GNOME for system administrators
Jessie edition

Mini Debconf Lyon 2015

12 april 2015

Introduction

- Debian is awesome to use in a 1000+ machines environment
  - Automated deployment tools
  - Customization: custom APT repositories
  - Administration tools, and our famous reliability!
- Workstations are a good use case, with GNOME as the desktop
  - The easy way: leave users with self-administration permissions
    → But it doesn't scale very well in terms of support
  - The secure way: standard workstations with no specific permissions
- In order to ship the best systems for users:
  - How does GNOME actually work on the inside?
  - Where are important places to look for a configuration / a problem?
  - What can I tweak on my systems?

OUTLINE

1. **The base plumbing for the desktop**
   DBus, PolicyKit

2. **Systemd services**
   logind, journald…

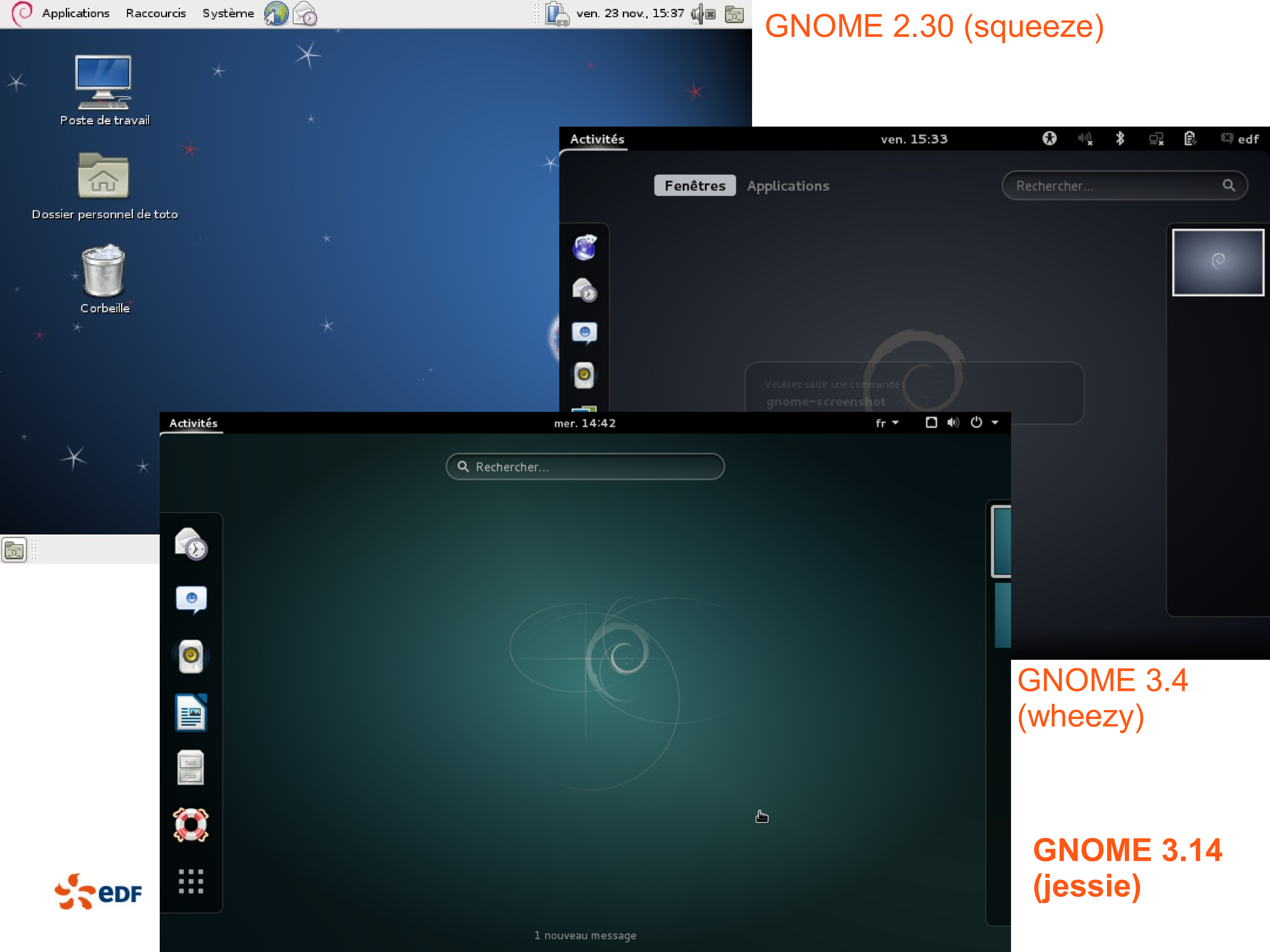
3. **User settings**
   GSettings and dconf
   Menus and applications

4. **Login and password management**
   The GNOME display manager
   Accountsservice
   The keyring

5. **Networking with GNOME**
   NetworkManager
   The virtual filesystem stack

6. **Hardware access**
   PulseAudio
   Printing
   Power management

7. **Miscellanea**
   PackageKit
   Using the plumbing in custom scripts
   Deploying the configuration on workstations



Veuillez saisir une commande :

```
gnome-screenshot
```

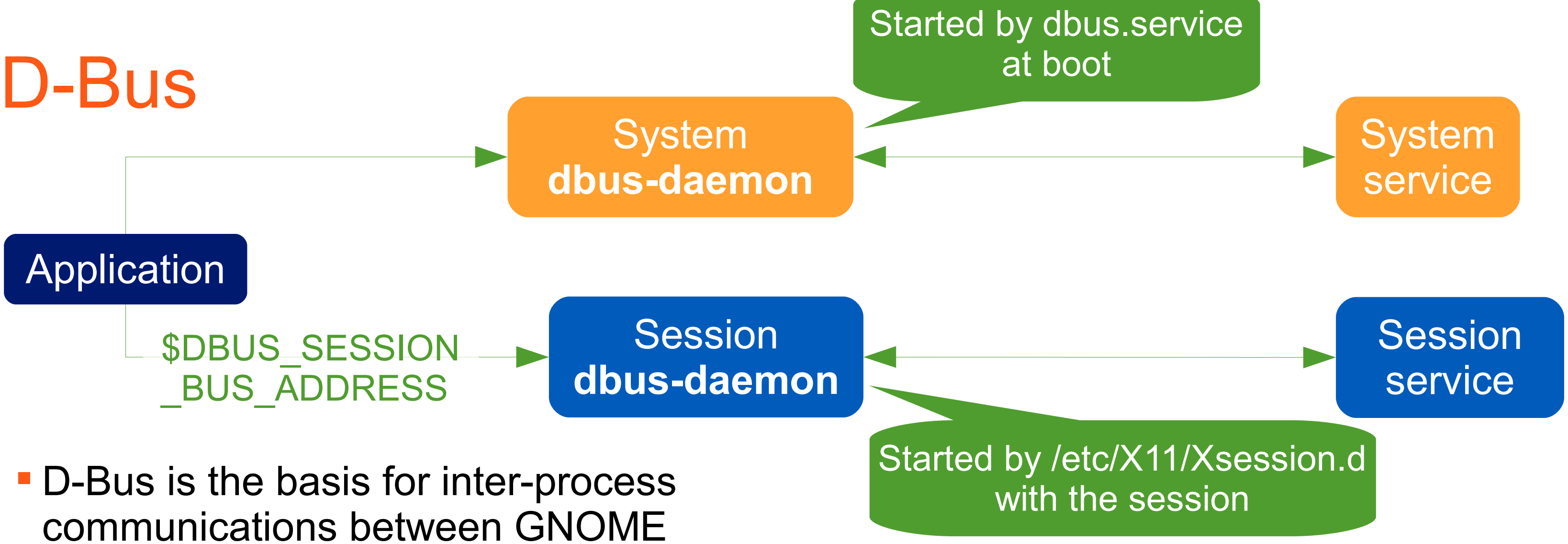
1 nouveau message

GNOME 2.30 (squeeze)

GNOME 3.4 (wheezy)

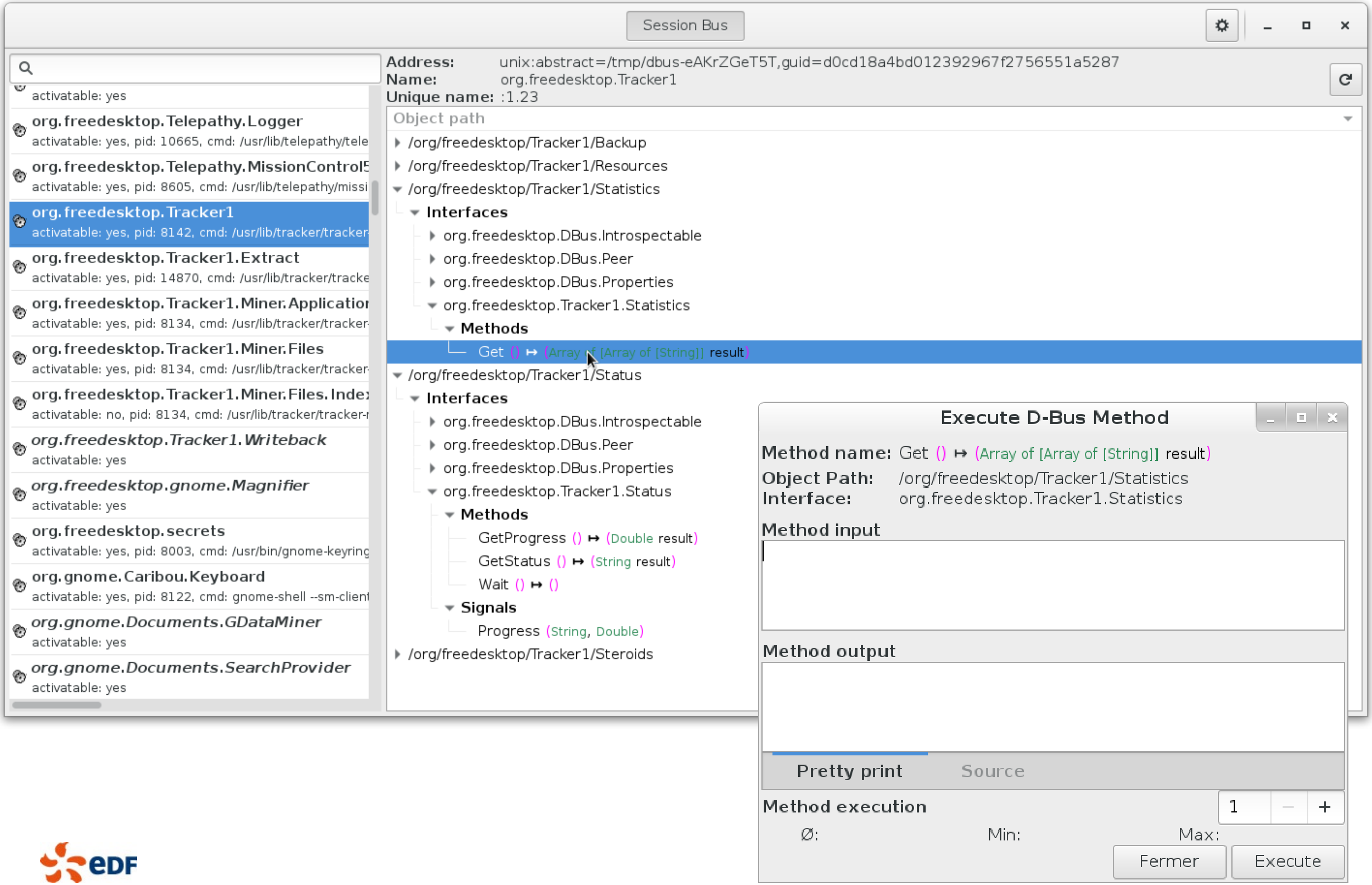
GNOME 3.14 (jessie)

D-Bus


Started by dbus.service at boot
System **dbus-daemon**
System service
Application
$DBUS_SESSION_BUS_ADDRESS
Session **dbus-daemon**
Session service
Started by /etc/X11/Xsession.d with the session

- D-Bus is the basis for inter-process communications between GNOME applications and the underlying system
  - Based on a typed messaging system over Unix sockets
  - Implements an asynchronous RPC mechanism
- Services can either
  - Start by themselves and *register* a name, e.g. org.freedesktop.NetworkManager
    → systemd handles the case with Type=dbus
  - Be auto-spawned by the DBus daemon
    → /usr/share/dbus-1/services/*.service
    → /usr/share/dbus-1/system-services/*.service
- Basic permissions management for system services in /etc/dbus-1/*.conf
  - Most relevant daemons use PolicyKit instead

Examining your system with D-Feet



Session Bus

activatable: yes

org.freedesktop.Telepathy.Logger
activatable: yes, pid: 10665, cmd: /usr/lib/telepathy/tele

org.freedesktop.Telepathy.MissionControl5
activatable: yes, pid: 8605, cmd: /usr/lib/telepathy/missi

org.freedesktop.Tracker1
activatable: yes, pid: 8142, cmd: /usr/lib/tracker/tracker

org.freedesktop.Tracker1.Extract
activatable: yes, pid: 14870, cmd: /usr/lib/tracker/tracke

org.freedesktop.Tracker1.Miner.Application
activatable: yes, pid: 8134, cmd: /usr/lib/tracker/tracker-

org.freedesktop.Tracker1.Miner.Files
activatable: yes, pid: 8134, cmd: /usr/lib/tracker/tracker-

org.freedesktop.Tracker1.Miner.Files.Index
activatable: no, pid: 8134, cmd: /usr/lib/tracker/tracker-

org.freedesktop.Tracker1.Writeback
activatable: yes

org.freedesktop.gnome.Magnifier
activatable: yes

org.freedesktop.secrets
activatable: yes, pid: 8003, cmd: /usr/bin/gnome-keyring

org.gnome.Caribou.Keyboard
activatable: yes, pid: 8122, cmd: gnome-shell --sm-client

org.gnome.Documents.GDataMiner
activatable: yes

org.gnome.Documents.SearchProvider
activatable: yes

Address: unix:abstract=/tmp/dbus-eAKrZGeT5T,guid=d0cd18a4bd012392967f2756551a5287
Name: org.freedesktop.Tracker1
Unique name: :1.23

Object path

```
/org/freedesktop/Tracker1/Backup
/org/freedesktop/Tracker1/Resources
/org/freedesktop/Tracker1/Statistics
  Interfaces
    org.freedesktop.DBus.Introspectable
    org.freedesktop.DBus.Peer
    org.freedesktop.DBus.Properties
    org.freedesktop.Tracker1.Statistics
      Methods
        Get () ↦ (Array of [Array of [String]] result)
/org/freedesktop/Tracker1/Status
  Interfaces
    org.freedesktop.DBus.Introspectable
    org.freedesktop.DBus.Peer
    org.freedesktop.DBus.Properties
    org.freedesktop.Tracker1.Status
      Methods
        GetProgress () ↦ (Double result)
        GetStatus () ↦ (String result)
        Wait () ↦ ()
      Signals
        Progress (String, Double)
/org/freedesktop/Tracker1/Steroids
```

Execute D-Bus Method

Method name: Get () ↦ (Array of [Array of [String]] result)
Object Path: /org/freedesktop/Tracker1/Statistics
Interface: org.freedesktop.Tracker1.Statistics

Method input

Method output

Pretty print | Source

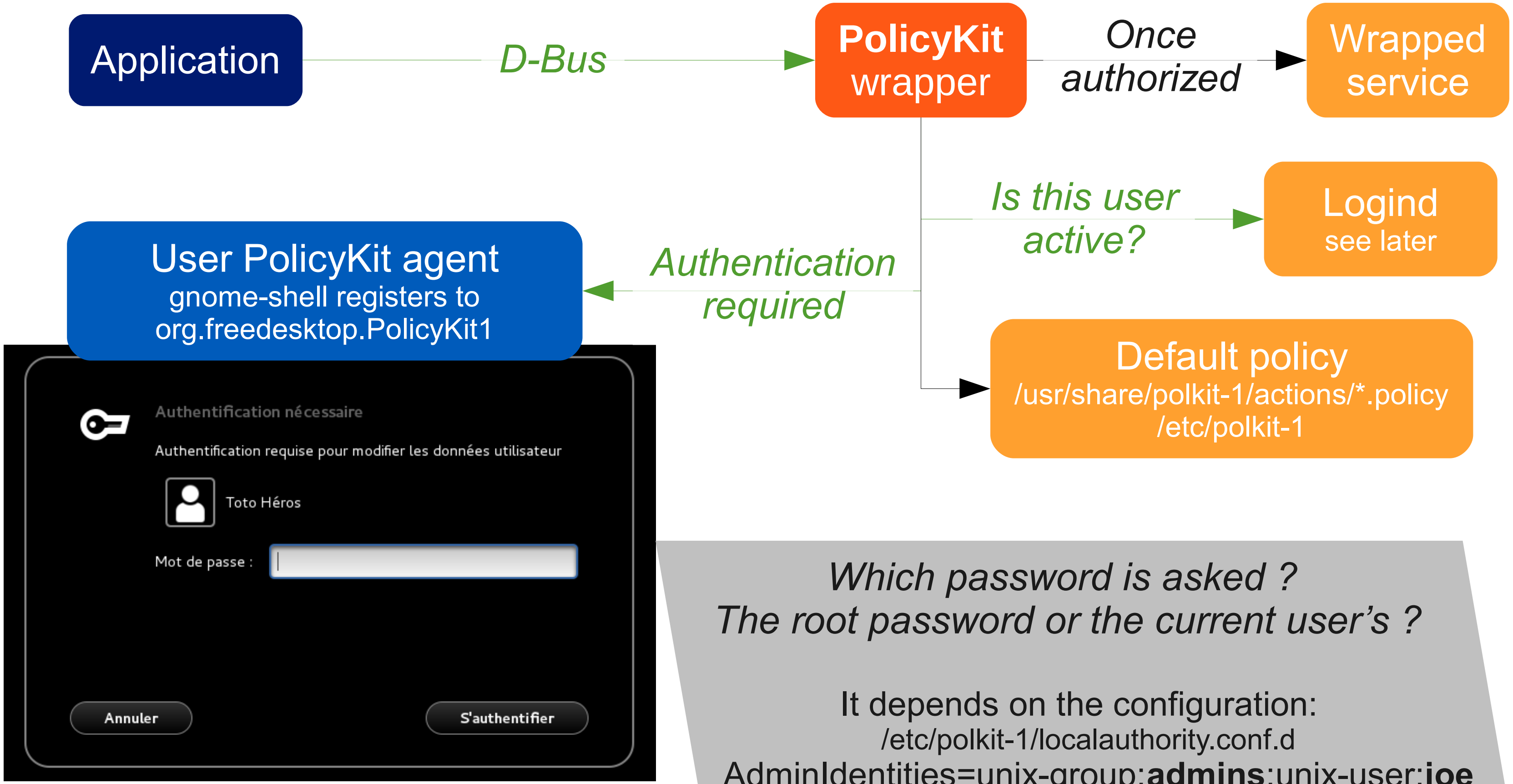
Method execution 1 − +

Ø: Min: Max:

Fermer | Execute

PolicyKit

- PolicyKit adds rich **permissions management** to a system D-Bus service
  - Can wrap any D-Bus call, invisible from the application



Authentification nécessaire

Authentification requise pour modifier les données utilisateur

Toto Héros

Mot de passe :

Which password is asked ?
The root password or the current user’s ?

It depends on the configuration:
/etc/polkit-1/localauthority.conf.d
AdminIdentities=unix-group:**admins**;unix-user:**joe**

Debian default: the **sudo** group

Tuning the default policy

- Policy tuning is done either with JavaScript files or PKLA (ini-like) files
  → Depending on the distribution choices

- Debian uses PKLA. You can create /etc/polkit-1/localauthority/30-site.d/my-config.pkla

  -
    ```
    [Allow users to shutdown, even when someone else’s application asks not to]
    Identity=*
    Action=org.freedesktop.login1.power-off-ignore-inhibit
    ResultAny=no
    ResultInactive=no
    ResultActive=yes
    ```

    ResultActive is for the user physically logged on

  -
    ```
    [Let some users change the CPU frequency by hand]
    Identity=unix-group:benchmarks
    Action=org.gnome.CPUFreqSelector
    ResultAny=no
    ResultInactive=no
    ResultActive=yes
    ```

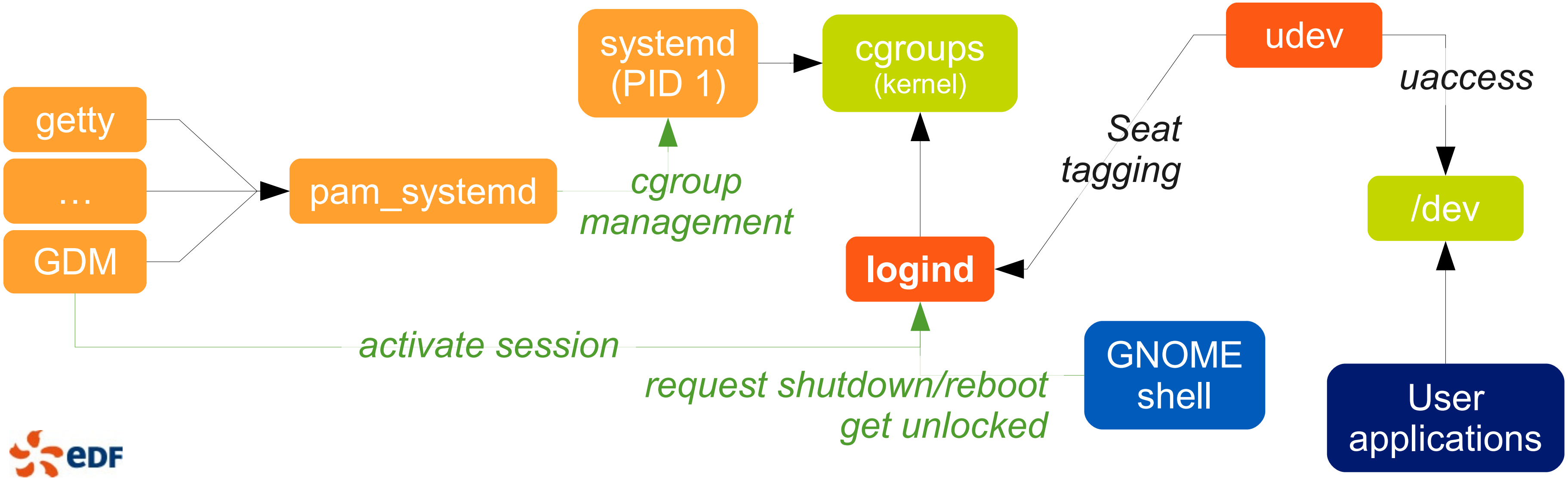
    Group selection

  -
    ```
    [Let a user install any package from the repository using PackageKit]
    Identity=unix-user:joss
    Action=org.freedesktop.packagekit.package-install
    ResultAny=no
    ResultInactive=no
    ResultActive=auth_self
    ```

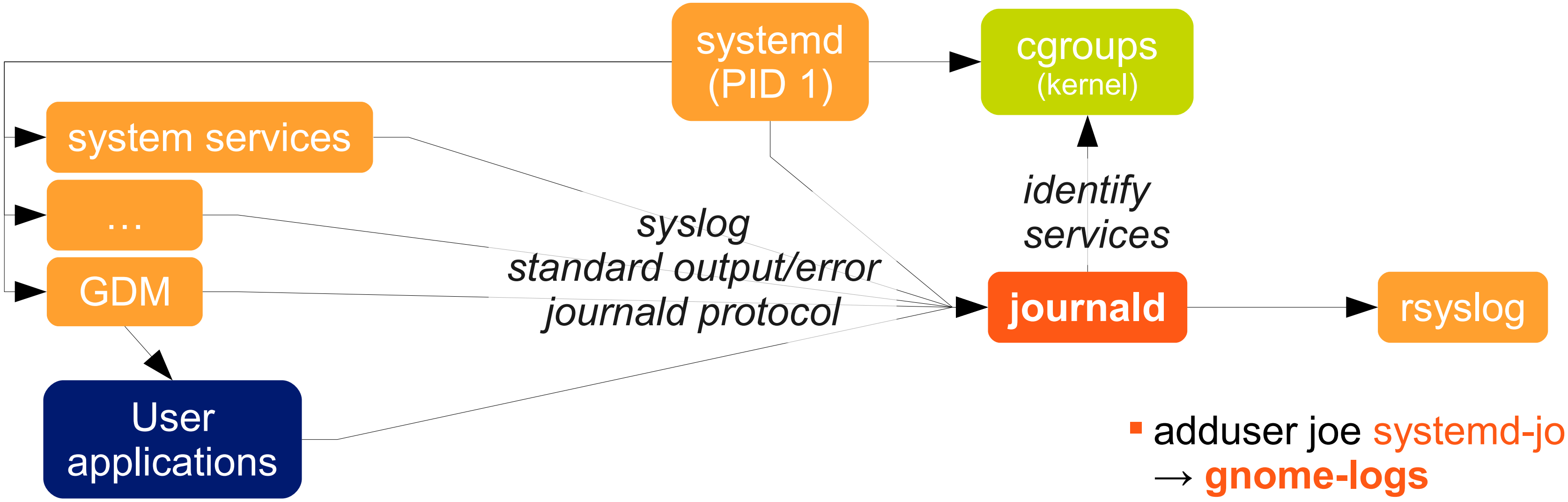
    Ask the user’s own password

Systemd services: logind

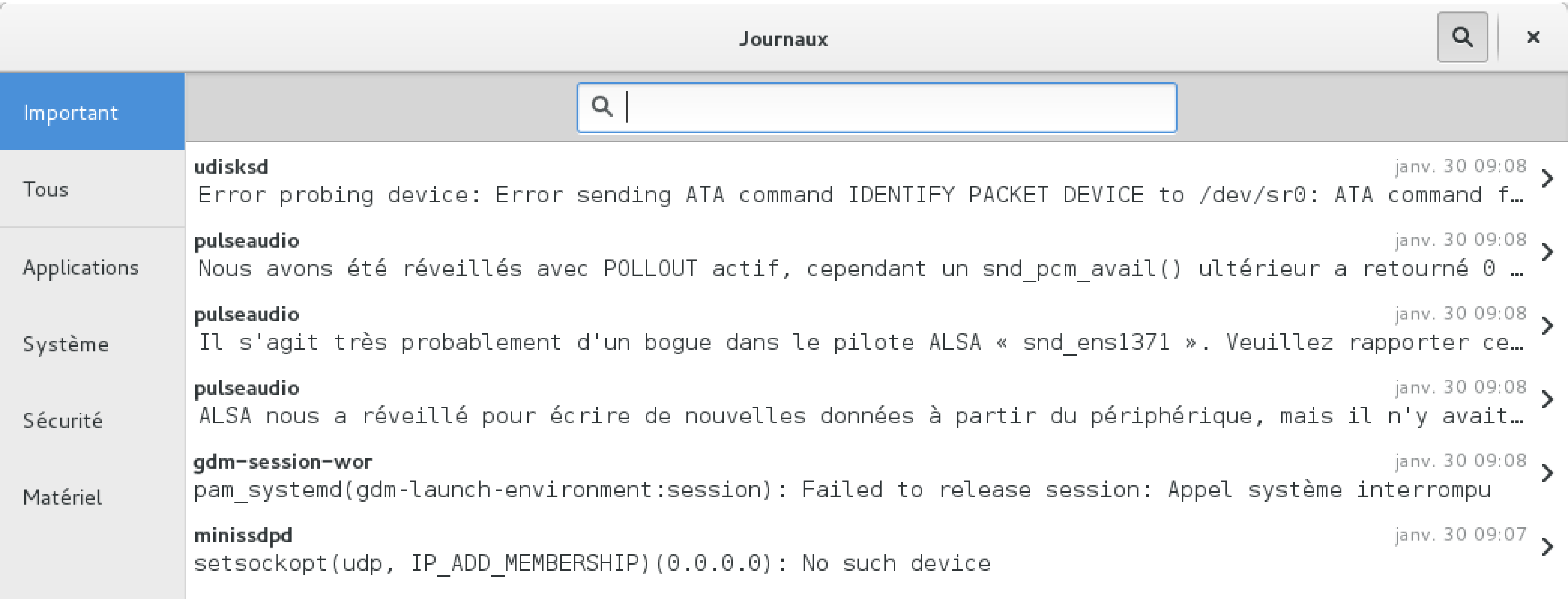
- Logind is the daemon that brings **reliable session management** on top of the existing kernel and system infrastructure.
  - Manages **seats** and their mapping with hardware components
  - Tells which session is active on which VT and which seat
    → Try the CLI interface: loginctl
  - Tells which session a process belongs to (using systemd cgroups)
  - Manages device permissions (see /lib/udev/rules.d/70-uaccess.rules)
    → Sets permissions dynamically on a number of devices like /dev/snd/*
    → Most specific groups (audio, video, netdev…) are obsolete.



Systemd services: the journal



- adduser joe systemd-journal → **gnome-logs**

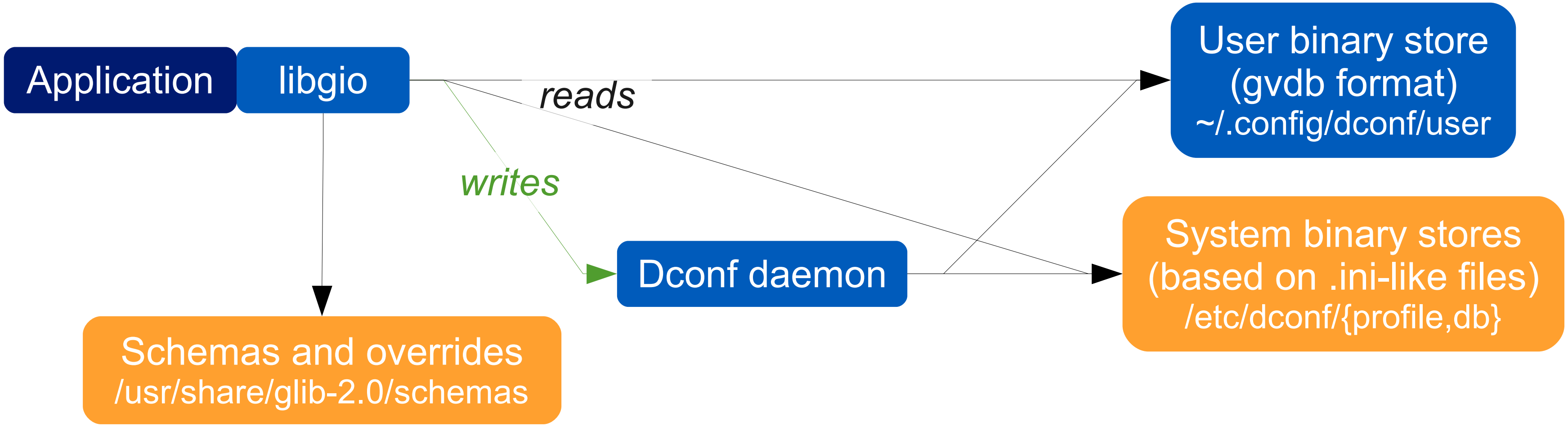


```
udisksd                                                                              janv. 30 09:08
Error probing device: Error sending ATA command IDENTIFY PACKET DEVICE to /dev/sr0: ATA command f…
pulseaudio                                                                           janv. 30 09:08
Nous avons été réveillés avec POLLOUT actif, cependant un snd_pcm_avail() ultérieur a retourné 0 …
pulseaudio                                                                           janv. 30 09:08
Il s'agit très probablement d'un bogue dans le pilote ALSA « snd_ens1371 ». Veuillez rapporter ce…
pulseaudio                                                                           janv. 30 09:08
ALSA nous a réveillé pour écrire de nouvelles données à partir du périphérique, mais il n'y avait…
gdm-session-wor                                                                      janv. 30 09:08
pam_systemd(gdm-launch-environment:session): Failed to release session: Appel système interrompu
minissdpd                                                                            janv. 30 09:07
setsockopt(udp, IP_ADD_MEMBERSHIP)(0.0.0.0): No such device
```

Other systemd services

- Timedated and timesyncd
  - Sets date/time
  - Switches time zones
  - Enables NTP support (systemd-timesyncd)
- Hostnamed
  - Sets the host name
- Localed
  - Sets the default system locale
  - Not directly used by GNOME (see later accountsservice)
- All of them are accessed using simple D-Bus services with PolicyKit authentication

User settings in GNOME 3.x: GSettings



- Schemas, defaults and overrides are managed by the client
- Dconf is optimized for speed: direct reads, binary database (GVDB)
- Changing a user setting:
  - gsettings set org.gnome.desktop.sound event-sounds false
- Listing all settings:
  - gsettings list-recursively org.gnome.nautilus
- There is also dconf-editor

Tuning GSettings in a package

- Ship an override file in debian/*package*.gsettings-override

  ```
  dh_installgsettings --priority=90
  ```

  -
    ```
    # Custom background
    [org.gnome.desktop.background]
    picture-options='zoom'
    picture-uri='file:///my/nice/picture.svg'
    ```

    You can also use XML files for evolving backgrounds or multiple resolutions

  -
    ```
    # Squeeze-like icons on the desktop
    [org.gnome.desktop.background]
    show-desktop-icons=true
    ```

  -
    ```
    # I haz a theme
    [org.gnome.desktop.interface]
    gtk-theme='FabulousTheme'
    icon-theme='WonderfulIcons'
    [org.gnome.desktop.wm.preferences]
    theme='CoolBorders'
    ```

    The GTK theme needs to have the same name for GTK+ 2.0 and 3.0

  -
    ```
    # Default applications and extensions in the shell
    [org.gnome.shell]
    favorite-apps=['evolution.desktop', 'libreoffice-impress.desktop', …..]
    enabled-extensions=['apps-menu@gnome-shell-extensions.gcampax.github.com']
    ```

Dconf: default and mandatory system settings

- Configure a system database: /etc/dconf/profile

```
user-db:user
system-db:local
```

- Default settings then go in /etc/dconf/db/local.d/00_my_defaults

  -
    ```
    # Those users are too dumb, don’t let them do anything
    [org/gnome/desktop/lockdown]
    disable-applications-handlers=true
    disable-log-out=true
    disable-print-setup=true
    …
    ```

Separator for dconf is /
(instead of . for GSettings)

- Make those defaults mandatory with **locks**: /etc/dconf/db/local.d/locks/my_locks

```
/org/gnome/desktop/lockdown/disable-applications-handlers
/org/gnome/desktop/lockdown/disable-log-out
/org/gnome/desktop/lockdown/disable-print-setup
…
```

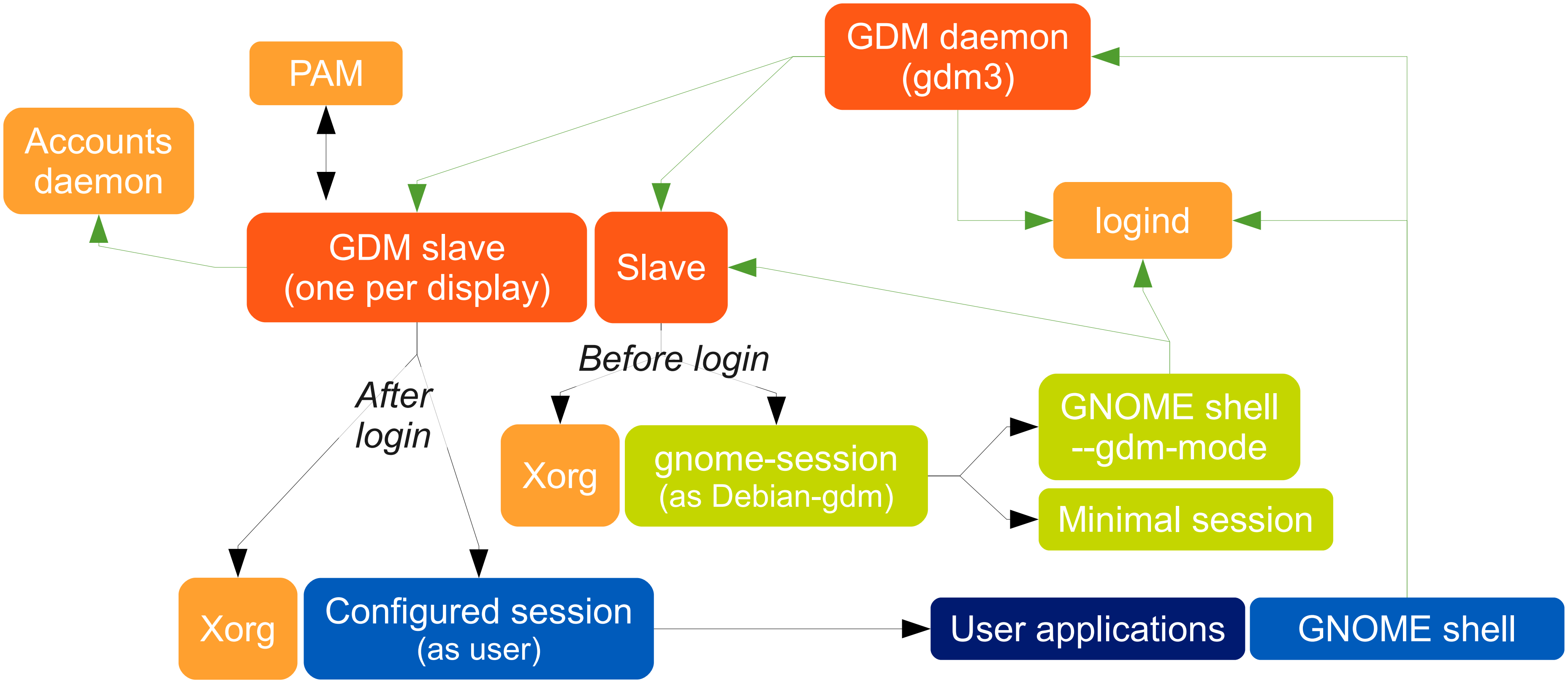
- To **update the database**:

```
dconf update
```

Menus and applications

- Available applications are described in .desktop files
  - MimeTypes describe file types the application can open
  - Virtual x-uri-scheme/* MIME types describe applications which can open URIs
- Found in /usr/share/applications
  - Overriden with $XDG_DATA_DIRS and ~/.local/share/applications
- Default MIME associations in Debian: /usr/share/gnome/applications/defaults.list
  - Overriden the same
- Adding/removing MIME associations: *datadir*/mimeapps.list
- Default menu (XDG standard): /etc/xdg/menus/gnome-applications.menu
  - Applications are affected in submenus using their Categories
  - Adding new sub-menus: /etc/xdg/menus/applications-merged/my-menu.menu

GDM: the display manager



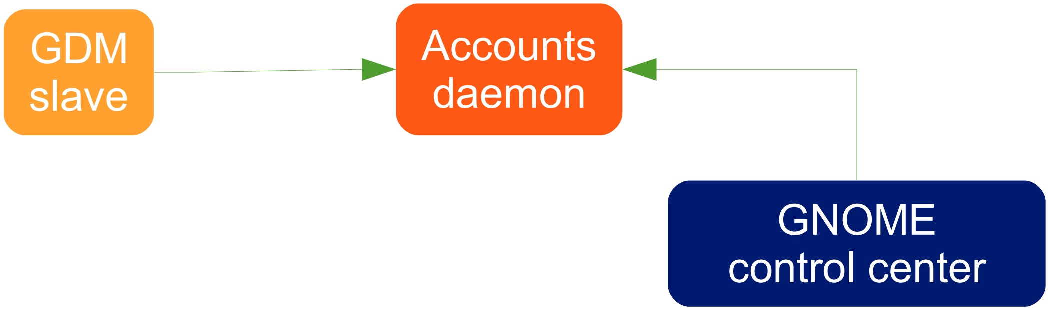
- GNOME shell uses the same code:
  → in the login screen (minimal login session)
  → in the lock screen (formerly screensaver)

- Displays are started and closed dynamically

Configuring GDM

- Daemon configuration: /etc/gdm3/daemon.conf (Debian-specific)
  - Enabling autologin, debugging, VT configuration…
  - XDMCP ⚠
- The real configuration for the minimal session (Debian-specific)
  - /etc/gdm3/greeter.gsettings (GSettings format)
  - In a package: /usr/share/gdm/dconf/50-my-settings (DConf format)
    + invoke-rc.d gdm3 reload

AccountsService



GDM slave

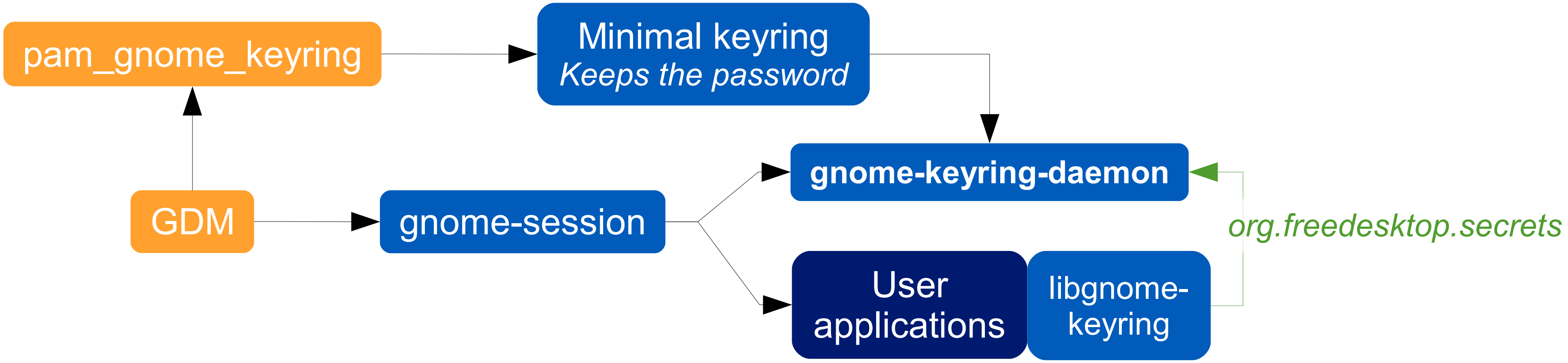
Accounts daemon

GNOME control center

- User defaults:
  language, icon, selected session
  - Storage: /var/lib/AccountsService
  - Also provides a D-Bus interface to create and configure accounts
    → Used by the control center

Storing secrets: the GNOME keyring

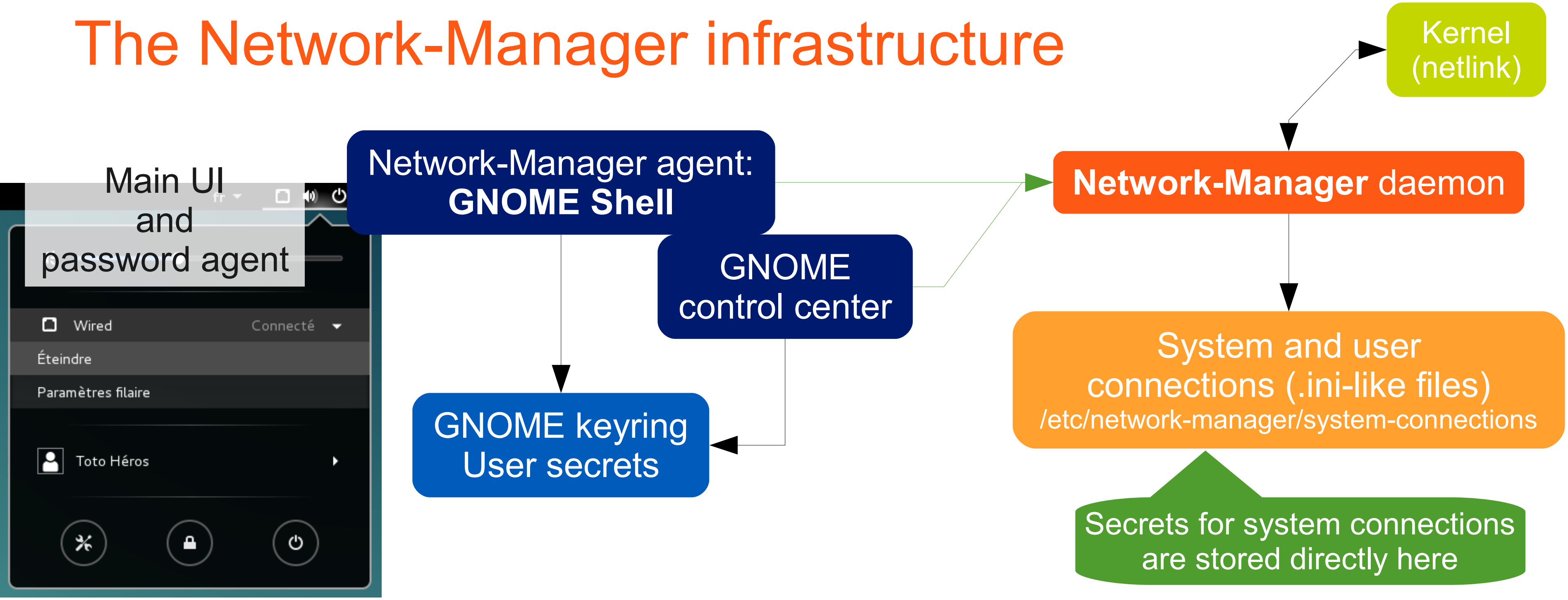
- Keeps user secrets in AES-encrypted files
  - Several *keyrings*, each with its own password
  - Also acts as GnuPG and SSH agent
  - Special case: the **login keyring** uses the login password



- User interface: **seahorse**
  - Access user keys and passwords
- pam_gnome_keyring also acts when **changing the password**
  - Infrastructure constraint: password change is on the same machine

Passwords are kept in sync

The Network-Manager infrastructure



Kernel (netlink)

Network-Manager daemon

Main UI and password agent

Network-Manager agent: **GNOME Shell**

GNOME control center

GNOME keyring User secrets

System and user connections (.ini-like files) /etc/network-manager/system-connections

Secrets for system connections are stored directly here

- **System connections**: started at boot time
  - Controlled by users with appropriate permissions (PolicyKit)
  - Preconfigured by the sysadmin
- **User connections**: started at login time / on-the-fly
  - Secrets stored securely in the keyring
  - Fast user switching: drops the connection (either wanted or buggy behavior)
- System connections with user secrets: e.g. 802.1x (WPA2 enterprise, NAC…)

Configuring system connections

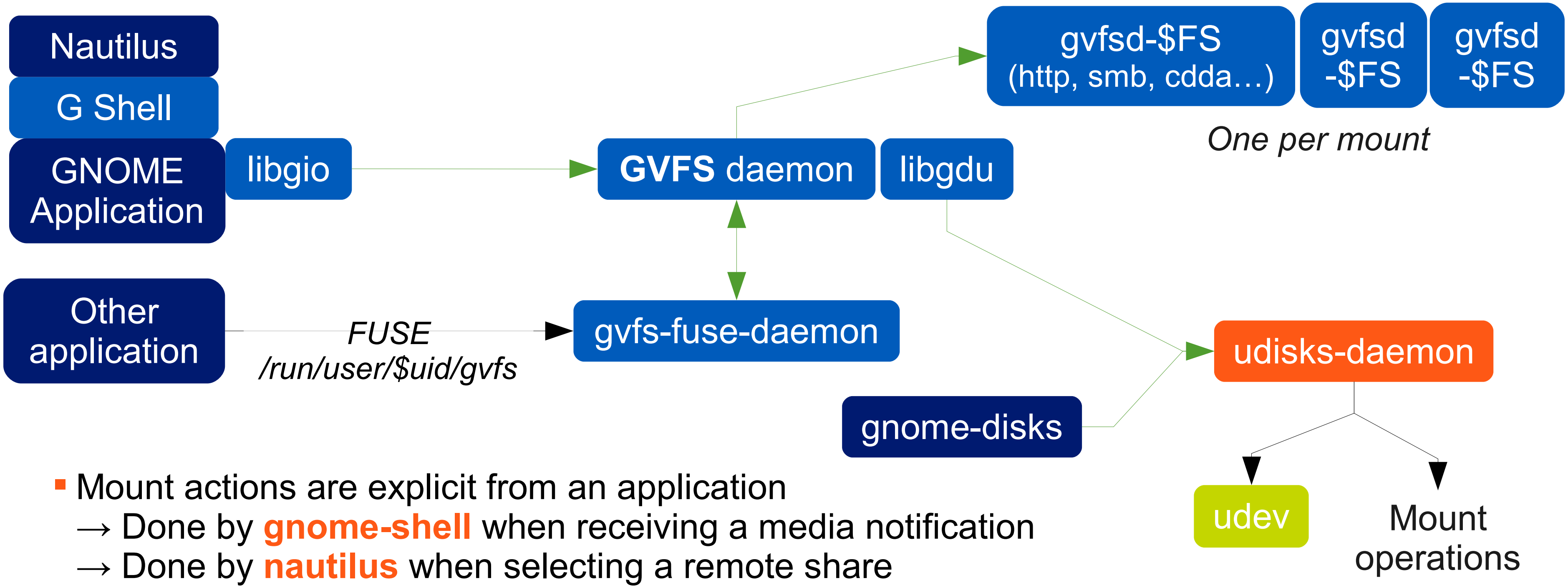
- Real example: deploy TLS 802.1x authentication over your Ethernet network with a per-machine certificate users don't know
- /etc/network-manager/system-connections/authenticated
- Other uses:
  - Pre-configuring Wi-Fi with a shared key
  - Pre-configured WPA2 enterprise using 802.1x with per-user credentials
  - Pre-configured VPN connection with per-user credentials
  - Pre-configured network with static IP that users are allowed to switch to
  - … (NM supports basically everything that ifupdown supports, in addition)
- Users with the appropriate **PolicyKit permissions** can still declare their own connections (*e.g.* WiFi roaming)

```
[802-3-ethernet]
duplex=full
mac-address=de:ad:be:ff:13:37

[connection]
id=NAC
uuid=b63b3cf5-4895-45e1-a5b6-3a4f38a20b99
type=802-3-ethernet

[ipv6]
method=auto

[802-1x]
eap=tls;
identity=Joe's machine
ca-cert=/etc/ssl/certs/nolcorp_ca.pem
client-cert=/etc/ssl/private/joe.pem
private-key=/etc/ssl/private/joe.key.pem
private-key-password=plop

[ipv4]
method=auto
```

Identifies the device

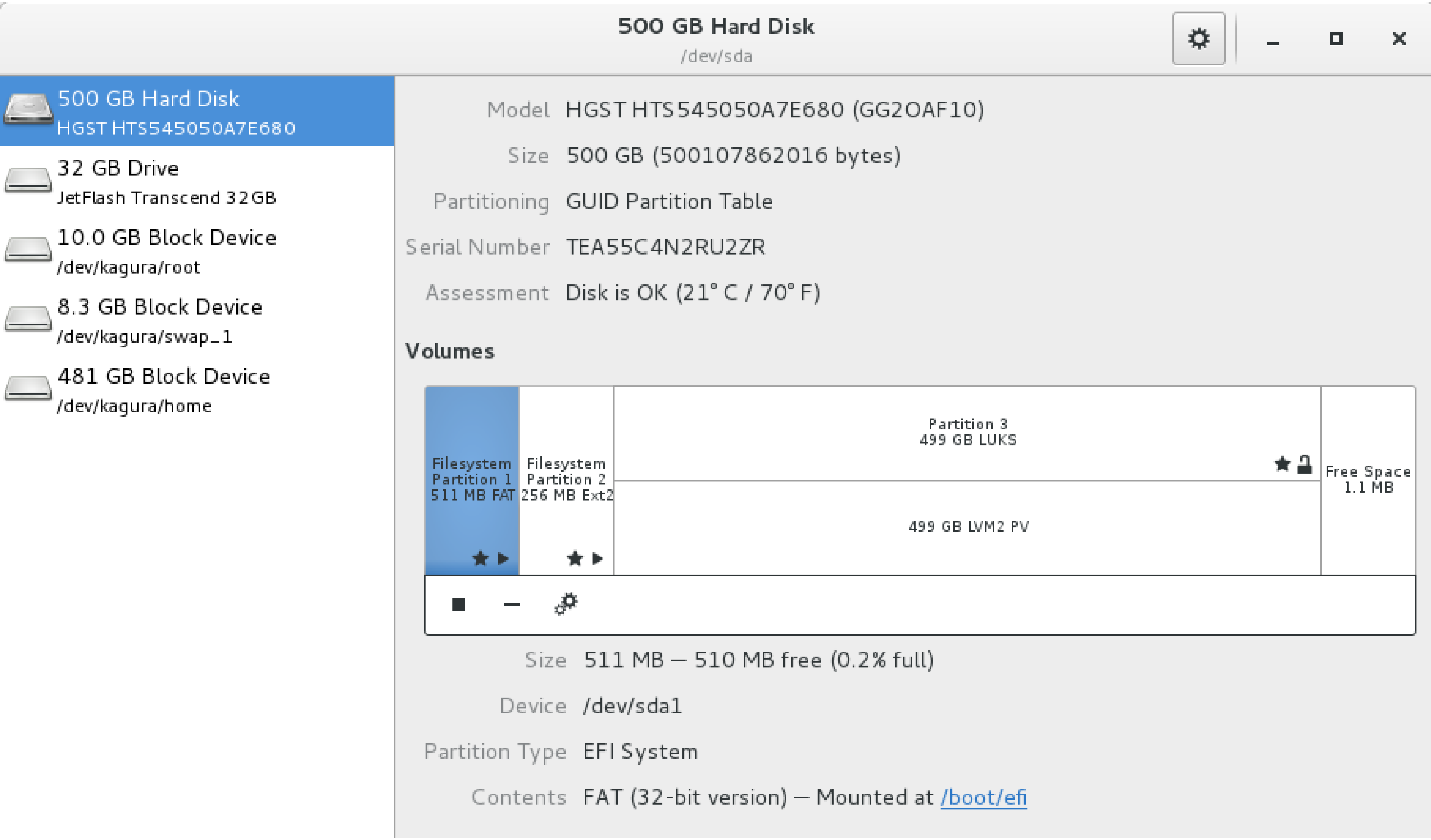
Random

Networked and local filesystems: the VFS stack



- Mount actions are explicit from an application
  → Done by **gnome-shell** when receiving a media notification
  → Done by **nautilus** when selecting a remote share
- Command-line:
  - See all mounted filesystems: gvfs-mount -l
    Mount a CIFS mount: gvfs-mount smb://server/share/path
- Gvfs-fuse: nautilus redirects applications not supporting GIO to /run/user/$uid/gvfs
  - Needs fuse group membership
- *Note:* jessie is in the middle of a udisks → udisks2 transition

The gnome-disks interface



500 GB Hard Disk
/dev/sda

500 GB Hard Disk
HGST HTS545050A7E680

32 GB Drive
JetFlash Transcend 32GB

10.0 GB Block Device
/dev/kagura/root

8.3 GB Block Device
/dev/kagura/swap_1

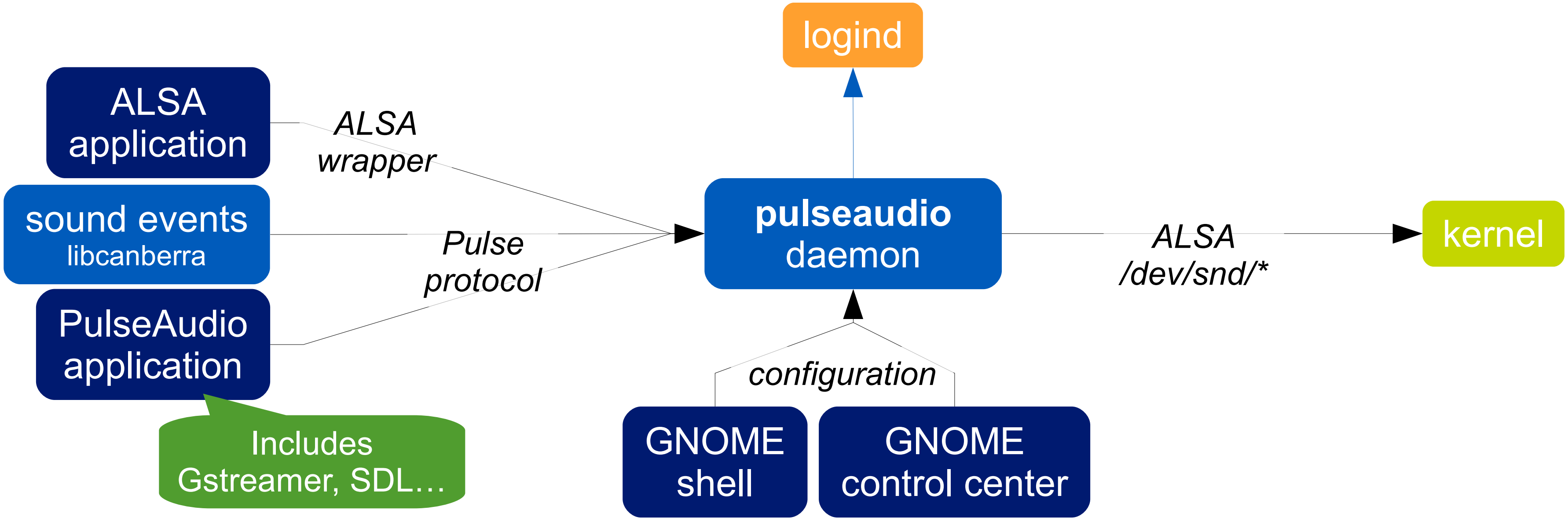
481 GB Block Device
/dev/kagura/home

Model	HGST HTS545050A7E680 (GG2OAF10)
Size	500 GB (500107862016 bytes)
Partitioning	GUID Partition Table
Serial Number	TEA55C4N2RU2ZR
Assessment	Disk is OK (21° C / 70° F)

Volumes

Size	511 MB — 510 MB free (0.2% full)
Device	/dev/sda1
Partition Type	EFI System
Contents	FAT (32-bit version) — Mounted at /boot/efi

PulseAudio



- Per-application software mixing for all sound providers
- Default Debian configuration is suitable for multiple users
  - Mute sound when switching users (using logind)
- Configuration needed only for people with specific needs
  - Sound over the network: RAOP/ZeroConf, EsounD, UPnP…
  - Pass-through

Printing

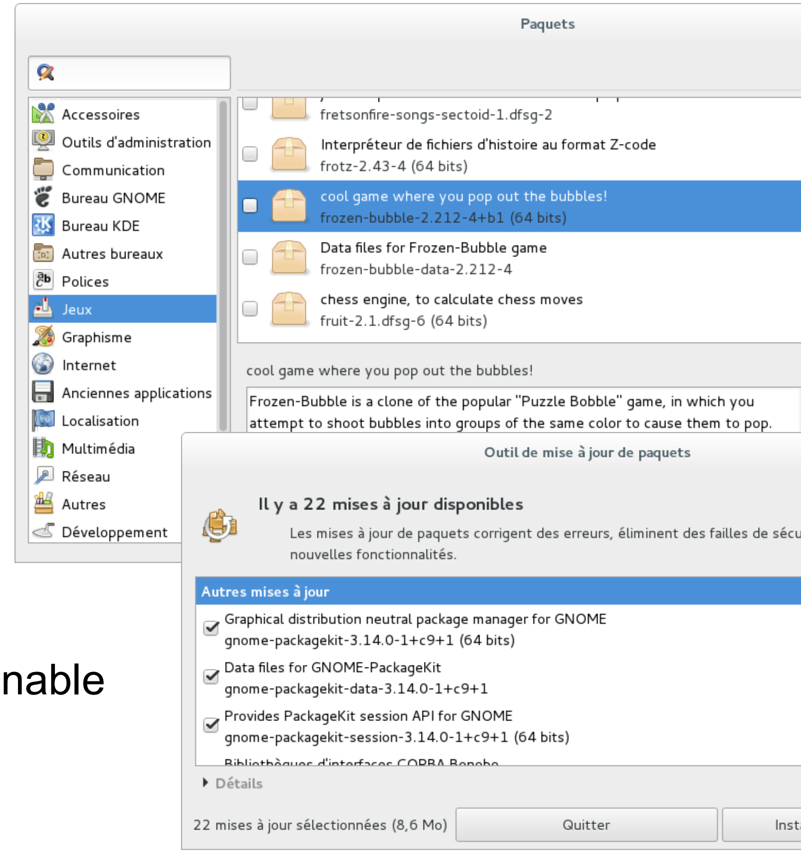
- CUPS DBus / PolicyKit interface: **cups-pk-helper**
  - gnome-control-center configures printers
    gnome-settings-daemon notifies of print operations
  - Not very useful in a multiple-user, multiple-machine environment
- A CUPS server can hold thousands of printers
  → but the UI on the clients becomes unusable
  - No standard solution to filter printers out

Power management

- System DBus / PolicyKit interface: **upower**
  - The policy is applied by gnome-settings-daemon based on Gsettings.
  - Also queried by GNOME shell (in session and in GDM)

PackageKit

- A D-Bus interface to abstract package managers
  - Checking for updates: **gnome-settings-daemon**
  - Installing updates: **gpk-update-viewer** frontend
  - Adding/removing software: **gpk-application**
  - Distribution upgrades: not recommended
- Do you want users to play with packages?
  - Sometimes **unattended-upgrades** is more reasonable



□ fretsonfire-songs-sectoid-1.dfsg-2

□ Interpréteur de fichiers d'histoire au format Z-code
frotz-2.43-4 (64 bits)

□ cool game where you pop out the bubbles!
frozen-bubble-2.212-4+b1 (64 bits)

□ Data files for Frozen-Bubble game
frozen-bubble-data-2.212-4

□ chess engine, to calculate chess moves
fruit-2.1.dfsg-6 (64 bits)

cool game where you pop out the bubbles!

Frozen-Bubble is a clone of the popular "Puzzle Bobble" game, in which you attempt to shoot bubbles into groups of the same color to cause them to pop.

Outil de mise à jour de paquets

Il y a 22 mises à jour disponibles

Les mises à jour de paquets corrigent des erreurs, éliminent des failles de sécu
nouvelles fonctionnalités.

Autres mises à jour

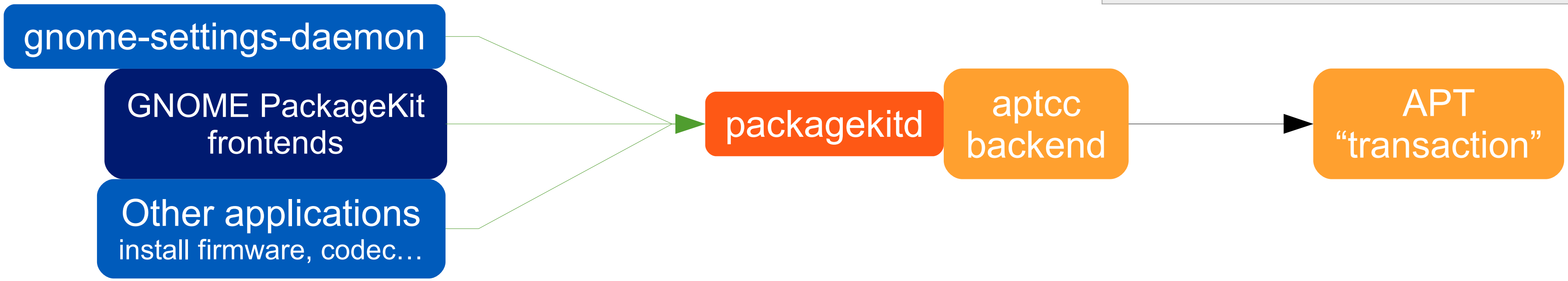
☑ Graphical distribution neutral package manager for GNOME
gnome-packagekit-3.14.0-1+c9+1 (64 bits)

☑ Data files for GNOME-PackageKit
gnome-packagekit-data-3.14.0-1+c9+1

☑ Provides PackageKit session API for GNOME
gnome-packagekit-session-3.14.0-1+c9+1 (64 bits)

Bibliothèques d'interfaces CORBA Bonobo

22 mises à jour sélectionnées (8,6 Mo)



gnome-settings-daemon

GNOME PackageKit frontends

Other applications
install firmware, codec…

packagekitd

aptcc backend

APT “transaction”

Note: Debian jessie doesn’t use gnome-software

GNOME is scriptable

- **In Python**:
  ```
  from gi.repository import Gtk, GnomeKeyring, …
  ```
- In JavaScript:
  ```
  #! /usr/bin/seed
  Gtk = imports.gi.Gtk;
  ```
- In shell with zenity
- Some real-world-examples:
  - □ A daemon / applet to bypass an IE-only enterprise proxy
    Notification area / libnotify: display status
    Autostart with the session
    Store the password in the keyring
  - □ A script to create CIFS shortcuts accessible from “Places” menu
    Store the password in the keyring for GVFS
    ~/.gtk-bookmarks → “Places” and the shortcuts for GtkFileChooser
  - □ A script to wrap a RDP / Citrix client
    Extract the same password as for CIFS

An infrastructure for Debian/GNOME machines

- Debian provides the desktop ready to use
  - But you need to **build your infrastructure** with the included bricks
- Authentication: OpenLDAP, Fedora directory server, Active Directory
  → Think about using **sssd**
- Printing is hard (see before)
- Network file systems: don’t forget about **NTP**!
- Need changes in packages? A Debian mirror and a custom APT repository
  → rsync / debmirror and reprepro / mini-dinstall / …
- Lots of machines? How about a custom installation media
- Remote management: you want a tool that works in pull mode, e.g. **Puppet**
  - Can be linked to inventory: GLPI + **FusionInventory**
- Root password management anyone?
- You encrypt partitions? Don’t forget about legal requirements (key escrow)

Thank you.