## Performance Section

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### Servers

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<tr>
<th>Category</th>
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<tr>
<td>Quantity</td>
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<tr>
<td>Server Manufacturer and Model</td>
<td>HP ProLiant DL560 Gen8</td>
</tr>
<tr>
<td>Processor Vendor and Model</td>
<td>Intel Xeon E5-4650</td>
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<tr>
<td>Processor Speed (GHz)</td>
<td>2.70</td>
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<tr>
<td>Total Sockets/Total Cores/Total Threads</td>
<td>4 Sockets / 32 Cores / 64 Threads</td>
</tr>
<tr>
<td>Primary Cache</td>
<td>32 KB I + 32 KB D on chip per core</td>
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<tr>
<td>Secondary Cache</td>
<td>256 KB I+D on chip per core</td>
</tr>
<tr>
<td>Other Cache</td>
<td>20 MB I+D on chip per chip L3</td>
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<tr>
<td>BIOS Version</td>
<td>P77 08/12/2012</td>
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<tr>
<td>Memory Size (in GB, Number of DIMMs)</td>
<td>512 GB, 32 x 16 GB DIMMs</td>
</tr>
<tr>
<td>Memory Type and Speed</td>
<td>dual rank PC3-12800 Registered DDR3/1600 MHz</td>
</tr>
<tr>
<td>Disk Subsystem Type</td>
<td>FC SAN</td>
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<tr>
<td>Number of Disk Controllers</td>
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<tr>
<td>Disk Controller Vendors and Models</td>
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<tr>
<td>Host Bus Adapter Vendors and Models</td>
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<tr>
<td>Number of Network Controllers</td>
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<td>Network Controller Vendors and Models</td>
<td>HP Ethernet 1 Gb 4-port 331FLR Adapter, 1 x Intel X520-DA2 Dual Port 10GbE Server Adapter</td>
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<tr>
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<tr>
<td>Other Software</td>
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### Network

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<th>Category</th>
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<tr>
<td>Network Switch Vendors and Models</td>
<td>1 x H3C S5820X-28S</td>
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<tr>
<td>Network Controller Vendors and Models</td>
<td>4 x HP Virtual Connect Flex-10 10Gb Ethernet Module for BladeSystem</td>
</tr>
<tr>
<td>Network Speed</td>
<td>H3C S5820X-28S - 24 x 10 GbE ports, 4 x 1 GbE ports</td>
</tr>
<tr>
<td></td>
<td>HP Virtual Connect Flex-10 - 10GbE</td>
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### Storage

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<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>none</td>
</tr>
</tbody>
</table>
### Array Vendors, Models, and Firmware Versions
| 2 x VS-SmartArray Storage Servers by id7 Limited |
| System BIOS: P70 05/30/2012 |
| HP SmartArray P420i firmware: 3.02 |
| HP SmartArray P420 firmware: 3.02 |

### Fibre Channel Switch Vendors and Models
| 1 x HP StorageWorks SAN Switch 8/24 |

### Disk Space Used
| 13.07 TB |

### Array Cache Size
| 2 GB |

### Total Number of Physical Disks Used
| 36 |

### Total Number of Enclosures/Pods/Shelves Used
| 2 |

### Number of Physical Disks Used per Enclosure/Pod/Shelf
- Internal: 2 disks per host (OS)
- 2 enclosures: 16 disks each

### Total Number of Storage Groups Used
| 0 |

### Number of LUNs Used
| 16 |

### LUN Size and Number of Disks Per LUN
| 16 LUNs: 742 GB on 8 disks |

### RAID Type
- RAID 0 for enclosures, RAID 1 for OS drives

### Number of Members per RAID Set
- RAID 1: 2
- RAID 0: 8

### Disk Vendors, Models, and Speeds
- 4 x HP 146GB 15K RPM SAS SFF (P/N 652605-B21)
- 32 x HP 400GB 6G SAS SFF SSD (P/N 653082-B21)

---

### Datacenter Management Server

#### System Model
- HP ProLiant BL460c G7

#### Processor Vendor and Model
- Intel Xeon X5675

#### Processor Speed (GHz)
| 3.06 |

#### Total Sockets/Total Cores/Total Threads
| 2 Sockets / 12 Cores / 24 Threads |

#### Memory
| 24 GB |

#### Network Controller(s) Vendors and Models
- 1 x HP NC553i Dual Port FlexFabric 10Gb Adapter

#### Operating System, Version, and Service Pack
- Microsoft® Windows® 2008 R2 Enterprise (64-bit)

#### Other Hardware
- none

#### Other Software
- VMware ESXi 5.0.0 Build 469512

### Clients

#### Number of Clients
- 4 physical servers
- 1 physical server used for non-virtualized prime client
- 3 physical servers hosting 18 virtual clients
| System Model(s)                        | HP ProLiant BL460c G7 (prime client)  
| HP ProLiant BL465c G7 (virtual client hosts) |
| Processor Vendor(s) and Model(s)      | Prime client: Intel Xeon X5675  
|                                         | Physical Clients: AMD Opteron 6174 |
| Processor Speed(s) (GHz)              | Prime Client: 3.06  
|                                         | Physical Clients: 2.2 |
| Total Sockets/Total Cores/Total Threads | Prime Client: 2 Sockets / 12 Cores / 24 Threads  
|                                         | Physical Clients: 2 Sockets / 24 Cores / 24 Threads |
| Memory per Client                     | Prime Client: 24 GB  
|                                         | Physical Clients: 64 GB |
| Network Controller(s) Vendors and Models | Prime Client: 1 x HP NC553i Dual Port FlexFabric 10GbE Adapter  
|                                         | Physical Clients 0-1: 1 x HP NC551i Dual Port FlexFabric 10GbE Adapter  
|                                         | Physical Client 2: 1 x HP NC551i Dual Port FlexFabric 10GbE Adapter, 1 x HP NC542m Dual Port Flex-10 10GbE adapter |
|                                         | Physical Clients 0-2: VMware ESXi 4.1 U1 (Build 348481)  
|                                         | Virtual Clients 0-17: Microsoft® Windows® 2008 R2 Enterprise (64-bit) |
| Other Hardware                        | none |
| Other Software                        | none |

**Notes for Workload**

**Virtualization Software Notes**

- all VMs used virtual hardware V7
- ethernet adapter type set to vmxnet3 for all VMs (default vmxnet2)
- logging was disabled for all VMs (default enabled)
- IDE & floppy devices were removed on all VMs (default enabled)
- firewall was disabled in the console os (default enabled)
- All Mailserver VMs: Paravirtual Controller
- Cluster DRS Automation Level set to Fully Automated
- DrsMigrationThreshold set to level 2
- Logical CPU layout changed for all multi-cpu VM's to 1 socket w/ multiple cores. (default Single core per socket)

**Advanced Settings:**

- Cpu.CoschedCrossCall = 0 (default 1)
- Cpu.HaltingIdleMsecPenalty = 0 (default 800)
- DataMover.HardwareAcceleratedInit = 0 (default 1)
- DataMover.HardwareAcceleratedMove = 0 (default 1)
- Disk.SchedNumReqOutstanding = 256 (default 32)
- Iq.RoutingPolicy = 0 (default 2)
- Mem.BalancePeriod = 0 (default 15)
- Mem.SamplePeriod = 0 (default 60)
- Mem.ShareScanGHz = 0 (default 4)
- Mem.VMOverheadGrowthLimit = 0 (default 4294967295)
- Misc.TimerMaxHardPeriod = 4000 (default 100000)
- Misc.TimerMinHardPeriod = 2000 (default 100)
• Misc.WorldletHTSharing = 45 (default 90)
• Net.MaxNetifRxQueueLen = 500 (default 100)
• Net.MaxNetifTxQueueLen = 1000 (default 500)
• Net.NetTxCompletionWorldlet = 0 (default 1)
• Net.NetTxWordlet = 0 (default 2)
• Numa.AutoSplitVM = 0 (default 1)
• Numa.LTermFairnessInterval = 0 (default 5)
• Numa.MonMigEnable = 0 (default 1)
• Numa.PageMigEnable = 0 (default 1)
• Numa.PreferHT = 1 (default 0)
• Numa.RebalancePeriod = 60000 (default 2000)
• Numa.SwapInterval = 1 (default 3)
• Numa.SwapLoadEnable = 0 (default 1)
• Numa.SwapLocalityEnable = 0 (default 1)
• VMFS3.HardwareAcceleratedLocking = 0 (default 1)

Driver Options:

• Updated Drivers:
  • net-tg3 400.3.122g.v40.2-1vmw.2.17.00000
  • scsi-hpsa 400.4.1.0-18OEM
  • net-be2net 400.4.1.334.0-1vmw.2.17.249663
• /vmkernel/module/qla2xxx.o/options = "ql2xmaxqdepth=256 ql2xintrdelaytimer=6 ql2xenablesi=1 " (default 32, 0, and 0)
• /vmkernel/module/ixgbe.o/options = "VMDQ=1,1,1 InterrupThrottleRate=500,500,500,500" " (default 8 and 16000)

Server Notes

• Intel Turbo Boost Technology up to 3.30 GHz
• Server BIOS settings:
  • HP Power Profile set to Maximum Performance (default: Balanced Power and Performance)
  • Thermal Configuration set to Max Cooling (default: Optimal Cooling)
  • HW Prefetcher set to Disabled (default: Enabled)
  • Adjacent Sector Prefetch set to Disabled: (default: Enabled)
  • Processor Power and Utilization Monitoring set to Disabled: (default: Enabled)
  • Memory Pre-Failure Notification set to Disabled: (default: Enabled)

Networking Notes

• vSwitch0 for the Service Console on vmnic0 at 1Gb/s
• vSwitch1 defined as vmkernel vMotion connection on vmnic1 at 1Gb/s
• vSwitch2 for the DS2* workloads on vmnic4 at 10Gb/s
• vSwitch3 for the Olio* workloads on vmnic5 at 10Gb/s
• vSwitch4 for the mailserver workloads on vmnic2 at 1Gb/s
• vSwitch5 for the standby and deploy workloads on vmnic3 at 1Gb/s

Storage Notes

• ESX was installed on two disks configured as RAID1 in the internal server storage bay
• Both "VS-SmartArray Storage Server" by idt Limited uses LUNs configured as block devices; as such no system memory is used for write caching.
Both "VS-SmartArray Storage Server" by id7 Limited hardware configuration details as below:

- **Processor Configuration**
  - Server #1: 2 x Intel Xeon E5-2690 2.9 GHz processors
  - Server #2: 2 x Intel Xeon E5-2643 3.3 GHz processors
  - 64 GB memory (8 x 8 GB dual rank PC3-12800 Registered DDR3 / 1600 MHz DIMMS)
  - HP 380/385 Gen8 8-SFF Cage/Bkpln Kit
  - 2xHP 82Q PCIe dual port 8Gb Fibre HBA
  - 1 x 32 GB SDHC memory card
    - used for OS and id7 VS-SmartArray
  - HP Smart Array P420i controller with 2 GB FBWC
    - Array A - 8 x HP 400GB SAS SSD SFF disks
      - Logical disk 1
        - 742 GB, RAID 0
        - exported as fibre target LUN
      - Logical disk 2
        - 742 GB, RAID 0
        - exported as fibre target LUN
      - Logical disk 3
        - 742 GB, RAID 0
        - exported as fibre target LUN
      - Logical disk 4
        - 742 GB, RAID 0
        - exported as fibre target LUN
  - HP Smart Array P420 controller with 2 GB FBWC
    - Array A - 8 x HP 400GB SAS SSD SFF disks
      - Logical disk 1
        - 742 GB, RAID 0
        - exported as fibre target LUN
      - Logical disk 2
        - 742 GB, RAID 0
        - exported as fibre target LUN
      - Logical disk 3
        - 742 GB, RAID 0
        - exported as fibre target LUN
      - Logical disk 4
        - 742 GB, RAID 0
        - exported as fibre target LUN

- **VM Layout on the id7 VS-SmartArray's as below:**
  - id7 VS-SmartArray #1
    - P420i:Logical Drive 1
      - All VMs except standby for tiles 0 and 16
    - P420i:Logical Drive 2
      - All VMs except standby for tile 1
    - P420i:Logical Drive 3
      - All VMs except standby for tile 2
    - P420i:Logical Drive 4
      - All VMs except standby for tile 3
      - DeployTemplate
    - P420i:Logical Drive 1
      - All VMs except standby for tiles 0 and 16
All VMs except standby for tile 4
- P420: Logical Drive 2
- All VMs except standby for tile 5
- P420: Logical Drive 3
- All VMs except standby for tile 6
- P420: Logical Drive 4
- All VMs except standby for tile 7
- Standby VMs for tiles 0 - 17

All VMs except standby for tiles 0 - 17
- idy VS-SmartArray #2
- P420i: Logical Drive 1
- All VMs except standby for tiles 8 and 17
- P420i: Logical Drive 2
- All VMs except standby for tile 9
- P420i: Logical Drive 3
- All VMs except standby for tile 10
- P420i: Logical Drive 4
- All VMs except standby for tile 11
- Deploy Target LUN
- P420i: Logical Drive 1
- All VMs except standby for tile 12
- P420i: Logical Drive 2
- All VMs except standby for tile 13
- P420i: Logical Drive 3
- All VMs except standby for tile 14
- P420i: Logical Drive 4
- All VMs except standby for tile 15
- Standby Target LUN

Datacenter Management Server Notes
- HP ProLiant BL460c G7 had ESXi 5.0.0 installed and had 2 virtual machines
  - vCenter for SUT
    - 4 virtual CPUs
    - 8 GB virtual memory
    - Microsoft® Windows® 2008 R2 Enterprise (64-bit)
  - vCenter for clients
    - 2 virtual CPUs
    - 4 GB virtual memory
    - Microsoft® Windows® 2008 R2 Enterprise (64-bit)

Operating System Notes
- All mailserver VMs running Microsoft® Windows® 2008 R2 Enterprise (64-bit)
- All standby VMs running Microsoft® Windows® 2003 Enterprise SP2 (32-bit)

Software Notes
- Microsoft® Exchange Server 2007 Enterprise SP3 (64-bit) was installed on each mailserver VM

Client Notes
Prime client functionality was split from the client0 driver and was run on a non-virtualized copy of Microsoft® Windows® 2003 Enterprise SP2 (32-bit).
Prime client was running VMware vSphere PowerCLI 4.1 U1 build 332441
All client drivers were run on virtual machines that were each defined with 4 virtual cpus, 4GB of memory, 1 vmxnet3 network, and 32GB of disk space.
Three HP ProLiant BL465c G7 clients ran 6 client virtual machines each
All client operating systems were updated via Windows Update.

Other Notes

None

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