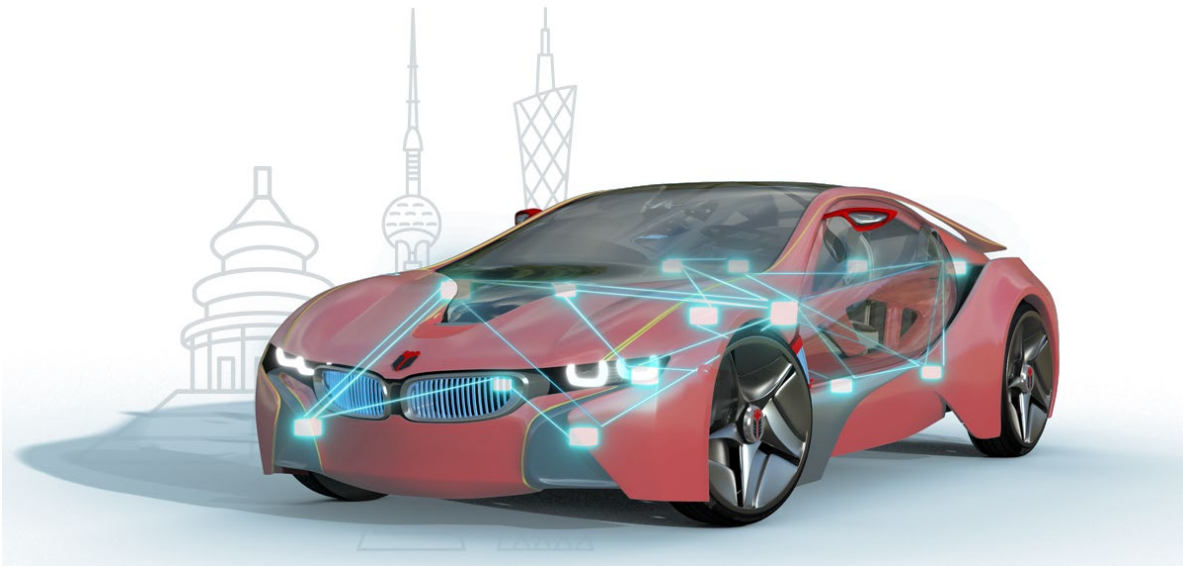
知从木牛基础软件杰发 AC7840 产品手册

ZC.MUNIU BASIC SOFTWARE PRODUCT MANUAL BASED ON AC7840

知从木牛基础软件平台

ZC.MuNiu Basic Software Platform



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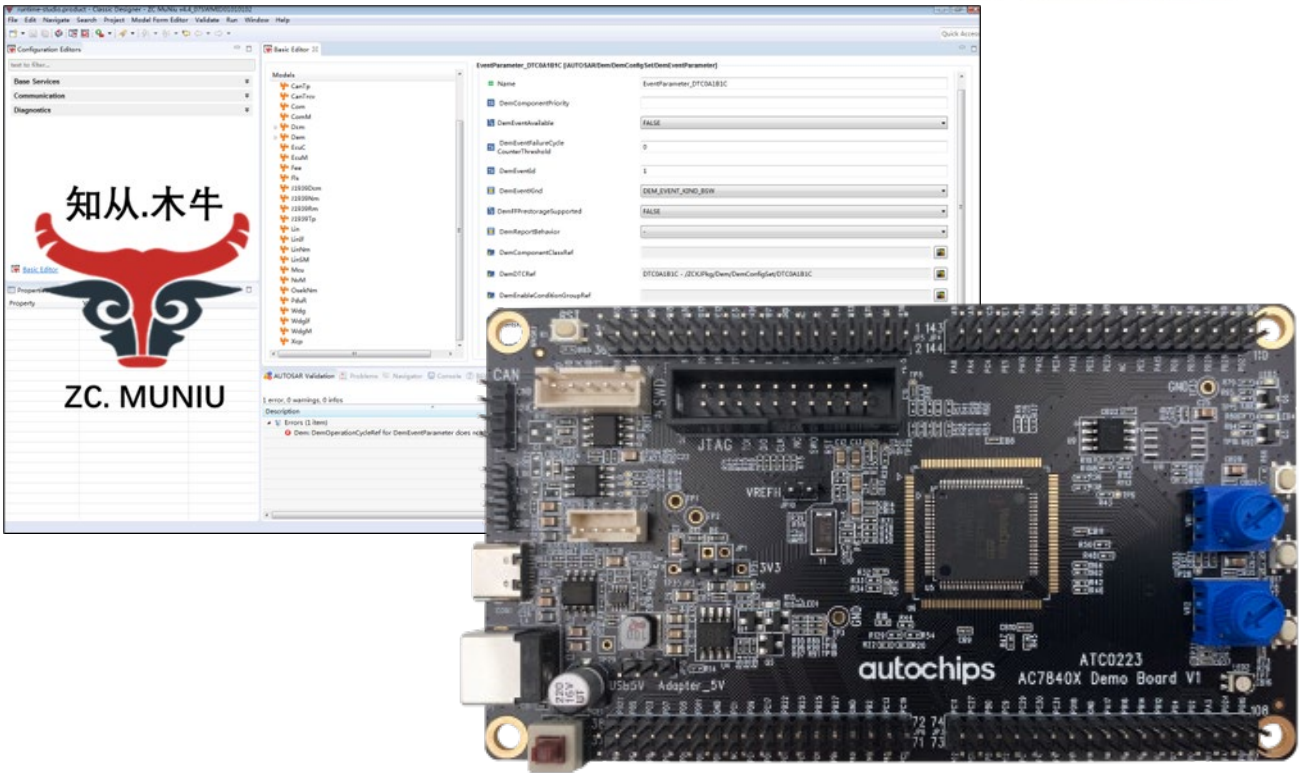
1 功能概述 FUNCTIONAL OVERVIEW

知从木牛基础软件平台（ ZC.MuNiu ）为汽车电子控制器产品开发，提供完整的基础软件平台解决方案。该产品参考 AUTOSAR、OSEK 等国际规范。有基于 AUTOSAR ARTOP 架构的上位机配置工具，支持上汽、一汽、吉利、广汽、长安、长城等整车厂通讯、诊断、网络管理规范。

ZC.MuNiu provides a comprehensive basic software platform solution for the development of automotive electronic control units. This product refers to international standards such as AUTOSAR and OSEK, and has a configuration tool based on the AUTOSAR ATOP architecture that supports communication, diagnostics, and network management specifications for major OEMs like SAIC Motor, FAW, Geely, GAC Group, Changan Automobile, and Great Wall Motors.

知从木牛 AC7840 基础软件平台，主要包括：操作系统、通讯协议栈（CAN \ LIN）、诊断协议栈(UDS \ J1939)、网络管理（OSEK \ AUTOSAR）、标定协议栈（XCP \ CCP）、存储协议栈、加密模块（CRYPTO）、复杂驱动等模块，配套知从的 Bootloader 刷新程序和上位机工具，可以根据不同的客户项目要求进行配置和再开发。知从科技提供基础软件产品的同时，也提供控制器基础软件功能实现的开发服务。

ZC.MuNiu AC7840 basic software platform mainly includes: operating system, communication protocol stack (CAN \ LIN), diagnostic protocol stack (UDS \ J1939), network management (OSEK \ AUTOSAR), calibration protocol stack (XCP \ CCP), storage protocol stack, crypto modules (CRYPTO), complex driver modules, etc., along with ZC's bootloader update program and configuration tool, which can be configured and redeveloped according to different customer project requirements. While providing basic software products, ZC also offers development services for the implementation of controller basic software functions.



ZC.MUNIU BASIC SOFTWARE PLATFORM FOR AUTOCHIPS AC7840

2 应用领域 APPLICATION FIELD

木牛基础软件平台可应用于使用杰发 AC7840 系列芯片的汽车电子控制器产品开发。例如：
ZC.MuNiu basic software platform can be applied to the development of automotive electronic control unit products using the AC7840 series chips of AutoChips. For example:

- 车身控制器
  Body Control Unit
- 智能座舱控制器
  Smart cockpit controller
- 空调控制器
  Air conditioning controller
- 虚拟仪表控制器
  Virtual Instrument Controller
- 电动尾门控制器
  Electric tailgate controller
- 车载通信终端
  Telematics Box

配置环境 Configuration Environment	
Hardware (Chip)	AC7840
Compilers Supported	IAR Embedded Workbench for ARM 8.32.2
Evaluation Hardware	AC7840 EVB
Debugger (SW)	IAR Embedded Workbench for ARM 8.32.2
Debugger (HW)	J-Link/J-Trace (ARM V9)
Configuration Tools	ZC MuNiu v4.4_AC7840
Configuration Environment	Win7/Win10 64bit

IAR 编译器选项 IAR Compiler Options	
IAR Embedded Workbench for ARM Compiler Options 编译选项	--no_unroll --debug --endian=little --cpu=Cortex-M4F -e --fpu=None --debug --dlib_config --endian little --cpu_mode thumb -On --no_cse --no_unroll --no_inline --no_code_motion --no_tbaa --no_clustering --no_scheduling
IAR Embedded Workbench for ARM Linker Options 链接选项	--cpu=Cortex-M4F -e --fpu=None DSTART_FROM_FLASH -DM4_DEVICE_RESERVED_ADDR

4 开发背景 DEVELOPMENT BACKGROUND

AUTOSAR 组织成立于 2003 年，主要由欧洲汽车制造商、部件供应商及其他电子、半导体和软件系统公司联合建立。致力于为汽车工业开发一个开放的、标准化的软件架构；希望大家“在标准上合作，在应用上竞争”提高基础平台的稳定，降低成本，提高控制器产品开发质量和速度。2006 年底发布了 2.1 版规范，2008 年发布 3.1 版本开始产品化；后续逐步增加了功能安全，以太网等内容，目前广泛使用 2014 年后发布的 4.2.1 和 4.2.2 版本，以及 4.3.1 版本。

The AUTOSAR organization was established in 2003, mainly by European car manufacturers, component suppliers, and other electronics, semiconductor, and software system companies. It is committed to developing an open, standardized software architecture for the automotive industry; the goal is for everyone to "cooperate on standards and compete on applications," improving the stability of the basic platform, reducing costs, and enhancing the quality and speed of controller product development. The 2.1 version of the specification was released at the end of 2006, and the 3.1 version was released in 2008 for productization; subsequently, functional safety, Ethernet, and other contents were gradually added. Currently, the widely used versions are 4.2.1 and 4.2.2 released after 2014, as well as version 4.3.1.

汽车在电动化、网联化、智能化的大趋势下，电子电器部件日益增多，电气结构越加复杂，整车开发周期不断缩短。平台化、智能化的基础软件起到至关重要。

In the major trends of electrification, networking, and intelligentization of automobiles, the number of electronic and electrical components is increasing, the electrical structure is becoming more complex, and the development cycle of the entire vehicle is continuously shortened. The platform-based and intelligent foundational software plays an essential role.

知从.木牛（ZC.MuNiu）为汽车电子控制器产品开发，提供完整的基础软件平台解决方案。该产品符合 AUTOSAR、OSEK 等国际规范，有基于 AUTOSAR ARTOP 架构的上位机配置工具，支持上汽、一汽、吉利、广汽、长安、长城等整车厂通讯、诊断、网络管理规范。该平台主要包括：操作系统、通讯协议栈（CAN \ LIN）、诊断协议栈(UDS\ J1939)、网络管理（OSEK\AUTOSAR）、标定协议栈（XCP\CCP）、存储协议栈、加密模块（CRYPTO）、复杂驱动等，配套知从 Bootloader 刷新程序和上位机工具，可以根据不同的客户项目要求进行配置和再开发。

ZC.MuNiu provides a comprehensive basic software platform solution for the development of automotive electronic control unit products. This product complies with international standards such as AUTOSAR and OSEK, and features a configuration tool based on the AUTOSAR ATOP architecture, supporting communication, diagnostics, and network management specifications for major vehicle manufacturers like SAIC, FAW, Geely, GAC, Changan, and Great Wall. The platform mainly includes: operating system, communication protocol stack (CAN \ LIN),

diagnostic protocol stack (UDS \ J1939), network management (OSEK \ AUTOSAR), calibration protocol stack (XCP/CCP), storage protocol stack, crypto modules (CRYPTO), complex driver modules, etc. It is equipped with ZC's bootloader update program and upper computer tool, which can be configured and redeveloped according to different customer project requirements.

知从科技提供基础软件产品的同时，也提供符合 ASPICE Level 3 和功能安全 ASILB/D 要求的控制器基础软件功能实现的开发服务，以及 SBC 芯片等软件的定制开发。

ZC provides not only basic software products but also development services for the implementation of controller basic software functions that comply with ASPICE Level 3 processes and functional safety requirements of ASIL B/D.

知从科技掌握 AUTOSAR 平台软件的开发和应用核心技术，提供本地现场支持，质量好，速度快，成本低。

ZC has mastered the core technology of development and application of the AUTOSAR platform software, providing on-site local support with high quality, fast speed, and low cost.

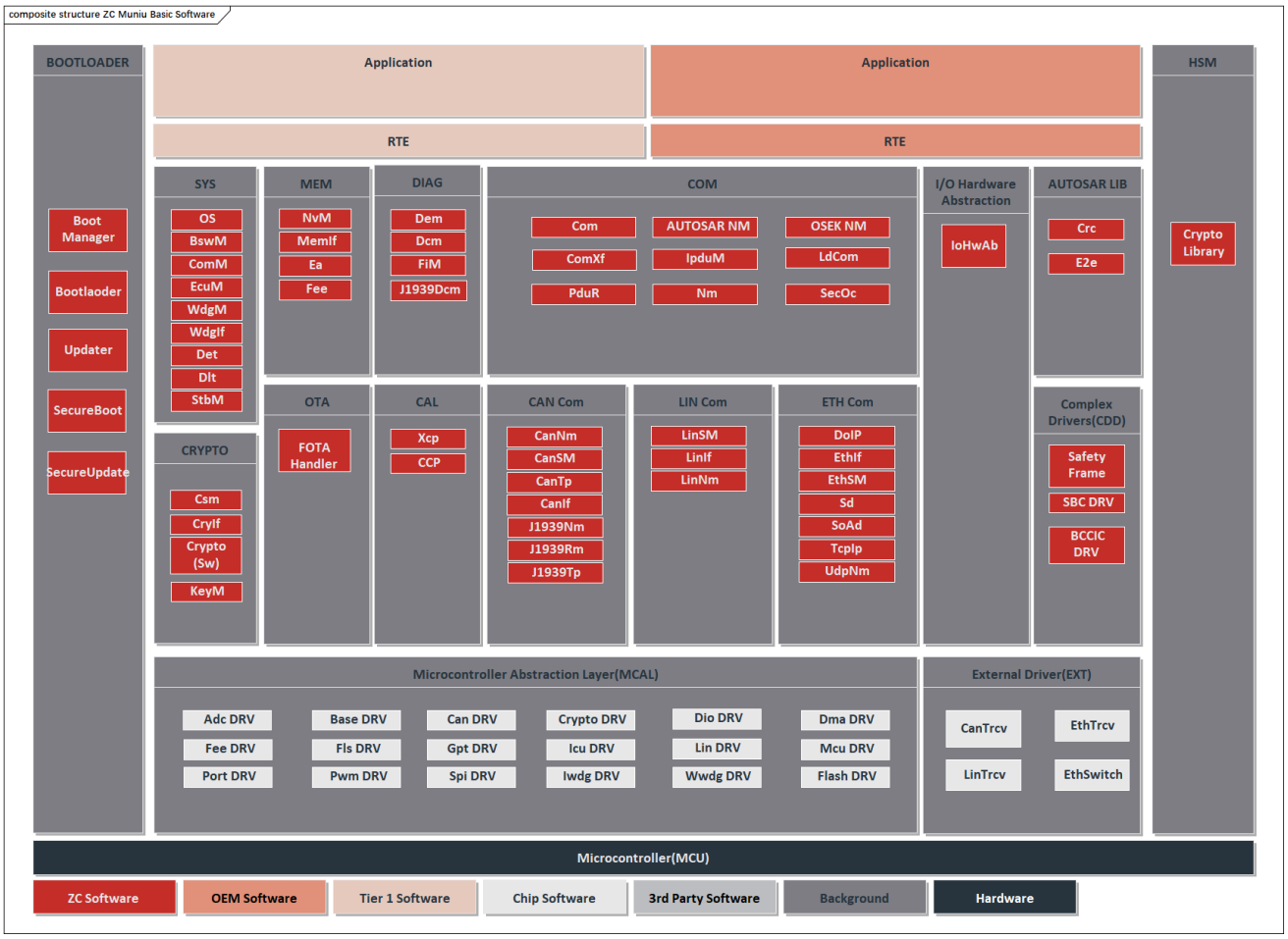
5 功能描述 FUNCTIONAL DESCRIPTION

5.1 产品特点 Product Feature

- 符合 AUTOSAR 4.3.1 版本 Compliant with AUTOSAR 4.3.1 version
- ARTOP 架构上位机配置工具，最高适配 AUTOSAR 4.4.0 版本

  ARTOP architecture upper machine configuration tool, compatible up to AUTOSAR 4.4.0 version
- 操作系统 Operating System
- 通讯协议栈 Communication Protocol Stack（CAN \ LIN）
- 诊断协议栈 Diagnostic Protocol Stack (UDS \ J1939)
- 网络管理 Network Management (OSEK \ AUTOSAR)
- 标定协议栈 Calibration Protocol Stack（XCP \ CCP）
- 存储协议栈 Storage Protocol Stack
- 加密模块 Cryptography Module（CRYPTO）
- 复杂驱动定制开发 Custom Development of Complex Drivers
- 工程服务 Engineering Services

5.2 软件架构 Software Architecture

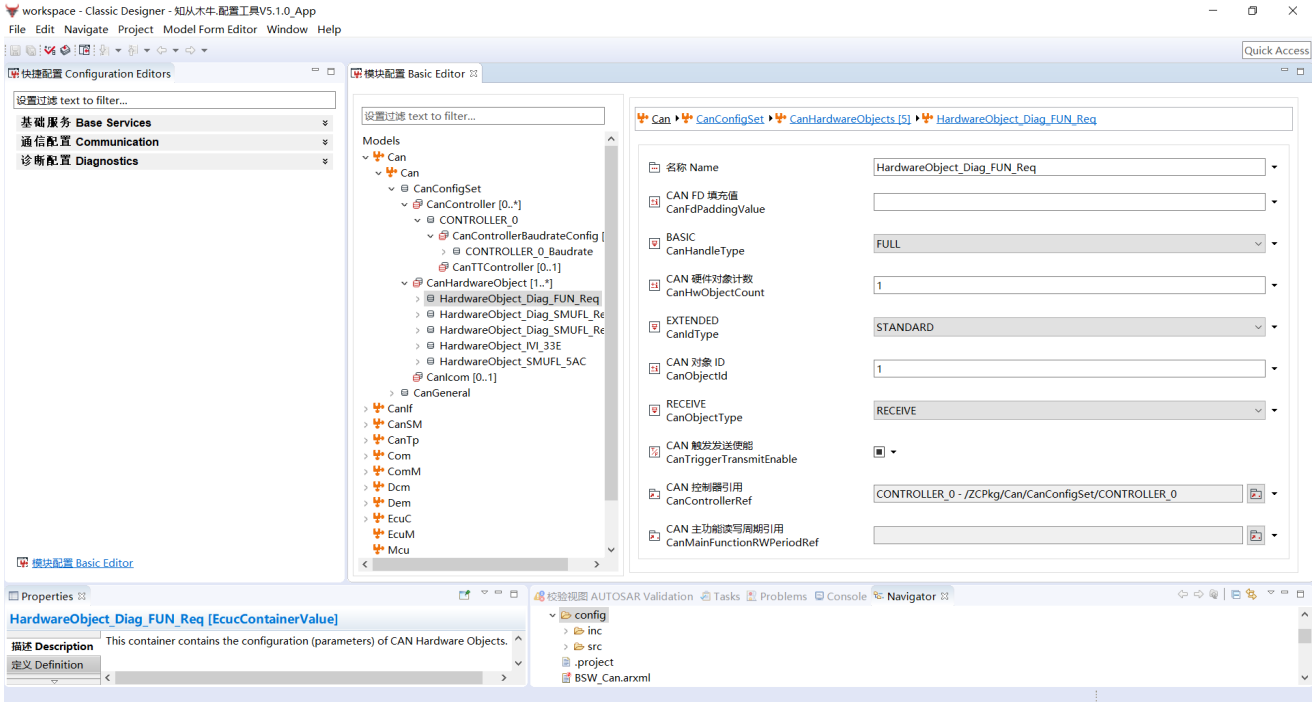


模块 Module	子模块 Submodule		描述 Description
微控制器底层驱动集成包 **Microcontroller Layer Integrated Package**	可集成第三方 MCAL 的集成工程服务包 ZC has an integrated engineering service packages that can be integrated with third-party MCAL.		
外部底层驱动 **External Low-Level Driver (EXT)**	CanTrcv DRV	CAN收发器驱动 CAN Transceiver Driver	实现外部硬件组件的AUTOSAR基础软件模块 Implement the AUTOSAR basic software module for communication with external hardware components.
	LinTrcv DRV	LIN收发器驱动	
系统服务 **System Service (SYS)**	OS	操作系统 Operating System	实现系统服务的AUTOSAR基础软件模块

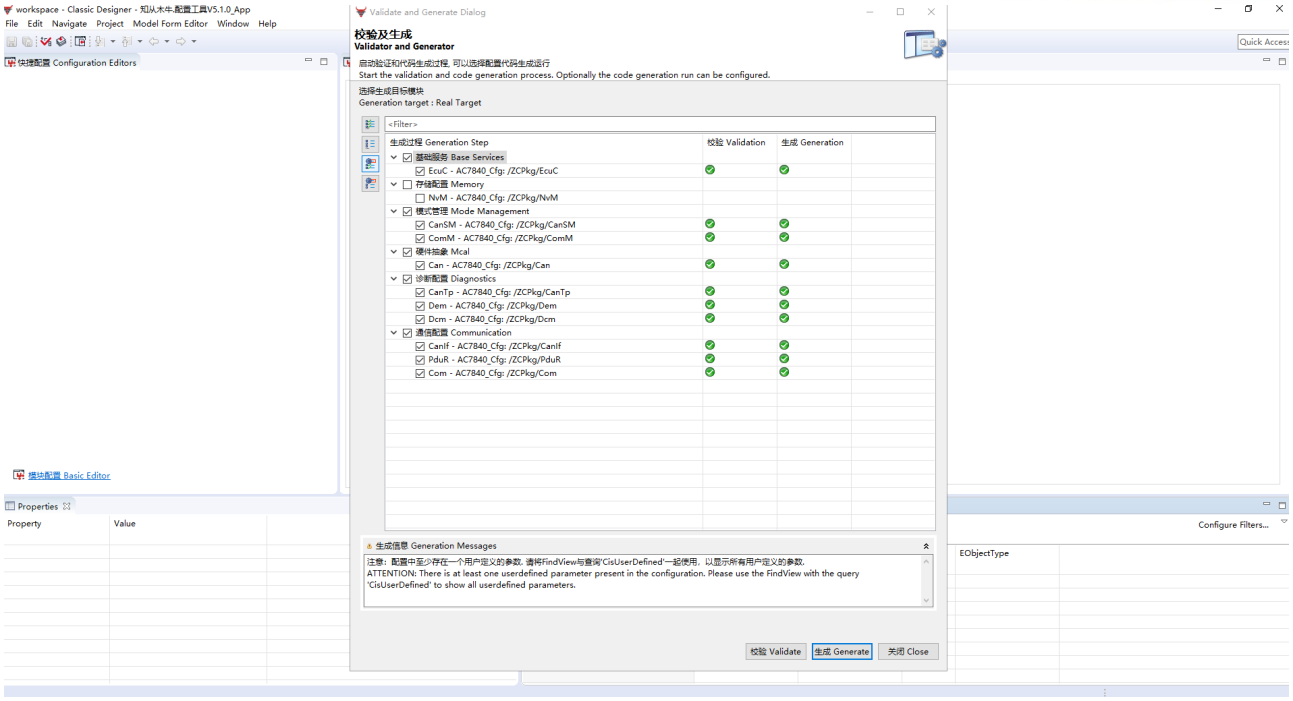
模块 Module	子模块 Submodule		描述 Description
	BswM	基础软件模式管理 Basic Software Mode Management	Implement the AUTOSAR Basic Software Module for System Services
	ComM	通信管理 Communication Management	
	Det	开发错误追踪 Development Error Tracking	
	EcuM	ECU管理 ECU Management	
	WdgIF	看门狗接口 Watchdog Interface	
	WdgM	看门狗管理器 Watchdog Manager	
诊断服务 Diagnostic Service (DIAG)	Dcm	诊断通信管理器 Diagnostic Communication Manager	实现诊断管理的AUTOSAR基础软件协议栈 Implement the AUTOSAR Basic Software Protocol Stack for Diagnostic Management
	Dem	诊断事件管理器 Diagnostic Event Manager	
	FiM	功能抑制管理器 Functional Suppression Manager	
加密模块 Cryptography Module（CRYPTO）	Csm	加密服务管理 Crypto Service Management	实现加密功能的AUTOSAR基础软件模块 Implement the encryption function of the AUTOSAR basic software module
	CryIf	加密接口 Crypto Interface	
	Crypto(Sw / Hw)	加密驱动 Crypto Driver	

模块 Module	子模块 Submodule	描述 Description
复杂驱动 Complex Driver （CDD）	Safety Frame	功能安全 Functional Safety	实现复杂驱动功能的AUTOSAR基础软件模块 Implement the AUTOSAR basic software module for complex driver functions.
… …			

5.3 配置工具 Configuration Tool



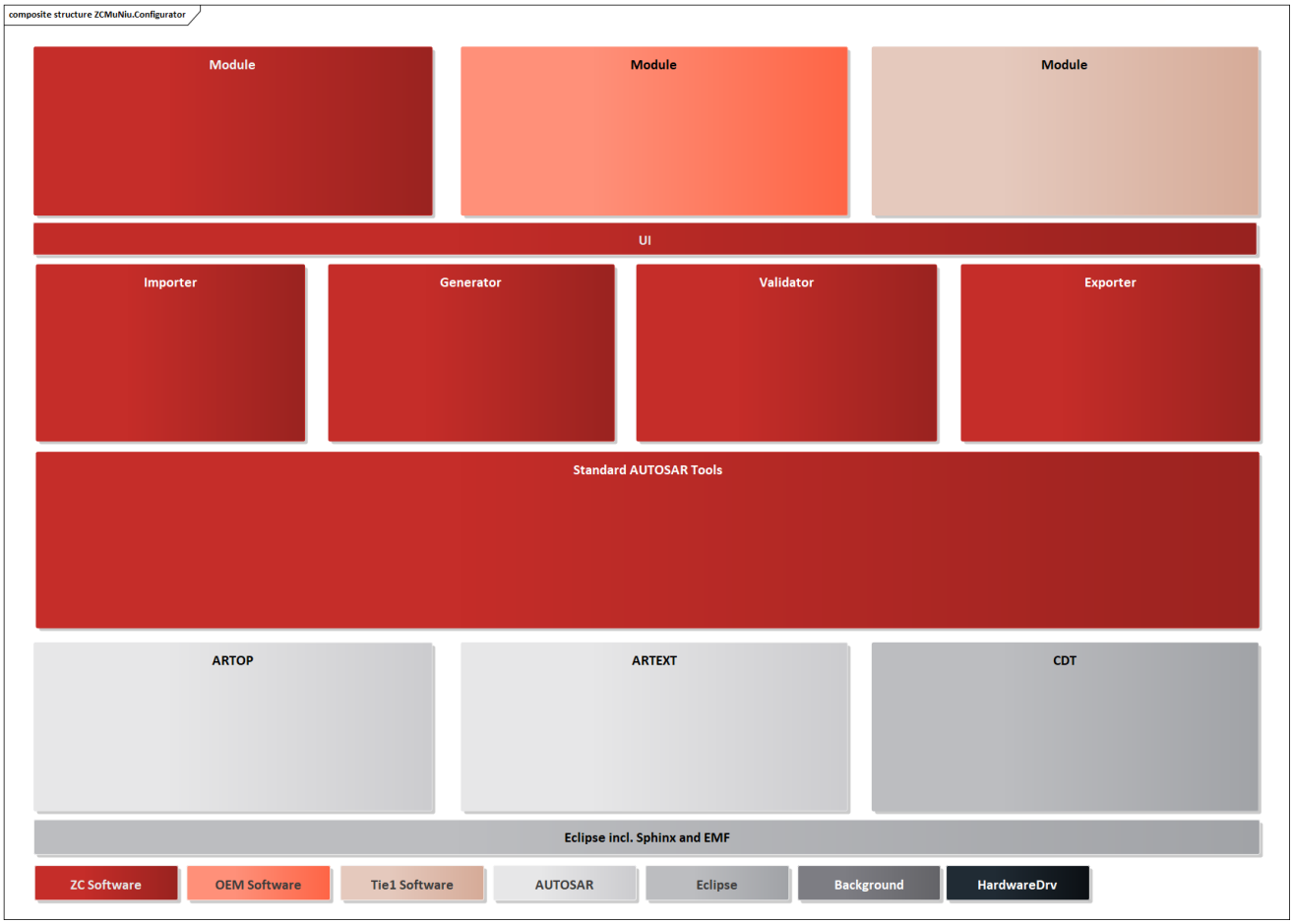
木牛配置工具主界面
MUNIU CONFIGURATION TOOL MAIN INTERFACE



木牛配置工具生成配置代码
MUNIU CONFIGURATION TOOL GENERATES CONFIGURATION CODE

为了满足客户的不同项目需求，提高基础软件平台的扩展性， 木牛基础软件平台实现了各个模块可配置性，并且实现了配置工具。客户可根据不同需求，在配置工具上完成各个模块的配置工作，可生成配置代码文件，将生成的配置文件集成到工程中即可。

To meet the diverse project requirements of customers and enhance the scalability of the basic software platform, the MuNiu basic software platform has implemented the configurability of each module and has also developed a configuration tool. Customers can complete the configuration of each module according to different needs on the configuration tool, generate configuration code files, and integrate the generated configuration files into the project.



木牛配置工具架构
ZC.MUNIU CONFIGURATION TOOL ARCHITECTURE

木牛基础软件平台的配置工具是基于 Eclipse 平台，并基于 ARTOP 架构，实现 AUTOSAR 模型和 ARXML 的解析。MuNiu Core 完成配置工具的 UI 界面，在 MuNiu Core 之上的 Module，实现 AUTOSAR 各个模块的配置。配置完成后，可生成各个模块的配置代码。

ZC.MuNiu basic software platform configuration tool is based on the Eclipse platform and is built on the ARTOP architecture, which implements the parsing of the AUTOSAR model and ARXML. ZC.MuNiu Core completes the UI interface of the configuration tool, and the Module on top of ZC.MuNiu Core realizes the configuration of each AUTOSAR module. After the configuration is completed, the configuration code for each module can be generated.

6 过程文档 PROCESS DOCUMENTATION

开发流程 Development Process	文档描述 Documentation Description
需求收集 Requirement Collection	客户需求文档 Customer Requirement Document
软件需求分析 Software Requirement Analysis	需求分析文档 Requirement Analysis Document
	软件需求追踪表 Software Requirement Traceability Matrix
	问题沟通表 Issue Communication Form
软件架构设计 Software Architectural Design	软件架构说明书 Software Architecture Specification
	软件架构的追踪表 Software Architecture Traceability Matrix
软件详细设计和单元设计 Software Detailed Design and Unit Design	软件详细设计说明书 Software Detailed Design Specification
	配置工具设计文档 Configuration Tool Design Document
	软件详细设计追踪表 Software Detailed Design Traceability Matrix
	软件详细设计评审表 Software Detailed Design Review Form
软件单元测试 Software Unit Testing	QAC 分析报告 QAC Analysis Report
	Tessy 测试报告 Tessy Test Report
	软件单元验证策略 Software Unit Verification Strategy
软件集成和集成测试	集成策略 Integration Strategy
	集成手册

开发流程 Development Process	文档描述 Documentation Description
Software Integration and Integration Testing	Integration Manual
	集成测试策略 Integration Test Strategy
	集成测试报告 Integration Test Report
	资源分析报告 Resource Analysis Report
软件系统测试 Software System Testing	系统测试报告 System Test Report
	系统测试报告评审 System Test Report Review
发布 Release	发布文档 Release Documentation

7 证书 CERTIFICATE

中华人民共和国国家版权局

计算机软件著作权登记证书

证书号：软著登字第6824926号

软件名称：知从木牛基础软件平台
[简称：知从木牛]
V4.4

著作权人：上海知从科技有限公司

开发完成日期：2020年06月18日

首次发表日期：2020年09月30日

权利取得方式：原始取得

权利范围：全部权利

登记号：2021SR0100609

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2021年01月19日

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