

---

# OpenVMS V8.4-1H1 performance

Performance improvements on HP Integrity  
bl8x0c-i4 and rx2800-i4 servers

Colin Butcher  
XDelta Limited

[www.xdelta.co.uk](http://www.xdelta.co.uk)  
+44 117 904 8209

# XDelta – who we are

- Independent consultants since 1996:
  - UK based with international reach
  - Over 30 years experience with OpenVMS
- We design and implement solutions:
  - Mission critical systems
  - Cross-sector experience
  - Engineering background
  - Gartner (2009):
    - Identified XDelta as one of few companies world-wide capable of OpenVMS migration related projects

**Business Partner**



---

# HP Integrity -i4 servers - highlights

- “Poulson” 2.53GHz 8 core processor with shared L3 cache
- Around 30% per core greater throughput
- Reduced NUMA effects for same core count
- Better memory latency and bandwidth
- Improved floating point and integer performance
- bl870c-i4 (32 cores) about 1.3x better than bl890c-i2

# HP Integrity -i4 servers – hardware

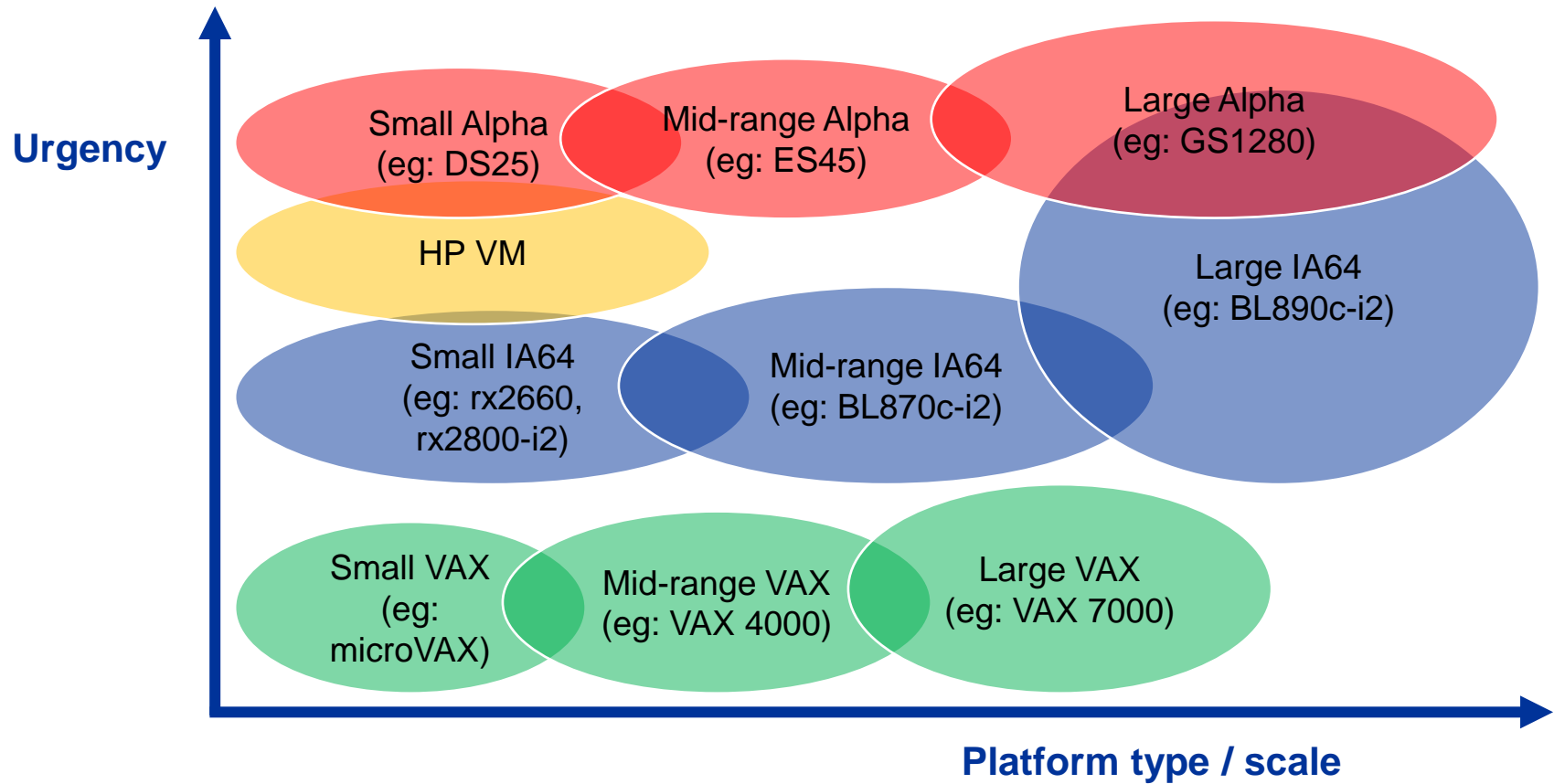
- **bl860c-i4:**  
single width, 16 cores, 384GB, 4x 10GigE, 3x mezz, 1c2d SAS
- **bl870c-i4:**  
double width, 32 cores, 768GB, 8x 10GigE, 6x mezz, 2c4d SAS
- **bl890c-i4:**  
quad width, 64 cores, 1.5TB, 16x 10GigE, 12x mezz, 4c8d SAS
  - OpenVMS currently supports a maximum of 32 cores
  - OpenVMS also supports nPARs
- **rx2800-i4:**  
2U rack, 16 cores, 384GB, 4x 1GigE, 6x PCIe, 1c8d SAS

---

# Migrating from Alpha to Integrity

- Multi-core processors, NUMA, hyperthreading
- 10GigE network
- 8GigFC SAN
- Blade chassis connectivity for bl8x0c-i4
- EVA to 3Par storage migration
- bl870c-i4 and bl890c-i4: good for GS1280 migration

# Migration to Integrity and beyond



# Server hardware differences (-i2 to -i4)

- Higher clock rate
- “Out of order” instruction execution
- Double the core count (8 cores)
- Greater memory capacity
- Reduced memory latency
- Shared on-chip cache
  
- 10GigE LoM (LAN on Motherboard) – LAN only, not FCoE
  
- Still use 8GigFC mezzanine cards

# Chassis hardware – c7000 / c3000

- Virtual Connect (GigE, 1/10GigE, 8GigFC)
- Flex10
- LAN side of FlexFabric
  
- 10GigE chassis based switching
- 10GigE passthrough
- 1GigE passthrough
  
- 8GigFC chassis switching
- 4GigFC passthrough



---

# Infrastructure hardware

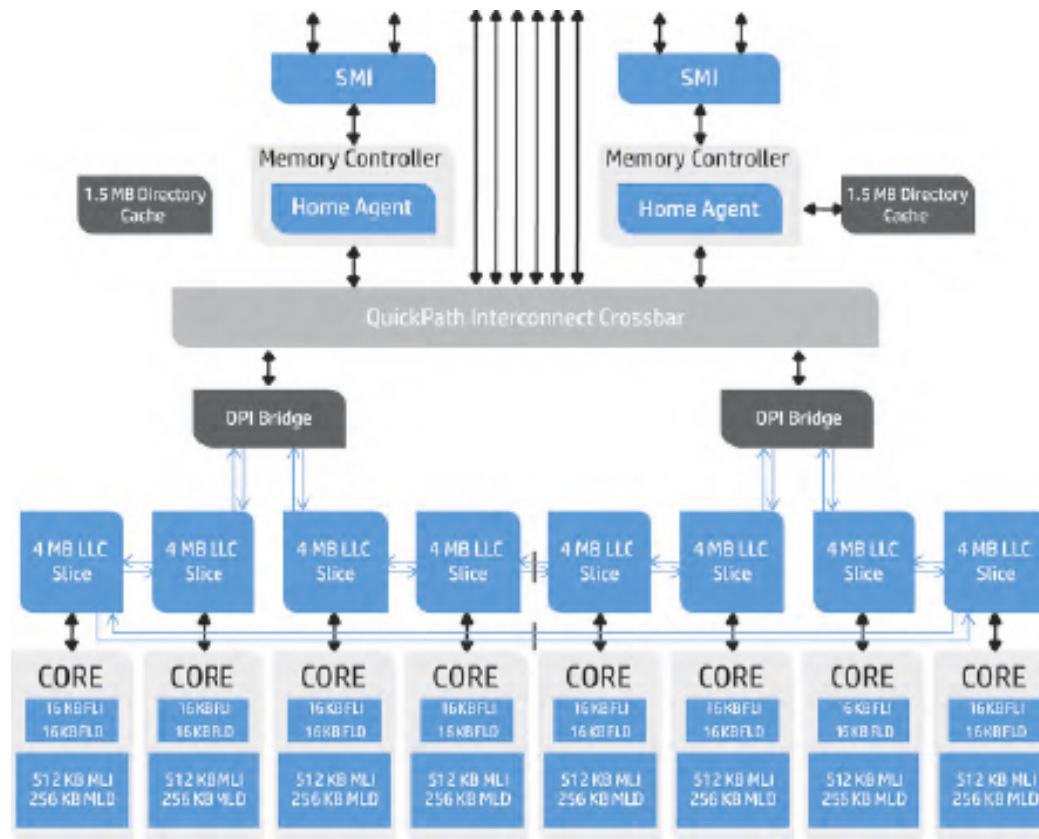
- 3Par storage arrays at 8GigFC
- SSD devices for local storage and 3Par storage arrays
- 8GigFC SAN – HP / Brocade switches
- 10GigE networking – HP Procurve, Cisco

---

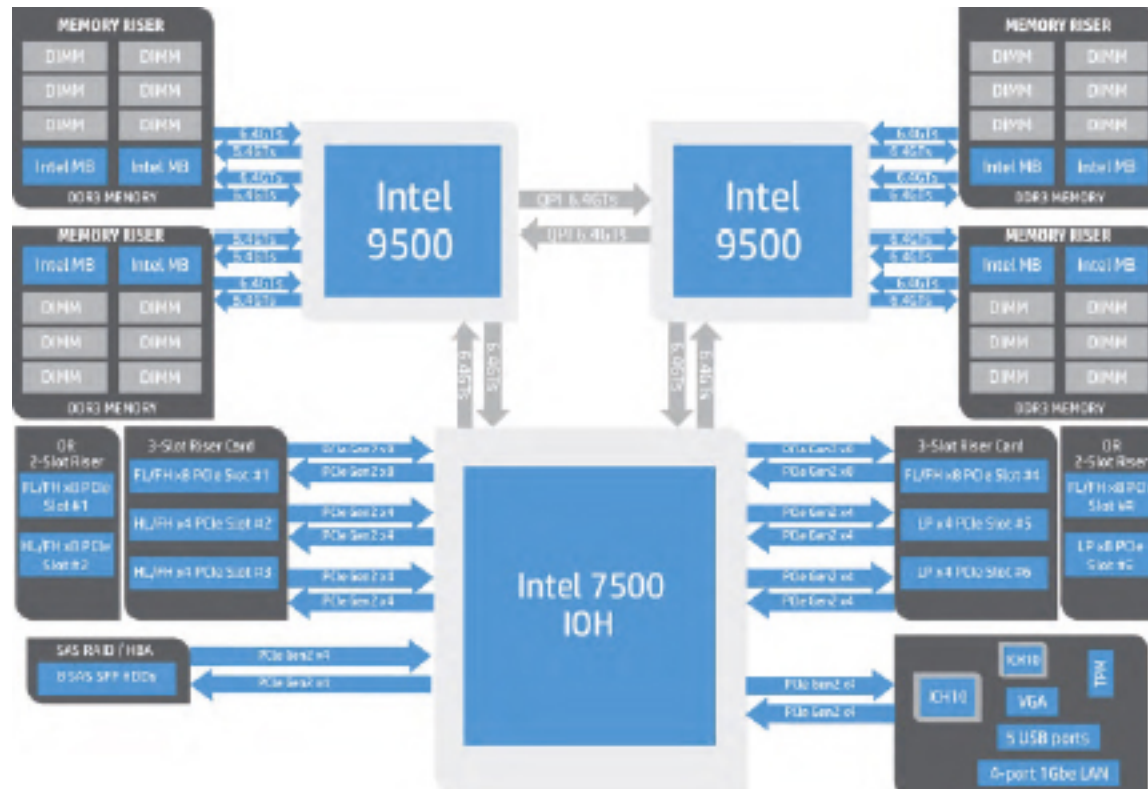
# OpenVMS V8.4-1H1 on -i4 servers

- Complete build of base system from sources
- -i4 hardware support (32 cores supported, threads off)
- New LoM driver
- VSI branding

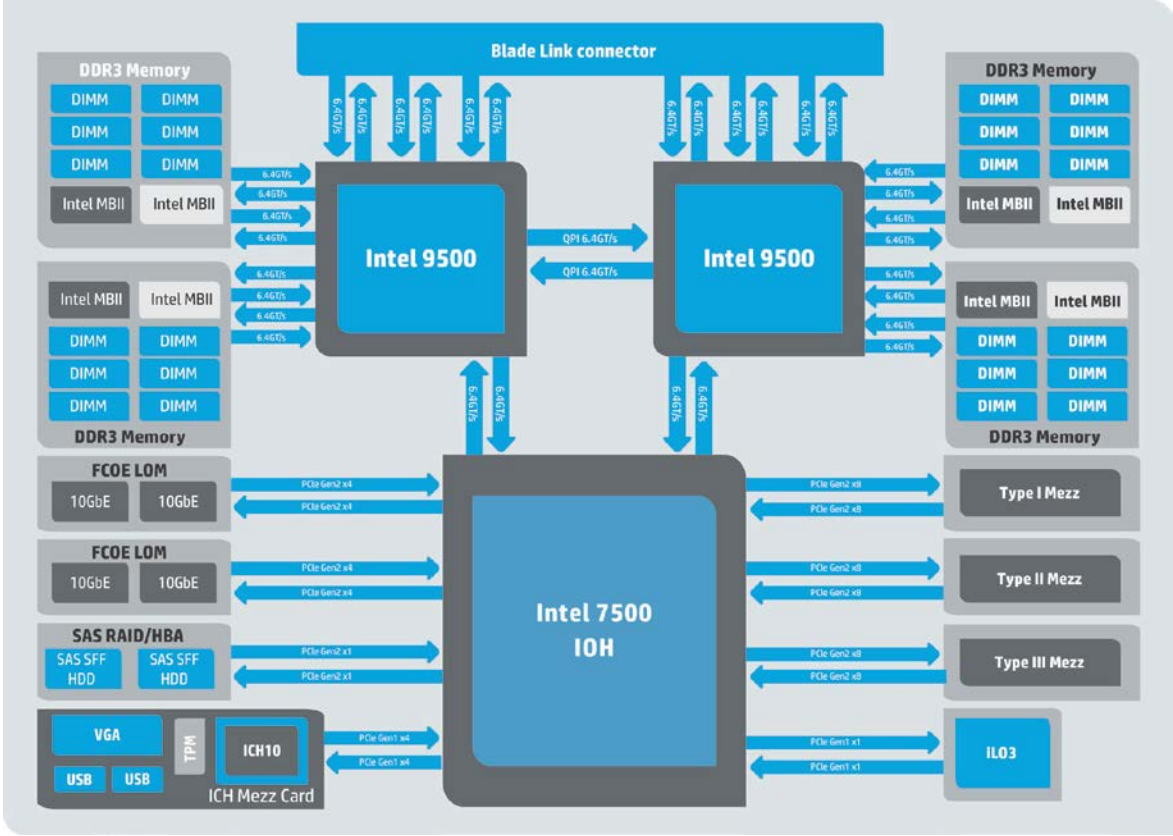
# CPU architecture - Intel 9500 – “Poulson”



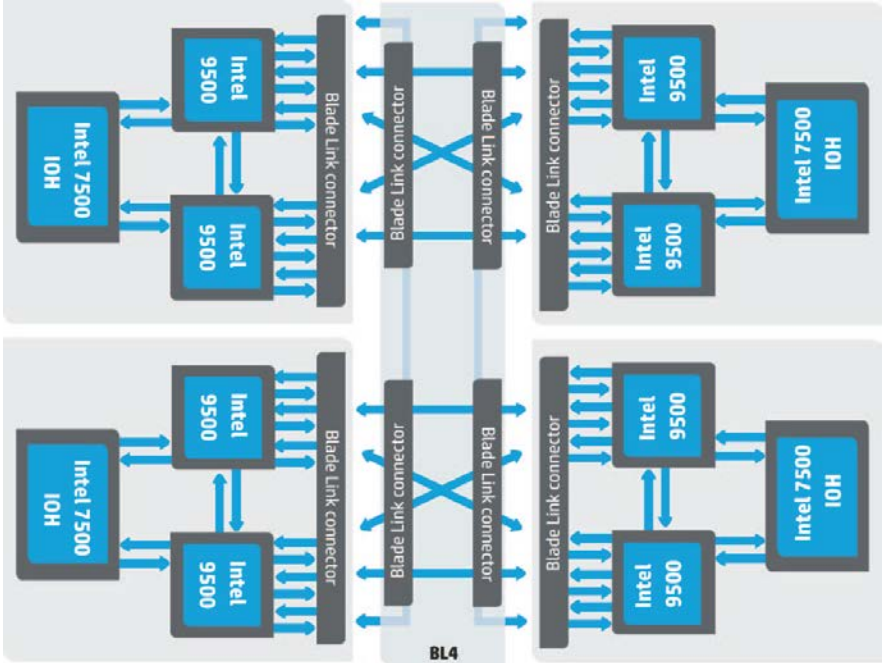
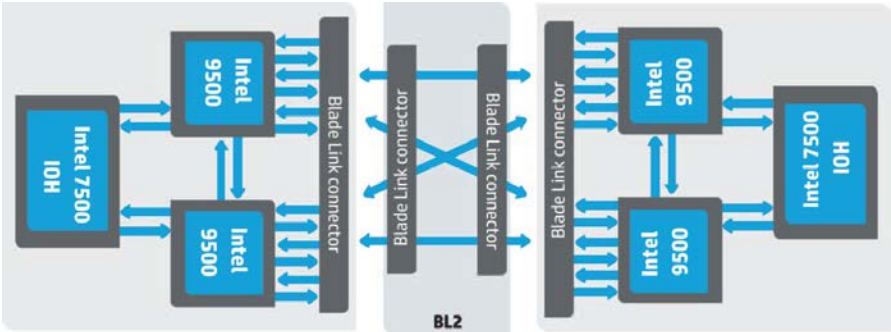
# System architecture – rx2800-i4



# Blade architecture – bl8x0c-i4



# QPI fabric – bl870c-i4 and bl890c-i4



---

# High core count

- CPU 00 is the primary CPU – try to reduce its workload
- Fastpath CPU selection – be aware of physical layout
- CPU choice for dedicated lock manager
- CPU choice for TCPIP packet processing engine
- Consider physical layout - RADs and NUMA

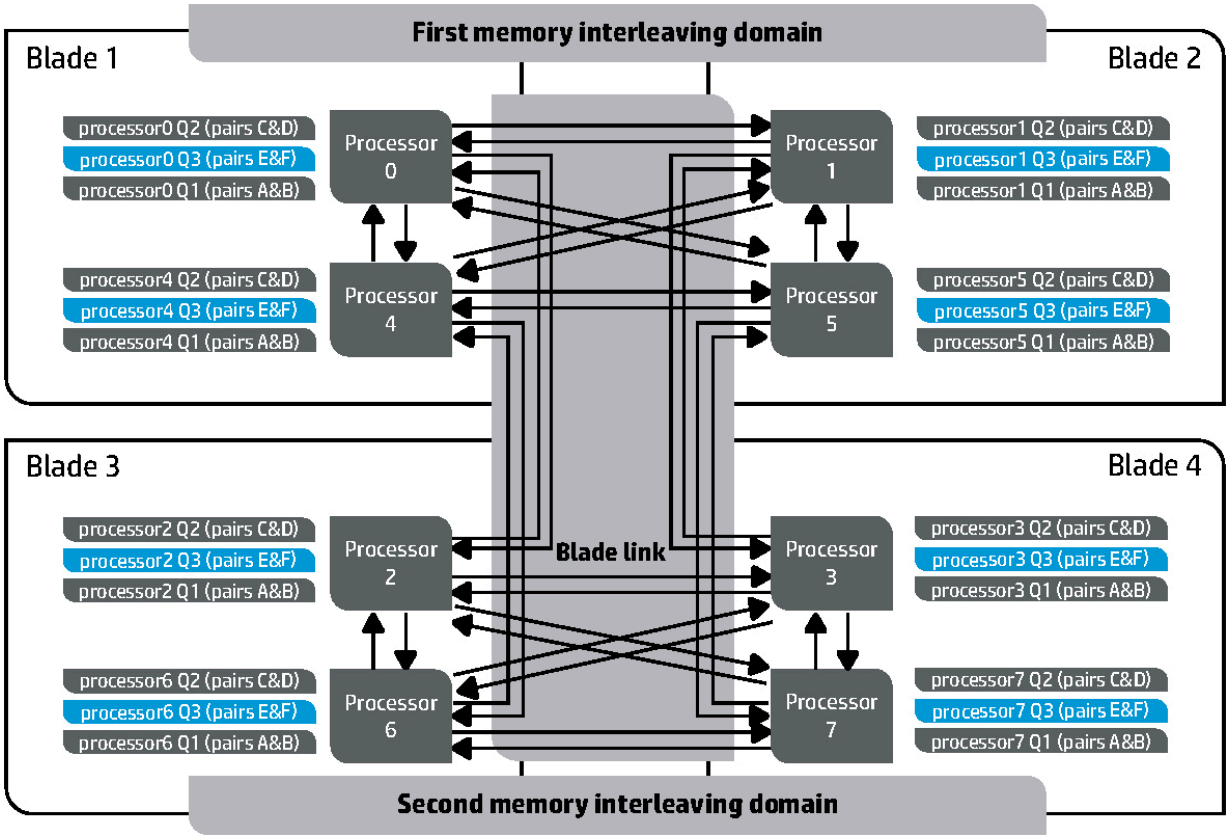
---

# Hyperthreading

- Hyperthreading is extremely workload dependent
- In general the OpenVMS scheduler does a better job
- Enable / disable hyperthreads and reboot
- “CPU” count will appear to double when enabled  
Note: OpenVMS currently supports a maximum of 32 “CPUs”



# Memory architecture – bl890c-i4



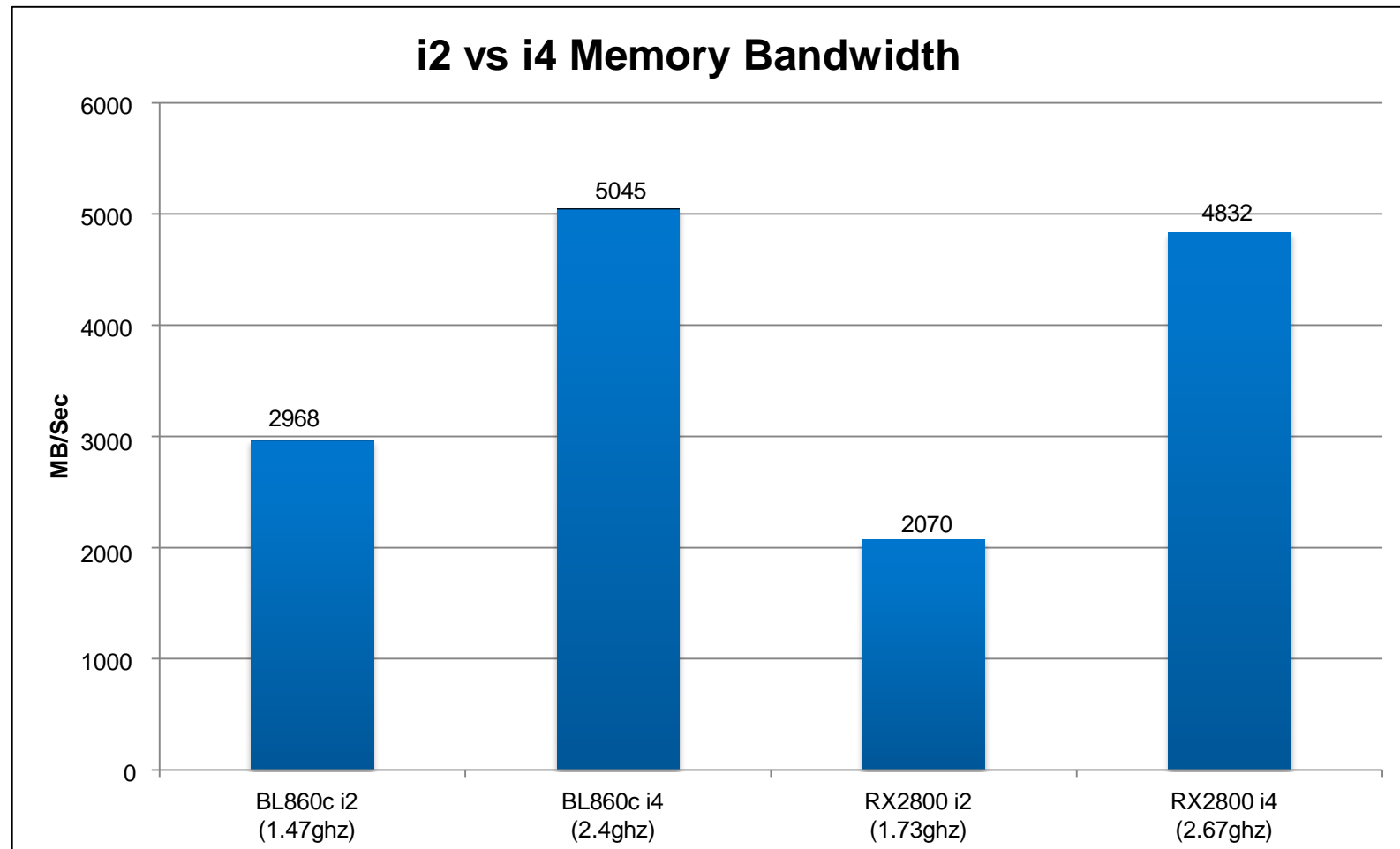
# NUMA (non-uniform memory access)

- OpenVMS uses large shared memory regions:
  - XFC (50% available memory by default)
  - RMS global buffers
  - Global sections (especially database caches)
  - Memory disc driver (MD devices)
- Useful starting point for OpenVMS is “mostly UMA”

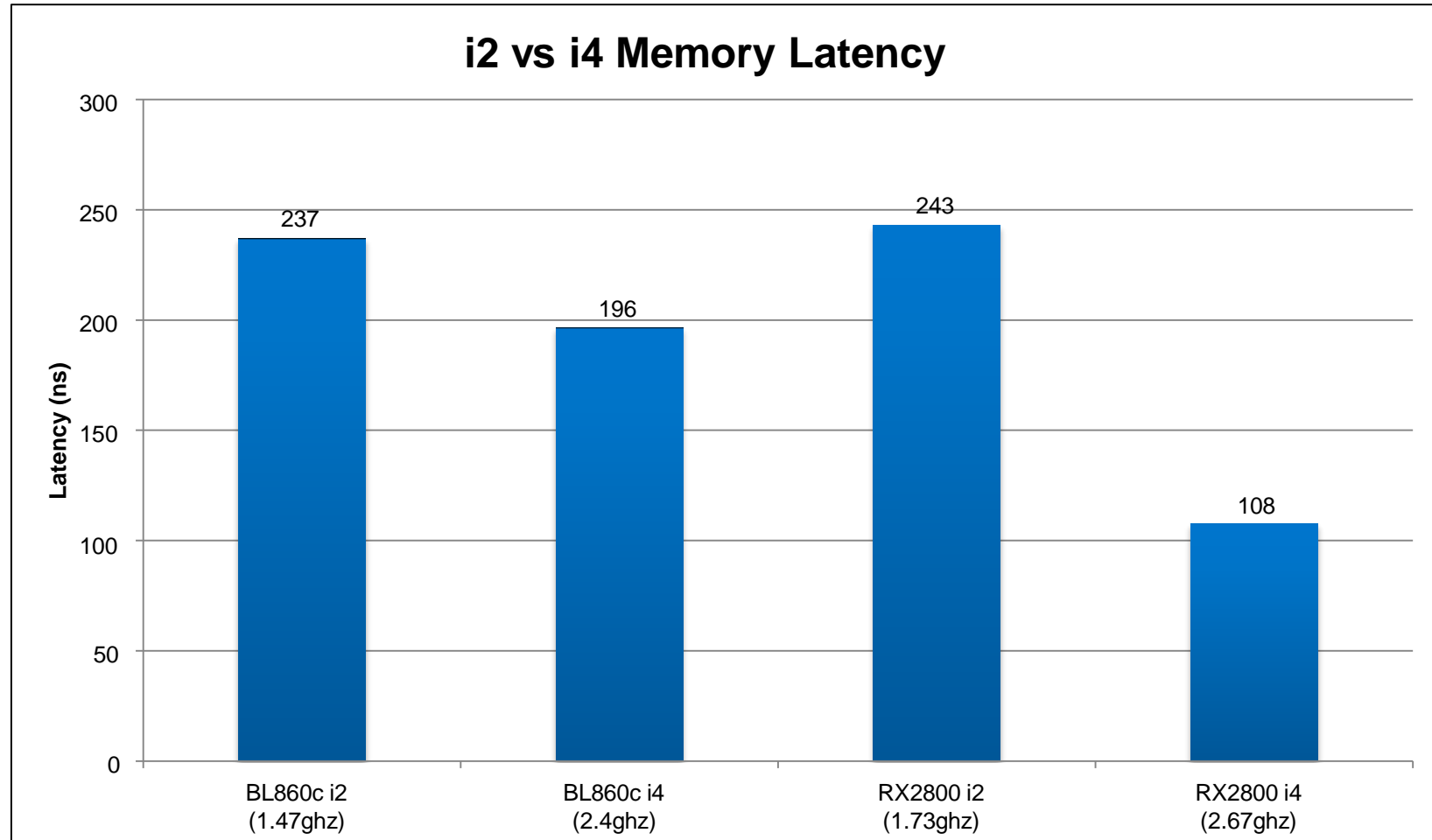
# Preliminary Performance Results i2 vs. i4

- The following slides contain preliminary data on performance differences between selected i2 and i4 servers running OpenVMS E8.4-1H1.
- The data was generated from VSI-written programs used to measure certain aspects of system performance.
- The results shown here should not be used as a general characterization of overall system performance or as an indication of how any specific application may perform.

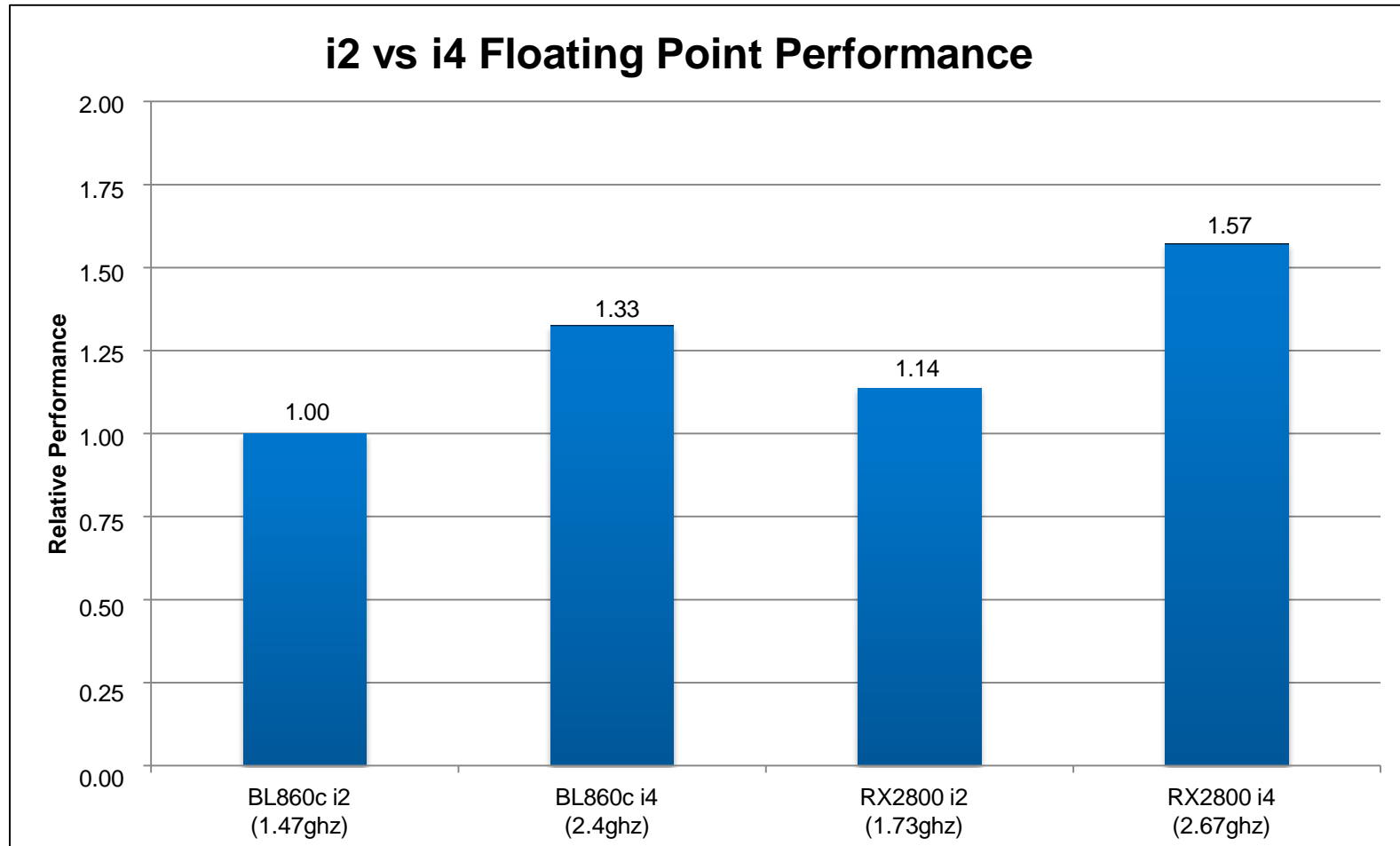
# i2 vs. i4 Memory Bandwidth



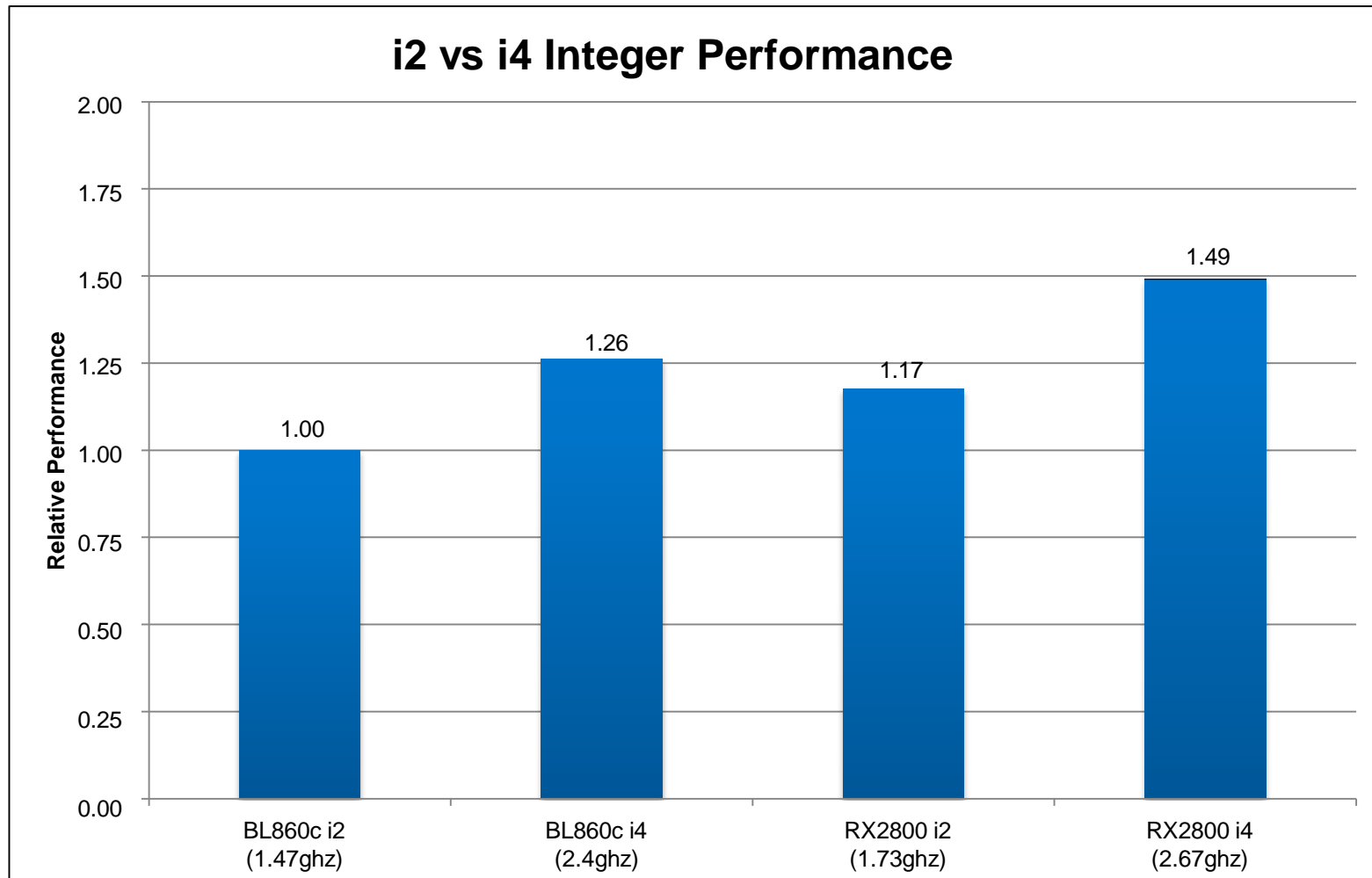
# i2 vs. i4 Memory Latency



# i2 vs. i4 Floating Point Performance



# i2 vs. i4 Integer Performance



---

# Performance engineering – use T4

- Avoid guesswork - run T4 all the time
- Without good data you cannot do good performance work
- A faster machine just waits more quickly
- Don't make it go faster, stop it going slower
- The fastest IO is the IO you don't do
- The fastest code is the code you don't execute



# Summary - VMS V8.4-1H1 on -i4 servers

- Disable devices you don't use  
SYSMAN IO SET EXCLUDE=(EWC,EWD,...)
- Experiment with memory interleave setting
- Use memory reservations
- Fastpath settings for device types
- Dedicated CPU for TCPIP + LCKMGR
- Experiment with hyperthreading

# OpenVMS Rolling Roadmap

Q2 2015

Q4 2015

Q3 2016

Q3 2017

## OpenVMS V8.4-1H1

### Architecture: Itanium

Itanium® Processor 9500 series

HP Integrity System Support

- rx2800 i4
- HP Integrity Server Blades
  - BL860c i4
  - BL870c i4
  - BL890c i4

- i2 versions of the above
- Blades FlexFabric LAN support

Software

- Improved performance over i2
- Availability Manager – update to 64-bit desktop

### Architecture: Itanium

HP Integrity system support

- V8.4-1H1 supported servers and more - such as rx2660, rx3600, rx6600, ....
- More network and storage devices
- Kittson-based systems (when available)

Software

- Improved performance, reliability
- New TCP/IP stack
- Support 64 cores (threads off)
- Enhanced GNV/CRTL for open source porting and development
- JAVA 1.8
- Updated Open Source Kits
  - Apache, gSOAP, Samba
  - SSL, Kerberos
  - and more

## OpenVMS V9.0

### Architecture: Common

New File System

- Eliminate 2TB volume size limit
- Improved performance

### Architecture: Integrity

Additional servers & I/O, depending on feedback

### Architecture: X86-64

- Selected HP servers
- OpenVMS as a VM guest
- Binary Translator
- Updated Language Standards
  - C
  - C++
  - FORTRAN

*Two releases are planned between V8.4-1H1 and V9.0. The order in which work makes it into these releases will be determined by readiness, HW availability, and customer feedback.*

---

# OpenVMS V8.4-1H1 performance

Performance improvements on HP Integrity  
bl8x0c-i4 and rx2800-i4 servers

Colin Butcher  
XDelta Limited

[www.xdelta.co.uk](http://www.xdelta.co.uk)  
+44 117 904 8209