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Breaking Open Linux Switching Drivers

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netdev01

Agenda

- Why
- History
- Design proposal
- Future possibilities

Why am I here?

Linux kernel should enable others to create the next generation of forwarding devices

Integrate support for offload hardware directly into the the Linux kernel

Hardware Platform History

Market dominated by switch and router vendors providing expensive proprietary solutions

Proprietary software running on switches and routers was not open for developers and users to enhance

Today’s hardware platforms are significantly higher-performance and more generally available

Spare CPU cycles are available for applications to run directly on the switch

Bare-metal platforms are now appealing and available to commercial Linux vendors, developers, and users

Software History

15+ years with Linux as a viable OS for host processor on switches/routers

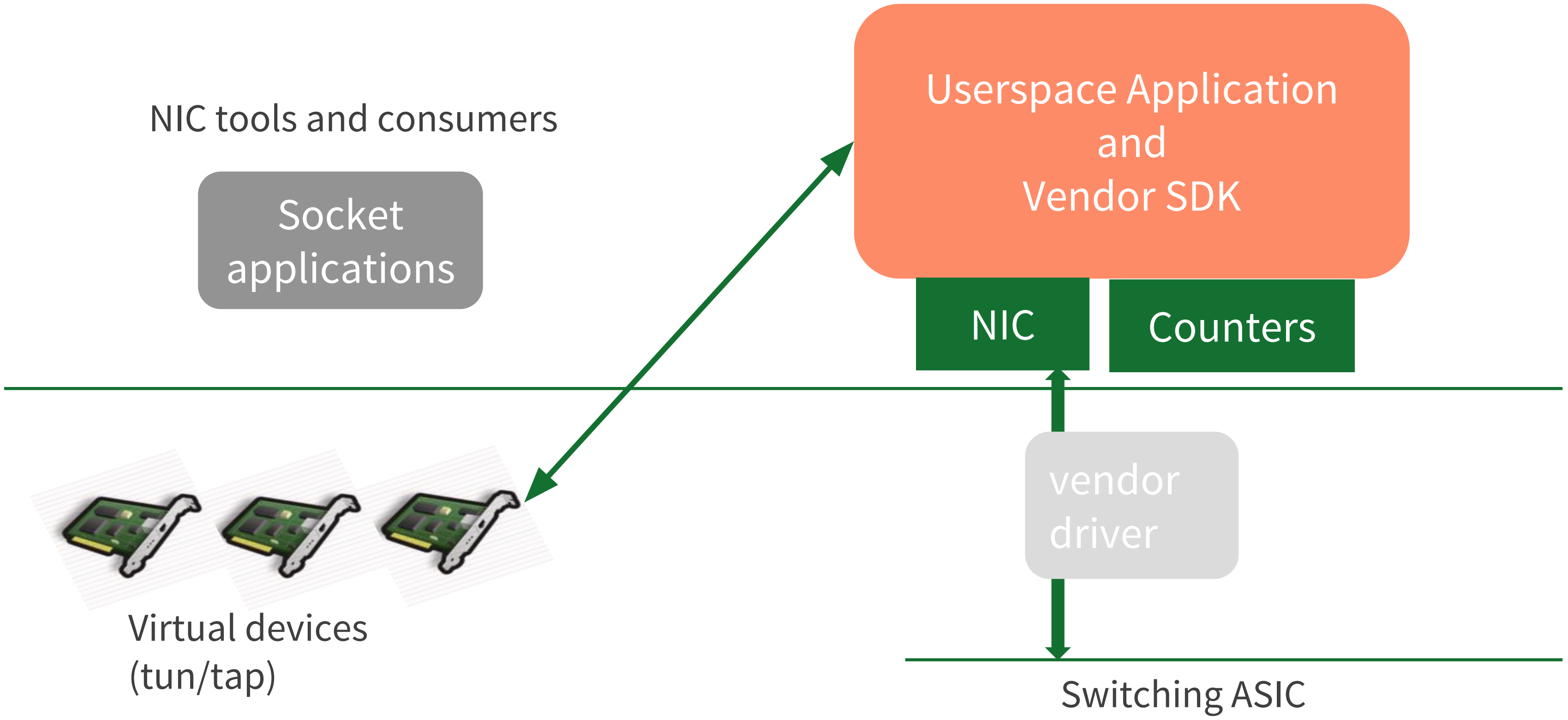
10+ years Linux “support” by ASIC vendors

Basic in-kernel switching/offload layer support in v3.19

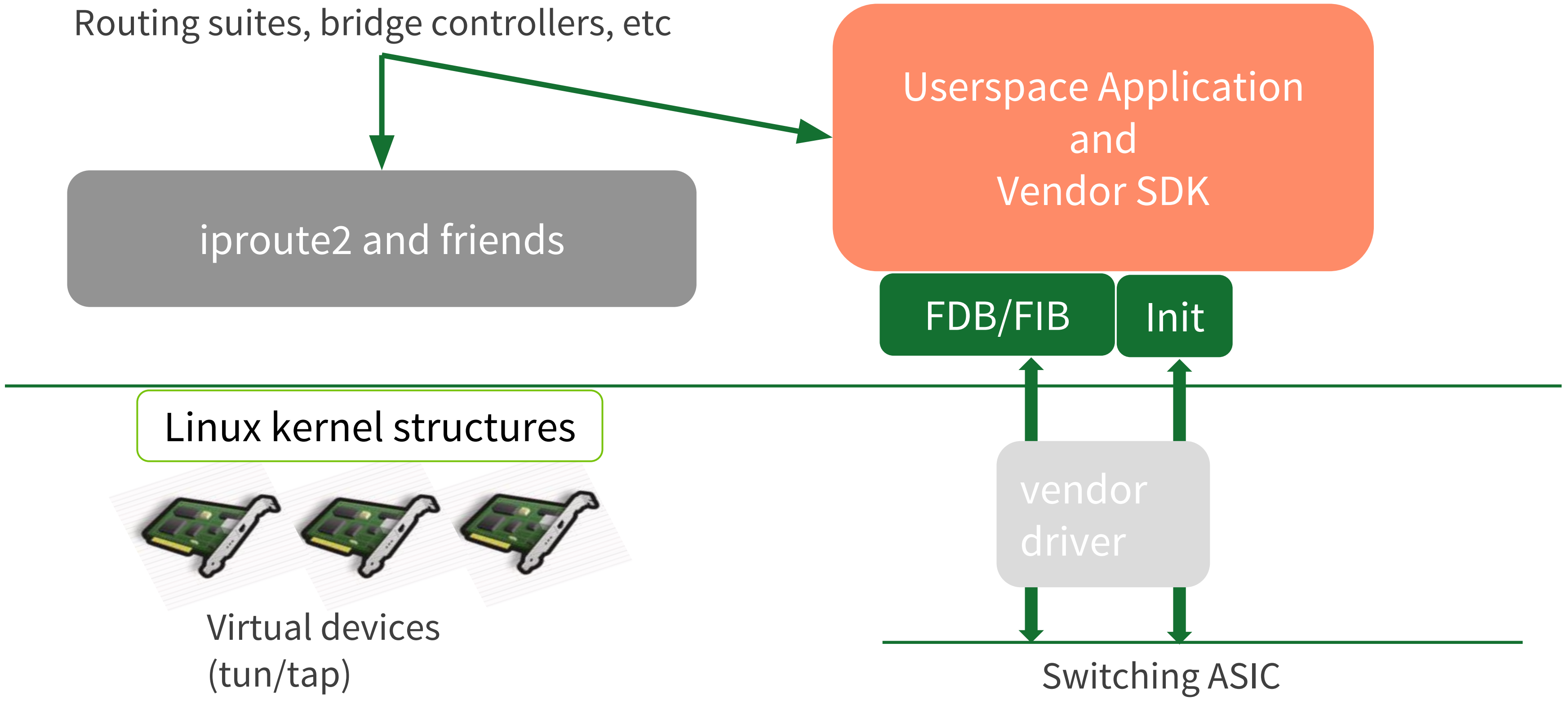
Software architecture to control ASICs has not fundamentally changed in the last decade

What exactly does that look like?

Typical packet path

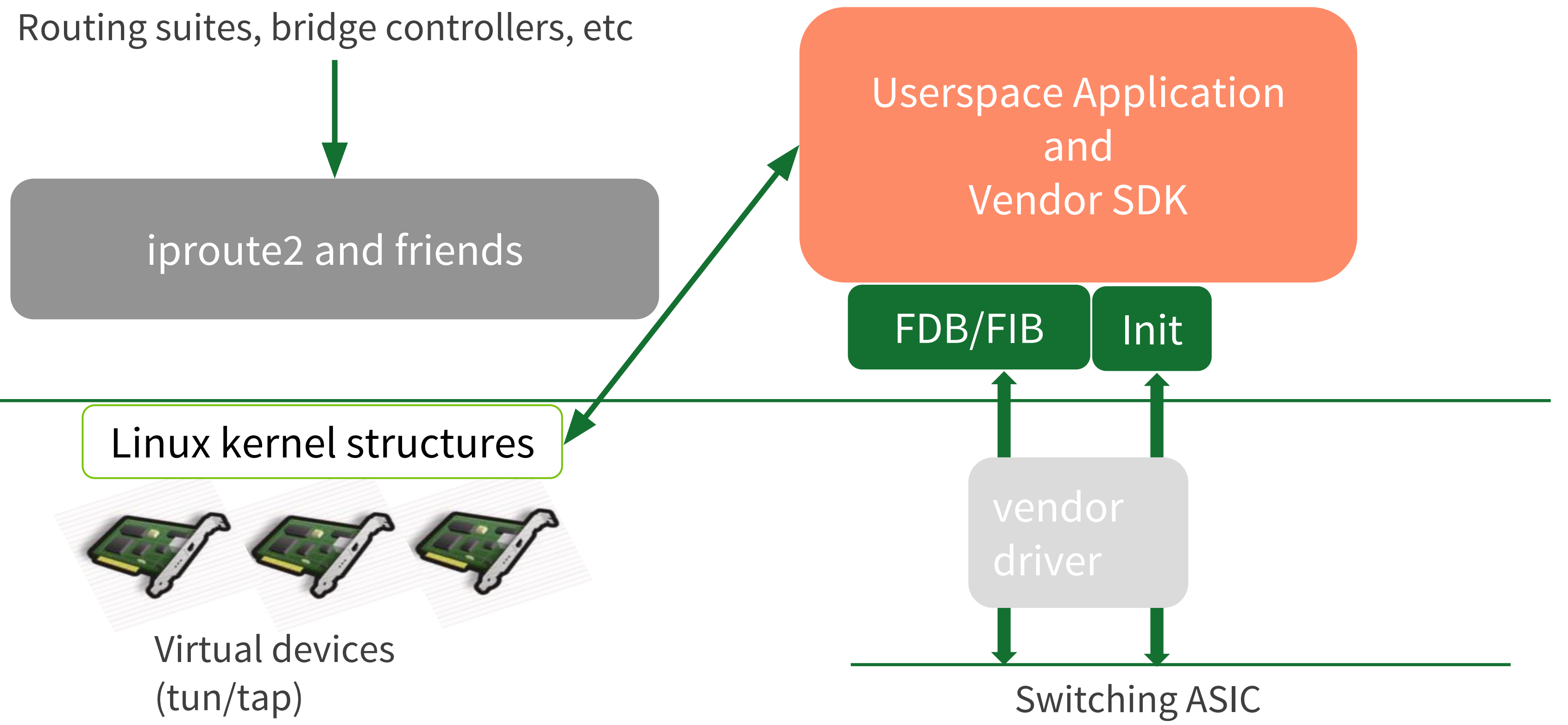


Control Plane Programming


Routing suites, bridge controllers, etc
Userspace Application and Vendor SDK
iproute2 and friends
FDB/FIB
Init
Linux kernel structures
vendor driver
Virtual devices (tun/tap)
Switching ASIC

Painful for those developing switches as management applications need to talk to kernel/netlink and SDKs

Netlink Control Path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Much better design, but each SDK supported needs a new translation between netlink and SDK

Kernel hackers and distribution vendors see a simple solution

Get rid of all closed-source SDKs

Great idea!

Vendors do not want to open source their SDKs

Can we use a userspace SDK and a kernel driver at the same time?

Not if you want it upstream!

OK...how do I get started?

Phased Approach

- Participate!
- Pick a hardware platform
- Write and post a switchdev-compatible network driver
- Enhance that driver to add ndo/offload_ops to driver

Attend conferences, participate on mailing-lists, and post patches

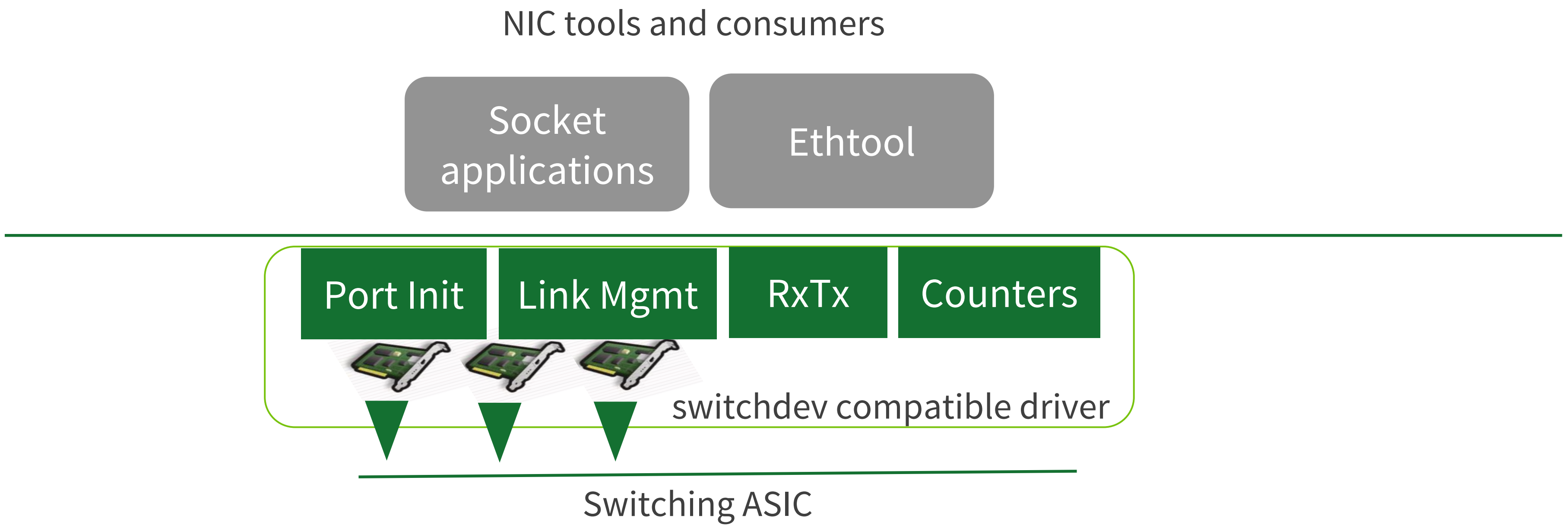
Write and post a switchdev-compatible network driver

Advantages

- Provide network access via front panel ports
- Phased approach to working upstream
- Applications can developed without need for hardware offload

What might that look like?

Base Switchdev Driver



Great, we are upstream!

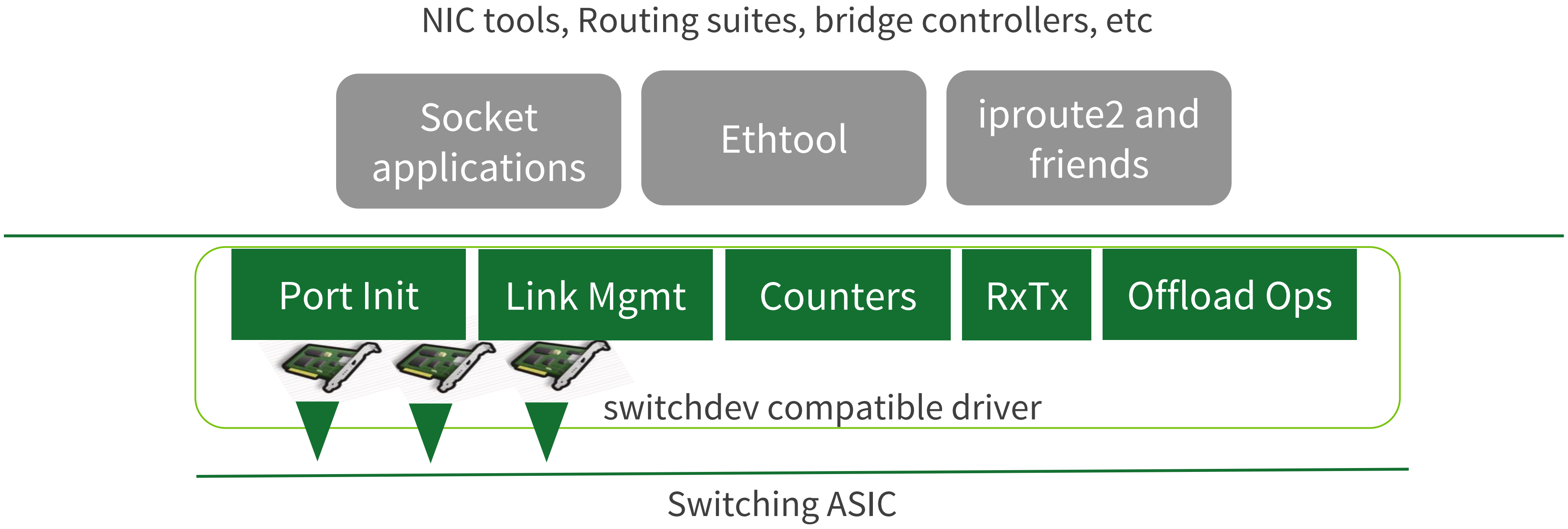
Are we done?

No!

Add offload support to driver as upstream infrastructure is developed

What might *that* look like?

Switchdev Offload Driver



“If you are the first you will be so cool.”

-DaveM

Get coding

“..and we’ll help you maintain it”

-DaveM

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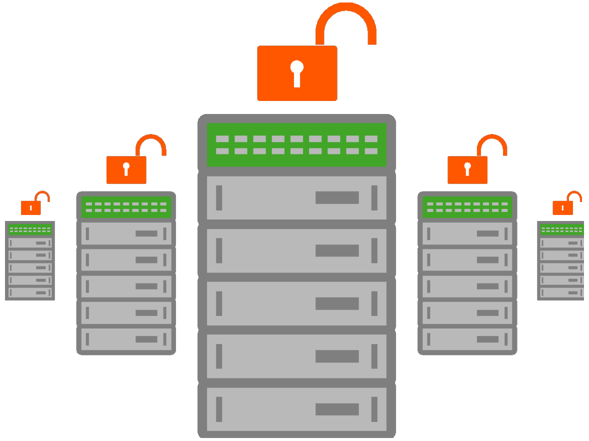

Thank You!