



# NordicWay

## Adverse Weather Warnings

Norwegian Pilot

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Stina Carlsson, Volvo Car Corporation



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# Adverse weather in NordicWay



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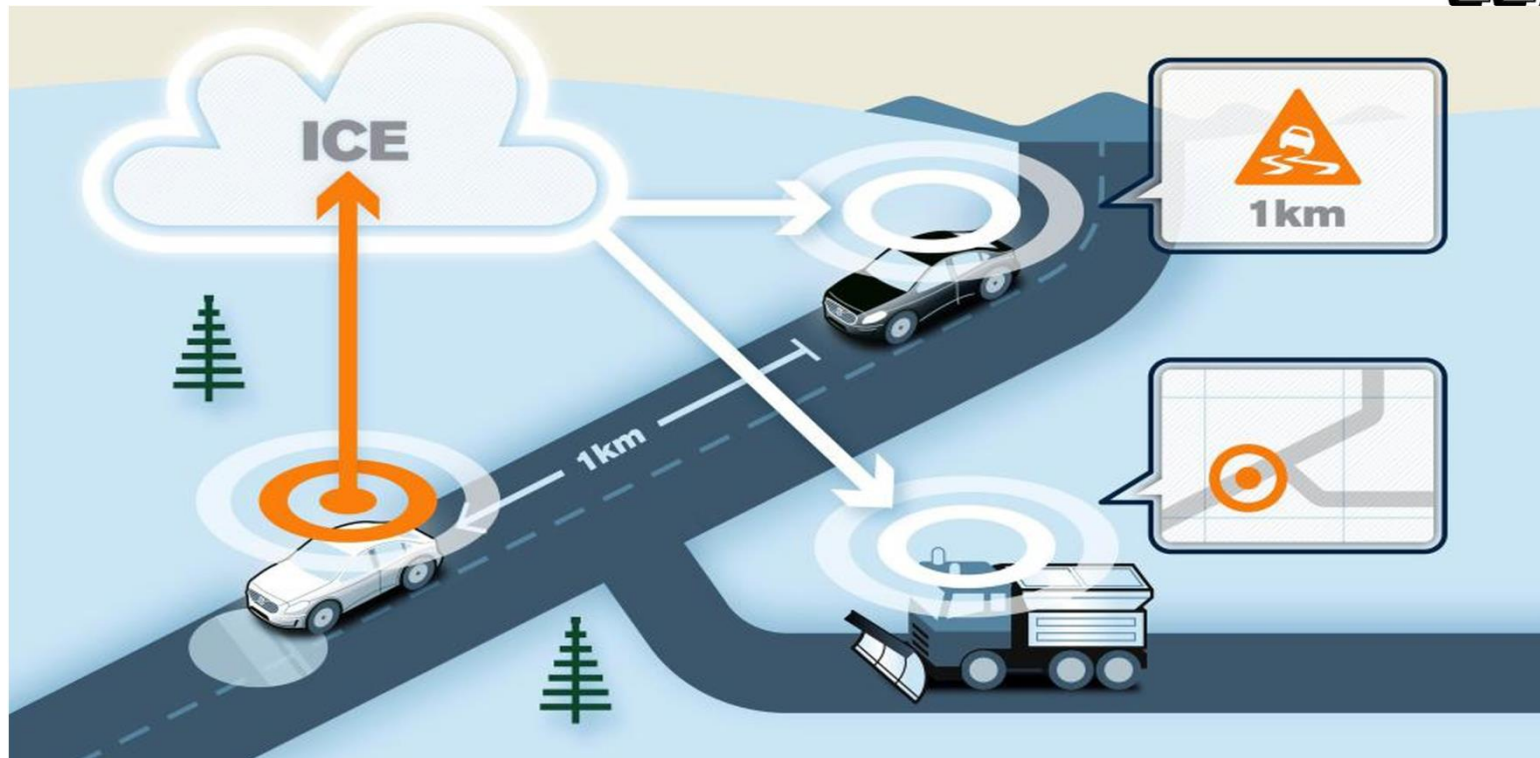
Photo: <https://www.rb.no/e6-er-et-kapittel-for-seg-selv/s/5-43-43155>

21.11.2017

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# Road Status Information



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Illustration: Volvo Car Corporation

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# Testing



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# Testsite Norway



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## Road Status Information - Volvo Cars

- Road Status Information consists of two parts:
  - Algorithms in the vehicle
  - Algorithms in the cloud (anonymization, aggregation and decay)
- Road Status Information can be shared between two parties:
  - By sharing the aggregated status for road segments.



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# Road Friction Estimation (in the car)



## Friction

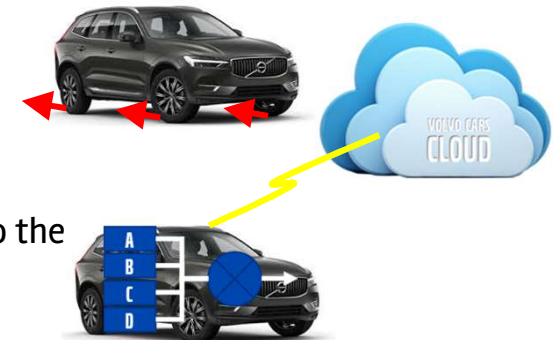
- The friction between the tire and the surface is the only thing keeping the car on the road.
  - Asphalt is generally high friction
  - Snow or ice is typically low friction

## How – Algorithms in the car

- Four separate algorithms are used to estimate the road friction
- The result is fused and if the confidence is high enough the friction value is sent to the cloud.

## When?

- The friction is measured when the car is close to the friction limit.
- This happens naturally when the friction is low – which is most important.
- The car needs to be steered, braked or accelerated in order for the algorithms to work

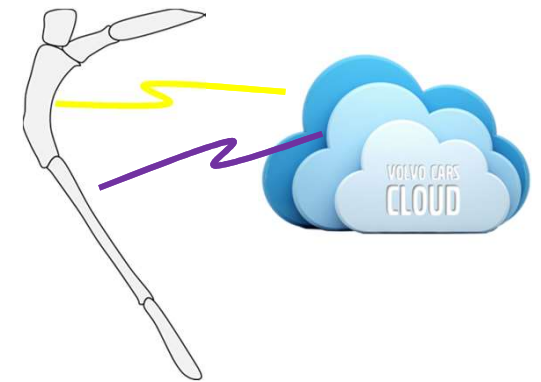


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# Cloud Road Friction (crowd sourced data)

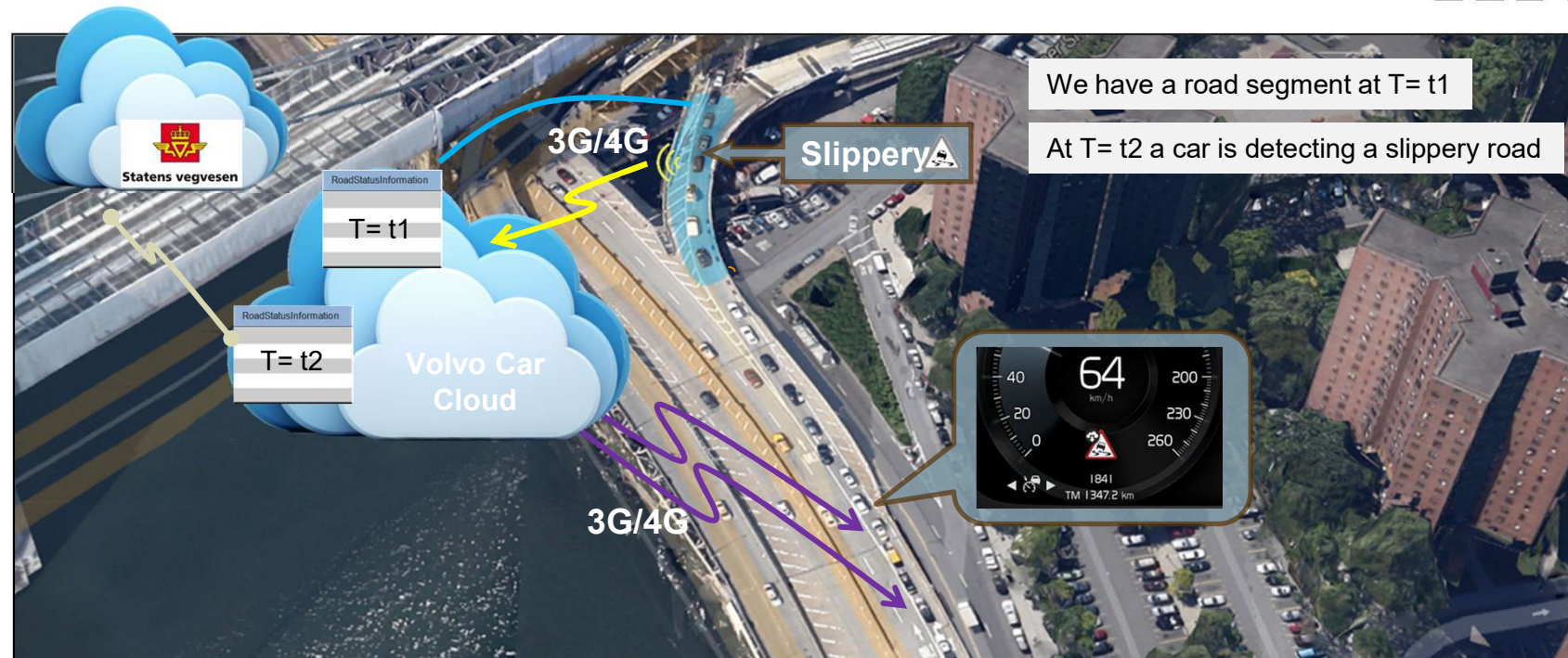


- In the cloud, the friction measurements are aggregated and matched to a road segment.
  - Vehicles uploads all friction measurements, both high and low.
  - If the confidence of the measurement is low, more measurements are required before the algorithm in the cloud confirms a low friction area.
  - If a connected vehicle approaches a road segment with low friction, the cloud sends a slippery road information back.
- With every new information, the algorithm in the cloud updates the status for the road segment:
  - estimated road friction
    - reliability
    - expiry time
- Reliability of the estimated road friction will decay with time, temperature ...





# Road Status Information



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# Example coverage



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# Lasting results

Fra pressemeldingen:

In 2015, Volvo Cars started a collaboration on sharing safety data with the road administration authorities in Sweden and Norway.

Via a cloud based network, all Volvo cars in a certain area share anonymized information about road friction from their anti-skid systems.

**“We think this type of data sharing should be done for free, for the greater good and to the wider benefit of society. It saves lives, time and taxpayer money”**

Håkan Samuelsson,  
President and Chief Executive Volvo Car Group



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VOLVO CAR GROUP

Press Release

Issue Apr 03, 2017 | ID: 207164

**Volvo Cars CEO urges governments and car industry to share safety-related traffic data**

Volvo Cars, the premium car maker, believes governments and car makers should join hands in sharing traffic data in order to improve global traffic safety, Håkan Samuelsson, president and chief executive, told a conference at the European Commission in Brussels on Monday.

Sharing anonymised data related to traffic safety in real time can provide a strong boost to overall traffic safety while safeguarding the privacy of individual road users, Mr Samuelsson said. Volvo started doing exactly this in Sweden and Norway two years ago, in collaboration with local authorities.

“We think this type of data sharing should be done for free, for the greater good and to the wider benefit of society. It saves lives, time and taxpayer money”, Mr. Samuelsson said. “I call on other car makers and governments to work with us on realising this type of data sharing as widely as possible.”



In 2015, Volvo Cars started a collaboration on sharing safety data with the road administration authorities in Sweden and Norway. Via a cloud based network, all Volvo cars in a certain area share anonymized information about road friction from their anti-skid systems. The info is transferred in real time to other Volvo drivers notifying them of icy road conditions. The same information will be shared with road administrations so that they quickly can address icy road conditions.

The same approach is used to warn drivers when another vehicle turns on its hazard lights, which may indicate a potential dangerous situation on the road ahead. These technologies, Slippery Road Alert and Hazard Light Alert are standard on all SPA-based vehicles on sale in Sweden and Norway: the XC90, S90, V90, V90 Cross Country and the new XC60.

Mr. Samuelsson's comments were made at the “1st European Conference on Connected and Automated Driving” in Brussels, where he also underlined the need to put safety first when developing a regulatory framework for autonomous cars. When it comes to autonomous driving, it is important that the user interface is crystal clear about the role of the driver, he noted.

Mr Samuelsson expressed his concern about the so-called Level 3 autonomous driving modes. “In this mode the car is in charge of the driving, yet the driver must still be prepared to take over in case of emergency, which is a matter of a few seconds. Volvo considers this Level 3 driving mode unsafe and will thus skip this level.”

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# Thank you!



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