



## E8/Borealis and the Vehicle as a Sensor

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### E8 Borealis, the challenges



Neither of these are your every day problems in mainland Europe, but they are important for the economic future of Norway! We need to put these problems on the map

## A Norwegian perspective

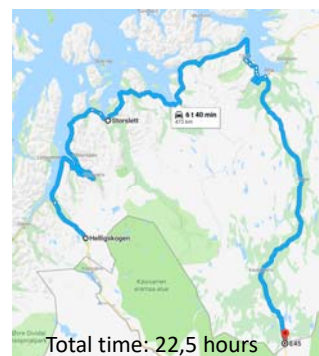
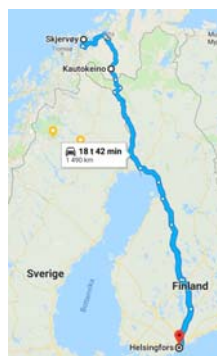
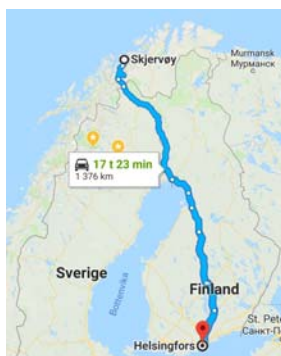


- **We want activity in the rural areas !**
- **We have a thriving fisheries industry**
  - Expected to grow (5x is the most optimistic guesstimate)
  - Main markets are Asia, Europe
  - The factories are seldom on the main routes
- **Most Norwegian roads are low volume**
  - But the value on the roads can be high
- **Most of Norway is rural**
  - Few houses = little infrastructure
  - Powerlines is not equal to having standard power
  - Cellular coverage is an issue
- **High latitudes is a challenge for GNSS**
  - Few satellites in view, low over the horizon
- **The E8 is an export route for fish bound for Asia!**

## What do want to achieve



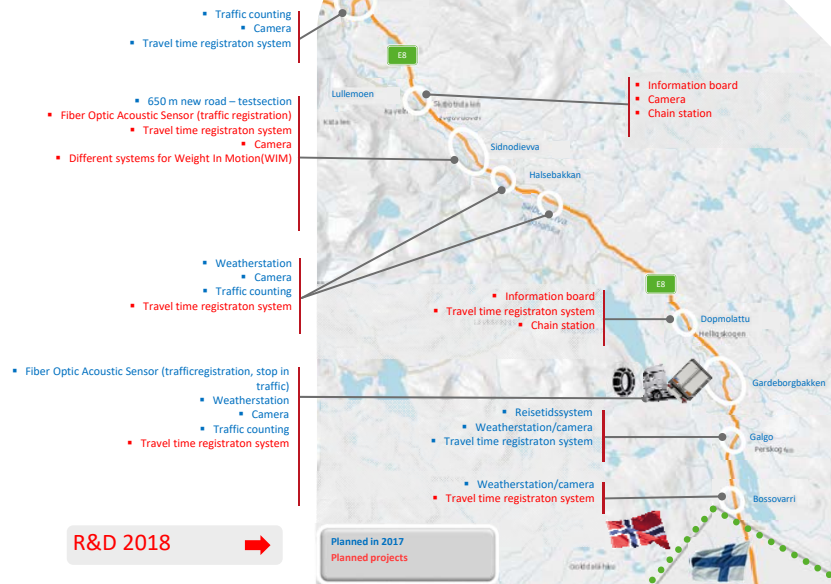
- **More robust road travel**
  - More stabile traveltimes (less variance do to weather)
- **Early warning in case of events**
  - Stop trucks at suitable spots
  - Reroute while there is still a chance
  - Find alternate solutions (leave the fish in the pennis)



Total time: 22,5 hours

The rerouting example!

## The equipment



## Using the vehicles as sensors

- **Fixed sensors have some issues**
  - Area coverage (spot)
  - Need to be on site to fix equipment
  - Costly infrastructure (power and connectivity)
- **Fixed sensors have some positive attributes**
  - Simpler to work with data, one dimension (time)
  - Typically high quality sensors (the infrastructure is the cost)
- **Moveable sensors have some issues**
  - 3 dimensions (time, latitude and longitude)
  - Susceptible to interference
  - Random patterns of movement
- **Moveable sensors have some strengths**
  - Area coverage
  - Cost (can some times be shared)
  - Typically larger number of sensors but lower quality

## Optical friction sensors



- In the E8 Borealis project we have 2 vehicle friction estimation sensors

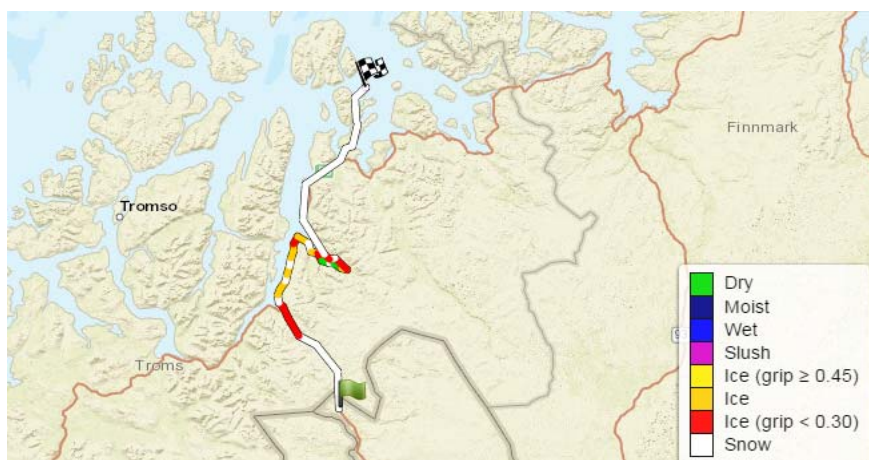


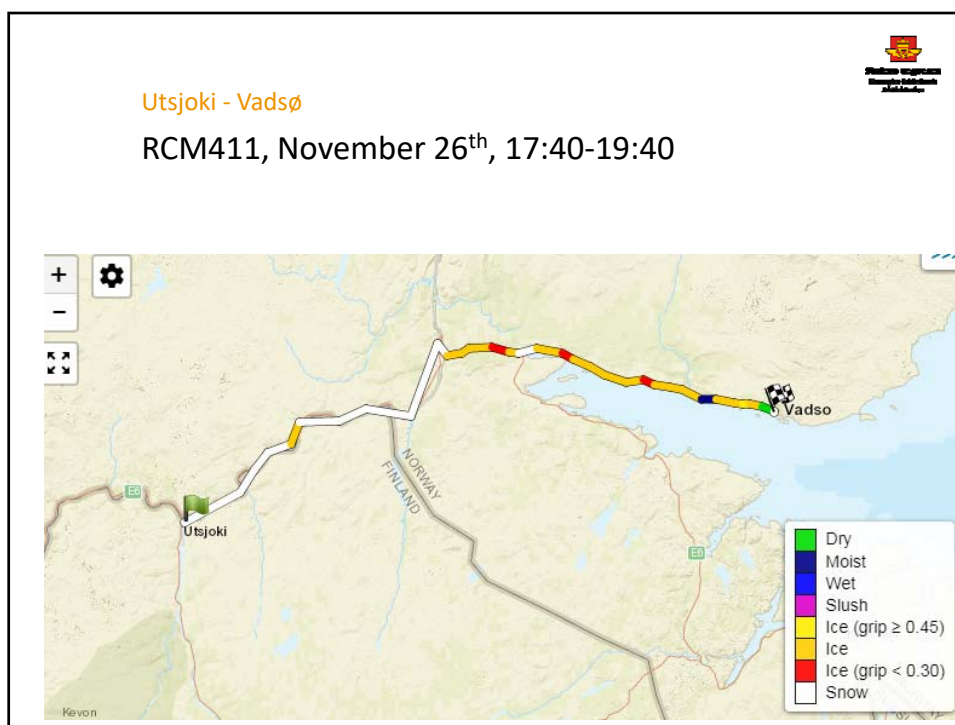
## E8 Borealis – eksempler på sensorer



### To Skjervøy, 26.3.17

- Cooperation with Lerøy Aurora and Pajalanmäen Kyljetus Oy





### Video as a sensor



The increase in computing power has made AI usefull for the masses !



## Object detection in video



**COCO**  
Common Objects in Context

Home People Dataset Tasks Evaluate

info@coco-dataset.org

**News**

• Congratulations to the winners of the ECCV 2018 Joint COCO and Mapillary Recognition Workshop! Please visit the challenge website to view the winners and their talk slides.

**What is COCO?**

COCO is a large-scale object detection, segmentation, and captioning dataset. COCO has several features:

- Object segmentation
- Recognition in context
- Superpixel stuff segmentation
- 330K images (>200K labeled)
- 1.5 million object instances
- 80 object categories
- 91 stuff categories
- 5 captions per image
- 250,000 people with keypoints

**Collaborators**

Tsung-Yi Lin (Google Brain)  
Gereon Rother (MPII, TUM)  
Mehmet H. Reiss (TUM)  
Yi Gao (Cornell Tech)  
Michael Maire (TU Chicago)  
Serge Belongie (Cornell Tech)  
Lubomir Bourdev (Microsoft, Inc.)  
Ross Girshick (FAIR)  
James Hays (Georgia Tech)  
Pietro Perazzi (Columbia)  
Deva Ramanan (CMU)  
Larry Zitnick (FAIR)  
Piotr Dollar (FAIR)

**Sponsors**

CVDF  
Microsoft  
facebook  
Mighty Ai

**Research Paper**

Download the paper that describes the Microsoft COCO dataset.

[Download paper here](#)

**Dataset examples**

There are several actors in the market that offer trained models for object detection.

This power is now in the hands of ordinary developers...

But only a few master the technique of figuring out where the objects are...

## Automated georeferencing of signs



Foto: Tomas Levin, SVV

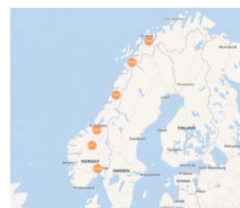
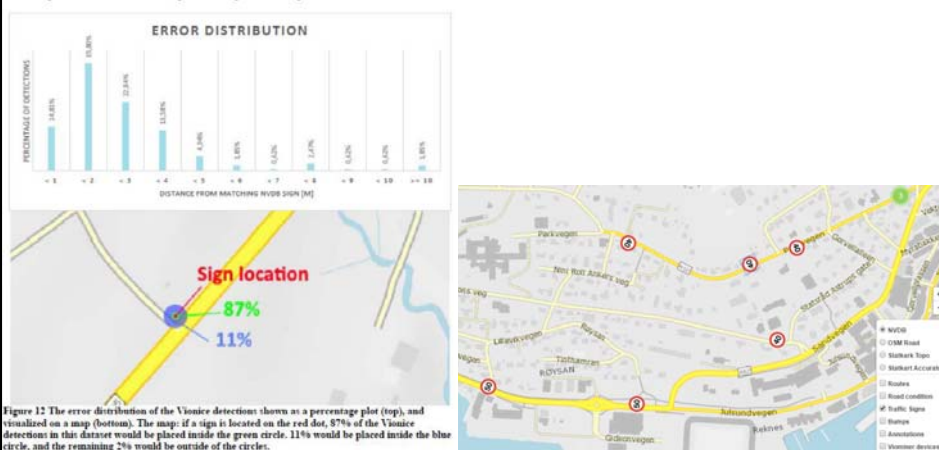


Foto: Elin Leikvang, SVV



Foto: Per Harald Hermansen, SVV

## Whats good enough (quality vs. Coverage)



Is it good enough when you have to correct for the drift of the continental shelves ?

## The next big thing



Time for a live demo



<https://map.vionice.io>