

# **Squirrel Standard Library 2.0**

**Alberto Demichelis**

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Alberto Demichelis

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# Chapter 1. Introduction

The squirrel standard libraries consist in a set of modules implemented in C++. While are not essential for the language, they provide a set of useful services that are commonly used by a wide range of applications(file I/O, regular expressions, etc...), plus they offer a foundation for developing additional libraries.

All libraries are implemented through the squirrel API and the ANSI C runtime library. The modules are organized in the following way:

- I/O : input and output
- blob : binary buffers manipulation
- math : basic mathematical routines
- system : system access function
- string : string formatting and manipulation

The libraries can be registered independently,except for the IO library that depends from the bloblib.

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# Chapter 2. The Input/Output library

the input lib implements basic input/output routines.

## Squirrel API

### Global symbols

**dofile**(path);

compiles a squirrel script or loads a precompiled one and executes it. returns the value returned by the script or null if no value is returned.

**fopen**(filename, mode);

opens or create a file and returns it as file object

*filename* is the absolute or relative path of the file, *mode* is the access mode. This string is exactly what is used in the standard C function `fopen`.

**loadfile**(path);

compiles a squirrel script or loads a precompiled one and returns it as a function.

`stderr`

File object bound on the os *standard error* stream

`stdin`

File object bound on the os *standard input* stream

`stdout`

File object bound on the os *standard output* stream

### File class

The file object is bla bla bla

**eos**( );

returns a non null value if the read/write pointer is at the end of the stream.

**flush**( );

flushes the stream. return a value != null if succeeded, otherwise returns null

**len**( );

returns the length of the stream

**readblob**(size);

read n bytes from the stream and returns them as blob

**readn**(type);

reads a number from the stream according to the type parameter. *type* can have the following values:

'i'	32bits number	returns an integer
's'	16bits signed integer	returns an integer
'w'	16bits unsigned integer	returns an integer
'c'	8bits signed integer	returns an integer
'b'	8bits unsigned integer	returns an integer
'f'	32bits float	returns an float
'd'	64bits float	returns an float

**readstr**(size, [encoding]);

reads n characters from the stream and returns it as string. if *encoding* is omitted the function read an 8bit string. *encoding* can have the following values:

'a'	8bits character string
'u'	16bits character string

**seek**(seek, [origin]);

Moves the read/write pointer to a specified location. *offset* indicates the number of bytes from *origin*. *origin* can be 'b' beginning of the stream, 'c' current location or 'e' end of the stream. If origin is omitted the parameter is defaulted as 'b'(beginning of the stream).

**tell**();

returns read/write pointer absolute position

**writeblob**(blob);

writes a blob in the stream

**writen**(n, type);

writes a number in the stream formatted according to the type parameter. *type* can have the following values:

'i'	32bits number
's'	16bits signed integer
'w'	16bits unsigned integer
'c'	8bits signed integer
'b'	8bits unsigned integer
'f'	32bits float
'd'	64bits float

**writestr**(str, [encoding]);

writes a string in the stream *str* is the string that as to be written, *encoding* is and optional parameter that can have the following values:

'a'	8bits character string
'u'	16bits character string

if *encoding* is omitted the default value is 'a'.

## C API

## Initialization

sqstd\_register\_iolib

SQRESULT **sqstd\_register\_iolib**(HSQUIRRELV *v*);

initialize and register the io library in the given VM.

parameters:

*HSQUIRRELV v* the target VM

return: an SQRESULT

remarks: The function aspects a table on top of the stack where to register the global library functions.

## File object

sqstd\_createfile

SQRESULT **sqstd\_createfile**(HSQUIRRELV *v*, SQFILE *file*, int *own*);

creates a file object bound to the SQFILE passed as parameter and pushes it in the stack

parameters:

*HSQUIRRELV v* the target VM

*SQFILE file* the stream that will be represented by the file object

*int own* if different than 0 the stream will be automatically closed when the newly create file object is destroyed.

return: an SQRESULT

sqstd\_getfile

SQRESULT **sqstd\_getfile**(HSQUIRRELV *v*, int *idx*, SQFILE \* *file*);

retrieve the pointer of a stream handle from an arbitrary position in the stack.

parameters:

*HSQUIRRELV v* the target VM

*int idx* and index in the stack

*SQFILE \* file* A pointer to a SQFILE handle that will store the result

return: an SQRESULT



## Script loading and serialization

sqstd\_loadfile

```
SQRESULT sqstd_loadfile(HSQIRRELVM v, const SQChar * filename,
int printerror);
```

compiles a squirrel script or loads a precompiled one and pushes it as closure in the stack.

parameters:

<i>HSQIRRELVM v</i>	the target VM
<i>const SQChar * filename</i>	path of the script that has to be loaded
<i>int printerror</i>	if different than zero the compiler error handler will be called if a error occurs.

return: an SQRESULT

sqstd\_dofile

```
SQRESULT sqstd_dofile(HSQIRRELVM v, const SQChar * filename,
int retval, int printerror);
```

Compiles a squirrel script or loads a precompiled one and executes it. Optionally pushes the return value of the executed script in the stack.

parameters:

<i>HSQIRRELVM v</i>	the target VM
<i>const SQChar * filename</i>	path of the script that has to be loaded
<i>int retval</i>	if different than zero the function will push the return value of the executed script in the stack.
<i>int printerror</i>	if different than zero the compiler error handler will be called if a error occurs.

return: an SQRESULT

remarks: the function aspects a table on top of the stack that will be used as 'this' for the execution of the script.

eg.

```
sq_pushroottable(v); //push the root table(were the globals of the script are)
sqstd_dofile(v, _SC("test.nut"), 0, 1); // also prints syntax errors if any
```

sqstd\_writeclosuretofile

```
SQRESULT sqstd_writeclosuretofile(HSQUIRRELVM v, const SQChar  
* filename);
```

serializes the closure at the top position in the stack as bytecode in the file specified by the parameter filename. If a file with the same name already exists, it will be overwritten.

parameters:

<i>HSQUIRRELVM v</i>	the target VM
<i>const SQChar * filename</i>	path of the script that has to be loaded

return: an SQRESULT

---

# Chapter 3. The Blob library

The blob library implements binary data manipulations routines. The library is based on blob objects that represent a buffer of arbitrary binary data.

## Squirrel API

### Global symbols

**blob(size);**

returns a new instance of a blob class of the specified size in bytes

**castf2i(f);**

casts a float to a int

**casti2f(n);**

casts a int to a float

**swap2(n);**

swap the byte order of a number (like it would be a 16bits integer)

**swap4(n);**

swap the byte order of an integer

**swapfloat(f);**

swaps the byteorder of a float

### The blob class

The blob object is a buffer of arbitrary binary data. The object behaves like a file stream, it has a read/write pointer and it automatically grows if data is written out of his boundary. A blob can also be accessed byte by byte through the [ ] operator.

**eos();**

returns a non null value if the read/write pointer is at the end of the stream.

**flush();**

flushes the stream. return a value != null if succeeded, otherwise returns null

**len();**

returns the lenght of the stream

**readblob(size);**

read n bytes from the stream and returns them as blob

**readn(type);**

reads a number from the stream according to the type parameter. *type* can have the following values:

'i'	32bits number	returns an integer
's'	16bits signed integer	returns an integer
'w'	16bits unsigned integer	returns an integer
'c'	8bits signed integer	returns an integer
'b'	8bits unsigned integer	returns an integer
'f'	32bits float	returns a float
'd'	64bits float	returns a float

**readstr**(size, [encoding]);

reads *n* characters from the stream and returns it as string. if *encoding* is omitted the function reads an 8bit string. *encoding* can have the following values:

'a'	8bits character string
'u'	16bits character string

**resize**(size);

resizes the blob to the specified *size*

**seek**(seek, [origin]);

Moves the read/write pointer to a specified location. *offset* indicates the number of bytes from *origin*. *origin* can be 'b' beginning of the stream, 'c' current location or 'e' end of the stream. If origin is omitted the parameter is defaulted as 'b'(beginning of the stream).

**swap2**();

swaps the byte order of the blob content as it would be an array of 16bits integers

**swap4**();

swaps the byte order of the blob content as it would be an array of 32bits integers

**tell**();

returns read/write pointer absolute position

**writeblob**(blob);

writes a blob in the stream

**writen**(n, type);

writes a number in the stream formatted according to the type parameter. *type* can have the following values:

'i'	32bits number
's'	16bits signed integer
'w'	16bits unsigned integer
'c'	8bits signed integer
'b'	8bits unsigned integer
'f'	32bits float
'd'	64bits float

**writestr**(str, [encoding]);

writes a string in the stream *str* is the string that is to be written, *encoding* is an optional parameter

that can have the following values:

'a'	8bits character string
'u'	16bits character string

if *encoding* is omitted the default value is 'a'.

## C API

### Initialization

`sqstd_register_bloblib`

```
SQRESULT sqstd_register_bloblib(HSQUIRRELV v);
```

initialize and register the blob library in the given VM.

parameters:

*HSQUIRRELV v* the target VM

return: an SQRESULT

remarks: The function aspects a table on top of the stack where to register the global library functions.

### Blob object

`sqstd_getblob`

```
SQRESULT sqstd_getblob(HSQUIRRELV v, int idx, SQUserPointer * ptr);
```

retrieve the pointer of a blob's payload from an arbitrary position in the stack.

parameters:

*HSQUIRRELV v* the target VM

*int idx* and index in the stack

*SQUserPointer \* ptr* A pointer to the userpointer that will point to the blob's payload

return: an SQRESULT

`sqstd_getblobsize`

```
int sqstd_getblobsize(HSQUIRRELV v, int idx);
```

retrieve the size of a blob's payload from an arbitrary position in the stack.

parameters:

*HSQUIRRELV**M* *v*    the target VM  
*int* *idx*            and index in the stack

return:            the size of the blob at *idx* position

<code>sqstd_createblob</code>
-------------------------------

```
SQUserPointer sqstd_createblob(HSQUIRRELV v, int size);
```

creates a blob with the given payload size and pushes it in the stack.

parameters:

*HSQUIRRELV**M* *v*    the target VM  
*int* *size*            the size of the blob payload that has to be created

return:            a pointer to the newly created blob payload

---

# Chapter 4. The Math library

the math lib provides basic mathematic routines. The library mimics the C runtime library implementation.

## Squirrel API

### Global symbols

**abs**(*x*) ;

returns the absolute value of *x* as integer

**acos**(*x*) ;

returns the arccosine of *x*

**asin**(*x*) ;

returns the arcsine of *x*

**atan**(*x*) ;

returns the arctangent of *x*

**atan2**(*x*, *y*) ;

returns the arctangent of *y/x*.

**ceil**(*x*) ;

returns a float value representing the smallest integer that is greater than or equal to *x*

**cos**(*x*) ;

returns the cosine of *x*

**exp**(*x*) ;

returns the exponential value of the float parameter *x*

**fabs**(*x*) ;

returns the absolute value of *x* as float

**floor**(*x*) ;

returns a float value representing the largest integer that is less than or equal to *x*

**log**(*x*) ;

returns the natural logarithm of *x*

**log10**(*x*) ;

returns the logarithm base-10 of *x*

**pow**(*x*, *y*) ;

returns  $x$  raised to the power of  $y$ .

**rand**( ) ;

returns a pseudorandom integer in the range 0 to RAND\_MAX

**sin**( $x$ ) ;

returns the sine of  $x$

**sqrt**( $x$ ) ;

returns the square root of  $x$

**srand**(seed) ;

sets the starting point for generating a series of pseudorandom integers

**tan**( $x$ ) ;

returns the tangent of  $x$

PI

The numeric constant pi (3.141592) is the ratio of the circumference of a circle to its diameter

RAND\_MAX

the maximum value that can be returned by the rand( ) function

## C API

### Initialization

sqstd_register_mathlib
------------------------

SQRESULT **sqstd\_register\_mathlib**(HSQUIRRELV  $v$ ) ;

initialize and register the math library in the given VM.

parameters:

*HSQUIRRELV*  $v$  the target VM

return: an SQRESULT

remarks: The function aspects a table on top of the stack where to register the global library functions.



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# Chapter 5. The System library

The system library exposes operating system facilities like environment variables, date time manipulation etc..

## Squirrel API

### Global symbols

**clock()** ;

returns a float representing the number of seconds elapsed since the start of the process

**date**([*time*], [*format*]);

returns a table containing a date/time splitted in the slots:

<i>sec</i>	Seconds after minute (0 - 59).
<i>min</i>	Minutes after hour (0 - 59).
<i>hour</i>	Hours since midnight (0 - 23).
<i>day</i>	Day of month (1 - 31).
<i>month</i>	Month (0 - 11; January = 0).
<i>year</i>	Year (current year).
<i>wday</i>	Day of week (0 - 6; Sunday = 0).
<i>yday</i>	Day of year (0 - 365; January 1 = 0).

if *time* is omitted the current time is used.

if *format* can be 'l' local time or 'u' UTC time, if omitted is defaulted as 'l'(local time).

**getenv**(*varaname*) ;

Returns a string containing the value of the environment variable *varname*

**remove**(*path*) ;

deletes the file specified by *path*

**rename**(*oldname*, *newname*) ;

renames the file or directory specified by *oldname* to the name given by *newname*

**system**(*cmd*) ;

executes the string *cmd* through the os command interpreter.

**time**() ;

returns the number of seconds elapsed since midnight 00:00:00, January 1, 1970.

the result of this function can be formatted through the faunction *date*

## C API

### Initialization

<code>sqstd_register_systemlib</code>
---------------------------------------

`SQRESULT sqstd_register_systemlib(HSQIRRELV v) ;`

initialize and register the system library in the given VM.

parameters:

*HSQIRRELV v* the target VM

return: an `SQRESULT`

remarks: The function aspects a table on top of the stack where to register the global library functions.

---

# Chapter 6. The String library

the string lib implements string formatting and regular expression matching routines.

## Squirrel API

### Global symbols

```
format(formatstr, ...);
```

Returns a string formatted according *formatstr* and the optional parameters following it. The format string follows the same rules as the `printf` family of standard C functions( the "\*" is not supported).

```
eg.  
sq> print(format("%s %d 0x%02X\n","this is a test :",123,10));  
this is a test : 123 0x0A
```

```
regexp(pattern);
```

compiles a regular expression pattern and returns it as a new regexp class instance.

<code>\</code>	Quote the next metacharacter
<code>^</code>	Match the beginning of the string
<code>.</code>	Match any character
<code>\$</code>	Match the end of the string
<code> </code>	Alternation
<code>(subexp)</code>	Grouping (creates a capture)
<code>(?:subexp)</code>	No Capture Grouping (no capture)
<code>[]</code>	Character class

#### GREEDY CLOSURES.

<code>*</code>	Match 0 or more times
<code>+</code>	Match 1 or more times
<code>?</code>	Match 1 or 0 times
<code>{n}</code>	Match exactly n times
<code>{n,}</code>	Match at least n times
<code>{n,m}</code>	Match at least n but not more than m times

#### ESCAPE CHARACTERS.

<code>\t</code>	tab (HT, TAB)
<code>\n</code>	newline (LF, NL)
<code>\r</code>	return (CR)
<code>\f</code>	form feed (FF)

#### PREDEFINED CLASSES.

<code>\l</code>	lowercase next char
-----------------	---------------------

<code>\u</code>	uppercase next char
<code>\a</code>	letters
<code>\A</code>	non letters
<code>\w</code>	alphanumeric <code>[_0-9a-zA-Z]</code>
<code>\W</code>	non alphanumeric <code>[^_0-9a-zA-Z]</code>
<code>\s</code>	space
<code>\S</code>	non space
<code>\d</code>	digits
<code>\D</code>	non nondigits
<code>\x</code>	exadecimal digits
<code>\X</code>	non hexadecimal digits
<code>\c</code>	control charactrs
<code>\C</code>	non control charactrs
<code>\p</code>	punctuation
<code>\P</code>	non punctuation
<code>\b</code>	word boundary
<code>\B</code>	non word boundary

## Regex class

The `regexp` object represent a precompiled regular expression pattern. The object is created through the function `regexp()`.

**capture**(*str*, [*start*]);

returns an array of tables containing two indexes("begin" and "end")of the first match of the regular expression in the string *str*. An array entry is created for each captured sub expressions. If no match occurs returns null. The search starts from the index *start* of the string, if *start* is omitted the search starts from the beginning of the string.

the first element of the returned array(index 0) always contains the complete match.

```
local ex = regexp(@"(\d+) ([a-zA-Z]+)(\p)");
local string = "stuff 123 Test;";
local res = ex.capture(string);
foreach(i,val in res)
{
    print(format("match number[%02d] %s\n",
                i,string.slice(val.begin,val.end))); //prints "Test"
}

...
will print
match number[00] 123 Test;
match number[01] 123
match number[02] Test
match number[03] ;
```

**match**(*str*);

returns a value different than null if the regular expression matches the string *str*, otherwise returns null.

**search**(*str*, [*start*]);

returns a table containing two indexes("begin" and "end") of the first match of the regular expression in the string *str*, otherwise if no match occurs returns null. The search starts from the index *start* of the string, if *start* is omitted the search starts from the beginning of the string.

```
local ex = regexp("[a-zA-Z]+");
local string = "123 Test;";
local res = ex.search(string);
print(string.slice(res.begin,res.end)); //prints "Test"
```

## C API

### Initialization

sqstd_register_stringlib
--------------------------

SQRESULT **sqstd\_register\_stringlib**(HSQUIRRELVM *v*);

initialize and register the string library in the given VM.

parameters:

*HSQUIRRELVM v* the target VM

return: an SQRESULT

remarks: The function aspects a table on top of the stack where to register the global library functions.

### Regular Expressions

sqstd_rex_compile
-------------------

SQRex \* **sqstd\_rex\_compile**(const SQChar \* pattern, const SQChar \*\* error);

compiles an expression and returns a pointer to the compiled version. in case of failure returns NULL. The returned object has to be deleted through the function sqstd\_rex\_free().

parameters:

*const SQChar \* pattern* a pointer to a zero terminated string containing the pattern that has to be compiled.

*const SQChar \*\* error* a pointer to a string pointer that will be set with an error string in case of failure.

return: a pointer to the compiled pattern

sqstd\_rex\_free

```
void sqstd_rex_free(SQRex * exp);
```

deletes a expression structure created with sqstd\_rex\_compile()

parameters:

*SQRex \* exp* the expression structure that has to be deleted

sqstd\_rex\_match

```
SQRexBool sqstd_rex_match(SQRex * exp, const SQChar * text);
```

returns SQRex\_True if the string specified in the parameter text is an exact match of the expression, otherwise returns SQRex\_False.

parameters:

*SQRex \* exp* the compiled expression

*const SQChar \* text* the string that has to be tested

return: SQRex\_True if successful otherwise SQRex\_False

sqstd\_rex\_search

```
SQRexBool sqstd_rex_search(SQRex * exp, const SQChar * text, const SQChar ** out_begin, const SQChar ** out_end);
```

searches the first match of the expressin in the string specified in the parameter text. if the match is found returns SQRex\_True and the sets out\_begin to the beginning of the match and out\_end at the end of the match; otherwise returns SQRex\_False.

parameters:

*SQRex \* exp* the compiled expression

*const SQChar \* text* the string that has to be tested

*const SQChar \*\* out\_begin* a pointer to a string pointer that will be set with the beginning of the match

*const SQChar \*\* out\_end* a pointer to a string pointer that will be set with the end of the match

return: SQRex\_True if successful otherwise SQRex\_False

sqstd\_rex\_searchrange

```
SQRexBool sqstd_rex_searchrange(SQRex * exp, const SQChar
* text_begin, const SQChar * text_end, const SQChar ** out_begin,
const SQChar ** out_end);
```

searches the first match of the expressin in the string delimited by the parameter `text_begin` and `text_end`. if the match is found returns `SQRex_True` and the sets `out_begin` to the beginning of the match and `out_end` at the end of the match; otherwise returns `SQRex_False`.

parameters:

<i>SQRex * exp</i>	the compiled expression
<i>const SQChar * text_begin</i>	a pointer to the beginnning of the string that has to be tested
<i>const SQChar * text_end</i>	a pointer to the end of the string that has to be tested
<i>const SQChar ** out_begin</i>	a pointer to a string pointer that will be set with the beginning of the match
<i>const SQChar ** out_end</i>	a pointer to a string pointer that will be set with the end of the match

return: an SQRRESULT

`sqstd_rex_getsubexpcount`

```
int sqstd_rex_getsubexpcount(SQRex * exp);
```

returns the number of sub expressions matched by the expression

parameters:

<i>SQRex * exp</i>	the compiled expression
--------------------	-------------------------

return: the number of sub expressions matched by the expression

`sqstd_rex_getsubexp`

```
int sqstd_rex_getsubexp(SQRex * exp, int n, SQRexMatch * subexp);
```

retrieve the begin and and pointer to the length of the sub expression indexed by `n`. The result is passed through the struct `SQRexMatch`.

parameters:

<i>SQRex * exp</i>	the compiled expression
<i>int n</i>	the index of the submatch(0 is the complete match)
<i>SQRexMatch * subexp</i>	a pointer to structure that will store the result

return:           the function returns `SQRex_True` if `n` is valid index otherwise `SQRex_False`.



---

# Chapter 7. The Aux library

The aux library implements default handlers for compiler and runtime errors and a stack dumping.

## C API

### Error handling

`sqstd_seterrorhandlers`

```
void sqstd_seterrorhandlers(HSQUIRRELVM v);
```

initialize compiler and runtime error handlers, the handlers use the print function set through(sq\_setprintfunc) to output the error.

parameters:

*HSQUIRRELVM v* the target VM

`sqstd_printcallstack`

```
void sqstd_printcallstack(HSQUIRRELVM v);
```

print the call stack and stack contents.the function uses the print function set through(sq\_setprintfunc) to output the stack dump.

parameters:

*HSQUIRRELVM v* the target VM

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