

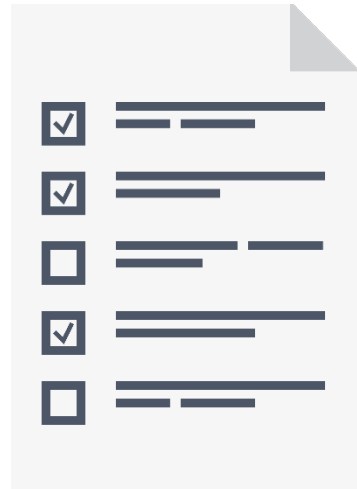
Hardware Issues



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What This Module Covers



Common hardware issues

Properly configuring hardware for performance

Power management

Processor selection for SQL Server

Common Hardware Issues



Using older servers with older, slower processors and lower PCIe slot performance

Using database servers where someone made a bad processor choice

Using a four-socket database server where a two-socket server would be a better choice

Having a database server without sufficient RAM

Using inappropriate BIOS settings for the workload

Key BIOS Settings

- Turbo Boost or Turbo Core (AMD) should always be enabled
 - Absolutely no performance or longevity downside from enabling
- Hyper-threading (HT) should be enabled in most situations
 - HT gives you more capacity for OLTP workloads
 - HT can hurt performance for some DW workloads
 - Make sure to test before disabling
- You may want to disable HT with virtualization
 - If HT is enabled on the host machine, vCPUs will use logical CPU cores

PCIe Throughput Limits

PCIe 1.0 Bus (one-way)

- x4 slot: 750MB/sec
- x8 slot: 1.5GB/sec

PCIe 2.0 Bus (one-way)

- x4 slot: 1.5-1.8GB/sec
- x8 slot: 3.0-3.6GB/sec

PCIe 3.0 Bus (one-way)

- x4 slot: 3.0-3.6GB/sec
- x8 slot: 6.0-7.0GB/sec

Power Management

Has a noticeable,
negative effect on
server performance

Causes reduced
processor clock
speed and reduced
PCIe slot voltage

Hardware PM,
Windows PM, and
hypervisor PM

Newer generation
processors handle
power management
more effectively

BIOS Power Management

BIOS-level power management will override Windows Power Plan

Power management should be set to OS control in BIOS

Energy savings come at a high cost to processor performance

Use CPU-Z to check what speed processor cores are running at

Using CPU-Z to Check Power Management

- CPU-Z is a free tool that you should use to check processor clock speed
 - Download at: <http://bit.ly/QhR6xF>
- Use it to check whether any form of power management is in effect
 - Can also be used to confirm whether Turbo Boost is enabled
 - Processor core speed should periodically run faster than base clock speed

Processor Selection for SQL Server

Consider modern Intel processors, paying close attention to detailed specifications

Focus on maximizing single-threaded processor performance

Physical core counts are very important for licensing

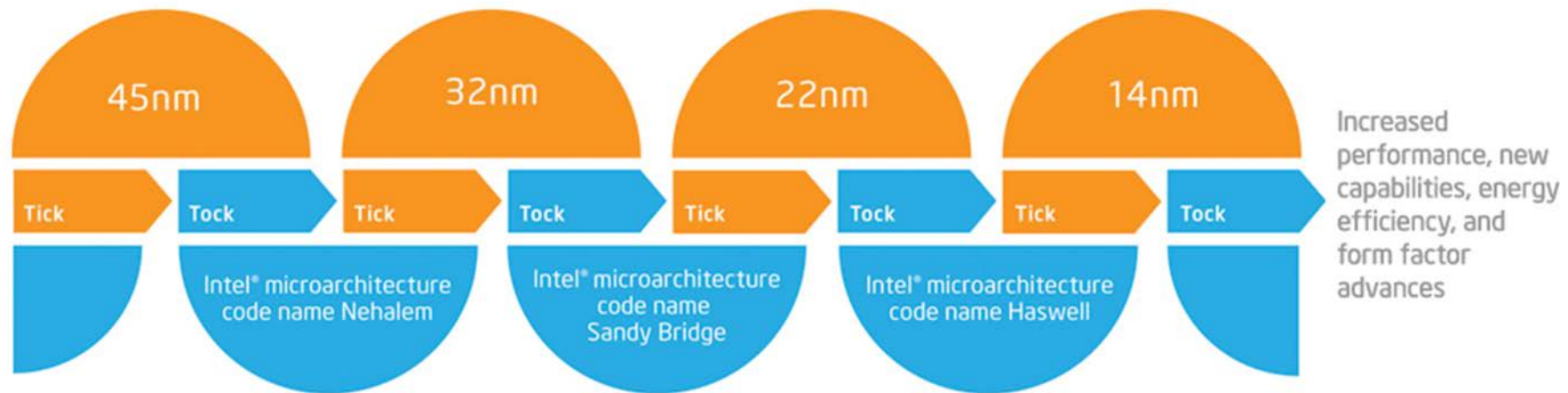
More details at: <http://bit.ly/1KpHCKi>

Intel Tick-Tock Release Strategy

The Tick-Tock model through the years

Manufacturing process technology

Microarchitectures



Intel Processor Family Tree

Year	Process	Model Families	Code Names
2006	65nm	3000, 3200, 5100, 7300	Woodcrest, Clovertown
2007	45nm	3100, 3300, 5400, 7400	Wolfdale, Harpertown
2008	45nm	3400, 3500, 5500, 7500	Nehalem-EP, Nehalem-EX (2010)
2010	32nm	3600, 5600, E7-4800	Westmere-EP, Westmere-EX (2011)
2011	32nm	E3-1200, E5-2600	Sandy Bridge, Sandy Bridge-EP (2012)
2012	22nm	E5-2600 v2, E7-4800 v2	Ivy Bridge-EP, Ivy Bridge-EX (2013)
2014	22nm	E5-2600 v3, E7-4800 v3	Haswell-EP, Haswell-EX (2015)
2016	14nm	E5-2600 v4, E7-4800 v4	Broadwell-EP, Broadwell-EX (Q4 2016)
2017	14nm	Combines E5 and E7 families	“Skylake Server CPU”
2018	14nm		Kaby Lake

Preferred Haswell-EP Processors

Model	Cores/L3 Cache	Base Speed	Turbo Speed	Price
E5-2699 v3	18/45MB	2.3 GHz	3.6 GHz	\$ N/A
E5-2698 v3	16/40MB	2.3 GHz	3.6 GHz	\$ N/A
E5-2697 v3	14/35MB	2.6 GHz	3.6 GHz	\$ 2,702.00
E5-2690 v3	12/30MB	2.6 GHz	3.5 GHz	\$ 2,094.00
E5-2687W v3	10/25MB	3.1 GHz	3.5 GHz	\$ 2,145.00
E5-2667 v3	8/20MB	3.2 GHz	3.6 GHz	\$ 2,057.00
E5-2643 v3	6/20MB	3.4 GHz	3.7 GHz	\$ 1,552.00
E5-2637 v3	4/15MB	3.5 GHz	3.7 GHz	\$ 996.00

Preferred Haswell-EX Processors

Model	Cores/L3 Cache	Base Speed	Turbo Speed	Price
E7-8890 v3	18/45MB	2.5 GHz	3.3 GHz	\$ 7,175.00
E7-8867 v3	16/45MB	2.5 GHz	3.3 GHz	\$ 4,672.00
E7-8891 v3	10/45MB	2.8 GHz	3.5 GHz	\$ 6,841.00
E7-8893 v3	4/45MB	3.2 GHz	3.5 GHz	\$ 6,841.00

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