AI Aware Scale-Up

AI Powered Awareness for Increased Traffic Safety

FINAL REPORT
V1.0

2023-12-22

Executive Summary

AI Aware Scale-Up - a vehicle related application of AI with the potential to take us one step closer to Vision Zero – no one should be killed or severely injured in road traffic.

The AI Aware Scale-Up project combined the successful implementation of an AI-powered data fusion platform with the innovative Safe Speed concept, significantly enhancing traffic safety and management. Its ability to integrate diverse data sources for real-time traffic analysis and accident risk prediction is a notable achievement. The project demonstrated its impact through various events, establishing itself as a leader in AI-driven traffic safety solutions. This, along with collaborative efforts involving key industry players, underscores its role in shaping the future of proactive traffic management.

The AI Aware Scale-Up project has been presented and demonstrated at numerous events, showcasing its innovative approach and findings. Key events included the Bifrost San Francisco presentation in March 2023, the Collaboration Workshop at Volvo Cars Sunnyvale, and the Graph Summit in Stockholm. Additionally, the project was featured at the ITS America Texas event in May 2023, along with demonstrations at ITS Europe Lisbon, the AD and ADAS Conference in Santa Clara, and the Drive Sweden Forum in Gothenburg. These events provided platforms for sharing the project's achievements and insights with a wider audience.

The successful outcome of the AI Aware Scale-Up project will most likely lead to future projects. All project members see great potential in continuing the exploration of predictive awareness for increased traffic safety within their own organizations.

Table of Contents

Introduction

The "AI Aware Scale-Up" project, as part of Drive Sweden's strategic initiatives, focuses on developing AI for predictive awareness in traffic safety contexts in California and Sweden. The project builds on previous Drive Sweden projects, leveraging new use cases and data sources for enhanced traffic safety and sustainability. Key participants include Volvo Cars, Carmenta Automotive, Zenseact, HERE Technologies, RISE, and Swedish Transport Administration, collaborating on various aspects of AI and data integration in traffic systems. The project emphasizes pragmatic, agile approaches and strong collaboration, aiming for innovative digital AI services to create safer traffic environments.

Project participants

Volvo Cars

Volvo Car Corporation has high ambitions when it comes to sustainable mobility solutions, especially within electrification and autonomous drive. Volvo Cars believes autonomous drive can generate significant potential road safety benefits for society as a whole when all cars are autonomous. Until that moment, the technology can offer customers a better driving experience by taking away mundane tasks such as stop-start driving in traffic jams. Our work on autonomous driving builds upon 90 years of safety know-how.

Carmenta Automotive

Carmenta Automotive is an international cloud software tech provider for situational awareness beyond sensor range for connected and automated vehicles. Carmenta TrafficWatch is the powerful, cloud-based software product that monitors vehicles in traffic, making use of both dynamic and static data to support constant analysis of the vehicle’s physical environment. Carmenta TrafficWatch automatically issues instructions or warnings to avoid situations or events that may compromise safe or efficient driving.

Zenseact

Zenseact originate from Volvo Cars and from Zenuity. Our software, tools and methodology are developed with a safety-first mindset. Currently, we are a proud provider of trusted Advanced Driver Assistance Systems (ADAS) and next generation Autonomous Drive (AD) features for consumer vehicles. But at the same time, we have an important story to tell; and our minds are set on a future where there will be no traffic related accidents.

HERE

HERE Technologies Since the first digital map for cars 1985 HERE has been the market leader. Today, a company of over 8000 employees all focused on the concept of location and the potential it has to radically improve the way we do business, the way we get around and the way we live, HERE is shaping the future by redefining what was formerly known as a map.

Swedish Transport Administration

Swedish Transport Administration is responsible for the overall long-term infrastructure planning of road, rail, sea, and air transport. Their assignment also includes the construction, operation and maintenance of state roads and railways, and are developers of society planning for a holistic integration of the entire transport system. Swedish Transport Administration works with long-term infrastructure planning in close dialogue with regions and municipalities. To ensure that this infrastructure is used effectively and that it promotes safe and environmentally sound transportation.

RISE

RISE is owned by the Swedish government and is a research company focusing on innovation. RISE is operating about 130 testbeds and has 3 000 employees who have competence in many areas. RISE’s mission is to work for sustainable growth in Sweden by strengthening the competitiveness and capacity for renewal of Swedish industry, as well as promoting the innovative development of society as a whole. One focus area is mobility that works with servification, energy and environment, digital systems, automation etc. Issues related to access

to data, data sharing and privacy are a part of the mobility focus area and fits well into the mission of creating safer and sustainable transports.

Visions for Traffic Safety

The new dimension explored in this project has a huge potential to solve the problem of unforeseen events causing accidents, lost lives, and disturbances in the traffic system. The logic for realizing this potential is based on the following capabilities having been explored in the project:

- Identifying patterns in data from the traffic system representing hazards.
- Predicting accident risk level.
- Predicting hazardous road conditions such as low friction.
- Preventing accidents through preemptive warnings.

The project further has provided new knowledge, technology, and concepts when it comes to applying AI for predicting events in a traffic system and using collaborative cloud solutions for preventing accidents to occur. By going beyond real-time intervention the project has contributed to the exploration of proactive preemptive measures as a new tool managing mobility in a Smart City.

Volvo Cars Zero Collisions Vision

Volvo Cars sees great potential in the exploration of data analysis and data fusion for the purpose of improving traffic safety. The AI Aware Scale-Up project has shown that it is possible to collaborate with multiple parties for the purpose of fusing data and deriving insights relevant for increased traffic safety. The ever-increasing data made available by the traffic system and the increasing processing capacity both in cloud and on the edge will create new possibilities for further improved traffic safety. Volvo Cars will therefore continue exploring this area even after the end of the project. This work will be an important part of Volvo Cars vision of Zero Accidents.
By exploring different geographies and data governance policies, AI Aware Scale-Up has contributed to the insights, and enabled better predictive algorithms.

Background and Drive Sweden Context

In a series of previous Drive Sweden projects, a cloud-based AD Aware Central Traffic Control (CTC) system have been designed, implemented, and extended in an iterative way. The AD Aware CTC system follows a loosely coupled systems-of-systems design and has proved to be a very efficient and easy to extend platform to test, evaluate, and demonstrate methods for sharing traffic-related information among different organizations. In the previous AI Aware project, the AD Aware CTC system was further improved by adding an AI-driven predictive awareness module to the system.

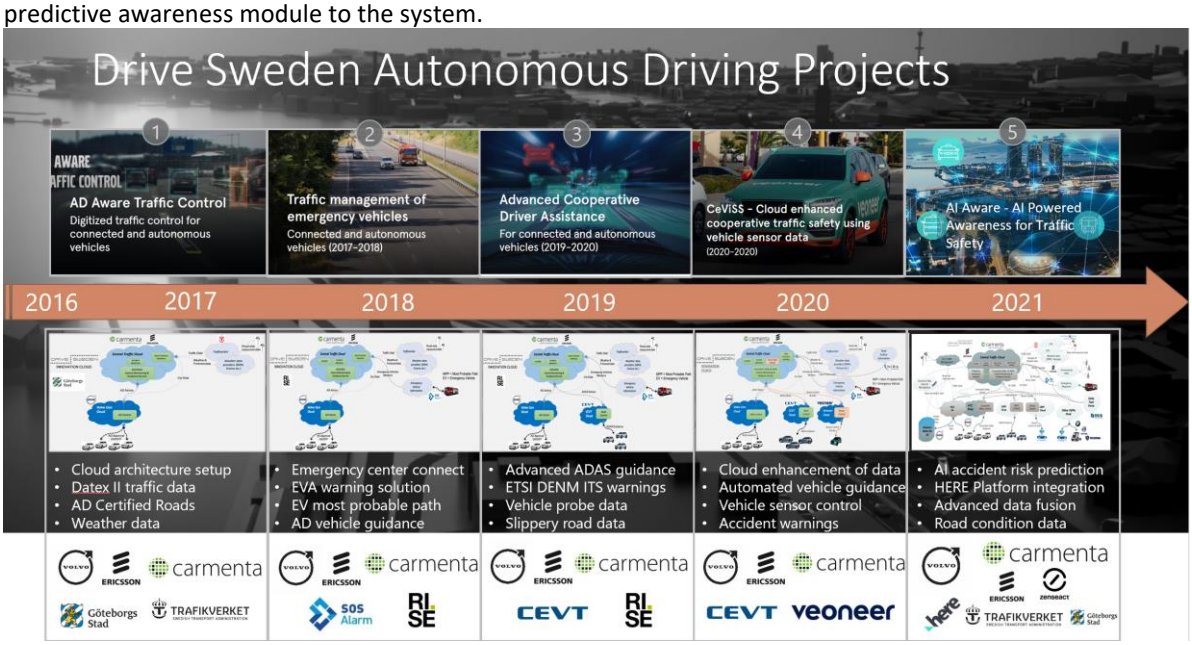

Figure 1. Overview showing the series of AD Aware and AI Aware Drive Sweden Projects.

To set the current project into the AD Aware and AI Aware context, a short summaries of the previous Drive Sweden projects are presented below.

AD Aware Traffic Control – Digitized traffic Control for connected and Autonomous Vehicles
The first Drive Sweden project laid the foundation for the AD Aware CTC platform and introduced the concept of using a central control system in the cloud to collect, fuse and send traffic-related data to connected organizations. The project defined the concept "advice" to dispatch customized messages to connected OEM vehicles, specifically to Volvo Cars Autonomous Driving (AD) test vehicles. Important results of the project were:

- Cloud architecture design, implementation, and evaluation
- Using the DATEX II traffic messaging standard and extending it for sending AD Advice
- Testing and verifying the concept of a shared CTC/OEM view of AD Certified Roads
- Added and adapted weather data from online data sources to the AD Advice model

Autonomous Drive Aware Traffic Control – Traffic Management of Emergency Vehicles
The second project focused on situations where emergency vehicles on rescue missions approach vehicles driving in AD mode. Real-time mission data from the Swedish 112 center was sent to the AD Aware CTC for analysis resulting in Emergency Vehicle Approaching (EVA) warnings to Volvo Cars AD test cars. Live tests were performed and some of the project results were:

- Emergency centers connect
- EVA warning solution
- Most probable path analysis of rescue vehicle routes for a precise dispatch of AD Advice
- AD vehicle advice to go from AD to manual driving and back

Advanced Cooperative Driver Assistance – For connected and Autonomous Vehicles
In the third project the CTC platform was extended to facilitate OEM to OEM communication over the central cloud. Live tests were done where alerts from one OEM (Volvo Cars) were sent to another (CEVT) and vice versa. A new connection was also added for near real-time road friction data (NIRA Dynamics). Live OEM alerts were then fused with the friction data for sending enhanced Hazardous Location Warnings (HLWs). The project resulted in more CTC platform capabilities, such as:

- Advanced ADAS guidance
- Supporting both DATEX II and ETSI DENM warnings and conversion from one to the other
- Collection and analysis of Vehicle probe data
- Slippery road data from NIRA Dynamics

CeViSS – Cloud-enhanced Cooperative Traffic Safety using Vehicle Sensor Data
In the fourth project functions were added to study and demonstrate how the CTC platform could be used to collect data from vehicle sensors (Veoneer), enhance it in real-time in the central cloud and share it with the two project OEM partners: CEVT and Volvo Cars. Tests were also done where the CTC had direct control of the vehicle on-board cameras to record live video when arriving to an accident scene. This could give 112 operators and first responders a better understanding of the accident before arriving to the scene. Some project results were:

- Cloud enhancement of vehicle sensor data
- Remote (cloud) control of the vehicle sensor platform (e.g., turn on/off sensor video)
- Accident location warnings
- Automated vehicle guidance

The Central Traffic Cloud (CTC) is designed to serve any number of OEM clouds with connected AD and ADAS vehicles by aggregating data of interest, including information about traffic, weather, and ongoing rescue missions. The CTC's central function is to monitor the overall traffic situation, and with automation support, trigger alerts to the OEM clouds if there are hazardous events detected in the road network.

The CTC implements a Publish/subscribe and Request/response mechanism for data exchange based on messaging following the DATEX II and/or ETSI DENM standards. The figure below gives an overview the system setup including the additions from the current project such as the Volvo Cars/Zenseact AI cloud, the HERE Platform, and the Drive Sweden Innovation Cloud.

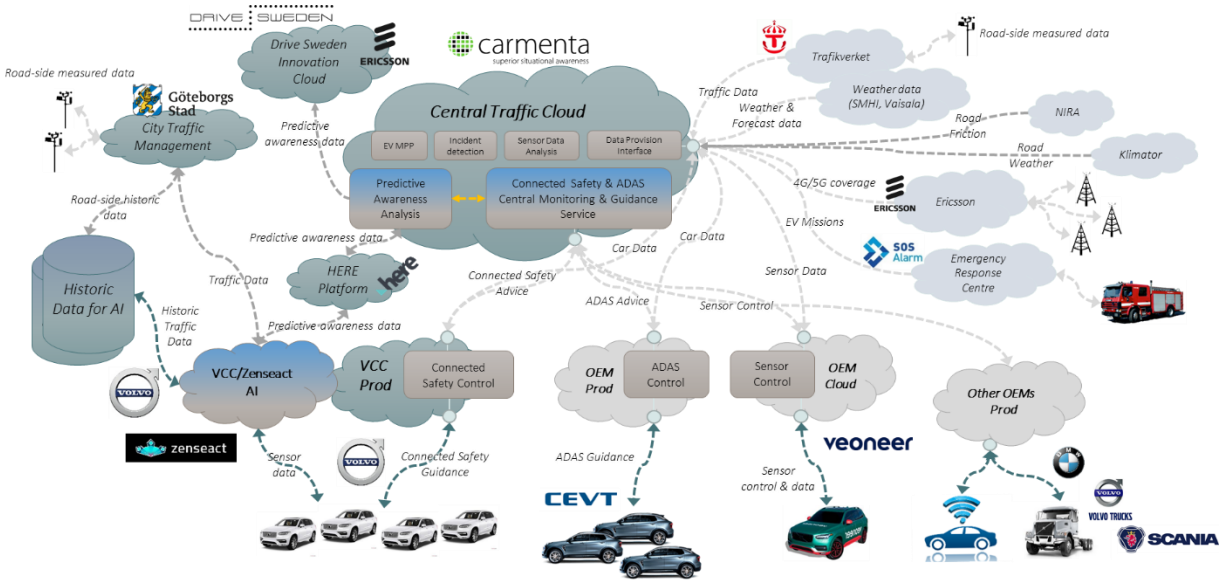

Figure 2. AD Aware project series collaboration overview with Carmenta TrafficWatch and additions as the VCC/Zenseact cloud, HERE Platform and the Drive Sweden Innovation Cloud.

AI Aware - AI Powered Awareness for Increased Traffic Safety

With the AI Aware project, the partners explored how multiple traffic- and road-related datasets can be analyzed using AI algorithms to identify roads with an elevated accident risk. Massive real-time data streams as well as large historic datasets were evaluated by the project and then used to feed the AI algorithm. The ability to turn huge, but currently under-utilized, datasets into specific and quantified accident risk predictions may be used for proactive traffic management that ultimately could prevent accidents from occurring. This would be a huge gain in the efforts to create a safer traffic system and the project has laid the foundation for this.

The focus during the project has been on identifying different types of hazards that could cause accidents and disturbances.

- By collaborating between traffic authorities, traffic management providers, map and location data providers and OEMs an increased level of predictive awareness has been reached.
- By aiming beyond real-time the project has started the exploration of predictive safety.

The AI Aware Predictive Awareness Solution

The risk for a particular driver to be in an accident is not evenly distributed in time and space. Rather, it depends on covariates such as friction, traffic flow, speed limits, curvature, precipitation, temperature, wind speed, wind direction, etc. Certain situations, where a combination of risk factors is present, are dramatically more prone to accidents than others. For practical purposes it is not a feasible solution to encourage drivers to lower their driving speed uniformly, at all times, as this will be simply too inefficient as an intervention tool. The reason is both that drivers won't comply, but also that the perceived "cost" in terms of time to complete a route exceeds the gain in lowered accident risk. To this end, there is a need to maximize the effect of the intervention in terms of accident risks, while keeping the perceived "cost" of the intervention acceptable. More specifically, we want to be able to find the optimal travel velocities which minimize the accident risk for a route, given constraints such as total travel time.

As part of the AI Aware project, Zenseact has developed a system for estimating the intensity (in a Poisson sense) for traffic accidents, given various covariates such as friction, traffic flow, speed limits, curvature, precipitation, temperature, wind speed, wind direction, etc. This means that we can, for a particular car in a particular position at a particular time, estimate that car's risk of being in an accident along its present route. As an extension to this problem, and based on its output, we have developed a technology which minimizes route accident risks based on these estimated accident intensities. This means that we can calculate the travel velocities throughout a particular route which minimizes the accident risk for that same route, given

constraints such as total travel time. It is also possible to directly quantify the effect on the total accident risk of altering constraints, such as changing the required total travel time or imposing different speed limits than the present ones. The technology is based on analytically tractable and well understood mathematics as opposed to “black box” technology. This makes it particularly suitable for safety critical systems such as the present one, which aims at minimizing accident risk.

Based on this technology, we in AI Aware Scale-Up have developed software which both minimizes accident risks per route, but also could offer assistance to the driver or AD to choose which route to take. Further, it can help decide when to engage an AD/ADAS system, as the safety and behavior of such systems will invariably depend on the circumstances as represented by the particular covariates our accident risk system monitors and analyzes. The advantage with this solution from a practical perspective is that the car can then potentially warn the driver about particularly dangerous situations and sites in advance, before the driver comes there, lowering accident risk significantly at an almost negligible cost in travel time.

There are to the best of our knowledge no previous solutions to the present problem. The reason is probably that the recent surge in AI technology and Data Science has made data, technology, and models available that previously weren’t. This has had the effect that building a system such as AI Aware may not have been feasible ten years ago.

The project cloud data ecosystem and data exchange

The Volvo Cars Predictive Awareness AI

Volvo Cars together with Zenseact have created a data fusion platform which consumes different real time data streams from the traffic system, applies an algorithm for accident intensity evaluation and provides a continuous evaluation of risk level for all monitored road segments. Input data streams among other are predicted road friction, actual measured road friction (when available), weather forecast, traffic flow, hazard warnings and road attributes. Data is consumed through the Here Platform and integrated with the VCC cloud.

A lot of time and effort has been spent on establishing knowledge of what data is available, what data is relevant, getting legal and technical access to data, and to transform different data sources to compatible and useful formats. Due to the explorative research nature of the project a trial-and-error approach has been applied. Architectural and technical rework has been needed to accommodate new datasets and new formats. The quantity and frequency of data have forced the project to rework initial technical implementations.

Insights in the form of Accident Risk Alerts (ARAs) and Safe Speed Information are visualized in the Carmenta TrafficWatch UI as a part of the AI Aware platform installed at Volvo Cars. The predictive awareness capabilities have developed more since the previous AI Aware project but are still at an early stage and performance will improve over time with more data flowing through the platform.

Figure 3. Snapshot from the AI Aware film depicting the moment when an ARA reach a Volvo Cars vehicle.

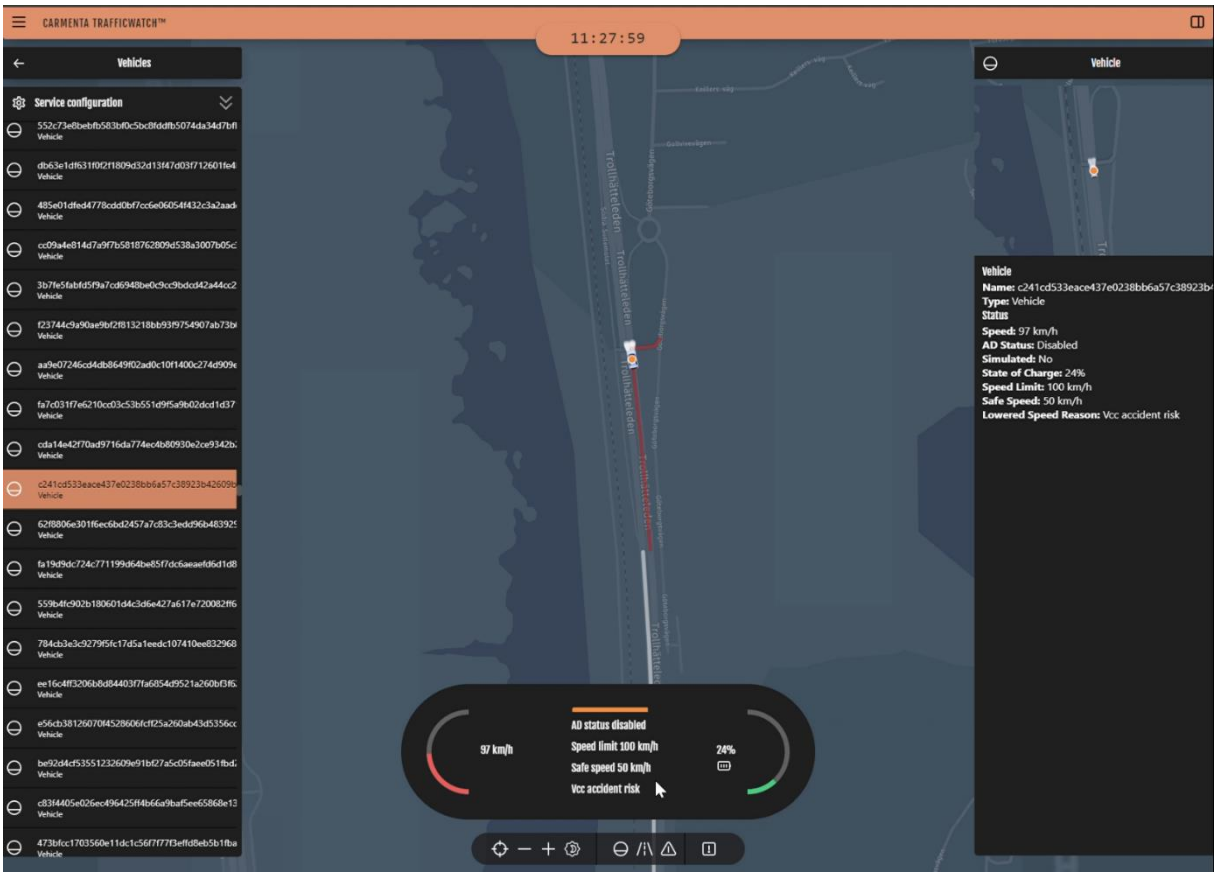

Figure 4 AI generated Accident Risk Alert (ARA) affecting the connected Volvo car.

The conceptual functionality is seen as a success.

Carmenta TrafficWatch™

Carmenta TrafficWatch core functionality is to supervise and control ongoing vehicle operations by collecting and analyzing data about the surrounding environment and traffic situation. It detects upcoming risks and distributes warnings and instructions to connected systems and vehicles that may influence the safety and performance of the vehicles.

In the AI Aware Scale-Up project, Carmenta TrafficWatch executed in the Volvo Cars cloud environment as an automated off-board system collecting situational awareness for the connected Volvo Cars fleet.

By integrating the Carmenta TrafficWatch software product and connecting to vehicle fleet data streams, a user gets access to

- High quality traffic information through standardized C-ITS services.
- Efficient dynamic supervision of operational design domain for L2-L4 functionality.
- A future proof, cost-efficient and data agnostic off-board system for connected and automated vehicle fleet.

Figure 5 Capabilites in Carmenta TrafficWatch used in AI Aware Scale-Up

In the project, Carmenta TrafficWatch have been used for handling Volvo Cars fleet data in US and Sweden together with the data from all external data providers and providing access to and visualizing all the developed services. By utilizing the capabilities of the product, services like the Safe Speed and Smart Energy Predictions have been developed and demonstrated.

Data Provider Ecosystem

Through the project collaboration with data providers has been essential to reach the objectives and getting the successful results. Main data providers outside of the project consortium contributing to the project results are:

- Klimator (https://www.klimator.se/)
- NIRA Dynamics (https://niradynamics.se/)
- HAAS Alert (https://www.haasalert.com/)

Deliverables

AI Aware film

Inspired from the very much appreciated film from the previous AI Aware project, a new refreshed and updated film was produced to demonstrate the up scaling of the AI Accident Risk Alert service and the fact that we deployed the ecosystem in US and showcased traffic safety services like the safe speed service in California. The new film has already been shown at several public events and are published at the Drive Sweden project web page (https://www.drivesweden.net/en/project/ai-aware-scale).

Figure 6 Screenshots from the AI Aware Scale-Up film

The following is a summary of how the project was executed with a description of deliverables per WP.

WP1 – Apply Accident Risk Alert Layer in California

New data sources as well as the data sources used in the previous AI Aware project have been added in California for the AI Accident Risk Alert service, also contributing to the updated AI model in WP3.

The AI Aware platform with Carmenta TrafficWatch has been set up in two mirrored Volvo Cars hosted cloud environments, one for the European data and one for the US data. Using mirrored sites that don't exchange data also secures data privacy.

WP2 – Connect Zenseact Test Fleet

The project has had in depth sessions involving Volvo Cars, Zenseact and the extended project team focusing on the Californian deployment of the Ride Pilot. The tools and datasets that have been explored within the

project have proved to be extremely valuable for future tests and deployment in the Californian context. Involved parties will evaluate the results and continue to work on future projects.

Several project team members have also participated in test driving and data collection activities both in California and in Europe during the project, both contributing to learnings and building knowledge within the traffic safety domain for connected and automated mobility.

WP3 – Explore California data sources for AI based Accident Risk Alert

In this work package the focus has been on identifying and getting access to necessary data sources, like open data from cities and sensor data from connected vehicles as well as weather, traffic, accidents, road works, and emergency vehicle data.
Data contributors in California have been Volvo Cars, HAAS Alert, Klimator, HERE Technologies and NHTSA.

WP4 – Safe Speed Information Service

A recommended safe speed that complements the legal speed has the potential to create a safer traffic environment and effecting both the informed driver and surrounding traffic in a positive way. By combining multiple different speed data points, such as map providers, authorities, sourced data, and traffic sign recognition data from connected vehicles with the dynamic road situational awareness data, a recommended safe speed service has been developed in a first version to demonstrate the possibilities.

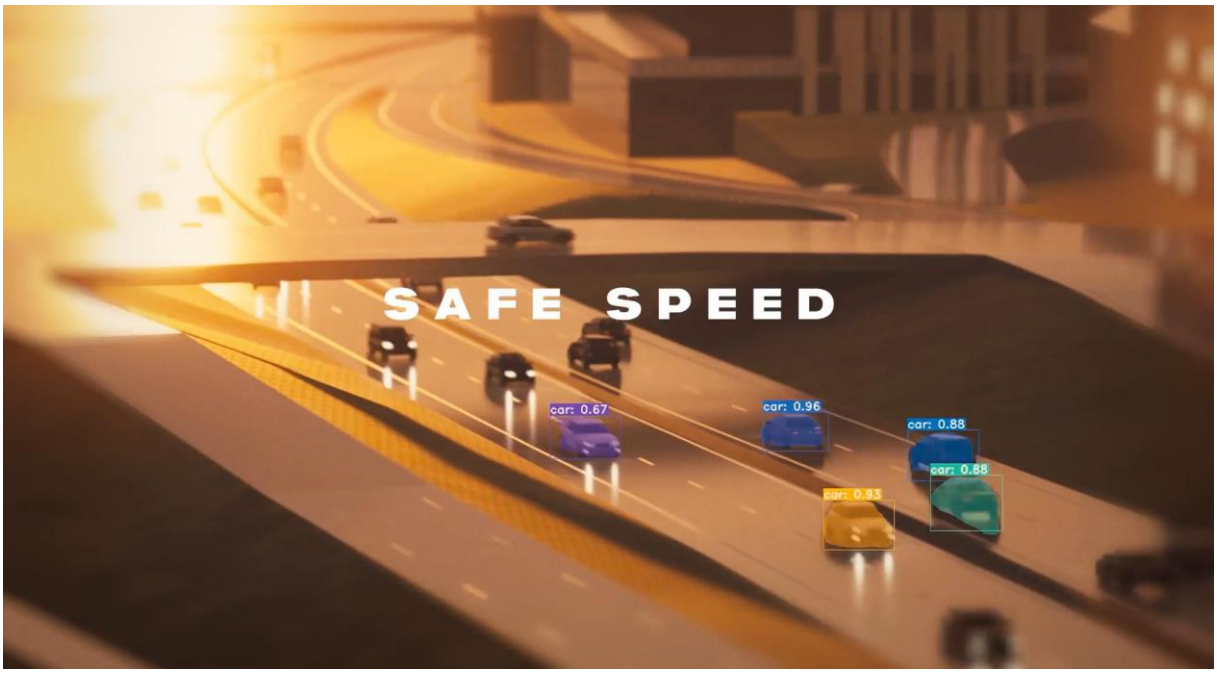

Figure 7 Safe Speed concept visualization from the AI Aware film

The safe speed service has been applied and demonstrated in Sweden and in California, by using the connected Volvo Cars fleet together with a number of different data providers in Carmenta TrafficWatch.

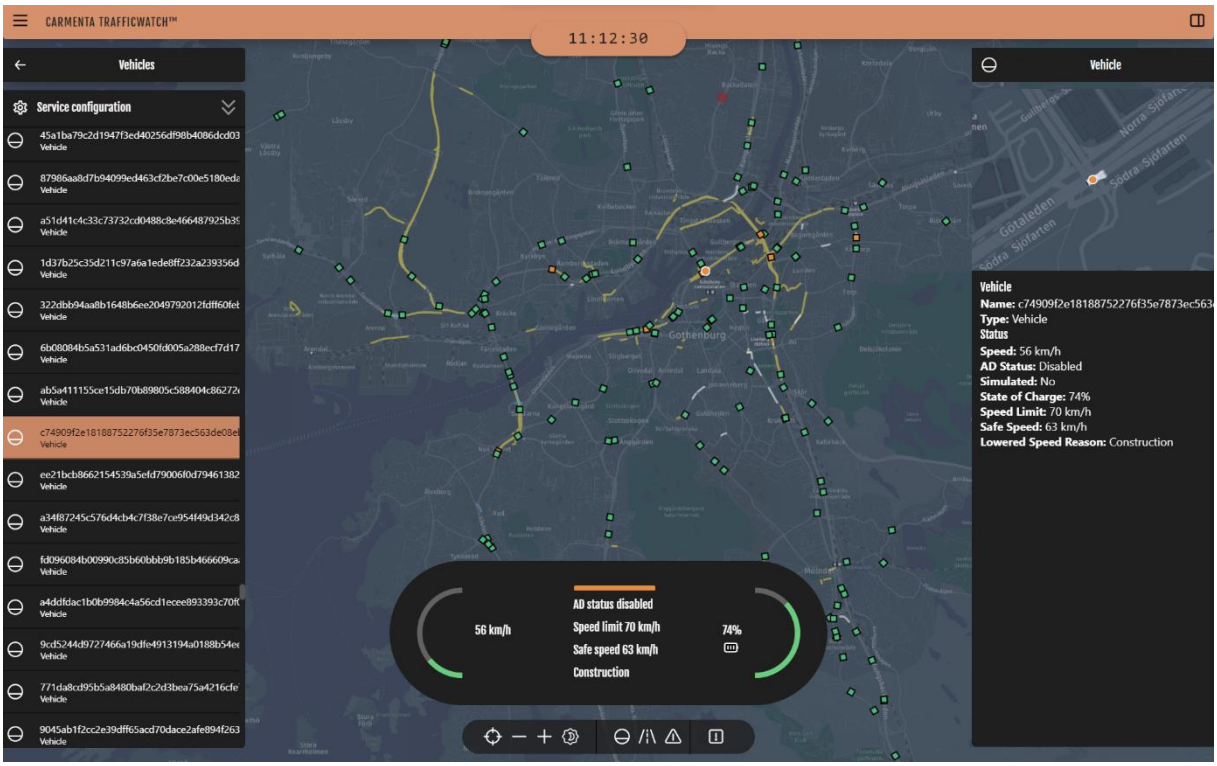

Figure 8 Safe Speed Service applied in Carmenta TrafficWatch for Swedish context.

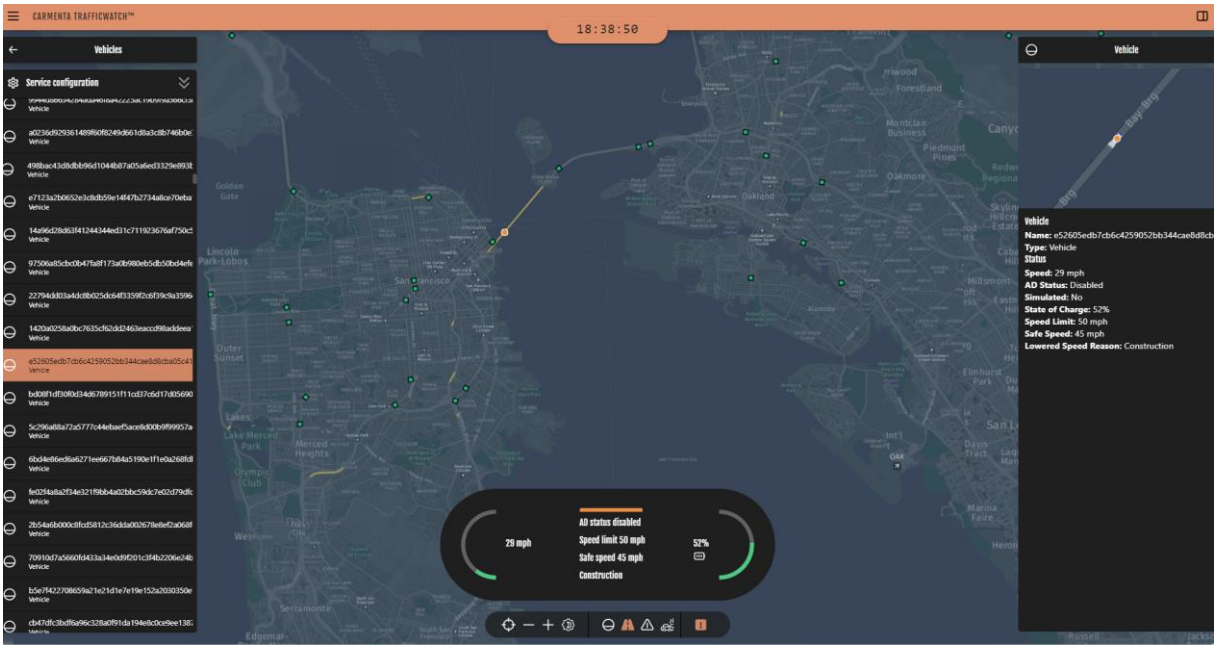

Figure 9 Safe Speed Service applied in Carmenta TrafficWatch for California.

The safe speed layer can be used to identify anomalies and improve quality of speed information which is highly relevant for ongoing development of intelligent speed adaptation services.

WP5 – Smart Energy Predictions

In the project, the connected Volvo Cars fleets from USA and Sweden was used to simulate an energy prediction for both demand and supply at a system level. This has the potential to contribute to a smarter use of the energy grid and can showcase how traffic safety and sustainability will both benefit from the connected data ecosystem.

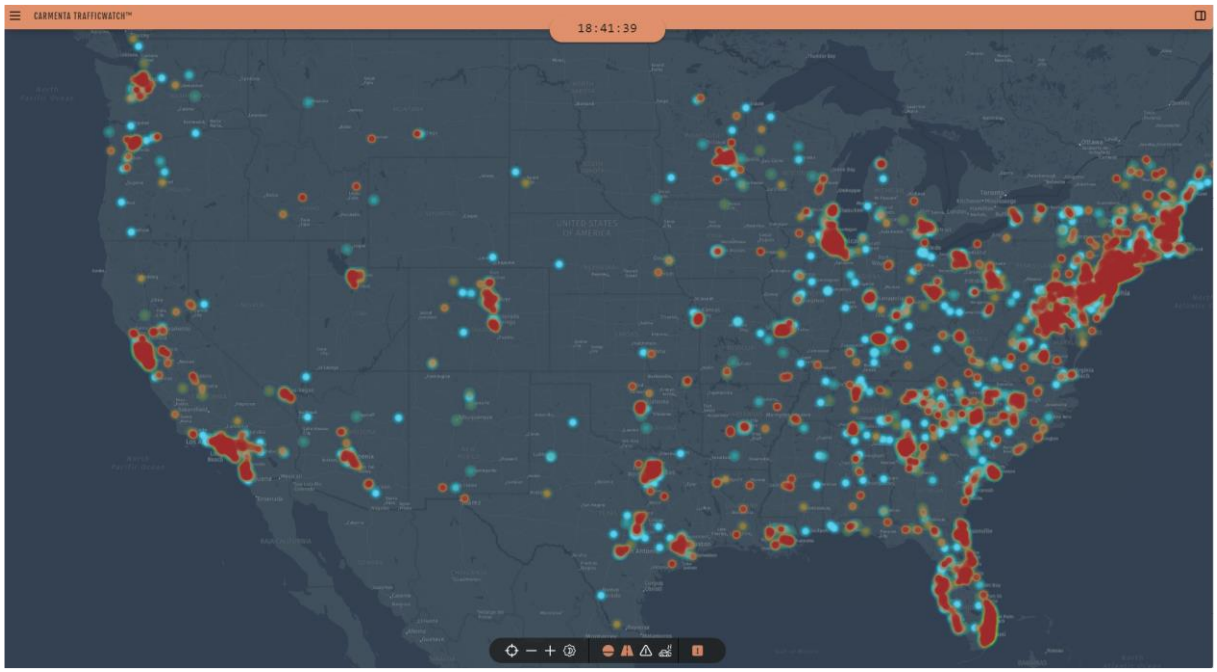

Figure 10 Energy supply demand heat map derived from VCC fleet in USA.

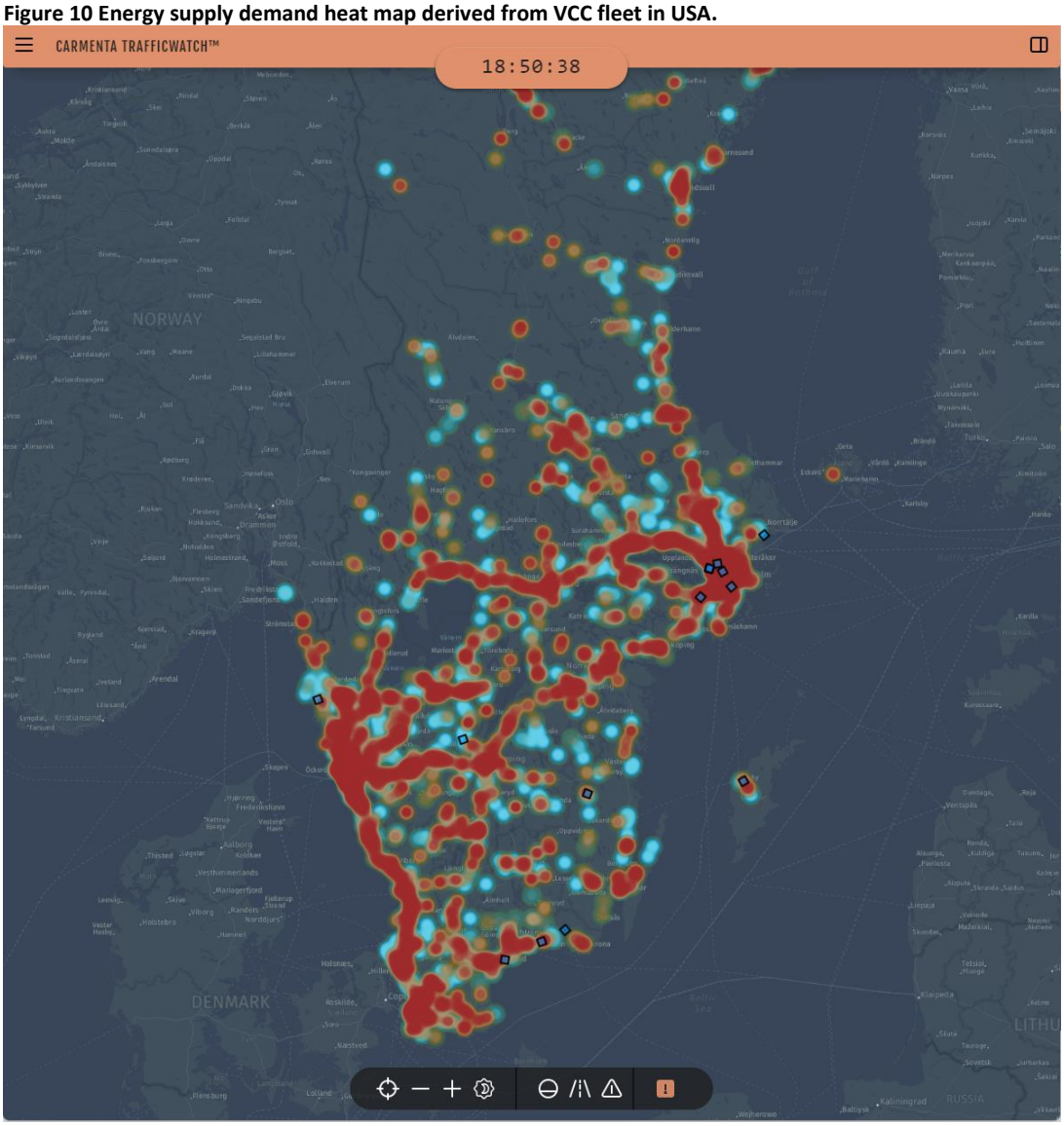

Figure 11 Energy supply demand heat map derived from VCC fleet in Sweden.

WP6 – Collaboration Sweden/California

The project has supported the international collaboration between Sweden and California by participating in various events and presenting the project findings. A few examples are joint panel participation in California with Waymo, online workshops with UC Davis and UC Berkley, as well as with multiple Californian transport agencies.

Together with HAAS Alert in US the project explored and investigated emergency vehicle data for traffic safety in the AI Aware platform. HAAS Alert also contributed with a live data feed for US that has been used during the project. With Oregon Department of Transportation (ODoT), the project engaged in discussions about the connected vehicle data ecosystem, to be launched by ODoT. This has the potential for further collaboration and expansion to more areas in US.

Multiple new dialogues related to smart mobility have been initiated with US companies and start-ups. Those discussions are active and will continue after the project.

WP7 – Policy investigation

This work package investigated differences and similarities in the regulatory environment between the two geographies Sweden and California with a focus on:

- challenges and opportunities from a policy perspective regarding access to data for vehicle-related AI
- how rules and policies in Sweden/Europe vs California/U.S. affect issues of data access, data sharing and data protection.

As part of this work package a virtual workshop was organized as a collaborative event with experts and stakeholders from Sweden and California to discuss the regulatory landscape in the two geographies. The workshop participants explored challenges and opportunities and shared their perspectives and experiences on key concerns and potential solutions in relation to policy and regulatory issues in the field of automotive AI, and in particular issues related to data access, data sharing and privacy.

The event was tailored for a smaller, selected group of professionals and experts in the field, with a specific focus on OEMs, academia and research institutes, and traffic authorities. This allowed the group to discuss current and emerging regulations and their implications for the automotive industry and new innovations, the role of research and academia in shaping policies, and insights from traffic authorities on e.g. how AI can be integrated into traffic management, etc.

The workshop was conducted in two stages. Initially, a preparatory workshop was held with selected participants to set the agenda, discuss contents, and identify additional participants for the subsequent workshop. In the second stage, we delved into the relevant issues in a comprehensive three-hour workshop. The AI Aware Scale Up project was presented briefly to set a context for the discussions during the workshop.

The topics we discussed at the workshop were:

- Definitions of AI (affects what is an AI system and thus which rules/requirements apply)
- Rules and policies in Sweden/Europe vs. California/U.S. regarding vehicle-related AI and data access, data sharing, and privacy-related issues
- Pros and cons of the regulations (or lack of regulations)
- Different actors' pros and cons of sharing data with each other
- Effects (positive and negative) in society of using vehicle-related AI and of actors sharing data
- Standards and interoperability issues

In the project, we have learned a lot about challenges and opportunities from a policy perspective regarding access to data for automotive AI, and the differences and similarities between Sweden/Europe and California/U.S. Nevertheless, future work will be needed to go deeper into these issues. Such issues could be addressed, for example, in future policy lab projects.

This work package also participated in a panel discussion at the Future Network Car Symposium (Session Two – "Artificial Intelligence Applied to Vehicle Safety, Services and Transport Management – Current Status and Future Directions") on 14 March 2023. Among other things, different policy issues related to automotive AI was discussed in the panel.

WP8 – Evaluation & Demo

The "AI Aware Scale-Up" project was presented and demonstrated at various events, showcasing its innovative approach and findings. Key events included the Bifrost San Francisco presentation in March 2023, the Collaboration Workshop at Volvo Cars Sunnyvale, and the Graph Summit in Stockholm. Additionally, the project was featured at the ITS America Texas event in May 2023, along with demonstrations at ITS Europe Lisbon, the AD and ADAS Conference in Santa Clara, and the Drive Sweden Forum in Gothenburg. These events provided platforms for sharing the project's achievements and insights with a wider audience.

In addition the project with its predecessors has been summarized in an article at the Drive Sweden web page: https://www.drivesweden.net/en/news/predictive-traffic-safety-ai-aware-accelerates-us

Full list of panel participations, presentations, and demonstrations during 2023:

Date	Event	Location
March	**Bifrost Presentation and Panel**	**San Francisco**
March	**Volvo Cars Collaboration Workshop and Presentation**	**Sunnyvale**
March (Online)	**UN Conference - Future Networked Car Symposium Panel and Presentation**	**Online**
March	**Graph Summit Presentation**	**Stockholm**
May	**ITS America Panel and Presentation**	**Texas**
May	**ITS Europe Demonstration**	**Lisbon**
July	**VTM Conference Demonstration**	**Detroit**
September	**AD and ADAS Conference Demonstration**	**Santa Clara**
September	**Drive Sweden Forum Demonstration**	**Gothenburg**
September	**Lindholmen Open Day Presentation**	
October	**Seminar "Motorförsäkringsföreningen" Presentation**	**Stockholm**
October	**UC Davis 3 Revolutions Workshop Panel and Presentation**	**Sacramento**
October	**Mobility Summit Presentation and Demonstration**	**Gothenburg**
November	**Drive Sweden Final Project Conference Presentation and Demonstration**	**Gothenburg**

Additional planned future presentations and events:
Presentation (accepted): VTM Conference, Turin, Italy, March 2024
Presentation (planned) : TRA, Dublin, Ireland, April 2024

Results and Findings

Conclusions

- Volvo Cars sees great potential in this project and will pursue the work with gathering, fusing, and analyzing more data. The goal is that the concepts explored in the AI Aware project will lead to increased traffic safety and eventually Zero Accidents. An anticipated additional effect is better traffic flow in general which will have positive effects for both personal health, the economy, and the environment.
- The AD Aware and AI Aware system developed and refined through a series of Drive Sweden project proved again to be a very efficient technical framework to share data between different types of organizations.
- The general understanding from the project parties is that timing is right for applying the potential and results from this project to unsupervised driving features.
- The project has shown the importance of the availability of high precision data sets. Thanks to the geographical expansion from the previous projects, new data sets have been explored showing the importance of, for example accident data sets used for the predictive accident awareness.
- The results from the Smart Energy and Safe Speed work packages were visualized in the same Carmenta TrafficWatch UI together with the Volvo Cars fleet data and became an eye opener for showcasing synergies can be made between sustainability and safety related use cases.

Findings

Data Governance and Policies

- RISE and partners arranged a virtual workshop (including a preparatory workshop) with participants from Sweden and California to discuss rules and policies around vehicle-related AI and data access in Swedish and Californian contexts. Through this we gained a deeper understanding of existing frameworks and regulations. This also ensured a two-way exchange of knowledge on these matters between experts and stakeholders from the two locations.
- We learned that the regulatory environment in this field differs between the two geographies. An important difference we found was that California/U.S. has much looser regulations compared to Sweden/Europe. Anyway, this was not unexpected because we have fundamentally different legal systems. The different approaches and rules (or lack of rules) affect access to data for AI applications in several ways. But both in California/U.S. and Sweden/Europe data sharing is often based on either legal requirements or economic incentives, and not (solely) for the benefit of society.
- Future work is needed to go deeper into these issues, for example in future policy lab projects.

AI modeling and cloud environment

- Exploring new geographies is important since this assures exposure to new data sets which have the potential to enable better model development.
- Less restrictive access to data from Swedish agencies could enable better traffic safety model development for Swedish traffic conditions.
- When setting up a cloud environment with traffic system data multiple use cases can be applied spanning from safety to sustainability. This was showcased in the project by addressing both the Safe Speed and Smart Energy Prediction use cases.

Future Work

Discussions are ongoing for future project collaborations and/or internal functional deployments.

The project parties will consolidate the findings from the AI Aware project and continue the exploration and let systems and algorithms feed on more data. Possibly a follow-up project will be launched.