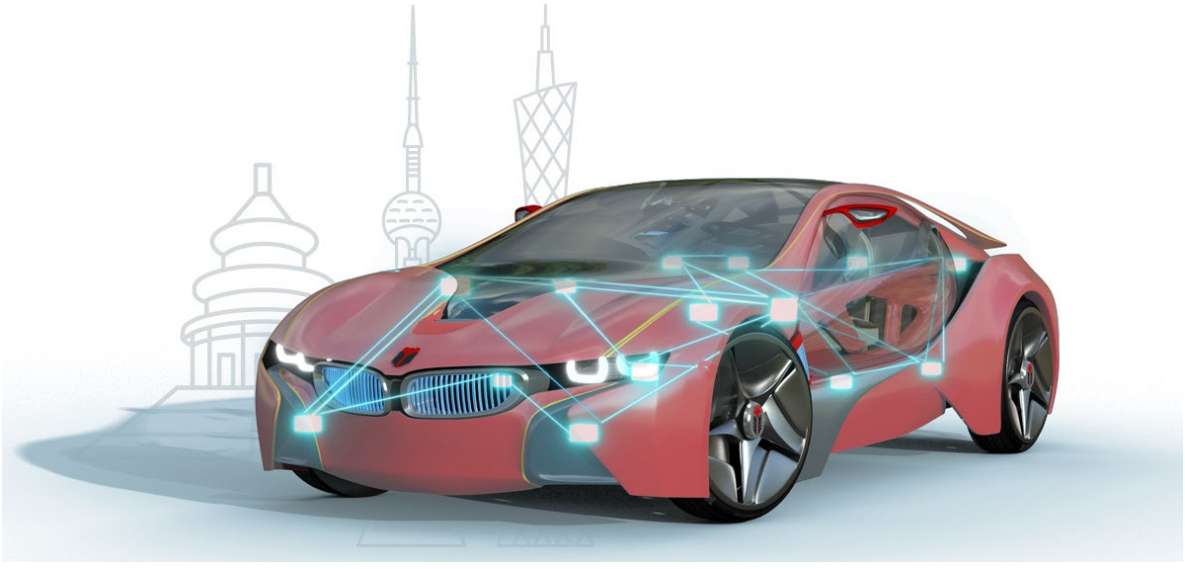
知从木牛 OSEK 网络管理恩智浦 S32K344 产品手册

ZC.MUNIU OSEK NETWORK MANAGEMENT PRODUCT MANUAL BASED ON NXP S32K344

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 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。

ZC.MuNiu Basic Software Platform provides a complete basic software platform solution for the development of automotive electronic controller products. This product refers to international specifications such as AUTOSAR and OSEK. It has a host - computer configuration tool based on the AUTOSAR ATOP architecture, and supports the communication, diagnostic, and network management specifications of vehicle manufacturers including SAIC, FAW, Geely, GAC, Changan, and Great Wall.

知从木牛 S32K3 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）、以太网协议栈（ETH）、远程更新（OTA）、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。

The ZC.MuNiu S32K3 Basic Software Platform mainly includes the following modules: operating system, communication protocol stacks (CAN \ LIN), diagnostic protocol stacks (UDS \ J1939), network management (OSEK \ AUTOSAR), calibration protocol stacks (XCP \ CCP), Ethernet protocol stack (ETH), remote update (OTA), storage protocol stack, encryption module (CRYPTO), complex drivers, etc. Complemented by ZC's Bootloader flashing program and host - computer tools, it can be configured and re-developed according to different customer project requirements. While providing basic software products, ZC also offers development services for implementing the basic software functions of controllers.

知从木牛 OSEK 网络管理恩智浦 S32K344 产品用于帮助客户实现基于 S32K344 平台的 OSEK NM 要求。本软件产品可帮助系统工程师和软件工程师能够快速地应用到客户产品中，同时

OSEK NM 具有高扩展性，可以根据不同的客户项目要求进行配置和再开发，最终满足客户的功能需求。

The ZC MuNiu OSEK Network Management NXP S32K344 product is used to assist customers in fulfilling the OSEK NM requirements based on the S32K344 platform. This software product enables system engineers and software engineers to quickly apply it to customer products. At the same time, OSEK NM has high scalability and can be configured and re - developed according to different customer project requirements, ultimately meeting the functional requirements of customers.

2 应用领域 APPLICATION FIELDS

木牛 OSEK 网络管理可应用于使用恩智浦 S32K344 芯片的汽车电子控制器产品开发。

MuNiu OSEK Network Management can be applied to the development of automotive electronic controller products using NXP's S32K344 chip.

例如:

For example:

- 车身控制器（BCM）
  Body Control Module (BCM)
- 电池管理系统（BMS)
  Battery Management System (BMS)
- 网关控制器
  Gateway Controller
- 车载娱乐模块
  In - vehicle Infotainment Module
- 胎压监控系统
  Tire Pressure Monitoring System
- 门控单元
  Door Control Unit
- 车灯控制单元
  Headlight Control Unit
- 电子驻车制动系统
  Electronic Parking Brake System

配置环境 Configuration Environment	
Hardware (Chip)	S32K344
Compilers Supported	S32 Design Studio for S32 Platform 3.5
Evaluation Hardware	S32K344 EVB
Debugger	Lauterbach (Trace32 R.2018.02) Isystem IC5000(winIDEA 9.21.150)
Configuration Tools	ZC MuNiu v4.4_S32K3xx
Configuration Environment	Win7/Win10 64bit

S32DS 编译器选项 S32DS Compiler Options	
S32 Design Studio for ARM 编译选项 S32 Design Studio for ARM Compilation Options	-std=c99 -DINIT_STDBY_RAM -DARMCM7_SP -DSINTRAM -DDISABLE_MCAL_INTERMODULE_ASR_CHECK -DS32K3XX -DS32K344 -DGCC -DAUTOSAR_OS_NOT_USE -DEU_DISABLE_ANSILIB_CALLS -DUSE_SW_VECTOR_MODE -DI_CACHE_ENABLE -DBTB_ENABLE -DENABLE_FPU –I -O0 -funsigned-char -fshort-enums -fomit-frame-pointer -fstack-usage -fdump-ipa-all -g3 -pedantic -Wall -Wextra -c -fmessage-length=0 -funsigned-bitfields -ffunction-sections -fdata-sections -fno-common -Wunused -Wstrict-prototypes -Wundef -Werror=implicit-function-declaration -Wsign-compare -mcpu=cortex-m7 -mfloat-abi=hard -mfpu=fpv5-sp-d16 -specs=nosys.specs --
S32 Design Studio for ARM 链接选项 S32 Design Studio for ARM Linking Options	-nostartfiles -lc -lm -lgcc -T -Wl,-Map,"Can_47827A_440_090.map" -Xlinker --gc-sections -n -mcpu=cortex-m7 -mfloat-abi=hard -mfpu=fpv5-sp-d16-specs=nosys.specs--

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 founded in 2003. It was jointly established mainly by European automakers, component suppliers, and other electronics, semiconductor, and software system companies. AUTOSAR is committed to developing an open and standardized software architecture for the automotive industry. The vision is for all parties to "cooperate on standards and compete in applications", aiming to enhance the stability of the basic platform, reduce costs, and improve the quality and speed of controller product development.By the end of 2006, the version 2.1 specification was released. In 2008, version 3.1 was launched and entered the productization stage. Subsequently, content such as functional safety and Ethernet was gradually added. 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 general trends of electrification, connectivity, and intelligence in the automotive industry, 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 shortening. Platform - based and intelligent basic software plays a crucial role.

由于整车网络中不同制造商提供的电子控制单元（ECU）不断增长，为了保证网络的正常工作， OSEK/VDX 规范了网络管理的接口协议 OSEKNM，为监视网络的流量提供了一组标准的功能函数，使网络中的 ECU 节点有序地睡眠和唤醒，在没有通信需求的时候睡眠，可以节约整车电池的电量，以保证车内通信网络的安全性和可靠性。OSEK/VDX 网络管理通常有直接网络管理和间接网络管理。直接网络管理通过建立逻辑环形令牌网络使用网络管理报文来检测网络节点状态，间接网络管理通过检测周期性应用报文来确定网络节点状态。本产品主要为 OSEK 直接网络管理。

As the number of Electronic Control Units (ECUs) provided by different manufacturers in the vehicle network continues to grow, to ensure the normal operation of the network, the OSEK/VDX has standardized the network management interface protocol OSEKNM. It provides a set of standard functional functions for monitoring network traffic, enabling ECU nodes in the network to sleep and wake up in an orderly manner. When there is no communication demand,

the nodes can sleep, which saves the vehicle's battery power and ensures the safety and reliability of the in - vehicle communication network.OSEK/VDX network management usually includes direct network management and indirect network management. Direct network management detects the status of network nodes by establishing a logical ring - shaped token network and using network management messages. Indirect network management determines the status of network nodes by detecting periodic application messages. This product mainly focuses on OSEK direct network management.

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）、标定协议栈（XCP\CCP）、以太网协议栈（ETH）、远程更新（OTA）、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 complete basic software platform solution for the development of automotive electronic controller products. This product complies with international specifications such as AUTOSAR and OSEK. It comes with a host - computer configuration tool based on the AUTOSAR ATOP architecture, supporting the communication, diagnostic, and network management specifications of vehicle manufacturers including SAIC, FAW, Geely, GAC, Changan, and Great Wall.This platform mainly consists of: an operating system, communication protocol stacks (CAN \ LIN), diagnostic protocol stacks (UDS \ J1939), network management (OSEK \ AUTOSAR), calibration protocol stacks (XCP \ CCP), an Ethernet protocol stack (ETH), remote update (OTA), a storage protocol stack, an encryption module (CRYPTO), complex drivers, etc. Complemented by ZC's Bootloader flashing program and host - computer tools, it can be configured and re - 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，集成知从的功能安全产品 SafetyFrame，可以满足功能安全要求。

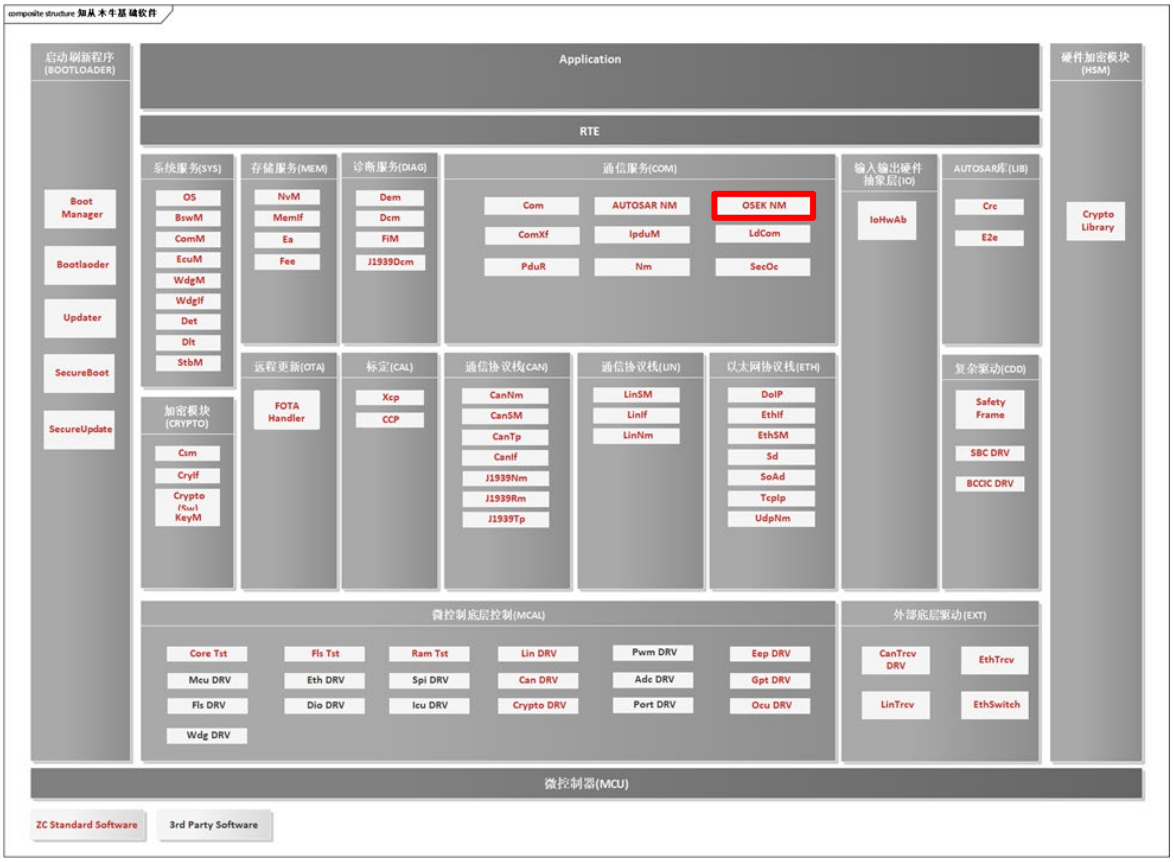
While providing basic software products, ZC also offers development services for implementing the basic software functions of controllers that meet the ASPICE Level 3 process and the functional safety requirements of ASIL B/D. It also undertakes customized development of various complex driver software for SBC chips and BCCIC chips. Additionally, by integrating ZC's functional safety product, SafetyFrame, the functional safety requirements can be met.

知从科技掌握 OSEK 网络管理基础软件产品开发和应用的核心技术，提供本地和现场支持，质量好，速度快，成本低。

ZC masters the core technologies for the development and application of OSEK network management basic software products. It provides local and on - site support, featuring high - quality service, fast response, and low cost.

5 功能描述 FUNCTIONAL DESCRIPTION

5.1 产品特点 Product Feature

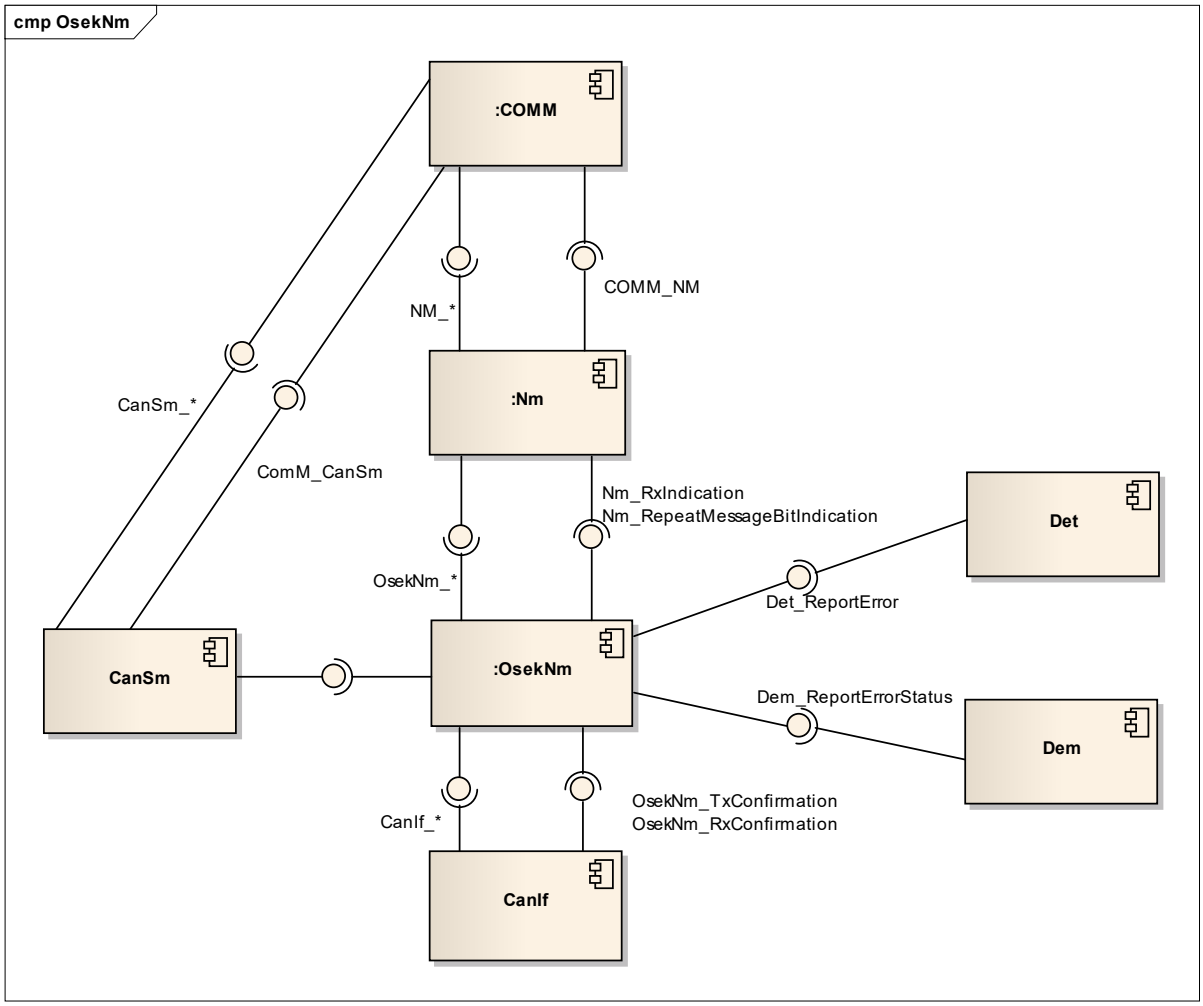


OSEK NM 为实现确保通信安全性和可靠性，提供如下的功能：

To ensure the security and reliability of communication, OSEK NM provides the following functions:

- 适用于多家整车厂的网络管理规范
  Network management specifications applicable to multiple vehicle manufacturers.
- 支持多家芯片厂商的芯片
  Support for chips from multiple chip manufacturers.
- 高扩展性：各个模块可配置满足不同用户的应用需求
  High scalability: Each module is configurable to meet the application requirements of different users.

5.2 软件架构 software architecture

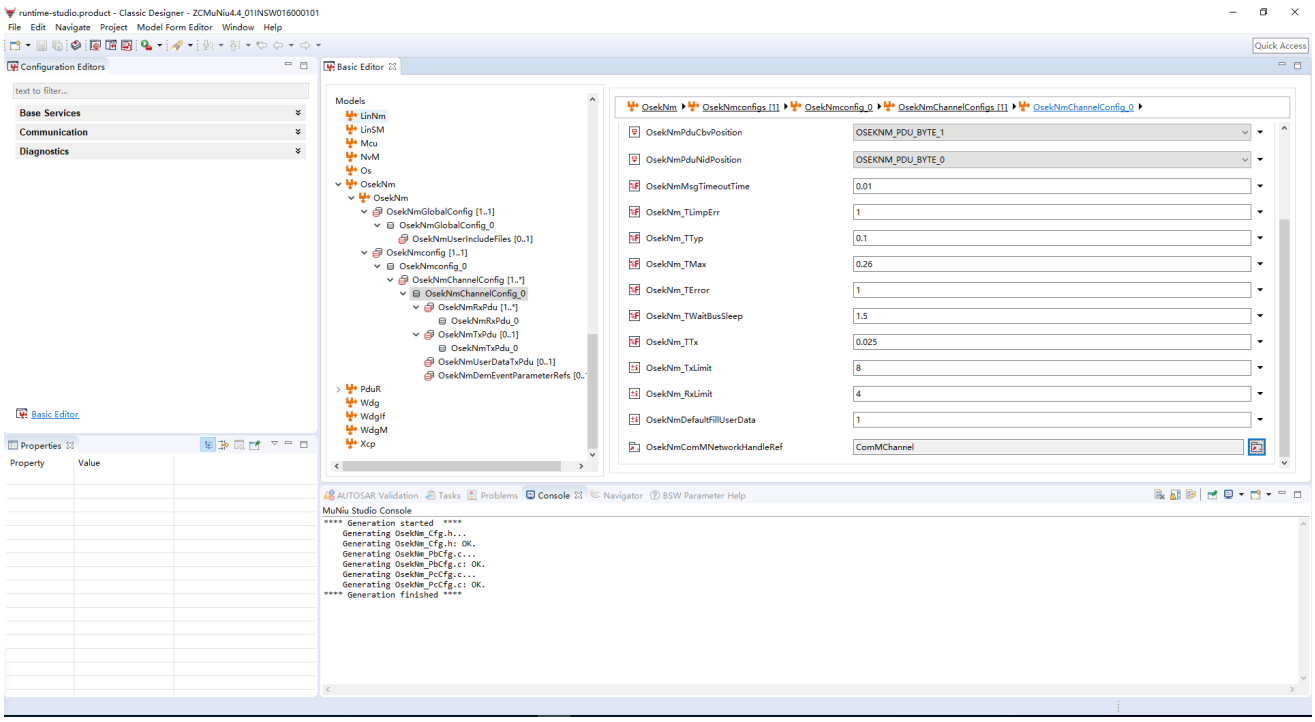


OSEK NM 由 ComM、CanIf、Nm、CanSM 等主要模块组成。OsekNm 模块的下层是 CanIf 和 CanSM，上层是 Nm，OSEK 网络管理（OsekNm）使用 CanIf 的服务并为 Nm 提供服务，实现 OSEK 网络管理中的直接网络管理功能。

OSEK NM is mainly composed of modules such as ComM, CanIf, Nm, and CanSM. Below the OsekNm module are CanIf and CanSM, and above it is Nm. The OSEK Network Management (OsekNm) utilizes the services of CanIf and provides services for Nm to implement the direct network management function in OSEK network management.

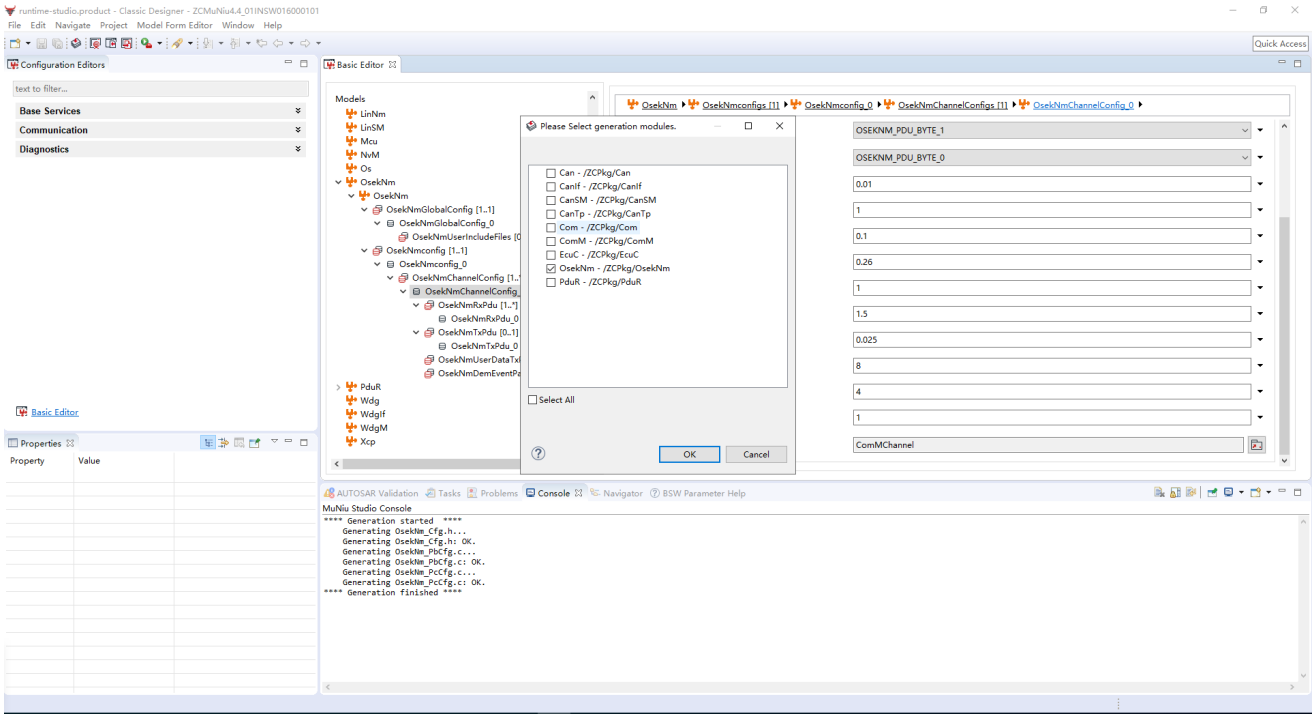
功能 Function	描述 Description
初始化功能 Initialization function	OsekNM模块初始化 Initialize the OsekNM module.
被动启动 Passive startup	从睡眠模式到网络模式将触发传输在Repeat Message The transition from sleep mode to network mode will trigger the transmission in the Repeat Message.
请求网络 Request network	ECU需要在总线上通信，网络状态应该为“requested” When the ECU requirements to communicate on the bus, the network status should be "requested".
释放网络 Release network	ECU不需要在网络上通信，网络状态应该为“released” When the ECU doesn't need to communicate on the network, the network status should be "released".
禁止NM PDU传输 Disable NM PDU transmission	网络进入被动状态 The network enters a passive state.
使能NM PDU传输 Enable NM PDU transmission	网络进入活动状态 The network enters an active state.
设置用户数据 Set user data	在总线上设置下一次传输的用户数据到NM报文 Set the user data for the next transmission on the bus into the NM message.
获取NM报文 Obtain NM message	获取最近接收到的NM报文到用户数据区 Retrieve the most recently received NM message to the user data area.
获取节点标识 Obtain node identifier	获取最近接收NM PDU的节点标识 Obtain the node identifier of the most recently received NM PDU.
获取网络管理状态和模式 Obtain network management status and mode	获取网络管理状态和模式。 Obtain the network management status and mode.
获取配置表 Obtain configuration table	提供指定网络节点实际配置表 Provide the actual configuration table of the specified network node.
获取状态 Obtain status	获取网络当前状态 Obtain the current network status.
主处理函数 Main processing function	周期处理OsekNM事件 Handle OsekNM events periodically.

5.3 配置工具 Configuration Tool



木牛配置工具主界面

Main Interface of MuNiu Configuration Tool

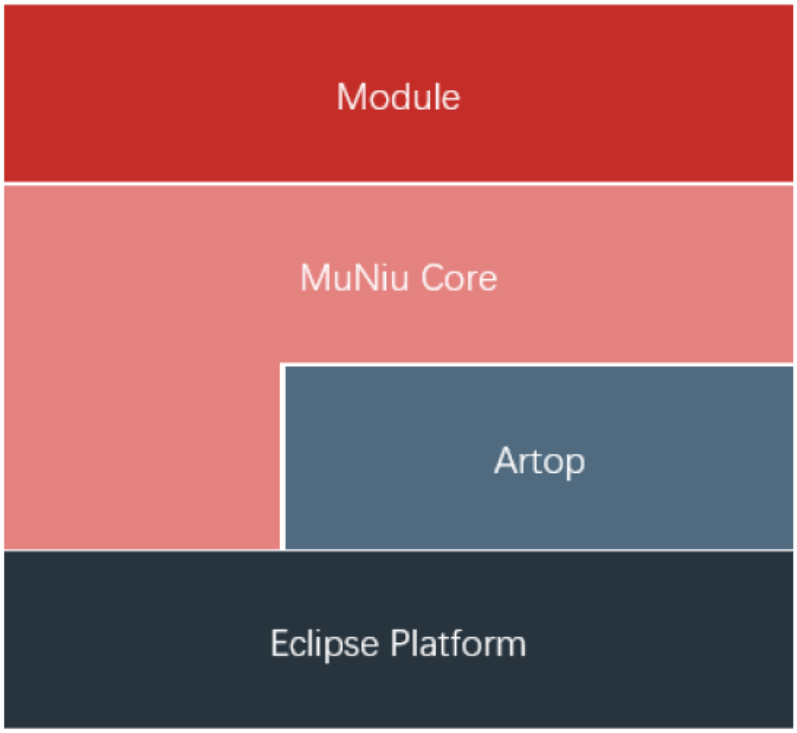


木牛配置工具主界面

The main interface of the MuNiu Configuration Utility

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。

In order 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 developed a configuration tool. Customers can, according to their different requirements, complete the configuration of each module on this tool. The tool can generate configuration code files, which can then be integrated into the project.



木牛配置工具架构

Architecture of MuNiu Configuration Tool

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。

The configuration tool of the MuNiu Basic Software Platform is based on the Eclipse platform and the ARTOP architecture, enabling the parsing of AUTOSAR models and ARXML. MuNiu Core is responsible for the UI interface of the configuration tool. The modules above MuNiu Core implement the configuration of various AUTOSAR modules. After the configuration is completed, 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 Document 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 Table
	问题沟通表 Problem Communication Table
软件架构设计 软件架构设计 Software Architecture Design	软件架构说明书 Software Architecture Specification
	软件架构的追踪表 Software Architecture Traceability Table
软件详细设计和单元设计 软件详细设计和单元设计 Detailed Software 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 Table
	软件详细设计评审表 Software Detailed Design Review Table
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

开发流程 Development Process	文档描述 Document Description
Software Integration and Integration Testing	集成手册 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 Document

7 试用包 TRIAL PACKAGE

知从木牛 OSEK 网络管理恩智浦 S32K344 产品已经推出配套的 OSEK 网络管理试用包，主要包括基础软件集成工程、配置手册、技术参考手册、测试工程等内容。方便客户深入了解产品。如有需要可以访问 http://www.shzckj.cn/，联系我们获取。

The ZC MuNiu OSEK Network Management product for NXP S32K344 has a supporting OSEK Network Management trial package. It mainly includes the basic software integration project, configuration manual, technical reference manual, test project, etc. This package is designed to help customers gain an in - depth understanding of the product. If you need it, please visit http://www.shzckj.cn/ and contact us to obtain it.

8 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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ZC. MUNIU SOFTWARE PRODUCT REGISTRATION CERTIFICATE