AIDE's three major sub-projects are intended to culminate in the development of a number of demonstrators, of which an FH12 will be a highly interesting example.

AIDE – a major EU project led by VTEC

Johan Engström and Jan Arfwidsson of Volvo Technology are the main project leaders of AIDE, the major integrated project which is part of the joint industry-public sector eSafety initiative and the EUCAR Integrated Safety Programme, under the umbrella of the EU Sixth Framework Programme. The four-year project involves 29 partners, about half of whom represent the European vehicle industry and the remainder research institutes and universities.

AIDE (Adaptive Integrated Driver-vehicle InterfacE) is one of the largest European projects ever undertaken in the area of automotive HMI (Human Machine Interaction). Volvo Technology is the project coordinator. AIDE has been conceived as a venture in which "the European automotive industry and research institutions join forces towards the driver-vehicle interaction concepts of the future".

The project addresses a number of key challenges, with the main focus on HMI integration and adaptation.

Twenty-nine partners

The AIDE integrated project gathers together the leading European vehicle manufacturers, automotive suppliers and research institutes, including Volvo Technology, BMW, Ford, Opel, PSA, CRF (Fiat), Bosch, Motorola, Institute of Communication and Computer Systems (ICCS), Greece, Netherlands Organisation for Applied Scientific Research (TNO), Swedish National Road and Transport Research Institute (VTI) and European Commission Joint Research Centre (JRC).

The project is part of the Integrated Safety Programme, a cluster of EUCAR projects under the umbrella of the EU's Sixth Framework Programme, all of which are related to road safety and in which top managers from the European vehicle industry serve as project mentors. A major objective is to create synergies between all of the projects and close liaison has been established between them. Other projects in the programme include PReVENT, EASIS and GST, in which VTEC is also playing a leading role.

Common interfaces

"AIDE will not develop functions", says Technical Project Leader Johan Engström, who is responsible for Driver Awareness R&D at VTEC. "The actual aim of the project is to create a common HMI interface between the driver and various in-vehicle functions, such as ADAS and IVIS."

ADAS (Advanced Driver Assistance Systems) describes a rapidly growing number of systems with significant potential for preventing accidents related to driver error. A critical challenge for AIDE is to design the HMI of these systems to maximise their efficiency and safety impact.

IVIS (In-Vehicle Information Systems), including 'nomadic devices' (such as PDAs and 'smart' phones brought on board by the driver or passengers), are likely to be major potential sources of distraction in the vehicles of the future. The key challenge for AIDE is to develop methods and HMI concepts that minimise the distraction caused by these devices.

"Our main challenge is to integrate all in-vehicle systems into a functioning whole, resolving conflicts and exploiting synergies between systems in their interaction with the driver", continues Johan Engström.

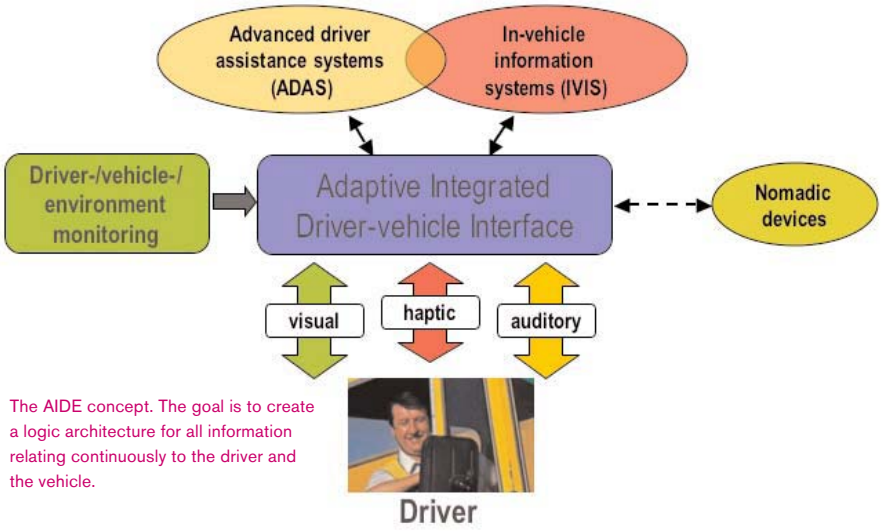
Four sub-projects

The work of AIDE is organised into four sub-projects:

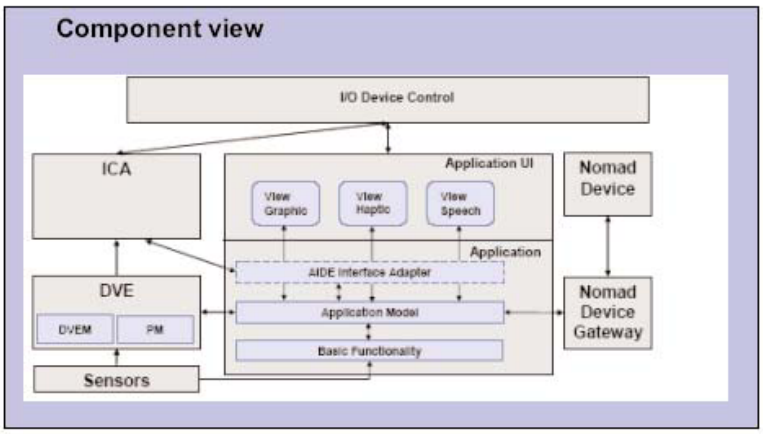
- SP1: Behavioural effects and driver-vehicle-environment modelling
- SP2: Evaluation and assessment methods
- SP3: Design and development of an Adaptive Integrated Driver-Vehicle Interface
- SP4: Horizontal activities

SP3, the main sub-project, will conclude in 2007 with the construction of full-scale prototypes, such as a complete Volvo truck. This prototype will integrate the AIDE HMI technologies with preventive safety functions developed as part of PReVENT, another major EU project in which VTEC is a leading participant.

SP1 focuses on basic research into driver behaviour, including empirical



The AIDE concept. The goal is to create a logic architecture for all information relating continuously to the driver and the vehicle.



The current version of the AIDE logic architecture.

studies as well as behaviour modelling and simulations. The findings regarding the effects of support systems on driver behaviour will then be applied in SP3.

The same applies to SP2, whose goal is to create a generic and cost-effective HMI assessment methodology for use in validating the prototypes developed in SP3.

Much to be achieved

SP4 is led by Jan Arfwidsson, manager of the Concept Centre at VTEC's Transport and Telematics Services, and the administrative project leader of AIDE.

"This is a horizontal, overall sub-project for project management, administration and information", explains Jan.

"Overall, AIDE will be capable of simulating the behavioural effects of ADAS and IVIS. The results will be used to design Adaptive Integrated HMIs that we can test in prototypes and evaluate using our methods. This is the scenario everybody hopes to have achieved by 2007."

He tells us that the AIDE project has a total budget of EUR12.5 million, of which EUR7.3 million is contributed by the European Commission. Volvo's share is EUR1.27 million (approx. SEK11.5 million).

Nomadic Forum

Johan Engström tells us that SP3 has given birth to a 'Nomadic Device Forum', which held its first workshop in January.

"There are more and more products, such as PDAs and SmartPhones, that are in no way designed for use in a vehicle and, as a result, impose significant safety risks," he explains. "This has led to unique cooperation between the automotive and telecommunications industries, as demonstrated by the presence of companies like Motorola and Nokia at the first workshop."

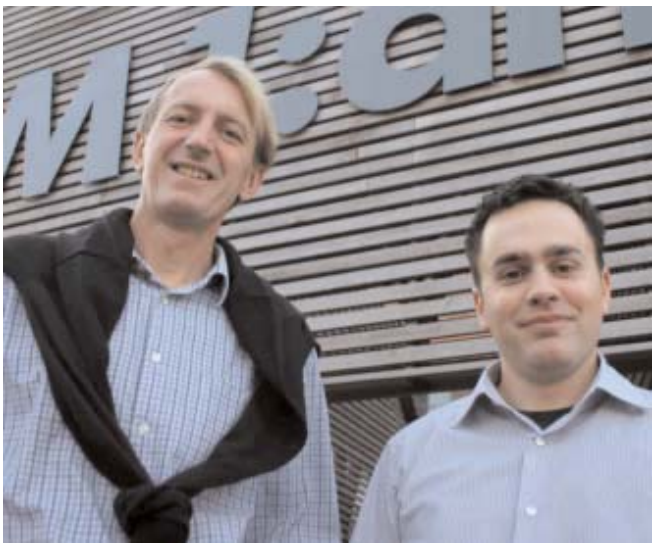
Led by ERTICO, the forum examines how nomadic devices could be integrated in the vehicle, e.g. how they could be enabled to share the on-board HMI.

"The response to the workshop was very positive, both from the industry and the authorities," says Johan. "The second workshop was held at Volvo's offices in Brussels in mid-June, when the 'Nomadic Device Forum' and its two working groups were launched formally."

Measures distraction

Another important goal of the AIDE project is to measure relevant aspects of the driver's condition and the traffic situation in real time in order to adapt the HMI dynamically. VTEC is responsible for what is known as the Cockpit Activity Assessments (CAA) module, whose purpose is to measure the driver's activity, in particular with respect to distraction.

"Measuring distraction, both visual and cognitive, is something we at Volvo Technology are very good at. Real-time measurement of driver distraction can be used, for example, to adapt safety warnings. When the driver is distracted, a warning can be given earlier and/or at higher intensity than when the attention is concentrated on the road ahead."

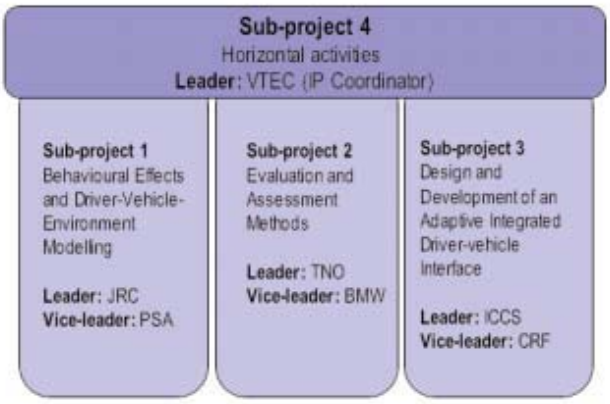


Jan Arfwidsson (left) and Johan Engström are leading the AIDE project.

Building the HMI architecture of the future

One of the main goals of AIDE is to create a HMI structure that overlays the complete on-board information architecture – a 'brain' that keeps track of all of the information, as well as nomadic devices, and adapts everything to the driver, the vehicle and the environment (DVE). The module that performs this centralised management of the HMI is known as ICA (Interaction and Communications Assistant). See the illustrations of the AIDE concept and the current version of the logic structure of the AIDE architecture on page 17.

"One of the key aims of AIDE is to develop a modular and scaleable architecture solution for the integrated HMI" explains Johan Engström. "In this work, we are collaborating closely with other projects, especially EASIS, which is concerned with the development of a general electronics architecture for integrated safety systems. The architecture work in AIDE is led by Bosch, with VTEC as a very active participant."



- **Integrated project**
- **Four-year duration**
- **Commenced: March 2004**
- **Budget: EUR 12.5 million total (incl. 7.3 million in EU funding)**
- **Twenty-nine partners (about 50/50 industrial/ academic)**
- **Part of the EUCAR Integrated Safety Programme)**

The different sub-projects and the structure of the AIDE project.

Examples of I/O devices studied as part of the AIDE project.

Head-up and configurable displays

Haptic input/output

Speech input/output

Input/output devices

These are the various devices, such as pushbuttons and displays, as well as more advanced means such as voice commands, that the driver uses to interact with different applications in the vehicle. A key goal of the AIDE project is to enable a many-to-many mapping between I/O devices and applications, so that an I/O device can be shared by many different applications, and vice versa. Apart from conventional devices, like displays and buttons, AIDE will investigate several new I/O concepts, such as:

a Head-up displays
b Haptic inputs in the form of 'multifunctional controls' with active haptic feedback
c Haptic outputs e.g. vibrating seats
d Voice commands for both ingoing and outgoing communications, including information that is read out rather than displayed to the driver, as well as certain information controlled by his or her voice

Significant involvement

"Each sub-project is as big as a 'traditional' EU project," notes Johan Engström. "But SP3 is the largest and the one in which Volvo Technology is most active. We are also highly involved in SP2, which deals with evaluation methods such as the VDM (Visual Demand Measurement) tool, with the aim of assessing the visual demand imposed by in-vehicle systems."

"Many people at Volvo Technology other than Jan Arfwidsson and myself are involved in the different parts of AIDE, and we believe that the project will provide important input for our customers' product development activities." TM

Examples of nomadic systems brought on board by the driver or passengers.