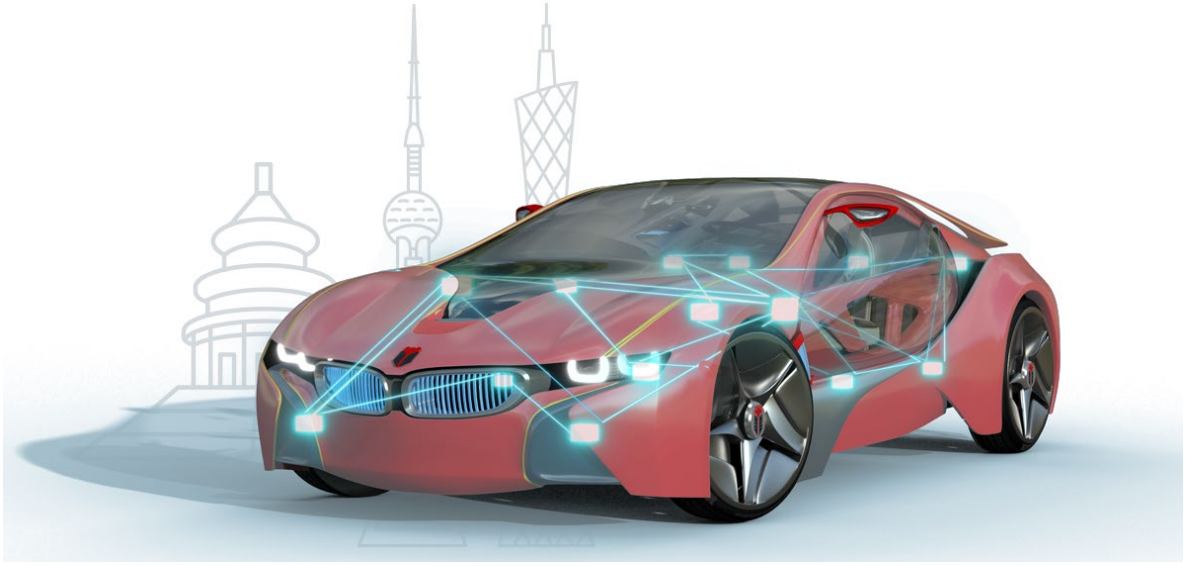
知从木牛 AUTOSAR 软件平台英飞凌 TC264 产品手册

ZC.MUNIU AUTOSAR SOFTWARE PLATFORM PRODUCT MANUAL BASED ON INFINEON TC264

知从木牛基础软件平台

ZC.MuNiu Basic Software Platform



知从木牛 AUTOSAR 软件平台英飞凌 TC264 产品手册

ZC.MUNIU AUTOSAR SOFTWARE PLATFORM PRODUCT MANUAL BASED ON INFINEON TC264

知从木牛基础软件平台

ZC.MuNiu Basic Software Platform

1 功能概述 FUNCTIONAL OVERVIEW

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。该产品参考 AUTOSAR、OSEK 等国际规范，有基于 AUTOSAR ATOP 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、启动刷新规范。

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.

知从木牛英飞凌 TC264 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）、标定协栈（XCP\CCP）、存储协议栈、复杂驱动模块等，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 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, 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.

2 应用领域 APPLICATION FIELD

木牛基础软件平台可应用于使用英飞凌 TC264 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 TC264 series chips of Infineon. For example:

- 新能源整车控制器
  New Energy Vehicle Controller
- 电机控制器
  Motor Controller
- 电池管理系统控制器
  Battery Management System Controller
- DC/DC 控制器
  DC/DC Converter Controller
- 电子助力转向控制器
  Electric Power Steering Controller
- 车身控制器
  Body Controller
- 空调控制器
  Air Conditioning Controller

配置环境 Configuration Environment	
Hardware (Chip)	INFINEON SAK-TC264T-64F200W CA
Compilers Supported	HighTec 4.6.6.1/Tasking v4.2r2
Evaluation Hardware	TriBoard TC264
Debugger	Lauterbach (Trace32 R.2018.02) Isystem IC5700（winIDEA 9.21.150）
Configuration Tools	Muniu_v5.1.3
Configuration Environment	Win7/Win10 64bit

Hightec 4.6.6.1 编译器选项 Hightec 4.6.6.1 Compiler Options	
编译选项 Compiler Options	-fno-common -fno-short-enums -Os -g2 -W -Wall -Wextra -Wdiv-by-zero -Warray-bounds -Wcast-align -Wignored-qualifiers -Wformat -Wformat-security -save-temps=obj -DBRS_DERIVATIVE_TC27X -fno-builtin -iquote -Wl,--gc-sections -Wl,--mem-holes -Wl,--no-warn-flags -Wl,--cref -fshort-double -mcpu=tc27xx -mversion-info -std=c99 -maligned-data-sections
链接选项 Linker Options	-nostartfiles -T"..\SafetyLibrary.ld" @iROM.objectlist -mcpu=tc26xx -Wl,--mem-holes -Wl,--warn-orphan

Taskingv4.2r2 编译器选项 Taskingv4.2r2 Compiler Options	
编译选项 Compiler Options	-Ctc26x --lsl-core=vtc --iso=99 --language=-gcc,-volatile,+strings --switch=auto --align=4 --no-clear --default-near-size=0 --default-a0-size=0 --default-a1-size=0 -O2 --tradeoff=4 --compact-max-size=200 -g --source
链接选项 Linker Options	-Ctc27x --lsl-core=vtc -l"D:\Git\xxx" -Wl-o"${PROJ}.hex":IHEX:4 -Wl-o"${PROJ}.sre":SREC:4 --hex-format=s -Wl-DMCU_SMALL_ENDIAN=1 "../xxx_SW.lsl" -Wl-OtxyCL -Wl--map-file="${PROJ}.mapxml":XML -Wl-mcrfiklsmnoduq -Wl--error-limit=42 -g

4 开发背景 DEVELOPMENT BACKGROUND

OSEK 标准旨在制定汽车电子标准化接口，主要定义了三个组件：实时操作系统（OSEKOS），通讯系统（OSEKCOM）和网络管理系统（OSEKNM）。OSEK 操作系统始于 20 世纪 90 年代，是第一个商业化的汽车嵌入式操作系统。

The OSEK standard aims to establish standardized interfaces for automotive electronics, primarily defining three components: the real-time operating system (OSEKOS), the communication system (OSEKCOM), and the network management system (OSEKNM). The OSEK operating system, which originated in the 1990s, was the first commercial automotive embedded operating system.

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, primarily by European automakers, component suppliers, and other companies in the electronics, semiconductor, and software systems industries. It is committed to developing an open and standardized software architecture for the automotive industry, with the motto “Cooperate on standards and compete on implementation,” which aims to enhance the stability of the basic platform, reduce costs, and improve the quality and speed of controller product development. The organization released version 2.1 of the standard at the end of 2006 and version 3.1 in 2008, which began to be commercialized. Subsequent versions gradually added content related to functional safety and Ethernet. Currently, versions 4.2.1 and 4.2.2, released after 2014, as well as version 4.3.1, are widely used.

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。

Under the major trends of electrification, connectivity, and intelligence in the automotive industry, the number of electronic and electrical components is increasing, and the electrical structure is becoming more complex, while the vehicle development cycle continues to shorten. Platform-based and intelligent basic software plays a crucial role in this context.

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 ATOP 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）、标定协栈（XCP\CCP）、存储协议栈、复杂驱动模块等，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。

ZC.MuNiu 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, complex driver modules, etc., along with ZC's bootloader update program and configuration tool, which can be configured and further developed 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 Level3 流程和功能安全 ASILB\D 要求的控制器基础软件功能实现的开发服务，SBC 芯片、BCCIC 芯片各种复杂驱动软件的定制开发。同时，集成知从科技的功能安全产品 SafetyFrame，可以满足功能安全要求。

In addition to providing basic software products, ZC offers development services for the implementation of controller basic software functions that comply with ASPICE Level 3 processes and meet the functional safety requirements of ASIL B and D. The company also provides customized development of complex driver software for various chips, such as SBC and BCCIC. Moreover, by integrating ZC's functional safety product SafetyFrame, the requirements for functional safety can be satisfied.

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 technologies for the development and application of AUTOSAR platform software and provides local on-site support with high quality, fast speed, and low cost.

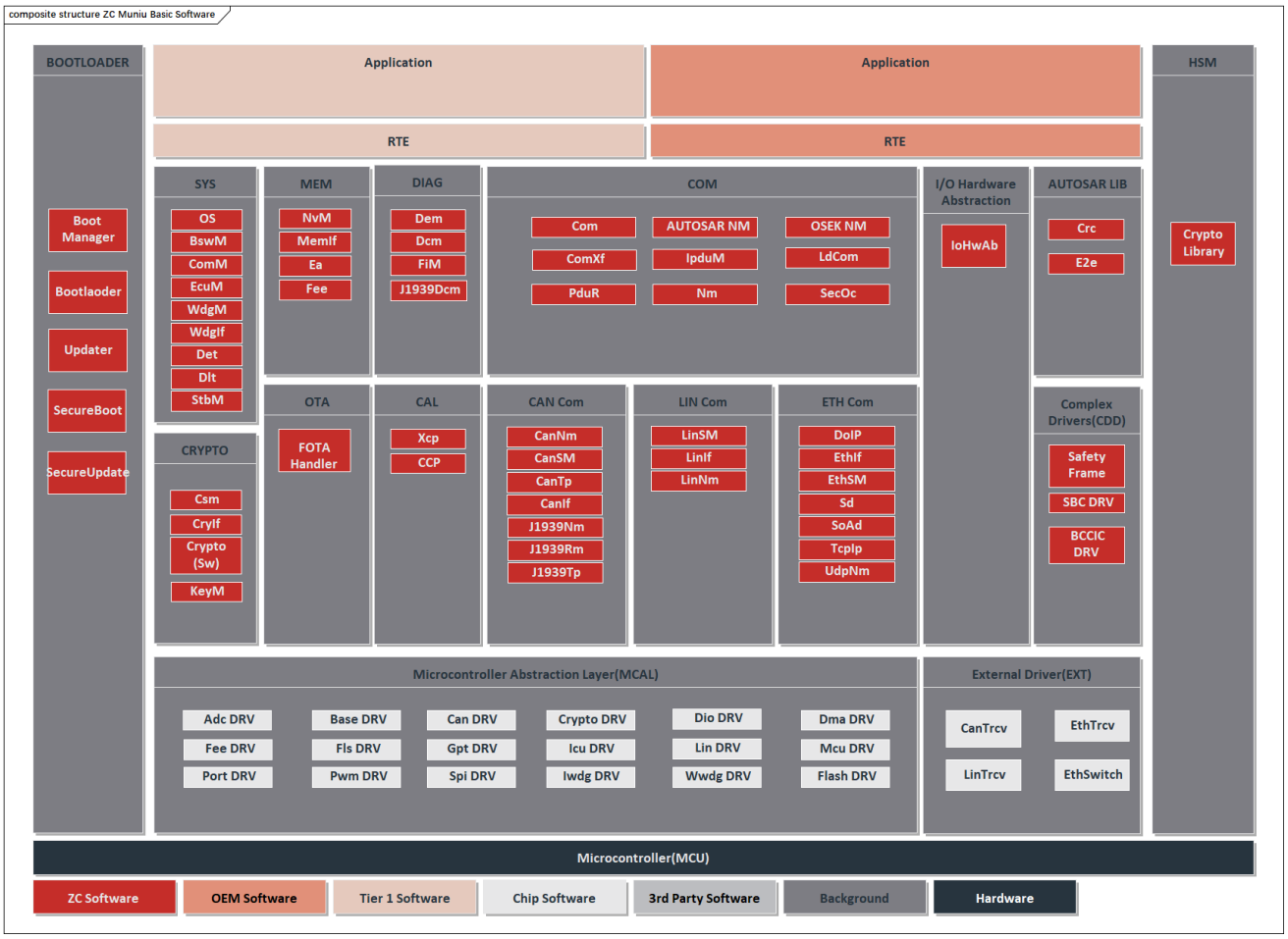
5 功能描述 FUNCTIONAL DESCRIPTION

5.1 产品特点 Product Features

- 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
- 符合 OSEK 标准 Compliant with the OSEK standard
- 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



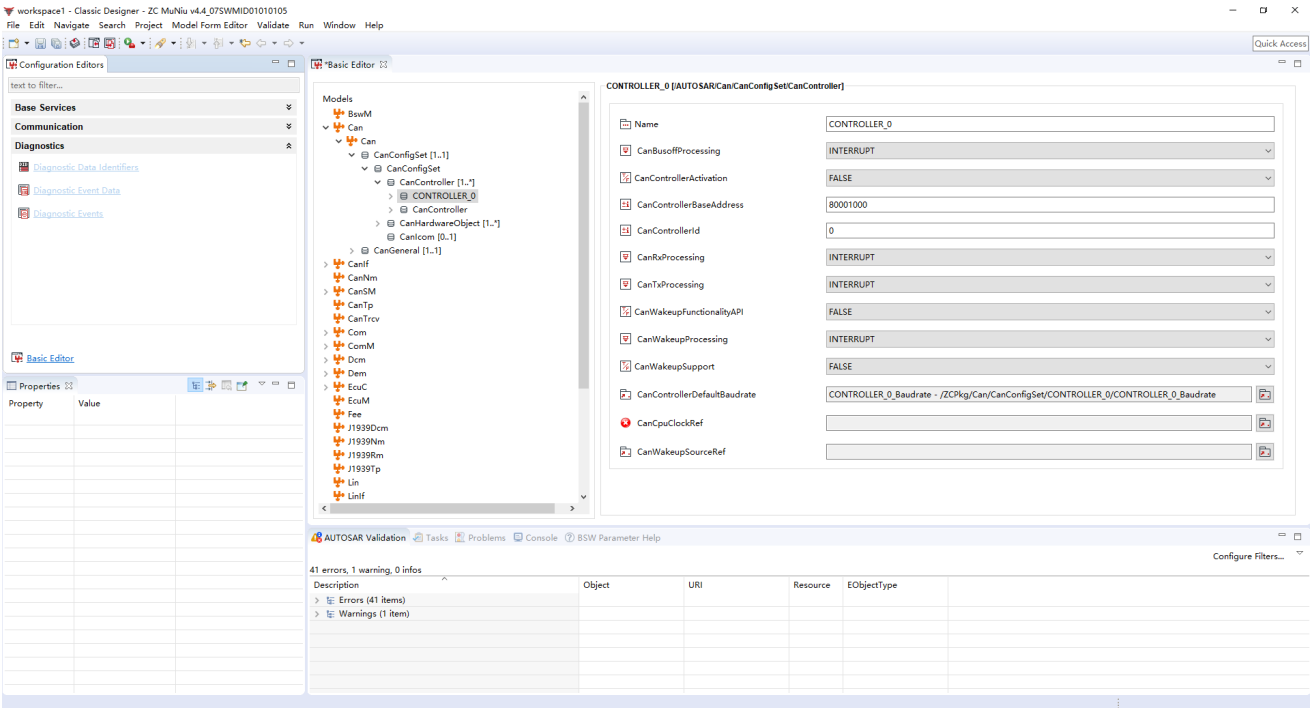
知从木牛基础软件架构
ZC.MUNIU BASIC SOFTWARE ARCHITECTURE

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
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 Implement the AUTOSAR Basic
	BSWM	基础软件模式管	

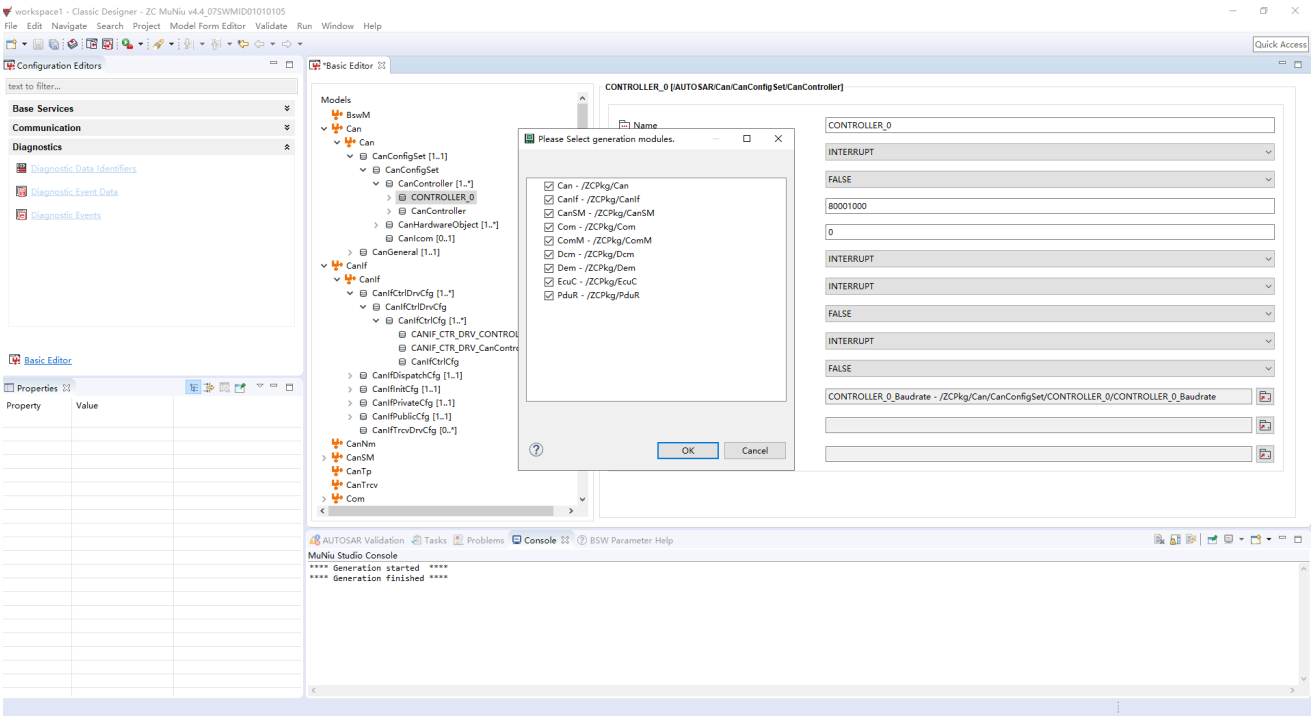
模块 Module	子模块 Submodule		描述 Description
		理 Basic Software Mode Management	Software Module for System Services
	COMM	通信管理 Communication Management	
	DET	开发错误追踪 Development Error Tracking	
	ECUM	ECU管理 ECU Management	
	WDGIF	看门狗接口 Watchdog Interface	
	WDGM	看门狗管理器 Watchdog Manager	
诊断服务 Diagnostic Service (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	
存储服务 Memory Service (MEM)	EA	EEPROM抽象层 EEPROM Abstraction Layer	实现非易失性存储管理的基础软件协议栈 Implement the basic software protocol stack for non-volatile storage management
	FEE	Flash的EEPROM模拟器 Flash EEPROM Emulator	
	MEMIF	存储器抽象层接口 Memory Abstraction Layer Interface	

模块 Module	子模块 Submodule		描述 Description
	NVM	NvRam管理器 NvRam Manager	
通信服务 Communication Service (COM)	COM	通信 Communication	实现通信管理的基础软件协议栈 Implement the basic software protocol stack for communication management.
	AUTOSAR NM	网络管理接口 Network Management Interface	
	OSEK NM	OSEK网络管理 OSEK Network Management	
	PduR	PDU路由 PDU Routing	
CAN通信 CAN Communication	CANIF	CAN接口 CAN Interface	实现CAN通信的AUTOSAR基础软件模块 Implement the AUTOSAR basic software module for CAN communication.
	CANNM	CAN网络管理 CAN Network Management	
	CANSM	CAN状态管理器 CAN State Manager	
	CANTP	CAN传输协议 CAN Transport Protocol	
	LINSM	LIN状态管理器 LIN State Manager	
复杂驱动 Complex Driver（CDD）	SBC DRV	电源芯片驱动 Power Chip Driver	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.
	BCCIC DRV	电池管理系统采样芯片驱动 Battery Management System Sampling Chip Driver	

5.3 配置工具 Configuration Tool



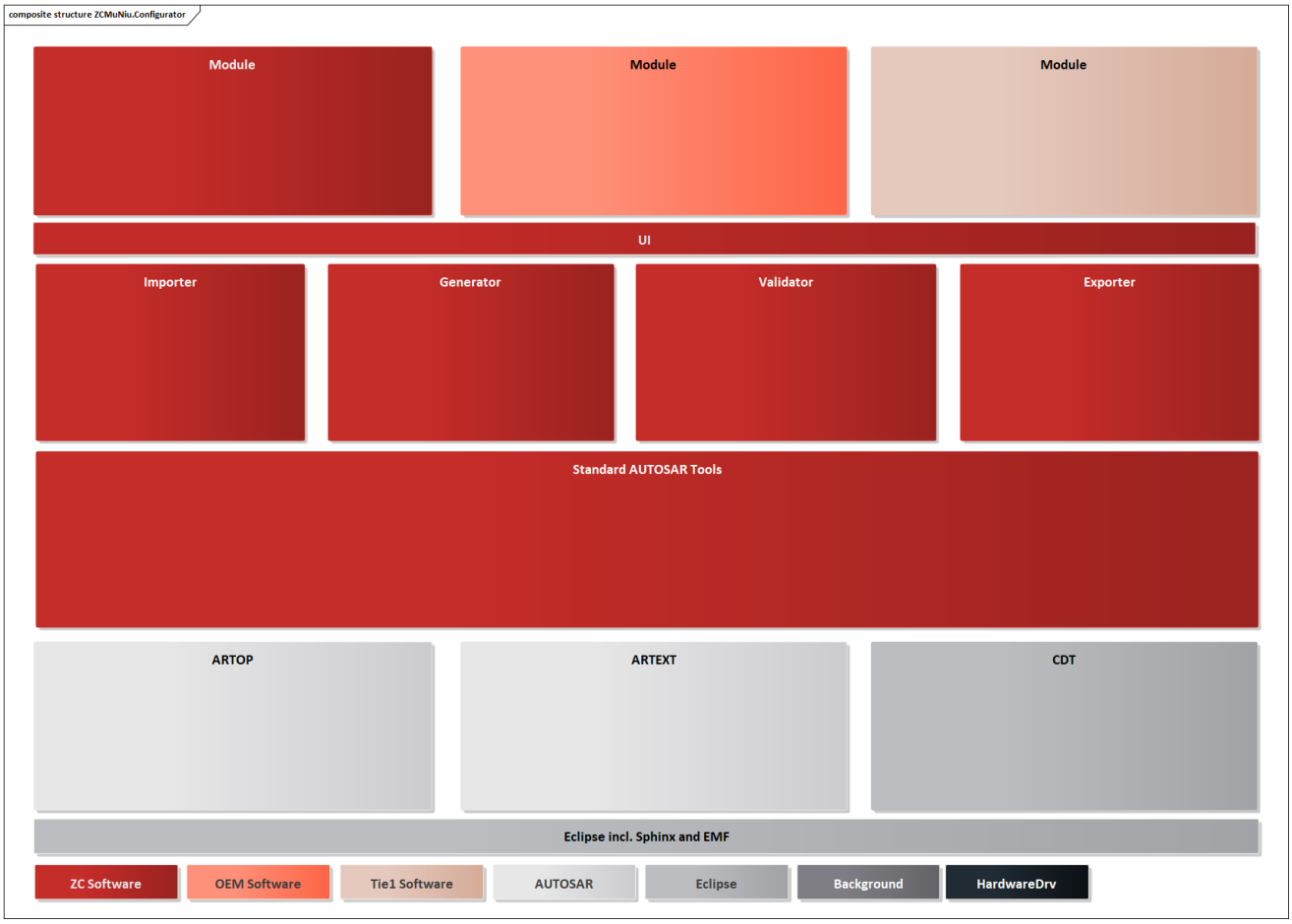
木牛配置工具主界面
MUNIU CONFIGURATION TOOL MAIN INTERFACE



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 requirements 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

根据《计算机软件保护条例》和《计算机软件著作权登记办法》的规定，经中国版权保护中心审核，对以上事项予以登记。

中华人民共和国国家版权局
计算机软件著作权登记专用章

No. 07262640

2021年01月19日

木牛软件著作权登记证书
MUNIU SOFTWARE COPYRIGHT REGISTRATION CERTIFICATE