

Siemens Mobility

software development challenge

Trains in the clouds

Not only your data but the trains are also moving to the cloud. Help us tackle the challenge which hundreds of connected trains could yield.

Introduction to the Challenge

The railway industry is moving to the digital age with full steam. One of this digitalization efforts is to move the non-safety critical communication to the cloud. There is plenty of data that a train can provide about itself like telemetry, schedules, passenger information... With this data there is a plenty of new opportunities to make the transportation easier and safer.

Imagine the complex ecosystem of the railway transportation: hundreds of trains are operating and continuously sending telemetry information and any special events which might occur. Passengers are waiting in the stations; technicians are conducting maintenance and manual operations. Meanwhile, operators in the command center are trying to monitor this complex system. The city management is in a meeting trying to decide whether a new metro line is needed or not.

We want you to use this data provided by the trains to come up with new ideas and applications which might help the railway transportation. This application can be a monitoring software tracking the trains helping the operators, a new app for the passengers to make it easier for planning their trips or an analysis tool for the railway companies.

The railway environment is so complex that issues can always happen. Trains experiencing internal errors, faulty data is provided to the cloud, the number of trains increase or decrease based on the time of the day. Cloud connections to the trains are not always reliable, any real time application must be able to handle the loss of connectivity to the trains. Make your application robust enough to handle those challenges. To help you to come up with new ideas we provide some operational scenarios. These scenarios are not requirements but there to help you understand what can happen in regular operation.

Who we are?

As a leader in transport solutions for more than 160 years, Siemens Mobility is constantly innovating its portfolio in its core areas of rolling stock, rail automation, and electrification as well as related services and research and development. With digitalization, Siemens Mobility is enabling mobility operators worldwide to make infrastructure intelligent,

increase value sustainably over the entire lifecycle, enhance passenger experience and guarantee availability.

Siemens Mobility R&D in Budapest:

- 30+ international projects in the fields of rail infrastructure and rolling stock,
- 160+ Ambitious, highly educated specialists developing digital solutions,
- endless opportunities to improve sustainable mobility systems for the future.

What we will provide

We provide you a list of typical information which the trains provide to the cloud and a set of operational scenarios which might happen during operation.

These scenarios are in another document on drive:

<https://docs.google.com/document/d/1PukLcU3B5zuWyGrHJRgBlw-ku6z7YWgRBPpd6LNcRqA/edit>

You can expect the trains to provide the following telemetry information (of course this is not a full list):

- Type of the train (eg.: intercity train, tram, metro)
- Owner of the train (railway company)
- Connection information (train is connected to the cloud)
- Localization information
 - Position (eg.: GNSS, GPS)
 - Velocity
 - Acceleration
 - Driving direction
- System status
 - Error state (fatal, error, warning, working) of the subsystems inside the trains, possible subsystems can be:
 - Rolling stock (computer handling low level actuation, brakes)
 - Safety critical computer (handling doors, emergency brakes)
 - Internal communication subsystem (responsible for communication between subsystems)
 - Recording unit (recording all the internal state of the train)
 - Temperature of the onboard computers
 - State of the passenger displays, and driver display inside the cabin (on, off)
 - State of the CCTV cameras (on, off)
- Mission (information where the train is going eg.: which is the next station) and the estimated times of arrival
- Status of the lights in the cabins
- Status of the AC and temperature
- Number of passengers based on CCTV cameras

As said before this is not a full list, if you had a great idea which would include some data not listed here but likely available on a train feel free to use it. Furthermore, you can expect to have the map of the tracks.

Our experienced mentors will also be available for you to ask questions about these systems, the example data or just to challenge your idea. Don't forget to book a slot for mentorship!

Implementation and technology

We will not restrict the programming languages, or the tools used, you may choose them as you see fit.

Judging criteria

We will take into consideration the quality of the UI used to display data, the scalability of the system (ie. how many simulated trains you can run in parallel without losing performance), how you apply good architecture principles to your system (loosely coupled components, design patterns, SOLID principles), innovativeness, quality and usefulness of the application and your presentation.

Prizes

The winner of this challenge will gain 500 € and also will get the opportunity to visit the Budapest office of Siemens Mobility where they can get a short insight into the projects and the company's everyday lives. In addition, Siemens Mobility will also invite them for lunch or dinner at Kopaszi-gát.

Next to the first place, the teams who will take the second and third places will get a Siemens gift bag.