CASE STUDY

Dynamic Bus Stop Management in Hamburg: Materna develops Gaia-X-Compliant Core Components

Challenge

In the GAIA-X 4 ROMS research project, part of the Gaia-X lighthouse project family Gaia-X 4 Future Mobility, Materna is developing core components for the „dynamic bus stop management“ use case. The aim here is to expand the range of mobility services in a scalable manner through the coordinated multiple use of existing transport infrastructure (i.e., bus stops).

The use case comprises an evaluation of stops in the Free and Hanseatic City of Hamburg (FHH) regarding their attractiveness for use in the context of on-demand shuttle transport. The purpose of the index is to provide the city and the Hamburg-Holstein public transportation authority (VHH) with a basis for evaluating at which stops the implementation of an on-demand shuttle is likely to make sense. It should be possible to carry out and confirm these assessments with the help of a visualization of all parameters.

Another task is to provide suitable consumers with the required data in a sovereign and Gaia-X-compliant manner via interfaces. These consumers include the Materna Data Factory as the data orchestration instance of the use case and the SmaLa app from TraffGo Road as the coordination instance for booking requests and billing.

Comprehensive Visualization

Optimized Bus Stop Management

Data-based Decisions

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Solution

Index on the attractiveness of stops
An attractiveness index was designed to provide the City of Hamburg (FHH) and the transport service provider (VHH) with an evaluation basis for the creation of offers in the form of usage slots at stops for on-demand shuttles. By processing and linking freely accessible data and data from Hamburg's public transport operators, spatial and temporal relationships are first identified using isochrones around the stops. The algorithm weights the input data (including availability, networks, environmental and stop parameters) and calculates an attractiveness score for each stop.

Dashboard with the static attractiveness index of VHH stops in the Hamburg city area

Dashboard Visualization and the SmaLa App
These ratings are visualized in color in a dashboard and linked to content in pop-ups and widgets so that the city and transport operators can make data-driven decisions. From the dashboard, users can be redirected to a web application created with the ArcGIS API for JavaScript. Here they can reserve stops and approve them for use in SmaLa–a virtual booking system for zone reservations. Different logins with specific role and user privilege concepts are used. The transport companies can suggest ideal stops, which must be finally confirmed by the city as the infrastructure provider via the web application.
The applications were developed and provided with the help of the Materna Data Factory, which relieves the developers in their work. The functionality of the web application was hosted as a service in the Factory and accesses a Java backend application via an externally visible REST interface. It manages the reservation and approval process, sends notifications to users as required and sends data to the SmaLa booking system.

Web application for the approval process: View for users of the Free and Hanseatic City of Hamburg (FHH)

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ABOUT MATERNA

The Materna Group–founded in 1980–implements IT and digitalization projects along the value chain from a single source: from consulting to operation. Today, the privately-held company includes several subsidiaries and holdings. At the interface between people and technology, Materna supports the public sector in the strategic and IT implementation of official tasks on the way to digital administration.
Since 2022, Materna is an Esri Partner. Materna and Esri are jointly implementing projects in the public sector and the Gaia-X field, among others.

Industry:
IT consulting and implementation, system integration

Locations:
more than 40 worldwide

Employees:
more than 4,000 worldwide

Founding:
1980

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Success Story

The stop-related attractiveness index enables well-founded, data-based decisions. The visualizations use clear relationships, symbols, and color gradations to ensure easy comprehensibility. By displaying the attractiveness of a stop as a percentage, which is made up of various parameters, spatial relationships and optimal stops can be easily identified. At the same time, the multimodal travel chain within an area can be sustainably strengthened and made more attractive using stop management. In addition, disruptions to private transport can be reduced.

The chosen approach is suitable for optimizing the utilization of transport infrastructure in almost any city or municipality. The corresponding data can be used to derive the attractiveness index and other use cases, such as delivery services or rest periods, can also be implemented using this methodology.

Summary

As part of the GAIA-X 4 ROMS project, Materna is developing an index for the city of Hamburg to evaluate the attractiveness of bus stops for on-demand shuttles. Through visualization in a dashboard, relations and parameters are summarized and presented in an understandable way for decision-makers. In a web application, relevant bus stops can be suggested by Hamburg's public transport operators and approved for use by the city via a virtual booking system (SmaLa app). The underlying data flows are recorded and processed via interfaces to the Materna Data Factory.

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ESRI TECHNOLOGY IN USE

- ArcGIS Pro
- ArcGIS Online
- ArcGIS Enterprise
- ArcGIS Dashboards
- ArcGIS StoryMaps
- ArcGIS Arcade