

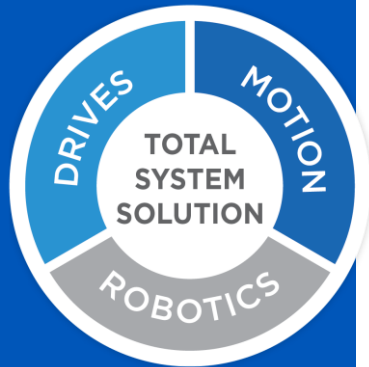


## i<sup>3</sup> CONTROL GOES TO IIoT

i3 Control closes the gap between motion/robotics and IIoT

Da Industry 4.0 a Society 5.0

**Italo Holguin Scacco**



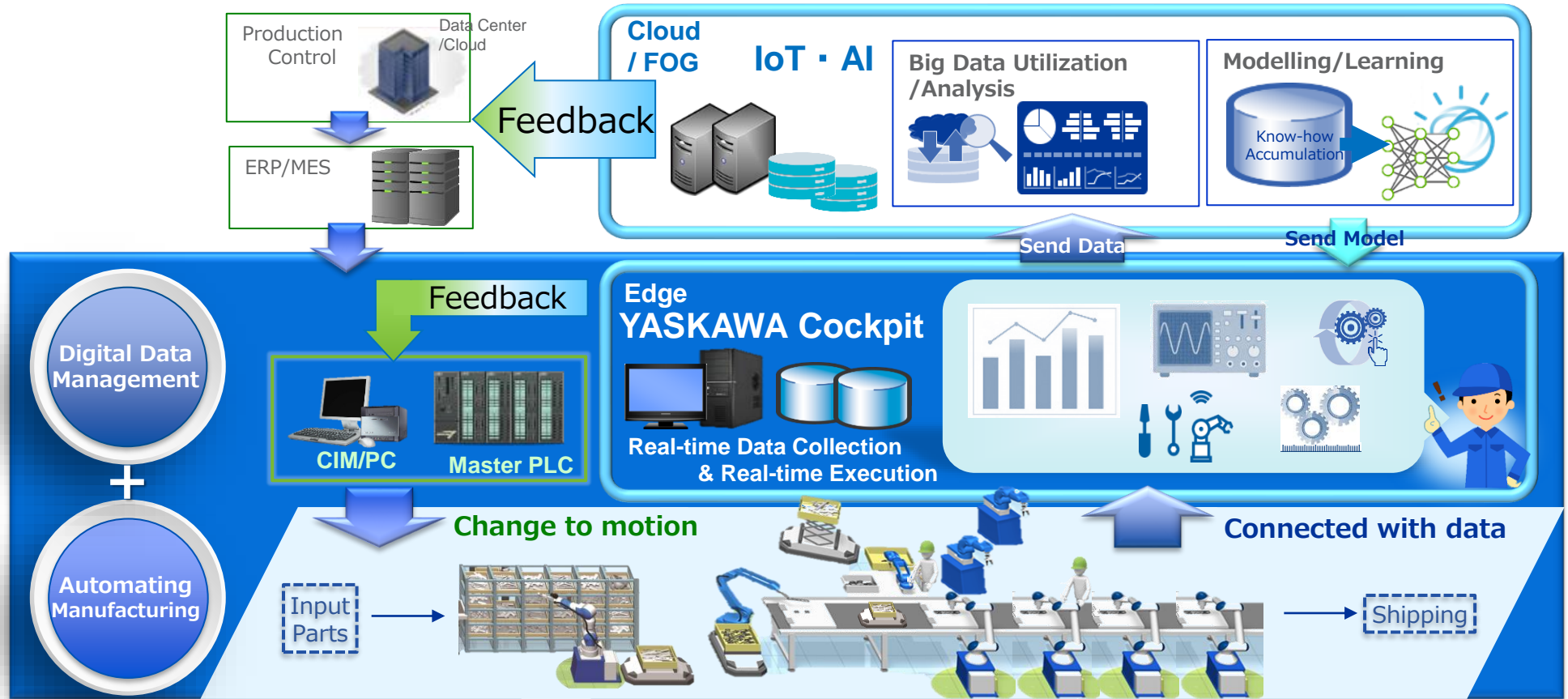
# INTRODUCING MYSELF



**ITALO HOLGUIN SCACCO**

Application Technology  
Manager

# i<sup>3</sup>-Mechatronics: Integrated, Intelligent, Innovative.



# i<sup>3</sup> CONTROL ECOSYSTEM



## i<sup>3</sup> MC

One machine controller for Motion, Logic, Robot, Safety, Security, VFD, HMI, and Network



## i<sup>3</sup> ENGINEER

One engineering tool for the entire platform with IEC61131-3 or scripting languages



## i<sup>3</sup> DATA

Real-time data collection, processing, communication, and feedback



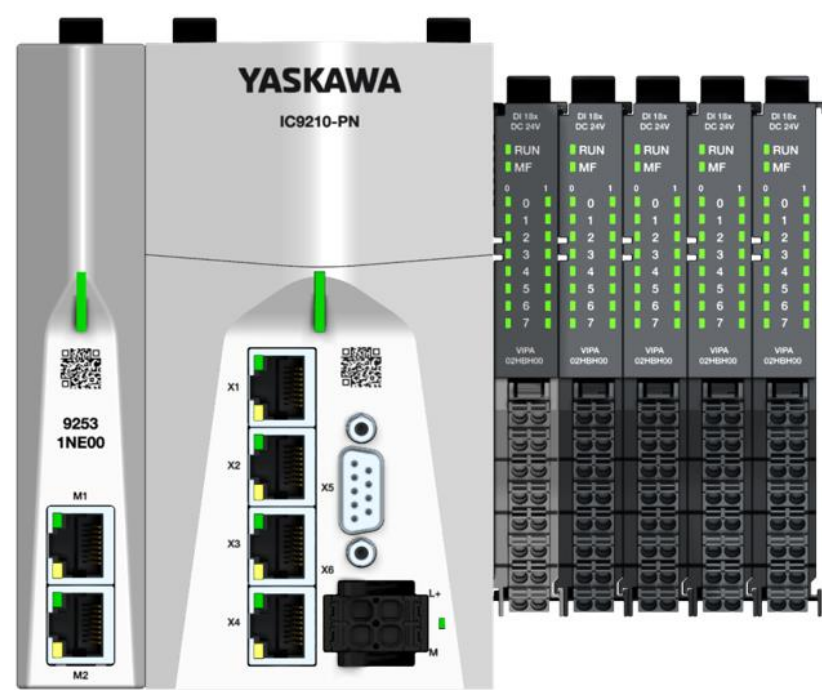
## i<sup>3</sup> KINEMATICS

Integrated control and safety for Delta, SCARA, 6-axis, gantry, and custom mechanisms



## i<sup>3</sup> WEB

Webshop and App-store for licenses and libraries, service hotline, online platform



## Our new controller: i<sup>3</sup>MC

# i<sup>3</sup> MC



## YASKAWA TRITON CHIP

an exclusive inhouse development for Yaskawa's high demand for synchronous motion

## SAFETY OVER ETHERCAT

FSoE network safety profile meeting SIL3 requirements



## MODULAR DESIGN

Scalable performance on a Realtime Linux system



## NETWORK COMMUNICATIONS

EtherCAT with 512 Nodes, OPC UA, Modbus TCP, EtherNet/IP

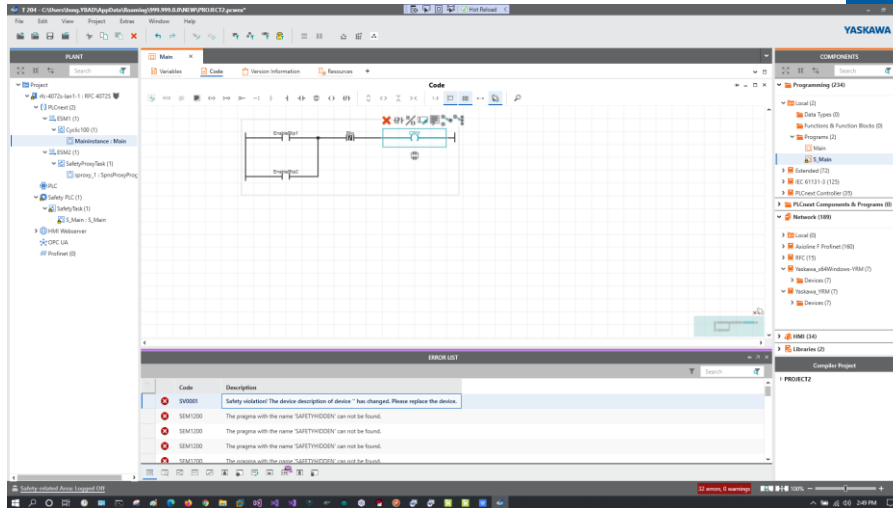


## OPEN PROGRAMMING

IEC61131-3 with PLCopen function blocks, C#, C++, Python, or MATLAB Simulink



# i<sup>3</sup> Engineer



## INTEGRATED ENVIRONMENT

Motion, Robot, Logic, HMI and VFD  
Fully integrated SIL 3 Safety programming  
Network configuration, diagnostics, and security

## OPEN PROGRAMMING

IEC61131-3 Graphical, Structured Text, or SFC Programming  
Create libraries with C#, C++, Python and MATLAB Simulink

## CONTROL SYSTEM SECURITY

Device certificates and password protection

## COLLABORATIVE

Managed Program Access for Multiple developers  
Online editing and version managing

# i<sup>3</sup> Kinematics



## SEAMLESS INTEGRATION

All Yaskawa products will be easy to integrate in the eco-system

## SCALABLE MOTION

Depending on the needs for motion, we can offer different solutions going from a single VFD in velocity mode to high-end synchronized motion with 64 axes

## COMMON HANDLING

Programming of the motion-devices will be common, no matter what network, no matter what motion



# 7 Highlights of the i<sup>3</sup> Ecosystem

1. SCALABLE and MODULAR Design
2. OPEN PROGRAMMING
3. REALTIME LINUX OPENSOURCE OPERATING SYSTEM
4. TIME TO MARKET IS MINIMIZED
5. INTEGRATED SECURITY AND SAFETY
6. ONE SOLUTION SUPPLIER FOR YOUR AUTOMATION
7. READY TO USE

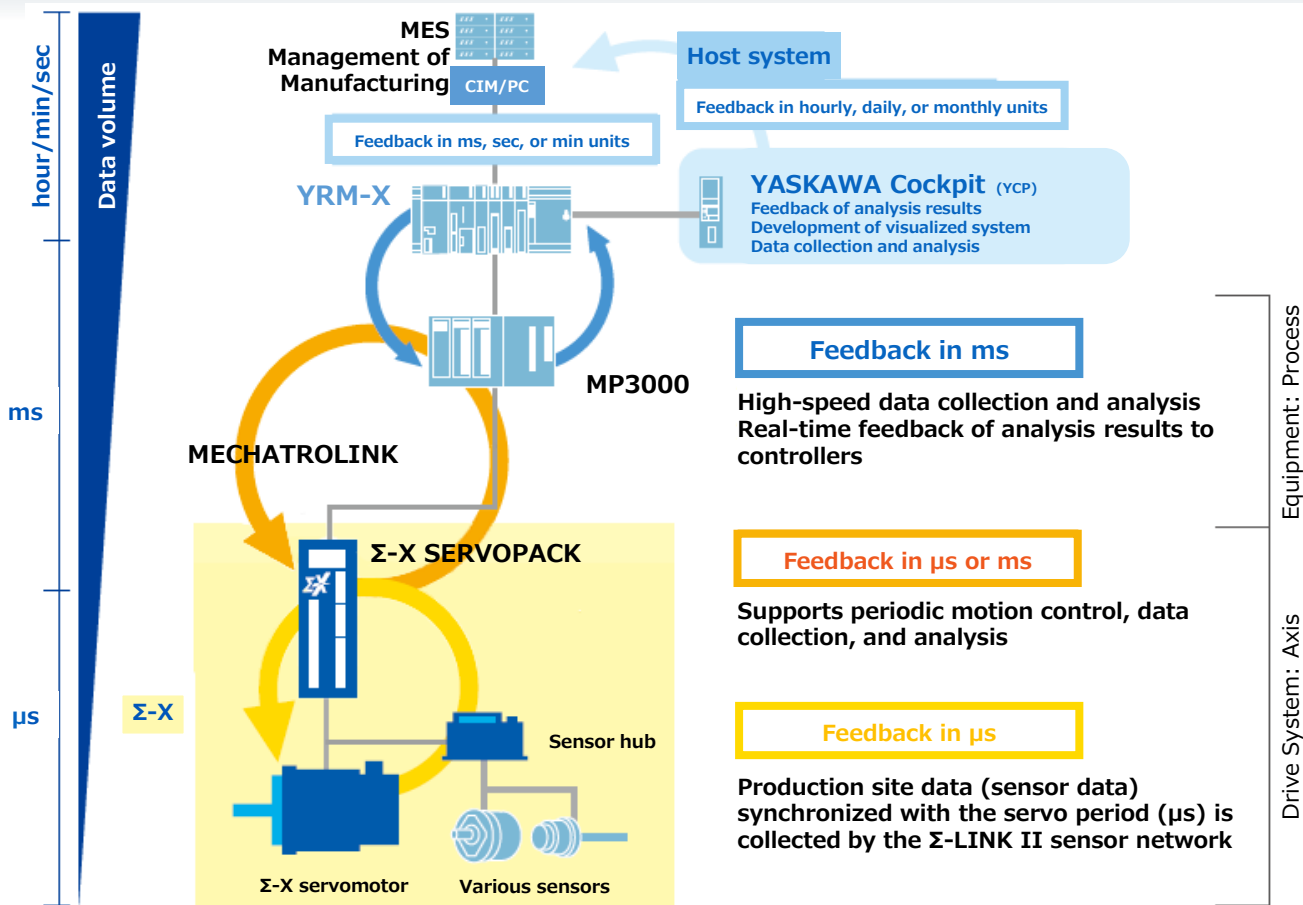
Motion × Digital data solution  
to accelerate evolution



Σ-X-Series AC Servo Drive



# Σ-X POSITIONING IN I<sup>3</sup>-MECHATRONICS



## Digital data solutions that start with servos

Enables immediate data collection, without device or equipment design changes. Analyzing and utilizing the data helps users anticipate sudden equipment stops or failure.



## Industry's highest class of motion performance

Upgrade to  $\Sigma$ -X series for improved production efficiency and equipment performance. Faster development with smart servos.



# Σ-X SOLUTIONS

## Servos that generate data and create added value

- Generates valuable data at no additional cost
- Enables digital evaluation of mechanical tuning
- Eliminates emergency service by field engineers

## Smart servos that can accelerate development

- Zero man-hours for tuning even in equipment with severe load fluctuations
- Zero setup for estimated moment of inertia even for equipment with limited ranges of motion
- Zero man-hours for re-tuning the servo during mass production

## Improve equipment performance with the industry's best motion performance

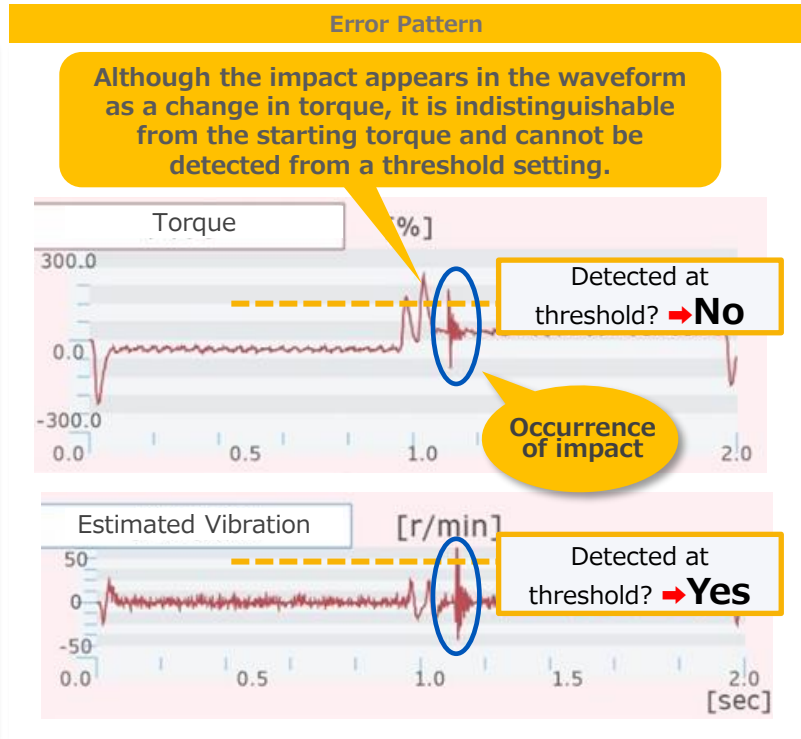
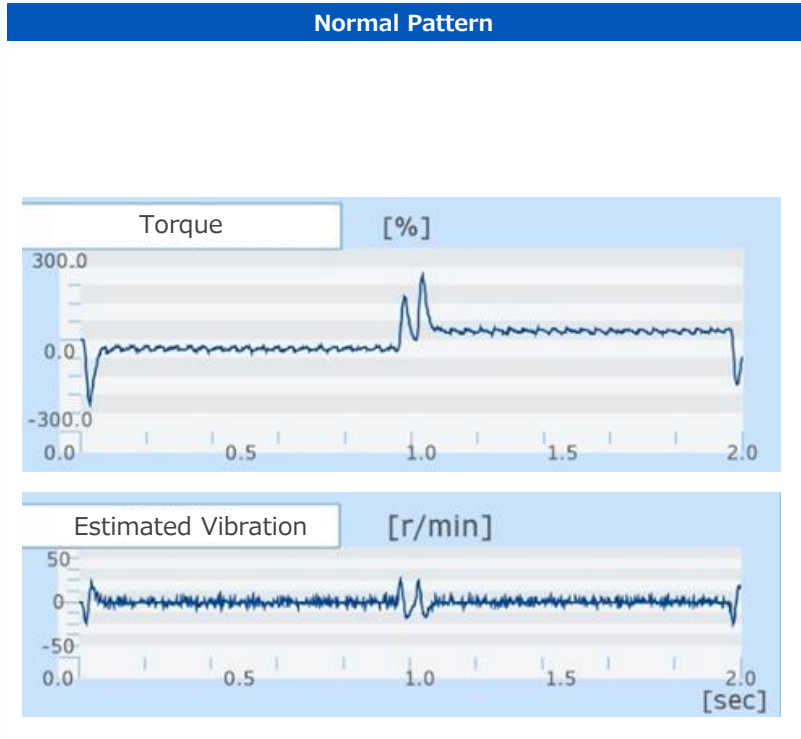
- Shortens equipment takt time
- Reduces speed fluctuations, improves product quality

# Servos that generate data and create added value

## Generates valuable data at no additional cost

Benefit	<b>Evidence</b>	Advantage	Feature
<b>In place of external sensors, <math>\Sigma</math>-X can extract vibration components at the end of shafts</b>			

### ● Data



# Servos that generate data and create added value

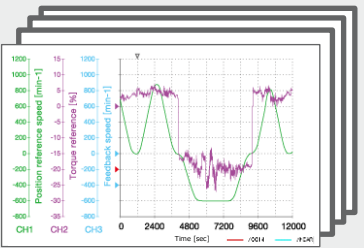
## Enables digital evaluation of mechanical tuning

Benefit Evidence Advantage **Feature**

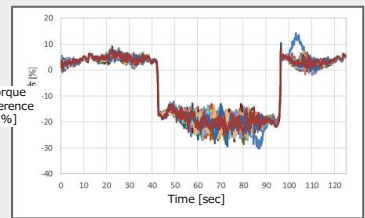

### Error detection enables detection of changes in the equipment

**Advance Preparation**

Acquire multiple sets of trace data with a fixed pattern of operation

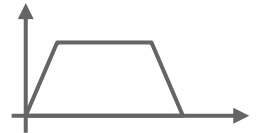
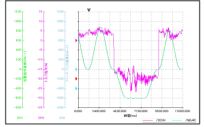


Prepare sample data and save it in the SERVOPACK

**Operation**

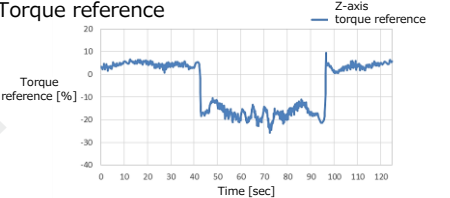
Operate with the same operation pattern, compare with sample data → Servo detects errors

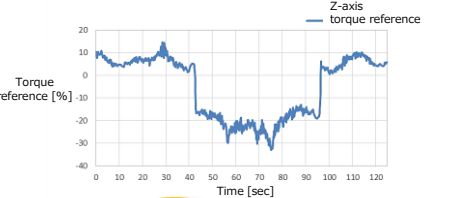
**Normal**

**Error**

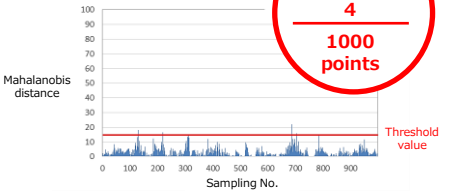
Torque reference



Z-axis torque reference



Mahalanobis distance

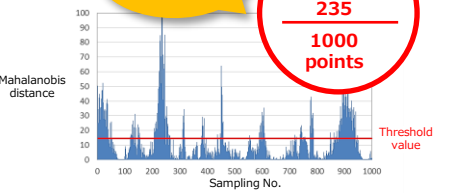


Error  
Detection  
4

1000  
points

Threshold value

**Error Detection**



Error  
Detection  
235

1000  
points

Threshold value

**YASKAWA**