

METHOD FOR IMPLEMENTING AUTOMATIC RECONNECTION TO TARGET DEVICE, ELECTRONIC DEVICE, AND STORAGE MEDIUM

TECHNICAL FIELD

5 **[0001]** This specification relates to the communication field, and in particular, to a method for connecting an electronic device to a target device, an electronic device, and a storage medium.

BACKGROUND

[0002] In daily business activities of a merchant, a POS device needs to be connected to a plurality of external devices to meet payment and other business requirements. For example, to
10 complete a payment transaction, the POS device may need to be connected to devices such as different card reading devices, code scanning devices, and cameras. To meet other requirements such as receipt printing and audio prompts, a printer and an audio output apparatus may further need to be connected. Usually, the POS devices can directly identify the external devices by reading serial numbers of the external devices. However, in some special cases, a connection
15 between the POS device and the external device may be affected by a special intermediate device (for example, a connection between the POS device and a NETS machine is affected by an RS-232 intermediate device), and consequently the serial number of the external device is shielded and cannot be correctly read by the POS device. Alternatively, the external device has no serial number, and therefore cannot be identified by the POS device. Therefore, when a reconnection is
20 established after the network connection between the POS device and the external device is interrupted, it cannot be automatically identified whether a connected device is a device connected last time, and data stored during a last connection to the external device cannot be obtained. Therefore, after the POS device is restarted or the external device is disconnected, the merchant usually needs to manually operate to reconfigure the external device. This is inefficient and
25 increases operation complexity.

[0003] It should be noted that the above-mentioned content of the related technology is merely

information known to the inventor, and neither means that the information has entered the public domain before the application date of this disclosure, nor means that the information can become the existing technology of this disclosure.

SUMMARY

5 **[0004]** This specification provides a method for implementing an automatic reconnection to a target device, a system, and a computer-readable nonvolatile storage medium, to avoid the above-mentioned technical problem.

10 **[0005]** According to a first aspect, this disclosure provides a method for implementing an automatic reconnection to a target device, applied to an electronic device. The electronic device implements a target communication connection to a target device through at least one intermediate device, and a unique identifier corresponding to the target device is not readable by the electronic device through a communication link. The method includes: after the target communication connection is interrupted, reading intermediate device information of the at least one intermediate device; obtaining an alternative identifier of the target device based on the intermediate device
15 information; and reestablishing the target communication connection to the target device based on the alternative identifier.

20 **[0006]** According to a second aspect, this disclosure provides an electronic device, including: at least one memory, where the memory stores a database and at least one group of instructions for establishing a target communication connection to a remote target device; and at least one processor that is communicatively connected to the at least one memory. When the electronic device runs, the at least one processor executes the at least one group of instructions to implement the method for implementing an automatic reconnection to a target device.

25 **[0007]** According to a third aspect, this specification discloses a computer-readable nonvolatile storage medium, including and storing at least one instruction set for implementing an automatic reconnection to a device. When the at least one instruction set is executed by at least one processor, the method for implementing an automatic reconnection to a target device is implemented.

[0008] It can be learned from the above-mentioned technical solutions that the method for implementing an automatic reconnection to a target device, the electronic device that can perform

the above-mentioned method, and the storage medium that stores instructions that can be used to perform the above-mentioned method can effectively resolve the above-mentioned technical problem. Specifically, in the method, the electronic device obtains the intermediate device information of the at least one intermediate device, and generates, based on the information, the
5 alternative identifier related to the target device. In this way, when implementing a connection to the target device next time, the electronic device can determine, based on the alternative identifier, whether a device connected to the electronic device is the target device.

[0009] The above-mentioned technology effectively resolves a problem of an automatic reconnection of the electronic device to the target device without a device serial number.
10 Specifically, when the electronic device implements a reconnection to a device after the target communication connection is disconnected, for example, when the electronic device is powered off and restarted or the external device is reconnected after being disconnected, the electronic device obtains an alternative identifier of the device, and performs a matching operation with a device identifier of the target device connected to the electronic device last time. Once the two can
15 be successfully matched, the electronic device implements an automatic reconnection to the device, to avoid a cumbersome procedure of manual configuration. This can implement more efficient use of the electronic device and the external device of the electronic device and further reduce an error risk caused by a manual operation, thereby improving overall user experience and device management convenience.

20 **[0010]** Other functions of the method for implementing an automatic reconnection to a target device, the electronic device that can perform the above-mentioned method, and the storage medium that stores instructions that can be used to perform the above-mentioned method are partially listed in the following descriptions. Creative aspects of the method, the electronic device, and the storage medium can be fully explained by practice or by using the methods, apparatuses,
25 and combinations described in the following detailed examples.

BRIEF DESCRIPTION OF DRAWINGS

[0011] To describe the technical solutions in the embodiments of this specification more clearly, the following briefly describes the accompanying drawings needed for describing the embodiments. Clearly, the accompanying drawings in the following description show merely some

embodiments of this specification, and a person of ordinary skill in the art can still derive other drawings from these accompanying drawings without creative efforts.

[0012] FIG. 1 is a schematic diagram of an application scenario of a POS device according to an embodiment of this specification;

5 [0013] FIG. 2 is a diagram of a hardware structure of an electronic device according to an embodiment of this specification; and

[0014] FIG. 3 is a flowchart of a method for implementing an automatic reconnection to a target device according to an embodiment of this specification.

DESCRIPTION OF EMBODIMENTS

10 [0015] Specific application scenarios and requirements of this specification are provided in the following descriptions, so that a person skilled in the art can manufacture and use content of this specification. Various local modifications to the disclosed embodiments are clear to a person skilled in the art. In addition, the general principles defined herein can be applied to other embodiments and applications without departing from the spirit and scope of this specification.
15 Therefore, this specification is not limited to the shown embodiments, but has a widest scope consistent with the claims.

[0016] The terms used herein are merely intended to describe specific example embodiments, and impose no limitation. For example, unless otherwise explicitly stated in the context, the singular forms "one", "an", and "the" used herein can include plural forms. When being used in
20 this specification, the terms "include", "comprise", and/or "have" mean existence of an associated feature, integer, step, operation, element, and/or component, but do not preclude existence of one or more other features, integers, steps, operations, elements, components, and/or groups or addition of other features, integers, steps, operations, elements, components, and/or groups to the system/method.

25 [0017] In consideration of the following descriptions, these and other features of this specification, operations and functions of related components of the structure, and economy of combination and manufacturing of components can be significantly improved. With reference to the accompanying drawings, all of these form a part of this specification. However, it should be clearly understood that the accompanying drawings are merely used for the purpose of illustration

and description, and are not intended to limit the scope of this specification. It should be further understood that the accompanying drawings are not drawn to scale.

[0018] The flowchart used in this specification shows operations implemented by a system according to some embodiments of this specification. It should be clearly understood that the operations in the flowchart can be implemented out of sequence. On the contrary, the operations can be implemented in a reverse sequence or simultaneously. In addition, one or more other operations can be added to the flowchart, and one or more operations can be removed from the flowchart.

[0019] In this specification, "X includes at least one of A, B, or C" means that X includes at least A, X includes at least B, or X includes at least C. That is, X can include only any one of A, B, or C, or include both any combination of A, B, and C and other possible content/elements. The any combination of A, B, and C can be A, B, C, AB, AC, BC, or ABC.

[0020] In this specification, unless explicitly stated, an association relationship generated between structures can be a direct association relationship or an indirect association relationship. For example, when "A is connected to B" is described, unless it is explicitly stated that A is directly connected to B, it should be understood as that A can be directly connected to B or can be indirectly connected to B. For another example, when "A is above B" is described, unless it is explicitly stated that A is directly above B (A is adjacent to B and A is above B), it should be understood as that A can be directly above B, or A can be indirectly above B (A is separated from B by another element and A is above B), and so on.

[0021] To facilitate understanding of this disclosure by a reader, at least some terms in this disclosure are explained herein as follows:

[0022] A point of sale (POS) device is a device or system used to complete a sales transaction. For example, electronic cash registers used at shopping mall checkout counters and computer devices in which sales software is installed are POS devices, and can perform a series of operations such as product scanning, pricing, collection, and ticket printing.

[0023] A product serial number is also referred to as a serial number (SN) and is a unique number used to identify an individual product. By using this number, a manufacturer can trace a production batch, a production date, a sales channel, and other information of the product.

[0024] A vendor identifier is also referred to as a vendor ID (VID) and is a unique identifier used to identify a hardware device manufacturer. The VID is usually allocated by an industry

standard organization. Each device manufacturer has a unique VID used to identify a device manufactured by the manufacturer. The VID is usually a 16-bit or 32-bit hexadecimal number allocated by a standardization organization. For example, a VID of PCI is a VID used to identify a PCI bus device, a VID of a USB interface can be used to identify a USB device manufacturer, and a VID of Bluetooth can be used for a Bluetooth device, for example, a VID of Sony is 0X000F.

[0025] A product identifier is also referred to as a product ID (PID) and is a 16-bit hexadecimal number independently allocated by a device manufacturer to a device of the device manufacturer. The PID is used to identify different devices manufactured by a same manufacturer.

[0026] NETS machine: NETS is an acronym of Network for Electronic Transfers Singapore.

The NETS can provide a debit card-based instant payment service, and supports two-dimensional code payment, mobile phone payment (NFC), and online payment. The NETS machine refers to a terminal device that supports the electronic transfer service, including a POS machine and an intelligent POS machine that support a NETS system, a NETS payment terminal (Standalone Terminal), a QR payment device, an electronic payment integrated system, and the like. The POS machine that supports the NETS system can receive NETS debit card payment, support a transaction through a chip, a magnetic strip, or an NFC technology, and deduct a payment amount from a bank account of a user in real time. The device is widely applied to retail stores, catering, and service industries. The intelligent POS machine that supports the NETS system can support a plurality of payment methods, including NETS payment, a credit card, and two-dimensional code payment (NETS QR), and can provide more abundant functions such as transaction record query, bill printing and data analysis. The NETS payment terminal is a terminal device specifically designed for a NETS transaction, and is usually small in size and convenient for mobile use. The device supports debit card payment and two-dimensional code payment. The QR payment device supports completion of payment by scanning a QR code (NETS QR). A user uses a NETS app or a bank app that supports the NETS to scan a QR code generated by a merchant, to make a payment. The electronic payment integrated system is integrated into a checkout system of a large merchant, and directly supports NETS payment without an additional POS device, thereby simplifying a payment procedure.

[0027] Commonly used scenarios of the NETS device can be retail, catering, public services, small merchants, e-commerce, and online payment. In scenarios such as supermarkets, convenience stores, and clothing stores, payment can be completed through a POS machine or a

QR code. In restaurants and cafes, checkout can be completed through a desktop terminal or a two-dimensional code. For the small merchant, a two-dimensional code payment device (for example, a mobile payment terminal) can be used for payment and collection. For the e-commerce and the online payment, a NETS virtual payment terminal can be used for payment and collection. When the NETS device is used for payment, a customer only needs to insert a bank card (usually a debit card, a credit card, or the like supporting the NETS service) into or place a bank card close to the NETS machine, and can quickly complete a payment process by performing operations such as entering a password and confirming a transaction amount, and funds are correspondingly transferred from a bank account of the customer to a merchant account.

10 **[0028]** RS-232 is one of commonly used serial communication interface standards and has a full name of "serial binary data exchange interface technology standard between data terminal equipment (DTE) and data communication equipment (DCE)".

[0029] Before the method for implementing an automatic reconnection to a target device described in this specification is described in detail, an application scenario of this specification is first described by using an example, to deepen understanding of the method for implementing an automatic reconnection to a target device in this disclosure by a reader.

[0030] The method for implementing an automatic reconnection to a target device and the electronic device provided in this specification can be applied to an electronic device that needs to implement an automatic reconnection to an external device without a fixed serial number, for example, can be applied to a POS device during service conduction by a merchant. The merchant can be merchants that provide various products or services, including but not limited to a catering merchant, a store, a supermarket, a fruit and vegetable store, a flower store, a bookstore, a hotel, a beauty salon, a dry cleaning store, a barbershop, and the like. The merchant can be a small/micro merchant, a large merchant, a chain merchant, or the like. This is not limited in this specification. In the following descriptions, a POS device is used as an example to describe the technical solutions in this specification. Certainly, a person skilled in the art can also understand that the technical solutions in this specification are also applicable to another electronic device.

[0031] In commercial transaction activities, the merchant can use the POS device to conduct business activities and receive online and offline orders. The online order refers to a product or service purchase request submitted by a consumer through an online channel (for example, a website or an application). The offline order refers to a product or service purchase request

submitted by a consumer through an offline channel, for example, a product or service purchase request submitted by the consumer and a cashier in a face-to-face manner.

5 **[0032]** When the merchant needs to conduct a service through the offline channel, the merchant needs to purchase a sales device and further needs to purchase a dedicated financial machine from an acquiring institution, to manage the offline order. The financial machine is communicatively connected to the acquiring institution through a dedicated network. The sales device provides an interaction function and can display a product or a service sold by the merchant. Based on a purchase requirement of the consumer, the cashier of the merchant can help the consumer select a product or a service on the sales device and submit an order. The order is an offline order. The sales device sends the offline order to the financial machine. After the consumer performs a payment operation (for example, card swiping or code scanning) on the financial machine, the financial machine generates a payment request of the offline order, and sends the payment request to the acquiring institution, so that the acquiring institution completes a payment procedure of the offline order.

15 **[0033]** In this specification, the acquiring institution is an institution that signs a contract with the merchant and is responsible for processing a payment request on a merchant side. In some embodiments, the acquiring institution can be a financial institution such as a card issuing bank. In some embodiments, the acquiring institution can be a payment service provider such as an electronic wallet. In some embodiments, the acquiring institution can alternatively be an aggregation service provider that aggregates a plurality of financial institutions or a plurality of payment service providers.

25 **[0034]** In an offline service conduction scenario, with diversified development of payment methods, different consumers may select different payment channels for payment. To meet payment requirements of different consumers, the merchant needs to interconnect with a plurality of acquiring institutions. In this case, the merchant needs to purchase the financial machine from each acquiring institution. During service conduction, based on a payment channel selected by the consumer, the merchant sends an order to a financial machine corresponding to the payment channel, so that the financial machine sends a payment request of the order to an acquiring institution corresponding to the payment channel.

30 **[0035]** FIG. 1 is a schematic diagram of an application scenario 001 of a POS device according to an embodiment of this specification. For ease of understanding, a catering scenario is used as

an example in FIG. 1 for description. As shown in FIG. 1, a point of sale (POS) device 110 (or referred to as a POS end) and a service device 120 (or referred to as a serving end, a server, or a back-end device) can be included.

5 [0036] The POS device 110 is a multi-functional terminal. In some embodiments, the POS device 110 can be a mobile device, for example, a handheld device. The POS device 110 can be carried by a staff member of a merchant to different locations of a store for operation, providing relatively high convenience. In some embodiments, the POS device 110 can be a non-mobile device. In this case, the POS device 110 is usually placed on a checkout counter of an offline store of a merchant.

10 [0037] In this specification, the POS device 110 can receive an offline order and an online order of the merchant. The POS device 110 can further perform checkout processing on the offline order. The POS device 110 can also be referred to as a checkout device, a sales device, or an integrated sales and checkout device.

15 [0038] The POS device 110 is an electronic device with a specific computing capability. In some embodiments, the POS device 110 can include a hardware device with a data processing function and a necessary program needed to drive the hardware device to work. The POS device 110 can manage an order by driving the hardware device to execute the program. For example, order management software (or an order management program) can be installed in the POS device 110. The POS device 110 can manage the order by running the order management software. The
20 order management software can correspond to an operating system installed in the POS device 110, or can correspond to an application (APP) or an instruction set installed in the POS device 110. The order management software can be software preset in the hardware device of the POS device 110 (for example, software included in the POS device 110 when the POS device 110 is delivered from a factory), or can be software subsequently installed in the POS device 110 by the
25 staff member of the merchant. This is not limited in this specification.

[0039] In some embodiments, the POS device 110 can have a display screen, or the POS device 110 can be externally connected to a display screen. The POS device 110 can provide an interaction capability through the display screen. For example, the POS device 110 displays, through the display screen, a product or a service sold by the merchant, and generates an offline order based
30 on a product or a service selected by an operator (the staff member of the merchant or a consumer). The POS device 110 can further display a checkout entry through the display screen, so that the

operator performs a checkout operation on the offline order.

[0040] When checking out an order, the POS device 110 supports a plurality of payment methods, including but not limited to cash payment, card swiping payment, code scanning payment, biometric recognition (for example, facial recognition)-based payment, near field communication-based payment, and the like.

[0041] The POS device can complete payment through a target device 300, for example, card swiping payment, code scanning payment, biometric recognition (for example, facial recognition)-based payment, and near field communication-based payment. Correspondingly, the target device 300 can be a card reading apparatus 111 used for card swiping payment, a code scanning apparatus 112 used for code scanning payment by a user, and a camera apparatus (not shown in FIG. 1) used for biometric recognition.

[0042] The target device 300 can alternatively be another electronic device that communicates with the POS device 110. For example, the target device 300 can be a printing apparatus 113 or a remote service device 120.

[0043] Some target devices 300 such as the card reading apparatus 111, the code scanning apparatus 112, the camera apparatus, and/or the printing apparatus 113 can be built in the POS device 110, or can be used as external devices and connected to the POS device 110. Some target apparatuses such as the service device 120 can be used only as external devices and connected to the POS device 110. When the built-in manner is used, the target device 300 can be disposed at any possible location of the POS device 110. This is not limited in this specification. When the external connection manner is used, the POS device 110 is connected to the external device in a wired or wireless manner. The wired connection manner can include but is not limited to a universal serial bus (USB) connection, an RS-232 serial port connection, an RS-485 serial port connection, an Ethernet connection, an optical fiber connection, or the like. The wireless connection manner can include but is not limited to a Wi-Fi connection, a Bluetooth connection, or the like.

[0044] The card reading apparatus 111 is an apparatus that can read card information of a payment card (for example, a debit card or a credit card) of the consumer according to a preset payment specification. When the consumer selects card swiping payment, the POS device 110 can control the card reading apparatus 111 to enter a card reading mode. The card reading apparatus 111 can read the card information of the payment card according to the preset payment

specification in response to the consumer placing the payment card close to, attaching the payment card to, or inserting the payment card into the card reading apparatus.

[0045] In some embodiments, when the POS device 110 supports code scanning payment, a code scanning apparatus 112 can be built in or externally connected to the POS device 110. When the built-in manner is used, the code scanning apparatus 112 can be disposed at any possible location of the POS device 110. This is not limited in this specification. When the external connection manner is used, the POS device 110 can be connected to the code scanning apparatus 112 in a wired or wireless manner. The code scanning apparatus 112 is an apparatus with a code scanning capability. For example, the code scanning apparatus 112 can include a camera module. When the consumer chooses to pay the offline order by using a payment code, the POS device 110 can control the code scanning apparatus 112 to enter a scanning mode. In response to the consumer aligning the payment code with the code scanning apparatus 112, the code scanning apparatus 112 scans code information of the payment code by using the camera module.

[0046] In some embodiments, when the POS device 110 supports biometric recognition-based payment, a camera apparatus (not shown in FIG. 1) can be built in or externally connected to the POS device 110. When the built-in manner is used, the camera apparatus can be disposed at any possible location of the POS device 110. When the external connection manner is used, the POS device 110 can be connected to the camera apparatus in a wired or wireless manner. This is not limited in this specification. For example, when the consumer chooses to use face scanning payment, the POS device 110 can control the camera apparatus to enter a camera mode. In response to the consumer aligning the face with the camera apparatus, the camera apparatus captures a face image of the consumer.

[0047] In some embodiments, when the POS device 110 supports near field communication-based payment, a near field communication apparatus (not shown in FIG. 1) can be built in or externally connected to the POS device 110. The near field communication apparatus can be disposed at any possible location of the POS device 110. This is not limited in this specification. When the consumer selects near field communication-based payment, the POS device 110 can control the near field communication apparatus to enter a communication mode. In response to the consumer placing a terminal device having a near field communication component close to the near field communication apparatus, the near field communication apparatus communicates with the near field communication component in the terminal to obtain order payment information.

[0048] In some embodiments, a printing apparatus 113 can be built in or externally connected to the POS device 110. When the built-in manner is used, the printing apparatus 113 can be disposed at any possible location of the POS device 110. This is not limited in this specification. When the external connection manner is used, the POS device 110 can be connected to the printing apparatus 113 in a wired or wireless manner. This is not limited in this specification. Printing paper or label paper can be disposed in the printing apparatus 113. After the consumer successfully pays the order, the POS device 110 can control the printing apparatus 113 to print a consumer ticket or an order label corresponding to the order.

[0049] In FIG. 1, the service device 120 is a computing system with a specific computing capability. The service device 120 is communicatively connected to the POS device 110, and provides an order management service to the POS device 110. The service device 120 can correspond to a single computing device, or can correspond to a computing cluster including a plurality of computing devices. The service device 120 can be deployed locally, or can be deployed remotely. The service provided by the service device 120 to the POS device 110 can include an order management service for an offline order, and can further include an order management service for an online order.

[0050] Regardless of a wired connection or a wireless connection, the target device 300 and the POS device 110 need to be connected through intermediate devices 115 and 117. The intermediate devices 115 and 117 can be one device, for example, the above-mentioned USB serial port, RS-232 serial port, RS-485 serial port, Ethernet interface connection, phone line connection, and dedicated interface connection, or can be a plurality of electronic devices connected in series.

[0051] In a process in which the POS device 110 is connected to an external device in a wired manner or a wireless manner, a serial number of the external device is automatically identified through an intermediate device, and a corresponding device database is constructed based on the serial number. The database stores connection information and a data record related to the external device. When the POS device 110 is powered off and restarted or the external device needs to be reconnected due to accidental disconnection, the POS device 110 performs an obtaining operation on the serial number of the external device again, and then compares the obtained serial number with the serial number that is of the external device connected to the POS device 110 last time and that is stored in the device database. If it is found that the two serial numbers are the same, the POS device 110 can directly retrieve and obtain data generated and stored during a last connection

to the external device corresponding to the serial number, to quickly restore a connection state and implement seamless data cohesion.

[0052] In some embodiments, there is a case in which the external device has no identifiable serial number, or a serial number of the external device is shielded by an intermediate device (or an intermediate device in a plurality of intermediate devices) on a connection path between the POS device 110 and the external device. For example, when an external payment device is a NETS machine and is connected to the POS device 110, an RS-232 intermediate device needs to construct a connection path between the external payment device and the POS device 110. However, because of a special structural characteristic of an RS-232 internal chip, in a connection process, a serial number of the NETS machine is shielded, and even the NETS machine is shielded. Consequently, the POS device 110 cannot effectively read valid information of the NETS machine, and therefore a database corresponding to the device cannot be successfully established. Therefore, when the POS device 110 is restarted after being powered off or the NETS machine needs to be reconnected due to accidental disconnection, the merchant needs to manually perform a device addition operation, and it is difficult to quickly restore a connection state and ensure seamless data cohesion. This undoubtedly reduces device use convenience and working efficiency to some extent, and adds an unnecessary cumbersome phase and a potential risk to an actual commercial operation procedure. Therefore, this problem needs to be urgently resolved by using a new technical means, to improve overall stability and ease of use of a system, and meet an actual requirement for efficient and reliable device running in commercial operation.

[0053] The technical solutions provided in this specification effectively resolve the above-mentioned problem. Specifically, in the method, intermediate device information of at least one intermediate device is obtained, and an alternative identifier related to the target device 300 is generated based on the information. When implementing a connection to the target device 300 next time, an electronic device can determine, based on the alternative identifier, whether a device connected to the electronic device is the target device 300. This effectively resolves a problem of an automatic reconnection of the electronic device to the target device 300 without a device serial number. Specifically, when the electronic device is powered off and restarted or the external device is disconnected and reconnected, the alternative identifier can be automatically identified and a reconnection to the correct target device 300 can be implemented, without a need for manual configuration. As described above, the electronic device can be the POS device 110 in the scenario

in FIG. 1, or can be another electronic device that needs to be connected to a device without a fixed serial number or a device whose serial number is shielded. The target device 300 can be the card reading apparatus, the code scanning apparatus, the camera apparatus, the printer, or the like in the scenario in FIG. 1, another electronic device that has a serial number but whose serial number is shielded, or another device without a fixed serial number. For example, the target device includes at least one of a NETS machine, a POS machine, or a printer of a merchant.

[0054] It should be noted that the above-mentioned application scenario of the POS device 110 is merely one of a plurality of use scenarios provided in this specification. The method for automatically reconnecting to a target device 300 provided in this specification can be applied not only to the above-mentioned scenario, but also to all scenarios in which the target device 300 needs to be automatically reconnected to, for example, an industrial sensor and a host. When the host obtains a device identifier of the sensor based on a conventional communication procedure, due to a lack of corresponding decryption permission, a serial number cannot be read as if the serial number is "shielded" by an invisible wall, and an obtaining failure result is finally received. Therefore, a corresponding database cannot be established for the sensor to store related information such as sensor calibration data and historical monitoring data. A person skilled in the art should understand that when the method for automatically reconnecting to a target device 300 provided in this specification is applied to another use scenario, an implementation and technical effects thereof are similar.

[0055] FIG. 2 is a diagram of a hardware structure of an electronic device according to an embodiment of this specification. The electronic device 200 can be the POS device 110 in the application scenario in FIG. 1, and performs the method for implementing an automatic reconnection to the target device 300 described in this specification.

[0056] As shown in FIG. 2, the electronic device 200 can include at least one storage medium 230 and at least one processor 220. In some embodiments, the electronic device 200 can further include a communication port 250 and an internal communication bus 210. The electronic device 200 can further include an I/O component 260.

[0057] The internal communication bus 210 can be connected to different system components. For example, the internal communication bus 210 can be connected to the storage medium 230, the processor 220, the communication port 250, the I/O component 260, and the like.

[0058] The I/O component 260 supports an input/output between the electronic device 200

and another component.

[0059] The communication port 250 is used for data communication between the electronic device 200 and the outside. For example, the communication port 250 can be used for data communication between the electronic device 200 and a network 140. The communication port
5 250 can be a wired communication port, or can be a wireless communication port.

[0060] The storage medium 230 can include a data storage apparatus. The data storage apparatus can be a computer-readable non-transitory storage medium, or can be a transitory storage medium. For example, the data storage apparatus can include one or more of a disk 232, a read-only storage medium (ROM) 234, or a random access storage medium (RAM) 236. The storage
10 medium 230 further includes at least one instruction set stored in the data storage apparatus. The instruction set can include computer program code. The computer program code can include a program, a routine, an object, a component, a data structure, a process, a module, and the like. The storage medium 230 stores at least one instruction set, and the instruction set can be computer code. When a processor reads and executes the instruction set, the instruction set indicates the
15 processor to perform the method in this specification.

[0061] The at least one processor 220 can be communicatively connected to the at least one storage medium 230. When the electronic device 200 runs, the at least one processor 220 reads the at least one instruction set, and performs, based on an indication of the at least one instruction set, the data processing and/or program modification method for a middle platform system provided
20 in this specification. The processor 220 can perform the steps included in the data processing and/or program modification method for a middle platform system. The processor 220 can be in a form of one or more processors. In some embodiments, the processor 220 can include one or more hardware processors, for example, a microcontroller, a microprocessor, a reduced instruction set computer (RISC), an application-specific integrated circuit (ASIC), an application-specific
25 instruction set processor (ASIP), a central processing unit (CPU), a graphics processing unit (GPU), a physical processing unit (PPU), a microcontroller unit, a digital signal processor (DSP), a field programmable gate array (FPGA), an advanced RISC machine (ARM), a programmable logic device (PLD), any circuit, processor, or the like that can perform one or more functions, or any combination thereof.

[0062] To merely describe a problem, only one processor 220 is shown in the electronic device 200 in the accompanying drawings. However, it should be noted that the electronic device 200 in

this specification can further include a plurality of processors. Therefore, the operations and/or method steps disclosed in this specification can be performed by one processor or can be jointly performed by a plurality of processors. For example, if the processor 220 in the electronic device 200 described in this specification performs step A and step B, it should be understood as that step A and step B can be jointly or separately performed by two different processors 220 (for example, a first processor performs step A and a second processor performs step B, or a first processor and a second processor jointly perform step A and step B).

[0063] The target device 300 can be an apparatus such as the card reading apparatus, the code scanning apparatus, the camera apparatus, the printer, and/or the service device in the application scenario of the POS device 110 in FIG. 1. The target device 300 includes at least one memory and at least one processor. In some embodiments, the target device 300 can further include a communication port and an internal communication bus. The target device 300 can further include an I/O component. A function of a component in the target device 300 is consistent with a function of a related component in the electronic device 200. Details are not described herein again.

[0064] FIG. 3 is a flowchart of a method P300 for implementing an automatic reconnection to a target device 300 according to an embodiment of this specification. As described above, the electronic device 200 can perform the method P300 for implementing an automatic reconnection to a target device 300 in this specification. Specifically, the processor 220 in the electronic device 200 can read the instruction set stored in the memory 230 in the electronic device 200, and then perform, based on a stipulation of the instruction set, the method P300 for implementing an automatic reconnection to a target device 300 in this specification. As shown in FIG. 3, the method P300 can include S310 to S330.

[0065] When the electronic device 200 establishes a target communication connection to a target device for the first time, a procedure of establishing the target communication connection for the first time needs to be started, and steps S310 to S330 are performed.

[0066] S310: When establishing the target communication connection to the target device 300 for the first time, attempt to obtain a device identifier of the target device 300 and receive an obtaining failure result.

[0067] The electronic device 200 implements the target communication connection to the target device 300 through at least one intermediate device. Usually, the electronic device 200 can directly obtain the device identifier of the target device 300 through the at least one intermediate

device. The device identifier specifically refers to a serial number of the target device 300. Based on the serial number of the target device 300, the electronic device 200 further creates a database of the target device 300. The database is mainly used to store connection information and a data record related to the target device 300, so that related data can be quickly and accurately invoked in a subsequent operation. If the target communication connection between the electronic device 200 and the target device 300 is interrupted, for example, when the electronic device 200 is powered off and restarted or the target device 300 needs to be reconnected due to accidental disconnection, the electronic device 200 automatically makes a reconnection attempt with the target device 300, that is, obtains the serial number of the target device 300 again, and then compares, one by one, the obtained serial number with serial number data stored in the device database. Once it is found that there is a same serial number in the database, the electronic device 200 can directly retrieve and obtain data generated and stored during a last connection to the target device 300 corresponding to the serial number, to quickly restore a connection state and implement seamless data cohesion.

[0068] In some special cases, a unique identifier corresponding to the target device 300 is not readable by the electronic device 200. This is manifested as that the electronic device 200 attempts to obtain the serial number of the target device 300 and receives the obtaining failure result. Specifically, this may be because the target device 300 has no unique device serial number or the serial number is shielded by one or more intermediate devices 115 and 117 between the target device 300 and the electronic device 200. Further, the electronic device 200 cannot establish a database about the target device 300 based on the serial number, resulting in a lack of effective basic information support for subsequent management, data recording, and other operations on the target device 300. Therefore, if the serial number of the target device 300 cannot be obtained, when the electronic device 200 establishes the target communication connection to the target device 300 for the first time, the electronic device 200 performs steps S320 and S330.

[0069] S320: Obtain the intermediate device information of the at least one intermediate device, and generate a corresponding identifier as an alternative identifier of the target device.

[0070] As described above, in a process of establishing the target communication connection to the target device 300, the electronic device 200 is connected to the target device 300 through the at least one intermediate device. The at least one intermediate device and the electronic device 200 constitute a communication link. The at least one intermediate device includes a target

intermediate device (for example, an RS-232 serial port), and the target intermediate device shields a serial number of another device that is connected to the target intermediate device on the communication link and that is on a side of the target device 300. Specifically, the target intermediate device is directly connected to the target device 300 or the target intermediate device is a device that is in the at least one intermediate device on the communication link, that is identifiable by the electronic device 200, and that is closest to the target device 300. Because the target intermediate device can shield a serial number of a device connected to the target intermediate device, the serial number or the device identifier of the target device is shielded by the target intermediate device.

10 **[0071]** The electronic device 200 generates, based on device information of the target intermediate device, the alternative identifier related to the target device 300. Specifically, step S320 can include steps S321 and S322.

[0072] S321: Read the intermediate device information of the at least one intermediate device. The intermediate device information is device information of the target intermediate device.

15 **[0073]** The electronic device 200 reads the intermediate device information of the at least one intermediate device. The at least one intermediate device includes the target intermediate device, and the intermediate device information is the device information of the target intermediate device. The intermediate device information includes at least one of a product serial number (SN), a PID, or a VID of the target intermediate device.

20 **[0074]** S322: Obtain the alternative identifier of the target device 300 based on the intermediate device information.

[0075] The electronic device 200 reassembles the device information that is of the target intermediate device and that is read in step S321 to generate the alternative identifier related to the target device 300. Specifically, the electronic device 200 assembles at least one piece of

25 information in the product serial number (SN), the PID, or the VID obtained from the target intermediate device to generate the alternative identifier related to the target device 300. For example, the electronic device 200 assembles the PID or the VID into a device identifier (device number), for example, the device number is equal to the PID plus the VID; and then assembles the serial number with the device identifier to generate the alternative identifier, that is, the alternative

30 identifier is equal to the product serial number (SN) of the target intermediate device plus the device number. If the product serial number (SN) of the target intermediate device is not obtained,

the product serial number (SN) of the target intermediate device in the alternative identifier is null. Similarly, if the PID and the VID of the target intermediate device are not obtained, the device number in the alternative identifier is null. If only one of the PID or the VID of the target intermediate device is obtained, the device number in the alternative identifier is the obtained PID or VID. The electronic device 200 obtains at least one piece of information to generate the alternative identifier.

[0076] S330: Establish the connection for the first time by using the alternative identifier as the device identifier of the target device 300, and store the alternative identifier in a database as information about the target communication connection.

[0077] If the electronic device 200 generates the alternative identifier related to the target device 300, the alternative identifier is stored in the database as a part of the information about the target communication connection. The database stores connection information and a data record related to the target device 300. Before the alternative identifier is stored, it is automatically detected whether there is a conflict with communication connection information of another device in the database. If it is found, in a detection process, that there is a conflict with communication connection information of another device in the database, a system sends a prompt to a user to prompt the user to replace the at least one intermediate device, so as to change the alternative identifier of the target device 300. This ensures that the alternative identifier of the target device 300 is effectively distinguished from an alternative identifier of another device in the database, thereby avoiding connection chaos caused by a same identifier. The target device 300 is usually fixedly paired with a specific intermediate device. If a fixed pairing combination of the target device 300 and the intermediate device is changed, for example, the target device 300 is replaced, the target communication connection needs to be reestablished, and steps S310 to S340 need to be performed again.

[0078] After generating the alternative identifier for the target device 300, the electronic device 200 uses the alternative identifier as the information about the target communication connection to the target device 300, and stores the alternative identifier in the database. The database stores connection information and a data record related to the target device 300.

[0079] It can be learned from the above-mentioned descriptions that when the connection is established for the first time, the electronic device 200 explicitly prompts the user (for example, the cashier in FIG. 1) that it is currently in an initial connection state. Once the electronic device

200 successfully establishes the target communication connection to the target device 300, and the connection state is stable and normal, in a subsequent use process, the user usually does not need to perform a connection operation again, thereby achieving an effect of automatically reconnecting the electronic device 200 to the target device 300.

5 **[0080]** The process of establishing target communication between the electronic device 200 and the target device 300 for the first time is described above. When the target communication connection is interrupted, for example, when the electronic device 200 is powered off and restarted or the target device 300 needs to be reconnected due to accidental disconnection, the electronic device 200 automatically makes a reconnection attempt with the target device 300 based on an
10 alternative identifier of the target device 300 that is stored last time. Specifically, the electronic device 200 performs steps S410 and S420.

[0081] S410: Read the intermediate device information of the at least one intermediate device.

[0082] S420: Obtain the alternative identifier of the target device 300 based on the intermediate device information.

15 **[0083]** Steps S410 and S420 are similar to steps S321 and S322. The electronic device 200 obtains the intermediate device information of the at least one intermediate device and generates the alternative identifier related to the target device 300.

[0084] S430: Make a comparison with last connection information of the electronic device, and reestablish the target communication connection to the target device 300 based on the
20 alternative identifier.

[0085] Before the electronic device 200 reestablishes the target communication connection to the target device 300, the electronic device 200 first reads information that is stored in the database and that is about last successful establishment of the target communication connection to the target device 300 by the electronic device 200, that is, reads the device identifier of the target device 300
25 connected to the electronic device 200 last time. The device identifier can be the alternative identifier that is related to the target device 300 and that is generated based on the intermediate device information when the electronic device 200 is connected for the first time. It can be learned from the above-mentioned descriptions that the alternative identifier is equal to the product serial number of the target intermediate device plus the device number. In the last connection information
30 obtained by the electronic device 200, there are the following three cases: In a first case, if product serial number information (SN) of the target intermediate device is missing (that is, a null value),

in this reconnection attempt process, there is no need to perform matching with the product serial number (SN) of the target intermediate device obtained this time. In a second case, if the device number is missing (is a null value), during this reconnection attempt, there is no need to perform matching with the device number obtained this time. In a third case, if both the product serial
5 number (SN) of the target intermediate device and the device number in the alternative identifier are obtained, in the reconnection attempt process, matching needs to be performed for both the two pieces of information.

[0086] If the alternative identifier obtained by the electronic device 200 in the reconnection attempt process matches an identifier of the target device 300 in the information that is about the
10 last successful establishment of the target communication connection to the target device 300, it is determined that the identifier of the target device 300 in the information is the same as the alternative identifier obtained this time. If information that needs to be matched is the same, the electronic device 200 automatically reestablishes the target communication connection to the target device 300.

[0087] The above-mentioned method is applied to the application scenario of the POS device 110 described in FIG. 1. An example in which the electronic device 200 is the POS device 110, and the target device 300 for implementing the target communication connection is the NETS machine. The POS device 110 is connected to the NETS machine through the RS-232 intermediate device, and a method for implementing an automatic reconnection to the NETS machine by the
15 POS device 110 in this specification is described.

[0088] When the POS device 110 is connected to the NETS machine for the first time, the user needs to start a procedure of establishing the target communication connection for the first time, and then the POS device 110 performs steps S310 and S330. Because the RS-232 intermediate device shields the NETS machine, the POS device 110 cannot obtain a device identifier of the
20 NETS machine, and the device identifier of the NETS machine is a product serial number (SN) of the NETS machine. That is, the POS device 110 receives, in step S310, a result of a failure in obtaining the product serial number of the NETS machine.

[0089] Further, the POS device 110 obtains intermediate device information of the RS-232 intermediate device to generate an alternative identifier related to the NETS machine. First, the
30 POS device 110 reads the intermediate device information of the RS-232 intermediate device. The intermediate device information includes at least one of a product serial number, a PID, or a VID

of the RS-232 intermediate device. The PID and the VID constitute a device number related to RS-232.

[0090] Further, the POS device 110 obtains the alternative identifier of the target device 300 based on the intermediate device information. Specifically, the POS device 110 reassembles at least one piece of information in the product serial number, the PID, or the VID obtained from the RS-232 intermediate device to generate the alternative identifier related to the target device 300. More specifically, the alternative identifier is equal to the product serial number of the RS-232 intermediate device plus the device number. Then, the connection is established for the first time by using the alternative identifier as the device identifier of the NETS machine, and the alternative identifier is stored in a database as information about the target communication connection.

[0091] Through the above-mentioned steps, the POS device 110 establishes the target communication connection to the NETS machine for the first time. In a subsequent use process, even if the target communication connection is disconnected, the user usually does not need to perform a connection operation again, thereby achieving an automatic reconnection effect between the POS device 110 and the NETS machine.

[0092] When the target communication connection is disconnected between the POS device 110 and the NETS machine, for example, when a reconnection instruction is triggered after the POS device 110 is powered off and restarted, the following content is executed again: reading the intermediate device information of the RS-232 intermediate device, obtaining, based on the intermediate device information, the alternative identifier related to the NETS machine, and reestablishing the target communication connection to the NETS machine based on the alternative identifier. After the POS device 110 obtains the alternative identifier again, matching with an identifier of the target device 300 in information about a device connected to the POS device 110 last time in the database of the POS device 110 is performed. If the alternative identifier can match the identifier of the target device 300 in the information in the database, the POS device 110 automatically reestablishes the target communication connection to the NETS machine.

[0093] Specific embodiments of this specification are described above. Other embodiments fall within the scope of the appended claims. In some cases, the actions or steps described in the claims can be performed in a sequence different from that in the embodiments and desired results can still be achieved. In addition, the process depicted in the accompanying drawings does not necessarily need a particular sequence or consecutive sequence to achieve the desired results. In

some implementations, multitasking and parallel processing are possible or may be advantageous.

[0094] In conclusion, after reading the detailed disclosure, a person skilled in the art can understand that the detailed disclosure can be presented only by using an example, and can impose no limitation. Although it is not explicitly stated herein, a person skilled in the art can understand that the requirements of this specification include various proper changes, improvements, and modifications to the embodiments. These changes, improvements, and modifications are intended to be provided in this specification, and fall within the spirit and scope of the example embodiments of this specification.

[0095] In addition, some terms in this specification are used to describe the embodiments of this specification. For example, "one embodiment", "embodiments", and/or "some embodiments" mean/means that specific features, structures, or characteristics described with reference to the embodiment can be included in at least one embodiment of this specification. Therefore, it can be emphasized and understood that two or more references to "embodiments", "one embodiment", or "alternative embodiments" in various parts of this specification do not necessarily refer to a same embodiment. In addition, specific features, structures, or characteristics can be appropriately combined in one or more embodiments of this specification.

[0096] It should be understood that in the above-mentioned descriptions of the embodiments of this specification, to help understand a feature, for the purpose of simplifying this specification, various features are combined in a single embodiment, accompanying drawing, or description thereof in this specification. However, this does not mean that a combination of these features is necessary. A person skilled in the art can completely label a part of the devices as separate embodiments when reading this specification. That is, the embodiments of this specification can also be understood as an integration of a plurality of secondary embodiments. Content of each secondary embodiment is also true when features are less than all features in one of the above-mentioned disclosed embodiments.

[0097] Each patent, patent application, publication of a patent application, and other materials, for example, articles, books, instructions, publications, documents, and products, that are cited in this specification and that are other than any document that is inconsistent or conflict with this document or that imposes limiting impact on the widest scope of the claims can be incorporated herein by reference and used for all purposes now or later associated with this document. In addition, the terms in this document shall prevail if there is any inconsistency or conflict between

the descriptions, definitions, and/or use of the related terms in any material and the descriptions, definitions, and/or use of the related terms in this document.

[0098] Finally, it should be understood that the principles of the implementation solutions of this specification are described in the implementation solutions of the application disclosed in this specification. Other modified embodiments also fall within the scope of this specification. Therefore, the embodiments disclosed in this specification are merely examples and not limitations. A person skilled in the art can use an alternative configuration according to the embodiments of this specification to implement the application in this specification. Therefore, the embodiments of this specification are not limited to the embodiments accurately described in the application.

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CLAIMS

What is claimed is:

1. A method for implementing an automatic reconnection to a target device, applied to an electronic device, wherein the electronic device implements a target communication connection to a target device through at least one intermediate device, and a unique identifier corresponding to the target device is not readable by the electronic device; and the method comprises: after the target communication connection is interrupted,
 - reading intermediate device information of the at least one intermediate device;
 - obtaining an alternative identifier of the target device based on the intermediate device information; and
 - reestablishing the target communication connection to the target device based on the alternative identifier.
2. The method according to claim 1, wherein the target device comprises at least one of a NETS machine, a POS machine, or a printer of a merchant.
3. The method according to claim 1, wherein
 - the at least one intermediate device comprises a target intermediate device; and
 - the intermediate device information is device information of the target intermediate device.
4. The method according to claim 3, wherein the target intermediate device shields a device identifier of another device that is connected to the target intermediate device on the communication link and that is on a side of the target device; or
 - the target device has no unique device identifier.
5. The method according to claim 4, wherein
 - the target intermediate device is directly connected to the target device; or
 - the target intermediate device is a device that is in the at least one intermediate device on the communication link, that is identifiable by the electronic device, and that is closest to the target device.
6. The method according to claim 3, wherein the device information comprises at least one of a product serial number, a product number, or a vendor identifier of the target intermediate device.
7. The method according to claim 6, wherein the obtaining an alternative identifier of the

target device based on the intermediate device information comprises:

combining the intermediate device information to generate the alternative identifier.

8. The method according to claim 1, wherein the reestablishing the communication connection to the target device based on the alternative identifier comprises:

5 reading information that is stored in a database and that is about last successful establishment of the target communication connection to the target device; and

determining that an identifier of the target device in the information is the same as the alternative identifier; and

reestablishing the target communication connection to the target device.

10 9. The method according to claim 1, before the reestablishing the target communication connection to the target device based on the alternative identifier, further comprising:

after the target communication connection is interrupted, automatically making a reconnection attempt with the target device based on a serial number of the target device, and receiving a reconnection failure result.

15 10. The method according to claim 1, further comprising: when the target communication connection is established for the first time,

attempting to obtain a device identifier of the target device and receiving an obtaining failure result;

obtaining the intermediate device information of the at least one intermediate device, and
20 generating the alternative identifier;

establishing the target communication connection for the first time by using the alternative identifier as the device identifier of the target device; and

storing the alternative identifier in a database as a part of information about the target communication connection.

25 11. The method according to claim 10, after the generating the alternative identifier and before the establishing the target communication connection for the first time, further comprising:

if the alternative identifier conflicts with communication connection information of another device in the database, reminding a user to replace the at least one intermediate device.

12. An electronic device, comprising:

30 at least one memory, wherein the memory stores a database and at least one group of instructions for establishing a target communication connection to a remote target device; and

at least one processor that is communicatively connected to the at least one memory, wherein when the electronic device runs, the at least one processor executes the at least one group of instructions to implement the method according to any one of claims 1 to 11.

13. A computer-readable nonvolatile storage medium, comprising and storing at least one instruction set for implementing an automatic reconnection to a device, wherein when the at least one instruction set is executed by at least one processor, the method for implementing an automatic reconnection to a target device according to any one of claims 1 to 11 is implemented.