How to conserve battery power using laptop-mode

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Introduction

Laptop mode is used to minimize the time that the hard disk needs to be spun up, to conserve battery power on laptops. It has been reported to cause significant power savings.

Installation

To use laptop mode, you don't need to set any kernel configuration options or anything. Simply install all the files included in this document, and laptop mode will automatically be started when you're on battery. For your convenience, a tarball containing an installer can be downloaded at:

http://www.samwel.tk/laptop_mode/laptop_mode/

To configure laptop mode, you need to edit the configuration file, which is located in /etc/default/laptop-mode on Debian-based systems, or in /etc/sysconfig/laptop-mode on other systems.

Unfortunately, automatic enabling of laptop mode does not work for laptops that don't have ACPI. On those laptops, you need to start laptop mode manually. To start laptop mode, run "laptop_mode start", and to stop it, run "laptop_mode stop". (Note: The laptop mode tools package now has experimental support for APM, you might want to try that first.)

Caveats

- The downside of laptop mode is that you have a chance of losing up to 10 minutes of work. If you cannot afford this, don't use it! The supplied ACPI scripts automatically turn off laptop mode when the battery almost runs out, so that you won't lose any data at the end of your battery life.
- Most desktop hard drives have a very limited lifetime measured in spindown cycles, typically about 50.000 times (it's usually listed on the spec sheet). Check your drive's rating, and don't wear down your drive's lifetime if you don't need to.
- If you mount some of your ext3/reiserfs filesystems with the -n option, then the control script will not be able to remount them correctly. You must set DO_REMOUNTS=0 in the control script, otherwise it will remount them with the wrong options -- or it will fail because it cannot write to /etc/mtab.
- If you have your filesystems listed as type "auto" in fstab, like I did, then the control script will not recognize them as filesystems that need remounting. You must list the filesystems with their true type instead.
- It has been reported that some versions of the mutt mail client use file access times to determine whether a folder contains new mail. If you use mutt and experience this, you must disable the noatime remounting by setting the option DO_REMOUNT_NOATIME to 0 in the configuration file.

The Details

Laptop mode is controlled by the knob /proc/sys/vm/laptop_mode. This knob is present for all kernels that have the laptop mode patch, regardless of any configuration options. When the knob is set, any physical disk I/O (that might have caused the hard disk to spin up) causes Linux to flush all dirty blocks. The result of this is that after a disk has spun down, it will not be spun up anymore to write dirty blocks, because those blocks had already been written immediately after the most recent read operation. The value of the laptop_mode knob determines the time between the occurrence of disk I/O and when the flush is triggered. A sensible value for the knob is 5 seconds. Setting the knob to 0 disables laptop mode.

To increase the effectiveness of the laptop_mode strategy, the laptop_mode control script increases dirty_expire_centisecs and dirty_writeback_centisecs in /proc/sys/vm to about 10 minutes (by default), which means that pages that are dirtied are not forced to be written to disk as often. The control script also changes the dirty background ratio, so that background writeback of dirty pages is not done anymore. Combined with a higher commit value (also 10 minutes) for ext3 or ReiserFS filesystems (also done automatically by the control script), this results in concentration of disk activity in a small time interval which occurs only once every 10 minutes, or whenever the disk is forced to spin up by a cache miss. The disk can then be spun down in the periods of inactivity.

Configuration

The laptop mode configuration file is located in /etc/default/laptop-mode on Debian-based systems, or in /etc/sysconfig/laptop-mode on other systems. It contains the following options:

MAX_AGE:

Maximum time, in seconds, of hard drive spindown time that you are comfortable with. Worst case, it's possible that you could lose this amount of work if your battery fails while you're in laptop mode.

MINIMUM_BATTERY_MINUTES:

Automatically disable laptop mode if the remaining number of minutes of battery power is less than this value. Default is 10 minutes.

AC_HD/BATT_HD:

The idle timeout that should be set on your hard drive when laptop mode is active (BATT_HD) and when it is not active (AC_HD). The defaults are 20 seconds (value 4) for BATT_HD and 2 hours (value 244) for AC_HD. The possible values are those listed in the manual page for "hdparm" for the "-S" option.

HD:

The devices for which the spindown timeout should be adjusted by laptop mode. Default is /dev/hda. If you specify multiple devices, separate them by a space.

READAHEAD:

Disk readahead, in 512-byte sectors, while laptop mode is active. A large readahead can prevent disk accesses for things like executable pages (which are loaded on demand while the application executes) and sequentially accessed data (MP3s).

DO_REMOUNTS:

The control script automatically remounts any mounted journaled filesystems with appropriate commit interval options. When this option is set to 0, this feature is disabled.

DO_REMOUNT_NOATIME:

When remounting, should the filesystems be remounted with the noatime option? Normally, this is set to "1" (enabled), but there may be programs that require access time recording.

DIRTY_RATIO:

The percentage of memory that is allowed to contain "dirty" or unsaved data before a writeback is forced, while laptop mode is active. Corresponds to the /proc/sys/vm/dirty_ratio sysctl.

DIRTY_BACKGROUND_RATIO:

The percentage of memory that is allowed to contain "dirty" or unsaved data after a forced writeback is done due to an exceeding of DIRTY_RATIO. Set this nice and low. This corresponds to the /proc/sys/vm/dirty_background_ratio sysctl.

Note that the behaviour of dirty_background_ratio is quite different when laptop mode is active and when it isn't. When laptop mode is inactive, dirty_background_ratio is the threshold percentage at which background writeouts start taking place. When laptop mode is active, however, background writeouts are disabled, and the dirty_background_ratio only determines how much writeback is done when dirty_ratio is reached.

DO_CPU:

Enable CPU frequency scaling when in laptop mode. (Requires CPUFreq to be setup. See Documentation/admin-guide/pm/cpufreq.rst for more info. Disabled by default.)

CPU_MAXFREQ:

When on battery, what is the maximum CPU speed that the system should use? Legal values are "slowest" for the slowest speed that your CPU is able to operate at, or a value listed in /sys/devices/system/cpu/cpu0/cpufreq/scaling_available_frequencies.

Tips & Tricks

- Bartek Kania reports getting up to 50 minutes of extra battery life (on top of his regular 3 to 3.5 hours) using a spindown time of 5 seconds (BATT_HD=1).
- You can spin down the disk while playing MP3, by setting disk readahead to 8MB (READAHEAD=16384). Effectively, the disk will read a complete MP3 at once, and will then spin down while the MP3 is playing. (Thanks to Bartek Kania.)
- Drew Scott Daniels observed: "I don't know why, but when I decrease the number of colours that my display uses it consumes less battery power. I've seen this on powerbooks too. I hope that this is a piece of information that might be useful to the Laptop Mode patch or its users."
- In syslog.conf, you can prefix entries with a dash - to omit syncing the file after every logging. When you're using laptop-mode and your disk doesn't spin down, this is a likely culprit.
- Richard Atterer observed that laptop mode does not work well with noflushd (http://noflushd.sourceforge.net/), it seems that noflushd prevents laptop-mode from doing its thing.
- If you're worried about your data, you might want to consider using a USB memory stick or something like that as a "working area". (Be aware though that flash memory can only handle a limited number of writes, and overuse may wear out your memory stick pretty quickly. Do _not_ use journalling filesystems on flash memory sticks.)

Configuration file for control and ACPI battery scripts

This allows the tunables to be changed for the scripts via an external configuration file

It should be installed as /etc/default/laptop-mode on Debian, and as /etc/sysconfig/laptop-mode on Red Hat, SUSE, Mandrake, and other work-alikes.

Config file:

```
# Maximum time, in seconds, of hard drive spindown time that you are
# comfortable with. Worst case, it's possible that you could lose this
# amount of work if your battery fails you while in laptop mode.
#MAX_AGE=600

# Automatically disable laptop mode when the number of minutes of battery
# that you have left goes below this threshold.
MINIMUM_BATTERY_MINUTES=10

# Read-ahead, in 512-byte sectors. You can spin down the disk while playing MP3/OGG
# by setting the disk readahead to 8MB (READAHEAD=16384). Effectively, the disk
# will read a complete MP3 at once, and will then spin down while the MP3/OGG is
# playing.
#READAHEAD=4096

# Shall we remount journaled fs. with appropriate commit interval? (1=yes)
#DO_REMOUNTS=1

# And shall we add the "noatime" option to that as well? (1=yes)
#DO_REMOUNT_NOATIME=1

# Dirty synchronous ratio.  At this percentage of dirty pages the process
# which
# calls write() does its own writeback
#DIRTY_RATIO=40

#
# Allowed dirty background ratio, in percent.  Once DIRTY_RATIO has been
# exceeded, the kernel will wake flusher threads which will then reduce the
# amount of dirty memory to dirty_background_ratio.  Set this nice and low,
# so once some writeout has commenced, we do a lot of it.
#
#DIRTY_BACKGROUND_RATIO=5

# kernel default dirty buffer age
#DEF_AGE=30
#DEF_UPDATE=5
#DEF_DIRTY_BACKGROUND_RATIO=10
#DEF_DIRTY_RATIO=40
#DEF_XFS_AGE_BUFFER=15
#DEF_XFS_SYNC_INTERVAL=30
#DEF_XFS_BUFD_INTERVAL=1

# This must be adjusted manually to the value of HZ in the running kernel
# on 2.4, until the XFS people change their 2.4 external interfaces to work in
# centisecs. This can be automated, but it's a work in progress that still
# needs# some fixes. On 2.6 kernels, XFS uses USER_HZ instead of HZ for
# external interfaces, and that is currently always set to 100. So you don't
# need to change this on 2.6.
#XFS_HZ=100

# Should the maximum CPU frequency be adjusted down while on battery?
# Requires CPUFreq to be setup.
# See Documentation/admin-guide/pm/cpufreq.rst for more info
#DO_CPU=0

# When on battery what is the maximum CPU speed that the system should
# use? Legal values are "slowest" for the slowest speed that your
# CPU is able to operate at, or a value listed in:
# /sys/devices/system/cpu/cpu0/cpufreq/scaling_available_frequencies
# Only applicable if DO_CPU=1.
#CPU_MAXFREQ=slowest

# Idle timeout for your hard drive (man hdparm for valid values, -S option)
# Default is 2 hours on AC (AC_HD=244) and 20 seconds for battery (BATT_HD=4).
#AC_HD=244
#BATT_HD=4

# The drives for which to adjust the idle timeout. Separate them by a space,
# e.g. HD="/dev/hda /dev/hdb".
#HD="/dev/hda"

# Set the spindown timeout on a hard drive?
#DO_HD=1
```

Control script

Please note that this control script works for the Linux 2.4 and 2.6 series (thanks to Kiko Piris).

Control script:

```
#!/bin/bash

# start or stop laptop_mode, best run by a power management daemon when
# ac gets connected/disconnected from a laptop
#
# install as /sbin/laptop_mode
#
# Contributors to this script:   Kiko Piris
#                                Bart Samwel
```

```
#                               Micha Feigin
#                               Andrew Morton
#                               Herve Eychenne
#                               Dax Kelson
#
# Original Linux 2.4 version by: Jens Axboe

############################################################################

# Source config
if [ -f /etc/default/laptop-mode ] ; then
      # Debian
      . /etc/default/laptop-mode
elif [ -f /etc/sysconfig/laptop-mode ] ; then
      # Others
        . /etc/sysconfig/laptop-mode
fi

# Don't raise an error if the config file is incomplete
# set defaults instead:

# Maximum time, in seconds, of hard drive spindown time that you are
# comfortable with. Worst case, it's possible that you could lose this
# amount of work if your battery fails you while in laptop mode.
MAX_AGE=${MAX_AGE:-'600'}

# Read-ahead, in kilobytes
READAHEAD=${READAHEAD:-'4096'}

# Shall we remount journaled fs. with appropriate commit interval? (1=yes)
DO_REMOUNTS=${DO_REMOUNTS:-'1'}

# And shall we add the "noatime" option to that as well? (1=yes)
DO_REMOUNT_NOATIME=${DO_REMOUNT_NOATIME:-'1'}

# Shall we adjust the idle timeout on a hard drive?
DO_HD=${DO_HD:-'1'}

# Adjust idle timeout on which hard drive?
HD="${HD:-'/dev/hda'}"

# spindown time for HD (hdparm -S values)
AC_HD=${AC_HD:-'244'}
BATT_HD=${BATT_HD:-'4'}

# Dirty synchronous ratio.  At this percentage of dirty pages the process which
# calls write() does its own writeback
DIRTY_RATIO=${DIRTY_RATIO:-'40'}

# cpu frequency scaling
# See Documentation/admin-guide/pm/cpufreq.rst for more info
DO_CPU=${CPU_MANAGE:-'0'}
CPU_MAXFREQ=${CPU_MAXFREQ:-'slowest'}

#
# Allowed dirty background ratio, in percent.  Once DIRTY_RATIO has been
# exceeded, the kernel will wake flusher threads which will then reduce the
# amount of dirty memory to dirty_background_ratio.  Set this nice and low,
# so once some writeout has commenced, we do a lot of it.
#
DIRTY_BACKGROUND_RATIO=${DIRTY_BACKGROUND_RATIO:-'5'}

# kernel default dirty buffer age
DEF_AGE=${DEF_AGE:-'30'}
DEF_UPDATE=${DEF_UPDATE:-'5'}
DEF_DIRTY_BACKGROUND_RATIO=${DEF_DIRTY_BACKGROUND_RATIO:-'10'}
DEF_DIRTY_RATIO=${DEF_DIRTY_RATIO:-'40'}
DEF_XFS_AGE_BUFFER=${DEF_XFS_AGE_BUFFER:-'15'}
DEF_XFS_SYNC_INTERVAL=${DEF_XFS_SYNC_INTERVAL:-'30'}
DEF_XFS_BUFD_INTERVAL=${DEF_XFS_BUFD_INTERVAL:-'1'}

# This must be adjusted manually to the value of HZ in the running kernel
# on 2.4, until the XFS people change their 2.4 external interfaces to work in
# centisecs. This can be automated, but it's a work in progress that still needs
# some fixes. On 2.6 kernels, XFS uses USER_HZ instead of HZ for external
# interfaces, and that is currently always set to 100. So you don't need to
# change this on 2.6.
XFS_HZ=${XFS_HZ:-'100'}

############################################################################

KLEVEL="$(uname -r |
            {
            IFS='.' read a b c
            echo $a.$b
           }
)"
case "$KLEVEL" in
      "2.4"|"2.6")
            ;;
      *)
            echo "Unhandled kernel version: $KLEVEL ('uname -r' = '$(uname -r)')" >&2
            exit 1
            ;;
esac

if [ ! -e /proc/sys/vm/laptop_mode ] ; then
      echo "Kernel is not patched with laptop_mode patch." >&2
      exit 1
fi

if [ ! -w /proc/sys/vm/laptop_mode ] ; then
      echo "You do not have enough privileges to enable laptop_mode." >&2
      exit 1
fi

# Remove an option (the first parameter) of the form option=<number> from
# a mount options string (the rest of the parameters).
parse_mount_opts () {
      OPT="$1"
      shift
      echo ",$*," | sed                \
       -e 's/,'"$OPT"'=[0-9]*,/,/g'    \
       -e 's/,,*/,/g'                  \
       -e 's/^,//'                     \
       -e 's/,$//'
}

# Remove an option (the first parameter) without any arguments from
# a mount option string (the rest of the parameters).
parse_nonumber_mount_opts () {
      OPT="$1"
      shift
      echo ",$*," | sed                \
       -e 's/,'"$OPT"',/,/g'           \
       -e 's/,,*/,/g'                  \
       -e 's/^,//'                     \
       -e 's/,$//'
}
```

```
# Find out the state of a yes/no option (e.g. "atime"/"noatime") in
# fstab for a given filesystem, and use this state to replace the
# value of the option in another mount options string. The device
# is the first argument, the option name the second, and the default
# value the third. The remainder is the mount options string.
#
# Example:
# parse_yesno_opts_wfstab /dev/hda1 atime atime defaults,noatime
#
# If fstab contains, say, "rw" for this filesystem, then the result
# will be "defaults,atime".
parse_yesno_opts_wfstab () {
	L_DEV="$1"
	OPT="$2"
	DEF_OPT="$3"
	shift 3
	L_OPTS="$*"
	PARSEDOPTS1="$(parse_nonumber_mount_opts $OPT $L_OPTS)"
	PARSEDOPTS1="$(parse_nonumber_mount_opts no$OPT $PARSEDOPTS1)"
	# Watch for a default atime in fstab
	FSTAB_OPTS="$(awk '$1 == "'$L_DEV'" { print $4 }' /etc/fstab)"
	if echo "$FSTAB_OPTS" | grep "$OPT" > /dev/null ; then
		# option specified in fstab: extract the value and use it
		if echo "$FSTAB_OPTS" | grep "no$OPT" > /dev/null ; then
			echo "$PARSEDOPTS1,no$OPT"
		else
			# no$OPT not found -- so we must have $OPT.
			echo "$PARSEDOPTS1,$OPT"
		fi
	else
		# option not specified in fstab -- choose the default.
		echo "$PARSEDOPTS1,$DEF_OPT"
	fi
}

# Find out the state of a numbered option (e.g. "commit=NNN") in
# fstab for a given filesystem, and use this state to replace the
# value of the option in another mount options string. The device
# is the first argument, and the option name the second. The
# remainder is the mount options string in which the replacement
# must be done.
#
# Example:
# parse_mount_opts_wfstab /dev/hda1 commit defaults,commit=7
#
# If fstab contains, say, "commit=3,rw" for this filesystem, then the
# result will be "rw,commit=3".
parse_mount_opts_wfstab () {
	L_DEV="$1"
	OPT="$2"
	shift 2
	L_OPTS="$*"
	PARSEDOPTS1="$(parse_mount_opts $OPT $L_OPTS)"
	# Watch for a default commit in fstab
	FSTAB_OPTS="$(awk '$1 == "'$L_DEV'" { print $4 }' /etc/fstab)"
	if echo "$FSTAB_OPTS" | grep "$OPT=" > /dev/null ; then
		# option specified in fstab: extract the value, and use it
		echo -n "$PARSEDOPTS1,$OPT="
		echo ",$FSTAB_OPTS," | sed \
		 -e 's/.*,'"$OPT"'=//'  \
		 -e 's/,.*//'
	else
		# option not specified in fstab: set it to 0
		echo "$PARSEDOPTS1,$OPT=0"
	fi
}

deduce_fstype () {
	MP="$1"
	# My root filesystem unfortunately has
	# type "unknown" in /etc/mtab. If we encounter
	# "unknown", we try to get the type from fstab.
	cat /etc/fstab |
	grep -v '^#' |
	while read FSTAB_DEV FSTAB_MP FSTAB_FST FSTAB_OPTS FSTAB_DUMP FSTAB_DUMP ; do
		if [ "$FSTAB_MP" = "$MP" ]; then
			echo $FSTAB_FST
			exit 0
		fi
	done
}

if [ $DO_REMOUNT_NOATIME -eq 1 ] ; then
	NOATIME_OPT=",noatime"
fi

case "$1" in
	start)
		AGE=$((100*$MAX_AGE))
		XFS_AGE=$(($XFS_HZ*$MAX_AGE))
		echo -n "Starting laptop_mode"

		if [ -d /proc/sys/vm/pagebuf ] ; then
			# (For 2.4 and early 2.6.)
			# This only needs to be set, not reset -- it is only used when
			# laptop mode is enabled.
			echo $XFS_AGE > /proc/sys/vm/pagebuf/lm_flush_age
			echo $XFS_AGE > /proc/sys/fs/xfs/lm_sync_interval
		elif [ -f /proc/sys/fs/xfs/lm_age_buffer ] ; then
			# (A couple of early 2.6 laptop mode patches had these.)
			# The same goes for these.
			echo $XFS_AGE > /proc/sys/fs/xfs/lm_age_buffer
			echo $XFS_AGE > /proc/sys/fs/xfs/lm_sync_interval
		elif [ -f /proc/sys/fs/xfs/age_buffer ] ; then
			# (2.6.6)
			# But not for these -- they are also used in normal
			# operation.
			echo $XFS_AGE > /proc/sys/fs/xfs/age_buffer
			echo $XFS_AGE > /proc/sys/fs/xfs/sync_interval
		elif [ -f /proc/sys/fs/xfs/age_buffer_centisecs ] ; then
			# (2.6.7 upwards)
			# And not for these either. These are in centisecs,
			# not USER_HZ, so we have to use $AGE, not $XFS_AGE.
			echo $AGE > /proc/sys/fs/xfs/age_buffer_centisecs
			echo $AGE > /proc/sys/fs/xfs/xfssyncd_centisecs
			echo 3000 > /proc/sys/fs/xfs/xfsbufd_centisecs
		fi

		case "$KLEVEL" in
			"2.4")
				echo 1                                  > /proc/sys/vm/laptop_mode
				echo "30 500 0 0 $AGE $AGE 60 20 0"     > /proc/sys/vm/bdflush
				;;
			"2.6")
				echo 5                                  > /proc/sys/vm/laptop_mode
				echo "$AGE"                             > /proc/sys/vm/dirty_writeback_centisecs
				echo "$AGE"                             > /proc/sys/vm/dirty_expire_centisecs
				echo "$DIRTY_RATIO"                     > /proc/sys/vm/dirty_ratio
				echo "$DIRTY_BACKGROUND_RATIO"          > /proc/sys/vm/dirty_background_ratio
				;;
```

```
                esac
                if [ $DO_REMOUNTS -eq 1 ]; then
                        cat /etc/mtab | while read DEV MP FST OPTS DUMP PASS ; do
                                PARSEDOPTS="$(parse_mount_opts "$OPTS")"
                                if [ "$FST" = 'unknown' ]; then
                                        FST=$(deduce_fstype $MP)
                                fi
                                case "$FST" in
                                        "ext3"|"reiserfs")
                                                PARSEDOPTS="$(parse_mount_opts commit "$OPTS")"
                                                mount $DEV -t $FST $MP -o remount,$PARSEDOPTS,commit=$MAX_AGE$NOATIME_OPT
                                                ;;
                                        "xfs")
                                                mount $DEV -t $FST $MP -o remount,$OPTS$NOATIME_OPT
                                                ;;
                                esac
                                if [ -b $DEV ] ; then
                                        blockdev --setra $(($READAHEAD * 2)) $DEV
                                fi
                        done
                fi
                if [ $DO_HD -eq 1 ] ; then
                        for THISHD in $HD ; do
                                /sbin/hdparm -S $BATT_HD $THISHD > /dev/null 2>&1
                                /sbin/hdparm -B 1 $THISHD > /dev/null 2>&1
                        done
                fi
                if [ $DO_CPU -eq 1 -a -e /sys/devices/system/cpu/cpu0/cpufreq/cpuinfo_min_freq ]; then
                        if [ $CPU_MAXFREQ = 'slowest' ]; then
                                CPU_MAXFREQ=`cat /sys/devices/system/cpu/cpu0/cpufreq/cpuinfo_min_freq`
                        fi
                        echo $CPU_MAXFREQ > /sys/devices/system/cpu/cpu0/cpufreq/scaling_max_freq
                fi
                echo "."
                ;;
        stop)
                U_AGE=$((100*$DEF_UPDATE))
                B_AGE=$((100*$DEF_AGE))
                echo -n "Stopping laptop_mode"
                echo 0 > /proc/sys/vm/laptop_mode
                if [ -f /proc/sys/fs/xfs/age_buffer -a ! -f /proc/sys/fs/xfs/lm_age_buffer ] ; then
                        # These need to be restored, if there are no lm_*.
                        echo $(($XFS_HZ*$DEF_XFS_AGE_BUFFER))           > /proc/sys/fs/xfs/age_buffer
                        echo $(($XFS_HZ*$DEF_XFS_SYNC_INTERVAL))        > /proc/sys/fs/xfs/sync_interval
                elif [ -f /proc/sys/fs/xfs/age_buffer_centisecs ] ; then
                        # These need to be restored as well.
                        echo $((100*$DEF_XFS_AGE_BUFFER))       > /proc/sys/fs/xfs/age_buffer_centisecs
                        echo $((100*$DEF_XFS_SYNC_INTERVAL))    > /proc/sys/fs/xfs/xfssyncd_centisecs
                        echo $((100*$DEF_XFS_BUFD_INTERVAL))    > /proc/sys/fs/xfs/xfsbufd_centisecs
                fi
                case "$KLEVEL" in
                        "2.4")
                                echo "30 500 0 0 $U_AGE $B_AGE 60 20 0" > /proc/sys/vm/bdflush
                                ;;
                        "2.6")
                                echo "$U_AGE"                           > /proc/sys/vm/dirty_writeback_centisecs
                                echo "$B_AGE"                           > /proc/sys/vm/dirty_expire_centisecs
                                echo "$DEF_DIRTY_RATIO"                 > /proc/sys/vm/dirty_ratio
                                echo "$DEF_DIRTY_BACKGROUND_RATIO"      > /proc/sys/vm/dirty_background_ratio
                                ;;
                esac
                if [ $DO_REMOUNTS -eq 1 ] ; then
                        cat /etc/mtab | while read DEV MP FST OPTS DUMP PASS ; do
                                # Reset commit and atime options to defaults.
                                if [ "$FST" = 'unknown' ]; then
                                        FST=$(deduce_fstype $MP)
                                fi
                                case "$FST" in
                                        "ext3"|"reiserfs")
                                                PARSEDOPTS="$(parse_mount_opts_wfstab $DEV commit $OPTS)"
                                                PARSEDOPTS="$(parse_yesno_opts_wfstab $DEV atime atime $PARSEDOPTS)"
                                                mount $DEV -t $FST $MP -o remount,$PARSEDOPTS
                                                ;;
                                        "xfs")
                                                PARSEDOPTS="$(parse_yesno_opts_wfstab $DEV atime atime $OPTS)"
                                                mount $DEV -t $FST $MP -o remount,$PARSEDOPTS
                                                ;;
                                esac
                                if [ -b $DEV ] ; then
                                        blockdev --setra 256 $DEV
                                fi
                        done
                fi
                if [ $DO_HD -eq 1 ] ; then
                        for THISHD in $HD ; do
                                /sbin/hdparm -S $AC_HD $THISHD > /dev/null 2>&1
                                /sbin/hdparm -B 255 $THISHD > /dev/null 2>&1
                        done
                fi
                if [ $DO_CPU -eq 1 -a -e /sys/devices/system/cpu/cpu0/cpufreq/cpuinfo_min_freq ]; then
                        echo `cat /sys/devices/system/cpu/cpu0/cpufreq/cpuinfo_max_freq` > /sys/devices/system/cpu/cpu0/cpufreq/scaling_ma
                fi
                echo "."
                ;;
        *)
                echo "Usage: $0 {start|stop}" 2>&1
                exit 1
                ;;

esac

exit 0
```

ACPI integration

Dax Kelson submitted this so that the ACPI acpid daemon will kick off the laptop_mode script and run hdparm. The part that automatically disables laptop mode when the battery is low was written by Jan Topinski.

/etc/acpi/events/ac_adapter:

```
event=ac_adapter
action=/etc/acpi/actions/ac.sh %e
```

/etc/acpi/events/battery:

```
event=battery.*
action=/etc/acpi/actions/battery.sh %e
```

/etc/acpi/actions/ac.sh:

```
#!/bin/bash

# ac on/offline event handler

status=`awk '/^state: / { print $2 }' /proc/acpi/ac_adapter/$2/state`

case $status in
        "on-line")
                /sbin/laptop_mode stop
                exit 0
```

```
        ;;
        "off-line")
                /sbin/laptop_mode start
                exit 0
        ;;
esac
```

/etc/acpi/actions/battery.sh:

```
#! /bin/bash

# Automatically disable laptop mode when the battery almost runs out.

BATT_INFO=/proc/acpi/battery/$2/state

if [[ -f /proc/sys/vm/laptop_mode ]]
then
   LM=`cat /proc/sys/vm/laptop_mode`
   if [[ $LM -gt 0 ]]
   then
     if [[ -f $BATT_INFO ]]
     then
        # Source the config file only now that we know we need
        if [ -f /etc/default/laptop-mode ] ; then
                # Debian
                . /etc/default/laptop-mode
        elif [ -f /etc/sysconfig/laptop-mode ] ; then
                # Others
                . /etc/sysconfig/laptop-mode
        fi
        MINIMUM_BATTERY_MINUTES=${MINIMUM_BATTERY_MINUTES:-'10'}

        ACTION="`cat $BATT_INFO | grep charging | cut -c 26-`"
        if [[ ACTION -eq "discharging" ]]
        then
           PRESENT_RATE=`cat $BATT_INFO | grep "present rate:" | sed  "s/.* \([0-9][0-9]* \).*/\1/" `
           REMAINING=`cat $BATT_INFO | grep "remaining capacity:" | sed  "s/.* \([0-9][0-9]* \).*/\1/" `
        fi
        if (($REMAINING * 60 / $PRESENT_RATE < $MINIMUM_BATTERY_MINUTES))
        then
           /sbin/laptop_mode stop
        fi
     else
       logger -p daemon.warning "You are using laptop mode and your battery interface $BATT_INFO is missing. This may lead to loss of dat
     fi
   fi
fi
```

Monitoring tool

Bartek Kania submitted this, it can be used to measure how much time your disk spends spun up/down. See tools/laptop/dslm/dslm.c