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(54) **Title**: USB STORAGE DEVICE WITH CONFIGURABLE CLOUD SPACES

(57) **Abstract**: A USB storage device with configurable cloud space and a method for managing the USB storage device are suggested. The method comprises: accessing one or more cloud storage spaces via Internet; and presenting a user interface for a user to manage and configure a local storage space of the storage device and the one or more cloud storage spaces.

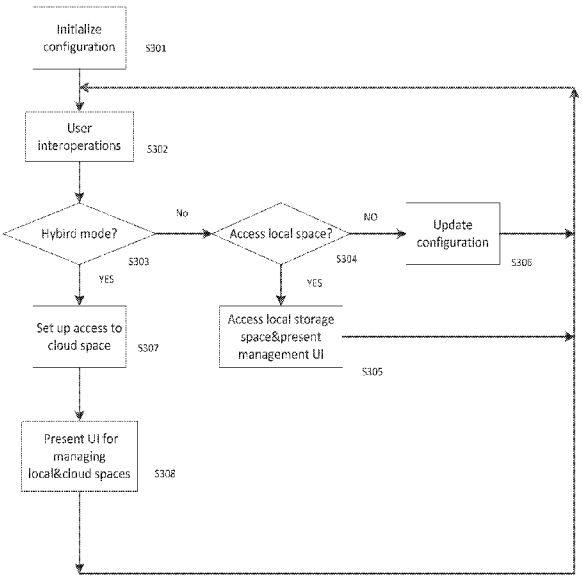


Fig.3

# USB STORAGE DEVICE WITH CONFIGURABLE CLOUD SPACES

## TECHNICAL FIELD

The present disclosure generally relates to USB storage device. In particular, the present disclosure relates to a USB storage device with configurable cloud space and a method for managing the USB storage device.

## BACKGROUND

The USB (Universal Serial Bus) standard is an industry standard developed in the mid-1990s that defines the cables, connectors and communications protocols used in a bus for connection, communication and power supply between computers and electronic devices. The USB standard has been evolved through several versions of USB1.x, USB 2.0 to USB3.0. A USB flash drive is a data storage device that includes flash storage with an integrated USB interface. The USB flash drive has several advantages over the conventional portable storage technologies, such as floppy disk and DVD. For example, the USB flash drive is typically removable and rewritable. In addition, it has relatively large capacity and can provide fast data transfer. But it will use little power, has no fragile moving parts, and for most capacities is small and light. Thus, the USB flash drive is currently very popular as mass storage device.

Cloud storage is an online data storage where the digital data is stored in logical pools which are typically owned and managed by a third party provider. Cloud storage provides several advantages over physical media storage solutions of greater accessibility and reliability, rapid deployment, strong protection for data backup, and lower overall storage cost.

Some known arts discuss the access of a USB device to a cloud storage server. For example, US patent application publication US20130282857A1 provides a cloud based storage synchronization device where a USB storage device can connect with at least one cloud storage network using a cloud storage network account.

However, there is still a need, in the case of a USB storage device accessing a cloud storage space, to configure and manage both the local and cloud storage spaces.

## SUMMARY

According to a first aspect of the disclosure, a method for managing a storage device is provided. The method comprises: accessing one or more cloud storage spaces via Internet; and presenting a user interface for a user to manage and configure a local storage space of the storage device and the one or more cloud storage spaces.

In an embodiment, the method further comprises: upon detection of the storage device connecting to an Internet access device by a USB interface, accessing the one or more cloud storage spaces via Internet.

In an embodiment, the method further comprises: accessing configuration information stored in the local storage space of the storage device for accessing the one or more cloud storage spaces via Internet.

In an embodiment, the method further comprises: presenting a user interface for a user to update the configuration information.

In an embodiment, the method further comprises: storing the configuration information as system file.

According to a second aspect of the disclosure, an storage device is provided. The apparatus comprises: a storage space; a USB interface unit configured to communicate with an external device according to USB protocol; and a processor configured to: access one or more cloud storage spaces via Internet; and present a user interface for a user to manage and configure the storage space of the storage device and the one or more cloud storage spaces.

In an embodiment, the storage device further comprises a mode switch unit configured to set whether to access the one or more cloud storage spaces via Internet.

In an embodiment, the storage device further comprises a power unit configured to adapt standard +5.0V USB power supply to the storage device.

In an embodiment, the processor is configured to access the one or more cloud storage spaces via Internet upon detection of the storage device connecting to an Internet access device by a USB interface.

In an embodiment, wherein the local storage space is stored with configuration information for accessing the one or more cloud storage spaces via Internet.

According to a third aspect of the present disclosure, there is provided a computer program product downloadable from a communication network and/or recorded on a medium readable by computer and/or executable by a processor, comprising program code instructions for implementing the steps of a method according to the first aspect of the disclosure.

According to a fourth aspect of the present disclosure, there is provided Non-transitory computer-readable medium comprising a computer program product recorded thereon and capable of being run by a processor, including program code instructions for implementing the steps of a method according to the first aspect of the disclosure.

It is to be understood that more aspects and advantages of the disclosure will be found in the following detailed description of the present disclosure.

## BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings are included to provide further understanding of the embodiments of the disclosure together with the description which serves to explain the principle of the embodiments. The disclosure is not limited to the embodiments.

In the drawings:

Figure 1 is an exemplary block diagram showing the architecture of a USB storage device with configurable cloud spaces according to an embodiment of the disclosure;

Figure 2 is a block diagram showing the hardware structure of a USB storage device according to an embodiment of the disclosure;

Figure 3 is flowchart showing the operation of the USB storage device according to an embodiment of the disclosure;

Figure 4 is a block diagram showing the software structure of the USB storage device for accessing the cloud storage spaces according to an embodiment of the disclosure;

Figure 5 is an exemplary diagram showing a user interface for a USB storage device to provide a local storage space and two extended cloud spaces according to an embodiment of the disclosure; and

Figure 6 is an exemplary diagram showing a user interface for a USB storage device to configure and maintain the index information to access cloud storage spaces according to an embodiment of the disclosure.

## DETAILED DESCRIPTION

An embodiment of the present disclosure will now be described in detail in conjunction with the drawings. In the following description, some detailed descriptions of known functions and configurations may be omitted for conciseness.

Figure 1 is an exemplary block diagram showing the architecture of a USB storage device with configurable cloud spaces according to an embodiment of the disclosure.

A USB drive according to the embodiment of the disclosure has two types of storage spaces: one or more normal local memories and one or more extended storage spaces that can access cloud storage services through Internet connection. In this sense, the USB drive according to the embodiment of the disclosure is a hybrid USB storage device. As shown in Figure 1, an example of the hybrid USB storage device according to an embodiment of the disclosure has one local storage space and a plurality of cloud storage spaces #1 to #n. The cloud storage spaces can be either public or private. It can be appreciated that a public cloud is owned and operated by a third-party service providers. A private cloud is built exclusively for an individual enterprise. Usually a public cloud is typically larger in scale than a private cloud, while a private cloud has better security protections and more availability variances.

The hybrid USB storage device can be connected, through a USB interface, with an Internet access device which is capable of providing Internet access to other

devices, including a USB storage device. The Internet access device can be a personal computer, a laptop, a mobile communication device, a PDA or a pad. In Figure 1, a personal computer is shown as an example of the Internet access device. The above-mentioned USB interface can be a USB2.0/3.0 interface. According to the embodiment of the disclosure, on one hand, the local storage USB storage device is always available through the USB2.0/3.0 interface. On the other hand, either public or private cloud storage spaces can be accessed through the Internet access provided by Internet access device based on a configured information index. The configured information index can be a list of addresses, user names and passwords for setting up the link to specific cloud storage resources. The configured information index is a part of the configuration data, which can be saved and maintained in the local storage space. Accordingly, a user can access all of the storage spaces, including the local and the remote cloud spaces, as long as the computer is connected to Internet and services properly.

According to an embodiment of the disclosure, a hybrid USB storage device provides not only storage spaces from its own hardware, but also on-line cloud spaces according to configured information in the USB drive.

A user interface can be provided for the user to configure and manage the the local and cloud storage spaces. In this embodiment, the user interface is presented by the Internet access device, for example, a personal computer.

Figure 2 is a block diagram showing the hardware structure of a USB storage device according to an embodiment of the disclosure.

As shown in Figure 2, the USB storage device 200 comprises a storage space 201 for storing data and information. The storage space 201 is the above-mentioned local storage space of the USB storage device 200. The storage space 201 can be implemented by a NAND flash memory. MLC and SLC series manufactured respectively by Micron and Spansion can be used.

The storage space 201 stores therein the configuration information which includes the Internet location of the cloud storage space of the USB storage device 200 and security verification data, such as user name & password. The configuration information can be stored in the storage space 201 as a system file which is hidden

and effectively protected from the possible misoperation of the user. It is important to obtain, manage, read and write the configuration information in a security manner. It can be appreciated that all these information is input through a user interface and then managed as a list of recording items. The information is properly written in a specifically defined system file and stored and can be read out to configure the Internet connection.

The USB storage device 200 comprises a USB interface unit 202 to communicate with external devices. The USB interface unit 202 transfers a local storage bus to a standard USB differential bus in order to be in compliance with the USB2.0/3.0 specification.

As for the implementation, a USB1210 stand-alone transceiver IC provided by for example Texas Instruments can be used as the USB interface unit 202.

The USB storage device 200 comprises a mode switch unit 203 to select the operation mode of the USB storage device 200. In an example, the operation mode can comprise a hybrid mode which offers both local and remote cloud storage spaces and a normal mode which only provides a local storage space. A user interface can be provided to the user for setting the mode. The mode switch unit 203 can be a hardware component, such as a switch or a push button. The mode switch unit 203 can also be implemented by a software flag kept in configuration files under USB root folder. Based on its status, a specific mode can be set in effective.

The USB storage device 200 comprises a controller 204 that accesses the local storage space to configure and manage the USB storage device 200 according to the configuration information.

The controller 204 can be implemented by a microcontroller or a specific-purpose processor. A typical microcontroller or a specific-purpose processor which can be used in this embodiment includes but is not limited to Atmel C51 series, Winbond's C51 series. In another implementation, a specific-purpose chip silicon, such as i5128 of iCreate, can used to integrate the controller 204 and the USB interface unit 202.

The USB storage device 200 also comprises a power unit 205 to adapt standard +5.0V USB power supply to all the hardware components described above. A LDO

(low dropout regulator), such as Linear's LT1761 - 100mA, low noise LDO micropower regulator, can be used as the power unit 204. The power unit 205 is needed if a different power supply is needed other than +5.0V from the USB interface unit 202.

Next, the operation of the USB storage device 200 will be described in details.

Figure 3 is flowchart showing the operation of the USB storage device according to an embodiment of the disclosure.

As shown in Figure 3, at step S301, the controller 204 starts to initialize the configuration of the USB storage device 200 by reading out the configuration information from the storage space 201. For example, the configuration can be done upon the connecting of the USB storage device 200 to an Internet access device. The configuration can comprise initializing the USB interface unit 202, reading out configuration information from the storage space 201, detecting available Internet service, and setting up a usable link to cloud storages. Specifically, the configuration information can include Internet locations of the cloud storage spaces and security verification data, such as user name&password. The configuration information is read out and obtained from the specific system file. The Internet locations of the cloud storage spaces are applied to set up their Internet connection. And the user name and password are transferred to have proper authorization to cloud resources. Data channels are set up to transfer useful data between remote cloud spaces and a user interface. The above process can be implemented through file open/read/write operations under operation systems such as Windows, Linux, iOS and Android.

At step S302, data are transmitted between the USB interface unit 202, the storage space 201 (the local storage) and one or more remote cloud spaces according to user-computer interoperations. Data in either the cloud spaces or local storage space 201 can be presented to the user.

At step S303, it determines whether the USB storage device 200 is to be operating in the hybrid mode. The determination can be made according to the output of the mode switch unit 203. If the determination result of the step S303 is "No", then the proceedings goes to step S304, wherein it determines whether the

access to local storage space is needed. Similarly, the determination can be made according to the output of the mode switch unit 203.

If the determination result of the step S304 is "Yes", then at step S305, it accesses data of the local storage space 201. The access to the local storage space 201 can be implemented by applying standard USB drivers and protocol stacks. More specifically, USB drivers adapt the hardware and internal registers of the USB interface unit 202 to operation systems running on the Internet access device (for example, a computer). Therefore, the USB storage device 200 is recognized and accessed in proper speed and transportation mode. Upper USB protocol stacks implement host-device API functions based on lower USB driver and access the local storage space.

Under the control of the controller 204, a user interface can be presented by the USB interface unit 202 to the user for managing the data of the local storage space 201. For example, according to the input and operation of an user, corresponding locations are modified, passwords are modified and maintained. The user interface can be presented on the Internet access device. If the determination result of the step S304 is "No", then at step S306, the configuration information can be updated. All the configuration data can be written in the specific system file for management use.

If the determination result of the step S303 is "Yes", then the proceedings goes to step S307, wherein an access to the local storage space and the one or more cloud spaces is set up.

Figure 4 is a block diagram showing the software structure of the USB storage device 200 for accessing the cloud storage spaces according to an embodiment of the disclosure.

In the lowest physical layer of the OSI (Open Systems Interconnection) model, the host machine, such as a computer, access the hybrid USB drive through standard USB-DEVICE hardware interface. All the data transactions are compliant with USB specifications according to compliant interface ICs.

In the upper protocol layers, Bulk-Only Transmission Protocol is implemented to make appropriate data transfer (In, Out or none) with the local storage space 201.

Sockets are used to set up connection to access Internet reaching cloud storage resources sand in parallel SCSI/UFI/RBC commands are applied to realize operations to Read/Write sectors from the USB drive.

In the top layer, HTTP protocol is implemented to access cloud storage resources , and FAT32/16 file system is applied as well.

In the top layer, the user interface which is implemented with file API interface is applied. Through the user interface, a user can access and operate local and remote cloud spaces as well as manage configuration information.

The controller 204 can read from and write into the local storage space 201 through the USB interface unit 202 (USB HOST-DEVICE interface) in compliance with the USB transmission protocols.

The controller 204 maintains a connection to the Internet by means of API sockets, accesses storage from cloud storages with HTTP, TCP/IP protocols applied. Data transmissions are between the software, remote cloud storages and hybrid USB drive, i.e. the software sets up Internet data connection and channel, transfers data between computer and cloud storage spaces. In parallel it maintains configuration information on the USB storage device 200.

Hypertext Transfer Protocol (HTTP) is an application protocol for distributed, collaborative, hypermedia information systems. HTTP is the foundation of data communication for the World Wide Web.

Transmission Control Protocol (TCP) and the Internet Protocol (IP) are most important communications protocols defining Internet computer networking model used on the Internet and similar computer networks. TCP/IP provides end-to-end connectivity specifying how data should be packetized, addressed, transmitted, routed and received at the destination. This functionality is organized into four abstraction layers which are used to sort all related protocols according to the scope of networking involved.

Please refer back to Figure 3, at step S308, under the control of the controller 204, a user interface can be presented by the USB interface unit 202 to the user for managing the data of the local storage space 201 and the one or more cloud spaces.

For example, the user interface is presented on the Internet access device for the user to access and manage the local and cloud storage spaces. It also presents and operates available spaces of both local and remote cloud memories. The user interface can offer interoperation to the user by a graphic menu, manage input/output windows and work as a transparent data accessing channel. It can comprise a series of popup menu, dialogue windows. The user interface can be implemented through user-machine input/output and file operations under operation systems such as Windows, Linux, iOS and Android. For instance, Windows' dialog boxes work to interact with user presenting information and get users' input. Windows' file management API functions "CreateFile", "OpenFile", "ReadFile", "WriteFile" work to create, open, read and save related information to local USB storage as system files.

Figure 5 is exemplary diagram showing a user interface for a USB storage device to provide a local storage space and two extended cloud spaces according to an embodiment of the disclosure.

As shown in Figure 5, an example is shown that the USB storage device 200 provides a local USB space and two extended cloud spaces as below.

1) Local USB space;

2) Extended cloud space #1 - https://developers.google.com/storage/, Google Cloud Storage) ;

3) Extended cloud space #2 - http://www.aliyun.com/, Ali Cloud Storage.

From the user interface shown in Figure 5, totally three memory spaces of the USB storage device 200 of an embodiment of the disclosure are presented, which include a local storage space and two remote cloud ones. The local space is folder F and has total 3.72G Bytes size of memory. The two cloud storage spaces include extended cloud space #1 with 100G Bytes size of Google Cloud storage and extended cloud space #2 with 499G Bytes size of Ali Cloud storage.

With the USB storage device 200 according to an embodiment of the disclosure, the user can access all the three spaces either locally or remotely.

Under the control of the controller 204, a user interface can be presented for the user to configure and maintain index information to access cloud storage spaces.

The user interface can be implemented through user-machine input/output and file operations under operation systems such as Windows, Linux, iOS and Android.

Figure 6 is exemplary diagram showing a user interface for a USB storage device to configure and maintain the index information to access cloud storage spaces according to an embodiment of the disclosure.

As shown in Figure 6, an example of user interface is shown that can be used to configure and maintain index information to access cloud storage spaces. In this case, a pop up menu implements the configuration operations: Add Cloud Space, Remove Cloud Space, Availability of Cloud, etc.

With the user interface shown in Figure 6, a user can operate the hybrid USB storage device 200 by popup menu, from which the user can select related items to operate storage data, check availability of clouds, add or remove cloud spaces and so on. For instance, detailed storage content is to be presented when user selects to “open” the drive.

With the user interfaces of Figures 5 and 6, the local and cloud storage spaces can be managed flexibly.

It is to be understood that the present disclosure may be implemented in various forms of hardware, software, firmware, special purpose processors, or a combination thereof. Moreover, the software is preferably implemented as an application program tangibly embodied on a program storage device. The application program may be uploaded to, and executed by, a machine comprising any suitable architecture. Preferably, the machine is implemented on a computer platform having hardware such as one or more central processing units (CPU), a random access memory (RAM), and input/output (I/O) interface(s). The computer platform also includes an operating system and microinstruction code. The various processes and functions described herein may either be part of the microinstruction code or part of the application program (or a combination thereof), which is executed via the operating system. In addition, various other peripheral devices may be connected to the computer platform such as an additional data storage device and a printing device.

It is to be further understood that, because some of the constituent system components and method steps depicted in the accompanying figures are preferably

implemented in software, the actual connections between the system components (or the process steps) may differ depending upon the manner in which the present disclosure is programmed. Given the teachings herein, one of ordinary skill in the related art will be able to contemplate these and similar implementations or configurations of the present disclosure.

## CLAIMS

1. A method, comprising, at the level of a storage device,

accessing one or more cloud storage spaces via Internet; and

presenting a user interface for a user to manage and configure a local storage space of the storage device and the one or more cloud storage spaces.

2. Method according to claim 1, further comprising

upon detection of the storage device connecting to an Internet access device by a USB interface, accessing the one or more cloud storage spaces via Internet.

3. Method according to claim 2, further comprising

accessing configuration information stored in the local storage space of the storage device for accessing the one or more cloud storage spaces via Internet.

4. Method according to claim 3, further comprising

presenting a user interface for a user to update the configuration information.

5. Method according to claim 3, further comprising

storing the configuration information as system file.

6. A storage device (200), comprising:

a storage space (201);

a USB interface unit (202) configured to communicate with an external device according to USB protocol; and

a processor (204) configured to:

access one or more cloud storage spaces via Internet; and

present a user interface for a user to manage and configure the storage space(201) of the storage device(200) and the one or more cloud storage spaces.

7. The storage device (200) according to claim 6, further comprising a mode switch unit (203) configured to set whether to access the one or more cloud storage spaces via Internet.

8. The storage device (200) according to claim 6, further comprising

a power unit (205) configured to adapt standard +5.0V USB power supply to the storage device (200).

9. The storage device (200) according to claim 6, wherein the processor (204) is configured to access the one or more cloud storage spaces via Internet upon detection of the storage device connecting to an Internet access device by a USB interface.

10. The storage device (200) according to claim 6, wherein the local storage space (201) is stored with configuration information for accessing the one or more cloud storage spaces via Internet.

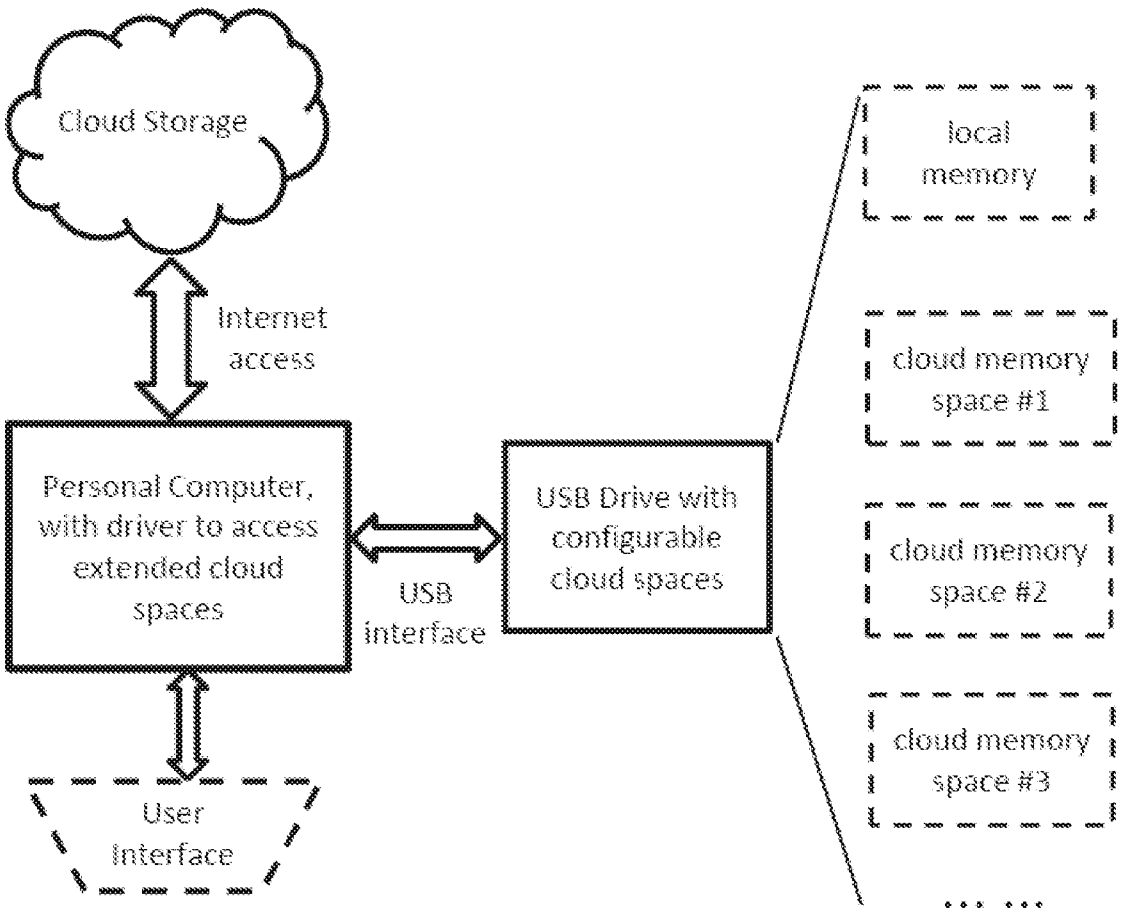
Cloud Storage
Internet access
Personal Computer, with driver to access extended cloud spaces
USB interface
USB Drive with configurable cloud spaces
User Interface
local memory
cloud memory space #1
cloud memory space #2
cloud memory space #3
... ...

Fig.1

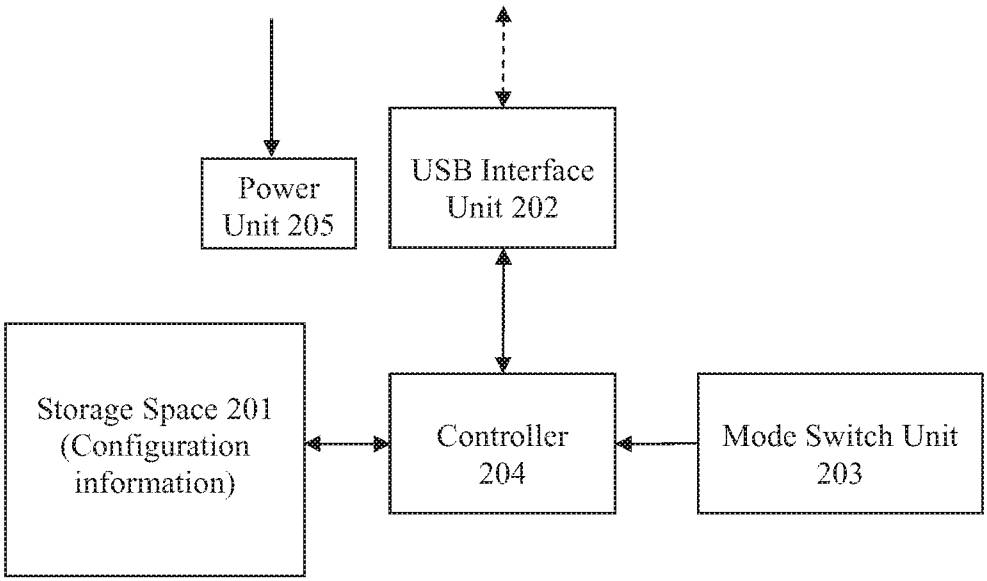
Power Unit 205
USB Interface Unit 202
Storage Space 201 (Configuration information)
Controller 204
Mode Switch Unit 203
200

Fig.2

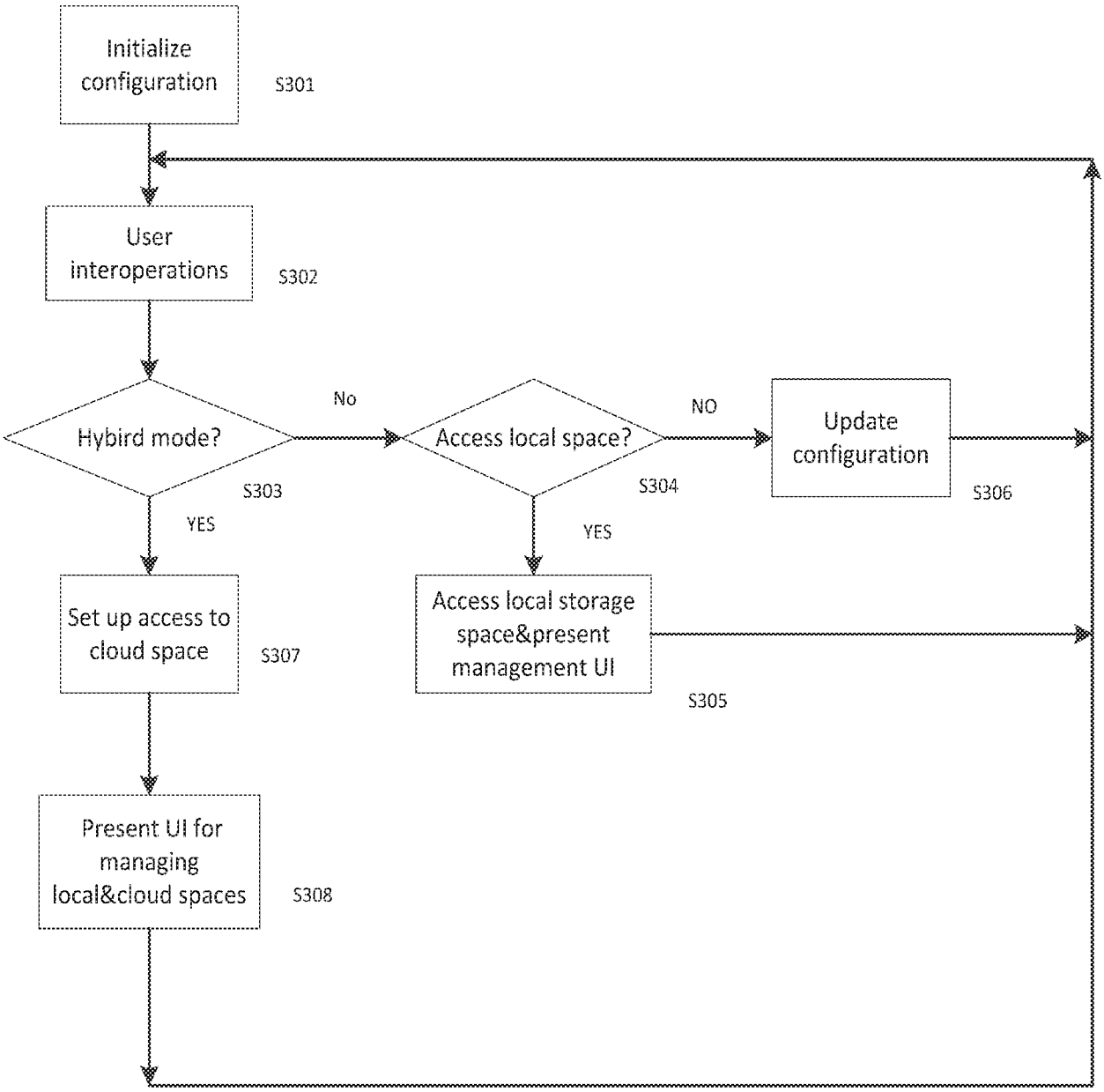
Initialize configuration
S301
User interoperations
S302
Hybird mode?
S303
No
Access local space?
S304
NO
Update configuration
S306
YES
YES
Set up access to cloud space
S307
Access local storage space&present management UI
S305
Present UI for managing local&cloud spaces
S308

Fig.3

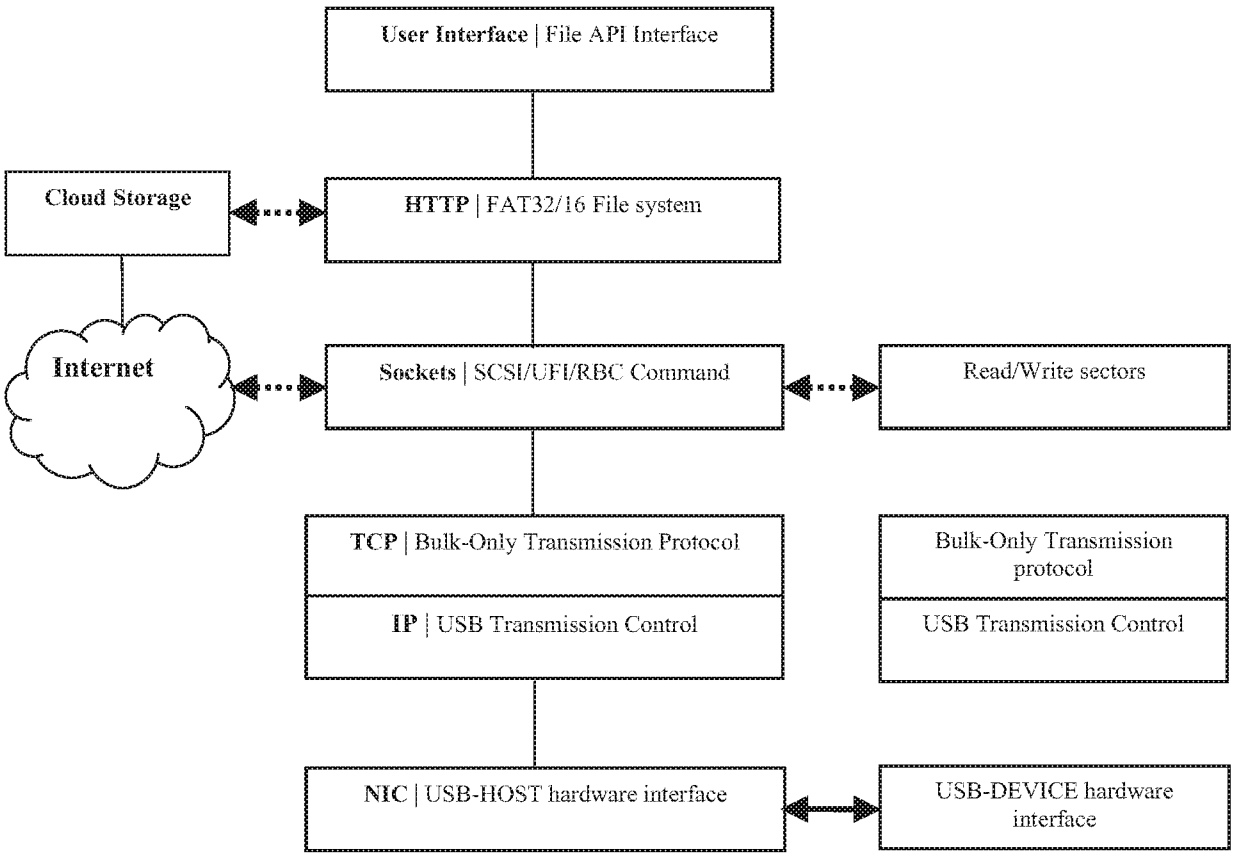
User Interface | File API Interface
Cloud Storage
HTTP | FAT32/16 File system
Internet
Sockets | SCSI/UFI/RBC Command
Read/Write sectors
TCP | Bulk-Only Transmission Protocol
IP | USB Transmission Control
Bulk-Only Transmission protocol
USB Transmission Control
NIC | USB-HOST hardware interface
USB-DEVICE hardware interface

Fig.4

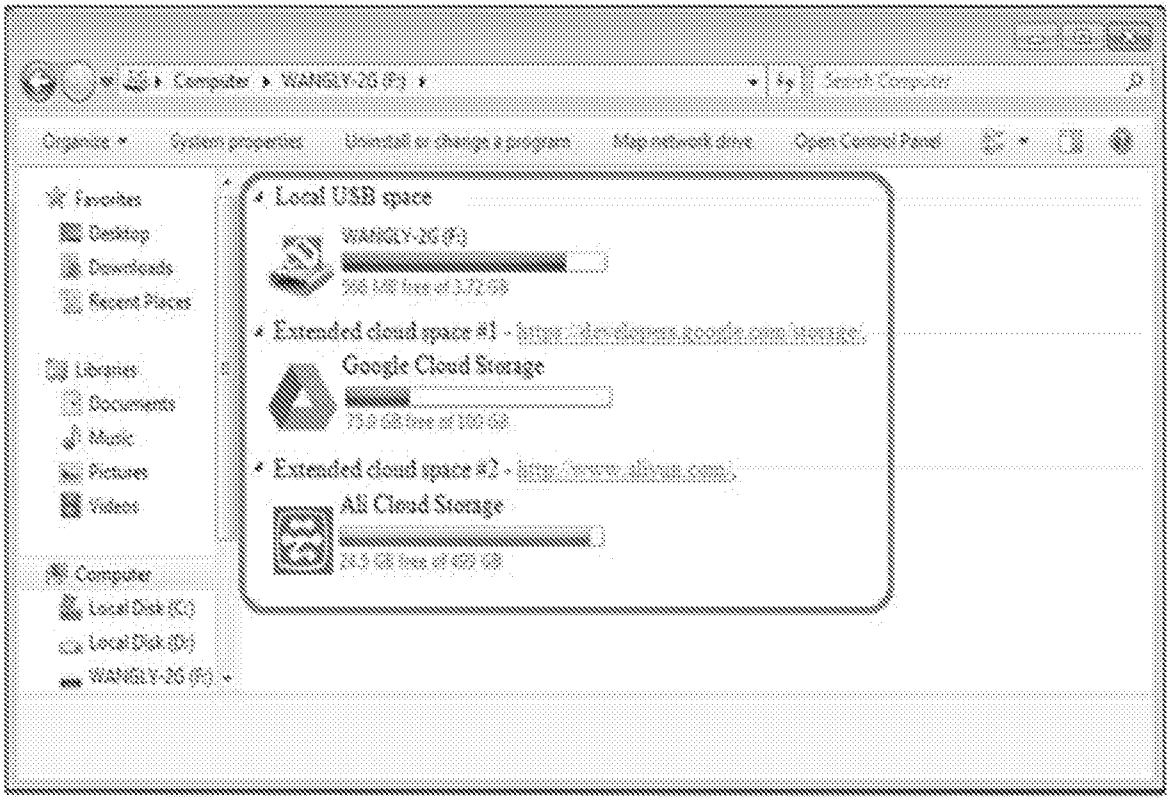
Computer
Organize
System properties
Uninstall or change a program
Map network drive
Open Control Panel
Favorites
Desktop
Downloads
Recent Places
Libraries
Documents
Music
Pictures
Videos
Computer
Local Disk (C:)
Local Disk (D:)
Local USB space
Extended cloud space #1 -
Google Cloud Storage
Extended cloud space #2 -
All Cloud Storage

Fig.5

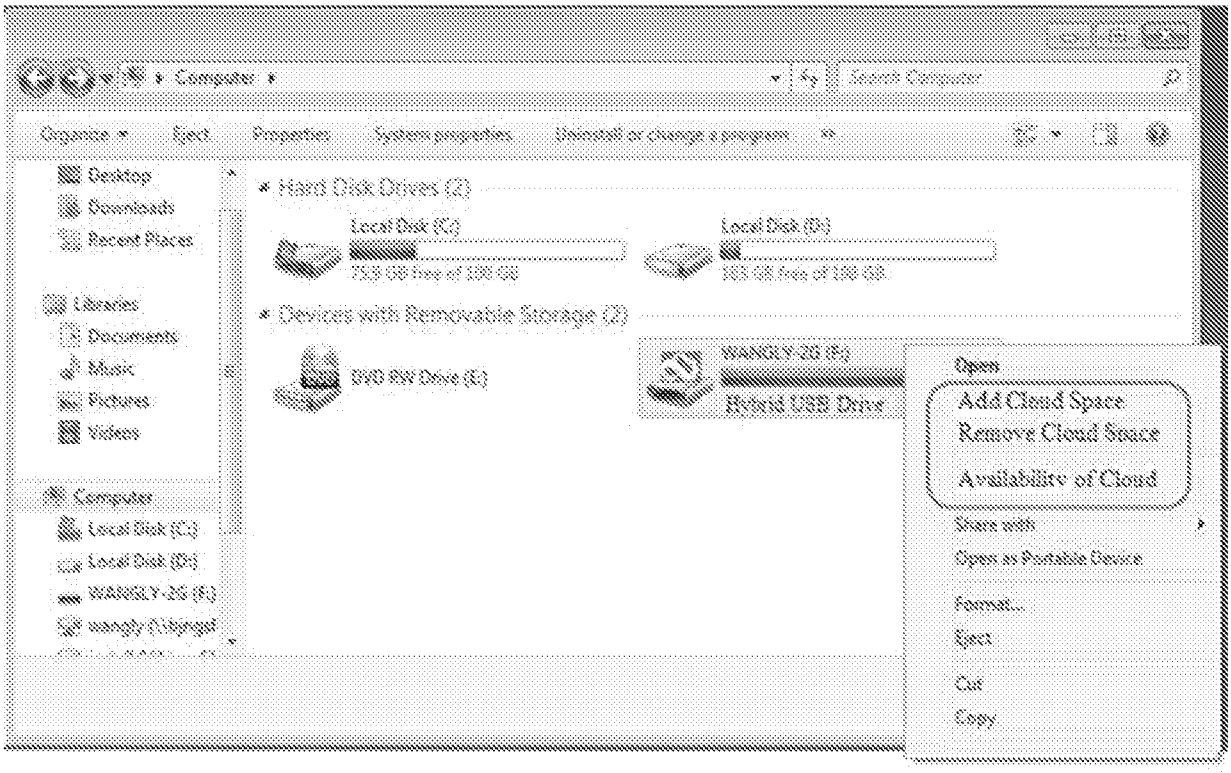
Computer
Search Computer
Organize
Eject
Properties
System properties
Uninstall or change a program
Desktop
Downloads
Recent Places
Libraries
Documents
Music
Pictures
Videos
Computer
Local Disk (C:)
Local Disk (D:)
Hard Disk Drives (2)
Local Disk (C:)
Local Disk (D:)
Devices with Removable Storage (2)
DVD RW Drive (E:)
Open
Add Cloud Space
Remove Cloud Space
Availability of Cloud
Share with
Open as Portable Device
Format...
Eject
Cut
Copy

Fig.6

# INTERNATIONAL SEARCH REPORT

International application No.
**PCT/CN2014/094780**

## A. CLASSIFICATION OF SUBJECT MATTER

G06F 12/00(2006.01)i; G06F 13/38(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G06F; H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNABS;CNKI;EPODOC;WPI:internet, USB, usb, "thomson licensing", USER, SPACE, LOCAL, USER, technicolor, UI, CLOUD, INTERFACE, STORAGE

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | CN 103984664 A (XIAOMI TECHNOLOGY CO., LTD.) 13 August 2014 (2014-08-13)<br>description paragraphs 0078-0080, 0091-0100, figures 2 and 5 | 1-10 |
| A | CN 104021451 A (JIANGSU YIHE DACHENG NETWORK TECHNOLOGY) 03 September 2014 (2014-09-03)<br>the whole document | 1-10 |
| A | CN 103581001 A (SHENZHEN ZHONGXING MOBILE COMMUNICATION) 12 February 2014 (2014-02-12)<br>the whole document | 1-10 |
| A | CN 102930227 A (MICROSOFT CORP.) 13 February 2013 (2013-02-13)<br>the whole document | 1-10 |

☐ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

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|---|---|
| **28 August 2015** | **11 September 2015** |
| Name and mailing address of the ISA/CN<br>**STATE INTELLECTUAL PROPERTY OFFICE OF THE P.R.CHINA**<br>**6, Xitucheng Rd., Jimen Bridge, Haidian District, Beijing 100088, China**<br>Facsimile No. **(86-10)62019451** | Authorized officer<br>**ZENG,Wei**<br>Telephone No. **(86-10)62411695** |

**INTERNATIONAL SEARCH REPORT**
**Information on patent family members**

International application No.
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| Patent document cited in search report | | | Publication date (day/month/year) | Patent family member(s) | | | Publication date (day/month/year) |
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