
Introducing GNOME Power Manager

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Introduction

- Modern machines allow many options to reduce power consumption:
 - Reduce CPU frequency
 - Dim the laptop panel when the machine is idle.
 - Turn off the display when inactive.
 - Allow longer cache-intervals for the hard drive and memory subsystem.
 - Hibernating and suspending the system.

The problem

- If you are running an Intel Thinkpad using Ubuntu, or PowerBook using Fedora Core, the power management facilities are very different.
 - To get your machine to suspend on lid close is already possible, but is difficult to know what files in `/etc/` to modify or what extra software to use.
 - To get your LCD screen brightness set to 50% when you remove the AC Adapter of your laptop is possible with a little bash script, but is not something that comes ready configured on all standard Linux distros for all hardware.

Power Subsystems : APM

- Advanced Power Management
 - API developed by Intel and Microsoft that allows developers to include power management in the i386 BIOS.
 - APM is now obsolete and 99% of modern computers today support ACPI.
 - APM and ACPI are mutually exclusive.

Power Subsystems: ACPI

- ACPI : Advanced Configuration Power Interface
 - Specification by Toshiba, Intel and Microsoft.
 - Besides many other things it also defines power management.
 - It allows the operating system to control the amount of power distributed to the computer's devices.
 - Devices not in use can be turned off, reducing unnecessary power expenditure.

Power Subsystems: PMU

- PMU: Power Management Unit
 - Used only on Apple hardware.
 - Apple PowerBooks do not support the ACPI or APM specifications, but they have a separate protocol for PMU.
 - Will become obsolete with Apple moving to Intel chips.

Other software

- **acpid**
 - Run scripts based on certain ACPI events.
 - Requires the user to edit a shell script with cryptic commands that are run as root.
- **apmd**
 - Monitors `/dev/apm` and `/dev/pmu` and can run scripts dependent on the events received
 - Does not work with ACPI computers, and again relies on the user editing scripts depending on the specific action that they want performed.

Other software (cont.)

- Powersaved
 - System daemon supporting APM and ACPI.
 - Can handle standby and suspend, CPU frequency scaling and other related power management tasks.
 - Now uses HAL for all battery data.
- KPowersave
 - Allows the user to invoke methods on powersaved and for powersaved to interact with the user.

HAL

- HAL is a “Hardware Abstraction Layer” which aims to abstract out device specific functions into a generic DBUS properties and methods.
- It runs as a system service and monitors most of the hardware in your system.
- Already installed and running by default in most Linux distributions and initial support for BSD and Solaris.
- Already integrated with GNOME with gnome-vfs, gnome-volume-manager, luks and gnome-mount.

HAL : Power Properties

- HAL now has 3 power management backends, namely APM, ACPI and PMU:
 - Provide the architecture and vendor independence for higher level software to use.
 - Unplugging the AC Adaptor from a laptop gives:

```
acpi_ADP1 property ac_adapter.present = false
acpi_BAT1 property battery.remaining_time = 7798 (0x1e76) (new)
acpi_BAT1 property battery.reporting.rate = 19224 (0x4b18)
acpi_BAT1 property battery.rechargeable.is_discharging = true
```

- Easily be processed by any service or program that can talk the DBUS protocol.

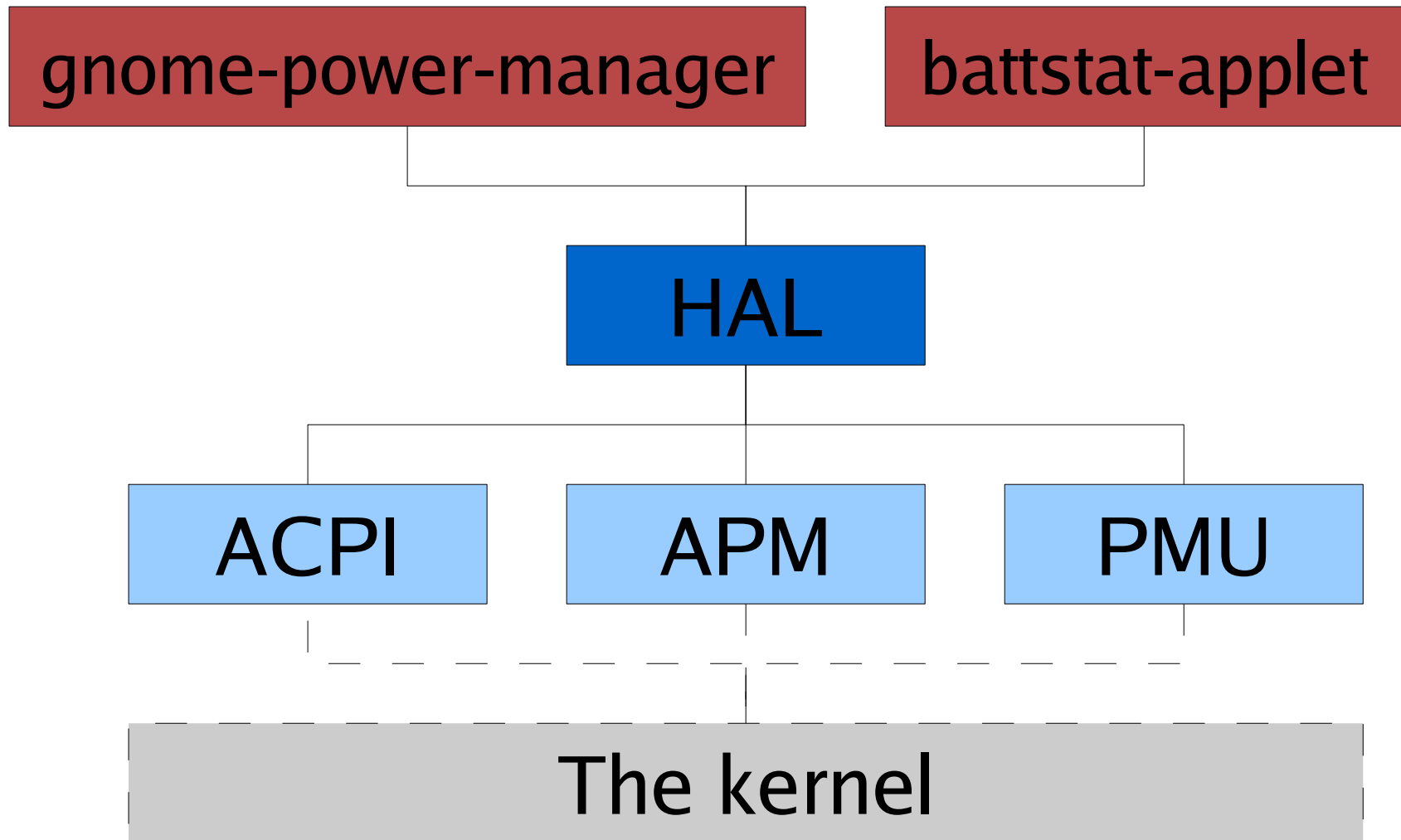
HAL: Power Properties (cont.)

- Existing USB battery mice backend:
 - The power level on certain Logitech mice and keyboards can be monitored
- Existing UPS battery backend:
 - UPS state and power usage can be monitored.
- Adding a new addons in HAL is easy:
 - It allows all the other software such as gnome-power-manager and battstat-applet to support the new device without any configuration or recompiling.

HAL: Power Properties (cont.)

- Using HAL in this abstract way allows us to design software that **does not care** what architecture it is running on, or what tools are currently installed.
- We do not have to make desktop programs setuid or make devices insecure just to read hardware data.
- It also means that any “quirks” can be dealt with in one central place, so that desktop software can trust the values as being correct.

HAL : The Solution



HAL : Power Methods

- HAL also provides some power management methods to control your computer.
 - `Shutdown()` To shutdown
 - `Suspend()` To suspend to RAM
 - `Hibernate()` To hibernate to disk
 - `SetLowPower()` To set low power mode, e.g. enabling laptop-mode.

HAL : Power Methods (cont.)

- Directly linked into shell scripts that perform the action.
 - located in `/usr/share/hal/scripts/`
- These scripts do the action depending on distro-specific tweaks or the tools installed.
 - If you have the Ubuntu “pmi” installed, then the `hal-system-power-suspend` script will suspend using this method, else it will fallback to the native `swsusp` kernel support.
- Permissions handled using DBUS rules.
 - Can use `at_console` for non-root, local use

pm-utils

- **Very new module** hosted on fd.org:
- Designed to run scripts at suspend and resume
- Will replace the legacy tools in hal-system-power-{suspend|hibernate}
- Simple scripts installed in /etc/pm/hooks/*
 - Turn on suspend LED's
 - Modprobe faulty modules
 - POST and RESUME laptop panels
- Designed to be easy to drop a file into a directory so that vendors can add functionality.

GNOME Power Manager

- Conceived in 2005 to be a small session power policy daemon for the GNOME Desktop.
- Runs as a session daemon to work with other DBUS enabled technologies such as gnome-screensaver and NetworkManager.
- Uses the HAL properties and methods to do all the low level work.
- Provides auto-suspend when idle.

GNOME Power Manager History

- Proposed for inclusion in GNOME 2.14 and 2.16 releases.
 - Uses GConf, gtk+, glade, glib, dbus-glib
 - Website, CVS, bugzilla, releases and mailing list hosted on gnome.org servers.
 - Followed GNOME release procedures since 2.14

Distribution Availability

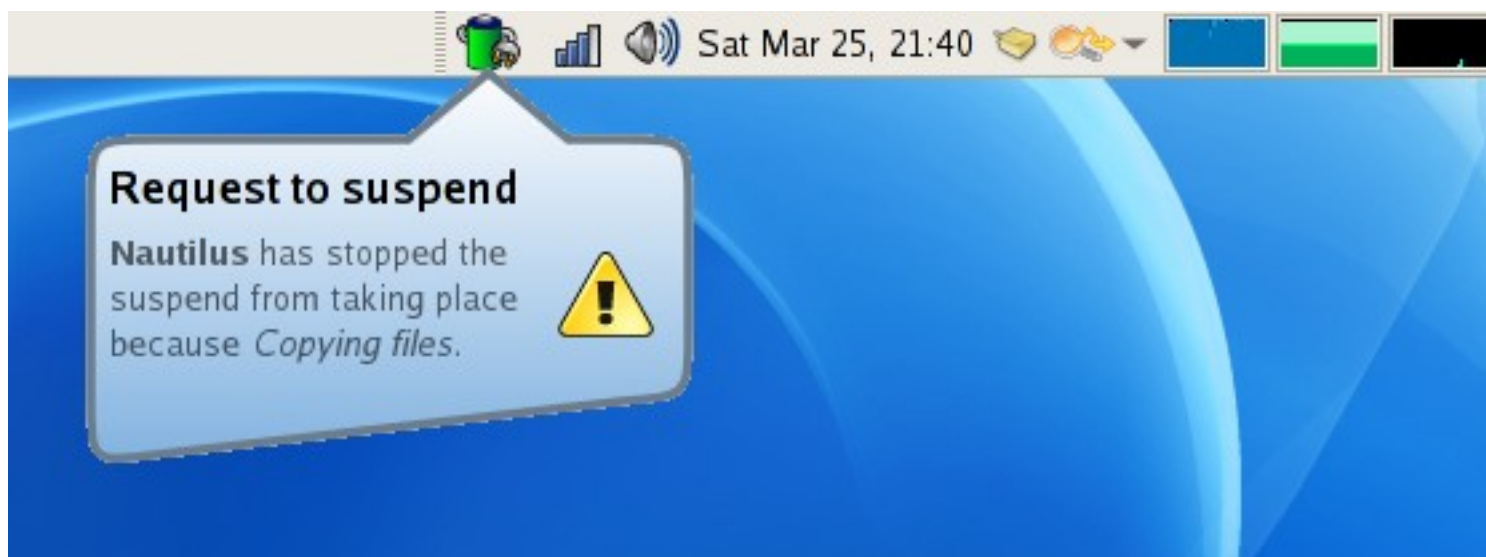
- Packages available:
 - Fedora Core 4 and 5 (installed by default in FC5)
 - Ubuntu Breezy and Dapper (by default in Dapper)
 - Foresight Linux
 - SUSE Linux
 - Arch Linux
 - Debian Unstable
 - Gentoo

GS Inhibit Interface

- gnome-screensaver is responsible for marking the session “idle”.
 - If you call the inhibit methods on gnome-screensaver, then gnome-screensaver will not mark your session as idle.
 - When not idle, the screen will not dim, the screensaver will not start and the computer will not suspend automatically.

GPM Inhibit Interface

- Some times you might not want your computer to auto-suspend or power-off even when the session is marked as idle.
 - Copying files in Nautilus
 - During a SELinux relabel

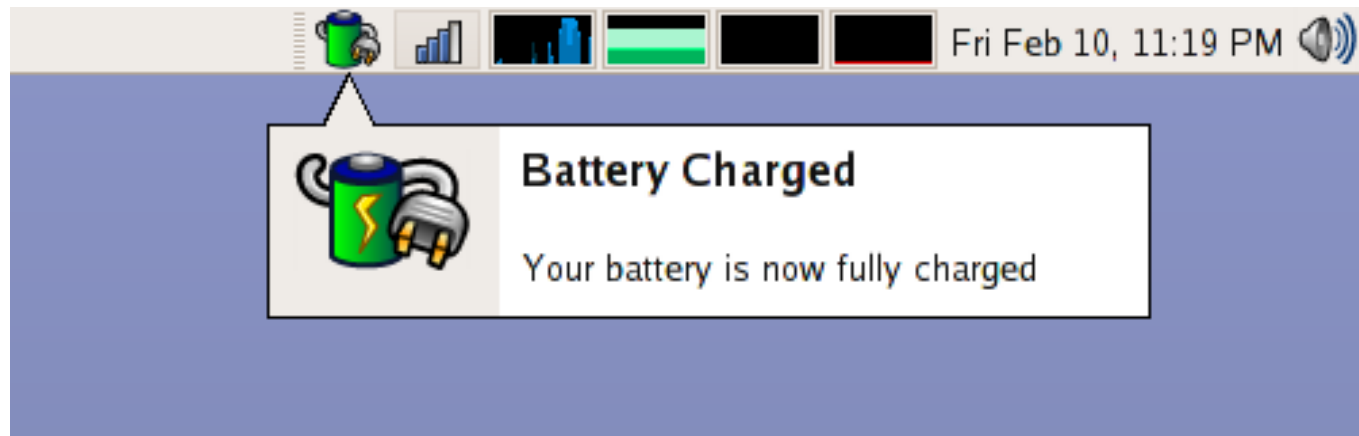


GPM Inhibit Interface

- Using the DBUS interface you can “inhibit” the idle action from being performed.
 - You should use this method if you really don't want the user to be able to suspend, or for the computer to save power by hibernating or suspending.
- Easily use the InhibitInactiveSleep and AllowInactiveSleep DBUS methods.
 - Trivial to use in C, C++, C# or python.

Notifications from libnotify

- Provides libnotify notifications when:
 - Battery is fully charged
 - Battery is low, and critically low
 - The computer is about to perform low power action
 - The AC adapter is removed
- These can be disabled in GConf for advanced users.



Notification Tray

- `gnome-power-manager` is not an applet:
 - Applets cannot be removed or added automatically
 - Multiple instances of `gnome-power-manager` would not make logical sense.
 - Users should know where to look for battery status information.
- Icon view modes include:
 - Always, battery present, charging or discharging, battery critical and never.

Why No Power Profiles?

- A recent Microsoft study found that most people do not change the power profile.
 - When watching a movie in totem, I shouldn't have to select the “DVD” profile before I start to watch it full screen
 - Totem should inhibit the screensaver automatically (and thus gnome-power-manager) so that the user is not bothered with the interruption
- “Manager software” like gnome-power-manager should work in the background, without being noticed by the user.

No System Service?

- The biggest problem people find with gnome-power-manager is that it's per-session rather than per-system. This gives it a two problems.
 - No policy when the user is not logged in
 - No policy when the machine is starting up
- Other issues such as multiple logged in users are not a problem as only the current at_console user can apply policy.
 - gnome-power-manager is not designed for servers.

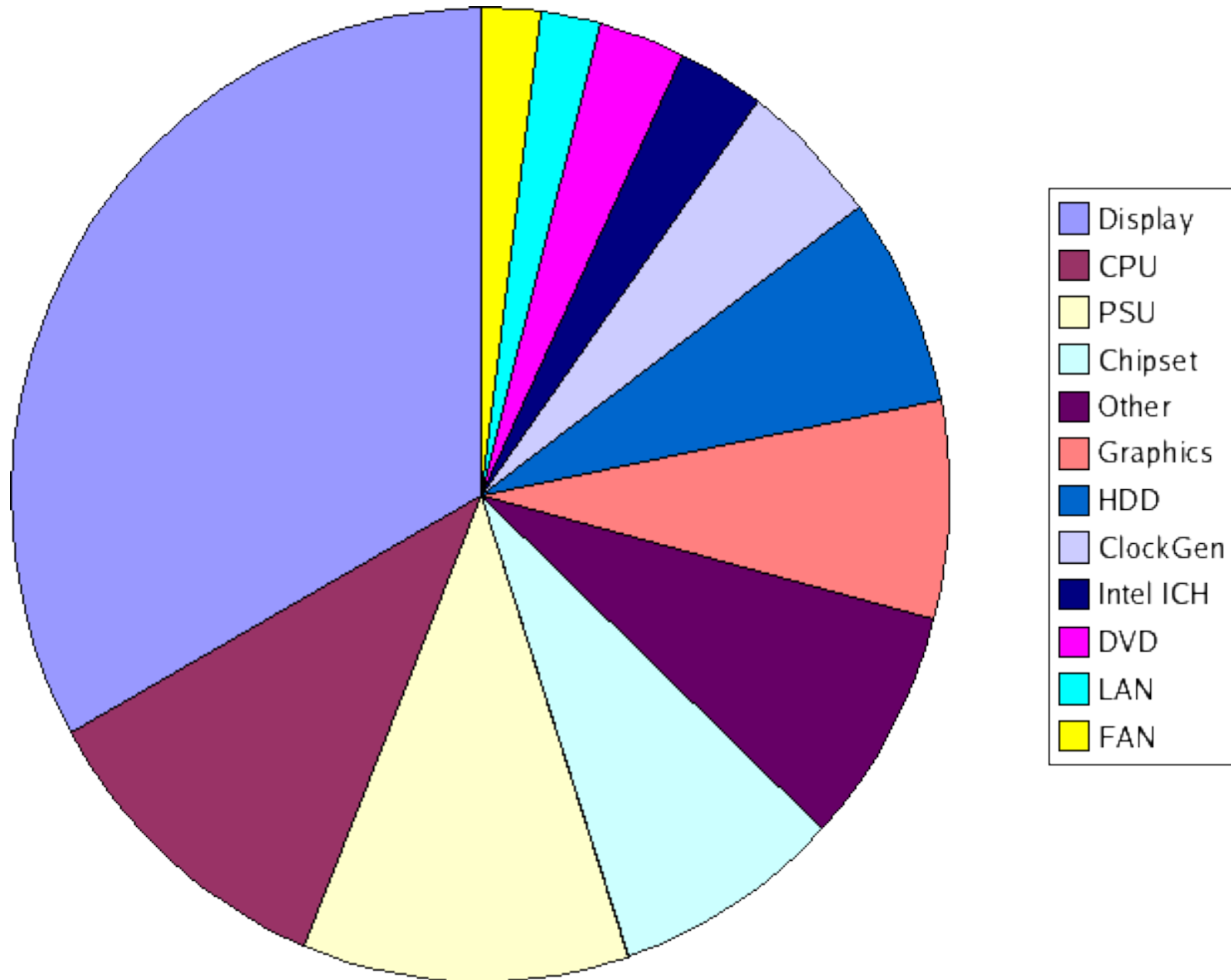
No System Service? (cont.)

- Being a per-session service allows users to interact in a much more natural way with the power manager.
 - If gnome-power-manager was split into session and system parts then the inter-process communication would be complicated and slow for no actual gain.
 - DBUS permissions assure that operations are secure, and restricted to authorized users.
 - Administrators can further refine the DBUS rules to disallow certain users from doing certain actions.

The Future: PolicyKit

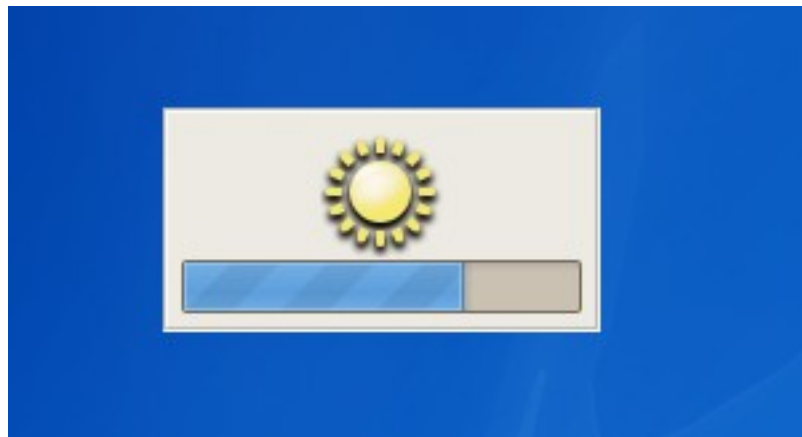
- PolicyKit is a system daemon to allow or disallow different users to do tasks depending on policy.
- Manages run-as-session software when in session and out of session.
- Long term solution to the “is user at console” generalization.
- Still very new (0.0.1) with an unstable API.
- HAL 0.5.8 depends on PolicyKit.

Where to Focus?



LCD Brightness

- Where we gain most is dimming the screen and turning off via DPMS.
- HAL understands the ACPI and PMU “brightness” hardware keys on most laptops.
- We can set the brightness with user feedback.



Conclusion

- GNOME Power Manager should be considered as an integral part of the GNOME Desktop Environment.
- Other GNOME Applications should use the new API's provided by gnome-power-manager for a more complete desktop experience.

Questions/Comments

- Thank you for your time.
 - Richard Hughes.