Easy Software-Installation on Linux, Solaris, NetBSD, etc. using pkgsrc
Problems

Installation of Open Source software on Unix and Unix-like systems has a number of problems:

- Many programs and lots of version changes
- Compilation costs time
- Software often is not written with portability in mind (but we don’t want to give a c0ding lesson here...)
- Installation is not trivial
Problems (cont’d)

- Installation is not trivial:
  - Some basic knowledge about tools is necessary
  - Various ways to configure things (GNU autoconf, Imake, …)
  - Side effects (depending on other packages, compiler, …)
  - Many inter-depending packages
  - Troubleshooting requires expert knowledge
Problems (cont’d)

Illustration of complexity of inter-depending packages:

(created from a pkgsrc system running NetBSD, using pkgdepgraph and dot/graphviz)
Solution: It depends! (1/2)

Classic, flexible software management:

Hybrid systems:

Complete integration of applications and system:

- difficult to install
+ easy to install
+ easy to maintain
+ easy to maintain
- difficult to maintain
E.g. Solaris, Irix, Linux From Scratch
E.g. NetBSD, FreeBSD, Debian & Gentoo Linux
E.g. SuSE, RedHat, Mandrake Linux

Hubert Feyrer <hubertf@pkgsrc.org>
Solution: It depends! (2/2)

Where do you want to go today?

- **Easy Installation:** choose this if your software doesn’t change often. Use ready-to-user binary distribution. E.g. for desktop systems install Windows or SuSE Linux from CD/DVD.

- **Easy Maintenance:** choose this if you have few packages that change a lot. Take a stable base operating system, and install important packages on your own, e.g. compile on your own on a webserver with Solaris, Apache and PHP.

- **Both:** Welcome to pkgsrc!
A Cross-Platform Solution: pkgsrc
Introducing pkgsrc

- System for easy installation and updating of packages
- Source-based package management system
- Uses original source code for compiling
- Creation and installation of binary packages is possible
- Components: Management tools & packages collection (pkgsrc)
- Automatic handling of dependencies (of course!?)

Hubert Feyrer <hubertf@pkgsrc.org>
Introducing pkgsrc (cont’d)

- Originally ported from FreeBSD to NetBSD
- Primary development platform of pkgsrc: NetBSD
- Ported to: AIX, BSD/OS, Darwin, FreeBSD, Irix, Linux, NetBSD, OpenBSD, Solaris, Windows w/ “Interix”
- Linux Distributions: SuSE 9.0, Debian, ROOT Linux, Slackware, RedHat 8.1/9, Mandrake 9.2, Bluewall, ...
pkgsrc in Detail
How to get going

- Grab pkgsrc
- Install bootstrap kit (binary, or compile via pkgsrc/bootstrap)
- cd pkgsrc/www/mozilla
- bmake install
Grabbing pkgsrc

% cd $HOME/OS
% env CVS_RSH=ssh \
cvs -d \\anoncvs@anoncvs.NetBSD.org:/cvsroot \
co pkgsrc
U pkgsrc/Makefile
U pkgsrc/Packages.txt
U pkgsrc/README
...

Bootstrap Kit: Binaries

- Grab a precompiled binary or compile on your own
- Precompiled binary kits are available on http://www.pkgsrc.org/ for:
  - Darwin 7.0/powerpc
  - Darwin 6.6/powerpc
  - Debian Linux/i386
  - FreeBSD 4.7/i386
  - FreeBSD 5.1/i386
  - IRIX 6.5/mips
  - IRIX64 6.5/mips
  - OpenBSD 3.2/i386
  - Slackware 8.1/i386
  - Slackware 9/i386
  - Solaris 8/sparc
  - Solaris 8/i386
  - Solaris 9/sparc
  - Solaris 9/i386

Hubert Feyrer <hubertf@pkgsrc.org>
% cd pkgsrc/bootstrap
% setenv MY_HOME $HOME/OS/OS-`uname -s`
% setenv LOCALBASE ${MY_HOME}/pkg
% setenv PKG_DBDIR ${MY_HOME}/db/pkg
% setenv PKGSRCDBDIR ${MY_HOME}/pkgsrc
% ./bootstrap \
?   --prefix=${LOCALBASE} \
?   --pkgdbdir=${PKG_DBDIR} \
?   --pkgsrcdir=${PKGSRCDBDIR} \
?   --ignore-user-check

==> bootstrap command: ./bootstrap --prefix=/home/feyrer/OS/OS-Linux/pkg --

==> bootstrap started: Sun Mar 28 21:19:05 CEST 2004

Working directory is: work

==> building directory as unprivileged user feyrer/bedienst

==> Creating mk.conf.example in work

==> running: (/bin/sh ./files/install-sh -d -o feyrer -g bedienst -m 755 /h

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......
Please remember to add /home/feyrer/OS/OS-Linux/pkg/bin to your PATH environment variable, and /home/feyrer/OS/OS-Linux/pkg/man to your MANPATH environment variable, in your init scripts.

An example mk.conf file "work/mk.conf.example" with the settings you provided to "bootstrap" has been created for you. Please copy work/mk.conf.example to /etc/mk.conf.

You can find extensive documentation of the NetBSD Packages Collection in /home/feyrer/OS/OS-Linux/pkgsrc/Packages.txt and packages(7).

Hopefully everything is now complete.
Thank you

bootstrap started:  Sun Mar 28 21:19:05 CEST 2004
bootstrap ended:  Sun Mar 28 21:28:35 CEST 2004

Hubert Feyrer <hubertf@pkgsrc.org>
Bootstrap Kit: Adjust $PATH etc.

% cd $HOME/OS/OS-`uname -s`/pkg
% set path=( `pwd`/bin `pwd`/sbin $path )
% rehash
% setenv PKG_DBDIR $HOME/OS/OS-`uname -s`/db/pkg
%
% pkg_info
digest-20021220 Message digest wrapper utility
Installed Commands

The binaries installed by the bootstrap procedure provide the core functionality of the pkgsrc system:

```bash
% cd OS/OS-`uname -s`/pkg/
% ls bin sbin
bin:
bmake     cpio     ftp
digest     pax      tar

sbin:
linkfarm  pkg_add  pkg_create  pkg_info
mtree     pkg_admin pkg_delete  pkg_view
```

Hubert Feyrer <hubertf@pkgsrc.org>
Beware! Make sure that instead of “make” the BSD-compatible “bmake” is being used!

% setenv MAKECONF `pwd`/pkgsrc_env_no-root # see below
%
% cd $HOME/OS/pkgsrc
% cd misc/figlet
% bmake
% bmake install
...
%
% pkg_info
digest-20021220 Message digest wrapper utility
figlet-2.2.1nb1 Print text banners in fancy ASCII art char
Compiling Packages - Details (1/2)

% bmake

====> *** No /home/feyrer/OS/OS-Linux/../distfiles/pkg-vulnerabilities
====> *** skipping vulnerability checks. To fix, install
====> *** the pkgsrc/security/audit-packages package and run
====> *** '/home/feyrer/OS/OS-Linux/pkg/sbin/download-vulnerabilities'

=> Checksum OK for figlet221.tar.gz.
work.i386 -> /home/feyrer/OS/OS-Linux/tmp/misc/figlet/work.i386
====> Extracting for figlet-2.2.1nb2
====> Patching for figlet-2.2.1nb2
====> Applying pkgsrc patches for figlet-2.2.1nb2
====> Overriding tools for figlet-2.2.1nb2
====> Configuring for figlet-2.2.1nb2
====> Building for figlet-2.2.1nb2

gcc -O2 -DDEFAULTFONTDIR="/home/feyrer/OS/OS-Linux/pkg/share"
chmod a+x figlet

gcc -O2 -o chkfont chkfont.c

%
% bmake install

====> Installing for figlet-2.2.1nb2

====> Becoming root@rfhinf032 to install figlet.

Warning: not superuser, can’t run mtree.

Become root and try again to ensure correct permissions.

install -d -o feyrer -g bedienst -m 755 /home/feyrer/OS/OS-Linux/pkg/share/figlet
mkdir -p /home/feyrer/OS/OS-Linux/pkg/share/figlet

cp figlet /home/feyrer/OS/OS-Linux/pkg/bin

cp chkfont /home/feyrer/OS/OS-Linux/pkg/bin

cp 555 figlist showfigfonts

cp figlist /home/feyrer/OS/OS-Linux/pkg/bin

cp showfigfonts /home/feyrer/OS/OS-Linux/pkg/bin


cp fonts/*.flf /home/feyrer/OS/OS-Linux/pkg/share/figlet

cp fonts/*.flc /home/feyrer/OS/OS-Linux/pkg/share/figlet

cp figlet.6 /home/feyrer/OS/OS-Linux/pkg/man/man6

====> Registering installation for figlet-2.2.1nb2

%
Compiling Packages - Running

% rehash
% which figlet
/home/feyrer/OS/OS-Linux/pkg/bin/figlet
%
% figlet Hello `uname -s`

Hello Linux
Compiling as Non-root

To use pkgsrc without root privileges, put the following into $MAKECONF (shortened!):

```
MY_NAME!= whoami
MY_GROUP!= groups | sed 's/.*$$//' 
MY_HOME= ${HOME}/OS
BINOWN= ${MY_NAME}
BINGRP= ${MY_GROUP}
WRKOBJDIR= ${MY_HOME}/tmp
X11PREFIX= ${MY_HOME}/pkg # X needs xpkgwedge installed!
LOCALBASE= ${MY_HOME}/pkg
VARBASE= ${MY_HOME}/var
OBJMACHINE= 1
SU_CMD= /bin/sh -c
CHOWN= true
CHGRP= true
BINMODE= 755
```

Complete: http://www.feyrer.de/OS/pkgsrc_env_no-root!

Hubert Feyrer <hubertf@pkgsrc.org>
Behind the Scenes

1. make fetch: Download sources
2. make checksum: Ensure integrity
3. make install-depends: Install required packages
4. make extract: Unpack
5. make patch: Apply patches
6. make configure: Configure
7. make build: Compile
8. make install: Install and register package (for pkg_info(1), pkg_delete(), etc.)
Other Interesting Targets

- **make package**: Create binary package for `pkg_add(8)`
- **make clean**: Remove working directory
- **make deinstall**: Deinstall package
- **make replace**: Replace installed package with new version
- **make update**: Rebuild package and all dependencies

Hubert Feyrer <hubertf@pkgsrc.org>
## What packages are there: Categories

```
% cd .../pkgsrc/
% ls
CVS          cross          japanese      parallel
Makefile     crypto         lang          pkglocate
Packages.txt databases licenses pkgtools
README       devel           mail          plan9
archivers    distfiles      math          print
athlon        doc            mbone         security
audio         editors        meta-pkgs     shells
benchmarks    emulators      misc          sysutils
biology      finance        mk            templates
cad          fonts          nessus-libraries textproc
cal          games          nessus-plugins time
comms        graphics       net           wm
converters    ham            news          www
corba        inputmethod    packages      x11
```

Hubert Feyrer &lt;hubertf@pkgsrc.org&gt;
% cd .../pkgsrc
% ls www

CVS
Makefile
Mosaic
MozillaFirebird
adzap
amaya
analog
ap-DBI
ap-Embperl
ap-access-referer
ap-aolserver
ap-auth-cookie
ap-auth-ldap
ap-auth-pam
ap-auth-pgsql
ap-auth-postgresql
ap-auth-script
...

libwww
links
links-gui
lynx
lynx-current
mMosaic
make_album
mknmz-wwwaffle
moz-bin-plugger
moz-linux-plugger
mozilla
mozilla-bin
mozilla-bin-nightly
mozilla-flash-bin
mozilla-flashplugin
mozilla-linux
mozilla-stable
php4-sablot
pkg
privoxy
privoxy-user
py-HTMLgen
py-curl
py-pcgi
py-zpublisher
qDecoder
quanta
quanta-docs
quanta3
ruby-borges
ruby-htmlsplit
ruby-tag
ruby-uri
ruby-webrick

Hubert Feyrer <hubertf@pkgsrc.org>
Number of Available Packages

% date
Sun Mar 28 22:07:02 MEST 2004
%
% cd .../pkgsrc/
% ls */*/Makefile | wc -l
  5348 <- total
% ls wip/*/*Makefile | wc -l
  792 <- SourceForge’s pkgsrc-wip
% expr 5348 - 792
  4556 <- NetBSD’s pkgsrc
Internals
% cat x11/xteddy/Makefile

DISTNAME= xteddy-1.1
CATEGORIES= x11 games
MASTER_SITES= http://www.ITN.LiU.SE/~stegu/xteddy/

MAINTAINER= johnam@mail.kemper.org
HOMEPAGE= http://www.ITN.LiU.SE/~stegu/xteddy
COMMENT= Xteddy is a cuddly teddy bear for your X Windows desktop

USE_BUILDLINK2= YES
USE_X11= YES
GNU_CONFIGURE= YES

pre-install:
    ${INSTALL_DATA_DIR} ${PREFIX}/share/xteddy
    ${INSTALL_DATA_DIR} ${PREFIX}/share/xteddy/pixmaps

.include "../../graphics/xpm/buildlink2.mk"
.include "../../mk/bsd.pkg.mk"
Dependencies

Various ways:

- Compile-time only: BUILD_DEPENDS
- Compile- and runtime: DEPENDS
- Compile- and runtime: buildlink[23].mk
% cd ../../../pkgsrc/
% grep ^DEPEND meta-pkgs/kde3/Makefile
DEPENDS+= kdeartwork-3.1.4:../../../misc/kdeartwork3
DEPENDS+= kdeaddons-3.1.4:../../../misc/kdeaddons3
...

The variable DEPENDS is assigned pairs of “Name-Version:Directory”. “Name-Version” is name and version of the required package, “Directory” is the path relative to this pkg’s directory where the package can be found if it’s not installed and needs to be built from source.
Dependencies: buildlink[23].mk

These files contain variables which say ...

- which header-files to use
- which libraries to use
- which name+version of this package should be expected
- in which pkgsrc directory to look if the package needs to be installed
- if there are additional CPP flags to use
- if this package needs further packages installed

Hubert Feyrer <hubertf@pkgsrc.org>
Example: tiff/buildlink3.mk

% cat graphics/tiff/buildlink3.mk
# $NetBSD: buildlink3.mk,v 1.7 2004/03/18 09:12:12 jlam Exp $

BUILDLINK_DEPTH:= ${BUILDLINK_DEPTH}+
TIFF_BUILDLINK3_MK:= ${TIFF_BUILDLINK3_MK}+

.if !empty(BUILDLINK_DEPTH:M+)
BUILDLINK_DEPENDS+= tiff
.endif

BUILDLINK_PACKAGES:= ${BUILDLINK_PACKAGES:Ntiff}
BUILDLINK_PACKAGES+= tiff

.if !empty(TIFF_BUILDLINK3_MK:M+)
BUILDLINK_DEPENDS.tiff+= tiff>=3.6.1
BUILDLINK_PKGSRCDIR.tiff?= ../../../graphics/tiff
.endif  # TIFF_BUILDLINK3_MK

.include "../../../devel/zlib/buildlink3.mk"
.include "../../../graphics/jpeg/buildlink3.mk"

BUILDLINK_DEPTH:= ${BUILDLINK_DEPTH:S/+$/}
Questions? Answers!

http://www.pkgsrc.org/

http://www.NetBSD.org/packages/

info@pkgsrc.org/