LynxOS-178 POSIX Conformance Document

LynxOS-178

DOC-2206-00

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Printed in the United States of America.

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Preface

Typographical Conventions

The typefaces used in this manual, summarized below, emphasize important concepts. All references to filenames and commands are case-sensitive and should be typed accurately.

Kind of Text	Examples
Body text; *italicized* for emphasis, new terms, and book titles	Refer to the *LynxOS-178 POSIX Conformance Document*
Environment variables, filenames, functions, methods, options, parameter names, path names, commands, and computer data	`ls -l myprog.c /dev/null`
Commands that need to be highlighted within body text or commands that must be typed as is by the user are **bolded**.	`login:` **`myname`** `#` **`cd /usr/home`**
Text that represents a variable, such as a filename or a value that must be entered by the user, is *italicized*.	`cat <filename>` `mv <file1> <file2>`

Blocks of text that appear on the display screen after entering instructions or commands	`Loading file /tftpboot/shell.kdi into 0x4000`
	`.....`
	`File loaded. Size is 1314816`
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Keyboard options, button names, and menu sequences	**`Enter`**, **`Ctrl-C`**

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- Product version number
- Target platform (for example, PowerPC)
- Board Support Package (BSP), Current Service Pack Revision, Development Host OS version
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- Priority of the problem - Critical, High, Medium, or Low?

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POSIX.1 Conformance Document

This document records the conformance of the LynxOS-178 operating system to the POSIX.1-2008 standard published by The Open Group in September 2016, also known as The Open Group Technical Standard Base Specifications, Issue 7 (with Technical Corrigenda 1 and 2), and simultaneously published as IEEE Std 1003.1-2008, 2016 Edition.

The text below completes the standard conformance template provided by The Open Group for POSIX.1-2008 (2016 Edition), after removing sections corresponding to option groups or options that are not applicable to the API feature set targeted by LynxOS-178, and providing additional commentary to describe behavior specific to LynxOS-178.

Unless stated otherwise below, this document describes API feature set inclusion and behavior as it applies to LynxOS-178 production mode only.

Requirements

The conformance document shall have the same structure as IEEE Std 1003.1-2008, with the information presented in the appropriate sections and subsections. Sections and subsections that consist solely of subordinate section titles, with no other information, are not required.

The conformance document shall not contain information about extended facilities or capabilities outside the scope of IEEE Std 1003.1-2008.

The conformance document shall contain a statement that indicates the full name, number, and date of the standard that applies.

The conformance document may also list international software standards that are available for use by a Conforming POSIX Application. Applicable characteristics where documentation is required by one of these standards, or by standards of government bodies, may also be included.

The conformance document shall describe the limit values found in the header `<limits.h>`, stating values, the conditions under which those values may change, and the limits of such variations, if any.

The conformance document shall describe the behavior of the implementation for all implementation-defined features defined in IEEE Std 1003.1-2008. This requirement shall be met by listing these features and providing either a specific reference to the system documentation or providing full syntax and semantics of these features. When the value or behavior in the implementation is designed to be variable or customized on each instantiation of the system, the implementation provider shall document the nature and permissible ranges of this variation.

The conformance document may specify the behavior of the implementation for those features where IEEE Std 1003.1-2008 states that implementations may vary or where features are identified as undefined or unspecified.

The conformance document shall not contain documentation other than that specified in the preceding paragraphs except where such documentation is specifically allowed or required by other provisions of IEEE Std 1003.1-2008.

The phrases “shall document” or “shall be documented” in IEEE Std 1003.1-2008 mean that documentation of the feature shall appear in the conformance document, as described previously, unless there is an explicit reference in the conformance document to show where the information can be found in the system documentation.

The system documentation should also contain the information found in the conformance document.

Base Definitions

3. Definitions

3.4 Additional File Access Control Mechanism

In LynxOS-178, processes running with superuser privileges (i.e., with effective UID 0) in ARINC 653 mode (i.e., with the P_ARINC653 flag set) do not enjoy default access for file I/O operations (reading a file, writing a file, executing a file and searching a directory) to all files, unless the superuser (effective UID 0) is explicitly granted permission for that file I/O operation on that file.

3.12 Alternate File Access Control Mechanism

LynxOS-178 does not support any alternate file access control mechanisms.

3.19 Appropriate Privileges

In LynxOS-178, a process is considered to have special privileges if and only if it is executed with superuser privileges (i.e., with effective UID 0). Refer to "3.4 Additional File Access Control Mechanism" for additional restrictions imposed by LynxOS-178 on superuser privileges w.r.t. file I/O operations.

The LynxOS-178 partitioning implementation establishes a one-to-one correspondence between real UIDs and ARINC 653 partitions (called virtual machines, and numbered as VM0, etc.) imposes additional restrictions on process privileges. The effective UID of a process, which defaults to the same value as the real UID on startup unless changed to a different value, is used for security checks for privileged operations. However, the real UID (i.e., the partition) may also be checked for some operations that may be available only from VM0 (real UID 0).

3.97 Clock Tick

Clock ticks per second is a build-time configurable parameter in LynxOS-178. It is defined by the macro `TICKSPERSEC` defined in the BSP-specific `uparam.h` header file. The default value is 1000, corresponding to a 1 ms time duration per clock tick.

3.118 CPU Time (Execution Time)

LynxOS-178 accounts CPU execution times on a per-thread basis. CPU times for user mode and system mode execution are accounted separately. The CPU time for a process equals the sum of all the execution times of all the threads that ever existed in the process.

3.160 Extended Security Controls

LynxOS-178 does not support any additional security controls or security policies other than those described in IEEE Std 1003.1-2008.

3.167 File Group Class

LynxOS-178 does not support any additional criteria to assign a process to the file group class of a file other than those specified in IEEE Std 1003.1-2008.

3.270 Parent Process ID

In LynxOS-178, when the lifetime of the original creator process of a given process ends, the latter's parent process ID is reassigned as follows:

- For VM0, the parent process ID is set to 1.
- For VMs other than VM0, the parent process ID is set to the process ID of the VM's master process (defined at VM creation time).

3.310 Read-Only File System

In LynxOS-178, a read-only file system is a file system to which all writes (explicit writes, such as file data writes, as well as implicit writes, such as file timestamp inode metadata updates) are prohibited.

3.435 User Database

LynxOS-178 does not support *Shell & Utilities* in production mode.

4. General Concepts

4.3 Directory Protection

In LynxOS-178, for a directory that is writable and has the mode bit S_ISVTX set, files in the directory that are writable by a process can be removed and renamed by it.

4.4 Extended Security Controls

Refer to "3.160 Extended Security Controls".

4.9 File Times Update

LynxOS-178 supports the Lynx file system type only. File timestamps have a resolution of 1 second on the Lynx file system.

4.11 Measurement of Execution Time

Refer to “3.118 CPU Time (Execution Time)”. <XREF>Execution time accounting is done within the rescheduling mechanism and the timer interrupt handler. CPU time consumed by interrupts gets charged to the process during which they occur. CPU time consumed by system services on behalf of the operating system is not charged to any process.

4.13 Pathname Resolution

LynxOS-178 limits the number of symbolic links that can be followed during the resolution of a pathname to the value set for the macro `MAXSYMLINKS` defined in the BSP-specific `uparam.h` header file. The default value is 4.

LynxOS-178 treats two successive slashes at the beginning of a pathname specification as a single slash. There is no any special handling or interpretation of the first component following the leading slash characters for such pathnames.

4.16 Seconds Since the Epoch

In LynxOS-178, a process with appropriate privileges may make changes to the value of seconds since the Epoch using the APIs provided by IEEE Std 1003.1-2008 for this purpose, such as `clock_settime()`. The value of seconds since the Epoch is exactly aligned to the operating system’s conception of current actual time.

4.20 Treatment of Error Conditions for Mathematical Functions

4.20.1 Domain Error

In case of a domain error, the value `NAN` is returned.

4.20.3 Range Error

4.20.3.2 Result Underflows

In case of an underflow result, either zero or a subnormal floating-point number is returned.

When the integer expression `(math_errhandling & MATH_ERRNO)` is non-zero, `errno` is set to `ERANGE`.

When the integer expression `(math_errhandling & MATH_ERREXCEPT)` is non-zero, the underflow floating-point exception (i.e., `FE_UNDERFLOW`) is raised.

5. File Format Notation

The style for representing floating-point infinity values for the `f` conversion specifier is "`[-]infinity`".

The style for representing floating-point infinity values for the `F` conversion specifier is "`[-]INFINITY`".

The style for representing floating-point NaN values for the `f` conversion specifier is "`[-]nan`".

The style for representing floating-point NaN values for the `F` conversion specifier is "`[-]NAN`".

6. Character Set

6.1 Portable Character Set

6.2 Character Encoding

LynxOS-178 supports the POSIX C locale only.

6.3 C Language Wide-Character Codes

LynxOS-178 does not support C language wide-character codes in production mode.

6.4 Character Set Description File

LynxOS-178 does not support any additional character set description files.

7. Locale

7.1 General

LynxOS-178 supports the POSIX C locale only.

7.2 POSIX Locale

LynxOS-178 supports the POSIX C locale only.

7.3 Locale Definition

LynxOS-178 does not support additional locale categories other than those specified in IEEE Std 1003.1-2008.

8. Environment Variables

8.2 Internationalization Variables

LynxOS-178 does not support internationalization and localization. Refer to “6. Character Set” and “7. Locale”.

8.3 Other Environment Variables

When the `PATH` environment variable is unset or set to null, no path search is performed.

When the first character of the `TZ` environment variable is a colon, the following characters are ignored and a default value is used for the timezone. The default value is calculated using internal timezone tables and the set timezone information. If the system timezone has not been set, then it defaults to `GMT`.

10. Directory Structure and Devices

10.1 Directory Structure and Files

The device special file associated with `/dev/console` is configurable in the BSP-specific `config.tbl` file.

11. General Terminal Interface

LynxOS-178 does not support the general terminal interface in production mode.

13. Headers

`<dlfcn.h>`

LynxOS-178 does not support dynamically loaded libraries, and does not provide this header.

`<fenv.h>`

The `FENV_ACCESS` pragma is not implemented, and the corresponding functionality is off by default.

`<float.h>`

The accuracy of floating-point operations and library functions in `<math.h>` and `<complex.h>` that return floating-point results is platform-dependent and set as per the toolchain, and differs from function to function.

In LynxOS-178, the floating-point addition rounding mode is “to nearest”. There are no additional values for the `FLT_ROUNDS` macro other than those specified in IEEE Std 1003.1-2008.

In LynxOS-178, the evaluation format for the values of operations with floating operands and values subject to the usual arithmetic conversions and for floating constants is platform-dependent and set as per the toolchain. There are no additional values for the `FLT_EVAL_METHOD` macro other than those specified in IEEE Std 1003.1-2008.

The values of the macros FLT_RADIX, FLT_MANT_DIG, DBL_MANT_DIG, LDBL_MANT_DIG, DECIMAL_DIG, FLT_DIG, DBL_DIG, LDBL_DIG, FLT_MIN_EXP, DBL_MIN_EXP, LDBL_MIN_EXP, FLT_MIN_10_EXP, DBL_MIN_10_EXP, LDBL_MIN_10_EXP, FLT_MAX_EXP, DBL_MAX_EXP, LDBL_MAX_EXP, FLT_MAX_10_EXP, DBL_MAX_10_EXP, LDBL_MAX_10_EXP, FLT_MAX, DBL_MAX, LDBL_MAX, FLT_EPSILON, DBL_EPSILON, LDBL_EPSILON, FLT_MIN, DBL_MIN and LDBL_MIN defined in <float.h> are platform-dependent and set as per the toolchain.

<limits.h>

The values of macros defined in <limits.h> cannot be modified at run-time. The numerical values of limits corresponding to various C types are platform-dependent and set as per the toolchain.

<math.h>

LynxOS-178 does not support any additional macros for floating-point classifications other than those defined in IEEE Std 1003.1-2008.

The FP_CONTRACT pragma is not implemented, and the corresponding functionality is off by default, unless the -funsafe-math-optimizations or -ffast-math toolchain options are used during the build to turn it on.

<nl_types.h>

LynxOS-178 does not support internationalization and localization, and does not provide this header.

<signal.h>

LynxOS-178 does not support real-time behavior for signals outside of the range SIGRTMIN through SIGRTMAX.

LynxOS-178 defines the signals SIGIO, SIGWINCH, SIGLOST and SIGPRIO in addition to those defined in and required by IEEE Std 1003.1-2008.

<stdint.h>

The numerical values of limits corresponding to various specified-width integer types are as follows:

{INT8_MIN}	-128
{INT16_MIN}	-32768
{INT32_MIN}	-2147483648
{INT64_MIN}	-9223372036854775808
{INT8_MAX}	127
{INT16_MAX}	32767
{INT32_MAX}	2147483647
{INT64_MAX}	9223372036854775807
{UINT8_MAX}	255
{UINT16_MAX}	65535
{UINT32_MAX}	4294967295
{UINT64_MAX}	18446744073709551615
{INT_LEAST8_MIN}	-128
{INT_LEAST16_MIN}	32768
{INT_LEAST32_MIN}	-2147483648
{INT_LEAST64_MIN}	-9223372036854775808
{INT_LEAST8_MAX}	127
{INT_LEAST16_MAX}	32767
{INT_LEAST32_MAX}	2147483647
{INT_LEAST64_MAX}	9223372036854775807
{UINT_LEAST8_MAX}	255
{UINT_LEAST16_MAX}	65535
{UINT_LEAST32_MAX}	4294967295
{UINT_LEAST64_MAX}	18446744073709551615
{INT_FAST8_MIN}	-128
{INT_FAST16_MIN}	-32768

{INT_FAST32_MIN}	-2147483648
{INT_FAST64_MIN}	-9223372036854775808
{INT_FAST8_MAX}	127
{INT_FAST16_MAX}	32767
{INT_FAST32_MAX}	2147483647
{INT_FAST64_MAX}	9223372036854775807
{UINT_FAST8_MAX}	255
{UINT_FAST16_MAX}	65535
{UINT_FAST32_MAX}	4294967295
{UINT_FAST64_MAX}	18446744073709551615
{INTPTR_MIN}	-2147483648
{INTPTR_MAX}	2147483647
{UINTPTR_MAX}	4294967295
{INTMAX_MIN}	-9223372036854775808
{INTMAX_MAX}	9223372036854775807
{UINTMAX_MAX}	18446744073709551615

The macros SIG_ATOMIC_MIN, SIG_ATOMIC_MAX, WINT_MIN and WINT_MAX are not defined. The following macros are defined as indicated:

PTRDIFF_MIN	INT32_MIN
PTRDIFF_MAX	INT32_MAX
SIZE_MAX	UINT32_MAX
WCHAR_MIN	INT32_MIN
WCHAR_MAX	INT32_MAX

<time.h>

The maximum possible clock jump for CLOCK_MONOTONIC is 1 clock tick.

System Interfaces

2. General Information

2.3 Error Numbers

2.3.1 Additional Error Numbers

LynxOS-178 does not define any additional error numbers other than those specified in IEEE Std 1003.1-2008.

2.4 Signal Concepts

2.4.1 Signal Generation and Delivery

When a subsequent occurrence of a pending signal is generated in circumstances other than those in which queuing is required, signals are not delivered or accepted more than once.

In LynxOS-178, the additional signal `SIGPRIO` is sent to a process when its priority or process group is changed.

2.4.2 Realtime Signal Generation and Delivery

LynxOS-178 does not support the SIGEV_THREAD functionality.

2.4.3 Signal Actions

In LynxOS-178, real-time behavior (including the ability to set the `SA_SIGINFO` flag) is only supported for real-time signals. No real-time signals are generated by functions or events other than those specified in IEEE Std 1003.1-2008. No additional `si_code` values are set other than those specified in IEEE Std 1003.1-2008.

2.5 Standard I/O Streams

When a file is opened in append mode, the file position indicator is initially positioned at the end of the file.

LynxOS-178 supports unbuffered, line buffered and fully buffered stream characteristics. The `setbuf()` and `setvbuf()` functions affect the stream buffering characteristics as described in IEEE Std 1003.1-2008.

2.5.1. Interaction of File Descriptors and Standard I/O Streams

All input is seen exactly once for pipes, FIFOs and UNIX domain stream sockets. For files with a seek-capable underlying device, all input is seen exactly once unless a seek operation moves the file position backwards between reads.

2.5.2. Stream Orientation and Encoding Rules

LynxOS-178 supports the POSIX C locale only.

2.8 Realtime

2.8.2 Asynchronous I/O

LynxOS-178 does not support asynchronous I/O.

2.8.3 Memory Management

LynxOS-178 does not support memory locking.

2.8.4 Process Scheduling

LynxOS-178 defines the additional `SCHED_DEFAULT` scheduling policy to provide the quantum priority scheduling algorithm.

`SCHED_DEFAULT` is essentially the same as `SCHED_RR`; the only difference is that the time quantum length is the value of the `QUANTUM` macro defined in the BSP-specific `uparam.h` file.

The resolution of the execution time clock for all supported scheduling policies is 1 clock tick.

All scheduling policies share the same priority thread lists.

2.8.5 Clocks and Timers

The maximum possible clock jump for `CLOCK_MONOTONIC` is 1 clock tick.

2.9 Threads

2.9.4 Thread Scheduling

LynxOS-178 supports the `PTHREAD_SCOPE_SYSTEM` scheduling contention scope only. LynxOS-178 does not support `PTHREAD_SCOPE_PROCESS`.

In LynxOS-178, the scheduling allocation domain size is 1. Applications cannot control the scheduling allocation domains.

LynxOS-178 supports only one processor per system.

2.10 Sockets

LynxOS-178 bundles support for UNIX domain stream sockets only in production mode. LynxOS-178 does not support IPv6.

3. System Interfaces

`_Exit, _exit`

Any open streams are closed without flushing.

The parent process ID is reassigned as follows:

- For VM0, the parent process ID is set to 1.
- For VMs other than VM0, the parent process ID is set to the process ID of the VM's master process (defined at VM creation time).

`acos`

For finite values of `x` not in the range `[-1,1]`, the return value is `NAN`.

`acosh`

For finite values of `x < 1`, the return value is `NAN`.

asin

For finite values of `x` not in the range `[-1,1]`, the return value is `NAN`.

asinh

For subnormal values of `x`, the return value is zero or subnormal.

atan

For subnormal values of `x`, the return value is zero or subnormal.

atan2

For values of `x` that would cause underflow, the return value is zero or subnormal.

atanh

For finite values of `|x| > 1`, the return value is `NAN`.

For subnormal values of `x`, the return value is zero or subnormal.

calloc

When the size of the space requested is zero, `calloc()` returns a unique pointer.

chmod

LynxOS-178 does not support the `S_ISUID` and `S_ISGID` mode bits.

chown

LynxOS-178 does not support the `S_ISUID` and `S_ISGID` mode bits.

clock

The era used for determining the return value of the `clock()` function starts with the first call to the `clock()` function within the given process.

clock_getcpuclockid

LynxOS-178 does not support CPU-time clocks.

clock_getres, clock_settime

The clock resolution for both the supported clocks CLOCK_REALTIME and CLOCK_MONOTONIC is 1 clock tick.

CLOCK_REALTIME can be set only by a process with appropriate privileges.

CLOCK_MONOTONIC cannot be set.

close

LynxOS-178 does not support asynchronous I/O.

exec

When the environment variable PATH is not present and the argument file does not contain a slash character, the execlp() and execvp() functions return -1 and set errno to ENOENT.

Due to the dynamic behavior of the memory allocation algorithm for the argument and environment list, its size is not restricted to ARG_MAX bytes and any combinations of null terminators, pointers, and/or alignment bytes are not included in this restriction. But there exists another restriction for the size of the argument and environment list. Because this list is part of the initial thread's user stack, the limit on the size of the initial thread's user stack is also the limit on the size of the argument and environment list.

The scheduling policy and parameters are not changed; the initial thread in the new process image inherits the scheduling policy and parameters from the calling process image for all supported scheduling policies.

exp

For values of x that would cause underflow, the return value is zero or subnormal.

fclose

Additional circumstances for an EIO error to be returned are similar to those described for the fflush() function.

fcntl

LynxOS-178 does not define any additional values for the cmd argument other than those specified in IEEE Std 1003.1-2008.

fegetexceptflag

The states of the floating-point status flags are stored in the unsigned integer variable pointed to by the flagp argument by taking a bitwise AND of the status bits of the hardware floating-point status register with the excepts mask argument. Each status flag may be represented by one or more status bits in the status register in a hardware-dependent manner.

feraiseexcept

The inexact floating-point exception is not automatically raised whenever the overflow or underflow floating-point exceptions are raised.

fflush

The additional circumstances for an EIO error to be returned are as follows:

1. The file descriptor associated with the stream has O_DSYNC or O_SYNC access mode bits set, the file descriptor is associated with a block device file, the stream is buffered and there are bytes in the buffer pending write, but the write operation fails in the block device driver.
2. The file descriptor associated with the stream has O_RSYNC, O_DSYNC, or O_SYNC access mode bits set, the file descriptor is associated with a regular file, the stream is buffered and there are bytes in the buffer pending write, but the write operation fails in the block device driver or the inode metadata update operation fails.

fgetc

Additional circumstances for an EIO error to be returned are similar to those described for the fflush() function.

fmod

For values of x and y that would cause underflow, the return value is zero or subnormal.

fork

For all scheduling policies, the policy and priority settings of the child process are inherited from the parent process.

fpclassify

There are no additional classification categories beyond NaN, infinite, normal, subnormal and zero.

fprintf

The low-order digit for floating-point arguments is rounded according to standard arithmetical rules; if the next digit is equal to or greater than 5, then the low-order digit is rounded up, otherwise it is rounded down.

The style for representing floating-point infinity values for the f conversion specifier is "[-]infinity".
The style for representing floating-point infinity values for the F conversion specifier is "[-]INFINITY".
The style for representing floating-point NaN values for the f conversion specifier is "[-]nan".
The style for representing floating-point NaN values for the F conversion specifier is "[-]NAN".

For the p conversion specifier, the value of a pointer is converted to a sequence of printable characters according to the rules for the x conversion specifier.

getaddrinfo

The implementation does not use (and, therefore, ignores) the `ai_addrlen`, `ai_addr`, `ai_canonname` and `ai_next` members of the `hints` structure.

freopen

No changes of mode are permitted under any circumstances.

fscanf

When a - is in the scanlist and is not the first character, nor the second where the first character is a `^`, nor the last character, then the behavior is as follows:

If the character that follows the minus sign is lower than the character that is before the minus sign and the first character following was `^`, then both the minus sign and the characters that precede and succeed it are included in the scanlist. Otherwise, the `A-B` sequence is considered a range specification and all the characters from `A` to `B` are included in the scanlist (or excluded from it if `^` was specified).

The set of sequences that are matched by the `p` conversion specifier is the same as for the `x` conversion specifier.

The input item for the `p` conversion specifier is interpreted as a pointer to void.

fseek

The behavior on streams of files with underlying devices that are incapable of seeking is similar to that described for the `lseek()` function.

LynxOS-178 supports the POSIX C locale only.

If the stream is writable, additional circumstances for an `EIO` error to be returned are similar to those described for the `fflush()` function. If the stream is not writable, then no additional circumstances exist for an `EIO` error to be returned.

fsetpos

The behavior on streams of files with underlying devices that are incapable of seeking is similar to that described for the `lseek()` function.

If the stream is writable, additional circumstances for an `EIO` error to be returned are similar to those described for the `fflush()` function. If the stream is not writable, then no additional circumstances exist for an `EIO` error to be returned.

`fstat`

LynxOS-178 does not support any additional or alternative file access control mechanisms.

`lstat`, `stat`

LynxOS-178 does not support any additional or alternative file access control mechanisms.

`fsync`

The inode associated with the file descriptor is updated and all dirty in-core blocks are written out to the storage device.

`getgroups`

The effective group ID is not returned in the `grouplist` array.

`kill`

The LynxOS-178 partitioning implementation establishes a one-to-one correspondence between real UIDs and ARINC 653 partitions (called virtual machines, and numbered as VM0, etc.). The following additional restriction is imposed on the sending of signals:

A process may only send signals to another process if the effective UID of the sending process is 0, or the effective UID of the sending process matches the saved set UID of the target process, or the effective UID of the sending process matches the real UID of the target process, or the real UID of the sending process matches the saved set UID of the target process, or real UID of the sending process matches the real UID of the target process.

ldexp

For values of x that would cause underflow, the return value is zero or subnormal.

link

When path1 names a symbolic link, link() follows the symbolic link.

listen

When listen() has been called with a backlog argument of 0, the socket is not allowed to accept connections.

log

For finite values of x < 0, the return value is NAN.

log10

For finite values of x < 0, the return value is NAN.

log1p

For finite values of x < -1, the return value is NAN.

For subnormal values of x, the return value is NAN.

log2

For finite values of x < 0, the return value is NAN.

lseek

The behavior of lseek() on files with underlying devices that are incapable of seeking is driver-dependent. An error is returned with errno set to ESPIPE for pipes, FIFOs and UNIX domain stream sockets.

malloc

When the size of the space requested is zero, `malloc()` returns a unique pointer.

mkdir

No additional mode bits other than file permission bits are supported.

The implementation does not provide any way to initialize the directory's group ID to the effective group ID of the calling process.

mkfifo

No additional mode bits other than file permission bits are supported.

The implementation does not provide any way to initialize the FIFO's group ID to the effective group ID of the calling process.

mmap

The returned address is either `MAP_FAILED` or the address at which the mapping was placed.

The `MAP_FIXED` flag is supported.

If the `MAP_FIXED` flag is not set, then the `addr` argument is ignored and a suitable address is returned.

There is no limit on the number of memory regions that can be mapped other than that imposed by memory resource exhaustion.

mq_open

The slash character is not interpreted as a special character by `mq_open()` other than the leading one. Multiple slash characters are treated as a single slash character. The `name` argument can contain any number of slash characters at any positions; however, the `name` argument string length should not exceed `PATH_MAX` and each pathname component of `name` should not exceed `NAME_MAX`.

The default message queue attributes are `mq_flags = 0`, `mq_maxmsg = 35`, `mq_msgsize = 120` and `mq_curmsgs = 0`.

mq_receive

A value of msg_len greater than SSIZE_MAX is not handled in any special manner. Any value of msg_len greater than or equal to the mq_msgsize attribute of the message queue is permitted.

mq_setattr

The MQ_LOADCONTROL flag is supported in addition to the O_NONBLOCK flag.

open

The implementation does not provide any way to initialize the file's group ID to the effective group ID of the calling process.

The O_TRUNC flag has no effect on files other than regular files and FIFOs.

pow

For finite values of x < 0 and finite non-integer values of y, the return value is NAN.

For values of x and y that would cause underflow, the return value is zero.

pselect, select

The maximum timeout value is INT_MAX clock ticks, that corresponds to less than 31 days when the tick duration is 1 ms (default case).

pthread_attr_destroy

The attr is invalidated by setting a special magic member of the pthread_attr_t structure to 0. An attr may be checked for validity using the PTHREAD_ATTR_VALID() macro.

pthread_attr_getguardsize, pthread_attr_setguardsize

The default value of the guardsize is PAGESIZE bytes.

pthread_attr_setstack

The stackaddr argument must be PAGESIZE aligned. The minimum value of stacksize is PAGESIZE bytes and it must be a multiple of PAGESIZE bytes. There is no limit on stacksize other than that imposed by memory resource exhaustion.

pthread_condattr_init

There are no additional attributes.

pthread_getschedparam, pthread_setschedparam

The scheduling parameters for the SCHED_OTHER(synonym of SCHED_DEFAULT) policy are the same as for SCHED_RRas defined by IEEE Std 1003.1-2008)

read

The result of subsequent read() requests after the end-of-file condition has been reached on device special files is as follows:

- For block device files: 0 is returned
- For character device files: the result is driver-dependent

If the value of nbyte is greater than SSIZE_MAX, read() will fail with EFAULT.

Additional circumstances for an EIO error to be returned are similar to those described for the fflush() function.

readlink

If the value of nbyte is greater than SSIZE_MAX, readlink() will fail with EFAULT.

realloc

When the size of the space requested is zero, realloc() returns a unique pointer.

sched_setparam

A process can change the scheduling parameters of another process if and only if the calling process is executed with superuser privileges (i.e., with effective UID 0), or if the effective UID of the calling process is equal to the effective UID of the target process.

The result of calling `sched_setparam()` when the current scheduling policy for the target process is not `SCHED_FIFO`, `SCHED_RR`, or `SCHED_SPORADIC` is the same as if it was `SCHED_RR`.

sched_setscheduler

A process can change the scheduling parameters of another process if and only if the calling process is executed with superuser privileges (i.e., with effective UID 0), or if the effective UID of the calling process is equal to the effective UID of the target process.

The result of calling `sched_setscheduler()` when the current scheduling policy for the target process is not `SCHED_FIFO`, `SCHED_RR`, or `SCHED_SPORADIC` is the same as if it was `SCHED_RR`.

sem_open

The slash character is not interpreted as a special character by `sem_open()` other than the leading one. Multiple slash characters are treated as a single slash character. The `name` argument can contain any number of slash characters at any positions; however, the `name` argument string length should not exceed `PATH_MAX` and each pathname component of `name` should not exceed `NAME_MAX`.

setlocale

The valid strings for the `locale` argument are "`C`" and "`POSIX`".

LynxOS-178 supports the POSIX C locale only.

shm_open

The slash character is not interpreted as a special character by `shm_open()` other than the leading one. Multiple slash characters are treated as a single slash character. The `name` argument can contain any number of slash characters at any

positions; however, the `name` argument string length should not exceed `PATH_MAX` and each pathname component of `name` should not exceed `NAME_MAX`.

sigaction

The `SA_SIGINFO` flag is only allowed to be set for real-time signals.

For real-time signals, subsequent occurrences of a pending signal are queued.

For standard signals, subsequent occurrences of a pending signal are discarded, and it is delivered only once.

signal

When a signal occurs and `func` points to a function, the same signal is prevented from occurring until the current signal handling has completed.

There are no signals other than `SIGFPE`, `SIGILL` and `SIGSEGV` that correspond to a computational exception.

sigwait

When prior to a call to `sigwait()` there are multiple pending instances of a single signal number, and the signal number corresponds to a real-time signal, then upon return from `sigwait()` only one instance of that signal is dequeued and the remaining instances are left pending. No queueing is supported for standard signals and thus there can never be multiple pending instances of a standard signal prior to a call to `sigwait()`.

sin

For subnormal values of `x`, the return value is zero or subnormal.

sinh

For subnormal values of `x`, the return value is zero or subnormal.

socket

LynxOS-178 bundles support for UNIX domain stream sockets (`AF_UNIX`) only.

socketpair

LynxOS-178 bundles support for UNIX domain stream sockets (`AF_UNIX`) only.

sqrt

For finite values of `x < -0`, the return value is `NAN`.

strtod, strtol

LynxOS-178 supports the POSIX C locale only.

symlink

The implementation does not provide any way to initialize the symbolic link's group ID to the effective group ID of the calling process.

tan

For values of `x` that would cause underflow, the return value is zero or subnormal.

For subnormal values of `x`, the return value is zero or subnormal.

tanh

For subnormal values of `x`, the return value is zero or subnormal.

timer_create

LynxOS-178 does not support CPU-time clocks.

timer_getoverrun

The value of the macro `DELAYTIMER_MAX` is `INT_MAX`.

tzset

When the `TZ` environment variable is not set, a default value is used for the timezone. The default value is calculated using internal timezone tables and the set

timezone information. If the system timezone has not been set, then it defaults to `GMT`.

`umask`

No additional mode bits other than file permission bits are supported in the `cmask` argument to `umask()`.

`uname`

There is no default communications network for a node in LynxOS-178.

The format of `utsname` structure members is as follows:

```
sysname  = "LynxOS-178"
nodename = hostname as returned by gethostname()
release  = "x.y.z"
```

where `x`, `y` and `z` are numbers representing the major version, the minor version and the subversion respectively.

```
version= "YYYYMMDD"
```

where `YYYY` is the year, `MM` is the month and `DD` is the day of the build of this version of LynxOS-178.

```
machine  = machine_name
```

where `machine_name` is the name of the architecture for which this version of LynxOS-178 is built.

`wait`, `waitpid`

There are no additional circumstances under which `wait()` or `waitpid()` report status other than those described in IEEE Std 1003.1-2008.

The parent process ID of a child process whose parent terminates before waiting for the termination of the child is reassigned as follows:

- For VM0, the parent process ID is set to 1.
- For VMs other than VM0, the parent process ID is set to the process ID of the VM's master process (defined at VM creation time).

`write`

If the value of `nbyte` is greater than `SSIZE_MAX`, `read()` will fail with `EFAULT`.

Additional circumstances for an `EIO` error to be returned are similar to those described for the `fflush()` function.

Shell & Utilities

LynxOS-178 does not support *Shell & Utilities* in production mode.