

## External BSF4Rexx Functions - Overview

The external BSF4Rexx functions allow interfacing with Java. If the Rexx script was invoked by Java, then the external Rexx function `BSF()` is registered already.

**BSF(args)** Main function to interface with Java, see "*Subfunctions of BSF()*".

**BsfDropFuncs()** Drops all registered BSF4Rexx functions.

**BsfGetTID(), BsfAttachToTID(tid), BsfDetach()** ooRexx multithreading support: returns the current ooRexx thread id, attaches the current ooRexx thread to the established Java interface of the given ooRexx `tid`, detaches from the attached Java interface.

**BsfInvokedBy()** Returns 0, if no Java is present, returns 1 if BSF4Rexx was invoked by Java, returns 2 if BSF4Rexx was invoked by Rexx.

**BsfLoadFuncs()** Loader function for registering the external BSF4Rexx functions.

**BsfLoadJava([args])** Loads Java. Optionally pass each startup Java argument as its own argument to this function. If the `-Djava.class.path=...` argument is given, the environment `CLASSPATH` value will not be used for starting up Java.

**BsfQueryAllFunctions()** Returns a stem array denoting all external BSF4Rexx functions defined in BSF4Rexx.dll (Windows) resp. libBSF4Rexx.so (Linux/Unix).

**BsfQueryRegisteredFunctions()** Returns a stem array denoting all external BSF4Rexx functions that are registered and can be therefore used.

**BsfShowErrorMessage([0|1])** Returns 1, if Java exception messages are displayed, 0 else. Supplying an argument of "1" turns on displaying Java exception messages (default), a value of "0" turns off showing Java error messages. In case of a Java exception, a Rexx variable named `BSF_ERROR_MESSAGE` is set to the Java exception message.

**BsfUnloadJava()** Unloads Java.

**BSFVersion()** Returns the version string of the BSF4Rexx dynamic link library, in the form `xnn.yyyymmdd_rexx-engine-package-name`, where `x` denotes the major version number, `nn` the minor version number, and `yyyymmdd` the date; after the space the Java package name of the Java BSF Rexx engine is given.

## Loading the External BSF4Rexx Functions

```
if rxFuncQuery("BSF") = 1 then /* not registered yet, hence load it! */
do
  call rxFuncAdd "BsfLoadFuncs", "BSF4Rexx", "BsfLoadFuncs"
  call BsfLoadFuncs /* registers all BSF4Rexx functions */
  call BsfLoadJava /* loads Java */
end
```

## Subfunctions of BSF()

The external Rexx function `BSF()` is the main interface to Java from Rexx and resides in the BSF4Rexx DLL/so. As such this function offers a wealth of functionality, organized into subfunctions, e.g.:

```
call BSF "sleep", 1.05 /* sleep 1050 msec, invoked as a procedure */
```

or

```
res=BSF("sleep", 1.05) /* sleep 1050 msec, invoked as a function */
```

Sometimes return values or arguments indicate that no value is supplied. For that purpose one uses the string `..NIL`, which represents the Java value `null`.

In very rare cases it is necessary to indicate the exact type of an argument. All subfunction names containing the string `strict` expect a `typeIndicator` to precede each argument, according to the following table (bold characters in `typeIndicator` strings must be at least given):

TypeIndicator	The Immediately Following Argument is of Type
"B0olean"	<b>boolean</b> , ie. the value <b>0</b> (false) or <b>1</b> (true)
"BYte"	a <b>byte</b> value
"Char"	<b>char</b> , ie. a single (UTF8) character
"Double"	a <b>double</b> value
"Float"	a <b>float</b> value
"Int"	<b>int</b> , ie. an integer value
"Long"	<b>long</b> a long value
"Object"	a Java object stored in the BSF registry
"SHort"	a <b>short</b> value
"SString"	a <b>String</b> value (UTF8)

In the following subfunctions `beanName` denotes the key in the BSF registry referencing the desired Java object (the bean):

- `addEventListener, beanName, eventSetName, eventName, eventText`
- `addEventListenerReturningEventInfos, beanName, eventSetName, - eventName, eventText, sendBackData`
- `arrayAt, arrayBeanName, idx0 [, idx1]...`  
`arrayAt, arrayBeanName, intArrayBean`
- `arrayLength beanName`
- `arrayPut, arrayBeanName, newValue, idx0 [, idx1]...`  
`arrayPut, arrayBeanName, newValue, intArrayBean`
- `arrayPutStrict, arrayBeanName, typeIndicator, newValue, idx0 - [, idx1]...`  
`arrayPutStrict arrayBeanName, typeIndicator, newValue, intArrayBean`
- `bsfPrefixReturnValue([0|1])` (if '1': prefix '<D>' and '<S>' added to all)
- `createArray, JavaClassObjectBeanName, dim0 [, dim1]...`  
`createArray, JavaClassObjectBeanName, intArrayBean`
- `exit [, [exitCode] [, time2wait_in_msec]]`
- `getBSFManager`
- `getFieldValue, beanName, fieldName`  
`getFieldValueStrict, beanName, fieldName`
- `getPropertyValue, beanName, propertyName, index|.NIL`
- `getStaticValue, JavaClassName, fieldName`  
`getStaticValueStrict, JavaClassName, fieldName`
- `haltThread, tid`
- `invoke, beanName, methodName [, argument]...`  
`invokeStrict, beanName, methodName [, typeIndicator, argument]...`
- `loadClass, JavaClassName`
- `lookupBean, beanName`
- `new|registerBean, [beanName], JavaClassName [, argument]...`
- `newStrict|registerBeanStrict, [beanName], JavaClassName - [, typeIndicator, argument]...`
- `pollEventText [, timeout_in_msec]`
- `postEventText, eventText[, priority]` (priority: 0=low,1=normal,2=high)
- `rawRegisterBean, beanName, object`
- `setFieldValue, beanName, fieldName, newValue`  
`setFieldValueStrict, beanName, fieldName, [typeIndicator,] newValue`
- `setPropertyValue, beanName, propertyName, index|.NIL, - newValue`  
`setPropertyValueStrict, beanName, propertyName, index|.NIL, - typeIndicator, newValue`
- `setRexxNullString, newString`
- `sleep, time2sleep_in_seconds`
- `unregisterBean, beanName`
- `version [All|ARayWrapper|BsfManager|EnumerationWrapper|Java4Rexx|REXXAndJava|REXXEngine|Supplier]`
- `wrapArray, arrayBeanName`
- `wrapEnumeration, enumerationBeanName`

## Preregistered Java Objects (BSF Registry)

To ease creating Java array objects, the most important Java class objects are preregistered in the BSF registry on the Java side. *Please note:* the name of the BSF registry keys for class objects representing the primitive datatypes `byte`, `char`, `short`, `int`, `long`, `float` and `double` start with a *lower case letter*:

BeanName (Key for Registry)	References the Java Class Object
"Array.class"	java.lang.reflect.Array
"Class.class"	java.lang.Class
"Method.class"	java.lang.reflect.Method
"Object.class"	java.lang.Object
"String.class"	java.lang.String
"System.class"	java.lang.System
"Thread.class"	java.lang.Thread
"boolean.class"	<b>boolean</b> (primitive datatype)
"Boolean.class"	java.lang.Boolean
"byte.class"	<b>byte</b> (primitive datatype)
"Byte.class"	java.lang.Byte
"char.class"	<b>char</b> (primitive datatype)
"Character.class"	java.lang.Character
"double.class"	<b>double</b> (primitive datatype)
"Double.class"	java.lang.Double
"float.class"	<b>float</b> (primitive datatype)
"Float.class"	java.lang.Float
"int.class"	<b>int</b> (primitive datatype)
"Integer.class"	java.lang.Integer
"long.class"	<b>long</b> (primitive datatype)
"Long.class"	java.lang.Long
"short.class"	<b>short</b> (primitive datatype)
"Short.class"	java.lang.Short
"void.class"	<b>void</b> (primitive datatype)
"Void.class"	java.lang.Void



## ooRexx Interface (Module BSF.CLS)

The object-oriented interface support for ooRexx is realized by calling or requiring the ooRexx module `BSF.CLS`, which defines public routines, classes and the environment symbol `.BSF4REXX` (a directory containing BSF objects). You can get at that support in one of two ways:

```
call BSF.CLS /* make oo-like BSF4Rexx support available */
```

or

```
::requires BSF.CLS /* make oo-like BSF4Rexx support available */
```

If Java needs to be started by `BSF.CLS` it honors the Java startup options (like setting the Java heap size) given in the optional shell environment variable named `"BSF4Rexx.JavaStartupOptions"`. It sets `bsfPrefixReturnValue`.

Sometimes return values or arguments indicate that no value is supplied. For that purpose the ooRexx object `.nil` (an environment symbol, hence not quoted) is used, which represents the Java value `null`. Java errors get stored in the environment (`.BSF_ERROR_MESSAGE`).

Most of the BSF4Rexx subfunctions are made available as class or instance methods of the public class `BSF`, prepended with the string `"bsf."`.

The public class `BSF` is used for representing Java (class) objects. Its instances are proxy objects which forward received messages to the Java side for invocation. When such ooRexx proxy objects get garbage collected, they will cause the BSF registry reference counter of the represented Java object to be decreased. If that reference counter drops to zero, the Java object gets removed from the BSF registry.

## Public Routines

- `box(typeIndicator, value)` wraps `value` as a Java object of type `typeIndicator` and returns the reference to it
- `bsf.createArray(...)` see BSF-subfunction
- `bsf.getConstant(JavaClassName, fieldName)`
- `bsf.getEventInfoObject(eventText)`
- `bsf.getStaticValue(...)` see BSF-subfunction
- `bsf.getStaticValueStrict(...)` see BSF-subfunction
- `bsf.haltThread(...)` see BSF-subfunction
- `bsf.import(javaClassName[, .nil|name4.local])`
- `bsf.loadClass(...)` see BSF-subfunction
- `bsf.lookupBean(...)` see BSF-subfunction
- `bsf.pollEventText(...)` see BSF-subfunction
- `bsf.postEventText(...)` see BSF-subfunction
- `bsf.unregisterBean(...)` see BSF-subfunction
- `bsf.version(...)` see BSF-subfunction
- `bsf.wrap(strBSFRegistryKey)` returns an ooRexx proxy object, if string is a Java object in the BSF registry, otherwise the supplied argument
- `bsf.wrapStaticFields(JavaClassName)` returns an ooRexx directory object
- `iif(truthValue, valueIfTrue, valueIfFalse)` returns `valueIfTrue`, if first argument is `.true`, returns `valueIfFalse` else
- `pp(argument)` returns argument's string value enclosed in square parenthesis
- `unbox(o)` returns the value from Java's primitive datatype wrapper object `o`

## Public Class BSF

This is the ooRexx proxy class for representing Java classes. ooRexx messages sent to it or its instances cause the invocation of the appropriate Java methods. All methods starting with `bsf.` are pass-through methods and its arguments are documented in the BSF subfunctions on the other page.

If the ooRexx proxy object gets garbage collected by ooRexx, the reference counter for the represented Java object in the BSF registry gets decreased (if that counter hits zero, the Java object is removed from the BSF registry, such that it can be garbage collected by Java).

## BSF's CLASS METHODS

- `bsf.createArray(...)` see BSF-subfunction
- `bsf.exit(...)` see BSF-subfunction
- `bsf.getStaticValue(...)` see BSF-subfunction
- `bsf.getStaticValueStrict(...)` see BSF-subfunction
- `bsf.haltThread(...)` see BSF-subfunction
- `bsf.import(JavaClassName [, .nil | name4.local])`
- `bsf.loadClass(JavaClassName)` see BSF-subfunction
- `bsf.lookupBean(...)` see BSF-subfunction
- `bsf.pollEventText(...)` see BSF-subfunction
- `bsf.postEventText(...)` see BSF-subfunction
- `bsf.setRexxNullString(...)` see BSF-subfunction
- `bsf.sleep(...)` see BSF-subfunction
- `bsf.wrapArray(...)` see BSF-subfunction
- `bsf.wrapEnumeration(...)` see BSF-subfunction
- `newStrict([ typeIndicator, argument]...)` only available, if the ooRexx class object proxy was created with `bsf.import()`; creates an instance of the given Java class using typed arguments (as opposed to the `new` method) and returns an ooRexx proxy object

## BSF's INSTANCE METHODS

- `bsf.class` returns Java class object proxy
- `bsf.addEventListener(...)` see BSF-subfunction
- `bsf.addEventListenerReturningEventInfos(...)` see BSF-subfunction
- `bsf.dispatch(methName[,args]...)` forwards to method `bsf.invoke(...)`
- `bsf.exit(...)` see BSF-subfunction
- `bsf.invoke(...)` see BSF-subfunction
- `bsf.invokeStrict(...)` see BSF-subfunction
- `bsf.getFieldValue(...)` see BSF-subfunction
- `bsf.getFieldValueStrict(...)` see BSF-subfunction
- `bsf.setFieldValue(...)` see BSF-subfunction
- `bsf.setFieldValueStrict(...)` see BSF-subfunction
- `bsf.getPropertyValue(...)` see BSF-subfunction
- `bsf.setPropertyValue(...)` see BSF-subfunction
- `bsf.setPropertyValueStrict(...)` see BSF-subfunction

## Private Class BSF\_ARRAY\_REFERENCE

`BSF_ARRAY_REFERENCE` is a subclass of `BSF` that allows interacting with Java array objects (stored in the BSF registry) as if they were ooRexx arrays (e.g. index values start with `1`, and the ooRexx array methods `AT`, `[]`, `DIMENSION`, `ITEMS`, `MAKEARRAY`, `PUT`, `[]=`, `SUPPLIER` are implemented).

The public routine `bsf.wrap` will use this class to create the ooRexx proxy object, if it detects that the supplied BSF registry key refers to a Java array object.

## Public Class BSF\_PROXY

`BSF_PROXY` is a subclass of `BSF` that allows creating proxy objects by passing the BSF registry key (a string) to its init method. This allows sending ooRexx messages which will cause the appropriate Java methods to be invoked.

Unlike direct instances of the `BSF` class, these proxy objects, if garbage collected, do not decrease the BSF registry counter.

## Directory Object .BSF4Rexx

`BSF.CLS` will initialize a directory object to contain proxies to all preregistered Java objects in the BSF registry. As ooRexx will translate statements into uppercase before executing them, the directory index values `Byte.class` and `byte.class` cannot be distinguished anymore as they both become `BYTE.CLASS`. Therefore the index value of the primitive class object references do not carry the suffix `.CLASS`.

Get the Java version by querying the Java class object `java.lang.System`:

```
call bsf.cls /* load the ooRexx support for BSF4Rexx */
say .bsf4Rexx~system.class ~getProperty('java.version')
```

or create a two dimensional Java array (3 by 4 elements) of the primitive datatype `int`:

```
a=bsf.createArray(.bsf4Rexx~int, 3, 4) /* create Java int array (3x4) */
::requires BSF.CLS /* load the ooRexx support for BSF4Rexx */
```

Index	References the Java Class Object
ARRAY.CLASS	<code>java.lang.reflect.Array</code>
BOOLEAN	<code>boolean</code> (primitive datatype)
BOOLEAN.CLASS	<code>java.lang.Boolean</code>
BYTE	<code>byte</code> (primitive datatype)
BYTE.CLASS	<code>java.lang.Byte</code>
CHAR	<code>char</code> (primitive datatype)
CHARACTER.CLASS	<code>java.lang.Character</code>
CLASS.CLASS	<code>java.lang.Class</code>
DOUBLE	<code>double</code> (primitive datatype)
DOUBLE.CLASS	<code>java.lang.Double</code>
FILE.SEPARATOR	File separator (e.g. <code>"/"</code> , <code>"\"</code> )
FLOAT	<code>float</code> (primitive datatype)
FLOAT.CLASS	<code>java.lang.Float</code>
INT	<code>int</code> (primitive datatype)
INTEGER.CLASS	<code>java.lang.Integer</code>
LINE.SEPARATOR	Line end character(s)
LONG	<code>long</code> (primitive datatype)
LONG.CLASS	<code>java.lang.Long</code>
METHOD.CLASS	<code>java.lang.reflect.Method</code>
OBJECT.CLASS	<code>java.lang.Object</code>
PATH.SEPARATOR	Path separator (e.g. <code>":"</code> , <code> ";"</code> )
SHORT	<code>short</code> (primitive datatype)
SHORT.CLASS	<code>java.lang.Short</code>
STRING.CLASS	<code>java.lang.String</code>
SYSTEM.CLASS	<code>java.lang.System</code>
THREAD.CLASS	<code>java.lang.Thread</code>
void	<code>void</code> (primitive datatype)
VOID.CLASS	<code>java.lang.Void</code>

## Public Class BSF\_DIALOG

Supplies the methods `messageBox()`, `dialogBox()` or `inputBox()`, via the class object `.BSF_DIALOG` or an instance of it.

- `messageBox(message, [title], [type])` always returns `.nil`
- `dialogBox(message, [title], [type], [optionType], [icon], [txtButtons], [defaultTxtButton])` returns button number (0=first button)
- `inputBox(message, [title], [type], [icon], [txtOptions], [defaultTxtOption])` returns entered/chosen text

where:

`type` one of `error`, `information`, `plain`, `question`, `warning`  
`optionType` one of `default`, `OkCancel`, `YesNo`, `YesNoCancel`

```
.bsf.dialog~messageBox("Think about it!") /* using the class object */
/* create and show a frame object for which a modal dialog is used */
f=.bsf~new("java.awt.Frame", "Hello!")~pack~show /* create and show */
fdlg=.bsf.dialog~new(f) /* create an instance, tell it about 'f' */
say fdlg~dialogBox("Continue?", , "warning", "YesNo") /* modal to 'f' */
```