Optimizing Server Designs for Speed
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We will discuss the latest in server hardware, virtualization, and disk storage that boosts Skyward’s performance. We will also discuss the benefits of share memory WebSpeed brokers and Database AppServers and how they can benefit your school district’s performance.
Agenda

- Skyward Supported Servers
- Server Architecture
- Improved Storage / Disk Technology
Windows 2016

- Currently testing
- Expect certification in third quarter 2017
- Testing Release Candidate 5
  - Updated installers
Skyward Supported Servers

• **Database Servers**
  • Windows 2012 R2
  • AIX version 5.3.x, or 6.1.x 64 Bit - Retired
  • SuSe Linux Enterprise Server 11.x

• **Web Servers**
  • Windows 2012 R2 64 Bit Server with IIS 8/8.5
General Server Recommendations

• Skyward supports Virtual Servers
  • (VMware & Hyper-V)
• Skyward Servers must be 64 bit Operating Systems
• Skyward Servers cannot be domain controllers
• Gigabit network connection required for all Skyward Servers
  • One NIC only; no teaming needed.
• Fiber Channel or 10GB iSCSI SAN storage is recommended for the best database performance
• Raid 1+0(10) is best, Raid 1 and Raid 5 are supported
Server Virtualization

• Server virtualization is the masking of physical server resources, including the number and identity of individual physical servers, processors, and operating systems, from server users.

• Advantages
  • Increases hardware utilization by 50-70%
  • Decreases hardware and software capital costs by 40%
  • Decreases operating costs by 50-70%
  • Flexibility of increasing/decreasing resources when needed

• Virtualization products
  • VMware vSphere products
  • Microsoft – Hyper-V
  • Citrix - XEN
  • Parallels
Skyward Recommendations

- [https://support.skyward.com/Page.ashx/ITServices/TechnicalInformation/SystemNet Requirements](https://support.skyward.com/Page.ashx/ITServices/TechnicalInformation/SystemNet Requirements)
Distributed Skyward Server Design
Consolidated Skyward Server Design

Sample Skyward System

<table>
<thead>
<tr>
<th>Server Name</th>
<th>Purpose</th>
<th>Protocol</th>
<th>Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKYDB</td>
<td>Database Ports</td>
<td>TCP</td>
<td>13500, 13501</td>
</tr>
<tr>
<td>SKYDB</td>
<td>Dynamic Ports</td>
<td>TCP</td>
<td>1000-1999</td>
</tr>
<tr>
<td>SKYDB</td>
<td>Client Access (https)</td>
<td>TCP</td>
<td>443</td>
</tr>
<tr>
<td>SKYDB</td>
<td>Broker Port</td>
<td>TCP</td>
<td>3067</td>
</tr>
<tr>
<td>SKYDB</td>
<td>Dynamic Ports</td>
<td>TCP</td>
<td>3059, 3069, 3072-3602</td>
</tr>
<tr>
<td>All Servers</td>
<td>Monolith NameServer Ports</td>
<td>TCP</td>
<td>2701, 5162</td>
</tr>
<tr>
<td>SKYDB</td>
<td>Monolith Update</td>
<td>TCP</td>
<td>3600</td>
</tr>
<tr>
<td>SKYDB</td>
<td>Report Queue</td>
<td>TCP</td>
<td>3000</td>
</tr>
</tbody>
</table>
Why the changes in server design?

• More Powerful Hardware Choices
• Improvements in OpenEdge 10.2B SP8
• Improved OS technology – ex. Windows 2012 R2
• 64 bit Operating System lifts database memory limits
• Read data in Nanoseconds vs. Milliseconds
• Improved Web Application Platform
• Improved Type 2 database structure
• Improvement in Disk Technology (SSD or NVMe SSD)
Improvements made in 64 bit

• Improvements in Server Memory (RAM)
  • Windows Server 2012 DataCenter
    • Supports up to 4TB of RAM
    • DataCenter Edition includes unlimited virtual instances. (hyper-v)
  • Windows Server 2012 Standard
    • Supports up to 4TB of RAM (HUGE Increase from 32GB)
    • Standard Includes 2 virtual instances (hyper-v)
    • OpenEdge 10.2B Maximum memory 8TB per database!
Improvements made in 64 bit

• Improvements in memory means:
  • Purchase Servers with more RAM
  • Allocate more RAM to virtual database servers
  • Allocate more memory to Database Buffers
  • Run WebSpeed Brokers in Shared Memory
What are the results?

The Web Experience Difference
No-Name District 13,800 students

Average WebSpeed Transaction Comparison

Distributed Design .92 / .89 Seconds
Consolidated Design .21 seconds

<table>
<thead>
<tr>
<th>Server Name</th>
<th>#</th>
<th>Max (sec)</th>
<th>Avg (sec)</th>
<th>Median (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skyweb1</td>
<td>26,782</td>
<td>58.36</td>
<td>0.92</td>
<td>0.87</td>
</tr>
<tr>
<td>Skyweb2</td>
<td>27,395</td>
<td>46.48</td>
<td>0.89</td>
<td>0.82</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Server Name</th>
<th>#</th>
<th>Max (sec)</th>
<th>Avg (sec)</th>
<th>Median (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKYNEW</td>
<td>49,185</td>
<td>37.30</td>
<td>0.21</td>
<td>0.11</td>
</tr>
</tbody>
</table>
Improvements using Type 2 Storage

- Efficient block formatting
  - Read one Cluster at a time
  - Fewer bi/ai notes written

- Block clustering
  - Alleviates object fragmentation
  - Improves I/O efficiency

- Concurrent Space Allocation
  - Area space Allocation
  - Object space allocation

Up to 40% allocation improvement
Disk Storage

Remember the days when floppy disks were used to share files? Since then the Megabyte has quickly given way to the Gigabyte; or more commonly the disk storage may be measured in Terabytes.

<table>
<thead>
<tr>
<th>Storage Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Megabyte</td>
<td>*1,000,000 bytes</td>
</tr>
<tr>
<td>1 Gigabyte</td>
<td>*1,000,000,000 bytes</td>
</tr>
<tr>
<td>1 Terabyte</td>
<td>*1,000,000,000 bytes</td>
</tr>
<tr>
<td>1 Petabyte</td>
<td>*1,000,000,000,000 bytes</td>
</tr>
</tbody>
</table>

*estimated value
Common Disk Drive Technology

**SATA** stands for Serial Advanced Technology Attachment is marketed as a general-purpose successor to parallel ATA and has become common in the consumer market. It is typically a lower cost disk and may be used in a SAN successfully if I/O is spread across many disks (spindles).

**SAS** stands for Serial Attached Small Computer Systems Interface AKA: Serial Attached SCSI (pronounced scuzzy). SAS is more expensive and targets critical server applications due to its higher throughput.

**SSD** stands for Solid State Disks and is a data storage device that uses integrated circuit assemblies as memory to store data persistently. SSD technology uses electronic interfaces compatible with traditional block input/output (I/O) hard disk drives. SSDs do not employ any moving mechanical components.

**NVMe SSD** is a new specification optimized for NAND flash and next-generation solid-state storage technologies. “Drive” requires the use of a PCIe slot.
Common SAN Technology

**Fiber Channel** is a high speed serial bus intended for high end storage devices such as Storage Area Networks.

**iSCSI** uses the SCSI protocol over a TCP/IP network. It enables any machine on an IP network to contact a remote dedicated target and perform block I/O on it just as it would do with a local hard disk.
What Storage Technology is the best?

What can you afford?

• SSD/NVMe is faster/est, but the most expensive
  • Caching drive?

• SAS is fast, but costs more than SATA

• SATA works ok if spread across many drives / spindles
What Storage Technology is the best?

How is the technology implemented?

• Fiber Channel vs iSCSI
What is better? SAN or Local Disks??

• SANs typically offer more flexibility (Replication, Virtualization, Redundancy)

• SAN storage can be just as fast or faster than Local Storage if implemented properly.

• Local Disk Storage is easier to configure
Thank you for attending.