

Measuring and optimizing power usage

Power consumption is one of the factors that one must keep on monitoring, especially on mobile devices, such as notebook computers, tablets, and so on. There are few tools available for Linux systems to measure power consumption, one such command is `powertop` which we are going to use for this recipe.

Getting ready

`powertop` doesn't come preinstalled with most Linux distributions, you will have to install it using your package manager.

How to do it...

Let's see how to use `powertop` to measure and optimize power consumption:

1. Using `powertop` is pretty easy, just run:

```
# powertop
```

`powertop` will start taking some measurements and once it's done, it will show a screen which will have detailed information about power usage, the processes using the most power, and so on:

```
PowerTOP 2.1 Overview Idle stats Frequency stats Device stats Tunables
The battery reports a discharge rate of 17.6 W
The estimated remaining time is 0 hours, 58 minutes
Summary: 186.4 wakeups/second, 0.5 GPU ops/seconds, 0.0 VFS ops/sec and 2.0% CPU use
Power est. Usage Events/s Device Category Description
1.46 W 0.0 pkts/s Device Network interface: eth0 (r8169)
931 mW 100.0% Device Audio codec hxC000: Realtek
931 mW 100.0% Device Audio codec hxC003: Intel
230 mW 0.0 pkts/s Device Network interface: wlan0 (rtl8192se)
142 mW 4.0 ms/s 0.24 kWork rfkill_poll
80.8 mW 2.3 ms/s 2.9 Process /usr/bin/yakuake
65.4 mW 1.8 ms/s 0.24 Process powertop
62.3 mW 1.8 ms/s 7.3 Process /usr/bin/quasselcore --logfile=/var/log/quassel/core.log --loglevel=Info --configdir=/var/lib/qu
41.0 mW 1.2 ms/s 0.7 Process /usr/bin/quasselclient
23.8 mW 674.7 us/s 0.7 Process /usr/bin/owncloud
22.3 mW 630.6 us/s 1.0 Process /usr/lib/telepathy/telepathy-gabble
18.7 mW 528.6 us/s 22.9 Process /usr/sbin/mysqld
18.0 mW 509.5 us/s 0.5 Process /usr/bin/X :0 -core -auth /var/run/lightdm/root/:0 -nolisten tcp vt7 -novtswitch -background non
11.5 mW 324.4 us/s 35.0 Interrupt [42] i915
11.3 mW 217.5 us/s 2.3 Process kwin
10.9 mW 309.4 us/s 2.0 Process kdeinit4: kded4 [kdeinit]
10.9 mW 309.2 us/s 1.8 Process /usr/bin/python /usr/bin/hp-systray
9.89 mW 279.8 us/s 0.00 Process dbus-daemon --system --fork
7.87 mW 222.8 us/s 0.00 Process [kworker/0:2]
7.87 mW 222.7 us/s 1.7 Process /usr/lib/upower/upowerd
7.78 mW 220.1 us/s 1.1 Interrupt [7] sched(softirq)
7.72 mW 218.4 us/s 5.3 Interrupt [23] ehci_hcd:usb2
7.63 mW 215.9 us/s 33.8 Timer tick_sched_timer
```

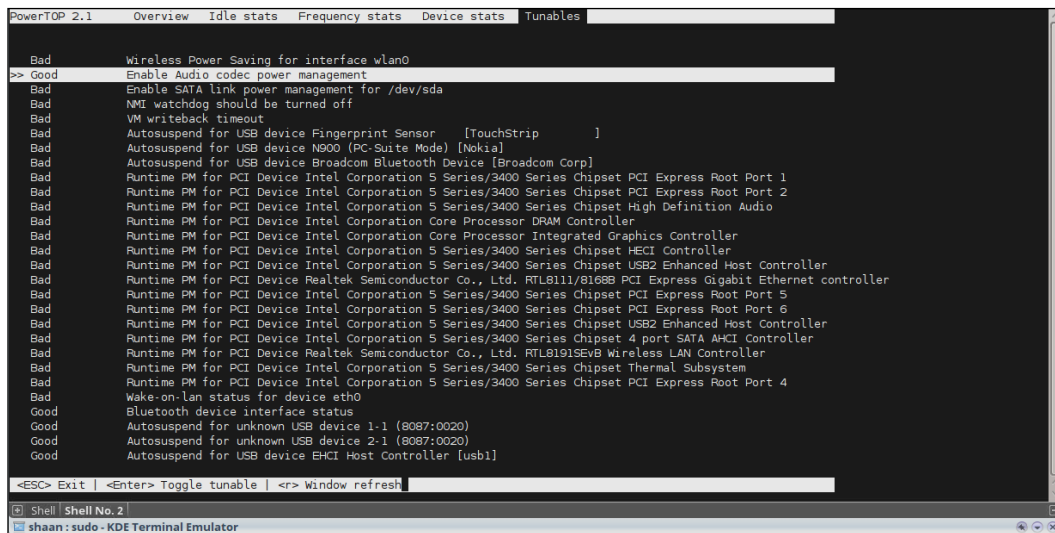
- For generating HTML reports, use:

```
# powertop --html
```

`powertop` will take measurements over a period of time and generate an HTML report with the default filename `PowerTOP.html`, which you can open using any web browser.

- For optimizing power usage, use:

When `powertop` is running, use the arrow keys to switch to the **Tunables** tab; this will show you a list of things that `powertop` can tune so that they consume less power. Just choose whichever ones you want, press *Enter* to toggle from **Bad** to **Good**:



```
PowerTOP 2.1 Overview Idle stats Frequency stats Device stats Tunables
Bad Wireless Power Saving for interface wlan0
>> Good Enable Audio codec power management
Bad Enable SATA link power management for /dev/sda
Bad NMI watchdog should be turned off
Bad VM writeback timeout
Bad Autosuspend for USB device Fingerprint Sensor [TouchStrip ]
Bad Autosuspend for USB device N900 (PC-Suite Mode) [Nokia]
Bad Autosuspend for USB device Broadcom Bluetooth Device [Broadcom Corp]
Bad Runtime PM for PCI Device Intel Corporation 5 Series/3400 Series Chipset PCI Express Root Port 1
Bad Runtime PM for PCI Device Intel Corporation 5 Series/3400 Series Chipset PCI Express Root Port 2
Bad Runtime PM for PCI Device Intel Corporation 5 Series/3400 Series Chipset High Definition Audio
Bad Runtime PM for PCI Device Intel Corporation Core Processor DRAM Controller
Bad Runtime PM for PCI Device Intel Corporation Core Processor Integrated Graphics Controller
Bad Runtime PM for PCI Device Intel Corporation 5 Series/3400 Series Chipset HECI Controller
Bad Runtime PM for PCI Device Intel Corporation 5 Series/3400 Series Chipset USB2 Enhanced Host Controller
Bad Runtime PM for PCI Device Realtek Semiconductor Co., Ltd. RTL8111/8168 PCI Express Gigabit Ethernet controller
Bad Runtime PM for PCI Device Intel Corporation 5 Series/3400 Series Chipset PCI Express Root Port 5
Bad Runtime PM for PCI Device Intel Corporation 5 Series/3400 Series Chipset PCI Express Root Port 6
Bad Runtime PM for PCI Device Intel Corporation 5 Series/3400 Series Chipset USB2 Enhanced Host Controller
Bad Runtime PM for PCI Device Intel Corporation 5 Series/3400 Series Chipset 4 port SATA AHCI Controller
Bad Runtime PM for PCI Device Realtek Semiconductor Co., Ltd. RTL8191SEVB Wireless LAN Controller
Bad Runtime PM for PCI Device Intel Corporation 5 Series/3400 Series Chipset Thermal Subsystem
Bad Runtime PM for PCI Device Intel Corporation 5 Series/3400 Series Chipset PCI Express Root Port 4
Bad Wake-on-Lan status for device eth0
Good Bluetooth device interface status
Good Autosuspend for unknown USB device 1-1 (6087:0020)
Good Autosuspend for unknown USB device 2-1 (6087:0020)
Good Autosuspend for USB device EHCI Host Controller [usb1]
<ESC> Exit | <Enter> Toggle tunable | <R> Window refresh
```



If you want to monitor the power consumption from a portable device's battery, it is required to remove the charger and use the battery for `powertop` to make measurements.

Monitoring disk activity

Going by the popular naming convention of monitoring tools ending in the word 'top' (the command used to monitor processes), the tool to monitor disk I/O is called `iotop`.