

# RailTrail

## Vehicle Localization at the REAKT-Track Malente-Lütjenburg

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# The RailTrail Project

Master's Project (summer term 2023)

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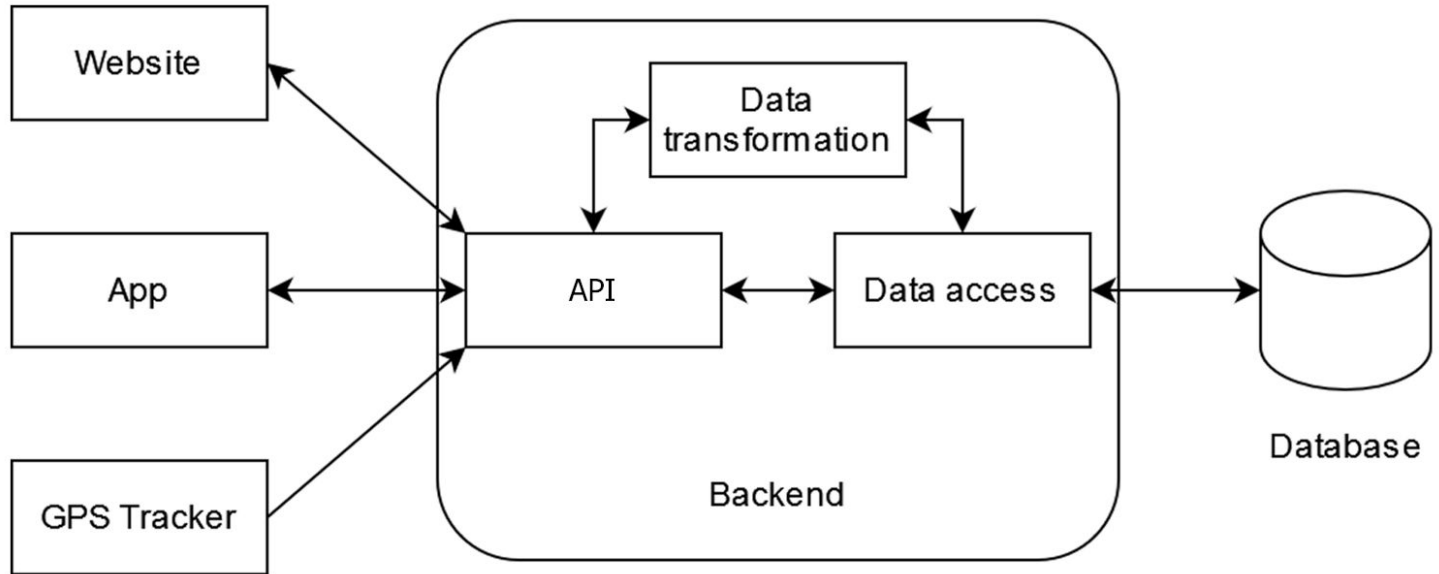
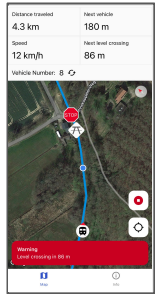
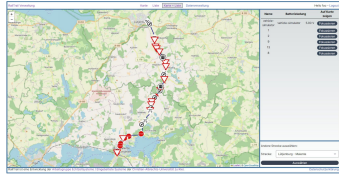


<https://github.com/kieler/RailTrail>

# REAKT DATA



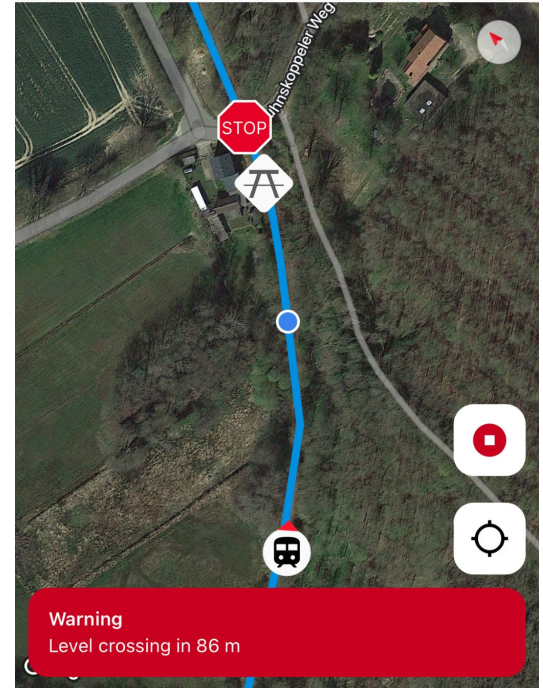
# Infrastructure



# App

Distance traveled	Next vehicle
4.3 km	180 m
Speed	Next level crossing
12 km/h	86 m

Vehicle Number: 8 ↻



Map

Info

# App

User vehicle

Distance traveled	Next vehicle
4.3 km	180 m
Speed	Next level crossing
12 km/h	86 m

Vehicle Number: 8 ↻

Warning  
Level crossing in 86 m

Map Info

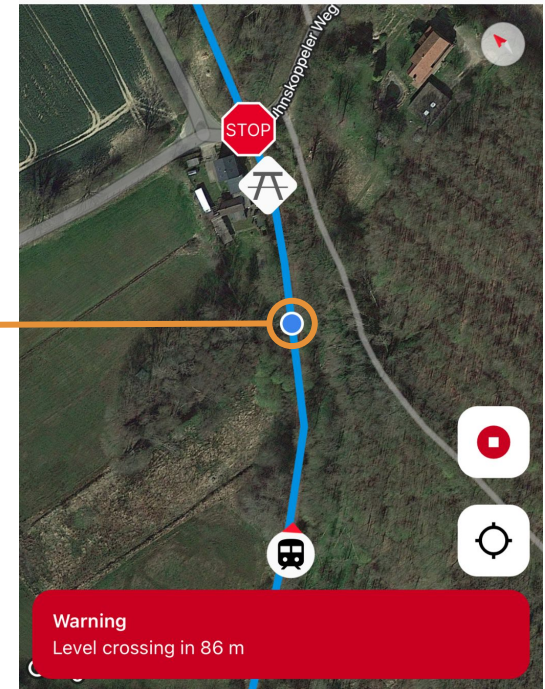
# App

## Vehicle statistics

Distance traveled 4.3 km	Next vehicle 180 m
Speed 12 km/h	Next level crossing 86 m

Vehicle Number: 8 ↻

## User vehicle



# App

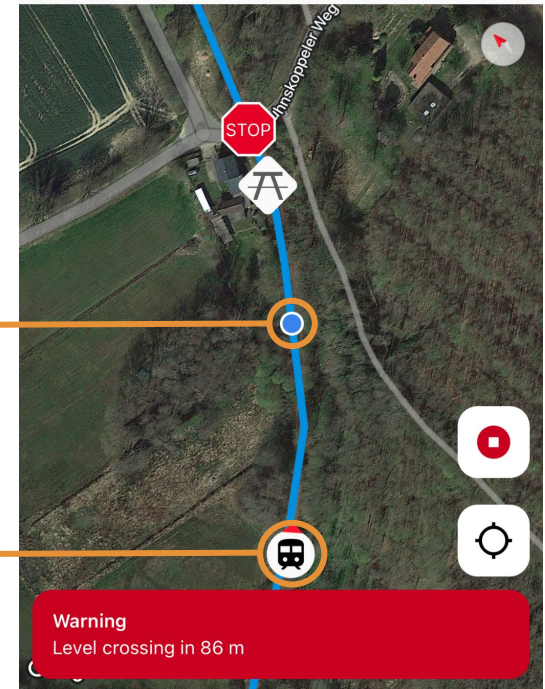
## Vehicle statistics

Distance traveled 4.3 km	Next vehicle 180 m
Speed 12 km/h	Next level crossing 86 m

Vehicle Number: 8 ↻

User vehicle

Other vehicle





# App

Vehicle statistics

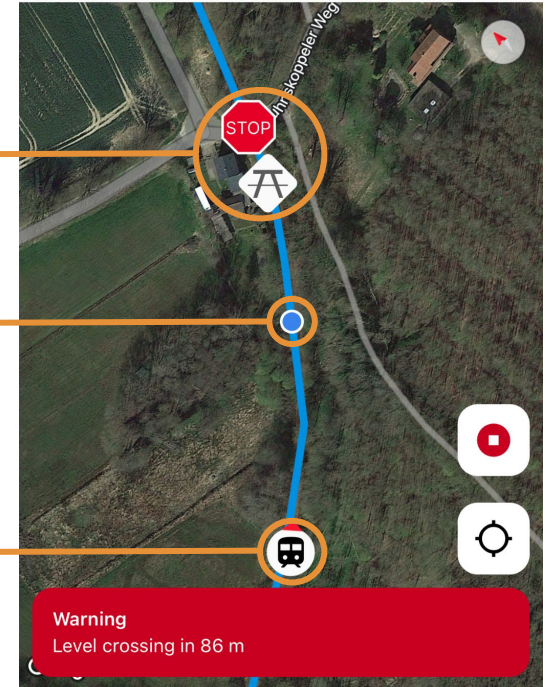
Distance traveled 4.3 km	Next vehicle 180 m
Speed 12 km/h	Next level crossing 86 m

Vehicle Number: 8 ↻

Points of interest

User vehicle

Other vehicle



# App

## Vehicle statistics

Distance traveled 4.3 km	Next vehicle 180 m
Speed 12 km/h	Next level crossing 86 m

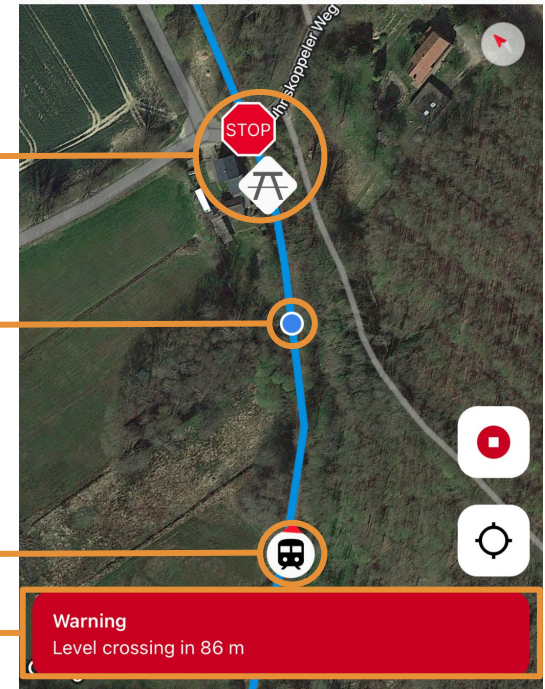
Vehicle Number: 8 ↻

## Points of interest

## User vehicle

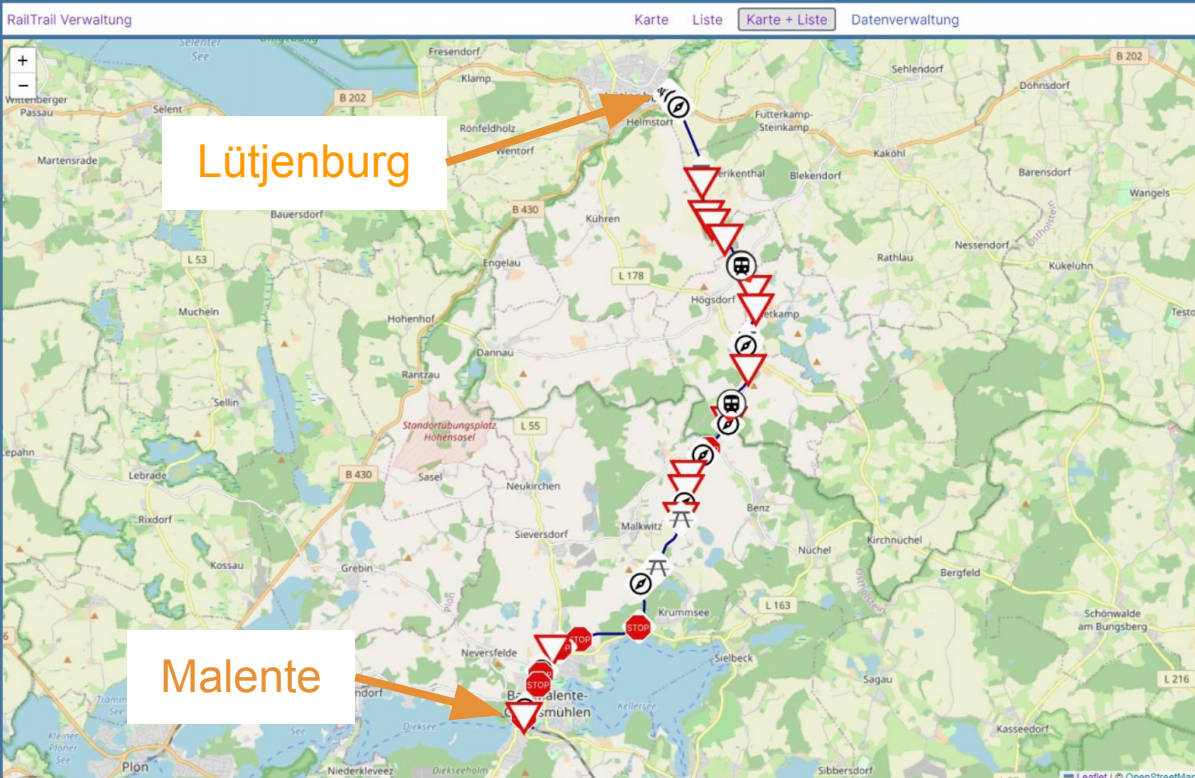
## Other vehicle

## Notifications



# Website

RailTrail Verwaltung Karte Liste Karte + Liste Datenverwaltung Hello foo – Logout



**Lütjenburg**

**Malente**

Name	Batterieladung	Auf Karte zeigen
vehicle-simulator	vehicle-simulator 5.00 V	<button>Fokussieren</button>
1		<button>Fokussieren</button>
2		<button>Fokussieren</button>
9		<button>Fokussieren</button>
13		<button>Fokussieren</button>
8		<button>Fokussieren</button>

Andere Strecke auswählen:

Strecke:

Auswählen

RailTrail ist eine Entwicklung der Arbeitsgruppe Echtzeitsysteme / Eingebettete Systeme der Christian-Albrechts-Universität zu Kiel. Datenschutzerklärung

# GPS Tracker

## Oyster 3 GPS Tracker

- rugged & weather resistant
- battery-powered
- LoRaWAN or LTE communication



# LoRaWAN

- “long range” (> 10km)
- limited coverage
- very low power
- limited bandwidth / frequency usage

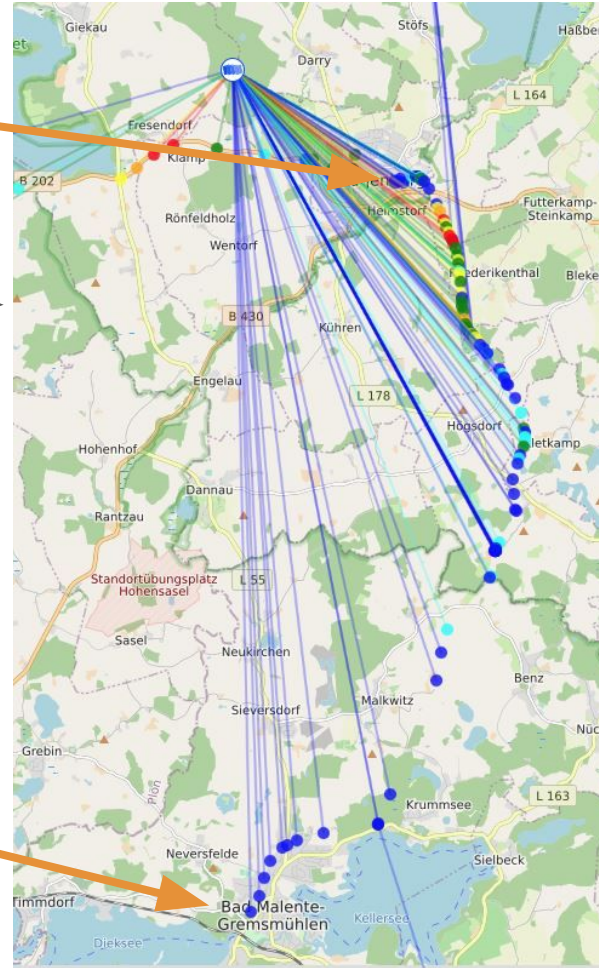
0,3 - 50 kbit/s

→ good for position updates every few minutes

Lütjenburg

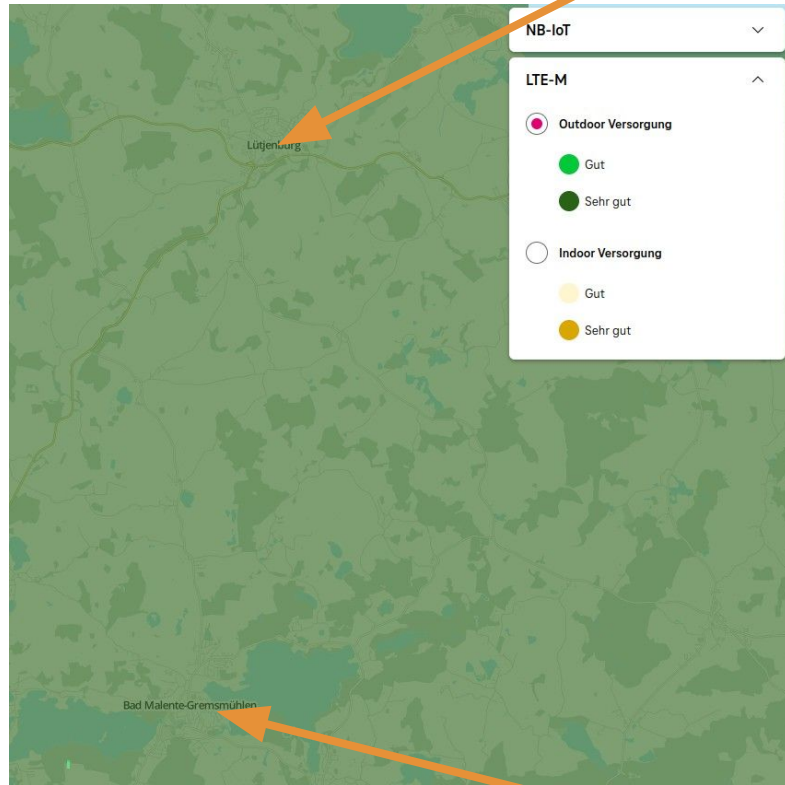
Malente

Source: Addix



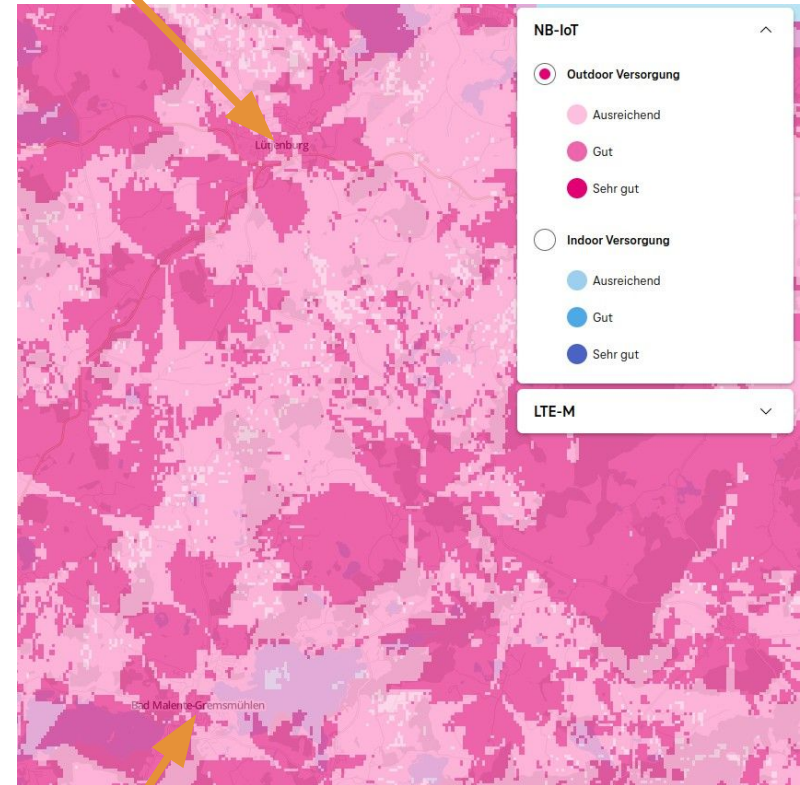
# LTE-M / NB-IoT

Lütjenburg



Source: Telekom

Malente



# Wrapping up

- localisation with LoRaWAN/LTE
- data collection for REAKT Data
- App/Website for tourists

You can find us at the “Markt der Möglichkeiten”



Christian-Albrechts-Universität zu Kiel



Bundesministerium  
für Bildung  
und Forschung

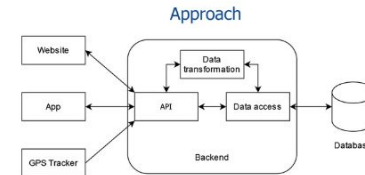


## Introduction

RailTrail is a project under the REAKT initiative, aimed at revitalizing the Malente-Lütjenburg railroad. ([www.schiene-m-l.de](http://www.schiene-m-l.de))

Herefore RailTrail is the first step in revitalizing and in approaching individual rail traffic with

- Tracking vehicles via GPS
- Use of mobile devices for presentation
- Alerts for safety concerns



GPS data gets collected from mounted trackers and apps, stored and aggregated to deliverable results for apps and an administrative website.



[github.com/kieler/RailTrail](https://github.com/kieler/RailTrail)

Masterproject 2023  
N. Bernal, L. Bredin, C. Beyer, J. Gevert,  
J. Grottel, D. Mackelmann, D. Rückert

## Features & Functionalities

### Frontend

- Presentation of track-bound data
- Management of visualized data
- Collision detection
- Individual alert system for safety concerns

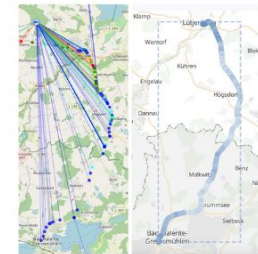
### Backend

- Storing & accessing GPS data
- Aggregation of vehicle based data
- Serve API for frontend usage

### Hardware

- Configurable GPS tracker
- Simulation of vehicles & their GPS data

## Network Coverage



Positional update rate is limited by upload rate & network availability.