

Maintain the NetBSD Base System Using pkg_* Tools

Yuuki Enomoto

Ken'ichi Fukamachi

Chitose Institute of Science and Technology

Abstract

- This presentation explains “basepkg.sh” .
- Fine granular system can be easily updated and customized.
- “syspkg” consisting a lot of Makefiles and shell script.
- We have developed a script simpler than syspkg framework.

Index

1. Background
2. Case Study
3. Our Goals
4. Proposal Scripts
5. Outstanding Issues
6. Suggestions to Improve NetBSD Source Tree
7. Conclusion

Index

1. Background

2. Case Study

3. Our Goals

4. Proposal Scripts

5. Outstanding Issues

6. Suggestions to Improve NetBSD Source Tree

7. Conclusion

Background 1/3

- In Unix, it is important to keep it up to date for security.
- Usually, we use “Package Manager” for up-to-date system.
Ex. pkgsrc, ports, apt, yum, ...
- Third-party softwares can be updated using package manager.

Background 2/3

- But, how do we keep the base system up-to-date?
- This picture shows NetBSD-7.0.2 amd64 base binaries.

Name	Last modified	Size
Parent Directory	21-Oct-2016 08:26	0kB
MD5	21-Oct-2016 11:13	0kB
SHA512	21-Oct-2016 11:13	2kB
base.tgz	21-Oct-2016 08:31	54474kB
comp.tgz	21-Oct-2016 08:33	101186kB
etc.tgz	21-Oct-2016 08:31	569kB
games.tgz	21-Oct-2016 08:31	3195kB
kern-GENERIC.tgz	21-Oct-2016 08:30	7030kB
kern-XEN3_DOM0.tgz	21-Oct-2016 08:30	5267kB
kern-XEN3_DOMU.tgz	21-Oct-2016 08:30	2184kB
man.tgz	21-Oct-2016 08:31	10610kB
misc.tgz	21-Oct-2016 08:31	5122kB
modules.tgz	21-Oct-2016 08:31	5934kB
tests.tgz	21-Oct-2016 08:31	6466kB
text.tgz	21-Oct-2016 08:31	2733kB
xbase.tgz	21-Oct-2016 08:31	6966kB
xcomp.tgz	21-Oct-2016 08:31	13609kB
xetc.tgz	21-Oct-2016 08:31	23kB
xfont.tgz	21-Oct-2016 08:31	32014kB
xserver.tgz	21-Oct-2016 08:31	12138kB

Background 3/3

```
uki@DESKTOP-N3TS7DS: ~  
drwxr-xr-x root/wheel 0 2016-10-21 08:31 .  
drwxr-xr-x root/wheel 0 2016-10-21 07:59 ./alroot  
drwxr-xr-x root/wheel 0 2016-10-21 08:20 ./bin  
-r-xr-xr-x root/wheel 15361 2016-10-21 08:20 ./bin/[  
-r-xr-xr-x root/wheel 15079 2016-10-21 08:19 ./bin/cat  
lrwxr-xr-x root/wheel 0 2016-10-21 08:19 ./bin/chgrp -> /sbin/chown  
-r-xr-xr-x root/wheel 19218 2016-10-21 08:19 ./bin/chio  
-r-xr-xr-x root/wheel 14460 2016-10-21 08:19 ./bin/chmod  
-r-xr-xr-x root/wheel 25860 2016-10-21 08:19 ./bin/cp  
-r-xr-xr-x root/wheel 154160 2016-10-21 08:20 ./bin/cpio  
-r-xr-xr-x root/wheel 175577 2016-10-21 08:19 ./bin/csh  
-r-xr-xr-x root/wheel 17671 2016-10-21 08:19 ./bin/date  
-r-xr-xr-x root/wheel 31461 2016-10-21 08:19 ./bin/dd  
-r-xr-xr-x root/wheel 16907 2016-10-21 08:19 ./bin/df  
-r-xr-xr-x root/wheel 9748 2016-10-21 08:19 ./bin/domainname  
-r-xr-xr-x root/wheel 9557 2016-10-21 08:19 ./bin/echo  
-r-xr-xr-x root/wheel 62999 2016-10-21 08:19 ./bin/ed  
-r-xr-xr-x root/wheel 16616 2016-10-21 08:20 ./bin/expr  
-r-xr-xr-x root/wheel 9781 2016-10-21 08:20 ./bin/hostname  
-r-xr-xr-x root/wheel 12037 2016-10-21 08:20 ./bin/kill  
-r-xr-xr-x root/wheel 247403 2016-10-21 08:20 ./bin/ksh  
-r-xr-xr-x root/wheel 12277 2016-10-21 08:20 ./bin/ln  
-r-xr-xr-x root/wheel 30405 2016-10-21 08:20 ./bin/ls  
-r-xr-xr-x root/wheel 10991 2016-10-21 08:20 ./bin/mkdir  
-r-xr-xr-x root/wheel 21799 2016-10-21 08:20 ./bin/mt  
-r-xr-xr-x root/wheel 15955 2016-10-21 08:20 ./bin/mv  
hr-xr-xr-x root/wheel 0 2016-10-21 08:20 ./bin/pax ./bin/cpio へのリンク  
-r-xr-xr-x root/wheel 51205 2016-10-21 08:20 ./bin/ps  
(stdin):
```

	Last modified	Size
./bin/domainname	21-Oct-2016 08:26	0KB
./bin/echo	21-Oct-2016 11:13	0KB
./bin/ed	21-Oct-2016 11:13	2KB
./bin/expr	21-Oct-2016 08:31	54474KB
./bin/hostname	21-Oct-2016 08:30	101166KB
./bin/kill	21-Oct-2016 08:31	569KB
./bin/ksh	21-Oct-2016 08:31	3195KB
./bin/ln	21-Oct-2016 08:31	7030KB
./bin/ls	21-Oct-2016 08:31	5267KB
./bin/mkdir	21-Oct-2016 08:31	2184KB
./bin/mt	21-Oct-2016 08:31	10610KB
./bin/mv	21-Oct-2016 08:31	5122KB
./bin/pax	21-Oct-2016 08:31	5934KB
./bin/ps	21-Oct-2016 08:31	8466KB
./bin/cpio	21-Oct-2016 08:31	2733KB
./bin/csh	21-Oct-2016 08:31	6366KB
./bin/date	21-Oct-2016 08:31	13609KB
./bin/dd	21-Oct-2016 08:31	23KB
./bin/df	21-Oct-2016 08:31	32014KB
./bin/echo	21-Oct-2016 08:31	12138KB

- This picture shows part of NetBSD base.tgz.
- It is an example of the base system.
- How do we manage these files?

Index

1. Background

2. Case Study

3. Our Goals

4. Proposal Scripts

5. Outstanding Issues

6. Suggestions to Improve NetBSD Source Tree

7. Conclusion

Case Study -- Debian GNU/Linux 1/2

- Debian is an example of base system management.
- Debian manages the base system and third-party software as a package.
- **Debian package' s document can be viewed from the web.**

Case Study -- Debian GNU/Linux 2/2

Package: base-passwd (3.5.37) [[essential](#)]

Debian base system master password and group files

These are the canonical master copies of the user database files (/etc/passwd and /etc/group), containing the Debian-allocated user and group IDs. The update-passwd tool is provided to keep the system databases synchronized with these master files.

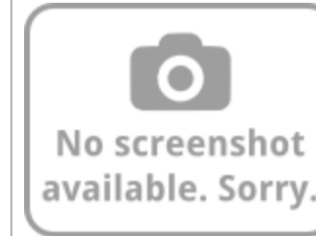
Tags: System Administration: [Configuration Tool](#), [User Management](#), Implemented in: implemented-in::c, interface::commandline, Role: [Application Data](#), [Program](#), Scope: scope::utility, security::authentication, Application Suite: [Debian](#), Purpose: [Login](#)

Other Packages Related to base-passwd

● depends ■ recommends ◆ suggests ▲ enhances

- **dep: [libc6](#) (>= 2.17) [arm64, ppc64el]**
GNU C Library: Shared libraries
also a virtual package provided by [libc6-udeb](#)
- dep: [libc6](#) (>= 2.8) [not arm64, ppc64el]**
- **dep: [libdebconfclient0](#) (>= 0.145)**
Debian Configuration Management System (C-implementation library)

Links for base-passwd



Debian Resources:

- [Bug Reports](#)
- [Developer Information \(PTS\)](#)
- [Debian Changelog](#)
- [Copyright File](#)

Download Source Package [base-passwd](#):

- [\[base-passwd_3.5.37.dsc\]](#)
- [\[base-passwd_3.5.37.tar.xz\]](#)

Maintainer:

- [Colin Watson \(QA Page\)](#)

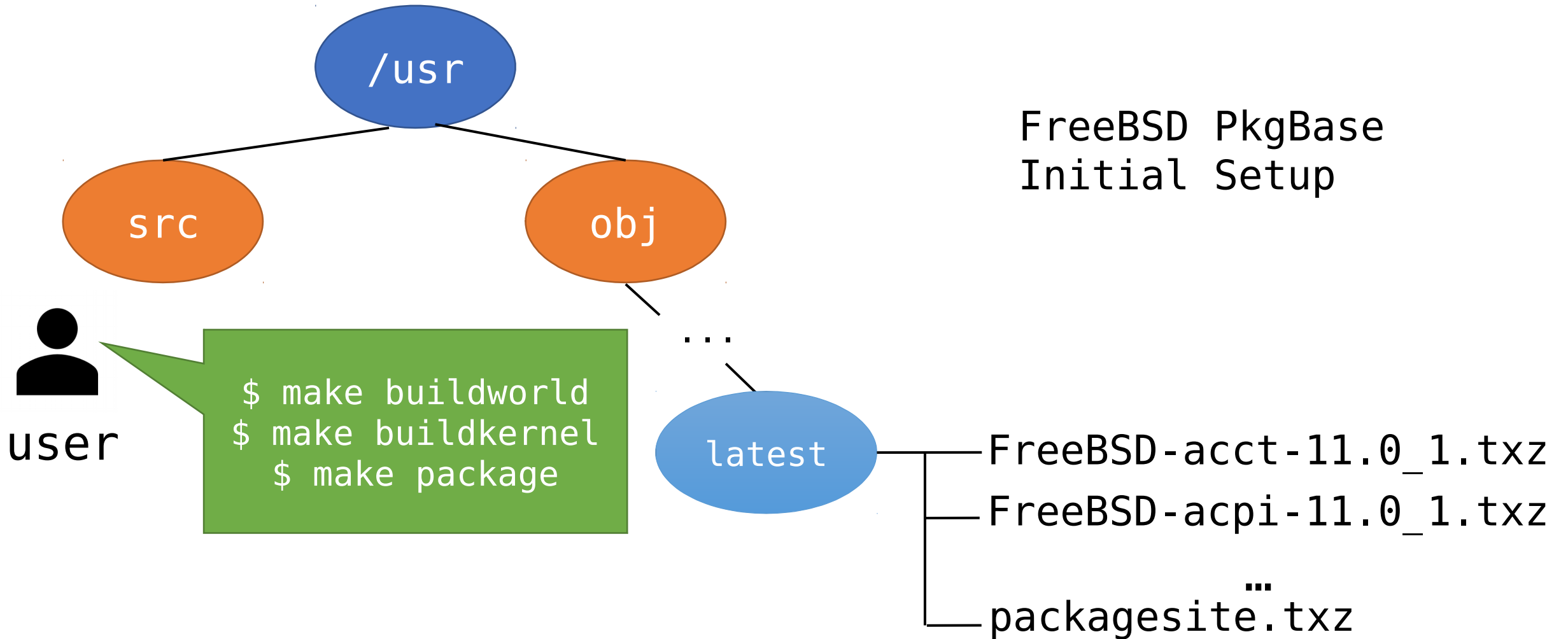
Similar packages:

- [libnss-pgsql2](#)
- [libpam-mklocaluser](#)
- [libpasswd-unix-perl](#)
- [python-reconfigure](#)
- [python3-reconfigure](#)
- [libnss-rainbow2](#)
- [passwd](#)
- [lbd](#)
- [xanian-tools](#)

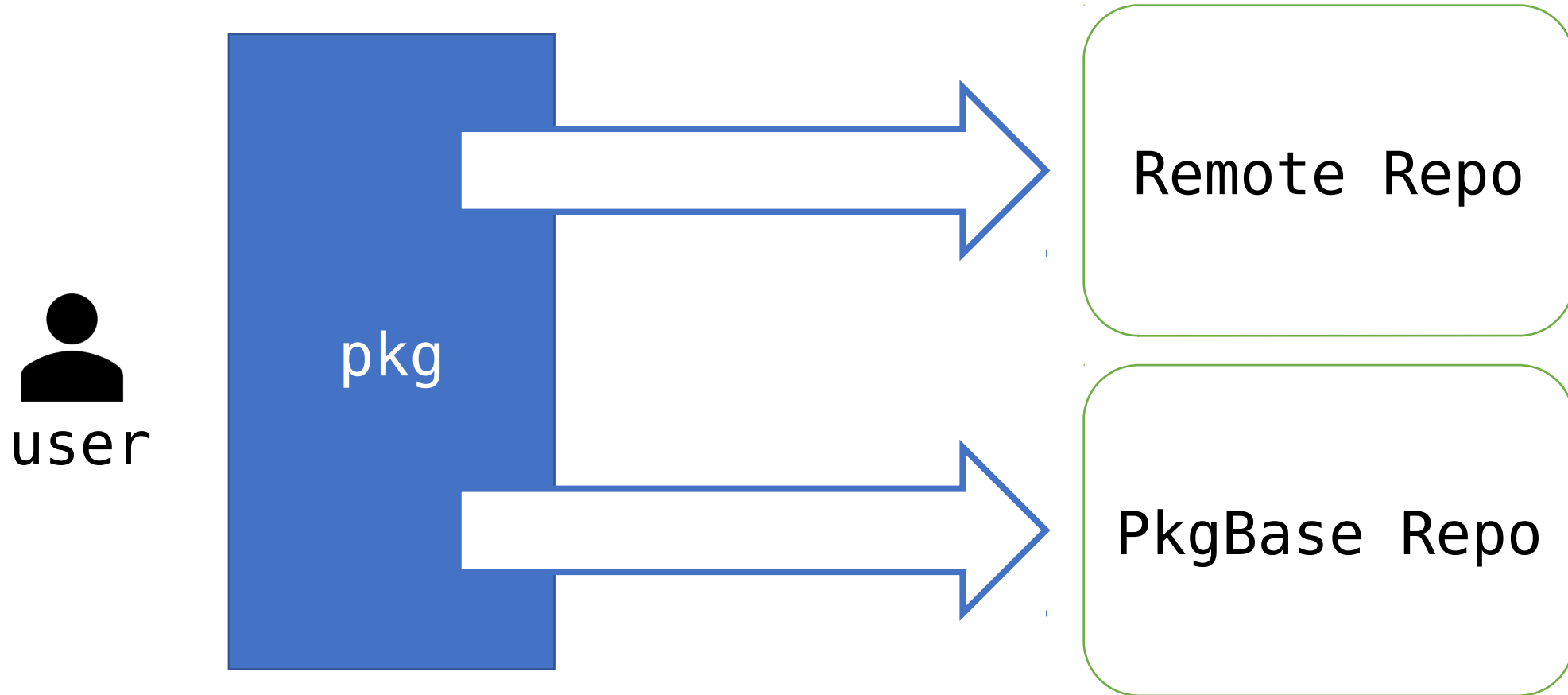
Case Study -- FreeBSD 1/3

- FreeBSD has “PkgBase” since FreeBSD-11.0.
- This mechanism can manage the base system using “pkg” .
- outstanding issues are remaining.
 - # pkg delete -a

Case Study -- FreeBSD 2/3



Case Study -- FreeBSD 3/3

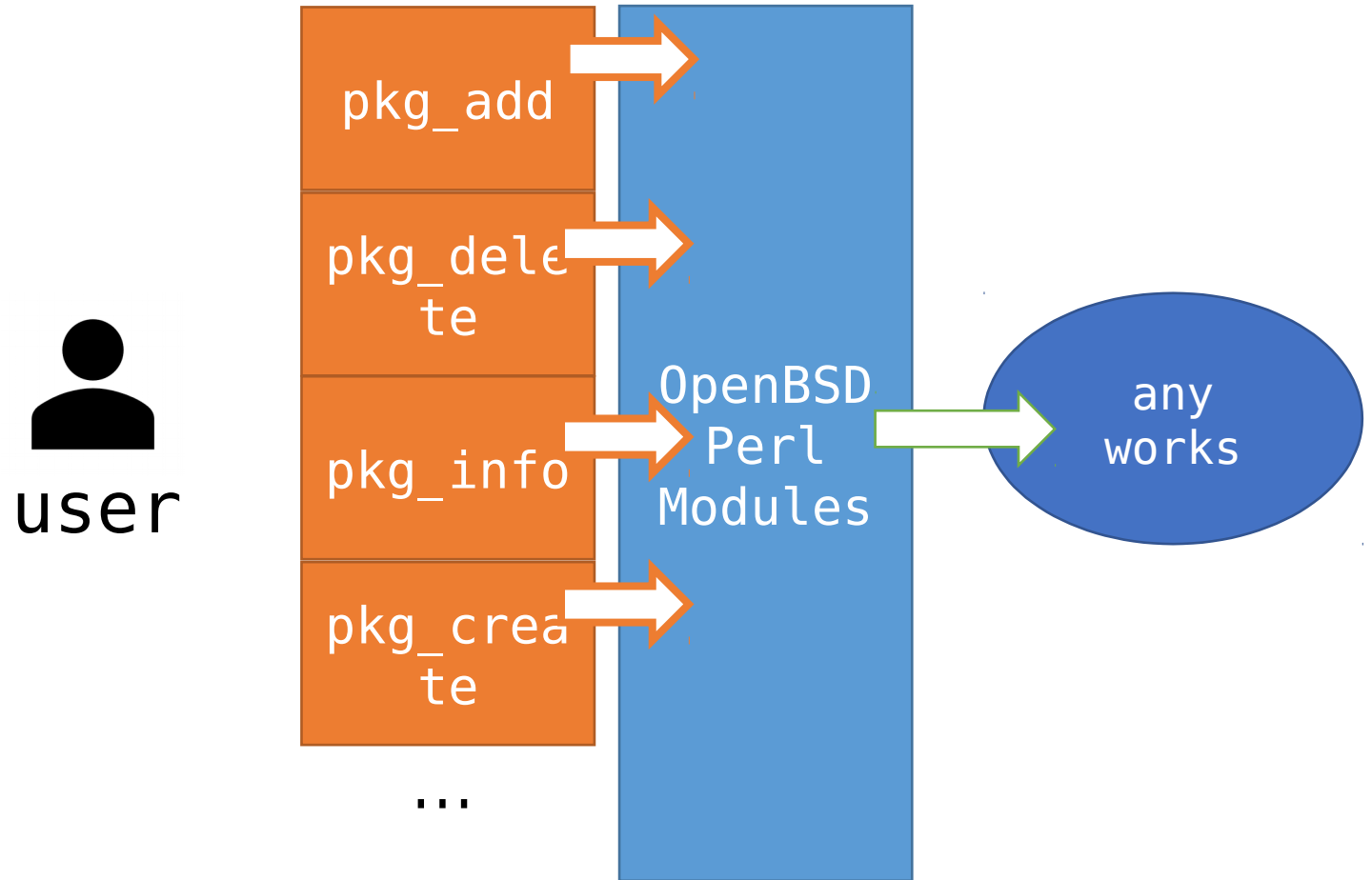


Case Study -- OpenBSD 1/2

- OpenBSD can't manage the base system yet.
- But, OpenBSD's package management mechanism serves as a useful reference.
- OpenBSD provides Perl modules.
pkg_* tools developed by the modules.

Case Study -- OpenBSD 2/2

- OpenBSD's `pkg_add` and `pkg_delete` command scripted by the same Perl code.
- Command jobs judged by the command name.



In NetBSD...

- The mechanism called “syspkg” like PkgBase.
- The syspkg’s process included in the build.sh.
 - `$ build.sh syspkgs`
- But syspkg project is not achieved.

syspkg 1/2

- syspkg creates many packages of the base system.
- NetBSD wiki(wiki.netbsd.org) says
“There has been a lot of work in this area already,
but it has not yet been finalized.”
-- <http://wiki.netbsd.org/projects/project/syspkgs/>

syspkg 2/2

- syspkg consisting of a lot of Makefiles and shell scripts.
 - src/distrib/syspkg (Makefile -- bsd.syspkg.mk)
 - src/distrib/sets (database and shellscript)
- syspkg mechanism is difficult for the above reason.
- We thought We could develop another base system packaging system simpler than syspkg.

Index

1. Background
2. Case Study
3. Our Goals
4. Proposal Scripts
5. Outstanding Issues
6. Suggestions to Improve NetBSD Source Tree
7. Conclusion

Our Goals

- Develop a base system packaging program simpler than syspkg for NetBSD.
- Clarify the problems of base system packaging of NetBSD.
- It is possible to ...
 - easy to update.
 - granular custom installation more than current installer.

Index

1. Background
2. Case Study
3. Our Goals
4. Proposal Scripts
5. Outstanding Issues
6. Suggestions to Improve NetBSD Source Tree
7. Conclusion

Proposal for another Script

- We have developed “basepkg.sh” for packaged NetBSD.
(<https://github.com/user340/basepkg>)
- This script makes packages from NetBSD binaries.
- Packages can be installed to NetBSD (base) system.

About basepkg.sh 1/4

- Easy to make a base package.
 - Prepare information files, then running pkg_create command.
- NetBSD's base package use the following files.
 - +BUILD_INFO -- Information of the environment.
 - +COMMENT -- Comment of the package.
 - +CONTENTS -- Information on the path of the file.
 - +DESC -- Description of the package.

About basepkg.sh 2/4

```
uki@~/src/basepkg:vim /usr/src/distrib/sets/lists/base/  
CVS/          md.cobalt      md.netwinder   md.x68k  
ad.aarch64    md.emips       md.news68k     mi  
ad.arm        md.ews4800mips md.newsmips    module.mi  
ad.arm.sh1    md.hp300       md.next68k     rescue.ad.arm  
ad.m68000     md.hpcarm      md.ofppc       rescue.ad.m68k  
ad.m68k       md.hpcmips     md.pmax        rescue.ad.m68k.sh1  
ad.m68k.sh1   md.hpcsh       md.prep        rescue.i386  
ad.mips       md.hppa        md.rs6000     rescue.mac68k  
ad.powerpc    md.i386        md.sandpoint   rescue.macppc  
md.acorn32    md.landisk     md.sbmips      rescue.mi  
md.alpha      md.luna68k     md.sgimips     rescue.shark  
md.amd64      md.mac68k     md.shark       rescue.sparc  
md.amiga      md.macppc     md.sparc       rescue.sparc64  
md.arc        md.mipsco     md.sparc64    rescue.sun2  
md.atari      md.mmeye       md.sun2        rescue.vax  
md.bebox      md.mvme68k    md.sun3        shl.mi  
md.cats       md.mvmeppc    md.vax
```


About basepkg.sh 3/4

```
18 .                base-sys-root
19 ./altroot        base-sys-root
20 ./bin            base-sys-root
21 ./bin/[          base-util-root
22 ./bin/cat        base-util-root
23 ./bin/chgrp      base-util-root
24 ./bin/chio       base-util-root
25 ./bin/chmod      base-util-root
26 ./bin/cp         base-util-root
27 ./bin/cpio       base-util-root
28 ./bin/csh        base-util-root
29 ./bin/date       base-util-root
30 ./bin/dd         base-util-root
31 ./bin/df         base-util-root
32 ./bin/domainname base-nis-root
33 ./bin/echo       base-util-root
```

- The files are classified.
- basepkg.sh makes hierarchical directories from “list” file.

About basepkg.sh 4/4

```
uki@~/src/basepkg/sets/base:ls
base-adofs-root      base-gnats-share    base-locale-fi      base-mail-root      base-reference-share base-texinfo_locale-nb
base-amd-bin         base-groff-font     base-locale-fr      base-mailwrapper-bin base-refuse-bin      base-texinfo_locale-nl
base-amd-examples   base-groff-share    base-locale-gl      base-man-bin        base-resolvconf-root base-texinfo_locale-no
base-atf-bin         base-hesiod-bin     base-locale-he      base-man-share      base-router-bin     base-texinfo_locale-pl
base-atf-share       base-hfs-root       base-locale-hr      base-mdns-bin       base-router-examples base-texinfo_locale-ro
base-audio-bin      base-htmldoc-share  base-locale-hu      base-miscfs-examples base-router-root    base-texinfo_locale-ru
base-bind-bin       base-i18n-root      base-locale-hy      base-miscfs-root    base-rpcbind-bin    base-texinfo_locale-sv
base-bind-root      base-i18n-shlib     base-locale-id      base-mk-share       base-rpcserver-bin  base-texinfo_locale-tr
base-bootserver-bin base-ipf-bin        base-locale-is      base-netutil-bin    base-rpcutil-bin    base-texinfo_locale-zh
base-c-bin          base-ipf-root       base-locale-it      base-netutil-examples base-secsh-bin      base-timed-bin
base-c-usr          base-iscsi-bin      base-locale-ja      base-netutil-root   base-slip-bin       base-tpm-bin
base-calendar-bin   base-isdn-bin       base-locale-ko      base-nfsclient-bin  base-slip-root      base-usd-share
base-calendar-share base-isdn-examples  base-locale-kr      base-nfsclient-root base-smbfs-root     base-util-bin
base-compat-lib     base-krb5-bin       base-locale-kt      base-nfsserver-bin  base-smm-share      base-util-root
base-compat-shlib   base-krb5-examples base-locale-lt      base-nis-bin        base-sup-bin        base-util-share
base-cron-bin       base-krb5-root      base-locale-lu      base-nis-root       base-sup-examples   base-util_locale-cs
base-cron-root      base-kyua-bin       base-locale-lv      base-nis-shlib      base-sys-examples   base-util_locale-de
base-crypto-bin     base-kyua-root      base-locale-mn      base-npfs-root     base-sys-root       base-util_locale-el
base-crypto-examples base-ldap-bin       base-locale-mo      base-npfs-shlib    base-sys-share      base-util_locale-eo
base-crypto-root    base-ldap-root      base-locale-ml      base-ntp-bin        base-sys-shlib      base-util_locale-es
base-cxx-usr        base-locale-Pig     base-locale-mp      base-ntp-root      base-sys-usr        base-util_locale-et
base-debug-bin      base-locale-af      base-locale-mr      base-objc-usr       base-sysutil-bin    base-util_locale-fr
base-dhclient-root  base-locale-be      base-locale-ms      base-obsolete       base-sysutil-examples base-util_locale-gl
base-dhcpd-root     base-locale-bg      base-locale-mt      base-perfuse-bin    base-sysutil-root   base-util_locale-hr
base-dhcpd-bin      base-locale-bin     base-locale-na      base-pf-bin         base-sysutil-share  base-util_locale-id
base-dhcpd-examples base-locale-ca      base-locale-nc      base-pf-root        base-terminfo-share base-util_locale-it
base-efs-root       base-locale-cs      base-locale-nd      base-pkgutil-bin    base-texinfo-bin    base-util_locale-ja
base-ext2fs-root    base-locale-da      base-locale-ne      base-postfix-bin    base-texinfo-share  base-util_locale-sv
base-filecorefs-root base-locale-de      base-locale-nl      base-postfix-examples base-texinfo_locale-cs base-video-bin
base-firmware-root  base-locale-ee      base-locale-no      base-postfix-root   base-texinfo_locale-da base-x11-root
base-firmware-usr   base-locale-el      base-locale-oc      base-postfix-usr    base-texinfo_locale-de base-zfs-bin
base-fstab-examples base-locale-en      base-locale-om      base-ppp-bin        base-texinfo_locale-eo base-zfs-root
base-games-root     base-locale-eo      base-locale-on      base-lpr-bin        base-texinfo_locale-fr etc-sys-etc
base-games-share    base-locale-es      base-locale-or      base-lpr-usr       base-puffs-bin      base-texinfo_locale-he
base-games-usr      base-locale-et      base-locale-os      base-lvm-root       base-puffs-usr      base-texinfo_locale-hr
base-gnats-bin      base-locale-eu      base-locale-pa      base-magic-share    base-rcs-bin        base-texinfo_locale-ja
base-locale-fi      base-locale-pt      base-locale-pb      base-mail-bin
```

How to install basepkg.sh

- Requirements

- NetBSD Source (For src/sys/conf/osrelease.sh)

- NetBSD Binaries tarball (From build.sh)

- Or download tarball from NetBSD ftp server, and extract tarballs at basepkg/work

- ```
tar xzf base.tgz -C basepkg/work/base
```

- ```
tar xzf comp.tgz -C basepkg/work/comp
```

- ...

- pkgtools/pkg_install (From pkgsrc)

- devel/git

```
$ git clone git://github.com/user340/basepkg
```

How to run basepkg.sh

```
$ ./basepkg.sh dir
```

```
$ ./basepkg.sh list
```

```
$ ./basepkg.sh pkg
```

- Packages are placed at basepkg/packages
- Use pkg_add to install package

basepkg.sh demonstration


1. Create packages using basepkg.sh
2. Install packages to NetBSD system on QEMU.
3. Reboot, and try to delete the part of base packages.

Index

1. Background
2. Case Study
3. Our Goals
4. Proposal Scripts
5. Outstanding Issues
6. Suggestions to Improve NetBSD Source Tree
7. Conclusion

basepkg.sh outstanding issues 1/5

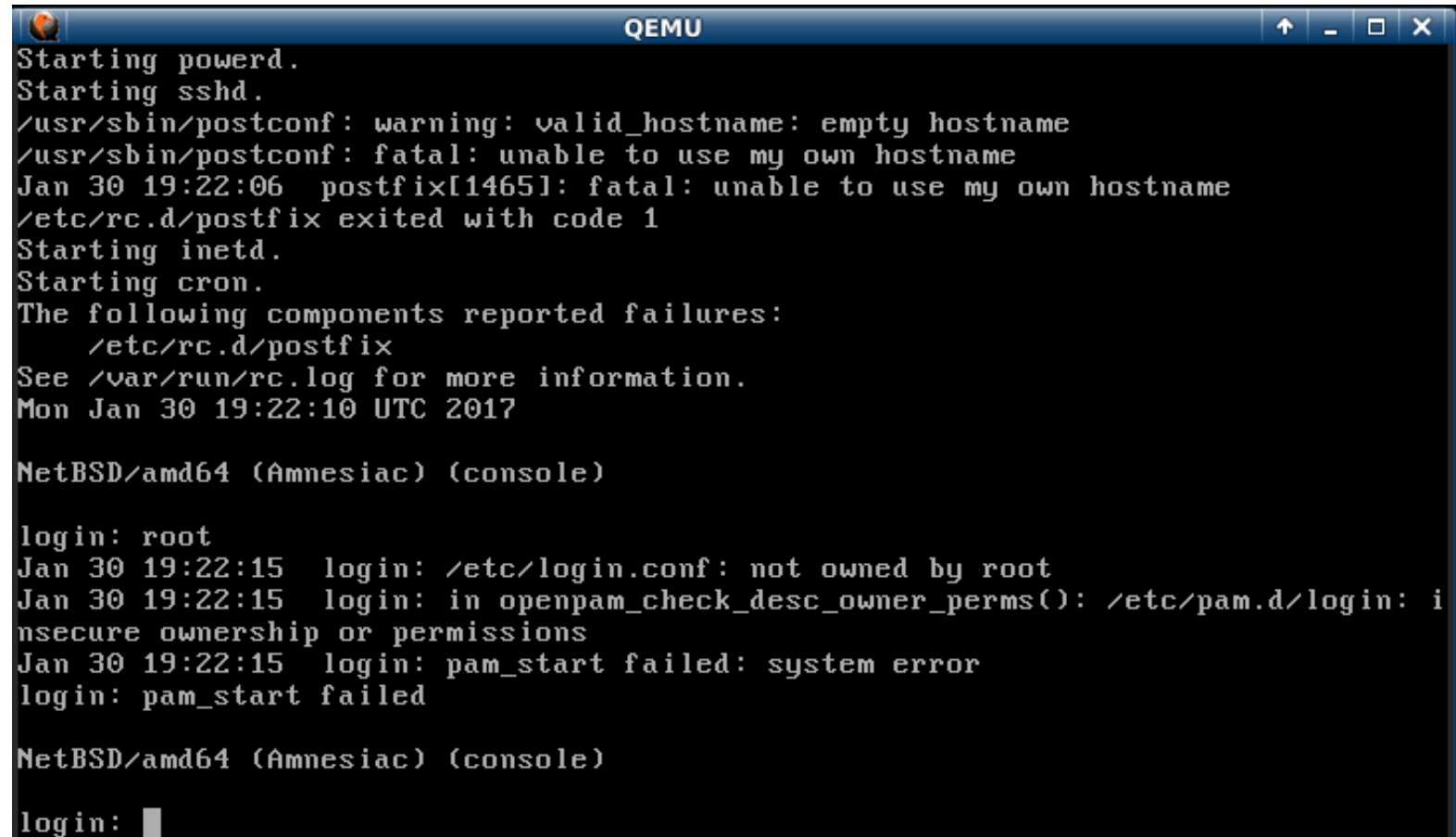
- Overwrite files
- This picture shows that /etc/rc.conf is overwritten by "etc-sys-rc" package
- rc_configured=NO



```
QEMU
lpt0 at isa0 port 0x378-0x37b irq 7
com0 at isa0 port 0x3f8-0x3ff irq 4: ns16550a, working fifo
attimer0 at isa0 port 0x40-0x43
pcppi0 at isa0 port 0x61
midi0 at pcppi0: PC speaker
sysbeep0 at pcppi0
fdc0 at isa0 port 0x3f0-0x3f7 irq 6 drq 2
attimer0: attached to pcppi0
acpicpu0 at cpu0: ACPI CPU
vmt0 at cpu0: Unknown
vmware: open failed, eax=564d5868, ecx=0000001e, edx=00005658
vmt0: failed to open backdoor RPC channel (TCL0 protocol)
fd0 at fdc0 drive 0: 1.44MB, 80 cyl, 2 head, 18 sec
wd0 at atabus0 drive 0
wd0: <QEMU HARDDISK>
wd0: 5120 MB, 10402 cyl, 16 head, 63 sec, 512 bytes/sect x 10485760 sectors
atapibus0 at atabus1: 2 targets
cd0 at atapibus0 drive 0: <QEMU DVD-ROM, QM00003, 2.5+> cdrom removable
pad0: outputs: 44100Hz, 16-bit, stereo
audio0 at pad0: half duplex, playback, capture
boot device: wd0
root on wd0a dumps on wd0b
root file system type: ffs
/etc/rc.conf is not configured. Multiuser boot aborted.
Enter pathname of shell or RETURN for /bin/sh: █
```

basepkg.sh outstanding issues 2/5

- This picture shows that /etc/group and /etc/passwd files are overwritten by "etc-sys-sys" package



```
QEMU
Starting powerd.
Starting sshd.
/usr/sbin/postconf: warning: valid_hostname: empty hostname
/usr/sbin/postconf: fatal: unable to use my own hostname
Jan 30 19:22:06 postfix[14651]: fatal: unable to use my own hostname
/etc/rc.d/postfix exited with code 1
Starting inetd.
Starting cron.
The following components reported failures:
  /etc/rc.d/postfix
See /var/run/rc.log for more information.
Mon Jan 30 19:22:10 UTC 2017

NetBSD/amd64 (Amnesiac) (console)

login: root
Jan 30 19:22:15 login: /etc/login.conf: not owned by root
Jan 30 19:22:15 login: in openpam_check_desc_owner_perms(): /etc/pam.d/login: i
nsecure ownership or permissions
Jan 30 19:22:15 login: pam_start failed: system error
login: pam_start failed

NetBSD/amd64 (Amnesiac) (console)

login: █
```


basepkg.sh outstanding issues 3/5

- “basepkg.sh” generates 879 (base) packages.
- Is it clear that the granularity is proper for managing system?
- What is criterion of the granularity and classification of packages?

basepkg.sh outstanding issues 4/5

- There are some empty packages named "obsolete".
- For example, "comp-obsolete" package.
- We have to fix the empty packages.

basepkg.sh outstanding issues 5/5

- Where is base packages document like as Debian?
- It is desirable to be able to be browse on the web.
- Hard work.

Index

1. Background
2. Case Study
3. Our Goals
4. Proposal Scripts
5. Outstanding Issues
6. Suggestions to Improve NetBSD Source Tree
7. Conclusion

Suggestions to Improve of NetBSD Source Tree

- In pkgsrc, its functions in the its tree.
- But, syspkg' s functions not in the src/distrib/syspkg.
- List files which is categorize base system files are located at src/distrib/sets/lists.
- Why pull together syspkg' s functions into one tree?

Index

1. Background
2. Case Study
3. Our Goals
4. Proposal Scripts
5. Outstanding Issues
6. Suggestions to Improve NetBSD Source Tree
7. Conclusion

Conclusion

- We could manage the NetBSD base system using pkg_*.
- But, outstanding issues are remaining.
 - Unexpected overwrite files
 - Granularity of packages
 - Empty packages
 - Documentation
- Thank you for listening.