

Sitecore Commerce 7.2 powered by Commerce Server

Commerce Performance Whitepaper for Azure

A whitepaper demonstrating general performance characteristics of Sitecore Commerce 7.2 powered by Commerce Server

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Table of Contents

Chapter 1 Executive Summary 4
1.1 Performance Testing Overview 4
1.2 Key Findings 5
Chapter 2 Deployment Configuration 6
2.1 Azure Configuration 7
2.2 Virtual Machine Instance Size 8
2.3 Software 9
2.4 Sitecore Commerce 7.2 Configuration 10
2.5 Sitecore Configuration 11
Chapter 3 Test Methodology 13
3.1 Test Rig Deployment 13
3.2 Test Scenarios 14
3.3 Test Configuration 15
3.4 Data Configuration 16
Chapter 4 Test Results 17
4.1 Observations 17
4.2 Page Views 18
4.3 Page Time 19
4.4 Checkouts 20
4.5 Web Server CPU Time 21
4.6 Database Servers CPU Time 22
4.7 Database Server Transactions 23
4.8 Index Server CPU Time 24

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Chapter 1

Executive Summary

The following sections highlight the test environment, methods and results.

1.1 Performance Testing Overview

Performance tests used the Sitecore Commerce MVC Sample Site to measure key performance and scale characteristics in a cloud-based enterprise production deployment. The cloud provider used for the testing was Microsoft Azure. The site traffic was simulated using a collection of common scenarios that are modeled in a test mix. The following statements summarize the key takeaways to consider when interpreting the results found in this whitepaper and building your own sites using Sitecore Commerce 7.2 powered by Commerce Server:

- Test runs were executed for a 1 hour period, with varying load starting at 125 users and ending with 3,000 users. User in this testing had an aggressive 2 second think time.
- Results are tightly linked to the software and virtual machine configurations used, including instance size, number of instances that make up the server farm(s), amount of system memory on each instance, the database disk configuration, and virtual CPU capabilities.
- The Sitecore Commerce MVC Sample Site is designed to minimize post backs using technologies such as JSON and AJAX to optimize round trips between the browser and server instance hosting the site.
- Simulated checkout test iterations only include pipeline operations that were related to writing the completed purchase order to the database. Depending on the credit card workflow of a, the cost of a checkout can vary greatly in a realistic site implementation.
- In an enterprise deployment, static content is typically located on content delivery network (CDN) or cached by a network appliance. The results presented in this document do not take into account the cost of providing static content.
- The database servers were configured with an instance type of Extra Large A4. The SQL data and logs file were configure to be stored on a hard drive made up of sixteen 25GB virtual hard drives and software striped using Storage Spaces. *Note: Disk performance around disk response time plays a key role in achieving throughput at desirable web response levels, production prototypes should be tested to validate the required IO levels of a solution.*
- Performance testing of Sitecore Commerce 7.2 powered by Commerce Server closely matches the testing that was done for Commerce Server 10.1 in 2-tier configuration.
- The deployment techniques described in this document are directly applicable to on premise and other Infrastructure as a Service (IaaS) cloud providers.

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1.2 Key Findings

The following sections summarize the key results and findings obtained from the test results.

- To achieve the best results follow Azure SQL on VM and Sitecore CMS/DMS guidance:
  - **Performance Best Practices for SQL Server in Azure Virtual Machines**
    http://msdn.microsoft.com/en-us/library/azure/dn133149.aspx
  - **Performance Guidance for SQL Server in Azure Virtual Machines**
    http://msdn.microsoft.com/en-us/library/dn248436.aspx
  - **CMS Performance Tuning Guide**
    https://sdn.sitecore.net/Reference/Sitecore%207/CMS%20Performance%20Tuning%20Guide.aspx
  - **DMS Performance Tuning Guide**
    https://sdn.sitecore.net/Reference/Sitecore%206/DMS%20Performance%20Tuning%20Guide.aspx
- Virtual machine instance size has a significant effect on the performance characteristics. Cost analysis should include instance sizes versus size of farm when attempting to determine cost versus required performance levels.
- Load at the content delivery web servers was distributed using Azure Load Balancer, which randomly distributes load. The load was evenly distributed, but VM instances would occasionally show unevenness in terms of % Processor Time. Because performance at the VM instance is not a consideration of load balancing, a VM could be handed more expensive requests, such as submit checkout requests, at an uneven rate.
- In a multi-region deployment, the use of Azure Traffic Manager to ensure the closest geographic location is recommended. This link provides more information: http://msdn.microsoft.com/en-us/library/azure/hh744833.aspx.
- Longer running tasks associated with larger datasets such as Indexing and importing a large number of profiles into Sitecore did not work well in the Azure environment. Random occasional drops within the environment tended to prevent these tasks from completing without exceptions.
- Use of Microsoft SQL Server Page Compression can improve disk throughput at the expense of CPU time. For these tests, page compression was used for databases that experience heavy writes.
- **Overall Test Results**
  The following results were collected over the 1 hour test run:
  - **Total Page Views**: 1.2 million page views.
  - **Total Checkouts**: 30 thousand checkouts completed.
  - **Max Page Views**: 580 per second (82 per second per server).
  - **Max Checkout Rate**: 16 Checkouts per second.

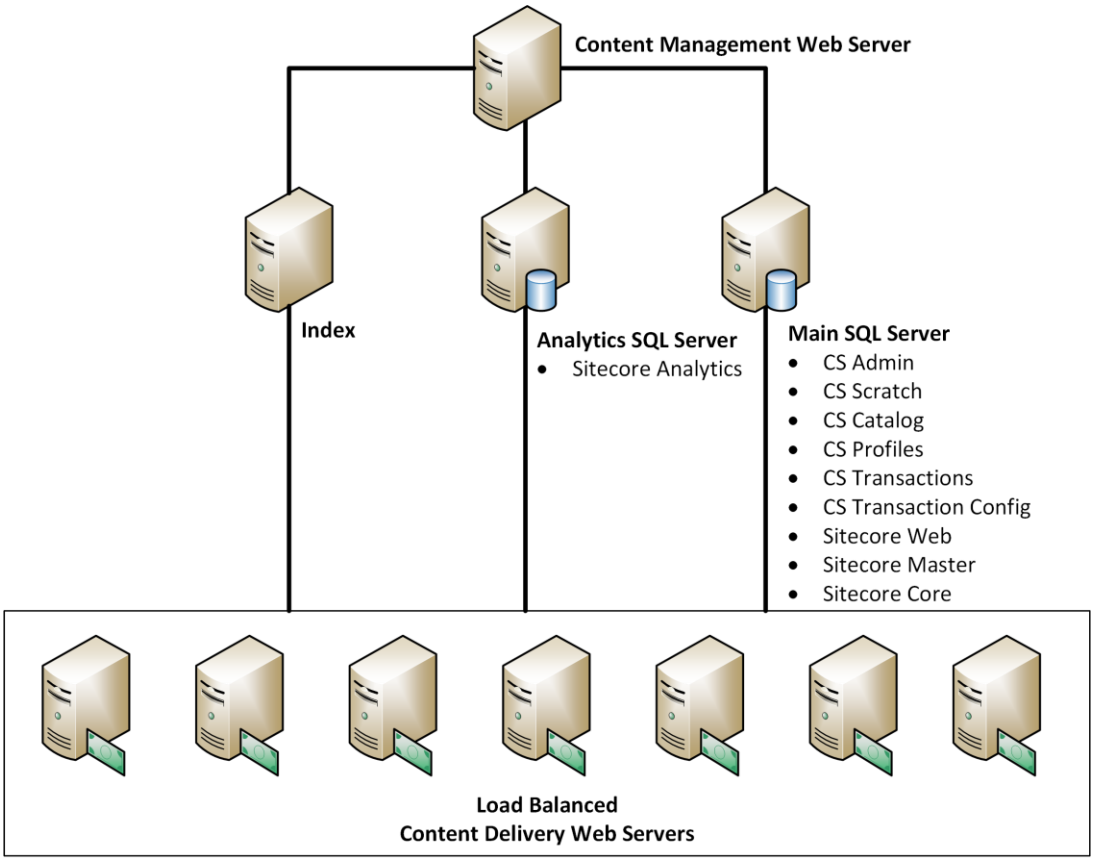
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Chapter 2

Deployment Configuration

Sitecore Commerce MVC Sample Site utilizes a two-tier deployment topology. In this configuration, all of the Sitecore Commerce 7.2 components are installed on all of the web server instances, which includes both content management and delivery web servers. This document refers to the load balanced web servers that would be internet facing as the content delivery web servers. These tests were focused on the production level runtime performance, so the Content Management portion of the deployment was not configured for load balancing. Sitecore does allow the content management environment to also scale horizontally.

For more information on supported Sitecore CMS Deployments, see the Sitecore CMS Scaling Guide here: http://sdn.sitecore.net/Reference/Sitecore%207/Scaling%20Guide.aspx.



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2.1 Azure Configuration

The following section documents the specific settings that were applied to Microsoft Azure.

General	• All virtual machine instances and storage accounts are in the same affinity group. • All virtual machine instances are in the same virtual network (VNet). • More information about Azure Affinity Groups and VNets can be found here: http://msdn.microsoft.com/en-us/library/azure/jj156085.aspx.
SQL Server Configuration & Best Practices	**SQL Server in Virtual Machine Performance Guidance** Both SQL servers in this deployment were configure for Online Transaction Processing (OLTP) workloads. • http://msdn.microsoft.com/en-us/library/azure/dn133149.aspx. • http://msdn.microsoft.com/en-us/library/dn248436.aspx. **Tables with SQL Page Compression enabled** The following tables that are write heavy had SQL Page Compression enable to optimize disk usage, *Note compression does have an impact on CPU usage*: • Sitecore Analytics. • Sitecore Commerce Transaction Table. **Disk Configuration** • Sixteen 25GB virtual hard disk, software striped with 64-KB cluster size using Microsoft Storage Spaces. Information regarding Microsoft Storage Spaces can be found here: http://social.technet.microsoft.com/wiki/contents/articles/15198.storage-spaces-overview.aspx.
Cloud Services	• All machines were hosted in a unique cloud service except the content delivery machine, which are all in the same cloud service to allow load balancing. More information about Azure Load Balancer can be found here: http://msdn.microsoft.com/en-us/library/azure/dn655058.aspx
Storage Accounts	Storage accounts that hosted virtual hard disks and data disks were split in the following way: • **Infrastructure**: Content Management, Directory Server instances. • **Main SQL Database**: Sitecore and Sitecore Commerce Databases instance and disk. • **Analytics SQL Database**: DMS analytics database instance and disk. • **Content Delivery**: All of the content delivery instances. • **Index**: SOLR instances and disk.

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2.2 Virtual Machine Instance Size

The following section documents the specific settings that were applied to Microsoft Azure Virtual Machine Instances.

Web Server	**Extra Large (A4) Instance** • 14 GB memory. • 8 virtual cores. • 64-bit platform.
Database Instance	**Extra Large (A4) Instance** • 14 GB memory. • 8 virtual cores. • Database disk (contains data and log files): sixteen 25GB virtual hard disk, software striped with 64-KB cluster size using Storage Spaces. • 64-bit platform.
Index Server	**Large (A3) Instance** • 7 GB memory. • 4 virtual cores. • Index disk is made up of four 100GB disks striped together with a cluster size of 64-KB using Storage Spaces. • 64-bit platform.
Load Test Rig	**Large (A3) Instance** • 1 Controller (Large (A3) instance). • 5 Agents (Large (A3) instance). • Followed Microsoft Guidance found here: http://msdn.microsoft.com/en-us/library/ff937706.aspx.
Load Balancer(s)	**Azure VM Load Balancer** • All farm instances are joined together into a common cloud service and configured with a shared endpoint at port 80.

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2.3 Software

The following section documents the specific software that was used.

Web Server
Content Management
	• Microsoft Windows Server 2012 R2 Datacenter
	• Microsoft Internet Information Services (IIS) 8.5 (Integrated Mode/.NET Framework v4.0)
	• Sitecore CMS 7.2
	  ○ DMS 7.2
	  ○ Sitecore.Solr.Support
	  ○ Sitecore Commerce Connect 7.2
	• Sitecore Commerce
	  ○ Sitecore Commerce Server Connect 7.2
	  ○ MVCSite 7.2

Web Server
Content Delivery
	• Microsoft Windows Server 2012 R2 Datacenter
	• Microsoft Internet Information Services (IIS) 8.5 (Integrated Mode/.NET Framework v4.0)
	• Sitecore CMS 7.2
	  ○ DMS 7.2
	  ○ Sitecore.Solr.Support
	  ○ Sitecore Commerce Connect 7.2
	• Sitecore Commerce
	  ○ Sitecore Commerce Server Connect 7.2
	  ○ MVCSite 7.2

Database Server	• Microsoft Windows Server 2012 R2 Datacenter • Microsoft SQL Server 2014 Enterprise
Index Server	• Microsoft Windows Server 2012 R2 Datacenter or Linux Server (CentOS based was tested) • Apache Tomcat (7.0.54.0 was tested) • Apache SOLR (4.9 was tested) • Java Runtime Environment (JRE) was 1.7 (64-bit edition)
Load Test Rig Servers	• Microsoft Visual Studio 2013 Ultimate (Update 2) • Microsoft Visual Studio 2013 Test Controller (Update 2) • Microsoft Visual Studio 2013 Test Agent (Update 2)

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2.4 Sitecore Commerce 7.2 Configuration

The following section documents the specific settings that were applied to Commerce Server 11.

Profiles	The registry value **UnsafeAuthenticatedConnectionSharing** was changed from its default value of zero (0) to the value one (1). This change causes the Sitecore Commerce 7.2 Profiles System to reuse database connections and prevents frequent log on and log off operations that would otherwise adversely affect performance. However, in some scenarios, there are security implications to consider. For more information about these security implications, see "Performance Issues Using SQL Server Windows Authentication" at http://go.microsoft.com/fwlink/?LinkId=195045. **Registry Setting** HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\CommerceServer\Profiles,UnsafeAuthenticatedConnectionSharing = 1
Catalog	Catalog and inventory database indexes were rebuilt and statistics were updated after large data import operations. The operations were done through a maintenance plan that included all Sitecore Commerce Databases, and included the Rebuild Index and Update Statistics tasks.
Sample Site	**Update Common Assemblies** Common assemblies should be updated to the latest version, as these libraries are constantly being improved. It was determined in final performance testing of the Sitecore Commerce MVC Sample Site, which shipped with WebGrease version 1.0, had a scale issue that resulted in errors and performance degradation under load. You can avoid this issue by updating the following libraries to their respective latest stable release: • WebGrease • Newtonsoft. • ANTLR (Required by latest version of WebGrease) **Notes** • Nuget can be used to obtain the latest version of these libraries. • The new versions of these libraries may also require modification to the web.config configuration\runtime section so that the existing assemblies are redirected to use the latest versions. More information about binding redirects can be found here: http://msdn.microsoft.com/en-us/library/eftw1fys(v=vs.110).aspx

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2.5 Sitecore Configuration

The following section documents the specific settings that were applied to Sitecore CMS and components.

Sitecore CMS Content Management	**CMS Performance Tuning Guide** https://sdn.sitecore.net/Reference/Sitecore%207/CMS%20Performance%20Tuning%20Guide.aspx **General Recommendations** If a larger catalog is in use, enable Product Buckets for better performance of the Sitecore Content Manager's Tree view of catalogs. To enable Product Buckets, go to \sitecore\Sitecore Commerce\Settings\Catalog\Product Buckets, and set Content:Value to true in the Sitecore Content editor. According to Sitecore's recommended best practices, it is recommended to have less that 100 sub categories under any category. **Index Recommendations** • SOLR is recommended in an environment that is load balanced, so all content delivery servers can utilize the same index. • Indexing is directly influenced by the number of active languages. Removing any language that are not in use will improve time to index. *Note: the impact will still occur applies if a language is simply enabled,even if no language enabled properties are specified for catalog items.* • If memory at the server performing indexing is an issue, reduce the memory footprint during indexing operations with the following setting: o /configuration/sitecore/settings/setting[@name=' Caching.DisableCacheSizeLimits'] (Web.config) : false o Tune Sitecore caches as needed, which prevents Sitecore caches from overusing memory while performing an index. o The Sitecore Commerce Catalog System, which utilizes the ASP.NET cache, can be made to scavenge memory more aggressively with this setting: /configuration/system.web/caching/cache[@percentagePhysicalMemoryUsedLimit'] (Web.config). Depending on the amount of physical memory of the server performing an index, the index system (Lucene or SOLR), and the size of catalog, it is recommended that this is set to a low number, such as 5, for the server performing the index.

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	○ Reduce the number of index thread with this setting: /configuration/settings/setting[@name=' ContentSearch.ParallelIndexing.MaxThreadLimit'] (App_Config\Include\Sitecore.ContentSearch.config) : lower number of threads will result in a lower indexing memory requirement at the expense of indexing time. ○ Disable parallel indexing: /configuration/settings/setting[@name=' ContentSearch.ParallelIndexing.Enabled'] (App_Config\Include\Sitecore.ContentSearch.config) : if set to false, only one thread will index, this will reduce the indexing memory requirements at the expense of indexing time.
Sitecore CMS Content Delivery	**CMS Performance Tuning Guide** https://sdn.sitecore.net/Reference/Sitecore%207/CMS%20Performance%20Tuning%20Guide.aspx **Recommended Settings** • Allows all system memory to be used by Sitecore caches /Configuration/sitecore/settings/setting[@name=' Caching.DisableCacheSizeLimits'] (Web.config) : true. This setting is recommended if the server hosting the deployment is 64-bit, and being used for content delivery. • Keep Sitecore log file writes to a reasonable level /Configuration/log4net/logger/* (Web.config) : WARN
Sitecore DMS	**DMS Performance Tuning Guide** https://sdn.sitecore.net/Reference/Sitecore%206/DMS%20Performance%20Tuning%20Guide.aspx

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Chapter 3

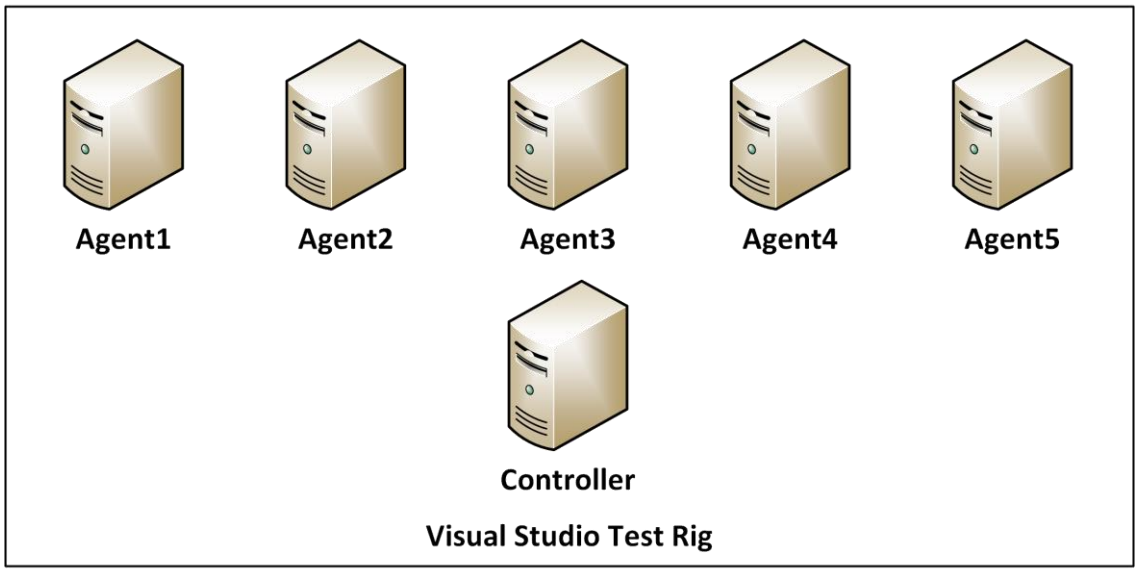
Test Methodology

The following sections detail the test scenarios and the test mix model that were used to load the deployment.

3.1 Test Rig Deployment

Visual Studio 2013 test agents and controller were deployed to Azure Large A3 Instances. Each agent had a single data disk attached, and the agent service was set to utilize the attached disk as the working directory. This was done to ensure the agent had enough disk capacity to handle load generation, because the default OS disk did not offer the required performance level.

For more information on setting up the Visual Studio Test agents and controllers, visit: http://msdn.microsoft.com/en-us/library/dd648127.aspx.



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3.2 Test Scenarios

Performance testing employed the following scenarios to create a test mix:

- **Anonymous Checkout Products**: A new user adds a product to cart and performs the checkout process.
- **Anonymous Checkout Product Families**: A new user adds a product family product, with a random variant to the cart and perform the checkout process.
- **Browse Product**: A new user browses for a random product within a set of products that represents 1% of total available products (10,000 products). This test simulates products that are likely to be in the Sitecore Commerce catalog cache.
- **Browse Product (Low Cache Hit)**: A new user browses for a random product from the entire set of products found in the test catalog. This test simulates products that are not likely to be in the Sitecore Commerce catalog cache.
- **Browse Category**: A new user browses for a random category within a set of categories that represents 1% of total categories (1,000 categories). This test simulates categories that are likely to be in the Sitecore Commerce catalog cache.
- **Browse Category (Low Cache Hit)**: A new user browse for a random category from all of the categories available in the performance catalog (11,000 categories). This test simulates categories that are not likely to be in the Sitecore Commerce catalog cache.
- **Home Page**: A new user browses to the homepage of the site.

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3.3 Test Configuration

Test runs used the following mix of scenarios to load the instances that make up the deployment:

3.3.1 Test Mix

Browse Product (Low Cache Hit)	0.5%
Browse Product	40.5%
Browse Category	30.5%
Browse Category (Low Cache Hit)	0.5%
Anonymous Checkout Products	2.0%
Anonymous Checkout Product Families	1.0%
Home Page	25.0%

The percentage is based on the number of tests started

3.3.2 User Configuration

- **User Think Time**: 2 seconds
- **User Load**:
    - **Pattern:** Step
    - **Initial User Count**: 125
    - **Maximum User Count**: 3,000
    - **Step Duration**: 2.5 minutes (150 seconds)
    - **Step Ramp Time**: 30 seconds
    - **Step User Count**: 125 users per step
- **Think Profile**: Normal Distribution
- **Percentage of New Users**: 100

3.3.3 Run Settings

- **Duration**: 1 hour
- **Warm up**: 5 minutes
- **Web Test Connection Model**: Connection Per User
- **Dependent Request**: Off

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3.4 Data Configuration

The following test datasets were deployed into the test environment:

3.4.1 Catalog

- **Products**: 1 Million (50% products, 50% product families)
- **Categories**: 11,000
- Product families contained random number of variants from 1-20.
- **Category Depth**: 5
- **Products/Category**: 100

3.4.1 Profiles

- Each user had one shipping address and four credit cards.
- Each credit card had one billing address.
- 10 million users.
- 40 million credit cards.
- 50 million addresses.
- Total of 100 million profiles objects.

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Chapter 4

Test Results

The following chapter provides detailed results of the test runs that were performed on the Microsoft Azure IaaS platform.

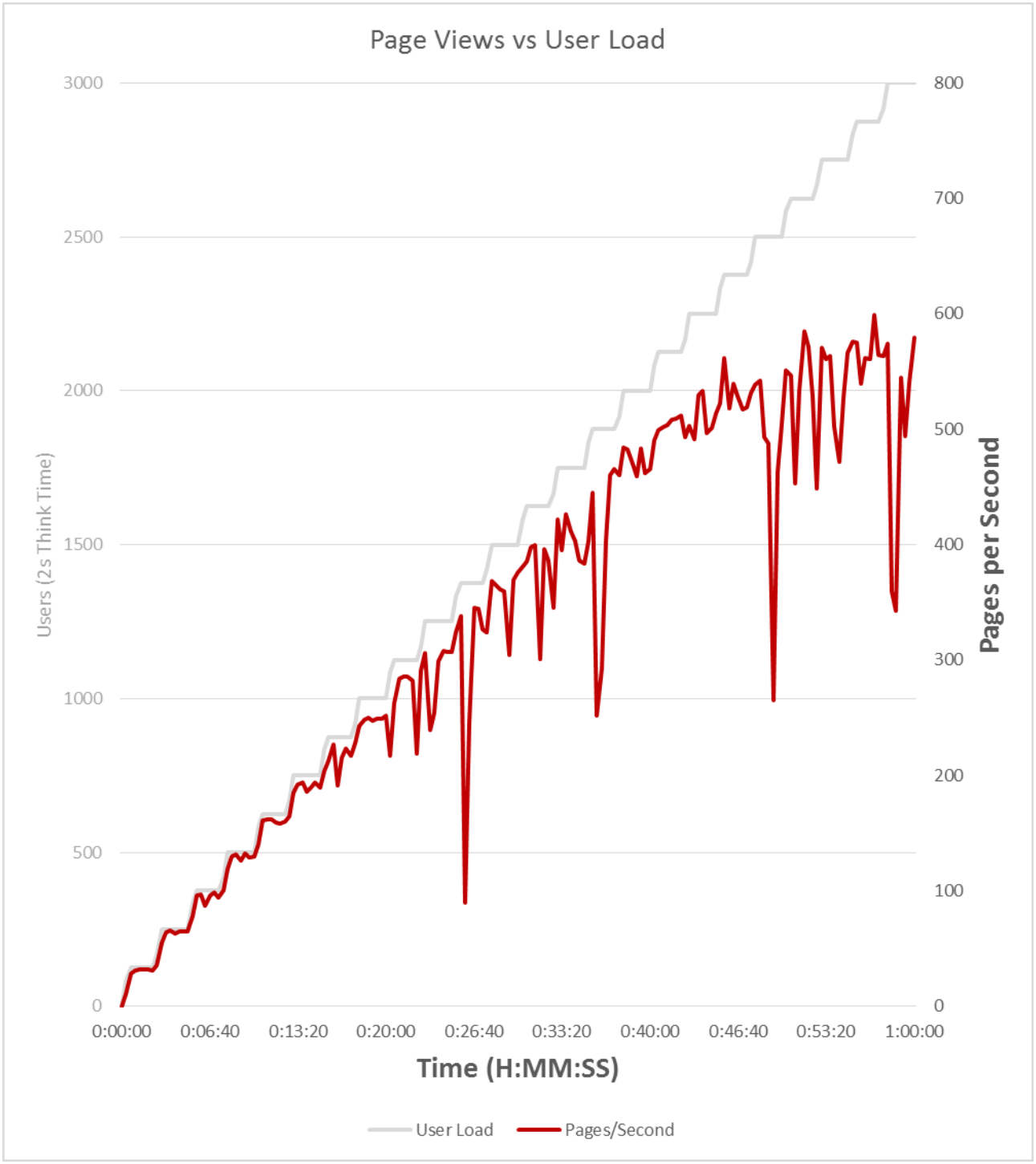
4.1 Observations

- Large, brief spikes were seen during this test run. This is considered normal in a cloud hosted environment. These spikes came in two forms:
  - Network delay between the content delivery servers and database servers.
  - Network delay between the load generation servers and the content delivery servers.
- Performance started to become bottlenecked around 2,000 users, or 580 pages/seconds. This was tracked back to the load on the Sitecore analytics database, and subsequently down to the performance of the disk hosting the analytics database. Various changes were made to the disk and SQL configuration based on guidance to allow for maximum performance levels.
- Once the database disk capacity thresholds are encountered, response times of the content delivery servers begins to increase as expected.

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4.2 Page Views

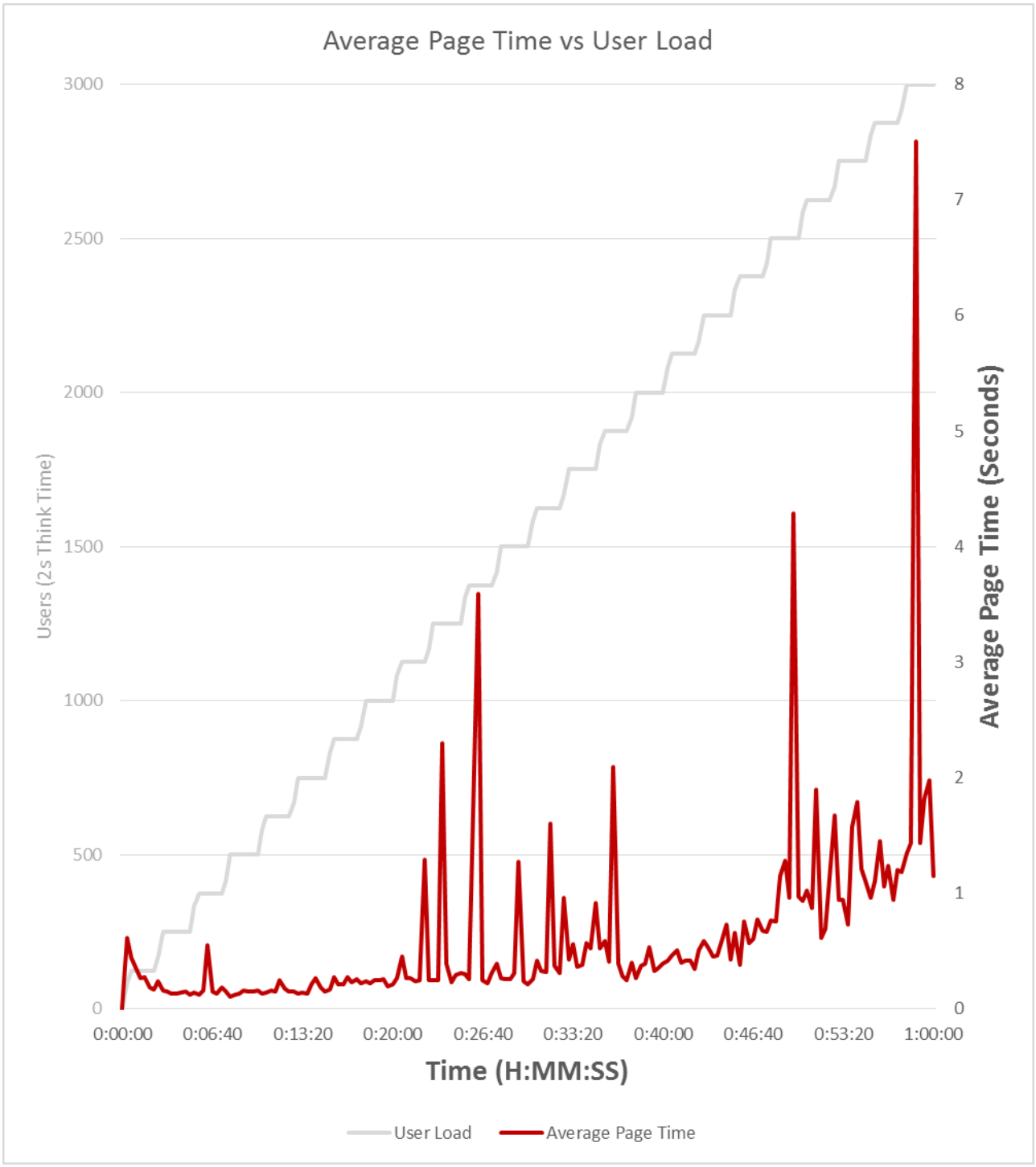
The following figure details the number of page hits/views that is handled as a function of user load:



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4.3 Page Time

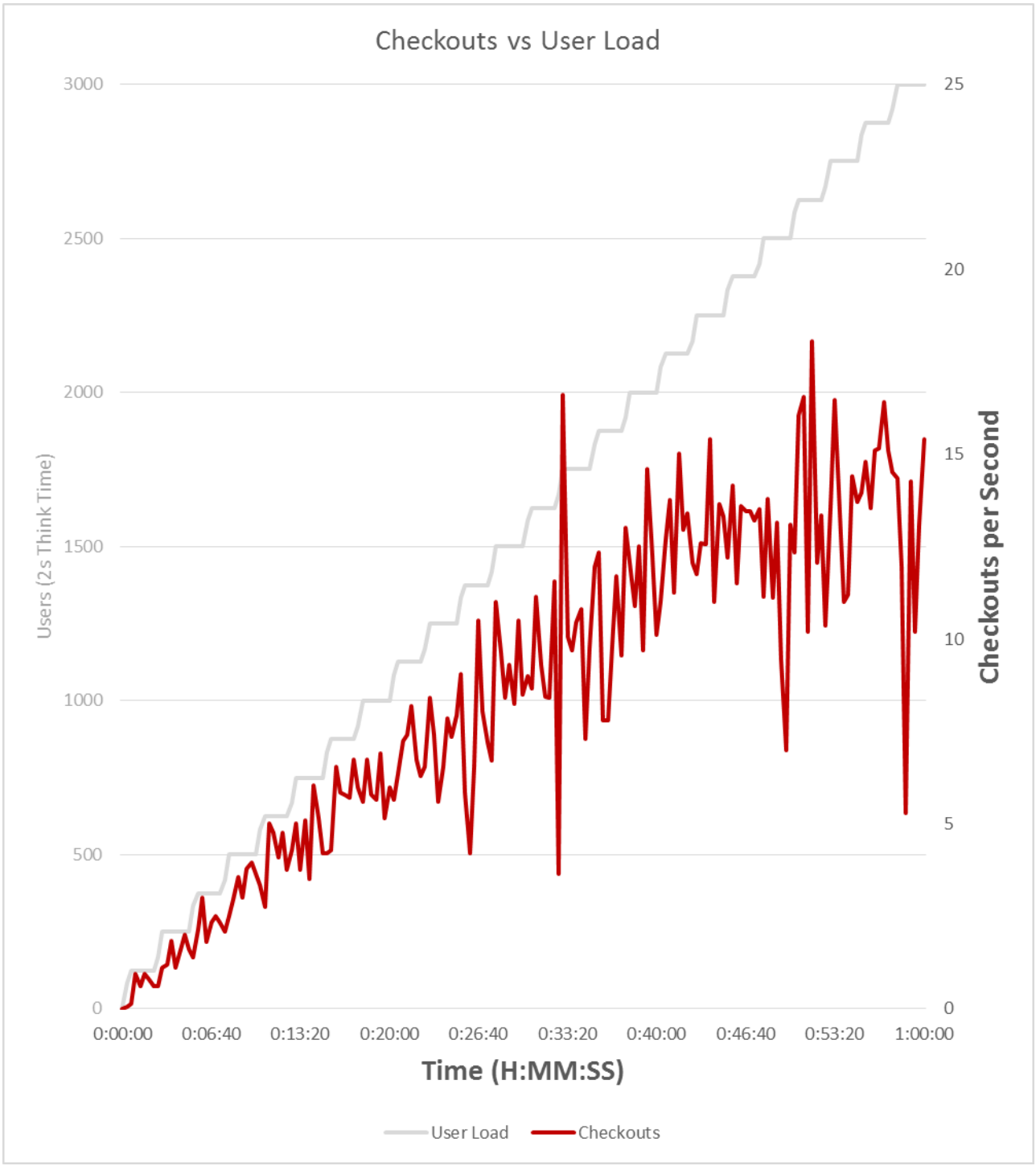
The following figure details the average page time as a function of user load:



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4.4 Checkouts

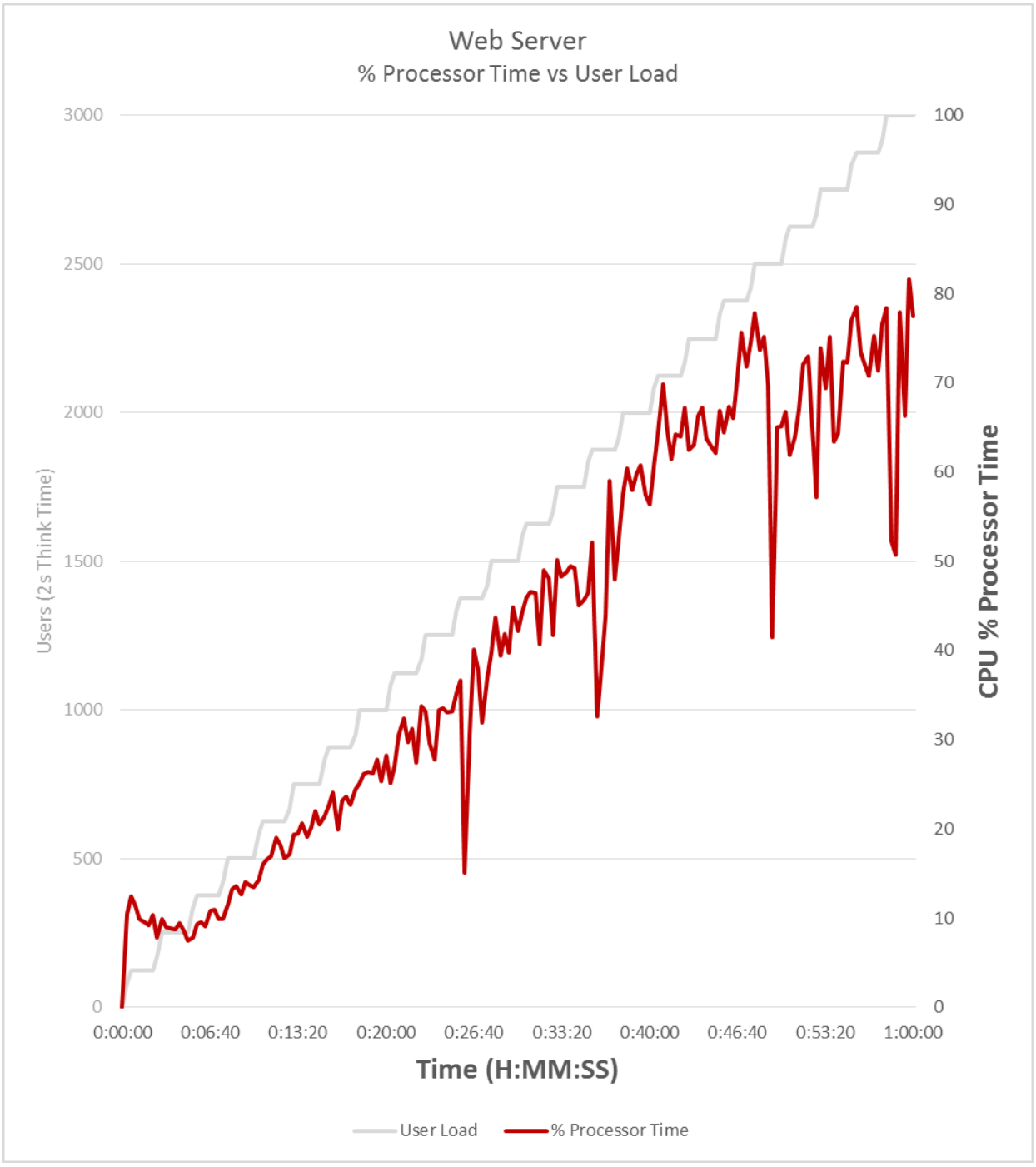
The following figure details the number of checkouts transactions as a function of user load:



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4.5 Web Server CPU Time

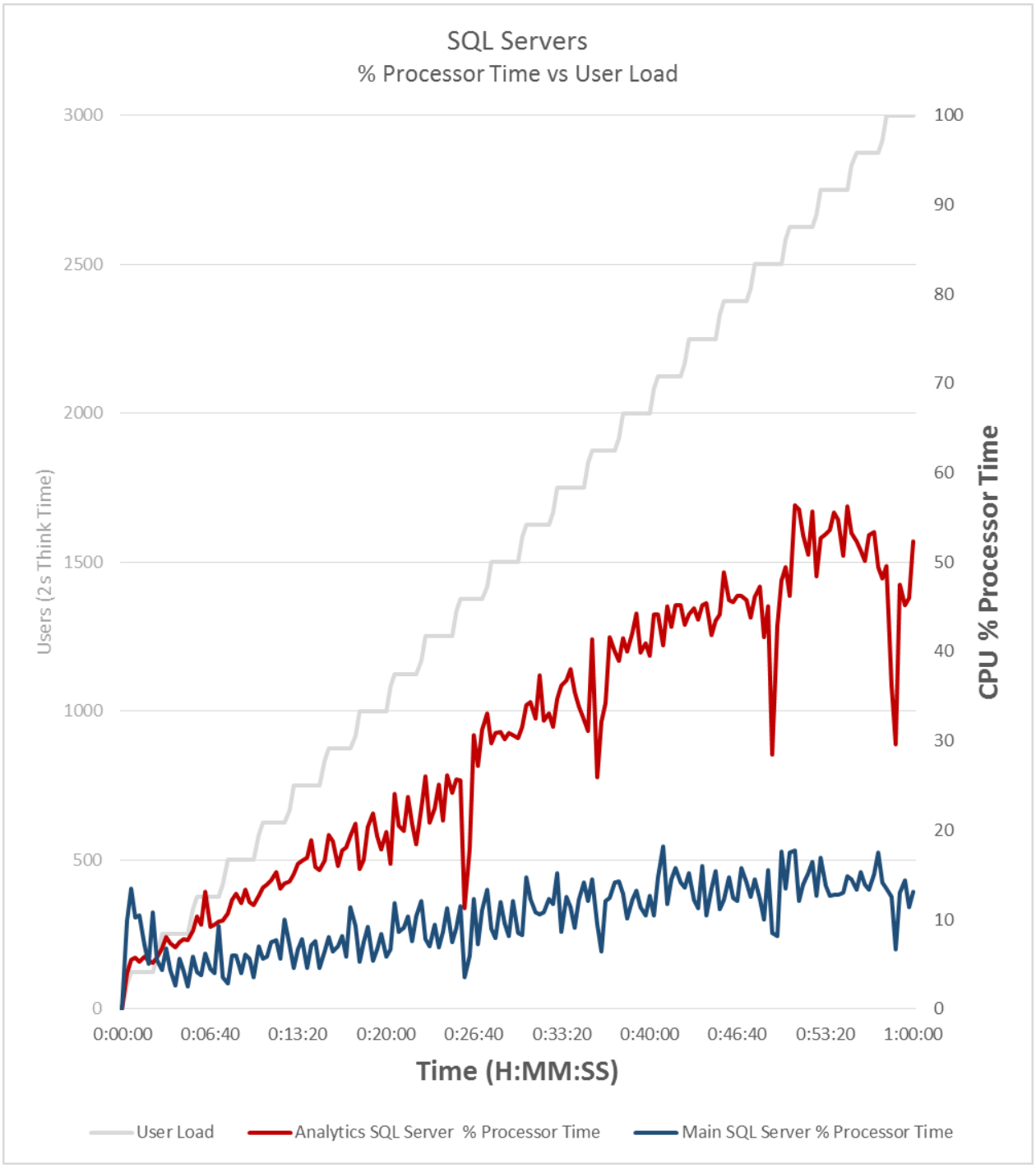
The following figures details the CPU time (% Processor Time_Total) of the Content Delivery instances as a function of user load. *Note: CPU time from virtual machine instances that make up the farm are averaged across all instances.*



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4.6 Database Servers CPU Time

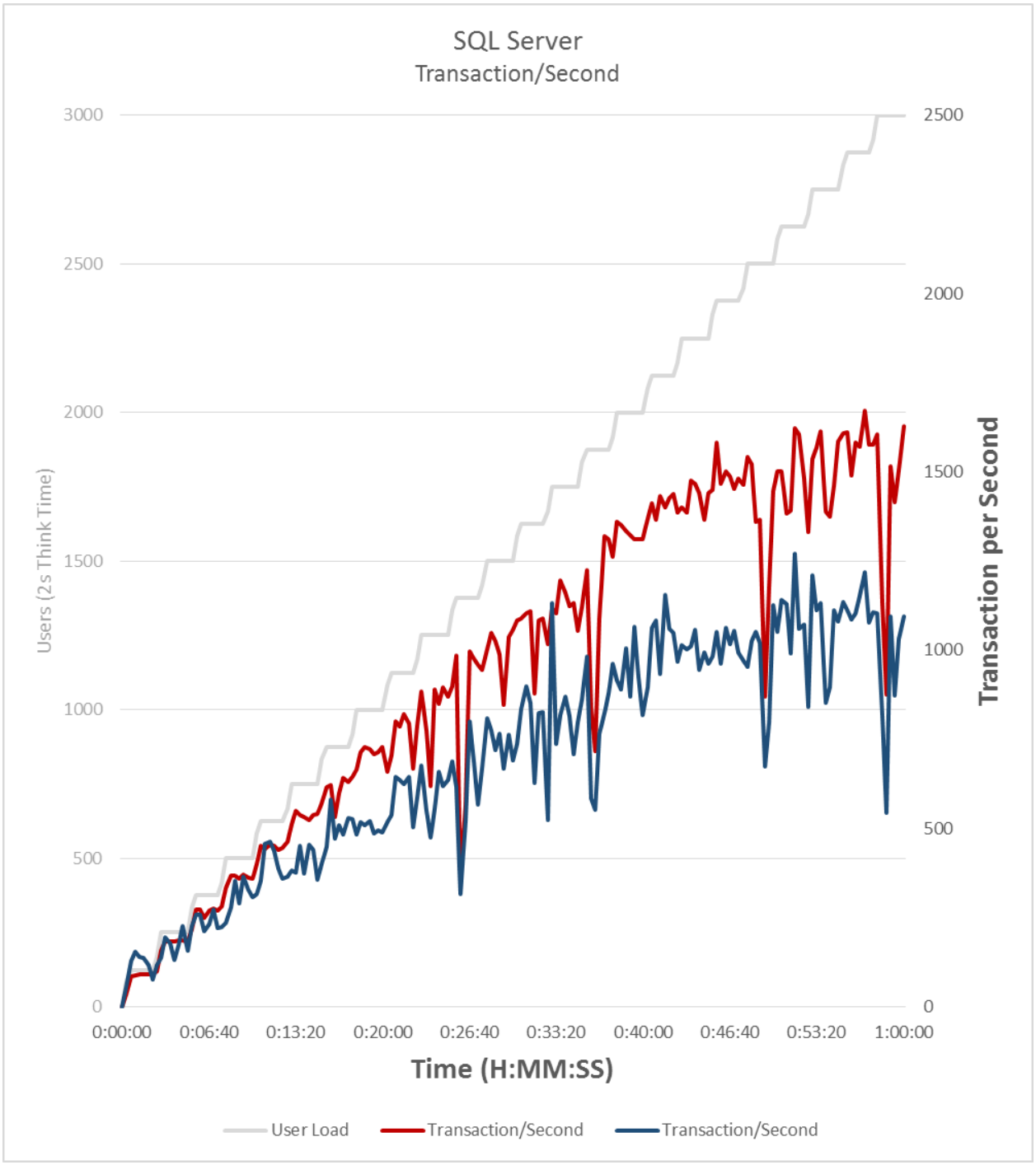
The following figures details the CPU time (% Processor Time_Total) of the Database Servers as a function of user load:



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4.7 Database Server Transactions

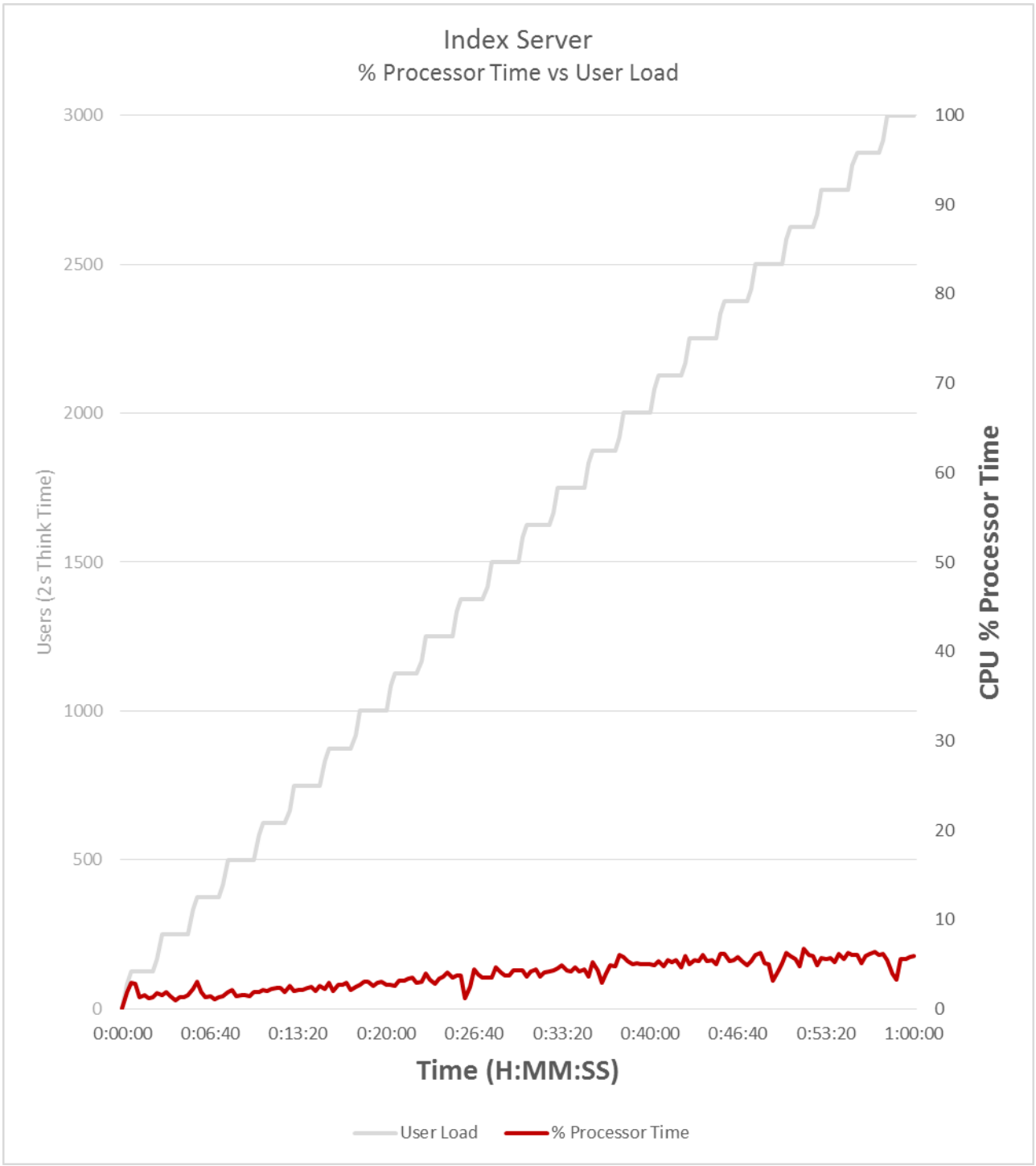
The following figures details the Transaction per second of the Database Servers as a function of user load:



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4.8 Index Server CPU Time

The following figures details the Transaction per second of the Main Database Server as a function of user load:



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