# PackageKit: Package Abstraction Framework

**Richard Hughes** 

February 24, 2008

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- My name is Richard Hughes
- Maintainer of GNOME Power Manager

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- My name is Richard Hughes
- Maintainer of GNOME Power Manager
- Co-maintainer of Open Hardware Manager
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- If you are using a laptop right now then checkout http://www.packagekit.org

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#### The problem

Problems that needed solving Re-inventing the wheel This is not working

#### Competitors

Windows Vista<sup>TM</sup> Apple Mac OS X<sup>TM</sup> Ubuntu Ximian Red Carpet

#### PackageKit: The solution

Introduction Internal design Important Ideas How to use Questions

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### We suck



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▶ Because we built kick-ass packaging formats (~1995)

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- ▶ Because we built kick-ass packaging formats (~1995)
- ► And then we layer on top dep-solvers and auto-downloaders (~2000)

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- ▶ Because we built kick-ass packaging formats (~1995)
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- And then we try to bolt on a UI ( $\sim$ 2004)

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- Want to have automatic updates without passwords?

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- Want to have automatic updates without passwords?
- Want to use fast-user-switching?

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- Want to have automatic updates without passwords?
- Want to use fast-user-switching?
- Want to have warnings translated into the correct locale?

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# We suck

- ▶ Because we built kick-ass packaging formats (~1995)
- ► And then we layer on top dep-solvers and auto-downloaders (~2000)
- And then we try to bolt on a UI ( $\sim$ 2004)
- Want to have automatic updates without passwords?
- Want to use fast-user-switching?
- Want to have warnings translated into the correct locale?
- Want to have common upstream GNOME and KDE tools?

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# What should we have done?

Studies on user interaction

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# What should we have done?

- Studies on user interaction
- Design the tools around the use-cases

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# What should we have done?

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- But we can't just do that...

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# What should we have done?

- Studies on user interaction
- Design the tools around the use-cases
- But we can't just do that...
- Hence why I'm here giving this talk...

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#### What we need to achieve

Keeping a system updated automatically

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#### What we need to achieve

- Keeping a system updated automatically
- Installing new software easily

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# What we need to achieve

- Keeping a system updated automatically
- Installing new software easily
- Sane user interactions based on formal use-cases

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# What we need to achieve

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- Working with native frontends

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- Working with yum, conary, apt-get, box, zypp, emerge and other backends

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# What we need to achieve

- Keeping a system updated automatically
- Installing new software easily
- Sane user interactions based on formal use-cases
- Working with native frontends
- Working with yum, conary, apt-get, box, zypp, emerge and other backends
- Existing package tools should continue to work

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#### We re-invent the wheel for every distro!

► Fedora: pup, pirut

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### We re-invent the wheel for every distro!

- Fedora: pup, pirut
- Ubuntu: gnome-app-install, update-manager

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## We re-invent the wheel for every distro!

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- Suse: libzypp command line tools, zen updater

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# We re-invent the wheel for every distro!

- Fedora: pup, pirut
- Ubuntu: gnome-app-install, update-manager
- Suse: libzypp command line tools, zen updater
- Others: same shit different day

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#### Our current tools suck!

Root passwords

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#### Our current tools suck!

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- ► Techno-babble: "GPG?"

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- Not multiple-user or fast-user-switch aware

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# Our current tools suck!

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- Power down during a transaction

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# Our current tools suck!

- Root passwords
- Techno-babble: "GPG?"
- Not multiple-user or fast-user-switch aware
- GNOME or KDE UI specifications
- Badly designed and translated
- Power down during a transaction
- Updates when on battery power

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### Linux: Hall of shame



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## Linux: Hall of shame



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### Linux: Hall of shame

6	Query				
	You are attempting to run "pup" which requires administrative privileges, but more information is needed in order to do so.				
	Authenticating as "root"				
	Password:				
	<u>(</u> <sup>2</sup> <u>O</u> K				

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### Linux: Hall of shame



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### Linux: Hall of shame



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## Linux: Hall of shame

3	Warning	X
<u>\</u>	The following problems were found on your system:	
W: GPG couldn' D0AFFF	; error: http://www.elisanet.fi dapper Release: The following signatures 't be verified because the public key is not available: NO_PUBKEY '5E937215FF	
		1945
		J
[ <b>1</b> ]	500000	·]

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Windows Vista<sup>TM</sup> Apple Mac OS X<sup>TM</sup> Ubuntu Ximian Red Carpet

# Windows Vista<sup>TM</sup>: Actually quite good



### Actually quite good!

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Windows Vista<sup>TM</sup>: Actually quite good

Works with fast user switching

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Windows Vista<sup>TM</sup>: Actually quite good

- Works with fast user switching
- Downloads updates using BITS in the background



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## Windows Vista<sup>TM</sup>: Actually quite good

- Works with fast user switching
- Downloads updates using BITS in the background
- Sane preferences pane



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Windows Vista<sup>TM</sup> Apple Mac OS X<sup>TM</sup> Ubuntu Ximian Red Carpet

Windows Vista<sup>TM</sup>: Actually quite good

- Works with fast user switching
- Downloads updates using BITS in the background
- Sane preferences pane
- ► Good feedback to the user, default is automatically update.

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## Vista: Nice error reporting...

Some updates were not installed
Failed: 1 update
Error(s) found:
Code 8000FFFF Get help

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### Vista: What the hell were they thinking...

User Account Control			
If you started this action, continue. Windows Update Microsoft Windows			
🕑 Details	Continue		
User Account Control helps stop unauthorized changes to your computer.			

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## Apple Mac OS $X^{TM}$ : The best of the bunch



### The best of the bunch!

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# Apple Mac OS $X^{TM}$ : The best of the bunch

Works with fast user switching

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Apple Mac OS  $X^{TM}$ : The best of the bunch

- Works with fast user switching
- Also downloads updates in the background

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Apple Mac OS  $X^{TM}$ : The best of the bunch

- Works with fast user switching
- Also downloads updates in the background
- Sane preferences pane and update viewer

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Windows Vista<sup>TM</sup> Apple Mac OS X<sup>TM</sup> Ubuntu Ximian Red Carpet

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#### Software Update



#### New software is available for your computer.

If you're not ready to install now, you can use the Software Update preference to check for updates later.

	Install	Name	Version	Size
		AirPort	4.2	12.3 MB
0		AirPort Update 2005-001	1.0	1.4 MB
	$\checkmark$	J2SE 5.0 Release 4	4.0	39.3 MB
0	$\checkmark$	QuickTime	7.1.3	49.7 MB
	$\checkmark$	iTunes	7.0.1	25.7 MB
0	$\checkmark$	Mac OS X Update Combined (P	10.4.8	153 MB

AirPort 4.2 fixes connection problems and resolves security issues with WPA2 wireless networks.

Note: Use of this software is subject to the original Software License Agreement(s) that accompanied the software being updated. A list of Apple SLAs may be found here: <a href="http://www.apple.com/legal/sla/">http://www.apple.com/legal/sla/</a>.

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### Ubuntu: Good try, but no cigar



Good try, but no cigar!

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### Ubuntu: Good try, but no cigar

No fast user switching

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## Ubuntu: Good try, but no cigar

- No fast user switching
- Locks other tools out when synaptic or update-manager is loaded

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- Update viewer isn't bad

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- Synaptics scares my fiancee

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## Ubuntu: Good try, but no cigar

- No fast user switching
- Locks other tools out when synaptic or update-manager is loaded
- No sane preferences pane
- Update viewer isn't bad
- Synaptics scares my fiancee
- gnome-app-install only works with ubuntu, although looks the nutz

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0	)	Software Updates			
		Available Updates			
		The following packages are found to be upgradable. You can upgrade them by using the Install button.			
	¥	at Delayed job execution and batch processing			
		New version: 3.1.8-11ubuntu3			
	¥	base-config Debian base system configurator			
		New version: 2.62ubuntu5			
	¥	mdadm Manage MD devices aka Linux Software Raid			
		New version: 1.9.0-lubuntu2			
	¥	<b>postfix</b> A high-performance mail transport agent			
		New version: 2.1.5-7ubuntul			
	V	postfix-tls TLS and SASL support for Postfix			
		New version: 2.1.5-7ubuntul	•		
	▶ Details				

Outline Windows Vista<sup>TM</sup> The problem Apple Mac OS X<sup>TM</sup> Competitors Ubuntu PackageKit: The solution Ximian Red Carpet

-	Synaptic Package Manager		_ • ×	
<u>F</u> ile <u>E</u> dit <u>P</u> ackage <u>S</u> ett	ings <u>H</u> elp			
C G Reload Mark All Upg	rades Apply Properties Search			
All	S Package Installed Version	Latest Version	Description	
vlc	🖻 videolan-doc	20040819-1	documentation for	
	🖻 vlc	0.8.4.debian-1ubun	r multimedia player I	
	🖻 vlc-plugin-alsa	0.8.4.debian-1ubun	r ALSA audio output	
	multimedia player for all audio and video for	mats		
VI C is the Videol AN project's media player. It plays MPEG. MPEG2_MPEG4				
DivX, MOV, WMV, QuickTime, mp3, Qaa/Vorbis files, DVDs, VCDs, and multimedia			edia	
streams from various network sources.				
VLC can also be used as a streaming server that duplicates the stream it				
Sections Status reads and multicasts them through the network to other clients, or serves				
	them through HTTP.			
Search Custom				
20 packages listed, 1065 installed, 0 broken. 0 to install/upgrade, 0 to remove				

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Windows Vista<sup>TM</sup> Apple Mac OS X<sup>TM</sup> Ubuntu Ximian Red Carpet



Richard Hughes PackageKit: Package Abstraction Framework

Windows Vista<sup>TM</sup> Apple Mac OS X<sup>TM</sup> Ubuntu Ximian Red Carpet

# Ximian (now Novell<sup>TM</sup>) Red Carpet: So close, but so far...

Well ahead of its time

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- Well ahead of its time
- Daemon running in the background all the time
- Enterprise focus
- Supported .deb and .rpm
- Replaced the depsolver and downloader
- Never reached critical mass

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## What is PackageKit?



Richard Hughes PackageKit: Package Abstraction Framework

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# What is PackageKit?

 A system designed to make installing and updating software on your computer easier

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# What is PackageKit?

- A system designed to make installing and updating software on your computer easier
- Unify all the graphical tools

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# What is PackageKit?

- A system designed to make installing and updating software on your computer easier
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- Make the authentication process suck less

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# What is PackageKit?

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- Not meant to replace nuts-and-bolts distro tool

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# What is PackageKit?

- A system designed to make installing and updating software on your computer easier
- Unify all the graphical tools
- Make the authentication process suck less
- Not meant to replace nuts-and-bolts distro tool
- A system activated daemon

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# Logical design



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#### Logical design: Backends

A backend is a compiled .so object

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## Logical design: Backends

- A backend is a compiled .so object
- It provides an interface

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# Logical design: Backends

- A backend is a compiled .so object
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- A backend converts an async request into either a new thread which in the same process, or using external "glue" scripts

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# Logical design: Backends

- A backend is a compiled .so object
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- A backend converts an async request into either a new thread which in the same process, or using external "glue" scripts
- The only parts that are distro specific are the backends typically ~900 lines of C or python

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# Logical design: Backends

- A backend is a compiled .so object
- It provides an interface
- A backend converts an async request into either a new thread which in the same process, or using external "glue" scripts
- The only parts that are distro specific are the backends typically ~900 lines of C or python
- Backends do not have to be complete

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# Quick intro to PolicyKit

 PackageKit uses PolicyKit for user authentication – therefore the dameon is security sensitive

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# Quick intro to PolicyKit

- PackageKit uses PolicyKit for user authentication therefore the dameon is security sensitive
- Can specify with fine-grained control

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# Quick intro to PolicyKit

- PackageKit uses PolicyKit for user authentication therefore the dameon is security sensitive
- Can specify with fine-grained control
- Unprivileged users can update the system and do searching, but are not allowed to install or remove packages

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# Quick intro to PolicyKit

- PackageKit uses PolicyKit for user authentication therefore the dameon is security sensitive
- Can specify with fine-grained control
- Unprivileged users can update the system and do searching, but are not allowed to install or remove packages
- ▶ For home users we can ask the user for their own password

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This is the name; version; arch; data in a single string and is meant to represent a single package

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- This is the name; version; arch; data in a single string and is meant to represent a single package
- The data field can be used for the repository name

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- This is the name; version; arch; data in a single string and is meant to represent a single package
- The data field can be used for the repository name
- A PackageID must be enough to uniquely identify an object

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- This is the name; version; arch; data in a single string and is meant to represent a single package
- The data field can be used for the repository name
- A PackageID must be enough to uniquely identify an object
- PackagelD's are not shown to the user

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#### Search filtering is done in the backend

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- Search filtering is done in the backend
- installed : if the package is installed on the system

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- Search filtering is done in the backend
- installed : if the package is installed on the system
- devel : development packages typically end -devel, -dgb and -static

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- visible : Should show in the UI.
- supported : Is supported by the distro.

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#### Process communication

#### If a backend can't operate in a thread

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#### Process communication

- If a backend can't operate in a thread
- Send standard stdin commands to the process, e.g. force liferea;2.20.1;i386;fedora

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#### Process communication

- If a backend can't operate in a thread
- Send standard stdin commands to the process, e.g. force liferea;2.20.1;i386;fedora
- Process UNIX stderr and stdout

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#### Process communication

- If a backend can't operate in a thread
- Send standard stdin commands to the process, e.g. force liferea;2.20.1;i386;fedora
- Process UNIX stderr and stdout
- Send the process UNIX signals for cancellation of processes

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## Cancellation

 AllowInterrupt is called if the daemon is able to abort the transaction by killing the process

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## Cancellation

- AllowInterrupt is called if the daemon is able to abort the transaction by killing the process
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# Cancellation

- AllowInterrupt is called if the daemon is able to abort the transaction by killing the process
- Cancel a transaction in a download phase, not in an install phase
- Threaded backends, Cancel() method used to terminate the thread

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# Cancellation

- AllowInterrupt is called if the daemon is able to abort the transaction by killing the process
- Cancel a transaction in a download phase, not in an install phase
- Threaded backends, Cancel() method used to terminate the thread
- For spawned backends, we send the process SIGQUIT, then SIGKILL

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#### Error enumerated types

Every error should have an enumerated type and also a description

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### Error enumerated types

- Every error should have an enumerated type and also a description
- The description is not translated and not converted into the users locale

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### Error enumerated types

- Every error should have an enumerated type and also a description
- The description is not translated and not converted into the users locale
- Examples; out-of-memory, not-supported, package-not-installed

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## Transaction ID

Unique identifier that identifies the present or past transaction

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## Transaction ID

- Unique identifier that identifies the present or past transaction
- One or more sub-transactions

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# Transaction ID

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# Transaction ID

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- Different status values as the transaction is processed

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# Transaction ID

- Unique identifier that identifies the present or past transaction
- One or more sub-transactions
- One role for the entire lifetime
- Different status values as the transaction is processed
- An example TransactionID would be 45;dafeca;checkpoint32

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- Search Name
- Search Group
- Search Details
- Search File
- Install Package
- Install File
- Remove Package
- Get Depends
- Resolve

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# Methods 2

- Get Update Detail
- Get Requires
- Get Description
- Get Files
- Update Package
- Update System
- Get Updates
- Refresh Cache
- Get Repo List
- Repo Enable
- Repo Set Data
- Service Pack

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- Progress
- Error
- Status
- RequireRestart
- Package
- Description
- UpdateDetail
- RepoSignatureRequired

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## How do I use PackageKit?

#### pkcon command line queries

[hughsie@laptop ~]\$ pkcon get updates normal powertop i386 1.8-1.fc8 fedora Power cons security kernel i386 2.6.23-0.115.rc3.git1.fc8 instal security gtkhtml2 i386 2.19.1-4.fc8 fedora An HTML with Runtime was 0.1 seconds

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### How do I use PackageKit?

pkcon command line searching

[hughsie@laptop ~]\$ pkcon search name power

installed	powerman	i386	1.0.25-2.fc7	installe
installed	powertop	i386	1.8-1.fc8	installe
installed	gnome-power-manager	i386	2.20.0-5.fc8	installe
available	kpowersave	i386	0.7.3-0.2svn20	070828.1
available	kadu-powerkadu	i386	0.5.0-4.fc8	develop
available	powermanga	i386	0.90-1	develop
Runtime was	s 2.1 seconds			

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## How do I use PackageKit?

libpackagekit gobject library

g\_object\_unref (client);

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# Why is this useful?

OpenOffice has missing clipart

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# Why is this useful?

- OpenOffice has missing clipart
- It prompts the user with:



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## QPackageKit frontend

### QPackageKit QT frontend

	Add/Remove So	oftware	
earch		📄 gnome-power-m	anager - 2.20.0-6.fc8 - i38
power	Find	🔮 gnome-power-m	anager - 2.21.1-1.93.2007
[·		gnome-power-m	anager-debuginfo - 2.20.0
L	\$	📄 kadu-powerkadu	- 0.5.0-4.fc8 - i386
Groups		kpowersave - 0.3	7.3-0.2svn20070828.fc8 -
		📄 kpowersave-deb	uginfo - 0.7.3-0.2svn2007
		powerman - 1.0.	25-2.fc7 - i386
		powerman-debu	ginfo - 1.0.25-2.fc7 - i386
		powermanga - 0	.90-1 - i386
ilters		📄 powermanga-de	buginfo - 0.90-1 - i386
incero -		🔮 powertop - 1.8-1	.fc8 - i386
Installed	All packages 💠	powertop-debug	info - 1.8-1.fc8 - i386
Development	All packages 💲		
Graphical	All packages 😫		
💂 Install	🔏 Remove		
🕤 Depends	equires	]	
3	🕽 Help		•
ansaction finished in 2	seconds with status succ		100%
		4	

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## **GNOME** Frontend

pk-application

Search Groups po By package nar	ne	ind ¢	PolicyKit-gnome-0.6-1.fc8 (i386) GNOME dialogs for PolicyKit f-spot-0.4.0-3.fc8 (i386) Photo management application gnome-power-manager-2.21.2-1.100.20080102syn fc9.hugt		
Filters			GNOME Power Manager		
Installed:	Installed	\$			
Development:	Non-development	\$	Description File List Depends on Required by		
Graphical:	Only graphical	\$	F-Spot is an application designed to provide personal photo management to the GNOME desktop. Features include import, export, printing advanced sociation of divide images		
Free:	All packages	\$	printing and advanced sorting of digital images.		
			Package size: 7.3 MB		
			Remove Remove		

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## **GNOME** Frontend

### pk-prefs

🕞 Software Update Preferences 🗕 🛛				
Update Settings				
Check for updates:	Daily	•		
Automatically install:	Only security updates	•		
□ Install updates automatically when on <u>b</u> attery power				
Display Notification				
$\checkmark$ When <u>updates are available</u>				
$\checkmark$ When long tasks have completed				
elp <u>H</u> elp		se		
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# **GNOME** Frontend





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## **GNOME** Frontend

#### pk-repo

ſ	6	Repos	itory Viewer	X)
	Enabled	Repository		a l
	✓	Fedora - Development		
	✓	Fedora - Development - D	ebug	
		Fedora - Development - Se	ource	
	✓	Livna for Fedora Core 8 - i386 - Development Tree		
	✓	Livna for Fedora Core 8 - i	386 - Development Tree - Debug	
		Livna for Fedora Core 8 - i	386 - Development Tree - Source	
				9
	<u>H</u> elp <u>X</u> <u>C</u> lose			
			・ロト ・四ト ・ヨト ・ヨト	
		Richard Hughes	PackageKit: Package Abstraction Framework	

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## **GNOME** Frontend

### pk-application

	Authenticate		
A	System policy prevents changing repository parameters		
	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:		
	✓ <u>R</u> emember authorization		
	For this session only		
▷ <u>D</u> etails			
	Cancel Authenticate		

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## **GNOME** Frontend

#### pk-update-viewer



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# **GNOME** Frontend

### pk-update-icon



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### Development

Done on packagekit.org git server

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### Development

- Done on packagekit.org git server
- Fast server on a good connection (thanks Ken and Elliot)

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### Development

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- Developers push and pull frequently during the day

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### Development

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- Developers push and pull frequently during the day
- Create git+ssh accounts in a few seconds

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### Development

- Done on packagekit.org git server
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- Create git+ssh accounts in a few seconds
- Commit if you have a single patch to apply

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### Development

- Done on packagekit.org git server
- Fast server on a good connection (thanks Ken and Elliot)
- Developers push and pull frequently during the day
- Create git+ssh accounts in a few seconds
- Commit if you have a single patch to apply
- Once a day synced with anonymous freedesktop

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### Current status

Last release was 0.1.8

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Introduction Internal design Important Ideas How to use Questions

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- Last release was 0.1.8
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Introduction Internal design Important Ideas How to use Questions

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Introduction Internal design Important Ideas How to use Questions

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Introduction Internal design Important Ideas How to use Questions

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- Interest from Ubuntu, openSUSE, openSolaris, Mandriva and a few more

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Rapid development

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- Rapid development
- A minor release a month

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- Rapid development
- A minor release a month
- 15-strong developer team

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- Rapid development
- A minor release a month
- 15-strong developer team
- PackageKit, QPackageKit and gnome-packagekit are GPLv2+

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### Why should I use PackageKit

Free up developers

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## Why should I use PackageKit

- Free up developers
- Working together is much more sane

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# Why should I use PackageKit

- Free up developers
- Working together is much more sane
- Translations and native frontends for free

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# Why should I use PackageKit

- Free up developers
- Working together is much more sane
- Translations and native frontends for free
- Only provide a small amount of support

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# Why should I use PackageKit

- Free up developers
- Working together is much more sane
- Translations and native frontends for free
- Only provide a small amount of support
- Thriving development team

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### Cool stuff we can do

Battery mode detection



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### Cool stuff we can do

System and session inhibit



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### Problems not yet properly solved

Time remaining

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#### Problems not yet properly solved

- Time remaining
- Reporting bugs in backends

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#### Problems not yet properly solved

- Time remaining
- Reporting bugs in backends
- Installing service packs

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Discussed the downsides of the tools we've got already

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- Discussed the downsides of the tools we've got already
- We've seen how other operating systems do it

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- Discussed the downsides of the tools we've got already
- We've seen how other operating systems do it
- I've introduced PackageKit and the concept of distribution specific backends

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- Discussed the downsides of the tools we've got already
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- Console, QT and GNOME tools can interact with PackageKit

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- Discussed the downsides of the tools we've got already
- We've seen how other operating systems do it
- I've introduced PackageKit and the concept of distribution specific backends
- Console, QT and GNOME tools can interact with PackageKit
- Distributions that adopt PackageKit can share common code
- There is strong positive momentum with PackageKit

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## PackageKit questions



- I'm expecting lots of difficult questions!
- Email: richard@hughsie.com
- Homepage: http://www.packagekit.org