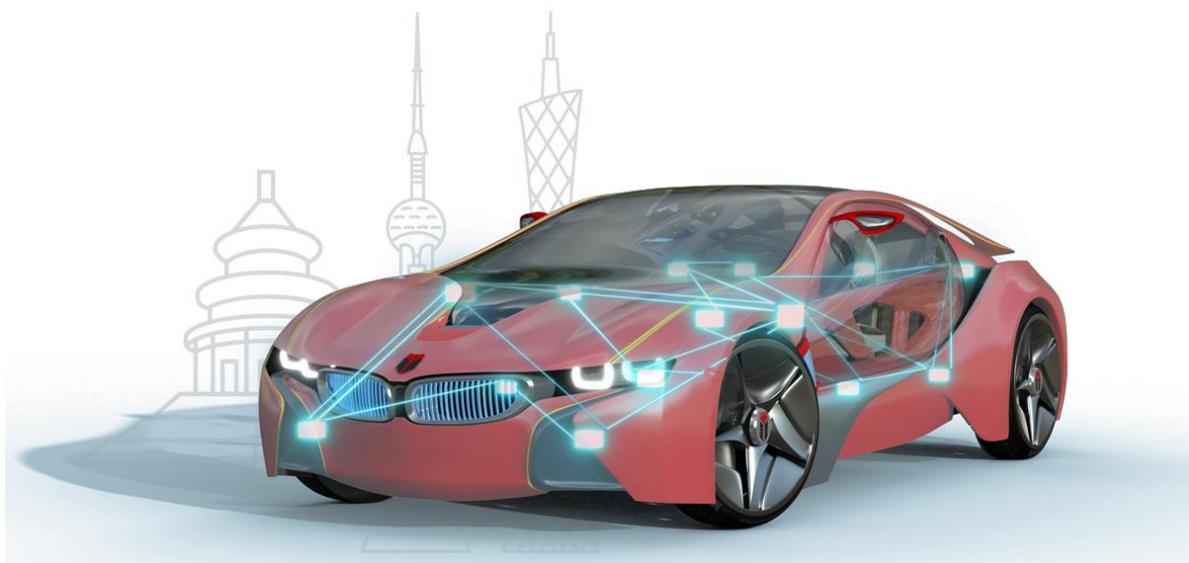




知从木牛基础软件旗芯微 FC7300 产品手册
ZC.MUNIU BASIC SOFTWARE PRODUCT
MANUAL BASED ON FLAGCHIP FC7300

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（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。知从木牛旗芯微 FC7300 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、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 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 configuration tool based on the AUTOSAR ARTOP Architecture. ZC.MuNiu supports communication, diagnostics, and network management specifications for major OEMs like SAIC, FAW, Geely, GAC, CCAG, and GWM. ZC.MuNiu 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. ZC.MuNiu also provide bootloader update program and configuration tool, which can be configured and redeveloped according to customer requirements. While providing basic software products, ZC also offers development services for the implementation of controller basic software functions.

旗芯微 FC7300 的安全等级为 ASIL D，拥有 3 个 Arm Cortex-M7 内核，最高可达 300MHz，支持 Arm Cortex-M7 内核操作系统。知从科技基于旗芯微 FC7300 提供符合 ASPICE Level3 流程和功能安全 ASIL D 要求的基础软件产品。

The safety level of FLAGCHIP FC7300 is ASIL D, with 3 * Arm Cortex-M7 core, up to 300MHz. FC7300 supports Arm Cortex-M7 kernel operating system. ZC can provide basic software

products that comply with ASPICE Level3 processes and functional safety ASIL D requirements based on the FLAGCHIP FC7300.

2 应用领域 APPLICATION FIELD

木牛基础软件平台可应用于使用旗芯微 FC7300 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 FLAGCHIP FC7300 series of chips. For example:

➤ 整车域控制器

Automotive Domain Controller

➤ 驾驶辅助系统(ADAS)

Automotive Driver Assistance Systems (ADAS)

➤ 集成式电液线性制动(One-Box)

Integrated electro-hydraulic linear brake (One-Box)

➤ 网关(Gateway)

Gateway

➤ 电池管理系统(BMS)

Battery Management System (BMS)

➤ 汽车天窗控制器

Car Sunroof Controller

➤ 电机控制器

Motor Controller

3 配置环境 CONFIGURATION ENVIRONMENT

配置环境 Configuration Environment	
Hardware (Chip)	FC7300
Compilers Supported	Greenhills
Evaluation Hardware	FC7300 Development Board
Debugger (SW)	Trace32 or WinIDE
Debugger (HW)	Lauterbach (ARM V7) or IC5000(ARM V7)
Configuration Tools	Muniu_v5.1.3
Configuration Environment	Win7/Win10 64bit

Greenhills 编译器选项 Greenhills Compiler Options	
编译选项 Compiler Options	<pre>-xc -std=c99 --target=arm-arm-none-eabi -mcpu=cortex-m7 - c-fno-rtti-funsigned-char -fshort-enums -fshort-wchar -D__EVAL -D__MICROLIB -gdwarf-4 -O0 -ffunction-sections -Weverything -Wno-packed -Wno-reserved-id-macro -Wno-unused-macros -Wno-documentation-unknown-command -Wno- documentation -Wno-license-management -Wno-parentheses- equality -Wno-reserved-identifier -I ./app -I ./MCAL/CAN/inc - I./MCAL_Gen/inc- I./RTE/Device/FC7300./RTE/_Target_1IC:/Users/Administrator/App Data/Local/Arm/Packs/ARM/CMSIS/5.9.0/CMSIS/Core/IncludeIC:/ Users/Administrator/AppData/Local/Arm/Packs/FLAGCHIP/FC730 0/device/tlelib/inc-D__UVISION_VERSION="538"-D_RTE_ DFC7300 -D_RTE_-o ./Objects/*.o -MD</pre>
链接选项 Linker Options	<pre>allgraph --symbols--info sizes --info totals --info unused --info veneers—list ".\Listings\getting_started.map"-o. .\Objects\getting_started.axf</pre>

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，并逐步增加了功能安全、以太网等内容。目前广泛使用 4.2.1、4.2.2 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 to "cooperate on standards and compete on applications", so can improve 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. Functional safety, Ethernet, and other contents are also added. Currently, the widely used versions are 4.2.1 and 4.2.2, 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, connectivity, and intelligence, the number of automotive electronic and electrical components is increasing. The electrical structure is becoming more complex, and the development cycle of the vehicle is continuously shortening. Basic software plays an increasingly important role.

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 the core technology of the AUTOSAR basic software. Can provide 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 Feature

- 符合 AUTOSAR 4.3.1 版本

Compliant with AUTOSAR 4.3.1

- ARTOP 架构上位机配置工具，最高适配 AUTOSAR 4.4.0 版本

ARTOP configuration tool, compatible up to AUTOSAR 4.4.0

- 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

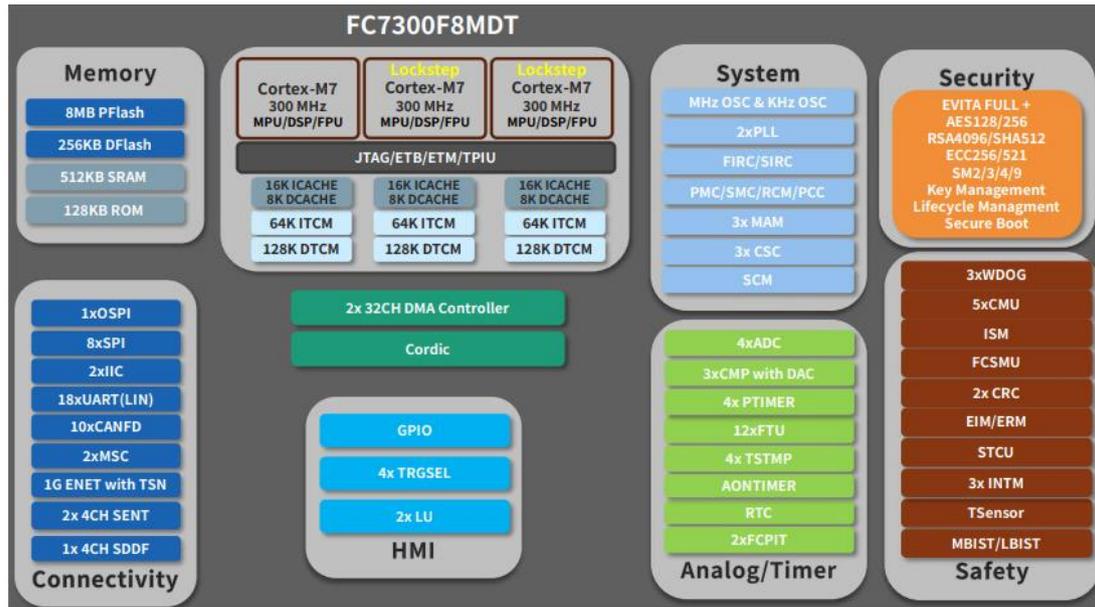
- 复杂驱动定制开发

Custom Development of Complex Drivers

- 工程服务

Engineering Services

5.2 芯片架构 MCU Architecture



主芯片参数如下:

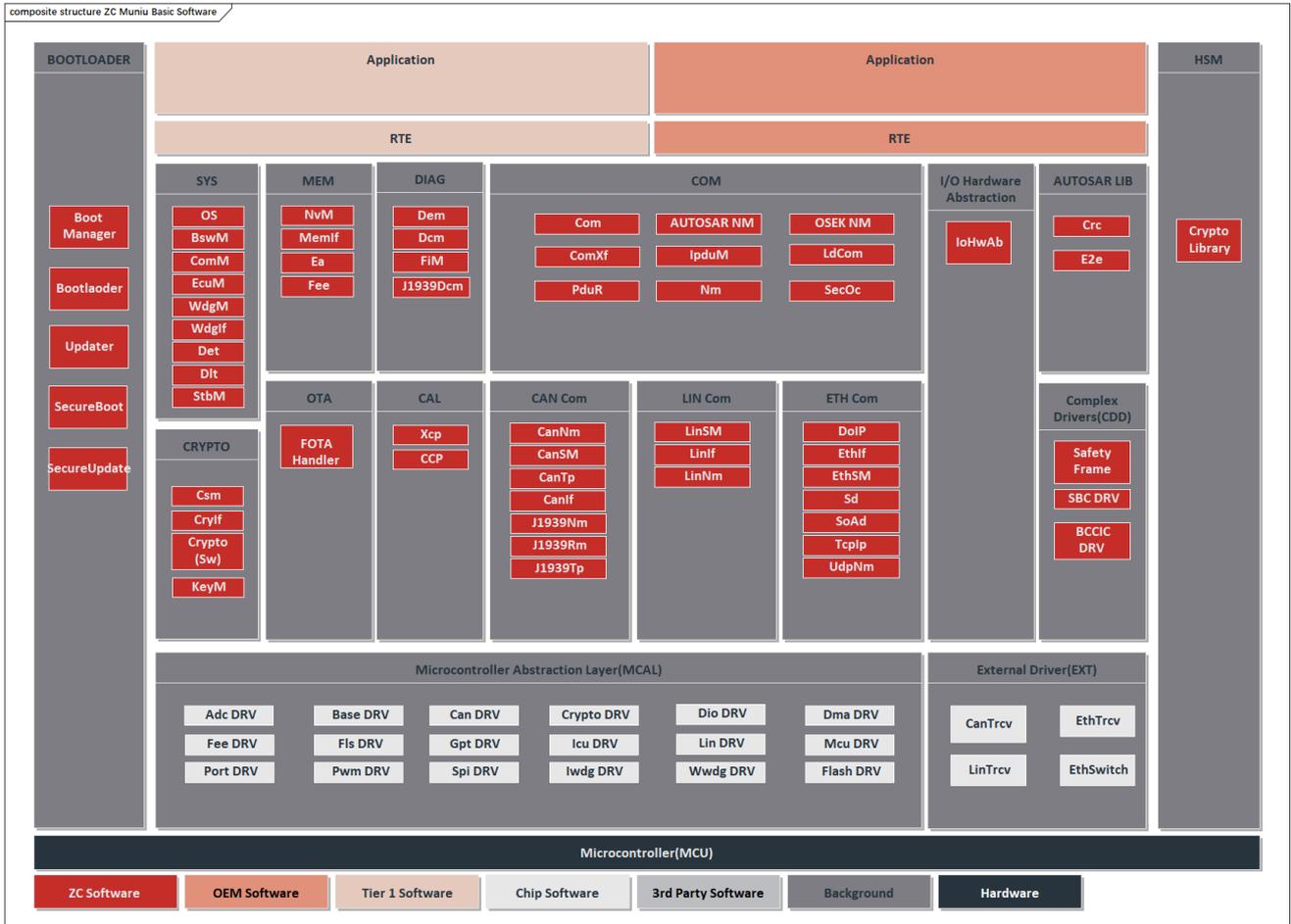
The main chip information is as follows:

- 3 Cortex-M7 (2 lockstep), 300MHz,
- 8MB P-Flash + 256K D-Flash, 1088KB RAM,
- 10 CAN-FD,
- 1 Gbit Ethernet with TSN

ASIL-D, AEC-Q100 Grade 1

MCU PARAMETERS			
Model:	FC7300MDT	Reference Standard:	ISO 26262
Input Voltage:	3.0~5.5V	Operating Temperature:	-40~125°C
Package:	176LQFP-EP and BGA320	Apply Scenario:	Domain Controller

5.3 软件架构 Software Architecture



知从木牛基础软件平台架构
ZC.MUNIUI BASIC SOFTWARE PLATFORM ARCHITECTURE

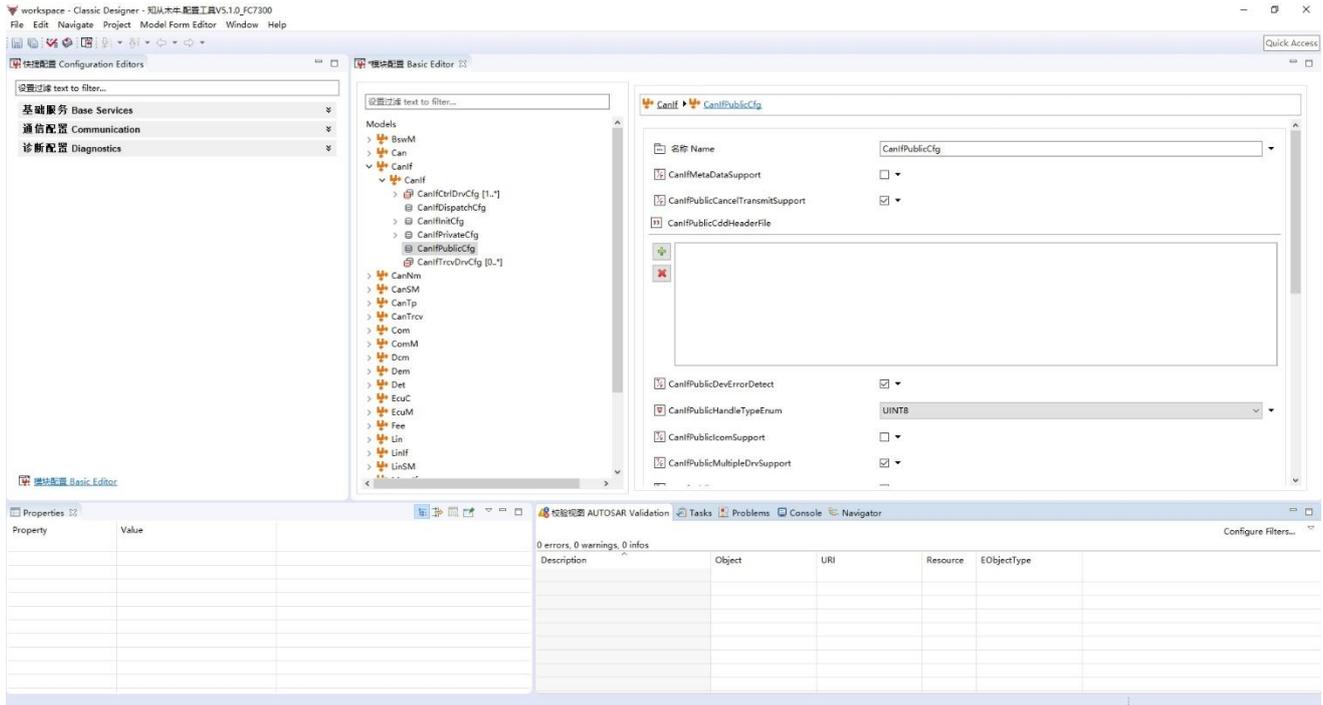
模块 Module	子模块 Submodule	描述 Description
微控制器底层驱动集成包 Microcontroller Abstraction Layer Integrated Package		可集成第三方 MCAL 的集成工程服务包 ZC has an Integrated engineering service package that can be integrated with third-party MCAL
外部底层驱动 External Low-Level Driver (EXT)	CanTrcv DRV	CAN收发器驱动 CAN Transceiver Driver
	EthTrcv	Eth收发器驱动 Eth Transceiver Driver
	LinTrcv	Lin收发器驱动 Lin Transceiver Driver
	EthSwitch	Eth交换机驱动 Eth Switch
		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.

模块 Module	子模块 Submodule	描述 Description	
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 Software Module for System Services
	BSWM	基础软件模式管理 Basic Software Mode Management	
	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	
	Dlt	诊断日志和跟踪 Diagnostic Log and Trace	
	StbM	同步时基管理器 Synchronized Time- Base 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	
	J1939Dcm	J1939诊断通信管理器 J1939 Diagnostic Communication 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
	FEE	Flash的EEPROM模拟	

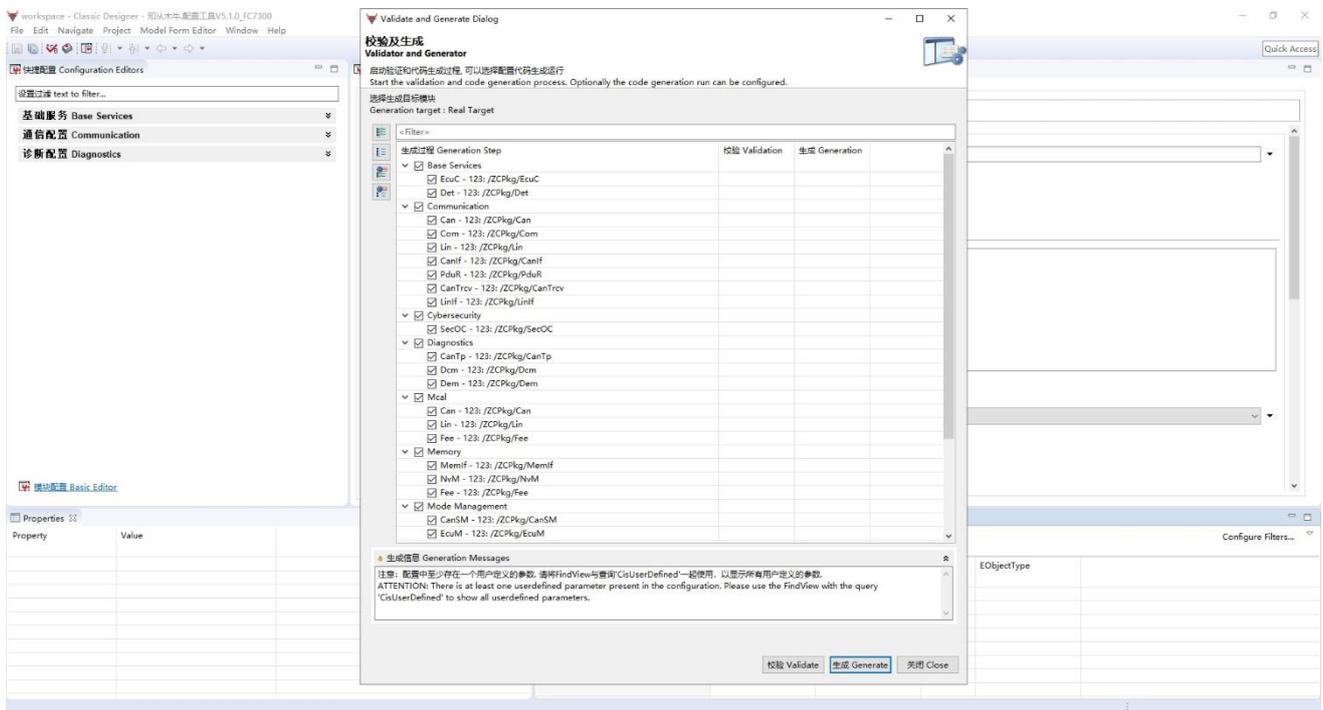
模块 Module	子模块 Submodule	描述 Description
		器Flash-based EEPROM Emulator
	MEMIF	存储器抽象层接口 Memory Abstraction Layer Interface
	NVM	NVRAM管理器 NVRAM Manager
通信服务 Communication Service (COM)	COM	通信 Communication
	AUTOSAR NM	网络管理接口 Network Management Interface
	OSEK NM	OSEK网络管理 Network Management Interface
	PduR	PDU路由 PDU Routing
	ComXf	COM通信序列化 COM Based Transformer
	IpduM	I-PDU多路复用 I-PDU Multiplexer
	LdCom	大数据信号通信 Large Data COM
	Nm	网络管理 Network Management
SecOc	安全车载通信 Secure Onboard Communication	
CAN通信 CAN Communication	CANIF	CAN接口 CAN Interface
	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 Transmission Protocol
	J1939Nm	J1939网络管理 J1939 Network

模块 Module	子模块 Submodule	描述 Description
	Management	
	J1939Rm J1939请求消息管理 J1939 Request Manager	
	J1939Tp J1939传输协议 J1939 Transmission Protocol	
ETH通信 ETH Communication	DoIP IP诊断协议 IP Diagnostic Protocol	实现ETH通信的AUTOSAR基础软件模块 Implement the AUTOSAR basic software module for ETH Communication
	EthIf ETH接口 ETH Interface	
	EthSM ETH状态管理器 ETH State Manager	
	Sd 服务发现 Service Discovery	
	SoAd Socket适配器 Socket Adapter	
	Tcplp TCP IP协议栈 TCP IP Protocol Stack	
	UdpNm UDP网络管理 UDP Network Management	
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
	BCCIC DRV 电池管理系统采样芯片驱动 Battery Management System Sampling Chip Driver	
	Safety Frame 功能安全框架 Safety Frame	
... ..		

5.4 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 requirements of customer and enhance the extensibility of the basic software platform, ZC.MuNiu has implemented configurable modules and configuration tool. Customers can use the configuration tool to configthe modules according to their specific needs, generate configuration code files, and integrate these files into projects.



木牛配置工具架构
 ZC.MUNIUI 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。除了 AUTOSAR 标准定义的模块之外，还支持 OEM 和 Tie1 厂商二次开发自己的模块。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. In addition to the modules defined by the AUTOSAR standard, it also supports OEM and

Tier1 manufacturers to develop their own modules for secondary development. 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 Software Integration and	集成策略 Integration Strategy
	集成手册 Integration Manual

开发流程 Development Process	文档描述 Documentation Description
Integration Testing	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



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



成为全球领先的**汽车基础软件**公司
To Be the Global Leading **Automotive Basic Software** Company

