# Comparison of the Z400 and xw4600 Architectures

**Introduction:** The HP Z400 is a new Intel® Xeon® based entry workstation, positioned above the HP xw4600 Personal Workstation. Its architecture introduces significant improvements, including processor microarchitecture, memory controller architecture, and performance.

**Processor Technology:** The Z400 uses the Intel® X58 Express chipset to support the latest Quad Core Intel® Xeon® processor W3500 Series (Nehalem), including processors up to 130W. These 45nm processors incorporate an integrated 3-channel memory controller, microarchitecture improvements and large L3 cache to provide significantly better performance than the previous generation (Penryn). The Z400 uses the Intel® QuickPath Technology to connect the processor and I/O controller with speeds up to 6.4 GT/s, significantly increasing peak aggregate data bandwidth over the xw4600.
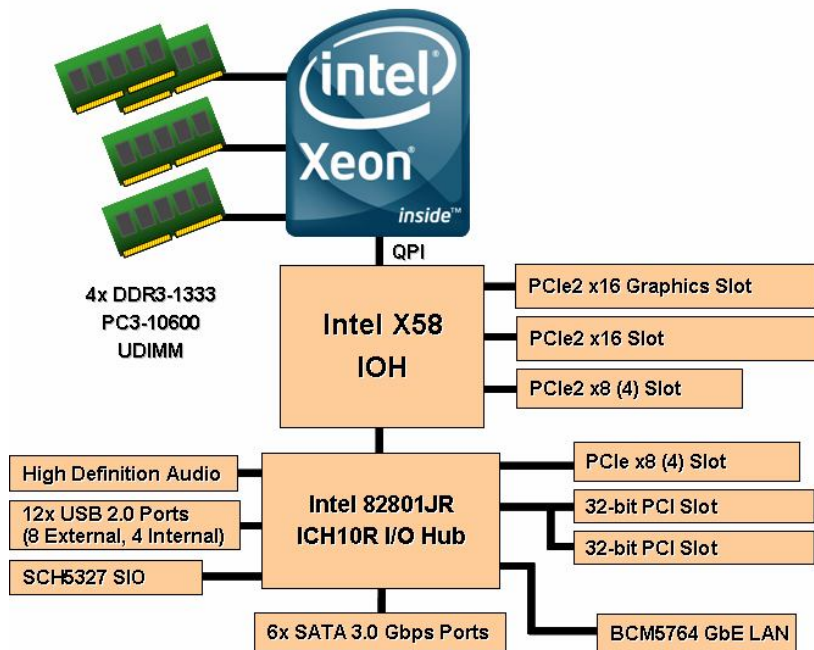
**Memory Technology:** The Z400's unbuffered DIMMs (UDIMMs) are based on DDR3 1333MHz technology, and are still ECC-protected. Three direct attach memory channels enable low latency accesses and fast data transfer, providing significant performance advantages over the xw4600 architecture, which has two memory channels. System memory sizes up to 16GB[1] (using 4GB DIMMs) are supported, a signicant increase over the 8GB system limit of the xw4600. DIMMs should be distributed across all three memory channels for optimal performance.



**Z400 Block Diagram**

**Graphics:** The Z400 continues support for PCIe Gen2 (PCIe2) bus speeds and can support dual PCIe Gen2 graphics cards in PCIe2 x16 slots. The Z400 allocates a total of 150W for graphics cards. A single graphics card of up to 150W can be supported in the primary graphics slot, to enable cutting edge graphics. If the primary graphics card consumes less than 150W, a second graphics card may be supported in the second Z400 PCIe2 x16 slot, subject to the overall 150W system limit for graphics.

**I/O Slots:** The Z400 implements an Intel® X58 I/O controller to provide a total of six high-performance Graphics and I/O slots. In addition to the two full x16 PCIe Gen2 slots, two additional PCIe x8 (4) slots (x8 mechanically, x4 electrically) on the Z400 provide extra I/O bandwidth for high speed I/O cards. Open ended PCIe x8 connectors allow the user to install x16 physical size cards in the x8 (4) slots. Serial Attached SCSI (SAS) drives are supported via a plug-in card.

**Other Features:** SATA RAID modes 0, 1, 5 and 10 are supported. eSATA (3.0 Gbps) is supported using an optional adapter. The Z400 provides 8 external and 4 internal USB 2.0 ports. The 475W power supply is 85% efficient and enables ENERGY STAR v5 qualified configurations. HP WattSaver technology enables support of the European Union EuP power limit of 1W in off mode. HP Quiet Fan Technology enables quiet system operation. The Intel Xeon W3500 Series workstation processors provide several benefits over Core i7 desktop processors, including support for ECC memory for increased system reliability and Direct Cache Access[2] for network performance.



**xw4600 Block Diagram**

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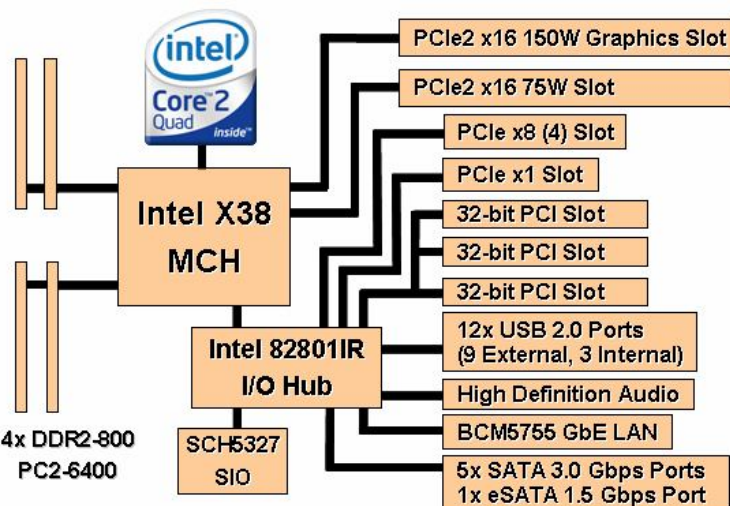
[1] Maximum memory capacities assume 64-bit operating systems. Microsoft® Windows® XP (32-bit) and Vista (32-bit) support 4GB (with Microsoft 32-bit, the amount of usable memory will be dependent upon your system configuration - it may be less than 4GB); 32-bit Linux can support up to 8GB.

[2] Direct Cache Access research paper: http://www.stanford.edu/group/comparch/papers/huggahalli05.pdf