Distribution-Independent Printer Driver Packages

Till Kamppeter

OpenPrinting Manager, The Linux Foundation

THE LINUX FOUNDATION

Introduction

- **Problems**
  - Distributions do not ship all available printer drivers
  - Free drivers from upstream need to be compiled by users -> driver installation too complicated for unexperienced users
  - Manufacturers make packages only for a few major distributions
  - Driver packages often difficult to find on manufacturer's web sites
  - Testing/packaging effort for manufacturers and driver developers too high to ship binary driver packages for all distributions
- **Existing Infrastructure**
  - **OpenPrinting database** (former linuxprinting.org), central database for printer/driver info
  - **LSB** provides tools and infrastructure to create **distribution-independent binary packages**

Solution

Distribution-independent printer driver packages

- Based on **LSB 3.1** for binary format (later **LSB 3.2**)
- Using **CUPS**, **Ghostscript** (with IJS, CUPS Raster and OpenPrinting Vector interfaces), **Perl**, and **foomatic-rip** which is in any distribution (and will be required by **LSB 3.2**)
- Installing everything in **`/opt/<supplier>/`** to avoid conflicts with distribution
- Linking PPDs to **`/usr/share/ppd/`**
- Discovering system directory/file locations at install time (maintainer scripts: pre/post (un)install) and symlinking system files appropriately
- Make packages part of OpenPrinting database, so that they can be easily found
- Infrastructure for automatic package lookup, download, and installation through the internet by printer setup tools

Advantages

- **Distribution-independent**
  - One package for Linux, instead of one for Red Hat, one for SuSE, one for Ubuntu, ...
- **Binary packages**
  - User does not need to compile, system is also suitable for closed-source drivers
- **Same installation method for all driver packages**
  - A printer setup tool can easily install them automatically
- **One download location at the OpenPrinting site**
  - Easy to find for both humans and printer setup tools
  - Granting redistribution permissions of non-free drivers is much easier.

Advantages

- **Driver query API for printer setup tools**
  - All needed info available: License, supplier, support contact, print quality indices. So the setup tool and the user can easily find the driver suiting best for him.
- **Distributions look up drivers at OpenPrinting**
  - Distributions do not need to support all printer models
  - So drivers newer than the distro are available, for updates and for new printer models.

Problems

- **Need to use resources not covered by LSB 3.1**
  - CUPS, Ghostscript, Perl, and foomatic-rip ship with every current distribution
  - **CUPS**, **Ghostscript**, **Perl**, and **foomatic-rip** will be **required by LSB 3.2**
- **LSB does not have enough requirements for system software**
  - Complicated maintainer scripts needed in package to access system resources, scripts now provided by an **RPM macro set** for easier packaging
  - **SANE** needed in LSB, for printer/scanner multi-function devices. For now added SANE to LSB DDK, SANE drivers compiled as LSB binaries work with the SANE of any distro.
- **Internet access needed to make use of the packages**
  - Distributions should ship some drivers for most common printers
  - Manufacturers should ship them also on their CDs
  - Most Linux environments have internet access

Available Driver Packages

- **For users (test the packages)**
  - Driver packages (see http://openprinting.org/driver_list.cgi):
    - Gutenprint (for Epson/Canon/HP inkjets, PCL lasers, dye sublimation)
    - SpliX (for Samsung SPL2/SPLc and compatibles: Xerox, Dell, Ricoh, ...)
    - min12xxw (Minolta PagePro 12xx W series)
    - lm1100 (Lexmark 1000, 1020, 1100)
  - Easy setup on current distributions (later automatically done by printer setup tools)
    1. Install “lsb” package
    2. Install CUPS, Ghostscript, Perl, and foomatic-rip (if needed)
    3. Convert .rpm package to .deb with “alien –scripts” (if needed)
    4. `mkdir -p /usr/share/ppd`
       `ln -s /usr/share/ppd /usr/share/cups/model/0-driverppds`
       (if needed)
    5. Install package
    6. Set up printer
    7. Steps 2-4 will not be needed for LSB-3.2-compliant distributions

Web Query API

- **For developers of printer setup tools/distributions**
  - Web API for querying the OpenPrinting database and downloading driver packages
    - Queries by calling a CGI script via URLs like
      - http://openprinting.org/query.cgi?type=manufacturers
      - http://openprinting.org/query.cgi?type=printers
      - http://openprinting.org/query.cgi?type=drivers
    - Modifier for output format (Text or XML)
      - http://openprinting.org/query.cgi?type=printers&format=xml
    - Modifier to show complete entry and not only name
      - http://openprinting.org/query.cgi?type=printers&moreinfo=1
    - Filters (to be added as “&<name>=<value>” to the URL)
      - printer, make, model, driver, onlydownload, onlyppdfiles, onlydriverpackages, sourcedriverpackages, nobinarydriverpackages, onlynewestdriverpackages, architectures, noobsoletes, onlyfree, onlynonfree, onlymanufacturer

Web Query API

- Printers can be selected by supplying the **IEEE-1284 device ID**
  - to find drivers for an **auto-detected printer**
- Printers can also be searched by a **model name not exactly matching the database** (fuzzy matching) or by **name fragments**
  - to find an auto-detected printer without the device ID being in the database
- The output can be restricted to only entries with
  - downloadable drivers and/or PPDs
  - selected architectures
  - only manufacturer-supplied drivers
  - only free or non-free drivers
  - only current version
  - ...
- The output contains for each driver
  - Driver name
  - Driver package/PPD URL(s)
  - License, free/non-free?
  - Supplier, manufacturer/third-party?
  - Support contact, commercial/voluntary?
  - Output/quality/performance ratings for different printing tasks

Web Query API

- **Typical steps for a printer setup tool**
  - Auto-detect printer, get IEEE-1284 device ID
  - Check for locally installed drivers and versions
  - Query OpenPrinting database for available drivers for system's architecture
  - Check whether driver download is needed, either due to no available local driver or downloadable driver being newer
  - For each suitable downloadable driver show an info panel to the user, with supplier, license, support contact/level, quality ratings
  - Let user choose driver/confirm download
  - If user agrees, download and install driver
  - Set up print queue
- **Possible extra functions**
  - Let user configure preferences: Only free drivers, only manufacturer-supplied, ...
  - Let distribution's build server download all available source RPMs and rebuild them to distribution-specific packages

The LSB DDK

- **For developers of printer drivers, especially manufacturers**
  - The **LSB Driver Development Kit** (DDK) provides all tools and resources to develop distribution-independent printer driver packages
  - The LSB DDK contains:
    - For LSB 3.1 LSB packages of CUPS, Ghostscript, and foomatic-rip to be added to the LSB Build Environment
    - The RPM macro set with macros
      - to facilitate installing everything in **`/opt`**
      - to generate the maintainer scripts (pre/post (un)install) to link the system files to the correct system directories
      - to put absolute paths for print filters installed in /opt into the PPDs
      - to rename and re-order the PPDs according to the planned LSB 3.2 requirements.
    - The printer driver development HOWTO:
  - http://www.linux-foundation.org/en/OpenPrinting/WritingAndPackagingPrinterDrivers

Developing Drivers

- Compiling drivers into Ghostscript is obsolete, use the following renderer interfaces for driver plug-ins:
  - CUPS Raster
  - OpenPrinting Vector
  - IJS
- Take care that your driver can be installed in **`/opt`**
- CUPS backends, extra daemons, auxiliary programs (nozzle cleaning, ...) are supported
- SANE was added to the LSB DDK, which allows building LSB binaries of scanner drivers. They work with the SANE packages of all distros. SANE searches drivers always in **`/usr/lib/sane`**.

Packaging drivers

- Install the build environment
  - LSB Build Environment chroot
  - Add LSB DDK packages CUPS, Ghostscript, foomatic-rip
  - Install RPM macro set of LSB DDK
- Build RPM packages inside the build environment chroot
- Use the macro set:
  - Let everything go into **`/opt/<supplier name>`**:
    ```
    %define supplier <supplier name>
    %define drivername <driver name>
    %install_into_opt
    ```
  - Put absolute paths to filter calls in the PPDs and arrange the PPDs according to LSB 3.2:
    ```
    %adjust_ppds
    ```
  - (In post-install script) Link the PPD directory into **`/usr/share/ppd`**:
    ```
    %set_ppd_links
    ```

The LSB DDK

- Statically link libcups and libcupsimage
  `%uses_libcups_and_libcupsimage`
- (post-install script) Symlink all CUPS files (backends, filters, mime rules) into appropriate directories
  `%set_cups_links`
- Set executable and man paths so that the executables and man pages in **`/opt`** get found
  `%has_bin_executables`
  `%has_sbin_executables`
  `%has_manpages`
  `%set_opt_paths`
- There are also macros for
  - Restarting CUPS
  - Setting up and starting services
  - Building PPDs from Foomatic XML data
  - Linking PAM modules
  - ...

Testing drivers

- Test the LSB compliance of the executables with
  `lsbappchk <name of the executable with full path>`
  Link libraries statically if they are not covered by the LSB
- Check Adobe-compliance of PPD files with
  `cupstestppd <name of the PPD file with full path>`
- Install the driver package. Should work like described in the user instructions
- Try to set up print queues and to print

More Info

- **General info**
  - http://www.openprinting.org/
- **For developers**
  - http://www.linux-foundation.org/en/OpenPrinting/Development
  - http://www.linux-foundation.org/en/Developers
- **For driver developers**
  - http://www.linux-foundation.org/en/OpenPrinting/WritingAndPackagingPrinterDrivers
- **For developers of printer setup tools**
  - http://www.linux-foundation.org/en/OpenPrinting/Database/Query
- **Available driver packages**
  - http://www.openprinting.org/driver_list.cgi
- **How to install driver packages**
  - http://www.linux-foundation.org/en/OpenPrinting/Database/DriverPackages