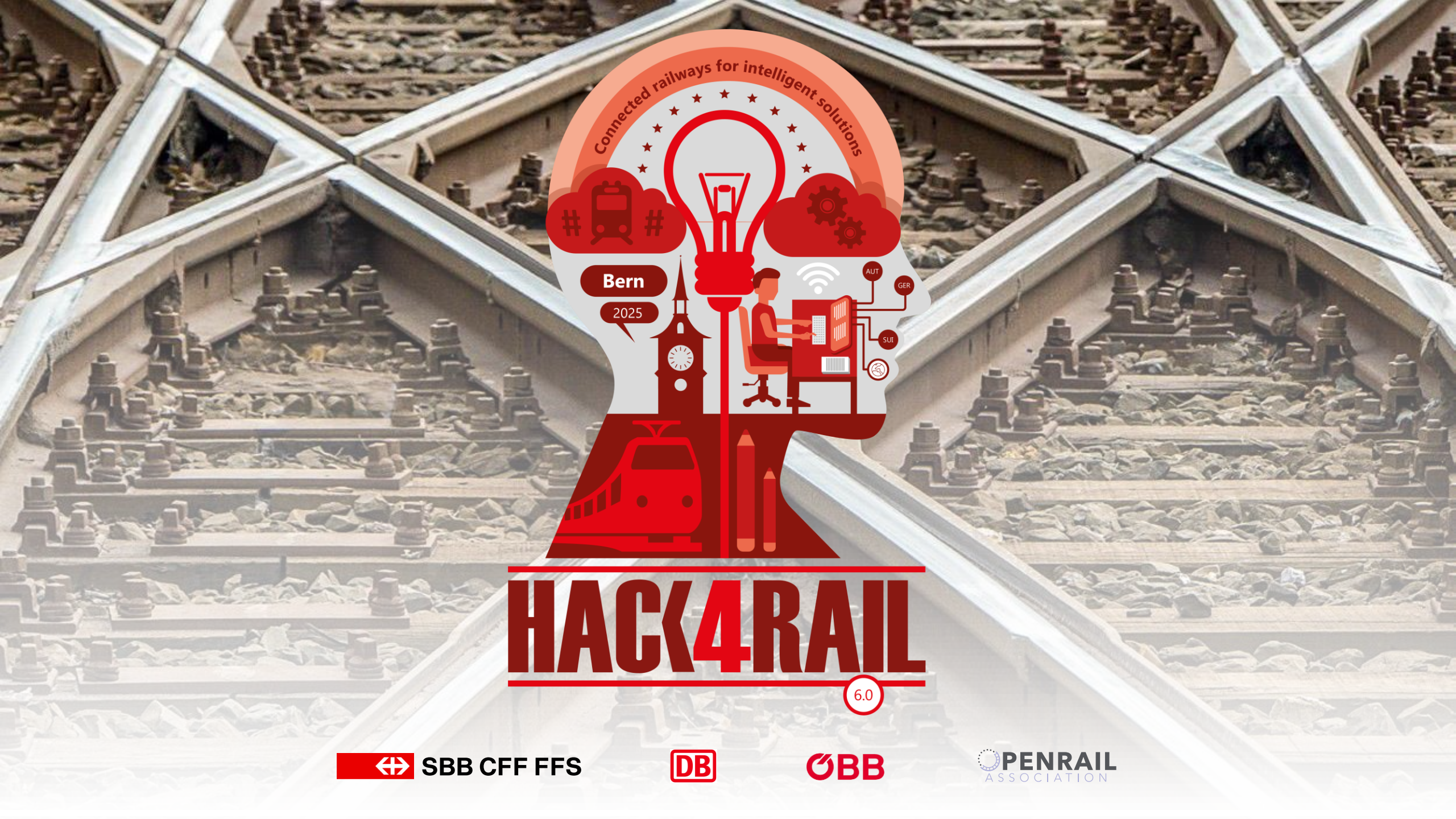

Connected railways for intelligent solutions
Bern
2025
AUT
GER
SUI
HACK4RAIL
6.0
SBB CFF FFS
DB
ÖBB
OPENRAIL
ASSOCIATION

Solution Pitches Hack4Rail 2025

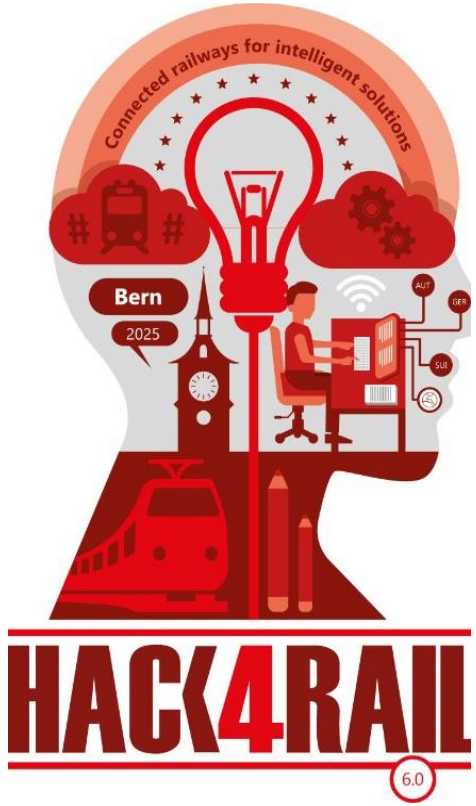
Track 2

Borderless mobility & logistics in Europe

VisualTravelScope: Make travel more personalised & accessible

Challenge owner:
DB

Teams:
Parametric Travellers
TrainTripGenerator5000+
TripHackerz



Parametric Travellers

DiscoveRail

Team SBB, ÖBB, SNCF

Description of the Challenge

What is the problem/idea? What is the current status?
Focus on important/central points.

Customers who want to spend time and have a vague idea of what they want to do should be supported in finding a way how to spend their time.

Offer these customers an experience, e.g. hiking, swimming, cultural options, that could be reached and „solved“ within their given „time budget“

Description of the Solution or Idea

What are the key features of the solution?
Focus on important/central points.

Customers provide their time budget and high-level category of activities.

Based on this input the application queries the source data to suggest at least 5 options to the customer. The experience can be done within the input time budget including return travel time at a 40/60-ratio.

Project Links

- GitHub Repository: https://github.com/david-sbb/rail-away
- Demo:
- Further Links:

Who are the user groups of the described solution?
Internal/external user groups (e.g., business sectors, b2c / b2b customers, etc.)

- B2C
- End users, Customers

What is the economic benefit?
E.g., reduction in compensation costs

- Increase return of invest by animating and nudging people to live experiences with public transport

What are the positive impacts on the rail system?
E.g., attractiveness of rail transport, ecological impacts, ...

- Increase of attraction of rail/public transport

What is the maturity level of the technologies used?
May depends on the railway company.

- High: Angular, Java

Are there any existing alternatives to the solution?

- The other teams of this challenge
- „Inspiration“ within SBB mobile preview

Which alternatives are out of the question and why?

- The other teams‘ solutions because ours offers high usability, easy implementation and a great UserExperience
- „Inspiration“ only gives random cities as destination but no experience or hint what could be done there.

Are there any foreseeable risks, hurdles or dependencies, how needs to be considered?

- Low number of users
- No interest by the management

What are the next Steps? What do you need to implement the solution?

- Proper architecture, Implementation of tariff information and booking
- User account integration, e.g. swisspass
- We need time

Team 2

Train Trip Generator 5000+

Team DB, ÖBB, Infrabel

Description of the Challenge

What is the problem/idea? What is the current status?
Focus on important/central points.

Planning long distance, multi-day trips by train is very difficult. Train travel is slow travel, but a traveller currently has to do a lot of research to combine

- Train schedules of different countries or operators
- Hotel locations, prices and availability
- Potential activities in places with long transfers

A traveller could have many preferences that they need to take into account, again and again for every trip

- How long is the traveller willing to travel in a day
- At what time does the traveller want to get up
- What type of accomodations does the traveller prefer
- What type of activities does the traveller prefer
- Is the traveller OK with doing tight connections

Combining all these criteria and all the research from many different sources is very painful to do, and the traveller currently has to combine it themselves.

Description of the Solution or Idea

What are the key features of the solution?
Focus on important/central points.

One cross-country application where the user can input all his criteria, and find suggestions of routes to take. The core feature would be:

Enter your departure and destination, and how much time you want to spend travelling in one day.
The application will find you a route that goes between the two, and gives you places where you can spend the night.

Project Links

- GitHub Repository: https://github.com/OpenRail-Playground/train-trip-generator-5000-plus
- Demo:
- Further Links:

Who are the user groups of the described solution?
Internal/external user groups (e.g., business sectors, b2c / b2b customers, etc.)

- Travellers, travel agencies

What is the economic benefit?
E.g., reduction in compensation costs

- Simplifying the planning of a train trip will increase the amount of train travellers, which will increase income for railway companies.

What are the positive impacts on the rail system?
E.g., attractiveness of rail transport, ecological impacts, ...

- Making train travel easier is a huge boost for the attractiveness of rail transport, and be beneficial for the environment by reducing the amount of people travelling by train.

What is the maturity level of the technologies used?
May depends on the railway company.

- Industry standards used, currently with local deployment and database

Are there any existing alternatives to the solution?

- No

Which alternatives are out of the question and why?

- Regular rail planners do not take users wishes into account for multi-day travel

Are there any foreseeable risks, hurdles or dependencies, which need to be considered?

- To enrich the application with potential activities and accommodation availability will be a major dependency on providers of these services.

What are the next Steps?
What do you need to implement the solution?

- Add full data for other countries and operators
- Expand the feature to link with accommodation, activities, request for long tranfers to have a break…

TripHackerz

Time to Go

Team DB, SBB, ÖBB

Description of the Challenge

What is the problem/idea? What is the current status?
Focus on important/central points.

Spontaneous regional travel by train is often too complex: scattered information, lack of intuitive planning tools, and little support for people with specific needs (e.g. pets, accessibility, children, tight budgets).

There is no existing app which offers an integration of travelling and touristic data with AI capabilities. As a result, many potential passengers give up before booking – especially for last-minute trips.

Description of the Solution or Idea

What are the key features of the solution?
Focus on important/central points.

An app that finds the best public transport trips for your weekend – based on your available time, start point, personal wishes, constaints in natural language.

You tell the app:

- where you're starting,
- how many changes you're okay with,
- how much time you're willing to spend travelling,
- …and what kind of experience you're looking for, like:
- "Somewhere my dog can run, my kid can learn something, I won't go broke, and the train ride isn't hell."

And the app gives you:

- Multiple options you can reach now
- By train/tram/bus
- That match your preferences, time and maximum travel time

Key features:

- Combined Input: Structured (start point, travel time, transfers, budget, maximum changes) and unstructured (freely described wishes).
- Determinations where you can get in X minutes with public transport.
- Classic Filters: Budget, barrier-free, child- or dog-friendly, etc. – fast and efficient where metadata is clear.
- LLM (only where it makes sense): To extract meaning from natural language wishes, not to replace simple rules.
- Open Source Core: Built for community use and adaptation across regions and use cases.
- Selective Use of Premium Services: We combine open tools with powerful commercial APIs where they deliver clear value
- It's simple, accessible and socially relevant – and it empowers spontaneous, sustainable travel for people who otherwise wouldn't go.

Project Links

- GitHub Repository: https://github.com/orgs/OpenRail-Playground/teams/triphackerz
- Demo: (only local)
- Further Links: TravelTime (Isochrone, Trip Time)
  - https://docs.traveltime.com/api/overview/isochrones
  - https://docs.traveltime.com/api/overview/routes

- Gemini (Activity Recommendation)
- https://ai.google.dev/gemini-api/docs?hl=de
- OJP (Station Data)
- data.opentransportdata.swiss
- Google (Image Search)
- https://developers.google.com/custom-search/v1/overview

Who are the user groups of the described solution?

Internal/external user groups (e.g., business sectors, b2c / b2b customers, etc.)

- External (B2C): Spontaneous , Families – especially with young children, pet owners – users with dogs looking for nature/outdoor-friendly destination, low-budget travelers – students, single parents, etc., eco-conscious users – people preferring public transport and regional discovery over flights, people with accessibility needs – using filters for barrier-free options
- Internal / Ecosystem (B2B / Partners): public transport providers – who benefit from increased visibility and ridership, tourism boards / local destinations – whose offers can be featured, regional governments / municipalities – especially those aiming to promote sustainable local travel, civic tech and open-source communities – through our open architecture and APIs, future integrators / developers – using or expanding the open-source solution in new regions or use cases.

What is the economic benefit?

E.g., reduction in compensation costs

- Increases off-peak ridership (not only mainstream routes will be used)
- Strengthens regional tourism

What are the positive impacts on the rail system?

E.g., attractiveness of rail transport, ecological impacts, ...

- Increases attractiveness of rail by making planning intuitive and need-based
- Promotes off-peak usage: leads to better system balancing without extra trains
- Encourages mode shift from car to train: leads to significant CO_2 savings
- Enhances inclusivity: offers more people experience rail as accessible and useful
- Supports data-driven understanding of real user needs

What is the maturity level of the technologies used?

May depends on the railway company.

- We use production-ready APIs and reliable datasets. Integration is flexible to existing rail systems and based on mature, scalable components.

Are there any existing alternatives to the solution?

- Not really
- There are some apps for special interests (e.g. Komoot for hiking)
- There‘re some for limited small regions (e.g. wir-entdecken-bayern.de)
- Travelling by airplane (Skyscanner, etc.)

Which alternatives are out of the question and why?

- Special interests apps do not give us the range of possible options.
- Apps for small regions also limit the options and do not save time by integrating different existing data sources
- Travelling by plane…well, we all know why not.

Are there any foreseeable risks, hurdles or dependencies, how needs to be considered?

- Key dependencies include access to high-quality public transit data and integration with local systems.

What are the next Steps? What do you need to implement the solution?

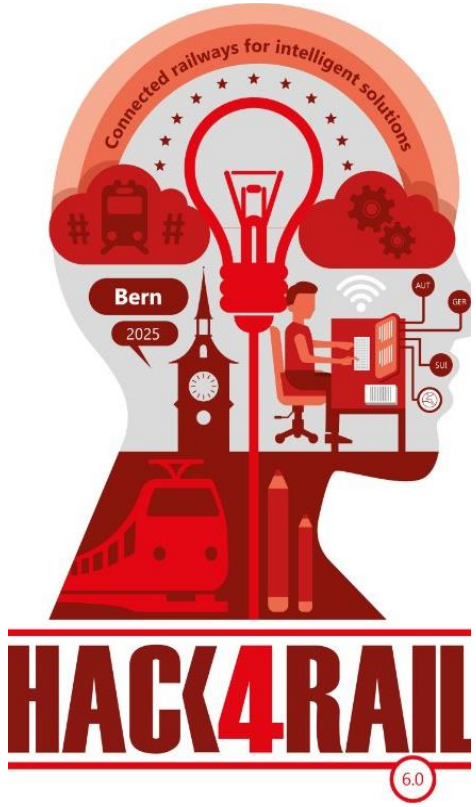
- Access to GTFS and real-time public transport data
- Collaboration with mobility providers and local tourism boards
- Support for hosting and scaling (cloud infrastructure or railway IT resources)
- User feedback for rapid iteration and validation

Open map style for railway infrastructures

Challenge owner:

SNCF

Teams:
European Train Spotters
OpenStreetTrainsformers
The Infra-Viewers



European Train Spotters

Team SBB, SNCF, Infrabel, ÖBB

Description of the Challenge

What is the problem/idea? What is the current status?
Focus on important/central points.

Description of the Challenge

Nearly all railway companies use default map background. Those maps are designed for cars and have no emphasis on railway.
Even worse, some of the biggest railway operators in Europe still use Google Maps.

The challenge is to design together a new style, that will be freely available and should become the new default basemap for any project that focuses on railway data.

Let us design (and actually do it!) how to display a nice hierarchy of railways, bridges, tunnels, electrification, etc.

The data on OpenStreetMap is probably sufficient (explore it through https://www.openrailwaymap.org/), but maybe some hackers might need to contribute to OpenStreetMap to improve some tags.

The style will probably be implemented following the https://maplibre.org/maplibre-style-spec/ specification to allow a broad integration.

Description of the Solution or Idea

What are the key features of the solution?
Focus on important/central points.

Let's create the best map for train lovers!

Our map focuses exclusively on rail, so users can easily plan or dream about train travel. That means we've made the choice not to show roads or routes for other modes of transport.

We want our map to be useful for leisure and business travelers, and also for train geeks who want to reuse our data for their own purposes.

Our approach is to provide a map that's easy to understand: clear, not too cluttered, and easy to navigate.

Depending on the type of user (whether traveling for business or pleasure) the needs are different. That's why our map displays different levels of detail: high-speed rail lines, regional lines, and even tourist trains.

Project Links

- GitHub Repository: https://openrail-playground.github.io/openrailwaystyle/european_train_spotter.html
- Demo: /
- Further Links:

Who are the user groups of the described solution?
Internal/external user groups (e.g., business sectors, b2c / b2b customers, etc.)

- Leasure travelers
- Business Travelers
- Geek lovers that want to use our data

What is the economic benefit?
E.g., reduction in compensation costs

- Open for reuse for business purpose (show maps inside a train), wide public who wants to plan vacations, business trips

What are the positive impacts on the rail system?
E.g., attractiveness of rail transport, ecological impacts, ...

- Train map is more accessible and more understandable

What is the maturity level of the technologies used?
May depends on the railway company.

- Decent

Are there any existing alternatives to the solution?

- Too many maps on the market, but not a lot that are on open source and rail focused

Which alternatives are out of the question and why?

- Alternative are not on open source (mostly pdf maps or interactive maps)

Are there any foreseeable risks, hurdles or dependencies, how needs to be considered?

- A lot of maps already exist
- Not showing roads / routs is risky

What are the next Steps?
What do you need to implement the solution?

- After Europe, next level is the world.

Team 2

OpenStreet Trainsformers

Team SNCF, SBB, ÖBB

Description of the Challenge

What is the problem/idea? What is the current status?
Focus on important/central points.

"As a traveller, I do not have a clear and simple representation of stations where I have to change trains or other means of transport. Today's solutions offer either too much or too little information."

Description of the Solution or Idea

What are the key features of the solution?
Focus on important/central points.

- By focusing on information only relevant for users of public transport, we make the visual representation plain, simple and easy to understand for everyone.
- Our solution supports travellers changing trains or other means of transport.

Project Links

- GitHub Repository: https://github.com/OpenRail-Playground/openrailwaystyle?tab=readme-ov-file
- Demo: https://openrail-playground.github.io/openrailwaystyle/openstreet_trainsformer.html
- Further Links:

Who are the user groups of the described solution?
Internal/external user groups (e.g., business sectors, b2c / b2b customers, etc.)

- All users of public transport (travellers)

Are there any existing alternatives to the solution?

- No open source alternative (In Switzerland there is trafimage but it costs money),
- No alternatives yet on a European level

What is the economic benefit?
E.g., reduction in compensation costs

- A good and easy to understand visualisation of the situation can help to encourage people to use public transport
- Handicaped people can better plan their changes of means in transports in advance

Which alternatives are out of the question and why?

- none

What are the positive impacts on the rail system?
E.g., attractiveness of rail transport, ecological impacts, ...

- Improved attractiveness of public transport systems

Are there any foreseeable risks, hurdles or dependencies, how needs to be considered?

- Data management: The quality and timeliness of the data is crucial.

What is the maturity level of the technologies used?
May depends on the railway company.

- Highly mature, no new development, only combining existing data

What are the next Steps?
What do you need to implement the solution?

- Using the providded Map-Styles for Maps in Websites/Apps
- Develop the Sytles futher zo improve usability

Team 3

The Infra-Viewers

Team SNCF, Infrabel, DB, ÖBB

Description of the Challenge

What is the problem/idea? What is the current status?
Focus on important/central points.

- Objective: Develop a map with a strong focus on rail tracks and their visibility
- Key Features: Include important infrastructure attributes relevant for internal operational use
- Perspective: Base the design on existing rail infrastructure, aligned with an internal viewpoint (e.g., planning, maintenance, asset management)
- Data Source: Use OpenStreetMap as the foundation to ensure the solution is accessible, coherent, and maintainable
- Target Users: Designed specifically for railway companies across Europe, supporting their internal workflows and decision-making processes.

Description of the Solution or Idea

What are the key features of the solution?
Focus on important/central points.

- Multiple map layers and attribute sets to address specific operational or analytical needs, including varying zoom levels
- Clustering and categorization of rail-related data (e.g., tram, subways, and mainline rail tracks). Smart filtering to display only the most relevant and essential data, enhancing the clarity and usefulness of the map for different user contexts.
- Adaptive detail levels and color schemes that dynamically adjust based on the map scale or zoom level, ensuring both overview and fine-grained insights are easily accessible

Project Links

- GitHub Repository: GitHub - OpenRail-Playground/openrailwaystyle
- Demo:
- Further Links:

Who are the user groups of the described solution?
Internal/external user groups (e.g., business sectors, b2c / b2b customers, etc.)

- Internal users (infrastructure holder) in order to evaluate specific use cases (e.g. surrounding areas/green field vs. brown field, condition of tracks/routes)

What is the economic benefit?
E.g., reduction in compensation costs

- A targeted decision-making tool for internal use and outcome effectiveness
- A time-saving, standardized model with integrated data input, tailored for European railway companies

What are the positive impacts on the rail system?
E.g., attractiveness of rail transport, ecological impacts, ...

- A standardized approach to enhancing data transparency and operational visibility for railway companies

What is the maturity level of the technologies used?
May depends on the railway company.

- Data extraction → data input is in a well-developed stage (already existing and implemented in Open Street Map)
- Prototype already implemented in Maputnik

Are there any existing alternatives to the solution?

- No coherent solution exists—OpenStreetMap's basemap lacks accuracy, so data must be adapted and extracted for use in a standalone model

Which alternatives are out of the question and why?

- **Open Railway Map:** Built on OpenStreetMap's transportation layer but lacks accuracy and clarity.
  OpenStreetMap: Primarily focuses on street visibility and includes only a basic transportation layer.

Are there any foreseeable risks, hurdles or dependencies, how needs to be considered?

- Based on OpenStreetMap — updated by individuals, so data may be outdated or incomplete, with accuracy varying by community input.
  Data clustering methods differ and cover various public transport modes, making it challenging to establish a standardized Europe-wide visibility approach (e.g., S-Bahn, trams, underground).

What are the next Steps?
What do you need to implement the solution?

- The solution could be published on GitHub and adopted by railway companies worldwide

Use cases for real-time data for deviations

Challenge owner:
ÖBB

Team:
D.I.R.T

D.I.R.T

Team ÖBB, DB

Description of the Challenge

What is the problem/idea? What is the current status?
Focus on important/central points.

- energy prognosis is currently provided one day ahead, and is not adjusted, leading to possible to higher use or payment of penalties
- Currently, there is no easy way to determine intra-day changes to planned energy supply and to adjust energy usage forecasts
- Currently, no system exists that easily combines the necessary data to support the energy load distributor in adjusting the forecast intra-day

Description of the Solution or Idea

What are the key features of the solution?
Focus on important/central points.

- Provide real-time data to the respective dispatcher / trader allowing better prediction of changes to planned energy consumption
- Visualize the effects of delays to energy consumption
- Provide a valuable forcast for consumption in order to be able to participate in intra-day trading (15min ahead)

Project Links

- GitHub Repository: https://github.com/OpenRail-Playground/challenge3-dirt
- Demo: https://hack4rail-dirt.lovable.app/
- Further Links: Raw Data: https://share.openrailassociation.org/s/qyR4HFLFZwYFkMA

Who are the user groups of the described solution?
Internal/external user groups (e.g., business sectors, b2c / b2b customers, etc.)

- Central Load Distribution Centers
- Energy traders/dispatchers
- by summarizing cross border trains in the train run – possible other users related to train runs

What is the economic benefit?
E.g., reduction in compensation costs

- Avoiding fees for take or pay
- Avoiding penalties for exceeding the forcast

What are the positive impacts on the rail system?
E.g., attractiveness of rail transport, ecological impacts, ...

- Precise forcast of energy consumption in the rail system
- Being able to trade intraday 15min – automatically
- Cross border (by trainrun) or national usage

What is the maturity level of the technologies used?
May depends on the railway company.

- State of the art generative AI coding technology together with standard language python
- Use of a redis-based Pub/Sub Service to simulate RNE messages

Are there any existing alternatives to the solution?

- Just eMail, phone calls and personal experience
- No record on why decisions were taken, data is missing

Which alternatives are out of the question and why?

- Currently, there are no existing known alternatives displaying this information transparently as we did

Are there any foreseeable risks, hurdles or dependencies, how needs to be considered?

- Getting access to online – data of network operators (f ex LEIDIS (D)) or Aramis-D (AT)),
- Integration of API output of different systems

What are the next Steps?
What do you need to implement the solution?

- Review PoC with core users & iterate
- Add multiple trains from additional RNE messages
- Connect to real timetable data & RNE data

Solution Pitches Hack4Rail 2025

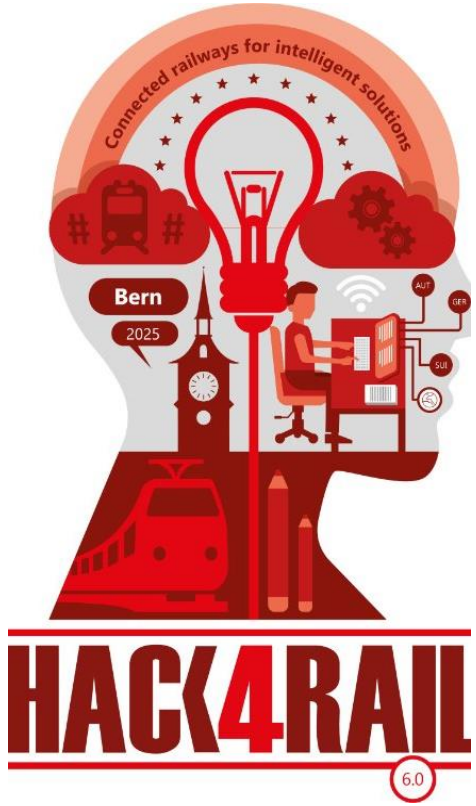
Track 3

Efficient disruption &
construction site management

Smart dispatch solutions for rail maintanance

Challenge owner:
SBB

Teams:
Human-Centred Dispatch
Smart Disoma



Human Centred Dispatch

Team SBB, ÖBB, DB

Description of the Challenge

What is the problem/idea? What is the current status?
Focus on important/central points.

- Resource allocation for staffing construction sites is currently done manually in a tool that is used via browser. The tool allows to select employees that are available (not on vacation etc.) and have the required qualification.
- However, the tool does not consider individual preferences of employees, social relationships, e.g. groups that want to work together and other factors that influence the quality of the resource allocation.
- The goal is to further automate the allocation job by supporting the dispatcher with suggestions that include the aforementioned factors.

Description of the Solution or Idea

What are the key features of the solution?
Focus on important/central points.

- Design of the mathematical formula for mapping the different resource limitations as formal constraints
- Using the *scip* library in python to solve the mathematical optimization problem identified in the previous step
- Our solution can be further developed to be part of the graphical interface used by the dispatcher and provide iterative suggestions with interaction of dispatcher
- For acceptance by dispatchers, it is essential to generate a tool with which the dispatcher can interact and generate suggestions that correspond to the additional framework conditions.
- The aim is to support the dispatcher not to replace them as the dispatcher's intuition may not be neglected.

Project Links

- GitHub Repository: https://github.com/OpenRail-Playground/human-centered-dispatch
- Demo:
- Further Links:

Who are the user groups of the described solution?
Internal/external user groups (e.g., business sectors, b2c / b2b customers, etc.)

- Despatchers of any kind of groups of persons (e.g. construction workers)

What is the economic benefit?
E.g., reduction in compensation costs

- More efficient allocation of human resources for construction sites, hence reduced costs for railway infrastructure maintenance.

What are the positive impacts on the rail system?
E.g., attractiveness of rail transport, ecological impacts, ...

- Better resource allocation leads to more efficient maintenance and repair work which in turns improves the availability of railway infrastructure. Availability of infrastructure is beneficial for railway undertakings and their customers because trains operate more reliable and punctual.

What is the maturity level of the technologies used?
May depends on the railway company.

- The used solver *scip* is a decade-old technology hence it is a reliable basis.

Are there any existing alternatives to the solution?

- Baustellenassistent (BSA) tool used by SBB. It would be possible to contact the vendor of this software and request new features to overcome the problems described in this challenge.

Which alternatives are out of the question and why?

- We did not pursue any approaches or alternatives that turned out to be dead ends or not recommendable.

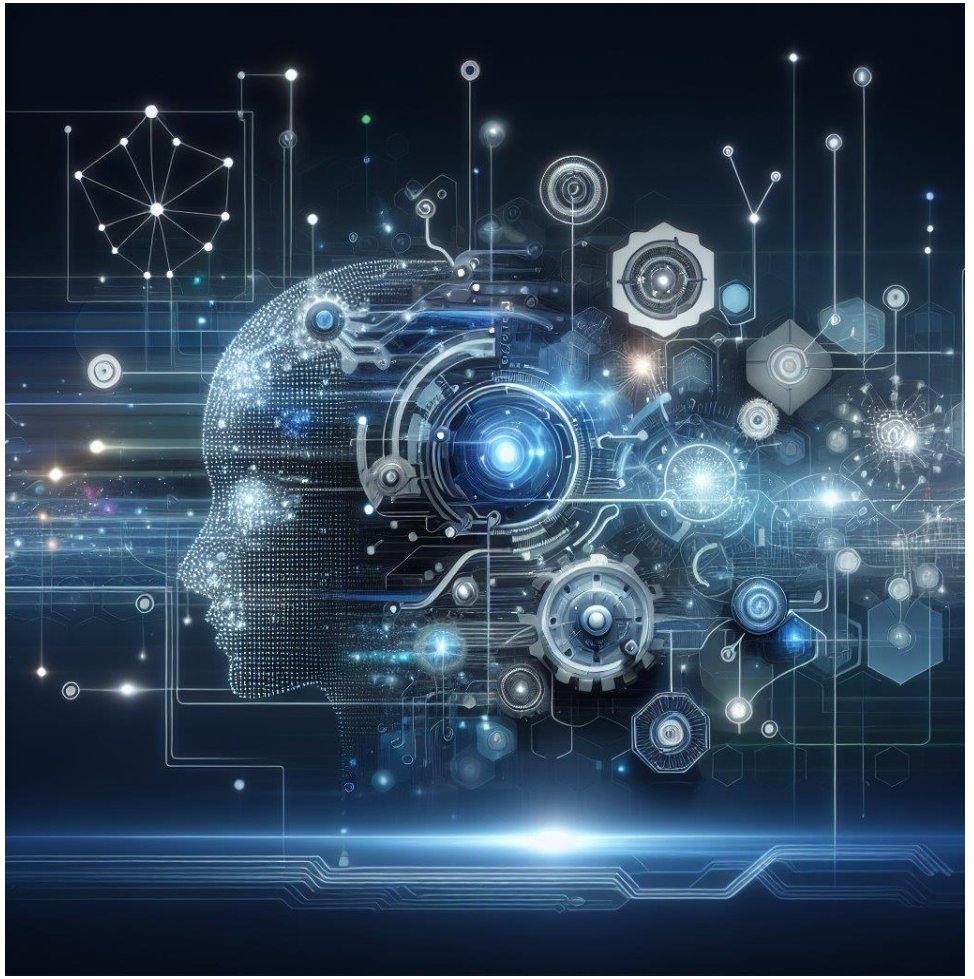
Are there any foreseeable risks, hurdles or dependencies, how needs to be considered?

- The quality of the output produced by our solution relies on the knowledge and experience of the dispatcher who uses our tool as it is crucial to know about the skills and roles as well as employee's individual preferences.

What are the next Steps?
What do you need to implement the solution?

- The next steps include integrating the suggestions made by our solution to the allocation assistant tool currently used by dispatchers.

Smart Disoma



Team SBB, DB, ÖBB

Description of the Challenge

What is the problem/idea? What is the current status?
Focus on important/central points.

Manual dispatch:

- Resource allocation is currently performed manually using the "Baustellenassistent (BSA)" tool.
- The efficiency of dispatch solutions is fully dependent on the individual dispatcher's skills and workload.

Time-consuming process:

- Dispatchers frequently receive new requirements and must search for available resources, which may already be allocated elsewhere.
- Finding the optimal solution in a time-efficient manner is challenging, especially when resources are tight or during replannings.

Complex factors:

- Best fit solutions depend on various factors such as travel/transport time from base, qualifications/roles, and legal requirements by the "Arbeitszeitgesetz" (Working Hours Act).

Problem statement:

- How can we support dispatchers by creating a system that suggests one or several optimal solutions for their consideration and approval?

Description of the Solution or Idea

What are the key features of the solution?
Focus on important/central points.

Optimization Tool:

- The implemented optimizer creates a valid construction shift schedule with 11 constraints defined in the challenge
- The first solution is calculated within seconds and can be enhanced by the same optimizer at any time
- The result is available over a REST API
- A simple UI demonstrates the solving process & the current optimization solution
- Additonal constraints can be added
- An opensource optimization framework has been used

Vision for integration:

- The calculated solution is **imported** in the **BSA or other systems** and then can be refined by dispatchers in their familiar applications
- Developed software is deployed as a recommending service and could be accessed via an API

Project Links

- GitHub Repository: https://github.com/OpenRail-Playground/smartDisom
- Video demo
- Further Links:
  - Share.filestorage
  - https://miro.com/app/board/uXjVIlRCCA4=/
  - https://github.com/TimefoldAI

Who are the user groups of the described solution?
Internal/external user groups (e.g., business sectors, b2c / b2b customers, etc.)

- Plant maintainance / dispatchers
- Internal personal, in order to see if there is a need for external workers

What is the economic benefit?
E.g., reduction in compensation costs

- Time efficiency and productivty increase for dispatchers
- Save costs by optimizing the resource allocation

What are the positive impacts on the rail system?
E.g., attractiveness of rail transport, ecological impacts, ...

- Increase happiness of workers
- An opensource solution

What is the maturity level of the technologies used?
May depends on the railway company.

- established

Are there any existing alternatives to the solution?

- Yes but not customized for this specific usecase

Which alternatives are out of the question and why?

- Enterprise solutions like SAP, which are integrated in their suites. The costs are outstanding for purchase, maintence and changemanagement in comparision to the same (or even better) solution we developed

Are there any foreseeable risks, hurdles or dependencies, how needs to be considered?

- Getting valid and accurate data in order being able to plan accuratley
- Willingness of BSA providers to integrate it
- Scaling could be maybe a challenge when having a big corporation with thousands of construction sites at the same time (or in planing)

What are the next Steps?
What do you need to implement the solution?

- Integrate real data
- Extend contraints
- Get user feedback

Boosting safety & availability in Railway construction

Challenge owner:
ÖBB

Team:
Height Watchers

Height Watchers

Team ÖBB, SBB, DB

Description of the Challenge

What is the problem/idea? What is the current status?
Focus on important/central points.

Problem: Road vehicles colliding with bridge structures usually lead to closures of the railway track for 30 to 60 minutes - and sometimes longer. The railway track on the bridge is closed for some hours until inspection verifies the extent of damage and also the road is closed until the damaged vehicle is removed.

Challenge: to help the railway infrastructure protect itself with smart technology.

The goal: to develop a bridge protection system, to proactively prevent collisions between oversized vehicles and (railway) bridges using smart, digital and sensor technologies.

Description of the Solution or Idea

What are the key features of the solution?
Focus on important/central points.

Two-stage solution with height detection in safe distance from the bridge activating traffic light to stop the truck and with sensors detecting crash in case of ignoring earlier warnings. For both prevention and detection stages, there is an information and/or alarm towards emergency authorities. Solution requires installation of sensors at a safe distance from and on the railway bridge, also the implementation of a dashboard app with the most relevant and important information for street management and emergency authorities in order to support decision making.

Project Links

- GitHub Repository: https://github.com/OpenRail-Playground/height-watchers#
- Demo: on GitHub – can be started with Angular on every computer (also see readme.md file at repository)
- Further Links: https://www.figma.com/design/oX8IUXWwalJ0iLsIesguTD/25-Hack4Rail--Bridge-Detector?node-id=0-1&p=f&t=cQgu59o7QzgIX5Y0-0

Who are the user groups of the described solution?
Internal/external user groups (e.g., business sectors, b2c / b2b customers, etc.)

- Asset Managers for Road and Railway, Road Traffic Management, Emergency / First Responders, Railway Emergency Coordinator

Are there any existing alternatives to the solution?

- Collision prevention in trucks
- Route planner for trucks considering height restrictions
- Red-white stripes emphasized marking on bridges

What is the economic benefit?
E.g., reduction in compensation costs

Minimalization of operational disruption both road and railway; Increase of Road and Rail Safety; Detection of non-visible damage and previously unnoticed collisions enabling predictive maintenance and understanding causality; ,Optimization of communication and emergency coordination process among affected authorities;

Which alternatives are out of the question and why?

- Physical barrier activation on trucks not stopping after warning in order to avoid damage on trucks and traffic congestion on the road.

What are the positive impacts on the rail system?
E.g., attractiveness of rail transport, ecological impacts, ...

- Enhancing Safety, Reducing Costs, Increasing Availability, Less Destruction – Less Disruption, Increasing Attractivity of Railway Transportation (Customer Satisfaction), Proactive incident management

Are there any foreseeable risks, hurdles or dependencies, how needs to be considered?

- Legal issues
- Interface to exisiting emergency systems

What is the maturity level of the technologies used?
May depend on the railway company.

- Real-time data and connection via interface to emergency systems need to be installed as well as a real time interactive map for railway bridges; At the moment only static solution with no real data source connection

What are the next Steps?
What do you need to implement the solution?

- Stakeholder and interface definition; Clarification of legal issues; Requirement engineering of sensors;Calculation of business case; Pilot project

Explainable Human-AI Collaboration Interface

Challenge owner:
Flatland

Team:
Chanel No. 6

Chanel No. 6

Team DB, SBB, ÖBB, Flatland

Description of the Challenge

What is the problem/idea? What is the current status?
Focus on important/central points.

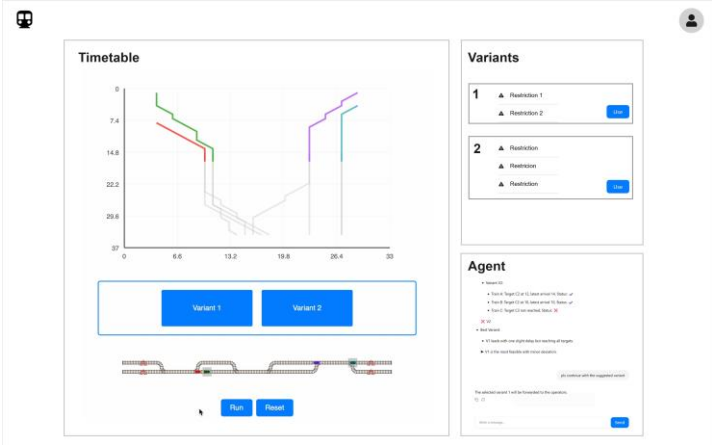
Traffic management systems predominantly rely on rules and human involvement or oversight. But in denser networks, this might not be enough. AI approaches, especially multi agent reinforcement learnings, could offer a more adaptive way to respond to deviations and disruptions. Still many open questions exist around how to keep the human in the loop.

Description of the Solution or Idea

What are the key features of the solution?
Focus on important/central points.

Our open source solution shows how to foster human-AI collaboration. In a traffic management simulation we provoke the demand for human intervention. We developed a novel interface with the following aspects.

- Time-way graph with variants to proposed by the AI assistant
- A chat interface to discuss the variants for the operational situation



Project Links

- GitHub Repository: https://github.com/flatland-association/flatland-hmi
- Demo: Chat https://share.openrailassociation.org/s/cFxZbEyjbxaXBxQ, Time-Way Graph https://share.openrailassociation.org/s/HJgz9YgMH8LbT3g
- Further Links: Simulation Documentation https://github.com/flatland-association/flatland-book , R&D Project https://ai4realnet.eu/project/

Who are the user groups of the described solution?
Internal/external user groups (e.g., business sectors, b2c / b2b customers, etc.)

- Target group for our Human-AI Collaboration Interface are dispatchers of public transportation. Schedule planners and analysts will also profit from our solution.

What is the economic benefit?
E.g., reduction in compensation costs

- More stable railroad networks will reduce compensations costs.
- Realization of energy-efficient decisions

What are the positive impacts on the rail system?
E.g., attractiveness of rail transport, ecological impacts, ...

- Greater attractiveness of rail transport, because passengers will experience a more reliable travel.
- Address staff shortages
- Higher capacity of existing infrastructure

What is the maturity level of the technologies used?
May depends on the railway company.

- Exploration level of maturity for the AI-based decision-making only.

Are there any existing alternatives to the solution?

There is a lot of development going on:

- Hitachi Time graph Plus with AI
- Deutsche Bahn ADA PMB

Which alternatives are out of the question and why?

- Fully automated AI-solutions are not capable to manage traffic in a foreseeable future.
- Completely manual decision-making is limited by human capabilities.

Are there any foreseeable risks, hurdles or dependencies, how needs to be considered?

- Maintaining competence levels for dispatchers due to high automation level may be a risk.
- AI is a fast developing and not yet mature technology.
- Regulatory decisions are outstanding.

What are the next Steps? What do you need to implement the solution?

- User feedback
- Increasing the complexity of the simulated railroad network

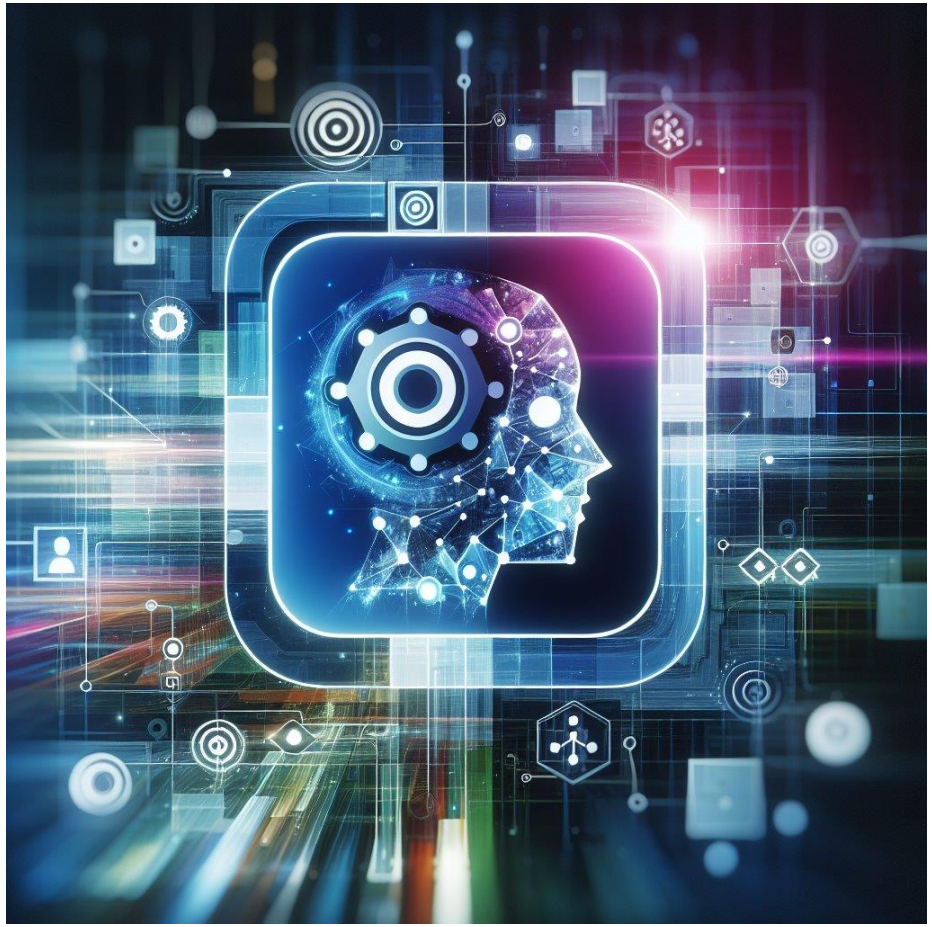
International coordination in the construction work planning

Challenge owner:
ÖBB

Team:
Use AI

Use AI

Team ÖBB, DB, SBB



Description of the Challenge

What is the problem/idea? What is the current status?
Focus on important/central points.

In Austria, numerous international trains operate across multiple national borders. Each country has its own infrastructure manager (IM), responsible for independently planning construction works. These IMs communicate such works to their respective national railway undertakings (RUs) using varying formats and timelines — for example, ÖBB uses PDF, DB uses Word, SBB uses PowerPoint, RFI uses Excel, and SZ doesn't provide any information themselves, so the website must be screened (see https://potniski.sz.si/en/help-and-travel-updates/#collapse-5).

When construction activities occur in Switzerland, SBB Infrastructure informs SBB Passenger Services (PV), which subsequently notifies ÖBB PV via email. International services, such as night trains, are frequently impacted by construction works in several countries. These works may overlap partially but rarely align precisely in time, resulting in multiple timetable versions within a single month. This leads to numerous route deviations or bus replacements, which complicates planning and negatively affects the passenger experience.

Furthermore, IMs do not coordinate the timing of their notifications. It is common for a timetable adjustment to be finalized based on Austrian works, only for additional changes to be required shortly thereafter due to late notifications of works in Germany — affecting the same train. In some cases, one IM may plan a diversion via another IM's network, only to discover that the latter has scheduled works that prevent the accommodation of additional diverted services.

Description of the Solution or Idea

What are the key features of the solution?
Focus on important/central points.

BuildConnect is a digital system that coordinates and publishes information on temporary capacity restrictions in European rail transport on an international scale.

BuildConnect provides harmonised information on planned construction work and other capacity restrictions for all infrastructure managers (IMs) and applicants (e.g. railway undertakings (RUs)) involved.

BuildConnect facilitates cross-border coordination to prevent conflicting or inefficient planning and minimise the impact on international rail traffic.

BuildConnect can also be used to display trains affected by availability restrictions. This allows RUs to easily determine which of their trains are affected and need to be derouted.

Project Links

- GitHub Repository: https://github.com/orgs/OpenRail-Playground/teams/build-connect-team
- Demo: https://share.openrailassociation.org/s/oD8L6KTaNT7XGn6
- Further Links:

Who are the user groups of the described solution?
Internal/external user groups (e.g., business sectors, b2c / b2b customers, etc.)

- infrastructure manager (IM)
- railway undertakings (RUs)

What is the economic benefit?
E.g., reduction in compensation costs

- Reduction of personnel costs through more efficient processes
- Reduction of communication failures through an easy-to-use platform

What are the positive impacts on the rail system?
E.g., attractiveness of rail transport, ecological impacts, ...

- More satisfied customers, as better coordination of closures can reduce train availability restrictions

What is the maturity level of the technologies used?
May depends on the railway company.

- The current process is not really user-friendly. The BuildConnect concept aims to reduce the general effort involved - both on the part of the infrastructure manager and on the part of the railway undertakings. Due to the shortage of time, BuildConnect is not yet fully developed, but the basis is ready.

Are there any existing alternatives to the solution?

- RailNetEurope (RNE) provides a Temporary Capacity Restriction Tool (see https://rne.eu/it/products/tcr-tool/), but the tool is not yet used a lot and doesn‘t allow a query for affected trains.

Which alternatives are out of the question and why?

- RailNetEurope (RNE) is not yet used a lot and doesn‘t allow a query for affected trains.

Are there any foreseeable risks, hurdles or dependencies, how needs to be considered?

- The system is very complex, especially due to the international nature of the issue. In some cases, better interpersonal communication is also required in order to better understand the other side and the background to the layout of construction sites.

What are the next Steps?
What do you need to implement the solution?

- Collaboration with employees from the affected areas in order to develop a better understanding and find a targeted solution.

Solution Pitches Hack4Rail 2025

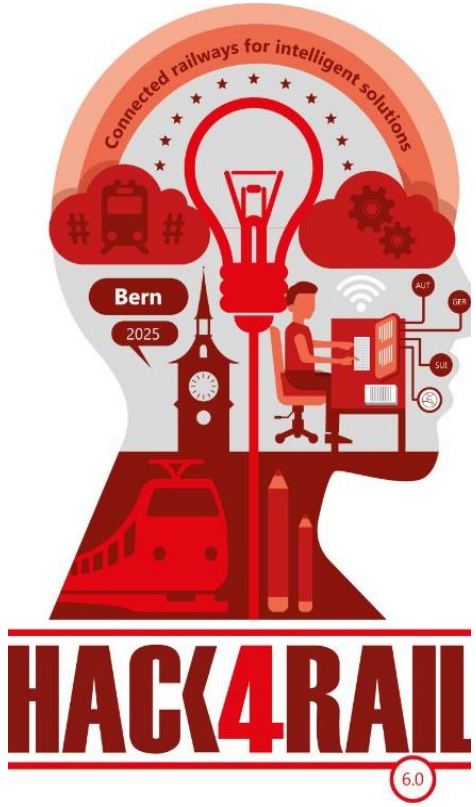
Track 4

Railway stations as mobility hubs

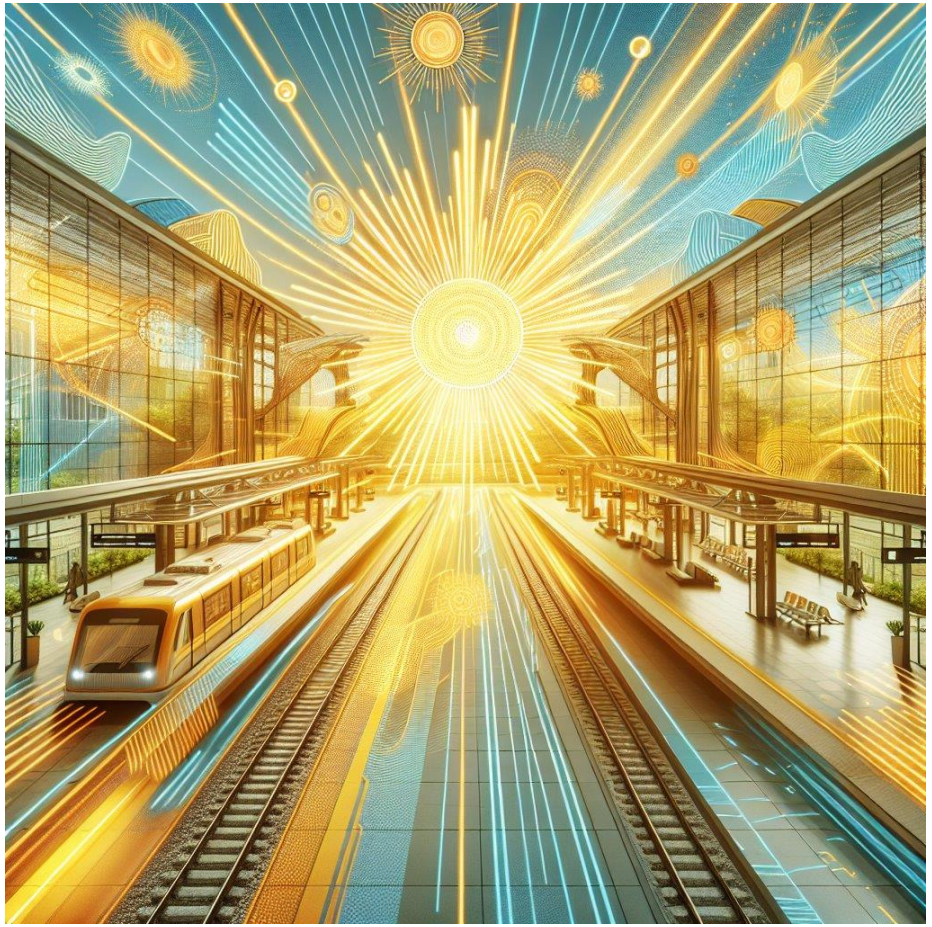
Insight into small stations with Paxcounter data

Challenge owner:
DB

Teams:
Stations of Sun (SOS)
StEyeFi
Brave New Station



Stations of Sun



Team DB, Infrabel, ÖBB, SBB

Description of the Challenge

What is the problem/idea? What is the current status?
Focus on important/central points.

Deutsche Bahn is currently introducing a new generation of information displays for small train stations, equipped with the passenger counting device "Paxcounter."

This device provides count data every minute and serves as a rough indicator of station occupancy. This challenge is about developing approaches and prototypes that use this data to help station managers identify usage patterns and manage resources more efficiently.

Models should be created to detect unusually high or low passenger numbers and to cluster stations with similar usage patterns. Advanced analyses could include weather-related effects or local events to further refine the data. The goal is to develop solutions that are not only applicable to the Paxcounter, but also to other counting methods used by different railway companies.

In addition to station managers, travelers and tourists can also use this information to see the occupancy levels of train stations and use this information if delivered to them in a useful way.

Description of the Solution or Idea

What are the key features of the solution?
Focus on important/central points.

Our solution is a web application designed **to enhance the travel experience for passengers**, especially day tourists visiting popular destinations such as the Baltic Sea region.

The app predicts the occupancy levels at train stations, helping travelers plan their journeys more comfortably by avoiding overcrowding. Currently, real-time train occupancy data is often inaccessible due to the involvement of multiple train companies.

Our approach leverages low-cost passenger counting devices and combines historical passenger flow data with weather information to accurately forecast station crowding. By providing reliable predictions of train station occupancy, our solution empowers passengers to make informed travel decisions, reduces congestion, and improves overall satisfaction. Additionally, the app helps influence and manage passenger flows, potentially lowering churn rates and enhancing operational efficiency.

Project Links

- GitHub Repository: https://github.com/OpenRail-Playground/stations-of-sun
- Demo: run it locally
- Further Links:

Who are the user groups of the described solution?
Internal/external user groups (e.g., business sectors, b2c / b2b customers, etc.)

- Passengers (mobile users)
- Security staff
- Train station manager

What is the economic benefit?
E.g., reduction in compensation costs

- Reduction of churn rate
- Low budget solution for capacity management
- Higher spendings in local stores (when passengers stay longer to avoid packed trains)

What are the positive impacts on the rail system?
E.g., attractiveness of rail transport, ecological impacts, ...

- Attractiveness of rail transport
- Influence passenger flows
- Increase passenger satisfaction
- Improved passenger information

What is the maturity level of the technologies used?
May depends on the railway company.

- Mature technology for the data and application stack
- Paxcounter: early introduction

Are there any existing alternatives to the solution?

- FQM – video analytics system (it‘s too expensive for small train stations)

Which alternatives are out of the question and why?

- Google – data is not accessible

Are there any foreseeable risks, hurdles or dependencies, how needs to be considered?

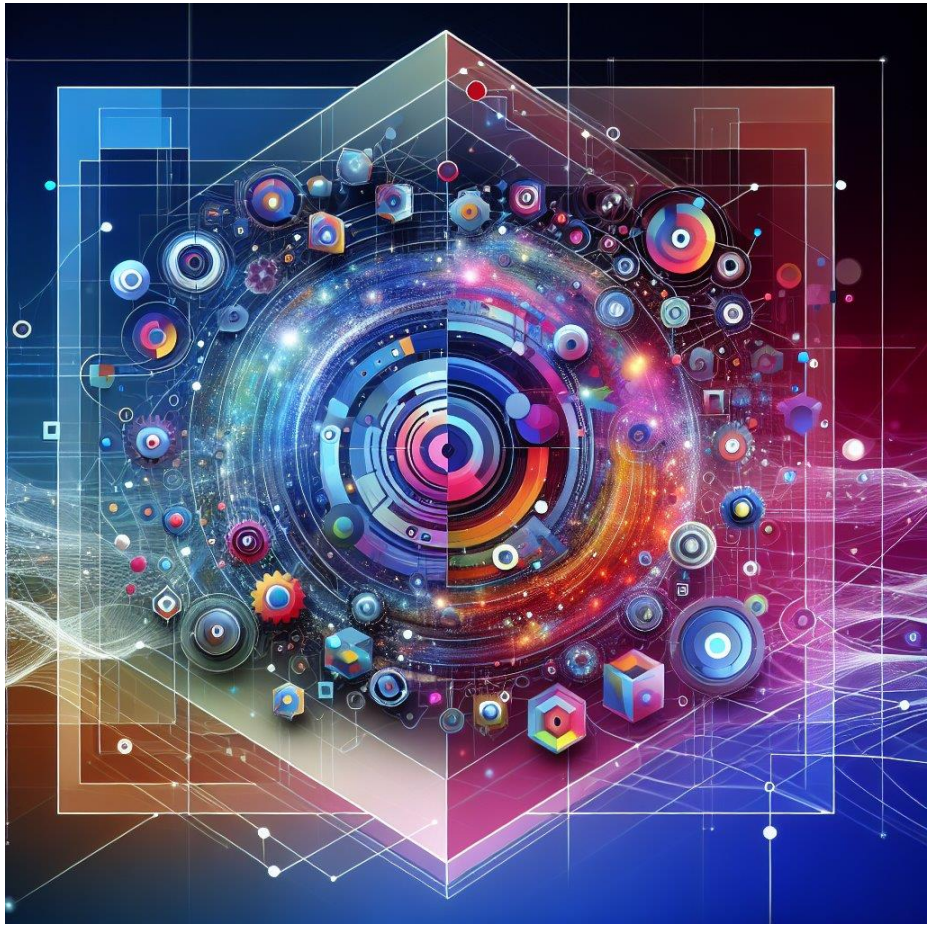
- Risks: wifi may be disabled (under/overrepresentation of some groups)
- Dependencies: requires Paxcounter to be installed at train stations
- Hurdles: accuracy of Paxcounters due to used technology

What are the next Steps?
What do you need to implement the solution?

- Data quality checks
- PaxCounter API delivering near real time data
- Publication of our **stations of sun** API to allow integration in existing apps e.g. Ostsee Guide and DB Navigator

StEyeFy

Team DB, ÖBB



Description of the Challenge

What is the problem/idea? What is the current status?
Focus on important/central points.

- DB is currently rolling out a new generation of information displays at smaller train stations, equipped with a passenger counting device called the “Paxcounter.” This device provides passenger count data every minute and serves as a rough indicator of how busy a station is.
- The goal of this challenge is to develop approaches and prototypes that leverage this data to help station managers identify usage patterns and manage resources more efficiently. Participants are expected to build models that can detect unusually high or low passenger volumes and group stations based on similar usage trends.
- Advanced analyses could also incorporate factors like weather conditions or local events to further refine the insights. The ultimate aim is to create solutions that are not only compatible with the Paxcounter but can also be adapted for other counting methods used by various rail operators.

Description of the Solution or Idea

What are the key features of the solution?
Focus on important/central points.

- As part of a hackathon challenge, our team is working on a data-driven solution that utilizes **PAX_Counter** devices—passive sensors that detect nearby devices (e.g., smartphones)—to estimate the number of people in the vicinity of a train station.
- Our goal: **detect unusually high crowd activity** near bins or specific station zones to **trigger alerts for service staff** to clean and maintain these areas proactively.

Project Links

- GitHub Repository: https://github.com/niklassmat/Hack4Rail_StEyeFi
- Demo:
- Further Links:

Who are the user groups of the described solution?
Internal/external user groups (e.g., business sectors, b2c / b2b customers, etc.)

- Stationmanager and Cleaningstaff

What is the economic benefit?
E.g., reduction in compensation costs

- Due to use-based data-driven decision making. Unnessesary cleanings can be reduced and therefore an economic benefit can be archived.

What are the positive impacts on the rail system?
E.g., attractiveness of rail transport, ecological impacts, ...

- Cleaner Station resulting in costumer satisfaction.

What is the maturity level of the technologies used?
May depends on the railway company.

- Standard software within DB AG
- Low entrylevel and lowcode for developers and users
- Fast success rate due to fast implementation and easy enablement and CI/CD, Cloud, Big Data, AI

Are there any existing alternatives to the solution?

- None, we saw a parallel need for digitization and automation of the solution due to a gap in the current process for stationmanagers and cleaning personell in DB AG.

Which alternatives are out of the question and why?

- Non digital solutions.
- Complicated IT-Solutions: low user hurdles are important due to a lack of tech confidence in part of the target group.

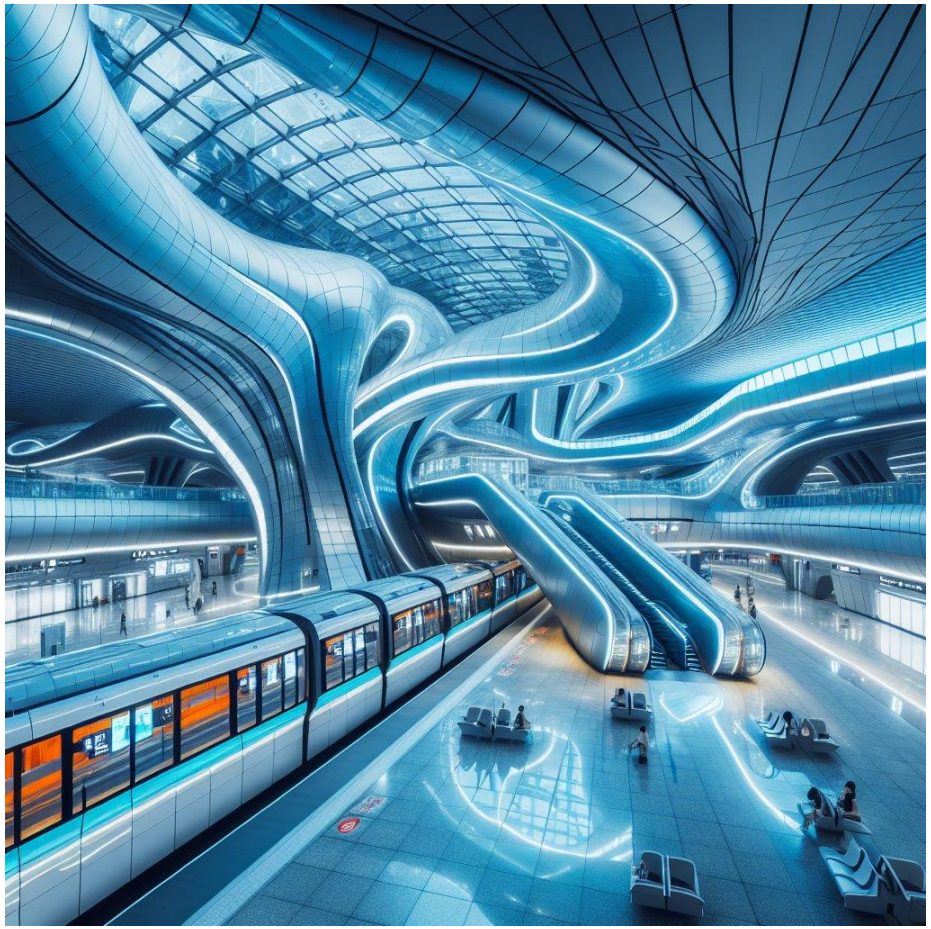
Are there any foreseeable risks, hurdles or dependencies, how needs to be considered?

- Mobile devices for cleaning staff
- Possible staff training necessary

What are the next Steps?
What do you need to implement the solution?

- Extended Datamodell
- Categorization based off of hours in a day
- Implementation of live data and automized decisionmaking
- Learning from cleaning staff Feedback

Brave New Station



Team DB, ÖBB, SBB

Description of the Challenge

What is the problem/idea? What is the current status?
Focus on important/central points.

Currently, many medium to small-sized train stations lack (near) real-time monitoring capabilities. This is due to the absence of on-site personnel and the lack of installed video surveillance systems. As a result:

- **Anomalies such as vandalism cannot be detected early**, which leads to increased damage and delayed responses.
- **Security personnel deployment is not demand-driven**, making it difficult to assign security staff based on actual risk levels.
- **Unnecessary travel and inefficient use of resources** occur due to the lack of situational awareness.
- **The overall sense of safety and service quality for passengers is reduced**, as potential threats or issues remain unnoticed until after the fact.

Description of the Solution or Idea

What are the key features of the solution?
Focus on important/central points.

The solution enables early detection of unusual behavior at smaller train stations and ensures that staff are deployed based on actual risk levels—not fixed schedules.

- **Near Real-Time Anomaly Detection**
  The system identifies unusual patterns or behaviors (e.g., unauthorized gatherings on platforms) that may indicate potential safety risks.
- **Immediate Notification and Response**
  Security personnel are alerted instantly when anomalies are detected, allowing them to assess and resolve the situation on-site.
- **Risk-Based Staff Allocation**
  Employees are dispatched based on actual threat levels rather than fixed schedules, ensuring efficient use of resources.
- **Damage Prevention**
  Early detection helps minimize the impact of incidents such as vandalism, reducing repair costs and service disruptions.
- **Operational Efficiency**
  By avoiding unnecessary travel and idle time, the system improves staff productivity and response times.
- **Enhanced Passenger Experience**
  A safer and more responsive station environment increases the perceived quality of service for travelers.

Project Links

- GitHub Repository: https://github.com/OpenRail-Playground/brave-new-stations
- Demo: https://preview--station-sentinel-dispatch-board.lovable.app/
- Further Links: https://share.openrailassociation.org/s/RjLqPXbFeEBPZxn

Who are the user groups of the described solution?
Internal/external user groups (e.g., business sectors, b2c / b2b customers, etc.)

- Security Personnel (respond to alerts and ensure on-site safety)
- Operations Teams (allocate staff based on real-time risk)
- Strategy & Development Units (monitor effectiveness and optimize processes)
- Passengers (B2C) (benefit from improved safety and service quality)
- Public Transport Partners (B2B) (collaborate on safety standards and integration)

What is the economic benefit?
E.g., reduction in compensation costs

- Lower repair and compensation costs (due to early detection of vandalism and incidents)
- Reduced personnel expenses (through risk-based staff deployment)
- Higher operational efficiency (by avoiding unnecessary travel and idle time)
- Improved customer satisfaction (leading to fewer complaints and reputational risks)

What are the positive impacts on the rail system?
E.g., attractiveness of rail transport, ecological impacts, ...

- Increased attractiveness of rail transport (due to improved safety and service quality)
- Reduced environmental impact (through more efficient staff deployment and fewer unnecessary trips)
- Higher passenger satisfaction (thanks to faster response times and a safer station environment)
- Better use of resources (by aligning operations with actual needs)

What is the maturity level of technologies used?
May depends on the railway comp**the**any.

- High (core components like WIFI detection and alerting are based on proven technologies)
- Adaptable to railway context (implementation may vary depending on existing infrastructure and digital readiness of the railway company)

Are there any existing alternatives to the solution?

- Manual station checks (resource-intensive and not real-time)
- Fixed surveillance systems (limited to locations with infrastructure and no intelligent detection)
- Scheduled staff patrols (not risk-based and often inefficient)
- Proprietary systems from specialized vendors (relatively expensive and offer no significant added value)

Which alternatives are out of the question and why?

- Manual station monitoring (not scalable and lacks real-time capability)
- Fixed patrol schedules (inefficient and not risk-based)
- High-cost proprietary systems (expensive with no significant functional advantage)

Are there any foreseeable risks, hurdles or dependencies, how needs to be considered?

- Data privacy concerns (depending on sensor types and data handling)
- Infrastructure limitations (at smaller stations with no connectivity or power)
- Integration complexity (with existing dispatch and alert systems)
- Budget and procurement dependencies (especially for hardware and rollout)

What are the next Steps?
What do you need to implement the solution?

- Coordination with relevant departments (to align on use cases and responsibilities)
- Provision of a dashboard for station managers (to visualize data)

Solution Pitches Hack4Rail 2025

Track 5

Green digitalistion - working together for sustainability & environmental protection

Monitoring and management of railway vehicle batteries

Challenge owner:
SBB

Teams:
Charged
Lithium +

Charged

Team SBB, DB

Description of the Challenge

What is the problem/idea? What is the current status?
Focus on important/central points.

The transition to battery-powered vehicles in the railway sector is essential for meeting net-zero climate targets, but it presents unique challenges in battery management and monitoring.

- **Transition to Net-Zero**: Replace diesel-powered vehicles with battery-powered alternatives to meet climate targets, where either electrification is not cost-efficient or not available during construction situations.
- **Increased Battery Use**: Anticipate a surge in diverse batteries across various vehicles and suppliers.
- **High-Cost, New Component**: Large capacity batteries are costly and new to the railway sector, necessitating careful monitoring.
- **Need for Standardization**: Address the lack of standardized analysis methods and error warning systems for effective battery management.

Our goal is an Open Source solution for vehicle battery monitoring that is shared between the European railway companies - not depending on external suppliers.

Description of the Solution or Idea

What are the key features of the solution?
Focus on important/central points.

To address the challenges of transitioning to battery-powered vehicles, we have developed an innovative tool designed to visually and effectively present battery data for SBB vehicles. This tool features an intuitive interface that leverages traffic light logic and dynamic graphs to illustrate key relationships, empowering users to make informed decisions.

Key Benefits Include:

- **Proactive Management**: Identify and counteract deviations between actual usage and design specifications to optimize performance.
- **Strategic Asset Rotation**: Facilitate the rotation of components and vehicles to maximize efficiency and lifespan.
- **Error Detection**: Quickly pinpoint hotspots of errors for timely intervention and maintenance.
- **Map-Based Visualization**: A graphical representation on a map for spatial awareness and easier tracking.
- **Grid-Friendly Operation**: A versatile solution for peak load management and vehicle-to-grid applications, enhancing the utility of traction batteries.

Project Links

- GitHub Repository: OpenRail-Playground/charged
- Demo: https://share.openrailassociation.org/s/bpRqo6dLXEACixQ
- Further Links: https://share.openrailassociation.org/s/8BHnS2BkGmLrwp3

Who are the user groups of the described solution?
Internal/external user groups (e.g., business sectors, b2c / b2b customers, etc.)

- Our solution, *Charged*, is designed for internal stakeholders responsible for battery and charging management, including train drivers, maintenance personnel, and operations managers. These users require real-time insights into battery status to ensure optimal performance and longevity.

What is the economic benefit?
E.g., reduction in compensation costs

- *Charged* enhances battery health, extending its lifespan and reducing replacement frequency. This offers significant economic benefits by lowering costs associated with battery procurement. Additionally, it supports sustainability goals, as batteries are environmentally critical resources, making efficient use crucial.

What are the positive impacts on the rail system?
E.g., attractiveness of rail transport, ecological impacts, ...

- *Charged* optimizes battery charging management, increasing efficiency and contributing to climate neutrality in a cost-effective manner. By ensuring batteries operate at optimal performance, it supports the reliability and sustainability of rail operations.

What is the maturity level of the technologies used?
May depends on the railway company.

- *Charged* is built on mature data integration technologies. While tailored for SBB, the tool provides a robust foundation for adaptation by other railway companies, allowing customization to meet varied data requirements and operational needs.

Are there any existing alternatives to the solution?

- Currently, no existing dashboard or tool comprehensively addresses the diversity of battery types and supplier variations in the rail industry. *Charged* stands out by providing a unified platform for comprehensive battery management.

Which alternatives are out of the question and why?

- Acquiring external tools from battery or vehicle suppliers limits flexibility and adaptability, preventing customization to meet specific operational needs. *Charged* ensures control over development and responsiveness to evolving requirements.

Are there any foreseeable risks, hurdles or dependencies, how needs to be considered?

- User-specific requirements necessitate diverse chart configurations and alarm systems. As exact roles and user needs are not yet fully defined, ongoing iteration and refinement of *Charged* are essential to accommodate real-world usage scenarios and feedback.

What are the next Steps?
What do you need to implement the solution?

- *Charged* aims to integrate across multiple railway operators, accommodating diverse fleets and battery manufacturers. Future enhancements will include charge control capabilities, threshold alarms and analysis of dependencies such as temperature and charging performance, ensuring comprehensive battery management.

Lithium +

Team SBB, DB

Description of the Challenge

What is the problem/idea? What is the current status?
Focus on important/central points.

New vehicles will be equipped with high-voltage (HV) batteries instead of diesel engines. HV-batteries are still new and relatively unknown in the rail sector. At the same time, batteries and related systems on the vehicles measure a large amount of data. When the vehicles are equipped with adequate broadcasting hardware, this data enables the vehicle owners to track the usage, state and development of their batteries and vehicles accurately.

As the future owner and operator of a large fleet of battery vehicles, SBB wants to use the recorded data to plan vehicle maintenance and make strategical decisions. Precise knowledge of battery usage and aging enables SBB to optimize vehicle operation for maximum battery life, plan battery replacement and detect anomalies and faults early. A battery monitoring cockpit facilitates the work of fleet and system managers, who observe battery and vehicle issues and make battery-related maintenance decisions on a mid- and long-term scale.

As a core component of new vehicles, the batteries and their data give insights into vehicle usage and lifecycle. By collecting and providing new, previously unrecorded data, battery monitoring enables the digitalization of the vehicle. Based on real-time data, vehicle behavior, fleet usage and development, battery state and potential issues are analyzed and monitored. In addition to fleet and system managers, also battery experts, supply chain managers and asset managers are potential users of the cockpit.

Description of the Solution or Idea

What are the key features of the solution?
Focus on important/central points.

Fleet dashboard for battery-operated vehicles

- **Fleet Overview**: A comprehensive dashboard provide an at-a-glance view of the entire fleet's status, including the location, operational status, and availability of each vehicle. This ensures quick access to necessary information for management and operational planning.
- **Monitoring of Battery Health**: Continuous monitoring of battery health is crucial for timely maintenance and replacement. The dashboard can display key metrics such as charge cycles, current battery capacity, and predicted lifespan to prevent unexpected downtimes.
- **Usage Tracking**: Detailed insights into vehicle usage patterns, including duration, frequency, and intensity of use, help identify trends and optimize operations. This data allows for better scheduling and maximization of vehicle availability.

These functionalities can enhance **overall efficiency, reduce costs, and improve sustainability** of the fleet operation.

Project Links

- GitHub Repository: https://github.com/OpenRail-Playground/lithium-plus
- Demo:
- Further Links:

Who are the user groups of the described solution?
Internal/external user groups (e.g., business sectors, b2c / b2b customers, etc.)

- Fleet Managers
- Battery Manager

Are there any existing alternatives to the solution?

- SAVVY as current solution for any kind of vehicles with only information on position, usage, main data...

What is the economic benefit?
E.g., reduction in compensation costs

- The dashboard can display key metrics such as charge cycles, current battery capacity, and predicted lifespan to prevent unexpected downtimes.

Which alternatives are out of the question and why?

- Software form train suppliers with ist dependencies and contracts
- No flexibility, retriction to sold products

What are the positive impacts on the rail system?
E.g., attractiveness of rail transport, ecological impacts, ...

- Better usage of batteries and fleets
- Extending life span of batteries and proactive maintanance,

Are there any foreseeable risks, hurdles or dependencies, how needs to be considered?

- No available data

What is the maturity level of the technologies used?
May depends on the railway company.

- Good, depending on available data of the vehicles

What are the next Steps?
What do you need to implement the solution?

- Working MVP to show benefits with bigger fleets
- Extending data set
- Use of different data like maps, weather, energy supply…

Smart CO_2 dashboard for sustainable business travel and commuting

Challenge owner:
SBB

Teams:
A Mission To Zero
LoCo2 LoCo

A Mission To Zero

Team SBB, DB, SNCF

Description of the Challenge

What is the problem/idea? What is the current status?
Focus on important/central points.

SBB's business to business (B2B) team supports 12,000 corporate clients in Switzerland, representing 1.25 million potential travelers, and seeks to leverage underutilized travel data to promote greener mobility. Emission reduction goals are common across European countries, for example the 2050 Climate Action Strategy, therefore the question is of interest to all railway undertakings and not just SBB.

There are three goals:

1) B2B clients often request sustainability and CO2 emission information for reporting and tracking purposes. The current methodology of responding to these requests is very manual and time-intensive. The B2B sales team at SBB would like to automate this reporting process, for example with a real-time CO2 Dashboard that can be automatically generated and delivered to clients.

2) Limited data is available for non-rail business travel. This results in limited data on business travel, because a lot of business travel happens by modes such as car or plane. We hope to generate additional data on car and air travel, which would allow for increased analysis and insights as well as personalized suggestions for companies and individuals (ex: switch from second to first class ticket for more comfortable working environment).

3) Railway undertakings want to promote a modal-shift to rail and reduce overall societal emissions. We believe an action-oriented dashboard featuring real-time CO_2 tracking, modal split visualization, efficiency comparisons, and personalized nudges will encourage more sustainable travel choices at the individual and company level.

Description of the Solution or Idea

What are the key features of the solution?
Focus on important/central points.

- Dashboard for the company (management level) and individual users that transparently shows the CO_2 savings achieved by choosing rail travel over other transport modes. This tool informs top management about progress toward sustainability goals while also reporting to individuals about their CO2 savings in a playful way. The dashboard automatically generates for every client.

- Leaderboards and challenges encourage tracking of individual travel, which allows for better tracking of the travel done by travel card holders (ex: Swiss GA, German Bahncard 100) and non-rail travel. We hope to integrate these leaderboards directly in the SBB mobile app accessible via the easy-ride function.

- Gamification and playful suggestions (company leaderboards, progress towards goals, hours saved in terms of Netflix series watched, etc) to encourage switch to rail. Gamification increases engagement to generate additional data on business travel. The challenge Nr 1 could provide the suggestions of personalized trips.

Project Links

- GitHub Repository: OpenRail-Playground/aMissionToZero
- Demo: Demo included in pitch slides (dashboard preview video, and mock-up for SBB mobile app)
- Further Links:

Who are the user groups of the described solution?
Internal/external user groups (e.g., business sectors, b2c / b2b customers, etc.)

- **Business sales manager of railway company**
- **Employees of the customer companies**
- **Management of the customer companies**

What is the economic benefit?
E.g., reduction in compensation costs

- Provides data-driven support for ESG (environmental, social, governmental) goal achievement, boosts employee engagement, enables compliant reporting, and drives the shift toward climate-neutral business travel (which reduces for example costly parking)

What are the positive impacts on the rail system?
E.g., attractiveness of rail transport, ecological impacts, ...

- **Increased attractiveness of rail** compared to other transport modes through comfort, reliability, and digital services, encouraging more people to switch.
- **Support for ESG goals** by significantly reducing CO_2 emissions and improving energy efficiency, aiding sustainable corporate and climate strategies.
- **Relief for roads and the environment** via lower air pollution, reduced traffic congestion, and more efficient land use

What is the maturity level of the technologies used?
May depends on the railway company.

- **Open source tech stack** (Python and Streamlit, SBB standard). Easily integrable into the existing solutions, for example the SBB Business Manager Tool
- **Mobile App mock-up** is designed in Figma. Integration into the app would require standard iOS and Android development.

Are there any existing alternatives to the solution?

- There is a basic version in use at SBB, but it is manually calculated in an excel spreadsheet each time that a client requests information.

Which alternatives are out of the question and why?

- We cannot show current modal split or total CO2 emissions, because we do not have data on non-rail business travel. The companies would need to report this data as well (which we hope to achieve in the future through increased engagement and reporting)

Are there any foreseeable risks, hurdles or dependencies, how needs to be considered?

- **Distorted results** caused by limited or faulty data (e.g.: limited car travel, “GA” subscription travels; booked trips/locations may be different from actual trips taken)
- **Employee and company culture** is crucial, active employee and company engagement is required for any long-term success
- **Many dependencies** in the reporting and booking of business trips or the general systems of client companies such as HR

What are the next Steps?
What do you need to implement the solution?

- **Implementation into existing solutions**, such as the dashboard into the SBB Business Manager Tool and individual tracking into the SBB mobile app
- **Integration of Open Source data**, such as data on business trips by car, for a broader comparison
- **Implementation of the dashboard** (github template) for other countries/RU, enabling cross-country comparison and the sharing of additional Open Data.

LoCo2 LoCo

Team SBB, DB, ÖBB

Description of the Challenge

What is the problem/idea? What is the current status?
Focus on important/central points.

SBB's B2B team serves 12,000 corporate clients in Switzerland (totaling around 1.25 million potential travelers), making those companies a powerful channel for driving greener mobility.

Currently, much of SBB's existing B2B travel data remains underutilized. The goal is to transform these data streams into an intuitive, action-oriented dashboard that helps corporate clients make more sustainable travel decisions.

This dashboard aims to encourage a modal shift and reduce overall CO_2 emissions by offering actionable insights and behavior-focused features, ultimately guiding both corporate clients and SBB itself toward more sustainable mobility strategies.

Description of the Solution or Idea

What are the key features of the solution?
Focus on important/central points.

Implementation of a Dashboard to see a companies business travels as they are today and how an increase in modal split could decrease the CO2 emission.

Companies have access to the following information via the dashboard: CO2 savings potential (relative to average modal split, kg CO2, equivalent to tree consumption of CO2), km travelled, CHF saved (compared to same amount of km by car), accumulated emissions and difference from baseline when modifying the modal split

Project Links

- Github Repository: github.com/biederfrau/locoloco
- Demo:
- Further Links: atlas (Betriebspunkte)

Who are the user groups of the described solution?
Internal/external user groups (e.g., business sectors, b2c / b2b customers, etc.)

- B2B customers (management with oversight on business travel)

What is the economic benefit?
E.g., reduction in compensation costs

- By introducing a modal shift companies can not only reduce their CO2 emissions but also reduce travel costs

What are the positive impacts on the rail system?
E.g., attractiveness of rail transport, ecological impacts, ...

- If companies increase the modal split they reduce the CO2 emissions and other pollutants emitted when travelling by car

What is the maturity level of the technologies used?
May depends on the railway company.

- The data is not sufficient for exact calculations, a lot of assumptions and simplifications are necessary, therefore the solution is not very mature
- Database on Supabase connected to dashboard on ??

Are there any existing alternatives to the solution?

- The saving of the emissions can be seen for a single journey on sbb.ch but this is limited to individual journeys and cannot be accessed for multiple purchases on business accounts
- Companies can have a report on demand, no real time solution available

Which alternatives are out of the question and why?

- Using google maps data for the computation of costs, duration and journey options, this would include substantial costs which might outweigh the benefit of the CO2 Dashboard

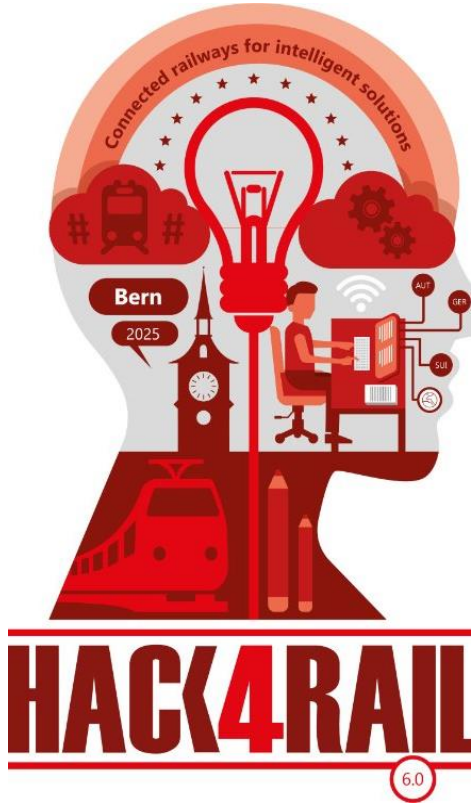
Are there any foreseeable risks, hurdles or dependencies, how needs to be considered?

- When comparing the CO2 emissions of different companies it is necessary to assure sufficient anonymization
- No data on how companies use other modes of transportation, which can bias the results
- No data on company size, might bias the results

What are the next Steps?
What do you need to implement the solution?

- More detailed data on the businesses to make comparisons between companies in the same sector (e.g. it would be ‚unfair' to compare a construction company with a IT-Consultant company)
- Information on the usage of yearly or monthly subscriptions (GA)

Smart Network Switch Management

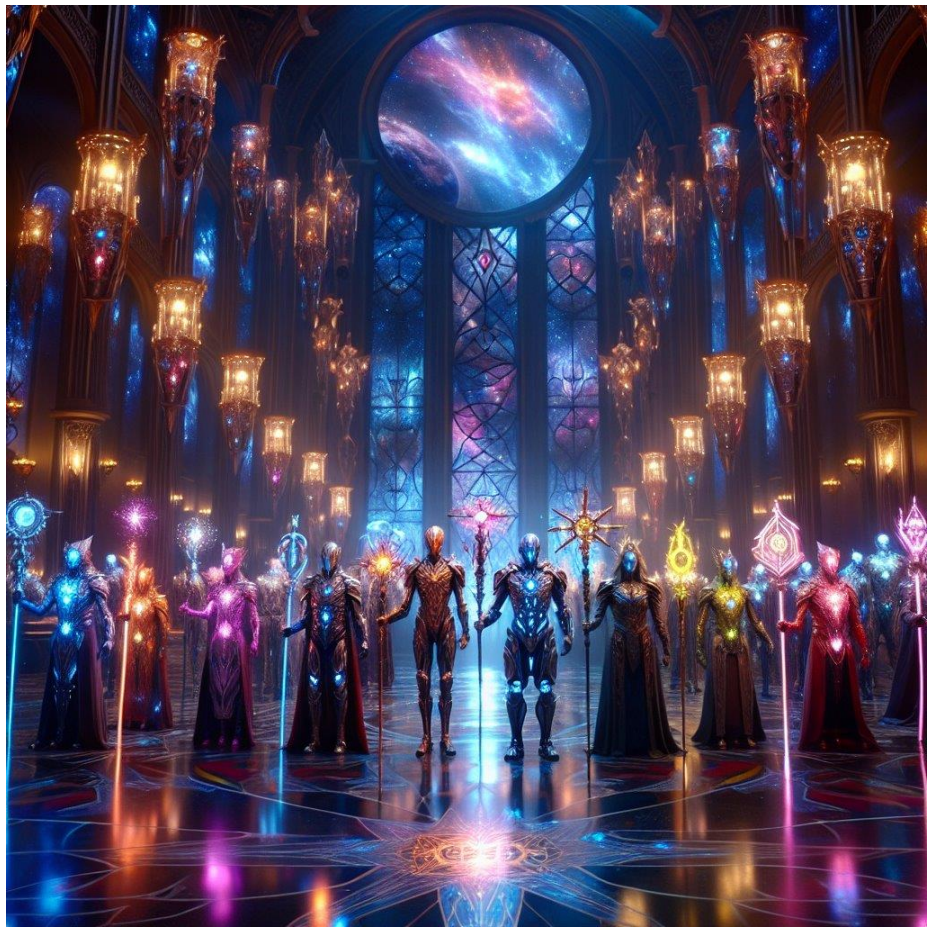


Challenge owner:
DB

Teams:
Switch Lords
Packet On Rails

Switch Lords

Team DB, ÖBB, SBB



Description of the Challenge

What is the problem/idea? What is the current status?
Focus on important/central points.

Topology-Discovery:

The challenge at hand is to develop a reliable method for discovering the network topology of train switches. Currently, there is no visibility into which switches are available on the network, making it difficult to manage and control them remotely.

This lack of information can lead to inefficiencies in operations, increased downtime, and challenges in maintenance. By implementing a topology discovery solution, we can enhance remote management capabilities, streamline operations, and improve overall safety and efficiency in train systems.

Description of the Solution or Idea

What are the key features of the solution?
Focus on important/central points.

We have successfully developed a topology discovery solution that is operational for five different types of switches. This modular approach allows easy extension to accommodate additional switch types in the future.

Next Steps: Focus on refining the solution and integrating it into existing systems for enhanced management capabilities.

Project Links

- GitHub Repository: https://github.com/carlbalmer/onboard-switches-iac/
- Demo:
- Further Links:

Who are the user groups of the described solution?
Internal/external user groups (e.g., business sectors, b2c / b2b customers, etc.)

- Operations
- Maintenance personnel

What is the economic benefit?
E.g., reduction in compensation costs

- Efficient configuration process

What are the positive impacts on the rail system?
E.g., attractiveness of rail transport, ecological impacts, ...

- Availability of the services

What is the maturity level of the technologies used?
May depends on the railway company.

- State of the art technology

Are there any existing alternatives to the solution?

- Not really, those are manually

Which alternatives are out of the question and why?

- Vendor specific software – only support their products

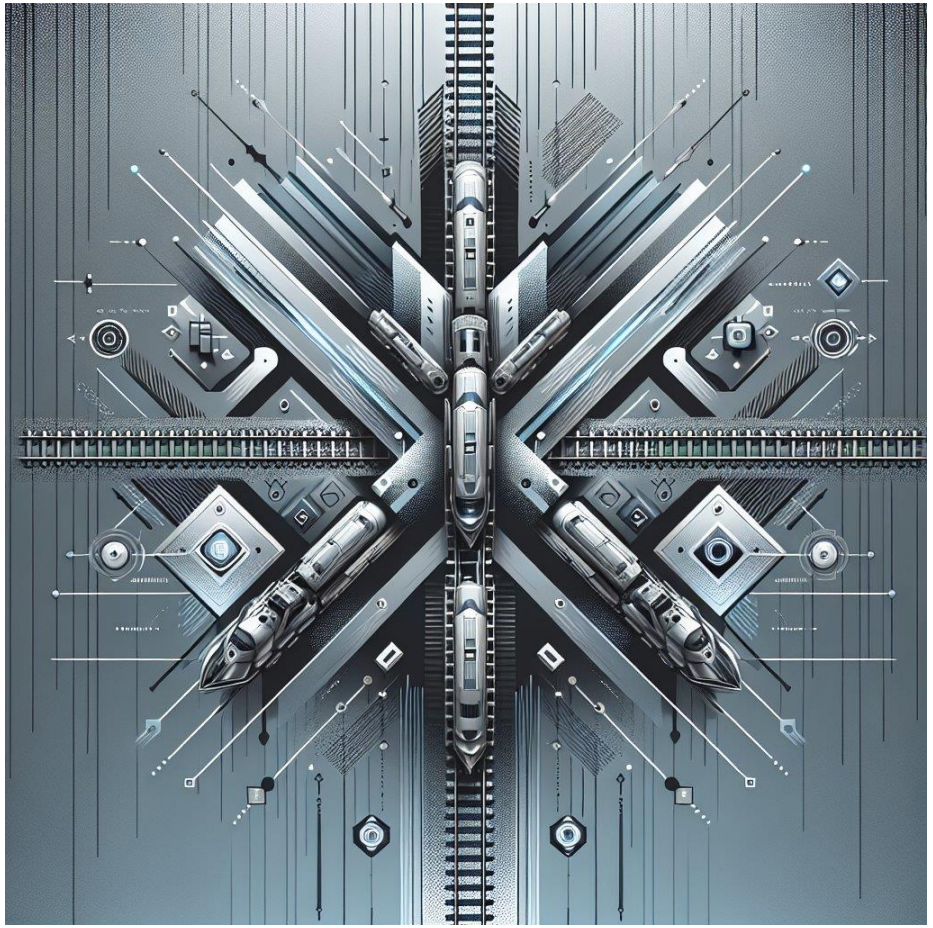
Are there any foreseeable risks, hurdles or dependencies, how needs to be considered?

- IT security and regulatory issues

What are the next Steps?
What do you need to implement the solution?

- Lab-Testing
- Further development and approval of the solution

Packet on Rails



Team DB, ÖBB, SBB

Description of the Challenge

What is the problem/idea? What is the current status?
Focus on important/central points.

The challenge revolves around the management and configuration of network switches used in trains, which connect various devices to the network. The core issues identified are:

- There are multiple manufacturers of these switches, leading to a diverse range of configuration requirements.

- Each switch must be manually configured by a skilled technician who is familiar with the specific manufacturer's requirements, creating a significant reliance on specialized knowledge.

- There is no reliable way to configure the switches remotely and automatically.

Description of the Solution or Idea

What are the key features of the solution?
Focus on important/central points.

The goal of the challenge is to develop an abstraction layer that standardizes the configuration process across all manufacturers. This enables automated remote configuration of all switches and ensures a uniform configuration regardless of the manufacturer.

This abstraction layer is implemented as a Ansible Module. This module an be published as an open source component, empowering other railways and users of these switches.

By addressing these issues, the challenge streamlines the management of network switches and reduces the dependency on specialized technicians.

Project Links

- GitHub Repository: https://github.com/carlbalmer/onboard-switches-iac/
- Demo:
- Further Links:

Who are the user groups of the described solution?
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- Operations
- Maintenance personnel

What is the economic benefit?
E.g., reduction in compensation costs

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What are the positive impacts on the rail system?
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What is the maturity level of the technologies used?
May depends on the railway company.

- State of the art technology

Are there any existing alternatives to the solution?

- Not really, those are manually

Which alternatives are out of the question and why?

- Vendor specific software – only support their products

Are there any foreseeable risks, hurdles or dependencies, how needs to be considered?

- IT security and regulatory issues

What are the next Steps?
What do you need to implement the solution?

- Lab-Testing
- Further development and approval of the solution