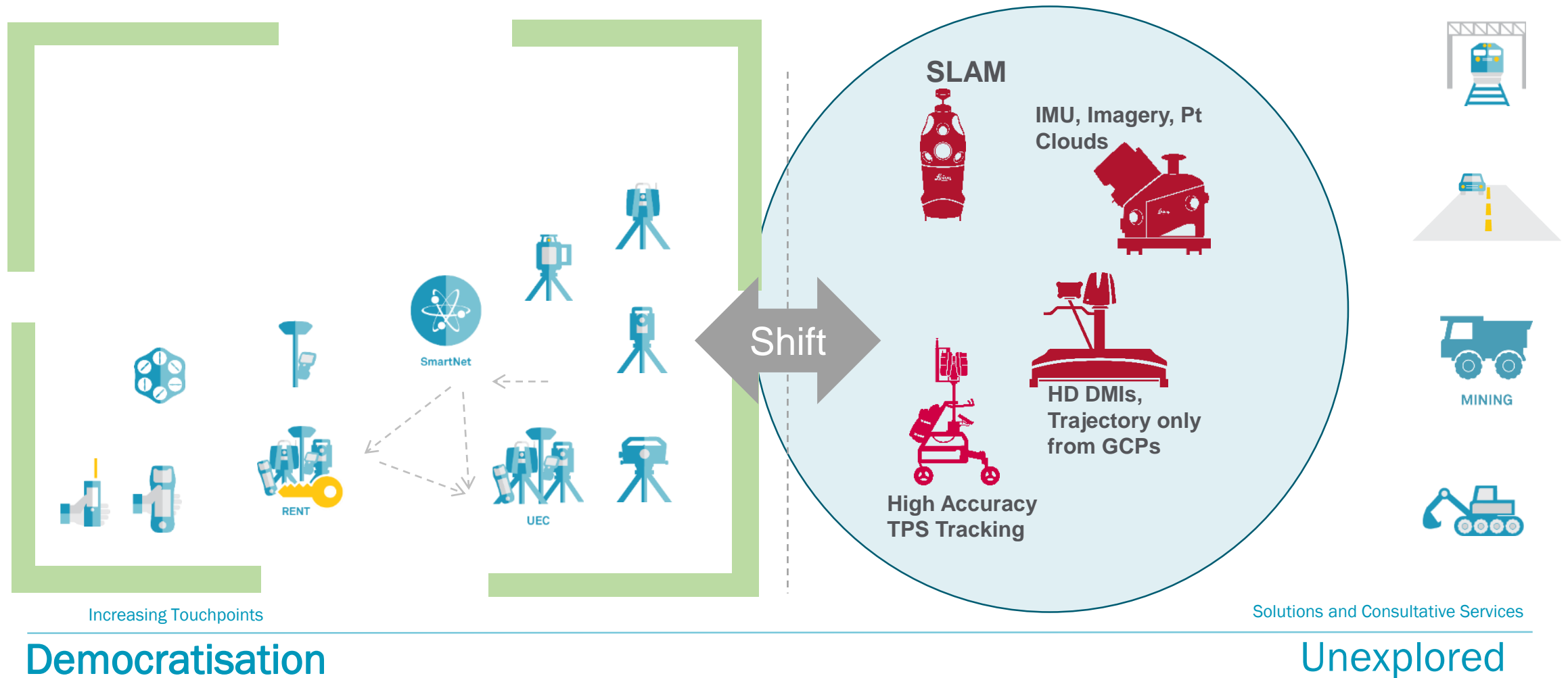
# Rail within Digital Realities









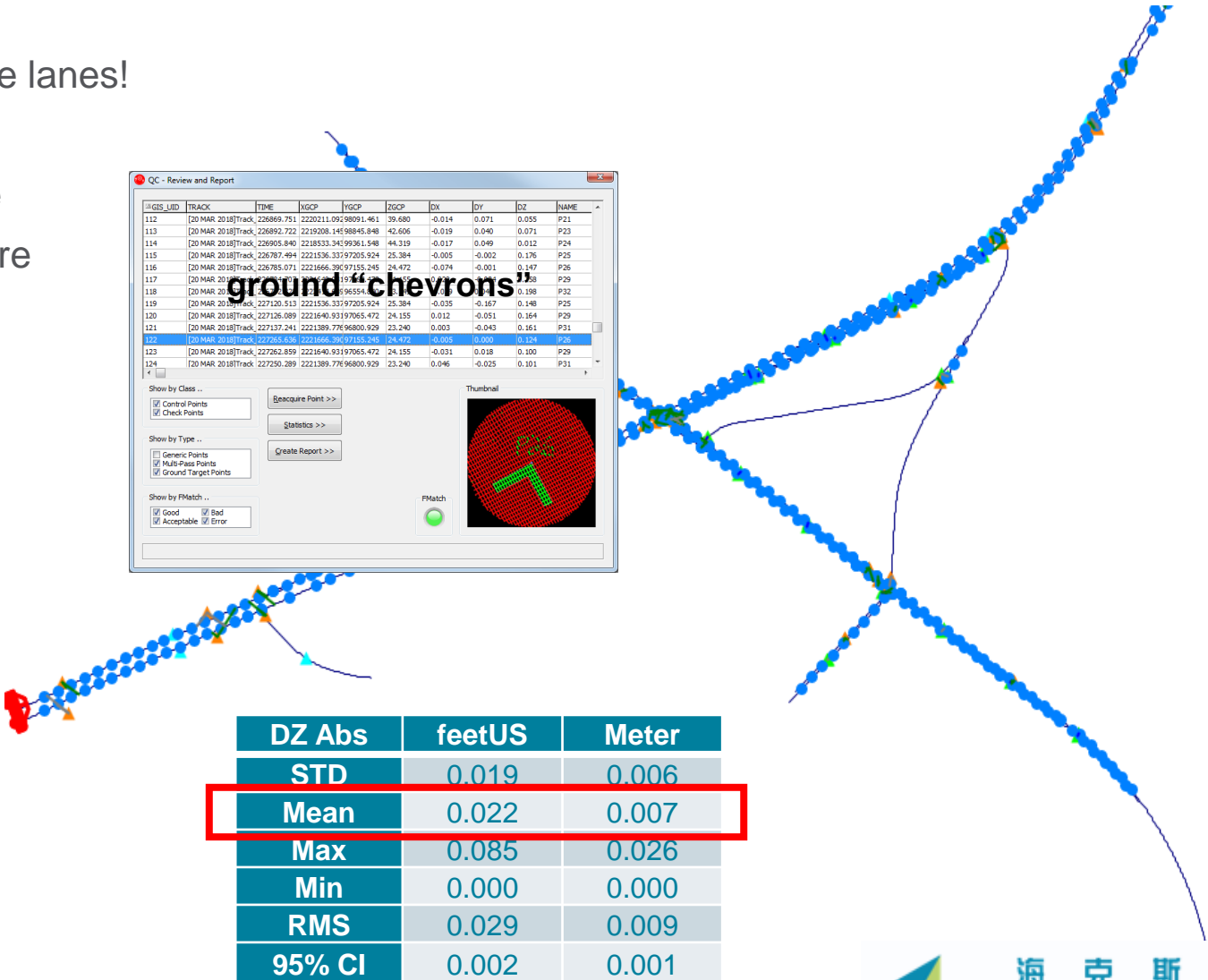
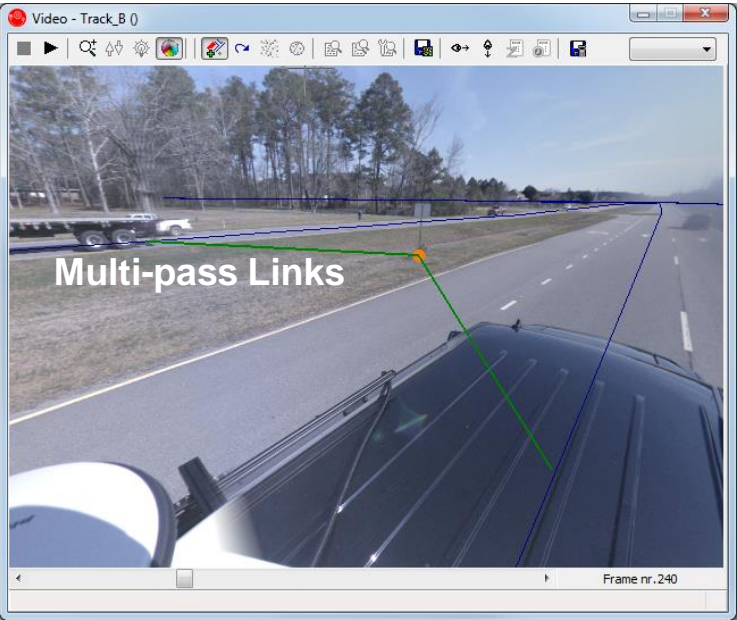


Leica Pegasus:Backpack  
in changing  
and challenging  
construction site



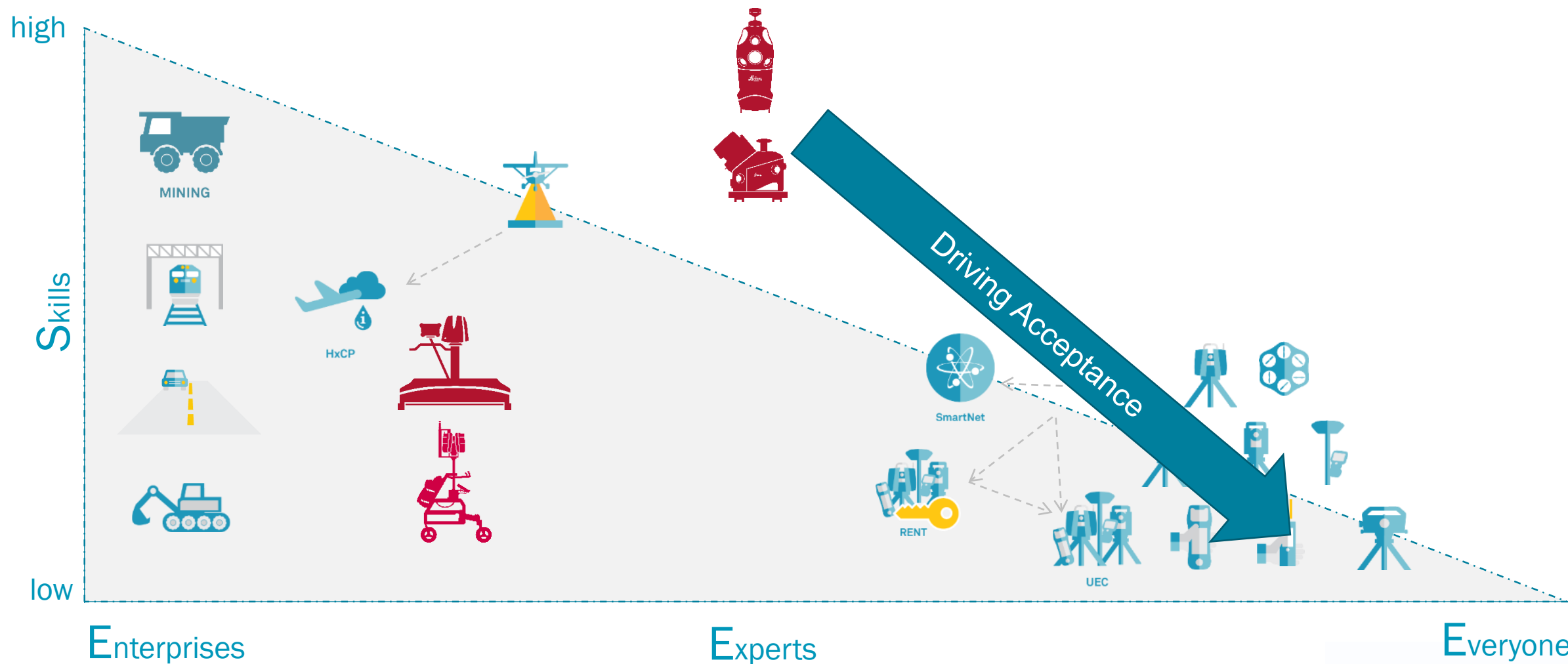
# McKim & Creed Results – Mapping Fast and Accurately – Leveraging SLAM Software

- 12.6 Km of trajectory – 8 separate passes, multiple lanes!
- Automatic recognition of ground “chevrons”
- Automatic measurement of point cloud misclosure
- Integration with manual measurement of misclosure
- 147 link points in total
- Automatic QC reports generated



Absolute Z value

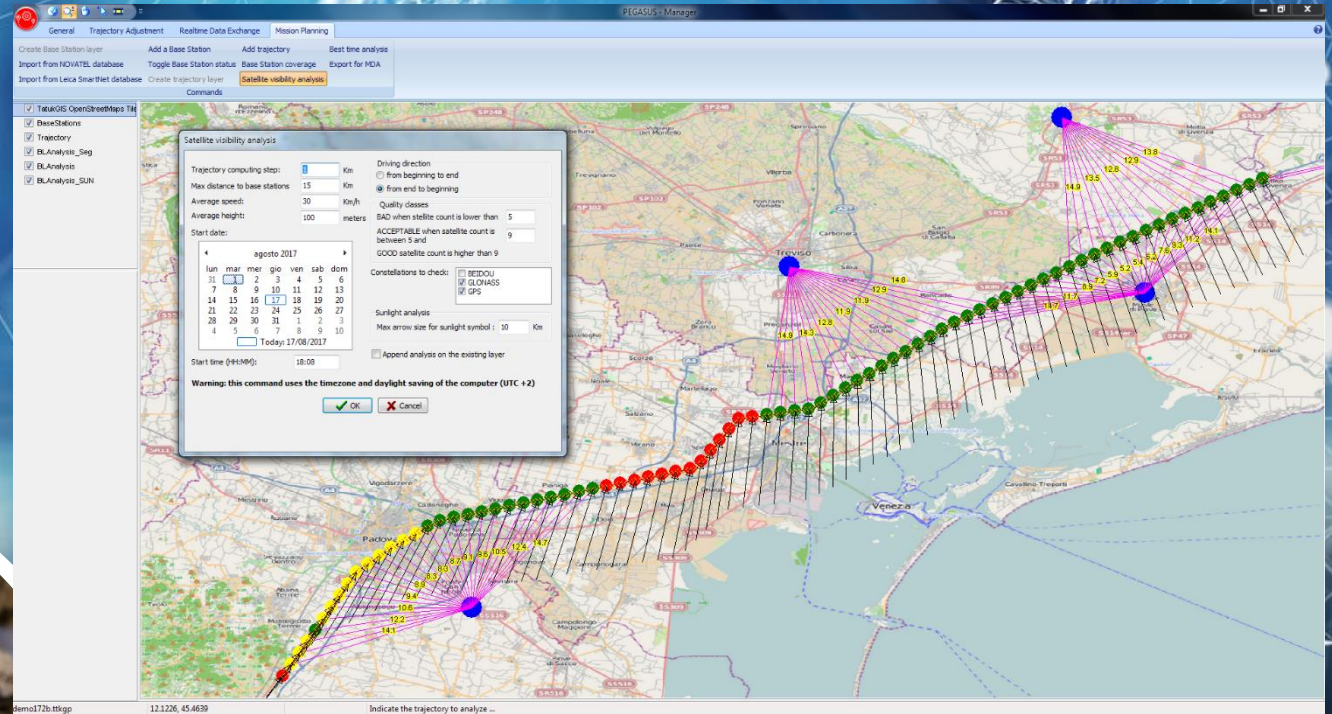
# Volumes driven by ease of use and Integrated SOFTWARE





# Mission Planning

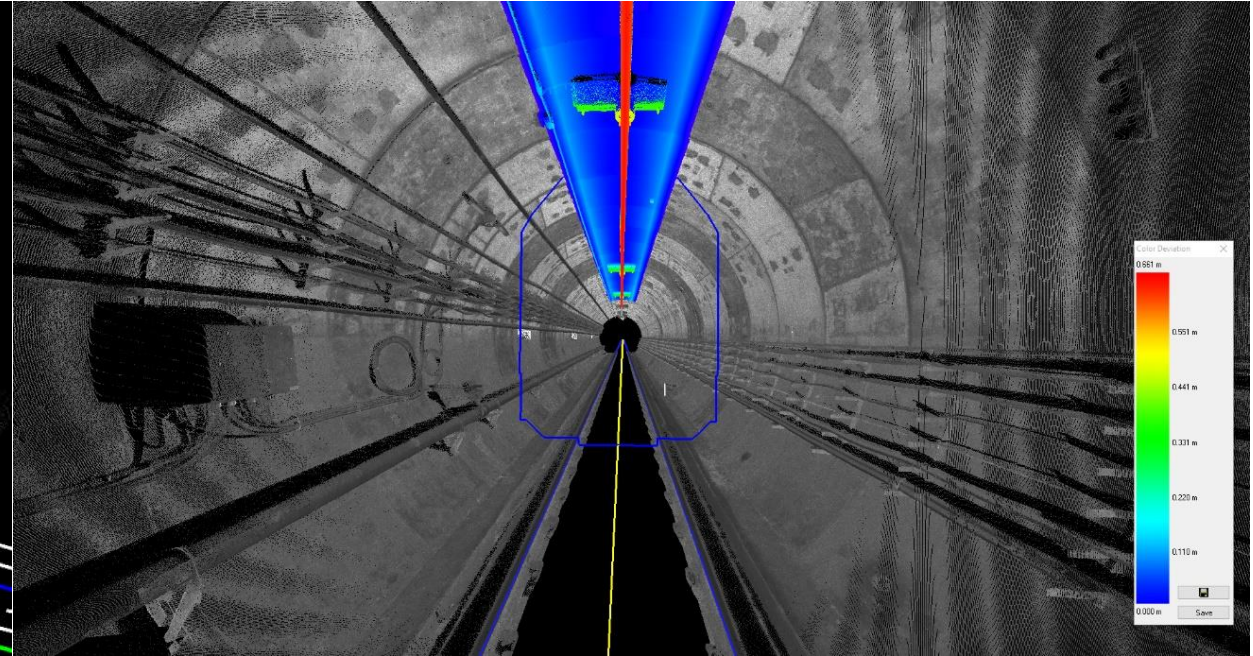
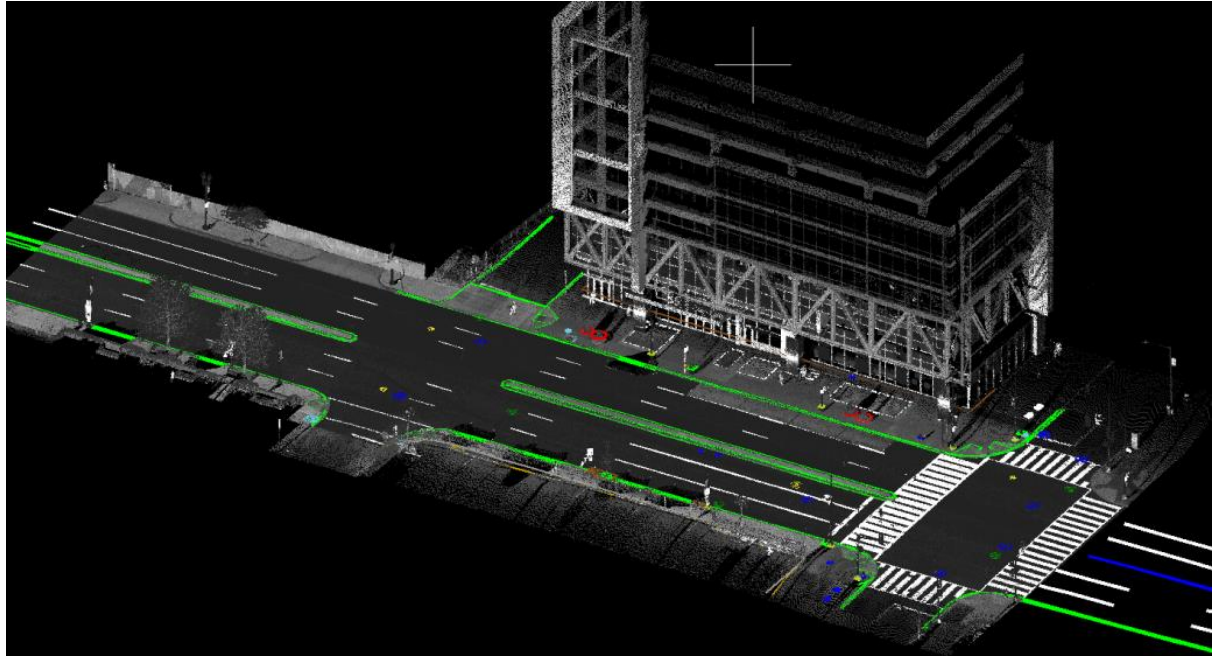
Smartnet GNSS service +  
Pegasus Manager





## Software Advances: Bulk Extraction

- Powerful feature extraction tools
- Ability to share point cloud data with multiple users across multiple devices







## SiRoad and SiRail Software – Vertical Specific Software

### Feature Extraction:

- Automated extraction
- Automated export to desired file format
- Data-in – Data-out with no user interaction

### Automation Advantages:

- Repetitive results
- Faster turnaround on deliverables
- Easier way to adopt mobile mapping



LA POSTE 







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OUR SOLUTION

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# YOUR AREA IN ALL ITS DIMENSIONS

Estimating the height and location of a candelabra to the nearest centimetre?

The surface area of a zebra crossing to the nearest square centimetre?

The volume of a building to the nearest cubic centimetre?

IT'S NOW POSSIBLE AT THE CLICK OF A BUTTON!





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