Designing Firmware Upgrades Around FreeBSD's pkgng

An Annotated Version History
Overview

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"I like nifty things. I read a lot. Sometimes I write stuff."

- UNIX networking engineer
- Firewalls, Operating Systems
- DragonFly BSD, OPNsense, mdocml, zeromq, FreeBSD ports

@fitchitis
fichtner
OPNsense

- Firewall distribution on top of FreeBSD, forked from pfSense
- pkg(ng) adoption, bootstrap interface, MVC, API, redesigned build tools, traffic shaper replacement, etc.
- Two major releases: 15.1 (January 2015), 15.7 (July 2015), with almost 40 minor releases in total in said 9 months
- Security enhancements: weekly updates, LibreSSL as an option, ASLR soon (via HardenedBSD), privilege separation as a long-term goal
- Open community platform, multiple translations (German, Japanese, Chinese, more on the way)
FreeBSD

- Since 1993, forked directly from the original BSD
- About three quarters of all BSD deployments
- Strong networking and storage (zfs)
- Large third party software collection (25000 ports)
- Viable desktop (manually or out of the box with PCBSD)
- pkg(ng) as the default manager since FreeBSD 10 (2014)
pkg(ng)

- Older FreeBSD tools were written over 20 years ago.
- Binary package manager rework started around 2012.
- Better dependency tracking (shared libraries).
- Eventually gains FreeBSD base and kernel support.
- Easy command structure, countless maintenance tools.
pkg(ng)

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```
# pkg install foobar
# pkg delete foobar
# pkg upgrade
```
Motivation

timely updates
Motivation

- timely updates
- sustainable release engineering
**Motivation**

- timely updates
- sustainable release engineering
- smallest possible impact for users
Requirements

reliable
fast
secure
modular
fancy
Requirements

reliable
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ok to trigger remotely or to automate
Timeline: 15.1 (Jan 2)

- first release version
- architecture amd64 only
- package updates only
- preliminary GUI and backend scripting
Timeline: 15.1.1 (Jan 12)

- added i386 architecture
Timeline: 15.1.6.1 (Feb 21)

- kernel and base upgrades support, direly needed for the upcoming FreeBSD 10.1 upgrade
- opnsense-update utility as an unified tool for updates
Timeline: 15.1.7.1 (Feb 28)

- Console (ssh) firmware update scripting done
- Base/kernel upgrades now only apply if needed ;)
- LibreSSL test version
Timeline: 15.1.8.4 (Apr 7)

- detached upgrade from the frontend code (aka upgrades terminated themselves via a loop)
- version number madness ;)

13.09.2015  Franco Fichtner  BalCCon, Novi Sad
Timeline: 15.1.10 (May 4)

- Switched on package signature verification
Timeline: 15.1.11 (May 22)

- MVC rewrite of firmware
- GUI including API
Timeline: 15.1.11.4 (Jun 12)

- lots of GUI UX tweaks
- opnsense-update now also deals with package updates in one go
Timeline: 15.7.2 (Jul 10)

- opnsense-update gained the ability to move from OpenSSL to LibreSSL and back seamlessly (command line only)
Timeline: 15.7.3 (Jul 17)

- GUI reboot probing
- GUI package overview
- First development versions that could be installed on the system manually
Timeline: 15.7.6 (Jul 31)

- opnsense-update gained the ability to move to a different firmware mirror (command line only)
Timeline: 15.7.7 (Aug 8)

- GUI mirror and crypto selection was integrated
Upgrading 15.7.11 to 15.7.12, plus OpenSSL to LibreSSL

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@matthiasr

Much love for @opnsense just because the web interface works on mobile & I can upgrade the FW without even getting out of bed

09:18 AM - 26 Aug 15
Future Work

- Daily snapshots of development and stable branches plus GUI support
- Scheduled updates (automatic mode)
- Plugin infrastructure and GUI support
- Upgrade to the next FreeBSD 11
- And probably more :)
Thank you!

Time for your questions, comments and ideas.

https://www.freebsd.org/
https://opnsense.org/