# EB Assist ADTF Automotive Data and Time Triggered Framework



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### Agenda

- EB Assist ADTF
  - General Information
  - Features
  - Field of Application
- Toolboxes add-ons to EB Assist ADTF
  - EB Assist ADASISv2 Map Information Toolbox
  - EB Assist ADASISv2 Reconstructor Toolbox
  - EB Assist Car Data Recorder Toolbox
  - Capture & Replay Solution

### EB Assist ADTF – Automotive data and time-triggered framework

#### **EB Assist ADTF**

- is the most used development and test environment worldwide for advanced driver assistance systems (ADAS)
- is used in development and series projects
- is used by leading carmakers and suppliers that continue to invest in feature development

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**EB Assist ADTF** covers various use cases and is already utilized for different applications i.e. measurement, sensor evaluation and software validation

## Applications range from comfort features to safety systems including e.g.:

- Lane Change Assistance
- Adaptive Cruise Control
- Collision Mitigation
- Adaptive Light Control
- •Lane Departure Warning

- •Blind Spot Detection
- Traffic Sign Recognition
- Driver Drowsiness Detection
- Night Vision
- Pedestrian Recognition



## EB Assist ADTF – A Flexible Framework

#### Extensible to your needs

- Filters: Data processing units implemented in a C++-Class
- Direct integration of C/C++-Code
- Develop your own modules (filters)

#### Record & playback

- Recording multiple data streams (test drives)
- Playback
  - Office PC
  - To HiL
- On and offline processing and testing

#### Supports whole lifecycle

- (prototypical) algorithm development
- Developing/testing production ready algorithms
- Verifying ECU processing





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## Visualization & Control via GUI

#### Easy to use GUI

- Flexible combination and parametrization of filters
- Various display capabilities
  - Signals (CAN, FlexRay, LIN, Most)
  - Arbitrary (DDL described) data
  - Scope displays and value display
    - Signal View, Scope Display
    - Table displays
  - Video data & overlays
  - 2D, 3D
- Profiling and debugging support
- Configure distributed processing

## Support for easy extension of GUI and display capabilities

• Write your own control and visualization modules



## EB Assist ADTF – Support for devices/connectivity

#### Support for data acquisition and connectivity

- Many devices already supported
  - Camera/Video
  - Audio
  - CAN, FlexRay, LIN, MOST
  - Ethernet
- Read and write from/to car-bus
- User configurable decoding/encoding of signals
  - Config Codec Filters for CAN, LIN, FlexRay
- Build-in support for signal descriptions
  - DBC for CAN
  - FIBEX for FlexRay
  - Open interface for extension

#### Support for easy integration of other devices

• Write your own device filter accessing the driver API of your device.





## EB Assist ADTF – Field of application



- Pre-development, development for mass production
- Test & Validation : SiL, HiL





### Toolboxes – add-ons to EB Assist ADTF

### **Standard toolboxes**

- EB Assist ADTF Device Toolbox
- EB Assist ADTF Display Toolbox
- EB Assist ADTF Compression Toolbox

### **Optional toolboxes**

- EB Assist Car Data Recorder Toolbox
- Capture & Replay Solution
- EB Assist ADASISv2 Reconstructor Toolbox
- EB Assist ADASISv2 Map Information Toolbox
- EB Assist ADTF Calibration Toolbox (XCP)
- EB Assist ADTF Matlab/Simulink <sup>®</sup> Blockset



#### EB Assist ADTF – Toolboxes





EB Assist ADASISv2 Electronic Horizon Toolboxes

EB Assist development tools and software modules for predictive driving



## **Electronic horizon**

**Electronic horizon** provides driver assistance systems with

- detailed map and GPS data about the route ahead
- e.g. intersections, speed limits, road curvatures, topographic information.

Useful for predictive driving features like, e.g.,

- Curve Speed Warning
- Predictive Curve Light
- Traffic Sign Recognition

Developement support in EB Assist ADTF

- EB Assist ADASISv2 Map Information Toolbox
  - Complete navigation system in ADTF
  - Provides electronic horizon in ADASISv2 format
- EB Assist ADASISv2 Reconstructor Toolbox
  - Target ready reconstruction lib.
  - Visualization, inspection



## Electronic horizon based ADAS



Electronic Horizon provides "roadway ahead" including data such as:

- Route and position, lanes
- Speed limits

- Street type (crossroad, motorway, ...)Most probable path
- Geometry and curvature

Map attributes are used as a "sensor" and available for several ECU

## Development and test tool chain in EB Assist ADTF

#### EB Assist ADASISv2 Map Information Toolbox

- Integrated EB street director navigation
- Map rendering (incl. zoom and pan)
- Full access to route calculation options
- Generate electronic horizon data based on
  - GPS track (NMEA)
  - GPS + car sensor data
  - Simulated route
  - Route guidance
- Provides electronic horizon on CAN
- Batch mode for automated test

#### EB Assist ADASISv2 Reconstructor Toolbox

- ADTF Filter available
- Target ready ADASISv2 Reconstructor
  - Full ADASISv2 Reconstructor datastore & Event API
  - EB extended API
  - Use it for your own developement
- Easy configurable
  - Electronic horizon history length
  - Number of car positions, number of paths
- <u>CAN message filter</u>



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### **Complete Development Toolbox Setup**



- Record and replay of sensor data
- Providing of ADASISv2 data on CAN
- Map display

- ADASISv2 elec. horizon data reconstruction
- Elec. horizon geometry visualization
- ADASISv2 data for driver assistance function

#### EB Assist ADTF – Toolboxes



EB Assist ADASISv2 Map Information Toolbox (MIT) - last enhancements (version 1.3.25)

- 2D and 3D map rendering
- NDS and PSF map format Support
- Configurable timestamp offset
- Intermediate targets
- Importing routes
- Velocity input from recorded drive
- Proposals for destinations
- New destination resolving by NVC (Next Valid Character)
- Changes and optimizations of the GUI
- Preview of upcoming maneuver



## EB Assist ADASISv2 Reconstructor Toolbox for ADTF

#### EB Assist ADASISv2 Reconstructor

EB Assist ADASISv2 Reconstructor Target Code wrapped into a filter. Additional statistics output pin, e.g. memory usage

#### **ADASISv2** Viewer

Graphical view of the electronic horizon in the 3D scene viewer.

#### **ADASISv2 Explorer**

Textual representation of the electronic horizon in "Windows-Explorer" style

#### ADASISv2 XML Dumper

Writes complete eHorizon in XML representation at every change

#### **ADASISv2 Signal Provider**

Provides selected elec. horizon attributes (e.g. effective speed limit, curvature) as signal. The signals can be viewed in the Signal viewer or even put on a physical CAN bus.

#### **ADASISv2** Trace View

Shows all ADASISv2 CAN messages human readable. Allows single stepping through ADASISv2 messages



### EB Assist ADASISv2 Reconstructor Toolbox for ADTF



### EB Assist ADASISv2 Reconstructor for Matlab/Simulink<sup>®</sup> Blockset

### EB Assist ADASISv2HR Reconstructor for MATLAB

- is an add-on to the MathWorks development environment
- reads CAN data and generates an elec. horizon data structure
- is compliant with the ADASISv2 specification
- uses EB's target-ready ADASISv2 Reconstructor
- is a turn-key solution letting the developer focus on the application
- reads ADASISv2 data from
  - -CAN bus (e.g. from head unit)
  - -recorded CAN (.asc file)
  - Navteq ADAS RP (via TCP/IP)
  - EB Assist ADASISv2 Map Information Toolbox for ADTF
- any other ADASISv2 provider

### Data access via ADASISv2 standard API and EB extension API



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### Use cases – electronic horizon in EB Assist ADTF





#### EB Assist ADTF – Toolboxes





### EB Assist Car Data Recorder (CDR)

Measurement technology for simplified and efficient test drive recordings in combination with EB Assist ADTF



### Test environment: EB Assist ADTF in test cars



Many "home-brew", special tailored, incompatible solutions exist

#### Typical recording setup

- Notebook mounted on passenger side
- Cables to interface to car busses and sensors
- Driver or passenger controls EB Assist ADTF via touchpad or mouse
- ▲ Bad usability in a moving car (small Windows UI elements + touchpad)
- Not all information is visible or is simply too small
- Controlling the recording process is hideous
- **▲** Lots of cables in the car front
- Not presentable to customers or management



### EB Assist Car Data Recorder (CDR)





### EB Assist Car Data Recorder – benefits at a glance





### EB Assist Car Data Recorder

Today:

- Live Demo by Ian
- Register at the registration desk

#### EB Assist ADTF – Toolboxes

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### **EB** Assist Capture and **EB** Assist Replay

Embedded modular system to capture and replay sensor data highly time synchronized and precisely



## EB Assist Capture & EB Assist Replay

#### **Dedicated hardware**

- Flexible I/O configuration using adapter boards, Video, CAN, FlexRay, LIN, Ethernet, GPS
- Precision timestamping @ 25 ns resolution
- Precise synchronization with one clock
- High transfer rate
- Automotive power supply
- Ready to use with easy access to connectors

ADTF filters and configuration for recording and replaying



# Thank you!



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