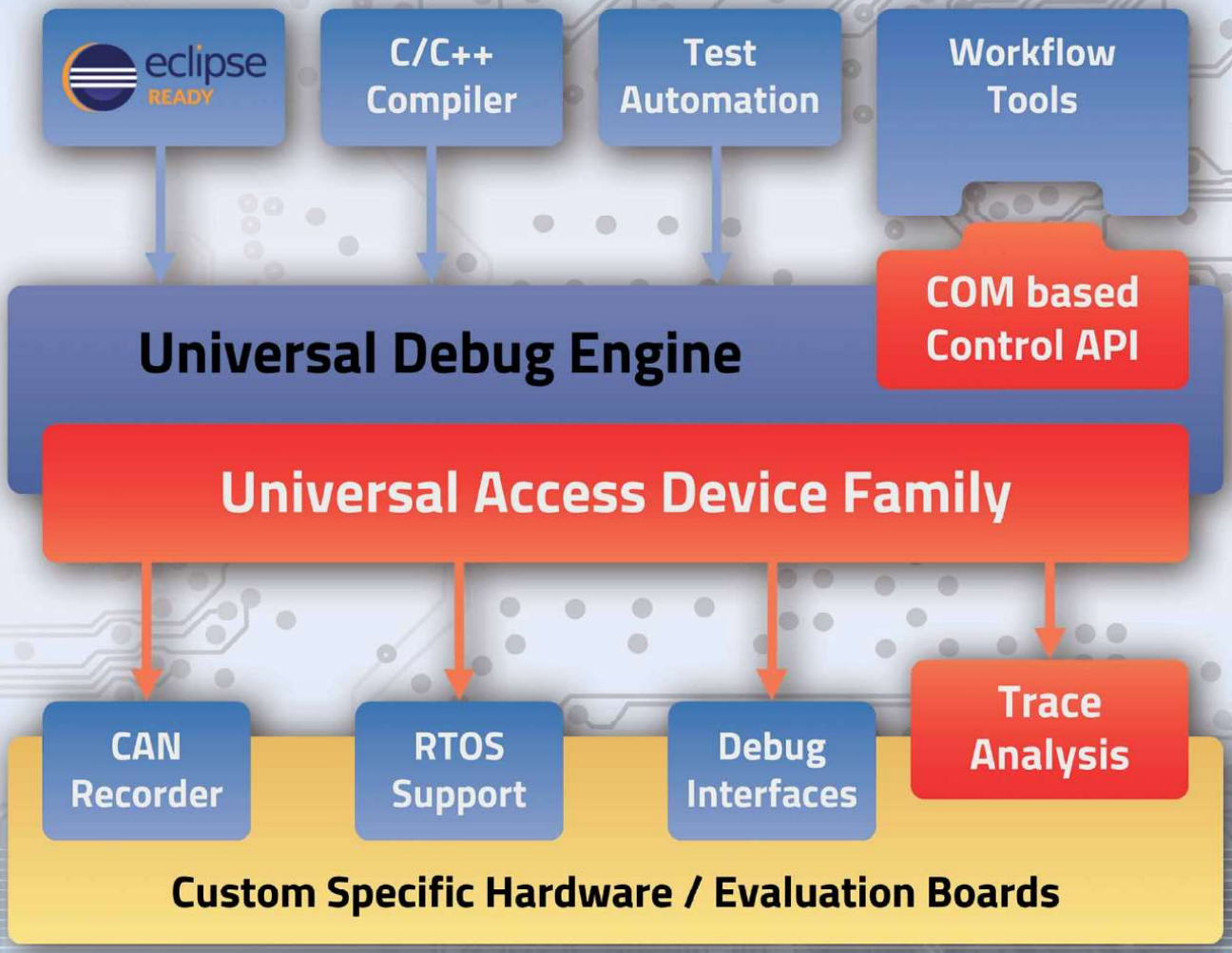
Product Information

universal debug engine®

Leading Edge in Debugging, Trace and Test



Powerful + Intuitive + Comprehensive

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Product Information

2025

Leading Edge in
Debugging, Trace and Test

Support for Microcontroller Families
Infineon AURIX™, TriCore™, TRAVEO™, XMC™
NXP S32N, S32G, S32K, S32S, S32V Automotive Platform
STMicroelectronics Stellar SR6P/SR6G/SR5E, STM32
Arm® Cortex®-M/R/A, Arm7™, Arm9™, Arm11™
Renesas RH850, RA, RZ/T2M, R-Car
Synopsys ARC®, RISC-V, Power Architecture®, etc.

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Release 9.35.03 UDE®

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What You Can Expect:

A Complete Development Environment for AURIX, TriCore, S32V, Stellar, Power Architecture, Arm Cortex-M/R/A, RH850, SH-2A, RISC-V, ARC, Arm7/9/11, XE166, XC2000

UDE® Universal Debug Engine – Workbench for efficient AURIX, TriCore, S32 Automotive Platform, Stellar, Power Architecture, Arm Cortex-M/R/A, RH850, SH-2A, RISC-V, ARC, Arm7/9/11, XE166, XC2000 Development

The UDE® Universal Debug Engine is a state-of-the-art Development Environment for application development with the supported microcontroller families. It offers a collection of tools including source file management, project building and a powerful HLL debugger. These tools include various high-speed communication paths to the customer's hardware target system with target monitoring. All components work together in an optimized manner.

The goal: Minimized turn-around time for efficient application engineering

The UDE® and its accompanying package, is a powerful HLL debugger to test microcontroller applications created in C/C++ language and/or Assembly. The UAD, the communication add-on of the UDE®, and the optional target monitor offer real-time execution between breakpoints on the customer's target system.

The user benefits from the Integrated Development Environment, with integrated tools. A single Graphical User Interface is used for Development, Debugging and Emulation. Multiple high-speed interfaces allow the user flexible access to the target system.

Further benefits

- **Save development time** – start with just one tool.
- **Cost efficient for workgroups** – save by choosing the right mixture of UDE® ROM monitor or emulator solutions.
- **One-stop support** for all components of the Integrated Development Environment (debugger, editor, compiler, RTOS ...).

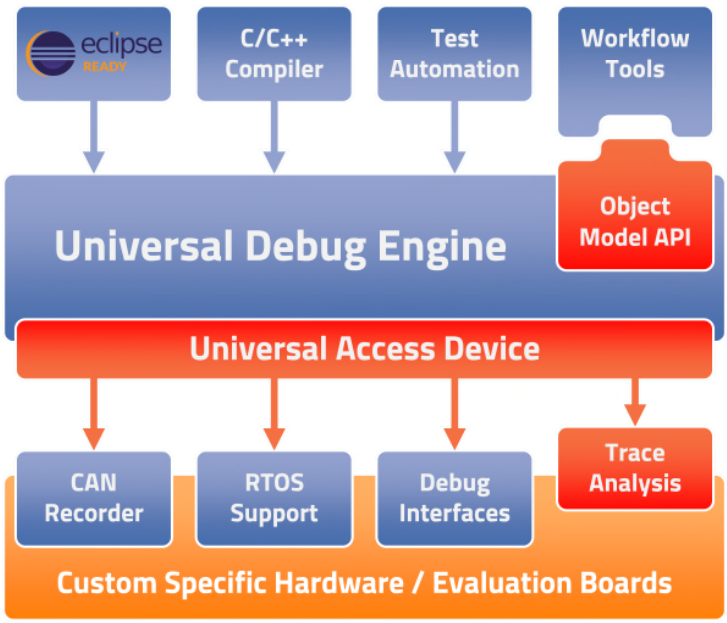
The UDE® and a AURIX, TriCore, Power Architecture, Cortex, Arm, RH850, SH-2A, RISC-V, ARC, XE166, XC2000, XScale cross compiler (Tasking, Keil, HighTec (GNU), Byte Craft, NXP's CodeWarrior, TI's CodeComposer, Green Hills and Wind River) create a complete and powerful package for starting a professional development project.

The UDE® is an open platform, which offers different interfaces to other tools.
Optionally, it can be feature-enhanced by the following components, which can be included into the workbench:

User Definable Enhancements

The open interface of the User Definable Enhancements enables the users to easily create completely new types of applications:

- The **Automation and Scripting Interface** of the UDE® components based on Microsoft COM allow using basic UDE® services for controlling the debugger, processing target communication, program flow control, symbol processing by external C/C++, Python, Perl, Java, VB Script, Power Shell and VBA applications.
- The COM interface allows the standard UDE® Platform to be replaced with custom desktops specifically tailored to fit the requirements of service tools, like Matlab™, Lab VIEW™, or another third-party software.



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UDE® Universal Debug Engine – High Level Language Debugger

UDE® - The Flexible Debug Platform with multi-core debugging features is one of the most powerful development workbenches for **32** and **64** bit MCUs available. The UDE® allows users to keep projects organized, supports building applications, and allows software to be run and tested in a convenient and cost-efficient way.

Highlights of UDE®

Complete **AURIX / TriCore** Development Platform

- Complete **TriCore / TriCore AURIX TC39x, TC4x MCA** (Multi-core Architecture) Development Platform and emulation kits with **DAP/DAP2** support.
- **Hardware Security Module (HSM)** debug / trace, **Generic Timer Module (GTM)**, **CIF** video stream trace support, **DF1** FLASH programming support.

Complete **Power Architecture** Development Platform

- **Power Architecture®** based Automotive SOCs
  - **NXP** MPC56x, MPC57x, MPC58x, S32Rx.
  - **STMicroelectronics** SPC56x, SPC57x, SPC58x, SPC58NH Cut2.
- **Hardware Security Module (HSM)** debug support.
- **Generic Timer Module (GTM)** support.
- **Universal Emulation Configurator (UEC)** with **Nexus Trace** and **Sequence Processing Unit (SPU)** support.
- **Nexus** code, data, watchpoint and ownership trace via **Aurora** or parallel interface with UAD3+ for Code Coverage.
- Time Processor Unit **Multi-eTPU**, Dualcore and LockStep support.
- Support **JTAG over MCAN** debugging support.

Supported MCU architectures from various vendors

- Renesas' **RH850**, **SH-2A**.
- **RISC-V E20**, **E31**, **E76**, **FE310**.
- Synopsys **ARC EM4**, **EM22**, **EV7**, **HS3**, **HS5**.

Enhanced Cortex-M0/M0+/M3/M4/M7/R4/R52, Cortex-A8/A9/A53/A72, Arm7/9/11 support

- ST's **Stellar**, TI's **Jacinto**, NXP's **S32 Automotive Platform**, Xilinx's **Zynq-7000** programmable SoC**, ERTEC200p,** ST's **STM32F3/4, STM32H7,** Infineon's **XMC4800** and **TLE 987x / TLE 986x,** Spansion's **M4**, Cypress **PSoC4,** intel's **Cyclone V**.
- Renesas' **R-CAR H3, RA, RZ/T2M**.
- Hilscher's **NetX90**, NetX51, NetX52 and **rcX/netX RTOS** support.
- Multi-core Debug via one JTAG chain support, and CoreSight **Gigabyte Trace**.

- **Software Test and Test Automation.**
- **PikeTec's Time Partition Testing (TPT)** systematic test case design supported.
- **Tool Qualification Packages (TQPs)** for the **TESSY** test platform for various architectures and cross compilers coupled with the full range of UDE® features.
- **LieberLieber UML debugger** allows together with UDE® graphical debugging at UML model level.

New features and further enhancements

- New intuitive user interface with improved support for multi-screen operation with "**Perspectives**" feature.
- **Python script console** introduced.
- **Call Graph** analysis for efficient investigation of runtime behavior.
- Displaying of ECU variables for measurement and calibration purposes based on **A2L files** according to **ASAM MCD-2 MC** description standard.
- **Execution Sequence Chart** for visualization the program flow and its sequence in time.
- TC3xx FLASH Programming: Support for 'Software Over The Air' (**SOTA**) mode.
- **Universal Trace Framework (UTF)** with persistent trace streams for offline analysis of captured trace data.
- **Unique search function** supports the rapid analysis of very large amounts of trace data, bookmarks of trace points introduced.
- **Graphical code coverage** analysis improved with more performance. It allows branch coverage to fulfil **ISO26262** requirements. The analysis is based only on code trace and works for highly optimized code.
- **Code Coverage** storages / reports for further analysis.
- **Profiling** functions based on code trace provided by hardware trace systems (e.g. MCDS, miniMCDS, SPU, Nexus Class 3, ETM, ETB, TMC, ITM, PTM, FTM) and also IP snooping or simulator output.
- Accumulation of **Profiling** and **Coverage data** over multiple trace measurement tasks.
- **AURIX TC4x PPU (Parallel Processing Unit)** based on ARC processor architecture supported. New
- Data trace for **GTM** Multi-channel sequencers.
- **GTM** trace support for **miniMCDS**.
- Support for **GTM** code and data symbol display for Tasking MCS Compiler/Assembler
- Extended multi-core-**run control manager**, extended **multi-core / multi-program loader**.
- **RTOS-Awareness** for RTX (CMSIS), PXROS-HR, CMX, µC/OSII, rcX, AUTOSAR/OSEK, **ARTI**, **FreeRTOS** / SAFE**RTOS**.
- Improved **Graphical** window with Hardware Trace (MCDS, Nexus, **TMC**, and ETM) Signal Chart, Graphical display of IP and function traces.
- Graphical Chart of **Variables Trace Data**.

Debug Solutions

Want to access the target system the way you like?
UDE® Universal Debug Engine escorts you either way.

Our debugging software escorts you either way. Please look at the following overview about the different debug solutions, and their accompanying support. You will see typical variants for remote debug connection, using the UDE®, and regarding the available communication interfaces on the AURIX, TriCore, Power Architecture, Cortex, S32, RH850, SH-2A, RISC-V, ARC, Arm7/9/11, XE166, XC2000, XScale MCU hardware:

Controller Peripheral	Interface	Baud Rate[1]	Supported Derivative	Monitor
DAP/DAP2, Single Pin DAP, DAP over CAN	LVTTL	up to 160 MHz	TriCore AUDO Future, AURIX, XE166, XC2000	no
SWD, ITM	LVTTL	up to 80 MHz	Cortex-M0/M0+M3/M4/M7, Cortex-A8/A9/R4/R52/A72	no
JTAG, cJTAG	LVTTL	up to 50 MHz	TriCore, Power Architecture, Cortex, RH850, SH-2A, RISC-V, ARC, Arm7/9/11, XE166, XC2000, C166S V2, XScale	no
ETM, TMC, CoreSight, Nexus Trace	LVTTL	up to 500 MHz	Power Architecture, Stellar, Cortex, Arm7/9/11	no
Aurora Trace	LVTTL	up to 3.1 Gbit/s	AURIX, Power Architecture, Arm	no
CAN (On-Chip CAN)	CAN	up to 1 Mbps	XC166, TriCore	required
ASC0 / ASC1 asynchronous	RS232	up to 625 kbps	XE166, XC2000, TriCore	required
ASC0 / ASC1 asynchronous/ synchronous	RS485/TTL	up to 625 kbps	XC166, TriCore	required
SSC synchronous	RS485/TTL	up to 5 Mbps	XC166	required
3-Pin-Hardware Interface	TTL	up to 400 kHz	XC166	required
Emulation Device	Master Interface	-	TriCore ED, XC2000 ED, Power Architecture ED	no

[1] The Baud Rate is defined by the physical transfer frequency of the transmission medium.

Debugging via DAP - Support

This new debug interface was established by Infineon, for the TriCore AUDO Future, AUDO MAX, and AURIX devices, as well as for other upcoming 16-bit and 32-bit microcontrollers. The Device Access Port **DAP/DAP2** allows debug communication with higher transmission rates than existing JTAG based communication channels (up to 160 MHz).

Single Pin DAP, and **DAP over CAN** are supported. All features of the DAP are supported by the UAD2^{pro}, UAD2^{next}, UAD3^{+}.

Debugging via SWD - Support

The Serial Wire Debug (**SWD**) interface, or Serial Wire Debug Port (**SW-DP**) is one of the features of the debug and trace technology Arm **CoreSight™**.

Both the SWD debug port and the alternative JTAG debug port can be combined to the Serial Wire JTAG Debug Port (**SWJ-DP**), or the CoreSight standard port. When using SWD, the TDO signal can provide trace event messages, via the Serial Wire Output (**SWO**).

The **SWD** and **ITM** target connections are supported by the communication devices UAD2^{pro}, UAD2^{next} and UAD3^{+}.

Debugging via JTAG - Support of OCDS L1, EmbeddedICE, ETM, ETB, TMC, CoreSight, Nexus, and H-UDI

JTAG (IEEE 1149.1, IEEE1149.7) offers direct access to microcontrollers with an On-Chip Debug Support module (e.g. AURIX, TriCore, Power Architecture, Cortex-M0, Cortex-M0+, Cortex-M3, Cortex-M33, Cortex-M4, Cortex-M7, Cortex-R4, Cortex-A8, Cortex-A9, Cortex-A53, Cortex-A72, RH850, SH-2A, RISC-V, ARC, Arm7/9/11, C166S V2, XScale.

OCDS L1, Nexus and EmbeddedICE are the base of the latest generation of development environments with new features:

- Event Triggering by the on-chip trigger unit, by software breakpoints or by the Break Input pin.
- Hardware breakpoints for debugging in ROM.
- Additional execution of data transfers.
- Complex trigger conditions.
- Symbolic conditions for enhanced definitions.
- Task-specific breakpoints automatic selection and optimized usage of the on-chip resources.
- Access to the entire address space of the controller without any external hard- or software resources.
- Optimized support for single-chip applications.

ETM, ETB, TMC, ITM, PTM, FTM, CoreSight, Nexus, Aurora, trace support the recording of the running program's trace of the core, SPU, PCP, PCP2, PPU, ICU, and DMA activity, if available. This feature allows the user to watch the running program's flow, within the process environment, in real time. Timing measurements of critical sections are also possible.

ETM, Nexus, and Aurora trace are supported by the Universal Access Device - Trace Board option (UAD2^{next}, UAD3^{+}).

Debugging via the Monitor

- Available for **XE166, XC2000, Arm*, and TriCore*** derivatives.
- **CAN bus is available for application,** even when debug communication channel is CAN.

The UDE® Universal Debug Engine gives you the following advantages

General Technical Information

- UDE® supports multi-core derivatives of AURIX, TriCore, Stellar, Power Architecture, Cortex, S32, Arm, RH850, SuperH SH-2A, RISC-V, ARC, XE166, XC2000, XScale.
- Enhanced state-of-the-art 32-bit and 64-bit debugging solution for debugging of complex high-level language based C- and C++ -applications.
- Code syntax highlighting.
- HTML based help for all windows and dialog boxes including usage summaries and fundamentals.
- FLASH programming tool for programming internal (on-chip) or external FLASH memories.
- Service Monitors available for each of the communication interfaces - the ideal solution for on-site application parameter setup.

Breakpoints

- Simple, Complex and Data breakpoints.

Host/Target System Communication

High-speed downloading is achieved by the communication devices UAD2^{pro}, UAD2^{next}, and UAD3^{+}.

- DAP and Single Pin DAP (SPD) up to 80 MHz.
- DAP over CAN Physical Layer (**DXCPL**).
- DAP2 up to 160 MHz.
- DAP over CAN.
- SWD up to 100 MHz.
- JTAG/cJTAG up to 3.5 MByte/s @ 50 MHz.
- 4-Pin, 1-Pin LPD interface (Renesas RH850).
- **XCP software debugging**.
- CAN up to 1 Mbps.
- **CAN bus monitoring** (even in parallel to debugging via CAN bus) with decoding of standard and user-defined CANopen messages.
- ASCx RS232/TTL, up to 1 Mbps.
- 3Pin-Hardware Interface TTL, up to 400 kbps.

UDE® supports communication to the host PC via a number of standard interfaces: USB, IEEE1394, and **Ethernet**.

Graphical Display

- Flexible calculation of curve data points from the targeted program data with UDE® expressions.
- Update of data after program hold or with programmable refresh rates, during running and stopped target program.

Watch and Locals Display

- **C/C++ and Assembly expressions supported.**
- **Watch expressions:** C variables and constants, linked in C syntax, to a self-calculating expression.

Simulator

- **UDE®-Sim** Support.
- **Infineon TSIM** Support.
- **Virtualizer Synopsys Simulator** Support.

Automation Support

- **Batch and Script control** of debug functions.
- UDE® object model for internal and external automation, internal scripts – macros for routine tasks during interactive debug sessions – and external scripts for debugger automation.
- **Python 3.12 script console** inside of UDE®. New

Compilers

Optimized support for Compilers and the **ELF, DWARF2.0, DWARF 3.0** and **DWARF4.0** format.

- GNU C/C++, MCS Compiler (HighTec).
- Tasking C/C++, MCS Compiler.
- Keil C/C++ Compiler (Keil).
- RDS C/C++ Compiler (Arm).
- C/C++ Compiler (ImageCraft).
- eTPU Compiler (Byte Craft).
- Diab C/C++ Compiler (Wind River).
- CodeWarrior C/C++ Compiler (NXP).
- Renesas C/C++ Compiler.
- CodeComposer Compiler (TI).
- Green Hills Compiler. New
- ARC Metaware Compiler (Synopsys).
- HighTec's RUST compiler for AURIX and Arm

Third Party Tool Support

- **Hypervisor Awareness for LynxSecure**.
- CASE Tool EasyCODE (EasyCODE).
- CASE Tool X32 (Blue River Software).

RTOS Support

- CMX-RTX (CMX Company).
- PXROS / PXROS-HR (HighTec).
- µC/OS-II (Micriµm).
- rcX Real-Time Kernel (Hilscher).
- Sciopta (Sciopta)
- RTX Real-Time Kernel (KEIL/Arm).
- **AUTOSAR/OSEK** – ARTI and ORTI.
- **FreeRTOS** / SAFE**RTOS**.

System Requirements

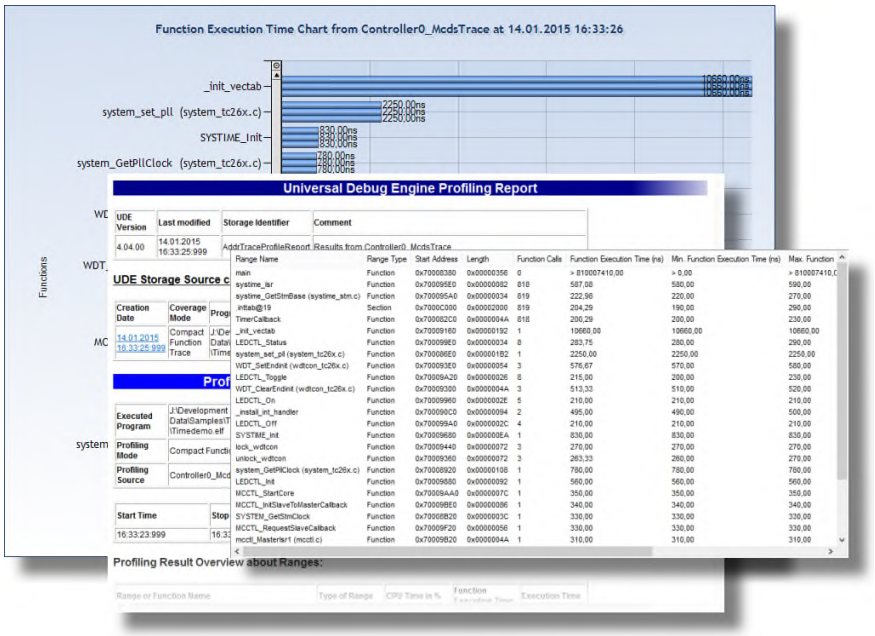
- Intel or AMD x86_64 (64-bit) processor
  - 4 GByte RAM,
  - 2 GByte available hard disk space.
- Display SXGA
- Operating System:
  - **Windows®10 or 11 (64-bit)**.
- Microsoft .NET™ Framework 4.
- CD-, DVD, or BD-drive for installation.
- IEEE1394, USB, PCI or TCP/IP Gigabit-Ethernet.
- Administrator permissions for the current login during installation.

PLS offers a complete toolchain support from a single source!

UDE® Trace Support for Run-Time Analysis of Applications – Profiling, Code Coverage, Visualization

The knowledge of Core load distribution of the running target application is a basic requirement to optimize their real-time behavior. The UDE® analyzing functions of real-time target data include:

- Trace profiling to calculate function execution time.
- Several types of code coverage algorithms provide qualification of software quality in real process environment.
- Two optimized windows of program flow assist to identify critical code sequences by two-dimensional line chart.
- Optimized window of traced data accesses enables identification of critical accesses by two-dimensional line chart.
- New The **UDE SimplyTrace®** feature completely hides the complexity of trace configuration from the user. Trace functions, taken from typical use cases, are context-sensitive and attached to the different debugger views.



UDE® supports trace data processing from **MCDS**, **miniMCDS**, **Nexus**, **ETM**, **ETB**, **TMC**, **ITM**, **PTM**, **FTM** and **CoreSight** based trace channels over various hardware interfaces. UDE® provides an additional feature to read memory locations periodically directly on the access device to obtain shortest polling periods. This method can be used to poll the IP or variables.

Trace Profiling Support

UDE® supports three methods to evaluate execution times:

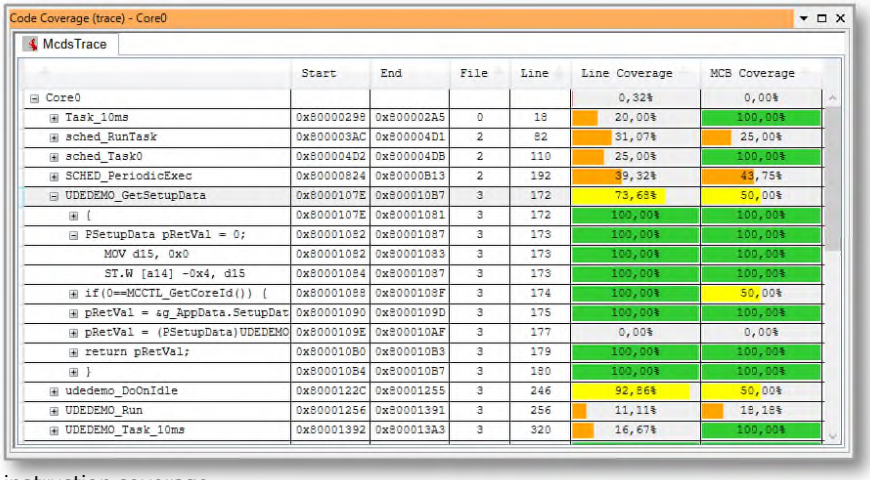
- **IP - Snooping** trace of IP of AURIX, TriCore, XC166, XE166/XC2000 and Cortex-M, Cortex-R, Cortex-A Core periodically with minimum poll period of 1 ms.
- Calculation of function execution times by full code trace of **MCDS**, **miniMCDS**, **Nexus**, **ETM, ITM, PTM, FTM**, **CoreSight, Aurora** trace channels. The results are influenced by size of trace and quality of related time information from trace channel.
- UDE® supports also the special optimized **Compact Function Trace** of AURIX processors with MCDS, which provides best utilization of trace memory for calculation of function execution time.

Profiling Visualisation and Result Export Functions

The results are available as chart diagrams and as numeric result tables. Additionally, the UDE® profiling page enables the results to save in a free selectable **XML storage based data sink** for later processing.

Non-Intrusive Code Coverage

UDE® Code Coverage support is a trace-based, non-intrusive method for determining statement coverage (C0 coverage) and branch coverage (C1 coverage) even with optimized code. Code coverage is generally considered a very meaningful metric for assessing test quality. The measurement is based on instruction traces provided by hardware trace channels: **MCDS, NEXUS, Arm CoreSight ETM**.



	Start	End	File	Line	Line Coverage	MCB Coverage
Core0					0,32%	0,00%
Task_10ms	0x80000298	0x800002A5	0	18	20,00%	100,00%
sched_RunTask	0x800003AC	0x800004D1	2	82	31,07%	25,00%
sched_Task0	0x800004D2	0x800004DB	2	110	25,00%	100,00%
SCHED_PeriodicExec	0x80000824	0x80000B13	2	192	39,32%	43,75%
UDEDEMO_GetSetupData	0x8000107E	0x800010B7	3	172	73,68%	50,00%
{	0x8000107E	0x80001081	3	172	100,00%	100,00%
PSetupData pRetVal = 0;	0x80001082	0x80001087	3	173	100,00%	100,00%
MOV d15, 0x0	0x80001082	0x80001083	3	173	100,00%	100,00%
ST.W [a14] -0x4, d15	0x80001084	0x80001087	3	173	100,00%	100,00%
if(0==MCCTL_GetCoreId()) {	0x80001088	0x8000108F	3	174	100,00%	50,00%
pRetVal = &g_AppData.SetupDat	0x80001090	0x8000109D	3	175	100,00%	100,00%
pRetVal = (PSetupData)UDEDEMO	0x8000109E	0x800010AF	3	177	0,00%	0,00%
return pRetVal;	0x800010B0	0x800010B3	3	179	100,00%	100,00%
}	0x800010B4	0x800010B7	3	180	100,00%	100,00%
udedemo_DoOnIdle	0x8000122C	0x80001255	3	246	92,86%	50,00%
UDEDEMO_Run	0x80001256	0x80001391	3	256	11,11%	18,18%
UDEDEMO_Task_10ms	0x80001392	0x800013A3	3	320	16,67%	100,00%

Code Coverage Visualisation

The **code coverage** window provides details of the coverage at 4 levels: core minimum-coverage, function coverage, source line coverage and machine instruction coverage.

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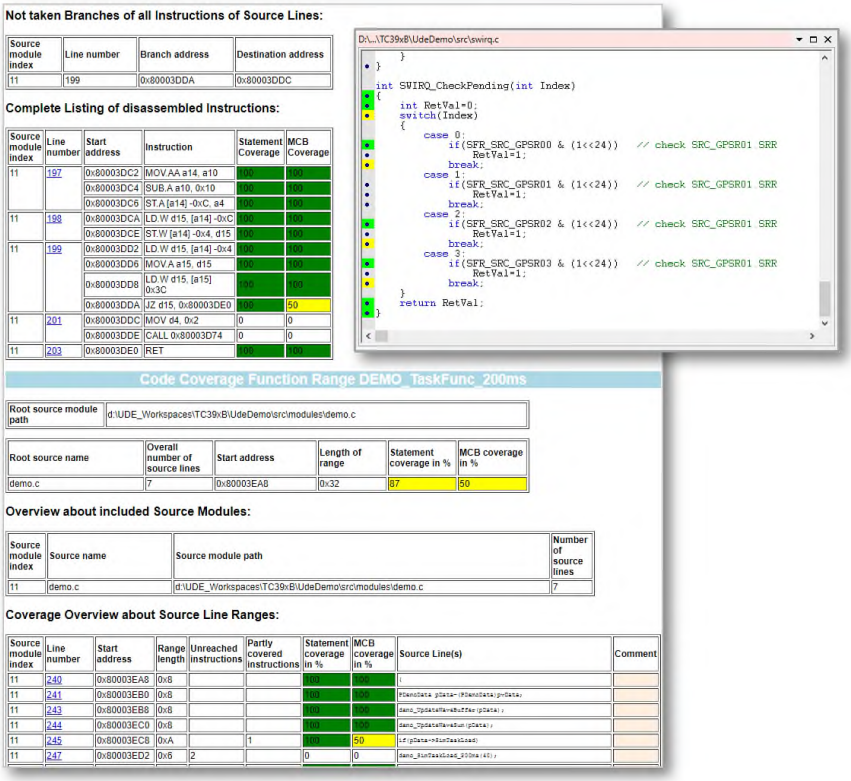
For C0 and C1 coverage the results are displayed as a percentage bar chart.
Additional functions include

- Sorting functions by name, start address, coverage value
- Pre-filtering the trace for analysis of specific functions
- Accumulation of coverage data over multiple trace recordings and sessions

The **program window** displays per-core statement coverage information as line marker for uncovered, partially covered and completely covered source lines and machine instructions.



Reporting According to ISO 26262 Process

To meet the requirements for evidence of the performed code coverage measurements within the overall software quality assurance process, complete reports with all details must be generated. These reports are essential for the subsequent traceability of the performed measurements and their interpretation.
Reports can be exported to HTML, XML, CSV and text formats.

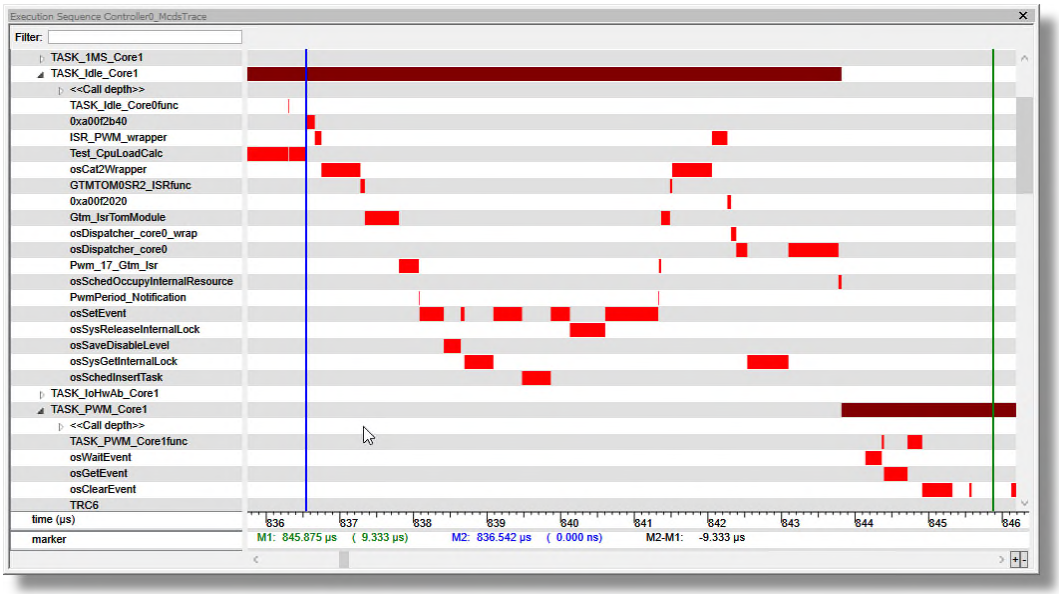
Access via object model

The code coverage analysis is accessible via the UDE® Object Model as a trace stream-based service. The interfaces provide fine-grained control over every aspect of the coverage analysis, including configuration, control, access to results and creating of reports. User-controlled or automatic start of the analysis or creating of reports and storage exports are provided

Execution Sequence Chart

The Execution Sequence Chart visualizes the program flow and its sequence in time. Based on recorded program trace information, the chart shows an exact timeline of the executed tasks and functions as well as the call-depth for every point in time.

The program flow of different cores can be displayed at the same time. That helps developers to find bottlenecks or synchronization issues in software, which is distributed on several cores easily.



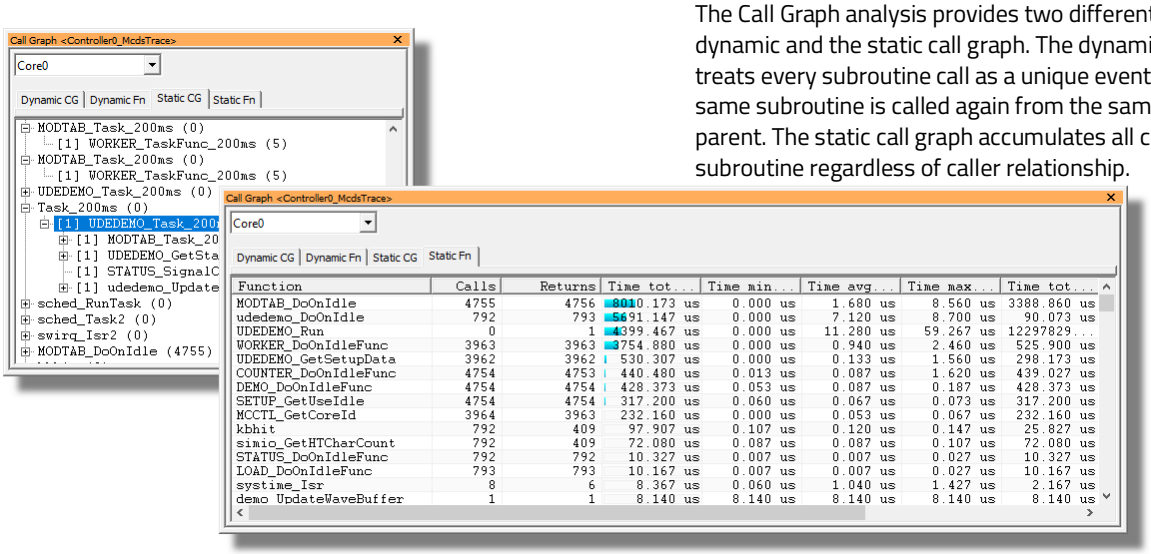
The Execution Sequence Chart provides time measurement between user-definable markers as well as fast navigation and zoom functions, which help to investigate the run-time behavior of specific program sequences.

Call Graph Analysis

New The Call Graph window visualizes the results of UDE®'s call graph analysis. The call graph analysis is a trace based analysis and creates a representation of the control flow at software level. It represents the calling relationships between functions and sub-functions.

In addition to that, the Call Graph window provides also profiling information and statistics of the run-time behavior for each function including total, minimum, maximum and average execution time (with and without sub-functions) as well as the number of calls and returns.

The Call Graph analysis provides two different call graphs: dynamic and the static call graph. The dynamic call graph treats every subroutine call as a unique event, except if the same subroutine is called again from the same call stack parent. The static call graph accumulates all calls of a subroutine regardless of caller relationship.



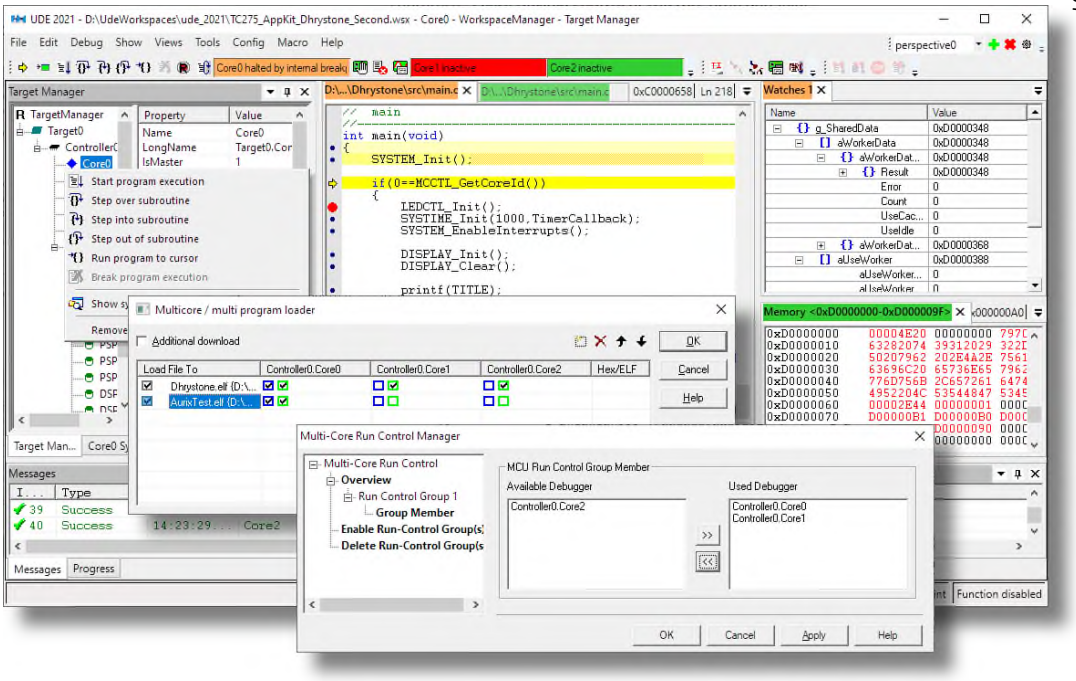
UDE® Multi-core and Multi-target Support

UDE® provides in depth support for all available on-chip debug resources and peripherals. The tool enables the control and monitoring of several cores of multi-core architectures within a single and consistent user interface.

This is supported by a flexible multi-core program loader that enables the loading of program code and data as well as symbol information separately for each core. Control of the cores is carried out by a multi-core run control manager, which offers a definition of core groups.

Therefore, a very flexible control of the run-time behavior of the complex architecture is possible, including combined start and stop mechanism of the several cores.

Multi-core Scenarios



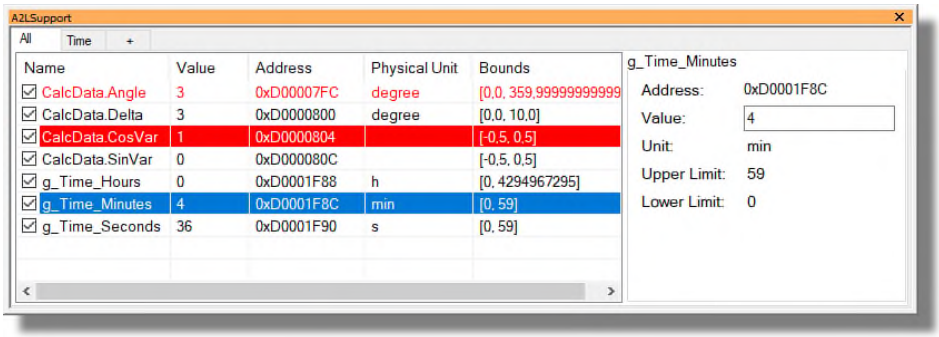
Several cores

- on one Chip using the same JTAG-Chain (AURIX).
- on different Chips using the same JTAG-Chain.
- on different Chips using different Debug-Channels.

pls Development Tools

Displaying of ECU variables for measurement and calibration purposes

According to the ASAM MCD-2 MC standard UDE® supports the display of ECU variables for measurement and calibration purposes based on A2L files.



In summary the A2L support add the ability to the debugger to execute certain calibration and measurement tasks without the need of any extra tool using the same target interface like the debugger.

Basic Features of the A2L support

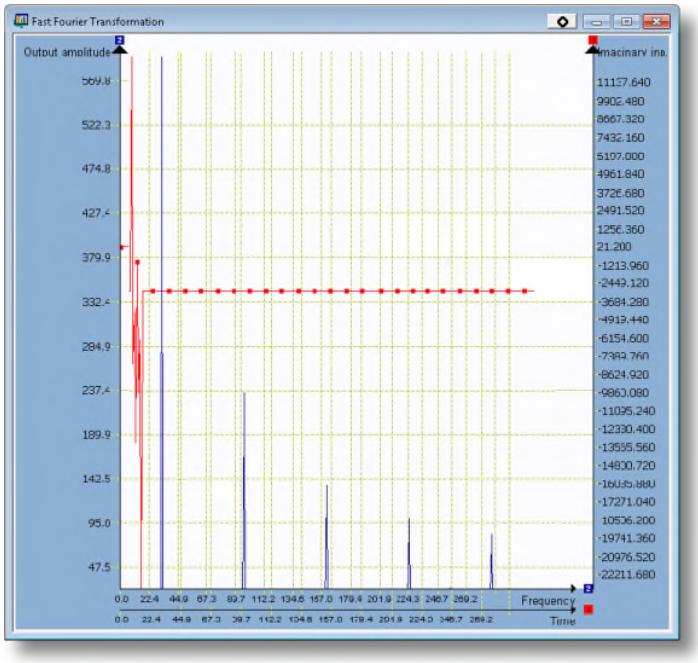
New

- Selection of variables for display by name or by module according to A2L file
- Multiple TAB support including free renaming and save/restore feature
- Display of raw value and value calculated to a physical unit
- Display of limit violations
- Display of changed values since last read
- Animated read from target
- Changing of values numerical and also textual based for enumerations
- Adjustable columns, fonts and colors
- Automation interface for use in scripts, own workflows or by third-party tools

UDE® Chart Windows for verification of complex data processing algorithms

Together, the UDE® Chart Windows, along with the verification of complex software algorithms, help the developer to quickly evaluate complex target program data from the process environment. The UDE® window displays pre-processed target system data as curves of a scientific 2-dimensional diagram.

The UDE® Chart Windows also feature zoom, pan, and cursor functions to help evaluate the data and windows details of the current curves. In particular, the cursor function makes it easier to access to the particular data values at specific coordinates of the curve.



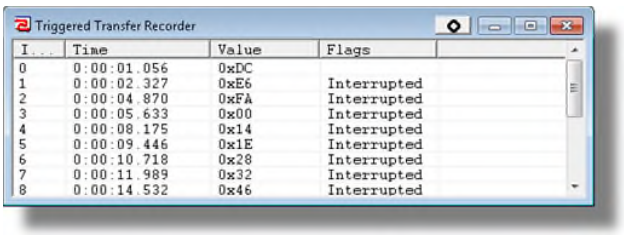
Basic features of the Chart Windows

- Multiple curves in one diagram window.
- Flexible calculation of curve data points from target program data with UDE® expressions.
- On-the-fly data acquisition after program hold or with programmable refresh rates during running and stopped target program.

UDE® Triggered Transfer

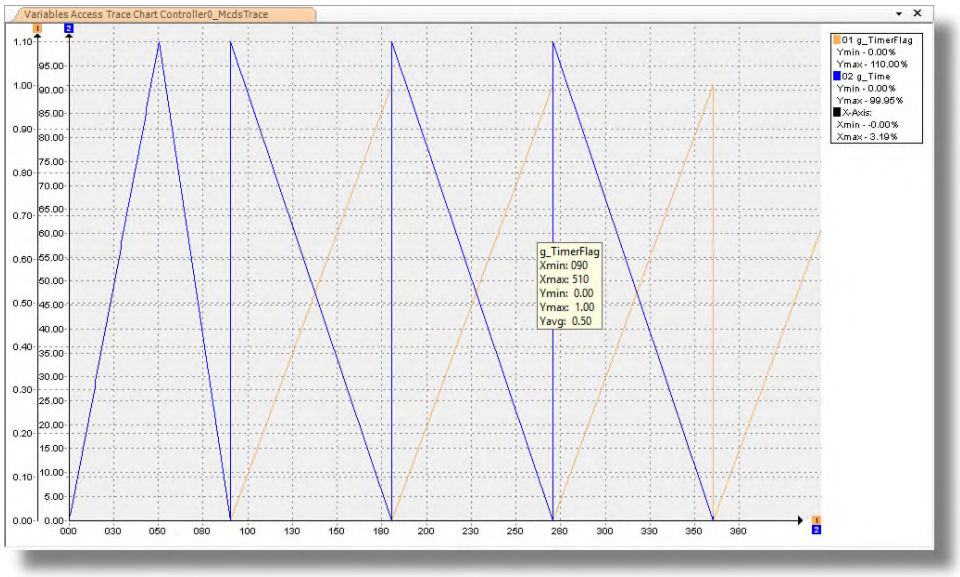
The UDE® TTF Recorder uses the **Triggered Transfer** feature of new Infineon microcontrollers. Triggered Transfer is part of the on-chip debug support, which is implemented on these controllers. It allows transferring the value of a single memory location via the JTAG debug interface.

The transfer is triggered by a debug event of the on-chip debug support (OCDS) unit. There are several types of debug events that can trigger the transfer depending on the actual type of controller. A typical use case, provided by all supported controller types, is to trigger on write accesses on a single variable and to transfer the new value of the variable to the recorder.
Data is recorded while the target system is running.



Variables Access Time Chart

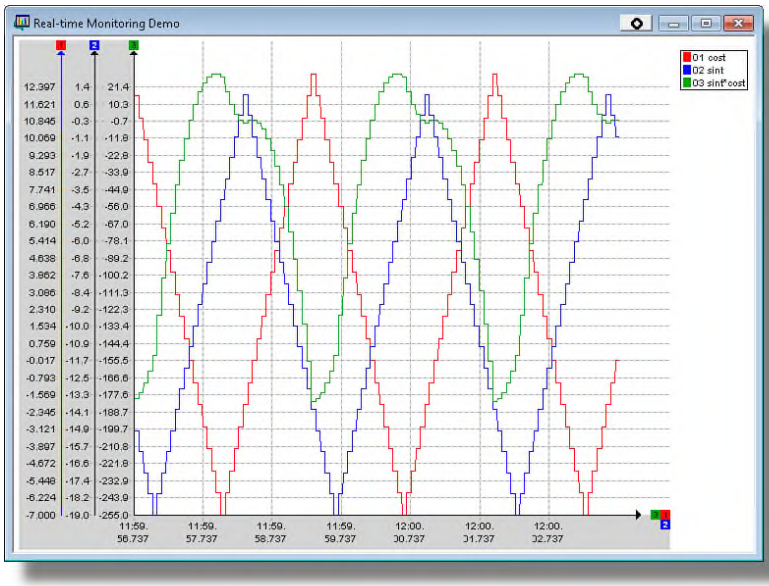
This UDE® window displays all data-access trace records of the current debugger instance assigned core as data series of a 2-dimensional scientific diagram
This feature makes it easier to detect time-related variable access problems and to accelerate the verification of complex software algorithms and input from process environment.
A suitable trace configuration for a MCDS, Nexus, CoreSight, ETM, ETB, TMC, ITM, PTM, FTM trace channel is required to deliver the data filling this specific line-chart window. The pre-processing algorithm detects automatically the high-level variables from recorded trace channel.



UDE® Real Time Data Monitoring and Collection

The UDE® makes it easy to **program variables**, contents of complex terms and physical terms, and **record in real-time** for evaluation. The UDE® makes it possible to analyze the real-time behavior of the developed software. The user can recognize and solve distribution problems with the performance of the processor, as well as synchronization problems between multiple parallel running programs.

By using only debug interfaces, the UDE® has minimal influence on the behavior of the system. The UDE® also allows the user to view a transparent read-out of system information, in the background of the active program. The information is visualized with a graphical representation of multiple signals in a chart.
All necessary signal data can be obtained as a result of scanning values from individual variables, elements from complex data structures, or via any complex combination from multiple data points. The option to compute complex physical values, in real-time, and from program variables, helps the developer to simplify the interpretation and evaluation of the displayed diagrams.



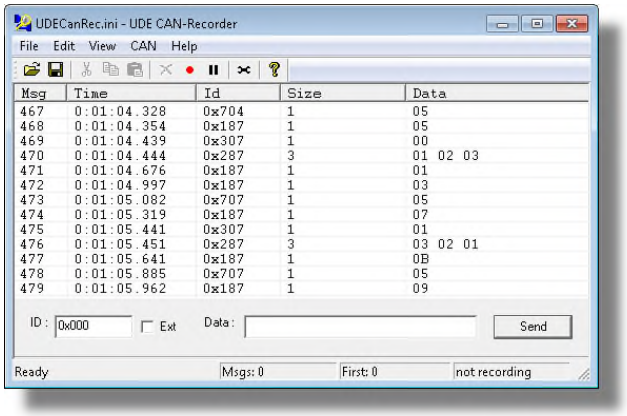
The data is pre-processed in the **Universal Access Device 2/3** (UAD2^{pro}, UAD2^{next}, UAD3^{+}), which is connected directly to the target system. Thanks to a 32-bit controller with its inherently powerful communication equipment, the user is guaranteed that even complex expressions, requiring a minimum sampling period (in the range of 1 millisecond), can be captured.

Following this, the computed data is buffered in the Universal Access Device. Captured data can be stored for up to 30 minutes and are retained until read-out by the UDE®. The data can also be stored in XML-Format and subsequently evaluated, via script, or another program (e.g. Excel).

Multiple selectable modes of the window ensure the user an optimal display of the recorded data. For a more detailed examination of the data, the graphical representation also enables the use of additional functions, such as zoom, data cursor, and switchable function markers.

UDE® CAN Message Recording with CANopen Visualization

The UDE® CAN recorder tool provides the visualization of CAN bus communication and can be used as an add-on or as a stand-alone application.



Equipped with the CANopen message formatter plug-in the CAN recorder can visualize the CANopen communication or a user-defined CAN-Layer-7-protocol.

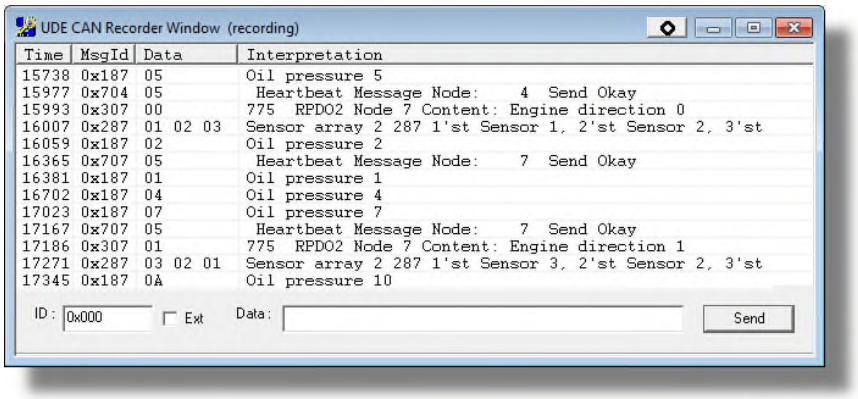
The recorder can be configured for filtering and for displaying of symbolic information. The recorder can also export CAN message streams to a file and the CAN bus can be sent or stimulated, via the send bar. CAN baud rates from 50 kbit/s up to 1 Mbit/s, and standard / extended CAN identifiers are supported. The UDE® CAN recorder supports a Common Object Model (COM).

This feature allows the usage of UDE® CAN recorder as a plug-in of user applications as well as the script-controlled by other applications.

CANopen Message Formatter

The CANopen message formatter is a plug-in for the UDE® CAN recorder and can visualize the CANopen communication. The plug-in scans and interprets DCF-files automatically. This makes data of CANopen networks and CAN nodes available to the user. If no DCF-file is available the message formatter interprets all CANopen standard objects corresponding to the default specification.

In other cases the CANopen message formatter handles an interpretation file for the visualization functionality of the UDE® CAN recorder. This file can be edited. For example, the developer can use the CANopen message formatter for the visualization of a user-defined CAN-Layer 7 protocol.



UDE® CAN Monitoring with/without On-chip Debug Support (OCDS) and CAN Bootstrap Loader

CAN Bootstrap loading for XE166, XC2000, and TriCore

The usage of the CAN bootstrap loading mechanism is supported by UDE® and UDE® Memtool.

OCDS Support of XE166, XC2000, and TriCore*

The latest software package, UDE-LIC-TC-Monitor, provides support of On-Chip Debug System (OCDS). The OCDS can accomplish direct debugging, via CAN-bus, and uses a standardized close connection to the JTAG.

The OCDS can enable hardware breakpoints for debugging, within the FLASH memory, and data breakpoints. These allow dedicated halt, with read or write access, to program variables.

The UDE-LIC-TC-Monitor is available for members of XE166/XC2000, and TriCore* families, without limitations. It is also available for communication via CAN-bus.

In addition to the extended application capabilities, the developer will benefit from **substantial cost savings**, since there is no longer a need for specific adaptation for user hardware.

The target monitor requires approximately 16 kBytes FLASH memory, 1 kBytes RAM for the TriCore derivatives, and approximately 4 kBytes FLASH memory, 100 Bytes RAM for members of the XE166 family. A message object and a CAN identifier also need to be provided.

The application and target monitor share utilization of one CAN module and can be easily implemented as the access to a separate CAN module of TwinCAN or MultiCAN units of the microcontroller. The monitor software includes the C and assembler sources for the various common compiler packages and can be easily integrated into existing applications.

*** On request**

Universal Emulation Configurator (UEC) – MCDS and SPU Support

Support of AUDO-NG and AUDO Future Emulation Device On-Chip Full Featured Emulator

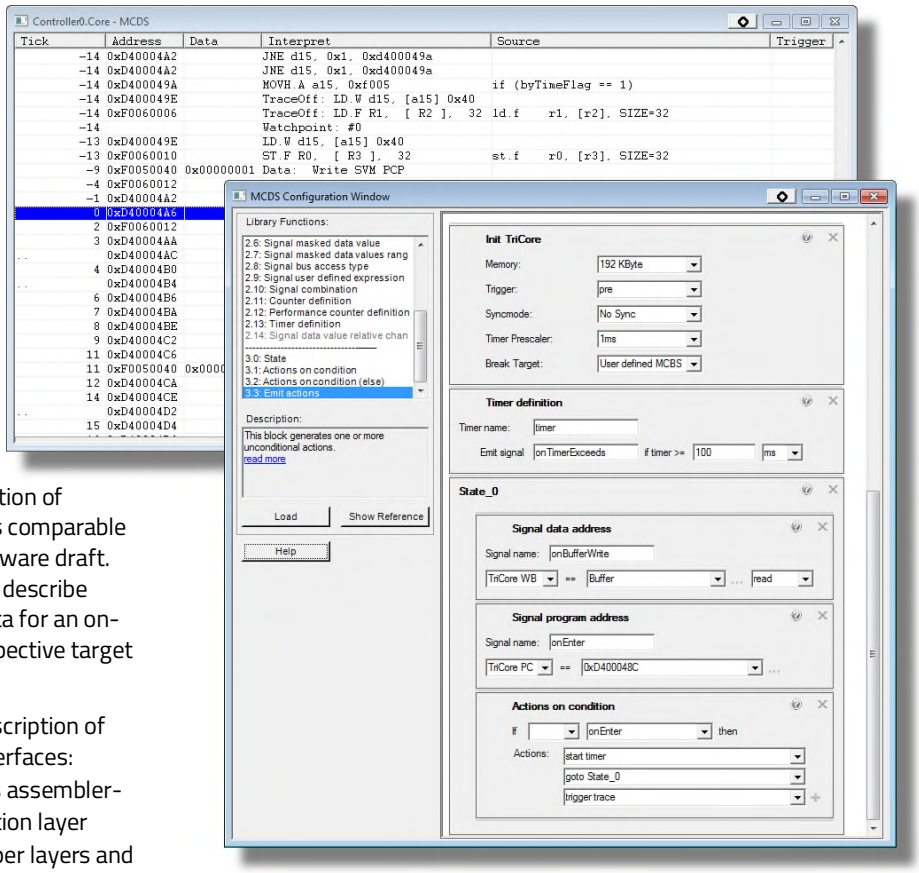
The AUDO-NG, AUDO Future, AUDO MAX, and AURIX family emulation devices (TC17xxED, TC27xED, and TC39xED) implement a new-generation debugging solution called **Multi Core Debug Support (MCDS)**. This new full-featured emulator on-silicon begins a new age of debugging capabilities.

Sequence Processing Unit (SPU) is used by Power Architecture, **Parallel Processing Units (PPU)** is used by AURIX and ARC architecture and can be debugged by UDE®.

Current implementations of on-chip emulators:

- Comparatively small capacities of the on-chip trace memory due to limited chip surface.
- Very complex programmable logic for data filtering, which arise internally with large bandwidth to the optimal utilization of the trace memory.
- Strong adjustment to the system properties, and consequently the concrete implementation is very different from chip to chip.

Due to these characteristics, the emphasis of error tracing shifts on the definition of the measuring task and thus the programming of the filter logic, while with traditional external emulators the evaluation of the trace data is the center of attention.



Universal Emulation Configurator
is the hardware-independent tool for description of measuring tasks for on-chip emulators and is comparable with development environments for the hardware draft. The UEC allows the user to quickly and easily describe measuring tasks and create configuration data for an on-chip emulator, totally independent of the respective target hardware.

For maximum freedom for the user in the description of the analysis tasks, the UEC offers various interfaces:

- Trace Qualification Language (**TQL**) - this assembler-similar language serves as the presentation layer between the hardware-independent upper layers and the on-chip emulator hardware.
- High Level Trace Qualification Language (**HTQL**) - this compiler-similar language allows the user to edit an abstract description for the functional hardware-independent description of the state-machine.
- A XML based library format contains the measuring task by embedded HTQL code and the description of its visualization for the schematic input.

The graphical user interface of the **UDE**® combines the easy-to-use interfaces of logic analyzer user front ends, with complete support of the whole observation, and trace capabilities of the **Multi Core Debug Support** unit. With the **Universal Emulation Configurator** the user now has a powerful configuration tool, to complete complex analysis tasks quickly and easily.

- Functional description of tasks based on a state-machine is now possible, independent of the actual target or emulator hardware.
- The user can now complete sophisticated measurement tasks independent of the actual target or emulator hardware.
- A fast and simple definition of complex measuring tasks is now possible and is done by joining pre-defined subtasks from expandable libraries and defined parameters.

The increase of the use efficiency due the **Universal Emulation Configurator** is absolutely comparable with the transition from the logical design to the description of behavior in the chip design.

AUDO Future and AURIX Emulation Device

For the first time, enhanced features of the AUDO Future's MCDS unit are integrated performance counters.

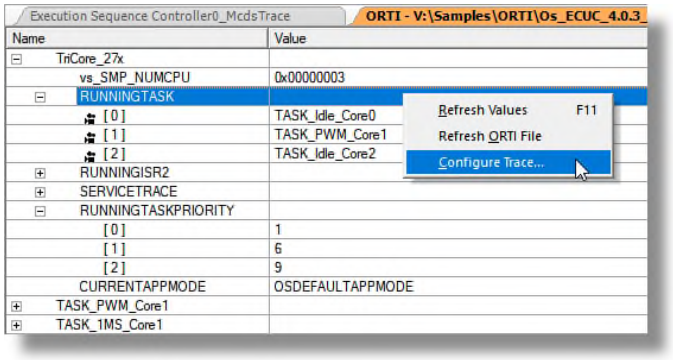
For application optimization, important data, such as the instruction counter, cache hits and misses separate from program data, interrupts, stall and idle cycles, etc., can be configured, recorded, and analyzed.

ORTI/OSEK – ARTI Support

ORTI Support - OSEK Run-Time Interface Awareness

For OSEK-based operating systems (AUTOSAR), UDE® provides functions for analyzing and visualization of OSEK-specific information as well as task and (optionally) code trace.

ORTI – OSEK Runtime Interface – is a standard interface and file format which provides information about OSEK/VDX compliant real-time operating systems. With this information, the UDE® gives the users an inside view of the operating system states.

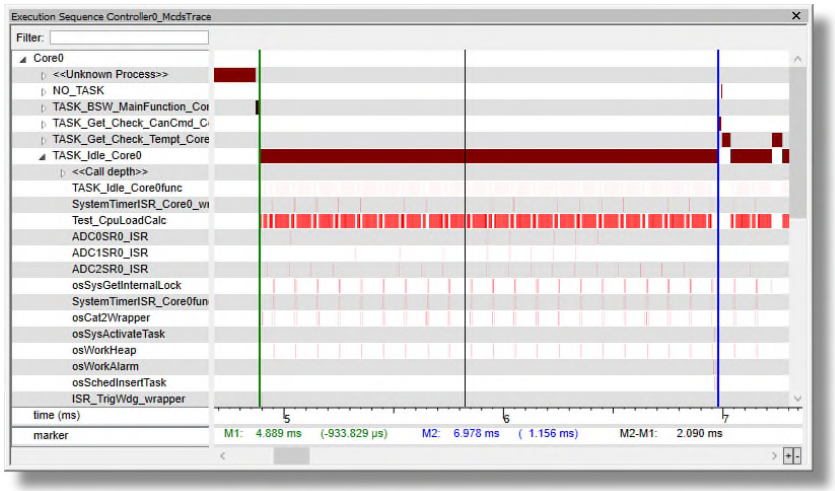


UDE® ORTI support provides:

- Evaluation of ORTI files for information about OSEK operating systems
- Presentation of operating system information including state, performance indicators, task states, operating system objects, etc.

Task Trace of OSEK Operating Systems

The trace features of microcontrollers allow a non-intrusive observation of the execution sequence of operating system tasks. UDE® uses the information provided by ORTI files for configuring data traces in order to determine task changes, which are indicated by OS variables. That enables a maximum utilization of the available trace resources and trace memory. If required, code trace can be enabled too.



UDE® analyzes the captured trace data to ensure a proper visualization of the sequences of executed operating-system tasks including their precise timing. Beside this, the Execution Sequence Chart can also display the function sequence of each task.

UDE® also allows the export of preprocessed traces to the widely used Best Trace Format (BTF) for additional analysis by third-party tools.

ARTI Support

ARTI (AUTOSAR runtime interface) defines an interface between build tools and debugging/tracing tools. The debugging/tracing tools shall then forward tracing information to trace/timing analysis tools. The interface is intended to facilitate and accelerate debugging, tracing and verification of the system behavior, as well as round-trip engineering. AR-CP (AUTOSAR Classic Platform) is AUTOSAR's solution for embedded systems with hard real-time and safety constraints.

The UDE® AUTOSAR (**ORTI** and **ARTI**) Support Add-In provides an overview of the AR-CP's operating system. The view is based on the information of an AUTOSAR XML file (*.arxml). The additional tool ArtiHookGenerator can be used to generate the ARTI hook macros specified by the standard.

By integrating the generated implementation with the AR-CP sources, UDE® is able to trace events and visualize the results graphically. Implementation examples are available e.g. for MICROSAR from Vector.

INCHRON Support

New

Seamless Tracing with UDE® and INCHRON chronVIEW

Trace information recorded by UDE® from running applications on real target systems can be used for third-party tools for further visualization and analysis. For data exchange between tools, UDE® provides the export of preprocessed trace into Best Trace Format (BTF) files.
A proven toolchain for real-time analysis of recorded on-chip trace exists with the chronVIEW® tool by INCHRON®. chronVIEW can visualize and analyze timing and performance information contained within a trace file.

INCHRON
THINK REAL-TIME

Customer Benefits

Straight-forward OS-aware tracing including

- Multi-core support
- Different targets
- OS configuration aware
- Long traces
- Independent from target architecture / target interface

Intuitive trace visualization of

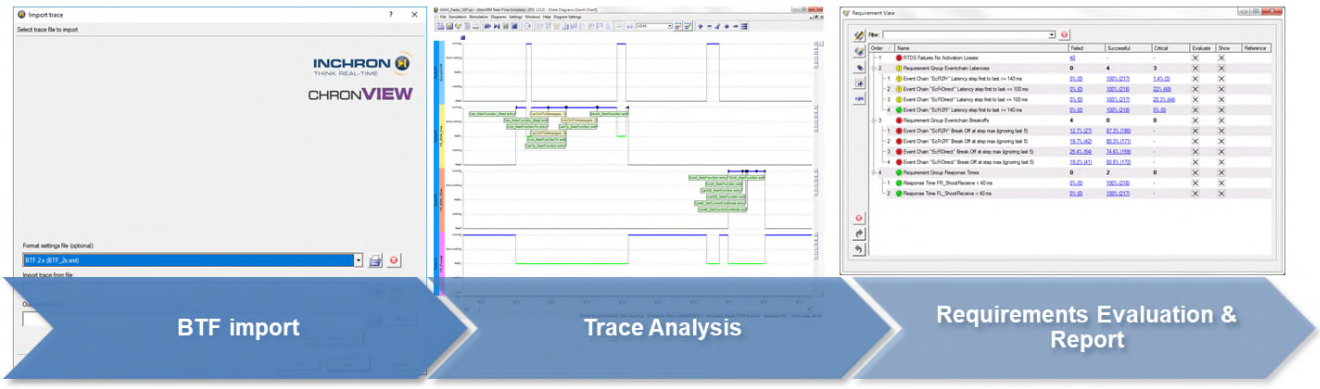
- RTOS states
- Function nesting / call depth
- Events
- Data values
- Rate changes
- Data flows
- Stack consumption

Efficient analysis and diagnosis of

- CPU load
- Net execution time
- Response time
- Jitter
- End-to-end latency
- Data age / loss / reuse
- Blocking time
- Statistics
- Requirements evaluation

Reliable decisions for

- Function mapping
- Execution order
- Partitioning
- Activation period
- Priority
- Start offset
- Core affinity
- Resource sharing



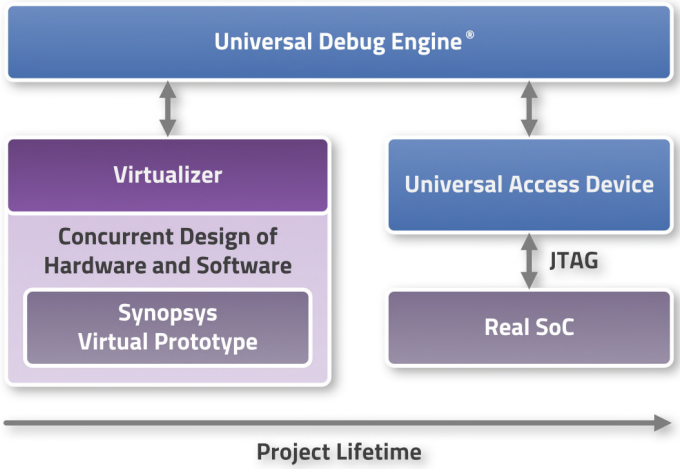
pls Development Tools

Simulator Support

It is common industry practice to evaluate the functionality and performance of new hardware and software by using development tools to study chip behavior. A simulator can use effectively in the early stages of software development, reducing the length of time spent later on system integration. Simulator access can also provide to all members of a software team at relatively low cost compared to other instrumentation. Simulation tackles the problems that involve collecting data about the run time behavior of an embedded application.

Synopsys Virtualizer Simulator

The coupling of the PLS UDE® and Synopsys virtual platforms reduces test times on the real hardware as the joint solution allows a more detailed analysis of timing behavior and performance of an embedded application at a very early stage of system design. This prevents downstream errors that cause redesigns and significantly reduces development cost and schedule. The software architecture of the UDE® guarantees optimal conditions for debugging SoC-based systems. For example, by means of the intelligent use of modern on-chip debugging and on-chip trace units, valuable functions such as profiling and code coverage are available for the system optimization.



Interoperability Description and Customer Benefits

The UDE® can establish a connection to Synopsys virtual platforms. The support includes multi-core designs with TriCore, Power Architecture, Arm and RISC-V cores. The solution offers debugging of software at high-level language level on the virtual platforms with configuration and control of the processor models.

The simple-to-use modular structure of the UDE® connection to the Synopsys tool is established via a special target interface component. UDE® also offers virtual target configuration and control of the processor models. If the real hardware is available, a simple exchange of this component allows a smooth continuation of work.

UDE® Sim Support

UDE® Sim is a dynamic binary translation (DBT) instruction set (IS) and full system simulator providing high simulation performance.

The purpose of UDE® Sim is to test and debug target software without the need for a real hardware target. The simulation may not only include the instruction set architecture, but may also comprise the IO components available on the target platform. From view of the UDE® user, the simulated target is treated like a regular hardware target platform. All features known within UDE® for the hardware target, such as breakpoints, single stepping, register and memory inspection, are available for the simulated target as well.

Infineon TSIM Support

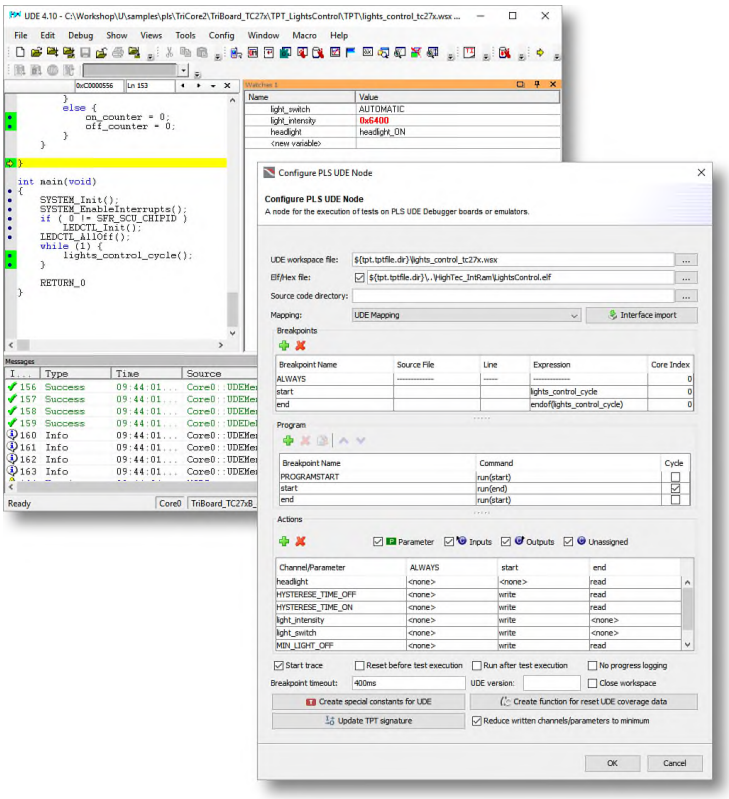
The **TSIM simulator** is an instruction model of the TriCore architecture. It can be used to debug programs without having any hardware. The time to finish a new product can be shorter with use of the simulator in early stages of developing.

The TSIM is integrated into UDE® via its Generic Debug Instrument (GDI) standard interface. The UDE® wraps its own communication model around this GDI interface.

Some additional configurations can be made to set up the **TSIM** simulator to your own requirements. The UDE® debugger uses the TSIM interface like a real hardware platform. All ad vantages of HLL-Debugging are offered with the combination of UDE® and TSIM environment.

Test Automation Support

The UDE® provides the necessary functionality for test automation support such as connection to the target system, FLASH programming, process control and reading and writing programmed data etc. via the standard Component Object Model (COM) interface. This COM object model also permits effective use of all debug functions necessary for successful test performance.



Time Partition Testing (TPT)

UDE® supports tests directly on the target hardware with PikeTec's TPT (Time Partition Testing) model-based software tool. TPT is an especially efficient method for automated software testing or software verification of embedded control systems. It supports all-important areas of the test process such as test management, test case modelling, test performance, test analysis and test documentation. With the help of the UDE® the user can run the tests now modelled and managed by the TPT "Processor-in-the-Loop" (PiL) in real time on the actual target software, for example a control device, for the first time.

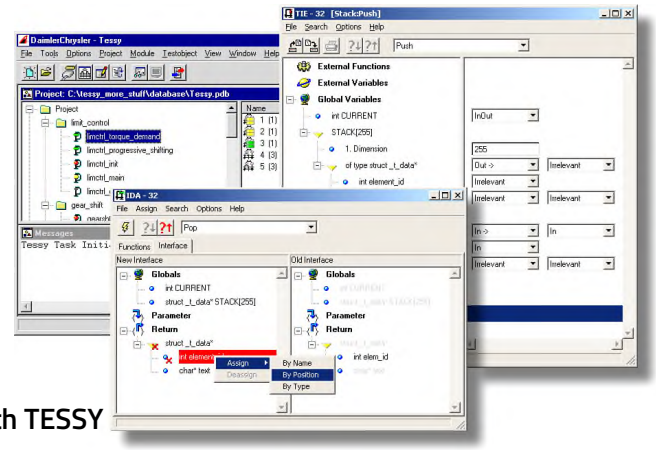
Since analysis and documentation also take place within the TPT, it can be used continuously for all test phases without limitations.

ECU-TEST Support

The ECU-TEST software tool was developed by TraceTronic for test and validation of embedded systems.

ECU-TEST uses UDE® automation software interface for

- Basic software tests.
- Run control with HLL breakpoints.
- Variable read/write.



TESSY Support

The test system TESSY from Razorcat, offers automated module testing of C code directly on the target system, using the UDE® debugging technology. It supports the whole unit testing cycle and works transparently on all target platforms currently supported by UDE®.

As a UDE® client, TESSY builds the complete test driver, including the necessary module environment, and controls the testing process. It allows systematic and reproducible testing in batch mode as well as step-by-step execution using test data from the TESSY database.

Since UDE® is the underlying debug engine, all debugging features are available during the execution of the test. This allows debugging based on input data from the test database.

TESSY analyses the source code and recognizes the usage of variables and their respective types. The interface information is stored separately from the test data and expected values.

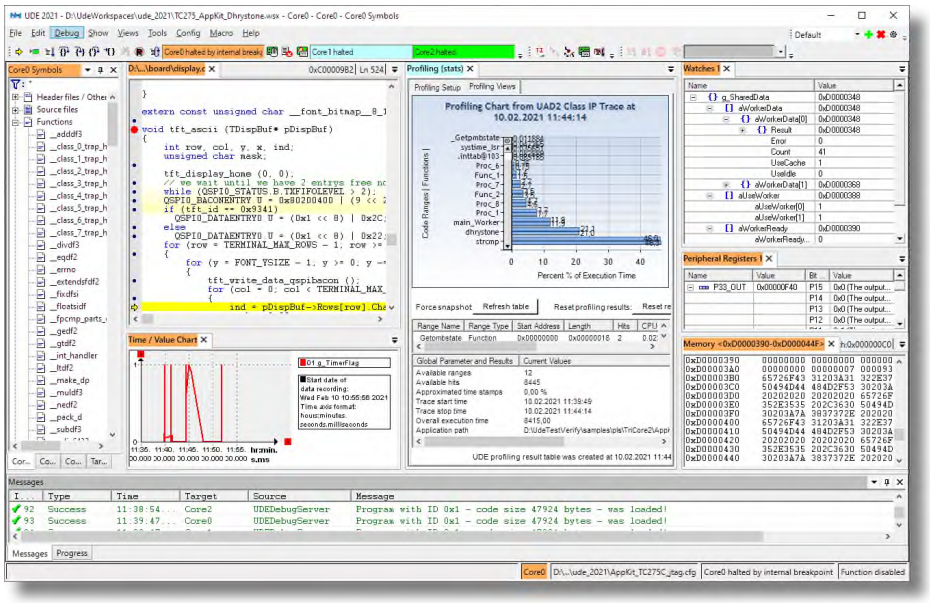
Advantages with TESSY

- **Systematic test case design** using the classification tree method: Intuitive and easy to learn graphical representation of test specifications.
- **Quick overview** of test objects interface and variable usage within interface browser tools.
- Easy creation of module environment: Definition of unresolved references and all necessary stubs.
- **Automatic test driver generation**, test execution, and evaluation of test results.
- Test driver in client/server technology allows **unlimited number of test cases** and minimum code/data requirements on the target system.
- Powerful **support for regression testing**: An interface browser tool shows both, old and changed interfaces, and provides comfortable interface assignment, which allows automatic re-usage of test data

UDE® WPF Platform

UDE® comes with a new front end based on **Windows Presentation Foundation** (WPF):

- Modern and state-of-the-art look and feel.
- User interface with "**Perspectives**" feature.
- Two different interface modes are provided for working with document windows:
  - Multiple documents mode - the IDE provides a parent frame that serves as a visual and logical container for all document windows.
  - Tabbed documents mode - Document windows are placed side-by-side on multiple tabbed panes.
- Multiple docked panes with multiple windows, and two modes:
  - Parallel window mode - all windows share one pane row.
  - Tabbed window mode - different windows can be switched in full row display mode, via the tab key.
- Floating frame windows, Full drag and drop support for windows navigation.



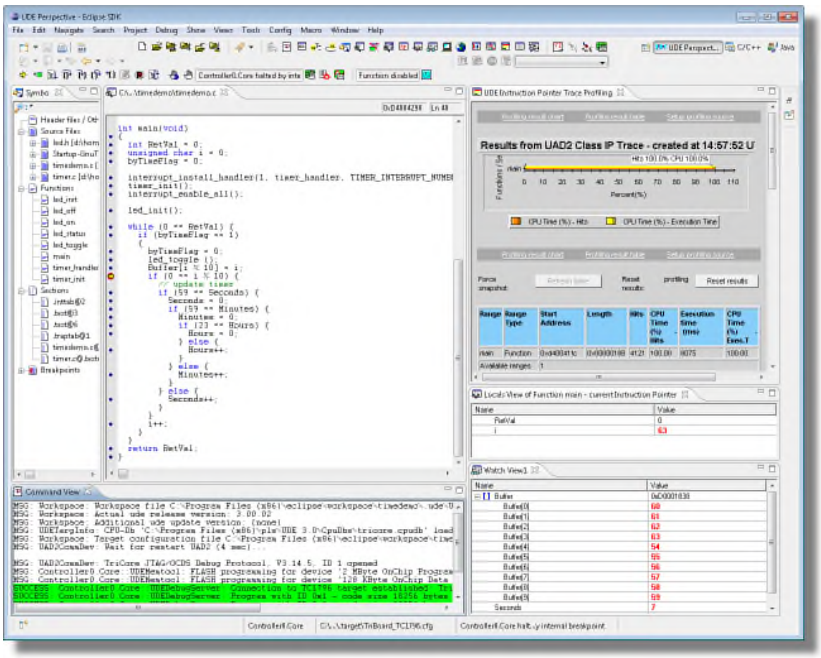
The same UDE® installation can be used with three different front-ends, **UDE® WPF Platform**, **UDE® Visual Platform** and **UDE® Eclipse** alternatively.

UDE® Eclipse Platform

UDE® comes with additional new front end as plug-in for 64-bit **Eclipse 4.8 (Photon) - 4.23 (2022-03) or higher** IDE (incl. C/C++ IDE support).

Features

- Seamless integration of **complete functionality** of UDE® inside the Eclipse IDE.



UDE® provides a unique perspective of the Eclipse IDE, and integrates UDE® workspace within Eclipse workspace.

- UDE® Eclipse Integration feature is included in the standard UDE® installation package, which can also be added to each existing Eclipse 4.x **(4.8 Photon, 4.23 2022-03, or higher)** installation.
- **Eclipse 64-bit** version supported since UDE® 2021
- UDE® Integration Package for HighTec Development Platform and TASKING VX-toolset are also available.
- UDE® debug session can be started via the Eclipse launch configuration.
- Code breakpoint can be set either by C/C++ editors or by UDE® specific functions.
- UDE® controls IP marker of C/C++ editors.
- UDE® Eclipse Plug-in will also support Eclipse RCP stand-alone application mode.

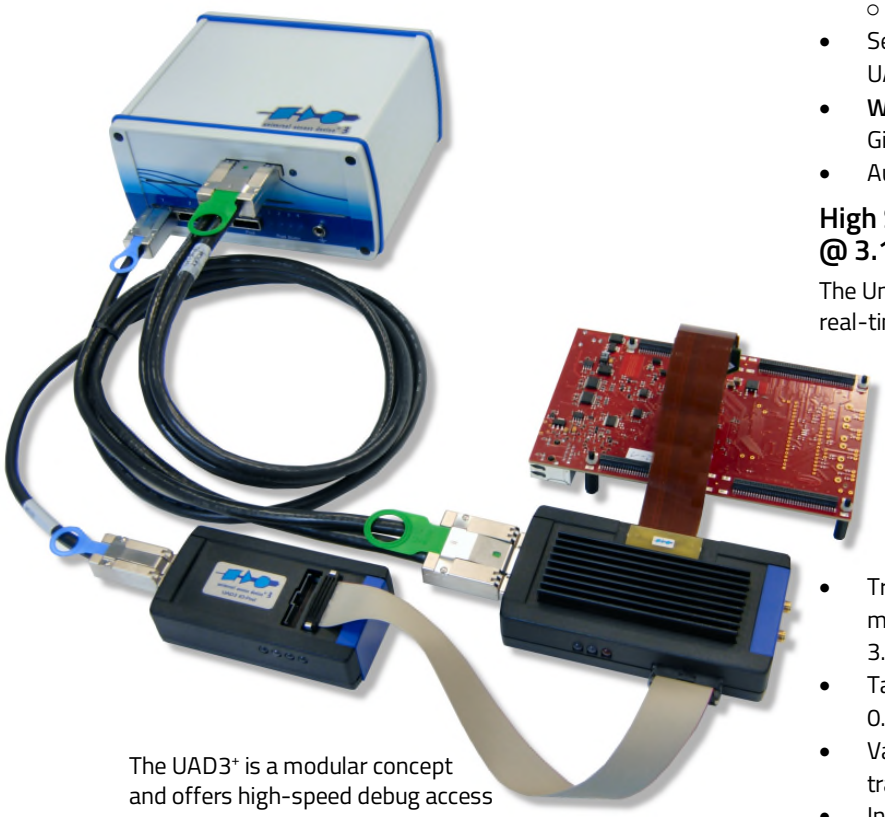
Universal Access Device 3⁺ – High-Speed Target Communication Accelerator Add-On for UDE®

The **Universal Access Device UAD3⁺** is the high-end member of the well-established UAD family. The **UAD3⁺** provides highly optimized high-bandwidth trace, multi-core and multi-target debugging, profiling, and calibration targeted for users of complex 64-bit, 32-bit and 16-bit microcontrollers.

High-Speed Multi-Target Access support, up to 100MHz

The UAD3⁺ is truly facilitates first class performance.

- High-speed JTAG/ DAP debug access with up to **100 MHz/ 160 MHz shift clock**.



The UAD3⁺ is a modular concept and offers high-speed debug access to AURIX, TriCore, Power Architecture, Cortex, S32V234, RH850, SH-2A, RISC-V, ARC, Arm7/9/11, XE166, XC2000, XScale and other MCU architectures. Optional JTAG extender pods are available with galvanic electrical isolation and ensure flexible adaptation with the target connector.

- Multi Target / Multi System Access - Up to eight cores and targets can be controlled, all with different debug protocols. Supported JTAG connector features include:
  - Standard I/O ring voltage 1.6V – 5.5V, extended I/O ring voltage 0.8 – 3.3V on request.
  - **OCDS JTAG connector**; 16 pin.
  - **Arm CoreSight connector**; 10 & 20 pin.
  - **Arm JTAG connector**; standard 20 pin.
  - **Nexus Debug Port connector.**
  - **CoreSight Serial Wire Debug (SWD) connector.**
  - Additional customer-specific debug connectors.
  - Optional galvanic isolation.
- Separated **JTAG extender pods** are connected to the UAD3⁺ by serial cables and offers lengths up to 5m.
- **Wide range of host interfaces** including: USB2.0, Gigabit-Ethernet (10/100/1000 Mbps), IEEE1394b.
- Automatic firmware update of UAD3+.

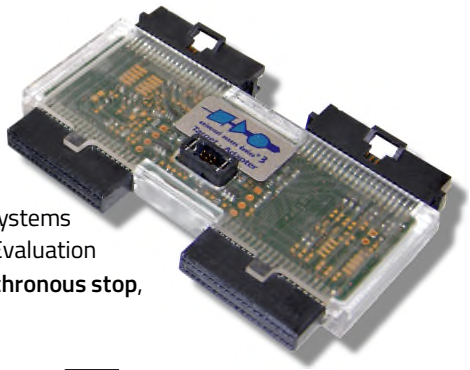
High Speed Serial Trace support up to 4 Lanes @ 3.125 Gbit/s

The Universal Access Device 3⁺ allows the user to record real-time trace information up to 500MHz.

- **ETM Mictor** and **Nexus class 3 Mictor** connectors.
- Maximum trace frontend bandwidth **800 MByte/s.**
- Trace memory extendable, up to **4 GBytes.**
- **Time-endless trace** for a continuous tracing and observation.

- Trace stream width up to 32-bit, and Half Rate clock mode up to 250 MHz, serial Aurora trace up to 3.125 Gbit/s.
- Target MCU I/O voltage used for I/O operations, 0.8V – 3.3 Volts.
- Variable time stamps are possible and inserted by the trace board on the frontend.
- Intelligent trace filters for optimal trace utilization, including Automatic edge detection.
- **Separated trace pod** is connected to the UAD3⁺ by a Gigabit serial multi-lane cable, with possible lengths of 0.5m, 1m, 2m, and 5m.
- External Trigger Pins.

UAD3+ Multi AURIX Debug Adapter



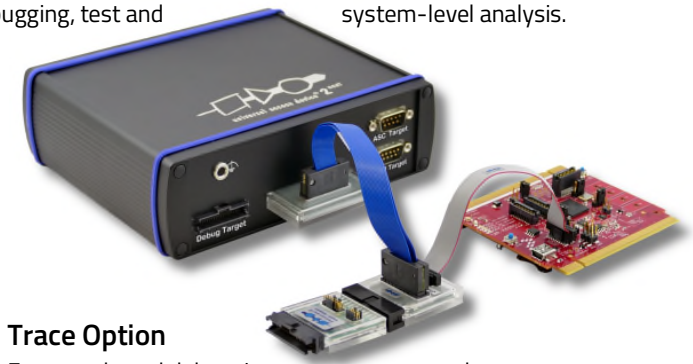
The UDE® Multi AURIX debug solution supports **AURIX™ systems with two separate microcontrollers** (MCUs) within one target system.

The UAD3 Multi AURIX Debug Adapter is an adapting solution and extension for the Universal Access Device 3+. It enables synchronized debugging of AURIX™ multi-chip systems with two tightly coupled AURIX™ MCUs (e.g. Infineon's Automotive Ethernet Gateway Evaluation Board) in one single debug session. The UDE® Multi AURIX debug solution ensures **synchronous stop**, **single step** and **restart** as well as **synchronized suspend of peripherals**.

Universal Access Device 2^{next} – All-Rounder for Debugging and Trace

The **Universal Access Device 2^{next}** is the new all-in-one device in PLS's UDE® target access device family. It acts as a bridge between the base model UAD2^{pro} and the high-end tool UAD3+ and combines the state-of-the-art debugging features of the UAD2^{pro} with trace capabilities, which makes it ideal for efficient debugging, test and system-level analysis.

- Proven and robust aluminum housing 17.0 x 14.5 x 5.5 cm



High-Speed Target Access

The UAD2^{next} is optimized for high-speed debug communication between UDE® running on the host PC and the target system.

- Proven target adapter solution offers fastest and reliable target access for state-of-the art debug interfaces: **DAP, SWD, JTAG, cJTAG, LPD.**
- High-speed debug access with up to **160 MHz shift clock** and **1.65 V – 5.5 V I/O voltages**.
- Galvanic isolated target adapters (RF coupler technology with 1,000 VRMS isolation) available.
- Longer distances between UAD2^{next} and target system. Up to 0.5 m possible, 2.0 m on request.
- Connectors for **ASC** and **CAN** with galvanic signal isolation up to 1,000 VRMS.
- Support for **DXCPL** (DAP over CAN Physical Layer).
- **USB3** or **Gigabit Ethernet** for connecting UAD2next to UDE® running on the PC.

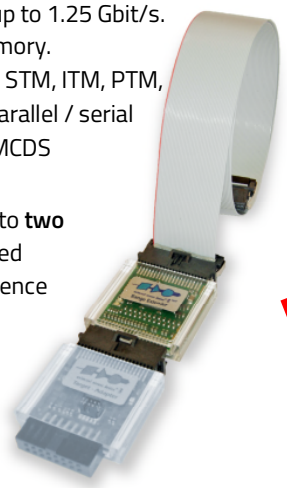
Trace Option

For trace based debugging, measurement and system-level analysis the UAD2^{next} can be extended with target specific trace modules.

- Easy mounting and robust plug-in modules for a wide range of trace interfaces.
- Up to 12-bit parallel trace with up to 250 Gbit/s.
- 2 lane serial trace supporting up to 1.25 Gbit/s.
- 512 MBytes internal trace memory.
- Ready for **Arm CoreSight** ETM, STM, ITM, PTM, Xilinx FTM, for **Nexus** class 3 parallel / serial **Aurora** trace and for Infineon MCDS

Universal Access Device 2^{next} Range Extender

The UAD2^{next} Range Extender increases the **distance** between the UAD2^{next} and the target system by up to **two meters**. This enables the UAD2^{next} to be used in test environments where larger distances must be bridged between the debug access device and the device under test. It is robust against electromagnetic interference through differential signal transmission between Range Extender and UAD2^{next}.

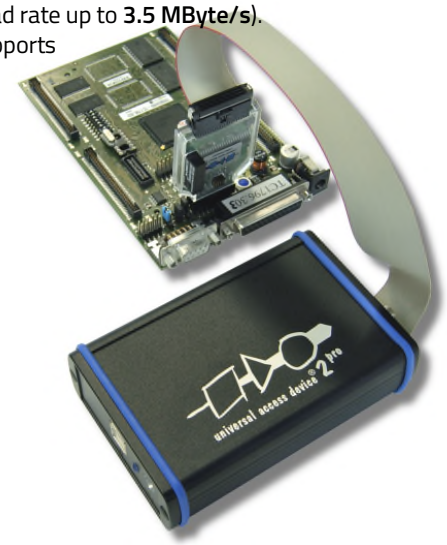


New

Please note the UAD2^{next} replaces the UAD2^{+}. For new projects, the UAD2^{+} is no longer available. Of course, all existing UDE®/UAD2^{+} licenses will be maintained continuously for the next years without limitations.

Universal Access Device 2^{pro} – Smart Communication Accelerator

The Universal Access Device **UAD2^{pro}** is the smart member of the UDE® target access device family. It offers the fastest available target access, via JTAG (up to **50 MHz** shift clock - download rate up to **3.5 MByte/s**). The UAD2^{pro} also supports the ASC, and CAN bootstrap loader.



High-Speed Target Access Modes UAD2^{pro}

- Separated target interface adapter.
- 1.6V – 5.5V I/O ring voltage.
- **JTAG /OCDS, SPD via CAN** and **DAP over CAN Physical Layer (DXCPL)**, **DAP, CoreSight (SWD)**, **Arm** JTAG, **and Nexus** Debug Port connector.
- Additional customer specific debug connectors are also possible.

Flexible Serial Target Access UAD2^{pro}

The UAD2^{pro} features flexible, high-speed communication via ASC RS232 and CAN interface to the TriCore, Power Architecture, and XC166 target systems via a serial D-Sub connector.

Host Connection via USB2.0

- 480 Mbps communication speed
- Supported OS: Windows®10/11 64-bit

Universal Access Devices – Comparison of Features and Functions

Feature	UAD2pro	UAD2next	UAD3+
Application purpose	Basic debugging Entry-level on-chip trace[1)] Production FLASH programming	Basic debugging and remote debugging Trace based debugging and measurement	High bandwidth trace recording for trace based system analysis, measurement and debugging Remote debugging Multi-target debugging
Supported debug channels	JTAG, cJTAG, DAP, DAP2, SPD (Single Pin DAP), NEXUS, SWD, LPD with up to 50 MHz 1.6 V - 5.5 V IO-voltage (0.8 V - 3.3 V on request)	JTAG, cJTAG, DAP, DAP2, SPD (Single Pin DAP), NEXUS, SWD, LPD with up to 160 MHz 1.6 V - 5.5 V IO-voltage (0.8 V - 3.3 V on request)	JTAG, cJTAG, DAP, DAP2, SPD (Single Pin DAP), NEXUS, SWD, LPD with up to 160 MHz 1.6 V - 5.5 V IO-voltage (0.8 V - 3.3 V on request)
Additional communication channel support	CAN, DXCPL (DAP over CAN Physical Layer), ASC via RS232 SUB-D9 (male) connector for CAN (CiA pin assignment) and ASC	CAN/CAN FD[2)], DXCPL (DAP over CAN Physical Layer), ASC via RS232 SUB-D9 (male), CAN connector (CiA pin assignment) SUB-D9 (male) ASC connector	Up to four Debug Pods with two debug interfaces each Additional connector for Trace Pod
Trace support	NEXUS, MCDS, miniMCDS, CoreSight™ on-Chip trace[1)]	Arm CoreSight™ ETM, STM, ITM, PTM, FTM NEXUS, MCDS, miniMCDS Plug-in trace module for AURORA up to 2 lanes @ 1.25 Gbit/s Plug-in parallel trace module, up to 12 bit, up to 250 Mbps, 1.6 V - 5.5 V IO-voltage On-Chip trace	Arm CoreSight™ ETM, STM, ITM, PTM, FTM NEXUS, MCDS, miniMCDS Trace Pod for AURORA, up to 4 lanes @ 3.125 Gbit/s Parallel trace Pod, up to 32 bit, up to 500 Mbit/s, 0.8 V - 3.3 V IO-voltage On-Chip trace
Trace memory	– [3)]	512 MBytes	Up to 4 GBytes
Other features	Build-in ESD protection Galvanic isolated target interfaces as an option Ground socket	Build-in ESD protection Galvanic isolated target interfaces as an option Ground socket	Separate Debug and Trace Pods for up to 5 meters distance to base device Galvanic isolated target interfaces as an option Ground socket
Communication to host PC	USB2.0	USB3 Gigabit-Ethernet	USB2.0 Gigabit-Ethernet IEEE1394b (FireWire-800)
Power supply	External, 12 V DC	External, 12 V DC	External, 18 V DC
Supported host operating systems	Windows 10/11	Windows 10/11	Windows 10/11
Size (W x D x H)	8.5 x 13 x 3.5 cm (3.3 x 5.1 x 1.4 in)	17 x 14.5 x 5.5 cm (6.7 x 5.7 x 2.2 in)	17 x 14.5 x 8.5 cm (6.7 x 5.7 x 3.3 in)
Housing material	Aluminum	Aluminum	Aluminum

[1)] For devices equipped with on-chip trace memory [2)] On request [3)] On-Chip trace memory of target devices used. Depends on target.

Monitor Development Kit – Add-On for UDE® Universal Debug Engine

Your Universal Target System Access to XC166, TriCore*, Arm* Hardware

The Monitor Development kit add-on for the UDE® provides universal target system access to XC 166, TriCore*, and Arm* devices. The basic package of UDE® includes target monitors for a number of evaluation boards and a generic bootstrap loader monitor.

Although the basic package of the UDE® includes target monitors for a number of evaluation boards, as well as a generic bootstrap loader monitor, the Monitor Development Kit ad-on allows the developer to create application hardware specific monitors for XC166, TriCore* and Arm*, with on-chip CAN controller based target systems.

In addition to the ASC/RS232, many other serial interfaces are supported to allow the developer maximum flexibility for adapting the microcontroller hardware.

The monitor requires 3-18 kByte s in ROM/FLASH, and 100-3000 bytes of RAM. Debugging, via a particular serial interface, disables the interface for the application, except for CAN debugging which can be used in parallel to an application running CAN.

Watchdog handling support is possible.

The portable monitor development toolkit is available for the various compilers; e.g. for Tasking and GNU compiler.

For your convenience, the first monitor adaptation to your target system is FREE of charge.

Package Contents

- Source code for various communication paths between target and host PC:
  1. Asynchronous serial RS232 interface.
  2. Asynchronous serial RS232 interface with bootstrap loader support.
  3. Synchronous serial interface (SSC Interface).
  4. Synchronous serial interface (3Pin Interface).
  5. CAN (XC166, TriCore, and Arm derivatives with on-chip CAN controller). The CAN interface may be shared with the application.
- Monitor Main Code in multiple object files for the XC166, TriCore*, and Arm* derivatives.
- Source examples for monitor reset code.
- Product user manual.
- Software is free for use in customer applications but is not for resale as a development tool.

Please note: Not all interfaces are supported on all derivatives.

Package Support

Monitor Development Kit- Basic version (Level B)
Level B includes monitor software **including one fully configured adaptation** specially designed to fit the customer's requirements. Support during start-up of the customized monitor is included, and available, via telephone or e-mail. The user may generate an unlimited number of additional customer specific configurations. Additional configuration services are available by PLS, upon request.

Monitor Development Kit- Source included version (Level S)
In addition to Level B, the Level S kit comes with all sources for target routines, including source updates via the Internet, and includes **an unlimited number of customized adaptations from PLS for one year from purchase date.**

Access to Target (Communication Channels)

Controller Peripheral	Interface	Transfer rate
ASC	RS232/TTL	Up to 115 kbps
SSC	RS485/TTL	Up to 5 Mbps
3-Pin	RS485/TTL	Variable
CAN (On-Chip CAN)	CAN-Bus	Up to 1 Mbps

Resources required by the monitor:

- 3 to 18 kBytes ROM (dep. from the used target).
- 100 Bytes to 3 kBytes of RAM (depending from the used target).
- Debug interrupt; communication channel interrupt.
- Optional one timer.
- CAN Monitor: 2 message objects, and 4 identifiers.

Special Solutions Available:

- Bootstrap loader + SSC / 3Pin / CAN combines availability of special interfaces with the convenience of ROMless debug target systems.
- Service Monitors for all interfaces available for integration into the product; especially useful for on-site control and setting parameters in the application.
- Watchdog handling is possible.

Please ask for your specific monitor solution.

* On request

In-System Memory Programming PCM, FLASH and OTP - UDE® Memtool

Speed up your turn-around cycle by programming the FLASH directly from the UDE® Universal Debug Engine! When using the debugger as a service and maintenance tool, firmware updates may be performed quickly and easily, in just one step!

Usage

UDE® Memtool is used for programming on-chip or external FLASH/OTP EPROM's on the AURIX, TriCore, Power Architecture, Cortex, RH850, SH-2A, RISC-V, ARC, Arm7/9/11, XE166, XC2000 target systems directly from the UDE®.

Supported Controller Derivatives

- Latest AURIX, TriCore, Power Architecture, Cortex, RH850, SH-2A, RISV-V, ARC, Arm, XE166, XC2000 derivative's On-Chip FLASH (for complete list see our website https://www.pls-mc.com/).
- Phase-Change Memory (PCM) of Stellar from ST.

Supported external FLASH-EPROM's

- M29Fxxx, M29Wxxx Family and 100% compatible external FLASH.
- AT29Cxxx Family external FLASH.
- SST39VFxxx, SST39LFxxx Family external FLASH.
- M58BWxxx Family external FLASH.
- i28Fxxx Family external FLASH.
- 24LC xx Family external FLASH.
- I²C, SPI, SPIFI FLASH support.
- NOR-/NAND-FLASH support.
- eMMC-FLASH support.
- Further devices under preparation, or on request.

Features

- Easy-to-Use: FLASH/OTP programming is integrated in the debugger-to-target program download.
- Loading Intel **Hex** and Motorola S-Record files.
- Transparent Erase Mode.
- Setting and Resetting the Chip/Sector Protection if applicable (on-chip only) support.
- **UCB, DF1** handling for some derivatives.
- **ABM**, **BMI** header handling for some derivatives.
- Support of **Phase-Change Memory (PCM).**

Operation

Automatic activation is done after the download of an application into the target, if write access onto the FLASH is required. All areas to be programmed are displayed in a dialog box. Programming may be started, or cancelled manually.

Communication between Host PC and Target System

All communication channels supported by UDE®, as ASC and CAN bootstrap loader, ASC, SSC, 3Pin, CAN and JTAG, DAP, SWD can be used. Use of appropriate interface hardware is required. The Memtool also offers the host-target communication, via bootstrap loader mechanism of the XE166, XC2000, TriCore, TriCore AURIX, MPC57xx, SPC57x, SPC58x derivatives, and a standard RS232 host interface (COMx). Beside RS232, the usage of the K-Line interface is also possible.

UDE® Memtool only uses on-chip RAM for execution.

UDE® Memtool and Automation

The UDE® Memtool comes with a separate front-end interface standalone tool, outside of the UDE®. All programming functions are also available via standard COM automation interfaces. Using these interfaces, the features of Memtool may be integrated into automatic production and test systems, or can be executed via scripts.

The UDE® Memtool can be further customized to include even more advanced features; e.g. integration into automatic production and test systems. With a full-custom UDE® Memtool, even more advanced features can be included into UDE® Memtool; e.g. integration into automatic production and test systems. Please contact us for a quote regarding a Memtool to fit your specific needs.

Communication devices supported between Host PC and Target System

Target µController[2] Communication interface	Universal Access Device 3⁺	Universal Access Device 2^next	Universal Access Device 2^pro	Host Serial RS232
TriCore, PowerArch, XC166, XC2000, XMC1000, XMC4500 **ASC bootstrap loader**		✓	✓	✓
TriCore , PowerArch, XC166, XC2000, XMC4500 **CAN bootstrap loader**		✓	✓	
TriCore , PowerArch, XC166, XC2000 **K-Line interface**		✓[1]	✓[1]	✓[1]
TriCore, PowerArch, Arm, Cortex, RH850, SH-2A, RISC-V, ARC, XC2000 **JTAG/DAP/SWD interface**	✓	✓	✓	

[1] External K-Line adapter required [2] Ask for supported derivatives and see website https://www-pls-mc.com/

UDE® Universal Debug Engine MCU Support Summary

New

UDE® Derivative Family*	C166S V2*		AURIX , TriCore [MCA]*					Power Architecture [MCA]*							Cortex-M0/M0+/M3/M4/M7/M23/M33/R4/R52/A8/A9/A53/A72 [V8] Arm7 Arm9 Arm11 Xscale*																							ARC / RISC-V* RH850*						
	XC166	XC2000, XE166, XC2000ED	TC1766ED, TC1796ED, TC1798ED	TC22x, TC23xED, TC24xED, TC29xED	TC33x, TC35x, TC37x, TC38x, TC39x	TC38xED, TC39xED	TC4x, TC4Dx	PPC440, PPC460EX, PPC460GT	Xilinx XC5VFX Virtex5	MPC567x, SPC560, SPC563, SPC564A	SPC56EL, SPC56HK, SPC56x	MPC572x, MPC574x, MPC577x	SPC57x, SPC58x	S32R 274, S32R372	ADuC70xx, AT91Mx, AT91SAMx	Ertec200p, i.MX21, i.MX25	LH7A400N0x, LPC2xxx, LPC3xxx	MAC7xxx, NetX10, NetX51, NetX1/500	NUC100, NS7520, NET+Arm	STR7xx, ST30F77xx, STR91x,	i.MX31, i.MX35, i.MX37, IXP4x	i.MX51, OMAP35xx, AM35xx, Zynq-7000	S32G2, S32V234	TDA4VM, DRA829, R-Car H3/M3	A2Fxx, AT91SAM3, EFM32x, EM773	FM3/FM4, LM3S, LPC1xxx, LPC4xxx	K20/K30/K60/K80/KV40/KV5, RA4/RA5	STM32, TLE98xx, TMPx3, TX03	XMC1000, XMC4500, XMC4800, NetX90	i.MX RT1160/1170, i.MX RT10xx, S32K1	PSoC4 4000, RA2A1/RA6M5/RA6T2	T2G CYT2/CYT3/CYT4/CYT6, XMC7000	S32K3, S32M2, KW45, Stellar SR5E1	TMS570, RM4xx	S32Z, S32E, S32S24	Stellar SR6G/SR6P	RZ/N2L, RZ/T2M	ARC EM4/EM22/EV7/HS3/HS4/HS5	RISC-V E20/E24/FE310	RH850 G3K F1KM/F1KH/F1L/E1M	RH850 G3M F1H/P1H/P1M/E1L/E1M	RH850 G4M E2H/E2M/E2UH/U2A/U2B	SH7201/SH7211/SH7251/SH7256	SH7261/SH7267
UDE® for XC166	✓	✓																																										
UDE® for TriCore			✓																																									
UDE® for TriCore[MCA]				✓	✓	✓																																						
UDE® for TriCore TC4							✓[3]																																					
UDE® for PowerArch								✓	✓	✓	✓																																	
UDE® for PowerArch[MCA]												✓	✓	✓																														
UDE® for Arm7/9															✓	✓	✓	✓	✓	✓																								
UDE® for Arm11																					✓																							
UDE® for Cortex-A																						✓																						
UDE® for Cortex-AV8																							✓	✓											✓[1]									
UDE® for Cortex-M																							✓[6]		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓[6]	✓[6]								
UDE® for Cortex-R																								✓[6]										✓										
UDE® for Cortex-RV8																																			✓[1]	✓[1]	✓							
UDE® for ARC																																						✓						
UDE® for RISC-V32																																							✓					
UDE® for RISC-V64																																							✓[6]					
UDE® for RH850-G3K																																								✓				
UDE® for RH850-G3M																																									✓			
UDE® for RH850-G4M																																										✓		
UDE® for RH850-ICU																																									✓[6]	✓[6]		
UDE® for SH-2A																																											✓	✓
UDE® for HSM[1] / CSRM[1]				✓[1]	✓[1]	✓[1]	✓[1]					✓[1]	✓[1]																				✓[1]		✓[1]	✓[1]								
UDE® for GTMv4							✓[1]																												✓[1]							✓[1]		
Communication Channels - Target Monitor Interfaces																																												
DAP[1] /JTAG /ICE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
DXCPL[1] (DAP over CAN)			✓	✓	✓	✓	✓																																					
Aurora/Nexus Trace[1]				✓[1]	✓[1]	✓[1]	✓[1]		✓[1]	✓[1]	✓[1]	✓[1]	✓[1]	✓[1]									✓[1]												✓[1]	✓[1]								
SWD/SWV/ITM/ETM/ETB[1]															✓[1]	✓[1]	✓[1]	✓[1]		✓[1]	✓[1]	✓[1]	✓[1]	✓[2]	✓[1]	✓[1]	✓[1]	✓[1]	✓[1]	✓[1]	✓[1]	✓[1]	✓[1]	✓[1]	✓[1]	✓[1]	✓[1]							
PTM/FTM[1]																						✓[1]																						
ASC-BSL, CAN or CAN-BSL[1]	✓	✓	✓[1]	✓[1]	✓[1]	✓[1]	✓[1]		✓[2]	✓[2]	✓[2]	✓[2]	✓[2]	✓[2]							✓[2]	✓	✓[2]																					
Enhanced Trace Support – Universal Emulation Configurator																																												
UEC (MCDS)		✓[4]	✓[4]	✓[4]	✓[4]	✓[4]	✓[4]																																					
UEC (miniMCDS)					✓[1]	✓[1]	✓[1]																																					
UEC (SPU)												✓[5]	✓[5]																															
FLASH/OTP Programming Support																																												
Programming[1]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3rd Party Tool Support / Operating System Support																																												
Virtualizer (Synopsys)					✓	✓	✓							✓																														
TPT (PikeTec)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓
ECU-TEST (Tracetronic)					✓	✓	✓					✓	✓	✓																														
CMX-RTX RTOS	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓							
µC/OS-II RTOS										✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓									✓	✓
RTX RTOS															✓	✓	✓	✓	✓				✓			✓	✓	✓	✓	✓	✓	✓	✓	✓										
PXROS RTOS	✓	✓	✓	✓	✓	✓	✓																																					
SAFERTOS / FreeRTOS			✓	✓	✓	✓	✓		✓			✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓			✓	✓	✓	✓	✓		✓					✓				✓	✓

* See full list at https://pls-mc.com/products/architectures-vs-ude-product-features/ 1) depends on device 2) on request 3) in preparation 4) for Emulation Device 5) for SPU 6) required as additional add-on

AURIX, TriCore, Power Architecture, Cortex, S32, Arm, RH850, SH-2A, XE166, XC2000, Compilers - An Essential Part of Your Development Environment for the creation of Embedded Applications

UDE® fully supports cross compiler packages for the AURIX, TriCore, Power Architecture, Cortex, S32, Arm, RH850, SH-2A, XE166, XC2000, XScale families – HighTec (GNU), Wind River, Byte Craft, ImageCraft, and Renesas. Using the UDE® Universal Debug Engine, you will be able to optimize the flexibility and efficiency of the selected compiler. A description of all supported compilers can be seen below. Since each compiler has its' own characteristics and features, please contact us if you have special development, or system requirements.

HIGHTEC LLVM and GCC based C/C++/Rust compiler

HighTec offers LLVM and GCC based compiler for C/C++ and Rust (AURIX, ARM) for different architectures: AURIX, ARM, RISC-V, PPC, RH850, XC800, MCS

TriCore architecture support

- All TriCore derivatives are supported.
- Fast and flexible TriCore interrupt/trap interface.
- TriCore-optimized DSP support library (C++).
- PCP C compiler.

Power Architecture support

- Little-endian and big-endian format are supported.
- VLE and SPE are supported.

Arm architecture support

- Support of "Arm Procedure Call" standard.
- 32-bit Arm and 16-bit Thumb instruction code.
- Little-endian and big-endian format are supported.

Other compiler features

- Supports the "ISO C" standard.

Debugging Support:

- When using UDE®, the complete symbolic information is used for C-level high-performance debugging.

TASKING TriCore, ARC, XE166, XC2000, Arm C/C++

The Tasking compiler is designed for all derivatives of the TriCore, ARC, XE166, XC2000, Arm microcontroller families. The generated program code shows compact size and excellent performance.

TriCore Architecture Support

- PCP assembler support for the TriCore's PCP.
- Infineon Technologies TriCore EABI compliant.
- Language extensions for Embedded/DSP/TriCore.
- VX technology for optimization of code size/ speed.

XE166, XC2000 Architecture Support

- User stack model for function calls are supported (to speed up RTOS task switches).
- VX technology for optimization of code size/ speed.

Arm Architecture Support

- Arm Mode and Thumb Mode Code Generation.

Other Compiler Features

- ISO C'99 and ISO C++ 14882-1998 compliant.
- C-level interrupt functions.
- IEEE floating-point operations.
- Re-entrant code and libraries.
- Industry standard ELF / DWARF3.0 and IEEE-695 output formats.

C++ Compiler

- C++ features like Dynamic Allocation of Objects, Passing References, Operator Overloading, Data Hiding, and Inheritance, are supported.

Debugging Support

- When using UDE®, the complete symbolic information is used for C-level high-performance debugging.

RTOS Support

- CMX-RTX (CMX Company).

KEIL/Arm and CA166 Compiler

The Keil/Arm C/C++ compiler is designed for all derivatives of the Arm7/9/11, and Cortex microcontroller families. The Keil CA166 compiler is designed for all derivatives of the XC166 microcontroller families.

Arm architecture support

- Arm Mode and Thumb/Thumb2 mode code function attributes for Hardware Support.
- C-level interrupt functions.
- User stack model for function calls are supported (to speed up RTOS task switches).
- Industry standard ELF / DWARF3.0 output format.
- Little-endian and big-endian format are supported.

XC166 architecture support

- Full pointer support for the 16K page architecture.
- C-level access to Special Function, MCU Registers.

Library Set

- C-interface and runtime library (different models).
- Floating point libraries.
- Re-entrant Run-time Library.
- Thread-safe Floating-point Operations.

Debugging Support:

- When using UDE®, the complete symbolic information is used for C-level high-performance debugging.

RTOS Support

- ARTX-Arm (Keil).
- RTX 166 (Keil).
- CMX-RTX (CMX Company).

Green Hills C/C++ Power Architecture, Arm, RH850 Compiler

The Green Hills Software C/C++ compiler is designed for all derivatives of the Power Architecture microcontroller families.

Power Architecture support

- Highly optimized compiler in program execution speed and program size.

Compiler compatibility

- Standard (ANSI/ISO) C++.
- Embedded C++ (EC++) with Templates.
- K&R Mode and Extensions to ANSI C.
- GNU C/C++, MISRA C Extensions.

Debugging Support:

- When using UDE®, the complete symbolic information is used for C-level high-performance debugging.

RTOS Support

- INTEGRITY, velOSity, µ-velOSity royalty-free RTOS*

* On request.

Byte Craft eTPU C Compiler

The Byte Craft eTPU C compiler is designed for the Enhanced Time Processing Unit (**eTPU**).

eTPU architecture support

- Highly optimized generated code.
- eTPU compiler works in conjunction with a host CPU compiler, to create CPU/eTPU applications.

Other compiler features

- Enhanced memory management support.
- Object libraries can be included directly in C source files, using Absolute Code mode.
- Extensions to the C language designed specifically for the embedded systems developer.

The C Compiler Package Includes:

- Optimizing C Compiler.
- BCLink Linker.
- Build-in Macro Assembler.

Debugging Support:

- When using UDE®, the complete symbolic information is used for C-level high-performance debugging.

WIND RIVER

Wind River C/C++ TriCore, Power Architecture, and Arm Compiler

The Wind River Compiler combines industry-leading optimization technology, with the flexibility and control needed to fully exploit today's complex Cores.

TriCore architecture support

- All TriCore derivatives are supported.

Power Architecture support

- Diab technology.
- VLE support.

Arm architecture support

- Arm7, Arm9, Arm11, and Cortex support.
- Arm and Thumb instruction set support.

Compiler features

- Industry-leading optimization technology.
- Performance and code size.
- Designed for demanding embedded requirements.
- 100% C++ ANSI compliance.
- Interoperability with other development tools.
- Professional support.

Debugging Support:

- When using UDE®, the complete symbolic information is used for C-level high-performance debugging.

RENESAS

Renesas C/C++ SH-2A, RH850 Compiler

The RENESAS compiler has a powerful optimization function for exhibiting the microcomputer performance to its full capacity in order to create a compact code.

SH-2A, RH850 architecture support

- All SuperH, RH850 derivatives are supported.

Compiler features

- Optimizing ANSI C and ANSI C++ compiler.
- Extended language function for the SuperH RISC and RH850 engine family.
- Complies with C/C++ language in ANSI specification.
- Introduces the latest optimization technology developed for supercomputers.
- Improved compile list output.
- Data types of 'long long' and 'unsigned long long' are supported.
- Standard object format (ELF/DWARF2).

Library set

- Embedded C++ language spec-compliant class libraries.
- High performance DSP library optimized by DSP instruction.

Debugging Support:

- When using UDE®, the complete symbolic information is used for C-level high-performance debugging.

CodeWarrior C/C++ Compiler for MPC55xx, MPC56xx, MPC57xx Power Architecture

The CodeWarrior Development Studio is designed for all derivatives of the NXP MCP55xx, MCP56xx, and MCP57xx Power Architecture.

MPC55xx architecture support

- All NXP MPC55xx, MPC56xx, MPC57xx derivatives are supported.

Compiler Features

- VLE Support.
- Industry standard ELF /DWARF 2.0 output format.

Debugging Support:

- When using UDE®, the complete symbolic information is used for C-level high-performance debugging.

Need a Real-Time Operating System for Your Application?
UDE® Universal Debug Engine supports it.

HIGHTEC

PXROS Real-Time Awareness for TriCore, Power Architecture, Arm

PXROS stands for **P**ortable e**X**tendable **R**eal-Time **O**perating **S**ystem. PXROS is a micro-kernel real-time operating system ported to run on TriCore, Power Architecture, and Cortex-M microcontrollers. PXROS allows you to design modern, object-oriented applications with independent tasks and associated handlers for high priority actions.

Manufacturer: HighTec EDV Systeme

- PXROS Real-Time Kernel.
- PXmon/ PXmon-RT Task Level Debugger.
- PXtcp TCP/ IP functionality.

Features

- PXROS-HR (TriCore) memory protection system.
- Pre-emptive multitasking.
- Scalable execution time.
- No interrupt locking for task switches.
- Implemented as C library.
- Small kernel code (7 to 14 kBytes).
- Task execution management.
- Handling for dynamically allocated memory objects.
- Timer management.
- Compiler support: GNU, and TASKING.

PXROS-HR Support for TriCore and AURIX

PXROS-HR is an object oriented real-time operating system for Infineon TriCore and AURIX and successor of the original real-time micro-kernel PXROS. PXROS-HR is officially safety approved and certified to be used for safety-related applications up to SIL3 (IEC61508) and ASIL-D (ISO 26262). It improves concepts of encapsulation and robustness by using the hardware protection mechanisms (MPU) of TriCore and AURIX.

Features

- Certified for safety-related applications up to SIL 3 (IEC61508) and ASIL D (ISO 26262)
- Excellent interrupt behavior (no interrupt locking!)
- Extreme robust behavior under heavy load
- Automatic run-time checks performed by the AURIX MPU
- Reloading and debugging tasks at run-time

CMX COMPANY

CMX-RTX™ for TriCore, Power Architecture, Arm, Cortex-M, XC166

The CMX-RTX™ Real-Time Operating System (RTOS) is a fully pre-emptive operating system, with a powerful set of system functions, very moderate memory requirements, and fast system response time.

Manufacturer: CMX Company

- CMX-RTX™ Real-Time Kernel.
- CMXBug™ Task Level Debugger (include in the CMX-RTX package included).
- CMXTracker™ CMX System activities logger.

Features

- Pre-emptive multitasking.
- Scalable execution time.
- Very small kernel code (approx. 5 kBytes only).
- Fast context switch and interrupts.
- Handling for dynamically allocated memory objects.
- FREE System Level Debugger CMXBug™.
- Compiler support: KEIL, TASKING.

rcX – High Performance Real-Time Awareness

The Architecture of rcX is organized to provide excellent Hard-Real-Time performance for small to medium sized embedded netX applications. The internal Kernel arrangements covering the Object Data Structures, Intertask Communication Paths and the Time Management. They are highly optimized in their sizes and access speed.

Manufacturer:
Hilscher Gesellschaft für Systemautomation mbH

Features

- Pre-emptive Multitasking Kernel.
- Well-crafted Services for Semaphore, Mutex, Event, Message, and Queue.
- Memory and Timer-Objects.
- Dynamic creation of an unlimited number of Objects.
- Centralized configuration in one parameter-file.
- On-Chip-integrated in netX-ROM.

RTOS Support

RTX – Real-Time Awareness for Cortex, Arm

The Keil RTX is a royalty-free, deterministic Real-Time Operating System designed for Arm and Cortex-M devices. It allows you to create programs that simultaneously perform multiple functions and helps to create applications, which are better structured and more easily maintained.

Manufacturer: Arm Ltd and Arm Germany GmbH

Features

- Royalty-free, deterministic RTOS with source code.
- Flexible Scheduling: round-robin, pre-emptive, and collaborative.
- High-speed real-time operations with low interrupt latency.
- Small footprint for resource constrained systems.
- Unlimited number of tasks each with 254 priority levels.
- Unlimited number of mailboxes, semaphores, mutex, and timers.
- Support for multithreading and thread-safe operation.

MicroC/OS-II Awareness for TriCore, Arm

µC/OS-II, The Real-Time Kernel is a portable, ROMable, scalable, pre-emptive real-time, multitasking kernel for microprocessors and microcontrollers. µC/OS-II can manage up to 63 application tasks.

Manufacturer: Micriμm

Features

- Semaphores and Event Flags.
- Mutual Exclusion Semaphores.
- Message Mailboxes and Queues.
- MISRA C Compliance, Source Code included.
- Task Management (Create, Delete, Change Priority, Suspend/Resume etc.).
- Fixed Sized Memory Block management.
- Time Management.
- **No royalties for embedded code!**

AUTOSAR Classic Awareness for TriCore, Power Architecture

(AUTomotive Open System ARchitecture) is a worldwide development partnership of automotive interested parties. It pursues the objective of creating and establishing an open and standardized software architecture for automotive electronic control units (ECUs).

It pursues the objective of creating and establishing an open and standardized software architecture for automotive electronic control units (ECUs).

Features

- Based on OSEK (“Offene Systeme und deren Schnittstellen für die Elektronik in Kraftfahrzeugen”)

Three layered software architecture of AUTOSAR

- Basic software.
- Runtime environment.
- Application layer.

SAFERTOS Awareness for TriCore, Power Architecture, Cortex, Arm

SAFERTOS® is a safety certified Real Time Operating System (RTOS) for embedded processors. It delivers superior performance and pre-certified dependability, whilst utilizing minimal resources.

Manufacturer: WITTENSTEIN Group

Features

- Developed by WHIS, a safety systems company.
- Supports a wide range of international development standards.
- Based on the FreeRTOS functional model.

Available pre-certified to IEC 61508-3 SIL 3.

FreeRTOS Support

FreeRTOS™ is an open source real-time operating system kernel available for a large number of microcontroller platforms and small devices. The design follows the principle to be small and simple.

Features

- Tiny, power-saving kernel
- Large architecture support
- Modular libraries
- MIT licensed, with options

Curious About What the UDE® Universal Debug Engine Can Do for Your Application Development?

Interested in a Crash Course or Special AURIX, TriCore, MCDS, Power Architecture, Arm/Cortex and UDE® Universal Debug Engine Classes?

Are you interested in gaining expert's knowledge about development systems for the AURIX, TriCore, MCDS, Arm/Cortex, and SPC5x/MPC5x?
Are you looking for support in configuring and launching your development environment?

Are you getting stuck in problems with your embedded application and need help?

In close cooperation with our partners in education, we offer classes for all AURIX, TriCore, MCDS, Arm/Cortex, and SPC5x/MPC5x related products. The contents of the classes may be fully adapted according to your special requirements. This way, immediate success is guaranteed when you start developing your application! You will be able to use all the tools of your embedded development tool chain efficiently right from the beginning - without the hassle of time-consuming, self-educating, trial-and-error methods!

PLS Special Classes

Simply tell us your special questions or problems and we will construct and execute individual training classes for you or your entire department.
For example, one of our experienced staff members can personally teach you or your team, saving countless hours when back at your desk. We also offer technical consulting when working on your project.

Our goal is to enable you to work successfully with your development workbench, using all advanced features in a highly efficient way. Together, with an experienced support engineer on your side, we can turn problems into solutions!

Time and location of the classes may be scheduled according to your needs. We offer in-house classes at your site, as well as courses in our home office in Lauta, Germany.

Please contact us! Just fill in the Request Form on the last page of this booklet or give us a call. It would be our pleasure to offer you a customized quotation!

Debugging with UDE® Universal Debug Engine

This one-day class is held in cooperation with MicroConsult at their Munich / Germany headquarters or in-house with the customer. The class is especially intended for engineers and technicians employed in planning, development, preparing, and realizing complex embedded applications.

Based on your experience in application development with the AURIX, TriCore, MCDS, Arm/Cortex, and SPC5x/MPC5x architecture, you will be enabled to rate the features and performance of a debugger and to use it efficiently for development, testing, and maintenance.

Beside theory, you will also be presented hands-on instruction regarding how the UDE® Integrated Development Environment is configured and adapted to supported target system hardware.

We would be pleased to serve you with detailed information about the agenda and upcoming classes. Just fill in the Request Form on the last page of this booklet or give us a call.

* Subject to previous knowledge and experience with similar development projects.

Ordering Codes Overview - HLL Debugger UDE®

UDE® Access Device / Target MCU Host Communication	UAD3+	UAD2next	UAD2pro
	Host: USB2.0, IEEE1394b, Gigabit-Ethernet	Host: USB3, Gigabit-Ethernet	Host: USB2.0
TriCore / AURIX			
JTAG / DAP OCDSL1	UDE-LIC-TC[-MCA][1]/UAD3+	UDE-LIC-TC[-MCA][1]/UAD2next	UDE-LIC-TC[-MCA][1]/UAD2pro
OCDSL2 Trace Add-On	+ UDE-LIC-TC/UAD3+ OCDSL2 Trace Add-On[3]		
Aurora Trace Add-On	+ UDE-LIC-TC-MCA/UAD3+ Aurora Trace Add-On[3]	+ UDE-LIC-TC-MCA/UAD2next Aurora Trace Add-On 512 MBytes	
MCDS UEC Add-On	+ UDE-LIC-TC UEC/MCDS Add-On	+ UDE-LIC-TC UEC/MCDS Add-On	+ UDE-TC-LIC UEC/MCDS Add-On
ASC/CAN-Bootstrap Loader		UDE-LIC-TC[-MCA][1]/UAD2next	UDE-LIC-TC[-MCA][1]/UAD2pro
CAN-ROM / OCDSL1 Monitor Add-On		+ UDE-LIC-TC[-MCA][1]-Monitor[2]	+ UDE-LIC-TC[-MCA][1]-Monitor[2]
Power Architecture			
JTAG / OnCE	UDE-LIC-PA[-MCA][1]-ONCE /UAD3+	UDE-LIC-PA[-MCA][1]-ONCE /UAD2next	UDE-LIC-PA[-MCA][1]-ONCE /UAD2pro
Nexus Trace Add-On	+ UDE-LIC-PA-MCA/UAD3+ Nexus Trace Add-On[3]	+ UDE-LIC-PA-MCA/UAD2next Nexus Trace Add-On 512 MBytes	
Nexus Aurora Trace Add-On	+ UDE-LIC-PA[-MCA][1]/UAD3+ Nexus Aurora Trace Add-On[3]	+ UDE-LIC-PA[-MCA][1]/UAD2next Nexus Aurora Trace Add-On 512 MBytes	
SPU UEC Add-On	+ UDE-LIC-PA UEC Add-On	+ UDE-LIC-PA UEC Add-On	+ UDE-LIC-PA UEC Add-On
Cortex-M0, Cortex-M3, Cortex-M4, Cortex-M7, Cortex-M23, Cortex-M33, Cortex-M52, Cortex-M55, Cortex-M85, Cortex-R4, Cortex-R5, Cortex-R52, Cortex R52+, Cortex-A8, Cortex-A9, Cortex-A53, Cortex-A57, Cortex-A72			
JTAG, SWD, ITM	UDE-LIC-CX[-M][1][-R][1][-A][1] [-MCA][1]/UAD3+	UDE-LIC-CX[-M][1][-R][1][-A][1] [-MCA][1]/UAD2next	UDE-LIC-CX[-M][1][-R][1][-A][1] [-MCA][1]/UAD2pro
ETM Trace Add-On	+ UDE-LIC-CX/UAD3+ ETM Trace Add-On[3]	+ UDE-LIC-CX/UAD2next ETM Trace Add-On[3]	
Arm7, Arm9, Arm11, XScale			
JTAG, SWD, ITM	UDE-LIC[- ARM7/ARM9][1] [-ARM11][1]/UAD3+	UDE-LIC[- ARM7/ARM9][1] [-ARM11][1]/UAD2next	UDE-LIC- [- ARM7/ARM9][3] [-ARM11][3]/UAD2pro
ETM Trace Add-On	+ UDE-LIC[- ARM7/ARM9][1] [-ARM11][1]/UAD3+ ETM Trace Add-On[3]	+ UDE-LIC[- ARM7/ARM9][1] [-ARM11][1]/UAD2next ETM Trace Add-On[3]	
RH850			
JTAG	UDE-LIC-RH850-G3K/UAD3+ UDE-LIC-RH850-G3M/UAD3+ UDE-LIC-RH850-G4M/UAD3+ UDE-LIC-RH850-ICU/UAD3+	UDE-LIC-RH850-G3K/UAD2next UDE-LIC-RH850-G3M/UAD2next UDE-LIC-RH850-G4M/UAD2next UDE-LIC-RH850-ICU/UAD2next	UDE-LIC-RH850-G3K/UAD2pro UDE-LIC-RH850-G3M/UAD2pro UDE-LIC-RH850-G4M/UAD2pro UDE-LIC-RH850-ICU/UAD2pro
SH-2A			
JTAG	UDE-LIC-SH2A/UAD3+	UDE-LIC-SH2A/UAD2next	UDE-LIC-SH2A/UAD2pro
RISC-V			
JTAG	UDE-LIC-RISCV32/UAD3+ UDE-LIC-RISCV64/UAD3+	UDE-LIC-RISCV32/UAD2next UDE-LIC-RISCV64/UAD2next	UDE-LIC-RISCV32/UAD2pro UDE-LIC-RISCV64/UAD2pro
ARC			
JTAG	UDE-LIC-ARC/UAD3+	UDE-LIC-ARC/UAD2next	UDE-LIC-ARC/UAD2pro
XE166, XC2000			
JTAG / DAP OCDSL1	UDE-LIC-XC2000/UAD3+	UDE-LIC-XC2000/UAD2next	UDE-LIC-XC2000/UAD2pro
MCDS UEC Add-On	+ UDE-LIC-XC2000 UEC/MCDS Add-On	+ UDE-LIC-XC2000 UEC/MCDS Add-On	+ UDE-LIC-XC2000 UEC/MCDS Add-On
ASC/CAN-Bootstrap Loader		UDE-LIC-XC2000/UAD2next	UDE-LIC-XC2000/UAD2pro

[-...][1] optionally, depends on supported MCU derivative [2] on request [3] 1-4 Gbytes

Package Content - HLL Debugger UDE® Universal Debug Engine

UDE-LIC-xx/UAD3⁺	Universal HLL-Debugger with **Universal Access Device 3⁺** Communication System target interfaces: see table 'Ordering Codes', host interfaces: USB2.0, IEEE1394b (FireWire™), Ethernet (TCP/IP) manual engl, software CD, Universal Access Device, JTAG Pod, JTAG Adapter, power supply, support & updates: 1 year included (Windows 10/11)
UDE-LIC-xx/UAD2ⁿᵉˣᵗ	Universal HLL-Debugger with **Universal Access Device 2ⁿᵉˣᵗ** Communication System target interfaces: see table 'Ordering Codes', galvanically isolated host interfaces: USB3, Gigabit-Ethernet (TCP/IP) manual engl, software CD, Universal Access Device, JTAG Adapter, power supply, support & updates: 1 year included (Windows 10/11)
UDE-LIC-xx/UAD2ᵖʳᵒ	Universal HLL-Debugger with **Universal Access Device 2ᵖʳᵒ** Communication System target interfaces: see table 'Ordering Codes', host interface: USB2.0, manual, software CD, Universal Access Device, JTAG cable, power supply, support & updates: 1 year included (Windows 10/11)

FLASH/OTP Memory Programming Tool

UDE-LIC-xx-Memtool/UAD3⁺	FLASH/OTP Memory Programming Tool via JTAG/DAP/SWD/OnCE based on package content of UDE-LIC-xx/UAD3⁺, custom specific configuration, manual engl, support & updates: 1 year included (Windows 10/11)
UDE-LIC-xx-Memtool/UAD2ⁿᵉˣᵗ	FLASH/OTP Memory Programming Tool via ASC, CAN, JTAG/DAP/SWD/OnCE based on package content of UDE-LIC-xx/UAD2ⁿᵉˣᵗ, custom specific configuration, manual engl, support & updates: 1 year included (Windows 10/11)
UDE-LIC-xx-Memtool/UAD2ᵖʳᵒ	FLASH/OTP Memory Programming Tool via ASC, CAN, JTAG/DAP/SWD/OnCE based on package content of UDE-LIC-xx/UAD2ᵖʳᵒ, custom specific configuration, manual engl, support & updates: 1 year included (Windows 10/11)
UDE-LIC-xx-Memtool/Custom	FLASH/OTP Memory Programming Tool, custom specific extension, Development Service

UDE® Architecture Upgrades

Architecture Upgrade UDE-LIC-xx	Architecture upgrade to AURIX, TriCore, Power Architecture, Cortex, RH850, SH-2A, RISC-V, ARC, Arm7/9/11, XC166, XC2000, C166CBC, XScale

Support / Service

UDE-SRVC	Maintenance and Support for additional one year via PLS Hotline and free updates for UDE® **Universal Debug Engine** UDE-LIC-xx

Update and Upgrade

When you purchase an UDE® Universal Debug Engine Integrated Development Environment, you get a FREE Update Service for the UDE® HLL Debugger for 12 months. The Update Service includes approximately two new software releases of the products including documentation, regular product news and updates, or upgrades of other development environment components (compiler, editor, evaluation hardware, etc.) at a favorable price.

General Conditions for the Updates Service:

- The Update Service is available for PLS products only.
- Updates/Upgrades for UDE® cannot be separated for technical reasons.
- PLS offers a generous one-year warranty, which begins on the date of purchase. During this time, the Update Service is free of charge, without limitation.
- The Update Service starts when the Service Form is delivered to PLS.
- When the one-year warranty comes to an end, the Update Service and Support is available at a cost of 20 percent of the current list price of the product needing the extended Update Service and Support.
- If the Updates Service lapses and you do not immediately renewed it, an additional 10 percent re-entry fee, in addition to the 20 percent of the current list price of product, will be charged.
- PLS delivers software and documentation updates on CD, disk, download, or via e-mail. Printed documentation updates are available upon request.
- Necessary updates for other (non-PLS) products for the latest version (e.g. Compiler, CodeWright, EasyCODE,) are not included and may be purchased separately.

Please contact us for your personalized quote.

Use only ONE Support Hotline for the Development Environment.

For questions or problems, we offer you our Technical Support Hotline. We specialize in supporting your entire development environment including interaction between the tools. Just give us a call, or send an email and have the following information handy:

- Problem description (as detailed as possible).
- Tool names, their version, and serial numbers.
- Host platform operating system, PC type.
- Sample data or files to reconstruct the problem at PLS.

Problem files should be sent to PLS by email. Your query is usually processed within one day. All sensitive data will be protected against unauthorized access. Additionally, the latest technical information about our whole product spectrum is available on our Website.

How You May Contact Our Tech Support Hotline:

Phone: Toll Free: +1 (877) 77DEBUG (U.S. only)
+49 35722 384-0
eMail: support@pls-mc.com
WWW: www.pls-mc.com

General Conditions for obtaining PLS Technical Support:

- The PLS Technical Support is available for PLS and non-PLS products purchased at PLS and authorized distributors only.
- Getting Technical Support by PLS requires a valid and current Update Service (Maintenance) contract along with conditions described there.
- The PLS product warranty is one-year and begins on the date of purchase. During this time, the Technical Support is free of charge, without limitation. Non-PLS products may have different support periods, which we are obliged to observe.
- The Technical Support is available from the day of purchase.
- Technical Support covered by this Maintenance Contract is available via telephone, email, or internet. On-site technical support is not part of the Maintenance contract - please ask for a quotation if required.
- It is required that the latest release of the Integrated Development Environment components is installed to receive technical support.
- Due to the given complexity, it is not possible to provide comprehensive application development support for a customer's individual project

Reference List

AGCO	Worldwide
Auerswald GmbH	Cremlingen
Beckhoff Industrie Elektronik GmbH	Verl
Bizerba GmbH & Co. KG	Balingen
BMW AG	München
BorgWarner	Worldwide
The Bosch Group	Worldwide
Carl Zeiss Jena GmbH	Jena
Conti Temic microelectronic GmbH	Worldwide
Daimler Chrysler AG	Stuttgart
Eppendorf Instrumente GmbH	Hamburg
ETAS GmbH	Worldwide
Hauni Maschinenbau AG	Hamburg
Heidelberg Finishing GmbH	Ludwigsburg
Infineon Technologies AG	Worldwide
Jetter	Ludwigsburg
KRONE	Spelle
LEAR Automotive Electronics GmbH	Kronach
Liebherr-Components Biberach GmbH	Biberach
Richard Wolf GmbH	Knittlingen
Rivian	US
Robert Bosch GmbH	Stuttgart
Securiton AG	Zöllighofen, Schweiz
SEW Eurodrive	Bruchsal
Sick AG	Reute
Siemens AG	Fürth
United Automotive Electronic Systems Co., Ltd.	Shanghai
Voith Turbo GmbH & Co. KG	Heidenheim
Vector Informatik	Stuttgart
Volkswagen AG	Wolfsburg
WMF	Geislingen
Woodward Governor Company	Stuttgart

Going to Order

To find the special solution for your Development Task needs, please contact us, or your local distributor.

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What Can We Do For You? Your Success Is Our Goal.

PLS Programmierbare Logik & Systeme GmbH is one of the leading manufacturers of development tools for 16-/32-bit and 64-bit microcontroller applications, specializing in the AURIX, TriCore, Power Architecture, Cortex, S32, RH850, SH-2A, RISC-V, ARC, Arm7/9/11, XE166, XC2000, XScale derivatives. PLS provides the following products and services:

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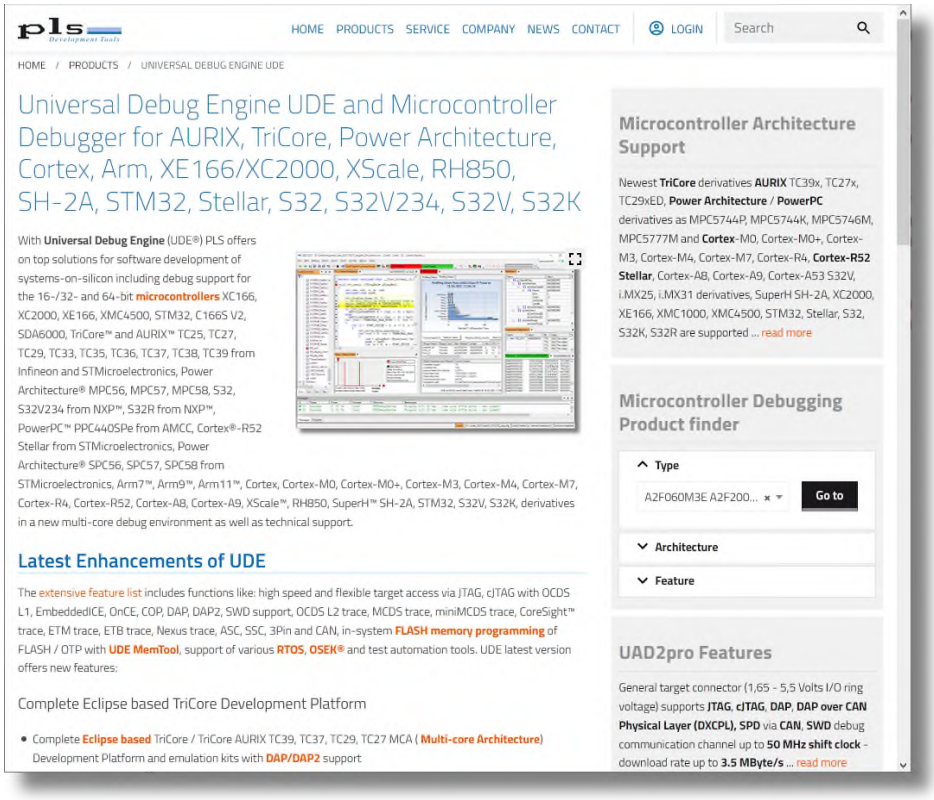

Info Request

Do you have any questions? Do you need further information? Do you want a quote?
Don't hesitate to get in contact with us.

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