Contemporary network configuration for Linux

ifupdown-ng

Aaron A. Glenn, Maximilian Wilhelm

Agenda

1. Who's who
2. Why something new?
3. What we built

Who's who

Aaron A. Glenn

- Network Janitor & Internetworking Curmudgeon
- Ask me about Re-programmable Networks
- Managing Director, Predicted Paths BV & Network Service Associates
- Contact
  - @networkservice / @aag@bsd.network
  - aag@bgp.beer

Who's who

Maximilian Wilhelm

- Senior Landscape Architect
- OpenSource Hacker
- Fanboy of
  - (Debian) Linux
  - IPv6
- Occupation:
  - By day: Senior Infrastructure Architect, Uni Paderborn
  - By night: Infrastructure Archmage, Freifunk Hochstift
  - In between: Freelance Solution Architect for hire
  - Member of technical advisory board - Network Services Association
- Contact
  - @BarbarossaTM
  - max@sdn.clinic

Who's who

Why?

Field Experience Leads to Strong Opinions

- NSP customer has uncommon financial and logistical constraints
  - 3300 site opportunity
  - Initial 45 sites are intentionally in "most difficult" (network) environment
  - Two vendors and six months have not led to any definition of success
- Given:
  - MIPS64 devices
  - Ancient Linux kernel
- Need:
  - Linux 5.4+
  - handle complex configuration scenarios
  - avoid dependency on Python/golang/Rust/etc.

Who's who

Why?

Strong Opinions Lead to New Code

- New Opportunities
    - Alpine Linux project looking to modernize network configuration
    - 'Complex' configurations are quite common!
    - Q: "where else might this be useful?"
- New Thoughts
    - Disaggregated networking = Linux
    - "what if..."

Network Services Linux

Linux distribution for networking devices

Based on Alpine Linux

- MUSL, no glibc

Flexible contemporary network configuration required

- Came with ifupdown1
- Not state of the art

Who's who

Why?

Status quo - what's out there

- iproute2
- ifupdown
  - ifupdown1
  - ifupdown2
- netplan
- NetworkManager
- systemd-networkd
- RedHat universe
- etc.

Status quo - ifupdown universe

Two mostly compatible suites

ifupdown1

- Used in Debian (plus derivates) for decades
- Used in Alpine for years (as part of busybox)
- Written in C
- Monolithic
- Can be extended through /etc/network/if-X.d

ifupdown2

- Used in Cumulus Linux
- Available for Debian (plus derivates)
- Written in Python
- Modular, easy to extend

Who's who

Why?

What we wanted

- Compatible with ifupdown1/2
- Support for contemporary features
- Easy to extend
- Small footprint

Who's who

Why?

What we built

Who's who

Why?

ifupdown-ng

Vision

Intended as a drop-in replacement for ifupdown1 and ifupdown2 installations

Today:

- Alpine and Debian primary supported environments
- Feature parity with ifupdown1
- Dependency resolution
- Extensible through executors
- Meaningful documentation
- Included in Alpine 3.13 and NSL 1

Planned:

- Support for other Linux distributions and *BSD
- Checking and reloading network configuration
- Native executors using netlink

Who's who

Why?

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Architecture

Core:

- Written in C
- Config parser
- Compatibility layer
- Dependency resolution

Executors:

- Written in whatever you like (up to now: shell)
- create, set up, tear down links, tunnels, ...
- configure IPs

Who's who

Why?

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Features

As of today:

- static addresses (incl. pointopoint)
- B.A.T.M.A.N. adv.
- bonding / LAGs
- (vlan-aware) bridges
- DHCP
- ethtool
- dummy
- PPP
- tunnels (GRE, GRETAP, IP*, …)
- vEth
- VRFs
- VXLAN
- Wireguard

Who's who

Why?

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Outlook

Features:

- Checking running config against configuration on disk
- Reloading network configuration (with minimum impact)
- Phase-wise execution
- Native executors (C, netlink)
- Support for static routes + PBR rules on interfaces

Support:

- Automated integration tests
- Become a native Debian package

Who's who

Why?

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Visions

Managing WIFI interfaces

```
iface wlan0
    wpa-ssid TwistedAir
    wpa-psk muchsecure
```

ifmond daemon

- Listens to netlink events
  - Network device added/removed
  - Cable plugged in or unplugged
- Reacts to netlink events by (de)configuring interfaces as appropriate
- Like udev, but for networking

-> Event-driven network management without blocking init

Who's who

Why?

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Links

Code: https://github.com/ifupdown-ng/ifupdown-ng/

Discussion: #ifupdown-ng at irc.as7007.net

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Questions

Questions?