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GemStone®

# *GemStone/S* *Release Notes*

Version 6.5

April 2009

GEMSTONE ™

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## PATENTS

GemStone is covered by U.S. Patent Number 6,256,637 "Transactional virtual machine architecture", Patent Number 6,360,219 "Object queues with concurrent updating", and Patent Number 6,567,905 "Generational Garbage Collector". GemStone may also be covered by one or more pending United States patent applications.

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## *Preface*

### **About This Documentation**

These release notes describe changes in the GemStone/S version 6.5 release. We recommend that everyone migrating to this version read these release notes before beginning installation, testing or development.

For information on installing or upgrading to this version of GemStone/S, please refer to the *GemStone/S Installation Guide* for version 6.5.

These documents are also available on the GemStone customer website, as described below.

### **Technical Support**

GemStone provides several sources for product information and support. The product-specific manuals and online help provide extensive documentation, and should always be your first source of information. GemStone Technical Support engineers will refer you to these documents when applicable.

**GemStone Web Site:** <http://support.gemstone.com>

GemStone's Technical Support website provides a variety of resources to help you use GemStone products. Use of this site requires an account, but registration is free of charge. To get an account, just complete the Registration Form, found in the same location. You'll be able to access the site as soon as you submit the web form.

The following types of information are provided at this web site:

**Help Request** allows designated support contacts to submit new requests for technical assistance and to review or update previous requests.

This Help Request system is in the process of being replaced by a new system:

<http://techsupport.gemstone.com/>

**Documentation** for GemStone/S is provided in PDF format. This is the same documentation that is included with your GemStone/S product.

**Release Notes** and **Install Guides** for your product software are provided in PDF format in the Documentation section.

**Downloads** and **Patches** provide code fixes and enhancements that have been developed after product release. Most code fixes and enhancements listed on the GemStone Web site are available for direct downloading.

**Bugnotes**, in the Learning Center section, identify performance issues or error conditions that you may encounter when using a GemStone product. A bugnote describes the cause of the condition, and, when possible, provides an alternative means of accomplishing the task. In addition, bugnotes identify whether or not a fix is available, either by upgrading to another version of the product, or by applying a patch. Bugnotes are updated regularly.

**TechTips**, also in the Learning Center section, provide information and instructions for topics that usually relate to more effective or efficient use of GemStone products. Some Tips may contain code that can be downloaded for use at your site.

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Technical information on the GemStone Web site is reviewed and updated regularly. We recommend that you check this site on a regular basis to obtain the latest technical information for GemStone products. We also welcome suggestions and ideas for improving and expanding our site to better serve you.

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- ▶ Your technical question is not answered in the documentation.
- ▶ You receive an error message that directs you to contact GemStone Technical Support.
- ▶ You want to report a bug.
- ▶ You want to submit a feature request.

Questions concerning product availability, pricing, keyfiles, or future features should be directed to your GemStone account manager.

When contacting GemStone Technical Support, please be prepared to provide the following information:

- ▶ Your name, company name, and GemStone/S license number
- ▶ The GemStone product and version you are using
- ▶ The hardware platform and operating system you are using
- ▶ A description of the problem or request
- ▶ Exact error message(s) received, if any

Your GemStone support agreement may identify specific individuals who are responsible for submitting all support requests to GemStone. If so, please submit your information through those individuals. All responses will be sent to authorized contacts only.

For non-emergency requests, the support website is the preferred way to contact Technical Support. Only designated support contacts may submit help requests via the support website. If you are a designated support contact for your company, or the

designated contacts have changed, please contact us to update the appropriate user accounts.

Requests for technical assistance may also be submitted by email or by telephone.

**Email: [support@gemstone.com](mailto:support@gemstone.com)**

**Telephone: (800) 243-4772 or (503) 533-3503**

We recommend you use telephone contact only for more serious requests that require immediate evaluation, such as a production system that is non-operational. In these cases, please also submit your request via the web or email, including pertinent details such error messages and relevant log files.

If you are reporting an emergency by telephone, select the option to transfer your call to the technical support administrator, who will take down your customer information and immediately contact an engineer.

Non-emergency requests received by telephone will be placed in the normal support queue for evaluation and response.

## 24x7 Emergency Technical Support

GemStone offers, at an additional charge, 24x7 emergency technical support. This support entitles customers to contact us 24 hours a day, 7 days a week, 365 days a year, if they encounter problems that cause their production application to go down, or that have the potential to bring their production application down. For more details, contact your GemStone account manager.

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- ▶ Customized consulting services can help you make the best use of GemStone products in your business environment.

Contact your GemStone account representative for more details or to obtain consulting services.



**Chapter 1. GemStone/S 6.5 Release Notes**

Overview . . . . . 1  
    Technical Support . . . . . 1  
Changes and New Features . . . . . 2  
    Additional Semaphores required . . . . . 2  
    Performance improvements . . . . . 2  
        Mark/sweep performance . . . . . 2  
        Bitmap optimizations . . . . . 2  
    Improved handling of low free space conditions . . . . . 2  
    Additional log information on login, requiring client library update . . . . . 2  
    Ability to count instances . . . . . 3  
    Ability to find Objects in Segment . . . . . 3  
    LostOTRoot handling . . . . . 3  
    Improved timestamps in log files . . . . . 3  
    Cache Statistics Changes . . . . . 3  
        Added Cache Statistics . . . . . 3  
Bugs Fixed . . . . . 4  
    After lostOT, gem could have crashed in lomClearCaches . . . . . 4  
    Potential for late or missing OOB events . . . . . 4  
    Reclaim during backup could have corrupted page being backed up . . . . . 4  
    Shrpcmon lock issues . . . . . 4  
        Core dump if process dies waiting on spin lock . . . . . 4  
        Stuck frame locks . . . . . 4  
        Additional logging . . . . . 4  
    Signal Handling Issues . . . . . 5  
        Risk of Stone hang or crash on Gem SIGTERM . . . . . 5  
        Risk of hang in SIGTERM error handling . . . . . 5  
        Incorrect signal handler for SIGINT . . . . . 5

Signal handler chaining could pass incorrect number of arguments . . .	5
Fatal error on SIGTERM in linked VW image . . . . .	5
Possible infinite recursion in SIGTERM handler . . . . .	5
AIO page server failures may introduce corruption. . . . .	5
Stone crash due to invalid access to remote session information . . . . .	6
Login and password related issues . . . . .	6
Commit during login could have failed, causing later errors. . . . .	6
Slow session logins . . . . .	6
With password aging, logins failed while PDR gems running. . . . .	6
Incorrect reason for disabled account . . . . .	6
UserProfile >> isDisabled may not have returned correct information . . . . .	6
Risk of access violation in logout of linked session . . . . .	7
Incorrect restore point in timeToRestoreTo: . . . . .	7
Reduced lostOT timeout for transactionless sessions . . . . .	7
GcGem startup failures caused session errors . . . . .	7
Object already exists errors. . . . .	7
PageReads, PageWrites cache statistics were zero. . . . .	7
Sessions incorrectly killed when timeout was -1. . . . .	7
Finalization of many set-valued indexes could result in commit record backlog	7
Character comparison failures. . . . .	7
Sessions did not receive lost OT Root signal . . . . .	8
Empty descriptionOfSession: IP address in linked . . . . .	8
Stack traces with gstack. . . . .	8
copydbf -i on active tranlog very slow . . . . .	8
Version information incorrect . . . . .	8
Upgrade leaves method in image . . . . .	8
DbfHistory not initialized correctly. . . . .	8
Incomplete class documentation installation. . . . .	8
Missing period in primitive failure handling code . . . . .	8

# *GemStone/S 6.5 Release Notes*

## **Overview**

GemStone/S 6.5 is a new version of the GemStone Smalltalk object server. This release provides several performance enhancements, new features, and includes several critical bug fixes. We recommend everyone using GemStone/S upgrade to version 6.5.

These release notes provide changes between the previous version of GemStone/S, version 6.3.1, and version 6.5. Note that there is no version 6.4, to avoid confusion with the GemStone/S 64 Bit product. If you are upgrading from a version prior to 6.3.1, please also review the release notes for each intermediate release to see the full set of changes. Although versions 6.2 and 6.3 were unavailable or not fully supported on Windows, the release notes for these versions include changes and bug fixes that also apply to Windows and should be reviewed before upgrading from version 6.1.x on Windows.

Also note that changes to Character collation in version 6.2 affect GemStone indexes. Upgrades from 6.1.6 or earlier to 6.2 or later require index rebuild, if Characters beyond basic ASCII are involved.

For details about installing GemStone/S 6.5 or upgrading from earlier versions of GemStone/S or other GemStone server products, see the *GemStone/S Installation Guide* for version 6.5. There are changes to the OS configuration requirements; additional semaphores are required. See “Improved handling of low free space conditions” on page 2, and the System Requirements section of Chapter 1 of the Installation Guide.

This release supports Solaris, Linux, AIX, and Windows.

## **Technical Support**

GemStone Technical Support has a new pilot Help Request system. Customers with support agreements are invited to submit Help Requests to:

<http://techsupport.gemstone.com>

## Changes and New Features

### Additional Semaphores required

To fix bug 36666, 'Risk of Stone hang or crash on Gem SIGTERM', an additional semaphore has been added to each GemStone process. This is a change in the Operating System configuration requirements, on platforms for which the number of semaphores is configurable. You must review your operating system configuration, and increase the semaphore limit if it would not be adequate for the maximum number of GemStone sessions.

*WARNING*

*Existing GemStone/S systems may require OS kernel adjustments in order to operate after upgrading to version 6.5.*

### Performance improvements

#### Mark/sweep performance

This release provides significant performance improvements in the mark/sweep operation, including Epoch, markForCollection, findDisconnectedObjects and findObjsConnectedTo:.

Note that with these changes, running with a very large setting for #mfcGcPageBufSize, along with large cache sizes, increases the risk of reaching the 4 GB address space limit of 32-bit processes. If you experience malloc issues, reduce the #mfcGcPageBufSize.

#### Bitmap optimizations

Bitmaps are structures that are used to communicate lists of OOPs. These structures have been optimized to take advantage of 64 bit registers on platforms that support them (Solaris and AIX). This improves performance for operations such as garbage collection that make heavy use of bitmaps.

### Improved handling of low free space conditions

In low free space conditions, the stone will now service the page manager while waiting for free space, to allow pages to be returned to make space available.

In addition, checkpoints during low free space conditions are now done every minute, rather than every three minutes.

### Additional log information on login, requiring client library update

More information is now included in the header information on session login, for both linked and RPC sessions.

```
gci login: currSession sessionId rpc gem processId pid
```

for linked logins, *pid* will be -1.

This is a change in the GCI, so as a result, you must use updated versions of the client libraries to log into GemStone/S version 6.5.

## Ability to count instances

A method has been added to return the number of instances of specific classes within the repository.

```
Repository >> countInstances: anArray
```

This method returns a count of instances on the receiver that belong to one of the classes listed in the argument *anArray*. *anArray* must be an array of kinds of Behavior containing 2024 or fewer elements. The result of this method is an Array of Associations, where each key is an element of the input array and the value is the count of all instances whose class is equal the key.

## Ability to find Objects in Segment

A method has been added to find all objects in a list of Segments.

```
Repository >> listObjectsInSegments: anArray
```

Returns a list of committed objects that belong to one of the segments listed in *anArray*. The result of this method is an Array of IdentitySets, where the contents of each set consists of all instances whose Segment is the corresponding element in *anArray*. Dead objects (those in the stone's `deadNotReclaimed` set) are not included in the scan results.

## LostOTRoot handling

As part of fixing bug 39908, “Sessions did not receive lost OT Root signal” on page 8, the internal code to handle lost OT root conditions has been refactored and improved. Consequently, in v6.5 there are behavior changes from previous releases, in which the documented behavior was not adhered to.

## Improved timestamps in log files

Timestamps in system log files now include the date as well as time, for all timestamps. Previously, only the first timestamp within each hour included the date; timestamps for subsequent events within the same hour omitted the date.

## Cache Statistics Changes

### Added Cache Statistics

The following statistics have been added:

#### **AioWriteFailures** (Pgsvr)

Total number of write errors detected by this page server, including write errors that succeeded on retry.

#### **BackupHighWaterPage** (Stone)

Only used when a full backup is in progress. Highest page ID that full backup has finished writing to the backup file, or `INT_MAX (2147483647)` if full backup is not active.

#### **GcHighWaterPage** (Stone)

Only used when `markGcCandidates` is in progress. Highest page ID that `markGcCandidates` has finished scanning, or `INT_MAX (2147483647)` if `markGcCandidates` is not active.

## Bugs Fixed

The following bugs in GemStone/S 6.3.1 have been fixed in GemStone/S 6.5:

### After lostOT, gem could have crashed in lomClearCaches

In the processing following a lostOTRoot, a gem could encounter a recursive call within the internal function lomClearCaches, and terminate. (#39408)

### Potential for late or missing OOB events

A code path existed where pending OOB events could have been missed during iteration of the set of sockets. This could result in OOB signals, such as sigAbort, being received late, or potentially being missed entirely. (#39523)

### Reclaim during backup could have corrupted page being backed up

It was possible for the GcGem to reclaim a page that was not yet backed up by a concurrently running programmatic backup. This would usually result in an error in the backup process, such as a page header fault if the page was reused, and a subsequent backup would complete successfully. However, it was possible that an invalid page could be backed up, resulting in a corrupt backup. (#39866)

## Shrpcmon lock issues

### Core dump if process dies waiting on spin lock

When two processes need the same page at the same time, and the page is not in the cache, the first process reads the page into the cache, while the second process sleeps on a spin lock until the read is complete. This is a new design in GemStone/S 6.2 (cf. #30900); previously, both processes performed the read, with the second process' read subsequently discarded.

The new design exposed a bug, where if the process that was waiting on the spin lock for the read to complete died, the lock was left in a corrupted state. This caused the other process, which was performing the read, to core dump. (#39576)

### Stuck frame locks

When recovering following a session death, the shrpcmon process could find frame locks that were held by processes other than the one that died. These stuck locks were left with a log warning, but not cleared, and later attempts by the shrpcmon to test the spin lock could hang. (#39572, #39633, #39844)

### Additional logging

In addition to fixing these bugs and other refactoring and improvements to spin lock code, this version includes additional printing to the SPC monitor for the slot recovery process, including stuck spin locks.

- ▶ The PID of the process holding the stuck frame lock, its executable name (on Solaris only), and its cache name if it is attached to the cache.
- ▶ The contents of the frame lock fields and the contents of the cache frame.

## Signal Handling Issues

### Risk of Stone hang or crash on Gem SIGTERM

On a heavily loaded system, if a Gem on the same host as the Stone gets a SIGTERM while waiting for a shared memory (SMC) response from the Stone, there is a possible race condition that can hang or bring down the Stone. This is because the same semaphore is used to signal Gems waiting for SMC communications, and waiting for spin locks.

The SIGTERM interrupts the Gem's wait for the SMC response from the Stone, and the Gem continues handling the SIGTERM, which can involve waiting on spin locks to get page frames, etc. as part of shutdown. However, when the Stone finally completes the SMC response and signals the Gem, the Gem assumes this is the signal that the spin lock it was waiting for is now available, resulting in spin lock problems that may hang or crash the Stone, depending on the specific spin lock. (#39666)

### Risk of hang in SIGTERM error handling

*AIX only*

On AIX, there is a risk that SIGTERM processing may loop and hang, printing log messages. This is due to an unnecessary fsync(). (#39265)

### Incorrect signal handler for SIGINT

The signal handler installed for SIGINT specified an invalid number of arguments. (#39680)

### Signal handler chaining could pass incorrect number of arguments

When signal handlers are chained, either one or three arguments should be passed, specified in SA\_SIGINFO. GemStone signal handlers did not check, and always passed three arguments, which could be incorrect for customer installed signal handlers. (#39670)

### Fatal error on SIGTERM in linked VW image

Cincom VW signal handlers pass one argument and do not set SA\_SIGINFO (Cincom AR55820). If GemStone signal handlers are installed before VW handlers, such that VW handlers are called first before chaining to the GemStone handlers, it may result in a SIGBUS in GemStone handlers. This version of GemStone includes a workaround for the Cincom problem, but there remains a slight risk of a SEGV. (#39668)

### Possible infinite recursion in SIGTERM handler

If a SIGTERM handler is installed in a linked VW image, processing can infinitely recurse between the GemStone and VW handlers. (#39686)

## AIO page server failures may introduce corruption

Under very rare circumstances, it is possible for the stone to not immediately detect and shut down in response to an aio page server write failure. This allows inconsistent data to be written to the extents and subsequent page cache faults. (#39358, #39362)

Now, AIO page servers will retry following write failures up to 5 times. Each failure is reported to the log, even if the write passes on retry. The new cache statistic

AioWriteFailure tracks all such write failures. If all retries fail, the stone will shut down, since dirty pages cannot be reliably written to the extents.

If an AIO page server is killed, or dies prematurely, the stone will also shut down.

## Stone crash due to invalid access to remote session information

Code that used session information returned by Page Manager for remote sessions did not have appropriate bounds checking. In some cases this could have resulted in invalid pointer references leading to Stone SEGV due to memory corruption. (#39176, #39244)

## Login and password related issues

### Commit during login could have failed, causing later errors

During the login process, a new session updates the account's last login time, write-locks the security data information, and commits. In scenarios with many logins occurring simultaneously, the write lock may fail or be dirty, or the commit may fail. The code did not handle these scenarios and several subsequent problems could occur:

- ▶ The first user commit after login by the new session may fail, since no abort was done following the failed commit.
- ▶ The write lock may remain on the security data information.
- ▶ User information, such as login count, may not get updated. This affects results such as number of logins permitted before a password change is required.

(#39481, #39525)

### Slow session logins

Code changes in 6.3.1 inadvertently introduced a one-second sleep in the login process. (#39428)

### With password aging, logins failed while PDR gems running

When running with password aging features enabled, such as `loginsAllowedBeforeExpiration:`, which permits a limited number of logins for a `userId` before the password must be changed, each login commits to the repository. However, commits are disallowed while Parallel Dead Reclaim (PDR) GcGems are running. As result, all logins failed until the PDR gems completed reclaim and shut down. (#39630)

### Incorrect reason for disabled account

After logins are disabled, the reason is recorded on the user's account, and further attempts to log in will fail. If the user then attempted to log in, after the configured number of failed login attempts, the original reason for the account disable was overwritten by `LoginsWithInvalidPassword`. (#39520)

### UserProfile >> isDisabled may not have returned correct information

A UserProfile using password age or login time expiration limits will be suspended the next time that user attempts to login after the time limit is exceeded. But until that login attempt, `#isDisabled` continued to return false for that UserProfile. (#35611)

## Risk of access violation in logout of linked session

There was a risk of access violation/SEGV during logout of a linked session. This error was not reported to the user, but prevented any further linked logins from that process. This only observed on Windows, but is potentially a problem on other platforms. (#39825)

## Incorrect restore point in timeToRestoreTo:

When the DateTime specified as an argument to Repository >> timeToRestoreTo: has a different offset from GMT as the current time, the calculation of the seconds offset, used internally to perform the restore, was incorrect by the amount of offset. This occurs for example when one time is during Daylight Savings Time and the other is not. (#39635)

## Reduced lostOT timeout for transactionless sessions

If all sessions holding the oldest commit record are in transactionless state, the time interval between a sigAbort and a lostOTRoot was reduced to 1/4 of the configured value. This was intended to help with GBJ pooled sessions, but affected any sessions in transactionless mode. Now, this is only done if the sessions holding the oldest commit record are all logged in as the Nameless user, as well as being in transactionless mode. (#39677)

## GcGem startup failures caused session errors

If the GcGem failed to start, after 15 failed attempts it sent an rtErrGcGemStartupFailure error to Administrative sessions. This interrupted topaz and GBS sessions. This signal is no longer sent; the stone log should be monitored for startup failures after any changes are made. (#39671, #39651)

## Object already exists errors

During certain store traversal operations, such as flush from GBS, there was a risk of OBJ\_ERR\_ALREADY\_EXISTS errors (error 2105). (#39626)

## PageReads, PageWrites cache statistics were zero

The gem cache statistics PageReads and PageWrites were not updated, and were always zero. (#39600)

## Sessions incorrectly killed when timeout was -1

If STN\_GEM\_LOSTOT\_TIMEOUT = -1, then the stone is supposed to forcibly abort a session that does not respond to LostOtRoot. However the stone incorrectly killed the session. (#39655)

## Finalization of many set-valued indexes could result in commit record backlog

As an indexed collection is dereferenced and garbage collected, any indexes must be finalized by the GcGem. This was being done in transaction, and for very large numbers of indexes it could cause a commit record backlog. Now, the GcGem will commit every 15 seconds during the finalization step. (#39866)

## Character comparison failures

Character types that allow multiple bytes, such as JISCharacter, failed equality comparisons with the equivalent ordinary Character. (#39726)

## Sessions did not receive lost OT Root signal

Sessions did not receive the lost OT Root signal at the appropriate time for their stone's STN\_GEM\_ABORT\_TIMEOUT and STN\_GEM\_LOSTOT\_TIMEOUT settings. (#39908)

In addition to fixing this, the documentation in system.conf has been clarified.

## Empty descriptionOfSession: IP address in linked

In sessions that are running in linked mode, the results of System class >> descriptionOfSession: includes an empty string in the array element designated to return the client/gem IP address. (#39402)

## Stack traces with gstack

To avoid problems with the installed location of gstack on Linux distributions, GemStone now includes gstack in the bin directory. This provides more reliable stack traces on Linux. (#39407)

gstack now uses bash instead of sh. (#39644)

## copydbf -i on active tranlog very slow

Running copydbf -i or -I on the current active tranlog was very slow, effectively hanging for larger tranlogs. This is since copydbf attempts to get a lock, which fails for the active tranlog. As a result, the copydbf incorrectly treated this as an compressed file, using the much slower gzip functions to read the tranlog. (#39444)

## Version information incorrect

The GciVersion() call returned incorrect version information (6.3.0) for version 6.3.1 and later. (#39784)

Under Windows, the internal version number (visible in file properties) also incorrectly returned 6.3.0. (#39775)

## Upgrade leaves method in image

The unsafeSetOop: method is added during upgrade for use only by the upgrade process, but was inadvertently not removed when upgrade completed. (#39309)

## DbfHistory not initialized correctly

The DbfHistory of a new 6.2 or later repository did not specify the correct starting version. Upgrades were not affected. (#39315)

## Incomplete class documentation installation

Recently added non-Kernel core classes did not have documentation installation completed correctly. (#39320)

## Missing period in primitive failure handling code

The primitive method \_startGcSession:extentId: was missing a period in the failure handling code. (#39811)