HD maps – sensing the horizon for autonomous driving

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Driving the future of software with Elektrobit (EB)

Embedded and connected software products and services for the automotive industry

Software powering over 1 billion devices in more than 100 million vehicles

Automated driving

Vehicle infrastructure

Connected vehicle

User experience
About EB

Technical competencies
EB’s technical core competencies are development of automotive-grade (software) products and engineering services.

Employees
More than 2600 employees* worldwide. Spans three continents and eleven countries.

Consistent growth
In 2018: +35 %

Global presence
Development and business offices in Austria, China, Finland, France, Germany, India, Israel, Japan, Romania, South Korea, and USA.

Continental AG
Wholly owned, independent subsidiary of Continental AG.

100+ million
Over 100 million vehicles on the road and 1 billion embedded devices.

*December 2018, incl. Argus, excl. e.solutions.
We disrupted the market with our Portable Navigation Device (PND) – made it available for the mass market and sold 95m in the process.

We continue to disrupt with our leading navigation technologies, such as creating High Definition (HD) maps for autonomous driving.
TomTom – Powered by 3 core technologies

01
Maps

02
Navigation

03
Services
Key to our continued success

Unique proposition for Autonomous Driving

Triple A customers

Only independent leading player

27 years of experience

High quality products and partnerships
Autonomous Driving (AD) is the single most disruptive trend since the invention of the motor vehicle. It promises to bring comfort, safety and higher efficiency.
Challenges for safe and comfortable autonomous cars

**Complexity**

**Unexpected situations**

**Hazards**

**Difficult conditions**
Covering the edge cases of driving, e.g. within

- Twilight, highly complex traffic
- Poor weather and icy roads
Making the vehicle see beyond its sensor range
By creating an HD horizon
The evolution of automotive maps

From navigation over driver assistance to automated driving

More advanced functions exponentially raise software complexity
The evolution of TomTom’s automotive maps

From navigation maps over maps for driver assistance to HD maps for automated driving
The need for high-definition maps

- HD maps offer highly accurate geometry of the lanes on the road

- Additional elements like road furniture or point clouds provide reference data for localization using various sensors

- Widespread coverage already available across Europe, America, South Korea and Japan. China through partnerships

- Highly accurate dynamic data created through crowd data
Keeping HD Maps up-to-date
Key criteria of an HD map

**Highly attributed**
- Lane model
- Traffic signs
- Localization data

**Highly accurate**
- Sub-meter absolute accuracy
- Decimeter relative accuracy

**Highly maintained**
- Sensor-derived observations
- Survey vehicle data
Applications benefitting from map data

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Distribution of map data to in-vehicle ECUs
Examples of use-cases

- Cars sense and collect data of their environment
- Dangerous spots
- Roadside barriers
- Where the sensor data is pre-processed, grouped, sorted and interpreted
Advancing map-enhanced driver assistance systems
AutoStream: Innovative map delivery for automated driving

- AutoStream service streams map data in tiles and layers along route or MPP
- AutoStream onboard client integrates with Vehicle Horizon
- Reduces complexity and development time thanks to smart on-board client software
- Minimize data consumption with onboard cache
TomTom maps feed Elektrobit as ADASIS provider

**Connectivity**

- **AutoStream** (on-demand map download)
- On-board map plus connected services
- On-board map

**Content**

- **SD ADAS Map**
  - Basic electronic horizon for driver assistance
  - Connected electronic horizon for driver assistance
  - Scalable electronic horizon for driver assistance

- **HD Map**
  - Connected electronic horizon for AD
  - Scalable electronic horizon for AD
  - Static electronic horizon for AD
TomTom AutoStream and EB robinos Predictor for ADASISv3
EB robinos Predictor

The electronic horizon provides other ECUs a continuous forecast of the upcoming road network by using optimized transmission protocols.

It integrates:
- Map matched positioning
- Most probable path (MPP)
- Static map attributes
  - Curvature, slopes, speed limits, road class, etc.
- Dynamic data
  - Route, traffic data, hazard warnings, road construction data, weather, etc.

ADAS applications:
- Automated driving
- Fuel efficient driving
- Predictive curve light
- Curve speed warning

The standard electronic horizon transmission protocol for the communication between EB robinos Provider & Reconstructor is developed by the ADASIS consortium.

Map and navigation data become additional predictive sensors for ADAS
EB robinos Predictor Eval Kit: ADASIS Provider for R&D

Record test-drives and play them in exact timing behavior at your desk

• Out-of-the-box device to run EB robinos Predictor
• Evaluate the capacity and performance of EB’s electronic horizon products
• Playback for pre-recorded test drive track
• Recording of new test drive tracks
• Possible to simulate any route
• Integrable into your testing and simulation environment by reading GPS information from CAN
• ADASIS v3 support with latest TomTom HD maps for Europe and North America plus OTA support
Let’s conclude

- Complementing sensors with HD maps enables a safe and comfortable automated driving experience
- ADASISv3 electronic horizon is a standardized way of providing HD map data to on-board units
- TomTom and Elektrobit offer a convenient way to implement an ADASISv3 electronic horizon
- Contact us to obtain a demo toolkit and access to relevant TomTom HD map evaluation data
Thank you!

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