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*GemStone*®

# **GemBuilder® for Java**

## **Release Notes**

**Version 3.2**

December 2024



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## PATENTS

GemStone software has been covered by U.S. Patent Number 6,256,637 “Transactional virtual machine architecture”, Patent Number 6,360,219 “Object queues with concurrent updating”, Patent Number 6,567,905 “Generational garbage collector with persistent object cache”, and Patent Number 6,681,226 “Selective pessimistic locking for a concurrently updateable database”.

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# Preface

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## About This Documentation

These Release Notes describe the changes in the GemBuilder® for Java version 3.2 release. Read these release notes carefully before you begin installation, upgrade, or development with this release.

For information on installing or upgrading to this version of GemBuilder for Java, please refer to the *GemBuilder for Java Installation Guide* for version 3.2.

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- ▶ **Product download** for the current and selected recent versions of GemTalk software.
- ▶ **Bugnotes**, identifying performance issues or error conditions that you may encounter when using a GemTalk product.
- ▶ **Supplemental Documentation** and **TechTips**, providing information and instructions that are not in the regular documentation.
- ▶ **Compatibility matrices**, listing supported platforms for GemTalk product versions.

We recommend checking this site on a regular basis for the latest updates.

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Please include the following, in addition to a description of the issue:

- ▶ The versions of GemBuilder for Java, GemStone, and of all related GemTalk products, and of any other related products, and the operating system and version you are using.
- ▶ Exact error message received, if any, including log files and statmonitor data if appropriate.

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# GemBuilder for Java 3.2 Release Notes

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GemBuilder for Java (GBJ) version 3.2 is a major new release of the GemBuilder for Java product.

GBJ 3.2 includes significant changes in the infrastructure involved in connecting to the GemStone server, and how RPC vs. linked sessions are configured. This affects how the environment is set up, but other than a few specific restrictions, the changes should be fairly transparent to the user.

This release also contains improvements in handling GemStone specials, and other changes and bug fixes.

These release notes provide details of the changes between the previous version of GBJ, version 3.1.3, and this release. If you are upgrading from a version earlier than 3.1.3, please refer to the *Release Notes* for each intermediate release as well.

To install GemBuilder for Java v3.2, follow the instructions in the *GemBuilder for Java Installation Guide* for v3.2.

## Supported Platforms

GemBuilder for Java version 3.2 is compatible with GemStone/S 64 Bit v3.7.2 only, with GemStone and clients on Linux only. Contact GemTalk for support on other platforms.

## Supported Java JDK

GBJ v3.2 requires Java version 8.

It was built and tested using 1.8.0\_102 on Linux on x86\_64, and with 1.8.0\_402 on Linux on ARM.

## New division of support for RPC vs. Linked

GBJ now supports two environments; one which supports robust, performant multithreaded applications using RPC sessions, and another to support maximum-performance single session linked applications.

The multithreaded RPC environment is supported by **gbj320.jar**, while the linked environment is supported by **gbjLnk320.jar**.

There are differences between the packages `com.gemstone.gbjgci` between the RPC and linked interfaces. However, using the `com.gemstone.gbj` package (which is recommended), a compiled java application should run correctly in both environments, provided the appropriate login parameters are used.

### Multithreaded RPC

To support performant multiple session GBJ applications, **gbj320.jar** loads the server thread-safe libraries, rather than the classic GCI libraries used in previous releases of GBJ. A related sources file is provided for debugging, **gbjsource320.jar**.

**gbj320.jar** loads the server shared library `libgcits*` and the GBJ-specific `libgbjts*`, which use GemStone/S 64 Bit's thread-safe GCI interface, with the API defined in `gcits.hf`.

The multiheaded RPC configuration using **gbj320.jar** has some limitations:

- ▶ linked logins are not supported
- ▶ client side user actions are not supported
- ▶ GsFile operations on the client are not supported

### Single Linked Session

To allow linked logins, **gbjLnk320.jar** is provided, which allows only a single instance of `GbjSession` to be logged in at a time. Using this `.jar` file provides the highest performance for a Java VM that only needs a single server session, with one Java thread executing queries. A related sources file is provided for debugging, **gbjLnksource320.jar**.

**gbjLnk320.jar** loads the server shared library `libgcilnk*`, and the GBJ-specific library `libgbjlnk*`, using the classic GCI defined in `gci.hf`.

A separate set of javadocs for this environment is provided under `docsLnk/`.

Using **gbjLnk320.jar**, the default java stack size is insufficient. The java argument to increase this value should be used; for example, `-Xss2048k`.

## Changes in this release

### Changes in synchronization for multithreading performance

Previous releases of GBJ used the classic GCI, which required significant extra handling to support multiple sessions.

**gbj320.jar** supports a Java VM containing multiple logged in instances of `GbjSession`. Access to the server is by synchronized methods in `com.gemstone.gbjgci.GbjGciSession`. This provides synchronizing on the instances of `GbjSession`, allowing multiple Java threads to simultaneously execute queries against multiple server sessions.



Previous releases of GBJ contained static synchronized native methods, which synchronized on the **com.gemstone.gbjgci.GbjGciInterface** class, which does not allow multithreaded execution of queries. Multiple sessions were supported by nonblocking executions. This access is now only used by the linked interface, and nonblocking executions have been removed. All access to the server is via blocking GCI calls.

## New required .jar file

GBJ v3.2 relies on BigFraction for Fraction support. This class is from Apache; see <https://commons.apache.org/proper/commons-math/>.

Your CLASSPATH or **-cp** argument must include the .jar file that supports this, **commons-math3-3.6.1.jar**.

This file can be downloaded from <https://dlcdn.apache.org/commons/math/binaries/>

## New semantics for handling GEMSTONE and locating shared libraries

GBJ requires access to a directory containing the GemStone server shared libraries, and it must know the version of the server that you are intended to connect to.

The process has changed in this release to unambiguously handle the expected configurations.

The follow are expected configurations:

- ▶ If you have a full GemStone installation (specifically with the shared libraries in \$GEMSTONE/lib/, and version.txt present), and you defined the \$GEMSTONE environment variable to point to this directory, then you do not need to do anything further. GBJ looks in the \$GEMSTONE/lib directory and does not look in any specification for LD\_LIBRARY\_PATH or **-Djava.library.path=**.
- ▶ If you do not have a full GemStone installation, for example if you want to compose a directory containing only the shared libraries on a client, do not define \$GEMSTONE. You must use the java command line option **-Dgemstone.version=3.7.2** and specify either LD\_LIBRARY\_PATH or **-Djava.library.path=**.

The \$GBJ\_GSVERSION environment variable is no longer used.

## TimeZone in Repository must match OS TimeZone during install

To avoid issues where a java.time.ZonedDateTime, which is based on /etc/timezone, and a GemStone server DateTime, which is based on TimeZone current, are not equal, the server's TimeZone must now match the OS's configured timezone.

The installation process verifies that the TimeZone installed in the repository (reported by TimeZone current) matches the TimeZone configured in the OS (in /etc/timezone), and reports an error if it does not match.

The GemStone/S 64 Bit v3.7.2 now includes support for updating the timezone by executing code, using `TimeZone >> installOsTimeZone`. See the *GemStone/S 64 Bit v3.7.2 Release Notes* or image method comments for more information.

## GbjCollection and GemStone Collections

Mapping Collections to GbjCollection did not work correctly for operations such as enumerations, when used against GemStone Collections that are not implemented by the

collection directly containing the content elements. These kinds of Collections are now mapped to GbjObject rather than GbjCollection.

Attempting to use GbjCollection with these kinds of collections is no longer allowed.

This includes: Set and Bag, as well as other GemStone specific collections such as GsPipe and RcQueue. Dictionaries are also not supported, due to variations in the implementations.

See GbjGciInterface class >> excludeFromGbjCollectionMapping for the excluded classes.

## Improved GemStone-Java class mapping

New class mappings have been added to better support recently added GemStone server specials.

The following table lists the current class mappings:

GemStone Server Class	Java Class
LargeInteger	BigInteger
SmallDouble	double
Float	double
SmallScaledDecimal	BigDecimal
ScaledDecimal	BigDecimal
DecimalFloat	BigDecimalFloat (new in 3.2)
SmallFraction	BigFraction (included from Apache library)
Fraction	BigFraction (included from Apache library)
SmallDate	LocalDate
SmallTime	LocalTime
GbjLocalDateTime (new class in v3.2)	LocalDateTime
GbjZonedDateTime (new class in v3.2)	ZonedDateTime
SmallDateAndTime	OffsetDateTime
DateAndTime	OffsetDateTime
GbjInstant (new class in v3.2)	Instant
GbjUtilDate (new class in v3.2)	java.util.Date
DateTime (not recommended)	Calendar

### Added classes

#### GbjInstant

GbjInstant is a subclass of DateAndTime, used to represent instances of Java.time.Instant. Instances in the server have a timezone offset of zero (GMT); any offset stored in the instance is ignored in Java.

### **GbjLocalDateTime**

GbjLocalDateTime is a subclass of DateAndTime, used to represent instances of Java LocalDateTime. Instances in the server have a timezone offset of zero (GMT); any offset stored in the instance is ignored in Java.

### **GbjUtilDate**

GbjUtilDate is a subclass of DateAndTime, used to represent instances of Java.util.Date.

### **GbjZonedDateTime**

GbjZonedDateTime is a subclass of DateAndTime, used to represent instances of Java ZonedDateTime.

## **Obsolete Class no longer installed**

### **GbjGciForwarder**

The class GbjGciForwarder was obsolete in v3.1 and later, and with v3.2 is no longer installed by GBJ. It will not be present in new installations, although will remain in upgraded installations.

## **GBJ Shared Library information printed**

When logging in using GBJ, the specific build information for the server and GBJ shared libraries is printed to stdout.

## **Bugs Fixed**

### **Handling strings with codepoints over 128**

Previously, there were a number of issues in the way java strings outside the ASCII range were handled in GemStone. A number of specific bugs have been fixed, and extensive testing and cleanup has been done in this area.

#### **java strings containing codepoints in the range 128 to 255 left UTF-8 encoding in the GemStone string**

For java strings containing codepoints in the range 128-255, the resulting single-byte String created in GemStone contained UTF-8 codepoints using two bytes, rather than the single 8-bit Character. #(50996)

#### **Handling codepoints over 16rFFFF**

Instances of java.lang.String contain UTF-16 encoded data. When these are converted to Smalltalk objects, java strings containing code points in the range 16r10000 to 16r10FFFF (the unicode maximum) were not correctly converted to QuadByteString/Unicode32. (#51112)

Note that GemStone/S 64 Bit now disallows characters with code points in the range 16rD800 to 16rDFFF; these are illegal characters in Unicode.

## Creating Legacy or Unicode Strings

GemStone supports two kinds of strings, the legacy String/DoubleByteString/QuadByteString, and the unicode strings Unicode7/Unicode15/Unicode32.

Previously, when a java string stored into GemStone, it was always a legacy string. Now, the kind of String created depends on the repository's configuration. If the class defined by (Globals at: #StringConfiguration) is String, then a legacy string of the appropriate class for that string's codePoint range is created; if this is Unicode16, then the appropriate class of unicode string is created. (#46427)

## GCSI statistics initialization failed

When running with GemStone/S 64 Bit v3.7 or later, GCSI statistics initialization failed, as a larger Array size was needed to hold results. (#50994)

## GbjIterator raised exception when accessing elements outside of the batch size range

When using an instance of GbjIterator to enumerate over a large collection, if the collection was larger than GbjIterator.BatchSize (which defaults to 1000), then an exception "startindex/numObjs out of range in getObjs()" was raised when attempting to enumerate to an element beyond the batch size. (#47289)

## Enumeration over large collection of registered class instances can fail with ClassCastException

When using registerStub to establish a correspondence between a java and GemStone Smalltalk class, and enumerating over a collection of instances of this class that was replicated from the server, and the size of the preload buffer (as set in GbjSession.initialize()) is smaller than the number of objects in the replicated collection, then retrieval of elements that were not preloaded failed with a java.lang.ClassCastException. (#47084)

## Incorrect results for GbjObject.stringValue() on very large integers

Using the GbjObject.stringValue() method returned incorrect results on LargeInteger objects. (#46551)

## Printout of OOP in GbjObject toString can be negative

When OOPs are printed using GbjObject asString(), for OOPs greater than 1152921504606846975, the printed version wrapped, and was printed as an incorrect negative value. (#48138)

## Problems using GbjLauncher programmatically

Calling up the GbjLauncher from a java program on an open session (via "new GbjLauncher(mySession)") worked, but subsequent subwindows could not be opened. This way of invoking GbjLauncher did not execute code that set GemStone-to-java class mappings correctly. (#46531)