Safe **I**nteraction, **C**onnectivity and **S**tate

SICS

&

Automotive Grade Android

AGA

Presenting today:

Volvo Group Trucks Technology

Claudia Wege

Advanced Technology and Research

Transport Analysis

Andreas Lindmark

Driver Electronics

Global Application SDK Coordinator

Eric Dutt

Driver Electronics

Operative Technology Strategy Responsible – Driver Interaction

Agenda

Introduction – Eric 5 min

SICS project description - Eric 10 min

Driver distraction - Claudia 20 min
+ NHTSA guidelines

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Discussion – 20 min

GROUP TRUCKS TECHNOLOGY

GROUP TRUCKS TECHNOLOGY

RESEARCH AND TECHNOLOGY DEVELOPMENT

for the Volvo Group


The Volvo Group vision:
To become the world leader in sustainable transport solutions

The Volvo Group vision:

HOW
we will reach our vision

- # By creating value for customers in selected segments
- # By pioneering products and services for the transport and infrastructure industries
- # By driving safety, quality and environmental care
- # By working with energy, passion and respect for the individual

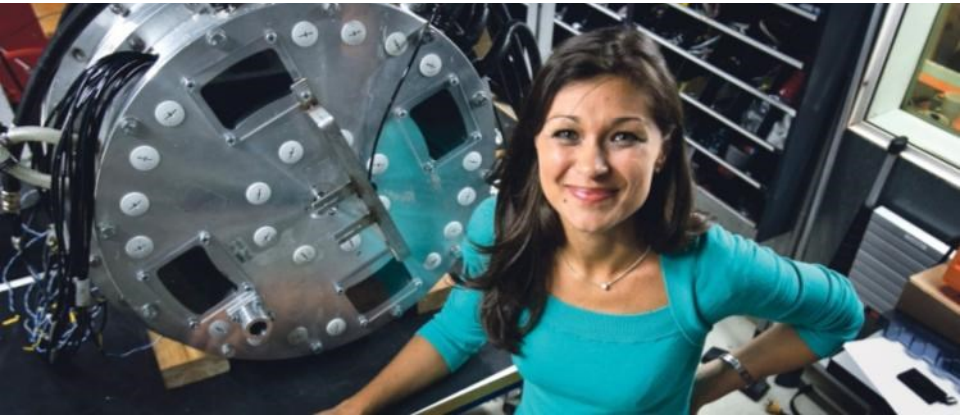
Sustainable transport solution technologies for society today and in the future

RENEWABLE FUELS	ALTERNATIVE DRIVELINES	FUEL ECONOMY	NOISE REDUCTION	SAFETY FOR DRIVERS AND SURROUNDINGS
				

Successful solutions based on great ideas and teamwork

Research collaboration with suppliers, academia, institutes and authorities

We work with energy, passion and respect for the individual




SHAPING
ANOTHER FUTURE

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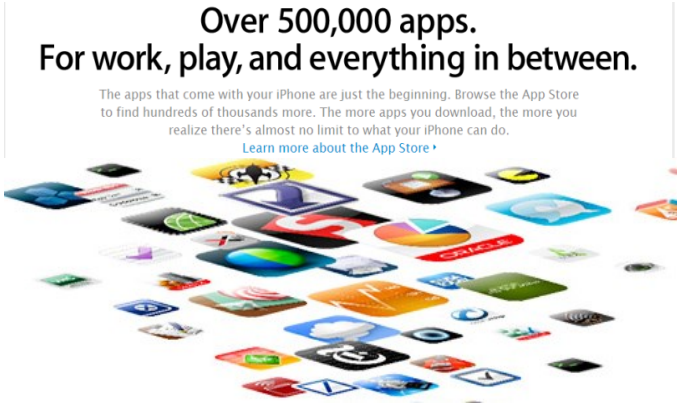
Safe Interaction, Connectivity and State SICS

- Volvo Group Truck Technology
- Volvo Car Corporation
- Chalmers University of Technology
- HiQ
- VINNOVA – FFI (Fordonsstrategisk Forskning och Innovation)

Automotive Grade Android AGA

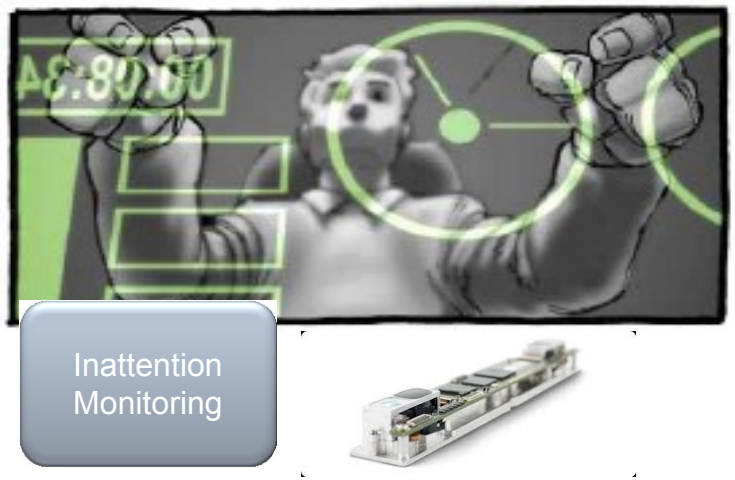
- Combitech
- Swedspot
- Vehicle ICT Arena

Background



- Enormous growth in on-board/off-board electronic functionality
- Strong inattention-risk relationship
- NHTSA Guidelines → performance tests
- Design of safe interaction with electronic equipment is a serious and difficult challenge

Non-integrated today



Inattention Monitoring

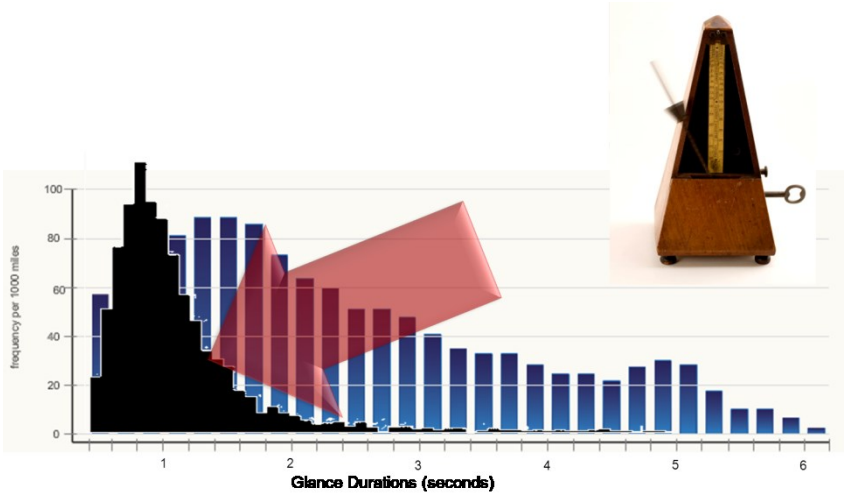
Safe Driving Mode Apps

Nomadic Device Integration

Onboard applications & telematics platform

Objectives

- Main goal is to ***safely*** deliver connected lifestyle functionality while also ***promoting*** driver attention
- Overcome challenges related to driver distraction guidelines and regulation
- Meet increased consumer demand for connected lifestyle
- Integrate state-of-the-art on-board drive inattention monitoring



Safe Connectivity Objectives (SP3)

The project objectives are:

- **Design, develop, and evaluate** *a safe* connectivity platform concept
- **Create new design principles** for open in-car platforms for safe connectivity
- **Propose a certification/approval procedures** for guiding application development and testing.

Chalmers Students taking DAT255

- Are the first in the world to use the result of all the work done in SICS/AGA projects!
- If you join the challenge, you will be part of the development of this important work

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Marina Keegan † 2012

WHO ”Decade of Action for Road Safety” 2011-2020

“Distracted driving is this generations chronic disease.”

– Wetzel, 2012

The main distractor is in our pockets

70 % of all drivers use a cell phone

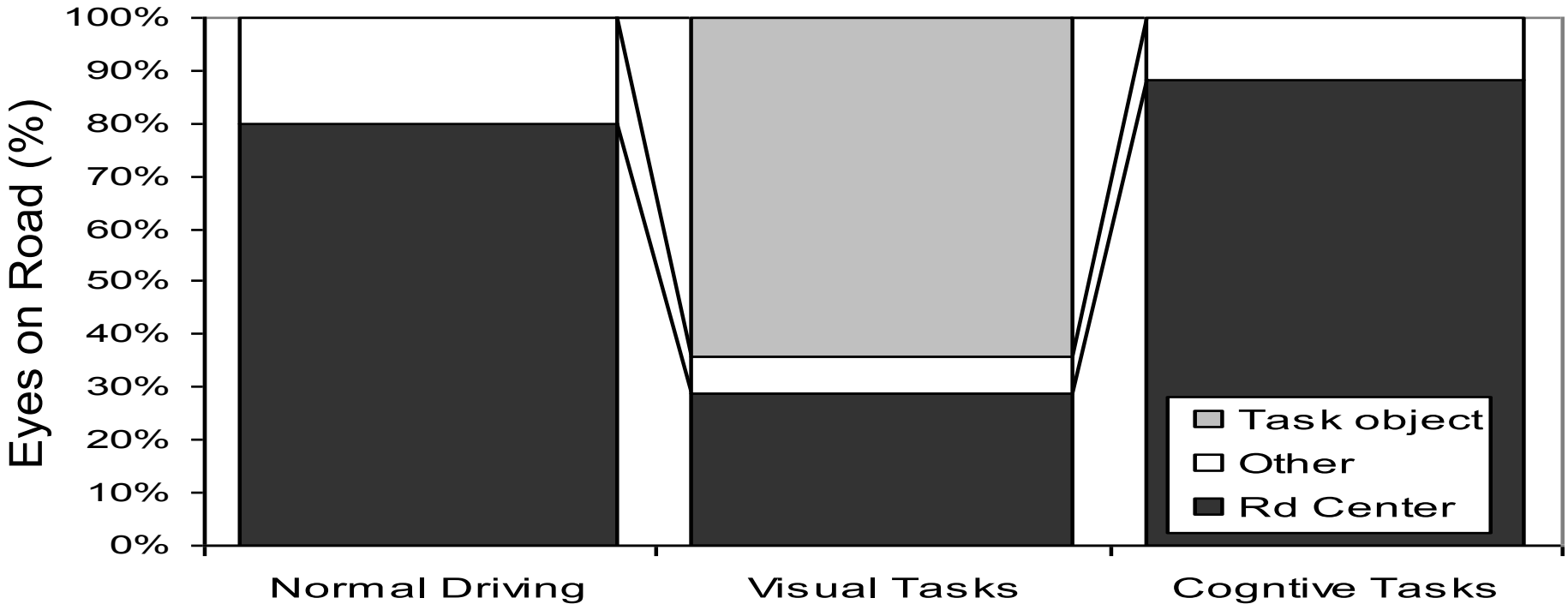
NHTSA anti-texting commercial link:

http://www.youtube.com/watch?v=Ss021L0hWU4

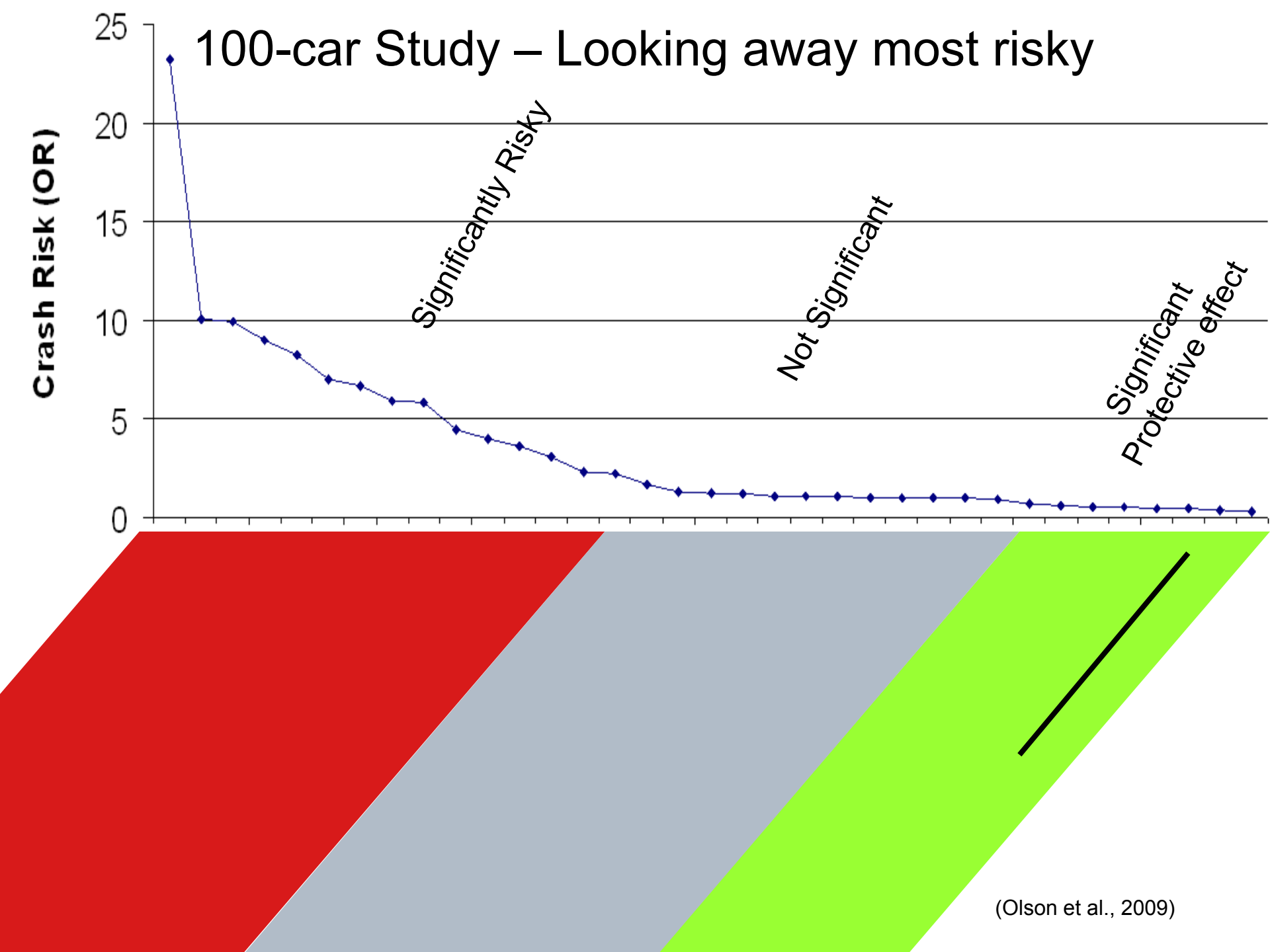
The developer of the future is within you!

Volvo´s mission –
”To promote attentive driving.”

Eyes Off Road Time



Victor, 2005


100-car Study – Looking away most risky
Crash Risk (OR)
25
20
15
10
5
0
Significantly Risky
Not Significant
Significant
Protective effect
(Olson et al., 2009)

Towards Risk-Quantified Glance Performance Criteria

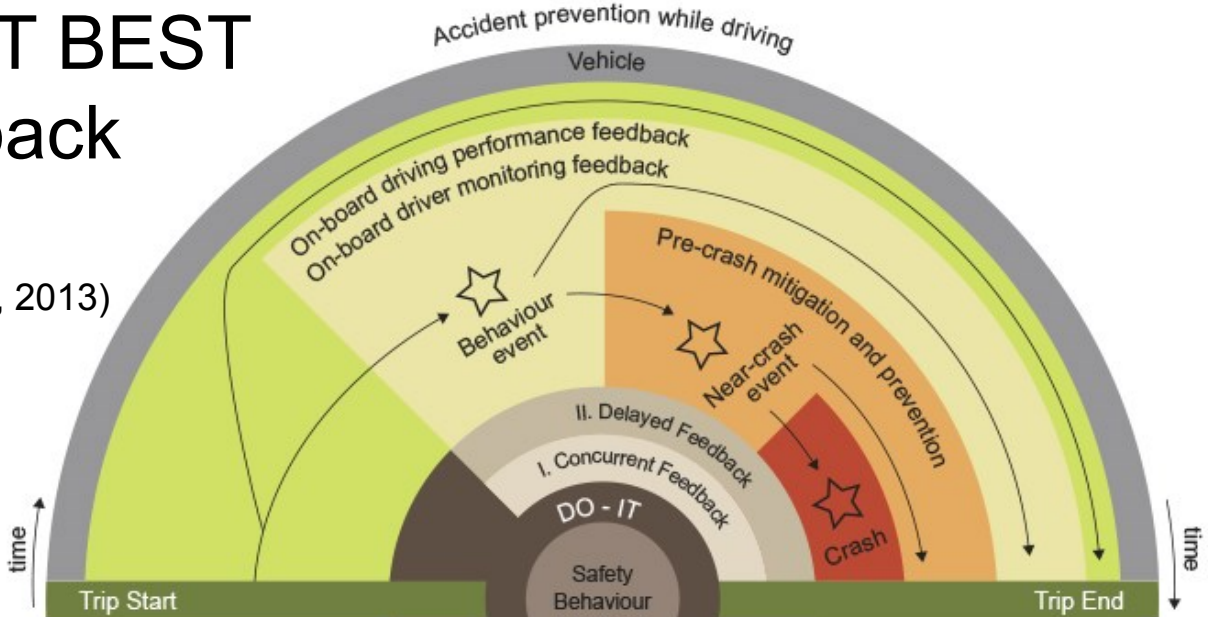
NHTSA Distraction Guidelines criteria

1. 2.0 s mean duration
2. Max 15% of glances above 2.0 s
3. Total glance time max 12 s

(Victor, 2013)

DO - IT BEST Feedback Model

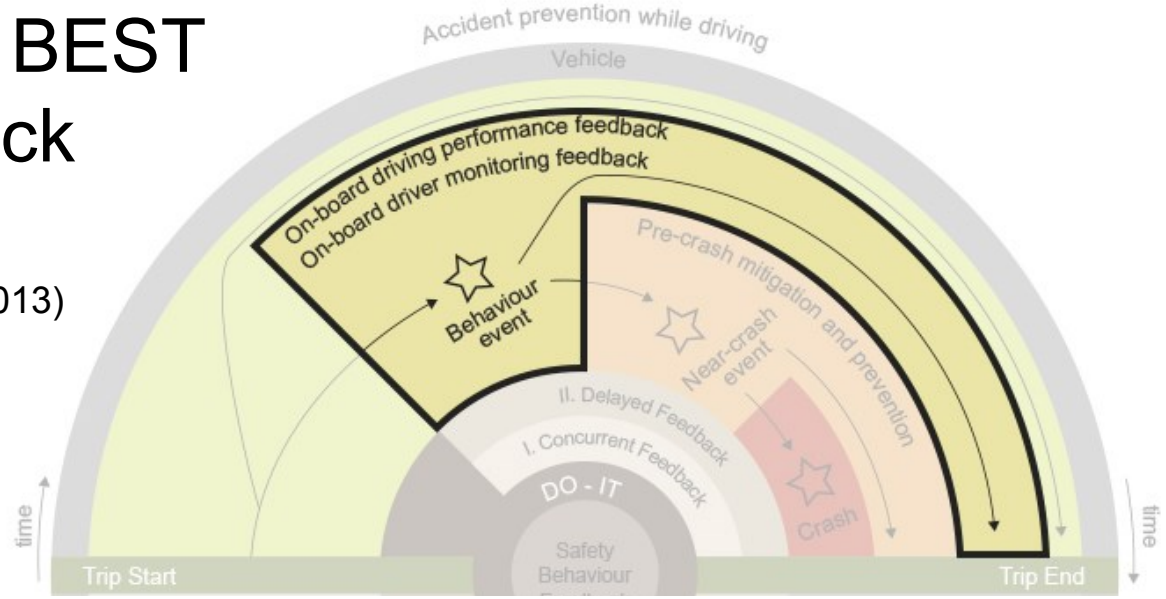
(Wege & Victor, 2013)



D	Define target behaviour
O	Observe target behaviour
I	Intervene to influence target behaviour
T	Test the measured effectiveness of the intervention
B	Behavioural check-ups
E	Education
S	Safety benefit analysis
T	Training

DO - IT BEST Feedback Model

(Wege & Victor, 2013)



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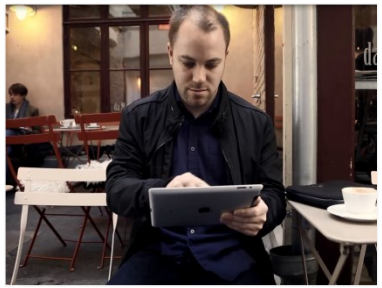

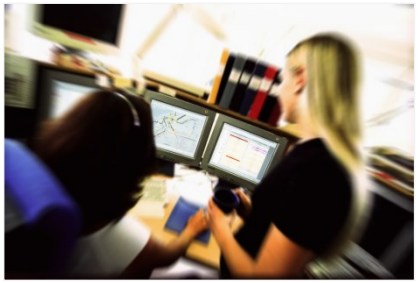

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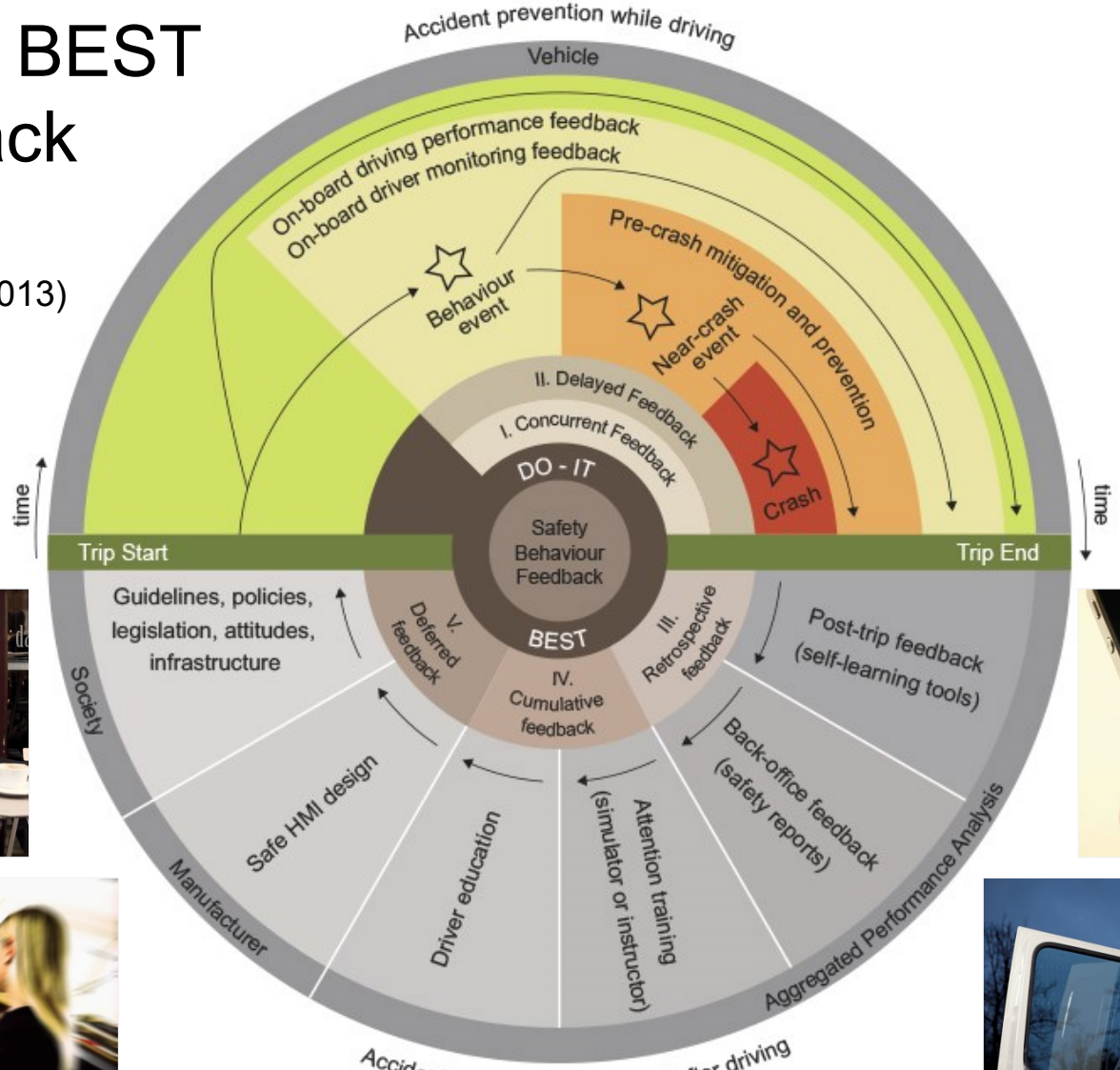

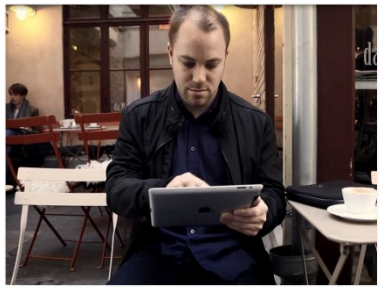

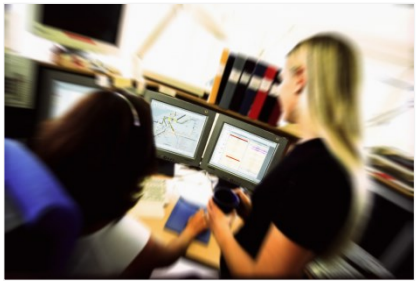

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- Victor, T.. (2005). Keeping eyes and mind on the road. Dissertation. Uppsala University.
- Wege, C., & Victor, T. (2013). *The DO-IT BEST Feedback Model - Distracted Driver Behaviour Management and Prevention Before, While And After Driving.* Proceedings of the Third International Conference on Driver Distraction and Inattention. Göteborg, Sweden.
- Wege, C., & Victor, T. (2014). Uniting a winning team: behaviour-based safety and Advanced Driver Assistance Systems – Applied to attention enhancement accident prevention strategies. In A. Stevens, C. Brusque, & J. Krems (Eds). *Driver adaptation to information and assistance systems*. IET published book. ISBN: 978-1-84919-639-0; E-ISBN: 978-1-84919-640-6.
- Wege, C. (2013). *Adaptive Eyes.* Driver Distraction and Inattention Prevention Through Advanced Driver Assistance Systems and Behaviour-Based Safety. Dissertation. Chemnitz University of Technology and AB Volvo.

http://yaledailynews.com/crosscampus/2012/05/27/keegan-the-opposite-of-loneliness/

http://www.youtube.com/watch?v=Ss021L0hWU4

http://www-nrd.nhtsa.dot.gov/departments/nrd-13/newDriverDistraction.html

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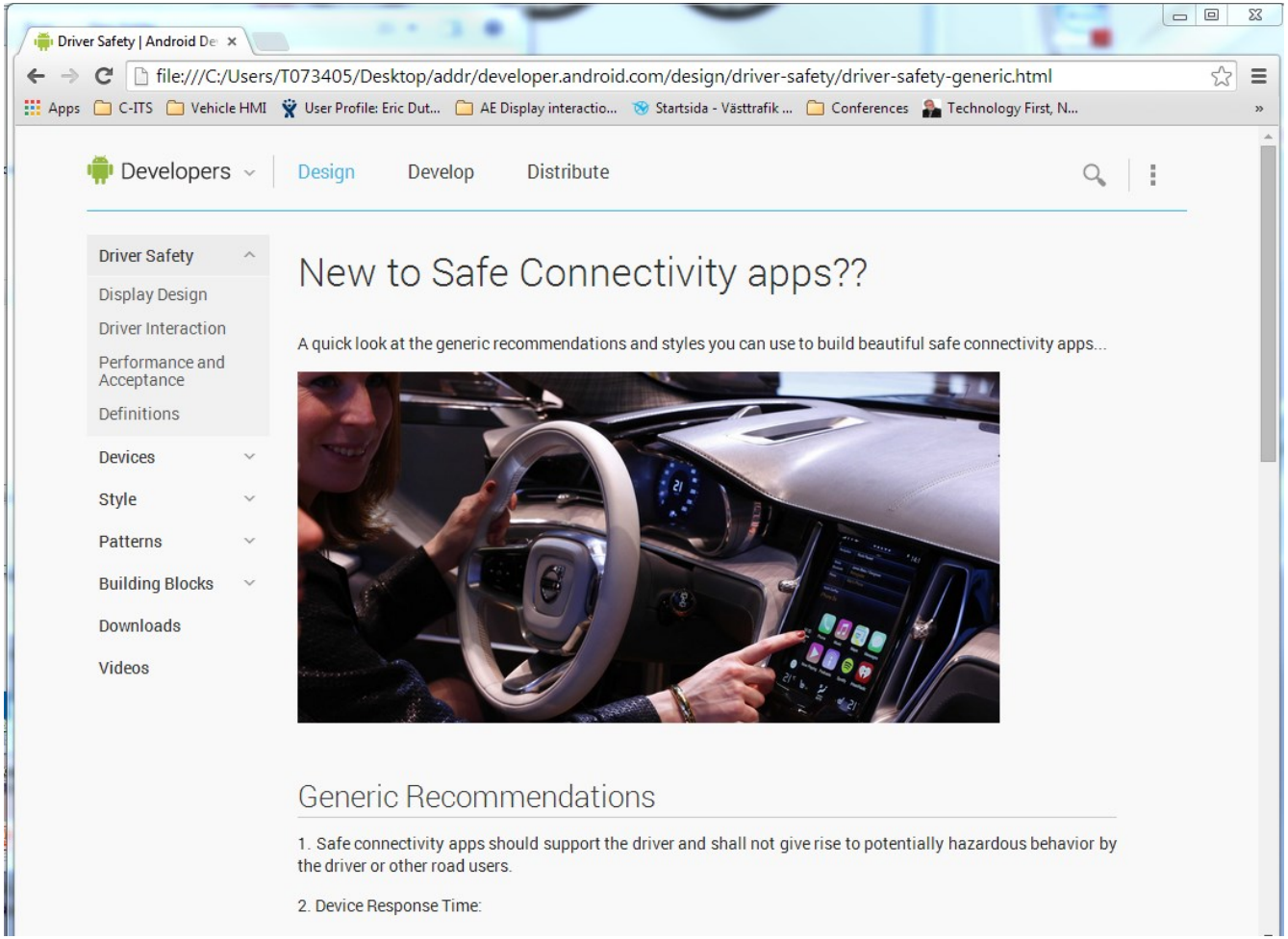
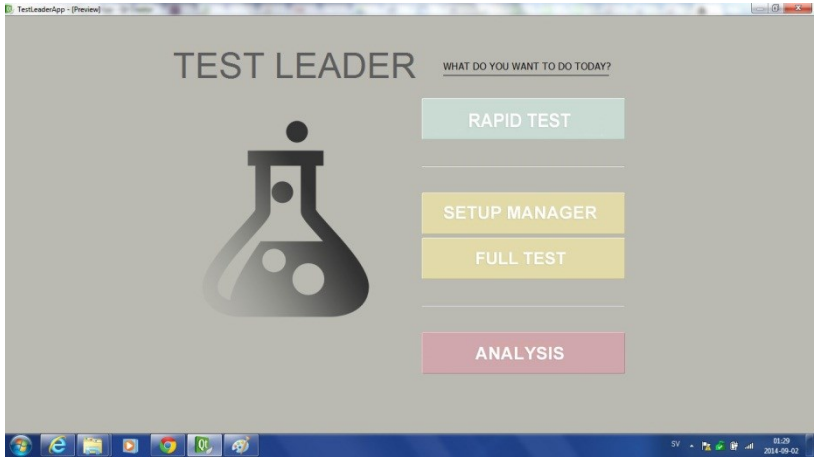
“Driver Safety” HMI recommendations

Integrated into Android developers design guidelines



Tools

- **Occlusion Service App** for testing during development sprints
- OpenCV Web-cam based **eye-tracking tool** for testing the app that will be submitted to the challenge
- **Test Leader App** with data collection – support the development team to more easily do testing and calculations according to ISO 16673



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The user of your app

-Tommy, 45 years old, long-haul truck
- for 23 years a truck driver in Sweden
- Works for *European Truck Transport*
- new assignment in intern. transport
- 500 km/day driving distance
- two near crashes in the last year
- several speeding tickets
- approx. 1 hour paper work every day

His fleet manager wants to track
- vehicle overload
- driver time violations
- fuel consumption
- safety indicators (e.g. unintended lane changes)

New Dynafleet App

New Dynafleet App

https://www.youtube.com/watch?v=ADtrS6RWZIs&feature=youtu.be

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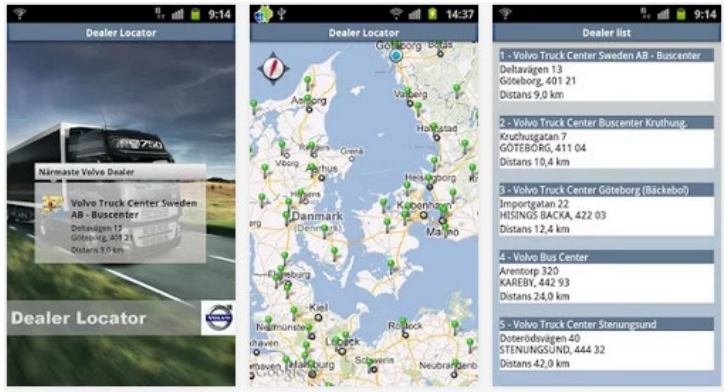
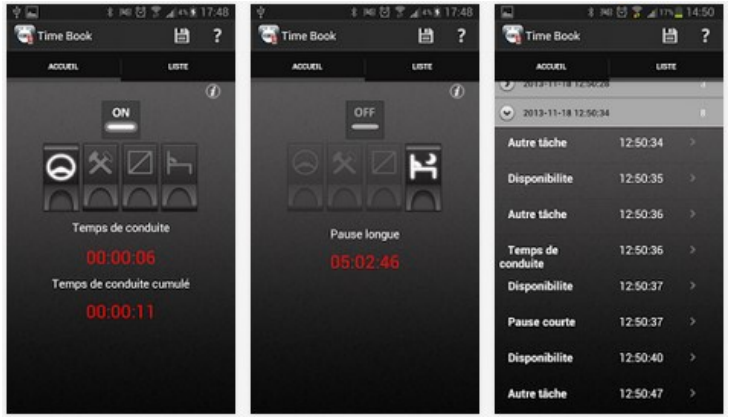
Examples of APPS

- VT Dealer locator
- RT Time Book





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Automotive Grade Android - AGA

VISION

- Open-innovation eco-system for in-vehicle software and connected services

CORNER STONES

- Open-source
- Piggy-back on a dynamic and large eco-system
- Light-weight framework that stays in sync with Android

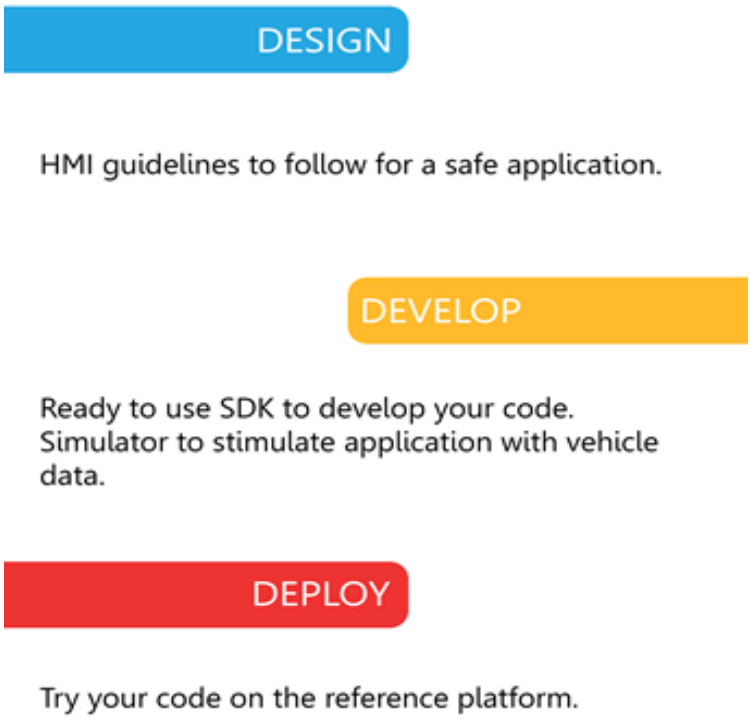
AGA

- Where developers and system builders meet
- A marketplace for developers
- A standardized framework for system builders

https://developer.lindholmen.se/redmine/projects/aga

Customer Offer for Developers

- **Developer Zone**
  an open and shared community
  an open portal enabling downloads of artefacts and information
- **SDK**
  software libraries and interfaces enabling infotainment application development for vehicles
- **Developer Guidelines**
  a collection that eases how to write safe and automotive adapted applications
- **Simulation Environment**
  tools for developers enabling test without having access to a real target environment
- **Reference Platform**
  the AGA SDK is deployable on hardware



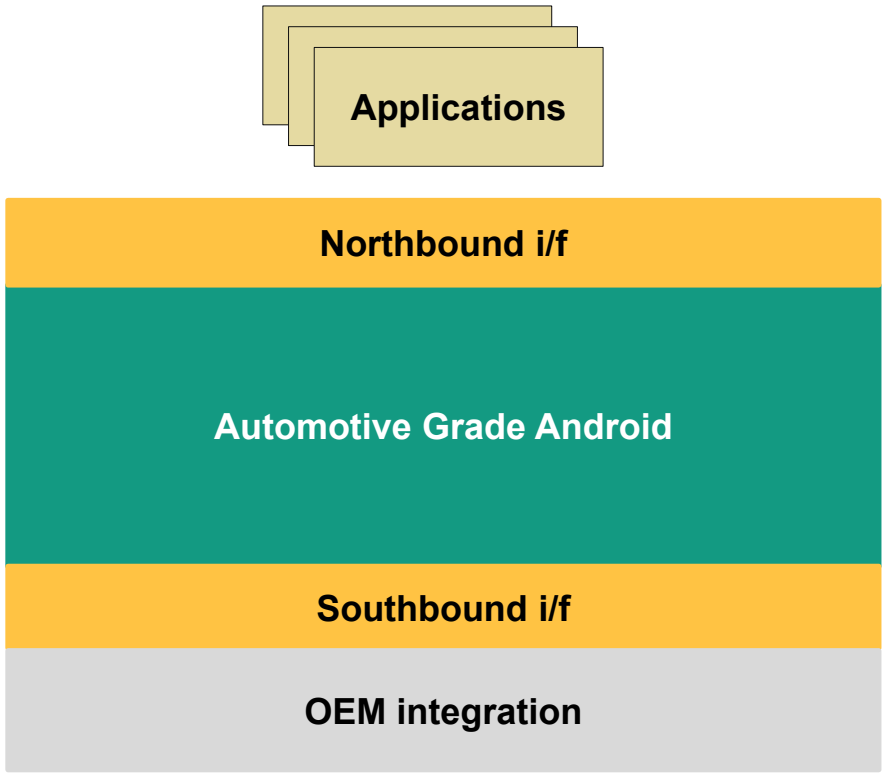
http://developer.lindholmen.se/

AGA is Android

This means that you can use (almost) all things that you can use on a standard Android. Examples:

- Mapping API:s, Google Maps, Bing Maps etc...
- Voice Recognition (For the evaluation we will not consider the acustic environment of the vehicle and you should feel free to use voice without restrictions)
- Messaging services
- Web API:s
- Text-to-speach

Automotive Grade Android - Architecture

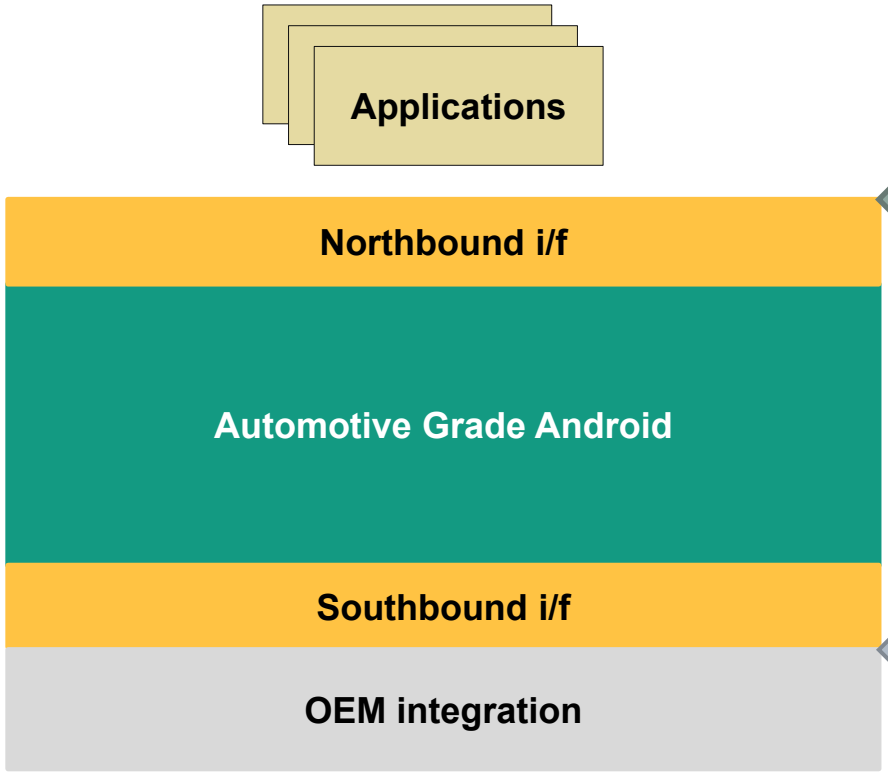


Northbound interface
- Read from vehicle
- Write to vehicle
- React on driver distraction changes

SDK
- Build ROMs
- Emulator
- Simulator
- Documentation

Southbound interface
- Integrate vehicle data
- Integrate hardware buttons
- Set access policies
- Change driver distraction level

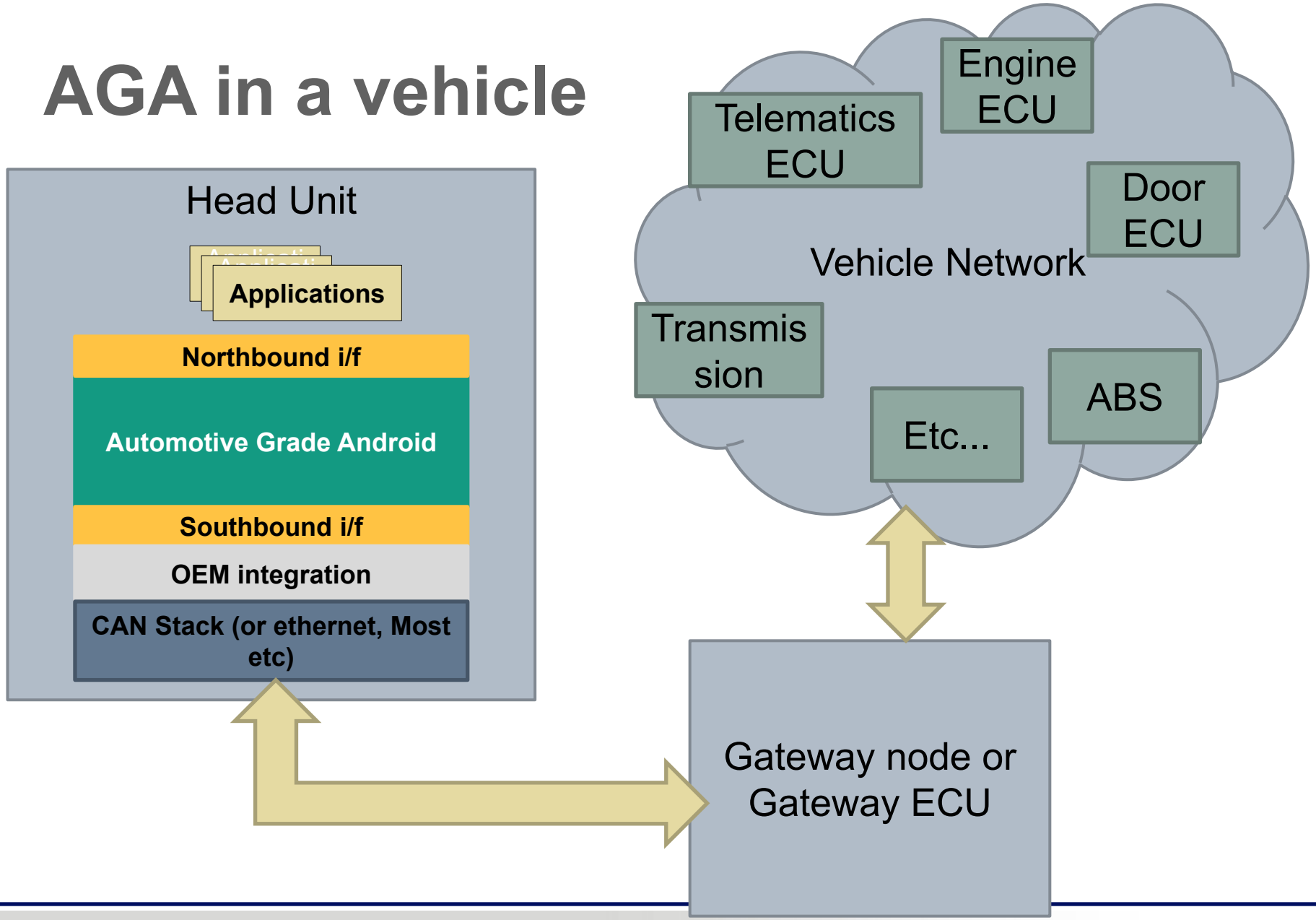
Automotive Grade Android - Architecture



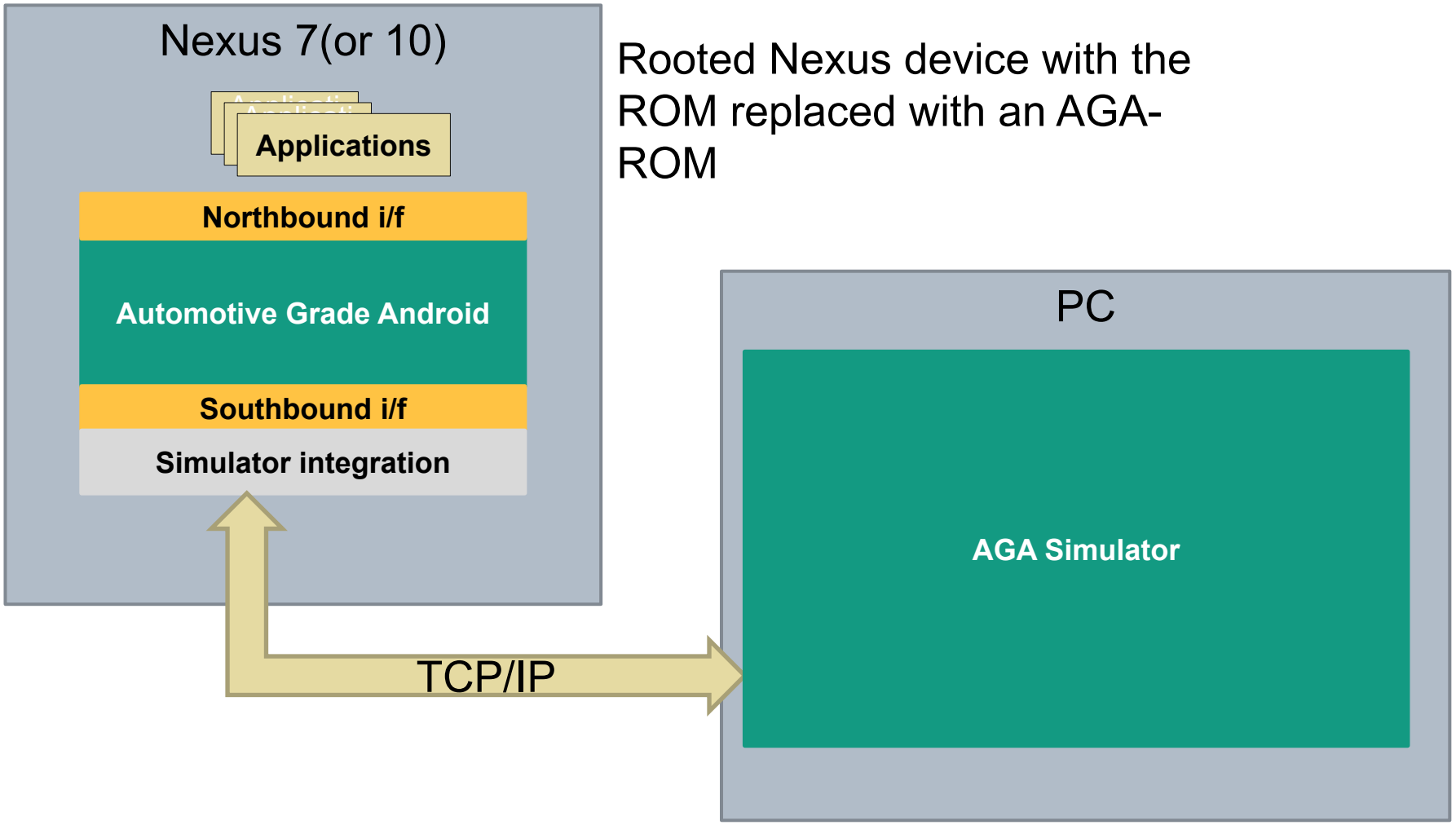
Allows apps to read vehicle data such as fuel level, speed, tire preassure etc. Get information and react to driver distraction.

The integration point for OEMs such as Volvo to provide vehicle data, steering wheel buttons etc.

AGA in a vehicle

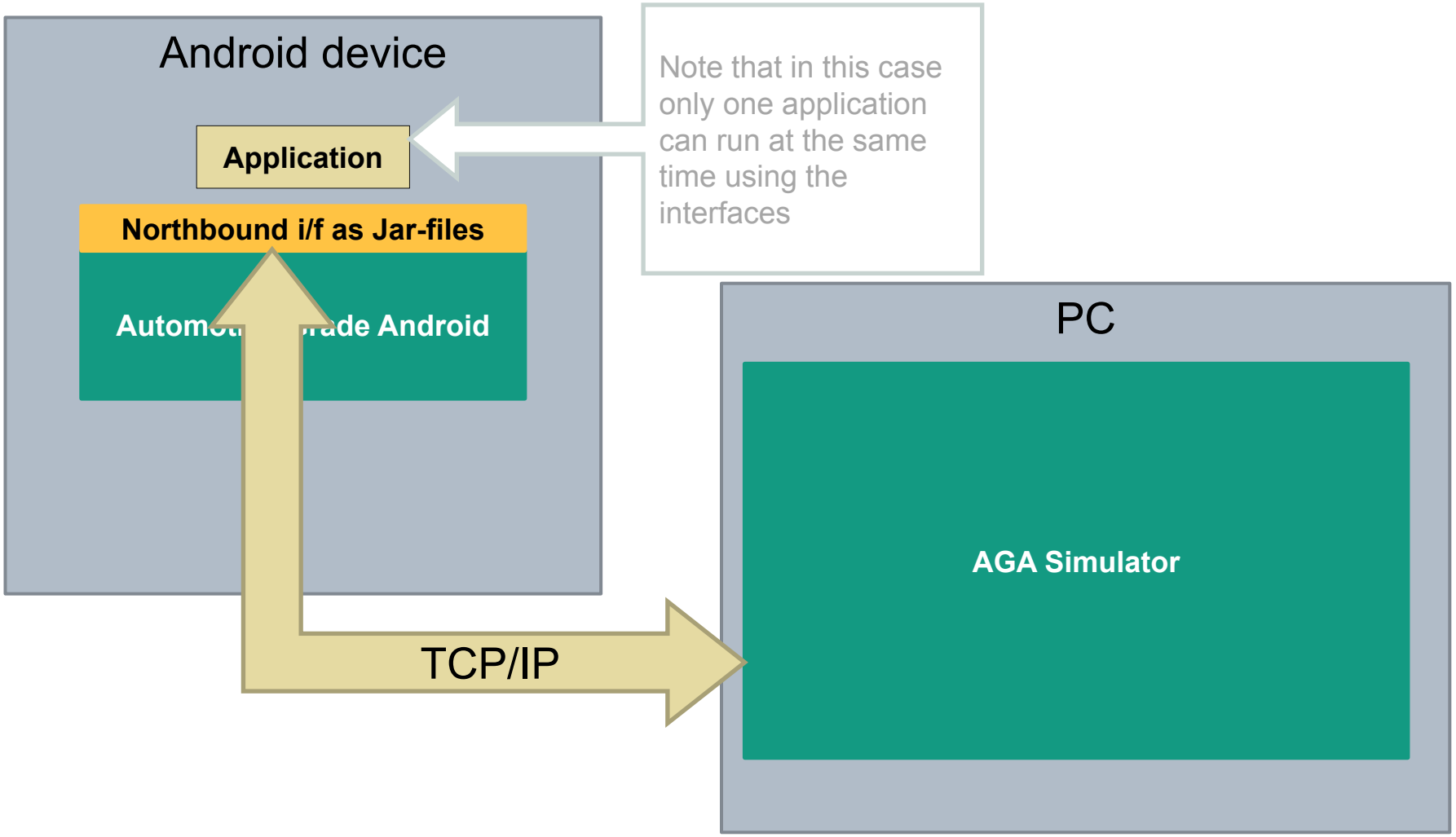


AGA on a Nexus 7 or 10



Rooted Nexus device with the ROM replaced with an AGA-ROM

AGA on a standard Android device



Vehicle Data

- The simulator and SDK supports the ”Fleet Management System Interface” (FMS) data out of the box. See AGA docs for details.
- Other data can be added to the SDK and simulator, but you should probably have a good reason for doing this. Controlling the brakes from an App is probably not a good idea... But reading the temperature from the freezer transporting goods might be!
- The Simulator has it’s own wiki-page, check it out!

A word of safety related to ”Safety API:s”

- AGA has an implementation based on the concept of several distraction levels.
- SICS (and NHTSA) guidelines only take into account **two** distraction levels. **Standstill** and **Driving**.
- With the AGA implementation it is up to the developer to interpret the design guidelines for the distraction levels and react to the changes accordingly.
- HiQ is developing another concept for Safety API, called ”CanDo”, which also will be available to you. HiQ:s Safety API is a layer on top of AGA:s API. There are potential benefits to both.
  - CanDo Safety API Beta release monday w38 (15 sept; code, examples, tutorial)
  - Indepth presentation of the CanDo Safety API by HiQ (17 sept)
  - CanDo Safety API Final Release end w39 (26 sept, full release)

Getting started!

- https://developer.lindholmen.se/redmine/projects/aga/wiki/Software_Engineering_Project_DAT255
  Contains some important notes on limitations when using the Jar-files approach compared to the ”full” AGA device approach.
- Use the forum for questions and feedback related to AGA https://developer.lindholmen.se/redmine/projects/aga/boards

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VOLVO SICS INNOVATION CHALLENGE RULES

- Challenge description
- Agreement
- The Challenge
  - The use of nomadic devices and other electronic equipment while driving has a strong potential for enhancing productivity, transport efficiency and safety. However, at the same time, driver inattention is a concrete safety problem.
- Prize
  - The winning teams will be invited to participate to the next Vehicle ICT Arena Innovation Contest “Challenge AGA” where they will have the possibility to further develop their App concept & compete with professional App developers during a 36-hour hackathon
  - Right of ownership
  - ....


VOLVO