Retrofitting privsep into dpb and pkg_add

Marc Espie <espie@openbsd.org>, <espie@lse.epita.fr>

September 25, 2016
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Privsep sometimes root is safer because it can drop privileges. How to do it when not root? Pledge(2) is not the answer.  

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Quizz

Which is safer

1. $ cmd
2. # cmd

Privsep

- sometimes root is safer
- because it can drop privileges
- how to do it when not root? pledge(2) is not the answer
If you missed the previous episodes

- DPB more or less runs `make package` in parallel.
- on multiple hosts
- some steps are separated for better reporting
- some steps (`fetch`) are done by DPB proper (caching etc)
It's all naddy@’s fault
naddy started using fake without root, and it worked surprisingly well

chroot made difficult
also we wanted chroot builds that would work
The problem with sudo (or doas)

SIGINT is not your friend

- add chroot to a build run sudo chroot /build
- switch back to normal user sudo chroot /build sudo -u espie make build
- try to kill it... doesn’t work
Instead of running as user espie, and using doas to gain privileges we run as root, and drop privileges to user espie

This solves the SIGINT issue

Note that most steps don’t need root
Just qualify code with the user that’s supposed to run it

```perl
$state->{log_user}->run_as(
    sub {
        open my $f, '>', $state->{permanent_log}.'.part' or return;
        for my $p (sort {$a->fullpkgpath cmp $b->fullpkgpath} DPB::PkgPath->seen) {
            for my $s (@{$p->{stats}}) {
                print $f DPB::Serialize::Build->write($s), "\n";
            }
        }
        close $f;
        rename $state->{permanent_log}.'.part', $state->{permanent_log};
    });
```
package DPB::Distfile;
our @ISA = (qw(DPB::UserProxy));
...

$self->run_as(
    sub {
        unlink($name);
    });
Of saved uids

Not real privsep
- uses saved uids
- only fully drops when running external commands

Okay perl is a bit weird

```perl
$( = $gid;
$) = "$gid $gid";
$< = $uid;
$> = $uid;
```

Testing
Just run id to make sure.
Trust issues

Who do we trust

- We do assume that dpb code is okay
- We don’t trust the ports tree proper
- So each time we run "make" anywhere, we drop privs
- We don’t really trust the network
- So each time we run "ftp", we drop privs
Different users

Everybody is different

- One user to fetch stuff
- One user to build stuff
- One user to write logs
- One user that can't do anything
We added default users for build (_pbuild) and fetch (_pfetch) and for dpb proper (_dpb) with appropriate defaults.

- block out quick proto {tcp,udp} from self user _pbuild
- They get used when you run dpb as root
Granularity

It’s actually difficult to know when you’ve done enough. We don’t have throw-away users yet.
Remaining issues

Installs still need root
Dependancy installs want root

Figuring out perms
A bit of a nightmare, who needs to have access to what. Interactive mode in dpb?
Enter proot

Proot: ports chroot builder

- Preparing chroot environments
- For ports builds on OpenBSD
Retrofitting privsep into dpb and pkg_add
Actually not so much

Why bother

- Existing tools don’t match the needs
- It has to be real fast
- It must be damn-fool proof
Copy what exactly

- Already have tools (locatedb) that tell us what comprises the base system, so we can copy from it.
- Alternately, start from a snapshot. Also have tools for that.
- Not even close to everything: forego manpages and X server.
How to do copies

- Speed: do not copy if it didn’t change.
- Use hardlinks when we can. Cool and fast cloning of existing chroot
What about the rest

Not enough for a functional system

- you need files for the network
- and ldconfig
- and also devices
static int
oldttyname(struct stat *sb, char *buf, size_t len)
{
    struct dirent *dirp;
    DIR *dp;
    struct stat dsb;

    if ((dp = opendir(_PATH_DEV)) == NULL)
        return (errno);

    while ((dirp = readdir(dp))) {
        if (dirp->d_fileno != sb->st_ino)
            continue;
        if (dirp->d_namlen > len - sizeof(_PATH_DEV)) {
            (void)closedir(dp);
            return (ERANGE);
        }
        memcpy(buf + sizeof(_PATH_DEV) - 1, dirp->d_name,
               dirp->d_namlen + 1);
        if (stat(buf, &dsb) || sb->st_dev != dsb.st_dev ||
            sb->st_ino != dsb.st_ino)
            continue;
        (void)closedir(dp);
        return (0);
    }
    (void)closedir(dp);
    return (ENOTTY);
}
practice makes perfect

static int
oldttnname(struct stat *sb, char *buf, size_t len)
{
    struct dirent *dirp;
    DIR *dp;
    struct stat dsb;
    
    if ((dp = opendir(_PATH_DEV)) == NULL)
        return (errno);
    return (0);
    
    while ((dirp = readdir(dp))) {
        if (dirp->d_type != DT_CHR && dirp->d_type != DT_UNKNOWN)
            continue;
        if (fstatat(dirfd(dp), dirp->d_name, &dsb, AT_SYMLINK_NOFOLLOW)
            || !S_ISCHR(dsb.st_mode) || sb->st_rdev != dsb.st_rdev)
            continue;
        (void)closedir(dp);
        if (dirp->d_namlen > len - sizeof(_PATH_DEV))
            return (ERANGE);
        memcpy(buf + sizeof(_PATH_DEV) - 1, dirp->d_name,
               dirp->d_namlen + 1);
        return (0);
    }
    (void)closedir(dp);
    return (ENOTTY);
}
Fixes everywhere

- database makes things okay
- so run database
- AND also fix the code!

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Design notes

Must be tweakable

- As a default, we remove unknown stuff
- Never under other mount points

Action man

- Set of actions, some are default
- Some can be added
- ...or removed
- Everything needed, writes mk.conf

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One size fits all?

Not really

- ports clusters vary immensely
- because of architectures
- and needs!
- still require 50G+ for distfiles, 50G+ for packages
- takes one day for fast architectures

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- ports clusters vary immensely
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- still require 50G+ for distfiles, 50G+ for packages
- takes one day for fast architectures
- I even wrote a manpage for those choices
Turning our eyes to pkg_add

let’s do ftp

We simply have a _pkgfetch user.

with a clean environment
(now that’s the fun part)
# create sanitized env for ftp
my %newenv = (  
    HOME => '/var/empty',  
    USER => $user,  
    LOGNAME => $user,  
    SHELL => '/bin/sh',  
    LC_ALL => 'C', # especially, laundry error messages  
    PATH => '/bin:/usr/bin'  
);

# copy selected stuff;
for my $k (qw(  
    TERM  
    FTPMODE  
    ...  
    FTP_PROXY  
    HTTPS_PROXY  
    HTTP_PROXY  
    NO_PROXY)) {
    if (exists $ENV{$k}) {
        $newenv{$k} = $ENV{$k};
    }
}

# don’t forget to swap!
%ENV = %newenv;

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The trust model of pkg_add

- get stuff from the internet
- unpack it
- check the signature
- install it
pulling signatures outside

- We stuff the signature inside the gzip comment
- Signify now has careful code that parses gzip headers
- This is not gzsig
- Chunks of the compressed data are hashed with SHA512/256
not quite finished

almost there

- need to update the signing machines
- new model is stricter PKG_TRUSTED_PATH
- pkg_add does abysmal reports
In the meantime

The base system installer

- is now privsep’d, thx to rpe@ and halex@
- I strongly suspect rpe@, who’s also active in ports, saw the pkg_add work and decided to do the same.
The future

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<td>One per port, just requires knowing distfiles and packages we need</td>
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<td>hence the hardlinks</td>
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The future 2

Security model

- do not need root in the chroot
- make directories writable
Questions !!!