NAME

spu_run − execute an SPU context

SYNOPSIS

#include <sys/spu.h>

int spu_run(int *fd***, unsigned int ****npc***, unsigned int ****event***);**

Note: There is no glibc wrapper for this system call; see NOTES.

DESCRIPTION

The **spu_run**() system call is used on PowerPC machines that implement the Cell Broadband Engine Architecture in order to access Synergistic Processor Units (SPUs). The *fd* argument is a file descriptor returned by **spu_create**(2) that refers to a specific SPU context. When the context gets scheduled to a physical SPU, it starts execution at the instruction pointer passed in *npc*.

Execution of SPU code happens synchronously, meaning that **spu_run**() blocks while the SPU is still running. If there is a need to execute SPU code in parallel with other code on either the main CPU or other SPUs, a new thread of execution must be created first (e.g., using **pthread_create**(3)).

When **spu_run**() returns, the current value of the SPU program counter is written to *npc*, so successive calls to **spu_run**() can use the same *npc* pointer.

The *event* argument provides a buffer for an extended status code. If the SPU context was created with the **SPU_CREATE_EVENTS_ENABLED** flag, then this buffer is populated by the Linux kernel before **spu_run**() returns.

The status code may be one (or more) of the following constants:

SPE_EVENT_DMA_ALIGNMENT
A DMA alignment error occurred.

SPE_EVENT_INVALID_DMA
An invalid MFC DMA command was attempted.

SPE_EVENT_SPE_DATA_STORAGE
A DMA storage error occurred.

SPE_EVENT_SPE_ERROR
An illegal instruction was executed.

NULL is a valid value for the *event* argument. In this case, the events will not be reported to the calling process.

RETURN VALUE

On success, **spu_run**() returns the value of the *spu_status* register. On error, it returns −1 and sets *errno* to one of the error codes listed below.

The *spu_status* register value is a bit mask of status codes and optionally a 14-bit code returned from the **stop-and-signal** instruction on the SPU. The bit masks for the status codes are:

0x02 SPU was stopped by a **stop-and-signal** instruction.

0x04 SPU was stopped by a **halt** instruction.

0x08 SPU is waiting for a channel.

0x10 SPU is in single-step mode.

0x20 SPU has tried to execute an invalid instruction.

0x40 SPU has tried to access an invalid channel.

0x3fff0000
The bits masked with this value contain the code returned from a **stop-and-signal** instruction. These bits are valid only if the 0x02 bit is set.

If **spu_run**() has not returned an error, one or more bits among the lower eight ones are always set.

ERRORS

EBADF
fd is not a valid file descriptor.

EFAULT
npc is not a valid pointer, or *event* is non-NULL and an invalid pointer.

EINTR
A signal occurred while **spu_run**() was in progress; see **signal**(7). The *npc* value has been updated to the new program counter value if necessary.

EINVAL
fd is not a valid file descriptor returned from **spu_create**(2).

ENOMEM
There was not enough memory available to handle a page fault resulting from a Memory Flow Controller (MFC) direct memory access.

ENOSYS
The functionality is not provided by the current system, because either the hardware does not provide SPUs or the spufs module is not loaded.

VERSIONS

The **spu_run**() system call was added to Linux in kernel 2.6.16.

CONFORMING TO

This call is Linux-specific and implemented only by the PowerPC architecture. Programs using this system call are not portable.

NOTES

Glibc does not provide a wrapper for this system call; call it using **syscall**(2). Note however, that **spu_run**() is meant to be used from libraries that implement a more abstract interface to SPUs, not to be used from regular applications. See ⟨http://www.bsc.es/projects/deepcomputing/linuxoncell/⟩ for the recommended libraries.

EXAMPLE

The following is an example of running a simple, one-instruction SPU program with the **spu_run**() system call.

```
#include <stdlib.h>
#include <stdint.h>
#include <unistd.h>
#include <stdio.h>
#include <sys/types.h>
#include <fcntl.h>

#define handle_error(msg) \
    do { perror(msg); exit(EXIT_FAILURE); } while (0)

int main(void)
{
    int context, fd, spu_status;
    uint32_t instruction, npc;

    context = spu_create("/spu/example-context", 0, 0755);
    if (context == -1)
        handle_error("spu_create");

    /* write a 'stop 0x1234' instruction to the SPU's
     * local store memory
```

```
         */
        instruction = 0x00001234;

        fd = open("/spu/example-context/mem", O_RDWR);
        if (fd == -1)
            handle_error("open");
        write(fd, &instruction, sizeof(instruction));

        /* set npc to the starting instruction address of the
         * SPU program. Since we wrote the instruction at the
         * start of the mem file, the entry point will be 0x0
         */
        npc = 0;

        spu_status = spu_run(context, &npc, NULL);
        if (spu_status == -1)
            handle_error("open");

        /* we should see a status code of 0x1234002:
         *   0x00000002 (spu was stopped due to stop-and-signal)
         * | 0x12340000 (the stop-and-signal code)
         */
        printf("SPU Status: 0x%08x\n", spu_status);

        exit(EXIT_SUCCESS);
    }
```

SEE ALSO

close(2), **spu_create**(2), **capabilities**(7), **spufs**(7)

COLOPHON

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