The Modern Linux Desktop

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Outline

1. D-Bus
   - Communication Protocol
   - Bus Model

2. ConsoleKit

3. Device Management
   - udev
   - HAL
   - DeviceKit

4. PolicyKit

5. XDG Specs
Wire Format

- Binary, message-oriented protocol
- Communication usually over UNIX sockets; other protocols supported
- Messages are structures of basic types (ints, strings, structs, dicts)
- Message types:
  - method call, method reply, error, signal
- SASL authentication, but usually “EXTERNAL”
Names

- Object path: /org/freedesktop/DBus
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- Interface name: org.freedesktop.DBus.Introspectable
- Member name: Introspect
Names

- Object path: /org/freedesktop/DBus
- Interface name: org.freedesktop.DBus.Introspectable
- Member name: Introspect
- Bus name: org.freedesktop.DBus
Names: a real example

- Object path: /org/freedesktop/ConsoleKit/Seat1
- Interface name: org.freedesktop.ConsoleKit.Seat
- Member name: ActivateSession
- Bus name: org.freedesktop.ConsoleKit
The Message Bus

Two standard buses: system and session

- **system** (/var/run/dbus/system_bus_socket)
- **session** ($DBUS_SESSION_BUS_ADDRESS)

dbus-launch, dbus-daemon, /etc/dbus-1
Operation: Method

- Connect to a bus.
- Send a message of type method call.
- Receive a message of type method reply.

- Connect to a bus and listen on a well-known name.
- Receive a message of type method call.
- Send a message of type method reply.
Operation: Signal

- Connect to a bus.
- Send a message of type signal.

Connect to a bus.
Call the org.freedesktop.DBus.AddMatch() method.
Receive a message of type signal.
Rationale

- “Switch User” was broken
- utmp is insufficient for tracking sessions
- Computers with multiple login seats are possible
Operation

- Track "sessions": GDM and PAM
- Track "seats"
- Provide API for querying sessions and seats
- Provide API for manipulating sessions
D-Bus API

org.freedesktop.ConsoleKit /org/freedesktop/ConsoleKit/Manager
Files in /dev. Who creates them?
Files in /dev. Who creates them? Static?
Files in /dev. Who creates them? Static? devfs?
Files in /dev. Who creates them? Static? devfs? Userspace?
Standard Operation

- Mount tmpfs on /dev
- Create basic devices (e.g., /dev/null)
- Listen for events from kernelspace
- Create devices with the kernel name
More features

- Provide persistent naming to devices
- Announce events to HAL / D-Bus
Rules

- KERNEL="sda"
- SYSFS_serial="W09090207101241330"
- PROGRAM="/usr/local/sbin/name %k"
Rules

- KERNEL="sda"
- SYSFS_serial="W09090207101241330"
- PROGRAM="/usr/local/sbin/name %k"
- NAME="dvd"
- NAME="%k"
- NAME="%p"
Components

- D-Bus interface
- Device objects
- Tree structure
- Callouts and addons
- Capabilities
- Device Information Files

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Motivation

HAL overlaps poorly with udev + D-Bus

Newer effort (DeviceKit-disks, DeviceKit-power) that fits better into the ecosystem
Motivation

“Provide mechanism, not policy.”
“Provide mechanism, not policy.”

D-Bus-using interface for authentication and authorization
Architecture

User Session

Authentication Agent
libpolkit-agent-1

System Message Bus

org.freedesktop.PolicyKit1
Backends + Extensions

System Context

Client

Mechanism
libpolkit-gobject-1

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Authentication is needed to run `/bin/bash' as the super user

An application is attempting to perform an action that requires privileges. Authentication as the super user is required to perform this action.

Password for root: 

Details
Command: /bin/bash
Run As: Super User (root)
Action: org.freedesktop.policykit.exec
Vendor: The PolicyKit Project

[Cancel] [Authenticate]
Base Directory Specification

- **Data**: `/usr/share`, `.local/share`

- **Config**: `/etc/xdg`, `.config`

- **Cache**: `.cache`
Base Directory Specification

- Data: /usr/share, .local/share
- $XDG_DATA_HOME, $XDG_DATA_DIRS
- Config: /etc/xdg, .config
- $XDG_CONFIG_HOME, $XDG_CONFIG_DIRS
- Cache: .cache
- $XDG_CACHE_HOME
[Desktop Entry]
Version=1.0
Type=Application
Name=Foo Viewer
Comment=The best viewer for Foo objects available!
TryExec=fooview
Exec=fooview %F
Icon=fooview
MimeType=image/x-foo;
Autostart Specification

- .desktop files
- $XDG_CONFIG_DIRS/autostart
Autostart Specification

- .desktop files
- $XDG_CONFIG_DIRS/autostart
- .autorun, autorun, autorun.sh
Learning More

- http://freedesktop.org/
- http://standards.freedesktop.org/
- http://freedesktop.org/wiki/Software