



# **BlackBerry AtHoc**

## **Capacity Planning Guidelines**

7.15



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# Overview

This document provides information about BlackBerry AtHoc system resource requirements including compute, network, storage, configuration, and other related components that support deployment planning in a physical or virtual environment.

This document categorizes the customer user base into 3 size levels: small, medium, or large.

The test results for each of these levels assist in designing a suitable system configuration.

Some of the parameters to consider for optimal BlackBerry AtHoc performance to support the required number of concurrent users are:

- BlackBerry AtHoc deployment configuration
- Number of application servers: combo or farm configuration
- Rate of transactions per minute
- Network and storage requirements

**Note:** All test numbers in this document have been computed based on BlackBerry AtHoc desktop app tests.

# Definitions

## Compute

Compute refers to the resources available for BlackBerry AtHoc servers including server specification, CPU, and memory for both the application and database. Compute typically relates to the total number of servers and the total number of vCPUs or cores in either virtual or physical environments.

The total memory allocated to a server in specific cases may also designate specific memory reservation, if applicable.

## Network

Network refers to the required bandwidth for the application to perform well. It considers the payload size and the number of packets that are transmitted over the network over time.

## Storage

Storage refers to the disk configuration (storage type) and capacity needed for optimal performance of BlackBerry AtHoc. Storage may be implemented as local server storage or as network based (SAN), which is more common in virtual environments.

## Customer size categories

This document categorizes BlackBerry AtHoc implementations into three categories:

- **Small:** Up to 80,000 concurrent users over a three-minute polling period
- **Medium:** 80,000 to 180,000 concurrent users over a three-minute polling period
- **Large:** 180,000 to 300,000 concurrent users over a three-minute polling period

These categories drive the planning and design of a suitable BlackBerry AtHoc system configuration.

# BlackBerry AtHoc compute requirements

This section details the server specifications for the application and database server, applicable to all three customer user base categories: small, medium, and large.

## Virtual environment

**Table 1: VMs needed per customer category**

Customer category	Application server VMs	DB server VMs
Small	1	1
Medium	2	1
Large	4	1

**Table 2: vCPUs needed per customer category**

Customer category	vCPUs per App VM	vCPUs per DB VM
Small	4	8
Medium	4 to 6	8
Large	6	12

vCPU reservations or shares are not strictly required for BlackBerry AtHoc to function in a virtual environment. However, they may be necessary on a case-by-case basis, depending on the VM host workload and provisioning strategy used by the VM host administrator. In general, if VM host CPUs are saturated (consistently over 80% usage), reservations may be required for BlackBerry AtHoc to perform adequately.

**Table 3: vRAM needed per customer category**

Customer category	vRAM per App VM (GB)	vRAM per DB VM (GB)
Small	8	32
Medium	8	32
Large	8	32

BlackBerry AtHoc requires vRAM reservations to be placed on the SQL virtual machine.

BlackBerry AtHoc database transactions are very latency-sensitive when they support large numbers of users. The BlackBerry AtHoc virtual machines can easily be affected by waiting on the hypervisor to free up resources from other virtual machines running on the same host.

You should make vRAM reservations on at least 70% of the total VM RAM allocation. Additionally, you should give a maximum allocation for the Microsoft SQL Server memory.

# Physical environment

**Table 4: Servers needed per customer category**

Customer category	App servers	Database servers
Small	1	1
Medium	2	1
Large	3	1

**Table 5: Cores recommended per customer category (not including hyper-threading)**

Customer category	Sockets/cores per App server	Sockets/cores per DB server
Small	2/12	2/16
Medium	2/12	2/16
Large	2/12	2/16

**Table 6: RAM needed per customer category**

Customer category	App server RAM (GB)	Database server RAM (GB)
Small	24	32
Medium	24	32
Large	24	32



# Storage requirements

This section describes the disk configuration, performance, and capacity requirements for virtual and physical environments.

## Virtual disk configuration

Virtual environments typically consist of different performance tiers of storage as a cost saving measure. Not all systems need premium storage.

During BlackBerry AtHoc's performance testing, it was found that Solid State Device (SSD) volumes are needed for database transaction logs when deploying medium-to-large systems. Provisioned input/output operations per second (IOPS) may also be necessary depending on Storage Area Network (SAN) and VM host configuration. Please refer to the IOPS requirements below.

The following storage disk configuration is applicable for both medium and large customer categories:

- **Operating system files:** RAID 5 (4 + 1 SAS 10,000)
- **SQL data files:** RAID 10 (8 + 2 SAS 10,000). This includes all user database data files.
- **SQL log files:** RAID 5 (4 + 1 SSD). This includes all user database log files. You should also put temporary DB (system database) data and log files both in this volume.
- **SQL backup files:** RAID 5 (4 + 1 SAS 10,000)

This disk configuration has led to peak disk IOPS and response times during the desktop client tests, as shown in the following table.

**Table 7: Peak disk IOPS for DB logs and files**

Customer category	Logical drive	RAID type	Disk IOPS
<b>Small</b>			
	DB Log Files	RAID 5 (SSD)	2000
	DB Files	RAID 10	200
<b>Medium</b>			
	DB Log Files	RAID 5 (SSD)	4300-4424
	DB Files	RAID 10	555-578
<b>Large</b>			
	DB Log Files	RAID 5 (SSD)	5000
	DB Files	RAID 10	600

# Physical disk configuration

For physical environments that utilize SAN storage, see [Virtual disk configuration](#).

For physical environments that utilize local storage:

- **Drive Type:** 15,000 RPM SAS
- **SQL files and operating system:** RAID5 (3 + 1)
- **SQL log files:** RAID 10 (1+1)

## Storage capacity requirements

This section describes capacity requirements for application server, database server, and compute database storage.

### Application server storage

- Application servers need a minimum of 10 GB disk space for BlackBerry AtHoc installation.
- Additional space is required to store IIS logs and Windows Event Logs. This varies depending upon the retention policies of the customer.
- Allocating 50 GB for the OS drive is a good practice.

### Database server storage

Database storage depends primarily on the following three factors:

- Total number of users
- Number of alerts published every year
- Number of years alerts will be kept online before they are archived

The following table lists the storage requirements for the BlackBerry AtHoc database.

**Table 8: Storage requirements for BlackBerry AtHoc**

Storage for	Factor	Storage needed (Example 10,000 users)
Core Install	None	50 G
Users	Add 160 MB for every 1000 users	= 160 MB x 10 = 1.6 GB
Alerts	Add 3.4 GB for 1000 alerts per 1000 users	= 3.4 GB x 1 x 10 = 34 GB for 1000 Alerts, 10,000 users over 1 Year
Alerts retention	Number of years	= 34 GB X 3 = 100 GB for 3000 Alerts, 10,000 users over 3 Years

# Computing database storage

Use the following formula to compute your total required database storage:

$$20 + (2.0 * U / 10000) + ((40 * U * A / (10000 * 1000)) * Y) \text{ GB}$$

where:

**U** = The number of users you will have.

**A** = The number of alerts you will create every year.

**Y** = The number of years the alerts will be kept online.

The following table depicts the storage requirements based on the formula above. This table has been computed assuming that alert data retention period is three years.

Retention 3 years	Total alerts per month				
	30	60	100	200	500
Users					
5,000	23	25	27	33	51
10,000	26	29	34	46	82
25,000	34	43	55	85	175
50,000	48	66	90	150	330
100,000	76	112	160	28	640
500,000	300	480	720	1320	3120

## Audit trace storage

If you enable SQL audit traces, be sure to account for the additional disk space needed. With the frequency of desktop client polling activity, audit files will fill disks very quickly. Some customers have reported that enabling full auditing on SQL Server results in approximately 1 GB of uncompressed audit traces per 10,000 clients per day.

# Network requirements

For the network, the minimum server backbone speed requirement is 1 Gbps.

10 Gbps is preferred.

## Assumptions

- 5,000 concurrent users/desktops
- 1.5 minutes (90 seconds) average delivery time. All connected users will receive alerts between 0-180 sec, evenly distributed.
- Alert audio (.wav) files are predefined and preloaded to desktop client applications
- Communication over SSL (HTTPS)
- Average check for new alerts packet size for one desktop client is ~2000 Bytes (total round trip including SSL handshake)
- Average alert packet size (without audio, which is preloaded) is ~ 6 KB (total round trip including SSL handshake)

## Desktop App bandwidth requirements

The aggregate network bandwidth requirement can be computed using the BlackBerry AtHoc network bandwidth calculator. The resulting numbers can be taken into consideration to compute the network bandwidth requirements for different customer categories.

- Keep alive (check update) payload size: 800 bytes per desktop client
- Retrieve one alert (get update) payload size: 15,000 bytes per desktop client

# Software performance configuration

This section addresses software configuration items that may impact the performance of BlackBerry AtHoc.

## Database server recommendations

This section describes database server recommendations.

### SQL common criteria and C2 auditing

BlackBerry AtHoc does not support Common Criteria Compliance or C2 auditing on the SQL server. Common Criteria and C2 Auditing drastically impact performance to the point of making even small systems unusable.

### SQL max instance memory

SQL should have a RAM cap put on the instance to avoid memory contention with the host operating system. In general, the SQL instance RAM should be set to 80% of the total system RAM.

If SQL memory consumption is left unconstrained, it will gradually consume all available memory, leaving none for the operating system to perform additional tasks. This can lead to memory paging and RAM being pulled away from SQL by the OS. Both conditions can affect SQL performance.

Click the following link to learn how to cap SQL memory: <https://technet.microsoft.com/en-US/library/ms191144%28v=SQL.105%29.aspx>.

### SQL TempDB

BlackBerry AtHoc is a heavy user of TempDB storage.

A good starting point for TempDB configuration is:

- 4 data files, 1 GB each
- 1 log file, 512 MB

This is the initial configuration set by the BlackBerry AtHoc installer MSI.

The TempDB files should be stored either with the database transaction logs, or on a volume with equivalent or better performance to the transaction logs volume. Some VMs have the option for a temporary drive, which is an SSD. Such a temporary drive is the recommended place to host temporary DB files.

# BlackBerry AtHoc application configuration recommendations

For optimal BlackBerry AtHoc performance, AtHoc Desktop Pool Worker Processes count should be set to 4. The default is 2.

# Platform configuration requirements

The following sections provide information about database and application server requirements.

## Database server

The following components are the recommended platform configuration for a database server:

- Windows Server 2019 (64-bit) or Windows Server 2016 (64-bit)
- Microsoft SQL Server 2019 (with cumulative updates) or Microsoft SQL Server 2016.
- If you require TLS 1.2 enforcement between the application servers and the database server, and your database server is running Microsoft SQL Server 2014, go to the following URL to install and update your software to support TLS 1.2:  
<https://support.microsoft.com/en-us/help/3135244/tls-1-2-support-for-microsoft-sql-server>
- Dual, redundant Intel NICs and power supplies are recommended. If using BroadCOM NICs, be sure that the latest drivers are installed and disable the TCP Chimney feature as per the guidelines in the following Microsoft article: <https://docs.microsoft.com/en-us/troubleshoot/windows-server/networking/information-about-tcp-chimney-offload-rss-netdma-feature>.
- Disk space for storage on a RAID 5, RAID 0+1 or RAID 10 configured disk system. The exact allocation of disks depends on the hardware configuration.

**Note:** The installation procedure requires at least 20 GB free for data, plus 60 percent additional free space to upgrade large NGOLADATA databases.

## Application server

The following components are the recommended platform configuration for an application server:

- Windows Server 2019 (64-bit) or Windows Server 2016 (64-bit)
- If you require TLS 1.2 enforcement between the application servers and the database server, and your application server is running Microsoft SQL Server 2014, install:
  - Microsoft ODBC Driver 11 for SQL Server version 2014.120.5543.11 or greater
  - Microsoft SQL Server Native client version 2011.110.6518.00 or greater.
- Dual, redundant Intel NICs and Power Supplies are recommended.

If you use BroadCOM NICs, be sure that the latest drivers are installed and disable the TCP Chimney feature as per the guidelines in the following Microsoft article: <https://docs.microsoft.com/en-us/troubleshoot/windows-server/networking/information-about-tcp-chimney-offload-rss-netdma-feature>

- A minimum of 2 GB free disk space.

# BlackBerry AtHoc performance tests

The following are the high-level test objectives that were used to run the desktop client tests:

- Determine the upper limit/maximum capacity of a single application server in terms of concurrent users and resource usage.
- Determine the upper limit/maximum capacity of load balanced multiple application servers (4 in this case) in terms of concurrent users and resource usage.
- Determine the impact of Transparent Data Encryption (TDE) on the overall application performance when enabled on the database side.

## Desktop client test details

**Test Scenario:** An alert was published for all users in an organization before the check and get-update transactions were run for the JMeter simulated users. Separate tests were run for user sign-on to get the maximum transactions per minute that the application can support.

**User Ramp-up Time:** Three minutes

**Test Data:** Various application and database metrics were collected during these tests, including CPU, memory, disk IO, and IIS request queue length. The [BlackBerry AtHoc test metrics](#) section provides some of the metrics that were gathered and used to troubleshoot and improve the BlackBerry AtHoc desktop client performance.

## Virtual test environment

The following hardware and software configuration items were used for the virtual performance tests in this document.

**BlackBerry AtHoc version:** 6.1.8.87

**Table 9: Application VM configuration**

Configuration type	Value
VMware Version	ESXi 5.1
VMware Host	Xeon E5-2680 @ 2.70GHz, Dual-Socket
Operating System	Windows Server 2008 R2 Standard
System Type	64-bit
Memory	8 GB
Memory Reservation	No
CPU Reservation	No



**Table 10: Database VM configuration**

Configuration type	Value
VMware Version	ESXi 5.1
VMware Host	Xeon E5-2680 @ 2.70GHz, Dual-Socket
Operating System	Windows Server 2012 R2 Standard
SQL Version	SQL Server 2012
Memory	32 GB
Memory Reservation	Yes
CPU Reservation	No

**Table 11: Database server configuration**

Configuration type	Value
SQL Instance Max Memory	26 GB
SQL Instance Min Memory	0
Temp DB Data Files Size and Count	1GB each, total 4 files – stored in log files volume
Temp DB Log Files and Count	512MB each, total 4 files – stored in log files volume

**Table 12: Load balancer details**

Model	Number
Load Balancer Model	F5 BIG-IP

## Physical test environment

The following hardware and software configuration items were used for the physical hardware performance tests in this document.

**BlackBerry AtHoc Version:** 6.1.8.85 R3 SP4 CP1

**Table 13: Application server configuration**

Configuration type	Value
Host	Xeon E5-2640 @ 2.50GHz

Configuration type	Value
Operating System	Windows Server 2008 R2 Standard
System Type	64-bit
Memory	24 GB

**Table 14: Database server configuration**

Configuration type	Value
SQL Instance Max Memory	26 GB
SQL Instance Min Memory	0
Temp DB Data Files Size and Count	1 GB each, total 4 files, stored in the log files volume
Temp DB Log Files and Count	512 MB each, total 4 files, stored in the log files volume

**Table 15: Load balancer details**

Model	Number
Load Balancer Model	F5 BIG-IP

# BlackBerry AtHoc performance test result summary

Several tests were run for both the virtual and physical environment. The following tables list the results for the virtual and physical environments.

## Virtual environment

These tests were performed without oversubscription of host resources and without competing virtual machines. As such, these tests show what is possible to achieve under an ideal virtual environment and should serve as guidelines, not guarantees, of performance. The following tables show the test results for the different customer categories.

**Table 16: Virtual environment test numbers for different customer categories**

Number of application VMs	VCPUs per application VM	Database vCPUs	Max concurrent users	Max TPM for SO	Max TPM for CUs and GUs	Transaction logs observed IOPS	DB files observed IOPS
<b>Small</b>							
1	4	8	80K	42K	63K	2500	500
<b>Medium</b>							
2	4	8	160K	84K	130K	3200	600
<b>Large</b>							
4	6	12	300K	—	—	—	—

## Physical environment

**Table 17: Physical environment test numbers for different customer categories**

Number of application servers	Cores per application VM	Database cores	Max concurrent users	Max TPM for SO	Max TPM for CUs and GUs
<b>Small</b>					
1	12	16	240K	—	—
<b>Medium</b>					
2	12	16	360K	—	—
<b>Large</b>					

Number of application servers	Cores per application VM	Database cores	Max concurrent users	Max TPM for SO	Max TPM for CUs and GUs
3	12	16	450K	–	–

**Legend**

SO = Sign On

CU = Check Update

GU = Get Update

TPM = Transactions per Minute

# Data encryption

There can be a large impact to encrypting the databases BlackBerry AtHoc runs on. For organizations that require encryption, the following scenarios were tested to give an expected decrease in system capacity under encryption. The SQL Server Transparent Data Encryption (TDE) encryption technology was used. Differences in encryption performance impacts between hardware and virtual deployments were negligible in the testing.

## 128-bit TDE

**Environment:** One large organization with 510,000 users

**Results:** The performance degradation with 128-bit TDE enabled is minimal. A 2% reduction in numbers was observed.

## 256-bit TDE

**Environment:** One large organization with 510,000 users and 25 smaller organizations with 5000 users each

**Results:** 17% performance degradation was observed with the most common scenario of CUs and GUs.

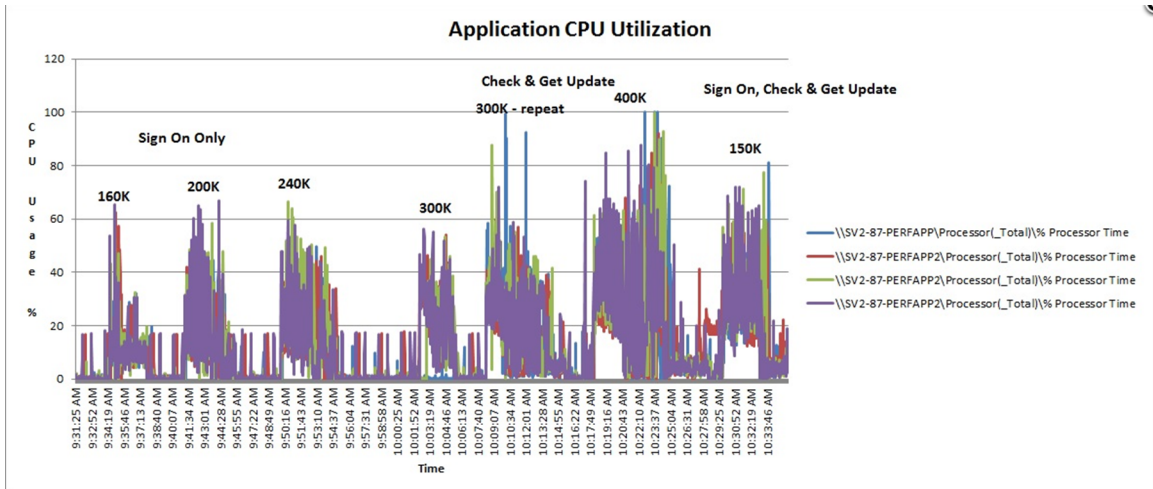
# BlackBerry AtHoc test metrics

Different metrics are collected during the BlackBerry AtHoc desktop client tests. The following are examples of the data gathered on the application and database side.

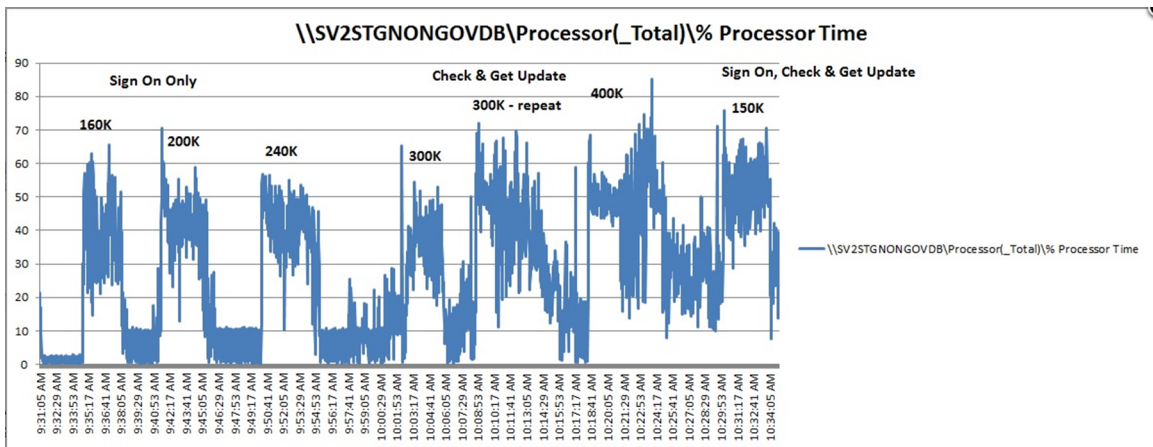
## Virtual environment

The following images show the CPU utilization percentage on the application and database VMs. The upper bound CPU usage is about 70%. When considering the maximum number of concurrent users that can be run for a given BlackBerry AtHoc setup, the average CPU usage during the test run must be below 70%.

### BlackBerry AtHoc application CPU utilization percentage

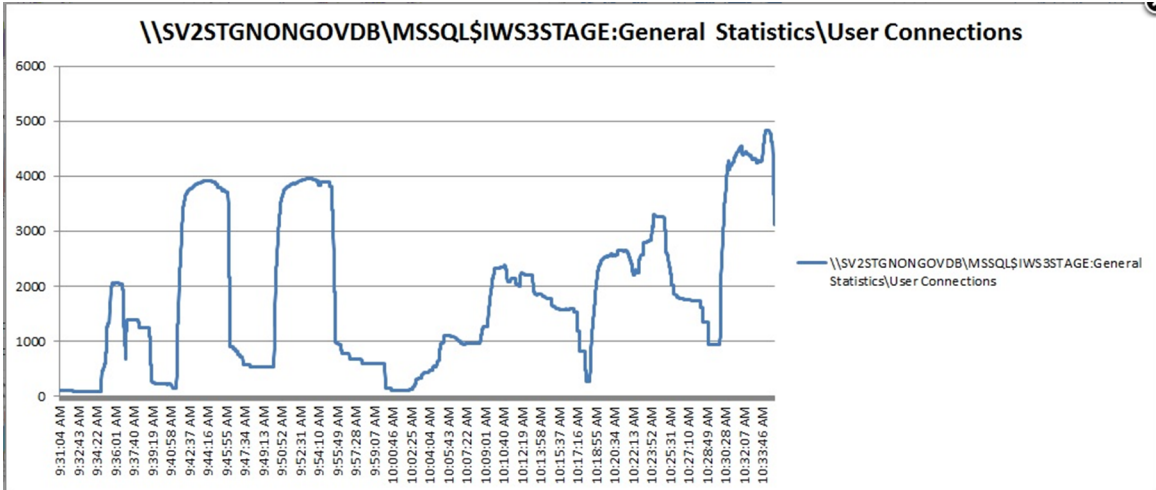


### Database CPU utilization percentage



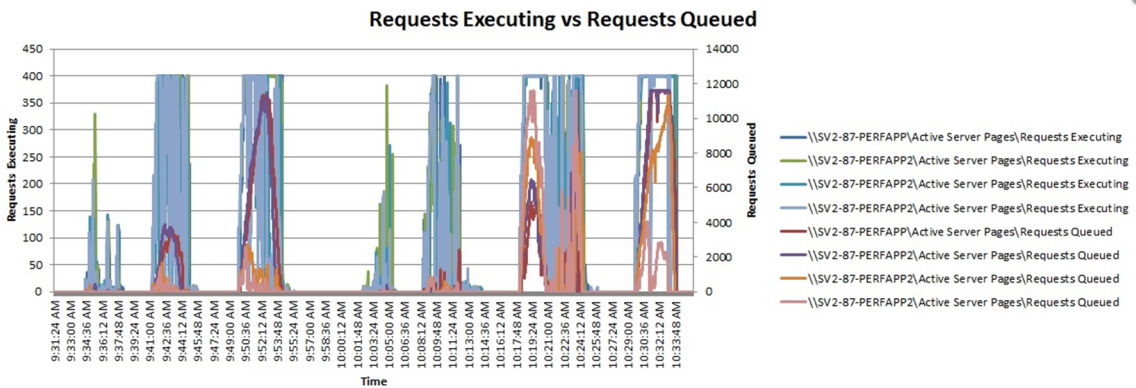
### Database user connections

The following image shows the total number of user connections that are open on the database side during the tests.



The following image shows the number of requests in the IIS queue at any given point of time in the test as opposed to the number of requests that the application can process. This metric helps to determine the number of desktop pool worker processes that must be used for optimal BlackBerry AtHoc performance.

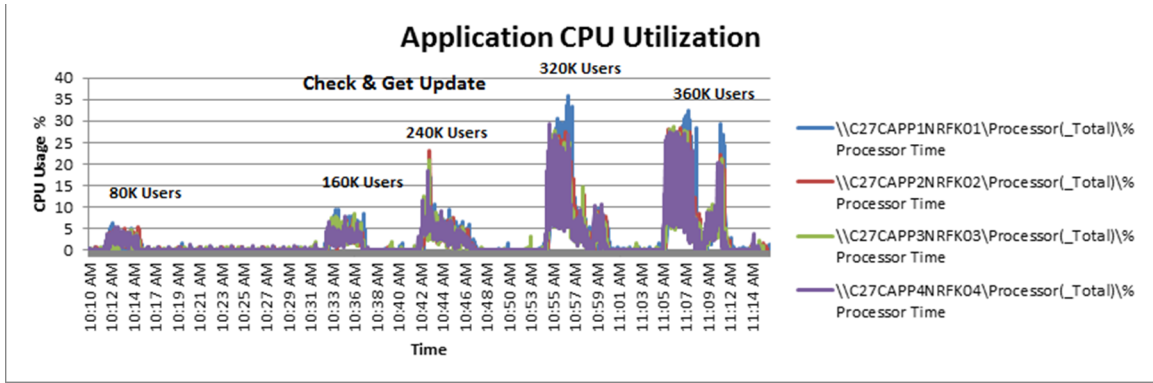
### Application requests executing vs requests queued



## Physical environment

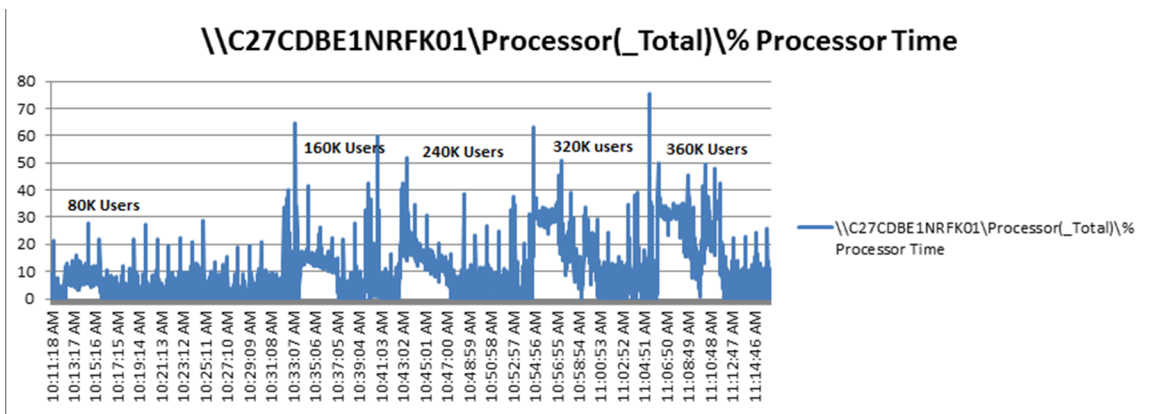
Similar metrics were collected for the tests run on servers in a physical environment. The following image shows the CPU usage for a three-server application desktop client test for different numbers of concurrent users over a three-minute polling interval.

### Application CPU utilization percentage



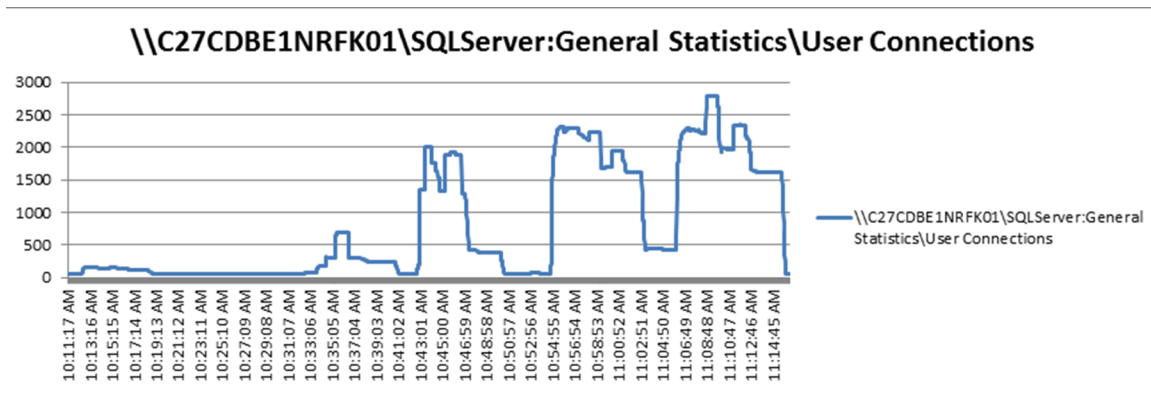
The following image shows the CPU usage on the database side.

**Database CPU utilization percentage**



The following image shows the user connections open on the database side during the different tests.

**Database user connections**

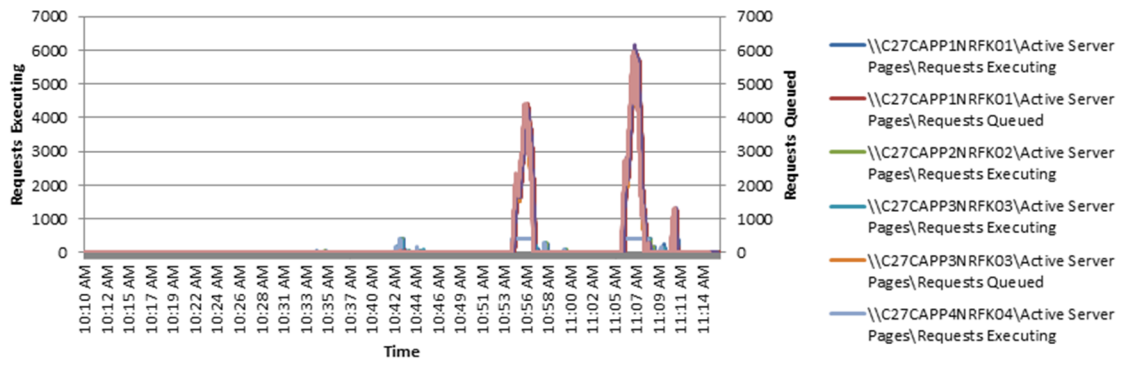


The following image shows the requests queued up on IIS as opposed to the number of requests being executed by the application at any given point of time during the tests.

**Application requests executing vs requests queued**



### Requests Executing vs Queued



# BlackBerry AtHoc Customer Support Portal

BlackBerry AtHoc customers can obtain more information about BlackBerry AtHoc products or get answers to questions about their BlackBerry AtHoc systems through the Customer Support Portal:

<https://www.blackberry.com/us/en/support/enterpriseapps/athoc>

The BlackBerry AtHoc Customer Support Portal also provides support via computer-based training, operator checklists, best practice resources, reference manuals, and user guides.

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