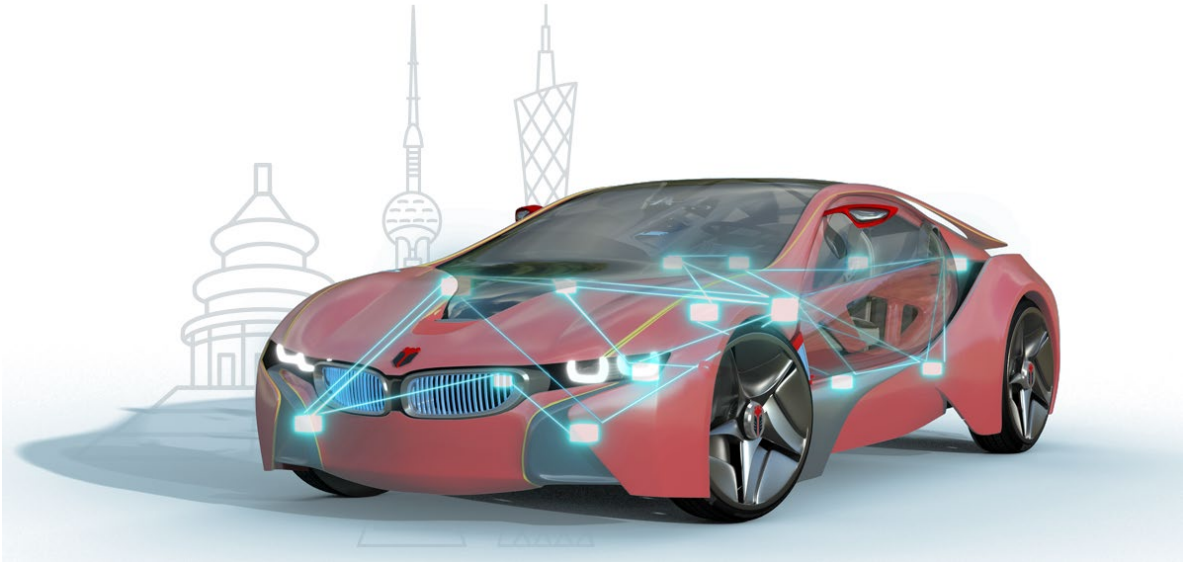
知从玄武 BOOTLOADER 上位机产品手册

ZC.XUANWU BOOTLOADER UPPER COMPUTER PRODUCT MANUAL

知从玄武工具

ZC.XuanWu Tool



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1 功能概述 FUNCTIONAL OVERVIEW

玄武上位机软件用来将电子控制器中的应用程序和数据，从 PC 端下载到电子控制器上。支持 UDSonCAN、UDSonIP、UDSonK-Line、UDSonLIN 协议。提供客户协议定制集成，广泛应用在电子控制器产品开发阶段，测试阶段，售后服务阶段。

ZC.XuanWu upper computer software is used to download application programs and data from the PC to the electronic controller. It supports UDS on CAN, UDS on IP, UDS on K-Line, and UDS on LIN protocols. It offers customized integration of customer-specific protocols and is widely used in the development, testing, and after-sales service stages of electronic controller products.

目前支持的整车厂程序刷写规范有广汽、长安、上汽、一汽、东风商用车、上汽通用、吉利、奇瑞、上汽通用五菱、长城、北汽新能源、蔚来、小鹏、爱驰、TOGG、比亚迪、Audi、大众（以上排名不分先后）。

Currently, it supports the program flashing specifications of various vehicle manufacturers such as GAC, Changan, SAIC, FAW, Dongfeng Commercial Vehicles, SGM, Geely, Chery, SGMW, Great Wall, BAIC New Energy, NIO, XPeng, Aiways, TOGG, BYD, Audi, and Volkswagen (listed in no particular order).

2 应用领域 APPLICATION FIELD

知从玄武程序刷新与诊断测试工具可应用于 OEM 和 Tier1 多种应用场景下。用户可以方便的在实验室，试验车辆以及实车上方便的进行程序刷写工作。

ZC.XuanWu program refresh and diagnostic testing tools can be applied in various application scenarios for OEMs and Tier 1 suppliers. Users can conveniently perform program flashing work in laboratories, test vehicles, and actual vehicles.

玄武上位机软件目前应用于各类电子控制器的程序刷写：

ZC.XuanWu upper computer software is currently used for program flashing of various electronic controllers:

- 车身控制器 Body Control Module (BCM)
- 空调控制器 Air Conditioning Controller
- DC/DC 控制器 DC/DC Converter
- 电子助力转向控制器 Electric Power Steering Controller
- 发动机控制器 Engine Management System (EMS)
- 变速箱控制器 Transmission Control Module (TCM)
- 电池管理系统 Battery Management System (BMS)
- 整车控制器 Vehicle Control Unit (VCU)
- 电机控制器 Motor Control Unit (MCU)
- 电动助力转向系统 Electric Power Steering System (EPS)
- 防抱死制动系统 Anti-lock Braking System (ABS)
- 电子稳定性控制程序 Electronic Stability Program (ESP)
- 主动防撞系统 Active Collision Avoidance System (ACC)
- 牵引力控制系统 Traction Control System (TCS)
- ADAS 控制器 Advanced Driver Assistance Systems Controller

3 配置环境 CONFIGURATION ENVIRONMENT

配置环境 Configuration Environment	
Hardware	PCAN 、 Mongoose 、 Kvaser 、 USBCAN （ ZLG ） 、 VN1640 、 TC1016、OBD-RJ45
Configuration Environment	Win7/10 64bit

PCAN

Mongoose

USBCAN（ZLG）

Kvaser

VN1640

OBD-RJ45

TC1016

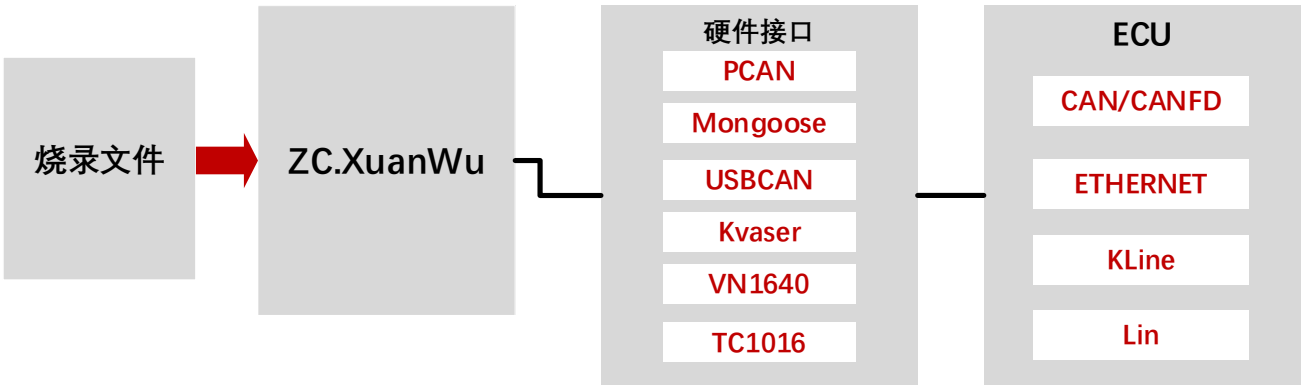
4 开发背景 DEVELOPMENT BACKGROUND

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。MCU 的数量也从最初的几个，变成十几个，到现在的几十个。软件规模比最初有了十倍、百倍的增长，软件 bug 也同样，越来越“失去控制”。

With the major trends of electrification, networking, and intelligence in the automotive industry, the number of electronic and electrical components is increasing, and the electrical structure is becoming more complex. The number of MCUs (Microcontroller Units) has grown from a few initially, to dozens now. The scale of software has increased tenfold or even a hundredfold compared to the beginning, and software bugs are also multiplying, becoming increasingly 'out of control'.

目前，整车研发上市时间变得越来越短，控制器软件开发及测试时间缩短，甚至整车先卖，软件功能后开发的情况在最近几年上市的新车型中也成了“厂家策略”。现在，汽车控制器产品工作环境从-40℃到 120℃，震动，环境湿度，电磁干扰都很强烈，控制器打开外壳后，基本上再也无法满足控制器原本的要求；安装位置多数也不便于拆卸。可以通过 CAN 总线，以太网进行程序刷新的功能成为控制器产品的“必备”。

At present, the time from vehicle research and development to market launch is becoming shorter and shorter. The development and testing time for controller software is also reduced. In recent years, it has even become a 'manufacturer strategy' to sell the whole vehicle first and then develop the software functions for newly launched models. Nowadays, the working environment for automotive controller products ranges from -40°C to 120°C, with strong vibrations, environmental humidity, and electromagnetic interference. Once the controller's casing is opened, it basically can no longer meet the original requirements; the installation locations are also mostly not easy to disassemble. The ability to refresh the program through the CAN bus and Ethernet has become a 'must-have' for controller products.



5 功能描述 FUNCTIONAL DESCRIPTION

5.1 产品特点 Product Feature

- 操作简易 Easy to operate
  - 图形化界面，方便配置

    Graphical interface for convenient configuration
  - 自动解析烧录文件（S19/BIN/HEX/VBF/MBF）

    Automatically parse programming files (S19/BIN/HEX/VBF/MBF)
  - 支持多文件下载，单文件 block 段下载，block 段地址映射可配

    Support multi-file download, single-file block segment download, and configurable block segment address mapping
- 使用灵活 Flexible to Use
  - 支持 CAN、CAN FD、Lin 总线、K 线、以太网刷新

    Supports CAN, CAN FD, LIN bus, K-line, and Ethernet refreshing
  - 支持 UDS 诊断 ISO 14229 协议

    Supports UDS diagnostic ISO 14229 protocol
  - 支持网络层、传输层 ISO15765-2、ISO13400-2、ISO14230、ISO17987-2 协议

    Supports network layer, transport layer protocols ISO15765-2, ISO13400-2, ISO14230, ISO17987-2
  - 支持多种硬件接口

    Supports various hardware interfaces
  - 支持多种刷新规范

    Supports a variety of flashing specifications
  - 支持多路刷写

    Supports multi-channel flashing
  - 可自定义刷新流程、可配置时间参数

    Customizable flashing process and configurable timing parameters

知从玄武 Bootloader 上位机 ZC.XuanWu Bootloader Upper Computer	
刷写规范和 Boot 测试支持	OEM for flashing specifications and Boot test support
广汽	GAC
长安	Changan
一汽	FAW
东风商用车	DFCV
上汽通用	SAIC-GM
吉利	Geely
奇瑞	Chery
上汽通用五菱	SAIC-GM-Wuling
长城	Great Wall Motor
北汽新能源	BAIC BJEV
蔚来	NIO
小鹏	XPeng
爱驰	AIWAYS
TOGG	TOGG
比亚迪	BYD
奥迪	Audi
大众	Volkswagen

- 安全刷新 Secure Flashing
  - 支持 29 服务证书传递

    Supports service 29 for certificate transfer
  - 支持 84 服务安全刷新

    Supports service 84 for Secure Flashing
  - 支持 31 服务证书签名

    Supports service 31 for certificate signing
  - 支持 AES-CBC/AES-CMAC 算法、RSA 算法、HASH 算法

    Supports AES-CBC/AES-CMAC algorithms, RSA algorithm, HASH algorithms

- 测试支持 Testing Support
  - 支持 UDS 诊断测试

    Supports UDS diagnostic testing
  - 可导入解析诊断调查表 excel

    Can import and parse diagnostic inquiry forms in Excel
  - 根据诊断调查表自动生成测试用例

    Automatically generates test cases based on diagnostic inquiry forms
  - 提供 Python API 接口，支持 Python 测试用例开发

    Provides a Python API interface, supporting the development of Python test cases
  - 支持 python 自动化测试

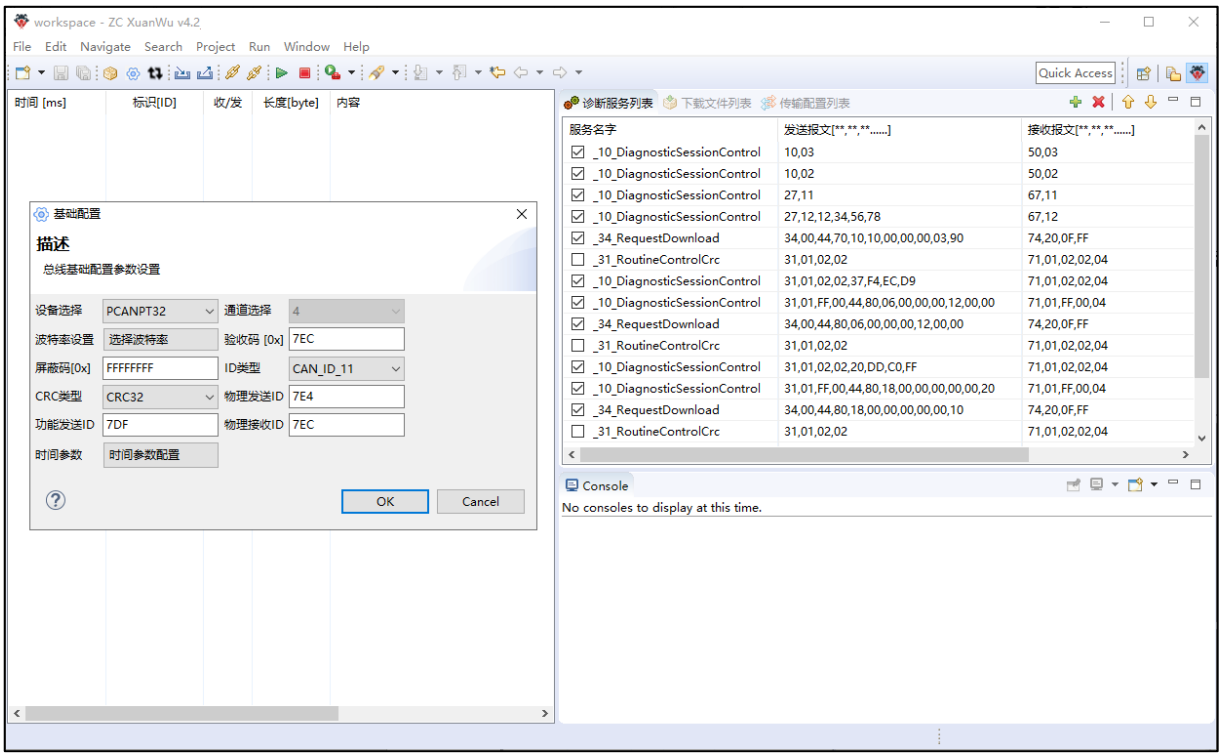
    Supports Python automated testing

5.2 具体功能 Specific Function

5.2.1 基于 UDS 刷写 UDS-based Flashing

玄武上位机软件主要是用于整车厂或者供应商下载程序到电子控制器。将文件导入后，客户可以进行通信参数配置和服务流程参数配置。在解析文件，连接设备之后，客户可以将程序下载到电子控制器中。在下载的过程中，客户可以看到每一条流程报文的运行情况和内容，每一个内容对应着一条服务。

ZC.XuanWu upper computer software is primarily used by vehicle manufacturers or suppliers to download programs to electronic controllers. After importing the files, customers can configure communication parameters and service process parameters. After parsing the files and connecting the devices, customers can download the programs to the electronic controllers. During the download process, customers can see the operation status and content of each process message, each content corresponding to a service.



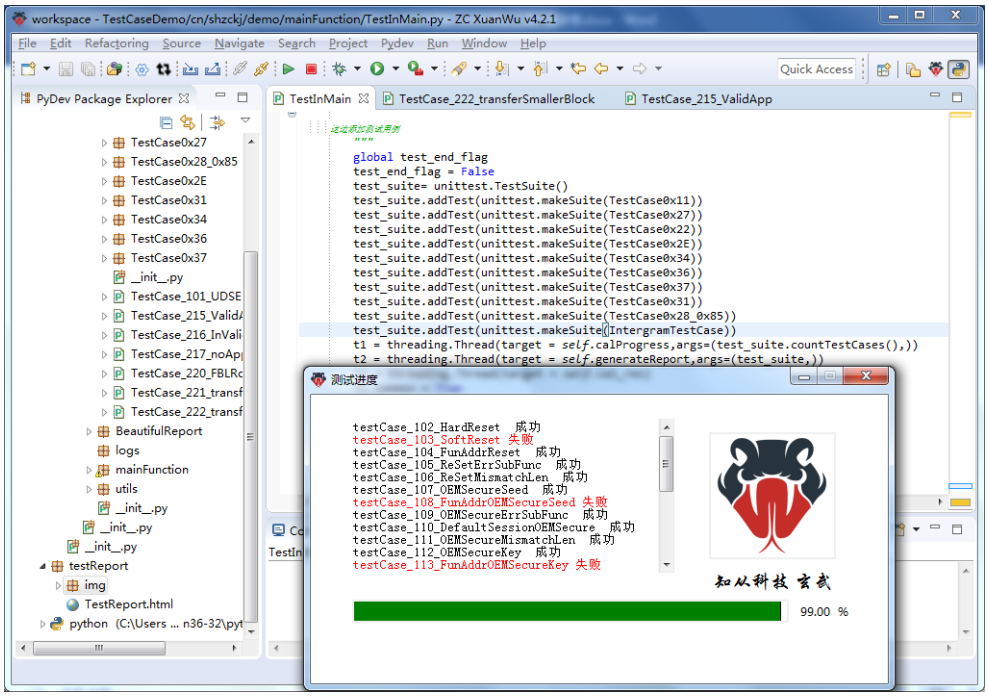
为了满足客户的不同项目需求，提高玄武上位机软件的可扩展性，玄武上位机软件可以让客户自行配置诊断服务。客户可根据不同需求，在配置界面上对各个服务进行添加、删除、开启和关闭操作。

To meet the varying project requirements of customers and enhance the extensibility of the Xuanwu upper computer software, the Xuanwu upper computer software allows customers to configure diagnostic services on their own. Depending on different requirements, customers can add, delete, enable, and disable various services on the configuration interface.

5.2.2 自动化测试 Automated Testing

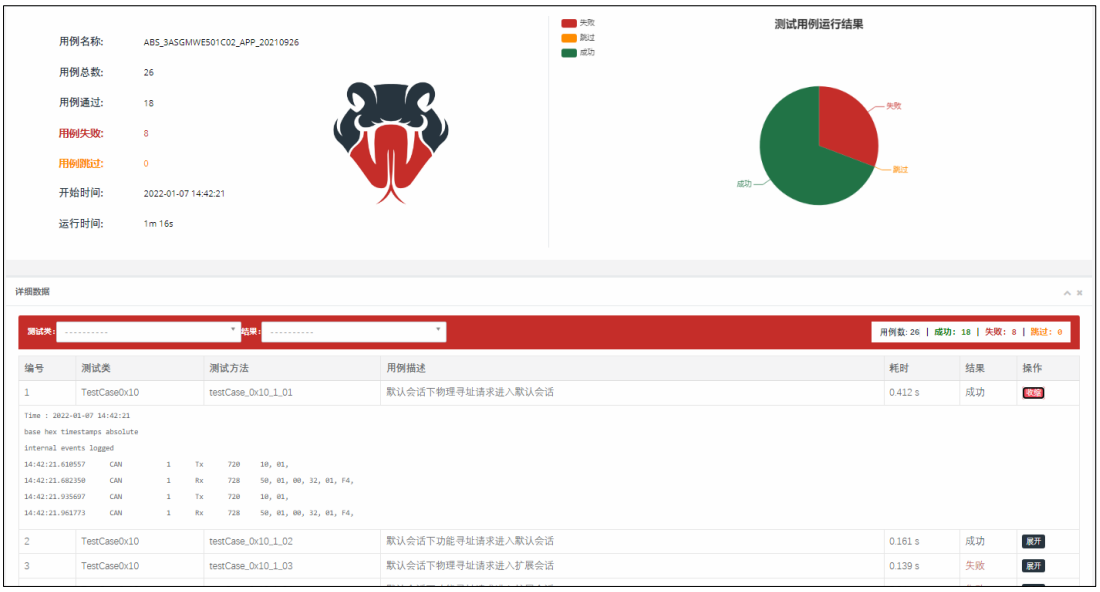
玄武根据不同整车厂诊断规范制定了测试用例库，导入玄武后可直接进行诊断服务的测试。不仅如此，用户可以在此基础上修改开发自己的测试用例库。

ZC.XuanWu has developed a test case library based on the diagnostic specifications of various vehicle manufacturers. After importing into ZC.XuanWu, diagnostic service testing can be conducted directly. Moreover, users can modify and develop their own test case libraries on this basis.



针对测试结果，玄武工具可以自动生成测试报告。

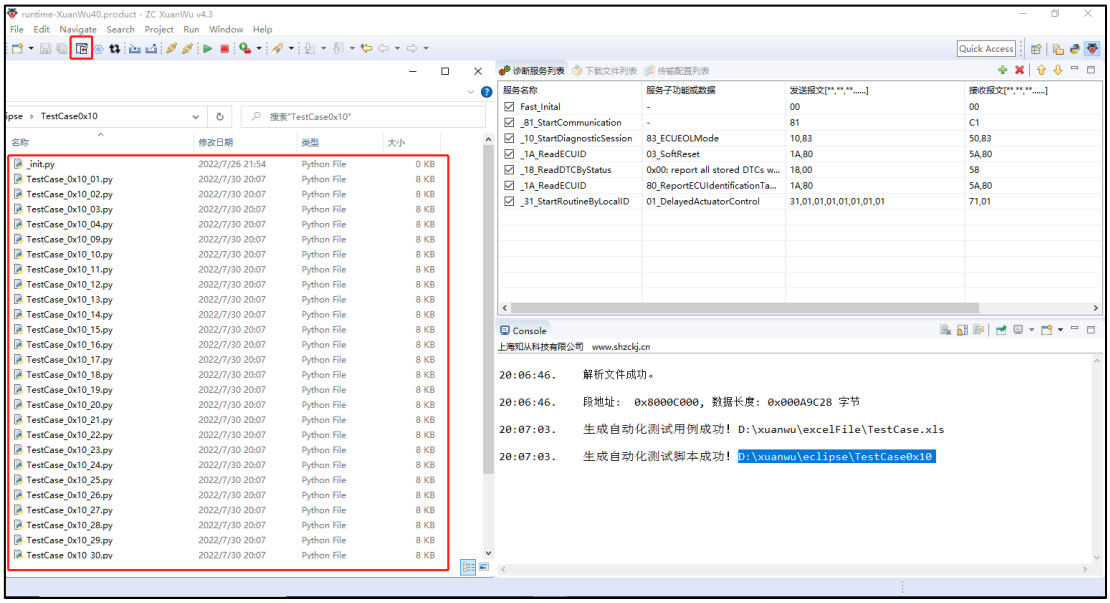
In response to test results, ZC.XuanWu tool can automatically generate test reports.



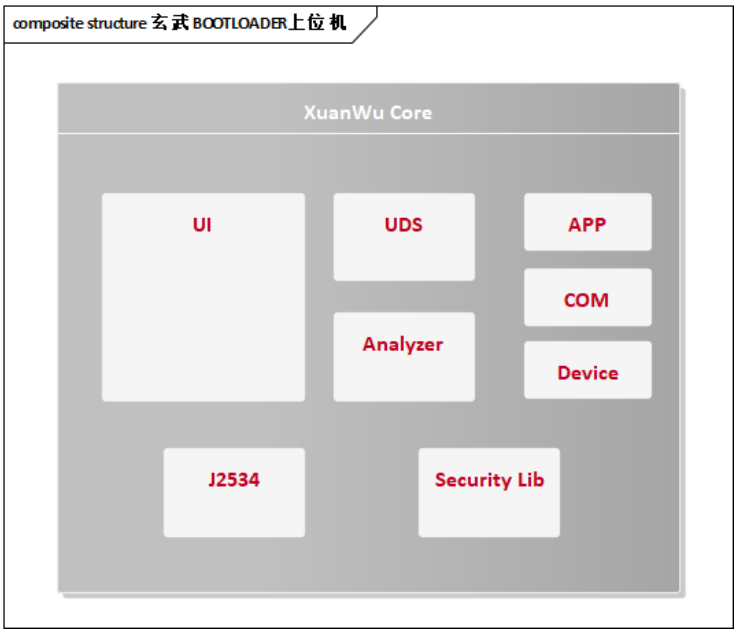
5.2.2 测试用例生成 Test Case Generation

玄武导入诊断调查表 excel 后，可以生成测试用例和自动化测试脚本。

After ZC.XuanWu imports the diagnostic survey spreadsheet in Excel, it can generate test cases and automated test scripts.



5.3 软件架构 Software Architecture



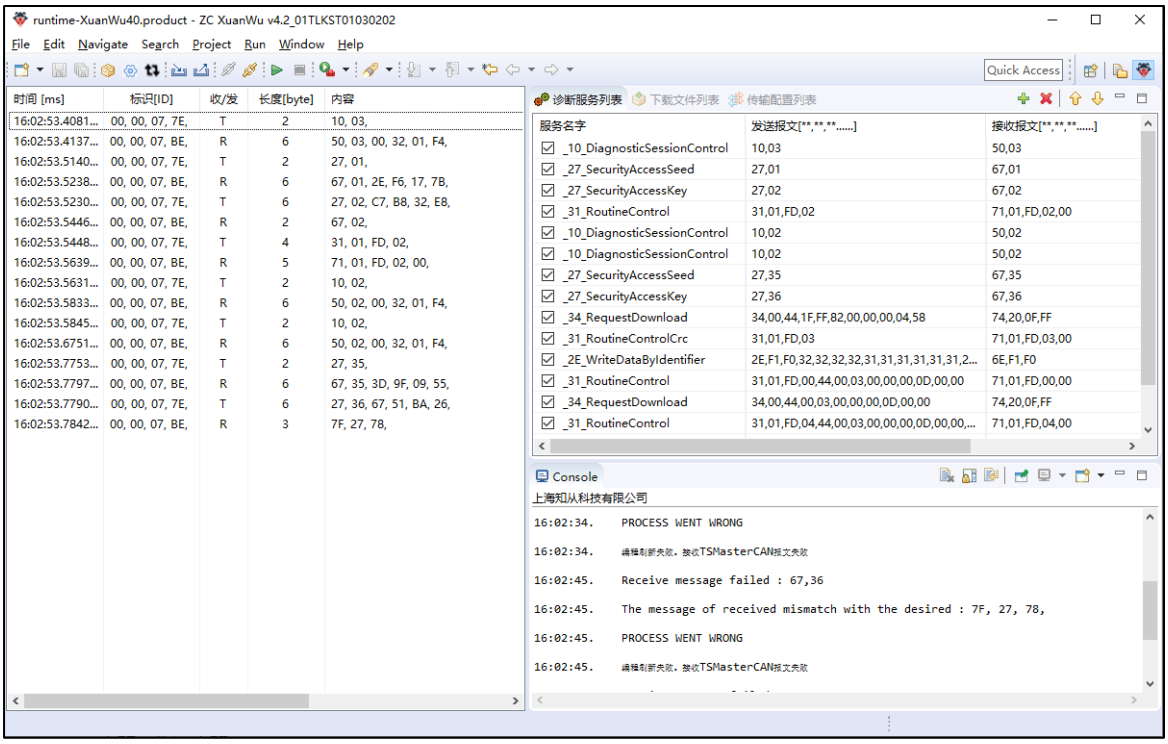
模块 Module	子模块 Submodule		描述 Description
玄武核心 (XuanWu Core)	UI	界面 Interface	基于 SWT/JFace 以及 Eclipse Workbench Based on SWT/JFace and Eclipse Workbench
	UDS	诊断服务 Diagnostic Services	基于 14229、15765 协议的服务的具体实现 Specific implementation of services based on the 14229 and 15765 protocols
	Analyzer	解析器 Parser	CRC 校验、UDS 服务解析及 XML 解析 CRC verification, UDS service parsing, and XML parsing
	APP	应用程序 Application Program	刷写的应用程序的相关信息及操作 Information and operations related to the flashed application program
	COM	CAN 通信 CAN Communication	关于 CAN 通信的具体实现 Specific implementation of CAN communication
		CANFD 通信 CAN FD Communication	关于 CANFD 通信的具体实现 Specific implementation of CAN FD communication
		Eth 通信 Ethernet Communication	关于以太网通信的具体实现 Specific implementation of Ethernet communication
		Lin 通信 LIN Communication	关于 Lin 通信的具体实现 Specific implementation of LIN communication

模块 Module	子模块 Submodule		描述 Description
	Device	连接设备 Connect Device	实现了 ZLG_USB, CAN, Mongoose, PCAN, TC1016, VN1640, RJ45 转 OBD 等设备的连接 Implementation of connections for devices such as ZLG_USB, CAN, Mongoose, PCAN, TC1016, VN1640, RJ45 to OBD, etc.
	J2534	J2534 协议 J2534 Protocol	J2534 协议的具体实现，主要包括与下位机通信相关的操作 Specific implementation of the J2534 protocol, mainly including operations related to communication with the lower computer
	Security Lib	安全库 Security Library	客户提供的安全算法库 Security algorithm library provided by the customer

5.4 界面简介 Interface Overview

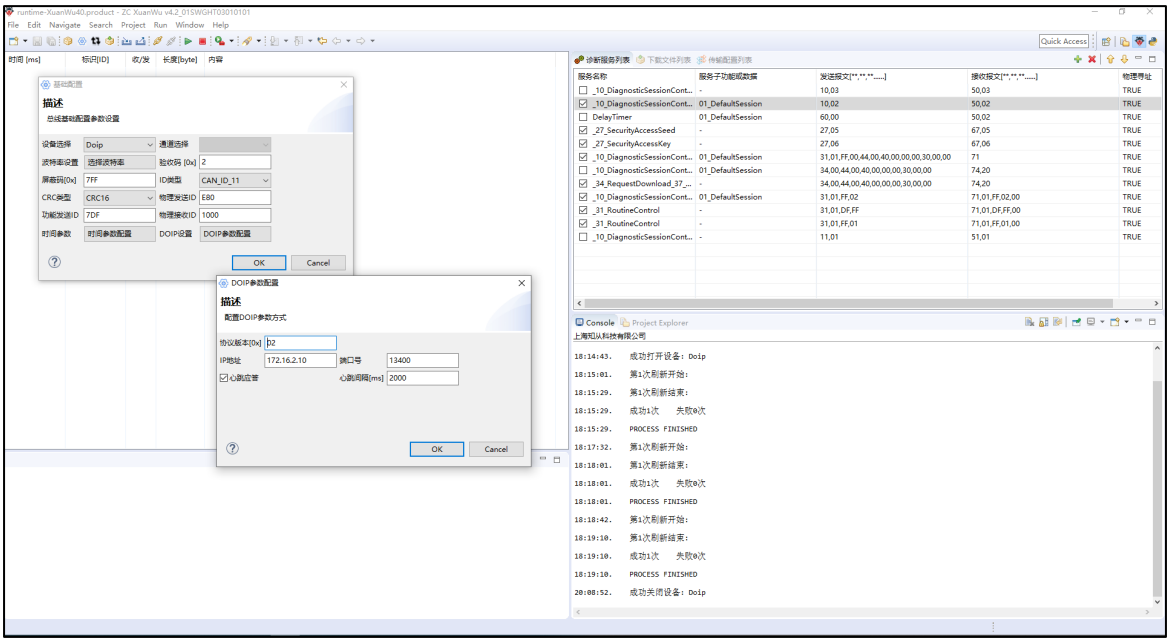
工具界面包括流程报文监控界面，诊断服务列表，下载文件列表，传输配置列表和信息输出框。客户可在此进行配置诊断服务，解析工程文件，监控报文信息，配置通信参数，配置信息安全算法等操作。

The interface overview includes the process message monitoring interface, diagnostic service list, download file list, transmission configuration list, and information output box. Customers can perform operations such as configuring diagnostic services, parsing project files, monitoring message information, configuring communication parameters, and setting up information security algorithms here.



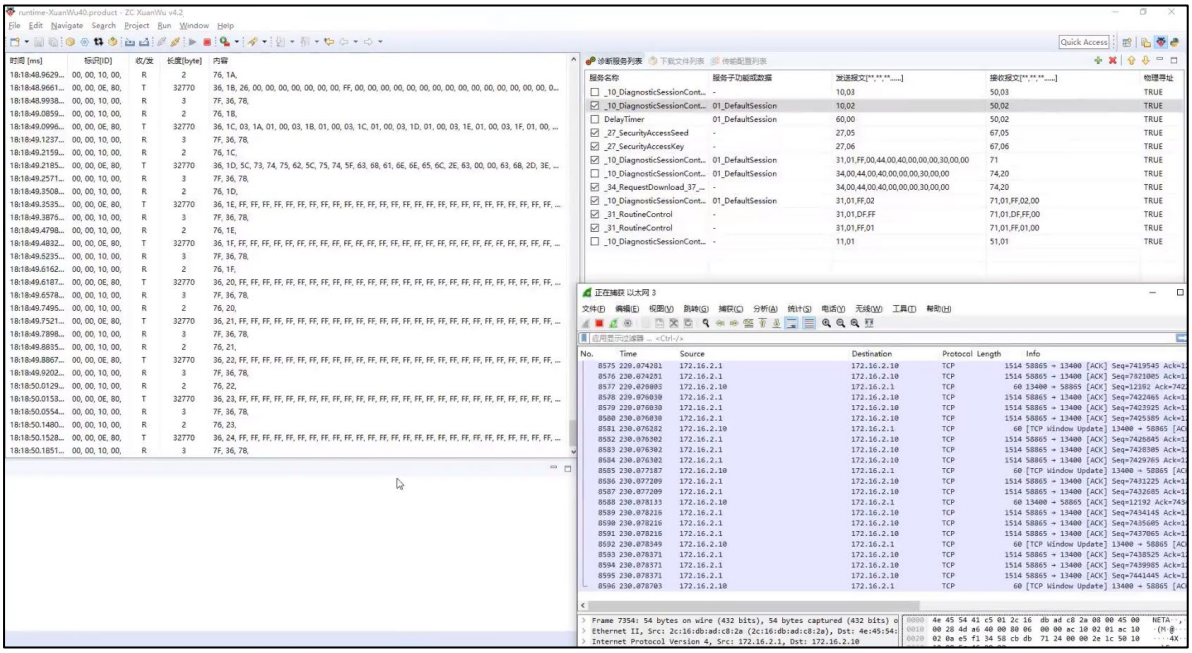
玄武工具目前最新支持以太网 Doip 刷新，用户可以配置以太网协议版本和 ip 地址，根据 Doip 报文功能，选择 TPC/UPD 传输方式。

ZC.XuanWu tool currently supports the latest Ethernet DoIP flashing, where users can configure the Ethernet protocol version and IP address, and select the TPC/UPD transmission method based on the DoIP message functionality.



以太网的刷写速度最高可达 100Mbit/s，速度是 CANFD 的 50 倍，标准 CAN 的 200 倍。

The Ethernet flashing speed can reach up to 100 Mbit/s, which is 50 times the speed of CAN FD and 200 times the speed of standard CAN.



5.5 定制开发 Customized Development

玄武支持定制开发，根据用户需求研发定制版本。

ZC.XuanWu supports customized development, which involves developing a tailored version based on user requirements.

成功案例：用于某客户产线基于 5744P 平台的电机控制器的定制版玄武刷新工具。

Success Case: Custom version of Xuanwu refresh tool for a customer's production line based on the 5744P platform for motor controllers.

定制功能：可扫描 ECU 设备上的二维码进行产品验证，从服务器上获取刷新文件和刷新配置，进行自动刷新，并将刷新结果和测试报告上传至后台数据库。

Custom Features: The tool can scan QR codes on ECU devices for product verification, retrieve refresh files and refresh configurations from the server, perform automatic refreshes, and upload refresh results and test reports to the backend database.

6 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3021600号

软 件 名 称：知从玄武上位机软件
[简称：玄武]
V1.0

著 作 权 人：上海知从科技有限公司

开发完成日期：2018年01月04日

首次发表日期：2018年01月10日

权利取得方式：原始取得

权 利 范 围：全部权利

登 记 号：2018SR692505

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