An Overview of Linux Networking Options

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Who is this guy?

- Husband, father, Jeeper, geek

- Blogger (11 years at http://blog.scottlowe.org)

- Author (7 books so far, 8th book in the works)

- Speaker (VMworld, Interop, OpenStack Summits, other events worldwide)

- Podcaster (The Full Stack Journey podcast)

- Engineering Architect at VMware, Inc.

- Jack of all trades, master of none

Agenda

- VLAN interfaces

- Network namespaces

- Virtual Ethernet (veth) interfaces

- MACVLAN interfaces

- Other cool stuff not covered here

- Q&A

VLAN interfaces: overview

- Allows you to have logical interfaces on multiple VLANs via a single physical interface

- Physical interface acts like a VLAN trunk (and must be connected to an appropriately configured switch port)

- Can place VLAN interfaces in a separate network namespace, if desired, to support unique IP routing tables per VLAN

Linux instance (default network namespace)

Namespace 1

IP routing table

Interface list

eth0.100

IP routing table

Interface list

eth0.200

eth0.300

eth0
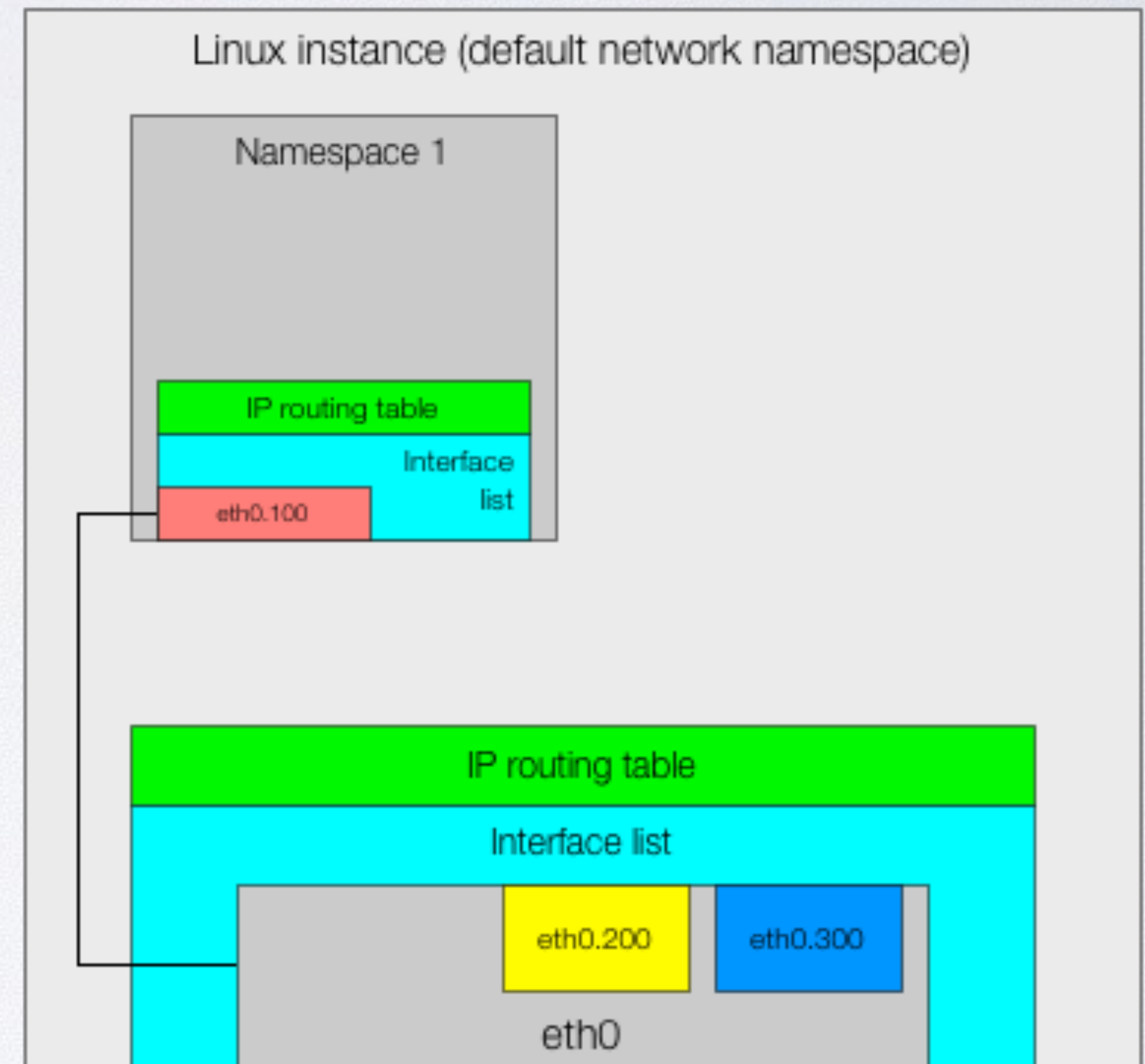
VLAN interfaces: commands involved

- **`ip link add link <dev> <name> type vlan id <ID>`** - Adds a VLAN interface

- **`ip link list`** - Lists interfaces

- **`ip link set <if> up/down`** - Configure a VLAN interface

- **`ip addr add <addr> dev <if>`** - Configure IP addressing on a VLAN interface

VLAN interfaces: demo

Network namespaces: overview

- Allows you to approximate VRF instances on Linux

- Scopes (limits) interfaces, routing tables, etc.

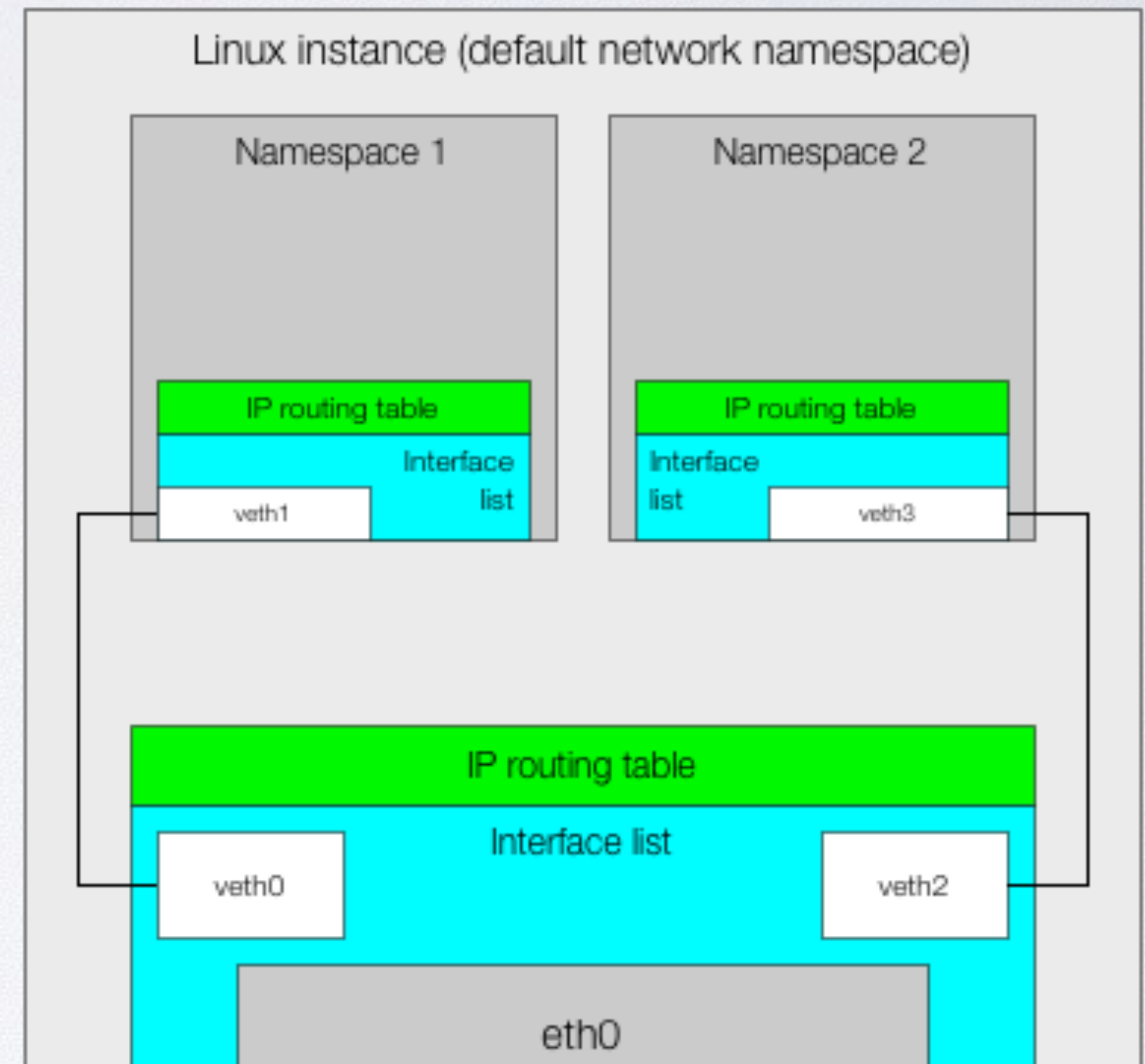- Used extensively by Linux containers (naturally)
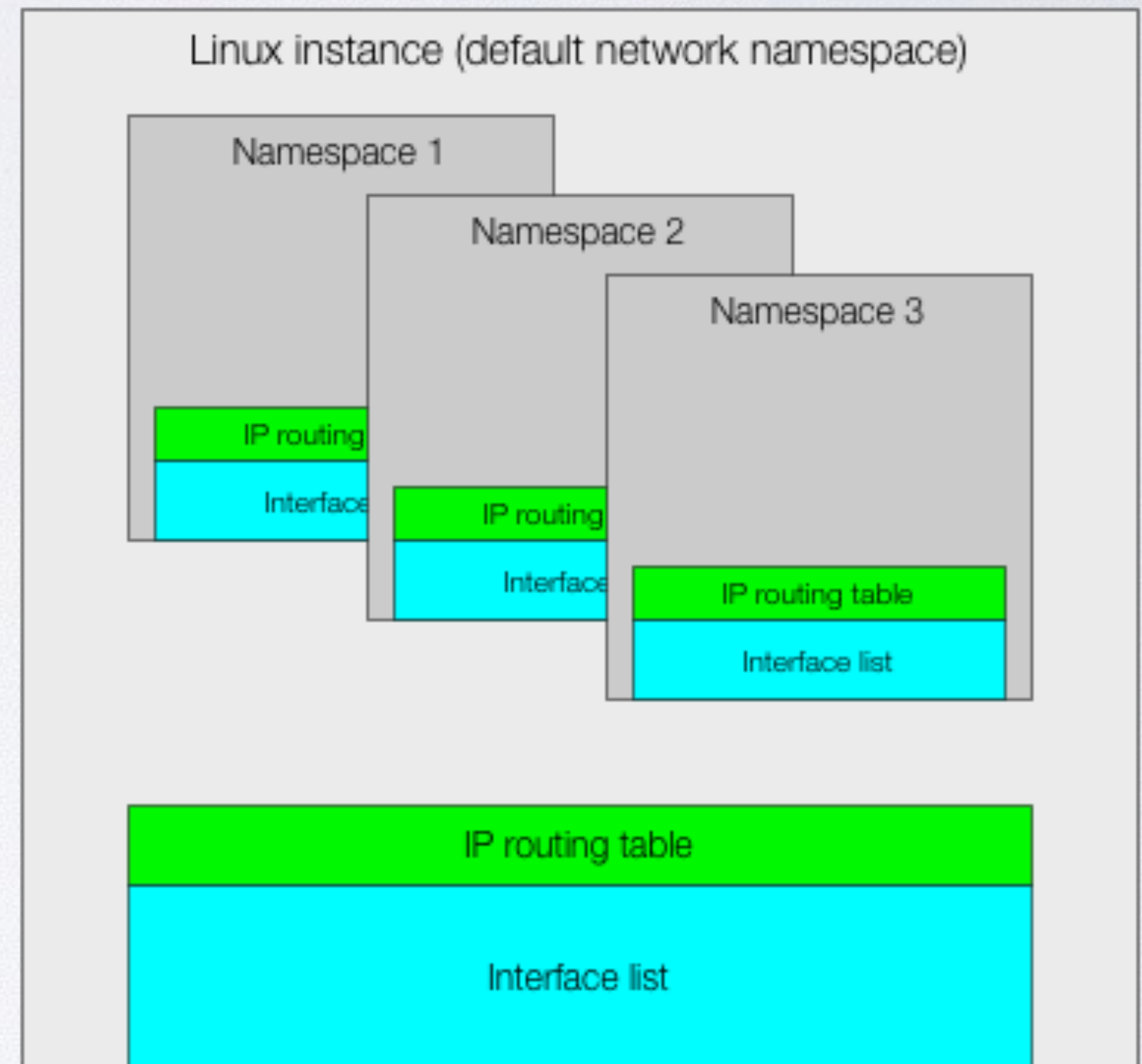
Network namespaces: commands involved

- **`ip netns list`** - Shows the network namespaces

- **`ip netns add <name>`** - Adds a network namespace

- **`ip netns del <name>`** - Removes a network namespace

- **`ip link set <if> netns <name>`** - Puts an interface into a network namespace

- **`ip netns exec <cmd>`** - Executes a command in the context of a specific network namespace

Network namespaces: demo

Virtual Ethernet (veth) interfaces: overview

- Virtual Ethernet (veth) interfaces are pairs of logical interfaces

- Traffic ingressing one veth interface egresses the peer interface

- Can be used to connect network namespaces together

Linux instance (default network namespace)

Namespace 1

Namespace 2

IP routing table

IP routing table

Interface list

veth1

Interface list

veth3

IP routing table
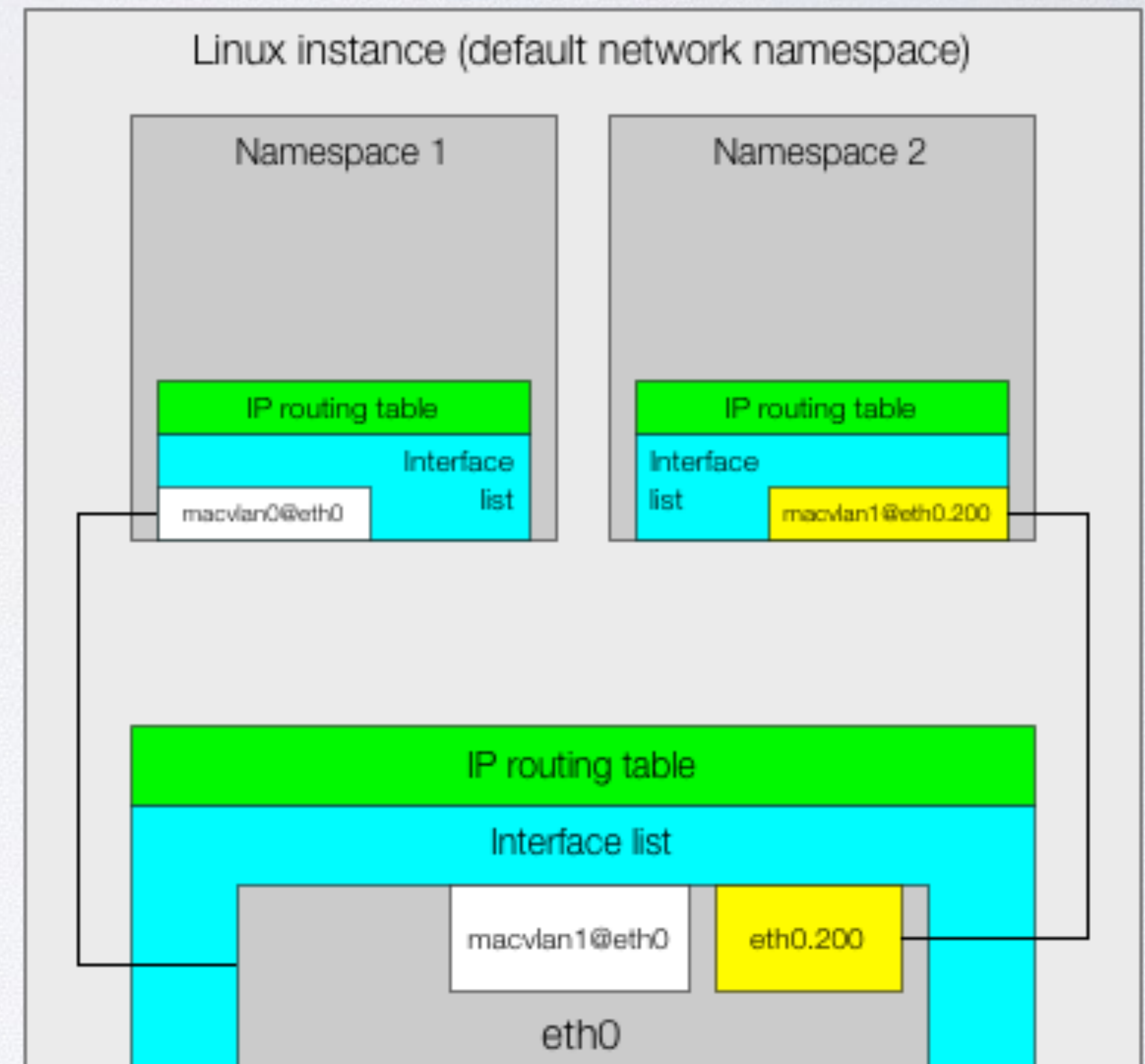
Interface list

veth0

veth2

eth0

Virtual Ethernet (veth) interfaces: commands involved

- **`ip link add <name> type veth peer name <name>`** - Create a veth pair

- **`ip link list`** - List interfaces

- **`ip link set <if> up/down`** - Configure a veth interface (peers managed independently)

- **`ip addr add <addr> dev <if>`** - Configure IP addressing on a veth interface (peers managed independently)

Virtual Ethernet (veth) interfaces: demo

MACVLAN interfaces: overview

- Allows you to host multiple logical interfaces on a single interface

- These logical interfaces are differentiated by MAC address

- Can host macvlan interfaces on physical interfaces or VLAN interfaces

- Can place macvlan interfaces in a separate network namespace, if desired

- Can use with KVM guest domains (macvtap)

MACVLAN interfaces: commands involved

- **`ip link add link <dev> <name> type macvlan mode <mode>`** - Add a macvlan interface

- **`ip link list`** - List interfaces

- **`ip link set <if> up/down`** - Configure a macvlan interface

- **`ip addr add <addr> dev <if>`** - Configure IP addressing on a macvlan interface

MACVLAN interfaces: demo

Other cool stuff not covered

- IPVLAN interfaces

  - L2 is very similar to MACVLAN interfaces

  - L3 is a different beast entirely

- Open vSwitch (OVS)

  - Highly programmable, multilayer virtual switch

  - Kernel module is part of upstream Linux kernel (since 3.3)

  - Can be used in conjunction with some of things discussed here (veth interfaces, as one example)

Questions & answers

Thank you!

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