# Mobile Mapping and Navigation

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**NAVTEQ Research**

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# Mobile Mapping & Navigation Markets


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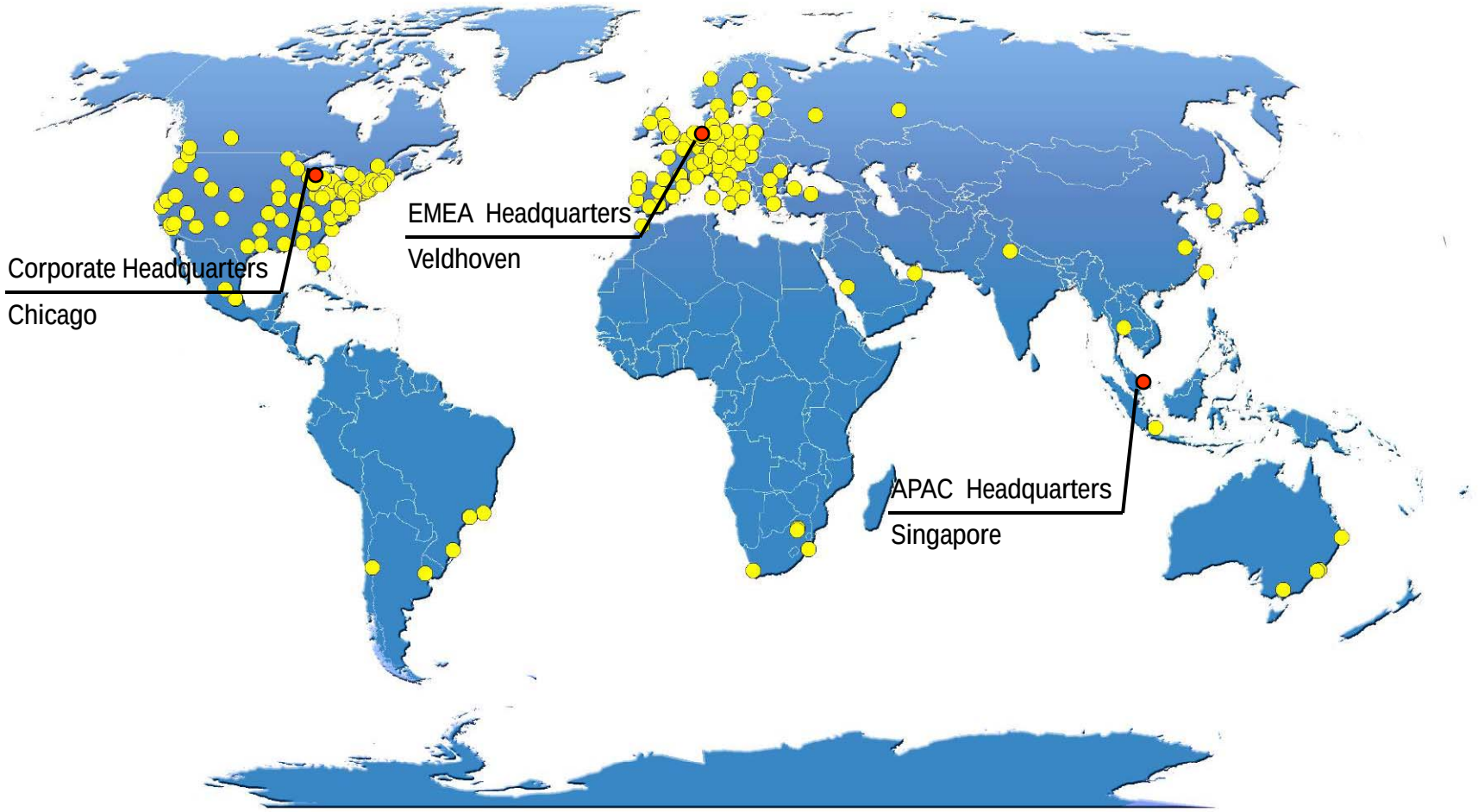
# Local Knowledge & Presence Used to Create Most Maps

## *196* local offices in *36* countries

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# Mobile Mapping: Data Capture & Verification

- 1,000 professional geographic analysts:
  - Drive millions of miles annually
  - Capture and verify road network and location-based content – as a driver or consumer would experience it
  - All vehicles equipped with cameras for video capture


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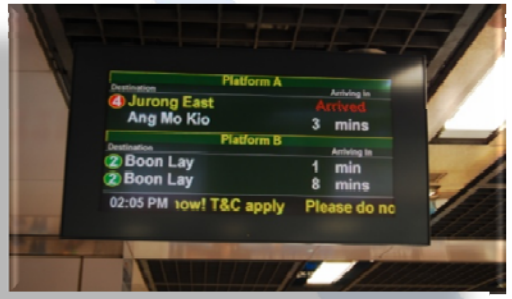
# Products: Rich Dynamic and Static Data

Navigable maps have up to 260 unique attributes, Points of Interest in more than 50 categories and a growing array of unique content …

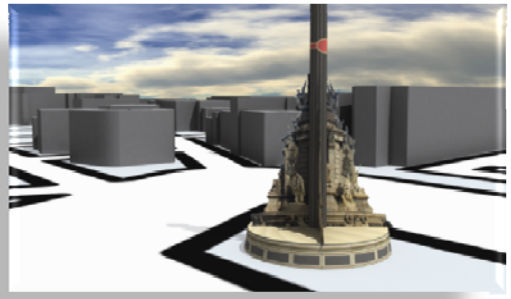
## Dynamic Content





## Pedestrian Content

## Visual Content



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# Technologies for Creating Content

- Data Collection
  - Mobile Mapping
  - Data Sourcing and Integration
  - Remote Sensing
  - Probe Data Collection
- Data Processing
  - Database Management
  - Geocoding
  - Computer Vision
  - Image Processing
  - Probe Data Processing


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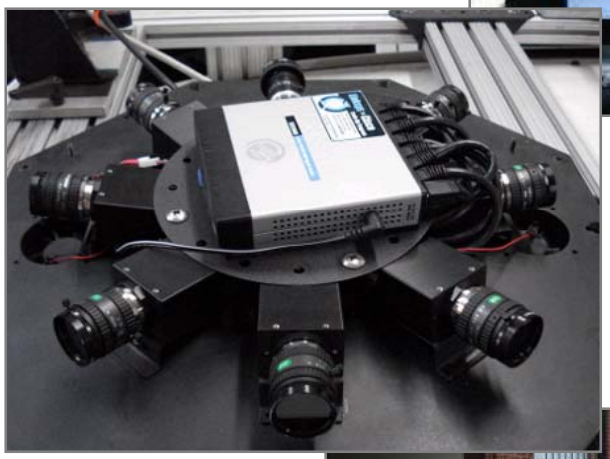
# Mobile Mapping Data Collection Equipment

- Vehicle
- On-board computer
  - HW controller
  - Removable hard drives
  - High speed network
- Sensors
  - Panoramic Camera
  - High Resolution Cameras
  - LIDAR
  - GPS
  - Inertial Measurement Unit (IMU)
  - Distance Measurement Instrument (DMI)

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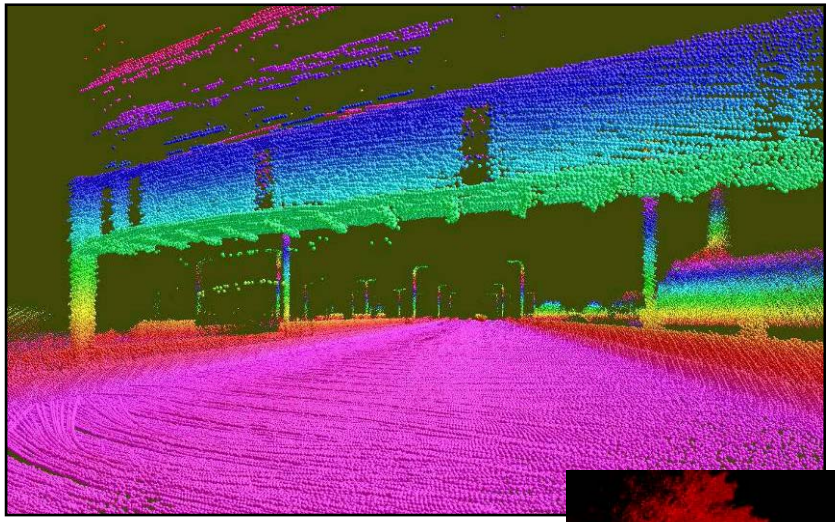
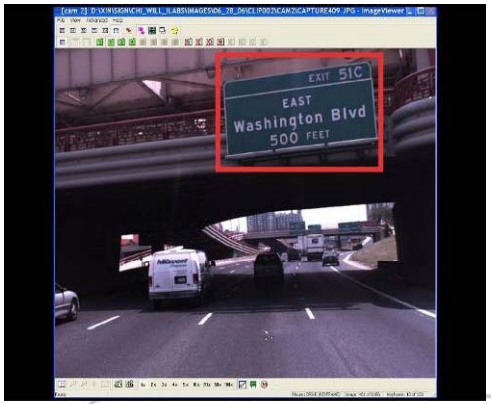
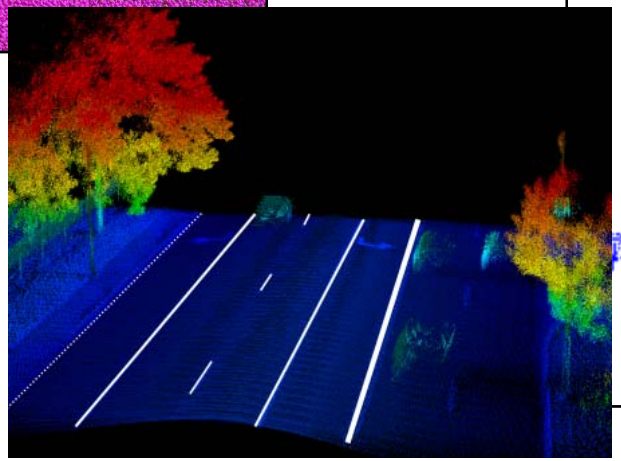
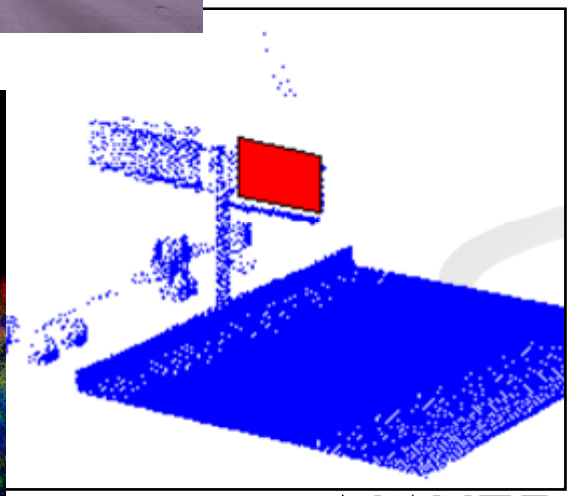
# Data Collection for Visuals

- Ground based imagery, LIDAR and inertial data





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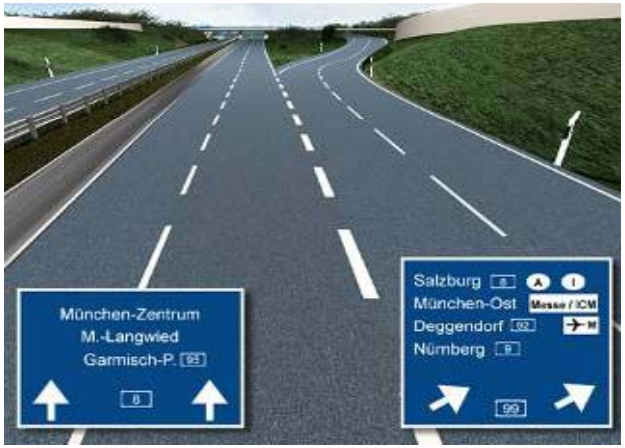
# Data Processing for Visuals

- Efficient and accurate creation of visual content such as pavement, lane markings, signs, and traffic lights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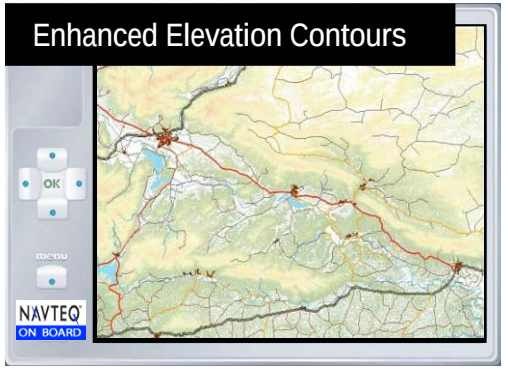
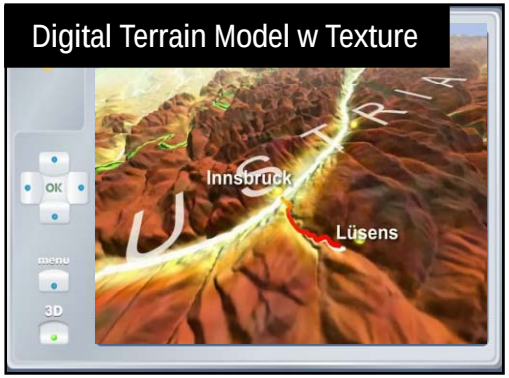
# Visual Content Products in Navigation

- Enhanced Elevation Contours
  - Topographic model of earth manipulated with 2D height information
- Digital Terrain Model
  - Topographic model of earth manipulated with 3D elevation data
  - Texturing adds color related to height
- Satellite Imagery
  - Satellite photographs add photo realism to the map display





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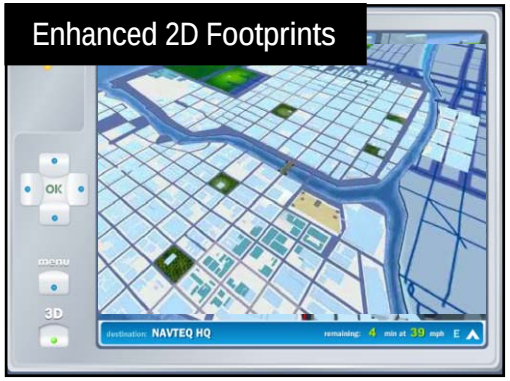
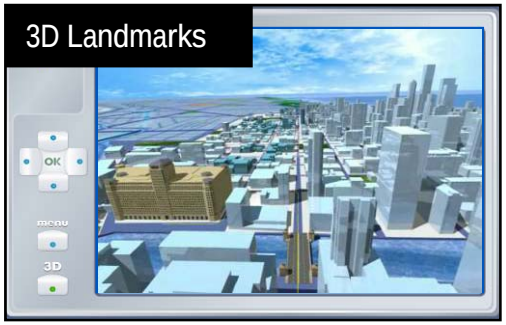
# Visual Content Products in Navigation

- 2D Landmark / Enhanced 2D Footprints
  - Polygons outlining either building footprints or building footprints for an entire inclusion area
- 3D City Models
  - Height data combined with Enhanced 2D Footprints to create three-dimensional city representations
- 3D Landmarks
  - Important, photorealistic structures in two resolutions and sizes that can be rotated





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# Pedestrian Mapping & Navigation

## Building to Building

## Floor to Floor

## Room to Room


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# Summary

- Maps will continue to evolve from 2D centerline maps to full 3D representations of reality
- Scale and product consistency will be achieved through automation using mobile mapping, computer vision and 3D graphics technologies
- Pedestrian mapping and navigation will continue it rapid growth as more and more GPS enabled mobile devices are deployed
- Pedestrian navigation will require higher quality visual content and rendering capabilities than traditional automotive navigation

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