SQL Server 2008 at the Speed of Light

Presented by: Sumeet Bansal, Fusion-io Principal Solutions Architect

Silicon Valley SQL Server User Group
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A real quick word about me, Sumeet Bansal

• Then
  – Vice President of IT at Wine.com
  – Served at Wine.com for a decade
  – Introduced Fusion-io at Wine.com last year

• Now
  – Principal Solutions Architect at Fusion-io
  – Evangelize through presentations, demos, webinars etc
  – Help Clients discover ways of maximizing efficiency and performance and at the same time cutting costs
  – Still a huge fan of Wine.com

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Agenda

1. The Injustice of it all
2. I can dream, can’t I?
3. The dream takes Shape
4. But Solid State Storage is not Enterprise Worthy...
5. What should I ask, when considering an SSD product?
6. Wine.com-It doesn’t get any better than this
7. Beyond SQL Server
8. Join the revolution with me – Open invitation
9. Q & A
10. The raffle – 320GB ioDrive (MSRP $7,495)!!!
The Injustice of it all

• Traditional SAN and rotating media based storage
  o Can a DBA ask for storage?
  o Can a DBA ask for dedicated storage?
  o Can a DBA ask for storage with a certain performance-profile?

• A performance-profile can be expressed in terms of
  o IOPS (Input/Output operations per second)
    □ Random
    □ Sequential
  o Latency
  o Throughput
The Injustice of it all

• Traditional SAN and rotating media based storage
  o What happens if your Business grows and transaction volume grows?
  o What happens when your data grows?

• Expected Solutions
  o Add more Spindles
  o Add more trays
  o Add more memory
  o Add more servers
  o Add more people
  o Repeat every year (yikes!!!)
The Injustice of it all

• What a waste
  o So much of raw capacity sacrificed in the name of performance
  o Unnecessary Power consumption
  o Unnecessary Power consumption to counter the unnecessary heat generation
  o When business grows, waste more
  o Keep going back to the architecture drawing board
I can dream, can’t I?

RAM

*Want*
- Really Fast

*Don’t Want*
- Volatile
- Expensive
- Limited Cap.

Disk

*Want*
- Non Volatile
- Cheap
- Large Cap.

*Don’t Want*
- Really Slow

Dream

*Want*
- Non Volatile
- Really Fast
- Large Cap.
- Reasonable Price
I can dream, can’t I?

3 orders of magnitude

SAN, NAS, RAIDed DAS

CPU

DRAM

L1 Cache

L2 Cache

L3 Cache

ioMemory

PB

TB

GB

MB

KB

nS

0.000000001s

uS

0.000001s

mS

0.001s

10/21/2009
The Dream takes Shape

David Flynn + Rick White = ioDrive

Take note of these names. You will hear them frequently in the news very soon.
The Dream takes Shape

- The dream becomes a reality. Its name is ioDrive
- I call it the Holy-Grail of database performance
- How to use the ioDrive
  - Find a server with PCIe slots
  - Fill the slots with these cards
  - Install the software (click-next-click-next...)
    - Firmware
    - Driver
    - Cool GUI based Management Utility
  - Set up MS SQL Server 2008
- Drop your jaws 2 inches (or more) to appreciate your database performance
The Dream takes Shape

- A new paradigm of enterprise database storage is realized
- The Share-Nothing architecture
- I call it the “Starship Enterprise” model
- The storage is realized in the server
- Cater to High Availability at the server level

Cool Tips

- Multiple ioDrives can be setup in a raid 0 to provide linear scaling of performance
- High Availability can be provided at a server level using Mirroring or third-party software
But Solid Stage Storage is not Enterprise Worthy...

- Raw NAND flash has issues
  - The ability to hold voltage and differentiate between different levels starts to fade away
  - Sometimes, the voltage just flips
  - Writing to it is very slow

- ioDrives are more than just NAND flash
  - It keeps an extra portion of NAND just for a rainy day
  - It knows when certain NAND cells have outlived their usefulness
  - It distributes writes evenly to all NAND cells to cause an even wear out
  - ioDrives have a process that regularly sets flipped cells straight
  - There is other cool Magic, that I can’t tell you 😊
What should I ask when considering an SSD product?

- Is the interface SAS, SATA or PCIe?
- How is ECC employed, what is the strength of ECC?
- What will happen to my customer data, if there is a sudden power loss?
- How much over-provisioning do you provide (translation: How reliable is your product in your own opinion)?
- What will happen if the entire NAND chip fails on your card?
- Is your PCIe based solution truly PCIe based?
- Does it have its own tiny processor or is it able to utilize the host processor?
- Does it have its own tiny bank of limited DRAM or can it utilize the host memory?
- Is it OEM verified for major vendors like IBM, HP, and Dell?
- Does it fit in several available servers?
- How many components will form my architecture?
Wine.com - It doesn’t get any better than this

Challenge
- Meet demand of 2008 buying season
- Support a significant number of new customers
- Minimum 30% improvement
- Eliminate performance bottlenecks
- Limited budget available

Problem
- Operating at capacity
- Must pay 3rd party to manage NetApp storage
- Shared storage obsolete
- Crucial reporting queries very slow
- SAN upgrade alone is expensive with no long-term scalability
Wine.com—It doesn’t get any better than this

Solution

• Share-Nothing Architecture for maximum performance
• Server attached Storage and Elimination of SAN equipment
• Highly Available MS SQL-2005 Mirroring Architecture
• Dramatically Improved Performance for both Storefront and ERP and ready for 3x customer growth
• Reduced operating expenses and power consumption
• Added double database redundancy with server failover protection
## Wine.com - It doesn’t get any better than this

<table>
<thead>
<tr>
<th>Metric</th>
<th>Pre Fusion-io</th>
<th>Post Fusion-io</th>
<th>Improvement</th>
<th>“Boost”</th>
<th>Customer Facing Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average duration of a SQL transaction</td>
<td>345 milliseconds</td>
<td>88 milliseconds</td>
<td>300%</td>
<td>4 Times</td>
<td>Website pages faster, each page has multiple DB requests. Reducing Time fetching data improves customer experience, leads to better conversion.</td>
</tr>
<tr>
<td>Time taken to take a full backup of the largest database</td>
<td>2 hours</td>
<td>6 minutes</td>
<td>1900%</td>
<td>20 Times</td>
<td>During backups, customer experience is no longer hindered.</td>
</tr>
<tr>
<td>Time taken to restore a full backup of the largest database</td>
<td>3 hours</td>
<td>15 minutes</td>
<td>1100%</td>
<td>12 Times</td>
<td>Faster time to recovery, less loss exposure in major outage.</td>
</tr>
<tr>
<td>Average number of read/write operations waiting in a queue to complete</td>
<td>0.4</td>
<td>0.008</td>
<td>4900%</td>
<td>50 Times</td>
<td>Less time for customer to wait on another customers long running operation.</td>
</tr>
<tr>
<td>Number of transactions in 1 hour window that took more than 500 milliseconds</td>
<td>3011</td>
<td>163</td>
<td>1700%</td>
<td>18 Times</td>
<td>Website pages faster, each page has multiple DB requests. Reducing Time fetching data improves customer experience, leads to better conversion. More cart transactions per second.</td>
</tr>
</tbody>
</table>

Website pages faster, each page has multiple DB requests. Reducing Time fetching data improves customer experience, leads to better conversion.

Website pages faster, each page has multiple DB requests. Reducing Time fetching data improves customer experience, leads to better conversion. More cart transactions per second.
Wine.com—It doesn’t get any better than this

• What did Wine.com get from Fusion-io?
  o Faster Customer Experience (PERFORMANCE)
  o Value Satisfaction (SCALABILITY)
  o Confidence in infrastructure (SIMPLICITY)
  o MORE FOR LESS

• Was it about performance gains really?
  o Yes and No

• Did it drive Business Value?
  o Absolutely

• Was it worth it?
  o No question about it
**Beyond SQL Server**

- I am saying SQL Server, but what I mean is:
  - MS Exchange on Fusion-io
  - MS Sharepoint on Fusion-io
  - SAP on Microsoft on Fusion-io
  - Dynamics on Fusion-io

- I am really also saying:
  - Oracle
  - Postgress
  - MySQL
  - Video editing
  - Cache based solutions
Beyond SQL Server

- Imagine a life, where maintenance operations like DBCC checkdb, rebuild of indexes, backups etc happen really fast
- Imagine a life, where maintenance operations co-exist peacefully with the primary systems without bringing them to their knees and ruining the experience for end-users
- Dare to imagine something completely unexpected. Is it be possible to have a MS SQL Server database without indexes (or minimal amount of indexes)? – Phil Hummel
- Harness the power of SQL Server 2008 compression and increase the value of your Fusion-io investment
Beyond SQL Server

• Fill the gaps now
  o Append to the SQL Server Mirroring capability by adding the Virtual IP and automatic failover concept
  o Implement memcache for MS SQL Server
  o What would you do to harness the power of Fusion-io media?
Join the revolution – Open Invitation

- A revolution is happening. Become a part of it
- Blog, Write, Comment, Share
- Design new solutions and ideas
- Accelerate adoption
- Experiment and test

Email me at sumeet@fusionio.com and I’ll work with you to design the database architectures of tomorrow.

- Sumeet Bansal
THANK YOU
To learn more or inquire about speaking opportunities, please contact:

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