

# PowerTOP

Выполнил студент гр. 13541/3:

А.

Преподаватель:

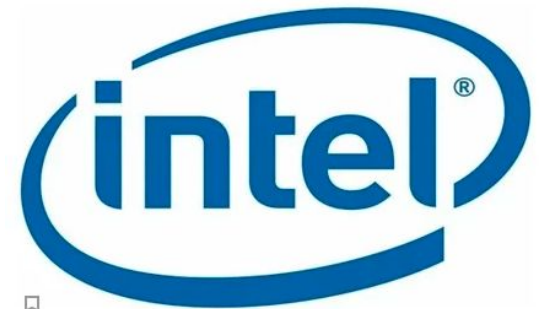
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# PowerTOP



- утилита, позволяющая обнаруживать в системе компоненты, которые заставляют ноутбук потреблять больше энергии, чем необходимо, во время простоя.
- Open Source
- By Intel
- Linux only
- C++



# Существующие решения

- Powertop
- TLP

# How It Works

- Active power - энергия, потребляемая системой во время активной работы
- Idle power - энергия, потребляемая в промежутках между активной работой

# ACPI

- Advanced Configuration and Power Interface
- Открытый промышленный стандарт, определяет общий интерфейс для обнаружения аппаратного обеспечения, управления питанием и конфигурации материнской платы и устройств
- C - States

# PowerTOP Overview

PowerTOP 2.8					
Overview					
Idle stats					
Frequency stats					
Device stats					
Tunables					
Summary: 891,1 wakeups/second, 0,0 GPU ops/seconds, 0,0 VFS ops/sec and 53,1% CPU use					
Power est.	Usage	Events/s	Category	Description	
11.2 W	29,0%		Device	Display backlight	
5.20 W	100,0%		Device	Radio device: btusb	
2.17 W	8,8 pkts/s		Device	Network interface: wlo1 (ath9k)	
2.02 W	100,0%		Device	Audio codec hwC0D3: Intel	
2.02 W	100,0%		Device	Audio codec hwC0D0: Realtek	
109 mW	425,1 ms/s	8,5	kWork	intel_atomic_commit_work	
107 mW	0,0 pkts/s		Device	Network interface: eno1 (r8169)	
94.6 mW	4,6 ms/s	258,3	Interrupt	[9] acpi	
86.0 mW	12,2 ms/s	229,4	kWork	acpi_os_execute_deferred	
31.1 mW	14,2 ms/s	76,2	Process	/opt/yandex/browser-beta/yandex_browser --type=renderer --field-trial-handle=3528981718451671225,27	
22.1 mW	2,5 ms/s	59,4	Timer	hrtimer_wakeup	
17.8 mW	1,8 ms/s	48,0	Timer	tick_sched_timer	
17.2 mW	12,5 ms/s	38,9	Process	/opt/yandex/browser-beta/yandex_browser	
10.8 mW	3,9 ms/s	27,1	Process	/opt/yandex/browser-beta/yandex_browser --type=renderer --field-trial-handle=3528981718451671225,27	
10.5 mW	1,6 ms/s	28,1	Process	/opt/telegram/telegram -nouupdate --	
7.47 mW	1,5 ms/s	19,6	Interrupt	[29] i915	
6.22 mW	16,5 ms/s	5,8	Process	/usr/lib/xorg/Xorg -core :0 -seat seat0 -auth /var/run/lightdm/root/:0 -nolisten tcp vt7 -novtswitc	
6.01 mW	6,8 ms/s	11,9	Process	compiz	
5.01 mW	6,3 ms/s	9,5	Process	gnome-system-monitor	
4.55 mW	94,0 µs/s	12,5	Process	[rcu_sched]	
4.19 mW	629,3 µs/s	11,1	Process	/opt/clion-2018.2.6/jre64/bin/java -classpath /opt/clion-2018.2.6/lib/bootstrap.jar:/opt/clion-2018	
2.88 mW	7,3 ms/s	2,9	Process	[kworker/0:2]	
2.69 mW	1,4 ms/s	6,5	Interrupt	[7] sched(softirq)	
2.15 mW	63,5 µs/s	5,9	kWork	gen6_pm_rps_work	
1.75 mW	22,6 µs/s	4,8	kWork	intel_atomic_helper_free_state_	

# PowerTOP Overview

PowerTOP 2.8		Overview		Idle stats		Frequency stats		Device stats		Tunables	
Package		Core		CPU 0		CPU 1					
				C0 active	94,9%	CPU 0	37,9%				
				POLL	0,0%	0,0 ms	0,1%			0,4 ms	
				C1E	0,0%	0,0 ms	62,5%			0,1 ms	
C2 (pc2)	0,0%										
C3 (pc3)	0,0%	C3 (cc3)	0,0%	C3	0,0%	0,0 ms	0,0%			0,1 ms	
C6 (pc6)	0,0%	C6 (cc6)	0,0%	C6	0,0%	0,0 ms	0,0%			0,0 ms	
C7 (pc7)	0,0%	C7 (cc7)	0,0%	C7	0,0%	0,0 ms	0,0%			0,3 ms	
		Core		CPU 2		CPU 3					
				C0 active	17,1%	CPU 2	16,5%				
				POLL	0,0%	0,0 ms	0,0%			0,6 ms	
				C1E	1,2%	0,2 ms	1,7%			0,2 ms	
		C3 (cc3)	4,9%	C3	1,8%	0,3 ms	3,7%			0,4 ms	
		C6 (cc6)	0,0%	C6	0,0%	0,4 ms	0,0%			0,6 ms	
		C7 (cc7)	65,1%	C7	80,0%	1,5 ms	78,5%			1,0 ms	
		GPU									
		Powered On		100,0%							
		RC6		0,0%							
		RC6p		0,0%							
		RC6pp		0,0%							

# PowerTOP Overview

PowerTOP 2.8   Overview   Idle stats   **Frequency stats**   Device stats   Tunables

Package		Core		CPU 0		CPU 1
				Actual		
Idle	0,0%	Idle	0,0%	Idle	0,2%	98,9%
2,00 GHz	0,0%	2,00 GHz	0,0%	2,00 GHz	0,0%	0,0%
2,60 GHz	99,8%	2,60 GHz	99,8%	2,60 GHz	99,7%	1,0%
1,91 GHz	0,0%	1,91 GHz	0,0%			0,0%
2,21 GHz	0,0%	2,21 GHz	0,0%			0,0%
2,10 GHz	0,1%	2,10 GHz	0,1%			0,1%
2,40 GHz	0,0%	2,40 GHz	0,0%			0,0%
2,31 GHz	0,0%	2,31 GHz	0,0%			0,0%
1,80 GHz	0,1%	1,80 GHz	0,1%			0,1%

		Core		CPU 2		CPU 3
				Actual		
		Idle	20,1%	Idle	23,4%	91,5%
		2,00 GHz	0,0%	2,00 GHz	0,0%	0,0%
		2,60 GHz	79,8%	2,60 GHz	76,6%	8,5%
		1,91 GHz	0,0%	1,91 GHz	0,0%	0,0%
		2,21 GHz	0,0%	2,21 GHz	0,0%	0,0%
		2,10 GHz	0,0%	2,10 GHz	0,0%	0,0%
		2,40 GHz	0,0%	2,40 GHz	0,0%	0,0%
		2,31 GHz	0,0%	1,80 GHz	0,0%	0,0%
		1,80 GHz	0,0%			0,0%



# PowerTOP Overview


PowerTOP 2.8			Overview	Idle stats	Frequency stats	Device stats	Tunables
System baseline power is estimated at 31.8 W							
Power est.	Usage	Device name					
11.6 W	29,0%	Display backlight					
8.48 W	301,7%	CPU core					
4.21 W	100,0%	Radio device: btusb					
2.36 W	100,0%	Audio codec hwC0D3: Intel					
2.36 W	100,0%	Audio codec hwC0D0: Realtek					
	100,0%	Radio device: ath9k					
590 mW	301,7%	CPU misc					
	16,2 pkts/s	Network interface: wlo1 (ath9k)					
	0,0 pkts/s	Network interface: eno1 (r8169)					
0 mW	0,0%	USB device: EHCI Host Controller					
0 mW	0,0%	USB device: usb-device-8087-0024					
0 mW	0,0%	USB device: usb-device-8087-0024					
0 mW	0,0%	USB device: usb-device-0cf3-3121					
0 mW	0,0%	USB device: xHCI Host Controller					
0 mW	0,0%	USB device: EHCI Host Controller					
0 mW	0,0%	USB device: xHCI Host Controller					
0 mW	0,0%	USB device: HP Truevision HD (DDTPN01BI5VD2S)					
	0,0%	runtime-reg-dummy					
	0,0%	runtime-rtsx_pci_sdmmc.0					
	0,0%	PCI Device: Intel Corporation 7 Series/C210 Series Chipset Family PCI Express Root Port 4					
	0,0%	runtime-PNP0C09:00					
	0,0%	PCI Device: Intel Corporation 3rd Gen Core processor DRAM Controller					
	0,0%	runtime-ACPI0003:00					
	0,0%	PCI Device: Intel Corporation 7 Series Chipset Family 6-port SATA Controller [AHCI mode]					
	0,0%	PCI Device: Intel Corporation 7 Series/C210 Series Chipset Family PCI Express Root Port 1					
	0,0%	PCI Device: Realtek Semiconductor Co., Ltd. RTS5229 PCI Express Card Reader					
	0,0%	PCI Device: Intel Corporation HM76 Express Chipset LPC Controller					
	0,0%	PCI Device: Intel Corporation Xeon E3-1200 v2/3rd Gen Core processor PCI Express Root Port					
	0,0%	runtime-PNP0C14:00					

# PowerTOP Overview

```
PowerTOP 2.8  Overview  Idle stats  Frequency stats  Device stats  Tunables
>> Bad      Enable SATA link power management for host4
Bad      Enable SATA link power management for host5
Bad      Enable SATA link power management for host3
Bad      Enable SATA link power management for host1
Bad      Enable SATA link power management for host2
Bad      Enable SATA link power management for host0
Bad      Enable Audio codec power management
Bad      Runtime PM for I2C Adapter i2c-3 (i915 gmbus dpc)
Bad      Runtime PM for I2C Adapter i2c-4 (i915 gmbus dpb)
Bad      Runtime PM for I2C Adapter i2c-0 (i915 gmbus ssc)
Bad      Runtime PM for I2C Adapter i2c-2 (i915 gmbus panel)
Bad      Runtime PM for I2C Adapter i2c-5 (i915 gmbus dpd)
Bad      Runtime PM for I2C Adapter i2c-1 (i915 gmbus vga)
Bad      Runtime PM for PCI Device Intel Corporation 7 Series/C210 Series Chipset Family High Definition Audio Controller
Bad      Runtime PM for PCI Device Intel Corporation 7 Series Chipset Family 6-port SATA Controller [AHCI mode]
Bad      Runtime PM for PCI Device Intel Corporation 7 Series/C210 Series Chipset Family PCI Express Root Port 1
Bad      Runtime PM for PCI Device Realtek Semiconductor Co., Ltd. RTS5229 PCI Express Card Reader
Bad      Runtime PM for PCI Device Intel Corporation HM76 Express Chipset LPC Controller
Bad      Runtime PM for PCI Device Intel Corporation Xeon E3-1200 v2/3rd Gen Core processor PCI Express Root Port
Bad      Runtime PM for PCI Device Qualcomm Atheros QCA9565 / AR9565 Wireless Network Adapter
Bad      Runtime PM for PCI Device Realtek Semiconductor Co., Ltd. RTL8101/2/6E PCI Express Fast/Gigabit Ethernet controller
Bad      Runtime PM for PCI Device Intel Corporation 7 Series/C210 Series Chipset Family SMBus Controller
Bad      Runtime PM for PCI Device Intel Corporation 7 Series/C210 Series Chipset Family PCI Express Root Port 4
Bad      Runtime PM for PCI Device Intel Corporation 7 Series/C210 Series Chipset Family MEI Controller #1
Bad      Runtime PM for PCI Device Intel Corporation 7 Series/C210 Series Chipset Family PCI Express Root Port 3
Bad      Runtime PM for PCI Device Intel Corporation 7 Series/C210 Series Chipset Family USB xHCI Host Controller
Bad      Runtime PM for PCI Device Intel Corporation 3rd Gen Core processor Graphics Controller
Bad      Runtime PM for PCI Device Intel Corporation 7 Series/C210 Series Chipset Family USB Enhanced Host Controller #1
Bad      Runtime PM for PCI Device Intel Corporation 7 Series/C210 Series Chipset Family USB Enhanced Host Controller #2
Bad      Runtime PM for PCI Device Intel Corporation 3rd Gen Core processor DRAM Controller
Good     NMI watchdog should be turned off
Good     VM writeback timeout
Good     Bluetooth device interface status
Good     Autosuspend for USB device xHCI Host Controller [usb4]
Good     Runtime PM for I2C Adapter i2c-7 (nvkm-0000:01:00.0-bus-0005)
Good     Autosuspend for USB device HP Truevision HD [DDTPN01BI5VD25]
Good     Autosuspend for USB device xHCI Host Controller [usb3]
Good     Autosuspend for unknown USB device 2-1 (8087:0024)
Good     Runtime PM for I2C Adapter i2c-6 (nvkm-0000:01:00.0-bus-0003)
```

# PowerTOP Overview

← ↻ file:///home/vovasq/powertop.html



**System Information**  
PowerTOP Version v2.8 ran at Wed Nov 21 23:27:12 2018  
Kernel Version Linux version 4.15.0-39-generic  
System Name Hewlett-Packard21BC0976100000405F10000610180  
CPU Information 4 Intel(R) Core(TM) i5-3230M CPU @ 2.60GHz  
OS Information Ubuntu 16.04.5 LTS

Summary CPU Idle CPU Frequency Software Info Device Info Tuning AHCI All

Target: 1 units/s System: 957.8 wakeup/s CPU: 78.5% usage GPU: 0 ops/s GFX: 2.4 wakeups/s VFS: 0 ops/s

### Top 10 Power Consumers

Usage	Events/s	Category	Description
72,8%	1,2	kWork	intel_atomic_commit_work
0,5%	262,9	Interrupt	[9] acpi
1,2%	233,7	kWork	acpi_os_execute_deferred
0,5%	62,4	Process	/usr/bin/pulseaudio --start --log-target=syslog
0,3%	172,9	Timer	hrtimer_wakeup
100,0%		Device	Audio codec hwc0D3: Intel
0,8%	49,0	Process	/opt/yandex/browser-beta/yandex_browser --type=renderer --field-trial-handle=3528981718451671225,2765983360578442771,131072 --j
0,2%	37,0	Process	/opt/telegram/telegram -nouupdate --
0,1%	30,1	Process	gnome-screenshot --area
0,4%	24,7	Process	/opt/yandex/browser-beta/yandex_browser



# PowerTOP autotune



## System Information

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## Software Settings in Need of Tuning

Description	Script
Enable SATA link power management for host4	echo 'min_power' > '/sys/class/scsi_host/host4/link_power_management_policy';
Enable SATA link power management for host5	echo 'min_power' > '/sys/class/scsi_host/host5/link_power_management_policy';
Enable SATA link power management for host3	echo 'min_power' > '/sys/class/scsi_host/host3/link_power_management_policy';
Enable SATA link power management for host1	echo 'min_power' > '/sys/class/scsi_host/host1/link_power_management_policy';
Enable SATA link power management for host2	echo 'min_power' > '/sys/class/scsi_host/host2/link_power_management_policy';
Enable SATA link power management for host0	echo 'min_power' > '/sys/class/scsi_host/host0/link_power_management_policy';
Enable Audio codec power management	echo '1' > '/sys/module/snd_hda_intel/parameters/power_save';
Runtime PM for I2C Adapter i2c-3 (i915 gmbus dpc)	echo 'auto' > '/sys/bus/i2c/devices/i2c-3/device/power/control';
Runtime PM for I2C Adapter i2c-4 (i915 gmbus dpb)	echo 'auto' > '/sys/bus/i2c/devices/i2c-4/device/power/control';
Runtime PM for I2C Adapter i2c-0 (i915 gmbus ssc)	echo 'auto' > '/sys/bus/i2c/devices/i2c-0/device/power/control';
Runtime PM for I2C Adapter i2c-2 (i915 gmbus panel)	echo 'auto' > '/sys/bus/i2c/devices/i2c-2/device/power/control';
Runtime PM for I2C Adapter i2c-5 (i915 gmbus dpd)	echo 'auto' > '/sys/bus/i2c/devices/i2c-5/device/power/control';

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72,8%	1,2	kWork	intel_atomic_commit_work
0,5%	262,9	Interrupt	[9] acpi
1,2%	233,7	kWork	acpi_os_execute_deferred
0,5%	62,4	Process	/usr/bin/pulseaudio --start --log-target=syslog
0,3%	172,9	Timer	hrtimer_wakeup
100,0%		Device	Audio codec hwc0D3: Intel
0,8%	49,0	Process	/opt/yandex/browser-beta/yandex_browser --type=renderer --field-trial-handle=3528981718451671225,2765983360578442771,131072 --j
0,2%	37,0	Process	/opt/telegram/telegram -nouupdate --
0,1%	30,1	Process	gnome-screenshot --area
0,4%	24,7	Process	/opt/yandex/browser-beta/yandex_browser

# Improve

- Графики
- Добавление своего режима