FTF 2016
TECHNOLOGY FORUM

DATAPATH APPLICATIONS FOR THE NEW NETWORK

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DIGITAL NETWORKING SYSTEMS & SOLUTIONS

FTF-NET-N1884
MAY 18, 2016

AGENDA

- Motivations
- Cloud Infrastructure
- Virtualization (e.g. Network Functions Virtualization)
- Virtualized Acceleration
- Acceleration Use Cases

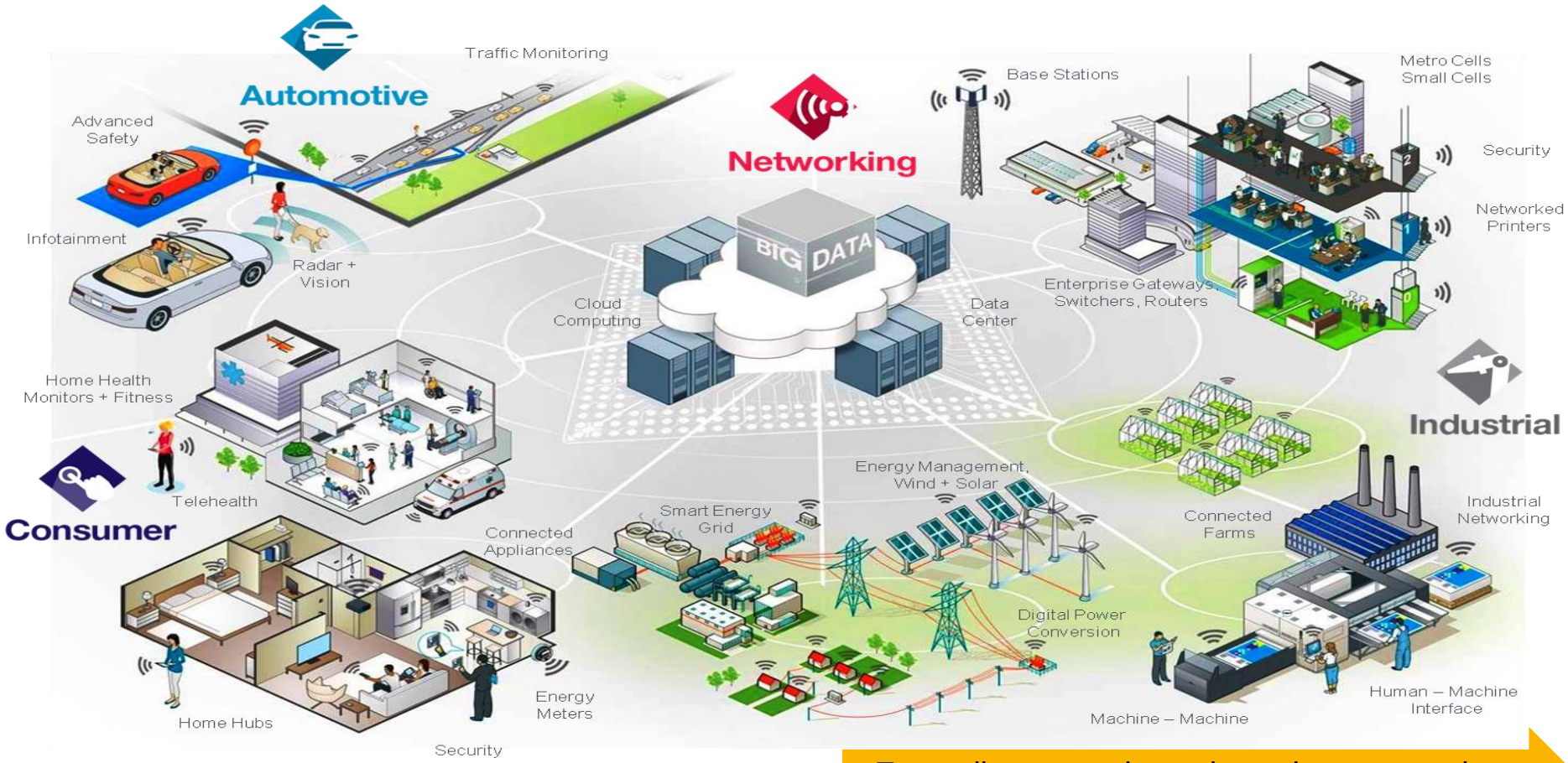
MOTIVATIONS

Session Overview and Objectives

- Introduction
  - This 1 hour session will explore the **“who, what, where and why”** questions behind market trends that are driving dramatic shifts in how devices will be connected, configured and services delivered to the end user from the Cloud.
- Objectives
  - Understand market trends and the forces behind them
  - Connect dots between trendy buzz words (IoT, IoE, NFV, SDN, Fog,…)
  - Explore key technologies and some examples of service delivery platforms
  - Obtain basic understanding of the relationship between technologies, placing Freescale SDN, NFV and cloud stack presentations in perspective; compare/contrast with whitebox & understand use cases

NXP's Key Market Drivers: An Expanding IP and Ethernet Market

Automotive, Industrial & Consumer Markets Are Getting Connected to Internet.



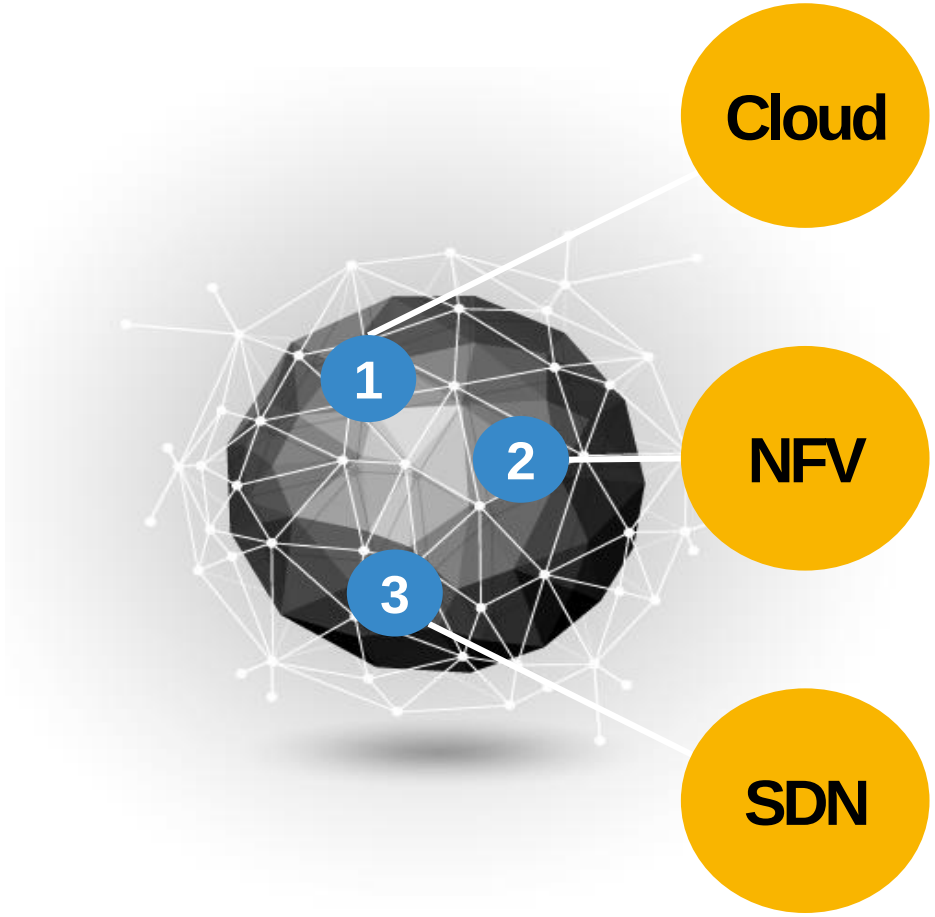
Expanding networks and growing expectations

NETWORKWORLD®

Freescale among the top ten companies making the Internet of Things a reality

Source :
http://www.networkworld.com/article/2225713/cisco-subnet/10-companies-making-the-internet-of-things-a-reality.html

The New Virtualized Network



Cloud – new services deployment model

- Composing applications from elastic compute, network and storage resources
- Commoditizing applications / appliances

NFV – service providers enabling networking Apps developers

- Network Appliances – become virtual appliances on high-volume compute platforms
- Standardization – vendor interoperability

SDN – operators exposing the network to Apps developers

- Cloud management of networking devices
- Separation between the programmable forwarding plane and control/management
- Standardized northbound interfaces from forwarding engines to allow cloud-based management and control

Networks Must Get Smarter, Fast!

- Demands on the network infrastructure continue to grow exponentially

Need to innovate to meet the demands

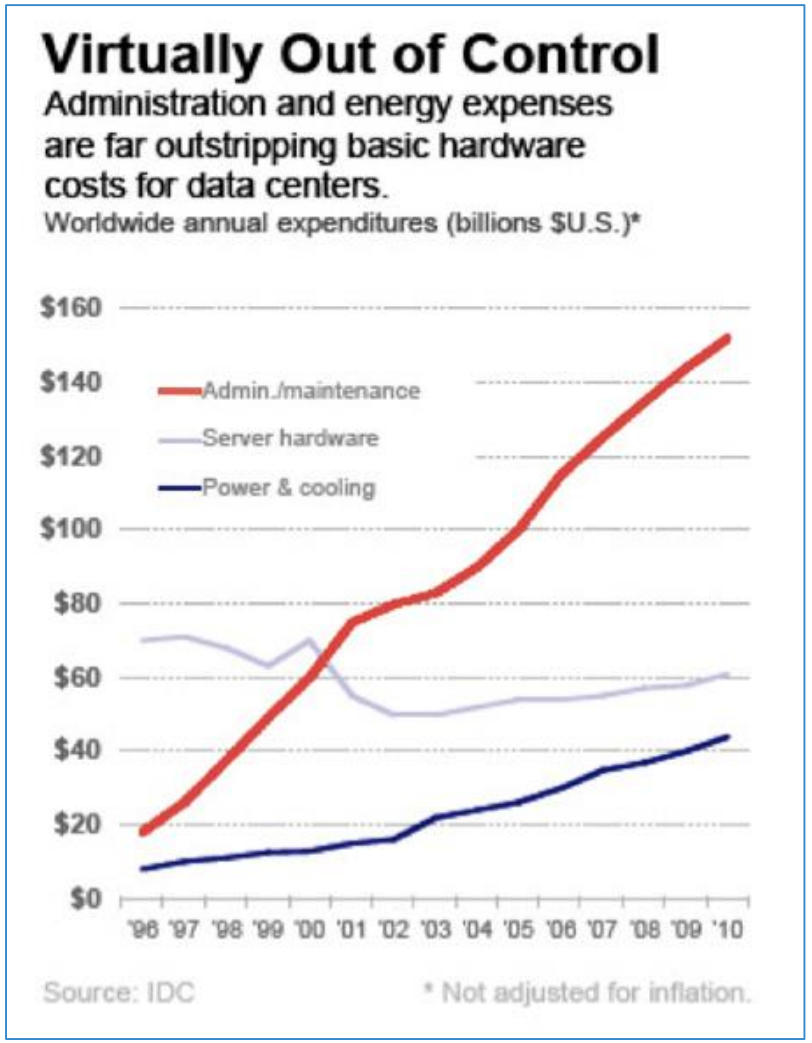
The Challenges…

Networks getting larger and smarter

- Network Traffic – Exponential traffic growth from Mobile, Cloud, Big Data, BYOD, IoT
- Explosive Expansion in the Number and Types of Connected Devices
- Diversity of New Services Being Deployed
- Constantly Changing Demand From Customers (Churn)

➔ CAPEX and OPEX Pressures on the Network Elements

- Rapid Obsolescence of Equipment
- Frequent Re-deployment/Reconfiguration
- Greater OPEX Pressures from Increased Operations & Administration Costs



CLOUD INFRASTRUCTURE

Motivates a New Vision for the Network (e.g. Domain 2.0)

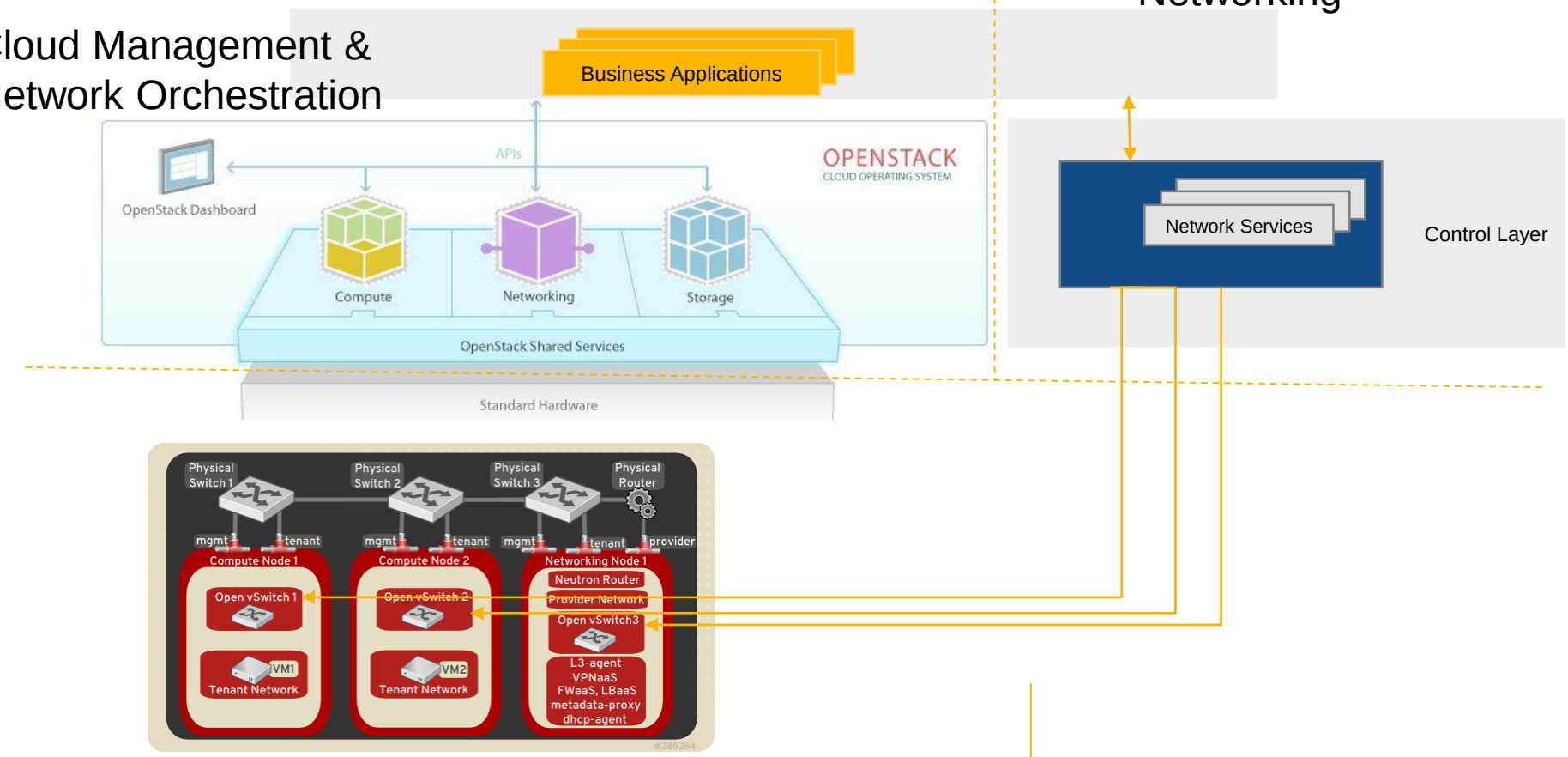
Transform the Network – inspired by cloud computing

- Cloud Networking – compose new network functions and services for one of many tenants (consumers) from pool of common infrastructure resources where those resources can be automatically provisioned and orchestrated as they are in the cloud data center
- Elastic – since resources are shared between tenants and often virtualized, tenants consume as little or as much resource as required, on demand
- Standardization – reduce the diversity among the different components in the infrastructure; make them universally configurable & programmable
- Simplify – deconstruct components into their simplest elements, allowing refactoring
- Centralize – migrate policy & management to a centralized location where it is more malleable

Cloud Networking Model

Software Defined Networking

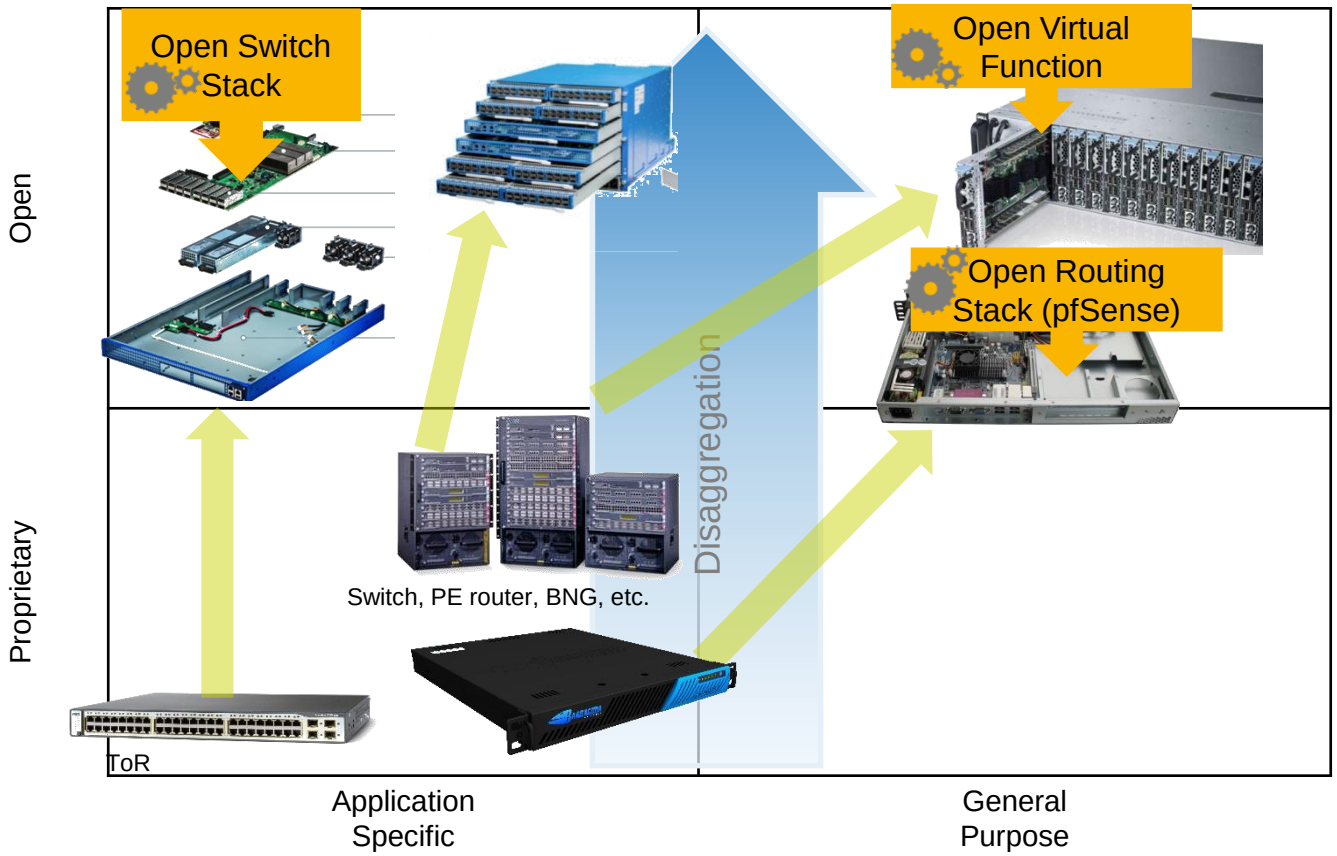
Cloud Management & Network Orchestration



Cloud – Compose systems from elastic set of standardized resources : compute, networking and storage

SDN – Separate policy (control & management) from (simplified) forwarding

Disaggregation: Commoditization/Platform Standardization



Vertical Disintegration / Disaggregation

Rapid innovation / evolution

Economies of scale

Open standards / software

Greater competition up and down the value chain → cost transparency for customers

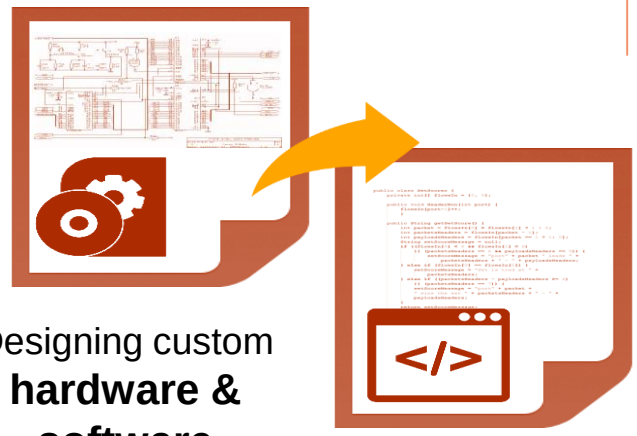
Full Commoditization Demands Disaggregation of the Software From the Hardware (e.g. Abstraction, Virtualization)

VIRTUALIZATION

Network Market Shifting to Virtualization (SDN/NFV)
Cloud / NFV Promises Three Benefits to Operators

Service Velocity

1

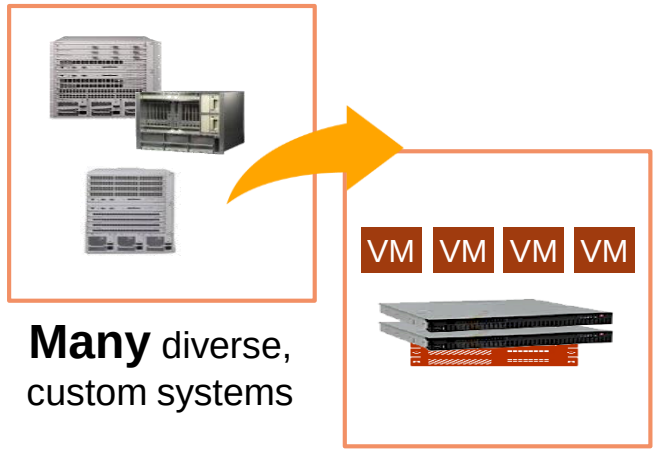


Designing custom **hardware & software**

Writing **code** you can run and test in a VM

Capex and Opex Reduction

2

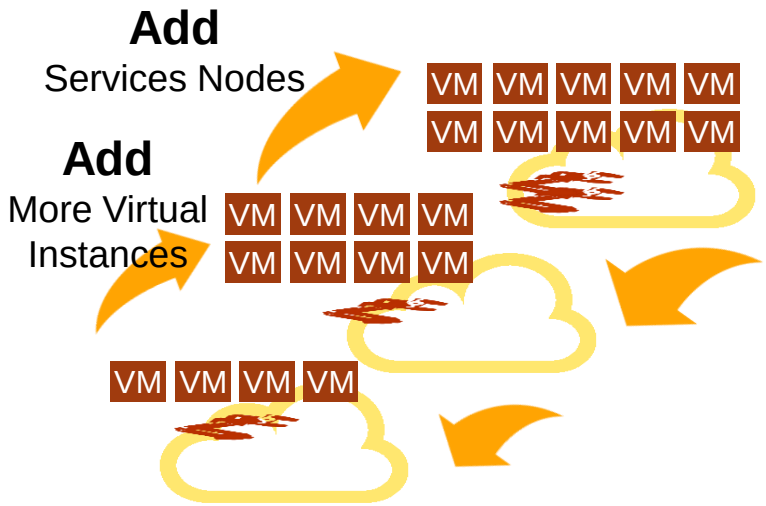


Many diverse, custom systems

Fewer, homogenous COTS systems

Scalability and Elasticity

3

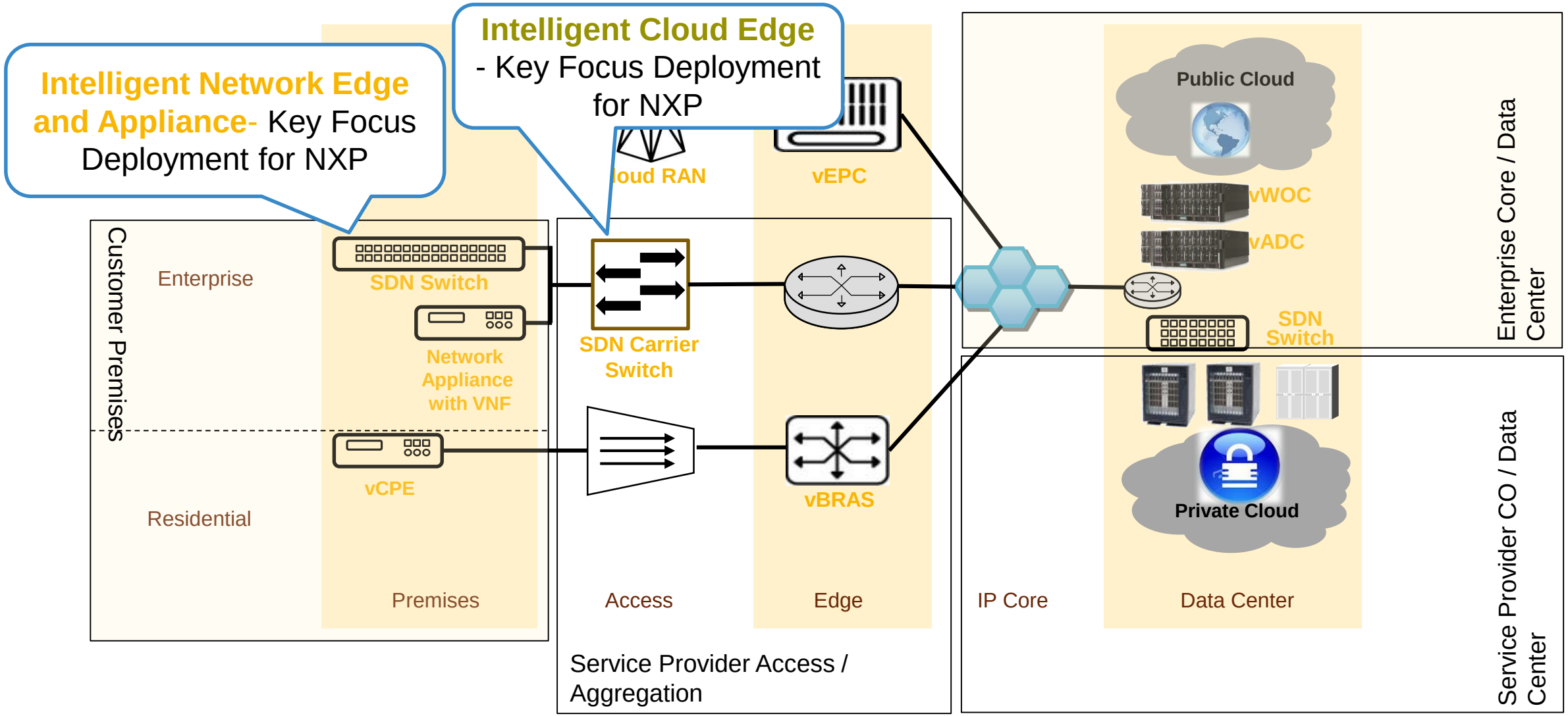


Add Services Nodes

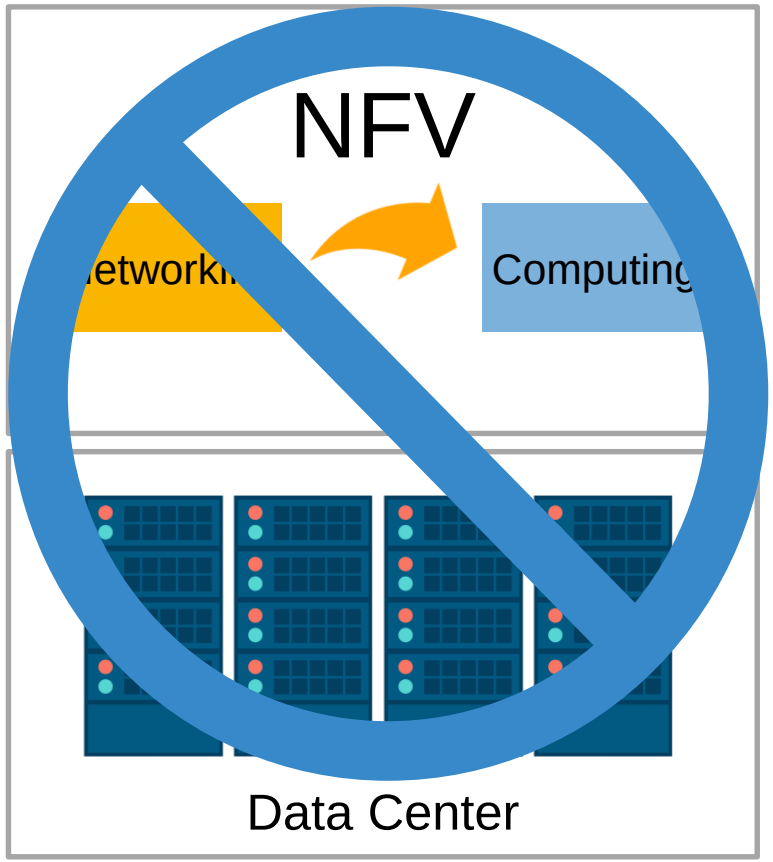
Add More Virtual Instances

Scale Back with Demand

Virtualization Will Be Used Throughout the Network

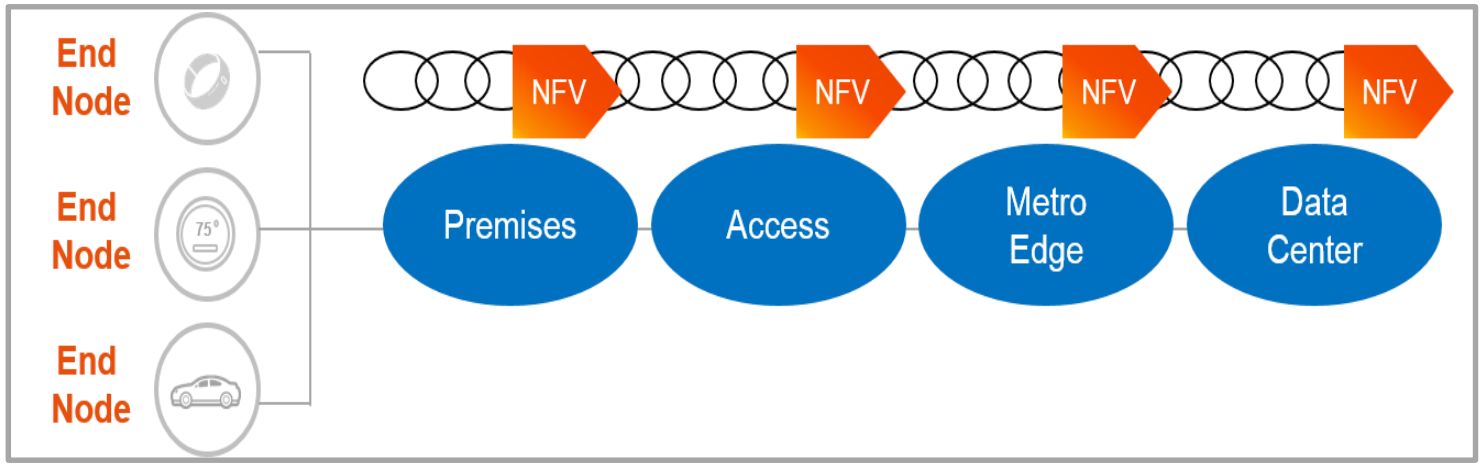


NFV Does Not Replace Networking With Computing But Blends the Two



Rigid Data Center Centralization

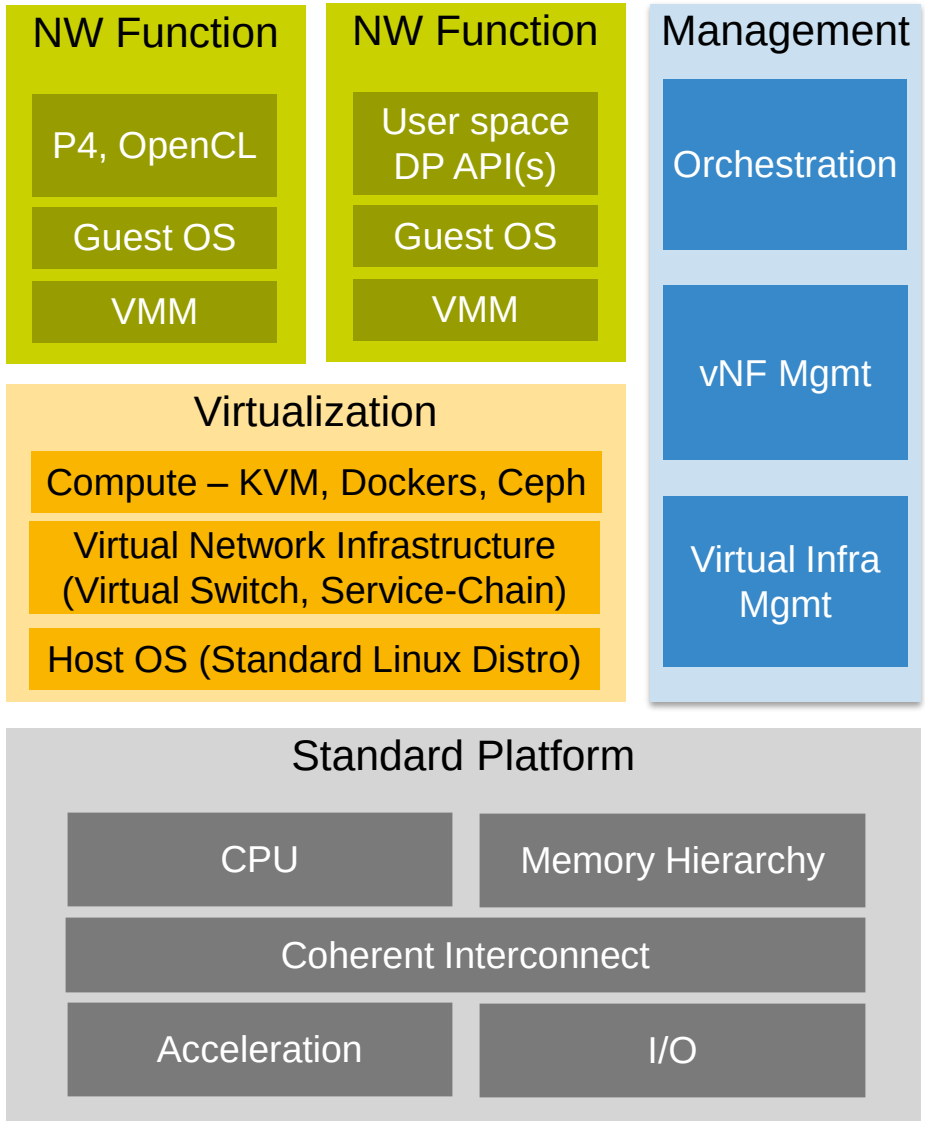
- **Systems in the field provide**
  - I/O, Acceleration
  - Low latency
- **The NFVI must be an intelligent flexible cloud**
  - VNF hosting distributed throughout network
  - Capability, capacity, context determine where VNFs run
- **Services can be chained across domains**



Intelligent Flexible Cloud

Distributed NFV places workload where it is most efficient and leverages local acceleration – yielding greater performance/W

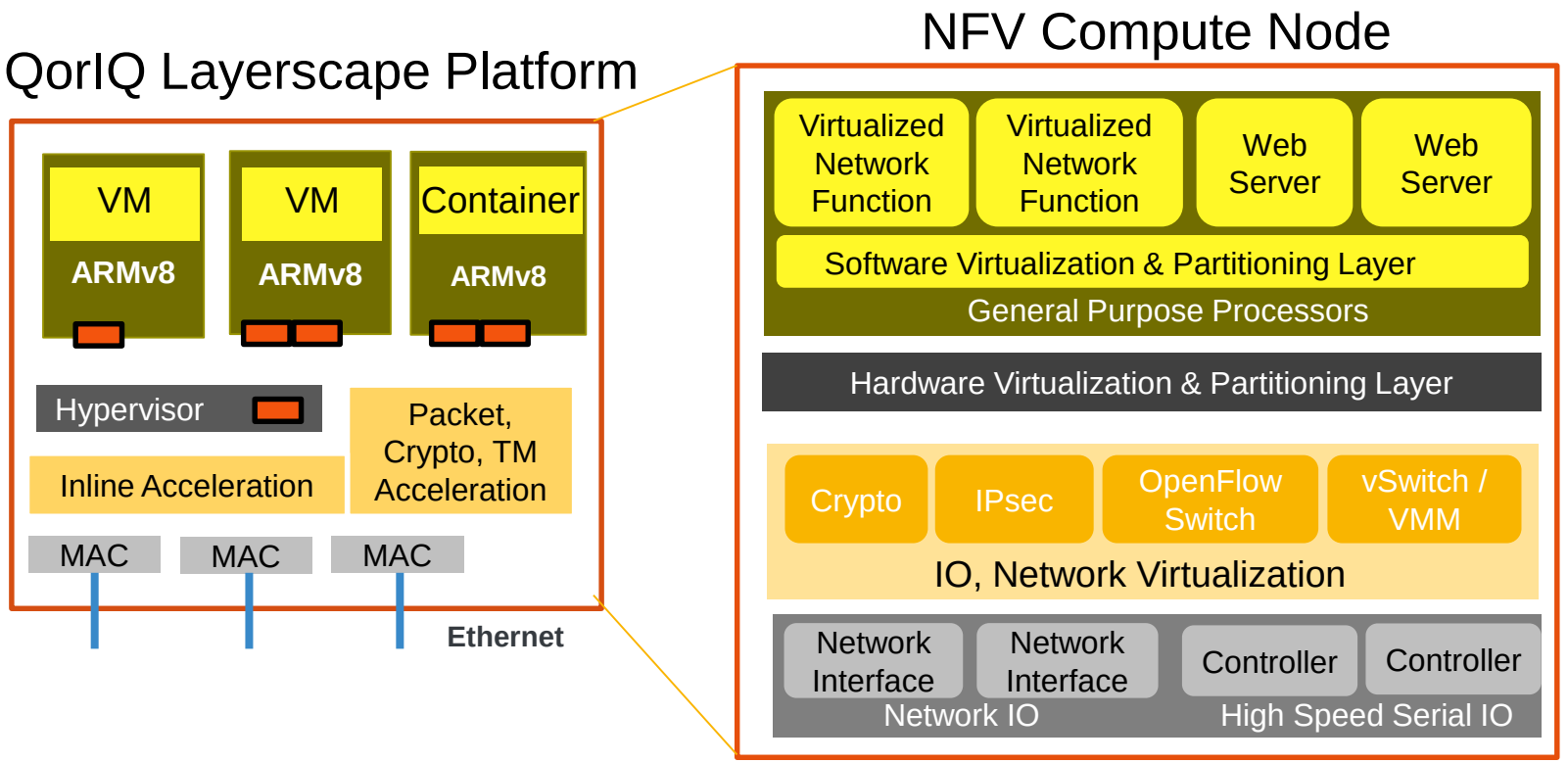
NFV – Driving a Common Open Eco-system for Enablement



- **Open Data Plane and Data-Path Development Kit**
  - **Standardized, offload-enabled data-path API**
  - **Virtualized access to acceleration: crypto, compression, etc.**
  - Supporting Open-source VNFs in user space
  - Vendor-neutral and cross-platform – x86, ARM
- **Virtual Network Infrastructure**
  - Running in user-space today over DPDK, ODP
  - **Datapath offloads: virtual switching, overlay, IPSec**
  - VNF Service-chaining using DPAA2 virtualized model
- **OPNFV on ARM**
  - Running on QorIQ processors
  - Supporting flexible installation, orchestration environment
- **Standard Platform Enablement**
  - Pre-boot execution environment: UEFI, ONIE installer
  - HAL/Platform standards: ACPI, APD, SBSA
  - OpenStack Management & orchestration

VIRTUALIZED ACCELERATION

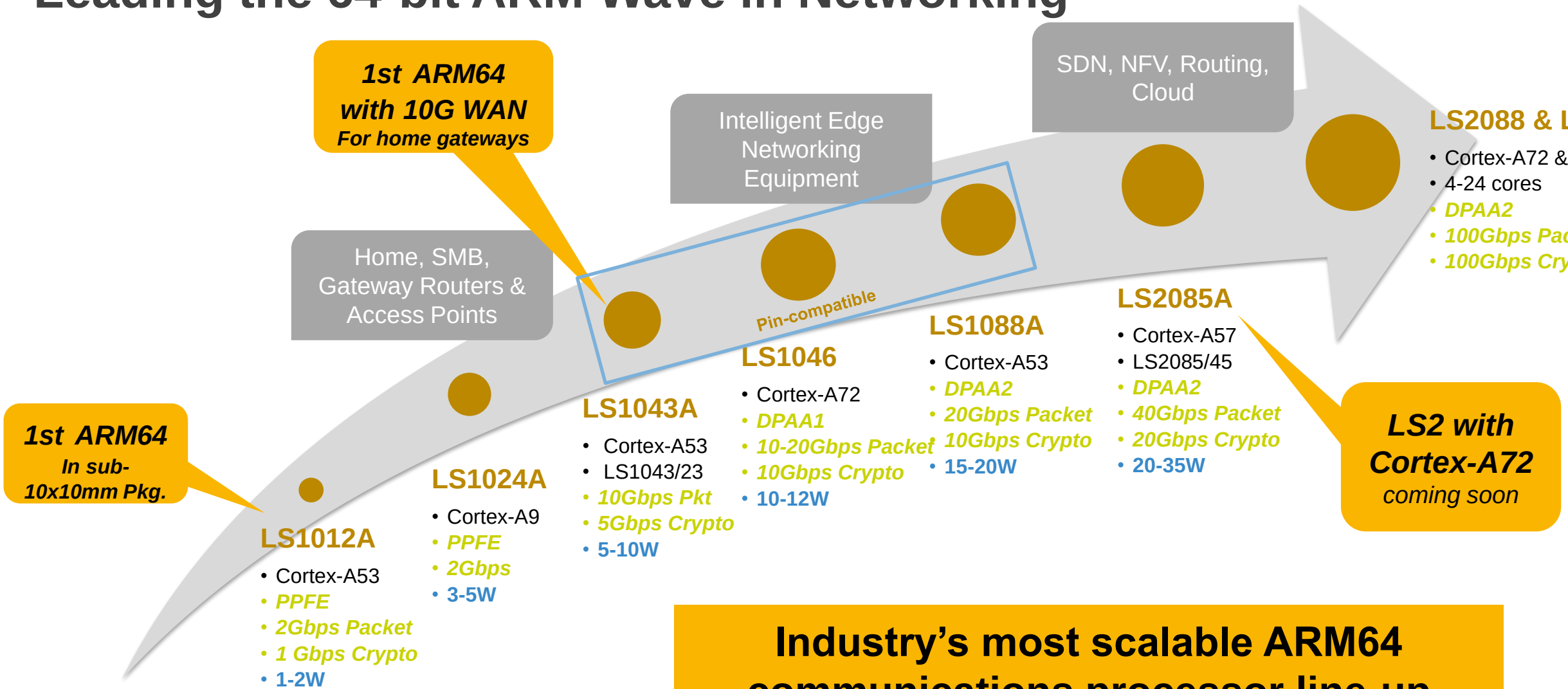
Open Platform for NFV – Mapping to Hardware



- **Expanded acceleration capability to offload Hypervisor and VMs**
  VxLAN, OVS, Firewall, Traffic Control, IPSec, Netflow, SDN
- **Virtualized Access to Acceleration Using virtio Interfaces**
  Crypto, Ipsec (protocol offload), veth (logical switch ports), etc.
- **Driving standardization**
  Linux, ODP, Virtio, DPDK
- **Driving relevant open standards bodies**
  ETSI NFV, OPNFV, ONF, LNF
- **Standard SW installation environment**
  - UEFI, ONIE, ACPI, uboot

Open, Scalable, Performance / Cost Optimized Solution
Software Fully Compatible with Open Standards Using Virtualizaed Acceleration

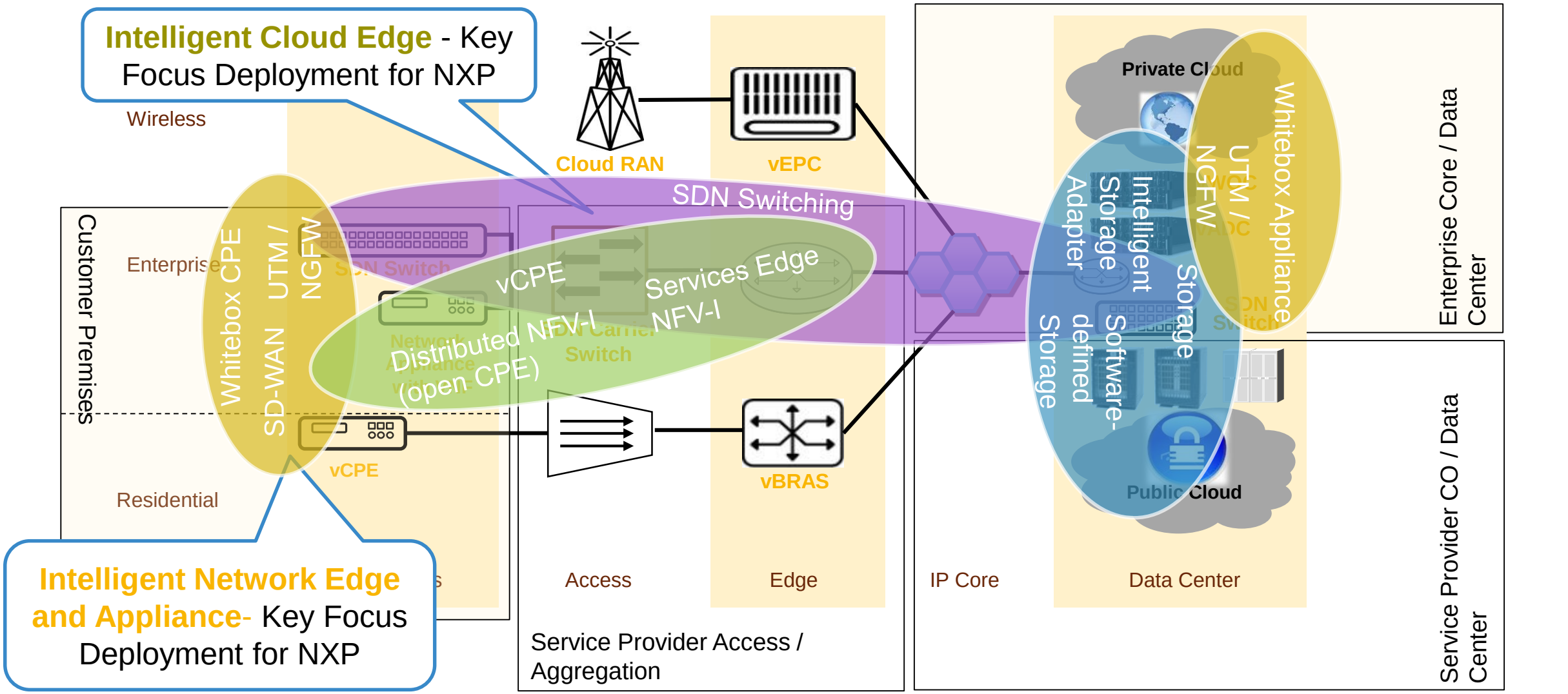
Leading the 64-bit ARM Wave in Networking



Industry's most scalable ARM64 communications processor line-up

ACCELERATION USE CASES

Virtualized Acceleration Use Cases



Network Switching – Increasing Bandwidth

3 Tbps

128x25G

8-Core Controller

1.3 Tbps

128x10G

4-Core Controller

640 Gbps

64x10G

2-Core Controller

320 Gbps

32x10G

1-Core Controller

80 Gbps

8x10G

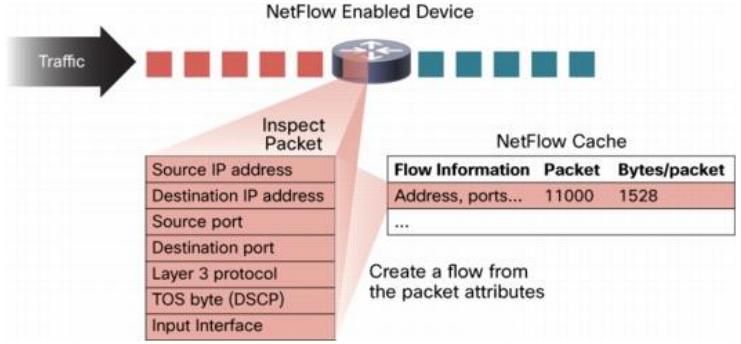
1-Core Controller

Drives requirements to offload intensive tasks from Control Processors – Analytics, OA&M protocols, services offload

Network Analytics Technology

Use of analytics to optimize the use of the data center network infrastructure

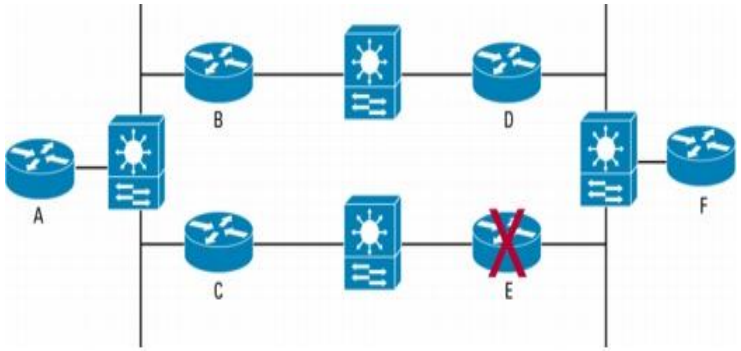
Netflow Use Case



- **Key tool for network trouble shooting, capacity planning and anomaly detection**

- **Conforms to Cisco Netflow RFC 3954**
- **Support for IPV4 and IPV6**
- **ACL support for selective monitoring**
- **Support multiple observation domains and observation points**
- **Support millions of flows**

BFD

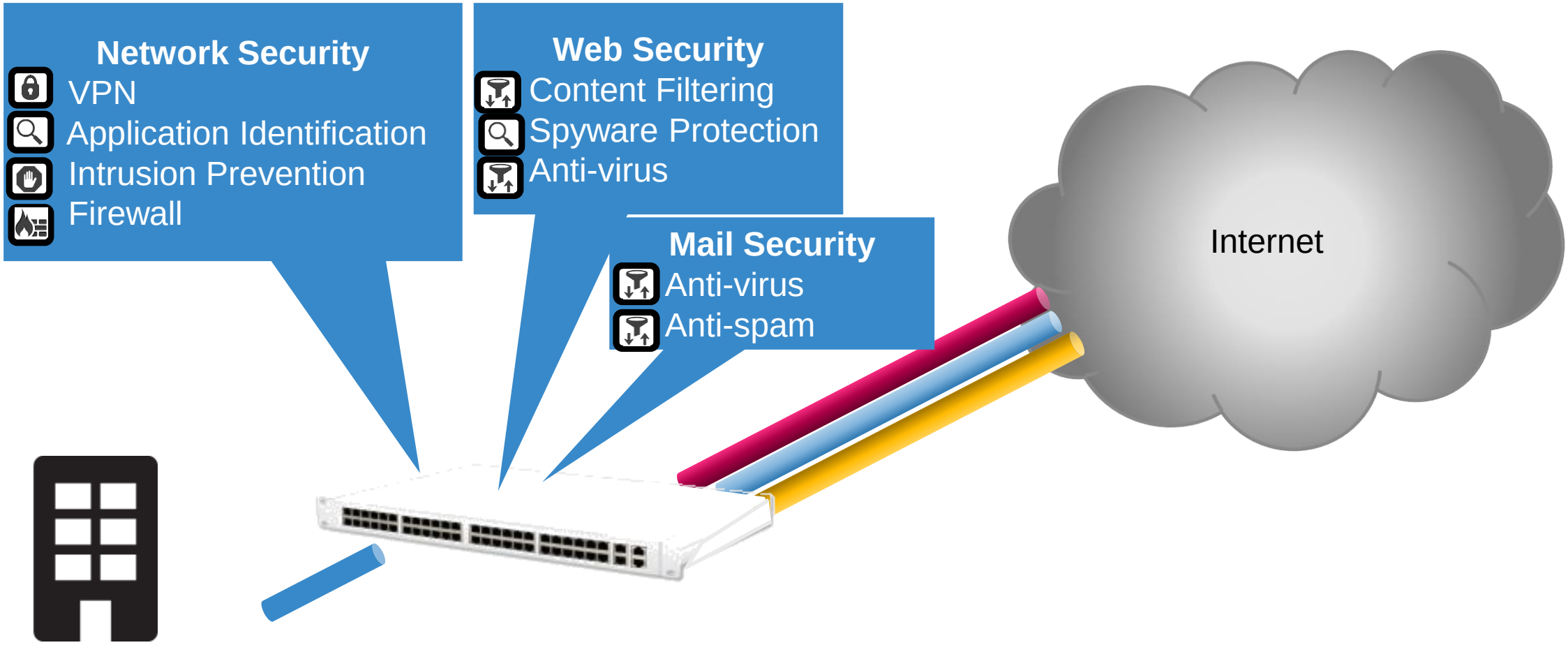


- **Provide failure detection in less than 1 sec.**

- **Conforms to RFC 5880/81/82/83**
- **Support for IPV4/V6 single hop and multi hop peer failure detections**
- **Supports BFD Authentication**

Analytics technologies drive the need to offload protocols like netflow, BFD from the Control Processor to DPAA 2 Advanced I/O Processor in Layerscape

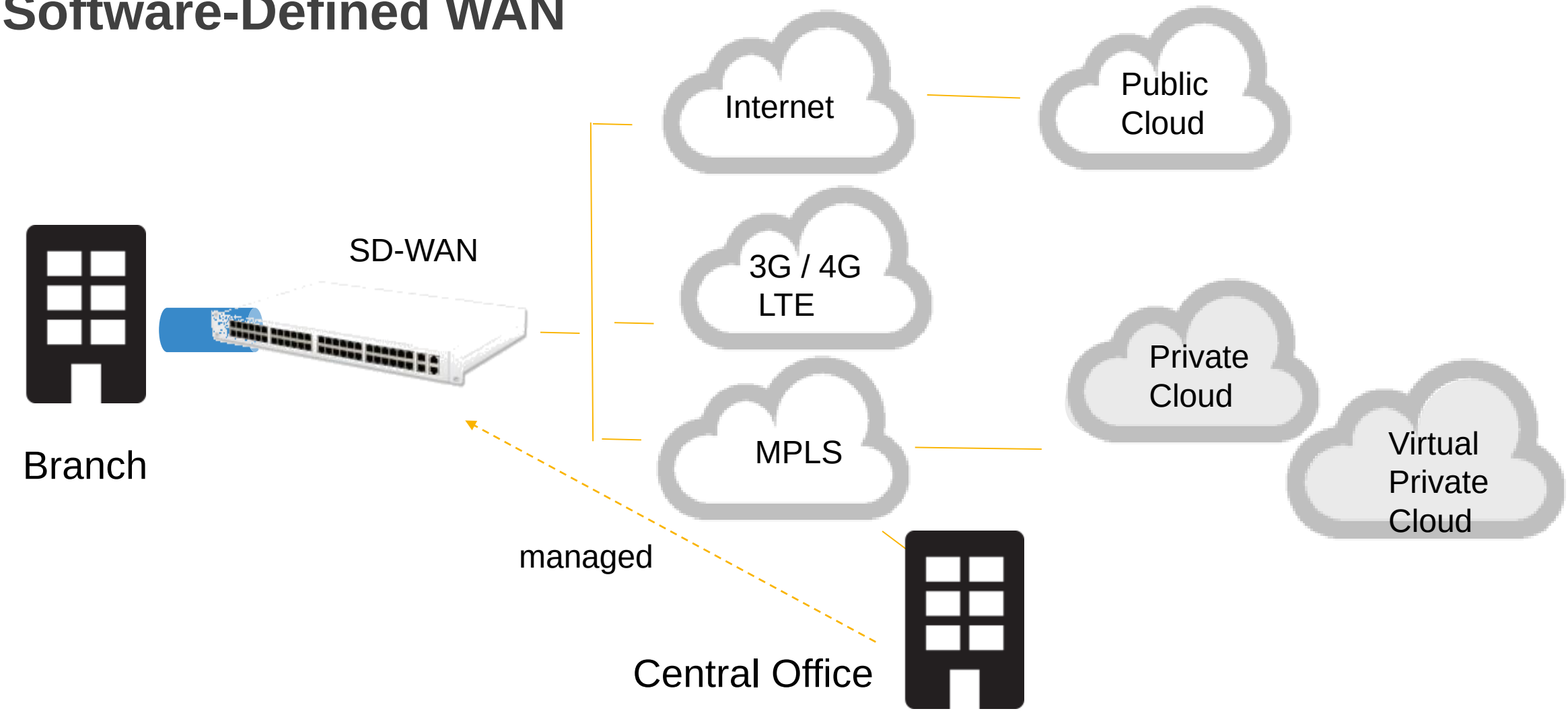
Unified Threat Management/Next-gen Firewall



SMB Enterprise

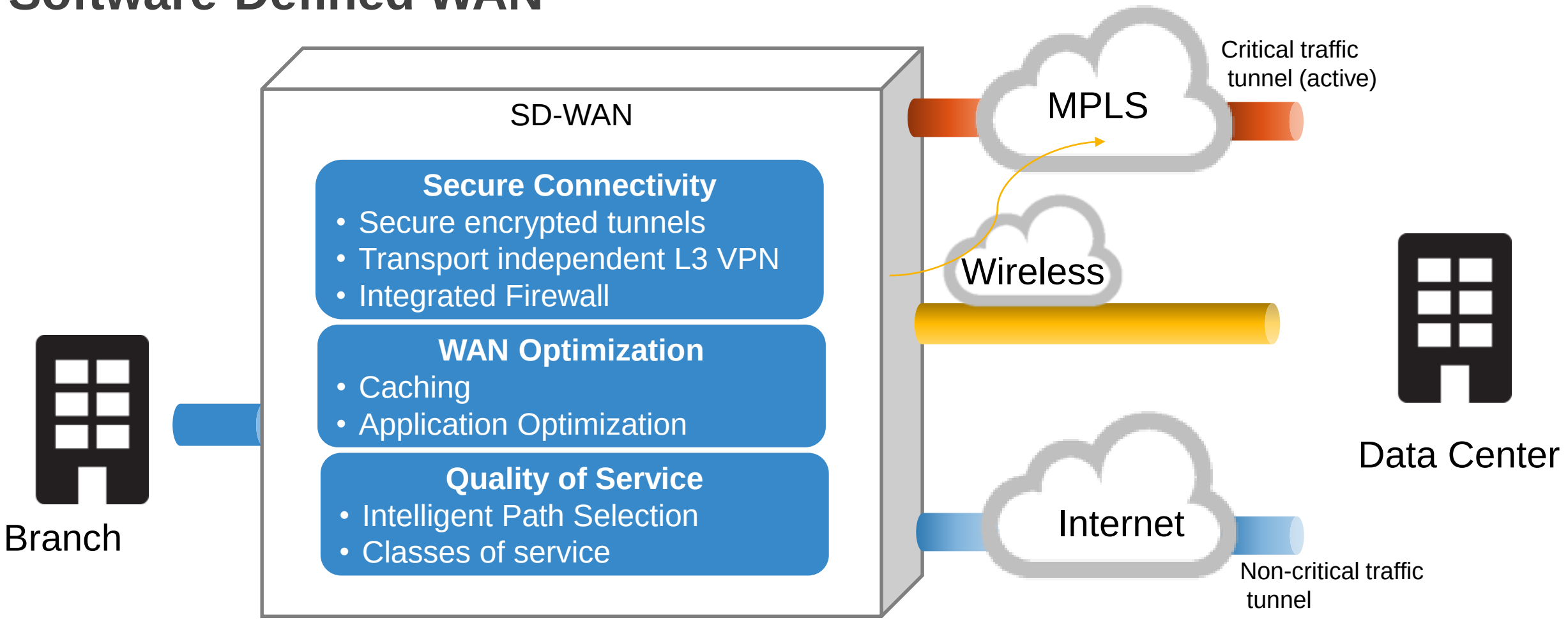
Network and application security drives need for virtualized access to cryptographic (ciphers, Ipsec) and pattern matching acceleration

Software-Defined WAN



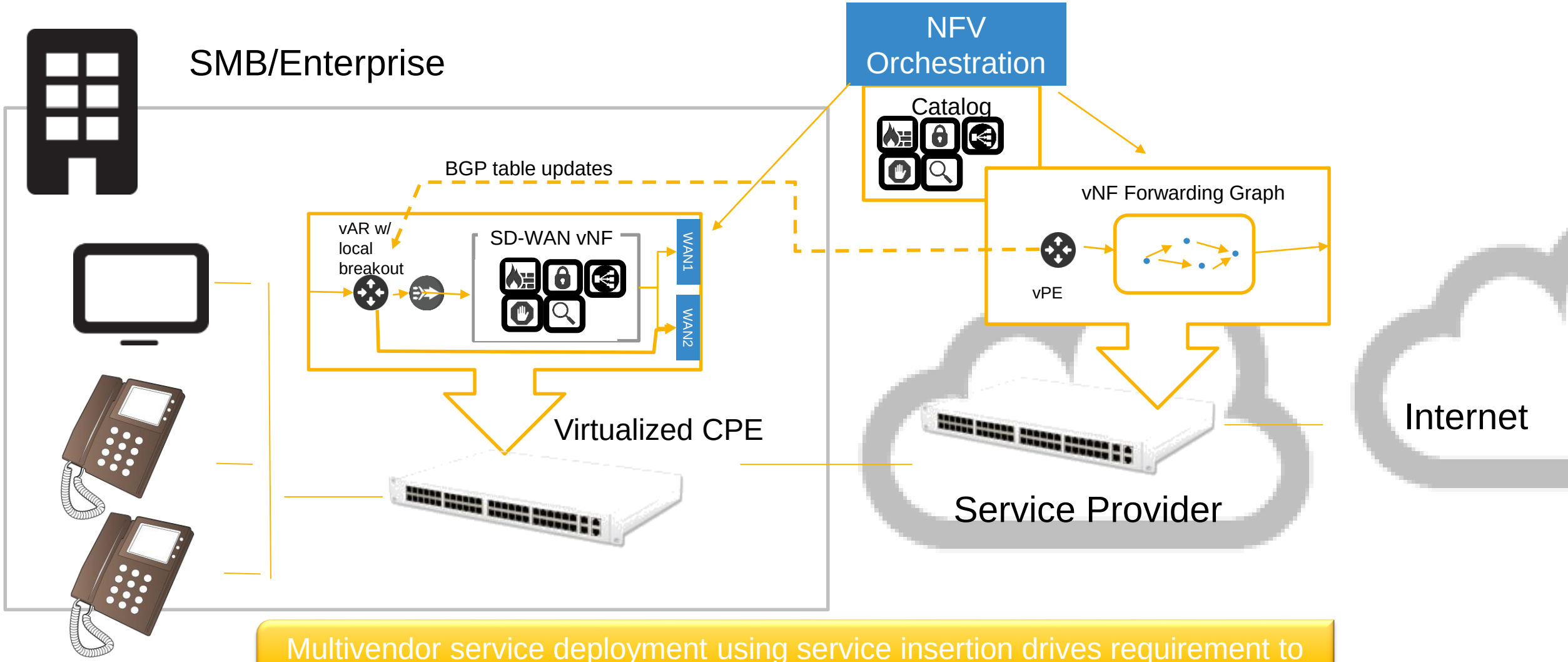
Software-defined WAN allows secure, optimized and efficient utilization of WAN networks that make widespread use of cloud computing services

Software-Defined WAN



Prevalence of secure protocols (Ipsec, SSL) drives requirement for virtualized access to cryptography accelerators and protocol offloads (e.g. Ipsec)

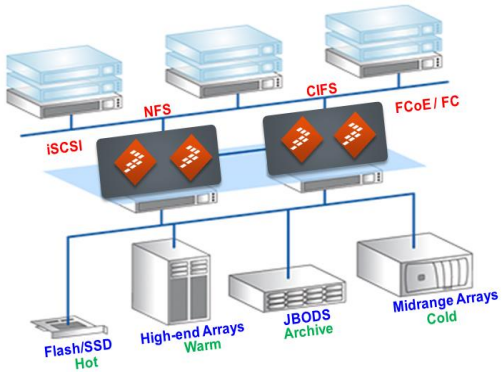
Virtual Enterprise CPE (vE-CPE)



Multivendor service deployment using service insertion drives requirement to offload virtual switching function from cores (using AIOP)

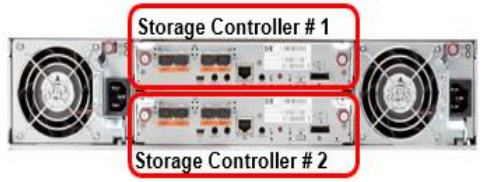
Range of Storage Applications

I
Software Defined Storage Platform (SDS)



Dedupe
Compression
Encryption
Storage Protocols

II
Storage Controllers (Arrays)



Storage Protocols
Dedupe
Compression

III
cNAS/ Prosumer NAS

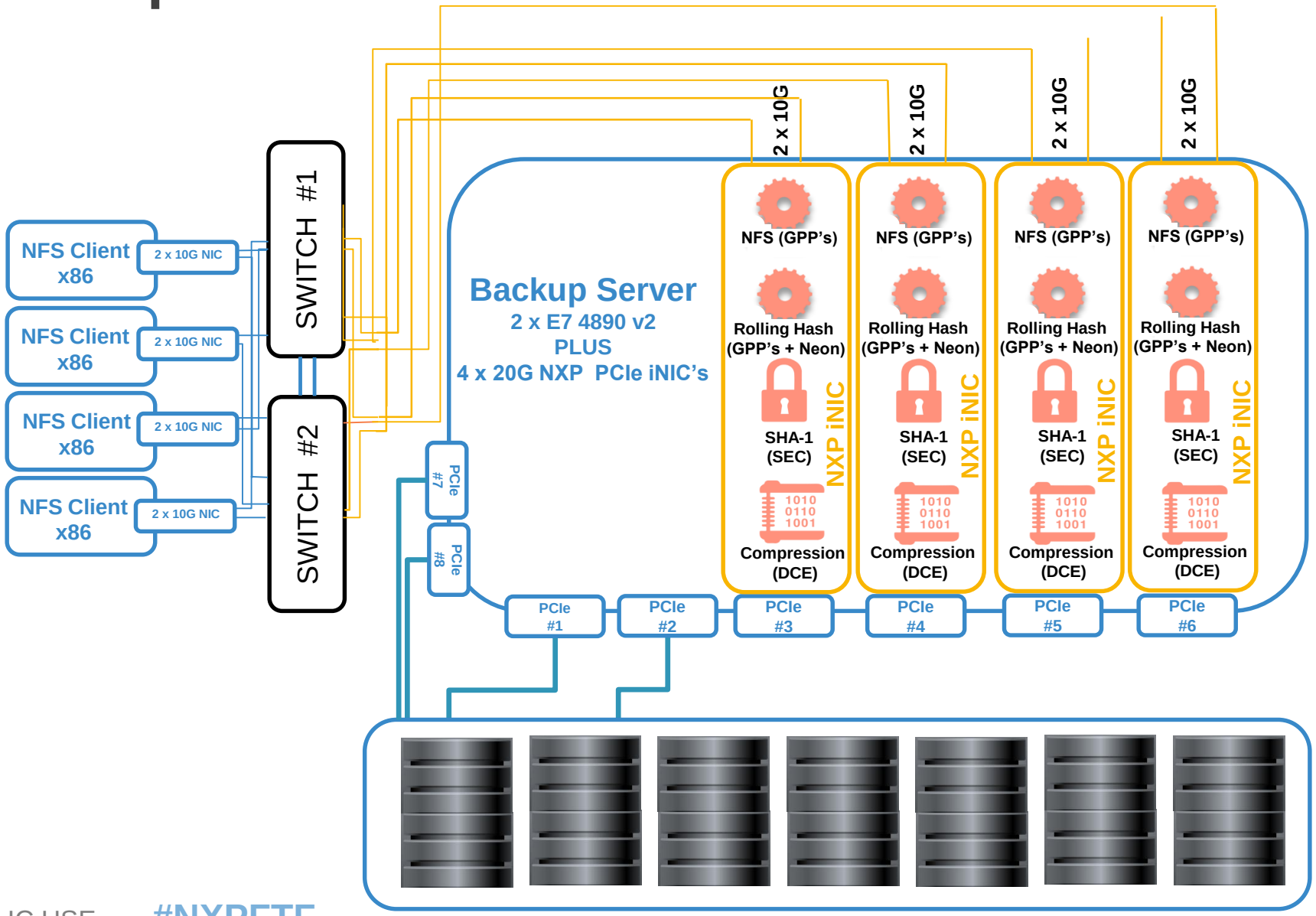
LRO, TSO
Encryption (Ipsec)

IV
DataCenter Cold Storage

Network Function(s)

Acceleration & Offloads

NXP Dedupe Solution



SUMMARY

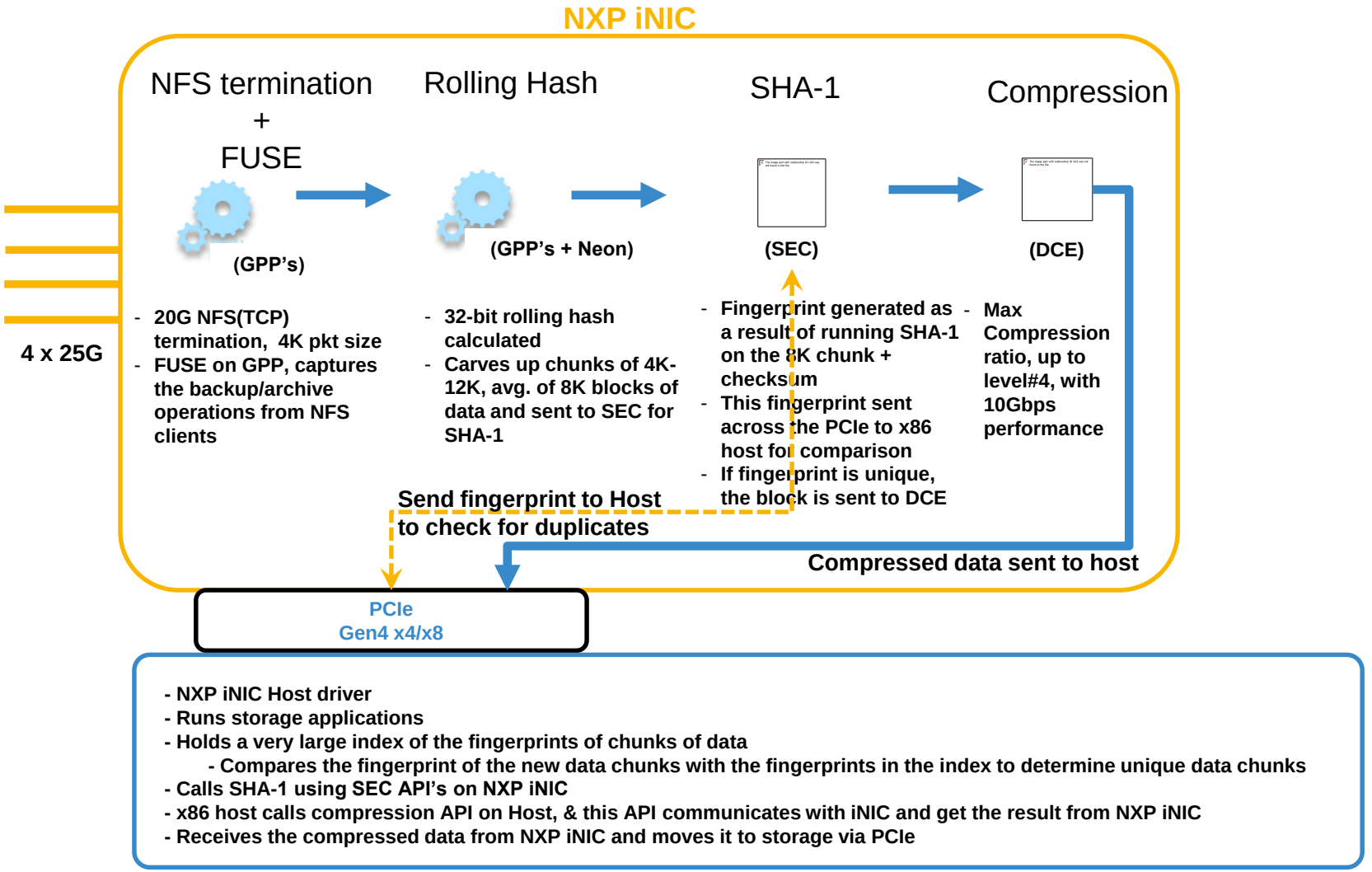
- Layerscape with DPAA 2 technology allows a common enablement environment:
  - For deploying commodity white box appliances
  - For hosting virtualized network appliances
- DPAA 2 provides transparent access to acceleration for virtualized applications
- DPAA 2 accelerates/offloads key functions, such as crypto, de/compression, pattern matching
- DPAA 2 advanced packet processing engine allows protocols such as Ipsec, netflow analytics to be offloaded from CPU cores

SECURE CONNECTIONS
FOR A SMARTER WORLD

NXP Storage Solutions

Function	LS1088	LS2 Rev2	T4240
10G Ethernet	2 x 10G	8 x10G + 8 x 1G	4 x 10G + 6 x 1G
NFS/TCP/iSCSI termination	20Gbps	20Gbps	30Gbps
Rolling Hash	Yes	15Gbps	25Gbps
SHA-1 Hash	20Gbps	15Gbps	25Gbps
Compression	Software	10Gbps	10Gbps
Encryption	20Gbps	20Gbps	20Gbps
RAID 5/6	Yes	Yes	Yes
Power	10-22W	25-40W	41-54W

Next Generation Storage Dedupe Functionality and Data Flow



ATTRIBUTION STATEMENT