For Software Defined Factory
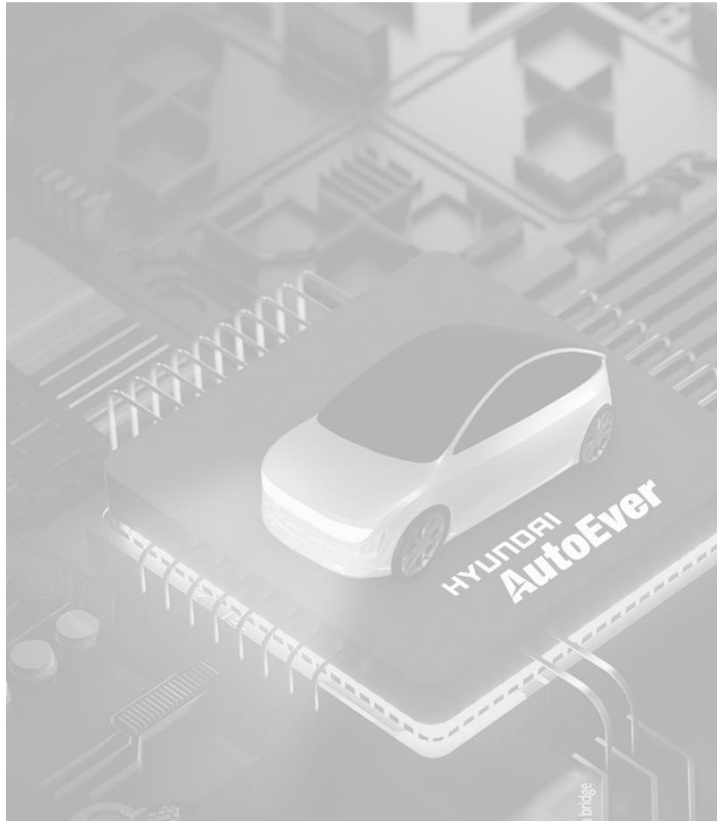
Hyundai-Autoever
NNNEOfactory Solution

Who We Are

—

As a **mobility tech leader**,
Hyundai Autoever provides
services and solutions for
all aspects of the mobility industry.

Leading Client Success through Smart Digital Transformation

Value Creator **HYUNDAI** *AutoEver*

HYUNDAI *AutoEver*

Company
Overview

Global Leader in
Automotive ICT/SW

HYUNDAI
AutoEver Hyundai AutoEver Corp.

We are the mobility tech expert within Hyundai Motor Group, providing tech solutions and services for automotive SW and enterprise IT businesses

Founded	April 10, 2000	**CEO**	Suh, Jung Sik

Revenue KRW 2.75 trillion **(2022, Consolidated)**
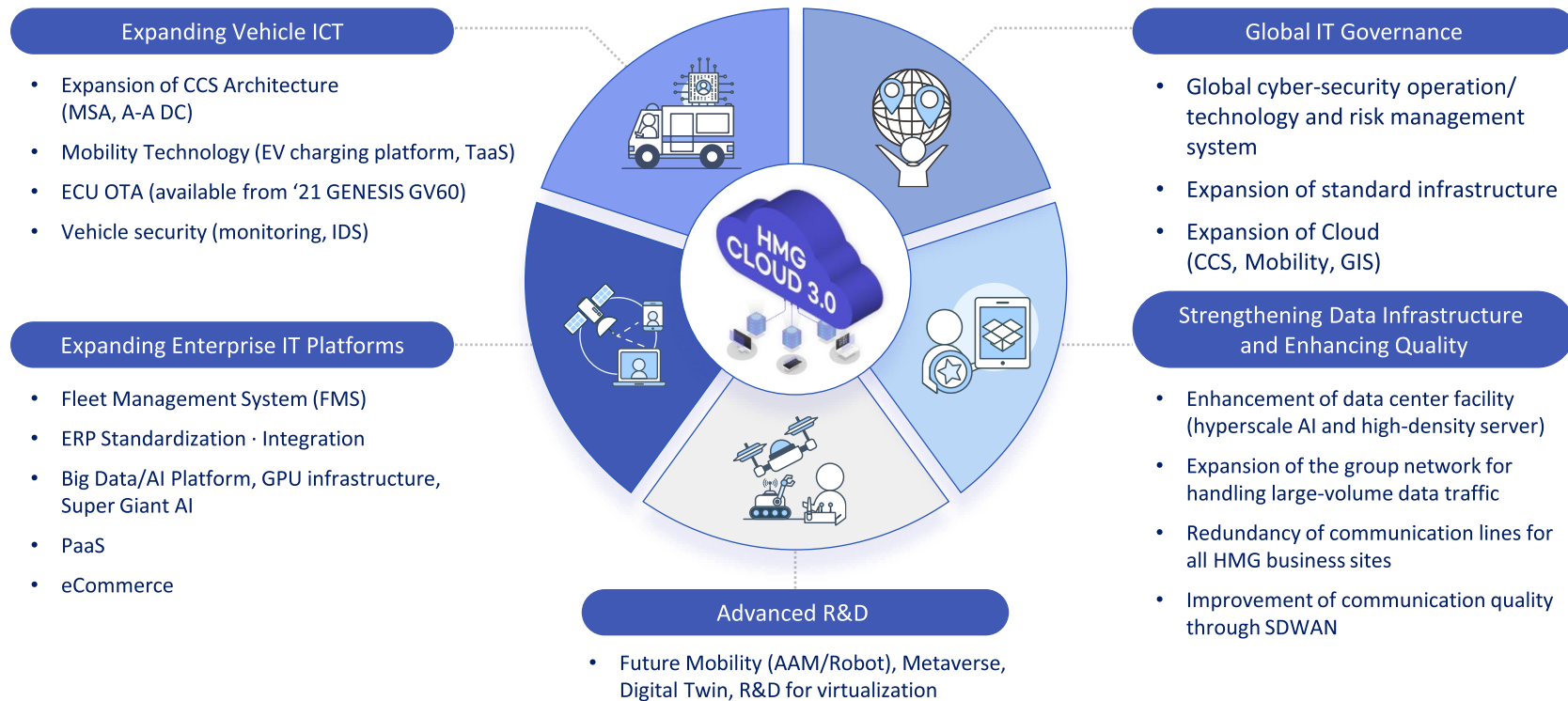
Market Cap. KRW 2.62 trillion (As of close Dec. 29, 2022)

Business Site

Headquarters	Data Center	Local Office	Overseas Office
510, Teheran-ro, Gangnam-gu, Seoul, Republic of Korea	Korea: Uiwang/Paju/Gwangju Overseas: North America/Europe	26 local offices in Korea including Seoul, Ulsan, Changwon	**10 overseas subsidiaries** North America, China (3 entities), India, Europe, Russia, Brazil, Mexico, Indonesia **2 Europe branches** **3 local offices** Czech, Slovakia Australia, Middle East, Vietnam

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Technology

Developing Technologies for Future Mobility

Focusing our R&D efforts on advancing both In-Car & Out-Car technologies

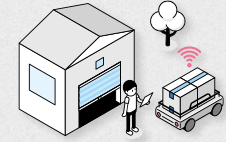### Expanding Vehicle ICT

- Expansion of CCS Architecture (MSA, A-A DC)
- Mobility Technology (EV charging platform, TaaS)
- ECU OTA (available from '21 GENESIS GV60)
- Vehicle security (monitoring, IDS)

Expanding Enterprise IT Platforms

- Fleet Management System (FMS)
- ERP Standardization · Integration
- Big Data/AI Platform, GPU infrastructure, Super Giant AI
- PaaS
- eCommerce

HMG CLOUD 3.0

Global IT Governance

- Global cyber-security operation/ technology and risk management system
- Expansion of standard infrastructure
- Expansion of Cloud (CCS, Mobility, GIS)

Strengthening Data Infrastructure and Enhancing Quality

- Enhancement of data center facility (hyperscale AI and high-density server)
- Expansion of the group network for handling large-volume data traffic
- Redundancy of communication lines for all HMG business sites
- Improvement of communication quality through SDWAN

Advanced R&D

- Future Mobility (AAM/Robot), Metaverse, Digital Twin, R&D for virtualization

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AutoEver

History

Smart-factory Journey for software defined factory

20 years of development, deployment and operational know-how

2000 — Established Hyundai Autoever

2003 — Navigation SW Development

2004 — Established Americas Corp

2006 — Established China / India corp

2007 — Established Europe corp

2008 — Open Datacenter

2014 — Established China−Joint company

2013 — OEM Navigation mass produce

2012 — Open Paju datacenter

2011 — Established Brazil corp

2010 — Established Russia corp

2015 — Established Russia corp

2016 — Mobilgene Classic Mass produce (1st generation E−architecture)

2019 — Stock exchange listing

2020 — Open NNNEOfactory(DX Platform)

2022 — Developing a virtual verification platform

2023 — Open HMGICS

2024 — Generative SDF Platform

※HMGICS : Hyudai Motors Group Innovation Center In Singapore
※SDF : Software Defined Factory

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Digital Trans-formation

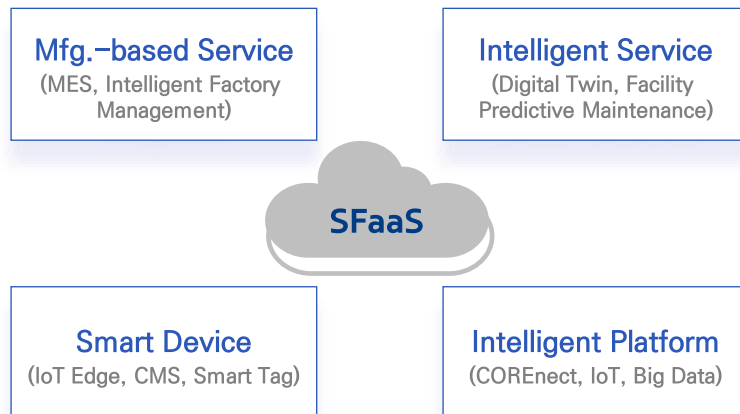A competitive edge of future manufacturing
Smart Factory Platform

Hyundai AutoEver's smart factory solution is a cloud-based integrated manufacturing platform that applies all leading ICT such as cloud, AI, robotics, IoT and big data. The data integration throughout the entire production process can enable intelligent, flexible, real-time and customer-oriented manufacturing and greatly improve connectivity within the value chain.
Currently under construction, HMGICs (Hyundai Motor Group Innovation Center in Singapore) will be the first facility to test our smart factory platform; once proven, it will become an important key to achieving future manufacturing competitiveness for HMG.
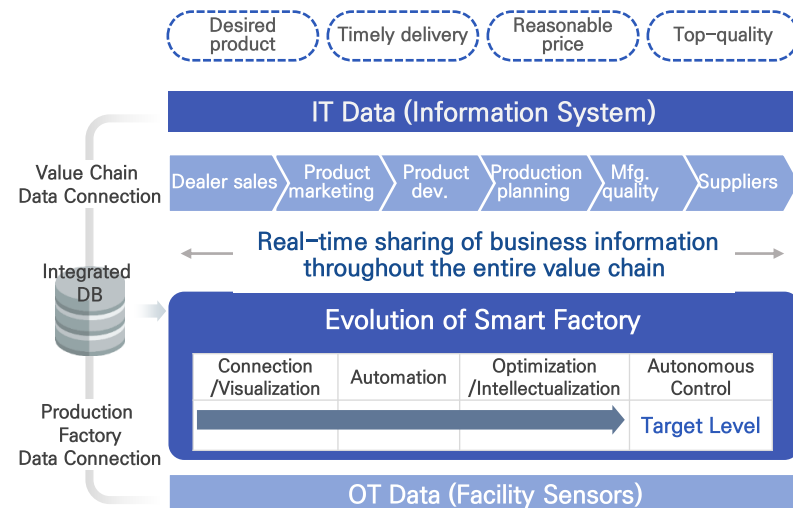
Globally competitive smart factory solutions

Intelligent/autonomous manufacturing through data connection/integration in the value chain

Application and Verification at HMGICS

Real-time reflection and feedback of customer demands throughout the value chain

Mfg.−based Service
(MES, Intelligent Factory Management)

Intelligent Service
(Digital Twin, Facility Predictive Maintenance)

SFaaS

Smart Device
(IoT Edge, CMS, Smart Tag)

Intelligent Platform
(COREnect, IoT, Big Data)

* SFaaS (Smart Factory as a Service) : A cloud−based intelligent manufacturing framework
* HMGICS (Hyundai Motor Group Innovation Center in Singapore)

Desired product | Timely delivery | Reasonable price | Top−quality

IT Data (Information System)

Value Chain Data Connection

Dealer sales | Product marketing | Product dev. | Production planning | Mfg. quality | Suppliers

Integrated DB

Real−time sharing of business information throughout the entire value chain

Production Factory Data Connection

Evolution of Smart Factory

Connection /Visualization	Automation	Optimization /Intellectualization	Autonomous Control

Target Level

OT Data (Facility Sensors)

For Customer-centric manufacturing, Implement 'optimize, intelligent, and autonomous' using manufacturing value chain and ICT technology
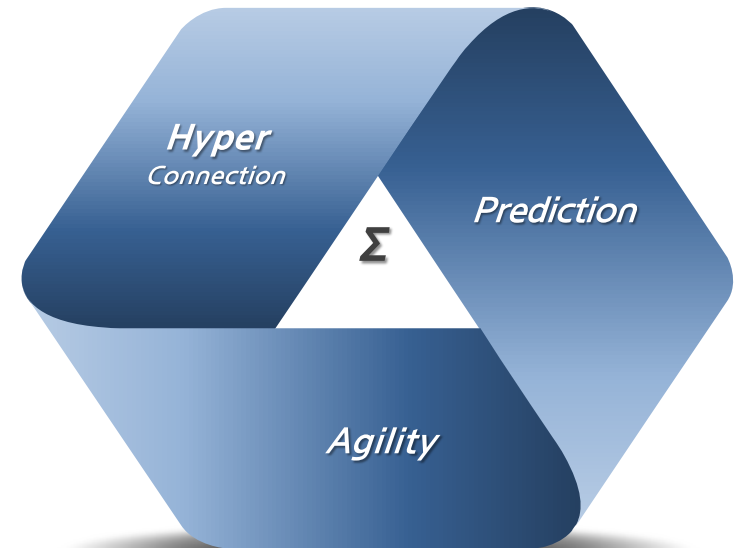
Smart Factory ==enables data-based decision-making and prediction== by connecting all information seamlessly
① Transform the perspective of customers (simple consumer → assetize customer experience and behavior) (IT area)
② Transform the perspective of manufacturing site (simple production → value of value chain)

Combine 'manufacturing site + customer/market value + future technology', SUM, Σ

Smart Factory

Products | Delivery | Price | Quality

Real-time feedback of customer's demand in overall value chain

IT Data (Information System)

Connecting data In Value chain → Selling ⟩ Marketing ⟩ R&D ⟩ Plan ⟩ production QA ⟩ SCM

Real-time data sharing in total value chain

Smart factory development stage

Visualization | Automation | Intellization | Autonomous Control **Target**

Connecting data In plant

[4M 1E connect] [Control, Analysis] [Intelligent manufacture]

OT Data(OT/AT Sensing)

Sensing production field

Be Intelligence/Autonomous through connecting and integrating of value chain information
(IT/OT Convergence → ICT intelligent platform + device)

+ *Connect all information of the value chain seamlessly (Hyper connection)*
+ *Respond quickly to customers and market environments(Agility)*
+ *Factory that enables data-based decision-making and prediction (Prediction)*

Hyper Connection

Prediction

Σ

Agility

Owns manufacturing end-to-end solutions under its own brand, NNNEO

Manufacturing Business Solution

Standard MES	Factory-BI	IQIS	3D Integrated Contorl & monitoring
Optimise Work order	FEMS	Integrated Logistics Mgmt	APS
Work flow mgmt	Robot Monitoring	Smart Vision	Smart SCM

Intelligence Solution

Digital Twin	Predictive maintenance
3D Asset	RaaS
CoreNect Simulator	Environment / Security monitor
CoreNect Cloud	
Virtual simulation	Bigdata Platform

Interface Solution

| Iot Platform | API Platform | Smart SCADA |

HW

| Smart Tag | Edge CMS/PHM |

OT Solution

| Vision Inspection | OT Security | • • • | Cloud |

※ SFaaS : Smart Factory as a Service　　MES : Manufacturing Execution System　　Factory-BI : Factory- Business Intelligence　　FEMS : Factory Energy Management System
　APS : Advanced Planning and Scheduling　SCM : Supply Chain Management　　CMS/PHM : Condition Monitoring System / Prognostic & Health Management
　RaaS : Robot as a Service　　　　　　　API : Application Programming Interface　OT : Operation Technology

What We Do

Hyundai Autoever Next Generation IT Division is
Hyundai Motor Group's software specialist;
consulting and implementing Smart Factories.
Operating, and develop innovative technologies for
customers' smart factory transformation.

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NNEO Factory
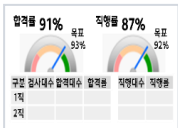
Optimising process operations with data "Factory-BI"

Intro Supports factory **optimisation for optimal management environment and improve competitiveness (Q/C/D)**

1 Real-time factory status visualisation analytics
2 Provide tailored information for quality / optimised process / cost-reduction

Extend connectivity outside the factory

| Order (Car/Option) | » | Planning (Schedule/ Logistics) | » | Partners (Quality) |

In-plant manufacturing data

Digital Factory

| Car Body | » | Painting | » | Assembly |

Extend connectivity outside the factory

| Post Process | » | VoC | » | Field (Repair) |

Quality

Real-Time Quality
- Goals / Performance
- Result(OK / NG)

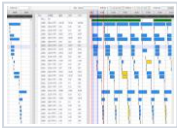**Outcome influencers monitoring**
- 4M Data Tracking
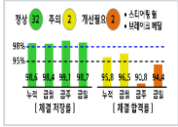
Real-Time Quality
- Goals / Performance
- Result(OK / NG)

Equipment

Rumtime monitoring
- Goals / Performance
- Run/Down/Idle time

Preventive Maintenance
- Time Analysis
- Current / vibration

Operating Rate
- Downtime Analysis
- Alarm analysis

Materials

Materials usage
- Goals / Performance
- Shop / Car / Floor

Materials monitoring
- Materials monitoring
- Shop / Car / Floor

Logis monitoring & Simulation
- Real-time materials
- Lot Tracking

Real-time analysis & Feedback

Real-Time Quality
- Alram
- 공통목표 공유

Multi-channel PUSH
- Mail
- Mobile

Analysis
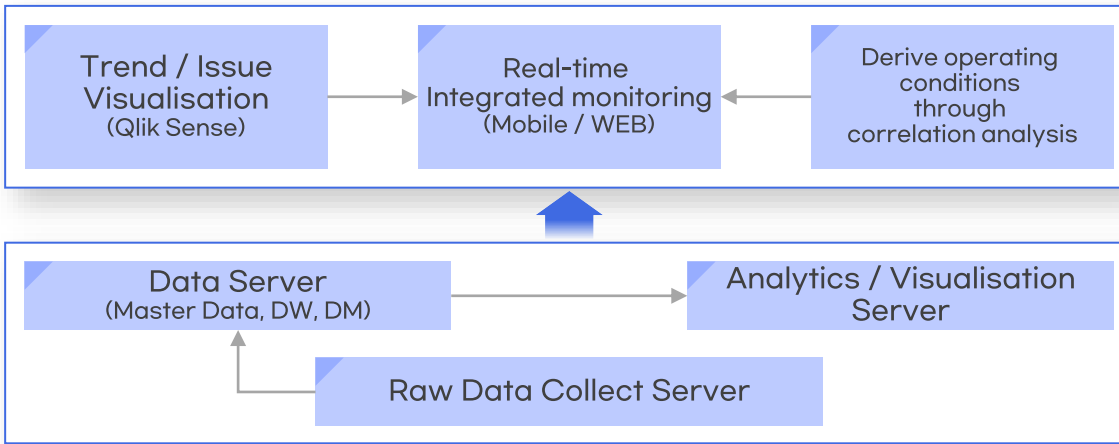- Correlation Analysis
- Trend Analysis

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NNEO Factory ▶ Factory-BI

Architecture Provide factory **integrated monitoring services based on a cloud** environment

Bigdata Visualisation Analytics

Trend / Issue Visualisation (Qlik Sense) → Real-time Integrated monitoring (Mobile / WEB) ← Derive operating conditions through correlation analysis

1 UI configuration and real-time alarms

Data Server (Master Data, DW, DM) → Analytics / Visualisation Server

Raw Data Collect Server

1 Raw Data, standardization /Integrated DM

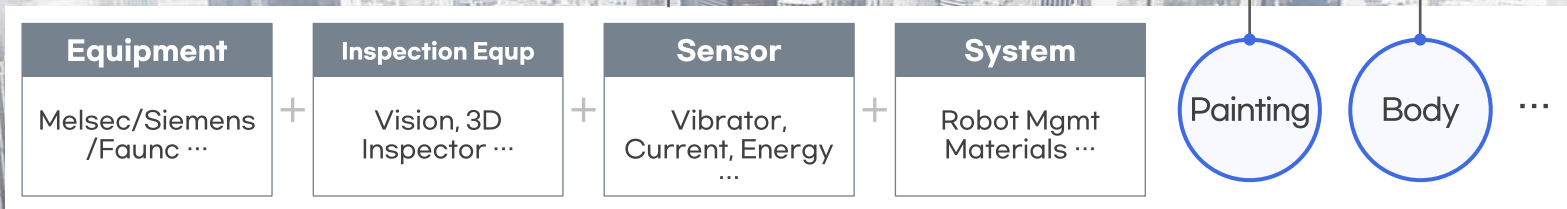**Cloud**

Easy to connect with Equipment

Integrated IoT Platform Server

- ▶ Common — Resource/Security/control Mgmt
- ▶ Mamt — Meta/Monotoring/Transaction
- ▶ Modeler — Interface Modeler
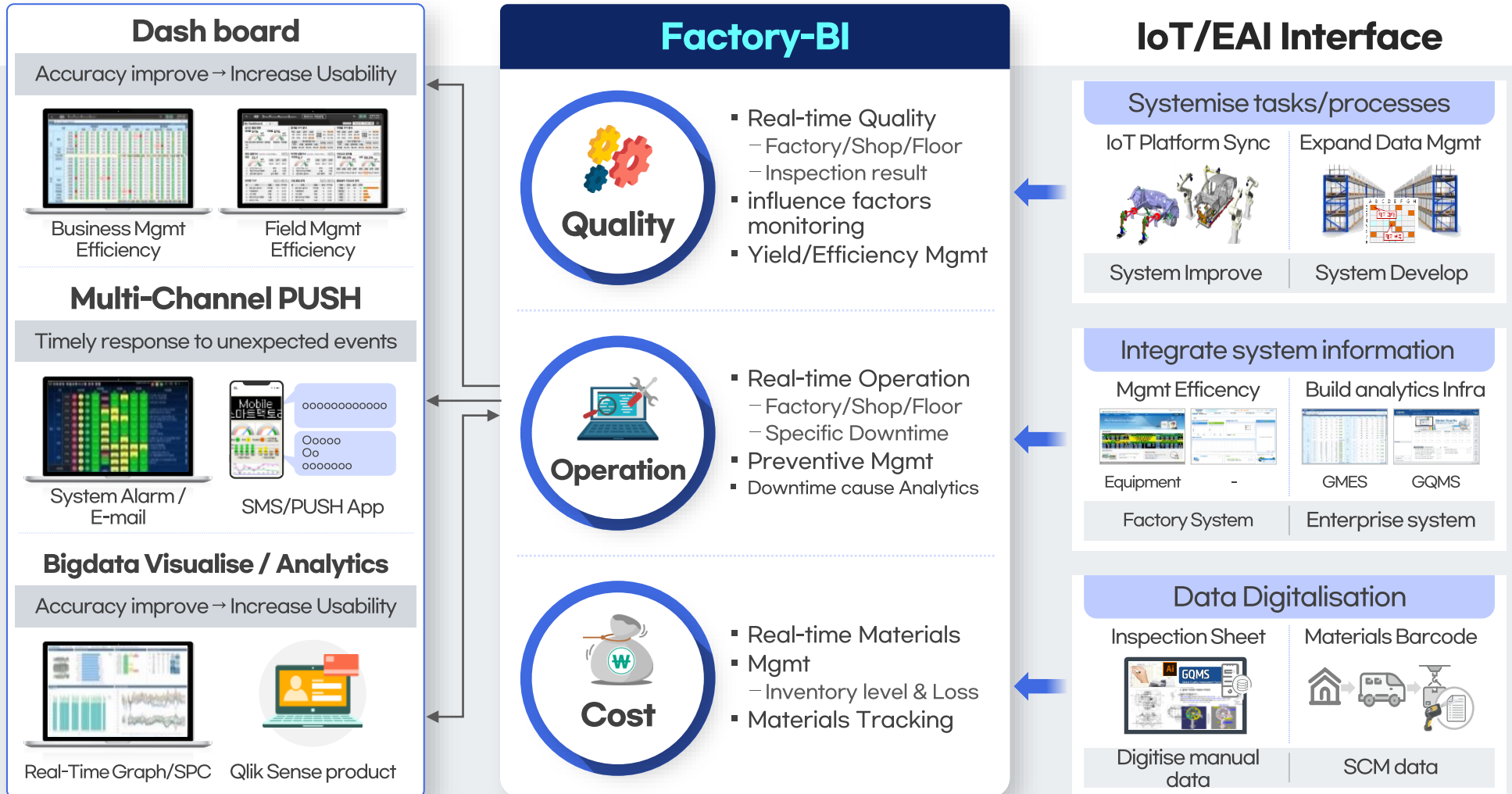
Factory IoT Server I/F module-Interface engine, Adapter, Agent

I/F Module   I/F Module   ⋯

Near and fat remote-wired Network

Equipment		Inspection Equp		Sensor		System
Melsec/Siemens /Faunc ⋯	+	Vision, 3D Inspector ⋯	+	Vibrator, Current, Energy ...	+	Robot Mgmt Materials ⋯

Painting   Body   ⋯

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Benefits
Applying an **integrated dashboard for all factories** and providing visualisation analysis of correlation data

Dash board

Accuracy improve → Increase Usability

Business Mgmt Efficiency | Field Mgmt Efficiency

Multi-Channel PUSH

Timely response to unexpected events

System Alarm / E-mail | SMS/PUSH App

Bigdata Visualise / Analytics

Accuracy improve → Increase Usability

Real-Time Graph/SPC | Qlik Sense product

Factory-BI

Quality
- Real-time Quality
  - Factory/Shop/Floor
  - Inspection result
- influence factors monitoring
- Yield/Efficiency Mgmt

Operation
- Real-time Operation
  - Factory/Shop/Floor
  - Specific Downtime
- Preventive Mgmt
- Downtime cause Analytics

Cost
- Real-time Materials
- Mgmt
  - Inventory level & Loss
- Materials Tracking

IoT/EAI Interface

Systemise tasks/processes

IoT Platform Sync	Expand Data Mgmt
System Improve	System Develop

Integrate system information

Mgmt Efficency		Build analytics Infra	
Equipment	-	GMES	GQMS
Factory System		Enterprise system	

Data Digitalisation

Inspection Sheet	Materials Barcode
Digitise manual data	SCM data

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NNEO Factory ▸ Factory-BI

Expectations **Data-driven decision-making** to run an efficient factory and manage potential quality risks

As-Is

[View key figures and operational status individually / need improvement]

- Sys : Pre-Process/Quality(Web), Process Quality(GQMS)..
- Local PC : Factory operation(Local PC, CCR), Vision …

Quality information

Operation information

[Difficulty identifying and analysing issue causes]

Manual production history

Manual Work Order

To-Be

[Integrated monitoring operations]

- User-friendly dashboards, automated mailings and integrated alarm mgmt

[Real-time monitoring of influencing factors to stabilise production conditions early and derive optimal mgmt conditions for each process based on big data.]

Down/Idle

BIG DATA
Optimal conditions

LOT NG

Production conditions change

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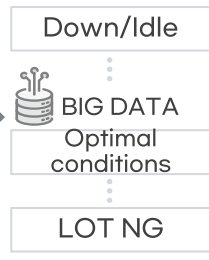
Status — Hyundai Asan / Czech Republic Plant(HMMC), KIA Gwanju 2 Plant

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HMG Automotive plant(Fin / On going)

Factory(5 case ↑)	Year

HMG Automotive plant(Planning)

Factory(5 case ↑)	Year

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Case **Asan/Gwangju2/HMMC Intelligent Factory Service Project**

Project ▶ Asan/Gwangju2/HMMC Factory-BI   **Site** ▶ Hyundai Asan / Kia Gwangju 2 / Czech Republic   **Period** ▶ 22.10~23.10

+

→ **Cloud Native service structure**
- Instant service delivery

→ **Subscribe service offering**
- Per service / per function subscribe

→ **Public Cloud based service offering**
- Offer equal quality service

→ **Portal and local Mgmt offering**
- transfer services by factory based on permissions
- Centralise permissions mgmt with Portal

Integrate real-time production information
- Sync and Expans(MES, ERP, GSMS, TDMS, IQIS)
- Display summary of key informaiont → Insight

MES sync
Simple monitoring (VIN)

219 옵션 추가
바디 위치 정보
기능 현황 추가 품질 정보 추가 이동시간 예측

Integrated Data monitoring

Effect ▪ Reduce Tracking time and total monitoring

Display buffer status in real time

차체 OFFLINE BODY 수량
의장 각 라인별 재공 및 라인간 정체 수량

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NNEO Factory

Key of the smart factory!
"IoT Platform"
for data collection and standardisation

Intro Provide connectivity to **collect, process, process, and transmit data from a variety of heterogeneous devices** in the industrial workplace

" through a single communication channel

Build a data integration framework that makes it easy to collect and manage data

The challenges of field data collection ···
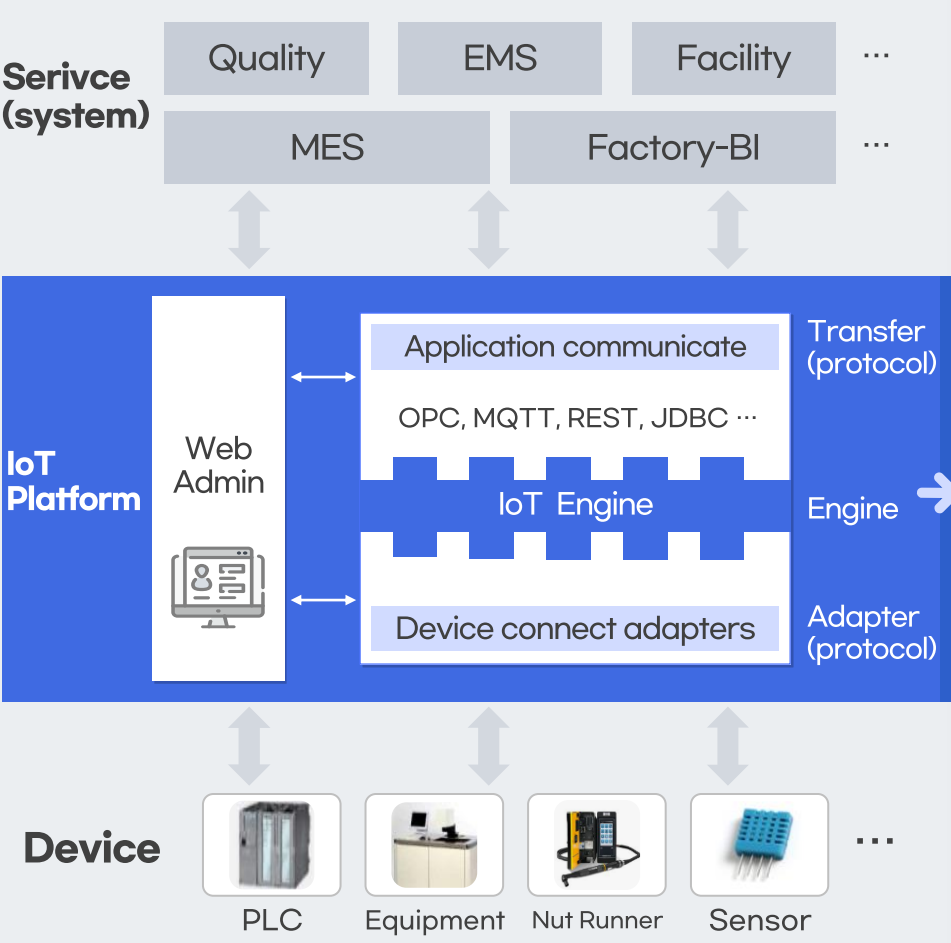
Requires different communication drivers to connect with heterogeneous devices

+

Requires knowledge and experience of how devices communicate when connecting

+

Mixed use of various S/W such as commercial solutions and SI software

+

Difficult to respond to changes in data processing processes

+

Difficult to respond quickly when new types of data communication are needed

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NNEO Factory ▶ IoT Platfotm

Architecture **Supports bi-directional communication and I/F** between production equipment and devices and applications

Architecture Diagram

Serivce (system)
- Quality
- EMS
- Facility …
- MES
- Factory-BI …

IoT Platform
- Web Admin
- Application communicate — Transfer (protocol)
- OPC, MQTT, REST, JDBC …
- IoT Engine — Engine
- Device connect adapters — Adapter (protocol)

Device
- PLC
- Equipment
- Nut Runner
- Sensor …

Key features

01	**Management Mornitoring** (Web Admin)	• Manage flow and node setup • Manage device connectivity • Monitoring Real-time server log
02	**Flow Editor**	• Work Flow Design by Drag & Drop UI
03	**Customize**	• Customize function - Write a script, add a Custom node
04	**Application inferface**	• Connecting applications, services - Link to legacy systems
05	**Real-time decisions**	• Rule-based alarm events
06	**Data Procssing**	• Data processing for different data types
07	**Connect Adapter**	• Connect different data sources using wired and wireless network protocols - PLC, Equipment, sensors …

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NNEO Factory ▸ IoT Platfotm

Benefits — Provide a various interface from device **connectivity to data management and control at the platform layer**

Key features

3 Service Layer

| Flexible Production Support Services | Marketing Support Services | Car to Life Services | ... |

| Data Analysis Platform | Open API Platform |

2 Platform Layer

IoT Platform Module

Common module

| Security | Data Storage |
| Resource | Control |

Domain service module

| B2B Service | B2C Service |
| Domain Integration service |

Interface Mgmt module

| Data gathering | Data preprocess | Data transfer | Connection Mgmt |

1 Device Layer

Communication Protocol (Fixed & Wireless)

| Factory Device | Marketing Device | Connected Car | ... |

Product Position | **Communicate layer I/F (adapter) + Platform layer**

01 HMG-specific adapters
- HMG factory-centric adapters (Reflect standardised site attributes)
- Support for non-standard devices via custom adapters

02 User-friendly GUI
- Easy to connect new devices
- Minimise SI development from connectivity to data processing
- User-friendly device connectivity/management
- PLC-specific UI

03 Support Various platform
- Works on low-end devices (Edge Computing, GPU)
- Windows, Linux OS support
- Support container and clould

04 Apply modularity
- Apply feature-specific modules (adapter/protocol modularity)
- Customising site/user attributes

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NNEO Factory ▶ IoT Platfotm

Expectations 1) Reduce the cost of building a data collection/management system
2) Simple to use

Data collect · Mgmt
Reduce system deployment costs

01
Reduce device I/F deployment time and cost

- Provides HMG factory-optimised device adapters & I/F
- Provide user-friendly platform services

02
Easy to combine with HMG solutions

- Easy to combine with MES, SFaaS,
  intelligent manufacturing platforms, etc.

Easy and Simple to use

01
Writing GUI-based Data Flows

- Easily process data transactions with Flow Editor
- Edit data process and flow with intuitive scenario creation
- Implement and reuse Custom Nodes
  → maxmise user convenience

※ HMG optimise adaptor : Offers 9 types of PLC, MODBUS, OPC, and more

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NNEO Factory ▶ IoT Platfotm

Applying IoT platform as a component technology for HMG and the others

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IoT

Standard MES	Digital Twin
Factory-BI	CMS/PHM
FEMS	3D Integrated Control
Work bench Mgmt	...

HMG Automotive plant

Factory(15 Case ↑)	Year

Affiliate/Overseas Plant

Factory(8 Case ↑)	Year

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NNEO Factory ▶ IoT Platfotm

Case — Apply Factory-BI at HMG Asan plant

01 PLC data collect
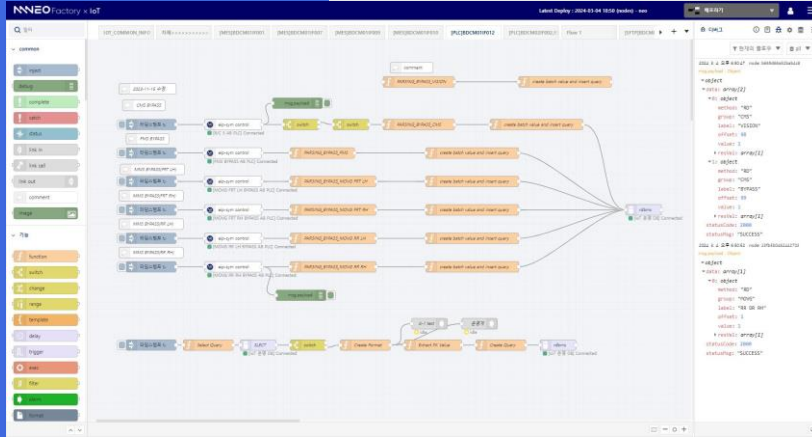
02 DB data collect
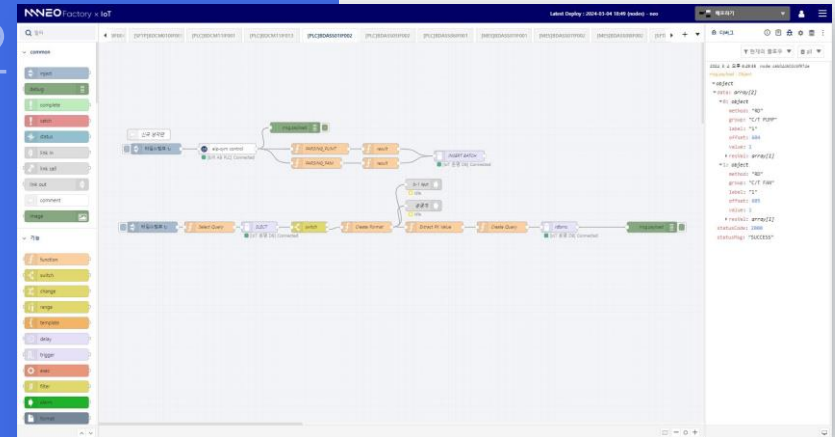
03 MES data collect
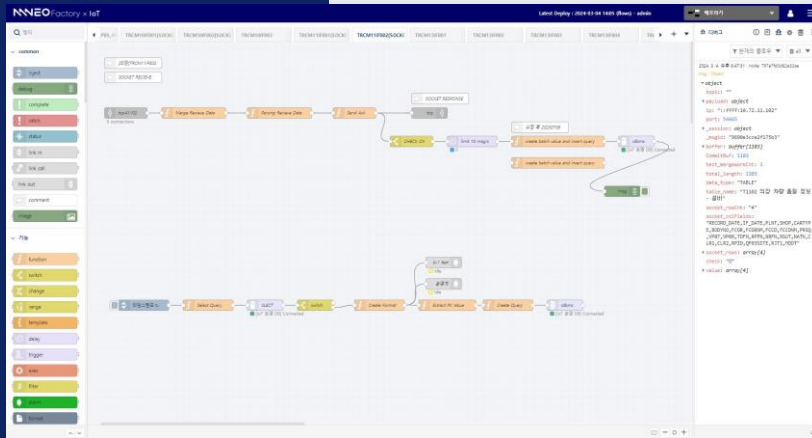
04 File data collect
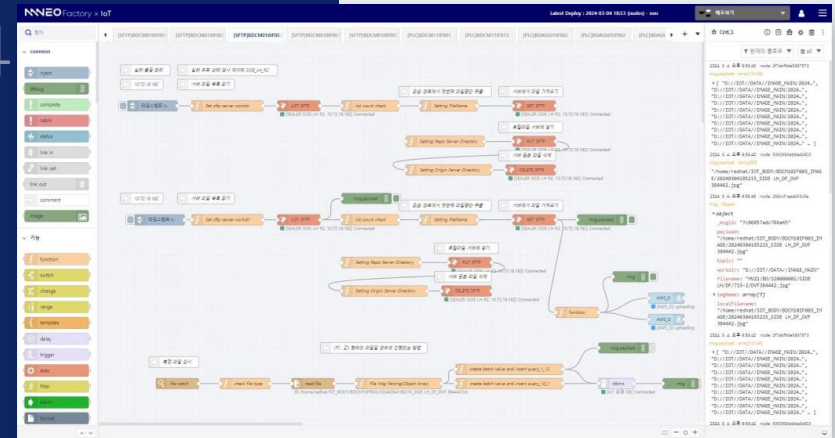
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Architecture **Digital twin to predict and optimise what happens on the physical manufacturing floor**

Manufacturing System

Production Mgmt	→	Resource Mgmt	→	Quality Mgmt	→	Logistic Mgmt

Virtual Environment

3D Modeling	SCADA	3D Rendering/Modelling	3D Engine

Scenarios (Process / Test)

CoreNect Digital Twin	Virtual Factory	Simulator	Emulator

3D Assets

Algorithms

IoT Platform	CoreNect Cloud	Algorithms Deploy	Algorithms Mgmt

	Data Lake	Storage	Analytics

	Connect / Monitoring	Collect / Process / Transfer	Control Mgmt

Digital Twin

Equipment

Production	Logistics	Inspection	Robot	Sensors	PLC

HAE Solution

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Intro **Acquire know-how and in-house engineering capabilities** to build virtual environments based on CoreNect solutions

System (Physical)

| Production Mgmt | → | Resource Mgmt | → | Quality Mgmt | → | Logistic Mgmt |

Virtual Data

Emulator

Virtual Factort

Optimise Production OP

Optimise Logistic OP

Algorithms

Twin Model Simulator

Algorithms

IoT | Big data | AI

Equipment (Physical)
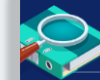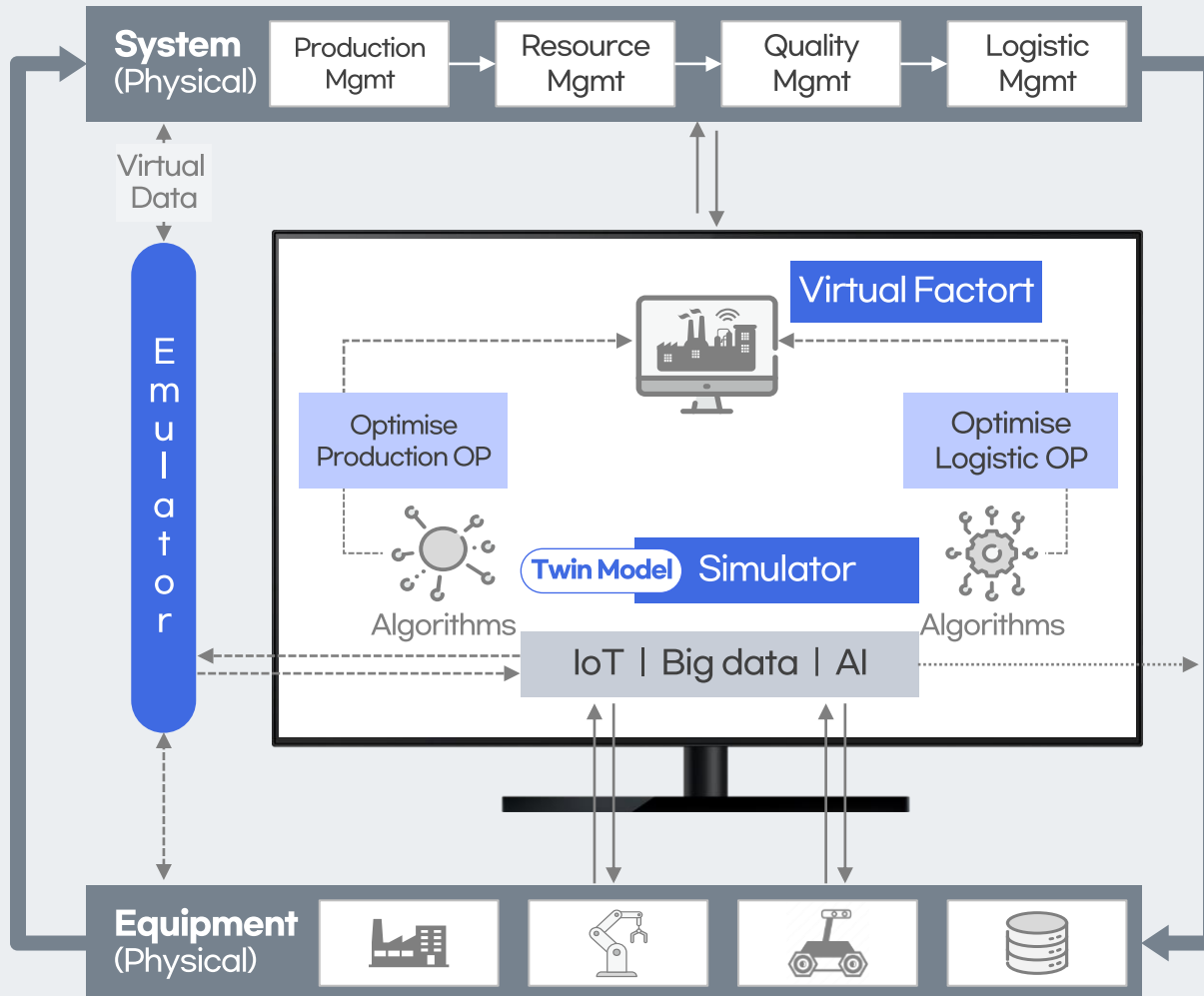
Key **Product** & **Function**

01 Virtual factory

| **3D editor** | ▪ 3D Asset Mgmt |
| **Visualise** | ▪ Validating objects
▪ 2D/3D model Visualising |

02 Simulator

Scenario	▪ Define process scenarios ▪ Scenario scheduling
Control simulation	▪ Scenario Mgmt / Run simulation ▪ Save result data
Twin model	▪ Logic model ▪ Copying business logic/algorithms

03 Emulator

| **Generate Virtual data** | ▪ Generate and process data for simulation |

HAE support boundary

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NNEO Factory ▶ Digital Twin

Usecase   HMGICS Logistics Digital Twin

▶ Project	▶ Site	Period	21.10~21.12 22.04~22.08 23.04~23.09
HMGICS 1~3 floor Logistics digital twin	▪ HMGICS		

Set simulator scenario
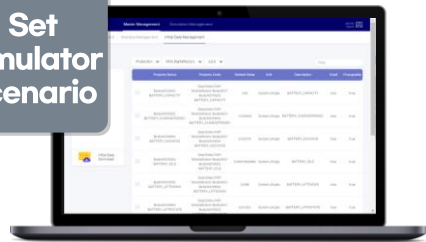
3D Editor
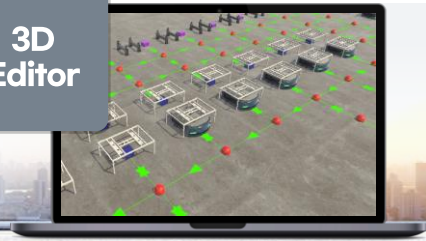
3D virtual factory simulation
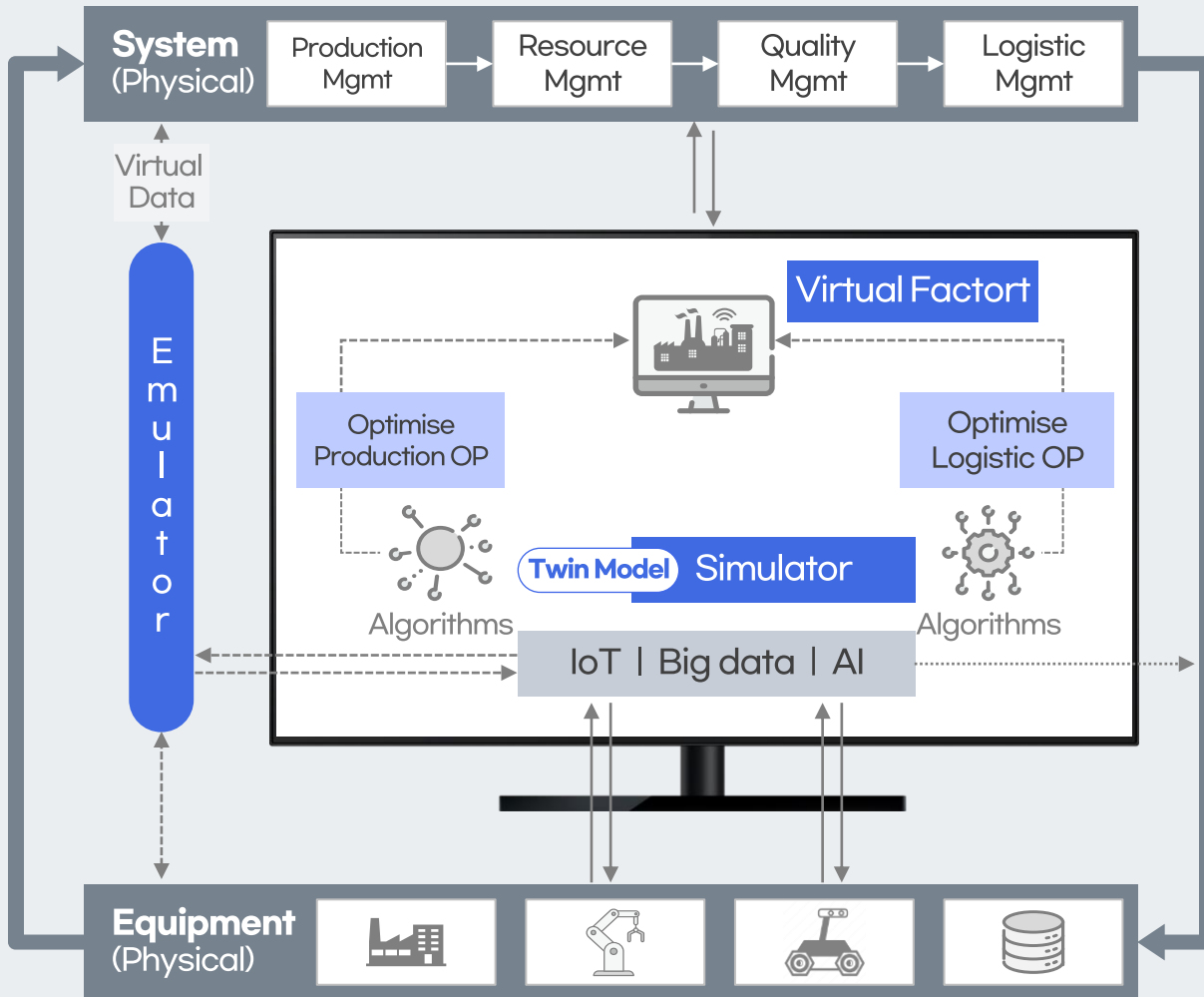
Logistics simulator Dashboard

Process simulator Dashboard

Type	Use-Case
Auto-warehouses/conveyors	Inspect bottlenecks in the logistics process based on volume loads
AGV/AMR	Check the optimal number of robots to achieve the target volume and check the movement path (layout)
유인작업장(GTP)	Check the optimal operating plan for production goals

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NNEO Factory ▶ Digital Twin

Benefits — Edit/combine virtual factory directives using **task-based architecture**

System (Physical)

Production Mgmt → Resource Mgmt → Quality Mgmt → Logistic Mgmt

Virtual Data

Emulator

Virtual Factort

Optimise Production OP

Optimise Logistic OP

Twin Model Simulator

Algorithms

Algorithms

IoT | Big data | AI

Equipment (Physical)

Key features

01 Data generation with virtual factory

Input data is processed by business logic in a virtual space, generating data about the process and results.

02 Task-Driven Architecture

Task-driven architecture is a unique architecture in CoreNet Simulator that directs the virtual factory by defining and scheduling this business logic as a combination of multiple single actions (tasks).

Decompose

Synthetic

Process Sequence

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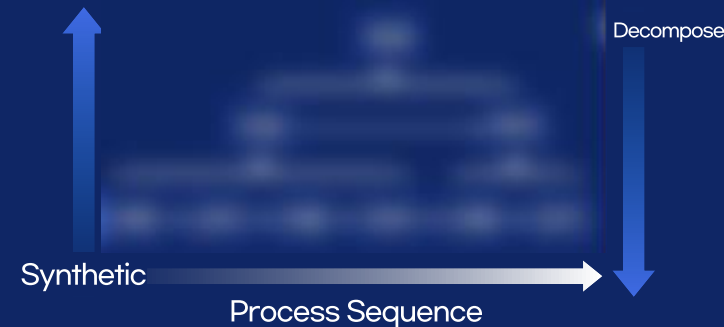
Benefits 1) Derive optimal operating standard 2) Resolve physical and time limitations when changing methods and plans

Implementing factory optimise with virtual simulation

☑ Optimise operations, including production/logistics

Logistics

Check conveyor volumes, warehouse in/out volumes, and PPS/rack stacking efficiency

Automated warehouse mgmt, conveyor motion checks, workplace assignment and queue mgmt

Production

Check for the proper number of AMRs/AGVs in operation and optimise AMR routing

Check processing logic in case of abnormalities, and cell rerouting logic

Resolve physical and time limits when changing standards

☑ Minimise impact when adding/changing Standard (UPH reduce, Down/Idle time Loss …)

AS-IS

- Perform limited validation using downtime
- Can't test without a physical Equipment

- Unable to test production changes due to logic/data changes in the system
- Unable to assess the impact of new systems/facilities on current operations

Resolve the constraints of physical verification environments

Digital Twin

Verify linkages between systems and Equipment
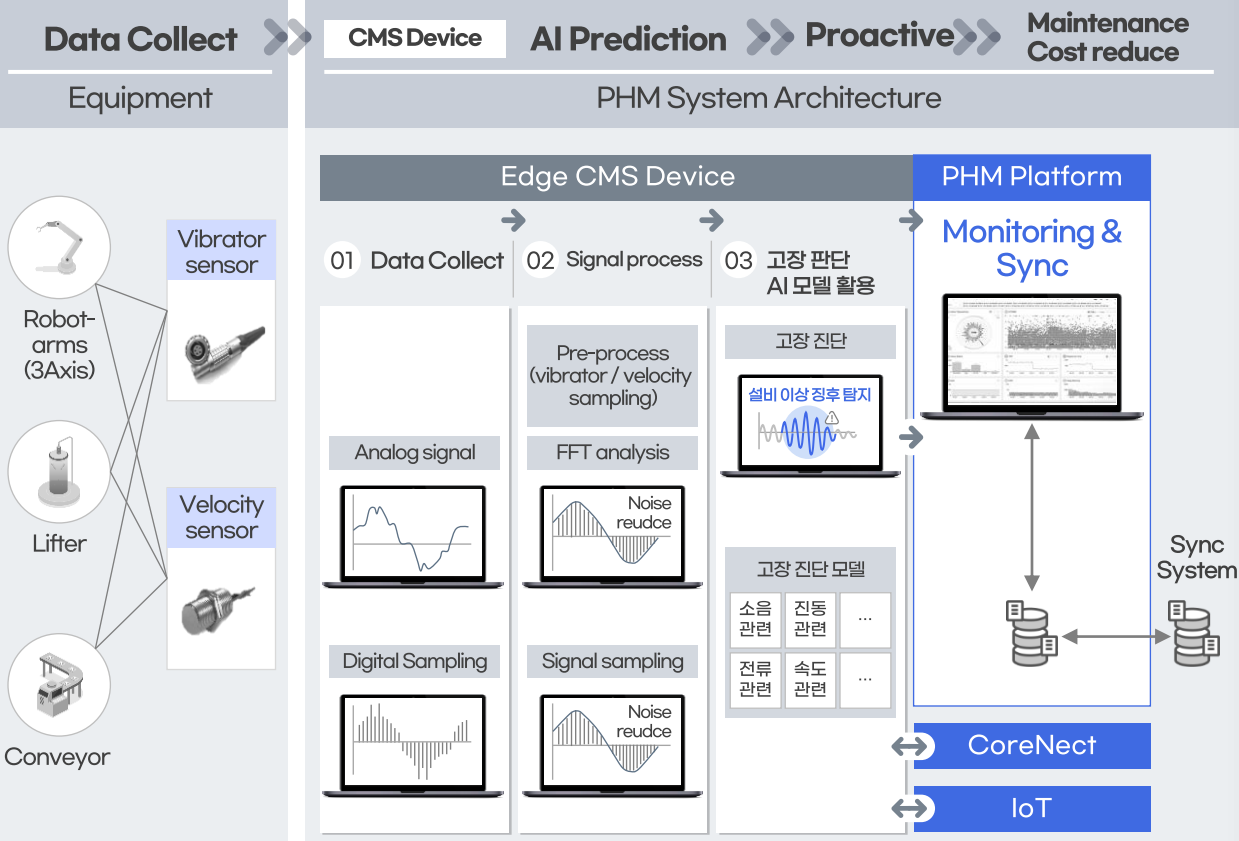
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NNEO Factory ▶ CMS/PHM

Intro — **Diagnostics and predictive maintenance solutions** for smart factory equipment

1. Real-time edge computing by maximise performance **with GPU chip on CMS Devices**
2. **Prediction with AI diagnostic models and trend analysis** with integrated monitoring

☑ Platform

| Data Collect | CMS Device | AI Prediction | Proactive | Maintenance Cost reduce |

Equipment

- Robot-arms (3Axis)
- Lifter
- Conveyor

- Vibrator sensor
- Velocity sensor

PHM System Architecture

Edge CMS Device

01 Data Collect
- Analog signal
- Digital Sampling

02 Signal process
- Pre-process (vibrator / velocity sampling)
- FFT analysis — Noise reudce
- Signal sampling — Noise reudce

03 고장 판단 AI 모델 활용
- 고장 진단
  - 설비 이상 징후 탐지
- 고장 진단 모델

| 소음 관련 | 진동 관련 | … |
| 전류 관련 | 속도 관련 | … |

PHM Platform

Monitoring & Sync
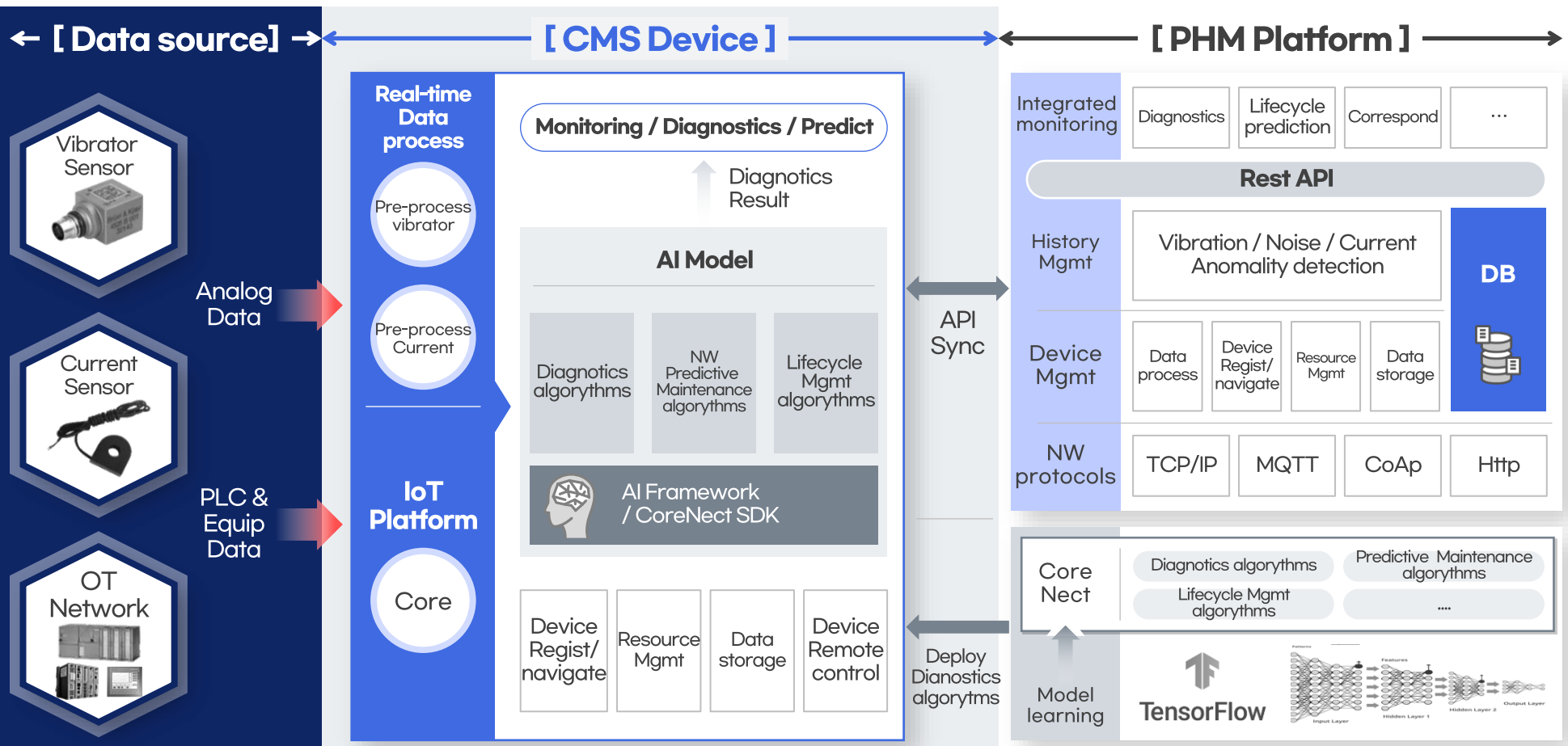
Sync System

↔ **CoreNect**

↔ **IoT**

Key function

01 Data Collect
- IEPE/MEMS vibrator data
  - 16KHi-speed sampling process
- Sensor Data Collect

02 Monitoring
- Vibrator reatl-time monitoring
- AI dignostics score trend
- Anomaly warning alarm
- Collect device monitoring

03 AI Diagnostics & Analytics
- EmbededDev. Edge computing
- ML-based Anomaly Detection
- Vibraotr FFT analysis

04 Edge Computing
- EdgeCMS Device
  - Sensor Hi-speed sampling
  - On-Device AI computing
  - Low power/lightweight devices

05 Operation Mgmt
- Remote control of edge devices
- Cloud Update (SW/Platform)
- RAW data collect & Scheduling

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Architecture **Edge computing systems** centred on EdgeCMS devices

1. CMS - Real-time analog data collection and AI diagnostics for embedded devices
2. PHM System - Rotational vibration monitoring and waveform analysis and AI-based abnormality prediction alarms

← **[Data source]** → **[CMS Device]** **[PHM Platform]**

[Data source]

- Vibrator Sensor
- Current Sensor
- OT Network

Analog Data →

PLC & Equip Data →

[CMS Device]

Real-time Data process
- Pre-process vibrator
- Pre-process Current

IoT Platform
- Core

Monitoring / Diagnostics / Predict

↑ Diagnotics Result

AI Model
- Diagnotics algorythms
- NW Predictive Maintenance algorythms
- Lifecycle Mgmt algorythms

AI Framework / CoreNect SDK

- Device Regist/ navigate
- Resource Mgmt
- Data storage
- Device Remote control

API Sync

Deploy Dianostics algorytms

[PHM Platform]

Integrated monitoring
- Diagnostics
- Lifecycle prediction
- Correspond
- …

Rest API

History Mgmt
- Vibration / Noise / Current Anomality detection

Device Mgmt
- Data process
- Device Regist/ navigate
- Resource Mgmt
- Data storage

DB

NW protocols
- TCP/IP
- MQTT
- CoAp
- Http

Core Nect
- Diagnotics algorithms
- Predictive Maintenance algorythms
- Lifecycle Mgmt algorythms
- ….

Model learning

TensorFlow

Patterns / Features / Input Layer / Hidden Layer 1 / Hidden Layer 2 / Output Layer

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Benefits **Provide the EdgeCMS device lineup for any Equipment type**

CMS

A type	**N** type	**W** type

Common	CoreNect enables appropriate diagnostic algorithms to be embedded within the CMS

Type	Diagnostics	OT NW diagnostics	Remote type
Collect signal	Motor / Velocity / Vibration	PLC / Equipment / RTU / HMI	Logistics warehouse carrier

Enable to expand Line-up with process-specific signal I/O module development

Expanding Line-up →

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Expectations Provide **downtime minimize and trouble-free factory** with proactively predict

PHM system based on edge computing (module+platform+algorithm)

- Real-time determinations with Edge CMS and diagnostics platform
- Easily develop and advance drive fault prediction AI algorithms

Robot

Auto-Equip

Real-time determine

CMS module

Diagnostics platform

Data storage

Diagnostics Learning model

Features extract

Data Pre-process

Data Determine

Classification

Anomality detect
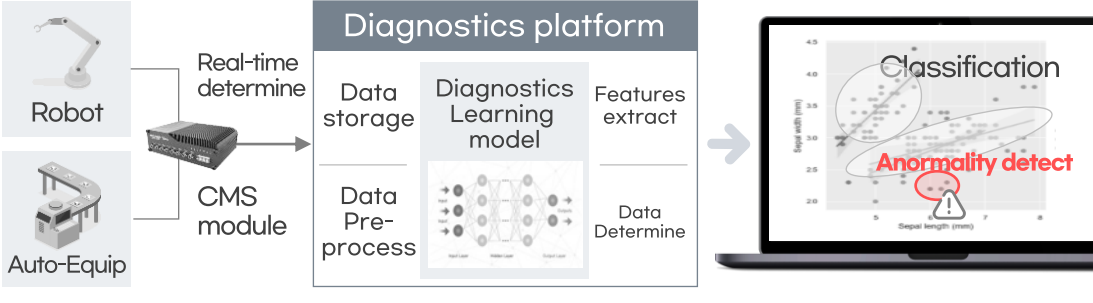
Enabling predictive maintenance with AI learning-based analytics

- Variable-Drive/Unstructured Data Analysis Algorithms + Anomaly Detection
  : Multi-algorithmic "And conditions" combinations minimise false positives and enhance predictive
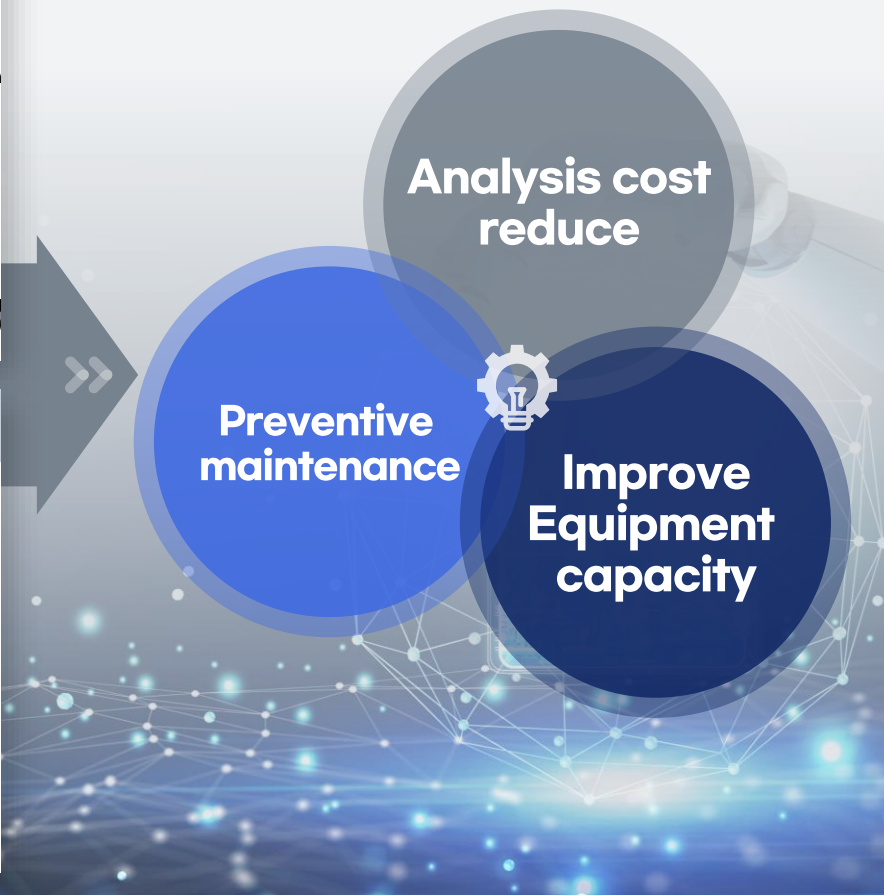
피처 분석 진단 알고리즘

+

예측

학습-정상

Anomaly Score Graph

Analysis cost reduce

Preventive maintenance

Improve Equipment capacity

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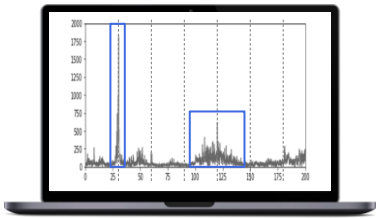
Usecase — HMGICS PHM system project

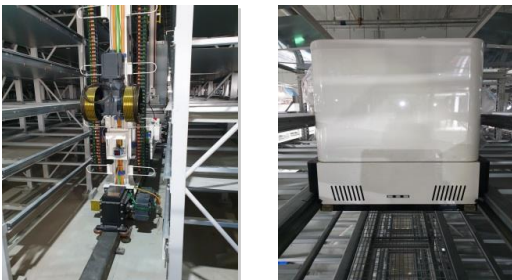| ▶ Project	▶ Site	Period	22.01~23.04
PHM system project	▪ HMGICS		

Scope

- **250 points for major drives in logistics/assembly line**
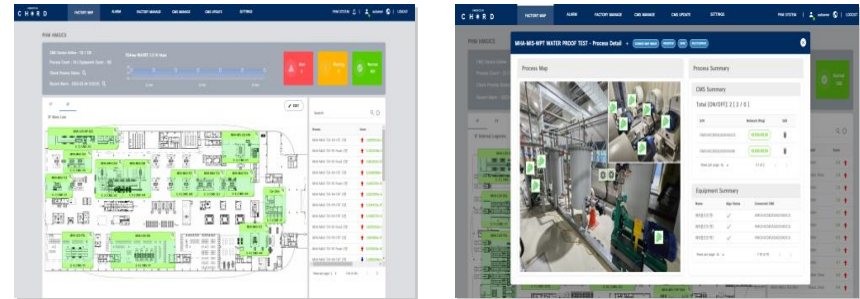 - 6 axis assembly robot, DROPLIFT, Conveyor belt

- **270 points of drive for 90+ warehouse wireless mobile units**
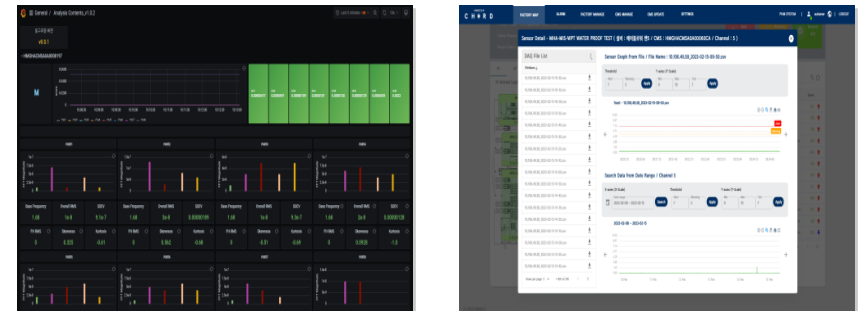 - SCM / MCS automated warehouse equipment

Key features

- **Map-based, real-time monitoring of equipment anomalies**

- **Data check / analysis per sensors**

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End of Document