# Realtime High performance PLC solution based on STM32MP135

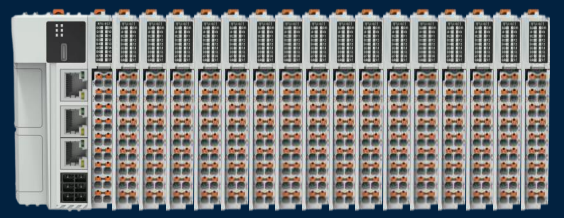
Nxtrol Technology

NXTROL

# Introduction

Henry Bao, Nxtrol technology Co-founder and General Manager, who served as the technical leader of the China branch of a well-known German IEC61131-3 PLC software solution company from 2010 to 2019. Specialized in IEC61131-3 standard PLC-related software and hardware technologies, with nearly 15 years of technical expertise in PLC core platform technology, as well as fieldbus, communication protocols, motion control, and other related technologies.

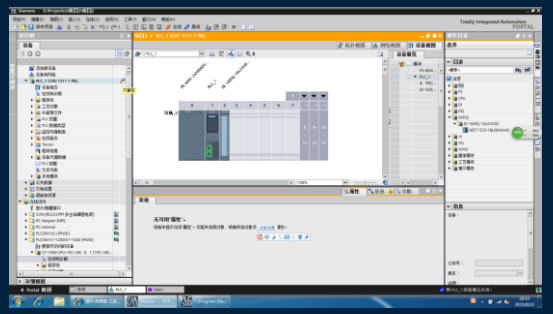
LOGIC LAB
IEC 61131-3 ENVIRONMENT



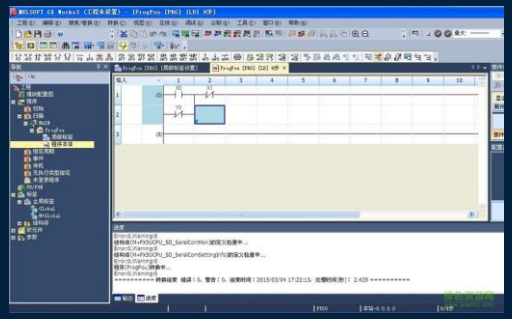
**Specialized in PLC software and hardware technology solutions**

# PLC market and Technological system(2023)

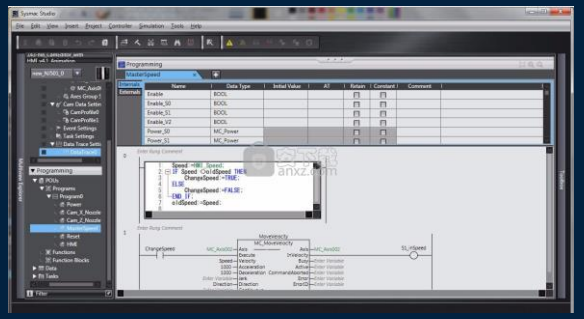
**Siemens(40%)**



**Mitsubish(12.9%)**



**Omron(11.2%)**



| Language | Datatype | | Task | POU |
|---|---|---|---|---|
| LD、FBD、ST、SFC、IL(*) | Basic/Advance/Custom datatype | PLCopen logic ST LD IL SFC FBD IEC 61131-3 | Realtime task architecture | Re-encapsulable FC (Function) / FB (Function Block) and PROG (Program) |

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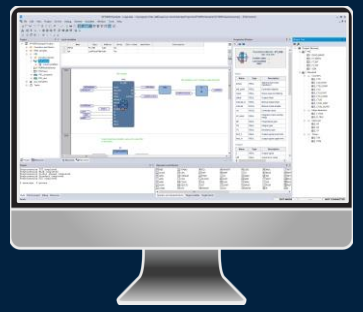
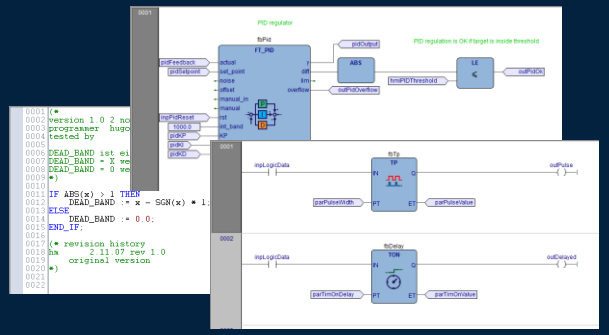
# Programmable Logic Controller

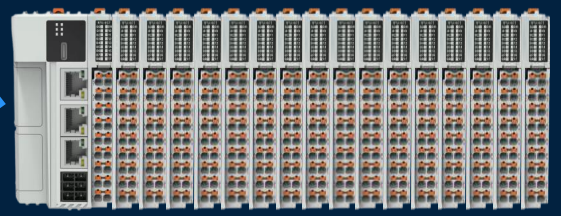


IEC61131-3 PLC Engineer

## Logic Program



## PLC Controller



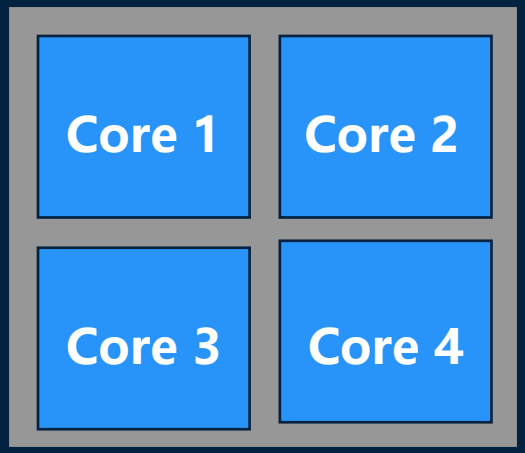
## HMI Communication

## On-site sensors and actuators

# Key points of new model high performance PLC from Market

1. Integration - Integrating more debugging tools to lower the application threshold.
2. High speed and more axis - 12 Axis:125us/128 Axis: less than 1ms
3. Low interrupt latency - 5us
4. High performance - around 27 times than traditional PLC
5. High Capacity - Approximately 2-100 times that of traditional models.

ARM Cortex-A Quad Core

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# Select best platform combination

- Performance and Stability
- Price and Cost
- Software Ecosystem
- PLC Core Architecture

# Reference Design based on STM32MP135

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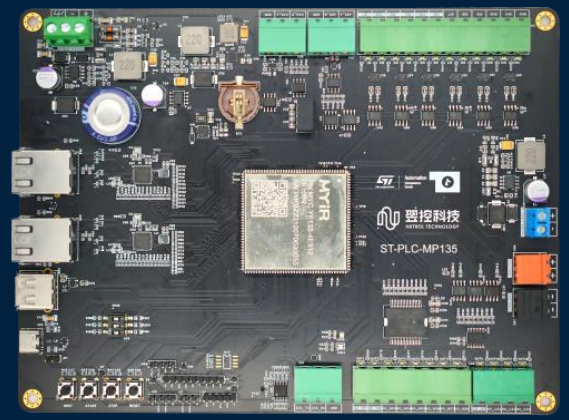
IEC 61131-3 ENVIRONMENT

## Full functionality reference design




## Open Cooperation

life.augmented — MPU & Reference Board

MYiR 米尔电子 Make Your Idea Real — SOM module

翌控科技 NXTROL TECHNOLOGY — Software Technology

# Product solution based on STM32MP135

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## Performance & Cost Balanced

## Open Cooperation

MPU

PLC Hardware

Local & Remote IO

Housing & Connector

Software Technology

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# LogicLab solution based on STM32MP135

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1GHz & 4ns/IL

Latency

<15us

EtherCAT

250us-4ms cycle
<1us sync diff

PLCopen
motion control

64 Axis

32 IO(2ms)

Modbus

CANopen

PROFINET

MQTT

EtherNet/IP

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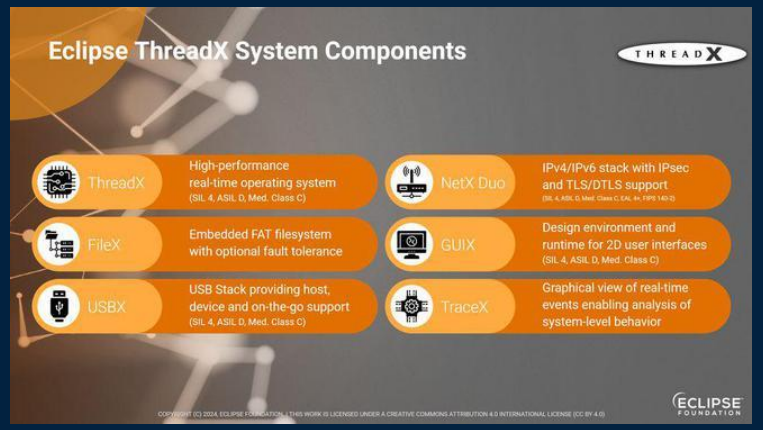
# 100% opensource and free RTOS - ThreadX

12 Billion devices

Business Component




MIT License

Microsoft Maintance

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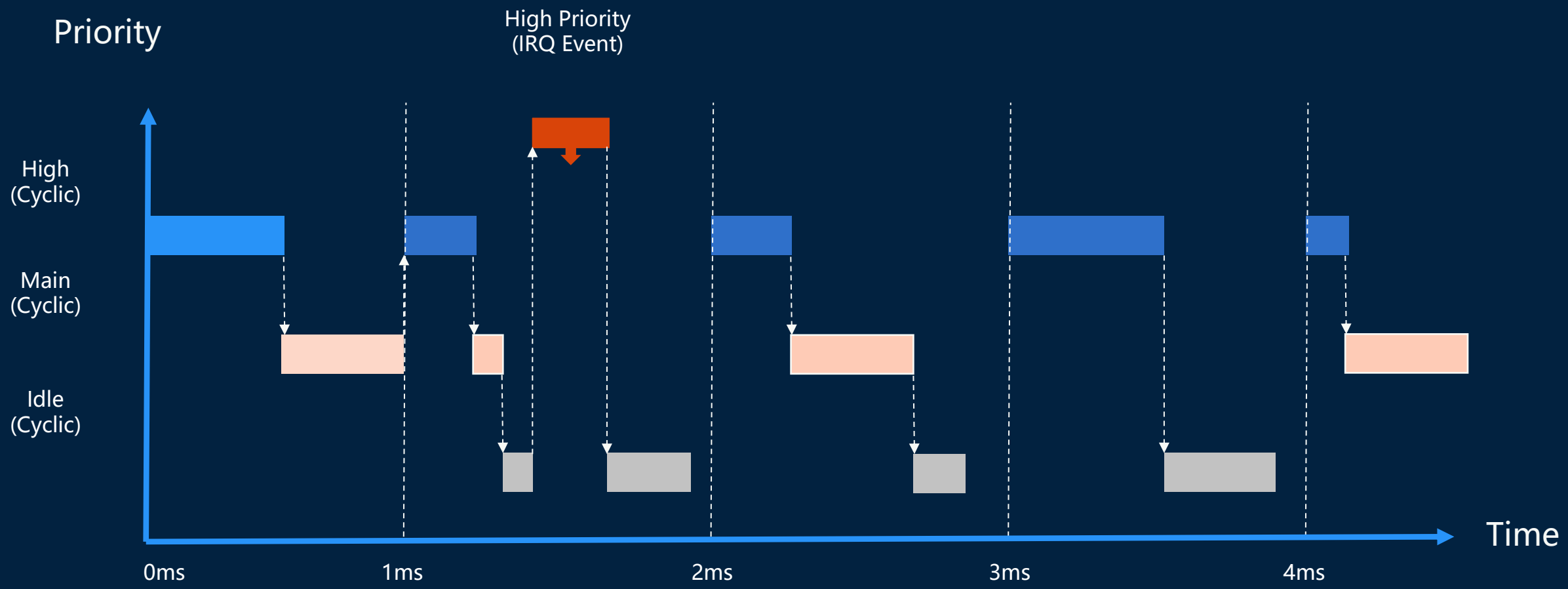
# WHY RTOS?




**PLC program execution**

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# LogicLab IDE feature

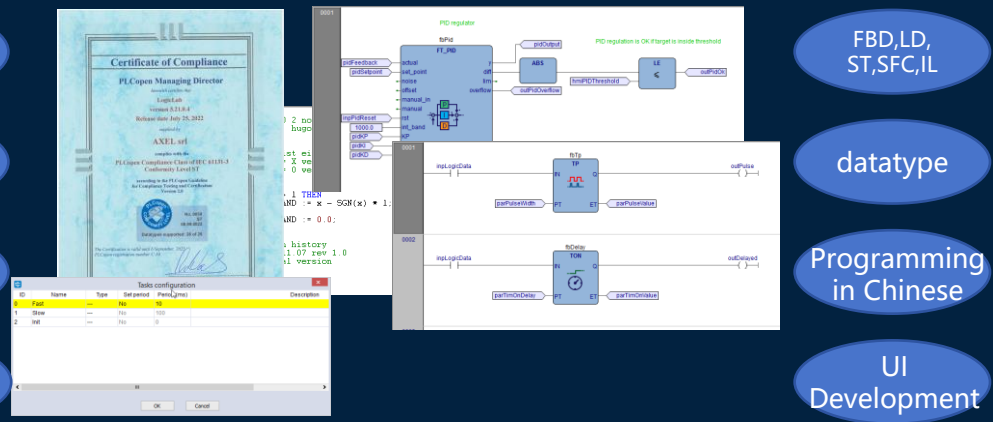
## IEC61131-3 Standard

Certified

Realtime Task

Object Orient

OEM Brandlabel




FBD,LD, ST,SFC,IL

datatype

Programming in Chinese

UI Development

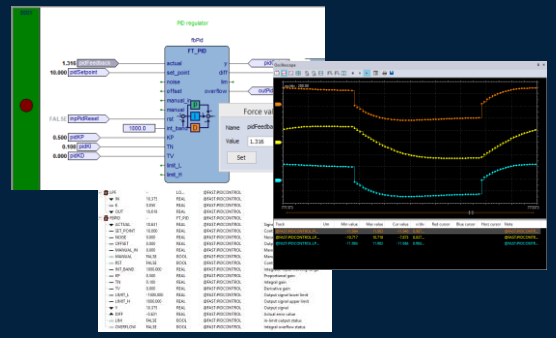
## Lightweight and high-performance

- Full feature installation < 200MB
- Machine code execution, more than 10 times faster than traditional PLC
- Fast compiling and debuging
- Low resource requirement, support IEC61131-3 on resource constrain MCU

## Logic debug and online

Breakpoint

online monitor



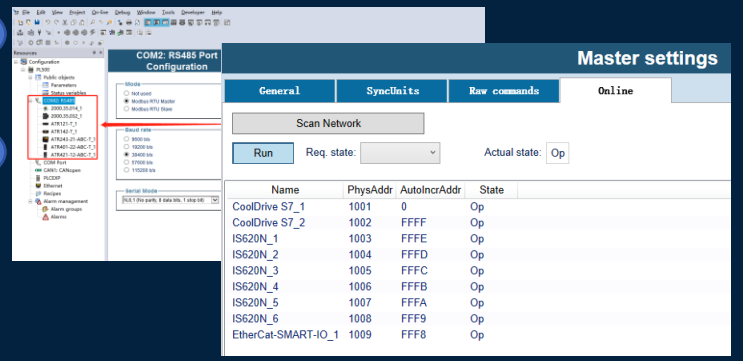
Oscilloscope

Overwrite

## Configurator and Diagnosis

Modbus

Motion




CANopen

EtherCAT

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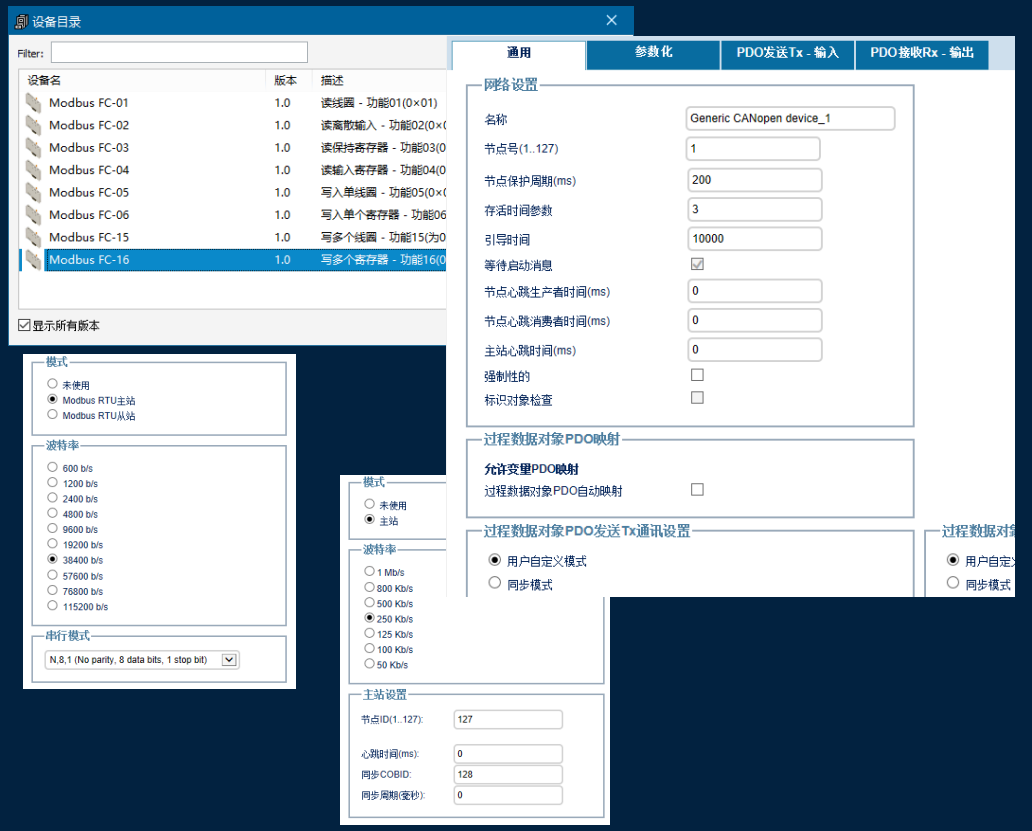
# High performance Modbus&CANopen protocol

## Modbus

- Modbus function code
- ModbusRTU&TCP Client and server
- UI network configuration
- Modbus function blocks
- Diagnosis datablocks

## CANopen

- Support DS301、DS302、DS402 standard
- Support import EDS
- UI Network configuration
- SDO and management Function Block
- Diagnosis datablocks

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# High performance EtherCAT master

## Core feature

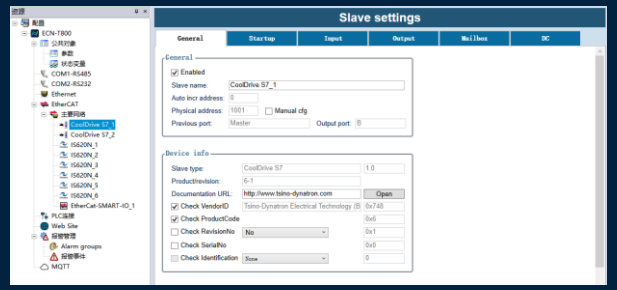
- CoE、FoE、EoE
- Online Configuration and Diagnosis
- Support standard ESI and ENI
- Support DC correction
- 125us-4ms EtherCAT cycle time

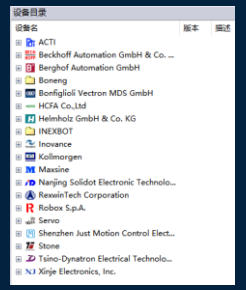
## Configuration

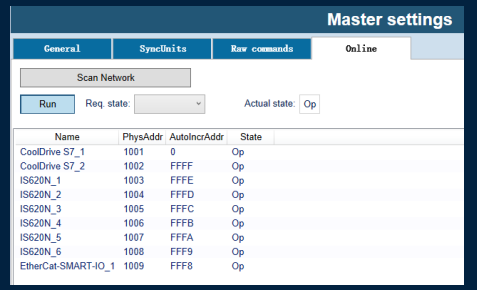
- Import ESI and generate and standard ENI
- Online scan and parameter setting
- Init commands and PDO configuration
- Online read and write EtherCAT ESC register、PDO、COE object
- Online monitor slaves status
- No slaves limitation, free of charge

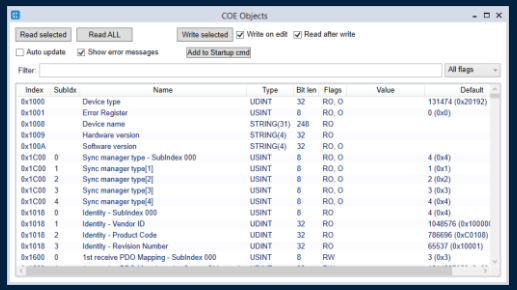
## Development

- PDO mapping
- SDO read and write
- Master and slave monitor
- Support PLC and C/C++ API



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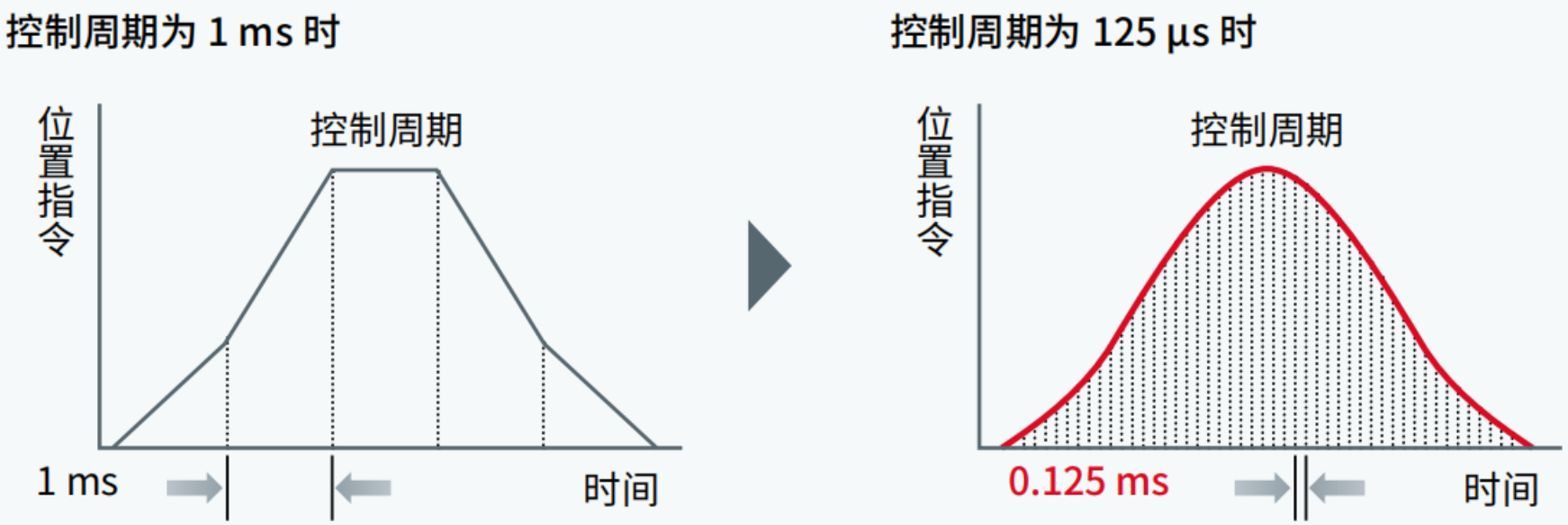
# Advantage of High performance EtherCAT

▶【高精度】位置指令的精度比较

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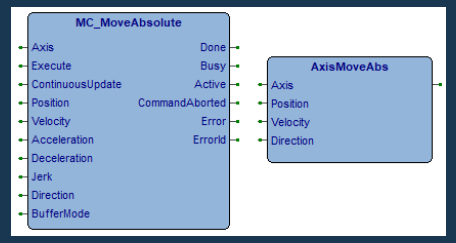
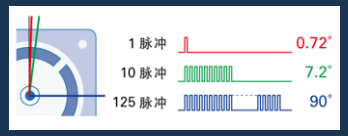
# Motion Control solution

## Duo Instruction (PLCopen & Base)

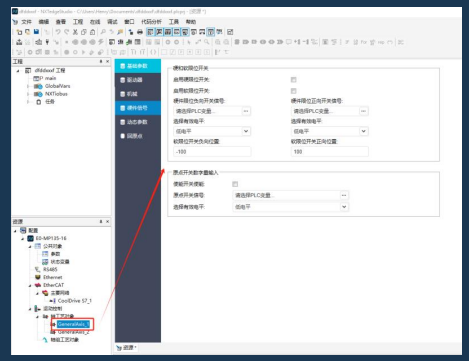



## Drive Interface (Virtual、Pulse、EtherCAT)




EtherCAT®

## Configuration and Diag



所有轴参数配置均通过界面配置完成

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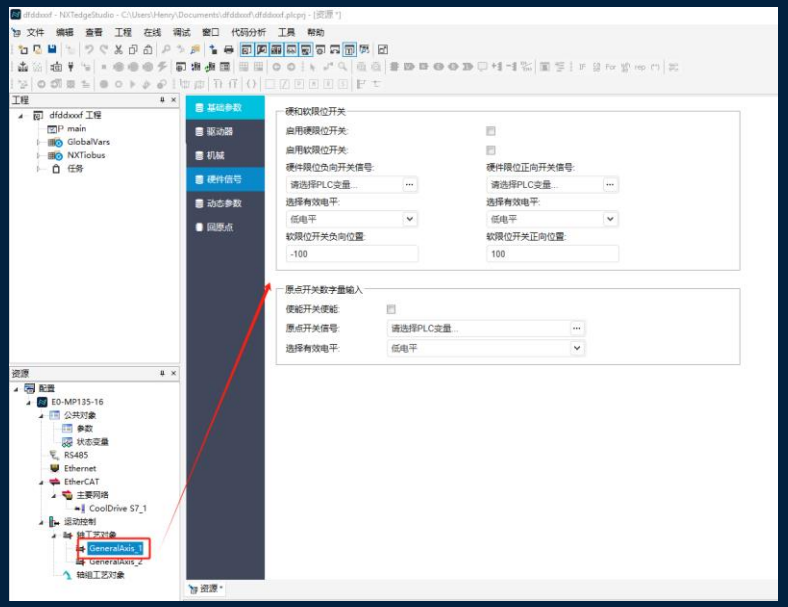
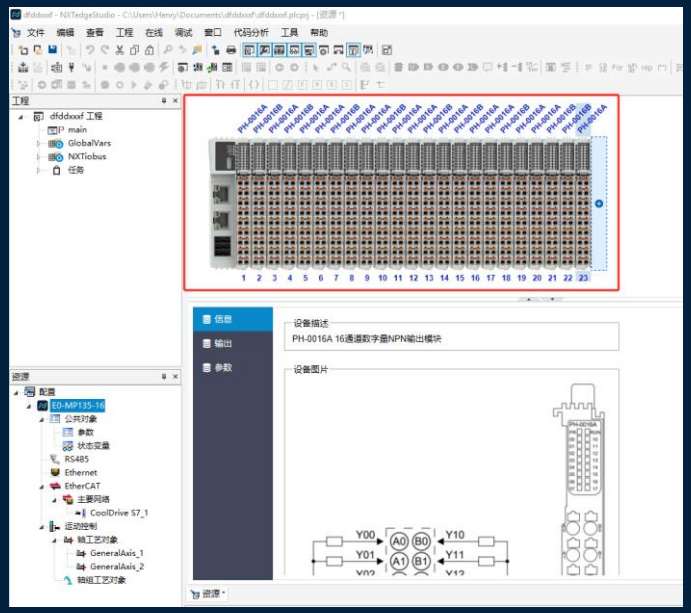
# Extend LoigcLab IDE through SDK



Axis Configuration and Diagnosis



IO Bus Configuration and Diagnosis

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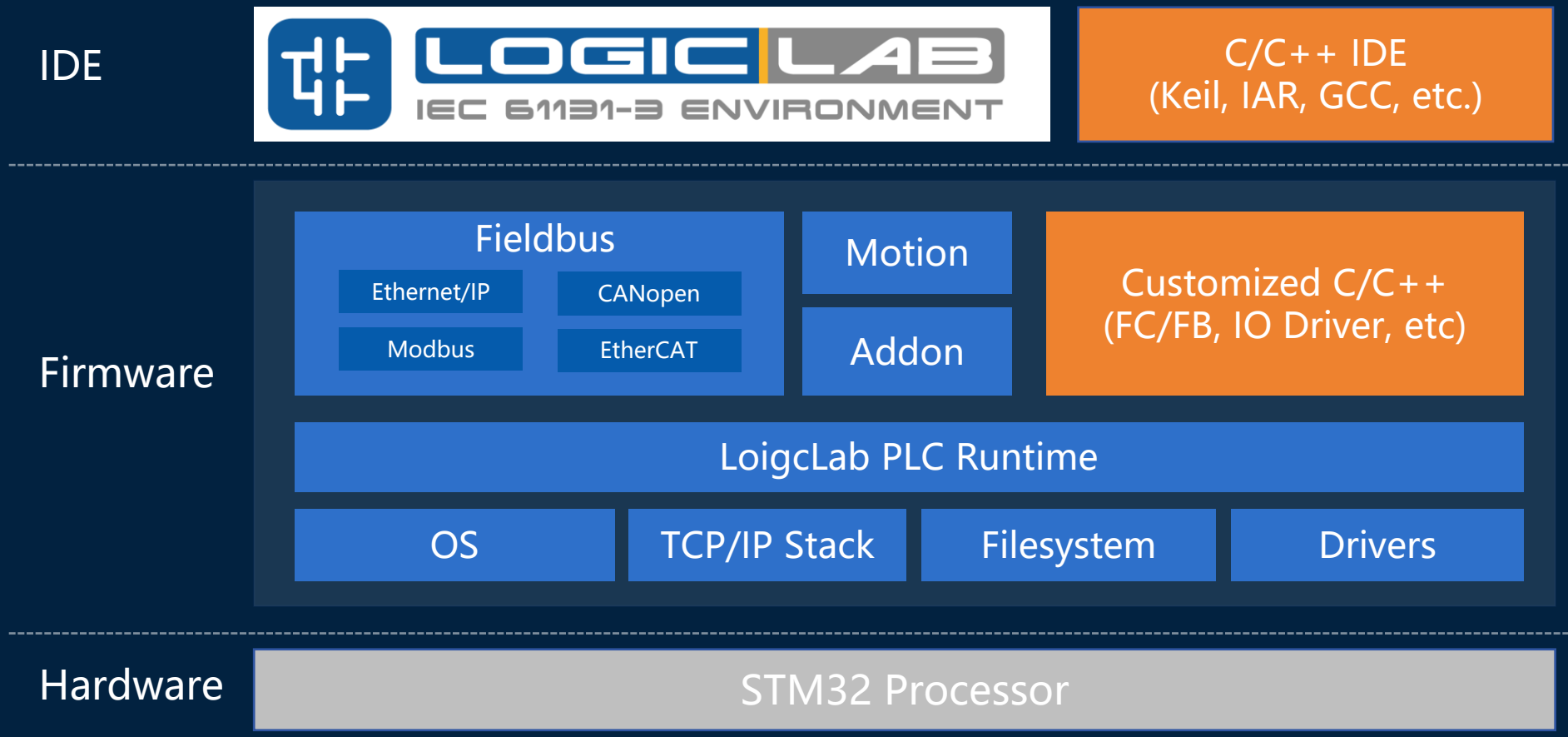
# One-stop software solution for core technologies of PLC

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# STM32MP257 + RTOS + LogicLab(Future)

1. **High performance - High CPU frequence and multi core optimization**
2. **Realtime enhancement - DDR4 high performance RAM**
3. **High performance network - TSN switch support high performance communication**
4. **PCI-E interface - Possible to replace traditional Motion Control Card**

Middle and large scale PLC

Display and PLC integrated controller

Motion Control Card

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# Q&A

Thanks for your attention!