

# Extending Kernel Hardware Offload (EKHO)

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# Elevator pitch

## What?

Extending Kernel  
Hardware Offload  
API

## Why?

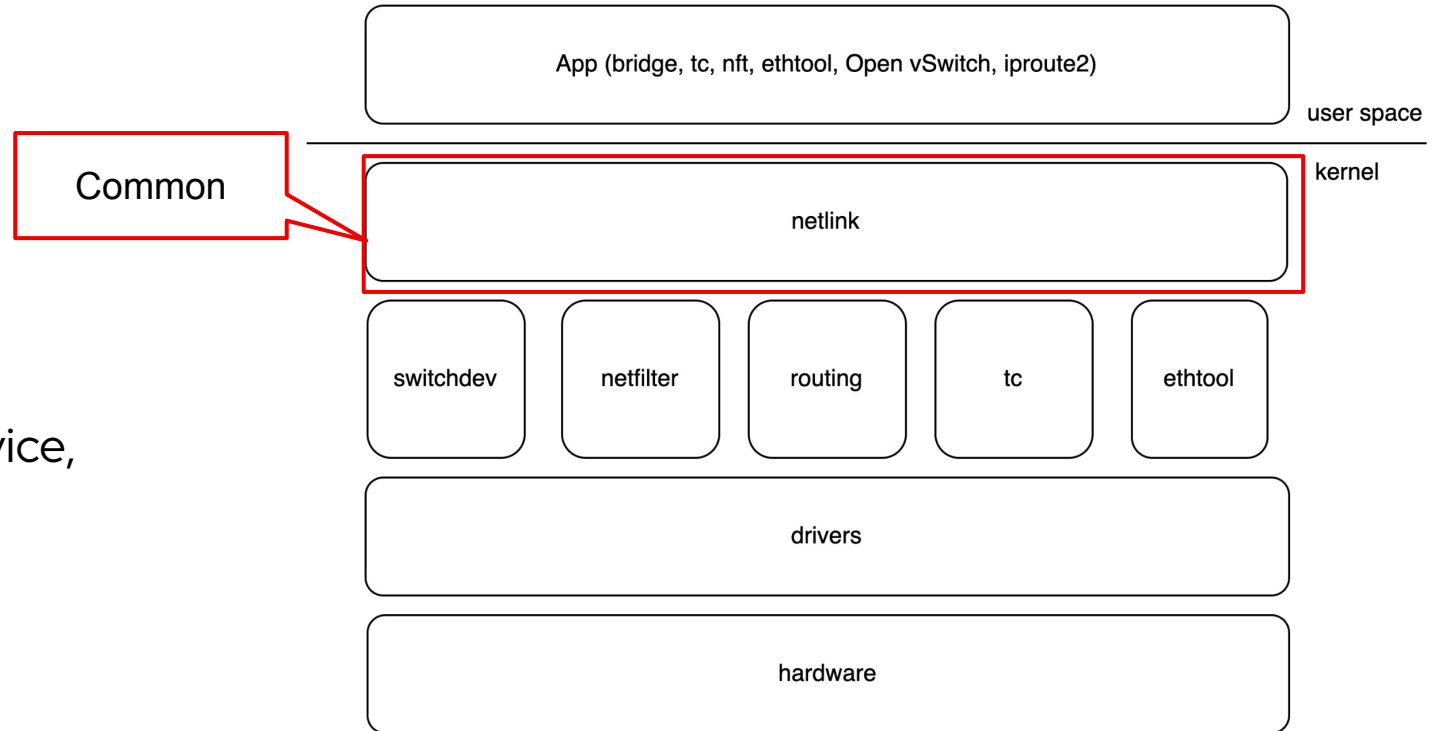
- Decouple hardware offload enablement from kernel driver development.
- A lot of different hardware offloading frameworks offered by the kernel - too many for vendors to integrate with.
- Limited/static offload capabilities offered with these traditional APIs.

## How?

1. Using a Netlink listener to enable an offload path entirely in user space by mirroring Network state.
2. Extending offloads with eBPF:
  - Provide a notification path to user space for kernel notifiers.
  - Enable new types of kernel offload beyond the current scope of what Kernel offload APIs support.

# Traditional Linux offload APIs

- ▶ TC
- ▶ Netfilter
- ▶ Ethtool
- ▶ Notifiers: switchdev, routing, netdevice, netevent, inetaddr\_notifier & inet6addr\_notifier.

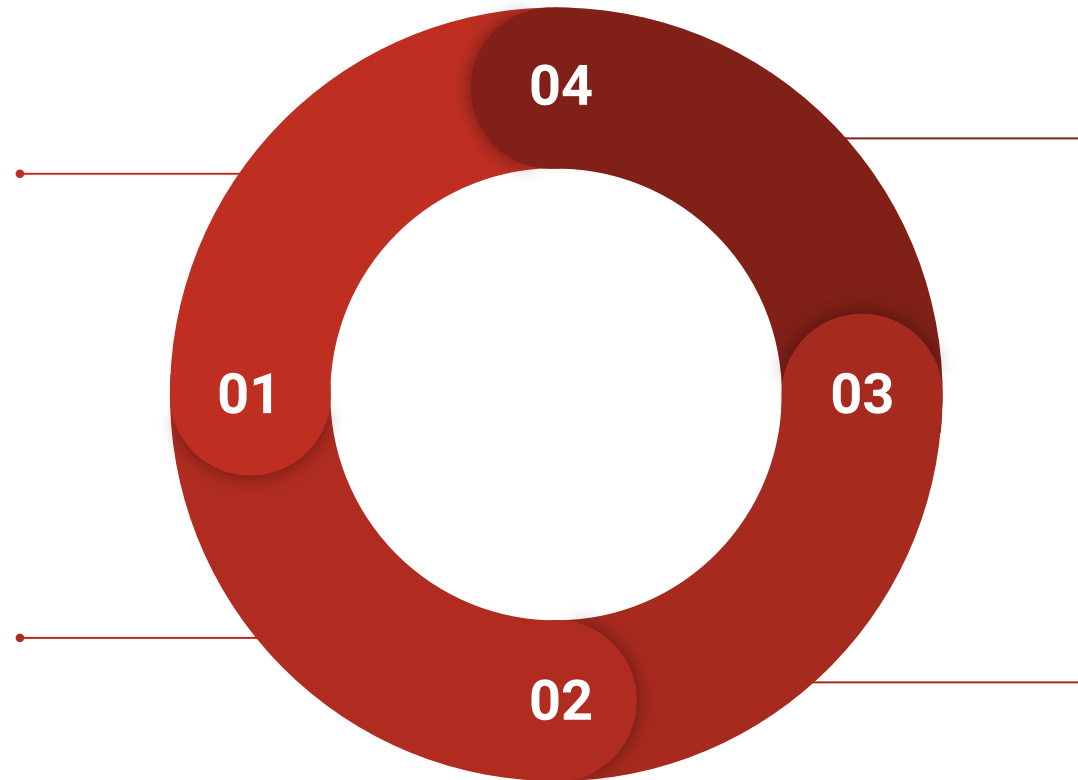


- **Tightly coupled with driver development and upstreaming (long process).**
- **Must support multiple APIs to accomplish a complete picture of offload support (heavy burden on vendors + impact on usability).**
- **Vendors and users are also limited by what these traditional APIs have to offer.**

# POC Activities/Streams

**Mirror Kernel Network state to userspace using a netlink listener to allow for hardware-accelerated route based forwarding.**

**Use eBPF to provide a notification path to user space for kernel notifiers.**



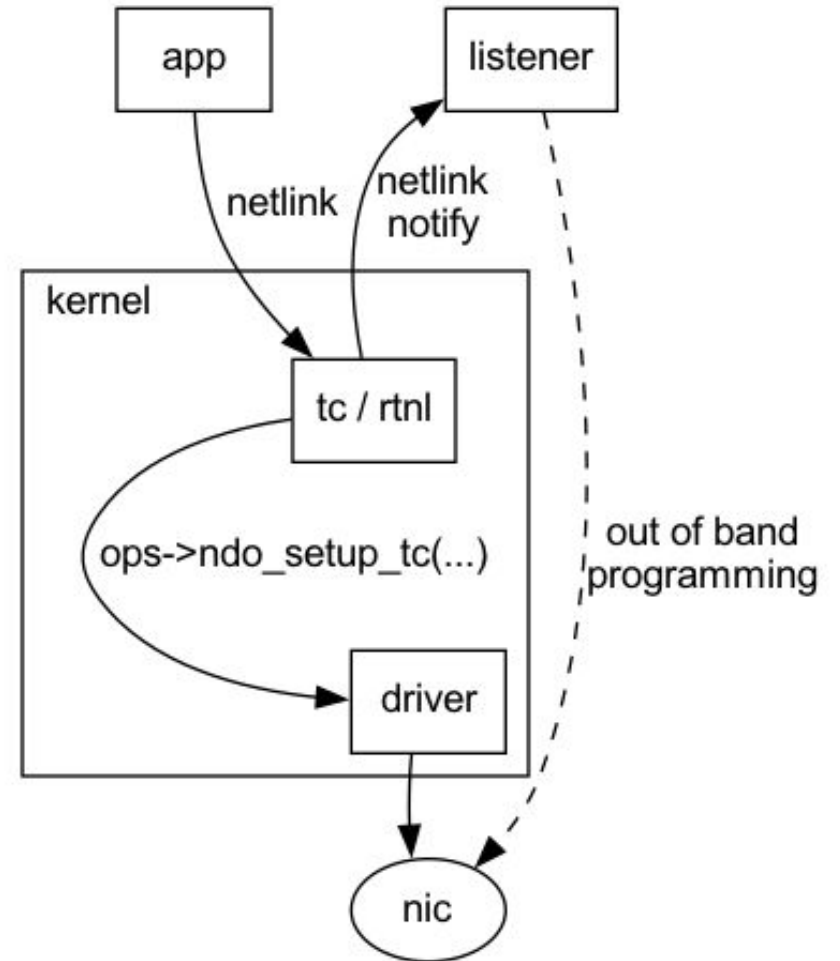
**Use eBPF to enable new types of kernel offload beyond the current scope of what Kernel offload APIs support.**

**Use eBPF to extend the offload functionality of kernel drivers.**

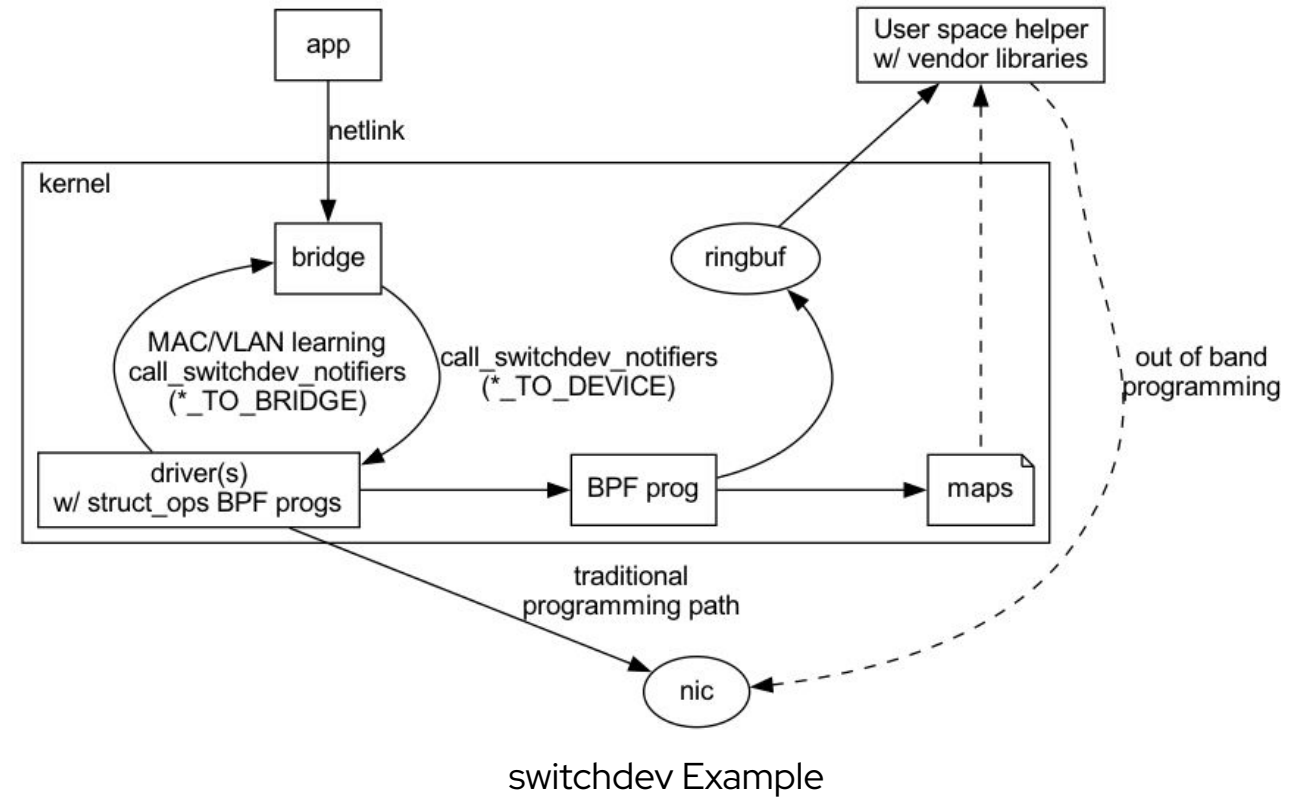
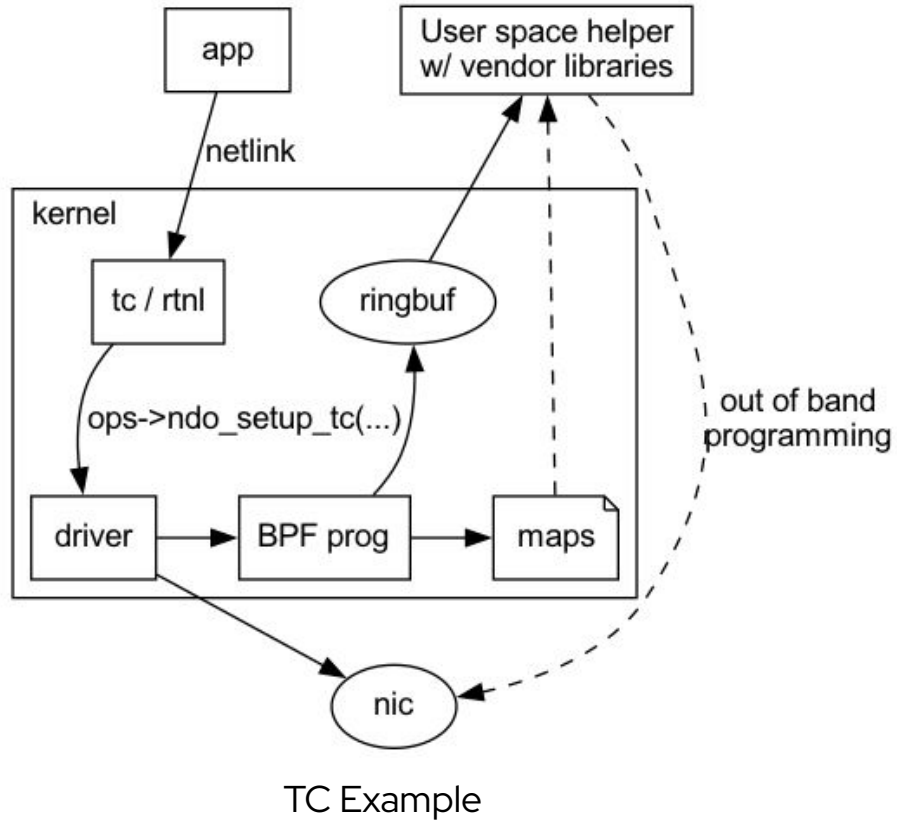
# Mirroring kernel networking state

All configuration of the Linux networking stack is done using netlink.

It is possible to listen for all application-driven configuration changes by registering for netlink notifications across all the relevant netlink message families.



# Extending offloads with eBPF



# Thank you

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