Evolution of the NAVTEQ Map Database for ITS Applications
Agenda

- Who is NAVTEQ?
- The Foundation: The NAVTEQ® Map
- Content, Services and Solutions to Power a Location-Enabled World
- Enabling ITS Applications
  - Traffic & Optimizing Road Usage
  - Tracking & Tracing
  - Safety
  - Link Vehicles to Infrastructure

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Who is NAVTEQ?
The Premier Provider of Digital Content

NAVTEQ is the leading global provider of digital map, traffic and location data that enables navigation and location-based platforms around the world.
A Global Presence
NAVTEQ® is the leading provider of the digital map, traffic and location data that powers many of the world’s most innovative navigation applications.
## Strong Customer Relationships

**Automotive**
- BMW
- Mercedes-Benz
- GM
- Audi
- Toyota
- Land Rover
- Jaguar
- Nissans

**Systems Vendors**
- Z
- HARMAN/BECKER AUTOMOTIVE SYSTEMS
- ALPINE
- MAGNETI MARELLI
- Pioneer
- DENSO

**Telematics**
- OnStar
- ATX
- SATELLITE RADIO
- SIRIUS SATELLITE RADIO

**Internet & Wireless**
- T-Mobile
- WAYFINDER
- MAPQUEST
- Yahoo!
- AAA
- telenav
- Networks in Motion

**Mobile Devices**
- GARMIN
- Dell
- MOTOROLA
- ROUTE 66
- SONY
- Magellan
- appello
- Android
- ALK

**Enterprise**
- American Digital Cartography inc.
- ORACLE
- teletac fleet director
- RAND McNALLY
- Business Objects
- FedEx

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The Foundation: The NAVTEQ® Map
The NAVTEQ Difference: Its People and Technology

Leveraging the right balance of people and technology allows for NAVTEQ’s competitive advantage in providing the highest quality map

- **NAVTEQ’s ~ 1,100 Geographic Analysts:**
  - Local knowledge: 204 offices in 46 countries
  - Field teams “own” their piece of the map

- **NAVTEQ’s Global Toolkit:**
  - A single global specification—One World, One Database
  - Tools and technology are mobile and scalable to adjust to unique scenarios

- **NAVTEQ’s Continuous Innovation:**
  - New ways to leverage existing tools
  - Powerful tools open the door to new content and boost collection capabilities

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Local Knowledge: A Key Value Add

This in-depth “human factor” delivers data consistent with real world conditions and results in a multi-faceted and comprehensive product

- Local field teams “own” their piece of the map
  - Collecting and verifying up to 260 attributes
  - Regular updating of changing/growing areas
  - Identifying new unique local sources
  - Adapting collection methods based on local constraints
  - Responding to customer update requests
  - Defining phonetic translation localization
  - Adding local content coding directly into the map
  - Monitoring quality at every step of collection and production

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Most Accurate and Comprehensive Global Footprint

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Distinct Map Products With Varying Levels of Detail

**Performance Level**

**Coverage**

- **NAVTEQ Maps**
  - Built to NAVTEQ specification with continued focus on navigability
  - 78 countries across six continents (Q1/10)

- **Intermediate Maps**
  - Third party sourced. Highest quality available but not verified to NAVTEQ specification
  - 7 countries available (Q1/09)
  - Enables search, display and basic route calculation

- **Entry Maps**
  - Third party sourced. No navigable attributes and limited road network
  - 150 countries across Africa, Asia, Eastern Europe, Indonesia, Latin America and Oceania
  - Not for navigable functionality

**Functionality**

- **NAVTEQ Maps**
  - No use restrictions

- **Intermediate Maps**
  - Enables search, display and basic route calculation

- **Entry Maps**
  - Not for navigable functionality

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Content, Services and Solutions to Power a Location-Enabled World
Content that Meets Consumer Needs

Each year we expand our product offerings and drive market innovation with new ideas and to deliver customer requested functionality.
NAVTEQ Connected Services

NAVTEQ Connected Services supports services and solutions that give consumers access to a wide array of NAVTEQ resources, including robust maps, dynamic content and real-time traffic.

NAVTEQ Traffic.com

- NAVTEQ Traffic.com delivers real-time traffic to directly to consumers via their computer or mobile phone.
- A location-aware homepage makes it fast and easy for consumers to search for traffic information that is relevant to their location and daily commutes.
- NAVTEQ Traffic.com also features personalized traffic alerts, color-coded traffic flow and incident icons and real-time news tickers to inform site visitors to severe traffic incidents.
- NAVTEQ TrafficOne® Web and Mobile Solutions offer NAVTEQ customers traffic and other mobile and online content that can be co-branded and delivered across multiple platforms.

NAVTEQ Connected Solutions

- NAVTEQ Content Store™ is an easy-to-use online web shop that allows drivers to download and activate the latest map and location content directly onto their navigation device.
  - NAVTEQ Content Store can be fully customized, helping our customers build end-user loyalty and differentiate their product offerings.
- NAVTEQ MapTP Location Portal Solution™ is a white label web portal that gives customers access to dynamic and rich content and the ability to synchronize with in-dash navigation devices.

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Developer Programs

NAVTEQ works closely with developers to advance market-driving applications that integrate the quality of the NAVTEQ Map®

NAVTEQ Network for Developers (NN4D)
- NAVTEQ connects with LBS developers and partners across the globe through its exclusive industry network– NN4D
- NN4D is an online web portal and community that provides the technical and business support needed to build, showcase and launch the industry’s most innovative LBS solutions
- A few of NN4D’s featured offerings include:
  - Free sample NAVTEQ map data and APIs
  - Extended NAVTEQ and third-party support for other industry leaders through NN4D’s Partner Zones
  - Online forums, webinars, newsletters and other educational and networking tools

Global LBS Challenge
- Each year, the NAVTEQ Global LBS Challenge brings together developers and the leading companies in the wireless space to inspire the development of new location-enabled applications
- Several past LBS Challenge winners and participants have launched commercial applications on major wireless carriers, as well as received significant venture capital funding
Enabling ITS Applications
Telematics drives ITS Applications

- Move towards Integrated Navigation
  - Mobile navigation connected to back office enterprise solutions (GIS, Mobile Asset Management …)
  - Proven strong RoI

- Guided Navigation
  - Based on dynamic traffic information

- Telematics growing in Europe.
  - Once ‘black box’ technology installed a range of services can be provided
  - Size of the PAYD and RUC market is to grow to about 12-15 Million units in 2012
  - PAYD CAGR predicted to be 40% in Europe with Italy leading
Telematics

Telematics refers to applications that make use of a ‘black box’ fitted to a vehicle or asset which tracks its location.

Once a telematics ‘black box’ is fitted in a vehicle, many services can be delivered including:

- PAYD / PHYD (Pay As You Drive / Pay How You Drive)
- Road User Charging, Congestion Charging
- Stolen Vehicle Recovery
- e-Call / b-Call
- Premium services (e.g. Traffic, Concierge Services)
Product Life Cycle Analysis

Navigation by Far is the Leading Product Segment within the Telematics Space, PAYD, eCall, Stolen Vehicle Tracking all in Infant Stages
High Level Telematics Infrastructure

In Vehicle Element

Network Segment

Tracking Element

Service Element
Install Infrastructure – Deploy Multiple Services

Telematics Service

- Usage-Based Rental / Leasing
- Pays As You Drive Tolling
- Pays As You Drive Tax
- Pays As You Pollute
- Pay As You Drive/ Usage-Based Insurance
- Stolen Vehicle Recovery
- Theft Notification
- Vehicle Monitoring
- Automatic diagnosis and software updates
- In Vehicle Driver Maintenance Assistance
- Real Time Traffic Information
- Integrated Multimedia Entertainment & Internet Access
- In-Vehicle Driver Navigation Assistance

Domain Application
- Insurance Industry Fleet Management
- Leasing Industry Vehicle Manufacturers
- Service Companies Roadways Infrastructure Management

Post Crash Assistance
- bCall Service
- eCall Service

Event Notification
- UBI
- SVT
- RVD
- Navigation

Standard Telematics Unit
Telematics within ITS Applications

- Traffic & Optimizing Road Usage

- Tracking & Tracing

- Safety

- Link Vehicles to Infrastructure
Truck Attributes - NAVTEQ Transport

- NAVTEQ Transport is a set of navigable attributes specifically designed for navigation for trucks and large vehicles.
- Dataset enhanced and maintained by NAVTEQ field.
- Included in the Core NAVTEQ Map (Q2/09).
- Global specification.
- Enhanced with additional navigation and Rich POI content.

Available features:

<table>
<thead>
<tr>
<th>Category</th>
<th>Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Restrictions</td>
<td>Available</td>
</tr>
<tr>
<td>Legal Restrictions</td>
<td>Available</td>
</tr>
<tr>
<td>Warnings</td>
<td>Available</td>
</tr>
<tr>
<td>Truck POIs</td>
<td>Available</td>
</tr>
</tbody>
</table>
Historical Traffic - NAVTEQ Traffic Patterns

Berechnung der Route anhand eines Standard-Algorithmus

Ziel

Montag

Freitag
Historical Traffic - NAVTEQ Traffic Patterns

Abfahrt: Montag morgen 8.00 Uhr

Berufsverkehr !!!

Alternativberechnung mit NAVTEQ Traffic

<table>
<thead>
<tr>
<th></th>
<th>Dauer</th>
<th>Entfernung</th>
<th>Realistische Dauer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Route</td>
<td>21.9 min</td>
<td>19.7 km</td>
<td>38.8 minutes</td>
</tr>
<tr>
<td>Alternative Route</td>
<td>23.6 km</td>
<td></td>
<td>26.2 minutes</td>
</tr>
</tbody>
</table>

Alternative Route spart 12 Minuten!
Real-Time Traffic

- Traffic information consist on two basic components
  - Incident information
  - Flow data

- Use cases:
  - Display of Traffic Information in the Map
    - incident and flow data
  - Traffic enabled Routing
    - mainly based on flow data
  - Estimation of Arrival Time
NAVTEQ Traffic

Available in the following countries:

- Western Europe:
  - Austria
  - Germany
  - Norway
  - Sweden
  - Finland
  - Denmark

- With restrictions:
  - Switzerland - limitations on licensing to Swiss entities in Government and Media (please contact Customer Marketing for more info)
  - France - No sub-licensing, can be only be licensed direct (please contact Customer Marketing for more info)

- Technically available but not licensed for Enterprise yet (not to be shared with customers)
  - Italy
  - Benelux
  - United Kingdom
Use Case – Truck Navigation

- Core map + Speed Category + Speed Limits + Traffic Patterns + Stop Signs + Traffic Signals
- NAVTEQ Transport
Use Case: Five Key Ways to Reduce CO₂

Every Day Navigation
Use of Nav System reduces miles driven
- 8-15% Savings

Eco Driving
Driver cues to accelerate and decelerate efficiently
- 5-15% Savings

Eco Routing
Route calculation for minimum energy, not minimum time
- 5-10% Savings

Predictive Cruise Control and Smart Transmission
Anticipation of hills and crests to optimize throttle position and gear
- 2-5% Savings

Electric and Hybrid Vehicle Powertrain Management
Anticipation of hills & charging to optimize power consumption and fuel savings in hybrid configurations
- 5-24% Savings

Road User Tolling

- Many projects taking place around Europe at National, Regional and City Levels
- Privacy concerns are hot topic in Europe and may limit initial progress
- Concerns reduced with use of GPS based systems and onboard map matching so no location is transmitted to service provider

Diagram:
- Vehicle enters toll zone
- Notification sent via DSRC or GPRS
- Tolling Operator
- Monthly billing charges to driver’s account
Life beyond tracking...

- Safety
- Cost savings
- Customer Service
- Productivity

- Route Optimisation
- Workforce Management
- Fleet Management
- Tracking
**Integrated Navigation**

- Integration of back office and in-vehicle navigation technologies
- Back office for scheduling, optimisation, tracking, etc.
- In-Vehicle for navigation

![Diagram showing the integration of back office and in-vehicle navigation technologies](image)
Example: Transport & Logistics

Back Office
- Scheduling
- Optimisation
- Tracking
- Real-time job planning
- Integration with call centre

In Vehicle
- In Vehicle Telematics
- Navigation
- Bar Code Scanning
- RFID
- Electronic Signature

Same Map data, Truck Restrictions
ROI in the Distribution Sector

**Operational Efficiency**
- Driver hours: 79%
- Driving Distance Saved: 14%
- Fuel Saving: 4%
- Communication Savings: 3%
- Vehicle recovery: 22%
- Vehicle gets lost: 7%
- Employees Back office: 22%
- Staff turnover: 4%
- Late Arrival: 7%
- Employees Per vehicle: 38%

**Revenue Generation**
- Customer Retention: 86%
- New Customer: 14%

**Direct Cost Savings**
- Driver hours: 79%
- Driving Distance Saved: 14%
- Fuel Saving: 4%
- Communication Savings: 3%
Summary Integrated Navigation

- 18% reduction in driver hours
- 15% fuel saving
- 11% reduction in driving distance
- 10% customer retention increase
- Up to 40% savings on communication costs
- Real opportunities to demonstrate clear ROI with ArcLogistics and Navigator
Advanced Driver Assistance Systems - ADAS
Proof of Concept: Electronic Horizon

1. Find current Position
2. Determine possible routes
3. Determine probabilities
4. Start from current position on most probable route

Most Probable Path
e-Call

- Aug 2009 new policy document for eCall in Europe
- If limited progress, new policies to be developed in 2010 ensuring manufacturers and EU states realise the vision
- Aiming for 100% new vehicles by 2014
- Will act as catalyst for other services

Diagram:

1. Crash detected by Vehicle
2. GPS position obtained
3. Voice call with GPS data initiated
4. Call / data received by PSAP
5. Emergency response
6. Emergency services contacted
Most mature telematics market, substantial base of customers
Usage based Insurance

- Car owner installs telematics unit
  - SVR service activated
    - Lower theft loss risk for insurer
      - Reduced claims for insurer
        - Discount on Insurance premium
          - Insurer receives driving data
            - Individual risk evaluation
Link Vehicles to Infrastructure
Use Case in the Utility Sector: The Smart Grid

- Planning the Smart Grid Infrastructure
  - Eg planning location of charging stations

- Managing Energy Consumption
  - Smart metering

- Optimizing Energy Sourcing
  - Using car’s batteries to store energy

- Operating the Smart Grid
  - Operating charging stations
Summary of what NAVTEQ Map Database provides

- One global specification
  - 260 Attributes

- NAVTEQ Unique Road Classification
  - 5 Functional Classes, Globally consistent
  - Based on the actual usage of the roads

- Relevant content
  - Speed limits
  - Speed categories
  - Road type
  - Road surface
  - Turn restrictions
  - Lane markings
  - Traffic lights
  - Driver alerts
  - Truck restrictions
  - Traffic (historical and real-time)