# **OpenVMS V8.4-1H1 performance**

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

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### 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
- 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)
  - o 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

#### <u>OpenVMS V8.4-1H1</u>

Architecture: Itanium

#### Itanium<sup>®</sup> 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

#### 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 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



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