WISE PaaS Expedites
Digital Transformation of the PCB Industry

研華 WISE PaaS 平台促進 PCB 業者數位轉型

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Advantech

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Mission
Enabling an Intelligent Planet

Revenue
USD $1.6 Billion (2018)

Market Cap
USD$5.71 Billion (May. 2019)

Service Field
Industry 4.0, Industry IoT,
Embedded Computing,
Smart City (Medical, Retail, Logistics)
Serve Worldwide IoT Solution Integrators

WISE-PaaS Architecture for iFactory/Industry 4.0

iFactory/Ind. 4.0 Domain SRP

iFactory/Industry 4.0

Industrial APP (I.APP)

OEE Monitoring
- Real-time Production Mgmt
- Machine Availability Mgmt
- Shift Scheduling

Machine Monitoring
- Changeover Efficiency Mgmt
- Predictive Maintenance

Situation Room
- D. Signage Mgmt

Factory Energy Management (FEMS)
- Energy Consumption & Cost Analysis
- Machine Utilization & Energy Efficiency

AI-based AOI for PCB Inspection (AOI)
- Defects Detection
- Defects Labelling

WISE-PaaS Microservices & Data Platform

Visualization
- WISE-PaaS/SaaS Composer
- WISE-PaaS/Dashboard
- Grafana
  - 2D/3D rendering
  - Multiple Data Sources
  - Multiple Panel Types

Asset Performance Management (APM)
- WISE-PaaS/APM
  - Asset Models
  - Asset Evaluation
  - Notification
  - Workflow/MES/ERP Interop
  - OTA
  - VPN
  - Video Service

AI Framework Service (AFS)
- WISE-PaaS/AFS
- TensorFlow   Caffe
- GPU
  - Code IDE
  - Hyper Parameter
  - Training & Deployment
  - Compute Resource Management

Compute Resource Management
- CLOUD FOUNDRY
- kubernetes

IoT Hub
- RabbitMQ
- kafka

Database & Storage Services
- PostgreSQL
- mongoDB
- influxdb
- ceph

Operation
- Multitenancy
- Metering

WISE-PaaS/EnSaaS | Public Cloud | Azure | aws | 阿里云 | Private Cloud | WISE-STACK | openstack

Edge Intelligence

WebAccess/SCADA
oma LwM2M
EDGE X FOUNDRY
Wireless Sensor Module

WISE-PaaS/EdgeLink
M2I Edge Engine
Remote I/O & DAQ Devices

WISE-PaaS/WISE.M+
IIoT Device Cloud Management
Machine Vision   RISC-Based Gateways

WISE-PaaS/DeviceOn
Remote Device Management
Embedded Automation PCs   Control IPC

WISE-PaaS/VideoSense
Video Management
Intelligent HMI

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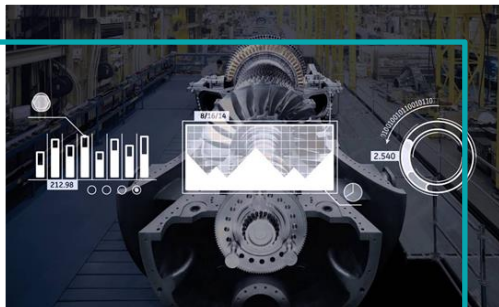
Industrial Solution Ready Packages (SRPs) with AIoT (AI + IoT)

WISE.M+ (CNC, Motors, E&E …, etc)

iFactory: OEE, EMS, AI AOI, …, etc.

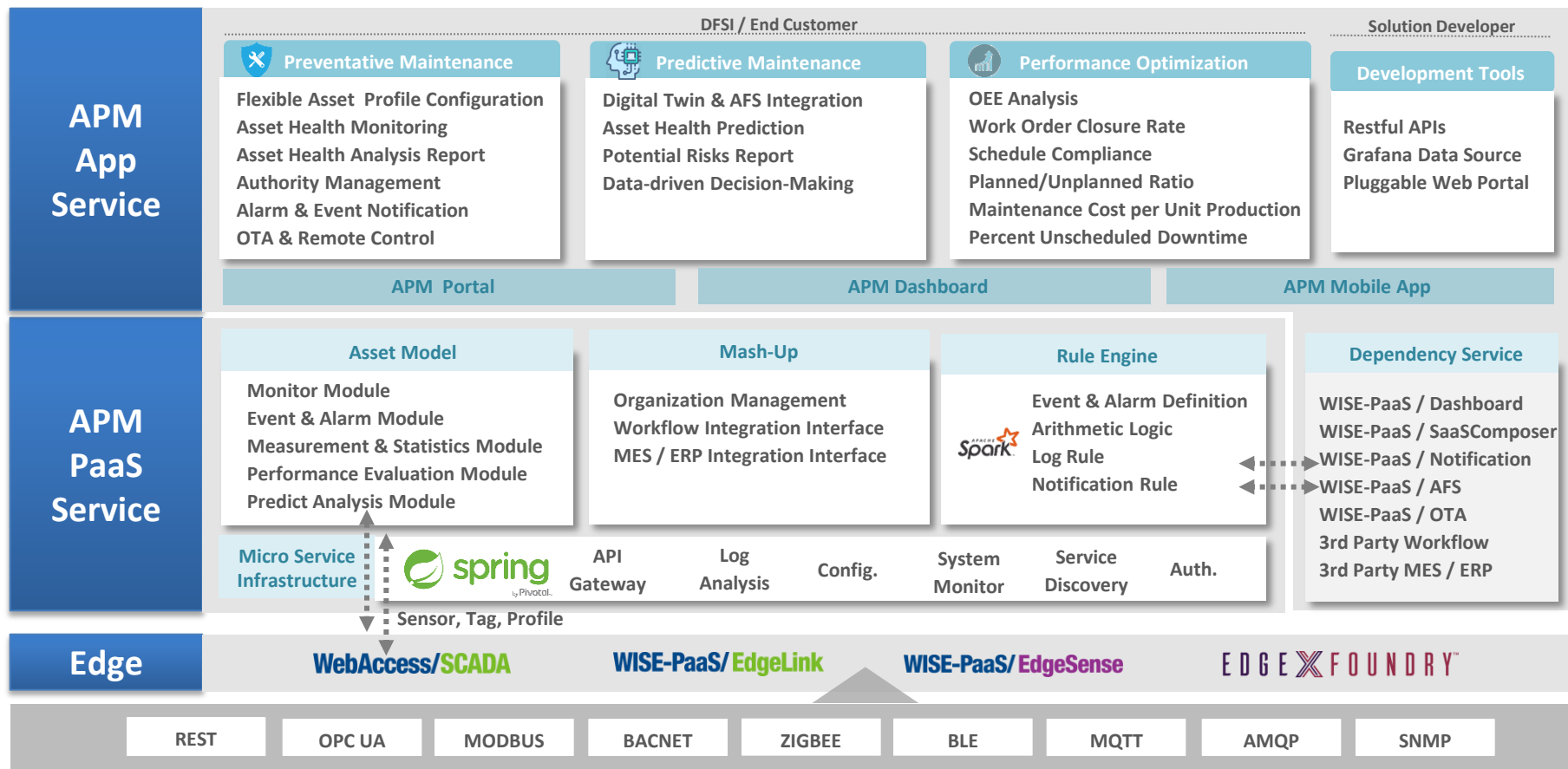**DeviceOn : Edge Platform Mmgt.**

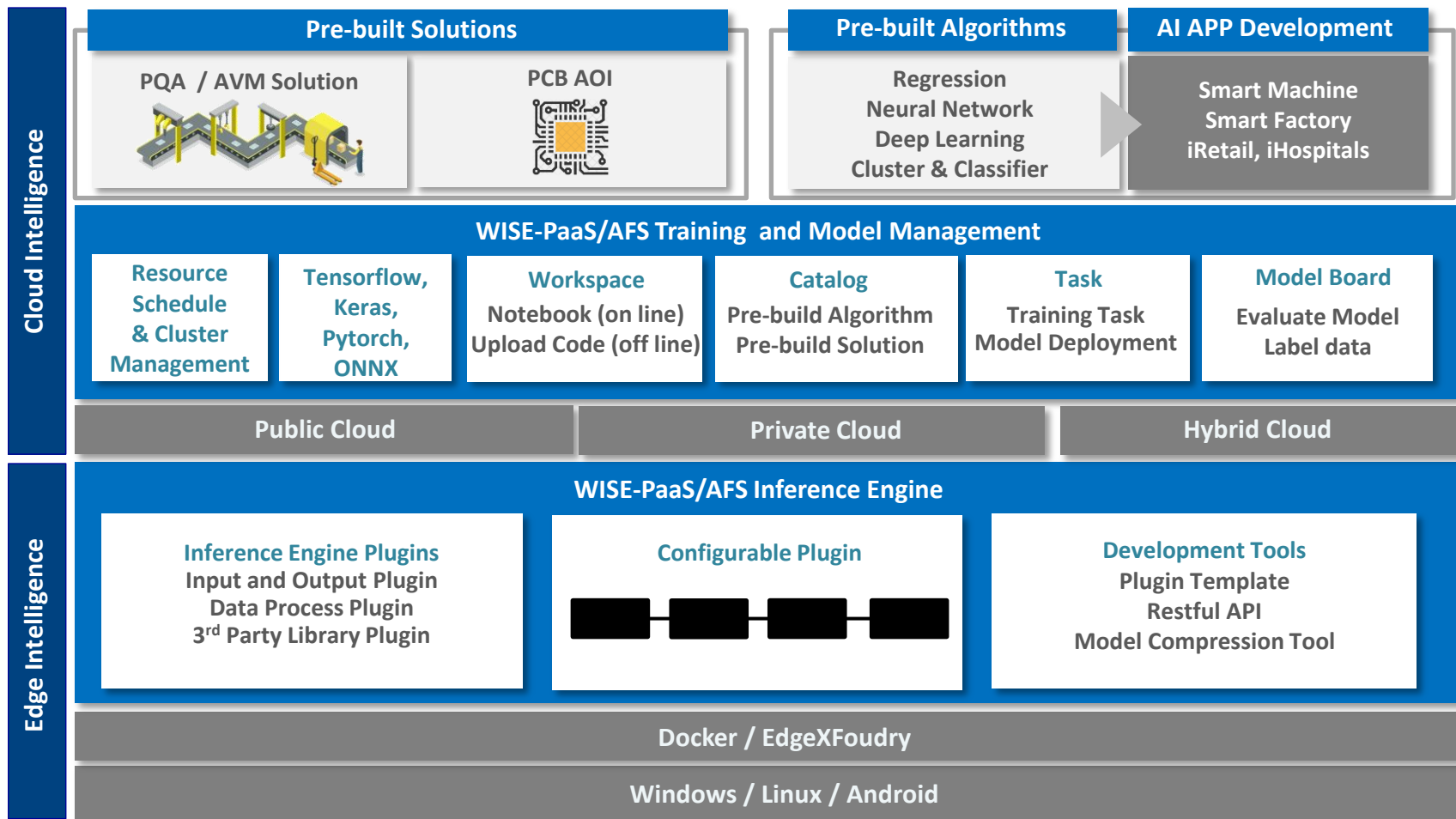**Command Center for Service sites**

WISE-STACK, Private Clouds

Partners' SRPs, …

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WISE-PaaS/APM – Asset Performance Management

APM App Service

DFSI / End Customer

Solution Developer

🔧 Preventative Maintenance

- Flexible Asset Profile Configuration
- Asset Health Monitoring
- Asset Health Analysis Report
- Authority Management
- Alarm & Event Notification
- OTA & Remote Control

Predictive Maintenance

- Digital Twin & AFS Integration
- Asset Health Prediction
- Potential Risks Report
- Data-driven Decision-Making

Performance Optimization

- OEE Analysis
- Work Order Closure Rate
- Schedule Compliance
- Planned/Unplanned Ratio
- Maintenance Cost per Unit Production
- Percent Unscheduled Downtime

Development Tools

- Restful APIs
- Grafana Data Source
- Pluggable Web Portal

APM Portal	APM Dashboard	APM Mobile App

APM PaaS Service

Asset Model

- Monitor Module
- Event & Alarm Module
- Measurement & Statistics Module
- Performance Evaluation Module
- Predict Analysis Module

Mash-Up

- Organization Management
- Workflow Integration Interface
- MES / ERP Integration Interface

Rule Engine

Apache **Spark**

- Event & Alarm Definition
- Arithmetic Logic
- Log Rule
- Notification Rule

Dependency Service

- WISE-PaaS / Dashboard
- WISE-PaaS / SaaSComposer
- WISE-PaaS / Notification
- WISE-PaaS / AFS
- WISE-PaaS / OTA
- 3rd Party Workflow
- 3rd Party MES / ERP

Micro Service Infrastructure

spring by Pivotal

API Gateway	Log Analysis	Config.	System Monitor	Service Discovery	Auth.

Sensor, Tag, Profile

Edge

WebAccess/SCADA   **WISE-PaaS/EdgeLink**   **WISE-PaaS/EdgeSense**   **EDGE✕FOUNDRY**

REST	OPC UA	MODBUS	BACNET	ZIGBEE	BLE	MQTT	AMQP	SNMP

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WISE-PaaS/AFS (AI Framework Service)

Cloud Intelligence

Pre-built Solutions

PQA / AVM Solution	PCB AOI

Pre-built Algorithms

Regression
Neural Network
Deep Learning
Cluster & Classifier

AI APP Development

Smart Machine
Smart Factory
iRetail, iHospitals

WISE-PaaS/AFS Training and Model Management

Resource Schedule & Cluster Management	Tensorflow, Keras, Pytorch, ONNX	Workspace Notebook (on line) Upload Code (off line)	Catalog Pre-build Algorithm Pre-build Solution	Task Training Task Model Deployment	Model Board Evaluate Model Label data

Public Cloud	Private Cloud	Hybrid Cloud

Edge Intelligence

WISE-PaaS/AFS Inference Engine

Inference Engine Plugins Input and Output Plugin Data Process Plugin 3rd Party Library Plugin	Configurable Plugin	Development Tools Plugin Template Restful API Model Compression Tool

Docker / EdgeXFoudry

Windows / Linux / Android

WISE-STACK – AIoT Edge Cloud in a Rack

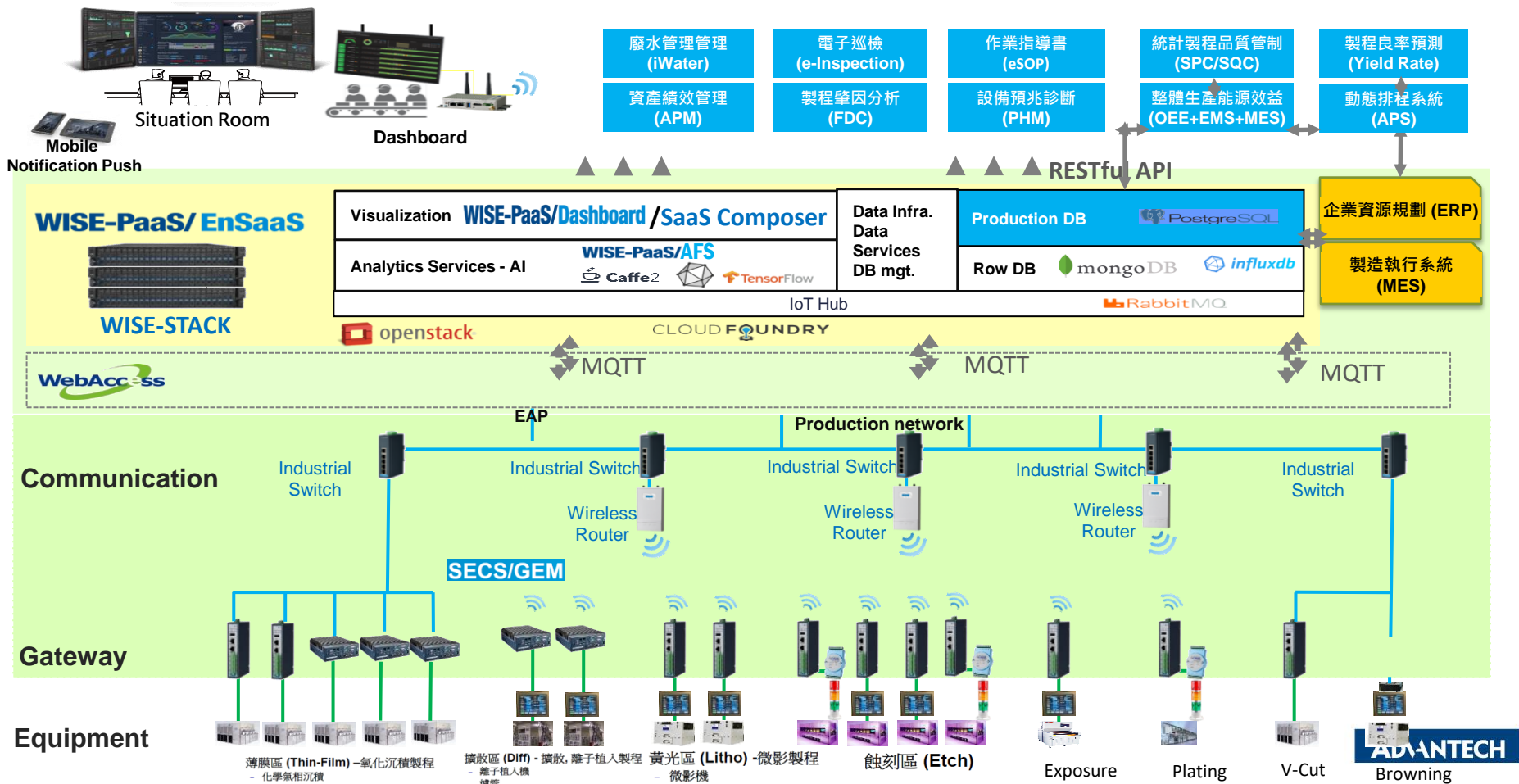|	Standard Data Platform & Device Mgmt.	Advanced Std + 3D Visualization & AI	Pro Advanced + GPU Management
Model	**WISE-STACK-200**	**WISE-STACK-300**	**WISE-STACK-600**
Software Package**	**WISE-PaaS/EnSaaS Standard:** Generic PaaS + Dashboards + APM Standard	**WISE-PaaS/EnSaaS Advanced:** Generic PaaS + Dashboards + SaaS Composer + APM Multi-tenancy + AFS	**WISE-PaaS/EnSaaS Pro:** Generic PaaS + Dashboards + SaaS Composer + APM Multi-tenancy + AFS GPU
Node	**(3) All-in-one nodes** **SKY-7221**	**(3) Controller Nodes** **SKY-8101** **(3) HCI Nodes** **SKY-8101**	**(3) Controller Nodes** **SKY-8101** **(6) HCI Nodes** **SKY-8101** **(1) HCI Nodes** **SKY-8101**

* Service Level Agreement (SLA) from 2nd year

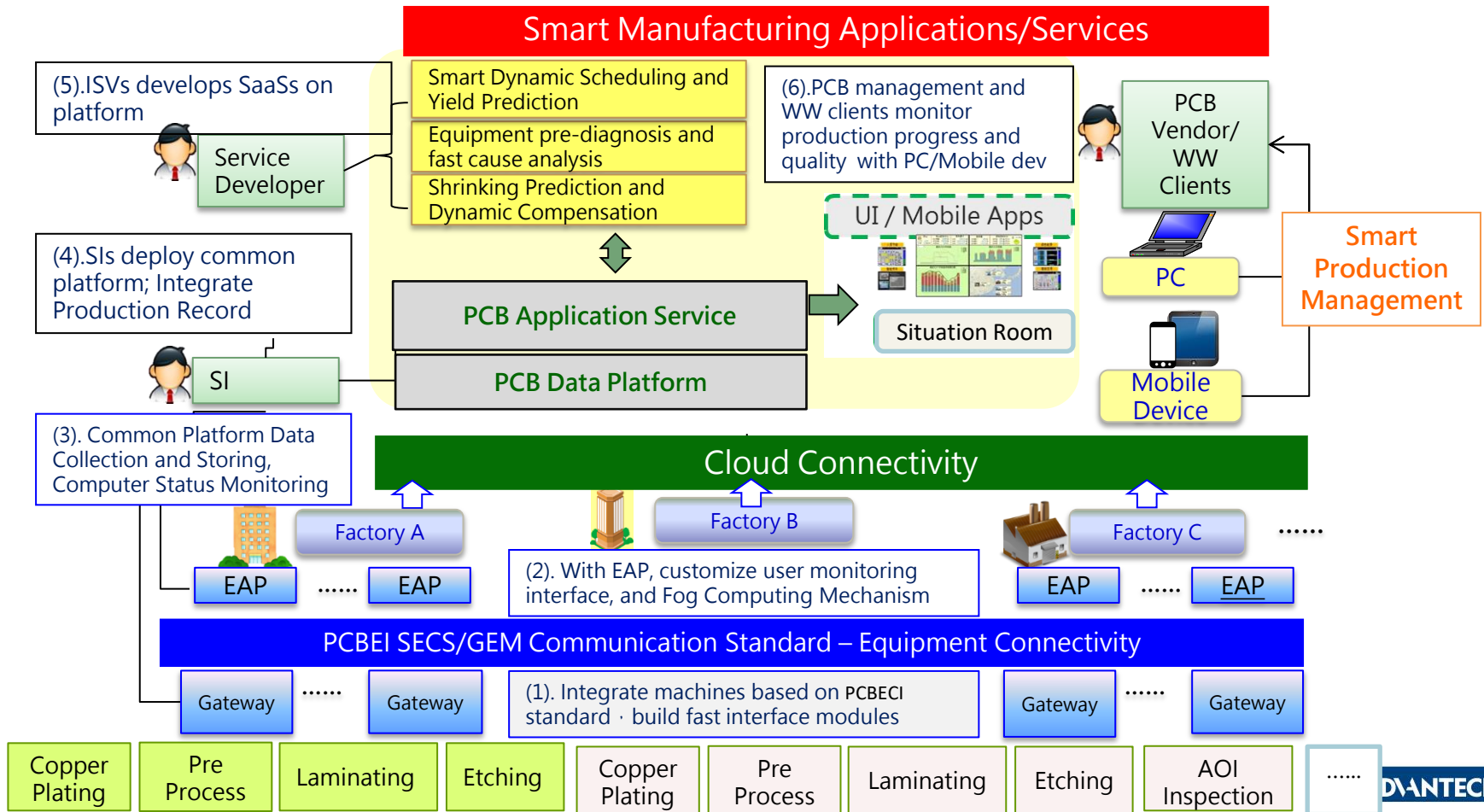** Annual software subscription from 2nd year

Smart Manufacturing Requirements of PCB Industry

PCB Common Requirements

- Communication Interface Standard for equipment
- Domain System Integrator

- Complete Production Data Collection
- OT and IT Information Integration
- Production Data Integration and Analytic capability

- Smart Manufacturing Solutions
- Transparent Supply Chain Information

- R&D, Design, and Manufacturing Simulation Applications
- Effective, Timely Executive Decision Support; Integrating information and Analytic Models

Digitalisation

Industrie 4.0

Value

How can an autonomous response be achieved? "Self-optimising"

What will happen? "Being prepared"

Why is it happening? "Understanding"

What is happening? "Seeing"

1. Computerisation
2. Connectivity
3. Visibility
4. Transparency
5. Predictive capacity
6. Adaptability

PCB Smart Manufacturing Architecture

Key Technologies and Applications/Services

In Operation - Situation Room

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In Operation – Real Time Monitoring

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Copper Plating Rectifier

Electric Plating Line

In Operation - OEE
(Overall Equipment Effectiveness)

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In Operation – SPC (Statistical Process Control)

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In Operation – Electronic Inspection
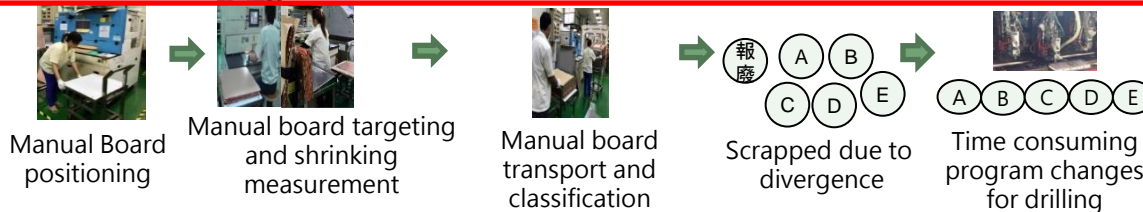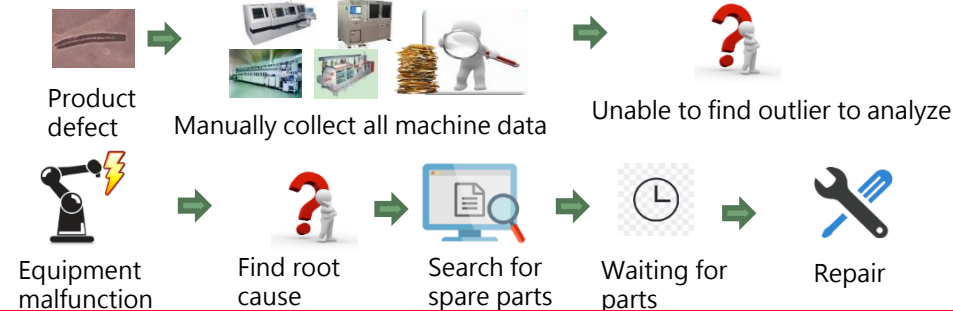
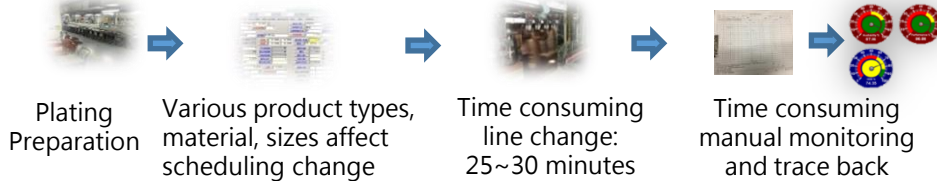業者 confidential 內容
只能在演講時 show

In Operation - Row Data Views

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Expected Benefits

As-Is	Production and Technologies	To-Be	Smart Factory/Dynamic Scheduling

Plating Preparation → Various product types, material, sizes affect scheduling change → Time consuming line change: 25~30 minutes → Time consuming manual monitoring and trace back

60 PH scheduling meeting reduced to 2 PH with dynamic scheduling - Efficiency improved by 90%

Product defect → Manually collect all machine data → Unable to find outlier to analyze

Equipment malfunction → Find root cause → Search for spare parts → Waiting for parts → Repair

Cause Analysis: Reduce product defect cause discovery from 15 days to less than 1 day
PHM: Predict malfunction 5 days ahead, to proceed with maintenance. 。

Diverged PCB lamination shrinkage –large QA effort, high product scrap rate (50%+)
Improve lamination defect ratio by 0.51% ⇨0.20%

Manual Board positioning → Manual board targeting and shrinking measurement → Manual board transport and classification → Scrapped due to divergence → Time consuming program changes for drilling

報廢 / A B C D E / A B C D E

Improve Shrinkage appropriate rate (4mil) of PCB New item number stack by 10%⇨80%

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Ecosystem & Value Chain of Industrial AIoT
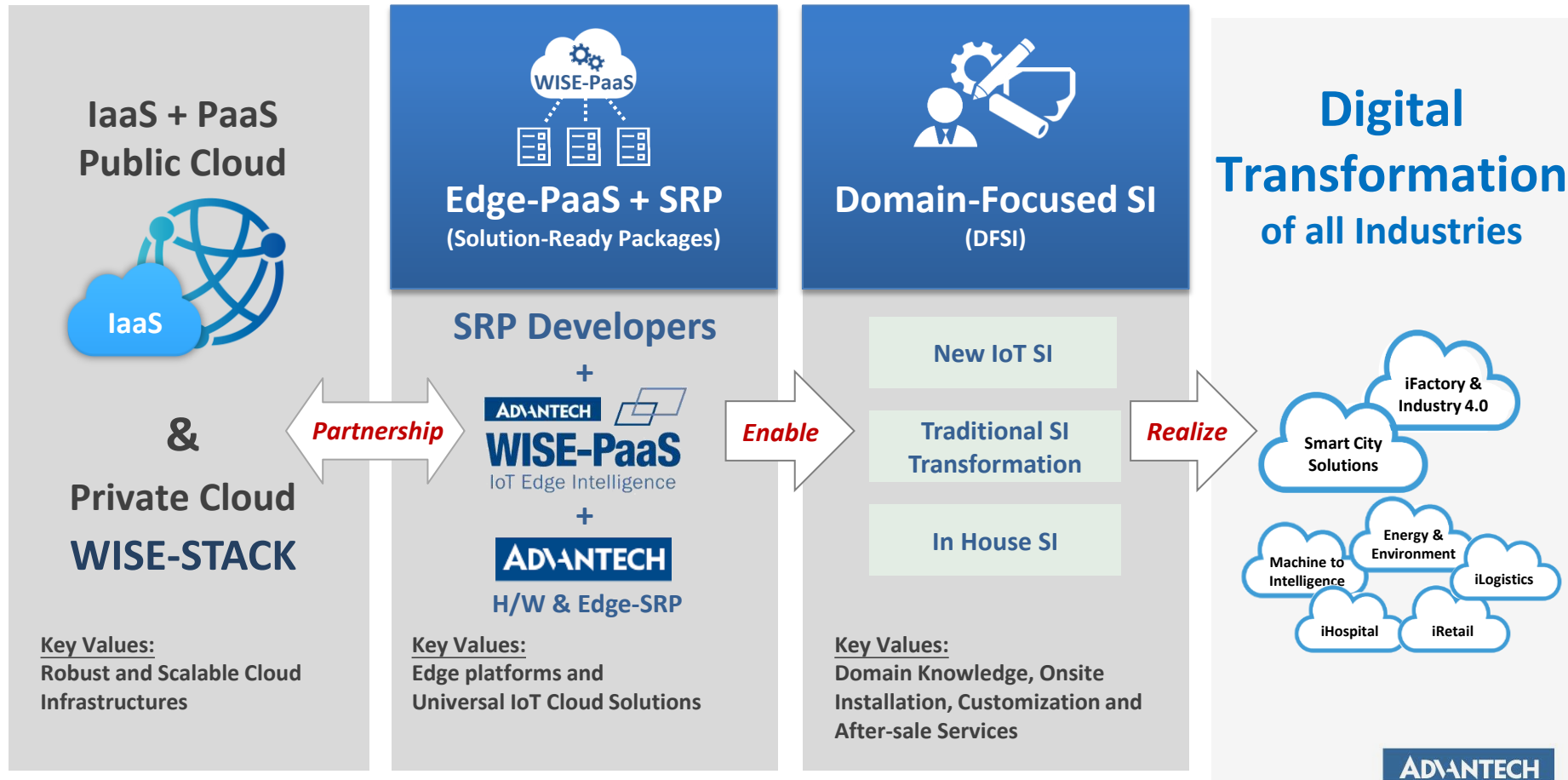
Summary

- Advantech has developed WISE-PaaS, jointly with Institute for Information Industry, as the core IIoT platform for Digital Transformation of the Manufacturing Industry (A Public Private Partnership success story).

- With the support of Ministry of Economic Affairs, Advantech has worked closely with leading Taiwanese PCB vendors to develop Industry Apps (Solution Ready Packages) to expediate the Digital Transformation of the PCB industry.

- These Industry Apps enable speedy edge equipment connection to the cloud, provide asset performance management, monitoring/visualization, AI analytic capabilities that significantly enhance the productivity and reduce cost of the PCB factories. These Industry Apps are in operation at our partner factories and can be easily replicated/deployed in worldwide PCB factories.

- Advantech is actively seeking partner Domain Focused System Integrators to co-create more Industry Apps, to speed up the Digital Transformation of the Manufacturing Industry and beyond.

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Go Together,
We Go Far and Grow Big