RTMaps
Development environment for multisensor applications (ADAS, robotics, etc.)

Highlights
- Prototyping, testing, and benchmarking of perception and data fusion algorithms
- Recording, synchronizing, and playing back data from numerous sensors and communication buses
- Available for different operating systems and x86- and ARM-based hardware platforms

Application Areas
Multisensor applications play an essential role in many areas such as advanced driver assistance systems (ADAS), autonomous driving, multimodal human-machine interfaces (HMIs), robotics, and aerospace. Developing these kinds of applications in the lab or in the vehicle typically requires capturing, synchronizing, and processing data in real time from various sensors such as cameras, laser scanners, radars, or GNSS receivers and interfacing with communication networks, such as CAN/CAN FD, LIN, or Ethernet. During the test and development phase, it is also essential to be able to record, visualize, and play back time-correlated data. RTMaps (Real-Time Multisensor applications) from Intempora (www.intempora.com) is specifically designed for these use cases. It provides a modular development and run-time environment for x86- and ARM-based platforms supporting operating systems such as Microsoft® Windows® and Linux.

Key Benefits
With RTMaps, data is acquired asynchronously and each data sample is captured along with its time stamp at its own pace. This ensures that all data is time-correlated. RTMaps’ unparalleled performance on multicore CPUs enables users to get the most out of their computing architectures and easily set up applications that handle multiple, high-bandwidth data streams, including real-time processing and data fusion. Sensor data can be recorded and played back synchronously for offline development and testing under reproducible conditions. RTMaps provides comprehensive component libraries for automotive sensors, buses, and perception algorithms and it supports any type and quantity of sensors and actuators. Algorithms can be developed easily by means of block diagrams or by integrating own code using dedicated software development kits for C++ and Python. It is even possible to process data on multiple distributed platforms while preserving time coherency and synchronization of heterogeneous data streams.

Integration in the dSPACE Tool Chain
RTMaps is tightly integrated in the dSPACE tool chain. For this, dSPACE provides an interface blockset designed specifically for dSPACE’s PC-based simulation platform VEOS and dSPACE real-time systems to exchange data with low latencies and synchronize clocks with RTMaps. In addition, dSPACE ControlDesk can be connected to RTMaps via the ASAM XIL API, which lets users monitor and parameterize components that are implemented and processed in RTMaps.
## Functionality Overview

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<tr>
<th>Functionality</th>
<th>Description</th>
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| **General**   | ■ Developing, testing, validating, and benchmarking processing algorithms and data fusion algorithms  
■ 2-D and 3-D visualization  
■ Data time-stamping, latency measurement, downstream resynchronization  
■ Data logging and real-time data playback for offline development and validation  
■ Graphical programming by means of block diagrams and easy integration of C++, Python and Simulink code  
■ Optimized, multithread run-time engine and dedicated real-time capabilities  
■ Data processing and data synchronization on multiple distributed platforms  
■ RTMaps Studio with large module libraries for graphical development  
■ RTMaps Remote Studio (additional license required) to directly develop applications on embedded platforms using a PC  
■ RTMaps Runtime Engine for embedded deployment and customized HMIs  
■ Record and play back measurement data in ADTF DAT-file format  |
| **Supported sensors, communication buses and protocols** | ■ Cameras (GigE Vision®, USB 2.0, USB 3.0, FireWire, analog, Camera Link, HDR, ... from Point Grey, IDS, Basler, AVT, NIT, ...)  
■ Stereo-vision heads  
■ Laser scanners (IBE0, Velodyne, SICK, Hokuyo, Quanergy)  
■ Radars (Delphi, Autocruise, Continental, etc.)  
■ Time-of-flight sensors (LeddarTech)  
■ CAN/CAN FD, LIN (Peak, Kvaser, Vector Informatik, .dbc file decoder)  
■ GPS, IMUs (SBG Systems, OxTS, Xsens, VectorNav, IXSEA, Phidgets, etc.)  
■ Communication (TCP & UDP, DDS, ASAM XIL API, etc.)  
■ Analog/digital I/O (Data Translation, Phidgets, Audio, etc.)  
■ Eye trackers (Pertech, faceLAB, SmartEye, SMI, The Eye Tribe, etc.) and biometrics (BIOPAC, Becker Meditec, etc.)  
■ Motion capturing (Kinect, Xsion, Vicon, etc.)  
■ The complete list of available components is provided under: https://intempora.com/products/rtmaps/included-components  |
| **Supported algorithms for developing functions for autonomous driving** | ■ Open Source Computer Vision Library (OpenCV) for CPU/GPU-based image processing  
■ Support for NVIDIA® DriveWorks for the DRIVE PX2 platform  
■ Augmented LiDAR 3D SLAM provided by Dibotics via Partners Components Store  |
| **Supported operating systems and platforms** | ■ Windows®, Linux, Embedded Linux  
■ x86, x86_64, ARM, MicroAutoBox Embedded SPU, Renesas HAD Solution Kit, NXP BlueBox, NVIDIA® DRIVE™ PX 2  |
| **Targeted applications** | ■ Advanced driver assistance systems (ADAS)  
■ Autonomous vehicles  
■ Mobile robotics  
■ Data recording  
■ Advanced multimodal HMIs  |

## Relevant Software and Hardware

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<tr>
<th>Software</th>
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<td>VEOS</td>
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<td>ControlDesk</td>
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Order Information

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<tr>
<th>Product</th>
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<tr>
<td>Intempora RTMaps Developer Version</td>
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<tr>
<td>Intempora RTMaps Run-Time Version</td>
<td>RTMAPS_RTV</td>
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<tr>
<td>Intempora RTMaps Remote Studio for Developer Version</td>
<td>RTMAPS_RSC</td>
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RTMaps – a modular, multithread framework for real-time, multisensor applications.

RTMaps Studio (Developer Version)
- Connection to RTMaps on an embedded platform
- Developing and editing algorithms on a PC
- Use of components compiled for an embedded platform

RTMaps Run-Time Version
- Easy deployment on embedded platforms
- Execution of algorithms (RTMaps diagram)
- Advantage of hardware acceleration

RTMaps Remote Studio – Develop algorithms directly on an embedded platform without having to connect a mouse, keyboard, and monitor.