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**Industrial internet platform - Technical requirement and testing
methods - Part 1: General rules**

工业互联网平台 技术要求及测试方法 第1部分:总则

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3 Terms and definitions

3.1 Compatibility is defined as the ability of software sharing the same hardware or platform environment to exchange information with other products, systems or components and to perform its required functions.

3.2 Edge computing platform is defined as the distributed open platform, sited on the edge close to the thing or the source of the data, that brings together network, computing, storage and application capability and supplies edge intelligence services locally, meeting the key needs of industrial digitalization in agile connection, real-time operation, data optimization, application intelligence, and security and privacy protection.

3.3 Functionality is defined as the ability of a platform product to provide, when used under stated conditions, the functions that meet stated and implied needs.

3.4 Industrial app is defined as the software that carries industrial knowledge and experience, that is best practice, is aimed at the industrial field and solves a particular business need in a setting such as research and design, manufacture, operation and maintenance or business management; the definition is taken from GB/T 42562-2023, 3.1.

3.5 Industrial DaaS platform is defined as the technical service that supplies the users of an industrial internet platform with capability in the integration, storage, computing, analysis, processing and management of data.

3.6 Industrial internet platform is defined as the hub through which the whole of the industrial factors are gathered and industrial resources are allocated; it faces the digital, networked and intelligent needs of manufacturing, builds a service system on the mass collection, aggregation and analysis of data, and carries the ubiquitous connection, elastic supply, efficient allocation and collaborative innovation of manufacturing resources.

3.7 Industrial PaaS platform is defined as the platform that packages industrial technology, knowledge, experience and models into microservice function modules, gathers the related industrial data capability and offers it to industrial app developers to call.

3.8 Industrial mechanism models are defined as the system models built from the internal mechanism or the physical and chemical processes of industrial production, using the knowledge, theorems, laws and principles of the sector.

4 Abbreviations

4.1 Three abbreviations apply: DaaS, data as a service; IaaS, infrastructure as a service; and PaaS, platform as a service.

5 Overall technical architecture of the industrial internet platform

5.1 Overview. The overall technical architecture takes in five parts, the edge computing platform, IaaS, the industrial PaaS platform, the industrial DaaS platform and industrial apps, as Figure 1 shows.

5.2 Edge computing platform. The edge computing platform takes in edge computing devices and platform products. Downwards it connects to production equipment through industrial protocols and collects data; upwards it connects to the PaaS platform through communication protocols, uploads the processed data and interacts with the platform. The test requirements for the edge computing platform take in at least edge operation and maintenance, edge node communication, protocol conversion, edge analysis and application deployment. This part of the series gives the technical framework only.

5.3 Industrial PaaS platform. The industrial PaaS platform is the core of the whole industrial internet platform: downwards it gathers the data collected at the edge layer, upwards it supplies resources for industrial app development. It takes in general PaaS, industrial models, industrial application development and human-machine interaction, the industrial app marketplace and inter-platform calling. General PaaS underpins the use of the various resources of the platform; industrial models gather the building and management of models of every kind; industrial application development and human-machine interaction are the intelligent interaction of the platform and its low-code development capability for

engineering staff; the industrial app marketplace gathers and manages industrial apps; and inter-platform calling shares platform capability. This part gives the technical framework only, the detailed test methods and requirements being in GB/T 44067.2-2024. Five constituent parts are then described: general PaaS capability, benchmarked against mainstream PaaS frameworks and taking in at least resource management, operation and maintenance management, application development and cloud-edge collaboration; industrial model capability, that is the building and management of models on the platform, taking in at least model management and model fusion, together with the building, running, deployment and management of data science models, research and design models, business process models and industrial mechanism models; industrial application development and human-machine interaction, built around the agile construction of industrial applications and the interaction functions of the platform and taking in at least low-code development and human-machine interaction; the industrial app marketplace, which gathers apps of every kind on the platform and manages them uniformly, taking in at least app onboarding and management; and inter-platform calling, taking in at least the opening of platform resources to third-party platforms and the ability of outside users to call the resources of this platform.

5.4 Industrial DaaS platform. The industrial DaaS platform mainly supplies the integration, storage, computing, analysis, processing and management of data and, sitting on the baseline capability of the general PaaS platform, offers data-related services outwards in one place. Resource management, operation and maintenance management and the rest of the PaaS platform support the DaaS platform; industrial application development calls data through DaaS; and the DaaS platform interacts with the industrial models. The DaaS platform puts requirements mainly on industrial big data and industrial data management, and this part gives the technical framework only, the detailed test methods and requirements being in GB/T 44067.3-2024. By function it divides into industrial big data, which brings in components for data storage, data processing, data analysis, computing modes, data integration and data security, and industrial data management, which takes in industrial data governance and data modelling and intelligent management. By deployment it divides into a data storage layer, a data storage management layer and a data processing and application layer, the first two together making up the data storage part.

6 General technical requirements for the industrial internet platform

6.1 Resource management capability. On functionality, resource management is to support multiple tenants, giving each tenant a resource quota and controlling the tenant's rights over user functions, resources and data; to schedule resources for the running requests of components, models and applications; to scale out horizontally as the business changes; to support automatic elastic scaling of applications driven by traffic and resource demand; to give tenants resource usage statistics; and to integrate external function modules. On compatibility, it is to be compatible with mainstream server hardware, with no special

requirement on the hardware it is deployed on, and compatible with the IaaS services of different suppliers.

6.2 Operation and maintenance management capability. The components on the platform are to have a degree of fault tolerance, the core components being able to recover from a fault. A centralized log management function is to be provided so that the running state of the platform is recorded and monitored in one place, with graded log backup, for instance key logs, operation logs, risk logs, security-related logs and system hardware fault logs, kept by grade at day level, month level, year level or permanently. A web-based operation monitoring interface is to be provided from which the platform running log can be seen readily. Grey upgrade without interrupting service is to be possible, with a matching rollback mechanism, and rolling release, canary release and disaster recovery backup are to be provided. Where the platform is installed on several or several groups of hardware, it is to keep running normally when any one item or one group of them fails; and where it is installed on several virtual machines on IaaS, it is to keep running normally when any one of those virtual machines fails.

7 General test methods for the industrial internet platform

7.1.1.1 Multi-tenancy test. The test content answers to 6.1 and verifies that the platform supports multi-tenancy technology and provides resource usage statistics. The procedure is to deploy the industrial PaaS platform on a public or private cloud, log in and simulate different users creating different tenants and running applications, and run a sample application under one tenant. The pass criteria are that the PaaS platform is available, that the tenant is created successfully, and that the sample application runs normally and the resource statistics of the tenant can be displayed.

7.1.1.2 Resource scheduling test. The test content answers to 6.1 and verifies that the platform can integrate external function modules and can schedule resources for the running requests of components, models and applications. The procedure is to deploy the platform on a public or private cloud, run a sample application under one tenant, integrate a third-party sample service through the platform interface, and deploy components, models and applications. The pass criteria are that the platform is available, that the sample application runs normally and the tenant resource statistics can be displayed, that the integration interface returns correct values and the third-party service can be used on the platform, and that computing resources are supplied to the components, models and applications deployed.

7.1.1.3 Horizontal scaling test. The test content answers to 6.1 and verifies that the platform itself supports horizontal elastic scaling and that the applications on it scale automatically with traffic and resource demand. The procedure is to prepare the test environment, scale the platform itself in and out online, and trigger automatic elastic scale-in of an application on the platform. The pass criteria are that the test environment is available, that the