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Functional architecture of industrial internet system for industrial automation applications

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FUNCTIONAL ARCHITECTURE OF INDUSTRIAL INTERNET SYSTEM FOR INDUSTRIAL AUTOMATION APPLICATIONS

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Draft PAS	**Report on voting**
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INTRODUCTION

For traditional plants, each piece of equipment is isolated, and the production data of equipment is collected manually, while the efficiency of manual statistics is also very low. With the continuous development of industrial automation, digitalization, and intelligent technologies, the intelligent and connected plant combined with "end-edge-cloud" collaboration extends the scope of the original plant and builds close ties between people and production equipment via data. In this way, it realizes the whole process with real-time interconnection between users, equipment and products, achieving zero distance between them, with transparent visibility of the whole process. In addition, the in-depth application of artificial intelligence and big data technologies in the industrial field contributes a large number of algorithms for intelligent optimization and decision-making, thus providing critical solutions for upgrading toward intelligent industrial systems.

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FUNCTIONAL ARCHITECTURE OF INDUSTRIAL INTERNET SYSTEM FOR INDUSTRIAL AUTOMATION APPLICATIONS

1 Scope

This document defines the functional architecture and functional model of the industrial internet system for industrial applications. It presents the models, structures, activities, and interaction contents between layers of the end, edge, and cloud: infrastructure as a service (IaaS), platform as a service (PaaS), and software as service (SaaS), respectively.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 62264-1:2013, *Enterprise-control system integration – Part 1: Models and terminology*

IEC 62264-2:2013, *Enterprise-control system integration – Part 2: Object and attributes for enterprise-control system integration*

IEC 62264-3:2016, *Enterprise-control system integration – Part 3: Activity models of manufacturing operations management*

3 Terms, definitions, abbreviated terms, and acronyms

3.1 Terms and definition

For the purposes of this document, the terms and definitions given in IEC 62264-1, IEC 62264-2 and IEC 62264-3 as well as the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1.1
industrial application
software which is based on the industrial internet, carries industrial know-how and experience, and meets specific needs

3.1.2
industrial big data
generic term of industrial data including enterprise informatization data, industrial IoT data, and external cross-field data

3.1.3
industrial internet system
industrial cloud system that builds a service system based on massive data collection, aggregation, and analysis, and supports the ubiquitous connection of manufacturing resources, flexible supply, and efficient allocation

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3.1.4
platform as a service
PaaS
business model providing the operation and development environment of application services as a cloud service

Note 1 to entry: PaaS is located between the IaaS and SaaS models and provides the development and operating environment for applications.

3.1.5
software as service
SaaS
model of providing software through the internet

Note 1 to entry: The vendor deploys applications on its own servers. Customers may order the required application services from vendors via the internet according to their actual needs, pay the vendor according to the number of services ordered and the period of services, and obtain the services through the internet.

3.1.6
infrastructure as a service
IaaS
model of utilization of all computing infrastructure as a service, including processing CPU, memory, storage, network, and other basic computing resources

Note 1 to entry: In this model, users are able to deploy and run any software, including operating systems and applications. Customers do not manage or control any cloud computing infrastructure, but are able to control the choice of operating system, storage space, deployed applications, and potentially obtain the control of restricted network components (such as routers, firewalls, and load balancers).

3.1.7
data management
process of efficiently collecting, storing, processing, and applying data using computer hardware and software technologies

3.1.8
microservice
independently deployable artifact providing a service implementing a specific functional part of an application

[SOURCE: ISO/IEC TS 23167:2020, 3.15]

3.1.9
microservices architecture
design approach that divides an application into a set of microservices

[SOURCE: ISO/IEC TS 23167:2020, 3.16]

3.1.10
cloud service
one or more capabilities offered via cloud computing invoked using a defined interface

[SOURCE: ISO/IEC 20924:2018, 3.1.8]

3.1.11
software defined networking
set of techniques that enables to directly program, orchestrate, control and manage network resources, which facilitate the design, delivery and operation of network services in a dynamic and scalable manner

[SOURCE: ISO/IEC TR 22417:2017, 3.9]

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3.1.12
data processing
systematic performance of operations upon data

[SOURCE: ISO/IEC 2382-1:1993]

3.2 Abbreviated terms and acronyms

For the purposes of this document, the abbreviated terms and acronyms given the following apply.

API	Application Programming Interface
DCS	Distributed Control System
EAL	Edge Application Layer
ECS	Elastic Container Service
EFL	Edge Foundation Layer
EIP	Elastic IP
IaaS	Infrastructure as a Service
IP	Internet Protocol
LAN	Local Area Network
LoP	List of Properties
OPC UA	OPC Unified Architecture
PaaS	Platform as a Service
PLC	Programmable Logic Controller
PLM	Product Lifecycle Management
SaaS	Software as a Service
SLB	Server Load Balancer
SDN	Software Defined Networking
TSD	Time series data
TSN	Time Sensitive Networking
VPC	Virtual Private Cloud
VPN	Virtual Private Network

4 General

4.1 Function and architecture

4.1.1 Hierarchy

The overall functions of the industrial internet system include:

– Synchronous collection and transmission of multi-source heterogeneous data, such as industrial process data, video, and audio;
– Edge data processing and real-time condition perception: Use edge equipment to realize the connection and unified management of industrial process related equipment;
– Visual analysis and know-how database construction combining industrial mechanism with big data, so as to ensure data association analysis;
– Design, management and decision-making based on industrial data analysis to support personalized service requirements.

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