



The Tip of the Iceberg: The Coming Era of Open Source Enterprise Storage

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Defining Open Source & Software Freedom

Free Software Foundation Four Freedoms

- ❑ The freedom to **run** the program as you wish, for any purpose
- ❑ The freedom to **study** how the program works, and change it so it does your computing as you wish
- ❑ The freedom to **redistribute** copies
- ❑ The freedom to distribute copies of your **modified** versions to others

See also: The **OSI** Open Source Definition

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Defining Open Source & Software Freedom

Two Leading Schools of Thought

- ❑ **Permissive Licensing:** You may keep your changes to my code if you preserve my copyright notice
- ❑ **Copyleft Licensing:** You must provide your changes to my code to your users

With or without **patent** protections/indemnification

Why would you do that?

Defining Open Source & Software Freedom

Joy's Law

“No matter who you are, most of the
smartest people work for someone else.”

Bill Joy, Sun Microsystems

Defining Open Source & Software Freedom

“A patent is not a business model.”

Tim Kastle

Technologies alone do not find customers, support them, build a brand, source vendors, manage HR...

Don't be afraid of sharing or collaborating

timkastle.org/blog/2010/03/a-patent-is-not-a-business-model

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Defining Open Source & Software Freedom

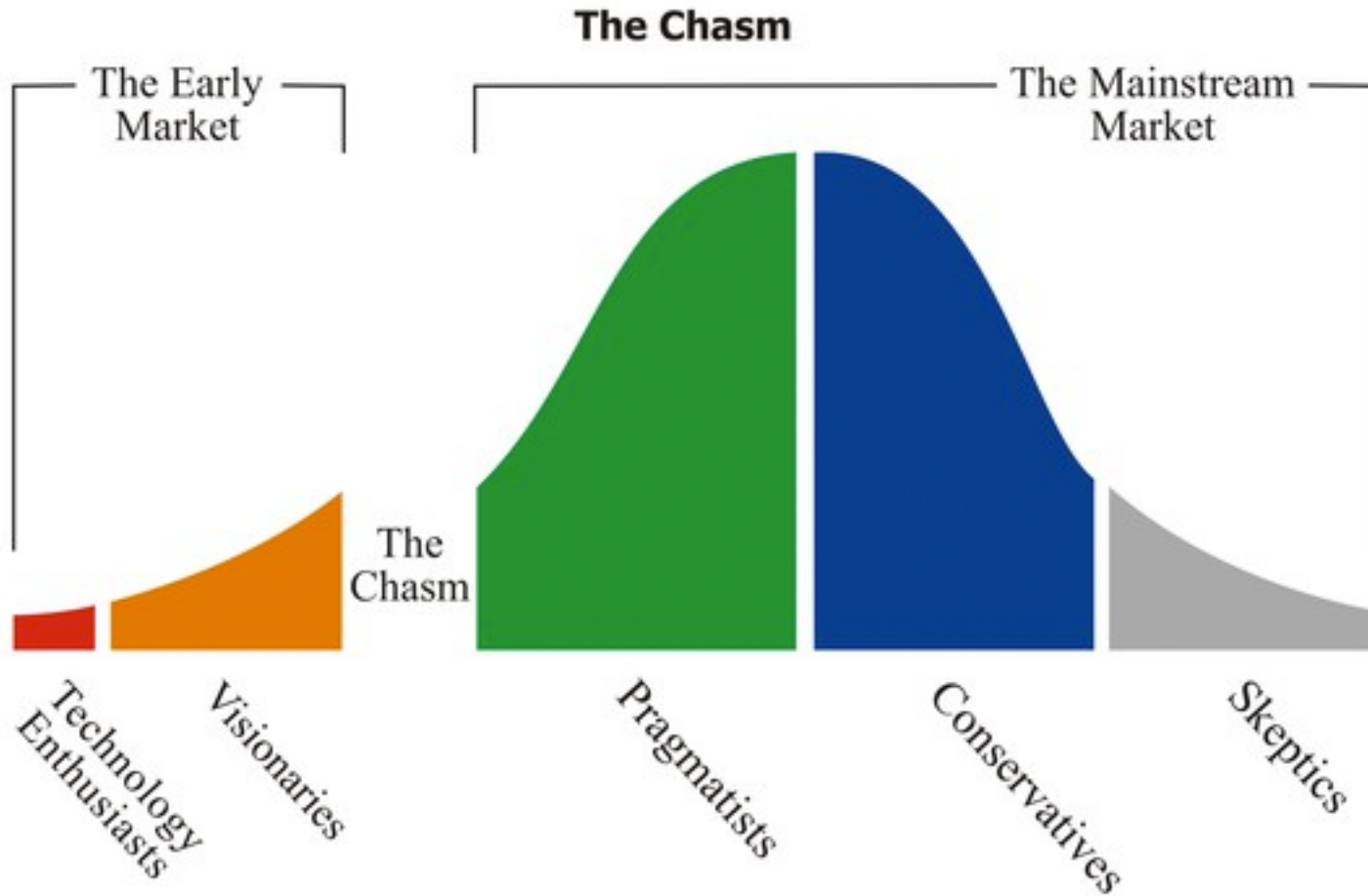
Dexter's Law

“Only proprietary software vendors want proprietary software. Everyone else will choose software freedom when given the choice.”

Michael Dexter

Open Source In Practice

“Crossing the Chasm” © Geoffrey A. Moore



Open Source In Practice

We've Crossed the Chasm

Top 500 Supercomputers

November 2015

494 or 98.8%

run GNU/Linux

One runs Windows

November 1998: One ran GNU/Linux

<http://www.top500.org/statistics/details/osfam/1>

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Open Source In Practice

We've Crossed the Chasm

Most Smart Phones

Most Network Infrastructure

Netflix, Yahoo!, Google, Amazon
and Facebook Servers

Most Internet of Things

Many Storage Vendors

<http://www.idc.com/prodserv/smartphone-os-market-share.jsp>

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A Brief History of Open Source Storage

- ❑ 1983 CSRG: Dr. Kirk McKusick and Bill Joy
Fast File System, TCP/IP, chroot(2)
- ❑ 1988 CSRG: First BSD License
- ❑ 2005 Sun: ZFS File System Scale Up
- ❑ 2010 Onward: Ceph, Swift, Gluster... Scale Out

“The single Greatest Piece of Software Ever, with the
broadest impact on the world, was BSD 4.3.”

www.informationweek.com/d/d-id/1046033¹⁰

Defining “Enterprise” Open Source

Price?
Performance?
Certification?
Support?

Defining “Enterprise” Open Source

Data Integrity

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Open Source Storage Generation Gaps

- ❑ Fast File System, Fast! Given the constraints...
- ❑ ZFS File System, Checksumming and Validating
- ❑ Ceph, Swift, Gluster... Catching up

The Fast File System derivatives that dominate Open Source and proprietary computing do not perform any data integrity validations to mitigate bit rot

Scale Up or Scale Out?

Ceph, Swift and Gluster vs. ZFS

You don't bolt-on data integrity
Back them with ZFS

ZFS Alternatives?

GNU/Linux Btrfs

- ❑ Incomplete volume manager added to a file system
- ❑ Many legacy conventions such as fstab and fsck
- ❑ Strong license obligations
- ❑ Not cross-platform

WAFL and ReFS cannot be licensed for modification

bcachefs is an alpha-status Btrfs alternative

We are out of choices

What is ZFS?

Always-consistent on-disk state

Continuous data integrity validation

Unlimited snapshotting, cloning & rollback

Integrated RAID volume manager

Snapshot-based replication

Hybrid SSD/HDD tiering

Cross-platform, strong community

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ZFS Platforms

- ❑ OpenSolaris → Illumos reference architecture
 - ❑ Intel, Sparc
- ❑ OmniOS, SmartOS, OpenIndiana... Illumos derivatives
 - ❑ Intel, Sparc?
- ❑ FreeBSD
 - ❑ Intel, ARM/ARM64, Power, MIPS
- ❑ OS X
- ❑ GNU/Linux
 - ❑ Intel, ARM/ARM64, Power
 - ❑ Legal Questions

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Chain of Data Integrity vs. Chain of Freedom

“It is not enough to require that the combined program be free software somehow. It must be released, as a whole, under the original copyleft license...”

<https://www.fsf.org/licensing/zfs-and-linux>

Our Logical Conclusions

- ❑ Make ZFS Available
 - ❑ FreeNAS has been downloaded nearly 9 million times
 - ❑ World's Number One Software-Defined Storage OS
- ❑ All Software Requires Hardware
 - ❑ FreeNAS Mini/Mini XL, FreeNAS Certified Line
- ❑ SDS Separation is the enemy of Hardware Integration
 - ❑ Integrated Hardware Platform
 - ❑ High Availability Option
 - ❑ Vendor Certification
 - ❑ Deployment and Maintenance Support

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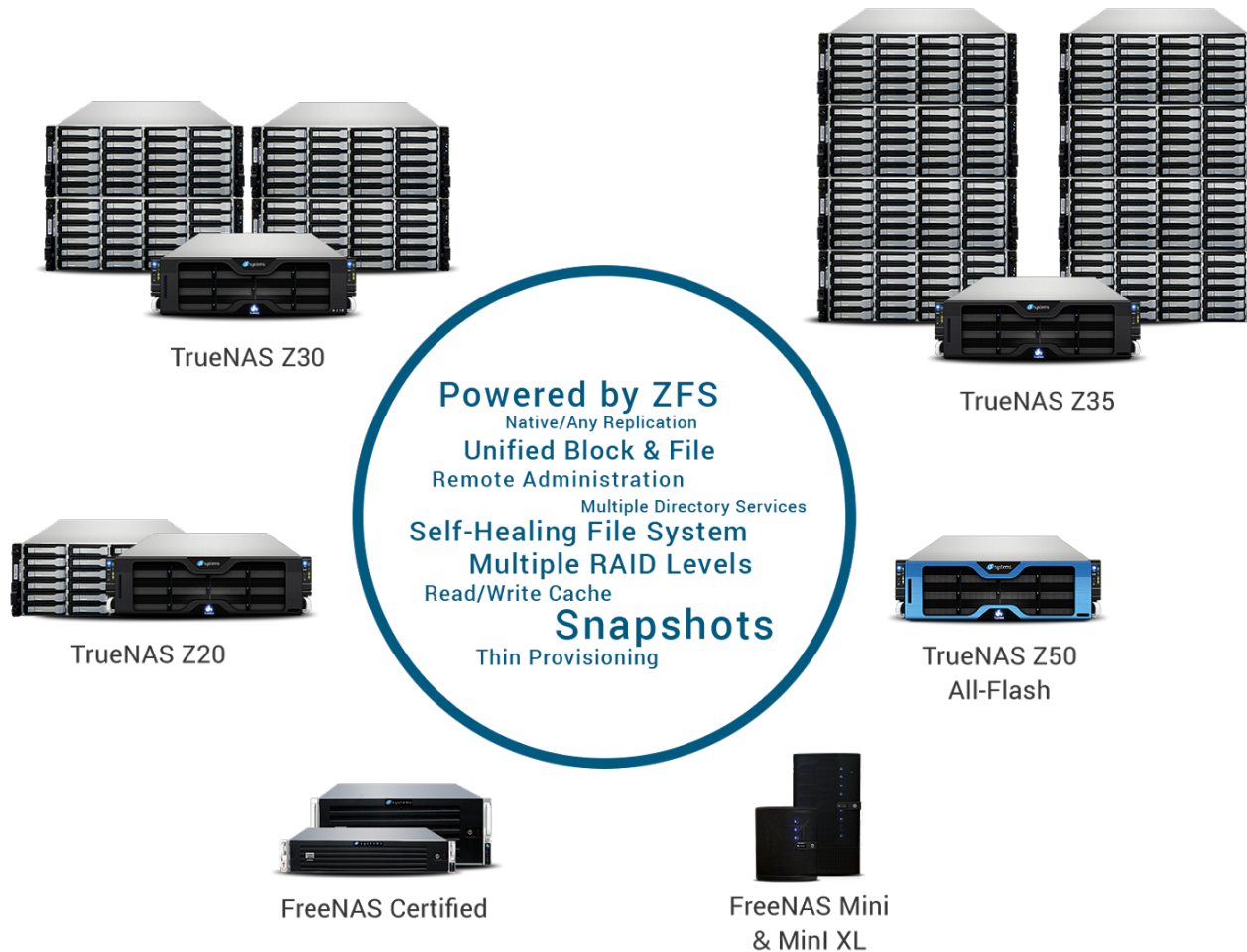
Our Logical Conclusions

TrueNAS Enterprise Storage



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Our Logical Conclusions





Thank You!

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