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SYSCALL functions available in MARS

Introduction

A number of system services, mainly for input and output, are available for use by your MIPS program. They are described in the table below.

MIPS register contents are not affected by a system call, except for result registers as specified in the table below.

How to use SYSCALL system services

Step 1. Load the service number in register $v0.
Step 2. Load argument values, if any, in $a0, $a1, $a2, or $f12 as specified.
Step 3. Issue the SYSCALL instruction.
Step 4. Retrieve return values, if any, from result registers as specified.

Example: display the value stored in $t0 on the console

```
li  $v0, 1           # service 1 is print integer
add $a0, $t0, $zero  # load desired value into argument register $a0, using pseudo-op
syscall
```

Table of Available Services

Service	Code in $v0	Arguments	Result
print integer	1	$a0 = integer to print	
print float	2	$f12 = float to print	
print double	3	$f12 = double to print	
print string	4	$a0 = address of null-terminated string to print	
read integer	5		$v0 contains integer read
read float	6		$f0 contains float read
read double	7		$f0 contains double read
read string	8	$a0 = address of input buffer $a1 = maximum number of characters to read	*See note below table*
sbrk (allocate heap memory)	9	$a0 = number of bytes to allocate	$v0 contains address of allocated memory
exit (terminate execution)	10		
print character	11	$a0 = character to print	*See note below table*
read character	12		$v0 contains character read

open file	13	$a0 = address of null-terminated string containing filename $a1 = flags $a2 = mode	$v0 contains file descriptor (negative if error). *See note below table*
read from file	14	$a0 = file descriptor $a1 = address of input buffer $a2 = maximum number of characters to read	$v0 contains number of characters read (0 if end-of-file, negative if error). *See note below table*
write to file	15	$a0 = file descriptor $a1 = address of output buffer $a2 = number of characters to write	$v0 contains number of characters written (negative if error). *See note below table*
close file	16	$a0 = file descriptor	
exit2 (terminate with value)	17	$a0 = termination result	*See note below table*
Services 1 through 17 are compatible with the SPIM simulator, other than Open File (13) as described in the Notes below the table. Services 30 and higher are exclusive to MARS.			
time (system time)	30		$a0 = low order 32 bits of system time $a1 = high order 32 bits of system time. *See note below table*
MIDI out	31	$a0 = pitch (0-127) $a1 = duration in milliseconds $a2 = instrument (0-127) $a3 = volume (0-127)	Generate tone and return immediately. *See note below table*
sleep	32	$a0 = the length of time to sleep in milliseconds.	Causes the MARS Java thread to sleep for (at least) the specified number of milliseconds. This timing will not be precise, as the Java implementation will add some overhead.
MIDI out synchronous	33	$a0 = pitch (0-127) $a1 = duration in milliseconds $a2 = instrument (0-127) $a3 = volume (0-127)	Generate tone and return upon tone completion. *See note below table*
print integer in hexadecimal	34	$a0 = integer to print	Displayed value is 8 hexadecimal digits, left-padding with zeroes if necessary.
print integer in binary	35	$a0 = integer to print	Displayed value is 32 bits, left-padding with zeroes if necessary.
print integer as unsigned	36	$a0 = integer to print	Displayed as unsigned decimal value.
(not used)	37-39		
set seed	40	$a0 = i.d. of pseudorandom number generator (any int). $a1 = seed for corresponding	No values are returned. Sets the seed of the corresponding underlying Java pseudorandom number generator (`java.util.Random`). *See note below table*

		pseudorandom number generator.	
random int	41	$a0 = i.d. of pseudorandom number generator (any int).	$a0 contains the next pseudorandom, uniformly distributed int value from this random number generator's sequence. *See note below table*
random int range	42	$a0 = i.d. of pseudorandom number generator (any int). $a1 = upper bound of range of returned values.	$a0 contains pseudorandom, uniformly distributed int value in the range 0 <= [int] < [upper bound], drawn from this random number generator's sequence. *See note below table*
random float	43	$a0 = i.d. of pseudorandom number generator (any int).	$f0 contains the next pseudorandom, uniformly distributed float value in the range 0.0 <= f < 1.0 from this random number generator's sequence. *See note below table*
random double	44	$a0 = i.d. of pseudorandom number generator (any int).	$f0 contains the next pseudorandom, uniformly distributed double value in the range 0.0 <= f < 1.0 from this random number generator's sequence. *See note below table*
(not used)	45-49		
ConfirmDialog	50	$a0 = address of null-terminated string that is the message to user	$a0 contains value of user-chosen option 0: Yes 1: No 2: Cancel
InputDialogInt	51	$a0 = address of null-terminated string that is the message to user	$a0 contains int read $a1 contains status value 0: OK status -1: input data cannot be correctly parsed -2: Cancel was chosen -3: OK was chosen but no data had been input into field
InputDialogFloat	52	$a0 = address of null-terminated string that is the message to user	$f0 contains float read $a1 contains status value 0: OK status -1: input data cannot be correctly parsed -2: Cancel was chosen -3: OK was chosen but no data had been input into field
InputDialogDouble	53	$a0 = address of null-terminated string that is the message to user	$f0 contains double read $a1 contains status value 0: OK status -1: input data cannot be correctly parsed -2: Cancel was chosen -3: OK was chosen but no data had been input into field
InputDialogString	54	$a0 = address of null-terminated string that is the message to user $a1 = address of input buffer $a2 = maximum number of characters to read	*See Service 8 note below table* $a1 contains status value 0: OK status. Buffer contains the input string. -2: Cancel was chosen. No change to buffer. -3: OK was chosen but no data had been input into field. No change to buffer. -4: length of the input string exceeded the specified maximum. Buffer contains the

			maximum allowable input string plus a terminating null.
MessageDialog	55	$a0 = address of null-terminated string that is the message to user $a1 = the type of message to be displayed: 0: error message, indicated by Error icon 1: information message, indicated by Information icon 2: warning message, indicated by Warning icon 3: question message, indicated by Question icon other: plain message (no icon displayed)	N/A
MessageDialogInt	56	$a0 = address of null-terminated string that is an information-type message to user $a1 = int value to display in string form after the first string	N/A
MessageDialogFloat	57	$a0 = address of null-terminated string that is an information-type message to user $f12 = float value to display in string form after the first string	N/A
MessageDialogDouble	58	$a0 = address of null-terminated string that is an information-type message to user $f12 = double value to display in string form after the first string	N/A
MessageDialogString	59	$a0 = address of null-terminated string that is an information-type message to user $a1 = address of null-terminated string to display after the first string	N/A

NOTES: Services numbered 30 and higher are not provided by SPIM
Service 8 - Follows semantics of UNIX 'fgets'. For specified length n, string can be no longer than n-1. If less than that, adds newline to end. In either case, then pads with null byte If n = 1, input is ignored and null byte placed at buffer address. If n < 1, input is ignored and nothing is written to the buffer.
Service 11 - Prints ASCII character corresponding to contents of low-order byte.