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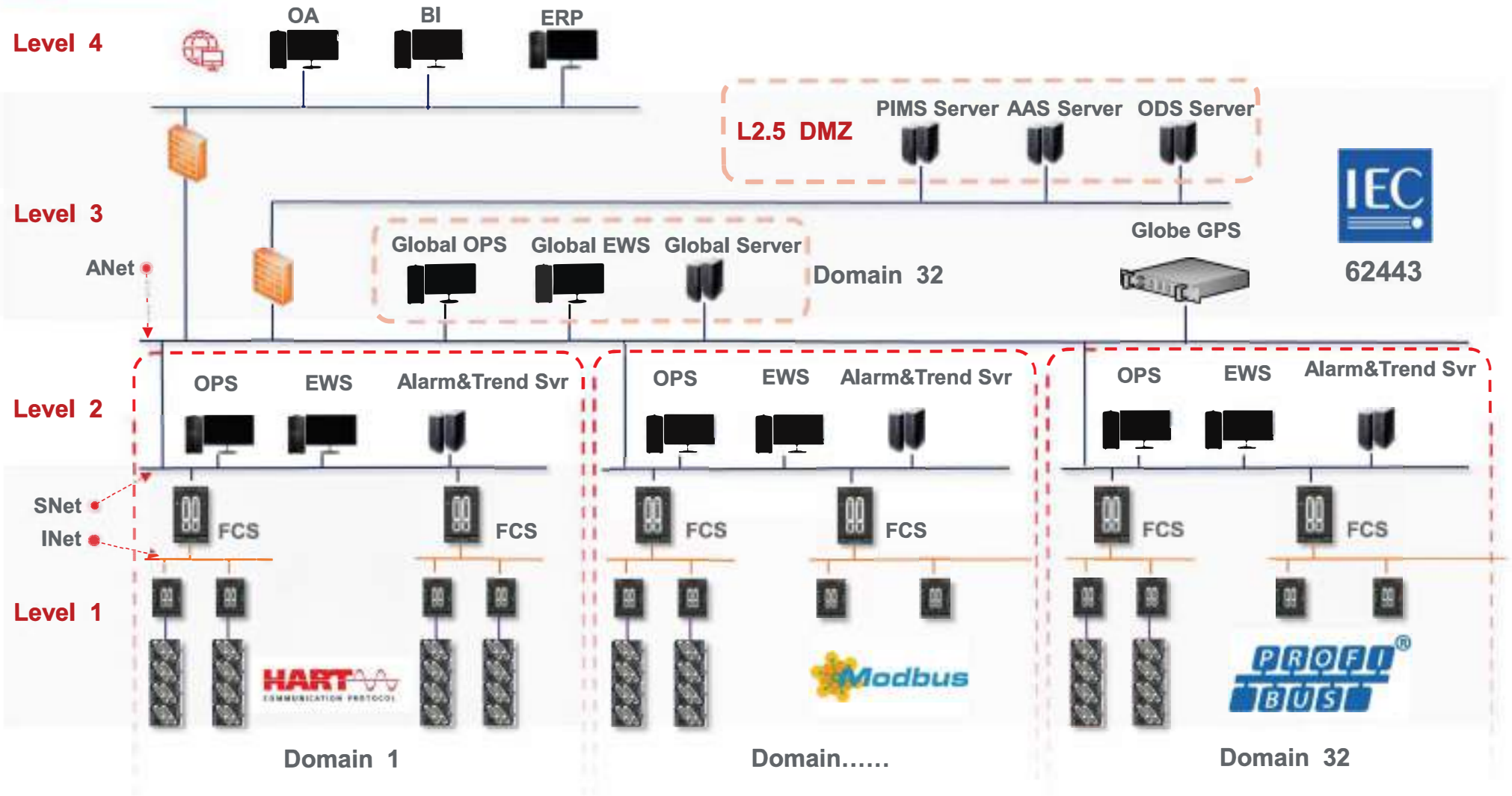
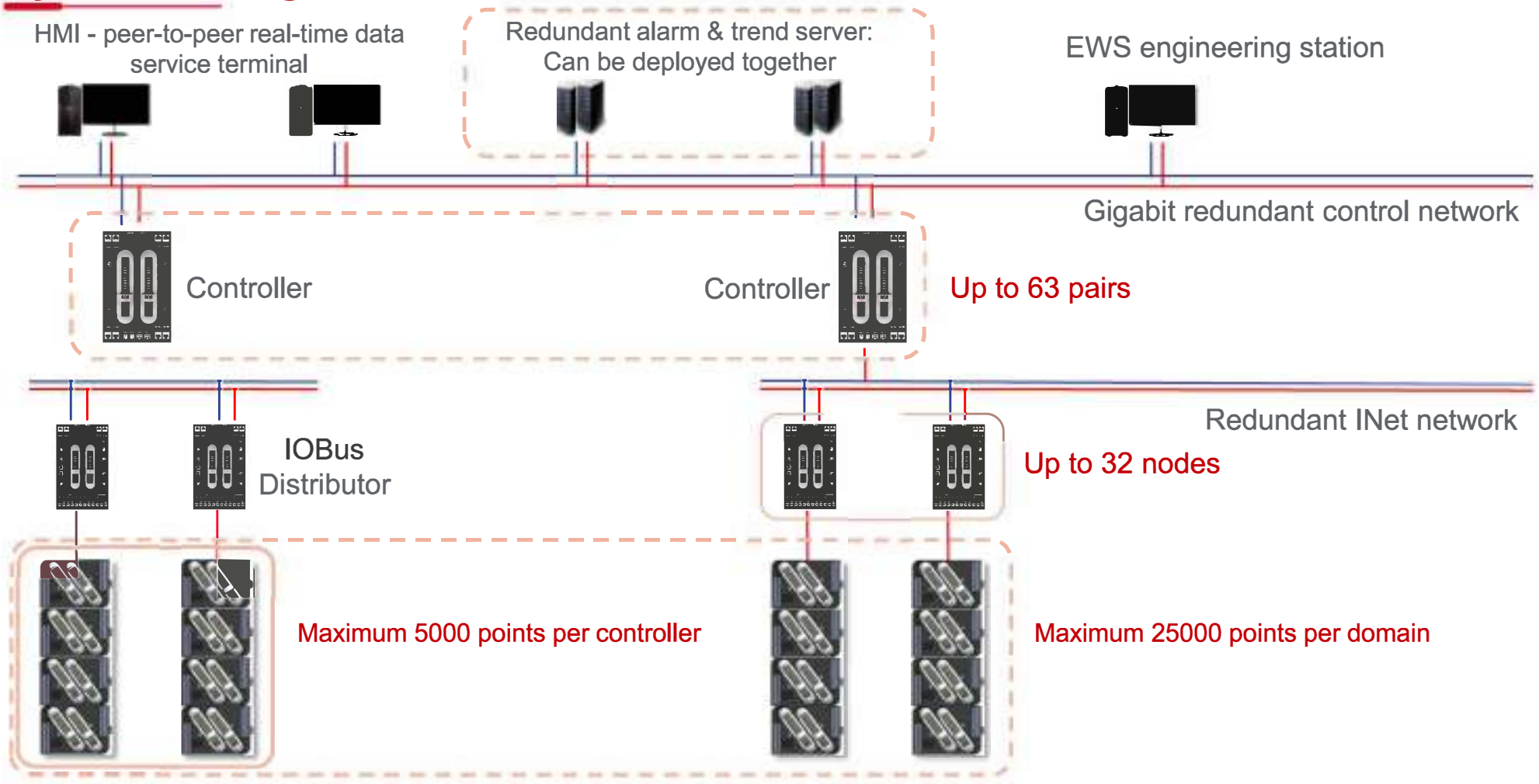
01 System Overview

System network structure



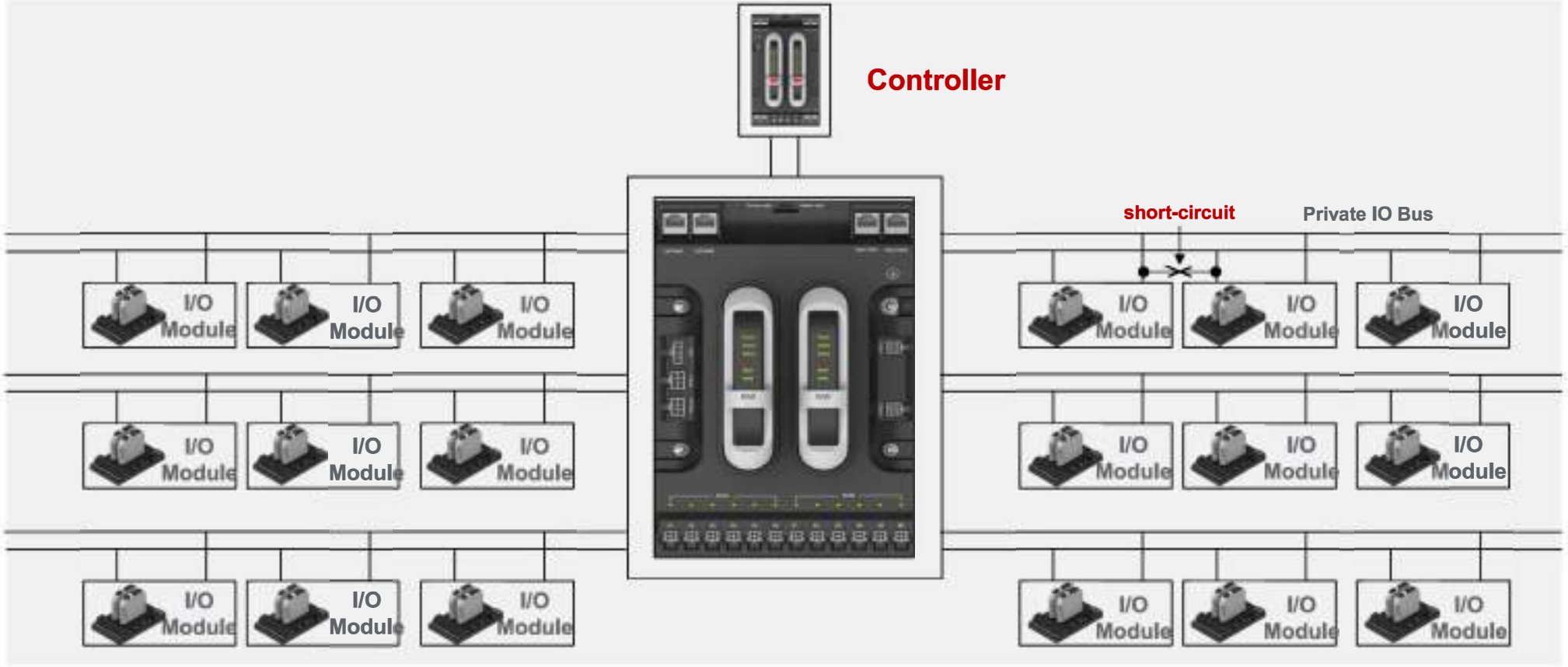
System single-domain structure



IO Bus

Star structure control network:

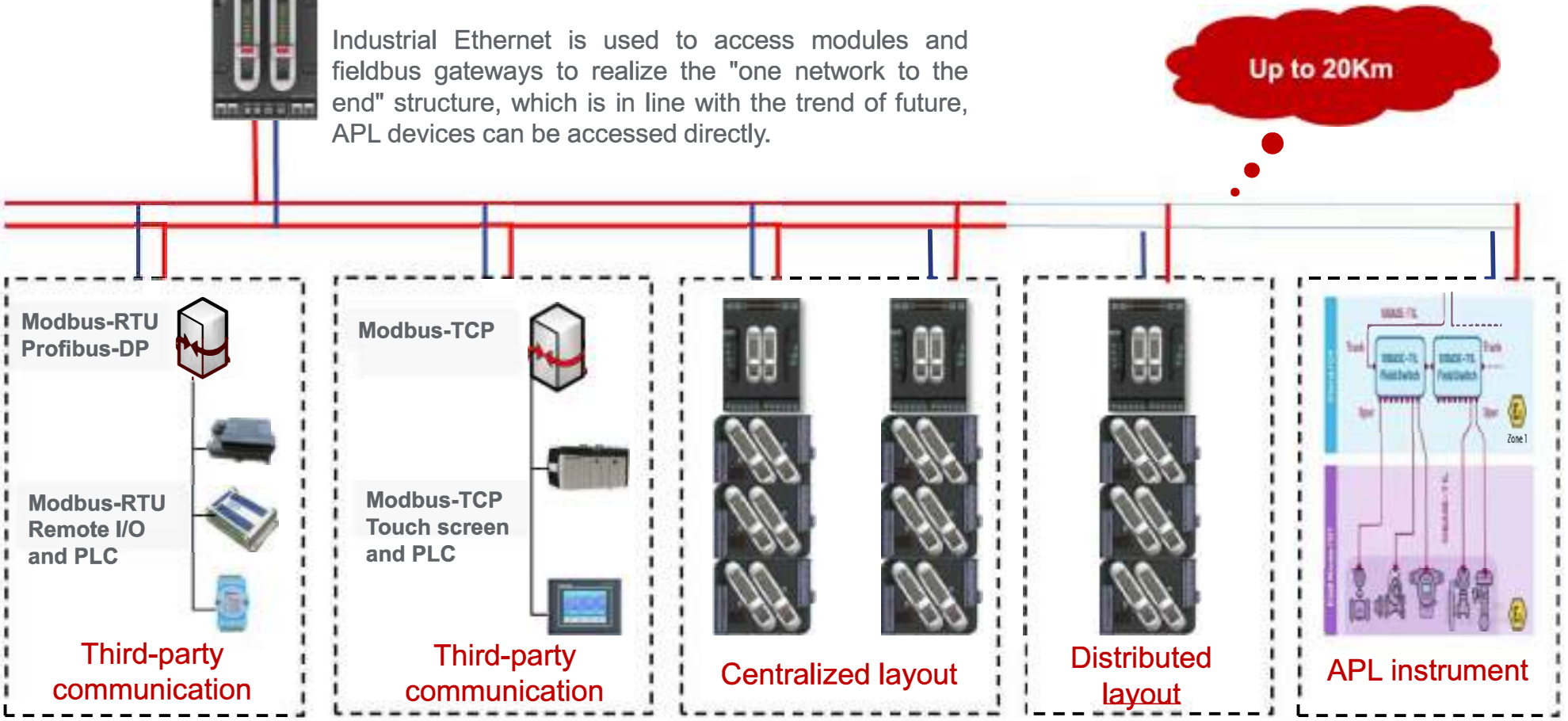
The IO Bus is star topology, which has high failure tolerance. Failure in one branch will not affect the other five.



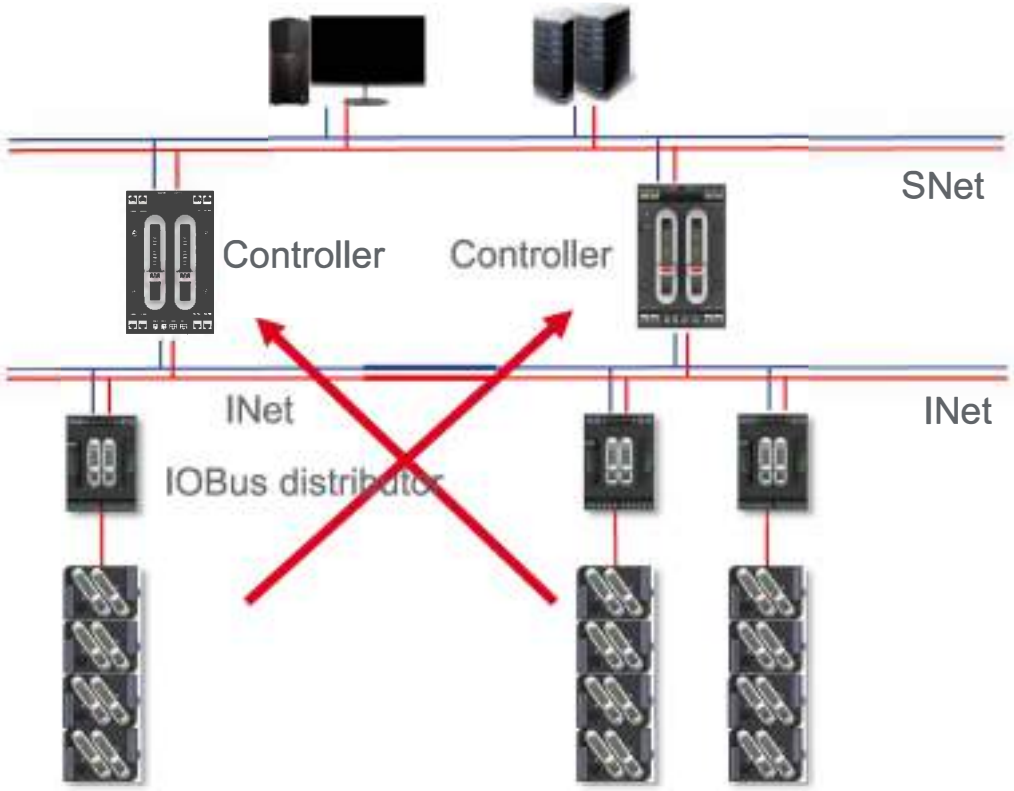
INet Industrial Control Network

Controller

Industrial Ethernet is used to access modules and fieldbus gateways to realize the "one network to the end" structure, which is in line with the trend of future, APL devices can be accessed directly.



Hardware-software decoupling



IO channels can be assigned to different controllers

1. Decoupling between Algorithm and hardware

The algorithm can be organized in parallel with hardware configuration, independent of hardware, process control can be designed and tested in advance.

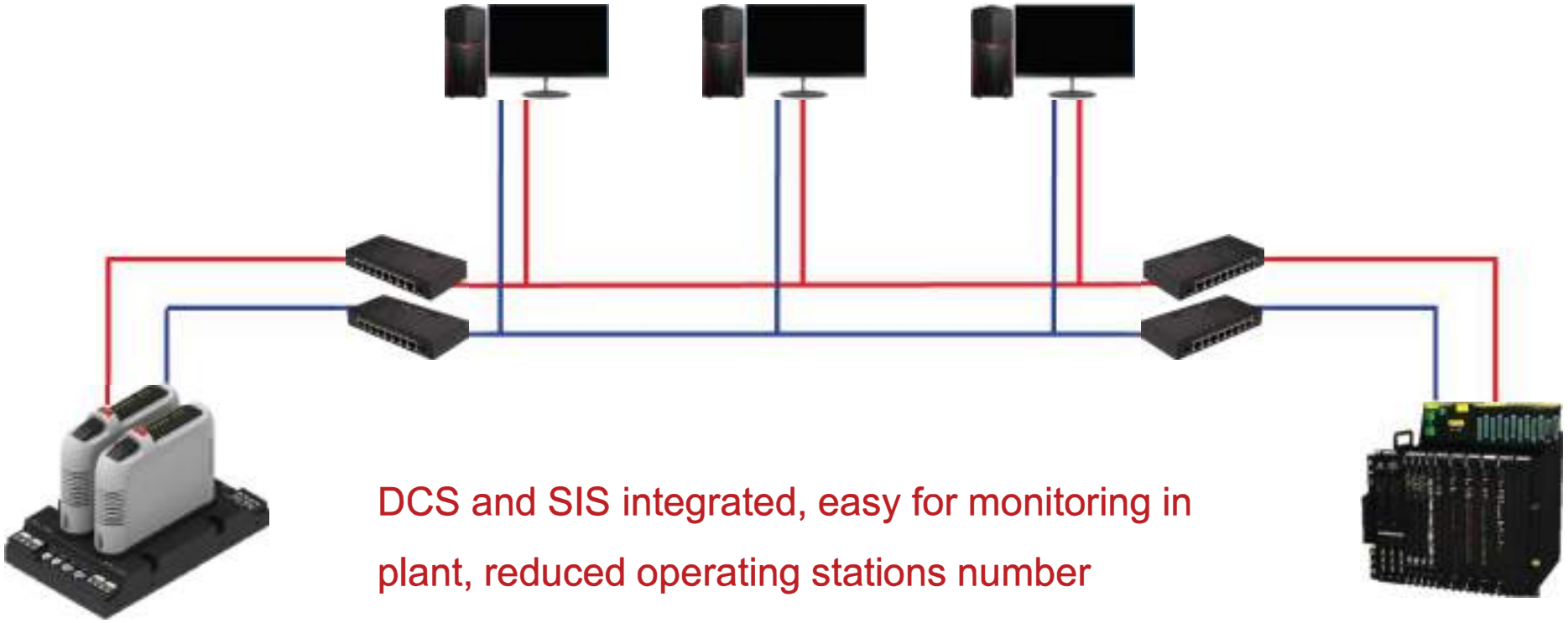
Hardware configuration

Algorithm configuration

2. Decoupling between Controller and IO

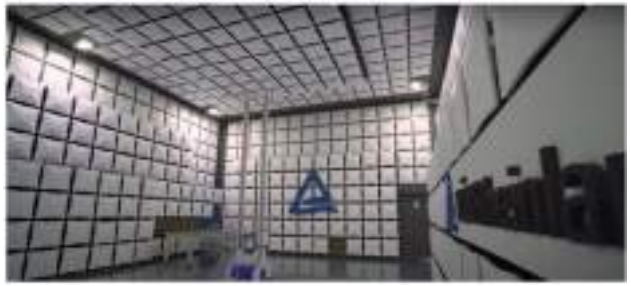
No need for pre-deployment, no more lateral communication between controllers

DCS+SIS integrated monitoring



DCS and SIS integrated, easy for monitoring in plant, reduced operating stations number

Certification & Standards



The system is designed in accordance with international standards strictly and meets the standards such as IEC61131-2, 61010-2-201 and EU directives.
DCS has the CE, G3, RoHS, WEEE certifications certified by TUV.

IEC 61010-2-201

IEC 61000-6-2

ISA-S71.04 G3

IEC 61131-2

IEC 61000-6-4

Localization

Localization is an inevitable choice under current international situation.

Chips: CPU, DDR, Flash, Ethernet chips, resistance-capacitance, and localization of EMC protection devices.

Operating system: localization of embedded operating system.

Embedded: fully autonomous and controllable code.

Muti-platform: Software is developed in an expanded platform, not limited to specific operating systems.

Operating system: not restricted by Windows & Intel

Applications: fully self-development.

02 Hardware Introduction

Hardware system

Reliability

- Vibration test, salt spray test
- Cabinet temperature rise test
- Electromagnetic compatibility test
- Temperature and humidity environment test

Appearance & Mechanical design

- Angle mounting design to improve heat dissipation efficiency
- Fast assembling
- 80 modules in cabinet
- Up to 6 racks and 120 modules for cabinet line-up

23 types of accessories

16 types of modules

7 types of baseplates

5 types of terminal boards

Heat dissipation optimization

Improve heat dissipation efficiency by

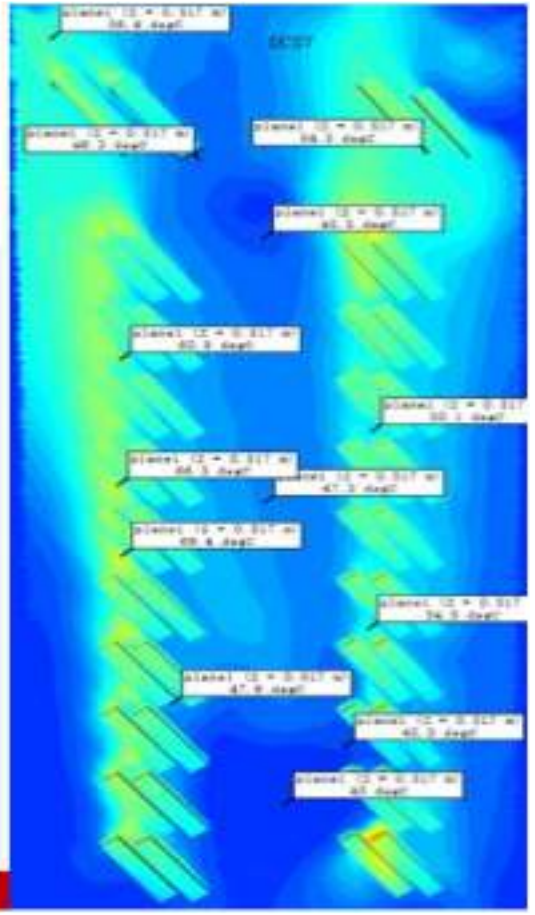
20% ↑

Mechanical optimization

- Angle mounting, good for heat dissipation.
- Heat from modules will not impact each other.

Built-in temperature monitoring

- The IObus distributor is equipped with built-in temperature monitoring for cabinet.



Controller

PM901

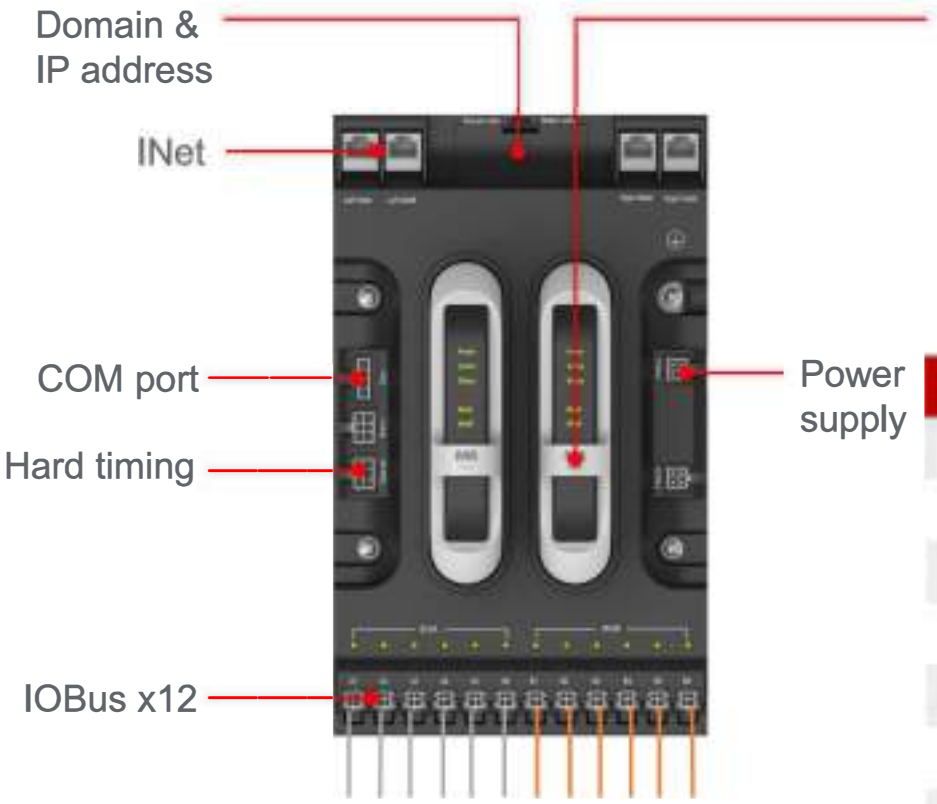
- Dual-core design to improve the computing ability, ensure system performance
- The controller is decoupled from the IO module, the IO points can be easily assigned to any controller
- Built-in firewall can effectively prevent network storms

IOBus Distributor

BI901

Redundant 6 star-topology internal buses ensures stable and reliable signal transmission.

IOBus Distributor



- 6 pairs of parallel buses to improve the response time
- Isolate branch bus fault
- High resolution time synchronization
- 6 pairs IOBus status monitoring
- Built-in cabinet temperature monitoring function

Item	Feature
Connections per controller	32 pairs (64)
IOBus bus number	6 pairs
Connection per IOBus	20
INet communication	100Mbps
IOBus communication	1Mbps*6
Memory	256Mbyte
Decoupling function	Support

Communication, IO modules

Analog I/O, digital I/O, communication module

- Various IO module types, meet the requirements for most of the field applications.
- Flexible & fast installation without tools.
- The system supports various fieldbuses. Modbus-RTU, Hart, Modbus-TCP and Profibus-DP etc.
- Perfect channel fail-safe mechanism, support variable replacement, besides the fixed fail-safe replacement.

IO module - Analog Input AI901, AIH901

Item	Feature
Signal type	4-20mA
Number of channels	16
Wiring type	2-wire, 4-wire
Extended range	Support, - 15~115%
Accuracy	Max. ±0.1%F.S.
Sampling period	400ms/16ch, 50ms/2ch @ fast acquisition
Channel diagnosis	Short circuit, wire break detection
Hot plug	Support
Fail safe	Support, variable replacement
HART function	4 variables/channels, supports HART variable reference
Baseplate	B-IO9011, B-IO9111, B-IO9001, B-IO9101
Terminal board	T-AI9001

Multi-fault self-test and protection:

Self-test for configuration consistency, device type consistency, baseplate redundancy type, AD failure, channel failure, etc.

Dual redundant communication:

Ensures fast redundancy switch to standby module

QR code, unique ID.:

Traceable production information, project information, material batches

IO Module - Analog Input TC901

Item	Feature
Signal type	K: -200~1200℃ E: -200~900℃ T: -200~350℃ J: -40~750℃ R: 0~1600℃ S: 0~1600℃ B: 0~1700℃ N: -200~1200℃ mV: -100~100mV
Number of channels	16
Accuracy	e.g. mV: Max. ±0.1%F.S.
Sampling period	1200ms/16 channels
Channel diagnosis	Wire-break detection
Hot plug	Support
Fail-safe	Support, variables replacement
Baseplate	B-IO9011, B-IO9111, B-IO9001, B-IO9101
Terminal board	T-GT9001

IO Module - Analog Input RTD901

Item	Feature
Signal type	Pt100/Cu50/Resistor
Number of channels	8
Wiring type	2-wire, 3-wire, 4-wire
Accuracy	Resistance/Pt100: Max 0.1%F.S. Cu50: Max. 0.2% F.S.
Sampling period	800ms/8 channels
Channel diagnosis	Wire-break detection
Hot plug	Support
Fail-safe	Support, variable replaceable
Baseplate	B-IO9011, B-IO9111, B-IO9001, B-IO9101
Terminal board	T-GT9001

IO module - Analog Output AO901, AOH901

Item	Feature
Signal type	4-20mA
Number of channels	16
Extended range	Support, - 15~115%
Accuracy	Max. ±0.2%F.S.
Data update	8ms after receiving data
Channel diagnosis	Wire-break detection
Hot plug	Support
Fail-safe	Support
Fault variable readback	Support
Device power-off tolerance	5ms
HART function	4 variables/channels, supports HART variable references
Baseplate	B-IO9011, B-IO9111, B-IO9001, B-IO9101
Terminal board	T-GT9001

Fail-safe:

In case of communication interruption, the module can enter the fail-safe mode and output the fail-safe value:

0%, 100%, hold

IO module-Digital Input DI901

Item	Feature
Signal type	Dry contact, wet contact (with terminal board)
Number of channels	32
Sampling period	10ms with change, 200ms without change
Hot plug	Support
Fail-safe	Support
Channel fault recovery preset value	Support variable replacement
Jitter alarm	Support
Baseplate	B-IO9011, B-IO9111, B-IO9001, B-IO9101
Terminal board	T-DI9001, T-DI9011, T-DI9021 (customized version)

Safety guarantee:

Each variable has its own quality flag, powerful ECC verification when data communication.

IO module-Digital Input SOE901

Item	Feature
Signal type	Dry contact
Number of channels	32
Jitter alarm	Support
Hot plug	Support
SOE cache	500
Timing accuracy	1ms
Event resolution	0.1ms
Baseplate	B-IO9011, B-IO9111
Terminal board	T-DI9001

Clock source support:

1 - Internal system pulse; 2-IRIG-B code

IO module-Digital Output DO901

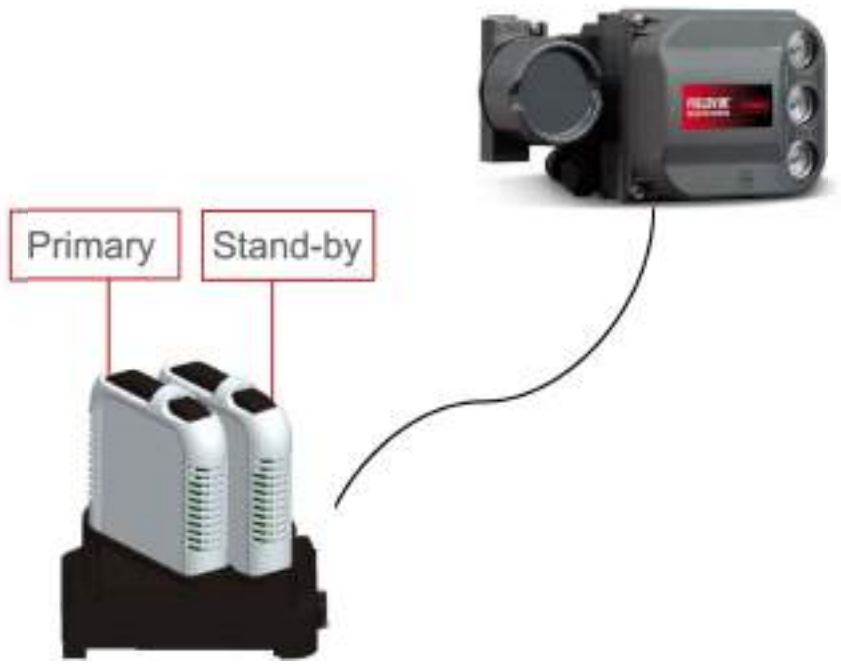
Item	Feature
Signal type	Dry contact, wet contact (with terminal board)
Number of channels	32
Dat a refresh	No change: 500ms With change: output per scan cycle
Hot plug	Support
Fail-safe	Support
Output readback	Support
Parallel output	Support
Baseplate	B-IO9011, B-IO9111, B-IO9001, B-IO9101
Terminal board	T-DO9011

Failsafe:

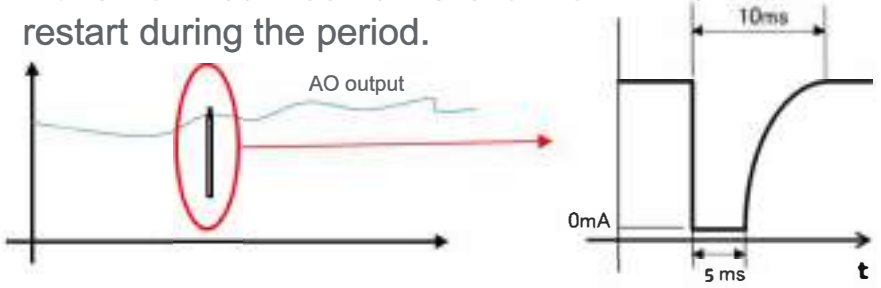
In case of communication interruption, the module can enter the fail-safe mode and output fail-safe value:

1-OFF,2-ON,3- hold

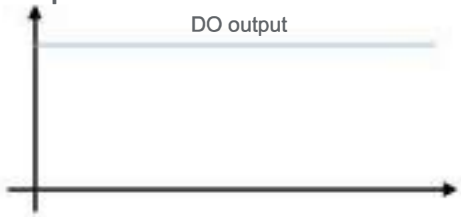
Bumpless Output



When AO module has a redundant switch, the instrument connect to AO channel will not restart during the period.

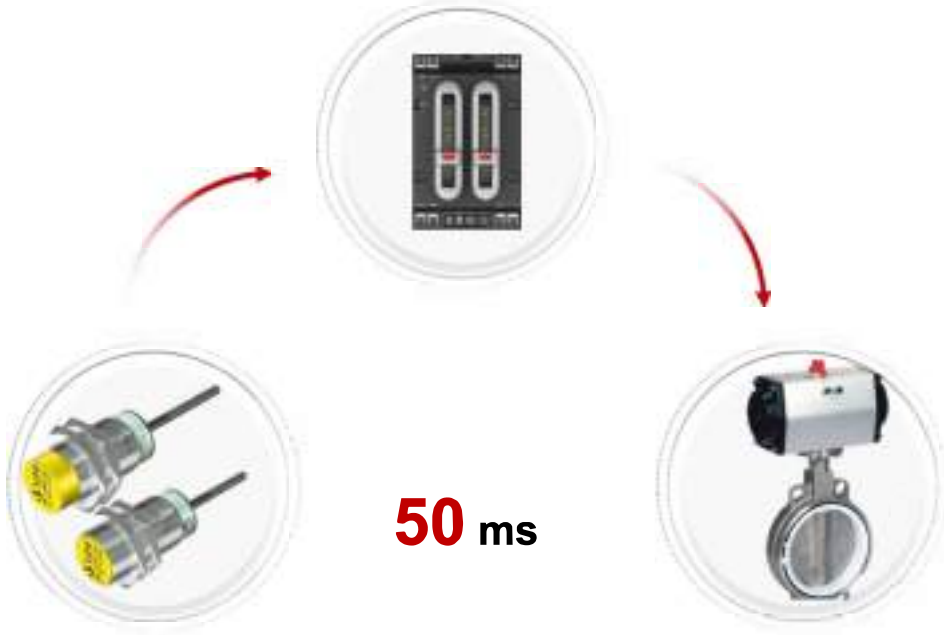


DO module signals are output in parallel, when DO module has a redundant switch, the signal can keep stable.



System rapid response

90 ms



50 ms

Minimum response time for analog loop: 90 ms

Minimum response time for digital loop : 50 ms

03 Software Introduction

Software overview

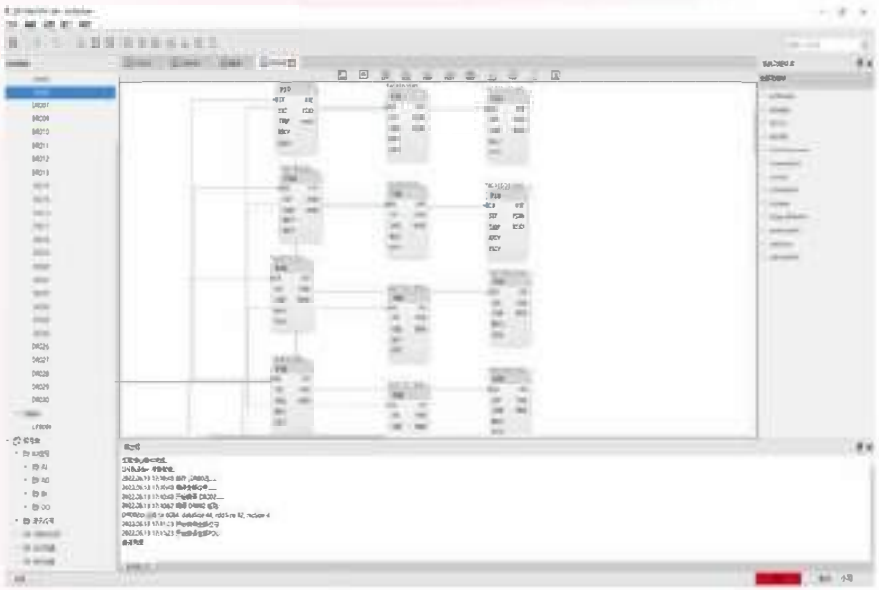
HMI

Configuration

New UI design for HMI

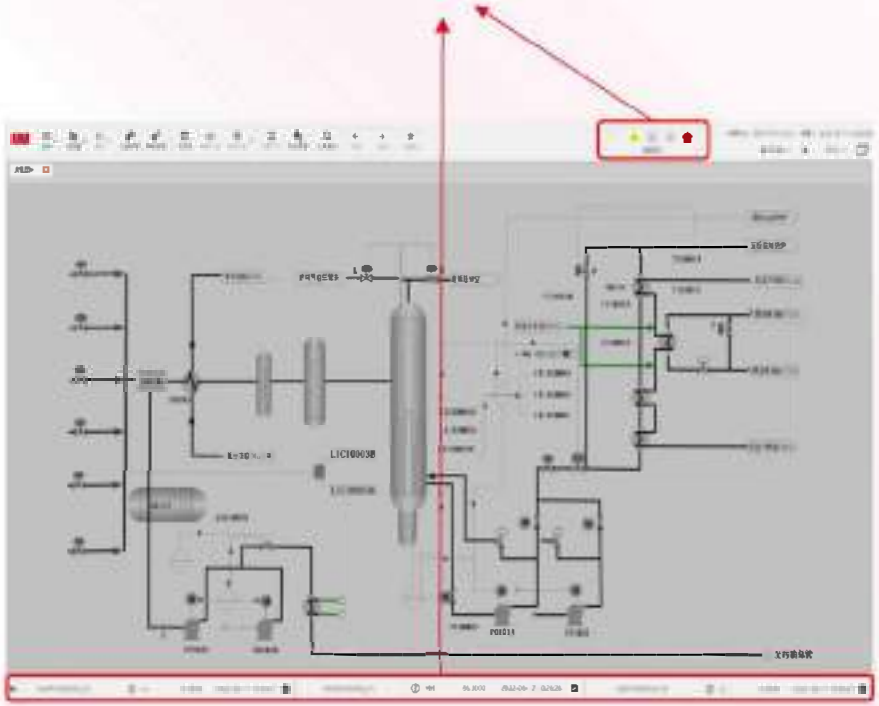
- Flat UI design, gray style, follows the ISA101.01 concept.

- When the production process is carried out as expected, the screen should give the minimum sensory stimulation. When error/alarm occurs, HMI shall provide strong visual \ auditory signals.

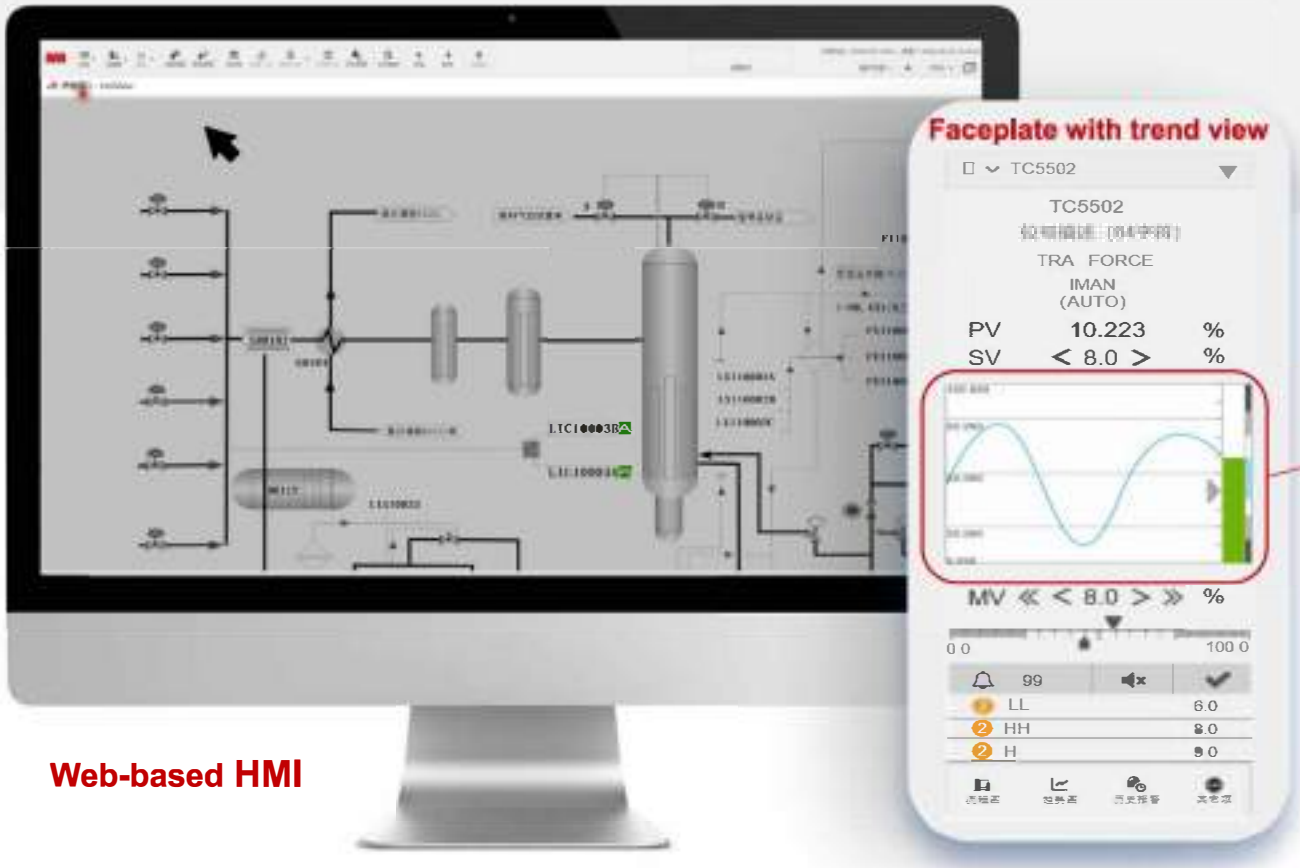


Situation awareness

Good for alarm addressing



Optimized human-machine interaction experience



Web-based HMI

Maximum 5 minutes trend, no need to open trend view, good for monitoring.

Innovative configuration method

Fast hardware parameters configuration

Independent algorithm editor

通道[01]	
启用	☑
信号类型	4mA~20mA
接线类型	二线制
滤波时间（倍采样周期）	关闭
采样周期	400ms
速率检测	☐
开方	☐
小信号切除值（百分比）	0.00
故障安全模式	预设值
故障安全值（mA）	4.00
测量位号	

Fill in with variable to align with hard configuration

1. Highly reproducible standardized control solution

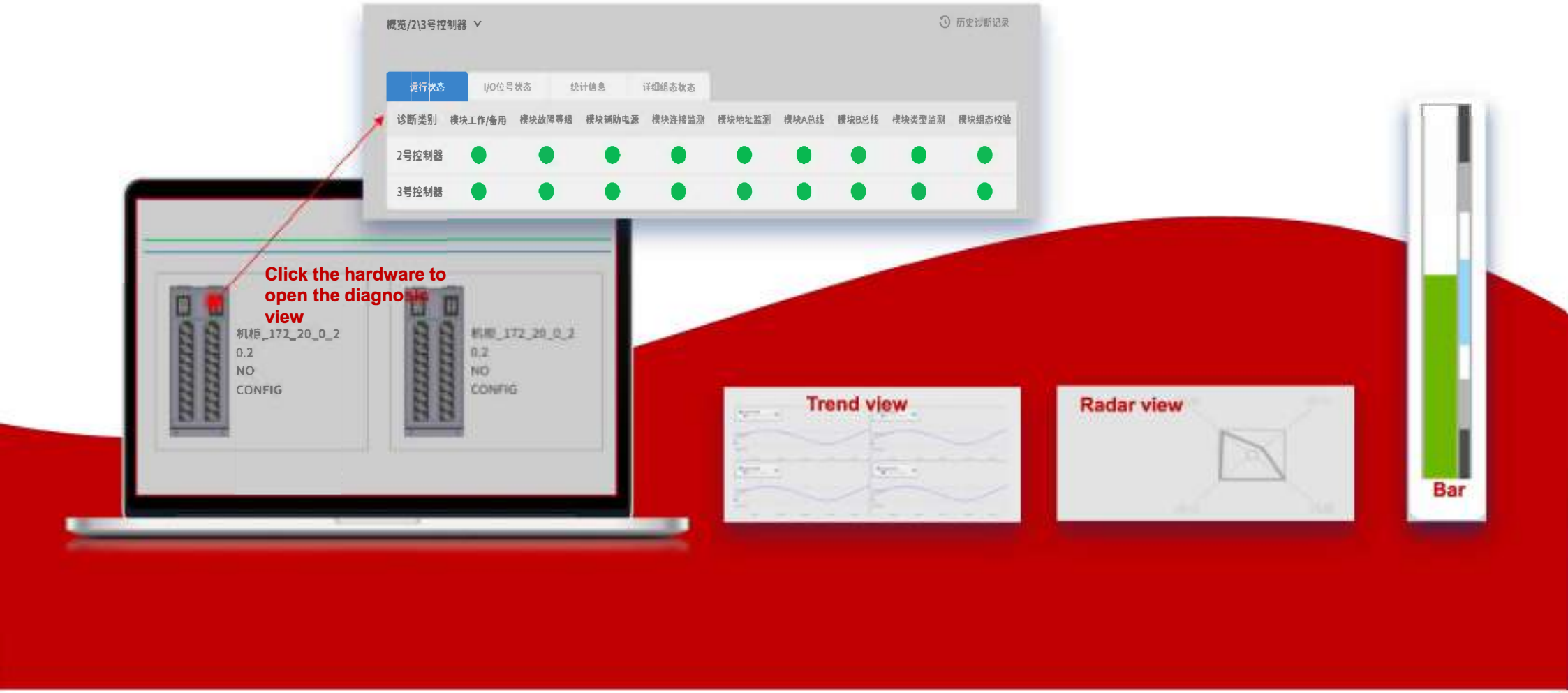
2. Accessible external algorithm

3. Parallel software and hardware configuration, improve engineering efficiency

Various function block library

Comply with 61131-3 standard and provide various function blocks

Data Visualization & Graphical Diagnosis



Features of ‘TSx Elite’

Network and architecture

System

- 80 IO modules per cabinet
- Up to 5000 points per controller
- Distributed and extended service architecture, support project which is up to 1 million points.

Security

- Utilize SIL3 design concept and network multiple verification technology for SNet
- Star topology for INet to have fault tolerance

Structure

- DCS+SIS integrated monitoring
- Gigabit network bandwidth for mass data

Hardware

Controller

- Three cores (dual CPU core +FPGA core)
- RISC Reduced Instruction Dual ARM Core Architecture
- Dynamic memory management technology based on ID identification-seamless online download

IO module

- Multi-fault self-inspection and protection
- Double redundant communication
- Unique IO identification
- Angle design, heat dissipation increased by 20%
- Built-in temperature monitoring for cabinet
- Intelligent power distributor

Software

- New UI design concept
- Domain level management
- Graphs hierarchical management and display
- Real-time, alarm, trend integrated operation
- Variables are maintained in table to improve configuration efficiency
- RBAC-based privilege access method
- Multiple platform: can run both on Windows and Linux operation systems

Product Planning

Now

System

- DCS + SIS integration
- High performance HMI
- Comprehensive functions
- IMS

Architecture

- Gigabit network
- Peer to Peer communication

~2024

System

- 100% localization system
- Multi-language version, support global market
- DEH system
- Digital marshaling
- Support more fieldbus
- Batch 1.0~2.0
- OPC UA

Architecture

- Support B/S architecture
- Support more versions based on Linux kernel

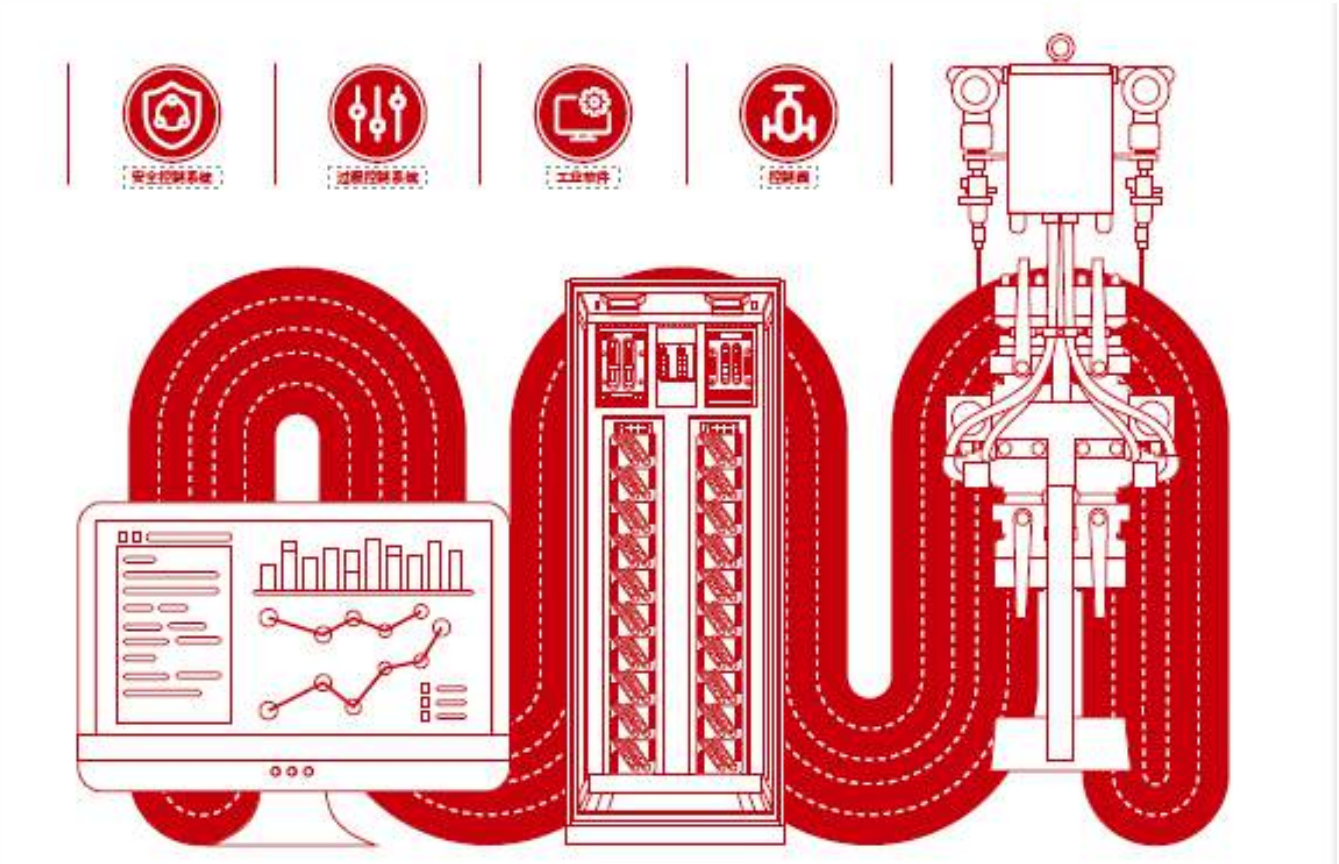
2025~2026

System

- AAS/APC
- APL
- Artificial intelligence
- Batch 3.0

Architecture

- Digital platform+ Applications
- Support IEC61499



The contact below could be reached for any queries.