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NonStop Strategy & the Future of Cloud Compute

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Forward-looking statements

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Agenda

– HPE Integrity NonStop today

– Recent and near future updates

– The future of cloud computer & virtual Nonstop

HPE Integrity NonStop Today

HPE Integrity NonStop – for businesses that never stop

Continuous availability

Designed from the ground up to deliver business continuity and availability.
Rated AL4 for highest availability for IDC[1]. Automatic failover protection.

Massive scalability

MPP architecture-enabled scaling to support thousands of users, concurrent sessions and petabytes of data.
Scales to 24,480 cores in a single system image.

Data integrity

Built-in transaction support with atomicity, consistency, isolation, durability (ACID) properties.

Virtualized by design

Pools and manages all resources. Shares processing capacity, storage and network resources.
Allows enterprises to transparently adjust to changing business needs.

Open Application Development

Open source frameworks and programming interfaces. Eclipse, JBOSS/Firefly, Java, JEE/EJB, Apache Tomcat web container, SASH Frameworks, Micro services

Real-time scale out database

NonStop SQL offers massive scalability. OLTP, batch and OLAP query workloads. Coming soon PL/SQL, UDFs, materialized views.

Business Continuity

Continuous availability of services. Active / Active, Sizzling Hot Takeover and Active/Passive. Business continuity architectures.

End-to-end security

Built-in data in transit security and event monitoring. Modern data tokenization for protection and compliance.

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[1] IDC Worldwide and U.S. High-Availability Server 2014-2018 Forecast and Analysis - Doc #250565, September 2014. HPE NonStop is IDC Availability Level 4, the highest availability ranking.

A family of HPE Integrity NonStop systems

Transforming continuous availability and scalability for x86

100% NonStop

NonStop i	NonStop X
Intel® Itanium® processor	Intel® Xeon® processor
Proprietary interconnect	Industry-standard InfiniBand interconnect
Massive scalability	
Highest AL4 availability	

NonStop X: The only fully-integrated, fault-tolerant compute on x86

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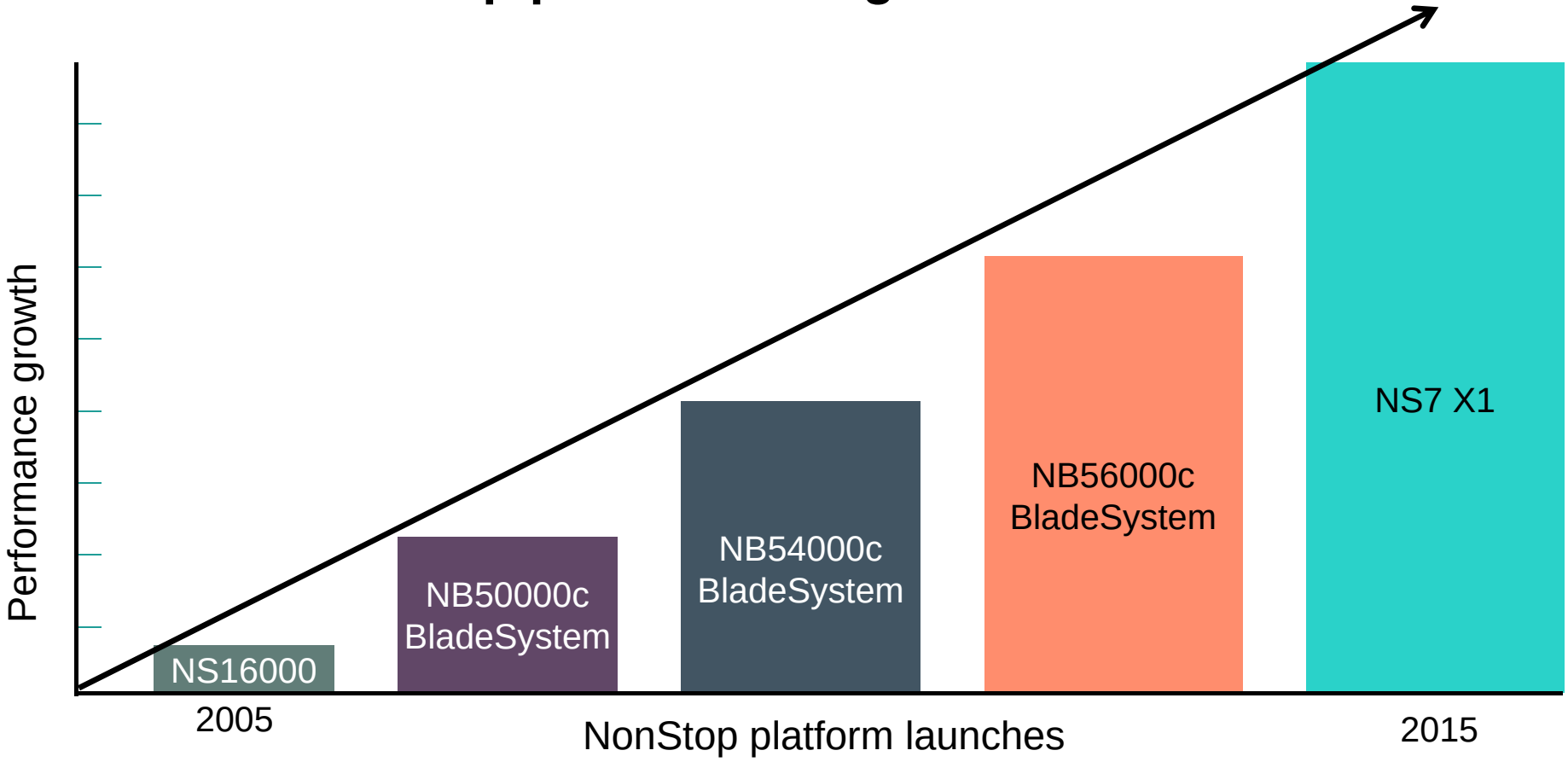
Sustained NonStop performance growth



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HPE Integrity NonStop i platforms

Meeting mission-critical customers' needs

BladeSystem

NB56000c

- Complex application environments
- Large databases
- Option for 2 or 4-core licensing
- Highly expandable I/O

NS2400

- Medium / emerging markets
- Stand-alone applications
- 2-core enabled
- Preconfigured HW bundles

NS2300

- Price sensitive markets
- Development & test
- 1-core enabled
- Preconfigured HW bundles

- **All** are based on Intel® Itanium® 9500 series

Common across all J-series NonStop servers

- NonStop J-series OS
- CLIM based I/O – communications and storage
- NonStop fundamentals – availability, scalability, data integrity, common modular architecture and security

Recent & Near Future Updates

HPE Integrity NonStop systems

NonStop X - Intel® Xeon®

NS7 X1
- 4-core SW licensed
- InfiniBand interconnect
- Expand-over-IP clustering

NS7 X1
- 2, 4, or 6-core SW licensing
- NonStop X Cluster Solution (NSXCS)

NS3 X1 – entry class systems
- 1 or 2-core SW licensing

NonStop X refresh
- Carrier-grade
- CPU refresh
- I/O refresh

2015 | **future**

NonStop i – Intel® Itanium®

NB56000c, NB56000c-cg (carrier-grade)
- 2 or 4-core SW licensing
- ServerNet interconnect
- ServerNet Clustering
- Expand-over-IP clustering

NS2400
- 2–core SW licensed

NS2300
- 1-core SW licensed

NonStop i refresh
- I/O refresh
- RoHS lead-free compliance

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HPE NonStop X Cluster Solution

NSXCS

– System to system connectivity for NS7 platforms
  – Direct InfiniBand connectivity

– Nodes and Zones
  – Maximum number of zones is 3
  – Maximum number of nodes per zone is 24
  – Maximum of 384 NonStop CPUs per cluster

– Dedicated NSXCS IB Cluster Solution switches

– Standard distance (minimum RVU is L15.08)
  – Node to switch distance is 30 meters maximum
  – 60 meters maximum between nodes in the same zone
  – 90 meters maximum between nodes in different zones

– Co-exists with other types of Expand lines (such as Expand-over-IP)

– Long distances up to 65km (available 2H CY 2016)

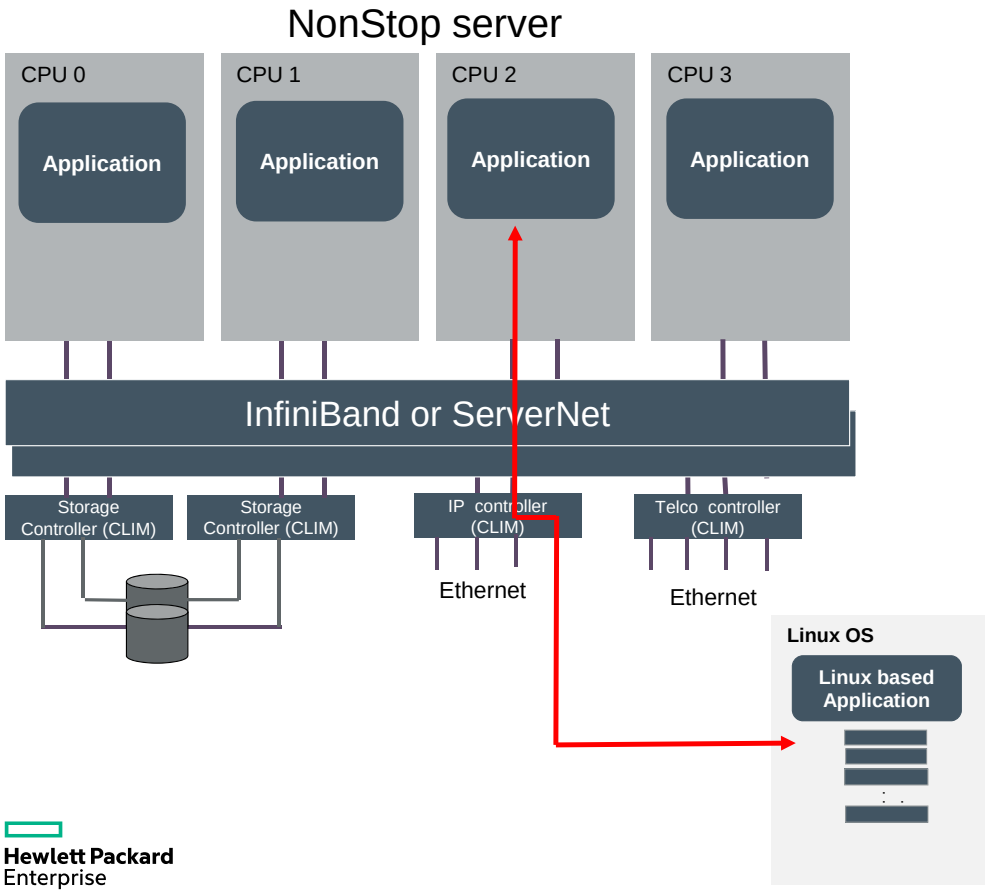
Introducing NSADI (AKA YUMA)

NonStop Application Data Interface

- A high-speed transport layer for application traffic leveraging user-mode InfiniBand (IB)
- NSADI is a NonStop OS capability that integrates a NonStop X application with an application running on a Linux platform
- Uses industry standard InfiniBand (IB) to connect a NonStop X system to a Linux system
- NSADI advantages include
  - A hybrid application appears as a single application to end users
  - Expansion of application functionality with minor porting effort
  - Ability to improve fault tolerance of Linux applications by moving key functions to NonStop X
- Applications using NSADI bypass kernel-mode execution layers
  - Transport latency is dramatically improved

Classic node-to-node connectivity

TCP/IP



The challenge is to bring a Linux server and application closer to NonStop processing to reduce latency and make the two environments operate in a more unified manner.

This figure depicts how existing Linux based applications interface to a NonStop user space application.

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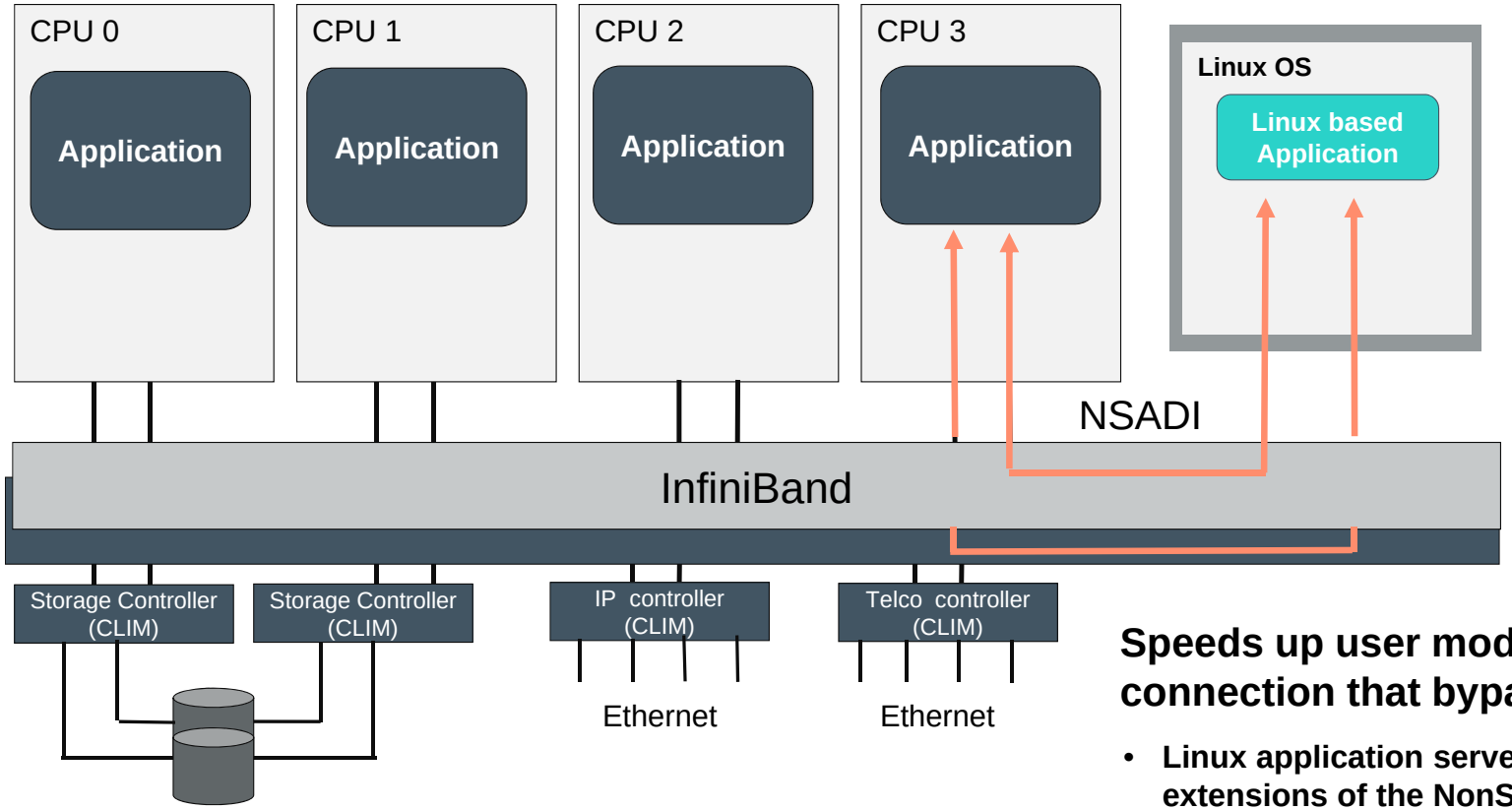
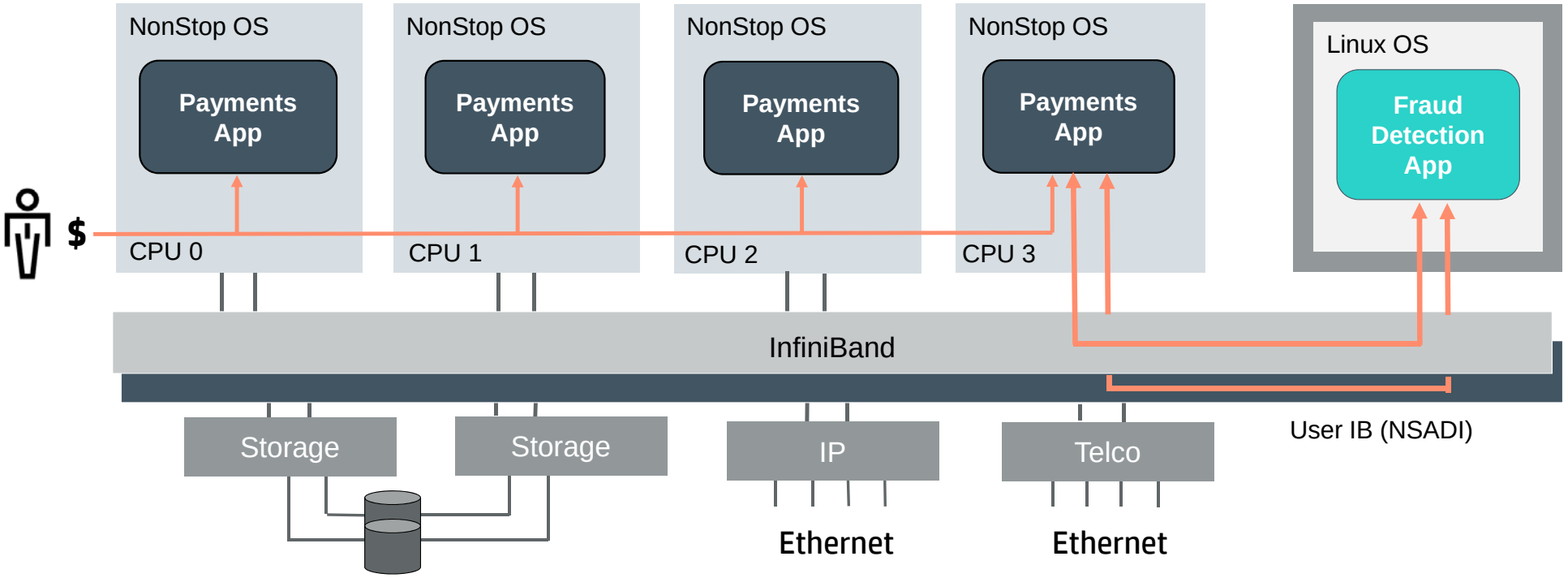
Hybrid application concept using NSADI

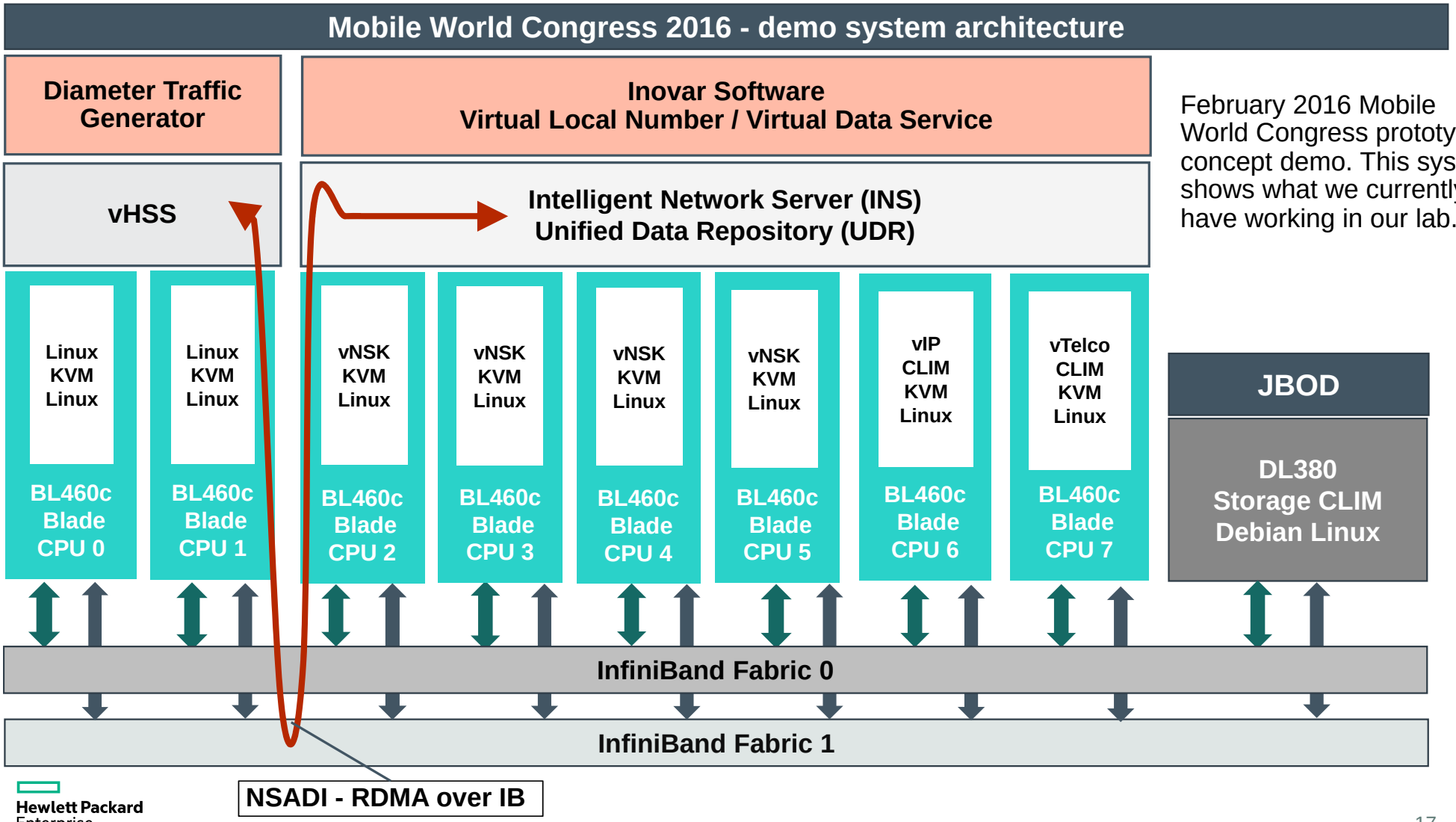


Speeds up user mode with direct connection that bypass the OS space

- **Linux application server operates as an extensions of the NonStop X system**
- **Dramatically improved latency**

NSADI use case: cooperating apps





February 2016 Mobile World Congress prototype/ concept demo. This system shows what we currently have working in our lab.

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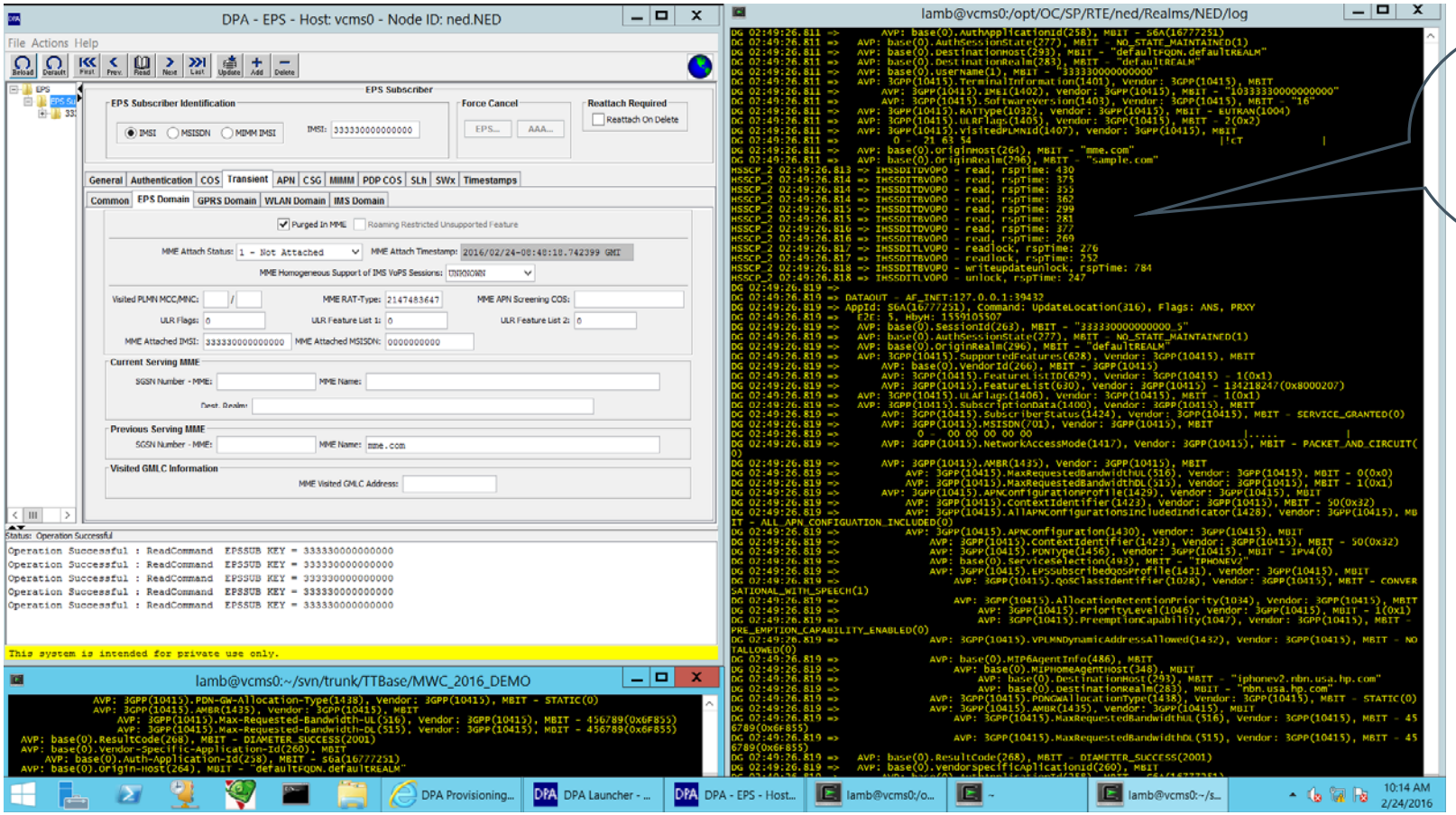
“Activate” demo at the MWC 2016

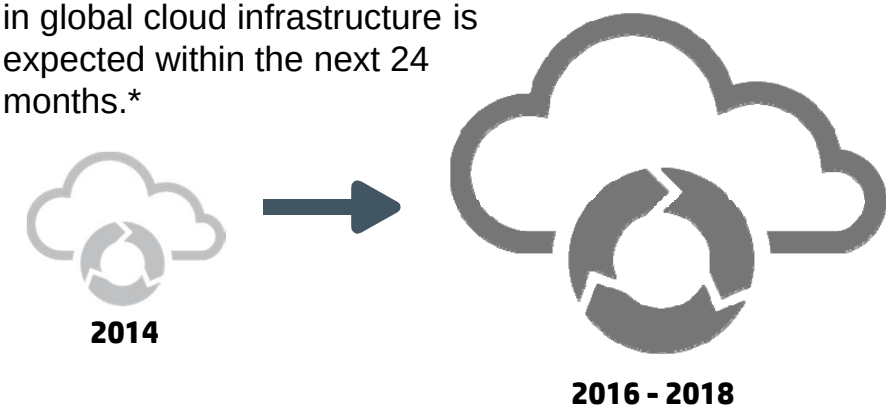


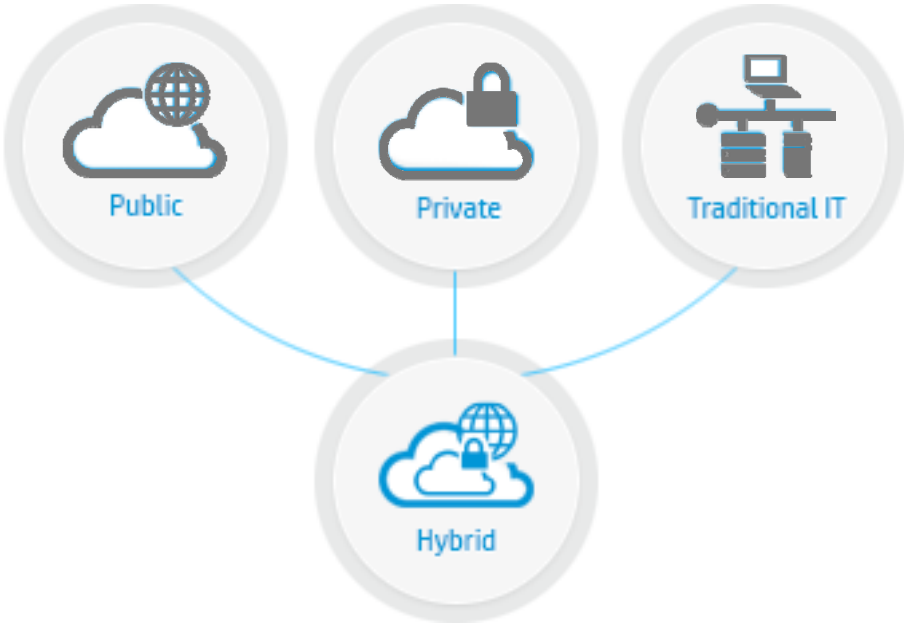
The Future of Cloud Compute & Virtual NonStop

The hybrid IT world

Data explosion and IT complexity will lead to multi-cloud environment with many different hybrid computing architectures.

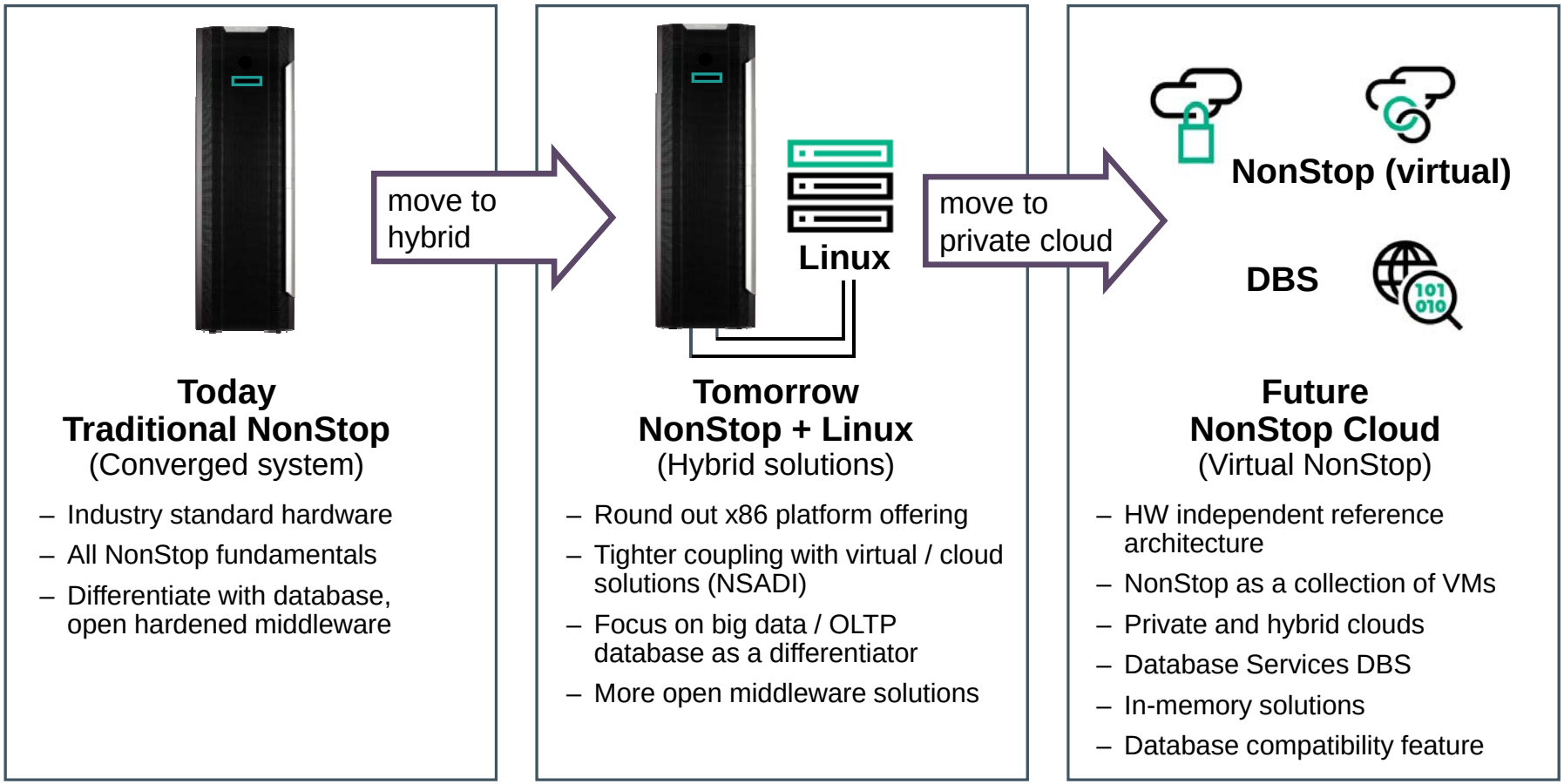
Two-fold growth
in global cloud infrastructure is expected within the next 24 months.*





*Source: Frank Gens, IDC Directions Conference, Key Battles and Strategies for Dominance on the 3rd Platform.

HPE Integrity NonStop vision for the new style of compute



Today
Traditional NonStop
(Converged system)

- Industry standard hardware
- All NonStop fundamentals
- Differentiate with database, open hardened middleware

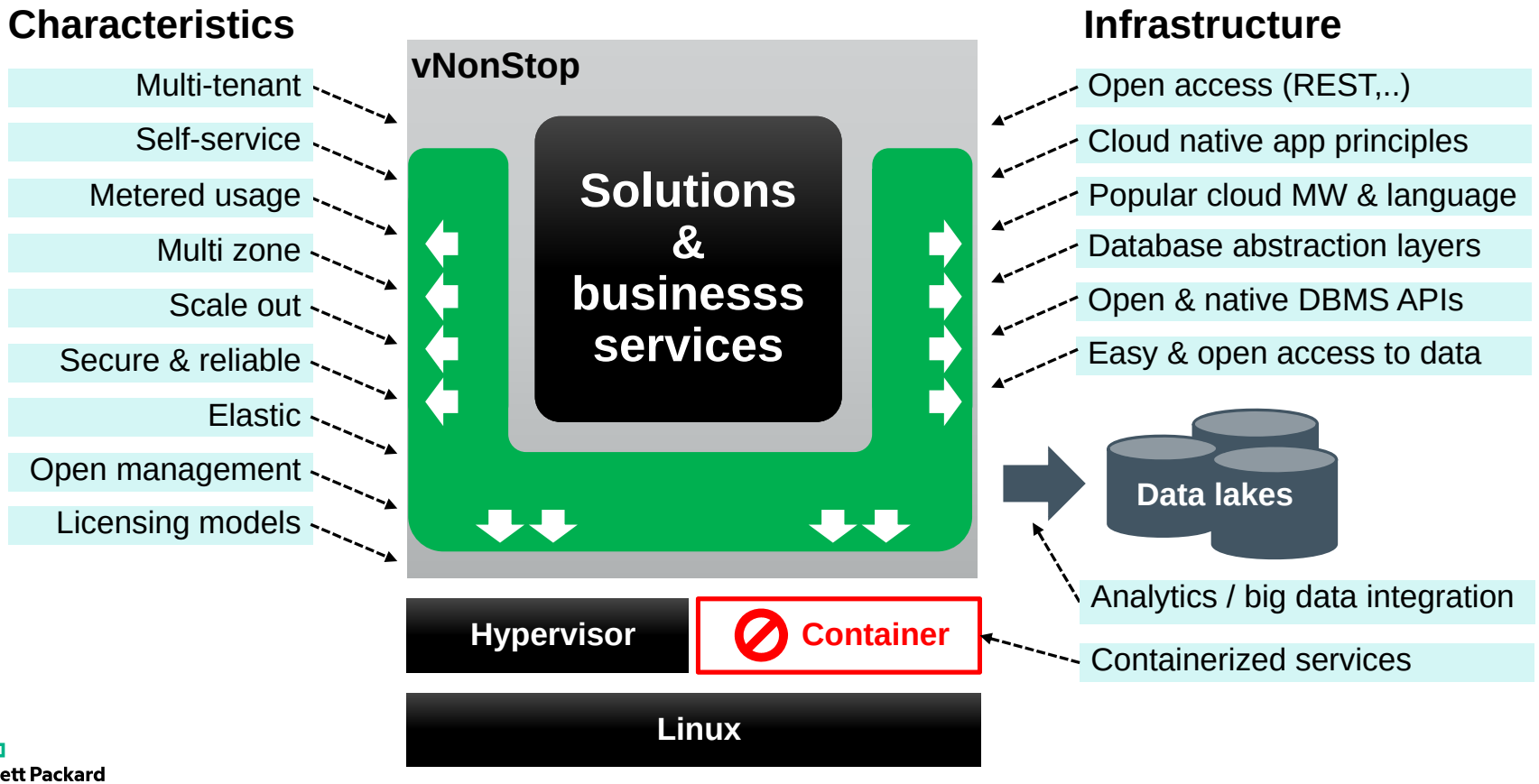
Tomorrow
NonStop + Linux
(Hybrid solutions)

- Round out x86 platform offering
- Tighter coupling with virtual / cloud solutions (NSADI)
- Focus on big data / OLTP database as a differentiator
- More open middleware solutions

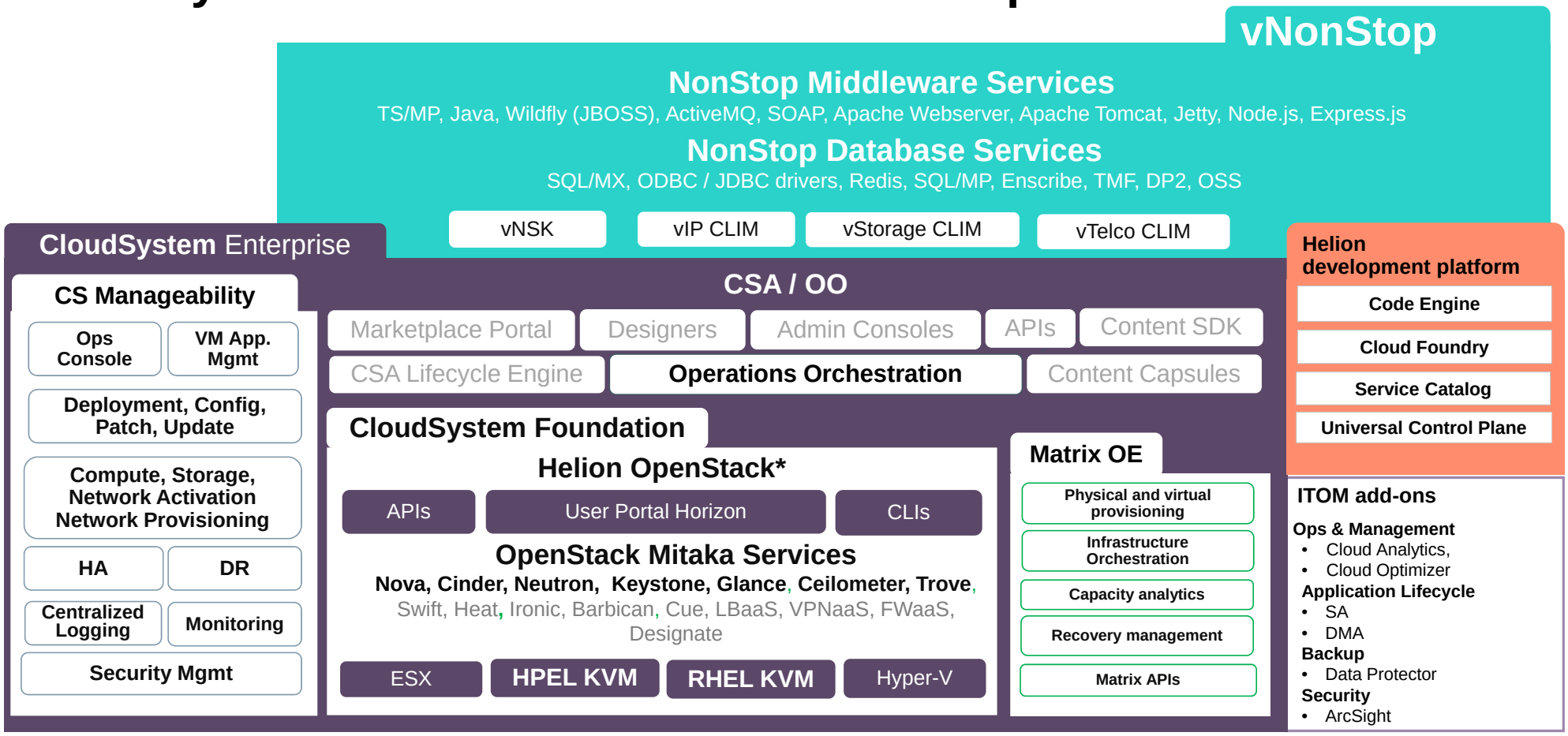
Future
NonStop Cloud
(Virtual NonStop)

- HW independent reference architecture
- NonStop as a collection of VMs
- Private and hybrid clouds
- Database Services DBS
- In-memory solutions
- Database compatibility feature

vNonStop – how will it “play” in the private cloud environment



CloudSystem next environment + vNonStop



* Black text are products we expect to work with vNonStop

Combined with today's modern stacks on NonStop

JEE / EJB 3.x	Web Container	JMS	Frame-works	Microservices	
NSASJ	**NSJSP**	**NSMQ**	**SASH**	**Open Source Java**	**3rd Party**
Servlets, EJB, JBoss AS	Servlets, Frame-works, Apache Tomcat	ActiveMQ	AXIS2, spring source, HIBERNATE, MyFaces	Vert.x, Spring Boot, Akka	Node.js (bomBora)

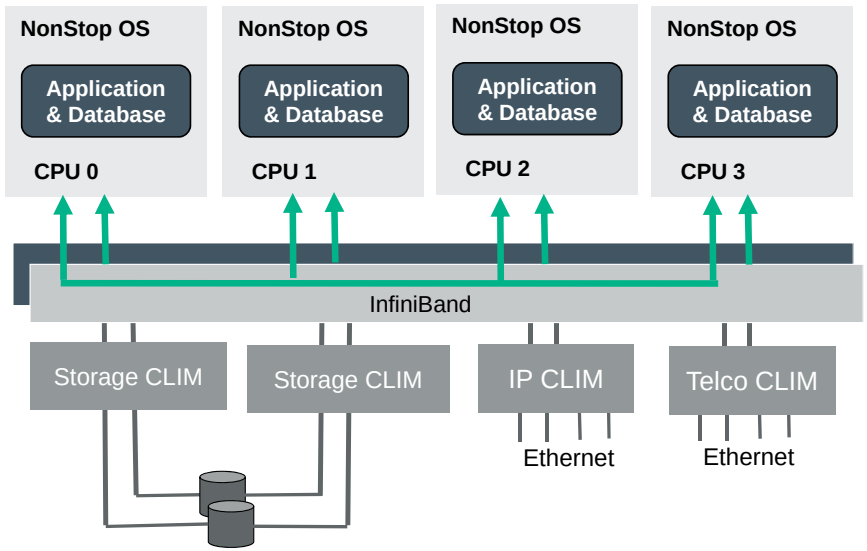
Java 8 / Java 7 Standard Edition

- JDK 8 / 7 compliance
- Hotspot compiler
- 32 & 64 bit
- Parallel & CMS GC
- JToolkit
- Java Infrastructure

Serverside JavaScript **V8**

Traditional NonStop system today – “converged system”

Traditional NonStop (converged system)



All elements come fully integrated from HPE NonStop and shipped with

- NonStop hardware
- NonStop software
- Integration on the system
- Burn-in during HPE Manufacturing

Fault tolerant out of the box

Safest choice for business protection

Environment is controlled

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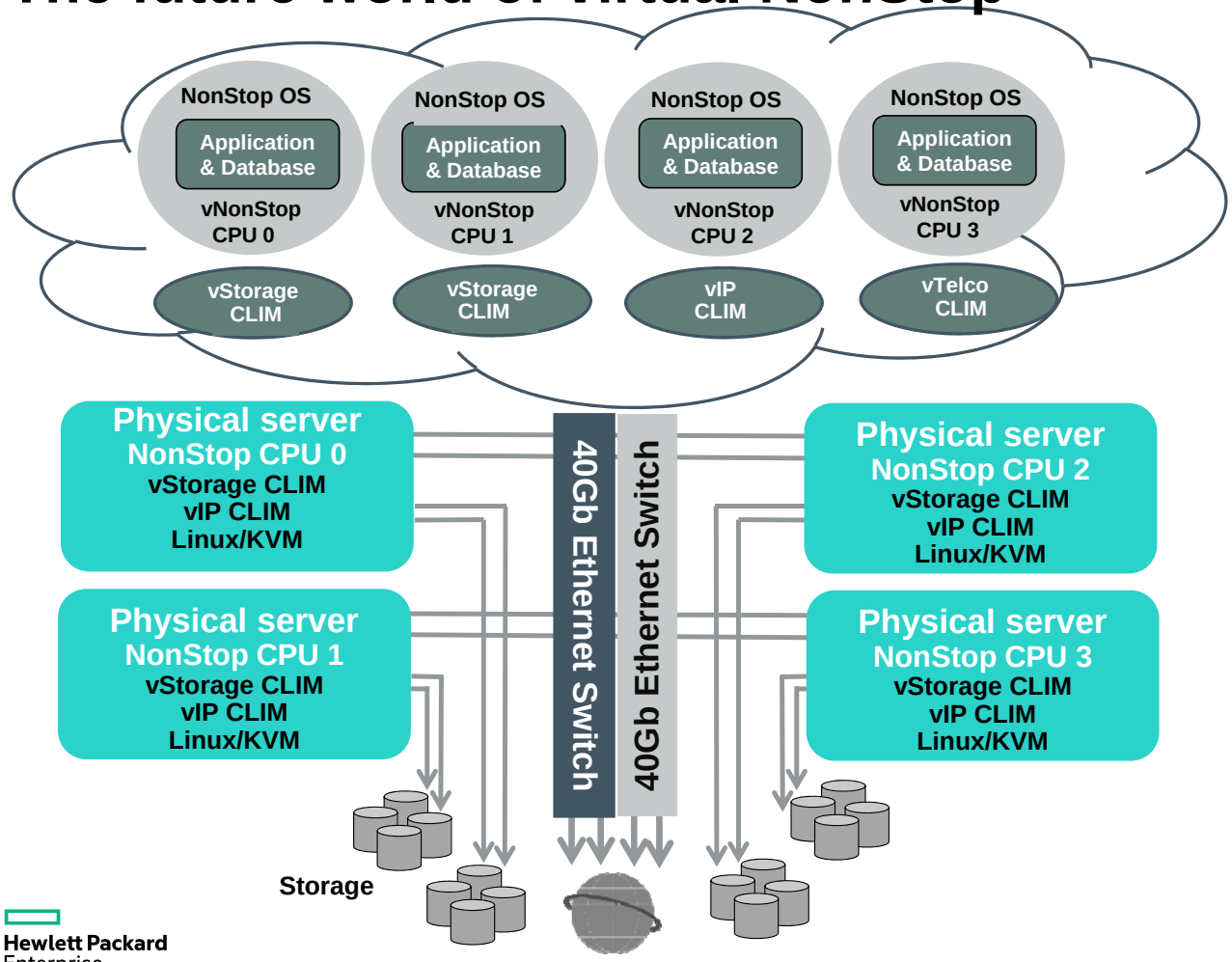
The future world of virtual NonStop



vNonStop software environment functions the same as NonStop X

Underlying environment is now

- Linux servers running KVM
- Running NonStop CPUs in some cores
- Running NonStop storage in some cores
- Running NonStop I/O in some cores

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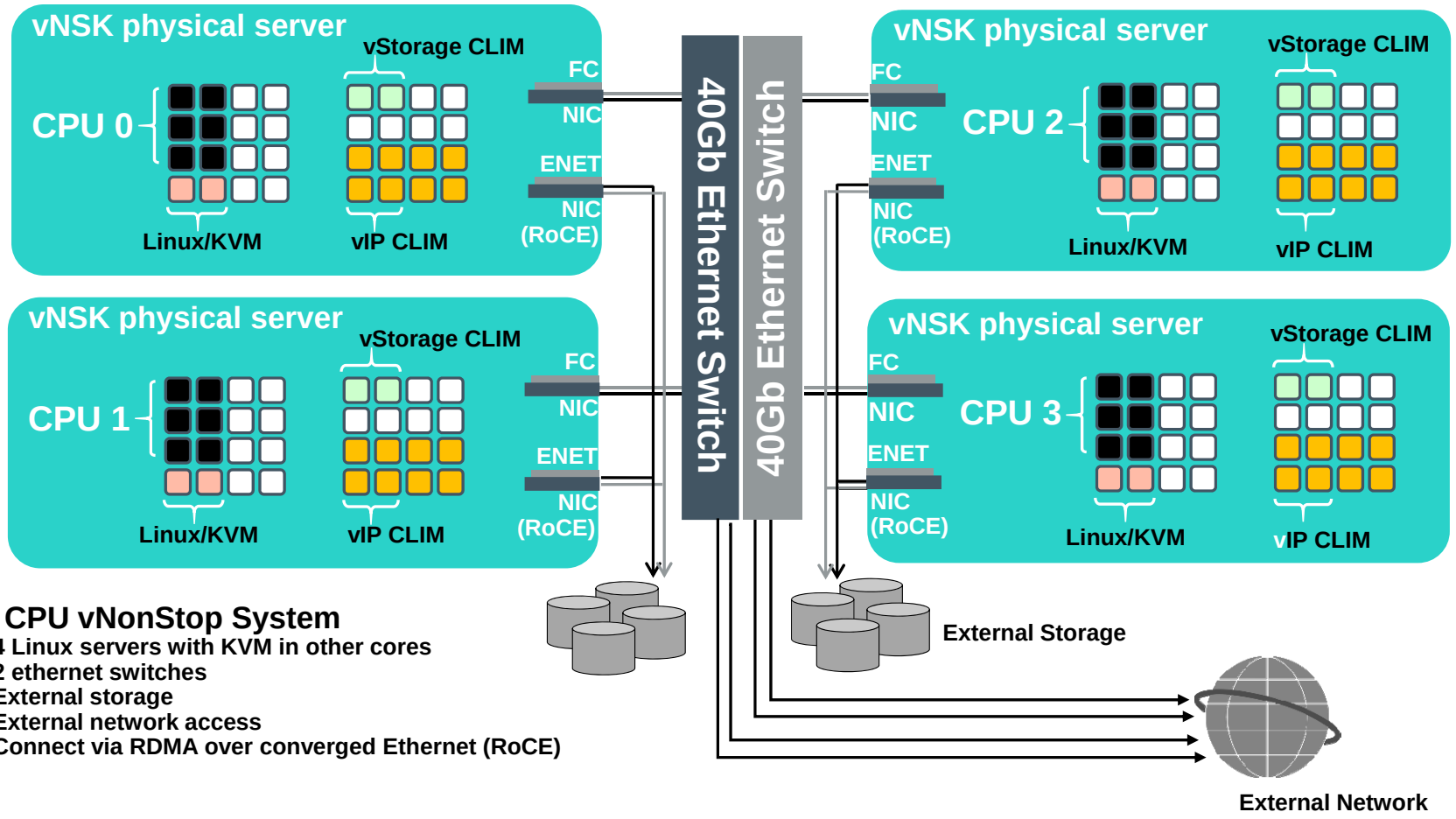
vNonStop underlying environment concept detail



A 4 CPU vNonStop System

- 4 Linux servers with KVM in other cores
- 2 ethernet switches
- External storage
- External network access
- Connect via RDMA over converged Ethernet (RoCE)

Technologies under consideration

Software

- IaaS
  - OpenStack
  - Linux + KVM
  - OFED 3.3 (RoCE support)
- PaaS
  - HPE CloudSystem Foundation
  - HPE CloudSystem Enterprise
  - HPE OpenNFV

Hardware

- Servers
  - Intel x86 microprocessors (Broadwell or later)
  - RoCE compatible Ethernet NICs
  - SR-IOV compliant
- Storage
  - Redundant storage arrays or enterprise storage
- Networking
  - Redundant lossless DCB Ethernet switches connecting servers

NonStop strategy & the future of cloud compute

- NonStop has always been integrated in hybrid environments
  - Countless customer use cases and examples
- NonStop X uses InfiniBand as the system interconnect – high bandwidth, low-latency
- InfiniBand allows the creation of seamless environments ranging across
  - Front-end / back-end hybrid environments (NSADI)
  - Internet of Things (IoT)
- Key investment areas
  - Hybrid
  - Virtualized environments
  - Cloud compute

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Thank you

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