Precise data for greater safety:
# Audi warns its drivers faster about slippery roads

- **Swarm data improves car-to-X service "Local Hazard Information"**
- **Around 1.7 million cars in the Group make up the swarm intelligence**
- **New procedure detects the smallest changes in friction coefficient**
- **Joint development between Audi and Car.Software organization, NIRA, and HERE**

Ingolstadt, March 8, 2021 – Audi is taking another step toward safer and more intelligent mobility. The premium carmaker is using high-precision swarm data for the first time to improve its car-to-X service "Local Hazard Information" (LHI). The new version uses a car-to-cloud application that is based on a novel procedure for estimating the coefficient of friction on the basis of the wheel slip. This technology can detect the tiniest changes in road surface adhesion, upload data to the cloud for processing, and warn upcoming drivers of road ice or other slippery conditions in near real time.

Since 2017, cars made by Audi have been able to warn each other about accidents, broken down vehicles, traffic jams, road ice, or limited visibility, a communication technology known as 'car to X'. It analyzes various data for Local Hazard Information, including activation of Electronic Stabilization Control (ESC), rain and light sensors, windshield wipers, headlights, emergency calls, and airbag triggers. Audi is now taking the next step by improving the service with high-precision swarm data to make the warning even faster and more precise. The brand with the four rings is the first manufacturer to use a patented solution from Swedish company NIRA Dynamics AB for this purpose. The two companies adapted this solution as a basis to develop the enhanced hazard alerts together with the Car.Software organization and HERE Technologies.

Within the car, the system can estimate the coefficient of friction between the tires and the road surface based on wheel slip. To calculate this, it uses chassis signals, such as wheel speed and acceleration values. It is already active in normal driving situations and not only during extreme situation when chassis control systems intervene. The sensor data is anonymized, both in the car itself and when transmitted to the cloud hosted by NIRA Dynamics AB. Aggregated data from many vehicles are then combined with metadata, such as current and historical weather information, and then transmitted by NIRA cloud to service provider HERE Technologies. When integrated with HERE location platform, the combined data intelligence represents the road network as a precise three-dimensional model.

Coming back to the vehicle, HERE servers send the warning information to those cars that are in or heading toward areas with poor conditions. The driver sees a warning in the Audi virtual cockpit or on the optional head-up display and can act accordingly.
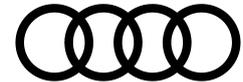
Number of vehicles involved is a key success factor
The greater the number of vehicles that deliver the data, the better the system can learn, analyze, and create maps, and thereby inform or warn the drivers depending on the situation. This is the basic principle of swarm data and swarm intelligence – an area in which Audi has acquired extensive knowledge over the past years. . In 2021, more than 1.7 million vehicles from the Volkswagen Group in Europe will contribute data for this improved hazard information service, and this will increase to more than 3 million in 2022, creating a significant competitive advantage. The service is available in new models from Audi, Volkswagen, SEAT, Škoda, Porsche, Bentley, and Lamborghini.

The Car.Software organization, a company of the Volkswagen Group, took the main responsibility for development. The project was designed so that the greatest number of drivers possible could benefit from these safety advantages, regardless of the group brand. This is also the first customer application in which vehicle data is applied to this type of cutting-edge data analysis. "The project for improved hazard information is a good example of the great potential of cross-brand software development. Together with other Group brands and our strategic partners, we were able to develop a digital service within a few months while making use of our own software skills and economies of scale," says Thomas Müller, Head of Advanced Driving Assistance Systems ADAS & Automated Driving AD at the Car.Software organization. "The improved hazard information service is just the beginning; we see wide-ranging potential for the future."

Utilizing current friction coefficient maps based on this data pool, municipalities can optimize their snow clearing service in real time, and also reduce the environmental impact by using less road salt. Driver assist systems can precondition themselves and adjust to the condition of the road with even greater precision, and the route guidance of the navigation system can take the road conditions into account in order to offer a more accurate computation of the expected time of arrival. Inside the car, control of the wheel slip can enable the development of tire maintenance services, for example, by detecting the level of wear as well as the performance level of the tire.

– End –

About NIRA Dynamics AB
This software company is headquartered in Linköping, Sweden, and is the market leader in the field of indirect tire pressure monitoring systems. NIRA uses cutting-edge analysis of tire and vehicle data from interaction between vehicles and the road. Tire Grip Indicator (TGI), the patented application for sensor fusion, calculates the friction coefficient and then uploads the

data to a cloud-based system for live mapping (Road Surface Information) and for further processing and distribution.

About HERE Technologies
HERE, a location data and technology platform, moves people, businesses and cities forward by harnessing the power of location. By leveraging our open platform, we empower our customers to achieve better outcomes - from helping a city manage its infrastructure or a business optimize its assets to guiding drivers to their destination safely.

About the Car.Software organization
The Car.Software organization is a software company of the Volkswagen Group that bundles and expands its software skills for the purpose of transforming mobility. Its mission is to develop the leading technology stack for the automotive industry and thereby make the driving experience safer, more sustainable, and more comfortable. Roughly 5,000 engineers and developers worldwide are working on developing a uniform software platform and architecture for all brands and markets of the Volkswagen Group. The Car.Software organization works in competence centers for software in Berlin, Ingolstadt, Munich, and Seattle, as well as near Stuttgart and Wolfsburg.

Product and Technology Communications
Michael Crusius
Spokesperson for Audi Q5
Phone: +49-841-8942-329
E-mail: michael.crusius@audi.de
https://www.audi-mediacenter.com/en