



# e-POSIX

**eposix short-flat  
listing of classes**

*written by Berend de Boer*

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# A

## Short (flat) listing of Standard C classes

### A.1 Short form of STDC\_BASE

```
class interface STDC_BASE
feature(s) from STDC_BASE
  -- Access
  errno: STDC_ERRNO
  -- Access to the variable that contains the error that occurred.
feature(s) from STDC_BASE
  -- Status
  raise_exception_on_error: BOOLEAN
  -- Should an exception be raised when an error occurs?
  -- If not, you have to check errno for any errors.
feature(s) from STDC_BASE
  -- Change
  set_default_action_on_error
  -- Use security.error_handling.exceptions_enabled to
  -- determine if an exception should be raised when a C call
  -- returns an error.
  set_raise_exception_on_error
  -- Always raise an exception when a C call returns an error.
  set_continue_on_error
  -- Never raise an exception when a C call returns an error.
  inherit_error_handling (an_instance: STDC_BASE)
  -- Handle errors like an_instance
invariant
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
end of STDC_BASE
```

## A.2 Short form of *STDC\_BUFFER*

**class** *interface* *STDC\_BUFFER*

**creation**

*allocate* (*a\_capacity*: *INTEGER*)

- Allocate memory of *a\_capacity* bytes.
- If *is\_owner* then the buffer is first deallocated.

*allocate\_and\_clear* (*a\_capacity*: *INTEGER*)

- Allocate memory of *a\_capacity* bytes, make sure its zeroed out.
- If *is\_owner* then the buffer is first deallocated.

*make\_from\_pointer* (*a\_pointer*: *POINTER*; *a\_capacity*: *INTEGER*; *a\_become\_owner*: *BOOLEAN*)

- Attach a pointer to this object. If *a\_become\_owner* is
- True, it will deallocate the pointer when *close* is
- called, or when this object is garbage collected.

**feature(s) from** *STDC\_BUFFER*

-- Allocation

*allocate* (*a\_capacity*: *INTEGER*)

- Allocate memory of *a\_capacity* bytes.
- If *is\_owner* then the buffer is first deallocated.

*allocate\_and\_clear* (*a\_capacity*: *INTEGER*)

- Allocate memory of *a\_capacity* bytes, make sure its zeroed out.
- If *is\_owner* then the buffer is first deallocated.

*make\_from\_pointer* (*a\_pointer*: *POINTER*; *a\_capacity*: *INTEGER*; *a\_become\_owner*: *BOOLEAN*)

- Attach a pointer to this object. If *a\_become\_owner* is
- True, it will deallocate the pointer when *close* is
- called, or when this object is garbage collected.

**feature(s) from** *STDC\_BUFFER*

-- Other allocation commands

*resize* (*new\_capacity*: *INTEGER*)

- Resize memory to *new\_capacity* bytes. Expanded memory is not
- guaranteed to be zeroed out.

**feature(s) from** *STDC\_BUFFER*

-- Element change

*copy* (*other*: **like** *Current*)

- Reinitialize by copying the characters of *other*.
- (This is also used by *twin*.)

**feature(s) from** *STDC\_BUFFER*

-- Comparison

*is\_equal* (*other*: **like** *Current*): *BOOLEAN*

- Is *other* attached to an object considered equal to
- current object ?

**feature(s) from** *STDC\_BUFFER*

-- Access

*resource\_usage\_can\_be\_increased*: *BOOLEAN*

- Can the number of allocated resources increased with *capacity*?

**feature(s) from** *STDC\_BUFFER*

-- Copy data internally or externally

```

copy_from (source: STDC_BUFFER; src_offset, dest_offset, bytes: INTEGER)
-- Move data from another buffer into ourselves.
-- Start at offset src_offset, into
-- offset dest_offset, moving bytes bytes
-- Memory may overlap.
memory_copy (source: POINTER; src_offset: INTEGER; dest_offset, bytes: INTEGER)
-- Copy data from source, offset src_offset, to location
-- dest_offset in this buffer, for bytes bytes.
-- Memory may not overlap, use move to copy within buffer
-- or memory_move to copy from potentially overlapping buffer.
memory_move (source: POINTER; src_offset: INTEGER; dest_offset, bytes: INTEGER)
-- Copy data from source, offset src_offset, to location
-- dest_offset in this buffer, for bytes bytes.
-- Memory may overlap.
move (src_offset, dest_offset: INTEGER; bytes: INTEGER)
-- Move data around in buffer itself from offset src_offset to
-- offset dest_offset, moving bytes bytes.
-- Memory may overlap.
feature(s) from STDC_BUFFER
-- Access
handle: POINTER
-- Alias for ptr
feature(s) from STDC_BUFFER
-- Set/get bytes (8-bit data)
peek_uint8 (index: INTEGER): INTEGER
-- consider memory an array of 8 bit values.
infix "@" (index: INTEGER): INTEGER
-- consider memory an array of 8 bit values.
poke_uint8 (index, value: INTEGER)
peek_int8 (index: INTEGER): INTEGER
-- consider memory an array of 8 bit values.
poke_int8 (index, value: INTEGER)
feature(s) from STDC_BUFFER
-- Set/get integers (16-bit data)
peek_int16 (index: INTEGER): INTEGER
-- Read signed 16 bit value at offset index in native
-- endian format.
peek_int16_native (index: INTEGER): INTEGER
-- Read signed 16 bit value at offset index in native
-- endian format.
peek_uint16 (index: INTEGER): INTEGER
-- Read unsigned 16 bit value at offset index in native format.
peek_uint16_native (index: INTEGER): INTEGER
-- Read unsigned 16 bit value at offset index in native format.
peek_int16_big_endian (index: INTEGER): INTEGER
-- Read 16 bit value at offset index in big endian format.
peek_uint16_big_endian (index: INTEGER): INTEGER
-- Read 16 bit value at offset index in big endian format.
peek_int16_little_endian (index: INTEGER): INTEGER

```

```

-- Read 16 bit value at offset index in little endian format.
peek_uint16_little_endian (index: INTEGER): INTEGER
-- Read 16 bit value at offset index in little endian format.
poke_int16 (index: INTEGER; value: INTEGER)
-- Write 16 bit value at offset index, in native endian format.
poke_int16_native (index: INTEGER; value: INTEGER)
-- Write 16 bit value at offset index, in native endian format.
poke_int16_big_endian (index: INTEGER; value: INTEGER)
-- Write 16 bit value at offset index, in big endian format.
poke_int16_little_endian (index: INTEGER; value: INTEGER)
-- Write 16 bit value at offset index, in little endian format.
feature(s) from STDC_BUFFER
-- Set/get integers (32-bit data)
peek_int32_native (index: INTEGER): INTEGER
-- Read 32 bit value at offset index, assume its byte order
-- is native, and return it.
peek_integer (index: INTEGER): INTEGER
-- Read 32 bit value at offset index, assume its byte order
-- is native, and return it.
peek_int32_big_endian (index: INTEGER): INTEGER
-- Read 32 bit value at offset index, assume its byte order
-- is big endian, and return it in native format.
peek_int32_little_endian (index: INTEGER): INTEGER
-- Read 32 bit value at offset index, assume its byte order
-- is little endian, and return it in native format.
peek_uint32_native (index: INTEGER): INTEGER
-- Read 32 bit unsigned int at offset index, assume native
-- byte order.
peek_uint32_big_endian (index: INTEGER): INTEGER
-- Read 32 bit unsigned int at offset index, assume its
-- byte order is big endian, and return it in native format.
peek_uint32_little_endian (index: INTEGER): INTEGER
-- Read 32 bit unsigned int at offset index, assume its
-- byte order is big endian, and return it in native format.
poke_integer (index: INTEGER; value: INTEGER)
-- Write 32 bit value at offset index, in native endian format.
poke_int32_native (index: INTEGER; value: INTEGER)
-- Write 32 bit value at offset index, in native endian format.
poke_int32_big_endian (index: INTEGER; value: INTEGER)
-- Write 32 bit value at offset index, in big endian format.
poke_int32_little_endian (index: INTEGER; value: INTEGER)
-- Write 32 bit value at offset index, in little endian format.
feature(s) from STDC_BUFFER
-- Set/get integers (64-bit data)
peek_int64_native (index: INTEGER): INTEGER_64
-- Read 64 bit value at offset index, assume its byte order
-- is native, and return it.
peek_integer_64 (index: INTEGER): INTEGER_64
-- Read 64 bit value at offset index, assume its byte order

```

```

-- is native, and return it.
peek_int64_big_endian (index: INTEGER): INTEGER_64
-- Read 64 bit int at offset index, assume its
-- byte order is big endian, and return it in native format.
peek_int64_little_endian (index: INTEGER): INTEGER_64
-- Read 64 bit int at offset index, assume its
-- byte order is little endian, and return it in native format.
poke_integer_64 (index: INTEGER; value: INTEGER_64)
-- Write 64 bit value at offset index, in native endian format.
poke_int64_native (index: INTEGER; value: INTEGER_64)
-- Write 64 bit value at offset index, in native endian format.
poke_int64_big_endian (index: INTEGER; value: INTEGER_64)
-- Write 64 bit value at offset index, in big endian format.
poke_int64_little_endian (index: INTEGER; value: INTEGER_64)
-- Write 64 bit value at offset index, in little endian format.
feature(s) from STDC_BUFFER
-- Set/get characters
append_to_string (dest: STRING; start_index, end_index: INTEGER)
-- Append all characters from start_index to end_index
-- inclusive to dest.
peek_character (index: INTEGER): CHARACTER
-- Return value at index as an 8-bit character.
poke_character (index: INTEGER; value: CHARACTER)
-- Set character at index index to value.
put_character (c: CHARACTER; index: INTEGER)
-- Set character at index index to value.
-- Same as peek_character with more Eiffel like parameter order.
put_string (s: STRING; a_start_index, an_end_index: INTEGER)
-- Put s starting at index start_index. s is written up
-- to end_index or when there are no more characters in
-- s.
put_to_string (dest: STRING; pos, start_index, end_index: INTEGER)
-- Put characters from start_index to end_index inclusive
-- in dest starting at position pos.
-- Useful for Gobo character buffers.
c_substring_with_string (dest: STRING; start_index, end_index: INTEGER)
-- As c_substring but used dest as the destination.
c_substring (start_index, end_index: INTEGER): STRING
-- Create a substring containing all characters from
-- start_index up to encountering a %U or when end_index is
-- reached, whatever happens first.
substring (start_index, end_index: INTEGER): STRING
-- Create a substring containing all characters
-- from start_index to end_index inclusive.
feature(s) from STDC_BUFFER
-- Fill
fill_at (start_index, a_count: INTEGER; byte: INTEGER)
-- Starting at position start_index, write byte for a_count bytes
feature(s) from STDC_BUFFER

```

```
-- Searching
locate_character (other: CHARACTER; start_index: INTEGER): INTEGER
  -- Return index of other in buffer, or -1.
  -- Search begins at start_index.
locate_string (other: STRING; start_index: INTEGER): INTEGER
  -- Does buffer contain other?
  -- Returns index where other is found.
  -- Returns -1 if not found
  -- searching starts at position start_index
feature(s) from STDC_BUFFER
  -- Status
  is_valid_index (index: INTEGER): BOOLEAN
  is_valid_range (from_index, to_index: INTEGER): BOOLEAN
    -- Is from_index..to_index a valid and meaningful range?
invariant
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
  capacity_not_negative: capacity >= 0;
  valid_capacity: is_allocated = (capacity > 0);
  open_implies_handle_assigned: is_allocated = (ptr /= unassigned_value);
  owned_implies_open: is_owner implies is_allocated;
  owned_implies_handle_assigned: is_owner implies ptr /= unassigned_value;
end of STDC_BUFFER
```

### A.3 Short form of `STDC_CONSTANTS`

```

class interface STDC_CONSTANTS
feature(s) from STDC_CONSTANTS
  -- Error codes
  edom: INTEGER
    -- Math argument out of domain of function
  erange: INTEGER
    -- Math result not representable
  emfile: INTEGER
    -- Too many open files
feature(s) from STDC_CONSTANTS
  -- Standard streams
  stream_stdin: POINTER
  stream_stdout: POINTER
  stream_stderr: POINTER
feature(s) from STDC_CONSTANTS
  -- Special characters
  const_eof: INTEGER
    -- signals EOF
feature(s) from STDC_CONSTANTS
  -- I/O buffering
  iofbf: INTEGER
    -- full buffering
  iolbf: INTEGER
    -- line buffering
  ionbf: INTEGER
    -- no buffering
feature(s) from STDC_CONSTANTS
  -- file positioning
  seek_set: INTEGER
  seek_cur: INTEGER
  seek_end: INTEGER
feature(s) from STDC_CONSTANTS
  -- Signal related constants
  sig_dfl: POINTER
  sig_err: POINTER
  sig_ign: POINTER
feature(s) from STDC_CONSTANTS
  -- Signals
  sigabrt: INTEGER
  sigfpe: INTEGER
    -- erroneous arithmetic operation, such as zero divide or an
    -- operation resulting in overflow
  sigill: INTEGER
    -- illegal instruction
  sigint: INTEGER
    -- receipt of an interactive attention signal
  sigsegv: INTEGER

```

```
-- invalid access to storage
sigterm: INTEGER
-- Request process to terminate; can be caught or ignored
feature(s) from STDC_CONSTANTS
-- random numbers
rand_max: INTEGER
-- maximum value returned by the random function
feature(s) from STDC_CONSTANTS
-- category constants
lc_ctype: INTEGER
lc_numeric: INTEGER
lc_time: INTEGER
lc_collate: INTEGER
lc_monetary: INTEGER
lc_all: INTEGER
feature(s) from STDC_CONSTANTS
-- various
clocks_per_sec: INTEGER
feature(s) from STDC_CONSTANTS
-- exit codes
exit_failure: INTEGER
-- exit status when something has gone wrong
exit_success: INTEGER
-- exit status upon success
end of STDC_CONSTANTS
```

## A.4 Short form of *STDC\_CURRENT\_PROCESS*

```

class interface STDC_CURRENT_PROCESS
feature(s) from STDC_SECURITY_ACCESSOR
  -- The singleton, available to any because its used in preconditions
  security: STDC_SECURITY
  -- Singleton entry point for security.
feature(s) from STDC_BASE
  -- Access
  errno: STDC_ERRNO
  -- Access to the variable that contains the error that occurred.
feature(s) from STDC_BASE
  -- Status
  raise_exception_on_error: BOOLEAN
  -- Should an exception be raised when an error occurs?
  -- If not, you have to check errno for any errors.
feature(s) from STDC_BASE
  -- Change
  set_default_action_on_error
  -- Use security.error_handling.exceptions_enabled to
  -- determine if an exception should be raised when a C call
  -- returns an error.
  set_raise_exception_on_error
  -- Always raise an exception when a C call returns an error.
  set_continue_on_error
  -- Never raise an exception when a C call returns an error.
  inherit_error_handling (an_instance: STDC_BASE)
  -- Handle errors like an_instance
feature(s) from ARGUMENTS
  command_name: STRING
feature(s) from CAPI_TIME
  -- Standard C binding
  current_time: INTEGER
  -- The current calendar time in seconds since the epoch
feature(s) from STDC_CURRENT_PROCESS
  -- Process standard input/output/error
  stdin: STDC_TEXT_FILE
  stdout: STDC_TEXT_FILE
  stderr: STDC_TEXT_FILE
feature(s) from STDC_CURRENT_PROCESS
  -- Various
  clock: INTEGER
  -- Approximation of processor time used by the program, or -1
  -- if unknown
feature(s) from STDC_CURRENT_PROCESS
  -- Random numbers
  random: INTEGER
  -- Returns a pseudo-random integer between 0 and RAND_MAX.
  set_random_seed (a_seed: INTEGER)

```

```
-- Sets a_seed as the seed for a new sequence of
-- pseudo-random integers to be returned by random. These
-- sequences are repeatable by calling set_random_seed with
-- the same seed value. If no seed value is provided, the
-- random function is automatically seeded with a value of
-- 1.
feature(s) from STDC_CURRENT_PROCESS
-- Global locale
locale: STRING
-- Current locale
numeric_format: STDC_LOCALE_NUMERIC
-- Various information for formatting numbers and monetary
-- quantities
set_locale (category: INTEGER; new_locale: STRING)
-- Set given locale to new_locale. new_locale is either a
-- well-known constant like "C" or "da_DK" or an opaque
-- string that was returned by another call of setlocale.
set_c_locale
-- Set locale to the Standard C locale (the default).
set_native_decimal_point
-- Set the decimal point character using the LC_NUMERIC
-- environment variable.
set_native_locale
-- Set entire locale to the natives setting which is
-- determined by environment variables like LC_NUMERIC,
-- LC_COLLATE, LC_CTYPE etc.
set_native_time
-- Set time display to the natives setting using the LC_TIME
-- environment variable.
invariant
accessing_real_singleton: security_is_real_singleton;
valid_error_action: error_action >= 0 and error_action <= 2;
end of STDC_CURRENT_PROCESS
```

## A.5 Short form of *STDC\_ENV\_VAR*

```
class interface STDC_ENV_VAR
creation
  make (a_name: STRING)
feature(s) from STDC_ENV_VAR
  -- Initialization
  make (a_name: STRING)
feature(s) from STDC_ENV_VAR
  -- Access
  exist: BOOLEAN
  -- Is this environment variable defined?
  name: STRING
  -- Name of environment variable.
  value: STRING
  -- Current value of environment variable.
invariant
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
end of STDC_ENV_VAR
```

## A.6 Short form of `STDC_FILE`

`STDC_FILE` is a deferred class. Use `STDC_TEXT_FILE` for accessing and creating text files, or `STDC_BINARY_FILE` for binary files.

```

deferred class interface STDC_FILE
feature(s) from STDC_FILE
  -- Initialization
  create_read_write (path: STRING)
    -- Open file for update (reading and writing). If the file
    -- already exists, it is truncated to zero length.
    -- So permissions seem to remain.
  create_write (path: STRING)
    -- Create new file for writing. If the file already exists,
    -- it is truncated to zero length.
    -- So permissions seem to remain.
  open (path, a_mode: STRING)
    -- Open file in given a_mode.
  open_append (path: STRING)
    -- Append to existing file or create file if it does not exist.
  open_read (path: STRING)
    -- Open file for reading.
  open_read_write (path: STRING)
    -- Open file for reading and writing.
  open_write (path: STRING)
    -- Open file for writing.
feature(s) from STDC_FILE
  -- Work with existing streams
  attach_to_stream (a_stream: POINTER; a_mode: STRING)
    -- Attach to a_stream. Does not become owner of stream so
    -- it will not close on close or when garbage collected.
feature(s) from STDC_FILE
  -- Reopen
  reopen (a_path, a_mode: STRING)
    -- Closes and then opens a stream.
feature(s) from STDC_FILE
  -- Control over buffering
  flush
    -- Updates this stream
  setbuf (buffer: POINTER)
    -- Determines how the stream will be buffered
    -- gives you a fully buffered input and output.
    -- Not sure: buffer should have at least BUFSIZ bytes?
    -- No operation should yet been performed on this file
    -- buffer = default_pointer: default buffer will be allocated
    -- buffer /= default_pointer implies buffer size = BUFSIZ
  set_buffer (buffer: POINTER)
    -- Determines how the stream will be buffered
    -- gives you a fully buffered input and output.
    -- Not sure: buffer should have at least BUFSIZ bytes?

```

```

-- No operation should yet been performed on this file
-- buffer = default_pointer: default buffer will be allocated
-- buffer /= default_pointer implies buffer size = BUFSIZ
set_full_buffering (buffer: POINTER; size: INTEGER)
-- Determines buffering for a stream.
-- If buffer is default_pointer, a buffer of size bytes
-- will be allocated by this routine.
set_line_buffering (buffer: POINTER; size: INTEGER)
-- Determines buffering for a stream.
-- If buffer is default_pointer, a buffer of size bytes
-- will be allocated by this routine.
set_no_buffering
-- Turn buffering off.
feature(s) from STDC_FILE
-- read, C like
last_byte: INTEGER
-- Last read character of get_character.
-- Can be negative, so is more a last_shortint or so!
getc
-- Reads a C unsigned char and converts it to an integer,
-- the result is left in last_byte.
-- This function probably can be used to read a single
-- byte.
get_character
-- Reads a C unsigned char and converts it to an integer,
-- the result is left in last_byte.
-- This function probably can be used to read a single
-- byte.
read (buf: POINTER; offset, bytes: INTEGER)
-- Read chunk, set last_read. offset determines how far
-- in buf you want to start writing.
feature(s) from STDC_FILE
-- Write, C like
putc (c: INTEGER)
-- Write a single character.
write (buf: POINTER; offset, bytes: INTEGER)
-- write bytes bytes from buf at offset offset
-- we do not really care if offset is positive or negative...
feature(s) from STDC_FILE
-- Access
last_boolean: BOOLEAN
-- last boolean read by read_boolean
last_double: DOUBLE
-- last double lread by read_double
last_integer: INTEGER
last_real: REAL
-- last real read by read_real
max_line_length: INTEGER
-- Maximum line length used in read_line

```

```
mode: STRING
  -- Mode in which the file is opened/created.
feature(s) from STDC_FILE
  -- Input
  read_boolean
    -- Attempt to read back a boolean written by write_boolean.
  read_buffer (buf: STDC_BUFFER; offset, bytes: INTEGER)
    -- More safe version of read in case you have a
    -- STDC_BUFFER object. Read starts at offset bytes in buf.
    -- Check last_read for number of bytes actually read.
  read_double
  read_character
    -- Read a single character and set last_character.
    -- If end-of-file encountered, eof is True.
  read_integer
  read_line
    -- Read characters from input stream until a line separator
    -- or end of file is reached. Make the characters that have
    -- been read available in last_string and discard the line
    -- separator characters from the input stream.
    -- Reads a maximum of max_line_length characters per line.
    -- The line should not have a %U character in it, because
    -- that is treated as end-of-file.
  read_new_line
    -- Read a line separator from input file.
    -- Make the characters making up the recognized
    -- line separator available in last_string,
    -- or make last_string empty and leave the
    -- input file unchanged if no line separator
    -- was found.
  read_real
  read_string (nb: INTEGER)
    -- Read at most nb characters from input stream.
    -- Make the characters that have actually been read
    -- available in last_string.
    -- The input stream should not contain %U characters.
feature(s) from STDC_FILE
  -- write, Eiffel like
  put (any: ANY)
    -- Write object as string.
  put_buffer (buf: STDC_BUFFER; offset, bytes: INTEGER)
    -- more safe version of write in case you have a
    -- STDC_BUFFER object
    -- Check last_written for number of bytes actually written,
    -- if you use asynchronous writing.
  write_buffer (buf: STDC_BUFFER; offset, bytes: INTEGER)
    -- more safe version of write in case you have a
    -- STDC_BUFFER object
    -- Check last_written for number of bytes actually written,
```

```

-- if you use asynchronous writing.
put_boolean (b: BOOLEAN)
-- Write "True" to output stream if
-- b is true, "False" otherwise.
write_boolean (b: BOOLEAN)
put_character (c: CHARACTER)
-- Write a single character.
write_character (c: CHARACTER)
-- Write a single character.
put_double (d: DOUBLE)
-- Write a double in Standard C %f format.
write_double (d: DOUBLE)
-- Write a double in Standard C %f format.
put_integer (i: INTEGER)
-- Write an integer in Standard C %d format.
write_integer (i: INTEGER)
-- Write an integer in Standard C %d format.
put_real (r: REAL)
-- Write a real in Standard C %f format.
write_real (r: REAL)
-- Write a real in Standard C %f format.
put_string (a_string: STRING)
-- Write a_string to stream.
-- Because the way this feature is written (it supports
-- writing the NULL byte), it is probably a very good idea to
-- turn on buffering, see set_full_buffering or
-- set_line_buffering.
write_string (s: STRING)
puts (s: STRING)
feature(s) from STDC_FILE
-- Unreading
ungetc (c: INTEGER)
-- Pushes c back to the stream. Only one push back is guaranteed.
-- Note that file positioning functions discard any
-- pushed-back characters.
unread_character (an_item: CHARACTER)
-- Put an_item back in input stream. Only one push back is
-- guaranteed.
-- This item will be read first by the next
-- call to a read routine.
-- Note that file positioning functions discard any
-- pushed-back characters.
feature(s) from STDC_FILE
-- File position
get_position: STDC_FILE_POSITION
-- Get the current position. Use set_position to return to
-- this saved position
rewind
-- Sets the file position to the beginning of the file.

```

```

seek (offset: INTEGER)
  -- Set file position to given absolute offset.
seek_from_current (offset: INTEGER)
  -- Set file position relative to current position.
seek_from_end (offset: INTEGER)
  -- Set file position relative to end of file.
set_position (a_position: STDC_FILE_POSITION)
  -- Set the current file position.
tell: INTEGER
  -- The current position
feature(s) from STDC_FILE
  -- Other
  clearerr
    -- Clears end-of-file and error indicators for a stream.
  clear_error
    -- Clears end-of-file and error indicators for a stream.
feature(s) from STDC_FILE
  -- Status
  end_of_input: BOOLEAN
    -- Is end-of-file encountered by getc or is the end-of-file indicator
    -- is set?
  error: BOOLEAN
    -- Is the error indicator is set?
  is_binary_mode_specification (a_mode: STRING): BOOLEAN
    -- Is the last character of a_mode equal to b?
  is_text_mode_specification (a_mode: STRING): BOOLEAN
    -- Is the last character of a_mode equal to t?
  is_valid_mode (a_mode: STRING): BOOLEAN
    -- Is a_mode a valid mode specification for Current?
  ensure
    not_empty: Result implies a_mode /= Void and then not a_mode.is_empty
  resource_usage_can_be_increased: BOOLEAN
    -- Is it allowed to open another file?
invariant
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
  open_in_sync: is_open_read or is_open_write implies is_open; -- The reverse is not
  true, for examples sockets can be
  -- closed for reading/writing, but still open.
  capacity_not_negative: capacity >= 0;
  valid_capacity: is_open = (capacity > 0);
  open_implies_handle_assigned: is_open = (stream /= unassigned_value);
  owned_implies_open: is_owner implies is_open;
  owned_implies_handle_assigned: is_owner implies stream /= unassigned_value;
  last_string_valid: last_string /= Void;
  gets_buf_valid: gets_buf /= Void;
end of deferred STDC_FILE

```

## A.7 Short form of *STDC\_FILE\_SYSTEM*

```

class interface STDC_FILE_SYSTEM
feature(s) from STDC_FILE_SYSTEM
  -- Path names
  expand_path (a_path: STRING): STDC_PATH
    -- returns a new path
feature(s) from STDC_FILE_SYSTEM
  -- Rename files/directories, remove files/directories
  remove_file (a_path: STRING)
    -- Removes a file from a directory.
    -- For Standard C, its implementation defined what
    -- remove_file does if file is opened by some process
    -- (remove_file fails on Windows for example).
    -- doesnt remove a directory.
  rename_to (current_path, new_path: STRING)
    -- Rename a file or a directory.
    -- new_path should not be an existing path.
feature(s) from STDC_FILE_SYSTEM
  -- Accessibility of files
  is_modifiable (a_path: STRING): BOOLEAN
    -- Is a_path readable and writable by this program?
    -- Does this by attempting to open a_path file read/write.
  is_readable (a_path: STRING): BOOLEAN
    -- Is a_path readable by this program?
    -- Does this by attempting to open a_path file read-only.
feature(s) from STDC_FILE_SYSTEM
  -- File and string
  write_string_to_file (s, a_file_name: STRING)
    -- Write s to file a_file_name.
invariant
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
end of STDC_FILE_SYSTEM

```

## A.8 Short form of STDC\_SECURITY

```
class interface STDC_SECURITY
feature(s) from STDC_SECURITY
  -- Modes
  make_allow_all
    -- Just allow everything.
  make_allow_sandbox
    -- Allow very little, use for setuid root programs.
feature(s) from STDC_SECURITY
  -- The security aspects
  cpu: STDC_SECURITY_CPU
  error_handling: STDC_SECURITY_ERROR_HANDLING
  files: STDC_SECURITY_FILES
  memory: STDC_SECURITY_MEMORY
feature(s) from STDC_SECURITY
  -- Various
  assert_once_memory_allocated
    -- Make sure that certain once functions in STDC_BASE are
    -- called. These once functions are called when an error
    -- occurs, at that time there might not be memory left to
    -- create them.
invariant
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
  remain_single: Current = singleton;
end of STDC_SECURITY
```

## A.9 Short form of *STDC\_SIGNAL*

```

class interface STDC_SIGNAL
creation
  make (a_value: INTEGER)
feature(s) from STDC_SIGNAL
  -- creation
  make (a_value: INTEGER)
feature(s) from STDC_SIGNAL
  -- set signal properties, make effective with apply
  apply
    -- Make changes effective.
  set_default_action
    -- Install signal-specific default action.
    -- Call apply to make changes effective.
  set_ignore_action
    -- Set action to ignore signal.
    -- Call apply to make changes effective.
  set_handler (a_handler: STDC_SIGNAL_HANDLER)
    -- Install ones own signal handler.
feature(s) from STDC_SIGNAL
  -- signal functions
  raise
    -- Raise the signal.
feature(s) from STDC_SIGNAL
  -- signal state
  is_ignorable: BOOLEAN
    -- All signals Standard C knows about are ignorable...
  value: INTEGER
    -- the signal
invariant
  --accessing_real_singleton: signal_switch_is_real_singleton
  -- Gives crash with ISE Eiffel
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
  valid_signal_value: value >= 1;
end of STDC_SIGNAL

```

## ***A.10 Short form of STDC\_SIGNAL\_HANDLER***

```
deferred class interface STDC_SIGNAL_HANDLER  
end of deferred STDC_SIGNAL_HANDLER
```

## A.11 Short form of *STDC\_SYSTEM*

```
class interface STDC_SYSTEM
feature(s) from STDC_SYSTEM
  -- run-time determined queries
  is_shell_available: BOOLEAN
    -- Return True if command interpreter is available
  is_windows: BOOLEAN
    -- Are we running on the Windows platform?
    -- Note that this is false when using cygwin as for all
    -- intends and purposes cygwin is unix to a program that
    -- compiled with it.
feature(s) from STDC_SYSTEM
  -- Compile time determined queries
  clocks_per_second: INTEGER
    -- Number per second of the value returned by the clock function
feature(s) from STDC_SYSTEM
  -- Time zone
  time_zone_seconds: INTEGER
    -- Number of seconds to add to UTC to arrive at the time for
    -- the current time zone
feature(s) from STDC_SYSTEM
  -- Endianess
  is_big_endian: BOOLEAN
    -- True if this is a big endian architecture
  is_little_endian: BOOLEAN
    -- True if this is a little endian architecture
invariant
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
end of STDC_SYSTEM
```

## A.12 Short form of *STDC\_TIME*

**class** *interface* *STDC\_TIME*

**creation**

*make\_date* (*a\_year*, *a\_month*, *a\_day*: *INTEGER*)

-- Create a time according to this day, time 00:00:00.  
-- Date is assumed to be a local date.

*make\_date\_time* (*a\_year*, *a\_month*, *a\_day*, *an\_hour*, *a\_minute*, *a\_second*: *INTEGER*)

-- Date is assumed to be a local date.  
-- We assume daylight saving time setting in effect is  
-- available from system.

*make\_from\_dt\_date\_time* (*a\_date\_time*: *DT\_DATE\_TIME\_VALUE*)

-- Make from Gobo date time.  
-- Date is assumed to be a local date.  
-- We assume daylight saving time setting in effect is  
-- available from system.

*make\_from\_now*

-- Make *value* equal to current unix time.  
-- Afterwards call *to\_local* or *to\_utc* to turn individual  
-- fields in local time or in utc time.

*make\_from\_unix\_time* (*a\_value*: *INTEGER*)

-- *a\_value* is a *time\_t* value.  
-- Afterwards call *to\_local* or *to\_utc* to turn individual  
-- fields in local time or in utc time.

*make\_time* (*an\_hour*, *a\_minute*, *a\_second*: *INTEGER*)

-- Time is assumed to be a local time.  
-- We assume daylight saving time setting in effect is  
-- available from system.  
-- Day will be January 1, *minimum\_year*.

*make\_utc\_date* (*a\_year*, *a\_month*, *a\_day*: *INTEGER*)

-- Create a time according to this day, time 00:00:00.  
-- Date is assumed to be in UTC.

*make\_utc\_date\_time* (*a\_year*, *a\_month*, *a\_day*, *an\_hour*, *a\_minute*, *a\_second*: *INTEGER*)

-- Date is assumed to be in UTC.  
-- Conversion to the unix time is done without taking into  
-- account leap seconds, as according to the specification.

*make\_utc\_time* (*an\_hour*, *a\_minute*, *a\_second*: *INTEGER*)

-- Time is assumed to be UTC time at January 1, *minimum\_year*.  
-- We assume daylight saving time setting in effect is  
-- available from system.

**feature(s) from** *STDC\_TIME*

-- Initialization

*make\_date* (*a\_year*, *a\_month*, *a\_day*: *INTEGER*)

-- Create a time according to this day, time 00:00:00.  
-- Date is assumed to be a local date.

*make\_date\_time* (*a\_year*, *a\_month*, *a\_day*, *an\_hour*, *a\_minute*, *a\_second*: *INTEGER*)

-- Date is assumed to be a local date.  
-- We assume daylight saving time setting in effect is  
-- available from system.

```

make_date_time_without_dst (a_year, a_month, a_day, an_hour, a_minute, a_second:
INTEGER)
    -- Date is assumed to be a date/time without daylight saving
    -- taken into account, such as a UTC based date/time.
make_from_dt_date_time (a_date_time: DT_DATE_TIME_VALUE)
    -- Make from Gobo date time.
    -- Date is assumed to be a local date.
    -- We assume daylight saving time setting in effect is
    -- available from system.
make_from_now
    -- Make value equal to current unix time.
    -- Afterwards call to_local or to_utc to turn individual
    -- fields in local time or in utc time.
make_from_unix_time (a_value: INTEGER)
    -- a_value is a time_t value.
    -- Afterwards call to_local or to_utc to turn individual
    -- fields in local time or in utc time.
make_utc_date (a_year, a_month, a_day: INTEGER)
    -- Create a time according to this day, time 00:00:00.
    -- Date is assumed to be in UTC.
make_utc_date_time (a_year, a_month, a_day, an_hour, a_minute, a_second: INTEGER)
    -- Date is assumed to be in UTC.
    -- Conversion to the unix time is done without taking into
    -- account leap seconds, as according to the specification.
make_utc_time (an_hour, a_minute, a_second: INTEGER)
    -- Time is assumed to be UTC time at January 1, minimum_year.
    -- We assume daylight saving time setting in effect is
    -- available from system.
feature(s) from STDC_TIME
    -- Make individual time fields valid
is_local_time: BOOLEAN
    -- Is time in local time?
is_utc_time: BOOLEAN
    -- Is the time zone UTC?
is_time_zone_known: BOOLEAN
    -- After a make routine, call either to_local or to_utc.
to_local
    -- Switch time fields to local time based on time in value.
to_utc
    -- Switch time fields to utc time based on time in value.
feature(s) from STDC_TIME
    -- Manually set individual time fields
set_date (a_year, a_month, a_day: INTEGER)
    -- Set date part, time remains unchanged, unless daylight
    -- savings has to be taken into account.
set_date_time (a_year, a_month, a_day, an_hour, a_minute, a_second: INTEGER)
    -- Set individual time fields. Set value based on given
    -- fields, assuming that it is a local time.
    -- We assume daylight saving time setting in effect (or not)

```

```

-- has been set.
set_dst_to_current
-- Let system figure out if daylight saving time is in effect.
set_dst_to_none
-- Daylight saving time is not in effect.
set_dst_in_effect
-- Daylight saving time is in effect.
set_time (an_hour, a_minute, a_second: INTEGER)
-- Set time part, date remains unchanged unless daylight
-- savings has to be taken into account.
to_dos_seconds
-- Make sure the seconds are divisible by two, a value DOS
-- and clones like Windows NT like.
feature(s) from STDC_TIME
-- Individual time fields, need call to to_local or to_utc
year: INTEGER
month: INTEGER
day: INTEGER
-- Day of the month.
weekday: INTEGER
-- Days since Sunday.
day_of_year: INTEGER
-- Days since January 1st
hour: INTEGER
minute: INTEGER
second: INTEGER
is_daylight_savings_in_effect: BOOLEAN
-- Does the broken down time take into account daylight savings?
is_daylight_savings_unknown: BOOLEAN
-- Do we not know if the broken time includes daylight saving?
feature(s) from STDC_TIME
-- Time as string
short_weekday_name: STRING
-- Abbreviated weekday name
weekday_name: STRING
-- Full weekday name
short_month_name: STRING
-- Abbreviated month name
month_name: STRING
-- Full month name
format (format_str: STRING): STRING
-- Formatted date/time according to format_str. See
-- man strftime for details.
default_format: STRING
-- Time as string of the form "Mon Apr 17 21:49:20 2000"
local_date_string: STRING
-- Date part in format local to current country.
local_time_string: STRING
-- Time part in format local to current country.

```

```

rfc_date_string: STRING
-- RFC 1123 (same as RFC 822) style date;
-- i.e. Tue, 15 Nov 1994 08:12:31 GMT
feature(s) from STDC_TIME
-- Date calculations
is_equal (other: like Current): BOOLEAN
-- Is other attached to an object considered equal to
-- current object ?
infix "+" (other: like Current): like Current
-- Sum with other
infix "-" (other: like Current): like Current
-- Creates a new time which is the difference between
-- Current and Other
infix "<" (other: like Current): BOOLEAN
-- Is current object less than other?
feature(s) from STDC_TIME
-- Status
is_two_digit_year (a_year: INTEGER): BOOLEAN
-- Is a_year a two digit year that can be handled by
-- four_digit_year.
is_valid_date (a_year, a_month, a_day: INTEGER): BOOLEAN
-- Do a_year, a_month and a_day form a date recognized
-- by this class?
-- Because this class represents unix dates, only dates
-- between 1970-Jan-01 UTC and 2038-Jan-19 UTC are valid.
is_valid_date_and_time (a_year, a_month, a_day, an_hour, a_minute, a_second:
INTEGER): BOOLEAN
-- Do a_year, a_month and a_day form a date that can be
-- represented by this class?
-- Because this class represents unix dates, only dates
-- between 1970-Jan-01 00:00 UTC and 2038-Jan-19 03:14:08 UTC
-- are valid.
is_valid_day (a_year, a_month, a_day: INTEGER): BOOLEAN
-- Is a_day a valid day given year and month.
is_valid_time (an_hour, a_minute, a_second: INTEGER): BOOLEAN
-- Do an_hour, a_minute and a_second form a valid 24
-- hour clock time?
feature(s) from STDC_TIME
-- Access
current_year: INTEGER
-- Current year.
four_digit_year (a_year: INTEGER): INTEGER
-- Return a four digit year given a possibly two digit year.
hash_code: INTEGER
-- The hash-code value of Current.
minimum_year: INTEGER
-- The minimum year for the current platform.
-- For POSIX is 1970, for Windows is 1980.
maximum_year: INTEGER

```

```
-- The maximum Epoch year.  
value: INTEGER  
-- Time in seconds since January 1, 1970.  
feature(s) from STDC_TIME  
-- Conversion  
as_dt_date_time: DT_DATE_TIME  
-- Date time in Gobo date time format.  
-- Always returns a new object.  
invariant  
accessing_real_singleton: security_is_real_singleton;  
valid_error_action: error_action >= 0 and error_action <= 2;  
tm_not_void: tm /= Void;  
tm_has_proper_capacity: tm.capacity >= posix_tm_size;  
value_not_negative: value >= 0;  
my_time_zone_valid: my_time_zone = 0 or else my_time_zone = utc_time_zone  
or else my_time_zone = local_time_zone;  
end of STDC_TIME
```

---

In this chapter:

*B.1 Short form of ABSTRACT\_CURRENT\_PROCESS*  
*B.2 Short form of ABSTRACT\_EXEC\_PROCESS*  
*B.3 Short form of ABSTRACT\_FILE\_DESCRIPTOR*  
*B.4 Short form of ABSTRACT\_FILE\_SYSTEM*  
*B.5 Short form of ABSTRACT\_HOST*  
*B.6 Short form of ABSTRACT\_IP4\_ADDRESS*  
*B.7 Short form of ABSTRACT\_IP6\_ADDRESS*  
*B.8 Short form of ABSTRACT\_PIPE*  
*B.9 Short form of ABSTRACT\_SERVICE*  
*B.10 Short form of ABSTRACT\_STATUS*  
*B.11 Short form of ABSTRACT\_TCP\_CLIENT\_SOCKET*  
*B.12 Short form of ABSTRACT\_TCP\_SERVER\_SOCKET*

## B Short listing of abstract classes

An abstract class is somewhat above the Standard C classes, and between the features you get when you use a POSIX or Windows class. It is mainly aimed at users who want to write software usable on Unix and Windows, and who do not want to use a POSIX emulator.

You never use an abstract class directly, always use the corresponding effective EPX\_XXXX, for which there is a variant in the `src/posix` or `src/windows` directory.

### B.1 Short form of ABSTRACT\_CURRENT\_PROCESS

```
deferred class interface ABSTRACT_CURRENT_PROCESS
feature(s) from STDC_SECURITY_ACCESSOR
  -- The singleton, available to any because its used in preconditions
  security: STDC_SECURITY
  -- Singleton entry point for security.
feature(s) from STDC_BASE
  -- Access
  errno: STDC_ERRNO
  -- Access to the variable that contains the error that occurred.
feature(s) from STDC_BASE
  -- Status
  raise_exception_on_error: BOOLEAN
  -- Should an exception be raised when an error occurs?
  -- If not, you have to check errno for any errors.
feature(s) from STDC_BASE
  -- Change
  set_default_action_on_error
  -- Use security.error_handling.exceptions_enabled to
  -- determine if an exception should be raised when a C call
  -- returns an error.
  set_raise_exception_on_error
  -- Always raise an exception when a C call returns an error.
  set_continue_on_error
  -- Never raise an exception when a C call returns an error.
```

```
    inherit_error_handling (an_instance: STDC_BASE)
        -- Handle errors like an_instance
feature(s) from ARGUMENTS
    command_name: STRING
feature(s) from CAPI_TIME
    -- Standard C binding
    current_time: INTEGER
        -- The current calendar time in seconds since the epoch
feature(s) from STDC_CURRENT_PROCESS
    -- Process standard input/output/error
    stdin: STDC_TEXT_FILE
    stdout: STDC_TEXT_FILE
    stderr: STDC_TEXT_FILE
feature(s) from STDC_CURRENT_PROCESS
    -- Various
    clock: INTEGER
        -- Approximation of processor time used by the program, or -1
        -- if unknown
feature(s) from STDC_CURRENT_PROCESS
    -- Random numbers
    random: INTEGER
        -- Returns a pseudo-random integer between 0 and RAND_MAX.
    set_random_seed (a_seed: INTEGER)
        -- Sets a_seed as the seed for a new sequence of
        -- pseudo-random integers to be returned by random. These
        -- sequences are repeatable by calling set_random_seed with
        -- the same seed value. If no seed value is provided, the
        -- random function is automatically seeded with a value of
        -- 1.
feature(s) from STDC_CURRENT_PROCESS
    -- Global locale
    locale: STRING
        -- Current locale
    numeric_format: STDC_LOCALE_NUMERIC
        -- Various information for formatting numbers and monetary
        -- quantities
    set_locale (category: INTEGER; new_locale: STRING)
        -- Set given locale to new_locale. new_locale is either a
        -- well-known constant like "C" or "da_DK" or an opaque
        -- string that was returned by another call of setlocale.
    set_c_locale
        -- Set locale to the Standard C locale (the default).
    set_native_decimal_point
        -- Set the decimal point character using the LC_NUMERIC
        -- environment variable.
    set_native_locale
        -- Set entire locale to the natives setting which is
        -- determined by environment variables like LC_NUMERIC,
        -- LC_COLLATE, LC_CTYPE etc.
```

```

set_native_time
  -- Set time display to the natives setting using the LC_TIME
  -- environment variable.
feature(s) from ABSTRACT_CURRENT_PROCESS
  -- Access
  effective_user_name: STRING
  -- Name of the user currently associated with the current
  -- thread
  ensure
    name_not_void: Result /= Void
  full_command_name: STRING
  -- command_name with fully qualified path;
  -- An empty string is returned in case command_name is
  -- empty. As any program can setup the arguments passed to
  -- another program, an empty command_name is a possibility.
  pid: INTEGER
  -- Process identifier, unique for this process
feature(s) from ABSTRACT_CURRENT_PROCESS
  -- Every process also has standard file descriptors which might not be compatible with
  stdin/stdout/stderr (Windows)
  fd_stdin: ABSTRACT_FILE_DESCRIPTOR
  ensure
    fd_stdin_not_void: Result /= Void;
    not_owner: not Result.is_owner
  fd_stdout: ABSTRACT_FILE_DESCRIPTOR
  ensure
    fd_stdout_not_void: Result /= Void;
    not_owner: not Result.is_owner
  fd_stderr: ABSTRACT_FILE_DESCRIPTOR
  ensure
    fd_stderr_not_void: Result /= Void;
    not_owner: not Result.is_owner
feature(s) from ABSTRACT_CURRENT_PROCESS
  -- Sleeping
  millisleep (a_milliseconds: INTEGER)
  -- Sleep for a_milliseconds milliseconds. Due to timer
  -- resolution issues, the minimum resolution might be in the
  -- order of 10ms or higher.
  require
    milliseconds_not_negative: a_milliseconds >= 0
  sleep (seconds: INTEGER)
  -- Delays process execution up to seconds. Can return early
  -- if interrupted. Check unslect_seconds
  unslept_seconds: INTEGER
  -- The number of seconds still to sleep, before being
  -- interrupted; it is set by sleep. If it is zero, no
  -- interrupt occurred and process slept for the allotted
  -- time.
invariant

```

```
accessing_real_singleton: security_is_real_singleton;  
valid_error_action: error_action >= 0 and error_action <= 2;  
end of deferred ABSTRACT_CURRENT_PROCESS
```

## B.2 Short form of `ABSTRACT_EXEC_PROCESS`

```

deferred class interface ABSTRACT_EXEC_PROCESS
feature(s) from ABSTRACT_EXEC_PROCESS
  -- (re)set arguments
  has_void_argument (a_arguments: ARRAY[STRING]): BOOLEAN
    -- Is one of the items in a_arguments Void?
  set_arguments (a_arguments: ARRAY[STRING])
feature(s) from ABSTRACT_EXEC_PROCESS
  -- i/o capturing
  capture_input: BOOLEAN
    -- is input captured on execute?
  capture_output: BOOLEAN
    -- is output captured on execute?
  capture_error: BOOLEAN
    -- is error captured on execute?
  set_capture_input (on: BOOLEAN)
  set_capture_output (on: BOOLEAN)
  set_capture_error (on: BOOLEAN)
  fd_stdin: ABSTRACT_FILE_DESCRIPTOR
    -- Input read by process
  fd_stdout: ABSTRACT_FILE_DESCRIPTOR
    -- Output emitted by process
  fd_stderr: ABSTRACT_FILE_DESCRIPTOR
    -- Error output from process
feature(s) from ABSTRACT_EXEC_PROCESS
  -- Execute
  execute
    -- Execute program_name with arguments arguments. After
    -- execution, at some point in time, you have to wait or
    -- wait_for for this process to terminate.
  require
    not_already_started: is_terminated
feature(s) from ABSTRACT_EXEC_PROCESS
  -- Actions that parent may execute
  wait_for (suspend: BOOLEAN)
    -- Wait for this process to terminate. If suspend then we
    -- wait until the information about this process is available,
    -- else we return immediately.
    -- If suspend is False, check is_terminated to see
    -- if this child is really terminated.
  require
    pid_refers_to_child: is_pid_valid;
    not_terminated: not is_terminated
  ensure
    stdin_closed: is_terminated implies fd_stdin = Void or else not fd_stdin.is_open;
  --stdout_closed: is_terminated implies fd_stdout = Void or else not fd_stdout.is_open
  --stderr_closed: is_terminated implies fd_stderr = Void or else not fd_stderr.is_open
  terminated: suspend implies is_terminated; -- Does not work for SE:

```

```
    pid_invalid: is_terminated implies not is_pid_valid
feature(s) from ABSTRACT_EXEC_PROCESS
  -- Access
  program_name: STDC_PATH
  -- Program to execute
  arguments: ARRAY[STRING]
  -- Arguments to pass to program_name
invariant
  --2007-12-13: invariant failure in some cases, root cause not determined yet
  --pid_known_is_not_terminated: is_pid_valid = not is_terminated
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
  program_name_not_empty: program_name /= Void and then not program_name.is_empty;
  arguments_not_void: arguments /= Void;
  all_arguments_not_void: not has_void_argument(arguments);
  descriptors_are_owners: (fd_stdin /= Void and then fd_stdin.is_open implies fd_stdin.is_owner)
and then (fd_stdout /= Void and then fd_stdout.is_open implies fd_stdout.is_owner)
and then (fd_stderr /= Void and then fd_stderr.is_open implies fd_stderr.is_owner);
end of deferred ABSTRACT_EXEC_PROCESS
```

### B.3 Short form of `ABSTRACT_FILE_DESCRIPTOR`

```

deferred class interface ABSTRACT_FILE_DESCRIPTOR
feature(s) from MEMORY
  dispose
    -- Close handle if owner.
feature(s) from KI_INPUT_STREAM
  -- Input
  non_blocking_read_character
    -- Read the next item in input stream.
    -- Make the result available in last_item.
  non_blocking_read_to_buffer (a_buffer: KI_BUFFER[CHARACTER]; pos, nb: INTEGER):
  INTEGER
    -- Fill a_buffer, starting at position pos, with
    -- at most nb items read from input stream.
    -- Return the number of items actually read.
feature(s) from KI_INPUT_STREAM
  -- Status report
  is_closable_for_reading: BOOLEAN
    -- Can current input stream be closed?
  is_open_read: BOOLEAN
    -- Can items be read from input stream?
  is_rewindable: BOOLEAN
    -- Can current input stream be rewound to return input from
    -- the beginning of the stream?
  end_of_input: BOOLEAN
    -- Has end-of-file been reached?
  valid_unread_character (a_character: CHARACTER): BOOLEAN
    -- Can a_character be put back in input stream?
feature(s) from KI_INPUT_STREAM
  -- Access
  name: STDC_PATH
    -- Scratch path
  last_character: CHARACTER
    -- Last character read by read_character and a few other
    -- routines
feature(s) from KI_INPUT_STREAM
  -- Basic operations
  close_for_reading
    -- Try to close input stream if it is closable. Set
    -- is_open_read to false if operation was successful.
  rewind
    -- Move input position to the beginning of stream.
feature(s) from KL_IMPORTED_ANY_ROUTINES
  -- Access
  any_: KL_ANY_ROUTINES
    -- Routines that ought to be in class ANY
feature(s) from KI_CHARACTER_INPUT_STREAM
  -- Input

```

```

non_blocking_read_string (nb: INTEGER)
  -- Read at most nb characters from input stream.
  -- Make the characters that have actually been read
  -- available in last_string.
non_blocking_read_to_string (a_string: STRING; pos, nb: INTEGER): INTEGER
  -- Fill a_string, starting at position pos, with
  -- at most nb characters read from input stream.
  -- Return the number of characters actually read.
feature(s) from KI_CHARACTER_INPUT_STREAM
  -- Access
  last_string: STRING
  -- Last string read;
  -- (Note: this query always return the same object.
  -- Therefore a clone should be used if the result
  -- is to be kept beyond the next call to this feature.
  -- However last_string is not shared between file objects.)
feature(s) from EPX_CHARACTER_INPUT_STREAM
  -- Access
  is_streaming: BOOLEAN
  -- Is data coming from a network stream?
feature(s) from EPX_CHARACTER_INPUT_STREAM
  -- Input
  last_read: INTEGER
  -- Last bytes read by read_buffer;
  -- Can be less than requested for non-blocking input.
  -- Check last_blocked in that case.
  read_buffer (buf: STDC_BUFFER; offset, nbytes: INTEGER)
  -- Read data into buf at offset for nbytes bytes.
  -- Number of bytes actually read are available in last_read.
  -- This is a more safe version of read in case you have a
  -- STDC_BUFFER object.
feature(s) from EPX_CHARACTER_INPUT_STREAM
  -- Debug
  set_dump_input (a_file_name: STRING)
feature(s) from KI_TEXT_INPUT_STREAM
  -- Input
  read_line
  -- Read characters from input stream until a line separator
  -- or end of file is reached. Make the characters that have
  -- been read available in last_string and discard the line
  -- separator characters from the input stream.
  -- Zero characters will be read when non-blocking i/o
  -- is enabled, and read_line would block at the first character.
  -- If a character has been read, read_line will block until
  -- a %N has been read or end_of_input occurs.
  read_new_line
  -- Read a line separator from input file.
  -- Make the characters making up the recognized
  -- line separator available in last_string,

```

```

-- or make last_string empty and leave the
-- input file unchanged if no line separator
-- was found.
feature(s) from KI_TEXT_INPUT_STREAM
-- Access
eol: STRING
-- Line separator;
-- EPX classes do not distinguish between a %R%N or just %N
-- end-of-line. The platform may though.
feature(s) from STDC_SECURITY_ACCESSOR
-- The singleton, available to any because its used in preconditions
security: STDC_SECURITY
-- Singleton entry point for security.
feature(s) from STDC_BASE
-- Access
errno: STDC_ERRNO
-- Access to the variable that contains the error that occurred.
feature(s) from STDC_BASE
-- Status
raise_exception_on_error: BOOLEAN
-- Should an exception be raised when an error occurs?
-- If not, you have to check errno for any errors.
feature(s) from STDC_BASE
-- Change
set_default_action_on_error
-- Use security.error_handling.exceptions_enabled to
-- determine if an exception should be raised when a C call
-- returns an error.
set_raise_exception_on_error
-- Always raise an exception when a C call returns an error.
set_continue_on_error
-- Never raise an exception when a C call returns an error.
inherit_error_handling (an_instance: STDC_BASE)
-- Handle errors like an_instance
feature(s) from KI_OUTPUT_STREAM
-- Output
put_character (c: CHARACTER)
-- Write a character.
append (an_input_stream: KI_INPUT_STREAM[CHARACTER])
-- Read items of an_input_stream until the end
-- of input is reached, and write these items to
-- current output stream.
-- append is safe for non-blocking descriptors.
feature(s) from KI_OUTPUT_STREAM
-- Status report
is_open_write: BOOLEAN
-- Can items be written to output stream?
is_closable_for_writing: BOOLEAN
-- Can current output stream be closed?

```

```
feature(s) from KI_OUTPUT_STREAM
-- Basic operations
close_for_writing
-- Try to close output stream if it is closable. Set
-- is_open_write to false if operation was successful.
feature(s) from KI_CHARACTER_OUTPUT_STREAM
-- Output
put_string (a_string: STRING)
-- Write a_string to output stream.
put_substring (a_string: STRING; s, e: INTEGER)
-- Write substring of a_string between indexes
-- s and e to output stream.
put_integer (i: INTEGER)
-- Write decimal representation
-- of i to output stream.
-- Regexp: 0|(-?[1-9][0-9]*)
put_boolean (b: BOOLEAN)
-- Write "True" to output stream if
-- b is true, "False" otherwise.
feature(s) from KI_CHARACTER_OUTPUT_STREAM
-- Basic operations
flush
-- Flush buffered data to disk.
feature(s) from EPX_CHARACTER_OUTPUT_STREAM
-- Output
last_written: INTEGER
-- How many bytes were written by the last call to a routine;
-- Can be less than requested for non-blocking output.
-- Check last_blocked in that case.
put_buffer (buf: STDC_BUFFER; offset, nbytes: INTEGER)
-- More safe version of write in case you have a
-- STDC_BUFFER object.
write_buffer (buf: STDC_BUFFER; offset, nbytes: INTEGER)
-- More safe version of write in case you have a
-- STDC_BUFFER object.
feature(s) from KI_TEXT_OUTPUT_STREAM
-- Output
put_line (a_string: STRING)
-- Write a_string to output stream
-- followed by a line separator.
put_new_line
-- Write a line separator to output stream.
feature(s) from EPX_CHARACTER_IO_STREAM
-- Basic operations
close
-- Close the resource.
feature(s) from EPX_CHARACTER_IO_STREAM
-- Status report
is_closable: BOOLEAN
```

```

-- Can current stream be closed for reading and writing?
is_open: BOOLEAN
-- Does handle contain an open handle?
is_owner: BOOLEAN
-- Does this object close the stream on close or dispose?
-- Only for resources that are owned, are resource limits checked.
feature(s) from STDC_HANDLE
-- Access
resource_usage_can_be_increased: BOOLEAN
-- Is it allowed to open another file?
feature(s) from STDC_HANDLE
-- Influence ownership of the handle. Can help to influence subtle garbage collector problems
become_owner
-- This class will own its handle. This is the only function
-- that actually increases the resource count.
unown
-- Resource will not be closed on dispose. Calling close will
-- be forbidden. This routine may not call any other object,
-- else it cannot be called from within dispose.
feature(s) from STDC_HANDLE
-- Close
detach
-- Forget the resource. Resource is not closed.
-- You cannot read and write anymore.
feature(s) from STDC_HANDLE
-- Resource
capacity: INTEGER
-- Number of resources that are in use by handle. For a
-- file this is 1, for a memory handle, this is the number of
-- bytes.
fd: H
-- Identifier of resource tracked by this class.
feature(s) from PORTABLE_PATH
-- Change
set_portable_path (a_path: STRING)
-- Set portable_path to a_path.
feature(s) from HASHABLE
hash_code: INTEGER
-- Hash code value
feature(s) from STDC_HANDLE_BASED_IO_STREAM
-- Stream or disk file
set_streaming (enable: BOOLEAN)
-- Influence behaviour of certain functions if they should be
-- optimized for data coming from disk or data coming from
-- the network. In particular is_streaming implies that a
-- client application is prepared to handle reads that
-- return less than the requested number of bytes, but dont
-- assume that means end-of-file.
feature(s) from ABSTRACT_DESCRIPTOR

```

```
-- Initialization
make
feature(s) from ABSTRACT_DESCRIPTOR
-- Special creation
attach_to_fd (a_fd: INTEGER; a_become_owner: BOOLEAN)
-- Create descriptor with value a_fd. Descriptor will close
-- it when a_become_owner.
make_as_duplicate (another: ABSTRACT_DESCRIPTOR)
-- On creation, create a duplicate from another descriptor.
-- As normal call, closes its own descriptor first (if open) and
-- duplicates next.
feature(s) from ABSTRACT_DESCRIPTOR
-- Read and write to memory block
last_blocked: BOOLEAN
-- Would last call to read or write block?
read (buf: POINTER; offset, nbytes: INTEGER)
-- Read data into buf at offset for nbytes bytes.
-- The number of bytes actually read, is available in last_read.
write (buf: POINTER; offset, nbytes: INTEGER)
-- Write given data from buf at offset, for nbytes
-- bytes. Number of actually written bytes are in
-- last_written. last_written can be unequal to nbytes
-- if i/o is non-blocking or some error has occurred.
feature(s) from ABSTRACT_DESCRIPTOR
-- Eiffel like output
put (a: ANY)
-- Write any Eiffel object as string using its out value.
write_character (c: CHARACTER)
-- Write a character.
write_string (a_string: STRING)
-- Write a_string to output stream.
puts (a_string: STRING)
-- Write a_string to output stream.
feature(s) from ABSTRACT_DESCRIPTOR
-- Buffered input
read_character
-- Sets last_character.
-- If this routine blocks, last_character has the value
-- %U. Therefore, if non-blocking is enabled, always check
-- last_blocked to see if the value make sense.
read_string (nb: INTEGER)
-- Read at most nb characters from input stream.
-- Make the characters that have actually been read
-- available in last_string.
-- Zero characters will be read when non-blocking i/o
-- is enabled, and read would block.
feature(s) from ABSTRACT_DESCRIPTOR
-- Status report
is_attached_to_terminal: BOOLEAN
```

```

-- Is the handle associated with character device?
feature(s) from ABSTRACT_DESCRIPTOR
-- Access
value: INTEGER
-- The actual file descriptor value
feature(s) from ABSTRACT_DESCRIPTOR
-- non-blocking i/o
is_blocking_io: BOOLEAN
-- Is blocking i/o enabled?
-- Blocking i/o is the default.
-- If false, calls like read and write will never wait
-- for input, if there is no input.
set_blocking_io (enable: BOOLEAN)
-- Set is_blocking_io.
supports_nonblocking_io: BOOLEAN
-- Does this descriptor support non-blocking input/output?
-- On POSIX systems, any descriptor does.
-- On Windows, sockets and pipes do.
feature(s) from ABSTRACT_FILE_DESCRIPTOR
-- Initialization
open (a_path: STRING; a_flags: INTEGER)
-- Open given file with access given by flags.
open_read (a_path: STRING)
-- Open given file with access given by flags.
open_write (a_path: STRING)
open_read_write (a_path: STRING)
open_truncate (a_path: STRING)
-- Open file, if it exists, truncate it first.
create_read_write (a_path: STRING)
-- Always create a file, existing or not.
-- Give read/write permissions to user only.
create_write (a_path: STRING)
-- Always create a file, existing or not.
-- Give read/write permissions to user only.
create_with_mode (a_path: STRING; flags, mode: INTEGER)
-- Create a file according to flags and with mode access
-- permissions. Make sure you have the O_CREAT flag in flags
-- if you really want to create something!
feature(s) from ABSTRACT_FILE_DESCRIPTOR
-- File position
seek (offset: INTEGER)
-- Set file position to given absolute offset.
seek_from_current (offset: INTEGER)
-- Set file position relative to current position.
seek_from_end (offset: INTEGER)
-- Set file position relative to end of file.
feature(s) from ABSTRACT_FILE_DESCRIPTOR
-- Access
status: EPX_STATUS

```

```
-- The status for this file descriptor;
-- Value is cached, recreated only when file reopened.
-- Call status.refresh to get updated values.
invariant
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
  open_in_sync: is_open_read or is_open_write implies is_open; -- The reverse is not
true, for examples sockets can be
-- closed for reading/writing, but still open.
  capacity_not_negative: capacity >= 0;
  valid_capacity: is_open = (capacity > 0);
  open_implies_handle_assigned: is_open = (fd /= unassigned_value);
  owned_implies_open: is_owner implies is_open;
  owned_implies_handle_assigned: is_owner implies fd /= unassigned_value;
  line_buffer_index_offset_ok: line_buffer /= Void implies line_buffer_index <= line_buffer.count;
  valid_status: not is_open implies my_status = Void;
end of deferred ABSTRACT_FILE_DESCRIPTOR
```

## B.4 Short form of *ABSTRACT\_FILE\_SYSTEM*

```

deferred class interface ABSTRACT_FILE_SYSTEM
feature(s) from STDC_SECURITY_ACCESSOR
  -- The singleton, available to any because its used in preconditions
  security: STDC_SECURITY
  -- Singleton entry point for security.
feature(s) from STDC_BASE
  -- Access
  errno: STDC_ERRNO
  -- Access to the variable that contains the error that occurred.
feature(s) from STDC_BASE
  -- Status
  raise_exception_on_error: BOOLEAN
  -- Should an exception be raised when an error occurs?
  -- If not, you have to check errno for any errors.
feature(s) from STDC_BASE
  -- Change
  set_default_action_on_error
  -- Use security.error_handling.exceptions_enabled to
  -- determine if an exception should be raised when a C call
  -- returns an error.
  set_raise_exception_on_error
  -- Always raise an exception when a C call returns an error.
  set_continue_on_error
  -- Never raise an exception when a C call returns an error.
  inherit_error_handling (an_instance: STDC_BASE)
  -- Handle errors like an_instance
feature(s) from STDC_FILE_SYSTEM
  -- Path names
  expand_path (a_path: STRING): STDC_PATH
  -- returns a new path
feature(s) from STDC_FILE_SYSTEM
  -- Rename files/directories, remove files/directories
  remove_file (a_path: STRING)
  -- Removes a file from a directory.
  -- For Standard C, its implementation defined what
  -- remove_file does if file is opened by some process
  -- (remove_file fails on Windows for example).
  -- doesnt remove a directory.
  rename_to (current_path, new_path: STRING)
  -- Rename a file or a directory.
  -- new_path should not be an existing path.
feature(s) from STDC_FILE_SYSTEM
  -- Accessibility of files
  is_modifiable (a_path: STRING): BOOLEAN
  -- tests if file is readable and writable by this program
  -- uses real user ID and real group ID instead of effective ones
  is_readable (a_path: STRING): BOOLEAN

```

```

-- Tests if a_path is readable by this program. a_path
-- can be a file or a directory.
-- Uses real user ID and real group ID instead of effective
-- ones.
feature(s) from STDC_FILE_SYSTEM
-- File and string
write_string_to_file (s, a_file_name: STRING)
-- Write s to file a_file_name.
feature(s) from ABSTRACT_FILE_SYSTEM
-- Directory access
change_directory (a_directory: STRING)
-- Changes the current working directory.
current_directory: STRING
-- The current directory
make_directory (a_directory: STRING)
-- Makes a directory, only accessible by owner.
mkdir (a_directory: STRING)
-- Makes a directory, only accessible by owner.
make_directories (a_path: STRING)
-- Makes a directory, only accessible by owner.
remove_directory (a_directory: STRING)
-- Removes an empty directory. See also force_remove_directory.
rmdir (a_directory: STRING)
-- Removes an empty directory. See also force_remove_directory.
force_remove_directory (a_directory: STRING)
-- Removes a directory, even when not empty.
-- I suggest you do not have hard or symbolic links in a_directory...
feature(s) from ABSTRACT_FILE_SYSTEM
-- File statistics
status (a_path: STRING): ABSTRACT_STATUS_PATH
-- Get information about a file.
require
  valid_path: a_path /= Void and then not a_path.is_empty;
  existing_file: is_existing(a_path)
ensure
  status_returned: Result /= Void
status_may_fail (a_path: STRING): ABSTRACT_STATUS_PATH
-- Retrieve status information for a_path. a_path may or
-- may not exist. Check Result.found to see if statistics
-- were retrieved.
require
  valid_path: a_path /= Void and then not a_path.is_empty
ensure
  status_returned: Result /= Void
feature(s) from ABSTRACT_FILE_SYSTEM
-- Directory browsing
browse_directory (a_path: STRING): EPX_DIRECTORY
-- Get information about a directory.
require

```

```

    valid_path: a_path /= Void and then not a_path.is_empty;
    path_is_directory: status_may_fail(a_path).found and then status_may_fail(a_path).is_directory
ensure
    directory_returned: Result /= Void
find_program_in_path (a_filename: STRING; a_paths: ARRAY[STRING]): STRING
-- Look for a_filename in a_paths, check if it is a
-- binary and return the full path to a_filename when
-- found. Return Void if not found.
feature(s) from ABSTRACT_FILE_SYSTEM
-- Accessibility of files
last_access_result: INTEGER
-- value of last access test
is_accessible (a_path: STRING; a_mode: INTEGER): BOOLEAN
-- Is a_path accessibility using a_mode?
access (a_path: STRING; a_mode: INTEGER): BOOLEAN
-- Is a_path accessibility using a_mode?
is_directory (a_path: STRING): BOOLEAN
-- Does a_path exists and is it a directory?
is_existing (a_path: STRING): BOOLEAN
-- Is a_path an existing file, directory, whatever?
-- Tests if file does exist, not if it is readable or writable by
-- this program!
-- Uses real user ID and real group ID instead of effective ones.
is_empty (a_path: STRING): BOOLEAN
-- True if file exists and has a size equal to zero.
is_executable (a_path: STRING): BOOLEAN
-- tests if file is executable by this program
is_regular_file (a_path: STRING): BOOLEAN
-- Does a_path exists and is it a regular file?
is_writable (a_path: STRING): BOOLEAN
-- tests if file is writable by this program
-- uses real user ID and real group ID instead of effective ones
feature(s) from ABSTRACT_FILE_SYSTEM
-- File system properties
is_case_sensitive: BOOLEAN
-- is file system case sensitive or not?
-- This query is dedicated to jwz
path_separator: CHARACTER
-- What is the path separator?
feature(s) from ABSTRACT_FILE_SYSTEM
-- File and string
file_content_as_string (a_file_name: STRING): STRING
-- Contents of a_file_name as a STRING
string_to_file (s, a_file_name: STRING)
-- Create or overwrite a file a_file_name and make its
-- contents s.
feature(s) from ABSTRACT_FILE_SYSTEM
-- Path names
resolved_path_name (a_path: STRING): STRING

```

```
-- Absolute pathname derived from a_path that names the
-- same file, whose resolution does not involve ".", "..", or
-- symbolic links
temporary_directory: STRING
-- The name of the temporary directory;
-- Name does not end with the directory separator.
ensure
  directory_returned: Result /= Void;
  directory_exists: is_directory(Result);
  directory_is_writable: is_modifiable(Result);
  last_char_not_separator: Result.item(Result.count) /= path_separator
invariant
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
end of deferred ABSTRACT_FILE_SYSTEM
```

## B.5 Short form of `ABSTRACT_HOST`

```

deferred class interface ABSTRACT_HOST
feature(s) from STDC_SECURITY_ACCESSOR
  -- The singleton, available to any because its used in preconditions
  security: STDC_SECURITY
  -- Singleton entry point for security.
feature(s) from STDC_BASE
  -- Access
  errno: STDC_ERRNO
  -- Access to the variable that contains the error that occurred.
feature(s) from STDC_BASE
  -- Status
  raise_exception_on_error: BOOLEAN
  -- Should an exception be raised when an error occurs?
  -- If not, you have to check errno for any errors.
feature(s) from STDC_BASE
  -- Change
  set_default_action_on_error
  -- Use security.error_handling.exceptions_enabled to
  -- determine if an exception should be raised when a C call
  -- returns an error.
  set_raise_exception_on_error
  -- Always raise an exception when a C call returns an error.
  set_continue_on_error
  -- Never raise an exception when a C call returns an error.
  inherit_error_handling (an_instance: STDC_BASE)
  -- Handle errors like an_instance
feature(s) from ABSTRACT_HOST
  -- Initialization
  make_from_name (a_name: STRING)
  -- Initialize host from name. If name is numerical, the
  -- behaviour is not specified.
  make_from_address (an_address: ABSTRACT_IP_ADDRESS)
  -- Initialize host from ip address an_address.
  -- An attempt is made to resolve the host name using this address.
  -- Status is always found, even when reverse lookup failed.
  make_from_ip4_any
  -- IP address that refers to all local interfaces.
  make_from_ip4_loopback
  -- IP address that refers to the loopback device.
  -- No attempt at resolving is done.
feature(s) from ABSTRACT_HOST
  -- Command
  find_by_address
  -- Attempt to lookup up the host by first ip address in
  -- addresses. Sets found if host could be found.
  -- If found, sets canonical_name, aliases,
  -- address_family, address_length and addresses.

```

```

    find_by_name
        -- Attempt to lookup up the host given in name. Sets
        -- found if host could be found.
        -- If found, sets canonical_name, aliases,
        -- address_family, address_length and addresses.
feature(s) from ABSTRACT_HOST
    -- Status
    found: BOOLEAN
        -- Does this class contain a resolved host?
        -- If False, not_found_reason contains the reason.
feature(s) from ABSTRACT_HOST
    -- Access
    name: STRING
        -- Name as given to make_from_name or else equal to
        -- canonical_name
    not_found_reason: INTEGER
        -- Reason why found is False;
        -- The interpretation of this value depends on the platform.
    canonical_name: STRING
        -- Official (canonical) name of host.
    aliases: ARRAY[STRING]
        -- Alias names.
    address_family: INTEGER
        -- Host address type: AF_INET or AF_INET6
    address_length: INTEGER
        -- Length of address: 4 or 16.
    addresses: ARRAY[ABSTRACT_IP_ADDRESS]
        -- Array with IPv4 or IPv6 addresses.
invariant
    accessing_real_singleton: security_is_real_singleton;
    valid_error_action: error_action >= 0 and error_action <= 2;
    name_void_or_not_empty: name = Void or else not name.is_empty;
    has_canonical_name: found implies name /= Void = (canonical_name /= Void);
    has_at_least_one_ip_address: found = (addresses /= Void and then addresses.count
    > 0);
    only_non_void_addresses: found implies is_every_address_not_void;
    has_aliases: found = (aliases /= Void);
    valid_length: found implies address_length > 0;
    consistent: addresses /= Void and then addresses.count > 0 implies found;
    my_not_found_reason_valid: found = (my_not_found_reason = 0);
end of deferred ABSTRACT_HOST

```

## B.6 Short form of `ABSTRACT_IP4_ADDRESS`

```

class interface ABSTRACT_IP4_ADDRESS
feature(s) from STDC_SECURITY_ACCESSOR
  -- The singleton, available to any because its used in preconditions
  security: STDC_SECURITY
  -- Singleton entry point for security.
feature(s) from STDC_BASE
  -- Access
  errno: STDC_ERRNO
  -- Access to the variable that contains the error that occurred.
feature(s) from STDC_BASE
  -- Status
  raise_exception_on_error: BOOLEAN
  -- Should an exception be raised when an error occurs?
  -- If not, you have to check errno for any errors.
feature(s) from STDC_BASE
  -- Change
  set_default_action_on_error
  -- Use security.error_handling.exceptions_enabled to
  -- determine if an exception should be raised when a C call
  -- returns an error.
  set_raise_exception_on_error
  -- Always raise an exception when a C call returns an error.
  set_continue_on_error
  -- Never raise an exception when a C call returns an error.
  inherit_error_handling (an_instance: STDC_BASE)
  -- Handle errors like an_instance
feature(s) from ABSTRACT_IP_ADDRESS
  -- Initialization
  make_from_pointer (a_ptr: POINTER)
  -- Initialize ip address from 32-bit integer pointed to by a_ptr.
  -- We assume a_ptr points to a value in network byte order.
feature(s) from ABSTRACT_IP_ADDRESS
  -- Status
  is_loopback_address: BOOLEAN
  -- Does this IP address refer to the loopback address?
feature(s) from ABSTRACT_IP_ADDRESS
  -- General ip address features
  address_family: INTEGER
  -- Is it an ip4 or ip6 address.
  address_length: INTEGER
  -- Length of an IPv4 address is 4.
  ptr: POINTER
  -- Pointer to an in_addr or in6_addr structure.
  -- (bytes are in network byte order for in_addr)
feature(s) from ABSTRACT_IP4_ADDRESS
  -- Initialization
  make_from_any

```

```
-- Initialize using the any address (i.e. 0.0.0.0).
make_from_integer (a_value: INTEGER)
-- Initialize ip address from 32-bit integer.
make_from_loopback
-- Initialize using the loopback address (i.e. 127.0.0.1).
make_from_components (a1, a2, a3, a4: INTEGER)
-- Make IP4 address given the four individual fields of an IP
-- 4 address.
feature(s) from ABSTRACT_IP4_ADDRESS
-- Access
value: INTEGER
-- IPv4 address as 32-bit integer.
-- Value is in host byte order.
feature(s) from ABSTRACT_IP4_ADDRESS
-- Change
set_value (new_value: INTEGER)
-- Change IP address value to new_value.
feature(s) from ABSTRACT_IP4_ADDRESS
-- Comparison
is_equal (other: like Current): BOOLEAN
-- Is other IP4 address equal to this IP address?
feature(s) from ABSTRACT_IP4_ADDRESS
-- Output
out: STRING
-- Friendly out
invariant
accessing_real_singleton: security_is_real_singleton;
valid_error_action: error_action >= 0 and error_action <= 2;
buf_not_void: buf /= Void;
buf_capacity_large_enough: buf.capacity >= abstract_api.posix_in_addr_size;
end of ABSTRACT_IP4_ADDRESS
```

## B.7 Short form of `ABSTRACT_IP6_ADDRESS`

```

deferred class interface ABSTRACT_IP6_ADDRESS
feature(s) from STDC_SECURITY_ACCESSOR
  -- The singleton, available to any because its used in preconditions
  security: STDC_SECURITY
  -- Singleton entry point for security.
feature(s) from STDC_BASE
  -- Access
  errno: STDC_ERRNO
  -- Access to the variable that contains the error that occurred.
feature(s) from STDC_BASE
  -- Status
  raise_exception_on_error: BOOLEAN
  -- Should an exception be raised when an error occurs?
  -- If not, you have to check errno for any errors.
feature(s) from STDC_BASE
  -- Change
  set_default_action_on_error
  -- Use security.error_handling.exceptions_enabled to
  -- determine if an exception should be raised when a C call
  -- returns an error.
  set_raise_exception_on_error
  -- Always raise an exception when a C call returns an error.
  set_continue_on_error
  -- Never raise an exception when a C call returns an error.
  inherit_error_handling (an_instance: STDC_BASE)
  -- Handle errors like an_instance
feature(s) from ABSTRACT_IP_ADDRESS
  -- Initialization
  make_from_pointer (a_ptr: POINTER)
  -- Initialize ip address from 32-bit integer.
feature(s) from ABSTRACT_IP_ADDRESS
  -- Status
  is_loopback_address: BOOLEAN
  -- Does this IP address refer to the loopback address?
feature(s) from ABSTRACT_IP_ADDRESS
  -- General ip address features
  address_family: INTEGER
  -- Is it an ip4 or ip6 address.
  address_length: INTEGER
  -- Length of an IPv6 address is 16.
  ptr: POINTER
  -- Pointer to an in_addr or in6_addr structure.
  -- (bytes are in network byte order for in_addr)
feature(s) from ABSTRACT_IP6_ADDRESS
  -- Comparison
  is_equal (other: like Current): BOOLEAN
  -- Is other IP4 address equal to this IP address?

```

```
feature(s) from ABSTRACT_IP6_ADDRESS
  -- Output
  out: STRING
  -- Friendly out
feature(s) from ABSTRACT_IP6_ADDRESS
  -- General ip address features
  scope_id: INTEGER
invariant
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
  buf_not_void: buf /= Void;
  buf_capacity_large_enough: buf.capacity >= abstract_api.posix_in6_addr_size;
end of deferred ABSTRACT_IP6_ADDRESS
```

## B.8 Short form of *ABSTRACT\_PIPE*

```
class interface ABSTRACT_PIPE
feature(s) from ABSTRACT_PIPE
  -- Pipe operations
  close
feature(s) from ABSTRACT_PIPE
  -- Access
  fdout: ABSTRACT_FILE_DESCRIPTOR
  -- Outgoing end of pipe
  fdin: ABSTRACT_FILE_DESCRIPTOR
  -- Incoming end of pipe
invariant
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
  valid_pipe: fdin /= Void and fdout /= Void;
end of ABSTRACT_PIPE
```

## B.9 Short form of `ABSTRACT_SERVICE`

```

deferred class interface ABSTRACT_SERVICE
feature(s) from STDC_SECURITY_ACCESSOR
  -- The singleton, available to any because its used in preconditions
  security: STDC_SECURITY
  -- Singleton entry point for security.
feature(s) from STDC_BASE
  -- Access
  errno: STDC_ERRNO
  -- Access to the variable that contains the error that occurred.
feature(s) from STDC_BASE
  -- Status
  raise_exception_on_error: BOOLEAN
  -- Should an exception be raised when an error occurs?
  -- If not, you have to check errno for any errors.
feature(s) from STDC_BASE
  -- Change
  set_default_action_on_error
  -- Use security.error_handling.exceptions_enabled to
  -- determine if an exception should be raised when a C call
  -- returns an error.
  set_raise_exception_on_error
  -- Always raise an exception when a C call returns an error.
  set_continue_on_error
  -- Never raise an exception when a C call returns an error.
  inherit_error_handling (an_instance: STDC_BASE)
  -- Handle errors like an_instance
feature(s) from ABSTRACT_SERVICE
  -- Initialization
  make_from_name (a_name, a_protocol: STRING)
  -- Retrieve service information with a_name and optional
  -- a_protocol from services database.
  -- If service not found, an exception is raised.
  make_from_name_with_default (a_name, a_protocol: STRING; a_default_port: INTEGER)
  -- Retrieve service information with a_name and optional
  -- a_protocol from services database.
  -- If service not found, a_default_port is used for port.
  make_from_ephemeral_port (a_protocol: STRING)
  -- Initialize service, but let kernel choose a port at bind time.
  -- Provide a a_protocol if necessary.
  make_from_port (a_port: INTEGER; a_protocol: STRING)
  -- Initialize service from given a_port.
  -- Make sure to provide a a_protocol if necessary!
feature(s) from ABSTRACT_SERVICE
  -- Access
  port: INTEGER
  -- port number if not zero
  name: STRING

```

```
-- official service name
aliases: ARRAY[STRING]
-- alias list
protocol: STRING
-- protocol to use (udp/tcp)
protocol_type: INTEGER
-- SOCK_STREAM or SOCK_DGRAM
feature(s) from ABSTRACT_SERVICE
-- Status
is_tcp: BOOLEAN
-- Is protocol_type the tcp protocol?
is_udp: BOOLEAN
-- Is protocol_type the datagram protocol?
invariant
accessing_real_singleton: security_is_real_singleton;
valid_error_action: error_action >= 0 and error_action <= 2;
name_void_or_not_empty: name = Void or else not name.is_empty;
valid_port: port >= 0 and port <= 65535;
valid_protocol: protocol = Void or else protocol.is_empty or else (protocol.is_equal(once_tcp)
or protocol.is_equal(once_udp));
valid_protocol_type: protocol_type = sock_stream or else protocol_type = sock_dgram;
valid_aliases: aliases /= Void;
end of deferred ABSTRACT_SERVICE
```

## B.10 Short form of ABSTRACT\_STATUS

```

deferred class interface ABSTRACT_STATUS
feature(s) from ABSTRACT_STATUS
  -- Status
  is_open: BOOLEAN
  -- Can status be refreshed?
feature(s) from ABSTRACT_STATUS
  -- Change
  refresh
  -- refresh the cached information
  require
    open: is_open
feature(s) from ABSTRACT_STATUS
  -- stat members
  atime: INTEGER
  -- Unix time of last access.
  access_time: INTEGER
  -- Unix time of last access.
  device_number: INTEGER
  -- ID of device containing the file.
  -- Windows: Drive number of the disk containing the file.
  is_character_special: BOOLEAN
  -- Is this file a character-special file?
  is_directory: BOOLEAN
  is_fifo: BOOLEAN
  is_regular_file: BOOLEAN
  mtime: INTEGER
  -- Unix time of last data modification.
  modification_time: INTEGER
  -- Unix time of last data modification.
  nlink: INTEGER
  number_of_hard_links: INTEGER
  size: INTEGER
  -- Size of file in bytes.
  status_change_time: INTEGER
  -- Unix time of last status change.
  -- For example changing the permission bits will set this time.
feature(s) from ABSTRACT_STATUS
  -- Direct access to the individual stat fields, not recommended
  unix_mode: INTEGER
invariant
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
  stat_not_void: stat /= Void and then stat.capacity >= abstract_stat_size;
end of deferred ABSTRACT_STATUS

```

**B.11 Short form of ABSTRACT\_TCP\_CLIENT\_SOCKET**

```

deferred class interface ABSTRACT_TCP_CLIENT_SOCKET
feature(s) from MEMORY
  dispose
    -- Close handle if owner.
feature(s) from KI_INPUT_STREAM
  -- Input
  non_blocking_read_character
    -- Read the next item in input stream.
    -- Make the result available in last_item.
  non_blocking_read_to_buffer (a_buffer: KI_BUFFER[CHARACTER]; pos, nb: INTEGER):
  INTEGER
    -- Fill a_buffer, starting at position pos, with
    -- at most nb items read from input stream.
    -- Return the number of items actually read.
feature(s) from KI_INPUT_STREAM
  -- Status report
  is_closable_for_reading: BOOLEAN
    -- Can current input stream be closed?
  is_open_read: BOOLEAN
    -- Can items be read from input stream?
  is_rewindable: BOOLEAN
    -- Can current input stream be rewound to return input from
    -- the beginning of the stream?
  end_of_input: BOOLEAN
    -- Has end-of-file been reached?
  valid_unread_character (a_character: CHARACTER): BOOLEAN
    -- Can a_character be put back in input stream?
feature(s) from KI_INPUT_STREAM
  -- Access
  name: STDC_PATH
    -- Scratch path
  last_character: CHARACTER
    -- Last character read by read_character and a few other
    -- routines
feature(s) from KI_INPUT_STREAM
  -- Basic operations
  close_for_reading
    -- Try to close input stream if it is closable. Set
    -- is_open_read to false if operation was successful.
  rewind
    -- Move input position to the beginning of stream.
feature(s) from KL_IMPORTED_ANY_ROUTINES
  -- Access
  any_: KL_ANY_ROUTINES
    -- Routines that ought to be in class ANY
feature(s) from KI_CHARACTER_INPUT_STREAM
  -- Input

```

```

non_blocking_read_string (nb: INTEGER)
  -- Read at most nb characters from input stream.
  -- Make the characters that have actually been read
  -- available in last_string.
non_blocking_read_to_string (a_string: STRING; pos, nb: INTEGER): INTEGER
  -- Fill a_string, starting at position pos, with
  -- at most nb characters read from input stream.
  -- Return the number of characters actually read.
feature(s) from KI_CHARACTER_INPUT_STREAM
  -- Access
  last_string: STRING
  -- Last string read;
  -- (Note: this query always return the same object.
  -- Therefore a clone should be used if the result
  -- is to be kept beyond the next call to this feature.
  -- However last_string is not shared between file objects.)
feature(s) from EPX_CHARACTER_INPUT_STREAM
  -- Access
  is_streaming: BOOLEAN
  -- Is data coming from a network stream?
feature(s) from EPX_CHARACTER_INPUT_STREAM
  -- Input
  last_read: INTEGER
  -- Last bytes read by read_buffer;
  -- Can be less than requested for non-blocking input.
  -- Check last_blocked in that case.
  read_buffer (buf: STDC_BUFFER; offset, nbytes: INTEGER)
  -- Read data into buf at offset for nbytes bytes.
  -- Number of bytes actually read are available in last_read.
  -- This is a more safe version of read in case you have a
  -- STDC_BUFFER object.
feature(s) from EPX_CHARACTER_INPUT_STREAM
  -- Debug
  set_dump_input (a_file_name: STRING)
feature(s) from KI_TEXT_INPUT_STREAM
  -- Input
  read_line
  -- Read characters from input stream until a line separator
  -- or end of file is reached. Make the characters that have
  -- been read available in last_string and discard the line
  -- separator characters from the input stream.
  -- Zero characters will be read when non-blocking i/o
  -- is enabled, and read_line would block at the first character.
  -- If a character has been read, read_line will block until
  -- a %N has been read or end_of_input occurs.
  read_new_line
  -- Read a line separator from input file.
  -- Make the characters making up the recognized
  -- line separator available in last_string,

```

```

-- or make last_string empty and leave the
-- input file unchanged if no line separator
-- was found.
feature(s) from KI_TEXT_INPUT_STREAM
-- Access
eol: STRING
-- Line separator;
-- EPX classes do not distinguish between a %R%N or just %N
-- end-of-line. The platform may though.
feature(s) from STDC_SECURITY_ACCESSOR
-- The singleton, available to any because its used in preconditions
security: STDC_SECURITY
-- Singleton entry point for security.
feature(s) from STDC_BASE
-- Access
errno: STDC_ERRNO
-- Access to the variable that contains the error that occurred.
feature(s) from STDC_BASE
-- Status
raise_exception_on_error: BOOLEAN
-- Should an exception be raised when an error occurs?
-- If not, you have to check errno for any errors.
feature(s) from STDC_BASE
-- Change
set_default_action_on_error
-- Use security.error_handling.exceptions_enabled to
-- determine if an exception should be raised when a C call
-- returns an error.
set_raise_exception_on_error
-- Always raise an exception when a C call returns an error.
set_continue_on_error
-- Never raise an exception when a C call returns an error.
inherit_error_handling (an_instance: STDC_BASE)
-- Handle errors like an_instance
feature(s) from KI_OUTPUT_STREAM
-- Output
put_character (c: CHARACTER)
-- Write a character.
append (an_input_stream: KI_INPUT_STREAM[CHARACTER])
-- Read items of an_input_stream until the end
-- of input is reached, and write these items to
-- current output stream.
-- append is safe for non-blocking descriptors.
feature(s) from KI_OUTPUT_STREAM
-- Status report
is_open_write: BOOLEAN
-- Can items be written to output stream?
is_closable_for_writing: BOOLEAN
-- Can current output stream be closed?

```

```
feature(s) from KI_OUTPUT_STREAM
-- Basic operations
close_for_writing
-- Try to close output stream if it is closable. Set
-- is_open_write to false if operation was successful.
feature(s) from KI_CHARACTER_OUTPUT_STREAM
-- Output
put_string (a_string: STRING)
-- Write a_string to output stream.
put_substring (a_string: STRING; s, e: INTEGER)
-- Write substring of a_string between indexes
-- s and e to output stream.
put_integer (i: INTEGER)
-- Write decimal representation
-- of i to output stream.
-- Regexp: 0|(-?[1-9][0-9]*)
put_boolean (b: BOOLEAN)
-- Write "True" to output stream if
-- b is true, "False" otherwise.
feature(s) from KI_CHARACTER_OUTPUT_STREAM
-- Basic operations
flush
-- Flush buffered data to disk.
feature(s) from EPX_CHARACTER_OUTPUT_STREAM
-- Output
last_written: INTEGER
-- How many bytes were written by the last call to a routine;
-- Can be less than requested for non-blocking output.
-- Check last_blocked in that case.
put_buffer (buf: STDC_BUFFER; offset, nbytes: INTEGER)
-- More safe version of write in case you have a
-- STDC_BUFFER object.
write_buffer (buf: STDC_BUFFER; offset, nbytes: INTEGER)
-- More safe version of write in case you have a
-- STDC_BUFFER object.
feature(s) from KI_TEXT_OUTPUT_STREAM
-- Output
put_line (a_string: STRING)
-- Write a_string to output stream
-- followed by a line separator.
put_new_line
-- Write a line separator to output stream.
feature(s) from EPX_CHARACTER_IO_STREAM
-- Basic operations
close
-- Close the resource.
feature(s) from EPX_CHARACTER_IO_STREAM
-- Status report
is_closable: BOOLEAN
```

```

-- Can current stream be closed for reading and writing?
is_open: BOOLEAN
-- Does handle contain an open handle?
is_owner: BOOLEAN
-- Does this object close the stream on close or dispose?
-- Only for resources that are owned, are resource limits checked.
feature(s) from STDC_HANDLE
-- Access
resource_usage_can_be_increased: BOOLEAN
-- Is it allowed to open another file?
feature(s) from STDC_HANDLE
-- Influence ownership of the handle. Can help to influence subtle garbage collector problems
become_owner
-- This class will own its handle. This is the only function
-- that actually increases the resource count.
unown
-- Resource will not be closed on dispose. Calling close will
-- be forbidden. This routine may not call any other object,
-- else it cannot be called from within dispose.
feature(s) from STDC_HANDLE
-- Close
detach
-- Forget the resource. Resource is not closed.
-- You cannot read and write anymore.
feature(s) from STDC_HANDLE
-- Resource
capacity: INTEGER
-- Number of resources that are in use by handle. For a
-- file this is 1, for a memory handle, this is the number of
-- bytes.
fd: H
-- Identifier of resource tracked by this class.
feature(s) from PORTABLE_PATH
-- Change
set_portable_path (a_path: STRING)
-- Set portable_path to a_path.
feature(s) from HASHABLE
hash_code: INTEGER
-- Hash code value
feature(s) from STDC_HANDLE_BASED_IO_STREAM
-- Stream or disk file
set_streaming (enable: BOOLEAN)
-- Influence behaviour of certain functions if they should be
-- optimized for data coming from disk or data coming from
-- the network. In particular is_streaming implies that a
-- client application is prepared to handle reads that
-- return less than the requested number of bytes, but dont
-- assume that means end-of-file.
feature(s) from ABSTRACT_DESCRIPTOR

```

```

-- Initialization
make
feature(s) from ABSTRACT_DESCRIPTOR
-- Special creation
attach_to_socket (a_fd: INTEGER; a_become_owner: BOOLEAN)
-- Create descriptor with value a_fd. Descriptor will close
-- it when a_become_owner.
make_as_duplicate (another: ABSTRACT_DESCRIPTOR)
-- On creation, create a duplicate from another descriptor.
-- As normal call, closes its own descriptor first (if open) and
-- duplicates next.
feature(s) from ABSTRACT_DESCRIPTOR
-- Read and write to memory block
last_blocked: BOOLEAN
-- Would last call to read or write block?
read (buf: POINTER; offset, nbytes: INTEGER)
-- Read data into buf at offset for nbytes bytes.
-- The number of bytes actually read, is available in last_read.
write (buf: POINTER; offset, nbytes: INTEGER)
-- Write given data from buf at offset, for nbytes
-- bytes. Number of actually written bytes are in
-- last_written. last_written can be unequal to nbytes
-- if i/o is non-blocking or some error has occurred.
feature(s) from ABSTRACT_DESCRIPTOR
-- Eiffel like output
put (a: ANY)
-- Write any Eiffel object as string using its out value.
write_character (c: CHARACTER)
-- Write a character.
write_string (a_string: STRING)
-- Write a_string to output stream.
puts (a_string: STRING)
-- Write a_string to output stream.
feature(s) from ABSTRACT_DESCRIPTOR
-- Buffered input
read_character
-- Sets last_character.
-- If this routine blocks, last_character has the value
-- %U. Therefore, if non-blocking is enabled, always check
-- last_blocked to see if the value make sense.
read_string (nb: INTEGER)
-- Read at most nb characters from input stream.
-- Make the characters that have actually been read
-- available in last_string.
-- Zero characters will be read when non-blocking i/o
-- is enabled, and read would block.
feature(s) from ABSTRACT_DESCRIPTOR
-- Status report
is_attached_to_terminal: BOOLEAN

```

```

-- Is the handle associated with character device?
feature(s) from ABSTRACT_DESCRIPTOR
-- Access
value: INTEGER
-- The actual file descriptor value
feature(s) from ABSTRACT_DESCRIPTOR
-- non-blocking i/o
is_blocking_io: BOOLEAN
require
  open: is_open_read
set_blocking_io (enable: BOOLEAN)
require
  supports_nonblocking_io: not enable implies supports_nonblocking_io;
  open: is_open
ensure
  blocking_set: enable = is_blocking_io
supports_nonblocking_io: BOOLEAN
feature(s) from ABSTRACT_SOCKET
-- Status
supports_receive_buffer_size: BOOLEAN
-- Does this socket implementation support querying and
-- setting the receive buffer size?
-- Supported on all platforms except BeOS
supports_send_buffer_size: BOOLEAN
-- Does this socket implementation support querying and
-- setting the send buffer size?
-- Supported on all platforms except BeOS
feature(s) from ABSTRACT_SOCKET
-- Access
receive_buffer_size: INTEGER
-- Size of receive buffer;
-- Not supported on BeOS.
send_buffer_size: INTEGER
-- Size of send buffer
-- Not supported on BeOS.
feature(s) from ABSTRACT_SOCKET
-- Change
set_receive_buffer_size (a_new_size: INTEGER)
-- Set size of receive buffer to at least a_new_size.
set_send_buffer_size (a_new_size: INTEGER)
-- Set size of send buffer to at least a_new_size.
feature(s) from ABSTRACT_SOCKET
-- Callbacks for the Multiplexer
multiplexer_read_callback (a_multiplexer: EPX_SOCKET_MULTIPLEXER)
-- callback for read
multiplexer_write_callback (a_multiplexer: EPX_SOCKET_MULTIPLEXER)
-- callback for read
multiplexer_error_callback (a_multiplexer: EPX_SOCKET_MULTIPLEXER)
-- callback for read

```

```

multiplexer_read_idle_callback (a_multiplexer: EPX_SOCKET_MULTIPLEXER)
  -- callback for read
multiplexer_write_idle_callback (a_multiplexer: EPX_SOCKET_MULTIPLEXER)
  -- callback for read
feature(s) from ABSTRACT_INTERNET_SOCKET
  -- Change
  set_low_delay
    -- Minimize delay.
  set_throughput
    -- Maximize throughput.
feature(s) from ABSTRACT_INTERNET_SOCKET
  -- Local and remote addresses
  local_address: ABSTRACT_SOCKET_ADDRESS_IN_BASE
    -- Return address used on this side to talk to remote.
  remote_address: ABSTRACT_SOCKET_ADDRESS_IN_BASE
    -- Return address used at remote side to talk to this side.
feature(s) from ABSTRACT_TCP_SOCKET
  -- Shutdown
  shutdown_read
    -- The read-half of the connection is closed. No more data
    -- can be received on the socket and any data currently in
    -- the socket receive buffer is discarded. The process can no
    -- longer issue any of the read functions on the socket. Any
    -- data received after this call for a TCP socket is
    -- acknowledged and then silently discarded.
  shutdown_read_write
    -- The read-half and write-half of the connection are both
    -- closed. This is equivalent to calling shutdown-read and
    -- shutdown-write.
  shutdown_write
    -- The write-half of the connection is closed. In the case of
    -- TCP, this is called a half-close. Any data currently in
    -- the socket send buffer will be sent, followed by TCPs
    -- normal connection termination sequence. The process can no
    -- longer issue any of the write functions on the socket.
feature(s) from ABSTRACT_TCP_SOCKET
  -- Socket options
  set_nodelay
    -- Disable TCPs Nagle algorithm. By default this algorithm
    -- is enabled.
feature(s) from ABSTRACT_TCP_CLIENT_SOCKET
  -- Socket specific open functions
  open_by_address (hp: EPX_HOST_PORT)
    -- Open socket to server specified in hp.
  open_by_name_and_port (a_host_name: STRING; a_port: INTEGER)
    -- Initialize given a server name and port.
    -- If a_host_name is an ip address, the result is unspecified.
    -- If a_host_name cannot be resolved, an exception is thrown.
invariant

```

```
accessing_real_singleton: security_is_real_singleton;
valid_error_action: error_action >= 0 and error_action <= 2;
open_in_sync: is_open_read or is_open_write implies is_open; -- The reverse is not
true, for examples sockets can be
-- closed for reading/writing, but still open.
capacity_not_negative: capacity >= 0;
valid_capacity: is_open = (capacity > 0);
open_implies_handle_assigned: is_open = (fd /= unassigned_value);
owned_implies_open: is_owner implies is_open;
owned_implies_handle_assigned: is_owner implies fd /= unassigned_value;
line_buffer_index_offset_ok: line_buffer /= Void implies line_buffer_index <= line_buffer.count;
end of deferred ABSTRACT_TCP_CLIENT_SOCKET
```

**B.12 Short form of ABSTRACT\_TCP\_SERVER\_SOCKET**

```

deferred class interface ABSTRACT_TCP_SERVER_SOCKET
feature(s) from SUS_CONSTANTS
  -- Socket kinds
  sock_stream: INTEGER
  -- Sequenced, reliable, connection-based byte streams.
feature(s) from SUS_CONSTANTS
  -- Protocol families
  af_inet: INTEGER
  -- Internet domain sockets for use with IPv4 addresses.
  af_inet6: INTEGER
  -- Internet domain sockets for use with IPv6 addresses.
feature(s) from MEMORY
  dispose
  -- Close handle if owner.
feature(s) from KI_INPUT_STREAM
  -- Input
  non_blocking_read_character
  -- Read the next item in input stream.
  -- Make the result available in last_item.
  non_blocking_read_to_buffer (a_buffer: KI_BUFFER[CHARACTER]; pos, nb: INTEGER):
  INTEGER
  -- Fill a_buffer, starting at position pos, with
  -- at most nb items read from input stream.
  -- Return the number of items actually read.
feature(s) from KI_INPUT_STREAM
  -- Status report
  is_closable_for_reading: BOOLEAN
  -- Can current input stream be closed?
  is_open_read: BOOLEAN
  -- Can items be read from input stream?
  is_rewindable: BOOLEAN
  -- Can current input stream be rewound to return input from
  -- the beginning of the stream?
  end_of_input: BOOLEAN
  -- Has end-of-file been reached?
  valid_unread_character (a_character: CHARACTER): BOOLEAN
  -- Can a_character be put back in input stream?
feature(s) from KI_INPUT_STREAM
  -- Access
  name: STDC_PATH
  -- Scratch path
  last_character: CHARACTER
  -- Last character read by read_character and a few other
  -- routines
feature(s) from KI_INPUT_STREAM
  -- Basic operations
  close_for_reading

```

```

-- Try to close input stream if it is closable. Set
-- is_open_read to false if operation was successful.
rewind
-- Move input position to the beginning of stream.
feature(s) from KL_IMPORTED_ANY_ROUTINES
-- Access
any_: KL_ANY_ROUTINES
-- Routines that ought to be in class ANY
feature(s) from KI_CHARACTER_INPUT_STREAM
-- Input
non_blocking_read_string (nb: INTEGER)
-- Read at most nb characters from input stream.
-- Make the characters that have actually been read
-- available in last_string.
non_blocking_read_to_string (a_string: STRING; pos, nb: INTEGER): INTEGER
-- Fill a_string, starting at position pos, with
-- at most nb characters read from input stream.
-- Return the number of characters actually read.
feature(s) from KI_CHARACTER_INPUT_STREAM
-- Access
last_string: STRING
-- Last string read;
-- (Note: this query always return the same object.
-- Therefore a clone should be used if the result
-- is to be kept beyond the next call to this feature.
-- However last_string is not shared between file objects.)
feature(s) from EPX_CHARACTER_INPUT_STREAM
-- Access
is_streaming: BOOLEAN
-- Is data coming from a network stream?
feature(s) from EPX_CHARACTER_INPUT_STREAM
-- Input
last_read: INTEGER
-- Last bytes read by read_buffer;
-- Can be less than requested for non-blocking input.
-- Check last_blocked in that case.
read_buffer (buf: STDC_BUFFER; offset, nbytes: INTEGER)
-- Read data into buf at offset for nbytes bytes.
-- Number of bytes actually read are available in last_read.
-- This is a more safe version of read in case you have a
-- STDC_BUFFER object.
feature(s) from EPX_CHARACTER_INPUT_STREAM
-- Debug
set_dump_input (a_file_name: STRING)
feature(s) from KI_TEXT_INPUT_STREAM
-- Input
read_line
-- Read characters from input stream until a line separator
-- or end of file is reached. Make the characters that have

```

```

-- been read available in last_string and discard the line
-- separator characters from the input stream.
-- Zero characters will be read when non-blocking i/o
-- is enabled, and read_line would block at the first character.
-- If a character has been read, read_line will block until
-- a %N has been read or end_of_input occurs.
read_new_line
-- Read a line separator from input file.
-- Make the characters making up the recognized
-- line separator available in last_string,
-- or make last_string empty and leave the
-- input file unchanged if no line separator
-- was found.
feature(s) from KI_TEXT_INPUT_STREAM
-- Access
eol: STRING
-- Line separator;
-- EPX classes do not distinguish between a %R%N or just %N
-- end-of-line. The platform may though.
feature(s) from STDC_SECURITY_ACCESSOR
-- The singleton, available to any because its used in preconditions
security: STDC_SECURITY
-- Singleton entry point for security.
feature(s) from STDC_BASE
-- Access
errno: STDC_ERRNO
-- Access to the variable that contains the error that occurred.
feature(s) from STDC_BASE
-- Status
raise_exception_on_error: BOOLEAN
-- Should an exception be raised when an error occurs?
-- If not, you have to check errno for any errors.
feature(s) from STDC_BASE
-- Change
set_default_action_on_error
-- Use security.error_handling.exceptions_enabled to
-- determine if an exception should be raised when a C call
-- returns an error.
set_raise_exception_on_error
-- Always raise an exception when a C call returns an error.
set_continue_on_error
-- Never raise an exception when a C call returns an error.
inherit_error_handling (an_instance: STDC_BASE)
-- Handle errors like an_instance
feature(s) from KI_OUTPUT_STREAM
-- Output
put_character (c: CHARACTER)
-- Write a character.
append (an_input_stream: KI_INPUT_STREAM[CHARACTER])

```

```

-- Read items of an_input_stream until the end
-- of input is reached, and write these items to
-- current output stream.
-- append is safe for non-blocking descriptors.
feature(s) from KI_OUTPUT_STREAM
-- Status report
is_open_write: BOOLEAN
-- Can items be written to output stream?
is_closable_for_writing: BOOLEAN
-- Can current output stream be closed?
feature(s) from KI_OUTPUT_STREAM
-- Basic operations
close_for_writing
-- Try to close output stream if it is closable. Set
-- is_open_write to false if operation was successful.
feature(s) from KI_CHARACTER_OUTPUT_STREAM
-- Output
put_string (a_string: STRING)
-- Write a_string to output stream.
put_substring (a_string: STRING; s, e: INTEGER)
-- Write substring of a_string between indexes
-- s and e to output stream.
put_integer (i: INTEGER)
-- Write decimal representation
-- of i to output stream.
-- Regexp: 0|(-?[1-9][0-9]*)
put_boolean (b: BOOLEAN)
-- Write "True" to output stream if
-- b is true, "False" otherwise.
feature(s) from KI_CHARACTER_OUTPUT_STREAM
-- Basic operations
flush
-- Flush buffered data to disk.
feature(s) from EPX_CHARACTER_OUTPUT_STREAM
-- Output
last_written: INTEGER
-- How many bytes were written by the last call to a routine;
-- Can be less than requested for non-blocking output.
-- Check last_blocked in that case.
put_buffer (buf: STDC_BUFFER; offset, nbytes: INTEGER)
-- More safe version of write in case you have a
-- STDC_BUFFER object.
write_buffer (buf: STDC_BUFFER; offset, nbytes: INTEGER)
-- More safe version of write in case you have a
-- STDC_BUFFER object.
feature(s) from KI_TEXT_OUTPUT_STREAM
-- Output
put_line (a_string: STRING)
-- Write a_string to output stream

```

```
-- followed by a line separator.
put_new_line
-- Write a line separator to output stream.
feature(s) from EPX_CHARACTER_IO_STREAM
-- Basic operations
close
-- Close the resource.
feature(s) from EPX_CHARACTER_IO_STREAM
-- Status report
is_closable: BOOLEAN
-- Can current stream be closed for reading and writing?
is_open: BOOLEAN
-- Does handle contain an open handle?
is_owner: BOOLEAN
-- Does this object close the stream on close or dispose?
-- Only for resources that are owned, are resource limits checked.
feature(s) from STDC_HANDLE
-- Access
resource_usage_can_be_increased: BOOLEAN
-- Is it allowed to open another file?
feature(s) from STDC_HANDLE
-- Influence ownership of the handle. Can help to influence subtle garbage collector problems
become_owner
-- This class will own its handle. This is the only function
-- that actually increases the resource count.
unown
-- Resource will not be closed on dispose. Calling close will
-- be forbidden. This routine may not call any other object,
-- else it cannot be called from within dispose.
feature(s) from STDC_HANDLE
-- Close
detach
-- Forget the resource. Resource is not closed.
-- You cannot read and write anymore.
feature(s) from STDC_HANDLE
-- Resource
capacity: INTEGER
-- Number of resources that are in use by handle. For a
-- file this is 1, for a memory handle, this is the number of
-- bytes.
fd: H
-- Identifier of resource tracked by this class.
feature(s) from PORTABLE_PATH
-- Change
set_portable_path (a_path: STRING)
-- Set portable_path to a_path.
feature(s) from HASHABLE
hash_code: INTEGER
-- Hash code value
```

```

feature(s) from STDC_HANDLE_BASED_IO_STREAM
  -- Stream or disk file
  set_streaming (enable: BOOLEAN)
    -- Influence behaviour of certain functions if they should be
    -- optimized for data coming from disk or data coming from
    -- the network. In particular is_streaming implies that a
    -- client application is prepared to handle reads that
    -- return less than the requested number of bytes, but dont
    -- assume that means end-of-file.
feature(s) from ABSTRACT_DESCRIPTOR
  -- Initialization
  make
feature(s) from ABSTRACT_DESCRIPTOR
  -- Special creation
  attach_to_socket (a_fd: INTEGER; a_become_owner: BOOLEAN)
    -- Create descriptor with value a_fd. Descriptor will close
    -- it when a_become_owner.
  make_as_duplicate (another: ABSTRACT_DESCRIPTOR)
    -- On creation, create a duplicate from another descriptor.
    -- As normal call, closes its own descriptor first (if open) and
    -- duplicates next.
feature(s) from ABSTRACT_DESCRIPTOR
  -- Read and write to memory block
  last_blocked: BOOLEAN
    -- Would last call to read or write block?
  read (buf: POINTER; offset, nbytes: INTEGER)
    -- Read data into buf at offset for nbytes bytes.
    -- The number of bytes actually read, is available in last_read.
  write (buf: POINTER; offset, nbytes: INTEGER)
    -- Write given data from buf at offset, for nbytes
    -- bytes. Number of actually written bytes are in
    -- last_written. last_written can be unequal to nbytes
    -- if i/o is non-blocking or some error has occurred.
feature(s) from ABSTRACT_DESCRIPTOR
  -- Eiffel like output
  put (a: ANY)
    -- Write any Eiffel object as string using its out value.
  write_character (c: CHARACTER)
    -- Write a character.
  write_string (a_string: STRING)
    -- Write a_string to output stream.
  puts (a_string: STRING)
    -- Write a_string to output stream.
feature(s) from ABSTRACT_DESCRIPTOR
  -- Buffered input
  read_character
    -- Sets last_character.
    -- If this routine blocks, last_character has the value
    -- %U. Therefore, if non-blocking is enabled, always check

```

```
-- last_blocked to see if the value make sense.
read_string (nb: INTEGER)
-- Read at most nb characters from input stream.
-- Make the characters that have actually been read
-- available in last_string.
-- Zero characters will be read when non-blocking i/o
-- is enabled, and read would block.
feature(s) from ABSTRACT_DESCRIPTOR
-- Status report
is_attached_to_terminal: BOOLEAN
-- Is the handle associated with character device?
feature(s) from ABSTRACT_DESCRIPTOR
-- Access
value: INTEGER
-- The actual file descriptor value
feature(s) from ABSTRACT_DESCRIPTOR
-- non-blocking i/o
is_blocking_io: BOOLEAN
require
  open: is_open_read
set_blocking_io (enable: BOOLEAN)
require
  supports_nonblocking_io: not enable implies supports_nonblocking_io;
  open: is_open
ensure
  blocking_set: enable = is_blocking_io
supports_nonblocking_io: BOOLEAN
feature(s) from ABSTRACT_SOCKET
-- Status
supports_receive_buffer_size: BOOLEAN
-- Does this socket implementation support querying and
-- setting the receive buffer size?
-- Supported on all platforms except BeOS
supports_send_buffer_size: BOOLEAN
-- Does this socket implementation support querying and
-- setting the send buffer size?
-- Supported on all platforms except BeOS
feature(s) from ABSTRACT_SOCKET
-- Access
receive_buffer_size: INTEGER
-- Size of receive buffer;
-- Not supported on BeOS.
send_buffer_size: INTEGER
-- Size of send buffer
-- Not supported on BeOS.
feature(s) from ABSTRACT_SOCKET
-- Change
set_receive_buffer_size (a_new_size: INTEGER)
-- Set size of receive buffer to at least a_new_size.
```

```

    set_send_buffer_size (a_new_size: INTEGER)
        -- Set size of send buffer to at least a_new_size.
feature(s) from ABSTRACT_SOCKET
    -- Callbacks for the Multiplexer
    multiplexer_read_callback (a_multiplexer: EPX_SOCKET_MULTIPLEXER)
        -- callback for read
    multiplexer_write_callback (a_multiplexer: EPX_SOCKET_MULTIPLEXER)
        -- callback for read
    multiplexer_error_callback (a_multiplexer: EPX_SOCKET_MULTIPLEXER)
        -- callback for read
    multiplexer_read_idle_callback (a_multiplexer: EPX_SOCKET_MULTIPLEXER)
        -- callback for read
    multiplexer_write_idle_callback (a_multiplexer: EPX_SOCKET_MULTIPLEXER)
        -- callback for read
feature(s) from ABSTRACT_INTERNET_SOCKET
    -- Change
    set_low_delay
        -- Minimize delay.
    set_throughput
        -- Maximize throughput.
feature(s) from ABSTRACT_INTERNET_SOCKET
    -- Local and remote addresses
    local_address: ABSTRACT_SOCKET_ADDRESS_IN_BASE
        -- Return address used on this side to talk to remote.
    remote_address: ABSTRACT_SOCKET_ADDRESS_IN_BASE
        -- Return address used at remote side to talk to this side.
feature(s) from ABSTRACT_TCP_SOCKET
    -- Shutdown
    shutdown_read
        -- The read-half of the connection is closed. No more data
        -- can be received on the socket and any data currently in
        -- the socket receive buffer is discarded. The process can no
        -- longer issue any of the read functions on the socket. Any
        -- data received after this call for a TCP socket is
        -- acknowledged and then silently discarded.
    shutdown_read_write
        -- The read-half and write-half of the connection are both
        -- closed. This is equivalent to calling shutdown-read and
        -- shutdown_write.
    shutdown_write
        -- The write-half of the connection is closed. In the case of
        -- TCP, this is called a half-close. Any data currently in
        -- the socket send buffer will be sent, followed by TCPs
        -- normal connection termination sequence. The process can no
        -- longer issue any of the write functions on the socket.
feature(s) from ABSTRACT_TCP_SOCKET
    -- Socket options
    set_nodelay
        -- Disable TCPs Nagle algorithm. By default this algorithm

```

```

-- is enabled.
feature(s) from ABSTRACT_TCP_SERVER_SOCKET
-- Socket specific open functions
listen_by_address (hp: EPX_HOST_PORT)
-- Listen on socket for address specified in hp.
-- It uses a backlog of backlog_default maximum pending
-- connections.
feature(s) from ABSTRACT_TCP_SERVER_SOCKET
-- Accept
accept: ABSTRACT_TCP_SOCKET
-- Return the next completed connection from the front of the
-- completed connection queue. If there are no completed
-- connections, the process is put to sleep.
-- If the socket is non-blocking, Void will be returned and
-- the process is not put to sleep..
last_client_address: ABSTRACT_SOCKET_ADDRESS_IN_BASE
-- Address of last client accepted by accept.
invariant
accessing_real_singleton: security_is_real_singleton;
valid_error_action: error_action >= 0 and error_action <= 2;
open_in_sync: is_open_read or is_open_write implies is_open; -- The reverse is not
true, for examples sockets can be
-- closed for reading/writing, but still open.
capacity_not_negative: capacity >= 0;
valid_capacity: is_open = (capacity > 0);
open_implies_handle_assigned: is_open = (fd /= unassigned_value);
owned_implies_open: is_owner implies is_open;
owned_implies_handle_assigned: is_owner implies fd /= unassigned_value;
line_buffer_index_offset_ok: line_buffer /= Void implies line_buffer_index <= line_buffer.count;
client_socket_address_not_void: is_open implies client_socket_address /= Void;
end of deferred ABSTRACT_TCP_SERVER_SOCKET

```

---

In this chapter:

*C.1 Short form of POSIX\_ASYNC\_IO\_REQUEST*  
*C.2 Short form of POSIX\_BASE*  
*C.3 Short form of POSIX\_CHILD\_PROCESS*  
*C.4 Short form of POSIX\_CONSTANTS*  
*C.5 Short form of POSIX\_CURRENT\_PROCESS*  
*C.6 Short form of POSIX\_DAEMON*  
*C.7 Short form of POSIX\_DIRECTORY*  
*C.8 Short form of POSIX\_EXEC\_PROCESS*  
*C.9 Short form of POSIX\_FILE*  
*C.10 Short form of POSIX\_FILE\_DESCRIPTOR*  
*C.11 Short form of POSIX\_FILE\_SYSTEM*  
*C.12 Short form of POSIX\_FORK\_ROOT*  
*C.13 Short form of POSIX\_GROUP*  
*C.14 Short form of POSIX\_LOCK*  
*C.15 Short form of POSIX\_MEMORY\_MAP*  
*C.16 Short form of POSIX\_PERMISSIONS*  
*C.17 Short form of POSIX\_PIPE*  
*C.18 Short form of POSIX\_SEMAPHORE*  
*C.19 Short form of POSIX\_SIGNAL*  
*C.20 Short form of POSIX\_SIGNAL\_SET*  
*C.21 Short form of POSIX\_STATUS*  
*C.22 Short form of POSIX\_SYSTEM*  
*C.23 Short form of POSIX\_TERMIOS*  
*C.24 Short form of POSIX\_TIMED\_COMMAND*  
*C.25 Short form of POSIX\_USER*  
*C.26 Short form of POSIX\_USER\_DATABASE*

## C Short (flat) listing of POSIX classes

### C.1 Short form of POSIX\_ASYNC\_IO\_REQUEST

```
class interface POSIX_ASYNC_IO_REQUEST
creation
  make (a_fd: POSIX_FILE_DESCRIPTOR)
feature(s) from POSIX_ASYNC_IO_REQUEST
  -- creation
  make (a_fd: POSIX_FILE_DESCRIPTOR)
feature(s) from POSIX_ASYNC_IO_REQUEST
  -- request properties
  raw_pointer: POINTER
    -- Location for read or written data, usually buffer is a
    -- better idea.
  count: INTEGER
    -- number of bytes to read/write
  offset: INTEGER
    -- file offset
feature(s) from POSIX_ASYNC_IO_REQUEST
```

```

-- set request properties
set_buffer (a_buffer: STDC_BUFFER)
  -- set memory location to read/write from.
set_count (a_count: INTEGER)
  -- set number of bytes to read/write
set_offset (a_offset: INTEGER)
set_raw_pointer (a_pointer: POINTER)
  -- set memory location to read/write from. Make sure you have
  -- called set_count first!
feature(s) from POSIX_ASYNC_IO_REQUEST
-- basic read/write requests
read
  -- execute async read request
write
  -- execute async write request
feature(s) from POSIX_ASYNC_IO_REQUEST
-- Eiffel friendly reads and writes
last_string: STRING
  -- attempt to return buffer as an Eiffel string
  -- buffer should have a terminating byte!
read_string
put_string (text: STRING)
write_string (text: STRING)
feature(s) from POSIX_ASYNC_IO_REQUEST
-- other operations
cancel_failed: BOOLEAN
  -- set by cancel, True if cancel request failed, probably
  -- because operation was already performed
cancel
  -- cancel request
synchronize
  -- force all i/o operations queued for the file descriptor
  -- associated with this request to the synchronous state.
  -- Function returns when the request has been initiated or
  -- queued to the file or device (even when the data cannot be
  -- synchronized immediately)
synchronize_data
  -- force all i/o operations queued for the file descriptor
  -- associated with this request to the synchronous state.
  -- Function returns when the request has been initiated or
  -- queued to the file or device (even when the data cannot be
  -- synchronized immediately)
wait_for
  -- suspend process, until request completed
feature(s) from POSIX_ASYNC_IO_REQUEST
-- Access
buffer: STDC_BUFFER
  -- Buffer where data that is being read/write comes from,
  -- unless set_pointer has been called

```

```
fd: POSIX_FILE_DESCRIPTOR
is_pending: BOOLEAN
  -- Is io request still pending?
return_status: INTEGER
  -- Return status of asynchronous i/o operation, equal to what
  -- the synchronous read, write of fsync would have returned
invariant
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
  valid_aiocb: aiocb /= Void;
  synced_buffer_and_raw_pointer: buffer /= Void implies buffer.ptr = raw_pointer;
end of POSIX_ASYNC_IO_REQUEST
```

## C.2 Short form of *POSIX\_BASE*

**class** *interface* *POSIX\_BASE*

**invariant**

*accessing\_real\_singleton*: *security\_is\_real\_singleton*;

*valid\_error\_action*: *error\_action*  $\geq 0$  **and** *error\_action*  $\leq 2$ ;

**end of** *POSIX\_BASE*

### C.3 Short form of `POSIX_CHILD_PROCESS`

```

deferred class interface POSIX_CHILD_PROCESS
feature(s) from POSIX_CHILD_PROCESS
  -- Childs pid
  pid: INTEGER
  -- The process identifier
feature(s) from POSIX_CHILD_PROCESS
  -- Status
  is_pid_valid: BOOLEAN
  -- Is pid valid?
feature(s) from POSIX_CHILD_PROCESS
  -- Actions that parent may execute
  wait_for (suspend: BOOLEAN)
  -- Wait for this process to terminate. If suspend then we
  -- wait until the information about this process is available,
  -- else we return immediately.
  -- If suspend is False, check the running property to see
  -- if this child is really terminated.
feature(s) from POSIX_CHILD_PROCESS
  -- Signal
  kill (a_signal_code: INTEGER)
  -- Send signal signal_code to the process.
  terminate
  -- Attempt to gracefully terminate the process.
invariant
  --2007-12-13: invariant failure in some cases, root cause not determined yet
  --pid_known_is_not_terminated: is_pid_valid = not is_terminated
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
end of deferred POSIX_CHILD_PROCESS

```

## C.4 Short form of `POSIX_CONSTANTS`

```
class interface POSIX_CONSTANTS
feature(s) from STDC_CONSTANTS
  -- Error codes
  edom: INTEGER
    -- Math argument out of domain of function
  erange: INTEGER
    -- Math result not representable
  emfile: INTEGER
    -- Too many open files
feature(s) from STDC_CONSTANTS
  -- Standard streams
  stream_stdin: POINTER
  stream_stdout: POINTER
  stream_stderr: POINTER
feature(s) from STDC_CONSTANTS
  -- Special characters
  const_eof: INTEGER
    -- signals EOF
feature(s) from STDC_CONSTANTS
  -- I/O buffering
  iofbf: INTEGER
    -- full buffering
  iolbf: INTEGER
    -- line buffering
  ionbf: INTEGER
    -- no buffering
feature(s) from STDC_CONSTANTS
  -- file positioning
  seek_set: INTEGER
  seek_cur: INTEGER
  seek_end: INTEGER
feature(s) from STDC_CONSTANTS
  -- Signal related constants
  sig_dfl: POINTER
  sig_err: POINTER
  sig_ign: POINTER
feature(s) from STDC_CONSTANTS
  -- Signals
  sigabrt: INTEGER
  sigfpe: INTEGER
    -- erroneous arithmetic operation, such as zero divide or an
    -- operation resulting in overflow
  sigill: INTEGER
    -- illegal instruction
  sigint: INTEGER
    -- receipt of an interactive attention signal
  sigsegv: INTEGER
```

```
-- invalid access to storage
sigterm: INTEGER
-- Request process to terminate; can be caught or ignored
feature(s) from STDC_CONSTANTS
-- random numbers
rand_max: INTEGER
-- maximum value returned by the random function
feature(s) from STDC_CONSTANTS
-- category constants
lc_ctype: INTEGER
lc_numeric: INTEGER
lc_time: INTEGER
lc_collate: INTEGER
lc_monetary: INTEGER
lc_all: INTEGER
feature(s) from STDC_CONSTANTS
-- various
clocks_per_sec: INTEGER
feature(s) from STDC_CONSTANTS
-- exit codes
exit_failure: INTEGER
-- exit status when something has gone wrong
exit_success: INTEGER
-- exit status upon success
feature(s) from POSIX_CONSTANTS
-- Error codes
e2big: INTEGER
-- Arg list too long
eacces: INTEGER
-- Permission denied
eagain: INTEGER
-- Resource temporarily unavailable
ewouldblock: INTEGER
-- Resource temporarily unavailable
ebadf: INTEGER
-- Bad file descriptor
ebusy: INTEGER
-- Resource busy
ecanceled: INTEGER
-- Operation canceled
echild: INTEGER
-- No child processes
edeadlk: INTEGER
-- Resource deadlock avoided
eexist: INTEGER
-- File exists
efault: INTEGER
-- Bad address
efbig: INTEGER
```

---

-- File too large  
*einprogress: INTEGER*  
-- Operation in progress  
*eintr: INTEGER*  
-- Interrupted function call  
*EINVAL: INTEGER*  
-- Invalid argument  
*EIO: INTEGER*  
-- Input/output error  
*EISDIR: INTEGER*  
-- Is a directory  
*EMLINK: INTEGER*  
-- Too many links  
*EMSGSIZE: INTEGER*  
-- Inappropriate message buffer length  
*ENAMETOOLONG: INTEGER*  
-- Filename too long  
*ENFILE: INTEGER*  
-- Too many open files in system  
*ENODEV: INTEGER*  
-- No such device  
*ENOENT: INTEGER*  
-- No such file or directory  
*ENOEXEC: INTEGER*  
-- Exec format error  
*ENOLCK: INTEGER*  
-- No locks available  
*ENOMEM: INTEGER*  
-- Not enough space  
*ENOSPC: INTEGER*  
-- There is no free space remaining on the device  
*ENOSYS: INTEGER*  
-- Function not implemented  
*ENOTDIR: INTEGER*  
-- Not a directory  
*ENOTEMPTY: INTEGER*  
-- Directory not empty  
*ENOTSUP: INTEGER*  
-- Not supported  
*ENOTTY: INTEGER*  
-- Inappropriate I/O control operation  
*ENXIO: INTEGER*  
-- No such device or address  
*EPERM: INTEGER*  
-- Operation not permitted  
*EPIPE: INTEGER*  
-- Broken pipe  
*EROFS: INTEGER*  
-- Read-only file system

```

espipe: INTEGER
    -- Invalid seek;
    -- An lseek() function was issued on a pipe or FIFO.
esrch: INTEGER
    -- No such process
etimedout: INTEGER
    -- Operation timed out
exdev: INTEGER
    -- Improper link;
    -- A link to a file on another file system was attempted.
feature(s) from POSIX_CONSTANTS
    -- standard file numbers
stderr_fileno: INTEGER
stdin_fileno: INTEGER
stdout_fileno: INTEGER
feature(s) from POSIX_CONSTANTS
    -- posix open symbolic constants
o_append: INTEGER
    -- Set the file offset to the end-of-file prior to each write
o_creat: INTEGER
    -- If the file does not exist, allow it to be created. This
    -- flag indicates that the mode argument is present in the
    -- call to open.
o_dsync: INTEGER
    -- Write according to synchronized i/o data integrity completion
o_excl: INTEGER
    -- Open fails if the file already exists
o_exclusive: INTEGER
    -- Open fails if the file already exists
o_noctty: INTEGER
    -- prevents terminal from becoming the controlling terminal
    -- for this process
o_nonblock: INTEGER
    -- Do not wait for device or file to be ready or available
o_rdnly: INTEGER
    -- Open for reading only
o_rdwr: INTEGER
    -- Open fo reading and writing
o_rsync: INTEGER
    -- Synchronized read i/o operations
o_sync: INTEGER
    -- Write according to synchronized i/o file integrity completion
o_trunc: INTEGER
    -- Use only on ordinary files opened for writing. It causes
    -- the file to be truncated to zero length.
o_wronly: INTEGER
    -- Open for writing only
feature(s) from POSIX_CONSTANTS
    -- posix permission symbolic constants

```

*s\_irusr: INTEGER*  
*s\_iread: INTEGER*  
*s\_iwusr: INTEGER*  
*s\_iwrite: INTEGER*  
*s\_ixusr: INTEGER*  
*s\_iexec: INTEGER*  
*s\_irgrp: INTEGER*  
*s\_iwgrp: INTEGER*  
*s\_ixgrp: INTEGER*  
*s\_iroth: INTEGER*  
*s\_iwoth: INTEGER*  
*s\_ixoth: INTEGER*  
*s\_isuid: INTEGER*  
*s\_isgid: INTEGER*

**feature(s) from POSIX\_CONSTANTS**

-- Posix accessibility constants

*f\_ok: INTEGER*  
*r\_ok: INTEGER*  
*w\_ok: INTEGER*  
*x\_ok: INTEGER*

**feature(s) from POSIX\_CONSTANTS**

-- Posix signal constants

*sa\_nocldstop: INTEGER*  
*sig\_hup: INTEGER*

-- hangup detected on controlling terminal or death of  
-- controlling process

*signal\_hangup: INTEGER*

-- hangup detected on controlling terminal or death of  
-- controlling process

*sigalrm: INTEGER*

-- Timeout signal, such as initiated by the alarm() function  
-- or see POSIX\_TIMED\_COMMAND

*signal\_alarm: INTEGER*

-- Timeout signal, such as initiated by the alarm() function  
-- or see POSIX\_TIMED\_COMMAND

*sigchld: INTEGER*

-- Child process terminated or stopped

*signal\_child: INTEGER*

-- Child process terminated or stopped

*sigkill: INTEGER*

-- Termination signal (cannot be caught or ignored)

*signal\_kill: INTEGER*

-- Termination signal (cannot be caught or ignored)

*sigpipe: INTEGER*

-- Write on a pipe with no readers

*signal\_pipe: INTEGER*

-- Write on a pipe with no readers

*sigquit: INTEGER*

-- Interactive termination signal

```

signal_quit: INTEGER
    -- Interactive termination signal
sigcont: INTEGER
    -- Continue if stopped
signal_continue: INTEGER
    -- Continue if stopped
sigstop: INTEGER
    -- Stop signal, cannot be caught or ignored
signal_stop: INTEGER
    -- Stop signal, cannot be caught or ignored
sigstsp: INTEGER
    -- Interactive stop signal
signal_interactive_stop: INTEGER
    -- Interactive stop signal
sigttin: INTEGER
    -- Read from control terminal attempted by a member of a
    -- background process group
signal_terminal_in: INTEGER
    -- Read from control terminal attempted by a member of a
    -- background process group
sigttou: INTEGER
    -- Write to control terminal attempted by a member of a
    -- background process group
signal_terminal_out: INTEGER
    -- Write to control terminal attempted by a member of a
    -- background process group
feature(s) from POSIX_CONSTANTS
    -- sigprocmask how values
sig_block: INTEGER
sig_unblock: INTEGER
sig_setmask: INTEGER
feature(s) from POSIX_CONSTANTS
    -- Posix pathconf constants
pc_name_max: INTEGER
    -- The maximum length of a filename for this directory
feature(s) from POSIX_CONSTANTS
    -- terminal i/o local mode flags
isig: INTEGER
icanon: INTEGER
echo: INTEGER
    -- If set, input characters are echoed back to the terminal
echoe: INTEGER
echok: INTEGER
echonl: INTEGER
noflsh: INTEGER
tostop: INTEGER
iexten: INTEGER
feature(s) from POSIX_CONSTANTS
    -- set terminal settings options

```

```
tcsanow: INTEGER
tcsadrain: INTEGER
tcsaflush: INTEGER
feature(s) from POSIX_CONSTANTS
-- Semaphore constants
sem_value_max: INTEGER
-- Valid maximum initial value for a semaphore.
feature(s) from POSIX_CONSTANTS
-- terminal baud rates
b0: INTEGER
b50: INTEGER
b75: INTEGER
b110: INTEGER
b134: INTEGER
b150: INTEGER
b200: INTEGER
b300: INTEGER
b600: INTEGER
b1200: INTEGER
b1800: INTEGER
b2400: INTEGER
b4800: INTEGER
b9600: INTEGER
b19200: INTEGER
b38400: INTEGER
b57600: INTEGER
b115200: INTEGER
b230400: INTEGER
feature(s) from POSIX_CONSTANTS
-- terminal i/o control mode constants
csize: INTEGER
cs5: INTEGER
cs6: INTEGER
cs7: INTEGER
cs8: INTEGER
cstopb: INTEGER
cread: INTEGER
parenb: INTEGER
parodd: INTEGER
hupcl: INTEGER
clocal: INTEGER
feature(s) from POSIX_CONSTANTS
-- terminal i/o input control flags
ignbrk: INTEGER
brkint: INTEGER
ignpar: INTEGER
parmrk: INTEGER
inpck: INTEGER
istrip: INTEGER
```

```
inlcr: INTEGER
igncr: INTEGER
icrnl: INTEGER
ixon: INTEGER
ixoff: INTEGER
feature(s) from POSIX_CONSTANTS
  -- category constants
  lc_messages: INTEGER
feature(s) from POSIX_CONSTANTS
  -- pathname variable values
  max_input: INTEGER
    -- Minimum number of bytes for which space will be available
    -- in a terminal input queue; therefore, the maximum number
    -- of bytes a portable application may required to be typed
    -- as input before eading them
  name_max: INTEGER
    -- Maximum number of bytes in a file name
  path_max: INTEGER
    -- Maximum number of bytes in a pathname
  pipe_buf: INTEGER
    -- Maximum number of bytes that can be written atomically
    -- when writing to a pipe.
feature(s) from POSIX_CONSTANTS
  -- invariant values
  ssize_max: INTEGER
    -- The maximum value that can be stored in an object of type ssize_t
feature(s) from POSIX_CONSTANTS
  -- Other limits
  stream_max: INTEGER
    -- The number of streams that one process can have open at
    -- one time. If defined, it has the same value as {FOPEN_MAX}.
end of POSIX_CONSTANTS
```

## C.5 Short form of `POSIX_CURRENT_PROCESS`

```

class interface POSIX_CURRENT_PROCESS
feature(s) from ARGUMENTS
  command_name: STRING
feature(s) from CAPI_TIME
  -- Standard C binding
  current_time: INTEGER
  -- The current calendar time in seconds since the epoch
feature(s) from STDC_CURRENT_PROCESS
  -- Process standard input/output/error
  stdin: POSIX_TEXT_FILE
  stdout: POSIX_TEXT_FILE
  stderr: POSIX_TEXT_FILE
feature(s) from STDC_CURRENT_PROCESS
  -- Various
  clock: INTEGER
  -- Approximation of processor time used by the program, or -1
  -- if unknown
feature(s) from STDC_CURRENT_PROCESS
  -- Random numbers
  random: INTEGER
  -- Returns a pseudo-random integer between 0 and RAND_MAX.
  set_random_seed (a_seed: INTEGER)
  -- Sets a_seed as the seed for a new sequence of
  -- pseudo-random integers to be returned by random. These
  -- sequences are repeatable by calling set_random_seed with
  -- the same seed value. If no seed value is provided, the
  -- random function is automatically seeded with a value of
  -- 1.
feature(s) from STDC_CURRENT_PROCESS
  -- Global locale
  locale: STRING
  -- Current locale
  numeric_format: STDC_LOCALE_NUMERIC
  -- Various information for formatting numbers and monetary
  -- quantities
  set_locale (category: INTEGER; new_locale: STRING)
  -- Set given locale to new_locale. new_locale is either a
  -- well-known constant like "C" or "da_DK" or an opaque
  -- string that was returned by another call of setlocale.
  set_c_locale
  -- Set locale to the Standard C locale (the default).
  set_native_decimal_point
  -- Set the decimal point character using the LC_NUMERIC
  -- environment variable.
  set_native_locale
  -- Set entire locale to the natives setting which is
  -- determend by environment variables like LC_NUMERIC,

```

```

-- LC_COLLATE, LC_CTYPE etc.
set_native_time
-- Set time display to the natives setting using the LC_TIME
-- environment variable.
feature(s) from ABSTRACT_CURRENT_PROCESS
-- Access
effective_user_name: STRING
-- Name of the user currently associated with the current
-- thread;
-- Name will not be Void, but can be empty if no name found
-- (you can screw up your /etc/passwd on Unix...)
full_command_name: STRING
-- command_name with fully qualified path;
-- An empty string is returned in case command_name is
-- empty. As any program can setup the arguments passed to
-- another program, an empty command_name is a possibility.
pid: INTEGER
-- Process identifier, unique for this process
feature(s) from ABSTRACT_CURRENT_PROCESS
-- Every process also has standard file descriptors which might not be compatible with
stdin/stdout/stderr (Windows)
fd_stdin: POSIX_FILE_DESCRIPTOR
fd_stdout: POSIX_FILE_DESCRIPTOR
fd_stderr: POSIX_FILE_DESCRIPTOR
feature(s) from ABSTRACT_CURRENT_PROCESS
-- Sleeping
millisleep (a_milliseconds: INTEGER)
-- Sleep for a_milliseconds milliseconds. Due to timer
-- resolution issues, the minimum resolution might be in the
-- order of 10ms or higher.
sleep (seconds: INTEGER)
-- Delays process execution up to seconds. Can return early
-- if interrupted. Check unslect_seconds
unslept_seconds: INTEGER
-- The number of seconds still to sleep, before being
-- interrupted; it is set by sleep. If it is zero, no
-- interrupt occurred and process slept for the allotted
-- time.
feature(s) from STDC_SECURITY_ACCESSOR
-- The singleton, available to any because its used in preconditions
security: STDC_SECURITY
-- Singleton entry point for security.
feature(s) from STDC_BASE
-- Access
errno: STDC_ERRNO
-- Access to the variable that contains the error that occurred.
feature(s) from STDC_BASE
-- Status
raise_exception_on_error: BOOLEAN

```

```

-- Should an exception be raised when an error occurs?
-- If not, you have to check errno for any errors.
feature(s) from STDC_BASE
-- Change
set_default_action_on_error
-- Use security.error_handling.exceptions_enabled to
-- determine if an exception should be raised when a C call
-- returns an error.
set_raise_exception_on_error
-- Always raise an exception when a C call returns an error.
set_continue_on_error
-- Never raise an exception when a C call returns an error.
inherit_error_handling (an_instance: STDC_BASE)
-- Handle errors like an_instance
feature(s) from PAPI_WAIT
-- C binding functions
posix_wait (statloc: POINTER): INTEGER
-- Waits for process termination
posix_waitpid (a_pid: INTEGER; statloc: POINTER; options: INTEGER): INTEGER
-- Waits for process termination
feature(s) from PAPI_WAIT
-- C binding statloc evaluation
posix_wexitstatus (a_value: INTEGER): INTEGER
-- Evaluates to the low-order eight bits of the status
-- argument that the child passed to exit, or the value the
-- child process returned from main.
posix_wifexited (a_value: INTEGER): BOOLEAN
-- Evaluates to a non-zero value if status was returned for
-- a child that terminated normally
posix_wifsignaled (a_value: INTEGER): BOOLEAN
-- Evaluates to a non-zero value if status was returned for
-- a child that terminated due to the receipt of a signal
-- that was not caught
posix_wifstopped (a_value: INTEGER): BOOLEAN
posix_wstopsig (a_value: INTEGER): BOOLEAN
posix_wtermsig (a_value: INTEGER): INTEGER
feature(s) from PAPI_WAIT
-- waitpid constants
wnohang: INTEGER
-- do not suspend execution
wuntraced: INTEGER
-- report status of childs that are stopped and whose status has not
-- yet been reported since they stopped
feature(s) from EPX_CURRENT_PROCESS
-- Access (doesn't make a lot of sense if you're not inheriting)
raw_environment_variables: ARRAY[STRING]
-- The raw list of name=value pairs of environment
-- variables passed to this process;
-- A new list is created every time this feature is accessed.

```

```
feature(s) from POSIX_CURRENT_PROCESS
  -- signal this process
  kill (a_signal_code: INTEGER)
    -- Send signal signal_code to current process.
feature(s) from POSIX_CURRENT_PROCESS
  -- POSIX locale specifics
  set_native_messages
    -- Select native language as the language in which messages
    -- are displayed.
invariant
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
end of POSIX_CURRENT_PROCESS
```

## C.6 Short form of POSIX\_DAEMON

```
deferred class interface POSIX_DAEMON
feature(s) from POSIX_DAEMON
-- Daemon specific actions
detach
-- detach from command-line, not very useful if you want to
-- spawn multiple daemons, but you can always pass daemons to
-- the fork routine yourself.
after_fork
-- Code thanks to W. Richard Stevens.
-- If you are started from inetd, youre in big trouble
-- already and sinking deeper in the mud. For inetd there will
-- be another method to call, perhaps init_inetd or so.
invariant
--2007-12-13: invariant failure in some cases, root cause not determined yet
--pid_known_is_not_terminated: is_pid_valid = not is_terminated
accessing_real_singleton: security_is_real_singleton;
valid_error_action: error_action >= 0 and error_action <= 2;
end of deferred POSIX_DAEMON
```

## C.7 Short form of *POSIX\_DIRECTORY*

**class** *interface* *POSIX\_DIRECTORY*

**creation**

*make* (*a\_directory\_name*: *STRING*)

-- Initialize for browsing *a\_directory\_name*.

**invariant**

*accessing\_real\_singleton*: *security\_is\_real\_singleton*;

*valid\_error\_action*: *error\_action*  $\geq 0$  **and** *error\_action*  $\leq 2$ ;

*directory\_name\_not\_empty*: *directory\_name*  $\neq$  *Void* **and then not** *directory\_name.is\_empty*;

*my\_status\_tracks\_item*: *my\_status*  $\neq$  *Void* **implies** *my\_status.path.is\_equal(full\_name)*;

**end of** *POSIX\_DIRECTORY*

## C.8 Short form of `POSIX_EXEC_PROCESS`

**class** *interface* `POSIX_EXEC_PROCESS`

**creation**

`make` (*a\_program*: `STRING`; *a\_arguments*: `ARRAY[STRING]`)

`make_capture_input` (*a\_program*: `STRING`; *a\_arguments*: `ARRAY[STRING]`)

`make_capture_output` (*a\_program*: `STRING`; *a\_arguments*: `ARRAY[STRING]`)

`make_capture_io` (*a\_program*: `STRING`; *a\_arguments*: `ARRAY[STRING]`)

-- Why not use three directional i/o, because youre getting

-- yourself in great, great trouble anyway.

-- A bit of advice: call `stdin.close` before starting to call

-- `stdout.read_string`. But: your pipe might not have a large

-- enough buffer, so you write to the process `stdin` and get

-- blocked, because the process must empty its `stdin`

-- first. The process will do that, but next write to

-- `stdout`. If the `stdout` buffer is full, the process will

-- block. Now we have a nice dead-lock. Happy coding.

`make_capture_all` (*a\_program*: `STRING`; *a\_arguments*: `ARRAY[STRING]`)

-- Three directional i/o is a great way to get yourself in trouble.

**feature(s) from** `STDC_CHILD_PROCESS`

-- Termination info

`has_exit_code`: `BOOLEAN`

-- Does `exit_code` return a valid value?

`is_terminated`: `BOOLEAN`

-- Is child not running any more?

`exit_code`: `INTEGER`

-- Low-order 8 bits of call to `_exit` or `exit` for this process

**feature(s) from** `ABSTRACT_CHILD_PROCESS`

-- Access

`pid`: `INTEGER`

-- The process identifier

**feature(s) from** `ABSTRACT_CHILD_PROCESS`

-- Status

`is_pid_valid`: `BOOLEAN`

-- Is `pid` valid?

**feature(s) from** `ABSTRACT_CHILD_PROCESS`

-- Signal

`terminate`

-- Attempt to gracefully terminate the process.

**feature(s) from** `ABSTRACT_CHILD_PROCESS`

-- Actions that parent may execute

`wait_for` (*suspend*: `BOOLEAN`)

-- Wait for this process to terminate. If *suspend* then we

-- wait until the information about this process is available,

-- else we return immediately.

-- If *suspend* is `False`, check `is_terminated` to see

-- if this child is really terminated.

**feature(s) from** `ARGUMENTS`

`command_name`: `STRING`

```

feature(s) from CAPI_TIME
  -- Standard C binding
  current_time: INTEGER
    -- The current calendar time in seconds since the epoch
feature(s) from STDC_CURRENT_PROCESS
  -- Process standard input/output/error
  child_stdin: POSIX_TEXT_FILE
  child_stdout: POSIX_TEXT_FILE
  child_stderr: POSIX_TEXT_FILE
feature(s) from STDC_CURRENT_PROCESS
  -- Various
  clock: INTEGER
    -- Approximation of processor time used by the program, or -1
    -- if unknown
feature(s) from STDC_CURRENT_PROCESS
  -- Random numbers
  random: INTEGER
    -- Returns a pseudo-random integer between 0 and RAND_MAX.
  set_random_seed (a_seed: INTEGER)
    -- Sets a_seed as the seed for a new sequence of
    -- pseudo-random integers to be returned by random. These
    -- sequences are repeatable by calling set_random_seed with
    -- the same seed value. If no seed value is provided, the
    -- random function is automatically seeded with a value of
    -- 1.
feature(s) from STDC_CURRENT_PROCESS
  -- Global locale
  locale: STRING
    -- Current locale
  numeric_format: STDC_LOCALE_NUMERIC
    -- Various information for formatting numbers and monetary
    -- quantities
  set_locale (category: INTEGER; new_locale: STRING)
    -- Set given locale to new_locale. new_locale is either a
    -- well-known constant like "C" or "da_DK" or an opaque
    -- string that was returned by another call of setlocale.
  set_c_locale
    -- Set locale to the Standard C locale (the default).
  set_native_decimal_point
    -- Set the decimal point character using the LC_NUMERIC
    -- environment variable.
  set_native_locale
    -- Set entire locale to the natives setting which is
    -- determined by environment variables like LC_NUMERIC,
    -- LC_COLLATE, LC_CTYPE etc.
  set_native_time
    -- Set time display to the natives setting using the LC_TIME
    -- environment variable.
feature(s) from ABSTRACT_CURRENT_PROCESS

```

```

-- Access
effective_user_name: STRING
  -- Name of the user currently associated with the current
  -- thread;
  -- Name will not be Void, but can be empty if no name found
  -- (you can screw up your /etc/passwd on Unix...)
full_command_name: STRING
  -- command_name with fully qualified path;
  -- An empty string is returned in case command_name is
  -- empty. As any program can setup the arguments passed to
  -- another program, an empty command_name is a possibility.
fork_parent_pid: INTEGER
  -- Process identifier, unique for this process
feature(s) from ABSTRACT_CURRENT_PROCESS
  -- Every process also has standard file descriptors which might not be compatible with
  stdin/stdout/stderr (Windows)
  child_fd_stdin: POSIX_FILE_DESCRIPTOR
  child_fd_stdout: POSIX_FILE_DESCRIPTOR
  child_fd_stderr: POSIX_FILE_DESCRIPTOR
feature(s) from ABSTRACT_CURRENT_PROCESS
  -- Sleeping
  millisleep (a_milliseconds: INTEGER)
    -- Sleep for a_milliseconds milliseconds. Due to timer
    -- resolution issues, the minimum resolution might be in the
    -- order of 10ms or higher.
  sleep (seconds: INTEGER)
    -- Delays process execution up to seconds. Can return early
    -- if interrupted. Check unslect_seconds
  unslept_seconds: INTEGER
    -- The number of seconds still to sleep, before being
    -- interrupted; it is set by sleep. If it is zero, no
    -- interrupt occurred and process slept for the allotted
    -- time.
feature(s) from STDC_SECURITY_ACCESSOR
  -- The singleton, available to any because its used in preconditions
  security: STDC_SECURITY
    -- Singleton entry point for security.
feature(s) from STDC_BASE
  -- Access
  errno: STDC_ERRNO
    -- Access to the variable that contains the error that occurred.
feature(s) from STDC_BASE
  -- Status
  raise_exception_on_error: BOOLEAN
    -- Should an exception be raised when an error occurs?
    -- If not, you have to check errno for any errors.
feature(s) from STDC_BASE
  -- Change
  set_default_action_on_error

```

```

-- Use security.error_handling.exceptions_enabled to
-- determine if an exception should be raised when a C call
-- returns an error.
set_raise_exception_on_error
-- Always raise an exception when a C call returns an error.
set_continue_on_error
-- Never raise an exception when a C call returns an error.
inherit_error_handling (an_instance: STDC_BASE)
-- Handle errors like an_instance
feature(s) from EPX_CURRENT_PROCESS
-- Access (doesn't make a lot of sense if you're not inheriting)
raw_environment_variables: ARRAY[STRING]
-- The raw list of name=value pairs of environment
-- variables passed to this process;
-- A new list is created every time this feature is accessed.
feature(s) from POSIX_CHILD_PROCESS
-- Signal
kill (a_signal_code: INTEGER)
-- Send signal signal_code to the process.
feature(s) from POSIX_CURRENT_PROCESS
-- signal this process
kill_fork_parent (a_signal_code: INTEGER)
-- Send signal signal_code to current process.
feature(s) from POSIX_CURRENT_PROCESS
-- POSIX locale specifics
set_native_messages
-- Select native language as the language in which messages
-- are displayed.
feature(s) from PAPI_WAIT
-- C binding functions
posix_wait (statloc: POINTER): INTEGER
-- Waits for process termination
posix_waitpid (a_pid: INTEGER; statloc: POINTER; options: INTEGER): INTEGER
-- Waits for process termination
feature(s) from PAPI_WAIT
-- C binding statloc evaluation
posix_wexitstatus (a_value: INTEGER): INTEGER
-- Evaluates to the low-order eight bits of the status
-- argument that the child passed to exit, or the value the
-- child process returned from main.
posix_wifexited (a_value: INTEGER): BOOLEAN
-- Evaluates to a non-zero value if status was returned for
-- a child that terminated normally
posix_wifsignaled (a_value: INTEGER): BOOLEAN
-- Evaluates to a non-zero value if status was returned for
-- a child that terminated due to the receipt of a signal
-- that was not caught
posix_wifstopped (a_value: INTEGER): BOOLEAN
posix_wstpsig (a_value: INTEGER): BOOLEAN

```

```

    posix_wtermsig (a_value: INTEGER): INTEGER
feature(s) from PAPI_WAIT
    -- waitpid constants
    unohang: INTEGER
    -- do not suspend execution
    wuntraced: INTEGER
    -- report status of childs that are stopped and whose status has not
    -- yet been reported since they stopped
feature(s) from ABSTRACT_EXEC_PROCESS
    -- (re)set arguments
    has_void_argument (a_arguments: ARRAY[STRING]): BOOLEAN
    -- Is one of the items in a_arguments Void?
    set_arguments (a_arguments: ARRAY[STRING])
feature(s) from ABSTRACT_EXEC_PROCESS
    -- i/o capturing
    capture_input: BOOLEAN
    -- is input captured on execute?
    capture_output: BOOLEAN
    -- is output captured on execute?
    capture_error: BOOLEAN
    -- is error captured on execute?
    set_capture_input (on: BOOLEAN)
    set_capture_output (on: BOOLEAN)
    set_capture_error (on: BOOLEAN)
    fd_stdin: POSIX_FILE_DESCRIPTOR
    -- Input read by process
    fd_stdout: POSIX_FILE_DESCRIPTOR
    -- Output emitted by process
    fd_stderr: POSIX_FILE_DESCRIPTOR
    -- Error output from process
feature(s) from ABSTRACT_EXEC_PROCESS
    -- Execute
    execute
    -- Execute program_name with arguments arguments. After
    -- execution, at some point in time, you have to wait or
    -- wait_for for this process to terminate.
    -- Current setting for error handling is retained for the
    -- captured i/o on the parent side, but not for the childs
    -- side (but maybe should??).
feature(s) from ABSTRACT_EXEC_PROCESS
    -- Access
    program_name: STDC_PATH
    -- Program to execute
    arguments: ARRAY[STRING]
    -- Arguments to pass to program_name
feature(s) from POSIX_FORK_ROOT
    -- termination info
    is_terminated_normally: BOOLEAN
    -- Has this process been terminated normally?

```

```

is_exited: BOOLEAN
  -- Has this process been terminated normally?
is_signalled: BOOLEAN
  -- Was child process terminated due to receipt of a signal
  -- that was not caught?
signal_code: INTEGER
  -- Signal which caused the process to terminate
invariant
  --2007-12-13: invariant failure in some cases, root cause not determined yet
  --pid_known_is_not_terminated: is_pid_valid = not is_terminated
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
  program_name_not_empty: program_name /= Void and then not program_name.is_empty;
  arguments_not_void: arguments /= Void;
  all_arguments_not_void: not has_void_argument(arguments);
  descriptors_are_owners: (fd_stdin /= Void and then fd_stdin.is_open implies fd_stdin.is_owner)
and then (fd_stdout /= Void and then fd_stdout.is_open implies fd_stdout.is_owner)
and then (fd_stderr /= Void and then fd_stderr.is_open implies fd_stderr.is_owner);
  streams_are_not_owner: (stdin /= Void implies not stdin.is_owner) and then (stdout
  /= Void implies not stdout.is_owner) and then (stderr /= Void implies not stderr.is_owner);
end of POSIX_EXEC_PROCESS

```

## C.9 Short form of `POSIX_FILE`

```
deferred class interface POSIX_FILE
feature(s) from POSIX_FILE
  -- special makes
  make_from_file_descriptor (a_file_descriptor: ABSTRACT_FILE_DESCRIPTOR;
a_mode: STRING)
  -- Open a stream from a given file descriptor.
  -- The stream will become leading so when the file
  -- descriptor is closed, it will not close, you have to close
  -- the stream to close the file descriptor.
  -- The stream will also inherit the error handling setting
  -- of a_file_descriptor.
invariant
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
  open_in_sync: is_open_read or is_open_write implies is_open; -- The reverse is not
true, for examples sockets can be
  -- closed for reading/writing, but still open.
  capacity_not_negative: capacity >= 0;
  valid_capacity: is_open = (capacity > 0);
  open_implies_handle_assigned: is_open = (stream /= unassigned_value);
  owned_implies_open: is_owner implies is_open;
  owned_implies_handle_assigned: is_owner implies stream /= unassigned_value;
  last_string_valid: last_string /= Void;
  gets_buf_valid: gets_buf /= Void;
end of deferred POSIX_FILE
```

## C.10 Short form of POSIX\_FILE\_DESCRIPTOR

**class** *interface* `POSIX_FILE_DESCRIPTOR`

**creation**

`open (a_path: STRING; a_flags: INTEGER)`

-- Open given file with access given by *flags*.

`open_read (a_path: STRING)`

-- Open given file with access given by *flags*.

`open_write (a_path: STRING)`

`open_read_write (a_path: STRING)`

`open_truncate (a_path: STRING)`

-- Open file, if it exists, truncate it first.

`create_read_write (a_path: STRING)`

-- Always create a file, existing or not.

-- Give read/write permissions to user only.

`create_write (a_path: STRING)`

-- Always create a file, existing or not.

-- Give read/write permissions to user only.

`create_with_mode (a_path: STRING; flags, mode: INTEGER)`

-- Create a file according to *flags* and with *mode* access

-- permissions. Make sure you have the `O_CREAT` flag in *flags*

-- if you really want to create something!

`make_as_duplicate (another: ABSTRACT_DESCRIPTOR)`

-- On creation, create a duplicate from another descriptor.

-- As normal call, closes its own descriptor first (if open) and

-- duplicates next.

`make_from_file (file: STDC_FILE)`

-- Create file descriptor from given stream

-- The stream is leading, so this file descriptor will

-- never close itself, unless it is made an owner.

`attach_to_fd (a_fd: INTEGER; a_become_owner: BOOLEAN)`

-- Create descriptor with value *a\_fd*. Descriptor will close

-- it when *a\_become\_owner*.

**feature(s) from** `MEMORY`

`dispose`

-- Close handle if owner.

**feature(s) from** `KI_INPUT_STREAM`

-- `Input`

`non_blocking_read_character`

-- Read the next item in input stream.

-- Make the result available in *last\_item*.

`non_blocking_read_to_buffer (a_buffer: KI_BUFFER[CHARACTER]; pos, nb: INTEGER):  
INTEGER`

-- Fill *a\_buffer*, starting at position *pos*, with

-- at most *nb* items read from input stream.

-- Return the number of items actually read.

**feature(s) from** `KI_INPUT_STREAM`

-- `Status report`

`is_closable_for_reading: BOOLEAN`

```

-- Can current input stream be closed?
is_open_read: BOOLEAN
-- Can items be read from input stream?
is_rewindable: BOOLEAN
-- Can current input stream be rewound to return input from
-- the beginning of the stream?
end_of_input: BOOLEAN
-- Has end-of-file been reached?
valid_unread_character (a_character: CHARACTER): BOOLEAN
-- Can a_character be put back in input stream?
feature(s) from KI_INPUT_STREAM
-- Access
name: STDC_PATH
-- Scratch path
last_character: CHARACTER
-- Last character read by read_character and a few other
-- routines
feature(s) from KI_INPUT_STREAM
-- Basic operations
close_for_reading
-- Try to close input stream if it is closable. Set
-- is_open_read to false if operation was successful.
rewind
-- Move input position to the beginning of stream.
feature(s) from KL_IMPORTED_ANY_ROUTINES
-- Access
any_: KL_ANY_ROUTINES
-- Routines that ought to be in class ANY
feature(s) from KI_CHARACTER_INPUT_STREAM
-- Input
non_blocking_read_string (nb: INTEGER)
-- Read at most nb characters from input stream.
-- Make the characters that have actually been read
-- available in last_string.
non_blocking_read_to_string (a_string: STRING; pos, nb: INTEGER): INTEGER
-- Fill a_string, starting at position pos, with
-- at most nb characters read from input stream.
-- Return the number of characters actually read.
feature(s) from KI_CHARACTER_INPUT_STREAM
-- Access
last_string: STRING
-- Last string read;
-- (Note: this query always return the same object.
-- Therefore a clone should be used if the result
-- is to be kept beyond the next call to this feature.
-- However last_string is not shared between file objects.)
feature(s) from EPX_CHARACTER_INPUT_STREAM
-- Access
is_streaming: BOOLEAN

```

```

-- Is data coming from a network stream?
feature(s) from EPX_CHARACTER_INPUT_STREAM
-- Input
last_read: INTEGER
-- Last bytes read by read_buffer;
-- Can be less than requested for non-blocking input.
-- Check last_blocked in that case.
read_buffer (buf: STDC_BUFFER; offset, nbytes: INTEGER)
-- Read data into buf at offset for nbytes bytes.
-- Number of bytes actually read are available in last_read.
-- This is a more safe version of read in case you have a
-- STDC_BUFFER object.
feature(s) from EPX_CHARACTER_INPUT_STREAM
-- Debug
set_dump_input (a_file_name: STRING)
feature(s) from KI_TEXT_INPUT_STREAM
-- Input
read_line
-- Read characters from input stream until a line separator
-- or end of file is reached. Make the characters that have
-- been read available in last_string and discard the line
-- separator characters from the input stream.
-- Zero characters will be read when non-blocking i/o
-- is enabled, and read_line would block at the first character.
-- If a character has been read, read_line will block until
-- a %N has been read or end_of_input occurs.
read_new_line
-- Read a line separator from input file.
-- Make the characters making up the recognized
-- line separator available in last_string,
-- or make last_string empty and leave the
-- input file unchanged if no line separator
-- was found.
feature(s) from KI_TEXT_INPUT_STREAM
-- Access
eol: STRING
-- Line separator;
-- EPX classes do not distinguish between a %R%N or just %N
-- end-of-line. The platform may though.
feature(s) from STDC_SECURITY_ACCESSOR
-- The singleton, available to any because its used in preconditions
security: STDC_SECURITY
-- Singleton entry point for security.
feature(s) from STDC_BASE
-- Access
errno: STDC_ERRNO
-- Access to the variable that contains the error that occurred.
feature(s) from STDC_BASE
-- Status

```

```

    raise_exception_on_error: BOOLEAN
        -- Should an exception be raised when an error occurs?
        -- If not, you have to check errno for any errors.
feature(s) from STDC_BASE
    -- Change
    set_default_action_on_error
        -- Use security.error_handling.exceptions_enabled to
        -- determine if an exception should be raised when a C call
        -- returns an error.
    set_raise_exception_on_error
        -- Always raise an exception when a C call returns an error.
    set_continue_on_error
        -- Never raise an exception when a C call returns an error.
    inherit_error_handling (an_instance: STDC_BASE)
        -- Handle errors like an_instance
feature(s) from KI_OUTPUT_STREAM
    -- Output
    put_character (c: CHARACTER)
        -- Write a character.
    append (an_input_stream: KI_INPUT_STREAM[CHARACTER])
        -- Read items of an_input_stream until the end
        -- of input is reached, and write these items to
        -- current output stream.
        -- append is safe for non-blocking descriptors.
feature(s) from KI_OUTPUT_STREAM
    -- Status report
    is_open_write: BOOLEAN
        -- Can items be written to output stream?
    is_closable_for_writing: BOOLEAN
        -- Can current output stream be closed?
feature(s) from KI_OUTPUT_STREAM
    -- Basic operations
    close_for_writing
        -- Try to close output stream if it is closable. Set
        -- is_open_write to false if operation was successful.
feature(s) from KI_CHARACTER_OUTPUT_STREAM
    -- Output
    put_string (a_string: STRING)
        -- Write a_string to output stream.
    put_substring (a_string: STRING; s, e: INTEGER)
        -- Write substring of a_string between indexes
        -- s and e to output stream.
    put_integer (i: INTEGER)
        -- Write decimal representation
        -- of i to output stream.
        -- Regexp: 0|(-?[1-9][0-9]*)
    put_boolean (b: BOOLEAN)
        -- Write "True" to output stream if
        -- b is true, "False" otherwise.

```

```

feature(s) from KI_CHARACTER_OUTPUT_STREAM
  -- Basic operations
  flush
    -- Flush buffered data to disk.
feature(s) from EPX_CHARACTER_OUTPUT_STREAM
  -- Output
  last_written: INTEGER
    -- How many bytes were written by the last call to a routine;
    -- Can be less than requested for non-blocking output.
    -- Check last_blocked in that case.
  put_buffer (buf: STDC_BUFFER; offset, nbytes: INTEGER)
    -- More safe version of write in case you have a
    -- STDC_BUFFER object.
  write_buffer (buf: STDC_BUFFER; offset, nbytes: INTEGER)
    -- More safe version of write in case you have a
    -- STDC_BUFFER object.
feature(s) from KI_TEXT_OUTPUT_STREAM
  -- Output
  put_line (a_string: STRING)
    -- Write a_string to output stream
    -- followed by a line separator.
  put_new_line
    -- Write a line separator to output stream.
feature(s) from EPX_CHARACTER_IO_STREAM
  -- Basic operations
  close
    -- Close the resource.
feature(s) from EPX_CHARACTER_IO_STREAM
  -- Status report
  is_closable: BOOLEAN
    -- Can current stream be closed for reading and writing?
  is_open: BOOLEAN
    -- Does handle contain an open handle?
  is_owner: BOOLEAN
    -- Does this object close the stream on close or dispose?
    -- Only for resources that are owned, are resource limits checked.
feature(s) from STDC_HANDLE
  -- Access
  resource_usage_can_be_increased: BOOLEAN
    -- Is it allowed to open another file?
feature(s) from STDC_HANDLE
  -- Influence ownership of the handle. Can help to influence subtle garbage collector problems
  become_owner
    -- This class will own its handle. This is the only function
    -- that actually increases the resource count.
  unown
    -- Resource will not be closed on dispose. Calling close will
    -- be forbidden. This routine may not call any other object,
    -- else it cannot be called from within dispose.

```

```

feature(s) from STDC_HANDLE
  -- Close
  detach
    -- Forget the resource. Resource is not closed.
    -- You cannot read and write anymore.
feature(s) from STDC_HANDLE
  -- Resource
  capacity: INTEGER
    -- Number of resources that are in use by handle. For a
    -- file this is 1, for a memory handle, this is the number of
    -- bytes.
  fd: H
    -- Identifier of resource tracked by this class.
feature(s) from PORTABLE_PATH
  -- Change
  set_portable_path (a_path: STRING)
    -- Set portable_path to a_path.
feature(s) from HASHABLE
  hash_code: INTEGER
    -- Hash code value
feature(s) from STDC_HANDLE_BASED_IO_STREAM
  -- Stream or disk file
  set_streaming (enable: BOOLEAN)
    -- Influence behaviour of certain functions if they should be
    -- optimized for data coming from disk or data coming from
    -- the network. In particular is_streaming implies that a
    -- client application is prepared to handle reads that
    -- return less than the requested number of bytes, but dont
    -- assume that means end-of-file.
feature(s) from ABSTRACT_DESCRIPTOR
  -- Initialization
  make
feature(s) from ABSTRACT_DESCRIPTOR
  -- Special creation
  attach_to_fd (a_fd: INTEGER; a_become_owner: BOOLEAN)
    -- Create descriptor with value a_fd. Descriptor will close
    -- it when a_become_owner.
  make_as_duplicate (another: ABSTRACT_DESCRIPTOR)
    -- On creation, create a duplicate from another descriptor.
    -- As normal call, closes its own descriptor first (if open) and
    -- duplicates next.
feature(s) from ABSTRACT_DESCRIPTOR
  -- Read and write to memory block
  last_blocked: BOOLEAN
    -- Would last call to read or write block?
  read (buf: POINTER; offset, nbytes: INTEGER)
    -- Read data into buf at offset for nbytes bytes.
    -- The number of bytes actually read, is available in last_read.
  write (buf: POINTER; offset, nbytes: INTEGER)

```

```

-- Write given data from buf at offset, for nbytes
-- bytes. Number of actually written bytes are in
-- last_written. last_written can be unequal to nbytes
-- if i/o is non-blocking or some error has occurred.
feature(s) from ABSTRACT_DESCRIPTOR
-- Eiffel like output
put (a: ANY)
-- Write any Eiffel object as string using its out value.
write_character (c: CHARACTER)
-- Write a character.
write_string (a_string: STRING)
-- Write a_string to output stream.
puts (a_string: STRING)
-- Write a_string to output stream.
feature(s) from ABSTRACT_DESCRIPTOR
-- Buffered input
read_character
-- Sets last_character.
-- If this routine blocks, last_character has the value
-- %U. Therefore, if non-blocking is enabled, always check
-- last_blocked to see if the value make sense.
read_string (nb: INTEGER)
-- Read at most nb characters from input stream.
-- Make the characters that have actually been read
-- available in last_string.
-- Zero characters will be read when non-blocking i/o
-- is enabled, and read would block.
feature(s) from ABSTRACT_DESCRIPTOR
-- Status report
is_attached_to_terminal: BOOLEAN
-- Is the handle associated with character device?
feature(s) from ABSTRACT_DESCRIPTOR
-- Access
value: INTEGER
-- The actual file descriptor value
feature(s) from ABSTRACT_DESCRIPTOR
-- non-blocking i/o
is_blocking_io: BOOLEAN
-- Is blocking i/o enabled (default)?
set_blocking_io (enable: BOOLEAN)
-- Set is_blocking_io.
supports_nonblocking_io: BOOLEAN
-- Does this descriptor support non-blocking input/output?
-- On POSIX systems, any descriptor does.
-- On Windows, sockets and pipes do.
feature(s) from ABSTRACT_FILE_DESCRIPTOR
-- Initialization
open (a_path: STRING; a_flags: INTEGER)
-- Open given file with access given by flags.

```

```

open_read (a_path: STRING)
  -- Open given file with access given by flags.
open_write (a_path: STRING)
open_read_write (a_path: STRING)
open_truncate (a_path: STRING)
  -- Open file, if it exists, truncate it first.
create_read_write (a_path: STRING)
  -- Always create a file, existing or not.
  -- Give read/write permissions to user only.
create_write (a_path: STRING)
  -- Always create a file, existing or not.
  -- Give read/write permissions to user only.
create_with_mode (a_path: STRING; flags, mode: INTEGER)
  -- Create a file according to flags and with mode access
  -- permissions. Make sure you have the O_CREAT flag in flags
  -- if you really want to create something!
feature(s) from ABSTRACT_FILE_DESCRIPTOR
  -- File position
seek (offset: INTEGER)
  -- Set file position to given absolute offset.
seek_from_current (offset: INTEGER)
  -- Set file position relative to current position.
seek_from_end (offset: INTEGER)
  -- Set file position relative to end of file.
feature(s) from ABSTRACT_FILE_DESCRIPTOR
  -- Access
status: POSIX_STATUS
  -- The status for this file descriptor. Cached value,
  -- refreshed only when file reopened.
feature(s) from PAPI_UNISTD
  -- C binding miscellaneous
posix_alarm (a_seconds: INTEGER): INTEGER
  -- Schedules an alarm.
posix_environ: POINTER
  -- The list of environment variables passed to this program
posix_execvp (file: POINTER; argv: POINTER): INTEGER
  -- Executes a program.
posix__exit (a_status: INTEGER)
  -- Cause program termination without calling exit handlers
  -- defined with atexit.
  -- a_status is returned to its parent.
posix_fork: INTEGER
  -- Create a process.
posix_getlogin: POINTER
  -- User name
posix_pause: INTEGER
  -- Wait for signal.
posix_sleep (seconds: INTEGER): INTEGER
  -- Delay process execution.

```

**feature(s) from PAPI\_UNISTD**

-- functions with path as argument  
*posix\_access* (*a\_path*: *POINTER*; *amode*: *INTEGER*): *INTEGER*  
 -- Tests for file accessibility  
*posix\_chdir* (*a\_path*: *POINTER*): *INTEGER*  
 -- Changes the current working directory  
*posix\_chown* (*a\_path*: *POINTER*; *a\_owner*, *a\_group*: *INTEGER*): *INTEGER*  
 -- Changes the owner and/or group of a file  
*posix\_getcwd* (*a\_buf*: *POINTER*; *a\_size*: *INTEGER*): *POINTER*  
 -- Gets current working directory  
*posix\_link* (*existing*, *new*: *POINTER*): *INTEGER*  
 -- Creates a link to a file  
*posix\_rmdir* (*a\_path*: *POINTER*): *INTEGER*  
 -- Removes a directory  
*posix\_unlink* (*a\_path*: *POINTER*): *INTEGER*  
 -- Removes a directory entry

**feature(s) from PAPI\_UNISTD**

-- C binding file descriptor routines  
*posix\_close* (*fildes*: *INTEGER*): *INTEGER*  
 -- Closes a file  
*posix\_dup* (*fildes*: *INTEGER*): *INTEGER*  
 -- Duplicates an open file descriptor  
*posix\_dup2* (*fildes*, *fildes2*: *INTEGER*): *INTEGER*  
 -- Duplicates an open file descriptor  
*posix\_fdatasync* (*fildes*: *INTEGER*): *INTEGER*  
 -- Synchronize the data of a file  
*posix\_fsync* (*fildes*: *INTEGER*): *INTEGER*  
 -- Synchronize the state of a file  
*posix\_fpathconf* (*fildes*: *INTEGER*; *name*: *INTEGER*): *INTEGER*  
 -- Gets configuration variable for an open file  
*posix\_isatty* (*fildes*: *INTEGER*): *BOOLEAN*  
 -- Determines if a file descriptor is associated with a terminal  
*posix\_lseek* (*fildes*: *INTEGER*; *offset*, *whence*: *INTEGER*): *INTEGER*  
 -- Repositions read/write file offset  
*posix\_pipe* (*fildes*: *POINTER*): *INTEGER*  
 -- Creates an interprocess channel  
*posix\_read* (*fildes*: *INTEGER*; *buf*: *POINTER*; *nbyte*: *INTEGER*): *INTEGER*  
 -- Reads from a file  
*posix\_ttyname* (*fildes*: *INTEGER*): *POINTER*  
 -- Determines a terminal pathname  
*posix\_write* (*fildes*: *INTEGER*; *buf*: *POINTER*; *nbyte*: *INTEGER*): *INTEGER*  
 -- Reads from a file

**feature(s) from PAPI\_UNISTD**

-- user and group ids  
*posix\_getegid*: *INTEGER*  
 -- Gets effective group ID  
*posix\_geteuid*: *INTEGER*  
 -- Gets effective user ID  
*posix\_getgid*: *INTEGER*

```

-- Gets real group ID
posix_getgroups (gidsetsize: INTEGER; grouplist: POINTER): INTEGER
-- Gets supplementary group IDs
posix_getpgrp: INTEGER
-- Gets process group ID
posix_getpid: INTEGER
-- Gets process ID
posix_getppid: INTEGER
-- Gets parent process ID
posix_getuid: INTEGER
-- Gets real user ID
posix_group_item (a_grouplist: POINTER; a_item: INTEGER): INTEGER
-- Gets a gid from a list returned by getgroups
posix_setgid (gid: INTEGER): INTEGER
-- Sets group ID
posix_setpgid (pid, ppid: INTEGER): INTEGER
-- Sets process group ID for job control
posix_setsid: INTEGER
-- Creates a session and sets the process group ID
posix_setuid (uid: INTEGER): INTEGER
-- Sets user ID
feature(s) from PAPI_UNISTD
-- sysconf, note that -1 will be returned in case functionality is not supported
posix_sc_arg_max: INTEGER
-- The length of the arguments for the exec() function
posix_sc_child_max: INTEGER
-- The number of simultaneous processes per real user ID
posix_sc_clk_tck: INTEGER
-- The number of clock ticks per second
posix_sc_ngroups_max: INTEGER
-- The number of simultaneous supplementary group IDs
posix_sc_stream_max: INTEGER
-- The maximum number of streams that one process can have
-- open at one time.
posix_sc_tzname_max: INTEGER
-- The maximum number of bytes in a timezone name.
posix_sc_open_max: INTEGER
-- The maximum number of files that one process can have
-- open at one time.
posix_sc_pagesize: INTEGER
-- granularity in bytes of memory mapping and process memory locking
posix_sc_job_control: INTEGER
-- Job control functions are supported.
posix_sc_saved_ids: INTEGER
-- Each process has a saved set-user-ID and a saved set-group-ID
posix_sc_version: INTEGER
-- Indicates the 4-digit year and 2-digit month that the
-- standard was approved.
feature(s) from PAPI_UNISTD

```

```

-- capability constants
posix_asynchronous_io: BOOLEAN
  -- True if _POSIX_ASYNCHRONOUS_IO is defined
def_fsync: BOOLEAN
  -- True if _POSIX_FSYNC is defined
posix_mapped_files: BOOLEAN
  -- True if _POSIX_MAPPED_FILES is defined
posix_memlock: BOOLEAN
  -- True if _POSIX_MEMLOCK is defined
posix_memlock_range: BOOLEAN
  -- True if _POSIX_MEMLOCK_RANGE is defined
posix_memory_protection: BOOLEAN
  -- True if _POSIX_MEMORY_PROTECTION is defined
posix_message_passing: BOOLEAN
  -- True if _POSIX_MESSAGE_PASSING is defined
posix_priority_scheduling: BOOLEAN
  -- True if _POSIX_PRIORITY_SCHEDULING is defined
posix_semaphores: BOOLEAN
  -- True if _POSIX_SEMAPHORES is defined
posix_shared_memory_objects: BOOLEAN
  -- True if _POSIX_SHARED_MEMORY_OBJECTS is defined
def_synchronized_io: BOOLEAN
  -- True if _POSIX_SYNCHRONIZED_IO is defined
posix_timers: BOOLEAN
  -- True if _POSIX_TIMERS is defined
posix_threads: BOOLEAN
  -- True if _POSIX_THREADS is defined
feature(s) from POSIX_FILE_DESCRIPTOR
-- Initialization
make_from_file (file: STDC_FILE)
  -- Create file descriptor from given stream
  -- The stream is leading, so this file descriptor will
  -- never close itself, unless it is made an owner.
feature(s) from POSIX_FILE_DESCRIPTOR
-- Status
is_closed_on_execute: BOOLEAN
  -- Is this descriptor closed when the process executes or
  -- spawns a child process?
feature(s) from POSIX_FILE_DESCRIPTOR
-- Close
close_on_execute
  -- Close this descriptor in the child process after a spawn
  -- or execute has happened. Important if you dont
  -- inadvertently want to leak important sockets to a client.
feature(s) from POSIX_FILE_DESCRIPTOR
-- Synchronisation
supports_file_synchronization: BOOLEAN
  -- Do we support synchronization?
supports_data_synchronization: BOOLEAN

```

```

-- Do we support synchronization of data without metadata?
synchronize
-- Synchronize the state of a file (includes synchronize_data).
synchronize_data
-- Synchronize the data of a file. Cheaper than
-- synchronize, but not always supported.
feature(s) from POSIX_FILE_DESCRIPTOR
-- Locking
get_lock (lock_to_test: POSIX_LOCK): POSIX_LOCK
-- Gets lock information, returns True if a lock is set on
-- the region in a_lock. a_lock is overwritten with that lock.
set_lock_failed: BOOLEAN
-- Did set_lock obtain a lock?
attempt_lock (a_lock: POSIX_LOCK)
-- Attempt to set lock, if not possible, set
-- set_lock_failed.
set_lock (a_lock: POSIX_LOCK)
-- Attempt to set lock, wait if necessary.
feature(s) from POSIX_FILE_DESCRIPTOR
-- Access
file_descriptor_flags: INTEGER
-- All file descriptor bits associated with this handle.
terminal: POSIX_TERMIOS
-- Terminal settings.
ttyname: STRING
-- Terminal path name, or empty if this file descriptor does
-- not refer to a terminal
invariant
accessing_real_singleton: security_is_real_singleton;
valid_error_action: error_action >= 0 and error_action <= 2;
open_in_sync: is_open_read or is_open_write implies is_open; -- The reverse is not
true, for examples sockets can be
-- closed for reading/writing, but still open.
capacity_not_negative: capacity >= 0;
valid_capacity: is_open = (capacity > 0);
open_implies_handle_assigned: is_open = (fd /= unassigned_value);
owned_implies_open: is_owner implies is_open;
owned_implies_handle_assigned: is_owner implies fd /= unassigned_value;
line_buffer_index_offset_ok: line_buffer /= Void implies line_buffer_index <= line_buffer.count;
valid_status: not is_open implies my_status = Void;
end of POSIX_FILE_DESCRIPTOR

```

## C.11 Short form of POSIX\_FILE\_SYSTEM

```

class interface POSIX_FILE_SYSTEM
feature(s) from STDC_SECURITY_ACCESSOR
  -- The singleton, available to any because its used in preconditions
  security: STDC_SECURITY
  -- Singleton entry point for security.
feature(s) from STDC_BASE
  -- Access
  errno: STDC_ERRNO
  -- Access to the variable that contains the error that occurred.
feature(s) from STDC_BASE
  -- Status
  raise_exception_on_error: BOOLEAN
  -- Should an exception be raised when an error occurs?
  -- If not, you have to check errno for any errors.
feature(s) from STDC_BASE
  -- Change
  set_default_action_on_error
  -- Use security.error_handling.exceptions_enabled to
  -- determine if an exception should be raised when a C call
  -- returns an error.
  set_raise_exception_on_error
  -- Always raise an exception when a C call returns an error.
  set_continue_on_error
  -- Never raise an exception when a C call returns an error.
  inherit_error_handling (an_instance: STDC_BASE)
  -- Handle errors like an_instance
feature(s) from STDC_FILE_SYSTEM
  -- Path names
  expand_path (a_path: STRING): STDC_PATH
  -- returns a new path
feature(s) from STDC_FILE_SYSTEM
  -- Rename files/directories, remove files/directories
  remove_file (a_path: STRING)
  -- calls unlink when a_path is a file, or rmdir when
  -- a_path is a directory.
  -- error when file could not be removed (and it exists)
  rename_to (current_path, new_path: STRING)
  -- Rename a file or a directory.
  -- new_path should not be an existing path.
feature(s) from STDC_FILE_SYSTEM
  -- Accessibility of files
  is_modifiable (a_path: STRING): BOOLEAN
  -- tests if file is readable and writable by this program
  -- uses real user ID and real group ID instead of effective ones
  is_readable (a_path: STRING): BOOLEAN
  -- Tests if a_path is readable by this program. a_path
  -- can be a file or a directory.

```

```

    -- Uses real user ID and real group ID instead of effective
    -- ones.
feature(s) from STDC_FILE_SYSTEM
    -- File and string
    write_string_to_file (s, a_file_name: STRING)
        -- Write s to file a_file_name.
feature(s) from ABSTRACT_FILE_SYSTEM
    -- Directory access
    change_directory (a_directory: STRING)
        -- Changes the current working directory.
    current_directory: STRING
        -- The current directory
    make_directory (a_directory: STRING)
        -- Makes a directory, only accessible by owner.
    mkdir (a_directory: STRING)
        -- Makes a directory, only accessible by owner.
    make_directories (a_path: STRING)
        -- Makes a directory, only accessible by owner.
    remove_directory (a_directory: STRING)
        -- Removes an empty directory, does not fail if directory
        -- does not exist
    rmdir (a_directory: STRING)
        -- Removes an empty directory, does not fail if directory
        -- does not exist
    force_remove_directory (a_directory: STRING)
        -- Removes a directory, even when not empty.
        -- I suggest you do not have hard or symbolic links in a_directory...
feature(s) from ABSTRACT_FILE_SYSTEM
    -- File statistics
    status (a_path: STRING): POSIX_STATUS_PATH
        -- Gets information about a file
    status_may_fail (a_path: STRING): ABSTRACT_STATUS_PATH
        -- Retrieve status information for a_path. a_path may or
        -- may not exist. Check Result.found to see if statistics
        -- were retrieved.
feature(s) from ABSTRACT_FILE_SYSTEM
    -- Directory browsing
    browse_directory (a_path: STRING): POSIX_DIRECTORY
        -- Get information about a directory.
    find_program_in_path (a_filename: STRING; a_paths: ARRAY[STRING]): STRING
        -- Look for a_filename in a_paths, check if it is a
        -- binary and return the full path to a_filename when
        -- found. Return Void if not found.
feature(s) from ABSTRACT_FILE_SYSTEM
    -- Accessibility of files
    last_access_result: INTEGER
        -- value of last access test
    is_accessible (a_path: STRING; a_mode: INTEGER): BOOLEAN
        -- Is a_path accessibility using a_mode?

```

```

access (a_path: STRING; a_mode: INTEGER): BOOLEAN
  -- Is a_path accessibility using a_mode?
is_directory (a_path: STRING): BOOLEAN
  -- Does a_path exists and is it a directory?
is_existing (a_path: STRING): BOOLEAN
  -- Is a_path an existing file, directory, whatever?
  -- Tests if file does exist, not if it is readable or writable by
  -- this program!
  -- Uses real user ID and real group ID instead of effective ones.
is_empty (a_path: STRING): BOOLEAN
  -- True if file exists and has a size equal to zero.
is_executable (a_path: STRING): BOOLEAN
  -- tests if file is executable by this program
is_regular_file (a_path: STRING): BOOLEAN
  -- Does a_path exists and is it a regular file?
is_writable (a_path: STRING): BOOLEAN
  -- tests if file is writable by this program
  -- uses real user ID and real group ID instead of effective ones
feature(s) from ABSTRACT_FILE_SYSTEM
  -- File system properties
  is_case_sensitive: BOOLEAN
    -- is file system case sensitive or not?
  path_separator: CHARACTER
    -- What is the path separator?
feature(s) from ABSTRACT_FILE_SYSTEM
  -- File and string
  file_content_as_string (a_file_name: STRING): STRING
    -- Contents of a_file_name as a STRING
  string_to_file (s, a_file_name: STRING)
    -- Create or overwrite a file a_file_name and make its
    -- contents s.
feature(s) from ABSTRACT_FILE_SYSTEM
  -- Path names
  resolved_path_name (a_path: STRING): STRING
    -- Absolute pathname derived from a_path that names the
    -- same file, whose resolution does not involve ".", "..", or
    -- symbolic links
  temporary_directory: STRING
    -- the temporary directory
feature(s) from POSIX_FILE_SYSTEM
  -- Read/write permissions
  chmod (a_path: STRING; a_mode: INTEGER)
    -- Changes file mode for a_path to a_mode.
  change_mode (a_path: STRING; a_mode: INTEGER)
    -- Changes file mode for a_path to a_mode.
  permissions (a_path: STRING): POSIX_PERMISSIONS
    -- The permissions object (a new one every time!) for the
    -- given file
  set_read_only (a_path: STRING)

```

```
-- Make given file read_only.  
set_writable (a_path: STRING)  
-- Make given a_path read_only.  
feature(s) from POSIX_FILE_SYSTEM  
-- File times  
touch (a_path: STRING)  
-- Sets the modification and access times of a_path to the  
-- current time of day.  
-- File is created if it does not exist.  
utime (a_path: STRING; access_time, modification_time: POSIX_TIME)  
-- Sets file access and modification times.  
feature(s) from POSIX_FILE_SYSTEM  
-- Further directory access  
link (existing, new: STRING)  
-- Create a hard link to a file.  
unlink (a_path: STRING)  
-- Remove a directory entry, should be a file, not a directory.  
-- Its not an error if path does not exist, but all other  
-- errors are reported.  
feature(s) from POSIX_FILE_SYSTEM  
-- FIFOs  
create_fifo (a_path: STRING; a_mode: INTEGER)  
-- Create a FIFO special file.  
mkfifo (a_path: STRING; a_mode: INTEGER)  
-- Create a FIFO special file.  
feature(s) from POSIX_FILE_SYSTEM  
-- Shared memory  
unlink_shared_memory_object (name: STRING)  
-- Remove a shared memory object.  
invariant  
accessing_real_singleton: security_is_real_singleton;  
valid_error_action: error_action >= 0 and error_action <= 2;  
end of POSIX_FILE_SYSTEM
```

## C.12 Short form of `POSIX_FORK_ROOT`

```

deferred class interface POSIX_FORK_ROOT
feature(s) from STDC_CHILD_PROCESS
  -- Termination info
  has_exit_code: BOOLEAN
    -- Does exit_code return a valid value?
  is_terminated: BOOLEAN
    -- Is child not running any more?
  exit_code: INTEGER
    -- Low-order 8 bits of call to _exit or exit for this process
feature(s) from ABSTRACT_CHILD_PROCESS
  -- Access
  child_pid: INTEGER
    -- The process identifier
feature(s) from ABSTRACT_CHILD_PROCESS
  -- Status
  is_child_pid_valid: BOOLEAN
    -- Is pid valid?
feature(s) from ABSTRACT_CHILD_PROCESS
  -- Signal
  terminate_child
    -- Attempt to gracefully terminate the process.
feature(s) from ABSTRACT_CHILD_PROCESS
  -- Actions that parent may execute
  wait_for (suspend: BOOLEAN)
    -- Wait for this process to terminate. If suspend then we
    -- wait until the information about this process is available,
    -- else we return immediately.
    -- If suspend is False, check the running property to see
    -- if this child is really terminated.
feature(s) from ARGUMENTS
  command_name: STRING
feature(s) from CAPI_TIME
  -- Standard C binding
  current_time: INTEGER
    -- The current calendar time in seconds since the epoch
feature(s) from STDC_CURRENT_PROCESS
  -- Process standard input/output/error
  stdin: POSIX_TEXT_FILE
  stdout: POSIX_TEXT_FILE
  stderr: POSIX_TEXT_FILE
feature(s) from STDC_CURRENT_PROCESS
  -- Various
  clock: INTEGER
    -- Approximation of processor time used by the program, or -1
    -- if unknown
feature(s) from STDC_CURRENT_PROCESS
  -- Random numbers

```

```

random: INTEGER
  -- Returns a pseudo-random integer between 0 and RAND_MAX.
set_random_seed (a_seed: INTEGER)
  -- Sets a_seed as the seed for a new sequence of
  -- pseudo-random integers to be returned by random. These
  -- sequences are repeatable by calling set_random_seed with
  -- the same seed value. If no seed value is provided, the
  -- random function is automatically seeded with a value of
  -- 1.
feature(s) from STDC_CURRENT_PROCESS
  -- Global locale
locale: STRING
  -- Current locale
numeric_format: STDC_LOCALE_NUMERIC
  -- Various information for formatting numbers and monetary
  -- quantities
set_locale (category: INTEGER; new_locale: STRING)
  -- Set given locale to new_locale. new_locale is either a
  -- well-known constant like "C" or "da_DK" or an opaque
  -- string that was returned by another call of setlocale.
set_c_locale
  -- Set locale to the Standard C locale (the default).
set_native_decimal_point
  -- Set the decimal point character using the LC_NUMERIC
  -- environment variable.
set_native_locale
  -- Set entire locale to the natives setting which is
  -- determined by environment variables like LC_NUMERIC,
  -- LC_COLLATE, LC_CTYPE etc.
set_native_time
  -- Set time display to the natives setting using the LC_TIME
  -- environment variable.
feature(s) from ABSTRACT_CURRENT_PROCESS
  -- Access
effective_user_name: STRING
  -- Name of the user currently associated with the current
  -- thread;
  -- Name will not be Void, but can be empty if no name found
  -- (you can screw up your /etc/passwd on Unix...)
full_command_name: STRING
  -- command_name with fully qualified path;
  -- An empty string is returned in case command_name is
  -- empty. As any program can setup the arguments passed to
  -- another program, an empty command_name is a possibility.
pid: INTEGER
  -- Process identifier, unique for this process
feature(s) from ABSTRACT_CURRENT_PROCESS
  -- Every process also has standard file descriptors which might not be compatible with
  stdin/stdout/stderr (Windows)

```

```

    fd_stdin: POSIX_FILE_DESCRIPTOR
    fd_stdout: POSIX_FILE_DESCRIPTOR
    fd_stderr: POSIX_FILE_DESCRIPTOR
feature(s) from ABSTRACT_CURRENT_PROCESS
    -- Sleeping
    millisleep (a_milliseconds: INTEGER)
        -- Sleep for a_milliseconds milliseconds. Due to timer
        -- resolution issues, the minimum resolution might be in the
        -- order of 10ms or higher.
    sleep (seconds: INTEGER)
        -- Delays process execution up to seconds. Can return early
        -- if interrupted. Check unslect_seconds
    unslept_seconds: INTEGER
        -- The number of seconds still to sleep, before being
        -- interrupted; it is set by sleep. If it is zero, no
        -- interrupt occurred and process slept for the allotted
        -- time.
feature(s) from STDC_SECURITY_ACCESSOR
    -- The singleton, available to any because its used in preconditions
    security: STDC_SECURITY
        -- Singleton entry point for security.
feature(s) from STDC_BASE
    -- Access
    errno: STDC_ERRNO
        -- Access to the variable that contains the error that occurred.
feature(s) from STDC_BASE
    -- Status
    raise_exception_on_error: BOOLEAN
        -- Should an exception be raised when an error occurs?
        -- If not, you have to check errno for any errors.
feature(s) from STDC_BASE
    -- Change
    set_default_action_on_error
        -- Use security.error_handling.exceptions_enabled to
        -- determine if an exception should be raised when a C call
        -- returns an error.
    set_raise_exception_on_error
        -- Always raise an exception when a C call returns an error.
    set_continue_on_error
        -- Never raise an exception when a C call returns an error.
    inherit_error_handling (an_instance: STDC_BASE)
        -- Handle errors like an_instance
feature(s) from EPX_CURRENT_PROCESS
    -- Access (doesn't make a lot of sense if you're not inheriting)
    raw_environment_variables: ARRAY[STRING]
        -- The raw list of name=value pairs of environment
        -- variables passed to this process;
        -- A new list is created every time this feature is accessed.
feature(s) from POSIX_CHILD_PROCESS

```

```

-- Signal
kill_child (a_signal_code: INTEGER)
-- Send signal signal_code to the process.
feature(s) from POSIX_CURRENT_PROCESS
-- signal this process
kill (a_signal_code: INTEGER)
-- Send signal signal_code to current process.
feature(s) from POSIX_CURRENT_PROCESS
-- POSIX locale specifics
set_native_messages
-- Select native language as the language in which messages
-- are displayed.
feature(s) from PAPI_WAIT
-- C binding functions
posix_wait (statloc: POINTER): INTEGER
-- Waits for process termination
posix_waitpid (a_pid: INTEGER; statloc: POINTER; options: INTEGER): INTEGER
-- Waits for process termination
feature(s) from PAPI_WAIT
-- C binding statloc evaluation
posix_wexitstatus (a_value: INTEGER): INTEGER
-- Evaluates to the low-order eight bits of the status
-- argument that the child passed to exit, or the value the
-- child process returned from main.
posix_wifexited (a_value: INTEGER): BOOLEAN
-- Evaluates to a non-zero value if status was returned for
-- a child that terminated normally
posix_wifsignaled (a_value: INTEGER): BOOLEAN
-- Evaluates to a non-zero value if status was returned for
-- a child that terminated due to the receipt of a signal
-- that was not caught
posix_wifstopped (a_value: INTEGER): BOOLEAN
posix_wstopsig (a_value: INTEGER): BOOLEAN
posix_wtermsig (a_value: INTEGER): INTEGER
feature(s) from PAPI_WAIT
-- waitpid constants
wnohang: INTEGER
-- do not suspend execution
wuntraced: INTEGER
-- report status of childs that are stopped and whose status has not
-- yet been reported since they stopped
feature(s) from POSIX_FORK_ROOT
-- termination info
is_terminated_normally: BOOLEAN
-- Has this process been terminated normally?
is_exited: BOOLEAN
-- Has this process been terminated normally?
is_signalled: BOOLEAN
-- Was child process terminated due to receipt of a signal

```

```
-- that was not caught?  
signal_code: INTEGER  
-- Signal which caused the process to terminate  
invariant  
--2007-12-13: invariant failure in some cases, root cause not determined yet  
--pid_known_is_not_terminated: is_pid_valid = not is_terminated  
accessing_real_singleton: security_is_real_singleton;  
valid_error_action: error_action >= 0 and error_action <= 2;  
end of deferred POSIX_FORK_ROOT
```

### C.13 Short form of POSIX\_GROUP

```
class interface POSIX_GROUP
creation
  make_from_name (a_name: STRING)
  make_from_gid (a_gid: INTEGER)
feature(s) from POSIX_GROUP
  -- Initialization
  make_from_name (a_name: STRING)
  make_from_gid (a_gid: INTEGER)
feature(s) from POSIX_GROUP
  -- Commands
  refresh
  -- Refresh cache with latest info from user database.
feature(s) from POSIX_GROUP
  -- Status
  is_member (a_name: STRING): BOOLEAN
  -- Is user a_name a member of this group?
  -- Only checks secondary membership, so will return false if
  -- this group is the users primary group
feature(s) from POSIX_GROUP
  -- Access
  name: STRING
  -- Group name
  gid: INTEGER
  -- ID number
invariant
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
  valid_group: group /= default_pointer;
end of POSIX_GROUP
```

## C.14 Short form of `POSIX_LOCK`

```

class interface POSIX_LOCK
creation
  make
feature(s) from POSIX_LOCK
  -- creation
  make
feature(s) from POSIX_LOCK
  -- members
  allow_read: BOOLEAN
    -- This is a read lock
  allow_all: BOOLEAN
    -- No lock or used to remove a lock
  allow_none: BOOLEAN
    -- This is a write lock
  start: INTEGER
  length: INTEGER
  pid: INTEGER
feature(s) from POSIX_LOCK
  -- settable members
  set_allow_read
    -- this is a read or shared lock
  set_allow_all
    -- to remove a lock
  set_allow_none
    -- this is a write or exclusive lock
  set_seek_start
    -- start is measured from the beginning of the file
  set_seek_current
    -- start is measured from the current position
  set_seek_end
    -- start is measured from the end of the file
  set_start (a_start: INTEGER)
    -- set relative offset in bytes
  set_length (a_length: INTEGER)
    -- number of bytes to lock
invariant
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
  valid_buf: buf /= Void;
  lock_type_known: allow_all or else allow_none or else allow_read;
end of POSIX_LOCK

```

## C.15 Short form of POSIX\_MEMORY\_MAP

**class** *interface* POSIX\_MEMORY\_MAP

**creation**

*make* (*a\_fd*: POSIX\_FILE\_DESCRIPTOR; *a\_offset*, *a\_size*: INTEGER; *a\_base*: POINTER; *a\_prot*, *a\_flags*: INTEGER)

-- Raw interface to mmap.  
 -- This function can fail on certain system (Linux for  
 -- example) if *a\_offset* is not a multiple of PAGE\_SIZE.

*make\_private* (*a\_fd*: POSIX\_FILE\_DESCRIPTOR; *a\_offset*, *a\_size*: INTEGER)

-- Make the given file descriptor. *a\_fd* should have been opened  
 -- with read/write access.  
 -- This is a mapping where changes are private.  
 -- *a\_offset* denotes the offset from *a\_fd*.

-- This function can fail on certain system (Linux for  
 -- example) if *a\_offset* is not a multiple of PAGE\_SIZE.

*make\_shared* (*a\_fd*: POSIX\_FILE\_DESCRIPTOR; *a\_offset*, *a\_size*: INTEGER)

-- Make the given file descriptor. *a\_fd* should have been opened  
 -- with read/write access.  
 -- This is a mapping where changes are shared, i.e. the  
 -- *a\_offset* denotes the offset from *a\_fd*.  
 -- underlying object is also changed.

-- This function can fail on certain system (Linux for  
 -- example) if *a\_offset* is not a multiple of PAGE\_SIZE.

**feature(s) from** POSIX\_MEMORY\_MAP

-- Initialization

*make* (*a\_fd*: POSIX\_FILE\_DESCRIPTOR; *a\_offset*, *a\_size*: INTEGER; *a\_base*: POINTER; *a\_prot*, *a\_flags*: INTEGER)

-- Raw interface to mmap.  
 -- This function can fail on certain system (Linux for  
 -- example) if *a\_offset* is not a multiple of PAGE\_SIZE.

*make\_private* (*a\_fd*: POSIX\_FILE\_DESCRIPTOR; *a\_offset*, *a\_size*: INTEGER)

-- Make the given file descriptor. *a\_fd* should have been opened  
 -- with read/write access.  
 -- This is a mapping where changes are private.  
 -- *a\_offset* denotes the offset from *a\_fd*.

-- This function can fail on certain system (Linux for  
 -- example) if *a\_offset* is not a multiple of PAGE\_SIZE.

*make\_shared* (*a\_fd*: POSIX\_FILE\_DESCRIPTOR; *a\_offset*, *a\_size*: INTEGER)

-- Make the given file descriptor. *a\_fd* should have been opened  
 -- with read/write access.  
 -- This is a mapping where changes are shared, i.e. the  
 -- *a\_offset* denotes the offset from *a\_fd*.  
 -- underlying object is also changed.

-- This function can fail on certain system (Linux for  
 -- example) if *a\_offset* is not a multiple of PAGE\_SIZE.

**feature(s) from** POSIX\_MEMORY\_MAP

-- Unmap

*close*

```

-- Remove the mapping.
feature(s) from POSIX_MEMORY_MAP
-- Access
fd: POSIX_FILE_DESCRIPTOR
-- The file that is mapped.
offset: INTEGER
-- Offset in fd where mapping begins.
invariant
accessing_real_singleton: security_is_real_singleton;
valid_error_action: error_action >= 0 and error_action <= 2;
capacity_not_negative: capacity >= 0;
valid_capacity: is_allocated = (capacity > 0);
open_implies_handle_assigned: is_allocated = (ptr /= unassigned_value);
owned_implies_open: is_owner implies is_allocated;
owned_implies_handle_assigned: is_owner implies ptr /= unassigned_value;
size_positive: is_open implies capacity > 0;
ptr_valid: is_open implies ptr /= default_pointer and not is_open implies ptr =
default_pointer;
offset_not_negative: offset >= 0;
have_file_descriptor: fd /= Void;
file_descriptor_open: fd.is_open;
end of POSIX_MEMORY_MAP

```

## C.16 Short form of POSIX\_PERMISSIONS

```
deferred class interface POSIX_PERMISSIONS
feature(s) from POSIX_PERMISSIONS
  apply
    -- make permissions changes (if any) permanent
  refresh
    -- synchronize with permission changes possibly made on disk
feature(s) from POSIX_PERMISSIONS
  -- query mode
  allow_anyone_execute: BOOLEAN
    -- anyone allowed to execute the file?
  allow_anyone_read: BOOLEAN
    -- anyone allowed to read the file?
  allow_anyone_read_write: BOOLEAN
    -- anyone allowed to read and write the file?
  allow_anyone_write: BOOLEAN
    -- anyone allowed to write the file?
  allow_group_execute: BOOLEAN
    -- process with a group ID that matches the files group
    -- allowed to execute the file?
  allow_group_read: BOOLEAN
    -- process with a group ID that matches the files group
    -- allowed to read the file?
  allow_group_read_write: BOOLEAN
    -- process with a group ID that matches the files group
    -- allowed to read the file?
  allow_group_write: BOOLEAN
    -- process with a group ID that matches the files group
    -- allowed to write the file?
  allow_owner_execute: BOOLEAN
    -- owner allowed to execute the file
  allow_read: BOOLEAN
  allow_owner_read: BOOLEAN
  allow_read_write: BOOLEAN
  allow_owner_read_write: BOOLEAN
  allow_write: BOOLEAN
  allow_owner_write: BOOLEAN
  is_set_group_id: BOOLEAN
    -- group ID set on execution?
  is_set_gid: BOOLEAN
    -- group ID set on execution?
  is_set_user_id: BOOLEAN
    -- user ID set on execution?
  is_set_uid: BOOLEAN
    -- user ID set on execution?
feature(s) from POSIX_PERMISSIONS
  -- set permissions
  set_allow_anyone_execute (allow: BOOLEAN)
```

```

-- give anyone execute permission
set_allow_anyone_read (allow: BOOLEAN)
-- give anyone read permission
set_allow_anyone_read_write (allow: BOOLEAN)
-- give anyone read and write permissions
set_allow_anyone_write (allow: BOOLEAN)
-- give anyone write permission
set_allow_group_execute (allow: BOOLEAN)
-- give group execute permission
set_allow_group_read (allow: BOOLEAN)
-- give group read permission
set_allow_group_read_write (allow: BOOLEAN)
-- give group read and write permission
set_allow_group_write (allow: BOOLEAN)
-- give group write permission
set_allow_owner_execute (allow: BOOLEAN)
-- give owner execute permission
set_allow_read (allow: BOOLEAN)
-- give read permission
set_allow_owner_read (allow: BOOLEAN)
-- give read permission
set_allow_read_write (allow: BOOLEAN)
-- give read/write permission
set_allow_write (allow: BOOLEAN)
-- give write permission
set_allow_owner_write (allow: BOOLEAN)
-- give write permission
feature(s) from POSIX_PERMISSIONS
-- direct access to Unix fields
uid: INTEGER
-- id of object owner, always 0 on NT
owner_id: INTEGER
-- id of object owner, always 0 on NT
gid: INTEGER
-- id of group, always 0 on NT
group_id: INTEGER
-- id of group, always 0 on NT
mode: INTEGER
-- the bit coded Unix mode field
feature(s) from POSIX_PERMISSIONS
-- set owner and group
set_owner_id (a_owner_id: INTEGER)
-- change the owner
set_group_id (a_group_id: INTEGER)
-- change the group
invariant
accessing_real_singleton: security_is_real_singleton;
valid_error_action: error_action >= 0 and error_action <= 2;
end of deferred POSIX_PERMISSIONS

```

## C.17 Short form of *POSIX\_PIPE*

```
class interface POSIX_PIPE
creation
  make
    -- Create pipe.
feature(s) from POSIX_PIPE
  -- the pipe
  fdin: POSIX_FILE_DESCRIPTOR
    -- Incoming end of pipe
  fdout: POSIX_FILE_DESCRIPTOR
    -- Outgoing end of pipe
invariant
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
  valid_pipe: fdin /= Void and fdout /= Void;
end of POSIX_PIPE
```

## C.18 Short form of `POSIX_SEMAPHORE`

**deferred class** *interface* `POSIX_SEMAPHORE`

**invariant**

*accessing\_real\_singleton*: *security\_is\_real\_singleton*;

*valid\_error\_action*: *error\_action*  $\geq 0$  **and** *error\_action*  $\leq 2$ ;

*capacity\_not\_negative*: *capacity*  $\geq 0$ ;

*valid\_capacity*: *is\_open* = (*capacity*  $> 0$ );

*open\_implies\_handle\_assigned*: *is\_open* = (*handle*  $\neq$  *unassigned\_value*);

*owned\_implies\_open*: *is\_owner* **implies** *is\_open*;

*owned\_implies\_handle\_assigned*: *is\_owner* **implies** *handle*  $\neq$  *unassigned\_value*;

**end of deferred** `POSIX_SEMAPHORE`

## C.19 Short form of POSIX\_SIGNAL

```

class interface POSIX_SIGNAL
creation
  make (a_value: INTEGER)
feature(s) from POSIX_SIGNAL
  -- Initialization
  make (a_value: INTEGER)
feature(s) from POSIX_SIGNAL
  -- Set signal properties, make effective with apply
  apply
    -- Make changes effective.
  set_child_stop (stop: BOOLEAN)
    -- Generate SIGCHLD when children stop.
  set_default_action
    -- Install signal-specific default action when apply is called.
  set_ignore_action
    -- Ignore signal when apply is called..
  set_handler (a_handler: STDC_SIGNAL_HANDLER)
    -- Install ones own signal handler when apply is called.
  set_mask (a_mask: POSIX_SIGNAL_SET)
feature(s) from POSIX_SIGNAL
  -- signal functions
  raise_in (a_pid: INTEGER)
    -- Raise the signal in the given process.
feature(s) from POSIX_SIGNAL
  -- Signal state
  child_stop: BOOLEAN
    -- generate SIGCHLD when children stop
  handler: POINTER
    -- pointer to function which catches this signal
  is_defaulted: BOOLEAN
    -- signal is handled by its specific default action
  is_ignored: BOOLEAN
    -- signal is ignored
  is_ignorable: BOOLEAN
    -- True if this signal is ignorable, either it is so by
    -- default or it may be set so.
  mask: POSIX_SIGNAL_SET
  refresh
    -- get latest state for this signal
invariant
  --accessing_real_singleton: signal_switch_is_real_singleton
  -- Gives crash with ISE Eiffel
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
  valid_signal_value: value >= 1;
  has_memory: sigaction /= Void;
end of POSIX_SIGNAL

```

## C.20 Short form of `POSIX_SIGNAL_SET`

```

class interface POSIX_SIGNAL_SET
creation
  make_empty
    -- make an initially empty signal set
  make_full
    -- make a set where all signals are enabled
  make_pending
    -- this signal set will be the set of signals that are blocked
    -- and pending
feature(s) from POSIX_SIGNAL_SET
  -- creation, make a set
  make_empty
    -- make an initially empty signal set
  make_full
    -- make a set where all signals are enabled
  make_pending
    -- this signal set will be the set of signals that are blocked
    -- and pending
feature(s) from POSIX_SIGNAL_SET
  -- change a set
  extend (signo: INTEGER)
    -- add signal to set
  put (signo: INTEGER)
    -- add signal to set
  prune (signo: INTEGER)
    -- remove the signal from the set
  wipe_out
    -- remove all items
feature(s) from POSIX_SIGNAL_SET
  -- commands to do something with set
  add_to_blocked_signals
    -- Add the signals to the set of blocked signals
  remove_from_blocked_signals
    -- Remove the signals from the set of blocked signals
  set_blocked_signals
    -- Set the set of blocked signals to this set
  suspend
    -- Suspend process, until delivery of a signal whose action
    -- is either to execute a signal-catching function or to
    -- terminate the process
feature(s) from POSIX_SIGNAL_SET
  -- queries
  has (signo: INTEGER): BOOLEAN
    -- is signal signo in the set
invariant
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;

```

```
    have_set: set /= Void;  
end of POSIX_SIGNAL_SET
```

## C.21 Short form of `POSIX_STATUS`

```
deferred class interface POSIX_STATUS
feature(s) from POSIX_STATUS
  -- stat members
  is_block_special: BOOLEAN
    -- True if block-special file
  ino: INTEGER
  inode: INTEGER
  permissions: POSIX_PERMISSIONS
    -- file permissions
  ensure
    valid_result: Result /= Void
feature(s) from POSIX_STATUS
  -- direct access to the unix fields, not recommended
  unix_gid: INTEGER
  unix_wid: INTEGER
invariant
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
  stat_not_void: stat /= Void and then stat.capacity >= abstract_stat_size;
end of deferred POSIX_STATUS
```

## C.22 Short form of `POSIX_SYSTEM`

```
class interface POSIX_SYSTEM
feature(s) from POSIX_SYSTEM
  -- Sysconf queries, run-time determined
  child_max: INTEGER
    -- The number of simultaneous processes per real user ID.
  clock_ticks: INTEGER
    -- The number of clock ticks per second.
  has_job_control: BOOLEAN
    -- Job control functions are supported.
  has_saved_ids: BOOLEAN
    -- Each process has a saved set-user-ID and a saved set-group-ID.
  ngroups_max: INTEGER
    -- The number of simultaneous supplementary group IDs.
  page_size: INTEGER
    -- granularity in bytes of memory mapping and process memory locking.
  posix_version: INTEGER
    -- Indicates the 4-digit year and 2-digit month that the
    -- standard was approved.
feature(s) from POSIX_SYSTEM
  -- Compile-time determined queries
  supports_asynchronous_io: BOOLEAN
    -- True if the message passing API is supported.
  supports_file_synchronization: BOOLEAN
    -- True if file synchronization is supported.
  supports_memory_mapped_files: BOOLEAN
    -- True if memory mapped files are supported.
  supports_memory_locking: BOOLEAN
    -- True if memory locking is supported.
  supports_memlock_range: BOOLEAN
    -- True if memory range locking is supported.
  supports_memory_protection: BOOLEAN
    -- True if memory protection is supported.
  supports_message_passing: BOOLEAN
    -- True if the message passing API is supported.
  supports_priority_scheduling: BOOLEAN
    -- True if priority scheduling is supported.
  supports_semaphores: BOOLEAN
    -- True if semaphores are supported.
  supports_shared_memory_objects: BOOLEAN
    -- True if shared memory objects are supported.
  supports_synchronized_io: BOOLEAN
    -- True if synchronized io is supported.
  supports_timers: BOOLEAN
    -- True if timers are supported.
  supports_threads: BOOLEAN
    -- True if thread are supported.
invariant
```

```
accessing_real_singleton: security_is_real_singleton;  
valid_error_action: error_action >= 0 and error_action <= 2;  
end of POSIX_SYSTEM
```

## C.23 Short form of POSIX\_TERMIOS

```

class interface POSIX_TERMIOS
creation
    make (a_fd: POSIX_FILE_DESCRIPTOR)
feature(s) from POSIX_TERMIOS
    -- Access, raw individual fields
    iflag: INTEGER
        -- Input mode flags
    oflag: INTEGER
        -- output mode flags
    cflag: INTEGER
        -- control mode flags
    lflag: INTEGER
        -- local mode flags
feature(s) from POSIX_TERMIOS
    -- More friendly settings
    is_input_echoed: BOOLEAN
        -- are input characters echoed back to the terminal?
    is_receiving: BOOLEAN
        -- If false, no characters are received
    set_echo_input (enable: BOOLEAN)
    set_echo_new_line (enable: BOOLEAN)
    set_input_control (enable: BOOLEAN)
        -- enable start/stop input control
    set_receive (enable: BOOLEAN)
feature(s) from POSIX_TERMIOS
    -- line control functions
    flush_input
        -- Discards all data that has been received but not read.
    drain
        -- Wait for all output to be transmitted to the terminal.
    send_break
        -- sends a break to the terminal
feature(s) from POSIX_TERMIOS
    -- Get/set baudrates as symbols
    input_speed: INTEGER
        -- The terminal input baud rate as symbolic value.
    output_speed: INTEGER
        -- The terminal output baud rate as symbolic value.
    set_input_speed (new_rate: INTEGER)
        -- Set terminal input baud rate, new_rate is one of the
        -- BXXXX constants
    set_output_speed (new_rate: INTEGER)
        -- Set terminal output baud rate, new_rate is one of the
        -- BXXXX constants
feature(s) from POSIX_TERMIOS
    -- symbol to baud rate conversions
    speed_to_baud_rate (symbol: INTEGER): INTEGER

```

```
-- Given a baud rate symbol, the real baud rate is returned.
feature(s) from POSIX_TERMIOS
-- Apply/refresh state
apply_now
-- Change occurs immediately.
apply_drain
-- Change occurs after all output written to fd has been
-- transmitted. This function should be used when changing
-- parameters that affect output.
apply_flush
-- Change occurs after all output written to fd has been
-- transmitted. All input that has been received but not
-- read, is discarded before the change is made.
refresh
-- Get terminal settings currently in effect.
feature(s) from POSIX_TERMIOS
-- Access
fd: POSIX_FILE_DESCRIPTOR
-- The file descriptor for these terminal settings.
invariant
accessing_real_singleton: security_is_real_singleton;
valid_error_action: error_action >= 0 and error_action <= 2;
valid_attr: attr /= Void and then attr.capacity = posix_termios_size;
valid_fd: fd /= Void;
end of POSIX_TERMIOS
```

## C.24 Short form of `POSIX_TIMED_COMMAND`

```
deferred class interface POSIX_TIMED_COMMAND
feature(s) from POSIX_TIMED_COMMAND
  -- Initialization
  make (a_seconds: INTEGER)
feature(s) from POSIX_TIMED_COMMAND
  -- Execution
  execute: BOOLEAN
  -- Did do_execute complete its task within seconds seconds?
feature(s) from POSIX_TIMED_COMMAND
  -- Access
  is_signal_alarm_handled: BOOLEAN
  -- Does the signal SIGNAL_ALARM cause an Eiffel exception?
feature(s) from POSIX_TIMED_COMMAND
  -- State
  remaining_seconds: INTEGER
  -- number of seconds left in previous request
  seconds: INTEGER
  -- the number of seconds available to execute the command
  set_seconds (a_seconds: INTEGER)
invariant
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
  valid_seconds: seconds >= 1 and seconds <= 65535;
end of deferred POSIX_TIMED_COMMAND
```

## C.25 Short form of *POSIX\_USER*

```
class interface POSIX_USER
creation
  make_from_name (a_name: STRING)
  make_from_uid (a_uid: INTEGER)
feature(s) from POSIX_USER
  -- creation
  make_from_name (a_name: STRING)
  make_from_uid (a_uid: INTEGER)
feature(s) from POSIX_USER
  -- Base commands
  refresh
  -- Refresh cache with latest info from user database.
feature(s) from POSIX_USER
  -- Access
  name: STRING
  -- login name
  uid: INTEGER
  -- ID number
  gid: INTEGER
  -- group ID number
  home_directory: STRING
  -- initial working directory
  shell: STRING
  -- initial user program
invariant
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
  valid_passwd: passwd /= default_pointer;
end of POSIX_USER
```

## C.26 Short form of *POSIX\_USER\_DATABASE*

```
class interface POSIX_USER_DATABASE
feature(s) from POSIX_USER_DATABASE
  -- Access
  is_existing_uid (uid: INTEGER): BOOLEAN
    -- Returns True if this uid exists in /etc/passwd
    -- (or through NIS or whatever mechanisms that might be in use)
  is_existing_login (login: STRING): BOOLEAN
    -- Returns True if this login exists in /etc/passwd
    -- (or through NIS or whatever mechanisms that might be in use)
invariant
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
end of POSIX_USER_DATABASE
```

---

In this chapter:

**D.1 Short form of `SUS_CONSTANTS`**  
**D.2 Short form of `SUS_ENV_VAR`**  
**D.3 Short form of `SUS_FILE_SYSTEM`**  
**D.4 Short form of `SUS_HOST`**  
**D.5 Short form of `SUS_SERVICE`**  
**D.6 Short form of `SUS_SOCKET_ADDRESS`**  
**D.7 Short form of `SUS_SYSLOG`**  
**D.8 Short form of `SUS_TCP_SOCKET`**

# D

## Short (flat) listing of Single Unix Specifica- tion classes

Classes in this appendix are based on the Single Unix Specification. They inherit from the POSIX classes. Inherited features are not shown.

### D.1 Short form of `SUS_CONSTANTS`

```
class interface SUS_CONSTANTS
feature(s) from SUS_CONSTANTS
  -- Syslog facility codes
  log_kern: INTEGER
    -- kernel messages
  log_user: INTEGER
    -- random user-level messages
  log_mail: INTEGER
    -- mail system
  log_daemon: INTEGER
    -- system daemons
  log_auth: INTEGER
    -- security/authorization messages
  log_lpr: INTEGER
    -- line printer subsystem
  log_news: INTEGER
    -- network news subsystem
  log_uucp: INTEGER
    -- UUCP subsystem
  log_cron: INTEGER
    -- clock daemon
  log_local0: INTEGER
    -- Reserved for local use
  log_local1: INTEGER
    -- Reserved for local use
  log_local2: INTEGER
    -- Reserved for local use
  log_local3: INTEGER
```

```
-- Reserved for local use
log_local4: INTEGER
-- Reserved for local use
log_local5: INTEGER
-- Reserved for local use
log_local6: INTEGER
-- Reserved for local use
log_local7: INTEGER
-- Reserved for local use
feature(s) from SUS_CONSTANTS
-- Syslog open options
log_pid: INTEGER
-- log the pid with each message
log_cons: INTEGER
-- log on the console if errors in sending
log_odelay: INTEGER
-- delay open until first syslog() (default)
log_ndelay: INTEGER
-- dont delay open
feature(s) from SUS_CONSTANTS
-- Syslog priorities
log_emerg: INTEGER
log_alert: INTEGER
log_crit: INTEGER
log_err: INTEGER
log_warning: INTEGER
log_notice: INTEGER
log_info: INTEGER
log_debug: INTEGER
feature(s) from SUS_CONSTANTS
-- Socket kinds
sock_dgram: INTEGER
-- Connectionless, unreliable datagrams of fixed maximum length.
sock_packet: INTEGER
-- Linux specific way of getting packets at the dev level.
-- For writing rarp and other similar things on the user
-- level.
sock_raw: INTEGER
-- Raw protocol interface.
sock_seqpacket: INTEGER
-- Sequenced, reliable, connection-based, datagrams of fixed
-- maximum length.
sock_stream: INTEGER
-- Sequenced, reliable, connection-based byte streams.
feature(s) from SUS_CONSTANTS
-- Protocol families
af_inet: INTEGER
-- Internet domain sockets for use with IPv4 addresses.
af_inet6: INTEGER
```

```

    -- Internet domain sockets for use with IPv6 addresses.
    af_unix: INTEGER
    -- UNIX domain sockets.
    af_unspec: INTEGER
    -- Unspecified.
feature(s) from SUS_CONSTANTS
    -- Shutdown options
    shut_rd: INTEGER
    -- No more receptions.
    shut_rdw: INTEGER
    -- No more receptions or transmissions.
    shut_wr: INTEGER
    -- No more transmissions.
feature(s) from SUS_CONSTANTS
    -- h_errno values
    try_again: INTEGER
    -- Non-Authoritative Host not found, or SERVERFAIL.
    no_recovery: INTEGER
    -- Non recoverable errors, FORMERR, REFUSED, NOTIMP.
    no_data: INTEGER
    -- Valid name, no data record of requested type.
    no_address: INTEGER
    -- No address, look for MX record. Equal to NO_DATA.
feature(s) from SUS_CONSTANTS
    -- Lengths of string forms of ip addresses
    inet_addrstlen: INTEGER
    -- Length of an IPv4 string.
    inet6_addrstlen: INTEGER
    -- Length of an IPv6 string.
feature(s) from SUS_CONSTANTS
    -- Other constants
    somaxconn: INTEGER
    -- Maximum backlog.
feature(s) from SUS_CONSTANTS
    -- Socket options level for getsockopt and setsockopt
    sol_socket: INTEGER
    ipproto_ip: INTEGER
    ipproto_ipv6: INTEGER
    ipproto_icmp: INTEGER
    ipproto_icmpv6: INTEGER
    ipproto_raw: INTEGER
    ipproto_tcp: INTEGER
    ipproto_udp: INTEGER
feature(s) from SUS_CONSTANTS
    -- SOL_SOCKET option names
    so_rcvbuf: INTEGER
    -- Receive buffer size;
    -- 0 if option not supported (only on BeOS).
    so_reuseaddr: INTEGER

```

```
-- Allow local address reuse
so_sndbuf: INTEGER
-- Send buffer size;
-- 0 if option not supported (only on BeOS).
feature(s) from SUS_CONSTANTS
-- IP type-of-service options
ip_tos: INTEGER
iptos_lowdelay: INTEGER
iptos_throughput: INTEGER
feature(s) from SUS_CONSTANTS
-- TCP options
tcp_nodelay: INTEGER
feature(s) from SUS_CONSTANTS
-- Special IPv4 addresses
inaddr_any: INTEGER
-- 0.0.0.0
inaddr_broadcast: INTEGER
-- 255.255.255.255
inaddr_loopback: INTEGER
-- 127.0.0.1
feature(s) from SUS_CONSTANTS
-- Available clocks (-1 if not available)
clock_realtime: INTEGER
clock_monotonic: INTEGER
clock_process_cputime_id: INTEGER
clock_thread_cputime_id: INTEGER
end of SUS_CONSTANTS
```

## D.2 Short form of *SUS\_ENV\_VAR*

```
class interface SUS_ENV_VAR
creation
  make (a_name: STRING)
feature(s) from SUS_ENV_VAR
  -- Commands
  set_value (a_new_value: STRING)
    -- Change environment value. Repeatedly creating a new
    -- SUS_ENV_VAR and calling set_value will lead to a memory
    -- leak.
invariant
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
end of SUS_ENV_VAR
```

### D.3 Short form of SUS\_FILE\_SYSTEM

```
class interface SUS_FILE_SYSTEM
feature(s) from SUS_FILE_SYSTEM
  -- File statistics
  status (a_path: STRING): SUS_STATUS_PATH
    -- Return information about path.
  symbolic_link_status (a_path: STRING): SUS_STATUS
    -- Return information about path, but if it is a symbolic
    -- link, about the symbolic link instead of the referenced path
feature(s) from SUS_FILE_SYSTEM
  -- Symbolic links
  create_symbolic_link (old_path, new_path: STRING)
    -- Creates a symbolic link
  symlink (old_path, new_path: STRING)
    -- Creates a symbolic link
feature(s) from SUS_FILE_SYSTEM
  -- File system properties
  resolved_path_name (a_path: STRING): STRING
    -- Derives from a_path an absolute pathname that names the
    -- same file, whose resolution does not involve ".", "..", or
    -- symbolic links.
invariant
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
end of SUS_FILE_SYSTEM
```

## D.4 Short form of SUS\_HOST

**class** *interface* SUS\_HOST

**creation**

*make\_from\_name* (*a\_name*: STRING)  
 -- Initialize host from *name*. If *name* is numerical, the  
 -- behaviour is not specified.  
*make\_from\_address* (*an\_address*: ABSTRACT\_IP\_ADDRESS)  
 -- Initialize host from ip address *an\_address*.  
 -- An attempt is made to resolve the host name using this address.  
 -- Status is always found, even when reverse lookup failed.

**invariant**

*accessing\_real\_singleton*: *security\_is\_real\_singleton*;  
*valid\_error\_action*: *error\_action* >= 0 **and** *error\_action* <= 2;  
*name\_void\_or\_not\_empty*: *name* = Void **or else not** *name.is\_empty*;  
*has\_canonical\_name*: *found* **implies** *name* /= Void = (*canonical\_name* /= Void);  
*has\_at\_least\_one\_ip\_address*: *found* = (*addresses* /= Void **and then** *addresses.count*  
 > 0);  
*only\_non\_void\_addresses*: *found* **implies** *is\_every\_address\_not\_void*;  
*has\_aliases*: *found* = (*aliases* /= Void);  
*valid\_length*: *found* **implies** *address\_length* > 0;  
*consistent*: *addresses* /= Void **and then** *addresses.count* > 0 **implies** *found*;  
*my\_not\_found\_reason\_valid*: *found* = (*my\_not\_found\_reason* = 0);  
**end** of SUS\_HOST

## D.5 Short form of SUS\_SERVICE

**class** *interface* SUS\_SERVICE

**creation**

*make\_from\_name* (*a\_name*, *a\_protocol*: STRING)  
-- Retrieve service information with *a\_name* and optional  
-- *a\_protocol* from services database.  
-- If service not found, an exception is raised.  
*make\_from\_port* (*a\_port*: INTEGER; *a\_protocol*: STRING)  
-- Initialize service from given *a\_port*.  
-- Make sure to provide a *a\_protocol* if necessary!

**invariant**

*accessing\_real\_singleton*: *security\_is\_real\_singleton*;  
*valid\_error\_action*: *error\_action* >= 0 **and** *error\_action* <= 2;  
*name\_void\_or\_not\_empty*: *name* = Void **or else not** *name.is\_empty*;  
*valid\_port*: *port* >= 0 **and** *port* <= 65535;  
*valid\_protocol*: *protocol* = Void **or else** *protocol.is\_empty* **or else** (*protocol.is\_equal*(*once\_tcp*)  
**or** *protocol.is\_equal*(*once\_udp*));  
*valid\_protocol\_type*: *protocol\_type* = *sock\_stream* **or else** *protocol\_type* = *sock\_dgram*;  
*valid\_aliases*: *aliases* /= Void;  
**end of** SUS\_SERVICE

## **D.6 Short form of SUS\_SOCKET\_ADDRESS**

```
class interface SUS_SOCKET_ADDRESS  
  "Use EPX_HOST_PORT instead."  
end of SUS_SOCKET_ADDRESS
```

## D.7 Short form of SUS\_SYSLOG

```
class interface SUS_SYSLOG
feature(s) from SUS_SYSLOG
  -- open and close
  open (a_identification: STRING; a_format, a_facility: INTEGER)
    -- start logging with the given identification
  close
    -- stop logging
feature(s) from SUS_SYSLOG
  -- Write log messages, will auto-open if not is_open
  emergency (msg: STRING)
    -- the system is unusable
  alert (msg: STRING)
    -- action must be taken immediately
  critical (msg: STRING)
    -- critical conditions
  error (msg: STRING)
    -- error conditions
  warning (msg: STRING)
    -- warning conditions
  notice (msg: STRING)
    -- normal but significant condition
  info (msg: STRING)
    -- informational
  debug_dump (msg: STRING)
    -- Debug-level messages.
feature(s) from SUS_SYSLOG
  -- Access
  identification: STRING
  format: INTEGER
  facility: INTEGER
  is_open: BOOLEAN
invariant
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
  remain_single: Current = singleton;
  have_identification: is_open implies identification /= Void and then not identification.is_empty;
end of SUS_SYSLOG
```

## D.8 Short form of *SUS\_TCP\_SOCKET*

**class** *interface SUS\_TCP\_SOCKET*

**creation**

```
attach_to_socket (a_fd: INTEGER; a_become_owner: BOOLEAN)
  -- Create descriptor with value a_fd. Descriptor will close
  -- it when a_become_owner.
```

**invariant**

```
accessing_real_singleton: security_is_real_singleton;
valid_error_action: error_action >= 0 and error_action <= 2;
open_in_sync: is_open_read or is_open_write implies is_open; -- The reverse is not
true, for examples sockets can be
-- closed for reading/writing, but still open.
capacity_not_negative: capacity >= 0;
valid_capacity: is_open = (capacity > 0);
open_implies_handle_assigned: is_open = (fd /= unassigned_value);
owned_implies_open: is_owner implies is_open;
owned_implies_handle_assigned: is_owner implies fd /= unassigned_value;
line_buffer_index_offset_ok: line_buffer /= Void implies line_buffer_index <= line_buffer.count;
unassigned_value_is_error_value: unassigned_value = -1;
end of SUS_TCP_SOCKET
```

---

In this chapter:

***E.1 Short form of EPX\_CGI***  
***E.2 Short form of EPX\_MIME\_PARSER***  
***E.3 Short form of EPX\_MIME\_PART***  
***E.4 Short form of EPX\_SOAP\_WRITER***  
***E.5 Short form of EPX\_XML\_WRITER***  
***E.6 Short form of EPX\_XHTML\_WRITER***

# ***E***

## ***Short (flat)***

### ***listing of***

#### ***Standard C***

##### ***bonus classes***

Classes in this appendix are based on Standard C only.

### ***E.1 Short form of EPX\_CGI***

```
deferred class interface EPX_CGI
feature(s) from EPX_CGI
  -- Output
  execute
    -- Execute the CGI action by emitting a valid MIME header and
    -- an optional body.
    -- Header and/or body text can be accumulated in
    -- as_uc_string and will be send to the client when this
    -- feature returns.
    -- In case of binary output it is advised to write the header
    -- yourself (build it up in header and use finish_header
    -- to write it, and write the binary output straight to
    -- stdout.
  require
    is_valid_request_method
feature(s) from EPX_CGI
  -- Error handling
  error_unauthorized
    -- Signal authorization error to client.
  error_invalid_method
    -- Signal invalid method to client.
feature(s) from EPX_CGI
  -- Debug support
  dump_input
    -- Write cgi input to $TMPDIR/cgi_input.
    -- First line contains the content header, is not actually in input!
feature(s) from EPX_CGI
  -- Status
  is_authorized: BOOLEAN
    -- May request_method be applied this resource?
    -- This method may implement any kind of authentication.
```

```

is_delete_method: BOOLEAN
    -- Is request_method equal to "DELETE"?
is_get_method: BOOLEAN
    -- Is request_method equal to "GET"?
is_head_method: BOOLEAN
    -- Is request_method equal to "GET"?
is_post_method: BOOLEAN
    -- Is request_method equal to "POST"?
is_put_method: BOOLEAN
    -- Is request_method equal to "PUT"?
is_http_header_written: BOOLEAN
    -- Has header been written to stdout?
    -- Such an action cannot be undone, and no more headers can
    -- be written.
is_valid_key (a_key: STRING): BOOLEAN
    -- Is a_key a valid key for value or raw_value?
is_valid_request_method: BOOLEAN
    -- Is request_method valid for this CGI?
feature(s) from EPX_CGI
    -- Access
    header: EPX_MIME_CGI_HEADER
        -- Response header
feature(s) from EPX_CGI
    -- Standard CGI variables
    auth_type: STRING
        -- Type of authentication used
    content_type: STRING
        -- MIME type of data when invoked with POST method
    content_length: INTEGER
        -- Length, in bytes, of data when invoked with POST method
    gateway_interface: STRING
        -- Name and version of the gateway, for example CGI/1.1
    http_accept: STRING
        -- Contents of the Accept header line sent by the client
    http_cookie: STRING
        -- All cookies sent by the client in the form of key=value,
        -- semi-colon separated
    http_referer: STRING
        -- Contents of the Referer header line
    http_user_agent: STRING
        -- Name of the client program that is making the request
    path_info: STRING
        -- Extra path information as it was passed to the server in
        -- the query URL
    path_translated: STRING
        -- Extra path information translated to a final, usable
        -- form; the Web document root is prepended to the query
        -- path, and any other path translations are executed.
    query_string: STRING

```

```
-- The input when invoked with the GET method
remote_address: STRING
-- IP address of the client that made the request
remote_host: STRING
-- Name of the remote computer that made the request
remote_ident: STRING
-- User name as given by the ident protocol
remote_user: STRING
-- Name of the remote user, if any, that made the request
request_method: STRING
-- Name of the method used to invoke the CGI application
remapped_request_method: STRING
-- As request_method but if method remapping is enabled,
-- return the remapped method
script_name: STRING
-- Name of script that was invoked
server_name: STRING
-- Domain name of the computer that is running the server software
server_port: INTEGER
-- TCP port number on which the server that invoked the CGI
-- application is operating
server_protocol: STRING
-- Name of the protocol that the server is using and the
-- version of that protocol. The protocol name and version
-- are separated by a forward slash with no spaces, for
-- instance HTTP/1.0
server_software: STRING
-- Name of the server that is handling the request
feature(s) from EPX_CGI
-- HTTP headers
if_match: STRING
-- The contents of the If-Match header if set or if
-- made available by the server;
-- Void otherwise
-- Bugs: If-Match: * not handled, has to be done manually.
if_none_match: STRING
-- The contents of the If-None-Match header if set or if
-- made available by the server;
-- Void otherwise
-- Bugs: If-None-Match: * not handled, has to be done manually.
if_modified_since: STDC_TIME
-- The contents of the If-Modified-Since header if set or if
-- made available by the server;
-- Void otherwise
feature(s) from EPX_CGI
-- CGI headers
content_text_html
-- Write Content-Type: text/html to stdout.
-- Clients will guess the charset, so its better to use the
```

```

-- explicit context_text_html_utf8 function.
content_text_html_utf8
-- Write Content-Type: text/html with explicit character set
-- UTF-8 to stdout.
-- Use this when emitting UTF-8.
content_text_plain
-- Write Content-Type: text/plain to stdout.
finish_header
-- Finish the header by emitting an empty line.
-- If cookies have been set, they are written as well.
location (a_url: STRING)
-- Redirect to a_url by emitting a Location header.
-- This is used to specify to the server that you are
-- returning a reference to a document rather than an actual
-- document.
-- If the argument to this is a URL, the server will issue a
-- redirect to the client.
-- If the argument to this is a virtual path, the server will
-- retrieve the document specified as if the client had
-- requested that document originally. ? directives will work
-- in here, but # directives must be redirected back to the
-- client.
-- If you return a status as well, it must be 200 it seems.
status (a_status_code: INTEGER; a_reason: STRING)
-- Set the status code sent back to the client.
-- This is used to give the server an HTTP/1.0 status line to
-- send to the client. The format is nnn xxxxx, where nnn is
-- the 3-digit status code, and xxxxx is the reason string,
-- such as "Forbidden".
-- Leave a_reason empty to return the default reason.
feature(s) from EPX_CGI
-- Cookies
cookies: DS_HASH_TABLE[EPX_HTTP_COOKIE,STRING]
-- Cookies that will be returned to the browser
set_cookie (a_cookie: EPX_HTTP_COOKIE)
-- Add a new cookie that will be send to the browser then
-- context_text_html is called.
feature(s) from EPX_CGI
-- Server push, multipart header
content_multipart_x_mixed_replace (boundary: STRING)
-- Initiate server push.
content_next_part
-- Write boundary so next part of multipart msg can be written.
content_multipart_end
-- Write boundary of multipart.
is_multipart_message: BOOLEAN
-- Are we writing server push, multipart output?
feature(s) from EPX_CGI
-- Form input

```

```

has_input: BOOLEAN
  -- Is input passed to cgi program?
has_key (a_key: STRING): BOOLEAN
  -- Is a_key passed as parameter/form-data?
is_meta_char (c: CHARACTER): BOOLEAN
  -- Is c a commonly used meta character?
meta_chars: STRING
  -- Commonly used meta characters.
  -- BdB: Check if this list is complete...
new_key_value_cursor (a_key_re, a_value_re: RX_PCRE_REGULAR_EXPRESSION;
an_on_match_found: EPX_KEY_VALUE_MATCH): EPX_CGI_KEY_VALUE_CURSOR
  -- New cursor to iterate over all keys, optionally including
  -- those keys and/or values that match a_key_re and
  -- a_value_re;
  -- Useful when a form returns table like names and you want
  -- to iterate over the keys for that table.
raw_value (a_key: STRING): STRING
  -- Returns value for key.
  -- if key does not exist, the empty string is returned.
remove_meta_chars (s: STRING)
  -- If s contains meta characters, theyre removed.
value (a_key: STRING): STRING
  -- As raw_value but meta characters are removed
invariant
  -- lower_a_code_definition: lower_a_code = (a).code
  -- Same thing for all other codes.
  -- (see "note" in indexing clause.)
accessing_real_singleton: security_is_real_singleton;
valid_error_action: error_action >= 0 and error_action <= 2;
my_xml_not_void: my_xml /= Void;
same_size: attributes.count = values.count;
has_tag_stack: tags /= Void;
comparing_references_is_not_good_enough: tags.equality_tester /= Void;
fragment_has_no_header: is_fragment implies is_header_written;
values_not_void: values /= Void;
attributes_not_void: attributes /= Void;
every_attribute_has_a_value: attributes.count = values.count;
tag_state_valid: tag_state >= tag_pending and tag_state <= tag_closed;
tag_started_and_pending_in_sync: tag_state = tag_pending implies is_tag_started;
tag_closed_is_not_started: tag_state = tag_closed = not is_tag_started;
end of deferred EPX_CGI

```

## E.2 Short form of EPX\_MIME\_PARSER

```

class interface EPX_MIME_PARSER
creation
  make
    -- Create a new parser.
  make_from_file (a_file: STDC_TEXT_FILE)
    -- Like make_from_stream, but turns off buffering in
    -- a_file.
  make_from_stream (a_stream: EPX_CHARACTER_INPUT_STREAM)
    -- Initialize parser, and set the input buffer to a_stream.
  make_from_string (s: STRING)
    -- Initialize parser, and set the input buffer to s.
  make_from_file_descriptor (a_fd: ABSTRACT_FILE_DESCRIPTOR)
feature(s) from EPX_MIME_PARSER
  -- Initialization
  make
    -- Create a new parser.
  make_from_file (a_file: STDC_TEXT_FILE)
    -- Like make_from_stream, but turns off buffering in
    -- a_file.
  make_from_stream (a_stream: EPX_CHARACTER_INPUT_STREAM)
    -- Initialize parser, and set the input buffer to a_stream.
  make_from_string (s: STRING)
    -- Initialize parser, and set the input buffer to s.
feature(s) from EPX_MIME_PARSER
  -- Character reading
  end_of_input: BOOLEAN
    -- Has read_character hit the end-of-file character?
feature(s) from EPX_MIME_PARSER
  -- Parsing
  reset_parsing_errors
    -- Reset count of parsing errors.
  parse
    -- Read input and build part.
    -- Check syntax_error for parsing errors.
  parse_body
    -- Parse MIME body.
    -- Assume input_buffer points to body part.
    -- If a_content_length positive, scans only as much body as
    -- given by a_content_length, given that the input buffer
    -- is an EPX_MIME_BUFFER.
  parse_header
    -- Read just the MIME header from the input and build a new
    -- part. Check syntax_error for parsing errors.
  set_header (a_header: STRING)
    -- Optional header that is parsed before the regular input
    -- is parsed.
  parsing_errors: INTEGER

```

```

-- Number of errors encountered when parsing.
feature(s) from EPX_MIME_PARSER
-- Access
read_first_body_part
-- First part of the body, if any, if parse_header has been
-- used;
-- Even if only the header is parsed using parse_header,
-- the first part of the body is still read by the parsers
-- buffer as it doesnt know its part of the body at that
-- time. Use this to retrieve the first part of the body, the
-- rest of the body can be read from the stream the usual
-- way.
part: EPX_MIME_PART
-- Structure were building
invariant
-- lower_a_code_definition: lower_a_code = (a).code
-- Same thing for all other codes.
-- (see "note" in indexing clause.)
accessing_real_singleton: security_is_real_singleton;
valid_error_action: error_action >= 0 and error_action <= 2;
yyss_not_void: yyss /= Void;
yytranslate_not_void: yytranslate /= Void;
yyr1_not_void: yyr1 /= Void;
yytypes1_not_void: yytypes1 /= Void;
yytypes2_not_void: yytypes2 /= Void;
yydefact_not_void: yydefact /= Void;
yydefgoto_not_void: yydefgoto /= Void;
yypact_not_void: yypact /= Void;
yypgoto_not_void: yypgoto /= Void;
yytable_not_void: yytable /= Void;
yycheck_not_void: yycheck /= Void;
input_buffer_not_void: input_buffer /= Void;
valid_start_condition: valid_start_condition(start_condition);
yy_content_not_void: yy_content /= Void;
yy_line_positive: yy_line >= 1;
yy_column_positive: yy_column >= 1;
yy_position_positive: yy_position >= 1;
yy_next_not_void: yy_next /= Void;
yy_chk_not_void: yy_chk /= Void;
yy_base_not_void: yy_base /= Void;
yy_def_not_void: yy_def /= Void;
yy_accept_not_void: yy_accept /= Void;
yy_state_stack_not_void: yyreject_or_variable_trail_context implies yy_state_stack
/= Void;
never_a_keyword_in_start_condition: start_condition = initial implies not expect_keyword
and not expect_keyword_after_space;
encoded_word_scanner_not_void: encoded_word_scanner /= Void;
last_line_not_void: last_line /= Void;
my_date_not_void: my_date /= Void;

```

```
my_date_in_utc: my_date.is_utc_time;  
my_time_not_void: my_time /= Void;  
my_time_in_utc: my_time.is_utc_time;  
end of EPX_MIME_PARSER
```

### E.3 Short form of EPX\_MIME\_PART

```

class interface EPX_MIME_PART
creation
    make_empty
        -- Make an empty MIME part. Useful during parsing to
        -- construct the message gradually.
feature(s) from EPX_MIME_PART
    -- Output
    append_to_string (s: STRING)
        -- Serialize contents of MIME structure to s.
        -- Adds the Content-Length field with the proper length, if
        -- this field does not exist. If there is a Content-Length
        -- field, it is assumed that this size is correct.
        -- Line lengths should remain within the limit set by RFC
        -- 822, i.e. no more than 998 characters, and preferably no
        -- more than 78 (this length excludes the CRLF).
    append_urlencoded_to_string (s: STRING)
        -- Append fields of this MIME structure to s, and the body
        -- as x-www-form-urlencoded. Message must conform to RFC 2388.
feature(s) from EPX_MIME_PART
    -- Access
    as_string: STRING
        -- Serialized MIME message
    auto_insert_content_length: BOOLEAN
        -- If a Content-Length field does not exist, should
        -- append_to_string automatically add one?
    body: EPX_MIME_BODY
        -- The body, can be multipart
    header: EPX_MIME_HEADER
        -- Fields for this part
    multipart_body: EPX_MIME_BODY_MULTIPART
        -- body if body contains multiple parts, Void otherwise
    text_body: EPX_MIME_BODY_TEXT
        -- body if body is a text body and not multi-part, Void otherwise
feature(s) from EPX_MIME_PART
    -- Status
    is_valid: BOOLEAN
        -- Does this message conform to the MIME specification?
        -- If so, it can be serialized.
        -- If the body is multi-part, the boundary must be set.
feature(s) from EPX_MIME_PART
    -- Body creation/removal
    clear_body
        -- Set body to Void.
    create_multipart_body
        -- Set body to a container.
    create_singlepart_body
        -- Set body to a single part body.

```

```
-- If we find a Content-Disposition field with a filename
-- parameter, body data will be saved to a temporary file when
-- set, instead of kept in memory.
create_base64_body
-- Create a single part body whose content is base 64
-- encoded when writing to it.
feature(s) from EPX_MIME_PART
-- Change
set_auto_insert_content_length (a_value: BOOLEAN)
-- Set if Content-Length fields should be automatically
-- supplied, if one doesn't exist, in append_to_string.
invariant
  header_not_void: header /= Void;
  bodies_in_sync: body /= Void implies body.is_multipart = (multipart_body /= Void)
and not body.is_multipart = (text_body /= Void);
end of EPX_MIME_PART
```

**E.4 Short form of EPX\_SOAP\_WRITER**

```

class interface EPX_SOAP_WRITER
creation
  make
    -- Create an XML document with initial capacity of 1024 characters.
  make_with_capacity (a_capacity: INTEGER)
    -- Create an XML document with initial capacity of
    -- a_capacity characters.
feature(s) from EPX_SOAP_WRITER
  -- SOAP specific calls
  start_envelope
  stop_envelope
  start_header
  stop_header
  start_body
  stop_body
feature(s) from EPX_SOAP_WRITER
  -- SOAP header attributes
  set_must_understand (value: BOOLEAN)
    -- Set the SOAP-Env:mustUnderstand attribute to value.
feature(s) from EPX_SOAP_WRITER
  -- Queries if tags started
  is_envelope_started: BOOLEAN
  is_header_started: BOOLEAN
  is_body_started: BOOLEAN
feature(s) from EPX_SOAP_WRITER
  -- SOAP tags
  soap_env_body: STRING
  soap_env_envelope: STRING
  soap_env_header: STRING
feature(s) from EPX_SOAP_WRITER
  -- SOAP name space
  soap_env: STRING
  soap_name_space: STRING
invariant
  -- lower_a_code_definition: lower_a_code = (a).code
  -- Same thing for all other codes.
  -- (see "note" in indexing clause.)
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
  my_xml_not_void: my_xml /= Void;
  same_size: attributes.count = values.count;
  has_tag_stack: tags /= Void;
  comparing_references_is_not_good_enough: tags.equality_tester /= Void;
  fragment_has_no_header: is_fragment implies is_header_written;
  values_not_void: values /= Void;
  attributes_not_void: attributes /= Void;
  every_attribute_has_a_value: attributes.count = values.count;

```

```
tag_state_valid: tag_state >= tag_pending and tag_state <= tag_closed;  
tag_started_and_pending_in_sync: tag_state = tag_pending implies is_tag_started;  
tag_closed_is_not_started: tag_state = tag_closed = not is_tag_started;  
end of EPX_SOAP_WRITER
```

**E.5 Short form of EPX\_XML\_WRITER**

```

class interface EPX_XML_WRITER
creation
  make
    -- Create an XML document with initial capacity of 1024 characters.
  make_with_capacity (a_capacity: INTEGER)
    -- Create an XML document with initial capacity of
    -- a_capacity characters.
  make_fragment
    -- Create an XML fragment (document without header) with
    -- initial capacity of 1024 characters.
  make_fragment_with_capacity (a_capacity: INTEGER)
    -- Create an XML fragment (document without header) with
    -- initial capacity of a_capacity characters.
feature(s) from EPX_XML_WRITER
-- Initialization
  make
    -- Create an XML document with initial capacity of 1024 characters.
  make_fragment
    -- Create an XML fragment (document without header) with
    -- initial capacity of 1024 characters.
  make_with_capacity (a_capacity: INTEGER)
    -- Create an XML document with initial capacity of
    -- a_capacity characters.
  make_fragment_with_capacity (a_capacity: INTEGER)
    -- Create an XML fragment (document without header) with
    -- initial capacity of a_capacity characters.
feature(s) from EPX_XML_WRITER
-- Status
  can_add_attributes: BOOLEAN
    -- Can attributes be added to the current tag?
  is_a_parent (a_tag: STRING): BOOLEAN
    -- Is tag the current element, or is it a parent of the
    -- current tag at some point?
  is_attribute_set (a_name_space, an_attribute: STRING): BOOLEAN
    -- Has an_attribute been given a value?
  is_element_with_data: BOOLEAN
    -- Has data been added to this element or in case this
    -- element has not yet been written, has data been added to
    -- its parents element?
  is_fragment: BOOLEAN
    -- Is the XML document being created a fragment?
  is_header_written: BOOLEAN
    -- Is the XML header is written or is this a fragment that
    -- does not need a header?
  is_indenting: BOOLEAN
    -- When XML is written, is an attempt made to beautify the
    -- results? This is the default.

```

```

-- Indented XML files are more readable, but it can create
-- invalid XML, because the schema is not known. It also
-- slows down writing the XML.
is_ns_started (a_name_space, a_tag: STRING): BOOLEAN
-- Is name_space:tag the current element?
is_started (a_tag: STRING): BOOLEAN
-- Is tag the current element?
is_tag_started: BOOLEAN
-- Is there an unclosed element?
feature(s) from EPX_XML_WRITER
-- Access
as_string: STRING
-- The result as plain STRING
as_uc_string: UC_STRING
-- The result as Unicode string, i.e. UC_STRING
tag (i: INTEGER): STRING
-- Retrieve current or parents of current tag
tag_depth: INTEGER
-- Number of tags that have been started, but not stopped
unfinished_xml: STRING
-- The xml in progress
feature(s) from EPX_XML_WRITER
-- Change
clear
-- Start fresh.
-- local
-- s: STRING
set_indenting (an_indenting: BOOLEAN)
feature(s) from EPX_XML_WRITER
-- Commands that expand xml
add_attribute (an_attribute, a_value: STRING)
-- Add an attribute of the current tag. Attribute cannot be
-- modified later unlike set_attribute and a_value does
-- not have to be cloned if you want to reuse that STRING.
-- attribute must be name-space less, else use add_ns_attribute.
-- value may not contain an entity reference.
add_a_name_space (a_prefix, a_uri: STRING)
-- Define a name space.
add_cdata (a_data: STRING)
-- Add data within a CDATA tag. With CDATA much less
-- meta-characters have to be quoted in case a_data is
-- itself XML.
add_data (a_data: STRING)
-- Write data in the current tag.
-- Invalid characters like < or > are quoted.
-- Use add_raw if you dont want quoting.
-- This routine is not safe when writing data inside comments.
puts (a_data: STRING)
-- Write data in the current tag.

```

```
-- Invalid characters like < or > are quoted.
-- Use add_raw if you dont want quoting.
-- This routine is not safe when writing data inside comments.
add_entity (an_entity_name: STRING)
-- Write entity_name as element data.
add_header (encoding: STRING)
-- Add the XML header, document is encoded in
-- encoding. Making sure this encoding is followed, is the
-- responsibility of the client.
add_header_iso_8859_1_encoding
-- Document is iso-8859-1 encoded.
add_header_utf_8_encoding
-- Document is utf8 encoded.
add_name_space (a_prefix, a_uri: STRING)
-- Define a name space.
add_ns_attribute (a_name_space, an_attribute, a_value: STRING)
-- Add an attribute to the current tag. This attribute cannot
-- be changed later, use set_ns_attribute for that.
-- a_value does not have to be cloned if you want to reuse
-- that STRING.
-- value may not contain an entity reference. name_space
-- is the optional prefix to be used, not the actual URI.
add_raw (raw_data: STRING)
-- Write raw_data straight in the current tag, meta
-- characters are not quoted, control characters are not
-- checked, etc.
add_system_doctype (root_tag, system_id: STRING)
-- Add a <!DOCTYPE element.
-- Only allowed when no tags have been written.
add_tag (a_tag, a_data: STRING)
-- Shortcut for add_tag, add_data and stop_tag.
add_ns_tag (name_space, a_tag, a_data: STRING)
-- Shortcut for add_ns_tag, add_data and stop_tag.
get_attribute (an_attribute: STRING): STRING
-- Get contents of attribute attribute for
-- current tag. attribute may include a name space.
-- Returns Void if attribute doesnt exist
put (a: ANY)
-- Write data within the current tag.
put_new_line
-- Add a new line in the current tag.
set_attribute (an_attribute, a_value: STRING)
-- Set an attribute of the current tag.
-- attribute must be name-space less, else use set_ns_attribute.
-- value may not contain an entity reference.
-- As the attribute is not immediately written, make sure
-- attribute and value do not change (ie are cloned or
-- immutable).
set_a_name_space (a_prefix, a_uri: STRING)
```

```

-- Define a name space.
-- As the attribute is not immediately written, make sure
-- a_prefix and a_uri do not change (ie are cloned or
-- immutable).
set_default_name_space (uri: STRING)
-- Set the default name space.
set_ns_attribute (name_space, an_attribute, value: STRING)
-- Set an attribute of the current tag. value may not
-- contain an entity reference. name_space is the optional
-- prefix to be used, not the actual URI.
-- As the attribute is not immediately written, make sure
-- name_space, an_attribute and value do not change (ie
-- are cloned or immutable).
start_ns_tag (name_space, a_tag: STRING)
-- Start a new tag in the given name_space. name_space is
-- a prefix only, not the actual URI. If name_space is Void
-- or empty, the tag will not get a prefix.
-- As the tag is not immediately written, be sure that tag
-- does not change (ie is cloned or immutable) if
-- name_space is Void or empty.
start_tag (a_tag: STRING)
-- Start a new tag.
-- As the tag is not immediately written, make sure a_tag
-- does not change (ie is cloned or immutable).
stop_tag
-- Stop last started tag.
feature(s) from EPX_XML_WRITER
-- Quote unsafe characters
replace_content_meta_characters (s: STRING)
-- Replace all characters in s that have a special meaning in
-- XML. These characters are < and & and the sequence "]]>".
-- This routine is slow when data is actually a UC_STRING
-- and is very large. Moving bytes to the right to insert the
-- quoting characters takes up a very long time.
feature(s) from EPX_XML_WRITER
-- Conversion
force_valid_string (s: STRING): STRING
-- s with all invalid characters replaced by spaces; if
-- there are no changes s is returned, else a new string
feature(s) from EPX_XML_WRITER
-- Comments
add_comment (a_comment: STRING)
-- Add a comment.
-- This routine does not yet quote meta data properly. Need a
-- separate comment state to properly quote meta data inside
-- comments.
start_comment
-- Write the XML comment start tag.
stop_comment

```

```
-- Stop a started XML comment.  
invariant  
-- lower_a_code_definition: lower_a_code = (a).code  
-- Same thing for all other codes.  
-- (see "note" in indexing clause.)  
accessing_real_singleton: security_is_real_singleton;  
valid_error_action: error_action >= 0 and error_action <= 2;  
my_xml_not_void: my_xml /= Void;  
same_size: attributes.count = values.count;  
has_tag_stack: tags /= Void;  
comparing_references_is_not_good_enough: tags.equality_tester /= Void;  
fragment_has_no_header: is_fragment implies is_header_written;  
values_not_void: values /= Void;  
attributes_not_void: attributes /= Void;  
every_attribute_has_a_value: attributes.count = values.count;  
tag_state_valid: tag_state >= tag_pending and tag_state <= tag_closed;  
tag_started_and_pending_in_sync: tag_state = tag_pending implies is_tag_started;  
tag_closed_is_not_started: tag_state = tag_closed = not is_tag_started;  
end of EPX_XML_WRITER
```

## E.6 Short form of EPX\_XHTML\_WRITER

```

class interface EPX_XHTML_WRITER
creation
  make
    -- Create an XML document with initial capacity of 1024 characters.
  make_with_capacity (a_capacity: INTEGER)
    -- Create an XML document with initial capacity of
    -- a_capacity characters.
  make_fragment
    -- Create an XML fragment (document without header) with
    -- initial capacity of 1024 characters.
  make_fragment_with_capacity (a_capacity: INTEGER)
    -- Create an XML fragment (document without header) with
    -- initial capacity of a_capacity characters.
feature(s) from EPX_XHTML_WRITER
  -- overrule some xml stuff
  new_line_after_closing_tag (a_tag: STRING)
    -- Outputs a new line, called when a_tag is closed
    -- can be overridden to start a new line only occasionally
    -- For XHTML documents a new line is treated as a single
    -- space, so it can influence layout.
  new_line_before_starting_tag (a_tag: STRING)
    -- Outputs a new line, called when a_tag is about to begin.
feature(s) from EPX_XHTML_WRITER
  -- doctype
  doctype
    -- Default doctype is doctype_strict.
  doctype_frameset
    -- Output will be frame-based.
  doctype_strict
    -- Output will be strict XHTML in the ISO-8859-1 encoding.
  doctype_strict_utf8
    -- Output will be strict XHTML in the UTF-8 encoding.
  doctype_transitional
    -- Output will be transitional XHTML with ISO-8859-1 encoding.
feature(s) from EPX_XHTML_WRITER
  -- Set well-known attributes
  set_id (a_id: STRING)
    -- Set the id attribute.
  set_xhtml_name_space
    -- Add the XHTML name space to the current tag.
feature(s) from EPX_XHTML_WRITER
  -- Page
  b_html
  e_html
feature(s) from EPX_XHTML_WRITER
  -- Header
  meta_content_type (a_content_type: STRING)

```

```
-- Add Content-Type to HTML. a_content_type is of the
-- format "text/html; charset=utf-8".
meta_refresh_other (a_time: INTEGER; a_url: STRING)
b_head
e_head
title (a_text: STRING)
feature(s) from EPX_XHTML_WRITER
-- Body
b_body
e_body
feature(s) from EPX_XHTML_WRITER
-- Section headers
h1 (header_text: STRING)
h2 (header_text: STRING)
feature(s) from EPX_XHTML_WRITER
-- Paragraph
br
-- break.
br_clear_all
-- Add break and flush all floats.
b_p
e_p
p (par: STRING)
feature(s) from EPX_XHTML_WRITER
-- Inline tags
b_b
-- Begin bold font.
e_b
-- End bold font.
b_i
-- Begin italic font.
e_i
-- End italic font.
b_tt
-- teletype writer font
e_tt
feature(s) from EPX_XHTML_WRITER
-- Lists
b_ul
-- Begin unordered list.
e_ul
-- End unordered list.
b_li
-- Begin list item.
e_li
-- End list item.
feature(s) from EPX_XHTML_WRITER
-- Quotes
b_blockquote
```

```

    e_blockquote
    blockquote (a_quote: STRING)
feature(s) from EPX_XHTML_WRITER
    -- Link
    b_a (href: STRING)
    e_a
    a (href, s: STRING)
feature(s) from EPX_XHTML_WRITER
    -- Rules
    hr
        -- horizontal rule
feature(s) from EPX_XHTML_WRITER
    -- White space
    nbsp
        -- Add a non breaking white space.
feature(s) from EPX_XHTML_WRITER
    -- Verbatim
    b_pre
    e_pre
feature(s) from EPX_XHTML_WRITER
    -- Images
    b_img (a_src, a_description: STRING)
        -- Start an img tag with a_src the source of the image and
        -- a_description the alternative (alt) text of the image.
    e_img
        -- Stop image.
    img (a_src, a_description: STRING)
        -- Emit an img tag with a_src the source of the image and
        -- a_description the alternative (alt) text of the image.
feature(s) from EPX_XHTML_WRITER
    -- Tables
    b_table
        -- Begin a table.
    e_table
        -- End a table.
    b_tr
        -- Begin a row.
    e_tr
        -- End a row.
    td (a_content: STRING)
        -- Add cell with optional contents.
    b_td
        -- Begin a column.
    e_td
        -- End a column.
    th (a_title: STRING)
        -- Add a header cell.
    b_th
        -- Begin a table header cell.

```

```
e_th
  -- Add a table header cell.
feature(s) from EPX_XHTML_WRITER
  -- Forms
  b_form (method, action: STRING)
  b_form_get (action: STRING)
  b_form_post (action: STRING)
  e_form
  b_input (type, name: STRING)
  e_input
  hidden (name, value: STRING)
  b_button_submit (name, value: STRING)
  e_button_submit
  button_submit (name, value: STRING)
  -- Submit button.
  b_button_reset
  e_button_reset
  button_reset
  b_checkbox (name, value: STRING)
  e_checkbox
  label (a_label, a_for: STRING)
  -- Emit label tag a_label for a control with id a_for.
  b_radio (name, value: STRING)
  e_radio
  b_select (name: STRING)
  e_select
  b_option
  e_option
  option (text: STRING)
  selected_option (choice: STRING)
  b_textarea (name: STRING)
  -- Begin multiline input control.
  e_textarea
  -- End multiline input control.
  input_text (name: STRING; size: INTEGER; value: STRING)
  -- Single line input.
  b_input_text (name: STRING; size: INTEGER; value: STRING)
  -- Single line input.
  e_input_text
  -- End single line input.
  input_password (name: STRING; size: INTEGER; value: STRING)
  -- Single line password input.
feature(s) from EPX_XHTML_WRITER
  -- CSS style sheet support
  b_style
  -- Start inline style.
  e_style
  set_class (name: STRING)
  -- set attribute class
```

```

set_style (an_inline_style: STRING)
-- Set the style attribute.
style_sheet (a_location, a_description, a_media: STRING)
-- Put in a link to refer to an external style sheet on disk.
-- a_media is the intended destination medium for style
-- information. It may be a single media descriptor or a
-- comma-separated list. The default value for this attribute
-- is "screen".
alternate_style_sheet (a_location, a_description, a_media: STRING)
-- Put in a link to refer to an alternative style sheet.
-- a_media is the intended destination medium for style
-- information. It may be a single media descriptor or a
-- comma-separated list. The default value for this attribute
-- is "screen".
feature(s) from EPX_XHTML_WRITER
-- Link
link (a_href, a_forward_link_types, a_backward_link_types, a_content_type, a_title,
a_media: STRING)
-- Add a <link> element. This is used for document relationships.
feature(s) from EPX_XHTML_WRITER
-- Divisions
b_div
-- Start a <div> tag.
e_div
-- Stop the <div> tag.
b_span
-- Start a <span> tag.
e_span
-- Stop the <span> tag.
feature(s) from EPX_XHTML_WRITER
-- JavaScript support
b_external_script (a_src: STRING; a_defer_execution: BOOLEAN)
-- Include external script. If a_defer_execution then
-- browser may defer execution of script until page is
-- rendered. This can improve performance.
b_script
-- Start JavaScript.
e_script
external_script (a_src: STRING; a_defer_execution: BOOLEAN)
-- Include external script. If a_defer_execution then
-- browser may defer execution of script until page is
-- rendered. This can improve performance.
set_onclick (an_action: STRING)
feature(s) from EPX_XHTML_WRITER
-- HTML tag names
once_a: STRING
once_blockquote: STRING
once_body: STRING
once_br: STRING

```

```

once_div: STRING
once_form: STRING
once_h1: STRING
once_h2: STRING
once_h3: STRING
once_head: STRING
once_html: STRING
once_img: STRING
once_input: STRING
once_label: STRING
once_link: STRING
once_meta: STRING
once_option: STRING
once_p: STRING
once_pre: STRING
once_script: STRING
once_select: STRING
once_span: STRING
once_table: STRING
once_td: STRING
once_textarea: STRING
once_tr: STRING
once_title: STRING
feature(s) from EPX_XHTML_WRITER
-- Attribute values
once_selected: STRING
once_submit: STRING
once_text: STRING
invariant
-- lower_a_code_definition: lower_a_code = (a).code
-- Same thing for all other codes.
-- (see "note" in indexing clause.)
accessing_real_singleton: security_is_real_singleton;
valid_error_action: error_action >= 0 and error_action <= 2;
my_xml_not_void: my_xml /= Void;
same_size: attributes.count = values.count;
has_tag_stack: tags /= Void;
comparing_references_is_not_good_enough: tags.equality_tester /= Void;
fragment_has_no_header: is_fragment implies is_header_written;
values_not_void: values /= Void;
attributes_not_void: attributes /= Void;
every_attribute_has_a_value: attributes.count = values.count;
tag_state_valid: tag_state >= tag_pending and tag_state <= tag_closed;
tag_started_and_pending_in_sync: tag_state = tag_pending implies is_tag_started;
tag_closed_is_not_started: tag_state = tag_closed = not is_tag_started;
end of EPX_XHTML_WRITER

```

---

# F

## Short (flat) listing of network pro- tocol bonus classes

In this chapter:

**F.1** Short form of `EPX_HOST_PORT`  
**F.2** Short form of `EPX_HTTP_10_CLIENT`  
**F.3** Short form of `EPX_IMAP4_CLIENT`  
**F.4** Short form of `ULM_LOGGING`

Classes in this appendix build upon the abstract layer and generally need network access.

### F.1 Short form of `EPX_HOST_PORT`

```
class interface EPX_HOST_PORT
creation
    make (a_host: EPX_HOST; a_service: EPX_SERVICE)
        -- Initialize socket for resolved host, using its first ip
        -- address.
feature(s) from STDC_SECURITY_ACCESSOR
    -- The singleton, available to any because its used in preconditions
    security: STDC_SECURITY
        -- Singleton entry point for security.
feature(s) from STDC_BASE
    -- Access
    errno: STDC_ERRNO
        -- Access to the variable that contains the error that occurred.
feature(s) from STDC_BASE
    -- Status
    raise_exception_on_error: BOOLEAN
        -- Should an exception be raised when an error occurs?
        -- If not, you have to check errno for any errors.
feature(s) from STDC_BASE
    -- Change
    set_default_action_on_error
        -- Use security.error_handling.exceptions_enabled to
        -- determine if an exception should be raised when a C call
        -- returns an error.
    set_raise_exception_on_error
        -- Always raise an exception when a C call returns an error.
    set_continue_on_error
        -- Never raise an exception when a C call returns an error.
    inherit_error_handling (an_instance: STDC_BASE)
```

```
-- Handle errors like an_instance
feature(s) from EPX_HOST_PORT
-- Access
host: EPX_HOST
-- Resolved host name.
service: EPX_SERVICE
-- Port and protocol (udp/tcp) type.
socket_address: ABSTRACT_SOCKET_ADDRESS_IN_BASE
-- The socket address struct to be used by connect.
feature(s) from EPX_HOST_PORT
-- Fill socket structure, so ptr returns something valid
set_address (item: INTEGER)
-- Use the ip address at item of host as the socket
-- address.
invariant
accessing_real_singleton: security_is_real_singleton;
valid_error_action: error_action >= 0 and error_action <= 2;
host_resolved: host /= Void and then host.found;
has_service: service /= Void;
socket_address_not_void: socket_address /= Void;
address_type_matches: host.address_family = socket_address.address_family;
port_matches: service.port = socket_address.port;
end of EPX_HOST_PORT
```

## F.2 Short form of EPX\_HTTP\_10\_CLIENT

```

class interface EPX_HTTP_10_CLIENT
creation
  make (a_server_name: STRING)
    -- Prepare for request to a_server_name.
  make_from_port (a_server_name: STRING; a_port: INTEGER)
  make_with_port (a_server_name: STRING; a_port: INTEGER)
    -- Prepare for request.
    -- Use port is 0 to use the default port (80).
  make_from_host (a_host: EPX_HOST)
    -- Prepare for request to resolved a_host. If port is 0,
    -- the default port is taken, else the port can be overruled.
  make_from_host_and_port (a_host: EPX_HOST; a_port: INTEGER)
    -- Prepare for request to a_host. If port is 0, the
    -- default port is taken, else the port can be overruled.
  make_secure (a_server_name: STRING)
    -- Prepare for secure (SSL) request to a_host.
  make_secure_with_port (a_server_name: STRING; a_port: INTEGER)
    -- Prepare for secure (SSL) request to a_host.
feature(s) from EPX_HTTP_10_CLIENT
  -- Access
  client_version: STRING
    -- Client http version
  last_data: EPX_MIME_PART
    -- Data of last request send to server;
    -- Used by read_response_with_redirect to properly redirect
    -- a request.
  last_verb: STRING
    -- Verb of last request send to server;
    -- Used by read_response_with_redirect to properly redirect
    -- a request.
feature(s) from EPX_HTTP_10_CLIENT
  -- Status
  reuse_connection: BOOLEAN
    -- Should HTTP connection be reused for more than 1 request?
feature(s) from EPX_HTTP_10_CLIENT
  -- Requests
  delete (a_request_uri: STRING; a_delete_data: EPX_MIME_PART)
    -- Send DELETE request to server.
    -- Use read_response to fetch the response and actual response code.
  get (a_request_uri: STRING)
    -- Send GET request to server.
    -- Sets response_code to 200 if the request was send successfully.
    -- If sending the request failed (usually because the server refused
    -- the connection), 503 is returned.
    -- Use read_response to fetch the response and actual response code.
  head (a_request_uri: STRING)
    -- Send HEAD request to server.

```

```

-- a_request_uri should not include http: and the host name, only
-- the page that is requested. Any query and fragment parts are ok.
-- Sets response_code to 200 if the request was send successfully.
-- If sending the request failed (usually because the server refused
-- the connection), 503 is returned.
-- Use read_response to fetch the response and actual response code.
options (a_request_uri: STRING)
-- Get server options. a_request_uri is required when the
-- request is being made to a proxy.
-- Sets response_code to 200 if the request was send successfully.
-- If sending the request failed (usually because the server refused
-- the connection), 503 is returned.
-- Use read_response to fetch the response and actual response code.
put (a_request_uri: STRING; a_put_data: EPX_MIME_PART)
-- Put a_put_data to host using the HTTP PUT request.
-- Sets response_code to 200 if the request was send successfully.
-- If sending the request failed (usually because the server refused
-- the connection), 503 is returned.
-- Use read_response to fetch the response and actual response code.
-- Tip: use EPX_MIME_FORM.make_form_data to build the
-- most common form data messages.
post (a_request_uri: STRING; a_post_data: EPX_MIME_PART)
-- Post a_post_data to host using the HTTP POST
-- request. a_post_data may be empty in which case no data
-- will be send with this POST request.
-- Sets response_code to 200 if the request was send successfully.
-- If sending the request failed (usually because the server refused
-- the connection), 503 is returned.
-- Use read_response to fetch the response and actual response code.
-- Tip: use EPX_MIME_FORM.make_form_data to build the
-- most common form data messages.
-- Tip 2: post_data_content_type_recognized is usually true if
-- you sent data to an HTTP server.
post_xml (a_request_uri: STRING; a_post_data: STRING)
-- Post a_post_data to host using the HTTP POST request.
-- Sets response_code to 200 if the request was send successfully.
-- If sending the request failed (usually because the server refused
-- the connection), 503 is returned.
-- Use read_response to fetch the response and actual response code.
-- a_post_data should be valid XML.
send_request (a_verb, a_request_uri: STRING; a_request_data: EPX_MIME_PART)
-- Send request a_verb with a_request_uri to host.
-- Additional header fields and an optional body can be passed in
-- a_request_data.
-- Sets response_code to 200 if the request was send successfully.
-- If sending the request failed (usually because the server refused
-- the connection), 503 is returned.
feature(s) from EPX_HTTP_10_CLIENT
-- Authentication response

```

```

is_authentication_required: BOOLEAN
-- Set if response from server indicates that proper
-- authentication is required
authentication_realm: STRING
-- Realm of authentication if defined; but according to the
-- spec all schemes should have one.
authentication_scheme: STRING
-- Required authentication scheme
feature(s) from EPX_HTTP_10_CLIENT
-- Authentication setup
basic_authentication: STRING
-- Optional authentication header to send with a request
set_basic_authentication (a_user_name, a_password: STRING)
-- Make sure the Authorization header is included in the
-- request.
feature(s) from EPX_HTTP_10_CLIENT
-- Cookies
cookies: DS_HASH_TABLE[EPX_HTTP_COOKIE,STRING]
-- Cookies that will be sent with the request to the server
set_cookie (a_cookie_name, a_cookie_value: STRING)
-- Add or update a cookie that will be send to the browser
-- then context_text_html is called.
wipe_out_cookies
-- Remove all cookies
feature(s) from EPX_HTTP_10_CLIENT
-- Fields that are send with a request if set
accept: STRING
-- What kind of output can the client handle?
-- Examples are:
-- Accept: text/plain; q=0.5, text/html,
--         text/x-dvi; q=0.8, text/x-c
user_agent: STRING
-- Identification of client program;
-- Common examples are:
-- Mozilla/4.0 (compatible; MSIE 6.0; Windows NT 5.1)
-- Mozilla/5.0 (X11; U; Linux i686; en-US; rv:1.0.0) Gecko/20020529
-- Microsoft Internet Explorer
set_accept (value: STRING)
-- Set the media types which are acceptable for the response.
set_user_agent (value: STRING)
-- Set the client identification.
feature(s) from EPX_HTTP_10_CLIENT
-- Response
body: EPX_MIME_BODY_TEXT
-- Body as text, if applicable, else Void
fields: DS_HASH_TABLE[EPX_MIME_FIELD,STRING]
-- Header fields of response
is_response_ok: BOOLEAN
-- Does the returned response_code indicate success?

```

```

last_uri: STRING
  -- URI of last request
read_response
  -- Read entire response and make it available in
  -- response. Header is available in fields, and text body, if
  -- any in body.
  -- If a redirect response is returned, the redirect is not
  -- automatically read. Use read_response_with_redirect to
  -- automatically handle redirects.
  -- If the server has returned an invalid response, the
  -- response_code is set to 500.
read_response_header
  -- Read the header and make it available in
  -- response. Header is available in fields. Due to
  -- buffering first part of body is usually also available in
  -- response.body.
  -- If a redirect response is returned, the redirect is not
  -- automatically read. Use read_response_with_redirect to
  -- automatically handle redirects.
  -- If the server has returned an invalid response, the
  -- response_code is set to 500.
  -- First part of body is made available in first_body_part
read_response_with_redirect
  -- As read_response, but if a redirect response code is
  -- received, request is automatically redirected.
  -- It assumes last_verb contains the verb of the last
  -- request send.
  -- A maximum of twenty redirects are followed, after that
  -- this routine just returns.
  -- Note then when a redirect is followed, the server_name
  -- and port will change to the redirected server.
response: EPX_MIME_PART
  -- The entire parsed MIME message;
  -- It is set by read_response. May be Void if there is no body.
response_phrase: STRING
  -- HTTP server response phrase;
  -- set by read_response.
server_version: STRING
  -- HTTP server version;
  -- set by read_response.
feature(s) from EPX_HTTP_10_CLIENT
  -- Individual response fields, Void if not available
location: STRING
  -- The contents of the Location field in the header, if any
invariant
  three_digit_reply_code: response_code = 0 or else response_code >= 100 and response_code
  <= 999;
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;

```

```
service_not_void: http_service /= Void;  
socket_void_or_connected: http = Void or else http.is_open;  
connected_is_readable: http /= Void implies http.is_open_read;  
open_implies_resolved: is_open implies is_resolved;  
valid_server_name: server_name /= Void and then not server_name.is_empty;  
is_valid_user: is_valid_user_name(user_name);  
is_valid_password: is_valid_password(password);  
have_www_authenticate_header_if_authentication_required: is_authentication_required  
implies response.header.has(field_name_www_authenticate);  
end of EPX_HTTP_10_CLIENT
```

### F.3 Short form of *EPX\_IMAP4\_CLIENT*

```

class interface EPX_IMAP4_CLIENT
creation
  make (a_host: STRING)
    -- Initialize client and try to open connection to imap server.
    -- Check is_open if could connect to server.
    -- If not, a_host might not be resolvable.
  make_with_port (a_host: STRING; a_port: INTEGER; a_secure: BOOLEAN)
    -- Initialize client and try to open connection to imap
    -- server at a_host.
    -- If a_port is zero, use the default port for an insecure
    -- or secure connection, depending on a_secure.
    -- Check is_open if could connect to server. If not,
    -- a_host might not be resolvable.
  make_secure (a_host: STRING)
    -- Initialize client and try to open connection to imap server.
    -- Check is_open if could connect to server.
    -- If not, a_host might not be resolvable.
feature(s) from EPX_IMAP4_CLIENT
  -- Open/close
  open
    -- Open connection to an imap server. On success is_open is
    -- True. If there is a failure, check error_message for any
    -- human readable error message.
  close
    -- Close connection to imap server.
feature(s) from EPX_IMAP4_CLIENT
  -- Access
  error_message: STRING
    -- Human readable error message when open fails; warning:
    -- might be Void even when there is an error!
  host_name: STRING
    -- Name of server running the imap daemon
  port: INTEGER
    -- Port at host_name
  response: EPX_IMAP4_RESPONSE
    -- Responses received by server.
  state: EPX_IMAP4_STATE
    -- Current state, one of four
feature(s) from EPX_IMAP4_CLIENT
  -- Status
  is_open: BOOLEAN
    -- Is client connected to IMAP server?
  is_secure_connection: BOOLEAN
    -- Do we have a secure connection to server?
feature(s) from EPX_IMAP4_CLIENT
  -- Not-authenticated state commands
  login (a_user_name, a_password: STRING)

```

```

-- Login to the IMAP server using a_user_name and
-- a_password. If login successful, then state will be
-- set to Authenticated_state. If login was unsuccessful,
-- see login_failure_reason for a human readable error message.
noop
-- Since any command can return a status update as untagged
-- data, the NOOP command can be used as a periodic poll for
-- new messages or message status updates during a period of
-- inactivity. The NOOP command can also be used to reset
-- any inactivity autologout timer on the server.
-- A noop can be issued in any state.
feature(s) from EPX_IMAP4_CLIENT
-- Authenticated state commands
create_mailbox (a_mailbox_name: STRING)
-- The CREATE command creates a mailbox with the given name.
-- An OK response is returned only if a new mailbox with that
-- name has been created. It is an error to attempt to
-- create INBOX or a mailbox with a name that refers to an
-- extant mailbox.
delete_mailbox (a_mailbox_name: STRING)
-- The DELETE command permanently removes the mailbox with
-- the given name.
examine (a_mailbox_name: STRING)
-- The EXAMINE command is identical to SELECT and returns the
-- same output; however, the selected mailbox is identified
-- as read-only. No changes to the permanent state of the
-- mailbox, including per-user state, are permitted.
get_delimiter
-- Make sure response.delimiter has the correct value.
list_all
-- list_all returns the complete set of all names available
-- to the client.
list_subscribed
-- list_subscribed returns the complete set of names that
-- the user has declared as being "active" or "subscribed".
select_mailbox (a_mailbox_name: STRING)
-- The SELECT command selects a mailbox so that messages in
-- the mailbox can be accessed.
-- If response.is_ok then response.current_mailbox
-- contains some information about the selected mailbox.
feature(s) from EPX_IMAP4_CLIENT
-- Selected state commands
check_mailbox
-- The CHECK command requests a checkpoint of the currently
-- selected mailbox. A checkpoint refers to any
-- implementation-dependent housekeeping associated with the
-- mailbox (e.g. resolving the servers in-memory state of
-- the mailbox with the state on its disk) that is not
-- normally executed as part of each command. A checkpoint

```

```
-- MAY take a non-instantaneous amount of real time to
-- complete. If a server implementation has no such
-- housekeeping considerations, CHECK is equivalent to NOOP.
-- There is no guarantee that an EXISTS untagged response
-- will happen as a result of CHECK. NOOP, not CHECK, SHOULD
-- be used for new mail polling.
close_mailbox
-- This command permanently removes from the currently
-- selected mailbox all messages that have the \Deleted flag
-- set, and returns to authenticated state from selected
-- state.
copy_message (sequence_number: INTEGER; to_mailbox_name: STRING)
-- Copy message with sequence_number sequence_number to the
-- mailbox to_mailbox_name.
delete_message (sequence_number: INTEGER)
-- Delete message with sequence_number sequence_number from
-- the current mailbox.
expunge
-- The EXPUNGE command permanently removes all messages that
-- have the \Deleted flag set from the currently selected
-- mailbox.
fetch (a_set: STRING; a_format: STRING)
-- Fetch messages described by a_set in format described by
-- a_format. Data is stored into a new
-- response.current_message object.
fetch_body (sequence_number: INTEGER)
-- Fetch message body, return raw RFC822 body in
-- last_body.
fetch_header (sequence_number: INTEGER)
-- Fetch just the message header (no flags for example),
-- return raw RFC822 header in
-- response.current_message.header.
fetch_header_and_flags (sequence_number: INTEGER)
-- Fetch the message header and flags.
-- Raw RFC822 header is in
-- response.current_message.header; flags are in
-- response.current_message.flags.
fetch_message (sequence_number: INTEGER)
-- Fetch message, return raw RFC822 message in response.message.
fetch_size (sequence_number: INTEGER)
-- Fetch message, return raw RFC822 size in response.message_size.
logout
-- Inform the server that the client is done with the
-- connection.
mark_unseen (sequence_number: INTEGER)
-- Remove the \Seen flag from the given message.
-- It does not update current_message.flags as it runs
-- silently.
feature(s) from EPX_IMAP4_CLIENT
```

```
-- Selected state queries
is_valid_sequence_number (a_number: INTEGER): BOOLEAN
  -- Is a_number a valid sequence number for current_mailbox?
is_valid_mailbox_name (a_name: STRING): BOOLEAN
  -- Is a_mailbox_name a valid mailbox name?
  -- It should not be empty, and it should not have the double
  -- quote character in its name.
invariant
  accessing_real_singleton: security_is_real_singleton;
  valid_error_action: error_action >= 0 and error_action <= 2;
  host_name_not_empty: host_name /= Void and then not host_name.is_empty;
  state_not_void: state /= Void;
  closed_implies_unauthenticated: not is_open implies state.is_not_authenticated;
  authenticated_implies_open: not state.is_not_authenticated implies is_open;
  response_not_void: response /= Void;
  selected_state_has_current_mailbox: state.is_selected implies response.current_mailbox
  /= Void;
  unselected_state_has_no_current_mailbox: not state.is_selected implies response.current_mailbox
  = Void;
end of EPX_IMAP4_CLIENT
```

## ***F.4 Short form of ULM\_LOGGING***

This class depends on Standard C only. It is the EPX\_LOG\_HANDLER that is platform specific. e-POSIX provides implementations of this class for Unix through syslog and for Windows through the NT event log.

```
class interface ULM_LOGGING  
"2007-12-24: Please use the new NET_LOGGER classes"  
end of ULM_LOGGING
```

