

FreeBSD and Windows Environments

*FreeBSD is Uniquely Positioned to Help Deploy, Virtualize, and Serve
Microsoft Windows Production Environments*

Michael Dexter

AsiaBSDCon 2024, Taipei, Taiwan

Read The Paper!

callfortesting.org/log/FreeBSD-Windows-MichaelDexter.pdf

Introduction

This all Started With a Book

"BSD is everywhere. Finally, with this book, you too can learn how to use the system that first deployed the Internet and plays a crucial role in running it today."

—Marshall Kirk McKusick

The FreeBSD

Corporate Networker's Guide



Ted Mittelstaedt

FreeBSD ネットワーク管理ガイド

テッド・ミッテルスタッド＝著

小川 彩子＝訳 宇夫 陽次朗＝監訳

The
FreeBSD
Corporate Networker's Guide
Ted Mittelstaedt



Pearson
Education
Japan

ピアソン・エデュケーション

Introduction

Ted “wrote the book”,
metaphorically and literally

Introduction

A few things have changed since 2000

- Jail had JUST arrived
- SMP
- 64-Bit Addressing
- UEFI/GPT
- libxo/libucl
- pkg (8)
- Packet Filter
- DTrace
- ZFS
- bhyve (8) / Xen

Introduction

A few things have not changed since 2000

- The License
- /usr/src – buildworld
- /usr/ports – packages
- The Unix Environment
- NFS
- SSH
- CTRL-T
- The BSDCons

Introduction

A few things have changed in the last few months

- `bsddialog(1)`
- Packaged Base
- `mount -t nullfs -f`
- `mkimg/makefs -t zfs`
- ZFS VM-IMAGEs
- OpenZFS 2.2.x
- GPU Pass-Through
- TPM Pass-Through
- bhyve/ARM64
- Samba 4.19.x

Introduction

It took time but...

FreeBSD 14.0 is *Really* Good

OpenZFS 2.2.x is *Really* Good

Samba 4.19 *Supports Functional Level 2016*

Introduction

Furthermore...

Search “`zfs initramfs`” to verify that...

FreeBSD is the *only* truly Tier-1

OpenZFS platform

Vendors have the staff, hobbyists have the time

Introduction

Furthermore...

The licenses will not change anytime soon

“Many of those Linux drivers are for reference”

ZFS on Linux with 100GbE is 20% slower

The World doesn't need more GPL Violators

GU



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STORAGE

TrueNAS CORE 13 is the end of the FreeBSD version

Debian-based TrueNAS SCALE is the future primary focus

 [Liam Proven](#)

Mon 18 Mar 2024 // 11:32 UTC

43 



Bad news from BSD land – the oldest vendor of BSD systems is changing direction away from FreeBSD and toward Linux.

NAS vendor iXsystems has been busy this year, but apart from some statements in online user communities, it hasn't been talking about the big news. Back in 2022, we [covered TrueNAS CORE 13](#), the new release of its FreeBSD-based turnkey OS for NAS servers, and in that article we mentioned its new product, the Debian-based TrueNAS SCALE, aimed at providing storage for Kubernetes users.

Introduction

Windows

The best-available implementation of the Win64 API used by many business applications, best-available hardware drivers, plus additional applications and features

Introduction

Windows: A few things have not changed over the years...

- Inconsistent, arthritis-inducing keyboard layout

 - Difficulty preserving date stamps on folders

- Folder views that do not automatically refresh

 - Different file and folder sort order

 - GUI-managed until Registry editing

Introduction

Windows: A few things have not changed over the years...

WindowsPE 11 still looks like Windows 7
XML-mapped configuration, except when not
XML-mapped configuration, except no export
Unnecessarily-Log-PowerShell-Commands
“Administrator” rather than “admin” or “root”

Introduction

Windows: A few things *have* changed over the years...

Windows and Windows Server have become
gaslighting OneDrive/Azure marketing gateways

“Your organization's policies do not allow you to...”

“Cloud-based backup” – “We think you’ll really like this.”

Introduction

Modern Windows and Windows Server *must be contained*

FreeBSD is the best-available platform for that

OpenZFS is a critical component for this

Deployment

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Deployment

As a end-user facing operating system, Windows withholds much administrative information

Deployment

As an administrator-facing operating system,
Windows Server withholds much...
administrative information

Deployment

Hardware facts should not be secrets

The open source `dmidecode(8)`, `acpidump(8)`, `diskinfo(8)`, and `smartctl(8)` allow you to collect hardware facts like serial numbers, product keys, and disk facts and health information

Some of this information is available from `wmic` and add-on utilities

Deployment

Hardware facts should not be secrets

Boot to FreeBSD, have the information in seconds:

`github.com/michaeldexter/pchw`

Optionally tab-formatted for use in a spreadsheet or database:

```
sh generate-tsv.sh my-new-laptop
```

```
LENOVOThinkPad T490 20N20042US Notebook ABCD1234 1.80 06/21/2023
```

```
Intel(R) Core(TM) i7-8665U CPU @ 1.90GHz No Asset Information
```

Deployment

Hardware facts should not be secrets

If `pchw.sh` finds an NVMe drive, it will provide the syntax to change its LBA format from say, 512b to 4Kn using FreeBSD's excellent `nvmecontrol(8)`

```
nvmecontrol format -f 01 nvme0ns1  
shutdown -r now
```

Deployment

WHICH will destroy all data on it, and is further reason not to boot a system and install these utilities to...

PRO TIP: Treat all existing and perhaps new systems as if you are performing a forensics investigation

FreeBSD's fast `camdd(8)` is very good at this

```
camdd -i file=/dev/da1,bs=1M -o file=4tb.raw
```

Deployment

You may need `sysutils/drescue`

```
ddrescue -d -r3 /dev/da1 4tb-ddrescue.raw ddrescue.log
```

Save those disk images to ZFS, snapshot them, boot them in bhyve, Xen, or QEMU when someone remembers they used that one system for that one application or account...

Deployment

You may need `gpart (8)` to destroy partitions

```
gpart destroy -F /dev/ada0
```

Windows and macOS are somewhat terrible at this

Firmware updating: Your mileage may vary...

Windows tools vs. FreeBSD tools like `mpr | s | tutil (8)`

Deployment

```
efibootmgr
```

```
BootCurrent: 001d
```

```
BootOrder : 0001, 0000, 001B, 001C, 001D, 001E, 001F,  
0020, 0021, 0022, 0012, 0011, 0023, 0024
```

```
  Boot0001* Windows Boot Manager
```

```
  Boot0000* FreeBSD
```

```
...
```

```
+Boot001D* NVMe0
```

```
efibootmgr --delete -b 0001
```

Deployment

FreeBSD can mount NTFS partitions with `sysutils/fusefs-ntfs`

```
kldload fusefs
```

```
ntfs-3g -o ro /dev/md0p2 /mnt
```

```
ls /mnt/
```

```
$RECYCLE.BIN WindowsImageBackup
```

It's slow, but it works

Deployment

FreeBSD can also mount SMB shares with `mount_smbfs(8)`

```
mount_smbfs -W MYDOMAIN \  
//user@myserver/mysmb_share /mnt
```

```
ls /mnt/  
$RECYCLE.BIN
```

It's slow, not great about metadata, but it works

Deployment

FreeBSD can also mount SMB shares with `sysutils/fusefs-smbnetfs`

```
mkdir ~/.smb
```

```
cp /usr/local/share/doc/smbnetfs-0.6.3/smbnetfs.conf \
~/.smb/
```

```
vi ~/.smb/smbnetfs.auth
```

```
auth 10.0.0.20 <user> <password>
```

```
chmod 600 ~/.smb/smbnetfs.auth
```

Deployment

```
vi ~/.smb/smbnetfs.host
    host 10.0.0.20 visible=true
mkdir ~/mnt
kldload fusefs
smbnetfs ~/mnt
ls ~/mnt/10.0.0.20
HelloWorld.txt
umount ~/mnt/10.0.0.20
```

Deployment

Data Copying/Transferring/Replication

There are at least three `rsync (8)` implementations for Windows

Yet “robust file copy” is still useful

```
robocopy D:\ E:\backups\previous-d-drive /MIR /FFT  
/R:1 /W:1 /Z /XJD
```

(+/- `rsync (8)` equivalent syntax) **Bonus! opensync is ported!**

Deployment

Bitlocker

Microsoft's Self-Imposed Ransomware

```
pkg install devel/libbde
```

```
bdemount -p <password> /dev/ada0p2 /mnt
```


Deployment

Bitlocker

As with any encryption, use it with extreme caution

Some vendors will not tell you that a system shipped with it, will wipe the key with a BIOS update, and you are separated from your data, free of charge

Deployment

PRO TIP: USB to IDE|SATA|NVMe adapters are your friend

PRO TIP: FreeBSD VM-IMAGES are your friend

```
github.com/michaeldexter/occambsd/blob/main/Imagine.sh
```

```
sh Imagine.sh -r FreeBSD-14.0 -z -m -t /dev/da0
```

`-m` keeps it mounted – You could `pkg add` to the device
from a FreeBSD host...

Deployment

FYI: FreeBSD raw VM-IMAGES are simply boot images

They don't know or care if they are on
real or virtualized hardware

The same is true of Debian “nocloud”, OmniOS “cloud”, and
raw images with Windows installed under a hypervisor

Deployment

```
github.com/michaeldexter/occamsbsd/blob/main/debugine.sh  
github.com/michaeldexter/occamsbsd/blob/main/omniagine.sh  
github.com/michaeldexter/occamsbsd/blob/main/winagine.sh
```

```
sh winagine.sh -x autounattend xml/win2025.xml -o \  
/path/to/your/windows-server/2025/insider-program.iso
```

```
sh /root/Imagine-work/windows/boot-windows-iso.sh
```

wait...

```
sh /root/Imagine-work/windows/boot-windows-raw.sh
```

Deployment

`autounattend.xml` is your friend

`win10.xml win11.xml win2012.xml win2016.xml`
`win2019.xml win2022.xml win2025.xml`

No recovery partition, create Administrator and “root” users,
enable RDP, disable Windows 11 TPM requirements...

All in minutes

Deployment

Finally...

Modern Windows and Windows Server have
reasonable SSH/SSHD support

FreeBSD has reasonable RDP support with `net/xrdp`
and a GPU driver or `net/tigervnc-server`

Deployment

```
pkg install -y xrdp tigervnc-server
```

```
service xrdp onestart
```

```
service xrdp-sesman onestart
```

Clipboard Sharing!

Connect with Microsoft Remote Desktop

And... connect to Windows RDP with `net/remmina`

Virtualization

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Virtualization

FreeBSD's bhyve hypervisor has supported Windows and Windows Server virtual machines since 2015

There were early quirks like needing to leaving an empty CD-ROM device for Windows Server, but largely down to setting the Low Pin Count (lpc) device to PCI slot 31

TPM Pass-Through arrived in FreeBSD 14.0

Virtualization

What matters is Virtualization with OpenZFS

Friends don't let friends use Windows
without OpenZFS backing storage

Virtualization *with OpenZFS*

OpenZFS is proven for mitigating or assisting with:

- Ransomware attacks
- Accidental data deletion
- Failed OS updates
- Staged OS and application installation
- Application data restoration

Virtualization *with OpenZFS*

Example staged application installation – *True story!*

- Install and snapshot the operating system
- Install old application version
- Import application data
- Upgrade the application
- Export application data
- Roll back the operating system
- Install new application version
- Re-import application data

Virtualization *with OpenZFS*

Eyes on the Prize

Corvin K has GPU pass-through working

Back a system with OpenZFS storage

*Every system is suddenly ZFS snapshottable, sendable
and bhyve bootable*

Serving

“The Power To Serve”

Serving

FreeBSD *and* Windows have very good histories
with iSCSI – *Because CIFS was terrible*

A quick example target on FreeBSD

```
truncate -s 10G /tmp/iscsi10G.raw
```

Serving

```
/etc/ctl.conf
```

```
portal-group default {
    discovery-auth-group no-authentication
    listen 10.0.0.20
}

target iqn.2014-09.org.freebsd:target0 {
    auth-group no-authentication
    portal-group default
    lun 0 {
        path /tmp/iscsi10G.raw
        size 10G
    }
}
```


Serving

Validate the file

```
ctld -f ctl.conf -t
```

Launch `ctld(8)` in debug mode

```
ctld -f ctl.conf -d
```

Connect with the Windows or FreeBSD initiator

Serving

Fun Fact

You can round-trip that `/tmp/iscsi10G.raw` image

Stop `ctld(8)`

Attach it with `mdconfig(8)`

Mount it with `ntfs-g3(8)`

The same with a ZVOL, adjusting the
`vfs.zfs.vol.mode` `sysctl` as needed

Serving

Another Fun Fact

Enterprise versions of Windows and Windows Server
have NFS servers and clients and someone,
somewhere, has gotten them to work

Serving

Samba

Serving

Samba is an open source implementation of Microsoft's Server Message Block (SMB) protocol

A LOT of data has passed through `samba (8)` on FreeBSD

Samba currently has 101 manual pages

`www.samba.org/samba/docs/man/`

Serving

The Samba Three Commandments

The Domain Controller is your DNS Server,
verify all aspects of DNS

Keep time in sync

Something extremely obscure

Serving

```
samba-tool domain provision --use-rfc2307 \  
--realm=MYDOMAIN.MYDOMAIN.MYCOMPANY.LOCAL \  
--domain=MYDOMAIN \  
--server-role=dc \  
--adminpass BigStrongPassword1! \  
--option="ad dc functional level = 2016"
```

github.com/michaeldexter/freebsd-ad

Serving

Shower Thought...

Samba on ARM64 is proven

Windows Server does not support ARM64

If you are power-constrained, you *must* consider alternatives

The Future

A dark blue diagonal shape, resembling a thick line or a wedge, starts from the bottom left corner and extends towards the top right corner, occupying the lower half of the page.

The Future

OpenZFS on Windows

Perhaps the shortest distance to bootability...
`github.com/maharmstone/quibble`

The Future

```
wmic diskdrive list brief
```

```
... DeviceID ...
```

```
\\.\PHYSICALDRIVE1
```

```
zpool.exe create -O casesensitivity=insensitive -O  
normalization=formD -O compression=lz4 -O atime=off  
-o ashift=12 tank PHYSICALDRIVE1
```

Field Notes

If there is time

Field Notes

Daniel B's Zelta

`github.com/bellhyve/zelta`

Field Notes

MAC Addresses are your friend

Use them for DHCP reservations

Generate them with one-liners

Assign them to VMs to see headless VMs with `arp -a`

Oh Proxmox

Field Notes

Happy IP Scanner!

`github.com/michaeldexter/hipscan`

`192.168.116.2 22 80 443 8080`

`192.168.116.3 80`

`192.168.116.40 22 80`

`...`

Field Notes

Going from an AD-joined account the local one?

`<ComputerName>\<UserName>`

`.\<UserName>`

Field Notes

The Production User Calls!

The Trifecta – Jail/Zones, OpenZFS, bhyve

callfortesting.org

All are welcome!

THANK YOU!

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