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Canadian Contribution:

Initial Work Scope Summary for updating Ada POSIX Bindings IS 14519:2001 to POSIX Draft IS 9945:2008 and Ada 2005

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Initial Work Scope Summary
for updating
ADA POSIX Bindings IS 14519:2001
to
POSIX Draft IS 9945:2008
and
ADA 2005

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1. Introduction

This document summarizes a review of the Draft IS 9945:2008 document and the existing IS14519:2001 Ada Binding to POSIX to determine the scope of an amendment to IS14519 to accommodate revisions to POSIX in light of the 2005 amendments to IS8652:1995 Ada Programming Language.

The document was prepared by a careful review of the C-Ada cross reference in 14519:2001 matched against the draft of IS9945 which is currently being drafted. The process that was followed was as follows:

1. All POSIX calls were reviewed and divided by functional area, such as math, tasking (or thread), timer, directory, character handling, etc.
2. POSIX calls that were omitted in 14519:2001 because they were legacy calls, because they were not "thread safe", because they were C-specific, because Ada already had adequate mechanisms (such as string functions, math functions) were marked as omitted in this document.
3. Other POSIX calls that were developed in intervening revisions to POSIX or which are proposed in the current draft that fall into Ada's domain were omitted. This includes Math, Character and String manipulation, Timer, Environment Variables, Directory. A large unknown is Stream functions and Real Time functions. We believe that most can be absorbed by Ada functionality but more study is required.
4. Other POSIX calls were added to the functional area as potentially required.

The results of this effort is summarized in the following sections.

2. LEGACY Functions

The LEGACY POSIX functions may be omitted from the Ada-POSIX bindings.

```
_longjmp
_setjmp
bcmp
bcopy
bzero
ecvt, fcvt, gcvt
fcvt
ftime
gcvt
getwd
index
mktemp
rindex
system
ualarm
utimes
wcswcs
```

3. Math Functions

These functions (rounding, elementary function, complex functions, random numbers) can be supported by the Ada language. They may be omitted from the Ada-POSIX bindings.

```
abs, cabs, cabsf, cabsl, labs, llabs
acos, acosf, acosl
acosh, acoshf, acoshl, acosl
asin, asinf, asinl
asinh, asinhf, asinhl
atan, atanf, atanl
atan2, atan2f, atan2l
atanh, atanhf, atanhl
cacos, cacosf, cacosl
cacosh, cacoshf, cacoshl
carg, cargf, cargl
casin, casinf, casinl
casinh, casinhf, casinhl
catan, catanf, catanl
catanh, catanhf, catanhl
cbrt, cbrtf, cbrtl
ccos, ccosf, ccosl
ccosh, ccoshf, ccoshl
ceil, ceilf, ceill
cexp, cexpf, cexpl
cimag, cimagf, cimagl
clog, clogf, clogl
conj, conjf, conjl
copysign, copysignf, copysignl
cos, cosf, cosl
cosh, coshf, coshl
cpow, cpowf, cpowl
cproj, cprojf, cprojl
creal, crealf, creall
csin, csinf, csinl
csinh, csinhf, csinhl
csqrt, csqrtf, csqrtl
ctan, ctanf, ctanl
ctanh, ctanhf, ctanhl
div
exp, expf, expl, frexp, frexpf, frexpl, ldexp, ldexpf, ldexpl
exp2, exp2f, exp2l
expm1, expm1f, expm1l
fabs, fabsf, fabsl
fdim, fdimf, fdiml
floor, floorf, floorl
fma, fmaf, fmal
```

```
fmax, fmaxf, fmaxl
fmin, fminf, fminl
fmod, fmodf, fmodl
ilogb, ilogbf, ilogbl
imaxabs, imaxdiv
initstate
lcong48
log, logf, logl
log10, log10f, log10l
log1p, log1pf, log1pl
log2, log2f, log2l
logb, logbf, logbl
logf, loglmodf, modff, modfl
nan
nearbyint, nearbyintf, nearbyintl
nextafter, nextafterf, nextaferl
nexttoward, nexttowardf, nexttowardl
pow
rand, random, srand, srand48, srandom, erand48, drand48, jrand48,
lrand48, nrand48, mrand48
remainder
remquo
rint, rintf, rintl, llrint, llrintf, llrintl, lrint, lrintf, lrintl
round, llround, llroundf, llroundl, lround, lroundf, lroundl
scalb, scalbln
seed48
setstate
sin, sinh, sinl
sqrt,
tan, tanh, tanl
```

These functions are C floating point related. They may be omitted from the Ada-POSIX bindings.

```
fpclassify
isfinite
isgreater
isgreaterequal
isinf
isless
islessequal
islessgreater
isnan
isnormal
isunordered
signbit
```

These functions are supported by Ada-POSIX 5c.

```
hypot, hypotf, hypotl
```

These functions may be included in the Ada-POSIX bindings.

```
j0, j1, jn (Bessel)
y0, y1, yn (Bessel)
erf, erff, erfl (Error)
erfc, erfcf, erfcl (Error)
ffs
lgamma, lgammaf, lgammal (Gamma)
tgamma
```

4. Character and String Functions

These functions can be supported by the Ada language. They may be omitted from the Ada-POSIX bindings.

```
_tolower
_toupper
atof
atoi
atol, atoll
btowc
fmtmsg (C specific)
isalnum
isalpha
isascii
isblank
iscntrl
isdigit
isgraph
islower
isprint
ispunct
isspace
isupper
iswalnum
iswalpha
iswblank
iswcntrl
iswdigit
iswgraph
iswlower
iswprint
iswpunct
iswspace
iswupper
iswxdigit
isxdigit
rindex
strcasecmp
strcat
strchr
strcmp
```

strcoll
strcpy
strcspn
strdup
strerror
strfmon
strftime
strlen
strncasecmp
strncat
strncmp
strncpy
strpbrk
strptime
strrchr
strspn
strstr
strtod
strtoimax
strtok
strtol
strtold
strtoll
strtoul
strtoumax
strxfrm
swab
toascii
tolower
toupper
towctrans
towlower
towupper
trunc
truncf
unlink
wcrtomb
wcscat
wcschr
wcscmp
wcscoll
wcscpy
wcscspn
wcsftime
wcslen
wcsncat
wcsncmp
wcsncpy

```
wcspbrk
wcsrchr
wcsrtombs
wcsspn
wcsstr
wcstod
wcstoimax
wcstok
wcstol
wcstold
wcstoll
wcstombs
wcstoul
wcstoumax
wcswcs
wcswidth
wcsxfrm
wctob
wctomb
wctrans
wctype
wcwidth
wmemchr, wmemcmp, wmemcpy, wmemmove, wmemset
```

5. Time and Timer Functions

These functions can be supported by the Ada language. They may be omitted from the Ada-POSIX bindings.

```
alarm
difftime
ctime, ctime_r
daylight
clock
clock_getres
getdate
getitimer
gettimeofday
gmtime, gmtime_r
asctime, asctime_r
clock_getcpuclockid
clock_nanosleep
clock_gettime, clock_settime
localtime, localtime_r
mktime
setitmer
time, timezone, tzset
```

These functions are currently supported in the Ada-POSIX bindings.

```
times
```

These functions may be included in the Ada-POSIX bindings.

```
timer_create, timer_delete, timer_getoverrun
```

6. Directory Functions

These functions can be supported by the Ada language.

```
access
basename
chdir
closedir
dirname
fnmatch
ftw, nftw
mkdir
opendir
readdir
realpath
remove
rename
rewinddir
rmdir
```

However, Ada.Directories does not support `chmod` and `chown`. The Ada-POSIX 5c POSIX_Files package, which supports

mkdir, access, chdir, closedir, stat, sysconf, may be retained and expanded to included these functions.

```
lchown
lstat
fchdir
fchown
glob, globfree (path name generator)
seekdir
statvfs, sync, symlink, syslog, tmpnam
```

7. Environment Variable Functions

These functions can be supported by the Ada language. These may be considered for deprecation from the Ada-POSIX bindings.

```
environ
getenv
putenv
```

```
setenv
```

8. Containers Functions

The following functions perform services matched by the children of Ada.Containers, and as such should not require inclusion in a binding of Ada to POSIX.

```
bsearch
dbm_*
hcreate, hdestroy, hsearch
insque
lfind
lsearch, lfind
qsort
```

9. Stream I/O Functions

A further study of POSIX stream I/O functions is suggested to investigate how well the Ada Stream I/O model can be mapped to the POSIX Stream I/O model. These are:.

```
fattach, fdetach
feof
ferror
fflush
fprintf, printf, snprintf, sprintf
fputc
fputs
fputwc
fputws
fscanf, scanf, sscanf
ftell, ftello
fwide
fwprintf, swprintf, wprintf
fwrite
fwscanf, swscanf, wscanf
getc
getchar
getc_unlocked
getchar_unlocked
gets
getwc
getwchar
fgetc
fgetpos
fgets
fgetwc
fgetws
fclose
fopen

getmsg, getpmsg
```

getpmsg
ioctl
pclose
perror
pipe
popen
pread
printf
putc
putchar
putchar_unlocked
putc_unlocked
putmsg
puts
putwc
putwchar
pwrite
rewind
setvbuf
tmpfile
ugetc
ugetwc

10. Async I/O Functions

These functions are currently supported by Ada-POSIX 5c.

lio_listio
aio_cancel
aio_error
aio_fsync
aio_read
aio_return
aio_suspend
aio_write

11. File Functions

These functions are currently supported by Ada-POSIX 5c.

chmod
chown
close
creat
dup, dup2
fchmod
fcntl
fdatasync
fstat
fsync
ftruncate

link
lockf
lseek
mkfifo
open
pathconf, fpathconf
read, readv
stat
utime
write
writev

These may be expanded to include

fstatvfs
flockfile, ftrylockfile, funlockfile
readlink
stdin

12.POSIX Tasking and IPC Functions

These functions are supported by the Ada language. They may be omitted from the Ada-POSIX bindings.

nanosleep
pause

These functions are currently supported by Ada-POSIX 5c.

bsd_signal
exec
fork
kill
getgid
getgroups
getpid
getpgrp
mlock
mlockall
mmap
mprotect
mq_close
mq_getattr
mq_notify
mq_open
mq_receive
mq_send
mq_setattr
mq_unlink
msync
munlock
munlockall
munmap

```
pthread_condattr_destroy
pthread_condattr_getpshared
pthread_condattr_init
pthread_condattr_setpshared
pthread_cond_broadcast
pthread_cond_destroy
pthread_cond_signal
pthread_cond_timedwait
pthread_mutexattr_destroy
pthread_mutexattr_getprioceiling
pthread_mutexattr_getprotocol
pthread_mutexattr_getpshared
pthread_mutexattr_init
pthread_mutexattr_setprioceiling
pthread_mutexattr_setprotocol
pthread_mutexattr_setpshared
sched_getparam
sched_get_priority_max
sched_getscheduler
sched_rr_get_interval
sched_setparam
sched_setscheduler
sched_yield
sem_close
sem_destroy
sem_getvalue
sem_init
sem_open
sem_post
sem_trywait
sem_unlink
sem_wait
setcontext
wait
```

It may be expanded to include these functions.

```
getpgid
getsid
getrlimit (resource limit)
getrusage (resource usage)
killpg
mq_timedreceive
mq_timedsend
nice
posix_spawn
posix_spawnattr_destroy
posix_spawnattr_getflags
posix_spawnattr_getpgroup
posix_spawnattr_getschedparam
```

posix_spawnattr_getschedpolicy
posix_spawnattr_getsigdefault
posix_spawnattr_getsigmask
posix_spawnattr_init
posix_spawnattr_setflags
posix_spawnattr_setpgroup
posix_spawnattr_setschedparam
posix_spawnattr_setschedpolicy
posix_spawnattr_setsigdefault
posix_spawnattr_setsigmask
posix_spawn_file_actions_addclose
posix_spawn_file_actions_adddup2
posix_spawn_file_actions_addopen
posix_spawn_file_actions_destroy
posix_spawnp
pthread_mutexattr_gettype
pthread_mutexattr_settype
pthread_mutex_lock
pthread_mutex_timedlock
pthread_mutex_trylock
pthread_rwlockattr_destroy
pthread_rwlockattr_getpshared
pthread_rwlockattr_init
pthread_rwlockattr_setpshared
pthread_rwlock_destroy
pthread_rwlock_rdlock
pthread_rwlock_timedrdlock
pthread_rwlock_timedwrlock
pthread_rwlock_tryrdlock
pthread_rwlock_trywrlock
pthread_rwlock_unlock
pthread_rwlock_wrlock
pthread_self
pthread_setcancelstate
pthread_setschedparam
pthread_setspecific
pthread_sigmask
pthread_spin_destroy
pthread_spin_lock
pthread_spin_unlock
semctl
semget
semop
sem_timedwait - Does not seem to be binding. One should be created.
setpriority
setrlimit
vfork
waitid

XSI message support is also possible. These are:

```
ftok
msgctl
msgget
msgrcv
msgsnd
```

These functions are not supported by POSIX 5c, and likely do not need Ada bindings.

```
abort, _Exit, _exit, exit, atexit
pthread_atfork
pthread_attr_destroy
pthread_attr_getdetachstate
pthread_attr_getguardsize
pthread_attr_getinheritsched
pthread_attr_getschedparam
pthread_attr_getschedpolicy
pthread_attr_getscope
pthread_attr_getstack
pthread_attr_getstackaddr
pthread_attr_getstacksize
pthread_attr_init
pthread_attr_setdetachstate
pthread_attr_setguardsize
pthread_attr_setinheritsched
pthread_attr_setschedparam
pthread_attr_setschedpolicy
pthread_attr_setscope
pthread_attr_setstack
pthread_attr_setstackaddr
pthread_attr_setstacksize
pthread_barrierattr_destroy
pthread_barrierattr_getpshared
pthread_barrierattr_init
pthread_barrierattr_setpshared
pthread_barrier_destroy
pthread_barrier_wait
pthread_cancel
pthread_cleanup_pop
pthread_condattr_getclock
pthread_condattr_setclock
pthread_create
pthread_detach
pthread_equal
pthread_exit
pthread_getconcurrency
pthread_getcpuclockid
pthread_getschedparam
```

```
pthread_getspecific
pthread_join
pthread_key_create
pthread_key_delete
pthread_kill
pthread_mutex_destroy
pthread_mutex_getprioceiling
pthread_mutex_init
pthread_mutex_setprioceiling
pthread_once
pthread_setconcurrency
pthread_setschedprio
pthread_testcancel
```

13.Network (Socket) Functions

These functions are currently supported by Ada-POSIX 5c.

```
accept
bind
connect
endprotoent
getaddrinfo
gethostbyaddr, gethostbyname
gethostname
getnetbyaddr
getpeername
getprotobyname
getservbyname, getservbyport
getsockname
getsockopt
htonl, htons, ntohl, ntohs
inet_addr, inet_ntoa
listen
recv
recvfrom
recvmsg
select
send
sendmsg
sendto
setsockopt
shutdown
socketpair
```

It may be expanded to include these network interface functions.

```
getnameinfo
if_freenameindex
if_indextoname
if_nameindex
```

if_nametoindex
gai_strerror
gethostid
inet_ntop, inet_pton

14. Terminal Functions

These functions are currently supported by Ada-POSIX 5c .

cfgetispeed
cfgetospeed
cfsetispeed
cfsetospeed
ctermid
tcdrain
tcflow
tcflush
tcgetattr
tcgetpgrp
tcsendbreak
tcsetattr
tcsetpgrp
ttyname
unlockpt

These functions may be included in the Ada-POSIX bindings.

posix_openpt
ptsname
tcgetsid

15. User Accounting Functions

These functions are currently supported by Ada-POSIX 5c.

getgrgid, getgrgid_r
getgrnam, getgrnam_r
endnetent
getlogin, getlogin_r
getcwd
getprotoent
getpwnam, getpwnam_r
getpwuid, getpwuid_r
getuid
pututxline
setgid
setpgid
setprotoent
setnetent
setsid
setuid
sysconf (some)

uname

It may be expanded to include these functions.

getegid
geteuid
getutxent, getutxid, getutxline
setegid
seteuid
setgrent
sethostent
setpgrp
setpwent
setregid
setreuid
setservent
setutxent

16.Shared Memory Functions

These functions are currently supported by Ada-POSIX 5c.

shmget
shm_open
shm_unlink

It may be expanded to include these functions.

shmat
shmctl
shmdt

17.Functions Considered And Rejected In Ada-POSIX 5C

assert
calloc
clearerr
_Exit, _exit
exit
feclearexcept
fegetenv, fesetenv
fegetexceptflag
fegetround
feholdexcept
feraiseexcept
fesetenv
fesetexceptflag
fesetround
fetestexcept
feupdateenv
fread
free
freopen

fseek, fseeko
fsetpos
localeconv
longjmp
malloc
mblen
mbrlen
mbrtowc
mbsinit
mbsrtowcs
mbstowcs
mbtowc
memccpy
memchr
memcmp
memcpy
memmove
memset
raise
realloc
setbuf
setjmp
sighold
siginterrupt
siglongjmp
signal
sigpause
sigprocmask
sigqueue
sigrelse
sigsetjmp
sleep
snprintf
sprintf
sscanf
syslog
time
tzset
ulimit
unsetenv
usleep

18.Functions that may be Omitted

Some of these functions may be omitted from the Ada-POSIX bindings. They may be specific to C, or they can be supported by other means.

catclose
clearerr
dlclose

dlerror
dlopen
dlsym
endhostent
endpwent
endservent
endutxent
endgrent
fdopen
fileno
freeaddrinfo
gethostent
getopt
getpwent
getsubopt
grantpt
getgrent
getpriority
getcontext
h_errno
iswctype
isastream
makecontext
mknod
mkstemp
optarg, opterr, optind, optopt
remque
swab
swapcontext
swprintf
va_arg vfprintf
vfscanf
vfwprintf
vfwscanf
vprintf
vscanf
vsnprintf
vsscanf
vswprintf
vswscanf
vwprintf
vwscanf
wscanf

19.Functions that may be Included

These new functions should be considered for possible inclusion in a binding of Ada to POSIX. We do not prejudge whether or not such a consideration would result in their inclusion..

Codeset Conversion

- iconv
- iconv_close
- iconv_open

Encryption

- a64l, l64a
- crypt
- encrypt
- setkey

Files

- posix_fadvise
- posix_fallocate
- posix_madvise
- posix_memalign
- posix_mem_offset
- swscanf
- simlink
- sync

Locale

- nl_langinfo
- setlocale

Logging

- openlog
- closelog
- setlogmask

Tracing

- posix_trace_attr_destroy
- posix_trace_attr_getclockres
- posix_trace_attr_getinherited
- posix_trace_attr_getlogsize
- posix_trace_attr_getname
- posix_trace_attr_getstreamfullpolicy
- posix_trace_attr_getstreamsize
- posix_trace_attr_init
- posix_trace_attr_setinherited
- posix_trace_attr_setlogsize
- posix_trace_attr_setname
- posix_trace_attr_setstreamfullpolicy
- posix_trace_attr_setstreamsize
- posix_trace_clear
- posix_trace_close
- posix_trace_create
- posix_trace_event
- posix_trace_eventid_equal
- posix_trace_eventid_open
- posix_trace_eventset_add

```
posix_trace_eventtypelist_getnext_id
posix_trace_flush
posix_trace_get_attr
posix_trace_get_filter
posix_trace_getnext_event
posix_trace_get_status
posix_trace_open
posix_trace_set_filter
posix_trace_shutdown
posix_trace_start
posix_trace_timedgetnext_event
posix_trace_trid_eventid_open
posix_trace_trygetnext_event
```

Other

```
posix_typed_mem_get_info – may be covered by Ada Storage pools
posix_typed_mem_open     - may be covered by Ada Storage pools
regcomp
tdelete
telldir
tempnam
tfind
tsearch
twalk
umask
```

POSIX Signals in 5C

```
sigaction
sigaddset
sigdelset
sigemptyset
sigfillset
sigismember
sigpending
sigsuspend
sigwait
sigwaitinfo
sigtimedwait
```

20.Changes to Existing Bindings

The following is the analysis of the POSIX calls with Ada bindings in IS14519. The following functions had changes to the interfaces as described below. We also know some semantic changes and some significant description changes. It is our belief that the semantic changes will not change the Ada-POSIX bindings significantly, but may change expected behavior.

Based on this analysis, we conclude that there will not be significant rework of the existing binding.

POSIX Function	Comments
accept	Additional errno.
aio_read	Add EOVERFLOW
aio_return	EINVAL is optional
aio_suspend	Add Monotonic Clock support
aio_write	Add EFBIG
bind	Additional errno
cfsetispeed	Define EINVAL
cfsetospeed	Define EINVAL
chdir	Additional errno
chmod	Add S_ISVTX support. EIO, ELOOP
chown	EIO, ELOOP
clock_gettime, clock_settime	Add Monotonic Clock support
close	Add STREAMS-based io. New errno
connect	Additional errno.
exec	Description changed substantially. Requires further investigation.
fchmod	Add typed memory object, STREAM. Remove some errno.
fcntl	New cmd F_GETOWN, F_SETOWN
fork	Description changed substantially. Requires further investigation.
fpathconf	Additional *name values.* Additional errno.
fstat	Add typed memory object. Remove some errno.
fsync	Additional errno.
ftruncate	Description changed substantially. Requires further investigation.
getenv	Description is more complete, essentially remains the same.
getgrgid_r	Description is more complete, essentially remains the same.
getgrnam_r	Description is more complete, essentially remains the same.
gethostname	Add HOST_NAME_MAX reference, essentially remains the same.
getlogin, getlogin_r	Additional errno.
getpeername	Additional errno.
getpwnam, getpwnam_r	Additional errno.

POSIX Function	Comments
getpwuid, getpwuid_r	Additional errno.
getsockname	Additional errno.
getsockopt	New sockopt SO_ACCEPT_CONN. Remove some errno.
kill	Add pis = -1 behavior
link	Add ELOOP, EXDEV
lio_listio	Add EFBIG
listen	Add implementation guidelines on listen queue. Add EDESTADDRREQ.
lseek	Add shared, typed mem object behavior. Add EOVERFLOW.
mkdir	Additional errno.
mlock	Remove addr alignment Note.
mmap	Add typed mem object support. Add EOVERFLOW
mprotect	Remove addr alignment Note.
mq_notify	Add nq_timedreceive behavior. Add EINVAL.
mq_receive	Define SSIZE_MAX behavior
mq_send	Refine EINVAL definition.
mq_unlink	Refine ENAMETOOLONG definition.
msync	Add typed memory object behavior, which is undefined.
munmap	Add typed memory object support
open	Additional errno, requires more investigation.
opendir	Additional errno ELOOP
pathconf	Significant changes, additional flags FILESIZEBITS new variable POSIX2_SYMLINKS new variable POSIX_ALLOC_SIZE_MIN new variable POSIX_REC_INCR_XFER_SIZE new variable POSIX_REC_MAX_XFER_SIZE new variable POSIX_REC_MIN_XFER_SIZE new variable POSIX_REC_XFER_ALIGN new variable SYMLINK_MAX new variable POSIX_ASYNC_IO new variable SOCK_MAXBUF seems to have gone away
poll	New flag POLLHUP

POSIX Function	Comments
pthread_mutex_getprioceiling	Additional errno, EDEADLK
pthread_mutex_setprioceiling	Additional errno, EDEADLK
recv	Additional errnos, ECONNRESET, ETIMEDOUT, EIO
recvfrom	Additional errnos, ECONNRESET, ETIMEDOUT, EIO
recvmsg	Additional errnos, ETIMEDOUT, EIO
setsocketop	Newe flag definitions
sigque	Parameter change – more restrictive types
sigwaitinfo	Parameter change – more restrictive types
socket	Expansion of protocols, additional errno
socketpair	Semantic Changes, Additional errno.
stat	Parameter change, additional errno.
sysconf	Change in system variables, must be carefully reviewed.
tcdrain	Additional errno, file type changes
tcflow	Additional errno.
tcflush	Additional errno
tcgetattr	Changes in
tcgetpgrp	Errorno ENOSYS removed
tcsendbreak	Additional errno.
tcsetattr	Additional errno
tcsetpgrp	Additional errno.
timer_create	Change errno, behavior change
timer_delete	Remove errno ENOSYS
timer_getioverrun	Remove errno ENOSYS
timer_gettime	Remove errno ENOSYS
timer_settime	Possible semantic changes
ttyname	Not thread safe, should use ttyname_r (may be reference problem only)
unlink	Add errno ELOOP, now applicable to streams.
utime	Add errno ELOOP
wait	Some semantic changes, probably does not affect interface
waitpid	Some semantic changes, probably does not affect interface

POSIX Function	Comments
write	Changed from process-orientation to thread orientation.