

## Prepoznavanje sklopovlja: naredba lspci



U ciklusu članaka o tome kako iskoristiti Linux da bi saznali više o sklopovlju računala, objasniti ćemo korištenje naredbe ***lspci***. Iz naziva je jasno o čemu se radi: izlistavanju podataka o PCI sabirnici i uređajima koji preko nje komuniciraju, poput, na primjer, grafičke ili mrežne kartice.

PCI je kratica za ***Peripheral Component Interconnect***, sabirnicu koju je zamislio Intel još 1992, kako bi zamijenila dotadašnju, sporiju, ISA sabirnicu, najprije u serverima, a potom i u stolnim računalima. PCI je doživjela dva poboljšanja. Najprije su IBM, HP i Compaq objavili PCI-X (eXtended) specifikaciju, a 2004. se pojavila PCI Express (PCIe) sabirnica, koja zadovoljava apetite brzih 64-bitnih procesora.

Podatke o PCI uređajima mogli bismo isčitati iz direktorija `/proc/bus/pci`, u kojem se nalazi datoteka `devices`. No tamo su podaci čitljivi strojevima:

```
cat /proc/bus/pci/devices
0000      80860044      0          0          0          0
          0          0          0          0          0
          0          0          0          0          0
0010      80860046      2e          d0000004      0          0          c000000c
          0          5051          0          2
          400000      0          10000000      0
          8          0          0          i915
00b0      80863b64      2b          d4724004      0          0          0
          0          0          0          0          0
          10          0          0          0          0
00c8      808610ea      2f          d4700000      d472a000      5021
          0          0          0          0          0
          20000      1000      20          0
          0          0          0          e1000e
00d0      80863b3c      10          d4729000      0          0          0
          0          0          0          0          0
          400          0          0          0          0
          0          0          0          ehci-pci
00d8      80863b56      2d          d4720004      0          0          0
          0          0          0          0          0
          4000      0          0          0          0
          0          0          0          snd_hda_intel
00e0      80863b42      28          0          0          0          0
          0          0          0          0          0
          0          0          0          0          0
          0          0          0          pcieport
00e1      80863b44      29          0          0          0          0
          0          0          0          0          0
          0          0          0          0          0
          0          0          0          pcieport
00e3      80863b48      2a          0          0          0          0
          0          0          0          0          0
```

	0		0		0		0		0
00e8	80863b34	14		d4728000		0	pcieport		0
	0			0		0			0
	400			0		0			0
00f0	80862448	0		0		0	ehci-pci		0
	0			0		0			0
	0			0		0			0
00f8	80863b07	0		0		0			0
	0			0		0			0
	0			0		0			0
00fa	80863b2f	2c		5049		0	lpc_ich		0
	5059			5001		0	505d		5041
	8			4		0	d4727000		0
	20		800			0	ahci		0
00fe	80863b32	12		d4726004		0			0
	0			0		0			0
	1000			0		0			0
4300	14e44315	13		d0500004		0	intel ips		0
	0			0		0			0
	4000			0		0			0
4430	11800832	14		d0401000		0	wl		0
	0			0		0			0
	800			0		0			0
4431	11800822	16		d0403000		0	firewire_ohci		0
	0			0		0			0
	100			0		0			0
4432	11800476	16		d0400000		0	sdhci-pci		0
	0			0		0			0
	1000			0		0			0
ff00	80862c62	0		0		0	yenta_cardbus		0
	0			0		0			0
	0			0		0			0
ff01	80862d01	0		0		0			0
	0			0		0			0
	0			0		0			0
ff10	80862d10	0		0		0			0
	0			0		0			0
	0			0		0			0
ff11	80862d11	0		0		0			0
	0			0		0			0
	0			0		0			0
ff12	80862d12	0		0		0			0
	0			0		0			0
	0			0		0			0
ff13	80862d13	0		0		0			0

```
0 0 0 0 0 0 0 0 0 0
```

Za nas obične smrtnike, koji se ne bavimo pisanjem *device drivera*, tu je naredba `lspci`. U osnovnom obliku naredba će izlistati kratak popis sklopovlja koje komunicira PCI sučeljem.

```
$ lspci
00:00.0 Host bridge: Intel Corporation Core Processor DRAM Controller (rev 02)
00:02.0 VGA compatible controller: Intel Corporation Core Processor Integrated Graphics Controller (rev 02)
00:16.0 Communication controller: Intel Corporation 5 Series/3400 Series Chipset HECI Controller (rev 06)
00:19.0 Ethernet controller: Intel Corporation 82577LM Gigabit Network Connection (rev 05)
00:1a.0 USB controller: Intel Corporation 5 Series/3400 Series Chipset USB2 Enhanced Host Controller (rev 05)
00:1b.0 Audio device: Intel Corporation 5 Series/3400 Series Chipset High Definition Audio (rev 05)
00:1c.0 PCI bridge: Intel Corporation 5 Series/3400 Series Chipset PCI Express Root Port 1 (rev 05)
00:1c.1 PCI bridge: Intel Corporation 5 Series/3400 Series Chipset PCI Express Root Port 2 (rev 05)
00:1c.3 PCI bridge: Intel Corporation 5 Series/3400 Series Chipset PCI Express Root Port 4 (rev 05)
00:1d.0 USB controller: Intel Corporation 5 Series/3400 Series Chipset USB2 Enhanced Host Controller (rev 05)
00:1e.0 PCI bridge: Intel Corporation 82801 Mobile PCI Bridge (rev a5)
00:1f.0 ISA bridge: Intel Corporation Mobile 5 Series Chipset LPC Interface Controller (rev 05)
00:1f.2 SATA controller: Intel Corporation 5 Series/3400 Series Chipset 6 port SATA AHCI Controller (rev 05)
00:1f.6 Signal processing controller: Intel Corporation 5 Series/3400 Series Chipset Thermal Subsystem (rev 05)
43:00.0 Network controller: Broadcom Corporation BCM4312 802.11b/g LP-PHY (rev 01)
44:06.0 FireWire (IEEE 1394): Ricoh Co Ltd R5C832 IEEE 1394 Controller (rev 06)
44:06.1 SD Host controller: Ricoh Co Ltd R5C822 SD/SDIO/MMC/MS/MSPro Host Adapter (rev 25)
44:06.2 CardBus bridge: Ricoh Co Ltd RL5c476 II (rev bb)
ff:00.0 Host bridge: Intel Corporation Core Processor QuickPath Architecture Generic Non-core Registers (rev 02)
ff:00.1 Host bridge: Intel Corporation Core Processor QuickPath Architecture System Address Decoder (rev 02)
ff:02.0 Host bridge: Intel Corporation Core Processor QPI Link 0 (rev 02)
ff:02.1 Host bridge: Intel Corporation Core Processor QPI Physical 0 (rev 02)
ff:02.2 Host bridge: Intel Corporation Core Processor Reserved (rev 02)
ff:02.3 Host bridge: Intel Corporation Core Processor Reserved (rev 02)
```

Tako možemo otkriti na primjer mrežne uređaje: ethernet je Intelov gigabitni 82577LM, a za bežičnu mrežu brine Broadcom BCM 4312.

Uz dodatne parametre naredba će nam dati mnogo više podataka. Na primjer, ako nas zanimaju kernel moduli koji daju softversku podršku izlistanim uređajima, dodat ćemo parametar `-k`:

```
$ lspci -k
00:00.0 Host bridge: Intel Corporation Core Processor DRAM Controller (rev 02)
    Subsystem: Hewlett-Packard Company Device 7007
```

```
Kernel driver in use: agpgart-intel
00:02.0 VGA compatible controller: Intel Corporation Core Processor Integrated Graphics Controller (rev 02)
  Subsystem: Hewlett-Packard Company Device 7007
Kernel driver in use: i915
00:16.0 Communication controller: Intel Corporation 5 Series/3400 Series Chipset HECI Controller (rev 06)
  Subsystem: Hewlett-Packard Company Device 7007
Kernel driver in use: mei
00:19.0 Ethernet controller: Intel Corporation 82577LM Gigabit Network Connection (rev 05)
  Subsystem: Hewlett-Packard Company Device 7007
Kernel driver in use: e1000e
00:1a.0 USB controller: Intel Corporation 5 Series/3400 Series Chipset USB2 Enhanced Host Controller (rev 05)
  Subsystem: Hewlett-Packard Company Device 7007
Kernel driver in use: ehci-pci
00:1b.0 Audio device: Intel Corporation 5 Series/3400 Series Chipset High Definition Audio (rev 05)
  Subsystem: Hewlett-Packard Company Device 7007
Kernel driver in use: snd_hda_intel
00:1c.0 PCI bridge: Intel Corporation 5 Series/3400 Series Chipset PCI Express Root Port 1 (rev 05)
Kernel driver in use: pcieport
00:1c.1 PCI bridge: Intel Corporation 5 Series/3400 Series Chipset PCI Express Root Port 2 (rev 05)
Kernel driver in use: pcieport
...
```

Mnogo više podataka dobit ćemo ako zatražimo opširniji izvještaj, za što se na Unixima tradicionalno koristi `-v` (verbose). Ako nam to nije dosta, radi i `-vv` i `-vvv`.

```
$ lspci -kv
00:19.0 Ethernet controller: Intel Corporation 82577LM Gigabit Network Connection (rev 05)
  Subsystem: Hewlett-Packard Company Device 7007
  Flags: bus master, fast devsel, latency 0, IRQ 45
  Memory at d4700000 (32-bit, non-prefetchable) [size=128K]
  Memory at d472a000 (32-bit, non-prefetchable) [size=4K]
  I/O ports at 5020 [size=32]
  Capabilities: <access denied>
  Kernel driver in use: e1000e
```

Pokazali smo samo podatke za ethernet kontroler. Obratite pažnju na predzadnji redak: neke podatke možemo dobiti samo s root ovlastima:

```
$ sudo lspci -kv
...
00:19.0 Ethernet controller: Intel Corporation 82577LM Gigabit Network Connection (rev 05)
  Subsystem: Hewlett-Packard Company Device 7007
  Flags: bus master, fast devsel, latency 0, IRQ 45
  Memory at d4700000 (32-bit, non-prefetchable) [size=128K]
  Memory at d472a000 (32-bit, non-prefetchable) [size=4K]
  I/O ports at 5020 [size=32]
  Capabilities: [c8] Power Management version 2
  Capabilities: [d0] MSI: Enable+ Count=1/1 Maskable- 64bit+
```

```
Capabilities: [e0] PCI Advanced Features
Kernel driver in use: e1000e
```

...

Stupanj rječitosti možemo povećati ponavljanjem prekidača -v:

```
$ sudo lspci -kvvv
...
00:19.0 Ethernet controller: Intel Corporation 82577LM Gigabit Network Connection (rev 05)
  Subsystem: Hewlett-Packard Company Device 7007
  Control: I/O+ Mem+ BusMaster+ SpecCycle- MemWINV- VGASnoop- ParErr- Stepping- SER-
R- FastB2B- DisINTx+
  Status: Cap+ 66MHz- UDF- FastB2B- ParErr- DEVSEL=fast >TAbort- <TAbort- <MAbort-
>SERR- <PERR- INTx-
  Latency: 0
  Interrupt: pin A routed to IRQ 45
  Region 0: Memory at d4700000 (32-bit, non-prefetchable) [size=128K]
  Region 1: Memory at d472a000 (32-bit, non-prefetchable) [size=4K]
  Region 2: I/O ports at 5020 [size=32]
  Capabilities: [c8] Power Management version 2
    Flags: PMEClk- DSI+ D1- D2- AuxCurrent=0mA PME(D0+,D1-,D2-,D3hot+,D3cold+)
    Status: D0 NoSoftRst- PME-Enable- DSel=0 DScale=1 PME-
  Capabilities: [d0] MSI: Enable+ Count=1/1 Maskable- 64bit+
    Address: 00000000fee0f00c Data: 4173
  Capabilities: [e0] PCI Advanced Features
    AFCap: TP+ FLR+
    AFCtrl: FLR-
    AFStatus: TP-
  Kernel driver in use: e1000e
```

Što ako želite ispis podataka o samo jednom uređaju? Za to postoji parametar -d (device), ali iza njega ne možete napisati ime uređaja, na primjer *ethernet*, nego se traži ID proizvođača, dvotočka, pa ID uređaja. U */proc/bus/pci/devices* ID-jevi su sadržani u drugom polju, ali bez dvotočke. U našem primjeru, redak iz *devices* za *ethernet* izgleda ovako:

```
00c8      808610ea
      2d          d4700000          d472a000          5021
0          0          0          0          20000
          1000          20          0          0
          0          0          e1000e
```

Prepoznavamo ga po kernel driveru *e1000e*. Šifre identiteta proizvođača i uređaja sadržane su u drugom polju (*808610ea*), preostaje u sredinu umetnuti dvotočku:

```
$ sudo lspci -kvvv -d 8086:10ea
```

Možda je lakši put pronalaženje ID-jeva korištenje parametra -n, pa se umjesto naziva proizvođača ispišu šifre identiteta. Evo primjera za *ethernet* sučelje:

```
$ lspci
...
00:19.0 Ethernet controller: Intel Corporation 82577LM Gigabit Network Connection (rev 05)
```

```
$ lspci -n
...
00:19.0 0200: 8086:10ea (rev 05)
```

Time smo otkrili osnove korištenja naredbe ***lspci***, koja nam pomaže pri prepoznavanju sklopovlja.

Vezani članci:

[Prepoznavanje sklopovlja računala](#) [1]

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