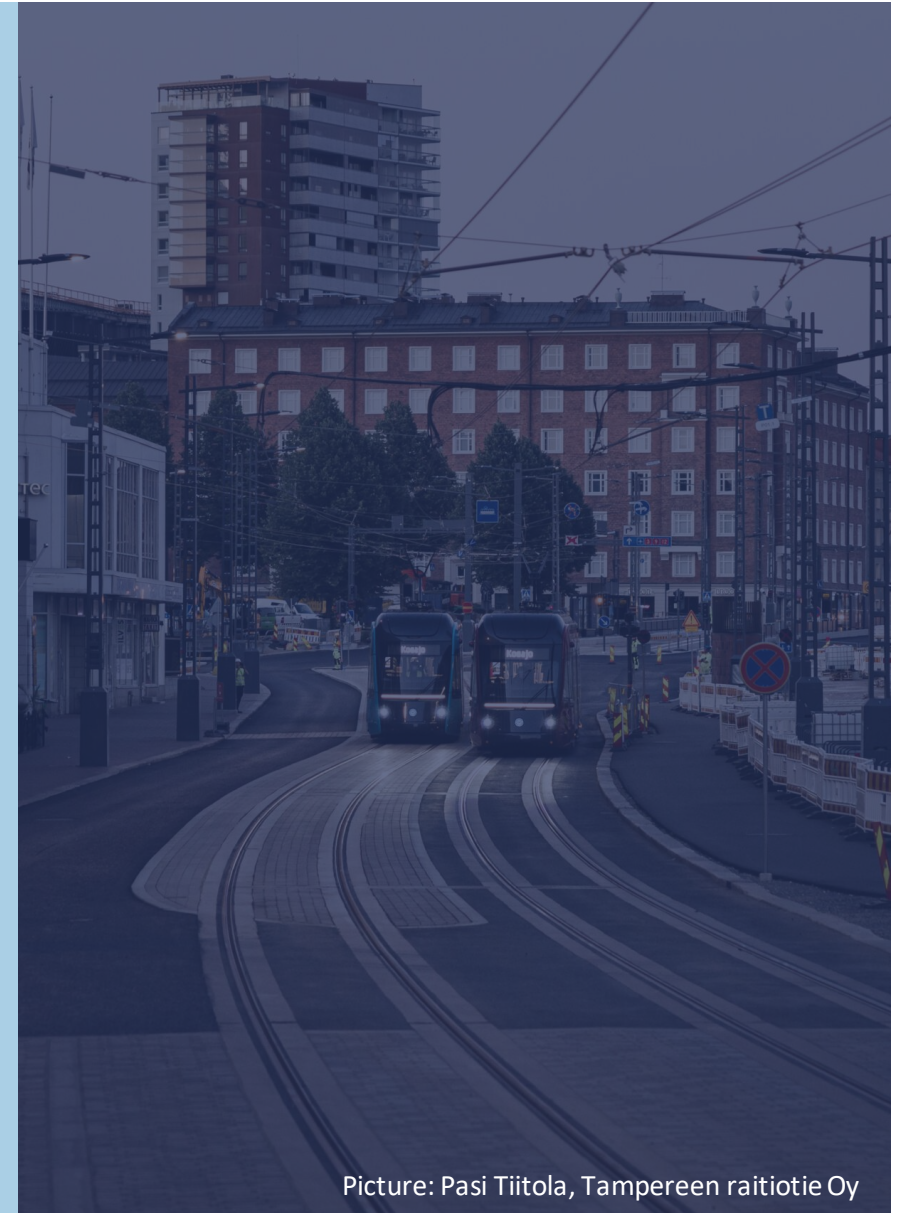


# SmartRail

**Co-creating Sustainable Cities on Rails.**

<https://smartrailecosystem.com/>

**Did you ever consider  
modern city  
transportation problems  
and sustainability  
challenges could be  
solved with rails?**



Picture: Pasi Tiitola, Tampereen raitiotie Oy

# Trend:

## Cities keep expanding

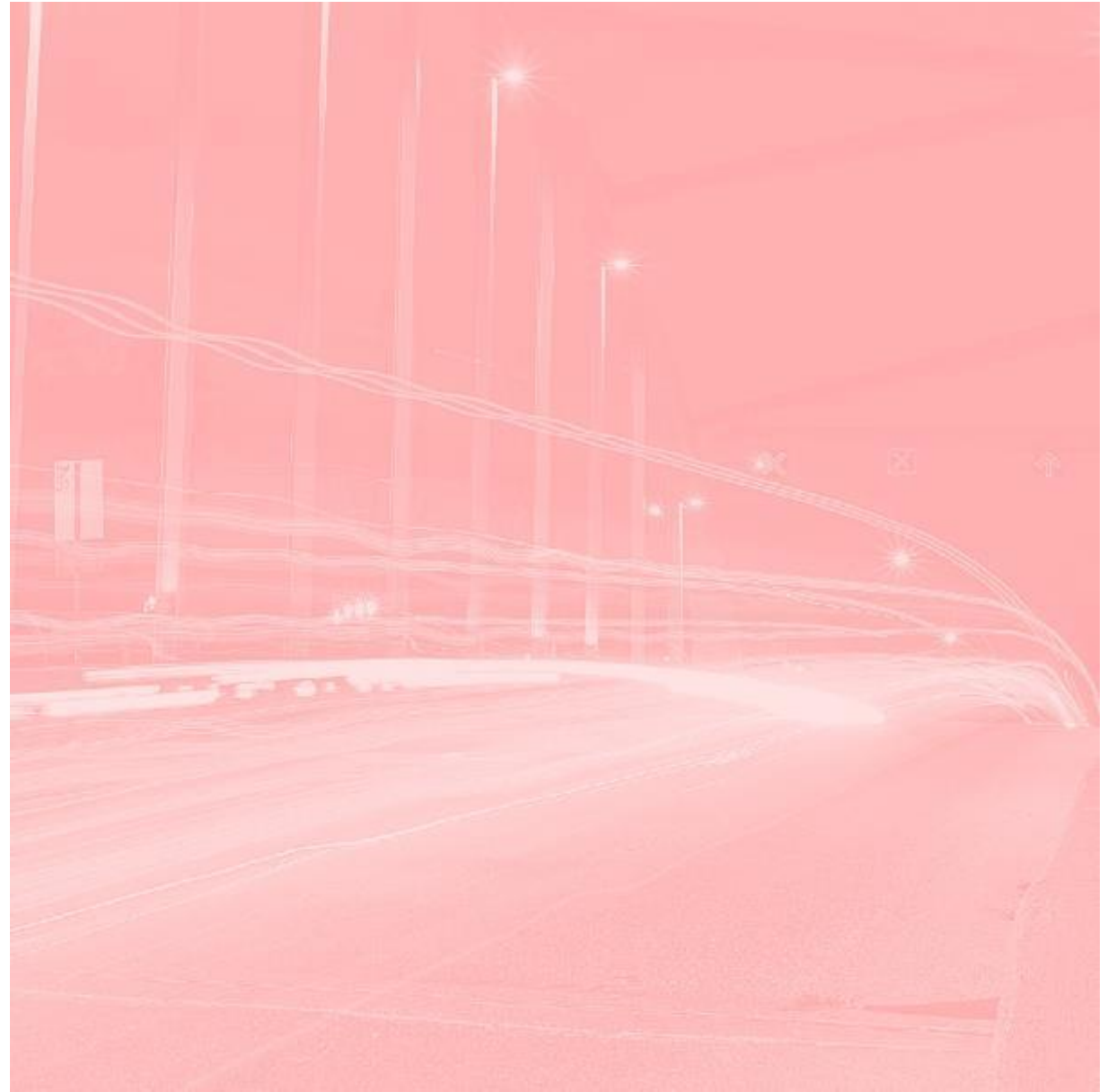
- Public transportation needs to reach wider and wider areas
- More investments in infrastructure and vehicles
- Businesses have difficulties in forecasting the development of different city areas and investing in them
- Citizen services become harder to reach and travel times become longer
- Higher amount of congestion in main roads and city centers

# Problem:

**Reducing mobility emissions becomes harder.**

# Vision:

**Smart & sustainable  
city that attracts  
people, investments  
and growth**



# Rails bring together citizens, business and technology for better and more sustainable future.

## Citizens

Living, working and free time located near to each other  
Different city areas become more reachable  
Easier access to necessary services  
Accessible vehicles  
New mobility services around rails  
Reliable and on-time city transportation  
Better quality of life

## Businesses

Better understanding of development of different areas  
Easier planning of business  
More understanding of people flow  
Stability enables making successful investments

## Technology

Safer trips enabled by automation and data from vehicles  
Smaller energy consumption by route & speed optimization  
Optimized maintenance for trams  
Long life cycle of the vehicle enables constant technological development of the vehicle

# Brighter future for cities

Private and public investments increase because of stable mobility environment

Urban development and financing get easier

Less congestion

Cheaper public transportation

Vehicle reliability improves

Enhanced reliability of the city transportation

Smaller life cycle expenses

Land and properties increase in value

# With smart tram you move more people and reach lower costs



# SmartRail

Brings  
stakeholders  
together to  
innovate





# What we offer

Best tools for for renewing cities through mobility

World's safest and most reliable and efficient smart trams

State of the art technology and platform for future mobility services



Kuva: Pasi Tiitola, Tampereen raitiotie Oy

# Renewing cities through mobility

Cities keep growing in both population and size creating a bridge between positive development and sustainability objectives.

The SmartRail ecosystem provides the best tools for evaluating different mobility solutions and long-term development outcomes for cities to make the most sustainable mobility choices both ecologically and socially.

## Ecosystem offering

**Tampere City Smart Tram Living Lab**

**Evaluation tools for cities**

Impact assessment including scenarios for city development as well as societal and business impacts

**Simulation tools**

Training  
Testing

**Virtual mobility development**

Digital Twins  
3D modeling

# World's safest and most reliable trams

In order to meet the emission targets and citizen needs in growing cities, the mobility network needs to be updated to 2020.

Finland is known for developing world class environment for trams. However, the true value is in the data that is collected from every single point of the vehicle and routes. This enables safer and more reliable trips for the citizens and cost efficiency for cities and transport service providers whether the goal is to update existing vehicles or to offer a completely new mobility experience.

## Ecosystem offering

### Safe path to autonomy

Machine intelligence up to full autonomy operations

### Cost efficiency through longer life cycle of trams

Real time analytics on upcoming tram maintenance work

### Energy efficiency

Brake-energy recovery

### Safety

Increased machine precision in highly demanding environments and extreme conditions

Predictive avoiding of collisions

Real time speed and route monitoring

### Reliability

Real time status of the whole tramway from infrastructure condition to security incidents

# Platform for future mobility services

Stability and predictability of tram routes provide new possibilities for businesses and cities to develop the citizens' customer experience even further.

State-of-the-art technology and data provided by companies in the SmartRail ecosystem enable solutions that shape the future of cities.

## Ecosystem offering

### **Better customer experience**

Easier ticketing and real time route planners and detection  
Always on time mobility due to real time status of the tram

### **User focused and data driven mobility solutions**

Passenger counting services  
Recognizing different passenger groups  
Route optimizing based on accurate passenger data  
Passenger guidance  
Easy travel chains for citizens

### **Cities that are better to live in**

Noise detection and measurement  
Accessible route from start to end





**The world's most premium modern light rail designed in extreme harsh Nordic conditions – made to be operated everywhere. Smart innovations combined with strong technical solutions**

## Škoda Transportation

Škoda Transtech is a leading European rolling stock manufacturer specialized in supplying low-floor trams and double-deck coaches. Currently Škoda Transtech is supplying state-of-the-art light rail vehicles to the Finnish metropolis of Helsinki, the city of Tampere and as well as coaches for Finnish Railways. Since 2015 Škoda Transtech is part of the Škoda Transportation Group. Škoda experts develop, produce and supply top products customized to the needs and wishes of its customers.

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## Our SmartRail offering

Škoda' supplies smart solutions for heavy and light rail vehicles, our target is to be able to supply fully automated vehicles in the near future.

Our available solutions today are driver's support systems (as e.g. collision protection and vigilance monitoring) and vehicle management tools (as e.g. vehicle management and passenger flow analytics).

We have test environments and simulators available for complete vehicle systems including driver's training system to digital twins.



## Benefits we deliver:

- 1** Durable rolling stock with smart mechanical and IOT solutions
- 2** Solutions proven in challenging conditions
- 3** Lower life-cycle costs due to highly optimized vehicle structure and attention to details
- 4** We design rail solutions with sustainability in mind, in terms of energy consumption, materials, recyclability and accessibility for a 40-year life cycle.

## Leading edge scientific and technical expertise in cross-sectoral solutions for rail-related city mobility through ecosystems and living labs

### VTT

VTT is one of Europe's leading research institutions. We advance the utilisation and commercialisation of research and technology in commerce and society through scientific and technological means.

### Contact us:

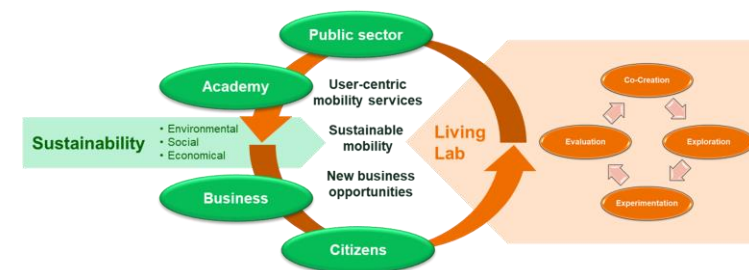
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### Our SmartRail offering

VTT offers tools for societal, business and environmental impact assessments as well as business models, working practices and living lab tools for ecosystemic co-creation.

Data-driven rail-related secure solutions for sustainable transport and mobility integrating other city transport and services.

Digital solutions for simulations, energy efficiency, optimization, proactive maintenance and autonomous rail transport development enable sustainable mobility for cities on rails.



### Benefits we deliver:

- 1 Decision support for cities to advance sustainable and user-focused mobility
- 2 More attractive and efficient travel experience for end users
- 3 Solutions for smart traffic system and safe pathway to autonomous systems
- 4 Speeding up of company RD&I for sustainable growth of business

# NODEON

Finnish technology company focusing on digitalization solutions in the fields of smart traffic (ITS), smart cities, built environment and infrastructure.

## Nodeon Finland Oy

We help our customers increase the intelligence and automation as well as data collection and analysis at all different layers of the systems. Nodeon's expertise is based on four technology pillars: software design, telecommunication solutions, automation and electrical design.

### Contact us:

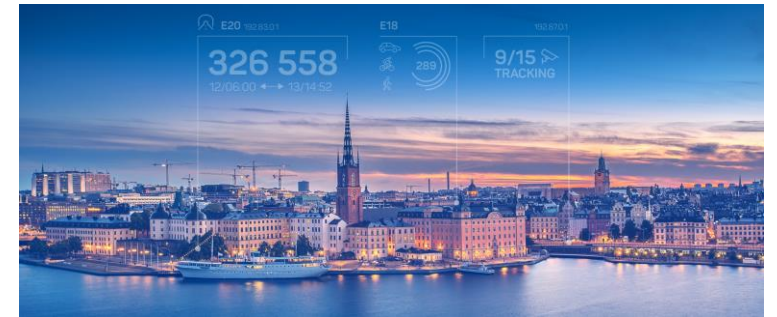
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## Our SmartRail offering

Nodeon offers expertise, tools and solutions for expanded and real-time situational awareness in safety critical locations in a city street network.

Solutions for C-ITS (co-operative ITS) related real-time communication between intelligent street infra and moving objects (trams, vehicles).

Automated solutions for tram monitoring for predictive maintenance purposes.



## Benefits we deliver:

- 1 Creation of traffic situational awareness for data-driven traffic controlling and safety solutions
- 2 Expertise for future development of C-ITS based traffic management in the cities
- 3 Improved and predictive maintenance and repairs for trams
- 4 Wide-scale expertise from traffic monitoring and analysis for creating user-oriented data-intensive mobility services for citizens



## Holistic impact assessments of rail-based urban mobility with automated feeder bus routes on land use, transport system, public transport level of service and passenger experiences with accessibility simulation

### Tampere University

Tampere University is one of the truly multidisciplinary universities in Finland, bringing together research and education in technology, health, and society. Collaboration with our partners is built on unique combinations of scientific disciplines and applied expertise.

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### Our SmartRail offering

Tampere University offers several tools for assessing urban rail systems, such as:

Land use, transport system and sustainability assessment framework.

Pahvimaketti - a unique physical showcase and testing environment at Nokia Arena, in the heart of Tampere to introduce and test future digital services in a physical environment.

Digital Virtual Reality simulation environments and interactive public displays.

Digital models of advanced materials and structures for design and simulation



### Benefits we deliver:

- 1 Support for designing accessible public transportation services for people with different needs.
- 2 A low-level solution to introduce and test future digital services in a physical environment.
- 3 Support for simulating and designing accessible public transportation services in XR.
- 4 Citizen and user experience surveys for assessing the effects of urban rail

## Holistic impact assessments of rail-based urban mobility with automated feeder bus routes on land use, transport system, public transport level of service and passenger experiences

### Transport Research Centre Verne

Transport Research Centre Verne at Tampere University promotes developing sustainable transport system and logistics through research and education activities and their societal impact.

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### Our SmartRail offering

Verne offers analytic tools for assessing the impact of urban rail and related mobility service offerings on:

- Land use
- Transport system
- Transport mode choice
- Emissions
- Safety and security
- Costs and benefits



## Benefits we deliver:

- 1 Holistic impact assessment tools for cities
- 2 User experience surveys for automated bus trials
- 3 Citizen surveys for assessing the effects of urban rail on accessibility
- 4 Emission reduction assessment framework and calculations



**Proxion is a fast-moving digital rail company and Finnish leader in the development of smart rail traffic usability and agility.**

## **Proxion**

The most important thing for us is that our customers succeed and rail traffic develops. Utilization of the data enables better planning of rail traffic and infrastructure as well as decision-making on how to proceed.

## **Contact us:**

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## **Our SmartRail offering**

Utilization of the data enables better planning of rail traffic and infrastructure as well as decision-making on how to proceed.

SmartRail products

**ProX Mobile 5G laboratory**  
**ProX Autonomous Train**  
**ProX TRL and ProX Radar**  
**ProX Situational awareness application**



## **Benefits we deliver:**

- 1** **Safety**  
We are appreciated as experts of safe rail traffic and railway infrastructure.
- 2** **Sustainability**  
Our mission is to double the rail transport and to develop more sustainable solutions to rails.
- 3** **Cost-efficiency**  
Developing ways to minimize shunting and maximize uptime and payload.
- 4** **Experts on tracks**  
We serve companies in all matters regarding to planning, designing, constructing or operating on rails.



**Smart cities where everyday life is paced on a sustainability and responsible choices. That is what we at Sitowise do.**

## SITOWISE

Sitowise is a Nordic expert in the built environment with a strong focus on digitality

We design smart cities, smooth travelling and spaces for living. We operate in three business areas: building design, infrastructure design and digital solutions.

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## Our SmartRail offering

Sitowise creates the digital landscape and sustainable mobility of the future. Our experts work to help clients save costs, time and the environment, rationalize design and construction, and create a society in which data is put to use for decision-making and service development.

Examples of the digital solutions we offer:

- Smart data management for the built environment, transport infrastructure and urban development project
- The mobility revolution: intelligent transport, MaaS, traffic data and public transport planning
- Virtual environments, building information modelling and VR
- Telecommunications consulting, 5G consultation and smart infrastructure
- Logistics



## Benefits we deliver:

- 1** Sustainable. Virtually design solutions for citizens.
- 2** Responsible. Take the circular economy into account for the whole project life cycle.
- 3** Risks reductions. Predict different scenarios and exceed the end user's expectations.
- 4** Cost effective. Real-time monitoring and corrections for a flawless journey.



**Smart ticketing for a smart future, PayiQ is leading the way to a smarter and more user-friendly world of transportation**

## **iQ Payments Oy**

PayiQ develops Ticketing as a Service platform that enables cities and transport operators to sell mobile tickets and validate them. The platform also gathers data on usage and movements that can be used to improve customer experience and process efficiency.

### **Contact us:**

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## **Our SmartRail offering**

PayiQ offers a widely used platform and mobile app for collecting user data to everyone's benefit.

Transport operators and city officials receive information on usage to better plan services. Users have an easy and safe contactless way to pay for transport tickets. In addition, they can get targeted information on traveling and other services.

Possibility to integrate with various services and offer tickets for the whole travel chain.



## **Benefits we deliver:**

- 1** Easy and secure mobile payments
- 2** Multimodal tickets and travel chains
- 3** Enriching travel experience with targeted services
- 4** Sustainable solutions for smart traffic

# Lumikko

**Lumikko Oy is flexible company specialized to development and production of customer tailored HVAC systems for challenging environments**

## Lumikko Oy

Lumikko Oy is Finland's leading company focused on the design and production of HVAC solutions for mobile applications, with its history stretching back to the 1970s.

### Contact us:

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## Our SmartRail offering

Lumikko Oy offers high technology knowledge and experiment for HVAC system development for railway applications.

With web based remote monitoring systems all needed service data can be collect, save and use for preventive maintenance activities

For air filtering Lumikko have advanced solutions for small particles and viruses filtration from circulation air.



## Benefits we deliver:

- 1 Energy efficient HVAC solutions with low life cycle costs
- 2 Clean air filtering against to dust, pollutions and viruses.
- 3 Web based service data monitoring for preventive maintenance activities
- 4 Passenger area and driver's cabin's accuracy temperature control





**Fueled by decades of peer-reviewed and hands-on hard science with real mobile machines, forged by dozens of global user cases, our proprietary GIM SW Stack can turn your rail machine even into a full-blooded field & service robot.**

## **GIM Robotics**

Full stack software for mobile machinery working in all weather conditions. Shared and full autonomy operations. Our competence covers e.g., sensor fusion, real time 3D localization and mapping, traversability analysis, computer vision systems and dynamic object tracking.

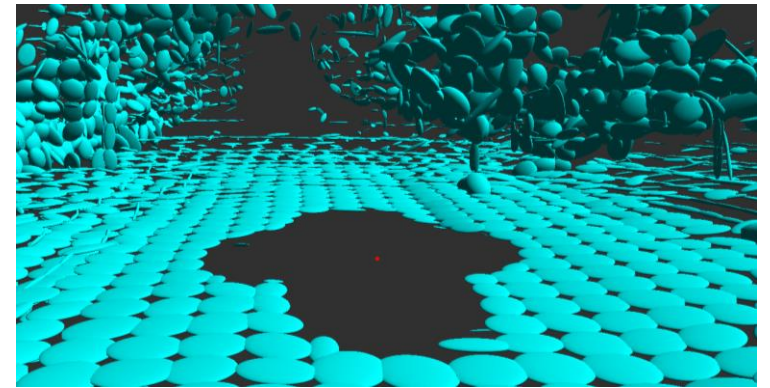
### **Contact us:**

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## **Our SmartRail offering**

Our background software and knowledge especially in perception, localization, and mapping accelerates the adoption of new operator assistive technology for next generation rail machines and speeds up the product development when the field is moving towards higher level of autonomy.

Our 3D localisation and environmental modelling sensor and software systems provides the foundations for situational awareness, obstacle detection and collision warning signals for the driver or for the automatic control/braking system.



## **Benefits we deliver:**

- 1** Making your rail machine safer, more intelligent, precise and efficient.
- 2** Speed-up your product development, open new markets and save your resources.
- 3** Reliable obstacle detection needed for the development of any autonomous rail systems.
- 4** Reduce the possibility of human error and increase the maximum usage of the rolling stock.



**Experienced and visionary development team providing an innovative approach to serious games, gamification and virtual environments**

### **Clever Simulation Entertainment / KAMK**

Clever Simulation Entertainment is a development team operating under Kajaani University of Applied Sciences.

Clever concentrates on serious game development, virtual and augmented reality development and other new technologies.

#### **Contact us:**

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### **Our SmartRail offering**

Clever / KAMK offers expertise on realistic 3D modeling using photogrammetry, laser data and automatic in-house modelling tools.

Development team has comprehensive knowhow on implementing gameplay elements and mechanics to traditional simulation environments.

Clever team has experience in combining physiological data e.g. eye movements with game environments and using this data either for research purposes or integration with games.



### **Benefits we deliver:**

- 1** Experienced team with an adaptive and innovative approach to customer's needs
- 2** Implementation of new and versatile technological solutions for design and production
- 3** Economical and modern solutions for simulation to enhance sustainability.
- 4** Unlimited possibilities for ecosystemic co-creation and continuous development



## Digitalisation of Smart Rail Solutions: Tramway Dashboard – Real Time Tram Traffic and Infrastructure Data in Action

### Ambientia Ltd.

We combine business, data, research, design and technology in a way that helps companies survive in tomorrow's competitive environment. We care and make sure that the success of our customers will not be prevented by changes in their business environment.

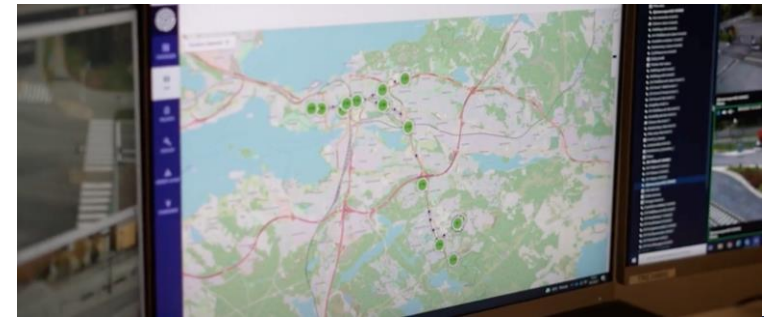
### Contact us:

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### Our SmartRail offering

Integrated application with a real time overview to tram traffic and infrastructure. This enables effective operating of the network of actors contributing to the smooth running of trams and optimizing the passenger experience.

We are also aiming to extend our digital offering by developing a software product utilizing AI and machine learning to provide tram customers with predictive understanding of their tram traffic.



### Benefits we deliver:

- 1 Better passenger experience as a result of real time overview of tramway operations
- 2 More effective processes for cities' tramway through better transparency
- 3 Data utilization of tram traffic flows allowing for developing new business models
- 4 More efficient cooperation between organizations in the tramway network



**Smarter Cities are built with AI on the Edge, where the data applications are needed and used – exactly where the people, businesses and the societies are.**

### **RAIN by Lempea Oy**

RAIN was born from over 200+ years of work expertise in networks, communications and business transformation/digitalisation.

Team RAIN are data-excited group young and veteran IT solution providers and partners for business development.

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FINLAND

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### **Our SmartRail offering**

RAIN democratizes data by bringing leadership into how data transforms into new business and asset efficiency. Digitalization is our mission and your data is your competitive edge - we make the data work for you!

Start small, scale big. RAIN adapts into your needs perfectly and enables you to scale horizontally and vertically when required.

Team RAIN has a vast network of like-minded professionals from all fields of industries for collaboration.



### **Benefits we deliver:**

- 1** Cutting-edge technology platform for everyone, today: AI, Edge, 5G Private Networks, Edge-to-Cloud
- 2** RAIN can be integrated into any existing IT & Cloud infrastructure. With unlimited scalability!
- 3** No code use speeds up every aspect of your work and deploying AI. Easy start for any business!
- 4** With RAIN you can make real-time, AI assisted business decisions and connect process data close to its origin

**Professionals with long and extensive experience in domestic and international ITS projects and solutions.**

### **Varala Engineering Oy**

Varala Engineering's core competencies are expertise related to the implementation of traffic monitoring and management systems and solutions. Varala Engineering was founded in 2019 and is part of the Normi Group.

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### **Our SmartRail offering**

Varala Engineering provides expertise in the following areas:

- Traffic management systems and solutions (traffic lights, dynamic road signs, camera surveillance systems)
- Co-operative solutions (C-ITS)
- Communication technologies
- Urban traffic situational awareness systems

## **Benefits we deliver:**

- 1** Expertise in automated public transport and feeder transport services.
- 2** Deep knowledge of traffic lights and KPIs.
- 3** Expertise of prioritization systems for different modes of transport.
- 4** Experiences of creating digital twin in Smart city environment.



**Solita helps companies to excel in digital transformation by providing digital, organizational and ecosystemic expertise and by building tomorrow's sustainable data-driven services and systems.**

## Solita

Solita has the most extensive expertise in the Nordics on creating customer and data-driven mobility solutions. With our customers, we operate on land, on rails and on rolling stock helping you to harness data for better services, effectiveness and new value for the whole ecosystem. We turn the change into a competitive advantage with comprehensive digital expertise that combines technology, data and human insight

## Contact us:

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## Our SmartRail offering

Future services will be built on data. Solita provides a range of services fostering data-drivenness:

1. Data governance within ecosystems: Data governance and management ensuring strategic data alignment, efficiency and ability to execute
2. Advanced analytics: Defining data strategies and roadmaps striving for business-driven analytics solutions utilizing multi-organizational data and AI.
3. Situational awareness: Modern customer-centric real-time services supporting mission-critical tasks.
4. Asset management: Infrastructure and asset management capabilities built on seamless processes over the life-cycle



## Benefits we deliver:

- 1 Supporting business renewal in digital landscape and ecosystems.
- 2 Data-driven excellence by empowering the digital workforce with modern tools, data and analytics.
- 3 Extending your reach and timing through connectivity, situational awareness and governance solutions.
- 4 Turning sustainability and life-cycle services into a competitive advantage.



## High quality passenger door solutions for rolling stock, engineered to sustain harsh climates and demanding use

### Tamware

Oy Tamware Ab is a leading European door solution provider for rolling stock, specializing in supplying electric door systems to the rail and bus sector.

Tamware's door systems are used for instance in Škoda Transtech's trams in the city of Tampere, in Stadler's trams for Milan and in Stadler's trams in Bolivia. Tamware door systems are always tailored to customer needs and

Tamware has been recently selected as a preferred supplier and solution provider for many OEM's, such as Stadler and Scania.

### Contact us:

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### Our SmartRail offering

Tamware supplies high-tech door solutions for light rail vehicles, and our intelligent door systems and their controlling will greatly support the fully automated vehicle production for the near future.

The recently created new generation SIL2 -level door controlling grants high safety for passengers, in addition to the default door safety equipment.

Tamware's high quality products will ensure long-lasting, environmentally friendly and safe travels for the OEM's, operators and passengers on board.



### Benefits we deliver:

- 1 Intelligent door systems with Tamware's own door controlling.
- 2 Widely tested door systems in a large variety of vehicles, from buses, shuttles and trucks to light rail vehicles.
- 3 Tailored systems to each customer's requirements.
- 4 Sustainable solutions with high recyclability, low energy consumption values and low lifecycle costs.