Technical white paper

Accelerating T24 Environment Management Using Flash Memory

Improved Temenos performance through advanced storage technology

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Hewlett Packard Enterprise

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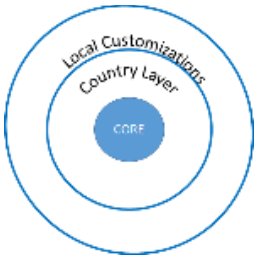
Executive summary

BlueShore Financial was able to show an 8X improvement in the performance of a critical business process, data throughput, through the use of flash memory technology.

In order to have a well maintained Temenos banking environment, there are two significant processes that are necessary to complete daily. One is the required pre and post Close of Business (COB) back-ups of the banking system, while the other is conducting the Close of Business operational integrity.

Close of Business (COB) is a required process to ensure the banking system operates properly. At BlueShore Financial this is on average a 3.5 hour process which increases in duration as the size of the database increases. Generally, financial institutions try to keep the COB operation to this duration or less, in order to have time for maintenance updates, variations in monthly volumes, etc. Operationally, BlueShore Financial performs two COB backups of the Temenos database, before and after COB, to ensure a rapid restore of the database can occur should any issues be uncovered. While keeping online backup copies is a viable option, this became less practical, due to storage limitations. BlueShore Financial's database is approximately 1TB in production. Two copies per day, for 7 days, in addition to the Development and Quality Assurance (Dev/QA) master copy, and the production copy(s) occupies roughly 20TB.



BlueShore Financial has chosen, like many Temenos customers, to utilize the T24 ability to create local customizations. These local customizations are stored primarily within the Temenos database. Software patches issued by Temenos for the Core and/or Country layers of the application are supplied and applied on a regular basis. The combination of patches(core patches, Country patches, and local customization) all affect the Temenos T24 database, and necessitate that the Development copy of the database be refreshed in synchronization with patching of the production database. At BlueShore Financial, the process of cleaning up and compressing the database prior to passing it to the development team originally took 48 hours. Since the preparation of the database could not be accomplished in one day, a local customization process was the optimal choice.

Two different approaches to Solid State Storage were tested in a T24 environment to assess the impact on performance of re-mastering the Development/Quality Assurance database and application data.

The optimized process takes about 6 hours, down from 48 hours. The result is a reduction of 87% or a factor of 8X improvement; but, more importantly, this means that database copy management can be done on a daily basis, allowing it to be used for backup as well. The reduced size of the database makes more effective use of storage for backup, as well as reducing the time to produce the backup.

NOTE: Testing of the COB using the technology below was also done, and the 3.5 hour COB process was completed in 1 hour. This includes 15-20 minutes of "wait" time that is currently programmed into T24 to ensure that any parallel processes have time to complete. (Potential 79% reduction in time or 4 X improvement). BlueShore Financial has requested information from Temenos to alter the "wait" times in order to release the full potential of this optimization.

Target audience: The target audience for this performance brief is the Information Technology (IT) community evaluating solutions for their T24/SQL environment. Business users and IT professionals who are interested in implementing or optimizing Temenos T24/SQL may find this report useful for a sample Temenos T24 configuration with HP servers and HP IO Accelerator.

This white paper describes performance testing performed in 2012/2013.

Introduction

Scenario

Temenos T24 is a core banking system that is highly customizable by the end-user customer. One characteristic of Temenos T24 is the ability to store a large quantity of business logic in the database. This provides enormous flexibility in terms of implementation architecture and platform.

This also means that, if a number of local customizations are done, the database can become larger than the initial release from Temenos. More importantly, it is necessary to refresh the Development/Quality Assurance environment copies of the database whenever patching is done to production. It becomes more important with the prevalence of virtualization of development environments for T24, as many copies of the Development/Quality Assurance database will exist. If these are not synchronized with patches, and a non-current copy of the Development/Quality Assurance database is used, development work may need to be recreated.

BlueShore Financial runs Temenos T24 R9 on a Microsoft platform based on Windows Server 2008 R2, and Microsoft SQL Server 2008 R2. The hardware platform is based on HP Blade servers, and HP EVA 8100 storage.

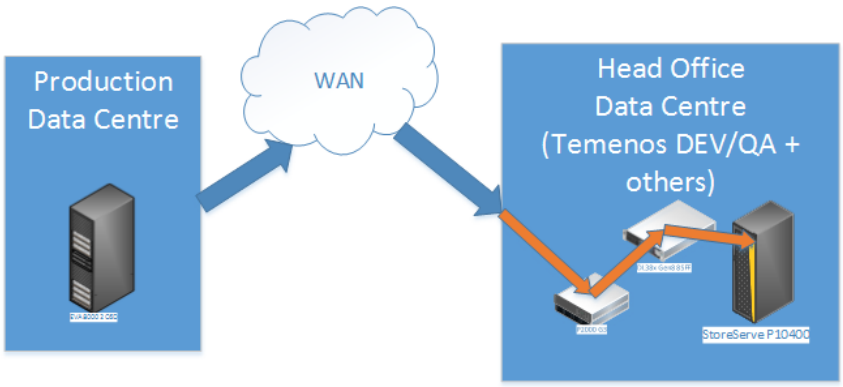
Building a new Development/Quality Assurance master database originally took 60 hours to complete. It involved moving a copy of the database from the Production Data Centre and truncating, shrinking, and re-indexing the database in preparation for replicating it through the virtualized development environments. Forty-eight of those 60 hours were used to prepare the database. The process also created compressed copies of the database to move to backup media (LTO Tape).

BlueShore Financial now completes the task in approximately 13 hours, 5 of which entail the initial data move from the Production Data Centre.

T24 Environment creation job characteristics

The Temenos T24 workload used for this test had the following characteristics:

- 90% I/O intensive jobs
- Truncation of T24 Database
- Shrink the T24 database – remove “dead-wood”
- Re-Index the T24 Database
- Job runtimes were consistent over many iterations

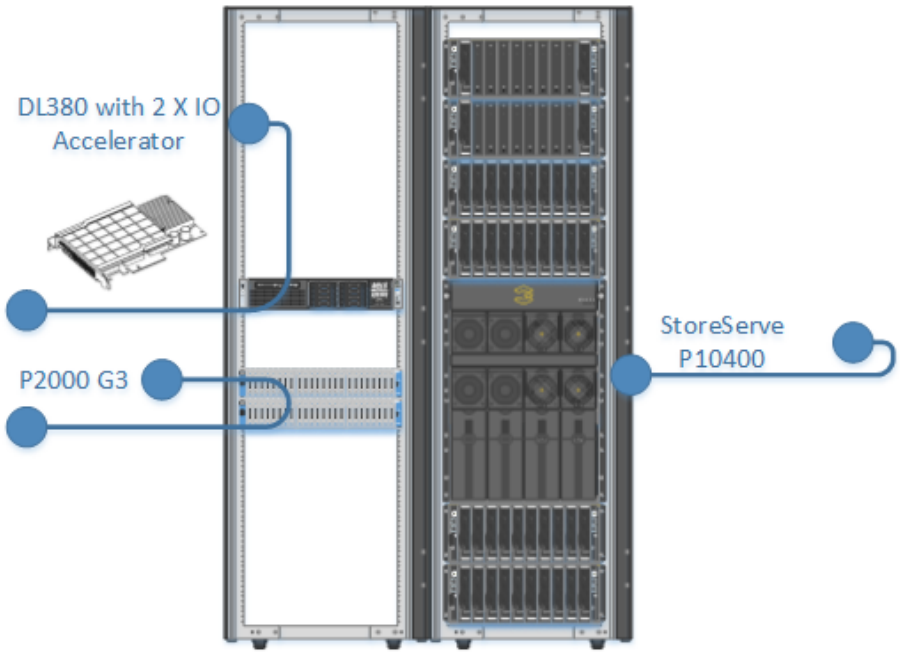


Test topology

The application environment under test included several different software components:

- Temenos T24 R9
- Microsoft Windows Server 2008 R2
- Microsoft SQL Server 2008 R2

Figure 1. Architectural diagram of test bed



The test environment was composed of Microsoft SQL server 2008 R2 on a DL380 Gen8 Server connected to HP MSA P2000 G3 Storage via 8G Fibre channel. No shared or clustered file system was utilized. The server above also contained 2 HP IO Accelerators (Made by Fusion I/O), each with 1.25TB of capacity.

Detailed storage configuration

The HP MSA P2000 G3 Storage utilized for this benchmark consisted of:

- 2 controller nodes
- 1 HP MSA P2000 Storage (12 x 600GB SAS LFF disks)
- 1 HP D2600 Storage (12x 600GB SAS LFF disks)

The HP IO Accelerator utilized for this benchmark consisted of:

- 2 x 1.25TB IO-Duo PCIe modules

Specific configuration details of the HP IO Accelerator:

- 2 x 1.25TB HP IO Duo Accelerator

– Total file system size of 2TB
– File system type: NTFS -64K allocation
– Number of RAID devices: 4
– Layout: RAID 0/Striped
– Formatted block size 4K

Note: the formatted block size has a significant impact on the amount of server memory needed for buffer space. Please refer to the HP Quickspec; HP PCIe IO Accelerators for ProLiant Servers, for RAM Requirements.

Tuning actions performed

To tune the test environment for optimal performance with Temenos T24 SQL, the following actions were performed:

Initial configuration was an HP BL490c blade with 64G memory, 2X 200G SSD disks for OS and SQL server, 2 X 10G NIC's, 2 8G Fibre Channel HBA's linked to an EVA4400 and the P2000 described above. Using this, the process took 48 hours to perform maintenance, not including the initial copy time, and to create the final copy on the target storage. Creating the encrypted backup on tape took a further two hours.

The first iteration was to move the processing to an HP DL380 GEN8 server with 128G memory and enough SSD disk to allow the database processing on the SSD. This server was linked to the network via 8 X 1G Ethernet links, rather than the 10G links in the original server.

Interestingly, just switching the network links from 2 X 10G to 8 X 1G significantly reduced the copy time to the current five hours.

The SSD disks for the data, however, were hampered by the relatively slow write speed of these drives. As a result, no significant improvement in processing time (48 hours) was realized. Monitoring of the DL380 server revealed that during points of the process, the SQL server would occupy most of the physical memory of the server and swapping would occur. The decision was made to move the swap file to SSD, which resulted in further improvements.

The next and most dramatic change was the addition of a pair of HP IO Accelerators (made by Fusion IO). These devices appear to the operating system like disks, 2 per module, but unlike disk or even SSD, they link directly to the IO bus, and are not throttled by a RAID controller as a conventional disk, or SSD, is. For comparison, disks respond in milliseconds while the IO accelerators respond in micro seconds. An interesting observation about Windows and disk was uncovered at this time - Windows limits the amount of I/O that a single disk spindle can provide. In order to achieve the maximum from the IO modules, a stripe set was created across the 4 "disks" that the OS read. Using this setup, the time to complete the SQL maintenance dropped from 48 hours to 5 hours.

Test methodology

Test data was created using snapshots of the production database, one of which was then moved to the Head Office Data Centre via a 30MB/sec WAN link using multi-threaded Robo-copy. The copy was placed on the P2000 G3 storage array for further processing. SQL Server 2008 R2 maintenance tasks were then used to truncate unused tables, shrink the entire database, and recreate the indices. This final step took 48 hours at the start of this optimization. The recreation of the database involved reading the data from the P200G3, then writing to the HP Storeserve P10400. This process was repeated with different configurations of the server that was used to process the data. No changes were made to the storage devices involved.

Test results

Table 1. I/O Throughput for HP IO Accelerator PCIe

Iteration	Transfer Time (hh:mm:ss)	DB Processing Time (hh:mm:ss)	DB Processing I/O Throughput (B/s)	Backup time (hh:mm:ss)
0 (baseline)	18:00:00	48:00:00	0.24	6:00:00
1 (upgrade WAN)	8:00:00	48:00:00	0. 24	6:00:00
3 (2X 10G changed to 8 X 1G LAN)	5:00:00	48:00:00	0. 24	6:00:00
4 (SSD in server)	5:00:00	40:00:00	0.30	6:00:00
5 (HP IO accelerator)	5:00:00	9:00:00	1.92	6:00:00

Test analysis summary

A significant (8X) improvement in data throughput was provided by configuring an HP DL380 Server with multiple 1G NIC's and 2 HP I/O Accelerators to act as intermediary storage for regular database maintenance.

This provides significant value to BlueShore Financial by ensuring that backups are done in a timely manner and enabling the Development and Quality Assurance staff to be more productive.

Recommendation

Examination of regular operational processes in a business flow may identify areas that consume a large amount of wall clock time, but which cannot be dropped or bypassed. Processes that involve manipulation of data in an entire file or database in a transient way will benefit greatly from this flash-based technology. It is not meant to replace conventional disks at this point. However, if you have a need to process data in 2TB chunks, for maintenance, or ETL processing, the HP I/O accelerator products can deliver.

HP ProLiant DL380p GEN8 benefits and features

HP ProLiant DL380p GEN8 servers provide SAS customers with maximum computing power in a small form factor. Each HP ProLiant DL380p GEN8 server supports up to two 6-Core Intel Xeon processors (12 cores), 384 GB memory and 2 mezzanine I/O expansion slots to support the network and I/O needs.

HP ProLiant GEN8 server blades come with HP Integrated Lights-Out 4 (iLO 4) remote management for unprecedented, high speed management which includes a secure graphical remote console that allows access to the system KVM and control of Virtual Power and media from a single console.

With I/O throughput of significant importance to Temenos customers, the HP ProLiant DL380p GEN8 server help eliminate I/O system performance bottlenecks with support for:

- Two fibre channel (FC) host bus adapters (HBAs) providing redundant FC HBA support
  - These HBAs feature optimal performance utilizing PCI Express technology, 8/4/2 Gb/s auto-negotiating speeds and dual-ports for redundant path connections
- Two HP IO Accelerator PCIe Modules
  - The IO Accelerator is an advanced storage device that uses solid state storage technology directly on the PCI bus, assuring high read and write data rates and accelerated application performance. The

associated application performance improvements will have a positive impact on business results and the ability to make decisions quickly, resulting in significant cost and time savings.
– Designed around ioMemory, a revolutionary storage architecture, HP IO Accelerator is an advanced NAND flash storage device. With performance comparable to DRAM and storage capacity on par with hard disks, IO Accelerator increases performance so that every server can contain internal storage that exceeds the I/O performance of an enterprise SAN
– HP IO Accelerator is the first data accelerator designed specifically to improve the bandwidth for I/O-bound applications

In addition to the hardware driver, the IO Accelerator includes a Virtual Storage Layer (VSL). This hybrid of the RAM virtualization subsystem and the disk I/O subsystem combines the best features of both systems. VSL functions as a disk to interface well with block-based applications and software, while also running like RAM underneath to maximize performance. This produces the following benefits:

- Performance: The VSL offers direct and parallel access to multiple CPU cores, enabling near linear performance scaling, and consistent performance across different read/write workloads, and low latency with minimal interruptions and context switching
- Extensibility: The VSL enables flash-optimized software development, making each IO Accelerator module a flexible building block for creating a flash-optimized data center.

While this report demonstrates a sample solution for Temenos environment synchronization, situations will vary greatly between implementations.

For more information

HP IO Accelerator: hp.com/go/ioaccelerator

HP BladeSystem: hp.com/go/bladesystem

Fusion I/O: fusionio.com/products/

Fusion I/O whitepaper: fusionio.com/solutions/financial/

BlueShore Financial: https://www.blueshorefinancial.com/ContactUs/