

ARTICLE PROCESSING METHOD, TERMINAL AND SYSTEM, AND LPWAN GATEWAY

TECHNICAL FIELD

[0001] Implementations of the present specification relate to the field of computer
5 technology, and in particular, to an article processing method, terminal and system,
and an LPWAN gateway.

BACKGROUND

[0002] In conventional technologies, long-range processing is usually performed on
articles, for example, by using a radio frequency identification (RFID) technology.
10 Therefore, a solution for implementing short-range processing on the articles is
needed.

SUMMARY

[0003] Implementations of the present specification describe an article processing
method, terminal and system, and an LPWAN gateway, to perform short-range
15 processing on articles, thereby improving accuracy of article processing.

[0004] According to a first aspect, an article processing method is provided,
including: controlling, by the control unit, an RFID reader to periodically scan a
plurality of short-range articles; when any one of the plurality of short-range articles
changes, receiving, by the control unit, an article identifier of the article sent by the
20 RFID reader; and controlling, by the control unit, the LPWAN module to send an
article change message to the LPWAN gateway, where the article change message
includes the article identifier and an address of an application server; and the article
change message is used to instruct the LPWAN gateway to instruct, based on the
address, the application server to perform a next processing step on the article
25 identified by the article identifier.

[0005] According to a second aspect, an article processing method is provided,
including: receiving, by an LPWAN gateway, an article change message sent by an
article processing terminal, where the article change message includes an article
identifier of a changed article and an address of an application server; and the article

identifier is read by the article processing terminal by using an RFID reader; and sending, by the LPWAN gateway, an article change notification to the application server based on the address, where the article change notification includes the article identifier; and the article change notification is used to instruct the application server to perform a next processing step on the article identified by the article identifier.

[0006] According to a third aspect, an article processing terminal is provided, including: a control unit, configured to periodically send a scanning instruction to an RFID reader; and an RFID reader, configured to periodically scan a plurality of short-range articles based on the scanning instruction; and when any one of the plurality of short-range articles changes, send an article identifier of the article to the control unit, where the control unit is further configured to: receive the article identifier; and send a sending instruction to an LPWAN module; and the LPWAN module, configured to send an article change message to an LPWAN gateway based on the sending instruction, where the article change message includes the article identifier and an address of an application server; and the article change message is used to instruct the LPWAN gateway to instruct, based on the address, the application server to perform a next processing step on the article identified by the article identifier.

[0007] According to a fourth aspect, an LPWAN gateway is provided, including: a receiving unit, configured to receive an article change message sent by an article processing terminal, where the article change message includes an article identifier of a changed article and an address of an application server; and the article identifier is read by the article processing terminal by using an RFID reader; and a sending unit, configured to send an article change notification to the application server based on the address, where the article change notification includes the article identifier; and the article change notification is used to instruct the application server to perform a next processing step on the article identified by the article identifier.

[0008] According to a fifth aspect, an article processing system is provided, including: an article processing terminal, configured to periodically scan a plurality of short-range articles, and send an article identifier of a changed article to an LPWAN gateway; the LPWAN gateway, configured to: receive the article identifier of the changed article; and send the article identifier to an application server; the application server, configured to: receive the article identifier to perform a next processing step on the article identified by the article identifier, and obtain attribute information of the

article based on the article identifier; and send the attribute information to a multimedia display; and the multimedia display, configured to receive the attribute information and display the attribute information.

[0009] According to the article processing method, terminal and system, and the LPWAN gateway provided in implementations of the present specification, a control unit controls the RFID reader to periodically scan a plurality of short-range articles. When any one of the plurality of short-range articles changes, the RFID reader obtains an article identifier of the article and sends the article identifier to a control unit. After receiving the article identifier, the control unit controls an LPWAN module to send an article change message to the LPWAN gateway. The LPWAN gateway instructs, based on the received article change message, an application server to perform a next processing step on the article. Therefore, short-range processing is performed on articles, and the accuracy of article processing is improved.

BRIEF DESCRIPTION OF DRAWINGS

[0010] To describe technical solutions of implementations of the present specification more clearly, the following briefly introduces the accompanying drawings required for describing the implementations. Apparently, the accompanying drawings in the following description are merely some implementations of the present specification, and for a person skilled in the art, other drawings can be obtained according to these drawings without creative labor.

[0011] FIG. 1 is a schematic diagram of an article processing terminal according to an implementation of the present specification;

[0012] FIG. 2 is a schematic diagram of an article processing system according to an implementation of the present specification;

[0013] FIG. 3 is a flowchart of an article processing method according to an implementation of the present specification;

[0014] FIG. 4 is a flowchart of an article processing method according to another implementation of the present specification; and

[0015] FIG. 5 is a schematic diagram of an LPWAN gateway according to an implementation of the present specification.

DESCRIPTION OF IMPLEMENTATIONS

[0016] Solutions provided in the present specification are described below with reference to accompanying drawings.

[0017] FIG. 1 is a schematic diagram of an article processing terminal 10 according to an implementation of the present specification. In FIG. 1, the article processing terminal 10 includes a radio frequency identification (RFID) reader 101, a control unit 102, and a low-power wide-area network (LPWAN) module 103. The RFID reader 101 can communicate with the control unit 102 by using a general purpose input/output (GPIO) interface, a universal asynchronous receiver/transmitter (UART) interface, or an Ethernet interface. The control unit 102 can send a sending instruction to the LPWAN module 103 by using the GPIO interface or the serial port.

[0018] In FIG. 1, the RFID reader 101 may be a near field communication (NFC) reader or an ultra-high frequency (UHF) RFID reader. The control unit 102 may be a microcontroller unit (MCU). The LPWAN module 103 may be a Long Range (LoRa) module or a cellular-based narrowband Internet of Things (NB-IOT). The control unit 102 may control the RFID reader 101 to periodically (for example, 300 ms) scan a plurality of short-range (for example, within 10 cm) articles to detect whether any article has changed (for example, picked up or put down). When detecting that an article has changed, the RFID reader 101 may send an article identifier of the article to the control unit 102. The control unit 102 may read attribute information (for example, origin and composition) of the article based on the article identifier. The control unit 102 may then control the LPWAN module 103 to send the article identifier, attribute information, and/or change status information) of the article to the LPWAN gateway. The change status information of the article here may be, for example, being picked up from a position or being put down at a position.

[0019] It is worthwhile to note that a process in which the RFID reader 101 scans a plurality of short-range articles is a process in which the RFID reader 101 identifies electronic tags on the articles by using an RFID antenna (for example, a printed circuit board (PCB) near-field antenna). It can be understood that when the RFID reader 101 is a UHF RFID reader, the RFID reader 101 can connect a plurality of RFID antennas. Because the above identification process belongs to a conventional technology, details are omitted here.

[0020] It is also worthwhile to note that when the identified article is a product on a

shelf, the article processing terminal 10 may be directly embedded on the shelf. Therefore, the problem of low identification rate caused by light, occlusion and the like when objects are identified at a long-range is alleviated.

[0021] Certainly, in practice, the article processing terminal may also include other
5 modules, for example, a battery, and details are omitted in the present application.

[0022] The article processing system shown in FIG. 2 may be constituted by the article processing terminal 10 shown in FIG. 1, an LPWAN gateway 20, an application server 30, and a multimedia display 40. The article processing system is used for tracking and other processing of products. In FIG. 2, the article processing
10 terminal 10 may be embedded and installed on the shelf to accurately identify a plurality of short-range articles. The LPWAN gateway 20 can be connected to tens of thousands of nodes (for example, article processing terminals), and has high scalability and flexibility. The application server 30 may be a cloud server. The multimedia display 40 may include an android smart television (TV) and an apple TV,
15 which can display attribute information (for example, origin and composition) to a user. It is also worthwhile to note that the article processing terminal 10 is connected to the LPWAN gateway 20 through the LPWAN, where the distance between the two is usually not more than two kilometers. The LPWAN gateway 20, the application server 30, and the multimedia display 40 are connected through the Internet.

[0023] Specifically, when determining that an article on the shelf has changed (for
20 example, an article is picked up), the article processing terminal 10 may send an article change message to the LPWAN gateway 20. After receiving the article change message, the LPWAN gateway 20 may instruct the application server 30 to perform corresponding processing (for example, tracking) on the article, for example,
25 recording change status information of the changed article (for example, recording that an article is picked up at a location). After recording the change status information, the application server 30 may send attribute information of the product to the multimedia display 40. The multimedia display 40 displays the attribute information of the product to the user, so that the user can know about the details of
30 the product.

[0024] In FIG. 2, the application server 30 may also analyze and manage the recorded change status information after a period of time. That is, the article processing terminal provided in some implementations of the present specification has data analysis and management functions.

[0025] FIG. 3 is a flowchart of an article processing method according to an implementation of the present specification. The method may be performed by a device with a processing capability: a server, a system or an apparatus, for example, the article processing terminal 10 in FIG. 1 or FIG. 2. As shown in FIG. 3, the method
5 may include the following steps:

[0026] Step 310: A control unit 102 controls an RFID reader 101 to periodically scan a plurality of short-range articles.

[0027] The short-range articles may refer to articles within 10 cm. The plurality of short-range articles have corresponding electronic tags.

10 **[0028]** Specifically, the control unit 102 may periodically (for example, 300ms) send a scanning instruction to the RFID reader 101 by using a GPIO/UART/Ethernet interface. After receiving the scan instruction, the RFID reader 101 can identify the plurality of short-range articles by using an RFID antenna. In a specific example, an article processing terminal 10 can pre-store an article list, which includes article
15 identifiers of all articles. While identifying the articles through the RFID antenna, the RFID reader 101 obtains the article identifier of each article. The RFID reader 101 can compare the obtained article identifier with the article identifier in the article list to determine whether there is a change in the article and determine the article identifier of the changed article. For example, when an article identifier, which is
20 recorded in the article list, is not currently obtained, the article identifier is the article identifier of the lost article.

[0029] In an example in which the product on the shelf is scanned by the article processing terminal, when the product is 30 cm away from the original position, the RFID reader 101 is unable to identify the product, that is, cannot obtain the identifier
25 of the product.

[0030] Step 320: When any one of the plurality of short-range articles changes, the control unit 102 receives an article identifier of the article sent by the RFID reader 101.

30 **[0031]** As described in the previous example, after determining that the article has changed and determining the article identifier of the changed article, the RFID reader 101 may send the article identifier to the control unit 102. After receiving the article identifier, the control unit 102 may read the attribute information of the article from the RFID reader 101 based on the article identifier. It can be understood that the attribute information is obtained by the RFID reader 101 during the process of

identifying the articles by using the RFID antenna.

[0032] Step 330: The control unit 102 controls the LPWAN module 103 to send the article change message to the LPWAN gateway.

[0033] In a specific implementation, the control unit 102 can send a sending
5 instruction to the LPWAN module 103 by using the GPIO interface or the serial port. After receiving the sending instruction, the LPWAN module 103 sends an article change message to the LPWAN gateway 20 through the LPWAN. It can be understood that the article change message may include protocol data (for example, Lora protocol data), an article identifier of a changed article (or an article identifier,
10 attribute information, and/or change status information), an identifier of an article processing terminal, an address of the application server 30, and the like.

[0034] After receiving the article change message, the LPWAN gateway 20 can separate protocol data from the article change message. Then, the LPWAN gateway 20 sends the article identifier (or article identifier, attribute information, and/or change
15 status information) of the changed article, identifier of the article processing terminal, etc. to the application server 30 based on the address of the application server 30. Thus, the application server 30 performs corresponding processing, for example, recording the change status information of the article. For example, when the application server 30 receives the change status information of the lost article, and the
20 change status information is: picked up from a shelf I of store A, the application server 30 will record that: the × × article is picked up from the shelf I of store A. After the change status information is recorded, if the attribute information is also received, the attribute information of the article can be sent to the multimedia display 40 so that the user can know about the details of the product.

[0035] It is worthwhile to note that, for communication security, the LPWAN gateway 20 usually encrypts a message when sending the message to the application server 30. The application server 30 decrypts the encrypted message first and then processes the message accordingly (for example, tracking).

[0036] It is also worthwhile to note that the application server 30 in the previous
30 implementation of the present specification may analyze the change status information related to an article after a period of time (for example, a day) and feed back an analysis result to a manufacturer. For example, if a dress is picked up many times in a day, but eventually is put down, an obtained analysis result may be that: the dress may look good, but uncomfortable to wear. That is, the application server 30 can

collect the trend data of the product, thus greatly promoting refined data operation of the retail industry.

[0037] FIG. 4 is a flowchart of an article processing method according to another implementation of the present specification. The method may be performed by an LPWAN gateway 102 in FIG. 2. As shown in FIG. 4, the method may include the following steps:

[0038] Step 410: An LPWAN gateway receives an article change message sent by an article processing terminal.

[0039] The article processing terminal 10 uses the RFID reader 101 to scan if an article changes. If the article changes, a change message is sent to the LPWAN gateway 20. The article change message may include the article identifier of the changed article and the address of the application server 30.

[0040] Step 420: The LPWAN gateway sends an article change notification to the application server based on the address.

[0041] The article change notification includes the article identifier. After receiving the article change notification, the application server 30 performs a next processing step on the article identified by the article identifier, for example, recording the change status information of the article.

[0042] Corresponding to the previous article processing method, an LPWAN gateway is also provided in an implementation of the present specification. As shown in FIG. 5, the gateway includes: a receiving unit 501 and a sending unit 502.

[0043] The receiving unit 501 is configured to receive an article change message sent by an article processing terminal, where the article change message includes an article identifier of a changed article and an address of an application server. The article identifier is read by the article processing terminal by using the RFID reader.

[0044] The sending unit 502 is configured to send an article change notification to the application server based on the address, where the article change notification includes an article identifier. The article change notification is used to instruct the application server to perform a next processing step on the article identified by the article identifier.

[0045] The functions of the functional modules of the apparatus in the previous implementations of the present specification may be implemented by performing the steps of the previous method implementations. Therefore, details of a specific operation process of the apparatus provided in one implementation of the present

specification are omitted here.

[0046] The LPWAN gateway provided in an implementation of the present specification may receive the article change message sent by the article processing terminal and send the article change message to the application server. Thus, the short-range processing on the article is realized.

[0047] A person skilled in the art should understand that in one or more of the previous examples, the functions described in the present specification may be implemented in hardware, software, firmware, or any combination thereof. When being implemented using software, these functions can be stored in a computer-readable medium or transmitted as one or more instructions or codes on the computer-readable medium.

[0048] The purpose, technical solutions and beneficial effects of the present specification are further described in detail in the specific implementation described above. It should be understood that the above description is merely a specific implementation of the present specification and is not intended to limit the protection scope of the present specification. Any modification, equivalent replacement and improvement made on the basis of the technical solutions of the present specification should be included in the protection scope of the present specification.

CLAIMS

What is claimed is:

1. An article processing method, wherein the article processing method is applied to an article processing terminal, and the article processing terminal comprises a radio
5 frequency identification (RFID) reader, a control unit, and a low-power wide-area network (LPWAN) module; and the method comprises:

controlling, by the control unit, an RFID reader to periodically scan a plurality of short-range articles with short-range communication capabilities;

when any one of the plurality of short-range articles changes, receiving, by the
10 control unit, an article identifier of an article sent by the RFID reader, wherein a changing of the article includes the article being picked up or put down; and

controlling, by the control unit, the LPWAN module to send an article change message to an LPWAN gateway, wherein the article change message comprises the article identifier and an address of an application server, and the article change
15 message is used to instruct the LPWAN gateway to instruct, based on the address, the application server to perform a next processing step on the article identified by the article identifier, wherein the method comprises pre-storing an article list, which includes article identifiers of the plurality of short-range articles, and further comprises that the RFID reader compares an obtained article identifier with the article
20 identifiers in the article list to determine whether there is a change in the article and determine the article identifier of the changed article.

2. The method according to claim 1, wherein the RFID reader is a near field communication (NFC) reader or an ultra-high frequency (UHF) RFID reader.
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3. The method according to claim 1, wherein the LPWAN module is a Long Range (LoRa) module or a cellular-based narrowband Internet of Things (NB-IOT).

4. An article processing terminal, comprising:
30 a control unit, configured to periodically send a scanning instruction to an RFID reader; and
an RFID reader, configured to periodically scan a plurality of short-range articles

with short-range communication capabilities based on the scanning instruction; and when any one of the plurality of short-range articles changes, wherein a changing of the article includes the article being picked up or put down, send an article identifier of an article to the control unit, wherein

5 the control unit is further configured to: receive the article identifier; and send a sending instruction to an LPWAN module; and

 the LPWAN module, configured to send an article change message to an LPWAN gateway according to the sending instruction, wherein the article change message comprises the article identifier and an address of an application server, and
10 the article change message is used to instruct the LPWAN gateway to instruct, based on the address, the application server to perform a next processing step on the article identified by the article identifier,

 wherein the article processing terminal is configured to pre-store an article list, which includes article identifiers of the plurality of short-range articles, and the RFID
15 reader is configured to compare an obtained article identifier with the article identifiers in the article list to determine whether there is a change in the article and determine the article identifier of the changed article.

5. The terminal according to claim 4, wherein the RFID reader is a near field
20 communication (NFC) reader or an ultra-high frequency (UHF) RFID reader.

6. The terminal according to claim 4, wherein the LPWAN module is a LoRa module or a cellular-based narrowband Internet of Things (NB-IOT).

25 7. An article processing system, comprising:

 an article processing terminal according to any one of claims 4 to 6, configured to periodically scan a plurality of short-range articles, and send an article identifier of a changed article to an LPWAN gateway;

 the LPWAN gateway, configured to: receive the article identifier of the changed
30 article; and send the article identifier to an application server;

 the application server, configured to: receive the article identifier to perform a next processing step on the article identified by the article identifier, and obtain attribute information of the article according to the article identifier; and send the attribute information to a multimedia display; and

the multimedia display, configured to receive the attribute information and display the attribute information.