



**Hewlett Packard
Enterprise**

NonStop Strategy & the Future of Cloud Compute

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VNUG 2016



Forward-looking statements

This is a rolling (up to three year) Roadmap and is subject to change without notice.

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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 IDC¹. 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.



A family of HPE Integrity NonStop systems

Transforming continuous availability and scalability for x86

100% NonStop



NonStop i

Intel® Itanium®
processor

Proprietary interconnect

NonStop X

Intel® Xeon®
processor

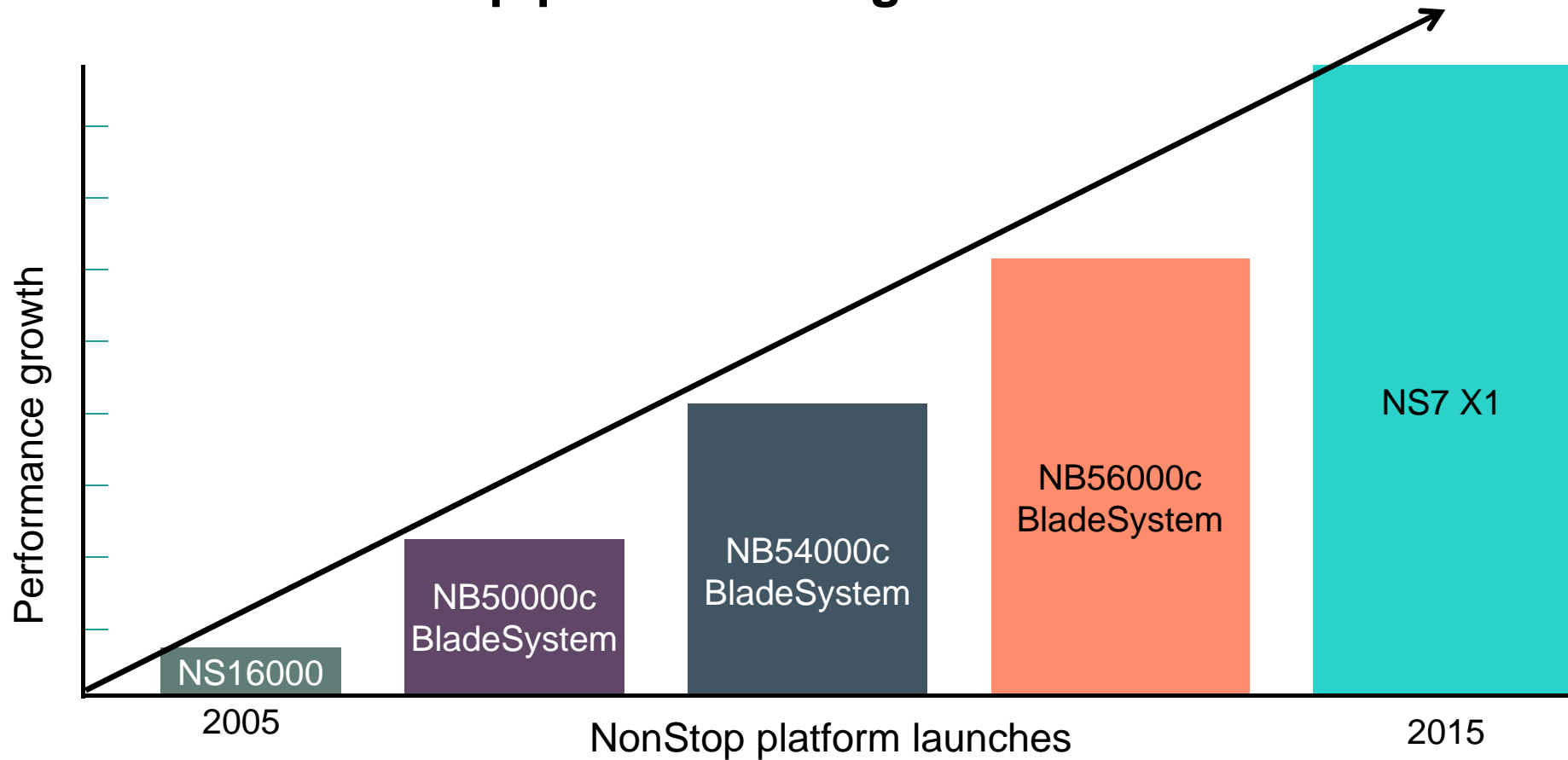
Industry-standard
InfiniBand interconnect

Massive scalability

Highest AL4 availability

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

Sustained NonStop performance growth



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

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)



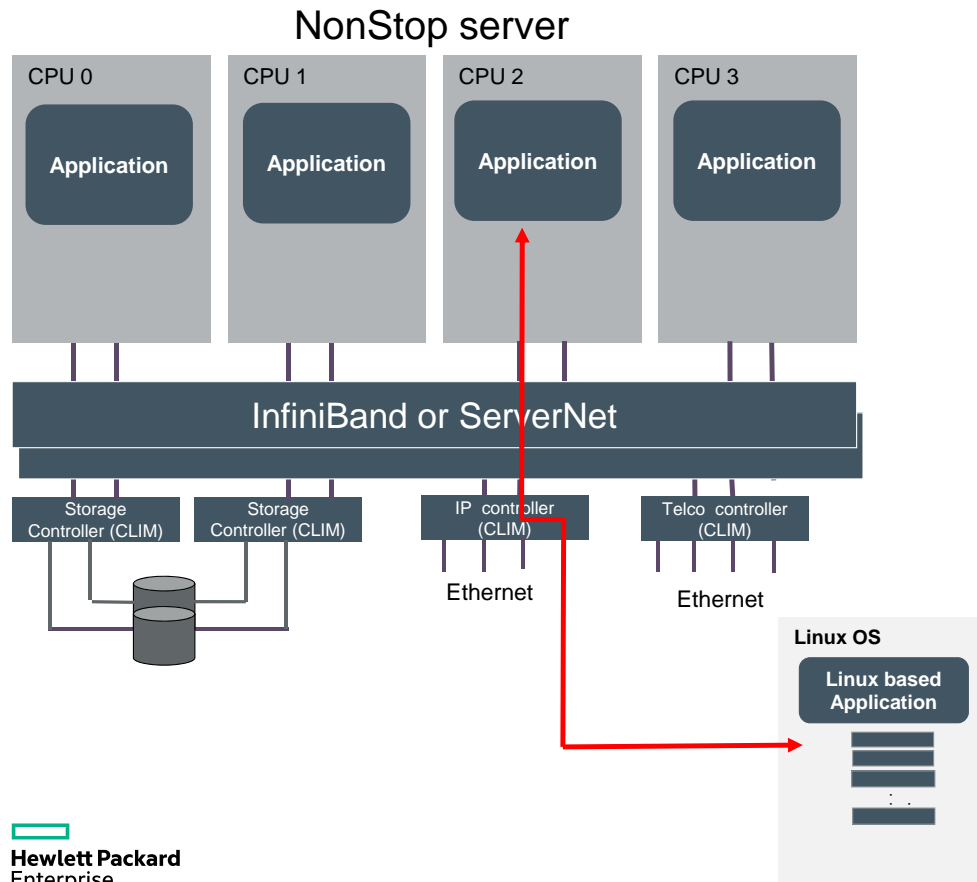
Introducing NSADI (AKA YUMA)

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

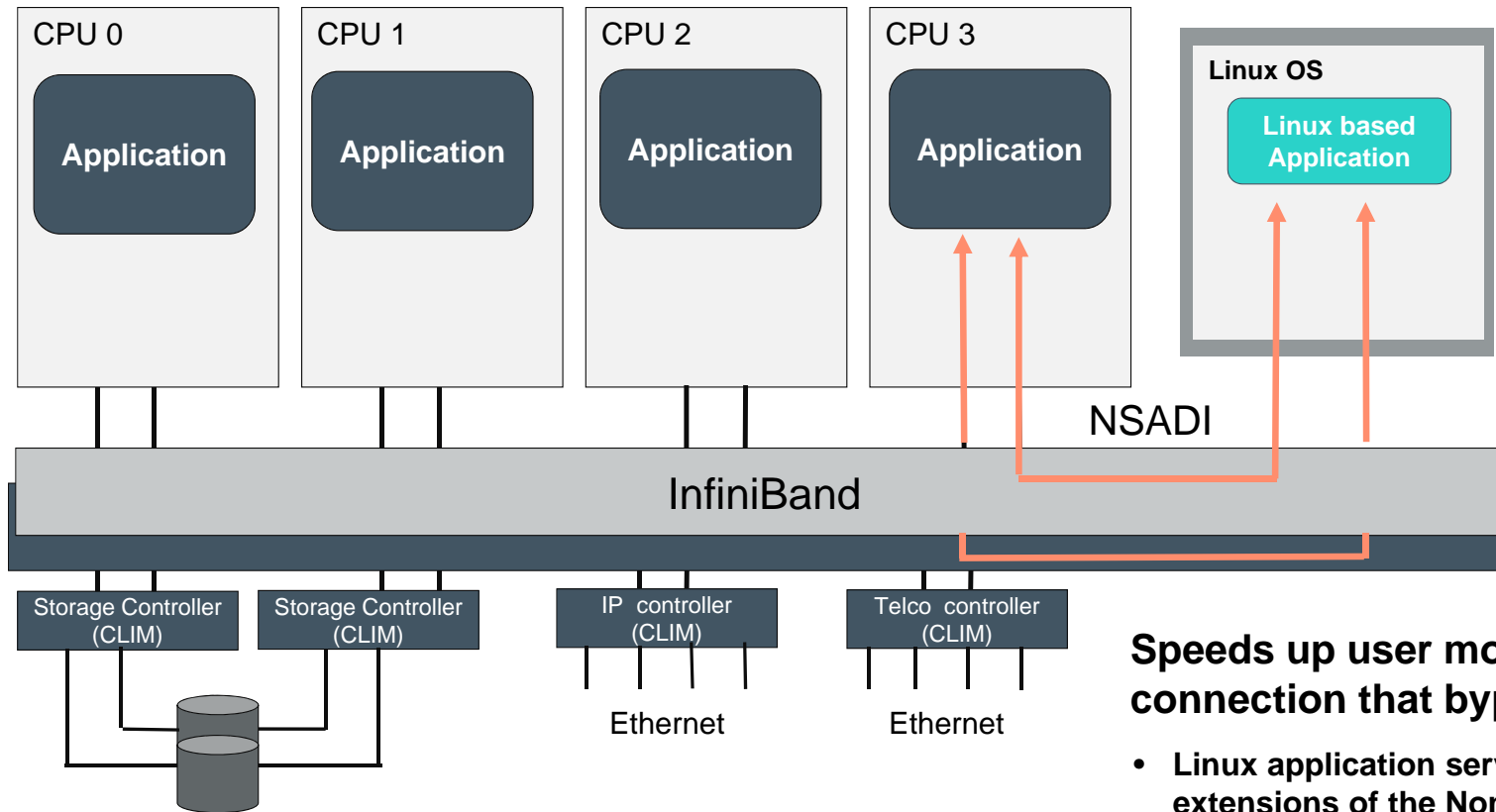
TCP/IP



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.

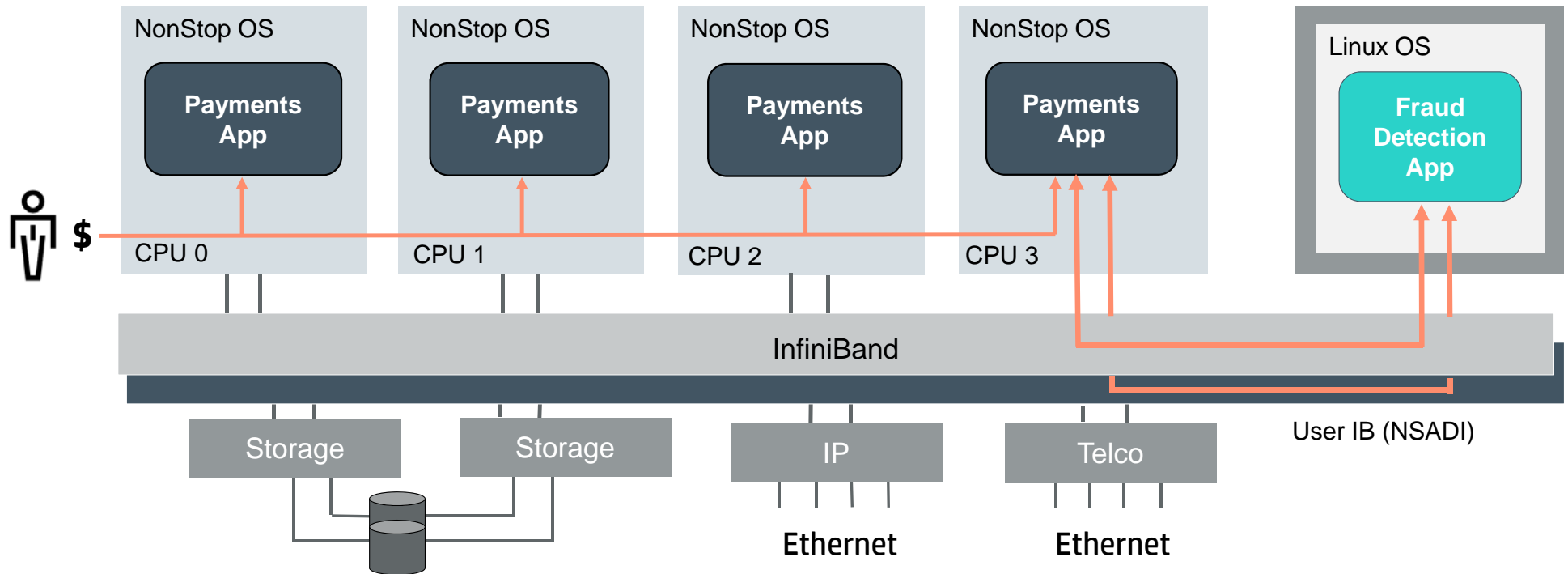
Hybrid application concept using NSADI



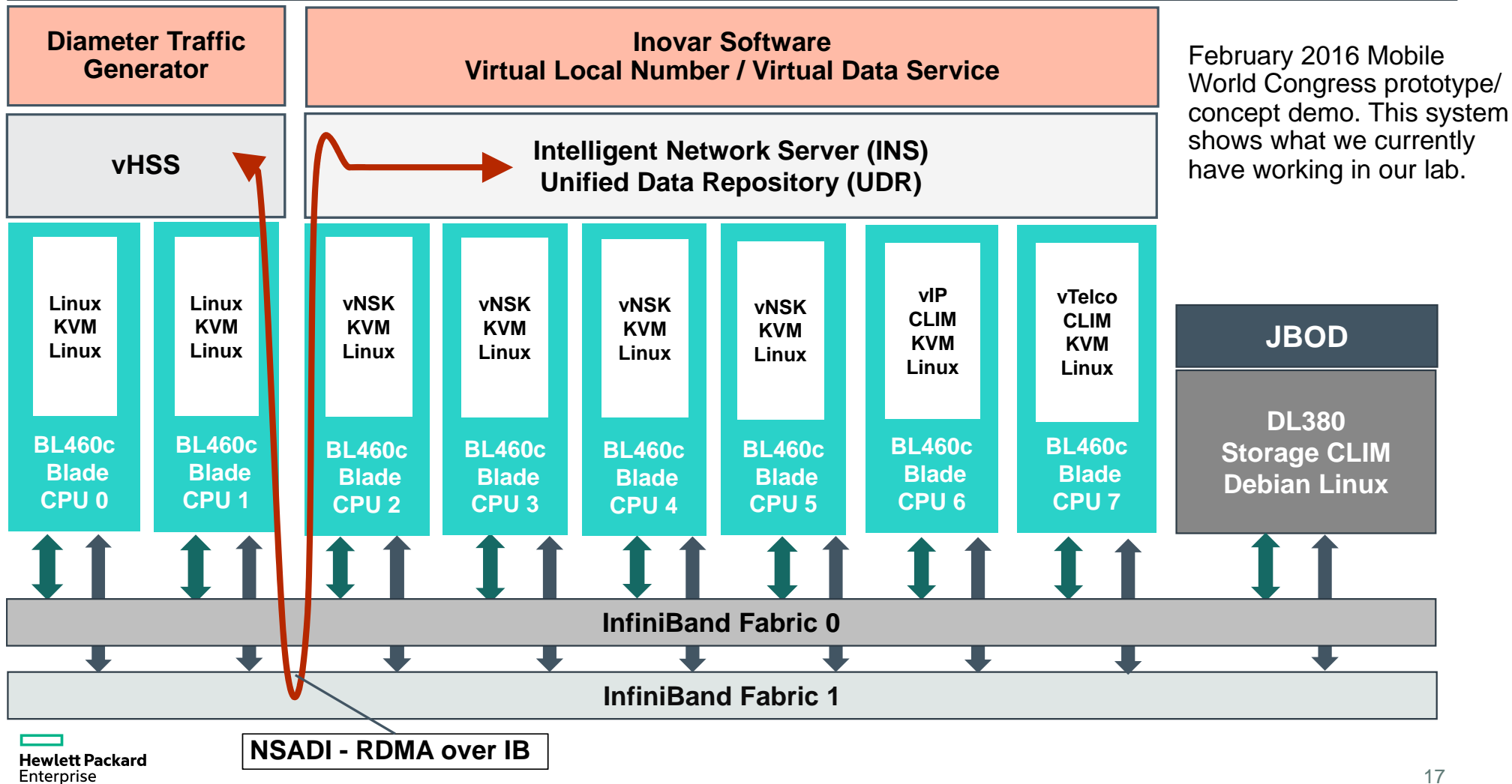
Speeds up user mode with direct connection that bypass the OS space

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

NSADI use case: cooperating apps



Mobile World Congress 2016 - demo system architecture



“Activate” demo at the MWC 2016

The image shows a screenshot of a DPA-EPN (DPA-EPN) interface and a terminal window. The DPA-EPN interface is titled "DPA - EPS - Host: vcms0 - Node ID: ned.NED" and displays various configuration fields for an EPS subscriber, including IMSI, MME Attach Status, and MME Homogeneous Support of IMS VoPS Sessions. The terminal window shows a log of network events, including MME Attach, MME Authentication, and MME Registration, with timestamps and details for each event.

DPA-EPN Interface Fields:

- EPS Subscriber Identification:** IMSI: 333330000000000, Force Cancel: [X], Reattach Required: [X]
- General:** Authentication, COS, Transient, APN, CSG, MIMM, POP COS, SLH, SWX, Timestamps
- Common:** EPS Domain, GPRS Domain, WLAN Domain, IMS Domain
- MME Attach Status:** 1 - Not Attached, MME Attach Timestamp: 2016/02/24-08:40:10.742399 GRC
- MME Homogeneous Support of IMS VoPS Sessions:** [X] Purged in MME, [X] Roaming Restricted Unsupported Feature
- Visited PLMN MCC/MNC:** [X] / [X], MME RAT-Type: 2147483647, MME APN Screening COS: [X]
- UPL Flaps:** 0, UPL Feature List 1: 0, UPL Feature List 2: 0
- MME Attached IMSI:** 333330000000000, MME Attached MSISDN: 0000000000
- Current Serving MME:** SGSN Number - MME: [X], MME Name: [X]
- Previous Serving MME:** SGSN Number - MME: [X], MME Name: [X]
- Visited GMLC Information:** MME Visited GMLC Address: [X]

Terminal Log (lamb@vcms0:/opt/OC/SP/RTE/ned/Realms/NED/log):

```

DG 02:49:26.811 => AVP: base(0).AuthAppId(16777251), MBIT = 56(16777251)
DG 02:49:26.811 => AVP: base(0).AuthSessionState(277), MBIT = NO_STATE_MAINTAINED(1)
DG 02:49:26.811 => AVP: base(0).DestinationHost(283), MBIT = "default-qon.defaultrealm"
DG 02:49:26.811 => AVP: base(0).UserName(1), MBIT = "333330000000000"
DG 02:49:26.811 => AVP: 3GPP(10415).TerminalInformation(1401), Vendor: 3GPP(10415), MBIT
DG 02:49:26.811 => AVP: 3GPP(10415).IMEI(1402), Vendor: 3GPP(10415), MBIT = "1033330000000000"
DG 02:49:26.811 => AVP: 3GPP(10415).SoftwareVersion(1403), Vendor: 3GPP(10415), MBIT "16"
DG 02:49:26.811 => AVP: 3GPP(10415).RATType(1032), Vendor: 3GPP(10415), MBIT = "EUTRAN(1004)"
DG 02:49:26.811 => AVP: 3GPP(10415).ULRFlap(1406), Vendor: 3GPP(10415), MBIT = 2(0x2)
DG 02:49:26.811 => AVP: 3GPP(10415).VisitedPLMN(1407), Vendor: 3GPP(10415), MBIT
DG 02:49:26.811 => AVP: base(0).OriginHost(264), MBIT = "mme.com"
DG 02:49:26.811 => AVP: base(0).OriginRealm(296), MBIT = "sample.com"
HSSCP 2 02:49:26.813 => IMSSDITDVOP - read, rspTime: 430
HSSCP 2 02:49:26.814 => IMSSDITDVOP - read, rspTime: 375
HSSCP 2 02:49:26.814 => IMSSDITDVOP - read, rspTime: 355
HSSCP 2 02:49:26.814 => IMSSDITDVOP - read, rspTime: 362
HSSCP 2 02:49:26.815 => IMSSDITDVOP - read, rspTime: 299
HSSCP 2 02:49:26.816 => IMSSDITDVOP - read, rspTime: 281
HSSCP 2 02:49:26.816 => IMSSDITDVOP - read, rspTime: 276
HSSCP 2 02:49:26.817 => IMSSDITDVOP - read, rspTime: 252
HSSCP 2 02:49:26.818 => IMSSDITDVOP - writeupdateunlock, rspTime: 784
HSSCP 2 02:49:26.818 => IMSSDITDVOP - unlock, rspTime: 247
DG 02:49:26.819 => DATAOUT - AF_INET:127.0.0.1:39432
DG 02:49:26.819 => AppId: 16777251, Command: UpdateLocation(316), Flags: ANS, PRXY
DG 02:49:26.819 => F2E: 5, Mhym: 155010507
DG 02:49:26.819 => AVP: base(0).SessionId(263), MBIT = "333330000000000.5"
DG 02:49:26.819 => AVP: base(0).AuthSessionState(277), MBIT = NO_STATE_MAINTAINED(1)
DG 02:49:26.819 => AVP: base(0).OriginRealm(296), MBIT = "defaultrealm"
DG 02:49:26.819 => AVP: 3GPP(10415).SupportedFeatures(628), Vendor: 3GPP(10415), MBIT
DG 02:49:26.819 => AVP: base(0).VendorId(266), MBIT = 3GPP(10415)
DG 02:49:26.819 => AVP: 3GPP(10415).FeatureList(629), Vendor: 3GPP(10415) - 1(0x1)
DG 02:49:26.819 => AVP: 3GPP(10415).FeatureList(630), Vendor: 3GPP(10415) - 134218247(0x8000207)
DG 02:49:26.819 => AVP: 3GPP(10415).ULRFlap(1406), Vendor: 3GPP(10415), MBIT = 1(0x1)
DG 02:49:26.819 => AVP: 3GPP(10415).SubscriptionData(1400), Vendor: 3GPP(10415), MBIT
DG 02:49:26.819 => AVP: 3GPP(10415).SubscriberStatus(1424), Vendor: 3GPP(10415), MBIT = SERVICE_GRANTED(0)
DG 02:49:26.819 => AVP: 3GPP(10415).MSISDN(701), Vendor: 3GPP(10415), MBIT
DG 02:49:26.819 => AVP: 3GPP(10415).NetworkAccessMode(1417), Vendor: 3GPP(10415), MBIT = PACKET_AND_CIRCUIT(0)
DG 02:49:26.819 => AVP: 3GPP(10415).AMBR(1425), Vendor: 3GPP(10415), MBIT
DG 02:49:26.819 => AVP: 3GPP(10415).MaxRequestedBandwidthDL(516), Vendor: 3GPP(10415), MBIT = 0(0x0)
DG 02:49:26.819 => AVP: 3GPP(10415).MaxRequestedBandwidthUL(515), Vendor: 3GPP(10415), MBIT = 1(0x1)
DG 02:49:26.819 => AVP: 3GPP(10415).APNConfigurationProfile(1423), Vendor: 3GPP(10415), MBIT
DG 02:49:26.819 => AVP: 3GPP(10415).ContextIdentifier(1422), Vendor: 3GPP(10415), MBIT = 50(0x32)
DG 02:49:26.819 => AVP: 3GPP(10415).AllAPNConfigurationsIncludedIndicator(1428), Vendor: 3GPP(10415), MBIT
DG 02:49:26.819 => AVP: 3GPP(10415).APNConfiguration(1430), Vendor: 3GPP(10415), MBIT
DG 02:49:26.819 => AVP: 3GPP(10415).ContextIdentifier(1423), Vendor: 3GPP(10415), MBIT = 50(0x32)
DG 02:49:26.819 => AVP: 3GPP(10415).PUNIPriority(1450), Vendor: 3GPP(10415), MBIT = IPV4(0)
DG 02:49:26.819 => AVP: base(0).ServiceSelection(495), MBIT = "IPHONEV2"
DG 02:49:26.819 => AVP: 3GPP(10415).EPSSubscriberQoSProfile(1431), Vendor: 3GPP(10415), MBIT
DG 02:49:26.819 => AVP: 3GPP(10415).QoSClassIdentifier(1028), Vendor: 3GPP(10415), MBIT = CONVER
DG 02:49:26.819 => AVP: 3GPP(10415).AllocationRetentionPriority(1034), Vendor: 3GPP(10415), MBIT
DG 02:49:26.819 => AVP: 3GPP(10415).PreemptivePriority(1046), Vendor: 3GPP(10415), MBIT = 1(0x1)
DG 02:49:26.819 => AVP: 3GPP(10415).PreemptivePriority(1047), Vendor: 3GPP(10415), MBIT
DG 02:49:26.819 => AVP: 3GPP(10415).VPLMNDynamicAddressAllowed(1432), Vendor: 3GPP(10415), MBIT = NO
DG 02:49:26.819 => AVP: base(0).MIP6AgentInfo(486), MBIT
DG 02:49:26.819 => AVP: base(0).MIP6AgentInfo(486), MBIT
DG 02:49:26.819 => AVP: base(0).DestinationHost(283), MBIT = "iphonev2.nbn.usa.hp.com"
DG 02:49:26.819 => AVP: base(0).DestinationHost(283), MBIT = "nbn.usa.hp.com"
DG 02:49:26.819 => AVP: 3GPP(10415).PUNIPriority(1450), Vendor: 3GPP(10415), MBIT = IPV4(0)
DG 02:49:26.819 => AVP: 3GPP(10415).QoSClassIdentifier(1028), Vendor: 3GPP(10415), MBIT
DG 02:49:26.819 => AVP: 3GPP(10415).MaxRequestedBandwidthDL(516), Vendor: 3GPP(10415), MBIT = 45
DG 02:49:26.819 => AVP: 3GPP(10415).MaxRequestedBandwidthUL(515), Vendor: 3GPP(10415), MBIT = 45
DG 02:49:26.819 => AVP: base(0).ResultCode(268), MBIT = DIAMETER_SUCCESS(2001)
DG 02:49:26.819 => AVP: base(0).VendorSpecificApplicationId(260), MBIT = 16777251

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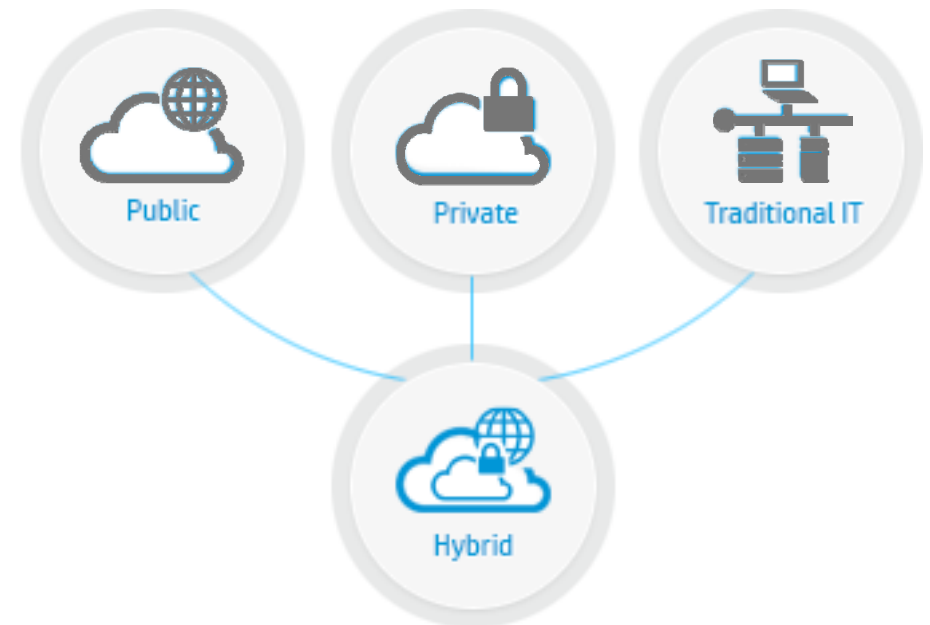
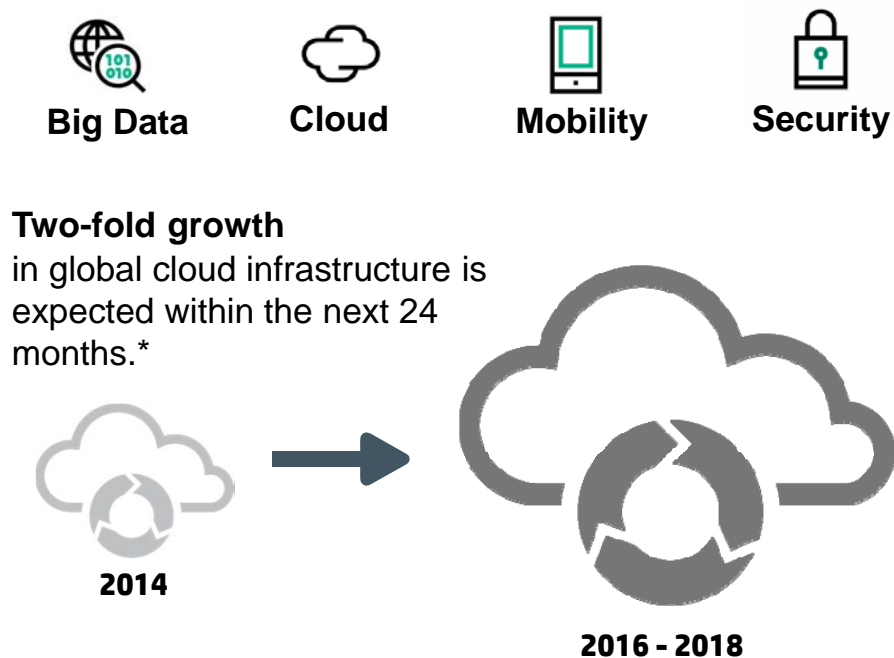
Message latencies from 250μS to 430μS



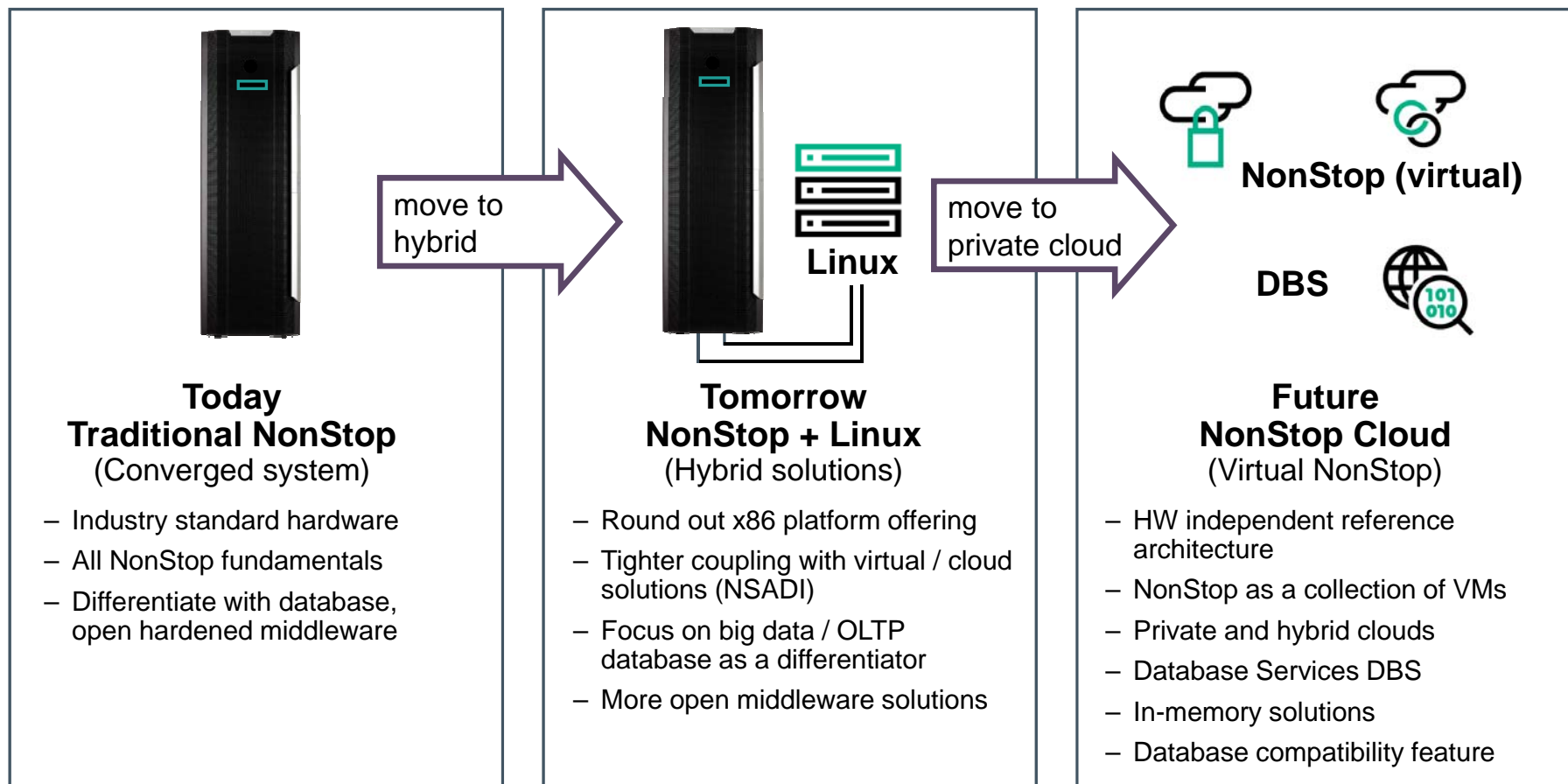
The Future of Cloud Compute & Virtual NonStop

The hybrid IT world

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



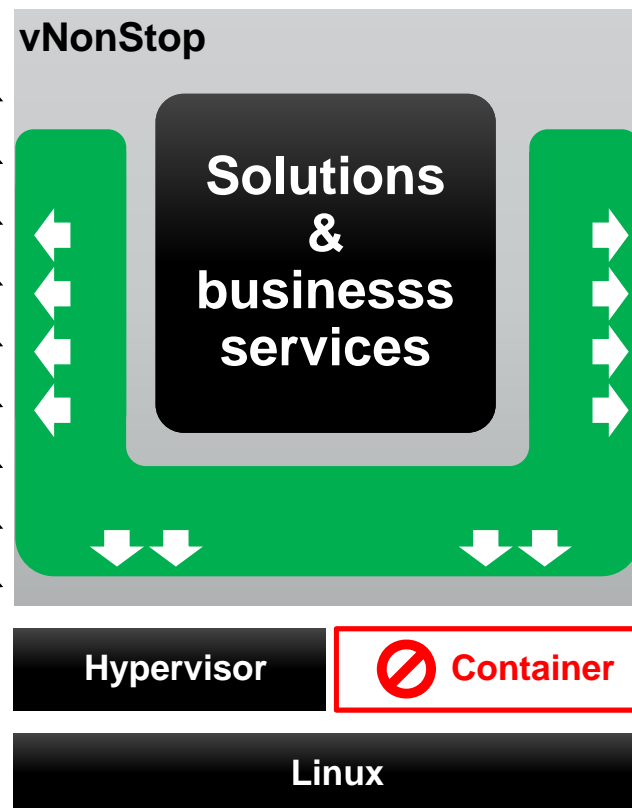
HPE Integrity NonStop vision for the new style of compute



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

Characteristics

- Multi-tenant
- Self-service
- Metered usage
- Multi zone
- Scale out
- Secure & reliable
- Elastic
- Open management
- Licensing models



Infrastructure

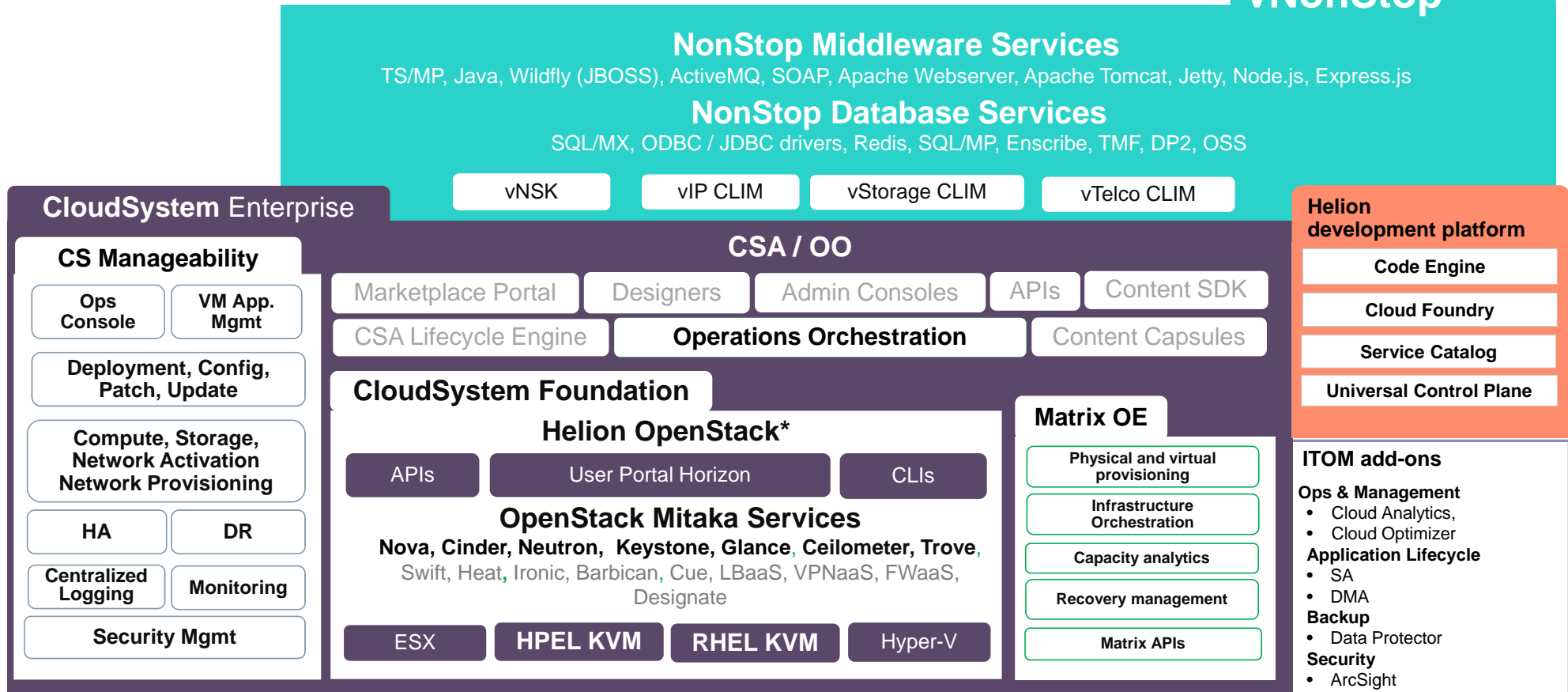
- Open access (REST,..)
- Cloud native app principles
- Popular cloud MW & language
- Database abstraction layers
- Open & native DBMS APIs
- Easy & open access to data



- Analytics / big data integration
- Containerized services

CloudSystem next environment + vNonStop

vNonStop



Combined with today's modern stacks on NonStop

JEE / EJB 3.x

NSASJ



EJB

JBoss AS



Web Container

NSJSP



Frame-
works

Apache Tomcat



JMS

NSMQ



Frame- works

SASH



Microservices

Open Source
Java

Vert.x
Spring Boot
Akka

3rd Party

Node.js
(bomBora)



Java 8 / Java 7 Standard Edition

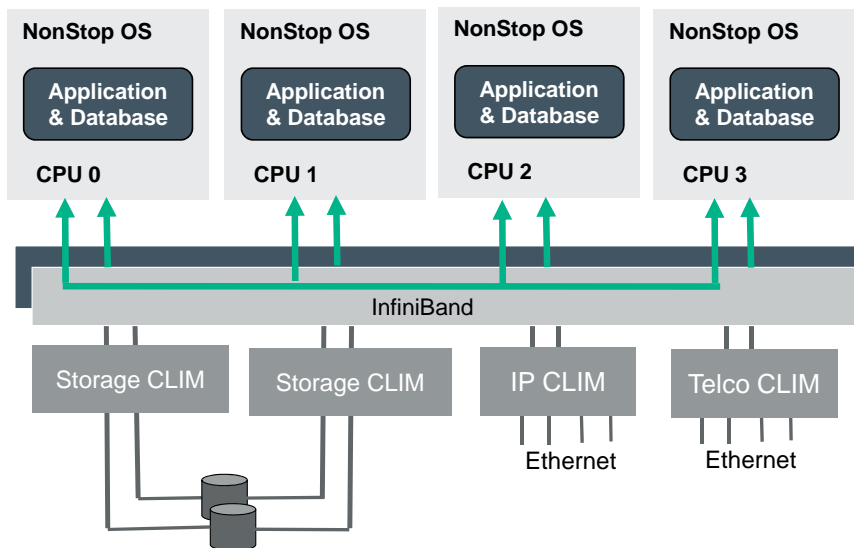
- JDK 8 / 7 compliance
- Hotspot compiler
- 32 & 64 bit
- Parallel & CMS GC
- JToolkit
- Java Infrastructure

Serverside
JavaScript
V8



Traditional NonStop system today – “converged system”

Traditional NonStop (converged system)



All elements come fully integrated from HPE NonStop and shipped with

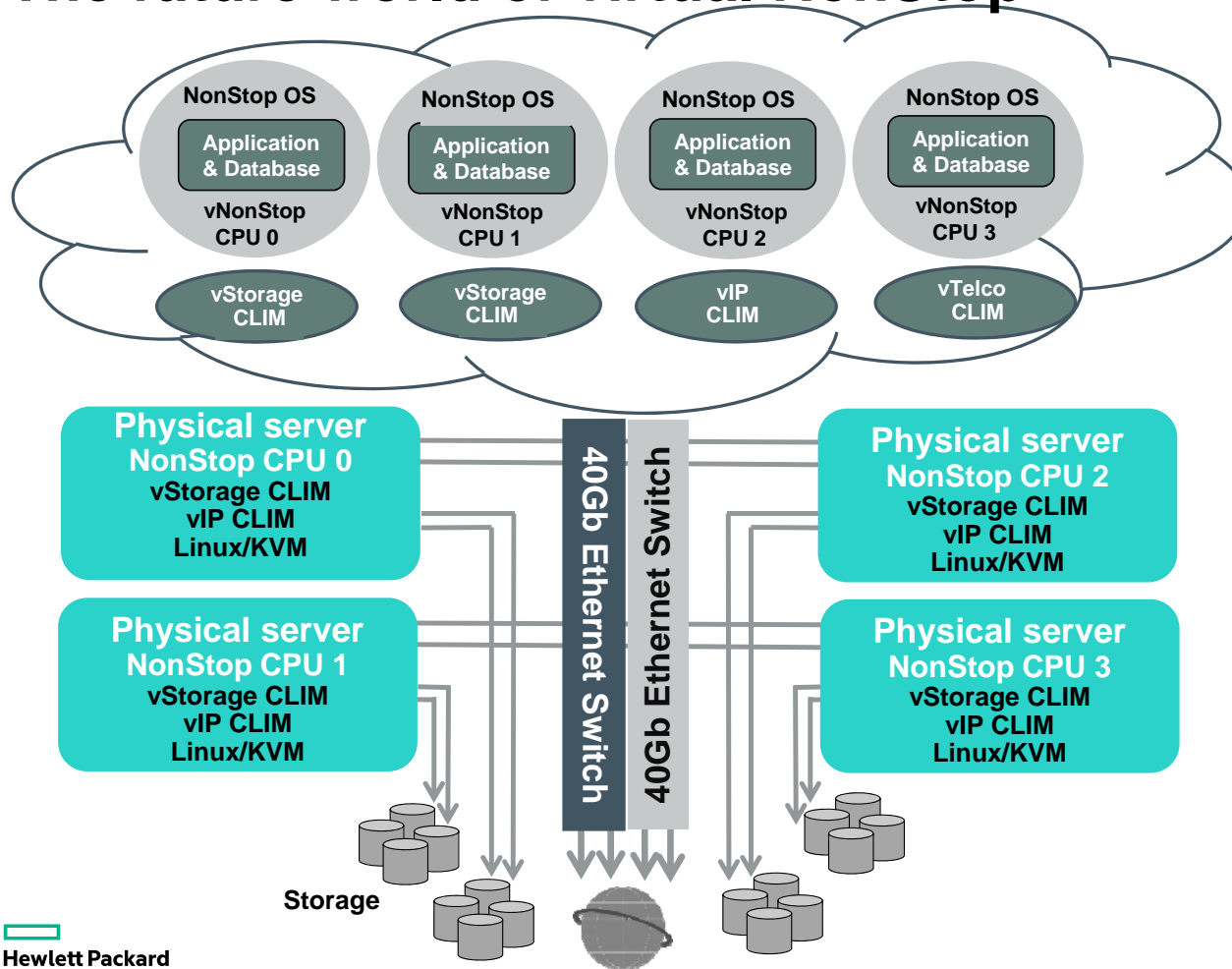
- NonStop hardware
- NonStop software
- Integration on the system
- Burn-in during HPE Manufacturing

Fault tolerant out of the box

Safest choice for business protection

Environment is controlled

The future world of virtual NonStop

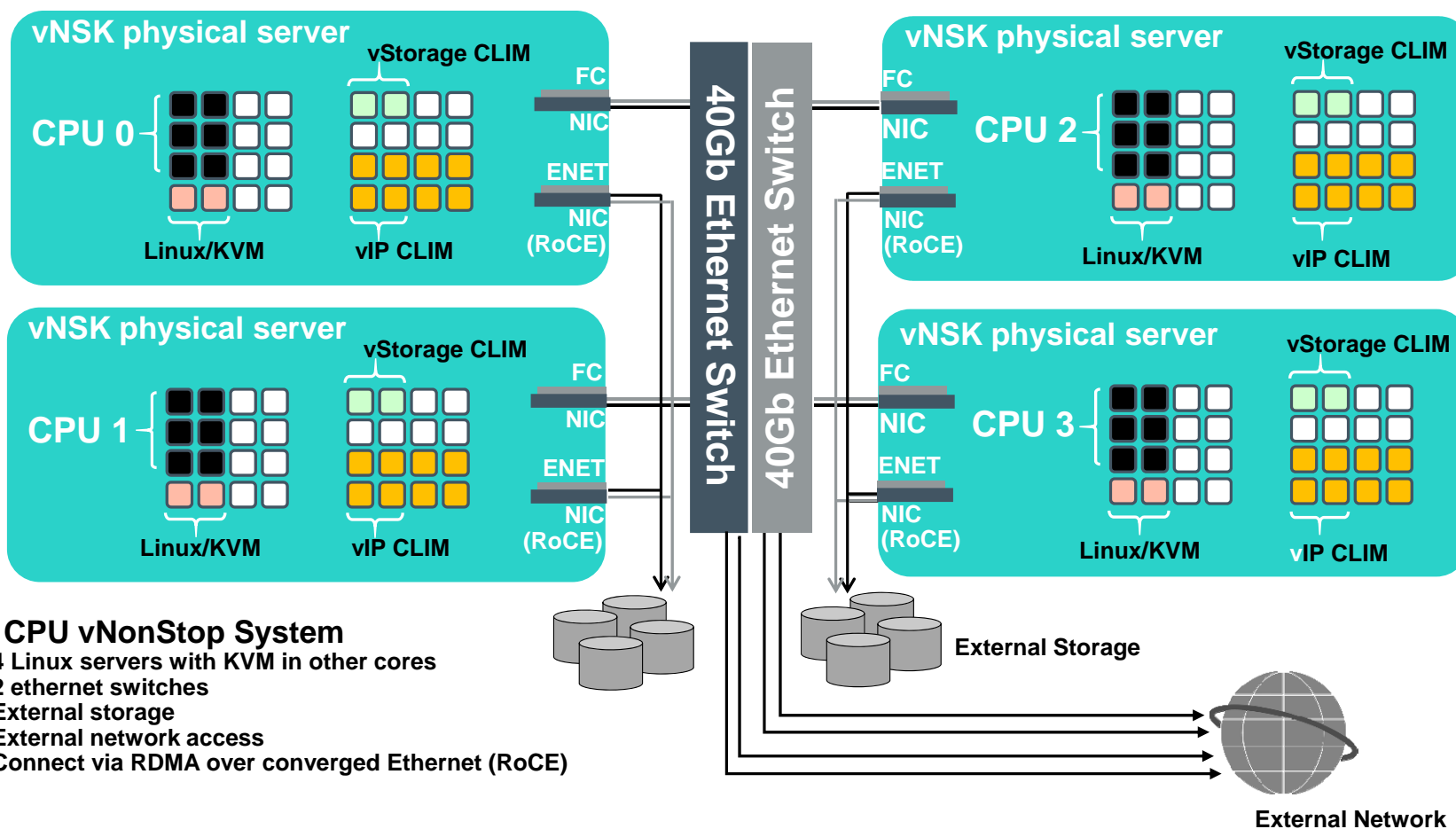


vNonStop software environment functions the same as NonStop X

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

vNonStop underlying environment concept detail



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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Enterprise

Thank you

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