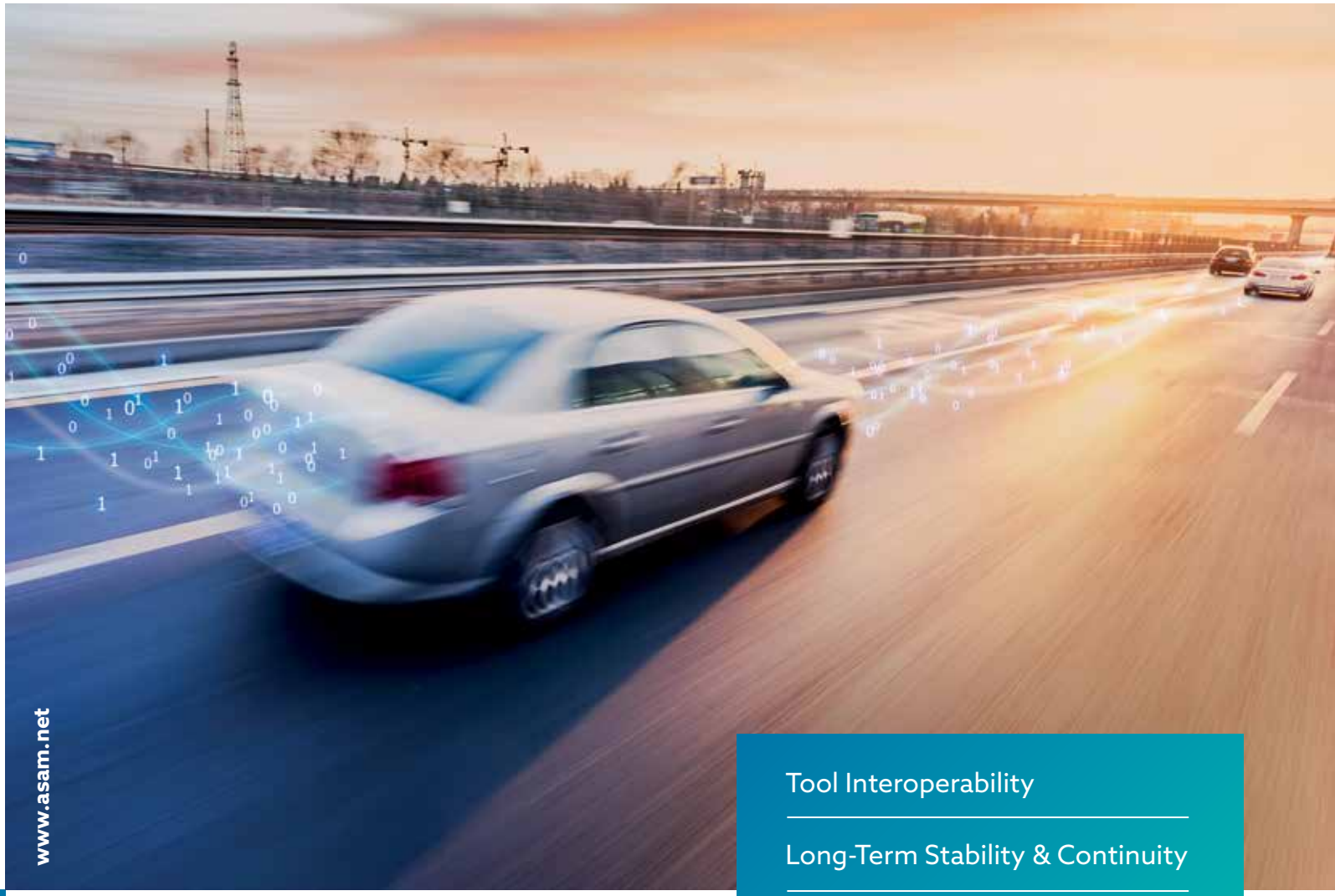
No. 8

ASAM SOLUTIONS GUIDE

STANDARDS I MEMBERS I PRODUCTS



Tool Interoperability

Long-Term Stability & Continuity

Seamless Data Exchange

ASAM

Association for Standardization of
Automation and Measuring Systems

Dear Reader,

The automotive industry is facing rapid change: *Disruptive innovations from the IT sector promise new business opportunities such as autonomous driving, connected technology, and – consequently – new business models for greater choice and convenience of transport. Each of these opportunities require complex integrated systems, which must be simulated, developed, and validated. Therefore, we see many interesting opportunities for ASAM ahead of us. Some opportunities have already been identified, such as changes to the ECU architecture, big data applications, and secure vehicle connectivity. Others are yet to be discovered.*

ASAM is the right community to take on these challenges.

We are a growing and dynamic community: *As projects from new domains are being addressed within ASAM, we also see new groups of experts joining our association: The ideation activities in the connected vehicle area have brought the first Telematic Service Providers into ASAM. New application ideas for ASAM XCP have driven the major debugging tool suppliers to join. All these new members integrate into the established community, contribute to standards and incorporate standards into tools. This way, the entire community becomes stronger and is enabled to take on the upcoming challenges.*

We are an active community: *Not only the membership but also the number of projects is increasing. In 2016, ASAM released two completely new standards, ASAM CERP and ASAM CPX. Further new standards are currently under development and critical standards are being advanced (for more information see pages 6 – 7). Some of the projects have been initiated by American and Japanese members. These international members bring new ideas and new requirements into ASAM thus improving the quality and expanding the reach of ASAM standards. The ASAM Team has been expanded to support and encourage international collaboration.*

ASAM is and will remain a community of technical experts in an increasingly expanding field of operation. The benefit of the community is driven by each member: your requirements, your needs, and your contribution in the working groups. We look forward to and encourage your continued participation.

Sincerely,
Marc Blatter
Chairman of the Board of Directors
ASAM e.V.

ASAM

ASAM MEMBERS

OEMs

TIER-1 SUPPLIERS

TOOL VENDORS

ACADEMICS

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ABOUT ASAM

Achievements 2016 / 2017:

ASAM has always had a highly motivated and engaged membership who believes in the benefits of standards. Together, the ASAM members turn common visions into projects, drive projects into standards, and implement these standards into products and development tool chains. The ASAM Office supports and nurtures this engagement which provides benefits and experience to all contributors.

ASAM invites you to become active in the community:

1. **Experience the ASAM Spirit**
   Be part of a global network of experts who all work together to bring projects forward to standards that drive automotive development.
2. **Experience Thought Leadership**
   Work together with experts on a common vision while simultaneously broadening understanding on highly relevant industry topics.
3. **Experience Efficiency and Proficiency**
   Take advantage of a well-organized association, with clearly structured processes and technical expertise – all focused to drive projects to success.
4. **Experience Reliability & Quality**
   Rely on solutions and standards that are based on joint decision-making by experts – thus increasing industry acceptance, quality and usefulness, and reducing likelihood of failure.

Learn about the recent developments in the ASAM community.

EXPERIENCE THE ASAM SPIRIT

ASAM's success is based on an open exchange among the membership. To promote this exchange, to spark discussions on common challenges, and to create an "ASAM Spirit" that cumulates in a joint solution finding, ASAM is offering various opportunities to meet and to connect:

ASAM International Conference
On Dec. 06 / 07, 2017 ASAM will host the 3rd ASAM International Conference in Dresden, Germany. Under the title "Autonomous Driving – Big Testing and Big Data as the Next Challenge of the Automotive Industry", international industry experts will talk about the radical changes to the automotive development process due to rising complexity of future vehicles and shorter software-like development cycles compounded by the risk of cybersecurity attacks. (www.asam.net/asam-conference-2017.html)

Continuous Exchange
ASAM is currently working on a new website and a new corporate design. The goal is to improve usability, enhance transparency, establish a basis for identification, and increase participation. The Go-Live is foreseen for fall 2017.

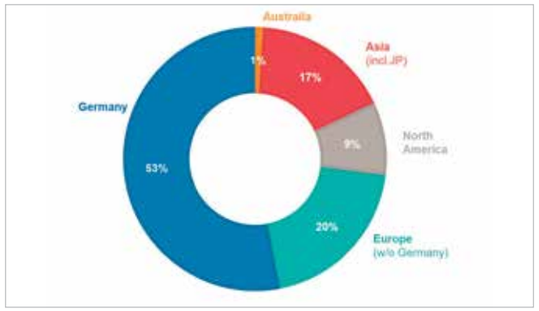
EXPERIENCE THOUGHT LEADERSHIP

ASAM's membership consists of experts in various fields that work together to overcome challenges in non-competitive areas. Each expert enriches the work group by different use cases and requirements. Working together in this setting offers all participants to broaden their understanding of various industry topics.

New Area of Activity
In 2016, Cummins Inc. initiated a new domain of interest broadly described as „Telematics". The aim is to establish a secure end-to-end bi-directional transmission of data between a vehicle ECU and the manufacturer's IT infrastructure. Standards in this area will allow the manufacturers more freedom in selecting global or regional Telematic Service Provider partners. In a first step, the participating organizations in the US, Canada, India and Germany are aligning requirements based on the needs in the different regions.

Extended Scope of Expertise within ASAM
In the past years, the ASAM community has experienced a steady increase in membership. Some of these new members bring in new areas of expertise: The first Telematics Service Providers joined driven by the "Telematics" activities and major debugging tool suppliers became members due to the project "Debugging over XCP". With these new members, ASAM continues to extend its scope of expertise within the community.

International Membership
Over the years, ASAM has grown into a truly international association. In the early 2000s, the ASAM Membership consisted of more German organizations than international organizations. Today, half of the total membership comes from outside of Germany.



2016 ASAM MEMBERSHIP: COMPOSITION BY REGION

One effect is that more project initiatives and participants come from abroad. The concept projects "Big Data Technologies for ASAM ODS" (initiated by US members) and "ASAM HEX File Management" (initiated by Japanese members) are just some of these initiatives.
ASAM tries to further push international exchange among experts. Therefore, ASAM is continuously looking for cost-effective solutions to overcome time differences and language barriers, to reduce travel costs.

EXPERIENCE EFFICIENCY AND PROFICIENCY

One of ASAM's advantages is the fast standards development process as it has been proven in many projects over the years. But while the whole process is focused to bring standardization to conclusion ASAM also stands for quality and usability of its standards.

Important Releases:
ASAM CPX and **ASAM MCD-2 CERP** provide a language and exchange format to capture expert knowledge about the calibration of ECU software. The two standards provide the basis for "Calibration Expert Systems" that help to manage the increasing complexity of ECU development. ASAM tool vendors have already started to develop tools based on these new standards.

A new update to the popular **ASAM ODS** standard has been released signifying a major technology update. ASAM ODS 6.0 adds a new client-server API based upon HTTP, called the „HTTP-API". This API exposes a set of web-services via HTTP-commands and uses Google protocol buffers (protobuf) to serialize the information transferred between client and server.

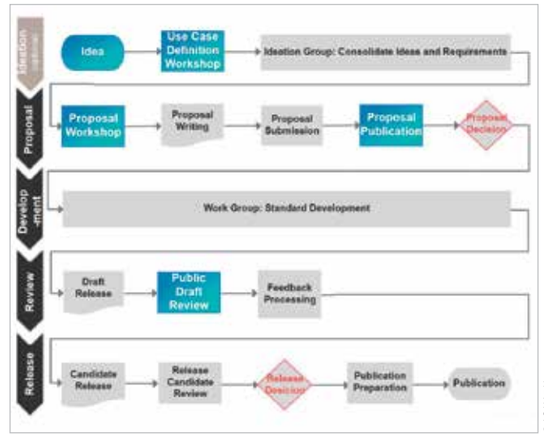
Current innovative projects:
ASAM MCD-1 POD (Plug-on-Device) is a completely new standard which has been released in June 2017. It describes the configuration of POD-adapters for a calibration system and their software interface toward the ECU. The standard eases the integration of different PODs to an ECU, and ultimately allows exchanging PODs without any changes in the ECU's software.

ASAM HEX-File Management is the first project initiated and driven by Japanese members. This project will determine a concept for a potential new ASAM standard that helps to select HEX Files that correctly work together due to the strong interdependencies between ECUs, particularly in the areas of ADAS and autonomous driving.

EXPERIENCE RELIABILITY & QUALITY

Standardization Process
ASAM is convinced that contribution by more global experts ultimately leads to more useful results. High quality, paired with increased usefulness, lead to more acceptance of the standards. ASAM has reworked the standard development process adding process steps that enable more members to provide input and expertise, even when not actively participating in a project group.

Ideation & Standard Development Process



PROCESS STEPS THAT ENABLE MORE MEMBERS TO PROVIDE INPUT AND EXPERTISE.

The new process is designed to create more transparency and to allow all members to provide input during critical phases of the development process:

1. **Ideation & Use Case Definition Workshop:**
   Members and non-members can propose ideas for new standards. The ASAM Office works with the group to gain international participation and to ultimately guide them into the standard development process.

2. **Proposal Workshop:**
   Members and non-members define their problem descriptions, use-cases, features, requirements and proposals for solutions. The goal is to find a wide overlap of interest among members in developing a new or expanded standard.

3. **Proposal Publications:**
   Members can enroll to directly participate in a project. Members can also comment on the proposal and ask the project group for consideration of certain features or requirements.

4. **Public Draft Reviews:**
   Members have the opportunity to review a draft standard and provide feedback. The project group will consider the feedback and correct errors or improve the technical content prior to release.

These opportunities will be regularly announced via ASAM Email alerts.

Increased Transparency
The ASAM Office has established several instruments to better inform and enable to participate in the community. Whether you sign up for the ASAM newsletter and email alerts or watch out for updates on the ASAM website: ASAM cordially invites everybody to actively participate.

ASAM

Long-Term Stability & Continuity – Tool Interoperability – Seamless Data Exchange

BACKGROUND

Automotive manufacturers are being forced to seek out new ways to cut costs while at the same time increasing electronic content to deliver new features to consumers. Standards-based solutions can contribute to both of these goals by making it easier to integrate low-cost off-the-shelf solutions in unique ways to develop cutting edge features for their customers. ASAM standard interfaces, protocols, and data exchange formats help automobile manufacturers survive and thrive in difficult times by enabling engineering teams to deliver the features that customers want while driving down costs.

ABOUT ASAM

ASAM, Association for Standardization of Automation and Measuring Systems, was founded in 1998 as an initiative of German car manufacturers. ASAM has since established itself as a reliable and strong partner for standardization projects. The ASAM organization was created with the goal of offering a platform for the development of universal standards. End users of a standard (OEMs and system suppliers) bring in their requirements and work together with tool vendors, service providers, and universities to commonly develop and maintain standards. All ASAM members have the opportunity to actively influence the development of the standards. ASAM is a registered association (e.V.) with the head office located near Munich, Germany and a branch office in Tokyo, Japan. The association has currently more than 190 members from the Automotive OEM, Tier-1, and tool supplier communities, as well as universities.

SCOPE

Measurement & Calibration

The ASAM standards in the measurement & calibration area support the ECU calibration process. The standards allow to seamlessly connect tools throughout the entire tool chain from the ECU to calibration data management systems. ASAM standards describe calibration protocols for typical automotive bus systems, file formats for unambiguous data exchange and APIs that provide remote access for tools and automation systems. ASAM standards for measurement & calibration are implemented in almost every calibration system on the market.

Diagnostics

ASAM standards in the diagnostics area support the development of diagnostic routines of an ECU and their communication to external devices. They allow a manufacturer-independent description of diagnostic services, error codes, parameters and interfaces available on an ECU. Furthermore, ASAM provides an API for programmatic and vendor-independent access to those features, e.g. from workshop testers.

ECU Networks

The lower-levels of vehicle bus systems are well standardized at ISO, SAE or other standardization organizations. However, they all have their proprietary description format, when it comes to specifying the actual communication on the bus (messages, frames, timing, etc.). ASAM MCD-2 NET (FIBEX) closes this gap by providing a formal data model and file exchange format for this purpose. The standard supports the most popular Automotive bus systems, which are FlexRay, MOST, CAN, TTCAN, LIN and Ethernet.

Software Development

The primary focus of ASAM standards in the software development area is to support the collaboration between customers (OEMs) and its suppliers. ASAM standards cover specific steps in the ECU software development process, for instance, by providing a formal and functional description of software components, software documentation generation, data format for change requests and a blockset for model-based development.

Test Automation

Test systems consist of many components, e.g. tools that control the tests, tools that execute the tests, test scripts, simulation models, sensors, actuators, the units-under-test and much more. They all need to communicate with each other and exchange data. ASAM standards provide APIs for integrating test components from different vendors into a seamlessly working system. If applied consequently, individual components of a test system can be exchanged without the need to re-write test scripts, simulation models, drivers or other major integration efforts.

Data Management & Analysis

ASAM standards for Data Management & Analysis allow to store, search, retrieve and analyze large amounts of data from test stands, data loggers or other sources in the testing area. Clearly defined semantics of the data, APIs for data access, format definitions for database and exchange files makes the data independent from their source and usable on an enterprise level. ASAM standards and compliant tools are an enabler to draw the maximum value from costly test data.

ASAM PROVIDES

For End Users: Easy system integration (plug & play) for automation and measurement systems with ECUs; exchangeability of tools (independent from manufacturer); seamless data exchange; data interpretation without misunderstandings and ultimately a competition boost. Long-term applicability guarantees the safeguarding of investments.

For Tool Suppliers: The ability to influence the standards with your knowledge; the ability to minimize development costs due to standardized requirements of various OEMs; the ability to share development costs through a common approach; and an increase in marketing potential.

For ASAM Service Providers: Know-how about standards; better technical solutions (e.g. connect data loggers with ODS data bases); a door-opener to clients; and a cost advantage due to using a few standards for many customers.

For Research Institutes: The opportunity to do industry-oriented research.

ASAM E.V. – THE ORGANIZATION

ASAM is setup as an incorporated association. This structure allows an easy integration of new members in the existing organization. The highest decision-making body of ASAM e.V. is the **Annual General Assembly**. Each company has voting rights in proportion to its annual membership fee. The delegates elect the Board of Directors and the Technical Steering Committee for alternating two-year terms. Additionally, they accept the annual financial report, approve changes of the statutes and vote upon any further decisions of strategic importance.

The **Board of Directors (BoD)** has operational control of the association, but is bound to the decisions of the membership meeting. The Board represents ASAM in all legal and public matters, it is responsible for the finances of the association, decides on the admission or expulsion of members, sets guidelines for the other committees and the head office, develops a long-term strategy for the association and monitors its execution.

The **Technical Steering Committee (TSC)** focuses mainly on technical and market aspects of ASAM standards. The primary goal of the TSC is to ensure that the standard portfolio of ASAM meets market requirements and stays competitive. The committee evaluates technical proposals, monitors the progress of ongoing projects, and reviews and releases new or revised standards.

The actual development work of standards is done by the **ASAM Project Groups**. These groups may work on the development of future versions of a standard (FVD Projects), or carry out maintenance tasks on a standard such as minor revisions or bug fixing (Maintenance Projects). New standard proposals are initiated by the members and submitted to the TSC for approval.

The central coordination role comes from the **ASAM Head Office** near Munich, Germany. It takes care of the distribution of standards, maintains an IT infrastructure for the Project Groups, provides first-level expertise on its standards, carries out technical marketing and provides general membership services.

ASAM cooperates closely with other organizations, e.g. ISO, AUTOSAR, Eclipse, ARTEMIS Standardization Working Group, MOST Cooperation (FIBEX-4MOST) and CAN in automation (CIA). With its branch office in Tokyo, Japan, and its representation in Pune, India, ASAM has created more support to advance standardization and the distribution of standards worldwide.

STRATEGY

The Board of Directors (BoD) is responsible for the strategic conept of ASAM e.V.

TECHNOLOGY

The TSC is responsible for the technical steering of ASAM e.V.

The standardization work is organized in project groups.

ASAM ORGANIZATIONAL STRUCTURE

MEASUREMENT & CALIBRATION

Standard Market Name	Type	Title	Version	Content Characterization	Technology Reference
ASAM CDF	BS	Calibration Data Model Format	2.1.0	Format Description (XML)	
ASAM CPX	BS	Calibration Process Exchange Format	1.0.0	API, Format Description (XML)	
ASAM MCD-1 CCP	BS	CAN Calibration Protocol	2.1.0	Protocol Definition	
ASAM MCD-1 XCP	BS	Universal Measurement and Calibration Protocol	1.4.0	Protocol Definition	
	AS	CAN Transport Layer	1.4.0	Transport Layer Specification	
	AS	Ethernet Transport Layer	1.4.0	Transport Layer Specification	
	AS	SxI Transport Layer	1.4.0	Transport Layer Specification	
	AS	USB Transport Layer	1.4.0	Transport Layer Specification	
	AS	FlexRay Transport Layer	1.4.0	Transport Layer Specification	
ASAM MCD-1 POD	BS	Plug-On Device Interface	1.0.0	API	
ASAM MCD-2 MC ASAP2 / A2L	BS	Data Model for ECU Measurement and Calibration	1.7.0	Format Description (NON-XML)	
ASAM MCD-2 CERP	BS	Calibration Expert System Rule and Product Model Format	1.0.0	API, Format Description (XML)	
ASAM MDF	BS	Measurement Data Format	4.1.1	Format Description (Binary)	
	AS	Naming of Channels and Channel Groups	1.0.0	Format Description (Binary)	
	AS	Bus Logging	1.0.1	Format Description (Binary)	
	AS	Measurement Environment	1.0.0	Format Description (Binary)	
	AS	Classification Results	1.0.0	Format Description (Binary)	

DIAGNOSTICS

Standard, Market Name	Type	Title	Version	Content Characterization	Technology Reference
ASAM MCD-2 D ODX	BS	Data Model for ECU Diagnostics	2.2.0	Format Description (XML)	Communication Parameter Specifications
	AS	Authoring Guidelines	1.0.0	Format Description (XML)	
ASAM OTX Extensions	BS	Open Test eXchange Format	2.0.0	API, Format Description (XML)	

ECU NETWORKS

Standard Market Name	Type	Title	Version	Content Characterization	Technology Reference
ASAM MCD-2 NET FIBEX	BS	Data Model for ECU Network Systems	4.1.2	Format Description (XML)	Communication Parameter Specifications

SOFTWARE DEVELOPMENT

Standard Market Name	Type	Title	Version	Content Characterization	Technology Reference
ASAM CC	BS	Container Catalog Data Model Format	3.0.0	Format Description (XML)	
ASAM FSX	BS	Functional Specification Exchange Format	1.1.0	Format Description (XML)	
ASAM ISSUE	BS	Issue Exchange Format	3.1.1	Format Description (XML)	
ASAM LXF	BS	Layout Exchange Format	1.0.0	Format Description (XML)	
ASAM MBFS	BS	Model Based Function Specification	1.0.0	Blockset Specification	MATLAB, Simulink
ASAM MDX	BS	Meta Data Exchange Format for Software Module Sharing	1.2.0	Format Description (XML)	

BS: Base Standard, AS: Associated Standard, SW: Software

TEST AUTOMATION

Standard Market Name	Type	Title	Version	Content Characterization	Technology Reference
ASAM ACI	BS	Automatic Calibration Interface	1.4.0	API	Corba
ASAM ATX	BS	Automotive Test Exchange Format	1.0.0	Format Description (XML)	
ASAM GDI	BS	Generic Device Interface	4.5.0	Set of Standards	C++ API
	AS	COM Communication Type	3.0.0	Transport Layer Specification	
	AS	IP4 Communication Type	3.0.0	Transport Layer Specification	
	AS	LPT Communication Type	3.0.0	Transport Layer Specification	
	AS	SoftSync Communication Type	3.0.0	Transport Layer Specification	
	AS	USB	3.1.0	Transport Layer Specification	
	AS	Chassis Dyno Device Capability Profile	1.0.0	Application Area Companion	Skeleton
	AS	Crash Device Capability Profile	1.0.0	Application Area Companion	
	AS	MCD-3 Device Capability Profile	2.1.0	Application Area Companion	Skeleton
	AS	MDAQ Device Capability Profile	2.0.0	Application Area Companion	Skeleton MDAQ Profile Definition
ASAM ASAP3	BS	Automation/Optimization Interface for ECU Calibration System	2.1.1	Protocol Definition	
ASAM MCD-3 MC	BS	Application Programming Interface or MC Systems	3.0.0	API	COM/DCOM
ASAM MCD-3 D MVCI D-Server API	BS	Application Programming Interface for D Systems	3.0.0	API	COM/DCOM, JAVA, C++
ASAM XIL	BS	API for ECU Testing via XIL	2.1.0	API	.NET (C#), PYTHON, XIL Software

DATA MANAGEMENT & ANALYSIS

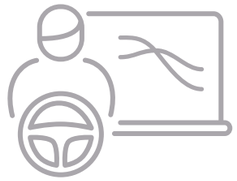
Standard Market Name	Type	Title	Version	Content Characterization	Technology Reference
ASAM CEA	BS	Components for Evaluation and Analysis	2.2.0	API	JAVA, .NE
ASAM ODS	BS	Open Data Services	6.0.0	Set of Standards	RPC API, CORBA API

SOFTWARE

Standard Market Name	Type	Title	Checked Version(s)	Checked Objects
ASAM MCD-2 MC Checker A2L Checker	SW	ASAM MCD-2 Checker	V1.5.1, 1.6.0, 1.7.0	a2l, aml

BS: Base Standard, AS: Associated Standard, SW: Software

MEASUREMENT & CALIBRATION



ASAM CDF
CALIBRATION DATA FORMAT

An essential part of control algorithms in an automotive ECU are parameters, i.e. scalars, curves and maps. These have a major impact on the control behavior of the ECU and are typically determined through an iterative calibration process. Calibration parameter values are a result of this process. They are produced over time from different tests, for different software versions of an ECU and for different hardware versions of the controlled system. Calibration engineers need the values and further information about their maturity level to be able to decide on further actions. Calibration values are typically processed by multiple tools of the ECU development process, such as calibration data management tools, model-based development tools, code generators, calibration expert systems and product life-cycle management tools. This requires a common file format that is understood by all tools.
ASAM CDF (Calibration Data Format) defines a description format to describe the values of ECU calibration parameters and associated meta data in a well-defined XML format. ASAM CDF is a complementary standard to ASAM MCD-2 MC, in that MCD-2 MC describes the properties of the calibration parameters and CDF describes their values and associated information about their origin and quality.

ASAM CDF supports all data types used in the ASAM MCD-2 MC standard like scalars, curves, maps, arrays and structures. ASAM CDF additionally defines six dedicated maturity levels plus one “undefined” state. These maturity levels can be mapped to company-specific definitions. This allows transferring and correctly interpreting maturity information between different systems.

Application Area
The ASAM CDF standard is widely used in the automotive industry and is supported by every major calibration tool on the market. It is aligned with other ASAM standards like ASAM MCD-1 XCP/CCP, ASAM MCD-2 MC and ASAM MCD-3 MC/ASAP3.

Standard Authors
Continental Automotive AG, dSPACE GmbH, ETAS GmbH, Robert Bosch GmbH, Vector Informatik GmbH, XI-Works

ASAM CPX
CALIBRATION PROCESS EXCHANGE FORMAT

ASAM CPX is an extension of the ISO OTX standard (ISO 13209), which defines functions to describe test procedures for the calibration of ECUs, i.e. to determine and validate the parameters of ECU software. This task is traditionally carried out by technical experts, who use their expert-knowledge in test runs on simulation models, test benches or with prototype vehicles. This expert-knowledge is business-critical IP of each company. However, without a standard, the knowledge is either not documented at all, or it is documented in formats chosen by the experts, e.g. verbal descriptions, Excel sheets or in a scripting language. This severely inhibits knowledge transfer within the company or between OEMs and its supplier.

ASAM CPX solves this problem by providing a formal description method, based upon ISO OTX, which provides the necessary functions to specify ECU calibration tests. ASAM CPX extends ISO OTX with a programmatic access API to calibration and measurement data on the ECU, access to meta information about this data (from A2L files), functions for controlling the execution of measurement tests and simulation models, and specific mathematical functions. Further extensions of OTX allow to use flow-charts and state-machines.

With the help of ASAM CPX, a company can now create comprehensive libraries of test sequences for all typical ECU calibration tasks, transfer this knowledge easily to new staff members, share the knowledge with their customers or suppliers, and increase the degree of automation step-by-step as better automation tools become available. In conjunction with ISO OTX part 1 to 3 and ASAM OTX part 4 and 5, a comprehensive language and exchange format is available for the automotive industry, which allows to specify the ECU calibration processes in detail and to freely exchange this knowledge.

Application Areas
ASAM CPX is used for the description of ECU tests for calibration parameter determination and validation. The standard is useful for exchanging the test specifications between tools. The tools may be used for documentation purposes, for partial of full test automation.

Standard Authors
EMOTIVE GmbH & Co. KG, ETAS GmbH, HORIBA, Technische Hochschule Aachen, Vector Informatik GmbH, ZF Friedrichshafen AG

ASAM MCD-1 XCP
UNIVERSAL MEASUREMENT AND CALIBRATION PROTOCOL

ASAM MCD-1 XCP (Universal Measurement and Calibration Protocol) defines a bus-independent, master-slave communication protocol to connect ECUs with calibration systems. XCP is short for Universal Measurement and Calibration Protocol. The primary purpose of XCP is to adjust internal parameters and acquire the current values of internal variables of an ECU. The first letter X in XCP expresses the fact that the protocol is designed for a variety of bus systems. The standard consists of a base standard, which describes memory-oriented protocol services without direct dependencies on specific bus systems. Several associate standards contain the transport layer definitions for CAN, FlexRay, Ethernet (UDP/IP and TCP/IP) and serial links (SPI and SCI).
ASAM MCD-1 XCP accesses parameters and measurement variables in a memory address oriented way. The properties and memory addresses of this data are described in the A2L-file format, which is standardized through ASAM MCD-2 MC. The A2L-file contains all the information necessary to access and correctly interpret the data that is transmitted via the XCP protocol. This means that access to a specific parameter or variable does not need to be hard-coded into the ECU application. In other words, the ECU contains only a generic XCP-protocol stack, which responds to memory access requests from the calibration system. Different calibration and measurement tasks can be performed by different configurations of the calibration system without recompiling and reprogramming the ECU application code.

ASAM MCD-1 XCP was designed with two main objectives. Firstly, to keep the impact on ECU resources, such as CPU load, RAM consumption and flash memory, as low as possible, and secondly, to achieve a maximal data transmission rate over the communication link with minimal protocol overhead. The standard also describes the organization of the ECU memory segments used by the ECU software. This allows memory-type specific access. If data is acquired from multiple ECUs, then the standard describes three techniques for correctly correlating the time between the data.

Application Areas
ASAM MCD-1 XCP is an established and mature standard since 2003 and is used by both OEMs and ECU manufacturers. Compliance to ASAM MCD-1 XCP reduces the variety of calibration systems as well as avoiding the need to create specific ECU implementations for specific application tasks. ASAM MCD-1 XCP originates from the predecessor standard ASAM MCD-1 CCP, which was a measurement and calibration protocol specific to the CAN bus.

Standard Authors
Accurate Technologies Inc., Continental Automotive GmbH, CSM GmbH, Daimler AG, dSPACE GmbH, ETAS GmbH, RA Consulting GmbH, Robert Bosch GmbH, Vector Informatik GmbH

ASAM MCD-1 POD
PLUG-ON DEVICE INTERFACE

Plug-on devices (POD) are hardware adapters, which provide direct read-write access for external tools, such as measurement and calibration systems or debuggers, to the ECU‘s internal resources, like memory . PODs require a driver in the ECU software, called the POD Service Software (PSS), which handles the communication between the ECU software and the external tool(s). ASAM MCD-1 POD standardizes major parts of the PSS, significantly easing the job of ECU basic software developers and integrators. This has the major advantage that PODs and external tools can be exchanged without major changes to the internal ECU software, or with no changes to the ECU software at all in the most ideal case (‚plug-and-play‘). Consequently, it becomes much easier to switch tools for ECU development and testing activities, and to ultimately achieve the freedom to select the most appropriate tools for a given task.
The standard supports the technical processes of POD configuration, detection and initialization. Furthermore, the use-cases of synchronous measurement and calibration are supported. More use-cases might be added in future versions of the standard. The standard specifies an API between the PSS and the ECU software. Some API functions are fully ASAM-specified and others just contain the syntactic interface description, allowing vendor-specific implementations within the PSS. Furthermore, an A2L-file is provided for ASAM-compliant measurement and calibration tools. In parallel, the ASAM MCD-1 XCP has been extended with new commands and events to configure a POD and retrieve status information. The standard is shipped with a reference implementation for the standardized PSS functions.

Application Area
The standard has been created to support the development and integration of vendor-independent software drivers for the integration of PODs in ECUs. Tool vendors in the area of measurement

and calibration systems, debuggers, data loggers and rapid control prototyping systems may decide to implement a driver according to this standard. ECU software developers and integrators, particularly in the area of basic ECU software, as well as experts in development tools & methods at OEM- and Tier-1-companies would profit most from using the standard. The most prominent benefit of having an ASAM-compliant PSS in the ECU is the easy integration and quick exchange of external ECU tools within the same development and testing project.

Standard Authors
Accurate Technologies Inc., AVL List GmbH, Continental Automotive GmbH, DIAWA Software Concepts & Engineering, dSPACE GmbH, ETAS GmbH, Intrepid Control Systems GmbH, M&K GmbH, RA Consulting GmbH, Robert Bosch GmbH, Vector Informatik GmbH, Volkswagen AG

ASAM MCD-2 MC
DATA MODEL FOR ECU MEASUREMENT AND CALIBRATION

An essential part of ECU software development is the calibration of control strategies parameters. This means the adaption of scalars, curves and maps to achieve an optimized and appropriate system behavior. Internal variables need to be read from the ECU to evaluate the effectiveness of the calibrated software. Such operations are carried out by tools which need a detailed description of the calibration parameters and internal variables. They furthermore need to have a description of the device interface to the ECU for read and write access. This description is typically produced by function developers, software engineers, tool & instrumentation experts, and is used by calibration engineers.
The ASAM MCD-2 MC standard (aka ASAP2) was developed to take into consideration the needs of all groups involved in the calibration process. The standard defines a description format that describes the calibration parameters (called CHARACTERISTIC) and internal variables (called MEASUREMENT) of ECU software. The description includes elementary information like addresses, data types, dimensions, identifiers and much more. To convert the ECU internal characteristic and measurement implementation values into physical values, ASAM MCD-2 MC describes computation methods for their conversion between both representations. Calibration engineers can work with the ECU data in a familiar format without having to understand ECU-internal data formats. Software engineers can provide this data to them or even get the description files automatically generated from code generators. An included mechanism ensures that description files can originate from different sources.
The standard also describes the organization of the ECU memory segments used by the ECU software. This allows memory type specific access. It additionally describes the ECU interface for data read- and write access. Users can create their own descriptions for their specific ECU interfaces via the ASAM Meta Language (AML).
The standard allows the connection of software development tools, calibration tools and ECU calibration interfaces with a neutral description format (A2L). All tools that support the description format are able to exchange and process the included information, hence there are no vendor-specific or technology-specific dependencies between tools of an ASAM-compliant calibration tool-chain.

Application Areas
The ASAM MCD-2 MC standard is widely used in the automotive industry and supported by every major calibration tool on the market. ASAM MCD-2 MC V1.7.0 introduced several features needed to calibrate AUTOSAR-compliant ECUs. This includes the introduction of call to transformer functions, which allow to calibrate highly optimized data structure as they are used in the AUTOSAR basic software modules FIM, DEM and DCM. Furthermore, the format now supports the definition of BLOBs (binary large objects) and structured data types. The standard is aligned with other ASAM standards like ASAM MCD-1 XCP/CCP, ASAM CDF and ASAM MCD-3 MC/ASAP3.

Standard Authors
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ASAM MCD-2 CERP
CALIBRATION EXPERT SYSTEM RULE AND PRODUCT MODEL FORMAT

ASAM MCD-2 CERP is an extension of the ISO OTX standard (ISO 13209), which defines functions to describe calibration parameter dependencies. The current version covers the use-case of calibration parameter checking. The standard may be extended in the future to include the use-case of calibration parameter calculation. Tools, which cover such use-cases, are broadly named „Calibration Expert Systems“.
The standard is an attempt to solve the problem of the steadily growing number of calibration parameters in ECU software and their variants. Parameter dependencies and variants become increasingly more enmeshed and complex. Ensuring that there are no contradictions and violations within the calibration data set of an ECU becomes a task that can not be handled without tool support any longer. Some OEMs and ECU supplier companies started to develop in-house tools, which allow to automate the task of calibration parameter checking.
ASAM MCD-2 CERP provides a standardized way for defining calibration parameter dependency rules. The standard has functions for access to database information (according to ASAM MCD-2 MC), calibration runtime data (values, units) and the product model exchange file. Additionally, sophisticated check functions and procedures are defined to compare and validate data. The standard includes a product model that describes properties and features of the system, which are not calibration parameters in the ECU, such as the number of cylinders or the emission law to which the vehicle has to comply with. Together with the language elements of ISO OTX, it is possible to write arbitrary check routines including branches, loops, conditions and mathematical calculations. This allows software engineers and calibration experts to write check scripts that formalize empiric calibration knowledge and relevant information about the control loop, software and hardware design. This expert knowledge is then used to validate calibration data.

Application Areas
Tools based on the standard can be used where parameter dependencies shall be checked against pre-formulated rules. Typical uses are in calibration tools and calibration data management systems. Control strategies engineers and ECU software developers typically write the rules. Calibration engineers, test engineers, quality assurance and release management then typically apply the rules to check their adherence. In some companies, formal parameter checking is part of the release procedure for ECU software.

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ASAM MDF
MEASUREMENT DATA FORMAT

Many software applications still use proprietary file formats to store acquired or calculated data. As a consequence, an exchange of data between different tools usually requires time-consuming data conversions that involve potential loss or alteration of information. The development of such converters is expensive and error-prone. Hence, a commonly accepted standard format greatly improves the seamless exchange of data between tools.
MDF (Measurement Data Format) is a binary file format which stores recorded or calculated data for post-measurement processing, off-line evaluation or long-term storage. MDF was originally developed as a proprietary file format in the 90s for use in the automotive industry, primarily for the areas of ECU development, calibration and testing. Since then, the format has evolved into a de-facto industry standard and is supported by many tools on the market, particularly by all leading tools in the measurement & calibration area. In 2009, MDF has been transferred to ASAM as an official industry standard.
As a compact binary format, ASAM MDF offers efficient and high performance storage of huge amounts of measurement data. MDF is organized in loosely coupled binary blocks for flexible and high performance writing and reading. Fast index-based access to each sample can be achieved by loss-free re-organization (i.e. sorting) of the data. Distributed data blocks even make it possible to directly write sorted MDF files. The file format allows storage of raw measurement values and corresponding conversion formulas, therefore raw data can still be correctly interpreted and processed by post-processing tools.
Since it became an ASAM standard, MDF has been developed in close alignment with other ASAM standards such as MCD-2 MC (ASAP2) or ODS. Consequently, ASAM MDF supports special data types and information particularly required in the automotive area, e.g. structures and arrays (curves/maps), bus events and synchronized video data.

In addition to the plain measurement data and all necessary meta information for its interpretation, MDF can also store descriptive and customizable supplementary data within the same file. MDF 4.0 offers flexible extensibility via generic XML fragments and a range of new features like custom signal grouping, events or attachments.

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DIAGNOSTICS

ASAM MCD-2 D
DATA MODEL FOR ECU DIAGNOSTICS

The electronics of passenger and commercial vehicles can be diagnosed, configured and programmed with new software. The design of these functions is specific to a vehicle model and/or manufacturer and thus the diagnostic capabilities of every vehicle and built-in ECU are highly individual. Within the life-cycle of the vehicle (engineering, production, service, end-of-life) many tools and applications access the ECU for testing, activation, de-activation, configuration and updating purposes. Before the standardization of ODX (Open Diagnostic Data Exchange) the diagnostic and configuration capabilities as well as the flash data descriptors were specified in non-standardized, mostly non-machine readable data formats (e.g. Word, PDF). Consequently, the relevant data had to be manually entered into all tools of the life-cycle, which is error-prone, expensive and impedes fast development cycles.
ODX addresses these challenges by providing an XML-based, machine-readable data format to specify and exchange vehicle and ECU diagnostic capabilities including variants throughout the vehicle life-cycle. ASAM took great care in producing a semantically well-defined data model that is the foundation for the data format. Together with the related standards ASAM MCD-3 D and ISO 22900-2 (D-PDU API), an architecture for vehicle communication has been defined that permits seamless processing of diagnostic, configuration and flash reprogramming data. This architecture enables the complete reuse of diagnostic data throughout the ECU's life-cycle and thus prevents errors and reduces effort for the creation of test-, configuration- and reprogramming-sequences.
Furthermore, ODX is independent of particular vehicle diagnostic protocols such as the KW 2000 (ISO 14230), UDS (ISO 14229) or SAE J1939. ODX is designed as a data model to describe the structure of data streams (aka "diagnostic services") and arbitrary protocols. In addition, specific descript ion formats have been defined to describe configuration data structures, flash re-programming data and vehicle functions.
ODX allows for some variance of how the vehicle and ECU capabilities are expressed. As a uniform usage of ODX within the process leverages greater benefits in using the data, it is an established best practice to formulate authoring guidelines for the creation of ODX and implement these guidelines in editors and/or checking tools.

Application Areas
The standard ODX can be employed anywhere in the vehicle life-cycle where vehicle electronics are tested, configured of flash re-programmed. OEMs employing this standard have reported considerably reduced setup times in the production of new models, highly reduced vehicle communication problems with diagnostic scan tools and much better support for vehicle variants.

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ASAM OTX EXTENSIONS
OPEN TEST EXCHANGE FORMAT

ASAM OTX is an extension of ISO 13029 „Open Test Exchange" (OTX) with added functionality required by the market. The parts 1 to 3 of the ISO standard contain the definition of a language and exchange format for the specification of executable test sequences. OTX has originally been developed for the area of ECU diagnostics testing, but is not limited to this area. Soon after the first OTX-based tools appeared on the market, end users required additional functionality, which were now implemented in ASAM OTX and are intended to be transferred to ISO to become part of ISO 13029.

Part 4 includes the functions:
- Definition of new data types, such as enumeration, structure and a type of undefined contend (similar to the C-type „void").
- Change monitoring and triggering of events when items in a List or Map of any depth has been changed.
- General read and write access to files, such as opening a file, reading and writing individual bytes or lines, closing a file or deleting a file.
- General processing of XML files, such as reading and writing an XML file, navigating through the XML structure, adding, changing or deleting elements and attributes.
- Load and save of persistent runtime data.

Part 5 includes the functions:
- Flow-charts.
- State-machines.

Furthermore, ASAM OTX contains a document that clarifies specification gaps, limitations and some known errors of ISO 13029.

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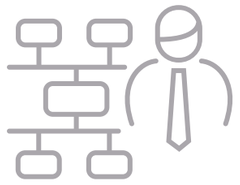
ECU NETWORKS



ASAM MCD-2 NET
DATA MODEL FOR ECU NETWORK SYSTEMS

During the implementation of ECU software, the correct configuration of the operating system's network stack is a fundamental requirement in ensuring the interoperability of ECUs within automotive networks. The configuration includes the definition of exchanged signals, datatypes and their explicitly defined declarations for various automotive communication systems. This information is typically provided in interface descriptions created by OEMs and forwarded to their ECU suppliers.
The ASAM MCD-2 NET standard (called FIBEX) provides a uniform, XML-based interface description for configuring the software of automotive networks. The standard allows the definition of network topologies, consisting of ECUs with network ports and gateways. The standard consists of a generic interface description and technology-specific extensions for FlexRay, MOST, CAN, TTCAN, LIN and Ethernet. Technology-specific properties are described for each network port. For example, addresses as well as transport protocols and the reserved ports are described for Ethernet and IP. Furthermore, the interface description contains a list of sent and received signals for each ECU. In the case of service-oriented communication, service provider instances and consumers are listed for each ECU.
ASAM MCD-2 NET is used for the design, configuration, monitoring and simulation of communication on automotive networks. For example, the standard supports auto-generation of software code for ECUs and the configuration of test tools for simple testing of ECUs. Test tools, which can import the interface description, are able to interpret network traces or carry out residual network simulation.

Application Areas
The ASAM MCD-2 NET standard is widely used in the automotive industry and is harmonized with the AUTOSAR system template. The current version 4.1.1 made the standard compatible with AUTOSAR 4.1 and resolved a few bugs.

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SOFTWARE DEVELOPMENT

ASAM CC
CONTAINER CATALOG

ASAM CC (Container Catalog) is used for describing engineering objects such as source code, compiled objects or documentation files. The objects are described with meta information such as creator, name, description, version, engineering domain, configuration and storage location. The standard is primarily used for exchanging information about engineering objects between OEMs and suppliers. Since ASAM CC-compliant description files are based upon XML with a standardized schema, tools and data repositories can import and export the data easily. Incremental data exchange is supported.

ASAM CC has the following main features:
- Description of the repository structure
- Description of the meta data for engineering objects
- Extensibility of the data model
- Revision information and change histories
- Support for linking
- Support for conditional document configurations (conditional compilation)
- Support for content view filtering

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ASAM FSX
FUNCTIONAL SPECIFICATION EXCHANGE FORMAT

A lot of companyes use common word processors or their own documentation systems to create functional specifications for software components. These systems are typically based on proprietary formats e.g. Word, PDF or HTML. This becomes a problem when different parties undertake projects. OEMs which develop parts of the ECU software and want to exchange their software components with one or more suppliers have to provide different documentation formats. Suppliers that have to integrate software components from different parties have to process different types of functional documentation formats and merge them with their own documentation to create a complete documentation of the ECU software.
Consequently, integrated documents often appear to be fragmented and inconsistent. Styling, layout and content structure may vary greatly across a document. Different documents aren't linked to each other by cross references and don't have shared tables of contents or indexes. This makes the readability and traceability of the documentation worse. Documentation, which is patched together in such a way, can give a confusing and unprofessional impression to readers.
The exchanged documents, furthermore, do not allow for parsing and extraction of data like labels, revision numbers and status of the software. The exchanged data formats are mostly pure presentation formats, which do not support a defined document content structure. Authors are allowed to do everything everywhere. This reduces the possibilities of automated data post-processing.
The functional documentation of software has to meet additional requirement like variant handling (i.e. create documents for each variant of a software component), handling of multilingual documents (i.e. create documents for different languages) and filtering of content (e.g. documents for internal and external use).
Different formats, the lack of machine-readability and no support for creating different versions of the documentation causes an increased workload for OEMs and suppliers. ASAM FSX (Functional Specification Exchange) overcomes those problems by defining an XML-based, machine-readable format for the creation, processing and exchange of functional documentation of software for ECUs.

ASAM FSX has the following main features:
- Description of software functions
- Standardized documentation structure
- Possibility to extend the documentation structure
- Full featured XML text model
- Support for multilingual texts
- Linking and indexing support
- Revision information and change histories
- Support for conditional document configurations (conditional compilations)
- Support for content view filtering

The standard is primarily used in the areas of model-based software development and software functional documentation. ASAM FSX is complementary to ASAM MDX, which contains the interface definitions of software functions.

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ASAM ISSUE
ISSUE EXCHANGE FORMAT

The development of software for electronic control systems is becoming increasingly widespread, either within one company or spread over several companies. Iterative and highly dynamic software development cycles between car makers and their suppliers cause an increasing amount of change requests, problem reports, and require a decreasing amount of time for solutions to be found. All parties involved have to concentrate on the actual issue content and not waste time on administrative tasks. Without automation the percentage of administrative work can easily amount to 50% of the total work needed to resolve an issue. This situation represents an increasing challenge for the automotive industry.
There is, furthermore, a clear motivation to go for a standardized cross-industry solution. Bilateral approaches between OEMs and system suppliers decrease productivity, as system suppliers would typically have to maintain several OEM-specific solutions in parallel. Previous to the ASAM-based solution, Email, fax and shared drives were the main channels for issue related information exchange. This had many disadvantages, as typically data consistency and progress tracking could not be ensured along the lifecycle of an issue request.
The ASAM ISSUE standard was created to overcome the problems of different exchange systems, information inconsistency and lack of progress tracking. The ISSUE schema is able to transport relevant information for an issue (e.g. identifier, title, responsible, lifecycle status, short textual description, delivery information, issue context, attachments) and is able to act as a tool-independent format for the exchange of change requests and problem reports between companies and their tools.
The schema of the ASAM ISSUE standard is flexible enough for process adaptations, but is still strict enough to allow content checks. In order to benefit from the ISSUE standard, it is necessary to export / import issues to the company-defined configuration & change management system. Some systems on the market provide such an ISSUE interface. The status of an issue remains fully transparent for all involved parties, as the complete lifecycle of an issue is supported and status changes are propagated.

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ASAM LXF
LAYOUT EXCHANGE FORMAT

The results of data post-processing are typically compiled in an automatically generated report. Tools that generate such reports use a description file that defines the layout of the reports. ASAM LXF standardizes the layout format description so that it can be defined once for a specific report and then shared among different reporting systems. This reduces the effort to maintain layout descriptions to a minimum and ensures that reports of the same type look the same, even though they have been created by different tools.
ASAM LXF (Layout Exchange Format) defines an XML-based format for describing layouts for graphical content used by data post-processing applications and automated document generators. A layout description contains the definition of a master layout, canvases, page formats, fonts and colors. The master layout determines the general page design, e.g. by specifying a header and footer, which are used on all pages. A page may contain just one canvas or a matrix of canvases. A canvas defines a drawing area and contains a set of graphical elements, such as images, lines, ellipses, rectangles, charts, tables or text. Elements can be grouped in one container. The XML format may contain embedded formulas that are resolved during runtime.

Application Areas
ASAM LXF is harmonized with and typically used in conjunction with ASAM CEA, which produces the content for generated reports.

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SOFTWARE DEVELOPMENT

ASAM MBFS
MODEL BASED FUNCTION SPECIFICATION

Embedded software development increasingly relies on model-based development and graphical programming. This has the advantage that control algorithms are more understandable to engineers, are better documented and that the specification is written in an executable format. Models are frequently the input for production code generators. The core of model-based development is the blockset, which essentially represents the programming language of the model. Several vendor-specific tool-suites emerged on the market, that use different blocksets with different semantics and different graphical representations. Although the blocksets are similar among all vendors, their differences still make conversion of models between different tool-suites very labor intensive and error-prone. Embedded software developers have to therefore learn different blocksets, which is an additional effort.
ASAM MBFS (Model Based Function Specification) over comes this problem by setting a standard for a blockset library. The blockset consists of 70 blocks, which cover the typical functionality needed in embedded software development. The standard includes blocks for linear and non-linear math operators, logical and relational operators, counters and timers, integrators, filters, curves, maps, delays, switches and memory blocks.

ASAM MBFS defines for each block:
- the graphical representation (icon, ports)
- input, output, internal states and temporary variables
- the semantics (verbal description and pseudo code)
- test vectors

Application Areas
Blocksets that are implemented according to ASAM MBFS are available in major tool-suites for model-based development and graphical programming. They are supported by code generators for production code generation. ASAM MBFS includes a description of a reference implementation in MATLAB/Simulink.

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ASAM MDX
META DATE EXCHANGE FORMAT FOR SOFTWARE MODULE SHARING

The development of software for automotive ECUs is typically carried out in distributed development processes, where software originating from different suppliers and engineering groups have to be integrated into one executable. Software integration is a highly repetitive and iterative task. If the suppliers used different interfaces or software architectures for the same software system, then the initial software integration will fail and cause time consuming debugging and issue-resolution activities. Failed software integrations are one of the major causes of ECU projects running out of time and budget.
To solve this problem, automotive companies have defined a description format via the ASAM MDX standard, which describes software functions, their interfaces, owned data and scheduling in a standardized XML-format. ASAM MDX contains the following definitions for functions and data:

- Software components, -features, -classes and -services
- Variables, calibration parameters and system constants
- Base types
- Type definitions for structures, enumerations and unions
- Units, constraints, computation methods, address methods and much more data properties

This format allows the user to unequivocally specify all integration aspects of the embedded software functions. OEMs have the advantage that they can link supplied software with the overall system without permanently running into integration issues. Suppliers can hide their know-how by delivering just the object code. The object code can still be linked and calibrated, even though the sources of the supplied software are not known by the integrator. Since MDX is technology- and vendor-independent, it allows all involved parties in a software development process to use the tools of their choice, as long as they are able to import and export MDX-compliant description files.

ASAM MDX can describe all data constructions (measurements and characteristics) defined in ASAM MCD-2 MC and the AUTOSAR Software Component Template. Furthermore, ASAM MDX is complementary to ASAM FSX, which contains the behavioral description of software functions.

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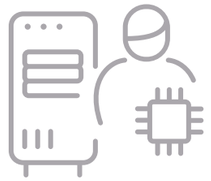
TEST AUTOMATION



ASAM ACI
AUTOMATIC CALIBRATION INTERFACE

The majority of ECUs in a vehicle undergo the calibration development step. The calibration of some vehicle components can be very complex and time consuming. This is particularly true for internal combustion engines. The role of an engine ECU is to continuously measure a large amount of engine data (requested load, speed, fuel and air temperature, etc.) and to calculate a set of optimal control output signals. The control strategies of the engine ECU have to meet contradicting optimization goals (high torque at low fuel consumption and emission, etc.) in a multitude of different environment and dynamic load conditions. Running the tests on an engine dynamometer to find the optimal calibration parameters, curves and maps is a function of many input parameters and conditions. This complex task can hardly be done manually anymore within acceptable time and cost limits. Consequently, test stands are increasingly equipped with systems that automate the calibration task.
ASAM ACI (Automatic Calibration Interface) defines an interface between test stand automation systems (TAS) and automated calibration systems (ACS). The interface consists of an object-oriented, client-server API, which offers four services. The services are requested by the ACS (the client) and carried out by the TAS (the server):

- **Player service:** controlling of test stand actuators for set-point adjustment
- **Recorder service:** recording of measurement values (mean or actual) from the test stand
- **Watcher service:** monitoring of out-of-bounds channel values
- **Device service:** further services such as ECU-specific and test stand-specific operations

The services allow the ACS to preset the unit-under-test, request specific measurement tasks and retrieve the measurement values from the TAS. Based on these services, an ACS can automatically run a set of predefined tests, modify tests based upon earlier test results and even modify ECU calibration parameters of the unit-under-test. Client and server may reside on different host systems and communicate via TCP/IP. ASAM ACI is suitable for both static and transient test executions. The interface is currently not suitable for supporting an ACS that has to respond under real-time conditions.

Application Areas
ASAM ACI was initially developed with engine calibration in mind. However, the standard has been successfully used in other test environments such as wind tunnels, electrical motor test stands and in-vehicle test systems.

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ASAM ATX
AUTOMOTIVE TEST EXCHANGE

Increasing complexity in the field of automotive electronics together with extended quality requirements causes additional investments for test automation. A lot of ECU projects use customized and vendor-specific turn-key test systems. For instance, such test systems typically use test automation software that is rigidly coupled with specific measurement & calibration hardware. The test automation software additionally stores test cases in proprietary formats. As a consequence of this, the choice of test software and test hardware, which can work together seamlessly, is very limited and often dictated by the turn-key system vendor.
If a user of testing systems is determined to use best-in-class systems that do not originate from one vendor, he will be confronted with an increased workload to maintain the different systems with regards to know-how, support, version compatibility and other issues. This is particularly true when different software systems are used for test case development. This can lead to the following problems:

- Know-how cannot be easily transferred from one test bench to the other (additional training costs for employees)
- Switch to the newest testing technology will always be difficult because of tool-specific formats and test-hardware incompatibility
- Test cases cannot be easily ported from one test system to another

ASAM ATX (Automotive Test Exchange) overcomes those issues by providing a standardized XML format, which enables the exchange of test data between different test systems. ATX supports the ISTQB “Certified Tester” syllabus methodology and can be used for many activities in the test process, e.g. test specification, test planning, test execution and test evaluation. The following data is handled by ASAM ATX:

- Test projects
- Test specifications
- Meta data of test cases, test steps and test actions, e.g. version information, documentation and implementation information
- Test programs
- Test libraries
- Test data (parameter values)
- Test suites (execution plans)
- Test reports and test result data

Application Area
ASAM ATX is frequently used in conjunction with ASAM HIL in hardware-in-the-loop test systems.

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ASAM GDI
GENERIC DEVICE INTERFACE

ASAM GDI (Generic Device Interface) was developed for providing an independent integration interface between measurement & control devices and test bed automation systems. Previously, this area was characterized by an almost unmanageable number of individual and incompatible devices. Integration of devices depended strongly on the availability of device drivers for specific operating systems, physical interfaces and protocols. Since test beds have a long lifetime, devices of different generations had to coexist in one system. All this caused high integration efforts, whenever a device had to be integrated or exchanged in an existing test bed system.

The goal of the standardization was to reduce cost and time efforts for the creation, support and maintenance of such complex automation systems and their measurement and control devices. Ideally, a new device would be integrated in a plug-and-play fashion with minimal to no integration efforts. Therefore, the GDI standard defines a four-layer architecture:

- **LAYER 4 - Coordinator:** The coordinator connects application programs to devices, i.e. by routing required application functionalities to device functionalities. The coordinator is configured via a parameterization instance description file (PID), which contains all abstract data sinks and sources and their connection to devices.
- **LAYER 3 - Device Driver:** The device driver provides uniform, virtualized access to the device via a model of the devices functionality and internal states. The device driver is described by the device capability description file (DCD).
- **LAYER 2 - Platform Adapter:** Provides standardized interfaces to specific devices and OS functions.
- **LAYER 1 - Transport Layer:** Provides the transport layer and communication types for communicating with devices via IPv4, USB, SoftSync, COM or LPT.

This approach abstracts the test bed automation system from the operating system, communication busses, protocols and measurement & control devices. As a result, ASAM GDI allows a device-independent application execution and application-independent device integration. This allows quickly exchanging devices in existing test beds, or conversely migrating to a new test automation system with less effort while still using existing measurement & control devices.

Application Areas
ASAM GDI is used in chassis dynamometers, engine dynamometers, emission test benches and transmission test beds. Furthermore, GDI-compliant devices are used in car assembly lines, e.g. for fluid-filling stations, and in service areas where miscellaneous measurement modules are integrated into a shop floor tester. The standard is also used for the integration of data loggers and measurement modules for supplier-independent device configuration.

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ASAM MCD-3 MC
APPLICATION PROGRAMMING INTERFACE FOR MC SYSTEMS

One of the major tasks of ECU development is the calibration of control strategies, i.e. tuning of parameters and look-up tables and the recording of values of internal variables during the runtime of the ECU. This is done via various busses, bus protocols or proprietary plug-on devices between the ECU and an application system. These are technology-dependent and can be vendor-specific. MC-servers are used to provide uniform calibration access to ECUs independent of the used busses, protocols or interfaces. The main objective of ASAM MCD-3 MC is to provide a remote control interface for such MC-servers, primarily by providing measurement and calibration services via an OO-API to the upstream tool-chain. The main advantage of the API is the encapsulation of vendor-specific and technology-dependent communication interfaces. The standard allows that any client application, such as test automation systems or automated calibration systems, can connect via the MC-server to an ECU and carry out typical measurement and calibration tasks. Several ECUs can be connected to one MC-server and accessed in parallel through client applications.

To be able to access data on an ECU, the MC-server reads an A2L data description file (ASAM MCD-2 MC), which contains a description of available calibration parameters (CHARACTERISTICS) and measurement variables (MEASUREMENTS). The MC-server then makes services available to access this data. Characteristics of the type ‘scalar’, ‘curve’, ‘map’, ‘cube 3D’, ‘cube 4D’, ‘cube 5D’, ‘value block’ and ‘ASCII’ can be adjusted. Measurement tasks are available via the Collector, Watcher and Recorder services. The Collector acquires the values of MEASUREMENT or CHARACTERISTIC objects with a common rate over a defined period of time (continuous data acquisition). The Recorder is a means to managing high bandwidth measurements that the MC-server acquires from the ECU or other external inputs, but which cannot be transferred from the MC-server to client applications synchronously because of the lower available bandwidth. Measurement data is therefore stored in a file that can be retrieved by client applications later on. A Watcher is a service which continuously monitors measurement values and triggers events if a predefined condition evaluates to “true”. Multiple Watchers can be defined to monitor multiple variables at the same time. The Watcher may be used to start and stop Collectors or Recorders.

The standard is used for calibration and measurement purposes in development, testing and production of ECUs. ASAM MCD-3 MC currently coexists with the older ASAM ASAP3 standard, which is dependent on specific interfaces (RS232, TCP/IP) and still holds a significant market share.

The ASAM MCD-3 MC API is specified in an object-oriented but technology-independent UML model and mapped to DCOM. This allows to easily add new programming language mappings to the standard without having to change the core of the standard.

Standard Authors
AFT GmbH, AVL LIST GmbH, Robert Bosch GmbH, BMW AG, D2T, Daimler AG, dSPACE GmbH, ETAS GmbH, IMC Meßsysteme GmbH, M&K Mess- und Kommunikationstechnik GmbH, Porsche AG, HORIBA, Continental Automotive GmbH, Visu-IT! GmbH, Vector Informatik GmbH

ASAM MCD-3 D
APPLICATION PROGRAMMING INTERFACE FOR D SYSTEMS

The ECUs of passenger and commercial vehicles can be diagnosed, configured and programmed with new software. These use-cases are performed through serial bus communication on established vehicle busses like CAN, K-Line or even Ethernet. Many different diagnostic protocols are used for the communication between an external test device and the ECU, e.g. UDS, KW2000 or J1939. Common to all these protocols is that the data stream is hexadecimal encoded and cannot be interpreted without detailed documentation of the data content. Before the standardization of ASAM MCD-3 D, it was common practice to implement diagnostic, flash reprogramming and configuration applications on the basis of these hexadecimal encoded messages. The increasing complexity of ECUs, their high number of variants and shortened development cycles made it virtually impossible to continue implementing diagnostic applications in this manner.

The standard ASAM MCD-3 D is employed anywhere in the vehicle life-cycle where vehicle electronics are tested, configured or re-programmed. The standard describes the API of a diagnostic kernel that is able to interpret the hexadecimal encoded messages and provides them as human-readable data values to an application. In order to achieve this, a compliant diagnostic kernel interprets an ODX data description file (ASAM MCD-2 D), which contains a full description of diagnostics data and their conversion between

TEST AUTOMATION

the physical and encoded views. The diagnostic kernel is also capable of resolving ECU variants and thus allowing the implementation of applications valid for multiple variants. Employing a diagnostic kernel is a key aspect of establishing an ODX-based diagnostic process chain as such a kernel guarantees uniform interpretation of the ODX data.

It was an important design goal of the ASAM MCD-3 D standard to cover all known vehicle communication use-cases based on diagnostic protocols and to establish a solution that is independent of the used protocol. An application developer needs to have no further knowledge of particular diagnostic protocols when implementing against the API. The ASAM MCD-3 D API is specified in an object-oriented but technology-independent UML model and then mapped to popular software technologies such as Java, C++ or DCOM. This allows to easily add new programming language mappings to the standard without having to change the core of the standard.

Standard Authors
Berner & Mattner Systemtechnik GmbH, BMW AG, Daimler AG, DSA Daten- und Systemtechnik GmbH, ETAS GmbH, General Motors Company, In2Soft, M&K Mess- und Kommunikationstechnik GmbH, Porsche AG, Samtec GmbH, Siemens AG, Softing Automotive Electronics GmbH, SPX UK Ltd., Vector Informatik GmbH, Volkswagen AG

ASAM XIL
GENERIC SIMULATOR INTERFACE

ASAM XIL is an API standard for the communication between test automation tools and test benches. The standard supports test benches at all stages of the development and testing process – most prominently model-in-the-loop (MIL), software-in-the-loop (SIL) and hardware-in-the-loop (HIL). The notation “XIL” indicates that the standard can be used for all “in-the-loop” systems. This has the advantage that it enables users to freely choose testing products according to their requirements and integrate them with little effort.

The standard furthermore decouples test-cases from real and virtual test systems. This allows to transfer tests between different test systems with little to no migration effort. Consequently, tests can be easily re-used. Know-how is much easier transferred from one test bench to another, resulting in reduced training costs for development- and test engineers.

The ASAM XIL API comprises access to the following components of the simulation system:

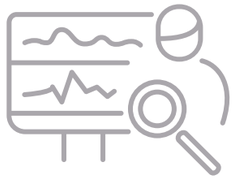
- Reading/writing parameters in simulation models
- Capturing/generating signals in simulation models
- Capturing, reading and writing of ECU variables
- Capturing of network messages (CAN only with current version)
- Exchanging data with an ECU via diagnostic services
- Controlling electrical error simulation hardware (e.g. to set up short circuits)

Application Areas
The ASAM XIL API is primarily used by hardware-in-the-look simulators (HIL systems) for testing ECU in real-time. The standard has been successfully applied in powertrain, steering and electric lighting tests.

Quality Assurance
Cross tests for ASAM HIL installations have been carried out in 2012 and are planned for the future to ensure compatibility between test automation software and HIL test systems.

Standard Authors
Audi AG, AVL LIST GmbH, Berner & Mattner Systemtechnik GmbH, BMW AG, Robert Bosch GmbH, Continental Automotive GmbH , D2T, Daimler AG, dSPACE GmbH, ETAS GmbH, HORIBA, M&K Mess- und Kommunikationstechnik GmbH, MBtech Group GmbH & Co. KGaA, National Instrument Corporation, RA-Consulting GmbH, Softing Automotive Electronics GmbH, TraceTronic GmbH, Vector Informatik GmbH

DATA MANAGEMENT & ANALYSIS



ASAM CEA
COMPONENT FOR EVALUATION AND ANALYSIS

Plenty of test-data post-processing applications are available on the market, which have either a proprietary plug-in architecture or no plug-in capabilities at all. Customized solutions for such applications, such as data file importers, special mathematic algorithms or special graphic elements, cannot be easily reused in another application and would require significant porting effort.

ASAM CEA (Component for Evaluation and Analysis) defines an application framework and functional components for the evaluation and analysis of test measurement data. The standard is most commonly used for the development of reusable application components for processing and visualization of testing data. It defines everything to create components in a standardized way in order to be able to be used in different programs from different manufacturers. If the application framework is compliant with the CEA-standard, then CEA-components can be loaded and used by the application. If the framework follows modern SW-architectural rules (e.g. object oriented, event driven, full-state, etc), then it will be easy to implement the functions needed for CEA-compliance. The standard describes the necessary techniques for component developers. ASAM CEA defines a component-based framework within a producer-consumer architecture. For a well-defined runtime sequence structure, events are defined which inform “consumers” of any change within the content. The framework can be extended by plug-in components. The interfaces, data items and events are clearly defined to obtain interchangeable components between CEA-compliant frameworks.

The standard itself is described as completely technology independent. It is tested and examples are available for C/C# and Java. In addition, a sample framework together with sample components are available as part of the standard to allow interested companies to start developing their own CEA-based applications.

Application Areas
ASAM CEA-compliant software is used in many industry applications. Many of them are running as web-based solutions inside a Measurement Data Management (MDM) system:

- **Engine / turbocharger test bench:** Online visualization, user interface and test-data post-processing.
- **Battery test stand:** Post-processing of test stand data.
- **Gear test stand:** Post-processing of terabytes of data incl. customized statistics components in a client-server application.
- **Data logger:** Vehicle test data analysis with logged data incl. GPS, movies and time signals.
- **Crash-data post-processing:** Importing of raw test data, creating MME13499-compatible data structures and gene ration of standardized reports.
- **Calibration lab for sensors:** Creating multi-page calibration reports.

Standard Authors
AMS GmbH, Daimler AG, HORIBA, Porsche AG, Volkswagen AG

ASAM ODS
OPEN DATA SERVICES

Numerous solutions in testing, evaluation and simulation within the automotive industry have their own administrative systems and proprietary formats to store data, with very different approaches in maintaining descriptive information. Extending and modifying such solutions, and connecting them to third party components, is a growing challenge as complexity is continuously increasing. Also the demand for unified knowledge bases as a foundation for data mining and for cross-disciplinary collaboration cannot be met by such diverse and usually inaccessible information pools. New ideas from new players in the market will hardly find their way into legacy systems unless an easy and standardized way for information access is available. Finally, the need for product lifetime storage & retr ieval calls for standardized methodologies that may be used even if tools and businesses have been discontinued.

The ASAM ODS (Open Data Services) standard focuses on persistent information storage & retrieval. The main objectives are to reduce costs and risks within projects and to provide a reliable basis for applications that produce and/or consume information. Using standardized interfaces and common data structures minimizes the efforts for system integration within heterogeneous environments and significantly eases information exchange. It moreover allows the integration of light-weight solutions that work on a standardized information pool. A fully standardized persistence layer secures the investments made in such data server systems, as information becomes independent from specific implementations.

DATA MANAGEMENT & ANALYSIS

ASAM ODS specifies:

- A common data model (base model) for unambiguous and complete definition of data, providing a rough classification by adding semantics to the data, which finally enables different systems to interpret similar data in the same way. It serves as a basis for many derived application models, which themselves cover the needs of specific application areas.
- Interfaces to store & retrieve data in ODS servers in a standardized way, including interfaces to maintain a formal description (meta-information) of the actual application model. This allows systems to generically operate on different ODS data sources.
- Standardized text-based formats (ASAM Transport Format) for exchanging data and meta-information between different systems & platforms (two variants: ATF/CLA, ATF/XML).
- A database model for relational databases used to physically store the information. It also allows exchanging database files between systems with the same data base management system.
- Application models, reflecting typical scenarios for the use of ASAM ODS. Currently models for NVH data, test bed calibration data, workflow descriptions and results, crash test data, geometrical data, and data from bus communications are provided.

Application Areas

ASAM ODS is predominantly used in the area of test automation and test bed systems, but is not limited to this area and can be used wherever information must be stored in a consistent manner. Application areas are: Test Data Management, Measurement & Calibration, Integration of Automation and Measurement Systems, Simulation, Data Post-Processing, Reporting, etc.

Latest Additions and Improvements

The object-oriented API for client-server communication (short: OO-API) has been supplemented by a new web-service API using the Hypertext Transfer Protocol (short: HTTP-API). The HTTP-API furthermore uses the Google Protocol Buffers specification for the serialization of application data. The new HTTP-API includes most of the functionality of the OO-API and is capable of replacing it in typical communication scenarios. The new API significantly eases client-server communication via the Internet and is an important step towards enabling ODS for Big-Data systems.

Major characteristics of the new API are:

- W3C HTTP transport protocol
- Binary & Json data serialization via Google Protocol Buffers 3.0
- W3C SSE notifications for change events
- Usable with reverse proxy

The specifications for the OO-API and RPC-API remain part of the standard.

Quality Assurance

Cross-tests are organized from time to time. They are open to ASAM members, who develop ODS-based servers or client applications. Cross-tests allow to check the communication and data exchange behavior of the tools, thereby improving tool-interoperability, easing tool-chain integration and increasing standard-compliance of the tools.

Standard Authors

Audi AG, AVL LIST GmbH, BMW AG, Cologne University of Applied Science, Daimler AG, EPOS CAT GmbH, HEAD acoustics GmbH, HighQSoft GmbH, HORIBA, LMS International NV, Müller-BBM VibroAkustik Systeme GmbH, National Instruments Corporation, Porsche AG, Robert Bosch GmbH, Volkswagen AG

MIGRATION FROM AN IN-HOUSE DIAGNOSTIC BASE SYSTEM TO A COTS SOLUTION

Softing Automotive Electronics GmbH & Daimler AG

FEATURED STANDARDS:
ASAM MCD-3D, ASAM MCD-2D (ODX)

SUMMARY

Since 1997 Daimler has been implementing a diagnostic system which, using a proprietary, data-driven communication platform, exchanges data between the diagnostic application and the vehicle. This platform incl. the data is used consistently at Daimler in Engineering/Development, Manufacturing and After Sales. When the S-Class 222 was launched in 2013, Daimler opted for a COTS product (commercial off-the-shelf) from Softing. Since then, the Softing product has been used for data communication between the diagnostic application and the vehicle for all new Mercedes cars and VAN series in Engineering/Development, Manufacturing and After Sales. Thanks to a clever migration strategy that was implemented from the very beginning, the project was not just successful in technological terms, but also ensured a fast return on investment.

SITUATION

Daimler had already successfully introduced a diagnostic communication platform in 1997, operating it in all processes throughout Engineering/Development, Manufacturing and After Sales. This system was (further) developed especially for use at Daimler. In essence this system was a database for storing ECU diagnostic information and sequence systems with an API. The ECU diagnostic information from the database was converted into a runtime system and processed by the sequence system making it legible for operators.

The advantage of this procedure is obvious:

- ECU diagnostic data is created just once and then used by multiple applications
- Integration into tools takes place using a standard API that is documented and supported centrally
- Due to the use of a standard platform, the runtime behavior of the diagnostic services is deterministic

Finally, the data process has the distinct advantage that the data for Manufacturing and After Sales Service is of uniform quality due to the fact that it is created in parallel to Engineering/ Development.
As it is extremely time-consuming to maintain a proprietary tool environment, Daimler decided to use an off-the-shelf tool for the areas of use named. Standardization had already created the prerequisites for this as the database was standardized with ODX (ASAM MCD-2D), and with ASAM MCD-3D the company had a programming interface for a standard-based diagnostic system at its disposal. Furthermore ODX 2.2. had a maturity and function scope that allowed it to be used as a replacement for the existing solution.

CHALLENGES

A new communication platform can generally only be introduced with a new vehicle project because otherwise all diagnostic descriptions, test sequences and tools would have to be modified during operation. For the new vehicle project, however, this means not only the challenge of implementing a new development, but also of migrating to the new communication platform. This necessitates a fallback which would enable diagnostics if the implementation of the new communication platform should falter. In this case, this was relatively simple because the authoring system for the ECU diagnostic data enables both an export to the old format and to ODX. All that needed to be done was generate both databases for a while. The data for the new vehicle was modified and then exported from the authoring system to the new format for the migration of acquisition control units.

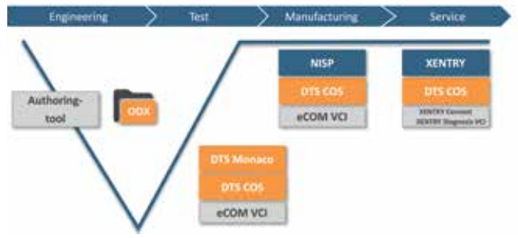


Figure: Main Tools in Life-Cycle to be Migrated

On the tool side, three tools in particular had to be adapted to suit the new runtime environment from the very beginning: the engineering tester that had just been launched and was already based on the new format (DTS Monaco from Softing), the manufacturing system NISP (used all over the world in all car manufacturing sites), and the After Sales service tester XENTRY Diagnostics. NISP is a Daimler-specific development whereas XENTRY Diagnostics is based on a framework that has already been implemented on the basis of a previous version of the ASAM MCD-3D standard. All components are very critical in terms of performance, instabilities and bugs due to their implementation worldwide.

SUCCESS STRATEGY

A multiple-phase procedure was agreed from the outset to be able to ensure project completion:

- Conversion of VCI driver to D-PDU API standard before all other steps
- Proof of Concept phase
- Implementation of the data with engineering tester
- In parallel, the piloting of the modified applications for Manufacturing and After Sales
- Drafting and implementation of a migration strategy for existing Manufacturing and After Sales data

> After years of contributing to standards it was time to implement and use them – and it paid off very fast even if you take the previous efforts into account.“
>
> **MARC BLATTER**
> PROJECT MANAGER, DAIMLER AG

> It was exciting to see that after years of standardizing, after years of developing a tool, the real life utilization of a standard implementation worked smoothly – even more smoothly than expected!“
>
> **MARKUS STEFFELBAUER**
> DIRECTOR PRODUCT MANAGEMENT, SOFTING AUTOMOTIVE ELECTRONICS GMBH

In the run-up to the implementation of a new VCI (Vehicle Communication Interface, eCOM) the driver layer was converted to the D-PDU API standard. This meant that the old system and a D-Server could work on the same hardware.
Then, a Proof of Concept (PoC) project was started in collaboration with several suppliers. The aim was to prove that the scope defined in the standards did actually satisfy requirements and could be implemented in the entire environment.
The system was implemented after a successful PoC within the engineering tester DTS Monaco, which, just like the MVCI-Server, is a Softing product. As this tester processes the data both in the old format and as ODX data, the quality of the data and ODX processing were very easy to achieve in a comparison of old data and ODX data. This meant that there was only minimal limitation of the test tasks with the ECUs. At the same time, the Manufacturing and After Sales testers as well as the authoring systems were adapted, and users trained.
To minimize migration, Daimler decided to run the old and new world in parallel to one another and phase out the old communication platform in Engineering/Development and Manufacturing. Support in After Sales does, however, have to be guaranteed for many years to come. The advantage is that existing data and test sequences no longer have to be changed which saves on time-consuming releases.

CHALLENGES DURING THE PROJECT

During the project, it became clear that the procedure selected was exactly the right one. All in all, the implementation was on schedule and delivered the right quality. To ensure total adherence some extra functions had to be added to the Softing MVCI-Server. This was necessary because the tools featured some operating sequences which could not be reproduced with the standard. The development methodology selected enabled simple extension implementation.

BUSINESS BENEFITS

- Free selection of tools and suppliers
- Simplified cooperation with other OEMs
- High level of maturity due to several different users

Figure: Different Migration Strategies

LAB DATA MANAGEMENT USING ASAM ODS

Robert Bosch Engineering and Business Solutions Pvt. Ltd.

FEATURED STANDARD:
ASAM ODS

SUMMARY

Challenge: Bosch has over 350 different validation facilities that cater to various component and system testing needs. The labs are spread across various business units; Diesel systems, chassis systems, power tools, electrical drives, and after market, to name a few. Each lab follows a unique tooling and process methodology for management of their lab and test data. This has resulted in a lot of duplicate and overlapping solutions making it difficult to maintain and improve

Solution: RBEI and CI division of Robert Bosch GmbH are jointly working on concepts that will help the Bosch labs to effectively manage the lab data. The overall goal is to provide a single solution for lab and test management across all Bosch labs and extend the solution even to small labs that currently do not have an IT system for lab data management.

Key Benefits: The test processes and metrics can be reproduced across labs. The efforts and costs involved in development and maintenance of parallel solutions is reduced. Test labs can rely on a solution that is already used and accepted by other labs. Productivity of test engineers is improved as they can use a single solution for various test processes.

SITUATION

The standard lab information management solution (sLIM), has been developed as a lab data management platform based on ASAM ODS. The overall goal is to streamline the common test processes at major test labs in Bosch in order to have a comprehensive lab data management solution. Common rail (CR) test facility at Bosch, India started a pilot phase to evaluate the potential benefits of the solution. After a successful pilot, the solution is now in pilot phase across various labs in other regions including Korea, China and Japan.

A survey of the validation facilities within Bosch indicated that there are over 350 labs that are responsible for testing activities. The labs were spread across geographies in order to cater to the needs of the local market. Many labs have developed their own solution for storing the details of test processes and documents. This approach not only was duplicating the cost and efforts spent on IT across labs but was also leading to islands of solutions, that were specific to domains. Many solutions were so specific to the needs of individual labs that it made the acceptability of solution very low when it was piloted across other domains. Another compelling issue was the lack of huge funds, for small labs in emerging markets such as China and India, for developing a comprehensive lab data management solution.

SUCCESS STRATEGY

The goal was to develop a comprehensive standard lab and test management solution (sLIM) that could be adapted across the various business domains with minimal changes. The approach commenced with the unifying of test processes from multiple labs.

The following were the main focus areas:

- Understand the common test processes across labs
- Understand the tools that were currently in use at the labs
- Use a common data standard for storage and management

A detailed process checklist was prepared by having a focused workshop with representatives from various business units. The most important features were ranked using nominal group technique. After several rounds of focus group workshops, the following common business problem clusters were identified:

- Requirement Management – How to manage test requests?
- Project Management – How to plan projects, test activities and track them to closure?
- Inventory Management – How to plan the equipment and test resource requirements for testing?
- Quality Management – How to ensure quality control?
- Commercials Links – How to control project procurements associated with testing?
- Management reporting – How to generate metrics that are useful for management?

A common scenario that existed in all the labs was the usage of excel sheets with data analysis setup like INCA, LabVIEW, FAMOS etc.

ASAM ODS standard was chosen for the data modelling of the standard lab and test management (sLIM) solution. To begin with, a simple application model on ASAM ODS core data model was used to model the data requirements of various processes in:

- Projects, test organization and tracking
- Management of inventory and test resources
- Search and building lab KPIs
- Integration with post processing

Although, choosing ASAM ODS looked to be an overkill in the beginning, the benefits were soon realized. The application model of ASAM ODS was flexible enough to accommodate major process requirements of the lab.

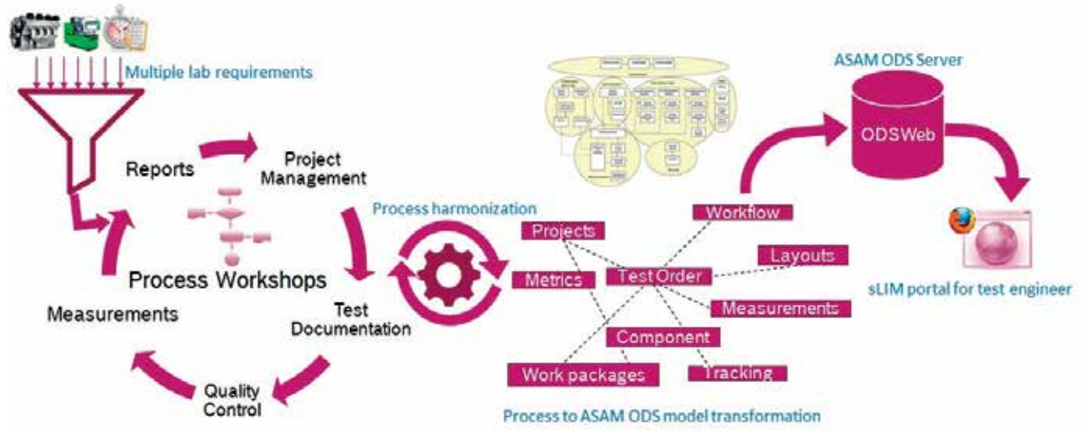
> The flexible ODS data model has helped us capture and centralize all our important process artefacts, e.g. traceability of data-sets, lessons learnt documentation, compression of measurement data, efficiency tracking. The solution is not only helping us improve the productivity of our engineers but also has improved our cost savings.”
>
> **RAJASHEKAR M B**
> COMMON RAIL SYSTEM DEVELOPMENT, ROBERT BOSCH INDIA

CHALLENGES DURING THE PROJECT

The process requirements practiced by each lab were different. Modelling the unified processes using a common data model was a difficult exercise. The requirements were so wide and diverse that, satisfying one lab meant opposition to another. A common data model and priority processes was shortlisted based on the requirements of the pilot labs in India. The processes were modelled into the ASAM ODS application model. The processes that were not directly mappable to the ASAM ODS model, took the benefit of AoAny application element, for example custom workflows, feature mapping etc. Based on an incremental approach, the lab clusters are identified and the requirements were modeled into the ASAM ODS model.

BUSINESS BENEFITS

The solution standardized test documentation and offered time saving functionalities like search. It improved the productivity of test engineers. Project management processes, such as calculation of effort overrun, utilization of lab resources, were standardized, automated and made reliable. This in turn helped to improve the project cost estimation. The hardware investment for storage of measurements were reduced through centralized approach along with techniques like compression. The solution has opened up numerous collaboration possibilities between labs, e.g. resource planning made it possible to share resources across labs improving the cost savings for the department. The management could now derive quantitative figures on lab utilization that was necessary to take critical business decisions. Overheads like user trainings were reduced because of a single solution strategy. The solution is now undergoing further improvements to include automation of part tracking. The overall goal of one standardized lab data management solution is finding high acceptance from labs across different business units and ASAM ODS has played a pivotal in this data centralization strategy.



Schematic that shows the transformation of test processes to the ASAM ODS data model

ASAM ODS: A FOUNDATION STANDARD FOR MODEL BASED SYSTEM ENGINEERING THAT SUPPORTS COMPLETE PRODUCT VALIDATION MANAGEMENT (PVM) ACROSS ALL VEHICLE DOMAINS

PVMsys InfraSolutions Pvt. Ltd.

FEATURED STANDARD:
ASAM ODS

SUMMARY

Challenges: Recently, it was observed that every OEM seemed to be facing these following questions:

- How to bring real testing data into the model world from hundreds of different kinds of test rigs with different file and data formats?
- How to connect business information to test data, to convert that data into knowledge?
- How to connect enterprise wide validation knowhow to improve efficiency in overall validation and verification process?

Similar problems were recently addressed by PVMsys, collaborating with a major Japanese luxury car manufacturer. As it was a one-of-a-kind ambitious project, we had to successfully work on a prototype with a team from a single domain. Now, it is on course to being implemented across all vehicle development domains and functions.

Solution: The solution was arrived upon by extending the usage of the ODS standard beyond test life cycle to complete the full validation life cycle. The ODS standard already has standardized test objects, and well defined engineering data types. This was extended with a companywide engineering meta data dictionary to support enterprise wide integration of different functions and domains, as well as, complete validation life cycle of one function.

ASAM ODS provides well defined semantics for test, subtest, and measurement, at an abstract level. At the OEM, every group could easily map their test types on the test, and measurement conditions as subtest, and as data on the measurement level.

Key Benefits: Now, the complete enterprise can talk a common engineering meta data language, and can access the data from any domain or function. This helps speed up the complete product development life cycle, and relevant information can be accessed in time, which is necessary to make quick engineering decisions and conclusions.

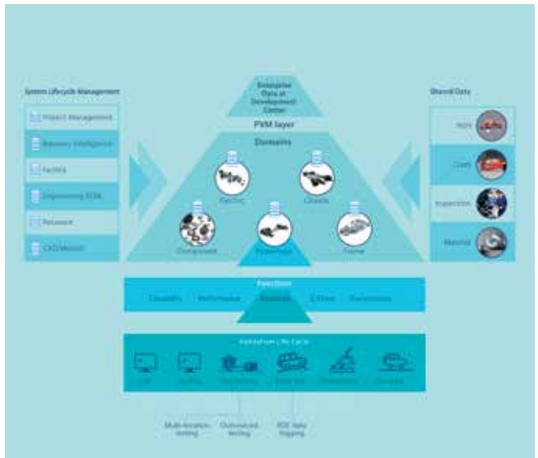
SITUATION

Most of the automotive OEMs have defined processes to capture key product life cycle data. However, when it comes to validation, every engineer is free to do his own experiment, store data in his own format, utilize tools of his own choice, and store data with limited or practically no business information. This makes it difficult to reuse the test information, as the context of the information is completely missing. This also leads to inconsistencies in the validation process, which in some cases, can be expensive. Some of the OEMs manage their test data, but only for engineers who want to access this data and do analysis. This still only serves the purpose for the engineer in that particular domain or function. The connectivity of one domain or function to others is still missing.

It is common knowledge that in the entire vehicle validation process, many functional groups are involved. On many occasions, there is a need to solve a vehicle problem jointly. Consider, for example, a problem of vibration observed during on-road testing. To identify the root cause of the problem, multidisciplinary teams have to work together from different domains, mainly because the source of vibration can either be the engine, or the structure of the vehicle.

When multidisciplinary teams work together, there is a need to exchange data. To pick up the example above, this means that a vehicle testing group will show the logged vibration data. The power train group then checks for same load condition, its combustion data, and the time series ECU data about the engine torque. After combining the data from different domains, they could identify the main source of vibration, which could be because of the sudden torque change for that test condition in the combustion data.

The above scenario clearly indicates the need to exchange data across vehicle domains, to solve a problem collaboratively, and quickly. It also highlights the need for an integration platform that allows engineers from different domains to exchange data without worrying about the source of data. This is possible mainly because of the ASAM ODS standard, which allows storing heterogeneous engineering data. The benefit of ASAM ODS is that the application model, and the defined data semantics allow seamless exchange of data between domains and functions.



Product Validation Management (PVM) at the Enterprise Level

> This is probably the first time ever where an ASAM standard is used to solve a multi-disciplinary engineering problem at an enterprise scale. The business benefits of this approach directly links to the time to market of the engineering product.“
>
> **PURAN PAREKH**
> CEO & MD, PVMSYS INFRASOLUTIONS PVT. LTD.

CHALLENGES

The initial proof of concept could validate the assumption that the base ODS standard can be the basis for managing product validation data. Nevertheless, the biggest challenge was to define an engineering meta data dictionary for every function group or domain, as they do not have standard nomenclature. An engineering meta data dictionary consists of domain, function, test plan, test type, test condition, measurement characteristic, and measurement points. It is unique for every domain and function group.

SUCCESS STRATEGY

Usually these projects are driven as an IT strategy by the IT team. However, in this case a different approach was followed - an approach that combines engineering domain expertise and adapts IT solution architecture.

We offered domain consulting to map engineering validation knowhow onto the standard validation life cycle process. Initially, a prototype was proposed to capture the key validation processes, and its external interfaces for one of the function groups in the powertrain domain. An important skeleton for an engineering meta data dictionary was created, where key validation meta data like test type, measurement characteristic, measurement condition, and measurement point definition was created. Another crucial strategy was used where standardization could be achieved with minimum additional efforts by the engineer. With just simple catalogues and templates, the engineer could easily organize the engineering meta data and test the data.

In the second phase, the same skeleton was used to map data from different domains and functions. It was also possible to map data to (?) third domains and processes (?). Every function group could define their engineering dictionary, which was then integrated on a domain level, and extended up to enterprise level.

For the whole process of implementation, the ODS standard was used. After the implementation, the nomenclature was standardized. With this, quick correlation was possible because of the engineering meta data dictionary. As for the solution finding, we followed a consulting approach. We listened to the customer’s use cases, considering the different domains, and then mapped the use cases using UML models. For that, we used ASAM ODS’ well-defined semantics and application model for test data, and mapped the defined UML diagrams.

CHALLENGES

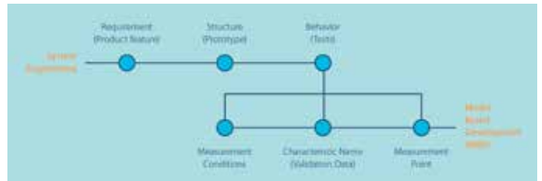
The biggest challenge in the project was the acceptance by the engineers from the different domains. They perceived their domain and data to be different from the other domains. However, once we mapped the domain data at an abstract level, they understood the benefit.

The second challenge was the effort for the standardization of engineering meta data. Initially, the engineers decided to go with the minimal standardization level, but then gradually extended the standardization level from mid-level to a full standardization level.

Since, this was an enterprise wide initiative (top down approach), a broad level integration strategy was established. Soon after every engineer had grasped the concept of a meta data dictionary, this approach was widely accepted.

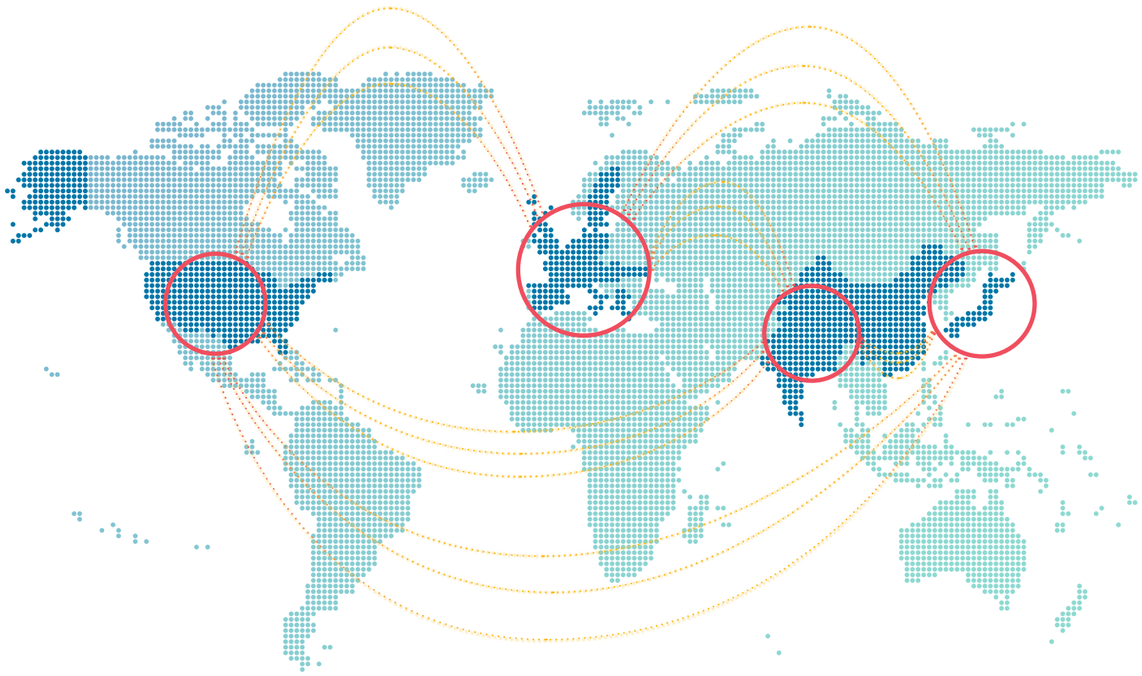
BUSINESS BENEFITS

Owing to the high probability of this being the first time any OEM has ever thought of using the base ODS standard to store data beyond the measurement domain, our client can now clearly see the great benefit of this approach to reduce time to market, and to better reuse the data. ODS already provides well defined semantics and application models. These models can easily be extended to store complete validation life cycle data for function groups. Additionally, these individual domains, and function groups can be glued together with a powerful enterprise level meta data dictionary.



Standard Engineering meta data : Foundation for Model Based System Engineering (MBSE)

ASAM connects:
People | Solutions | Standards



ASAM – Where engineers meet to standardize connections between devices and software applications for seamless data exchange

Co-develop standards with our 190+ member-organizations:

Experience the ASAM Spirit
Be part of a global network of experts who all work together to turn ideas into standards that drive automotive development.

Experience Thought Leadership
Work together with experts on a common vision while broadening understanding on highly relevant industry topics.

Experience Efficiency and Proficiency
Take advantage of a well-organized association, with clearly structured processes and technical expertise – all focused to drive projects to success.

Experience Reliability & Quality
Rely on solutions and standards that are based on joint decision-making by experts – thus increasing industry acceptance, quality and usefulness and reducing likelihood of failure.

More information
www.asam.net

ASAM Association for Standardization of Automation and Measuring Systems

LIST OF MEMBERS: **OEMs**

AUDI AG
www.audi.com

BWM AG
www.bmw.com

Daimler AG
www.daimler.com

Ford Motor Company
www.ford.com

General Motors Company
www.gm.com

Hino Motors, Ltd.
www.hino-global.com

Honda R&D Co.,
Ltd. Automobile R&D Center
world.honda.com

Jaguar Land Rover
www.jaguarlandrover.com

MAN Truck & Bus AG
www.man-mn.com

Nissan Motor Co. Ltd.
www.nissan.co.jp/EN

ADAM OPEL AG
www.opel.com

Polaris Industries, Inc.
www.polaris.com

Porsche AG
www.porsche.com

PSA Peugeot Citroën
www.psa-peugeot-citroen.com

SAIC Motor Corporation Ltd.
www.saicmotor.com

Subaru Corporation
www.subaru.co.jp/en/

Toyota Motor Corporation
www.toyota-global.com

VOLKSWAGEN AG
www.volkswagen.com

VOLVO Car Corporation
www.volvocars.com

TIER-1 SUPPLIERS

Robert Bosch GmbH

The Robert Bosch GmbH company and its employees are as from the very beginning partners of the ASAM e. V. We are involved in the definition of standards applicable to various topics being related to automotive control units. We will integrate the ASAM standards into our products according to our customers' wishes.

www.bosch.com

Continental Automotive GmbH

As a leading international supplier of automotive electronics and mechatronics it is essential to fully support industry standards instead of dedicated and proprietary solutions. Especially within the context of calibration, measurement, diagnosis and for distributed OEM-supplier development Continental relies on ASAM standards.

www.continental-corporation.com

Cummins Inc.

Cummins Inc., a global power leader, is a corporation of complementary business units that design, manufacture, distribute and service engines and related technologies, including fuel systems, controls, air handling, filtration, emission solutions and electrical power generation systems. Cummins earned $1.66 billion on sales of $17.3 billion in 2012.

www.cummins.com

DELPHI Corporation

Delphi Automotive PLC is a leading global supplier of electronics and technologies for automotive, commercial vehicle and other market segments. Operating major technical centers, manufacturing sites and customer support facilities in 30 countries, Delphi delivers real-world innovations that make products smarter and safer as well as more powerful and efficient.

www.delphi.com

DENSO Corporation

DENSO is one of the largest global automotive suppliers of advanced technology, systems and components, heading toward an automotive society where cars put less drag on the environment and drivers have fewer worries about traffic accidents. Everything we do at DENSO is based on our philosophy: "Contributing to a better world by creating value together with a vision for the future."

www.globaldenso.com

Detroit Diesel Corporation

For over 80 years, Detroit Diesel has designed and built the heavy-duty engines that fuel commerce and transportation across North America and around the world. Our engines drive a wider range of heavy-duty vehicles. and now we're offering our own line of axles built with same precise engineering and rock-solid durability you expect from our engines.

demanddetroit.com

FPT Industrial

FPT Industrial is a brand of CNH Industrial, dedicated to the design, production and sale of powertrains for on and off-road vehicles, marine and power generation applications. The FPT Industrial sales network consists of 93 dealers and over 900 service centers in almost 100 countries. A wide product offering, including six engine ranges from 31 kW up to 740 kW, transmissions with maximum torque of 200 Nm up to 500 Nm.

www.fptindustrial.com

Hyundai MOBIS

As an automotive parts company founded in 1977, Hyundai MOBIS produces and supplies products such as automotive modules, core automotive parts, and after-sales parts, and has been recently ranked fifth among global automotive parts suppliers. Aiming at creating value for the safety and happiness of customers, Hyundai MOBIS is increasing its influence in the automotive parts industry through superior quality and technology.

en.mobis.co.kr

Keihin Corporation

At a time of substantial changes in automobiles and motorcycles, Keihin is evolving with the aim of continuing to lead the world as a "manufacturer of integrated systems." We are further broadening our old perspective of pursuing the world's highest quality for individual parts by working on advanced integration of mechanics and electronics to achieve optimization in whole energy management systems.

www.keihin-corp.co.jp

Motorenfabrik Hatz GmbH & Co. KG

Hatz is a specialist in 1 to 4-cylinder diesel engines which are used in all manner of applications, such as construction machinery, compressors and utility vehicles. Besides, Hatz produces components for the automotive industry and systems like pumps, generating sets and scalable electricity stations based on customer demand.

www.hatz-diesel.com

MTU Friedrichshafen GmbH

MTU is one of the world's leading manufacturers of large diesel engines and complete propulsion systems. Together with MTU Onsite Energy, MTU is one of the leading brands of Rolls-Royce Power Systems. Its product range is the widest and most modern in the sector. It covers diesel engines as well as complete propulsion systems for ships, for heavy agricultural, rail and military vehicles, and for the oil and gas industry.

www.mtu-online.com

NIRA Dynamics AB

Founded in 2001 and headquartered in Sweden, NIRA Dynamics is at the forefront of sensor fusion, providing cost-efficient, value-adding services to the global vehicle industry. Customers include some of the world's leading car manufacturers, such as Audi, Volkswagen, Seat, Skoda and Renault.

www.niradynamics.com

NSK Ltd.

NSK supplies a wide variety of bearings, as well as automatic transmission parts, steering column, and joints. Further, NSK also make the electric power steering system (EPS), which is ready for the 21st century steer-by-wire technology.

www.nsk.com

Powerteq LLC

Powerteq produces modules, programmers, and monitors for all major vehicle manufacturers, under the Diablo Sport, Edge Products, and Superchips brands. Powerteq endeavors to produce the highest quality products on the market and delivers them with superior customer and technical support. As leaders in the automotive performance market place, each Powerteq brand delivers unmatched value to customers by providing an extraordinary driving experience.

www.powerteq.com

ZF Friedrichshafen AG

ZF is a global leader in driveline and chassis technology with 121 production companies in 26 countries. In 2013, the Group will presumably achieve a sales figure of around €17 billion with 73,600 employees. In order to continue to be successful with innovative products, ZF annually invests about 5 % of its sales in research and development. ZF is one of the ten largest automotive suppliers worldwide.

www.zf.com

TOOL VENDORS

A&D Company, Limited

A&D Company specializes in measurement, control and simulation solutions for powertrain testing and vehicle development. Our open, flexible and cost-effective tools are designed to fit a wide variety of applications, from durability and performance to hardware-in-the-loop simulation and hybrid/electric vehicle development and testing. Our complete range of products includes torque transmitters (wheel, axle, drive plate), FFT analyzers, hydraulic testing systems, data acquisition and control and combustion analysis systems, as well as real-time simulation systems and model-based automated calibrations tools.

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CN info@aanddtech.com

A&D Data Acquisition Products

Type	Software for engine/powertrain test cell automation systems
Functionalities	Automation system for engine/powertrain/EV/HEV test cells
ASAM Standards	ASAM CAT ACI, ASAM AE MCD-3

A&D ORION

Type	Software automated ECU calibrationa
Functionalities	Automated calibration of ECU\'s on the test bed.
ASAM Standards	ASAM AE MCD-1 XCP, ASAM AE MCD-1 CCP, ASAM AE MCD-3

A&D Real-Time Platforms

Type	Executing Environment for A&D-DSP system
Functionalities	Utilizing real-time OS, executing measurement, controls, real-time simulation
ASAM Standards	ASAM AE MCD-1 XCP, ASAM AE MCD-1 CCP

A&D Real-Time Software Development Environment

Type	Development Environment for A&D-DSP system
Functionalities	Model Builder, C or Execution Code Generation, GUI Generation, Execution System
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L)

A&D VirtualConsole

Type	Graphical User Interface (GUI) Designer
Functionalities	Arranging GUIs, Measuring values and graphs, linking with external applications
ASAM Standards	ASAM AE MCD-3

Accurate Technologies Inc.

Accurate Technologies Inc. (ATI) is a global, independent supplier of control system development tools headquartered in Wixom, Michigan, USA. ATI's portfolio of hardware and software products provides easy to use, customizable solutions to accelerate controls system design, rapid prototyping, in-vehicle calibration and network analysis.

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26999 Meadowbrook Road
Novi, MI 48377, United States
Phone + 1 248 848 9200
Fax + 1 248 848 9016

www.accuratetechnologies.com

Offices: next page

CANary Interface Module

Type	Interface for CAN and ISO 9141 devices
Functionalities	Pocket-sized CAN interface for ATI's VISION Calibration and Data Acquisition system. Communicating via the Universal Serial Bus (USB) connection, its two CAN channels enable communication from ATI VISION software to ATI data acquisition hardware, ECUs for calibration, and other CAN-based products. Use either CAN Channel to bridge data between ATI's data acquisition hardware, ECUs (using CCP or XCP), or other CAN devices that are compatible with VISION Calibration and Data Acquisition Software. These devices include ATI's EMX Data Acquisition Series and most third party data acquisition modules.
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP

CANLab™ Network Analysis Software

Type	Multi-bus Network Analysis Tool
Functionalities	Multi-bus network analysis tool that provides a complete solution for key industry standard network protocols including Controller Area Network (CAN) including J1939 and Local Interconnect Network (LIN) with the support of popular databases and hardware with advanced post analysis included. It can be used to view network activity, send and receive signals or messages, record and replay data, manipulate and analyze data, and check statistics, all in real-time.
ASAM Standards	ASAM AE MCD-1 CCP

DLX Datalogger Module

Type	Data logger, measurement, and interface for CAN and ISO 9141 devices
Functionalities	Offers a unique Combination of a CAN interface, data acquisition module, and data logger all in one compact package. Communication channels include CAN, K-line, and LIN that interface to ECUs or communicate with ATI data acquisition hardware.
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-3

VISION Network Hub

Type	Interface for CAN and ISO 9141 devices
Functionalities	Rugged interface used to enable synchronous CAN communication between VISION software and memory emulated, CAN CCP, ISO 9141 KWP2000 base controllers, and ATI EMX and EDAQ Data Acquisition modules.
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP

VISION™ Calibration & Data Acquisition Software

Type	Measurement and Calibration System
Functionalities	Integrated calibration and data acquisition tool that collects signals from the ECU and external sources, measures relationships between inputs and outputs, enables real-time calibration and modification of closed loop control systems, time aligns and analyzes all information, manages calibration data changes, and programs the ECU. VISION works with legacy systems or tools including those that follow the ASAM standard. Convert files to/from VISION for data sharing or, in many cases, use hardware supplied by other vendors. For the physical access to ECUs, VISION supports the full range of hardware interfaces.
ASAM Standards	ASAM AE CDF, ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-3

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AMIUM GmbH

Your partner for gas analysis, signal processing and automation.

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6342 Niederndorf, Austria

www.amium.at

AMS GmbH

AMS is the specialist for measurement and analysis of engineering data, especially data from test and simulation. The award-winning data processing software jBEAM is a platform-independent tool for data aquisition, analysis and visualization. AMS is intensively committed in the CEA and ODS standards.

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Fax + 49 371 918668 99

www.AMSonline.de

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CA Rui.Liang@AMSonline.cn

AMS-ATF Importer/Konverter

Type	CEA Component
Functionalities	Import/export of ODS-ATF files, including extensive checking functionality
ASAM Standards	ASAM CAT ODS

jBEAM

Type	CEA Framework for desktop usage
Functionalities	Complete area of data import, data analysis, and data visualization
ASAM Standards	ASAM CAT CEA, ASAM CAT ODS

jBEAM-Web

Type	Library for web-based applications
Functionalities	Complete area of data import, data analysis, and data visualization
ASAM Standards	ASAM CAT CEA, ASAM CAT ODS

MaDaM

Type	Web-based test and measurement data management system
Functionalities	An indexing technology based MDM system without the need of a relational database. A web-based user interface (HTML5) allows the usage of modern smart devices. Manual and automatic import of files, supporting nearly all data formats inkl. MDF4, ATFX, Diadem, Excel. Server based reporting and interactive analysis. Analysis features can be extended by ASAM-CEA components.
ASAM Standards	ASAM CAT CEA, ASAM CAT ODS, ASAM COMMON MDF

TesteeM

Type	Test Automation
Functionalities	Test management software for developing and executing test sequences. Sequences can be configured graphically using Petri-net theory, which allow to analyse the defined sequences. Full multithreading for parallel execution flows. Test steps can be programed with Groovy scripting language. Integrated online visualization (extendable by ASAM-CEA components) and flexible reporting features. Test results can be exported in ATFX or MDF4 file formats. Multi language aware.
ASAM Standards	ASAM CAT CEA, ASAM CAT ODS, ASAM COMMON MDF

Apicom S.p.A.

Apicom designs and develops test equipment for motorcycles, automotive industries, engine manufacturers, and offers and a complete range of products and services., providing state-of- the-art cost effective systems.

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Via Statale 20/a
44042 Cento, Italy
Phone + 39 51 6835273
Fax + 39 51 6830348

www.api-com.com

Horus

Type	Software
Functionalities	Test bed software automation
ASAM Standards	ASAM CAT ODS

APTJ Co., Ltd.

APTJ provides AUTOSAR based software platforms for automotive control systems. Our products are developed upon the study conducted by Nagoya University which have been installed on the H-IIB rockets. Our future development plan extends to autonomous driving and dynamic mapping technology. We provide leading edge technology and efficient support.

Contact: Mr. Hiroyuki Takashima, Mail: hiroyuki_takashima@aptj.co.jp

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Phone + 81 52 782 5705
Fax + 81 52 782 5706

www.aptj.co.jp

Julinar

Type	AUTOSAR-based software platform which includes implementation of the XCP slave
Functionalities	Our software solution, Julinar, is based on AUTOSAR Classic Platform R4.2.2 with various optimizations and enhancements. Consists of: Basic Software Modules including Xcp which supports the XCP Slave features; Runtime Environment which supports measurement and calibration using the XCP protocols.
ASAM Standards	ASAM AE MCD-1 XCP

ArcCore AB

Being one of the vendors providing AUTOSAR products to the automotive market, we bring a new way of developing and offering state-of-art products and services to the market. It can easily be described in three words: Standards, Open and Innovative.

Contact: Mr. Michael Svenstam

Datavägen 2
43632 Askim, Sweden
Phone + 46 31 3012830
Fax + 46 31 3012839

www.arccore.com

BSWBuilder

Type	Tool
Functionalities	Configuration of Autosar BSW
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L)

Level 5, 76 Waymouth Street
5000 Adelaide, Australia
Phone + 31 6 83177471

www.astc-design.com

Australian Semiconductor Technology Company

ASTC is a design partner to the global electronics supply chain, from semiconductor, IP, and software vendors, to software, OEM, and systems companies.

Contact: Mr. Ad Peeters, Mail: ad.peeters@astc-design.com

10050 Colonial Industrial Drive
South Lyon, MI 48178, United States
Phone + 1 248 486 9900

www.autient.com

Autient, Inc.

Autient is an engineering services company specializing in automotive ECUsoftware development and test systems.

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AVL LIST GMBH

AVL is the world largest privately owned and independent company for the development of powertrain systems with internal combustion engines as well as instrumentation and test systems.

Contact: Dr. Gerald Sammer, Mail: gerald.sammer@avl.com

CAMEO calibration environment

Type	Software for the automated calibration of combustion engines and transmissions
Functionalities	Online control of the calibration process and offline global modeling
ASAM Standards	ASAM CAT ACI, ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-3

CONCERTO Data Postprocessing Software

Type	For interactive & automated data postprocessing in automotive application
Functionalities	Data format conversion & management, data analysis, calculation & visualization
ASAM Standards	ASAM CAT CEA, ASAM CAT ODS

CRETA™ Calibration Data Browser

Type	Calibration Data Browser
Functionalities	The AVL CRETA Calibration Data Browser allows calibration engineers of engine and transmission control units to interactively visualize any control unit maps, curves and parameters while studying or reading the application note of a control unit.
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L)

CRETA™ Calibration Data Management

Type	Enterprice Calibration Data Management for engines, transmissions and hybrid.
Functionalities	As a central calibration data management system of xCU parameters, AVL CRETA™ allows the central storage, conflict-free merging and traceable documentation of calibration datasets during series calibration projects.
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L)

iGEM Offline

Type	AVL iGEM Offline test data evaluation is an innovative solution for efficient data analysis of exhaust emission tests according to legislative demands
Functionalities	iGEM Offline includes a series of effective tools and offers the possibility for authorized users to change or expand an existing record configuration. The Formula Editor helps to change calculation variables and formulas and add them into the database. The configuration can be adapted to comply with new legislation or modified technical conditions. Report templates can be created and modified easily via drag and drop operations in the Report Layout Editor. Sever al different types of reports can be created besides the typical standard reports such as online and modal reports; specimen, equipment and consumable data record sheets; statistics COP and audit reports; testing series reports and also combinations of different types of reports.
ASAM Standards	ASAM CAT ODS

PUMA Open Test Bed Automation

Type	Software for test bed automation for stand alone and networked environments
Functionalities	Automation system for engine, transmission/powertrain and chassis dyno test beds
ASAM Standards	ASAM CAT ACI, ASAM CAT CEA, ASAM CAT GDI, ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-3, ASAM CAT ODS

SANTORIN Data Management Server

Type	Software for ASAM ODS compliant data storage, access and exchange
Functionalities	ODS Server for ODS data models, ODS data browser & Admin clients
ASAM Standards	ASAM CAT ODS

Test Factory Management Suite (TFMS)

Type	Process data management software for test fields
Functionalities	Test request handling, Test equipment management, scheduling of resources, UUTmanagement, reporting, utilization optimization
ASAM Standards	ASAM CAT ODS

TestGate

Type	Web based software for remote monitoring of test fields
Functionalities	Graphical overview of the test field, overview of test beds and online values
ASAM Standards	ASAM CAT ODS

ASAM Solutions Guide 2017

b-plus GmbH

b-plus GmbH was founded 1996 in Deggendorf and is specialized as an innovative system provider with state-of-the-art technologies in the business segments automotive, automation and embedded system solutions. Equipped with long experience and profound know-how in project and product area, like industrial networking, design of complex control system software or the design of embedded µController and PC hardware solutions, several development teams realize qualified solutions for challenging industrial and automotive applications. We consider ourselves as a competent full service provider beginning with professional consulting through the conception and management phase of a project up to it's realisation. Thus we are a professional partner of our customers comencing at the development phase to the series production and the system integration.

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94469 Deggendorf, Germany
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Fax +49 991 270302 99

www.b-plus.com

CANTucan

Type	CAN gateway and bus simulator
Functionalities	Designed for the use in development, test and diagnosis environment for communication networks in cars, trucks and laboratories - Fast and easy to use by complete tool based device configuration - Interactive configuration via USB or CAN - Tool chain integration by XCP (via USB or CAN) - ECU conform firmware and hardware architecture - Smallest dimensions and robust aluminum housing for on-board use - Reduced time to market and non-recurring engineering cost
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP

GiraBITE

Type	Universal flash-/parameterization-tool
Functionalities	Flashing of bootloader or firmware for updates of ECU software. Hardware independent support of various bus interfaces in production. - Configurable Flash processes, Use via command line or GUI support of different CAN and FlexRAY™ bus interfaces, ODX Flashcontainer
ASAM Standards	ASAM AE MCD-2 D (ODX), ASAM AE MCD-2 NET (FIBEX)

UNIBoot

Type	Universal Bootloader for ECUs
Functionalities	Security: Seed & key support, SafeMode according to ISO26262 - Hardware independent: support of various chip manufacturers - Configuration: static configuration, standard and extended CAN identifier - Update toolchain: UNIBOOT-Manager
ASAM Standards	ASAM AE MCD-1 XCP

BASELABS GmbH

The Baselabs GmbH is focused on the data fusion in multiple sensor scenarios. We provide software and consulting services for the implementation of advanced driver assistance systems (ADAS) and automated vehicles. The design of environment perception algorithms and the convenient provision of these algorithms to our customers is a key part of our offering. Exemplary customers are Bosch, Denso and Daimler.

Contact: Mr. Norman Mattern, Mail: norman.mattern@baselabs.de

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09126 Chemnitz, Germany
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www.baselabs.de

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BASELABS Code

Type	Code Generator
Functionalities	BASELABS Code is a prototypical C-Code generator to generate C-Code from a data fusion system that has been developed using BASELABS Create.
Supported ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L)

BASELABS Consulting

Type	Service
Functionalities	Consulting for the implementation of complex driver assistance systems. Special focus on algorithm development for the environment perception.
ASAM Standards	ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L)

BASELABS Create

Type	Software dvelopment tool for statistical signal processing algorithms
Functionalities	BASELABS Create provides sophisticated algorithms for driver assistance systems as ready-to-use components and allows new algorithm developments. It is suitable for all sensor-based driver assistance applications and increases the efficiency of the design process.
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L)

BASELABS Modules

Type	Customer-specific software applications
Functionalities	With BASELABS Modules, we offer our customers software components in the field of data fusion and environment perception that are provided on a ready-to-use basis. Examples are multiple object tracking (MOT) applications or car-2-car (C2C) communication applications.
ASAM Standards	ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L)

Beijing Rainfe Technology Ltd.

Beijing Rainfe Technology Ltd. was founded in 2007. It is one of the top ten PLM solutions providers in China (according to Cimidata report 2010). The company focuses on design/simulation and testing solutions through its enterprise software platform and engineering tools. Beijing Rainfe's clients come from the aerospace, marine, defense, auto, and energy industries.

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tdm3000

Type	Test data management system
ASAM Standards	ASAM CAT ODS

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BETA CAE Systems International AG

BETA CAE Systems offers state-of-the-art CAE solutions that meet the requirements of all simulation disciplines, for many sectors, including the automotive motorsports and aerospace. The company's products, ANSA pre-processor, Epilysis solver, µETA post-processor, and SPDRM simulation-process-data-and-resources manager, hold a worldwide leading position.

Contact: Dr. Sam Saltiel, Mail:ansa@beta-cae.com

ANSA/META suite

Type	Pre- & Post-processing for FEA & CFD simulation and test.
Functionalities	META provides an embedded ASAM ODS browser specifically designed to ensure flexibility, performance and ease of use in navigating and querying ASAM ODS data sources. It provides an overview to the data hierarchy included in the data model and a powerful query tool for retrieving data from the server. The wide range of tools in META for assisting NVH testing through the selection of suitable measurement and excitation locations along with the various specific plot types such as Campbell diagrams, and the output of geometry in ATFX format from ANSA, enable our software suite to easily fit in a development cycle process which includes test and simulation. All functionality is also available through scripting thus, allowing the full automation of tasks involving interaction with ASAM ODS data sources.
ASAM Standards	ASAM CAT ODS

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Brüel & Kjaer Sound and Vibration A/S

Brüel & Kjær is a world-leading manufacturer and supplier of sound and vibration measurement systems. Our focus areas are automotive businesses, ground transportation, aerospace, space, defence, airport environment, urban environment, telecom and audio. Brüel & Kjær has an unparalleled portfolio of sound and vibration measuring equipment and is a renowned deliverer of innovative instrumentation solutions.

Contact: Mr. Torben Nielsen, Mail: torbeng.nielsen@bksv.com

ASAM ODS Connectivity

Type	8605
Functionalities	Data exchange using ATF/XML format
ASAM Standards	ASAM CAT ODS

CAETEC GmbH

CAETEC is one of the leading company´s in developing data acquisition hardware like data loggers and measuring devices for automotive testing. The ARCOS data logger family is the most powerful and flexible data logger for fleet testing. The CLIC devices are the newest and fastest data acquisition modules for analogue signals in vehicles.

Contact: Mr. Stephan Bacher, Mail: bacher@caetec.de

ARCOS

Type	data logger
Functionalities	CCP/XCP measuring on CAN & Flex Ray
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX)

ARCOS

Type	data logger
Functionalities	ATFX/mdf 4 data format
ASAM Standards	ASAM CAT ODS, ASAM COMMON MDF

µCROS

Type	data logger
Functionalities	CCP/XCP measuring on CAN & Flex Ray
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX)

µCROS

Type	data logger
Functionalities	ATFX/mdf 4 data format
ASAM Standards	ASAM CAT ODS, ASAM COMMON MDF

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www.caetec.de

Canoo Engineering AG

Canoo Engineering AG is a software company specialized in custom solutions and consulting on the Java and web platform. Canoo focuses on user experience design, UI engineering, and development of omni-channel business applications. Canoo is a founding member of the openMDM® working group, an open-source platform and toolbox for management of measurement data based on ASAM ODS. Canoo also develops general ASAM ODS solutions.

Contact: Mr. Hans-Dirk Walter Mail: hans-dirk.walter@canoo.com

Application development and integration for ASAM ODS.

ASAM Standards	ASAM CAT ODS

openMDM committer & service provider

ASAM Standards	ASAM CAT ODS

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www.cansystem.co.kr

CANsystem

CANsystem provides professional vehicle testing solution such as all common used vehicle bus systems (CAN, CANFD, LIN, CCP, XCP, FLEXray, MOST…), mobile data acquisition for worst environments, voltage variation test, and EV test. CANSystem also is distributor of Ipetronik, KIKUSUI, Softing, Eberspaecher, K2L, and Ruetz System Solutions in Korea. Each and every member of our company strive to satisfy our customers with CANsystem's rich experience in vehicle electronics measurement and testing solution. We are professionals with confidence in the automotive electronic testing industry

Contact: Mr. In-Ho Jung, Mail: jungih@cansystem.co.kr

DTS Monaco

Type	Engineering Tool (measurement and diagnostics)
Functionalities	Full feature engineering tool with application oriented user interfaces for diagnostics, flash programming, measurement, variant coding,OBD, bus node emulation, communication analysis, etc. supported hardware: EDIC family, Softing CAN HW family, DCDI, CANlink/2, Kvaser CAN HW, Vector CAN HW, D-PDU-API-compliant interfaces, SAE J2534 compliant interfaces
ASAM Standards	ASAM AE MCD-2 D (ODX)

DTS Venice

Type	ODX editor/checker. Available for ODX 2.0.1 and ODX 2.2
Functionalities	Administration of ODX/PDX databases, editing of ECU diagnostics, symbolic and semantical check of databases, export to RTF and PDF, verification of interpretation without ECUpossible
ASAM Standards	ASAM AE MCD-2 D (ODX), ASAM AE MCD-2 MC (ASAP2/A2L)

IPEmotion

Type	DAQ Software
Functionalities	Windows DAQ-Software for configuration, acquisition, visualization, analysis, automation, and control applications.
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX), ASAM COMMON MDF

OTX Studio

Type	Comfortable editor for OTX sequences including ASAM MCD-3D server
Functionalities	Easy-to-use authoring system according to ISO 13209, based on Softing D-Server DTS COS and ODX data, specification view (flow charts) and implementation view (line-based), debugging, online-change of code while debugging, reporting. Many supplements to the standard, e.g. DLL access, file access, GUI library
ASAM Standards	ASAM AE MCD-2 D (ODX), ASAM AE MCD-3 D

CMORE Automotive GmbH

We are experts in the development of new systems in the field of vehicle electronics as well as the validation of sensor-based driver assistance and safety systems. At our facilities in Lindau (Bodensee) and Böblingen, our range of services encompasses not only embedded software development, we also execute complex projects for our customers, and manage them throughout the entire product development process, from prototyping and testing to series production. A key focus in the development of the automotive branch is highly-automated an autonomous driving. With our expertise and know-how we thrive to become one of the pioneers of autonomous driving.

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www.cmore-automotive.com

PODBOX

Type	Diagnosis ECU
Functionalities	The multifunctional platform for the automated reporting of test drives, as well as a measurement and diagnostic unit. Its compact design combined with its numerous interfaces permits the PODBOX to be used in the laboratory and also in the vehicle. A highlight of the PODBOX is its independence from operating system, as all data are accessible via a web browser.
ASAM Standards	ASAM AE MCD-2 D (ODX)

Cognitran Ltd.

Cognitran provide the tools that help companies gain control over complex business activities and provide innovative ways to deliver product-specific and market-specific information to end users via the Internet. Our systems deliver cost efficiencies by re-using data across multiple information types and programs with our advanced linguistic tools minimising translation costs. All solutions are built on non-proprietary and modular XML technology using advanced software and techniques. Existing work has met industry-wide acclaim for the use of pioneering technology and our customer base includes many global manufacturing companies. Through our core products we deliver an end to end solution for OEM publication requirements 1. ISIS – a fully integrated online AfterSales Package, incorporating maintenance and repair documentation, diagnostics and service history. 2. Blaise – a comprehensive document creation and management system which simplifies content re-use and gives you total control over the creation, translation and publishing process.

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Concurrent HPS Europe S.A.

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CONTROLTEC
UNLOCKING THE POWER OF DATA

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Control-Tec LLC

Established in 2009, Control-Tec is a start-up technology-based company specializing in vehicle data acquisition systems & custom analysis software for the light and heavy-duty transportation industries. Our Vehicle Data Recorders record data in near real-time from the vehicle and upload the data via cellular from all over six continents.

Contact: Mr. William Leisenring, Mail: bleisenring@control-tec.com

CT-1000

Type	Data Logger
Functionalities	Vehicle Data Acquisition & Telematics
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MDX

Qualifier

Type	Automated Vehicle Validitation Service
Functionalities	Data Acquisition & Analysis, Telematics, Cloud
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MDX

C*PAC

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Offices: US

CPAC Systems AB

System integrators for vehicle industry. Development and manufacturing of safety critical control systems for industrial vehicles, marine vessels and trucks.

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CSM

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CSM Computer-Systeme-Messtechnik GmbH

Computer-Systeme-Messtechnik GmbH is a leading and innovative manufacturer of mobile measurement technology and data acquisition systems. For more than 30 years, we have been setting benchmarks in the field of automotive measurement technology with our products being successfully applied by almost all manufacturers of passenger cars and commercial vehicles as well as their suppliers and service contractors worldwide. Our measurement modules and data loggers have been proven to be very reliable for developing and testing new vehicles and their components, even under most demanding environmental conditions. Given the continuous demands on measurement technology CSM is constantly facing new challenges, like, for example, currently in the fields of electric and hybrid vehicles (e-mobility). Continuous innovation in combination with long-term satisfied customers are the two key factors for our success now and in the future.

Contact: Mr. Christoph Mühleis, Mail: info@csm.de

INCA AddOn

Type	SW AddOn for ETAS INCA Development Tool
Functionalities	Configuration and handling of CSM MiniModules in INCA
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L)

MiniModules

Type	Measurement modules for analog data
Functionalities	Acquisition of analog signals and output to CAN or EtherCAT
ASAM Standards	ASAM AE MCD-1 XCP

UniCAN 2

Type	Failsafe µ-controller based datalogger
Functionalities	CAN bus data acquisition and monitoring, fleet management, J1939
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP

Cybermetrix Inc.

CyberMetrix is an engine test technology and services company. Complete delivery from built-for-customer test cell facility and equpment design, integration, commissioning, as well contract testing services using our high-end labs, including world's highest thermal capacity engine cold test facility.

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CyberMetrix
the measure of innovation.

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CyFlex

Type	Test bed automation
Functionalities	High end data acquisition and controls, intelligent instrument integration, enterprise features.
ASAM Standards	ASAM AE MCD-3, ASAM ASAP3

Mach

Type	Test data analysis
Functionalities	Centralized and traceable engine analysis for modular complex products such as engines and vehicles, enterprise features.
ASAM Standards	ASAM CAT ODS

Danlaw Technologies India Limited

Danlaw Technologies India Limited (DTIL) is established in the year 1999. DTIL specializes in providing the automotive testing solutions, automotive electronic control unit testing and developing automated testing tools. DTIL has expertise in development of products such as Mx-Suite (embedded software verification and validation tool), Diagnostic and Physical layer testing automation Tools, Portable Reprogrammable Device and Datalogger (Telematics). DTIL also provides services such as CAN, LIN, Ethernet protocol testing using standards such as GMW14241, GNW3110, GGDS, ISO11898, ISO14229.

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Dassault Systèmes

Dassault Systèmes, the 3DEXPERIENCE Company, provides business and people with virtual universes to imagine sustainable innovations. Its world-leading solutions transform the way products are designed, produced, and supported. Dassault Systèmes' collaborative solutions foster social innovation, expanding possibilities for the virtual world to improve the real world. For more information, visit www.3ds.com.

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DEWETRON GmbH

DEWETRON is specialist for universal test and measurement systems. The company is headquartered in Graz and develops, produces and sells high precision and sophisticated measurement solutions all over the globe. We provide state-of-the-art solutions for a wide range of industries focusing on the core markets of automotive, energy & power analysis, transportation, aerospace and general measurement engineering.

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DSA Daten- und Systemtechnik GmbH

Being an innovative partner for the automotive industry, DSA develops hardware and software solutions for enabling diagnostic and data logistic processes at all stages of the vehicle life cycle. The DSA portfolio ranges from offline and over-the-air flash programming and coding of ECUs to guided repair, M2M solutions, and remote diagnostics for vehicle fleets. The DSA Skylyze platform offers customized Big Data analytics for vehicle manufacturers and other manufacturing domains. Currently more than 400 employees are working for DSA at subsidiaries all over the world. DSA is market leader and has been repeatedly awarded by major OEMs. DSA systems are operated in 29 countries, 175 car plants, and 30,000 workshops all over the world.

Contact: Mr. Tobias Katz, Mail: Tobias.Katz@dsa.de

Authoring Guidelines & Process Setup

Type	Consulting & Technical Documentation
Functionalities	Interested in setting up ODX- and/or OTX-based diagnostic processes within your organization? We have all the necessary know-how to define efficient and streamlined processes for all process participants starting with the supply-chain and covering engineering, production, service and the independent after-market. We document your processes, define and specify the necessary authoring guidelines for ODX and OTX and help your tool suppliers to implement process and guidelines into the tools. Please ask for our project references.
ASAM Standards	ASAM AE MCD-2 D (ODX), ASAM AE MCD-3, ASAM AE MCD-3 D

Firmware Update over-the-Air (FOTA)

Functionalities	With the DSA connected vehicle solution, software updates and configuration can be pushed to the vehicle "over the air" at any time. The vehicle health status is transmitted over wireless networks to a Connected Vehicle Server, which contains the current configuration of the vehicle together with performance indicators and error codes. Flash files are reconstructed based on the deltas of the current configuration and an up-to-date configuration matrix. All changes can be applied using the infotainment unit or vehicle connectivity gateway as a diagnostics tester, which performs flash programming and configuration to all ECUs. With firmware updates over-the-air (FOTA) campaigns no longer require expensive recalls and problems can be proactively corrected in the field. More cars will receive safety-critical updates because customers do not have to spend time taking the car to the workshop. With over-the-air configuration, it is possible to provide on-demand activation of features based either on additional customer purchases or changes on customer profile.
ASAM Standards	ASAM AE MCD-3 D

PRODIS.Authoring

Type	Diagnostic Data and Application Authoring Tool
Functionalities	PRODIS.Authoring is a full-fledged authoring environment to edit, maintain, test and release all your diagnostic data and applications for dealerships and workshops. Its elaborate ODX import functionality and graphical test application authoring capabilities - including OTX support - make it the number one authoring tool for service diagnostics worldwide. Apart from the support of these cutting edge standards, it comprises features for the integration of technical documentation (RMI -Repair & Maintenance Information), wiring diagrams, part locators, repair videos etc. Its module to author and maintain helpful guided diagnostics has received astonishing market attention. With PRODIS.Authoring you provide vehicle platform data releases to be excuted in our lean and fast service diagnostic runtime system PRODIS.RTS with one button click. A key feature of PRODIS.Authoring is its elaborate support for variant management in the life-cycle of your vehicle platforms.
ASAM Standards	ASAM AE MCD-2 D (ODX), ASAM AE MCD-3, ASAM CAT GDI

PRODIS.Automation

Type	Authoring tool for engineering and production diagnostic, flash programming and configuration applications
Functionalities	PRODIS.Automation is the most advanced solution for the graphical authoring, maintenance and release of diagnostic, flash programming and configuration applications for your engineering and production purposes. It comprises our renown ODX Browser, which allows for the efficient drag&drop implementation of sequences, also compliant to the new OTX standard. Interfaces for vehicle communication (ASAM MCD-3D) as well as test stand and test equipment integration (ASAM GDI) are integrated into the tool. PRODIS.Automation ships with an integrated version and configuration management solution, ideally supporting team collaboration and traceability of all changes.
ASAM Standards	ASAM AE MCD-2 D (ODX), ASAM AE MCD-3, ASAM AE MCD-3 D, ASAM CAT GDI

PRODIS.OET

Functionalities	With PRODIS.OET you can interactively test your ODX data against an ECU (prototype) or against simulations. The testing of partially integrated vehicle electronics is also supported. All tests and test results are recorded and can be reported in different formats, e.g. for exchange with the ECU developer or for archiving. The automatic repetition of previous tests as well as the monitoring and analysis of all ongoing bus communication are key features of the tool. And if you want to

integrate your parameterized ODX services and jobs into test sequences: Just drag them out of OET and drop them in a graphical PRODIS.Automation or PRODIS.Authoring test sequence. Naturally, PRODIS.OET comprises our renown implementation of the ASAM MCD-3D standard PRODIS.MCD.

ASAM Standards: ASAM AE MCD-2 D (ODX), ASAM AE MCD-3, ASAM AE MCD-3 D

PRODIS.RTS

Type: Diagnostic runtime system for vehicle & machine manufacturing plants

Functionalities: PRODIS.RTS is our benchmark-winning diagnostic runtime system for all manufacturing plants. It supports utmost parallelism in communicating to ECUs and comprises both our renown PRODIS.MCD (implementing ASAM MCD-3D) and a full GDI Stack for communication to test equipment and test stands, like rolls, filling, robots etc. Apart from this standardized functionality PRODIS.RTS is an automation system with full support for digital vehicle data supply, quality data storage, worker guidance etc. PRODIS.MCD is designed for robustness in the field and can be operated multi-shift around the clock.

ASAM Standards: ASAM AE MCD-2 D (ODX), ASAM AE MCD-3, ASAM AE MCD-3 D, ASAM CAT GDI

PRODIS.Share

Type: Internet Distribution Platform for Diagnostic Data

Functionalities: Consistently and efficiently shipping diagnostic data, including ODX and OTX data, to the field (e.g. to service technicians or dealerships) has become a key challenge. PRODIS.Share solves all your needs for a flexible, secure and highly available internet-based distribution platform. It is capable to serve diagnostic data packages and core software to thousands of dealerships simultaneously through cloud replication services. But, it is also possible to deliver a patch release to only one or a small set of dealerships for tryout. With PRODIS.Share the need for DVDs to distribute service tester updates to the field is history.

ASAM Standards: ASAM AE MCD-2 D (ODX)

PRODIS.WTS

Type: Diagnostic runtime systems for service uses cases

Functionalities: PRODIS.WTS is our cutting-edge diagnostic and flash runtime system for all vehicle service purposes. It runs in more than 18,000 installations worldwide in dealerships of 9 machine and vehicle OEMs. Its flexibility in accomodating specific workflows and CI requirements as well as its full support for ASAM standards MCD-3D and ODX, ISO standard 22900-1 and SAE standard J2534 makes it a future-ready tool that also supports all known requirements of Euro 5/6 and V/VI legislation, respectively. As such it has been successfully analyzed for compliance by representatives of the european legislation body. As you would expect with any member of the PRODIS family, PRODIS.WTS is very fast and allows for the parallel communication to all ECUs in the vehicle.

ASAM Standards: ASAM AE MCD-3, ASAM AE MCD-3 D

PRODIS.MCD

Type: ASAM MCD-3D Diagnostic Kernel

Functionalities: PRODIS.MCD is our implementation of the ASAM MCD-3D standard. We support versions 2.0.2 and the newest standard version 3.0.0. PRODIS.MCD is recognized as the fastest implementation of the standard in terms of execution time and supports unchallenged parallelism to communicate with many ECUs simultaneously. PRODIS.MCD has the capability to operate on ODX data of all three major released versions (2.0.1, 2.1.0, 2.2.0) of the ODX standard, even if multiple files of different standards are mixed within one project! To ensure safe and fast distribution of the ODXdata to testers in the field (pilot, production, service) PRODIS.MCD ships with an intelligent data converter that releases a very compact binary file. With respect to VCI integration, PRODIS.MCD can integrate VCIs compliant to the ISO 22900-2 D-PDU API standard as well as VCIs compliant to the SAE J2534-1 standard. PRODIS.MCD is part of our extensive diagnostic test tool suite PRODIS, but can also be licensed as a separate product for integration into your diagnostic tool chain. By the way - this product is also DoIP-ready!

ASAM Standards: ASAM AE MCD-3, ASAM AE MCD-3 D

PRODIS.MVCI (Modular Vehicle Communication Interface)

Type: Diagnostic hardware interface with MCD-3D compliant software interface

Functionalities: Our VCI hardware is always equipped with support for the ISO 22900-2 (D-PDU API) standard. As such our VCIs are an ideal basis for MCD-3D implementations, like our PRODIS.MCD, PRODIS.RTS and PRODIS.WTS. By the way - this product is also DoIP-ready.

ASAM Standards: ASAM AE MCD-2 D (ODX), ASAM AE MCD-3, ASAM AE MCD-3 D

Remote Diagnosis and Telematics

Functionalities: Monitoring of construction as well as agricultural vehicles and transportation fleets to detect defective systems or critical situations saves time and money. Determined real-time monitoring of working machines and commercial vehicles can be used to optimize fleet management. DSA provides hardware and software technology platforms for telematics and remote diagnosis independent of the vehicle type and manufacturer as well as the integration of existing standalone Internet of Things (IoT)-based solutions. DSA telematics units enable for transmission of fleet management data like GPS position, driving speed, and machine parameters, information on state and driver, parameters of sensor systems (tire pressure, coupling sensor, door lock, freight, etc.) as well as information about cooling aggregate/sections of refrigerated trucks (temperature etc.).

ASAM Standards: ASAM AE MCD-3 D

dSPACE GmbH

dSPACE stands for complete development systems for electronic controls in automotives, aerospace and mechatronics. dSPACE systems are used in R&D applications in industry and universities where fast time-to-market and solid results are key requirements. Typical applications are system and software architecture design, rapid control prototyping, automatic production code generation, hardware-in-the-loop simulation and calibration.

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AutomationDesk

Type: Automated testing for hardware-in-the-loop (HIL) simulation

Functionalities: AutomationDesk is a powerful front-end tool for automated testing of the application software or diagnostic functions of electronic control units (ECUs).

ASAM Standards: ASAM AE HIL, ASAM AE MCD-3 D, ASAM AE MCD-3 MC, ASAM AE XIL, ASAM AE XIL-MA

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dSPACE

ControlDesk Next Generation

Type	Experiment and instrumentation software for ECU development
Functionalities	The software includes functionalities for layouting experiments, instrumentation, measurement, post-processing, ECU calibration, as well as diagnostics access. It offers synchronized data capture across ECUs, RCP and HIL platforms, and bus systems, and has an integrated project and experiment management.
ASAM Standards	ASAM AE CDF, ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 D (ODX), ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX), ASAM AE MCD-3, ASAM AE XIL, ASAM AE XIL-MA, ASAM COMMON MDF

dSPACE ECU Flash Programming Tool

Type	ECU flash programming
Functionalities	Software for programming the ECU flash memory via XCP on CAN, XCP on Ethernet, various types of on-chip debug ports like JTAG/NEXUS, NBD/AUD, JTAG/OCDS, DAP and JTAG/ SDI and the dSPACE Generic Serial Interfaces GSI1 and GSI2.
ASAM Standards	ASAM AE MCD-1 XCP

dSPACE Ethernet Configuration Package

Type	Hardware-in-the-loop (HIL) simulation
Functionalities	Convenient software tool for configuring a dSPACE system as a simulation node in a Ethernet network. It relies on network data available in a FIBEX representation. It is also used to generate the communication code and controller configuration.
ASAM Standards	ASAM AE MCD-2 NET (FIBEX)

dSPACE FlexRay Configuration Package

Type	Hardware-in-the-loop (HIL) simulation and rapid control prototyping
Functionalities	Convenient software tool for configuring a dSPACE system as a simulation node in a FlexRay network. It relies on network and scheduling data available in a FIBEX or AUTOSAR representation. It is also used to generate the communication code and controller configuration.
ASAM Standards	ASAM AE MCD-2 NET (FIBEX)

dSPACE XCP Service

Type	XCP service to be implemented on the ECU
Functionalities	ECU service code for XCP on CAN and Ethernet (TCP/IP, UDP/IP) supporting measurement, calibration, bypassing and ECU flash programming.
ASAM Standards	ASAM AE MCD-1 XCP

Platform API Package

Type platforms	Package of application programming interfaces (API) for accessing simulation
Functionalities	Program interfaces in .NET and Python for reading, writing, stimulating and capturing model variables on dSPACE real-time platforms.
ASAM Standards	ASAM AE HIL, ASAM AE XIL, ASAM AE XIL-MA

RTI Bypass Blockset

Type	Rapid control prototyping (primarily bypassing) and hardware-in-the-loop (HIL) simulation
Functionalities	Simulink® blockset providing ECU read and write access from dSPACE real-time platforms via different kinds of ECU interfaces such as CCP, XCP, DPMEM PODs or on-chip debug ports. The blockset is especially designed for the dialog-based configuration of bypass applications. It allows ASAM MCD-2 MC (ASAP2) files to be imported and ECU variables to be selected via a convenient browser. It handles conversion formulas and the selection of bypass hooks automatically. In addition, the RTI Bypass Blockset supports on-target (internal) bypassing, allowing the bypass model to be compiled and downloaded directly into the free flash memory and RAM of the target ECU. For this, model parameters and signals are automatically added to the ECU's ASAM MCD-2 MC (ASAP2) file.
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L)

dSPACE

SystemDesk

Type	System and software architecture development
Functionalities	SystemDesk supports the development of software architectures and distributed automotive electrics/electronics (E/E) systems. Such systems can be modeled according to the AUTOSAR standard. Existing communication matrix files can be imported in SystemDesk to specify network communication. When AUTOSAR software components are modeled or imported in SystemDesk, available ASAM MCD-2 MC (ASAP2) models can be imported as well. During generation of the AUTOSAR run-time environment (RTE) and virtual ECUs (V-ECUs), ASAP2 file generation is also performed for variables that are tagged for calibration and measurement according to the AUTOSAR concept. When V-ECUs are built, instances of the XCP service (XCP on Ethernet – TCP/IP) are implemented in the V-ECU code. Thus, the V-ECUs and variables described in the ASAM MCD-2 MC (ASAP2) files can be accessed during simulation.
ASAM Standards	ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX)

TargetLink

Type	Production code generation (for ECU development)
Functionalities	TargetLink is a software system that generates production code (C code) straight from the MATLAB®/Simulink®/Stateflow® graphical development environment. The C code generation options range from plain ANSI C code to optimized fixed- or floating-point code for AUTOSAR platforms. Versatile code configuration options ensure that the production code copes with processor constraints. Converting graphical models directly into production code ensures perfect consistency between model and code at all times. Since the same model will always result in the same proven code, TargetLink's code generation is deterministic and thus guarantees the highest software quality. Every step can be tested against the specification via the built-in simulation features.
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L)

Variable Editor

Type	Variable description file editor
Functionalities	Convenient tool for visualizing, editing and creating ECU description files according to the AE MCD-2MC standard.
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L)

VEOS

Type	PC-based simulation platform for ECU development
Functionalities	VEOS is a PC-based simulation platform for virtual validation in the development of electronic control units (ECUs) and systems. VEOS is used in the early development stages to simulate a wide range of models – function models, virtual ECUs, bus systems, and vehicle models – independently of the simulation hardware.
ASAM Standards	ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE XIL-MA

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DTS INSIGHT CORPORATION

DTS INSIGHT CORPORATION is engaged in designing and development of microcomputer, peripheral system and others to providing consulting and tools that help Japanese and international companies improve the develoment process for embedded product. We can provide ECUmeasurement tools, software development environments, ICE, debugger, and CAN/Serial programmer.

Contact: Mr. Tomoaki Suenaga, Mail: info-mvi@dts-insight.co.jp

NETIMRESS

Type	Programmer (CAN/Serial)
Functionalities	Versatile/high-speed flash on-board programmer for both small production line and large production line that can support both stand-alone and network control.
ASAM Standards	ASAM AE MCD-1 XCP, ASAM AE MCD-2 D (ODX)

RAMScope

Type	Data measurement, analysis tool
Functionalities	High-speed monitor tool for the environment that measures synchronously and analyzes RAM in two or more ECU
ASAM Standards	ASAM AE MCD-3 MC

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Dynamometer Services Group Ltd.

DSG Ltd. is a UK based privately owned company supplying systems for diesel and petrol enginge, vehicle, transmission, component development and end of line testing world wide. Drawing on over 40 years of experience we focus on our customers' requirements to ensure that our solutions are both technically and commercially viable and successful.

Contact: Mr. Gregg Atkins, Mail: Gregg@dsgroup.uk.com

DaTAQ Pro

Type	Test Bed Control System Software
Functionalities	Data Acquistion, Test Bed Control
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L), ASAM ASAP3

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www.esrlabs.com

E.S.R. Labs GmbH

E.S.R.Labs is a software startup company focusing mainly on embedded software in the automotive industry. On the supplier side we continued to roll out state of the art software technologies in a number of projects for different OEMs. Part of our portfolio are Autosar-Tools, different SW stacks as well as ODX and Fibex tools.

Contact: Mr. Wolfgang Köcher, Mail: wolfgang.koecher@esrlabs.com

E.S.R. FIBEX Tools

Type	Product
Functionalities	FIBEX editor, FIBEX library
ASAM Standards	ASAM AE MCD-2 NET (FIBEX)

E.S.R. ODX Tools

Type	Product
Functionalities	ODX editor, ODX library
ASAM Standards	ASAM AE MCD-2 D (ODX)

eGlue Technologies Srl

eGlue Technologies is an Italian SME founded in 2008 by a group of engineers with academic and industrial experience. eGlue Technologies designs and develops innovative software platforms for automotive and industrial applications. The focus of the company is the research of new technologies and paradigms to design and develop complex systems in a simple way. Besides the solid experience in embedded software development, the team has a detailed understanding of all the latest platforms, tools and industry standards.

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Elektrobit Automotive GmbH

Elektrobit (EB) establish itself among the key suppliers of embedded automotive software solutions. Apart from the development of future-oriented products, the company also specializes in services and consulting for the automotive industry, supplying serial-software-solution implementations for a broad range of AUTOSAR and FlexRay, Infotainment, Navigation, HMI and Driver Assistance systems.

Contact: info.automotive@elektrobit.com

EB tresos Busmirror

Type	Rest Bus Simulation Solution
Functionalities	EB tresos Busmirror is able to emulate missing FlexRay nodes in the network (rest bus simulation). This allows developers to test their own ECU software performance in interaction with emulated ECUs and to simulate potential error scenarios. Functions can be processed on the hardware in real-time using target user-modules.
ASAM Standards	ASAM AE MCD-2 NET (FIBEX)

EB tresos Designer

Type	Network design tool for AUTOSAR based embedded systems
Functionalities	The EB tresos Designer is a versatile system design tool for the generation of CAN and FlexRay network configurations. Powerful wizards support the configuration of the interdependent protocol parameters and immediately highlight parameter constraint violations. Standardized exchange formats like ASAM MCD-2 (FIBEX)

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enable the further use of the generated communication matrix in other COTS tools and the whole EB tresos product family, e.g. EB tresos Studio or EB tresos Inspector.

ASAM Standards: ASAM AE MCD-2 NET (FIBEX)

EB tresos Inspector

Type: Measuring and analysis tool in FlexRay and CAN networks

Functionalities: EB tresos Inspector seamlessly integrates both FlexRay and CAN bus systems. Measurements are displayed in frame and signal analysis windows. It can be used for gateway and run-time analysis and and entails various signal-display instruments such as bar and pointer instruments as well as y-t oscilloscopes.

ASAM Standards: ASAM AE MCD-2 NET (FIBEX)

EB tresos Studio

Type: Basis Software Configuration for AUTOSAR Modules

Functionalities: EB tresos Studio is a feature-rich configuration environment for basic software components in accordance with AUTOSAR. It allows to configure, validate and generate basic software in an easy-to-use graphical user environment. Through its open interfaces it can be extended with customer-specific software modules. Consequently, legacy parameter descriptions, like BDC, LDF or OIL, can be imported as well, making it the ideal tool for company-wide software deployment.

ASAM Standards: ASAM AE MCD-2 NET (FIBEX)

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www.embeddeers.com

embeddeers is an engineering service company for automotive, industrial and consumer electronics. The main focus concentrates on automotive ECUs (body controller; driver assistance), eMobility (motor control; user interface), test (management; customized HiL-systems), consulting (safety; aSPICE) and product development as a service.

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Emotive is an independent expert for automotive diagnostic systems. Based on the diagnostic standards OTX (ISO 13209), ODX (ISO 22901) and the MVCI D-Server (ISO 22900) emotive offers modern and innovative software products for the diagnostic process chain. Emotive supports their customers to implement their diagnostic concepts through consulting, training and custom developments.

Contact: Mr. Jörg Supke, Mail: Joerg.Supke@emotive.de

Open Test Framework

Type: Software

Functionalities: The EMOTIVE Open Test Framework (OTF) is a complete and native development environment for OTX (ISO 13209). It has been architected for the designing, visualization, maintaining and testing of a new generation of more reliable tester applications. Strictly based on standardized common language and communication mechanisms, the testing Know-how can be exchanged between different departments within the company (Development, Production, Service etc.) and between OEMs and suppliers.

ASAM Standards: ASAM AE MCD-2 D (ODX), ASAM AE MCD-3 D

OTX-API

Type: Software Library

Functionalities: The OTX-API provides client applications with easy, fast and reliable access to OTX data model. The main task is loading of OTX projects and the editing and validating of OTX procedures.

ASAM Standards: ASAM AE MCD-2 D (ODX)

OTX-Runtime-API

Type: Software Library

Functionalities: The OTX-Runtime-API provides client applications with easy, fast and reliable access to OTX for runtime execution. The main task is loading of OTX projects, browsing the structure and executing of procedures.

ASAM Standards: ASAM AE MCD-2 D (ODX), ASAM AE MCD-3 D

OTX-Viewer

Type: Firefox Addon

Functionalities: The emotive OTX/PTX-Viewer Firefox Addon gives the user the opportunity to view and analyze single OTX files as well as whole OTX projects (PTX) in a very easy and convenient way without a lot of requirements and installation effort. The only requirement is the wellknown Mozilla Firefox Browser. The following section describes the installation and usage of the OTX/PTX-Viewer.

ASAM Standards: ASAM AE MCD-2 D (ODX)

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Esterel Technologies is a leading provider of critical systems and software development solutions for the aerospace, defense, rail transportation, nuclear, and industrial & automotive domains. System and software engineers use SCADE® solutions to graphically design, verify, and automatically generate critical systems and software applications with high dependability requirements. Esterel Technologies SCADE product solutions easily integrate, allowing for development optimization and increased communication among team members.

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SCADE Suite

Type: Software development environment

Functionalities: model based software development, certified/qualified

ASAM Standards: ASAM AE MCD-2 MC (ASAP2/A2L)

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ETAS GmbH

ETAS provides innovative solutions for the development of embedded systems for the automotive industry and other sectors of the embedded industry. As a systems provider, ETAS supplies a multifaceted portfolio that covers the range from integrated tools and tool solutions to engineering services, consulting, training, and support. Security solutions in the area of embedded systems are offered by the ETAS subsidiary ESCRYPT. Established in 1994, ETAS GmbH is a 100-percent subsidiary of the Bosch Group, with international locations in 12 countries in Europe, North and South America, and Asia.

Contact: Ms. Anja Krahl, Mail: anja.krahl@etas.com

ETAS ASCET

Type	Function Development and Software Engineering Tool
Functionalities	ETAS ASCET – Model-based ECU Software Development: The ASCET product family provides an integrated solution for model-based development of application software for embedded systems. ASCET is widely used for modeling, simulation, rapid prototyping, and ISO 26262/IEC 61508 SIL3 certified automatic code generation for a variety of HW platforms. ASCET supports automotive standards such as ASAM, AUTOSAR, MISRA-C:2004, and OSEK.
ASAM Standards	ASAM AE MBFS, ASAM AE MCD-2 MC (ASAP2/A2L)

ETAS ASCMO

Type	Measurement, Calibration, and Diagnostics Tool
Functionalities	ETAS ASCMO – Accurate Prediction of Complex System Behavior: ETAS ASCMO facilitates the optimization and calibration of complex systems in virtual environments on the PC. The use of ETAS ASCMO significantly reduces the effort required for testing on real-world systems, e.g., at the test bench or in the vehicle. ETAS ASCMO uses a data-based model of high accuracy to describe system behavior. The model is based on a minimal number of measurements taken on the actual system.
ASAM Standards	ASAM COMMON MDF

ETAS EHANDBOOK

Type	Measurement, Calibration, and Diagnostics Tool
Functionalities	ETAS EHANDBOOK – Interactive ECUDocumentation: ETAS EHANDBOOK is an interactive documentation solution for efficient ECU calibration. It offers a large variety of views and chained links for improved ease of navigation through extensive ECUdocumentation. ASCET and Simulink® are translated into new interactive models to understand the ECU functions and their dependencies in an easy way. This allows calculation and highlighting of signal flows across model hierarchy boundaries, too. ETAS EHANDBOOK links to ETAS INCA to facilitate the live display of values from INCA experiments and to create INCA experiments more quickly. The entire contents (texts, structures, graphics, models) of the ECU documentation is stored in a so-called EHANDBOOK Container. The generation of it based on input data in standard ASAM formats.
ASAM Standards	ASAM AE CC, ASAM AE FSX, ASAM AE MDX

ETAS EHOOKS

Type	Function Development, Software Engineering, Measurement, ECU Calibration, and Diagnostics Tool
Functionalities	ETAS EHOOKS – Bypass Hook Insertion Tool: ETAS EHOOKS is a software tool that facilitates the efficient insertion of bypass hooks into ECU software. The EHOOKS user can place bypass hooks directly into the HEX & A2L files without knowledge of software details – there is no need for access to either ECU source code or ECU software build environment. EHOOKS ECU ports are developed with the support and involvement of the Tier 1 ECU software development team. This allows EHOOKS to do a very high quality job of placing the hooks into the ECU software, but also makes EHOOKS very simple to use.
ASAM Standards	ASAM AE MBFS, ASAM AE MCD-2 MC (ASAP2/A2L)

ETAS INCA

Type	Measurement, Calibration, and Diagnostics Tool
Functionalities	ETAS INCA – Integrated Environment for Measurement, ECU Calibration, and Diagnostics: INCA is a universal product family for online and offline calibration of ECU function parameters, controlled via a graphical user interface or remote access. INCA performs the measurement of signals obtained from ECUs and from the vehicle environment, and incorporates powerful tools for managing ECU projects and parameters, analyzing measured and reading diagnostic data, as well as flash programming.
ASAM Standards	ASAM AE CDF, ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 D (ODX), ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX), ASAM AE MCD-3 MC, ASAM COMMON MDF

ETAS INCA-FLOW

Type	Measurement, Calibration, and Diagnostics Tool
Functionalities	ETAS INCA-FLOW – Guided and Automated Calibration: INCA-FLOW provides a graphical development environment enabling calibration engineers to specify automation sequences for INCA without the need for programming. To ensure results of consistent quality, INCA-FLOW is fully integrated with INCA and supports best-practice processes for calibration, validation, and measurement.
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L), ASAM COMMON MDF

ETAS INTECRIO

Type	Function Development Tool
Functionalities	ETAS INTECRIO – Integrated Prototyping Environment: INTECRIO Integrated Prototyping Environment supports the development of embedded control software through integrated functions modeled in the engineers familiar ASCET-MD, MATLAB®/Simulink®, AUTOSAR, and/or C code development environment. INTECRIO provides a common environment for prototyping control functions on the PC or in the real world by means of rapid prototyping hardware.
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX)

ETAS INTECRIO-RLINK

Type	Function Development Tool
Functionalities	ETAS INTECRIO-RLINK – Prototyping Blockset: With INTECRIO-RLINK, function developers can perform all steps of prototype configuration and generation directly in Simulink®. The Prototyping Blockset supports configuration tasks for the various ETAS prototyping targets and their connectivity with ECU bypass plus sensor and actuator signals. In addition, the Windows PC is supported for non-realtime prototyping.
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX)

ETAS ISOLAR-A

Type	Software Engineering Tool
Functionalities	ETAS ISOLAR-A – AUTOSAR Authoring: ISOLAR-A is an AUTOSAR authoring tool. It is built on Eclipse technology and uses the Artop framework to enable easy integration into existing development environments. ISOLAR-A can be integrated with other AUTOSAR-compliant tools from ETAS or third-party vendors.
ASAM Standards	ASAM AE MCD-2 NET (FIBEX)

ETAS ISOLAR-EVE

Type	Software Engineering Tool
Functionalities	ETAS ISOLAR-EVE – AUTOSAR Software Validation: ISOLAR-EVE is an Eclipse-based environment for the configuration of virtual ECUs. ISOLAR-EVE is closely integrated with the ETAS ISOLAR-A AUTOSAR authoring tool and the application software behavior modeling/auto-coding tool ETAS ASCET. ISOLAR-EVE is open to other AUTOSAR-compliant authoring and behavior-modeling tools as well as to manually coded AUTOSAR application software components.
ASAM Standards	ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L)

ETAS LABCAR-AUTOMATION

Type	Test and Validation Tool
Functionalities	ETAS LABCAR-AUTOMATION – Automated ECU Testing: Develops, manages, and executes abstract and test bench-independent automated tests for embedded software. To ensure high-quality automated tests, the tool supports different activities and roles in the testing process.
ASAM Standards	ASAM AE MCD-2 D (ODX), ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE XIL

ETAS LABCAR-OPERATOR

Type	Test and Validation Tool
Functionalities	ETAS LABCAR-AUTOMATION - Automated ECU Testing: Develops, manages, and executes abstract and test bench-independent automated tests for embedded software. To ensure high-quality automated tests, the tool supports different activities and roles in the testing process.
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE XIL

ETAS XETK/ETK

Type	ECU Interface
Functionalities	ETAS XETK/ETK – Universal ECU Interfaces: XETKs/ETKs comprise parallel or serial Electronic Control Unit (ECU) interfaces for calibrating, flashing, measuring, rapid prototyping (bypass), and debugging. XETKs/ETKs are designed to support function development for, and calibration of, automotive ECUs in harsh environments (operating temperature ranges from -40 °C to +110 °C), XETKs/ETKs provide excellent power-on (cold start) features, proven reliability, high performance, low latency, and high data throughput. XETKs support the ASAM XCPstandard.
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L)

FEV Automatisierungssysteme GmbH

Founded in 1978, FEV is an internationally recognized leader in the design and development of internal combustion engines and supplier of advanced test and instrumentation systems. In 2011, the FEV Automatisierungssysteme GmbH has been established to combine the company-wide expertise in automation systems. This newly established subsidiary can look back on many years of experience in the proper and efficient operation of engine test cells. This enhances FEV's position as a highly competent and experienced provider of advanced test cell solutions. We only offer test cell equipment to our customers that has already met the arduous operational demands presented by our own powertrain test facilities and engineering staff.

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TestCellManager TCM

Type	Test Bed Automation System
Functionalities	Engine Driveline and component test beds automation and data acquisition
ASAM Standards	ASAM CAT ACI

FEV France

FEV France offers a large selection of modular solutions, which are easy to integrate and fully compliant with other equipments and softwares on the market. It also provides test bed engineering solutions and powertrain engineering services. Its worldwide presence enables FEV France to offer the full range of its services and products to all transport sector manufacturers.

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MORPHEE

Type	Test bed automation system
Functionalities	One single system covering automation, ECUcalibration and real-time simulation on a test cell. Reliable, powerful, open and upgradeable as it is, MORPHEE is a perfect solution for controlling your test cells as safely as can be. Whatever kind of test facility you have, MORPHEE adapts to your working methods and provides you with the latest technology in order to reduce your development time.
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX), ASAM AE MCD-3, ASAM AE MCD-3 MC, ASAM CAT ACI, ASAM CAT ODS

OSIRIS

Type	Combustion analysis system
Functionalities	Real time combustion analysis in a test cell or on-board a vehicle. OSIRIS is a turn-key fast acquisition system. Originally designed to sample data at each engine revolution crank angle, it can also work as a time based oscilloscope. Fast to install and easy to use, it covers all needs of engine engineers during every step of a powertrain development.
ASAM Standards	ASAM AE MCD-3

TEST MANAGER

Type	Test data management system
Functionalities	This data base solution perfectly fits the collaborative working environment of

modern test centers. TEST MANAGER is an essential add-on to MORPHEE for maximum productivity at reduced administration costs. It provides central handling, sharing and protection of the test data of all your co-workers, from the test demands to the result files, including test procedures. It is based on robust, powerful and proven data bases and easily adjusts to customer specific data flow and data models.

ASAM Standards: ASAM CAT ODS

xMOD

Type: Simulation platform

Functionalities: xMOD is a simulation platform involved for every stage of the development cycle by integrating control and operative models. The integration is first MIL (Model-In-the-Loop) then SIL (Software-In-the-Loop) and finally HIL (Hardware-In-the-Loop) and EIL (Engine-In-the-Loop). It facilitates stand alone and tool coupling co-simulation between several simulation tools.

ASAM Standards: ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-3

FuelCon AG

Technology, which always knows the ideal method to use: These are our testing, assembling and diagnostic systems for fuel cells, batteries and electric powertrains. Innovative engineering “Made in Germany”, based on years of experience in automated testing and assembling processes.

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TestWork

Type: Automation Software

Functionalities: data acquisition, data storage, test planning, test execution, test automation, test evaluation

ASAM Standards: ASAM ASAP3, ASAM CAT ODS, ASAM COMMON MDF

Gailogic Corp.

Gailogic Corporation is a Technical Trading Company established in 2002 to introduce new technologies from the United States and Europe into Japan. The office is located in Tokyo. Gailogic provides services and high-value products such as Diagnostic Tools and Measurement Equipments for the automotive market.

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DTS-Monaco (Diagnostic Tool Set)

Type: Engineering Tool (Diagnostic)

Functionalities: Full feature engineering tool with application oriented user interfaces for diagnostics, flash programming, measurement, variant coding, OBD, bus node emulation, communication analysis

ASAM Standards: ASAM AE MCD-2 D (ODX), ASAM AE MCD-3 D

IPEmotion

Type	DAQ Software
Functionalities	Windows DAQ-Software for configuration, acquisition, visualization, analysis, automation, and control applications.
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX), ASAM COMMON MDF

M-LOG, IPElog, FLEETlog2

Type	Hardware for data acquisition and bus measurement
Functionalities	Acquisition, online calculation and storage
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM CAT GDI, ASAM CAT ODS

M-Series Modules, X-Modules

Type	Measurement modules for analog data acquisition
Functionalities	Acquisition of analog signals, A/D conversion and output to CAN and Ethernet
ASAM Standards	ASAM AE MCD-1 XCP, ASAM CAT GDI

OTX Studio

Type	Comfortable editor for OTX sequences
Functionalities	Easy-to-use authoring system according to ISO 13209, based on Softing D-Server DTS COS and ODX data, Many supplements to the standard, e.g. DLL access, file access, GUI library
ASAM Standards	ASAM AE MCD-2 D (ODX), ASAM AE MCD-3 D

Geotab

Geotab securely connects commercial vehicles to the internet with the Geotab GO and GO RUGGED devices, providing advanced web-based analytics for fleet management. Geotab's open platform and Marketplace with third-party solutions make it easy for businesses to improve productivity, optimize, enhance driver safety, and achieve stronger compliance to regulatory changes.

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GIGATRONIK Ingolstadt GmbH

GIGATRONIK is a development partner specialized in the field of automotive electronics and information technology. We develop solutions in the field of System Architecture & Electrical Systems, Component Development, System Integration & Testing, Vehicle Integration, Process & Project Management, Diagnostics, Data Management, Environmental Systems and Rapid Application Prototyping.

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MDM Based Systems

Type	www.mdm-community.org
Functionalities	Data management
ASAM Standards	ASAM CAT ODS

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HBM Prenscia

nCode products are offered through HBM Prenscia, developer of innovative concepts and software solutions for improving reliability, availability, maintainability, safety, durability and performance. For over 30 years, the nCode brand has provided cutting-edge solutions spanning both test and CAE applications with specific capabilities for fatigue and durability. nCode product development is ISO9001 certified. HBM-nCode has a global team of regional sales and application engineers that are available through offices in Europe, North America and Asia.

Contact: Mr. Kevin Miller, Mail: info@hbmprenscia.com

nCode GlyphWorks

Type	Analysis Software
Functionalities	A graphical, process-oriented environment that contains a wide range of data processing and visualization capabilities with specialized options for durability such as fatigue analysis, accelerated testing, and frequency domain tool such as ride quality and rotating machinery analysis. The ASAM ODS connectivity capability in GlyphWorks enables users to browse, search and select data from ASAM ODS database.
ASAM Standards	ASAM CAT ODS, ASAM COMMON MDF

nCode VibeSys

Type	Analysis Software
Functionalities	nCode VibeSys is a powerful data processing system for acoustics and vibration test data analysis. It is an easy-to-use software that enables acoustics and vibration engineers to design a reliable product that satisfies customers\' expectations in terms of sound, comfort, and regulatory requirements.The ASAM ODS connectivity capability in VibeSys enables users to browse, search and select data from ASAM ODS database.
ASAM Standards	ASAM CAT ODS, ASAM COMMON MDF

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The NVH Division of HEAD acoustics provides high-performance products and systems for multichannel sound and vibration analysis and for binaural recording and playback. Founded in 1986, the scope of services includes almost any application in the areas of sound and vibration as well as consulting, training, and support. The products and solutions offered by HEAD acoustics are mainly used in the automotive industry, but also by manufacturers of IT, office, and household appliances, as well as companies and institutions working in the area of acoustic environment protection.

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ArtemiS SUITE

Type	Software
Functionalities	Sound & Vibration Acquisition & Analysis ArtemiS SUITE is the universal software solution for your sound and vibration analysis. It combines all the tools required for performing comprehensive measurements and analyses with functions for data management, report generation, and automation – all in a consistent software environment. The software is optimally suited for troubleshooting and sound engineering in the noise and vibration area. Use ArtemiS SUITE for sound optimization and sound design for technical products, the evaluation of environmental noise and many other purposes. Enjoy the modern look and feel and the sophisticated concept!
ASAM Standards	ASAM CAT ODS

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Hewlett Packard Enterprise is an industry leading technology company that enables customers to go further, faster. With the industry's most comprehensive portfolio, spanning the cloud to the data center to workplace applications, our technology and services help customers around the world make IT more efficient, more productive, and more secure.

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HGL markets a wide range of innovative digital acquisition, storage and analysis products, ranging from hand-held to full rack-based test cell systems. Customer benefits include: large channel counts, higher bandwidths, shorter tests and reduced costs. HGL also provides professional consultancy services for vibration analysis, software development and test measurement support.

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For over twenty-five years, HighQSoft GmbH has been an international leader and independent partner for the development of Measurement Data Management systems (MDMs). We develop server-side infrastructure solutions to handle testing data, which range in scale from a single test stand to an entire enterprise, for our customers, which are primarily from the automotive and transportation industries. Our flagship product, the Avalon ODS Server Suite, provides everything from data preparation and import, data management, and access to data evaluation. We specialize in taking time-, frequency- and event-based raw data from any source or proprietary format, combining it with valuable use-case information, and turning it into actionable knowledge for businesses. Our software and solutions transform vehicle innovations into high-quality serial production at all major OEM's around the world.

Contact: Dr. Ralf Nörenberg, Mail: ralf.noerenberg@highqsoft.de

Avalon Big Data Application Server (ABAS)

Type	ASAM ODS Server with integrated big data processing and storage, ASAM ODS 5.3.0 and 6.x compliant
Functionalities	Our Avalon Big Data Application Service (ABAS) permits ODS-based measurement data management systems to connect to big-data resources. The implementation as a SPARK client defines interfaces for communication (and standardization) between our Avalon ODS Server and SPARK. While metadata operations remain within Oracle, thereby allowing the system to retain most of ODS's management functionalities, the system redirects mass data operations to predefined jobs in SPARK. Therefore, ABAS provides a scalable and high-performing ODS system. Our current implementation works with Apache Parquet but is independent to the physical storage technology used.
ASAM Standards	ASAM CAT ODS, ASAM COMMON MDF

Avalon ODS Server Suite

Type	ASAM ODS Server, ASAM ODS 5.3.0 and 6.x compliant server
Functionalities	Our Avalon ASAM ODS Server Suite is the reference server implementation of the ASAM ODS Standard and backbone of the majority of ODS 5.3 compliant data storage solutions for OEMs and suppliers within the worldwide automotive industries. The server is fully compatible with all ASAM ODS features and any Application Model. Therefore, the application receives the flexibility to store and manage measurement data of any technical domain (e.g. Noise-Vibration-Harshness, Road-Load, Engine, Wind-Tunnel, Crash, Brakes, …), integrates several Measurement Data Format Files (e.g. MDF4.1, MDF3.x) and provides interchangeability with the ASAM Transport Format file (ATFx). Our Avalon ODS Server now supports ODS 6.x.
ASAM Standards	ASAM CAT ODS, ASAM COMMON MDF

HQL

Type	ighQSoft Query Language
Functionalities	Our HighQSoft Query Language (HQL) is designed to provide easy access to the ODS API, for developers as well as for end-users. The development of specific ODS client software on basis of the generic ODS API is a challenge that can be met by experts only. Business entities utilized for the application use case (test, vehicle, user) are usually also contained in the application model (database schema) of the ODS server. The ASAM ODS API by definition is free of entities of the business logic, which complicates the task of developing an application interface for it. HQL solves exactly this issue by providing a more abstract interface, which ac-

cepts both base model and application model entities. Features are: • Full Support of the ASAM ODS API funtionality • distinct OO API without ASAM ODS definitions • statements may be utilized by an interpreter • Supports application development as a library and web-service

ASAM Standards: ASAM CAT ODS

Manatee Web Application

Type: Web-based Measurement Data Management (MDM) application for the ASAM ODS server

Functionalities: Our Manatee Web is a Measurement Data Management (MDM) application to grant end users a convenient access to their ASAM ODS database. The web application initially provides users with functionality to quickly and dynamically browse, search for, bookmark, share and export their measurement data – and all that as a configurable product which is independent of the application model used. Furthermore, the integration of third-party tools like DIAdem allows quick processing of the data for domain-specific analysis. Administrators have intuitive access to features as e.g. user group and user management and the Avalon ODS Server Control Service. Key features of the application are: • data browser – a very flexible data navigator with configurable navigation trees, presentation of instance meta-information and dependencies, tabular and graphical channel quick view, presentation of AoFile dependencies • data search – with multiple and configurable search patterns and a HighQSoft Query Language (HQL) console to create favorite searches • favorites and cart – for measurement data and searches • data sharing with colleagues – without creating redundancies and the data leaving the database • data export options – export your data to CSV and ATFx • third-party tool interfaces (e.g. DIAdem) • user group and user management • application administration

ASAM Standards: ASAM CAT ODS, ASAM COMMON MDF

Matlab® Integration Toolbox

Type: ODS Integration Toolbox for Matlab®

Functionalities: Integrating Matlab into ODS applications and evaluations has been a long struggle ever since. Until now. MATLAB® offers to create a toolbox that you can share with others. These files can include MATLAB® code, data, apps, examples, and documentation. When you create a toolbox, MATLAB® generates a single installation file (.mltbx) that enables you or others to install your toolbox. We are using this feature to provide a seamless HQL and ASAM ODS integration package for MATLAB. Our toolbox contains Java libraries, programming examples, documentation and help in order to provide everything you require for including ODS data in your Matlab.

ASAM Standards: ASAM CAT ODS

Merlin Analysis Server

Type: Analysis Server for ODS based Measurement Data Management systems (MDM). Integrates serve-side and automated analysis (Matlab, DIAdem, JAVA, ...).

Functionalities: Our Merlin Analysis Server 2G is a second generation analysis framework to move the task of executing evaluations from the individual engineer to the server. Thus, analysis may be initiated by e.g. automated import processes or certain events in the Avalon server (Notification Server). The results may be whatever you want them to be: A new measurement, a graph, a document, an email, … . See for yourself, Merlin is a wizard.

ASAM Standards: ASAM CAT ODS, ASAM COMMON MDF

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HORIBA

HORIBA Automotive Test Systems, part of the HORIBA Group, achieved global leadership as a supplier of emissions and various certification test systems, as well as a testing partner for powertrain research and development. HORIBA is able to provide total solutions to its customers with full turnkey capability for all industries using electric motors, internal combustion engines, and turbines. These include the automotive, heavy-duty, off-road, consumer goods, marine, aerospace, and locomotive sectors.

Contact: info@horiba.de

STARS

Type	Automation System
Functionalities	Engine, Driveline, Vehicle and Brake Test Bed Automation; Component Test Bed Automation; Distributed Operation; Automatic Engine ECU Calibration; Small, Light Duty and Heavy Duty Engine Emission Test Application Suite; Web Based Remote Status Monitoring; Integrated Automatic Engine ECU Calibration Option; Chassis, Automation System for Chassis Dyno, Vehicle Emission Testing; Automation System for Mileage Accumulation
ASAM Standards	ASAM AE MCD-3 MC, ASAM ASAP3, ASAM CAT ACI, ASAM CAT ODS

VETS ONE: Vehicle Emission Test System

Type	Automation Software for Vehicle Emission Testing
Functionalities	Chassis, Automation System for Chassis Dyno, Vehicle Emission Testing, Laboratory Management
ASAM Standards	ASAM AE MCD-3 MC, ASAM CAT CEA, ASAM CAT ODS

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Huijing Electronic Technology (Shanghai) Co.,Ltd.

Shiningview is a fast growing professional vehicle and ECU design, development, testing tool chain solutions provider. With stable product quality, high cost performance and rapid response to the customer, shiningview has been recognized by more and more customers. The company's business continues to expand.

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I-Chin Motor Technology Co., Ltd.

I.C.M. specializes in vehicle communications. We provide OEM/ODM for CAN BUS solutions, diagnostic tools and head-light control module.

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OBD Trace

Type	Diagnostic tool
Functionalities	Diagnosis, Data logger, Data Analysis.
ASAM Standards	ASAM AE MCD-2 D (ODX)

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iASYS Technology Solutions Pvt. Ltd.

iASYS is an independent integrator which designs and manufactures data acquisition and controls systems for advanced powertrain test rigs.

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Orbit Central

Type	Central repository to monitor all test benches data from one location. Test plans can be synchronized on test benches from a central location.
Functionalities	
ASAM Standards	ASAM CAT ODS

Orbit test automation platform

Type	Simulation, automation and controls systems for engine, transmission, powertrain, chassis dyno and electric vehicle test benches for research and development.
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-3 MC, ASAM CAT ACI, ASAM CAT GDI, ASAM CAT ODS

Test benches

Type	Engine & vehicle chassis dyno test benches for entire range of vehicles.
ASAM Standards	ASAM CAT ODS

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IAV GmbH

What we develop moves you. IAV – Your Partner for Automotive Engineering Our engineering is at the heart of vehicles across the globe. As one of the leading development partners to the automotive industry, IAV offers more than 30 years of experience and a range of skills second to none. With our expertise in the entire vehicle, and the passion to match, we provide technically perfected solutions that balance both rational and emotional aspects. Employing 6,000 members of staff and first-class facilities, we assist manufacturers and suppliers in carrying out their projects wherever they are in the world – from concept to start of production: Your goals are our mission.

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ICS AG - Informatik Consulting Systems AG

ICS is a partner for the complete product lifecycle - from evaluation and consulting to realisation and maintenance. The domains are Automotive, Transportation and Aerospace&Defence (e.g. Embedded Control Systems, RAMS, Verification&Test, Quality Assurance). Our wide diversification helps us to understand the problems of our customers. A competent knowledge of technologies, methods and standards enables us to transfer this knowledge into applicable solutions.

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Consulting

Type	Consulting, engineering
Functionalities	Consulting in regards to organization and standardization of measurement data storage
ASAM Standards	ASAM CAT ODS

Data Modelling

Type	Consulting, engineering
Functionalities	Design of application models based on the ASAM ODS Standard
ASAM Standards	ASAM CAT ODS

Tool Development

Type	Consulting, engineering
Functionalities	Development of individual applications for user-friendly access to ASAM ODS / ATFX based data. Converter to ATFX.
ASAM Standards	ASAM CAT ODS

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By focusing on test and measurement productivity, imc Meßsysteme GmbH creates tools which empower engineers to efficiently deploy data acquisition systems and test strategies, thus, meeting the test and measurement challenges of development departments world-wide. Specializing in an integrated approach to physical test and measurement, imc solutions are well suited for mixed signal testing of complex mechanical and electromechanical systems. In these situations, test engineers demand flexibility and scalable capabilities - especially when a company understands that testing productivity is all about the efficient use of testing resources.

Contact: imc Hotline Team, Mail: hotline@imc-berlin.de

On-Road, off-road measurement equipment, software & solutions

Type	Mobile Applications
Functionalities	Endurance testing, Climate testing, Fatigue analysis, Cold-start behavior, Model verification in vehicle trials, Brake tests, Crash tests, Road performance, Vehicle dynamics, Engine and powertrain testing, Performance tests, Supported field busses and interfaces: CAN, LIN, FlexRay, GMLAN, J1939, ARINC, RSxxx, OBD-2
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM CAT ODS

Test stand, measurement equipment, software & solutions

Type	Test stand tools & applications
Functionalities	Component test stands, Test stands for engines & powertrains, Hardware-in-the-Loop (HiL) test beds (simulation), Facilities for noise tests, Climate and wind-tunnel testing, End-of-line test stands for AC/DC motors, Supported field busses and interfaces: CAN, LIN, FlexRay, GMLAN, J1939, ARINC, RSxxx, OBD-2
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM CAT ODS

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Influx Technology make specialist tools for the development of automotive control systems. Vehicle (MCD) data loggers, (OBD) diagnostic and specialist (CDM) tools for development engineers. Formed in 1999 we operate in the UK and Bulgaria with distributors in the US, China, India and Japan.

Contact: Ms. Fiona Keen, Mail: fkeen@influxtechnology.com

Rebel LT Data Logger

Type	CAN data logger
Functionalities	2x CAN buses, 1x K-Line, 4x analog inputs, 4x digital Input/output channels, SDHC card logging, ABS enclosure; Supports J1939 and OBD logging; Connects to Module Analyser for on-line CAN Analyser functionality; Can be combined and stacked with the Influx K-Box for additional sensors and thermocouples. Add-on modules(charged separately): Internal 18 Hz GPS with antenna, 1kHz internal XYZ accelerometer +/-16G max, 3G Modem.
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP

INTEMPORA

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Intempora develops the RTMaps software and other related tools for real-time multimodal applications. RTMaps is widely used in the automotive and mobile robotics domains, either for facilitating the development, tests and validation of perception functions based on multiple sensors (vision, data fusion, localization…) or for HMI developments and human factors analysis.

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Dataloggers

Type	Wide range of data loggers from small ARM-based architecture devices to clusters of distributed high-performance PCs
ASAM Standards	ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE XIL, ASAM AE XIL-MA

RTMaps

Type	Software development environment
Functionalities	Multiple & heterogeneous sensors acquisition Data Timestamping, Graphical development, C/C++ SDK, Record / Playback, Multithread, Embedded deployment, Interoperability with many complementary tools (Matlab, Simulink, simulators…)
ASAM Standards	ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE XIL, ASAM AE XIL-MA

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Intrepid Control Systems is a global provider of innovative tools to engineers in vehicle, test, and embedded engineering. With thousands of customers worldwide, Intrepid provides embedded communication interfaces for protocols such as CAN, LIN, FlexRay, J1850, Keyword 2000, UART, J1939, ISO14229 and GMLAN. Major customers include automotive and commercial vehicle OEMs from a wide variety of countries. Along with a global network of distributors, Intrepid has offices in the USA, China, Japan, Germany, India, and Australia for direct sales and support.

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neoVI FIRE / neoVI RED

Type	Vehicle Interface Adaptor, PC to Vehicle Network Adaptor
Functionalities	Monitor vehicle network, Log vehicle network data, Run real-time scripts, Simulate networks, ECU's, & gateways. Use a stand-alone data logger by logging data to removable SD card. Use for ECU prototyping.
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 D (ODX), ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX), ASAM AE MDX

neoVI PLASMA

Type	Remote Data Logging Tool, Vehicle Fleet Management Tool
Functionalities	Standalone data logger ; Remote data logger with auto-download via WIFI, 3G or Ethernet ; Heads-up display for test vehicles; In-vehicle data acquisition system; Captive test fleet data collection; Fleet management and more. Support for CAN, LIn, FlexRay, MOST, XCP/CCP, Ethernet, ISO14229, GMLAN, J1939, Analog Inputs, and more.
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 D (ODX), ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX), ASAM AE MDX

ValueCAN

Type	PC to CAN (Controller Area Network) Adaptor/Interface
Functionalities	Dual Channel Isolated Dual Wire CAN to USB interface; Connect PC to a Controller Area Network (CAN) bus
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 D (ODX), ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX), ASAM AE MDX

Vehicle Spy Professional

Type	Software
Functionalities	Software for performing diagnostics, node/ECU simulation, data acquisition, automated testing, memory edit or calibration, and vehicle network bus monitoring, and more. Supports CAN, LIN FlexRay, MOST, J1939, J1850, K-Line, ISO9141, J1708, ISO14229, UART, Keyword, GMLAN, CCP/XCP, and more.
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 D (ODX), ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX), ASAM AE MDX

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Operating via its four interrelated divisions: IPEmeasure measurement technology; IPEmotion software; IPEengineering Technical Center; and IPEtec Test Bench Technology, IPETRONIK is uniquely positioned to offer one of the industry's only true customer-specific turnkey data acquisition solutions. Having begun as a hardware-only provider nearly two decades ago, IPETRONIK has now developed into an internationally renowned technology partner to some of the world's most prominent vehicle manufacturers, offering a combination of measurement technologies, software, accessories, and unique in-house testing capabilities and facilities. Consistent with the company mission of PROGRESS IS THE FUTURE, 180 highly trained IPETRONIK staff members and sales partners, headquartered in Baden-Baden, Germany; with additional offices in the United States and India, as well as subsidiaries worldwide, ensure constant growth and innovation in response to market needs. We look forward to providing customers with innovations and improved solutions far into the future.

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IPEmotion

Type	DAQ Software
Functionalities	Windows DAQ-Software for configuration, acquisition, visualization, analysis, automation, and control applications.
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX), ASAM COMMON MDF

M-LOG

Type	Hardware for data acquisition and bus measurement
Functionalities	Acquisition, online calculation and storage
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM CAT GDI, ASAM CAT ODS

M-Series Modules

Type	Measurement modules for analog data acquisition
Functionalities	Acquisition of analog signals, A/D conversion and output to CAN
ASAM Standards	ASAM CAT GDI

Mx-SENS, Sx-STG

Type	Measurement modules for fast analog data acquisition
Functionalities	Acquisition of analog signals, A/D conversion and output to Ethernet
ASAM Standards	ASAM AE MCD-1 XCP

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IPG Automotive GmbH is a worldwide leading provider of simulation solutions, test systems and engineering services for OEMs and suppliers in the automotive industry. IPG supports its customers in mastering the technological challenges relating to safety, comfort, agility and fuel economy/energy consumption – with forward-thinking solutions for the entire development process. In addition to conventional vehicle dynamics simulation, the CarMaker, TruckMaker and MotorcycleMaker simulation tools open up a wide range of Model-, Software- and Hardware-in-the-Loop simulation. It encompasses the development and testing of chassis control systems, driver assistance systems as well as systems combining chassis, powertrain and steering. Also included are holistic fuel economy/energy consumption analyses, hybrid technology and electric mobility.

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CarMaker

Type	Open integration and test platform for virtual test driving. Applications: General Vehicle Dynamics, Control Systems, Advanced Driver Assistance Systems, Fuel Consumption & Emissions
Functionalities	Flexible model integration from multi-domain environments, maneuver- and event-based testing through „CarMaker Operation System“, easy reconstruction of complex real test driving tasks, efficient system validation in the whole vehicle environment, integrated application in all development phases „X-in-the-Loop“, automated test of comprehensive maneuver catalogs and vehicle variants, powerful interface structure for third party tools
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 NET (FIBEX), ASAM COMMON MDF

MotorcycleMaker

Type	Open integration and test platform for virtual test driving. Applications: General Vehicle Dynamics, Control Systems, Advanced Driver Assistance Systems, Fuel Consumption & Emissions
Functionalities	Supporting of different front and back wheel carriers like telescopic fork, telelever, upside-down swing arm and paralever, different drive concepts based on driveshaft, on chain or on swing arm mounted engine, the bending and the torsional stiffness of the body frame and the wheel carriers is taking into account, influence of the driving stability with aerodynamic effects, driving behavior analysis on downhill and uphill slopes and banking on three-dimensional tracks
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 NET (FIBEX), ASAM COMMON MDF

TruckMaker

Type	Many axles - much more variants - all in real-time. Applications: General Vehicle Dynamics, Control Systems, Advanced Driver Assistance Systems, Fuel Consumption & Emissions
Functionalities	Real-time performance with every truck/trailer configuration, up to 10 axles with configurable single or twin tires, all special suspension types for trucks and trailers, various powertrain versions up to 8x8, all typical trailer hitch systems (ball, trapezoid, fifth wheel etc.), flexible truck and trailer body, fixed or movable loads and suspended cabin, pneumatic tool box for active brake and air suspension systems
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 NET (FIBEX), ASAM COMMON MDF

iSyst Intelligente Systeme GmbH

As an independent test house we are your competent partner in ensuring function and quality of embedded systems across all industry sectors. Right from the beginning of the development process we take care of all different aspects of software and hardware testing thus providing a complete and continuous testing solution – from one source.

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iTestStudio

Type	test automation system
Functionalities	test implementation and test execution system for automated tests with test reporting functionality
ASAM Standards	ASAM AE HIL, ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP

iSYSTEM AG

iSYSTEM was founded in 1986 and is a privately held company headquartered in Schwabhausen close to Munich and subsidiaries in Slovenia and the USA. For 30 years now iSYSTEM is i.a. specializing in customers from the automotive, aerospace and medical industries where quality and safety play a huge role. Customers of iSYSTEM develop embedded systems that can save lives and ensure that this is not unnecessary in danger. iSYSTEM develops, manufactures and markets on embedded software development and test specialized hardware and software tools. The BlueBox hardware and software allow quick access to all kinds of single and multi-core microcontroller via the many different forms of debug interfaces. This software can be developed and tested directly on the real hardware without code instrumentation.

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IXXAT Automation GmbH

IXXAT is a supplier of data communication solutions for the automotive and the industrial market. IXXAT employs a staff of 80 people and has an ISO 9001 certified quality management. Our core technologies are FlexRay, CAN, LIN, Real-Time Ethernet, IEEE1588 as well as safety relevant solutions (IEC61508). Beside hardware components, the product range includes solutions for test stands, hardware-in-the-loop, vehicle communication test-/analyzing tools, OEM components and protocol software.

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CANio-Modules

Type	IO modules for CAN, CANopen and EtherCAT
Functionalities	CANio-Modules to provide a CAN/EtherCAT based access to analog and/or digital IO or to host a customer dependent ECU application.
ASAM Standards	

EtherCat extension

Type	EtherCat extension of the FRC-EP190
Functionalities	A solution to interface the industrial communication world in test-stands with the automotive communication world in vehicles. By means of the gateway solutions, signals can be mapped between the vehicle and EtherCAT.
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 D (ODX), ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX)

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IXXAT

FRC-EP190

Type	Automotive communication platform
Functionalities	Powerful automotive communication platform for FlexRay, CAN, LIN, Ethernet and EtherCAT which can be used in many different applications.
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 D (ODX), ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX)

Gateway

Type	Gateway solution for FlexRay, CAN, LIN, Ethernet or FDX
Functionalities	Universal gateway solution which can be used standalone or on-top of an RBS. It can be used to create signal based mappings from and to several communication busses or protocols like FlexRay, CAN, LIN, Ethernet or FDX. The mappings are done by means of a Windows Explorer like drag&drop tool.
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 D (ODX), ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX)

Residual Bus Simulation

Type	Residual Bus Simulation software package for the FRC-EP190 hardware plattform
Functionalities	Residual Bus Simulation, a tool to generate a simulation of a single or several ECU's. The RBS is created without coding effort and can be downloaded to the automotive communication platform for autonomous execution.
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 D (ODX), ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX)

KGC 株式会社計測技研

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Keisokugiken Corporation

Keisokugiken Corporation (KGC) is established in 1980. We specialize in development distribution and customizing system integration of products for automotive measurement and test automation solution based on LabVIEW. We also have experience in engine control data acquisition solutions with combustion analysis system. We also research technology in hardware- in- the-loop- simulation for hybrid and new energy vehicle.

Contact: Mr. Noriyuki Hirose, Mail: hirose@kgc.co.jp

Connecting to ECU calibration tool via ASAP3

Type	Using ECU calibration tool for Hardware in the loop system of transmission.
Functionalities	ECU data measurement and calibration.
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L), ASAM ASAP3

MARC

Type	Standard customized measurement software using National Instruments devices for fuel cell, FCV, engine, transmission test cell automation systems etc...
Functionalities	Standard measurement , standard physically analog/ digital input output function, Automation system for fuel cell, FCV, engine transmission
ASAM Standards	ASAM AE MCD-2 CERP

Kistler Instrumente AG

Kistler is a strong partner of the automotive industries for measurements of force, torque, pressure and acceleration. A worldwide organization with 1200 employees and 25 group companies supplies the automotive industries with sophisticated high-end system solutions. Instrumented crash test facilities, e.g. crash barriers and crash trolleys with piezo-technology as well as wheel force measuring systems with piezo- and strain gauges technology for almost every application are core competencies in the field of automotive engineering.

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KISTLER
measure. analyze. innovate.

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Kithara Software GmbH

Kithara Software is a specialist for real-time solutions, especially for the Windows operating systems. The real-time extension RealTime Suite is a comprehensive system library for hardware-dependent programming, communication, automation and image processing in real-time. It is therefore a key element in machine building and for testing rigs, especially in the automotive industry.

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RealTime Automation

Type	EtherCAT Master
Functionalities	Powerful EtherCAT Master - I/O reaction times in microsecond range, cycle frequency < 20 kHz possible - Real-time PDO data exchange - SDO and mailbox communication: CoE, FoE, EoE, SoE - Distributed Clocks, Hot Connect, Cable Redundancy - Safety over EtherCAT up to SIL3 - Powerful EtherCAT Master - I/O reaction times in microsecond range, cycle frequency < 20 kHz possible - Real-time PDO data exchange - SDO and mailbox communication: CoE, FoE, EoE, SoE - Distributed Clocks, Hot Connect, Cable Redundancy - Safety over EtherCAT up to SIL3 - EtherCAT PC Slaves - EtherCAT Automation Protocol
ASAM Standards	

RealTime Automotive

Type	Automotive real-time management software
Functionalities	Real-time software tools for measurement, storage and simulation - Can be used for data acquisition and Hardware-in-the-loop - Direct real-time connection between Windows-PC and automotive bus - Support of FlexRay, CAN, CAN-FD and LIN in real-time - For measurement systems, testing rigs
ASAM Standards	ASAM COMMON MDF

RealTime Machine Vision

Type	Image capture and processing software
Functionalities	Image capture with GigE Vision (incl. 10 Gbit/s) and USB3 Vision - Multi-Camera support, Hot Connect - GenICam access and configuration - Image processing with HALCON and OpenCV - Immediate control reaction to processed images in real-time

Kithara

RealTime Suite

Type	Modular real-time extension for Windows
Functionalities	Hard real-time capabilities with priority-based preemptive real-time multi-tasking - High-precision timers and clock mechanisms - “Dedicated” real-time on exclusively used CPU cores - Event-triggered Ethernet communication (TCP/UDP, raw) - Hardware-dependent programming: I/O ports, phys. memory, interrupts
ASAM Standards	

KPIT

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KPIT Technologies GmbH

KPIT is expert for Diagnostics and Telematics. Bundled in the Diagnostic and Connectivity Platform, our remote diagnostics capable Diagnostic Stack as well as our software tools cover all possible applications of off-board diagnostics in Engineering, Testing, Production and Aftersales Service. We globally provide system solutions, consulting and engineering services as well as training.

Contact: Ms. Stefanie Köhler, Mail: stefanie.koehler@kpit.com

Database Designer

Type	
Functionalities	Creates and administers ODX data in conformance with the international industry standards ODX 2.0.1 and ODX 2.2.0. Provides options for creating a completely new data structure or selectively adapting the existing data in the desired format (OEM and Tier1 collaboration). Compatible to work with all dialects of the ODX standards. Provides an option to create the right data for UDS control unit with in-built UDS on CAN description of KPIT. Object-based comparison of whole ODX projects or selected layers, resolved inheritance, expert and diagnostic modes, XML/PDF report. Complete project or single layer formatting, output formats: PDF, MSR, DOC/RTF (on demand). XML validation, ASAM rule set check, API for company-specific rules, configurable error descriptions and correction instructions, XML/XLS and PDF export.
ASAM Standards	ASAM AE MCD-2 D (ODX)

K-DCP Authoring (OTX Suite)

Type	OTX Editor, Executer and Debugger, UI and Navigation Editor, Multi-User Workflow and Publication management
Functionalities	
ASAM Standards	ASAM AE MCD-2 D (ODX), ASAM AE MCD-3 D, ASAM AE OTX

K-DCP Communicator

Type	
Functionalities	Execution of ODX diagnostic services and OTX sequences. Bus monitoring (CAN / K-Line) with timestamps, filtering and symbolic (CANdb-/ODX-based) offline analysis of bus traces. Simulation channel. Supported hardware: I2S-eCOM (KPIT Interface), DoIP, Vector CANcardX-XL/CANcase, dSpace DCI-CAN/Calibration Hub, others on request.
ASAM Standards	ASAM AE MCD-2 D (ODX), ASAM AE MCD-3 D, ASAM AE OTX

KPIT

K-DCP Framework

Type	Platform to create customer specific solutions for Engineering / Production and Aftersales Use-Cases
Functionalities	Data driven platform for Engineering, End-of-Line and Aftersales solutions based on ODX and OTX that can be used stand-alone, on cloud servers or telematics hardware and can be extended with customer specific use-cases created with the K-DCP Diagnostic Authoring tool. Supported hardware: I2S-eCOM (In2Soft Interface), DoIP, Vector CANcardX-XL/CANcase, dSpace DCI-CAN/Calibration Hub, others on request.
ASAM Standards	ASAM AE MCD-2 D (ODX), ASAM AE MCD-3 D, ASAM AE OTX

Project Services

Type	System solutions, consulting and engineering services as well as training
Functionalities	- On-site/Off-site Engineering - Process definition - Authoring Guidelines - Diagnostic content creation and management - Aftersales service tool development - Training & workshops on tools, technologies and standards
ASAM Standards	ASAM AE MCD-2 D (ODX), ASAM AE MCD-3 D, ASAM AE OTX

Kratzer Automation AG

KRATZER AUTOMATION provides innovative, turn-key software for testing efficiency covering the entire spectrum from test automation in real time over full corporate data integration up to efficient optimization of your testing results. We also deliver complete and individually configured test benches for the automotive industry.

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PAoptimizer

Type	Optimization system
Functionalities	Optimization system supporting the complete design chain from DOE, measurement, modeling, evaluation, optimization, support of ECU calibration tools.
ASAM Standards	ASAM CAT ACI, ASAM AE MCD-3

PAtools®

Type	Open test system
Functionalities	Open test system Functionalities: Free configurable test bench automation system for all types of test benches in research and development and quality assurance.
ASAM Standards	ASAM AE MCD-3

testXplorer

Type	Test data management system
Functionalities	Free configurable functions for central data storage and archiving, data integrity check, web-based retrieval, process support in the test center with functions for order management, test bench planning, SAP-interface and traceability.
ASAM Standards	ASAM CAT CEA, ASAM CAT ODS

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www.ksengineers.at

Kristl, Seibt & Co GmbH

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Tornado

Type	Test bed automation system
Functionalities	The KS Tornado software package provides measurement, control and report functions for test benches and is optimized for engine and chassis dynamometer test stands, power train test benches and vehicle component test rigs.
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-3, ASAM CAT ACI, ASAM CAT ODS

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Ks.MicroNova GmbH

ks.MicroNova GmbH (formerly carts GmbH) is a leading provider of hardware-in-the-loop (HiL) test benches for the validation of Electronic Control Units (ECU) and control components. For the development of high-quality testing solutions for the automotive industry, the company works in close cooperation with its sister company MicroNova AG (based in Vierkirchen near Munich). In order to make this shared identity more visible to the outside market, the company operates under the name of ks.MicroNova GmbH since January 2017.

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Kvaser AB

Kvaser – world leading CAN development Kvaser supplies advanced CAN solutions to engineers designing and deploying systems in areas as wide ranging as trucks and buses, petrol-driven and electric cars, industrial automation, avionics, construction equipment, building automation, domestic appliances, marine, medical, military, railway, telecoms, textiles and more. With 30 years of experience and more than 60 CAN-related products to our name, Kvaser has deep knowledge of CAN and related bus technologies. Whilst R&D and production are carried out in Sweden, our standard products are available through a worldwide network of sales representatives. What's more, our global Technical Associate network can provide you with state-of-the-art solutions, for whatever sector you operate in • Universal API makes life easier for both software developers and the end user • Free software, free updates and free support

Contact: Ms. Silvia Küller, Mail: sk@kvaser.com

Kvaser Memorator Pro 5xHS

Type	CAN data logger
Functionalities	A five channel CAN bus interface and standalone datalogger that allows users to monitor and collect data from up to five CAN channels. Standalone mode logs data to an SD card; interface mode connects to the PC via USB. Supports CAN FD.
ASAM Standards	ASAM COMMON MDF

Lauterbach GmbH

Lauterbach is the leading manufacturer of complete, modular and upgradeable microprocessor development tools worldwide with experience in the field of embedded designs since 1979. It is an internationally well-established company with blue chip customers from every corner of the globe and close relationship with all semiconductor manufacturers.

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Lipowsky Industrie-Elektronik GmbH

Development and production of microcontroller equipped electronic units for automotive, industrial and scientific applications. We are specialized on LIN and CAN-Bus systems and realtime, multitasking applications.

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M&K Mess- und Kommunikationstechnik GmbH

M&K as software house provides systems for analysis and diagnosis of communication software and interfaces. The company is specialized for software development in the areas of device integration and connection of physical interfaces. This also includes software development for embedded systems and middleware for embedded device integration. ASAM solutions from application till device are in focus. M&K offers development and diagnostic tools for creation, interactive testing and analysis of ASAM interfaces and products. This includes also training for ASAM Standards and expert opinions for ASAM solutions. For ASAM GDI a complete tool chain is provided, which includes development tools and as runtime environment a middleware solution. M&K develops test cases and realizes the frameworks for testing.

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an@coord

Type	GDI Warehouse - Runtime Environment; Platform Windows and Linux, available as source code or run time licence
Functionalities	Individual adapted Coordinator with specific optimization features (performance, memory, security, ...) and C++ Technology Reference; string overloaded data type interface for shortcut service based configuration (description of DCD\'s by application); PIDsupport; device drivers of any alignnment useable.
ASAM Standards	ASAM CAT GDI

an@dapt

Type	GDI Warehouse - Runtime Environment; Platform Windows and Linux, available as source code or run time licence
Functionalities	Platform adapter for operating system independent Device drivers
ASAM Standards	ASAM CAT GDI

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an@mod

Type	Warehouse Development Tools; Development and diagnostic tools for creation, interactive testing and analysis of ASAM interfaces and products
Functionalities	graphical UML GDI Device model generator and generation of the accomplishing DCD / DIT / DII files. Released GDI Companion DCD of MCD3 OO model was generated by an@mod.
ASAM Standards	ASAM CAT GDI

an@pact

Type	GDI Warehouse - Runtime Environment; Platform Windows and Linux, available as source code or run time licence
Functionalities	Communication Types GDI_IP (TCP/IP, UDP/IP) and GDI_COM
ASAM Standards	ASAM CAT GDI

an@pars

Type	Warehouse Development Tools; Development and diagnostic tools for creation, interactive testing and analysis of ASAM interfaces and products
Functionalities	GDI and MCD parser and semantic checker with data access
ASAM Standards	ASAM CAT GDI, ASAM AE MCD-2 MC (ASAP2/A2L)

an@skel

Type	Warehouse Development Tools; Development and diagnostic tools for creation, interactive testing and analysis of ASAM interfaces and products
Functionalities	C++ Skeleton generator for GDI Device Driver; automatic user code integration through directed programming and reengineering
ASAM Standards	ASAM CAT GDI

an@stub

Type	Warehouse Development Tools; Development and diagnostic tools for creation, interactive testing and analysis of ASAM interfaces and products
Functionalities	Object oriented application generation based on DCD classes ;Efficient application generation for testing of application sequences and effective usage of devices drivers; available for C++ and Python; Stub classes encapsulate GDI specific Coordinator access (Coordinator API version independent); Profile independent usage of GDI device drivers; automatically serialization of data types described by DCD for stream oriented data exchange. STUB is additionally available as OTX output (capable of being integrated with OTX standard mechanism into OTX editor) to create test-, diagnostic and automation sequences. The GDI functionality can be used directly by the user in OTX (access to device specific functionality which encapsulates the generic access via one device independent extension for all devices)
ASAM Standards	ASAM AE OTX, ASAM CAT GDI

an@test

Type	Warehouse Development Tools; Development and diagnostic tools for creation, interactive testing and analysis of ASAM interfaces and products
Functionalities	The goal of the test application is the development and verification of ACI server solutions. Execution of defined test cases based on ACI test catalogue and evaluation of result. Initial (re-entry), repetition and acceptance test are possible. In case of error, faults are analyzed and a diagnosis is made. Additional test cases can be modified for application specific procedures. Results of the test application are comparable and reproducible.
ASAM Standards	ASAM CAT ACI

an@vis

Type	Warehouse Development Tools; Development and diagnostic tools for creation, interactive testing and analysis of ASAM interfaces and products
Functionalities	Interactive online testing of device drivers with analysis and visualization
ASAM Standards	ASAM CAT GDI

iMCa

Type	MATLAB High Performance connector between AUSY, MATLAB and MC-System
Functionalities	The iMCa (intelligent multi client adapter) allows the access from different clients to ECU via a MC-System for high speed data measurement and calibration of characteristics. A sample time from 4 ms is guaranteed. The solution allows an easy integration in existing test benches or alternatively the realization of automation tasks via MATLAB applications. Transient and dynamic system state illustration allows closed loops. Additionally a bidirectional process value exchange between MATLAB and AUSY is possible. Different MATLAB instances can run in parallel. MATLAB in connection with iMCa can be used as standalone automation system. With iMCa it is possible to extend an existing test bench environment with a MATLAB access. The MCA MATLAB user is independent from the knowledge of communication protocols. The MCA .NET interface can be used in C#, C++ and IronPython additionally.
ASAM Standards	ASAM ASAP3

Training

Type	Consulting and coaching (also inhouse available)
Functionalities	Support from modeling till running GDI device drivers; Usage and work principle of GDICoordinators; Capabilities of MCD-3 OO model; Integration and migration is considered.
ASAM Standards	ASAM AE MCD-3 D, ASAM AE MCD-3 MC, ASAM CAT GDI

MAHA-AIP GmbH & Co. KG

MAHA-AIP (Automotive Industry Products), located in South-Germany, designs and manufactures various test stands for light-, medium- and heavy-duty vehicles, motorcycles and ATVs for vehicle manufacturers, their sub-suppliers and certification labs (EPA, NIER, JRC, CARB etc.). Test drives can be simulated indoors with reproducible results on roller test stands (rolling roads) to improve product quality and optimize costs.

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MathWorks GmbH

The MathWorks is the world's leading developer of technical computing software for engineers and scientists. With an extensive product set based on MATLAB and Simulink®, The MathWorks provides software and services to solve challenging problems and accelerate innovation in automotive, aerospace, communications, electronics, instrumentation, process and other industries.

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MATLAB

Type	Technical computing environment
Functionalities	High-level programming language for numeric computation, data analysis and visualization, system design and other technical applications. MCD-2 data can be imported into MATLAB using various third-party add-ons.
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L)

Real-Time Workshop Embedded Coder

Type	ECU production code generation
Functionalities	Real-Time Workshop Embedded Coder provides production code generation for Simulink models, designed for embedded systems development. Real-Time Workshop Embedded Coder generates optimized ANSI-C code for fixed-point and floating-point microprocessors, plus automatic generation of MCD-2 data definition file.
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L)

Simulink

Type	Model-based Design environment for modeling and simulation
Functionalities	Block-diagram environment for modeling, simulating, analyzing and generating code for prototyping, hardware-in-the-loop and production code generation. MCD-2 data can be imported for use with Simulink models using MATLAB programming.
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L)

Target Support Package

Type	Target-specific extension for Real-Time Workshop Embedded Coder to support multiple embedded targets
Functionalities	Includes blocks for use with Simulink and Real-Time Workshop Embedded Coder, providing support for CCP (CAN Calibration Protocol) and creates a MCD-2 data definition file for the generated C code and automatically inserts memory address attributes for variables and parameters (dependent on selected target).
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-2 MC (ASAP2/A2L)

xPC Target

Type	Rapid control prototyping and HIL system
Functionalities	xPC Target is a solution for prototyping, testing and deploying real-time systems using standard PC hardware. It is an environment that uses a target PC, separate from a host PC, for running real-time applications. It can connect to CAN calibration tools, such as Vector CANape, using an XCP interface.
ASAM Standards	ASAM AE MCD-1 XCP

MBtech Group GmbH & Co. KGaA

The MBtech Group is a leading international engineering consulting service provider focusing on the mobility industry. From the automotive industry to rail transport to aerospace, companies worldwide profit from the integrated solutions offered by MBtech as a member of the AKKA Technologies Group. MBtech has approximately 3,300 employees at locations in Europe, North America and Asia.

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measX GmbH & Co. KG

MeasX offers complete test and data management systems for component and electronics testing in the automotive industry. This includes test rig automation, data acquisition, data analysis and storage. Based on standard hardware and software tools, measX systems are efficient, flexible and cost effective.

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MVA-PC

Type	Engine test data evaluation and reporting
Functionalities	DIAdem(R) based solution optimized for the requirements of engine test data analysis. Automatic generation of standard reports including data evaluation via formulas and scripts. Management of evaluation methods, formulas, layouts on different levels (user related, company standards). Batch processing of evaluations and report generation.
ASAM Standards	ASAM CAT ODS

X-Frame

Type	Data evaluation and data management system
Functionalities	Ready to use solution and development platform for DIAdem(R) based data evaluation applications. Covers data management, evaluation, management of evaluation methods and formulas, reporting, user management, parameter and layout management. Open interface for customizing. Implemented applications include: Data management and analysis of long-term drive and handling tests; Link of individual component test rigs into the ODS environment; Management of tests, test samples and results in a companywide ASAM ODS environment.
ASAM Standards	ASAM CAT ODS

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Meidensha Corporation

The quality and reliability of the Meiden Dynamometer has been established on a worldwide basis and the company continues to expand its reputation in all areas of dynamometer systems, i.e. drive simulation and analysis, test rigs, data acquisition and analysis, computer systems.

Contact: Mr. Takuya Ito, Mail: ito-taku@mb.meidensha.co.jp

MEIDACS-DY6000P

Type	Data acquisition and control
Functionalities	Data acquisition and test automation for engine, vehicle and vehicle components
ASAM Standards	ASAM CAT ACI, ASAM AE MCD-3

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MFP GmbH

MFP creates tailored solutions for Test Automation and Manufacturing Execution. Our recent development is an application for optimising the material flow in production, based on the interaction of several software agents with ASAM GDI interface. The execution system controls a just-in-time production in real-time, based on RFID-measurements and adapting to unforeseen events.

Contact: Dr. Robert Patzke, Mail: robert.patzke@mfp-online.de

Aptovia

Type	Application for adaptive material flow control
Functionalities	Report current material position; Control any transport system; Integrate express orders
ASAM Standards	ASAM CAT GDI

MAGUS

Type	Software for supplier independent device configuration
Functionalities	Device independent planning of automation and measurement applications; Automated device configuration from application parameters
ASAM Standards	ASAM CAT GDI, ASAM CAT ODS

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Micro Technology Co., Ltd.

Micro Technology is a measurement tool supplier company based in Tokyo, Japan. We have been providing measurement devices for automotives to major automotive companies for twenty years. We develop measurement tool based on customer\'s request. Our products shows our experience of automotive related technologies such as CAN, LIN and other communication protocols.

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MicroNova AG

MicroNova AG is a German software and system company with more than 160 employees. The company offers products, solutions and services for testing of electronics and mechatronics for the automotive sector.

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EXAM

Type	Testautomation System
Functionalities	EXAM defines a comprehensive tool and methodology based on UML to represent, implement and evaluate test cases. It enables you to graphically model test processes in sequence diagrams without programming knowledge. EXAM is suitable for use in Hardware-in-the-Loop simulation (HiL), test bench automation and Software-in-the-Loop simulation (SiL).
ASAM Standards	ASAM AE HIL

NovaCarts

Type	Hardware-in-the-loop (HiL) simulation platform
Functionalities	NovaCarts is a modular HiL simulation platform and software supporting setups from HiLs for single ECUs up to complete integration HiL-Systems. NovaCarts offers modularity in hardware and software, allowing it to extend setups on demand. The modularity also allows it to switch easily between hardware and software simulations instanteneously.
ASAM Standards	ASAM AE HIL

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Müller-BBM VibroAkustik Systeme GmbH

Müller-BBM VibroAkustik Systeme is one of the leading suppliers of vibroacoustic measurement technology for the interpretation of dynamic data, particularly in the fields of acoustics, vibration and strength. Our engineering expertise and competence for the measurement tasks at hand results in innovative solutions that seamlessly integrate into existing system environments. As one of the ASAM foundation members, we demonstrate enduring ASAM ODS expertise. This is reflected in our involvement in the definition of standards including the definition of the format for digital bus data, NVH or geometry.

Contact: Mr. Florian Kluiber, Mail: info.de@MuellerBBM-vas.de

edp

Type	Web-based engineering data portal
Functionalities	Interactively browse, query and analyze ASAM ODS data in the internet browser. Access to ASAM ODS data - especially NVH data (ODS-relational database, OO-

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MÜLLER-BBM
VibroAkustik Systeme

API, ATF/XML). Data processing (depiction of sum levels, nth octaves and orders, statistical calculation, data mining, audio). Export of stored data and processing results. Presentation of interactive graphics (SVG - scalable vector graphics). Creation of high quality VAS Graphics2Go® packages for interactive Microsoft® Office integration. Supported ASAM standards: ASAM ODS V5.1, V5.2, V5.3; NVH and Geometry data model; ASAM ODS data access with OO-API; exchange format ATF/XML.

ASAM Standards: ASAM CAT ODS

PAK

Type: Dynamic Data Measurement and Analysis System

Functionalities: Data acquisition: fast, static, digital (CAN, FlexRay™, EtherCAT®) channels; limitless channel counts. Data analysis: real-time analysis; selectable track parameters; configurable measurement descriptions; ASAM ODS based; user-configurable quantity catalog; system-independent data viewing based on ATF/XML; interactive graphics; creation of high quality VAS Graphics2Go® packages for interactive Microsoft® Office integration. Supported ASAM standards: ASAM ODS V5.1, V5.2, V5.3; NVH, Geometry and Bus data model; database; exchange format ATF/XML.

ASAM Standards: ASAM CAT ODS

PAK capture suite

Type: Data acquisition system

Functionalities: Data acquisition: fast, static, digital (CAN) channels; Interactive operation via smart devices or as standalone unit; Time recordings – manually or triggered; Supported ASAM standards: ASAM ODS V5.2, V5.3; NVH; Native writing of ATF/XML format.

ASAM Standards: ASAM CAT ODS

NATIONAL INSTRUMENTS

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Offices
National Instruments is a worldwide organization with direct operations in more than 40 countries and a presence in almost every region of the world.

National Instruments Corporation

National Instruments is the leader in Graphical System Design and offers sophisticated hardware and software products. Found at nearly every automotive OEM and Tier 1 supplier, our tools save time and money across all stages of the automotive engineering process by providing a common platform. NI's revolutionary concept has changed the way engineers and scientists approach measurement and automation, through industry-leading I/O, flexible off-the-shelf hardware and the powerful software development environments, to create user-defined solutions for applications ranging from End-of-Line and infotainment test to in-vehicle data logging and embedded software validation.

Contact: Ms. Stephanie Amrite, Mail: stephanie.amrite@ni.com

ECU Measurement and Calibration Toolkit

Type: Add-on for ECU measurement and calibration.

Functionalities: The NI ECU Measurement and Calibration Toolkit extends the NI LabVIEW, NI LabWindows™/CVI, and Microsoft C/C++ development environments to support measurement and calibration applications for the design and validation of electronic control units (ECUs).

ASAM Standards: ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L)

NATIONAL INSTRUMENTS

NI DataFinder Server Edition

Type: Centralized ASAM ODS compliant data management software

Functionalities: NI DataFinder Server Edition is an ASAM ODS server which works out-of-the-box by indexing test files with no need for IT support or database knowledge. NI DataFinder Server Edition integrates easily into existing systems and offers the indexed data through an ASAM ODS CORBA interface.

ASAM Standards: ASAM CAT ODS, ASAM COMMON MDF

NI DIAdem

Type: Data management, analysis, report generation and script based automation.

Functionalities: NI DIAdem is a single software tool that can be used to quickly locate, load, visualize, acquire, analyze, and report measurement data collected during data acquisition and/or generated during simulations.

ASAM Standards: ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX), ASAM CAT ODS, ASAM COMMON MDF

NI LabVIEW

Type: Graphical System Design based application development environment (ADE).

Functionalities: Graphical System Design software that provides engineers and scientists with the tools needed to create and deploy measurement and control systems through unprecedented hardware integration.

ASAM Standards: ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX), ASAM ASAP3, ASAM COMMON MDF

NI LabWindows™/CVI

Type: ANSI C based application development environment (ADE)

Functionalities: LabWindows™/CVI is a proven ANSI C development environment for engineers and scientists which increases productivity when creating test and measurement applications.

ASAM Standards: ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX)

NI TestStand

Type: Test Automation

Functionalities: NI TestStand is a ready-to-run test management software used for developing, executing, and deploying test and validation systems. Users can develop test sequences that integrate code modules written in any test programming language. Sequences also specify execution flow, reporting, database logging, and connectivity to other enterprise systems.

ASAM Standards: ASAM AE HIL, ASAM AE XIL, ASAM AE XIL-MA

NI VeriStand

Type: Application development environment (ADE) for real-time testing applications.

Functionalities: NI VeriStand is a powerful out-of-the-box software environment for configuring and performing real-time testing applications, such as HIL, MIL, SIL and test cells more efficiently.

ASAM Standards: ASAM AE HIL, ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX), ASAM AE XIL, ASAM AE XIL-MA, ASAM ASAP3

NATIONAL INSTRUMENTS

NI-XNET

Type	Hardware Driver
Functionalities	High-performance driver software technology behind NI's CAN, LIN, and FlexRay interfaces for PCI, PXI and NI C Series, which provides a set of driver software and APIs for NI LabVIEW, NI LabWindows/CVI, and C/C++ on Windows and LabVIEW Real-Time OSs.
ASAM Standards	ASAM AE MCD-2 NET (FIBEX)

NorCom

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NorCom Information Technology AG

NorCom specializes in augmenting automotive development processes by employing today's big data technologies. Based on Hadoop we set up big data technology frameworks for analytics and data logistic capable of dealing with automotive data formats. Scalability is proven up to several hundred petabytes. We also provide solutions for document based collaboration using natural language processing and deep learning to interlink information of structured and un-structured nature.

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OnoSokki Co., Ltd.

We, Ono Sokki Co., Ltd., are designing and manufacturing the measurement and control system for automobile testing and development. Also the instruments for analyzing the noise and vibration are available on our production line.

Contact: Mr. Yu Kumakura, Mail: kumay@onosokki.co.jp

Engine Test Bed

Type	FAMS8000
ASAM Standards	ASAM CAT ACI, ASAM AE MCD-3 MC

ORANGE

Type	OP-3000
Functionalities	ECU Calibration
ASAM Standards	ASAM AE MCD-3 MC

ORME

ORME is a French company located in Toulouse, specializing in signal and image processing. ORME has based its activities on its know-how and on a close relationship with its customers to fit their needs. ORME realizes specific algorithm studies and software developments as well as training. ORME also develops and commercializes its own software for data analysis: TrackImage (image sequence analysis) and TrackReport (test analysis and reporting).

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ORME Signals & Images

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TrackReport

Type	Software
Functionalities	Automatic test analysis and reporting
ASAM Standards	ASAM CAT ODS

Parametric Technology Corporation

PTC unterstützt mit seiner Integrity-Business Unit Unternehmen dabei, ihre Softwareentwicklung zu optimieren und für kontinuierliche Innovationen zu sorgen. Gleichzeitig werden die Komplexität der Software reduziert, Zykluszeiten verkürzt und in allen Entwicklungsstufen Risiken minimiert. Unsere Softwareentwicklungsplattform Integrity ist die einzige einheitliche Plattform, die alle Funktionalitäten für die Zusammenarbeit und Kontrolle von Entwicklungskomponenten und -aktivitäten umfasst. Unsere schnell anpassbaren Lösungen sind für 10 bis 10.000 Benutzer in unterschiedlichen Funktionen geeignet. Sie lassen sich problemlos mit ähnlichen Systemen integrieren und haben sich in den Umgebungen anspruchsvoller globaler Unternehmen vielfach bewährt.

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Integrity, a PTC product

Type	Application Lifecycle Management System
Functionalities	Requirements Management, Architecture Management, Change Management, Test Management, Traceability
ASAM Standards	ASAM AE Issue

Source, a PTC product

Type	Software Configuration Management
Functionalities	Integrated Configuration and Change Management. Full traceability to Requirements and Models. Integration in Test Management.
ASAM Standards	ASAM AE CC

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Peak Solution GmbH

Peak Solution is focused on the design and implementation of software applications for the planning, description, evaluation and documentation of tests. The solutions are based on standardized, flexibly adjustable software components which, thanks to their open interfaces, can be integrated smoothly into existing application and system landscapes. Special focus is placed on the use of applicable standards like ASAM ODS.

Contact: Mr. Guido Schneider, Mail: g.schneider@peak-solution.de

openMDM based systems

Type	An open and manufacturer independent open source software platform for the implementation of company-wide test and measurement data management solutions
Functionalities	Proven software modules for test definition and order placement as well as storage, search and exchange of measurement data, customizable application model, interfaces to many measurement systems and data formats, like e.g. DIADEM, FAMOS, Excel, etc.
ASAM Standards	ASAM CAT ODS

Peak BigODS Engine

Type	Evaluation of test data in a Big Data Cluster
Functionalities	The Peak BigODS Engine offers you the possibility to evaluate comprehensive amounts of test data in a HDFS/YARN-based Big Data Cluster considering complex criteria. Along with the Peak Peak BigODS Engine, we provide special connectors (= input formats) for different measurement data formats (e.g. ASAM ODS, MDF3, MDF4, ISOMME, etc.). Data analysts can integrate the connectors into Apache Spark applications in order to “decode” the measurement data and to evaluate them through complex analyses. Apache Spark’s In-Memory technology ensures particularly quick data processing. Providing an accordingly large Cluster of physical and virtual servers, petabytes of measurement data can easily be processed. Just like HDFS/YARN, the Spark Cluster\’s performance increases linearly with its size. Using Java and Python, our predefined query algorithms can be integrated in existing applications (e.g. Peak ODS Server, openMDM®).
ASAM Standards	ASAM CAT ODS

Peak ODS Permission Manager

Type	Reliable protection for measurement data
Functionalities	The Peak ODS Permission Manager helps you to automate the often very complex allocation of granular read, write, edit and delete authorizations for different ODS instances (e.g. projects) and their assigned elements (e.g. tests and measurement results that are linked to a project). This is done on the basis of freely definable criteria and conditions, which you can comfortably manage in an administration interface. For example: At periodic intervals, the Peak ODS Permission Manager determines those projects, tests and measurement results to which the defined selection criteria apply (e.g. project type = confidential) and allocates or withdraws the respectively included rights for the defined user groups. In this way, it is guaranteed that the access to new test data or tests that change their status over time is protected promptly and in accordance with the agreed security and confidentiality guidelines.
ASAM Standards	ASAM CAT ODS

Peak ODS Server

Type	Peak ODS Server offers standardized methods and interfaces for saving and reading test data on the basis of ODS
Functionalities	Peak ODS Server supports the ASAM standards ODS 5.3, ODS Mixed Mode and ODS Extended Query. It is optimized for use in connection with the measurement data management framework openMDM. But also other data acquisition, automation and analysis systems can be expanded fast and cost-effectively to access ODS databases using the Peak ODS server. Providers who would like to use the Peak ODSServer in their own OEM solutions or customer projects will find that Peak Solution has a fair partner concept with interesting conditions. The Peak ODS server works with Oracle and MS-SQL data bases.
ASAM Standards	ASAM CAT ODS

Professional services for openMDM

Type	Professional services for the implementation of company-wide test and measurement data management solutions
Functionalities	Consulting, system set-up, customizing, software development, system integration, support and maintenance for the open MDM framework
ASAM Standards	ASAM CAT ODS

PEAK-System Technik GmbH

The company PEAK-System from Germany is a leading provider of hardware, software, and services for the mobile and industrial communication sector with emphasis on the field busses CAN and LIN. The product range includes:

Contact: Mr. Uwe Wilhelm, Mail: info@peak-system.com

Hardware ...

- CAN FD connections for High-speed USB 2.0 and PCI Express
- CAN/LIN interfaces for conventional PC interfaces and embedded applications
- I/O modules with CAN connection for control, measured data recording, and processing
- Converters for different physical transmission types (bus converter modules)
- Routers and gateways for the forwarding of messages between CAN busses and other networks
- Data loggers and diagnostic hardware
- Products for education, demonstrations, and test setups
- Chip solutions for the CAN connection to USB, PCI, and PCI Express

Software ...

- CAN development systems for Windows® 10, 8.1, 7, CE 6.x and for Linux
- Programming interfaces for various protocols and standards like CCP, XCP, ISO-TP, UDS, OBD-II, and PassThru
- Software to monitor and diagnose CAN and LIN busses
- Programs for recording, playback, and simulation of message traffic
- Configuration software for CAN hardware from PEAK-System

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64293 Darmstadt, Germany
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Fax + 49 6151 8173 29

www.peak-system.com

Accessories ...
- Helpful CAN accessories
- PC adapter cards for PC/104 Small Form Factor Boards
- CAN cables and adapters for various applications

In addition to development as well as distribution and trade of hardware and software products, PEAK-System Technik provides know-how in form of different services like custom-designed hardware and software development or hardware adjustments.
PEAK-System from Darmstadt, Germany was successfully certified according to the international standards ISO 9001:2008 and ISO 14001:2004.

PCAN-CCP API

Type	API / Programming Interface
Functionalities	Free CCP programming interface for Windows (32/64-bit). The API covers functions for each command of the CCP standard and additional commands for communication management. The physical communication via CAN is based on the programming interface PCAN-Basic. Both APIs are part of the scope of supply of every CAN interface from PEAK-System.
ASAM Standards	ASAM AE MCD-1 CCP

PCAN-XCP API

Type	API / Programming Interface
Functionalities	Free XCP programming interface for Windows (32/64-bit). The API covers functions for each command of the XCP standard and additional commands for communication management. The physical communication via CAN FD and CAN is based on the programming interface PCAN-Basic. Both APIs are part of the scope of supply of every CAN interface from PEAK-System.
ASAM Standards	ASAM AE MCD-1 XCP

Pico Technology Ltd.

Pico Technology is the market leader in PC-based Oscilloscopes and Dataloggers; our award-winning PicoScopes are used to improve quality and reduce cost. PicoScope complements serial diagnostics as an essential part of accurate diagnostics. PicoScope verifies problems and repairs in service, and debug designs effectively and efficiently in development.

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PikeTec GmbH

PikeTec is a software company specialized in functional testing and verification of ECU software. For this, PikeTec created the tool TPT which supports systematic automated test of control software. Testing Simulink-models works as well as testing ASCET-models or C-Code. TPT supports MiL, SiL or even PiL and HiL testing procedures.

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Test Consulting

Type	Consulting
Functionalities	We provide support for designing test processes and test methodologies.
ASAM Standards	

Test Engineering

Type	ngineering
Functionalities	We do testing of all kind of automotive control software like powertrain controller, body controller, drive dynamics controller etc.
ASAM Standards	

TPT

Type	Testing tool
Functionalities	TPT is a model based testing and verification tool for control systems. TPT supports modeling of reactive testing, real-time testing, automatic test execution on e.g. Simulink or ASCET models, C-Code, PiL or HiL. Tests are evaluated and reported automatically. Requirements tracing and testing according to ISO26262 is possible.
ASAM Standards	ASAM AE MCD-3 MC

PLS Programmierbare Logik & Systeme GmbH

PLS is among the worldwide leading suppliers of debuggers, emulators and trace solutions for microcontrollers and System-on-Chips. The leading edge Universal Debug Engine (UDE) offers entirely new dimensions for fast, flexible and robust access to multi-core systems and deeply embedded systems.

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Universal Debug Engine® (UDE)

Type	Debug, test and trace tool
Functionalities	Real-time debugging, trace, system-level analysis
ASAM Standards	ASAM AE MCD-1 XCP

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Polytec GmbH

Polytec is a global corporation with facilities in Europe, North America and Asia. It is the worldwide leading supplier for non-contact laser Doppler vibration measurement systems. Polytec's innovative measurement solutions allow our customers to maintain their own technical leadership in markets from automotive and aerospace to micro technology.

Contact: Mr. Jörg Sauer, Mail: j.sauer@polytec.de

PSV-500 Scanning vibrometer

Type	Scanning vibrometer
Functionalities	Full-field vibration measurement for testing of acoustic materials
ASAM Standards	ASAM CAT ODS

PSV-500-3D-H 3D Scanning Vibrometer

Type	3D Scanning Vibrometer
Functionalities	Full-field vibration measurement for NVH and structural dynamic testing
ASAM Standards	ASAM CAT ODS

RoboVib Structural Test Station

Type	Automated Modal Testing
Functionalities	RoboVib is a robotic experimental modal test station utilizing non-contact Laser Doppler Vibrometry for sample probing. The main purpose is the validation of structural dynamic models on component level up to for full car bodies. RoboVib is offered as solution for NVH labs or as a measurment service by Polytec GmbH for Europe or Polytec Inc. for the United States
ASAM Standards	ASAM CAT ODS

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PVMsys Infra Solutions Pvt. Ltd.

Since 1999, PVMsys offers Product Verification & Validation Management (PVM) solutions using BRIX integration platform for complete enterprise. BRIX is flexible and scalable integration platform which can be used by individual engineer to manage his day to day data, or at lab level or even for every validation function or domain level across enterprise. BRIX is designed to work even for multi-location development centers globally. BRIX also provides foundation for Model Based System Engineering (MBSE) by maintaining complete validation life cycle (VLC)

Contact: Mr. Puran Parekh Mail: info@pvmsys.co.in

BRIX Distributed ODS

Type	A platform to manage test data across big data cluster in a distributed environment
Functionalities	BRIX Distributed ODS provides ODS semantics and data access layer to big data clusters so that big data analytics can be performed in distributed environment.
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L), ASAM CAT ODS, ASAM COMMON MDF

BRIX Engineer / Researcher

Type	Engineer / Researcher level standalone data management Solution
Functionalities	It is a standalone data management tool which an engineer/researcher can use to manage his day to day data.
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L), ASAM CAT ODS, ASAM COMMON MDF

BRIX Lab

Type	Lab level solution: Facility planning and scheduling system combined with lab level data management solutions
Functionalities	BRIX Lab supports lab level facility planning and scheduling system which support complete micro level of test execution process (Test life cycle - TLC).
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L), ASAM CAT ODS, ASAM COMMON MDF

BRIX PVM

Type	Enterprise Solution: A product verification and validation management (PVM) platform to manage complete validation life cycle (VLC) for each function in every domain.
Functionalities	BRIX PVM provides a foundation to connect every function in each domain for complete enterprise which can provides seamless engineering validation data exchange.
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L), ASAM CAT ODS, ASAM COMMON MDF

QTronic GmbH

QTronic provides tools and services for model-based development. Our outstanding software tools are used by developers at Mercedes-Benz, AMG, BOSCH, ZF, IAV, Continental, Toyota, Honda, SAIC and others. Silver and TestWeaver support highly automated validation and test of virtual ECUs on Windows PCs. This helps to identify design problems much earlier and faster with much lower costs than ever possible.

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www.qtronic.de

Silver

Type	Virtual ECU on Windows PC
Functionalities	Silver is a tool used by automotive development engineers to simulate ECUs in closed loop with a vehicle model on Windows PC. This way, work on control development, test, and calibration can be selectively shifted from road, test rigs, and HiL to Windows PC where it can be performed faster, cheaper and without blocking limited resources. Silver provides built-in support for automotive standards such as ASAP2/A2L, MDF, CAN, and XCP to perform co-execution of control software and of vehicle simulation models. Silver also supports the FMI (Functional Mockup Interface), which greatly simplifies the import of models from simulation tools such as Dymola, SimulationX, MapleSim, AMESim, SIMPACK or JModelica into the Silver environment. Silver is a product partner of The MathWorks, which translates into seamless integration of Silver into the MATLAB®/Simulink tool chain. Silver can be connected to CANape or INCA for measurement and calibration, or can be used for rapid-control prototyping via CAN. Silver provides interfaces for test automation with Python, TestWeaver, ECU-TEST, TPT and others. Advanced testing support: range check for all measurements and characteristics, detection of common software bugs, measurement of speed and stack consumption for ECU tasks, back-to-back tests, code coverage and other criteria recommended by ISO26262. Silver is in use for control development at Mercedes-Benz, BMW, AMG, IAV, Continental and others.
ASAM Standards	ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L), ASAM COMMON MDF

TestWeaver

Type	Automated System Validation
Functionalities	TestWeaver (testing without test scripts) is a tool that autonomously searches for weak points and bugs in control software and calibration data. Users have to supply a simulation model (implemented e.g. using MATLAB®/Simulink, Silver or HiL) and to specify computable quality indicators. TestWeaver constructs automatically driving scenarios that minimize these indicators. This helps to find bugs early and with much less effort than otherwise possible. A typical ECU (software + calibration data) is checked within 24 hours on a standard PC. The automatic test case generation of TestWeaver can run with MiL, SiL, or HiL setups and allows to achieve a much higher test coverage with less effort than otherwise possible. TestWeaver is in use for software development at Mercedes-Benz, AMG, Bosch, ZF, SAIC and others.
ASAM Standards	ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L), ASAM COMMON MDF

RA Consulting GmbH

RA Consulting offers software tools, programming for embedded systems as well as classic IT and consulting services for the automotive and other industries. RAC is ORACLE Gold Partner.

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CalveRA

Type	Expert system for project independent processing of application data
Functionalities	CalveRA is a standard server-oriented software for the knowledge-based validation of parameter data sets in ECU software. The special knowledge is entered into CalveRA by experts into special, restricted parameter data sets. Development engineers in different projects can resort to this knowledge. From the parameter data inside CalveRA, reference parameter sets can be created which are then used to validate the results of the development engineers. By these means the experience from historical projects can be reused. Furthermore the reference data set can be used as suggestion for the application data, allowing new, manifold projects to be dealt with. Label list are imported out of A2L description files. DCM calibration data files are used to import the specific data sets that have to be validated against the expert data in CalveRA and to export the reference data sets as basic data for new application projects.
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L)

DiagRA D

Type	Diagnostic tool
Functionalities	Diagnostics tool DiagRA D with support for ISO9141, ISO 14230, ISO 15765, ISO 14229 (UDS). Specific workshop tester functions for several OEM. Complete OBDII / EOBD / HD-OBD(SAE J1979/SAE J1939) scantool with WWH-OBD(World Wide Harmonized – Onboard Diagnostics). Support for the Open Source SAE J1699-3 OBDII Compliance Test Cases tool as well as for the official SAE J1939-84 OBD-Communications Compliance Test Cases tool for Heavy Duty Components and Vehicles. SAE J1699-3 tool log-file formatter with outputs as XML or PDF files. These OBDII / EOBD / HD-OBD / WWHOBD functionalities are also available as single tool Silver Scan-Tool. Advanced functions for developers work with MCD-2 MC (ASAP2) and CANdb files. These functions permit to read out and display the internal fault code memory of ECUs in full, display the status of the diagnostics functions, read out RAM cells, adaptation ID fields etc. Remote control via Windows DDE, ASAP3 and WebServices after ASAM HIL-API. MCD-2 D (ODX) description set import for parameterization of UDS on ISO-CAN diagnosis. Flash programming and script execution plug-ins available. Diagnostics and flash programming on FlexRay supported.
ASAM Standards	ASAM AE HIL, ASAM AE MCD-1 CCP, ASAM AE MCD-2 D (ODX), ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX), ASAM AE MCD-3, ASAM AE XIL-MA

DiagRA MC

Type	Measurement and calibration tool
Functionalities	Measurement tool DiagRA M with support for MCD-1 (CCP/XCP), CANdb, SMB (serial management bus) and for measurement data accessed by DiagRA D. Calibration tool DiagRA C for adjustment (CCP/XCP) of parameters as well as characteristic curves and fields with graphical and numerical display. Adjustment on-line and off-line. XCP on CAN, FlexRay and Ethernet. Integrated functionality for parameterization of DEPM (Diagnostics Error Path Manager). Data included in ODX can be compared with calibrated values in the A2L/HEX projects. ASAP3 interface for remote controlled measuring implemented.
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 D (ODX), ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX), ASAM AE MCD-3 MC, ASAM ASAP3

DiagRA MCD Toolset

Type	Integrated toolset for measurement, diagnostics and calibration
Functionalities	The DiagRA MCD Toolset is an applications and diagnostics tool for working with electronic control units in the automotive industry. It is an integration of the already widespread tools DiagRA M, DiagRA C and DiagRA D. It is used in the whole cycle of vehicle development, production and life.
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 D (ODX), ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX), ASAM AE MCD-3 D, ASAM AE MCD-3 MC, ASAM ASAP3

RA ODX Viewer

Type	ODX Data mangement tool
Functionalities	ODX viewer tool filters and displays the data out of ODX projects in several ways, arrange them well and exports complete or reduced data sets in several formats like XML, PDF and CSV. Manufacturer-specific configurations are possible. PDX containers can be imported in full. Parameters and their calculations can be displayed in a detail window. RA ODX Viewer comes with an integrated structural view through ODX Explorer.
ASAM Standards	ASAM AE MCD-2 D (ODX)

Silver Scan-Tool

Type	OBDII/EOBD/HD-OBD/WWH-OBD diagnostic tool
Functionalities	omplete OBDII / EOBD / HD-OBD (SAE J1979/SAE J1939) scantool with WWH-OBD(World Wide Harmonized – Onboard Diagnostics). Support for the Open Source SAE J1699-3 OBDII Compliance Test Cases tool as well as for the official SAE J1939-84 OBDCommunications Compliance Test Cases tool for Heavy Duty Com-

	ponents and Vehicles. SAE J1699-3 tool log-file formatter with outputs as XML or PDF files. Own implementation of the SAE J1939-84 OBD Communications Compliance Test Cases for Heavy Duty Components and Vehicles. SAE J 2534 PassThru, RP1210A and D-PDU-API interface connection is supported.
ASAM Standards	ASAM AE ATX, ASAM AE COMMON Seed&Key and Checksum Calculation

rd electronic gmbh

rd electronic supports tools and systems for data management, device integration, test and automation systems for end-of-line test and integration frameworks for different computer platforms. In the area of ECUs rd electronic develops and manufactures on-board interfaces and controllers as well as real-time bus analyzers for all bus systems.

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FLG

Type	Driver guide system for run-in and brake test stands
Functionalities	Driver guide system for run-in, diagnosis and brake test systems in end-of-line and development test stands. Connects to ECUs via radio transmission, test and driver guidance editor, online test compilation, test order and report integration, chassis dyno GDI integration platform, prepared for MCD-3 migration.
ASAM Standards	ASAM CAT GDI

GDI Framework

Type	GDI Integration platform for Windows and Linux (RT)
Functionalities	Integration platform for ASAM GDI devices for test and automation systems. DLL, shared lib and Java coordinator interfaces. ASAM GDI V4.2/4.3/4.4 DCD/DIT parser integrated or stand alone. Macro engine for system persistence and setup procedures - GINA2010 compatible. Platform adapter for Windows and Linux include serial, IP4, CAN, CANopen, and USB.
ASAM Standards	ASAM CAT GDI

Lexikon

Type	Metadata and Application Data Model Management
Functionalities	Web-based solution providing full metadata management services; (Parameter generation, Application Data Mdels, Equation). Capable of saving Business Rules for naming conventions, equation generation and model construction. Vendor and operating system independent, multilingual support from single licence to full enterprise version. Provides metadata integrity to ODS data repositories.
ASAM Standards	ASAM CAT ODS

Services

Type	Consulting and co-engineering
Functionalities	rd electronic supports development of: ODS-Data models, ODS system architecture; GDI-Integration and driver development; CEA-Component development; MCD-Migration
ASAM Standards	ASAM CAT CEA, ASAM CAT GDI, ASAM AE MCD-3, ASAM CAT ODS

SP Host

Type	Data management system
Functionalities	Automatic data scanning of test field data generating systems or hosts, scheduled operation of data conversion to ASAM ODS ATF and report generation, upload to ODS repositories, built in security related company authentication services, automatic archival, web based manual access to local and global test data, configurable components for test report generation. Vendor independent.
ASAM Standards	ASAM CAT CEA, ASAM CAT ODS

UBAT

Type	Universal Bus Analyzer for parallel real-time analysis
Functionalities	Monitoring, online analysis and complex triggering for any combination of CAN, MOST, K-Line, FlexRay, BSD, I-, K-, P-Bus. Programmable gateway and simulation procedures in any combination of up to 10 equal or mixed bus systems.
ASAM Standards	ASAM CAT GDI, ASAM AE MCD-2 MC (ASAP2/A2L)

ReliaTec GmbH

The ReliaTec is specialized in supporting their customers in the design and development of innovative products and services. As a technologically oriented innovation partner we apply our know-how in the development of software components and tools for networked real-time systems based on LIN, CAN, FlexRay and Ethernet.

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ReliaFX Access

Type	Software Product
Functionalities	FIBEX-Importer Library
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 D (ODX), ASAM AE MCD-2 NET (FIBEX)

RENK Test System GmbH

RENK Test System GmbH, a member of the MAN-group provides various turnkey test systems for R&D and Quality Assurance applications customized for the automotive, aviation, wind turbine and railway industry for more than 25 years now. RENK also offers consulting for test system design as well as services, maintenance of test systems, technical support and training.

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www.schleissheimer.de

Schleißheimer Soft- und Hardwareentwicklung GmbH

Schleissheimer GmbH specializes in Software and hardware development for microcontroller real-time Systems. The Company performs Software tests for the automotive industry. Schleissheimer develops Software and hardware products as prototypes or in small batches. Schleissheimer's portfolio includes the Software tools CanEasy and CanX for CAN/LIN bus development, analysis, and Simulation.

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science + computing ag

science + computing ag (s+c) an Atos Company – founded in 1989 – is an IT-services and software development company operating in the fields of computer aided testing, engineering and design (CAT/CAE/CAD). s+c offers a broad spectrum of services related to the handling of huge amounts of engineering data: consulting and concepts, system analysis and integration, custom tool development, optimization of distributed systems, data management and operation of complex, heterogeneous IT-environments. 2015 s+c has become part of Atos SE and operates under the brand of Atos since July 1st 2016. Visit Atos SE at: http://de.atos.net/de-de/home.html

Contact: Dr. Dietmar Rapf, Mail: D.Rapf@atos.net

ASAM ODS consulting and integration

Type	Consulting, engineering, support
Functionalities	Consulting customers in the organization of their test data. Design of ASAM ODS application models. Implementation of ASAM ODS databases.
ASAM Standards	ASAM CAT ODS

ASAM ODS database and version migration

Type	Consulting, engineering, support
Functionalities	Migrating engineering data to ASAM ODS databases. Migrating ASAM ODS based data or ASAM ODS databases to newer versions of the standard.
ASAM Standards	ASAM CAT ODS

ASAM ODS server and Database operation

Type	Support and operations
Functionalities	1st and 2nd level support in the operation of ASAM ODS servers, underlying databases (i.e. Oracle) and servers, problem analysis and operations.
ASAM Standards	ASAM CAT ODS

Software development

Type	Component based GUI application development, consulting
Functionalities	Mapping individual Engineering processes into Datamanagement applications. Programming of individual GUI applications for comfortable access to ASAM ODS based data using rich client or web based applications. Integration of and integration in Customer software. Using and utilizing standard software i.e. developing data management systems based on the open MDM framework http://www.openmdm.org
ASAM Standards	ASAM CAT ODS

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Scienlab electronic systems GmbH

Scienlab produces test systems to test industrial products as well as electrified drive train components for electric and hybrid vehicles. The business unit Test Systems develops customer-specific test environments for energy storage systems, battery management systems, inverters, DC/DC converters, charging devices and charging infrastructures, and for the integration of multiple components.

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EnergyStorageDiscover

Type	Software for battery tests
ASAM Standards	ASAM COMMON MDF

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SesKion GmbH

We provide measurement and simulation systems for automotive sensor interfaces like PSI5, DSI3, SENT and SPI. Our Simulyzer product family is used in development and production of ECU and sensors for airbag systems. Including crash data capturing and algorithm validation.

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sge-ing.de

SGE GmbH

The SGE Ingenieur GmbH is specialized in ECU development for the vehicle and mobility industry. We provide ECU calibration, functional development, calibration and testbed automation, application development in MATLAB/SIMULINK and simulation model development for HIL/MIL/SIL/residual bus applications.

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DataArtist

Type	Software
Functionalities	Measurement Data Visualization and Analysis
ASAM Standards	ASAM COMMON MDF

MapArtist

Type	Software
Functionalities	Map Creation, Map Visualization and Optimization
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L), ASAM COMMON MDF

ModelArtist

Type	Software
Functionalities	Model based calibration.
ASAM Standards	ASAM COMMON MDF

SGE Circus

Type	Software
Functionalities	Measurement Data Visualization and Analysis, Map Creation, Map Visualization and Optimization, Model based calibration
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L), ASAM COMMON MDF

SIEMENS

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Siemens AG

For 35 years Siemens is delivering test systems for the automotive industry and automotive suppliers and leverage the long term experience to build optimized solutions. The ASAM solutions ASAM MCD-3D server, ASAM MCD 2D(ODX) and ASAM GDI are integral part of the Siemens SIDIS Pro test software and can be used from administration, test authoring and execution.

Contact: Mr. Klaus Karpf, Department Manager of Diagnostic Systems, Mail: klaus.karpf@siemens.com

SIDIS Authoring

Type	Editor
Functionalities	The SIDIS Pro authoring suite is used to design all test routines required in the production environment. The suite takes advantage of the integrated ASAM MCD 2D (ODX) and the ASAM GDI interface as well as the import of OTX routines. The graphical user interface with the Flow view allows the easy design of the test flow. A full implemented version control system enables a comprehensive support of the complete releasing process.
ASAM Standards	ASAM AE MCD-2 D (ODX), ASAM AE MCD-3 D, ASAM CAT GDI

SIDIS GDI

Type	Editor, GDI API
Functionalities	SIDIS GDI provides a GDI API to interface roller benches, wheel alignment machines or filling stations according to ASAM GDI standards. The authoring tool of SIDIS Pro provides an editor to create the test sequences.
ASAM Standards	ASAM CAT GDI

SIDIS MCD-3 D Server

Type	ASAM Runtime Kernel
Functionalities	Server API (3D) interface (.net, COM/DCOM, Java), multi client and remote capable. Interface to SIDIS MVCI is available with performance optimized CIF Interface and PDU API. High performance diagnostic kernel incl. time measurement traces. Communication processor supports standard protocols (KWP 2000 on K and CAN), UDS and dedicated OEM protocols.
ASAM Standards	ASAM AE MCD-2 D (ODX), ASAM AE MCD-3 D

SIDIS MVCI

Type	Vehicle communication interface
Functionalities	VCI supports standard protocols like KWP 2000 on K-Line and CAN-Bus, UDS, J1939 and dedicated OEM protocols. ASAM features like asynchronous operation, multilink and multi-client capability are available. Devices with WLAN, RF, USB, LAN and serial interfaces are available.
ASAM Standards	ASAM AE MCD-3 D

SIDIS Runtime

Type	Runtime component
Functionalities	The SIDIS Pro runtime component executes the tests design and developed with the SIDIS Pro authoring system and takes advantage of the parallel communication to multiple ECUs and GDI components to save cycle time in the production line. The embedded CANalyser, debugging and logging functionality simplifies the validation of the test routines.
ASAM Standards	ASAM AE MCD-2 D (ODX), ASAM AE MCD-3 D, ASAM CAT GDI

Siemens PLM Software

Siemens PLM Software is an engineering innovation partner for companies in the automotive, aerospace and other advanced manufacturing industries. Siemens PLM Software enables its customers to get better products faster to market, and to turn superior process efficiency to their strategic competitive advantage. Siemens PLM Software offers a unique combination of virtual simulation software, testing systems, engineering services, process and data management. Siemens PLM Software is committed to openness of its Simulation and Test solutions, based on the support of standards, so as to enable optimal interoperability of Siemens PLM Software solutions with complementary solutions supporting the development processes at its customers.

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SIEMENS

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LMS Test.Lab

Type	Integrated environment for functional performance Testing
Functionalities	LMS Test.Lab is a complete solution for test-based engineering combining high-speed multi-channel data acquisition with a suite of integrated testing, analysis and report generation tools. LMS Test.Lab is designed to make testing more efficient and more convenient for the users. It includes solutions for rotating machinery, structural and acoustic testing and vibration control. Support of the ASAM ODS format is a cornerstone of the LMS Test.Lab application, providing full data compatibility with data originating from other sources than LMS Test.Lab.
ASAM Standards	ASAM CAT ODS

LMS Test.Lab Data Management

Type	Engineering Data Management Solution
Functionalities	The LMS Test.Lab Data Management solution provides an environment for efficient management, sharing and data exchange for both work-in-progress and published NVH test data. LMS Test.Lab Data Management can manage ASAM-ODS data securely, publish data beyond the restricted project team and increase the efficiency of sharing data across the company.
ASAM Standards	ASAM CAT ODS

Sierra CP Engineering Ltd.

Sierra-CP Engineering has over 30 years' experience in providing test equipment solutions, all based on our proprietary CADET V14 Control & Automation package. Our range comprises of engine, powertrain, vehicle and component testing equipment as well as engine combustion air handling systems, emissions sampling, robot drivers, fuel measurement and fuel conditioning solutions. We design and manufacture all of our own solutions and support them globally with locations in UK China, UK, USA, India and Malaysia.

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CADET Automation System

Type	Test Bed Automation System
Functionalities	Data acquisition, real time control, test sequencing
ASAM Standards	ASAM AE MCD-1 CCP

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www.simtec-elektronik.de

SIMTEC Elektronik GmbH

SIMTEC Elektronik GmbH develops and produces customer specific measurement devices, control devices and power electronics for industrial applications. The measurement devices collect and analyse non electrical quantities like force, temperature, flow and pressure. All devices are equipped with well-established field busses. The in-house production is capable of assembling and testing printed circuit boards, mounting modules and complete devices.

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Sky Technology Inc.

SkyTechnology.inc provide measurement system that specializes in R&D in response to your request. We will aim to risk reduction and cycle shortening of the system development.

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Engine Analysis System

Type	Analysis Tool
Functionalities	Save the engine data to the ODS server, data analysis, report output
ASAM Standards	ASAM CAT ODS

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Sodius SAS

Linking, synchronizing or exchanging engineering data are the most needed capabilities today to enhance productivity and collaboration not only between applications but between teams and organizations. Sodius develops data synchronization products and services that allow people and systems to work together to deliver projects across disciplines, teams, and organizations. In order to ensure high quality on-time deliverables, Sodius supports both systems and software design teams with dedicated services and solutions for requirements management, architecture, modeling and ALM/PLM domains.

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Softing Automotive Electronics GmbH

Softing provides products and services covering the entire life cycle of an ECU. Its range includes the Diagnostic Tool Set (DTS) product family with authoring, flash and analysis tools as well as ODX runtime systems, and the Softing TDX workshop application. Additional tools based on VCI Communication Framework VCF like data logger for the vehicle bus systems, residual bus simulation, and measuring enable symbolic access to the ECUs. Furthermore, Softing offers customer-specific solutions for every stage of the ECU life cycle, especially solutions for development, test, production or after sales applications.

Contact: Mr. Markus Steffelbauer, Mail: markus.steffelbauer@softing.com

DTS Flash

Type	Flash programming
Functionalities	Flash programming based on ODX v2.0.2 and 2.2 files, Motorola S-record or Intel Hex input files also supported One button solution for end-users and step-wise execution for developing
ASAM Standards	ASAM AE MCD-2 D (ODX)

DTS Monaco

Type	Engineering Tool (measurement and diagnostics)
Functionalities	Fully featured engineering tool with application oriented user interfaces for diagnostics, flash programming, measurement, variant coding, OBD, bus node emulation, communication analysis, etc. supported hardware: Softing EDIC/VIN|ING/HS-family, Softing CAN HW family, DCDI/eCOM, CANlink/2, Kvaser CAN HW, Vector CAN HW, D-PDU-API compliant interfaces, SAE J2534 compliant interfaces
ASAM Standards	ASAM AE MCD-2 D (ODX), ASAM AE MCD-3 D, ASAM AE OTX

DTS OBD

Type	OBD test and verification
Functionalities	Test of ECU's OBD functionality - starting on scan tool level down to issue analysis on communication level.
ASAM Standards	ASAM AE MCD-2 D (ODX)

DTS Venice

Type	ODX editor/checker. Available for ODX 2.0.1 and ODX 2.2
Functionalities	Administration of ODX/PDX databases, editing of ECU diagnostics, symbolic and semantical check of databases, export to RTF and PDF, verification of interpretation without ECUpossible
ASAM Standards	ASAM AE MCD-2 D (ODX), ASAM AE MCD-2 MC (ASAP2/A2L)

ECU-Test (TestCASE)

Type	Fully featured Test Automation
Functionalities	Test automation for diagnostics and function tests of ECUs; including great varity of test systems which allows overall test, e.g. Softing DTS (ODX/MCD-3D) and EDIABAS, dSPACE HiL, ETAS INCA (A2L), Vector CANoe, Matlab/Simulink, etc. special versions for UDS and ODX testing
ASAM Standards	ASAM AE MCD-2 D (ODX), ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-3, ASAM AE OTX, ASAM AE XIL

ODX/OTX/MCD-3 training

Type	Training, workshops and consulting on diagnostic related standards
Functionalities	Based on the experience coming from active workgroup participation Softing provides trainings and workshops on ODX, OTX, and ASAM MCD-3, off-the-shelf or tailor-made, on-site or at our training center in Haar/Munich. We also provide consulting on how to use those standards efficently.
ASAM Standards	ASAM AE MCD-2 D (ODX), ASAM AE MCD-3 D, ASAM AE OTX

OTX Server

Type	Run-time interpreter for OTX sequences including ASAM MCD-3D server
Functionalities	Interpreter for OTX sequences based on ODX v2.0.1/2.2 diagnostic data, based on fully featured ASAM MCD-3D/MVCI-server, provides easy-to-use API allowing

optimize! softing

	efficent integration into any diagnostic tool
ASAM Standards	ASAM AE MCD-2 D (ODX), ASAM AE MCD-3 D, ASAM AE OTX

OTX Studio

Type	Comfortable editor for OTX sequences including ASAM MCD-3D server
Functionalities	Easy-to-use authoring system according to ISO 13209, based on Softing D-Server DTS COS and ODX data, specification view (flow charts) and implementation view (line-based), debugging, online-change of code while debugging, reporting. Many supplements to the standard, e.g. DLL access, file access, GUI library
ASAM Standards	ASAM AE MCD-2 D (ODX), ASAM AE MCD-3 D, ASAM AE OTX

Softing TDX

Type	Workshop tester based on ODX/OTX/ASAM MCD-3D
Functionalities	Fully configurable workshop tester for all diagnostic functions incl. handling of error memory, measurement, flash programming and guided functions/diagnostics
ASAM Standards	ASAM AE MCD-2 D (ODX), ASAM AE MCD-3 D, ASAM AE OTX

VCF

Type	Run time environment (API) supporting simulation, measurement and diagnostic capabilites on current bus systems
Functionalities	VCI communication framework (VCF) based on HS- and VIN|ING VCI families; supports low level diagnostics, measurement (XCP and direct bus), residual bus simulation, and data logging; data interpretation via CANdb/FIBEX/LDF/AUTOSAR
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX), ASAM COMMON MDF

SOHATEX Software Hardware Technology

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Sohatex GmbH

Sohatex GmbH is a specialist for the development of control software for internal combustion engines and measurment software for test cells. The used modular ECU-hardware enables very flexible control of internal combustion engines (including “Next-Cycle Control”) from one-cylinder R&D engines to 16 cylinder engines with any kind of fuel injection.

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Sontheim Industrie Elektronik GmbH

As a manufacturer of high performance and quality hard- and software products Sontheim Industrie Elektronik GmbH provides a broad range of high-tech products for automation and automotive industry and is also specialized in protocol stacks like ISO15765 (KWP2000 on CAN), J1939 and RAW-CAN, which can be used by the M.D.T to develop diagnostic applications.

Contact: Mr. Daniel Magnus, Mail: daniel.magnus@s-i-e.de

CANexplorer 4

Type	CAN-Bus monitoring, logging and analyzing software
Functionalities	Modular, efficient, intuitive - the CANexplorer 4 is a completely new developed fieldbus analyzing software which reflects years of know-how regarding the work with CAN-networks within complex machines and vehicles. This new generation features a lot of more functions combined with an intuitive and flexible handling. The CANexplorer provides the complete range of function modules for data acquisition, data processing, data conversion, data logging and data visualization.
ASAM Standards	ASAM AE MCD-2 D (ODX)

CANfox

Type	CAN-to-USB interface
Functionalities	The CANfox is a compact CANto-USB interface with a 32-Bit micro controller. It provides 1 opto isolated CAN-channel and 1 RS232 channel. With its compact design and providing high performance it‘s perfect for mobile use. The multithread software interface SiECA132 with demo application for own applications is included.
ASAM Standards	ASAM AE MCD-2 D (ODX)

CANUSB

Type	CAN-to-USB interface
Functionalities	The CANUSB is a robust CAN-to-USB interface even for rough use and provides up to 2 opto isolated CAN-channels with additional features like ErrorFrame detection and analogue level measurement of the CAN-level. The multithread software interface SiECA132 with demo application for own applications is included.
ASAM Standards	ASAM AE MCD-2 D (ODX)

COMhawk

Type	ECU, Telematics Module, Diagnostic Module, CAN-to-Ethernet Gateway, CAN-to-Wi-Fi Gateway
Functionalities	Equiped with a 32-bit microcontroller and based on a MicroC/OS-II or Linux operating systems, COMhawk™ offers standard interfaces such as CAN and Ethernet as well as a Wi-Fi interface and optional digital in- and outputs. The on-board device has a robust design of IP67k and is capable of operating in harsh environments including exposure to dust, extreme temperatures, shock, vibration, and high pressure water or steam jets. A webserver is also integrated.
ASAM Standards	ASAM AE MCD-2 D (ODX)

M.D.T. Modular Diagnostic Tool

Type	Development Tool
Functionalities	he M.D.T. is a tool for the development of diagnostic applications for the automotive industry by using the latest technology. The multithread based systems provide the possibility to develop diagnostic application without coding by using multiple protocol stacks like ISO15765 (KWP 2000 on CAN), RAW-CAN, J1939 and ISO11783 (ISOBUS).
ASAM Standards	ASAM AE MCD-2 D (ODX)

ODX-Editor

Type	Development Tool
Functionalities	In addition to the M.D.T. the ODX-Editor provides the user an easy way for editing existing or the creation of new ODX-Data by using a graphical user interface. It cares to observe the rules for creating valid data, tests existing databases and provides help functions during the editing.
ASAM Standards	ASAM AE MCD-2 D (ODX)

Sontheim

STAR ELECTRONICS GmbH & Co. KG

STAR ELECTRONICS (formerly Eberspaecher Electronics GmbH & Co) belongs to the pioneers in the field of the automotive bus system FlexRay, which is used in particularly safety critical enviroments. Eberspaecher Electronics develops and manufactures hardware and software platforms for the evaluation of FlexRay in various customer environments. Star Electronics is leading in the sales of FlexRay interface platforms and provides a wide range of further FlexRay products for remaining bus simulation, gateways and signal manipulation. The STAR COOPERATION Group acquired the Goeppingen-based company Eberspaecher Electronics with its proven products in vehicle networking technology as an ideal supplement to the development and workshop services of its subsidiary BERGER ELEKTKRONIK in Sindelfingen. From September 1st, 2015, on, both companies carry the name STAR ELECTRONICS while maintaining their independency under company law. The umbrella brand STAR COOPERATION will dominate the brand identity of these two companies. The EE solutions portfolio of the STAR COOPERATION Group comprises of standardized products for vehicle networking, energy as well as sensor/actor technologies and development by proxy of special products, test benches, testing boards and applications/embedded software. The production line is equipped with a fully automated PCB assembly. In addition, the workshops produce cable sets and install and modify vehicles to order.

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CHI Generator

Type	Export tool to generate CHI (Controller Host Interfaces) files out of FIBEX files
Functionalities	The CHI Generator reads the FIBEX file and supports the CHI export of the communication controllers Bosch E-Ray, FreeScale MFR4200, MFR4300, MFR4310, MPC5567 and Fujitsu MB88121, MB91F465X.
ASAM Standards	ASAM AE MCD-2 NET (FIBEX)

CHI Generator RBS

Type	Export tool to generate CHI (Controller Host Interfaces) files to stimulate a couple of ECUs described in a FIBEX file
Functionalities	The CHI Generator reads the FIBEX file and supports the CHI export of the communication controllers Bosch E-Ray, FreeScale MFR4200, MFR4300, MFR4310, MPC5567 and Fujitsu MB88121, MB91F465X. The physical ECUs of an RBS (remaining bus simulation) together with a number of ECUs, which are to be simulated, will be defined, and thus a CHI file for an ECU simulating the remaining bus will be exported.
ASAM Standards	ASAM AE MCD-2 NET (FIBEX)

STAR COOPERATION®
Your Partners in Excellence

FlexConfig Developer

Type	Configuration tool for FlexRay networks
Functionalities	FlexConfig Developer is a cost-effective, powerful and user-friendly design and configuration software for automotive networks. New networks are easily created by using wizards. Existing networks are clearly displayed and can be changed easily. With the help of the numerous export options, almost every hardware platform can be configured with the network data.
ASAM Standards	ASAM AE MCD-2 NET (FIBEX)

FlexConfig RBS

Type	Creation of complete hardware based remaining bus simulations (RBS), gateways an signal manipulation for FlexRay, CAN, Ethernet, BroadR-Reach and CAN-FD
Functionalities	FlexConfig RBS is a configuration software tool consisting of three packages: RBS (remaining bus simulation), gateway and control (signal manipulation). In combination with the FlexDevice hardware product family is made available a compact, high-performance, comprehensive solution for applications such as: • ECU development • Rapid prototyping • Function tests • Test benches
ASAM Standards	ASAM AE MCD-2 NET (FIBEX)

STIEGELE Datensysteme GmbH

STIEGELE Datensysteme GmbH

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www.stiegele.eu

The STIEGELE Datensysteme GmbH is specialized in sophisticated hard- and software solutions for data acquisition, processing and test rig control. The company, located in Rothenburg ob der Tauber / Germany, was founded in 1984. The software supports standard data acquisition hardware from all major manufacturers and common data formats.

Contact: Mr. Max Staudacher, Mail: max.staudacher@stiegele.eu

MGraph

Type	Software
Functionalities	Data analysis and presentation
ASAM Standards	ASAM CAT ODS

MLab

Type	Software
Functionalities	Data acquisition and test rig control
ASAM Standards	ASAM AE MCD-1 XCP, ASAM AE MCD-1 CCP, ASAM AE MCD-2 NET (FIBEX)

Synchrotek d.o.o.

Synchrotek

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Synchrotek is using the array of in-house built applications and software modules providing almost automatic transfer from model based solutions to prototyping hardware, so the focus is on flexible and cost effective solutions.

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Synopsys GmbH

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Synopsys, Inc. is the Silicon to Software™ partner for innovative companies developing the electronic products and software applications we rely on every day. As the world's 15th largest software company, Synopsys has a long history of being a global leader in electronic design automation (EDA) and semiconductor IP and is also growing its leadership in software quality and security solutions. Whether you're a system-on-chip (SoC) designer creating advanced semiconductors, or a software developer writing applications that require the highest quality and security, Synopsys has the solutions needed to deliver smart, secure products for the era of connected everything. – *See more at: http://**www.synopsys.com**/Company/AboutSynopsys/Pages /CompanyProfile.aspx#sthash.deZyqD4b.dpuf*

Virtualizer

Type	Simulation Tool for automotive Platforms
Functionalities	Virtualizer™ addresses the increasing development challenges associated with software-rich semiconductor and electronic products by enabling companies to accelerate both the development and deployment of virtual prototypes. The results: Accelerated time to market, Increased developer productivity, Improved product quality, Enhanced communication between teams
ASAM Standards	ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L)

Taylor Dynamometer

Taylor Dynamometer

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Turn to Taylor Dynamometer for proven products, deep expertise and accountable support for your vehicle testing operations. Founded in 1929, Taylor is a global manufacturer of complete test cell solutions, engine, chassis and towing dynamometers, hydraulic test centers and data acquistion and control systems. Everything you need to succeed.

Contact: Mr. Jeff Brown, Mail: sales@taylordyno.com

DynPro2

Type	Data Acquisition and Control System
Functionalities	Engine, Chassis, Hydraulic and other applications. DynPro2 provides data analysis tools, centralized management of data, support for vehicle communication protocols, reporting, post-processing, closed loop control, even integrate room temperature, lights, safety interlocks and much more into your testing process.
ASAM Standards	ASAM CAT ODS

TechSAT GmbH

techSAT
mastering integration complexity

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TESIS DYNAware GmbH

OEMs and suppliers throughout the world rely on simulation solutions from TESIS DYNAware. With over 20 years of experience in the Automotive Industry, customers can benefit from simulation expertise in the development of new engine and drivetrain concepts as well as for vehicle dynamics control systems, complete vehicle simulation, energy management and driver assistance systems.

Contact: Mr. Maximilian Chucholowski, Mail: m.chucholowski@tesis.de

DYNA4

Type	Automotive Simulation Software
Functionalities	Open and flexible simulation framework with model handling, test automation and result management, extensive real-time model library for vehicle dynamics, engine dynamics, advanced powertrains and driver assistance systems
ASAM Standards	ASAM AE HIL, ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX), ASAM AE XIL, ASAM COMMON MDF

veDYNA

Type	Vehicle Dynamics Simulation Software
Functionalities	Vehicle dynamics simulation model for real-time simulation of passenger cars, trucks and trailers with conventional, hybrid or electric powertrains, tools for suspension analysis and
ASAM Standards	ASAM AE HIL, ASAM AE XIL, ASAM COMMON MDF

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TEXA S.R.L.

Environmental testing (temperature, vibration). Pulse pressure testing. Air filter testing. Straing gauge and mechanical testing. Creation of customer tailored test benches integrating different systems (automation).

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TOYO Corporation

TOYO Corporation is just independent Technical trading company in Japan, as the TECHNOLOGY INTERFACE between European/American and Japanese/Asian test and measurement engineering since 60 years ago. And TOYO Corporation also provide system integration, localization and after services of from data measurement, data analysis to data management to Japanese Automotive Engineering in any fields.

Contact: Mr. Haruo Fukuro, Mail fukuro@toyo.co.jp

CRONOS-compact/-flex

Type	Universal data acquisition system for in-vehicle tests and test-beds
Functionalities	imc CRONOS-compact is a networkable data acquisition system with up to 512ch for analog and digital buses (like CAN/CCP, LIN etc) measurement in any environment. CRONOS-Compact can be connected with any test-bed controller and MCD tools via XCP on Ethernet by using A2L files.
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-2 MC (ASAP2/A2L)

imc-CANSAS

Type	CAN-bus based Measurement & Analysis Modules
Functionalities	High-performance CAN-bus based measurement modules for applications in test stands, in-vehicle and industrial environments. imc CANSAS is a revolutionary concept for the decentralized capture of physical measurement data.
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L)

imc-FAMOS

Type	Comprehensive data processing & signal analysis framework
Functionalities	imc FAMOS provides you with the versatile software tools necessary to visualize and analyze your data, automating routine and complex tasks, from data import to test report. imc-FAMOS can be also used as ASAM-ODS Client by using ODS Browser funstionality.
ASAM Standards	ASAM CAT ODS

PAK/edp

Type	Dynamic Data Measurement and Analysis system / Web-based engineering data portal
Functionalities	Data acquisition of fast, slow of physical measurements and buses measurements. Data analysis with innovative technologies. Highly effective Engineering Data Management
ASAM Standards	ASAM CAT ODS

Peak ODS Server - ASAM-ODS tools

Type	Server and clients for measurement data management with openMDM framework
Functionalities	Consultation for the Process and Methology in any Test & Measurement fields, Support services and Training for Japanese engineers who is considering improving Measurement Data Management.
ASAM Standards	ASAM CAT ODS

TrackReport

Type	Signal Analysis & Automated Report Generation Software
Functionalities	TrackReport offers a full data visualization and analysis environment, where interactivity and automation help creating simulation or test reports. Configurable report models handle data post-processing algorithms as well as the graphical setup. TrackReport can be also used as ASAM-ODS Client tool.
ASAM Standards	ASAM CAT ODS

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Toyota Technical Development Corporation

Toyota Technical Development Corp. provides development services for production of cars. Its business activities include developing and manufacturing measurement instruments and systems; planning of equipment and systems; proposal and supply of model base development solutions; calibration, inspection, and repair of measurement instruments; and development support for next-generation businesses.

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TraceTronic GmbH

Since its foundation as a spin-off from Dresden University of Technology, TraceTronic has been working with a large number of strong partners throughout the automotive industry. Our highly competent and interdisciplinary team of engineers offers a wide range of services in the field of software applications for validation of embedded systems. Due to our close relationship with customers and the years of experience and scientific research, we have the expertise to guarantee powerful and customized products and services.

Contact: Mr. Frank Günther, Mail: info@tracetronic.de

ECU-TEST

Type	Test automation software
Functionalities	ECU-TEST is a test automation software for the validation of embedded systems in automotive environments. This software executes regression tests which are essential for validating complex technical products such as electronic control units (ECUs). ECU-TEST can be applied during product development as well as during quality control of production itself.
ASAM Standards	ASAM AE ATX, ASAM AE COMMON Seed&Key and Checksum Calculation, ASAM AE HIL, ASAM AE MCD-2 D (ODX), ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX), ASAM AE MCD-3, ASAM AE XIL, ASAM AE XIL-MA, ASAM COMMON MDF

TEST-GUIDE

Type	Software for test report management
Functionalities	TEST-GUIDE is a centralized database application, flexibly deployable in different development and test environments. It has been developed specifically for use in the automotive area (by ASAM ATX-compliant interface) and provides the capability to manage, view and analyze test executions and results via an intuitive, web-based interface.
ASAM Standards	ASAM AE ATX, ASAM AE COMMON Seed&Key and Checksum Calculation

TRACE-CHECK

Type	Tool for fully automated evaluation and reporting of recorded signal data
Functionalities	TRACE-CHECK is the highly efficient tool for the automatic evaluation and validation of recorded measured data. With TRACE-CHECK, even complex requirements can be formalized efficiently and reusable. The created test specifications enable the automatic validation of measured data and thus a fast assessment of large amounts of data in different recording formats.
ASAM Standards	ASAM AE MCD-2 NET (FIBEX), ASAM COMMON MDF

TTTech Automotive GmbH

TTTech Automotive, a subsidiary of TTTech Computertechnik AG, provides reliable control unit platforms and software solutions offering highest safety classification in accordance with ISO 26262/ASIL D. The modular, certified hardware and software solutions are used for serial production in the field of control and monitoring of electric and hybrid propulsion systems as well as for vehicle dynamics and driver assistance. To validate the vehicle functions, the product range is completed by intelligent data loggers and test equipment for networked systems. TTTech Automotive is a premium member of the FlexRay and AUTOSAR consortia and endorses these open standards for automotive electronic architectures with its products and solutions. Further information on the company and products is available at www.tttech-automotive.com and **products@tttech-automotive.com.**

Contact: Mr. Marc Lang, Mail: marc.lang@tttech-automotive.com

TTX-Connexion

Type	Intelligent gateway for signal manipulation
Functionalities	4-Way-Gateway (2 x CAN, 2 x FlexRay); signal routing and manipulation; Datalogging on CF card; Comfortable network configuration via FIBEX, CANdb, and AUTOSAR TL (V3.0); Online-viewing and analyzing with TTXAnalyze; Stand alone in vehicle operation
ASAM Standards	ASAM AE MCD-2 NET (FIBEX)

TTX-DataLogger

Type	Comprehensive Recording & Analysis of the entire vehicle Network
Functionalities	Simultaneous, extensive data logging with a central time stamp; Configurable power management Filters, triggers, pre-analysis; Open data format; Integrated CCP/XCP master; Freely programmable; Wake-up recording
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX)

TTX-Disturbance Node

Type	Reproduceable failure injection for FlexRay
Functionalities	synchronous and asynchronous disturbances; global and local disturbances; Disturbances on channel A and/or channel B; Configurable, triggerable disturbances (incl. 60 test cases); Termination resistor and short-circuit tests; Sending of disturbed frames; Can be automated
ASAM Standards	ASAM AE MCD-2 NET (FIBEX)

TTX-Optical Link

Type	Optical decoupling for FlexRay
Functionalities	Minimal effect on FlexRay time response - fulfilling the requirements of ISO 11452-2 and CISPR 25
ASAM Standards	ASAM AE MCD-2 NET (FIBEX)

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Vector Informatik GmbH

Vector is the leading manufacturer of software tools and software components for networking of electronic systems based on CAN, LIN, FlexRay, Ethernet, WLAN and MOST as well as multiple CAN based protocols. The Vector know-how is reflected in a wide range of tools as well as in integrated consulting services with software and systems engineering. Workshops and seminars complete the manifold training program. Customers from the automotive engineering, the commercial vehicle, aerospace, transportation and control technologies around the world trust in the solutions and products from the independently-owned Vector Group.

Contact: Mr. Alfred Kless, Mail: info@vector.com

ASAP2 Editor

Type	Editor for MCD-2MC (ASAP2) files
Functionalities	Comfortable editor for creating, modifying and updating MCD-2MC description files (*A2L) exploiting the corresponding linker map file.
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L)

ASAP2 Lib

Functionalities	The ASAP2 Lib is a function library for reading ASAP2 files of all released versions, including the current V1.61. The library was developed for the C programming language and can be embedded in applications. On demand Vector offers development of customized A2L-converters.
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L)

ASAP2 Tool-Set

Type	Updating and merging MCD-2MC (ASAP2) files
Functionalities	The ASAP2 Updater updates the address and data type information of an ASAP2 file using the linker map file. The ASAP2 Merger merges several ASAP2 files to a common ASAP2 file.
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L)

CANalyzer

Type	Tool for stimulation and analysis of networks
Functionalities	CANalyzer is the universal software analysis tool for ECU networks and distributed systems. CANalyzer makes it easy to observe, analyze, and supplement data traffic in CAN, LIN, MOST, FlexRay or Ethernet systems. With powerful functions and user-programmability, all needs are covered from simple network analysis to advanced troubleshooting of complex problems. CANalyzer support the developer in implementing the diagnostic functionality of an ECU.
ASAM Standards	ASAM AE MCD-2 D (ODX), ASAM AE MCD-2 NET (FIBEX), ASAM COMMON MDF

CANape

Type	Measurement, calibration and diagnostic system
Functionalities	Time-synchronous acquisition of measurement data via CCP or XCP from CAN, LIN, FlexRay, MOST or external test equipment. Environment recognition by video, audio or GPS. Convenient real-time calibration by CCP or XCP. Seamlessly integrated diagnostics by KWP2000 and UDS. Convenient management of calibration data.
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 D (ODX), ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX), ASAM AE MCD-3, ASAM COMMON MDF

CANdelaStudio

Type	Authoring tool for diagnostic specification
Functionalities	Specify ECU diagnostic services and data in a user-friendly way. This information can be used for test system data supply, ECU auto-code and ECU software validation. Import/export from/to many different formats, including ODX (MCD-2D). A template concept ensures a consistent development process and allows diagnostic data to be reused in different OEM-specific protocols. CANdelaStudio supports several standards like KWP2000, UDS, WWH-OBD, J1939, DoIP, FlexRay. A quick learning curve is guaranteed, not just for diagnostic experts. Data consistency is ensured and enhances product quality.
ASAM Standards	ASAM AE MCD-2 D (ODX)

CANoe

Type	Tool for test, simulation, diagnostic and analysis of networks
Functionalities	CANoe is the comprehensive software tool for development, test and analysis of entire ECU networks and individual ECUs. It supports you throughout the entire development process of CAN, LIN, MOST, FlexRay or Ethernet systems. Its versatile functions and configuration options are used worldwide by OEMs and suppliers. The open design makes CANoe the first choice for ECU development for combustion engines and projects related to electrification of the powertrain.
ASAM Standards	ASAM AE HIL, ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 D (ODX), ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX), ASAM AE XIL, ASAM AE XIL-MA, ASAM COMMON MDF

CANoe.DiVa

Type	Tool for Automated Testing of Diagnostic Protocol Implementation and Integration in ECUs
Functionalities	Automatic generation of test cases with comprehensive test coverage based on ECU diagnostic descriptions in ODX or CANdela format. Test cases are executed, an extensive test report is generated. According to a case study, savings of effort by a factor of 4 up to 20 are achieved.
ASAM Standards	ASAM AE MCD-2 D (ODX)

CDM Studio

Type	Calibration Data Management
Functionalities	CDM Studio is an efficient tool for editing parameter set files. It is easily used to display, compare and edit parameters created in ECU calibration. When solving complex tasks, filters are used to reduce the number of parameters shown on the screen. In addition to calibrating parameter values you can take values from different files and merge them to create new version levels. In using CDM Studio, you retain an overview of your work packages, reliably track parameter changes and manage data levels responsibly. Since all relevant file formats of the automotive industry are supported, it does not matter which measurement and calibration tool is used to generate the parameter files.
ASAM Standards	ASAM AE CDF, ASAM AE MCD-2 MC (ASAP2/A2L)

Consulting & Engineering Services for ODX

Type	Vector gives you the best conditions for implementing your requirements. The knowledge of our experienced employees is your advantage in coming up with efficient and customer specific diagnostic solutions.
Functionalities	Vector can provide you with both technical consultation and adaptation or customization of Vector tools in service projects. Our employees are very familiar with many OEM-specific data formats, the ASAM and ISO standards and underlying processes. Our services are: Optimization of existing diagnostic processes, Migrations of master data to ODX, consultation on the implementation/integration of ODX in existing diagnostic development processes, definition and implementation of authoring guidelines, OEM-specific ODX Techdays
ASAM Standards	ASAM AE MCD-2 D (ODX)

DaVinci Configurator Pro

Type	Configuration of AUTOSAR basic software
Functionalities	DaVinci Configurator Pro is the configuration tool for MICROSAR basic software (BSW) and runtime environment (RTE). It masters the complete ECU configuration workflow and supports multiple input formats such as AUTOSAR System Description or the ASAM file formats FIBEX (description for CAN and FlexRay networks) and ODX (description of diagnostic implementation). DaVinci Configurator Pro exports A2L files that describes the measurement and calibration parameters of MICROSAR BSW and RTE.
ASAM Standards	ASAM AE MCD-2 D (ODX), ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX)

FIBEX Explorer pro

Type	Tool for viewing, editing and creating FIBEX XML files
Functionalities	View, edit and create FIBEX files for FlexRay including manufacturer extensions in a user-friendly way without detailed knowledge of the XML-based file format. The tool provides loss-less editing functions for FIBEX files.
ASAM Standards	ASAM AE MCD-2 NET (FIBEX)

GL Logger Family

Type	Data logger for test fleet operators and test benches
Functionalities	Logging of CAN, LIN, MOST150, FlexRay networks. Additional logging of analog and digital channels. Support of CCP/XCP on CAN and XCP on FlexRay. Diagnostics via UDS and KWP2000 on CAN.
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 D (ODX), ASAM AE MCD-2 NET (FIBEX)

Indigo

Type	Vehicle-oriented diagnostic test system
Functionalities	Easy-to-use diagnostic tester to apply diagnostics during system development and vehicle integration. No diagnostic expert knowledge required by users. Self-configuring, use-case driven and vehicle-oriented GUI. Parameterized via ODX and other relevant data formats. Simultaneous support of KWP, UDS and GMW3110. Also support of Diagnostics over CAN FD and DoIP, as well as OBD (OBD2 or WWH-OBD). Direct overview of vehicle status and vehicle identification data. Additionally Indigo Remote is the remote diagnostics solution that lets you access vehicles directly and interactively from anywhere in the world.
ASAM Standards	ASAM AE MCD-2 D (ODX)

MDF Validator

Type	Tool for viewing and validating the structure of MDF files
Functionalities	MDF Validator is a freeware tool to validate and analyze the block structure of MDF files (3.x/4.x). It will check the loaded MDF file and display format errors and

violations to the specification that disallow loading the file in Vector tools. Unusual or unsupported features are indicated as warnings. MDF Validator also shows the structure of the MDF blocks that contain the (meta) information about the measurement data, which helps exploring the file content and understanding the MDF format. Please note: MDF Validator is NOT able to display the measurement data itself, e.g. as a graphic curve representation. Use Vector vSignalyzer instead.

ASAM Standards: ASAM COMMON MDF

MDF4 Lib

Type: Function library for reading and writing MDF3 and MDF4 files

Functionalities: MDF4 Lib is a powerful function library you can use to validate and sort MDF files and read them in your own applications. Along with the widely used MDF3 format, the new ASAM-standardized MDF4 format is also supported. The library offers a convenient C++ and .NET interface for easy access to signal data and meta information in a MDF file, independent of the specific MDF version (3.x/4.x).

ASAM Standards: ASAM COMMON MDF

MICROSAR

Type: AUTOSAR basic software which includes an implementation of the XCP Slave

Functionalities: The package MICROSAR XCP supports XCP communication with an XCP master on various communication topologies such as CAN, CAN-FD, LIN, FlexRay or Ethernet. The runtime environment MICROSAR RTE supports software components with calibration ports allowing access to calibration data. MICROSAR RTE manages calibration data access during offline and online calibration; the latter supports different data access strategies like initialized RAM and Single- and Double Pointered. Configuration (e.g. transport layer parameters or XCP events) is done in the configuration and generation tool DaVinci Configurator Pro.

ASAM Standards: ASAM AE MCD-1 XCP

ODXStudio

Type: Authoring Tool for diagnostic data in ODX format

Functionalities: Easy-to-operate user-oriented authoring tool for diagnostic data in ODX format. Standard conformant - perfect round-trip functionality by use of ODX as internal data format. Quick loading, editing and saving of even very large sets of ODX data (>> 100MB). Optimal scalability: From individual ECU to entire vehicle or platform. Extensive features to support OEM-specific authoring guidelines. Full coverage of all ODX categories ODX-D, ODX-C, ODX-V, ODX-F, ODX-E, ODX-FD

ASAM Standards: ASAM AE MCD-2 D (ODX)

Training for ODX

Type: Training

Functionalities: Training for ODX, with exercises

ASAM Standards: ASAM AE MCD-2 D (ODX)

vCDM

Type: Collaboration platform for calibrators

Functionalities: vCDM is a collaboration platform to exchange data within and among globally distributed calibration teams. It provides sophisticated functions to support an iterative calibration approach. The database founded tool collects, merges, transforms and distributes calibration data. Many formats are supported (DCM, CDF 2.0, CSV, PaCo, CANape PAR, Intel-HEX and Motorola S-Record). The physical calibration data is tracked within a data warehouse. Reports to track calibration maturity are available. Analysis functions and APIs can be used to benefit from the collected intellectual property.

ASAM Standards: ASAM AE CDF, ASAM AE MCD-2 MC (ASAP2/A2L)

vFlash

Type: (Re-)Programming ECUs over CAN, CAN FD, FlexRay, LIN or Ethernet (DoIP)

Functionalities: vFlash is a very easy-to-use tool for programming one or more ECUs via CAN, CANFD, FlexRay, LIN or Ethernet (DoIP). It provides ECU programming based on direct “native” flashing in Intel hex, Motorola-S and binary format as well as flash programming based on ODX-F. Because of its flexible approach, vFlash can support different flash specifications of a wide variety of automotive OEMs without requiring modifications by the end user. The edition vFlash Station allows additionally the simultaneous flashing of up to 8 ECUs each on a separate communication channel.

ASAM Standards: ASAM AE MCD-2 D (ODX)

vSignalyzer

Type: Display, Evaluate and Document Measurement Data

Functionalities: vSignalyzer is a convenient tool for efficiently evaluating measurement data of all types. It gives you extensive options for visualizing the data as well as functions for manual and automated analysis and reporting. Measurement data acquired in network development, analysis and ECU calibration may be read-in from various file formats.

ASAM Standards: ASAM COMMON MDF

VX1000

Functionalities: The VX1000 System is a scalable solution with top performance for your measurement and calibration tasks. It can be used in the vehicle – both in the interior and in the engine compartment –, on test benches and in the laboratory. The VX1000 base module is connected to a PC over XCP on Ethernet. Overview of Advantages: very small adapter (POD) for the ECU interface, high measurement data throughput of up to 50 Mbyte/s, 80000 samples/s, function bypassing with very short latency times. VX1000 supports all features for Engine Management ECUs like coldstart, page switching …

ASAM Standards: ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L)

XCP Professional

Type: Implementation of the XCP Slave

Functionalities: Implementation of an XCP slave for non-AUTOSAR ECUs using the Vector CANbedded stack. Supporting CAN and LIN network topologies. Configuration (e.g. transport layer parameters or events) is done in the configuration and generation tool GENy.

ASAM Standards: ASAM AE MCD-1 XCP

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VIBES.technology is company enabling Experimental Dynamic Substructuring and modern TPA techniques for the engineering community. Our vision is that every engineer should be able to do these complex Substructuring analyses “first time right”. We develop intuitive and user-friendly applications that guide the engineer through all the steps from component measurement to simulation of sound & vibration levels.

Contact: Mr. Eric Pasma, Mail: epasma@vibestechnology.com

VIBES Toolbox for MATLAB

Type	MATLAB Add-on
Functionalities	Data management, design of experiment, dynamic substructuring and advanced transfer path analysis techniques
ASAM Standards	ASAM CAT ODS

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ViGEM develops and produces innovative test tools for the automotive industry with special focus to ADAS and AD validation/verification. ViGEM Car Communication Analizer (CCA) systems offer impressive levels of performance, comfort, and reliability. E.g. ViGEM CCA solutions enable to record automotive buses and Gigabit Ethernet at continuous data rates up to 4 Gbit/s and offer up to 8 TB removable data storage mmodules.

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CCA 9002

Type	Car Communication Analyser, high performance multi-bus data logger, test tool
Functionalities	The CCA 9002 is a high-performance, multi-bus data logger focussing ADAS, AD, e-mobility, infotainment, and eAVB validation and verification. It offers continuous and/or event-based recording at data rates up to 4 Gbit/s. The data is stored on removable data storage modules with 2 TB, 4 TB, or 8 TB capacity. The system configuration is modular, i.e. by adding plug-in capture units you can adapt type and number of interfaces to the specific application requirements.
ASAM Standards	ASAM AE MCD-1 XCP

CCA CS1-10G

Type	Copy Station. For improved data handling. Special focus on enhanced data availability while road/endurance tests.
Functionalities	Continuously increasing data rates require an innovative, easy-to-use data handling. The Copy Station CCA CS1-10G is the ideal complement for your ViGEM CCA 9002 Car Communication Analyzers. The CCA CS1-10G copies reliable and quick recorded data from a removable data storage module via 4x USB 3.0 to USB drives, or via 10 Gbit Ethernet to a server. Ease-of-use is of importance during road tests. No drivers, no software and no PC connection is required. Simply insert the CCA removable data storage module, connect USB Drives\\\’ via USB 3.0 to the CCA CS1-10G and start copying. All data will be copied automatically. The copy progress is displayed.
ASAM Standards	ASAM AE CC, ASAM AE CDF, ASAM AE ATX, ASAM AE COMMON Seed&Key and Checksum Calculation, ASAM AE Container Catalog, ASAM AE FSX, ASAM AE HIL, ASAM AE Issue, ASAM AE MBFS, ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE CPX, ASAM AE MCD-2 D (ODX), ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX), ASAM AE MCD-3, ASAM AE MCD-3 D, ASAM AE MCD-3 MC, ASAM AE MDX, ASAM AE XIL, ASAM AE XIL-MA, ASAM AIS MSRSW, ASAM ASAP3, ASAM CAT ACI, ASAM CAT CEA, ASAM CAT GDI, ASAM CAT ODS, ASAM COMMON LXF, ASAM COMMON MDF

Visu-IT! GmbH

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Visu-IT! supplies high quality tools for the ECU function and software development of electronic control units. Main objective is to ensure and maintain data consistency in the whole development process - that means both in the system-/ function-development and in the software-development. Visu-IT! also offers development and engineering services in the automotive area.

Contact: Mr. Franz Lohberger, Mail: Franz.Lohberger@visu-it.de

ASAM MCD-2MC File Parser

Type	ASAP2 Parser (Software Component)
Functionalities	High performance A2L File Parser. Highlights: generic parser, supports all ASAP2 keys, full support of AML, provides both a COM and a .NET interface.
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L)

ASAP2 Library (A2Lib)

Type	Software component (.NET and Java) to semantically access both A2L and Hex file
Functionalities	The Visu-IT! ASAP2 Library is a software component which allows to (a) Read/Write ASAP2 files. (b) Read/Write Hex files. The A2Lib combines the ASAP2 information with the Hex data in order to provide ‘semantic’ high level access to the Hex file.
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L)

ASAP2Toolkit

Type	ASAP2 Editor & Tools
Functionalities	The Visu-IT! ASAP2Toolkit is a standalone application to create, import, merge and update “ASAM MCD 2MC” description files (*.a2l). The ASAP2Toolkit contains an easy to use and intuitive ASAP2 editor, provides an automatic address update and enables the user to use standard development process files “*.i3e” (IEEE-695) and “*.elf” (ELF-DWARF) to generate an a2l description file automatically.
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L)

Automotive Data Dictionary (ADD)

Type	Global data dictionary for ECU variables
Functionalities	The Automotive Data Dictionary (ADD) represents a global data dictionary for all ECU labels/variables used in a company/organisation. The single source concept of ADD eases the handling and management of data declarations over all projects. Due to the (company-wide) availability and uniqueness of these labels, ADD allows a continuous and consistent data declaration during the whole development process.
ASAM Standards	ASAM AE MDX

Data Declaration System (DDS)

Type	ECU SW Development Environment
Functionalities	DDS represents a central repository for all ECU variable declarations and thereby ensures consistency between your ECU source code and your ASAP2 description file. Interfaces: ANSI-C Export: Address Import (IEEE 695, ELF/DWARF), ASAP2 Import & Export, XML Export & Import, Interface to autocoding tools
ASAM Standards	ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 D (ODX), ASAM AE MDX

FunDoc

Type	Automated function documentation of simulation models
Functionalities	The objective of the Visu-IT! FunDoc tool is to ease the documentation process of simulation models. At this junction it is designed as a first-step tool in your documentation process chain. FunDoc is able to connect to several development tools and place the gathered information at users disposal for edit or print.
ASAM Standards	ASAM AE CC, ASAM AE CDF, ASAM AE FSX, ASAM AE MDX

PACES

Type	High performance access to a global data dictionary for ECU variables
Functionalities	The tool PACES (Parametrisation and Configuration of Embedded Software) provides a high performance access (Java) to a global data dictionary. It eases the handling and management of data declarations as well as the configuration of projects. PACES can be integrated into different tool chains and environments, e.g. Eclipse.
ASAM Standards	ASAM AE MDX

VisualThreat Inc.

VisualThreat is a leading connected-car security vendor based in California. The company offers the end-to-end connected-car security solutions to minimize penetration from cyber attacks. VisualThreat's Vehicle Cyber Security Protection Framework (FUSE) includes: F-Firewall U-Umbrella Policy S-Security-Over-The-Air (SOTA) E-Event Intelligence

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Phone + 1 408 802 2383

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Offices
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VisualThreat Auto-X

Type	testing tool
Functionalities	CAN BUS testing
ASAM Standards	ASAM AE ATX, ASAM AE COMMON Seed&Key and Checksum Calculation, ASAM CAT ACI

We4Data GmbH

We4Data GmbH develops testautomation software for HIL and SIL environment from the Hardware-Software-Interface- to any functional application tests. We support our customer in the measurement system integration and design and deliver testbeds for ECUs.

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Weber Electronic & Race Engineering GmbH & Co KG

Development and integration of measurement systems. Automotive chassis analysis. Automation systems in combination with PLC's

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PECM

Type	Dewatering Pump Controller
Functionalities	Engine Controller, Pump Condition Monitoring & Reporting System
ASAM Standards	ASAM COMMON MDF

WLS12

Type	Data Logger
Functionalities	12 CAN/FD, WIFI, Bluetooth, GPS (10Hz), LTE, BroadR Reach, Ethernet, 3x Gyro, 3x ACC, 4xDig IN/OUT, Dual Core, Linux, Online Calculations
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-3 MC, ASAM CAT ODS, ASAM COMMON MDF

Weisang GmbH

Weisang GmbH is developing software and providing services for technical applications. Weisang's core product FlexPro is a standard software package for analysis and presentation of measurement data and is used worldwide by thousands of engineers, scientists and measurement technology experts in automotive and other industries. FlexPro is the client tool of choice to access data stored on ASAM ODS servers and in ATX files as well as data from various data acquisition systems.

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FlexPro

Type	Software
Functionalities	Archiving, analysis and presentation of measurement data.
ASAM Standards	ASAM CAT ODS

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White Pine Software Technologies, LLC

White Pine is a new company that specializes in engineering data management and analysis solutions and software development services. Our company is developing a variety of useful software tools and products primarily aimed at very large scale, high speed data acquisition, processing and analysis using both ASAM ODS and Big Data technologies.

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Wind Hill Technologies Co., Ltd.

Wind Hill Technologies was founded in 2003, the headquarters is located in Beijing where set up its R&D center and factory, and we have branches in Shanghai and in Hong Kong. Our product series include ECU tools, test and measurement, industrial automation, testing equipment and engineering services. At present, our products have been widely used in automobiles, engineering machinery, railway, military, etc.

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Visual Analyzer

Type	Network Analysis, Measurement and Calibration Tool
Functionalities	Complete solution for bus communication, data logging, measurement, and calibration via CAN, LIN including J1939, CANopen, CCP and XCP protocol support.
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP

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X2E GmbH

X2E is a highly innovative and flexible partner in the development of advanced electronic solutions for automotive and aerospace applications. The main products are high performance automotive data loggers for the automotive industry. Additionally X2E provides complex solutions, from development of ECUs to automotive bus analyzing tools. Our high performance multibus data loggers are capable of recording data from several automotive bus systems simultaneously (CAN, LIN, FlexRay, RS232, Analog, MOST, Ethernet, BroadR-Reach) with a 100ns precision timestamp. Furthermore, our product range provides a platform which not only collects data, it is also capable of sending data at any time. The data loggers can be tailored to your requirements because of our flexible slot-concept. X2E supports its customers by equipping them with the products which are tailored to their exact needs and more importantly by developing new innovative solutions for them. With an in-house production facility, X2E can provide the full service range from development to production. Innovation, Quality and Customer Satisfaction is what X2E offers to its customers.

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Xoraya 6810 Quad V5

Type	Automotive Bus Data Logger
Functionalities	100ns precise timestamp CAN, LIN, FlexRay, MOST, Ethernet, BroadR-Reach, RS-232, GNlog, DLT, Analog, XCP, CCP, PSI5, Video-Interface
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX), ASAM COMMON MDF

Xoraya Car PC

Type	Automotive PC Platform
Functionalities	BroadR-Reach; CAN; RS232; GBit-Ethernet; WLAN; GPS; GSM; HDMI

Xoraya Connect

Type	Remaining Bus Simulation Platform
Functionalities	CAN, LIN, FlexRay, MOST, Ethernet, RS-232
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP

Xoraya Minilogger

Type	automotive data logger
Functionalities	100ns precise timestamp CAN, LIN, FlexRay, MOST, Ethernet, BroadR-Reach, RS-232, GNlog, DLT, Analog, XCP, CCP, PSI5, Video-Interface
ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L), ASAM AE MCD-2 NET (FIBEX), ASAM COMMON MDF

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XI-Works

XI-Works provides professional services in the fields of engineering processes, documentation, data management and diagnosis. The firm develops engineering documentation and data management solutions and integrates them into customers' system landscapes. XI-Works offers a range of products and framework solutions that can be used to create such systems.

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Advanced XML Editor (Axe) for Eclipse Generic XML Editor

Type	Generic XML Tool
Functionalities	XML-Editing in different views (Plain Text, Tree, CSS, Forms), XML-Checking, Spell Checking, Table Editing, Formula Editing, Image Display, Diffing highly customizable by rich API and Extension Points.
ASAM Standards	ASAM AE CC, ASAM AE CDF, ASAM AE Container Catalog, ASAM AE FSX, ASAM AE Issue, ASAM AE MDX, ASAM AIS MSRSW

ATX Consulting Services

Type	Consulting Service
Functionalities	The ATX consulting services deliver concepts and specifications for your specific test environment about question like: - How to use ATX? - How to map your existing test descriptions? - Which tools are needed to work with ATX? - How to generate implemation code out of ATX? - How to structure ATX projects? - How to specify specific profiles for my test usecases? - How to define ATX libraries? - How to create test reports? - How to manage test results? Learn from the ATX specification editor.

AXE ATX Workbench

Type	Test Specification Editor
Functionalities	Define and Organize ATX Projects Editing, Checking ATX Files
ASAM Standards	ASAM AE CC

xioworks exploring information

AxeEcuDoc Ecu Documentation Suite Editing solution for functional specification based on MSRSW, AE-FSX, AE-MDX, MSRREP, AE-CC and AE-ATX

Type	Documentation System
Functionalities	Editing, Checking, PDF-Publishing for Functional Specification and Test Specification
ASAM Standards	ASAM AE CC, ASAM AE CDF, ASAM AE Container Catalog, ASAM AE FSX, ASAM AE MDX, ASAM AIS MSRSW

EcuDoc-Publisher PDF publishing for functional specification.

Type	Documentation System
Functionalities	Checking, PDF-Publishing for Functional Specification
ASAM Standards	ASAM AE CC, ASAM AE CDF, ASAM AE FSX, ASAM AE MDX

EcuDoc-Publisher Server Web application server for server based PDF publishing and continuous integration of functional specification

Type	Documentation System
Functionalities	Checking, PDF-Publishing for Functional Specification
ASAM Standards	ASAM AE CDF, ASAM AE MDX, ASAM AE FSX, ASAM AE CC

XIDiff Generic XML differ

Type	Generic XML Tool
Functionalities	Show the differences between XML documents, merge of XML documents.
ASAM Standards	ASAM AE CC, ASAM AE CDF, ASAM AE Container Catalog, ASAM AE FSX, ASAM AE Issue, ASAM AE MCD-2 D (ODX), ASAM AE MCD-2 NET (FIBEX), ASAM AE MDX, ASAM AIS MSRSW

XMetal-Kit for MSRSW, MDX, Container Catalog, MSRREP and MSRSYS

Type	Documentation System
Functionalities	Editing, Checking, PDF-Publishing
ASAM Standards	ASAM AE CC, ASAM AE CDF, ASAM AE FSX, ASAM AE MDX, ASAM AIS MSRSW

ACADEMICS

Aristotle University

Aristotle University of Thessaloniki is the largest university in Greece with more than 90,000 undergraduate and postgraduate students. The Laboratory of Applied Thermodynamics (LAT) belongs to the Energy Division of the Mechanical Engineering Department of Aristotle University. Its educational and research activities cover • Applied Thermodynamics and Combustion • Internal Combustion Engines and Emissions Control • Emissions Inventories and Forecasts • Energy Policy and Renewable Energy Sources

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Brandenburgische Technische Universität Cottbus

The Chair of Automotive Technologies and Propulsion Systems teaches and performs research on conventional and alternative powertrains for vehicles and motorcycles. The research focuses particularly on thermal and energy management of vehicles, waste heat re-utilization concepts, and cooling systems for the evaluation of fuel consumption and emission in legal reporting as well as in real driving situations.

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Budapest Univ. of Technology and Econ, Dep. of Control and Transport Automation

The Budapest University of Technology and Economics can trace its evolution through several academic institutions, dating back to 1782. With 24 000 students and many researchers it is one of the most important research centres in Central Europe. The main research area of the Department of Control and Transport Automation are the control theory and automotive engineering.

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Das virtuelle Fahrzeug Forschungsgesellschaft mbH

VIRTUAL VEHICLE is an independent, international platform for research and development of new simulation methods/tools in the automotive and rail industry, enabling faster and more efficient development, early validation of concepts and a multidisciplinary development approach. Fields of research include Vehicle Safety, Thermodynamics, NVH, E/E, Software, System Design and Optimization.

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virtual vehicle

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FH Aachen

The FH Aachen is a major research center in Germany. The competencies of the scientists in our 10 faculties and 7 institutes lie in the future fields of energy, mobility, and life sciences. In addition, outstanding experts in the areas of design, architecture, and civil and mechanical engineering, as well as in economics and logistics, and also in the fields of electrical, information and production technology work at the FH.

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XIL - Co-Simulationsbackplane

ASAM Standards ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 MC (ASAP2/A2L)

FZI Forschungszentrum Informatik

Forschungszentrum Informatik (FZI) is a non-profit contract research organisation that concentrates its efforts on innovative information technologies for providers of investment and consumer products, production processes and information services. FZI supports the development of innovative applications based on recent but already proven techniques, offering its partners a unique interdisciplinary environment that fosters joint research amongst diverse fields of Informatics, Mechanical and Electrical Engineering.

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Hochschule für Angewandte Wissenschaften Hamburg

With 14,000 students Hamburg University of Applied Sciences is one of the largest of its kind in Germany. Founded in 1970, our roots go back to the 18th century. The CoRE (Communication over Real-time Ethernet) group of the department of computer science researches in the area of future automotive communication infrastructures.

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Hochschule Heilbronn

Heilbronn University ranks amongst the major institutions of Higher Education in the state of Baden-Württemberg with over 8,000 students. It works closely with its partners in business and industry in education and research, e.g. the study programme Automotive-Systems-Engineering is sponsored by major companies and offers support and consulting to every interested organisation.

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Consulting

ASAM Standards ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 NET (FIBEX)

Research and Development Projects

ASAM Standards ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 NET (FIBEX)

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Hochschule Trier

Hochschule Trier is a University of Applied Sciences with 6000 students. We perform research in Vehicular Systems and Electronics as well as in Energy Efficient e-mobility.

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HTW Dresden

Dresden University of Applied Sciences provides programmes like vehicle engineering, mechatronic systems / automotive mechatronics and informatics, with a close connection to automation, measuring, and automotive electronic systems. The university is a centre for teaching and applied research: a Research Institute for Vehicle Engineering, numerous state-of-the-art laboratories and a wide range of third-party funded projects guarantee a high standard in innovation and development. For our partners we offer industrial contract research, studies to elaborate on detailed questions, technical expert opinion on failure analysis at existing facilities, joint research projects, technology transfer, consulting, and academic training.

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Japan Automobile Research Institute

Our Institute is a non-profit organization and work for environmental issues and safety issues of Automotive society in the world. The number of the employees are about 360, 300 researchers, engineers and 60 employees in administrative section.

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Jiangnan University

Jiangnan University, situated in the beautiful city of Wuxi, Jiangsu Province, is one of China's national key "211 Project" universities and functions directly under the supervision of China's Ministry of Education.

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Nagoya University

Due to the growing complexity of recent embedded systems, the industry faces difficulties in designing and implementing high-quality systems according to demand. To address these industrial needs, we established the Center for Embedded Computing systems in April 2006 for promotion of collaboration among industry, academia, and government.

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RWTH Aachen

The Institute for Automotive Engineering (ika) of RWTH Aachen University is Europe's leading institute in automotive engineering. Starting from the idea to innovative concepts for components and systems up to vehicle prototypes the staff of the institute creates and design the future vehicle. In cooperation with car manufacturers and suppliers the ika is making an acknowledged contribution to help solve current and future global challenges.

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Technische Hochschule Köln

TH Köln represents a broad range of educational and research activities. With more than 20,000 students, half of them in engineering programs, there are many opportunities for automotive and ASAM-related projects, student thesis, and other kinds of cooperation. Faculty members are actively involved in ASAM Project groups and familiar with ASAM standards.

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Consulting

ASAM Standards	ASAM CAT ACI, ASAM CAT GDI, ASAM AE MCD-2 NET (FIBEX), ASAM CAT ODS)

Contract Research/Development

ASAM Standards	ASAM CAT ACI, ASAM CAT GDI, ASAM AE MCD-2 NET (FIBEX), ASAM CAT ODS)

Student Internship

ASAM Standards	ASAM CAT ACI, ASAM CAT GDI, ASAM AE MCD-2 NET (FIBEX), ASAM CAT ODS)

Student Projects

ASAM Standards	ASAM CAT ACI, ASAM CAT GDI, ASAM AE MCD-2 NET (FIBEX), ASAM CAT ODS)

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TU Darmstadt, Institut für Verbrennungskraftmaschinen und Fahrzeugantriebe

The Institute for Internal Combustion Engines and Powertrain Systems is a subdivision of the Technical University of Darmstadt. The institute has about 70 employees, 14 of them scientific assistants. There are 12 dynamic engine test beds, 3 of them with hybrid simulation systems. Main topics are: Electrification, Methology and Simulation, Exhaust aftertreatment, ICE Optimization, alternative fuels

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TU Dresden, IAD – Institut für Automobiltechnik

The Institute of Automotive Technology (IAD) at the Dresden University of Technology covers all automotive related topics in research and teaching. The IAD consists of the three chairs in Automotive Engineering, Vehicle Mechatronics and Internal Combustion Engines. The IAD as a main collaborative research partner of the automotive industry provides competence in modeling and simulation of various automotive domains and operates several test benches, e.g. for engines, generators, batteries and many more.

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Universität Kassel

Perform Research and Development Work in the fields of: Hardware-in-the-Loop Simulation and Modeling, Design of Experience supported Testing on Test beds for Engines and Gear Boxes, Functions development for engine ECUs.

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Universität Stuttgart, Institut für Verbrennungsmotoren (IVK)

IVK/FKFS (Research Institute of Automotive Engineering and Vehicle Engines Stuttgart) operate various test facilities, e.g. a full-scale and a model-scale wind tunnel, a driving simulator and several engine test stands. Additionally, the institute offers support in simulation, NVH, thermodynamics, vehicle dynamics, road load studies, automotive electronic systems, communication and power networks, alternative vehicle and powertrain concepts.

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University of Bath, Powertrain and Vehicle Research Centre

The Powertrain and Vehicle Research Centre (PVRC) conducts internationally prize-winning research, focusing on improving the efficiency and emissions of both diesel and petrol engines. We conduct research that is systems-based on all aspects of automotive powertrain engineering. Our research represents four decades of achievement and extensive engagement with the automotive industry.

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University of Bologna

The University of Bologna is considered to be the oldest University in the Western World (founded 1088). Today it hosts about 90.000 students in 11 Schools, 33 Departments on 5 Campuses.

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Virginia Tech Transportation Institute

The Virginia Tech Transportation Institute (VTTI) conducts research to save lives, time, and money and protect the environment. As one of seven premier research institutes created by Virginia Tech to answer national challenges, VTTI is continually advancing transportation through innovation and has impacted public policy on national and international levels.

VirginiaTech

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http://www.vtti.vt.edu

Zhejiang University

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SMR Automation

ASAM Standards	ASAM AE MCD-1 CCP, ASAM AE MCD-1 XCP, ASAM AE MCD-2 D (ODX)

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MEASUREMENT & CALIBRATION

ASAM CDF	Accurate Technologies Inc.	38	ViGEM GmbH	130	
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	Accurate Technologies Inc.	38	iSyst Intelligente Systeme GmbH	80	
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	CANSystem	48	National Instruments Corporation	94	
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	FH Braunschweig / Wolfenbüttel	140	TTTech Automotive GmbH	123	
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ASAM MCD-1 XCP	A&D Company, Ltd.	38	IPETRONIK GmbH & Co. KG	79	
	Accurate Technologies Inc.	38	IPG Automotive GmbH	79	
	APTJ Co., Ltd.	41	iSyst Intelligente Systeme GmbH	80	
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	CAETEC GmbH	47	National Instruments Corporation	94	
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	Control-Tec LLC	50	Gailogic Corp.	66	
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ASAM OTX	KPIT Technologies GmbH	84	Softing Automotive Electronics GmbH	112	
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	IXXAT Automation GmbH	81	Vector Informatik GmbH	124
	National Instruments Corporation	94	ViGEM GmbH	130
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	Intrepid Control Systems, Inc.	78	XI-Works	135

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	iASYS Technology Solutions Pvt. Ltd.	75	ViGEM GmbH	130
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ASAM ASAP3	Cybermetrix Inc.	51	M&K Mess- und Kommunikationstechnik GmbH	87
	Dynamometer Services Group Ltd.	58	National Instruments Corporation	94
	FuelCon AG	66	RA Consulting GmbH	104
	HORIBA	74	ViGEM GmbH	130
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TEST AUTOMATION

ASAM MCD-3	A&D Company, Ltd.	38	Kratzer Automation AG	85
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	DSA Daten- und Systemtechnik GmbH	52	ViGEM GmbH	130
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	DTS INSIGHT CORPORATION	58	OnoSokki Co., Ltd.	96
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	FEV France	65	RA Consulting GmbH	104
	HORIBA	74	ViGEM GmbH	130
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ASAM MCD-3 D	CANSystem	48	M&K Mess- und Kommunikationstechnik GmbH	87
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	Gailogic Corp.	66	ViGEM GmbH	130
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	imc Meßsysteme GmbH	76	Weber Electronic & Race Engineering GmbH & Co KG	133
	IPETRONIK GmbH & Co. KG	79		

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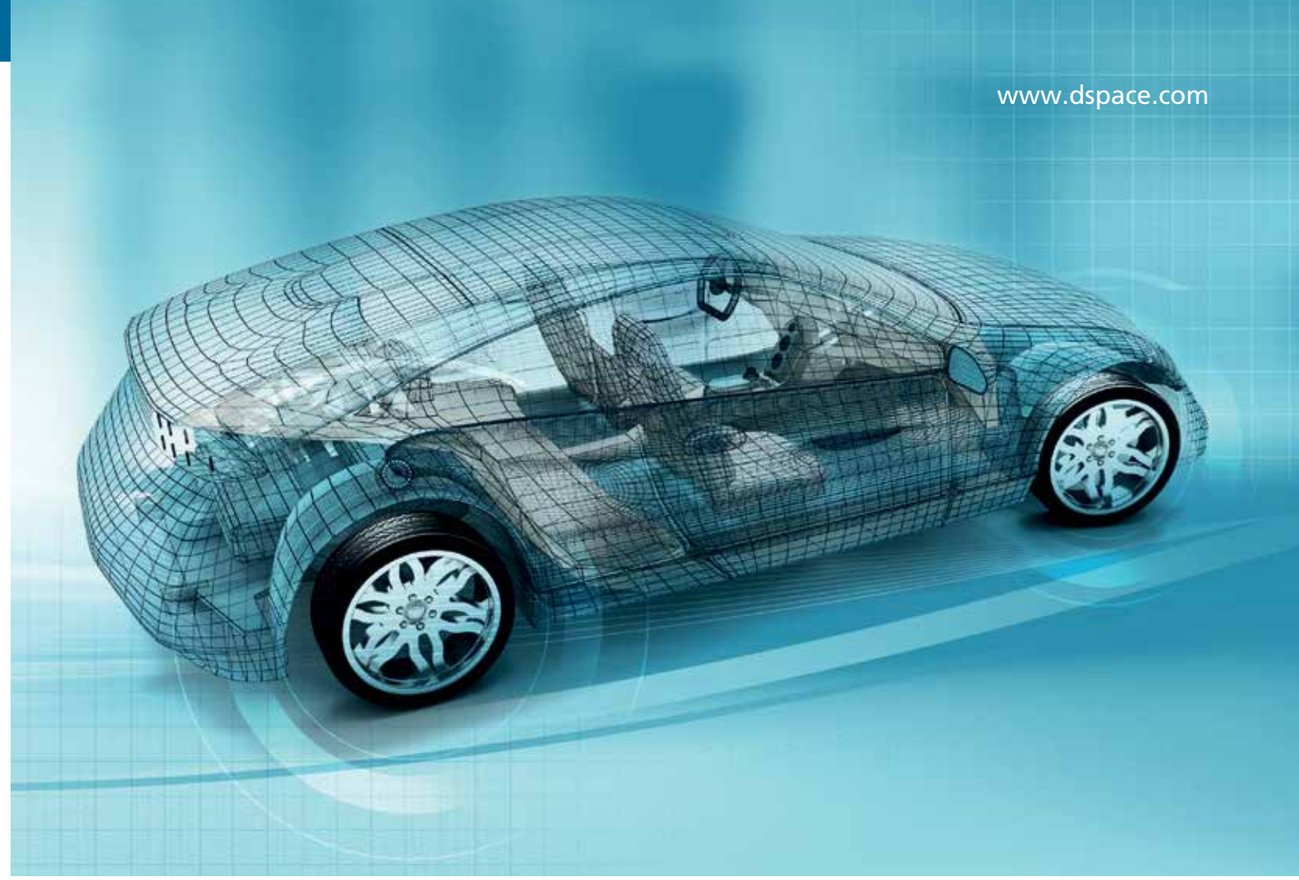

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