



A Manufacturing & Transportation Center of Excellence

Whitepaper

Leveraging Location Data to Accelerate Mapping Solutions

INTRODUCTION

Asset tracking and asset visibility are essential pillars to building more advanced solutions to improve operations by streamlining the processes. They start from simple asset localization and monitoring through utilization tracking to increasing human safety, work efficiency, cost optimization, and simulations. Location visibility solutions can also serve as data sources for partner systems apart from playing their primary role. A simple example is a notification of an asset entering/leaving a geofence or an asset being delayed, consumed by partner systems that adjust their behavior accordingly.

Asset location precision varies based on the asset type and use case. It is often enough to use the warehouse name and vehicle type to determine the package location. While vehicle tracking requires better precision using longitude and latitude values, even better accuracy is needed in autonomous driving. Regardless of the position data type, they need to be placed on a map that provides the context for location data by accumulating real-world and augmented data. A few examples are road topology, points of interest, country boundaries, congestion zones, and frequent accident areas.

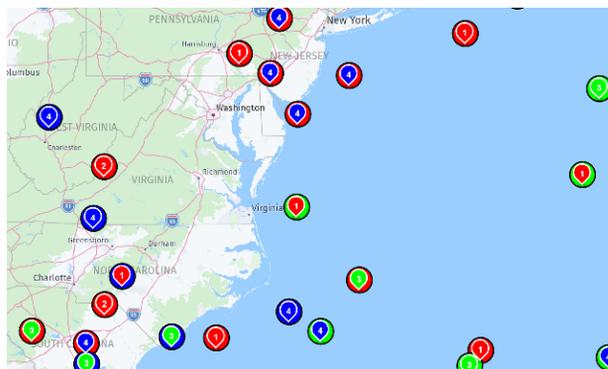
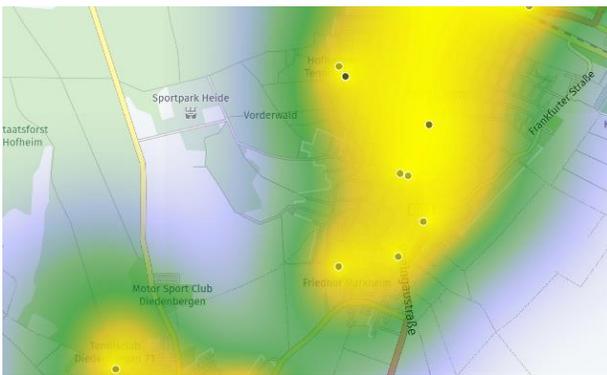
However, many a time, the context is not complete for particular solution needs. It wouldn't contain custom data or would have a gap in data. Custom data being part of the map data can help in the decision process and empower valuable solutions—for instance, the position of other fleet vehicles, delivery regions, operation history, or custom routing preferences. On the other hand, gaps in the map data are in areas where the demand for it is not so high—for the same reason, the provider is not keen on collecting data for such locations. Other examples are private venues, construction areas, or mining sites. In case there is a need to fill the

gap, it would be an advantage to have the option to extend the map data seamlessly by leveraging ready-to-use tools, processes, and data structures. Bring-Your-Own-Data (BYOD) approach can be seen as part of map data provider services.

Map data and location data are changed constantly. Hence, maintaining a full context and keeping it up to date require computation resources that work proficiently. Efficiency and scalability are hidden in how location data is processed—hence, the big data frameworks play a crucial role in such solutions.

IMPLEMENTING MAPPING SOLUTIONS

It is proven that competitive advantage is firmly based on custom tools or the proper utilization of existing tools. At Ness Digital Engineering, we invest in resources to get the maximum from current tools and extend usability by providing custom solutions. Such an approach will help our customers to focus on their core business and let us use the right tools to achieve core goals. One example is recognizing the HERE platform as a leading tool in location data processing solutions. Our teams have been deeply involved in the map content creation process with **HERE Technologies, a leading location data and technology platform**. The familiarity with the map data structure speeds up our expertise in providing location data processing solutions for our customers. Let's see how the HERE platform addresses map context challenges described at the beginning of this paper.



Bring Your Own Data

The custom Point of Interest (POI) dataset is uploaded to the platform so that data is aligned with the standard map data and used by the existing location services. There are a couple of ways to upload the custom data to the platform, process the data, and finally access the same. The solution's needs determine the proper approach. One concrete example is charging stations set for electric vehicles. The standard data set contains publicly available charging stations. Many a times, a fleet of EVs has access to private charging stations. A set of such charging stations is blended with the standard set so that the routing service provides more efficient fleet management.

Custom Maps

Custom maps can be perceived as a BYOD case. The slight difference is that custom maps extend the existing map data to fill the gap. The area is not part of the existing maps because of private access and utilization restrictions. Such custom maps can be split into three different categories:

1. Surface map:

Maps for surface mining and construction site areas are the primary examples. It is a very dynamic space. The road topology constantly changes, and a road segment lifetime can be relatively short. Data collection can rely mainly on standard approaches such as GPS positioning. The process of the map creation and update is semi-automated. Data is collected by commercial vehicles during standard operations. The backend processing aggregates data and compares them with the existing road topology to find discrepancies and new roads. In straightforward cases, the data is updated right away. An operator is notified to evaluate the new data state in other scenarios. Map data can be enriched with traffic rules to increase safety and optimize vehicle flow. A restricted driving maneuver can be detected and reported once traffic rules and custom attributes are in place. One of the main benefits of choosing the HERE platform as the underlying implementation technology is that the map data are modeled using standard data structures. By using available data schemas, we can be sure that standard location services will be able to operate over them—e.g., routing service. The HERE platform contains a set of tools available for the efficient map creation process—the pipeline templates, map editing tool, and map visualization—to name a few.

2. Underground map:

The location data collection and positioning are a bit different here. We cannot rely on satellite positioning—hence, beacons, anchor points, or a private 5G cellular network must be used. The same applies to the map structures. A map can have multiple connected levels similar to buildings. A couple of supporting tools are part of the HERE platform, even though it is a unique environment.

3. Indoor map:

The HERE platform completely covers indoor mapping. The end-to-end toolchain exists since the HERE platform maps public venues such as shopping malls and parking facilities. These tools are available to map private sites too. We can make data adjustments and enrichments and use standard or customized location services. The improvement of indoor mapping is in progress. New tools and methods that process point cloud data from lidar and ML/AI-based automated feature recognition will be plugged into the toolchain to create better indoor maps.

Location Data Processing

Solutions operate over the map data, and processing location data is data intensive. The high throughput and scalable computation power are needed to handle batch updates or peak shaving. The HERE Workspace has been designed to serve such a purpose as part of the HERE platform. Its batch and streaming pipelines are built on top of big data frameworks Apache Spark and Apache Flink. According to the HERE tiling schema, data organized in catalogs and layers support parallel data processing. The managed pipeline runtime environment of the HERE Workspace can allocate computation resources to accommodate processing speed requirements. The pipelines and access to standard and custom map data position the HERE Workspace as an ideal tool for unique data location processing solutions.

CASE STUDY



Here Technologies, a Mapping Solutions Provider, Partnered with Ness to Improve their Customer Experience

Our investment into location data processing expertise helps our customers to accelerate their mapping solutions. Map content creation and processing expertise, together with the understanding of the HERE platform capabilities, are used to design cutting-edge solutions.

HERE provides a rich set of APIs and SDKs for modern mapping and routing services, including tracking, fleet connectivity, and geofencing extensions to support mobile asset tracking. They wanted to extend their engineering capabilities to increase and optimize the number and quality of products and refactor their existing services as part of their digital agenda.

Ness collaborated with HERE to digitally transform automotive data flows, supporting the next generation of 2D and 3D mapping on the HERE location platform. This evolution is a critical factor in the future of autonomous driving.

As part of the solution, Ness implemented the following:

- Visual products that relate complex data on physical junctions, landmarks, and signage to the core mapping platform to provide information to the driver
- Visual buildings that represent buildings as objects with content POI, not just pictures
- ADAS, an extension of the 2D digital map with height information
- Pipeline – a core map infra team of Oracle DBAs
- Automotive Cloud Services (ACS) for drivers and passengers, automated driving (HD Live Map), and digital infrastructure services
- HLP migration self-hosting
- Innovation on continuous delivery and SAFe
- Innovation in 3D rendering, search, and intelligent routing

The partnership between Ness and HERE improved the customer experience by shortening the time for visual data processing through the integrated Visual Product System (VPS).

AUTHOR



Maros is a solution architect in Ness's Manufacturing & Transportation Center of Excellence. With 15+ years of experience in M&T-related domains and technical solutions, Maros primarily focuses on researching current trends and emerging technologies. He is also responsible for analyzing customer requirements, proposing solution architecture, and working with development teams to achieve the goal using software development best practices and industry standards. Maros has extensive knowledge in the location data processing domain, and his contribution to visual map data processing resulted in two joint patents.

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The Manufacturing & Transportation Center of Excellence delivers outcomes through solutions that work at the intersection of business and technology.



Expertise

1000+ person years of experience with industry-leading smart transportation systems and fleet management solutions



Digital Accelerators

50%+ time to market reduction by tailor-made, industry-specific, software enablers and accelerators | Digital Twins | AWS IoT | PoCs and Prototypes



Thought Leadership

Geolocation patent holders, industrial community speakers, and contributors | Industry 4.0 Keynote for IT Valley | EU Urban Mobility Citython



Strategic Alliances

Deep strategic alliances in mapping and navigation solutions

M&T INDUSTRY OFFERINGS

At Ness, we help our customers quickly adapt to change by providing the right platforms like Connected Services that manage data from devices and provide additional services. We work with location data and integrate it into a proper backend to support efficient fleet operations. In the mobility space, Ness has helped realize many use cases, including real-time and multi-modal ticketing solutions, integrating with social payment solutions and using AI to improve run-time predictions. Ness transforms leading manufacturing and transportation companies into next-generation connected enterprises.

- » **Mapping and Navigation Solutions**
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- » **Smart Energy Management**
- » **Predictive Analytics**
- » **Connected Platform for Advanced Telematics and Fleet Management**



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ABOUT NESS

Ness Digital Engineering designs, builds, and integrates digital platforms and enterprise software that help organizations engage customers, differentiate their brands, and drive profitable growth. Our customer experience designers, software engineers, data experts, and business consultants partner with clients to develop roadmaps that identify ongoing opportunities to increase the value of their digital solutions and enterprise systems. Through agile development of minimum viable products (MVPs), our clients can test new ideas in the market and continually adapt to changing business conditions—giving our clients the leverage to lead market disruption in their industries and compete more effectively to grow their business.

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