

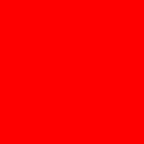
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A brief introduction to IPS

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Outline

- Why build a new packaging system
- Design assertions
- Packaging basics
- Actions
- Dependency types
- Installation / Upgrade
- Implementing side effects safely – actuators
- Handling diversity – variants and facets
- Tools

Why Build A New Packaging System?

- Existing SVR4 packaging needed work
 - Required better integration of patching with packaging
 - Artificial distinction between what was in a patch vs. what was in a package
 - No automatic installation of dependencies
 - Required better network support
 - Install-time scripting was error prone and scripts broke when new installation contexts were introduced (eg, zones)
 - Too much installer-specific logic required
 - Required better tools

Design Assertions

- All packaging data belongs in packages
- Meta-data must be extensible
- No install-time scripting, will use software *self-assembly* whenever possible
- Package dependencies must define safe surfaces (combinations of package versions)
- No difference between packages, patches or upgrades
- Will use ZFS snapshots & clones

Packaging basics

- A package is a minimisation boundary
- A package has a version
- Only one version of a package may be installed at a time
- A package is defined by a **manifest**
- A manifest is a collection of **actions**
- A package is named by an **FMRI**:
`pkg://{publisher}/{package name}@{version}`

`pkg://opensolaris.org/package/pkg@0.5.11,5.11-0.149:20100924T020949Z`

Actions

- How IPS delivers content and metadata: causes things to occur during installation
- 12 different actions at present
 - file, directory, link, hardlink, license and user, group, set, depend, driver, signature, legacy
- Each action takes a set of attributes containing meta-data
 - **file** 14d...ec group=bin mode=0555 \ owner=root path=usr/bin/ls variant.arch=i386
 - **dir** group=bin mode=0755 owner=root path=usr/bin
 - **user** gcos-field="pkg(5) server UID" group=pkg5srv \ uid=97 username=pkg5srv

Dependency Types

- How a package expresses constraints
- `depend fmri=pkg:/foo@0.5.11,5.11-0.149 type={type}`
 - **require**: the package must be present (at a version \geq the version given, if specified)
 - **optional**: the package, if present must be at a version \geq the version specified. Omitting the version does nothing.
 - **exclude**: the package installed must be at a version $<$ the specified version. If the version has been specified, the package must not be present.
 - **incorporate**: constrains the package to be within the version specified at that precision
 - eg. `pkg:/foo@2` allows 2, 2.1, 2.99.99, but not 1.99 or 3.0
(groups collections of packages, allowing them to upgrade in lock-step)

Dependency Types

- `depend fmri=pkg:/foo@0.5.11,5.11-0.149 type={type}`
 - **conditional**: the listed package must be installed if the package marked by the 'predicate' attribute is installed (version rules as per 'require')
 - **require-any**: any one of the listed packages must be installed (version rules as per 'require')
 - **origin**: the given package must have already been installed prior to the package operation installing this action (version rules as per 'require')
- We're considering other dependency types (eg. to help group packages)

Installation / Upgrade

- We install packages to **images**, either live or non-live full root images, linked-images, user-images
- Installing a newer version of an already installed package is an *upgrade* operation.
 - Actions that are different in the new version of the package are installed
 - Unchanged actions are left alone
 - Any actions that have disappeared from the new manifest are deleted
- Download sizes are determined by amount of change
- Downgrading is limited: use boot environments

Implementing side effects safely – actuators

- An action tag to trigger side-effects when modifying **live-images**, deferring those to boot for non-live images
 - file 5c2...33ebd group=sys mode=0444 owner=root \
path=var/svc/manifest/application/pkg-server.xml \
restart_fmri=svc:/system/manifest-import:default
- Actuators are tied to actions – if the action doesn't change, the actuator doesn't fire
- Actuators with the same name & value are combined and only fire once

Handling diversity – variants and facets

- Variant tags allow a single package to deliver different content depending on image properties
 - eg. **variant.arch** with current values **i386** and **sparc**
- Facet tags are similar, but used to deliver optional content
- Facets have a hierarchical namespace
 - eg.

facet.locale.*	false
facet.locale.fr	true
facet.locale.fr_FR	true

Matches facet.locale.fr_FR, facet.locale.fr but not facet.locale.fr_CA

Command line tools

- Client
 - `pkg(1)` `packagemanager(1)`
- Developer
 - `pkgfmt(1)`, `pkgdepend(1)`, `pkgdiff(1)`, `pkglint(1)`, `pkgmogrify(1)`
- Publisher
 - `pkgsend(1)`, `pkgrecv(1)`, `pkg.depotd(1M)`
- Related tools
 - `Installadm(1)`, `distro_const(1)`

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