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drand48, erand48, lrand48, nrand48, mrand48, jrand48, srand48, seed48, lcong48 − generate uniformly distributed pseudo-random numbers

LIBRARY

Standard C library (*libc*, *−lc*)

SYNOPSIS

```
#include <stdlib.h>

double drand48(void);
double erand48(unsigned short xsubi[3]);

long lrand48(void);
long nrand48(unsigned short xsubi[3]);

long mrand48(void);
long jrand48(unsigned short xsubi[3]);

void srand48(long seedval);
unsigned short *seed48(unsigned short seed16v[3]);
void lcong48(unsigned short param[7]);
```

Feature Test Macro Requirements for glibc (see **feature_test_macros**(7)):

All functions shown above:
_XOPEN_SOURCE
|| /* glibc >= 2.19: */ _DEFAULT_SOURCE
|| /* glibc <= 2.19: */ _SVID_SOURCE

DESCRIPTION

These functions generate pseudo-random numbers using the linear congruential algorithm and 48-bit integer arithmetic.

The **drand48**() and **erand48**() functions return nonnegative double-precision floating-point values uniformly distributed over the interval [0.0, 1.0).

The **lrand48**() and **nrand48**() functions return nonnegative long integers uniformly distributed over the interval [0, 2^31).

The **mrand48**() and **jrand48**() functions return signed long integers uniformly distributed over the interval [−2^31, 2^31).

The **srand48**(), **seed48**(), and **lcong48**() functions are initialization functions, one of which should be called before using **drand48**(), **lrand48**(), or **mrand48**(). The functions**erand48**(), **nrand48**(), and **jrand48**() do not require an initialization function to be called first.

All the functions work by generating a sequence of 48-bit integers, *Xi*, according to the linear congruential formula:

```
Xn+1 = (aXn + c) mod m, where n >= 0
```

The parameter *m* = 2^48, hence 48-bit integer arithmetic is performed. Unless **lcong48**() is called, *a* and *c* are given by:

```
a = 0x5DEECE66D
c = 0xB
```

The value returned by any of the functions **drand48**(), **erand48**(), **lrand48**(), **nrand48**(), **mrand48**(), or **jrand48**() is computed by first generating the next 48-bit *Xi* in the sequence. Then the appropriate number of bits, according to the type of data item to be returned, is copied from the high-order bits of *Xi* and transformed into the returned value.

The functions **drand48**(), **lrand48**(), and **mrand48**() store the last 48-bit *Xi* generated in an internal buffer. The functions **erand48**(), **nrand48**(), and **jrand48**() require the calling program to provide storage for the successive *Xi* values in the array argument *xsubi*. The functions are initialized by placing the initial value

of *Xi* into the array before calling the function for the first time.

The initializer function **srand48**() sets the high order 32-bits of *Xi* to the argument *seedval*. The low order 16-bits are set to the arbitrary value 0x330E.

The initializer function **seed48**() sets the value of *Xi* to the 48-bit value specified in the array argument *seed16v*. The previous value of *Xi* is copied into an internal buffer and a pointer to this buffer is returned by **seed48**().

The initialization function **lcong48**() allows the user to specify initial values for *Xi*, *a*, and *c*. Array argument elements *param[0−2]* specify *Xi*, *param[3−5]* specify *a*, and *param[6]* specifies *c*. After **lcong48**() has been called, a subsequent call to either **srand48**() or **seed48**() will restore the standard values of *a* and *c*.

ATTRIBUTES

For an explanation of the terms used in this section, see **attributes**(7).

Interface	Attribute	Value
drand48(), **erand48**(), **lrand48**(), **nrand48**(), **mrand48**(), **jrand48**(), **srand48**(), **seed48**(), **lcong48**()	Thread safety	MT-Unsafe race:drand48

The above functions record global state information for the random number generator, so they are not thread-safe.

STANDARDS

POSIX.1-2001, POSIX.1-2008, SVr4.

SEE ALSO

rand(3), **random**(3)