Isolated BSD Build Environments Using Virtual and Hardware Machines

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Gainframe CTO – Support! Hypervisors!

iXsystems Senior Analyst – OpenZFS! FreeNAS!

Storage Industry Networking Association Standards! Policy! Awareness!

Hypervisors like bhyve are nice and all but…

Are you adequately safeguarding your data?

Bit rot? Ransomware? eDiscovery?

The most pressing issues in storage
are best solved with…

Hypervisors!

Feature Augmentation

Backup Validation

Regression Hunting

Regression Hunting

A murder mystery

svn commit murder?

THE FACTS

Samba smbd on FreeBSD performance slaughtered with 1000+ files in a directory

Some time between 9.3 and 10.0

THE VICTIMS

Those with electron microscopes
inspecting CPU wafers...

Those counting lumber
at high speed...

```
svn info ~/9.3/src/
Last Changed Rev: 260789

svn info ~/10.0/src/
Last Changed Rev: 268523
```

Only 7734 places to look!

Whodunnit?

"This could take all afternoon"

– Actual Quotation

Any responsible sysadmin begins with...

Blaming Samba!

+/- 80 individual utilities!
Cryptic de facto standard!
Legendary complexity!

Step One

Spin up 9.3 & 10.0 boxes
Perform ad hoc tests
Develop consistent tests
Tweak variables...

```
# touch /mnt/<1,000,000 files>
# \time -h ls /tmp/smbtest/ > /dev/null
#   10.93s real    10.51s user    0.40s sys

# mount_smbfs -W WORKGROUP -I 0.0.0.0 \
//tmp/smbtest /mnt

# \time -h ls /mnt > /dev/null
#   49.21s real    11.01s user    3.65s sys
```

45 ~ 60 minutes over the LAN (!)

Step Two

Contact Developers & Support Engineers with my tests & findings, plus beautiful graphs from clients

"I once had that many files & NEVER a problem!"

– Actual Quotation

"You didn't read the (nonexistent) fine manual!"

– Actual Quotation

"So what's the fix?"

– Actual Quotation

"You're holding it wrong!"

– Actual Quotation, close enough context

Step Three

Blame `iconv(1)`!

That UTF-8 GSoC project *must* have broken it… it crashed `vi(1)`

Step Four

Run `truss(1)` on the `smbd(8)` process while benchmarking…

Convince *one* developer, who broke out `dtrace(1)`

Thank you Ash!

Nine month process. Really?

Is there a better way?

Shortly thereafter…

"So, OpenJDK isn't building..."

– Actual Quotation

Poodlerare? Pootlepair? Poudrierr?

Without a doubt…

Spinning up random systems to build random versions of software to chase needles in haystacks is insane

"It builds on my box Bro!"

– Actual Quotation

Define a Scope

1972 AT&T UNIX in C?
1993 FreeBSD 1.0?
1994 FreeBSD 2.0?
1995 4.4BSD-Lite2?
1998 FreeBSD 3.0?
2000 FreeBSD 4.0?
2003 FreeBSD 5.0?

Define a Scope

*Your regression is somewhere between 1972
and whatever FreshBSD.org says*

*"My Docker Container keeps
restarting again and again"*

– Actual Quotation

"Don't look back Bro!"

Works great if you never ship a single bug or regression

The 9.3~10.0 regression occurred in EOL software

It's Open Source

The history is available commit by commit

Let's build some infrastructure...

A Local SVN Mirror

`freebsd.org/pub/FreeBSD/development/subversion/`

`svnmirror-base-r290116.tar.xz`   `1761997 KB 10/28/15`

A Local SVN Mirror

```
svnsync sync file://pub/svnmirror/base

svnlite co file:///pub/svnmirror/base/release@5.0.0 ...
```

Please update these snapshots!

https://svnweb.**freebsd**.org/base/release/

/ [base] / release

Index of /release

viewvc

Files shown: **0**

Directory revision: 321354 (of 322831)

Sticky Revision: [ ] [Set]

File ▲	Rev.	Age	Author	Last log entry
🕯 Parent Directory				
🗀 10.0.0/	260789	3 years	gjb	Copy releng/10.0 to release/10.0.0 as part of the 10.0-RELEASE cycle. Approved ...
🗀 10.1.0/	274417	2 years	gjb	Tag releng/10.1@274401 as release/10.1.0 now that the 10.1-RELEASE builds have c...
🗀 10.2.0/	286717	2 years	gjb	Tag releng/10.2@286666 as release/10.2.0 (10.2-RELEASE). Approved by: re (impli...
🗀 10.3.0/	297553	16 months	marius	Tag releng/10.3@297264 as release/10.3.0 (10.3-RELEASE).
🗀 11.0.0/	306280	10 months	gjb	Tag releng/11.0@r306211 as release/11.0.0. Approved by: re (implicit) Sponsored...
🗀 11.0.1/	306421	10 months	gjb	Tag releng/11.0@r306420 as release/11.0.1 for 11.0-RELEASE-p1. Approved by: re ...
🗀 11.1.0/	321354	4 weeks	gjb	Tag releng/11.1@r321309 as 11.1-RELEASE. Approved by: re (implicit) Sponsored b...
🗀 2.0/	4780	22 years	jkh	Tell stupid users to write the bootcode.
🗀 2.0.5/	9201	22 years	cvs2svn	This commit was manufactured by cvs2svn to create tag 'RELENG_2_0_5_RELEASE'.
🗀 2.1.0/	13149	21 years	cvs2svn	This commit was manufactured by cvs2svn to create tag 'RELENG_2_1_0_RELEASE'.
🗀 2.1.5/	18741	20 years	cvs2svn	This commit was manufactured by cvs2svn to create tag 'RELENG_2_1_5_RELEASE'.

Interrogate Your SVN Mirror

```
# svnlite co file:///pub/svnmirror/base/release/11.1.0 \
~/11.1/src/usr/src > /dev/null && \
tar -cf ~/11.1/src.txz -C ~/11.1/src . && \
svn info ~/11.1/src/usr/src > ~/11.1/svninfo.txt
```

Repeat...

Interrogate Your SVN Mirror

```
# find . -name dialog
# find . -name sshd
# find . -name jail | sort
# find . -name zpool | sort
# find . -name ahci.c | sort
# find . -name xen | sort
# find . -name xz | sort
# find . -name pkg | sort
# find . -name virtio | sort
# find . -name clang | sort
# find . -name bhyve | sort
# find . -name uefi.8 | sort
```

Interrogate Your SVN Mirror

dialog	2.0.5
ssh/sshd	4.0
jail	4.0
AMD64	5.2
jexec	5.4
zpool	7.0
AHCI	8.0
Xen DomU	8.0
xz	8.1
pkg	8.4
VirtIO	8.4
Clang	9.0
bhyve	10.0

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@michaeldexter

Follow

Sure would be helpful to use #bhyve to run #FreeBSD versions...

71% 5.0 and newer

29% 4.11 and older

49 votes · Final results

eekfire from t. 4 to 5 a.m. Se

ersions...

1:26 AM - 27 Aug 2017

5 Retweets **6** Likes
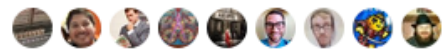
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Michael Dexter @michaeldexter · Aug 27
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@sevanjaniyan Give others a chance to vote!

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Michael Dexter @michaeldexter · Aug 28

FreeBSD 5.0 looks like a good place to start!
(Stability Aside)

Jail Management Tools
compat_4~1
/boot/kernel/kernel
AMD64 come 5.2
`bhyveload(8)` likes it

Remarkably familiar!

We have src.txz…
/boot/kernel/…

Woah there! `base.aa base.ab`…

Hello `ftp-archive.freebsd.org`

Fortunately, history is stationary (when available)

Interrogate ftp-archive

```
# fetch <url>/5.0/5.0-RELEASE-i386-disc1.iso -o \
FreeBSD-5.0-RELEASE-i386-disc1.iso

# mdconfig -af FreeBSD-5.0-RELEASE-i386-disc1.iso
md0

# mount_cd9660 /dev/md0 /mnt

# cp /mnt/* ~/5.0/iso

# cat ~/5.0/iso/base/base.?? > ~/5.0/base.tgz

...
```

Learn about the history of FreeBSD Release Engineering

*Avoid violating the
Prime Directive…*

Repack, rinse, repeat...
(All via a script)

Result: base.txz src.txz doc.txz*

Sound familiar?

ZFS with lz4 eh? `libarchive(3)` don' care!

Take a breath

Suddenly, you can install
FreeBSD 5.0 with `bsdinstall(8)`
12-CURRENT

Cruft be gone!

POLA: Principle Of Least Astonishment *in action*

Interesting Facts

FreeBSD has supported
root on NFS from day one

FreeBSD 12-CURRENT
supports root on UFS1

File and Block boot options

Interesting Facts

bhyve NE2000 emulation appears to work

bhyve e1000 emulation works quite well

bhyve ATA emulation is incomplete

bhyve AHCI emulation works quite well

Interesting Facts

While bhyve is awesome…

QEMU is famous for compatibility

Xen is on FreeBSD

VirtualBox is still around

While FreeBSD 5.0 on a zvol sounds great,
an NFS root is better for *science*

Nested VT-x would be great but would involve
an insane amount of work

Where is he heading with this?

`bhyveload(8)` can load FreeBSD 5.0 onward
`bhyveload -e` can feed in boot parameters

Extract `base.txz` and `kernel.txz`, create an `fstab`, adjust the `/etc/ttys` if necessary, share over NFS and FreeBSD 5.0 through 12-CURRENT are at your fingertips

So about those regressions...

Obviously they are hiding between releases

Obviously building world is "slow"

FreeBSD can be significantly modularized with `src.conf` knobs

"Meta mode" builds and `ccache(1)` can speed incremental builds

My `STUDENT` kernel that boots under bhyve builds in seconds to minutes depending on your hardware

Minimum `world` builds in seconds to minutes depending on your hardware

Regression Hunting

Define Success with a Test

Ports are a pain but *-dvd1.iso is your friend

With 7734 places to look, start at 3867 and work up and down to 1933 and 5800

Regression Hunting

FreeBSD 9.3 will *not* build on 11.1

Isolate your build in a VM

Perform your test in a *second VM*

Regression Hunting

root on NFS is half way to PXE

Perform your tests on *real hardware*
as appropriate using the same infrastructure

So about *that* regression...

🦊 ⚙ D10408 Optimize pat ✕ | +

https://reviews.**freebsd**.org/D10408

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⚙ **Differential** ＞ **D10408**

⚙ Optimize pathologic case of telldir()

☑ Closed   🌐 Public

👤 Authored by **mav** on Apr 16 2017, 8:16 AM.

Details

Reviewers	💬 jhb
	💬 jilles
Commits	rS317064: Optimize pathologic case of telldir() for Samba.

☰ SUMMARY

When application reads large directory, calling telldir() for each entry, it creates exponential performance drop as number of entries reach tenths to hundreds of thousands. It is caused by full search through the internal list, that never finds matches in that scenario, but creates O(n^2) delays. My patch optimizes that search, limiting it to entries of the same buffer, turning time from O(n^2) closer to O(n) in the case of linear directory scan.

PR: 218622

✏ Edit Revision

⬆ Update Diff

⬇ Download Raw Diff

⚙ Edit Related Revisions...   ▸

⧉ Edit Related Objects...   ▸

⊕ Subscribe

🏆 Award Token

⚑ Flag For Later

Tags

None

Revision 269204

viewvc

Jump to revision: 269204   [Go]   ↩↩

Author: jhb

Date: Tue Jul 29 00:16:33 2014 UTC *(3 years, 1 month ago)*

Changed paths: 2

Log Message:
```
If telldir() is called immediately after a call to seekdir(), POSIX
requires the return value of telldir() to equal the value passed to
seekdir().  The current seekdir code with SINGLEUSE enabled breaks
this case as each call to telldir() allocates a new cookie.  Instead,
remove the SINGLEUSE code and change telldir() to look for an existing
cookie for the directory's current location rather than always creating
a new cookie.

CR:          https://phabric.freebsd.org/D490
PR:          121656
Reviewed by: jilles
MFC after:   1 week
```

Changed paths

Path	Details
📄 head/lib/libc/gen/directory.3	modified , text changed
📄 head/lib/libc/gen/telldir.c	modified , text changed

Lessons Learned

Regressions can live *anywhere* in history

History is far easier to *maintain* than *reconstruct*

Don't assume anyting in software

Questions to Answer

What past and future RELEASEs
can each RELEASE build?

What make - `jN`'s will each RELEASE support?

Your question here!

TO DO

Plug `src.conf` leaks. You will thank yourself.

Update the SVN mirror TAR balls,
with each release?

Fill in ftp-archive. Thank you gad@freebsd.org!

Thank You!

Thank you Team Verisign!

@MichaelDexter
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