ICS 35.110
CCS L 79



# NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

# GB/T 41780.2-2024

## Internet of things - Edge computing - Part 2: Data management requirements

物联网 边缘计算 第2部分:数据管理要求

**Issued on: May 28, 2024** **Implemented on: December 1, 2024**

**Issued by: State Administration for Market Regulation;**
**Standardization Administration of the PRC**

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## 3 Terms and definitions

Six terms are defined. Edge computing (3.1) is a computing architecture that places data processing and storage on the edge side of the internet of things, taken from GB/T 41780.1-2022, 3.1. An edge computing node (3.2) is a device on the edge side with data processing, network communication and storage capability, a note naming internet of things terminals, edge gateways, edge controllers and edge computing servers, taken from GB/T 41780.1-2022, 3.2. A data management function (3.3) is a function of an edge computing node relating to the acquisition, aggregation, processing, storage, transmission, sharing, display, deletion and security of data.

Data description (3.4) is the representation of data in a suitable form on the basis of its features and regularities, providing the input for data modelling. Data quality (3.5) is the degree to which the characteristics of data satisfy stated and implied needs when used under specified conditions, taken from GB/T 36344-2018, 2.3. Metadata (3.6) is data that defines and describes other data, taken from GB/T 18391.1-2009, 3.2.16. The abbreviations of Clause 4 are CoAP, HTTP, MQTT, OPC UA, TCP and UDP.

## 5 Functional framework for edge computing data management

5.1 Following 5.1 of GB/T 41780.1-2022 on the system architecture, the kinds of edge computing node are the internet of things terminal, the edge gateway, the edge controller and the edge computing server. Following the functional architecture of the same subclause, the functional framework for data management is shown in Figure 1: the data management functions of each kind of node are data acquisition, data aggregation, data processing, data storage, data transmission, data sharing, data display, data deletion and data security, and the functions may be selected as the deployment needs. Every kind of edge computing node shall have the data security function. The cloud, or data centre, of Figure 1 may be a private cloud, a public cloud, a hybrid cloud or a data centre, and the legend of the figure distinguishes edge computing points from cloud or data centre and mandatory from optional functions.

5.2 Table 1 describes the data management functions of the four kinds of node in a five column matrix, one column for the function and one for each kind of node, and marks with a dash the combinations that do not apply. Data acquisition is carried out by the internet of

things terminal alone and is described as converting the information of the target object, such as a thing or an environment, into a data description according to a certain regularity by means of a sensing unit. Data aggregation is carried out by the gateway, the controller and the server, and brings distributed, cross network, multi source data in over several data interfaces. Data sharing is carried out by the edge computing server alone and provides data exchange with external systems and open sharing.

Table 1 continues with the functions that all four kinds of node share. Data processing is described for the terminal as pre-processing data according to certain rules, or converting control instruction data into control execution according to a certain regularity, the printed Chinese phrase for what the instruction data is converted into reading control execution force; for the gateway it is protocol conversion together with analysis, filtering, coding and compression of the data and parsing and issuing of control instructions; for the controller it is complex logic control, parameter control optimization, control protocol conversion and data response; and for the server it is complex data processing and analysis providing edge services. Data storage is temporary caching on the terminal; short term storage of acquired data and long term storage of system configuration data on the gateway, with local and expansion storage and storage monitoring and data backup; and, on the controller and the server, storage management, verification updating and redundant backup on top of what the gateway does.



Table 1 ends with data transmission, supported on the terminal for exchange with an upper level edge computing node or the cloud, and on the other nodes for the same exchange plus, where necessary, exchange between nodes of the same level; with data display, for which an edge computing node should provide a real time visual data interface; with data deletion, where the storage resources of an edge computing node are limited and the acquired data that has passed its storage period is to be deleted automatically according to the needs of the application scenario; and with data security, where data is classified and graded for protection according to its importance and the degree of harm that its tampering, destruction or leakage would cause.

## 6 Data acquisition requirements

The data acquisition of the internet of things terminal shall guarantee the precision, the period and the quality of the acquisition; shall meet the requirements of the system for regularity, completeness, accuracy, consistency and timeliness of the data; shall not affect the normal running of the business of the edge computing node; and shall include the identifier of the terminal in the acquired data. It should support multi-channel acquisition, should support marking the first and the last position of the acquired data, and should timestamp the acquired data.

## 7 Data aggregation requirements

7.1 Data aggregation shall be able to obtain dynamic or non-dynamic data from multiple data sources, such as the target objects and the underlying devices, over different data interfaces; shall be able to recognize the source of the data; shall be able to recognize the type of the data; and shall include the identifier of the edge computing node in the aggregated data. It should support offline or real time acquisition and should provide visual configuration, management or monitoring tools that make configuration and management more efficient and convenient.

7.2 The edge gateway shall be able to obtain data concurrently over several data interfaces, should support structured, semi-structured and unstructured data, and should be able to obtain data relating to the edge computing network communication. 7.3 The edge controller shall be able to obtain real time data and control command feedback data, should be able to obtain analogue data, and should be able to obtain data concurrently over several data interfaces. 7.4 The edge computing server shall support structured, semi-structured and unstructured data and concurrent acquisition over several data interfaces, and should support the publish and subscribe acquisition mode.

## 8 Data processing requirements

8.1 Data processing shall be able to split and reassemble data packets, should be able to pre-process data by cleaning and extraction, should be able to load data processing modules dynamically so as to suit different kinds of data, and should be able to configure timed data analysis.

8.2 The internet of things terminal shall support converting the acquired data into a digital signal and, where it has an actuating device, shall guarantee the timeliness and the accuracy of the response to control instruction data. It should support event based acquisition, a configurable processing mode, conversion of the acquired data into a unified data description, and selection of the acquired data by particular rules; it should not carry out complex data analysis, so that computing resources are not occupied for a long time.

8.3 The edge gateway shall be able to filter and decode data, and should support interpreting and converting data of different protocols into a unified data model, extracting features, coding, packing and compressing the data, managing the issue of simple control instructions, a data rule engine and statistical analysis; it may have a data quality assessment capability that improves the value of the data in use. 8.4 The edge controller shall support data processing for complex logic control, shall be able to respond in good time to process control and emergency event data, and shall guarantee the timeliness of the processing; it should support rule engine configuration for complex business logic, data aggregation and fusion, optimization of control system parameters and event based data analysis.

8.5 The edge computing server shall be able to recognize identifiers automatically and parse data labels and ciphertext, shall classify, reassemble and fuse the data obtained by