

Best Practice Series

Intel Xeon 5600 Series Memory Configuration

Introduction

In Q2 of 2010, Intel released its newest Xeon 5600 Series “Westmere-EP” processors for servers and workstations. The Xeon 5600 processor line includes two types of processors, each supporting either up to 1333MHz or 1066MHz memory data speeds. This document will explain the recommended memory configurations for these processors utilizing Registered DIMMs (RDIMMs).

Triple-channel Memory

Like the Xeon 5500 series, the new Xeon 5600 series of processors utilizes a triple-channel memory architecture. These processors deliver the highest memory bandwidth and performance when memory is installed in matched sets of three modules. Kingston® provides “K3” kits of three modules to ensure that memory is optimally configured. Always install memory in sets of three modules per processor at a time and configure all processors the same way to achieve the highest memory bandwidth.

Recommended: Configure both processors the same way and use “K3” Kits of 3 exactly matched modules for best performance.

Kingston K3 Kits:

- 3 x 2GB Modules = 6GB K3 Kit
- 3 x 4GB Modules = 12GB K3 Kit
- 3 x 8GB Modules = 24GB K3 Kit
- 3 x 16GB Modules = 48GB K3 Kit

Configuring for Best Performance or Capacity

Regardless of whether your Xeon 5600 processor(s) support 1333MHz or 1066MHz memory speeds, please refer to the following guidelines for memory configuration:

A. Best Performance:

Install up to two Single/Dual Rank memory kits of 3 (K3) per processor (or four kits per server). This will result in the processor running at its top memory speed of either 1333MHz or 1066MHz with up to two K3 kits per processor (note that if you use memory modules rated at 1066MHz with a processor capable of faster 1333MHz memory speed, memory will be set to run at 1066MHz to match the modules’ speed).

B. Maximum Capacity:

Install up to two 48GB Quad Rank kits per processor (or four 48GB Quad Rank kits per server) for a platform maximum of 192GB of memory. This is the ultimate memory capacity for virtualization servers utilizing 16GB Quad Rank modules. Quad Rank modules will run at 800MHz with four K3 kits per two-processor server. An alternative to 18 memory socket servers would be to use six 24GB Dual Rank kits resulting in 144GB of memory running at 800MHz.

C. Mixed Configurations:

You can mix K3 kit capacities on each triple-channel bank for the servers’ processors. For example, you can install a 24GB kit and a 12GB kit for each processor in a two-way server, resulting in 72GB of total server memory. If you use three K3 kits per processor, you can only use Single or Dual Rank kits and memory speed will be set to 800MHz. If you use a Quad Rank kit with a processor, you can only add one more K3 kit; on 18 memory socket servers, the use of Quad Rank kits will limit memory to two K3 kits per processor.

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D. Greener Servers:

On the Xeon 5600 servers, the following practices will reduce power consumption and result in cooler and greener servers:

1. Use Higher-Capacity Modules:

Every memory kit installed in a server increases memory power consumption. By reducing the total number of memory modules in a server, memory power consumption and related heat can be reduced. So, instead of using two 6GB kits per processor, use a single 12GB kit for the same memory capacity with fewer modules.

2. 1.35V Low Voltage DDR3 Memory (DDR3L):

DDR3L low voltage server memory will be available in Q3 2010 to provide significant power savings on the order of 15% or more over standard 1.5V DDR3 server memory. Kingston's DDR3L modules are dual-voltage, providing backward compatibility from 1.35V to 1.5V. When mixed with standard DDR3 server modules, DDR3L modules will default to 1.5V. Install only DDR3L modules to achieve the greatest power savings, as mixing DDR3 and DDR3L memory will result in all memory running at the higher voltage (1.5V). DDR3L Single and Dual Rank modules will run at up to 1333MHz for one K3 kit or 1066MHz for two K3 kits per processor.

Technology	MHz Speed (Data)	Module Classification	Module Peak Bandwidth
DDR3 (1.5V) DDR3L (1.35V)	800 (DDR3-800)	–	6400MB/sec. or 6.4GB/sec.
	1066 (DDR3-1066)	PC3-8500 PC3L-8500	8500MB/sec. or 8.5GB/sec.
	1333 (DDR3-1333)	PC3-10600 PC3L-10600	10600MB/sec. or 10.6GB/sec.

3. Use Quad Rank Modules:

Quad Rank memory modules, also available in K3 kits, will reduce power consumption by about 15%. When Quad Rank modules are used, memory speed starts at 1066MHz for one K3 kit, and is set to 800MHz for a second kit (per processor). The third bank of memory sockets on 18-socket servers cannot be used if one or more Quad Rank kits are used.

When comparing the DDR3L 1.35V Single or Dual Rank memory modules to DDR3 1.5V Quad Rank modules, power savings are similar, however the DDR3L 1.35V modules will support higher memory speeds of 1333MHz for one K3 kit and 1066MHz for a second K3 kit per processor. They make sense for customers seeking power savings and faster memory performance over Quad Rank modules.

	1.5V SR/DR	1.5V QR	1.35V SR/DR
Supported on	Nehalem-EP Westmere-EP	Nehalem-EP Westmere-EP	Westmere-EP
Power Savings	Baseline	~15%	~15%
Kits per Processor	3x K3	2x K3 Kits	2x K3 Kits
Max Memory Speed per Kit	1333MHz 1333MHz 800MHz	1066MHz 800MHz –	1333MHz 1066MHz –

similar power savings but better performance than Quad Rank RDIMMs with 1.35V PC3L modules

