

Why (and how) we're migrating many of our servers from Linux to the BSDs



Stefano Marinelli - EuroBSDCon, Dublin - 21 September 2024

Introduction

"I'm Stefano Marinelli, I solve problems."

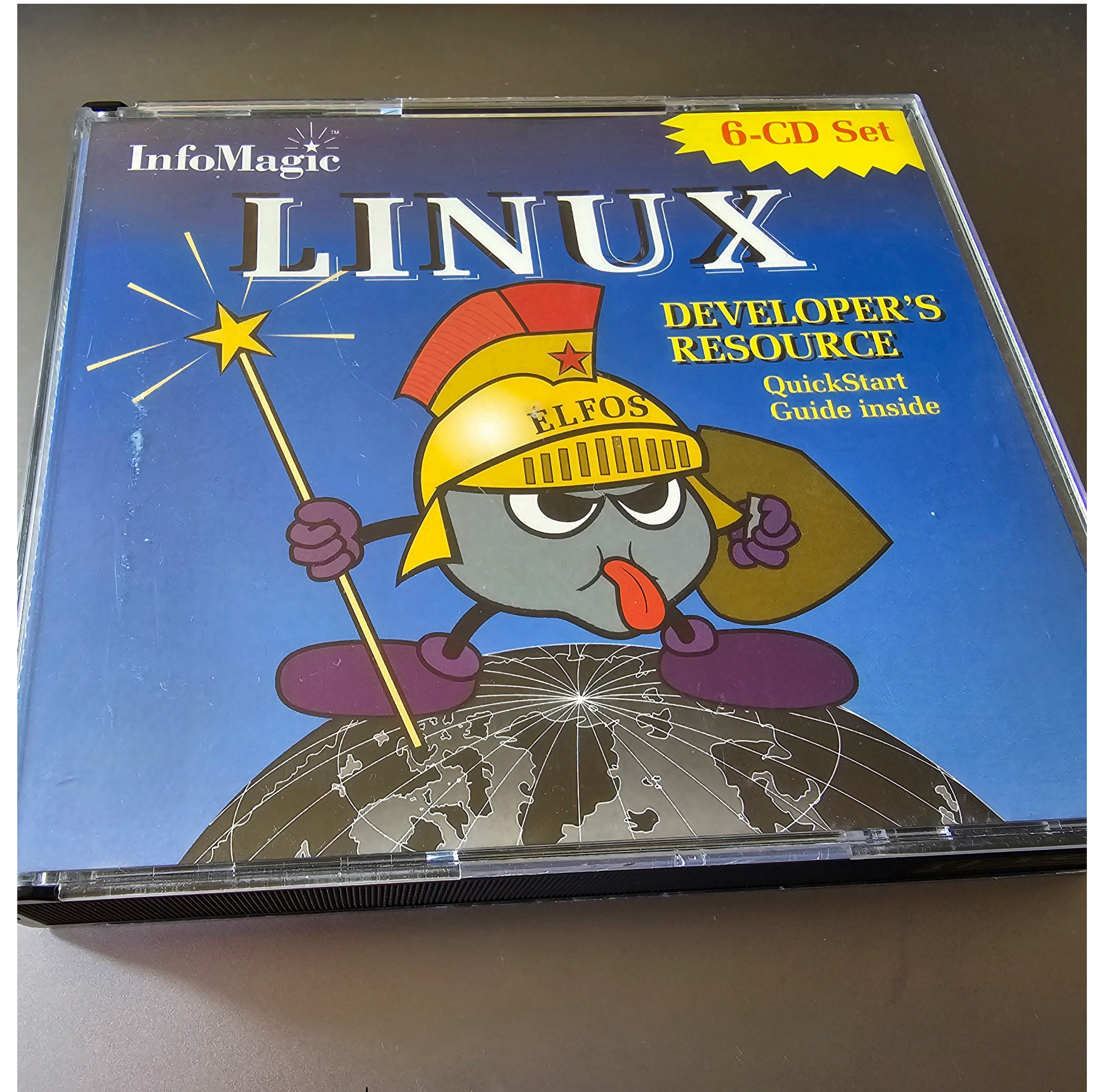
- Founder and Barista of the [BSD Cafe](#) - a virtual space where enthusiasts of BSD systems come together to share knowledge
- I work in my company, called [Prodottoinrete](#)—a container of ideas and solutions.
- Passionate about technology and computing
- Made my passion my profession



Stefano Marinelli - EuroBSDCon, Dublin - 21 September 2024

Early days with Linux

- Linux user since 1996, before turning 17
- Experimented with Linux distributions from CDs
- Used Linux for secondary tasks; Windows remained daily driver
- In 1997, Linux became my everyday system
- Realized Linux could replace Windows except for (some) gaming



University Years

- 1998: Started University, in Bologna, Italy
- Computer Science department oriented towards Open Source
- I was one of the few students familiar with Linux and Open Source concepts
- 2000: Inspired by Prof. Ozalp Babaoglu to explore BSDs
- Limited resources delayed hands-on experiments
- 2002: Began exploring BSD systems, starting with FreeBSD
- Managed and ran FreeOSZoo, where ready-to-use, virtualized operating system images could be downloaded and later run inside a browser

Embracing FreeBSD

- Convinced my parents to buy me a laser printer (actually for the FreeBSD handbook)
- FreeBSD became my daily driver - great support for my Sony Vaio
- "Nights spent compiling KDE" - I slept a meter away from my laptop's wildly spinning fans
- 2003: Thesis on OSS virtualization solutions - NetBSD/xen

Professional Beginnings

- Worked at a company offering Linux-based solutions
- Criticized for making systems that didn't require constant interventions - disappointed and sad
- I was teaching the basics of Linux to experienced system administrators. One of them suggested that I work independently, following my own philosophy.
- I started developing the guidelines that I would follow from that day on. In a few months, it will be twenty years since that day.
- Make Your Own Kind of Music

Defining My Philosophy

- **I solve problems - I don't sell boxes.**
- I would work for myself, following my own philosophy.
- I would not be tied to any particular vendor. I love exploring and learning, so I would always study solutions in depth and recommend the one I thought best suited for the client.
- I would use and promote Open Source solutions whenever possible.
- I would use BSD whenever feasible and Linux where a BSD was not suitable.

Challenges with Clients

- Open Source systems seen as "toys for universities"
- Clients accepted Linux reluctantly; rejected BSDs due to unfamiliarity
- Used BSDs where clients didn't have direct access (email servers, web hosting)
- NetBSD and Xen for virtualization
- OpenBSD as network/firewall entry points
- FreeBSD (with ZFS) for various services, including backup servers

Positive Client Outcomes

- Clients surprised by stability and reduced need for maintenance
- Experienced more uptime and reliability
- **Problem:** "If everything's working, what am I paying you for?"
- Chose clients who understood the value of systems that just work
- Emphasized that preventing problems is better than fixing them
- **I solve problems.**

Rise of Linux Popularity

- Linux demand grew with its popularity - people started asking for Linux based solutions
- Necessary to implement Linux where specifically requested
- Clients love GUIs - Had to replace those NetBSD/Xen hosts with Linux ones
- Transitioned to virtualization solutions like OpenNebula and Proxmox
- Linux based solutions were now accepted - not a toy anymore

Data Loss Experiences

- **No BSD has ever caused me to lose data requiring restore from backup - in 22 years**
- Experienced data loss on Linux with ext4, XFS, and btrfs
- Switched to FreeBSD with ZFS after losing data with Btrfs; haven't lost a single bit since
- Creating a read-only FreeBSD system is straightforward - the OS is always preserved in case of a power outage or disaster (e.g., an earthquake in 2012).

Observing Industry Trends

- I introduced Docker to Devs - Devs began demanding Docker - some only to bypass limitations
- The development of Linux and its distributions sometimes seems to shift toward the interests of cloud providers
- Concerned about trends creating more problems than they solve - the UNIX philosophy is fading away...
- Often focused on the constant push to replace "the old with the new" with solid theoretical reasons but sometimes seemingly without practical benefit
- There's no "one size fits all"

Solving Problems

- New technology should solve old problems without creating worse ones
- Common people don't care whether their service runs on Docker, Podman, Linux, or a *BSD - they want security, stability, and reliability
- **There isn't a single solution to all problems, but many solutions for each problem.**
- My job is to give clients the best solution to solve their specific problem, not the most fashionable one

Focus on Solving Problems - back to the BSDs

- Computing should solve problems and provide opportunities
- **"I solve problems."**
- The BSDs are stable, reliable, upgradable and secure
- Clients care about solutions being stable, upgradable, and secure
- -> Reversed proportion to recommend BSD for all possible workloads
- Each BSD has unique characteristics and target audiences
- **Goal:** Create stable, coherent, upgradable, and secure systems

Advantages of BSD Systems

- **OpenBSD:** Minimal additional packages; secure by default
- **NetBSD:** Runs for years with few updates; rare need for patches
- **FreeBSD:** ZFS, bhyve hypervisor, native jail system, etc...
- **DragonflyBSD:** Hammer2

Migration Strategy

- At first, migrate systems needing updates or causing problems
- Created twin machines with FreeBSD for performance comparison
- Noticed significant increase in I/O performance and lower resource usage
- I migrated client hosts without initially informing them - no bias involved
- Clients noticed massive performance boost
- Reduced number of VMs and hosts; significant cost savings - happy client

Embracing FreeBSD Jails

- Replicated VM setups inside FreeBSD jails - easy access to the ZFS snapshots
- Faster operations and resource savings
- No double buffering or wasted RAM - native I/O speed
- The bhyve NVMe drivers made the VMs' I/O performance soar
- Developers began requesting FreeBSD jails over Linux containers like Docker or Podman
- Younger developers have become aware of the importance of having access to data in the simplest form possible

Overcoming Ideological Challenges

- Main challenge often ideological, not technical
- Clients influenced by current hype (e.g., Kubernetes for simple websites)
- Clients often want to follow trends, as sellers use hype to market their products, despite their relevance (e.g., AI)
- Advocated for simpler, maintainable solutions and...
- **Always Own Your Data**
- **Avoid any Lock-in**

Simplifying Solutions

- Simplest solutions are easiest to maintain over time - the BSDs are conservative
- Every additional layer can create more problems - too many moving parts
- The BSDs evolve while retaining their foundations. We have reached the *OpenBSD of Theseus*: still, it remains the same operating system, without upheavals from one release to another
- **"I solve problems"** by not overcomplicating solutions

Stability of BSD Systems

- No surprises during updates or reboots - a reboot won't change the network interfaces' names
- For example - enx3e3300c9e14e won't suddenly become enp10s0f0np0, which would make the host inaccessible
- Consistent network interface names (e.g., ix0 remains ix0) (OpenBSD)
- Reliable ZFS without the need for recompilation (FreeBSD)
- Your architecture will be supported and tested (NetBSD)

Positive Devs Feedback

- Many developers I work with have embraced the challenge
- Many began explicitly requesting "jails" instead of Docker hosts
- They learned to manage the resources at their disposal
- No more "*we need mooooooar powaaaaar!*"

Positive Client Feedback

- Clients experienced no major issues after migration
- Appreciated moving away from IT monocultures
- Valued the stability and security of BSD systems

The Managers' Problems

- In some cases, the challenge wasn't technical but rather "commercial": Linux sells well
- "Cloud" sells even better - especially if randomly combined with AI and Kubernetes
- Compliance problems: I was told that OpenBSD ssh isn't considered 'secure' because it doesn't match a client's checklist (e.g., OpenSSH_9.2p1 Debian-2+deb12u3)
- Those who prepare these documents are often, sadly, unaware of what they're asking for
- Generally speaking, the BSDs aren't a part of their checklists

Ongoing Transition

- **78%** of hypervisors I manage are running on FreeBSD
- **66%** of workloads I manage are running on BSD systems
- Clients are requesting more setups based on OpenBSD
- Clients love [OPNsense](#)
- Developers love FreeBSD jails

Next Steps

- Moving clients away from the big email providers restores the Internet's decentralization principles.
- I'm planning to launch the **BSDMail** service - entirely based on BSD systems (opensmtpd on OpenBSD, Dovecot and rspamd on FreeBSD jails, etc.)
- The client must want and appreciate our service, not feel trapped by lock-in. People will always choose freedom
- **Own Your Data** - Always give clients a copy of the data in its simplest and restorable form
- Achieve over **90%** adoption rate of BSD for the systems I manage
- Open Solutions - Continue documenting some of the challenges I face on my IT Notes blog, in the hope of attracting new people to BSDs

Final Thoughts

- The transition to BSDs is going smoothly
- Clients are satisfied, and developers appreciate the stability and security features
- We are satisfied. Near-zero critical notifications at night for BSD systems
- Committed to providing the best solutions for clients' specific needs - no hypes, no shiny but closed boxes
- "I'm Stefano Marinelli, **I solve problems.**" - and I love solving problems using BSD systems

THANK YOU!

See you at [BSD Cafe!](#)



Stefano Marinelli - EuroBSDCon, Dublin - 21 September 2024