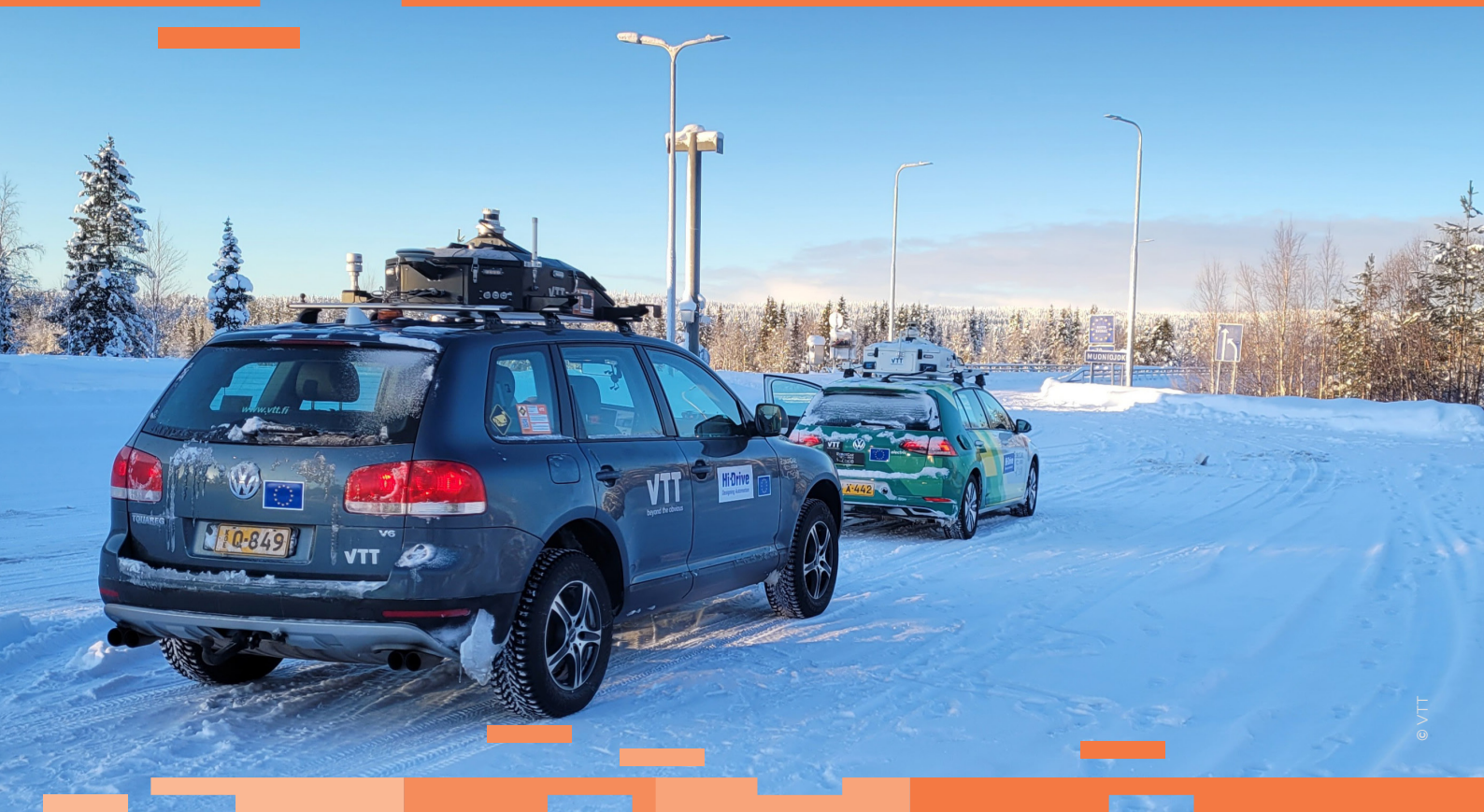
Hi-Drive
Designing Automation

ARCTIC CAD: ENABLING AUTOMATED DRIVING IN ADVERSE WINTER WEATHER

Improve positioning in limited visibility conditions through an external database of detectable landmarks

VTT has performed extensive winter condition testing in the challenging weather of wintery Lapland. Most recently, an application was developed to enable the automated vehicle to recognize and react to conditions where heavy snowfall greatly weakens lidar-based localization by blocking the view of the sensors. This was a joint effort with Bosch, who provided a real-time cloud database containing infrastructure landmarks (regular traffic signs, poles etc.). Based on these known landmarks and their supposed real-world locations, combined with the snow-blinded lidar, the vehicle was able to "detect what was missing", and switched to GNSS positioning on the go.

The Bosch map database and ICCS positioning signal prediction enablers are integrated to two of VTT's automated vehicles which will evaluated by IKA. The vehicles are a Volkswagen Touareg named Martti, and a Volkswagen eGolf named eLvira. Both vehicles patrolled a route which included landmarks with known world coordinates. The Hotspot map service by Bosch provided a list of nearby landmarks based on the vehicles position. With the known perception capabilities of the lidar sensor, the vehicles performed constant estimation of how well their lidar was detecting landmarks at their supposed locations, based on returned point amounts and intensities. With heavy snowfall, the lidar sensors returned very low amounts of reflections, which resulted in the vehicles making a decision of switching the visual-based localization of the lidar, to a GNSS localization for as long as the lidar visibility was poor quality. These switches in localization mode were done multiple times when driving a route, and it did not stop or slow down the actual driving of the vehicles. This resulted in an uninterrupted completion of the route, regardless of visibility loss in some sensors.



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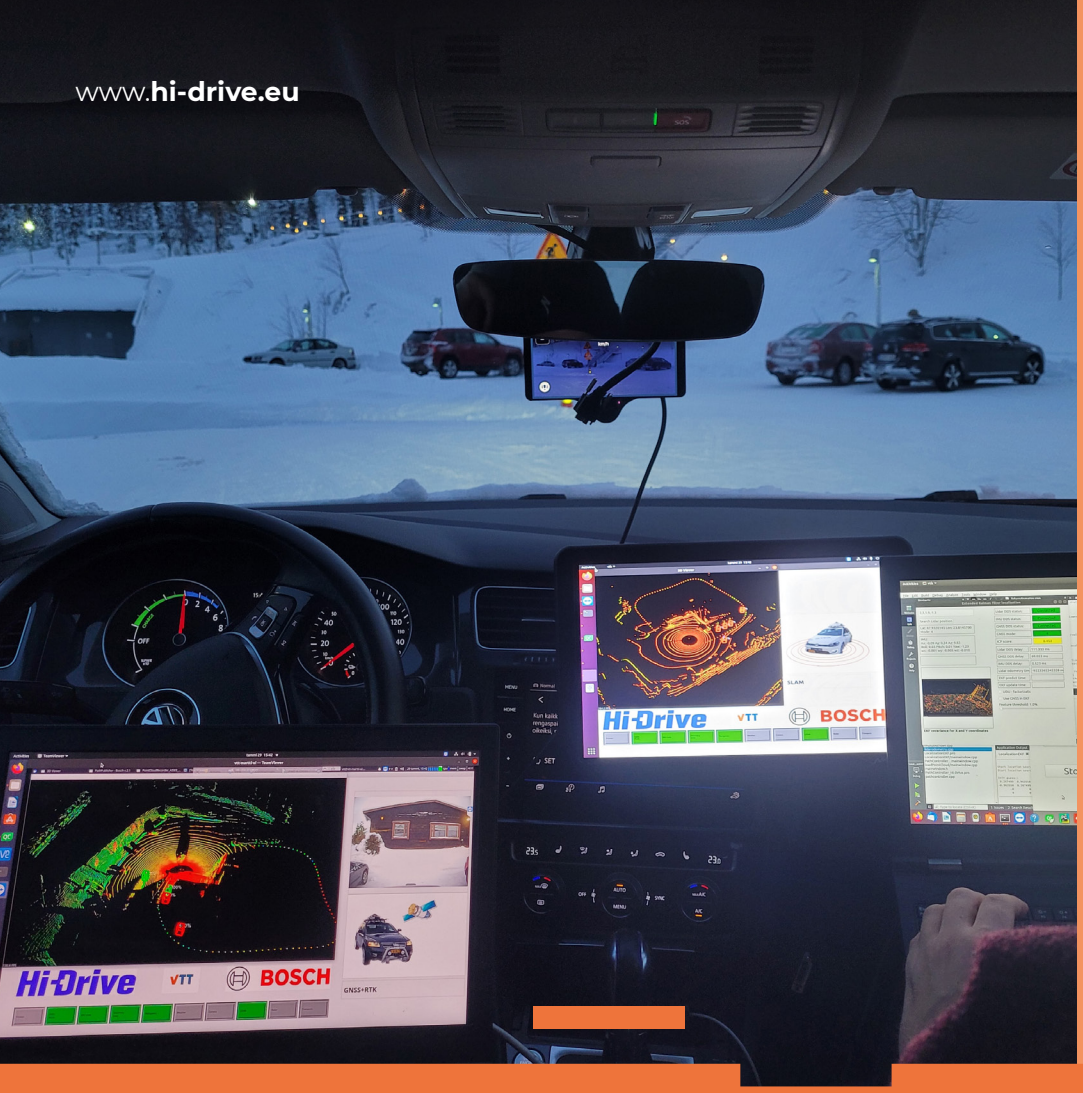

The challenges of adverse weather, and especially winter conditions are a key topic for enabling 24/7 automated driving. As the presented application shows, snowy conditions provide some of the most challenging use cases in the industry. Especially when performing in the barren arctic conditions such as North of Europe, where features perceived by visual sensors are often close to zero, daylight sometimes lasts only an hour or two, and mobile connections can be cut off in remote places.

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PROJECT FACTS

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