SQL Server 2012: Evaluating and Sizing Hardware

Module 1: Introduction

Glenn Berry
Glenn@SQLskills.com

Introduction

- **The importance of choosing the correct hardware for SQL Server 2012**
  - Affects SQL Server 2012 license costs, performance, and scalability
- **The importance of processor selection for SQL Server 2012**
  - Processor selection drives most other hardware selection decisions
- **SQL Server 2012 editions and license limits**
  - Different editions and licensing compared to previous versions
- **Choosing the correct type of storage subsystem**
  - Many different choices are available for different workloads
- **The importance of properly sizing your hardware and storage**
  - Balancing act between cost, performance, and scalability
- **Hardware and storage sizing techniques**
  - Using metrics and benchmarks
- **Choosing components for redundancy**
  - This is the first aspect of high availability (HA)

Why Hardware Selection is So Important

- **Inappropriate hardware choices have several dire consequences**
  - Extra SQL Server 2012 core-licensing costs
    - This can far out-weigh the hardware cost
  - Poor single-threaded performance
  - Inadequate CPU capacity for your workload
  - Inadequate memory capacity for your workload
  - Inadequate I/O performance for your workload
- **Take the time to do some careful analysis before buying new hardware**
  - Consider your workload volume and type
    - OLTP, DW/DSS or mixed
  - Compare your current hardware to new hardware
    - Use standardized benchmarks like TPC-E, TPC-H, and Geekbench
    - How hard is your current hardware working?

The Importance of Processor Selection

- **SQL Server 2012 Enterprise Edition is licensed by physical core**
  - All physical processor cores cost the same to license
    - 25% discount for newer AMD processors with six or more cores
    - Intel hyper-threading is free for licensing purposes
  - Huge difference in performance with different processor cores
    - Single-threaded performance is extremely important for database servers
  - You want to get the most performance possible from each physical core
    - Otherwise you are wasting money and giving up performance
- **Processor selection drives most other hardware selection decisions**
  - Controls how many processor sockets you can have in the server
  - Limits how much physical memory you can have in the server
  - Influences how much I/O capacity you will have in the server
  - It is unlikely you will ever upgrade the processors in an existing server
    - This means you should choose your processors wisely!

Main SQL Server 2012 Editions

- **SQL Server 2012 Enterprise Edition**
  - Top of the line edition, only uses core-based licensing
  - Many valuable features are only in Enterprise Edition
  - OS limit for memory and logical processors for any use
    - Windows Server 2012: 4TB RAM, 640 logical processors
    - Windows Server 2008 R2: 2TB RAM, 256 logical processors
- **SQL Server 2012 Business Intelligence Edition**
  - New edition for 2012, uses Server plus CAL licensing
  - OS limit for memory and logical processors for SSAS and SSRS
  - 64GB limit for memory for Database Engine
- **SQL Server 2012 Standard Edition**
  - Most affordable edition, but it lacks many valuable features
  - You can choose Server plus CAL or core-based licensing
  - 64GB limit for memory for Database Engine
  - 64GB limit for memory for SSAS, and for SSRS
  - Four-socket or 16 logical core limit

Additional SQL Server 2012 Editions

- **SQL Server 2012 Developer Edition**
  - All features of Enterprise Edition, licensed for development and test usage
  - Best choice for developer and DBA workstations
  - Very inexpensive (less than $50.00)
  - Free for high school and college students from Microsoft Dreamspark
    - http://bit.ly/KkN5F
- **SQL Server 2012 Express Edition**
  - Free edition
  - Lesser of 1 socket or four-core CPU limit, 1GB RAM limit
  - 10GB database size limit
- **SQL Server 2012 Web Edition**
  - Targeted at web hosting
  - 64GB limit for memory for Database Engine
  - 64GB limit for memory for SSAS

Licensing Costs for SQL Server 2012

- **SQL Server 2012 Enterprise Edition**
  - Core-based
    - $6874.00 per core (four-core minimum per socket)
- **SQL Server 2012 Business Intelligence Edition**
  - Server license plus CALs
    - $8592.00 per server, plus CALs
- **SQL Server 2012 Standard Edition (you can pick method)**
  - Core-based
    - $1793.00 per core (four-core minimum per socket)
  - Server license plus CALs
    - $898.00 per server, plus CALs
- **Client Access License (CAL)**
  - $209.00 per CAL

Choosing an Appropriate Storage Type

- **Five main types of storage for SQL Server 2012**
  - Internal drives in the database server
  - PCI-E flash storage in the database server
  - Direct-attached storage (DAS)
  - Storage area network (SAN)
  - Server message block (SMB) file shares
    - Only with Windows Server 2012
- **Traditional magnetic drives vs. flash-based storage**
  - Magnetic drives are much less expensive (and still most common)
  - Magnetic drives have poor random I/O performance
  - Flash-based storage has extremely high random I/O performance
  - Flash-based storage also has higher sequential performance
  - A small number of SSDs can often replace a large number of magnetic drives (for performance)
    - With PCI-E flash-based storage, use RAID 1 across two physical cards

The Importance of Proper Selection and Sizing

- **Your choices have a huge effect on overall cost and performance**
  - SQL Server 2012 license costs and hardware costs
- **Total processor core count drives SQL Server 2012 license costs**
  - Bad choices have a dramatic effect on overall cost of the system
- **Poor processor selection directly affects performance and scalability**
  - The minor details of what processor(s) you select matter a great deal
  - Newer processors are much better than older models
- **Two-socket servers have the capacity to handle many workloads**
  - They also support much faster processors
  - They can have PCI-E 3.0 support, and support up to 384GB of RAM
- **Don't neglect or undersize the I/O subsystem**
  - This is a very common mistake
  - You want to have a balanced system, with enough I/O performance to support your workload

Hardware and Storage Sizing Techniques

- **Determine whether you will have Enterprise Edition or not**
  - Lower-level SKUs have hardware licensing limits
    - Memory limits, processor socket and core count limits
- **Determine the magnitude and type of your workload**
  - OLTP vs. DW/DSS, number of databases, volatility of data
  - How hard is your current hardware and storage subsystem working?
  - How large are your databases, what is your log generation rate?
- **Consider the necessary I/O performance characteristics**
  - Required IOPs and required sequential throughput
  - Required RAID level for performance and redundancy
    - Also consider RAID level effect on required storage space
  - Consider architectural influence on storage choices
    - Shared storage, DAS, internal storage, etc.
  - Required amount of storage space (be conservative)
    - Consider the effects of short-stroking

Selecting Components for Redundancy

- **Database servers are usually mission-critical assets**
  - You should invest in redundant components where possible
  - This is in addition to any high-availability technology you implement
  - It is not a substitute for a complete HA/DR strategy
- **Having redundant components reduces the chances of a failure**
  - Protects against a single point of hardware failure in one server
  - Reduces the chance that your HA technology will be needed
- **Common redundant components and techniques**
  - Dual power supplies, plugged into separate circuits
  - Multiple network ports, plugged into multiple switches
  - Using RAID 1 for the operating system and SQL Server 2012 binaries
  - Logical drives protected by an appropriate RAID level
  - Hot-swappable components such as drives, power supplies and cooling fans

Summary

- **Choosing the correct hardware and storage is very important!**
  - Provides better performance, scalability and hardware redundancy
  - Possible to drastically reduce your SQL Server 2012 licensing costs
- **SQL Server 2012 uses a new licensing model**
  - Core-based licensing requires you to rethink your hardware choices
    - High core-count processors can be very expensive for licensing
- **Use metrics and benchmarks to size your hardware and storage**
  - Don't just guess about sizing
- **You also need to consider hardware redundancy for a database server**
  - This is the basic foundation of high availability (HA)

Course Structure

- Module 1: Introduction
- Module 2: Choosing the correct hardware for your workload
- Module 3: Choosing the correct processor for SQL Server 2012
- Module 4: SQL Server 2012 editions and license limits
- Module 5: Choosing an appropriate storage type for your workload
- Module 6: Hardware and storage sizing techniques
- Module 7: Selecting components for redundancy