

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.

```
Naming:~ # zypper install -y strace
Refreshing service 'Basesystem_Module_x86_64'.
Refreshing service 'Desktop_Applications_Module_x86_64'.
Refreshing service 'Development_Tools_Module_x86_64'.
Refreshing service 'SUSE_Linux_Enterprise_Server_x86_64'.
Refreshing service 'SUSE_Package_Hub_x86_64'.
Refreshing service 'Server_Applications_Module_x86_64'.
Loading repository data...
Reading installed packages...
Resolving package dependencies...

The following NEW package is going to be installed:
  strace

1 new package to install.
Overall download size: 396.1 KiB. Already cached: 0 B. After the operation, additional 1.5 MiB will be used.
Continue? [y/n/v/...? shows all options] (y): y
Retrieving package strace-5.3-1.44.x86_64 (1/1), 396.1 KiB ( 1.5 MiB unpacked)
Retrieving: strace-5.3-1.44.x86_64.rpm .....[done (78.4 KiB/s)]

Checking for file conflicts: .....[done]
(1/1) Installing: strace-5.3-1.44.x86_64 .....[done]
Naming:~ #
```

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 (`lusb`), 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.

```

usb:~ # grep -Ei -A1 "1d6b|2a4b" /lib/udev/hwdb.d/20-usb-vendor-model.hwdb
usb:v1D6B*
  ID_VENDOR_FROM_DATABASE=Linux Foundation      Definition about vendor "1D6B"
---
usb:v1D6Bp0001*
  ID_MODEL_FROM_DATABASE=1.1 root hub
---
usb:v1D6Bp0002*
  ID_MODEL_FROM_DATABASE=2.0 root hub
---
usb:v1D6Bp0003*
  ID_MODEL_FROM_DATABASE=3.0 root hub      Definition about vendor&device "1d6b:0003"
---
usb:v1D6Bp0100*
  ID_MODEL_FROM_DATABASE=PTP Gadget
---
usb:v1D6Bp0101*
  ID_MODEL_FROM_DATABASE=Audio Gadget
---
usb:v1D6Bp0102*
  ID_MODEL_FROM_DATABASE=EEM Gadget
---
usb:v1D6Bp0103*
  ID_MODEL_FROM_DATABASE=NCM (Ethernet) Gadget
---
usb:v1D6Bp0104*
  ID_MODEL_FROM_DATABASE=Multifunction Composite Gadget
---
usb:v1D6Bp0105*
  ID_MODEL_FROM_DATABASE=FunctionFS Gadget
---
usb:v1D6Bp0200*
  ID_MODEL_FROM_DATABASE=Qemu Audio Device
usb:~ #

```

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:

```

root@usb-ids:~# grep -A3 -Ei "1d6b|2a4b" /usr/share/misc/usb.ids
1d6b Linux Foundation
    0001 1.1 root hub
    0002 2.0 root hub
    0003 3.0 root hub
root@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.

```

root@usb-ids:~# update-usbids
--2022-11-30 01:50:03-- http://www.linux-usb.org/usb.ids
Connecting to ..... connected.
Proxy request sent, awaiting response... 200 OK
Length: 716614 (700K) [text/plain]
Saving to: '/var/lib/usbutils/usb.ids.new'

/var/lib/usbutils/usb.ids.new  100%[=====>] 699.82K  599KB/s  in 1.2s

2022-11-30 01:50:11 (599 KB/s) - '/var/lib/usbutils/usb.ids.new' saved [716614/716614]

Done.
root@usb-ids:~#
root@usb-ids:~# grep -A3 -Ei "1d6b|2a4b" /usr/share/misc/usb.ids
1d6b Linux Foundation
    0001 1.1 root hub
    0002 2.0 root hub
    0003 3.0 root hub

2a4b EMULEX Corporation
    0400 Pilot4 Integrated Hub

2a62 Flymaster Avionics
    b301 LiveSD
root@usb-ids:~#

```

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:

```

usb:v2A4B*
ID_VENDOR_FROM_DATABASE=EMULEX Corporation Definition about vendor ID

usb:v2A4Bp0400*
ID_MODEL_FROM_DATABASE=Pilot4 Integrated Hub Definition about vendor ID and device ID

```

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`.

```

usb:~ # systemd-hwdb update
usb:~ #
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 EMULEX Corporation Pilot4 Integrated Hub
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
usb:~ #

```

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.

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Related product families

Product families related to this document are the following:

- [Red Hat Enterprise Linux](#)
- [SUSE Linux Enterprise Server](#)

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