RTMaps

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

INTEMPORA
MULTISENSOR SOFTWARE SOLUTIONS
A dSPACE COMPANY

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
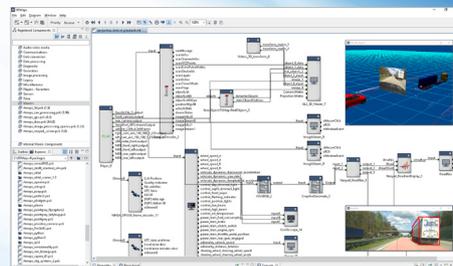
Application Areas

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

| Functionality	Description
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 (IBEO, Velodyne, SICK, Hokuyo, Quanergy, Ouster) ■ 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, Xtion, Vicon, etc.) ■ The complete list of available components is provided under: https://intempora.com/products/rtmaps/included-components Support for additional components on request.
Supported algorithms for developing functions for autonomus 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, QNX ■ x86, x86_64, ARM, MicroAutoBox Embedded SPU, AUTERA, 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

Software		Order Number
Optional	RTMaps Interface Blockset	■ RTMAPS_INTERFACE_SW
	VEOS	■ See relevant product information
	ControlDesk	■ See relevant product information

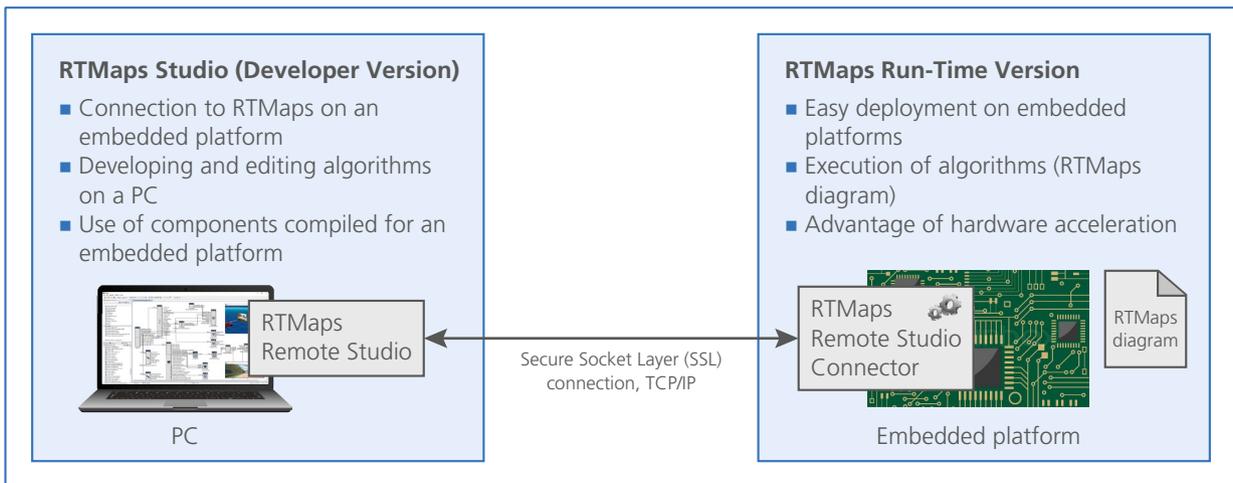| Hardware		Order Number
Optional	MicroAutoBox Embedded SPU	■ See relevant product information
	MicroAutoBox Embedded PC	■ See relevant product information
	MicroAutoBox Embedded DSU	■ See relevant product information

Order Information

Product	Order Number
Intempora RTMaps Developer Version	■ RTMAPS_DEV
Intempora RTMaps Run-Time Version	■ RTMAPS_RTV
Intempora RTMaps Remote Studio for Developer Version	■ RTMAPS_RSC
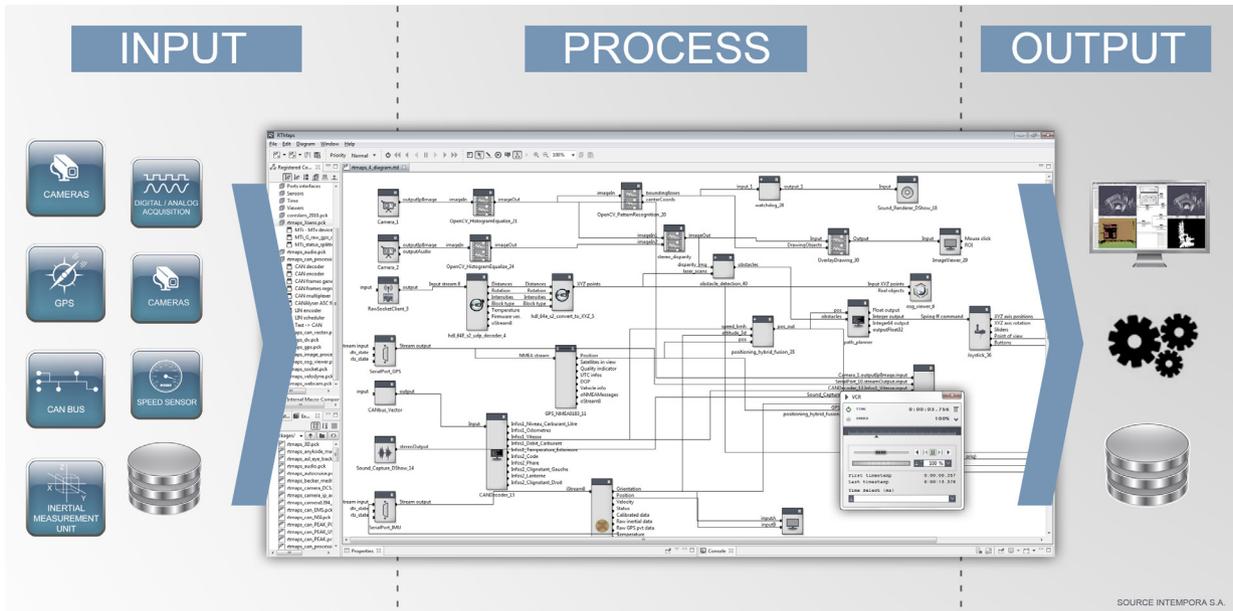
RTMaps – a modular, multithread frame-work for real-time, multisensor applications.

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.

IVS
Intempora Validation Suite

IVS is a set of software solutions for the test, benchmarking and validation of your ADAS and HAD software functions including perception and deep learning algorithms against large driving sensor datasets stored in big data architectures (cloud or on-premise).
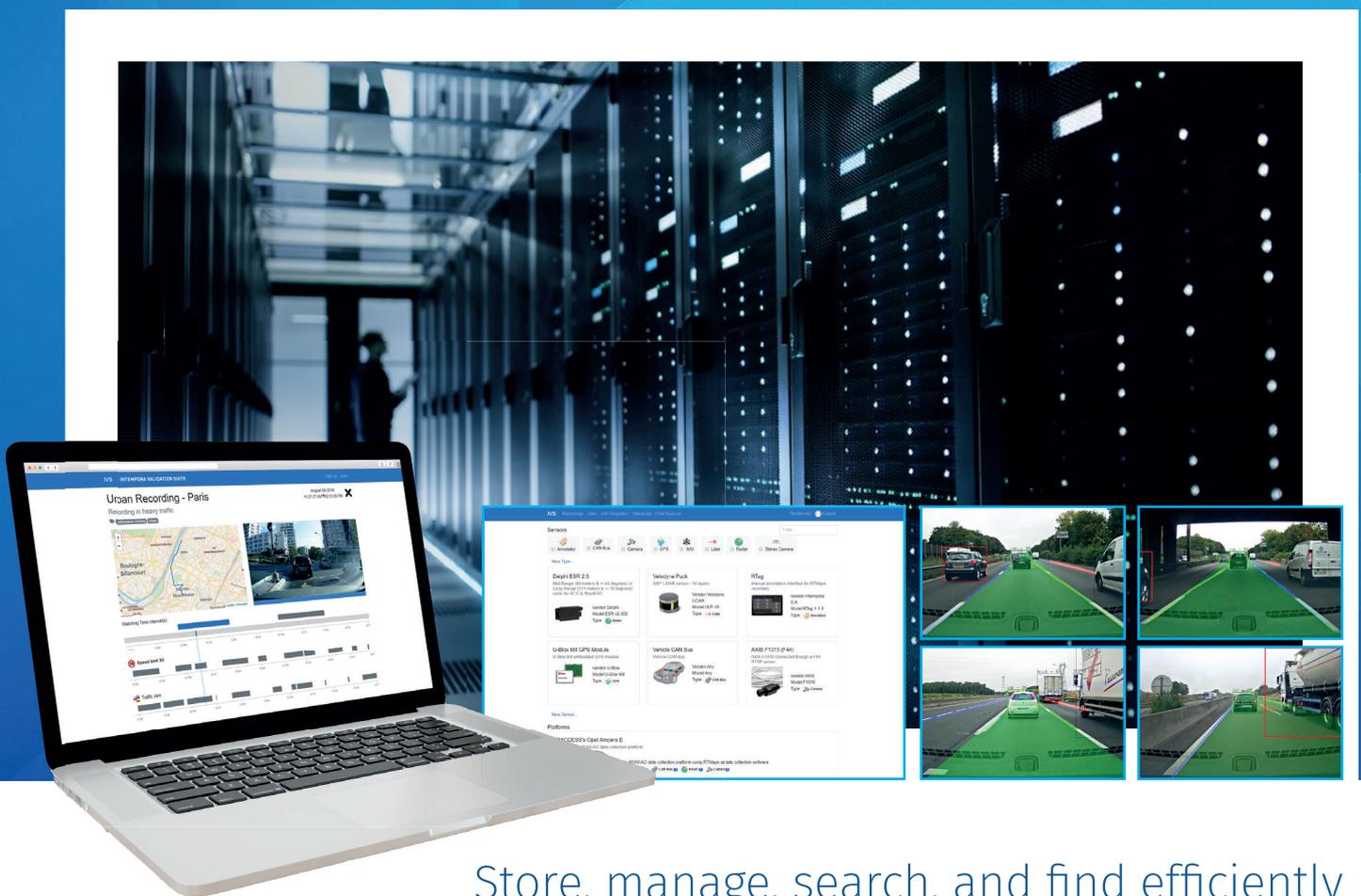
Store, manage, search, and find efficiently your PetaBytes of recorded sensor data.

■ WHAT IS IVS?

IVS - Intempora Validation Suite allows automotive engineers to centralize, store and share their recorded driving situations with raw sensor data in the cloud or on-premises, index them, search for particular situations, preview results, prepare and automate the post-processing of such huge amount of driving data on parallel and high-performance computing clusters.
IVS is made of two main modules.

■ IDM - INTEMPORA DATA MANAGER

IDM is the core part of the IVS solution. It consists in a centralized big-data database to store, re-index, preview and search for particular driving scenarios among your large amounts of recorded data (up to PetaBytes, including video streams, Lidars, Radars, GPS, CAN, biometrics and any other automotive sensors data)

■ ITM - INTEMPORA TEST AUTOMATION MANAGER

Based on the search results found in IDM, the Intempora Test Automation Manager allows you to inject your own software features, perception and deep learning algorithms in the cloud and auto-mate post-processing tasks in a distributed manner on clusters of computing nodes in your Cloud environment.

■ COMPLEMENTARY SOFTWARE TOOLS

℞ RTMaps

Thanks to RTMaps (Real-Time Multisensor applications), engineers can develop high-end in car data recording systems and design algorithms and software features for integration, execution and testing. RTMaps can be used in IVS as a post-processing framework.

℞ RTag

RTag is a live manual tagging software application available on tactile tablet. Connected to your data recorder, it becomes easy to manually annotate data while driving, in conjuction with potental annotation algorithms running in real-time in your data recorder.

ADVANTAGES

• Tackle the SOTIF (Safety Of The Intended Functionality - ISO 21448) recommendations for your perception and deep learning algorithms.

• Seamless workflow between Intempora software products.
• RTMaps for IVS offering an optimized post-processing framework with unprecedented execution performance, saving time and computing resources.
• RTag for IVS offering an easy-to-use manual tagging tool to annotate and monitor your self-driving sessions.
• Support for more data formats and middleware environments such as ROS.
• Interoperability with third party labeling sofware tools.
• High capacity and efficient storage based on state-of-the-art big data technologies.
• Blazing fast search for particular situations and corner cases thanks to indexed tags and metadata.
• Direct online driving data preview.
• Transfer the algorithms not the data.
• Make the masses of collected driving data available and share it to all your development, testing and validation teams around the world.
• Take the most out of your cloud infrastructure and drastically reduce offline testing duration and cost.

"Data management and test automation for ADAS/AD functions validation are a longtime request by our users all over the world.
We are proud to release the Intempora Validation suite (IVS) and partner with Microsoft Azure to answer to the automotive industry needs»
Nicolas du LAC, CEO of Intempora

■■ Microsoft
■■ Azure