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Autonomous Driving Traffic Control project

Dubai World Congress for Self-driving Transport
2019-10-16

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Carmenta – 30 years of innovation and industry track-record

/ Founded in Sweden in 1985

/ 115 employees

/ Software Product company

/ Develops situational awareness technology and products since 1995.

/ Offices: Sweden, France, Germany and Spain

/ Three business areas:

- Geospatial Technology
- Automotive
- Public Safety

Situational Awareness

- What
  - Situational Awareness is the possibility to understand the surrounding environment in a way that allow you to act and see the effects of your actions
- How
  - Situational Awareness is accomplished by fusing data into a Common Operational Picture (COP)
  - With the COP you can decide how to act in the best possible way for your mission
  - You will base that decision on all available data and processed information
- Result
  - You have created a operational advantage that will support you to do the correct actions.
  - Avoid situations outside the Operational Design Domain
  - Situational Awareness gives you the means to create safety and efficiency - building **trust** in the system

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Information Classification: General


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Carmenta TrafficWatch™
Powerful Situational Awareness for Connected and Autonomous Vehicles

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Situational Awareness Data
Terrain models
Traffic flow
Road works
Traffic hazards
Road network
Weather
Roadside equipment data
Mobile cell information
Vehicle performance data
Vehicle manufacturer 1..n
Vehicle sensor generation 1..n
Vehicle sensor data
Maps: HERE, TomTom, Google…
Emergency vehicle information

Carmenta TrafficWatch™

- Compiles Common Operational Picture
- Supervise traffic & surrounding situation
- Combines Situational Awareness with rule base
- Dispatch advice - instructions
- Store results

Sensor data & status

Decision support - Driving instruction –
Vehicle behaviour - Advice

Autonomous Driving Aware Traffic Control

A series of Drive Sweden projects; www.drivesweden.net

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What are the “Autonomous Driving Aware” projects all about?

- First AD Aware Traffic Control project was launched in 2016
- Concept in the Drive Sweden Innovation Cloud to investigate and test central traffic control supporting Connected and Automated Vehicles
- Combines traffic information with connected vehicles sensor data to create automatic guidance for connected and automated vehicles

Information Classification: General

DRIVE SWEDEN

A cross-functional collaboration platform to drive the development towards sustainable mobility solutions for people and goods.

Together, we develop and demonstrate connected, automated and shared transport system solutions.

With support from

VINNOVA

Swedish Energy Agency

FORMAS

Strategic innovation programmes

Drive Sweden Members

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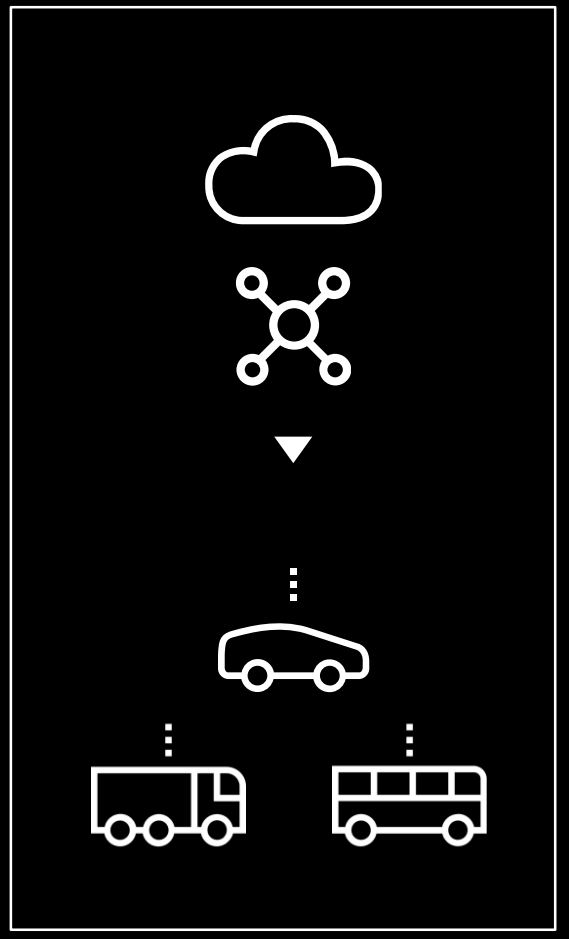
Drive Sweden Innovation Cloud

Drive Sweden Innovation Cloud enables Drive Sweden partners to jointly develop and demonstrate new services within Automated Mobility.

Key functionality

— Sharing of data to build a connected ecosystem
— Billing services engine
— Live Visualization of data, traffic and KPIs
— Advanced functionality including geofencing, rule engine, connectivity management and AI support
— Easy onboarding of partners



Drive Sweden Innovation Cloud

DRIVE SWEDEN

Partner Services using Innovation Cloud

- Test Site Stockholm
- LIMA Gothenburg
- AD Aware
- ASTA Zero
- Connected Automated Truck

Connected Infrastructure

Infra-structure APIs

Connectivity Management

Analytics | Connected Automation | AI

Connected Aut Fleets | Connected Infra | MaaS support | Other services

Connected Services

Digital Twin

Cloud Infrastructure

Vehicle and Fleet APIs

Partner onboarding

Connected (4G, 5G)

Cooperative (V2X)

Connected vehicles

Connected Automated Fleets

Automated Mobility Services

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Research Partners
"Autonomous Driving Aware" projects

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ERICSSON

VOLVO

CEVT

Göteborgs Stad

SOS Alarm

TRAFIKVERKET
SWEDISH TRANSPORT ADMINISTRATION

RI. SE

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1. Autonomous Driving Aware Traffic Control

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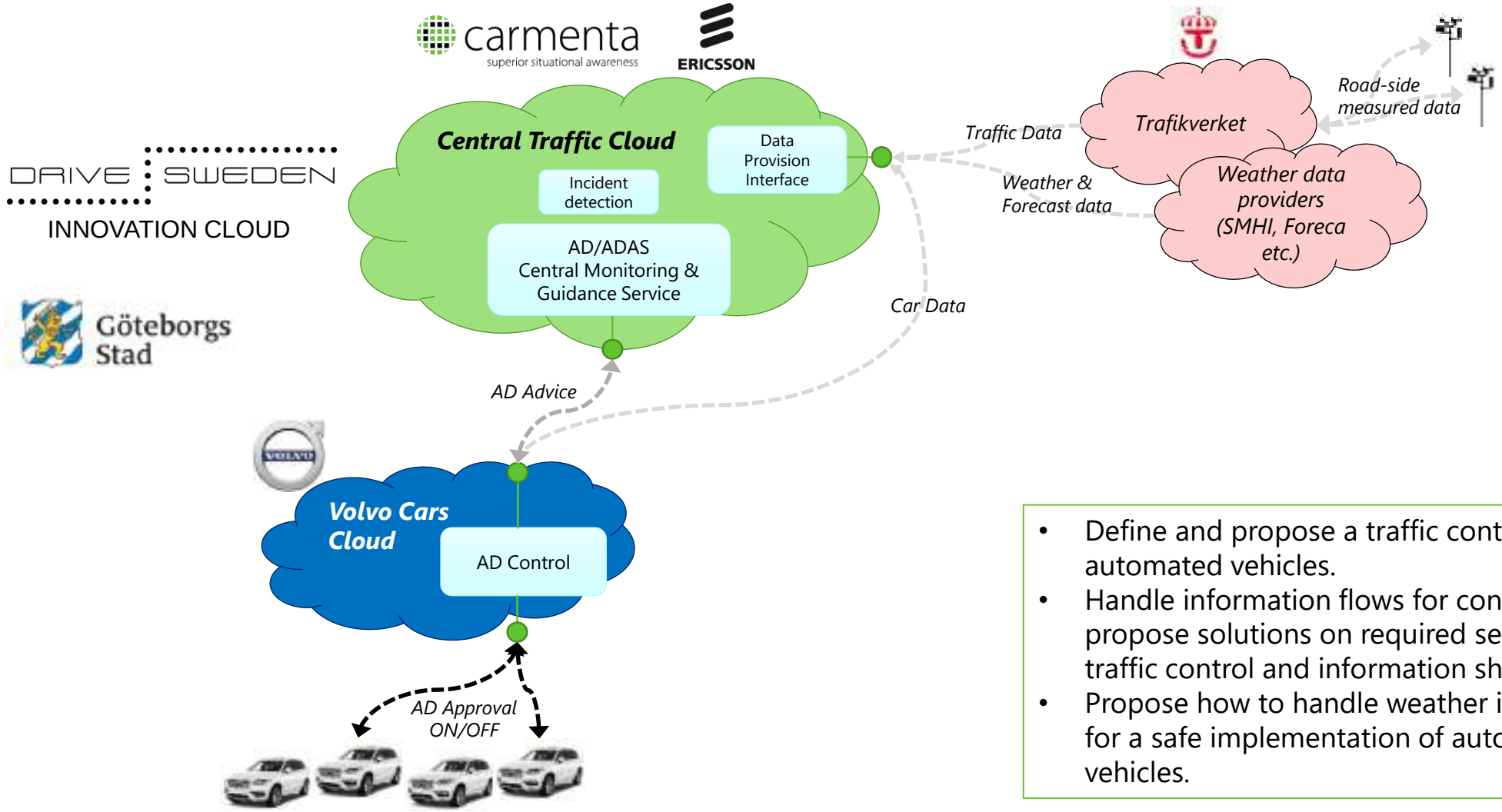

- Define and propose a traffic control cloud for automated vehicles.
- Handle information flows for connected vehicles and propose solutions on required services including traffic control and information sharing.
- Propose how to handle weather information required for a safe implementation of autonomous driving vehicles.

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2. Autonomous Driving Aware Traffic Control – Emergency Vehicle Information

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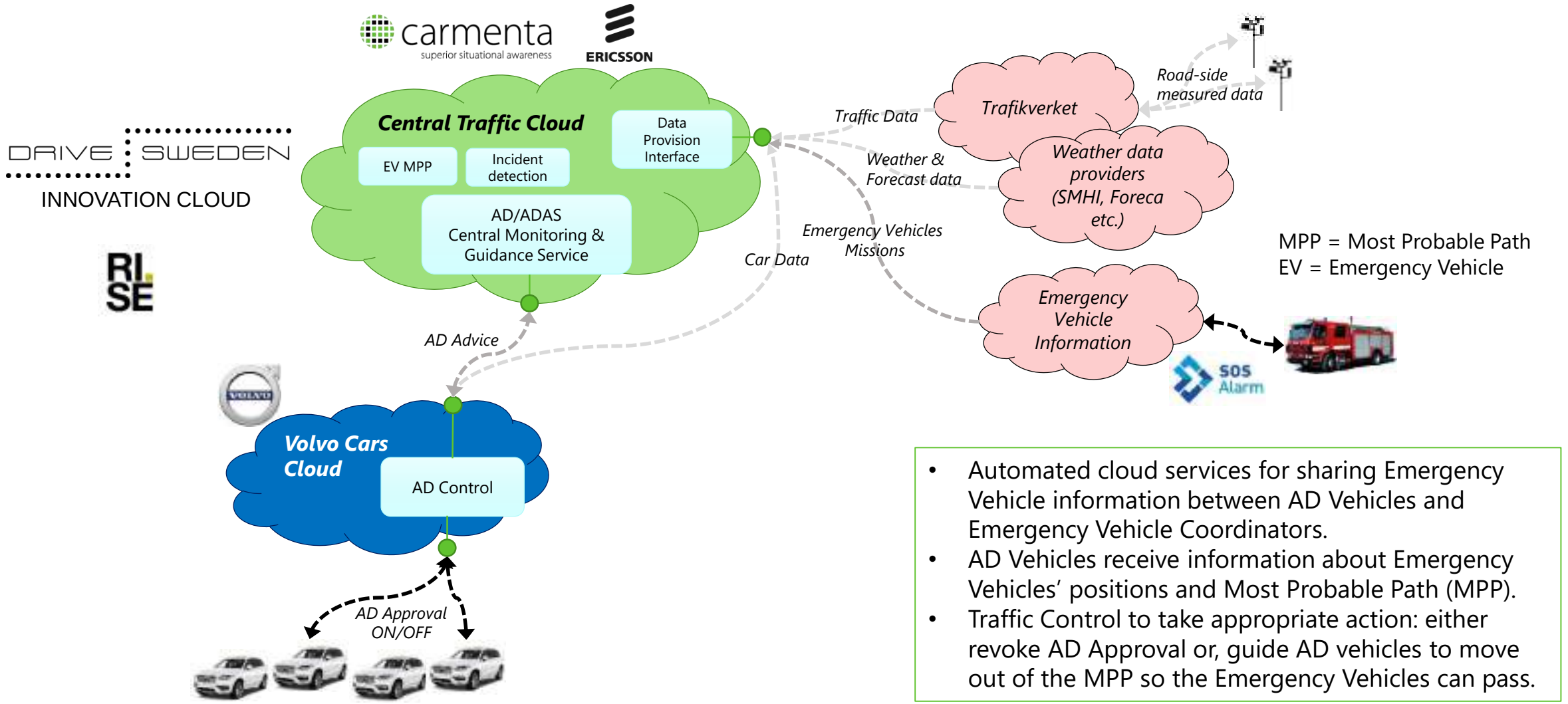

- Automated cloud services for sharing Emergency Vehicle information between AD Vehicles and Emergency Vehicle Coordinators.
- AD Vehicles receive information about Emergency Vehicles' positions and Most Probable Path (MPP).
- Traffic Control to take appropriate action: either revoke AD Approval or, guide AD vehicles to move out of the MPP so the Emergency Vehicles can pass.

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3. Autonomous Driving Aware Traffic Control – Advanced Cooperative Driver Assistance

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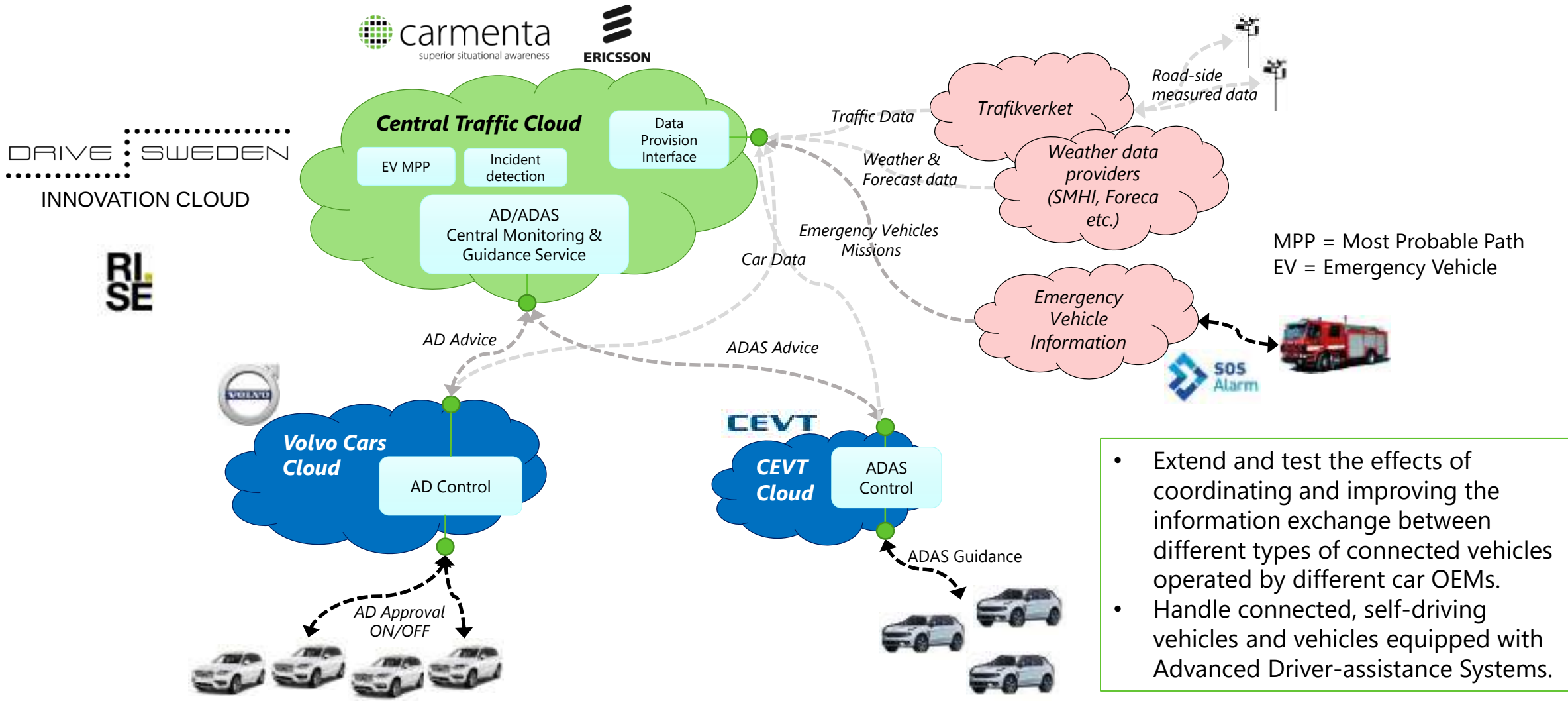

- Extend and test the effects of coordinating and improving the information exchange between different types of connected vehicles operated by different car OEMs.
- Handle connected, self-driving vehicles and vehicles equipped with Advanced Driver-assistance Systems.

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Project findings

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Community/Society

- The CTC creates a Collaborative Situational Awareness that is beneficial for all connected stakeholders
- Points out the way to evolve traffic management by aggregating and sharing traffic as well as sensor data from connected vehicles. The situation awareness will reach new levels of detail.

Environmental

- All connected vehicles can contribute with data that enhances the possibility of proactive traffic management that can be used to reduce congestion.

Business

- Enhancing Autonomous fleet efficiency and reliability.
- The CTC could act as a data broker, potentially creating a marketplace for information from autonomous and connected vehicles.

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Project findings

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Organisational

- The responsibility for operating the CTC remains to be further investigated.
- Other organizational issues still to be investigated are relations between the CTC and other commercial integration platforms, relations between the CTC and traffic management systems on regional, national and international levels, etc.
- The CTC is a central node but it must be possible to arrange a “federated network” of CTC´s that can interact and cover adjacent areas (cities or nations) or even the same area (public and private roads).

Technical

- The project has shown that on a technical level it is possible to build a cloud based central traffic control for autonomous and connected vehicles using existing and open standards (i.e. DATEX II, Open Geospatial Consortium (OGC), OpenLR, AMQP).

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Project findings

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Emergency Vehicle Approaching

- Real-time traffic situation monitoring on a central level that includes information about ongoing emergency operations provides:
  - better overall traffic control as well as creating a safer and more efficient operation of connected emergency vehicles.
  - better guidance to avoid conflicts that hamper the execution of emergency missions.
  - the ability to send specific guidance messages about approaching EV´s results in a more proactive guidance of OEM AD vehicle fleets.
  - The sharing of information about emergency vehicles MPP´s and AD vehicle positions among connected entities greatly improve the overall safety and efficiency for both Emergency Response operations and guidance of AD vehicles.
  - The use of standardized formats and services in the cloud-based environment makes it easy for other systems to connect

Information Classification: General

Project report fase 1 & 2

www.drivesweden.net

YouTube

AD Aware Traffic Control Emergency Vehicles

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Thank you!

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