How to Correct the Missing Device Names of PCI and USB Devices under Linux

Planning / Implementation

Missing/incomplete device names can cause misunderstanding and suspicion for customers. This section will explain the origin of device name clearly and provide the solution accordingly.

PCI device names

In this section, we provide a guide to introduce the origin of the name about PCI device and how to correct the missing name definition in Linux OSes.

- PCI ID Repository
- Finding the PCI device name
- Modifying the PCI device name

PCI ID Repository

There is an open-source project: The PCI ID Repository, which is a public repository of all known IDs used in PCI devices: IDs of vendors, devices, subsystems and device classes for various programs (e.g., The PCI Utilities) to display full human-readable names instead of hexadecimal code. Everyone can browse the latest database and download the latest database in form of a pci.ids file.

For different Linux distributions, there may have multiple pci.ids files in your operating system in different locations. To find out the actual pci.ids you are using, you need to install a debugging tool named `strace`.

1. Install the strace tool.

Figure 1. Install strace

2. Execute strace command with lspci commands. The following screenshot indicates that the database is located in /usr/share/pci.ids.

```
Naming:~ # strace lspci 2>&1 | grep "pci.ids"
openat(AT_FDCWD, "/usr/share/pci.ids.gz", O_RDONLY) = -1 ENOENT (No such file or directory)
openat(AT_FDCWD, "/usr/share/pci.ids", O_RDONLY) = 4
Naming:~ #
```
Figure 2. Running strace to find pci.ids files

Finding the PCI device name

Each PCI device typically has a vendor & device ID indicating the chip and a subvendor & subdevice ID (collectively called subsystem) indicating the board on which the chip resides. There should be one line for each device vendor & device ID and subsystem ID in the naming file. You can get the device information with the steps below:

1. Grab the device domain information (The first column of output is domain). We will use "5b:00.0" for the example:

```
Naming:~ # lspci

00:00.0 Host bridge: Intel Corporation Sky Lake-E DMI3 Registers (rev 05)
00:05.2 System peripheral: Intel Corporation Sky Lake-E RAS (rev 05)

......

5b:00.0 Serial Attached SCSI controller: Broadcom / LSI SAS3408 Fusion-MPT Tri-Mode I/O
Controller Chip (IOC) (rev 01)
```
Figure 3. Get the device domain information

2. Get the vendor and device ID and subsystem information.

```
Naming:~ # lspci -mns 5b:00.0 -v
Device: 5b:00.0
Class:  0107
Vendor: 1000
Device: 00af
SVendor:        1d49
SDevice:        0200
PhySlot:        2
Rev:    01
NUMANode:       0

Naming:~ #
```
Figure 4. Get the vendor and device ID and subsystem information

3. Check the name definition in your OS.

```
Naming:~ # cat /usr/share/pci.ids | grep -E "^1000 |00af|^1d49|1d49 0200"
1000   Broadcom / LSI
        00af   SAS3408 Fusion-MPT Tri-Mode I/O Controller Chip (IOC)
        00af   Capture slave device
1d49   Lenovo
Naming:~ #
```
Figure 5. Checking the database

Based on the above output, vendor id (1000), device id (00af) and subvendor id are available in the database while subdevice id is not available.

```
Naming:~ # lspci -s 5b:00.0 -v |head -n2
5b:00.0 Serial Attached SCSI controller: Broadcom / LSI SAS3408 Fusion-MPT Tri-Mode I/O Controller Chip (IOC) (rev 01)
        Subsystem: Lenovo Device 0200
Naming:~ #
```

Figure 6. Determine the current name of the device

Modifying the PCI device name

There are two alternatives to updating the PCI device name.

The easiest way is to run the `update-pciids` command if the missing data is available in PCI ID repository. This requires your machine to be able to access the Internet. The following screenshot shows the subdevice information available after the database is updated from the Internet.

```
Naming:~ # update-pciids
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100  283k 100  283k    0     0   202k       0  0:00:01 0:00:01 --:--:--  202k
Done.
Naming:~ #
Naming:~ # lspci -s 5b:00.0 -v | head -n2
5b:00.0 Serial Attached SCSI controller: Broadcom / LSI SAS3408 Fusion-MPT Tri-Mode I/O Controller Chip (IOC) (rev 01)
        Subsystem: Lenovo ThinkSystem 430-8i SAS/SATA 12Gb HBA
Naming:~ # cat /usr/share/pci.ids | grep -E "^1000 |00af|^1d49|1d49 0200"
1000  Broadcom / LSI
        00af  SAS3408 Fusion-MPT Tri-Mode I/O Controller Chip (IOC)
                1d49 0200  ThinkSystem 430-8i SAS/SATA 12Gb HBA
        00af  Capture slave device
1d49  Lenovo
Naming:~ #
```

Figure 7. Using update-pciids to update the device name

If your system doesn't have internet access then you can manually update the database. If PCI ID repository does not include a device ID, please consult the device vendor and add one-line information to the database.

Open the pci.ids file using the vi/vim commands, find the line of device ID "00af" and add the definition of subdevice ID below, then save it.

```
00ae  SAS3508 Fusion-MPT Tri-Mode RAID On Chip (ROC)
00af  SAS3408 Fusion-MPT Tri-Mode I/O Controller Chip (IOC)  Device ID definition
        1d49 0200  ThinkSystem 430-8i SAS/SATA 12Gb HBA  Add sub device ID definition
        1000 3010  HBA 9400-8i
```

Figure 8. Adding the new device name

USB device names

In this section, we provide a guide to introduce the origin of the name of USB device and how to correct it to the expected name in Linux OSes.

- USB ID Repository
- Finding the USB device name
- Modifying the USB device name

USB ID Repository

There is an open-source project: The USB ID Repository, which is a public repository of all known ID's used in USB devices: ID's of vendors, devices, subsystems and device classes. It is used in various programs (e.g., The USB Utilities) to display full human-readable names instead of hexadecimal codes. Everyone can browse the latest database list and download the latest database in form of a usb.ids file.

For the early build of USB Utilities (lsusb), which uses the file usb.ids directly for USB device naming, we can use the tool "strace" to locate the path to USB database (usb.ids) in Ubuntu 18.04:

```
root@usb-ids:~# strace lsusb 2>&1 | grep -E "hwdb.bin|usb.ids"
openat(AT_FDCWD, "/var/lib/usbutils/usb.ids", O_RDONLY) = 3
```

Figure 9. Use strace to locate the usb.ids file

Note that the database usb.ids is not used anymore since Sep 30, 2019.Instead, udev hardware database is used.

```
root@usb:~# strace lsusb 2>&1 | grep -E "hwdb.bin|usb.ids" |grep -v "ENOENT"
openat(AT_FDCWD, "/lib/udev/hwdb.bin", O_RDONLY|O_CLOEXEC) = 3
root@usb:~#
```

Figure 10. Using strace to locate the hwdb.bin file

According to the output of the command "man hwdb", hwdb.bin is generated after systemd-hwdb reads all the */hwdb.d/*.hwdb. The file "20-usb-vendor-model.hwdb" is for the USB device naming file imported from: http://www.linux-usb.org/usb.ids.

Thus, all the USB names always come from USB ID Repository in different ways.

Finding the USB device name

Each USB device typically has a vendor & device ID indicating the chip. There should be one line for vendor & device ID about each device in the naming file. You can get the device information with the steps below:

1. Grab the USB device ID (After the keyword "ID").
    ```
    usb:~ # lsusb
    Bus 002 Device 001: ID 1d6b:0003 Linux Foundation 3.0 root hub
    Bus 001 Device 004: ID 04b3:4010 IBM Corp.
    Bus 001 Device 002: ID 2a4b:0400
    Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
    usb:~ #
    ```
    Figure 11. Get the USB device ID

2. Check the definition about vendor & device ID "2a4b:0400" and "1d6b:0003" in the file /lib/udev/hwdb.d/20-usb-vendor-model.hwdb and usb.ids.

Figure 12. Check the USB device definition (udev hardware database)

The above is about the format of the udev hardware database. The following image shows the format of usb.ids:

Figure 13. Check the USB device definition (usb.ids file)

There is no information about vendor 2a4b in either usb.ids or hardware database.

Modifying the USB device name

The process to modify the USB device name depends on the USB database:

For original usb.ids naming: Run the `update-usbids` command if the missing data is available in USB ID repository. This requires your machine to be access the Internet. The following screenshot shows the vendor and device information available after the database is updated from the Internet.

Figure 14. update-usbids command

For udev hardware database naming, find out the standard definitions in the USB ID repository and add them to file /lib/udev/hwdb.d/20-usb-vendor-model.hwdb, for example below:

Figure 15. Updating the device name with the udev database

The following screenshot shows the vendor and device information available after rebuilding the file hwdb.bin.

Figure 16. Checking the updated name

Note: If USB ID repository does not include a vendor/device ID, please consult the device vendor and add one-line information to the database.

Author

Song Shang is a Linux Engineer in Lenovo Infrastructure Solutions Group, based in TianJin, China.

Related product families

Product families related to this document are the following:

- Red Hat Enterprise Linux
- SUSE Linux Enterprise Server

Notices

Lenovo may not offer the products, services, or features discussed in this document in all countries. Consult your local Lenovo representative for information on the products and services currently available in your area. Any reference to a Lenovo product, program, or service is not intended to state or imply that only that Lenovo product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any Lenovo intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any other product, program, or service. Lenovo may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

Lenovo (United States), Inc.
8001 Development Drive
Morrisville, NC 27560
U.S.A.
Attention: Lenovo Director of Licensing

LENOVO PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some jurisdictions do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. Lenovo may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

The products described in this document are not intended for use in implantation or other life support applications where malfunction may result in injury or death to persons. The information contained in this document does not affect or change Lenovo product specifications or warranties. Nothing in this document shall operate as an express or implied license or indemnity under the intellectual property rights of Lenovo or third parties. All information contained in this document was obtained in specific environments and is presented as an illustration. The result obtained in other operating environments may vary. Lenovo may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Any references in this publication to non-Lenovo Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this Lenovo product, and use of those Web sites is at your own risk. Any performance data contained herein was determined in a controlled environment. Therefore, the result obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

This document, LP1704, was created or updated on March 4, 2023.

Send us your comments in one of the following ways:

- Use the online Contact us review form found at:
  https://lenovopress.lenovo.com/LP1704
- Send your comments in an e-mail to:
  comments@lenovopress.com

This document is available online at https://lenovopress.lenovo.com/LP1704.

Trademarks

Lenovo and the Lenovo logo are trademarks or registered trademarks of Lenovo in the United States, other countries, or both. A current list of Lenovo trademarks is available on the Web at https://www.lenovo.com/us/en/legal/copytrade/.

The following terms are trademarks of Lenovo in the United States, other countries, or both:
Lenovo®
ThinkSystem®

The following terms are trademarks of other companies:

Linux® is the trademark of Linus Torvalds in the U.S. and other countries.

Other company, product, or service names may be trademarks or service marks of others.