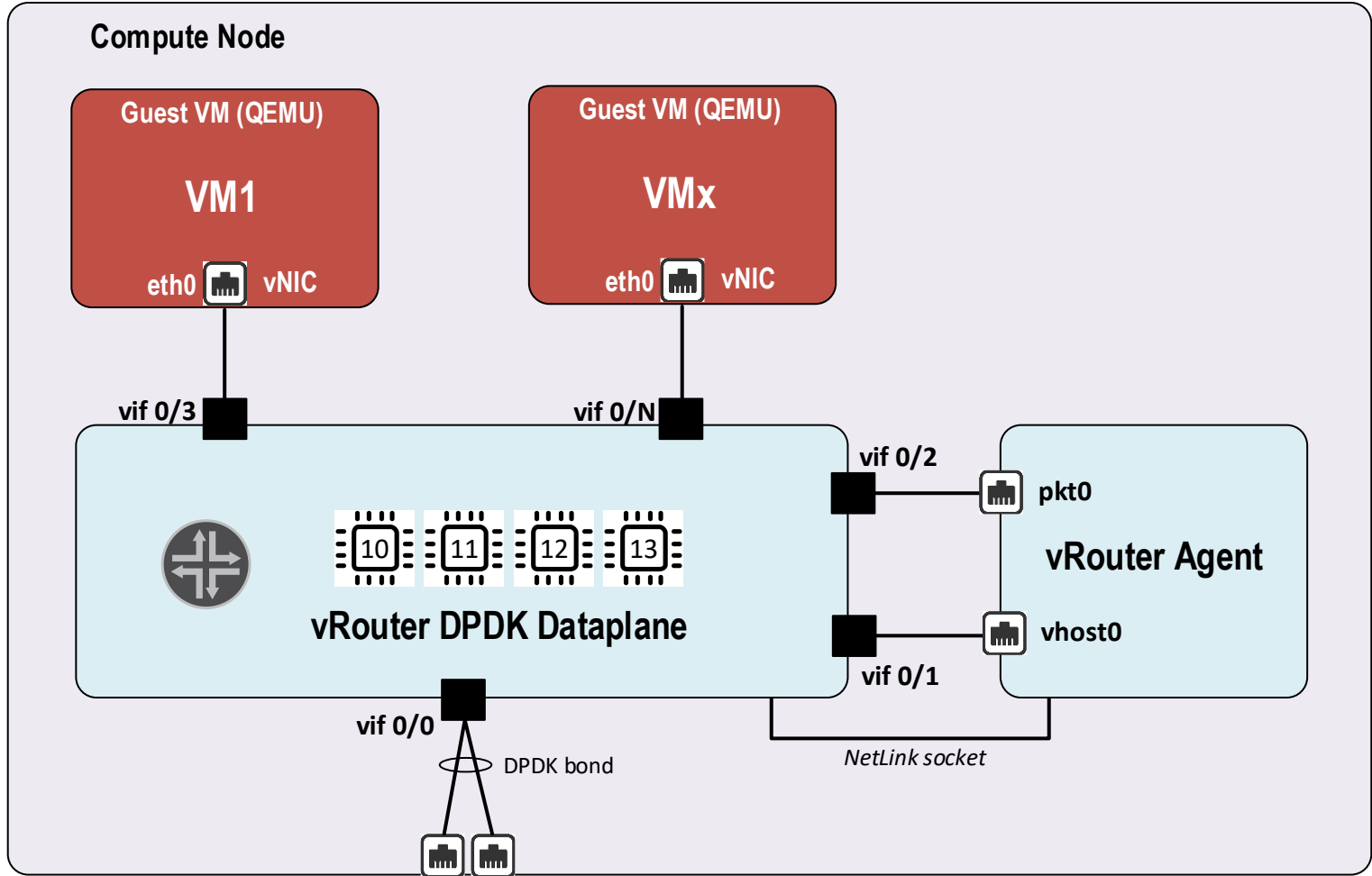


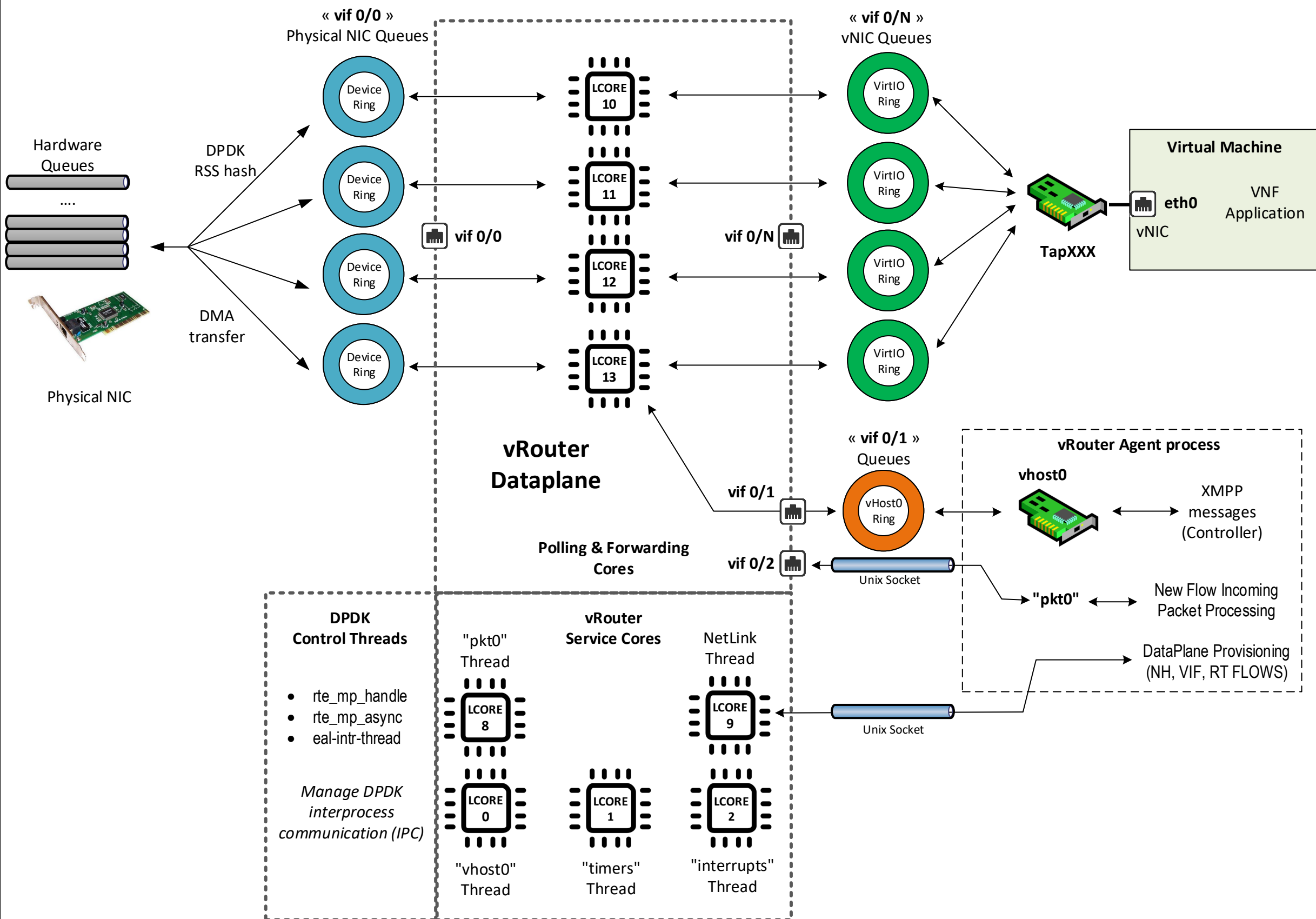
Title: vrouter overview

version: 1.0

date: 25/03/2020



Title: vRouter interfaces overview	
version: 1.0	date: 27/03/2020

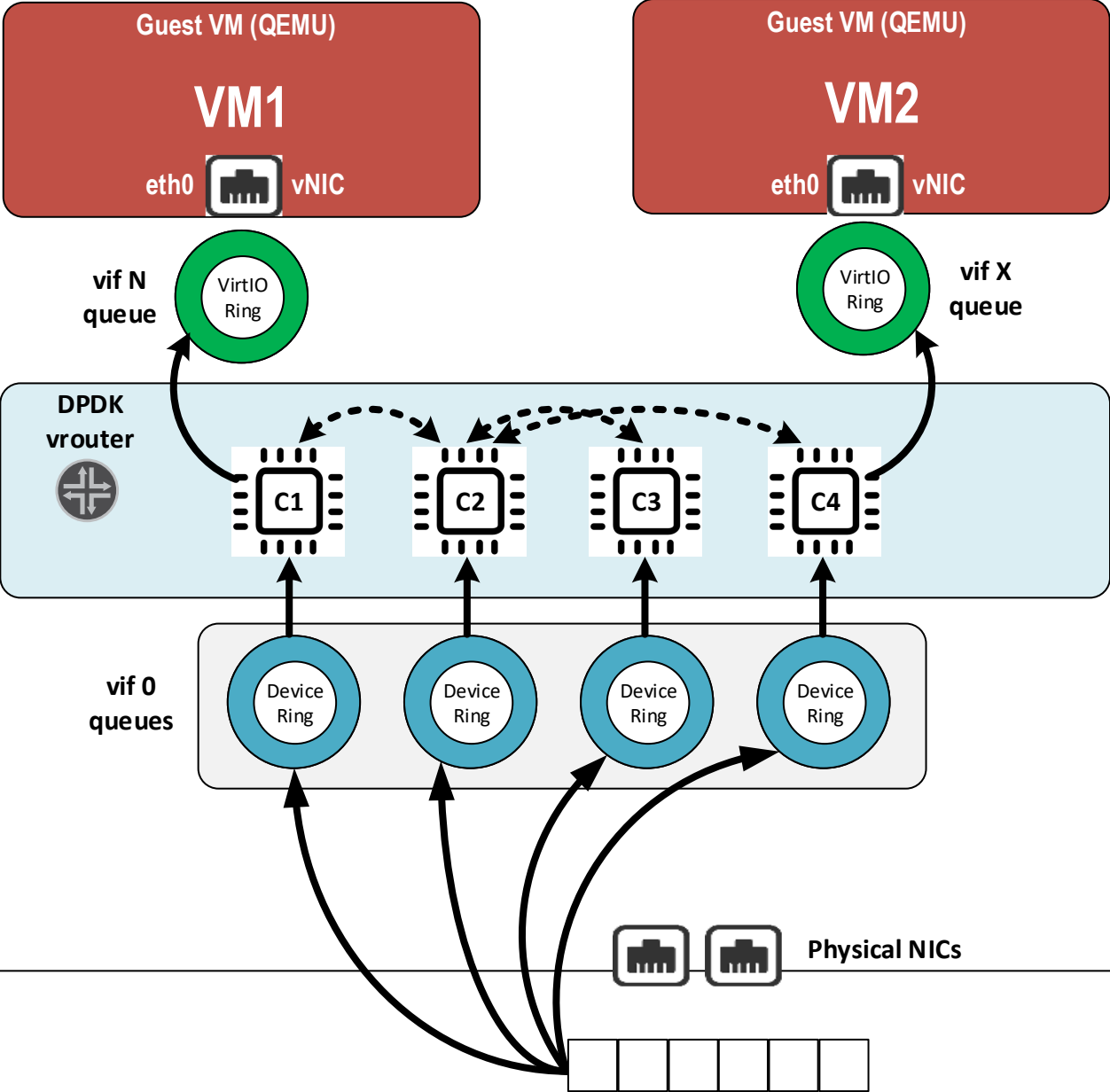


Title: vRouter Internal Architecture

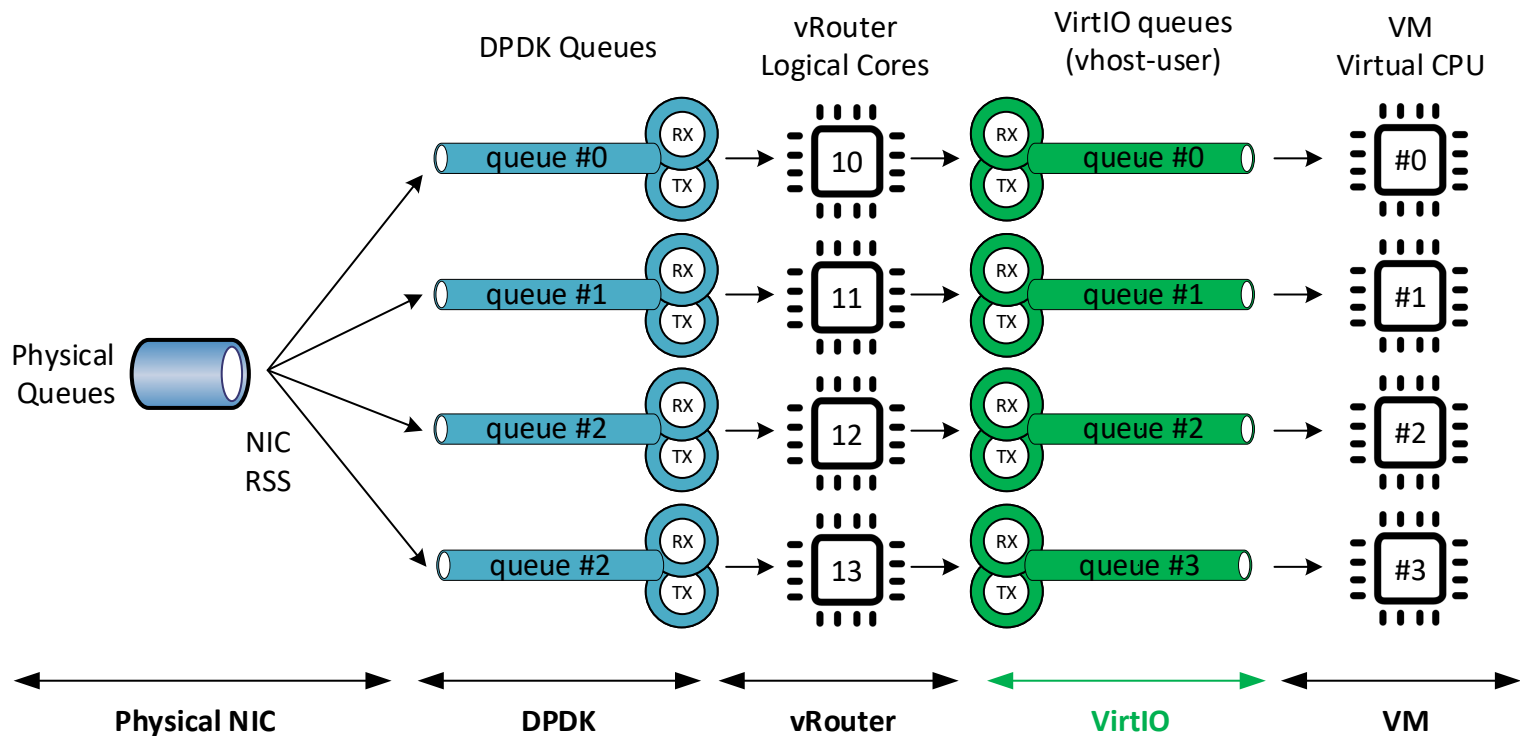
version: 1.1

date: 22/05/2020

Compute Node



Title: DPDK Packet Processing Overview	
version: 1.0	date: 25/03/2020



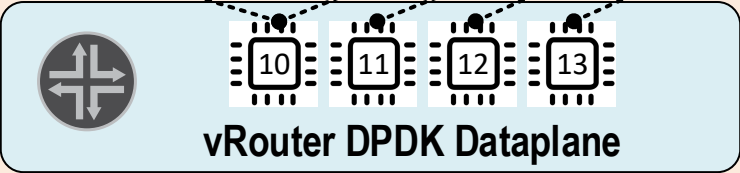
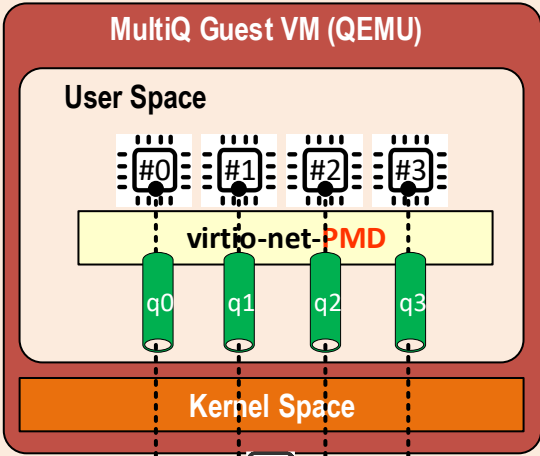
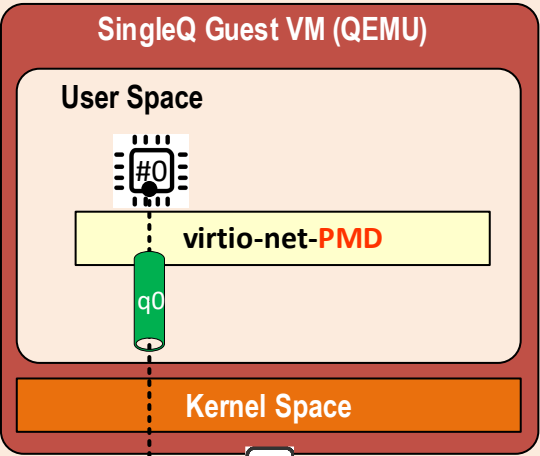
Title: DPDK End to End Packet Processing

version: 1.0

date: 27/03/2020

Compute Node

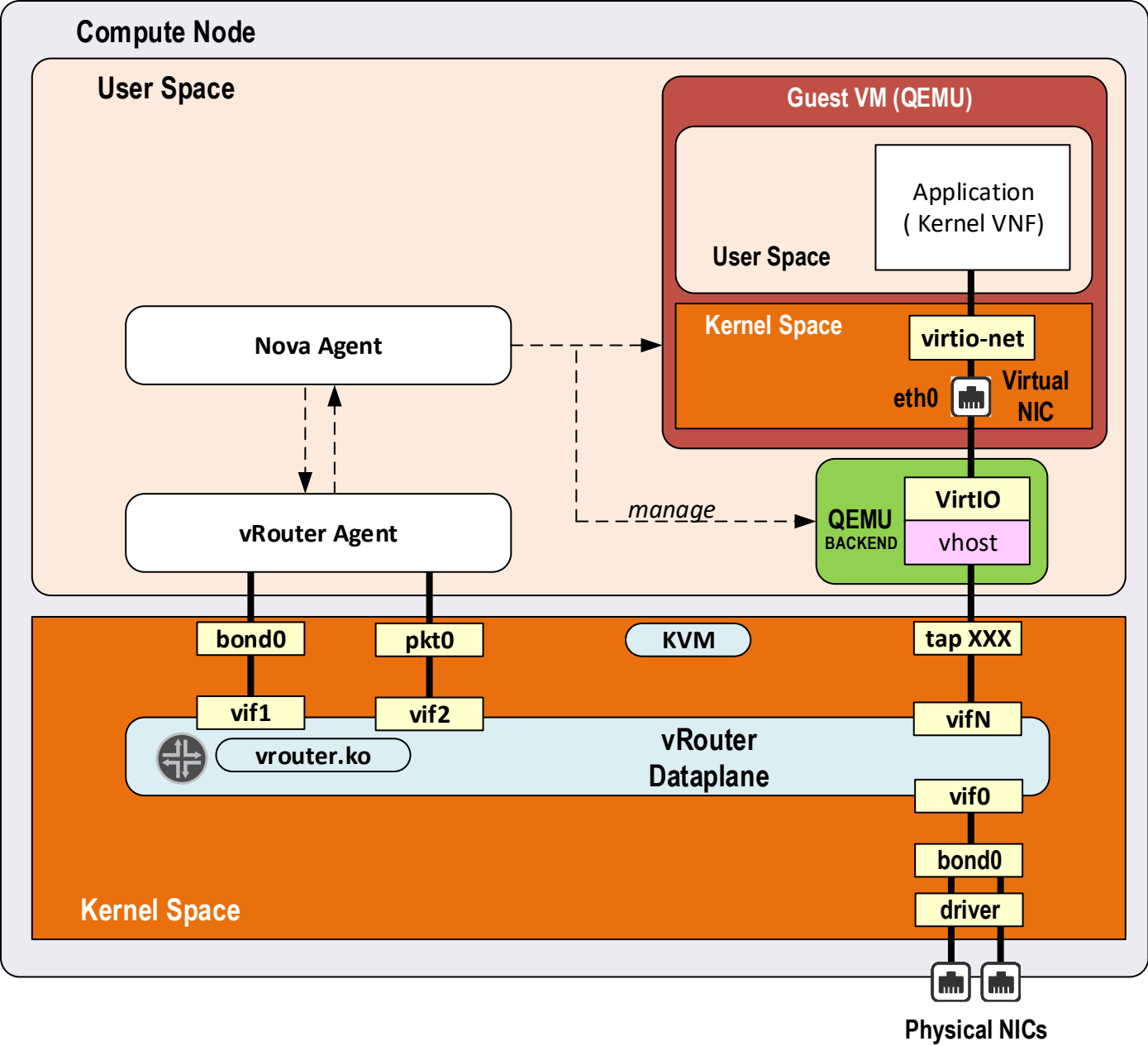
User Space



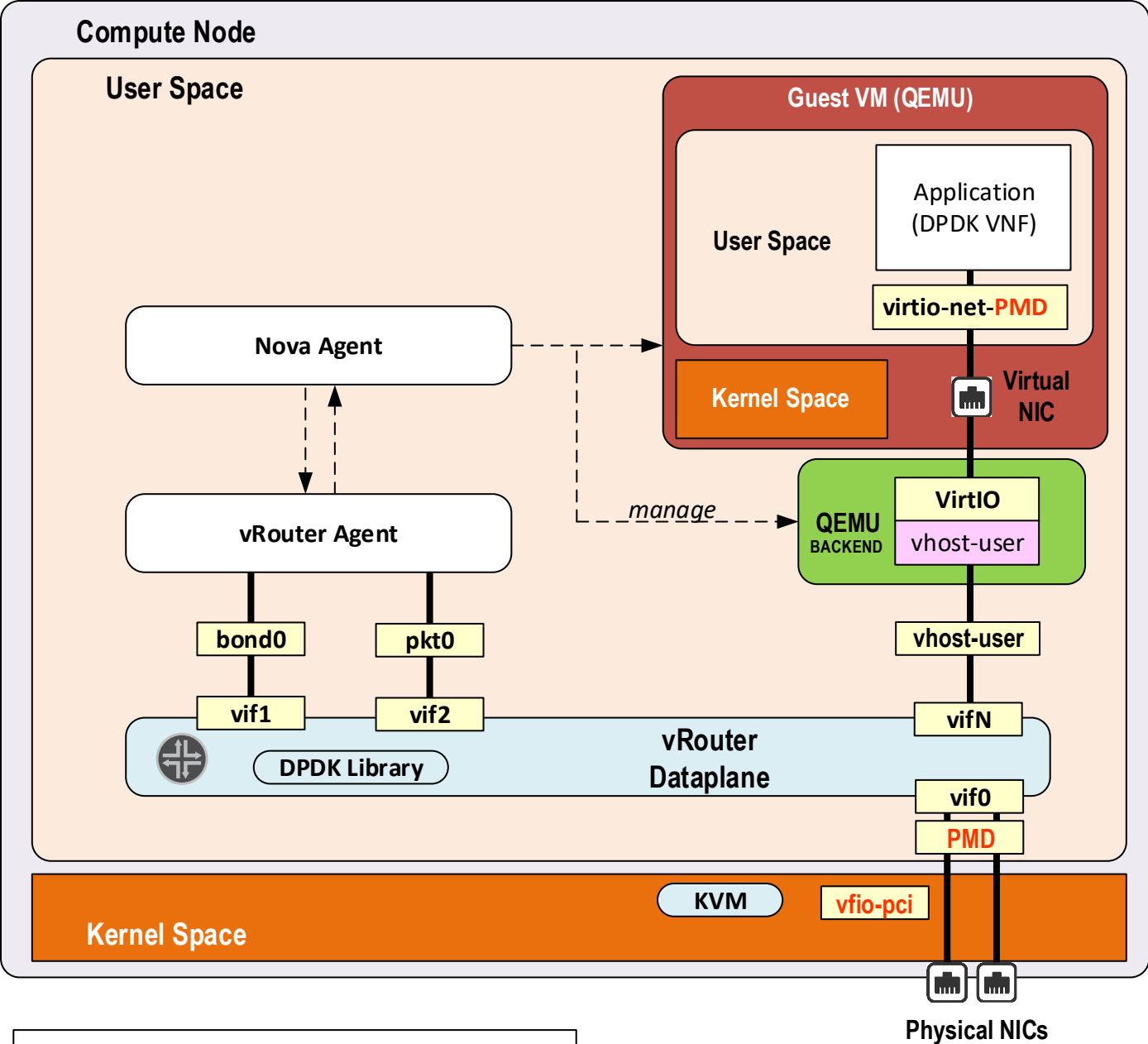
Title: SingleQ versus MultiQ VNF

version: 1.0

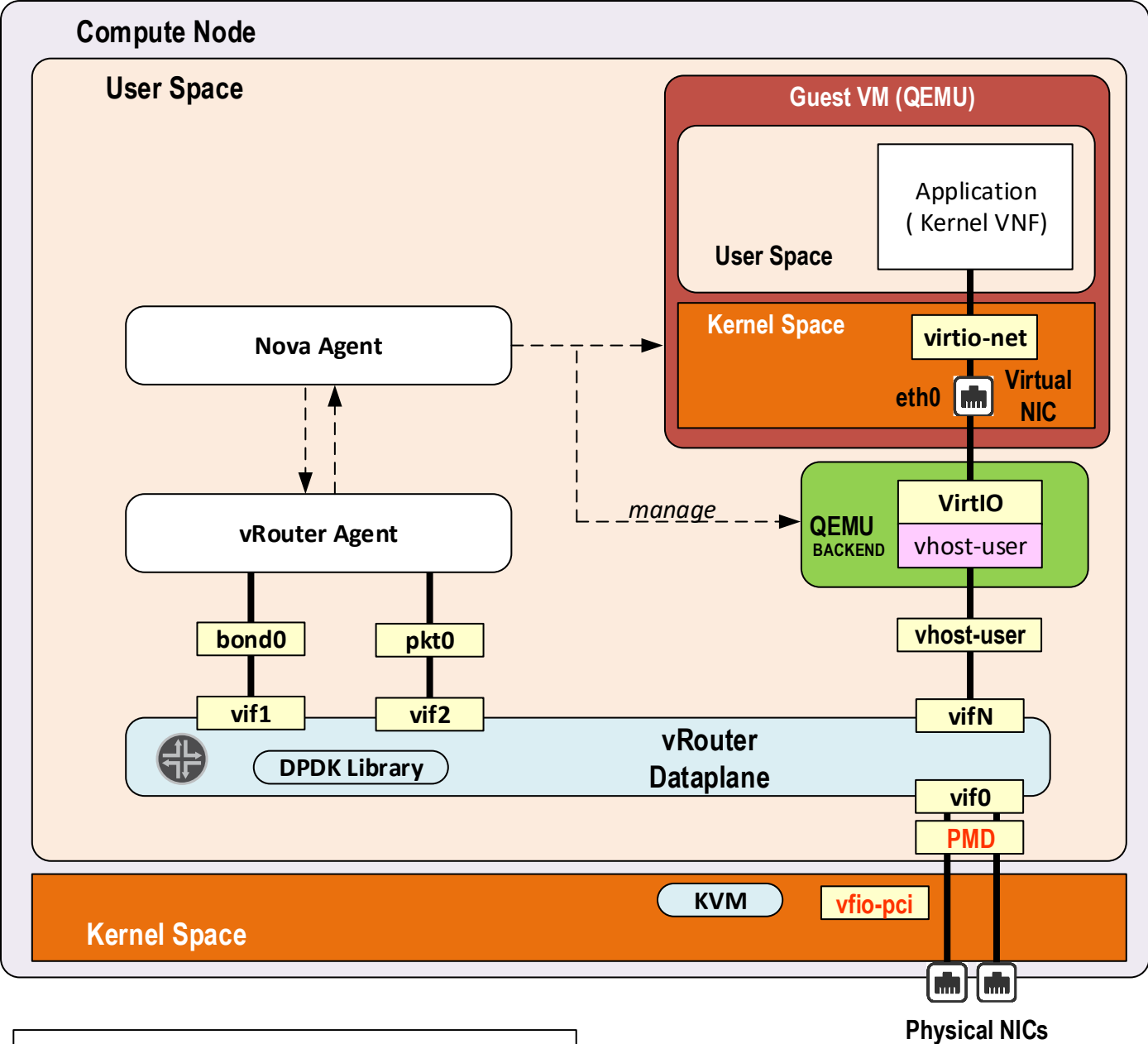
date: 27/03/2020



Title: Kernel vRouter details	
version: 1.0	date: 25/03/2020



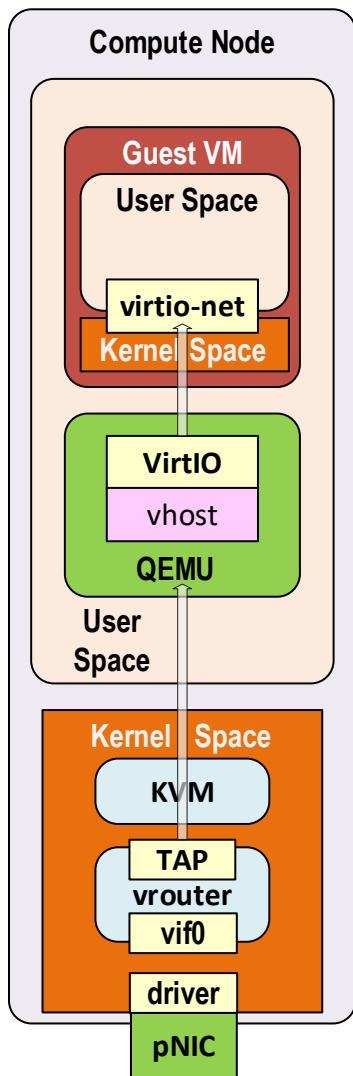
Title: DPDK vRouter details (DPDK App)	
version: 1.0	date: 25/03/2020



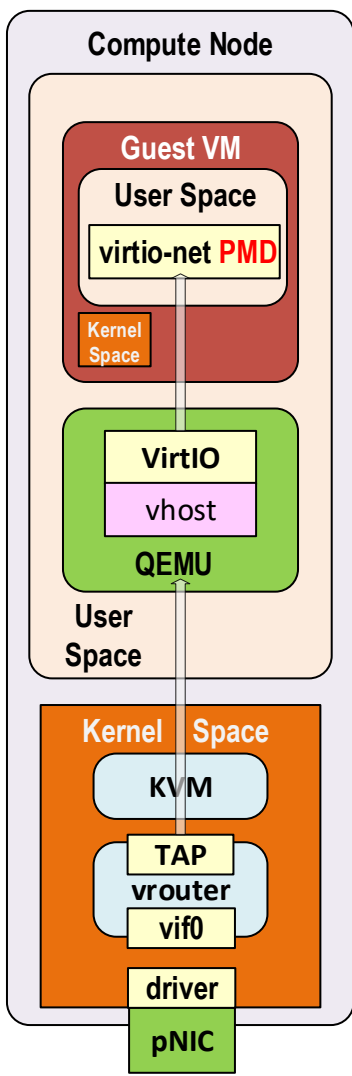
Title: DPDK vRouter details (Kernel App)	
version: 1.0	date: 25/03/2020

Kernel Mode vRouter

Virtio-net (Kernel)

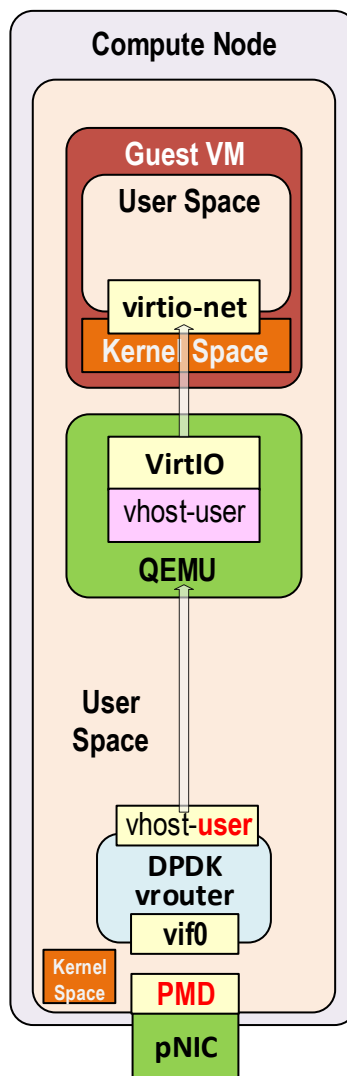


DPDK (user)

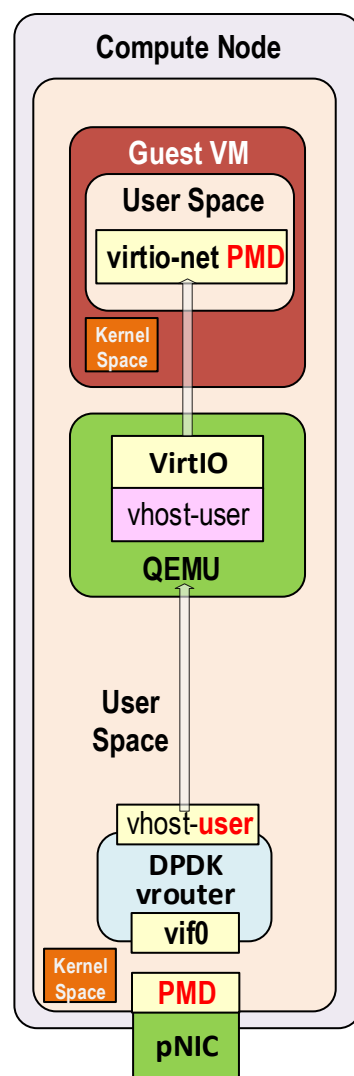


DPDK vRouter

Virtio-net (Kernel)



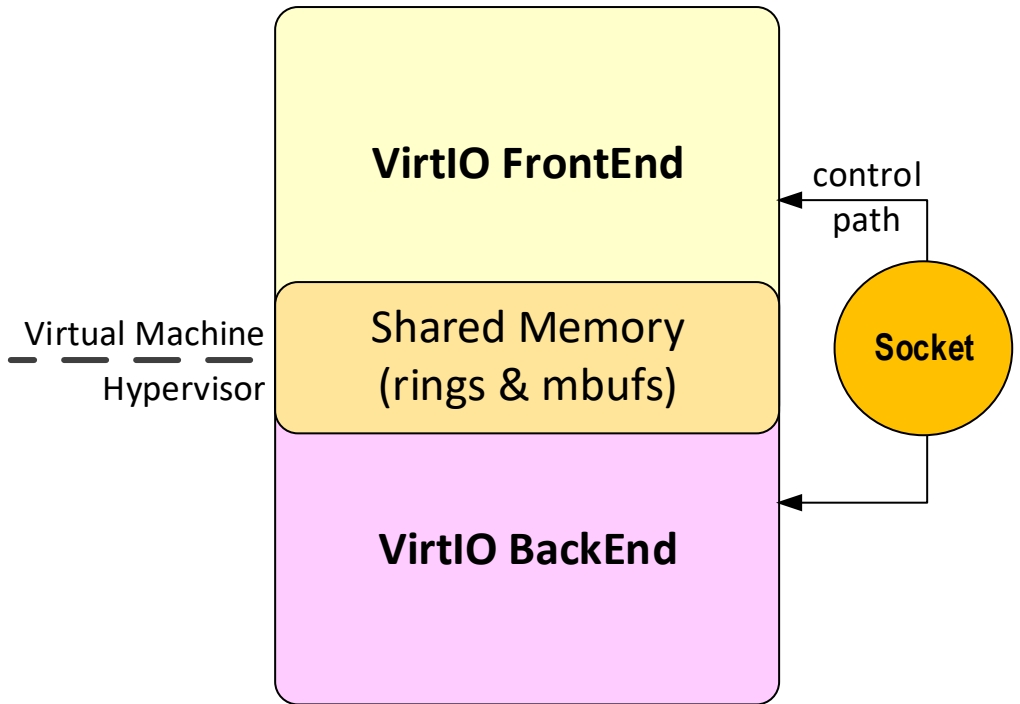
DPDK (user)



Title: Kernel vRouter All Cases

version: 1.1

date: 22/05/2020



Title: VirtIO overview	
version: 1.0	date: 25/03/2020

Compute Node

User Space

Shared Memory

TX
Ring

RX
Ring

Mempool

virtio (backend)

vHost-user (server)

vifN

vRouter
Dataplane

IOCTL

socket

Guest VM (QEMU)

User Space

eth0



Virtual
NIC

Kernel Space

virtio-net driver
(virtio frontend)

vHost-user (client)

ioevent FD

IRQ FD

Kernel Space

cuse

kvm.ko

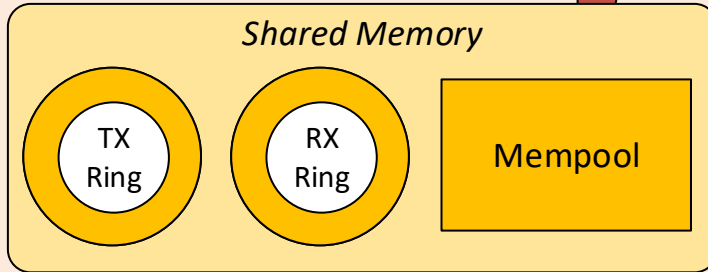
VirtIO details (Kernel App)

version: 1.0

date: 25/03/2020

Compute Node

User Space



virtio (backend)

vHost-user (server)

vifN

vRouter
Dataplane

socket

Guest VM (QEMU)

User Space

virtio-net **PMD**
(virtio frontend)

eth0



Virtual
NIC

Kernel Space

vHost-user (client)

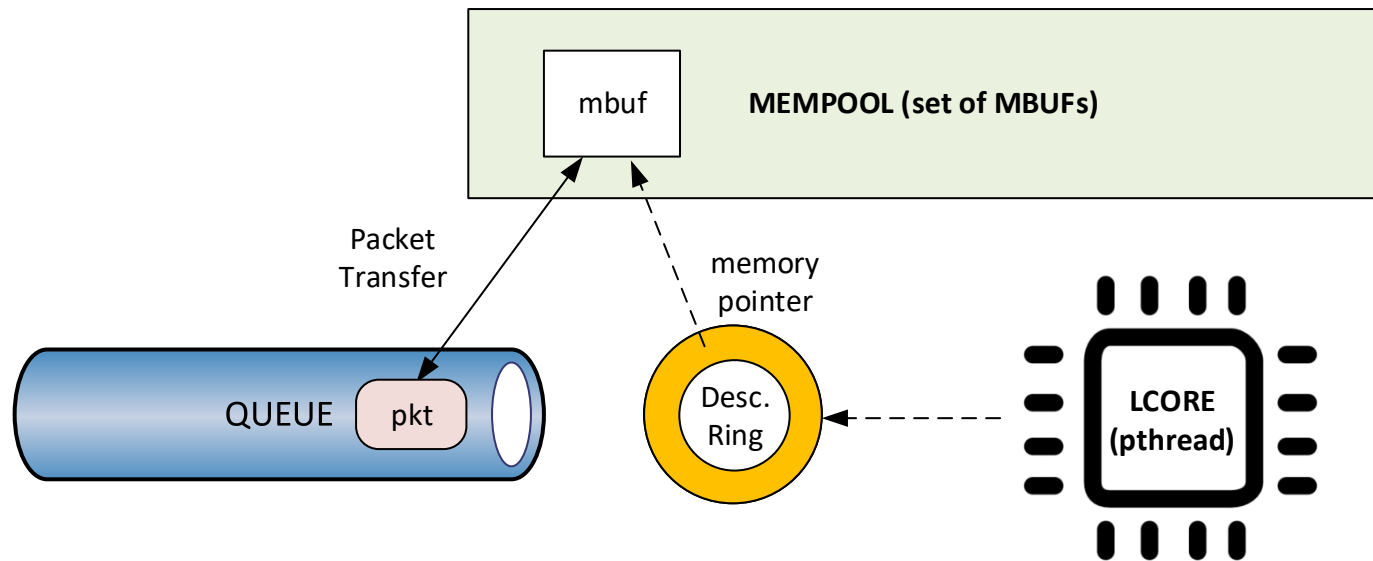
Kernel Space

kvm.ko

VirtIO details (DPDK App)

version: 1.0

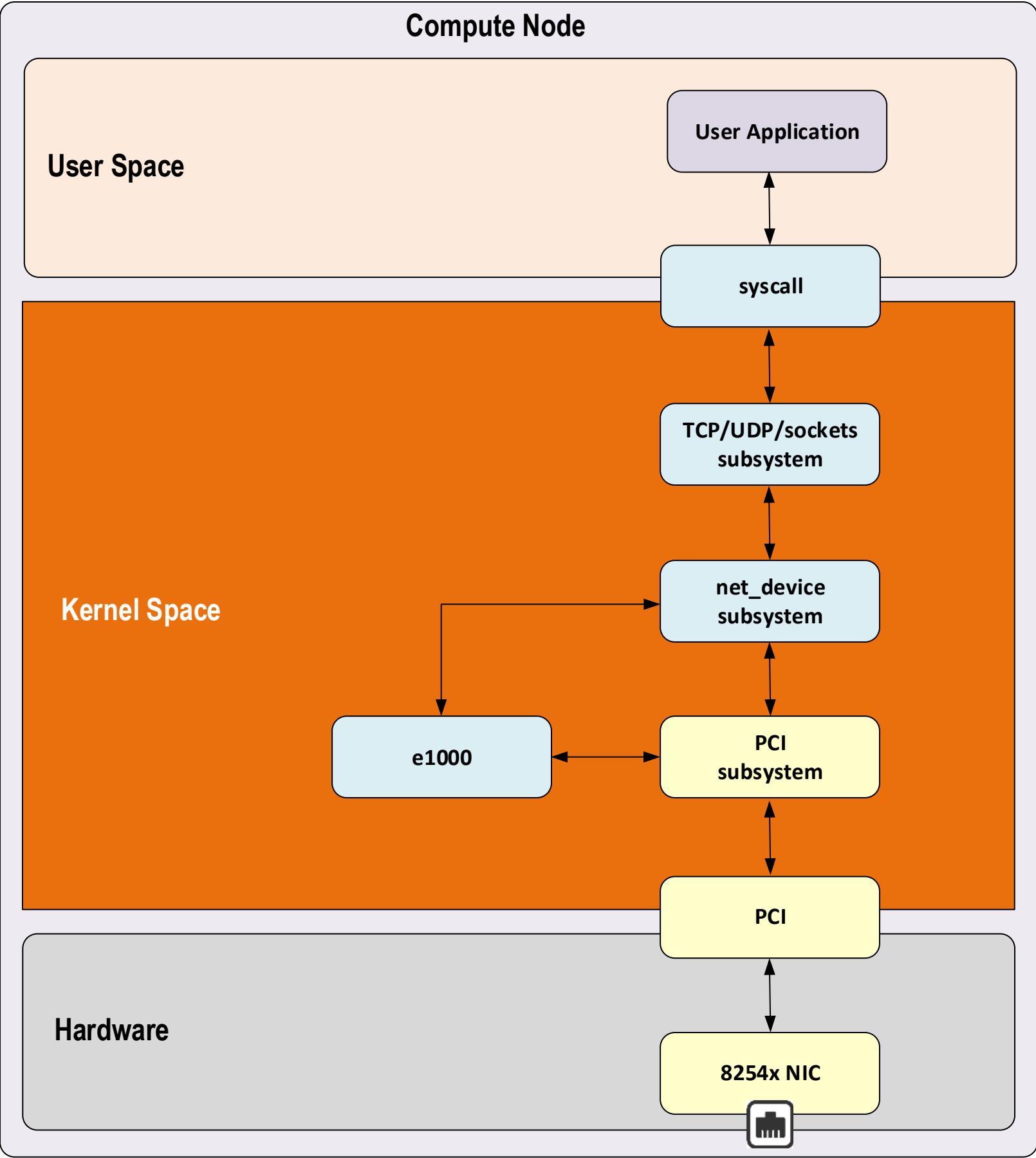
date: 25/03/2020



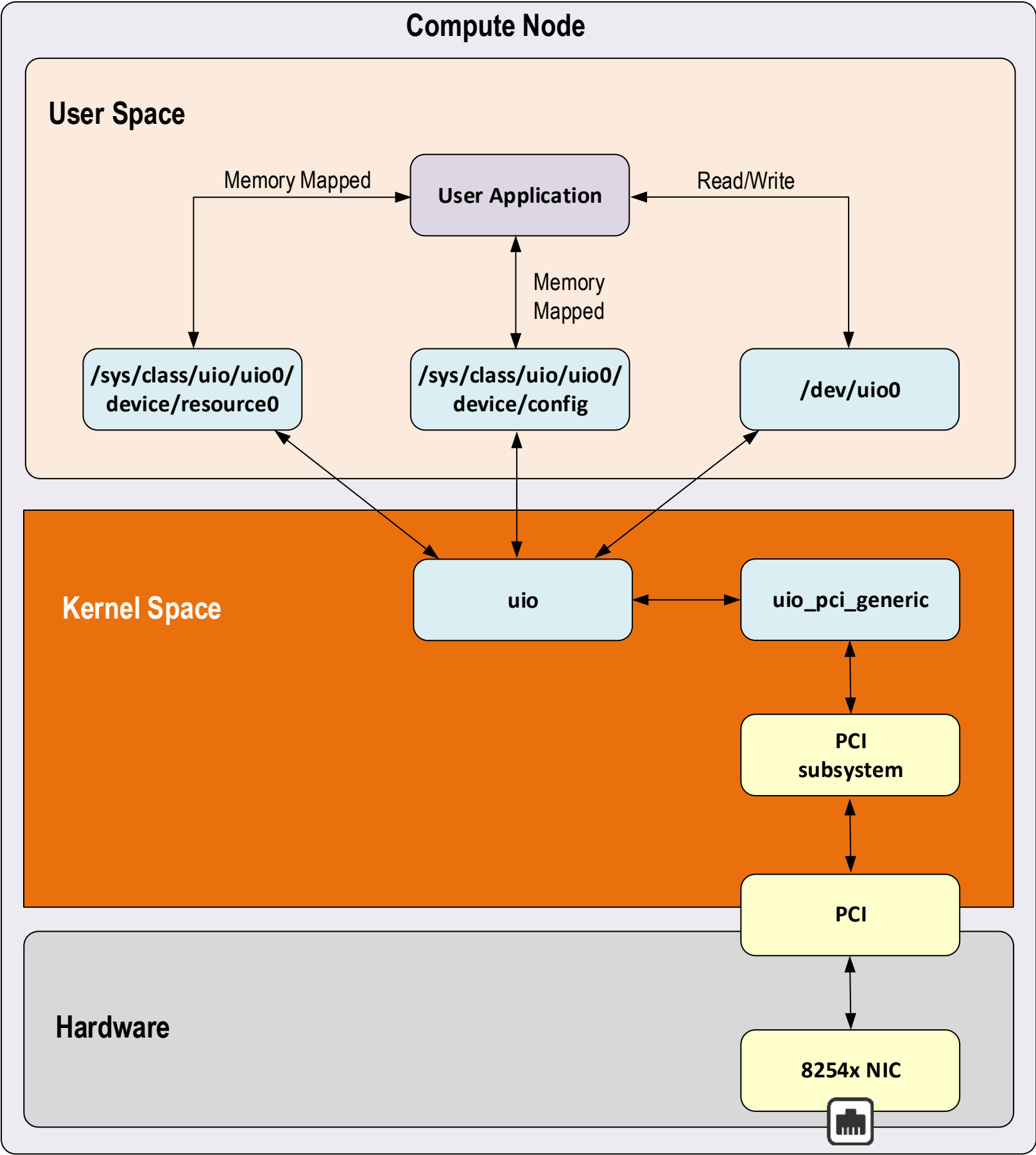
Title: DPDK High Level Components

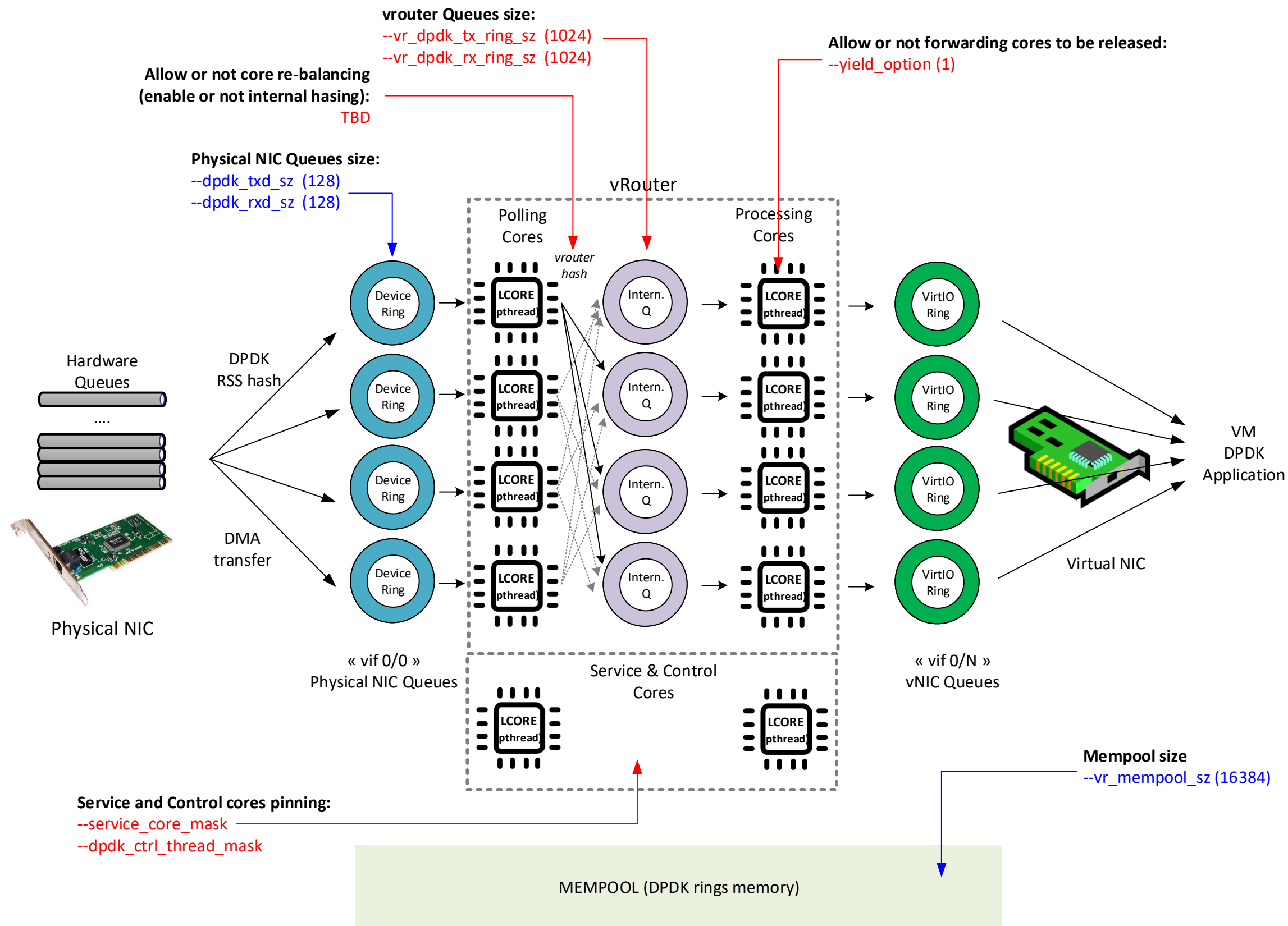
version: 1.0

date: 25/03/2020

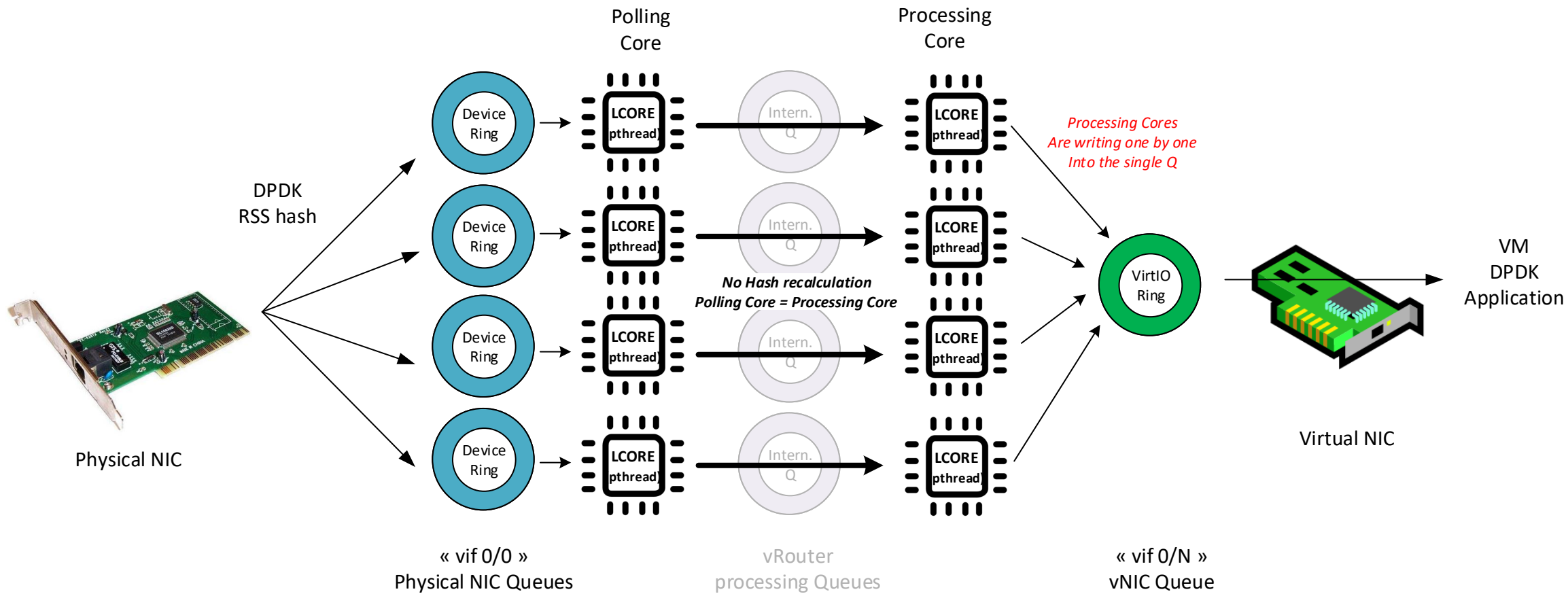


Title: NIC Kernel Driver	
version: 1.0	date: 30/05/2020





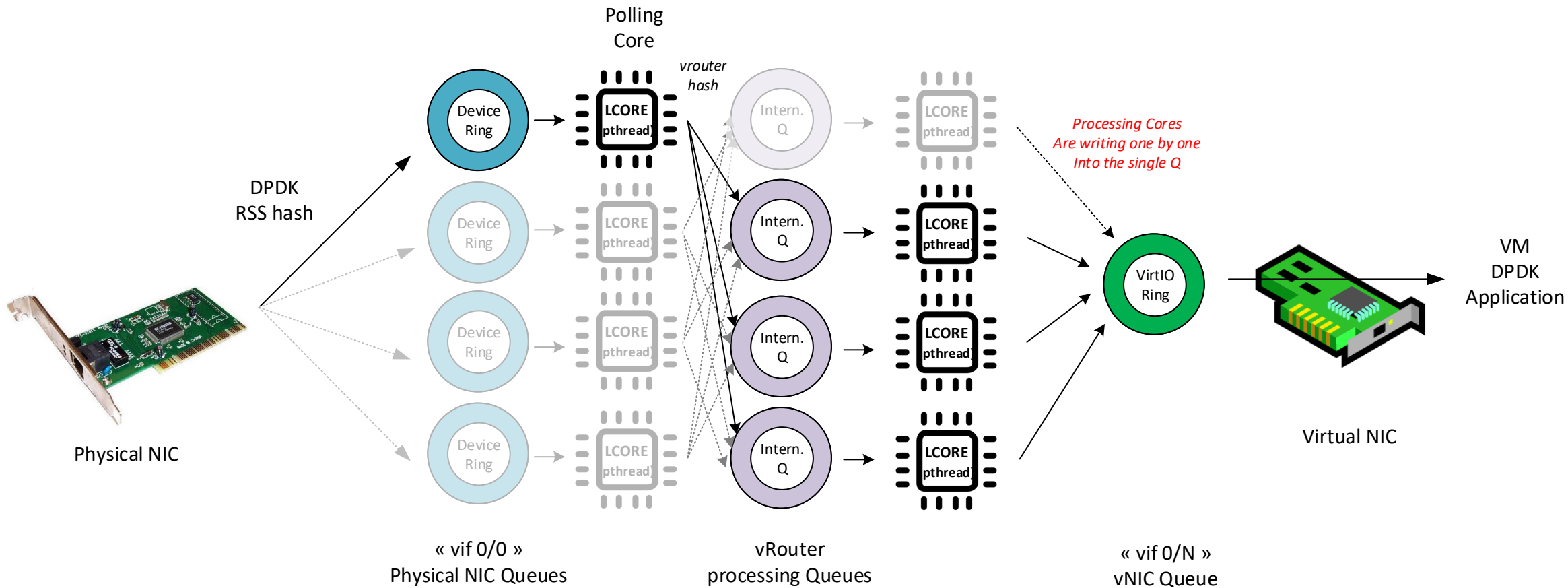
Title: vRouter Architecture	
version: 1.1	date: 22/05/2020



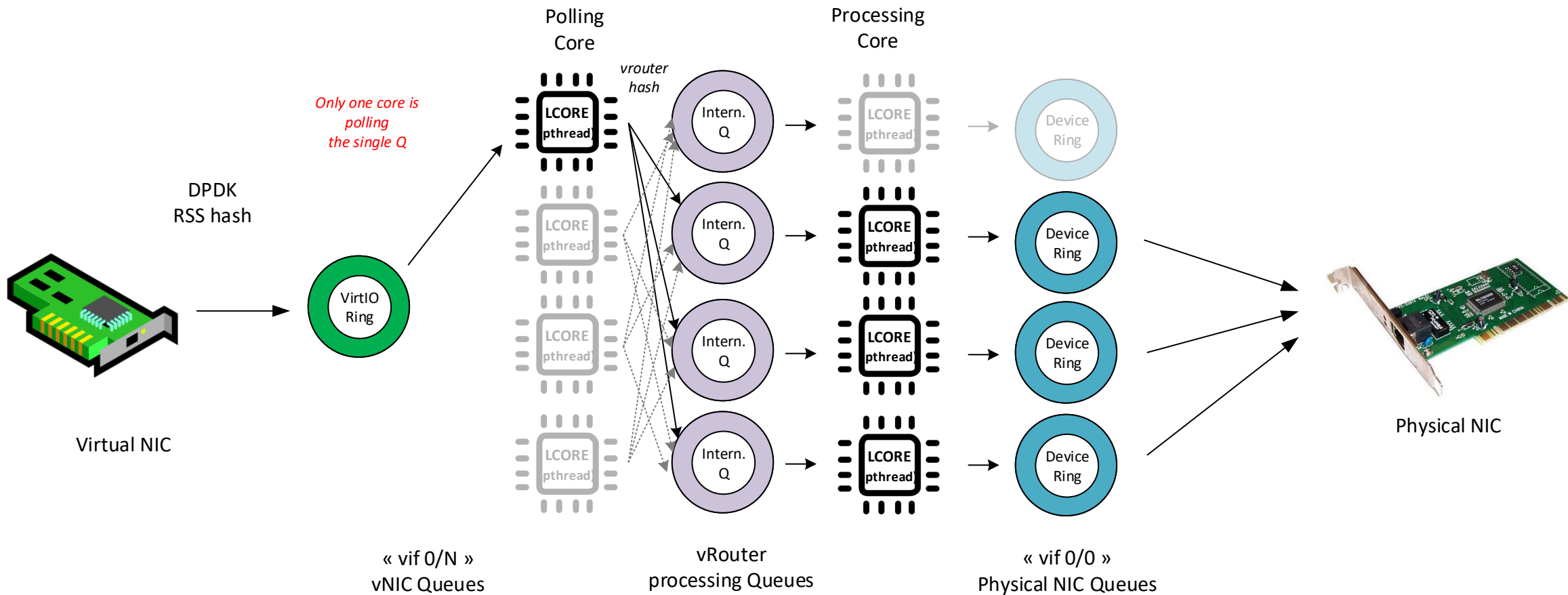
Title: UDP to SingleQ

version: 1.0

date: 25/03/2020



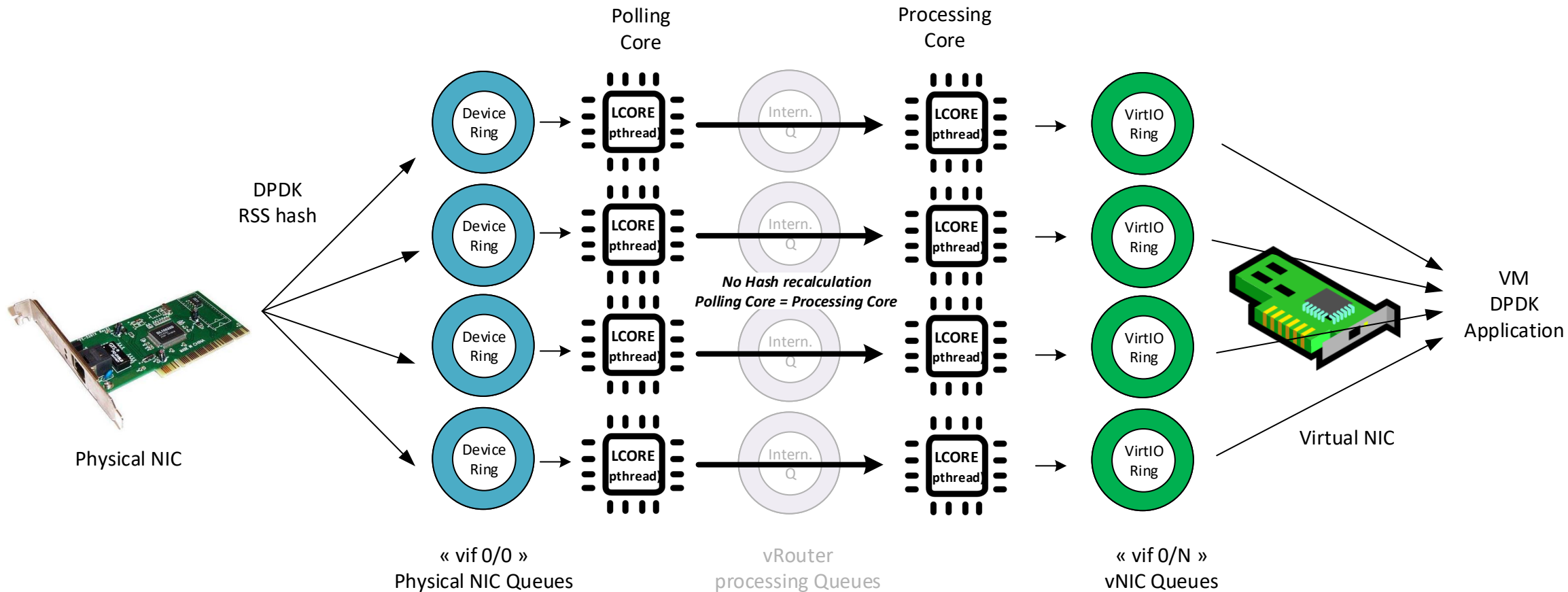
Title: GRE to SingleQ	
version: 1.0	date: 25/03/2020



Title: SingleQ to Underlay

version: 1.0

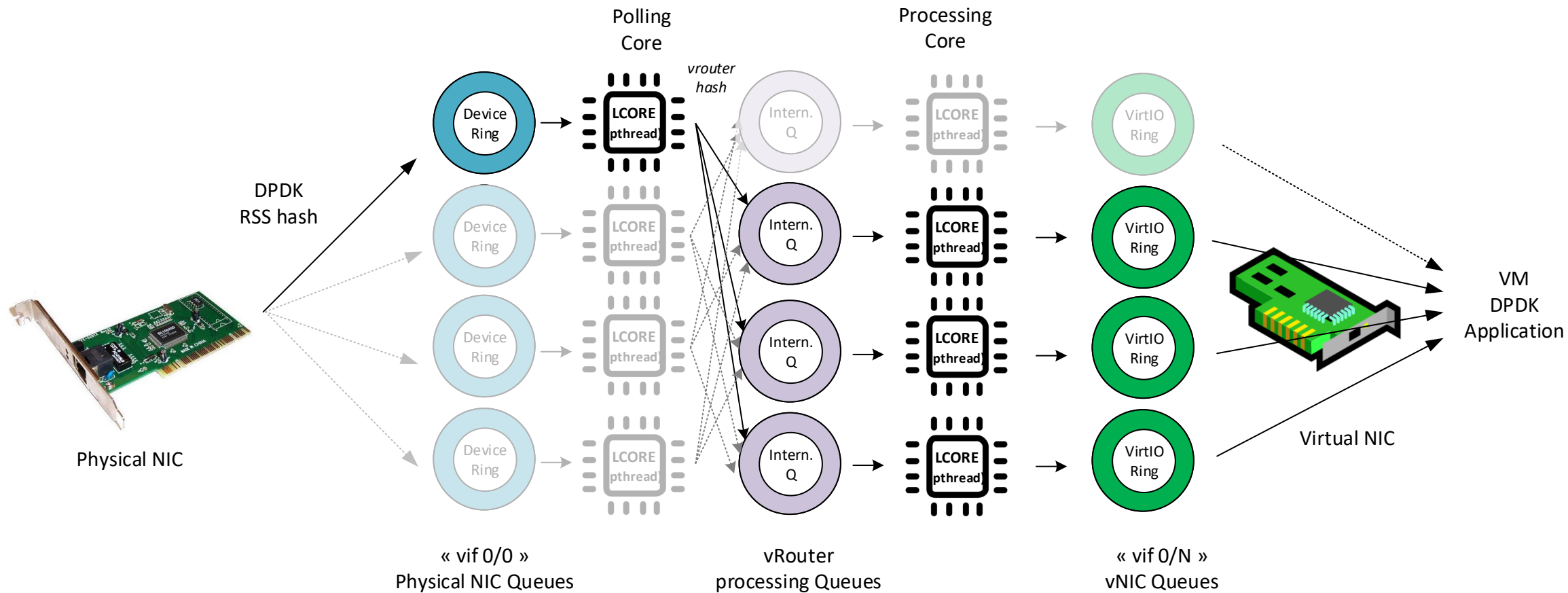
date: 25/03/2020



Title: UDP to MultiQ

version: 1.0

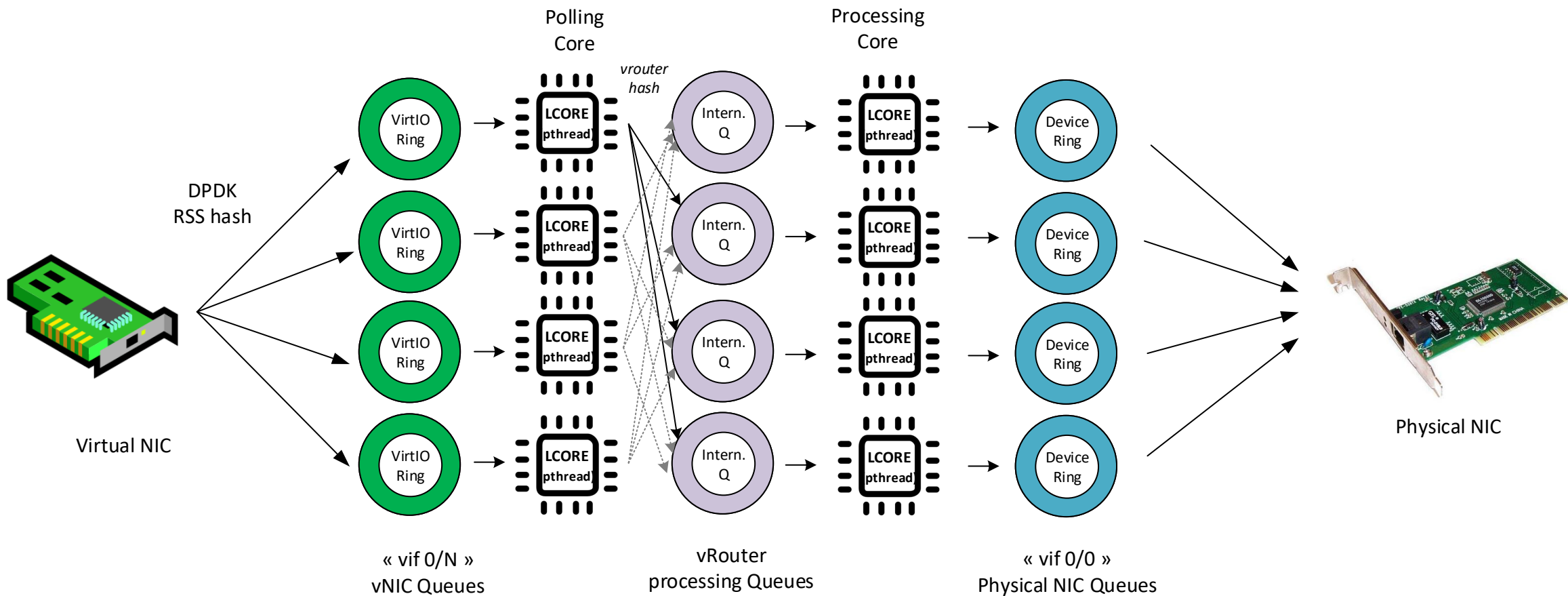
date: 25/03/2020



Title: GRE to MultiQ

version: 1.0

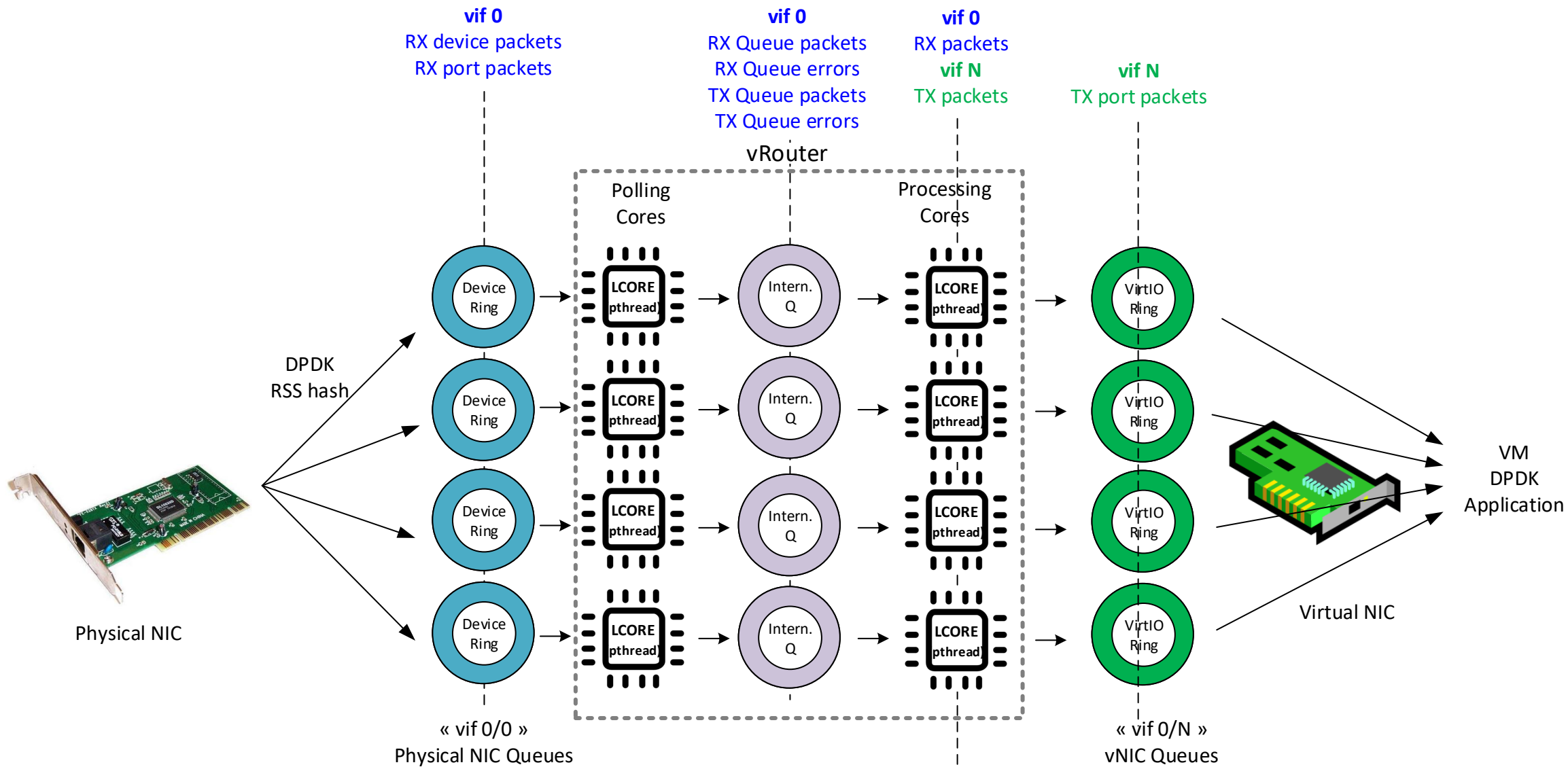
date: 25/03/2020



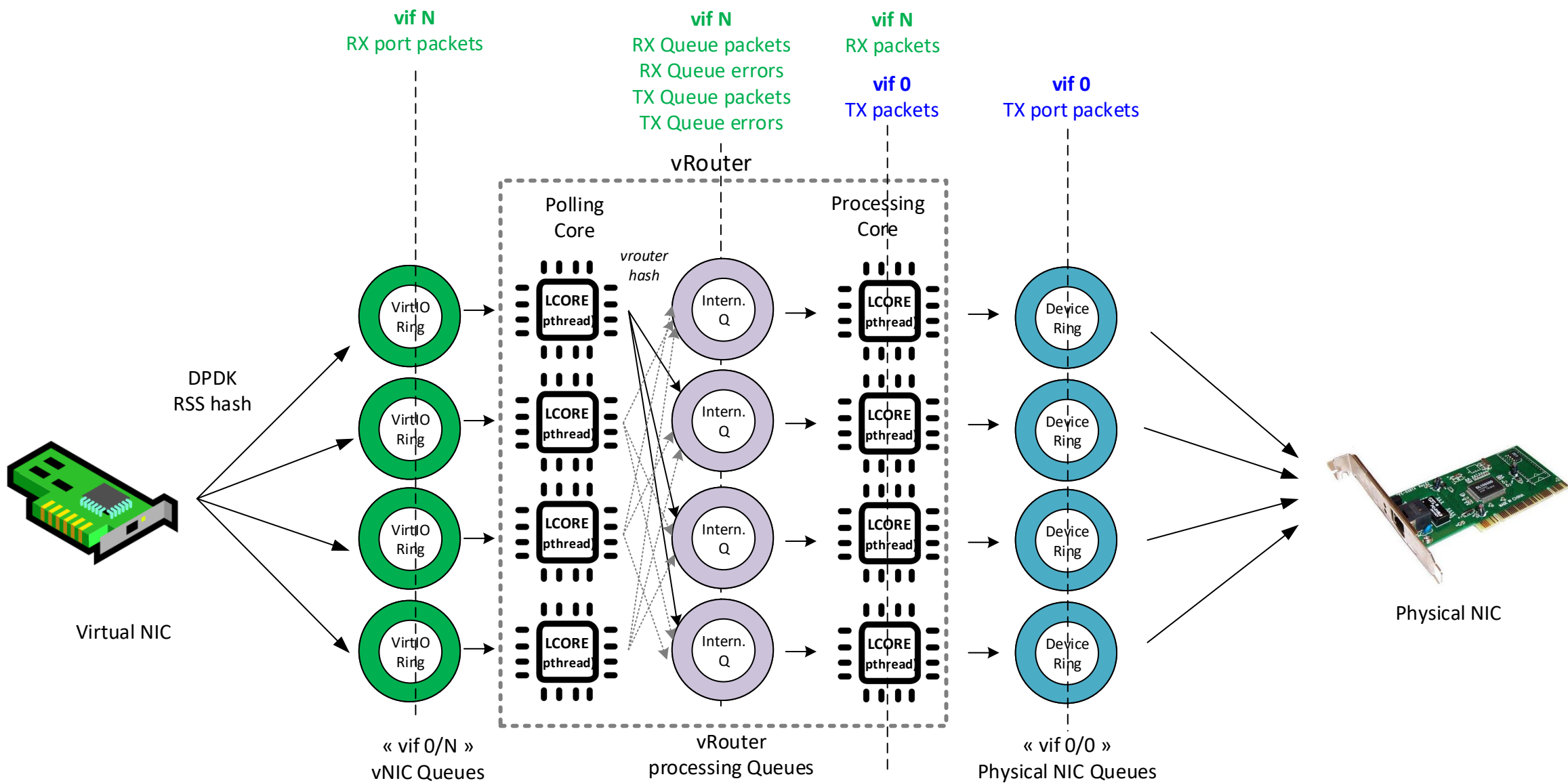
Title: MultiQ to Underlay

version: 1.0

date: 25/03/2020



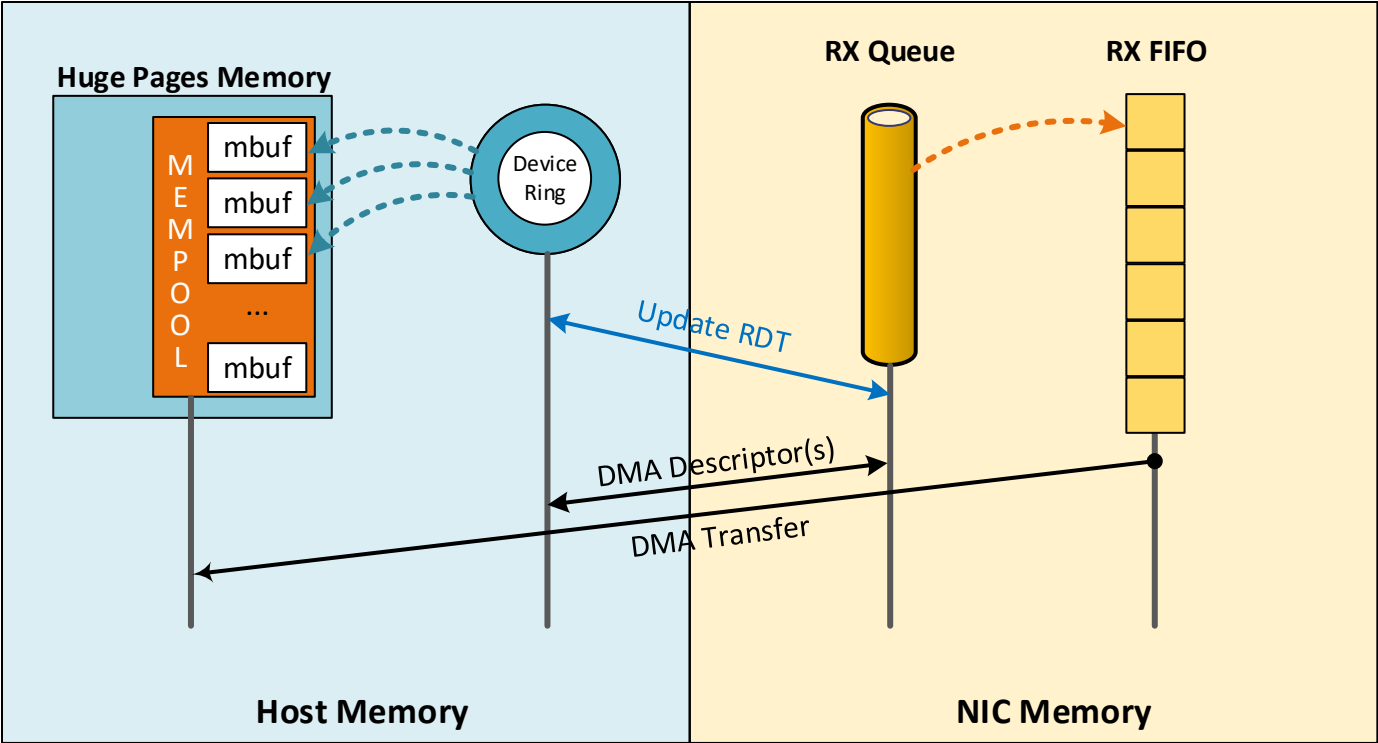
Title: vif counters (phys to virt)	
version: 1.0	date: 25/03/2020



Title: vif counters (virt to phys)

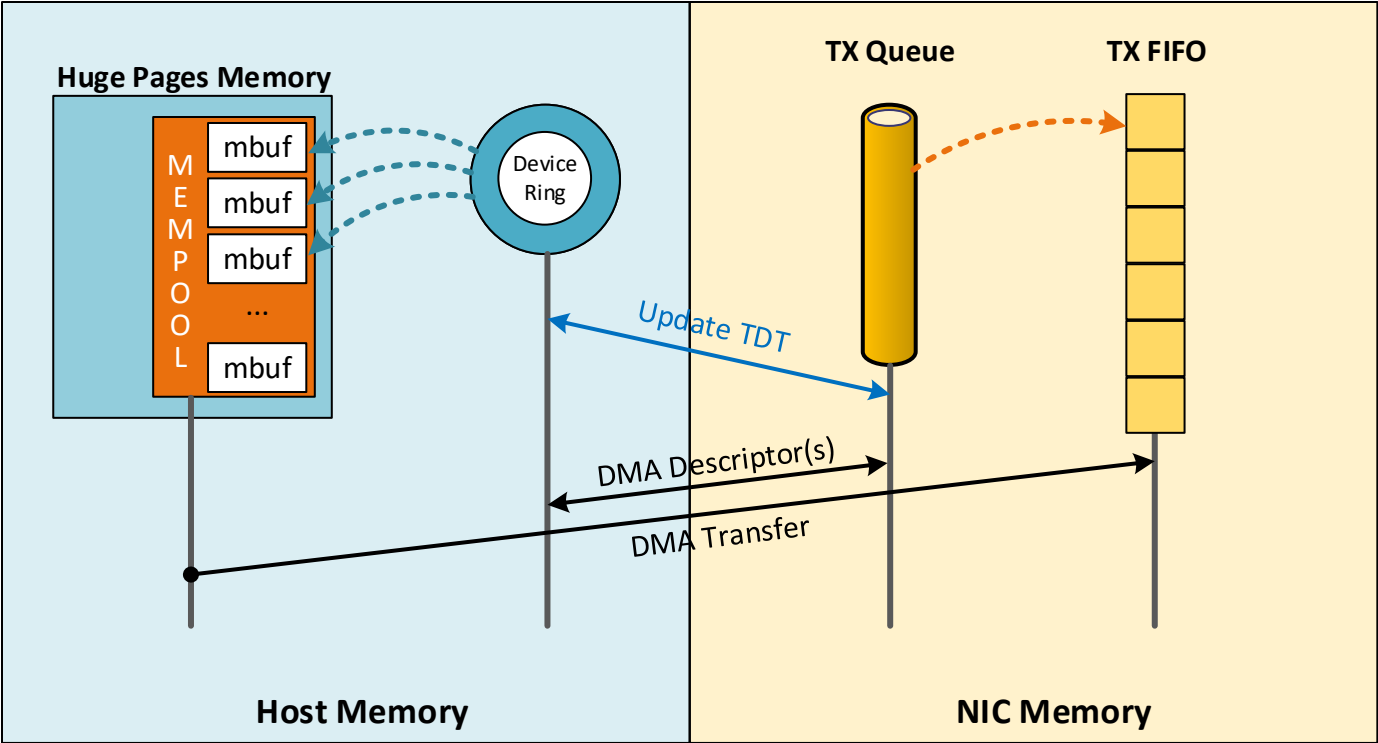
version: 1.0

date: 25/03/2020



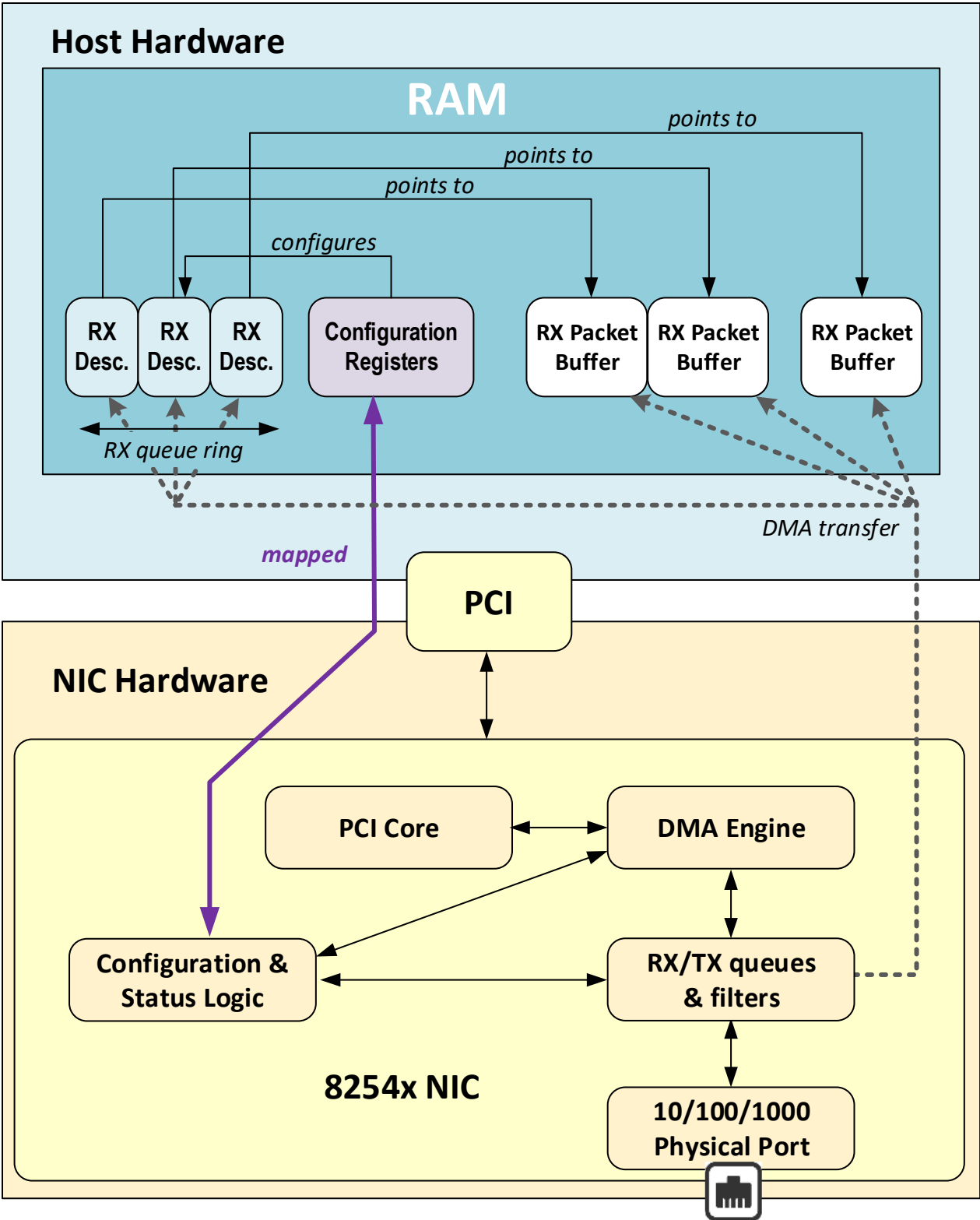
RDT: Receive Descriptor Tail

Title: pNIC incoming packet	
version: 1.0	date: 25/03/2020



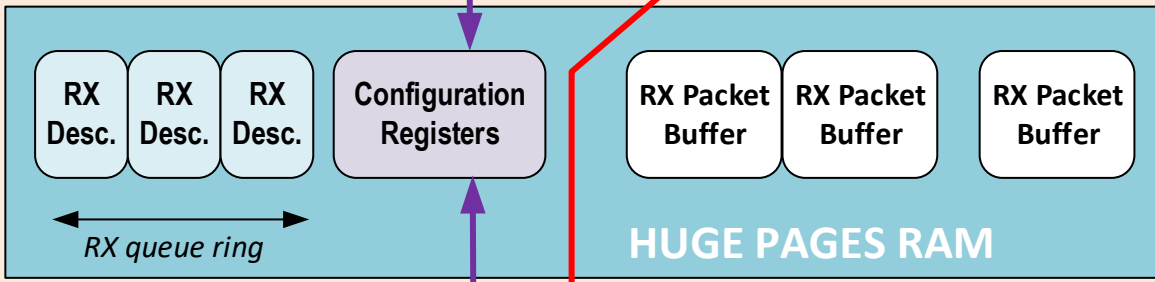
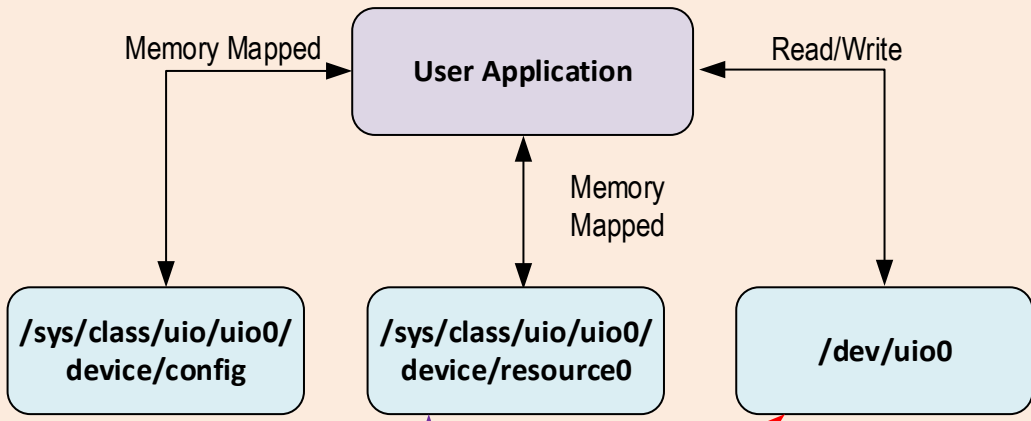
TDT: Transmit Descriptor Tail

Title: pNIC outgoing packet	
version: 1.0	date: 25/03/2020

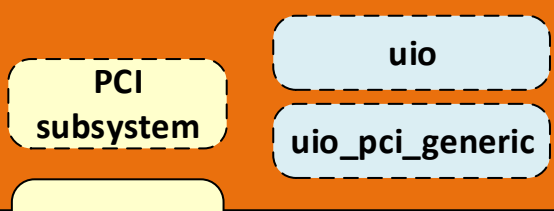


Host Hardware

User Space

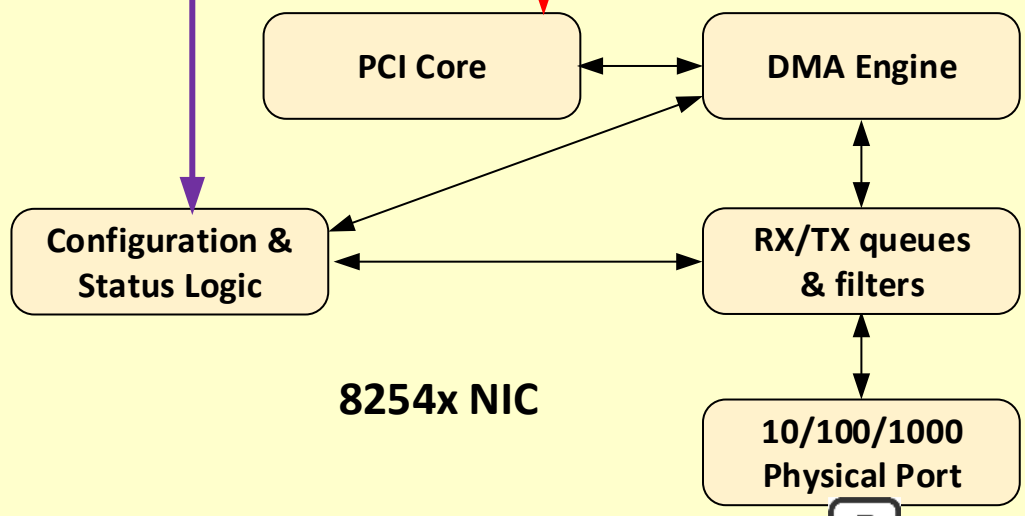


Kernel Space



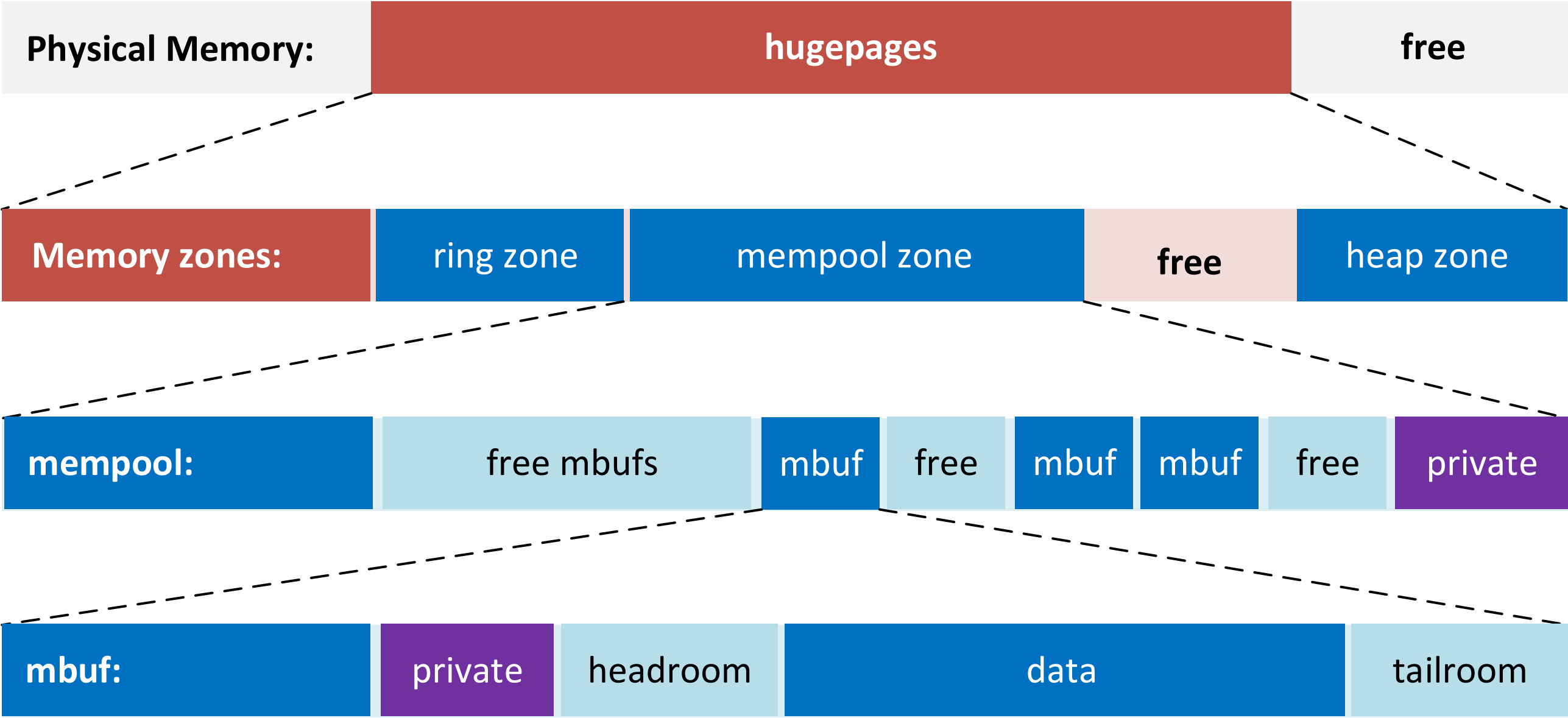
PCI

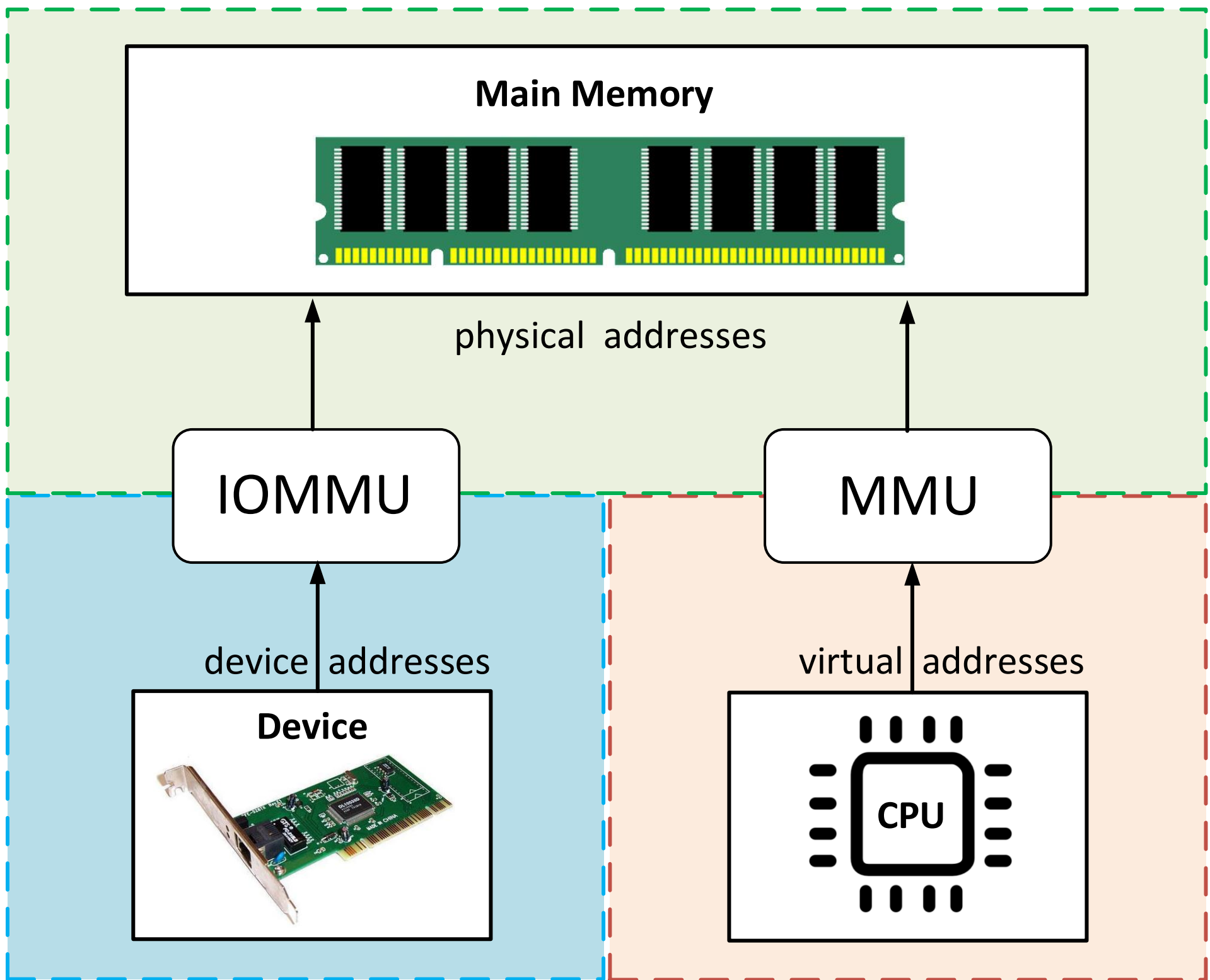
NIC Hardware



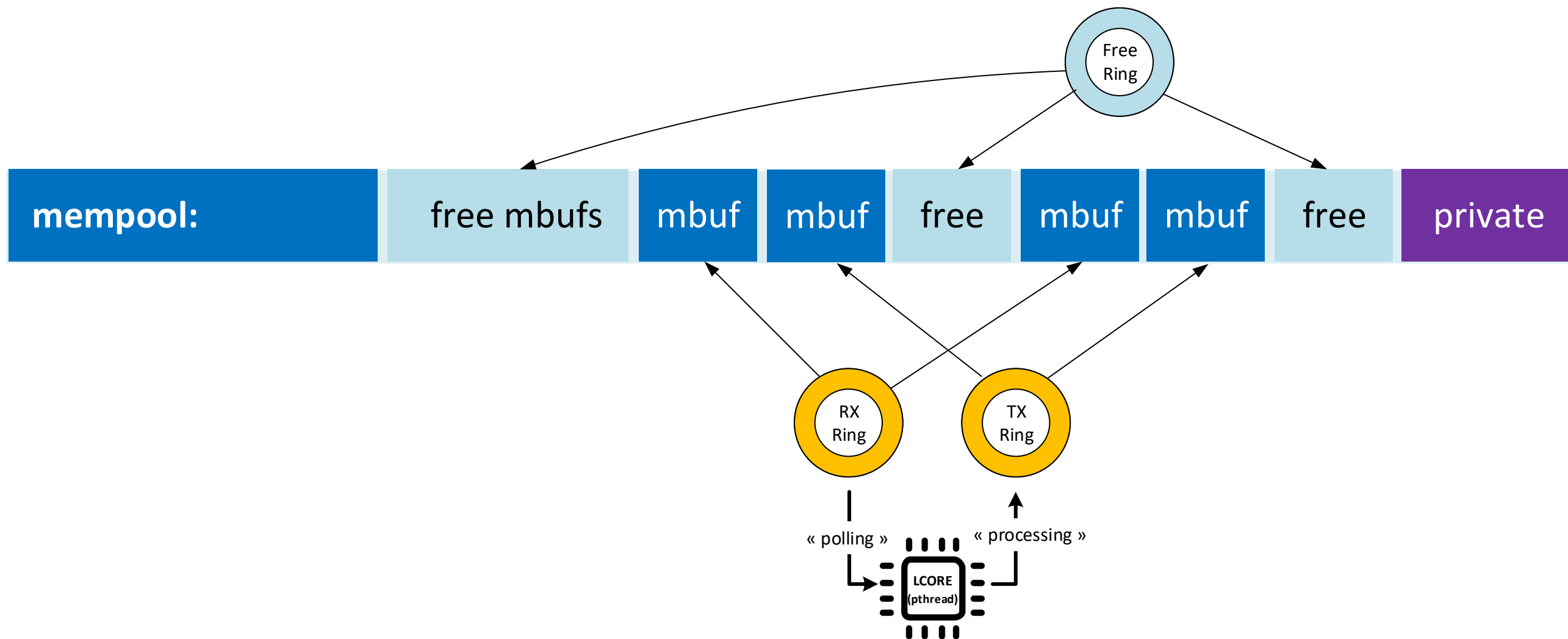
8254x NIC



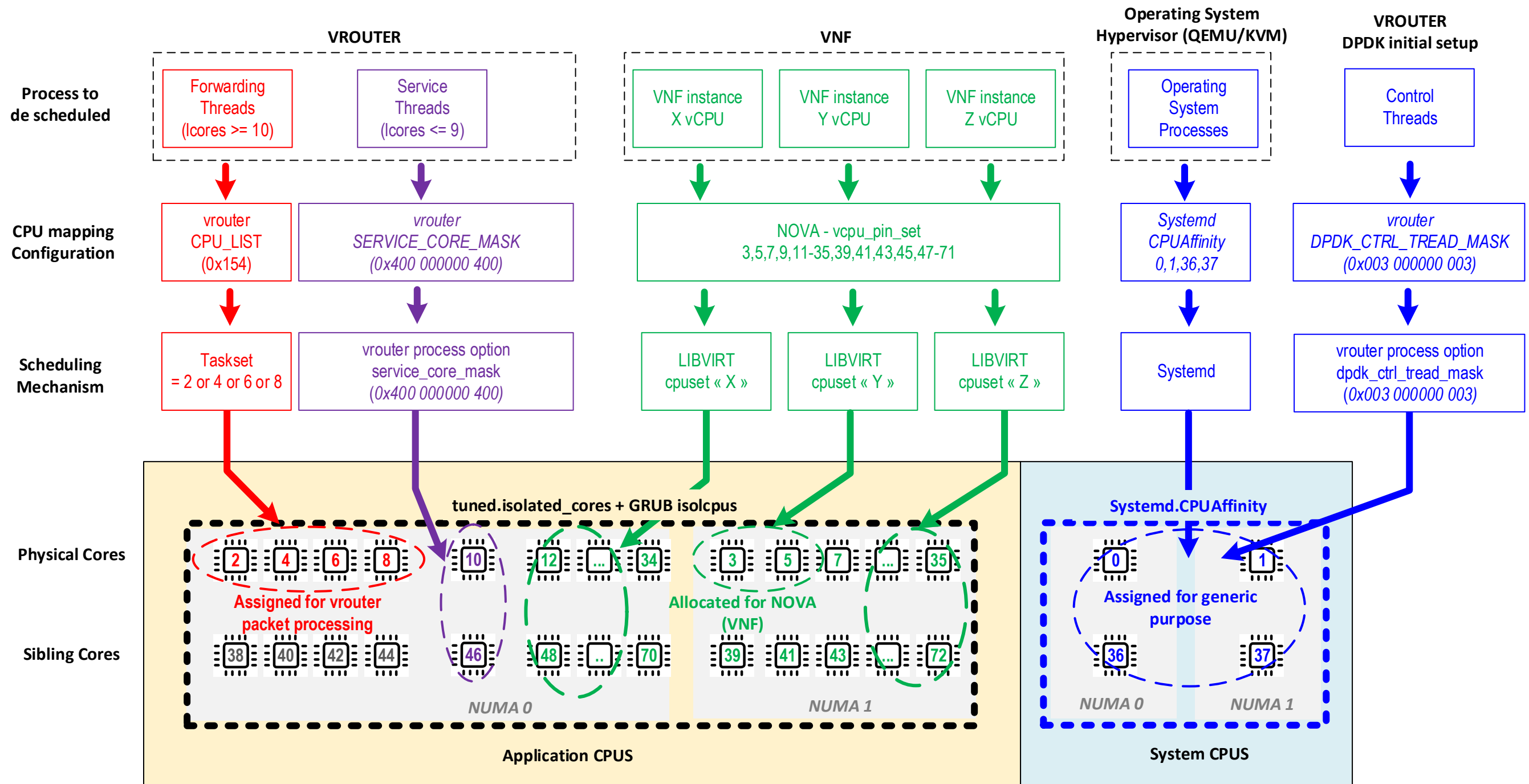


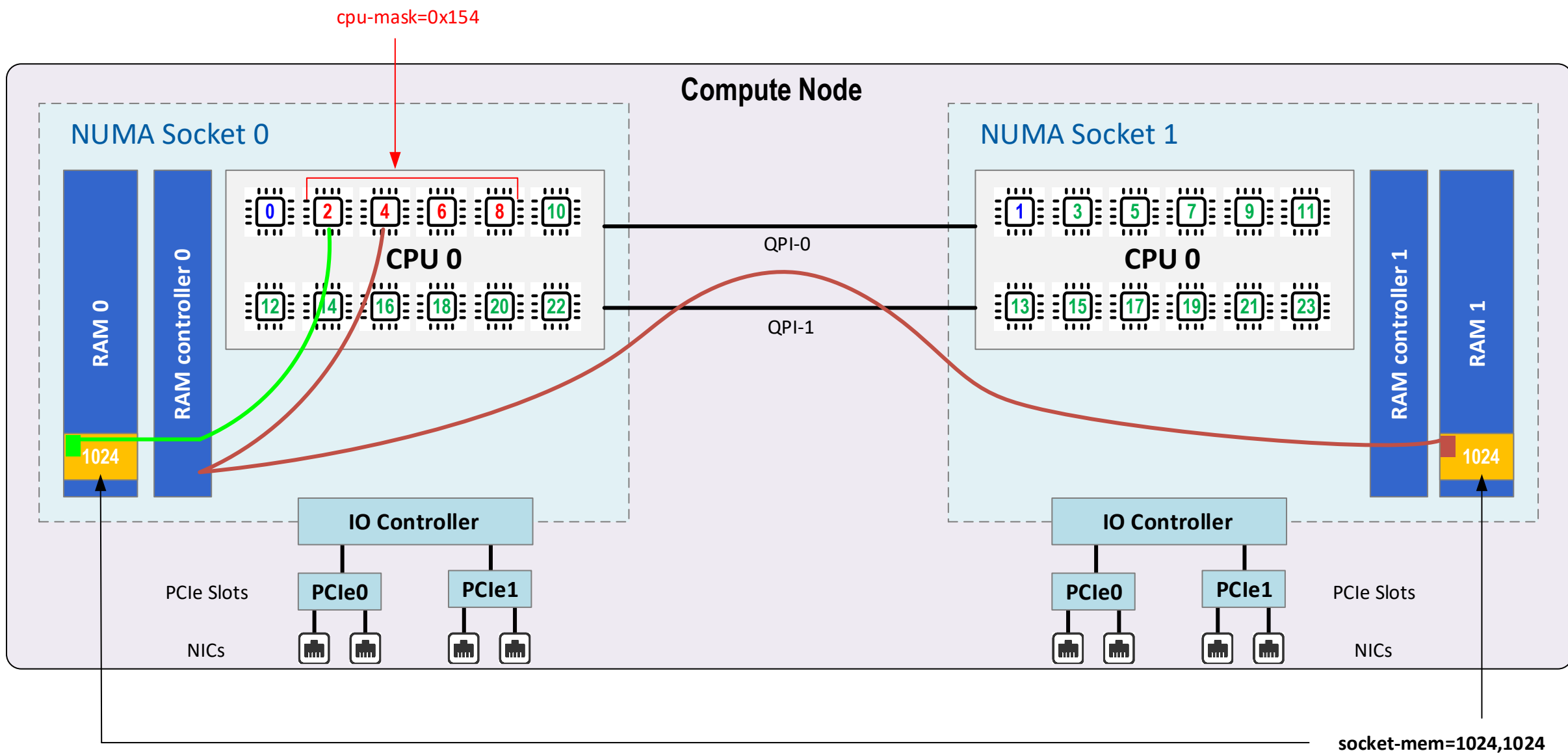


Memory Addressing	
version: 1.0	date: 27/03/2020



Packets Processing and Memory	
version: 1.0	date: 25/03/2020





vRouter DPDK PMD allocated CPUs

VM allocated CPUs

Host OS allocated CPUs



vRouter memory access shortest path

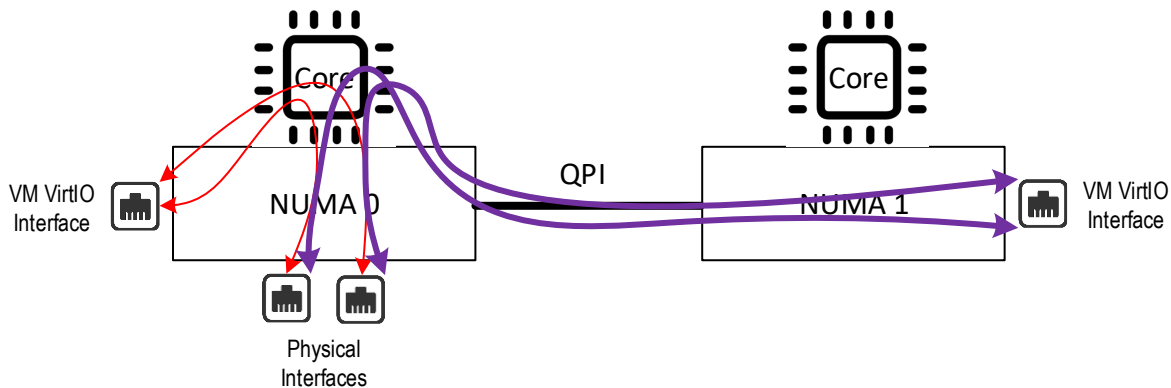
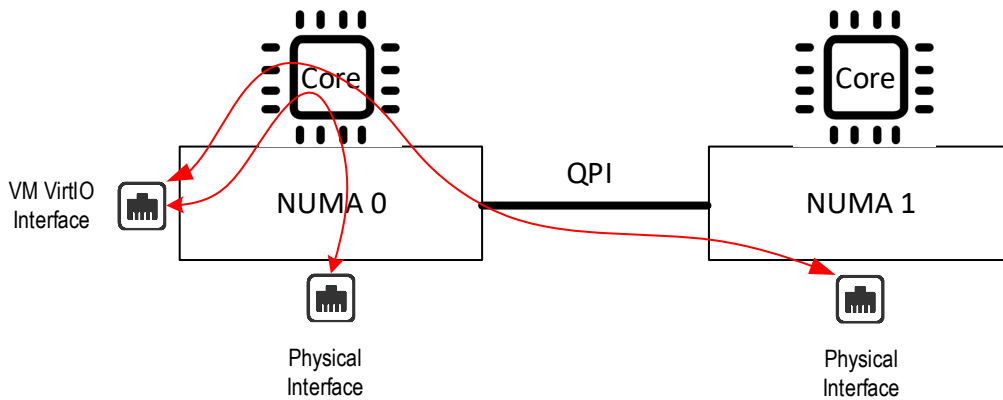


vRouter memory access longer path

Title: vRouter Memory Access and NUMA

version: 1.0

date: 27/03/2020

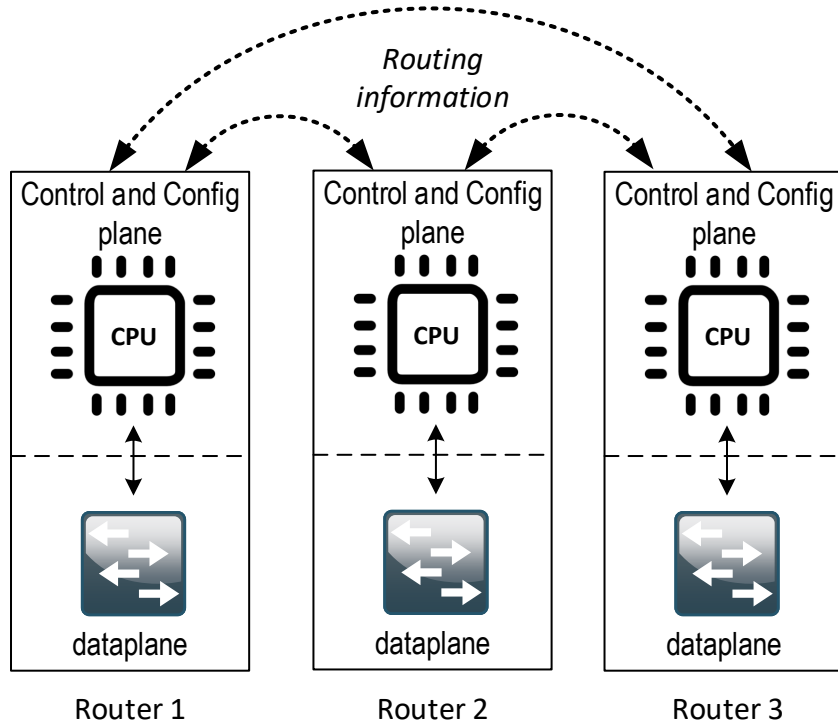


Title: NUMA concern

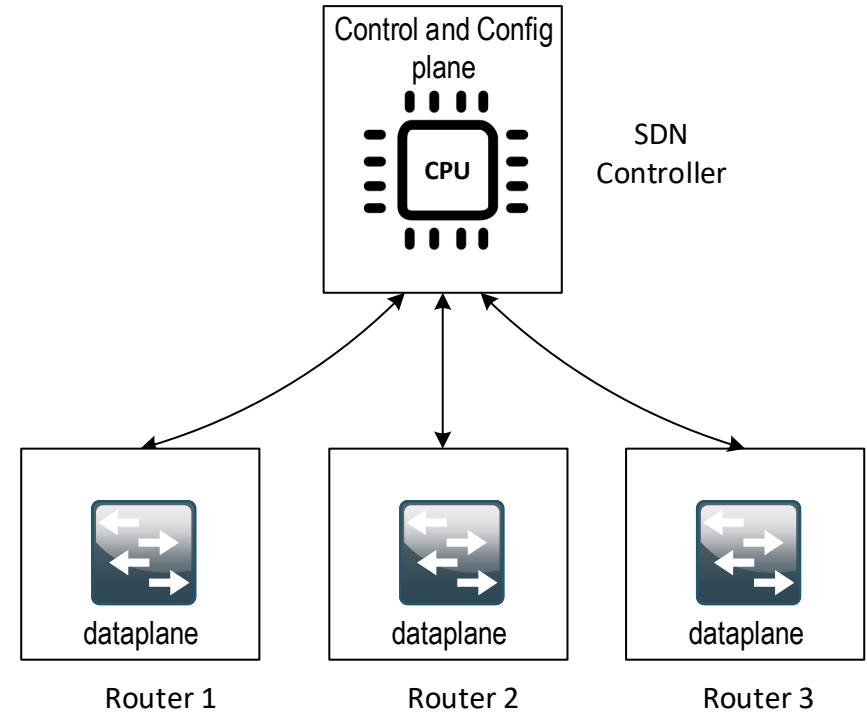
version: 1.0

date: 25/03/2020

Traditional Network Devices



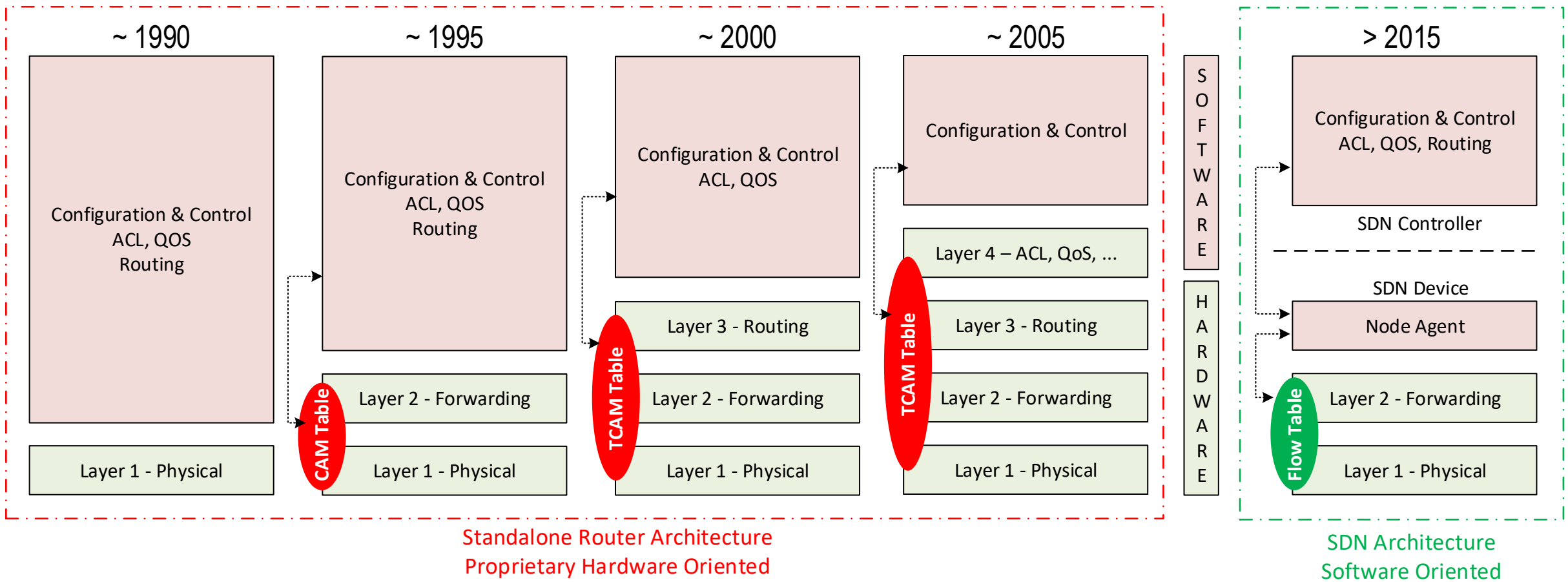
SDN Devices



Title: SDN Overview

version: 1.0

date: 13/04/2020



Title: SDN History	
version: 1.0	date: 13/04/2020

Configuration

Modular Router



Console
Port

Router
Processor Card

OSPF

ISIS

BGP

LDP

RSVP-TE

*Network
Protocols*

RIB

LIB

FIB

LFIB

Switch
Fabric

Line Cards
...

Packets Walk

Control Packets

Traditional Network Node

version: 1.0

date: 13/04/2020

Modular Router

Router Processor Card

Configuration Plane

CLI

SNMP

NetConf

Control Plane

OSPF

ISIS

BGP

LDP

RSVP-TE

Switch
Fabric

Forwarding Plane

TCAM

ASIC

Line Cards
...

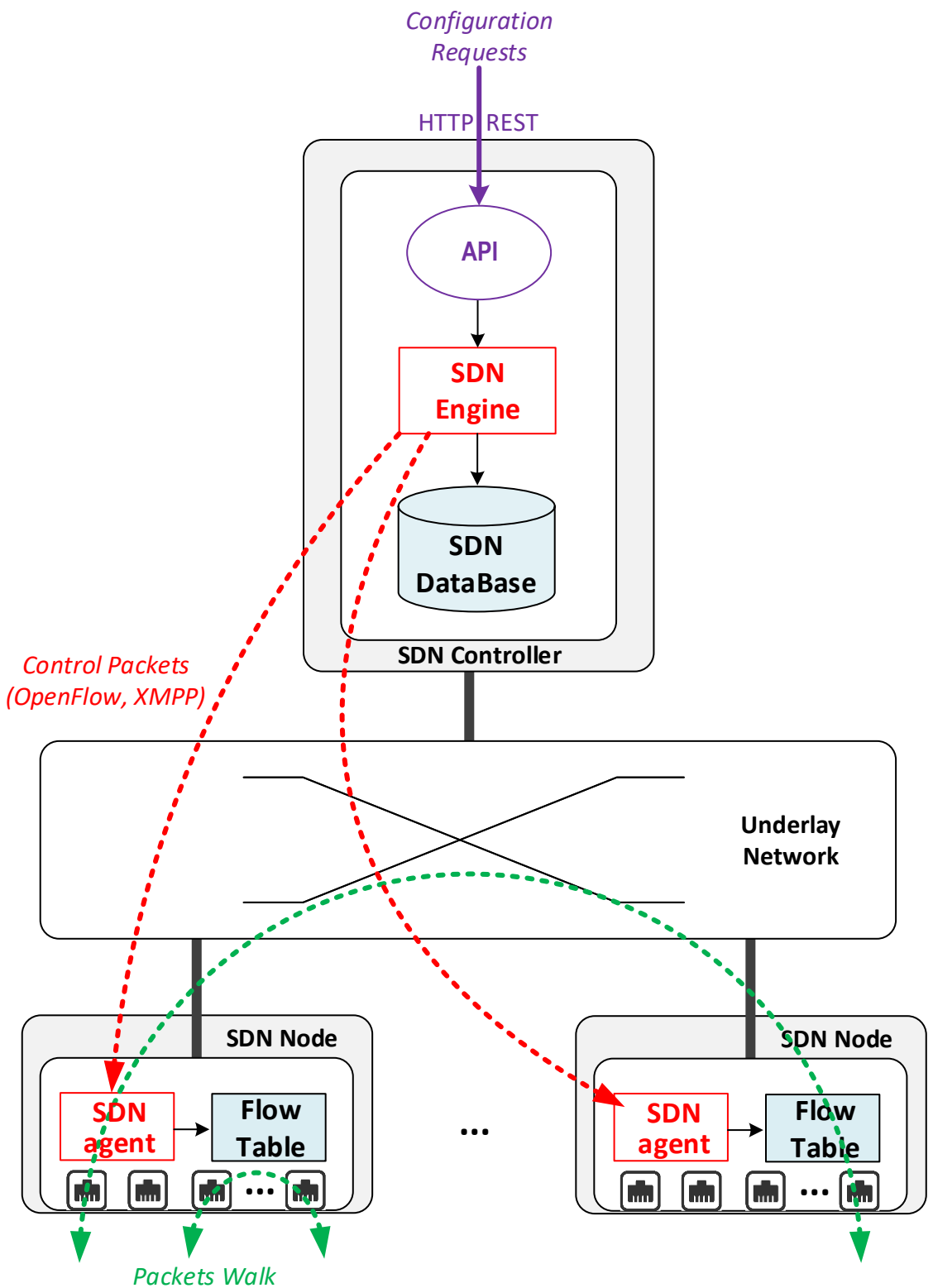
TCAM

ASIC

Traditional Network Planes

version: 1.0

date: 13/04/2020



SDN Detailed Architecture	
version: 1.0	date: 13/04/2020

Admin and Users

OpenStack

Kubernetes

APPLICATION
LAYER

SDN Dashboard
Web GUI
Application

Cloud Network
Interface

Container Network
Interface

CONTROL
LAYER

SDN Controller

Northbound Interfaces

REST
API

Python
API

JAVA
API

SDN Engine

SDN Control
Logic

Routing Info
(flows)

Topology

Statistics

NetFlow

XMPP

NetConf

BGP/LS

PECP

Southbound Interfaces

Underlay
Network

INFRASTRUCTURE
LAYER

SDN Node

SDN
agent

Flow
Table

Packet Engine

Forwarding Plane

SDN Node

SDN
agent

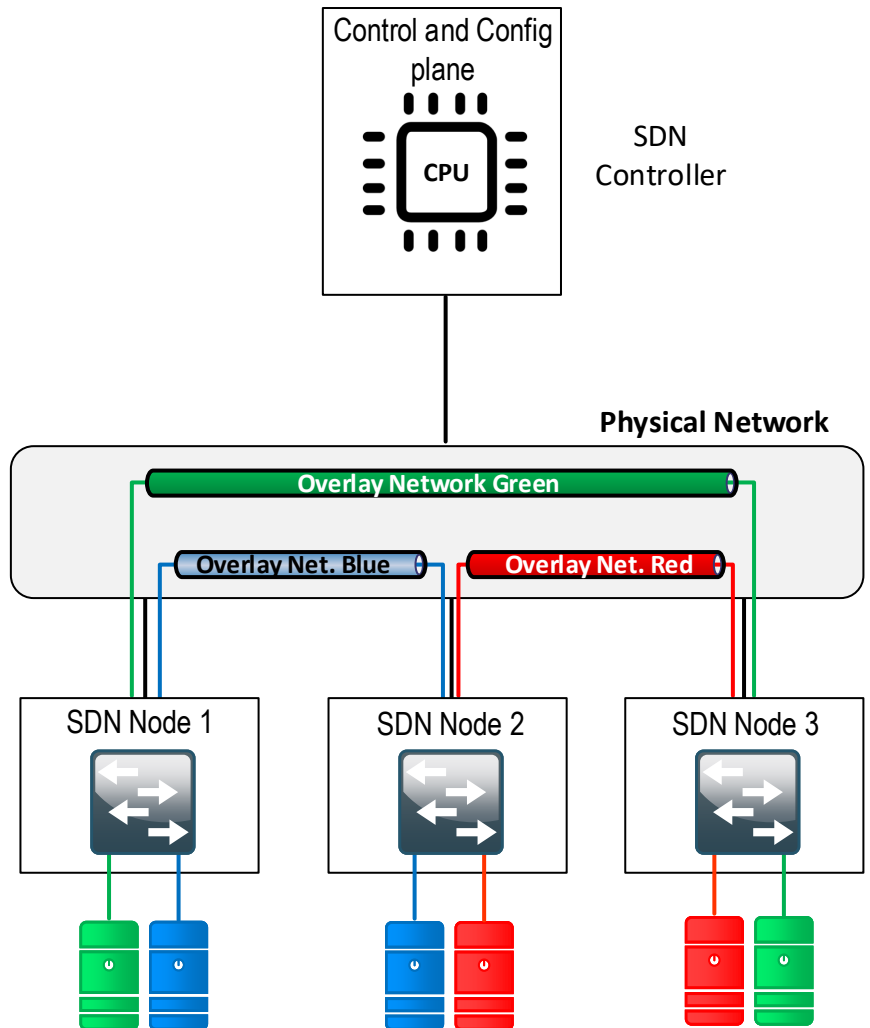
Flow
Table

Packet Engine

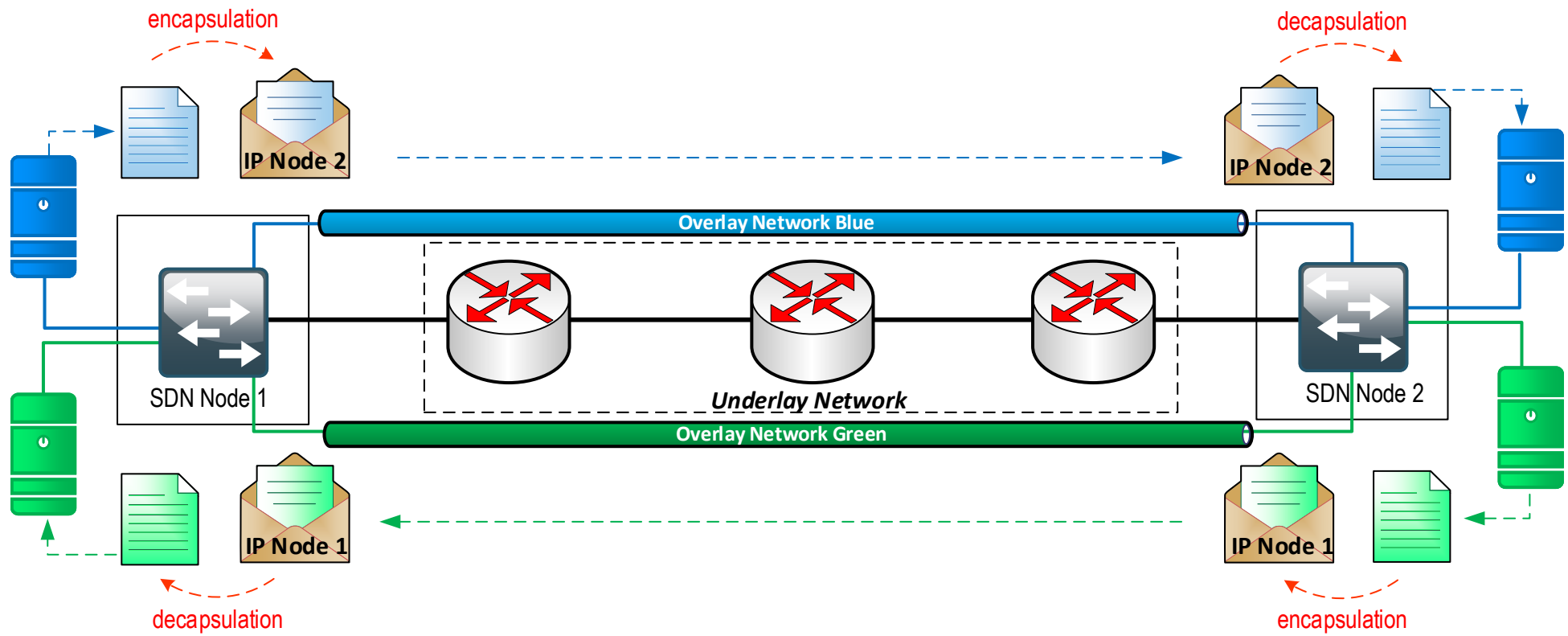
SDN Layers

version: 1.0

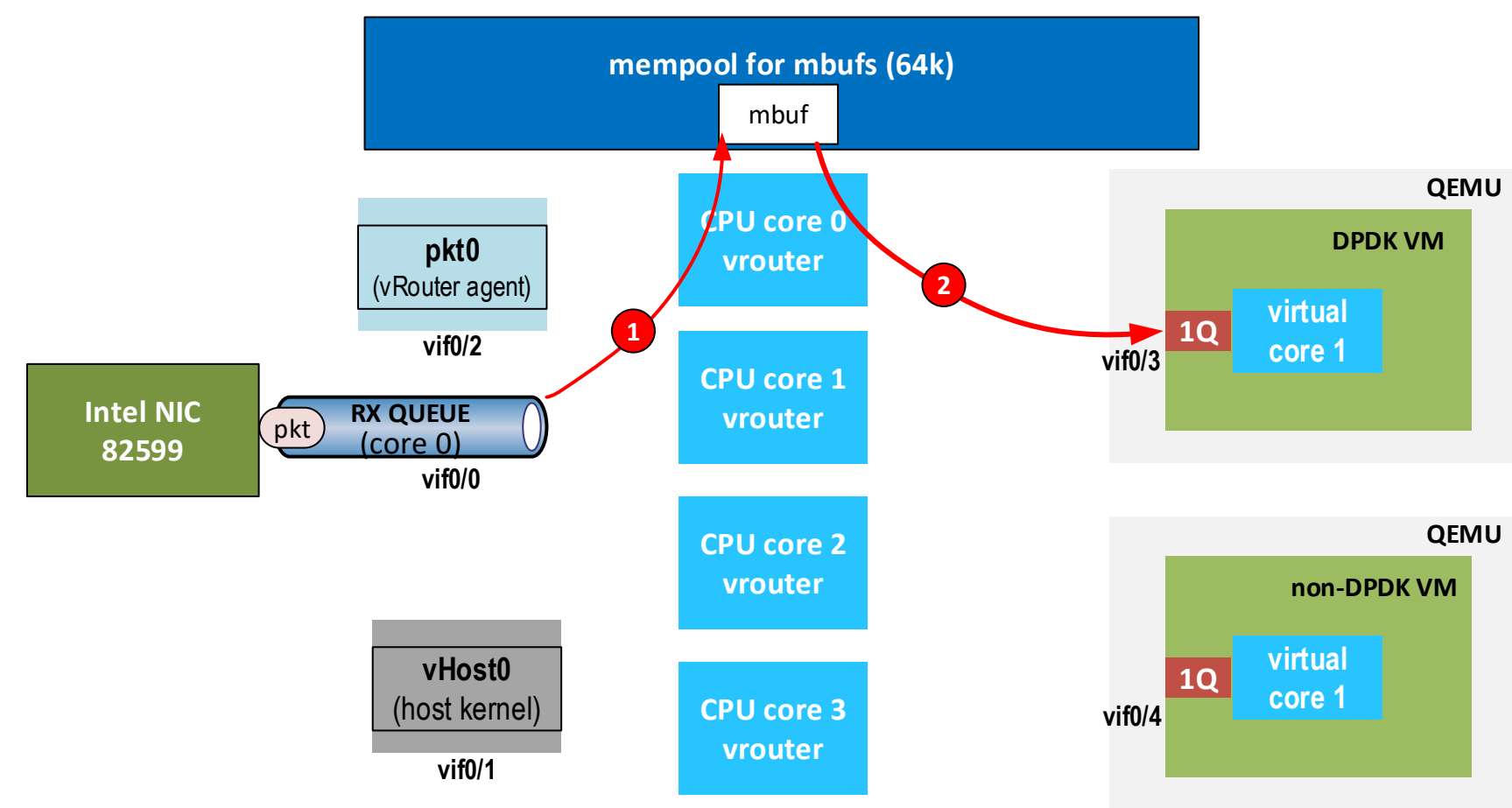
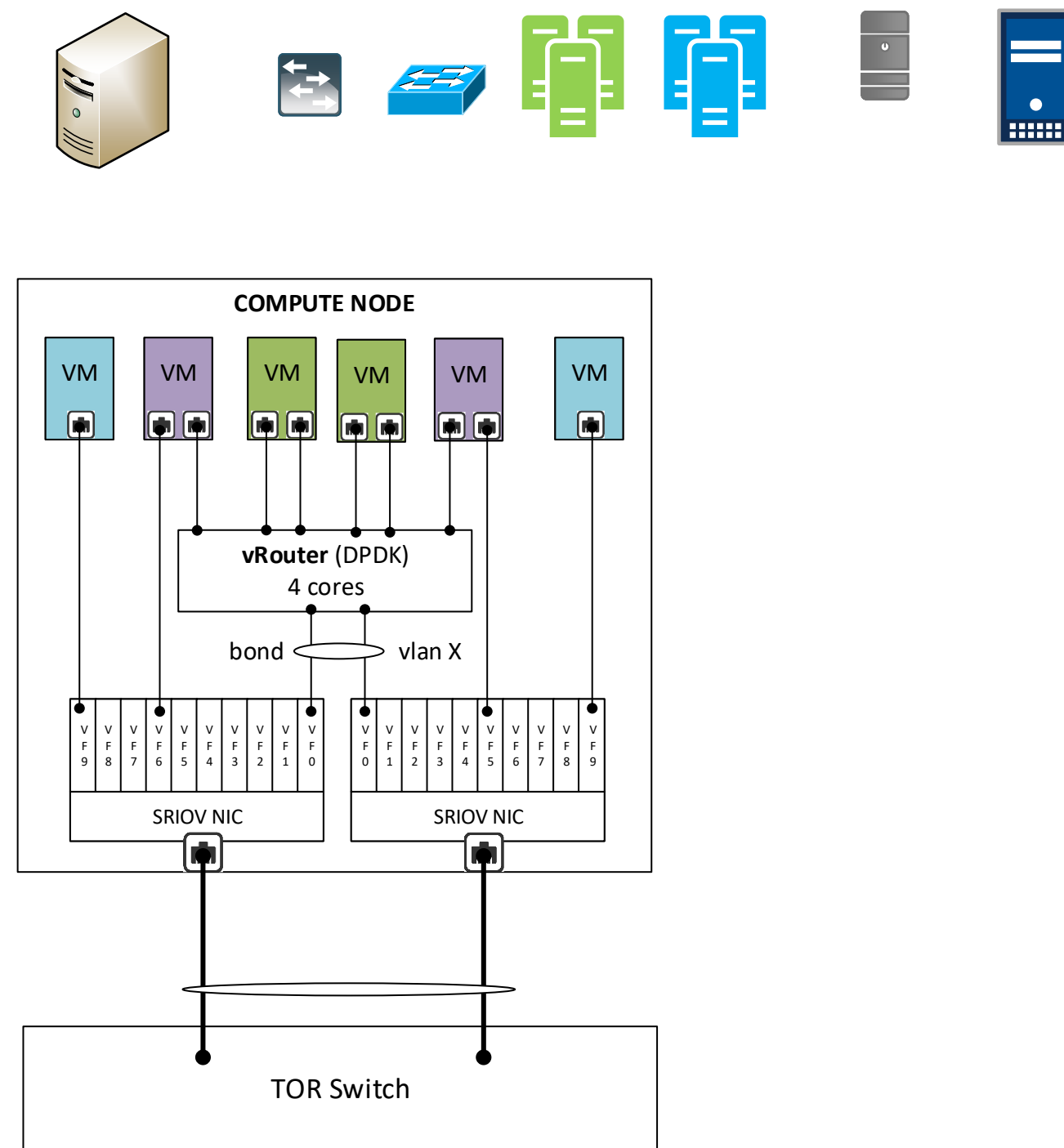
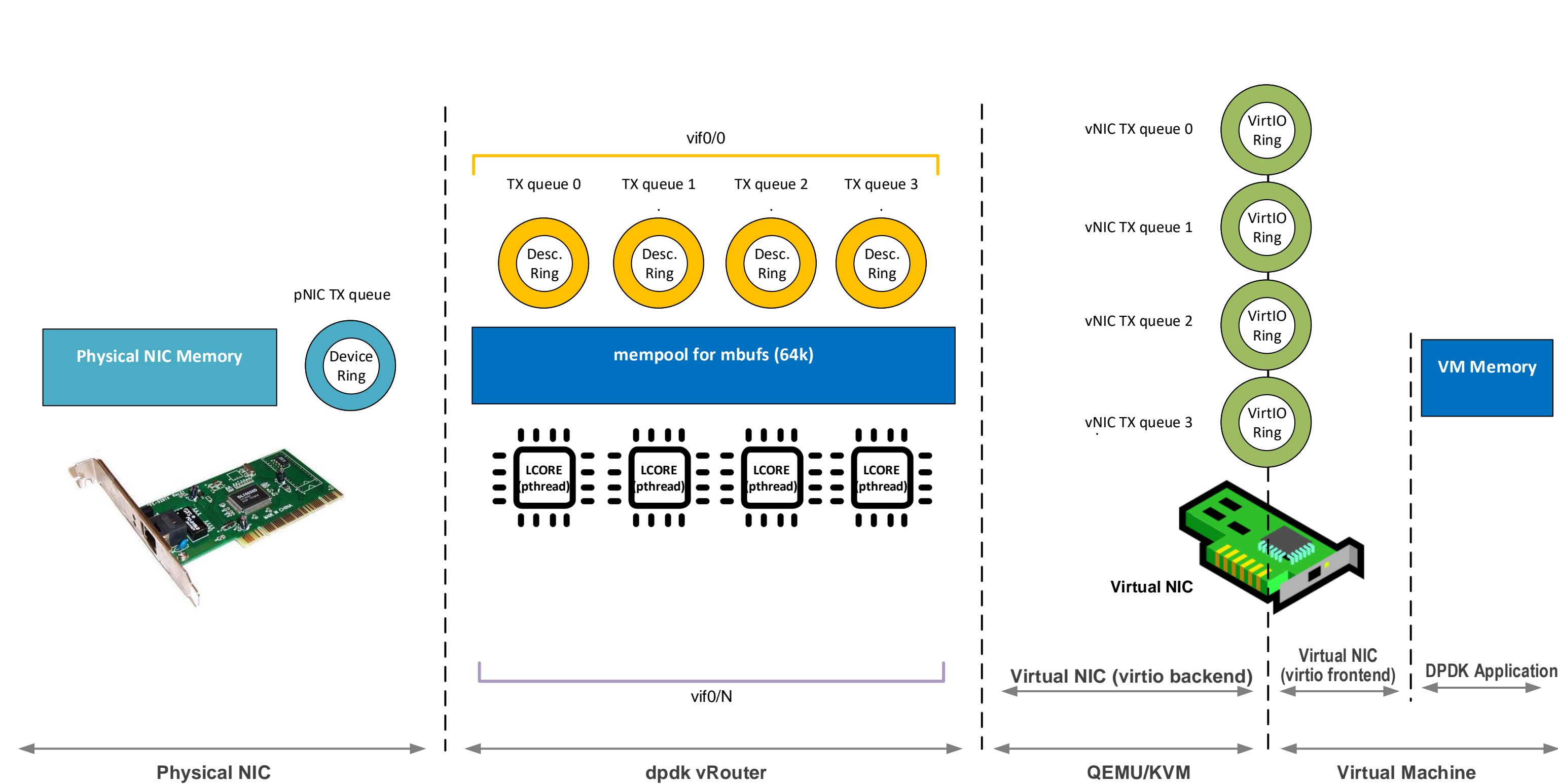
date: 13/04/2020



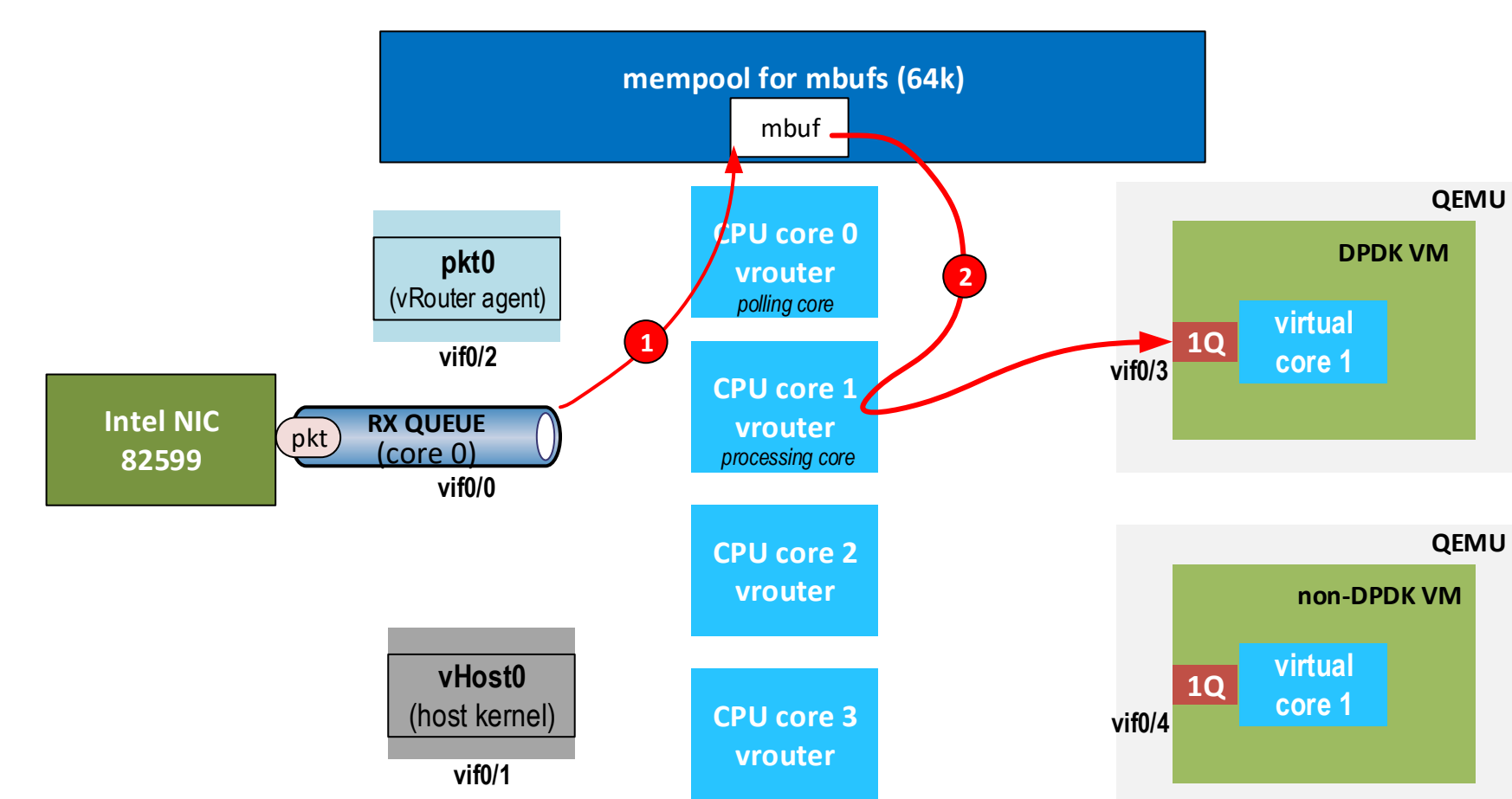
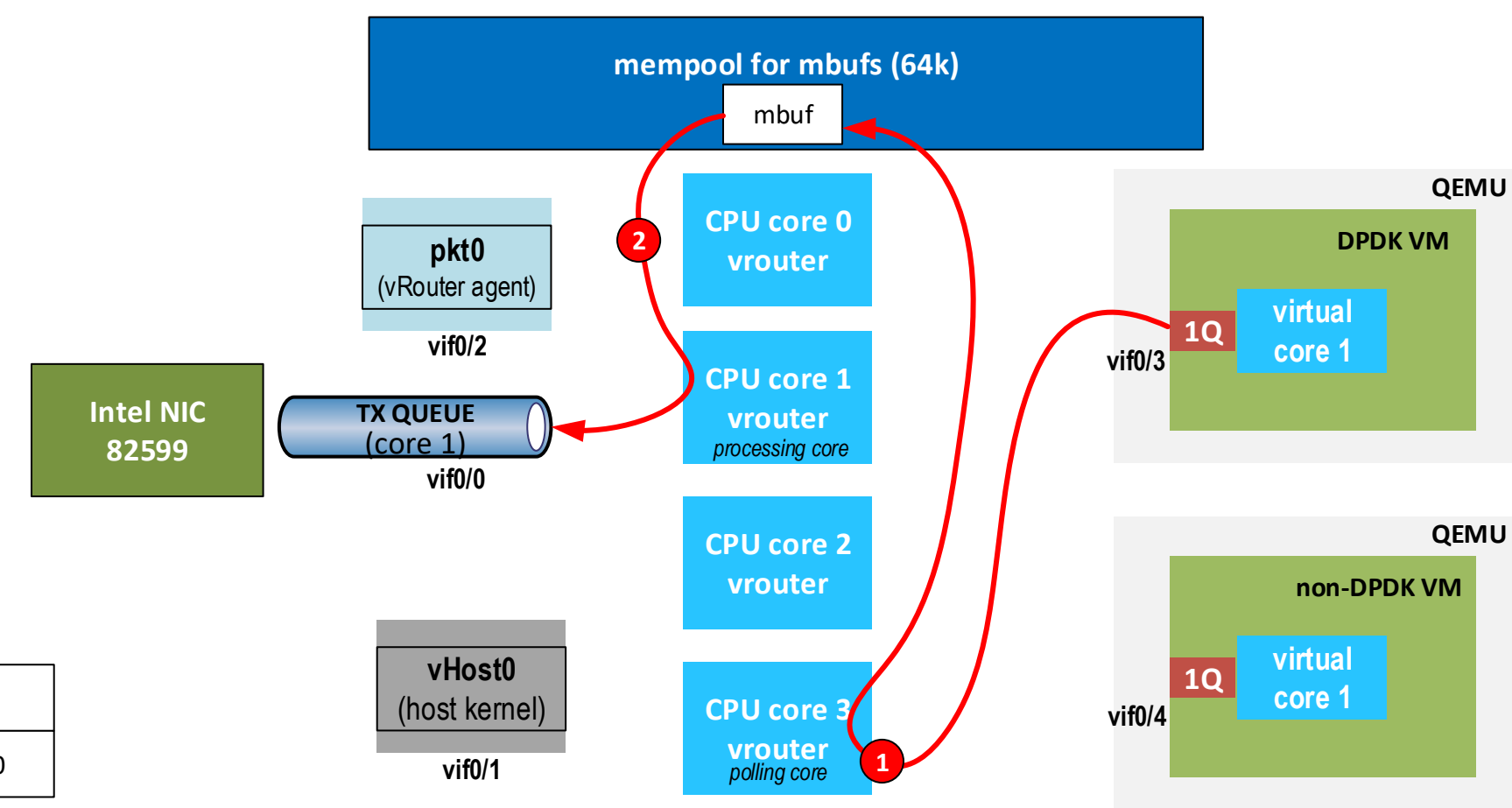
SDN and Overlay	
version: 1.0	date: 13/04/2020



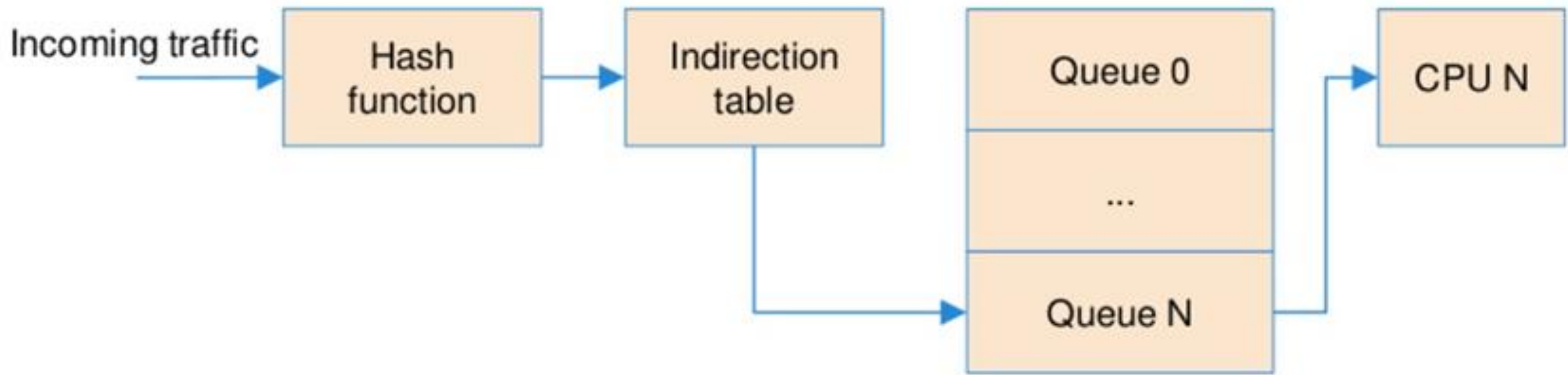
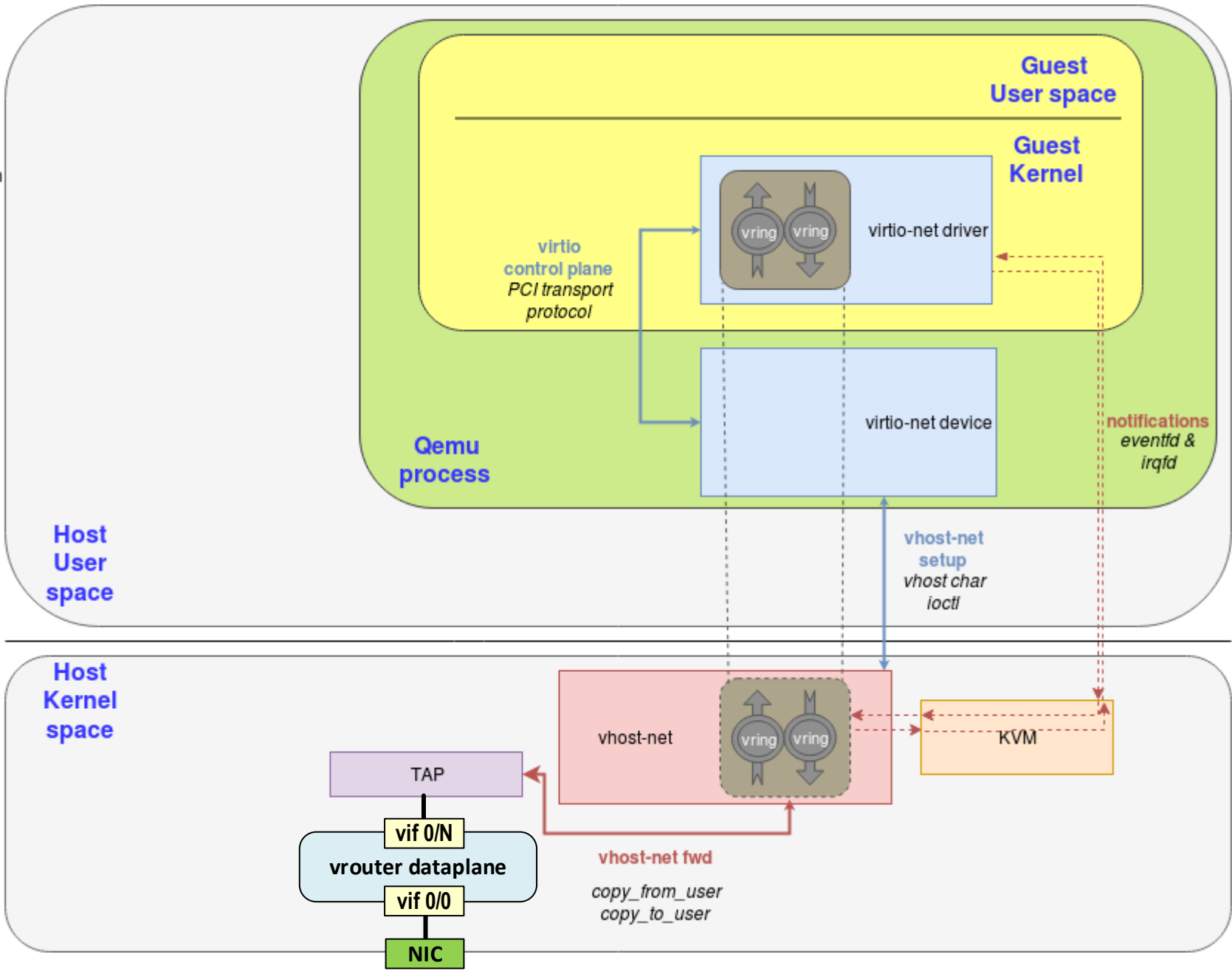
SDN and Encapsulation Principle	
version: 1.0	date: 13/04/2020



Title: Personal Stuff	
version: 1.0	date: 25/03/2020

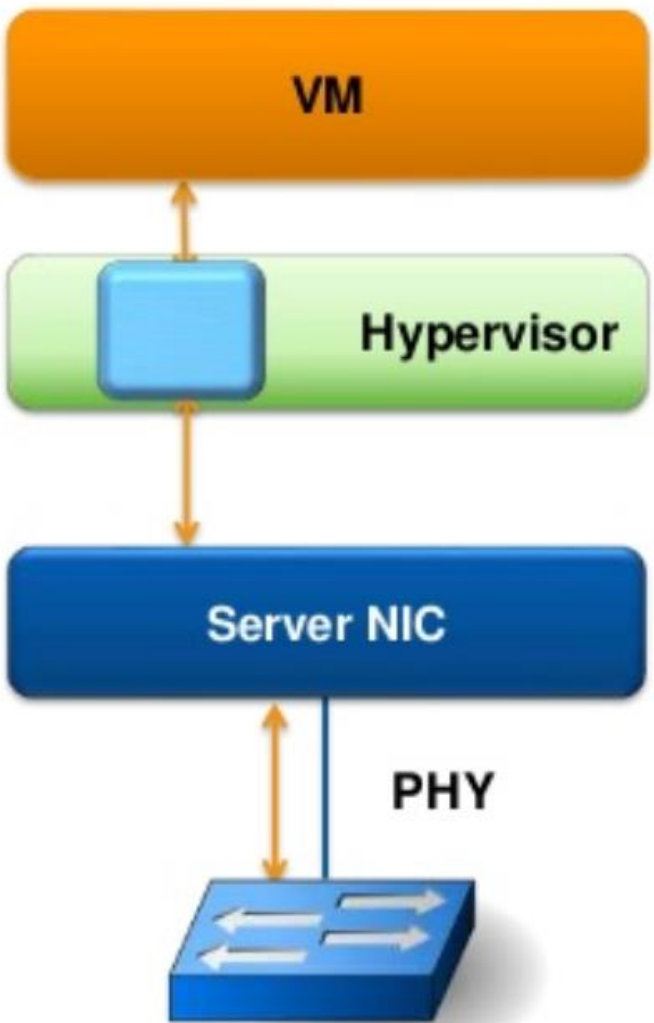


Symbol	Meaning
	virtio data path element
	non-virtio data path element
	virtio control path element
	port
	virtio shared memory
	data path
	interrupts / notifications
	control path

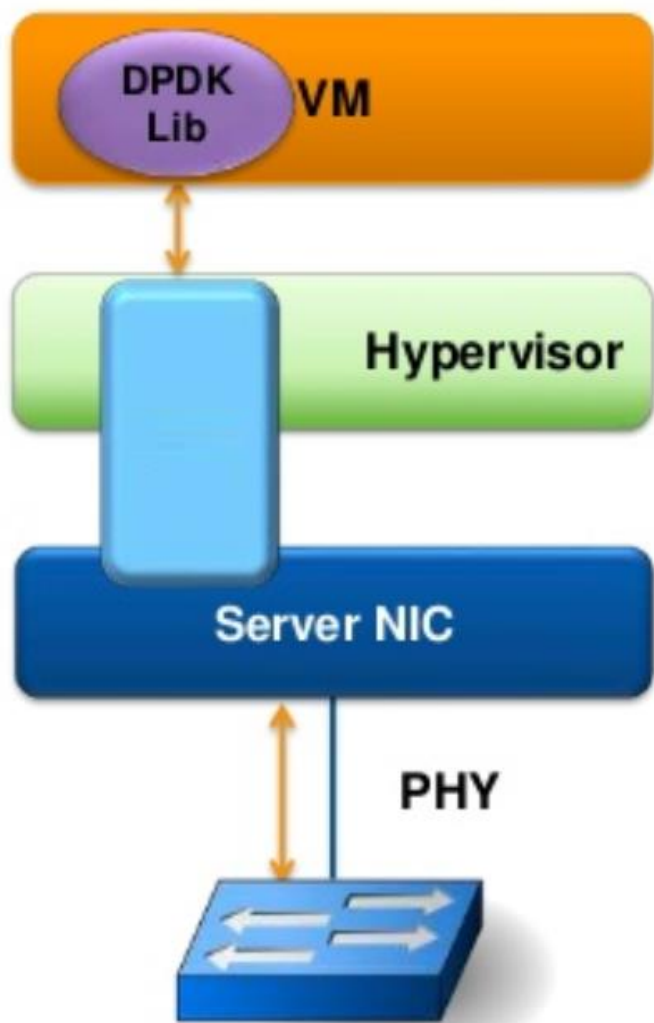


Title: Stuff (no source)	
version: 1.0	date: 25/03/2020

KERNEL MODE



DPDK MODE



SRIOV (vrouter bypassed)

