opensolaris™

Image packaging

From 2008.05 to 2008.11

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Outline

- High-level view
  - Schedule
- Software delivery
  - Technologies
  - Content
  - Six months; twelve months; beyond
- Repositories
  - Where's my software go?
- Summary

High-level view

Software delivery matters

- Can't get it means can't run it
  - Doesn't matter how great it might be
- OpenSolaris non-competitive
  - All: License restrictions
  - OS: 15 years of incremental neglect
- Must catch up, if not lead
  - Make differentiating choices

Stephen Foster, http://flickr.com/photos/shf/363108804/

Incremental neglect in a delivery system

OpenSolaris, the product

- An “easy to get, easy to use” distribution
  - Redistributable
  - Regularly emitted, developer focused
  - Limited support available
  - Technology change to network packaging, distribution construction
  - Process change from “big product” to “core, plus repository”

100% OPEN SOURCE

Technologies

- Distribution constructor [Dave]
  - Emit ISOs, other images from a recipe and a repository
- Lightweight installer, LiveCD... [Dave]
- Image packaging system
  - Network-aware controlled software delivery
  - Multi-repository, bandwidth efficient, ZFS aware, multi-platform
  - No scripting, zones/diskless capable

pkg(5) operational need

- Patch complexity of S10 overwhelming
  - Update delivery dependent on correct patches
- More flexible software delivery
  - Number of products and update rate increasing
  - Network update rather than media update
  - Multi-platform product
- How to switch packaging at Sun
  - Don't impose a build system

pkg(5) competitive need

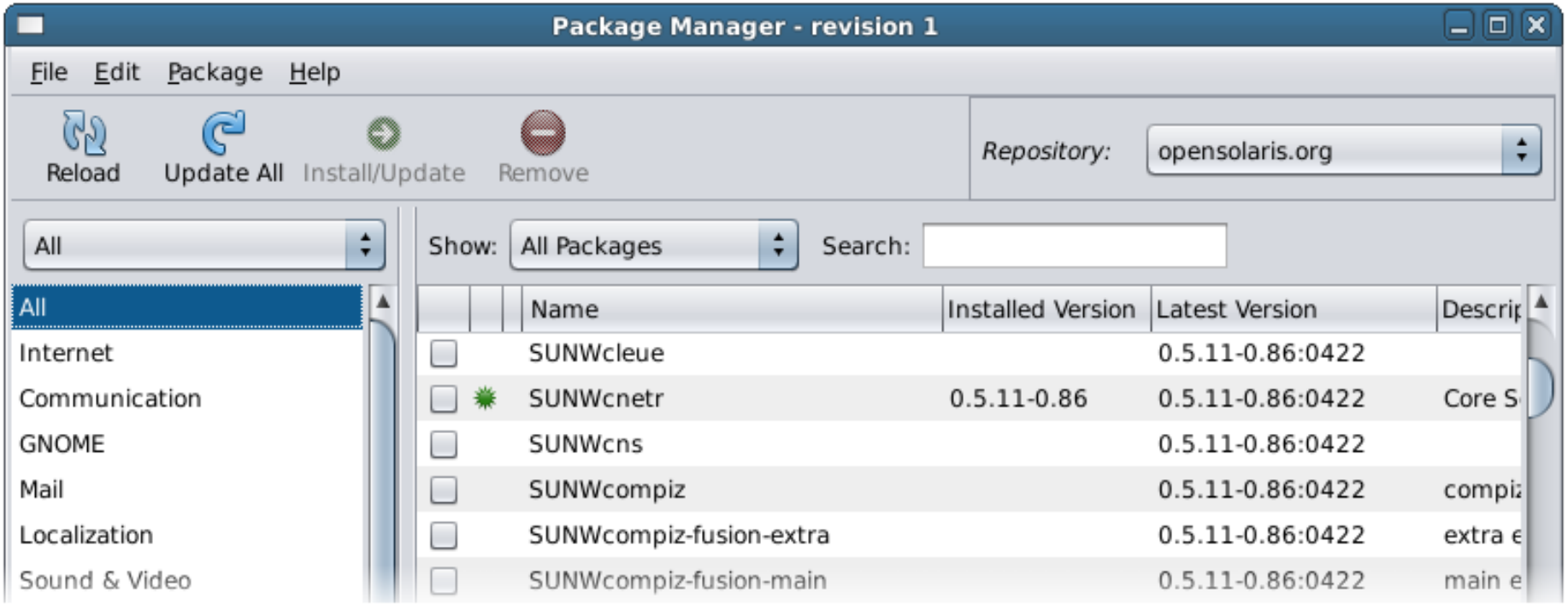
- Simplified update
  - Complexity: zones, virtual systems, appliances
- Distribution construction is now expected
  - Virtualization/appliances an OS deployer choice, rather than a vendor option
- Current implementation far behind expected feature set
  - Windows/MacOS/Linux all have fine-grained software update

Retrieving software

- Use either the command line

```
$ pfexec pkg install openoffice
```

- Or use the Package Manager utility



Example: basic CLI usage

```
# pkg refresh
# pkg install gnu-coreutils
DOWNLOAD                                PKGS       FILES     XFER (MB)
Completed                                1/1     193/193     4.20/4.20

PHASE                                    ACTIONS
Install Phase                            207/207
$ ls /usr/gnu/bin
basename  ...
```

- Ensure catalog is up to date
- Install package

What just happened?

- Updated the catalog, checked status
- Pulled the new version's manifest
- Diffed the old manifest with the new
- Made a plan (pkgplan) to transition each changed action; ignores rest
- Downloaded only changed files
- Ran install() methods on each changed action
- Checked everything was OK

Retrieving software

- Connected to pkg.opensolaris.org by default
- Add sunfreeware.com packages

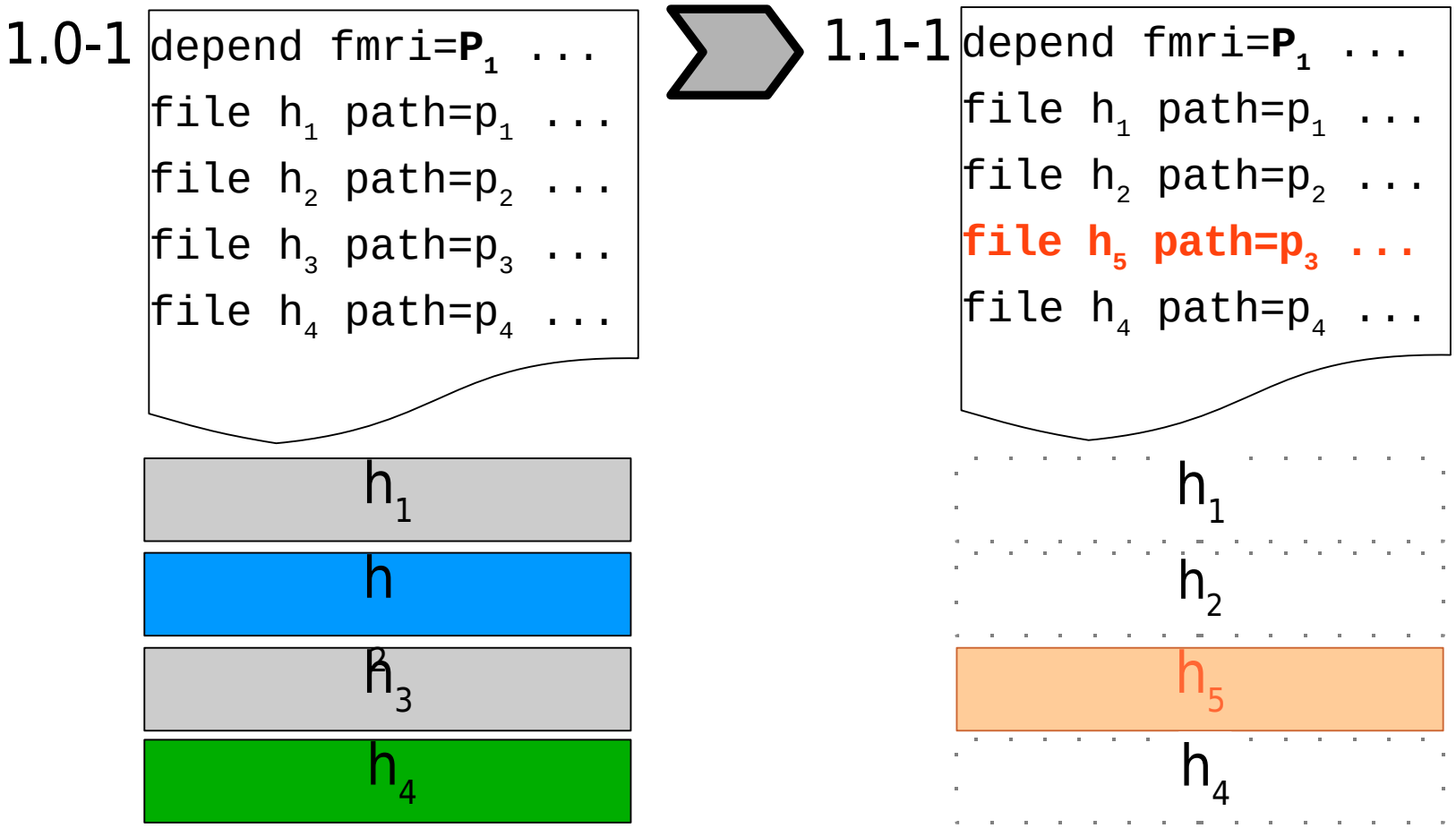
```
$ pfexec pkg set-authority \
  -O http://pkg.sunfreeware.com:9000 \
  sunfreeware.com
```

  - blastwave.org close
- Run your own depot:

```
# svcadm enable pkg/server
```

  - *By default, serves repository at* **`/var/pkg/repo`**, *on port 80; smf(5) properties*

Bandwidth efficiency



Always compressed; only new content retrieved; verify/fix

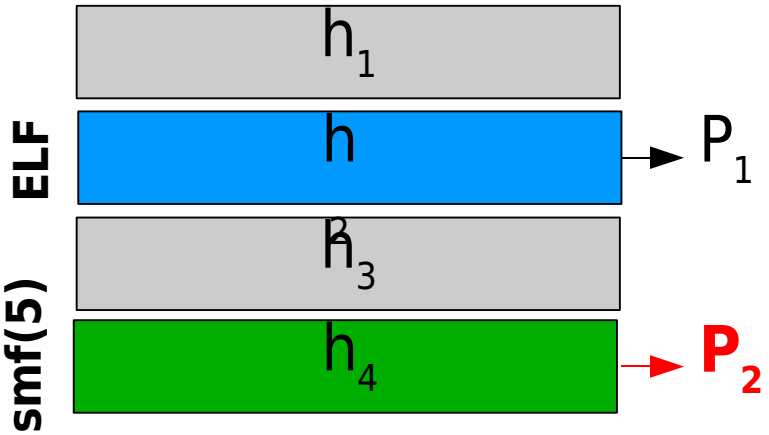
Example: update a package

```
# pkg refresh; pkg list gnu-coreutils
NAME                          VERSION     STATE       UFIX
application/gnu-coreutils     6.7-0.71    installed   u---
# pkg install gnu-coreutils
...
$ pkg list gnu-coreutils
NAME                          VERSION     STATE       UFIX
application/gnu-coreutils     6.7-0.72    installed   ----
$ pkg verify -v gnu-coreutils
PACKAGE                                   STATUS
pkg:/application/gnu-coreutils            OK
```

- Update catalog; heck on a package of interest; install newer version

Publication safety

```
depend fmri=P1 ...
file h1 path=p1 ...
file h2 path=p2 ...
file h3 path=p3 ...
file h4 path=p4 ...
```



- Check dependencies of known file types
  - C binaries (ELF), startup ordering (smf(5)), Java (JAR), ...
- Packages with incomplete dependency statements denied published state

Rich metadata

- Example: Patch README info
- com.sun.service.info_url
  - "http://service.opensolaris.com/xml/pkg/SUNWcsu@0.5.11,5.11-1:20080514I120000Z"
- com.sun.service.keywords
  - "sort null -n -m -t sort 0x86 separator"
- com.sun.service.incorporated_changes
  - "6556919" "6627937" [list-valued]
- com.sun.service.changeset
  - [unique ID for changeset--not possible for teamware]
- All searchable: pkg search -r 6556919

2008.11 (or sooner)

- Updates to pkg(5), PackageManager
  - Performance fixes
  - Support for easier publication
    - Actions support smf(5) restart/refresh
  - Mirroring and better transport handling
  - Better web reporting
  - Multi-platform packages
- Additional packages
  - pkg.sun.com for encumbered software
  - Community repository for “new bits” OSS

2009.*n* (or later)

- Updates to pkg(5), PackageManager
  - Further publication improvement
    - Additional file analysis
  - Cryptographic signing
  - Peer-to-peer transport
  - Server-side BUI for search/publication
- Additional packages
  - Project repositories

OpenSolaris content

Software selection matters

- Have the basic technologies for distributions—not enough
- Distribution must have compelling content
  - Target known deficits/dissatisfiers
  - Target specific audiences: Web, HPC, ...

Scott Library YorkU, http://flickr.com/photos/7883660@N05/4662211141/

Need content: can't just build frameworks anymore

Content

- What to add?
  - Supported, high performance Web components
  - Productivity and development tools
- What to change?
  - Remove unused/obsolete features
  - Change unhelpful/obsolete components
    - Update shell defaults (bash, ksh93), prompt
    - Update editors, GNU utilities, “expected tools”

Building packages

- First release of **pkg**(5) was focused on basic client-server function
- Publication intelligence ended up in distro importer
  - Brain transplant
    - Mmm, brains
- Intelligence checks dependency completeness for known file types
  - ELF now, more to come
- Transaction using **pkgsend**(1)

Community repository

- Got a built package? Want to share it?
- Announce your depot URL on pkg-discuss@opensolaris.org
  - Or use **`pkgrecv`** to grab it out of your depot, tar that up, and send the URL
  - Say it's for the community repository and become the maintainer*
- We'll get a group of people to review and mildly test packages
- Main repositories?
  - SFW, JDS, other consolidation

Software in repositories

pkg.sun.com/support/

Specific fixes for 2008.05, 2008.11, ...

pkg.sun.com/extras/

Encumbered software requiring EULA

SSL certificate required

pkg.opensolaris.org/

Development builds; separate products: redistributable only

.../contrib/

Community packages

.../webstack/

Project repositories

Software delivery matters

jeffwilcox, http://flickr.com/photos/jeffwilcox/186235756/

Otto Yamamoto, http://flickr.com/photos/otto-yamamoto/459310815/

Keep final destination in mind: limit costly detours

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Supplemental materials

Assertions, 1

- No “dim sum” patching
  - Multiple version streams, with constraints
- No install magic
  - Dependencies, groupings in package system
- No build system
  - Making a package must be simple: one file
  - Autoconvert SysV packages, tar archives, directory trees, etc.

Assertions, 2

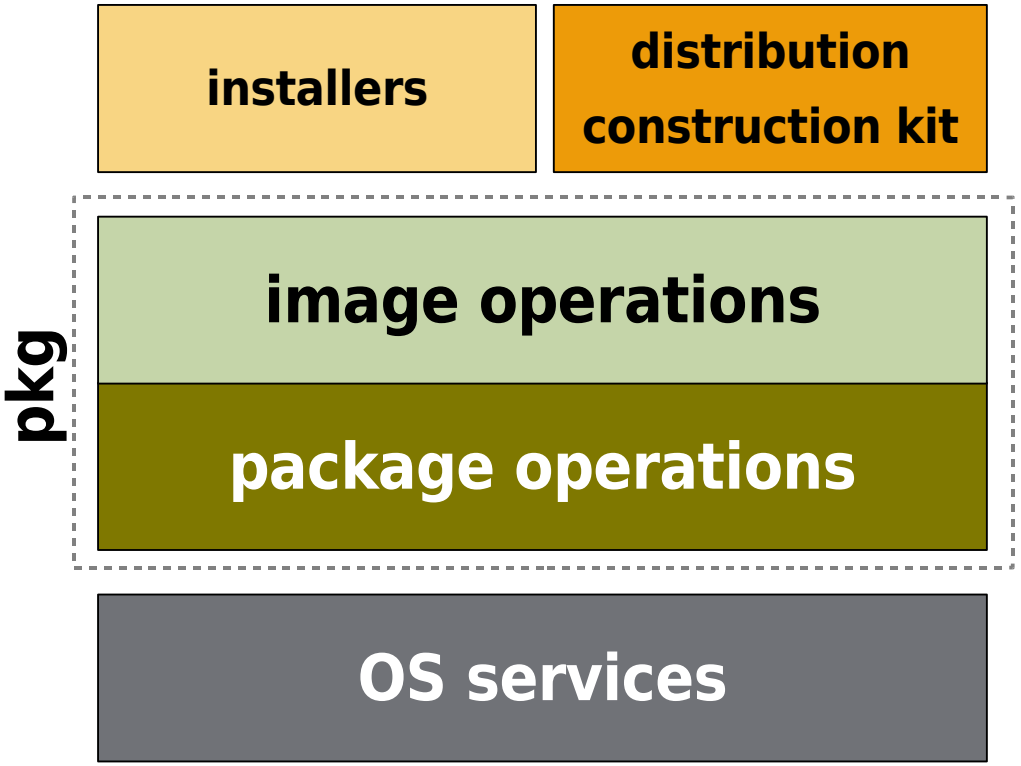
- No scripting
  - Not reversible; too many legitimate contexts: error prone
  - Specific actions for various resources
- Package refactoring
  - Combine packages: conventions encoded in client and not a burden for package creator
  - Separate packages: based on minimization input and comparative rates of change

Assertions, 3

- Virtualization-ready
  - Partial images linked to parent images; image updates can proceed in parallel
- Per-user images
  - Multiple install support—a common enterprise developer deployment scenario
- ZFS aware
  - Snapshots simplify reversion to a previous configuration (“Live Upgrade all-the-time”)

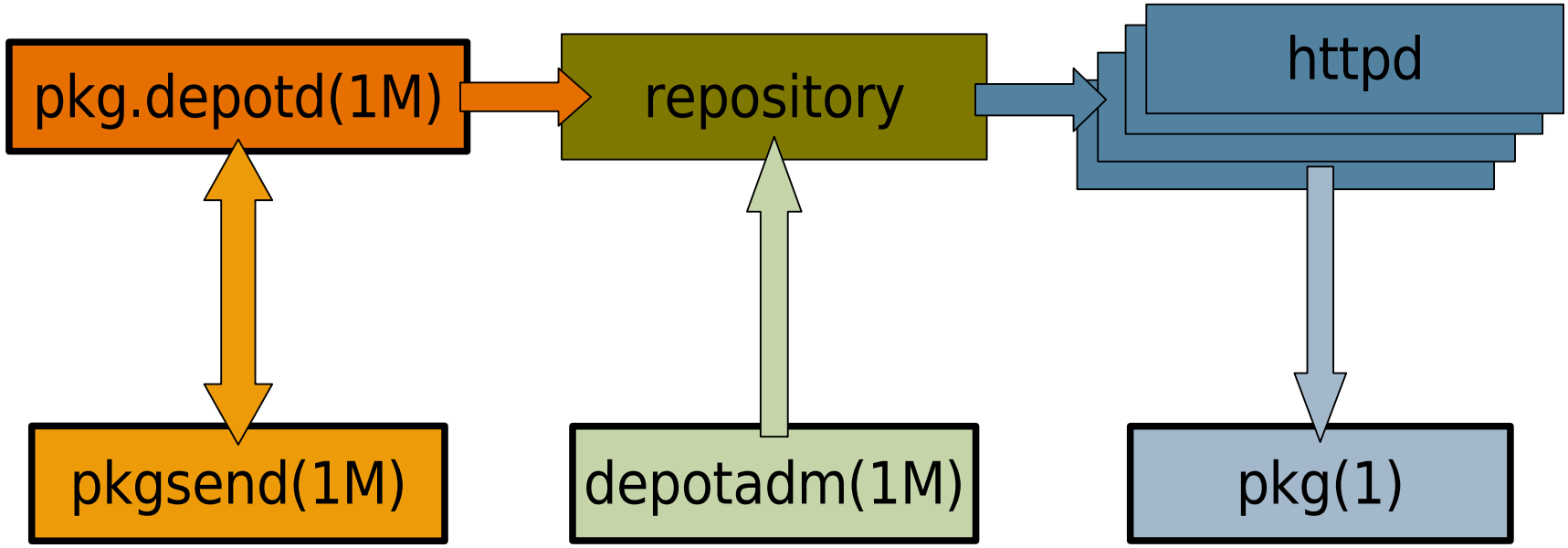
Layering

- Package system will provide image mgmt APIs, as well as more primitive package ops
- Distro kit being designed alongside new installer



Components

TENTATIVE



Package developer
→creates, updates, removes package and group versions

Depot operator
→closes versions, removes stale versions and files

Customer
→installs, upgrades, and deletes local packages

Package names [FMRIs]

pkg://[authority]/[pkg_name]
@[version][,build]-[branch]:[timestamp]

- Commands know short forms and globs
- **authority** refers to a publisher of a coherent group of packages, like a distro
- **pkg_name** allows hierarchy using **'/'**
- **version**, **build**, and **branch** unlimited precision dot vectors (1.1.1...)

Example: constraints

TENTATIVE

```
$ pkg freeze -v 6.7-0.71 gnu-coreutils
$ pkg status gnu-coreutils
FMRI                                          STATE       UFIX
pkg:/application/gnu-coreutils@6.7-0.71       installed   UF--
pkg:/application/gnu-coreutils@6.7-0.72       known       ----
...
$ pkg install gnu-coreutils
pkg: cannot upgrade pkg:/application/gnu-coreutils to
     6.7-0.72 from 6.7-0.71
     frozen at 6.7-0.71 by sch (Stephen Hahn) on
     2007-10-02T051655Z
$ pkg unfreeze -a gnu-coreutils
```

- “Freeze”: manual constraint operation
- Allows precise stoppage of update

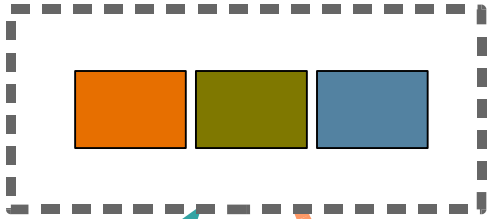
Example: incorporations

TENTATIVE

```
$ pkg status -a
FMRI                                          STATE       UFIX
pkg:/group/basic-user@5.11-0.71               installed   ----
pkg:/application/sunos-coreutils@5.11-0.71 installed   -I--
...
$ pkg status
FMRI                                          STATE       UFIX
pkg:/group/basic-user@5.11-0.71               installed   ----
...
```

- Dependency that constrains dependent package: a“built-in” freeze
- Absorbs cluster/metacluster/[stacks]

OpenSolaris repository



...

pkg.opensolaris.org (plus mirrors)

Redistributable bits from projects/ consolidations: ON, JDS, SFW, ... FOX, SFE, ...

Developers, evaluators, and other **OpenSolaris base system** users

Plus pull from any other pkg(5) depot

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From 2008.05 to 2008.11

sch@sun.com

http://blogs.sun.com/sch/