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TECHNOLOGY
FORUM 2015**

Intelligent NIC Solution Based on QorIQ T Series Processors

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Roy Zang | Software Architect

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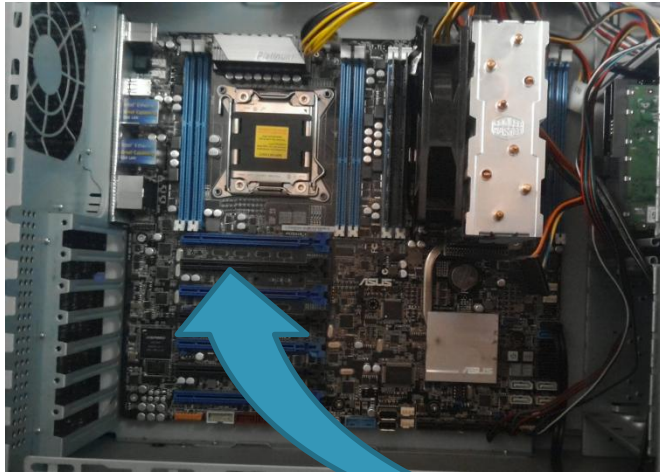


Agenda

- Intelligent NIC (iNIC) General Introduction
- QorIQ T Series iNIC Solution
- QorIQ T Series iNIC Software Design



iNIC Hardware Connection



QorIQ T4/T2 PCIe Card

Core	1667MHZ
CCB	667MHZ
Fman	667MHZ
DDR	1600MT/s 800MHZ ECC is ON
DMA	3 Engines X 8 channels

x86 Server

Type	E5-2650
Core	2.6GHZ 8 Cores X 2 threads
DDR	1600MT/s

PCI

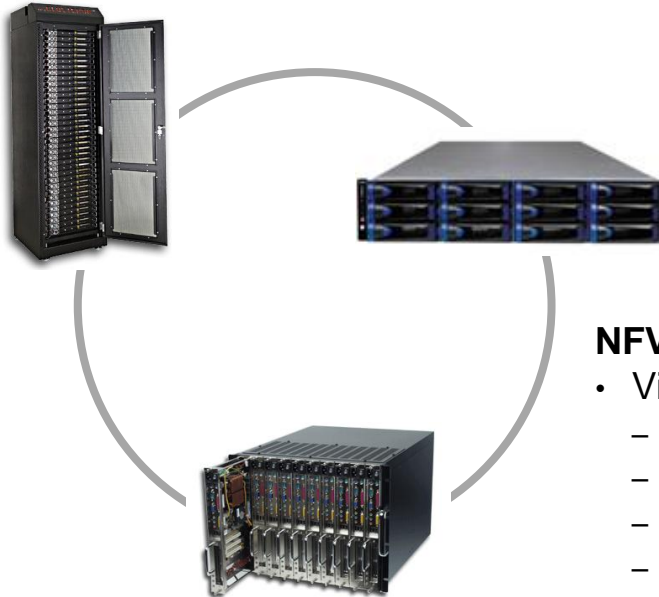
Link Speed	8GT/s
Link Width	x4
MAXPayload	256B

Server Market by Function

- In the converged Ethernet world, iNICs are used throughout the servers deployed in compute, storage and network infrastructure

Compute Servers

- Business Applications
 - Databases
 - Web Servers
 - Big Data Analytics



Storage Server

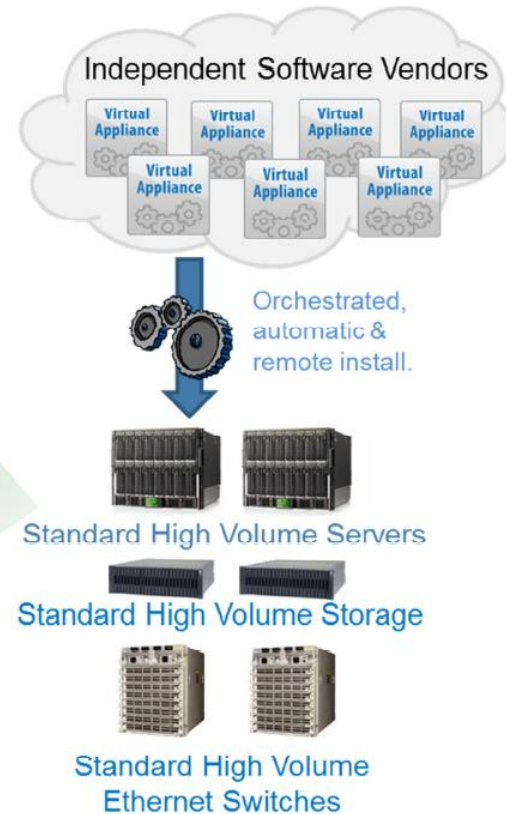
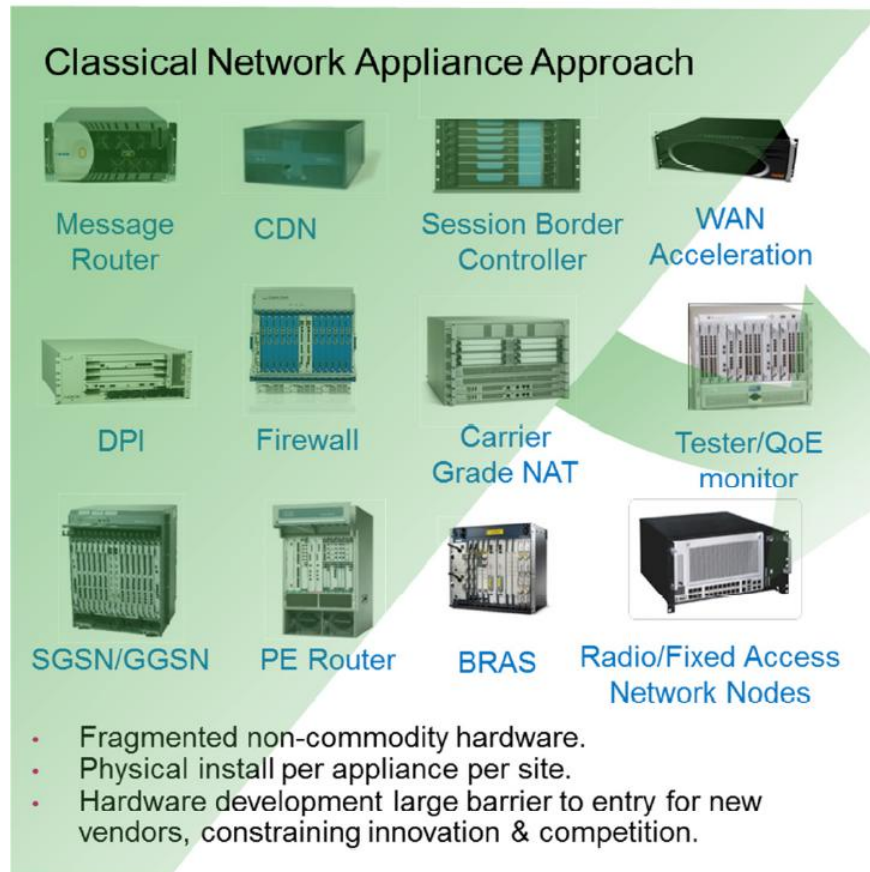
- Shared Mass Storage
- Backup/Disaster Recovery
- Deduplication

NFV Server

- Virtualized Network Device
 - Router
 - Firewall / NAT
 - Unified Thread Management
 - DPI

- Throughout these applications, the iNIC share many common requirements
 - Line rate data flow, Security & Network Protocol offloads, virtualized I/O
- Desire is to use one set of iNIC hardware and differentiate application with **software**

Network Functions Virtualization



Network Functions Virtualisation Approach

Source: ETSI NFV standard group

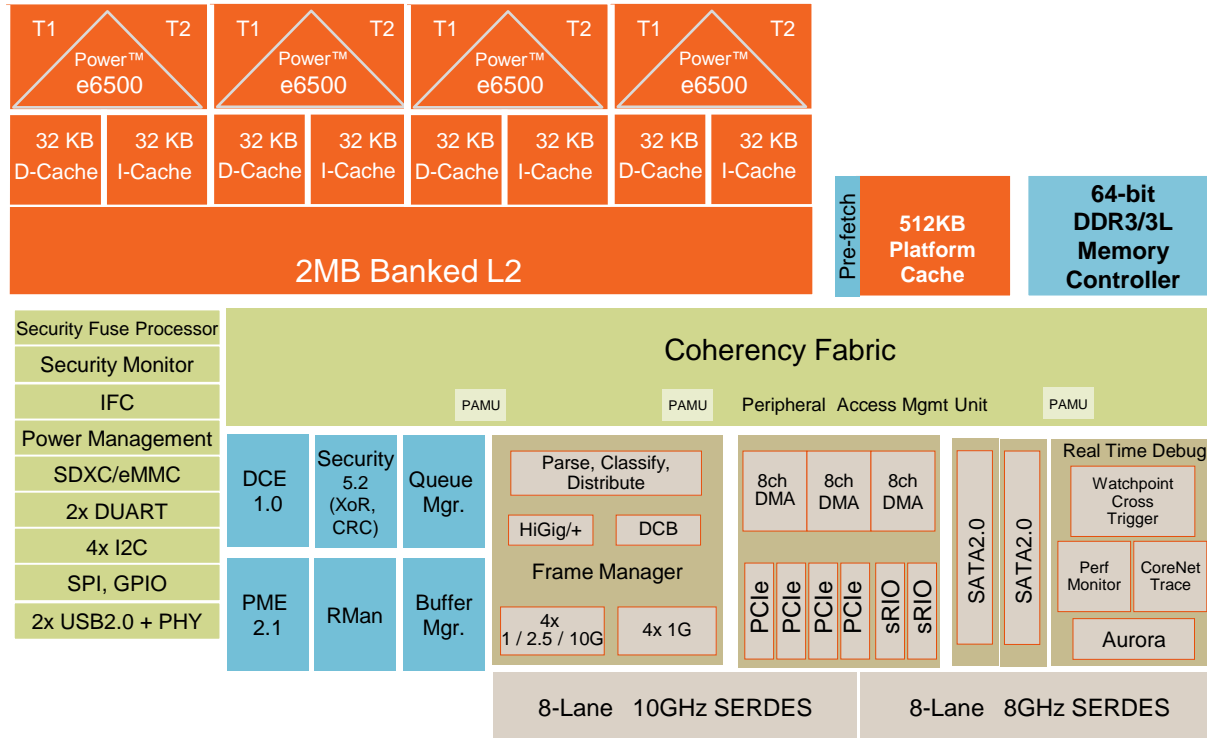
As networks transition to the NFV model, CPU tasks of these appliances move to servers. Providing iNIC solutions allow Freescale to **retain and growth value in it's prime market.**

QorIQ T Series iNIC Solution

OVS offload



QorIQ T2080 Block Diagram



Datapath Acceleration

- **SEC**- crypto acceleration 10Gbps
- **DCE** - Data Compression Engine 17.5Gbps
- **PME** – Pattern Matching Engine to 10Gbps

Processor

- 4x e6500, 64b, 1.2 - 1.8GHz
- Dual threaded, with 128b AltiVec
- 2MB shared L2; 256KB per thread

Memory Subsystem

- 512KB Platform Cache w/ECC
- 1x DDR3/3L Controllers up to 2.1GHz
- Up to 1TB addressability (40 bit physical addressing)
- HW Data Prefetching

Switch Fabric

High Speed Serial IO

- 4 PCIe Controllers, one at Gen3 three at Gen2
 - 1 with SR-IOV support
 - x8 Gen2
- 2 sRIO Controller
 - Type 9 and 11 messaging
 - Interworking to DPAA via RMan
- 2 SATA 2.0 3Gb/s
- 2 USB 2.0 with PHY

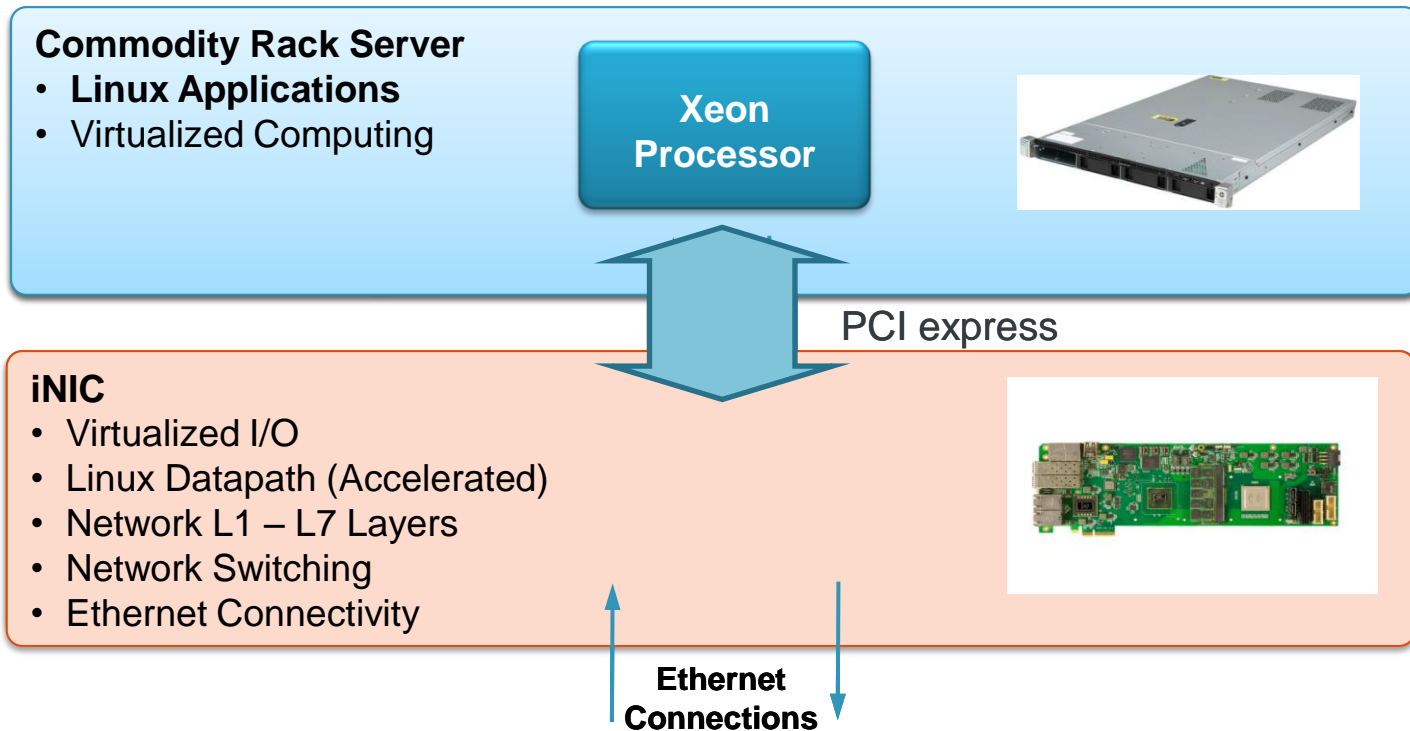
Network IO

- Up to 25Gbps Simple PCD each direction
 - 4x1/10GE, 4x1GE or 2.5Gb/s SGMII
 - XFI, 10GBase-KR, XAUI, HiGig, HiGig+, SGMII, RGMII, 1000Base-KX
- Device
- TSMC 28HPM Process
- 25x25mm, 896 pins, 0.8mm pitch
- Power estimated at 15.5 – 25.3W (thermal) depending on frequency
- **Schedule:** Q3-2013 (alpha); mid-2014 qual



Freescale iNIC Solutions

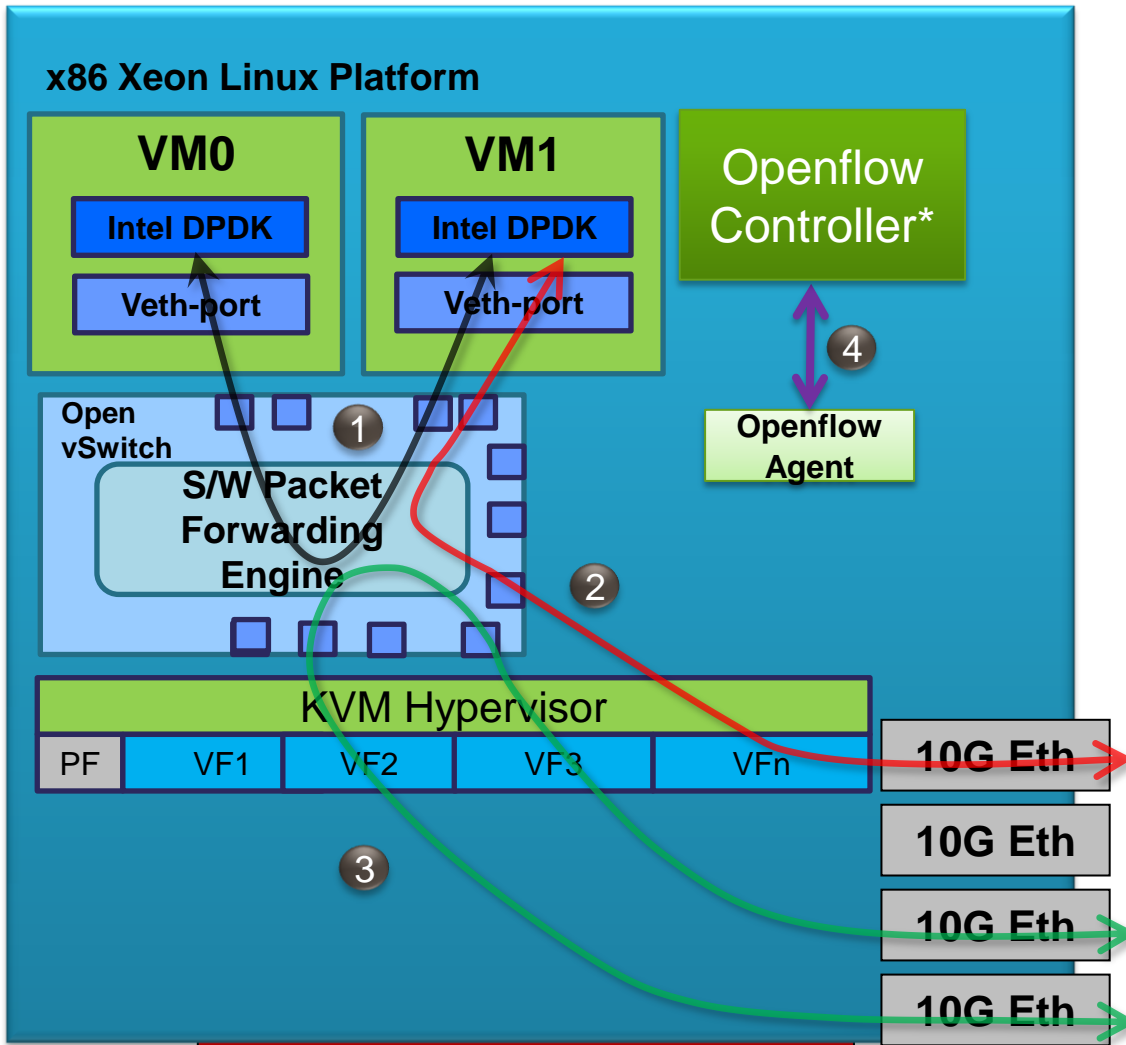
Standard Server + *Intelligent* Network Interface Controller (iNIC)



iNIC Advantage:

- Offloads network centric operations to **increase server processing for applications**

Virtualized Server – OVS Running in Host Kernel



Traffic Flow

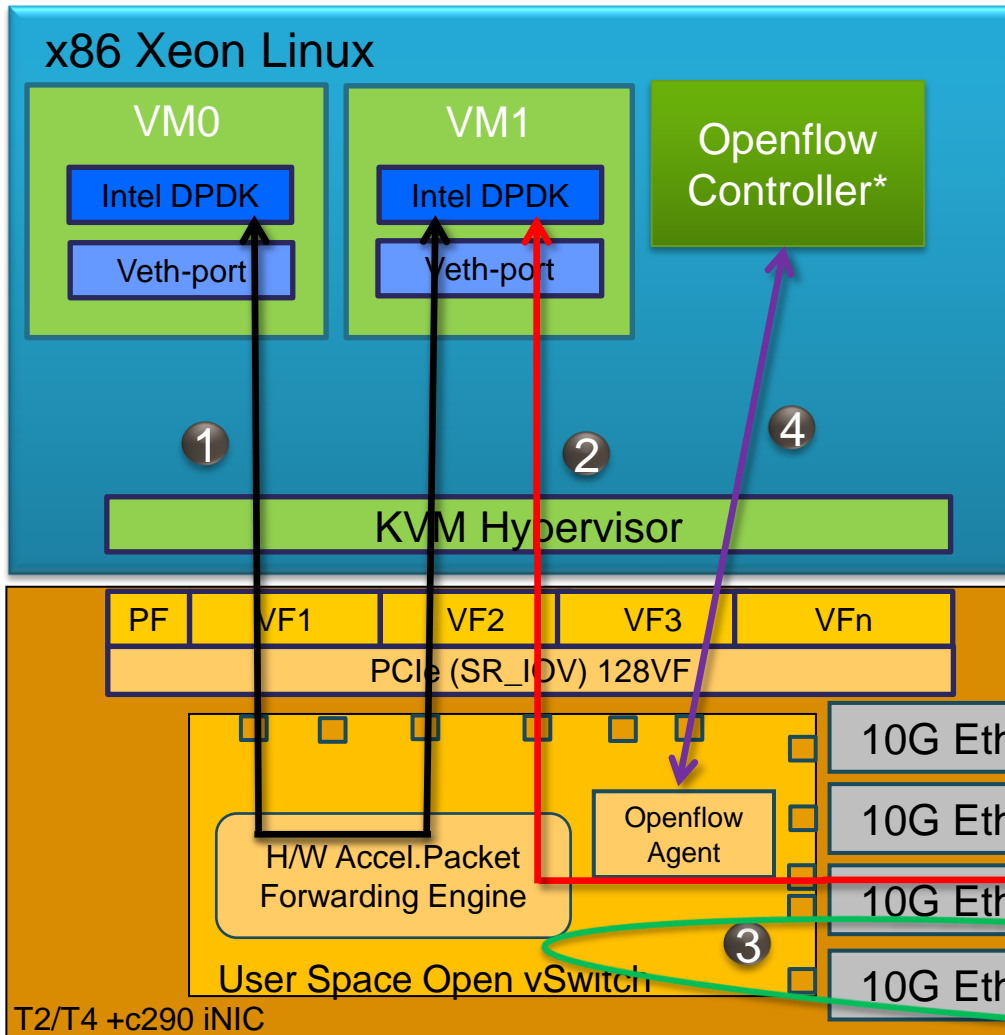
- 1 VM-to-VM
- 2 VM-to-ethernet
- 3 ethernet-to-ethernet
- 4 Openflow Control Plane path

Main Components and Functions

- DPDK NIC driver
- Support for up to 128 VF
- Kernel Space vSwitch
- Openflow Agent for traffic management

* Can be external

Virtualized Server – OVS Running on Freescale iNIC



iNIC Traffic Flow

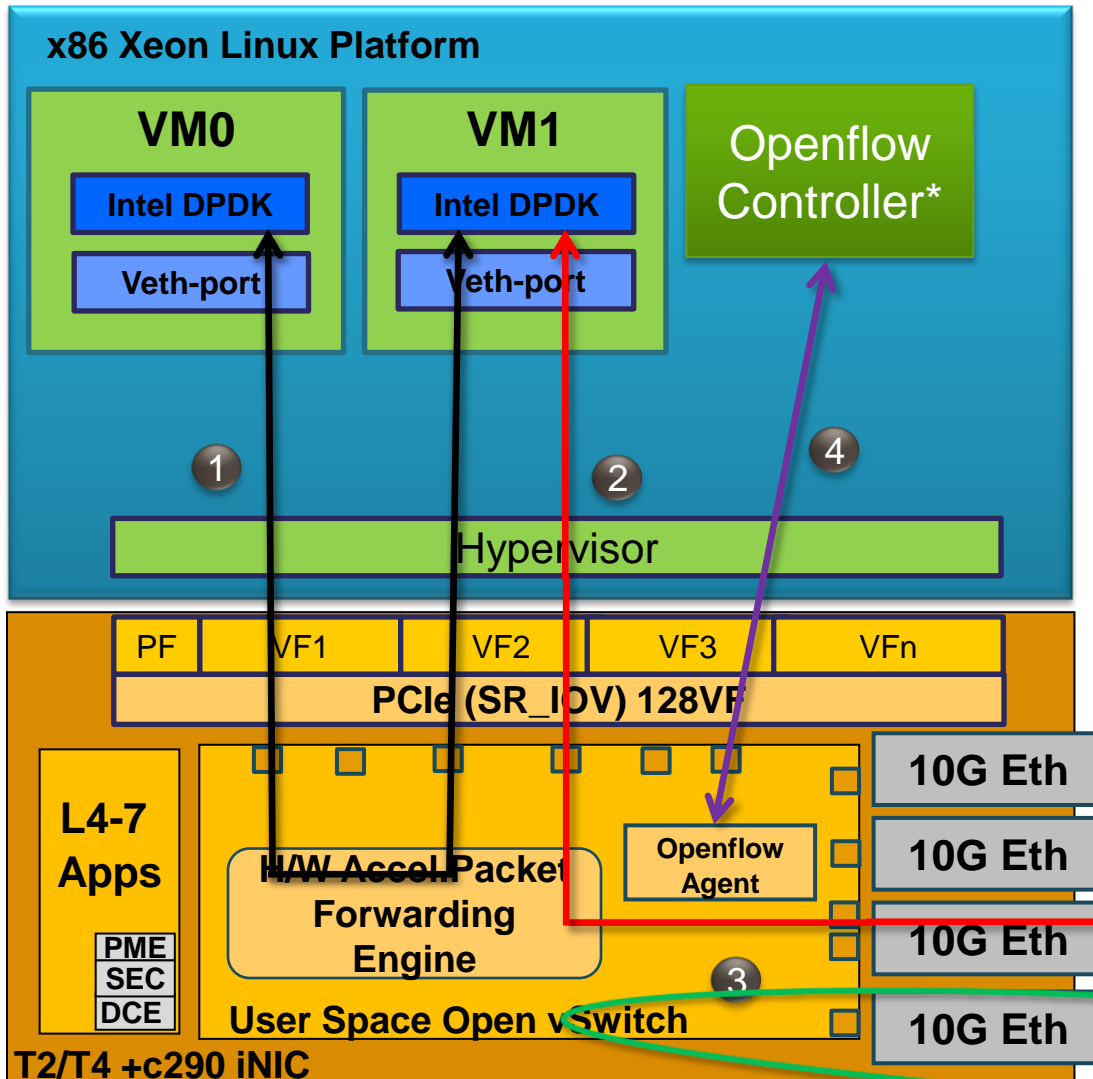
- ① VM-to-VM
- ② VM-to-ethernet
- ③ Ethernet-to-ethernet
- ④ Openflow Control Plane path

Main Components and Functions

- Intel DPDK compliant vPort driver optimized for QorIQ iNIC
- Support for up to 128 VF
- User Space Open vSwitch with hardware accelerated Packet Forwarding Engine
- Supports Openflow Agent

*Can be external

Server with Freescale iNIC (With Offloads)



Enhanced L4-7 Functionality

- IPSEC
- TCP offload
- Data Compression
- Deep Packet Inspection
- Load Balancing
- OpenSSL + record offload
- SDN/Firewall/ACL
- Vendor defined applications

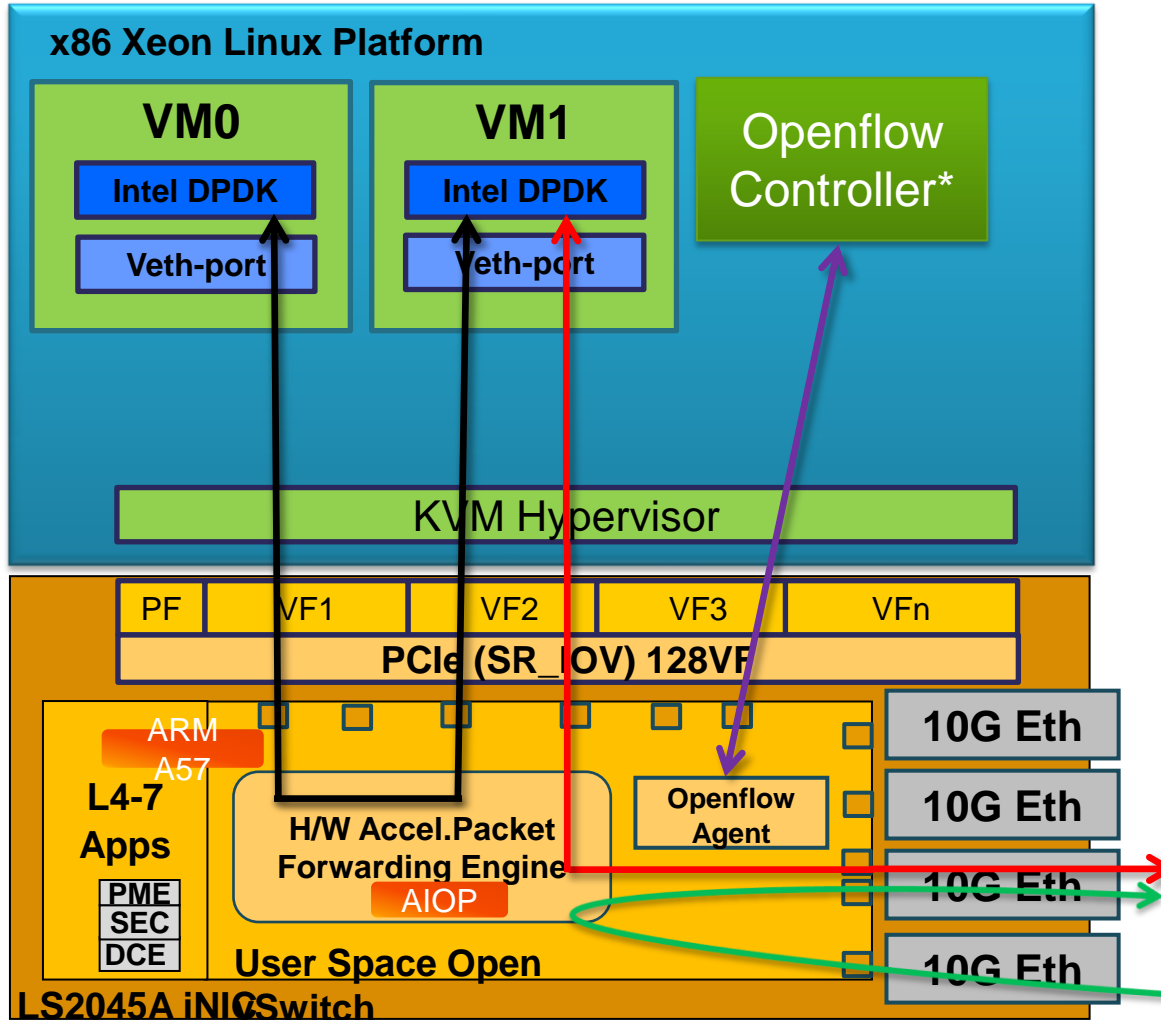
Benefits

- Offloading of x86 CPU to increase aggregate with app performance cost effectively
- Increase top end server performance
- Scalable iNIC platform performance T2080 to T4240; Reusable software
- Hardware acceleration for Data Path, Pattern Matching, Security and Decompression /Compression, PKC/Record offload

* Can be external

Virtualized Server – OVS & L4-7

Offloads to LS1080A and LS2085A iNIC



Enhanced L4-7 Functionality

- SDN/NFV/Firewall/ACL
- IPSEC
- TCP offload
- Data Compression
- Deep Packet Inspection
- Load Balancing
- OpenSSL + record offload
- Vendor defined applications

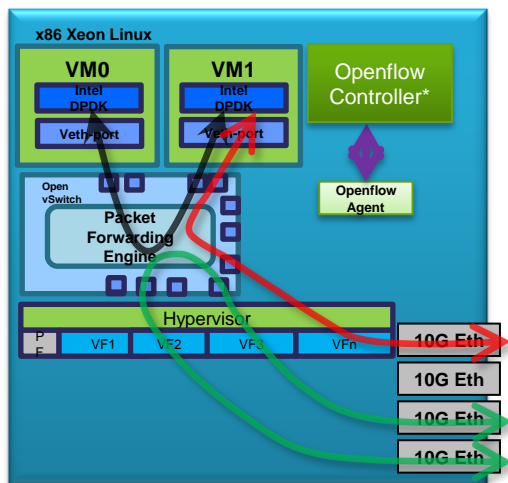
Benefits

- Offloading of x86 CPU to increase aggregate with application performance cost effectively
- Increase top end server performance
- Scalable iNIC platform performance LS1080 to LS2085.
- Reusable software
- Hardware acceleration for critical networking use cases

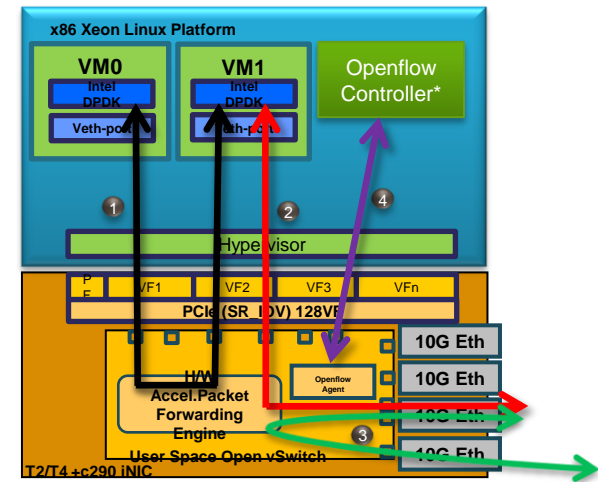
* Can be external

Freescale iNIC Performance Advantage

- OVS offload for x86 cores
- Additionally Freescale processors contain network application oriented hardware accelerators (security, compress/decompress, pattern matching) which accelerate key iNIC use cases

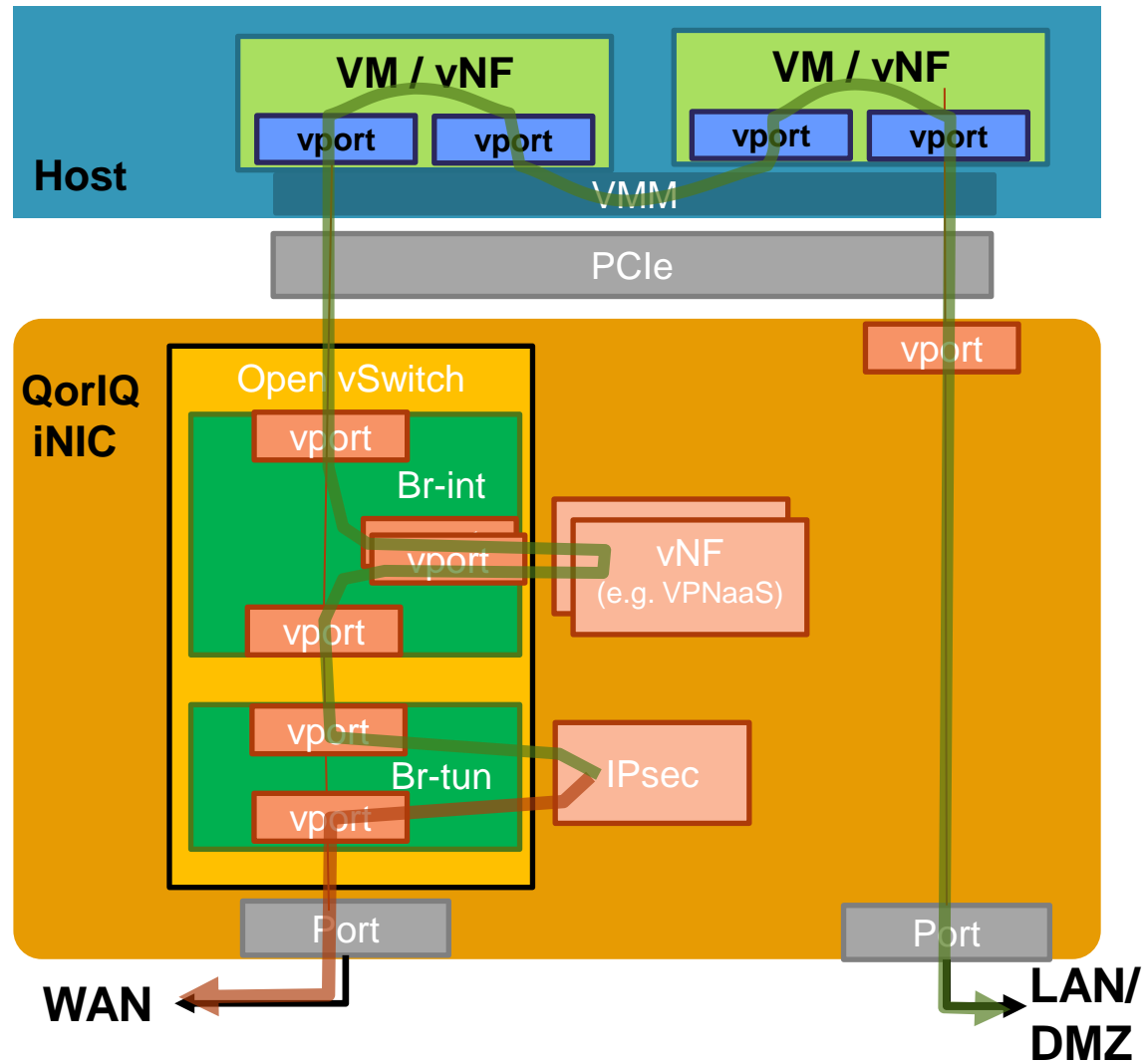


Xeon cores freed up



NFV Server with QorIQ iNIC Security Offload

- Offload computationally intensive operations from host
 - Items performed more efficiently with accelerators (crypto, compression, etc.)
 - Secure tunneling function over public networks
 - vNF Services
 - Chain several inline services together
 - Manage with traffic policy (using OF)
- Manage service chains via OpenFlow controller / extensions



QorIQ T Series iNIC Solution

Hardware and Roadmap



Freescale QorIQ T2/T4 iNIC Boards



	PCIe-2220E T2080 iNIC Board	T2080 RDB Evaluation Board	Niagara 732 T4240 iNIC Board
Board Vendor	Advantech	Freescale	Interface Masters
SoC	T2080	T2080	T4240
Processor Core	8 threads e6500	8 threads e6500	24 threads e6500
Processor Frequency	1.5 GHz	1.8GHz	1.667 GHz
Co-Processor	None	C291	C293
Memory	4GB DDR3 w/ ECC on-board	Up to 16GB w/ECC DDR3 SODIMM	Up to 48GB GB w/ECC DDR3 SODIMMs
Memory Speed	1600MHz	1867MHz	1867MHz
Ethernet I/O	2 10G SPF+ / 1 GigE	2 10G SPF+/2 10GBase-T / 4 GigE	4 10G SPF+ / 2 GigE
PCIe Card Size	Half height / Half length	Full height / Full length	Full height / Full length
Card Power	<25W	<50W	<80W

PCIe-2220E – QorIQ T2080 iNIC Board



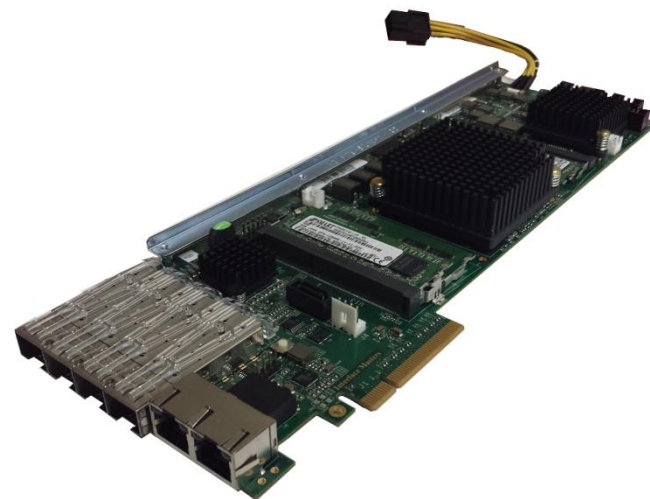
Processor	Chipset 1	Freescale QorIQ T2080	
	Max. Speed	1.5 GHz	
	Processor Cores	4 cores	
System Memory	Memory for T2080	DDR3 1600 MHz SDRAM on board up to 4 GB with ECC	
Boot Flash	SPI Flash	4MB	
Ethernet	Controller	Broadcom BCM84752	
	Interface	2 x SFP+ ports	
Storage	eMMC	4GB	
Management Interface	Management Port	1 x RJ45 (GbE) port	
Interface	Physical Connection	PCIe x8 gen.2 (5Gbps/lane) gold fingers	
	Logical Connection	PLX PEX8747	
I/O Interface	Serial Port	1x mini-USB console port	
Software Support	Bootloader	Freescale SDK 1.0, U Boot	
	Operating System	Freescale QorIQ DPAA SDK	
	Driver	Freescale QorIQ T2080 driver (compliant Intel DPDK)	
Cooling	CPU Heatsink	Passive Heatsink	
Power	Power Supply Voltage	12V	
	Power Type	DC-in	
	Power Consumption	25 Watts	
Physical Characteristics	Dimensions	180(W) x 21(D) x 14(H) mm(6.57" x 2.7" x 0.57")	
	Weight	0.26 kg	
Environment	Temperature	Operating	Non-operating
		0 ~ 40° C (32 ~ 131° F)	- 40 ~ 70° C (-40 ~ 158° F)
	Humidity	5 to 93% @ 40° C (non condensing)	95% @ 40° C (non-condensing)
Compliance	EMC/Safety	CE/FCC Class A	

ADVANTECH



Niagara 732 - QorIQ T4240 PCIe- High Performance iNIC

- Quad Port 10Gb CPU based NIC
 - QorIQ T4240, 12 core, 24 threads CPU based on PPC architecture
 - Up to 48GByte of DDR3
 - Network interfaces Quad 10Gb SFP+ (SR, LR)
 - Includes Flash and SD Memory
 - Management and Console ports
 - Offload C293 encryption acceleration
- Linux BSP/SDK + PCI-e driver support



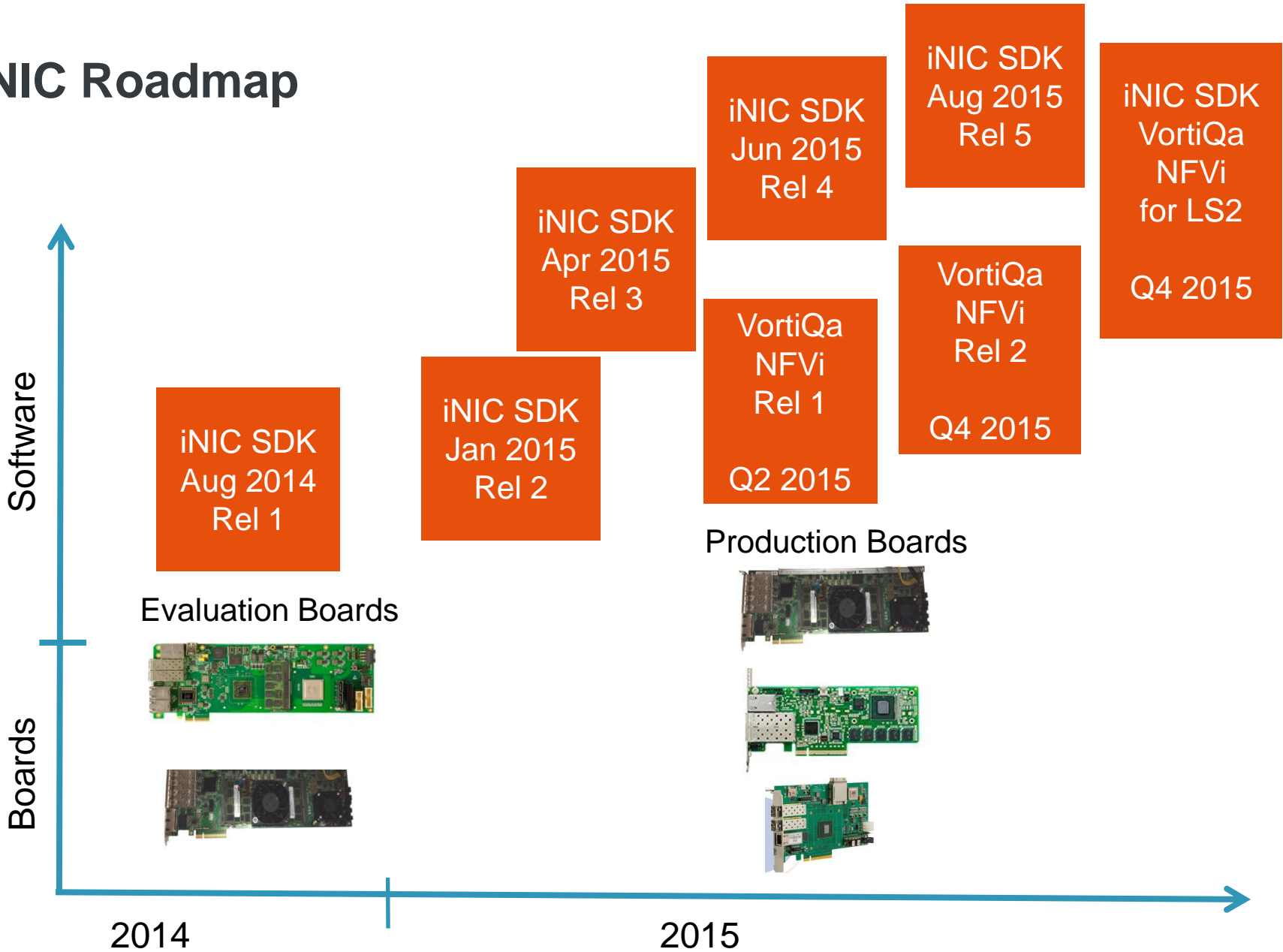
Interface Masters



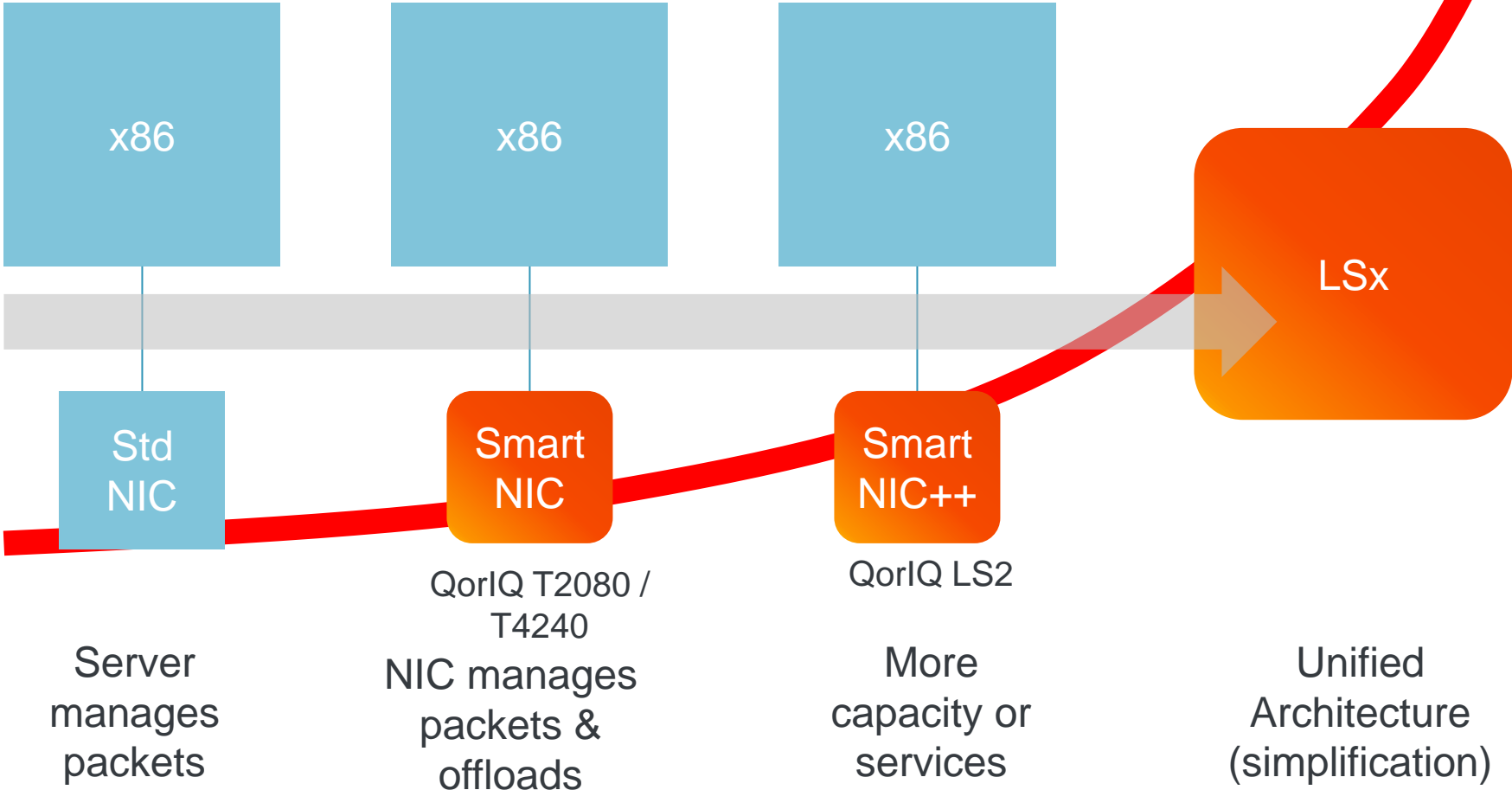
Innovative Network Solutions



iNIC Roadmap



Increasing Server Intelligence and Performance for NFV



iNIC Development Kit

Major Features

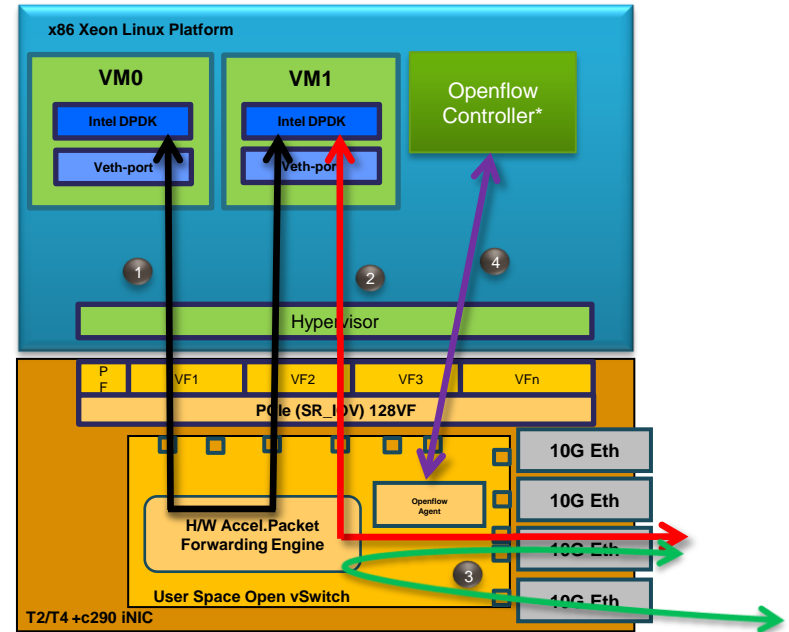
- All open sources

Host

- x86 Linux/KVM host environment
- Upstreamable iNIC Linux kernel driver
- DPDK compatible iNIC interface in user space

iNIC

- T2080 and T4240 support
- Patch release based on SDK 1.6
- External Floodlight or Opendaylight SDN controller support
- Open vSwitch in user space
 - virtual machine to virtual machine
 - virtual machine to physical network
 - physical network to physical network
- Provided sources or links to open source code with build instructions
- Flash image for quick startup on support boards
- Availability: T2080 & T4240 - Now
LS2045/85 - Q3/4 2015

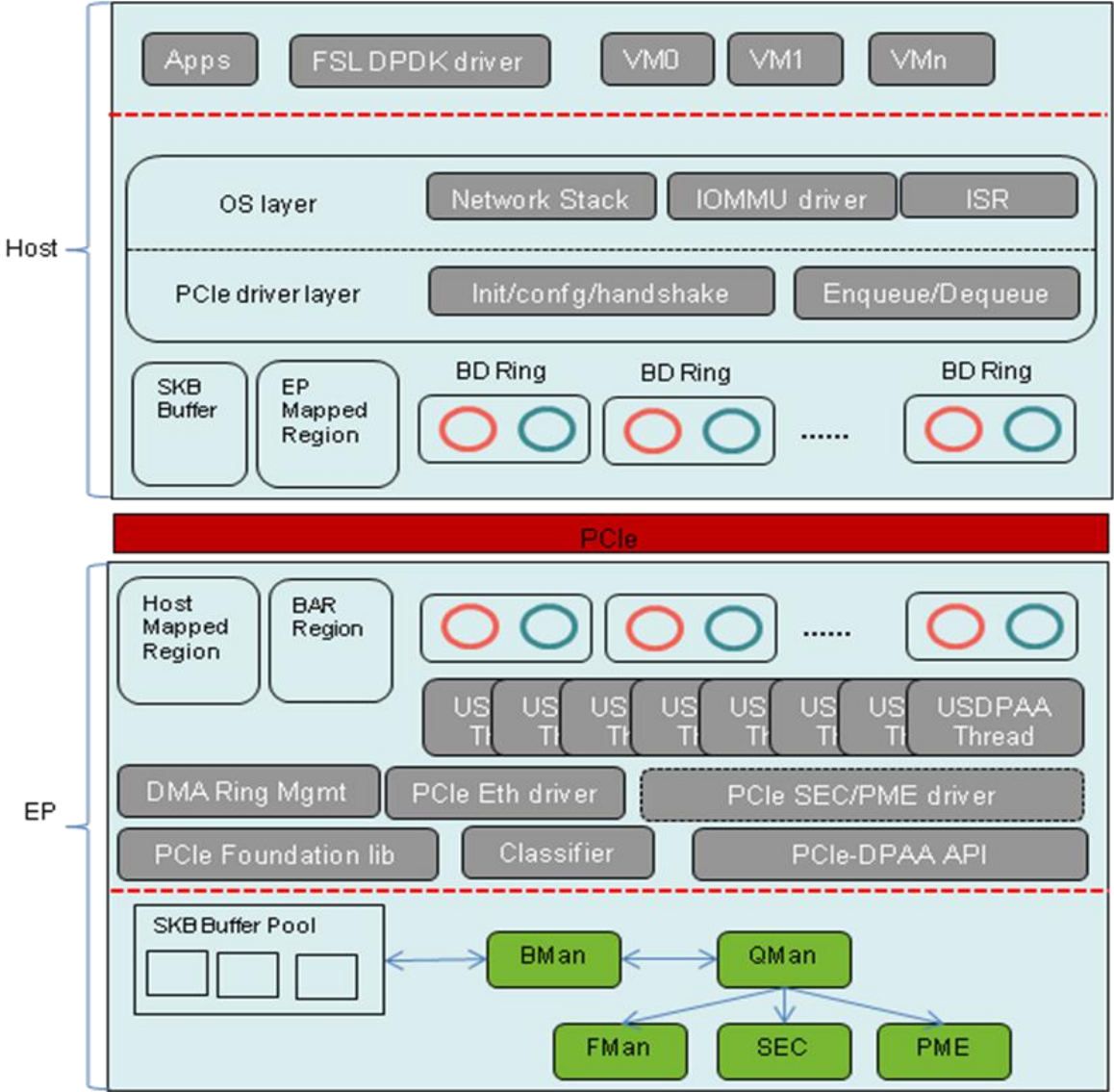


**Rapid prototyping and
development platform for
iNIC applications**

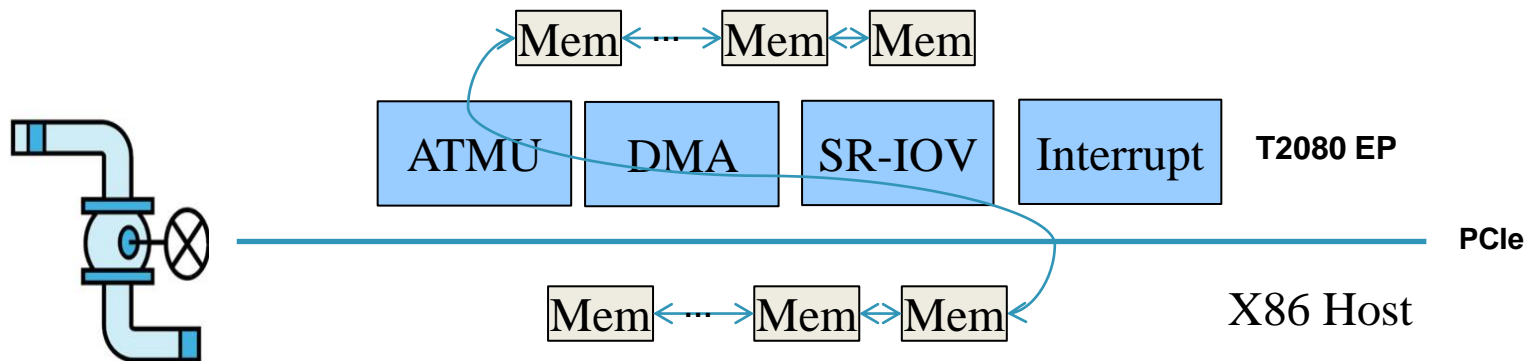
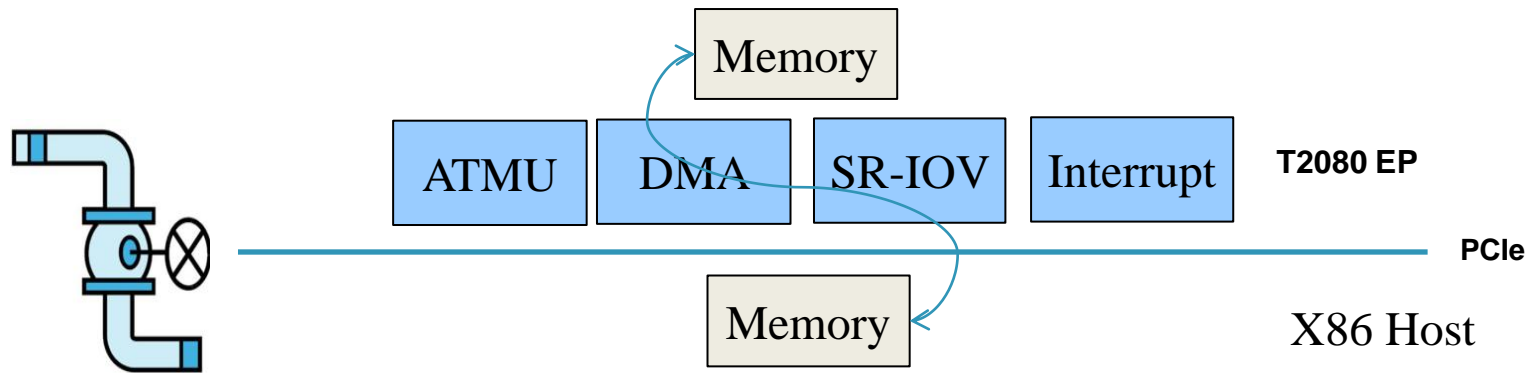
QorIQ T Series iNIC Software Design



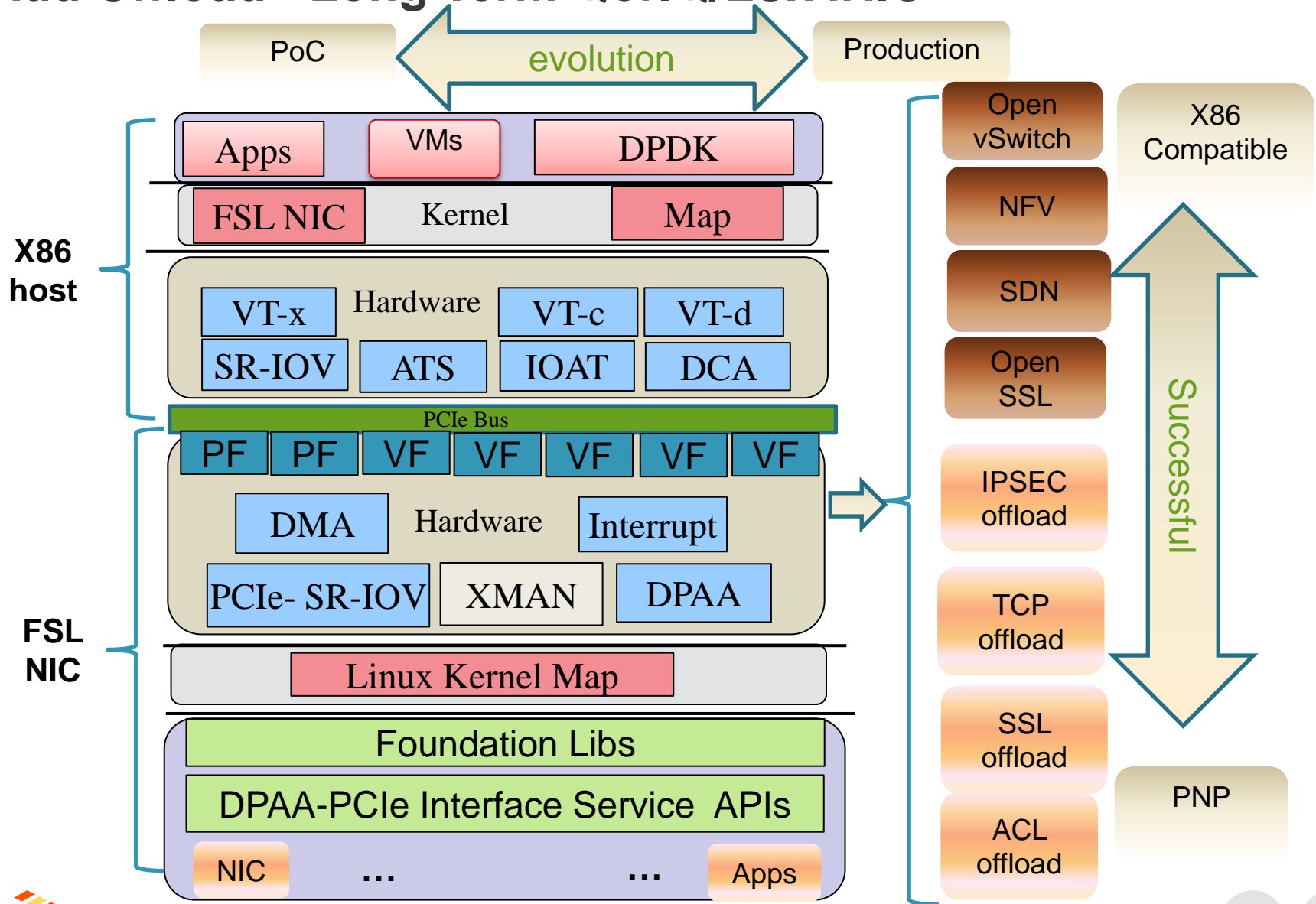
iNIC Software Architect Design



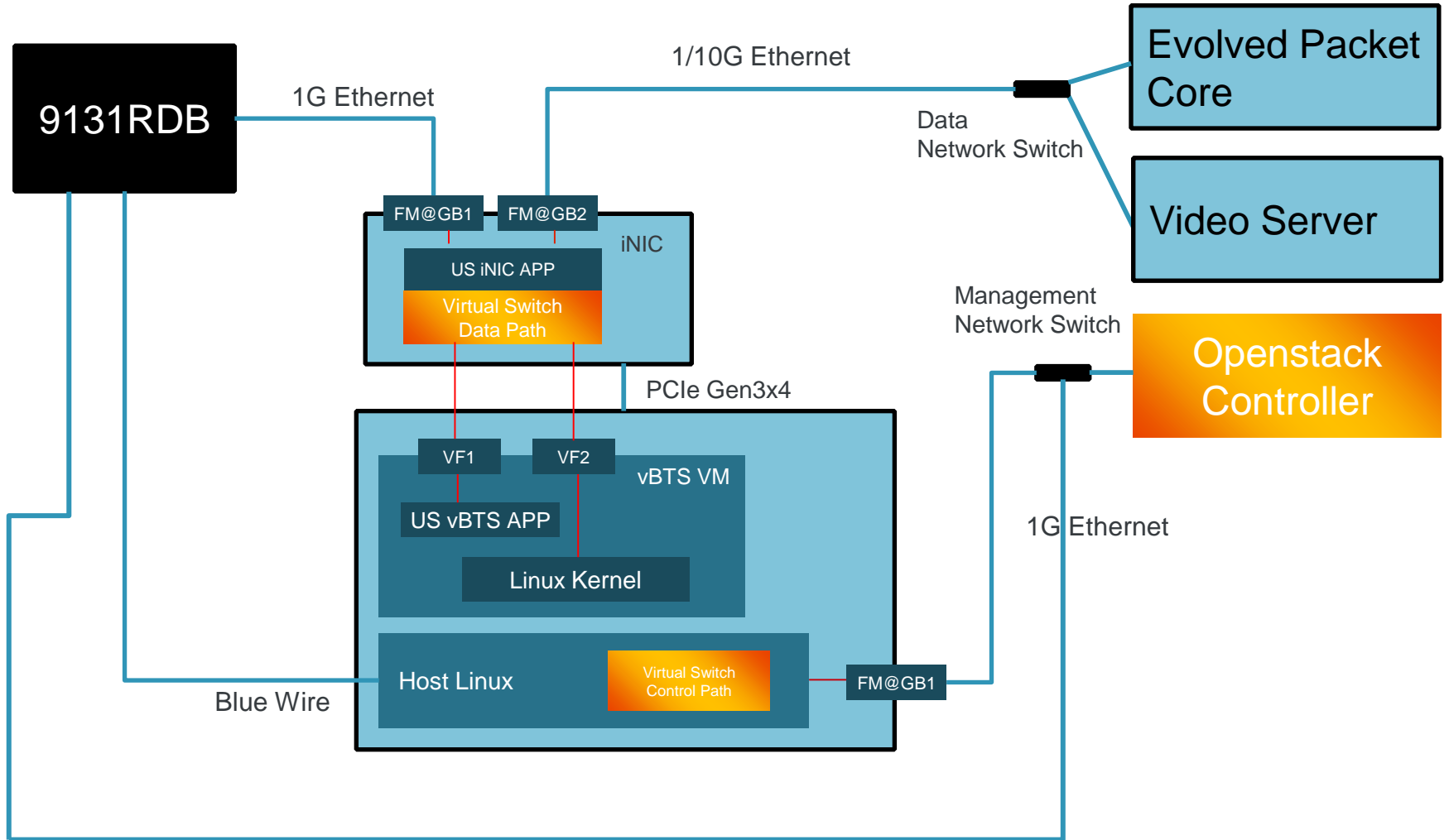
Basic Pipe



Add Offload - Long Term QorIQ/LSx iNIC



Virtual Access Demo System



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